

**02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS**

Submit only ONE copy of this form for each PI/PD and co-PI/PD identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.C.a. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. **DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.**

PI/PD Name: P. Michael Tuts

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
(Select one or more)
 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
 Other
 None

Citizenship: (Choose one) U.S. Citizen Permanent Resident Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name):

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project

Ethnicity Definition:

Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.

Race Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information received from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

DEVIATION AUTHORIZATION (if Applicable)

DEVIATION AUTHORIZATION:

From: Aizenman, Morris L. [mailto:maizenman@nsf.gov]

Sent: Tuesday, November 30, 2010 6:36 PM

To: Pripstein, Moishe; Aizenman, Morris L.

Cc: Dehmer, Joseph L.; Caldwell, C. Denise; Cytryn, Darren E.

Subject: Re: Request for page exemption for US ATLAS Cooperative Agreement proposal for 2012-2016

Hi Moishe,

Your request for a waiver with respect to the number of pages included in the Project Description for a proposal to be submitted by Michael Tuts of Columbia University for the renewal of the U.S. ATLAS cooperative agreement for the period 2012 to 2016 is granted.

The Project Description is not to exceed 60 pages.

Regards,

Morris

At 03:37 PM 11/30/2010, Pripstein, Moishe wrote:

From: Dehmer, Joseph L.

Sent: Tuesday, November 30, 2010 3:32 PM

To: Pripstein, Moishe

Subject: RE: Request for page exemption for US ATLAS Cooperative Agreement proposal for 2012-2016

Moishe,

I approve this request. Please forward.

Joe

From: Pripstein, Moishe

Sent: Tuesday, November 30, 2010 3:18 PM

To: Dehmer, Joseph L.

Subject: FW: Request for page exemption for US ATLAS Cooperative Agreement proposal for 2012-2016

Hi Joe,

As program director for the LHC Operations, I endorse the request from U.S. ATLAS for the page limit to be increased to 60 pages. Considering the scope and complexity of their program, the request is certainly justified.

-- Moishe

DEVIATION AUTHORIZATION (if Applicable)

Deviation Authorization contd...

From: Michael Tuts [<mailto:tuts@nevis.columbia.edu> <<mailto:tuts@nevis.columbia.edu>>]
Sent: Thursday, November 25, 2010 8:37 AM
To: Pripstein, Moishe
Cc: Gordon, Howard A; Ann Therrien
Subject: Request for page exemption for US ATLAS Cooperative Agreement proposal for 2012-2016

Dear Moishe,

We are writing to seek a page exemption for the Project description section of the Cooperative Agreement proposal we will be submitting to the NSF in Mid December 2010. We are requesting that the 15 page limit be increased to 60 pages. As you know this CA is a major proposal for \$50M (2012-2016), covering the activities of the US ATLAS Operations Program, involving some 20 subawards to be administered by Columbia University in the areas of Physics Support and Computing (PS&C), ATLAS detector Maintenance and Operations (M&O), and research and development of detector technologies to be used for future upgrades of the ATLAS detector (R&D). The scope of the program is such that in order to provide an adequate description and context which can be sensibly reviewed will require significantly more than the normal 15 pages. Also, in comparison to the last cooperative agreement, we need additional pages to provide a description of the achievements from the last CA, which also form the basis for setting the scope of activities to be covered in the proposal. Hence our request for 60 pages of project description. If you need any further information regarding our request, please do not hesitate to ask.

Regards,

Mike Tuts (US ATLAS Operations Program manager) Howard Gordon (US ATLAS Deputy Operations Program Manager)

=====

Morris L. Aizenman
Senior Science Associate
Directorate for Mathematical and Physical Sciences
National Science Foundation
4201 Wilson Boulevard, Room 1005
Arlington, VA 22230

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703-292-9151 (Fax)
maizenman@nsf.gov

=====

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 10-1 NSF 10-1					FOR NSF USE ONLY	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.) PHY - ELEMENTARY PARTICLE ACCEL USER					NSF PROPOSAL NUMBER 1119200	
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
01/06/2011	1	03010000 PHY	1221	049179401	01/07/2011 11:37am S	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN) 135598093		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE Columbia University			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE Columbia University 2960 Broadway New York, NY. 100276902			
AWARDEE ORGANIZATION CODE (IF KNOWN) 0027078000						
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS		<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier						
REQUESTED AMOUNT \$ 50,000,000	PROPOSED DURATION (1-60 MONTHS) 60 months	REQUESTED STARTING DATE 11/01/11	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2)			<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____			
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)			Exemption Subsection _____ or IRB App. Date _____			
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)			<input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)			
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)			_____			
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)			<input type="checkbox"/> HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)			
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____ PHS Animal Welfare Assurance Number _____						
PI/PD DEPARTMENT Physics/ Nevis Labs		PI/PD POSTAL ADDRESS 136 South Broadway Irvington New York, NY 10533 United States				
PI/PD FAX NUMBER 914-591-8120						
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
PI/PD NAME P. Michael Tuts	PhD	1979	914-591-2810	tuts@nevis.columbia.edu		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, lobbying activities (see below), responsible conduct of research, nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 10-1). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

Conflict of Interest Certification

In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes

No

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:

- (1) community in which that area is located participates in the national flood insurance program; and
- (2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:

- (1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
- (2) for other NSF Grants when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR)

(This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research.

The undersigned shall require that the language of this certification be included in any award documents for all subawards at all tiers.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Alexander B Samsky		Electronic Signature	Jan 6 2011 1:37PM
TELEPHONE NUMBER 212-854-6866	ELECTRONIC MAIL ADDRESS as2735@columbia.edu	FAX NUMBER 212-854-2738	

* EAGER - EARly-concept Grants for Exploratory Research

** RAPID - Grants for Rapid Response Research

Summary

The ATLAS collaboration, consisting of 174 institutes from 38 countries, completed construction of the ATLAS detector at the Large Hadron Collider (LHC) at CERN, and began first data collection with colliding beams in late 2009 and 7 TeV running in April 2010. The 44 institutions of U.S. ATLAS, with the support of the NSF, made major and unique contributions to the construction and initial operation of the detector, together with the computing and software program. These investments are allowing U.S. physicists to contribute significantly to physics analyses and the associated publications. Numerous panels have identified the LHC program as having the highest national priority. This proposal requests continued NSF support for the U.S. ATLAS Operations Program in the initial years of LHC running, when there is great potential for discovery. The total request for the five-year period beginning in FY12 is \$50M. The U.S. ATLAS Operations Program aims to provide U.S. university scientists with access to the unique science opportunities at the LHC through a balanced program encompassing: (1) the technical effort associated with maintenance and operation of the U.S. built detector subsystems, essential for a detailed understanding of the detector and sound physics results; (2) the maintenance and ongoing development of software, computing, and physics analysis support, critical in allowing scientists at U.S. universities to exploit the physics potential of the LHC; (3) an R&D program for detector upgrades to ensure that the detector performance keeps pace with improvements of the LHC and that U.S. technical expertise is maintained and exploited; and (4) a strong education and outreach program.

The **Intellectual Merit** of the U.S. ATLAS Operations Program is empowering U.S. physicists to address questions in particle physics: what is the physical origin of mass? Do supersymmetric particles exist and are they associated with dark matter? Does space-time have extra spatial dimensions? Answers to these questions would provide a major advance toward a unified view of the particles in nature, the forces with which they interact, and their role in the universe. There are particularly compelling indications that the LHC, with collision energies three to seven times higher than previous facilities, will lead to discoveries with implications over a broad field of fundamental science. This proposal rests on both that scientific case and the involvement of the international community in providing a major part of the investment necessary to pursue it. The bold initiative of the NSF, in partnership with the DOE, to carry out a significant portion of the construction of the ATLAS detector opened this opportunity for U.S. scientists. The present proposal will follow that vision with a program to operate the facility, and to participate in the planning of detector upgrades. It will allow U.S. scientists and students to continue a leading role in the pursuit of new discoveries at the frontier of scientific knowledge.

The **Broader Impact** of this proposal is to enhance the computing infrastructure for research, education and beyond. The LHC computing requirements are driving a paradigm shift towards global computing with potentially significant economic impacts, and our students will be at the forefront in using and contributing to these new technologies. The NSF-ATLAS groups continue to expand their education and outreach programs, with particular focus on high school teachers and students, and on outreach to under-represented populations. We plan on expanding our outreach efforts during ATLAS data taking, including the network of worldwide grid facilities. The LHC is the major accelerator-based program in which the next generation of physicists is being trained. Support for R&D activities will lay the groundwork for new technologies and detector techniques that might be adopted by other fields as well as train our graduate and undergraduate students. For U.S. physicists, especially those at universities, to profit fully from these investments, and to be at the forefront of the physics discoveries, it is vital that the U.S. continue to be a leading participant in the scientific operational phase of the experiment.

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Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

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U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier

1 Introduction

The scientific investigations of the 20th century have revealed a universe which is fourteen billion years old and of enormous extent. A constant stream of discoveries since the 1960's has given unique insight into the matter that makes up this universe and has allowed particle physics to formulate the Standard Model. The Standard Model (SM), a theory which describes all matter and interactions in the universe at a fundamental scale, has been amazingly successful in predicting experimental outcomes. However, there are several issues with the Standard Model, and their resolution has the potential to significantly change our understanding of our universe, the matter in it, and its interactions. The LHC is designed to address many of these issues, making it a lynch pin in furthering our understanding.

A number of fundamental questions remain unanswered about the structure of matter and energy - such as the origin of quark masses, the nature of dark matter, and the overall organizing symmetry of fermions and bosons. To answer these questions, both theory and experiment point to the need for studying particle interactions at multi-TeV energies. The physics mandate of this exciting program is firmly grounded in previous searches for heavy particles and precision electroweak measurements performed over the last several decades at electron-positron and proton-antiproton colliders, as well as in high precision atomic physics experiments. These measurements make up the components of the Standard Model.

Perhaps the most widely known missing piece of the Standard Model is the as-yet unobserved Higgs boson. Finding it is a major goal of the LHC and ATLAS. A Standard Model without the Higgs boson is a Standard Model in which the fermions (quarks and leptons) are basically massless. The fermions are believed to acquire mass by interacting with the Higgs field. Experiments have been in hot pursuit of the Higgs particle for decades. Searches performed at the LEP collider at CERN, showed there was no SM Higgs below 114 GeV at 95% confidence level. For the past several years the searches at the Tevatron at Fermilab have shown the Higgs does not exist in a mass range between 158 GeV and 175 GeV. Over the next 5 years the LHC and ATLAS are expected to be able to search for the SM Higgs over the full expected mass range above 114 GeV.

Though some electroweak symmetry breaking mechanism to generate the observed masses must exist, it does not have to be the Standard Model Higgs mechanism. However, any such mechanism would be revealed by detectable effects in the same mass range. Further there are two unexplained gravitational effects - so-called dark-matter and dark-energy - that must have an explanation provided by a complete fundamental theory. Dark matter may consist of new particles, possibly the lightest supersymmetric particles, with masses well within the reach of the LHC. The very nature of space-time can be explored through the search for extra spatial dimensions in proton-proton collisions at the LHC. There is no better place in the world to search for such new phenomena than the LHC and if we find something unexpected a new theory must supersede the Standard Model.

These are some of the reasons why the field is so excited by the prospects of the LHC, which has just collected its first 45 pb^{-1} of data at 7 TeV. This is a tiny fraction of the data expected over the next 5 years - almost 100 times more data is expected just in 2011 alone. However, results are already being published by ATLAS and the other LHC experiments, less than a year from the start of data collection. ATLAS has had 8 physics papers published or accepted,¹⁻⁸ and many more are in preparation. A major contributing

factor to such quick publication is the excellent performance of the detector and computing infrastructure. Not only is it working well with fewer than 5% dead channels, but our Monte Carlo and simulation models of the detector have shown remarkably good agreement with observations for a newly started experiment. As a result 7 papers have also been published on the detector performance with cosmic rays or collision data and an eighth has been submitted.⁹⁻¹⁶ In addition to these physics and detector papers, thousands of plots of detector performance and physics quantities have been released by all the experiments (over 4,000 this calendar year by ATLAS alone¹⁷) and are freely available on the web.¹⁸ The U.S. institutions played major roles in many of these papers and plots. As an example of an analysis where U.S. institutions had such a role, Figure 1 shows the measured cross section for production of pairs of top quarks measured by ATLAS and compared with other results.

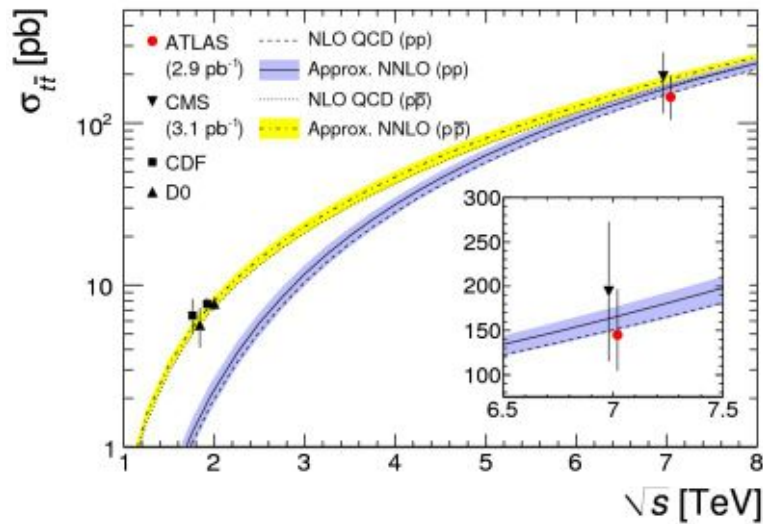


Figure 1. The $t\bar{t}$ cross section measured by ATLAS (red circle) and other experiments shown as a function of center of mass energy. The blue line shows the mass dependence for production at a proton-proton collider (LHC), and the yellow shows that for production at a proton-antiproton collider (Tevatron). This measurement requires essentially all elements of the detector and software systems to be functioning well.

With the center of mass energy of 7 TeV, 3.5 times higher than previously available, additional results include searches for new particles in mass regions never before accessible. During the period of the proposal the energy will increase to ~ 14 TeV, further extending the mass reach. As the LHC performance increases, detector upgrades will be required to retain physics sensitivity. Lead times are long so that R&D for upgrades has already begun, and U.S. institutions are actively participating. The efforts by institutions funded by this proposal are described here.

The goal of this proposal is to empower U.S. university physicists to make major advances toward completing a unified view of the particles in nature, the forces with which particles interact and their role in the past and future of our universe as well as to be ready to make unanticipated discoveries. The overall U.S. ATLAS Operations program is supported by both the DOE and this NSF proposal. The DOE support is $\sim \$29$ M/yr. The Operations Program proposed in this NSF Cooperative Agreement (CA, $\$10$ M/yr, an

~10% increase over the current CA funding of \$9M/yr) achieves that empowerment goal by supporting technical personnel and equipment in three main areas of activity:

- o Maintenance and Operations of the ATLAS Detector (M&O)
- o Physics Support and Computing (PS&C)
- o Upgrade Research and Development (R&D)

2 The Instruments of Discovery: The Large Hadron Collider and the ATLAS Detector

The LHC is designed to collide protons-on-protons at 14 TeV center of mass energy – the highest energy that could be obtained practically with superconducting magnet technology in the LEP tunnel at CERN. However, the cryogenic incident of September 2008, when some 50 magnets were damaged by an electrical connection failure during excitation of a sector, has forced a change of the operations program for the next few years. The LHC was initially operated more conservatively at a lower energy (7 TeV) and instantaneous luminosity than design ($10^{32} \text{ cm}^{-2}\text{s}^{-1}$). For the longer-term program during 2013-2015, after a 15 month shutdown needed to fix the LHC splices and install an enhanced collimator system, the LHC will eventually operate near the design energy of 14 TeV with a luminosity of $10^{34} \text{ cm}^{-2}\text{s}^{-1}$. This will allow the full range of proposed physics to be explored. Another year-long shutdown is scheduled for 2016 when upgrades of the ATLAS detector as well as the LHC accelerator complex will be undertaken. Shortly after the end of the decade, the goal is to significantly exceed the design luminosity, thereby driving the need for further ATLAS upgrades.

The ATLAS experiment is one of two general purpose detectors now operating at the Large Hadron Collider (LHC) at CERN. Based on a toroidal magnet geometry for its muon system, a solenoidal central tracker, exceptional hadronic and electromagnetic calorimetry and a versatile triggering system the detector has a broad range of sensitivity to most of the new physics signatures proposed. U.S. groups have been involved in all ATLAS detector subsystems. Figure 2 shows the general layout of the detector.

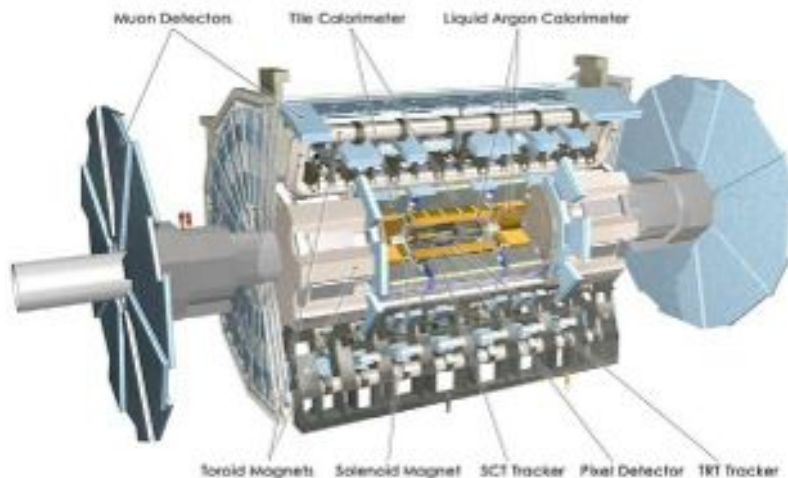


Figure 2. Shown is the layout of the ATLAS detector located at Point 1 at the LHC. Visible in cutaway are the 8 coils of the barrel toroid system, the endcap toroids, the central solenoid, the muon chambers, calorimeters and inner tracker. The dimensions of the detector are 25 m in height and 44 m in length. The overall weight of the detector is approximately 7,000 tons.

The ATLAS detector has excellent performance that covers all aspects of physics signatures that may be present in both p-p and Pb-Pb collisions at LHC energies. Table 1 is a summary of the design resolutions and triggering coverage. We are already approaching these resolutions and see no limitations in fully achieving them.

Detector component	Required resolution	η coverage	
		Measurement	Trigger
Tracking	$\sigma_{p_T}/p_T = 0.05\% p_T \oplus 1\%$	± 2.5	
EM calorimetry	$\sigma_E/E = 10\%/\sqrt{E} \oplus 0.7\%$	± 3.2	± 2.5
Hadronic calorimetry (jets)			
barrel and end-cap	$\sigma_E/E = 50\%/\sqrt{E} \oplus 3\%$	± 3.2	± 3.2
forward	$\sigma_E/E = 100\%/\sqrt{E} \oplus 10\%$	$3.1 < \eta < 4.9$	$3.1 < \eta < 4.9$
Muon spectrometer	$\sigma_{p_T}/p_T = 10\%$ at $p_T = 1$ TeV	± 2.7	± 2.4

Table 1. General performance goals of the ATLAS detector. Note that, for high- p_T muons, the muon-spectrometer performance is independent of the inner-detector system. The units for E and p_T are GeV.

The ATLAS experimental program has been very successful to date. Data from proton-proton and heavy ion collisions have been collected with high efficiency since the LHC started providing p-p collisions in late March 2010.

3 U.S. Leadership

The U.S. ATLAS organization consists of 40 university groups together with 4 DOE national laboratories.¹⁹ It represents about 21% of the overall collaboration. The U.S. groups had major construction responsibilities in all five ATLAS detector systems that have now been commissioned and are taking data. The groups now have important responsibilities for the organization of the experiment, the operation of the detector, and the analysis of the data. U.S. physicists have served as Deputy Spokesperson, Physics Coordinator, and Collaboration Board Chair. They typically comprise about 25% of the experiment's Executive Board. The ATLAS physics analysis organization is divided into 16 areas, each with a convener reporting to the Physics Coordinator. Currently four of these physics conveners are U.S. physicists. Because of very robust computing support and experience at the Fermilab Tevatron, U.S. physicists are also playing major roles in the extraction of the physics results noted above.

4 Summary of Results from Past NSF Support (2007-2011)

4.1 Maintenance and Operations

The ATLAS detector, although an entity unto itself, is also the integration of subsystems of extraordinary complexity.¹³ The support of the NSF from 2007 to 2011 (Cooperative Agreement PHY06-12811 for \$9M/yr) has been critical in enabling U.S. ATLAS universities to contribute to an M&O effort that spans the range from front-line daily operations to leadership roles. The U.S. role as an essential and

trusted partner in the M&O effort is a necessary precursor to assuming leadership roles in the physics analysis.

The M&O program of U.S. ATLAS has been supported by both the DOE and the NSF. Although there are two funding sources the overall management of the Operations Program is performed by the same team thereby assuring full coherence and coordination across the entire program. All the national laboratory contributions to U.S. ATLAS are supported by the DOE, as well as some of the U.S. ATLAS universities that traditionally have DOE core research program contracts.

4.1.1 Inner Detector

The primary NSF CA institution involved in silicon activities is University of California-Santa Cruz (UCSC). The silicon tracker is made up of two components, the Pixel detector and the SCT (silicon strip) detector, which are detector elements closest to the interaction region. Installation and preliminary commissioning were completed in 2007 and 2008 such that both systems were ready for the anticipated LHC collisions in September 2008. Members from all eleven U.S. Silicon institutions made important contributions to meeting this goal. When the accelerator “incident” occurred soon after turn-on, forcing a further delay of more than one year, the two silicon systems used the extra time collecting cosmic ray data as well as detailed calibration and timing data. Much of the cosmic ray data were taken during runs commissioning the entire ATLAS detector including full trigger and data acquisition. This step allowed refinement of the internal alignment constants and timing, and provided operational experience, leading to a Si system that was fully prepared for the first collisions in late 2009.¹¹

During the early running after installation, the cooling system for the silicon tracker was plagued with problems. These included leaks, premature failure of compressor pistons, and failed valves. Most of these problems were resolved by 2009. The fluid distribution rack was re-plumbed to fix leaks and to provide better monitoring of fluid flow and leaks. The preventative maintenance schedule for the compressor plant was accelerated to match the operational experience. UC Santa Cruz technical staff contributed to this work during the shutdown in early 2009. These cooling issues will be addressed again during the 2012 shutdown.

Since the initiation of proton-proton collisions in November 2009 through to the end of operation in 2010, cooling problems have not caused any loss of data taking. The Pixel detector operated with 97% of its 80 M channels live and the SCT with 99% of its 6.3 M channels. Also, the Pixel and SCT up time has been 99% of the stable beam time of the LHC.

Personnel from University of New Mexico and UCSC have designed and built an add-on to the Pixel high voltage distribution panels to allow monitoring of leakage current of individual modules and have provided technical oversight for electronics issues that arise, especially modifications or additions to the silicon electrical systems, respectively.

Most recently, the optical transmitters (VCSEL – Vertical Cavity Surface Emitting Laser) used to send clock, trigger and commands to the on-detector electronics have started to fail much earlier than their expected lifetime. All failures so far have been in components accessible with the detector closed. Prompt intervention and the use of spares have kept the impact to a minimum. Parts are being replaced as necessary and studies are underway to determine the cause and best final remedy. Among these are analytical failure analysis studies by UCSC.

The Transition Radiation Detector, which is an essential part of the Inner Detector, was previously supported by NSF funds but will be tasked to the DOE in the future and therefore not covered by this proposal.

Since the beginning of data taking at 7 TeV in March 2010, the TRT system has been 100% operational. The tracking resolution and the transition radiation pion rejection have all met the design specifications.

Indiana University was one of the founding members of the U.S. ATLAS Transition Radiation Tracker (TRT) group. The barrel tracker was built by Duke University, Hampton University, and Indiana University. The TRT electronics was designed and built by the University of Pennsylvania and CERN. University of Pennsylvania personnel were the major contributors to the commissioning of the TRT electronics and integration of the readout and the DAQ.

The TRT barrel and end caps were installed in the ATLAS detector and commissioned in 2006. An engineer from Indiana University was directly involved in the day-to-day installation, including the on-detector integration. It is largely because of his thorough work that the TRT system had very few problems in coming up to operational status.

Prior to p-p collision data, cosmic ray data were used to commission the TRT and Silicon Detectors. This culminated in the testing of the completed system, with Xenon gas in the TRT system, full cooling, and full magnetic field in the solenoid in the fall of 2008. The TRT system was ready for data taking during the initial beam injection and featured in many of the ATLAS images of interactions in those first exciting days.

The Indiana University team with collaborators has developed methods to use the TRT for measurements of specific energy loss (dE/dx) for particles traversing the TRT straws in order to distinguish pions from kaons. In addition, the TRT works well to distinguish electrons from pions with a lower γ by transition radiation.

4.1.2 Liquid Argon Calorimeter

The majority of U.S. university groups (Columbia, Pittsburgh, Southern Methodist University (SMU), and Stony Brook) that contributed to the M&O of the Liquid Argon Calorimeter subsystem (LAr) were supported by the NSF CA. The LAr Calorimeters are performing very well,⁹ with an earlier estimated 93% availability for physics. The downtime was divided into two categories: luminosity blocks that are excluded from the data because of many "noise" events in the block, and downtime because of an HV trip and subsequent ramp-up of the tripped HV channel.

During the commissioning and cosmic ray data collection stage and during initial operations the performance of the detector has been excellent. At the start of LHC data taking period in March 2010 about 99.2% of about 220,000 individual channels in all calorimeter sections (barrel, electromagnetic endcaps, hadronic endcaps and forward) were fully operational providing energy resolution for photon and electron identification in agreement with the design criteria.

There were several problems encountered during the commissioning of the LAr that required special attention. Faulty design and fabrication by a vendor of the low voltage power supplies (LVPS) has been rectified by two retrofits which have been very successful. During the 2012 shutdown, all the on-detector LVPSs will be replaced by a new design from a new vendor. During the 2010 year-end shutdown faulty optical transmitters (OTx) will be replaced. Despite these difficulties the LAr has operated with good efficiency ~93% with only a minor impact on its performance.

The Stony Brook group carries the responsibility for the High-Voltage (HV) system of the Liquid Argon (LAr) Calorimeters. The HV Feedthroughs and filters have been functioning without failure during the first ATLAS physics run. Currently, personnel from Stony Brook maintain the system. This involves taking the on-site technical responsibility for the LAr HV.

4.1.3 Scintillating Tile Calorimeter (TileCal)

During the current grant the assembly and commissioning of the tile calorimeter was completed and it was brought into operation as a research instrument. It was available for physics in the fall of 2008 when first beams circulated in the LHC. Following the cryogenic incident of September 2008, the full detector was used for cosmic ray studies and millions of events were recorded. These data were the basis of several valuable technical papers.^{15 16} During the LHC data collection the Tile Calorimeter has operated as an essential part of the ATLAS detector and has been an important element in many of the early journal publications. Approximately 97% of the calorimeter channels are operational.

The detector has been closed since the completion of consolidation work in the winter and spring of 2009. During the past 18 months of detector-closed operation the stability of the response has been tracked by a Cs source system irradiating each of the 460,000 scintillating tiles, by a laser system injecting light into each of the 10,000 photomultipliers (PMT) and by a charge injection system monitoring the gain and stability of the electronic readout channels. Also, important operational experience has also been accumulated.

The stability of the calibration is outstanding. The goal is an accuracy of 1%. The readout electronics are stable with no systematic trends seen over an 18 month period and an RMS variation of about 0.1%. The laser shows the PMT responses to be stable to within about 1% over this same period. The Cs source system shows a response increasing smoothly at a rate of about 1% per year. This can easily be tracked and recorded in the calibration data base but we are working to understand the source of the effect. It is seen for both the detector modules in the underground area and for a module in a test building on the surface.

The most unpleasant observation is the limited reliability of the 256 on-detector low voltage power supplies. These custom units have a failure rate of about 5 per year. Because they are inaccessible during detector operation they can only be repaired about once per year. Currently eight (3.1%) are inoperable. There are also trips of the supplies which may be associated with instantaneous luminosity. Recovery takes about 6 minutes. A replacement design is being developed for installation during the 2012 shutdown.

The University of Chicago (UC) group, which built much of the TileCal front-end electronics, and groups from Michigan State University (MSU), University of Illinois Urbana-Champaign (UIUC), Northern Illinois University (NIU), and the University of Texas at Arlington (UTA), monitors and maintains the calibration of the system and performs repairs as necessary.

4.1.4 Muon Spectrometer

The muon system is fully commissioned and operates routinely with high efficiency over the full rapidity range $|\eta| < 2.7$.^{14 16} All but the 50 remaining EE chambers that were staged have been installed. Personnel from Boston University, Brandeis University, University of Michigan and University of California Irvine (UCI) are supported by NSF funds. Brandeis concentrates on the endcap alignment system and UCI on the firmware/software (FW/SW) and operation of the Cathode Strip Chamber (CSC) Readout Drivers (RODs). Boston and Michigan work on the chamber operation, database, calibration and background studies.

The Michigan ATLAS group is responsible for integrating, commissioning, operating and maintaining the ATLAS endcap Monitored Drift Tubes (MDT) muon chambers and on-chamber electronics for all MDT chambers (barrel and endcap). They work closely with groups from Boston and Brandeis and other U.S. ATLAS institutes. A critical contribution during the commissioning period

was the final shakedown of the Chamber Service Modules (CSM) that are mounted on all MDTs. They were designed and largely built by Michigan.

The Michigan MDT Calibration Center is managed by research staff with faculty oversight. Members of the Michigan ATLAS group also provide computing support. The Michigan center collaborates with similar centers in Rome and Munich to provide calibration constants necessary to keep the Muon Spectrometer operating at its full potential: 2% momentum resolution at 100 GeV rising to 10% at 1 TeV. The calibrations required by the MDT tubes are the timing offset (T0), and time-to-space function (RT function).

On the hardware side, the ATLAS Michigan group and Israeli collaborators have constructed and are operating an MDT gas monitor chamber located near the ATLAS detector at CERN. This provides hourly monitoring of the drift spectra and rapid feedback on the chemical integrity of 22 Million liters of Ar/CO₂ flowing through the MDT system every 24 hours and is used to deliver standard MDT calibration RT functions.

Michigan personnel have developed, tested, and maintained the ATLAS MDT and CSC Configuration Database in collaboration with Tel Aviv University. This database stores and provides the information necessary for online data acquisition, such as muon detector configuration and initialization, high level trigger and monitors, and provides access to configuration and mapping data for the offline software and users.

UCI maintains primary responsibility for maintenance and operation of the CSC off-detector electronics and data acquisition systems, and it plays an important role in day-to-day CSC operations and in CSC commissioning and data quality checking. During 2007 and 2008, the CSC chambers were tested and mounted on the Small Wheels, then installed and commissioned in the cavern. UCI participated actively in each of these steps, particularly testing and mounting the chambers, and providing data acquisition support and test software for these activities. In addition, in 2008 the off-detector electronics system was installed and commissioned at Point 1.

At that time, the embedded software for data acquisition from the full system was found not to meet the design data rate specifications. From mid-2008 through 2010, UCI (with critical technical assistance from SLAC) redesigned the software that runs on the CSC ROD, which receives data from the CSCs and formats it for readout by TDAQ. The second half of 2008, 2009, and 2010 were spent developing improvements to the ROD DSP-based software and associated ROD FPGA firmware to improve its operational stability and readout rate. Successive code releases were deployed in summer 2009 and after. The CSC readout was integrated with the rest of ATLAS during the 2009 data taking at 900 GeV, and the CSCs have since taken data without compromising ATLAS performance. The current release of the CSC readout code operates at the ATLAS-specified level 1 trigger rate of 75 kHz with small (6-7%) deadtime (and at 65 kHz with no deadtime). Meanwhile, UCI has been active in commissioning and performance assessment of the CSC system, first with horizontal muons produced by 900 GeV collisions in late 2009, and throughout 2010 with muons from 7 TeV collisions.

4.1.5 Trigger and Data Acquisition System (TDAQ)

During the first beam in 2008, the initial low energy collisions in 2009 and the first 7 TeV collisions in 2010 the DAQ and High Level Trigger (HLT) system worked without problems and met all requirements.²⁰ A run efficiency of well over 90% is regularly achieved.

UCI and MSU contributed to the installation, commissioning and operation of the ATLAS TDAQ system. In 2007 the Level 2 supervisor and Region-of-Interest Builder were commissioned and the first

four racks of the HLT farm installed. In the following years this has increased to 27 HLT racks usable for both Level 2 and Event Filter, and 10 event filter only racks. MSU was involved in the Detector Control System (DCS) support for all HLT racks as well as the Region of Interest (RoI) Builder.

Continuous support for detector operations and combined ATLAS cosmic runs was provided, both before the first beam and in 2009 during the LHC repairs. In addition special week-long tests of the full trigger and DAQ system were performed on a regular basis during that period. Remote monitoring facilities were implemented to allow experts to take shifts from their home institute and the web based monitoring was improved to provide full access to most data that had previously been visible only inside the ATLAS Point 1 network. The ability to run pure offline Athena-based monitoring or reconstruction for on-line events was provided and is now used by most detectors and the global monitoring jobs which reconstruct express stream events in real-time.

Members of UCI are the key developers for the trigger steering and menus used in both Level 2 and event filter and have responded in the past few years to many requests for new features as well as updates needed to meet the changing conditions of the LHC. On the trigger algorithm side, support for Inner Detector tracking in the event filter was provided, as well as on-going development and support for the Level 2 muon trigger. An automated system to re-process all events that caused online processing problems was implemented and has turned out to be an essential tool to test new software and menu versions before they are allowed to go online.

During 2009 all machines in Point 1 were updated to the latest operating system version, and all software development moved from Concurrent Version System (CVS) to Subversion. The prototype system hardware was decoupled physically from the Point 1 network while still providing a small scale version of the full system. Several major changes to the run control Graphical User Interface (GUI) were implemented during this period, as well as improvements to the ATLAS electronic logbook. Members of both institutions provided on-going support as on-call experts (networking, RoI Builder, DAQ, trigger, menu) and through regular control room shifts. Members of UCI and MSU hold various leadership positions in both the DAQ and Trigger area, including TDAQ system run coordinator and TDAQ software coordinator.

4.1.6 Technical Coordination

Brandeis University contributed to the Technical Coordination (TC) of the ATLAS detector by providing mechanical engineering expertise to locate components of the Muon endcap system as well as alignment sensors that are used to readout positions of the endcap calorimeters during closing.

4.2 Physics Support and Computing

The physics support and computing effort in U.S. ATLAS has been focused on creating the infrastructure to allow U.S. physicists to take a leadership position in LHC physics. This has included providing computing resources in a distributed facility integrating Tier 1, Tier 2 and Tier 3 centers with one another and with international ATLAS; contributing to the distributed software systems that enable the distributed facility; contributing to the core offline software; and building a team of software and analysis experts able to provide direct support to physicists and undertake targeted development work on software important to U.S. detector responsibilities and analysis.

The commissioning and startup of the LHC have constituted a tremendous success and validation for the distributed computing systems of ATLAS. The full processing workflow, from dataflow off the detector, prompt reconstruction at CERN, data distribution to Tier 1s and Tier 2s, reprocessing and group

production at Tier 1s and Tier 2s, and finally to end user physics analysis at Tier 1, Tier 2 and Tier 3 centers has performed exceptionally well and has met the goal of being an effective enabler for timely analysis. An early indicator of this was at the ICHEP conference in July 2010 at which ATLAS talks on Friday incorporated data taken the previous Monday.²¹ During the 2010 run the total data volume produced by ATLAS and distributed and analyzed around the world was 35 Petabytes (PB). By the end of the run ATLAS was routinely running up to 70,000 concurrent production jobs around the world, plus another 15,000 analysis jobs from over 1,000 analysis users, for a total of over 600,000 jobs per day. Figure 3 shows the global growth in distributed analysis over the past year (U.S. in blue). The U.S. has contributed strongly to this success, with its distributed facility consistently being ranked as the best in ATLAS in its performance and reliability (and popularity with both production and analysis users). Both labs and universities fulfill many leadership roles in distributed computing, software, and operations.

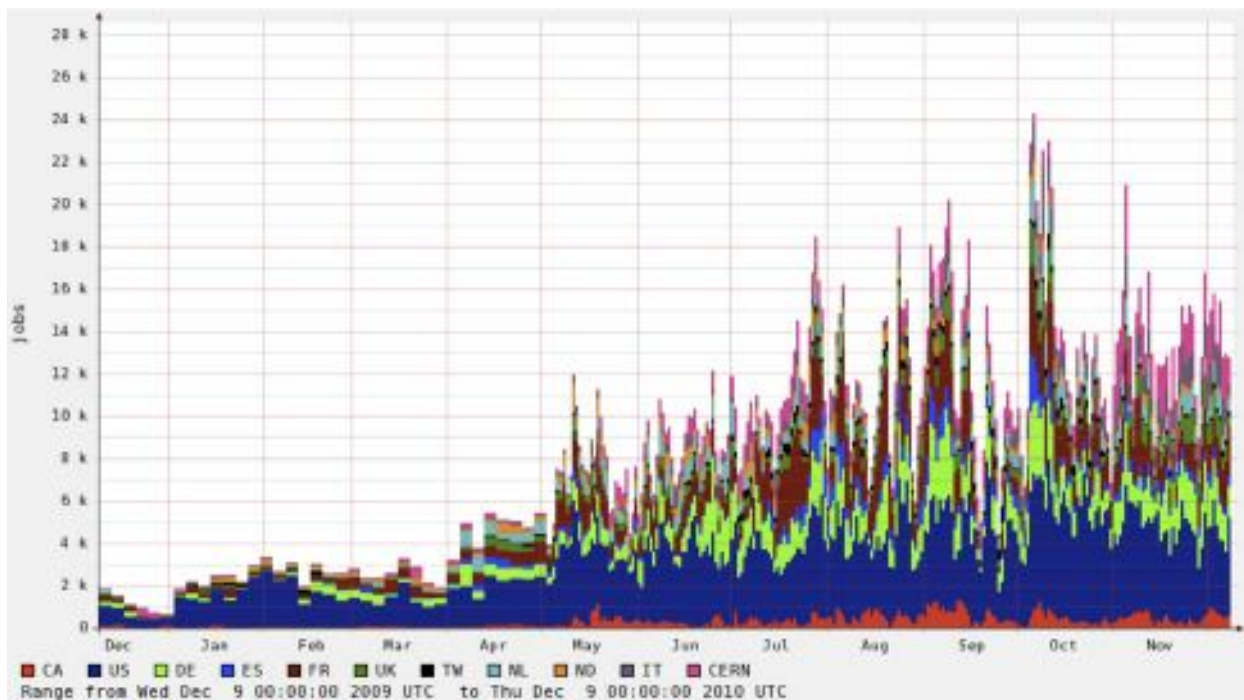


Figure 3. Number of concurrent ATLAS distributed analysis jobs running globally in the U.S. developed PanDA distributed production and analysis system, from December 2009 to December 2010. U.S. jobs are in blue.

The U.S. program in ATLAS core software has been in place for close to a decade. The focus areas of core framework, data management, and distributed software established at the beginning remain the focus areas today. In each of these areas the U.S. continues to play the lead role in delivering central components of the software: the Athena control framework, its event data persistency services, and the PanDA distributed production and analysis system. Their smooth operation through ATLAS commissioning and the first year of data taking was a strong credit to the U.S. program and the institutions that have supported their steady evolution for many years. Software support for users has long been an important part of the effort as well, with U.S. ATLAS librarians serving the software infrastructure needs of the U.S.

The program of placing detector software experts in software infrastructure development roles at universities that are centers of detector expertise has proven very successful. Through these efforts the U.S. has gained prominent roles in the development of muon reconstruction software, hadron calorimeter reconstruction and jet studies, tracking, vertexing and b reconstruction. U.S. physicists doing detector studies and physics analysis derive great benefit from having in their midst experts on detector system software who provide direct user support and act as a pool of software expertise for priority development and operations tasks.

An addition to the program in the last two years, motivated by the success of the detector software infrastructure program, was to place analysis software experts at universities close to physicists with deep expertise in analysis tools and the software needs of analysis. These developers and their supervisors are charged to contribute to physics analysis tools development with a particular focus on U.S. priorities but in a way coherent with international ATLAS. This strategy has been very successful as a primary contributor to the emergence of a common format and tool set for Ntuple based analysis.

With ATLAS now operating, all software and computing roles include a substantial and sometimes dominant operations component, supporting users and system operators, and responding in the development program to feedback from operations. The U.S. program makes no separation in terms of personnel between development and operations activities, ensuring development is closely coupled to the real needs of data processing and analysis. The U.S. has secured leading operations roles in ATLAS, including overall leadership, and in the U.S. we run the most successful computing operation in the collaboration.

In the following (Sections 4.2.1-4.2.3) we describe in more detail the U.S. activities in physics support and computing and the results they have shown, with an emphasis on the university-based activities for which continued support is sought in this proposal.

4.2.1 Physics Analysis Support

The work undertaken in physics analysis support empowers U.S. physicists to take leadership roles in the ATLAS physics working groups and ensures that they will have access to the resources needed for these roles. Physics analysis per se is an activity carried out by physicists, and is not considered part of the program receiving operations support. However, because ATLAS analysis software is complex, and a large fraction of U.S. physicists are not based at CERN, and the U.S. has a vested interest in having a strong role in analysis tools and detector performance in ATLAS, U.S. ATLAS has an organization designed to support physics analysis, to promote communication and to stimulate collaboration among U.S. ATLAS physicists.

The primary components of the organization are U.S. analysis forums, a network of Analysis Support Centers (ASCs) acting as hubs for analysis tools assistance and training, an active program of physics analysis jamborees located primarily but not exclusively at the ASCs, and a program in analysis tool software development. A further component, the Analysis Support Group to provide technical expertise to U.S. physicists, has largely been superseded by ATLAS-level technical support channels where the U.S. plays a strong and, in many cases, leading role.

The U.S. analysis forums bring together U.S. physicists with common interests, and in turn strengthen the U.S. participation in LHC physics. They provide a setting for young researchers to discuss and present analyses in a more preliminary and informal way than ATLAS-level meetings. Each forum has two conveners, one based in the U.S. and one based at CERN, with the explicit intent that the forums and their conveners act as a communication channel between analysis activities in the U.S. and at CERN. The

CERN-based conveners also act as a source of help and support for U.S. researchers based at CERN, and they contribute to a strong coupling between U.S. and overall ATLAS analysis activity. The forums include: electron/photon; muon; *b*-tagging/vertexing; jets/missing ET; and trigger, as well as two physics-based forums: Beyond the Standard Model, including supersymmetry and exotics; and Standard Model physics, including Higgs. Operating these forums has been and remains a learning experience. The activity level varies forum to forum, and one motivation for the introduction of dual U.S./CERN conveners was to broaden the responsibility to promote greater activity. We are continuing to evolve the analysis support and are presently developing plans to strengthen the forums for the future. One way is to assign a primary role for forum conveners in organizing the physics content of the U.S. ATLAS annual collaboration meeting, as well as a larger role in the regular U.S. ATLAS analysis meetings.

The Analysis Support Centers, together with the software and analysis experts supporting them, provide tutorials, regular video/phone meetings, physics jamborees several times per year, one-on-one discussions and web documentation. With the ASCs co-located with hubs of computing and software as well as analysis expertise at ANL, BNL and LBNL, the ASCs and their users have many resources on which to draw. Their regional distribution answers a demonstrated need for training and gathering places that are accessible by car -- and thus cheaply by students. This has motivated the establishment of a fourth center, not a full ASC but a physics jamboree host site, at UTA.

The jamboree program has been very successful as measured by the level of activity and participation. The total number of jamborees per year is about 8, each typically having close to 30 attendees. They are often coupled to an adjoining physics meeting. The tutorials at the jamborees and elsewhere have fostered the development and improvement of analysis documentation, and they help to provide feedback to the developers from experience of their users.

A further element of the physics analysis support program, added in the last 2 years, is the support of analysis tools developers, modeled on the successful program in detector software support. Developers were supported by the DOE Operations Program funding at two universities, Iowa State and New York University (NYU), supervised by physicists there who are experts on analysis software and the computing needs of analysis. This program has proven to be very valuable with the prospect that it will be even more so in the future. Together with other U.S. physicists these developers played a role in developing the Derived Physics Data (D3PD) infrastructure for late-stage, ROOT Ntuple based analysis that over the last year has emerged as a broadly adopted de facto standard in the ATLAS physics and detector performance working groups. It is extremely unusual that an experiment of ATLAS' scale this early in its lifetime is able to standardize on late-stage analysis tools, so the wide adoption of the D3PD is a major success. One of the developers is involved in an important extension of this infrastructure driven by its success, to establish a framework for D3PD analysis within which analysis algorithms operating on the D3PD format events can utilize common tools, somewhat analogous to the Athena framework at an earlier stage of processing.

Our analysis software experts are also playing an important role in the expanding Tier 3 program. A key means by which the U.S. can encourage the use of common and effective approaches to analysis is through training and examples. The physics jamborees and tutorials have been one avenue for this and the Tier 3s are becoming another: they are developing functional examples of typical analyses in a Tier 3 setting that users of new Tier 3s will be able to pick up and use. We expect the Tier 3 support role of these positions to continue to grow as about 20 new Tier 3s come online in the next year or so. They also represent an important resource with the recent naming of a U.S. physicist to a two-year appointment as

co-convener of the Physics Analysis Tools (PAT) group in ATLAS; our analysis tools developers will strengthen his ability to drive the PAT program.

A further analysis software expert at Indiana University (IU) Bloomington, a shared position in which he also serves as a tracking and vertexing software expert as described below, provides an essential service to U.S. ATLAS and ATLAS physicists. He is the author and maintainer of the ATLAS Physics Analysis Workbook, a comprehensive wiki that explains by example how to use ATLAS software and physics analysis tools in the real world conditions of specific software releases, good run lists, a rapidly growing data set in still-evolving formats, etc. Our other analysis software specialists assist in improving the workbook. This work was supported by NSF CA Operations Program funding.

4.2.2 Developing and Maintaining ATLAS Core Software

U.S. groups lead the development of a number of core ATLAS software components used to access event data, provide I/O, configure and run algorithms, manage data distribution, and utilize distributed facilities for production and analysis. This software is independent of detector-specific algorithms. This effort is coordinated within the international ATLAS collaboration and is part of the ATLAS Maintenance and Operations MOU. The ATLAS control framework, data management and distributed software are primary U.S. core software deliverables. These activities are primarily centered at national laboratories and funded by the DOE. LBNL leads the development of the ATLAS offline software framework, Athena. This is the main steering code within which reconstruction and analysis algorithms run, and create the output products of the successive stages of the offline processing chain. These output formats are the province of ANL, which leads the ATLAS event data persistency effort. BNL leads development of the PanDA distributed production and analysis system as well as high level distributed data management and production operations tools.

In addition to these lab-based efforts, U.S. universities play key roles in core software, leveraging local expertise and contributing to a tight coupling between software development and the real needs of physicists doing analysis. This distributed effort, with critical mass teams at the labs complemented by university efforts that broaden involvement and expertise and strengthen the coupling to the physics program, has proven very effective. The university contributions to core software are outlined here.

The University of Pittsburgh group accrued substantial experience in detector geometry representations and visualization during their work at the CDF experiment at Fermilab, so a software professional was placed at Pittsburgh to work for ATLAS in this area, and has been supported by NSF CA Operations Program funds. This has been very successful, with the individual leading the development, optimization and maintenance of the ATLAS detector description framework that delivers to physics algorithms the current geometrical description of the detector. The Pittsburgh work has moved this area from a serious problem on the critical path prior to Pittsburgh's entry, to a stable and successful software component today. The group is now also contributing its substantial expertise in visualization to the ATLAS event display effort, which draws heavily on their geometry description work.

Building on significant experience from the D0 experiment at Fermilab, SMU has worked on tools for monitoring ATLAS event data as it is collected, with the software professional engaged in the effort supported by NSF CA funding. They have developed software that quickly combines histograms and trigger objects for monitoring of ATLAS event data as it is collected. The system accesses data from the ~6,000 nodes in the ATLAS online event farm and provides updates about once a minute with the processing of millions of histograms. The usage to date has been the online environment, but the system is now being extended to offline access. It will become a tool for widely distributed monitoring and

evaluation of detector performance, possibly contributing in the future to a capability for remote shift taking.

The UTA group is a long standing contributor to distributed processing systems and operations for ATLAS, so support for a software professional was established there to participate in the development of the PanDA distributed production and analysis system, co-led by UTA and BNL. PanDA has progressed from its origins as a U.S. based system has become the basis for distributed production and analysis ATLAS-wide. The contribution of the UTA developer to the program has been critical; he has developed and supports the software for PanDA's 'pilot jobs' that manage the process of acquiring and executing an ATLAS job and managing its inputs and outputs. UTA also contributes to managing site information metadata, and through their strong operations role they help ensure that PanDA development is closely coupled to the real needs of ATLAS computing operations.

4.2.3 Detector Software Development and Maintenance

A major portion of the detector-specific software comes from base program contributions from physicists working at U.S. universities and national laboratories. However to maximally leverage these contributions and to make the overall U.S. physics impact in ATLAS as strong as possible, we have funded some software professionals with strong physics backgrounds to work on developing and maintaining detector software and its surrounding infrastructure. This includes simulation, reconstruction, database integration and support, data persistency, testing and validation tools, performance metrics and monitors, and service tools required for reconstruction. Previous major investment in the construction phase of ATLAS produced many experts in the subsystem detectors. Placing software experts in the same locations as these detector experts has proven extremely effective in leveraging that expertise in contributions to ATLAS detector software infrastructure. The developer team has been stable and productive, accruing deep expertise in the detector software systems beyond their own contributions, which makes them a valuable pool of information and assistance for U.S. physicists doing analysis.

For the last four years we have funded three software professionals to support subsystem software infrastructure in calorimetry, Muon Spectrometer and Inner Detector software. The developers have all been in place at least 3 ½ years and have accrued significant accomplishments. They have been recognized with prominent roles, as will be described.

A software professional at the University of Massachusetts Amherst works on muon reconstruction software, and is supported by the NSF CA. Members of the Amherst group have long been active in ATLAS muon reconstruction software, and the Boston area institutions have significant responsibilities in the Muon Spectrometer construction and M&O. The developer has gathered and harnessed the local expertise in the underlying muon reconstruction software and has provided direct support to U.S. physicists incorporating muons in their physics analysis. A clear measure of his effectiveness is that the developer is now himself responsible ATLAS-wide for the Muon Spectrometer software. This is a great asset to the proximate Muon Spectrometer community.

A software professional at the University of Arizona, supported by the DOE Operations Program funding provides technical support to the strong effort in calorimeter software there. Members of the Arizona group spearheaded the ATLAS calorimeter reconstruction software, and have co-coordinated the ATLAS Jets combined performance group. They also have significant responsibilities in the Forward Calorimeter. The developer is responsible for much of the calorimeter's calibration code and conditions data. His role has evolved and broadened so that he now plays a key role in reconstruction operations for the experiment, as the coordinator for prompt event reconstruction at the CERN Tier 0. He also continues

to contribute to calorimeter specific tasks such as managing calibration constants in the conditions database.

A software professional at IU, supported by NSF CA funds, works in the area of Inner Detector reconstruction and analysis support, for the ATLAS Physics Analysis Workbook. His activities include tracking, vertexing and *b*-tagging. Mapping the material in the Inner Detector and ensuring its proper modeling in the simulation is critical to reconstruction performance. He has developed a procedure that reconstructs vertices of interactions in the detector material and provides a direct material map. The same procedure applied to simulation data permits direct comparison of the simulation model with the real detector's material distribution.

4.2.4 Computing Infrastructure in ATLAS: Computing and Networking Challenges

ATLAS has just commenced a multi-decade physics program that places unprecedented demands on computing to process and analyze the enormous data volumes arising from the high interaction rates, fine grained instrumentation and sheer size of the detector. The 10^9 Hz interaction rate is filtered by multiple trigger levels to reach a recording rate of 200-400 Hz. In its first year ATLAS has recorded 45 pb^{-1} of integrated luminosity, with the total data volume stored by ATLAS growing in that year from 15 PB to 50 PB. Distributed processing loads tripled over the year, with over 600,000 jobs/day by the end of the 2010 run. About 1,300 physicists worldwide currently use ATLAS's distributed analysis services, about a quarter from the U.S. Next year the integrated luminosity is expected to increase a hundred fold, with further increases year by year. The required computing capacity scales roughly with integrated luminosity, making LHC computing unprecedented in the scale of its storage, processing, and distributed analysis.

A robust computing infrastructure for the LHC experiments is particularly crucial for the U.S. and other remote participants because many of the most challenging (and therefore vulnerable) aspects of LHC computing are associated with providing an effective distributed computing environment that fully enfranchises remote participants in physics analysis. U.S. leadership in building LHC computing is an essential prerequisite to U.S. leadership in physics analysis.

The LHC physics environment makes analysis a complex challenge as well. Much of the interesting physics expected at the LHC is predicted to occur at very low rates. A typical light Higgs signal, for example, may involve of order 1,000 signal events distilled from the 10^{14} occurring in the detector in a year of data taking. The ATLAS trigger provides a rejection factor of 10^5 , but the further selection of one event in a million must be performed in offline processing. This presents one of the central computing challenges: the rapid and efficient extraction of sparse physics samples from extremely large datasets.

The scale and global nature of ATLAS computing motivated the development of a computing model that leverages national, regional, and institutional computing resources and expertise, integrated in a distributed hierarchy of centers fulfilling specific roles. The hierarchical computing model of ATLAS begins with the Tier 0 center at CERN. It receives the raw data from the detector and produces the first detailed event reconstruction. Ten Tier 1 centers are associated with national or geographical regions, with U.S. ATLAS served by one at Brookhaven National Lab. The Tier 1 centers hold large volumes of reconstructed and simulated data for samples of the greatest physics interest, and they serve as a redundant archival store for raw data. Their resources are used for re-reconstruction of the data once detailed calibrations are available (reprocessing), analysis by physics working groups and individual users, and simulation. Five Tier 2 centers in the U.S. (of about 70 ATLAS-wide), four of which are supported by NSF

CA funds, provide access to data of the greatest analysis interest, do the bulk of the simulation, and support physics analysis for individuals and physics working groups. Tier 3 centers are resources at universities and labs intended primarily to support local analysis users; their organization lies outside the scope of U.S. ATLAS program management but their close integration is a necessity. The U.S. Tier 3 organization works closely with U.S. ATLAS computing to ensure this. The U.S. contribution to ATLAS Tier 1 and Tier 2 resources scales with the number of scientific authors and is presently about 23%.

A lesson of ATLAS experience to date is that the Tier 2 centers play a more important role than the hierarchical model foresaw. The evolution of ATLAS computing is towards a 'flatter' architecture that discriminates less between Tier 1s and Tier 2s in how they interconnect in the distributed facility, and so is better able to leverage the substantial storage and processing resources of Tier 2s. This larger Tier 2 role stems from the fact that the Tier 2s have much more powerful networking connections than foreseen when the hierarchical model was designed a decade ago.

The distributed computing model depends on linking all sites through high-speed networks into a distributed fabric that manages data and workloads globally in a way that presents a tractable operational load. This has required both a large international effort in developing 'grid middleware' software and large efforts in the experiments to build on this middleware foundation to create the processing and data management systems required. In the U.S. the common efforts in grid infrastructure and middleware are managed by the Open Science Grid (OSG), which is well established as an essential component of ATLAS computing. It enables us to leverage efforts in the common grid computing fabric, and it provides the principal U.S. link to the international grid organizations centered at CERN, in particular the Worldwide LHC Computing Grid (WLCG).

4.2.5 Tier 2 Computing Centers

The U.S. ATLAS Tier 2 computing centers were first funded four years ago through the present NSF cooperative agreement, with a fifth Tier 2 supported by the DOE Operations Program funds. These have proven to be extremely successful facilities based on both substantial support from the universities and sustained funding from U.S. ATLAS. The Tier 2s collectively rely on tight integration as part of the U.S. ATLAS Distributed Facility, and ultimately as part of the Open Science Grid. The ATLAS physicists who initiated the U.S. Tier 2 centers have built strong and stable staffs, and now have a great deal of hard won knowledge about building and operating a successful large-scale computing facility. A tightly knit management for the U.S. ATLAS Distributed Facility under the U.S. ATLAS Facilities Manager has successfully integrated the Tier 2s as part of an overall U.S. ATLAS distributed resource. It has outperformed all other regions in ATLAS, by metrics both quantitative (cycles and job throughput delivered) and qualitative (ATLAS physicists show a strong preference for running their analysis jobs in the U.S. over anywhere else, and production operators show the same preference). The U.S. Tier 2s are all highly ranked among computing facilities ATLAS-wide. The ATLAS Computing Coordinator recently reported that in the latest measure of ATLAS analysis activity, while ATLAS has about 75 analysis sites, 75% of the analysis is done in only 20 sites, and all of the U.S. Tier 1 and Tier 2 sites are in the top 16. This ranking includes not just Tier 2s worldwide but Tier 1s as well; many of our Tier 2s are running more analysis jobs than several Tier 1s. This is not because U.S. sites are over-provisioned; we have generally had just enough resources to meet our ATLAS pledges. It is because the U.S. sites make the most of their resources with high performance and availability within a well-integrated distributed facility.

The Tier 2s have made contributions well beyond their successes in delivering computing capacity. They have innovated in a number of areas, as a matter of necessity in building a large-scale

facility with low manpower support. Several have built high-throughput inter-campus computing and networking infrastructures which have reduced costs through the pragmatic use of existing remote resources. Each of the Tier 2s has built up particular areas of expertise: U.S. ATLAS Great Lakes Tier 2 Center (AGLT2) is a leader in networking development and monitoring; Midwest Tier 2 Center (MWT2) in storage systems, storage management software and distributed data access; Northeast Tier 2 Center (NET2) in software tools for infrastructure management; and Southwest Tier 2 Center (SWT2) in distributed workload management systems and distributed computing operations.

Over the years the Tier 2s have evolved according to principles established by the ATLAS computing model. They have also benefited from practical lessons of early data challenges, functional tests, large scale simulation campaigns, detector commissioning, and now the workloads of the first year of the LHC physics program. Through this time the Tier 2 centers have collaborated closely among themselves and with the BNL Tier 1 center in providing a substantial part of the U.S. computing capacity as part of a coordinated reliable facility for U.S. and international ATLAS collaborators. In the following subsections we describe the NSF-supported Tier 2s themselves, primarily in terms of their development to this point and their status today. Future plans are addressed in Section 5.2.4.

In supplementary materials we include the proposals from all five of our Tier 2s for their participation in 2012-2016. Space limitations prevent us from describing our DOE-supported Western Tier 2 directly in this proposal.

All U.S. ATLAS Tier 2 centers see their roles as much more than a simple service provider, but rather an active participant in researching, testing and enabling cost-effective infrastructures capable of effectively supporting ATLAS physicists and, more generally, all those involved in data-intensive, distributed science. They have demonstrated themselves to be a very reliable and effective resource for U.S. ATLAS and they expect to continue to be so for the foreseeable future.

U.S. ATLAS Great Lakes Tier 2

AGLT2 started operations in September 2006 with strong support from the University of Michigan and Michigan State University (our Tier-2 center is composed of sites at both Universities, which currently split the funding roughly 60/40 respectively). This support has helped AGLT2 to become one of the top Tier 2s ATLAS-wide. During the past five years AGLT2 has delivered resources to U.S. ATLAS to at least meet what was required by the international MOU, by carefully allocating resources where they would bring the most impact. Beyond delivering capacity above expectation, AGLT2 has contributed to the U.S. ATLAS distributed facility in many ways. They have some of the best networking expertise in U.S. ATLAS, they do network research supporting the data-intensive WAN flows characteristic of our computing, they are driving the U.S. ATLAS adoption of a standard perfSONAR based networking monitoring infrastructure across the facility, and they act as an important liaison between U.S. ATLAS and external networking organizations. They have participated in a strong program among the U.S. Tier 2s in storage system research and benchmarking. They also work on facility management and performance issues, including reliable system configuration and system optimization, throughput monitoring and testing, and configuration management and node provisioning.

AGLT2 is hosted at the University of Michigan and Michigan State University. Both sites have provided power, space and cooling over the 5 years and will continue to do so. These university contributions to the program are estimated at \$180k/year over the two sites. The University of Michigan's facility hosts 8 equipment racks, with potential room for 6 more. Critical equipment is backed by an 80kW

UPS system, itself backed by a generator. The Michigan State facility can host up to 15 racks, and here too the critical equipment is backed up by UPS and generator. Both sites benefit from the excellent network infrastructure the Universities have put into place. Currently the Tier-2 has dedicated 10 Gbps links from each site to a Chicago peering point and a shared link between the sites. Network capacity can be expanded quickly and easily as needed.

Midwest Tier 2

MWT2 is a consortium which will consist of two institutions: the UC and IU. Beginning in 2012 the University of Illinois and the National Center for Supercomputing Applications (NCSA) will join. The program began in 2005 with the first production deployments in the summer of 2006 at IU and UC. The resources delivered to U.S. ATLAS included substantial equipment and infrastructure contributions from the two universities. This enabled MWT2 to become a major production and analysis resource for the ATLAS physics community, consistently ranking in the top five of 163 WLCG Tier2s in terms of delivered CPU and storage capacity.

The MWT2 facilities will be hosted at three sites: the Enrico Fermi Institute at the University of Chicago, the IU Informatics and Communications Technology Complex (ICTC) in Indianapolis, and the Advanced Computation Building (ACB) in Urbana (starting in 2012). The universities have provided at substantial expense the space, power and cooling for the past five years, as well as the network infrastructure and regional provider connectivity fees. These expenses will continue to be provided by the universities for the next five-year period. At the University of Chicago, the present MWT2 machine room is next to the high energy physics building and hosts 17 racks of MWT2 equipment, with critical services backed up by 40kW UPS, and served by a 10 Gbps network link. At IU, the ICTC is a 213,815-square-foot building on the Indianapolis campus, housing several major IU computing projects, including the IU Teragrid site. The OSG Grid Operations Center is co-located there, and it is a major peering hub for Internet2. At present MWT2 occupies 6 racks in this facility with room to expand to 10. Should MWT2 require more, it is highly likely additional space and associated infrastructure could be provided. At the UIUC, the MWT2 will be hosted in the ACB, a stone's throw from the Loomis Laboratory of Physics. The ACB houses NCSA's specially designed machine room and most of the Center's high-performance computing and storage systems. The facility also includes conference space and NCSA's Help Desk. The MWT2 resource will be part of the Illinois Campus Cluster (ICC). The floor space, racks, power, cooling, network infrastructure, regional provider connectivity fees, and staffing for core infrastructure support are provided through campus funds that subsidize the operation and maintenance of the ICC resource.

In spring/summer 2011 the Chicago facility will move to a new server room, a major new investment by the University of Chicago on behalf of MWT2. The university is building a new physical sciences research center that will replace the structure currently hosting MWT2 equipment. Cognizant of long-term commitments to the ATLAS computing program represented by the Tier 2 facility, the Dean of the Physical Sciences Division built into the project plan construction of a new server room for the Fermi Institute, with ATLAS as the primary stakeholder, at a cost of \$1.2M from an alumni gift. The new server room will be located in the basement of the adjacent "accelerator building" that once housed Fermi's proton cyclotron. The room will have space for up to 30 racks for ATLAS, more than the expected MWT2 need for the next five years, and will be backed up by 140kW UPS.

The network capacity between all sites is 10 Gbps over multiple regional providers. Connectivity to Internet2, important for Tier 3 access, is provided by this route. UC has a second 10 Gbps link that runs

from the campus to an ESnet peering point, providing a direct path to Brookhaven over a dedicated circuit. The UC campus and edge networks are being redesigned to provide a 40 Gbps core in the next 2 years, with possible expansion to 100 Gbps in the next 5 years.

MWT2 has successfully employed a shared administrative model in which the systems administration domain of each facility is available to all systems staff so as to provide redundancy in operational response and systems monitoring, and to share expertise between the sites, thereby achieving some measure of administrative efficiency. At UC the primary sysadmin is funded by NSF CA funds; a second sysadmin is supported in 1/3 by those funds and the remainder provided by other projects or the University. At Indiana the primary sysadmin is supported 2/3 by NSF CA funds and 1/3 by the University, with a further half-time technician supported by NSF CA funds. At Illinois, the staffing will come from three sources: NCSA core staff supporting the ICC infrastructure, NCSA staff providing integration support for ATLAS workload and data management services, and from the high energy physics group that will provide ATLAS support for the MWT2 activities for outside users.

MWT2 has made contributions to U.S. ATLAS and the distributed facility well beyond its provisioning of computing resources. The MWT2 team has contributed testbed resources, troubleshooting support, and operational feedback through a long period of software and infrastructure development on many fronts: the Open Science Grid (OSG) software stack, ATLAS PanDA and distributed data management (DQ2) development, and storage system deployments (primarily dCache but also some XRootd for Tier 3 sites). UC has expanded its MWT2-directed activity in data management to important roles in providing data management tools to U.S. and international ATLAS, and in designing and developing a data management architecture for the future than can incorporate the needs of a growing number of Tier 2 centers. The UC team has done diagnostic and development work on elements of the dCache storage system, providing feedback to the developers. The Indiana team has also made important contributions to several U.S. ATLAS facility-wide tasks, most recently in the debugging and validation of all the U.S. Tier 2s for proper operation of a crucial caching system for ATLAS conditions data (based on web caching and the U.S. CMS-developed FroNtier system) that enables scalable access to this data for production and analysis worldwide.

The MWT2 team also provides an important interconnect between U.S. ATLAS and OSG. The MWT2 head is also the head of integration for OSG, where he is responsible for validating and sustaining the operation of OSG as a functioning integrated facility through the evolution of the OSG software stack - that is, OSG releases must be validated in an integration testbed that tests its performance against the expectations of users, including of course U.S. ATLAS. MWT2 serves as an important element of the integration testbed and this testing process, helping to ensure U.S. ATLAS expectations for software functionality and stability are met.

Northeast Tier 2

The U.S. ATLAS Northeast Tier 2 center (NET2) is a joint project between Boston University (BU) and Harvard University. As a facility, NET2 is split between three sites in Boston. The Boston University site holds disk storage which is used both by BU worker nodes and by worker nodes which are part of the Harvard Odyssey cluster. A third site on the Harvard campus holds the Harvard gatekeeper and servers and the Harvard Tier 3. NET2 has 10 Gbps connectivity to the BNL Tier 1 and to CERN and has dedicated 10 Gbps internal connectivity between the Boston University and Odyssey cluster sites.

Bandwidth between BU storage and Harvard worker node local storage is more than 6.4 Gbps, effectively as good as in-cluster networking. NET2 presently runs approximately 2,700 PanDA jobs simultaneously.

NET2 leverages experienced campus facility IT teams for much of its support: the Scientific Computing and Visualization Group at BU, and the Faculty of Arts and Sciences Research Computing group at Harvard. Each of these groups provides a primary contact who spends most of their time on ATLAS and who can call on colleagues for further assistance. NET2 experience is that about 3 FTEs is required for maintenance, operations, problem response and facility expansion. The NET2 institutions provide half of this, while program funds pay for the remaining 1.5 FTEs, covering higher level support specific to the ATLAS computing environment and software stack.

In addition to manpower, the NET2 institutes make substantial material contributions to NET2. Harvard has provided all manpower related costs, all power costs, two racks and two air conditioner units for the worker nodes, all maintenance costs, all networking fees and all rental costs for the downtown Boston site. This has been provided at no cost to the program since 2009. Harvard has also provided approximately 500 cores from the Odyssey cluster as contributed capacity to NET2. Boston University in addition to providing approximately 1 FTE of effort above the 1.5 FTEs program funded work, pays for all electrical costs, AC equipment maintenance and networking fees. BU also has contributed a \$180k fund which can be used for NET2 infrastructure costs over the next few years. Both universities have given assurances that these costs will continue to be absorbed by them through 2016. The move to Holyoke will incur no additional costs to the program. The director of Harvard FAS research computing has indicated to us that NET2 will also be able to continue to use opportunistic resources from the Odyssey cluster at approximately 4% of Odyssey continuing as Odyssey expands over the period 2012-2016.

NET2 has also made major infrastructure contributions to U.S. ATLAS, ATLAS and the larger high energy and nuclear physics community. The Pacman software installer created there is used by ATLAS, OSG, Teragrid and others to manage packaging, distributing and installing the very large software systems used by experiments and facilities of this scale. A more recent development is the "Egg" software system which provides a simple, coherent interface to interact with all parts of a distributed computing infrastructure. It grew out of the complex challenge of technically managing a large distributed infrastructure like the U.S. ATLAS facility, and is being used to help manage NET2. Egg is beginning to capture wider interest in ATLAS as a potentially powerful operations tool.²²

Southwest Tier 2

SWT2 sites include the University of Texas at Arlington (UTA) and the University of Oklahoma (OU). During the first four years of U.S. Tier 2 operations, SWT2 has consistently been among the top performers. SWT2 currently provides 2,772 dedicated job slots to ATLAS, and 1,239 TB of storage. The scale of its resources, excellent stability, and efficiency in job completion make SWT2 one of the top Tier 2 sites in ATLAS.

The computing resources for SWT2 are located at three facilities. The main location is in the CPB building at UTA. A dedicated machine room at CPB provides space, power, and cooling for a maximum of 50 racks, 16 of which are currently occupied. A second facility is available at ARDC, a University of Texas System data center located in Ft. Worth. SWT2 has an allocation of 16 racks at this facility (half of which are currently being used). The SRTC facility at OU is capable of providing space, power, and cooling for 5-10 racks, three of which are currently used. Resources operated by OSCER are utilized for ATLAS computing as available.

An additional university is associated with SWT2 through OU: Langston University (LU). Resources provided by LU are hosted at the OU site. They provide resources to ATLAS and broaden the outreach of U.S. ATLAS to traditionally under-privileged institutions.

UTA is connected at 10 Gb/s through Lonestar Education and Research Network (LEARN) and National Lambda Rail (NLR). A second 10 Gb/s connection is expected soon from Internet2. OU has been connected at 10 Gb/s for a few years. Therefore, we expect networking to be well provisioned for the future.

UTA and OU provided a large level of local funding (approximately 1:1) for the first five years of Tier 2 operations. Local funds will continue to be available for the next five years for personnel, travel and M&S, and will support a large physical infrastructure (about 80 racks) with power, cooling and networking. About 40% of the SWT2 funding from the NSF operations program will be spent on personnel in 2012-2016 with substantial local contributions.

The SWT2 facilities team benefits from excellent synergy with the U.S. ATLAS operations team at UTA, OSG support teams at UTA and OU, PanDA development team at UTA, and the physicists who perform LHC data analysis in the Southwest region. The regional contributions to ATLAS are far greater because these local groups operate as a single team. For example, the SWT2 organizes regional jamborees (focused physics analysis support sessions), which bring all teams together. Such activities are usually carried out at National Laboratories: since the Southwest region does not have one locally, the SWT2 acts as the de facto focus of physics and computing in the region.

4.3 Upgrade R&D

For the past 5 years the vigorous ATLAS Upgrade R&D program has engaged physicists and technical personnel from U.S. Universities. The program has grown over time and now involves 23 universities, listed in Table 2. The program is composed of projects detailed in proposals submitted to an ATLAS-wide Upgrade Steering Group. The proposals are evaluated with respect to relevance to ATLAS, including the long term needs of the experiment, and technical feasibility prior to submittal for approval by the ATLAS collaboration board. This program has included studies of potential improvements to ATLAS, including explorations of commercially available new technologies not available 10 years ago in the areas of triggering and data acquisition, as well as development of novel particle sensors, for example using diamond or improved silicon detectors, and the use of very modern electronics technologies, requiring design and test of custom chips. The university R&D program has developed new chips using Si-Ge bipolar technology, small feature size CMOS, and Silicon on Sapphire, providing new data on performance of use to the whole particle physics community. The work has aimed at the frontier of both radiation hardness and extreme data rates, to prepare for an eventual large luminosity increase at the LHC. Other areas of interest have included the development of very light weight, stiff, mechanical support structures for tracking detector improvements, and better integrated electronics systems for calorimetry. ATLAS has already decided on its first major performance upgrade, a new pixel tracking layer at 3 cm radius, leaning heavily on the work supported by the Upgrade R&D program. The final development and construction activities for this device, called the Insertable B Layer (IBL) will be separately supported as an NSF MRI project, with 11 universities participating. The device will allow an increase of a factor of two in rejection of non- b jets for a given b -jet tagging rate.

The upgrade activities, described very briefly below, have been organized around the detector subsystems in the present ATLAS detector. The goal is to have a small number of improvements ready for installation in 2016, including the IBL, after which the luminosity is expected to go up to a few times the

design luminosity, and then a major upgrade ready for installation in 2020, after which the detector is expected to run for 10 years at five times the design luminosity. Given a typical construction time, the major upgrades need to be ready to start construction around 2015. This implies that the bulk of the R&D for the 2020 installation has to be done during the period of the present proposal. It will, however, build on the successful work of the past 5 years.

Given the significant challenges, the upgrade program has focused on the most difficult areas of the upgrade. These include:

- An entirely new tracker made of more radiation resistant pixel and strip detectors with much less mass in support, cooling and cabling systems, together with lower power consumption per channel.
- New electronics for both the Liquid Argon and the Scintillating Tile ATLAS calorimeters with much improved radiation hardness. An additional goal is to allow examination of the full calorimeter information for newer and more restrictive triggers. Work toward early improvements in the Level 1 trigger using new boards has also begun.
- A new track trigger to allow rapid identification of tracks prior to a level 2 trigger. This will improve triggering, and the rapid identification of b -jets, isolated leptons and tau decays.
- Development of newer and better muon electronics for upgrades to the forward muon system in the 2016 shutdown.

University Participation in Upgrade R&D	
Institution	Areas of Interest
Arizona	Forward Calorimetry and Muons
Boston University*	Trigger DAQ
Brandeis*	Muon System
Chicago*	Calorimeter and Track Trigger
Columbia*	LAr Electronics
Duke	Strip Tracker
Hawaii	Novel Pixel Detectors
Indiana	Trigger DAQ
Michigan State Univ.*	Level 1 Calorimeter Trigger Improvements
New Mexico	New Inner Tracker
NIU	Simulations for Tracker and Track Trigger
NYU*	Strip Tracker
Ohio State	Diamond Detectors and Optical Readout
Oklahoma State	Pixel Detector
Penn	Electronics for New Tracker and LAr
SMU*	Data Transmission Electronics
SUNY Stony Brook	Pixel and Strip Tracker
UC Berkeley	Pixel Electronics
UC Irvine*	Trigger DAQ
UC Santa Cruz*	Pixel and Strip Tracker
Univ. of Oklahoma	Pixel Tracker
Washington	Pixel Tracker
Yale	Mechanics and Powering for New Tracker

Table 2. University participation in Upgrade R&D. Asterisks indicate proposed support from the NSF.

4.4 Education and Outreach

This program of education and outreach by U.S. ATLAS is now in its 14th year. These past and forthcoming periods provide an unparalleled opportunity to share the excitement of new physics with a national audience. The past year saw the start-up at 7 TeV and the first results from the ATLAS experiment. We must share with our stakeholders the excitement and fascination our research generates. We also participate in educating the next generation of scientific leaders by involving students of many levels in our research. Collectively this provides unique goodwill in many communities.

The members of U.S. ATLAS have taken part in hundreds of widely varying activities as reflected in a survey of these members conducted in October 2010. Table 3 shows the breadth of these activities. Since only a fraction of active members responded, the percentages are approximate. The “other” category includes adopt-a-physicist participation, blogging, ATLAS-made interviews videos, Masterclass programs, newsletters, exhibits, podcasts, and various other activities with students. Table 3 does not reflect the activities conducted by the American leadership of global ATLAS Education and Outreach, which is described further below.

Type of activity	percent
Lecture	29%
Magazine article	14%
Other interview	7%
TV interview	6%
Radio interview	4%
Science cafe	5%
Tours at ATLAS	>5%
QuarkNet etc.	>4%
Open house	3%
Webcast	2%
Op-ed article	1%
Other	16%

Table 3. Outreach Activities. This is the result of a poll conducted in U.S. ATLAS. We know that not all outreach activities are represented in these numbers.

At the signing of the LHC agreement, Dr. Neal Lane, then Director of the National Science Foundation said: “Major discoveries like the top quark and antimatter make headlines on the front pages of the world's major newspapers. Whether readers fully appreciate the significance of these breakthroughs is another matter altogether. That is why this agreement places such a high priority on public education and outreach. Each of the U.S. detectors has named an education coordinator to its senior program management teams. You'll also see that the integration of research and education stands out as a primary objective and responsibility within the overall U.S. investment strategy.”

This directive has been fully carried out in the ensuing years. The global ATLAS education and outreach programs have had U.S. leadership for the past 14 years. In the activities described below, many U.S. ATLAS people have been involved.

One of the earliest projects was the production of the “ATLAS Movie”, which won gold medals at four international film festivals. It was followed by the production of two popular animated features that described the construction of ATLAS and how the detector works. At this time, ATLAS has produced 32 videos. All are on the ATLAS website,²³ as well as on the ATLAS YouTube site, where they have had 600,000 viewings (one has 125,000 viewings, and many have the highest possible rating). The LHC Rap video (produced by an American employee of ATLAS) became a “viral” hit and has had 6 million viewings.

More recently, people within U.S. ATLAS have taken the lead in producing exciting animated versions of actual events recorded by ATLAS. Another popular feature was a movie of interviews with people in ATLAS (many U.S. ATLAS people). To give a perspective of the enormous task of constructing ATLAS, a time-lapse video was made in which ATLAS is built in 1 minute (with 3 and 5-minute versions too).

ATLAS maintains a public website (based at LBNL) that has received 13 million page views in the past years, with over 3 million expected this year. These pages are updated daily with news, videos, photos, live and special event images, resources, products, and links to everything for students and the public. The site has a news ticker with top stories from within ATLAS, as well as top stories about ATLAS from the news media. U.S. ATLAS people are prominent in writing the internal news stories about developments in ATLAS.

The website contains an extensive and well-organized collection of photographs of the detector, control room, people, and occasions. The majority of these photos were taken by U.S. personnel. Also on the website is the ATLAS Control Room blog, which has several U.S. ATLAS personnel amongst the bloggers. The Twitter site gives headlines from the blog site.

U.S. ATLAS education and outreach leadership as well as many others have been proactive in communicating with local newspapers as well as the New York Times, television, radio, PBS, science magazines, news magazines, etc. These interactions have led to many major stories that have reflected well on the U.S. ATLAS program. Even the production of a huge mural directly above the ATLAS cavern received substantial and favourable coverage (including from arts publications). U.S. ATLAS outreach leadership led the media training for the start-up events, and also led planning for media contingency in the case of problems due to ATLAS.

A major goal of ATLAS has been the development of programs that allow high school students to analyze actual data from collisions in ATLAS. These programs proceed to two variations:

- a) Teachers are trained by physicist mentors, and then students analyze data in their classrooms.
- b) Students attend “masterclasses” at ATLAS institutions, where physicists guide them through hands-on activities with these real data.

In the first case, the primary example of this is QuarkNet, which was founded by U.S. ATLAS and U.S. CMS in response to the directive from then NSF Director Lane. In the second case, the initiative was greatly enhanced by a major grant from the EU Commission that helped develop the computer programs that students use in analyzing data.

U.S. ATLAS has led the production of many educational products and materials for students and the public. These have included:

- a) Various brochures: general, technology transfer, computing, fact sheets, technical, etc.

- b) A 24-page Booklet on *Antimatter and Other Mysteries of the ATLAS Experiment*
- c) A 3D Viewer with slides of the detector and actual events
- d) A very new brochure on the physics of ATLAS
- e) A Pop-up book about ATLAS detector and physics, now in second printing, on sale on Amazon (etc.) plus many bookstores. It is an extremely popular item.
- f) A full-color photo book documenting the ATLAS Experiment.

In connection with the launch of the pop-up book, a major event was held at the New York Academy of Sciences earlier this year. It had a standing-room only audience of 330 people, plus a number of reporters including Dennis Overbye from the New York Times. The actor Alan Alda was the moderator, and the speakers included Lisa Randall and Michael Tuts. Book signing followed.

The release of a major Hollywood feature film (*Angels & Demons*) with a five-minute segment filmed in ATLAS provided an extraordinary opportunity for ATLAS outreach to the public. U.S. ATLAS personnel travelled to Sony Pictures in Los Angeles on two occasions to meet with high-level personnel in order to maximize the communications opportunities. One result of this was that the DVD release of *Angels & Demons* includes a 15-minute featurette (extra) about CERN and ATLAS. U.S. ATLAS guided the content of this featurette. Many U.S. ATLAS personnel took part in a special nationwide lecture series that drew in very large audiences. These lectures connected the physics of *Angels & Demons* with the physics of LHC. Many other later lectures were initiated by this process.

Many more activities have occurred than there is space to describe. A few of them are:

1. Exhibitions and special events at CERN and elsewhere.
2. A very well-attended session at a meeting of science centers.
3. LHC startup events including ATLAS achieved national and worldwide attention.
4. New ATLAS visitor center adjoining the ATLAS Control Room.
5. Large U.S. ATLAS participation in an extensive program of tours of ATLAS.

5 Proposed Research for 2012-2016

5.1 Maintenance and Operations

During 2012-2016 the LHC will operate at increasing luminosity and energy but will be shut down for two 15-month periods. During times of beam operations the detector must be maintained with relatively short access periods when broken electronics modules can be swapped, etc. The longer shutdowns will allow more extensive repairs and upgrades to be undertaken. The first shutdown starts in 2012 when the bus bar splices between the LHC magnets will be reworked, and the second is scheduled for 2016. Planning for these long shutdowns when the detector will be opened allowing extensive repairs is the major focus of the M&O component of this proposal.

An update of the LHC running schedule will be made at the Chamonix LHC Workshop in early January 2011. Of note at this writing (December 2010) is a dialog between managements of CERN and the LHC experiments concerning the continued operation of the LHC during 2012. This run plan would enable significantly more data to be accumulated during the first running period of the LHC but would delay the 2012 shutdown, thereby delaying accelerator and detector improvements by one year and perhaps delaying the second shutdown until 2017.

5.1.1 Inner Detector

A considerable amount of work is planned for the Silicon Tracker during the year-plus shutdown starting in 2012. We seek NSF funding to support UCSC personnel to contribute to the overall operation of the Si-tracker and in the short-term to develop a solution to the VCSEL lifetime problem, see Table 4.

The cooling plant will be refurbished with new compressors of a more reliable design. These new compressors are now being extensively tested in the surface building under real operating conditions to prove their reliability. Another change being considered is to move the compressor plant to the surface instead of having it housed in an underground service cavern as it is now. This would allow gravity to increase the pressure of the compressed fluid cycle thereby lowering the operating temperature of the detector cooling loops. This would be very desirable as the detector undergoes more radiation damage. A decision on this change of location will be made early in 2011.

Once the Inner Detector end plate is opened, an investigation will be made to better locate the leaks inside the detector, in particular the one in the disabled SCT cooling loop. They will be repaired if this can be done without further intervention than is already planned. Given past involvement with the commissioning and repairs to the cooling system, some U.S. technical support will be expected for this work.

The VCSELs devices located in the service cavern USA15 are being replaced as needed with very little effect on operational uptime, however, there is great concern that the Pixel on-detector VCSELs may also start to fail when their on-time starts to approach that of the clock/trigger/command transmitters. Replacement of these devices will require a major intervention of the Pixel detector. A large effort is underway to understand the failure cause and correct it. Also, a parallel effort is preparing for a possible intervention to replace the Pixel on-detector VCSELs during the 2012 long shutdown if this should prove to be necessary. U.S. institutions, including UCSC (NSF) and OSU (DOE), are actively involved in performing lifetime tests of the VCSELs of the type on detector as well as tests to determine the cause of the off-detector failures. If a full intervention of the Pixel detector is deemed necessary for 2012, this will require extra contribution of U.S. personnel at CERN supported by the DOE Operations Program. These plans are still being formulated. Assuming the cause of the off-detector VCSELs has been found, they will be all replaced with new units that correct the problem. This could be a new, more robust technology, new packaging or new electrical support, whatever is required to achieve the industry expected >100,000 hours lifetime.

The current LHC schedule for spring 2013 through late 2015 plans for proton collisions at the target center of mass energy of 14 TeV. That will be 27 months of operation with only two 2-month shutdowns around the intervening winter holidays, a long haul that will certainly test the robustness of the LHC and the detectors. Our goal is to maximize the uptime of the Silicon Tracker. Given that most of the U.S. responsibilities are inside the detector, which cannot be opened, only small amounts of technical support are anticipated during this period to handle system electronics issues as they arise, for example, fractional FTE EE and technician support from UCSC. Most of the operational responsibilities will fall to physicists and graduate students resident at CERN.

At the end of 2015, another long shutdown is anticipated lasting through all of 2016. The focus of this shutdown for the Silicon Tracker will be the installation and commissioning of the IBL. The U.S. University responsibilities for this project are already covered by an NSF-MRI grant and will not be discussed further here. Other maintenance work may be scheduled for this period based upon issues

arising during the long three year run but no specific plans exist at this time (to be supported by the DOE Operations Program).

	FY12	FY13	FY14	FY15	FY16
Silicon M&O					
EE (FTEs)	0.08	0.08	0.08	0.08	0.08
Tech (FTEs)	0.67	0.67	0.67	0.67	0.67
Total Costs (Labor and Material)	137.54	141.67	145.92	150.30	154.81

Table 4. Requested NSF Operations Silicon M&O labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support UCSC.

5.1.2 Liquid Argon Calorimeter

The U.S. universities involved in the M&O of the LAr system requesting NSF funds are Columbia Nevis, SMU and Stony Brook, see

Table 5. These institutes are essential for maintaining the efficient operation of the LAr system. In particular, Stony Brook is responsible for the HV system, SMU for the optical couplers (OTx) that are used in the transmission of data from the pit to the off-detector RoDs, and Columbia for the testing and operating of the LVPS as well as supplying expertise for the OTx replacements.

The delivery of the new LVPS units will start in 2011. These will undergo extensive performance, radiation and lifetime testing. They will be installed on the detector during the 15 months shutdown scheduled to start in 2012. The period of commissioning will extend through a large fraction of 2013. In addition to modified slow control boards that will be installed at the same time, a major modification of the control and monitoring software and various on-line display panels will be needed.

The production of the redundant OTx units is contingent on the ATLAS Collaboration endorsement. If the go-ahead is given the replacement would take place during the 2012 shutdown and would require installation of additional optical fibers. The corresponding commissioning stage would extend through 2013.

The projected increase of the LHC currents and collision luminosity is likely to necessitate major TDAQ, on-line monitoring and control changes in order to run smoothly during 2012-2016. These monitoring and control changes, together with projected reduction of the on-line shift personnel will require a new layer of the on-line software and the integration of the data acquisition system of LAr and Tile calorimeters.

As recently discussed by Stony Brook personnel at the ATLAS DCS Workshop (June 14-16 2010), a new OLE for Process Control (OPC) technology is now available. Called the OPC Unified Architecture (OPC-UA), it is virtually platform-independent. We have started an internal discussion focused on this approach. The new technology allows us to migrate the HV system to a Linux platform, thereby improving the operational stability of the HV control servers.

The ISEG OPC server has proven to be the weakest link in the LAr HV control software and requires a significant overhaul. Based on Microsoft Windows proprietary technology and developed by the HV PS manufacturer Iseg, it is still not 100% reliable. We have already received a proposal for the development of an OPC-UA server from Iseg, where the bugs that affect the current release would be fixed by a fully re-written code. If the decision to migrate towards the OPC-UA architecture is taken, an intense test phase will start to debug the new OPC server and test the control software, which will be unchanged, operating in a Linux environment. The PVSS SCADA development tool for Linux exists and all the control scripts are interpreted, so no compilation problems are expected.

The first test phase of the Linux OPC-UA in a test machine is foreseen for late 2011 and the successive migration of the whole HV system is foreseen in 2012, at the end of the first LHC physics run.

During the planned 15-month 2012 shut-down, repair of accumulated faults will be required, and this may involve also repair and changes to the on-detector components of the LAr HV system. Depending on operational experience and expectations for running in 2013 and beyond, we may decide to change resistor components in the HV filters to reduce voltage drop in the filters. We will probably want to overhaul the HV PS modules as well, and we expect a prototype higher-current HV PS module from Iseg sometime in early 2011 for testing.

	FY12	FY13	FY14	FY15	FY16
LAr M&O					
EE (FTEs)	2.00	2.00	2.00	2.00	2.00
Tech (FTEs)	0.20	0.20	0.20	0.20	0.20
Total Costs (Labor and Material)	390.39	402.11	414.17	426.59	439.39

Table 5. Requested NSF Operations LAr M&O labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support SMU, Stony Brook, and Columbia Nevis.

5.1.3 Scintillating Tile Calorimeter (TileCal)

The University of Chicago, NIU and MSU are the NSF institutes of the TileCal system, see Table 6 for the request. Personnel from the University of Chicago propose to continue the maintenance and monitoring work on the front-end electronics they constructed as well as to continue to operate the calibration and test facility. NIU will contribute to the online and offline data quality assessment and MSU will be responsible for the Drawer (which contain PMT and frontend electronics) maintenance.

The need for M&O activity is especially strong when the detector is open and the hardware is accessible. This occurs in December through February each year. The work involves replacing faulty components and bringing the system back into operation. Since the time is limited the pace is intense and requires at least 2 shifts per day. Outside these periods, effort is needed to repair the components removed, to maintain and operate the test facility in Building 175 as well as to perform calibrations and to further refine the calibration systems.

During 2012 shutdown the Tile Calorimeter plans to replace all 256 low voltage power supplies as well as to repair any other faults in the system. A similar shutdown is planned in 2016 when the crack and gap scintillators located between the barrel and endcap calorimeters should be replaced. These scintillators provide valuable information but are subject to radiation damage. By 2016 they are expected to need replacement. Some of the labor costs for this work are included in the totals below.

Another element of on-going work is maintaining and updating the analysis software associated with the calorimeter. New capabilities must be added and speed bottlenecks removed. We plan ½ FTE for this work on a continuing basis.

	FY12	FY13	FY14	FY15	FY16
Tile M&O					
EE (FTEs)	0.10	0.10	0.10	0.10	0.10
Computer Professional (FTEs)	0.50	0.50	0.50	0.50	0.50
Tech (FTEs)	3.00	3.00	3.00	3.00	3.00
Total Costs (Labor and Material)	392.90	404.69	416.83	429.33	442.21

Table 6. Requested NSF Operations Tile M&O labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support Chicago, MSU, and NIU.

5.1.4 Muon Spectrometer

Boston, Brandeis, the University of Michigan and UCI groups proposes to the NSF to continue providing computer professional, technical and engineering personnel to maintain and operate the muon system, see Table 7. Boston and Michigan will concentrate on the M&O of the MDT chamber system, Brandeis on the endcap alignment system and UCI to maintain and operate the off-chamber data acquisition of the CSC tracking chambers.

During FY12 efforts will concentrate on the commissioning of the EE-chambers in the cavern following their certification in Building 191 during 2011 and installation in 2012. Twelve of the 62 EE chambers have been installed in ATLAS in 2009. The remaining 50 chambers are now stored in Building 191 at CERN. Michigan, Boston, Brandeis, Harvard (DOE supported), et al. will contribute to the EE commissioning in Building 191 for readout electronics and gas tests. Michigan faculty and staff are the key personnel for the EE chamber commissioning. The UM, Harvard. Boston and Brandeis students will also make contributions to the tasks.

Planning is underway to replace the current Small-Wheel chambers with new chambers that could handle much higher rate at luminosities beyond $10^{34} \text{ cm}^{-2}\text{s}^{-1}$. At the moment, the technical choice of the new Small-Wheel detectors has not been determined. The UM group is expected to be part of the working team to test the new detectors and to implement the online configuration DB for DAQ with new detectors.

The Michigan group will continue monitoring MDT readout performance as the LHC luminosity increases. One major task is to monitor the MDT noise and beam background. In case the single tube rate exceeds 50 kHz, the Amplifier Shaper Discriminator (ASD) threshold must be raised in the readout chain to minimize MDT readout inefficiencies. In addition, the DCS quantities must be monitored continuously

and the corresponding monitoring data needs to be added to the conditions database (voltages and temperatures of ~18,000 frontend electronic cards & power supplies; ~13,000 on-chamber temperature sensors; ~2,000 Hall probes and many gas parameters).

Michigan electronics personnel will monitor the front-end board failure rates and establish a repair or replacement program for faulty boards. Some boards have already been exchanged during commissioning and can serve to define future repair options. About half of the CSM boards removed have been found to function fully and will be returned to the spares pool. Our spares count of ~5% is likely to be adequate for the possible upcoming ~2 year run. Depending on the survival rate for front-end cards, we may or may not need to supplement our spares.

The gas monitor operation relies on the combined efforts of the Michigan group working in collaboration with an Israeli group. Routine tasks are daily system checks, internal calibrations, computer and analysis software upgrades, specialized data analysis, routine maintenance and shutdowns, maintenance of network and communications channels, repairs of instrumentation faults and instrumentation upgrades. This work is ongoing and essential to maintain smooth operation.

Precise MDT calibrations are crucial for identifying muons that decay from high mass objects. The major challenges are to develop methods to handle the MDT drift spectra with pileup events, develop new techniques to reject cosmic ray and beam halo contaminations in special Level 2 calibration streams and carefully monitor the T0 “jumps” from run to run and to make the corresponding corrections in the calibration DB. The goal is to provide precise calibration constants and validate these constants promptly for muon reconstruction used in physics analyses. These tasks will be mainly carried out by scientific staff at the Michigan Calibration Center.

Brandeis University proposes to maintain and operate the endcap global alignment system (EGAS). The EGAS is composed of many interlinking optical alignment lines readout by precision sensors.

Throughout 2012-2016, UCI will maintain and operate the CSC off-detector electronics and data acquisition systems, for which it holds primary responsibility. UCI will also play an important role with collaborating institutions in day-to-day CSC operations and data quality checking during data-taking periods and in hardware maintenance and software updates during shutdowns. Maintenance and operation of the CSC off-detector electronics and data acquisition system will include activities such as: routine replacement and repair of failed hardware; updates to data acquisition code to satisfy newly identified functionality requirements, to improve operational efficiency, and to maintain compatibility with ATLAS global data acquisition code; and maintenance of test beds for off-detector electronics and for chambers.

Day-to-day support of CSC operations during data-taking will include providing on-call expertise, support for calibration runs, data quality checking, performance assessment using recorded collision data, and resolution of problems identified. During shutdowns, UCI will provide support for chamber repairs and checkout and will contribute to other system maintenance activities. 2012 shutdown activities will include removal and repair of two chambers with broken wires and repair or replacement of faulty on-chamber electronics boards. (The BNL group has primary responsibility for the chamber repair and maintenance activities.) UCI personnel involved in these activities at all times will be faculty, technical staff, two postdocs, and one to two graduate students.

	FY12	FY13	FY14	FY15	FY16
Muon M&O					
ME (FTEs)	0.50	0.50	0.50	0.50	0.50
EE (FTEs)	0.75	0.75	0.75	0.75	0.75
Techs (FTEs)	4.00	3.00	3.00	3.00	3.00
Computer Professional (FTEs)	2.00	2.00	2.00	2.00	2.00
Total Costs (Labor and Material)	778.76	740.33	762.54	785.42	808.98

Table 7. Requested Muon Operations Muon M&O labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support Boston, Michigan, UCI and Brandeis.

5.1.5 Trigger and Data Acquisition System (TDAQ)

The TDAQ institutes are UCI and MSU. With this NSF CA funding they propose to continue their support for on-going operation, both during beam time and the planned shutdowns, see Table 8. As in the past, they will participate in the commissioning of new HLT hardware. Currently only 50% of the final HLT CPU capacity is installed (20% of the event filter). It is expected to be finalized over the next years as computing power is required, especially with the upgrade to design energy of 14 TeV and the ever-increasing luminosity. In addition there is a replacement cycle of the existing hardware.

Members of the MSU group will continue the data quality monitoring (DQMF) efforts. The tasks of this on-call expert are to maintain the reliability of the DQMF and continue its development as the ATLAS experiment records data with triggers and signatures that increase in complexity over time. Besides the database work, this also involves communication with all of the trigger signature groups to stay up-to-date on proposed configurations and to implement database updates corresponding to trigger changes. MSU staff will continue working on the HLT, dataflow and trigger development and monitoring, and as cosmic signature group convener as well as trigger on-call expert.

In the DAQ/HLT area both UCI and MSU are planning to contribute to evolutionary improvements of the current dataflow and HLT system. Initial discussions on this have started inside the TDAQ subsystem to follow the increased demands on the trigger system as the luminosity increases. The new design takes advantage of the large common code base which is already shared by the Level 2 and Event Filter software and proposes to merge the two systems into a single one. An additional advantage will be the reduction in the overall number of dataflow applications compared to the current system (by a factor of two) and the consequent simplification of the overall architecture. Additional flexibility in the trigger strategy will be gained by removing the strict boundary between ROI-based algorithms and those operating on a full event.

The new architecture requires modifications in many areas of the dataflow, HLT and trigger steering and menu as well as the network setup. In all these areas, members of UCI and MSU hold key developer positions. The timescale for the deployment of such a system would be after the 2012 shutdown when a large increase in luminosity is anticipated.

The overall TDAQ software will have to adapt to the existence of machines with many more CPU cores than in the past. Though already multi-threaded in nature, the current system does not take advantage of more than a few cores, let alone the parallelism available in upcoming vector operations for standard

Intel chips, or GPGPUs. It is expected that modifications will be necessary in all parts of the software, including the infrastructure for monitoring and run control.

	FY12	FY13	FY14	FY15	FY16
TDAQ M&O					
Computer Professional (FTEs)	5.85	5.85	5.85	5.85	5.85
Total Costs (Labor and Material)	655.45	675.11	695.36	716.22	737.71

Table 8. Requested NSF Operations TDAQ M&O labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support MSU and UCI.

5.1.6 Technical Coordination

Brandeis University (NSF) proposes to continue working with BNL (DOE) on technical coordination issues, see Table 9. The TC activity will concentrate on the technical aspects of installing, integrating and aligning the muon EE chambers. It is expected that all 50 of these chambers will be installed and integrated during the 2012-2013 shutdown. Thereafter, TC work will be devoted to the technical aspects of installing the IBL.

A major improvement to the ATLAS pixel system is the addition of the IBL to increase tracking robustness and precision. To achieve this objective a 7.4 meter section of the existing beam pipe has to be removed and a new beam pipe containing the additional pixel layer has to be inserted. This requires a special tool, called the Long Guiding Tube (LGT), to be inserted into the beam pipe to support it during the removal process. The same tool will be used to insert the new beam pipe with the additional pixels.

Beam pipe extraction consists of opening the Inner Detector ends, removing the external beam pipe sections, and freeing the beam pipe from services. Then the LGT is inserted into the beam pipe and supported at both ends. With the LGT in place, the beam pipe can be disconnected from its present support and the full mechanical load taken. The main problem is deflection (gravity sag) of the beam pipe in the pixel detector region during the extraction and reinsertion. Deflection of even a few millimeters can damage the existing pixel detector. The LGT Tube cannot be a simple object, as that will not achieve the required sag control. A complex tool (active and pretensioned) is required to insure that as the beam pipe is extracted and the load on the LGT changes, a control system changes the tensions rods to adjust to the new load configuration without the LGT changing its shape. An additional requirement is that this activity be controlled remotely to reduce human radiation exposure from the activated beam pipe.

Because of the Brandeis expertise with active alignment bars, they were asked by ATLAS TC to design this tool. This includes the mechanical design of the LGT, the instrumentation to monitor the shape of the tube and the tension in the tensions rods and a remote control system that will control the operations of the tube and the extraction of the beam pipe.

At this writing, Brandeis has a design and has built a 6 meter prototype. The prototype will enable development of the LGT concept including the internal instrumentation to determine shape, ancillary instrumentation for monitoring performance and the writing of the necessary control program. When this is complete (expected around January 2011) Brandeis will build a 7.4 meter prototype to be shipped to

CERN where a full sized mock-up of the relevant parts of the Inner Detector are being built to practice IBL installation and establish pixel safety procedures.

Other activities of the Brandeis group have been the continued work on the integration of the EE chambers into the ATLAS detector. Several issues have been studied including installation clearances, placement of services, and the ability to access chambers once installed.

	FY12	FY13	FY14	FY15	FY16
TC M&O					
ME (FTEs)	0.50	0.50	0.50	0.50	0.50
Tech (FTEs)	0.75	0.75	0.75	0.75	0.75
Total Costs (Labor and Material)	154.63	159.26	164.04	168.96	174.03

Table 9. Requested NSF Operations TC M&O labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support Brandeis.

5.1.7 Common Funds

Other items that are covered in the M&O component include the so-called “common costs”. This component is based on the full cost of running the ATLAS detector (consumables, some personnel, etc). The costs are agreed to by an international CERN group called the Resource Review Board (RRB) that has representation by all ATLAS funding agencies. These common costs proposed by the ATLAS collaboration are carefully scrutinized by a subcommittee of the RRB, the Scrutiny Group (which has a U.S. representative).

The common costs are divided into two categories, “A” and “B”. The sum is the total operating cost for ATLAS (determined in CHF). The category A costs include items shared by the whole collaboration including TDAQ while the category B costs are specific to the various systems: Inner Detector, Liquid Argon Calorimeter, TileCal and the Muon Spectrometer. The share to be paid by the U.S. is apportioned according to the fraction of PhD authors for any given country. The NSF CA share requested in this proposal proportional to the number of Ph.D. authors supported by the NSF base research program is about \$3.9M over this period with the balance being provided by the DOE component of the Operations Program.

5.2 Physics Support and Computing

In Sections 4.2.1-4.2.3 we described the physics analysis support and computing program that we have developed over the last four years. Motivated by the success of this program in building U.S. software professional expertise through which we leverage the detector performance and physics analysis knowledge of U.S. physicists, we propose to extend these parts of the program essentially intact for the period of this proposal. The program has had a positive impact on the overall U.S. ATLAS program goal of enabling U.S. leadership in ATLAS physics analysis and improving the ATLAS software in areas of importance to the US. We revisit some highlights of this in Sections 5.2.1-5.2.2 below, together with comments on the proposed continuation and the anticipated activities over the next five years.

In Sections 4.2.4-4.2.5 we have described the computing infrastructure and Tier 2 computing centers built over the last four years that have made the U.S. the foremost regional computing provider in ATLAS, both for production and analysis. We propose to continue the program that has built this success, following closely the architecture currently in place but making some changes to leverage new opportunities and prepare ourselves for the data onslaught that the LHC will deliver through 2016. Sections 5.2.3 and 5.2.4 describe these plans, on the foundation of the detailed description of the present distributed facility found in the earlier sections.

5.2.1 Physics Analysis Support

As described in Section 4.2.1, there are three primary components of our physics analysis support program: the U.S. analysis forums; the three Analysis Support Centers; the Physics Analysis Jamboree program supported by the ASCs, our technical staff, as well as U.S. ATLAS scientists; and a program in analysis tool software development. Support for these activities presently comes from a mix of DOE and NSF sources. Support for the analysis tools work at Indiana (Physics Analysis Workbook) will come from DOE for 2012 and beyond. In a survey of U.S. ATLAS institutes on analysis support needs in January 2010, improving documentation was the foremost concern of the community, and this need will only grow in the future as analysis activity continues to ramp up. We also propose to transfer the NYU work to the NSF, see Table 10, 1/2 FTE on physics analysis tools and specifically on developing the highly successful D3PD infrastructure, and supporting its use and other analysis chain components on U.S. Tier 3s. Presently this effort is supported by DOE funds. The great success of D3PD standardization is something we must continue and build on, and we foresee a continuous program through 2016 in supporting end-user analysis tools, with as much standardization across ATLAS as possible.

	FY12	FY13	FY14	FY15	FY16
Analysis Support					
Computer Professional (FTEs)	0.50	0.50	0.50	0.50	0.50
Total Costs (Labor and Material)	55.16	56.82	58.52	60.28	62.09

Table 10. Requested NSF Operations Analysis Support labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support NYU.

5.2.2 Developing and Maintaining ATLAS Core Software

As described in Section 4.2.2, the U.S. program in ATLAS core software has a long record of success in its core elements of control framework, data management and distributed software. With most of the effort lab-based, the NSF contribution has been relatively small, but unique and valuable. We use university-based activity to leverage specific university-based expertise in core software. There are presently two such cases, both supported by NSF, see Table 11. The Pittsburgh work (1 FTE) on detector geometrical description and related areas such as geometry database and detector/event visualization has delivered the ATLAS standard systems in this area, a great success given the area's previous instability. Continuing this program, building on the deep ATLAS knowledge accrued by the Pittsburgh group in these areas over the last four years, will have a very high return. Similarly for the PanDA effort supported

at UTA. This work draws on the central role of UTA (1.42 FTEs) not only in the leadership and development of PanDA but also in U.S. and ATLAS-wide leadership in computing operations, which informs their PanDA effort with the rapidly evolving real-world needs of day-to-day ATLAS production and analysis. ATLAS computing practice and policy has been dynamic enough in the first year of data-taking that it is clear this close development/operations connection is vital and will remain so.

The support for university based software professionals working on detector software, described in Section 4.2.3, has enabled U.S. ATLAS physicists to leverage the detector expertise housed in U.S. universities (which often built the hardware) towards major contributions to the detector software upon which their physics analyses depend. The software professionals, all with a physics background, also constitute a resource for direct assistance with the detector software specifically and the ATLAS software generally. The program has been popular both with the U.S. ATLAS physics community and with the developers themselves; the corps of developers hired initially is still in place, and they have the deep expertise and prominent ATLAS roles to show for it. The specific roles of these developers has evolved over the four years, and will continue to do so; we anticipate that they or their eventual successors will be just as valuable in the coming years as at present, so we propose to extend the NSF support for 1.0 FTE in this area (U Mass Amherst) through 2016.

	FY12	FY13	FY14	FY15	FY16
Software					
Computer Professional (FTEs)	3.42	3.42	3.42	3.42	3.42
Total Costs (Labor and Material)	494.58	509.42	524.70	540.45	556.66

Table 11. Requested NSF Operations Software labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support Pittsburgh, UTA and UMass.

5.2.3 Computing Infrastructure in ATLAS: Computing and Networking Challenges

With the distributed computing systems and service of ATLAS and U.S. ATLAS now established and successful, the focus of the next five years will be on operational support as the scale of operations increases dramatically with integrated luminosity and analysis activity. Within this operations focus, essential development activities will be important as well to ensure the scalability of our software systems tracks what is required as ATLAS computing needs grow. Here we describe these operations-oriented activities at the two facilities where it is supported by the NSF, MWT2 (U Chicago) and SWT2 (UTA).

Computing Facility Integration

The Computing Facility Integration Program was organized in 2007 to integrate into a single distributed computing facility all components of the U.S. ATLAS computing “cloud”, i.e. the resource as it appears to its users and operators. This includes coordination of facility upgrades, deployments of grid and ATLAS services, and site-level operations at each of the computing centers in U.S. ATLAS including Tier

1, Tier 2s and increasingly Tier 3s. Each quarter year a set of tasks is defined such as upgrades or fresh deployments of OSG software, local ATLAS services including releases, web caches, data management services, and benchmarks of analysis and/or network throughput performance. Coordination of purchases of computing equipment (CPU and storage) is made so that ATLAS requirements are met and pledges are satisfied with leveraged pricing. The program organizes a forum for tight coordination with U.S. ATLAS computing operations, anticipating and responding quickly to functional or performance issues, and planning for periods of heavy processing loads. We propose to sustain the current level of support for this activity at a level of 0.4 FTE, see Table 12.

	FY12	FY13	FY14	FY15	FY16
Facilities Integration					
Management (FTEs)	0.40	0.40	0.40	0.40	0.40
Total Costs (Labor and Material)	123.81	127.52	131.35	135.29	139.35

Table 12. Requested NSF Operations Facilities Integration labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support University of Chicago.

Facilities Grid Storage and Data Management

This area covers development and support of utilities for efficient Tier 2 data management and access. Examples are tools to validate consistency between datasets stored at the Tier 2, the local file catalog, the storage system name server, and filenames on disk. A local caching framework, *pcache*, was developed at MWT2 to allow re-use of files on worker nodes by subsequent jobs which reduced load on the storage services by as much as 40%. Pcache has been adopted by several sites in the U.S., UK and CERN. Performance optimization for access to local storage for analysis jobs depends on efficient access to data, either from local disk or from network attached storage, and therefore this has been a major focus of activity. An important current and future activity is on extending the xrootd storage system to support distributed access to Tier 2 storage systems, also with great potential as a means of sharing data among Tier 3s in a manageable and scalable way. We propose to sustain support for this activity at a level of 1 FTE, see Table 13.

	FY12	FY13	FY14	FY15	FY16
Grid Storage Development					
Computing Professional (FTEs)	1.00	1.00	1.00	1.00	1.00
Total Costs (Labor and Material)	174.45	179.69	185.08	190.63	196.35

Table 13. Requested NSF Operations Grid Storage Development labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support University of Chicago.

Computing Operations

When ATLAS readied itself for LHC operations a few years ago it established the ATLAS Distributed Computing (ADC) group which integrates operations and development responsibilities. The UTA group has a long history of leading Monte Carlo production, integration of facilities operations, and distributed analysis support, and has assumed leadership responsibilities in ADC. These efforts are tightly integrated with the PanDA software development effort at UTA, working in close partnership with BNL. We request ongoing support at the level of 3.6 FTEs at UTA for these cross-cutting activities. This will support two Deputy Computing Operations Coordinators (2 FTEs) in charge of resource management (storage and CPU) and Distributed Analysis coordination across all US facilities. Currently, over 14 PB of storage is deployed in the US, in Tier 1 and Tier 2 sites, containing tens of millions of files. Operational coordination of these resources is vital to the success of the physics program. The remaining 1.6 FTEs request at UTA supports Monte Carlo (MC) production, reprocessing, software validation, Tier 3 PanDA support, distributed analysis support and other critical operational tasks, see Table 14.

	FY12	FY13	FY14	FY15	FY16
Computing Operations					
Computer Professional (FTEs)	3.58	3.58	3.58	3.58	3.58
Total Costs (Labor and Material)	471.47	485.62	500.19	515.19	530.65

Table 14. Requested NSF Computing Operations labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support University of Texas, Arlington.

5.2.4 Tier 2 Computing Centers

The institutional makeup of the Tier 2s four years ago was decided through a rigorous review process in order to select the Tier 2 sites. The evaluation of the proposals was based on the delivery of effective computing capacity, consisting of the raw capacity which would be made available, the effectiveness with which the capacity was delivered, and other site benefits. In the last 5 months we have conducted an extensive cost/benefit review of the now well-established Tier 2 centers, in order to evaluate how we should proceed for the future. We also invited each of our Tier 2s to submit a proposal describing their plans should their Tier 2 continue for another five years, including what local resources their consortium members would contribute. In order to ensure an open process that welcomed potential new entrants into the Tier 2 program, we repeatedly used the U.S. ATLAS Institutional Board as the channel to invite U.S. institutes with potential interest to come forward.

All presently participating Tier 2s, and all their active consortium members, expressed strongly that they wish to continue to participate. The proposals received from all of them are strong expressions of intent to contribute through 2012-2016 as they have so successfully for the past four years. The consortium members also plan to continue making significant local contributions, as described below. The cost/benefit performance of the Tier 2s are broadly comparable, all are among the top performers among ATLAS

computing sites globally, and all have developed strengths and contributions well beyond the delivery of computing capacity, as described in Section 4.2.5. Accordingly we have decided to support the involvement of all existing Tier 2s in the 2012-2016 program, and we seek their continued support with this proposal.

The solicitation for new sites interested in participating yielded two expressions of interest that proceeded to proposals, and of those, one was selected for inclusion in this proposal, based on the strength of its potential contribution to the U.S. ATLAS Distributed Facility. The establishment of a new Tier 2 site depends of course on the outcome of this proposal and the funding level. The potential new site is a collaboration between The University of Illinois and its supercomputing center, NCSA. A condition on any new entrant was that they join an existing Tier 2 consortium, so as not to dilute our funding with the expense of establishing an autonomous new Tier 2 but instead leverage the expertise and resources of an existing Tier 2. Illinois/NCSA after in-depth discussion with a number of Tier 2s has arranged with MWT2 to develop an integration plan with them, outlined below.

As an outcome of the cost/benefit analysis we present here our current best understanding of how Tier 2 capacity will evolve in terms of CPU and disk over the 2012-2016 period, under defined funding assumptions, and what the cost will be to fund the capacity that we estimate will be required to support U.S. and ATLAS analysis out to 2016. ATLAS does not presently have official resource requirements estimates beyond 2012, so we have created estimates to 2016 based on present knowledge of LHC running schedule, luminosity, data volume, and processing requirements from simulation, reprocessing and analysis. The estimates include a 20% component dedicated to U.S. use, such that the community that built the very successful U.S. facility has some preferential access to it for physics analysis. These estimates are shown in Figure 4. Specifics of how these estimates were calculated, together with details on the U.S. ATLAS Tier 2 centers and their plans for 2012-2016, are found on a supplementary web page.²⁴

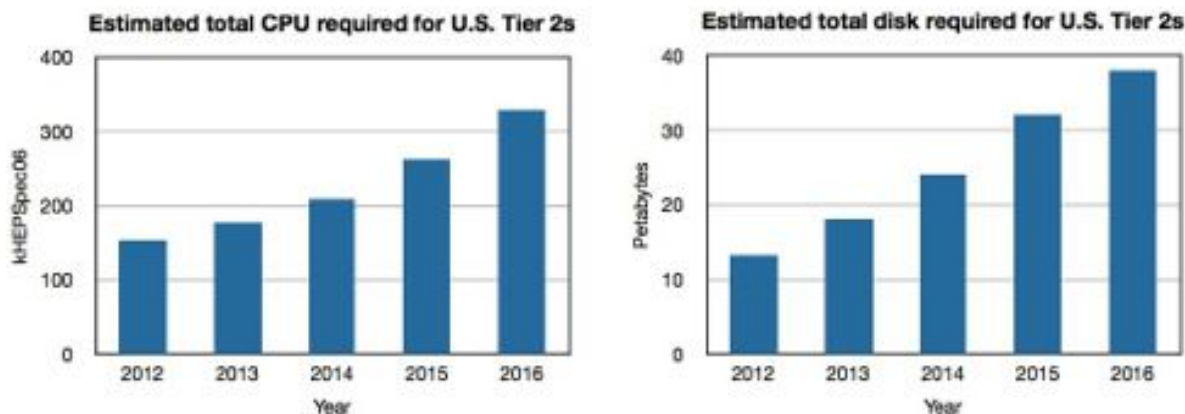


Figure 4. Estimated CPU and disk capacity required for U.S. Tier 2s 2012-2016, total across all five Tier 2s.

In translating funding level to delivered capacity we use the costs outlined in Table 15 to determine the impact of future equipment funds on computing and storage resource capacities. Both CPU (HepSpec06) and disk (TB) assume a 3-year "Moore's Law" doubling time (factor of 1.26 per year). That is, for a fixed cost the procured capacity increases by a factor of 1.26 every year. The cost estimates are based on typical Tier 2 hardware pricing in Fall 2010, e.g., storage includes "delivered useable" TB,

including a powerful server and 10 Gbps networking. We assume a 60/40 split in expenditures between CPU and storage, which gives the best match to the ATLAS requirements. We account for retiring of resources by assuming that resources (both CPU and disk) have a four-year lifetime; each year, the resources procured in the 5th year prior are removed from the capacity calculations. This is consistent with CERN/WLCG's use of a four-year life cycle as a standard.

In Table 15 we summarize for each Tier 2 the next five-year period showing the funding profile at each Tier 2 site and the corresponding delivered resources. The budget assumptions we use are \$600k base funding per Tier 2, as in the past; inflation of this by 1.5% in 2013-2016 to account for 3% inflation of the ~50% of Tier 2 budgets spent on salaries; plus an allocation of \$300k/year to Illinois/NCSA as a new member of MWT2. The year-by-year and integrated budgetary shortfall to reach our ATLAS required capacity across the Tier 2s is shown also. The line "Extra Disk Requested" represents the amount needed to satisfy the requirements which will be funded by NSF and DOE.

Here follows a short summary of how the four NSF supported Tier 2s see their development over the next five years. Common to all of them is great enthusiasm for continuing in the Tier 2 program, among the Tier 2 leadership, their staff and their host institutions.

At AGLT2, for the next five years both universities have committed to provide power, space, and cooling within the existing facility footprint at each site. The MSU networking costs will be covered by MSU for the next 5-year period. UM is presently examining whether these costs can continue to be covered by the university. It is probable that WAN connection will be covered by the university (\$30k/year). Together MSU and UM are providing 3.1 FTEs for Tier-2 related work which is not funded by the program. Their networking infrastructure provides the ability to quickly and easily expand network capacity if demand calls for it.

At MWT2, the expansion plans at UC for a new \$1.2M MWT2 computing room in the new physical science research center, paid by the university, have been described. Indiana has as much expansion space as we foresee requiring. While funding has been divided generally equally between UC and Indiana to date, in the next five-year period the split will be 70/30 between UC and IU to maximize resources, but flexibility in provisioning hardware will be retained in order to optimize local resource contributions. At UC, the university will continue to provide the equivalent 2/3 FTE support to complement the program funded systems administration effort. IU will contribute \$35k/year to local Tier 2 facilities and operations support. At Illinois/NCSA, MWT2 resources will come from a shared campus computing and storage resource, the Illinois Campus Cluster (ICC) with an ATLAS funded component. The facility will follow a "campus Grid" computing model supporting a number of research groups and therefore benefiting from an economy of scale resulting from shared common infrastructure and services (such as network services, file system/storage servers, and systems administration). In addition to dedicated ATLAS cycles, access to unused resources following an opportunistic access policy is envisioned. Over the 2012-2016 period we expect all raw CPU and storage resources to fit seamlessly behind common "head" services for job and data management, resulting in a single operational point of contact for job submission and data storage. The arrangement benefits already from the excellent, low-latency and high bandwidth networks between the sites, as well as their physical proximity. Illinois/NCSA will provide the equivalent of 1/3 FTE core support for server and storage hardware, operation systems and any virtual machine hypervisor management, and storage file systems (currently GPFS is planned). In addition, 1/3 FTE of an NCSA staff member will support integration of the "ATLAS application" into the ICC environment including additional ATLAS-specific storage service endpoints and caches.

At NET2, the 2012 migration plans to move the facility to a large new computing center shared by Boston and Harvard.²⁵ Construction began in October 2010 on a large new high performance computing facility in Holyoke, MA to be shared by a consortium of Boston-area universities (BU, Harvard, MIT, Northeastern, UMass). When completed in 2012, the facility will be capable of powering and cooling 648 racks using hydroelectric and nuclear power. Besides being carbon-neutral, the new facility will reduce the electricity costs to the Universities by more than a factor of two. NET2 has had a major role in the planning for this facility. The bulk of NET2 computing will move to Holyoke starting late in 2012. In the mean time, there is plenty of power, space and cooling capacity to expand NET2 at their current sites.

Assurances have been received that moving the NET2 facilities to the new Holyoke green HPCC center will incur no costs seen by the program. BU and Harvard will each continue to provide ~1 FTE of support effort. The universities will continue to pay for all electrical costs, AC equipment maintenance and networking fees. In addition, BU has contributed a \$180k fund which can be used for NET2 infrastructure costs over the next few years. Harvard will continue to absorb all costs associated with NET2 resources located in the Odyssey cluster.

SWT2 has sufficient capacity for up to a factor of three increase in resources. No upgrades to computing rooms are therefore necessary for the next 5 years. The universities will continue to pay for all electrical costs and campus networking. In addition, commitments of additional local resources have been secured from both UTA and OU to support SWT2 personnel and equipment.

Cost Projections	FY11	FY12	FY13	FY14	FY15
\$/H506 (CPU power)	\$14.29	\$11.34	\$9.00	\$7.14	\$5.67
\$/TB (storage)	\$216.68	\$171.98	\$136.50	\$108.34	\$85.95
Tier-2	FY11	FY12	FY13	FY14	FY15
AGL2	\$600,000	\$609,000	\$618,135	\$627,407	\$636,838
Delivered H506	46,536	43,805	37,975	34,827	44,731
Delivered TB	2,711	3,021	3,224	3,388	4,368
Manpower Program \$	\$125,780	\$134,854	\$144,304	\$153,813	\$163,760
Manpower Program FTEs	1.90	1.90	1.90	1.90	1.90
University Contributed FTEs	3.10	3.10	3.10	3.10	3.10
Equipment Program \$	\$132,780	\$226,454	\$226,241	\$225,884	\$125,378
Infrastructure Program \$	\$61,440	\$47,690	\$47,690	\$47,690	\$47,690
MWT2	\$900,000	\$913,500	\$927,203	\$941,111	\$955,227
Delivered H506	40,618	52,574	54,004	72,419	91,453
Delivered TB	2,760	3,504	5,483	7,379	9,285
Manpower Program \$	\$393,192	\$404,869	\$452,701	\$466,363	\$480,029
Manpower Program FTEs	1.77	1.77	2.02	2.02	2.02
University Contributed FTEs	1.70	1.70	1.70	1.70	1.70
Equipment Program \$	\$456,158	\$477,981	\$443,851	\$439,297	\$444,547
Infrastructure Program \$	\$58,651	\$30,651	\$30,651	\$35,651	\$30,651
NIT2	\$600,000	\$609,000	\$618,135	\$627,407	\$636,838
Delivered H506	46,011	48,675	43,748	52,259	61,823
Delivered TB	2,426	2,240	3,392	4,243	5,348
Manpower Program \$	\$127,540	\$137,366	\$147,487	\$157,911	\$168,649
Manpower Program FTEs	1.50	1.50	1.50	1.50	1.50
University Contributed FTEs	1.60	1.60	1.60	1.60	1.60
Equipment Program \$	\$253,460	\$252,634	\$251,648	\$250,496	\$249,349
Infrastructure Program \$	\$19,000	\$19,000	\$19,000	\$19,000	\$19,000
SWT2	\$600,000	\$609,000	\$618,135	\$627,407	\$636,838
Delivered H506	47,590	51,377	42,285	52,706	67,896
Delivered TB	3,000	3,727	4,123	5,213	6,715
Manpower Program \$	\$230,387	\$235,949	\$241,677	\$247,578	\$253,655
Manpower Program FTEs	1.75	1.75	1.75	1.75	1.75
University Contributed FTEs	0.75	0.75	0.75	0.75	0.75
Equipment Program \$	\$297,238	\$323,051	\$326,458	\$329,829	\$333,363
Infrastructure Program \$	\$72,375	\$50,000	\$50,000	\$50,000	\$50,000
WT2 (DOE Funded)					
Delivered H506	22,493	26,064	31,046	40,738	52,832
Delivered TB	2,465	2,929	3,032	4,039	5,225
ATLAS requirements H506	153,000	177,000	208,000	262,000	329,000
ATLAS requirements TB	13,300	18,100	24,300	32,000	38,000
Tier-2 H506 Sum	209,308	217,495	209,058	252,949	320,727
Tier-2 TB Sum	13,361	15,422	19,254	24,252	30,938
Surplus/Deficit H506	50,308	40,495	1,058	-9,051	778
Surplus/Deficit TB	41	-2,678	-2,368	-2,902	684
\$ for H506 deficit	\$0	\$0	\$0	\$64,653	\$0
\$ for TB deficit	\$0	\$460,645	\$295,895	\$914,408	\$0
Baseline NSF Tier-2 \$	\$2,700,000	\$2,780,500	\$2,782,608	\$2,823,912	\$2,865,682
Extra Dnd Requested \$	\$0	\$460,645	\$295,895	\$919,063	\$0

Table 15. Tier-2 summary of Operations Program labor, material and equipment costs. The shaded areas in pink represent the CPU and disk available for ATLAS each year. The shaded areas in yellow represents the surplus and/or deficit in CPU and disk for ATLAS.

5.3 Upgrade R&D

Upgrade R&D is aimed at detector improvements that will sustain ATLAS physics at much higher luminosities than given by the present design luminosity. This will require replacement of some of the detector elements, such as the tracking detectors and the forward muon system, and possibly the very forward calorimeter, where rates and radiation damage require major upgrades. To cope with higher rates the electronics for the calorimeters as well as much of the trigger system will need replacement, typically with very modern electronics and using a higher degree of integration. The various upgrade projects, to be enabled by NSF support over the next 5 years, where in all cases universities play a major role in the work, are described below. The participating university groups are indicated. Graduate and undergraduate students involved in these projects get training with cutting edge research work. To maintain U.S. leadership and educational abilities on the technical front, it is essential to continue to support the upgrade program in the U.S.

5.3.1 Inner Detector

The upgrade of the inner tracker will involve replacing the entire present Inner Detector with an all silicon tracker made of several layers of pixel and strip detectors. The big issues to face with the new requirements are larger track density by a factor of 5, larger total dose and total fluence by up to a factor of 10, and larger data throughput by up to a factor of 10, all this without allowing any larger volume for support services. The U.S. universities, with NSF support (see Table 16), will provide the R&D that will enable us to address these issues in the coming 5 year time span. The specific projects are described below.

Sensors

The University of California at Santa Cruz (UCSC, supported by this proposal), continues with a leadership role in evaluating sensor technologies that could meet the upgrade requirements, especially various silicon technologies. The n-on-p silicon technology has been chosen for the strip sensor based on the NSF CA support to date. The choice for the pixel sensors still requires further investigation. Topics to be investigated over the next few years center on the choice for the inner most pixel layers, with continued radiation studies and electrical performance measurements required. Another area to be investigated is the detailed structure at the edge of the sensor and the methods of cutting the wafers with a goal to greatly reduce the inactive area at the edge of each sensor. In the case of pixels, the sensors are sufficiently small in area that inactive regions have a large impact on coverage and total material burden.

Staves

The baseline plan for the silicon strip part of the tracker is to construct the barrel section out of fully integrated staves, each containing up to 24 modules on the top and on the bottom, where each module consists of a silicon sensor wafer with up to 40 readout ICs and 1 or 2 module controllers.

Figure 5 shows the n-on-p sensor wafer we have developed. It is a single detector subdivided electrically into four sections. The staff would integrate cooling tubes and a bus cable to supply power, control and readout signals. At the end of the staff, data transmission to and from the staff would be converted to high speed Gbits/s optical transmission. The end-cap disks will employ the same integrated concept with wedge shaped objects now called petals.



Figure 5. ATLAS Upgrade sensor module on a test board. A stave will have 24 such modules per side.

We have recently demonstrated a one third scale model of a stave, providing initial validation of the new ideas introduced by the U.S. groups. The development of these ideas into a full length, fully functioning device, is the goal of the next 5 years. Yale University, supported by the DOE, will provide mechanical engineering for development of this stave concept. This will involve materials R&D, mechanical engineering design and prototype fabrication leading to development of production fabrication techniques. Module assembly, i.e. mounting readout ICs onto hybrid circuits and hybrid circuits onto sensors plus making all necessary electrical interconnects with up to 6,000 wire bonds per module will be performed by UCSC along with other ATLAS collaborators. Testing of these modules will be performed by UCSC and the DOE supported Duke University group. New York University will provide tooling for electrical testing and also radiation testing.

On-detector Electronics

The electronics for readout of the silicon tracker will have to be completely redesigned in new technologies given that most of the technologies used for the present ATLAS Detector will not be available when construction starts and the requirements for more channels at lower power as well as the radiation levels are much more severe. Evaluation of new technologies at 130 nm and 90 nm minimum feature size has started and we are beginning to learn the idiosyncrasies of designing in these technologies. The University of Pennsylvania, supported by the DOE, is leading the effort to design a necessary module controller to interface multiple readout ICs on a module to long bus cables on the staves and petals that will make up the barrel and end-cap structures. UCSC will provide support for these electronics efforts in the form of an experienced IC designer and an electronics system engineer who was responsible for the existing ATLAS strip detector powering and grounding system. Initial prototypes and then a final design will be produced during the 5 year period of this proposal.

Optical Data Transmission

Transmission of clock and control signals to the staves as well as data from the staves will be handled by 5-10 Gbps optical transmission from the end of stave to the service cavern. SMU (supported by this NSF CA) is part of a collaboration of ATLAS and CMS groups called the Versatile Link Common Project to develop such an optical system from optical transmitter through fiber to optical receiver. The

common project has been working for several years and is on track to deliver a system level specification and prototype units by Spring 2011. This ~5 Gbps system will work with the 5 Gbps multiplexer/demultiplexer chip set called GigaBit Transceiver (GBT) being developed by the CERN microelectronics group. The Versatile Link group then plans to move forward during the period of this proposal to explore parallel optics for ultra high data bandwidth and new technologies emerging from the telecom industry for ultra low power data links. This work will complement the second phase of the GBT project to advance to 10 Gbps, which will be required for the inner most pixel layers of the Silicon Tracker and the Liquid Argon Calorimeter.

	FY12	FY13	FY14	FY15	FY16
Silicon Tracker R&D					
EE (FTEs)	2.00	2.00	2.00	2.17	2.50
Student (FTEs)	1.25	1.25	1.25	1.25	2.50
Tech (FTEs)	0.78	0.78	0.78	1.03	1.45
Total Costs (Labor and Material)	376.00	376.00	376.00	410.00	520.00

Table 16. Requested NSF Operations Silicon Tracker R&D labor (FTEs) and costs (AYk\$s). Total costs include labor and materials. These funds support NYU, UCSC and SMU.

5.3.2 Liquid Argon Calorimeter

There is an active upgrade program for the ATLAS Liquid Argon Calorimeter (LAr) to meet the requirements arising from high luminosity running, expected after upgrading the LHC. U.S. university groups, together with their collaborators at national labs, have taken leading responsibilities in both detector and readout electronics R&D projects for this upgrade. This collaboration has proved successful in the present ATLAS detector design and construction, and in the initial phase of these R&D projects, with many important results reported at international conferences. The initial work has produced very early prototype electronics blocks, which will be developed fully into an integrated front-end electronics system over the duration of this proposal. The support requested from NSF is given in Table 17.

LAr Electronics

At Columbia University's Nevis Laboratories, steady progress is being made on the development of the next generation LAr calorimeter front-end board (FEB2) design and some of its essential components. A pre-prototype ADC was fabricated in late 2010 in IBM 130 nm CMOS technology and the next step, a prototype with almost complete functionality is planned for 2012. Work on the layout of FEB2 has been started to identify the constraints on the ASICs imposed by the multitude of fast communication paths needed, and design of a multiplexer ASIC to aggregate traffic from the ADCs to the optical links will start as soon as the ADC work allows.

SMU has successfully identified the 0.25 μm thin-film silicon-on-sapphire CMOS technology for high speed radiation tolerant ASIC developments for detector front-end electronics. Our recent successful

designs, the 5 Gbps serializer LOCs1 and the 5 GHz LCPLL, are essential milestones towards meeting the unprecedented challenge in the optical link of 100 Gbps per FEB. As the characterizing tests on LOCs1 and the LCPLL are coming to an end, we have started the investigation of array serializer design with each channel operating at 10 Gbps. We plan to prototype this design in 2012. If successful, work can start on both a final design as well as integration into the full front-end electronics chain.

	FY12	FY13	FY14	FY15	FY16
LAr System R&D					
EE (FTEs)	3.00	3.00	3.00	3.00	3.00
Tech/Student (FTEs)	2.25	2.25	2.25	2.25	2.25
Total Costs (Labor and Material)	683.00	597.00	617.00	679.00	595.00

Table 17. Requested NSF Operations LAr System R&D labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support SMU and Columbia Nevis.

5.3.3 Scintillating Tile Calorimeter

The TileCal upgrade required for high luminosity performance is focused on replacement of most of the readout electronics, including the links between on- and off-detector electronics. This development is driven by the requirements for increased radiation tolerance and the need to provide the level one trigger with improved information. The availability of new electronics and communication components and planned developments in the Level-1 trigger will require a revision of the architecture of both the Liquid Argon and the Tile Calorimeter readout systems. It has been proposed to bring all the waveform samples off the detector so they can be used for the Level 1 calorimeter trigger. It will necessitate very high data transmission rates.

An intensive upgrade program will be needed for the Tile Calorimeter electronics as shown in Table 18. This effort has mostly progressed on the conceptual level, and the real R&D is planned to begin over the next 5 year period. The on-detector electronics will require a new front-end board for each channel to use modern components, to be more radiation resistant, and to take advantage of improved performance in the components now available. The mother boards in the electronics drawers will need to be replaced. These will contain control electronics, ADCs for each channel, serializing FPGAs and optical transmission elements. The University of Chicago (supported by this proposal) leads this effort. Work will also be needed for the off-detector system which interfaces with the Level 1 trigger. MSU (supported by this proposal) and the UIUC (supported by the DOE Operations Program component) are active here.

	FY12	FY13	FY14	FY15	FY16
Tile Calorimeter R&D					
EE (FTEs)	1.80	1.80	1.80	1.80	1.80
Tech/Student (FTEs)	1.25	1.25	1.25	1.25	1.25
Total Costs (Labor and Material)	432.00	432.00	432.00	432.00	432.00

Table 18. Requested NSF Operations Tile Calorimeter R&D labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support MSU and Chicago.

5.3.4 Muon Spectrometer

Readout Electronics

Over the past two years the U.S. has significantly increased its activity in developing an upgraded, forward muon system for ATLAS for a high luminosity LHC. The CSC (Cathode Strip Chamber) system was one of the significant U.S. deliverables for the present ATLAS experiment. However, as the luminosity increases beyond the nominal, the rates in the existing forward muon system will begin to significantly degrade its performance. The U.S. groups have been investigating a relatively new detector technology called Micromegas. Micromegas have excellent rate capability as well as good spatial and time resolution. By employing a novel approach of using Micromegas as a TPC (Time Projection Chamber), one is able to form track stubs with just one plane of Micromegas detector.

Alignment System

The new muon chambers for the upgrade will have to be integrated into the existing endcap muon alignment system. This is the responsibility of Brandeis University. To do this will require studies to determine the optical paths that are necessary to link the new system with the rest of the muon endcap. In addition we will need to work with each of the candidate chamber technologies to insure that whatever mechanical design is selected can be aligned. We will insure that the features which provide the precision of the measurement are transferred to outside of the chamber with “hooks” that can be related to the alignment system. We will also have to design sensors that relate these “hooks” to the existing alignment system.

Since we first designed the alignment system over 10 years ago, many of the electronic components have become obsolete and are no longer in production or obtainable. In particular the basic CCD that is used in all of our systems, TP255, is no longer in production and there is no reliable source for them. The new muon system requires that redesign many of the circuits to utilize a different sensor. Also the main data collection board, the LWDAQ driver, has many obsolete components and will have to be

redesigned. An additional complication is that we will have to go further into the high radiation area so that some circuits will have to have a more rad-tolerant design.

To insure the proper operation of the alignment system we will have to work closely with the technical coordination. We plan to maintain a detailed model including all the structural components, detector components, services, and optical stay-clears. We have done this for the original alignment system and it is necessary that we maintain the activity if we are to successfully include the new muon detectors in the endcap alignment system. The resources requested from NSF for all this work is shown in Table 19.

	FY12	FY13	FY14	FY15	FY16
Muon System R&D					
EE (FTEs)	0.25	0.25	0.25	0.25	-
ME (FTEs)	0.25	0.25	0.25	0.25	-
Tech/Student (FTEs)	0.20	0.20	0.40	0.40	-
Total Costs (Labor and Material)	81.00	86.00	91.00	89.00	0.00

Table 19. Requested NSF Operations Muon System R&D labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support Brandeis.

5.3.5 TDAQ

Increases in instantaneous luminosity at the LHC beyond the design goal of $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ will require extensive changes to the ATLAS Trigger and Data Acquisition system to retain sensitivity to interesting physics processes while staying within data readout, storage, and access limitations. We have already begun a program to address some of the issues that will arise as design luminosity is approached. We intend to expand this program in the upcoming five years to: 1) complete those TDAQ improvements necessary for efficient operation at $10^{34} \text{ cm}^{-2}\text{s}^{-1}$, and 2) begin R&D on new systems to cope with luminosities beyond the baseline. Real data is now available to allow evaluation of the TDAQ performance and provide guidance for the future effort.

Several trigger improvements are planned for installation or testing during the 2012/13 LHC shutdown. U.S. groups have strong involvement in the development of a new system, the *FTK*, designed to provide precise track information at the beginning of Level 2 processing, and are also participating in upgrades to the Level 1 Calorimeter trigger (*L1Calo*). Funding for the U.S. FTK effort is being sought through other avenues and plans in this area will not be discussed here. Members of the MSU TDAQ group are leading the U.S. effort for the Level 1 calorimeter trigger upgrade. A faculty member is in charge of Monte Carlo for L1Calo Upgrade. For the Phase 1 L1Calo upgrade, our initial plans are to add topological trigger algorithms to the existing L1Calo triggers. This can be achieved by using RoI (feature) information from the existing cluster and jet modules in a real time data path. A draft plan, backed up by recent hardware tests, describes increased dataflow rates to Level 1 by quadrupling the backplane clock speed to 160 Mb/s. A design document contains a technically limited schedule that would enable early

prototyping using the 2012 LHC shutdown so that the Phase 1 upgrade, including a new Common Merger Module (CMM++), could be fully tested before the 2016 shutdown. The card would be laid out at MSU.

Beyond the near term trigger upgrades, work is also beginning on more ambitious changes to meet the challenges of luminosities beyond $10^{34} \text{ cm}^{-2}\text{s}^{-1}$. U.S. groups are involved in R&D related to the evolution of the FTK and L1Calo systems as the ATLAS Inner Detector is replaced and Calorimeter readout electronics are modified. Significant changes may also be required in the L1Muon system, where the possibility of including precise Monitored Drift Tube information into the trigger is being studied. This effort is led by Boston University. Finally, U.S. groups are participating in R&D to develop a new L1 track trigger aimed primarily at managing L1 electron, muon, and tau trigger rates. Although the exact schedule for achieving beyond-design luminosities is still uncertain, design and integration issues for these trigger systems must be worked out over the next few years, with first prototype hardware required toward the end of this five-year period.

In addition to hardware development, software work is also needed throughout the TDAQ Upgrade program. As part of the HLT/DAQ evolution, U.S. groups are making major contributions in the areas of TDAQ dataflow architecture and HLT processing schemes. Changes in these areas will be made incrementally as luminosity increases. Also of vital importance to the TDAQ Upgrade is accurate and efficient simulation of trigger systems. Challenges in this area include coping with memory requirements imposed by the large numbers of interactions per bunch crossing observed at high luminosities, and accurately estimating trigger rates from neutron backgrounds. These efforts are led by UCI and MSU. The U.S. is taking a leading role in all of these studies.

The request to the NSF is shown in Table 20 includes the work for the Level 1 trigger, R&D and the software R&D.

	FY12	FY13	FY14	FY15	FY16
TDAQ System R&D					
EE/Computer (FTEs)	2.50	2.50	2.50	2.50	2.50
Total Costs (Labor and Material)	465.00	425.00	425.00	375.00	425.00

Table 20. Requested NSF Operations TDAQ System R&D labor (FTEs) and costs (AYk\$). Total costs include labor and materials. These funds support Boston, UCI and MSU.

5.4 Education and Outreach

These many programs described in section 4.4 will continue during the coming years as U.S. ATLAS takes full advantage of the unprecedented opportunities that physics at the energy frontier provides us. We are actively preparing for an era of major discoveries. We leverage the outreach work done at all the NSF supported institutions. The budget for this activity (~\$50k/year) supports specific tasks or costs which are decided each year. A truly exciting project in the planning stages is a major Planetarium show about Dark Matter and the Big Bang. It will feature amazing footage and animation of ATLAS and the LHC, as well as covering cosmology and deep underground experiments. A short trial segment was

already tested on a planetarium audience with a very enthusiastic response.

U.S. ATLAS will continue to follow the NSF Director's charge to place a very high priority on public education and outreach with an extensive and effective program.

6 Open Data Implementation

We recently had a discussion with the leadership of the experiment and found that ATLAS is moving towards the Open Data policy as agreed in the OECD Communiqué of 2004: http://www.oecd.org/document/0,2340,en_2649_34487_25998799_1_1_1_1,00.html . In our experiment with over 2×10^8 channels and complex alignment and calibration procedures, as well as changing conditions and triggers, it is impossible to imagine someone outside of the experiment being able to deal with the raw data. However, due to the world wide effort to preserve high energy physics data for future researchers <https://www.dphep.org/>, we know that ATLAS will find a format for the data so that scientists outside of the experiment will be able to use it. We imagine this will take a few years.

In the immediate future though, we will make available subsets of our data, for example W boson events, for master classes of high school students.

7 Mentoring Postdocs

Although as a matter of policy we do not support any postdocs in this proposal (there are a couple of operations program supported postdocs working in largely technical roles, whose institutional mentoring plans are discussed in the additional documents section), there are many postdocs who are working in the ATLAS experiment and each NSF supported institution has a mentoring plan in place which has been approved by the NSF. We note that postdocs in this extremely international experiment have a very unique opportunity. There is intense involvement of U.S. faculty members with postdocs in all areas of the experiment.

8 Schedule and Budget

As the detector modules arrived at CERN we had begun operating and maintaining them as soon as possible after delivery and continued those maintenance and operations tasks until the initial LHC collisions and into the operations phase. Substantial commissioning was accomplished in cosmic ray running in 2008 and 2009. LHC pp collision operation began in December 2009 (low energy) progressing to 7 TeV starting in March 2010. The successful operation of the U.S. Deliverables was very gratifying.

For the software and computing, the schedule was largely determined by the high-level ATLAS computing milestones and we met the important goal of having the network of Tier 2 centers fully operational by the start of LHC data taking ahead of schedule.

The U.S. ATLAS Operations Program is jointly funded by the NSF and the DOE. The total NSF operations needs described in this proposal amount to \$50M (AY\$), for the five-year period FY12-FY16, based essentially on a constant level of effort, except in those cases on a longer term shut-down. A summary of costs at WBS Level 2 is given in Table 21. Cost data are derived from resource-loaded FTE schedules for Maintenance and Operations, Physics Support and Computing, and Upgrade R&D. These cost estimates have been extensively reviewed in joint NSF and DOE committees.

Further details on cost estimates are given in the Budget Justification.

NSF Operations Proposal Needs (AYk\$s)						
Subsystem	FY12	FY13	FY14	FY15	FY16	Total
Computing						
Software	495	509	525	540	557	2,626
Facilities & Tier 2	3,470	3,986	3,895	3,750	3,732	18,833
Analysis Support	55	57	59	60	62	293
Total	4,019	4,552	4,479	4,351	4,351	21,752
M&O						
Silicon	138	142	146	150	155	730
TRT	-	-	-	-	-	-
LAr	390	402	414	427	439	2,073
Tile	393	405	417	429	442	2,086
Muon	779	740	763	785	809	3,876
TDAQ	655	675	695	716	738	3,480
Common	949	787	753	752	678	3,920
Outreach	50	52	53	55	56	265
Program Management	435	170	175	180	186	1,146
Technical Coordination	155	159	164	169	174	821
Total	3,944	3,532	3,580	3,664	3,677	18,397
Upgrade						
Silicon Tracker	376	376	376	410	520	2,058
Liquid Argon	683	597	617	679	595	3,171
Tile Calorimeter	432	432	432	432	432	2,160
Muon	81	86	91	89	-	347
TDAQ	465	425	425	375	425	2,115
Total	2,037	1,916	1,941	1,985	1,972	9,851
Total NSF Operations Needs	10,000	10,000	10,000	10,000	10,000	50,000
Requested DOE Funds	28,255	28,962	29,685	30,427	31,187	148,516

Table 21. Total NSF Operations needs in AYk\$. The DOE total represents a request to DOE to support additional M&O, Physics Support and Computing, and Upgrade R&D work scope which is not part of this proposal.

9 Program Management

We manage the program by a detailed U.S. ATLAS Operations Program Management Plan (PMP).²⁶ We are using the DRAFT as of April 2010 in conducting our Operations. Michael Tuts is the U.S. ATLAS Operations Program Manager (OPM).²⁷ The Operations Program Manager (Michael Tuts) and Deputy (DOPM, Howard Gordon) were recently re-appointed for two year terms by the BNL ALD,

Steve Vigdor, after extensive consultation with the U.S. ATLAS collaboration through a subcommittee of the U.S. ATLAS Institutional Board (as called for in the PMP). The subcommittee spoke to and solicited nominations for the OPM and DOPM positions from the representatives of each to the 44 U.S. ATLAS institutions. After this rigorous process was completed, they recommended to the BNL ALD that Tuts and Gordon be re-appointed as OPM and DOPM respectively. That recommendation was accepted.

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- 1 ATLAS Collaboration, "Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC", Phys Lett B 688 (2010), 21.
 - 2 ATLAS Collaboration, "Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC", Phys. Rev. Lett. 105 (2010), 161801.
 - 3 ATLAS Collaboration, "Search for Quark Contact Interactions in Dijet Angular Distributions in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC", accepted by PLB (submitted 26 Sep 2010).
 - 4 ATLAS Collaboration, "Measurement of inclusive jet and dijet cross sections in proton-proton collisions at 7 TeV centre-of-mass energy with the ATLAS detector", accepted by EPJC (submitted 30 Sep 2010).
 - 5 ATLAS Collaboration, "Measurement of the $W \rightarrow \nu$ and $Z/\gamma^* \rightarrow e^+e^-$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector", accepted by JHEP (submitted 11 Oct. 2010).
 - 6 ATLAS Collaboration, "Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s} = 2.76$ TeV with the ATLAS detector at the LHC", accepted by Phys. Rev. Lett. 105 (2010) 252303.
 - 7 ATLAS Collaboration, "Measurement of underlying event characteristics using charged particles in pp collisions at $\sqrt{s} = 900$ GeV and 7 TeV with the ATLAS detector", submitted to PRD (3 Dec 2010).
 - 8 ATLAS Collaboration, "Measurement of the top quark-pair production cross section with ATLAS in pp collisions at $\sqrt{s} = 7$ TeV", submitted to EPJC (8 Dec 2010).
 - 9 ATLAS Collaboration, "Readiness of the ATLAS Liquid Argon Calorimeter for LHC Collisions", accepted by EPJC (submitted 14 Dec 2009).
 - 10 ATLAS Collaboration, "Drift Time Measurement in the ATLAS Liquid Argon Electromagnetic Calorimeter using Cosmic Muons", accepted by EPJC (submitted 22 Feb 2010).
 - 11 ATLAS Collaboration, "The ATLAS Inner Detector commissioning and calibration", accepted by EPJC (submitted 26 Apr 2010).
 - 12 ATLAS Collaboration, "The ATLAS Simulation Infrastructure?", accepted by EPJC (submitted 20 May 2010).
 - 13 ATLAS Collaboration, "Performance of the ATLAS Detector using First Collision Data", JHEP Volume 2010, Number 9, 1-66 (2010). <http://www.springerlink.com/content/26783w473n507xq6/>.
 - 14 ATLAS Collaboration, "Commissioning of the ATLAS Muon Spectrometer with Cosmic Rays", accepted by EPJC (submitted 18 Jun 2010).
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REFERENCES CITED

15 ATLAS Collaboration, "Readiness of the ATLAS tile calorimeter for LHC collisions", accepted by EPJC (submitted 30 July 2010).

16 ATLAS Collaboration, "Studies of the performance of the ATLAS detector using cosmic-ray muons", submitted to EPJC (1 Dec 2010).

17 <https://twiki.cern.ch/twiki/bin/view/AtlasPublic>

18 https://twiki.cern.ch/twiki/bin/view/AtlasPublic/WebHome#Publications_of_the_ATLAS_collab

19 http://www.usatlas.bnl.gov/USATLAS_TEST/institutes,%20reps,%20emails.htm

20 ATLAS Collaboration, "Readiness of the ATLAS Trigger and Data Acquisition system for the first LHC beams", Nuclear Physics B Proceedings Supplements 197, 306 (2009).

21 <http://indico.cern.ch/conferenceTimeTable.py?confId=73513&ttLyt=room#20100723.detailed>

22 <http://egg.bu.edu/>

23 <http://atlas.ch/>

24 Supplementary materials regarding U.S. ATLAS Tier 2 centers: <http://bit.ly/hPziOM>

25 <http://atlas.bu.edu/NET2-tour/>

26 http://www.usATLAS.bnl.gov/USATLAS_TEST/Operations%20Program.shtml

27 http://www.usatlas.bnl.gov/USATLAS_TEST/Org%20Chart%20Sept%202010.pdf

Biographical Sketch
Philip Michael Tuts
Born: 1/1/1953

Professional Preparation

M.I.T.	Physics	BS, 1974
M.I.T.	Mathematics	BS, 1974
SUNY, Stony Brook	Physics	PhD, 1979
SUNY, Stony Brook	Experimental HEP	1979-1983

Appointments

2004-present	Operations Program Manager, US ATLAS
2004-2006	Secretary/Treasurer DPF
2002-2005	Director of Nevis Labs
2001	APS Fellow
1996-present	Professor of Physics, Columbia University
1991-2001	Co-leader/project manager D0 Upgrade
1999-2000	Visiting Scientist, Fermilab
1990-1999	Associate Director of Nevis Labs
1987-1996	Associate Professor of Physics, Columbia University
1987-1991	Co-spokesman for CUSB Experiment
1986-1990	Alfred P. Sloan Foundation Fellow
1983-1987	Assistant Professor of Physics, Columbia University

Publications – closely related to proposed project

1. The ATLAS Experiment at the CERN Large Hadron Collider, The ATLAS Collaboration, G. Aad et al., JINST 3 (2008) S08003.
2. Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Lett. B 688, issue 1, 21 (2010).
3. Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 161801 (2010).
4. Measurement of the $W \rightarrow \ell\nu$ and $Z/\gamma^* \rightarrow \ell\ell$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector, ATLAS Collaboration, accepted by JHEP (2010).
5. Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 252303 (2010).

Publications – other significant publications

1. Observation of the Y''' at the Cornell Electron Storage Ring, CUSB Collaboration, Phys. Rev. Lett. **45**, 222 (1980).
2. Semileptonic Decay of the B Meson, CUSB Collaboration, Phys. Lett. **B130**, 444 (1983).
3. Observation of the Top Quark, D0 Collaboration, Phys. Rev. Lett. **74**, 2632 (1995).

4. Measurement of the W Boson Mass, D0 Collaboration, Phys. Rev. Lett. **77**, 3309 (1996).

Synergistic Activities

US ATLAS Research Program Manager; Physics Advisory Panel (BNL 1998-2004); Electronic classroom development; CMS/ATLAS review panels; proposed and received GAANN fellowships for Columbia University to support underrepresented physics graduate students; worked as graduate admissions chair to increase minority admissions. PI on NSF grant to support travel by South American colleagues to attend ATLAS workshops. PI on subcontract from Wisconsin to foster OSG computing outreach activities with South African colleagues. PI on LHC Experimental Experience award program for graduate students. As DPF Sec/Treasurer initiated travel grant program for graduate students to attend APS meeting (joint funding from NSF and DPF). Winner of Columbia Presidential Teaching Award. Given numerous public lectures and interviews on LHC/ATLAS (CBC, CNN, NY Times, Science Friday, Leonard Lopate, 92nd St Y, Guggenheim Museum, Café Science...).

Collaborators

The D0 collaboration (see <http://www-d0.fnal.gov/~madaras/authorlist.html>)

The ATLAS collaboration (see

<http://graybook.cern.ch/programmes/experiments/lhc/ATLAS.html>)

Graduate and Postdoctoral Advisors

Prof. Juliet Lee-Franzini (INFN), Dr. Robert Schamberger (SUNY, Stony Brook)

Thesis Advisor and Postgraduate-Scholar Sponsor

Quiwen Wu (Radiation Oncology, Virginia Commonwealth University), Ian Adam (Network Physics), Chris Hays (Lecturer, Oxford University), Mingcheng Gao (Assistant Professor, Loyola University Chicago – Radiation Oncology), Shaohua Fu (Fermilab), Ulrich Heintz (Prof of Physics, Brown University), Ashutosh Kotwal (Prof. of Physics, Duke University), Leslie Groer (Toronto), Georg Steinbruck (MPI), Christos Leonidopolous (CERN), David Khatidze (postdoc, Brown University).

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EDUCATION

1979 Ph.D., Physics, Michigan State University
1974 B.S., Physics, Michigan State University

EMPLOYMENT

2006-Present Lead Electronics Engineer, University of Michigan
2003-2006 Senior Research Associate Engineering, University of Michigan
2002-2003 Engineering Consultant, University of Michigan
2000-2002 Senior Software Engineer, Service Level Corporation, Ann Arbor, MI
1996-2000 Senior Research Associate, Science and Engineering, U. of Michigan
1995-1996 Senior Research Scientist, University of Michigan
1988-1995 Associate Research Scientist, University of Michigan
1982-1987 Assistant Research Scientist, University of Michigan
1979-1982 Post-Doctoral Fellow, University of Michigan

HONORS

1993 University of Michigan Research Scientist Award

POSITIONS

2006-Present Manager, ATLAS Great Lakes Tier-2 (AGLT2) Computing Center
1996-1997 Coordinated Selection and Installation of Physics Dept. Network Equipment/Wiring
1990-1993 Chair of Physics Dept. Computing Committee
1989-1997 Member of Physics Dept. Computing Committee
1988 Member of Physics Dept. Computer Upgrade Committee
1986-1988 Member of Physics Dept. Telecommunications Committee
1986-1987 Member of University Committee on Coordinated Email Delivery
1985-1986 Member of University Parallel Processing Computer Search Committee
1983-1984 Co-Coordinator of High Energy Physics Seminar Series

RECENT RESEARCH ACTIVITIES

ATLAS ELECTRONICS Design and development of the ATLAS CSM, the on-board data multiplexer circuit board for the ATLAS Monitored Drift Tube system. With a Xilinx Virtex-II fpga at its core, this circuit board collects serial data streams from as many as 18 24-channel Time to Digital Converter boards mounted on an MDT chamber and time-division multiplexes the resultant parallel data for transmission over fiber to upstream data coordination hardware. Designed in collaboration with Prof. J. Chapman this began as a VME board that simulated components of the ATLAS experiment that were not yet built, and provided access to ATLAS muon chamber data early in the chamber design cycle.

CREST ELECTRONICS Planning and design for the CREST trigger and readout electronics.

This Antarctic balloon flight experiment design work incorporates Xilinx fpgas and cplds into a Time to Digital Conversion system for measuring the arrival of cosmic ray shower particles with a least count of 1ns. Sixteen input channels share a single circuit board. Multiple such circuit boards share a serial bus I designed, with multiple busses operating in parallel.

L3 COMPUTER FARM Together with Prof. Byron P. Roe we designed a parallel systems pre-compiler. When applied to the L3 Experiment analysis code, the resultant software was linked with the Fermilab Advanced Computer Project (ACP) libraries and run on an ~60 processor compute farm. Event-wise parallelism was thus implemented and coordinated over the entire farm and served as a major source of Monte Carlo simulations for the L3 experiment.

SELECTED PUBLICATIONS

D.Levin *et al*, “Drift Time Spectrum and Gas Monitoring in the ATLAS Muon Spectrometer Precision Chambers”, Nucl. Inst. Meth. **A588**, 347-358 (2008).

James R. Bensinger

Born:

August 20, 1941
Washington, D.C.

Education:

1963 B.S. Bucknell University
1970 Ph.D. University of Wisconsin

Professional Record:

1970 – 73: Instructor/Assistant Professor, University of Pennsylvania
1973 – 74: Research Associate, Brandeis University
1974 – 80: Assistant Professor, Brandeis University
1980 – 89: Associate Professor, Brandeis University
1989 – Present: Professor, Brandeis University
1996 – 2000: Chair, Brandeis University Physics Department

HEP Collaborations:

1. Multiparticle Spectrometer (MPS), Brookhaven Laboratory
2. Venus Detector at Tristan, KEK
3. Collider Detector at Fermilab (CDF), Fermilab
4. SDC Experiment, SSC
5. ATLAS Experiment, CERN

Contributions to the ATLAS Experiment

1. Design of the on-chamber gas flow system for MDT chambers
2. Integration of the endcap muon system
3. Design and construction of the muon endcap alignment system
4. Mechanical construction of the big and small MDT wheels
5. Currently: Level-2 US Muon Subsystem Manager

Recent Publications Relevant to Current Position:

1. "Reference Bars for the Alignment of the ATLAS Muon Spectrometer" C. Amelung, J.R. Bensinger, et al., Nuclear Instruments and Methods A555, 36-47 (2005).
2. "The Optical Alignment System of the ATLAS Muon Spectrometer Endcaps," C. Amelung, et al., JINST 3:P11005, 2008.
3. "The ATLAS Experiment at the CERN Large Hadron Collider," The ATLAS Collaboration, JINST 3:S08003, 2008.
4. "System test of the ATLAS muon spectrometer in the H8 beam at the CERN SPS," The ATLAS Muon Collaboration, Nucl. Instrum. Meth. A593:232-254,2008. May 2008.
5. "Study of the ATLAS MDT spectrometer using high energy CERN combined test beam data," C. Adorisio, et al., Nucl. Instrum. Meth. A598:400-415, 2009.

Biographical Sketch--Joseph F. Boudreau

1. Professional Preparation

Harvard University, Cambridge MA , B.A. (Physics) 1983

University of Wisconsin, Madison WI , Ph.D (Physics) 1991

CERN, Geneva Switzerland, Particle Physics, 1991-1993 (CERN Associate)

2. Appointments

2000-present Associate Professor, University of Pittsburgh, Pittsburgh, PA

1994-2000 Assistant Professor, University of Pittsburgh, Pittsburgh, PA

3. Publications

Most Relevant to Proposed Research

The ATLAS Simulation Infrastructure, G. Aad et al. (The ATLAS Collaboration), Eur. Phys. J. C **70** (2010) 823-874

The ATLAS Experiment at the CERN Large Hadron Collider, G. Aad et al. (The ATLAS Collaboration)

Performance of the ATLAS Detector using First Collision Data, G. Aad et al. (The ATLAS Collaboration), JHEP09 (2010) 056

Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC, G. Aad. et al. (The ATLAS Collaboration), Phys Lett. B **688** 1, 21

Measurement of inclusive jet and dijet cross sections in proton-proton collisions at 7 TeV centre-of-mass energy with the ATLAS detector, G. Aad et al. (The ATLAS Collaboration), arXiv:1009.5908, accepted by EPJC.

Other Significant Publications

Formulae for the Analysis of the Flavor-Tagged Decay $B_s^0 \rightarrow J/\psi \phi$, F. Azfar et al., JHEP11 (2010) 158

First Flavor-Tagged Determination of Bounds on the Mixing Induced CP Violation in $B_s^0 \rightarrow J/\psi \phi$ decays, T. Aaltonen et al. (The CDF Collaboration), Phys. Rev. Lett. **100**, 161802 (2008)

Measurement of Lifetime and Decay-Width Difference in $B_s^0 \rightarrow J/\psi \phi$ decays, T. Aaltonen et al. (The CDF Collaboration), Phys. Rev. Lett. **100**, 161803 (2008)

Measurement of the Λ_b^0 Lifetime in $\Lambda_b^0 \rightarrow J/\psi \Lambda^0$ in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV, A. Abulencia et al., The CDF Collaboration, Phys. Rev. Lett. 98, 122001 (2007)

Observation of B_s^0 - \bar{B}_s^0 Oscillations, A. Abulencia et al., The CDF Collaboration, Phys. Rev. Lett. 97, 242003 (2006).

4. Synergistic Activities

2009-2010 Guest Scientist, Centre de Physique des Particules, Marseille (CPPM)

2003 and 2004 Starr Visiting Fellow, Lady Margaret Hall, Oxford

2000-2001 Guest Scientist, Fermi National Accelerator Laboratory

International Organizing Committee, CHEP97, April 7-11, Berlin

International Organizing Committee, HepVis95, 96, 98, and 99

Leader of the ATLAS Liquid Argon Simulation and the ATLAS Frozen Shower Group.

Geant 4 Development Team

Virtual Reality Event Display at Fermilab "Open Day" events, 1999-2001

5 . Collaborators and Other Affiliations

Recent Collaborators

Manfred Paulini (CMU), Michal Kreps (Universitaet Karlsruhe), Giovanni Punzi (INFN Pisa), Rick Van Kooten (University of Indiana), Petar Maksimovic(JHU), Gavril Giurgiu(JHU), Farrukh Azfar(Oxford), Srinu Rajagopalan(BNL), Jim Shank(Boston University), Wolfgang Ehrenfeld(DESY), Sasha Glazov(DESY), Juan Pablo Fernandez (CIEMAT, Madrid), Mossadek Talby (CPPM, Marseille)

Students Supervised and Postdocs Sponsored

Luis Flores Castillo (University of Wisconsin), Chunlei Liu (CMU), Yuri Gotra (University of Rochester), George Pope (left the field), Karen Gibson (Case Western)

Thesis Advisors and Postdoctoral Sponsors

Prof. Sau Lan Wu, University of Wisconsin, Madison (Thesis Advisor)

Horst Wachsmuth, CERN (retired, Postdoctoral Sponsor)

John M. Butler

Biographical Sketch

Professional Preparation

University of Notre Dame: B.S. in physics, with high honors, 1980
Stanford University: Ph.D. in physics, 1986

Appointments

2008-2009 Visiting Researcher, CEA Saclay, Gif sur Yvette, France
2004-present Professor of Physics, Boston University
2003-2006 Project Director, Boston University DOE HEP Umbrella Grant
2003-2006 Associate Chairman, Department of Physics, Boston University
1998-2004 Associate Professor (with tenure), Boston University
1995-1998 Associate Professor, Boston University
1991-1995 Associate Scientist, Fermi National Accelerator Laboratory
1988-1991 Research Associate, Fermi National Accelerator Laboratory
1986-1988 Scientific Associate, CERN, Geneva, Switzerland

Publications

(i) Publications closely related to the proposed project

- G. Aad et al. [ATLAS Collaboration], “Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC,” Phys. Rev. Lett. 105, 252303.
- G. Aad et al. [ATLAS Collaboration], “Search for Quark Contact Interactions in Dijet Angular Distributions in pp Collisions at $\sqrt{s} = 7$ TeV Measured with the ATLAS Detector,” Phys. Lett. B694 (2011) 327-345.
- G. Aad et al. [ATLAS Collaboration], “Commissioning of the ATLAS Muon Spectrometer with Cosmic Rays,” EPJC 70 (2010) 875.
- G. Aad et al. [ATLAS Collaboration], “Performance of the ATLAS Detector using First Collision Data,” JHEP 1009:056,2010.
- G. Aad et al. [ATLAS Collaboration], “The ATLAS Experiment at the CERN Large Hadron Collider,” JINST 3, S08003 (2008).

(ii) Significant publications

- V. M. Abazov et al. [DØ Collaboration], “Direct Limits on the B_s^0 Oscillation Frequency,” Phys. Rev. Lett. 97, 021802 (2006).
- V. M. Abazov et al. [DØ Collaboration], “A precision measurement of the mass of the top quark,” Nature 429, 638 (2004).
- S. Abachi et al. [DØ Collaboration], “Observation of the Top Quark,” Phys. Rev. Letters 74, 2632 (1995).
- S. Abachi et al. [DØ Collaboration], “The DØ Detector,” Nucl. Instr. and Methods A338, 185 (1994).

- J. M. Butler et al. [DØ Collaboration], “Study of Fast Gases, Resolutions and Contaminants in the DØ Muon System,” Nucl. Instr. Meth. A290, 122 (1990).

Synergistic Activities

- Lecturer at the *New England Particle Physics Student Retreats*, see <http://physics.bu.edu/NEPPSR/>
- Participant in Boston University’s LERNet *Saturday Science Labs* program, see <http://www.bu.edu/lernet/>
- Co-organized a field trip for Boston University’s SPS chapter to Fermilab

Collaborators

For lists of collaborators, see the web links listed below:

ATLAS Collaboration: <http://atlas.web.cern.ch/>

CALICE Collaboration: <https://twiki.cern.ch/twiki/bin/view/CALICE>

Graduate Advisor

Prof. Joseph Ballam, Stanford Linear Accelerator Center

Postdoctoral Sponsors

Dr. Rafael Armenteros, CERN

Dr. Dan Green, Fermi National Accelerator Laboratory

Dr. Hugh Montgomery, Thomas Jefferson National Accelerator Facility

Graduate Advisees

Jeremy Love: Boston University

Postdoctoral Advisees

Robert Harrington: Boston University

Jason Kasper: Industry

Manas Maity: Visva-Bharati University

BIOGRAPHICAL SKETCH

Dhiman Chakraborty

Professional preparation

Post-doctoral: State University of New York at Stony Brook, 1995-1997;

University of Iowa, 1994-1995

Graduate: State University of New York at Stony Brook, Physics, Ph.D. , 1994

Undergraduate: Indian Institute of Technology, India , B.Tech., Engineering Physics, 1988

Appointments

2010-present: Director of Graduate Studies, Physics Dept, Northern Illinois University

2010-present: Professor, Physics Dept, Northern Illinois University

2008-2009: Visiting Scientist, Laboratoire de Physique Subatomique et de Cosmologie, Grenoble (France).

2007-2010: Associate Professor, Physics Dept, Northern Illinois University

2001-2007: Assistant Professor, Physics Dept, Northern Illinois University

1997-2001: Research Scientist, Dept of Physics and Astronomy, State University of New York at Stony Brook, Stony Brook, New York

Publications

(i) Most closely related to the proposed project

1. "The ATLAS Experiment at the CERN Large Hadron Collider", Aad G et al. (the ATLAS Collaboration), *JINST* 3 S08003 (2008),
2. "Charged-particle multiplicities in pp interactions at $\sqrt{s} = 7$ TeV", ATLAS Collaboration, *Phys. Lett. B* 688, issue 1, 21 (2010),
3. "Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions With the ATLAS Detector at the LHC", ATLAS Collaboration, *Phys. Rev. Lett.* 105, 161801 (2010),
4. Measurement of the $W \rightarrow l\nu$ and $Z/\gamma^* \rightarrow ll$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector", ATLAS Collaboration, accepted by *JHEP* (2010),
5. Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC, ATLAS Collaboration, *Phys. Rev. Lett.* 105, 252303 (2010),

(ii) Other significant publications

1. "Photon Detectors" (in "The Review of Particle Physics"), Nakamura K et al. (the Particle Data Group), *J. Phys.* :1 (2010) <http://pdg.lbl.gov>
2. "Directly Coupled tiles as elements of a scintillator calorimeter with MPPC readout", Blazey G et al, *NIM A* {605} 277 (2009),
3. "Investigation of a solid-state photodetector", Beznosko D et al, *NIM A* {553} 438 (2005),
4. "Top Quark Physics", Chakraborty D, Konigsberg J, Rainwater DL, *Ann. Rev. Nucl. & Part. Phys.* {53} 301 (2003),
5. "Direct Search for Charged Higgs Bosons in Decays of Top Quarks", Abazov VM et al. (the D0 Collaboration), *Phys. Rev. Lett.* {88} 151803 (2002),
6. "Search for Charged Higgs Bosons in Decays of Top Quark Pairs", Abbott B et al. (the D0 Collaboration), *Phys. Rev. Lett.* {82} 4975 (1999),

7. "Observation of the Top Quark", Phys. Rev. Letters {74} 2632 (1995).

Synergistic activities

Leader, NIU Atlas team, 2007-present
Member, Detector R&D Common Tasks Group appointed by the ILC Research Director, 2008-present,
Member, Executive Board, International Linear Collider Detector (ILD) collaboration, 2008-present,
Co-leader, Calorimetry working group of the American Linear Collider Physics Group, 2002-2008,
Coordinator, Digitization validation, Atlas collaboration, 2008-2010,
Co-convener, tau identification group, D0 collaboration, 2001-2005,
Co-convener, top physics group, D0 collaboration, 1998-2000,
Coordinator, Calorimeter Software, D0 Collaboration, 1995-1997
Volunteer, "Ask a scientist" - A sunday afternoon outreach program held at Fermilab, 2001-present,
Coordinator and mentor, QuarkNet center at NIU, 2008-present.

Collaborators in past 24 months

All member institutions on D0, ALCPG, CALICE, ATLAS.
Other co-authors: members of the Particle Data Group (PDG).

Graduate Advisor - R. Engelmann (SUNY, Stony Brook, NY).

PostDoctoral Advisors - U. Mallik (U. of Iowa), M. Baarmand/P. Grannis/J. Hobbs (SUNY, Stony Brook).

Thesis Students Supervised - M. Arov (PhD, 2001-2007), J. McCormick (MS, 2002-2004), D. Menezes (PhD, 2006-), R. Calkins (PhD, 2007-), C. Suhr (PhD, 2007-).

Post-doctoral scholars sponsored - A. Dychkant, J.G. Lima, V. Rykalin.

Biographical Sketch: Kyle Cranmer

Education & Training

Rice University	Physics, Mathematics	B.A., 1999
University of Wisconsin-Madison	Physics	M.A., 2002
University of Wisconsin-Madison	Physics	Ph.D., 2005
Brookhaven National Lab	Physics	2005-2007

Research & Professional Experience

Assistant Professor	Physics Dept., New York University	2007-current
Visiting Researcher (on leave)	LAPP, Annecy, France	Feb.-Aug.2008
Goldhaber Fellow	Brookhaven National Laboratory	2005-2007

Selected Publications

- [1] R. Barate *et al.* [ALEPH Collaboration] "Observation of an excess in the search for the standard model Higgs boson at ALEPH," *Phys. Lett. B* **495**, (2000) [arXiv:hep-ex/0011045].
- [2] K. S. Cranmer, "Kernel estimation in high-energy physics," *Comput. Phys. Commun.* **136**, 198 (2001) [arXiv:hep-ex/0011057].
- [3] LEP Higgs Working Group, "Search for the standard model Higgs boson at LEP". *Phys. Lett.*, B **565** (2003). [arXiv:hep-ex/0306033]
- [4] S. Asai, *et al.* "Prospects for the search for a standard model Higgs boson in ATLAS using vector boson fusion," *Eur. Phys. J.* **C3252**:19–54, (2004). [hep-ph/0402254].
- [5] K. Cranmer "The ATLAS Analysis Architecture", *Nucl. Phys. B* P-12266 (2007)
- [6] B. C. Allanach, K. Cranmer, C. G. Lester and A. M. Weber, "Natural Priors, CMSSM Fits and LHC Weather Forecasts," *JHEP* **08**, 023 (2007). [arXiv:0705.0487 (hep-ph)].
- [7] K. Cranmer, "Statistics for the LHC: Progress, Challenges, and Future", CERN yellow report CERN-2008-001, 2008
- [8] [ATLAS] (K. Cranmer, S. Tsuno, *et. al.*) "Search for the Standard Model Higgs via Vector Boson Fusion production process in the di-tau channel with ATLAS", in *Expected Performance of the ATLAS Experiment - Detector, Trigger and Physics*, [arXiv:0901.0512].
- [9] [ATLAS] (K. Cranmer, M. Cristinziani, A. Loginov, A. Shibata, D.B. Ta, *et. al.*) "Prospects for measuring top pair production in the dilepton channel with early ATLAS data at $\sqrt{s}=10$ TeV" ATLAS public result, ATL-PHYS-PUB-2009-086.
- [10] ALEPH Collaboration, S. Schael *et al.*, *Search for neutral Higgs bosons decaying into four taus at LEP2*, *JHEP* **05** (2010) [hep-ex/1003.0705].

Synergistic Activities

- Level-3 Manager US-ATLAS Analysis Support (2009-). Convener of US-ATLAS Standard Model and Higgs Forum (2007-10). Convener of US-ATLAS Trigger Forum (2005-07).
- Various ATLAS activities and responsibilities: coordinator of MissingET Trigger (2005-2009), official 'expert' of statistics committee member of software architecture team, member of event management board (adjudicates content of ATLAS data).
- Primary organizer 2009 ATLAS Workshop of the Americas, held at NYU August 3-5
- Founder of the RooStats project, developing common statistical tools for the LHC.
- Lecture series on "Statistical Techniques for Particle Physics" for CERN academic training lectures and at LAPP in Annecy, France. Member of steering committee for PhyStat.org, an online repository for statistical tools used in particle physics and astrophysics.

Collaborators:

The ATLAS Collaboration, The CDF Collaboration, The ALEPH Collaboration

Ben Allanach (The University of Cambridge), Doug Benjamin (Duke), Marteen Bosman (IFAE), Michael Bridges (The University of Cambridge), Bob Cousins (UCLA), Glen Cowan (Royal Holloway, U. of London), Markus Cristinziani (Bonn University), Luc Demortier (The Rockefeller University), Michael Ernst (Brookhaven National Lab), Amir Farbin (University of Texas-Arlington), Farhan Feroz (The University of Cambridge), Pamela Ferrari (NIKHEF), Eilam Gross (Weizmann Institute), Chris Hays (Oxford University), Mike Hobson (The University of Cambridge), Ashutosh Kotwal (Duke University), Tadashi Maeno (Brookhaven National Lab), Stephanie Majewski (Brookhaven National Lab), Bruce Mellado (Wisconsin University-Madison), Chris Lester (The University of Cambridge), Andrey Loginov (Yale University), Sergey Panitkin (Brookhaven National Lab), Tilman Plehn (University of Edinburgh), Edward Quinlan (University of California-Irvine), Roberto Ruiz de Austri (IFIC-UV/CSIC), Philip Schuster (Perimeter Institute), Jorgen Sjolin (Stockholm University), Oliver Stelzer-Chilton (TRIUMF), Natalia Toro (Perimeter Institute), Roberto Trotta (Imperial College London), Arne Weber (Max Planck Institute in Munich), Itay Yavin (New York University), Wouter Verkerke (NIKHEF), Ofer Vitells (Weizmann Institute), Daniel Whiteson (University of California-Irvine)

Co-Editors:

Soshi Tsuno (The University of Tokyo, International Center for Elementary Particle)
Co-editor of ATLAS publication on Vector Boson Fusion Higgs Decaying to Taus.

Graduate Student and Postdoctoral Advisors:

Sau Lan Wu (University of Wisconsin-Madison), David Lissauer (Brookhaven National Lab)

Graduate Student Advised:

George Lewis, James Beacham, Sven Kreiss (New York University)

Postdoctoral Advisees:

Akira Shibata (New York University, 2007-2010), Attila Krasznahorkay (New York University, 2009-current), Kirill Prokofiev (New York University, 2010-current)

Curriculum Vitae

Kaushik De

Department of Physics, University of Texas at Arlington, Box 19059, Arlington, TX 76019

E-mail: kaushik@uta.edu, URL: <http://heppc1.uta.edu/kaushik/index.htm>

Phone: (817) 272-2813 (office), -2266 (physics dept.), -2824 (FAX), (682)521-5323 (cell)

Professional Preparation

B.A./M.A., *Physics/Honors Curriculum, Summa Cum Laude*,
Hunter College of CUNY, Class Rank 1/734, GPA 3.94/4.00 **1978-81**
Sc.M., *Physics*, Brown University **1982**
Ph.D., *Physics*, Brown University **1988**

Appointments

Professor, University of Texas at Arlington **2003-**
Associate Dean, Honors College, UT Arlington **1999-2003**
Associate Professor, University of Texas at Arlington **1997-2003**
Assistant Professor, University of Texas at Arlington **1993-1997**
Assistant Research Scientist, University of Michigan **1992**
Research Fellow, University of Michigan **1989-1992**
Research Associate, Indiana University **1988-1989**
Research Assistant/Teaching Assistant, Brown University **1984-88**
Teaching Assistant, Hunter College of CUNY **1980-81**

Publications – closely related to proposed project

1. The ATLAS Experiment at the CERN Large Hadron Collider, The ATLAS Collaboration, G. Aad et al., JINST 3 (2008) S08003.
2. Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Lett. B 688, issue 1, 21 (2010).
3. Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 161801 (2010).
4. Measurement of the $W \rightarrow \ell\nu$ and $Z/\gamma^* \rightarrow \ell\ell$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector, ATLAS Collaboration, accepted by JHEP (2010).
5. Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 252303 (2010).

Publications – other significant publications

1. T. A. Fuess et al., "Search for Anomalous Particles in High-Energy Hadron Proton Interactions", Phys. Rev. D {35}, 3297, (1987).
2. E-745 Collaboration, "A New Method to Investigate the Nuclear Effect in Leptonic Interactions", Phys. Lett. B {214}, 281, (1988).
3. S. Kartik et al., "A-Dependence of J/Psi Production in Pi-Nucleus Collisions at 530 GeV/c", Phys. Rev. D {41}, 1, (1990).

4. DØ Collaboration, "The DØ Detector", Nucl. Instrum. Methods A {338}, 185, (1994).
5. DØ Collaboration, "Observation of the Top Quark", Phys. Rev. Lett. {74}, 2632, (1995).

Synergistic Activities

- a) **New Physics:** pioneered search for supersymmetric particles in top quark decays using the DØ detector at Fermi National Accelerator Laboratory.
- b) **Grid Computing:** led implementation of a computing grid for ATLAS. Coordinated development of new software tools: Windmill and Panda, used at hundreds of supercomputing centers internationally. Managed ATLAS MC production and U.S. Computing Operations. Co-supervised masters and Ph.D. theses in CSE.
- c) **New Physics:** led search for large extra dimensions at DØ.
- d) **New Detector:** proposed a new Intermediate Tile Calorimeter for the ATLAS experiment at CERN. Led five year project to build 50 tons of calorimeter detector at UTA.
- e) **Planning for the Future:** led effort to motivate high luminosity Fermilab upgrade from the viewpoint of supersymmetry discovery, through the TeV2000 and TeV33 groups and at the Snowmass workshop.
- f) **Supercomputing technology:** founding director of SouthWest Tier 2 supercomputing center, located at UTA and Oklahoma University.
- g) **Beyond the Standard Model:** pioneered search for dilepton supersymmetry signatures at DØ.

Collaborators

The D0 collaboration (see <http://www-d0.fnal.gov/~madaras/authorlist.html>)

The ATLAS collaboration (see

<http://graybook.cern.ch/programmes/experiments/lhc/ATLAS.html>)

Graduate and Postdoctoral Advisors

Prof. Mildred Widgoff (Brown University), Prof. Andrej Zieminski (Indiana University), Prof. Homer Neal (University of Michigan).

Thesis Advisor and Postgraduate-Scholar Sponsor

Yan Song (IBM), Barry Spurlock (UTA), Rishiraj Pravahan (UTA), Elizabeth Gallas (Oxford), Mark Sosebee (UTA), Armen Vartapetian (UTA), Nurcan Ozturk (UTA), Paul Nilsson (UTA), Alden Stradling (UTA).

ROBERT W. GARDNER

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+1 773 834 6818 fax
rwg@uchicago.edu

Education

University of California, Riverside
University of Notre Dame
University of Illinois, Urbana-Champaign

Physics
Physics
Physics

BS (Honors), 1980-1984
Ph.D., 1984-1991
Res. Assoc., 1991-1993

Appointments

2002-present Senior Research Associate, Enrico Fermi Institute, University of Chicago
Senior Fellow, Computation Institute, University of Chicago
1996-2002 Assistant Professor of Physics, Indiana University Bloomington
2000-2002 Affiliated Faculty Member, School of Informatics, Indiana University Bloomington
1993-1996 Visiting Research Assistant Professor, University of Illinois Urbana-Champaign

Publications on Distributed Computing in Physics

- [1] “Virtualization Platforms for LHC Tier 3 Clusters”, with M. Mambelli et al., to appear in *Proc. Computing in High Energy and Nuclear Physics (CHEP '10)*, 2010.
 - [2] “Automated Validation of Integration Testbeds”, with S. Thapa et al., to appear in *Proc. Computing in High Energy and Nuclear Physics (CHEP '10)*, 2010.
 - [3] “Employing Open Science Grid to Support National Grid Initiatives in South America and South Africa”, with J. Caballero et al., to appear in *Proc. Computing in High Energy and Nuclear Physics (CHEP '10)*, 2010.
 - [4] “A Science Driven Production Cyberinfrastructure: the Open Science Grid”, with R. Pordes et al., FERMILAB-PUB-10-236-CD, submitted to Journal of Grid Computing, Springer-Verlag, 2010.
 - [5] “Job Optimization in ATLAS Tag-based Distributed Analysis”, with M. Mambelli et al., 2010 J. Phys.: Conf. Ser. 219 072041.
 - [6] “A Skimming Service for Locally Resident Analysis Data”, M. Mambelli, et al., *Proc. Computing in High Energy and Nuclear Physics (CHEP '07)*, 2007.
 - [7] “The Open Science Grid Integration Testbed”, R. Gardner et al., *Proc. Computing in High Energy and Nuclear Physics (CHEP '06)*, 2006.
 - [8] “The Capone Workflow Manager”, M. Mambelli et al., *Proc. Computing in High Energy and Nuclear Physics (CHEP '06)*, 2006.
 - [9] “Progress in Grid Computing for Particle Physics”, R. Gardner, *Proc. 9th International Conference on Advanced Technology and Particle Physics (ICATPP)*, Como, Italy, 2005.
- ### Invited Talks on Grid Computing
- [1] “The Open Science Grid Integration Testbed”, R. Gardner et al., *Computing in High Energy and Nuclear Physics (CHEP '06)*, Mumbai, India, February 13-17, 2006.
 - [2] “Progress in Grid Computing for Particle Physics”, R. Gardner, *9th International Conference on Advanced Technology and Particle Physics (ICATPP)*, Como, Italy, October 17-21, 2005.
 - [3] “ATLAS Grid Computing on Grid3 and the Open Science Grid”, *13th Annual Mardi Gras Conference on “Frontiers on Grid Applications and Technologies”*, Louisiana State University, Baton Rouge, LA, February 4-7, 2005.
 - [4] “Grid3: An Application Grid Laboratory for Science”, *Computing in High Energy and Nuclear Physics (CHEP '04)*, Interlaken, Switzerland, September 27 – October 1, 2004.

- [5] "Lessons Learned in Grid Deployments: Grid2003", *GGF-11: 11th Global Grid Forum, Honolulu, Hawaii, June 6-10, 2004*.
- [6] "The Grid2003 Production Grid: Principles and Practice", *13th IEEE Intl. Symposium on High Performance Distributed Computing, Honolulu, Hawaii, June 4-6, 2004*.
- [7] "Grid Applications, Testbeds, and Demonstrations" Plenary summary, *Conference on Computing in High Energy and Nuclear Physics (CHEP '03), La Jolla, California, 24-28 March 2003*.
- [8] "Virtual Data Grid Technologies for High Energy Physics", *American Physical Society Conference on Computational Physics, San Diego, CA, 25-28 August 2002*.
- [9] "GridPhyN and ATLAS: Grid Computing for the ATLAS Experiment at CERN", *GGF-1: 1st Global Grid Forum, Amsterdam, Netherlands, March 5-7, 2001*.

Leadership Activities

- 2007-present: U.S. ATLAS Facilities Integration Program Manager
- 2006-present: Integration and Sites Coordinator, Open Science Grid Consortium
- 2005-present: Principal Investigator, ATLAS Midwest Tier2 Center
- 2004-2006: Director, The Teraport Project, University of Chicago
- 2001-2005: Coordinator and co-PI of the International Virtual Data Grid Laboratory (iVDGL)
- 2003-2005: Co-Coordinator of the Grid2003 Project
- 2003-2005: Co-Coordinator for International ATLAS Grid Infrastructure
- 2003-2005: Project Manager for Grid Tools and Services, U.S. ATLAS Computing Project
- 2000-2002: Project Manager, Distributed IT Infrastructure, U.S. ATLAS Collaboration
- 2000-2002: U.S. ATLAS Grid liaison to International ATLAS Collaboration
- 2000-2002: IT Advisory Committee, Telecommunications Taskforce, IU Bloomington IT Council
- 1998-2000: Project Lead, Forward Tracking System, Fermilab BTeV Collaboration

Synergistic Activities

- Computing in High Energy Physics: I lead a research group working on distributed Grid computing technologies for the CERN/LHC ATLAS experiment. ATLAS physicist since 1998. Currently responsible for ATLAS Midwest Tier2 Center and the distributed U.S. ATLAS Computing Facility Integration Program.
- Distributed Computing Infrastructure: Area lead for Grid Integration testbeds and sites coordination for the Open Science Grid; various coordination roles in OSG, iVDGL and ATLAS.
- Computer Science Research: GridPhyN (Grid Physics Network, NSF-ITTR): development of virtual data technologies for high energy physics dataset provenance tracking and automated workflow generation. Collaborative work with FiveSight Technologies to develop frameworks based on process calculi for distributed, service-based computation in physics (DOE-SBIR). Collection and measurement of metrics for distributed computing (Grid Telemetry, NSF-ITTR).

Awards

- Joseph and Sophia Konopinski Award for Outstanding Teaching in Physics, Indiana University, 1999.
- Outstanding Teaching Assistant in Physics, University of Notre Dame, 1986.

c. Reiner Hauser

i) Professional Preparation

1989 Diploma in Physics, University of Heidelberg, Germany
1994 Ph.D. Physics, University of Heidelberg, Germany

Appointments

2007-present Research Assistant Professor, Michigan State University
1999-2007 Research Associate, Michigan State University
1997-1999 Research Associate, CERN/Digital Joint Project, CERN,
Geneva, Switzerland
1994-1996 CERN Fellowship, CERN, Geneva, Switzerland

ii) Publications

Publications most closely related to the proposed project

1. ["Search for supersymmetry via associated production of charginos and neutralinos using trilepton final states", V.M.Abazov et al., Phys. Rev. Lett. **95** 151805 \(2005\)](#)
2. ["High-Level Trigger, Data Acquisition and Controls Technical Design Report" \(CERN/LHCC/2003-022\)](#)
3. ["Commissioning of the ATLAS Trigger and Data Acquisition System with Single Beam and Cosmic Rays", R. Hauser, Proceedings 11th ICATPP Conference, Como \(2000\) \[http://villaolmo.mib.infn.it/ICATPP11th_2009/accepted/HEP/Hauser.pdf\]\(http://villaolmo.mib.infn.it/ICATPP11th_2009/accepted/HEP/Hauser.pdf\)](#)

iii) Synergistic Activities

Co-leading the re-design of the D0 Level 3 event building system. Convener of the D0 Common Samples group responsible for providing all official data samples (2004-2006). Currently ATLAS TDAQ software coordinator.

iv) Collaborators & Other Affiliations

Collaborators:

Members of the DØ collaboration

Members of the Atlas collaboration

v) Thesis Advisor(s)

Reinhard Männer (Heidelberg)

Postdoctoral Advisor:

Rudolf Bock (CERN), Maris Abolins(MSU)

a. Joey Walter Huston

i) Professional Preparation:

B.S. Physics (with University Honors)	Carnegie-Mellon University 1976
M.A. Physics	University of Rochester 1979
Ph.D Physics	University of Rochester 1983
Thesis: "Radiative Width of the ρ^+ " Thesis advisor: Fred Lobkowitz	

ii) Appointments

Visiting Professor: Durham University, UK 2003-Present
Professor: Michigan State University 1998-Present
Associate Prof.: Michigan State University 1991-1998
Assistant Prof.: Michigan State University 1986-1991
Visiting Assistant Prof.: Michigan State University 1985-1986
Research Associate: University of Rochester 1983-1985

iii) Publications

Publications closely related to project:

1. Hard Interactions of Quarks and Gluons: a Primer for LHC Physics, J. Campbell, J. Huston, W.J. Stirling, *Rept. Prog. Phys.* **70**, 89 (2007); <http://stacks.iop.org/0034-4885/70/89>.
2. Jets in Hadron-Hadron Collisions", *Prog. Part. Nucl. Physics* **60**, 484 (2008), S. Ellis, K. Hatakayama, J. Huston, P. Loch, M. Toennesman
3. Inclusive Jet Production, Parton Distributions and the Search for New Physics, J. Huston et al., *JHEP* **0310**, 046 (2003).
4. Measurement of the Inclusive Jet Cross Section in $p\bar{p}$ Interactions at $\sqrt{s} = 1.96$ -TeV Using a Cone-based Jet Algorithm," J. Huston et al. *Phys. Rev. D* **74**, 071103 (2006).
5. The Les Houches SM and NLO Multileg Working Group: Summary Report", T. Binoth, J. Huston et al., arXiv:1003.1241.

JH has over 500 publications with greater than 30,000 citations including 8 renown papers (> 500 cites), 4 of which are experimental papers and 4 phenomenology.

iv) Synergistic Activities:

JH is the co-spokesman of the CTEQ collaboration. He is a visiting professor at the Institute for Particle Physics at Durham University (UK) and has been invited as a Distinguished Visitor by the the Scottish Universities Physics Alliance (SUPA). He has given a series of lectures on LHC QCD physics at national meetings in the U.S., Canada, France and Germany, as well as ATLAS collaboration-wide. He has organized many workshops, including six at Les Houches, at Santa Barbara (a 3 month workshop at the Kavli Institute), at Cambridge University and at Fermilab (TeV4LHC, Higgs Physics at the Tevatron and LHC, Standard Model Benchmarks at the Tevatron and LHC). He delivered the plenary talk on QCD at the 1998 International Conference in High Energy Physics held in Vancouver and the plenary talk on Photon and Drell-Yan physics at the 1989 Lepton-Photon meeting at Stanford. He is one of the authors of the Handbook on Perturbative QCD, published by CTEQ in the Reviews of Modern Physics. He is one of the authors of the CTEQ parton distribution functions and has worked on

developing many phenomenology tools (such as parton error pdf's , the Les Houches accords, the Les Houches NLO *wishlist*, PDF4LHC LHC cross section benchmarks) crucial for today's experimental analyses. He is the co-developer of *SpartyJet*, a framework to allow for very flexible jet reconstruction and analysis, in use at the Tevatron, LHC and phenomenology community. He has organized many CTEQ summer schools as well as the first sub-Saharan school on high energy physics (South Africa, August 2010). JH was a member of the Fermilab Users Executive Committee from 1995-1996 and 2002-2003. He organized the 1995, 2002 and 2003 UEC trips to Washington. In 1996, he was appointed by the Fermilab director to an ad hoc Public Policy Committee to deal with relations with both Congress and the Administration. In 2007, he was elected to the first executive committee for the newly formed US LHC Users Organization.

He has published recent review articles on physics at the LHC and on jet production in hadron-hadron colliders. His review paper with John Campbell and James Stirling is one of the most downloaded articles for the ROP in recent years. He is expanding it into a book to be published by Oxford University Press.

He has been invited to be an author for the Reviews of Particle Properties by the Particle Data Group (with responsibility for jet and W/Z cross section measurements) and has written an "Explain it in 60 seconds" article on jets for Symmetry magazine.

v) *Collaborators and Other Affiliations:*

Collaborators

- a. The CDF Collaboration, www-cdf.fnal.gov/cdfmemb.html
- b. The ATLAS Collaboration, graybook.cern.ch/programmes/experiments/ATLAS.html

Graduate and Postdoctoral Advisors

- c. Ph.D thesis: Prof. Fred Lobkowicz, University of Rochester
- d. Postdoctoral advisor: Prof. Tom Ferbel, University of Rochester

Thesis Advising and Postgraduate Scholar Sponsor

- e. Thesis advisor for Lee Sorrell, Simona Murgia, (Valeria Tano, Matthias Tonnesmann; formal advisor was Siggie Bethke but they were working with me on CDF as visitors at MSU), Gene Flanagan, Brian Martin, Mohammad Hussein, Ulrike Schnoor, Jessica Muir
- f. Postdoctoral advisor for John Mansour, Carlos Yosef, Ben Cooper, Andrea Messina, Mario Campanelli, Giorgi Arabidze

Biographical Sketch
Andrew J. Lankford

Mail address: Department of Physics & Astronomy
University of California
Irvine, CA 92697

Telephone: 949-824-2632
e-mail: Andrew.Lankford@uci.edu

PROFESSIONAL PREPARATION:

Yale University Mathematics and Physics, *Magna Cum Laude* w/ Departmental Honors B.S. 1972
Yale University Physics M.Phil 1974, Ph.D. 1978
Thesis: *Production of Vector Mesons and Direct Photons at the CERN ISR*

APPOINTMENTS:

University of California, Irvine:		
Professor,	Dept. of Physics and Astronomy	1990-present
Chair,	Dept. of Physics and Astronomy	2002-2007
CERN, European Laboratory for Particle Physics		
Scientific Associate	Physics Department	2009-present
Superconducting Super Collider Lab.:		
Guest Scientist	Physics Research Division	1993
Stanford Linear Accelerator Center:		
Physicist - Experimental (Tenure Staff)	Research Division	1990
Physicist - Experimental (Continuing Staff)	Research Division	1981-90
Stanford University:		
Lecturer,	Dept. of Physics	1988-90
Lawrence Berkeley Laboratory:		
Staff Scientist	Physics Research Division	1978-81
Research Physicist	Physics Research Division	1978

PUBLICATIONS:

Publications closely related to the proposed project:

1. *Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC*, with G. Aad, *et al.* [ATLAS Collaboration], Phys. Rev. Lett. **105** (2010) 252303.
2. *Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC*, with G. Aad, *et al.* [ATLAS Collaboration], Phys. Rev. Lett. **105** (2010) 161801.
3. *Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC*, with G. Aad, *et al.* [ATLAS Collaboration], Phys. Lett. **B688**, issue 1 (2010), 21.
4. *Off-detector electronics for a high-rate CSC detector*, J. Dailing, N. Drego, D. Hawkins, A.J. Lankford, Y. Li, M. Medve, S. Pier, M. Schernau, D. Stoker., IEEE Trans. Nucl. Sci. **51** (2004) 461.
5. *The Second Level Trigger of the ATLAS Experiment at CERN's LHC*, with A. Dos Anjos, *et al.* [ATLAS Trigger and Data Acquisition Collaboration], IEEE Trans. Nucl. Sci. **51** (2004) 909.

Other significant publications:

1. *Observation of direct CP violation in $B^0 \rightarrow K^+ \pi^-$ decays*, with B. Aubert, *et al.* [BABAR Collaboration], Phys. Rev. Lett. **93** (2004) 131801.
2. *Observation of a narrow meson decaying to $D_s^+ \pi^0$ at a mass of 2.32 GeV/c²*, with B. Aubert, *et al.* [BABAR Collaboration], Phys. Rev. Lett. **90** (2003) 242001.
3. *Measurement of the CP violating asymmetry amplitude $\sin 2\beta$* , with B. Aubert, *et al.* [BABAR Collaboration], Phys. Rev. Lett. **89** (2002) 201802.
4. *Observation of CP violation in the B^0 meson system*, with B. Aubert, *et al.* [BABAR Collaboration], Phys. Rev. Lett. **87** (2001) 091801.
5. *Architecture of the BABAR Electronics System*, Nucl. Instr. Meth. **A409** (1998) 654.

SYNERGISTIC ACTIVITIES:

1. ATLAS Collaboration (1994-present), including Deputy Spokesperson (2009-2013), Project Leader for Trigger, Data Acquisition, and Controls System (2000-02), Trigger and Data Acquisition Steering Group (2000-2009), Chair of Trigger and Data Acquisition Institute Board (2007-2009), Trigger and Data Acquisition Resource Committee (2001-present), Executive Board (2000-02, 2009-2011), Technical Management Board (2001-02)
2. U.S. ATLAS Collaboration (1994-present), including Trigger and Data Acquisition Subsystem Manager (1996-2000, 2003-present), Executive Committee (1994-2010)
3. BABAR Collaboration (1993-present), including Central Management Group (1997-99), Electronics System Co-Manager (2001-2008), Electronics System Manager (1994-2001), Technical Board (1994-2008), Online Software Coordinator (1999)
4. Committee to Assess the Science Proposed for the Deep Underground Science and Engineering Laboratory, National Research Council (Chair 2010-present)
5. Particle Physics Project Prioritization Panel (P5), Subpanel of High Energy Physics Advisory Panel to DOE and NSF (2008-present)
6. Visiting Committee for Fermilab Science Programs, Fermilab Research Alliance (2009-present; Chair 2010)
7. DOE Office of Science Review Committees (*e.g.* 12 GeV CEBAF Upgrade Project, JLab (2005-present), U.S. ALICE Experiment, CERN (2005-present), Facility for Rare Isotope Beams Merit Review Panel (2008))
8. Physics Advisory Committee, Fermi National Accelerator Laboratory (2001-2006; Chair 2005-2006)
9. Beyond Einstein Assessment Committee, National Research Council (2006-2007)

AWARDS:

Alfred P. Sloan Fellow (1972-1974)
Fellow, American Physical Society (2000)

COLLABORATORS & OTHER AFFILIATIONS:

Collaborators and Co-Editors (last 5 years):

Collaborators: ATLAS Collaboration, *BABAR* Collaboration

Graduate and Postdoctoral Advisors:

Graduate Advisors: William J. Willis (Columbia), Jack Sandweiss (Yale)

Postgraduate Advisor: George H. Trilling (Berkeley)

Thesis Advisor and Postgraduate-Scholar Sponsor (last 5 years):

Thesis Advisor: Ming Chao (Ph.D. 2005; Stanford), Donovan Hawkins (Ph.D. 2005; industry),
R. Porter (present, UCI)

Total number of graduate students advised: 20

Postgraduate-Scholar Sponsor: J. Deng, C. Flacco, H. Okawa, N. Zhou (UCI),
M. Bondioli (industry), Yong Li (industry), A. Negri (Pavia),

BIOGRAPHICAL SKETCH

Jose Guilherme Lima

Professional preparation

Post-doctoral: Fermilab, 1998–2000;

Graduate: Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro, Brazil. M.Sc. 1991, Ph.D. 1995

Undergraduate: Universidade Federal do Pará, Brazil, Physics, 1988

Appointments

2004–present: Research Scientist, Physics Dept, Northern Illinois University

2003–2004: Visiting Assistant Professor, Physics Dept, Northern Illinois University

1996–2003: Adjunct Professor, Universidade do Estado do Rio de Janeiro, Brazil

1995–1996: Visiting Professor, Universidade do Estado do Rio de Janeiro, Brazil

1991–1993: Guest Scientist, Fermilab

Publications

(i) Most closely related to the proposed project

1. “Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC”, ATLAS Collaboration, *Phys. Lett. B* 688, issue 1, 21 (2010),
2. “Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions With the ATLAS Detector at the LHC”, ATLAS Collaboration, *Phys. Rev. Lett.* 105, 161801 (2010),
3. “Measurement of the $W \rightarrow l\nu$ and $Z/\gamma^* \rightarrow ll$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector”, ATLAS Collaboration, accepted by *JHEP*(2010),
4. “Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC”, ATLAS Collaboration, *Phys. Rev. Lett.* 105, 252303 (2010),
5. “The status of the simulation project for the ATLAS experiment in view of the LHC startup”, ATLAS Collaboration, *J. Phys. Conf. Ser.* {219} 032060 (2010).

(ii) Other significant publications

1. “Directly Coupled tiles as elements of a scintillator calorimeter with MPPC readout”, Blazey G et al, *NIMA* {605} 277 (2009),
2. “Particle flow reconstruction based on the directed tree clustering algorithm”, Chakraborty D., Lima J.G.R., McIntosh R. and Zutshi V., *AIP Conf. Proc.* {867} 546 (2006),
3. “Investigation of a solid-state photodetector”, Beznosko D et al, *NIMA* {553} 438 (2005),
4. “Small-angle muon and bottom-quark production in pp collisions at $\sqrt{s} = 1.8$ TeV”, Abbott et al. (the D0 Collaboration), *Phys. Rev. Lett.* {84} 5478 (2000),
5. “Inclusive μ and b-quark production cross-sections in p anti-p collisions at $\sqrt{s} = 1.8$ TeV”, Abachi S. et al. (D0 Collaboration), *Phys.Rev.Lett.* {74} 3548 (1995)
6. “Study of the doubly Cabibbo suppressed decay $D^+ \rightarrow \phi K^+$ and the singly Cabibbo suppressed decay $D(s)^+ \rightarrow \phi K^+$ ”, Anjos J.C. (TPS Collaboration), *Phys. Rev. Lett.* {69} 2892 (1992)

Synergistic activities

Co-coordinator, Atlas tile calorimeter software, 2010–present
Deputy leader, NIU Atlas team, 2007–present
Co-convener, Vertex-ID group, D0 collaboration, 2000–2003

Collaborators in past 24 months

All member institutions on ALCPG calorimetry, CALICE and ATLAS.

Graduate Advisor - A. Santoro (CBPF, Rio de Janeiro, Brazil).

PostDoctoral Advisors – M. Narain (Boston Univ.)

Shawn P. McKee

Department of Physics &
School of Information
University of Michigan
Ann Arbor, Michigan 48109



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EDUCATION

1991 Ph.D., Physics, University of Michigan, Ann Arbor, Michigan
1986 B.Sc., Physics, Michigan State University, Lansing, Michigan
1986 B.Sc., Astrophysics, Michigan State University, Lansing, Michigan

EMPLOYMENT

2008- Joint appointment: Asst.(SI) & (Physics) Research Scientist
2004-2008 Joint appointment: Asst.(SI) & Assoc.(Physics) Research Scientist
2003-2004 Joint appointment with MGRID and Physics, Asst. Research Scientist
1999-2003 Asst. Research Scientist, Physics Department, University of Michigan
1993-1999 Research Fellow, Physics Department, University of Michigan
1992-1993 SSC Fellow, Physics Department, University of Michigan
1991-1992 Research Fellow, Physics Department, University of Michigan
1986-1991 Rackham Fellow, GRA, Physics Department, University of Michigan
1983-1986 Undergrad. RA, National Superconducting Cyclotron Facility, Michigan State U

POSITIONS

2006- Director of US ATLAS Great Lakes Tier-2 Computing Center
2005- Co-Chair of new Open Science Grid technical group on networking
2005-2006 Organizer of LHC Tier0-Tier1 Network Monitoring
2003-2004 Chair of Internet2 End-to-End Technical Advisory Group (E2E-TAG)
2002-2005 Technical Lead, Michigan NMI test-bed project
2002- Member of ICFA SCIC Sub-Committee on Monitoring
2001- Network Project Manager, US ATLAS
2001- Co-Chair, HENP Internet2 Working Group

RECENT RESEARCH ACTIVITIES

ATLAS (A Toroidal LHC AparatuS) One of four primary experiments planned for the Large Hadron Collider (LHC) at CERN which will search for the Higgs particle and explore a new energy regime. I have worked on online software and database activities for the MDT (Monitored Drift Tube) production at Michigan, as well as working on the detector simulation and analysis software. My recent focus has been the US ATLAS grid infrastructure and network efforts, where I am the Network Project Manager as well as the Director of the ATLAS Great Lakes Tier-2 (AGLT2). This has allowed me to pursue integrating my network research efforts into “production” in support of the ATLAS computing infrastructure. As of Fall of 2009, I am working on analyzing possible SUSY physics channels in ATLAS, focusing on the 2 and 3 lepton channels which show promise for early discovery.

WORK EXPERIENCE AND AWARDS

Co-PI on UltraLight: An Ultra-scale Optical Network Laboratory for Next Generation Science, an NSF ITR funded by MPS 9/15/2004-9/14/2008 (*\$2 Million*)

Co-PI on GridNFS: A NMI Development project to create a grid-aware version of NFS based upon V4. Funded for 8/1/2004-7/31/2007 (*\$1.2 Million*)

Co-PI on PLaNetS: Physics-Lambda based Network System. Fund for 8/1/07-9/1/08 for (*\$460K*)

Co-PI on DYNES: Development of a Dynamic Network System for 6/1/10-5/31/13 for (*\$1.4M*)

UltraLight Project wins **Internet2 IDEA award** for 2007. See <http://www.internet2.edu/idea/2007> for details.

Featured on LiveScience.com, see the article at http://www.livescience.com/technology/070824_bts_ultralight.html, August 2007.

UltraLight Project wins the **CENIC 2008 Innovations in Networking Award**. See <http://cenic08.cenic.org/program>, March 11, 2008.

Editor for “Challenges in Internet” part of the International Journal on Advances in Internet Technology (See http://www.ariajournals.org/internet_technology/index.html).

INTERNET 2009 Technical Program Committee Chair (See <http://www.aria.org/conferences2009/INTERNET09.html>).

Interviewed for “Research Computing and Engineering” RCE podcast, aired June 6 2009. See <http://www.rce-cast.com>

Merit Network's Award for Innovation in Networking and Information Technology, June 2009

INTERNET2009 Best Paper Award for “Establishment and Management of Virtual End-to-End QoS Paths through Modern Hybrid WANs with TeraPaths”, September 8, 2009.

SELECTED TALKS

1. “The Dark Matter Puzzle: The Search for What Makes Up 90% of Our Universe”, University of Michigan Public Lecture Series, Ann Arbor, MI, December 2 and December 9, 1995.
2. “Indirect Detection of WIMPs with Cosmic Ray Positrons and Antiprotons: Current Status and Future Prospects”, (Invited Talk) 2nd International Conference on the Sources and Detection of Dark Matter in the Universe, Santa Monica, CA, February 16, 1996.
3. “The Grid: The Future of HEP Computing?”, University of Michigan Physics Department Seminar, January 7, 2002 (<http://wlap.org/umich/phys/seminars/hep-astro/2002/mckee/>)
4. “UltraLight Overview”, US ATLAS Tier-1 and Tier-2 Network Planning Meeting, invited talk, Brookhaven National Lab, NY, December 14, 2005.
5. “The ATLAS Computing Model: Status, Plans and Future Possibilities”, Invited Talk, Conference on Computing in Physics, Gyeongju, Republic of Korea, August 30th 2006.
6. “High-Energy Physics, ATLAS and Trans-Pacific Collaboration Opportunities”, Invited talk for Driving eResearch Collaboration Across the Pacific Workshop, Perth Australia, October 12th 2007.
7. "Preparing for the Data Deluge: Some Experiences in Networking for the ATLAS Experiment at the LHC", Invited talk for Merit Member's Annual meeting, Ann Arbor, MI, June 12 2009.
8. “Preparing for the LHC Restart: An Overview of the ATLAS Experiment and its Related Networking Needs”, Invited Talk for Fall Internet2 Member Meeting, San Antonio, Texas, October 7, 2009.

RECENT COLLABORATORS

William Adamson – University of Michigan
Homer Neal – University of Michigan
Paul Avery – University of Florida

Gregory Tarle – Thesis Advisor
Peter Honeyman – University of Michigan
Harvey Newman - Caltech

BIOGRAPHICAL SKETCH OF ALLEN MINCER

Professional Preparation:

Brooklyn College	Physics & Mathematics (Magna Cum Laude, Honors in Math & Physics)	B.S. 1978
University of Maryland, College Park	High Energy Cosmic Ray Physics	Ph.D. 1984
The Technion - Israel Inst. Tech.	Lady Davis Fellow	1984 - 1986
Caltech - Calif. Inst. Tech.	Research Fellow	1986-1989
Caltech - Calif. Inst. Tech.	Senior Research Fellow	1989

Appointments:

Professor, 2001 - present; Associate Professor, 1995 - 2001; Assistant Professor, 1989 - 1995
New York University, New York, New York 10003
Visiting Associate Professor, A.Y. 1997
The Technion - Israel Inst. Tech., Haifa 32000, Israel

Administrative Appointments:

Chair, Department of Physics, Sep. 2001 - Aug. 2005, NYU
Director at NYU, NYU - Stevens Inst. Tech. Joint Degree Program, Sep. 2000 - Aug. 2001, NYU
Physics Department Director of Undergraduate Studies, Sep. 1997 - Aug. 2000, NYU
Physics Department Director of Graduate Studies, Sep. 1995 - Aug. 1996, NYU

Honors and Awards:

Collegiate Professor Sep. 2008 - Aug. 2011, New York University
Golden Dozen Teaching Award - 2000 & 1995, New York University

Five Publications Closely Related to Proposed Project:

- "Beam Tests of the D0 Uranium Liquid Argon End Calorimeters," With the D0 Collaboration, N.I.M. **A324**, 53 (1993).
- "The Lead Liquid Argon Sampling Calorimeter of the SLD Detector," With the SLD Collaboration, N.I.M. **A328**, 472 (1993).
- "Observation of the Top Quark," With the D0 Collaboration, FERMILAB-PUB-95/028-E; Phys. Rev. Lett. **74**, 2632 (1995), http://prola.aps.org/abstract/PRL/v74/i14/p2632_1
- "Measurement of the W Boson Mass," With the D0 Collaboration, Phys. Rev. Lett. **77**, 3309 (1996), http://prola.aps.org/abstract/PRL/v77/i16/p3309_1
- "The ATLAS Experiment at the CERN Large Hadron Collider," With the ATLAS Collaboration, JINST **3** S08003 (2008). <http://www.iop.org/EJ/abstract/1748-0221/3/08/S08003>

Five Other Significant Publications:

- "Resonant Substructure in $K^- \pi^+ \pi^+ \pi^-$ Decays of D^0 Mesons," With the MARK-III Collaboration, P.R.L. **64**, 2615 (1990), http://prola.aps.org/abstract/PRL/v64/i22/p2615_1
- "First Measurement of the Left-Right Cross-Section Asymmetry in Z Boson Production by $e^+ e^-$ Collisions," With the SLD Collaboration, Phys. Rev. Lett. **70**, 2515 (1993), http://prola.aps.org/abstract/PRL/v70/i17/p2515_1

- “Muon Conversion Experiments - Current and Future,” Presented by A.I. Mincer, for the MECO Collaboration, Intersections of Particle and Nuclear Physics - 7th Conference CIPANP2000, Quebec City, Canada, May 22 - 28, 2000, AIP Conf. Proc. 549 (p. 942), <http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=APCPCS000549000001000942000001&idtype=cvips&gifs=yes>
- “Charge Production in Thin Gap Multi–Wire Chambers,” A.I. Mincer, S. Dado, J.J. Goldberg, Y. Gernitzky, D. Lazic, N.Z. Lupu, S. Robins, Y. Rozen, and S. Tarem, N.I.M. **A439**, 147 (2000).
- “TeV Gamma-Ray Sources from a Survey of the Galactic Plane with Milagro,” With the Milagro Collaboration, Ap.J. Lett. **664**, L91 (2007), <http://arxiv.org/abs/0705.0707>

Synergistic Activities:

Physics Education research with Jhumki Basu of the NYU Department of Teaching and Learning.

Collaborators and Co-Editors Within the Past 48 Months:

Milagro Collaborators: GMU: R.W. Ellsworth; LANL: B. Dingus, S. Casinova, G. Gisler, T.J. Haines, C. Hoffman, F. Samuelson, C. Sinnis, G. Walker, M. Wilson, X. Xu; MSU: A. Abdo, J. Linnemann; NYU: L. Fleysher, R. Fleysher, P. Nemethy, UCI: B. Allen, S. Delay, I. Leonor, A. Shoup, G.B. Yodh; UCR: B. Shen, T. Tumer, K. Wang, M. Wascko; UCSC: W. Benbow, D. Coyne, D. Dorfan, L. Kelley, J. McCullough, M. Morales, P. Saz Parkinson M. Schneider, S. Westerhoff, D. Williams; U of Md.: D. Berley, E. Blaufuss, J. Bussons-Gordo, T. DeYoung, J. Goodman, E. Hays, C. Lansdell, D. Noyes, A. Smith, G. Sullivan; UNH: A. Falcone, R. Miller, J. Ryan; U. of Wisc.: R. Atkins, M. Gonzalez, J. McEnery;

MECO Collaborators: BNL: M. Brennan, K. Brown, G. Greene, L. Jia, W. Marciano, W. Meng, W. Morse, P. Pile Y. Semertzidis, P. Yamin; BU: J. Miller, O. Rind, L. Roberts; INR, Moscow: V.M. Lobashev, A.N. Toropin; NYU: R. Djilkibaev, P. Nemethy, J. Sculli; Osaka U.: M. Aoki, Y. Kuno, A. Sato; Syracuse U.: R. Holmes, P. Souder; UCI: C. Chen, M. Hebert, T.J. Liu, W. Molzon, J. Popp, V. Tumakov; U. of Houston: Y. Cui, E.V. Hungerford, K.J. Lan, B.W. Mayes, L.S. Pinsky, J. Wilson; U. Ill.: D. Koltick; U. Mass.: K. Kumar U Penn.: W.D. Wales; U VA.: E.C. Dukes, K.S. Nelson, A. Norman; Wm and Mary: M. Eckhause, J. Kane, R. Welsh

ATLAS Collaboration: <http://graybook.cern.ch/programmes/experiments/lhc/ATLAS.html>

Science Education Collaborators: BNL: S. Bronson, J. Clodius, K. White; U. of Houston: J. Wilson; NYU Teaching and Learning: J. Basu, P. Fraser-Abder, C. Milne, R. Wallace.

Graduate and Postdoctoral Advisors:

Thesis Advisor: Gaurang B. Yodh, Univ. of California, Irvine, Postdoctoral Advisors: David Hitlin, Caltech; Jacques Goldberg, The Technion-Israel Institute of Technology

Graduate Students Advised & Postdoctoral Scholars Sponsored Over the Past Five Years:

Postdoctoral Scholars Sponsored (3): James Popp & Alexander Toropin (with J. Sculli & P. Nemethy), Diego Casadei (with P. Nemethy)

Graduate Students - PhD's sponsored (3): Grant Christopher, Lazar Fleysher, Long Zhao

Homer A. Neal
Samuel A. Goudsmit Distinguished University Professor of Physics
University of Michigan, Ann Arbor, Michigan 48109-1120

Professional Preparation

June, 1961	B.S., Physics (with honors), Indiana University
Feb., 1963	M.S., Physics, University of Michigan
April, 1966	Ph.D., Physics, University of Michigan

Appointments

1967-70	Assistant Professor of Physics, Indiana University
1970-72	Associate Professor of Physics, Indiana University
1972	Visiting Scientist, Stanford Linear Accelerator Center, Stanford University
1972-81	Professor of Physics, Indiana University
1974	Visiting Scientist, Niels Bohr Institute, University of Copenhagen
1976-81	Dean, Research and Graduate Development, Indiana University
1981-87	Professor of Physics, State University of New York at Stony Brook
1981-86	Provost, State University of New York at Stony Brook
1987-	Professor of Physics University of Michigan
1987-93	Chair, Department of Physics, University of Michigan
1993-97	Vice President for Research, University of Michigan
1996-97	Interim President, University of Michigan
2000-	Samuel A. Goudsmit Distinguished University Professor of Physics

Selected Recent Publications

1. Search for 3- and 4-body Decays of the Scalar Top Quark in $p\bar{p}$ Collisions at $\sqrt{s} = 1.8$ TeV, V.M. Abazov, Phys. Lett. B **581**, 147-155 (2004).
2. Search for Narrow $t\bar{t}$ Resonances in $p\bar{p}$ Collisions at $\sqrt{s} = 1.8$ TeV, V.M. Abazov, *et al.*, Phys. Rev. Lett. **92**, 221801-1 (2004).
3. Search for New Particles in the Two-jet Decay Channel with the D0 Detector, V.M. Abazov, *et al.*, Phys. Rev. D **69**, 111101-1 (2004).
4. An Improved Measurement of the Top Quark Mass, V.M. Abazov, *et al.*, Nature **429**, 638 (2004).
5. Search for Pair Production of Light Scalar Quarks in $p\bar{p}$ Collisions at $\sqrt{s} = 1.8$ TeV, V.M. Abazov, *et al.*, Phys. Rev. Lett. **93**, 011801-1 (2004).
6. Combination of CDF and D0 Results in the W Boson Mass and Width, V.M. Abazov, *et al.*, Phys. Rev D **70**, 092008 (2004).
7. Search for Doubly Charged Higgs Boson Pair Production in the Decay to $\mu^+\mu^+\mu^-\mu^-$ in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV, V.M. Abazov, *et al.*, Phys. Rev. Lett. **93**, 141801-1 (2004).
8. Observation and Properties of the $X(3872)$ Decaying to $J/\psi\pi^+\pi^-$ in $p\bar{p}$ Collisions at $\sqrt{s} = 19.6$ TeV, V.M. Abazov, *et al.*, Phys. Rev. Lett. **93**, 162002-1 (2004).

9. Search for Supersymmetry with Gauge-Mediated Breaking in Diphoton Events at D0, V.M. Abazov, *et al.*, Phys. Rev. Lett. **94**, 041801-1 (2005).
10. Measurement of the B_s^0 Lifetime in the Exclusive Decay Channel $B_s^0 \rightarrow J/\psi\phi$, V.M. Abazov, *et al.*, Phys. Rev. Lett. **94**, 042001-1 (2005).
11. Search for the Flavor-Changing Neutral Current Decay $B_s^0 \rightarrow \mu^+\mu^-$ in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV with the D0 Detector, V.M. Abazov, *et al.*, Phys. Rev. Lett. **94**, 071802-1 (2005).
12. Measurement of the Lambda(b) lifetime in the exclusive decay Lambda(b) $\rightarrow J/\psi$ Lambda. By D0 Collaboration (V.M. Abazov *et al.*). FERMILAB-PUB-07-094-E, Apr 2007. 7pp. Published in Phys.Rev.Lett.99:142001,2007.
13. Direct observation of the strange b baryon Xi(b)-. By D0 Collaboration (V.M. Abazov *et al.*). FERMILAB-PUB-07-196-E, Jun 2007. 7pp. Published in Phys.Rev.Lett.99:052001,2007.
14. DOE/NSF, High Energy Physics Advisory Panel, University Grants Program Subpanel Report, July 22, 2007, Department of Energy, National Science Foundation
15. The ATLAS Experiment at the CERN Large Hadron Collider, The ATLAS Collaboration, G. Aad *et al.*, JINST 3 (2008) S08003.
16. Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Lett. B 688, issue 1, 21 (2010).
17. Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 161801 (2010).
18. Measurement of the $W \rightarrow l\nu$ and $Z/\gamma^* \rightarrow ll$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector, ATLAS Collaboration, accepted by JHEP (2010)
19. Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 252303 (2010)

Synergistic Activities

H.A. Neal is the ATLAS Institutional Representative for the University of Michigan and is also Director of the University of Michigan ATLAS Collaboratory Project, which is focused on the use of web based archiving technology and other collaboration tools in support of research and training. One accomplishment in this latter work has been the development of tools for software training and web recordings in the ATLAS high energy physics experiment. Neal is a member of the National Academies Board on Physics and Astronomy, is a member of the External Advisory Board for Lawrence Berkeley National Laboratory, a member of the Board of Trustees of the Lounsbery Foundation, and a member of the Board of Directors of the Ford Motor Company. Neal leads the ATLAS B-physics Working Group on the preparation for a study of the polarization of inclusively produced Λ_b hyperons in ATLAS. His postdoc, Eduard de la Cruz Burelo, spearheaded the recently announced discovery of the Ξ_b hyperon in DZERO, partly as a step in preparing for the ATLAS Λ_b studies. Another of his postdocs, Natalia Panikashvili, led the recently PRL published DZERO Λ_b precision lifetime analysis, and is coordinating the UM ATLAS group's plans for SUSY studies.

JAMES E. PILCHER

12/17/10

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Enrico Fermi Institute
University of Chicago
5640 S. Ellis Avenue
Chicago, IL 60637

+1 773 702 7443
+1 773 702 1914 fax
j-pilcher@uchicago.edu

Professional Preparation

Undergraduate	University of Toronto	Engineering Physics	BASc, 1964
Graduate	University of Toronto	Physics	MSc, 1966
	Princeton University	Physics	PhD, 1968
Postdoctoral	Princeton University	High Energy Physics	1968-69

Appointments

Professor	University of Chicago, Department of Physics and EFI	1979-present
Associate Professor	University of Chicago, Department of Physics and EFI	1977-79
Assistant Professor	University of Chicago, Department of Physics and EFI	1972-77
Assistant Professor	Harvard University, Department of Physics	1970-72
Visiting Scientist	CERN	1969-70

Publications (selected from a total of 477)

(a) Related to current proposal

- [1] *Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC*, The ATLAS Collaboration, Phys Lett B 688, 21 (2010).
- [2] *Study of energy response and resolution of the ATLAS barrel calorimeter to hadrons of energies from 20 to 350 GeV*, ATLAS Collaboration (E. Abat *et al.*), Nucl. Instr. and Meth. **A621**, 134 (2010).
- [3] *Readiness of the ATLAS Tile Calorimeter for LHC collisions*, The ATLAS Collaboration, submitted to EPJC.
- [4] *Testbeam studies of production modules of the ATLAS Tile Calorimeter*, ATLAS Collaboration (P. Adragna *et al.*), Nucl. Instr. and Meth. **A606**, 362 (2009).
- [5] *Design of the front-end analog electronics for the ATLAS tile calorimeter*, ATLAS Collaboration (K. Anderson *et al.*), Nucl. Instr. and Meth. **A551**, 469 (2005).

(b) Others

- [1] *Measurement of the Mass and Width of the W Boson*, The OPAL Collaboration, Euro. Phys. Journal **C45**, 307 (2006).
- [2] *Measurement of Single Photon Production in e^+e^- Collisions near the Z^0 Resonance*, The OPAL Collaboration, Zeit. Phys. **C65**, 17 (1995).
- [3] *Measurement of the Z^0 Mass and Width with the OPAL Detector at LEP*, The OPAL Collaboration, Phys. Lett. **B235**, 379 (1990).

- [4] Determination of the Pion Structure Function from Muon-Pair Production, C.B. Newman, K.J. Anderson, R.N. Coleman, G.E. Hogan, K.P. Karhi, K.T. McDonald, J.E. Pilcher, E.I. Rosenberg, G.H. Sanders, A.J.S. Smith, J.J. Thaler, Phys. Rev. Lett. **42**, 951 (1979).
- [5] *Experimental Study of the Decay $K_L \rightarrow \pi^0 \pi^0$ and Other Rare Decay Modes*, M. Banner, J. W. Cronin, J. K. Liu, J. E. Pilcher, Phys. Rev. **188**, 2033 (1969).

Synergistic Activities

- Chair, ATLAS Publications Committee, 2009-10
- Associate Editor, European Physical Journal C, 2007-present.
- Organizer of the Compton Lectures, a series of 10 public lectures offered each fall and spring at the University of Chicago, 2001 to 2007.
- Science fair judge, Chicago Public School System.
- Organizing Committee, International Workshop on LHC Physics, 2001.
- Chair, ATLAS Collaboration Board, 2000-2001.
- Editorial Board, Physical Review Letters, 1995-98.

Collaborators and Other Affiliations

(i) Collaborators and Co-Authors

The OPAL Collaboration

The ATLAS Collaboration

(ii) Graduate and Postdoctoral Advisors

James W. Cronin - University of Chicago

Carlo Rubbia - CERN

(iii) Thesis Advisees and Postdoctoral Scholars of the past 5 years

PhD Students (15 total)	E. Feng	University of Chicago
	I. Jen-La Plante	University of Chicago
	M. Hurwitz	University of Chicago
Postdoctoral Scholars (20 total)	G. Choudalakis	University of Chicago
	P. Onyisi	University of Chicago
	M. Dunford	CERN
	G. Usai	University of Texas, Arlington
	A. Gupta	
	R. Teuscher	University of Toronto / CERN

b. Bernard Pope

i) Professional Preparation

B.Sc. Physics (First Class Honours),	1965,	University of Birmingham (U.K.)
M.A. Physics,	1967,	Columbia University, New York
Ph.D. Physics,	1971,	Columbia University, New York

ii) Appointments

Professor, Department of Physics, Michigan State University	1982 – present
Visiting Research Associate, PPE Division, CERN	1995 – 1996
Assistant Professor, Physics Department, Princeton University	1977 – 1982
Staff Member, EP Division, CERN	1973 – 1977
CERN Fellow, NP/EP Division, CERN	1971 – 1973
Research Assistant, Nevis Laboratory, Columbia University	1967 – 1971
Teaching Assistant, Physics Department, Columbia University	1965 – 1967

iii) Publications

Publications related to the proposed project

1. “Multivariate searches for single top quark production with the DZero detector”, Phys. Rev. D {75}, 092007 {2007}.
2. “Evidence for production of single top quarks and first direct measurement of $|V_{tb}|$ ”, Phys. Rev. Lett. {98}, 181902 (2007).
3. “Prospects for single top observation with ATLAS data at 10 TeV and at 7 TeV”, J.L. Holzbauer, P. Ryan, B.G. Pope, R. Schwienhorst, ATL-COM-PHYS-2010-324, (July 2010).
4. “Performance of the ATLAS detector using first collision data”, the ATLAS Collaboration, arXiv:1005.5254v1, accepted by JINST (submitted May 2010).
5. “Search for top pair candidate events in ATLAS at $\sqrt{s}=7$ TeV”, the ATLAS Collaboration, ATLAS-CONF-2010-063, submitted to the 35th International Conference on High Energy Physics, Paris, (July 2010).

Other significant publications

1. “Physics Possibilities of $p\bar{p}$ Collisions in the CERN SPS”, B.G. Pope and S. Van der Meer, CERN/06/77-1 (1977).
2. “An Improved Measurement of the Top Quark Mass”, Nature {429}, 638 {2004}.
3. “ATLAS High-Level Trigger Data Acquisition and Controls”, CERN/LHCC/2003-022, ATLAS TDR 016, (June 2003).
4. “The ATLAS High Level Trigger Region of Interest Builder”, ATL-DAQ-PUB-2007-001. Published in the Journal of Instrumentation, 2008-JINST-3-P04001 (April 2008).
5. “Charged-particle multiplicities in pp interactions at $\sqrt{s}=900$ GeV measured with the ATLAS detector at the LHC”, CERN-PH-EP/2010-004 (15 March 2010), Phys. Lett. B 688, Issue 1, 21-42.

iv) Synergistic Activities

Secretary/Treasurer of the Division of Particles and Fields, American Physical Society, 1986-1989. Chair of the DØ Speakers’ Bureau, 1998-2000. Have several times coordinated the DØ collaboration’s submission of abstracts to APS conferences. Institutional Representative on ATLAS Collaboration Board. Member of ATLAS Trigger/DAQ Institutes Board. Active in Quarknet which has included organized visits to Fermilab for mid-Michigan teachers and

students, a two-weekly, summer training session for local teachers, organized a *World Year of Physics/ Einstein Centennial* Symposium (March 2005). Taught SME862, a course in modern physics leading to a masters' degree for high school teachers. Awarded the 2010 Distinguished Faculty Award of Michigan State University.

v) *Collaborators & Other Affiliations*

Members of the DØ Collaboration

Members of the ATLAS Collaboration

vi) *Graduate and Postdoctoral Advisors*

Thesis Advisor – Leon Lederman, Columbia University and Fermilab

Postdoctoral Advisor – Luigi DiLella, CERN

vii) *Thesis Advisees*

Jenny Holzbauer

Total number of PhD students – 7

viii) *Postgraduate Scholar Advisees*

Barbara Alvarez-Gonzalez

Alessandro DiMattia

Patrick Ryan

Total number of postdoctoral scholars sponsored– 6

MICHAEL M. RIJSSENBEEK

Department of Physics and Astronomy, Stony Brook University
Stony Brook, New York 11794-3800, Phone: 631-632-8099, Fax: 631-632-8101

I. EDUCATION

University of Amsterdam	B.S., Physics and Astronomy	January, 1972
University of Amsterdam	Ph.D. Physics	October, 1979

II. PROFESSIONAL CAREER

1994–	Professor	Stony Brook University, NY; DØ and ATLAS experiments
1989–1994	Associate Professor	Stony Brook University, NY; DØ experiment
1985–1989	Assistant Professor	Stony Brook University, NY; DØ experiment
1981–1985	CERN Staff member	CERN, Switzerland; UA1 experiment
1979–1981	CERN Fellow	CERN, Switzerland; UA1 experiment

III. Publications

~500 Publications with the UA1 (46), DØ (~420), PP2PP, and ATLAS Collaborations.

Five publications related to building detectors

1. "The Construction of the Central Detector for an Experiment at the CERN Anti-p p Collider," the UA1 Collaboration ([M. Barranco-Luque et al.](#)). Nucl.Instrum.Meth.176:175,1980.
2. "The DØ Detector," the DØ Collaboration ([S. Abachi et al.](#)). Nucl. Instrum. Meth. A338:185-253,1994.
3. "The Upgraded Dzero Detector," V. M. Abazov et al., (DZero Collaboration), Nucl. Instrum. Meth. A 565, 463, 2006.
4. "Construction, Assembly and Tests of the ATLAS Electromagnetic Barrel Calorimeter," the ATLAS Electromagnetic Barrel Liquid Argon Calorimeter Group ([Bernard Aubert et al.](#)). Nucl. Instrum. Meth. A558:388-418, 2006.
5. "The High Voltage Feedthroughs for the ATLAS Liquid Argon Calorimeters," B.Botchev, G.Finocchiaro, J.Hoffman, R.L.McCarthy, M.Rijssenbeek, JSteffens, A.Talalaevskii, M.Thioye, M.Zdrzil, J.Farrell, S.Kane. JINST 2:T10002, 2007.

Five other significant publications

1. "Experimental Observation of Lepton Pairs of Invariant Mass Around 95-GeV/c**2 at the CERN SPS Collider," the UA1 Collaboration ([G. Arnison et al.](#)). Phys. Lett. B126:398-410,1983
2. "Experimental Observation of Isolated Large Transverse Energy Electrons with Associated Missing Energy at $s^{1/2} = 540$ -GeV," the UA1 Collaboration ([G. Arnison et al.](#)). Phys. Lett. B122:103-116,1983.
3. "Observation of the Top Quark," the DØ Collaboration ([S. Abachi et al.](#)). Phys. Rev. Lett. 74:2632-2637,1995.
4. Conference Summary XIth International Conference on Elastic and Diffractive Scattering, [Stanley J. Brodsky](#), (SLAC) and [Michael Rijssenbeek](#); SLAC-PUB-11553, Nov 2005. Invited talk at 11th Int. Conf. on Elastic and Diffractive Scattering: Towards High Energy Frontiers: The 20th Anniversary of the Blois Workshops, Chateau de Blois, France, 15-20 May 2005. e-Print: hep-ph/0511178.
5. "Measurement of the W boson mass," the DØ Collaboration ([V. Abazov et al.](#)). Phys. Rev. Lett. 103:141801,2009.

IV. PROFESSIONAL ACTIVITIES

Reviewer of PRL, PRD, IEEE submissions; reviewer of NSF and DOE grant proposals (1996–)

Member/chair of several DØ Editorial Boards (1994–)

Chair Local Organizing Committee for XIIth International Conference on Hadron Collider Physics, June 1997, Stony Brook.

Invited conference talks, colloquia, and seminars

V. SYNERGISTIC ACTIVITIES

2002–2004 Convener of the ATLAS Luminosity and Forward Physics Working Group

1997–present Stony Brook ATLAS representative

1995–1998 Co-convener of DØ W mass group

1989–1992 Co-convener of DØ Electroweak Physics group

1986 DØ Tracking test-beam czar

VI. COLLABORATORS

- Dzero Collaboration (<http://www-d0.fnal.gov>)
- ATLAS Collaboration (<http://atlas.web.cern.ch/Atlas/Welcome.html>)
- FP420 Collaboration (<http://www.fp420.com>)

VII. ADVISEES (Stony Brook: DØ and ATLAS)

1. James Cochran PhD 1993; Professor, Iowa State University
2. Joseph Thomson PhD 1994; CEO Circadiant Systems Inc.
3. Dennis Shpakov PhD 2000; Northeastern University
4. Abid Patwa PhD 2001; Scientist, Brookhaven National Laboratory
5. Chunmei Chang PhD 2001
6. Andrei Talalaevskii Engineer, HYPRES Inc.
7. Zhongmin Wang PhD 2004, University of Pennsylvania, Medical Center
8. Marian Zdrazil PhD 2004, Royal Bank of Canada
9. Moustapha Thioye PhD 2008, Postdoc, Yale University
10. Feng Guo PhD 2010, Financial Industry (Chicago)
11. Julia Ann Gray PhD 2011 (estimated)
12. John Stupak PhD 2013 (estimated)

VIII. ADVISORS

- (Postdoctoral) C. Rubbia, CERN, B. Sadoulet, CERN.
- (Ph.D. Thesis) D. Harting, UvA; L. H. Muirhead, U Liverpool (deceased).

IX. AWARDS and HONORS

- Faculty Teaching Award, Physics Dept., Stony Brook, 1997.
- APS Fellow, 2010

Abraham Seiden
Santa Cruz Institute for Particle Physics (SCIPP)
UC Santa Cruz Department of Physics

PROFESSIONAL PREPARATION

Columbia University	Applied Physics	B.S.	1967
California Institute of Technology	Physics	M.S.	1970
University of California, Santa Cruz	Physics	Ph.D.	1974

POST DOCTORAL APPOINTMENTS

1975-1976	Postdoctoral Research Scientist, High Energy Physics, University of California, Santa Cruz
1974-1975	Visiting Scientist, CERN

APPOINTMENTS

2008-present	Distinguished Professor of Physics, University of California, Santa Cruz
1981-2010	Director, Santa Cruz Institute for Particle Physics
1986-2008	Professor of Physics, University of California, Santa Cruz
1985-1986	Visiting Scientist, European Laboratory for Particle Physics (CERN)
1981-1985	Associate Professor of Physics, University of California, Santa Cruz
1978-1981	Assistant Professor of Physics, University of California, Santa Cruz
1976-1978	Assistant Professor of Physics in Residence, University of California, Santa Cruz

SELECTED PUBLICATIONS PERTINENT TO THIS PROPOSAL

1. Radiation-hard semiconductor detectors for Super LHC.
M. Bruzzi *et al.* Nucl. Instrum. Meth. A 541, 189 (2005).
2. Tracking detectors for the sLHC, the LHC upgrade.
H.F.-W. Sadrozinski and A. Seiden. Nucl. Instrum. Meth. A 541, 434 (2005)
3. The Particle Tracking Microscope PTSM.
H. F.-W. Sadrozinski *et al.* IEEE Trans. Nucl. Sci., 51(5): 2032-2036, 2004.
4. Ionization Damage on Atlas-SCT Front-End Electronics considering Low-Dose-Rate Effects.
M. Ullan *et al.*, IEEE Trans. Nucl. Sci. 49:1106-1111, 2002.
5. The BaBar silicon vertex tracker, performance and running experience.
V. Re *et al.*, Nuclear Instruments and Methods A 485, 10(2002).

OTHER PUBLICATIONS

1. Search for CP Violation in the Decays $D^0 \rightarrow K^-K^+$ and $D^0 \rightarrow \pi^-\pi^+$.
B. Aubert *et al.* (BaBar Collaboration), Phys. Rev. Lett. 100:061803 (2008).

2. Evidence for D0-anti-D0 Mixing.
B. Aubert *et al.* (BaBar Collaboration). Phys. Rev. Lett. 98:211802 (2007).
3. Search for D0-anti-D0 Mixing and Branching-Ratio Measurement in the Decay $D0 \rightarrow K^+\pi^-\pi^0$.
B. Aubert *et al.* (BaBar Collaboration). Phys. Rev. Lett. 97:221803 (2006).
4. Limits on D0-anti-D0 mixing and CP violation from the ratio of lifetimes for decay to $K^-\pi^+$, K^+K^+ and $\pi^-\pi^+$.
B. Aubert *et al.* (BaBar Collaboration). Phys. Rev. Lett. 91:121801 (2003).
5. Tracking at the SSC/LHC.
H. F.-W. Sadrozinski, A. Seiden, A. Weinstein, Nuclear Instruments and Methods A 279, 223, 1998.

SYNERGISTIC ACTIVITIES

Author of a textbook on particle physics: “Particle Physics, A Comprehensive Introduction”, published by Addison Wesley in 2005.

Have had significant service roles for US ATLAS, various laboratories, the US High Energy Physics Program and other areas of physics. Examples, with dates of service are given below.

2010	Member of DUSEL Program Advisory Committee
2009	Member of Particle Astrophysics Scientific Assessment Group
2005-present	Manager, US ATLAS Upgrade Effort
2002-2007	Chair, Particle Physics Project Prioritization Panel
2001-2003	Chair of LIGO Program Advisory Committee
1994-2000	Member of CERN Scientific Policy Committee

COLLABORATORS & OTHER AFFILIATIONS

a) Collaborators

I am a member of the ATLAS collaboration with approximately 3000 members.

Recent individuals with whom I have worked closely include: Howard Gordon (BNL), Mike Tuts (Columbia), Maurice Garcia-Sciveres (LBNL), Carl Haber (LBNL), M. Gilchriese (LBNL), Phil Allport (Liverpool, U.K.), Nigel Hessey (Nikhef, Holland).

b) Graduate Advisor

Clemens Heusch, retired.

c) Postdoctoral Advisor

Pierre Darriulat, retired

d) Advisees

Graduate Students: Michael Wilson, Christian Flacco, Ken Fowler, Peter Manning (current).
Postdoctoral Scientists: Jovan Mitrevski, Sofia Chouridou.

James Thomas Shank

Physics Department
Boston University
590 Commonwealth Ave
Boston, MA 02215

+1-617-353-6028
+1-617-353-9393 (fax)
shank@bu.edu

Professional Preparation

Undergraduate	Oakland University	Physics	BS, 1976
Graduate	University of California, Berkeley	Physics	PhD, 1988

Appointments

Research Professor	Boston University, Center for Computational Science and Physics Department	2006-present
Research Associate Professor	Boston University, Physics Department	2000-2006
Research Assistant Professor	Boston University, Physics Department	1991-2000
Research Associate	Boston University, Physics Department	1988-91
Research Assistant	University of California, Berkeley Physics Department	1980-88
Teaching Assistant	University of California, Berkeley Physics Department	1976-79

Publications

- [1] Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC, 14 Aug 2010, Submitted to Physical Review Letters. [arXiv:1008.2461v1](https://arxiv.org/abs/1008.2461v1)
- [2] The ATLAS Detector: Status and Results from Cosmic Rays, James T. Shank for the ATLAS Collaboration, Proceedings of DPF-2009, Detroit, MI, July 2009, eConf C090726. [arXiv:0910.3081](https://arxiv.org/abs/0910.3081)
- [3] Expected Performance of the ATLAS Experiment - Detector, Trigger and Physics, The ATLAS Collaboration, (Submitted on 28 Dec 2008 (v1), last revised 1 Apr 2009 (this version, v3)) [arXiv:0901.0512v3](https://arxiv.org/abs/0901.0512v3)
- [4] The ATLAS Experiment at the CERN Large Hadron Collider. August, 2008. JINST 3 S08003 <http://www.iop.org/EJ/journal/-page=extra.lhc/jinst>
- [5] The ATLAS Computing Technical Design Report. June, 2005. ATLAS-TDR-017, CERN-LHCC-2005-022 <http://doc.cern.ch/archive/electronic/cern/preprints/lhcc/public/lhcc-2005-022.pdf>
- [6] A Step Towards a Computing Grid for the LHC Experiments: ATLAS DATA CHALLENGE 1. By ATLAS DC1 Task force Collaboration ([R. Sturrock et al.](#)). CERN-PH-EP-2004-028, Apr 2004.24pp. Submitted to Nucl.Instrum.Methods
- [7] High-level Triggers in ATLAS. [A. Radu et al.](#). 2002. Prepared for 12th IEEE-NPSS Real Time Conference, Valencia, Spain, 4-8 Jun 2001. Published in IEEE Trans.Nucl.Sci.49:377-382,2002
- [8] Search for Charmless Hadronic Decays of B Mesons with the SLD Detector. By SLD Collaboration ([Kenji Abe et al.](#)). SLAC-PUB-8280, SCIPP-99-45, Oct 1999. 15pp. Published in Phys.Rev.D62:071101,2000
- [9] Detector and Physics Performance Technical Design Report, The ATLAS collaboration, LHCC 99-14/15 (1999)
- [10] Measurement of hadronic shower punchthrough in magnetic fields, C. Albajar, *et al.* Z. Phys.C69, 415-425, 1996
- [11] A UV Laser Technique for the Lorentz Angle Effect Compensation Studies in End-cap Cathode Strip Chambers Yu. Bonushkin *et al.* Nucl. Instr. Methods A367 (1995) 311-315.
- [12] Double Track Resolution of Cathode Strip Chambers, V. Gratchev *et al.*; Nucl. Instr. and Methods A365 (1995) 576-581.
- [13] Position and Timing Resolution Interpolating Cathode Strip Chambers in a Test Beam, G. Bencze *et al.*, Nucl. Instr. and Methods A357 (1995) 40-54.
- [14] Test Beam Performance of a Tracking TRD Prototype. J. T. Shank et al., Nucl. Inst. Meth. A309:377 (1991).

Invited Talks/Conferences

The ATLAS Detector: Status and Results from Cosmic Rays. DPF2009, Meeting of the Division of Particle and Fields of the American Physical Society. 26-31 July, 2009.

To be published in the proceedings of DPF-2009, Detroit, MI, July 2009, eConf C090726.

Synergistic Activities

- Currently Deputy ATLAS Computing Coordinator.
- Co-Chair of the Experimental Particle Physics group of the “Workshop on the Scientific Challenges for Understanding the Quantum Universe and the Role of Computing at Extreme Scale” sponsored by the DOE ASCR/HEP.
- Member International Advisory Committee, Computing in High Energy Physics, 2009.
- Executive Project Manager for Computing and Physics Support in the U.S. ATLAS collaboration. (2003-2009)
- ATLAS Distributed Computing manager (2009)
- Chair of the ATLAS Computing Resource Management group.
- Recently elected by the ATLAS Collaboration Board:
 - Deputy Computing Coordinator (starting 1 March, 2010)
 - Computing Coordinator (starting 1 March, 2011)
- Member of the Open Science Grid governing Council.
- Member of the steering committees for the International Virtual Data Grid Laboratory and the Particle Physics Data Grid projects.
- Offline software coordinator for the ATLAS muon system 2002-2003.
- Deputy to the Assistant Project Manager for Physics and Computing, U.S. ATLAS collaboration 2000-2003.

Collaborators and Other Affiliations

(i) Collaborators and Co-Authors

The ATLAS Collaboration - http://atlas.web.cern.ch/Atlas/ORGANISATION/member_query.html

(ii) Graduate and Postdoctoral Advisors

Thesis title	Charmed Particle Pair and Associated Production at 20 GeV.
Thesis advisor	Harry Bingham (deceased) University of CA, Berkeley.

Edwin Spencer
Santa Cruz Institute for Particle Physics (SCIPP)
UC Santa Cruz Department of Physics

PROFESSIONAL PREPARATION

University of California, Santa Cruz Physics B.S. 1984

APPOINTMENTS

1995-present Senior Development Engineer, Santa Cruz Institute for Particle Physics
1989-1995 Assistant Development Engineer, Santa Cruz Institute for Particle Physics

SELECTED PUBLICATIONS PERTINENT TO THIS PROPOSAL

1. The ATLAS Experiment at the CERN Large Hadron Collider, The ATLAS Collaboration, G. Aad *et al.*, *JINST* **3** (2008) S08003.
2. The integration and engineering of the ATLAS SemiConductor Tracker Barrel, A. Abdesselam *et al.*, *JINST* **3** P10006 (2008).
3. Engineering for the ATLAS SemiConductor Tracker (SCT) End-cap, A. Abdesselam *et al.*, *JINST* **3** P05002 (2008).
4. Evaluation of silicon-germanium (SiGe) bipolar technologies for use in an upgraded ATLAS detector, M. Ullán *et al.*, *Nucl. Instrum. Methods* **A604**, 668 (2009).
5. The ATLAS semiconductor tracker end-cap module, A. Abdesselam *et al.*, *Nucl. Instrum. Methods* **A575** 353 (2007).

SYNERGISTIC ACTIVITIES

Engineer responsible for grounding and shielding design for the Insertable B-Layer (IBL) upgrade of the ATLAS Detector.
Electronics System Engineer for the SCT sub-detector of the ATLAS Detector.
Architect of the grounding and shielding design of the SCT sub-detector of the ATLAS Detector now successfully operating at the CERN Laboratory.

COLLABORATORS

The ATLAS collaboration
(see: <http://graybook.cern.ch/programmes/experiments/lhc/ATLAS.html>)

Ryszard Stroynowski

Education

Ph.D. in Physics, 1973, University of Geneva, Switzerland.

M.Sc. in Physics, 1968, University of Warsaw, Poland.

Employment

Since 1993 Professor, SMU, Dallas, TX 75275.

1991-1993 Associate Professor, SMU, Dallas, TX 75275.

1983-1991 Senior Research Associate, Caltech, Pasadena, CA 91125.

1987 Lecturer, Caltech, Pasadena, CA 91125.

1980-1983 Senior Research Fellow, Caltech, Pasadena, CA 91125.

1975-1980 Research Associate, SLAC, Stanford, CA 94305.

1970-1975 Staff Physicist, CERN, Geneva, Switzerland.

1969-1970 Visiting Scientist, CERN, Geneva, Switzerland.

1968-1969 Assistant, University of Warsaw, Poland.

Short visits

1997+2002 Professeur Invite, Academie de Versailles and Laboratoire d'Accelérateur Lineaire, Orsay, France.

1986 Visiting Professor, University of California Los Angeles.

1983 Visiting Professor: Enseignement du troisieme cycle de la physique, Lausanne, Switzerland.

1972 University of Helsinki, Helsinki, Finland.

1969 Niels Bohr Institute, Copenhagen, Denmark.

Societies

Fellow: American Physical Society.

Member: Society of Physics Students.

Synergistic activities

PI of the SMU Experimental Particle Physics program, since 1991.

Level-2 Manager for the US-ATLAS Liquid Argon Calorimeter, 1996-2010.

Member ATLAS Collaboration Board Advisory Group 2002-2005.

US Representative to the Steering Committee, NATO Science for Peace Program 1997-2004.

Gerald L. Ford Research Fellowship and Medal, 2006.

Chair, Department of Physics, SMU, 2007-2010.

Research experience

2007 - ebubble

1997 - ATLAS at LHC.

1990-2004 CLEO at CESR.

1991-1993 GEM at SSC.

1985-1989 MARK II at SLC.

1980-1984 DELCO at PEP.

1975-1980 SLAC E-127 experiment (LASS Spectrometer).

1973-1975 Split Field Magnet Facility at ISR, CERN.

1967-1972 Bubble chamber experiments at CERN and Fermilab.

Research interests

Higgs boson, physics beyond the Standard Model, physics of the tau lepton, solar neutrinos

Selected publications

Full list contains over 600 items published in refereed journals. Notes representing various activities are:

- 1) Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC. G. Aad et al., Phys.Lett.B688:21-42,2010.
- 2) Prospects for the discovery of the standard model Higgs boson using the $H \rightarrow \gamma\gamma$ decay. ATLAS Collaboration C. Adam Bourdarios et al., ATL-PHYS-PUB-2009-053, ATL-COM-PHYS-2009-204, May 2009.
- 3) The ATLAS Experiment at the CERN Large Hadron Collider, G. Aad et al, JINST 3 (2008) S080003.
- 4) Construction, Assembly and Tests of the ATLAS Electromagnetic Calorimeter. B. Aubert et al., NIM.A5583, 2006.
- 5) Radiation qualification of the front-end electronics for the readout of the ATLAS liquid argon calorimeters. N. J. Buchanan et al., JINST 3 P10005 (2008).
- 6) Search for new particles in two-jet final states in 7 TeV proton-proton collisions with ATLAS detector at LHC, Physics Letters 103, 161801 (2010).
- 7) Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at 2.76 TeV with ATLAS detector at the LHC. G. Aad et al, Phys. Rev. Lett. 105, 252303 (2010).
- 8) Neutrinoless tau decays. Nucl. Phys. B76, 185-191 (1999).
- 9) The tau lepton and its neutrino. R. Stroynowski and A. Weinstein, Annu. Rev. Nucl. Part. Sci.43,457-528 (1993).
- 10) First measurement of the rate for the inclusive radiative penguin decay $b \rightarrow s + g$. M. S. Alam et al., Phys. Rev. Lett.74, 2885 (1993).

Graduate advisors: R. Mermod, (University of Geneva) & D. R. O. Morrison (CERN)

Postdoctoral sponsors: D.R.O. Morrison (CERN), G. Charpak (CERN), D. Leith (SLAC), B. Barish (Caltech)

Graduate Students Advised at Caltech: Max Marshall, Eric Soderstrom, Andrew Weir, Hitoshi Yamamoto, M. Chadha

Graduate Students Advised at SMU: Pavel Zadorozhny, M.Sc. 1994, Guoheng Wei, M.Sc. 1995, Igor Volobouyev, Ph.D. 1997, Vasili Shelkov, Ph.D. 1997, Ilia Korolkov, Ph.D.1999, Vitaliy Fadeyev, Ph.D. 2000, Ilya Narsky, Ph.D. 2001, Yuri Maravin, Ph.D. 2002, Ana Firan, Ph.D. 2008. Y. Li, Ph.D. 2010, R. Daya, R. Ishmukhametov, R. Rios

Postdocs Supervised at Caltech: C. Hawkes, E. Wicklund, J. McKenna, B. Milliken, M. Kuhlen, D. Akerib, D. Cowen, J. Urheim, G. Eigen, S. Sherman

Postdocs supervised at SMU: J. Dominick, M. Lambrecht, S. Sanghera, J. Staeck, J. Ye, T. Wlodek. E. Barberio, J. Hoffman, D. Joffe, F. Liu, S. Simion, D. Goldin, A. Firan, H. Hadavand

Biographical Sketch **Anyes Taffard**

PROFESSIONAL PREPARATION:

Institut Universitaire de Technologie, France	Computer Sciences	D.U.T. 1994
Brunel University, U.K.	Physics	Master 1998
University of Liverpool, U.K.	Physics	Ph.D. 2002
University of Illinois, Urbana, U.S.A.	Physics	Postdoc 2003-2006

APPOINTMENTS:

<i>University of California, Irvine</i> Assistant Professor	Dept. of Physics and Astronomy	January 2007
<i>University of Liverpool, U.K.</i> PPARC Research Fellow	Dept. of Physics	2002-2003
<i>University of Liverpool, U.K.</i> Research Associate	Dept. of Physics	2001-2002

PUBLICATIONS:

Publications closely related to the proposed project:

1. “*Measurement of the top quark-pair production cross section with ATLAS in pp collisions at $\sqrt{s}=7\text{TeV}$* ”, The ATLAS Collaboration, [arXiv:1012.1792](https://arxiv.org/abs/1012.1792), Submitted to EPJC.
2. The CDF Collaboration, “*Search for Standard Model Higgs Boson Production in Association with a W Boson at CDF*”, Phys. Rev. **D78** (2008) 032008
3. The CDF Collaboration, “*First Measurement of the Production of a W Boson in Association with a Single Charm Quark in Proton Anti-proton Collisions at $\sqrt{s} = 1.96\text{TeV}$* ” Phys. Rev. Lett. **100** (2008) 091803
4. The CDF Collaboration, “*Search for anomalous semileptonic decay of heavy flavor hadrons produced in association with a W boson at CDF II*”. Phys.Rev.D **73**, (2006) 051101.
5. The CDF Collaboration, “*Measurement of the $t\bar{t}$ production cross-section in $p\bar{p}$ collisions at $\sqrt{s} = 1.96\text{TeV}$ using lepton plus jets events with semileptonic B decays to muons*”, Phys.Rev.D **72**, (2005) 032002.

Other significant publications:

1. The CDF Collaboration, “*Observation of B_s^0 anti- B_s^0 oscillations*”. Phys.Rev.Lett **97**, (2006) 062003.
2. The CDF Collaboration, “*Search for H to b anti-b produced in associations with a W boson in p anti-p collisions at $\sqrt{s} = 1.96\text{TeV}$* ”, Phys.Rev.Lett **96**, (2006) 081803.
3. The CDF Collaboration, “*Top quark mass measurement using the template method in the lepton+jets channel at CDFII*”, Phys.Rev.D **73**, (2006) 032003.
4. The CDF Collaboration, “*First measurements of inclusive W and Z cross sections from Run II of the Tevatron collider*”, Phys.Rev.Lett **94**, (2005) 091803.

5. R. Downing,, N. Eddy, L. Holloway, M. Kasten, H. Kim, J. Kraus, C. Marino, K. Pitts, J. Strologas, A. Taffard, for the CDF collaboration, “*Track Extrapolation and Distribution for the CDF-II Trigger System*”, NIM A570:36-50, 2007

SYNERGISTIC ACTIVITIES:

- ATLAS editor for conference note and publication for Winter 2011
- Missing Transverse Energy liaison for ATLAS Top working group
- US-ATLAS Executive Board, 2008-Present
- US-ATLAS: IB chair election committee (2010), Cola review committee (2009).
- Top Properties co-convener, U.S. CDF Collaboration, 2005-2007
- Review committee member for the CDF publications (2009, 2010).
- UCI graduate admission committee (2007-present)

COLLABORATORS & OTHER AFFILIATIONS:

Collaborators and Co-Editors (last 5 years):

Collaborators: ATLAS Collaboration, CDF Collaboration, DELPHI Collaboration

Direct Collaborators:

Prof. Andrew Lankford, University of California, Irvine

Prof. Daniel Whiteson, University of California, Irvine

Prof. Tony Liss, University of Illinois, Urbana

Prof. Kevin Pitts, University of Illinois, Urbana

Thesis and Postdoctoral Advisor:

Brokk Toggerson, University of California, Irvine (graduate student)

Steve Farrell, University of California, Irvine (graduate student)

Matt Relich, University of California, Irvine (graduate student)

Cristobal Cuenca (postdoc Yale University)

Hideki Okawa, University of California, Irvine (postdoc)

Biographical Sketch of **Daniel Whiteson**Professional Preparation

University of Pennsylvania Postdoctoral Research Fellow, CDF experiment	2003-2007
University of California, Berkeley Ph.D. Physics, D0 experiment	1998-2003
Niels Bohr Institute, University of Copenhagen Fulbright Fellow, DELPHI experiment	1997-1998
Rice University B.A. Physics, Computer Science	1993-1997

Appointments

University of California, Irvine Assistant Professor, Department of Physics & Astronomy	2007-present
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Selected Publications

“Discovering Majorana neutrinos produced via a Z boson at hadron colliders.” *Phys. Rev., D81:071301, 2010.*

□ Search for New Bottomlike Quark Pair Decays $QQ \rightarrow (tW)(tW)$ in Same-Charge Dilepton Events.” *Phys. Rev. Lett., 104:091801, 2010.*

“Tevatron Discovery Potential for Fourth Generation Neutrinos: Dirac, Majorana and Everything in Between”. *Accepted Phys. Rev. D, 2010*

“Direct Mass Limits for Chiral Fourth-Generation Quarks in All Mixing Scenarios”. *Accepted Phys. Rev. Lett., 2010.*

“Search for the associated production of the standard model Higgs boson in the all-hadronic channel”, *submitted to Phys. Rev. Lett (2009)*

“Machine learning for event selection in high energy physics”, *Engineering Applications of Artificial Intelligence (2009)*

“Search for maximal flavor violating scalars in same-charge lepton pairs in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV”, *Physical Review Letters 2009*

“Top quark mass measurement with dilepton events using neuro-evolution”, *Physical Review Letters 2009*

“Tevatron signatures of MxFV models”, *Physical Review D 2008*

“Probing the Standard Model with Dilepton Events”, *Modern Physics Letters A - Vol. 22, No. 38, 2007*

“Stochastic Optimization for Event Selection in Top Quark Mass Measurement”, *International Applications of Artificial Intelligence, 2007*

“Top quark mass measurement from dilepton events at CDF II”, *Phys. Rev. Lett 96, 152002 (2006)*

Synergistic Activities

CDF Statistics Committee

UC Irvine Physics Department, Graduate Education Committee

Fermilab Colloquium Committee

Tevatron University Dean

University of Chicago Lab School, substitute physics teacher

Numerous public lectures

Liquid Nitrogen Demonstrations, area elementary schools

Collaborations:

CDF, D0 and ATLAS collaborations

Post-doctoral advisor

Prof. H.H. Williams, University of Pennsylvania

Graduate Advisor

Prof. Mark Strovink, University of California, Berkeley

Direct Collaborators

Prof. Max Welling, University of California, Irvine

Prof. David Gerdes, University of Michigan

Prof. Ashutosh Kotwal, Duke University

Prof. I Joseph Kroll, University of Pennsylvania

Prof. Andrew Lankford, University of California, Irvine

Prof. Anyes Taffard, University of California, Irvine

Prof. Shimon Whiteson, University of Amsterdam

Biographical Sketch
Stephane Willocq
Born: 13 Dec 1963

Professional Preparation

SLAC, Stanford U.	Experimental HEP	1995-1998
Yale University	Experimental HEP	1993-1995
Tufts University	Physics	PhD, 1992
Univ. Libre de Bruxelles	Physics	BS, 1985

Appointments

2010-present	Professor of Physics, U. Massachusetts-Amherst
2010-present	Deputy Manager US ATLAS Physics Support & Computing
2009-present	Co-Chair of ATLAS Speakers Committee Advisory Board
2007-2009	ATLAS Muon Software Coordinator
2005-2007	ATLAS Muon Reconstruction Coordinator
2004-2010	Associate Professor of Physics, U. Massachusetts-Amherst
1999-2004	Assistant Professor of Physics, U. Massachusetts-Amherst

Publications – closely related to proposed project

1. The ATLAS Experiment at the CERN Large Hadron Collider, The ATLAS Collaboration, G. Aad et al., JINST 3 (2008) S08003.
2. Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Lett. B 688, issue 1, 21 (2010).
3. Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 161801 (2010).
4. Measurement of the $W \rightarrow \ell\nu$ and $Z/\gamma^* \rightarrow \ell\ell$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector, ATLAS Collaboration, accepted by JHEP (2010).
5. Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 252303 (2010).

Publications – other significant publications

1. Measurement of the $B \rightarrow Xs \ell^+ \ell^-$ branching fraction with a sum over exclusive modes, BaBar Collaboration, Phys. Rev. Lett. **93**, 081802 (2004).
2. Search for time-dependent B_0 s – B_0 sbar oscillations using a vertex charge dipole technique, SLD Collaboration, Phys. Rev. D **67**, 012006 (2003).
3. Measurement of the $B \rightarrow K^* \gamma$ branching fractions and charge asymmetries, BaBar Collaboration, Phys. Rev. Lett. **88**, 221803 (2002).
4. Highlights of the SLD physics program at the SLAC Linear Collider, with P.C. Rowson and D. Su, Ann. Rev. Nucl. Part. Sci. **51**, 345 (2001).

Synergistic Activities

US ATLAS Deputy Manager for Physics Support & Computing; ATLAS Physics Review Committee for Upsilon observation and lepton-jet search; ATLAS Muon software validation coordinator; Main organizer for New England Particle Physics Student Retreat.

Collaborators

The SLD collaboration (see <http://www-sld.slac.stanford.edu/sldwww/sld.html>)

The BaBar collaboration (see <http://www-public.slac.stanford.edu/babar/>)

The ATLAS collaboration (see

<http://graybook.cern.ch/programmes/experiments/lhc/ATLAS.html>)

Graduate and Postdoctoral Advisors

Prof. Jacob Schneps (Tufts U), Prof. Charles Baltay (Yale U), Dr. Blair Ratcliff (SLAC)

Thesis Advisor and Postgraduate-Scholar Sponsor

Tulin Varol (PhD student), Emily Thompson (PhD student), Niels van Eldik (postdoc), Martin Woudstra (postdoc), Karsten Koeneke (CERN), Ventzislav Koptchev (former PhD student), Hermann Staengle (former postdoc), Cheng-Ju Lin (LBNL)

Biographical Sketch
Jingbo Ye
Born: 3/17/1964

Professional Preparation

University of Science and Technology of China (USTC)	Physics	B.Sc., 1986
USTC, ETH, Zurich and IHEP Beijing	Physics	Ph.D., 1992

Appointments

2009-present Tenured Associate Professor in Physics and EE, SMU, Dallas, Texas.
2004-2009 Assistant Professor in Physics and Electrical Engineering, SMU, Dallas, Texas.
1998-2004 Senior Research Associate in Physics, SMU, Dallas, Texas.
1995-1998 Postdoctoral Research Associate in Physics, SMU, Dallas, Texas.
1993-1995 Scientific Associate, CERN, Geneva, Switzerland.
1992-1993 Lecturer, USTC, China.

Professional experience

I am an experimental particle physicist. From 1989 to 1995 I worked in L3 at LEP on detector simulation, physics data analysis, software development and maintenance. From 1995 to 1998 I worked in CLEO at CESR on detector development for the CLEO III upgrade. Since 1998, I have been a member of ATLAS at LHC. I coordinated the design and construction of the optical link system for the Liquid Argon Calorimeter (LAr) front-end readout. I now lead R&D programs at SMU for upgrades in ATLAS for the sLHC and for LArTPC front-end readout in LBNE.

Hardware projects and Research Infrastructure establishments at SMU:

- I am the Principal Investigator (PI) for the R&D programs at SMU. In this program we successfully developed a 5 Gb/s serializer and a 5 GHz phase-locked-loop for high speed serial data transmission in particle physics experiments.
- I am PI at SMU and in the steering group of the Versatile Link collaboration to develop radiation tolerant optical transceivers that conform to industrial standards.
- From 2000 to 2007, I coordinated an international team which designed, constructed, installed and commissioned the radiation tolerant optical links for the ATLAS LAr readout system. I am responsible for this link's maintenance and operation at SMU.
- In 1998 I established the Optoelectronics laboratory in the Department of Physics at SMU. The ATLAS LAr optical link project and other projects were carried out in this lab. In 2006, I added to this lab the capability to design and develop ASIC chips. I maintain full responsibility for this lab since 2004. Projects in this lab now support three engineers, one technician and a few graduate students from both the Physics and the Electrical Engineering Departments.

Physics Data Analyses and Other Research Activities at SMU:

- I advised one postdoc in the following studies in ATLAS: searches for the Higgs particles in its $Z\gamma$ decay channel, in its Z or W associate production and in its WW decay channel.
- I co-supervised Ph.D. students in the search for the Dirac magnetic monopole with the ATLAS detector, and in DiBoson physics studies ($Z\gamma$ and ZZ channels) with the ATLAS (MC) data. I also supervised Master students in the following studies: "*A Time to Digital Converter Implemented in FPGA*"; "*The Production Cross Section Calculation of the Dirac Magnetic Monopole Production through the Two Photon Process*"; "*The Experimental Studies and GEANT4 Based Monte Carlo Modeling on Radiation Effects of Silicon-on-Sapphire Semiconductor Devices*".
- Since 2008, I am the PI for the Advanced Detector Research (ADR) program supported by the Department of Energy on the "Evaluation of the 0.25 μm Silicon-on-Sapphire technology for ASIC developments for future particle physics detector front-end readout systems".

Publications – closely related to proposed project

- J. Ye on behalf of the ATLAS Liquid Argon Calorimeter Group, “A Serializer ASIC at 5 Gbps for Detector Front-end Electronics Readout”, presented at the XIV International Conference on Calorimetry in High Energy Physics, May 10-14, 2010, Beijing, China.
- With T.Liu, D. Gong, A. Xiang, C. Liu and M. King, *et al.*, presented at the Topical Workshop on Electronics for Particle Physics, Sep. 20-24, 2010, Aachen, Germany, and submitted to JINST for publications: “A 4.9-GHz Low Power, Low Jitter, LC Phase Locked Loop”, “A 16:1 Serializer ASIC for Data Transmission at 5 Gbps”, “Link Model Simulation and Power Penalty Specification of Versatile Link Systems”, “Design and Verification of a Bit Error Rate Tester in Altera FPGA for Optical Link Developments”, “R&D Towards Cryogenic Optical Links”, “Response of a Commercial 0.25 μm Thin-Film Silicon-on-Sapphire CMOS Technology to Total Ionizing Dose”.
- With B. Arvidsson *et al.*, “The radiation tolerance of specific optical fibres exposed to 650 kGy(Si) of ionizing radiation”, JINST 4 P07010 (2009).
- With A.Firan *et al.*, “Search for Magnetic Monopoles using the ATLAS Detector” ATL-COM-PHYS-2008-208
- With N.J.Buchanan *et al.*, “Design and Implementation of the Front End Board for the readout of the ATLAS liquid argon calorimeters”, JINST 3, P03004 (2008) and with A. Bazan *et al.*, “Atlas Liquid Argon Calorimeter Back End Electronics”, JINST 2, P06002 (2007)
- D.Goldin and J.Ye, “Survey of Higgs Production in Association with W and Z bosons”, ATL-COM-PHYS-2007-064
- With M.-L. Andrieux *et al.*, “Single-event upset studies of a high-speed digital optical data link”, Nucl. Instrum. Meth. A 456 (2001) 342-351.

Publications – other significant publications

- J.Ye *et al.*, “Radiation Resistance of Single Frequency 1310-nm AlGaInAs-InP Grating-Outcoupled Surface-Emitting Lasers”, Photonics Technology Letters, Vol.18, No 1, Jan. 2006, pp148-150.
- T.Coan, T.Liu and J.Ye, “A compact apparatus for muon lifetime measurement and time dilation demonstration in the undergraduate laboratory”, Am. J. Phys. 74 (2), Feb. 2006, p.161 – 164.
- With R.J.Mountain *et al.*, “The CLEO III ring imaging Cherenkov detector”, Nucl. Instrum.Meth. A 433 (1999) 77
- With M. Acciarri *et al.*, “Tests of QED at LEP Energies using $e^+e^- \rightarrow \gamma\gamma(\gamma)$ and $e^+e^- \rightarrow l^+l^-\gamma\gamma$ ”, Phys.Lett. B 353 (1995) 136.
- J. Ye, “Meas. of Photon Polarization from 3γ Annihilation of Orthopositronium”, Phys.Lett. A 133 (1988)309.

Synergistic activities: I am a member of ATLAS and LBNE. I am the deputy L2 manager for US-ATLAS LAr upgrade program for sLHC. I am the ATLAS coordinator in the Joint ATLAS-CMS Optoelectronics Working Group to address common issues in development of radiation tolerant optical links.

Collaborators: Close collaborations with BNL, Columbia University, CERN and Oxford.

Graduate advisors: X.W.Tang (USTC), J.Ulbricht (ETH) and H.S.Chen (IHEP)

Graduate students advised at SMU: Y.He, T.Dougall, J.Norton, A.Firan, Z.Liang and Y.Li.

Postdocs supervised at SMU: D.Goldin and A.Firan

SAUL YOUSSEF

Professional Preparation

Undergraduate: Carnegie-Mellon University, Physics, B.S., 1977.

Graduate: Carnegie-Mellon University, Physics, Ph.D., 1982.

Postdoctoral: Columbia University, High Energy Physics, 1982-1986.

Appointments

Research Associate Professor, Center for Computational Science, Boston University, 2000-present.

Research Scientist, SCRI, Florida State University, 1996-1999.

Associate Research Scientist, SCRI, Florida State University, 1990-1996.

Assistant Research Scientist, SCRI, Florida State University, 1987-1990.

(i) Publications most closely related to the proposal

The ATLAS Experiment at the CERN Large Hadron Collider, Journal of Instrumentation, 3 S08003 (2008), by the ATLAS collaboration.

The ATLAS Simulation Infrastructure, European Physical Journal C, Volume 70, Number 3, 823-874 (2010), by the ATLAS collaboration.

Study of Jet Shapes in Inclusive Jet Production in pp Collisions at $\sqrt{s}=7$ TeV using the ATLAS Detector, submitted to Phys. Rev. D (2010), by the ATLAS Collaboration.

(ii) Five other significant publications

S.Youssef, J.Brunelle, J.Huth, D.C.Parkes, M.Seltzer and J.Shank, *Minimal Economic Distributed Computing*, arXiv:0902.4730v1, 2009.

S.Youssef, *Is complex probability theory consistent with Bell's theorem?*, Phys. Lett. A204, 18, 1995.

S.Youssef, *Physics with exotic probability theory*, hep-th/0110253, 2001.

S. Abachi et al., *Observation of the Top Quark*, S. Abachi et al., Phys. Rev. Lett. 74, 3548 (1995) .

S.Youssef, *Prospects for Category Theory in Aldor*, Categorical Programming Languages Workshop, University of Western Ontario, London, Canada, July 2001.

Synergistic Activities

- Member of the ATLAS collaboration;
- Manager of the U.S. ATLAS Northeast Tier 2 center;
- Author of software for general use in high energy physics including *Egg* (distributed computing) and *Pacman* (software installation);
- Taught courses in mathematical physics and computational physics at Boston University;
- PI of the ITR funded Egg project involving physicists and computer scientists;
- Recent seminars about the Egg project at Harvard University, Tufts University, Boston University and Argonne National Laboratory.
- Co-founded FreeHEP organization with Tony Johnson of SLAC;

Collaborators and other affiliations

The ATLAS Collaboration: http://atlas.web.cern.ch/Atlas/ORGANISATION/member_query.html

Graduate and Postdoctoral Advisors

My thesis advisor was Professor Robert Kraemer of Carnegie-Mellon University. My post-doctoral advisor was Professor Paolo Franzini of Columbia University.

Biographical Sketch
Bing Zhou

Physics Department
The Univ. of Michigan
Ann Arbor, MI 48109
bzhou@umich.edu

Education

Ph.D 1987	Physics	M.I.T.
BS 1982	Physics	Univ. of Sci. and Tech. of China

Appointments

2002 – Present	Professor of Physics, the Univ. of Michigan
1998 – 2002	Associate Professor of Physics, the Univ. of Michigan
1997 – 1998	Associate Professor of Physics, Boston University
1991 – 1997	Assistant Professor of Physics, Boston University
1990 – 1991	Research Assistant Professor, Boston University
1992 – 1993	L3 experiment EX Committee member
1992 – 1993	Leader for L3 Silicon detector integration and test
1991 – 1997	Leader for L3 SMD radiation monitor system
1997 – 2001	US ATLAS Muon Software Coordinator
1999 – 2001	ATLAS EX Committee member
2005 – 2007	ATLAS Muon Steering Group member
2000 – 2005	US ATLAS Muon MDT Detector Production Project Leader
2005 – 2009	Co-leader for US ATLAS Muon system calibration
2005 – 2009	Associate Chair for Research, Physics Department, UM
2010 --	ATLAS Speaker Committee member

Awards and Honors

1990 – 1991	SSC Fellowship for postdoctoral Physicists
1992 – 1993	SSC Fellowship for Junior Faculty
1994 – 1995	NSF Career Advancement for Woman Scientist
2001	Elected APS Fellow
2004 – 2005	CERN Scientific Fellow

Publications – closely related to proposed project

1. The ATLAS Experiment at the CERN Large Hadron Collider, The ATLAS Collaboration, G. Aad et al., JINST 3 (2008) S08003.
2. Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Lett. B 688, issue 1, 21 (2010).
3. Search for New Particles in Two-Jet Final States in 7 TeV Proton-Proton Collisions with the ATLAS Detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 161801 (2010).

4. Measurement of the $W \rightarrow l\nu$ and $Z/\gamma^* \rightarrow ll$ production cross sections in proton-proton collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector, ATLAS Collaboration, accepted by JHEP (2010).
5. Observation of a centrality-dependent dijet asymmetry in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS detector at the LHC, ATLAS Collaboration, Phys. Rev. Lett. 105, 252303 (2010).

Publications – other significant publications

1. Search for the Standard Model Higgs Boson in e^+e^- interactions at $161 \text{ GeV} < \sqrt{s} < 172 \text{ GeV}$, L3 Collaboration, Phys. Lett. B411 (1997) 373.
2. Direct Measurement of the W Boson Decay Width with the D0 Experiment, D0 Collaboration, Phys. Rev. D66 (2002) 032008.
3. A Measurement of the $p\bar{p} \rightarrow WZ+X$ Cross-section at $\sqrt{s} = 1.96$ TeV and limits on WWZ trilinear Gauge Couplings, D0 Collaboration, Phys. Rev. D76, (2007) 111104.
4. The First Precision Chambers for ATLAS Muon Spectrometer, Nucl. Instr. & Methods, A 487 (2002) 153.
5. Large Precision Muon Detector for ATLAS, Nucl. Instr. & Meth. A494 (2002) 464.

Synergistic Activities

DOE/NSF ILC Detector R&D review panel (2006 – 2009); The Organization Committee member for NSF PATHWAYS program to encourage high school girls to study nature science in universities (1994 – 1995). Given numerous lectures in HEP summer schools in China (1997, 2010) and interviews on LHC/ATLAS (for Michigan radio stations and news papers).

Current Collaborators

The D0 collaboration (see <http://www-d0.fnal.gov/~madaras/authorlist.html>)

The ATLAS collaboration (see

<http://graybook.cern.ch/programmes/experiments/lhc/ATLAS.html>)

Postdoctoral Advisors

Professor S. Hou (Central Research Institute, Taiwan), Professor Z. Zhao (USTC, China), Professor X. Zhang (USTC, China), Dr. Q. Xu (Fermilab), Dr. M. Cirilli (CERN), Dr. E. Diehl (UM), Dr. H. Yang (UM)

Ph. D. Thesis Advisor

Joel Goldstein (L3 experiment), Jianguo Xu (L3 experiment), James Degenhardt (D0 experiment), Qichun Xu (D0 experiment), Alan Wilson (D0 experiment), Xufei Li (ATLAS experiment), Alex Burgers (ATLAS experiment), Yusheng Wu (ATLAS experiment)

Biographical Sketch

Junjie Zhu

Born: 2/2/1980

Professional Preparation

University of Science and Technology of China	Applied physics	BS, 07/2000
University of Maryland	Physics	PhD, 10/2004

Appointments

2010 - present	Assistant professor, University of Michigan
2009 – 2010	Research scientist, SUNY Stony Brook
2004 – 2009	Research associate, SUNY Stony Brook

Publications – closely related to proposed project

1. Measurement of direct photon pair production cross sections in ppbar collisions at $\sqrt{s}=1.96$ TeV, Phys. Lett. B **690**, 108 (2010).
2. Measurement of the W boson width, Phys. Rev. Lett **103**, 231802 (2009).
3. Measurement of the W boson mass, Phys. Rev. Lett. **103**, 141801 (2009).
4. Search for resonant diphoton production with the DØ detector, Phys. Rev. Lett. **102**, 231801 (2009).
5. Measurement of W boson charge asymmetry in electron channel, Phys. Rev. Lett. **101**, 211801 (2008).
6. Measurement of the forward-backward asymmetry and extraction of $\sin^2\theta_W$ in $Z/\gamma^* \rightarrow ee$ events produced at $\sqrt{s}=1.96$ TeV, Phys. Rev. Lett. **101**, 191801 (2008).
7. Measurement of the shape of the boson transverse momentum distribution in $Z/\gamma^* \rightarrow ee$ events produced at $\sqrt{s}=1.96$ TeV, Phys. Rev. Lett. **100**, 102002 (2008).
8. A novel method for modeling the recoil in W boson events at hadron colliders, Nucl. Instrum. and Meth. A **609**, 250 (2009).
9. The DØ Run II impact parameter trigger, submitted to Nuclear Instruments and Methods A, physics/0701195.

Publications – others

1. Tevatron-for-LHC report: top and electroweak physics, Fermilab-CONF-07-052.
2. Updated combination of CDF and D0 results for the mass of the W boson, Fermilab-TM-2439-E, arXiv:0908.1374.
3. Recent electroweak results at the Tevatron, Fermilab-CONF-09-364.
4. A precision measurement of the W boson mass at D0, Fermilab-CONF-09-291.
5. Combination of CDF and D0 results on the W boson width, Fermilab-TM-2330-E.
6. Direct measurement of the W width in ppbar collisions at $\sqrt{s}=1.96$ TeV, International Journal of Modern Physics A, Vol 20, No. 15 (2005).

Awards

1. June 2009, Alvin Tollestrup award for outstanding postdoctoral researcher at Fermilab, Universities Research Association
“for his outstanding work on the measurement of the mass of the W boson”
2. January 2008, Martin and Beate Block award, Aspen Center for Physics

3. January 2008, Travel support for Aspen meeting
4. May 2004, Travel support for APS meeting
5. June 2000, USTC Undergraduate Student Excellence Award
6. September 1999, Liu Yong-Lin (Elite) Prize
7. September 1998, Excellent Student Scholarship
8. September 1997, Japanese Enterprise Communication Prize

Research Positions

- 2008– 2010 Convener of electroweak physics group at DØ
 2008– 2009 Convener of W and Z boson properties group at DØ
 2005– 2010 Leader of Silicon Track Trigger (STT) group
 2003– present Member of the Tevatron Electroweak Working Group
 2004– 2007 MC representative of electroweak physics group

Conference, Seminar and Colloquium Talks

RBRC workshop at BNL (2010), Aspen physics meeting (2010), Fermilab (2010), Rutgers University (2009), CTEQ workshop (2009), Argonne (2009), SLAC (2009), Fermilab Users meeting (2009), CIPANP (2009), Texas A&M (2009), Yale (2009), MSU (2009), FSU (2009), KSU (2009), BNL (2008), University of Mich (2008), ISU (2008), University of Washington (2008), SMU (2008), Fermilab Joint Experimental Theoretical Seminar (2008), University of Chicago (2008), PHENO (2008), Aspen physics meeting (2008), Northwestern (2007), MSU (2007), USTC (2006), University of Chicago (2004), DPF (2004), APS meeting (2004), Lepton and Photon (2003)

Synergistic Activities

Graduate student mentorship: directly mentored eight graduate students for their thesis work at DØ

Electroweak physics and STT group leaders: helped to advise about 20 graduate students and postdocs for their physics analyses and service work at DØ

Collaborators

The DØ collaboration (see <http://www-d0.fnal.gov/atwork/index.html>)

The ATLAS collaboration (see <http://atlas.web.cern.ch/Atlas/Collaboration/>)

Graduate and Postdoctoral Advisors

Nicholas Hadley and Sarah Eno (University of Maryland)

John Hobbs, Paul Grannis and Robert McCarthy (SUNY, Stony Brook)

Thesis Advisor and Postgraduate-Scholar Sponsor

Lulu Liu, Jiaming Yu, Sara Borroni

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Columbia University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR P. Michael Tuts				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. P. Michael Tuts - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				51.00	0.00	0.00	409,590
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							80,553
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							490,143
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							140,815
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							630,958
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Nevis12 chip				\$	43,000		
TOTAL EQUIPMENT							43,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							7,937
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							7,969,876
6. OTHER							998,857
TOTAL OTHER DIRECT COSTS							8,968,733
H. TOTAL DIRECT COSTS (A THROUGH G)							9,650,628
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Off campus rate (Rate: 26.0000, Base: 7937) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							349,372
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							10,000,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 10,000,000 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME P. Michael Tuts				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**

On campus rate (Rate: 60.0000, Base 578847)

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Columbia University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR P. Michael Tuts				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. P. Michael Tuts - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				51.00	0.00	0.00	413,800
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							75,815
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							489,615
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							140,647
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							630,262
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							7,937
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							7,979,604
6. OTHER							1,291,241
TOTAL OTHER DIRECT COSTS							9,270,845
H. TOTAL DIRECT COSTS (A THROUGH G)							9,909,044
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) off campus (Rate: 26.0000, Base: 7937) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							90,956
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							10,000,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 10,000,000 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME P. Michael Tuts				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs
on campus (Rate: 60.0000, Base 148154)**

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Columbia University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR P. Michael Tuts				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. P. Michael Tuts - Prof				0.00	0.00	0.00	\$ 0
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				51.00	0.00	0.00	418,136
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							78,090
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							496,226
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							142,756
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							638,982
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
multiplexer prototype				\$	13,000		
TOTAL EQUIPMENT							13,000
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							8,175
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							0
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							8,143,103
6. OTHER							1,103,577
TOTAL OTHER DIRECT COSTS							9,246,680
H. TOTAL DIRECT COSTS (A THROUGH G)							9,906,837
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
off campus (Rate: 26.0000, Base: 8175) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							93,163
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							10,000,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 10,000,000
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME				FOR NSF USE ONLY			
P. Michael Tuts				INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG	
Alexander Samsky							

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs
on campus (Rate: 60.0000, Base 151728)**

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION				FOR NSF USE ONLY			
Columbia University				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.			
P. Michael Tuts							
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. P. Michael Tuts - Prof	0.00	0.00	0.00	\$	0	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	51.00	0.00	0.00		429,756		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					80,432		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					510,188		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					147,210		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					657,398		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Multiplexer final prototype				\$	23,000		
TOTAL EQUIPMENT					23,000		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					8,420		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$	0					
2. TRAVEL		0					
3. SUBSISTENCE		0					
4. OTHER		0					
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					8,322,574		
6. OTHER					892,607		
TOTAL OTHER DIRECT COSTS					9,215,181		
H. TOTAL DIRECT COSTS (A THROUGH G)					9,903,999		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
off campus (Rate: 26.0000, Base: 8422) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					96,001		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					10,000,000		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 10,000,000	\$	
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME				FOR NSF USE ONLY			
P. Michael Tuts				INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG	
Alexander Samsky							

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs
on campus (Rate: 60.0000, Base 156351)**

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Columbia University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR P. Michael Tuts				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. P. Michael Tuts - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				51.00	0.00	0.00	384,292
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (1) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							82,845
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							467,137
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							133,477
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							600,614
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							8,673
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							8,562,028
6. OTHER							734,309
TOTAL OTHER DIRECT COSTS							9,296,337
H. TOTAL DIRECT COSTS (A THROUGH G)							9,905,624
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) off campus (Rate: 26.0000, Base: 8673) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							94,376
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							10,000,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 10,000,000 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME P. Michael Tuts				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs
on campus (Rate: 60.0000, Base 153535)**

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Columbia University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR P. Michael Tuts				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. P. Michael Tuts - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (25) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				255.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (5) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						397,735
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						2,453,309
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						704,905
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						3,158,214
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
				\$	79,000	
TOTAL EQUIPMENT						79,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						41,142
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						40,977,185
6. OTHER						5,020,591
TOTAL OTHER DIRECT COSTS						45,997,776
H. TOTAL DIRECT COSTS (A THROUGH G)						49,276,132
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						723,868
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						50,000,000
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 50,000,000 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME P. Michael Tuts				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

In this section we provide an overview of the budget justification including all subcontracts. At the end of this section is the detailed yearly budget justification for Columbia University for each of the 5 years. M. Tuts is the PI for the Cooperative Agreement at Columbia University. The budget justification description is complex, so for clarity of reference we note that in the following sections names in italics correspond to lines in Table 1 in the program description section of the proposal (and shown below), whereas the numbered items (for example G.5) refer to lines in the year by year “summary proposal budget” (SPB) sheets. Table 2 shows a detailed breakout of the activities funded for each subcontract.

NSF Operations Proposal Needs (AYk\$s)						
Subsystem	FY12	FY13	FY14	FY15	FY16	Total
Computing						
Software	495	509	525	540	557	2,626
Facilities & Tier 2	3,470	3,986	3,895	3,750	3,732	18,833
Analysis Support	55	57	59	60	62	293
Total	4,019	4,552	4,479	4,351	4,351	21,752
M&O						
Silicon	138	142	146	150	155	730
TRT	-	-	-	-	-	-
LAr	390	402	414	427	439	2,073
Tile	393	405	417	429	442	2,086
Muon	779	740	763	785	809	3,876
TDAQ	655	675	695	716	738	3,480
Common	949	787	753	752	678	3,920
Outreach	50	52	53	55	56	265
Program Management	435	170	175	180	186	1,146
Technical Coordination	155	159	164	169	174	821
Total	3,944	3,532	3,580	3,664	3,677	18,397
Upgrade						
Silicon Tracker	376	376	376	410	520	2,058
Liquid Argon	683	597	617	679	595	3,171
Tile Calorimeter	432	432	432	432	432	2,160
Muon	81	86	91	89	-	347
TDAQ	465	425	425	375	425	2,115
Total	2,037	1,916	1,941	1,985	1,972	9,851
Total NSF Operations Needs	10,000	10,000	10,000	10,000	10,000	50,000
Requested DOE Funds	28,255	28,962	29,685	30,427	31,187	148,516

Table 1. Total NSF Operations needs in AYk\$. The DOE total represents a request to DOE to support additional M&O, Physics Support and Computing, and Upgrade R&D work scope which is not part of this proposal.

The total budget request for the ATLAS Operations Program is \$50M (AY\$) for the five-year period FY12–FY16 of this proposal, and includes Maintenance and Operations (M&O), Physics Support and Computing (PS&C), Upgrade R&D, Education and Outreach, and Program Management. Cost data for both M&O and PS&C are derived from fully resource-loaded FTE schedules. These have been the subject of annual NSF /DOE joint agency Reviews, most recently May 11-12, 2010 for PS&C, M&O and R&D (see <https://indico.bnl.gov/conferenceDisplay.py?confId=254> (access=DOENSFLHCreview)). The funds requested for the U.S. ATLAS Operations program in this proposal essentially maintain a constant level of effort. Not shown is the DOE component of the U.S ATLAS Operations Program which is approximately \$28-31M/year. The DOE and NSF funds are controlled by the Program Manager (Tuts, PI of this proposal).

Maintenance and Operations (M&O)

The M&O components of the budget supported by this proposal are described in the text in the individual tables at the end of each section in the program description, and shown under M&O in Table 1. The costs in Table 1 appear in different items of the SPB's (B.4, B.5, C., D., E.1, E.2, G.5 and G.6). Detailed explanations follow under the principal categories shown in Table 1:

Subsystem specific (Inner Detector, LAr, Tile, Muon, TDAQ, Technical Coordination): The maintenance and operations (M&O) component of the Operations Program requires funds for personnel to operate and maintain the ATLAS detector. The associated costs such as travel, repair equipment, and some spare parts form an integral part of this request. General maintenance (beam off) and operations (beam on) tasks are included for all subsystems. Detailed estimates of the personnel and associated costs are provided in the program description for each of the subsystems with U.S. responsibilities: Inner Detector (Silicon); Liquid Argon Calorimeter (LAr); scintillating tile hadronic calorimeter (Tile); Muon Spectrometer (Muon); trigger and data acquisition system (TDAQ); and Technical Coordination (TC). In FY12 there are a total of 21 FTEs supported by this proposal. The total cost for these subsystems (personnel plus associated costs) in FY12 is \$2.51M, broken down by subsystem in Table 1 under the titles Silicon, LAr, Tile, Muon, TDAQ, and Technical Coordination. Most of these funds form part of SPB item G.5 (sub-awards), with the exception of the Columbia LAr items which appear elsewhere in the budget sheets (next paragraph).

Since some of the LAr calorimeter detector activities take place at Columbia University's Nevis Labs, those costs are broken out separately in the budget as they are not part of a sub-award, but rather direct costs to Columbia University. The Columbia LAr activities focus on the maintenance and operations of the front-end electronics. Based on the resource loaded FTE schedule, an average of 1 FTE of electrical engineering is required at a salary of \$196k in FY12. These costs are part of the LAr item in Table 1.

Common Costs: Other items that are covered in the M&O component include the so-called "common costs". This component is based on the full cost of running the ATLAS detector (consumables, some personnel, etc). The costs are agreed to by an international CERN group called the Resource Review Board (RRB) that has representation by all ATLAS funding agencies. These common costs proposed by the ATLAS collaboration are carefully scrutinized by a subcommittee of the RRB, the Scrutiny Group (which has a U.S. representative). The costs are divided into two categories, "A" and "B".

The sum is the total operating cost for ATLAS (determined in CHF). The share to be paid by the U.S. is determined in one of two ways: Category A costs are globally shared costs apportioned according to the fraction of PhD authors for any given country; and Category B costs are for operating costs of specific detector subsystems and apportioned approximately by author share (the actual algorithm is a bit more complex). The category A costs to be supported by this proposal are re-evaluated every year along with re-determinations of the country shares. Documentation of these costs is available on the CERN RRB website (<http://indico.cern.ch/categoryDisplay.py?categId=852>). The common costs to be supported by this proposal are totaled at \$3.9M for the five years. These costs appear as the Common item in Table 1 of the program description and as SPB item G.6.

Program Management: The program management costs associated with the processing and oversight of some 17 sub-awards are shown in the M&O category as well, although it includes NSF program management costs for all aspects of the Operations Program (M&O, PS&C, R&D). The support personnel required to manage this program consist of 1.0 FTE (administrative assistant). There is also some yearly travel support for the Program Manager (Tuts) included in the program management costs. The largest one-time component is the indirect cost for each subcontract (60% on the first \$25k of each sub-award) which totals \$255k in FY12 but is not repeated over the life of this award. These costs are shown as Program Management in Table 1 and in SPB items B.5. (the 1.0 FTE administrator), E.2 (Program Manager travel), I. (sub-award indirect costs), G.5 (subawards).

Education: Based upon the success of our U.S. ATLAS Education and Outreach efforts during the Construction phase, in conjunction with the expansion of the QuarkNet program, we expect to continue our effort and expenditure at a similar level during the five-year period of the proposal (\$50-56k/year). This funding will support the continuation of programs described in the program description of this proposal, as well as new initiatives. This item appears as Education in Table 1 and in SPB item G.5.

Software and Computing (PS&C)

Costs for software professionals involved in the developing and maintaining the ATLAS core and detector software are estimated at \$137k/year/FTE (fully loaded) in FY12, based on collaboration university averages. This proposal is requesting support for a total of 3 FTEs in sub-awards to the University of Massachusetts Amherst, the University of Texas Arlington, and the University of Pittsburgh. Additional costs for travel and COLA support of \$28k/year/FTE are also included in the sub-awards. The total cost for software maintenance in FY12 is \$495k, which is shown as Software in Table 1, and forms part of G.5. in the SPB.

Costs for the computing facility integration program includes supporting 0.4 FTE of a computer professional (Chicago sub-award) for coordination of computing fabric upgrades, deployments of Grid and ATLAS services, and site-level operations at each of the computing resource centers in U.S. ATLAS. The total cost for this work in FY12 is \$124k.

Also included in the proposal for software and computing is support of one full-time individual (Chicago sub-award) covering development of utilities necessary for efficient Tier 2 site level data management and access. The cost for this support is \$174k in FY12.

This proposal also requests support for continuation of the ATLAS-wide ADC (ATLAS Distributed Computing) group which integrates both operations and development. This work will

continue to be performed under a NSF supported sub-award at UTA. We anticipate support at the level of 3.58 FTEs at UTA to support this operating work, costing \$471k in FY12.

Costing for the Tier 2's (T2) is based on the successful integration of the Tier 2s as part of an overall U.S. ATLAS distributed resource that has outperformed all other regions in ATLAS. The U.S. Tier 2's are all highly ranked among computing facilities ATLAS-wide, greatly based on previous and current NSF funding. This proposal requests support for four such T2 sites, where costs supported by this proposal, for each site, are \$600k in FY12. We note that in addition the T2 sites leverage considerable institutional resources to the benefit of the U.S. ATLAS Operations Program. The funds from this proposal support just under 2 FTEs at each of four sites for operations support at an estimated cost of \$184k/FTE (based on collaborations university averages), with the balance of the funds used for commercial computing hardware purchases. The total Tier 2 cost in FY12 is \$2.7M, which is shown as Tier 2 in Table 1, and forms part of G.5 in the SPB.

The sum of these items under Software and Computing represents the total cost for the Computing line in Table 1 and totals \$4.4M in FY12. This amount forms part of the sub-award funding shown in item G.5 in the SPB.

Upgrade R&D

The upgrade R&D activities focus on silicon tracker upgrades, liquid argon upgrades, tile calorimeter upgrade, muon upgrades, and the TDAQ subsystem upgrades. The timescales are such that R&D must commence now based on an overall plan for research in critical detector areas that will need replacement for high luminosity running. The detailed activities are described in the program description, but generally are a mix of design and prototyping activities. The 15-16 FTEs are supported at the various universities participating in the R&D activities. In FY12 the plan is to fund a total of \$2M for the upgrade work, and is shown under the Upgrade R&D in Table 1. Some of the liquid argon upgrade R&D will take place at Columbia University's Nevis Labs and thus appears as direct costs in the SPB item B.2.

U.S. ATLAS NSF Operations Proposal Institutional Needs (AYk\$)				
NSF Proposal Columbia Needs (AYk\$)				
Sub-contract/ institution	Subsystem	Proposal k\$	Proposal FTEs	Work Scope
Columbia University	Common Funds	3,920	-	In this proposal we request the category A and B funds for the operations phase of the running in FY12 and beyond equivalent to 15% of the total common fund requirement
	Outreach	265	-	This funding will support the continuation of successful programs described in the project description of this proposal
	Extra Disk	835	-	Funding for extra disk to insure goal of having T2's fully able to meet the U.S. commitment to ATLAS. The specific T2 institutional allocation will be determine at a later date
	Program Management	1,146	5.00	The support personnel required to manage this program including processing and oversight of the 17 subcontracts listed in Table xx along with travel support for the Program Manager
		6,167	5.00	
	LAr M&O	1,042	5.00	Continued maintenance and operation of the FEB of the LAr readout. Testing of OTx replacement solution in collaboration with SMU. Testing and certification of the Weiner LVPS replacements in collaboration with BNL.
	Upgrade R&D	1,614	16.25	Continued development of the next generation LAr calorimeter front-end board design and some of its essential components. A prototype with almost complete functionality is planned for 2012.
		2,858	21.25	
	Total Columbia Needs	9,023	26.25	
NSF Proposal Subcontract Needs (AYk\$)				
Sub-contract/ institution	Subsystem	Proposal k\$	Proposal FTEs	Work Scope
Boston Univ Computing	Tier 2	3,091	7.50	Continued purchasing and operating CPU & disk equipment to ensure goal of having the T2 center fully operational to meet the U.S. commitment to ATLAS
Boston University	Muon M&O	467	5.00	Maintain and operate the MDT chamber system and also participate in the commissioning of the EE chambers as they are installed
	TDAQ R&D	615	2.50	Boston University is working on the Level 1 muon trigger using Monitored Drift Tube information. Improvements in the trigger will be required at higher luminosities to allow for a single muon trigger with acceptable rates.
		1,082	7.50	
Brandeis	Muon M&O	927	7.50	Maintain and operate the endcap global alignment system and also work on the mechanical design of EE alignment fixtures and chamber installation tooling
	TC M&O	821	6.25	Brandeis will design the Long Guiding Tube (LGT), needed for the IBL, which has to be inserted into the beam pipe to support it during the removal process. Other activities will be the continued work on the integration of the EE chambers into the ATLAS detector.
	Muon R&D	347	3.20	Studies to determine the optical path that are necessary to link the new muon chambers for upgrade with the rest of the muon endcap.
		2,095	16.95	
Chicago Computing	Facilities Operations	1,594	7.00	Coordination and operations support for the U.S. ATLAS integrated T1/T2/T3 computing facility. Development and support of grid storage and data management tools and services to meet scalability goals and support Tier 2s.
	Tier 2	4,637	15.27	Continued purchasing and operating CPU & disk equipment to ensure goal of having the T2 center fully operational to meet the U.S. commitment to ATLAS
		6,221	22.27	
Chicago	Tile M&O	1,438	13.00	F/E maintenance and support, along with drawer maintenance replacing faulty components and keeping the system in operation. Also involved in the maintaining and operating the calibration and test facility.

Sub-contract/ Institution	Subsystem	Proposal M\$	Proposal FTEs	Work Scope
	Tile R&D	1,500 2,938	7.75 26.75	Chicago will lead the effort in replacing the mother boards in the electronic drawers. These will contain control electronics, ADCs for each channel, serializing FPGAs and optical transmission elements.
NIU	Tile M&O	388	2.50	As collision data taking progresses there will be many "new" needs (and repairs) for software tools for monitoring and QA. Constant effort will be needed for monitoring online operations and offline access to conditions database.
NYU	Analysis Support	293	2.50	Working on Physics analysis tools & specifically on developing the highly successful D3PD infrastructure.
	Silicon Tracker R&D	100 393	1.00 3.50	NYU will provide looking for electrical testing and also radiation testing.
MSU	Tile M&O	260	2.50	Drawer maintenance replacing faulty components and keeping the system in operation.
	TDAQ M&O	642	5.00	Members of the MSU group will continue the data quality monitoring efforts. There are also plans to contribute to an evolutionary upgrade of the current flow and high level trigger system.
	Tile R&D	660	7.50	Work will be needed for the off-detector system which interfaces with the Level 1 trigger.
	TDAQ R&D	1,750 2,812	7.50 22.50	MSU will be working on both the improvements planned for the Level 1 calorimeter trigger to include topological information through new cluster merging modules and improvements to the High Level Trigger processing schemes and TDAQ dataflow.
SMU	Liquid Argon M&O	862	5.00	Maintenance and operation of OTs.
	Silicon Tracker R&D	735	5.00	Developing an optical system from optical transmitter through fiber to optical receiver.
	Liquid Argon R&D	1,357 2,954	10.00 26.00	Array serializer design and prototyping with each channel operating at 10Gbps.
Stony Brook	Liquid Argon M&O	169	1.00	Working on maintaining the HV filter system, replacing capacitors when required along with other responsibilities.
UC Irvine	Muon M&O	741	5.00	Maintaining and operating the CSC ROD System along with maintaining the CSC DSP code located on the CSC RODs.
	TDAQ M&O	2,838	24.25	UCI will continue their support for on-going operations, both during beam time and the planned shutdowns and also participate in the commissioning of new HLT hardware.
	TDAQ R&D	250 3,629	2.50 31.75	UC Irvine will be working on improvements to the High Level Trigger processing and TDAQ data flow required at higher luminosities.
UCSC	Silicon Tracker M&O	730	3.75	Testing of the VCSELS of the type on detector and general SCT operations support.
	Silicon Tracker R&D	1,223 1,953	17.00 26.75	Performs a leadership role in evaluating sensor technologies that could meet upgrade requirements and also provides on-detector electronics support.
Univ of Mass Amherst	Software	927	5.00	Muon infrastructure.
U of Michigan Computing	Tier 2	3,091	9.50	Continued purchasing and operating CPU & disk equipment to ensure goal of having the T2 center fully operational to meet the U.S. commitment to ATLAS.
Univ of Michigan	Muon M&O	1,742	14.75	Working the commissioning of the EE chambers and also will continue monitoring the MDT noise and beam background. The Michigan group will also maintain the gas monitoring system operation which is essential to maintaining a smooth operation.
Univ of Pittsburgh	Software	776	5.00	Detector geometrical description.
UTA Computing	Software	922	7.50	Development and support for the PanDA workload management system for ATLAS distributed production and analysis.

Sub-contract/ Institution	Subsystem	Proposal k\$	Proposal FTEs	Work Scope
	Facilities Operations	2,503	17.90	Coordination and support for ATLAS production and analysis computing operations in the U.S. and internationally. Management of storage and CPU resources for U.S. ATLAS.
	Tier 2	3,091	8.75	Continued purchasing and operating CPU & disk equipment to ensure goal of having the T2 center fully operational to meet the U.S. commitment to ATLAS.
		6,517	33.75	
	U.S. ATLAS NSF Proposal Subcontract Total	40,977	244.97	
	U.S. ATLAS NSF Proposal Total	50,000	271.22	

Table 2. Subcontracts Details.

Columbia University Budget Justification YEAR 1

B.2 Engineering and Technical Salaries: Salaries for Upgrade Electronics and LAr construction. \$409,590

B.5 Administrative Support: Administrative support for 17 sub-awards and ATLAS project. \$80,553

C Fringe @ 31.9% of Base \$441,429 = \$140,815

D Equipment: Nevis12 Chip for Upgrade construction \$43,000

E Travel: Project management travel for P.I. Tuts \$7,937

G.5 Sub-Awards:

1. Boston Univ. \$203,000
2. Boston Computing \$600,000
3. Brandeis \$410,156
4. Chicago \$570,900
5. Chicago Computing \$1,198,260
6. Michigan \$376,730
7. Michigan Computing \$600,000
8. Michigan State \$601,860
9. Pittsburgh \$146,232
10. SMU \$592,300
11. SUNY, Stony Brook \$31,827
12. U. Cal, Irvine \$724,087
13. U. Cal, Santa Cruz \$346,540
14. UTA Computing \$1,245,200
15. U. Mass \$174,624
16. NIU \$73,000
17. NYU \$75,160

TOTAL \$7,969,876

G.6 Other: Foreign exchange rate corrections, CERN category A & B dues, Common Costs,
And Outreach (\$50,000) – Total \$998,857

I Indirect Costs:

See following calculation

J Total Direct and Indirect Costs \$10,000,000

Subawards 17 X 25,000 = \$425,000 X 60% = \$255,000

Administration (Salary & Fringe) \$106,249 X 60% = \$63,750

Technical (Salaries & Fringe) Base: (\$475,998 X 10%) \$47,598 X 60% = \$ 28,558

Project Management Travel \$7,937 X 26% = \$2,064

TOTAL = \$349,372

Columbia University Budget Justification YEAR 2

B.2 Engineering and Technical Salaries: Salaries for Upgrade Electronics and LAr construction. \$413,800

B.5 Administrative Support: Administrative support for 17 sub-awards and ATLAS project. \$75,815

C Fringe @ 31.9% of Base \$440,901 = \$140,647

D Equipment:

E Travel: Project management travel for P.I. Tuts \$7,937

G.5 Sub-Awards:

1. Boston Univ. \$215,640
2. Boston Computing \$609,000
3. Brandeis \$425,030
4. Chicago \$579,030
5. Chicago Computing \$1,220,708
6. Michigan \$326,240
7. Michigan Computing \$609,000
8. Michigan State \$556,950
9. Pittsburgh \$150,619
10. SMU \$554,200
11. SUNY, Stony Brook \$32,782
12. U. Cal, Irvine \$744,310
13. U. Cal, Santa Cruz \$350,666
14. UTA Computing \$1,273,556
15. U. Mass \$179,863
16. NIU \$75,190
17. NYU \$76,820

TOTAL \$7,979,604

G.6 Other: Foreign exchange rate corrections, CERN category A & B dues, Common Costs, Outreach (\$51,500), and Extra Disk for T2 (\$452,376) – Total \$1,291,241

I Indirect Costs:

See following calculation

J Total Direct and Indirect Costs \$10,000,000

Administration (Salary & Fringe) $\$100,000 \times 60\% = \$60,000$

Technical (Salaries & Fringe) Base: $(481,552 \times 10\%) \$48,154 \times 60\% = \$28,892$

Project Management Travel $\$7,937 \times 26\% = \$2,064$

TOTAL = \$90,956

Columbia University Budget Justification YEAR 3

B.2 Engineering and Technical Salaries: Salaries for Upgrade Electronics and LAr construction. \$418,136

B.5 Administrative Support: Administrative support for 17 sub-awards and ATLAS project. \$78,090

C Fringe @ 31.9% of Base \$447,512 = \$142,756

D Equipment: Multiplexer Prototype for LAr electronics \$13,000

E Travel: Project management travel for P.I. Tuts \$8,175

G.5 Sub-Awards:

1. Boston Univ. \$218,360
2. Boston Computing \$618,140
3. Brandeis \$440,200
4. Chicago \$587,400
5. Chicago Computing \$1,243,627
6. Michigan \$336,020
7. Michigan Computing \$618,140
8. Michigan State \$562,200
9. Pittsburgh \$155,138
10. SMU \$566,200
11. SUNY, Stony Brook \$33,765
12. U. Cal, Irvine \$765,139
13. U. Cal, Santa Cruz \$354,917
14. UTA Computing \$1,302,628
15. U. Mass \$185,259
16. NIU \$77,450
17. NYU \$78,520

TOTAL = \$8,143,103

G.6 Other: Foreign exchange rate corrections, CERN category A & B dues, Common Costs, Outreach (\$53,045), and Extra Disk for T2 (\$297,234) – Total \$1,103,577

I Indirect Costs:

See following calculation

J Total Direct and Indirect Costs \$10,000,000

Administration (Salary & Fringe) $\$103,000 \times 60\% = \$61,800$

Technical (Salaries & Fringe) Base: $(\$487,269 \times 10\%) \$48,728 \times 60\% = \$29,237$

Project Management Travel $\$8,175 \times 26\% = \$2,126$

TOTAL = \$93,163

Columbia University Budget Justification YEAR 4

B.2 Engineering and Technical Salaries: Salaries for Upgrade Electronics and LAr construction. \$429,756

B.5 Administrative Support: Administrative support for 17 sub-awards and ATLAS project. \$80,432

C Fringe @ 31.9% of Base \$461,474 = \$147,210

D Equipment: Multiplexer FINAL Prototype \$23,000

E Travel: Project management travel for P.I. Tuts \$8,420

G.5 Sub-Awards:

1. Boston Univ. \$221,160
2. Boston Computing \$627,410
3. Brandeis \$448,679
4. Chicago \$596,020
5. Chicago Computing \$1,267,028
6. Michigan \$346,100
7. Michigan Computing \$627,410
8. Michigan State \$517,610
9. Pittsburgh \$159,792
10. SMU \$613,400
11. SUNY, Stony Brook \$34,778
12. U. Cal, Irvine \$786,593
13. U. Cal, Santa Cruz \$393,294
14. UTA Computing \$1,332,434
15. U. Mass \$190,816
16. NIU \$79,770
17. NYU \$80,280

TOTAL = \$8,322,574

G.6 Other:

Foreign exchange rate corrections, CERN category A & B dues, Common Costs, Outreach (\$54,636), and Extra Disk for T2 (\$85,825) -- Total \$892,607

I Indirect Costs:

See following calculation

J Total Direct and Indirect Costs \$10,000,000

Administration (Salary & Fringe) $\$106,090 \times 60\% = \$63,654$

Technical (Salaries & Fringe) Base: $(\$502,595 \times 10\%) \$50,261 \times 60\% = \$30,157$

Project Management Travel $\$8,420 \times 26\% = \$2,190$

TOTAL = \$96,001

Columbia University Budget Justification YEAR 5

B.2 Engineering and Technical Salaries: Salaries for Upgrade Electronics and LAr construction. \$384,292

B.5 Administrative Support: Administrative support for 17 sub-awards and ATLAS project. \$82,845

C Fringe @ 31.9% of Base \$418,423 = \$133,477

D Equipment:

E Travel: Project management travel for P.I. Tuts \$8,673

G.5 Sub-Awards:

1. Boston Univ. \$224,040
2. Boston Computing \$636,820
3. Brandeis \$370,467
4. Chicago \$604,900
5. Chicago Computing \$1,290,922
6. Michigan \$356,490
7. Michigan Computing \$636,820
8. Michigan State \$573,180
9. Pittsburgh \$164,586
10. SMU \$627,700
11. SUNY, Stony Brook \$35,822
12. U. Cal, Irvine \$808,691
13. U. Cal, Santa Cruz \$507,803
14. UTA Computing \$1,362,996
15. U. Mass \$196,541
16. NIU \$82,160
17. NYU \$82,090

TOTAL = \$8,562,028

G.6 Other:

Foreign exchange rate corrections, CERN category A & B dues, Common Costs, and Outreach (\$56,275) – Total \$734,309

I Indirect Costs:

See following calculation

J Total Direct and Indirect Costs \$10,000,000

Administration (Salary & Fringe) $\$109,273 \times 60\% = \$65,563$

Technical (Salaries & Fringe) Base: $(\$442,628 \times 10\%) \$44,262 \times 60\% = \$26,558$

Project Management Travel $\$8,673 \times 26\% = \$2,255$

TOTAL = \$94,376

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Brandeis University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James Bensinger				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/ PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. James Bensinger - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				33.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (3) UNDERGRADUATE STUDENTS						17,000
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						207,992
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						54,436
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						262,428
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						43,544
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						78,928
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						78,928
H. TOTAL DIRECT COSTS (A THROUGH G)						384,900
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) travel (Rate: 58.0000, Base: 43544)						
TOTAL INDIRECT COSTS (F&A)						25,256
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						410,156
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 410,156 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/ PD NAME James Bensinger				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Brandeis University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James Bensinger				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. James Bensinger - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				33.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (3) UNDERGRADUATE STUDENTS						17,360
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						214,082
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						56,057
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						270,139
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						44,250
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						84,976
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						84,976
H. TOTAL DIRECT COSTS (A THROUGH G)						399,365
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) travel (Rate: 58.0000, Base: 44250)						
TOTAL INDIRECT COSTS (F&A)						25,665
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						425,030
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 425,030
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME James Bensinger				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Brandeis University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James Bensinger				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. James Bensinger - prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				33.00	0.00	0.00	202,623
3. (0) GRADUATE STUDENTS							0
4. (3) UNDERGRADUATE STUDENTS							17,731
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							220,354
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							57,727
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							278,081
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							44,978
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							91,054
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							91,054
H. TOTAL DIRECT COSTS (A THROUGH G)							414,113
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) travel (Rate: 58.0000, Base: 44978)							
TOTAL INDIRECT COSTS (F&A)							26,087
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							440,200
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 440,200 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME James Bensinger				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Brandeis University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James Bensinger				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. James Bensinger - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				33.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (3) UNDERGRADUATE STUDENTS						18,113
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						226,816
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						59,448
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						286,264
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						45,727
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						90,166
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						90,166
H. TOTAL DIRECT COSTS (A THROUGH G)						422,157
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) travel (Rate: 58.0000, Base: 45727)						
TOTAL INDIRECT COSTS (F&A)						26,522
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						448,679
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 448,679 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME James Bensinger				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Brandeis University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James Bensinger				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. James Bensinger - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				33.00	0.00	0.00	177,165
3. (0) GRADUATE STUDENTS							0
4. (3) UNDERGRADUATE STUDENTS							18,506
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							195,671
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							50,523
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							246,194
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							26,499
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							82,405
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							82,405
H. TOTAL DIRECT COSTS (A THROUGH G)							355,098
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
travel (Rate: 58.0000, Base: 26499)							
TOTAL INDIRECT COSTS (F&A)							15,369
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							370,467
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 370,467 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME James Bensinger				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Brandeis University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR James Bensinger				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. James Bensinger - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (15) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				165.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (15) UNDERGRADUATE STUDENTS						88,710
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						1,064,915
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						278,191
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						1,343,106
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL						0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						204,998
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0)						
TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						427,529
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						427,529
H. TOTAL DIRECT COSTS (A THROUGH G)						1,975,633
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						118,899
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						2,094,532
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 2,094,532
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME James Bensinger				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

BRANDEIS UNIVERSITY PROPOSAL BUDGET

NSF BUDGET

02/01/12 - 01/31/13

FOR NSF USE ONLY

Proposal NO	Duration (Months)

AWARD NO.	Proposed	Granted

ORGANIZATION **Brandeis University**

PRINCIPAL INVESTIGATOR: **Bensinger**

NSF Funded Person-months			Funds	Funds
CAL	ACAD	SUMR	Requested	Granted

A SENIOR PERSONNEL:

TOTAL SENIOR PERSONNEL:

B OTHER PERSONNEL:

Postdoctoral Associate - Engineer

Other Professionals - Engineers

Graduate Students

Undergraduate Students

Technicians

Other

TOTAL SALARY AND WAGES

C FRINGES Engineers & Technician = 28.3%; Undergrad (summer) = 7.7%

TOTAL SALARY-WAGES-FRINGE BENEFITS

D EQUIPMENT:

E TRAVEL: DOMESTIC:

FOREIGN:

F PARTICIPANT SUPPORT

G OTHER DIRECT COSTS:

Materials and Supplies

Publication/Documentation

Consultant Services

Computer Services

Other-Machining

Other-Shipping

TOTAL OTHER DIRECT COSTS

H TOTAL DIRECT COSTS

I INDIRECT COSTS: MTDC * 58.0% travel only

J TOTAL DIRECT AND INDIRECT COSTS

K RESIDUAL FUNDS

L AMOUNT OF THIS REQUEST

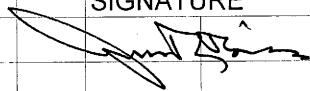
M COST SHARING: Proposed Level

Agreed Level If Different

PI/PD TYPED NAME

James Bensinger

SIGNATURE



DATE

11/30

FOR NSF USE ONLY

INDIRECT COST RATE VERIFICATION

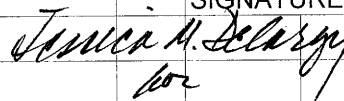
Date Checked	Date of Rate	Initials-ORG
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ORGANIZATION REP. TYPED NAME

Paul O'Keefe

SIGNATURE



DATE

11/30/10

BRANDEIS UNIVERSITY PROPOSAL BUDGET

NSF BUDGET

02/01/13 - 01/31/14

FOR NSF USE ONLY

Proposal NO Duration (Months)

AWARD NO. Proposed Granted

ORGANIZATION **Brandeis University**

PRINCIPAL INVESTIGATOR: Bensinger

NSF Funded Person-months			Funds	Funds
CAL	ACAD	SUMR	Requested	Granted

A SENIOR PERSONNEL:

TOTAL SENIOR PERSONNEL:

B OTHER PERSONNEL:

Postdoctoral Associate - Engineer					
Other Professionals - Engineers	2	21.0			147,484
Graduate Students					
Undergraduate Students	3	12.0			17,360
Technicians	1	12.0			49,238
Other					0

TOTAL SALARY AND WAGES 214,082

C FRINGES Engineers & Technician = 28.3%; Undergrad (summer) = 7.7% 56,057

TOTAL SALARY-WAGES-FRINGE BENEFITS 270,139

D EQUIPMENT: 0

E TRAVEL: DOMESTIC: 0

FOREIGN: 44,250

F PARTICIPANT SUPPORT

G OTHER DIRECT COSTS:

Materials and Supplies					
Fabrication of Equipment					84,976
Publication/Documentation					
Consultant Services					
Computer Services					
Other-Machining					
Other-Shipping					

TOTAL OTHER DIRECT COSTS 84,976

H TOTAL DIRECT COSTS 399,365

I INDIRECT COSTS: MTDC * 58.0% travel only 44,250 25,665

J TOTAL DIRECT AND INDIRECT COSTS 425,030

K RESIDUAL FUNDS

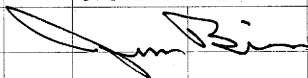
L AMOUNT OF THIS REQUEST 425,030

M COST SHARING: Proposed Level Agreed Level If Different

PI/PD TYPED NAME

James Bensinger

SIGNATURE



DATE

11/30

FOR NSF USE ONLY

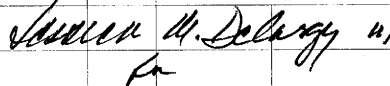
INDIRECT COST RATE VERIFICATION

Date Checked	Date of Rate Sheet	Initials-ORG

ORGANIZATION REP. TYPED NAME

Paul O'Keefe

SIGNATURE



DATE

11/30/10

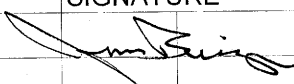
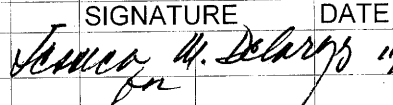
BRANDEIS UNIVERSITY PROPOSAL BUDGET

NSF BUDGET
02/01/14 - 01/31/15

FOR NSF USE ONLY		
Proposal NO	Duration (Months)	
AWARD NO.	Proposed	Granted

ORGANIZATION: **Brandeis University**
PRINCIPAL INVESTIGATOR: **Bensinger**

		NSF Funded Person-months			Funds	Funds
		CAL	ACAD	SUMR	Requested	Granted
A	SENIOR PERSONNEL:					
	TOTAL SENIOR PERSONNEL:					
B	OTHER PERSONNEL:					
	Postdoctoral Associate - Engineer					
	Other Professionals - Engineers	2	21.0		151,908	
	Graduate Students					
	Undergraduate Students	3	12.0		17,731	
	Technicians	1	12.0		50,715	
	Other				0	
	TOTAL SALARY AND WAGES				220,354	
C	FRINGES Engineers & Technician = 28.3%; Undergrad (summer) = 7.7%				57,727	
	TOTAL SALARY-WAGES-FRINGE BENEFITS				278,081	
D	EQUIPMENT:				0	
E	TRAVEL: DOMESTIC:				0	
	FOREIGN:				44,978	
F	PARTICIPANT SUPPORT					
G	OTHER DIRECT COSTS:					
	Materials and Supplies					
	Fabrication of Equipment				91,054	
	Publication/Documentation					
	Consultant Services					
	Computer Services					
	Other-Machining					
	Other-Shipping					
	TOTAL OTHER DIRECT COSTS				91,054	
H	TOTAL DIRECT COSTS				414,113	
I	INDIRECT COSTS: MTDC * 58.0% travel only	44,978			26,087	
J	TOTAL DIRECT AND INDIRECT COSTS				440,200	
K	RESIDUAL FUNDS					
L	AMOUNT OF THIS REQUEST				440,200	
M	COST SHARING: Proposed Level					

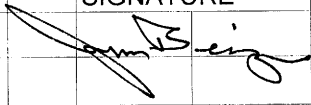
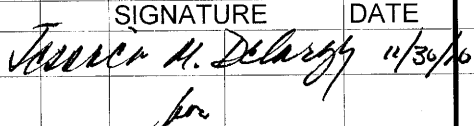
PI/PD TYPED NAME	SIGNATURE	DATE	FOR NSF USE ONLY		
James Bensinger		11/30	INDIRECT COST RATE VERIFICATION		
			Date Checked	Date of Rate	Initials-ORG
ORGANIZATION REP. TYPED NAME	SIGNATURE	DATE			
Paul O'Keefe		11/30/10			

BRANDEIS UNIVERSITY PROPOSAL BUDGET

NSF BUDGET
02/01/15 - 01/31/16

FOR NSF USE ONLY		
Proposal NO	Duration (Months)	
AWARD NO.	Proposed	Granted

ORGANIZATION	Brandeis University							
PRINCIPAL INVESTIGATOR:	Bensinger							
		NSF Funded Person-months			Funds	Funds		
A SENIOR PERSONNEL:		CAL	ACAD	SUMR	Requested	Granted		
	TOTAL SENIOR PERSONNEL:							
B OTHER PERSONNEL:								
	Postdoctoral Associate - Engineer							
	Other Professionals - Engineers	2	21.0			156,466		
	Graduate Students							
	Undergraduate Students	3	12.0			18,113		
	Technicians	1	12.0			52,237		
	Other					0		
	TOTAL SALARY AND WAGES					226,816		
C FRINGES	Engineers & Technician = 28.3%; Undergrad (summer) = 7.7%					59,448		
	TOTAL SALARY-WAGES-FRINGE BENEFITS					286,264		
D EQUIPMENT:						0		
E TRAVEL: DOMESTIC:						0		
	FOREIGN:					45,727		
F PARTICIPANT SUPPORT								
G OTHER DIRECT COSTS:								
	Materials and Supplies							
	Fabrication of Equipment					90,166		
	Publication/Documentation							
	Consultant Services							
	Computer Services							
	Other-Machining							
	Other-Shipping							
	TOTAL OTHER DIRECT COSTS					90,166		
H TOTAL DIRECT COSTS						422,157		
I INDIRECT COSTS: MTDC * 58.0% travel only			45,727			26,522		
J TOTAL DIRECT AND INDIRECT COSTS						448,679		
K RESIDUAL FUNDS								
L AMOUNT OF THIS REQUEST						448,679		
M COST SHARING: Proposed Level								
								Agreed Level If Different

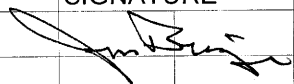
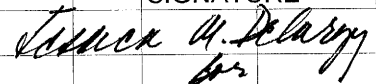
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James Bensinger		11/30	INDIRECT COST RATE VERIFICATION		
			Date Checked	Date of Rate Sheet	Initials-ORG
ORGANIZATION REP. TYPED NAME	SIGNATURE	DATE			
Paul O'Keefe		11/30/16			

BRANDEIS UNIVERSITY PROPOSAL BUDGET

NSF BUDGET
02/01/16 - 01/31/17

FOR NSF USE ONLY		
Proposal NO	Duration (Months)	
AWARD NO.	Proposed	Granted

ORGANIZATION		Brandeis University				
PRINCIPAL INVESTIGATOR:		Bensinger				
		NSF Funded Person-months			Funds	Funds
		CAL	ACAD	SUMR	Requested	Granted
A	SENIOR PERSONNEL:					
TOTAL SENIOR PERSONNEL:						
B	OTHER PERSONNEL:					
	Postdoctoral Associate - Engineer					
	Other Professionals - Engineers	2	18.0		136,812	
	Graduate Students					
	Undergraduate Students	3	12.0		18,506	
	Technicians	1	9.0		40,353	
	Other				0	
TOTAL SALARY AND WAGES					195,671	
C	FRINGES Engineers & Technician = 28.3%; Undergrad (summer) = 7.7%				50,523	
TOTAL SALARY-WAGES-FRINGE BENEFITS					246,194	
D	EQUIPMENT:				0	
E	TRAVEL: DOMESTIC:				0	
	FOREIGN:				26,499	
F	PARTICIPANT SUPPORT					
G	OTHER DIRECT COSTS:					
	Materials and Supplies	Fabrication of Equipment			82,405	
	Publication/Documentation					
	Consultant Services					
	Computer Services					
	Other-Machining					
	Other-Shipping					
TOTAL OTHER DIRECT COSTS					82,405	
H	TOTAL DIRECT COSTS				355,098	
I	INDIRECT COSTS: MTDC * 58.0% travel only	26,499			15,369	
J	TOTAL DIRECT AND INDIRECT COSTS				370,467	
K	RESIDUAL FUNDS					
L	AMOUNT OF THIS REQUEST				370,467	
M	COST SHARING: Proposed Level	Agreed Level If Different				

PI/PD TYPED NAME	SIGNATURE	DATE	FOR NSF USE ONLY		
James Bensinger		11/30	INDIRECT COST RATE VERIFICATION		
			Date Checked	Date of Rate	Initials-ORG
ORGANIZATION REP. TYPED NAME	SIGNATURE	DATE	Sheet		
Paul O'Keefe		11/30/16			

BRANDEIS UNIVERSITY PROPOSAL BUDGET

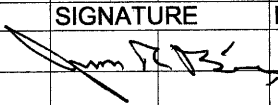
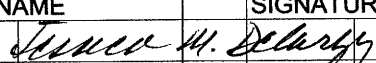
NSF BUDGET
02/01/12 - 01/31/17

FOR NSF USE ONLY

Proposal NO Duration (Months)

CUMULATIVE

AWARD NO. Proposed Granted

ORGANIZATION		Brandeis University							
PRINCIPAL INVESTIGATOR:		Bensinger							
					NSF Funded Person-months		Funds	Funds	
					CAL	ACAD	SUMR	Requested	Granted
A	SENIOR PERSONNEL:								
		TOTAL SENIOR PERSONNEL:							
B	OTHER PERSONNEL:								
	Postdoctoral Associate - Engineer								
	Other Professionals - Engineers		2	102.0			735,858		
	Graduate Students								
	Undergraduate Students		3	60.0			88,710		
	Technicians		1	57.0			240,347		
	Other							0	
		TOTAL SALARY AND WAGES					1,064,915		
C	FRINGES		Engineers & Technician = 28.3%; Undergrad (summer) = 7.7%					278,191	
		TOTAL SALARY-WAGES-FRINGE BENEFITS					1,343,106		
D	EQUIPMENT:							0	
E	TRAVEL: DOMESTIC:							0	
	FOREIGN:							204,998	
F	PARTICIPANT SUPPORT								
G	OTHER DIRECT COSTS:								
	Materials and Supplies		Fabrication of Equipment					427,529	
	Publication/Documentation								
	Consultant Services								
	Computer Services								
	Other-Machining								
	Other-Shipping								
		TOTAL OTHER DIRECT COSTS					427,529		
H	TOTAL DIRECT COSTS							1,975,633	
I	INDIRECT COSTS: MTDC * 58.0% travel only		204,998					118,899	
J	TOTAL DIRECT AND INDIRECT COSTS							2,094,532	
K	RESIDUAL FUNDS								
L	AMOUNT OF THIS REQUEST							2,094,532	
M	COST SHARING: Proposed Level		Agreed Level If Different						
PI/PD TYPED NAME		SIGNATURE			DATE		FOR NSF USE ONLY		
James Bensinger					12/7		INDIRECT COST RATE VERIFICATION		
		Date Checked		Date of Rate		Initials-ORG			
ORGANIZATION REP. TYPED NAME		SIGNATURE			DATE		Sheet		
Paul O'Keefe					12/14/10				

Budget Justification

**Brandeis University - Columbia University Subcontract
Physics Department - High Energy
YEAR 1
02/01/12 - 01/31/13**

Salaries						190,992
Engineer	1.0 FTE	9.0 months	Full time		64,896	
Engineer	1.0 FTE	12.0 months	Full time		78,292	
Research Tech	1.0 FTE	12.0 months	Full time		47,804	
Students	3.0 FTE	12.0 months	Part time	No Fringe	17,000	17,000
Fringe						54,051
					28.30% engineers & research tech	
					7.70% Students - summer only	385
Total Salaries & Fringe Benefits						262,428
Travel						
Domestic		none				0
Foreign						43,544
					Approx 20 trips to CERN at \$2,250 each (airfare = \$1,250, housing \$500, per diem \$300, misc \$200)	
Materials/Supplies, Machining, Shipping						78,928
					Materials purchased at Brandeis and CERN and part fabrications necessary to further develop project.	
Indirect					58.0% on travel only	25,256
TOTAL						410,156

Budget Justification

**Brandeis University - Columbia University Subcontract
Physics Department - High Energy
YEAR 2
02/01/13 - 01/31/14**

Salaries						196,722
Engineer	1.0 FTE	9.0 months	Full time		66,843	
Engineer	1.0 FTE	12.0 months	Full time		80,641	
Research Tech	1.0 FTE	12.0 months	Full time		49,238	
Students	3.0 FTE	12.0 months	Part time	No Fringe	17,360	17,360
Fringe						55,672
					28.30% engineers & research tech	
					7.70% Students - summer only	385
Total Salaries & Fringe Benefits						270,139
Travel						
Domestic		none				0
Foreign					Approx 20 trips to CERN at \$2,250 each (airfare = \$1,250, housing \$500, per diem \$300, misc \$200)	44,250
Materials/Supplies, Machining, Shipping						84,976
					Materials purchased at Brandeis and CERN and part fabrications necessary to further develop project.	
Indirect					58.0% on travel only	25,665
TOTAL						425,030

Budget Justification

**Brandeis University - Columbia University Subcontract
Physics Department - High Energy
YEAR 3
02/01/14 - 01/31/15**

Salaries						202,623
Engineer	1.0 FTE	9.0 months	Full time		68,848	
Engineer	1.0 FTE	12.0 months	Full time		83,060	
Research Tech	1.0 FTE	12.0 months	Full time		50,715	
Students	3.0 FTE	12.0 months	Part time	No Fringe	17,731	17,731
Fringe						57,342
					28.30% engineers & research tech	
					7.70% Students - summer only	385
Total Salaries & Fringe Benefits						278,081
Travel						
Domestic		none				0
Foreign						44,978
					Approx 20 trips to CERN at \$2,250 each (airfare = \$1,250, housing \$500, per diem \$300, misc \$200)	
Materials/Supplies, Machining, Shipping						91,054
					Materials purchased at Brandeis and CERN and part fabrications necessary to further develop project.	
Indirect					58.0% on travel only	26,087
TOTAL						440,200

Budget Justification

**Brandeis University - Columbia University Subcontract
Physics Department - High Energy
YEAR 4
02/01/15 - 01/31/16**

Salaries						208,703
Engineer	1.0 FTE	9.0 months	Full time		70,914	
Engineer	1.0 FTE	12.0 months	Full time		85,552	
Research Tech	1.0 FTE	12.0 months	Full time		52,237	
Students	3.0 FTE	12.0 months	Part time	No Fringe	18,113	18,113
Fringe	28.30%	engineers & research tech				59,063
	7.70%	Students - summer only				385
Total Salaries & Fringe Benefits						286,264
Travel						
Domestic	none					0
Foreign	Approx 20 trips to CERN at \$2,250 each (airfare = \$1,250, housing \$500, per diem \$300, misc \$200)					45,727
Materials/Supplies, Machining, Shipping						90,166
Materials purchased at Brandeis and CERN and part fabrications necessary to further develop project.						
Indirect	58.0%	on travel only				26,522
TOTAL						448,679

Budget Justification

**Brandeis University - Columbia University Subcontract
Physics Department - High Energy
YEAR 5
02/01/16 - 01/31/17**

Salaries						177,165
Engineer	1.0 FTE	6.0 months	Full time		48,694	
Engineer	1.0 FTE	12.0 months	Full time		88,118	
Research Tech	1.0 FTE	9.0 months	Full time		40,353	
Students	3.0 FTE	12.0 months	Part time	No Fringe	18,506	18,506
Fringe	28.30%	engineers & research tech				50,138
	7.70%	Students - summer only				385
Total Salaries & Fringe Benefits						246,194
Travel						
Domestic	none					0
Foreign	Approx 12 trips to CERN at \$2,250 each (airfare = \$1,250, housing \$500, per diem \$300, misc \$200)					26,499
Materials/Supplies, Machining, Shipping						82,405
Materials purchased at Brandeis and CERN and part fabrications necessary to further develop project.						
Indirect	58.0%	on travel only				15,369
TOTAL						370,467

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Michigan State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Reiner Hauser				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Reiner Hauser - Prof			6.00	0.00	0.00	\$ 40,800
2.	Joey W Huston - Prof			0.00	0.00	0.00	0
3.	Bernard Pope - Prof			0.00	0.00	0.00	0
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)			6.00	0.00	0.00	40,800
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(1) POST DOCTORAL SCHOLARS			7.90	0.00	0.00	37,026
2.	(3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			20.40	0.00	0.00	115,455
3.	(0) GRADUATE STUDENTS						0
4.	(1) UNDERGRADUATE STUDENTS						8,800
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							202,081
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							62,198
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							264,279
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	ATLAS Upgrade CMM++			\$	100,000		
TOTAL EQUIPMENT							100,000
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							23,939
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						11,906
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						98,178
TOTAL OTHER DIRECT COSTS							110,084
H. TOTAL DIRECT COSTS (A THROUGH G)							498,302
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 398300)							
TOTAL INDIRECT COSTS (F&A)							103,558
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							601,860
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 601,860 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Reiner Hauser				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION Michigan State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Reiner Hauser				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Reiner Hauser	6.00	0.00	0.00	\$	42,024	\$	
2. Joey W Huston	0.00	0.00	0.00		0		
3. Bernard Pope	0.00	0.00	0.00		0		
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)	6.00	0.00	0.00		42,024		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS	7.90	0.00	0.00		38,137		
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	20.40	0.00	0.00		118,918		
3. (0) GRADUATE STUDENTS					0		
4. (1) UNDERGRADUATE STUDENTS					9,064		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					208,143		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					64,905		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					273,048		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
ATLAS Upgrade CMM++				\$	50,000		
TOTAL EQUIPMENT					50,000		
E. TRAVEL					0		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					23,000		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					7,116		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					99,178		
TOTAL OTHER DIRECT COSTS					106,294		
H. TOTAL DIRECT COSTS (A THROUGH G)					452,342		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 402340)							
TOTAL INDIRECT COSTS (F&A)					104,608		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					556,950		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	556,950	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Reiner Hauser				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Michigan State University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Reiner Hauser				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/ PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Reiner Hauser				6.00	0.00	0.00
2. Joey W Huston				0.00	0.00	0.00
3. Bernard Pope				0.00	0.00	0.00
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				6.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (1) POST DOCTORAL SCHOLARS				7.90	0.00	0.00
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				20.40	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (1) UNDERGRADUATE STUDENTS						9,336
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						214,386
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						67,457
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						281,843
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
ATLAS Upgrade CMM++				\$	50,000	
TOTAL EQUIPMENT						50,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						22,000
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0)						0
TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						4,822
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						97,843
TOTAL OTHER DIRECT COSTS						102,665
H. TOTAL DIRECT COSTS (A THROUGH G)						456,508
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 26.0000, Base: 406508)						
TOTAL INDIRECT COSTS (F&A)						105,692
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						562,200
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	562,200	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/ PD NAME Reiner Hauser				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Michigan State University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Reiner Hauser				Proposed	Granted		
				AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Reiner Hauser	6.00	0.00	0.00	\$	44,584	\$	
2. Joey W Huston	0.00	0.00	0.00		0		
3. Bernard Pope	0.00	0.00	0.00		0		
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)	6.00	0.00	0.00		44,584		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS	7.90	0.00	0.00		40,067		
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	20.40	0.00	0.00		126,159		
3. (0) GRADUATE STUDENTS					0		
4. (1) UNDERGRADUATE STUDENTS					9,616		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					220,426		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					70,682		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					291,108		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					21,100		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$	0					
2. TRAVEL		0					
3. SUBSISTENCE		0					
4. OTHER		0					
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					3,464		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					95,129		
TOTAL OTHER DIRECT COSTS					98,593		
H. TOTAL DIRECT COSTS (A THROUGH G)					410,801		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 410802)							
TOTAL INDIRECT COSTS (F&A)					106,809		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					517,610		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 517,610	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Reiner Hauser				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Michigan State University				FOR NSF USE ONLY				
				PROPOSAL NO.	DURATION (months)			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Reiner Hauser				AWARD NO.	Proposed	Granted		
					A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR		
1. Reiner Hauser				6.00	0.00	0.00	\$ 45,922	\$
2. Joey W Huston				0.00	0.00	0.00	0	
3. Bernard Pope				0.00	0.00	0.00	0	
4.								
5.								
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0	
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				6.00	0.00	0.00	45,922	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1. (1) POST DOCTORAL SCHOLARS				7.90	0.00	0.00	41,269	
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				20.40	0.00	0.00	129,945	
3. (0) GRADUATE STUDENTS							0	
4. (1) UNDERGRADUATE STUDENTS							9,904	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0	
6. (0) OTHER							0	
TOTAL SALARIES AND WAGES (A + B)							227,040	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							72,136	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							299,176	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
ATLAS Upgrade Phase II						\$ 50,000		
TOTAL EQUIPMENT							50,000	
E. TRAVEL							0	
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0	
2. FOREIGN							19,900	
F. PARTICIPANT SUPPORT COSTS								
1. STIPENDS \$ _____							0	
2. TRAVEL _____							0	
3. SUBSISTENCE _____							0	
4. OTHER _____							0	
TOTAL NUMBER OF PARTICIPANTS (0)								
TOTAL PARTICIPANT COSTS							0	
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES							3,215	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0	
3. CONSULTANT SERVICES							0	
4. COMPUTER SERVICES							0	
5. SUBAWARDS							0	
6. OTHER							92,934	
TOTAL OTHER DIRECT COSTS							96,149	
H. TOTAL DIRECT COSTS (A THROUGH G)							465,225	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)								
MTDC (Rate: 26.0000, Base: 415213)								
TOTAL INDIRECT COSTS (F&A)							107,955	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							573,180	
K. RESIDUAL FUNDS							0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 573,180	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$				
PI/PI NAME Reiner Hauser				FOR NSF USE ONLY				
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION				
		Date Checked	Date Of Rate Sheet	Initials - ORG				

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION Michigan State University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Reiner Hauser				AWARD NO.		
				NSF Funded Person-months		Funds Requested By proposer
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Reiner Hauser				30.00	0.00	0.00
2. Joey W Huston				0.00	0.00	0.00
3. Bernard Pope				0.00	0.00	0.00
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				30.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (5) POST DOCTORAL SCHOLARS				39.50	0.00	0.00
2. (19) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				102.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (5) UNDERGRADUATE STUDENTS						46,720
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						1,072,076
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						337,378
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						1,409,454
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
\$ 250,000						
TOTAL EQUIPMENT						250,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						109,939
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						30,523
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						483,262
TOTAL OTHER DIRECT COSTS						513,785
H. TOTAL DIRECT COSTS (A THROUGH G)						2,283,178
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						528,622
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						2,811,800
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 2,811,800 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Reiner Hauser ORG. REP. NAME* Alexander Samsky				FOR NSF USE ONLY		
				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



FOR NSF USE ONLY

1ST YEAR PROPOSAL BUDGET

ORGANIZATION Michigan State University		PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Bernard Pope Dr. Joey Hutton		AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: P/PI, Co-PIs, Faculty and Other Senior Associates (List each separately with name and title. (A-F Show number in brackets))		NSF Funds Person-months		Funds Requested by Proposer	Funds Available, NSF (if Different)
		COL	ACAD		
1. Dr. Bernard Pope		0	0	0	0
2. Dr. Joey Hutton		0	0	0	0
3. Dr. Robert Hutter		0	0	0	0
4.					
5.					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES		7.0	0	0	\$37,620
2. () OTHER PROFESSIONALS (TECHNICAL PROGRAMMER, ETC.)		20	0	0	115,455
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS					5,800
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. () OTHER					
TOTAL SALARIES AND WAGES (A + B)					202,881
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					62,198
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					264,279
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000) ATLAS Upgrade CRM++					
TOTAL EQUIPMENT					100,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS) 2. FOREIGN					23,920
F. PARTICIPANT SUPPORT					
1. STIPENDS \$ _____					
2. TRAVEL _____					
3. SUBSISTENCE _____					
4. OTHER _____					
TOTAL NUMBER OF PARTICIPANTS ()		TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					11,908
2. PUBLICATION/DOCUMENTATION/REPRODUCTION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBGRANTS					
6. OTHER (FFSIC - Fuel Expense @ \$608.50 per month x 12 months - Storage Solutions @ \$15,000/yr)					95,178
TOTAL OTHER DIRECT COSTS					224,523
H. TOTAL DIRECT COSTS (A THROUGH G)					498,302
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) $398,302 \times 26\% = 103,558$					
TOTAL INDIRECT COSTS (F&A)					103,558
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					601,860
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE OPG 10.7.1)					
L. AMOUNT OF THIS REQUEST (H OR J, WHATEVER)					360,180 \$
M. COST SHARING, PROPOSED LEVEL 3		AGREED LEVEL IF DIFFERENT, 3		FOR NSF USE ONLY	
P/PI THIRD NAME AND SIGNATURE Dr. Bernard Pope - Dr. Joey Hutton		DATE 12/20/10			
OPI, REP. THIRD NAME & SIGNATURE Bernard Pope		DATE 12/20/10			
		SIGNATURE DATE VERIFICATION			
		Date Checked	Date of Rate Sheet	Initials OPI	

Budget Justification
Michigan State University
Year 1 DRAFT

A.3	Salary for Senior Personnel: Deputy Program Manager for TDAQ	\$40,800
B.1	Postdoctoral Associates: TDAQ M&O	\$37,026
B.2	Other Professionals: TDAQ R&D, Elec. Engs. TileCal M&O, Techs. TileCal R&D, Techs.	\$50,591 \$19,336 \$45,528
B.4	Undergraduate Students: TileCal R&D	\$8,800
C.	Fringe Benefits:	\$62,198
D.	Equipment: ATLAS Upgrade R&D CMM++	\$100,000
E.2	Travel (Foreign): TDAQ R&D for Test Stand (2 trips) TileCal M&O (3 trips) Tile Cal R&D (4 trips)	\$5,139 \$8,800 \$10,000
G.1	Materials and Supplies: TDAQ M&O Misc. TDAQ R&D Misc. Test Stand Construction TileCal M&O Misc. TileCal R&D Misc.	\$279 \$5,000 \$1,849 \$4,778
G.6	Other (Contractual Services): TDAQ R&D (Engineer, Y. Ermoline) TileCal R&D (Shooltz Solutions Inc.)	\$81,678 \$16,500
I.	Indirect Costs: 26% on all except equipment	\$103,558
J.	Total Direct and Indirect Costs	\$601,860



FOR NSF USE ONLY

2ND YEAR PROPOSAL BUDGET

ORGANIZATION				PROPOSAL NO.		DURATION (MONTHS)	
Michigan State University				AWARD NO.		Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				NSF FUNDS		Funds	Funds
Dr. Bernard Pope Dr. Joey Huston				Foreign months		Received by	Committed by
				CHG	ACAD	SUM	Proposed
A. SENIOR PERSONNEL, PI/PI, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)							
1	Dr. Bernard Pope	0	0	0	0	0	0
2	Dr. Joey Huston	0	0	0	0	0	0
3	Dr. Robert House	0	0	0	542,024		
4							
5							
6	OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7	TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1	(1) POSTDOCTORAL ASSOCIATES			18	0	0	338,137
2	(4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			32	0	0	118,918
3	() GRADUATE STUDENTS			4			
4	() UNDERGRADUATE STUDENTS						9,054
5	() SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6	() OTHER						
TOTAL SALARIES AND WAGES (A + B)							356,143
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							64,905
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							273,048
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000) ATLAS Upgrade CMM++							
TOTAL EQUIPMENT							50,000
E. TRAVEL (1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS) 2. FOREIGN)							23,000
F. PARTICIPANT SUPPORT							
1	STIPENDS \$ _____						
2	TRAVEL _____						
3	SUBSISTENCE _____						
4	OTHER _____						
TOTAL NUMBER OF PARTICIPANTS () TOTAL PARTICIPANT							
G. OTHER DIRECT COSTS							
1	MATERIALS AND SUPPLIES						7,130
2	PUBLICATION/DOCUMENTATION/DESERGATION						
3	CONSULTANT SERVICES						
4	COMPUTER SERVICES						
5	SUBGRANTS						
6	OTHER PPIC - Two licenses @ \$825.50 per month x 12 months/Speed Solutions @ \$17,500/yr						26,172
TOTAL OTHER DIRECT COSTS							17,624
H. TOTAL DIRECT COSTS (A THROUGH G)							402,342
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 402,342 x 26% = 104,608							
TOTAL INDIRECT COSTS (F&A)							104,608
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							556,950
K. RESERVA FUND (IF FOR FURTHER SUPPORT OF CURRENT PROJECT (SEE GPC #0.7.1))							
L. AMOUNT OF THIS REQUEST (J OR L) (WHICHEVER)							556,950 3
M. COST SHARING - PROPOSED LEVEL 1				AGREED LEVEL IF DIFFERENT 3			
PI/PI TYPED NAME AND SIGNATURE Dr. Bernard Pope - Dr. Joey Huston				DATE 12/01/2010		FOR NSF USE ONLY	
CPI/PI TYPED NAME AND SIGNATURE Bernard Pope				DATE 12/16/10		AGREED COST RATE VERIFICATION	
				DATE CHECKED		DATE OF RATE SHEET	
						INITIALS CPI/PI	

Budget Justification
Michigan State University
Year 2 DRAFT

A.3	Salary for Senior Personnel: Deputy Program Manager for TDAQ	\$42,024
B.1	Postdoctoral Associates: TDAQ M&O	\$38,137
B.2	Other Professionals: TDAQ R&D, Elec. Engs. TileCal M&O, Techs. TileCal R&D, Techs.	\$52,108 \$19,916 \$46,894
B.4	Undergraduate Students: TileCal R&D	\$9,064
C.	Fringe Benefits:	\$64,905
D.	Equipment: ATLAS Upgrade R&D CMM++	\$50,000
E.2	Travel (Foreign): TDAQ R&D for Test Stand (1 trip) TileCal M&O (3 trips) Tile Cal R&D (4 trips)	\$4,000 \$9,000 \$10,000
G.1	Materials and Supplies: TDAQ M&O Misc. TDAQ R&D Misc. Test Stand Construction TileCal M&O Misc. TileCal R&D Misc.	\$102 \$3,940 \$1,813 \$1,261
G.6	Other (Contractual Services): TDAQ R&D (Engineer, Y. Ermoline) TileCal R&D (Shooltz Solutions Inc.)	\$81,678 \$17,500
I.	Indirect Costs: 26% on all except equipment	\$104,608
J.	Total Direct and Indirect Costs	\$556,950



3RD YEAR PROPOSAL BUDGET

ORGANIZATION Michigan State University	PROPOSAL NO.	DURATION (MONTHS)		
		Approved	Granted	
PROPOSAL TOGETHER WITH PROJECT DIRECTOR Dr. Bernard Pope Dr. Joey Huston	AWARD NO.			
A. SCHOLAR PERSONNEL: FIPD, Co-PI, Family and Other Senior Associates List each separately with name and title (A.1 Steps number in brackets)	NSF-Funded Person-months		Funds (amounts, not Proposal)	
	COI	SCOR	ELAB	Funds (amounts, not Proposal)
1. Dr. Bernard Pope	0	0	0	0
2. Dr. Joey Huston	0	0	0	0
3. Dr. Robert Heuser	0	0	0	\$43,280
4.				
5.				
6. (OTHERS LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				
7. (3) TOTAL SCHOLAR PERSONNEL (1-6)				
B. OTHER PERSONNEL (SHOW MEMBERS IN BRACKET)				
1. (1) POSTDOCTORAL ASSOCIATES	7.9	0	0	\$30,281
2. (4) OTHER PROFESSIONALS (TECHNICAL PROGRAMMER, ETC.)	20	0	0	\$22,484
3. () GRADUATE STUDENTS				
4. (1) UNDERGRADUATE STUDENTS				\$1,300
5. () SECRETARIAL - CLERICAL OR CHAPERON SERVICES ()				
6. () OTHER				
TOTAL SALARIES AND WAGES (A + B)				\$114,306
C. FRINGE BENEFITS (IF CHARGED - SEE DIRECT COSTS)				\$7,487
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				\$121,793
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH - NSF ENCLOSED 24-080) ATLAS Upgrade CMM++				
TOTAL EQUIPMENT				\$1,300
E. TRAVEL 1. DOMESTIC (incl. lodging, meals and U.S. airfare) ()				
2. FOREIGN				\$2,300
F. PARTICIPANT SUPPORT				
1. STIPENDS ()				
2. TRAVEL				
3. SUBSISTENCE				
4. OTHER				
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT	
G. OTHER DIRECT COSTS				
1. MATERIALS AND SUPPLIES				\$4,822
2. PUBLICITY/ADVERTISING/POSTAGE/REPRODUCTION				
3. CONSULTANT SERVICES				
4. COMPUTER SERVICES				
5. SUBGRANTS				
6. OTHER PPSC - Full Executive @ \$8K \$0 per month x 10 months/Student Solutions @ \$7K \$6/yr				\$97,840
TOTAL OTHER DIRECT COSTS				\$124,285
H. TOTAL DIRECT COSTS (A THROUGH G)				\$485,508
I. INDIRECT COSTS (F&M) (SPECIFY RATE AND BASE) 40% \$242,603 = \$106,660				
TOTAL INDIRECT COSTS (F&M)				\$106,660
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				\$592,168
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPS # 07)				
L. AMOUNT OF THIS REQUEST (J OR L) (MAX \$0)				\$592,168
M. COST SHARED PROPOSED LEVEL ()				
AWD TYPED NAME AND SIGNATURE Dr. Bernard Pope - Dr. Joey Huston	DATE 10/20/13	FOR NSF USE ONLY		
DATE 10/20/13	DATE OF THIS BUDGET		DATE OF THIS BUDGET	
NSF Form 1010 (10/09) Replaces NS Form 1010-1	SIGNATURES REQUIRED ONLY FOR REVISION BUDGET FORMS			

Budget Justification
Michigan State University
Year 3 DRAFT

A.3	Salary for Senior Personnel: Deputy Program Manager for TDAQ	\$43,285
B.1	Postdoctoral Associates: TDAQ M&O	\$39,281
B.2	Other Professionals: TDAQ R&D, Elec. Engs. TileCal M&O, Techs. TileCal R&D, Techs.	\$53,671 \$20,513 \$48,300
B.4	Undergraduate Students: TileCal R&D	\$9,336
C.	Fringe Benefits:	\$67,457
D.	Equipment: ATLAS Upgrade R&D CMM++	\$50,000
E.2	Travel (Foreign): TDAQ R&D for Test Stand (1 trip) TileCal M&O (3 trips) Tile Cal R&D (4 trips)	\$3,000 \$9,000 \$10,000
G.1	Materials and Supplies: TDAQ M&O Misc. TDAQ R&D Misc. Test Stand Construction TileCal M&O Misc. TileCal R&D Misc.	\$118 \$2,809 \$1,895
G.6	Other (Contractual Services): TDAQ R&D (Engineer, Y. Ermoline) TileCal R&D (Shooltz Solutions Inc.)	\$81,678 \$16,165
I.	Indirect Costs: 26% on all except equipment	\$105,692
J.	Total Direct and Indirect Costs	\$562,200



4TH YEAR PROPOSAL BUDGET

ORGANIZATION Michigan State University		PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Bernard Pope Dr. Joey Huston		00000105		Program	Grant
2. SENIOR PERSONNEL (PI, CO-PI, FACULTY AND OTHER SENIOR PERSONNEL) List each separately with name and title (A-7, Show number in brackets)		NSF Funded Person-months		Funds Available to Applicant	Funds Available to NSF
		CAF	ACAD		# Direct
1. Dr. Bernard Pope		0	0	0	0
2. Dr. Joey Huston		0	0	0	0
3. Dr. Hanneke Hauser		8	0	304,504	
4.					
5.					
6. () OTHERS (LIST INDIVIDUALLY OR GROUPS) (EXPLAIN IN DETAIL)					
7. (X) TOTAL SENIOR PERSONNEL (A-F)					
B. OTHER PERSONNEL (SHOW NUMBERS IN PARENTHESES)					
1. () POSTDOCTORAL ASSOCIATES		10	0	340,087	
2. (4) OTHER PROFESSIONALS (TECHNICAL PROGRAMMER, ETC.)		28	0	128,199	
3. () GRADUATE STUDENTS		4			
4. () UNDERGRADUATE STUDENTS				8,816	
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. () OTHER					
TOTAL SALARIES AND WAGES (J + K)				223,428	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				70,680	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (J + B + C)				294,108	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)					
TOTAL EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN				21,108	
F. PARTICIPANT SUPPORT					
1. STIPENDS \$ _____					
2. TRAVEL _____					
3. SUBSISTENCE _____					
4. OTHER _____					
TOTAL NUMBER OF PARTICIPANTS ()		TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				3,494	
2. PUBLICATIONS/DOCUMENTATION/DISTRIBUTION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBWARDS					
6. OTHER PPSC - Full Time @ \$30,000 per month x 12 months + 10% overhead @ \$33,450/yr				58,125	
TOTAL OTHER DIRECT COSTS				170,680	
H. TOTAL DIRECT COSTS (A THROUGH G)				470,828	
I. INDIRECT COSTS (FSA) (DEFLECT RATE AND \$AMT) 413,801 x 26% = 107,588.26					
TOTAL INDIRECT COSTS (FSA)				107,588	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				578,416	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SHE (CHECK IF Y))					
L. AMOUNT OF THIS REQUEST (A OR J, WHICHEVER)				581,610	5
M. COST SHARING PROPOSED LEVEL 3		NSF FUND LEVEL (IF DIFFERENT) 3		FOR NSF USE ONLY	
PI/CO-PI TYPED NAME AND SIGNATURE Dr. Bernard Pope - Dr. Joey Huston		DATE 02/20/2012			
ORSE FOR, THIRDPARTY & SIGNATURE Karin Schuler		DATE 02/20/12			
		INDIRECT COST RATE (PERCENTAGE)		INSTRUMENT	
		Cost Center	Date of This Cost	Inst. ID#	

Budget Justification
Michigan State University
Year 4 DRAFT

A.3	Salary for Senior Personnel: Deputy Program Manager for TDAQ	\$44,584
B.1	Postdoctoral Associates: TDAQ M&O	\$40,067
B.2	Other Professionals: TDAQ R&D, Elec. Engs. TileCal M&O, Techs. TileCal R&D, Techs.	\$55,282 \$21,128 \$49,749
B.4	Undergraduate Students: TileCal R&D	\$9,616
C.	Fringe Benefits:	\$70,682
D.	Equipment: ATLAS Upgrade R&D CMM++	
E.2	Travel (Foreign): TDAQ R&D for Test Stand (1 trip) TileCal M&O (3 trips) Tile Cal R&D (4 trips)	\$1,600 \$9,500 \$10,000
G.1	Materials and Supplies: TDAQ M&O Misc. TDAQ R&D Misc. Test Stand Construction TileCal M&O Misc. TileCal R&D Misc.	\$136 \$1,701 \$1,627
G.6	Other (Contractual Services): TDAQ R&D (Engineer, Y. Ermoline) TileCal R&D (Shooltz Solutions Inc.)	\$81,678 \$13,451
I.	Indirect Costs: 26% on all except equipment	\$106,809
J.	Total Direct and Indirect Costs	\$517,610

5TH YEAR PROPOSAL BUDGET

ORGANIZATION Michigan State University			FISCAL YEAR		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Bernard Pope Dr. Joey Hutton			AWARD NO.		FUNDING SOURCE	
1. SENIOR PERSONNEL (PI, CO-PI, FAMILY AND OTHER SENIOR PERSONNEL) List each separately with name and title (A-Z. Show number in brackets)			NSF FUNDING PERIOD (MONTHS)		FUNDING SOURCE	
			FUNDING SOURCE		FUNDING SOURCE	
1. Dr. Bernard Pope			0	0	0	0
2. Dr. Joey Hutton			0	0	0	0
3. Dr. Robert Houser			0	0	0	0
4.						
5.						
6. 1. OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. 2. TOTAL SENIOR PERSONNEL (1-6)						
8. OTHER PERSONNEL (POSTDOCTORALS, GRADUATES, etc.)						
1. 11 POSTDOCTORAL ASSOCIATES			7.8	0	0	141,200
2. 14 OTHER PROFESSIONALS (TECHNICAL PROGRAMMER, ETC.)			23	0	0	128,940
3. 1. 1 GRADUATE STUDENTS						
4. 11 UNDERGRADUATE STUDENTS						9,304
5. 1. 1 BIODIVERSITY - CLERICAL (IF CHARGED DIRECTLY)						
6. 1. 1 OTHER						
TOTAL SALARIES AND WAGES (7-6)						277,044
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						72,138
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (7-6 + C)						349,182
D. EQUIPMENT COST (ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000) ATLAS Upgrade Phase II						
TOTAL EQUIPMENT						20,000
E. TRAVEL 1. DOMESTIC AND 2. FOREIGN 3. FOREIGN						10,000
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS: 1 TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						3,215
2. FUNDING ACCOUNTS/CONTRIBUTION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBGRANTS						
6. OTHER FFSC - 1 year @ \$100.00 per month x 12 months @ \$11,200/yr						10,836
TOTAL OTHER DIRECT COSTS						140,346
H. TOTAL DIRECT COSTS (A THROUGH G)						489,528
I. INDIRECT COSTS (F&A) (PERCENT RATE AND BASE) 416,226 x 20% = 83,245						
TOTAL INDIRECT COSTS (F&A)						83,245
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						572,773
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE CPU # 07.1)						
L. AMOUNT OF THIS REQUEST (J OR L/MANUE #)						587,180 \$
M. COST SHARING PROPOSED LEVEL: 0			AGREED LEVEL IF DIFFERENT: 0			
PI/PI-TYPED NAME AND SIGNATURE Dr. Bernard Pope - Dr. Joey Hutton			DATE 12/2/2018		FOR NSF USE ONLY	
COPIES TYPED NAME & SIGNATURE Bernard Pope Joey Hutton			DATE 12/2/18		DATE CHECKED	
					DATE OF PI'S REVIEW	

Budget Justification
Michigan State University
Year 5 DRAFT

A.3	Salary for Senior Personnel: Deputy Program Manager for TDAQ	\$45,922
B.1	Postdoctoral Associates: TDAQ M&O	\$41,269
B.2	Other Professionals: TDAQ R&D, Elec. Engs. TileCal M&O, Techs. TileCal R&D, Techs.	\$56,941 \$21,762 \$51,242
B.4	Undergraduate Students: TileCal R&D	\$9,904
C.	Fringe Benefits:	\$72,136
D.	Equipment: ATLAS Upgrade Phase II Module	\$50,000
E.2	Travel (Foreign): TDAQ R&D for Test Stand TileCal M&O (3 trips) Tile Cal R&D (4 trips)	\$9,900 \$10,000
G.1	Materials and Supplies: TDAQ M&O Misc. TDAQ R&D Misc. Test Stand Construction TileCal M&O Misc. TileCal R&D Misc.	\$286 \$1,242 \$1,687
G.6	Other (Contractual Services): TDAQ R&D (Engineer, Y. Ermoline) TileCal R&D (Shooltz Solutions Inc.)	\$81,678 \$11,256
I.	Indirect Costs: 26% on all except equipment	\$107,955
J.	Total Direct and Indirect Costs	\$573,180



COMMITTEE PROPOSAL BUDGET

ORGANIZATION Michigan State University			PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Bernard Pope Dr. Joey Huber			AWARD NO.		Proposed	Revised
A. SENIOR PERSONNEL - PI/PO, Co-PIs, Faculty and Other Senior Associates (List each separately with name and title. (A.T. Show number in brackets))			NSF-Funded Months (months)		Funds Requested Proposed	Funds From Other (if Different)
			CAL	MON		
1. Dr. Bernard Pope			0	0	0	0
2. Dr. Joey Huber			0	0	0	0
3. Dr. Robert Huser			0	0	0	3218.815
4.						
5.						
6. 1. OTHERS LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE						
7. (2) TOTAL SENIOR PERSONNEL (1-6)						
B. MID-LEVEL PERSONNEL (POSTDOCTORAL, GRADUATE, etc.)						
1. (1) POSTDOCTORAL ASSOCIATES			7.9	8	0	8708.780
2. (2) OTHER PROFESSIONALS (TECHNICAL, PROGRAMMER, ETC.)			20	8	0	612,087
3. 1. GRADUATE STUDENTS			4			
4. (1) UNDEGREE GRADUATE STUDENTS						48,720
5. 1. SECRETARIAL, CLERICAL, OR EMPLOYED INDIRECTLY						
6. 1. OTHER						
TOTAL SALARIES AND FEES (A + B)						1,512,676
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						307,376
TOTAL SALARIES, FEES AND FRINGE BENEFITS (A + B + C)						1,820,054
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000) ATLAS Upgrade GMM++ ATLAS Upgrade Phase II						
TOTAL EQUIPMENT						280,000
E. TRAVEL 1. DOMESTIC (W/CL. CANADA, MEXICO AND U.S. POSSESSIONS) 2. FOREIGN						128,000
F. PARTICIPANT SUPPORT 1. STIPENDS 2. TRAVEL 3. SUBSISTENCE 4. OTHER						
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						35,500
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBGRANTS						
6. OTHER (SPEC - Year Creating @ \$500.00 per month x 12 months Student Solutions @ \$74,672						485,280
TOTAL OTHER DIRECT COSTS						875,724
H. TOTAL DIRECT COSTS (A THROUGH G)						2,383,178
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASIS) 2,033,178 x 26% = 528,626						
TOTAL INDIRECT COSTS (F&A)						528,626
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						1,402,347
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE (DAS 8 D 7))						
L. AMOUNT OF THIS REQUEST (J OR L MINUS K)						\$2,811,800
M. COST SHARING (PROPOSED LEVEL)			AGREED LEVEL (IF DIFFERENT)			
PI/PO TYPED NAME AND SIGNATURE Dr. Bernard Pope - Dr. Joey Huber			DATE 12/02/10	FOR NSF USE ONLY		
DATE, REP. THIRD NAME & SIGNATURE Rita Soman			DATE 12/16/10	INDIRECT COST RATE (IF REVISION) Date Checked Date of Rate Check Initials (PI/PO)		

Budget Justification
Michigan State University
CUMULATIVE DRAFT

A.3	Salary for Senior Personnel: Deputy Program Manager for TDAQ	\$216,615
B.1	Postdoctoral Associates: TDAQ M&O	\$195,780
B.2	Other Professionals: TDAQ R&D, Elec. Engs. TileCal M&O, Techs. TileCal R&D, Techs.	\$268,593 \$102,655 \$241,713
B.4	Undergraduate Students: TileCal R&D	\$46,720
C.	Fringe Benefits:	\$337,378
D.	Equipment: ATLAS Upgrade R&D CMM++ & Phase II Module	\$250,000
E.2	Travel (Foreign): TDAQ R&D for Test Stand (5 trips) TileCal M&O (15 trips) Tile Cal R&D (20 trips)	\$13,739 \$46,200 \$50,000
G.1	Materials and Supplies: TDAQ M&O Misc. TDAQ R&D Misc. Test Stand Construction TileCal M&O Misc. TileCal R&D Misc.	\$921 \$14,692 \$8,871 \$6,039
G.6	Other (Contractual Services): TDAQ R&D (Engineer, Y. Ermoline) TileCal R&D (Shooltz Solutions Inc.)	\$408,390 \$74,872
I.	Indirect Costs: 26% on all except equipment	\$528,622
J.	Total Direct and Indirect Costs	\$2,811,800

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer				0.00	0.00	0.00	\$ 0
2. Allen I Mincer				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	29,630
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,204
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							40,834
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							11,230
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							52,064
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							58,064
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							17,096
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							75,160
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 75,160 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 43778)

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer				0.00	0.00	0.00	\$ 0
2. Allen I Mincer				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	30,543
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							41,704
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							11,677
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							53,381
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							59,381
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							17,439
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							76,820
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 76,820 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 45095)

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				Proposed	Granted		
				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kyle Cranmer				0.00	0.00	0.00	\$ 0
2. Allen I Mincer				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	31,597
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							42,758
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							11,972
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							54,730
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							60,730
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							17,790
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							78,520
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 78,520
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 46445)

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer				0.00	0.00	0.00	\$ 0
2. Allen I Mincer				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	32,688
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							43,849
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							12,278
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							56,127
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							62,127
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							18,153
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							80,280
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 80,280 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 47841)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer				0.00	0.00	0.00	\$ 0
2. Allen I Mincer				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	33,811
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							44,972
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							12,592
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							57,564
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							63,564
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							18,526
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							82,090
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 82,090
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs**

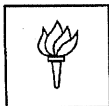
MTDC - off campus (Rate: 26.0000, Base 49278)

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kyle Cranmer				0.00	0.00	0.00	\$ 0
2. Allen I Mincer				0.00	0.00	0.00	0
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (5) POST DOCTORAL SCHOLARS				30.00	0.00	0.00	158,269
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12.00	0.00	0.00	55,848
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							214,117
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							59,749
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							273,866
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							30,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							303,866
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							89,004
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							392,870
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 392,870 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



New York University

A private university in the public service

Office of Sponsored Programs
665 Broadway Suite 801
New York, NY 10012-2331
Telephone: (212) 998-2121
Fax: (212) 995-4029

NYU COOPERATING INSTITUTION CONSORTIUM STATEMENT

Title of Application: U.S. ATLAS Operations: Empowering University Physicists to Make Discoveries at the Energy Frontier

Prime Grantee/Contractor Organization: Columbia University

Sponsor: NSF

Prime Grantee/Principal Investigator: Michael Tuts (Columbia)


Sub-Grantee/Contractor: New York University
Washington Square
New York, NY 10012

NYU Principal Investigator: Kyle Cranmer
Phone Number: 212-998-7736
Email address: kyle.cranmer@nyu.edu

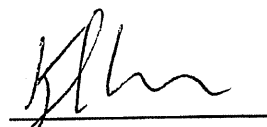
Period of Performance: 2/1/12 - 1/31/17
Human Subjects Approval Date: N/A
Animal Subjects Approval Date: N/A

	<u>Current Year</u>	<u>Entire Project</u>
NYU Direct Costs:	58,064	303,866
NYU Indirect Costs:	17,096	89,004
NYU Total Costs:	\$75,160	\$392,870

For New York University
Richard L. Louth, Director
Office of Sponsored Programs
(212) 998-2121
osp.agency@nyu.edu


Signature and Date 12/13/10

NYU Principal Investigator
Kyle Cranmer


Signature and Date 12/9/10

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer - PI				0.00	0.00	0.00	\$ 0
2. Allen I Mincer - Co-PI				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	29,630
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,204
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							40,834
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							11,230
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							52,064
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							58,064
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							17,096
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							75,160
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 75,160 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 43778)

Budget Justification: Year 1

B1. 50% of Postdoc salary (Analysis Toolset)

B2. 20% of Technician salary (Upgrade Electronics)

C. Fringe @ 27.5%

E. Travel (2. Foreign) Cost of Living Adjustment (COLA) for Postdoc stationed at CERN

I. Indirect Costs:

Split rate to reflect:

- 1) Calculation uses off-campus rate of 26% for Postdoc stationed at CERN
- 2) Calculation uses mixed rate of 40% for Technician; based on the average of $\frac{1}{2}$ on-campus rate (54%) and $\frac{1}{2}$ off-campus rate (26%)

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer - PI				0.00	0.00	0.00	\$ 0 \$
2. Allen I Mincer - Co-PI				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	30,543
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							41,704
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							11,677
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							53,381
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____ 0							
2. TRAVEL _____ 0							
3. SUBSISTENCE _____ 0							
4. OTHER _____ 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							59,381
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							17,439
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							76,820
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 76,820 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 45095)

Budget Justification: Year 2

B1. 50% of Postdoc salary (Analysis Toolset)

B2. 20% of Technician salary (Upgrade Electronics)

C. Fringe @ 28%

E. Travel (2. Foreign) Cost of Living Adjustment (COLA) for Postdoc stationed at CERN

I. Indirect Costs:

Split rate to reflect:

- 1) Calculation uses off-campus rate of 26% for Postdoc stationed at CERN
- 2) Calculation uses mixed rate of 40% for Technician; based on the average of $\frac{1}{2}$ on-campus rate (54%) and $\frac{1}{2}$ off-campus rate (26%)

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kyle Cranmer - PI				0.00	0.00	0.00	\$ 0 \$
2. Allen I Mincer - Co-PI				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	31,597
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							42,758
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							11,972
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							54,730
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							60,730
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							17,790
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							78,520
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 78,520 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 46445)

Budget Justification: Year 3

B1. 50% of Postdoc salary (Analysis Toolset)

B2. 20% of Technician salary (Upgrade Electronics)

C. Fringe @ 28%

E. Travel (2. Foreign) Cost of Living Adjustment (COLA) for Postdoc stationed at CERN

I. Indirect Costs:

Split rate to reflect:

- 1) Calculation uses off-campus rate of 26% for Postdoc stationed at CERN
- 2) Calculation uses mixed rate of 40% for Technician; based on the average of $\frac{1}{2}$ on-campus rate (54%) and $\frac{1}{2}$ off-campus rate (26%)

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kyle Cranmer - PI				0.00	0.00	0.00	\$ 0
2. Allen I Mincer - Co-PI				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	32,688
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							43,849
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							12,278
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							56,127
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							62,127
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							18,153
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							80,280
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 80,280
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 47841)

Budget Justification: Year 4

B1. 50% of Postdoc salary (Analysis Toolset)

B2. 20% of Technician salary (Upgrade Electronics)

C. Fringe @ 28%

E. Travel (2. Foreign) Cost of Living Adjustment (COLA) for Postdoc stationed at CERN

I. Indirect Costs:

Split rate to reflect:

- 1) Calculation uses off-campus rate of 26% for Postdoc stationed at CERN
- 2) Calculation uses mixed rate of 40% for Technician; based on the average of $\frac{1}{2}$ on-campus rate (54%) and $\frac{1}{2}$ off-campus rate (26%)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				Proposed	Granted		
				AWARD NO.			
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kyle Cranmer - PI				0.00	0.00	0.00	\$ 0
2. Allen I Mincer - Co-PI				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (1) POST DOCTORAL SCHOLARS				6.00	0.00	0.00	33,811
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.40	0.00	0.00	11,161
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							44,972
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							12,592
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							57,564
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							63,564
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC - mixed rate (Rate: 40.0000, Base: 14286) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							18,526
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							82,090
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 82,090
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs**

MTDC - off campus (Rate: 26.0000, Base 49278)

Budget Justification: Year 5

B1. 50% of Postdoc salary (Analysis Toolset)

B2. 20% of Technician salary (Upgrade Electronics)

C. Fringe @ 28%

E. Travel (2. Foreign) Cost of Living Adjustment (COLA) for Postdoc stationed at CERN

I. Indirect Costs:

Split rate to reflect:

- 1) Calculation uses off-campus rate of 26% for Postdoc stationed at CERN
- 2) Calculation uses mixed rate of 40% for Technician; based on the average of $\frac{1}{2}$ on-campus rate (54%) and $\frac{1}{2}$ off-campus rate (26%)

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION New York University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kyle Cranmer				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kyle Cranmer - PI				0.00	0.00	0.00	\$ 0
2. Allen I Mincer - Co-PI				0.00	0.00	0.00	0
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (5) POST DOCTORAL SCHOLARS				30.00	0.00	0.00	158,269
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12.00	0.00	0.00	55,848
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							214,117
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							59,749
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							273,866
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							30,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							303,866
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							89,004
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							392,870
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 392,870 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Kyle Cranmer				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification: **Cumulative**

B1. 50% of Postdoc salary (Analysis Toolset)

B2. 20% of Technician salary (Upgrade Electronics)

C. Fringe @ 28%

E. Travel (2. Foreign) Cost of Living Adjustment (COLA) for Postdoc stationed at CERN

I. Indirect Costs:

Split rate to reflect:

- 1) Calculation uses off-campus rate of 26% for Postdoc stationed at CERN
- 2) Calculation uses mixed rate of 40% for Technician; based on the average of $\frac{1}{2}$ on-campus rate (54%) and $\frac{1}{2}$ off-campus rate (26%)

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Northern Illinois University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Dhiman Chakraborty				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Dhiman Chakraborty - Prof				0.00	0.00	0.00	\$ 0
2. J. Guilherme Lima - Rsearch scientist				7.00	0.00	0.00	41,680
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				7.00	0.00	0.00	41,680
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							41,680
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							16,256
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							57,936
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							57,936
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MDTC (Rate: 26.0000, Base: 57937)							
TOTAL INDIRECT COSTS (F&A)							15,064
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							73,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 73,000
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Dhiman Chakraborty				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION Northern Illinois University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Dhiman Chakraborty				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Dhiman Chakraborty - Prof	0.00	0.00	0.00	\$	0	\$	
2. J. Guilherme Lima - Research scientist	6.94	0.00	0.00		42,931		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	6.94	0.00	0.00		42,931		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					42,931		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					16,744		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					59,675		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					0		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					0		
H. TOTAL DIRECT COSTS (A THROUGH G)					59,675		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MDTC (Rate: 26.0000, Base: 59674)							
TOTAL INDIRECT COSTS (F&A)					15,515		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					75,190		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 75,190	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Dhiman Chakraborty				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Northern Illinois University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Dhiman Chakraborty				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Dhiman Chakraborty - Prof	0.00	0.00	0.00	\$	0	\$	
2. J. Guilherme Lima - Research scientist	6.87	0.00	0.00		44,221		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	6.87	0.00	0.00		44,221		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					44,221		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					17,247		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					61,468		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					0		
H. TOTAL DIRECT COSTS (A THROUGH G)					61,468		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MDTC (Rate: 26.0000, Base: 61468)							
TOTAL INDIRECT COSTS (F&A)					15,982		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					77,450		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	77,450	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Dhiman Chakraborty				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Northern Illinois University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Dhiman Chakraborty				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
	CAL	ACAD	SUMR				
1. Dhiman Chakraborty - Prof	0.00	0.00	0.00	\$ 0			
2. J. Guilherme Lima - Research Scientist	6.80	0.00	0.00	45,546			
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0			
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	6.80	0.00	0.00	45,546			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0			
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0			
3. (0) GRADUATE STUDENTS				0			
4. (0) UNDERGRADUATE STUDENTS				0			
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0			
6. (0) OTHER				0			
TOTAL SALARIES AND WAGES (A + B)				45,546			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				17,764			
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				63,310			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT				0			
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0			
2. FOREIGN				0			
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS				0			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES				0			
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0			
3. CONSULTANT SERVICES				0			
4. COMPUTER SERVICES				0			
5. SUBAWARDS				0			
6. OTHER				0			
TOTAL OTHER DIRECT COSTS				0			
H. TOTAL DIRECT COSTS (A THROUGH G)				63,310			
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MDTC (Rate: 26.0000, Base: 63309)							
TOTAL INDIRECT COSTS (F&A)				16,460			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				79,770			
K. RESIDUAL FUNDS				0			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$ 79,770	\$		
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Dhiman Chakraborty				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Northern Illinois University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Dhiman Chakraborty				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Dhiman Chakraborty - Prof	0.00	0.00	0.00	\$	0	\$	
2. J. Guilherme Lima - Research scientist	6.74	0.00	0.00		46,911		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	6.74	0.00	0.00		46,911		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					46,911		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					18,295		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					65,206		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					0		
H. TOTAL DIRECT COSTS (A THROUGH G)					65,206		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MDTC (Rate: 26.0000, Base: 65206)							
TOTAL INDIRECT COSTS (F&A)					16,954		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					82,160		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 82,160	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Dhiman Chakraborty				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Northern Illinois University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Dhiman Chakraborty				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
	CAL	ACAD	SUMR				
1. Dhiman Chakraborty - Prof	0.00	0.00	0.00	\$	0	\$	
2. J. Guilherme Lima - Rsearch scientist	34.35	0.00	0.00		221,289		
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	34.35	0.00	0.00		221,289		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					221,289		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					86,306		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					307,595		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					0		
H. TOTAL DIRECT COSTS (A THROUGH G)					307,595		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)					79,975		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					387,570		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	387,570	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Dhiman Chakraborty				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Northern Illinois University			PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dhiman Chakraborty			AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded Person-months			Funds Requested By Proposer
			CAL	ACAD	SUMR	Funds Granted by NSF (If Different)
1. D. Chakraborty, PI						\$0
2. J. Guilherme Lima, Research Scientist			7.00			\$41,680
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. () TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$41,680
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						\$16,256
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$57,936
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						\$57,936
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% Modified Total Direct Costs						
TOTAL INDIRECT COSTS (F&A)						\$15,064
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						\$73,000
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$73,000
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE* Dhiman Chakraborty <i>D. Chakraborty</i>		DATE 12/17/10	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE* David Stone <i>DS</i>		DATE 12/17/10	Date Checked	Date of Rate Sheet	Initials-ORG	



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Northern Illinois University			PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dhiman Chakraborty			AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title (A.7. Show number in brackets)			NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR	
1. D. Chakraborty, PI						\$0
2. J. Guilherme Lima, Research Scientist			6.94			\$42,931
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. () TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$42,931
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						\$16,744
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$59,675
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						\$59,675
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% Modified Total Direct Costs						
TOTAL INDIRECT COSTS (F&A)						\$15,515
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						\$75,190
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$75,190
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$			
PI/PPD TYPED NAME AND SIGNATURE*			DATE		FOR NSF USE ONLY	
Dhiman Chakraborty			12/17/10		INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE			DATE		Date Checked	Date of Rate Sheet
David Stone			12/17/10			Initials-ORG



SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Northern Illinois University			PROPOSAL NO.		DURATION (MONTHS)	
					Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dhiman Chakraborty			AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR	
1. D. Chakraborty, PI						\$0
2. J. Guilherme Lima, Research Scientist			6.87			\$44,221
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. () TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$44,221
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						\$17,247
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$61,468
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)					\$61,468	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% Modified Total Direct Costs						
TOTAL INDIRECT COSTS (F&A)					\$15,982	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					\$77,450	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$77,450	
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$			
PI/PI TYPED NAME AND SIGNATURE*		DATE	FOR NSF USE ONLY			
Dhiman Chakraborty <i>Dhiman Chakraborty</i>		12/17/10	INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE*		DATE	Date Checked	Date of Rate Sheet	Initials-ORG	
David Stone <i>DS</i>		12/17/10				



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Northern Illinois University			PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dhiman Chakraborty			AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PI, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR	
1. D. Chakraborty, PI						\$0
2. J. Guilherme Lima, Research Scientist			6.8			\$45,546
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. () TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$45,546
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						\$17,764
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$63,310
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						\$63,310
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% Modified Total Direct Costs						
TOTAL INDIRECT COSTS (F&A)						\$16,460
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						\$79,770
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$79,770
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$			
PI/PI TYPED NAME AND SIGNATURE* Dhiman Chakraborty			DATE	12/17/10	FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE David Stone			DATE	12/17/10	INDIRECT COST RATE VERIFICATION	
			Date Checked	Date of Rate Sheet	Initials-ORG	



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Northern Illinois University			PROPOSAL NO.		DURATION (MONTHS)	
					Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dhiman Chakraborty			AWARD NO.			
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR	
1. D. Chakraborty, PI						\$0
2. J. Guilherme Lima, Research Scientist			6.74			\$46,911
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. () TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$46,911
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						\$18,295
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$65,206
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT			
COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)					\$65,206	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% Modified Total Direct Costs						
TOTAL INDIRECT COSTS (F&A)					\$16,954	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					\$82,160	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$82,160	
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$			
PI/PPD TYPED NAME AND SIGNATURE Dhiman Chakraborty <i>D. Chakraborty</i>			DATE 12/17/10		FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE David Stone <i>DS</i>			DATE 12/17/10		Date Checked	Date of Rate Sheet
					Initials-ORG	



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Northern Illinois University		PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dhiman Chakraborty		AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)		NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
		CAL	ACA	SUMR	
1. D. Chakraborty, PI					\$0
2. J. Guilherme Lima, Research Scientist		34.35			\$221,289
3.					
4.					
5.					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES					
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS					
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. () OTHER					
TOTAL SALARIES AND WAGES (A + B)					\$221,289
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					\$86,306
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					\$307,595
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TOTAL EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT					
1. STIPENDS \$ _____					
2. TRAVEL _____					
3. SUBSISTENCE _____					
4. OTHER _____					
TOTAL NUMBER OF PARTICIPANTS ()		TOTAL PARTICIPANT			
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					\$307,595
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% Modified Total Direct Costs					
TOTAL INDIRECT COSTS (F&A)					\$79,975
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					\$387,570
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$387,570
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$			
PI/PPD TYPED NAME AND SIGNATURE* Dhiman Chakraborty <i>Dhiman Chakraborty</i>		DATE 12/17/10	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE David Stone <i>DS</i>		DATE 12/17/10	Date Checked	Date of Rate Sheet	Initials-ORG

NIU

Budget Justification
YEAR 1

A2. Engineering and Technical Salaries:	
Salary for Tile calorimeter software including coordination	\$41,680
C. Fringe @ 39% of Base \$41,680	\$16,256
I. Indirect costs: 26% of \$57,936 (= \$41,680 + \$16,256)	\$15,064
J. Total Direct and Indirect Costs	\$73,000

Budget Justification
YEAR 2

A2. Engineering and Technical Salaries:	
Salary for Tile calorimeter software including coordination	\$42,931
C. Fringe @ 39% of Base \$42,931	\$16,744
I. Indirect costs: 26% of \$59,675 (= \$42,931 + \$16,744)	\$15,515
J. Total Direct and Indirect Costs	\$75,190

Budget Justification
YEAR 3

A2. Engineering and Technical Salaries:	
Salary for Tile calorimeter software including coordination	\$44,221
C. Fringe @ 39% of Base \$44,221	\$17,247
I. Indirect costs: 26% of \$61,468 (= \$44,221 + \$17,247)	\$15,982
J. Total Direct and Indirect Costs	\$77,450

Budget Justification
YEAR 4

A2. Engineering and Technical Salaries:	
Salary for Tile calorimeter software including coordination	\$45,546
C. Fringe @ 39% of Base \$45,546	\$17,764

NIU

I. Indirect costs: 26% of \$63,310 (= \$45,546 + \$17,764)	\$16,460
J. Total Direct and Indirect Costs	\$79,770

Budget Justification
YEAR 5

A2. Engineering and Technical Salaries: Salary for Tile calorimeter software including coordination	\$46,911
C. Fringe @ 39% of Base \$46,911	\$18,295
I. Indirect costs: 26% of \$59,675 (= \$42,931 + \$16,744)	\$16,954
J. Total Direct and Indirect Costs	\$82,160

Budget Justification
CUMULATIVE

A2. Engineering and Technical Salaries: Salary for Tile calorimeter software including coordination	\$221,289
C. Fringe @ 39% of Base \$221,289	\$86,303
I. Indirect costs: 26% of \$307,592 (= \$221,289 + \$86,303)	\$79,974
J. Total Direct and Indirect Costs	\$387,566

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Research Foundation of the State University of New York				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Michael Rijssenbeek - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.00	0.00	0.00	8,000
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							8,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							4,269
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							12,269
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,600
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							4,927
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							4,927
H. TOTAL DIRECT COSTS (A THROUGH G)							23,796
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 25% on campus (rate 57%), 75% off campus (26%) (Rate: 33.7500, Base: 23796)							
TOTAL INDIRECT COSTS (F&A)							8,031
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							31,827
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 31,827 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Michael Rijssenbeek				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION Research Foundation of the State University of New York				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO.	Proposed	Granted
				NSF Funded Person-months		
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Michael Rijssenbeek				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						8,240
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						4,397
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						12,637
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL						0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						6,900
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0)						
TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						4,973
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						4,973
H. TOTAL DIRECT COSTS (A THROUGH G)						24,510
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
25% on campus (rate 57%), 75% off campus (26%) (Rate: 33.7500, Base: 24510)						
TOTAL INDIRECT COSTS (F&A)						8,272
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						32,782
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 32,782
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Michael Rijssenbeek				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Research Foundation of the State University of New York				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Michael Rijssenbeek	0.00	0.00	0.00	\$	0	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	2.00	0.00	0.00		8,487		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					8,487		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					4,529		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					13,016		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					0		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					6,900		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					5,329		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					5,329		
H. TOTAL DIRECT COSTS (A THROUGH G)					25,245		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 25% on campus (rate 57%), 75% off campus (26%) (Rate: 33.7500, Base: 25245)							
TOTAL INDIRECT COSTS (F&A)					8,520		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					33,765		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	33,765	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Michael Rijssenbeek				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Research Foundation of the State University of New York				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Michael Rijssenbeek				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				2.50	0.00	0.00	10,927
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							10,927
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							5,831
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							16,758
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,900
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							2,344
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							2,344
H. TOTAL DIRECT COSTS (A THROUGH G)							26,002
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 25% on campus (rate 57%), 75% off campus (26%) (Rate: 33.7500, Base: 26002)							
TOTAL INDIRECT COSTS (F&A)							8,776
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							34,778
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 34,778 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Michael Rijssenbeek				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Research Foundation of the State University of New York				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Michael Rijssenbeek	0.00	0.00	0.00	\$	0	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	2.50	0.00	0.00		11,255		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					11,255		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					6,006		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					17,261		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					0		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					6,900		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					2,622		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					2,622		
H. TOTAL DIRECT COSTS (A THROUGH G)					26,783		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 25% on campus (rate 57%), 75% off campus (26%) (Rate: 33.7500, Base: 26783)							
TOTAL INDIRECT COSTS (F&A)					9,039		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					35,822		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 35,822	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Michael Rijssenbeek				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Research Foundation of the State University of New York				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Michael Rijssenbeek				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				11.00	0.00	0.00	46,909
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							46,909
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							25,032
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							71,941
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							34,200
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							20,195
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							20,195
H. TOTAL DIRECT COSTS (A THROUGH G)							126,336
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							42,638
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							168,974
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 168,974 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Michael Rijssenbeek				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Research Foundation of the State University of New York at Stony Brook		PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Michael Rijssenbeek		AWARD NO. for NSF-PHY-06-12811		Proposed	Granted
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)		NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
		CAL	ACAD	SUMR	
1.					\$
2.					\$
3.					
4.					
5.					
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				
7.	(0) TOTAL SENIOR PERSONNEL (1-6)				
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1.	(0) POSTDOCTORAL ASSOCIATES	0			\$ 0
2.	(1) OTHER PROFESSIONALS (2 mo, e.g. Technician Jack Steffens)	2			\$ 8,000
3.	(0) GRADUATE STUDENTS	0	0	0	\$ 0
4.	() UNDERGRADUATE STUDENTS				
5.	() SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				
6.	() OTHER				
TOTAL SALARIES AND WAGES (A + B)					\$ 8,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) IFR: 53.36%					\$ 4,269
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					\$12,269
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TOTAL EQUIPMENT					\$ 0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					\$ 0
2. FOREIGN - 3 trips to CERN (\$900 fare, \$400 transp, 8 days/7 nights of \$60 per diem + \$60 lodging)					\$ 6,600
F. PARTICIPANT SUPPORT					
1. STIPENDS \$ _____					
2. TRAVEL _____					
3. SUBSISTENCE _____					
4. OTHER _____					
TOTAL NUMBER OF PARTICIPANTS (0)		TOTAL PARTICIPANT COSTS			\$ 0
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					\$ 4,927
2. PUBLICATION/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					\$ 0
TOTAL OTHER DIRECT COSTS					\$ 4,927
H. TOTAL DIRECT COSTS (A THROUGH G)					\$23,796
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 25% on campus (rate 57.0%), 75% off-campus (rate 26.0%); effective rate: 33.75%					\$ 8,031
TOTAL INDIRECT COSTS (F&A)					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					\$31,827
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)					\$ 0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$31,827 \$
M. COST SHARING: PROPOSED LEVEL \$ _____		AGREED LEVEL IF DIFFERENT: \$ _____			
PI/PPD TYPED NAME AND SIGNATURE Michael M Rijssenbeek		DATE 12/08/2010	FOR NSF USE ONLY		
ORG. REP. TYPED NAME & SIGNATURE Lydia Chazy		DATE 12/14/10	INDIRECT COST RATE VERIFICATION		
		Date Checked	Date of Rate Sheet	Initials-ORG	



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Research Foundation of the State University of New York at Stony Brook			PROPOSAL NO		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Michael Rijssenbeek			AWARD NO for NSF PHY 06-12811		Proposed	Granted
A. SENIOR PERSONNEL: P/VPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR	
1.						\$
2.						\$
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. (0) TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POSTDOCTORAL ASSOCIATES			0			\$ 0
2. (1) OTHER PROFESSIONALS (2 mo, e.g. Technician Jack Steffens)			2			\$ 8,240
3. (0) GRADUATE STUDENTS			0	0	0	\$ 0
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$ 8,240
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) IFR: 53.36%						\$ 4,397
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$12,637
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						\$ 0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						\$ 0
2. FOREIGN - 3 trips to CERN (\$1000 fare, \$400 transp, 8 days/7 nights of \$60 per diem + \$60 lodging)						\$ 6,900
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS (0)			TOTAL PARTICIPANT COSTS			\$ 0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 25% on campus (rate 57.0%), 75% off-campus (rate 26.0%); effective rate: 33.75%						
TOTAL INDIRECT COSTS (F&A)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$			
PI/VPD TYPED NAME AND SIGNATURE Michael M Rijssenbeek			DATE 12/08/2010		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE Dydia Chabza			DATE 12/14/10		INDIRECT COST RATE VERIFICATION	
					Date Checked	Date of Rate Sheet
					Initials-ORG	



SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Research Foundation of the State University of New York at Stony Brook			PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Michael Rijssenbeek			AWARD NO. for NSF PHY 06-12811		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR	
1.						\$
2.						\$
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. (0) TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POSTDOCTORAL ASSOCIATES			0			\$ 0
2. (1) OTHER PROFESSIONALS (2 mo, e.g. Technician Jack Steffens)			2			\$ 8,487
3. (0) GRADUATE STUDENTS			0	0	0	\$ 0
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)						\$ 8,487
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) IFR: 53.36%						\$ 4,529
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						\$13,016
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						\$ 0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						\$ 0
2. FOREIGN - 3 trips to CERN (\$1000 fare, \$400 transp, 8 days/7 nights of \$60 per diem + \$60 lodging)						\$ 6,900
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS (0)			TOTAL PARTICIPANT COSTS			\$ 0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 25% on campus (rate 57.0%), 75% off-campus (rate 26.0%); effective rate: 33.75%						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING: PROPOSED LEVEL \$ _____			AGREED LEVEL IF DIFFERENT: \$ _____			
PI/PD TYPED NAME AND SIGNATURE Michael M Rijssenbeek			DATE 12/08/2010		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE Lynnie Chazy			DATE 12/14/10		INDIRECT COST RATE VERIFICATION	
					Date Checked	Date of Rate Sheet
					Initials-ORG	



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SUMMARY PROPOSAL BUDGET**FOR NSF USE ONLY**

ORGANIZATION Research Foundation of the State University of New York at Stony Brook		PROPOSAL NO.		DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Michael Rijssenbeek		AWARD NO. for NSF PHY 06-12811		Proposed	Granted	
A. SENIOR PERSONNEL: P/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)		NSF-Funded Person-months			Funds Requested By Proposer	Funds Granted by NSF (If Different)
		CAL	ACAD	SUMR	\$	\$
1.						
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. (0) TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POSTDOCTORAL ASSOCIATES		0			\$ 0	
2. (1) OTHER PROFESSIONALS (2.5 mo, e.g. Technician Jack Steffens)		2.5			\$10,927	
3. (0) GRADUATE STUDENTS		0	0	0	\$ 0	
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)					\$10,927	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) IFR: 53.36%					\$ 5,831	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					\$16,758	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT					\$ 0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					\$ 0	
2. FOREIGN - 3 trips to CERN (\$1000 fare, \$400 transp, 8 days/7 nights of \$60 per diem + \$60 lodging)					\$ 6,900	
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS (0)		TOTAL PARTICIPANT COSTS			\$ 0	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					\$ 2,344	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER					\$ 0	
TOTAL OTHER DIRECT COSTS					\$ 2,344	
H. TOTAL DIRECT COSTS (A THROUGH G)					\$26,002	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 25% on campus (rate 57.0%), 75% off-campus (rate 26.0%); effective rate: 33.75%					\$ 8,776	
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					\$34,778	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)					\$ 0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$34,778	\$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$				
PI/PPD TYPED NAME AND SIGNATURE Michael M Rijssenbeek		DATE 12/08/2010	FOR NSF USE ONLY			
ORG. REP. TYPED NAME & SIGNATURE* Lynne Chaz		DATE 12/14/10	INDIRECT COST RATE VERIFICATION			
		Date Checked	Date of Rate Sheet	Initials-ORG		



SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION Research Foundation of the State University of New York at Stony Brook				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO. for NSF PHY 06-12811		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1.							\$
2.							\$
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (0) TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POSTDOCTORAL ASSOCIATES				0			\$ 0
2. (1) OTHER PROFESSIONALS (2.5 mo, e.g. Technician Jack Steffens)				2.5			\$11,255
3. (0) GRADUATE STUDENTS				0	0	0	\$ 0
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							\$11,255
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) IFR: 53.36%							\$ 6,006
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							\$17,261
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							\$ 0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$ 0
2. FOREIGN - 3 trips to CERN (\$1000 fare, \$400 transp, 8 days/7 nights of \$60 per diem + \$60 lodging)							\$ 6,900
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			\$ 0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)							
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 25% on campus (rate 57.0%), 75% off-campus (rate 26.0%); effective rate: 33.75%							
TOTAL INDIRECT COSTS (F&A)							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							
M. COST SHARING: PROPOSED LEVEL \$ _____				AGREED LEVEL IF DIFFERENT: \$ _____			
PI/PD TYPED NAME AND SIGNATURE Michael M Rijssenbeek				DATE 12/08/2010		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE* Lynette Chabza				DATE 12/14/10		INDIRECT COST RATE VERIFICATION	
						Date Checked	Date of Rate Sheet
						Initials-ORG	



SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY			
PROPOSAL NO.		DURATION (MONTHS)	
AWARD NO. <small>for NSF PHY 06-12811</small>		Proposed	Granted

ORGANIZATION Research Foundation of the State University of New York at Stony Brook				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Michael Rijssenbeek				AWARD NO. <small>for NSF PHY 06-12811</small>		Proposed	Granted
A. SENIOR PERSONNEL: PI/PI, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1.							\$
2.							\$
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (0) TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POSTDOCTORAL ASSOCIATES				0			\$ 0
2. (1) OTHER PROFESSIONALS (11 mo, e.g. Technician Jack Steffens)				11			\$46,910
3. (0) GRADUATE STUDENTS				0	0	0	\$ 0
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							\$46,910
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) IFR: 53.36%							\$25,031
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							\$71,940
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							\$ 0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$ 0
2. FOREIGN - 15 trips to CERN (\$900-\$1000 fare, \$400 transp, 8 days/7 nights of \$60 per diem + \$60 lodging)							\$34,200
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		\$ 0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES				\$20,195			
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER				\$ 0			
TOTAL OTHER DIRECT COSTS				\$20,195			
H. TOTAL DIRECT COSTS (A THROUGH G)				\$126,335			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 25% on campus (rate 57.0%), 75% off-campus (rate 26.0%); effective rate: 33.75%							
TOTAL INDIRECT COSTS (F&A)				\$ 42,638			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				\$168,974			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)				\$ 0			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$168,974 \$			
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PI TYPED NAME AND SIGNATURE Michael M Rijssenbeek				DATE 12/08/2010		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE Lepida Chabza				DATE 12/14/10		INDIRECT COST RATE VERIFICATION	
				Date Checked		Date of Rate Sheet	
						Initials-ORG	

Budget Justification for Stony Brook Proposal FY2012 – FY2016

Below we justify the Stony Brook budget request for maintenance and operations of the High Voltage of the ATLAS Liquid Argon Calorimeters. We require technical support for maintenance of the HV Filters (repairs, maintenance of test setup) and support during yearly access. We request funds for three trips to CERN per year, specifically for LAr M&O. One of these trips will be for Rijssenbeek's long-term stay at CERN (typically 5 months/yr) during which he will spend about 20% of research time on HV M&O. One trip each for Dr. Dean Schamberger (~20% FTE on LAr HV) and for the senior technician. We request Materials and Supplies in support of the LAr M&O task: for parts and tools, cables, software, and test supplies at CERN and at Stony Brook.

B2. Salaries.

We request 2 months salary (i.e. \$8,000 in FY12; we increase by 3%/yr in succeeding years) of our in-house senior technician Jack Steffens, or equivalent personnel.

C2. The Fringe Benefits (IFR) cost is 53.36%.

E2. Foreign Travel.

We request three CERN visits per year directly related to the LAr M&O task of Stony Brook: per year one extended trip by Rijssenbeek, one trip by Dean Schamberger, and one trip by Steffens. We expect travel cost to increase by \$100/trip in FY14 and following.

G1. Materials and Supplies.

We request about 5k\$/yr in materials and supplies to support our LAr HV M&O responsibilities.

I. Indirect Costs.

Our ATLAS task is charged university overhead at the minimum rate because 75% of the work takes place off-campus. The current overhead rates are 26% for off-campus work and 57% for on-campus work. The resulting overhead rate is 33.75%.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Southern Methodist University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Ryszard Stroynowski - Prof	0.00	0.00	0.00	\$ 0	\$	
2.	Jingbo Ye - Prof	0.00	0.00	0.00	0		
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	48.00	0.00	0.00	260,900		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					260,900		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					73,000		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					333,900		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					20,600		
2. FOREIGN					39,600		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____	0					
2.	TRAVEL _____	0					
3.	SUBSISTENCE _____	0					
4.	OTHER _____	0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES				75,800		
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3.	CONSULTANT SERVICES				0		
4.	COMPUTER SERVICES				0		
5.	SUBAWARDS				0		
6.	OTHER				0		
TOTAL OTHER DIRECT COSTS					75,800		
H. TOTAL DIRECT COSTS (A THROUGH G)					469,900		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 470768)							
TOTAL INDIRECT COSTS (F&A)					122,400		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					592,300		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 592,300	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Ryszard Stroynowski				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Southern Methodist University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Ryszard Stroynowski	0.00	0.00	0.00	\$	0	\$	
2. Jingbo Ye	0.00	0.00	0.00		0		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	48.00	0.00	0.00		268,700		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					268,700		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					75,200		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					343,900		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					20,700		
2. FOREIGN					40,600		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					34,600		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					34,600		
H. TOTAL DIRECT COSTS (A THROUGH G)					439,800		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 26.0000, Base: 440000)							
TOTAL INDIRECT COSTS (F&A)					114,400		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					554,200		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	554,200	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Ryszard Stroynowski				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Southern Methodist University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Ryszard Stroynowski				0.00	0.00	0.00	\$ 0 \$
2. Jingbo Ye				0.00	0.00	0.00	0
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				48.00	0.00	0.00	276,700
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							276,700
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							77,500
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							354,200
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							18,900
2. FOREIGN							41,600
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							34,800
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							34,800
H. TOTAL DIRECT COSTS (A THROUGH G)							449,500
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 26.0000, Base: 448848)							
TOTAL INDIRECT COSTS (F&A)							116,700
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							566,200
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 566,200 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Ryszard Stroynowski				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Southern Methodist University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Ryszard Stroynowski	0.00	0.00	0.00	\$	0	\$	
2. Jingbo Ye	0.00	0.00	0.00		0		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	48.00	0.00	0.00		285,100		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					285,100		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					79,800		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					364,900		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					18,300		
2. FOREIGN					40,100		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					63,600		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					63,600		
H. TOTAL DIRECT COSTS (A THROUGH G)					486,900		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 26.0000, Base: 486540)							
TOTAL INDIRECT COSTS (F&A)					126,500		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					613,400		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	613,400	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Ryszard Stroynowski				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Southern Methodist University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Ryszard Stroynowski	0.00	0.00	0.00	\$	0	\$	
2. Jingbo Ye	0.00	0.00	0.00		0		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (4) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	48.00	0.00	0.00		293,500		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					293,500		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					82,200		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					375,700		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					18,300		
2. FOREIGN					39,700		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					64,500		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					64,500		
H. TOTAL DIRECT COSTS (A THROUGH G)					498,200		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 26.0000, Base: 498078)							
TOTAL INDIRECT COSTS (F&A)					129,500		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					627,700		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	627,700	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Ryszard Stroynowski				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Southern Methodist University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Ryszard Stroynowski	0.00	0.00	0.00	\$ 0	\$	
2.	Jingbo Ye	0.00	0.00	0.00	0		
3.							
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(20) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	240.00	0.00	0.00	1,384,900		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					1,384,900		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					387,700		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					1,772,600		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					96,800		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					201,600		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					273,300		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					273,300		
H. TOTAL DIRECT COSTS (A THROUGH G)					2,344,300		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)					609,500		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					2,953,800		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 2,953,800	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Ryszard Stroynowski				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**SUMMARY
PROPOSAL BUDGET**

SUMMARY

FOR NSF USE ONLY

ORGANIZATION Southern Methodist University			PROPOSAL NO.		Duration (MONTHS)		
					Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Ryszard Stroynowski			AWARD NO.				
A SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7 show number in brackets)			NSF Funded Person-mos.			Funds Requested by Proposer	Funds Granted By NSF (If Different)
			CAL	ACAD	SUMR		
1	Ryszard Stroynowski	0.0	0.0	0.0	0		
2	Jingbo Ye	0.0	0.0	0.0	0		
3	Associate Research Professor	60.0	0.0	0.0	402,700		
4		0.0	0.0	0.0	0		
5		0.0	0.0	0.0	0		
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)	0.0	0.0	0.0	0		
7.	(15) TOTAL SENIOR PERSONNEL (1-6)	60.0	0.0	0.0	402,700		
B OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES	0.0	0.0	0.0	0		
2.	(15) OTHER PROFESSIONALS (TECHNICAL PROGRAMMER, ETC)				982,200		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					1,384,900		
C FRINGE BENEFITS (F CHARGED AS DIRECT COSTS)					387,700		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)					1,772,600		
D EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E TRAVEL 1 DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)					96,800		
2 FOREIGN					201,600		
F PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$0					
2.	TRAVEL	\$0					
3.	SUBSISTENCE	\$0					
4.	OTHER	\$0					
TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES				273,300		
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3.	CONSULTANT SERVICES						
4.	COMPUTER SERVICES						
5.	SUBGRANTS			Amount added to Indirect: \$0			
6.	OTHER			Tuition = \$0			
TOTAL OTHER DIRECT COSTS					273,300		
H TOTAL DIRECT COSTS (A THROUGH G)					2,344,300		
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
26.0% Modified Total Direct Costs							
TOTAL INDIRECT COSTS (F&A)				Base Amount: \$2,344,300	609,500		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					2,953,800		
K. RESIDUAL FUNDS IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7 ()					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					2,953,800		
M. COST SHARING PROPOSED/LEVEL			AGREED LEVEL IF DIFFERENT \$				
PI/PO TYPED NAME & SIGNATURE		DATE	FOR NSF USE ONLY				
Ryszard Stroynowski		12/15/2010	INDIRECT COST RATE VERIFICATION				
ORG. REP. TYPED NAME & SIGNATURE		DATE	Date Checked	Date of Rate Sheet	Initials-ORG		
Alicia Brossette		12/15/10					

**SUMMARY
PROPOSAL BUDGET**

YEAR 1

ORGANIZATION SOUTHERN METHODIST UNIVERSITY				FOR NSF USE ONLY			
				PROPOSAL NO	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co.-PI's, Faculty and Other Senior Associates (List each separately with title, A 7. show number in brackets)				NSF Funded Person-mos.		Funds Requested by Proposer	Funds Granted By NSF (If Different)
		CAL	ACAD	SUMR			
1	Ryszard Stroynowski	0.0	0.0	0.0	0		
2	Jingbo Ye	0.0	0.0	0.0	0		
3	<i>Associate Research Professor</i>	12.0	0.0	0.0	75,900		
4		0.0	0.0	0.0	0		
5		0.0	0.0	0.0	0		
6	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)	0.0	0.0	0.0	0		
7	(3) TOTAL SENIOR PERSONNEL (1-6)	12.0	0.0	0.0	75,900		
B OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1	(0) POST DOCTORAL ASSOCIATES	0.0	0.0	0.0	0		
2	(3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC)				185,000		
3	(0) GRADUATE STUDENTS				0		
4	(0) UNDERGRADUATE STUDENTS				0		
5	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					260,900		
C FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					73,000		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)					333,900		
D EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1 DOMESTIC (INCL CANADA AND U.S. POSSESSIONS)					20,600		
2 FOREIGN					39,600		
F. PARTICIPANT SUPPORT COSTS							
1	STIPENDS						
2	TRAVEL						
3	SUBSISTENCE						
4	OTHER						
() TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1	MATERIALS AND SUPPLIES				75,800		
2	PUBLICATION COST/DOCUMENTATION/DISSEMINATION						
3	CONSULTANT SERVICES						
4	COMPUTER SERVICES						
5	SUBAWARDS						
6	OTHER						
Sum of all other Direct Costs, NOT tuition =				Tuition =	0	0	
TOTAL OTHER DIRECT COSTS					75,800		
H. TOTAL DIRECT COSTS (A THROUGH G)					469,900		
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
26.0% Modified Total Direct Costs							
TOTAL INDIRECT COSTS (F&A)				Base Amount: \$469,900	122,400		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					592,300		
K RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7 j)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					592,300		
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY		
Ryszard Stroynowski					INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date of Rate Sheet	
Alicia Brossette						Initials-ORG	

Budget Justification
Year 1

A3.	Associate research professor (electronics engineering) salary Salary for electronics engineer working on LAr M&O	\$75,900
B2.	Engineering and technical staff (1.5 EE, 0.5 ET) salaries: Salaries for engineers and technical staff working on upgrade R&D for tracker and for LAr systems	\$185,000
C.	Fringe 28%	\$73,000
E 1.	Domestic travel to collaborating institutions	\$20,600
E 2.	Foreign travel to CERN - electronics repairs and meetings	\$39,600
G1.	Optical spectrum analyzer, serializer chip submission	\$75,800
I.	Indirect cost 26% of salary, benefits, travel and components	\$122,400
	Total direct and indirect cost	\$592,300

**SUMMARY
PROPOSAL BUDGET**

YEAR 2

ORGANIZATION SOUTHERN METHODIST UNIVERSITY				PROPOSAL NO.		DURATION (MONTHS)		
				Proposed		Granted		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.				
A SENIOR PERSONNEL: PI/PD, Co.-PI's, Faculty and Other Senior Associates (List each separately with title, A 7 show number in brackets)				NSF Funded			Funds	Funds
				Person-mos			Requested by	Granted By NSF
			CAL	ACAD	SUMR	Proposer	(If Different)	
1	Ryszard Stroynowski		0.0	0.0	0.0	0		
2	Jingbo Ye		0.0	0.0	0.0	0		
3	Associate Research Professor		12.0	0.0	0.0	78.100		
4			0.0	0.0	0.0	0		
5			0.0	0.0	0.0	0		
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)		0.0	0.0	0.0	0		
7.	(3) TOTAL SENIOR PERSONNEL (1-6)		12.0	0.0	0.0	78.100		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	(0) POST DOCTORAL ASSOCIATES		0.0	0.0	0.0	0		
2	(3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					190.600		
3.	(0) GRADUATE STUDENTS					0		
4	(0) UNDERGRADUATE STUDENTS					0		
5	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6.	(0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)						268.700		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						75.200		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						343.900		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
TOTAL EQUIPMENT						0		
E TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						20.700		
2. FOREIGN						40.600		
F. PARTICIPANT SUPPORT COSTS								
1	STIPENDS	_____						
2	TRAVEL	_____						
3	SUBSISTENCE	_____						
4	OTHER	_____						
TOTAL PARTICIPANT COSTS						0		
G. OTHER DIRECT COSTS								
1	MATERIALS AND SUPPLIES					34,600		
2	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3	CONSULTANT SERVICES							
4	COMPUTER SERVICES							
5	SUBGRANT	Amount subject to indirect			\$0			
6.	OTHER	Sum of all other Direct Costs, NOT tuition =			Tuition =	\$0	0	
TOTAL OTHER DIRECT COSTS						34,600		
H. TOTAL DIRECT COSTS (A THROUGH G)						439,800		
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)								
0.0% Modified Total Direct Costs								
TOTAL INDIRECT COSTS (F&A)						114,400		
Base Amount: \$439,800								
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						554,200		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPO II.D.7 (1))								
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						554,200		
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$				
PI/DP TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY		
Ryszard Stroynowski						INDIRECT COST RATE VERIFICATION		
ORG. REP TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet	
Alicia Brossette							Initials-ORG	

Budget Justification
Year 2

A3.	Associate research professor (electronics engineering) salary Salary for electronics engineer working on LAr M&O	\$78,100
B2.	Engineering and technical staff (1.5 EE, 0.5 ET) salaries: Salaries for engineers and technical staff working on upgrade R&D for tracker and for LAr systems	\$190,600
C.	Fringe 28%	\$75,200
E 1.	Domestic travel to collaborating institutions	\$20,700
E 2.	Foreign travel to CERN - electronics repairs and meetings	\$40,600
G1.	ASIC testing setups and materials	\$34,600
I.	Indirect cost 26% of salary, benefits, travel and components	\$114,400
	Total direct and indirect cost	\$554,200

**SUMMARY
PROPOSAL BUDGET**

YEAR 3

ORGANIZATION SOUTHERN METHODIST UNIVERSITY				PROPOSAL NO.		DURATION (MONTHS)	
				AWARD NO.		Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Ryszard Stroynowski							
A. SENIOR PERSONNEL: PI/PD, Co.-PI's, Faculty and Other Senior Associates (List each separately with title, A 7. show number in brackets)				NSF Funded Person-mos.		Funds Requested by Proposer	Funds Granted By NSF (If Different)
		CAL	ACAD	SUMR			
1	Ryszard Stroynowski	0.0	0.0	0.0		0	
2	Jingbo Ye	0.0	0.0	0.0		0	
3	Associate Research Professor	12.0	0.0	0.0		80,500	
4		0.0	0.0	0.0		0	
5		0.0	0.0	0.0		0	
6	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)	0.0	0.0	0.0		0	
7	(3) TOTAL SENIOR PERSONNEL (1-6)	12.0	0.0	0.0		80,500	
B OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1	(0) POST DOCTORAL ASSOCIATES	0.0	0.0	0.0		0	
2	(3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					196,200	
3	(0) GRADUATE STUDENTS					0	
4	(0) UNDERGRADUATE STUDENTS					0	
5	(0) SECRETARIAL / CLERICAL (IF CHARGED DIRECTLY)					0	
6	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)						276,700	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						77,500	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						354,200	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT						0	
E TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						18,500	
2. FOREIGN						41,600	
F. PARTICIPANT SUPPORT COSTS							
1	STIPENDS						
2	TRAVEL						
3	SUBSISTENCE						
4	OTHER						
TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1	MATERIALS AND SUPPLIES					34,800	
2	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3	CONSULTANT SERVICES						
4	COMPUTER SERVICES						
5	SUBAWARDS			Amount subject to Indirect:	\$0		
6	OTHER	Sum of all other Direct Costs, NOT tuition =		Tuition =	\$0	0	
TOTAL OTHER DIRECT COSTS						3,800	
H TOTAL DIRECT COSTS (A THROUGH G)						449,500	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
0.0% Modified Total Direct Costs							
TOTAL INDIRECT COSTS (I&A)				Base Amount: \$449,500		116,700	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						566,200	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE (SP) II D.7.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						566,200	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Ryszard Stroynowski						INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
Alicia Brossette							Initials-ORG

Budget Justification
Year 3

A3.	Associate research professor (electronics engineering) salary Salary for electronics engineer working on LAr M&O	\$80,500
B2.	Engineering and technical staff (1.5 EE, 0.5 ET) salaries: Salaries for engineers and technical staff working on upgrade R&D for tracker and for LAr systems	\$196,200
C.	Fringe 28%	\$77,500
E 1.	Domestic travel to collaborating institutions	\$18,900
E 2.	Foreign travel to CERN - electronics repairs and meetings	\$41,600
G1.	ASIC testing, PCB level studies and system integration	\$34,800
I.	Indirect cost 26% of salary, benefits, travel and components	\$116,700
	Total direct and indirect cost	\$566,200

**SUMMARY
PROPOSAL BUDGET**

YEAR 4

ORGANIZATION SOUTHERN METHODIST UNIVERSITY				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.		Funds Requested by Proposer	Funds Granted By NSF (If Different)
				CAL	ACAD	SUMR	
1	Ryszard Stroynowski	0.0	0.0	0.0		0	
2	Jing Ye	0.0	0.0	0.0		0	
3	Associate Research Professor	12.0	0.0	0.0		82.900	
4		0.0	0.0	0.0		0	
5		0.0	0.0	0.0		0	
6	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)	0.0	0.0	0.0		0	
7	(3) TOTAL SENIOR PERSONNEL (1-6)	12.0	0.0	0.0		82.900	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1	(0) POST DOCTORAL ASSOCIATES	0.0	0.0	0.0		0	
2	(3) OTHER PROFESSIONALS (TECHNOLOGICAL PROGRAMMER, ETC.)					202.200	
3	(0) GRADUATE STUDENTS					0	
4	(0) UNDERGRADUATE STUDENTS					0	
5	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)						285.100	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COST)						79.800	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						364.900	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT						0	
E. TRAVEL 1 DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						18.300	
2 FOREIGN						40.100	
F. PARTICIPANT SUPPORT COSTS							
1	STIPENDS						
2	TRAVEL						
3	SUBSISTENCE						
4	OTHER						
() TOTAL PARTICIPANT COSTS						0	
G. OTHER DIRECT COSTS							
1	MATERIALS AND SUPPLIES					63.600	
2	PUBLICATION COSTS/DOCUMENTATION/DESEMINATION						
3	CONSULTANT SERVICES						
4	COMPUTER SERVICES						
5	SUBAWARDS				50		
6	OTHER				50	0	
Sum of all other Direct Costs NOT tuition =							
Tuition =						0	
TOTAL OTHER DIRECT COSTS						63.600	
H. TOTAL DIRECT COSTS (A THROUGH G)						486.900	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
0.0% Modified Total Direct Costs							
TOTAL INDIRECT COSTS (F&A)						126.500	
Base Amount: 486,900							
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						613.400	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						613,400	
M. COST SHARING: PROPOSED LEVEL \$							
AGREED LEVEL IF DIFFERENT \$							
PI/PD TYPED NAME & SIGNATURE*		DATE		FOR NSF USE ONLY			
ORG. REP. TYPED NAME & SIGNATURE*		DATE		INDIRECT COST RATE VERIFICATION			
				Date Checked	Date of Rate Sheet	Initials-ORG	

Budget Justification
Year 4

A3.	Associate research professor (electronics engineering) salary Salary for electronics engineer working on LAr M&O	\$82,900
B2.	Engineering and technical staff (1.5 EE, 0.5 ET) salaries: Salaries for engineers and technical staff working on upgrade R&D for tracker and for LAr systems	\$202,200
C.	Fringe 28%	\$79,800
E 1.	Domestic travel to collaborating institutions	\$18,300
E 2.	Foreign travel to CERN - electronics repairs and meetings	\$40,100
G1.	ASIC prototyping, testing and system integration	\$63,600
I.	Indirect cost 26% of salary, benefits, travel and components	\$126,500
	Total direct and indirect cost	\$613,400

**SUMMARY
PROPOSAL BUDGET**

YEAR 5

ORGANIZATION SOUTHERN METHODIST UNIVERSITY				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Ryszard Stroynowski				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A 7 show number in brackets)				NSF Funded Person-mos		Funds Requested by Proposer	Funds Granted By NSF (If Different)
		CAL	ACAD	SUMR			
1	Ryszard Stroynowski	0.0	0.0	0.0		0	
2	Jingbo Ye	0.0	0.0	0.0		0	
3	Associate Research Professor	12.0	0.0	0.0		85,300	
4		0.0	0.0	0.0		0	
5		0.0	0.0	0.0		0	
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)	0.0	0.0	0.0		0	
7.	(3) TOTAL SENIOR PERSONNEL (1-6)	12.0	0.0	0.0		85,300	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1	(0) POST DOCTORAL ASSOCIATES	0.0	0.0	0.0		0	
2	(3) OTHER PROFESSIONALS (TECHNICAL PROGRAMMER, ETC.)					208,200	
3.	(0) GRADUATE STUDENTS					0	
4.	(0) UNDERGRADUATE STUDENTS					0	
5	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6.	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)						293,500	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						82,200	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						375,700	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT						0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						18,300	
2. FOREIGN						39,700	
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS						
2.	TRAVEL						
3.	SUBSISTENCE						
4.	OTHER						
TOTAL PARTICIPANT COSTS						0	
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES					64,500	
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3.	CONSULTANT SERVICES						
4.	COMPUTER SERVICES						
5.	SUBAWARDS				Amount added to Indirect: \$0		
6.	OTHER				Tuition = \$0		
TOTAL OTHER DIRECT COSTS						64,500	
H. TOTAL DIRECT COSTS (A THROUGH G)						498,200	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
0.0% Modified Total Direct Costs							
TOTAL INDIRECT COSTS (F&A)					Base Amount: \$498,200	129,500	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						627,700	
K. RESIDUAL FUNDS IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7 ()							
L. AMOUNT OF THIS REQUEST (J) OR (J) MINUS (K)						627,700	
M. COST SHARING: PROPOSED LEVEL %				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY		
Ryszard Stroynowski					INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date of Rate Sheet	Initials-ORG
Alicia Brossette							

Budget Justification
Year 5

A3.	Associate research professor (electronics engineering) salary Salary for electronics engineer working on LAr M&O	\$85,300
B2.	Engineering and technical staff (1.5 EE, 0.5 ET) salaries: Salaries for engineers and technical staff working on upgrade R&D for tracker and for LAr systems	\$208,200
C.	Fringe 28%	\$82,200
E 1.	Domestic travel to collaborating institutions	\$18,300
E 2.	Foreign travel to CERN - electronics repairs and meetings	\$39,700
G1.	ASIC prototyping, testing and system integration	\$64,500
I.	Indirect cost 26% of salary, benefits, travel and components	\$129,500
	Total direct and indirect cost	\$627,700

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION The Regents of the University of California				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Abraham Seiden				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Abraham Seiden - Prof				0.00	0.00	0.00	\$ 0
2. Edward Spencer - Engineer				4.60	0.00	0.00	29,804
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				4.60	0.00	0.00	29,804
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				19.40	0.00	0.00	85,741
3. (0) GRADUATE STUDENTS							0
4. (2) UNDERGRADUATE STUDENTS							15,191
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							130,736
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							51,251
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							181,987
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Equipment						\$ 10,000	
TOTAL EQUIPMENT							10,000
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							36,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							49,108
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							49,108
H. TOTAL DIRECT COSTS (A THROUGH G)							277,095
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 267095)							
TOTAL INDIRECT COSTS (F&A)							69,445
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							346,540
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 346,540
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Abraham Seiden				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION The Regents of the University of California				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Abraham Seiden				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Abraham Seiden - Prof			0.00	0.00	0.00	\$ 0 \$
2.	Edward Spencer - Engineer			4.60	0.00	0.00	30,698
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)			4.60	0.00	0.00	30,698
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			18.80	0.00	0.00	85,457
3.	(0) GRADUATE STUDENTS						0
4.	(2) UNDERGRADUATE STUDENTS						15,645
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							131,800
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							52,014
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							183,814
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	Equipment			\$		10,000	
TOTAL EQUIPMENT							10,000
E. TRAVEL							0
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							36,630
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						49,926
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							49,926
H. TOTAL DIRECT COSTS (A THROUGH G)							280,370
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 270370)							
TOTAL INDIRECT COSTS (F&A)							70,296
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							350,666
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 350,666 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Abraham Seiden				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet			Initials - ORG	

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION The Regents of the University of California				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Abraham Seiden				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Abraham Seiden - Prof			0.00	0.00	0.00	\$ 0
2.	Edward Spencer - Engineer			4.60	0.00	0.00	31,619
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)			4.60	0.00	0.00	31,619
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			18.20	0.00	0.00	85,104
3.	(0) GRADUATE STUDENTS						0
4.	(2) UNDERGRADUATE STUDENTS						16,115
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							132,838
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							52,782
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							185,620
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	Equipment			\$		10,000	
TOTAL EQUIPMENT							10,000
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
	2. FOREIGN						37,278
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						50,846
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							50,846
H. TOTAL DIRECT COSTS (A THROUGH G)							283,744
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 273744)							
TOTAL INDIRECT COSTS (F&A)							71,173
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							354,917
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 354,917 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Abraham Seiden				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet			Initials - ORG	

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION The Regents of the University of California				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Abraham Seiden				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Abraham Seiden - Prof			0.00	0.00	0.00	\$ 0
2.	Edward Spencer - Engineer			4.60	0.00	0.00	32,588
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)			4.60	0.00	0.00	32,588
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			19.40	0.00	0.00	93,671
3.	(0) GRADUATE STUDENTS						0
4.	(2) UNDERGRADUATE STUDENTS						22,132
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							148,391
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							56,105
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							204,496
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	Equipment			\$		10,000	
TOTAL EQUIPMENT							10,000
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
	2. FOREIGN						37,947
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	<u>0</u>				
2.	TRAVEL		<u>0</u>				
3.	SUBSISTENCE		<u>0</u>				
4.	OTHER		<u>0</u>				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						61,758
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							61,758
H. TOTAL DIRECT COSTS (A THROUGH G)							314,201
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 304202)							
TOTAL INDIRECT COSTS (F&A)							79,093
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							393,294
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 393,294 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Abraham Seiden				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet			Initials - ORG	

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION The Regents of the University of California				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Abraham Seiden				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Abraham Seiden - Prof			0.00	0.00	0.00	\$ 0
2.	Edward Spencer - Engineer			5.20	0.00	0.00	37,959
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)			5.20	0.00	0.00	37,959
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			23.80	0.00	0.00	123,667
3.	(0) GRADUATE STUDENTS						0
4.	(4) UNDERGRADUATE STUDENTS						54,709
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							216,335
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							67,811
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							284,146
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	Equipment			\$		10,000	
TOTAL EQUIPMENT							10,000
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
	2. FOREIGN						38,635
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						72,301
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							72,301
H. TOTAL DIRECT COSTS (A THROUGH G)							405,082
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 395082)							
TOTAL INDIRECT COSTS (F&A)							102,721
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							507,803
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 507,803 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Abraham Seiden				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet			Initials - ORG	

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION The Regents of the University of California				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Abraham Seiden				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Abraham Seiden - Prof				0.00	0.00	0.00
2. Edward Spencer - Engineer				23.60	0.00	0.00
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				23.60	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (25) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				99.60	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (12) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						760,100
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						279,963
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						1,040,063
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
\$ 50,000						
TOTAL EQUIPMENT						50,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						186,490
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						283,939
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						283,939
H. TOTAL DIRECT COSTS (A THROUGH G)						1,560,492
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						392,728
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						1,953,220
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 1,953,220
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME Abraham Seiden				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**SUMMARY
PROPOSAL BUDGET**

YEAR 01 Start 02/01/2012 End 01/01/2017

ORGANIZATION The Regents of the University of California					PROPOSAL NO.		DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Seiden, Abraham					AWARD NO.		Proposed	Granted	
A. SENIOR PERSONNEL - PI/PI, Co-PIs, Faculty and Other Senior Associates (List each separately with name and title. (A.7. Show number in brackets))					NSF-FUNDED PERSONNEL			Funds	Funds
					CAL	ACAD	SUMR		
1.	E. Spencer	Engineer			4.6	0.0	0.0	\$ 29,804	\$
2.								\$	
3.									
4.									
5.									
6.	(3) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				9.2	0.0	0.0	46,853	
7.	(4) TOTAL SENIOR PERSONNEL (1-6)				13.8	0.0	0.0	76,657	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)									
1.	(0) POST DOCTORAL ASSOCIATES				0.0	0.0	0.0	0	
2.	(2) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)				10.2	0.0	0.0	38,888	
3.	GRADUATE STUDENTS							0	
4.	(2) UNDERGRADUATE STUDENTS							15,191	
5.	(0) SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)							0	
6.	(0) OTHER							0	
TOTAL SALARIES AND WAGES (A+B)								130,736	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)								51,251	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								181,987	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)									
Equipment 10,000									
								10,000	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)									
2. FOREIGN								36,000	
F. PARTICIPANT SUPPORT									
1. STIPENDS \$ _____									
2. TRAVEL _____									
3. SUBSISTENCE _____									
4. OTHER _____									
(<Fiel) TOTAL PARTICIPANT SUPPORT									
G. OTHER DIRECT COSTS									
1. MATERIALS AND SUPPLIES								49,108	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								0	
3. CONSULTANT SERVICES								0	
4. COMPUTER SERVICES								0	
5. SUBAWARDS									
6. OTHER								0	
TOTAL OTHER DIRECT COSTS (G.1 THROUGH G.6)								49,108	
H. TOTAL DIRECT COSTS (A THROUGH G)								277,095	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)									
26.0% x 267,095 MTDC Base								69,445	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								346,540	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG (I.D.7.J.))									
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$ 346,540	\$
M. COST SHARING: PROPOSED LEVEL \$					AGREED LEVEL IF DIFFERENT \$				
PI/PD TYPED NAME & SIGNATURE Seiden, Abraham <i>Abraham Seiden</i>				DATE 12/13/10		FOR NSF USE ONLY			
ORG. REP. TYPED NAME & SIGNATURE* Jennifer Welling <i>Jennifer Welling</i>				DATE 12-14-10		INDIRECT COST RATE VERIFICATION			
						Date Checked	Date of Rate Sheet	Initials - ORG	

**SUMMARY
PROPOSAL BUDGET**

Year02

Start 02/01/2012

End 01/01/2017

ORGANIZATION				FOR NSF USE ONLY			
The Regents of the University of California				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Seiden, Abraham				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL (PI/PI, Co PI, Faculty and Other Senior Associates) (List each separately with name and title. (A.7. Show number in brackets)				NSF-FUNDED PERSON MOS		Funds	Funds
				CAL	ACAD	SUMR	
1.	E. Spencer	Engineer		4.6	0.0	0.0	\$ 30,698
2.							\$
3.							
4.							
5.							
6.	(3) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			9.2	0.0	0.0	48,259
7.	(4) TOTAL SENIOR PERSONNEL (1-6)			13.8	0.0	0.0	78,957
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES			0.0	0.0	0.0	0
2.	(2) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)			9.6	0.0	0.0	37,198
3.	(0) GRADUATE STUDENTS						0
4.	(2) UNDERGRADUATE STUDENTS						15,645
5.	(0) SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A+B)							131,800
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							52,014
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							183,814
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Equipment 10,000							
							10,000
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							36,630
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
() TOTAL PARTICIPANT SUPPORT							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							49,926
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							
6. OTHER							0
TOTAL OTHER DIRECT COSTS (G.1 THROUGH G.6)							49,926
H. TOTAL DIRECT COSTS (A THROUGH G)							280,370
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
26.0% x 270,370 MTDC Base							70,296
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							350,666
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.J.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 350,666 \$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PI D TYPED NAME & SIGNATURE*		DATE		FOR NSF USE ONLY			
Seiden, Abraham		12/13/10		INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE		DATE		Date Checked	Date of Rate Sheet	Initials - ORG	
Jennifer Welling		12-14-10					

**SUMMARY
PROPOSAL BUDGET**

Year03

Start 02/01/2012 End 01/01/2017

ORGANIZATION The Regents of the University of California		PROPOSAL NO.			DURATION (MONTHS)	
		AWARD NO.			Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Seiden, Abraham		NSF-FUNDED PERSON MOCS			Funds	Funds
A. SENIOR PERSONNEL (PI/PIA Co-PIs, Faculty and Other Senior Associates) (List each separately with name and title. (A.7. Show number in brackets))		CAL	ACAD	SUMR		
1.	E. Spencer Engineer	4.6	0.0	0.0	\$ 31,619	\$
2.					\$	
3.						
4.						
5.						
6. (3) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)		9.1	0.0	0.0	49,143	
7. (4) TOTAL SENIOR PERSONNEL (1-6)		13.7	0.0	0.0	80,762	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES		0.0	0.0	0.0	0	
2. (2) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)		9.1	0.0	0.0	35,961	
3. (0) GRADUATE STUDENTS					0	
4. (2) UNDERGRADUATE STUDENTS					16,115	
5. (0) SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)					0	
6. (0) OTHER					0	
TOTAL SALARIES AND WAGES (A+B)					132,838	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					52,782	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)					185,620	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Equipment 10,000						10,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						37,278
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
() TOTAL PARTICIPANT SUPPORT						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					50,846	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3. CONSULTANT SERVICES					0	
4. COMPUTER SERVICES					0	
5. SUBAWARDS						
6. OTHER					0	
TOTAL OTHER DIRECT COSTS (G.1 THROUGH G.6)					50,846	
H. TOTAL DIRECT COSTS (A THROUGH G)					283,744	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26.0% x 273,744 MTDC Base						71,173
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						354,917
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.J.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 354,917	\$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT \$				
PI/PIA TYPED NAME & SIGNATURE* Seiden, Abraham		DATE	FOR NSF USE ONLY			
<i>Abraham Seiden</i>		12-13-10	INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE* Jennifer Welling		DATE	Date Checked	Date of Rate Sheet	Initials - ORG	
<i>Jennifer Welling</i>		12-14-10				

**SUMMARY
PROPOSAL BUDGET**

Year04

Start 02/01/2012

End 01/01/2017

ORGANIZATION The Regents of the University of California		FOR NSF USE ONLY		
		PROPOSAL NO.	DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Seiden, Abraham		AWARD NO.	Proposed	Granted
A. SENIOR PERSONNEL - DUDD, Co Dir, Faculty and Other Senior Associates (List each separately with name and title. (A.7. Show number in brackets))		NSF-FUNDED PERSONAL MOS		Funds
		CAL	ACAD	SUMR
1.	E. Spencer Engineer	4.6	0.0	0.0
2.				
3.				
4.				
5.				
6.	(3) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)	9.2	0.0	0.0
7.	(4) TOTAL SENIOR PERSONNEL (1-6)	13.8	0.0	0.0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1.	(0) POST DOCTORAL ASSOCIATES	0.0	0.0	0.0
2.	(2) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)	10.2	0.0	0.0
3.	(0) GRADUATE STUDENTS			
4.	(2) UNDERGRADUATE STUDENTS			
5.	(0) SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)			
6.	(0) OTHER			
TOTAL SALARIES AND WAGES (A+B)				148,391
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				56,105
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)				204,496
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)				
	Equipment 10,000			
				10,000
E. TRAVEL				
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
2. FOREIGN				37,947
F. PARTICIPANT SUPPORT				
1. STIPENDS \$ _____				
2. TRAVEL _____				
3. SUBSISTENCE _____				
4. OTHER _____				
() TOTAL PARTICIPANT SUPPORT				
G. OTHER DIRECT COSTS				
1. MATERIALS AND SUPPLIES				61,758
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0
3. CONSULTANT SERVICES				0
4. COMPUTER SERVICES				0
5. SUBAWARDS				
6. OTHER				0
TOTAL OTHER DIRECT COSTS (G.1 THROUGH G.6)				61,758
H. TOTAL DIRECT COSTS (A THROUGH G)				314,201
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)				
26.0% x 304,201 MTDC Base				79,093
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)				393,294
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.J.)				
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$ 393,294 \$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT \$		
PI/PO TYPED NAME & SIGNATURE* Seiden, Abraham		DATE 12/13/10	FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE* Jennifer Welling		DATE 12-14-10	INDIRECT COST RATE VERIFICATION	
		Date Checked	Date of Rate Sheet	Initials - ORG

**SUMMARY
PROPOSAL BUDGET**

Year05

Start 02/01/2012

End 01/01/2017

ORGANIZATION				FOR NSF USE ONLY			
The Regents of the University of California				PROPOSAL NO.		DURATION (MONTHS)	
				AWARD NO.		Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Seiden, Abraham							
A. SENIOR PERSONNEL (PI/D, Co PI, Faculty and Other Senior Associates) (List each separately with name and title. (A.7. Show number in brackets))				NSF-FUNDED PERSONAL MOS		Funds	Funds
			CAI	ACAD	SUMR		
1.	E. Spencer	Engineer	5.2	0.0	0.0	\$ 37,959	\$
2.						\$	
3.							
4.							
5.							
6.	(3) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)		13.6	0.0	0.0	79,898	
7.	(4) TOTAL SENIOR PERSONNEL (1-6)		18.7	0.0	0.0	117,857	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES		0.0	0.0	0.0	0	
2.	(2) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)		10.2	0.0	0.0	43,769	
3.	(0) GRADUATE STUDENTS					0	
4.	(2) UNDERGRADUATE STUDENTS					54,709	
5.	(0) SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)					0	
6.	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A+B)						216,335	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						67,811	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						284,146	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	Equipment		10,000				
						10,000	
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN						38,635	
F. PARTICIPANT SUPPORT							
1.	STIPENDS	\$ _____					
2.	TRAVEL	_____					
3.	SUBSISTENCE	_____					
4.	OTHER	_____					
() TOTAL PARTICIPANT SUPPORT							
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES					72,301	
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3.	CONSULTANT SERVICES					0	
4.	COMPUTER SERVICES					0	
5.	SUBAWARDS						
6.	OTHER					0	
TOTAL OTHER DIRECT COSTS (G.1 THROUGH G.6)						72,301	
H. TOTAL DIRECT COSTS (A THROUGH G)						405,082	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)							
26.0% x 395,082 MTDC Base						102,721	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						507,803	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.J.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 507,803	\$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE Seiden, Abraham		<i>Abraham Seiden</i>		DATE 12/13/10		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE Jennifer Welling		<i>Jennifer Welling</i>		DATE 12-14-10		INDIRECT COST RATE VERIFICATION	
				Date Checked		Date of Rate Sheet	
						Initials - ORG	

UCSC Budget Justification
Year 5

A.1	Senior Personnel:	
	E. Spencer Engineer	\$37,959
A.6	Other Senior Personnel:	
	V. Fadeyev, S. Kachiguin, G. Martinez-McKinney	\$79,898
B.2	Other Professional:	
	M. Wilder, J. DeWitt	\$43,769
B.4	Undergraduate Students:	\$54,709
C	Fringe (31.4% of Base \$216,335)	\$67,811
D	Equipment:	
	Lab test instrument	\$10,000
E	Travel:	
	Travel for M&O tasks, collaboration meetings and workshops	\$38,635
G	Other Direct Costs:	
	Materials and Supplies	\$72,301
I	Indirect Costs:	
	26% x \$395,082 MTDC Base	\$102,721
J	Total Direct and Indirect Costs:	\$507,803

**SUMMARY
PROPOSAL BUDGET**

Cumulative Start 02/01/2012 End 01/01/2017

ORGANIZATION		PROPOSAL NO.	DURATION (MONTHS)		FOR NSF USE ONLY	
The Regents of the University of California			Proposed	Granted		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR		AWARD NO.				
Seiden, Abraham						
A. SENIOR PERSONNEL (PI/PIA, Co-PIs, Faculty and Other Senior Associates) (List each separately with name and title. (A.7. Show number in brackets))		NSF-FUNDED PERSONAL MGS			Funds	Funds
		CAL	ACAD	SUMR		
1.	E. Spencer Engineer	23.4	0.0	0.0	\$ 162,648	\$
2.					\$	
3.						
4.						
5.						
6. (3) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)		50.4	0.0	0.0	275,350	
7. (4) TOTAL SENIOR PERSONNEL (1-6)		73.8	0.0	0.0	437,998	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL ASSOCIATES		0.0	0.0	0.0	0	
2. (2) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)		49.3	0.0	0.0	198,310	
3. (0) GRADUATE STUDENTS					0	
4. (2) UNDERGRADUATE STUDENTS					123,792	
5. (0) SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)					0	
6. (0) OTHER					0	
TOTAL SALARIES AND WAGES (A+B)					760,100	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					279,963	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)					1,040,063	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
Equipment 50,000						
					50,000	
E. TRAVEL						
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN					186,490	
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
() TOTAL PARTICIPANT SUPPORT						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					283,939	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3. CONSULTANT SERVICES					0	
4. COMPUTER SERVICES					0	
5. SUBAWARDS						
6. OTHER					0	
TOTAL OTHER DIRECT COSTS (G.1 THROUGH G.6)					283,939	
H. TOTAL DIRECT COSTS (A THROUGH G)					1,560,492	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)						
Refer to individual budget pages attached.					392,728	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)					1,953,220	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.J.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 1,953,220	\$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT \$				
PI/PIA TYPED NAME & SIGNATURE* Seiden, Abraham <i>Abraham Seiden</i>		DATE 12-13-10		FOR NSF USE ONLY		
ORG. REP. TYPED NAME & SIGNATURE* Jennifer Welling <i>Jennifer Welling</i>		DATE 12-14-10		INDIRECT COST RATE VERIFICATION		
		Date Checked		Date of Rate Sheet		Initials - ORG

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION The Regents of the University of California, Irvine				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Andrew J Lankford				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Andrew J Lankford - Prof			0.00	0.12	0.00	\$ 0
2.	Anyes Taffard - Asst Prof			0.00	0.12	0.00	0
3.	Daniel Whiteson - Asst prof			0.00	0.12	0.00	0
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)			0.00	0.36	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			76.20	0.00	0.00	448,285
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							448,285
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							112,071
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							560,356
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							4,000
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____						0
2.	TRAVEL _____						0
3.	SUBSISTENCE _____						0
4.	OTHER _____						0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						9,316
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						1,000
TOTAL OTHER DIRECT COSTS							10,316
H. TOTAL DIRECT COSTS (A THROUGH G)							574,672
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 26.0000, Base: 574672)							
TOTAL INDIRECT COSTS (F&A)							149,415
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							724,087
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 724,087 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Andrew J Lankford				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION The Regents of the University of California, Irvine				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Andrew J Lankford				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Andrew J Lankford - Prof	0.00	0.12	0.00	\$	0	\$	
2. Anyes Taffard - Asst Prof	0.00	0.12	0.00		0		
3. Daniel Whiteson - Asst Prof	0.00	0.12	0.00		0		
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.36	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	76.20	0.00	0.00		453,967		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					453,967		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					122,571		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					576,538		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					0		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					4,120		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,034		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					1,030		
TOTAL OTHER DIRECT COSTS					10,064		
H. TOTAL DIRECT COSTS (A THROUGH G)					590,722		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 590722)							
TOTAL INDIRECT COSTS (F&A)					153,588		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					744,310		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 744,310	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Andrew J Lankford				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION The Regents of the University of California, Irvine				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Andrew J Lankford				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Andrew J Lankford - Prof	0.00	0.12	0.00	\$	0	\$
2.	Anyes Taffard - Asst Prof	0.00	0.12	0.00		0	
3.	Daniel Whiteson - Asst Prof	0.00	0.12	0.00		0	
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0	
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.36	0.00		0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0	
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	76.20	0.00	0.00		459,114	
3.	(0) GRADUATE STUDENTS					0	
4.	(0) UNDERGRADUATE STUDENTS					0	
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6.	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)						459,114	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						133,143	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						592,257	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT						0	
E. TRAVEL						0	
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0	
2. FOREIGN						4,244	
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____					0	
2.	TRAVEL _____					0	
3.	SUBSISTENCE _____					0	
4.	OTHER _____					0	
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						9,692	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0	
3. CONSULTANT SERVICES						0	
4. COMPUTER SERVICES						0	
5. SUBAWARDS						0	
6. OTHER						1,060	
TOTAL OTHER DIRECT COSTS						10,752	
H. TOTAL DIRECT COSTS (A THROUGH G)						607,253	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 607253)							
TOTAL INDIRECT COSTS (F&A)						157,886	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						765,139	
K. RESIDUAL FUNDS						0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 765,139	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Andrew J Lankford				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION The Regents of the University of California, Irvine				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Andrew J Lankford				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Andrew J Lankford - Prof	0.00	0.12	0.00	\$ 0	\$	
2.	Anyes Taffard - Asst Prof	0.00	0.12	0.00	0		
3.	Daniel Whiteson - Asst Prof	0.00	0.12	0.00	0		
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.36	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	76.20	0.00	0.00	464,921		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					464,921		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					144,126		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					609,047		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					4,371		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES				9,770		
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3.	CONSULTANT SERVICES				0		
4.	COMPUTER SERVICES				0		
5.	SUBAWARDS				0		
6.	OTHER				1,092		
TOTAL OTHER DIRECT COSTS					10,862		
H. TOTAL DIRECT COSTS (A THROUGH G)					624,280		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 26.0000, Base: 624280)							
TOTAL INDIRECT COSTS (F&A)					162,313		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					786,593		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 786,593	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Andrew J Lankford				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION The Regents of the University of California, Irvine				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Andrew J Lankford				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Andrew J Lankford - Prof	0.00	0.12	0.00	\$ 0	\$	
2.	Anyes Taffard - Asst Prof	0.00	0.12	0.00	0		
3.	Daniel Whiteson - Asst prof	0.00	0.12	0.00	0		
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.36	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	76.20	0.00	0.00	470,894		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					470,894		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					155,395		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					626,289		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL					0		
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN					4,502		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,902		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					1,125		
TOTAL OTHER DIRECT COSTS					11,027		
H. TOTAL DIRECT COSTS (A THROUGH G)					641,818		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 641818)							
TOTAL INDIRECT COSTS (F&A)					166,873		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					808,691		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 808,691	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Andrew J Lankford				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION The Regents of the University of California, Irvine				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Andrew J Lankford				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Andrew J Lankford - Prof	0.00	0.60	0.00	\$ 0	\$	
2.	Anyes Taffard - Asst Prof	0.00	0.60	0.00	0		
3.	Daniel Whiteson - Asst Prof	0.00	0.60	0.00	0		
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	1.80	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(35) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	381.00	0.00	0.00	2,297,181		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					2,297,181		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					667,306		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					2,964,487		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					21,237		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____				0		
2.	TRAVEL _____				0		
3.	SUBSISTENCE _____				0		
4.	OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES				47,714		
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3.	CONSULTANT SERVICES				0		
4.	COMPUTER SERVICES				0		
5.	SUBAWARDS				0		
6.	OTHER				5,307		
TOTAL OTHER DIRECT COSTS					53,021		
H. TOTAL DIRECT COSTS (A THROUGH G)					3,038,745		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)					790,075		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					3,828,820		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 3,828,820	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Andrew J Lankford				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



SUMMARY PROPOSAL BUDGET

2/1/2012

1/31/2013

FOR NSF USE ONLY

ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR A. Lankford, Prof. VIII - off scale				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates (List each separately with title; A.7. show number in brackets)			NSF-Funded Person-mos.		Funds Requested by Proposer	Funds Granted by NSF (If Different)	
			CAL	ACAD	SUMR		
1. A. Lankford, Principal Investigator (wos - 1% effort)				0.12			
2. A. Taffard, Co-Investigator (wos - 1% effort)				0.12			
3. D. Whiteson, Co-Investigator (wos - 1% effort)				0.12			
4. Specialist III (TBN)							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)			76.20			448,285	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						448,285	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						112,071	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						560,356	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL			1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
			2. FOREIGN		4,000		
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER \$ _____							
() TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANTS COSTS				
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,317		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER					1,000		
TOTAL OTHER DIRECT COSTS					10,316		
H. TOTAL DIRECT COSTS (A THROUGH G)					574,672		
I. INDIRECT COSTS (F & A) (SPECIFY RATE AND BASE)			26.00%		of Base		\$574,672
TOTAL INDIRECT COSTS (F & A)					149,415		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					724,087		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) or (J MINUS K)					724,087 \$		
M. COST-SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$				
PI/PD TYPED NAME AND SIGNATURE*			DATE		FOR NSF USE ONLY		
Andrew J. Lankford <i>Andrew J. Lankford</i>					INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE*			DATE		Date Checked	Date of Rate Sheet	Initials-ORG
Allison Ramos <i>Allison Ramos</i>							

Budget Justification
University of California, Irvine
Year 1

B.2	Engineering and Technical Salaries: Salaries for Muon & TDAQ M&O and TDAQ Upgrade.	\$448,285
C	Fringe @ 25% of Base \$448,285	\$112,071
E	Travel: Foreign: Engineers to ATLAS meetings and/or conferences	\$4,000
G.1	Materials & Supplies: Electronics components, laboratory tools, computer supplies	\$9,317
G.6	Other: Shop charges, special handling shipping & mailing	\$1,000
I	Indirect Costs @ 26% (off-campus rate) of Direct costs \$574,672	\$149,415
J	Total Direct and Indirect Costs	\$724,087



SUMMARY PROPOSAL BUDGET

2/1/2013

1/31/2014

FOR NSF USE ONLY

ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR A. Lankford, Prof. VIII - off scale				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates (List each separately with title; A.7. show number in brackets)			NSF-Funded Person-mos.		Funds Requested by Proposer		Funds Granted by NSF (If Different)
			CAL	ACAD	SUMR		
1. A. Lankford, Principal Investigator (wos - 1% effort)				0.12			
2. A. Taffard, Co-Investigator (wos - 1% effort)				0.12			
3. D. Whiteson, Co-Investigator (wos - 1% effort)				0.12			
4. Specialist III (TBN)							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)			76.20			453,967	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						453,967	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						122,571	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						576,538	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL			1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
			2. FOREIGN		4,120		
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER \$ _____							
() TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANTS COSTS				
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,034		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER					1,030		
TOTAL OTHER DIRECT COSTS					10,064		
H. TOTAL DIRECT COSTS (A THROUGH G)					590,722		
I. INDIRECT COSTS (F & A) (SPECIFY RATE AND BASE)			26.00% of Base		\$590,722		
TOTAL INDIRECT COSTS (F & A)					153,588		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					744,310		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) or (J MINUS K)					744,310 \$		
M. COST-SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$				
PI/PD TYPED NAME AND SIGNATURE*			DATE		FOR NSF USE ONLY		
Andrew J. Lankford <i>Andrew J. Lankford</i>					INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE*			DATE		Date Checked	Date of Rate Sheet	Initials-ORG
Allison Ramos <i>Allison Ramos</i>							

Budget Justification
University of California, Irvine
Year 2

B.2	Engineering and Technical Salaries: Salaries for Muon & TDAQ M&O and TDAQ Upgrade.	\$453,967
C	Fringe @ 27% of Base \$453,967	\$122,571
E	Travel: Foreign: Engineers to ATLAS meetings and/or conferences	\$4,120
G.1	Materials & Supplies: Electronics components, laboratory tools, computer supplies	\$9,034
G.6	Other: Shop charges, special handling shipping & mailing	\$1,030
I	Indirect Costs @ 26% (off-campus rate) of Direct costs \$590,722	\$153,588
J	Total Direct and Indirect Costs	\$744,310



SUMMARY PROPOSAL BUDGET

2/1/2014

1/31/2015

FOR NSF USE ONLY

ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR A. Lankford, Prof. VIII - off scale				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates (List each separately with title; A.7. show number in brackets)			NSF-Funded Person-mos.		Funds Requested by Proposer	Funds Granted by NSF (If Different)	
			CAL	ACAD	SUMR		
1. A. Lankford, Principal Investigator (wos - 1% effort)				0.12			
2. A. Taffard, Co-Investigator (wos - 1% effort)				0.12			
3. D. Whiteson, Co-Investigator (wos - 1% effort)				0.12			
4. Specialist III (TBN)							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)			76.20			459,114	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						459,114	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						133,143	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						592,257	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL			1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
			2. FOREIGN		4,244		
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER \$ _____							
() TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANTS COSTS				
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,692		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER					1,061		
TOTAL OTHER DIRECT COSTS					10,753		
H. TOTAL DIRECT COSTS (A THROUGH G)					607,253		
I. INDIRECT COSTS (F & A) (SPECIFY RATE AND BASE)			26.00% of Base		\$607,253		
TOTAL INDIRECT COSTS (F & A)					157,886		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					765,139		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) or (J MINUS K)					765,139 \$		
M. COST-SHARING: PROPOSED LEVEL \$ _____			AGREED LEVEL IF DIFFERENT: \$ _____				
PI/PD TYPED NAME AND SIGNATURE*			DATE		FOR NSF USE ONLY		
Andrew J. Lankford <i>Andrew J. Lankford</i>					INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE*			DATE		Date Checked	Date of Rate Sheet	Initials-ORG
Allison Ramos <i>Allison Ramos</i>							

Budget Justification
University of California, Irvine
Year 3

B.2	Engineering and Technical Salaries: Salaries for Muon & TDAQ M&O and TDAQ Upgrade.	\$459,114
C	Fringe @ 29% of Base \$459,114	\$133,143
E	Travel: Foreign: Engineers to ATLAS meetings and/or conferences	\$4,244
G.1	Materials & Supplies: Electronics components, laboratory tools, computer supplies	\$9,692
G.6	Other: Shop charges, special handling shipping & mailing	\$1,061
I	Indirect Costs @ 26% (off-campus rate) of Direct costs \$607,253	\$157,886
J	Total Direct and Indirect Costs	\$765,139



SUMMARY PROPOSAL BUDGET

2/1/2015

1/31/2016

FOR NSF USE ONLY

ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR A. Lankford, Prof. VIII - off scale				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates (List each separately with title; A.7. show number in brackets)			NSF-Funded Person-mos.		Funds Requested by Proposer	Funds Granted by NSF (If Different)	
			CAL	ACAD	SUMR		
1. A. Lankford, Principal Investigator (wos - 1% effort)				0.12			
2. A. Taffard, Co-Investigator (wos - 1% effort)				0.12			
3. D. Whiteson, Co-Investigator (wos - 1% effort)				0.12			
4. Specialist III (TBN)							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)			76.20			464,921	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						464,921	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						144,126	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						609,047	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL			1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
			2. FOREIGN		4,371		
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER \$ _____							
() TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANTS COSTS				
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,770		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER					1,093		
TOTAL OTHER DIRECT COSTS					10,862		
H. TOTAL DIRECT COSTS (A THROUGH G)					624,280		
I. INDIRECT COSTS (F & A) (SPECIFY RATE AND BASE)			26.00% of Base		\$624,280		
TOTAL INDIRECT COSTS (F & A)					162,313		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					786,593		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) or (J MINUS K)					786,593 \$		
M. COST-SHARING: PROPOSED LEVEL \$ _____			AGREED LEVEL IF DIFFERENT: \$ _____				
PI/PD TYPED NAME AND SIGNATURE* Andrew J. Lankford			DATE		FOR NSF USE ONLY		
ORG. REP. TYPED NAME AND SIGNATURE* Allison Ramos			DATE		INDIRECT COST RATE VERIFICATION		
					Date Checked	Date of Rate Sheet	Initials-ORG

Budget Justification
University of California, Irvine
Year 4

B.2	Engineering and Technical Salaries: Salaries for Muon & TDAQ M&O and TDAQ Upgrade.	\$464,921
C	Fringe @ 31% of Base \$464,921	\$144,126
E	Travel: Foreign: Engineers to ATLAS meetings and/or conferences	\$4,371
G.1	Materials & Supplies: Electronics components, laboratory tools, computer supplies	\$9,770
G.6	Other: Shop charges, special handling shipping & mailing	\$1,093
I	Indirect Costs @ 26% (off-campus rate) of Direct costs \$624,280	\$162,313
J	Total Direct and Indirect Costs	\$786,593



SUMMARY PROPOSAL BUDGET

2/1/2016

1/31/2017

FOR NSF USE ONLY

ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR A. Lankford, Prof. VIII - off scale				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates (List each separately with title; A.7. show number in brackets)			NSF-Funded Person-mos.		Funds Requested by Proposer	Funds Granted by NSF (If Different)	
			CAL	ACAD	SUMR		
1. A. Lankford, Principal Investigator (wos - 1% effort)				0.12			
2. A. Taffard, Co-Investigator (wos - 1% effort)				0.12			
3. D. Whiteson, Co-Investigator (wos - 1% effort)				0.12			
4. Specialist III (TBN)							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)			76.20			470,894	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						470,894	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						155,395	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						626,289	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL			1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
			2. FOREIGN		4,502		
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER \$ _____							
() TOTAL NUMBER OF PARTICIPANTS			TOTAL PARTICIPANTS COSTS				
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,902		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER					1,125		
TOTAL OTHER DIRECT COSTS					11,027		
H. TOTAL DIRECT COSTS (A THROUGH G)					641,818		
I. INDIRECT COSTS (F & A) (SPECIFY RATE AND BASE)			26.00% of Base		\$641,818		
TOTAL INDIRECT COSTS (F & A)					166,873		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					808,691		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) or (J MINUS K)					808,691 \$		
M. COST-SHARING: PROPOSED LEVEL \$ _____			AGREED LEVEL IF DIFFERENT: \$ _____				
PI/PD TYPED NAME AND SIGNATURE*			DATE		FOR NSF USE ONLY		
Andrew J. Lankford <i>Andrew J. Lankford</i>					INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME AND SIGNATURE*			DATE		Date Checked	Date of Rate Sheet	Initials-ORG
Allison Ramos <i>Allison Ramos</i>							

Budget Justification
University of California, Irvine
Year 5

B.2	Engineering and Technical Salaries: Salaries for Muon & TDAQ M&O and TDAQ Upgrade.	\$470,894
C	Fringe @ 33% of Base \$464,921	\$155,395
E	Travel: Foreign: Engineers to ATLAS meetings and/or conferences	\$4,502
G.1	Materials & Supplies: Electronics components, laboratory tools, computer supplies	\$9,902
G.6	Other: Shop charges, special handling shipping & mailing	\$1,125
I	Indirect Costs @ 26% (off-campus rate) of Direct costs \$641,818	\$166,873
J	Total Direct and Indirect Costs	\$808,691



SUMMARY PROPOSAL BUDGET

2/1/2012

1/31/2017

FOR NSF USE ONLY

ORGANIZATION THE REGENTS OF THE UNIVERSITY OF CALIFORNIA				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR A. Lankford, Prof. VIII - off scale				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates (List each separately with title; A.7. show number in brackets)				NSF-Funded Person-mos.		Funds Requested by Proposer	
				CAL	ACAD	SUMR	Funds Granted by NSF (If Different)
1. A. Lankford, Principal Investigator (wos - 1% effort)					0.60		
2. A. Taffard, Co-Investigator (wos - 1% effort)					0.60		
3. D. Whiteson, Co-Investigator (wos - 1% effort)					0.60		
4. Specialist III (TBN)							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)				381.00			2,297,181
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							2,297,181
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							667,306
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							2,964,487
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL				1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			
				2. FOREIGN		21,237	
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER \$ _____							
() TOTAL NUMBER OF PARTICIPANTS				TOTAL PARTICIPANTS COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						47,714	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER						5,309	
TOTAL OTHER DIRECT COSTS						53,022	
H. TOTAL DIRECT COSTS (A THROUGH G)						3,038,745	
I. INDIRECT COSTS (F & A) (SPECIFY RATE AND BASE)				26.00%		of Base \$3,038,745	
TOTAL INDIRECT COSTS (F & A)						790,074	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						3,828,819	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) or (J MINUS K)						3,828,819 \$	
M. COST-SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE		FOR NSF USE ONLY	
Andrew J. Lankford <i>Andrew J. Lankford</i>						INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME AND SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
Allison Ramos <i>Allison Ramos</i>						Initials-ORG	

Budget Justification
University of California, Irvine
CUMULATIVE

B.2	Engineering and Technical Salaries: Salaries for Muon & TDAQ M&O and TDAQ Upgrade.	\$2,297,181
C	Fringe @ 29-33% of Base \$2,297,182	\$667,306
E	Travel: Foreign: Engineers to ATLAS meetings and/or conferences	\$21,237
G.1	Materials & Supplies: Electronics components, laboratory tools, computer supplies	\$47,714
G.6	Other: Shop charges, special handling shipping & mailing	\$5,309
I	Indirect Costs @ 26% (off-campus rate) of Direct costs \$3,038,745	\$790,074
J	Total Direct and Indirect Costs	\$3,828,819

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John M Butler				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. John M Butler - Prof				0.00	0.00	0.00	\$ 0
2. James T Shank - Research Prof				0.00	0.00	0.00	0
3. Saul Youssef - Research Assoc Prof				12.00	0.00	0.00	113,882
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				12.00	0.00	0.00	113,882
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				17.63	0.00	0.00	101,073
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							214,955
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							55,028
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							269,983
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU Upgrade				\$	100,000		
T2 Storage upgrade					154,160		
TDAQ R&D					115,000		
TOTAL EQUIPMENT							369,160
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							4,000
2. FOREIGN							5,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							5,000
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							5,000
H. TOTAL DIRECT COSTS (A THROUGH G)							653,143
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MDTC (Rate: 26.0000, Base: 69841) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							149,857
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							803,000
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 803,000 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME John M Butler				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**
MTDC (Rate: 61.5000, Base 214143)

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John M Butler				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. John M Butler - Prof	0.00	0.00	0.00	\$	0	\$	
2. James T Shank - Research Prof	0.00	0.00	0.00		0		
3. Saul Youssef - Research Assoc Prof	12.00	0.00	0.00		117,298		
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)	12.00	0.00	0.00		117,298		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	17.63	0.00	0.00		104,105		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					221,403		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					56,679		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					278,082		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU Upgrade				\$	100,000		
T2 Storage Upgrade					154,465		
TDAQ R&D					125,000		
TOTAL EQUIPMENT					379,465		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					4,000		
2. FOREIGN					5,000		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					4,381		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					4,381		
H. TOTAL DIRECT COSTS (A THROUGH G)					670,928		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 71937) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					153,712		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					824,640		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	824,640	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME John M Butler				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs**
MTDC T2 (Rate: 61.5000, Base 219526)

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John M Butler				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. John M Butler - Prof				0.00	0.00	0.00	\$ 0
2. James T Shank - Resaerch prof				0.00	0.00	0.00	0
3. Saul Youssef - Research Assoc Prof				12.00	0.00	0.00	120,817
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				12.00	0.00	0.00	120,817
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				17.63	0.00	0.00	107,229
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							228,046
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							58,380
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							286,426
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU upgrade				\$	100,000		
T2 storage upgrade					153,600		
TDAQ R&D					125,000		
TOTAL EQUIPMENT							378,600
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							4,000
2. FOREIGN							5,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							4,390
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							4,390
H. TOTAL DIRECT COSTS (A THROUGH G)							678,416
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 74095) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							158,084
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							836,500
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 836,500 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME John M Butler				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs**
MTDC T2 (Rate: 61.5000, Base 225722)

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John M Butler				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/ PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. John M Butler - Prof				0.00	0.00	0.00
2. James T Shank - Research Prof				0.00	0.00	0.00
3. Saul Youssef - Research Assoc Prof				12.00	0.00	0.00
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)				12.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				17.63	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
T2 CPU upgrade						
T2 Storage upgrade						
TDAQ R&D						
TOTAL EQUIPMENT						
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN						
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS						
H. TOTAL DIRECT COSTS (A THROUGH G)						
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 26.0000, Base: 76317) (Cont. on Comments Page)						
TOTAL INDIRECT COSTS (F&A)						
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						
K. RESIDUAL FUNDS						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						
M. COST SHARING PROPOSED LEVEL \$ 0						
AGREED LEVEL IF DIFFERENT \$						
PI/PD NAME John M Butler				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs**
MTDC T2 (Rate: 61.5000, Base 228816)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John M Butler				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. John M Butler - Prof	0.00	0.00	0.00	\$	0	\$	
2. James T Shank - Research Prof	0.00	0.00	0.00		0		
3. Saul Youssef - Research Assoc Prof	12.00	0.00	0.00		128,175		
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)	12.00	0.00	0.00		128,175		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	17.63	0.00	0.00		113,755		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					241,930		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					61,934		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					303,864		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU upgrade				\$	100,000		
T2 storage upgrade					157,283		
TDAQ R&D					125,000		
TOTAL EQUIPMENT					382,283		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					4,000		
2. FOREIGN					5,000		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					747		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					747		
H. TOTAL DIRECT COSTS (A THROUGH G)					695,894		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 78603) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					164,966		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					860,860		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	860,860	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME John M Butler				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs**
MTDC T2 (Rate: 61.5000, Base 235007)

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John M Butler				AWARD NO.	Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR			
1. John M Butler - Prof	0.00	0.00	0.00	\$	0	\$
2. James T Shank - Resaerch prof	0.00	0.00	0.00		0	
3. Saul Youssef - Research Assoc Prof	60.00	0.00	0.00		604,614	
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0	
7. (3) TOTAL SENIOR PERSONNEL (1 - 6)	60.00	0.00	0.00		604,614	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0	
2. (10) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	88.15	0.00	0.00		536,608	
3. (0) GRADUATE STUDENTS					0	
4. (0) UNDERGRADUATE STUDENTS					0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6. (0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)					1,141,222	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					292,152	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					1,433,374	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
				\$	1,892,380	
TOTAL EQUIPMENT					1,892,380	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					20,000	
2. FOREIGN					25,000	
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____					0	
2. TRAVEL _____					0	
3. SUBSISTENCE _____					0	
4. OTHER _____					0	
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					15,633	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3. CONSULTANT SERVICES					0	
4. COMPUTER SERVICES					0	
5. SUBAWARDS					0	
6. OTHER					0	
TOTAL OTHER DIRECT COSTS					15,633	
H. TOTAL DIRECT COSTS (A THROUGH G)					3,386,387	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)					787,183	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					4,173,570	
K. RESIDUAL FUNDS					0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 4,173,570	\$
M. COST SHARING PROPOSED LEVEL \$ 0					AGREED LEVEL IF DIFFERENT \$	
PI/PD NAME John M Butler				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**SUMMARY
PROPOSAL BUDGET**

				FOR NSF USE ONLY				
ORGANIZATION Trustees of Boston University				PROPOSAL NO.:		DURATION (MONTHS)		
						Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James T. Shank				AWARD NO.				
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.			Funds Requested By	Funds Granted By NSF
				CAL	ACAD	SUMR	Proposer	(If Different)
1.	Research Associate Professor Saul Youssef			12.0			113,882	
2.								
3.								
4.								
5.								
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7.	(1) TOTAL SENIOR PERSONNEL (1-5)			12.0			113,882	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	() POST DOCTORAL ASSOCIATES							
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			6.0			45,467	
3.	() GRADUATE STUDENTS							
4.	() UNDERGRADUATE STUDENTS							
5.	() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)							
6.	() OTHER							
TOTAL SALARIES AND WAGES (A+B)							159,349	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							40,793	
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)							200,142	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
	T2 CPU upgrade	\$100,000						
	T2 storage upgrade	\$154,160						
TOTAL EQUIPMENT							254,160	
E. TRAVEL								
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						4,000	
	2. FOREIGN						5,000	
F. PARTICIPANT SUPPORT COSTS								
	1. STIPENDS	\$	_____					
	2. TRAVEL		_____					
	3. SUBSISTENCE		_____					
	4. OTHER		_____					
	() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS								
	1. MATERIALS AND SUPPLIES						5,000	
	2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
	3. CONSULTANT SERVICES							
	4. COMPUTER SERVICES							
	5. SUBAWARDS							
	6. OTHER							
TOTAL OTHER DIRECT COSTS							5,000	
H. TOTAL DIRECT COSTS (A THROUGH G)							468,302	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
		61.5%	of MTDC,			\$214,142		
TOTAL INDIRECT COSTS							131,698	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							600,000	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)								
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							600,000	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$				
PI/PD TYPED NAME & SIGNATURE *				DATE		FOR NSF USE ONLY		
James T. Shank						INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE				DATE		Date Checked	Date of Rate Sheet	
Gillian Emmons <i>Gillian Emmons</i>				12/21/2010			Initials-ORG	

1* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**BUDGET JUSTIFICATION
BOSTON UNIVERSITY**

The following budget justification explains the planned allocation of funding for the period February 1, 2012--January 31, 2013.

A. SENIOR PERSONNEL. Proposed compensation is consistent with that paid to other personnel engaged in similar work both within and outside Boston University.

A1. Research faculty – The Boston University PI, James Shank, is supported primarily by the University and by Task A of our Department of Energy HEP grant. Salary support for Dr. Shank is not requested in this proposal. Twelve months' salary per year, including an annual estimated merit increase of 3% effective September 1, is requested for Associate Research Professor Saul Youssef to cover his full-time effort on Tier 2 support.

B. OTHER PERSONNEL

B2. Computing professionals. We request 6 months of support for A. Abaris, who runs the CPU and disk systems for this research. We estimate merit increases of 3% per year.

C. FRINGE BENEFITS. Benefits are requested at the rate of 25.6% of professional salaries. This rate is in accordance with Boston University's rate agreement with the Department of Health and Human Services dated December 21, 2009.

D. PERMANENT EQUIPMENT. Equipment funds are requested for upgrades as follows:

T2 CPU upgrade	\$100,000
T2 storage upgrade	\$154,160

E. TRAVEL AND SUBSISTENCE. Our domestic travel budget of \$4,000 will support trips to participate in ATLAS, Open Science Grid, and other computing grid meetings. We estimate approximately 5 such trips during the coming budget period.

Our foreign travel budget of \$5,000 will support trips to CERN for ATLAS and grid meetings. We estimate approximately 2 such trips during the coming budget period.

G. OTHER DIRECT COSTS.

G1. Materials and supplies -- The budgeted funds of \$5,000 will be used for the purchase of research supplies, including software licenses, distribution, media, and backup.

**SUMMARY
PROPOSAL BUDGET**

				FOR NSF USE ONLY			
ORGANIZATION				PROPOSAL NO.:		DURATION (MONTHS)	
Trustees of Boston University						Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.			
James T. Shank							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.		Funds Requested By	Funds Granted By NSF
				CAL	ACAD	Proposer	(If Different)
1.	Research Associate Professor Saul Youssef			12.0		117,298	
2.							
3.							
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7.	(1) TOTAL SENIOR PERSONNEL (1-5)			12.0		117,298	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	() POST DOCTORAL ASSOCIATES						
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			6.0		46,831	
3.	() GRADUATE STUDENTS						
4.	() UNDERGRADUATE STUDENTS						
5.	() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)						
6.	() OTHER						
TOTAL SALARIES AND WAGES (A+B)						164,129	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						42,017	
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)						206,146	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU upgrade \$100,000							
T2 storage upgrade \$154,465							
TOTAL EQUIPMENT						254,465	
E. TRAVEL						4,000	
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						4,000	
2. FOREIGN						5,000	
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						4,381	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS						4,381	
H. TOTAL DIRECT COSTS (A THROUGH G)						473,992	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
61.5% of MTDC, \$219,527							
TOTAL INDIRECT COSTS						135,008	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						609,000	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						609,000	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE *				DATE		FOR NSF USE ONLY	
James T. Shank						INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE				DATE		Date Checked	Date of Rate Sheet
Gillian Emmons <i>Gillian Emmons</i>				12/21/2010			Initials-ORG

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**BUDGET JUSTIFICATION
BOSTON UNIVERSITY**

The following budget justification explains the planned allocation of funding for the period February 1, 2013--January 31, 2014.

A. SENIOR PERSONNEL. Proposed compensation is consistent with that paid to other personnel engaged in similar work both within and outside Boston University.

A1. Research faculty – The Boston University PI, James Shank, is supported primarily by the University and by Task A of our Department of Energy HEP grant. Salary support for Dr. Shank is not requested in this proposal. Twelve months' salary per year, including an annual estimated merit increase of 3% effective September 1, is requested for Associate Research Professor Saul Youssef to cover his full-time effort on Tier 2 support.

B. OTHER PERSONNEL

B2. Computing professionals. We request 6 months of support for A. Abaris, who runs the CPU and disk systems for this research. We estimate merit increases of 3% per year.

C. FRINGE BENEFITS. Benefits are requested at the rate of 25.6% of professional salaries. This rate is in accordance with Boston University's rate agreement with the Department of Health and Human Services dated December 21, 2009.

D. PERMANENT EQUIPMENT. Equipment funds are requested for upgrades as follows:

T2 CPU upgrade	\$100,000
T2 storage upgrade	\$154,465

E. TRAVEL AND SUBSISTENCE. Our domestic travel budget of \$4,000 will support trips to participate in ATLAS, Open Science Grid, and other computing grid meetings. We estimate approximately 5 such trips during the coming budget period.

Our foreign travel budget of \$5,000 will support trips to CERN for ATLAS and grid meetings. We estimate approximately 2 such trips during the coming budget period.

G. OTHER DIRECT COSTS.

G1. Materials and supplies -- The budgeted funds of \$4,381 will be used for the purchase of research supplies, including software licenses, distribution, media, and backup.

**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY			
				PROPOSAL NO.:	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James T. Shank				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL	ACAD	SUMR	
1. Research Associate Professor Saul Youssef				12.0			120,817
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-5)				12.0			120,817
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				6.0			48,236
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							169,053
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)							43,278
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)							212,331
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU upgrade \$100,000							
T2 storage upgrade \$153,600							
TOTAL EQUIPMENT							253,600
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							4,000
2. FOREIGN							5,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							4,390
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							4,390
H. TOTAL DIRECT COSTS (A THROUGH G)							
							479,321
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
61.5% of MTDC, \$225,721							
TOTAL INDIRECT COSTS							138,819
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							
							618,140
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							618,140
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE * James T. Shank				DATE		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE Gillian Emmons				DATE 12/21/10		INDIRECT COST RATE VERIFICATION	
				Date Checked	Date of Rate Sheet	Initials-ORG	

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**BUDGET JUSTIFICATION
BOSTON UNIVERSITY**

The following budget justification explains the planned allocation of funding for the period February 1, 2014--January 31, 2015.

A. SENIOR PERSONNEL. Proposed compensation is consistent with that paid to other personnel engaged in similar work both within and outside Boston University.

A1. Research faculty – The Boston University PI, James Shank, is supported primarily by the University and by Task A of our Department of Energy HEP grant. Salary support for Dr. Shank is not requested in this proposal. Twelve months' salary per year, including an annual estimated merit increase of 3% effective September 1, is requested for Associate Research Professor Saul Youssef to cover his full-time effort on Tier 2 support.

B. OTHER PERSONNEL

B2. Computing professionals. We request 6 months of support for A. Abaris, who runs the CPU and disk systems for this research. We estimate merit increases of 3% per year.

C. FRINGE BENEFITS. Benefits are requested at the rate of 25.6% of professional salaries. This rate is in accordance with Boston University's rate agreement with the Department of Health and Human Services dated December 21, 2009.

D. PERMANENT EQUIPMENT. Equipment funds are requested for upgrades as follows:

T2 CPU upgrade	\$100,000
T2 storage upgrade	\$153,600

E. TRAVEL AND SUBSISTENCE. Our domestic travel budget of \$4,000 will support trips to participate in ATLAS, Open Science Grid, and other computing grid meetings. We estimate approximately 5 such trips during the coming budget period.

Our foreign travel budget of \$5,000 will support trips to CERN for ATLAS and grid meetings. We estimate approximately 2 such trips during the coming budget period.

G. OTHER DIRECT COSTS.

G1. Materials and supplies -- The budgeted funds of \$4,390 will be used for the purchase of research supplies, including software licenses, distribution, media, and backup.

**SUMMARY
PROPOSAL BUDGET**

		FOR NSF USE ONLY				
ORGANIZATION Trustees of Boston University		PROPOSAL NO.:		DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James T. Shank		AWARD NO.		Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)		NSF Funded Person-mos.		Funds Requested By	Funds Granted By NSF	
		CAL	ACAD	SUMR	Proposer	(If Different)
1.	Research Associate Professor Saul Youssef	12.0			124,442	
2.						
3.						
4.						
5.						
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7.	(1) TOTAL SENIOR PERSONNEL (1-5)	12.0			124,442	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1.	() POST DOCTORAL ASSOCIATES					
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	6.0			49,683	
3.	() GRADUATE STUDENTS					
4.	() UNDERGRADUATE STUDENTS					
5.	() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)					
6.	() OTHER					
TOTAL SALARIES AND WAGES (A+B)					174,125	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					44,576	
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)					218,701	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
	T2 CPU upgrade \$100,000					
	T2 storage upgrade \$157,872					
TOTAL EQUIPMENT					257,872	
E. TRAVEL	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				4,000	
	2. FOREIGN				5,000	
F. PARTICIPANT SUPPORT COSTS						
	1. STIPENDS \$ _____					
	2. TRAVEL _____					
	3. SUBSISTENCE _____					
	4. OTHER _____					
() TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS						
	1. MATERIALS AND SUPPLIES				1,115	
	2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
	3. CONSULTANT SERVICES					
	4. COMPUTER SERVICES					
	5. SUBAWARDS					
	6. OTHER					
TOTAL OTHER DIRECT COSTS					1,115	
H. TOTAL DIRECT COSTS (A THROUGH G)					486,688	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)						
	61.5% of MTDC, \$228,816					
TOTAL INDIRECT COSTS					140,722	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)					627,410	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					627,410	
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT \$				
PI/PD TYPED NAME & SIGNATURE *		DATE		FOR NSF USE ONLY		
James T. Shank				INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE		DATE		Date Checked	Date of Rate Sheet	
Gillian Emmons <i>Gillian Emmons</i>		12/21/10			Initials-ORG	

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**BUDGET JUSTIFICATION
BOSTON UNIVERSITY**

The following budget justification explains the planned allocation of funding for the period February 1, 2015--January 31, 2016.

A. SENIOR PERSONNEL. Proposed compensation is consistent with that paid to other personnel engaged in similar work both within and outside Boston University.

A1. Research faculty – The Boston University PI, James Shank, is supported primarily by the University and by Task A of our Department of Energy HEP grant. Salary support for Dr. Shank is not requested in this proposal. Twelve months' salary per year, including an annual estimated merit increase of 3% effective September 1, is requested for Associate Research Professor Saul Youssef to cover his full-time effort on Tier 2 support.

B. OTHER PERSONNEL

B2. Computing professionals. We request 6 months of support for A. Abaris, who runs the CPU and disk systems for this research. We estimate merit increases of 3% per year.

C. FRINGE BENEFITS. Benefits are requested at the rate of 25.6% of professional salaries. This rate is in accordance with Boston University's rate agreement with the Department of Health and Human Services dated December 21, 2009.

D. PERMANENT EQUIPMENT. Equipment funds are requested for upgrades as follows:

T2 CPU upgrade	\$100,000
T2 storage upgrade	\$157,872

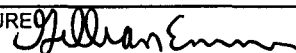
E. TRAVEL AND SUBSISTENCE. Our domestic travel budget of \$4,000 will support trips to participate in ATLAS, Open Science Grid, and other computing grid meetings. We estimate approximately 5 such trips during the coming budget period.

Our foreign travel budget of \$5,000 will support trips to CERN for ATLAS and grid meetings. We estimate approximately 2 such trips during the coming budget period.

G. OTHER DIRECT COSTS.

G1. Materials and supplies -- The budgeted funds of \$1,115 will be used for the purchase of research supplies, including software licenses, distribution, media, and backup.

**SUMMARY
PROPOSAL BUDGET**

				FOR NSF USE ONLY			
ORGANIZATION				PROPOSAL NO.:		DURATION (MONTHS)	
Trustees of Boston University						Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.			
James T. Shank							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.		Funds Requested By	Funds Granted By NSF (if Different)
				CAL	ACAD	SUMR	
1.	Research Associate Professor Saul Youssef			12.0			128,175
2.							
3.							
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7.	(1) TOTAL SENIOR PERSONNEL (1-5)			12.0			128,175
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	() POST DOCTORAL ASSOCIATES						
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			6.0			51,173
3.	() GRADUATE STUDENTS						
4.	() UNDERGRADUATE STUDENTS						
5.	() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)						
6.	() OTHER						
TOTAL SALARIES AND WAGES (A+B)						179,348	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						45,913	
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)						225,261	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
T2 CPU upgrade \$100,000							
T2 storage upgrade \$157,283							
TOTAL EQUIPMENT						257,283	
E. TRAVEL						4,000	
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						4,000	
2. FOREIGN						5,000	
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						747	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS						747	
H. TOTAL DIRECT COSTS (A THROUGH G)						492,291	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
61.5% of MTDC, \$235,008							
TOTAL INDIRECT COSTS						144,529	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						636,820	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						636,820	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE *				DATE		FOR NSF USE ONLY	
James T. Shank						INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE				DATE		Date Checked	Date of Rate Sheet
Gillian Emmons 				10/21/10			Initials-ORG

**BUDGET JUSTIFICATION
BOSTON UNIVERSITY**

The following budget justification explains the planned allocation of funding for the period February 1, 2016--January 31, 2017.

A. SENIOR PERSONNEL. Proposed compensation is consistent with that paid to other personnel engaged in similar work both within and outside Boston University.

A1. Research faculty – The Boston University PI, James Shank, is supported primarily by the University and by Task A of our Department of Energy HEP grant. Salary support for Dr. Shank is not requested in this proposal. Twelve months' salary per year, including an annual estimated merit increase of 3% effective September 1, is requested for Associate Research Professor Saul Youssef to cover his full-time effort on Tier 2 support.

B. OTHER PERSONNEL

B2. Computing professionals. We request 6 months of support for A. Abaris, who runs the CPU and disk systems for this research. We estimate merit increases of 3% per year.

C. FRINGE BENEFITS. Benefits are requested at the rate of 25.6% of professional salaries. This rate is in accordance with Boston University's rate agreement with the Department of Health and Human Services dated December 21, 2009.

D. PERMANENT EQUIPMENT. Equipment funds are requested for upgrades as follows:

T2 CPU upgrade	\$100,000
T2 storage upgrade	\$157,283

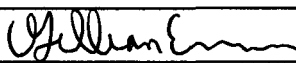
E. TRAVEL AND SUBSISTENCE. Our domestic travel budget of \$4,000 will support trips to participate in ATLAS, Open Science Grid, and other computing grid meetings. We estimate approximately 5 such trips during the coming budget period.

Our foreign travel budget of \$5,000 will support trips to CERN for ATLAS and grid meetings. We estimate approximately 2 such trips during the coming budget period.

G. OTHER DIRECT COSTS.


G1. Materials and supplies -- The budgeted funds of \$747 will be used for the purchase of research supplies, including software licenses, distribution, media, and backup.

**SUMMARY
PROPOSAL BUDGET**

				FOR NSF USE ONLY			
ORGANIZATION Trustees of Boston University				PROPOSAL NO.:		DURATION (MONTHS)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James T. Shank				AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL	ACAD	SUMR	
1.	Research Associate Professor Saul Youssef			60.0		604,614	
2.							
3.							
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7.	(1) TOTAL SENIOR PERSONNEL (1-5)			60.0		604,614	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	() POST DOCTORAL ASSOCIATES						
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			30.0		241,390	
3.	() GRADUATE STUDENTS						
4.	() UNDERGRADUATE STUDENTS						
5.	() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)						
6.	() OTHER						
TOTAL SALARIES AND WAGES (A+B)						846,004	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						216,577	
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)						1,062,581	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	T2 CPU upgrade		500,000				
	T2 storage upgrade		777,380				
TOTAL EQUIPMENT						1,277,380	
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					20,000	
	2. FOREIGN					25,000	
F. PARTICIPANT SUPPORT COSTS							
	1. STIPENDS	\$	_____				
	2. TRAVEL		_____				
	3. SUBSISTENCE		_____				
	4. OTHER		_____				
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
	1. MATERIALS AND SUPPLIES					15,633	
	2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
	3. CONSULTANT SERVICES						
	4. COMPUTER SERVICES						
	5. SUBAWARDS						
	6. OTHER						
TOTAL OTHER DIRECT COSTS						15,633	
H. TOTAL DIRECT COSTS (A THROUGH G)						2,400,594	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
		61.5%	of MTDC,		\$1,123,214		
TOTAL INDIRECT COSTS						690,776	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						3,091,370	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						3,091,370	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PI TYPED NAME & SIGNATURE *				DATE		FOR NSF USE ONLY	
James T. Shank						INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE				DATE		Date Checked	Date of Rate Sheet
Gillian Emmons 				12/21/10			Initials-ORG

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET


**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION	FOR NSF USE ONLY			
	PROPOSAL NO.:	DURATION (MONTHS)		
Trustees of Boston University		Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR John Butler	AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)	NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
	CAL	ACAD	SUMR	
1.				
2.				
3.				
4.				
5.				
6.() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				
7. () TOTAL SENIOR PERSONNEL (1-5)				
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1.() POST DOCTORAL ASSOCIATES				
2.(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	11.63			55,606
3.() GRADUATE STUDENTS				
4.() UNDERGRADUATE STUDENTS				
5.() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)				
6.() OTHER				
TOTAL SALARIES AND WAGES (A+B)				55,606
C. FRINGE: BENEFITS (IF CHARGED AS DIRECT COSTS)				14,235
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)				69,841
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)				
TDAQ R&D				
TOTAL EQUIPMENT				115,000
E. TRAVEL: 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS) 2. FOREIGN				
F. PARTICIPANT SUPPORT COSTS				
1. STIPENDS \$ _____				
2. TRAVEL _____				
3. SUBSISTENCE _____				
4. OTHER _____				
() TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS				
1. MATERIALS AND SUPPLIES				
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				
3. CONSULTANT SERVICES				
4. COMPUTER SERVICES				
5. SUBAWARDS				
6. OTHER				
TOTAL OTHER DIRECT COSTS				
H. TOTAL DIRECT COSTS (A THROUGH G)				184,841
I. INDIRECT COSTS (SPECIFY RATE AND BASE)				
26.0% of MTDC, \$69,841				
TOTAL INDIRECT COSTS				18,159
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)				203,000
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)				
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				203,000
M. COST SHARING: PROPOSED LEVEL \$	AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE * John Butler	DATE 1 Dec. 2010	FOR NSF USE ONLY		
ORG. REP. TYPED NAME & SIGNATURE John Imbergamo 	DATE 9 Dec 2010	Date Checked	Date of Rate Sheet	Initials-ORG

Senior Associate VP for Financial Affairs

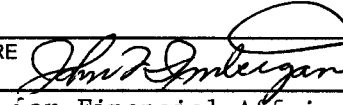
1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY				
				PROPOSAL NO.:		DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR John Butler				AWARD NO.		Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.			Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL	ACAD	SUMR		
1.								
2.								
3.								
4.								
5.								
6.	()	OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7.	()	TOTAL SENIOR PERSONNEL (1-5)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	()	POST DOCTORAL ASSOCIATES						
2.	(1)	OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			11.63		57,274	
3.	()	GRADUATE STUDENTS						
4.	()	UNDERGRADUATE STUDENTS						
5.	()	SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)						
6.	()	OTHER						
TOTAL SALARIES AND WAGES (A+B)						57,274		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)								
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)						14,662		
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)						71,936		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
TDAQ R&D								
TOTAL EQUIPMENT						125,000		
E. TRAVEL								
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								
2. FOREIGN								
F. PARTICIPANT SUPPORT COSTS								
1. STIPENDS \$ _____								
2. TRAVEL _____								
3. SUBSISTENCE _____								
4. OTHER _____								
() TOTAL PARTICIPANT COSTS								
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES								
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								
3. CONSULTANT SERVICES								
4. COMPUTER SERVICES								
5. SUBAWARDS								
6. OTHER								
TOTAL OTHER DIRECT COSTS								
H. TOTAL DIRECT COSTS (A THROUGH G)						196,936		
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
26.0% of MTDC, \$71,936								
TOTAL INDIRECT COSTS						18,704		
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						215,640		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)								
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						215,640		
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$				
PI/PD TYPED NAME & SIGNATURE *				DATE		FOR NSF USE ONLY		
John Butler				1 Dec. 2010		INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE				DATE		Date Checked	Date of Rate Sheet	
John Imbergamo 				9 Dec 2010				
Senior Associate VP for Financial Affairs							Initials-ORG	

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**SUMMARY
PROPOSAL BUDGET**

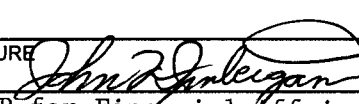
ORGANIZATION		FOR NSF USE ONLY			
		PROPOSAL NO.:	DURATION (MONTHS)		
Trustees of Boston University			Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR John Butler		AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)		NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
		CAL	ACAD	SUMR	
1.					
2.					
3.					
4.					
5.					
6.() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-5)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1.() POST DOCTORAL ASSOCIATES					
2.(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		11.63			58,993
3.() GRADUATE STUDENTS					
4.() UNDERGRADUATE STUDENTS					
5.() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)					
6.() OTHER					
TOTAL SALARIES AND WAGES (A+B)					58,993
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					15,102
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)					74,095
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TDIAQ R&D					
TOTAL EQUIPMENT					125,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS \$ _____					
2. TRAVEL _____					
3. SUBSISTENCE _____					
4. OTHER _____					
() TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES					
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					199,095
I. INDIRECT COSTS (SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS 26.0% of MTDC, \$74,095					19,265
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)					218,360
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					218,360
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT \$			
PI/PD TYPED NAME & SIGNATURE *		DATE	FOR NSF USE ONLY		
John Butler		1 Dec. 2010	INDIRECT COST RATE VERIFICATION		
ORG. REF. TYPED NAME & SIGNATURE		DATE	Date Checked	Date of Rate Sheet	Initials-ORG
John Imbergamo 		9 Dec 2010			
Senior Associate VP for Financial Affairs		1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET			

**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Trustees of Boston University				FOR NSF USE ONLY				
				PROPOSAL NO.:		DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR John Butler				AWARD NO.		Proposed	Granted	
A. SENIOR PERSONNEL: P/PI, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.			Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL	ACAD	SUMR		
1.								
2.								
3.								
4.								
5.								
6.	()	OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7.	()	TOTAL SENIOR PERSONNEL (1-5)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	()	POST DOCTORAL ASSOCIATES						
2.	(1)	OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			11.63		60,763	
3.	()	GRADUATE STUDENTS						
4.	()	UNDERGRADUATE STUDENTS						
5.	()	SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)						
6.	()	OTHER						
TOTAL SALARIES AND WAGES (A+B)						60,763		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						15,555		
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)						76,318		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
TD)AQ R&D								
TOTAL EQUIPMENT						125,000		
E. TRAVEL								
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								
2. FOREIGN								
F. PARTICIPANT SUPPORT COSTS								
1. STIPENDS \$ _____								
2. TRAVEL _____								
3. SUBSISTENCE _____								
4. OTHER _____								
() TOTAL PARTICIPANT COSTS								
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES								
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								
3. CONSULTANT SERVICES								
4. COMPUTER SERVICES								
5. SUBAWARDS								
6. OTHER								
TOTAL OTHER DIRECT COSTS								
H. TOTAL DIRECT COSTS (A THROUGH G)						201,318		
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
TOTAL INDIRECT COSTS 26.0% of MTDC, \$76,318						19,842		
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						221,160		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)								
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						221,160		
M. COST SHARING: PROPOSED LEVEL \$ _____				AGREED LEVEL IF DIFFERENT \$ _____				
PI/PI D TYPED NAME & SIGNATURE *				DATE				
John Butler				1 Dec. 2010				
ORG. REF. TYPED NAME & SIGNATURE				FOR NSF USE ONLY				
John Imbergamo				INDIRECT COST RATE VERIFICATION				
Senior Associate VP for Financial Affairs				Date Checked	Date of Rate Sheet	Initials-ORG		
				9 Dec 2010				

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

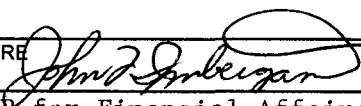
**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Trustees of Boston University				PROPOSAL NO.:			DURATION (MONTHS)	
				AWARD NO.			Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR John Butler								
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)				NSF Funded Person-mos.			Funds Requested By Proposer	Funds Granted By NSF (If Different)
				CAL	ACAD	SUMR		
1.								
2.								
3.								
4.								
5.								
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)								
7. () TOTAL SENIOR PERSONNEL (1-5)								
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1. () POST DOCTORAL ASSOCIATES								
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				11.63			62,582	
3. () GRADUATE STUDENTS								
4. () UNDERGRADUATE STUDENTS								
5. () SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)								
6. () OTHER								
TOTAL SALARIES AND WAGES (A+B)							62,582	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							16,021	
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)							78,603	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)								
TD)AQ R&D								
TOTAL EQUIPMENT							125,000	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								
2. FOREIGN								
F. PARTICIPANT SUPPORT COSTS								
1. STIPENDS \$ _____								
2. TRAVEL _____								
3. SUBSISTENCE _____								
4. OTHER _____								
() TOTAL PARTICIPANT COSTS								
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES								
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								
3. CONSULTANT SERVICES								
4. COMPUTER SERVICES								
5. SUBAWARDS								
6. OTHER								
TOTAL OTHER DIRECT COSTS								
H. TOTAL DIRECT COSTS (A THROUGH G)							203,603	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
TOTAL INDIRECT COSTS 26.0% of MTDC, \$78,603							20,437	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							224,040	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)								
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							224,040	
M. COST SHARING: PROPOSED LEVEL \$ _____				AGREED LEVEL IF DIFFERENT \$ _____				
PI/PD TYPED NAME & SIGNATURE * John Butler				DATE 1 Dec. 2010	FOR NSF USE ONLY			
ORG. REF. TYPED NAME & SIGNATURE John Imbergamo 				DATE 9 Dec 2010	INDIRECT COST RATE VERIFICATION			
				Date Checked	Date of Rate Sheet	Initials-ORG		

Senior Associate VP for Financial Affairs

1 * ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION Trustees of Boston University		FOR NSF USE ONLY			
		PROPOSAL NO.:		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR John Butler		AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: P/PI, Co-PI's, Faculty and other Senior Associates (List each separately with title; A.7 show number in brackets)		NSF Funded Person-mos.		Funds Requested By Proposer	Funds Granted By NSF (If Different)
		CAL	ACAD	SUMR	
1.					
2.					
3.					
4.					
5.					
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)				
7.	() TOTAL SENIOR PERSONNEL (1-5)				
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1.	() POST DOCTORAL ASSOCIATES				
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	58.15			295,218
3.	() GRADUATE STUDENTS				
4.	() UNDERGRADUATE STUDENTS				
5.	() SECRETARIAL-CLERICAL (IF CHARGED DIRECTLY)				
6.	() OTHER				
TOTAL SALARIES AND WAGES (A+B)					295,218
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					75,575
TOTAL SALARIES, WAGES, AND FRINGE BENEFITS (A+B+C)					370,793
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)					
TOTAL EQUIPMENT					615,000
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT COSTS					
1.	STIPENDS \$ _____				
2.	TRAVEL _____				
3.	SUBSISTENCE _____				
4.	OTHER _____				
() TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1.	MATERIALS AND SUPPLIES				
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				
3.	CONSULTANT SERVICES				
4.	COMPUTER SERVICES				
5.	SUBAWARDS				
6.	OTHER				
TOTAL OTHER DIRECT COSTS					
H. TOTAL DIRECT COSTS (A THROUGH G)					985,793
I. INDIRECT COSTS (SPECIFY RATE AND BASE)					
26.0% of MTDC, \$370,793					
TOTAL INDIRECT COSTS					96,407
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)					1,082,200
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j)					
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					1,082,200
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT \$			
PI/PI D TYPED NAME & SIGNATURE *		DATE		FOR NSF USE ONLY	
John Butler		1 Dec. 2010		INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE		DATE		Date Checked	Date of Rate Sheet
John Imbergamo 		9 Dec 2010			Initials-ORG

Senior Associate VP for Financial Affairs

1* ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

BUDGET JUSTIFICATION
BOSTON UNIVERSITY

The following budget justification explains budget for fiscal years 2012-2016, corresponding to the period February 1, 2012 – January 31, 2017.

A. SENIOR PERSONNEL.

B. OTHER PERSONNEL. Proposed compensation is consistent with that paid to other personnel engaged in similar work both within and outside Boston University.

B2. Other Professionals. We request 11.63 months of support annually for Z. Yan, the engineering physicist who devotes 100% of his effort to this project. Salary is based on the current rate, with estimated 3% increases effective annually on September 1.

C. FRINGE BENEFITS. Benefits are requested at the rate of 25.6% of professional salaries. This rate is in accordance with Boston University's rate agreement with the Department of Health and Human Services dated December 21, 2009.

D. EQUIPMENT. Development of an upgraded Level 1 muon trigger. Services will be provided by Boston University's Electronics Design Facility (EDF), currently charged at \$55/hour and \$38/hour for senior and junior engineer labor, respectively.) Budget amounts for FY2012 through FY2016 represent our best current estimate, based on experience.

I. INDIRECT COSTS. Boston University's predetermined indirect cost rate for off-campus research is currently 26% of MTDC.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Chicago				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Gardner				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Robert W Gardner - Senior Research Assoc			4.80	0.00	0.00	\$ 53,561
2.	James E Pilcher - Prof			0.00	0.00	0.00	0
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)			4.80	0.00	0.00	53,561
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			52.00	0.00	0.00	266,728
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							320,289
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							73,667
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							393,956
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	computer server cluster upgrade			\$	209,887		
	EDG, M&O, \$80,000; M&O Equipment \$35,000				115,000		
	EDG, R&D \$258,000; R&D Equipment \$36,054				294,054		
TOTAL EQUIPMENT							618,941
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						12,000
	2. FOREIGN						27,000
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____						0
2.	TRAVEL _____						0
3.	SUBSISTENCE _____						0
4.	OTHER _____						0
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						12,400
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						466,000
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							478,400
H. TOTAL DIRECT COSTS (A THROUGH G)							1,530,297
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 56.0000, Base: 366906) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							238,863
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,769,160
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 1,769,160 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Robert W Gardner				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**

MTDC, off campus, excludes D (Rate: 26.0000, Base 128448)

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION University of Chicago				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Gardner				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Robert W Gardner - Senior Research Assoc	4.80	0.00	0.00	\$	55,436	\$	
2. James E Pilcher - Prof	0.00	0.00	0.00		0		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		55,436		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	52.00	0.00	0.00		274,788		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					330,224		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					75,952		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					406,176		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
compute server cluster upgrade				\$	223,723		
EDG, M&O, \$81,600; M&O Equipment, \$32,928					114,528		
EDG, R&D, \$263,160; R&D Equipment, \$37,135					300,295		
TOTAL EQUIPMENT					638,546		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000		
2. FOREIGN					27,450		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					11,481		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					487,200		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					498,681		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,582,853		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 56.0000, Base: 326787) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					216,885		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,799,738		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 1,799,738	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Robert W Gardner				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs**

MTDC, off-campus, excludes item D (Rate: 26.0000, Base 130323)

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Chicago				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Gardner				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Robert W Gardner - Senior Research Assoc				4.80	0.00	0.00
2. James E Pilcher - Prof				0.00	0.00	0.00
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				4.80	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				52.00	0.00	0.00
3. (0) GRADUATE STUDENTS						
4. (0) UNDERGRADUATE STUDENTS						
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. (0) OTHER						
TOTAL SALARIES AND WAGES (A + B)						
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
compute server cluster upgrade					\$	223,369
EDG, M&O, \$83,232; M&O Equipment, \$30,714						113,946
EDG, R&D, \$268,423; R&D Equipment, \$38,250						306,673
TOTAL EQUIPMENT						643,988
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						12,000
2. FOREIGN						27,914
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____						0
2. TRAVEL _____						0
3. SUBSISTENCE _____						0
4. OTHER _____						0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						10,678
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						494,508
6. OTHER						0
TOTAL OTHER DIRECT COSTS						505,186
H. TOTAL DIRECT COSTS (A THROUGH G)						1,607,881
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 56.0000, Base: 337019) (Cont. on Comments Page)						
TOTAL INDIRECT COSTS (F&A)						223,146
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						1,831,027
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 1,831,027 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Robert W Gardner				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs**

MTDC, off-campus, excludes item D (Rate: 26.0000, Base 132366)

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of Chicago				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Gardner				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Robert W Gardner - Senior Research Associate	4.80	0.00	0.00	\$	59,384	\$	
2. James E Pilcher - Prof	0.00	0.00	0.00		0		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		59,384		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	52.00	0.00	0.00		291,688		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					351,072		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					80,747		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					431,819		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
compute server cluster upgrade				\$	222,738		
EDG, M&O, \$84,897; M&O Equipment, \$28,506					113,403		
EDG, R&D, \$273,792; R&D Equipment, \$39,397					313,189		
TOTAL EQUIPMENT					649,330		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000		
2. FOREIGN					28,391		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,926		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					501,926		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					511,852		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,633,392		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 56.0000, Base: 347669) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					229,656		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,863,048		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,863,048	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Robert W Gardner				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs**

MTDC, off-campus, excludes item D (Rate: 26.0000, Base 134467)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of Chicago				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Gardner				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Robert W Gardner - Senior Research Associate	4.80	0.00	0.00	\$	61,463	\$	
2. James E Pilcher - prof	0.00	0.00	0.00		0		
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		61,463		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	52.00	0.00	0.00		300,544		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					362,007		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					83,262		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					445,269		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
compute server cluster upgrade				\$	221,895		
EDG, M&O, \$86,595; M&O Equipment, \$26,320					112,915		
EDG, R&D, \$279,267; R&D Equipment, \$40,579					319,836		
TOTAL EQUIPMENT					654,646		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000		
2. FOREIGN					28,883		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					9,174		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					509,455		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					518,629		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,659,427		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 56.0000, Base: 358700) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					236,395		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,895,822		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,895,822	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Robert W Gardner				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs**

MTDC, off-campus, excludes item D (Rate: 26.0000, Base 136626)

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Chicago				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Gardner				AWARD NO.	Proposed	Granted
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR			
1. Robert W Gardner - Senior Research Assoc	24.00	0.00	0.00	\$	287,220	\$
2. James E Pilcher - Prof	0.00	0.00	0.00		0	
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0	
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)	24.00	0.00	0.00		287,220	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0	
2. (25) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	260.00	0.00	0.00		1,416,854	
3. (0) GRADUATE STUDENTS					0	
4. (0) UNDERGRADUATE STUDENTS					0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6. (0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)					1,704,074	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					2,096,013	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
				\$ 3,205,451		
TOTAL EQUIPMENT					3,205,451	
E. TRAVEL						
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					60,000	
2. FOREIGN					139,638	
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS	\$				0	
2. TRAVEL					0	
3. SUBSISTENCE					0	
4. OTHER					0	
TOTAL NUMBER OF PARTICIPANTS (0)					TOTAL PARTICIPANT COSTS	0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					53,659	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3. CONSULTANT SERVICES					0	
4. COMPUTER SERVICES					0	
5. SUBAWARDS					2,459,089	
6. OTHER					0	
TOTAL OTHER DIRECT COSTS					2,512,748	
H. TOTAL DIRECT COSTS (A THROUGH G)					8,013,850	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)					1,144,945	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					9,158,795	
K. RESIDUAL FUNDS					0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 9,158,795	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME Robert W Gardner				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Year 1

SUMMARY PROPOSAL BUDGET

		FOR NSF USE ONLY				
ORGANIZATION The University of Chicago		PROPOSAL NO.		DURATION (MONTHS)		
				Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James E. Pilcher		AWARD NO.				
A. SENIOR PERSONNEL: PI/PI, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)		NSF-Funded Person-months			Funds Requested By	Funds Granted by NSF
		CAL	ACAD	SUMR	Proposer	(If Different)
1. James E. Pilcher					0	\$
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. (1) TOTAL SENIOR PERSONNEL (1-6)					0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		24			85,000	
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS						
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)					85,000	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					19,550	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					104,550	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) EDG, R&D, \$258,000; R&D Equipment, \$36,054 EDG, M&O, \$80,000; M&O Equipment, \$35,000						
TOTAL EQUIPMENT					409,054	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						
2. FOREIGN					15,000	
F. PARTICIPANT SUPPORT						
1. STIPENDS \$ _____						
2. TRAVEL _____						
3. SUBSISTENCE _____						
4. OTHER _____						
TOTAL NUMBER OF PARTICIPANTS ()		TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					8,900	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES						
4. COMPUTER SERVICES						
5. SUBAWARDS						
6. OTHER						
TOTAL OTHER DIRECT COSTS					8,900	
H. TOTAL DIRECT COSTS (A THROUGH G)					537,504	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) MTDC, off-campus, excludes item D (Base: \$128,450; Rate: 26%)						
TOTAL INDIRECT COSTS (F&A)					33,396	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					570,900	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)						
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$570,900	\$
M. COST SHARING: PROPOSED LEVEL \$		AGREED LEVEL IF DIFFERENT: \$				
PI/PI TYPED NAME AND SIGNATURE* James Pilcher <i>James E. Pilcher</i>		DATE	FOR NSF USE ONLY			
		12/22/10	INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE* Carol Zuches, Assoc. VP for Research Administration <i>Carol Zuches</i>		DATE	Date Checked	Date of Rate Sheet	Initials-ORG	
		12/21/10				

Year 2

SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION The University of Chicago				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James E. Pilcher				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. James E. Pilcher							0 \$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)							0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24			86,700
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							86,700
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							19,941
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							106,641
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) EDG, R&D, \$263,160; R&D Equipment, \$37,135 EDG, M&O, \$81,600; M&O Equipment, \$32,928							
TOTAL EQUIPMENT							414,823
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							15,450
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							8,231
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							8,231
H. TOTAL DIRECT COSTS (A THROUGH G)							545,146
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) MTDC, off-campus, excludes item D (Base: \$130,323; Rate: 26%)							
TOTAL INDIRECT COSTS (F&A)							33,884
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							579,030
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$579,030 \$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PPD TYPED NAME AND SIGNATURE James Pilcher <i>James E. Pilcher</i>				DATE 10/22/16	FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE* Carol Zuchies, Assoc. VP for Research Administration <i>Carol Zuchies</i>				DATE 12/21/10	Date Checked	Date of Rate Sheet	Initials-ORG

Year 3

SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION The University of Chicago			PROPOSAL NO.		DURATION (MONTHS)		
					Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James E. Pilcher			AWARD NO.				
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)			NSF-Funded			Funds	Funds
			Person-months			Requested By	Granted by NSF
			CAL	ACAD	SUMR	Proposer	(If Different)
1. James E. Pilcher						0	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)						0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			24			88,434	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						88,434	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						20,340	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						108,774	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) EDG, R&D, \$268,423; R&D Equipment, \$38,250 EDG, M&O, \$83,232; M&O Equipment, \$30,714							
TOTAL EQUIPMENT						420,619	
E. TRAVEL			1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				
			2. FOREIGN			15,914	
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT COSTS				
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						7,678	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS						7,678	
H. TOTAL DIRECT COSTS (A THROUGH G)						552,985	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) MTDC, off-campus, excludes item D (Base: \$132,366; Rate: 26%)							
TOTAL INDIRECT COSTS (F&A)						34,415	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						587,400	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$587,400	\$
M. COST SHARING: PROPOSED LEVEL \$			AGREED LEVEL IF DIFFERENT: \$				
PI/PD TYPED NAME AND SIGNATURE James Pilcher <i>James E. Pilcher</i>		DATE 12/22/10	FOR NSF USE ONLY				
			INDIRECT COST RATE VERIFICATION				
ORG. REP. TYPED NAME & SIGNATURE Carol Zuiches, Assoc. VP for Research Administration <i>Carol Zuiches</i>		DATE 12/21/10	Date Checked	Date of Rate Sheet	Initials-ORG		

Year 4

SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION The University of Chicago				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James E. Pilcher				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By	Funds Granted by NSF
				CAL	ACAD	SUMR	Proposer (If Different)
1. James E. Pilcher							0 \$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)							0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24			90,203
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							90,203
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							20,747
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							110,950
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) EDG, R&D, \$273,792; R&D Equipment, \$39,397 EDG, M&O, \$84,897; M&O Equipment, \$28,506							
TOTAL EQUIPMENT							426,592
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							16,391
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							7,126
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							7,126
H. TOTAL DIRECT COSTS (A THROUGH G)							561,059
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) MTDC, off-campus, excludes item D (Base: \$134,467; Rate: 26%)							
TOTAL INDIRECT COSTS (F&A)							34,961
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							596,020
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$596,020 \$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PPD TYPED NAME AND SIGNATURE James Pilcher <i>James E. Pilcher</i>				DATE	FOR NSF USE ONLY		
				12/22/10	INDIRECT COST RATE VERIFICATION		
ORG. REP. TYPED NAME & SIGNATURE* Carol Zuiches, Assoc. VP for Research Administration <i>Carol Zuiches</i>				DATE	Date Checked	Date of Rate Sheet	Initials-ORG
				12/21/10			

Year 5

SUMMARY PROPOSAL BUDGET

						FOR NSF USE ONLY				
ORGANIZATION The University of Chicago						PROPOSAL NO.		DURATION (MONTHS)		
								Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James E. Pilcher						AWARD NO.				
A. SENIOR PERSONNEL: PI/PPD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)						NSF-Funded Person-months			Funds Requested By	Funds Granted by NSF
						CAL	ACAD	SUMR	Proposer	(If Different)
1. James E. Pilcher								0	\$	
2.										
3.										
4.										
5.										
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)										
7. (1) TOTAL SENIOR PERSONNEL (1-6)								0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)										
1. () POSTDOCTORAL ASSOCIATES										
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)						24		92,007		
3. () GRADUATE STUDENTS										
4. () UNDERGRADUATE STUDENTS										
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)										
6. () OTHER										
TOTAL SALARIES AND WAGES (A + B)								92,007		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)								21,162		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)								113,169		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) EDG, R&D, \$279,267; R&D Equipment, \$40,579 EDG, M&O, \$86,595; M&O Equipment, \$26,310										
TOTAL EQUIPMENT								432,751		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)										
2. FOREIGN								16,883		
F. PARTICIPANT SUPPORT										
1. STIPENDS \$ _____										
2. TRAVEL _____										
3. SUBSISTENCE _____										
4. OTHER _____										
TOTAL NUMBER OF PARTICIPANTS ()										
TOTAL PARTICIPANT COSTS										
G. OTHER DIRECT COSTS										
1. MATERIALS AND SUPPLIES								6,574		
2. PUBLICATION/DOCUMENTATION/DISSEMINATION										
3. CONSULTANT SERVICES										
4. COMPUTER SERVICES										
5. SUBAWARDS										
6. OTHER										
TOTAL OTHER DIRECT COSTS								6,574		
H. TOTAL DIRECT COSTS (A THROUGH G)								569,377		
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) MTDC, off-campus, excludes item D (Base: \$136,626; Rate: 26%)										
TOTAL INDIRECT COSTS (F&A)								35,323		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)								604,900		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)										
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$604,900	\$	
M. COST SHARING: PROPOSED LEVEL \$						AGREED LEVEL IF DIFFERENT: \$				
PI/PPD TYPED NAME AND SIGNATURE James Pilcher <i>James E. Pilcher</i>						DATE	FOR NSF USE ONLY			
						12/22/10	INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE* Carol Zuiches, Assoc. VP for Research Administration <i>Carol Zuiches</i>						DATE	Date Checked	Date of Rate Sheet	Initials-ORG	
						11/21/10				

Cumulative

SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

ORGANIZATION The University of Chicago				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR James E. Pilcher				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. James E. Pilcher							0 \$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)							0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				120			442,344
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							442,344
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							101,740
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							544,084
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							2,103,839
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							79,638
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							38,509
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS							38,509
H. TOTAL DIRECT COSTS (A THROUGH G)							2,766,070
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) MTDC, off-campus, excludes item D (Base: \$662,232; Rate: 26%)							
TOTAL INDIRECT COSTS (F&A)							172,180
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							2,938,250
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$2,938,250 \$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE* James Pilcher <i>James E. Pilcher</i>				DATE 12/22/10		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE* Carol Zuiches, Assoc. VP for Research Administration <i>Carol Zuiches</i>				DATE 12/21/10		INDIRECT COST RATE VERIFICATION	
				Date Checked		Date of Rate Sheet	
						Initials-ORG	

Budget Justification
University of Chicago
Year 1

B.2	Engineering and Technical Salaries:	
	2 junior technicians based at CERN for M&O activity	\$85,000
C.	Fringe:	
	23% of \$85,000	\$19,550
D.	Equipment:	
	Eng. and tech. manpower R&D (1.3 FTE EE, 0.3 FTE tech)	\$258,000
	Eng. and tech. manpower M&O (0.2 FTE EE, 0.4 FTE tech)	80,000
	M&S for constructed equip (R&D) (parts, PCBs)	36,054
	M&S for constructed equip (M&O) (parts, PCBs)	35,000
	Subtotal	\$409,054
E.	Travel:	
	6 trips to CERN (4 for junior techs, 2 for engineering personnel)	\$15,000
G.	Materials and supplies (non-constructed equipment):	
	Small tools, stockroom withdrawals, computer items, etc.	\$8,900
I.	Indirect Costs:	
	26% of MTDC base of \$128,450; excludes (D)	\$33,397
J.	Total Direct and Indirect Costs:	\$570,900

General Comments

Acronyms: M&O: Maintenance and Operations. R&D: Research and Development.

Engineers: The electronics engineer and senior technician will be hired through the University's Electronics Development Group. Their projected salaries are based on the current rates. They are not subject to indirect costs.

Indirect Costs: Indirect costs are assessed on Modified Total Direct Costs at the rate of 26% for off-campus activity per the University of Chicago's rate agreement dated 28 January 2010 with our cognizant agency, the Department of Health and Human Services.

Labor costs (B2, C, and the engineers in item D) are adjusted by 2% in years 2-5 of this budget. Travel costs (E) are adjusted by 3%.

Budget Justification
University of Chicago
Cumulative

B.2	Engineering and Technical Salaries:		
	10 FTE junior technicians based at CERN for M&O activity		\$442,344
C.	Fringe:		
	23% of \$442,344		\$101,739
D.	Equipment:		
	Eng. and tech. manpower R&D (6.5 FTE EE, 1.5 FTE tech)	\$1,342,642	
	Eng. and tech. manpower M&O (1.0 FTE EE, 2.0 FTE tech)	416,323	
	M&S for constructed equip (R&D) (parts, PCBs)	191,416	
	M&S for constructed equip (M&O) (parts, PCBs)	153,458	
	Subtotal		\$2,103,839
E.	Travel:		
	30 trips to CERN (20 for junior techs, 10 for engineering personnel)		\$79,637
G.	Materials and supplies (non-constructed equipment):		
	Small tools, stockroom withdrawals, computer items, etc.		\$38,511
I.	Indirect Costs:		
	26% of base of \$662,232		\$172,180
J.	Total Direct and Indirect Costs:		\$2,938,250

SUMMARY YEAR 1
PROPOSAL BUDGET

ORGANIZATION University of Chicago				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Gardner				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI/D, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Personnel months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Robert Gardner - PI	4.80	0.00	0.00	\$	53,561	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		53,561		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	28.00	0.00	0.00		181,728		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					235,289		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					54,117		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					289,406		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
compute server cluster upgrade				\$	209,887		
TOTAL EQUIPMENT					209,887		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000		
2. FOREIGN					12,000		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					3,500		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					466,000		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					469,500		
H. TOTAL DIRECT COSTS (A THROUGH G)					992,793		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 56.0000, Base: 366906)							
TOTAL INDIRECT COSTS (F&A)					205,467		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,198,260		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,198,260	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
P/PI/D NAME Robert Gardner				FOR NSF USE ONLY			
ORG. REP. NAME Carol Zuchner				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

Robert W Gardner 12/13/10
Carol Zuchner 12/15/10

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**

Subaward to IU (Rate: 56.0000, Base 25000)

Subaward to UIUC (Rate: 56.0000, Base 25000)

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION University of Chicago				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Gardner				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Robert Gardner - PI	4.80	0.00	0.00	\$	55,436	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		55,436		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	28.00	0.00	0.00		188,088		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					243,524		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					56,011		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					299,535		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
compute server cluster upgrade				\$	223,723		
TOTAL EQUIPMENT					223,723		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000		
2. FOREIGN					12,000		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					3,250		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					487,200		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					490,450		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,037,708		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 56.0000, Base: 326785)							
TOTAL INDIRECT COSTS (F&A)					183,000		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,220,708		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,220,708	\$	
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Robert Gardner				FOR NSF USE ONLY			
ORG. REP. NAME Carol Zuchner				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

Robert Gardner 12/9/10
Carol Zuchner 12/15/10

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Chicago				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Gardner				AWARD NO.	Proposed	Granted
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)		
	CAL	ACAD	SUMR			Funds granted by NSF (if different)
1. Robert Gardner - PI	4.80	0.00	0.00	\$	57,376	\$
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		57,376	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0	
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	28.00	0.00	0.00		194,672	
3. (0) GRADUATE STUDENTS					0	
4. (0) UNDERGRADUATE STUDENTS					0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6. (0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)					252,048	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					57,971	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					310,019	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
compute server cluster upgrade				\$	223,369	
TOTAL EQUIPMENT					223,369	
E. TRAVEL						
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000	
2. FOREIGN					12,000	
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS	\$		0			
2. TRAVEL			0			
3. SUBSISTENCE			0			
4. OTHER			0			
TOTAL NUMBER OF PARTICIPANTS (0)						
TOTAL PARTICIPANT COSTS					0	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					3,000	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3. CONSULTANT SERVICES					0	
4. COMPUTER SERVICES					0	
5. SUBAWARDS					494,508	
6. OTHER					0	
TOTAL OTHER DIRECT COSTS					497,508	
H. TOTAL DIRECT COSTS (A THROUGH G)					1,054,896	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 56.0000, Base: 337019)						
TOTAL INDIRECT COSTS (F&A)					188,731	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,243,627	
K. RESIDUAL FUNDS					0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,243,627	\$
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$	
PI/PD NAME Robert Gardner				FOR NSF USE ONLY INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME Carol Zuchow						
<i>Robert W Gardner</i> 12/9/10 <i>Carol Zuchow</i> 12/15/10				Date Checked	Date Of Rate Sheet	Initials - ORG

SUMMARY PROPOSAL BUDGET YEAR 4

ORGANIZATION University of Chicago				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Gardner				AWARD NO.	Proposed	Granted
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)		
	CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)	
1. Robert Gardner - PI	4.80	0.00	0.00	\$ 59,384	\$	
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00	59,384		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	28.00	0.00	0.00	201,485		
3. (0) GRADUATE STUDENTS				0		
4. (0) UNDERGRADUATE STUDENTS				0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6. (0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)				260,869		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				60,000		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				320,869		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
compute server cluster upgrade				\$ 222,738		
TOTAL EQUIPMENT				222,738		
E. TRAVEL						
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				12,000		
2. FOREIGN				12,000		
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS	\$	0				
2. TRAVEL		0				
3. SUBSISTENCE		0				
4. OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES				2,800		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3. CONSULTANT SERVICES				0		
4. COMPUTER SERVICES				0		
5. SUBAWARDS				501,926		
6. OTHER				0		
TOTAL OTHER DIRECT COSTS				504,726		
H. TOTAL DIRECT COSTS (A THROUGH G)				1,072,333		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 56.0000, Base: 347669)						
TOTAL INDIRECT COSTS (F&A)				194,695		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				1,267,028		
K. RESIDUAL FUNDS						
				0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$ 1,267,028		\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Robert Gardner				FOR NSF USE ONLY		
ORG. REP. NAME* Carol Zuchner				INDIRECT COST RATE VERIFICATION		
		12/9/10	Date Checked		Date Of Rate Sheet	Initials - ORG
		12/15/10				

SUMMARY PROPOSAL BUDGET YEAR 5

ORGANIZATION University of Chicago				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Gardner				Proposed		Granted
				AWARD NO.		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer
	CAL	ACAD	SUMR			Funds granted by NSF (if different)
1. Robert Gardner - PI	4.80	0.00	0.00	\$	61,463	\$
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0	
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00		61,463	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0	
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	28.00	0.00	0.00		208,537	
3. (0) GRADUATE STUDENTS					0	
4. (0) UNDERGRADUATE STUDENTS					0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6. (0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)					270,000	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					62,100	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					332,100	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
compute server cluster upgrade				\$	221,895	
TOTAL EQUIPMENT					221,895	
E. TRAVEL						
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					12,000	
2. FOREIGN					12,000	
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS	\$		0			
2. TRAVEL			0			
3. SUBSISTENCE			0			
4. OTHER			0			
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0	
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES					2,600	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3. CONSULTANT SERVICES					0	
4. COMPUTER SERVICES					0	
5. SUBAWARDS					509,455	
6. OTHER					0	
TOTAL OTHER DIRECT COSTS					512,055	
H. TOTAL DIRECT COSTS (A THROUGH G)					1,090,050	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 56.0000, Base: 358700)						
TOTAL INDIRECT COSTS (F&A)					200,872	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,290,922	
K. RESIDUAL FUNDS					0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,290,922	\$
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$	
PI/PD NAME Robert Gardner				FOR NSF USE ONLY		
ORG. REP. NAME Carol Zuches				INDIRECT COST RATE VERIFICATION		
				Date Checked	Date Of Rate Sheet	Initials - ORG

Robert Gardner 12/9/10
Carol Zuches 12/15/10

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION				FOR NSF USE ONLY			
University of Chicago				PROPOSAL NO.	DURATION (months)		
					Proposed	Granted	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.			
Robert Gardner							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded person-months		Funds Requested By proposer	Funds granted by NSF (if different)
			CAL	ACAD	SUMR		
1.	Robert Gardner - PI		24.00	0.00	0.00	\$ 287,220	\$
2.							
3.							
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)		0.00	0.00	0.00	0	
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)		24.00	0.00	0.00	287,220	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS		0.00	0.00	0.00	0	
2.	(15) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		140.00	0.00	0.00	974,510	
3.	(0) GRADUATE STUDENTS					0	
4.	(0) UNDERGRADUATE STUDENTS					0	
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6.	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)						1,261,730	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						290,199	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						1,551,929	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
				\$ 1,101,612			
TOTAL EQUIPMENT						1,101,612	
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					60,000	
	2. FOREIGN					60,000	
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____	0					
2.	TRAVEL _____	0					
3.	SUBSISTENCE _____	0					
4.	OTHER _____	0					
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS						0	
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES					15,150	
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0	
3.	CONSULTANT SERVICES					0	
4.	COMPUTER SERVICES					0	
5.	SUBAWARDS					2,459,089	
6.	OTHER					0	
TOTAL OTHER DIRECT COSTS						2,474,239	
H. TOTAL DIRECT COSTS (A THROUGH G)						5,247,780	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)						972,765	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						6,220,545	
K. RESIDUAL FUNDS						0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 6,220,545	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
Robert Gardner				INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG	
Carol Zuchner							

Robert Gardner 12/9/10
Carol Zuchner 12/15/10

*ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

University of Chicago
Computation and Enrico Fermi Institutes
Budget Justification
For February 1, 2012 through January 31, 2013

A. Senior Personnel

Includes salary for the Principal Investigator corresponding to 40% FTE. A fringe benefit rate of 23% is used. We are requesting an exception to exceed NSF's standard 2 months salary rule for Robert Gardner [PI], who will be responsible for managing the U.S. ATLAS Computing Facilities Integration Program including developing a program of work of phased deliverables for computing fabric upgrades, integration of Grid services with site resources, and coordination of the each of the five U.S. ATLAS Tier 2 Centers and their integration with the Tier 1 Center at Brookhaven National Laboratory.

B. Other Personnel

Personnel include one full time Unix systems administrator, and 1/3 FTE of a second Unix systems administrator. A fringe benefit rate of 23% is used.

Personnel also include one full time developer for Grid data storage management tools and infrastructure.

C. Equipment

Equipment purchases each year are to expand the computing and storage capacity of the Midwest Tier 2 center clusters. These include compute (CPU) servers matching ATLAS specifications for processing speed, memory and local disk and RAID controllers, and storage systems which consist of a head storage server equipped with 10 Gigabit Ethernet interface and an external RAID controller connecting (via SAS) storage shelves containing hard disk drives. The purchases may include Ethernet switching units and other items (racks, cables, power distribution units) as appropriate to build the clusters. These quantities of these systems purchased at each institution will vary according to available budget after fixed costs.

D. Travel

Travel of \$12K/year to requested to fund trips for the PI (R. Gardner) and two computing professional staff to domestic U.S. ATLAS meetings (to Brookhaven National Laboratory in New York, or to other Tier 2 institutions). Approximately 18 person-trips per year are planned. International travel at the level of \$12K/year for trips to CERN (for ATLAS software weeks) and to conferences for the PI and the software developer of Grid data management tools is planned at 6 person-trips per year.

E. Other Direct Costs

Miscellaneous expenses for additional parts and/or supplies for the Tier2 center or for supporting group research are included, such as expenses for broadband wireless modems for laptops. These are absolutely necessary to provide access for troubleshooting and monitoring of the facility during non-business hours or during periods of travel away from the office.

F. Indirect Costs

A 56% indirect cost rate is applied to the Modified Total Direct Costs.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Massachusetts Amherst				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Stephane Willocq				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Stephane Willocq - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							138,590
TOTAL OTHER DIRECT COSTS							138,590
H. TOTAL DIRECT COSTS (A THROUGH G)							138,590
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 26% off-campus overhead rate (Rate: 26.0000, Base: 138591)							
TOTAL INDIRECT COSTS (F&A)							36,034
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							174,624
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 174,624 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Stephane Willocq				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of Massachusetts Amherst				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Stephane Willocq				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Stephane Willocq - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							142,748
TOTAL OTHER DIRECT COSTS							142,748
H. TOTAL DIRECT COSTS (A THROUGH G)							142,748
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 26% off-campus overhead rate (Rate: 26.0000, Base: 142749)							
TOTAL INDIRECT COSTS (F&A)							37,115
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							179,863
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 179,863 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Stephane Willocq				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Massachusetts Amherst				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Stephane Willocq				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Stephane Willocq - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							147,030
TOTAL OTHER DIRECT COSTS							147,030
H. TOTAL DIRECT COSTS (A THROUGH G)							147,030
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 26% off-campus overhead rate (Rate: 26.0000, Base: 147033)							
TOTAL INDIRECT COSTS (F&A)							38,229
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							185,259
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 185,259 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Stephane Willocq				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of Massachusetts Amherst				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Stephane Willocq				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/ PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Stephane Willocq - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						151,442
TOTAL OTHER DIRECT COSTS						151,442
H. TOTAL DIRECT COSTS (A THROUGH G)						151,442
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 26% off-campus overhead rate (Rate: 26.0000, Base: 151440)						
TOTAL INDIRECT COSTS (F&A)						39,374
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						190,816
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 190,816 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/ PD NAME Stephane Willocq				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of Massachusetts Amherst				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Stephane Willocq				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Stephane Willocq - Prof	0.00	0.00	0.00	\$	0	\$	
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00		0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (0) OTHER					0		
TOTAL SALARIES AND WAGES (A + B)					0		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					0		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					0		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					0		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____					0		
2. TRAVEL _____					0		
3. SUBSISTENCE _____					0		
4. OTHER _____					0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					155,985		
TOTAL OTHER DIRECT COSTS					155,985		
H. TOTAL DIRECT COSTS (A THROUGH G)					155,985		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) 26% off-campus overhead rate (Rate: 26.0000, Base: 155985)							
TOTAL INDIRECT COSTS (F&A)					40,556		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					196,541		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	196,541	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Stephane Willocq				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Massachusetts Amherst				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Stephane Willocq				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Stephane Willocq - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						735,795
TOTAL OTHER DIRECT COSTS						735,795
H. TOTAL DIRECT COSTS (A THROUGH G)						735,795
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						191,308
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						927,103
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 927,103
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME Stephane Willocq				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



UNIVERSITY OF MASSACHUSETTS
AMHERST

Research Administration Building
70 Butterfield Terrace
Amherst, MA 01003-9242

Office of Grant and
Contract Administration

voice: 413.545.0698
fax: 413.545.1202

December 17, 2010

Columbia University
Ann Therrien
Nevis Labs
PO Box 137
Irvington, NY 10533

RE: Proposed Subcontract to University of Massachusetts
UM Reference No. 111-0785
Entitled: Atlas Experiment at the Large Hadron Collider

Dear Ms. Therrien:


Attached is the subject proposal submitted on behalf of Professor Stephane Willocq of the Physics Department.

It is our understanding that this proposal will be included in a prime proposal which you are submitting to the National Science Foundation.

The University is looking forward to participating in this project, subject to the execution of a mutually acceptable subcontract.

If you have questions on the technical aspects of the proposal, please contact Professor Willocq at (413) 545-0525. Administrative concerns may be directed to Kimberley Broderick, Grant and Contract Administrator, at (413) 545-0698. In all future correspondence about this proposal, please refer to UMass Proposal No. 111-0785.

Sincerely,


Jennifer A. Donais, CRA
Associate Director

JD/as
attachment
cc: Willocq, P.I.

Statement of Work
USATLAS subcontract with UMass
1 Feb 2012 to 31 Jan 2017

The project to be funded under this subcontract consists of the development and maintenance of the ATLAS Muon Spectrometer software. This work will be done by Physicist/Programmer Edward Moyse in collaboration with the CERN based Muon Spectrometer software group. The reporting line is to Professor Willocq.

The planned tasks covered in this statement are part of activities that will start on Feb 1, 2012 and end by Jan 31, 2017. These tasks include:

- Development and maintenance of the muon event data model and common tracking software required for prompt processing of the ATLAS data as well as for reprocessing campaigns.
- Support of overall muon software infrastructure, including event display software.
- Muon software coordination.

Edward Moyse is located at CERN throughout the duration of the time period defined above. The title of the position is physicist/programmer.

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**NSF Proposal Year 1: 2/1/12 — 1/31/13
SUMMARY PROPOSAL BUDGET**

ORGANIZATION University of Massachusetts-Amherst				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Stephane Willocq				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. Stephane Willocq				0			\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER Reimbursement to CERN team account						138,590	
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)						138,590	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% off-campus overhead rate							
TOTAL INDIRECT COSTS (F&A)						36,034	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						174,624	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$174,624	\$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE	FOR NSF USE ONLY		
ORG. REP. TYPED NAME & SIGNATURE*				DATE	INDIRECT COST RATE VERIFICATION		
					Date Checked	Date of Rate Sheet	Initials-ORG

Budget Justification
UMass Subcontract from Columbia University
Year 1: 1 Feb 2012 to 31 Jan 2013

G.6	OTHER:		
	Software professional 1 FTE		
	Salary		\$115,360
	Health Insurance		\$6,000
	Materials & Supplies		\$2,000
	Travel/COLA		\$15,230
	2 trips at \$2,000/trip		
I	Indirect Costs:		
	Off-campus rate 26%		\$36,034
J	Total Direct and Indirect Costs		\$174,624

All expenses are included under the item "OTHER DIRECT COSTS" to allow us to use a Team Account at CERN for all expenses. UMass Amherst will apply the off-campus overhead rate of 26% on all expenses related to this proposal since the activity is entirely off campus (based at CERN in Geneva, Switzerland).

FOR NSF USE ONLY

**NSF Proposal Year 2: 2/1/13 — 1/31/14
SUMMARY PROPOSAL BUDGET**

ORGANIZATION University of Massachusetts-Amherst				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Stephane Willocq				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. Stephane Willocq				0			\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER Reimbursement to CERN team account				142,748			
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)				142,748			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% off-campus overhead rate							
TOTAL INDIRECT COSTS (F&A)				37,115			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				179,863			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$179,863		\$	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		INDIRECT COST RATE VERIFICATION	
				Date Checked		Date of Rate Sheet	
						Initials-ORG	

Budget Justification
UMass Subcontract from Columbia University
Year 2: 1 Feb 2013 to 31 Jan 2014

G.6	OTHER:		
	Software professional 1 FTE		
	Salary		\$118,821
	Health Insurance		\$6,180
	Materials & Supplies		\$2,050
	Travel/COLA		\$15,697
	2 trips at \$2,050/trip		
I	Indirect Costs:		
	Off-campus rate 26%		\$37,115
J	Total Direct and Indirect Costs		\$179,863

All expenses are included under the item "OTHER DIRECT COSTS" to allow us to use a Team Account at CERN for all expenses. UMass Amherst will apply the off-campus overhead rate of 26% on all expenses related to this proposal since the activity is entirely off campus (based at CERN in Geneva, Switzerland).

FOR NSF USE ONLY

**NSF Proposal Year 3: 2/1/14 — 1/31/15
SUMMARY PROPOSAL BUDGET**

ORGANIZATION University of Massachusetts-Amherst				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Stephane Willocq				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. Stephane Willocq				0			\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER Reimbursement to CERN team account				147,030			
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)				147,030			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% off-campus overhead rate							
TOTAL INDIRECT COSTS (F&A)				38,229			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				185,259			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$185,259		\$	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		INDIRECT COST RATE VERIFICATION	
				Date Checked		Date of Rate Sheet	
						Initials-ORG	

Budget Justification
UMass Subcontract from Columbia University
Year 3: 1 Feb 2014 to 31 Jan 2015

G.6	OTHER:		
	Software professional 1 FTE		
	Salary		\$122,386
	Health Insurance		\$6,365
	Materials & Supplies		\$2,100
	Travel/COLA		\$16,179
	2 trips at \$2,100/trip		
I	Indirect Costs:		
	Off-campus rate 26%		\$38,229
J	Total Direct and Indirect Costs		\$185,259

All expenses are included under the item "OTHER DIRECT COSTS" to allow us to use a Team Account at CERN for all expenses. UMass Amherst will apply the off-campus overhead rate of 26% on all expenses related to this proposal since the activity is entirely off campus (based at CERN in Geneva, Switzerland).

FOR NSF USE ONLY

**NSF Proposal Year 4: 2/1/15 — 1/31/16
SUMMARY PROPOSAL BUDGET**

ORGANIZATION University of Massachusetts-Amherst				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Stephane Willocq				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. Stephane Willocq				0			\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER Reimbursement to CERN team account						151,442	
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)						151,442	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% off-campus overhead rate							
TOTAL INDIRECT COSTS (F&A)						39,375	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						190,816	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$190,816	\$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE	FOR NSF USE ONLY		
ORG. REP. TYPED NAME & SIGNATURE*				DATE	INDIRECT COST RATE VERIFICATION		
					Date Checked	Date of Rate Sheet	Initials-ORG

Budget Justification
UMass Subcontract from Columbia University
Year 4: 1 Feb 2015 to 31 Jan 2016

G.6	OTHER:		
	Software professional 1 FTE		
	Salary		\$126,057
	Health Insurance		\$6,556
	Materials & Supplies		\$2,150
	Travel/COLA		\$16,678
	2 trips at \$2,150/trip		
I	Indirect Costs:		
	Off-campus rate 26%		\$39,375
J	Total Direct and Indirect Costs		\$190,816

All expenses are included under the item "OTHER DIRECT COSTS" to allow us to use a Team Account at CERN for all expenses. UMass Amherst will apply the off-campus overhead rate of 26% on all expenses related to this proposal since the activity is entirely off campus (based at CERN in Geneva, Switzerland).

FOR NSF USE ONLY

**NSF Proposal Year 5: 2/1/16 — 1/31/17
SUMMARY PROPOSAL BUDGET**

ORGANIZATION University of Massachusetts-Amherst				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Stephane Willocq				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. Stephane Willocq				0			\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER Reimbursement to CERN team account						155,985	
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)						155,985	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% off-campus overhead rate							
TOTAL INDIRECT COSTS (F&A)						40,556	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						196,541	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$196,541	\$
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE	FOR NSF USE ONLY		
ORG. REP. TYPED NAME & SIGNATURE*				DATE	INDIRECT COST RATE VERIFICATION		
					Date Checked	Date of Rate Sheet	Initials-ORG

Budget Justification
UMass Subcontract from Columbia University
Year 5: 1 Feb 2016 to 31 Jan 2017

G.6	OTHER:		
	Software professional 1 FTE		
	Salary		\$129,839
	Health Insurance		\$6,753
	Materials & Supplies		\$2,200
	Travel/COLA		\$17,193
	2 trips at \$2,200/trip		
I	Indirect Costs:		
	Off-campus rate 26%		\$40,556
J	Total Direct and Indirect Costs		\$196,541

All expenses are included under the item "OTHER DIRECT COSTS" to allow us to use a Team Account at CERN for all expenses. UMass Amherst will apply the off-campus overhead rate of 26% on all expenses related to this proposal since the activity is entirely off campus (based at CERN in Geneva, Switzerland).

FOR NSF USE ONLY

**NSF Proposal Cumulative: 2/1/12 — 1/31/17
SUMMARY PROPOSAL BUDGET**

ORGANIZATION University of Massachusetts-Amherst				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Dr. Stephane Willocq				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title. (A.7. Show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted by NSF (If Different)
				CAL	ACAD	SUMR	
1. Stephane Willocq				0			\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POSTDOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)							
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
TOTAL NUMBER OF PARTICIPANTS ()				TOTAL PARTICIPANT COSTS			
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER Reimbursement to CERN team account				735,794			
TOTAL OTHER DIRECT COSTS							
H. TOTAL DIRECT COSTS (A THROUGH G)				735,794			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 26% off-campus overhead rate							
TOTAL INDIRECT COSTS (F&A)				191,309			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				927,103			
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.j.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				927,103		\$	
M. COST SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT: \$			
PI/PD TYPED NAME AND SIGNATURE*				DATE		FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		INDIRECT COST RATE VERIFICATION	
						Date Checked	Date of Rate Sheet
						Initials-ORG	

Budget Justification
UMass Subcontract from Columbia University
Cumulative: 1 Feb 2012 to 31 Jan 2017

G.6	OTHER:		
	Software professional 1 FTE		
	Salary		\$612,463
	Health Insurance		\$31,854
	Materials & Supplies		\$10,500
	Travel/COLA		\$80,977
I	Indirect Costs:		
	Off-campus rate 26%		\$191,309
J	Total Direct and Indirect Costs		\$927,103

All expenses are included under the item "OTHER DIRECT COSTS" to allow us to use a Team Account at CERN for all expenses. UMass Amherst will apply the off-campus overhead rate of 26% on all expenses related to this proposal since the activity is entirely off campus (based at CERN in Geneva, Switzerland).

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN #: 043167352

DATE: July 8, 2009

INSTITUTION:
 University of Massachusetts at Amherst
 340 Whitmore Administration Bldg.
 181 Presidents Drive
 Amherst MA 01003-9313

FILING REF.: The preced:
 Agreement was dated
 June 26, 2008

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: FACILITIES AND ADMINISTRATIVE COST RATES*

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
PRED.	07/01/08	06/30/10	57.0	On-Campus	Research
PRED.	07/01/10	06/30/11	58.0	On-Campus	Research
PRED.	07/01/11	06/30/12	58.5	On-Campus	Research
PRED.	07/01/12	06/30/13	59.0	On-Campus	Research
PRED.	07/01/08	06/30/13	26.0	Off-Campus	Research
PRED.	07/01/08	06/30/13	47.0	On-Campus	Instruction
PRED.	07/01/08	06/30/13	26.0	Off-Campus	Instruction
PRED.	07/01/08	06/30/13	34.0	On-Campus	Other Sponsored Act.
PRED.	07/01/08	06/30/13	24.0	Off-Campus	Other Sponsored Act.
PROV.	07/01/13	UNTIL AMENDED	Use same rates and conditions as those cited for fiscal year ending June 30, 2013.		

*BASE:

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first \$25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of \$25,000.

INSTITUTION:
University of Massachusetts at Amherst

AGREEMENT DATE: July 8, 2009

SECTION II: SPECIAL REMARKS

TREATMENT OF PAID ABSENCES:

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made.

1. The rates in this Agreement have been negotiated to reflect the administrative cap provisions of the revisions to OMB Circular A-21 published by the Office of Management and Budget on May 8, 1996. No rate affecting the institution's fiscal periods beginning on or after October 1, 1991 contains total administrative cost components in excess of that 26 percent cap.

2. Fringe benefits are claimed using approved rates contained in the Massachusetts State-Wide Cost Allocation Plan. The following additional fixed fringe benefit charges are approved for the University:

	FYE 6/30/10	
Workers' Comp. Ins..	.37%	(S&W)
Health & Welfare(1)	\$13 per week	
Sick Leave Bank	.20%	(S&W)

(1) Health and Welfare - The State negotiated rate with collective bargaining units.

3. Equipment means an article of nonexpendable, tangible personal property having a useful life of more than one year, and an acquisition cost of \$5,000 or more per unit.

INSTITUTION:
University of Massachusetts at Amherst

AGREEMENT DATE: July 8, 2009

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that been created as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accounted consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to the programs.

BY THE INSTITUTION:

University of Massachusetts at Amherst

(INSTITUTION)

Joyce M. Hatch
(SIGNATURE)

Joyce M. Hatch

(NAME)

Vice Chancellor for Administration & Finance

(TITLE)

7/9/2010

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

Robert I. Aaronson
(SIGNATURE)

Robert I. Aaronson

(NAME)

DIRECTOR, DIVISION OF COST ALLOCATION

(TITLE)

July 8, 2009

(DATE) 0742

HHS REPRESENTATIVE: Michael Stanco

Telephone: (212) 264-2069

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Michigan Ann Arbor				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Ball				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
	CAL	ACAD	SUMR				
1. Robert Ball - Senior Engineer	11.00	0.00	0.00	\$	76,949	\$	
2. Shawn P McKee - Prof	2.40	0.00	0.00		19,029		
3. Homer Neal - Prof	0.00	0.00	0.00		0		
4. Bing Zhou - Prof	0.00	0.00	0.00		0		
5. Junjie Zhu - Asst Prof	0.00	0.00	0.00		0		
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)	13.40	0.00	0.00		95,978		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	36.00	0.00	0.00		118,680		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (1) OTHER					37,080		
TOTAL SALARIES AND WAGES (A + B)					251,738		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					72,406		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					324,144		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
grid computing system (computers, storagenodes, networking)				\$	122,030		
TOTAL EQUIPMENT					122,030		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					9,900		
2. FOREIGN					60,713		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					38,604		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					23,810		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					218,125		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					280,539		
H. TOTAL DIRECT COSTS (A THROUGH G)					797,326		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 298992) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					179,404		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					976,730		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	976,730	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Robert Ball				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs**

MTDC T2 (Rate: 55.5000, Base 158182)

subaward >25k (Rate: 55.5000, Base 25000)

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION University of Michigan Ann Arbor				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Ball				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Robert Ball - Senior Engineer				11.00	0.00	0.00	\$ 79,257
2. Shawn P McKee - Prof				2.40	0.00	0.00	19,600
3. Homer Neal - Prof				0.00	0.00	0.00	0
4. Bing Zhou - Prof				0.00	0.00	0.00	0
5. Junjie Zhu - Asst Prof				0.00	0.00	0.00	0
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)				13.40	0.00	0.00	98,857
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24.00	0.00	0.00	90,508
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							38,193
TOTAL SALARIES AND WAGES (A + B)							227,558
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							65,693
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							293,251
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
grid computing system (computers, storagenodes, networking)				\$	128,514		
TOTAL EQUIPMENT							128,514
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							9,800
2. FOREIGN							54,900
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							39,099
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							24,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							228,375
6. OTHER							0
TOTAL OTHER DIRECT COSTS							291,474
H. TOTAL DIRECT COSTS (A THROUGH G)							777,939
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 258921) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							157,301
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							935,240
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$	935,240
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Robert Ball				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs**
MTDC T2 (Rate: 55.5000, Base 162129)

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Michigan Ann Arbor				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Ball				AWARD NO.	Proposed	Granted
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)		
				CAL	ACAD	SUMR
1. Robert Ball - Senior Engineer				11.00	0.00	0.00
2. Shawn P McKee - Prof				2.40	0.00	0.00
3. Homer Neal - Prof				0.00	0.00	0.00
4. Bing Zhou - Prof				0.00	0.00	0.00
5. Junjie Zhu - Asst Prof				0.00	0.00	0.00
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)				13.40	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (1) OTHER						39,338
TOTAL SALARIES AND WAGES (A + B)						234,384
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						67,664
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						302,048
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
grid computing system (computers, storagenodes, networking)				\$	128,461	
TOTAL EQUIPMENT						128,461
E. TRAVEL						
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						9,900
2. FOREIGN						56,800
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0)						
TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						38,772
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						25,000
4. COMPUTER SERVICES						0
5. SUBAWARDS						231,801
6. OTHER						0
TOTAL OTHER DIRECT COSTS						295,573
H. TOTAL DIRECT COSTS (A THROUGH G)						792,782
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 26.0000, Base: 266683) (Cont. on Comments Page)						
TOTAL INDIRECT COSTS (F&A)						161,378
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						954,160
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	954,160	\$
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$	
PI/PI NAME Robert Ball				FOR NSF USE ONLY		
				INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME* Alexander Samsky				Date Checked	Date Of Rate Sheet	Initials - ORG

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs**
MTDC T2 (Rate: 55.5000, Base 165838)

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of Michigan Ann Arbor				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Ball				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Robert Ball - Senior Engineer				11.00	0.00	0.00	\$ 84,084
2. Shawn P McKee - Prof				2.40	0.00	0.00	20,794
3. Homer Neal - Prof				0.00	0.00	0.00	0
4. Bing Zhou - Prof				0.00	0.00	0.00	0
5. Junjie Zhu - Asst Prof				0.00	0.00	0.00	0
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)				13.40	0.00	0.00	104,878
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24.00	0.00	0.00	96,020
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							40,519
TOTAL SALARIES AND WAGES (A + B)							241,417
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							69,694
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							311,111
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
grid computing system (computers, storagenodes, networking)				\$	128,101		
TOTAL EQUIPMENT							128,101
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							9,800
2. FOREIGN							60,067
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							38,500
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							25,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							235,278
6. OTHER							0
TOTAL OTHER DIRECT COSTS							298,778
H. TOTAL DIRECT COSTS (A THROUGH G)							807,857
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 274683) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							165,653
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							973,510
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$	973,510
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PD NAME				FOR NSF USE ONLY			
Robert Ball				INDIRECT COST RATE VERIFICATION			
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG	
Alexander Samsky							

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs**
MTDC T2 (Rate: 55.5000, Base 169793)

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of Michigan Ann Arbor				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Ball				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/ PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
	CAL	ACAD	SUMR				
1. Robert Ball - Senior Engineer	11.00	0.00	0.00	\$	86,606	\$	
2. Shawn P McKee - Prof	2.40	0.00	0.00		21,418		
3. Homer Neal - Prof	0.00	0.00	0.00		0		
4. Bing Zhou - Prof	0.00	0.00	0.00		0		
5. Junjie Zhu - Asst Prof	0.00	0.00	0.00		0		
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0		
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)	13.40	0.00	0.00		108,024		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00		0		
2. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	24.00	0.00	0.00		98,901		
3. (0) GRADUATE STUDENTS					0		
4. (0) UNDERGRADUATE STUDENTS					0		
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0		
6. (1) OTHER					41,734		
TOTAL SALARIES AND WAGES (A + B)					248,659		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					71,785		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					320,444		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
grid computing system (computers, storagenodes, networking)				\$	127,643		
TOTAL EQUIPMENT					127,643		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					9,900		
2. FOREIGN					61,722		
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					38,734		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					26,000		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					238,807		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					303,541		
H. TOTAL DIRECT COSTS (A THROUGH G)					823,250		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 26.0000, Base: 282929) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					170,060		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					993,310		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	993,310	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/ PD NAME Robert Ball				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs**

MTDC T2 (Rate: 55.5000, Base 173871)

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION University of Michigan Ann Arbor				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert Ball				AWARD NO.			
				Proposed	Granted		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Robert Ball - Senior Engineer				55.00	0.00	0.00	\$ 408,531
2. Shawn P McKee - Prof				12.00	0.00	0.00	101,029
3. Homer Neal - Prof				0.00	0.00	0.00	0
4. Bing Zhou - Prof				0.00	0.00	0.00	0
5. Junjie Zhu - Asst Prof				0.00	0.00	0.00	0
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (5) TOTAL SENIOR PERSONNEL (1 - 6)				67.00	0.00	0.00	509,560
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (11) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				132.00	0.00	0.00	497,332
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (5) OTHER							196,864
TOTAL SALARIES AND WAGES (A + B)							1,203,756
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							347,242
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							1,550,998
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
				\$	634,749		
TOTAL EQUIPMENT							634,749
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							49,300
2. FOREIGN							294,202
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							193,709
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							123,810
4. COMPUTER SERVICES							0
5. SUBAWARDS							1,152,386
6. OTHER							0
TOTAL OTHER DIRECT COSTS							1,469,905
H. TOTAL DIRECT COSTS (A THROUGH G)							3,999,154
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							833,796
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							4,832,950
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 4,832,950 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Robert Ball				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Sponsors: NSF(prime) Columbia (direct)
 10/1/2011-9/30/2016

For the period

YEAR Total

CUMULATIVE BUDGET-NSF

FOR NSF USE ONLY

ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109					PROPOSAL NO.			DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Zhou					AWARD NO.			Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					NSF Funded Person-months			Funds Requested By	
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR	Proposer	
1.	Bing		Zhou	Professor, PI	0.00	0.00	0.00	\$0	
2.	Homer		Neal	Professor	0.00	0.00	0.00	\$0	
3.	Junjie		Zhu	Assistant Professor	0.00	0.00	0.00	\$0	
() TOTAL SENIOR PERSONNEL (1-6)								\$0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)									
1. (0) POST DOCTORAL ASSOCIATES					0.00	0.00	0.00	\$0	
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					0.00	0.00	0.00	\$497,332	
3. (3) GRADUATE STUDENTS								\$0	
4. (0) UNDERGRADUATE STUDENTS								\$0	
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)								\$0	
6. (0) OTHER								\$196,864	
TOTAL SALARIES AND WAGES (A+B)								\$694,196	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 28% est of sS&W								\$194,375	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								\$888,571	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)									
TOTAL EQUIPMENT								\$0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								\$0	
2. FOREIGN								\$269,902	
F. PARTICIPANT SUPPORT COSTS									
1. STIPENDS								\$0	
2. TRAVEL								\$0	
3. SUBSISTENCE								\$0	
4. OTHER								\$0	
(0) TOTAL NUMBER OF PARTICIPANTS								\$0	
G. OTHER DIRECT COSTS									
1. MATERIALS AND SUPPLIES								\$99,924	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								\$0	
3. CONSULTANT SERVICES								\$123,810	
4. COMPUTERS SERVICES								\$0	
5. SUBAWARDS								\$0	
6. OTHER Graduate Student Tuition Expenses								\$0	
TOTAL OTHER DIRECT COSTS								\$223,734	
H. TOTAL DIRECT COSTS (A THROUGH G)								\$1,382,207	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)									
Name of indirect cost item					Amount		Rate		
modified Total Direct Costs					\$1,382,207		26.0%	\$359,374	
TOTAL INDIRECT COSTS								\$359,373	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								\$1,741,580	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)								\$0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$1,741,580	
M. COST SHARING: PROPOSED LEVEL					AGREED LEVEL IF DIFFERENT \$			\$0	
PI/PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY				
INST. REP. TYPED NAME & SIGNATURE*				DATE	INDIRECT COST RATE VERIFICATION				
				12/9/10	Date Checked	Date Rate of Sheet			

For the period

10/1/2011-9/30/2012

YEAR 1

Title:				FOR NSF USE ONLY			
ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109				PROPOSAL NO.		DURATION (MONTHS)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Bing				AWARD NO.		Funds	
						Granted by NSF	
A. SENIOR PERSONNEL: PI/PD, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months			Funds Requested By Proposer
0.	Bing		Title	CAL	ACAD	SUMR	
1.	Bing	Zhou	Professor, PI	0.00	0.00	0.00	\$0
2.	Homer	Neal	Professor	0.00	0.00	0.00	\$0
3.	Junjie	Zhu	Assistant Professor	0.00	0.00	0.00	\$0
() TOTAL SENIOR PERSONNEL (1-6)							\$0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	\$0
2. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				36.00	0.00	0.00	\$118,680
3. (0) GRADUATE STUDENTS							\$0
4. (0) UNDERGRADUATE STUDENTS							\$0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							\$0
6. (0.5) OTHER (Electric Engineer-6 months)							\$37,080
TOTAL SALARIES AND WAGES (A+B)							\$155,760
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 28% est of sS&W							\$43,613
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							\$199,373
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$0
2. FOREIGN							\$55,913
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$0							
2. TRAVEL \$0							
3. SUBSISTENCE \$0							
4. OTHER \$0							
(0) TOTAL NUMBER OF PARTICIPANTS							\$0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							\$19,896
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							\$0
3. CONSULTANT SERVICES (Chapman .25 FTE)							\$23,810
4. COMPUTERS SERVICES							\$0
5. SUBAWARDS							\$0
6. OTHER Graduate Student Tuition Expenses							\$0
TOTAL OTHER DIRECT COSTS							\$43,706
H. TOTAL DIRECT COSTS (A THROUGH G)							\$298,992
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
Name of indirect cost item		Amount	Rate				
modified Total Direct Costs		\$298,992	26.0%	\$77,738			
TOTAL INDIRECT COSTS							\$77,738
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							\$376,730
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)							\$0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$376,730
M. COST SHARING: PROPOSED LEVEL				AGREED LEVEL IF DIFFERENT \$			\$0
PI/PD TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Bing				12/19/10		INDIRECT COST RATE VERIFICATION	
INST. REP. TYPED NAME & SIGNATURE				DATE		Date Checked	Date Rate of Sheet

David M. Plawchan
 Managing Project Representative
 Div. of Research Develop. & Admin.

For the period

10/1/2012-9/30/2013

YEAR 2

				FOR NSF USE ONLY				
ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109				PROPOSAL NO.		DURATION (MONTHS)		
						Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Zhou				AWARD NO.		Funds		
						Granted by NSF		
A. SENIOR PERSONNEL: PI/PD, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months			Funds Requested By	
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR	Proposer
1.	Bing		Zhou	Professor, PI	0.00	0.00	0.00	\$0
2.	Homer		Neal	Professor	0.00	0.00	0.00	\$0
3.	Junjie		Zhu	Assistant Professor	0.00	0.00	0.00	\$0
() TOTAL SENIOR PERSONNEL (1-6)								\$0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	(0) POST DOCTORAL ASSOCIATES			0.00	0.00	0.00		\$0
2.	(2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			24.00	0.00	0.00		\$90,508
3.	(0) GRADUATE STUDENTS							\$0
4.	(0) UNDERGRADUATE STUDENTS							\$0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							\$0
6.	(0.5) OTHER(Electric engineer, 6 months)							\$38,193
TOTAL SALARIES AND WAGES (A+B)								\$128,701
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 28% est of sS&W								\$36,036
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								\$164,737
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)								
0								
TOTAL EQUIPMENT								\$0
E. TRAVEL								
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								\$0
2. FOREIGN								\$50,000
F. PARTICIPANT SUPPORT COSTS								
1.	STIPENDS							\$0
2.	TRAVEL							\$0
3.	SUBSISTENCE							\$0
4.	OTHER							\$0
(0) TOTAL NUMBER OF PARTICIPANTS								\$0
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES								\$20,184
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								\$0
3. CONSULTANT SERVICES (Chapman .25 FTE)								\$24,000
4. COMPUTERS SERVICES								\$0
5. SUBAWARDS								\$0
6. OTHER Graduate Student Tuition Expenses								\$0
TOTAL OTHER DIRECT COSTS								\$44,184
H. TOTAL DIRECT COSTS (A THROUGH G)								\$258,921
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
Name of indirect cost item				Amount	Rate			
modified Total Direct Costs				\$258,921	26.0%	\$67,320		
TOTAL INDIRECT COSTS								\$67,320
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								\$326,240
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)								\$0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$326,240
M. COST SHARING: PROPOSED LEVEL				AGREED LEVEL IF DIFFERENT \$				\$0
PI/PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY			
INST. REP. TYPED NAME & SIGNATURE*				DATE	INDIRECT COST RATE VERIFICATION			
				12/9/10	Date Checked	Date Rate of Sheet		

NSF Form 1030 (10/97) Includes All Previous Editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III.B)

David M. Plawchan
 Managing Project Representative
 Div. of Research Develop. & Admin.

For the period

10/1/2013-9/30/2014

YEAR 3

ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109					FOR NSF USE ONLY				
					PROPOSAL NO.		DURATION (MONTHS)		Funds Granted by NSF
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Zhou					AWARD NO.		Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					NSF Funded Person-months			Funds Requested By Proposer	
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR		
1.	Bing		Zhou	Professor, PI	0.00	0.00	0.00	\$0	
2.	Homer		Neal	Professor	0.00	0.00	0.00	\$0	
3.	Junjie		Zhu	Assistant Professor	0.00	0.00	0.00	\$0	
() TOTAL SENIOR PERSONNEL (1-6)								\$0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)									
1.	(0)	POST DOCTORAL ASSOCIATES			0.00	0.00	0.00	\$0	
2.	(2)	OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			24.00	0.00	0.00	\$93,223	
3.	(0)	GRADUATE STUDENTS						\$0	
4.	(0)	UNDERGRADUATE STUDENTS						\$0	
5.	(0)	SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						\$0	
6.	(0.5)	OTHER (Electric engineer, 6 months)						\$39,338	
TOTAL SALARIES AND WAGES (A+B)								\$132,561	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 28% est of s&w								\$37,117	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								\$169,678	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)									
TOTAL EQUIPMENT								\$0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								\$0	
2. FOREIGN								\$52,000	
F. PARTICIPANT SUPPORT COSTS									
1.	STIPENDS			\$0					
2.	TRAVEL			\$0					
3.	SUBSISTENCE			\$0					
4.	OTHER			\$0					
(0) TOTAL NUMBER OF PARTICIPANTS								\$0	
G. OTHER DIRECT COSTS									
1. MATERIALS AND SUPPLIES								\$20,004	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								\$0	
3. CONSULTANT SERVICES (Chapman .25 fte)								\$25,000	
4. COMPUTERS SERVICES								\$0	
5. SUBAWARDS								\$0	
6. OTHER Graduate Student Tuition Expenses								\$0	
TOTAL OTHER DIRECT COSTS								\$45,004	
H. TOTAL DIRECT COSTS (A THROUGH G)								\$266,682	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)									
Name of indirect cost item		Amount		Rate					
modified Total Direct Costs		\$266,682		26.0%		\$69,337			
TOTAL INDIRECT COSTS								\$69,338	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								\$336,020	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)								\$0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$336,020	
M. COST SHARING: PROPOSED LEVEL					AGREED LEVEL IF DIFFERENT \$			\$0	
PI/PI TYPED NAME & SIGNATURE*					DATE		FOR NSF USE ONLY		
0							INDIRECT COST RATE VERIFICATION		
INST. REP. TYPED NAME & SIGNATURE*					DATE		Date Checked	Date Rate of Sheet	
					12/9/10				

NSF Form 1030 (10/97) Supersedes All Previous Editions

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III.B)

David M. Plawchan
 Managing Project Representative
 Div. of Research Develop. & Admin.

For the period

10/1/2014-9/30/2015

YEAR 4

ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109				FOR NSF USE ONLY			
				PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Zhou				AWARD NO.		Funds Granted by NSF	
A. SENIOR PERSONNEL: PI/PI, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months			Funds Requested By Proposer
0.	First Name	M Last Name	Title	CAL	ACAD	SUMR	
1.	Bing	Zhou	Professor, PI	0.00	0.00	0.00	\$0
2.	Homer	Neal	Professor	0.00	0.00	0.00	\$0
3.	Junjie	Zhu	Assistant Professor	0.00	0.00	0.00	\$0
() TOTAL SENIOR PERSONNEL (1-6)							\$0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES			0.00	0.00	0.00	\$0
2.	(2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			24.00	0.00	0.00	\$96,020
3.	(0) GRADUATE STUDENTS						\$0
4.	(0) UNDERGRADUATE STUDENTS						\$0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						\$0
6.	(0.5) OTHER (Electric engineer, 6 months)						\$40,519
TOTAL SALARIES AND WAGES (A+B)							\$136,539
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 28% est of sS&W							\$38,231
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							\$174,770
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							\$0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$0
2. FOREIGN							\$55,167
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS						\$0
2.	TRAVEL						\$0
3.	SUBSISTENCE						\$0
4.	OTHER						\$0
(0) TOTAL NUMBER OF PARTICIPANTS							\$0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							\$19,746
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							\$0
3. CONSULTANT SERVICES							\$25,000
4. COMPUTERS SERVICES							\$0
5. SUBAWARDS							\$0
6. OTHER Graduate Student Tuition Expenses							\$0
TOTAL OTHER DIRECT COSTS							\$44,746
H. TOTAL DIRECT COSTS (A THROUGH G)							\$274,683
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
Name of indirect cost item		Amount	Rate				
modified Total Direct Costs		\$274,683	26.0%				\$71,418
TOTAL INDIRECT COSTS							\$71,418
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							\$346,100
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)							\$0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$346,100
M. COST SHARING: PROPOSED LEVEL				AGREED LEVEL IF DIFFERENT \$			\$0
PI/PI TYPED NAME & SIGNATURE*		DATE		FOR NSF USE ONLY			
INST. REP. TYPED NAME & SIGNATURE*		DATE		INDIRECT COST RATE VERIFICATION			
		12/9/10		Date Checked	Date Rate of Sheet		

David M. Pawchan
 Managing Project Representative
 Div. of Research Develop. & Admin.

For the period

10/1/2015-9/30/2016

YEAR 5

					FOR NSF USE ONLY				
ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109					PROPOSAL NO.		DURATION (MONTHS)		
							Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Zhou					AWARD NO.		Funds		
							Granted by NSF		
A. SENIOR PERSONNEL: PI/PI, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					NSF Funded Person-months			Funds Requested By	
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR	Proposer	
1.	Bing		Zhou	Professor, PI	0.00	0.00	0.00	\$0	
2.	Homer		Neal	Professor	0.00	0.00	0.00	\$0	
3.	Junjie		Zhu	Assistant Professor	0.00	0.00	0.00	\$0	
(3) TOTAL SENIOR PERSONNEL (1-6)								\$0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)									
1.	(0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	\$0	
2.	(2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24.00	0.00	0.00	\$98,901	
3.	(0) GRADUATE STUDENTS							\$0	
4.	(0) UNDERGRADUATE STUDENTS							\$0	
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							\$0	
6.	(0.5) OTHER (Electric engineer)							\$41,734	
TOTAL SALARIES AND WAGES (A+B)								\$140,635	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 28% est of SS&W								\$39,378	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								\$180,013	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)									
TOTAL EQUIPMENT								\$0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								\$0	
2. FOREIGN								\$56,822	
F. PARTICIPANT SUPPORT COSTS									
1. STIPENDS								\$0	
2. TRAVEL								\$0	
3. SUBSISTENCE								\$0	
4. OTHER								\$0	
(0) TOTAL NUMBER OF PARTICIPANTS								\$0	
G. OTHER DIRECT COSTS									
1. MATERIALS AND SUPPLIES								\$20,094	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								\$0	
3. CONSULTANT SERVICES								\$26,000	
4. COMPUTERS SERVICES								\$0	
5. SUBAWARDS								\$0	
6. OTHER Graduate Student Tuition Expenses								\$0	
TOTAL OTHER DIRECT COSTS								\$46,094	
H. TOTAL DIRECT COSTS (A THROUGH G)								\$282,929	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)									
Name of indirect cost item					Amount		Rate		
modified Total Direct Costs					\$282,929		26.0%	\$73,561	
TOTAL INDIRECT COSTS								\$73,561	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								\$356,490	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)								\$0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$356,490	
M. COST SHARING: PROPOSED LEVEL					AGREED LEVEL IF DIFFERENT \$				\$0
PI/PD TYPED NAME & SIGNATURE*					DATE		FOR NSF USE ONLY		
INST. REP. TYPED NAME & SIGNATURE*					DATE		INDIRECT COST RATE VERIFICATION		
							Date Checked	Date Rate of Sheet	

NSF Form 1030 (10/97) Superfund Review Edition

*SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPG III.B)

David M. Flawchan
 Managing Project Representative
 Div. of Research Develop. & Admin.

BUDGET JUSTIFICATION

*U.S. ATLAS Operations: Empowering University Physics to make Discoveries
at the Energy Frontier
PI: BING ZHOU*

Senior Personnel

Principal Investigator—Bing Zhou, Professor: who will coordinate all personnel effort on the project; but is requesting no summer month support from this proposal.

Co-Investigator

– Homer Neal, Professor: who is the Institute Representative to oversee the UM ATLAS project activities; but is requesting no summer month support from this proposal.

– Zhu, Junjie Assistant Professor, who is in charge of Muon MDT detector electronics maintenance and upgrade; but is requesting no summer month support from this proposal.

Other Personnel

Tiesheng Dai— Electric engineer, who is responsible for maintaining and improving the muon configuration database, diagnose the Muon frontend electronics and CMS readout system for MDT detector. A support for Dai at 50% level is required in this proposal. Compensation rate is based on salary of _\$76,636 per year, with increases of 3% each year.

Claudio Ferretti— Computing Professional, who is responsible for maintaining the mezzaning and CMS inventory for Muon system and operating the B-sensors and Temperature monitoring of the Muon system as well as helping the maintaining and operating the entire MDT system for ATLAS. A full support for Ferretti is required in this proposal. Compensation rate is based on salary of \$45,000 per year, with increases of 3% each year.

Ben Meekhof— Computing Assistance, who is responsible for maintaining and operating the Linux computing cluster for muon calibration center at Michigan. A full support for Meekhof is required in this proposal. Compensation rate is based on salary of \$40,000 per year, with increases of 3% each year.

Jianbei Liu— Physics engineer, who is responsible for maintaining and operating the ATLAS MDT gas system. A full support for Liu for FY2012 is required in this proposal. Compensation rate is based on salary of \$33,680 per year, with increases of 3% each year.

J Chapman— A technical consultant, who was the muon CMS designer and production projector, is required to be supported at 25% level per year (\$24,000) for electronics diagnose and fixing the CMS firmware problems.

Fringe Benefits

The fringe benefit rate is calculated at 28% which is based on University wide cost estimates for the average for above positions.

Travel –

Foreign: Total \$55,913 is required for the first year, similar for the rest years in the proposal. The cost includes the COLA (Cost of Living Adjustment) cost at CERN for Dai, Ferretti and Liu (\$45,000). Additional \$10,913 is budgeted for three trips to CERN by Chapman and Meekhof at a rate of \$3638 per trip (ticket costs \$1200; and housing/per diem/rental car cost 2438 for two weeks) The amounts were determined by comparing prices for airfare and lodging on the web.

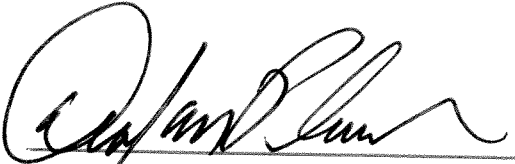
Other Direct Costs

Materials and Supplies: We have been budgeted a total of \$19,890 each year for lab materials and consumables, including the pre-fixed drift gases for gas monitor calibration, the lab safety supplies, the computing system (including parts) for chamber test and communications – (disposable cell phones are required for communications between researchers only while at the large CERN facility in Switzerland.), DB

recording, the chamber maintaining tools (such as gas leak detector), and other operational costs at CERN. The amount was determined by looking at previous yearly expenditures for the laboratory.

Indirect Costs

Over 50% of research will be off campus, located at CERN facility in Geneva Switzerland. The current indirect cost rate of 26% is based upon an approved rate from DHHS for off campus research.



David M. Plawchan
Managing Project Representative
Div. of Research Develop. & Admin.

Sponsors Direct : Columbia

Prime : NSF

For the period 10/1/2011-9/30/16

YEAR Total

CUMULATIVE BUDGET-NSF

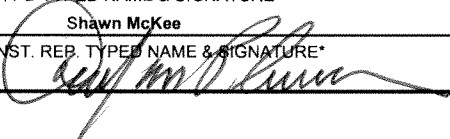
FOR NSF USE ONLY

ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109				PROPOSAL NO.		DURATION (MONTHS) Proposed Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Shawn McKee				AWARD NO.		Funds Granted by NSF	
A. SENIOR PERSONNEL: PI/PI, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months			Funds Requested By
0.	First Name	M Last Name	Title	CAL	ACAD	SUMR	Proposer
1.	1 Shawn	McKee	Associate Research Scientist	12.00	0.00	0.00	\$101,029
2.	1 Bob	Ball	Senior Engineer	55.00	0.00	0.00	\$408,531
3.				0.00	0.00	0.00	\$0
(2) TOTAL SENIOR PERSONNEL (1-6)							\$509,560
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES			0.00	0.00	0.00	\$0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	\$0
3.	(0) GRADUATE STUDENTS						\$0
4.	(0) UNDERGRADUATE STUDENTS						\$0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						\$0
6.	(1) OTHER						\$0
TOTAL SALARIES AND WAGES (A+B)							\$509,560
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 30% est of sS&W							\$152,868
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							\$662,428
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
\$5 Grid Computing System (computers, storagenodes, networking components) 1 each year							
TOTAL EQUIPMENT							\$634,749
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$49,300
2. FOREIGN							\$24,300
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS		\$0				
2.	TRAVEL		\$0				
3.	SUBSISTENCE		\$0				
4.	OTHER		\$0				
(0) TOTAL NUMBER OF PARTICIPANTS							\$0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							\$93,785
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							\$0
3. CONSULTANT SERVICES							\$0
4. COMPUTERS SERVICES							\$0
5. SUBAWARDS(Michigan State)							\$1,152,386
6. OTHER Graduate Student Tuition Expenses							\$0
TOTAL OTHER DIRECT COSTS							\$1,246,171
H. TOTAL DIRECT COSTS (A THROUGH G)							\$2,616,948
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
Name of indirect cost item		Amount	Rate				
modified Total Direct Costs		\$829,813	55.5%	\$460,546			
subaward > 25K		\$25,000	55.5%	\$13,875			
TOTAL INDIRECT COSTS							\$474,422
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							\$3,091,370
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)							\$0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$3,091,370
M. COST SHARING: PROPOSED LEVEL				AGREED LEVEL IF DIFFERENT \$			\$0
PI/PI TYPED NAME & SIGNATURE*			DATE	FOR NSF USE ONLY			
Shawn McKee				INDIRECT COST RATE VERIFICATION			
INST. REP. TYPED NAME & SIGNATURE			DATE	Date Checked	Date Rate of Sheet		
			12/16/10				

For the period

10/1/1/2011-9/30/2012

YEAR 1

Title:				FOR NSF USE ONLY				
ORGANIZATION				PROPOSAL NO.		DURATION (MONTHS)		
The Regents of The University of Michigan, Ann Arbor, MI 48109						Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.		Funds		
Shawn McKee						Granted by NSF		
A. SENIOR PERSONNEL: PI/PI, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months			Funds Requested By	
0.	Shawn		Title	CAL	ACAD	SUMR	Proposer	
1.	1 Shawn	McKee	Professor, PI	2.40	0.00	0.00	\$19,029	
2.	1 Bob	Ball	Senior Engineer	11.00	0.00	0.00	\$76,949	
3.				0.00	0.00	0.00	\$0	
(2) TOTAL SENIOR PERSONNEL (1-6)							\$95,978	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	(0)	POST DOCTORAL ASSOCIATES		0.00	0.00	0.00	\$0	
2.	(0)	OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		0.00	0.00	0.00	\$0	
3.	(0)	GRADUATE STUDENTS					\$0	
4.	(0)	UNDERGRADUATE STUDENTS					\$0	
5.	(0)	SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					\$0	
6.	(0)	OTHER					\$0	
TOTAL SALARIES AND WAGES (A+B)							\$95,978	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 30% est of s&W							\$28,793	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							\$124,771	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)								
Grid Computing System (computers, storagenodes, networking components)								
TOTAL EQUIPMENT							\$122,030	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$9,900	
2. FOREIGN							\$4,800	
F. PARTICIPANT SUPPORT COSTS								
1.	STIPENDS		\$0					
2.	TRAVEL		\$0					
3.	SUBSISTENCE		\$0					
4.	OTHER		\$0					
(0) TOTAL NUMBER OF PARTICIPANTS							\$0	
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES							\$18,708	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							\$0	
3. CONSULTANT SERVICES							\$0	
4. COMPUTERS SERVICES							\$0	
5. SUBAWARDS(Michigan State)							\$218,125	
6. OTHER Graduate Student Tuition Expenses							\$0	
TOTAL OTHER DIRECT COSTS							\$236,833	
H. TOTAL DIRECT COSTS (A THROUGH G)							\$498,335	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
Name of indirect cost item		Amount	Rate					
modified Total Direct Costs		\$158,180	55.5%	\$87,790				
subaward > 25K		\$25,000	55.5%	\$13,875				
TOTAL INDIRECT COSTS							\$101,665	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							\$600,000	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)							\$0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$600,000	
M. COST SHARING: PROPOSED LEVEL				AGREED LEVEL IF DIFFERENT \$		\$0		
PI/PI TYPED NAME & SIGNATURE*			DATE	FOR NSF USE ONLY				
Shawn McKee				INDIRECT COST RATE VERIFICATION				
INST. REP. TYPED NAME & SIGNATURE*			DATE	Date Checked	Date Rate of Sheet			
			12/16/10					

For the period

10/1/2012-9/30/2013

YEAR 2

ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109					FOR NSF USE ONLY		
					PROPOSAL NO.	DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Shawn McKee					AWARD NO.	Proposed	Granted
A. SENIOR PERSONNEL: PI/PD, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					NSF Funded Person-months		
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR
1.	1 Shawn		McKee	Professor, PI	2.40	0.00	0.00
2.	1 Bob		Ball	Senior Engineer	11.00	0.00	0.00
3.					0.00	0.00	0.00
(2) TOTAL SENIOR PERSONNEL (1-6)							\$98,857
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00
3.	(0) GRADUATE STUDENTS						\$0
4.	(0) UNDERGRADUATE STUDENTS						\$0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						\$0
6.	(0) OTHER						\$0
TOTAL SALARIES AND WAGES (A+B)							\$98,857
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 30% est of s&w							\$29,657
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							\$128,514
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
Grid Computing System (computers, storagenodes, networking components) \$128,514							\$128,514
TOTAL EQUIPMENT							\$128,514
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							\$9,800
2. FOREIGN							\$4,900
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$0							
2. TRAVEL \$0							
3. SUBSISTENCE \$0							
4. OTHER \$0							
(0) TOTAL NUMBER OF PARTICIPANTS							\$0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							\$18,915
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							\$0
3. CONSULTANT SERVICES							\$0
4. COMPUTERS SERVICES							\$0
5. SUBAWARDS(Michigan State)							\$228,375
6. OTHER Graduate Student Tuition Expenses							\$0
TOTAL OTHER DIRECT COSTS							\$247,290
H. TOTAL DIRECT COSTS (A THROUGH G)							\$519,018
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
Name of indirect cost item					Amount	Rate	
modified Total Direct Costs					\$162,129	55.5%	\$89,982
subaward > 25K					\$0	55.5%	\$0
TOTAL INDIRECT COSTS							\$89,982
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							\$609,000
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)							\$0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$609,000
M. COST SHARING: PROPOSED LEVEL					AGREED LEVEL IF DIFFERENT \$		\$0
PI/PD TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY		
Shawn McKee					INDIRECT COST RATE VERIFICATION		
INST. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date Rate of Sheet	
[Signature]				12/16/10			

the period

10/1/2013-9/30/2014

YEAR 3

							FOR NSF USE ONLY																																																				
ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109							PROPOSAL NO.		DURATION (MONTHS)																																																		
							AWARD NO.		Proposed	Granted																																																	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Shawn McKee							Funds Granted by NSF																																																				
SENIOR PERSONNEL: PI/PD, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)							NSF Funded Person-months			Funds Requested By Proposer																																																	
<table border="1"> <thead> <tr> <th>First Name</th> <th>M</th> <th>Last Name</th> <th>Title</th> <th>CAL</th> <th>ACAD</th> <th>SUMR</th> <th colspan="2"></th> </tr> </thead> <tbody> <tr> <td>1 Shawn</td> <td></td> <td>McKee</td> <td>Professor, PI</td> <td>2.40</td> <td>0.00</td> <td>0.00</td> <td colspan="2">\$20,188</td> </tr> <tr> <td>1 Bob</td> <td></td> <td>Ball</td> <td>Senior Engineer</td> <td>11.00</td> <td>0.00</td> <td>0.00</td> <td colspan="2">\$81,635</td> </tr> <tr> <td colspan="7"></td> <td colspan="2">\$0</td> </tr> <tr> <td colspan="7">2) TOTAL SENIOR PERSONNEL (1-6)</td> <td colspan="2"></td> <td colspan="2">\$101,823</td> </tr> </tbody> </table>							First Name	M	Last Name	Title	CAL	ACAD	SUMR			1 Shawn		McKee	Professor, PI	2.40	0.00	0.00	\$20,188		1 Bob		Ball	Senior Engineer	11.00	0.00	0.00	\$81,635									\$0		2) TOTAL SENIOR PERSONNEL (1-6)									\$101,823							
First Name	M	Last Name	Title	CAL	ACAD	SUMR																																																					
1 Shawn		McKee	Professor, PI	2.40	0.00	0.00	\$20,188																																																				
1 Bob		Ball	Senior Engineer	11.00	0.00	0.00	\$81,635																																																				
							\$0																																																				
2) TOTAL SENIOR PERSONNEL (1-6)									\$101,823																																																		
OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)																																																											
0) POST DOCTORAL ASSOCIATES							0.00		0.00		0.00		\$0																																														
0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							0.00		0.00		0.00		\$0																																														
0) GRADUATE STUDENTS													\$0																																														
0) UNDERGRADUATE STUDENTS													\$0																																														
0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)													\$0																																														
0) OTHER													\$0																																														
TOTAL SALARIES AND WAGES (A+B)													\$101,823																																														
FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)													\$30,547																																														
													30% est of sS&W																																														
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)													\$132,370																																														
PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)																																																											
Grid Computing System (computers, storagenodes, networking components) 128,461													\$128,461																																														
TOTAL EQUIPMENT													\$128,461																																														
TRAVEL													\$9,900																																														
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)																																																											
2. FOREIGN													\$4,800																																														
PARTICIPANT SUPPORT COSTS																																																											
1. STIPENDS													\$0																																														
2. TRAVEL													\$0																																														
3. SUBSISTENCE													\$0																																														
4. OTHER													\$0																																														
0) TOTAL NUMBER OF PARTICIPANTS													\$0																																														
OTHER DIRECT COSTS																																																											
1. MATERIALS AND SUPPLIES													\$18,768																																														
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION													\$0																																														
3. CONSULTANT SERVICES													\$0																																														
4. COMPUTERS SERVICES													\$0																																														
5. SUBAWARDS(Michigan State)													\$231,801																																														
6. OTHER Graduate Student Tuition Expenses													\$0																																														
TOTAL OTHER DIRECT COSTS													\$250,569																																														
TOTAL DIRECT COSTS (A THROUGH G)													\$526,100																																														
INDIRECT COSTS (SPECIFY RATE AND BASE)																																																											
Name of indirect cost item							Amount		Rate																																																		
modified Total Direct Costs							\$165,838		55.5%				\$92,040																																														
subaward > 25K							\$0		55.5%				\$0																																														
TOTAL INDIRECT COSTS													\$92,040																																														
TOTAL DIRECT AND INDIRECT COSTS (H+I)													\$618,140																																														
RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)													\$0																																														
AMOUNT OF THIS REQUEST (J) OR (J MINUS K)													\$618,140																																														
COST SHARING: PROPOSED LEVEL									AGREED LEVEL IF DIFFERENT \$				\$0																																														
D TYPED NAME & SIGNATURE*							DATE		FOR NSF USE ONLY																																																		
Shawn McKee							12/16/10		INDIRECT COST RATE VERIFICATION																																																		
F. REP. TYPED NAME & SIGNATURE*							DATE		Date Checked		Date Rate of Sheet																																																

For the period

10/11/2014-9/0/2015

YEAR 4

ORGANIZATION The Regents of The University of Michigan, Ann Arbor, MI 48109					FOR NSF USE ONLY			
					PROPOSAL NO.	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Shawn McKee					AWARD NO.	Funds Granted by NSF		
A. SENIOR PERSONNEL: PI/PP, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					NSF Funded Person-months			Funds Requested By Proposer
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR	
1.	1 Shawn		McKee	Professor, PI	2.40	0.00	0.00	\$20,794
2.	1 Bob		Ball	Senior Engineer	11.00	0.00	0.00	\$84,084
3.					0.00	0.00	0.00	\$0
(2) TOTAL SENIOR PERSONNEL (1-6)								\$104,878
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)								
1.	(0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	\$0
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	\$0
3.	(0) GRADUATE STUDENTS							\$0
4.	(0) UNDERGRADUATE STUDENTS							\$0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							\$0
6.	(0) OTHER							\$0
TOTAL SALARIES AND WAGES (A+B)								\$104,878
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 30% est of sS&W								\$31,463
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								\$136,341
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)								
Grid Computing System (computers, storagenodes, networking components) 128,101								\$128,101
TOTAL EQUIPMENT								\$128,101
E. TRAVEL								
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								\$9,800
2. FOREIGN								\$4,900
F. PARTICIPANT SUPPORT COSTS								
1. STIPENDS								\$0
2. TRAVEL								\$0
3. SUBSISTENCE								\$0
4. OTHER								\$0
(0) TOTAL NUMBER OF PARTICIPANTS								\$0
G. OTHER DIRECT COSTS								
1. MATERIALS AND SUPPLIES								\$18,754
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								\$0
3. CONSULTANT SERVICES								\$0
4. COMPUTERS SERVICES								\$0
5. SUBAWARDS(Michigan State)								\$235,278
6. OTHER Graduate Student Tuition Expenses								\$0
TOTAL OTHER DIRECT COSTS								\$254,032
H. TOTAL DIRECT COSTS (A THROUGH G)								\$533,174
I. INDIRECT COSTS (SPECIFY RATE AND BASE)								
Name of indirect cost item					Amount	Rate		
modified Total Direct Costs					\$169,795	55.5%	\$94,236	
subaward > 25K					\$0	55.5%	\$0	
TOTAL INDIRECT COSTS								\$94,236
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								\$627,410
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)								\$0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$627,410
M. COST SHARING: PROPOSED LEVEL					AGREED LEVEL IF DIFFERENT \$			\$0
PI/PP TYPED NAME & SIGNATURE*				DATE	FOR NSF USE ONLY			
Shawn McKee					INDIRECT COST RATE VERIFICATION			
INST. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date Rate of Sheet		
				12/16/10				

For the period

10/11/2015-9/30/2016

YEAR 5

					FOR NSF USE ONLY				
ORGANIZATION					PROPOSAL NO.		DURATION (MONTHS)		
The Regents of The University of Michigan, Ann Arbor, MI 48109							Proposed	Granted	
							Funds Granted by NSF		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR					AWARD NO.				
Shawn McKee									
A. SENIOR PERSONNEL: PI/PI, Co-PI'S, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					NSF Funded Person-months			Funds Requested By Proposer	
0.	First Name	M	Last Name	Title	CAL	ACAD	SUMR		
1.	1 Shawn		McKee	Professor, PI	2.40	0.00	0.00	\$21,418	
2.	1 Bob		Ball	Senior Engineer	11.00	0.00	0.00	\$86,606	
3.					0.00	0.00	0.00	\$0	
(2) TOTAL SENIOR PERSONNEL (1-6)								\$108,024	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)									
1.	(0)	POST DOCTORAL ASSOCIATES			0.00	0.00	0.00	\$0	
2.	(0)	OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00	\$0	
3.	(0)	GRADUATE STUDENTS						\$0	
4.	(0)	UNDERGRADUATE STUDENTS						\$0	
5.	(0)	SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						\$0	
6.	(0)	OTHER						\$0	
TOTAL SALARIES AND WAGES (A+B)								\$108,024	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS) 30% est of s&w								\$32,407	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)								\$140,431	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)									
Grid Computing System (computers, storagenodes, networking components) 127643									
TOTAL EQUIPMENT								\$127,643	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)								\$9,900	
2. FOREIGN								\$4,900	
F. PARTICIPANT SUPPORT COSTS									
1. STIPENDS \$0									
2. TRAVEL \$0									
3. SUBSISTENCE \$0									
4. OTHER \$0									
(0) TOTAL NUMBER OF PARTICIPANTS								\$0	
G. OTHER DIRECT COSTS									
1. MATERIALS AND SUPPLIES								\$18,640	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION								\$0	
3. CONSULTANT SERVICES								\$0	
4. COMPUTERS SERVICES								\$0	
5. SUBAWARDS(Michigan State)								\$238,807	
6. OTHER Graduate Student Tuition Expenses								\$0	
TOTAL OTHER DIRECT COSTS								\$257,447	
H. TOTAL DIRECT COSTS (A THROUGH G)								\$540,321	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)									
Name of indirect cost item					Amount	Rate			
modified Total Direct Costs					\$173,871	55.5%	\$96,499		
subaward > 25K					\$0	55.5%	\$0		
TOTAL INDIRECT COSTS								\$96,499	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)								\$636,820	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.)								\$0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)								\$636,820	
M. COST SHARING: PROPOSED LEVEL					AGREED LEVEL IF DIFFERENT \$			\$0	
PI/PI TYPED NAME & SIGNATURE*					DATE		FOR NSF USE ONLY		
Shawn McKee							INDIRECT COST RATE VERIFICATION		
INST. REP. TYPED NAME & SIGNATURE*					DATE		Date Checked	Date Rate of Sheet	

BUDGET JUSTIFICATION
Atlas Great Lakes Tier 2 Center
PI: Shawn McKee

Senior Personnel

Principal Investigator — McKee, Shawn Research Scientist, who will direct the project; and will be paid 2.4 Calendar months each year from the award at his current salary rate of \$7,925 per month. It is based on current market conditions for his level of expertise.

Other Personnel

Senior Engineer— Ball, Robert, who will manage the Tier-2 center and will be paid 11 Calendar months each year from the award at his current salary rate of \$6,996 per month. It is based on current market conditions for his level of expertise.

Note: Increase of 3% is factored in each year for salaries.

Fringe Benefits

The fringe benefit rate is calculated at 30% for personnel based on University wide cost estimates for the average for these positions.

Equipment

Each year we purchase computers, storage and network components for our grid computing system to deliver on our USATLAS MOU resource requirements. Individual components may be less than the equipment price limit but are part of the larger grid computing system and thus are equipment. The annual equipment budget is estimated based upon standardized pricing used USATLAS-wide and will just meet our MOU requirements in each year.

Travel

Domestic: All members of the Tier-2 travel to various domestic facility meetings, grid and networking workshops annually. Based upon our experience during the first 5-year period of AGLT2 we estimate 8 trips annually; 2-3 Tier-2 members attending two facility meetings and single members attending 3-4 other meetings and workshops. The amounts were determined by comparing prices for airfare and lodging on the web and using our prior experiences. Typical cost is \$1225/person (varies by meeting...this is an average) and we therefore budget \$9800 for domestic travel.

Foreign: All members of the Tier-2 travel internationally to relevant meetings and international conferences. Typically, relevant meetings like HEPHX, CHEP and grid and networking meetings are held at international venues. The amounts were determined by comparing prices for airfare and lodging on the web and using our prior experience. Typical cost is \$2450/person and 2 meetings annually are assumed. We therefore are budgeting \$4900 for international travel.

Other Direct Costs

Materials and Supplies: We have budgeted approximately \$6500/year in miscellaneous parts and component costs (cables, disks, memory, software, etc). The amount was determined by looking at previous yearly expenditures for AGLT2.

Facility Expense: We have two known yearly expenses: 1) yearly support fees for VMware for approximately \$3000/year and 2) network peering charges for our wide-area network connections for approximately \$9000/year. In addition, our existing 10GE WAN connectivity from Michigan to Chicago and from Michigan to Michigan State will be provided at no cost to the project.

Subcontract: Each year we subcontract to Michigan State University for their participation in AGLT2. The first year expense will be \$218,125. The second year will be \$228,375 and will increase by 1.5% in each of the succeeding years.

Indirect Costs

The current indirect cost rate of 55.5% is based upon an approved rate from DHHS.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Pittsburgh				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Joseph F Boudreau				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Joseph F Boudreau - Prof			0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			12.00	0.00	0.00	79,216
3.	(0) GRADUATE STUDENTS						0
4.	(0) UNDERGRADUATE STUDENTS						0
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)							79,216
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							26,616
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							105,832
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							8,870
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						3,227
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							3,227
H. TOTAL DIRECT COSTS (A THROUGH G)							117,929
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 24.0000, Base: 117929)							
TOTAL INDIRECT COSTS (F&A)							28,303
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							146,232
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 146,232 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Joseph F Boudreau				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet			Initials - ORG	

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION University of Pittsburgh				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Joseph F Boudreau				AWARD NO.	Proposed	Granted
				NSF Funded Person-months		
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Joseph F Boudreau - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						81,592
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						27,415
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						109,007
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						9,136
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____ 0						
2. TRAVEL _____ 0						
3. SUBSISTENCE _____ 0						
4. OTHER _____ 0						
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						3,324
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						3,324
H. TOTAL DIRECT COSTS (A THROUGH G)						121,467
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 24.0000, Base: 121467)						
TOTAL INDIRECT COSTS (F&A)						29,152
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						150,619
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 150,619 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Joseph F Boudreau				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Pittsburgh				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Joseph F Boudreau				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Joseph F Boudreau - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						84,040
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						28,237
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						112,277
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						9,410
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						3,424
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						3,424
H. TOTAL DIRECT COSTS (A THROUGH G)						125,111
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 24.0000, Base: 125111)						
TOTAL INDIRECT COSTS (F&A)						30,027
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						155,138
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 155,138 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME Joseph F Boudreau				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION University of Pittsburgh				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Joseph F Boudreau				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Joseph F Boudreau - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12.00	0.00	0.00	86,561
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							86,561
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							29,085
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							115,646
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							9,692
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							3,527
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							3,527
H. TOTAL DIRECT COSTS (A THROUGH G)							128,865
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 24.0000, Base: 128864)							
TOTAL INDIRECT COSTS (F&A)							30,927
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							159,792
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 159,792 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Joseph F Boudreau				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of Pittsburgh				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Joseph F Boudreau				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Joseph F Boudreau - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						89,158
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						29,957
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						119,115
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						9,983
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						3,633
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						3,633
H. TOTAL DIRECT COSTS (A THROUGH G)						132,731
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 24.0000, Base: 132731)						
TOTAL INDIRECT COSTS (F&A)						31,855
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						164,586
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 164,586 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Joseph F Boudreau				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Pittsburgh				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Joseph F Boudreau				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Joseph F Boudreau - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (5) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				60.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						420,567
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						141,310
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						561,877
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						0
2. FOREIGN						47,091
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						17,135
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						0
4. COMPUTER SERVICES						0
5. SUBAWARDS						0
6. OTHER						0
TOTAL OTHER DIRECT COSTS						17,135
H. TOTAL DIRECT COSTS (A THROUGH G)						626,103
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
TOTAL INDIRECT COSTS (F&A)						150,264
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						776,367
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 776,367
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PP NAME Joseph F Boudreau				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY
PROPOSAL BUDGET

				FOR NSF USE ONLY			
ORGANIZATION				PROPOSAL	DURATION (MONTHS)		
University of Pittsburgh, 350 Thackeray Hall, Pittsburgh PA 15260					Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.			
Joseph F. Boudreau							
A. SENIOR PERSONNEL: P/PO, Co-PIs, Faculty and Other Senior Associates (List each separately with title, A.T. show number in brackets)				NSF Funded Person-month		Funds Requested By Proposer	Funds Granted By NSF (if Different)
				CAL	ACAD/SUMM		
1.							
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12		79,216	
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)						79,216	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						26,616	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						105,832	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN						8,870	
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						3,227	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER							
TOTAL OTHER DIRECT COSTS						3,227	
H. TOTAL DIRECT COSTS (A THROUGH G)							
						117,929	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
24.0% of MTEC Base - \$117,929							
TOTAL INDIRECT COSTS						28,303	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							
						146,232	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG 11.0.7.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						146,232	\$
M. COST-SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
P/PO TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Joseph F. Boudreau <i>Joseph F. Boudreau</i>				9/26/2010		INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
Alan A. DiPalma, Director, Office of Research <i>Alan A. DiPalma</i>				12/15/10			Initials-ORG

**NSF Cooperative Agreement on ATLAS Operation:
University of Pittsburgh Budget Justification
FY 2012**

B.2.	Other Professionals - Programmer: Vakhtang Tsulaia	(12.0 PM)	\$79,216
C.	Fringe Benefits	(33.6%)	26,616
E.2.	Travel - Foreign: 2 trips to U.S.A @ \$2,700 2 trips to ATLAS meetings/workshops/tutorials @ \$1,735		\$5,400 <u>3,470</u> 8,870
G.1.	Other Direct Costs - Materials and Supplies: Rackmount processor		3,227
I.	Indirect Costs	(24% of MTDC - \$117,929)	28,303
J.	Total Direct and Indirect Costs		\$146,232

SUMMARY
PROPOSAL BUDGET

ORGANIZATION University of Pittsburgh, 350 Thackeray Hall, Pittsburgh PA 15260				FOR NSF USE ONLY			
				PROPOSAL	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Joseph F. Boudreau				AWARD NO.			
A. SENIOR PERSONNEL: PI/PO, Co-PIs, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted By NSF (if Different)
				CAL	ACAD	SUMM	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.							
2.	1			12			81,592
3.							
4.							
5.							
6.							
TOTAL SALARIES AND WAGES (A+B)							81,592
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							27,415
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							109,007
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							9,136
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$					
2.	TRAVEL	\$					
3.	SUBSISTENCE	\$					
4.	OTHER	\$					
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES						3,324
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3.	CONSULTANT SERVICES						
4.	COMPUTER SERVICES						
5.	SUBAWARDS						
6.	OTHER						
TOTAL OTHER DIRECT COSTS							3,324
H. TOTAL DIRECT COSTS (A THROUGH G)							121,467
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
34.0% of MTEC Base - \$121,467							
TOTAL INDIRECT COSTS							29,152
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							150,619
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG 11.D.7.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							150,619 \$
M. COST-SHARING: PROPOSED LEVEL 1				AGREED LEVEL IF DIFFERENT 1			
PI/PO TYPED NAME & SIGNATURE*				FOR NSF USE ONLY			
Joseph F. Boudreau				INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE*				DATE	Date Checked	Date of Rate Sheet	Initials-ORG
Alan A. DiPalma, Director, Office of Research				7 Dec 2010			
				12/15/10			

**NSF Cooperative Agreement on ATLAS Operation:
University of Pittsburgh Budget Justification
FY 2013**

B.2.	Other Professionals - Programmer: Vakhtang Tsulaia	(12.0 PM)	\$81,592
C.	Fringe Benefits	(33.6%)	27,415
E.2.	Travel - Foreign: 2 trips to U.S.A @ \$2,780 2 trips to ATLAS meetings/workshops/tutorials @ \$1,788	\$5,560 <u>3,576</u>	9,136
G.1.	Other Direct Costs - Materials and Supplies: Laptop		3,324
I.	Indirect Costs	(24% of MTDC - \$121,467)	29,152
J.	Total Direct and Indirect Costs		\$150,619

SUMMARY
PROPOSAL BUDGET

ORGANIZATION University of Pittsburgh, 350 Thackeray Hall, Pittsburgh PA 15260				FOR NSF USE ONLY			
				PROPOSAL	DURATION (MONTHS)		
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Joseph F. Boudreau				AWARD NO.		Proposed	Granted
A. SENIOR PERSONNEL: P/VP, Co-PIs, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF-Funded Person-months		Funds Requested By Proposer	Funds Granted By NSF (if Different)
		CAL	ACAD	SUMR			
1.							
2.							
3.							
4.							
5.							
6.							
7.							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.							
2.	1				12	84,040	
3.							
4.							
5.							
6.							
TOTAL SALARIES AND WAGES (A+B)						84,040	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						28,237	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)						112,277	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN						9,410	
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$					
2.	TRAVEL	\$					
3.	SUBSISTENCE	\$					
4.	OTHER	\$					
TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1.	MATERIALS AND SUPPLIES					3,424	
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						
3.	CONSULTANT SERVICES						
4.	COMPUTER SERVICES						
5.	SUBAWARDS						
6.	OTHER						
TOTAL OTHER DIRECT COSTS						3,424	
H. TOTAL DIRECT COSTS (A THROUGH G)						125,111	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
24.0% of MTDC Base - \$125,111							
TOTAL INDIRECT COSTS						30,027	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						155,138	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG 11.D.7.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						155,138	\$
M. COST-SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
P/VP TYPED NAME & SIGNATURE Joseph F. Boudreau				FOR NSF USE ONLY			
DATE 1/15/14				INDIRECT COST RATE VERIFICATION			
ORG. REP. TYPED NAME & SIGNATURE Alan A. DiPalma, Director, Office of Research				DATE 12/15/14	Date Checked	Date of Rate Sheet	Initials-ORG

**NSF Cooperative Agreement on ATLAS Operation:
University of Pittsburgh Budget Justification
FY 2014**

B.2.	Other Professionals - Programmer: Vakhtang Tsulaia	(12.0 PM)	\$84,040
C.	Fringe Benefits	(33.6%)	28,237
E.2.	Travel - Foreign: 2 trips to U.S.A @ \$2,864		\$5,728
	2 trips to ATLAS meetings/workshops/tutorials @ \$1,841		<u>3,682</u>
			9,410
G.1.	Other Direct Costs - Materials and Supplies: Disk storage		3,424
I.	Indirect Costs	(24% of MTDC - \$125,111)	30,027
J.	Total Direct and Indirect Costs		\$155,138

SUMMARY
PROPOSAL BUDGET

ORGANIZATION				FOR NSF USE ONLY			
				PROPOSAL	DURATION (MONTHS)		
University of Pittsburgh, 350 Thackeray Hall, Pittsburgh PA 15260					Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR				AWARD NO.			
Joseph F. Boudreau							
A. SENIOR PERSONNEL: P/PO, Co-PIs, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF-Funds Person-month		Funds Requested By Proposer	Funds Granted By NSF (if Different)
				CAL	ACAD	SUMM	
1.							
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12			86,561
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							86,561
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							29,085
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							115,646
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN						9,092	
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						3,527	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER _____							
TOTAL OTHER DIRECT COSTS						3,527	
H. TOTAL DIRECT COSTS (A THROUGH G)						128,865	
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
24.0% of MTRC Base - \$128,865							
TOTAL INDIRECT COSTS						30,927	
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)						159,792	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPO 11.D.7.)							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						159,792	\$
M. COST-SHARING: PROPOSED LEVEL \$ _____				AGREED LEVEL IF DIFFERENT \$ _____			
P/PO TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Joseph F. Boudreau <i>Joseph F. Boudreau</i>				7/12/15		INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		Initials-ORG	
Allen A. DiPalma, Director, Office of Research <i>Allen A. DiPalma</i>				12/15/13			

**NSF Cooperative Agreement on ATLAS Operation:
University of Pittsburgh Budget Justification
FY 2015**

B.2.	Other Professionals - Programmer: Vakhtang Tsulaia	(12.0 PM)	\$86,561
C.	Fringe Benefits	(33.6%)	29,085
E.2.	Travel - Foreign: 2 trips to U.S.A @ \$2,950 2 trips to ATLAS meetings/workshops/tutorials @ \$1,896	\$5,900 <u>3,792</u>	9,692
G.1.	Other Direct Costs - Materials and Supplies: Disk storage		3,527
I.	Indirect Costs	(24% of MTDC - \$128,865)	30,927
J.	Total Direct and Indirect Costs		\$159,792

**SUMMARY
PROPOSAL BUDGET**

ORGANIZATION				FOR NSF USE ONLY			
				PROPOSAL	DURATION (MONTHS)		AWARD NO.
University of Pittsburgh, 350 Thackeray Hall, Pittsburgh PA 15260					Proposed	Granted	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR							
Joseph F. Boudreau							
A. SENIOR PERSONNEL: P/PI, Co-PIs, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF-Funds Person-month		Funds Requested By Proposer	Funds Granted By NSF (if Different)
				CAL	ACAD	SUMR	
1.							
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. () TOTAL SENIOR PERSONNEL (1-6)							
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. (1) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				12			89,158
3. () GRADUATE STUDENTS							
4. () UNDERGRADUATE STUDENTS							
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							
6. () OTHER							
TOTAL SALARIES AND WAGES (A+B)							89,158
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							29,957
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)							119,115
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000)							
TOTAL EQUIPMENT							
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							
2. FOREIGN							9,983
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL \$ _____							
3. SUBSISTENCE \$ _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							3,633
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER SERVICES							
5. SUBAWARDS							
6. OTHER _____							
TOTAL OTHER DIRECT COSTS							3,633
H. TOTAL DIRECT COSTS (A THROUGH G)							132,731
I. INDIRECT COSTS (SPECIFY RATE AND BASE)							
24.0% of NTDC Base - \$132,731							
TOTAL INDIRECT COSTS							31,856
J. TOTAL DIRECT AND INDIRECT COSTS (H+I)							164,586
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE (GPG 11.D.7.))							
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							164,586 \$
M. COST-SHARING: PROPOSED LEVEL \$				AGREED LEVEL IF DIFFERENT \$			
PI/PI TYPED NAME & SIGNATURE*				DATE		FOR NSF USE ONLY	
Joseph F. Boudreau <i>J.F. Boudreau</i>				7 Dec 2015		INDIRECT COST RATE VERIFICATION	
ORG. REP. TYPED NAME & SIGNATURE*				DATE		Date Checked	Date of Rate Sheet
Allen A. DiPalma, Director, Office of Research <i>Allen A. DiPalma</i>				10/15/15			Initials-ORG

**NSF Cooperative Agreement on ATLAS Operation:
University of Pittsburgh Budget Justification
FY 2016**

B.2.	Other Professionals - Programmer: Vakhtang Tsulaia	(12.0 PM)	\$89,158
C.	Fringe Benefits	(33.6%)	29,957
E.2.	Travel - Foreign:		
	2 trips to U.S.A @ \$3,040		\$6,080
	2 trips to ATLAS meetings/workshops/tutorials @ \$1,951.50		<u>3,903</u>
			9,983
G.1.	Other Direct Costs - Materials and Supplies: Rack mount processor		3,633
I.	Indirect Costs	(24% of MTDC - \$132,731)	31,855
J.	Total Direct and Indirect Costs		\$164,586

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Texas at Arlington				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kaushik De				AWARD NO.	Proposed	Granted
					NSF Funded Person-months	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				CAL	ACAD	SUMR
1. Kaushik De - Prof				0.00	0.00	0.00
2.						
3.						
4.						
5.						
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				78.00	0.00	0.00
3. (0) GRADUATE STUDENTS						0
4. (0) UNDERGRADUATE STUDENTS						0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6. (0) OTHER						0
TOTAL SALARIES AND WAGES (A + B)						385,706
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						115,712
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						501,418
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
Tier 2 computing farm				\$	232,238	
TOTAL EQUIPMENT						232,238
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						17,000
2. FOREIGN						70,000
F. PARTICIPANT SUPPORT COSTS						
1. STIPENDS \$ _____				0		
2. TRAVEL _____				0		
3. SUBSISTENCE _____				0		
4. OTHER _____				0		
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1. MATERIALS AND SUPPLIES						30,178
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3. CONSULTANT SERVICES						10,000
4. COMPUTER SERVICES						0
5. SUBAWARDS						115,000
6. OTHER						0
TOTAL OTHER DIRECT COSTS						155,178
H. TOTAL DIRECT COSTS (A THROUGH G)						975,834
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
off campus MTDC (Rate: 26.0000, Base: 230482) (Cont. on Comments Page)						
TOTAL INDIRECT COSTS (F&A)						269,366
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						1,245,200
K. RESIDUAL FUNDS						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	1,245,200	\$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Kaushik De				FOR NSF USE ONLY		
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

**** I- Indirect Costs
on campus MTDC (Rate: 49.5000, Base 423113)**

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION				FOR NSF USE ONLY			
University of Texas at Arlington				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kaushik De				AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kaushik De - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				78.00	0.00	0.00	397,277
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							397,277
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							119,183
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							516,460
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Tier 2 computing farm				\$	258,051		
TOTAL EQUIPMENT							258,051
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							17,000
2. FOREIGN							70,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							25,960
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							10,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							115,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							150,960
H. TOTAL DIRECT COSTS (A THROUGH G)							1,012,471
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
off campus MTDC (Rate: 26.0000, Base: 235863) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							261,085
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,273,556
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 1,273,556 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME				FOR NSF USE ONLY			
Kaushik De				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	
ORG. REP. NAME*							
Alexander Samsky							

SUMMARY PROPOSAL BUDGET COMMENTS - Year 2

**** I- Indirect Costs
on campus MTDC (Rate: 49.5000, Base 403557)**

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Texas at Arlington				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kaushik De				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PP, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Kaushik De - Prof	0.00	0.00	0.00	\$ 0	\$	
2.							
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	78.00	0.00	0.00	409,196		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					409,196		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					122,759		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					531,955		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
	Tier 2 computing farm			\$ 261,458			
TOTAL EQUIPMENT					261,458		
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					17,000		
2. FOREIGN					70,000		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____			0			
2.	TRAVEL _____			0			
3.	SUBSISTENCE _____			0			
4.	OTHER _____			0			
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS	0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					28,828		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					10,000		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					115,000		
6. OTHER					0		
TOTAL OTHER DIRECT COSTS					153,828		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,034,241		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
off campus MTDC (Rate: 26.0000, Base: 243469) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)					268,387		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					1,302,628		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					\$ 1,302,628	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PP NAME Kaushik De				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET COMMENTS - Year 3

**** I- Indirect Costs
on campus MTDC (Rate: 49.5000, Base 414313)**

SUMMARY PROPOSAL BUDGET

YEAR 4

ORGANIZATION				FOR NSF USE ONLY			
University of Texas at Arlington				PROPOSAL NO.		DURATION (months)	
						Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kaushik De				AWARD NO.			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kaushik De - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				78.00	0.00	0.00	421,472
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							421,472
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							126,441
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							547,913
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Tier 2 computing farm				\$	264,829		
TOTAL EQUIPMENT							264,829
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							20,000
2. FOREIGN							72,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							25,851
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							10,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							115,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							150,851
H. TOTAL DIRECT COSTS (A THROUGH G)							1,055,593
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
off campus MTDC (Rate: 26.0000, Base: 245372) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							276,841
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,332,434
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 1,332,434 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
Kaushik De				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	
ORG. REP. NAME*							
Alexander Samsky							

SUMMARY PROPOSAL BUDGET COMMENTS - Year 4

**** I- Indirect Costs
on campus MTDC (Rate: 49.5000, Base 430392)**

SUMMARY PROPOSAL BUDGET

YEAR 5

ORGANIZATION University of Texas at Arlington				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kaushik De				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Kaushik De - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				78.00	0.00	0.00	434,116
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							434,116
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							130,235
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							564,351
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Tier 2 computing farm				\$	268,163		
TOTAL EQUIPMENT							268,163
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							20,000
2. FOREIGN							72,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0)							
TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							28,335
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							10,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							115,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							153,335
H. TOTAL DIRECT COSTS (A THROUGH G)							1,077,849
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
off campus MTDC (Rate: 26.0000, Base: 249882) (Cont. on Comments Page)							
TOTAL INDIRECT COSTS (F&A)							285,147
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							1,362,996
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 1,362,996 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Kaushik De				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

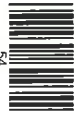
SUMMARY PROPOSAL BUDGET COMMENTS - Year 5

**** I- Indirect Costs
on campus MTDC (Rate: 49.5000, Base 444804)**

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Texas at Arlington				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kaushik De				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1. Kaushik De - Prof				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.00	0.00	0.00	0
2. (35) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				390.00	0.00	0.00	2,047,767
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							2,047,767
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							614,330
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							2,662,097
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
							\$ 1,284,739
TOTAL EQUIPMENT							1,284,739
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							91,000
2. FOREIGN							354,000
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							0
2. TRAVEL _____							0
3. SUBSISTENCE _____							0
4. OTHER _____							0
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							139,152
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							50,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							575,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							764,152
H. TOTAL DIRECT COSTS (A THROUGH G)							5,155,988
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							1,360,826
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							6,516,814
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 6,516,814 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Kaushik De				FOR NSF USE ONLY			
ORG. REP. NAME* Alexander Samsky				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET



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SUMMARY PROPOSAL BUDGET

ORGANIZATION
The University of Texas at Arlington

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Kaushik De

PROPOSAL NO.

DURATION (MONTHS)

AWARD NO.

Proposed

Granted

A. SENIOR PERSONNEL: P/PI/D, Co-PIs, Faculty and Other Senior Associates

List each separately with name and title. (A.7. Show number in brackets)

	NSF-Funded Person-months	Funds Requested By Proposer	Funds Granted by NSF (If Different)
1		\$	\$
2			
3			
4			
5			
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			
7. () TOTAL SENIOR PERSONNEL (1-6)			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. () POSTDOCTORAL ASSOCIATES			
2. (7) OTHER PROFESSIONAL (TECHNICIAN, PROGRAMMER, ETC.)	78	\$	385706
3. () GRADUATE STUDENTS			
4. () UNDERGRADUATE STUDENTS			
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)			
6. () OTHER			
TOTAL SALARIES AND WAGES (A + B)			
\$ 385706			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			
\$ 115712			
TOTAL SALARIES AND WAGES AND FRINGE BENEFITS (A + B + C)			
\$ 501418			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Tier 2 Computing Farm			
TOTAL EQUIPMENT			
\$ 232238			
E. TRAVEL			
1. DOMESTIC INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			
\$ 17000			
2. FOREIGN			
\$ 70000			
F. PARTICIPANT SUPPORT			
1. STIPENDS \$			
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
TOTAL NUMBER OF PARTICIPANTS ()			
TOTAL PARTICIPANT COSTS			
\$ 30178			
G. OTHER DIRECT COSTS			
1. MATERIALS AND SUPPLIES			
\$ 10000			
2. PUBLICATION/DOCUMENTATION/DISSEMINATION			
\$ 115000			
3. CONSULTANT SERVICES			
4. COMPUTER SERVICES			
5. SUBAWARDS			
6. OTHER			
TOTAL OTHER DIRECT COSTS			
\$ 975834			
H. TOTAL DIRECT COSTS (A THROUGH G)			
\$ 269366			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)			
49.5% of \$423113 = \$209441 (on-campus)			
26% of \$230482 = \$59925 (off-campus)			
TOTAL INDIRECT COSTS (F&A)			
\$ 269366			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			
\$ 1245200			
K. DUAL FUNDS IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.1			
\$ 1245200			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)			
\$ 1245200			
M. COST SHARING: PROPOSED LEVEL \$			
\$			

ORG. REP. TYPED NAME: KAUSHIK DE
 P/PI/D TYPED NAME AND SIGNATURE: *Kaushik De*
 DATE: 12/10/10
 DATE CHECKED: 12/10/10
 DATE OF RATE SHEET: 12/10/10
 INITIALS-ORG: *KS*

FOR NSF USE ONLY

PROJECT COST RATE VERIFICATION

Budget Justification

Year 1

B.2	Software & Computing specialist salaries	\$385,706
	1.5 FTE Southwest Tier 2 operations, 1.4 FTE Panda developers, 2 FTE US Computing Operations, 1 FTE Production, 0.6 FTE Tier 3 support	
C	Fringe on B2 salaries	\$115,712
D	CPU & Storage for Tier 2 Computing Center	\$232,238
E.1	Domestic travel by computing specialist (BNL, Tier 2 mtg...)	\$ 17,000
E.2	COLA for people at CERN (2x12x\$2000), trips to CERN for 5 people	\$ 70,000
G.1	Servers, rack, cables, supplies	\$ 30,178
G.3	Software consultants at CERN	\$ 10,000
G.5	Subcontract for Tier 2 center at Oklahoma University	\$115,000
I	Indirect costs, onsite 49.5%, offsite 26%, (includes \$25k for subcontract)	\$269,366
J, L	Total costs/Amount of Request	\$1,245,200



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SUMMARY PROPOSAL BUDGET

ORGANIZATION
The University of Texas at Arlington

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Kaushik De

A. SENIOR PERSONNEL: P/PI/D, Co-PIs, Faculty and Other Senior Appointments

List each separately with name and title. (A.7. Show number in brackets)

	CAL	NSF-Funded		Funds Requested by Proposer	Funds Granted by NSF (If Different)
		Person-months	ACAD SUMR		
1				\$	\$
2					
3					
4					
5					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL - SHOW NUMBERS IN BRACKET					
1. () POSTDOCTORAL ASSOCIATES					
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			78	\$ 397277	
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS				\$	
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. () OTHER					
TOTAL SALARIES AND WAGES (A + B)				\$ 397277	
C. FRINGE BENEFITS (CHARGED AS DIRECT COSTS)				\$ 119183	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				\$ 516461	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Tier 2 Computing Farm					
TOTAL EQUIPMENT				\$ 258051	
E. TRAVEL	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			\$ 17000	
	2. FOREIGN			\$ 70000	
F. PARTICIPANT SUPPORT	1. STIPENDS \$				
	2. TRAVEL				
	3. SUBSISTENCE				
	4. OTHER				
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT		
G. OTHER DIRECT COSTS				\$ 25959	
1. MATERIALS AND SUPPLIES					
2. PUBLICATION/DOCUMENTATION/DISSEMINATION				\$ 10000	
3. CONSULTANT SERVICES				\$ 115000	
4. COMPUTER SERVICES					
5. SUBAWARDS					
6. OTHER					
TOTAL OTHER DIRECT COSTS				\$ 1012471	
H. TOTAL DIRECT COSTS (A THROUGH G)				\$ 261085	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)				\$ 1273556	
	49.5% of \$403557 = \$199761 (on-campus)				
	26% of \$236863 = \$61324 (off-campus)				
TOTAL INDIRECT COSTS (F&A)				\$ 1273556	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				\$ 1273556	
K. RESIDUAL FUNDS - IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.i.					
L. AMOUNT OF THIS REQUEST (J) OR (J) MINUS K)				\$ 1273556	\$
M. COST SHARING: PROPOSED LEVEL \$					
AGREED LEVEL IF DIFFERENT: \$					
PI/PD TYPED NAME AND SIGNATURE	DATE				
Kaushik De	12/10/10				
ORG. REP. TYPED NAME & SIGNATURE	DATE				
	12/10/10				

PROPOSAL NO.	DURATION (MONTHS)	
AWARD NO.	Proposed	Granted

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Second Year

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AGREED COST RATE VERIFICATION

Date Checked Date of Rate Sheet Initials-ORG

Budget Justification

Year 2

B.2	Software & Computing specialist salaries	\$397,277
	1.5 FTE Southwest Tier 2 operations, 1.4 FTE Panda developers, 2 FTE US Computing Operations, 1 FTE Production, 0.6 FTE Tier 3 support	
C	Fringe on B2 salaries	\$119,183
D	CPU & Storage for Tier 2 Computing Center	\$258,051
E.1	Domestic travel by computing specialist (BNL, Tier 2 mtg...)	\$ 17,000
E.2	COLA for people at CERN (2x12x\$2000), trips to CERN for 5 people	\$ 70,000
G.1	Servers, rack, cables, supplies	\$ 25,959
G.3	Software consultants at CERN	\$ 10,000
G.5	Subcontract for Tier 2 center at Oklahoma University	\$115,000
I	Indirect costs, onsite 49.5%, offsite 26%	\$261,085
J, L	Total costs/Amount of Request	\$1,273,556



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SUMMARY PROPOSAL BUDGET

ORGANIZATION
The University of Texas at Arlington

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Kaushik De

A. SENIOR PERSONNEL: P/PI/D, Co-PIs, Faculty and Other Senior Associates
List each separately with name and title. (A.7. Show number in brackets)

	NSF-Funded Person-months CAL ACAD SUMR	Funds Requested By Proposer	Funds Granted by NSF (If Different)			
				PROPOSAL NO.	DURATION (MONTHS)	Proposer
1		\$	\$			
2						
3						
4						
5						
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)						
7. () TOTAL SENIOR PERSONNEL (1-6)						
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1. () POSTDOCTORAL ASSOCIATES						
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	78		\$ 409196			
3. () GRADUATE STUDENTS						
4. () UNDERGRADUATE STUDENTS			\$			
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						
6. () OTHER						
TOTAL SALARIES AND WAGES (A + B)			\$ 409196			
C. FRINGE BENEFITS IF CHARGED AS DIRECT COSTS			\$ 122759			
TOTAL SALARIE WAGE AND FRINGE BENEFITS (A + B + C)			\$ 531954			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Tier 2 Computing Farm						
TOTAL EQUIPMENT			\$ 261494			
E. TRAVEL 1. DOMESTIC INCL. CANADA, MEXICO AND U.S. POSSESSIONS)			\$ 17000			
2. FOREIGN			\$ 70000			
F. PARTICIPANT SUPPORT						
1. STIPENDS \$						
2. TRAVEL						
3. SUBSISTENCE						
4. OTHER						
TOTAL NUMBER OF PARTICIPANTS ()						
TOTAL PARTICIPANT COSTS						
G. OTHER DIRECT COSTS			\$ 28828			
1. MATERIALS AND SUPPLIES						
2. PUBLICATION/DOCUMENTATION/DISSEMINATION						
3. CONSULTANT SERVICES			\$ 10000			
4. COMPUTER SERVICES						
5. SUBAWARDS			\$ 115000			
6 OTHER			\$			
TOTAL OTHER DIRECT COSTS			\$ 1034241			
H. TOTAL DIRECT COSTS (A THRU G)						
1. INDIRECT COSTS (FEE) SPECIFY RATE AND BASE						
49.5% of \$414313 = \$205085 (on-campus)						
26% of \$243469 = \$63302 (off-campus)						
TOTAL INDIRECT COSTS (FEE)			\$ 268387			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)			\$ 1302628			
K. RESIDUAL FUNDS IF FOR FURTHER SUPPORT OR CURR/ENT (PROJECT SEE GPG 8.07.1)						
L. AMOUNT OF THIS REQUEST (J) OR (J) MINUS K)			\$ 1302628			\$
M. COST SHARING: PROPOSED LEVEL \$						
AGREED LEVEL IF DIFFERENT: \$						

PROPOSAL NO.		DURATION (MONTHS)	
		Proposer	Granted
AWARD NO.			

Third Year

PI/PD TYPED NAME AND SIGNA Kaushik De	TITLE Supervisor	DATE 12/01/10	INDIRECT COST RATE VERIFICATION
ORG. REP. TYPED NAME & SIGNATURE Kaushik De	DATE 12/01/10	Date Checked	Date of Rate Sheet

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INITIALS-ORG

Budget Justification

Year 3

B.2	Software & Computing specialist salaries	\$409,196
	1.5 FTE Southwest Tier 2 operations, 1.4 FTE Panda developers, 2 FTE US Computing Operations, 1 FTE Production, 0.6 FTE Tier 3 support	
C	Fringe on B2 salaries	\$122,759
D	CPU & Storage for Tier 2 Computing Center	\$232,238
E.1	Domestic travel by computing specialist (BNL, Tier 2 mtg...)	\$ 17,000
E.2	COLA for people at CERN (2x12x\$2000), trips to CERN for 5 people	\$ 70,000
G.1	Servers, rack, cables, supplies	\$ 28,828
G.3	Software consultants at CERN	\$ 10,000
G.5	Subcontract for Tier 2 center at Oklahoma University	\$115,000
I	Indirect costs, onsite 49.5%, offsite 26%	\$268,387
J, L	Total costs/Amount of Request	\$1,302,628



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SUMMARY PROPOSAL BUDGET

FOR NSF USE ONLY

Fourth Year

ORGANIZATION
The University of Texas at Arlington

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Kaushik De

A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates

List each separately with name and title. (A.7. Show number in brackets)

	CAL	NSF-Funded		Funds Requested By Proposer	Funds Granted by NSF (If Different)
		Person-months	ACAD SUMM		
1				\$	\$
2.					
3					
4					
5.					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES					
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	78			\$ 421472	
3. () GRADUATE STUDENTS					
4. () UNDERGRADUATE STUDENTS				\$	
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					
6. () OTHER					
TOTAL SENIOR AND NON-PI + B				\$ 421472	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				\$ 126441	
TOTAL SALARY & WAGES AND FRINGE BENEFITS (A + B + C)				\$ 547913	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Tier 2 Computing Farm					

TOTAL EQUIPMENT

E. TRAVEL	1. DOMESTIC (VCL CANADA MEXICO AND U.S. POSSESSIONS)	\$ 264829
	2. FOREIGN	\$ 20000
		\$ 72000

F. PARTICIPANT SUPPORT

1. STIPENDS	\$
2. TRAVEL	
3. SUBSISTENCE	
4. OTHER	
TOTAL NUMBER OF PARTICIPANTS ()	TOTAL PARTICIPANT

G. OTHER DIRECT COSTS

1. MATERIALS AND SUPPLIES	\$ 25851
2. PUBLICATION/DOCUMENTATION/DISSEMINATION	
3. CONSULTANT SERVICES	\$ 10000
4. COMPUTER SERVICES	
5. SUBAWARDS	\$ 115000
6. OTHER	\$
TOTAL OTHER DIRECT COSTS	\$ 1055593

H. TOTAL DIRECT COSTS (A THRU F)

INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE)	
49.5% of \$430393 = \$213044 (on-campus)	
26% of \$245372 = \$63797 (off-campus)	
TOTAL INDIRECT COSTS (F&A)	\$ 276841
J. TOTAL DIRECT AND INDIRE	\$ 1332434

K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECT SEE GPG II.D.7.i.)

L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)	\$ 1332434
M. COST SHARING: PROPOSED LEVEL \$	\$

M. COST SHARING: PROPOSED LEVEL \$

PI/PD TYPED NAME AND SIGNATURE Kaushik De	DATE 12/10/10	AGREED LEVEL IF DIFFERENT: \$	FOR NSF USE ONLY	
ORG. REP. TYPED NAME & SIGNATURE	DATE		INDIRECT COST RATE VERIFICATION	INITIALS-ORG
			Date Checked	Date of Rate Sheet

Budget Justification

Year 4

B.2	Software & Computing specialist salaries	\$421,472
	1.5 FTE Southwest Tier 2 operations, 1.4 FTE Panda developers, 2 FTE US Computing Operations, 1 FTE Production, 0.6 FTE Tier 3 support	
C	Fringe on B2 salaries	\$126,441
D	CPU & Storage for Tier 2 Computing Center	\$264,829
E.1	Domestic travel by computing specialist (BNL, Tier 2 mtg...)	\$ 20,000
E.2	COLA for people at CERN (2x12x\$2000), trips to CERN for 5 people	\$ 72,000
G.1	Servers, rack, cables, supplies	\$ 25,851
G.3	Software consultants at CERN	\$ 10,000
G.5	Subcontract for Tier 2 center at Oklahoma University	\$115,000
I	Indirect costs, onsite 49.5%, offsite 26%	\$276,841
J, L	Total costs/Amount of Request	\$1,332,434



SUMMARY PROPOSAL BUDGET

ORGANIZATION
The University of Texas at Arlington

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Koushik Das

PROPOSAL NO.		DURATION (MONTHS)	
		Proposed	Granted
AWARD NO.			

FOR NSF USE ONLY

	NSF-Funded Person-months CAL ACAD SUMR	Funds Requested By Proposer	Funds Granted by NSF (If Different)
A. SENIOR PERSONNEL: P/PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title (A.7. Show number in brackets)			
1		\$	\$
2			
3			
4			
5			
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)			
7. () TOTAL SENIOR PERSONNEL (1-6)			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)			
1. () POSTDOCTORAL ASSOCIATES			
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	78	\$ 404116	
3. () GRADUATE STUDENTS			
4. () UNDERGRADUATE STUDENTS			
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)			
6. () OTHER			
TOTAL SALARIES AND WAGES (A + B)		\$ 404116	
C. INDIRECT COSTS CHARGED AS DIRECT COSTS		\$ 130235	
TOTAL SALARIES, WAGES AND INDIRECT BENEFITS (A + B + C)		\$ 564350	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Tier 2 Computing Farm			

TOTAL EQUIPMENT		\$ 268163	
E. TRAVEL	1. DOMESTIC (INCL CANADA, MEXICO AND U.S. POSSESSIONS)	\$ 20000	
	2. FOREIGN	\$ 72000	

F. PARTICIPANT SUPPORT			
1. STIPENDS	\$		
2. TRAVEL			
3. SUBSISTENCE			
4. OTHER			
TOTAL NUMBER OF PARTICIPANTS ()			TOTAL PARTICIPANT

G. OTHER DIRECT COSTS			
1. MATERIALS AND SUPPLIES		\$ 28200	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION			
3. CONSULTANT SERVICES		\$ 10000	
4. COMPUTER SERVICES			
5. SUBAWARDS		\$ 115000	
6. OTHER			
TOTAL OTHER DIRECT COSTS		\$ 1077849	

H. TOTAL DIRECT COSTS (A THROUGH G)		\$ 285147	
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 49.5% of \$444804 = \$220178 (on-campus) 26% of \$249882 = \$64969 (off-campus)		\$ 1362996	
TOTAL INDIRECT COSTS (F&A)		\$ 1362996	

J. TOTAL DIRECT AND INDIRECT COSTS (H + I)		\$ 1362996	
K. RESIDUAL FUNDS FOR FURTHER SUPPORT OF CURRENT PROJECT SEE (PG II, D.7)			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)		\$ 1362996	

M. COST SHARING: PROPOSED LEVEL \$	AGREED LEVEL IF DIFFERENT: \$		
PI/PD TYPED NAME AND SIGNATURE Koushik Das	DATE 12/10/10	INDIRECT COST RATE VERIFICATION	FOR NSF USE ONLY
ORG. REP. TYPED NAME & SIGNATURE	DATE 12/10/10	Date Checked	Date of Rate Sheet
			Initials-ORG

Budget Justification

Year 5

B.2	Software & Computing specialist salaries	\$434,116
	1.5 FTE Southwest Tier 2 operations, 1.4 FTE Panda developers, 2 FTE US Computing Operations, 1 FTE Production, 0.6 FTE Tier 3 support	
C	Fringe on B2 salaries	\$130,235
D	CPU & Storage for Tier 2 Computing Center	\$268,163
E.1	Domestic travel by computing specialist (BNL, Tier 2 mtg...)	\$ 20,000
E.2	COLA for people at CERN (2x12x\$2000), trips to CERN for 5 people	\$ 72,000
G.1	Servers, rack, cables, supplies	\$ 28,366
G.3	Software consultants at CERN	\$ 10,000
G.5	Subcontract for Tier 2 center at Oklahoma University	\$115,000
I	Indirect costs, onsite 49.5%, offsite 26%	\$285,147
J, L	Total costs/Amount of Request	\$1,362,996



SUMMARY PROPOSAL BUDGET

ORGANIZATION
The University of Texas at Arlington

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Kaushik De

PROPOSAL NO.

DURATION (MONTHS)

Proposed Granted

AWARD NO.

A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates

List each separately with name and title. (A.7. Show number in brackets)

NSF-Funded Person-months	Funds Requested By Proposer	Funds Granted by NSF (If Different)			
			CAL	ACAD	BLVN
1		\$			
2					
3					
4					
5					
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. () TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. () POSTDOCTORAL ASSOCIATES					
2. (7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	390	\$ 2047766			
3. () GRADUATE STUDENTS		\$			
4. () UNDERGRADUATE STUDENTS		\$			
5. () SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)		\$			
6. () OTHER		\$ 204,766			
TOTAL SALARIES AND WAGES (A + B)		\$ 614330			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)		\$ 200,095			
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)		\$ 1284739			
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.) Tier 2 Computing Farm		\$ 352000			
TOTAL EQUIPMENT		\$ 352000			
E. TRAVEL					
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					
2. FOREIGN					
F. PARTICIPANT SUPPORT					
1. STIPENDS \$					
2. TRAVEL					
3. SUBSISTENCE					
4. OTHER					
TOTAL NUMBER OF PARTICIPANTS ()					
TOTAL PARTICIPANT COSTS					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES		\$ 139152			
2. PUBLICATION/DOCUMENTATION/DISSEMINATION		\$ 50000			
3. CONSULTANT SERVICES		\$ 575000			
4. COMPUTER SERVICES		\$			
5. SUBAWARDS		\$			
6. OTHER		\$			
TOTAL OTHER DIRECT COSTS		\$ 51,000			
H. TOTAL DIRECT COSTS (A THROUGH G)		\$ 1,850,095			
I. INDIRECT COSTS (F&A) (SPECIFY RATE AND BASE) 49.5% of \$2116180 = \$1047509 (on-campus) 26% of \$1205068 = \$313318 (off-campus)		\$ 1,336,815			
TOTAL INDIRECT COSTS (F&A)		\$ 651,681.5			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)		\$ 3,186,910			
K. RESIDUAL FUNDS (F FOR FURTHER SUPPORT FOR CURRENT PROJECT SEE GPG II.D.7)		\$ 651,681.5			
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)		\$ 2,535,228.5			
M. COST SHARING: PROPOSED LEVEL \$		\$ 651,681.5			

DATE 12/10/10
DATE 12/10/10

AGREED LEVEL IF DIFFERENT: \$
FOR NSF USE ONLY
INTEGRITY CONF. RATE VERIFICATION

PI/PD TYPED NAME AND SIGNATURE: Kaushik De
ORG. REP. TYPED NAME & SIGNATURE: [Signature]

Date Checked: Date of Rate Sheet: Initials-ORG:

Budget Justification

Cumulative

B.2	Software & Computing specialist salaries	\$2,047,766
C	Fringe on B2 salaries	\$614,330
D	CPU & Storage for Tier 2 Computing Center	\$1,284,739
E.1	Domestic travel by computing specialist (BNL, Tier 2 mtg...)	\$ 93,000
E.2	COLA for people at CERN, trips to CERN for 5 people	\$352,000
G.1	Servers, rack, cables, supplies	\$139,152
G.3	Software consultants at CERN	\$ 50,000
G.5	Subcontract for Tier 2 center at Oklahoma University	\$575,000
I	Indirect costs, onsite 49.5%, offsite 26%	\$1,360,827
J, L	Total costs/Amount of Request	\$6,516,815

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: P. Michael Tuts	Other agencies (including NSF) to which this proposal has been/will be submitted.
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Experimental Physics Research program at Columbia University/Nevis Labs</p> <p>Source of Support: NSF PHY0758118</p> <p>Total Award Amount: \$ 7,497,814 Total Award Period Covered: 02/01/08 - 01/31/11</p> <p>Location of Project: Nevis Labs</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad:0.00 Sumr: 2.00</p>	
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: LHC Experimental experience at CERN</p> <p>Source of Support: NSF PHY0840636</p> <p>Total Award Amount: \$ 450,000 Total Award Period Covered: 09/15/08 - 09/14/11</p> <p>Location of Project: CERN</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad:1.00 Sumr: 0.00</p>	
<p>Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: U.S. ATLAS Operations: Empowering U.S. Universities for Discoveries at the Energy Frontier</p> <p>Source of Support: NSF PHY0612811</p> <p>Total Award Amount: \$ 45,017,650 Total Award Period Covered: 02/01/07 - 01/31/12</p> <p>Location of Project: Nevis/CERN</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad:8.00 Sumr: 0.00</p>	
<p>Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: Experimental Physics Research Program at Columbia University/Nevis Labs</p> <p>Source of Support: NSF PHY1067934</p> <p>Total Award Amount: \$ 9,910,424 Total Award Period Covered: 02/01/11 - 01/31/14</p> <p>Location of Project: Nevis Labs, Columbia University</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad:0.00 Sumr: 2.00</p>	
<p>Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support</p> <p>Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier</p> <p>Source of Support: NSF - this proposal</p> <p>Total Award Amount: \$ 50,000,000 Total Award Period Covered: 02/01/12 - 01/31/17</p> <p>Location of Project: Nevis Labs</p> <p>Person-Months Per Year Committed to the Project. Cal:0.00 Acad:8.00 Summ:0.00</p>	
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.	

B

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Robert C. Ball** Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title: **ATLAS Great Lakes Tier-2**

Program notice: DE-FG01-04ER04-03/LAB 04-03

Source of Support: **NSF**
Total Award Amount: **\$ 3,000,000** Total Award Period Covered: **09/01/06 - 08/31/11**

Location of Project: **University of Michigan**
Person-Months Per Year Committed to the Project. 10.8 Cal: 10.8 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title: **MRI-R2 Consortium: Development Dynamic Network System (DYNES)**

Source of Support: **NSF**
Total Award Amount: **\$1,740,000** Total Award Period Covered: **8/01/09-7/30/12**

Location of Project: **University of Michigan**
Person-Months Per Year Committed to the Project. 1.2 Cal: 1.2 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title: **ATLAS Great Lakes Tier-2 Renewal**

Source of Support: **NSF**
Total Award Amount: **\$ 3,091,360** Total Award Period Covered: **9/1/2011-8/31/2016**

Location of Project:
Person-Months Per Year Committed to the Project. 10.8 Cal:10.8 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title:

Source of Support:
Total Award Amount: \$ Total Award Period Covered:

Location of Project:
Person-Months Per Year Committed to the Project. 0.0 Cal: 0.0 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support

Source of Support:
Total Award Amount: Total Award Period Covered:

Location of Project:
Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.0

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.



**CURRENT AND PENDING SUPPORT
DR. JOSEPH F. BOUDREAU**

CURRENT GRANT SUPPORT:

Project Title: Experimental Particle Physics at the University of Pittsburgh B Task L (ATLAS Electronics)
Source of Support: Department of Energy Grant #DE-FG02-91ER40646
Total Award Amount: \$1,058,000
P.I.: Vittorio Paolone
Co-PIs: Joseph Boudreau, Vladimir Savinov, James Mueller, Wilfred Cleland
Total Award Period: 11/01/08 B 10/31/11
Location of Project: University of Pittsburgh
Person-Months per Year: Cal: 0.00 Acad: 0.00 Summer: 2.00

Project Title: Electronics Construction for the ATLAS Experiment at LHC
Source of Support: Columbia University Subaward 9 under NSF Prime Award PHY-06-12811
Total Award Amount: \$439,505
P.I.: Vladimir Savinov
Co-PI: Joseph Boudreau
Total Award Period: 03/01/07 B 1/31/11
Location of Project: University of Pittsburgh
Person-Months per Year: Cal: 0.00 Acad: 0.00 Summer: 0.00

Pending

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier - This proposal
Source of Support: National Science Foundation
Total Award Amount: \$776,367
Total Award Period Covered: 2/1/12-1/31/17
Role: Co-PI
Location of Project: Pitt, CERN

John M. Butler

Current and Pending Support

Sponsor	Role	Project Title	Amount	Award Period	Status
DOE	Co-PI	Research in Particle Physics: Task A - ATLAS	463,000	02/01/2010-01/31/2011	Current
NSF	PI	US ATLAS Research Program: Empowering US Universities for Discoveries at the Energy Frontier	34,780	10/01/2010-09/30/2011	Current
DOE	PI	Development of the Data Collector for ILC R&D	20,000	03/20/2009-06/29/2011	Current
DOE	PI	Construction of a Prototype Section of Digital Hadron Calorimeter	53,597	09/01/2007-08/31/2011	Current
NSF	PI	Construction of a Prototype Section of Digital Hadron Calorimeter	20,000	08/01/2009-07/31/2011	Current
DOE	PI	Construction and Testing of a Digital Calorimeter	76,400	08/15/2009-08/14/2011	Current

Current and Pending Support

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman.				
Project/Proposal Title: ATLAS Project				
Source of Support: Argonne National Laboratory				
Total Award Amount: \$ 20,084.00		Total Award Period Covered: 07/12/10-06/15/11		
Location of Project: Argonne National Laboratory				
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: ATLAS Project				
Source of Support: Argonne National Laboratory				
Total Award Amount: \$ 130,865.00		Total Award Period Covered: 09/01/09-08/31/11		
Location of Project: Argonne National Laboratory				
Person-Months Per Year Committed to the Project. Cal: Acad: 0.5 Sumr:				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: Development of Particle-Flow Algorithms and Simulation Software for ILC Detector(s)				
Source of Support: University of Oregon				
Total Award Amount: \$ 159,499.00		Total Award Period Covered: 09/01/05-08/31/11		
Location of Project: Northern Illinois University / Argonne National Laboratory				
Person-Months Per Year Committed to the Project. Cal: Acad: 0.5 Sumr:				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: MRI-R2 Consortium: Development of the US ATLAS Physics Analysis Instrument for the Analysis of Data from the ATLAS Experiment.				
Source of Support: California State University, Fresno				
Total Award Amount: \$ 122,760.00		Total Award Period Covered: 03/01/10-02/29/12		
Location of Project: Northern Illinois University				
Person-Months Per Year Committed to the Project. Cal: Acad: 0.5 Sumr: 0.15				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: Searches for New Phenomena with High-Energy Particle Accelerators				
Source of Support: National Science Foundation				
Total Award Amount: \$ 1,000,000.00		Total Award Period Covered: 08/15/09-07/31/12		
Location of Project: Northern Illinois University				
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 2				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: The Quarknet Project				
Source of Support: University of Notre Dame				
Total Award Amount: \$ 25,080.00		Total Award Period Covered: 09/01/10-08/31/11		
Location of Project: Northern Illinois University				
Person-Months Per Year Committed to the Project. Cal: Acad: 0.5 Sumr:				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier				
Source of Support: Columbia University				
Total Award Amount: \$ 76,000.00		Total Award Period Covered: 10/01/09-01/31/11		
Location of Project: Northern Illinois University				
Person-Months Per Year Committed to the Project. Cal: Acad: 0.5 Sumr:				
Support:	<input type="checkbox"/> Current	<input checked="" type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier (this proposal)				

Current and Pending Support

Source of Support: Columbia University	Total Award Period Covered: 02/01/12-01/31/17
Total Award Amount: \$ 387,570.00	
Location of Project: Northern Illinois University	
Person-Months Per Year Committed to the Project.	Cal: Acad: 0.5 Sumr:

Current and Pending Support: Kyle Cranmer

Current Awards:

Title: PECASE Award
Source: Department of Energy
Location: New York University
Amount: \$250,000
Period: 06/01/2008 5/31/2013
Commitment: none

Title: Elementary Particle Physics with ATLAS
Source: National Science Foundation
Location: New York University
Amount: \$1,980,000
Period: 09/01/2009 08/31/2012
Commitment: 1 summer months

Title: CAREER: Applying New Tools to the Discovery and Measurement of the New Standard Model
Source: National Science Foundation
Location: New York University
Amount: \$400,000
Period: 07/01/2010 06/30/2015
Commitment: 1 summer month

Title: MRI-R2 Consortium: Development of Instrumentation for the Analysis of Data from the ATLAS Experiment at the Large Hadron Collider
Source: National Science Foundation
Location: New York University
Amount: \$41,194
Period: 03/01/2010 02/29/2012
Commitment: none

Title: BNL: U.S. ATLAS Computing MOU
Source: The U.S. ATLAS Research Program Office
Location: CERN in Geneva, Switzerland
Amount: \$104,040
Period: 10/01/2009 09/30/2011
Commitment: none

Pending Proposals:

Title: RECAST extending the impact of existing searches for new physics
Source: Department of Energy
Location: New York University
Amount: \$750,000
Period: 05/01/2011 04/30/2016
Commitment: 1 summer month

Current and Pending Support

Investigator: Kaushik De

Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current

Project/Proposal Title: ATLAS Experiment Research and Computing

Source of Support: DoE (sub-contract through Brookhaven National Laboratory)

Total Award Amount: \$2,142,745 Total Award Period Covered: 02/01/04 - 12/31/12

Location of Project: The University of Texas at Arlington

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.0

Support: Current

Project/Proposal Title: The U.S. ATLAS Research Program: Empowering U.S. Universities for Discoveries at the Energy Frontier

Source of Support: NSF (sub-contract through Columbia University)

Total Award Amount: \$2,818,130 Total Award Period Covered: 02/01/08 - 01/31/11

Location of Project: The University of Texas at Arlington

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.0

Support: Current

Project/Proposal Title: High Energy Physics Base Funding

Source of Support: DoE

Total Award Amount: \$567,000 Total Award Period Covered: 02/01/09 - 01/31/10

Location of Project: The University of Texas at Arlington

Person-Months Per Year Committed to the Project. Cal: 2.0 Acad: 2.0 Sumr: 2.0

Support: Pending

Project/Proposal Title: HTC Software Infrastructure for Experimental Physics Applications

Source of Support: NSF

Total Award Amount: \$593,966 Total Award Period Covered: 10/01/10 - 09/30/16

Location of Project: The University of Texas at Arlington

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.0

Support: Pending

Project/Proposal Title: Easily Deployable, Intelligent, Computational Tiers for the ATLAS Experiment

Source of Support: NSF

Total Award Amount: \$513,678 Total Award Period Covered: 03/01/11 - 02/28/14

Location of Project: The University of Texas at Arlington

Person-Months Per Year Committed to the Project. Cal: 1.0 Acad: 1.0 Sumr: 1.0

Support: Pending

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier

Source of Support: NSF (This Proposal)

Total Award Amount: \$6,516,185 Total Award Period Covered: 02/01/12-01/31/17

Location of Project: The University of Texas at Arlington

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 00 Sumr: 0.0

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Robert Gardner	Other agencies (including NSF) to which this proposal has been/will be submitted:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier	
Source of Support: NSF via Columbia University (PHY-06-12811) Total Award Amount: \$ 889,533 Total Award Period Covered: 10/01/10 - 09/30/11 Location of Project: University of Chicago Person-Months Per Year Committed to the Project: Cal:4.80 Acad: 0.00 Summ: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Sustaining and Extending the Open Science Grid: Science Innovation on a Petascale Nationwide Dacility	
Source of Support: NSF Total Award Amount: \$ 45,313 Total Award Period Covered: 10/01/09 - 09/30/10 Location of Project: University of Chicago Person-Months Per Year Committed to the Project: Cal:3.00 Acad: 0.00 Summ: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Sustaining and Extending the Open Science Grid: Science Innovation on a Petascale Nationwide Facility	
Source of Support: DOE via University of Wisconsin Total Award Amount: \$ 747,002 Total Award Period Covered: 10/01/09 - 09/30/10 Location of Project: University of Chicago Person-Months Per Year Committed to the Project: Cal:3.00 Acad: 0.00 Summ: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: MRI-R2 Consortium Development: Development of the U.S. ATLAS Physics Analysis Instrument	
Source of Support: NSF Total Award Amount: \$ 62,798 Total Award Period Covered: 03/01/10 - 02/29/12 Location of Project: University of Chicago Person-Months Per Year Committed to the Project: Cal:0.00 Acad: 0.00 Summ: 0.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier (this proposal)	
Source of Support: NSF via sub-award from Columbia University Total Award Amount: \$ 6,220,543 Total Award Period Covered: 02/01/12 - 01/31/17 Location of Project: University of Chicago Person-Months Per Year Committed to the Project: Cal:4.80 Acad: 0.00 Summ: 0.00	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.			
Investigator: Reiner Hauser	Other agencies (including NSF) to which this proposal has been/will be submitted:		
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: ATLAS Trigger/DAQ M & O			
Source of Support: NSF – (Columbia University)			
Total Award Amount: \$177,699		Total Award Period Covered: 10/1/09 – 1/31/2011	
Location of Project: MSU, CERN			
Person-Months Per Year Committed to the Project.		Cal: 6	Acad: Sumr: 0
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Research in Elementary Particle Physics			
Source of Support: NSF			
Total Award Amount: \$2,765,520		Total Award Period Covered: 5/1/2008 – 4/30/2011	
Location of Project: MSU, FNAL, CERN			
Person-Months Per Year Committed to the Project.		Cal: 6	Acad: Sumr: 0
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Investigations in Elementary Particle Physics and Particle Astrophysics			
Source of Support: NSF			
Total Award Amount: \$7,289,971		Total Award Period Covered: 5/1/2011 – 4/30/2014	
Location of Project: MSU, CERN			
Person-Months Per Year Committed to the Project.		Cal: 6	Acad: Sumr: 0
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title:			
Source of Support:			
Total Award Amount: \$		Total Award Period Covered:	
Location of Project:			
Person-Months Per Year Committed to the Project.		Cal:	Acad: Sumr: 0
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title:			
Source of Support:			
Total Award Amount: \$		Total Award Period Covered:	
Location of Project:			
Person-Months Per Year Committed to the Project.		Cal:	Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Joey Huston	Other agencies (including NSF) to which this proposal has been/will be submitted:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Particle Physics at High Energy Colliders Source of Support: NSF Total Award Amount: \$785,000 Total Award Period Covered: 5/1/08 – 4/30/2011 Location of Project: MSU, FNAL, CERN Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 2	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: M & O for ATLAS TileCal Source of Support: NSF – Columbia University Total Award Amount: \$58,141 Total Award Period Covered: 10/1/09 – 1/31/2011 Location of Project: MSU, CERN Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 0	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Biennial African School on Fundamental Physics Source of Support: NSF Total Award Amount: \$8,000 Total Award Period Covered: 10/1/10 – 9/30/2011 Location of Project: MSU, South Africa Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 0	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: CTEQ Summer School Source of Support: NSF Total Award Amount: \$20,000 Total Award Period Covered: 10/1/10 – 9/30/2011 Location of Project: MSU, Germany, Wisconsin Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 0	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Investigations in Elementary Particle Physics and Particle Astrophysics Source of Support: NSF Total Award Amount: \$7,289,971 Total Award Period Covered: 5/1/11 – 4/30/2014 Location of Project: MSU, FNAL, CERN Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 2	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current & Pending Support for Andrew J. Lankford, UC Irvine
Updated 1/1/2011

Current:

Project/Proposal Title: A Research Program in Elementary Particle Physics – Task E
(DOE DE-FG02-91ER40679)

Source of Support: Department of Energy

Total Award Amount: \$794,000

Total Award Period Covered: 2/1/10-1/31/11

Role: PI

Location of Project: UCI, SLAC, CERN

Person-Months Per Year committed to the Project: 2 summer months

Project/Proposal Title: Technical Activities of University of California, Irvine for WBS 3.5 Muon Subsystem and
WBS 3.6. Trigger and Data Acquisition System of the U.S. ATLAS Operations Program

Source of Support: Columbia University (NSF subcontract; NSF PHY-06-12811)

Total Award Amount: \$3,651,778

Total Award Period Covered: 03/01/07 – 1/31/11

Location of Project: UCI, CERN

Pending:

Project/Proposal Title: A Research Program in Elementary Particle Physics – Task E
(DOE DE-FG02-91ER40679)

Source of Support: Department of Energy

Total Award Amount: \$588,000

Total Award Period Covered: 2/1/11-1/31/12

Role: PI

Location of Project: UCI, SLAC, CERN

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries
at the Energy Frontier

Source of Support: National Science Foundation

Total Award Amount: \$3,828,820

Total Award Period Covered: 2/1/12-1/31/17

Role: Co-PI

Location of Project: UCI, CERN

Current and Pending Support

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: ATLAS Project				
Source of Support: Argonne National Laboratory				
Total Award Amount: \$ 130,865.00		Total Award Period Covered: 09/01/09-08/31/11		
Location of Project: Argonne National Laboratory				
Person-Months Per Year Committed to the Project. Cal: 7.84 Acad: Sumr:				
Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier				
Source of Support: Columbia University				
Total Award Amount: \$ 76,000.00		Total Award Period Covered: 10/01/09-01/31/11		
Location of Project: Northern Illinois University				
Person-Months Per Year Committed to the Project. Cal: 2.61 Acad: Sumr:				
Support:	<input type="checkbox"/> Current	<input checked="" type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project Director/PI: Chakraborty, Dhiman				
Project/Proposal Title: US ATLAS Operations: Empowering US Universities for Discoveries at the Energy Frontier (this proposal)				
Source of Support: Columbia University				
Total Award Amount: \$ 387,570.00		Total Award Period Covered: 02/01/12-01/31/17		
Location of Project: Northern Illinois University				
Person-Months Per Year Committed to the Project. Cal: 7 Acad: Sumr:				

B

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Shawn P. McKee** Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title: **ATLAS Great Lakes Tier-2 Renewal**

Source of Support: **NSF**
Total Award Amount: **\$ 3,091,360** Total Award Period Covered: **9/1/2011-8/31/2016**

Location of Project: **University of Michigan**
Person-Months Per Year Committed to the Project. 2.0 Cal: 2.0 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title: **MRI-R2 Consortium: Development Dynamic Network System (DYNES)**

Source of Support: **NSF**
Total Award Amount: **\$1,740,000** Total Award Period Covered: **8/01/10-7/30/12**

Location of Project: **University of Michigan**
Person-Months Per Year Committed to the Project. 1.0 Cal: 1.0 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title: **ATLAS Great Lakes Tier-2**

Program notice: DE-FG01-04ER04-03/LAB 04-03

Source of Support: **NSF**
Total Award Amount: **\$ 3,000,000** Total Award Period Covered: **09/01/06 - 08/31/11**

Location of Project: **University of Michigan**
Person-Months Per Year Committed to the Project. 3.0 Cal:3.0 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support
Project/Proposal Title

Source of Support:
Total Award Amount: Total Award Period Covered:

Location of Project:
Person-Months Per Year Committed to the Project. 0.0 Cal: 0.0 Acad: 0.0 Sumr: 0.0

Support: Current Pending Submission Planned in Near Future *Transfer of Support

Source of Support:
Total Award Amount: Total Award Period Covered:

Location of Project:
Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.0

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.



Allen Mincer

Current and Pending Support

Current Awards:

Title: Elementary Particle Physics with ATLAS
Source: National Science Foundation
Location: New York University
Amount: \$1,980,000
Period: 09/01/2009 – 08/31/2012
Commitment: 2.0 summer months

Title: NYU Noyce Scholarship Program
Source: National Science Foundation
Location: New York University
Amount: \$749,596
Period: 09/01/2007 – 08/31/2011
Commitment: none

Pending

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier - This proposal

Source of Support: National Science Foundation

Total Award Amount: \$392,870

Total Award Period Covered: 2/1/12-1/31/17

Role: Co-PI

Location of Project: New York University

Current and Pending Support

Investigator: James Pilcher

Current

Project Title: Research in Elementary Particle Physics under the direction of Mark Oreglia
Source of Support: NSF
Grant No.: PHY-0757196
Total Award Amount: \$7,730,374 **Period of Performance:** 5/01/2008 – 4/30/2011
Location of Project: The University of Chicago, CERN, Fermilab
PI Person-Months Committed to Project: 2 Summer Months

Project Title: US/ATLAS Operations
Source of Support: NSF; subaward from Columbia University
Grant No.: PHY-0612811
Total Award Amount: \$1,066,850 **Period of Performance:** 3/02/2007 – 1/31/2011
Location of Project: The University of Chicago; CERN; Columbia University
PI Person-Months Committed to Project: 0.5 Academic Month

Proposal Title: MRIR2 Consortium Development: Development of the U.S. ATLAS Physics Analysis Instrument
Source of Support: NSF
Grant No.: NSF-0959141
Total Award Amount: \$62,798 **Period of Performance:** 3/1/2010 – 2/29/2012
Location of Project: The University of Chicago, CERN
PI Person-Months Committed to Project: 0.0 Academic Month

Pending

Proposal Title: Research in Elementary Particle Physics at the University of Chicago
Source of Support: NSF
Total Request: \$11,377,547 **Period of Performance:** 5/01/2011 – 4/30/2014
Location of Project: The University of Chicago, CERN, Fermilab
PI Person-Months Committed to Project: 2 Summer Months

Proposal Title: Maintenance, Operation, and Upgrade of the Tile Calorimeter on the ATLAS Experiment at CERN (THIS PROPOSAL)
Source of Support: NSF subaward via Columbia University
Total Request: \$2,238,250 **Period of Performance:** 2/01/2012 – 1/31/2017
Location of Project: The University of Chicago, CERN
PI Person-Months Committed to Project: 0.5 Academic Month

Current and Pending Support

See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.				
Investigator: Bernard Pope	Other agencies (including NSF) to which this proposal has been/will be submitted:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: ATLAS Trigger/DAQ M & O				
Source of Support: NSF – (Columbia University)				
Total Award Amount: \$177,699		Total Award Period Covered: 10/1/09 – 1/31/2011		
Location of Project: MSU, FNAL, CERN				
Person-Months Per Year Committed to the Project.		Cal:	Acad:	Sumr: 0
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: Research in Elementary Particle Physics				
Source of Support: NSF				
Total Award Amount: \$2,765,520		Total Award Period Covered: 5/1/2008 – 4/30/2011		
Location of Project: MSU, FNAL, CERN				
Person-Months Per Year Committed to the Project.		Cal:	Acad:	Sumr: 2
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title: Investigations in Elementary Particle Physics and Particle Astrophysics				
Source of Support: NSF				
Total Award Amount: \$7,289,971		Total Award Period Covered: 5/1/2011 – 4/30/2014		
Location of Project: MSU, FNAL, CERN				
Person-Months Per Year Committed to the Project.		Cal:	Acad:	Sumr: 2
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title:				
Source of Support:				
Total Award Amount: \$		Total Award Period Covered:		
Location of Project:				
Person-Months Per Year Committed to the Project.		Cal:	Acad:	Sumr: 0
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support				
Project/Proposal Title:				
Source of Support:				
Total Award Amount: \$		Total Award Period Covered:		
Location of Project:				
Person-Months Per Year Committed to the Project.		Cal:	Acad:	Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Michael Rijssenbeek	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Nucleon Decay and Neutrino Experiments and Experiments at High Energy Hadron Colliders Source of Support: Department of Energy Total Award Amount: \$ 493,000 Total Award Period Covered: 11/15/09 - 11/14/10 Location of Project: Stony Brook, NY, Fermilab, Batavia, Il., CERN, Geneva, Switz Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 4.50 Sumr: 2.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Nucleon Decay and Neutrino Experiments and Experiments at High Energy Hadron Colliders Source of Support: Department of Energy Total Award Amount: \$ 157,000 Total Award Period Covered: 11/15/10 - 03/31/11 Location of Project: Stony Brook, NY, Fermilab, Batavia, Il., CERN, Geneva, Switz Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 2.25 Sumr: 0.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: (THIS PROPOSAL) Experimental Studies of the Standard Model and Beyond at High Energy Colliders Source of Support: National Science Foundation Total Award Amount: \$ 5,253,443 Total Award Period Covered: 04/01/11 - 03/31/14 Location of Project: Stony Brook, NY, Fermilab, Batavia, Il., CERN, Geneva, Switz Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 4.50 Sumr: 2.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: MRI Consortium: Development of an Ultra-precise Proton Time-of Flight Detector System for ATLAS Source of Support: NSF via University of Texas at Arlington (Subcontract) Total Award Amount: \$ 187,670 Total Award Period Covered: 01/11/11 - 01/10/14 Location of Project: Stony Brook, NY, CERN, Geneva, Switzerland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Recovery Act ARRA Supplement to Nucleon Decay and Neutrino Experiments and Experiments at High Source of Support: DOE Total Award Amount: \$ 79,600 Total Award Period Covered: 11/15/09 - 11/14/10 Location of Project: Stony Brook, NY Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Summ: 0.00	
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.	

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Michael Rijssenbeek	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: U.S. ATLAS Operations Empowering U.S. Universities for Discoveries of the Energy Frontier Source of Support: NSF via Nevis, Columbia University Total Award Amount: \$ 246,897 Total Award Period Covered: 03/01/07 - 01/31/11 Location of Project: Stony Brook, NY, CERN, Geneva, Switzerland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Summ:	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Michael Rijssenbeek	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Nucleon Decay and Neutrino Experiments and Experiments at High Energy Hadron Colliders Source of Support: Department of Energy Total Award Amount: \$ 493,000 Total Award Period Covered: 11/15/09 - 11/14/10 Location of Project: Stony Brook, NY, Fermilab, Batavia, Il., CERN, Geneva, Switz Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 4.50 Sumr: 2.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Nucleon Decay and Neutrino Experiments and Experiments at High Energy Hadron Colliders Source of Support: Department of Energy Total Award Amount: \$ 157,000 Total Award Period Covered: 11/15/10 - 03/31/11 Location of Project: Stony Brook, NY, Fermilab, Batavia, Il., CERN, Geneva, Switz Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 2.25 Sumr: 0.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: (THIS PROPOSAL) Experimental Studies of the Standard Model and Beyond at High Energy Colliders Source of Support: National Science Foundation Total Award Amount: \$ 5,253,443 Total Award Period Covered: 04/01/11 - 03/31/14 Location of Project: Stony Brook, NY, Fermilab, Batavia, Il., CERN, Geneva, Switz Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 4.50 Sumr: 2.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: MRI Consortium: Development of an Ultra-precise Proton Time-of Flight Detector System for ATLAS Source of Support: NSF via University of Texas at Arlington (Subcontract) Total Award Amount: \$ 187,670 Total Award Period Covered: 01/11/11 - 01/10/14 Location of Project: Stony Brook, NY, CERN, Geneva, Switzerland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Recovery Act ARRA Supplement to Nucleon Decay and Neutrino Experiments and Experiments at High Source of Support: DOE Total Award Amount: \$ 79,600 Total Award Period Covered: 11/15/09 - 11/14/10 Location of Project: Stony Brook, NY Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Summ: 0.00	
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.	

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Michael Rijssenbeek	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: U.S. ATLAS Operations Empowering U.S. Universities for Discoveries of the Energy Frontier Source of Support: NSF via Nevis, Columbia University Total Award Amount: \$ 246,897 Total Award Period Covered: 03/01/07 - 01/31/11 Location of Project: Stony Brook, NY, CERN, Geneva, Switzerland Person-Months Per Year Committed to the Project. Cal:0.00 Acad: 0.00 Sumr: 0.00	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Summ:	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Senior Scientist: Abraham Seiden

CURRENT

Title: Research in High Energy Physics

Co PI: W. Atwood, T. Banks, M. Dine, H. Haber, R. Johnson, A. Litke, J. Nielsen, S. Profumo, H. Sadrozinski, T. Schalk, B. Schumm

Funding Agency: Department of Energy

Award Amount: \$6,233,000

Award Start and End Dates: 11/1/09 – 10/31/12

Person-Months Per Year: 2 Summer, 2 Academic

Title: UCSC Work on ATLAS Detector

Funding Agency: Columbia University / NSF

Award Amount: \$299,732

Award Start and End Dates: 01/26/10 – 1/31/11

Person-Months: 2 Academic

Title: MRI: Developments for a Novel Pixel Tracking Layer for the ATLAS Detector

Funding Agency: National Science Foundation

Award Amount: \$3,550,000 (4 years cumulative)

Award Start and End Dates: 10/01/10 – 9/30/14

Person-Months Per Year: 3 Academic

Title: Research in High Energy Physics (supplement)

Co PI: W. Atwood, T. Banks, M. Dine, H. Haber, R. Johnson, A. Litke, J. Nielsen, S. Profumo, S. Ritz, H. Sadrozinski, T. Schalk, B. Schumm

Funding Agency: Department of Energy

Award Amount: \$107,920

Award Start and End Dates: 11/1/09 – 10/31/12

Person-Months: 0

Title: Recovery Act: Infrastructure Proposal for the HEP Group at UCSC

Funding Agency: Department of Energy

Award Amount: \$296,025

Award Start and End Dates: 08/01/10-12/31/11

Person-Months: 0

PENDING (this proposal)

Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier

Project Location: BNL, CERN, UC Santa Cruz

Funding Agency: National Science Foundation

Total Proposed Award Amount: \$50 Million

Award Start and End Dates: 10/01/11 – 09/31/16

Person-Months Per Year: 2 Academic

Current and Pending Support
for James T. Shank

(See GPG Section 11.0.8 for guidance on information to include on
this form.)

The following information should be provided for each investigator and other senior personnel. Failure
to provide this information may delay consideration of this proposal.

Investigator: James T.
Shank

Support Current

Project/Proposal Title: U.S. ATLAS Research Program: Empowering U.S. Universities for Discoveries at the Energy
Frontier.

Source of Support: NSF via Columbus University {PI, Mike Tuts}

Total Award Amount: \$2,400,000.00 Total Award Period Covered: 2/1/07- 1/31/12

Location of Project: Boston University

Support: Current

Project/Proposal Title: Research In Particle Physics (PO: J. Butler) Task A2: Colliding Beams, Year 1-4 (R.S. Whitaker)

Source of Support: DOE grant number: DE-FG02-91ER40676

Total Award Amount: \$436,500 Total Award Period Covered: 2/1/10-1/31/11

Location of Project: Boston University

Pending

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at
the Energy Frontier – This Proposal

Source of Support: National Science Foundation

Total Award Amount: \$3,091,370

Total Award Period Covered: 2/1/12-1/31/17

Role: Co-PI

Location of Project: Boston University

Current and Pending Support for Ryszard Stroynowski

(i) PI for the DOE base program at SMU (4 tasks), \$886,000

(ii) Columbia University subcontract, ebubble R&D, \$59,340

(iii) US-ATLAS LAr M&O, NSF-Columbia University, \$222,600

(iv) BNL – cryogenics designs for micro-BOONE and LBNE, \$273,420

(v) Pending: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier – NSF (this proposal 2/1/12-1/31/17) \$2,953,800

Current and Pending Support for Anyes Taffard:

Current:

Project/Proposal Title: A Research Program in Neutrino Physics, Cosmic Rays and Elementary Particles – Task E Research in Collider Physics (DOE DE-FG02-91ER40679)

Source of Support: Department of Energy

Total Award Amount: \$1,764,000

Total Award Period Covered: 2/1/10-1/31/13

Role: Co-PI

Person-Months Per Year committed to the Project: 2 summer month

Pending:

Project/Proposal Title: A Simplified Model Approach To Explore The Energy Frontier (DE-FOA-0000395)

Source of Support: Department of Energy

Total Award Amount: \$750,000

Total Award Period Covered: 7/1/11-6/30/16

Person-Months Per Year committed to the Project: 1 summer month

Current and Pending Support for **DANIEL WHITESON**

Current and Pending Support

DOE HEP Original Junior Investigator Award 2007 “*New physics with electrons and muons at ATLAS*”, \$82k/year Role: PI

Department of Energy "A Research Program in Neutrino, Cosmic Rays and Elementary Particles – Task E" 2010-2013, \$582k/year Role: Co-PI (shared with Lankford, Taffard)

Alfred P Sloan Foundation Fellowship (2010-2011), \$25k/year Role: PI

Pending

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier

Source of Support: National Science Foundation

Total Award Amount: \$3,828,820

Total Award Period Covered: 2/1/12-1/31/17

Role: Co-PI

Location of Project: UCI, CERN

Stephane Willocq

Current and Pending Support

Current

- US DOE grant DE-FG02-92ER40715

Co-PI with Ben Brau and Carlo Dallapiccola

1 Jan 2011 - 31 Dec 2011 \$469,000

1 Jan 2010 - 31 Dec 2010 \$455,000

- Teaching buyout for US ATLAS Deputy Manager PS&C duties

US DOE, 1 Jan 2011 - 31 Dec 2011 \$27,000

US ATLAS Operations Program, 1 Jan 2011 - 31 Dec 2011 \$27,000

US DOE, 1 Jan 2010 - 31 Dec 2010 \$27,000

US ATLAS Operations Program, 1 Jan 2010 - 31 Dec 2010 \$27,000

- Columbia University for US ATLAS Operations Program NSF subcontract
PI

1 Oct 2010 - 30 Sep 2011 \$153,837

Pending

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier - This proposal

Source of Support: National Science Foundation

Total Award Amount: \$927,103

Total Award Period Covered: 2/1/12-1/31/17

Role: Co-PI

Location of Project: Amherst, CERN

JINGBO YE Current and Pending Support

- (i) The DOE base program at SMU of which Ye is one of the co-PIs.
- (ii) ADR/DOE, Award No: DE-FG02-08ER41573, from August 15, 2008 to August 14, 2011, in the amount of \$334,210
- (iii) US-ATLAS Upgrade R&D, subcontracted from Columbia University, from March 1, 2007 to January 31, 2011, in the amount of \$840,910
- (iv) Pending: ADR/DOE, in answering the funding opportunity announcement number: DE-FOA-0000407. A collaborative proposal with Duke University, Vanderbilt University and Yale University for a total amount of \$537,150 for two years.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.				
Investigator: Saul Youssef	Other agencies (including NSF) to which this proposal has been/will be submitted.			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: U.S. Atlas Research Program: Empowering U.S. Universities for Discoveries at the Energy Frontier				
Source of Support: National Science Foundation Total Award Amount: \$2,400,000 Total Award Period Covered: March 1, 2007 – January 31, 2011 Location of Project: Boston University Person-Months Per Year Committed to the Project. 12 Cal: Acad: Sumr:				
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: "NSF – This proposal"				
Source of Support: National Science Foundation Total Award Amount: \$3,091,370 Total Award Period Covered: 2011-2016 Location of Project: Boston University Person-Months Per Year Committed to the Project. 12 Cal: Acad: Sumr:				
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:				
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:				
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:				
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:				
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:				
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:				
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.				



Current and Pending Support

Investigator: Bing Zhou	Other agencies to which this proposal has been/will be submitted. None
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: <i>(current proposal)</i> U.S. ATLAS Operations: Empowering University Physics to make Discoveries at the Energy Frontier Source of Support: Direct-Columbia University : Prime-National Science Foundation Total Award Amount: \$ 1,741,580 Total Award Period Covered: 10/1/11-9/30/16 Location of Project: Geneva, Switzerland (CERN) Person-Months Per Year Committed to the Project. 0 Cal: Acad: Sumr:	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Maintenance & Operation of WBS 3.5.a Muon System Source of Support: Direct-Columbia University : Prime-National Science Foundation Total Award Amount: \$ 2,183,237 Total Award Period Covered: 10/1/06-9/30/11 Location of Project: Geneva, Switzerland (CERN) Person-Months Per Year Committed to the Project. 0 Cal: Acad: Sumr:	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Study the Properties and Interactions of Elementary Particles- DOE Task A Source of Support: Department of Energy Total Award Amount: \$ 4,361,983 Total Award Period Covered: 11/1/09-10/31/11 Location of Project: Geneva, Switzerland (CERN) Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 2 mths	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: 0 Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: 0 Acad: Sumr:	
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.	

USE ADDITIONAL SHEETS AS NECESSARY

Junjie Zhu

Current and Pending Support

Current

35k startup support from University of Michigan.

Pending

Submitted a proposal titled "CAREER: Discovery of New Physics with Muons at the ATLAS experiment" to the NSF faculty early career development (CAREER) program on July 2010. At this time it is still in the pending state.

Submitted a proposal titled "Exploring New Physics Beyond the Standard Model with Muons at the ATLAS experiment" to the DOE early career development program on September 2010. At this time it is still in the pending state.

Submitted a joint proposal titled "LHC Summer Research Experience" with my UM colleagues (Professors Homer Neal, Jean Krisch and Aaron Leanhardt) on September 2010. This CERN-UM REU program brings about fifteen undergraduate students selected from all US universities to CERN for eight weeks in the summer to work with physicists. At this time this proposal is still in the pending state.

Project/Proposal Title: U.S. ATLAS Operations Program: Empowering University Physicists to make Discoveries at the Energy Frontier

Source of Support: National Science Foundation

Total Award Amount: \$1,741,580

Total Award Period Covered: 2/1/12-1/31/17

Role: Co-PI

Location of Project: Michigan, CERN

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. USE additional pages as necessary.

Laboratory: 4580 sq. ft. high bay area with overhead crane and semi trailer access
6293 sq. ft. machine shop
4565 sq. ft. electronics shop

Clinical:

Animal:

Computer: 2025 sq. ft. computer facility with 4 offices
Associated computer equipment

Office: 17 research staff offices at 4533 sq. ft.
Local HEP journal and preprint library
8 research group rooms at 4850 sq. ft.

Other: purchasing and stock 3170 sq. ft.

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate identifying the location and pertinent capabilities of each.

Machine shop/high bay area:
Large travel numerically controlled milling machines
Specialized aluminum welding equipment
High Vacuum leak detector equipment

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual arrangements with other organizations.

Microcircuits laboratory (funded mainly by the Keck Foundation) at 5070 sq. ft.
IC design, layout and simulation hardware/software
HP IC measuring and testing facility
High precision analog test equipment probe station and VME
DAQ system

POSTDOC MENTORING PLAN (details)

Although as a matter of policy we do not support any postdocs in this proposal (there are two operations program supported postdocs working in largely technical roles, whose institutional mentoring plans are discussed below), there are many postdocs who are working in the ATLAS experiment and each NSF supported institution has a mentoring plan in place which has been approved by the NSF. We note that postdocs in this extremely international experiment have a very unique opportunity. There is intense involvement of U.S. faculty members with postdocs in all areas of the experiment. In addition our Analysis Support manager keeps track of the physics activities of all groups and is able help in promoting postdocs to positions of responsibility within the ATLAS collaboration at large.

NYU: Post-doc Attila Krasznahorkay has faculty mentoring in two major forms. The first is from weekly group meetings using EVO to connect those at CERN with those at NYU. These include Professors Cranmer, Mincer, and Nemethy as well as the other post-docs and graduate students in the group. The second, and primarily form of mentoring, is one-on-one discussions with Kyle Cranmer. The content of these discussions have a broad range. Some discussions are on technical implementation or design of analysis tools -- they occur approximately five times per year, particularly when we have an idea for a new tool or when a major decision within ATLAS is required. Other meetings are devoted to advice in collaboration matters, such as taking on new roles of responsibility. For instance, Attila was simultaneously asked to coordinate the D3PD Making tools and be the trigger liaison for the top-physics group, and the discussion centered on whether it was wise to accept one or both positions. Attila was also nominated and considered for the ATLAS co-coordinator of the physics analysis tools group; showing that he is well respected within the collaboration and has promising prospects for future employment. In addition, Kyle and Attila have frequent discussions on active research topics in the top and exotic groups; planning future studies and reviewing the status and approach of current studies. Finally, Attila's work within the physics analysis tools group is also coordinated with the conveners of that group as well as the relevant people in US-ATLAS analysis support. In summary, Attila receives both broad and detailed mentoring from a number of established physicists.

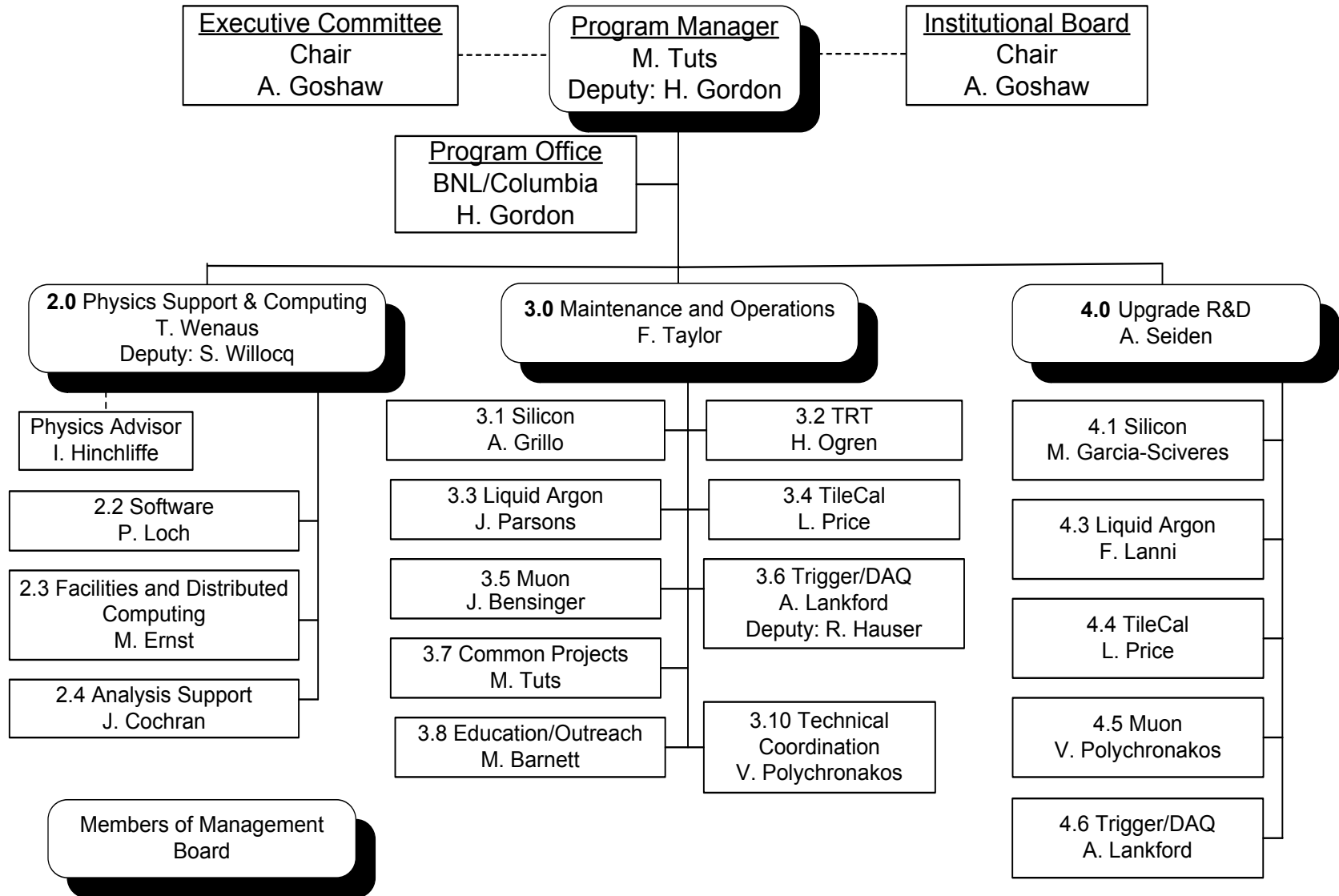
Michigan State University: We have always had strong post-docs, who go on to successful careers. This proposal includes a request for partial support for post-docs to work in our projects and we will endeavor to provide an interesting opportunity for them to gain valuable experience on all aspects of our experiments including: hardware design and construction, software development, analysis development and paper writing. In addition our post-docs' development will be enhanced through a program of personalized mentoring activities. The goal of the mentoring program will be to provide the skills, knowledge and experience to prepare the postdoctoral researcher to excel in his/her career path. Specific elements of the mentoring plan will include:

- Working with the postdoctoral researcher to establish and implement a personalized set of goals.
- We have always encouraged our post-docs to develop their own paths in physics analysis and in service roles within our experiments. For example, the user computing facility, ClueD0 was developed by a team of MSU post-docs as a response to lagging Linux computing support in the early DØ. They were slightly outside of the mainstream and we supported and encouraged them fully and were pleased that their collaborative efforts resulted in the primary user cluster in the experiment to this day. We expect similar independent work for the ATLAS Collaboration.
- We will try to give post-docs opportunities to teach classes if they are stationed at MSU, but in any case, we encourage their active involvement with our graduate and undergraduate students.
- We have always encouraged travel to at least one conference and international collaboration meetings each year and likewise encourage that they give talks at the conference and make presentations at the collaboration meetings.

Participation in the collaboration's weekly research group meetings, in which members will be expected to present their research regularly, and feedback and coaching will be given to help all members to develop their communication and presentation skills.

Success of this mentoring plan will be assessed by tracking the progress of the postdoctoral fellow through her/his sets of goals, interviews of the postdoctoral fellow to assess satisfaction with the mentoring program, and tracking of the postdoctoral fellow's progress toward his/her career goals after finishing this phase of their career.

U.S. ATLAS Operations Program Organization as of September 27, 2010



U.S. ATLAS Institutional Board

September 2010

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