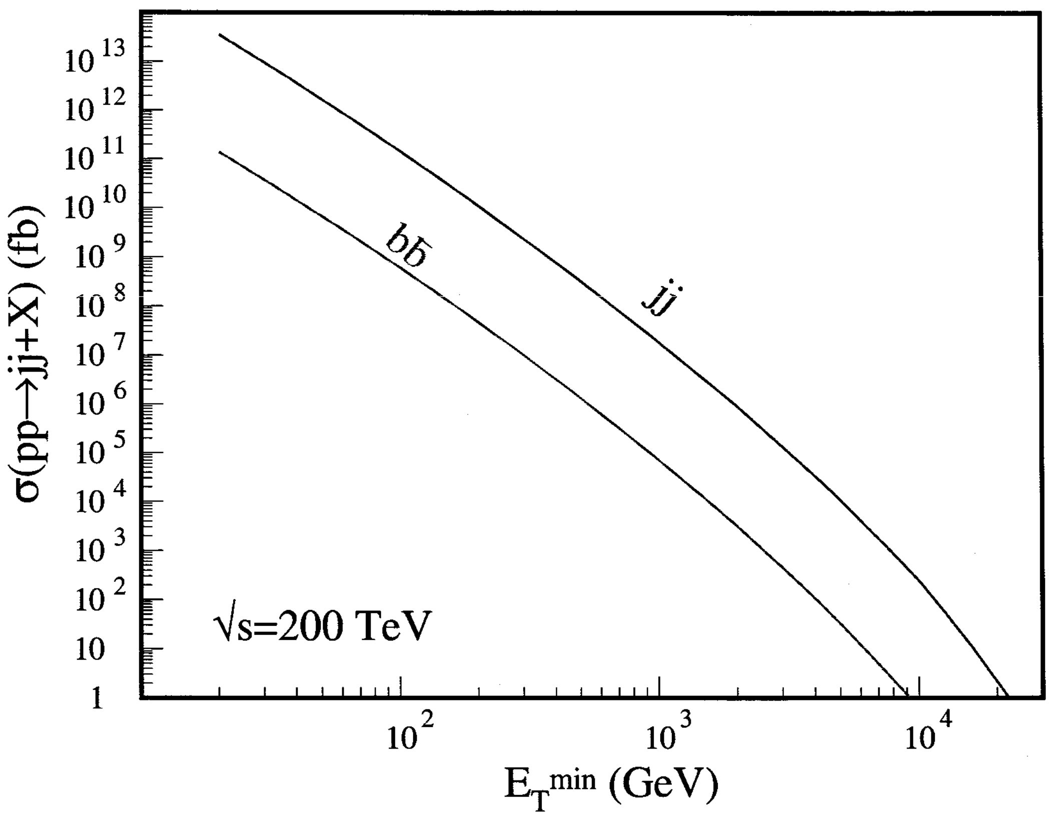
# Event Characteristics at 200 TeV

**Dijet cross sections**
**Multiple interactions**
**Characteristics of SM events**

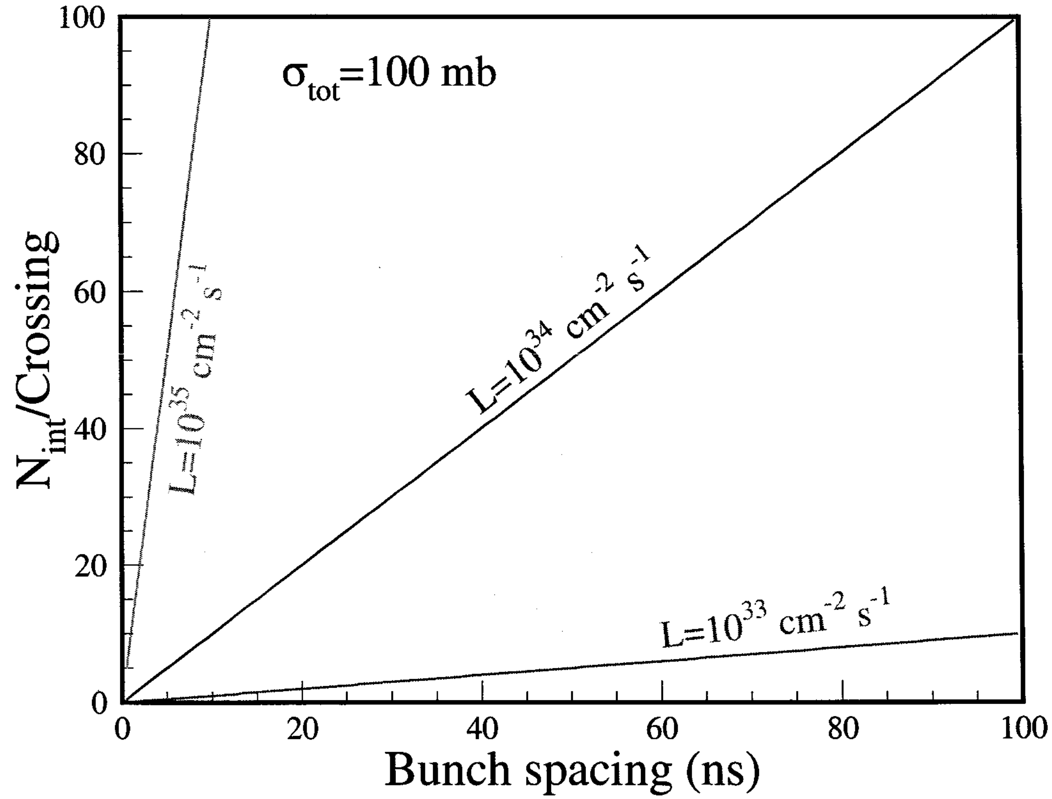
**Jianming Qian**
**The University of Michigan**

# Dijet Cross Section vs pT Cut



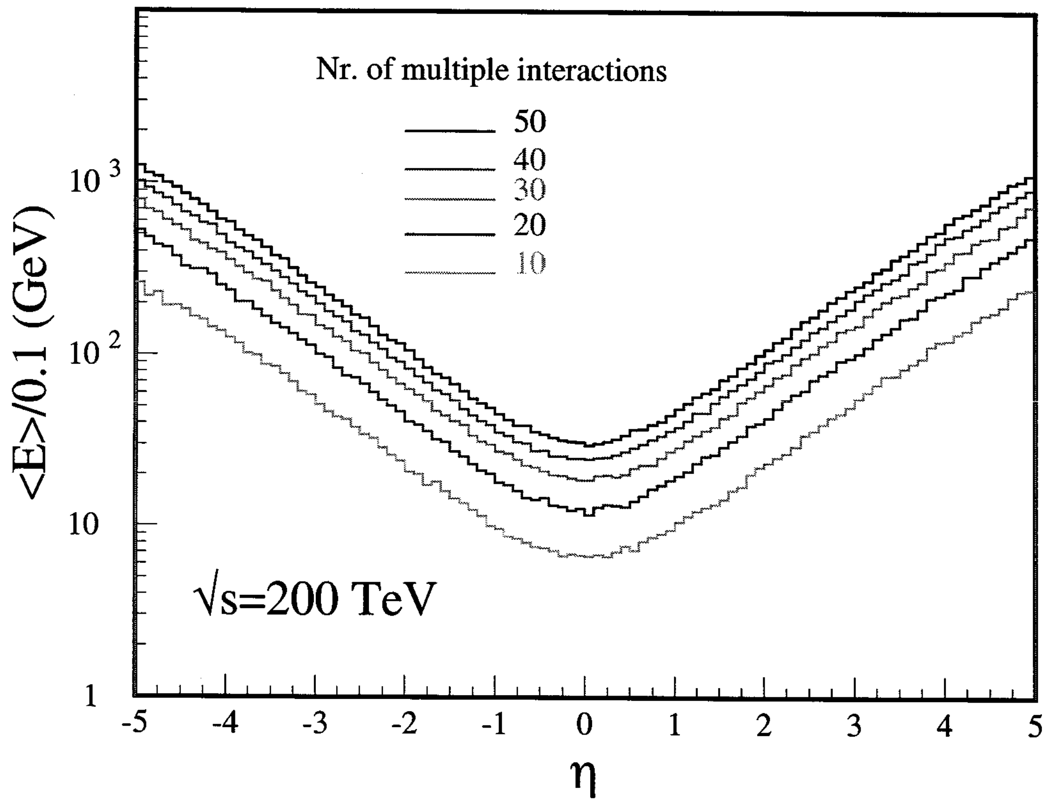

**For a pT cut of 10 TeV, the LO dijet cross section is about 0.3 pb**

# Number of Multiple Interactions




**For L~$10^{34}$ cm$^{-2}$ s$^{-1}$ and 25ns bunch spacing, on average 25 multiple interactions are expected**

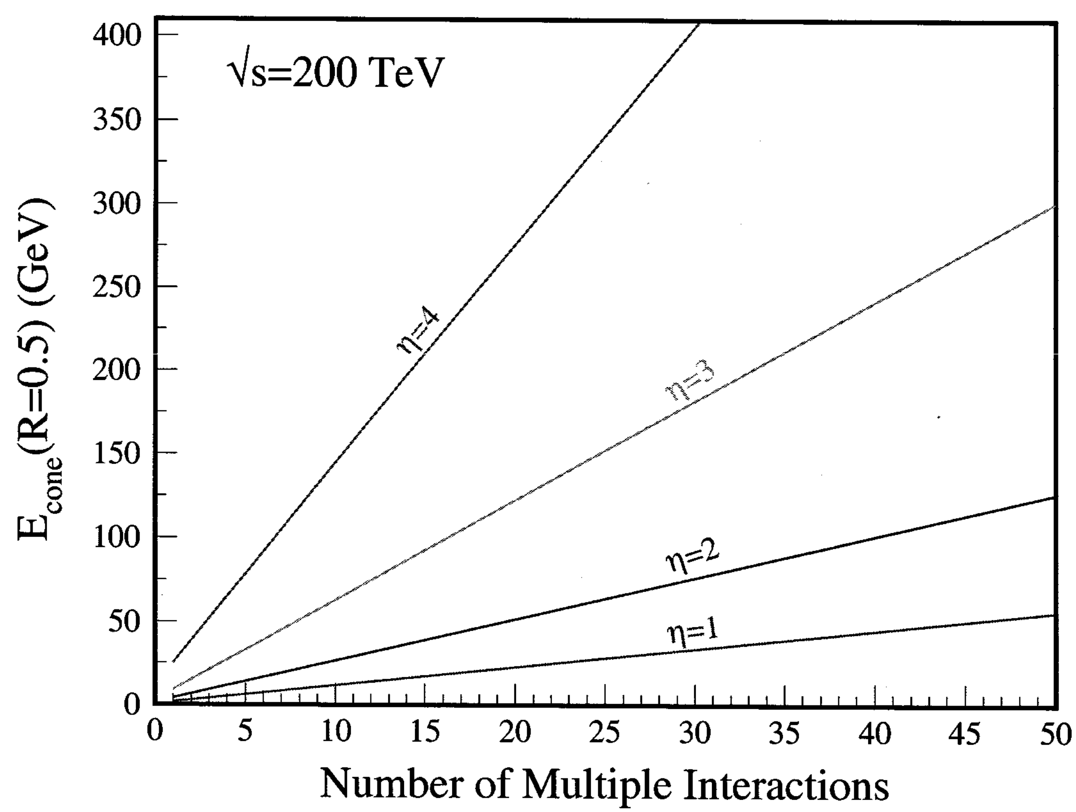
# Energy Distributions of MI Events




**At eta=3, the energy flow is about 200 GeV per unit eta unit phi for 25 MI events**

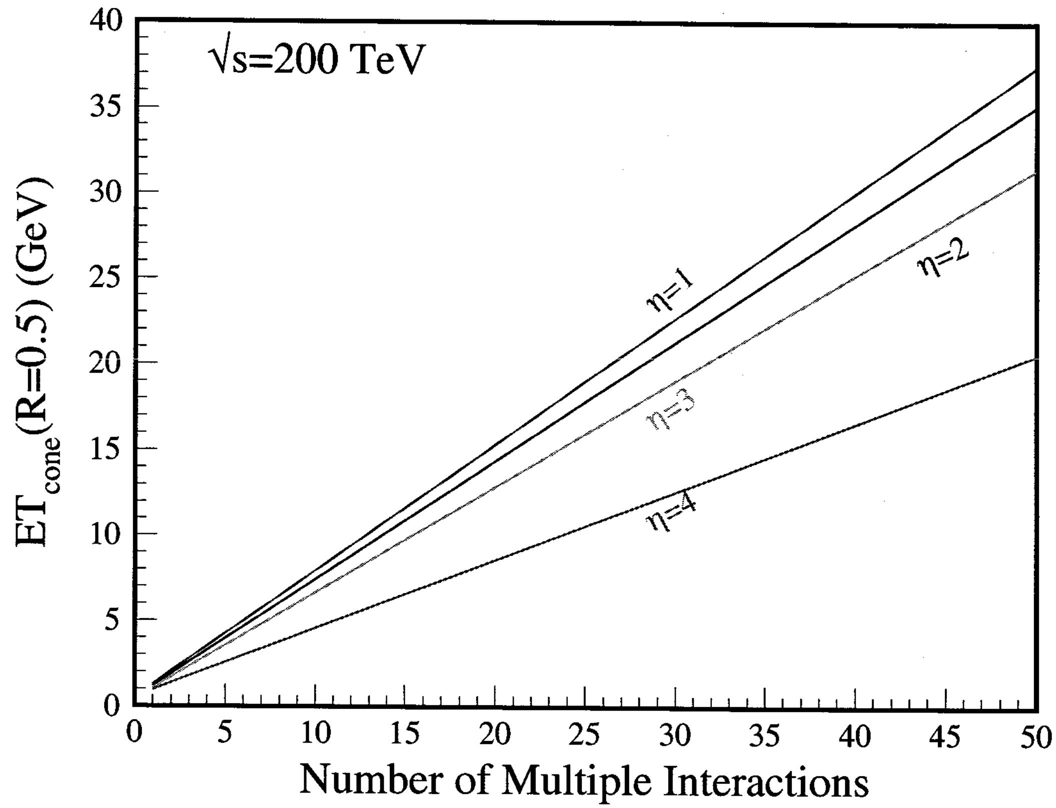
**Estimation based on Dzero underlying event number is a factor two higher**

# Average Energy in a R=0.5 Cone




**Magnetic field may modify the distribution**
**Lower in the central and higher in the forward (?)**

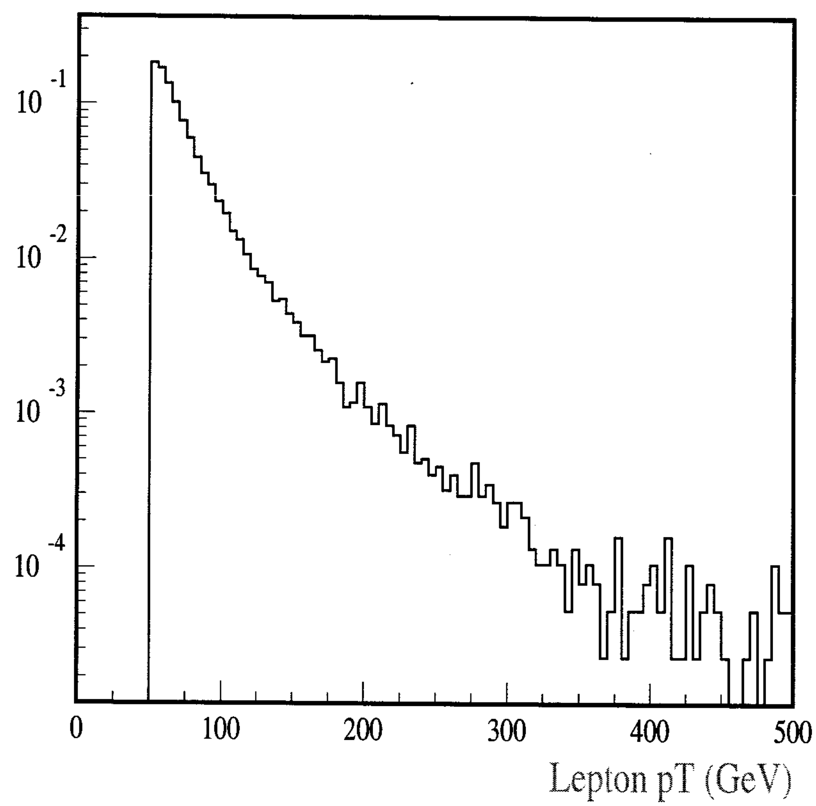
# Average ET in a R=0.5 Cone

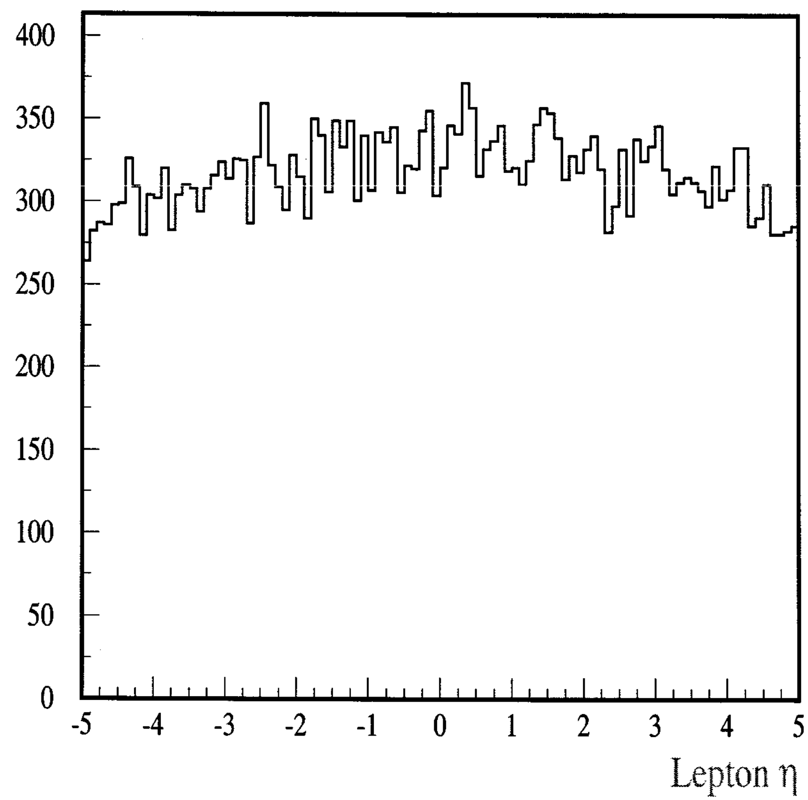



**Jet ET threshold has to be way above this energy deposit (20 GeV at eta=1 for 25 MI events)**

# Lepton Kinematic Distributions (I)

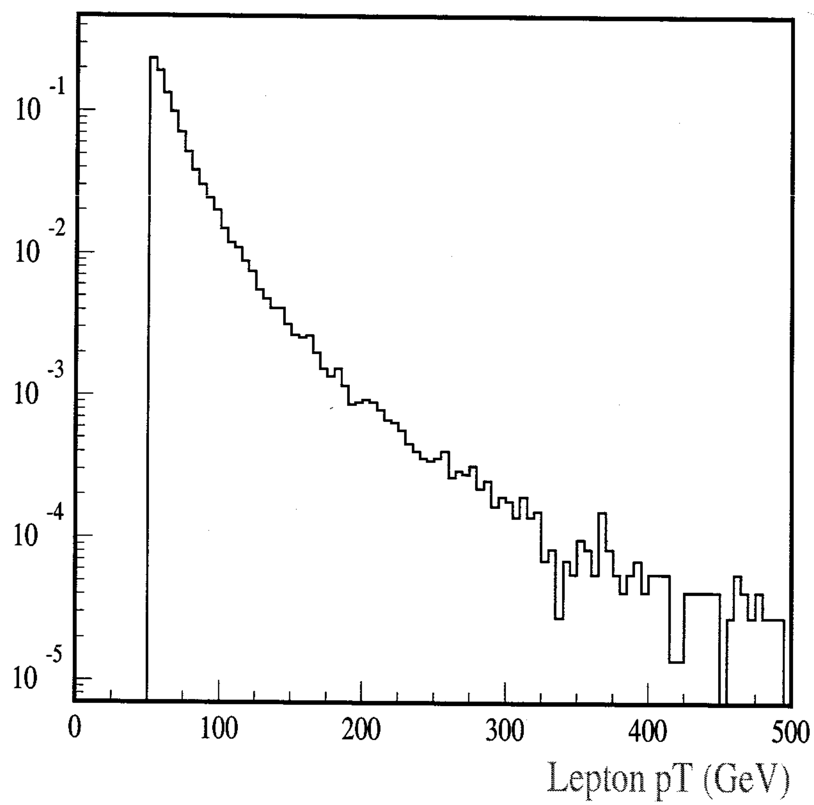
## W events

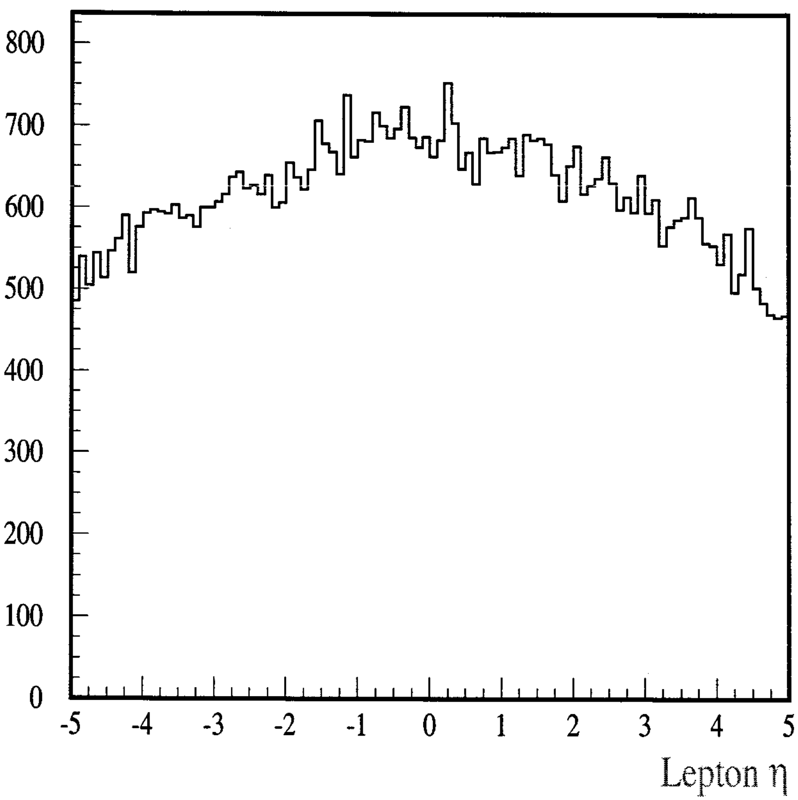


# Lepton Kinematic Distributions (II)

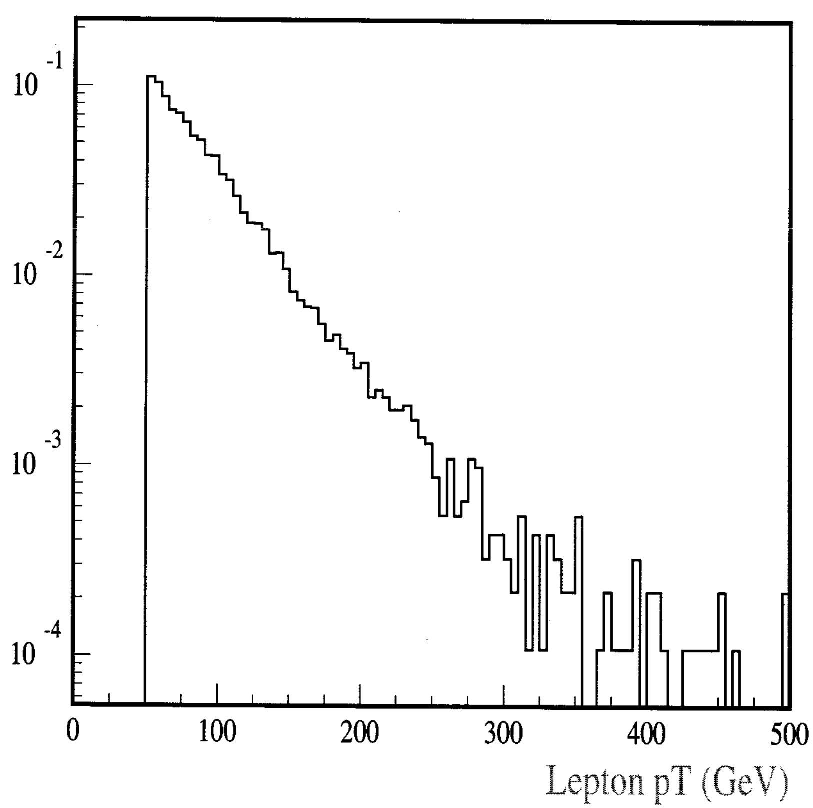
## Z events

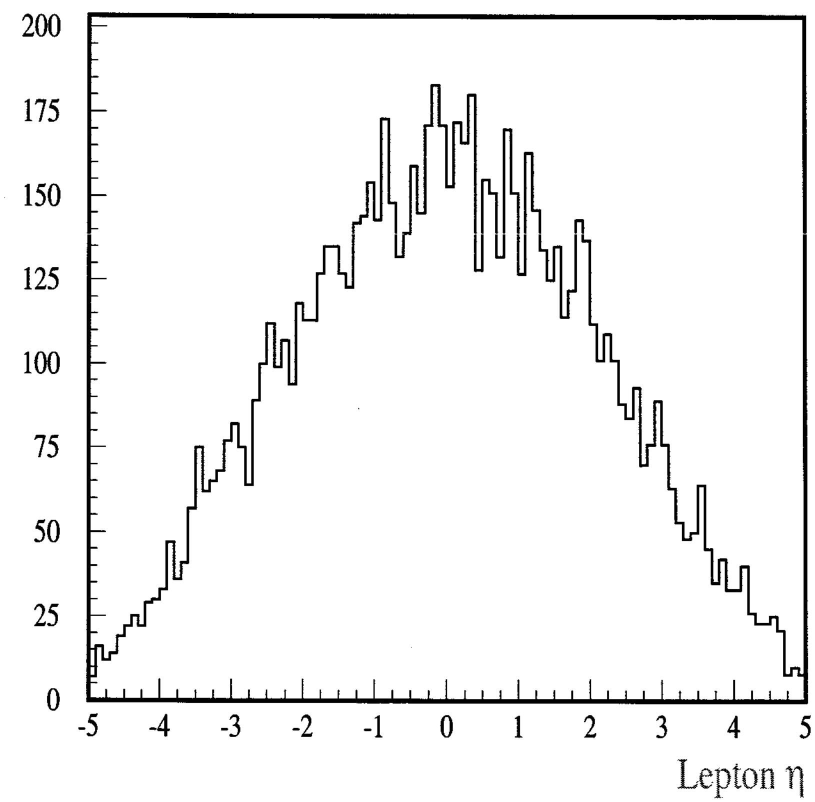


# Lepton Kinematic Distributions (III)

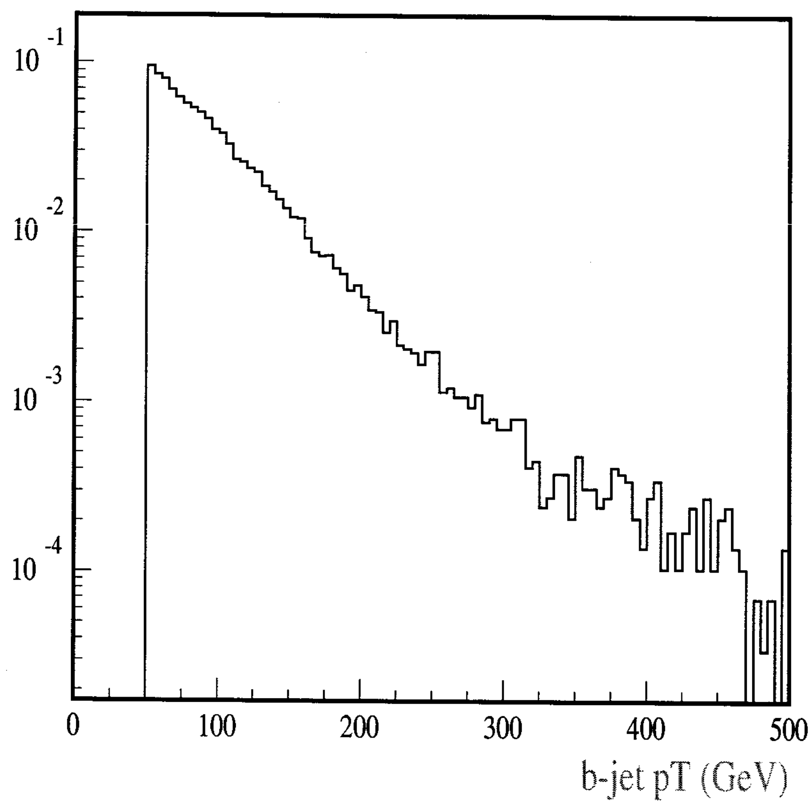
## top quark pair events

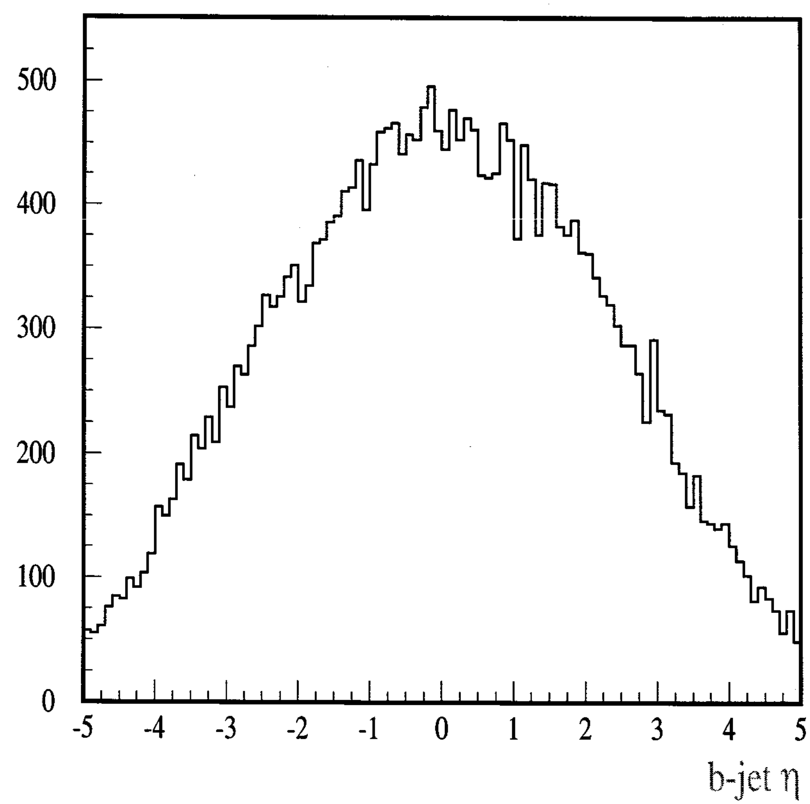


# b-jet Kinematic Distributions

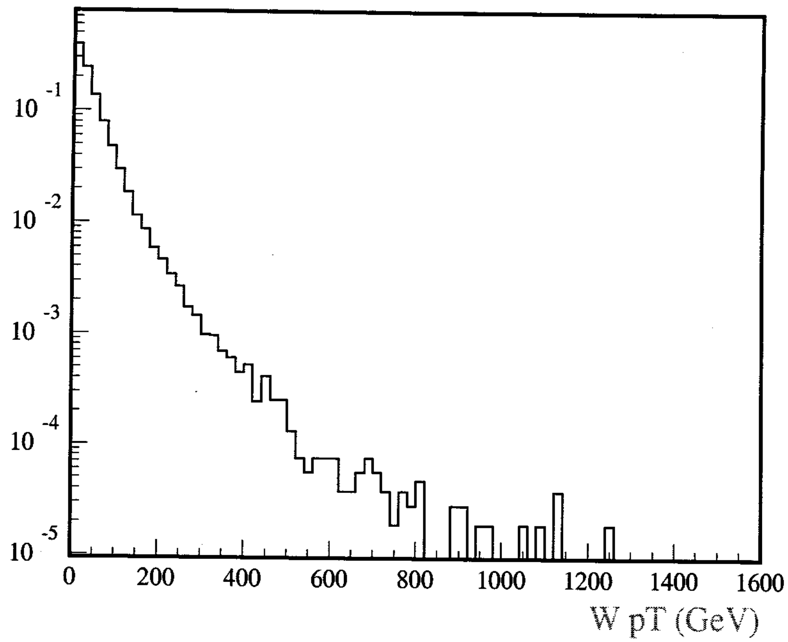
## top quark pair events



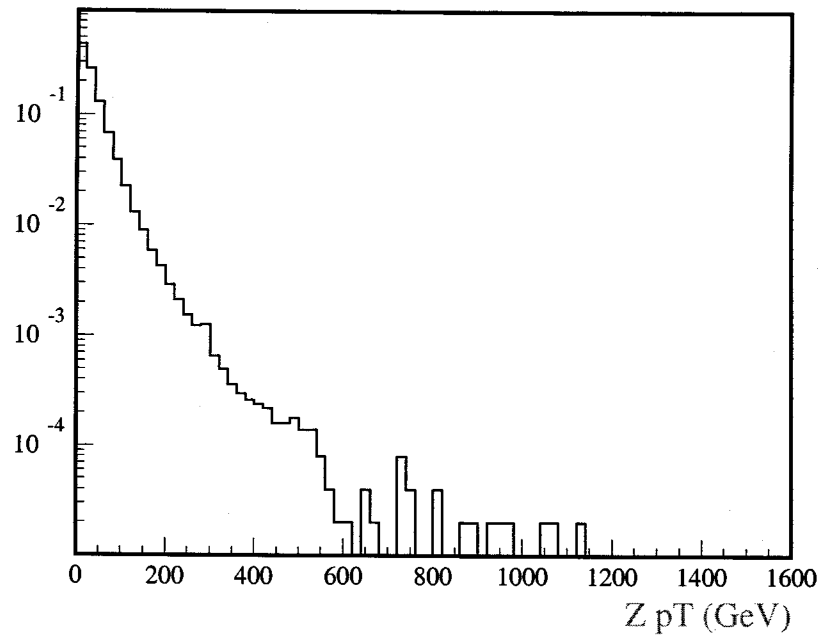



# Summary

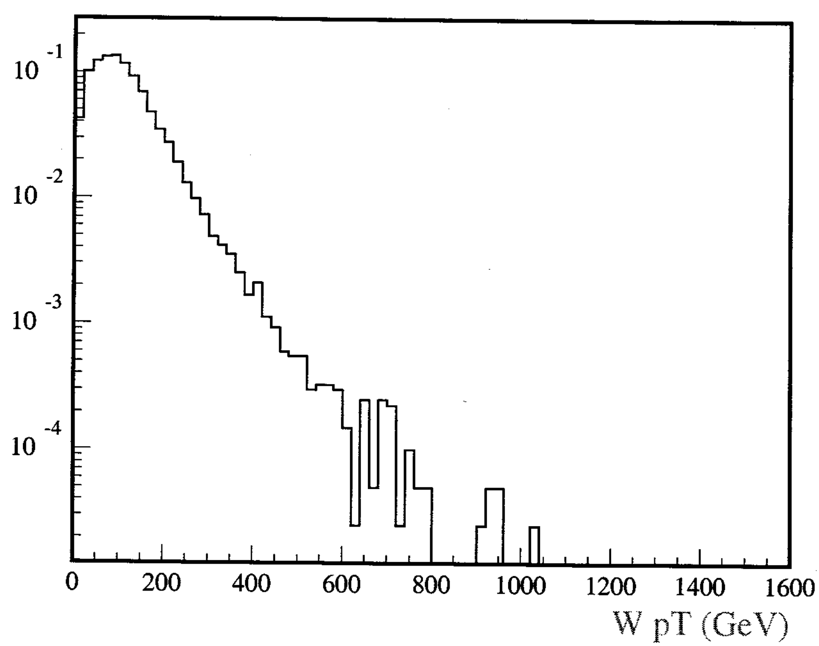
- dijet cross section is large even for large pT cut
- multiple interactions deposit a large amount of energy in a jet cone. Jet ET cut has to be way above this deposit.
- Leptons from W/Z are essentially flat in eta and their pTs are generally less than 500 GeV
- Leptons and jets from ttbar events are central



10 -1
10 -2
10 -3
10 -4
10 -5
0
200
400
600
800
1000
1200
1400
1600
W pT (GeV)

10 -1
10 -2
10 -3
10 -4
0
200
400
600
800
1000
1200
1400
1600
Z pT (GeV)

10 -1
10 -2
10 -3
10 -4
0
200
400
600
800
1000
1200
1400
1600
W pT (GeV)

# Working Group E4C Summary: Detectors for VLHC

Snowmass 2001

*Conveners: M. Albrow, D. Denisov*

- **Group charge**
- **List of talks**
- **Brief overview of presented results**
- **Interface with accelerator**
- **Radiation doses**
- **Tracking, calorimetry, muon detection**
- **R&D on detectors for VLHC**
- **Summary**

# Summary

- E4C group concentrated on discussions of detectors for VLHC Stage I (40TeV, $10^{34}$) and Stage II (175TeV, $2.10^{34}$)
- Accelerator parameters presented in 2001 VLHC design study are suitable for detectors. Reduction in bunch spacing time below 18ns, if handled by detectors and electronics, will provide reduction in number of interactions per crossing
- Radiation dose in central rapidity region is function of luminosity, "not" beam energy. Forward region doses increase rapidly with energy
- Detectors for stage I VLHC could be built based on existing (~LHC) technology. For Stage II detectors major issues are:
  - Momentum resolution of tracker and muon system
  - Radiation doses in the forward region
  - Events pileup
- Major areas of VLHC detectors and electronics R&D: radiation hardness, precision timing, tracker/muon momentum resolution, cost
- In addition to two general purpose detectors specialized detectors should be considered
- Cost of general purpose Stage I VLHC detector based on LHC/SSC extrapolation is ~$0.7B, unless cost reduction ways are established
- While R&D is needed in order to reduce cost and improve experiments capabilities detectors for VLHC are feasible