Major VLHC detector parameters: from benchmarks group ~ A. Kotwal

> > 1. Central tracking:
> > a) what tracking eta coverage is needed?

since we expect multilepton final states from various processes, requiring all of them to be central is fairly harsh. tracking coverage upto eta<2 will be needed, particularly at 200 TeV when longitudinal boosts will be large.

> > b) what tracking muon momentum resolution is adequate and what is maximum momentum of particles to be measured?

highest Pt leptons are produced from W' and Z' for which we will have sensitivity upto say 40 TeV. So we can expect 20 TeV electrons and muons. Typical width may be ~5-10% of mass, so we would need momentum resolution of that order at 20 TeV.

> > c) how important is B tagging and what is min/max momentum of B hadrons to be measured?

I think minimum would be from 120 GeV Higgs decay, so 50 GeV energy. Pt is less. For B physics also, a minimum pt cut of say 30-50 GeV is reasonable. If we have heavy objects at mass=1 TeV decaying to top and then t->b, we will get B with 250 GeV energy. if there is a direct decay, then 500 GeV B hadrons

> > 2. Central magnetic field:
> > d) is it essential to have central tracking momentum measurement or could one measure jets/e/gamma energies in calorimeter/muon system only?

for B hadrons the field is essential. for jets/e/gamma, tracking+calorimetry without field can work if calorimetry has fine segmentation a la D0. Muon system momentum resolution is too poor for reconstructing resonances.

> > 3. Calorimetry:
> > a) what eta coverage is needed for em and hadron calorimeters?

at least eta<2 I think

> > b) what energy resolution vs eta is required?

jets - 100%/sqrt(E) will be enough
electrons - 20%/sqrt(E) will be enough
constant term - 1-2% for electrons, 5% for hadron should be OK

> > c) what calorimeter granularity (eta/phi) is needed?

in the absence of magnetic field, 0.1x0.1 with 0.05x0.05 at shower max and 4 EM layer readout for electromagnetic calorimeter was really useful for e/gamma in D0. for jets 0.1x0.1 is more than enough. with magnetic tracking, we can give up a little on EM segmentation, but 1st layer readout is useful for photon ID.

> > d) what is min/max energy of jets/e/gamma?
for electron from inclusive W or Z, min energy~20 GeV. max can go up to 20 TeV. photon max can be same for very heavy resonances. 20 TeV jets will also be interesting. min jet Et ~ 50 GeV from b jets from Higgs.

> > 4. Muon system: > > a) what eta coverage is needed?

eta~2

> > b) do we need precise (better then 20%) muon momentum measurement? yes, for reconstruction dimuon resonances - 5-10% resolution. I dont know if we expect extremely narrow resonances.

> > c) what is min/max energy of muons interesting for benchmark
> > processes?

20 GeV-20 TeV

dynamic range at Tevatron was 1.5 GeV (psi) upto 400 GeV for W' or Z', more than factor of 200. at VLHC the range will increase to ~1000 or couple of thousand.