JetMET status
and
plans for ICHEP

Intro

- Summary of many efforts in the JetMET group in the last months, with particular attention on December 2009 data and what we want to do for ICHEP.
- **Many contributions from many authors!!**
- Jets and MET fundamental ingredients to many analyses, careful commissioning needed, in strong collaboration with subdetectors.

- Calorimeter Jets
Input: calorimeter towers
Scheme 6 for E and E_T towers thresholds
- JPT jets
Input: calorimeter Jets, ZSP, Tracks
Using single pion calorimeter-response map
- PF Jets
Input: PF candidates (photons, electrons, charged and neutral hadrons)
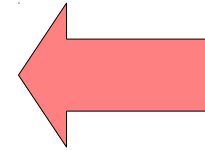
- Calo MET
- Track corrected MET (tcMET)
- pfMET

JetMET: plans for ICHEP 2010

- Monitoring of JetMET objects
    - Part of the standard DQM offline
    - Prompt analysis carried out by teams of experts
    - Jet reconstruction and noise effects in Jets
    - raw calo MET in MinBias events for signs of detector malfunction and noise
   - MET algorithms

- Jet energy corrections
- Measurements of jet resolution using dijet asymmetry.
- Clearly there will also be jet physics JetMET will contribute to directly

JetMET: plans for ICHEP 2010

- for RAW CaloMET
  - continue to optimize noise removal for RawCaloMET
  - check the modeling of MET in dijet events
  - measure the resolution for MET as a function of Z(gamma) pT in Z(single photon) events

- Corrections:
  - Study type 1 corrected MET in dijet events
  - Work on unclustered energy corrections

- Check MET distribution in e.g. W events and compare different algorithms

- With 1-10 pb-1 of data at 7 TeV, we would have
  - a large sample of jet and single photon events
  - 1000-10000 Z to ee and mumu events
  - 10000-100000 W to enu and munu events
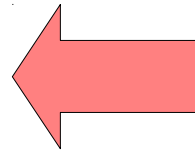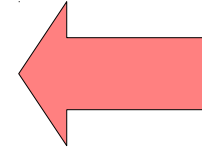
Monitoring and noise studies on data

Base collision events selection (common to all the analyses performed on 900GeV and 2.36TeV Decembre 2009 data)

L1 technical trigger bits
• BPTX bit 0 (2 beam coincidence)
• BSC bits 40 OR 41
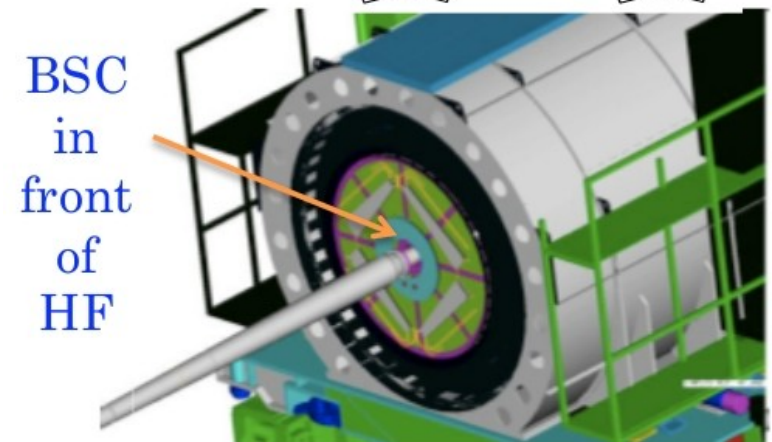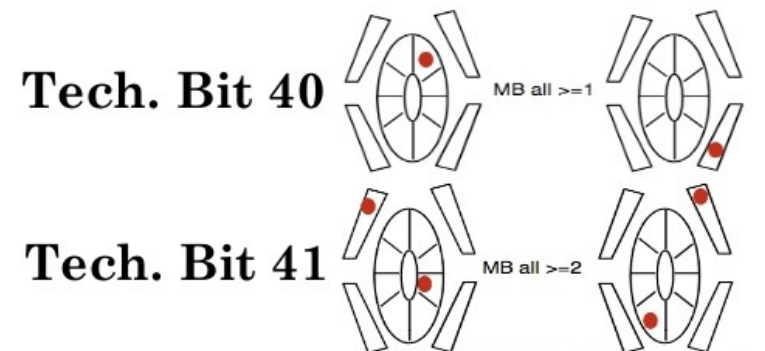• Veto BSC BeamHalo bits 36-39

Physics Declared bit set (tracker and pixel HV ON)

Require event to have a good vertex:
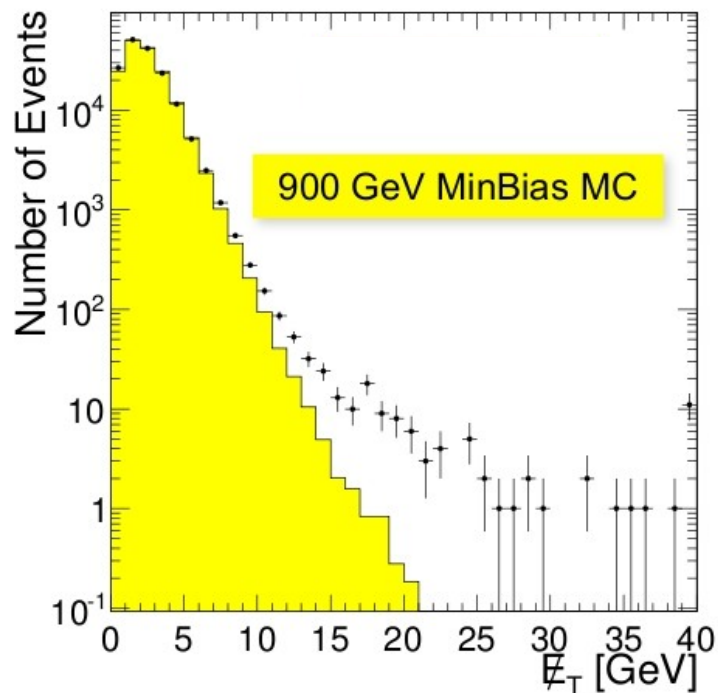• vertex is NOT fake,
• NDF >= 5,
• |Vtx(z)| <= 15cm

Removal of "beam scrape events" :
• require the fraction of "high-purity" tracks in events with more than 10 tracks to be greater than 25%

Data a first glance at MET

After selection, first look at raw calo MET. Discrepancies in the tail

900 GeV MinBias MC

Events with MET>15 GeV due to:

• 43% HF PMT hits form charged particles, beam related (**cleaned** looking at isolation of the deposit in long and short fibers)
• 24% ECAL spikes from particle interaction with APDs (**cleaned** with ET>5GeV and E4/E1<0.05 – in PromptReco from 355 for 7TeV)
• 5% HB/HE anomalous noise,not beam related and not a big effect, for the moment uncorrected
• 16% fiduciality (e.g. transition region)
• 12% unclassified

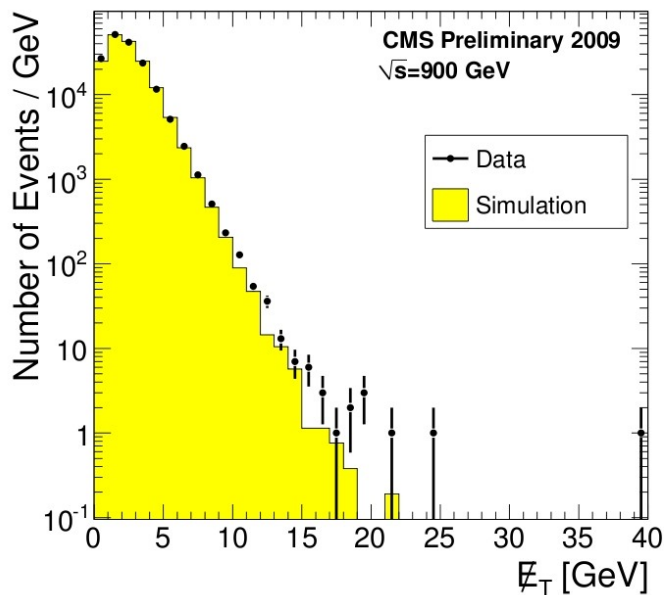Lot of work done and ongoing in ECAL and HCAL groups!

Plots and numbers from the MET PAS approved in February

Effect of the cleaning on MET
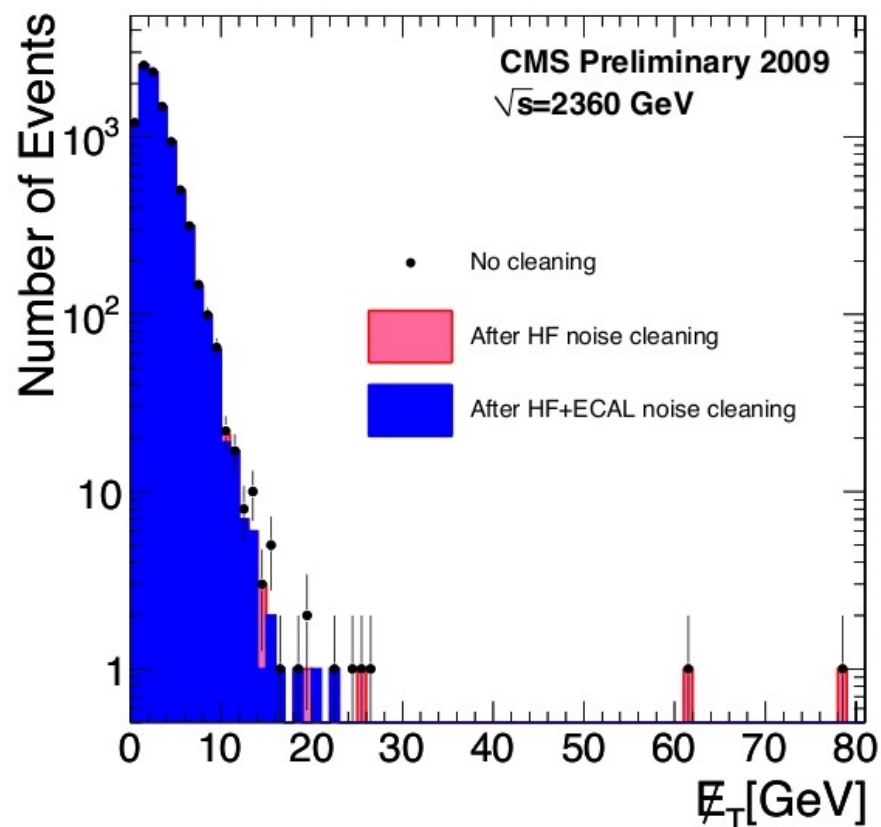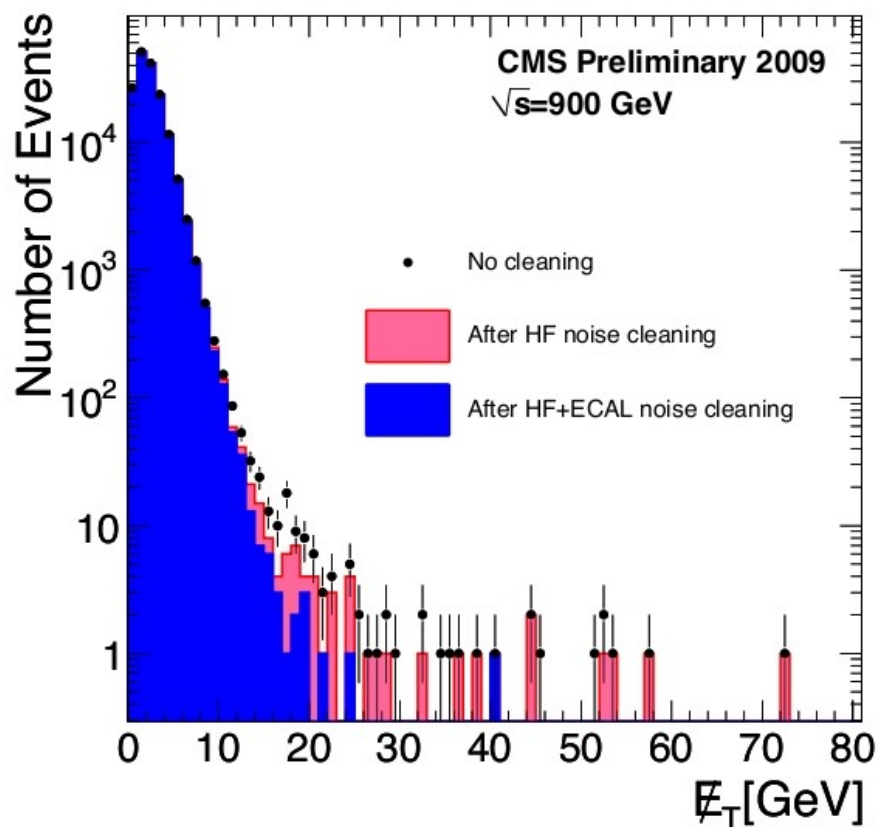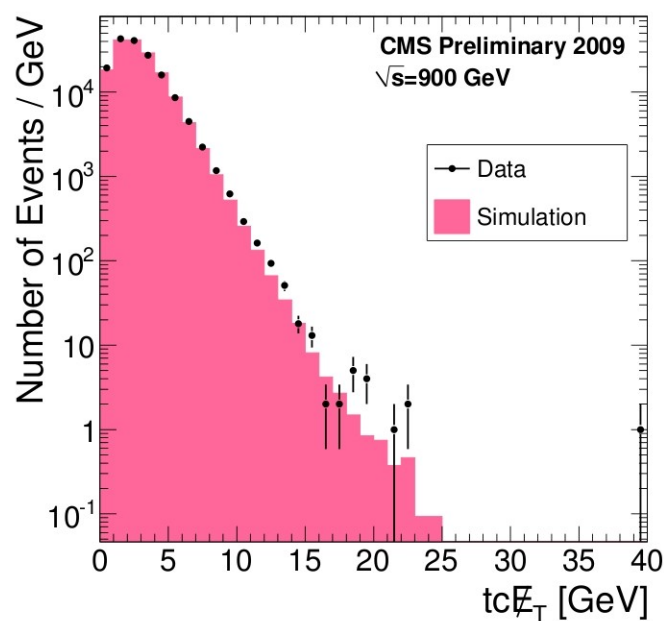
Effect of the cleaning on MET
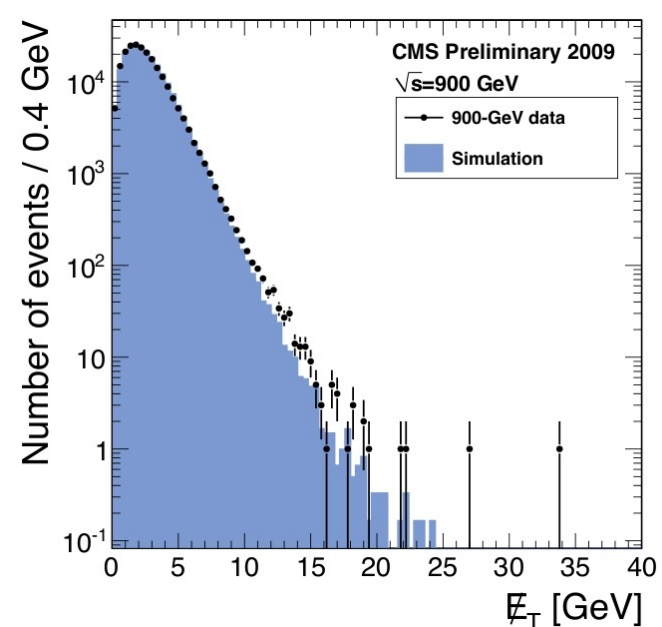
CaloMET   tcMET   pfMET

Residual tails studied and attributed to instrumental noise. Overall very good agreement.

Jet ID variables

Several variables for removal of detector noise in Jets studied in cosmic and collision data

|		
CALO JETS	resEMF	Electromagnetic energy fraction
	n90Hits	minimum number of hits (ECAL &HCAL RecHits) to contribute 90% of the jet energy
	fHPD	maximum jet energy fraction contributed by a single HPD (HCAL)
	fRBX	maximum jet energy fraction contributed by a single RBX (HCAL)
	$\sigma\eta$	ET-weighted jet width in η
	$\sigma\phi$	ET-weighted jet width in φ
PF JETS	CHF	charged hadron energy fraction
	NHF	neutral hadron energy fraction
	CEF	charged electromagnetic (electron) energy fraction
	NEF	neutral electromagnetic (photon) energy fraction

Jet ID criteria

	Loose	Tight
resEMF	>0.01 ($|\eta|$<2.6)	>0.01 ($|\eta|$<2.6)
n90Hits	>1	>4
fHPD	<0.98	<0.98
fRBX	-	<0.98
$\sigma\eta$	-	>0.01
$\sigma\phi$	-	>0.01
CHF	>0.0 ($|\eta|$<2.4)	>0.0 ($|\eta|$<2.4)
NHF	<1.0	<0.9
CEF	<1.0	<1.0
NEF	<1.0	<0.9

Jet ID loose selection

On inclusive ak5 jet sample from December data (all jets with uncorrected pT>8GeV)
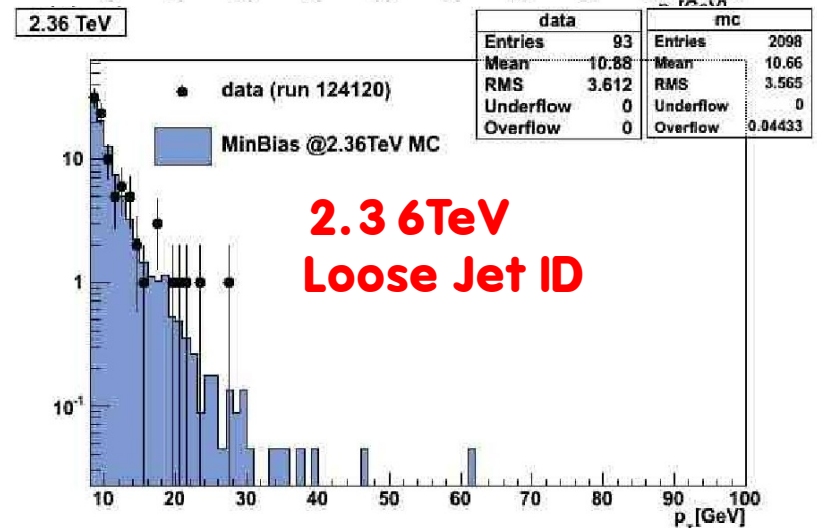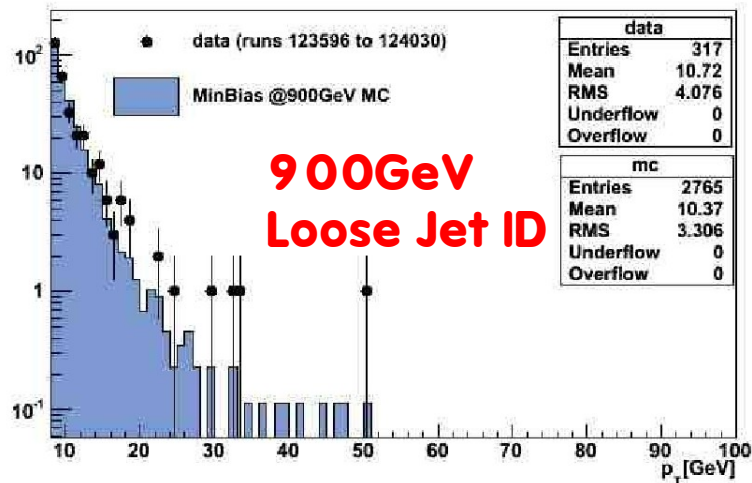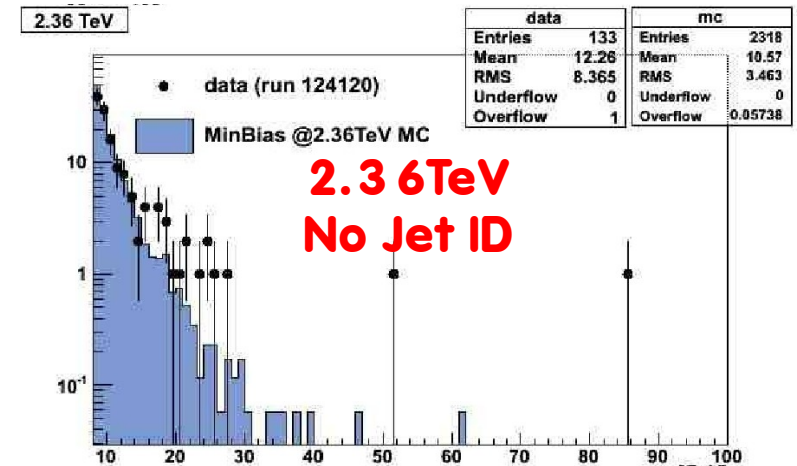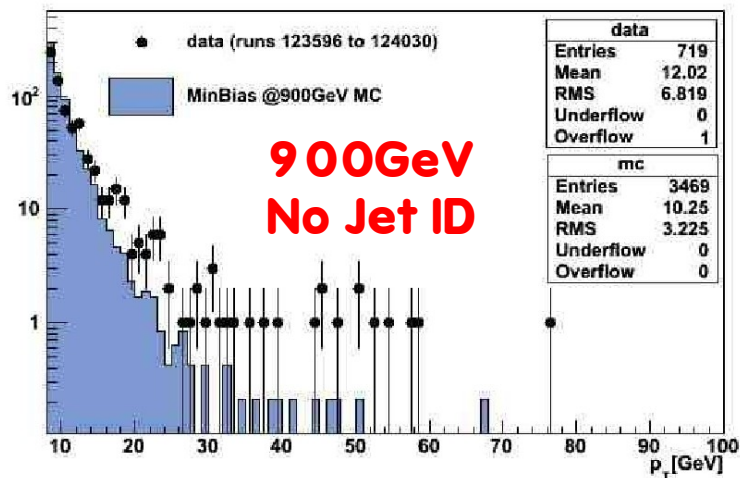
Dijet studies

Dijet selection (for Calo/JPT/PF jets)

- pT>10./8/8 GeV
- |eta|<3./2./3
- Dphi(j1,j2)>2.1
- Loose Jet ID
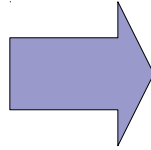
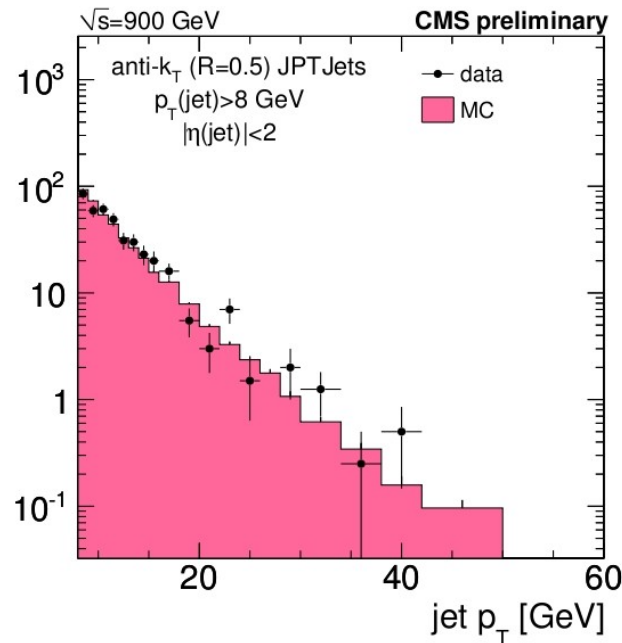246, 218 and 531 events for CaloJets, JPT jets and PF jets respectively on 900 GeV data.
(46, 48, 11 on 2.36 TeV)
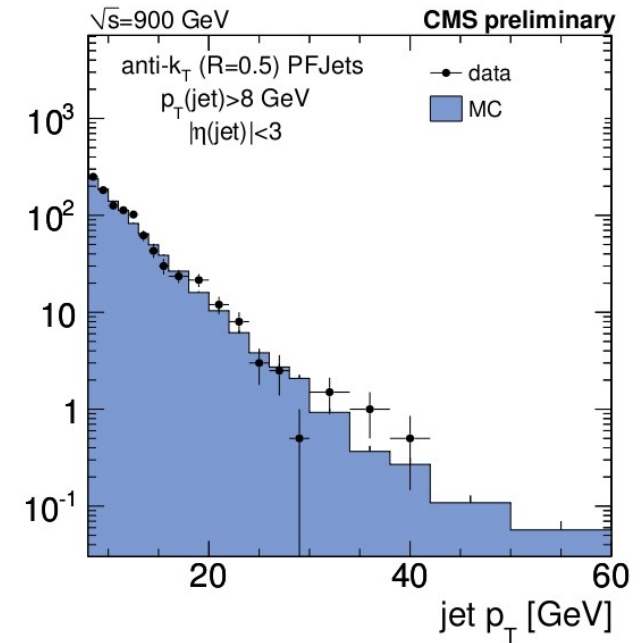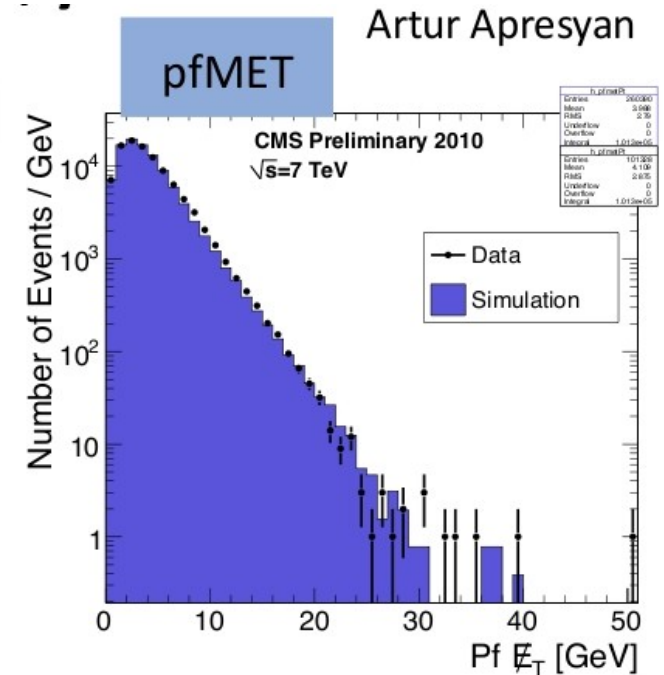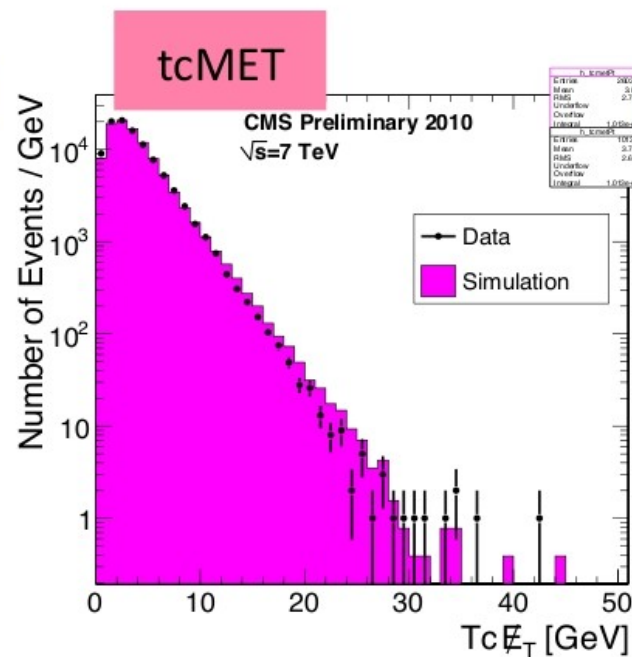Plots and numbers from the Jet PAS approuved in February
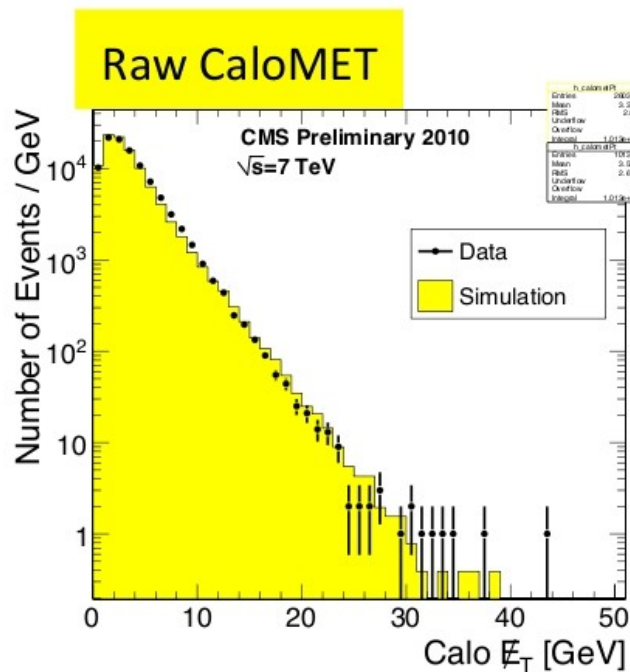
CaloJets
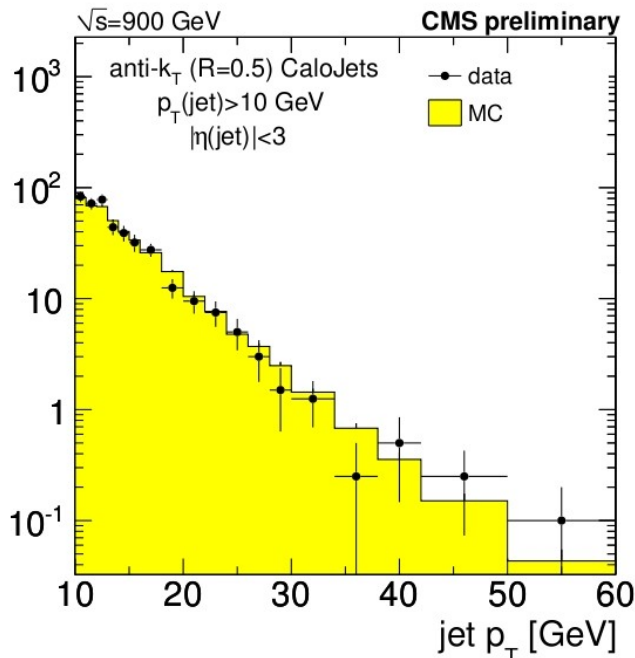
JPTjets

pfJets

First glance at 7TeV data from Tuesday

The experience from December collisions put us in very good shape for
7TeV collisions last Tuesday!
First VERY PRELIMINARY results
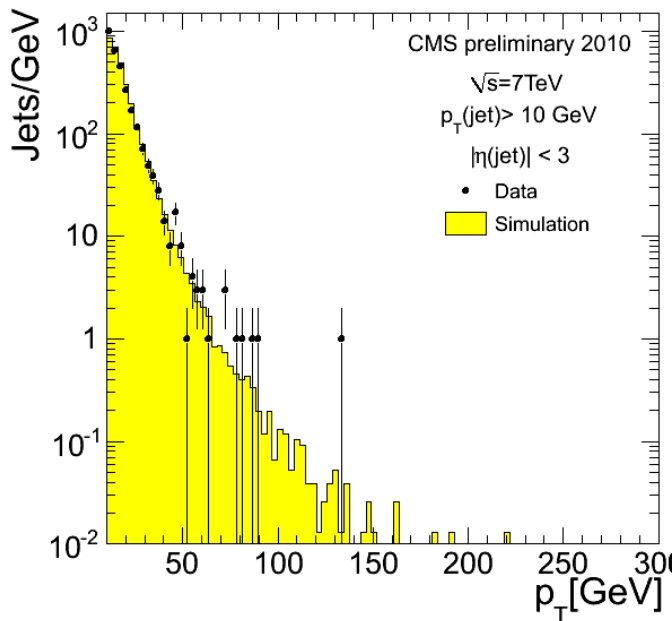
Run 132440
Express stream

First glance at 7TeV data from Tuesday
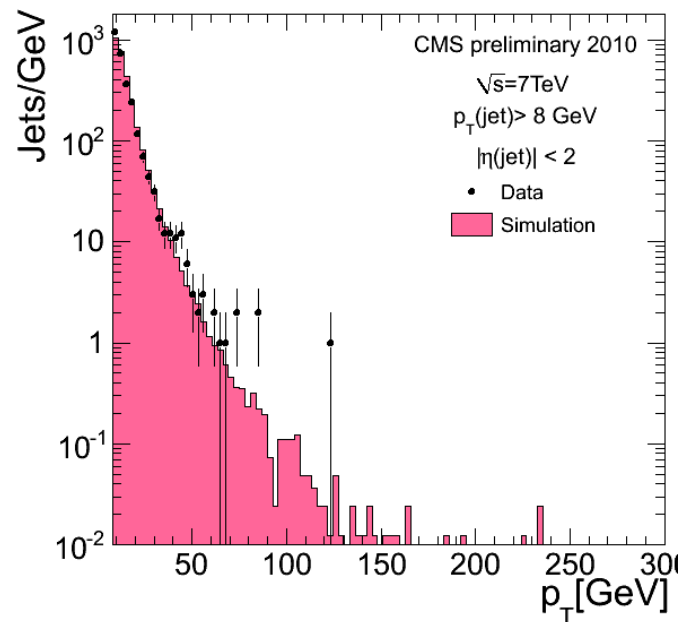
Dijet selection (for Calo/JPT/PF jets)
- pT>10./8/8 GeV
- |eta|<3./2./3
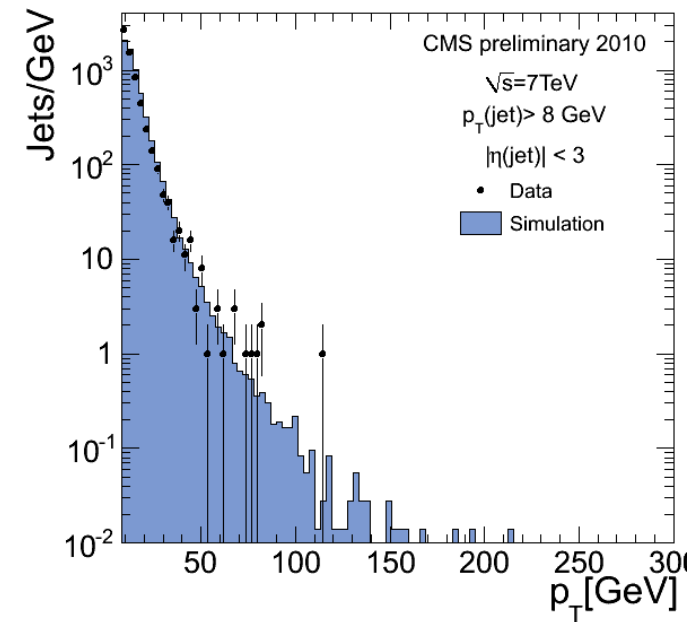- Dphi(j1,j2)>2.1
- Loose Jet ID

Run 132440
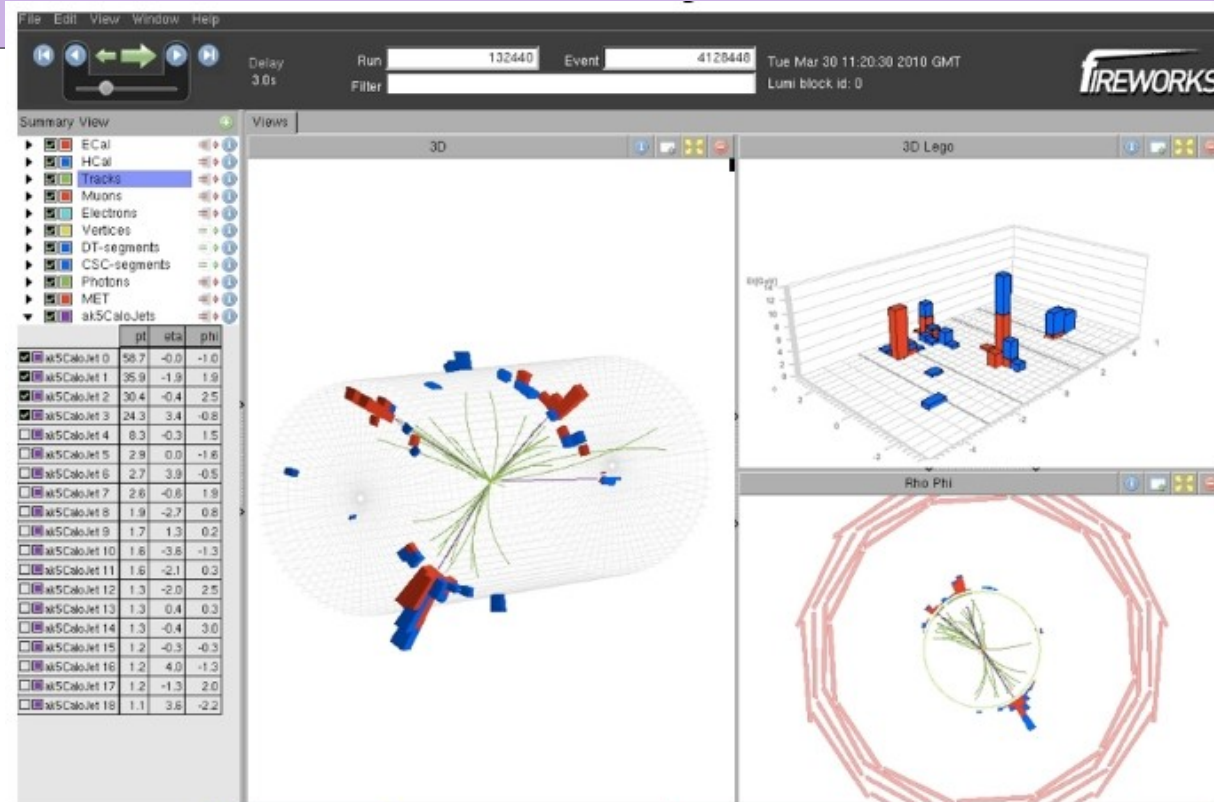Express stream

..and nice events..

Still a lot to do and a lot of work ongoing...

Jet Energy Corrections
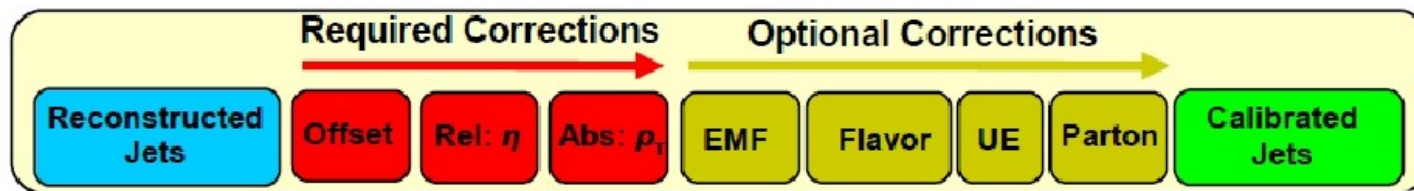
For ICHEP
Measure:
- Offset energy on Zero Bias data (already done on 900GeV collision data)
- Relative response (vs eta) from dijet balance: complete measurement with 1pb-1, probably not in time to be used as a correction to analyses!

Have a first idea of
- absolute (vs pT) correction, expect 500-1000 useful gamma+jet events in 1 pb-1 (pT in [25,200]GeV)
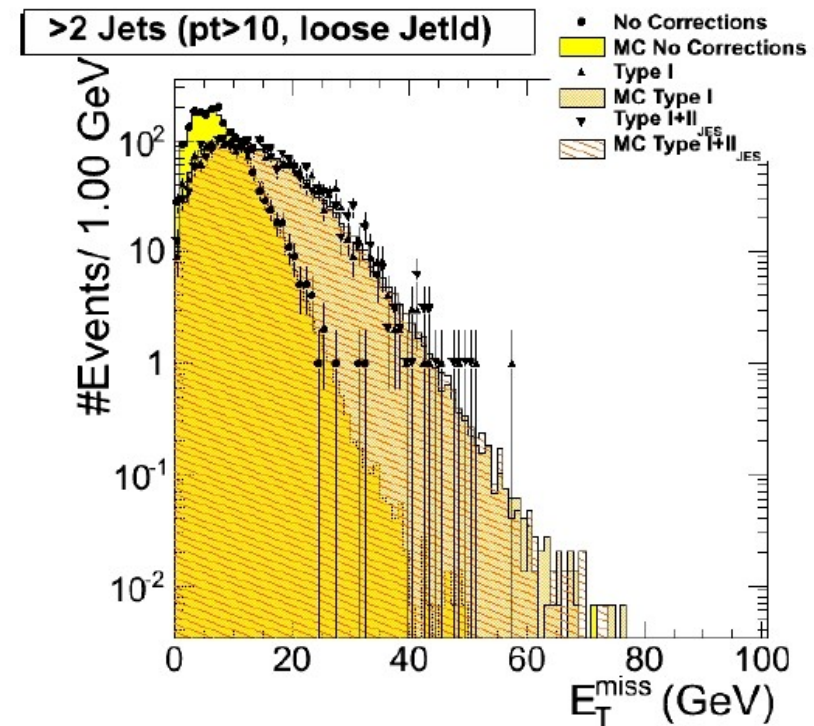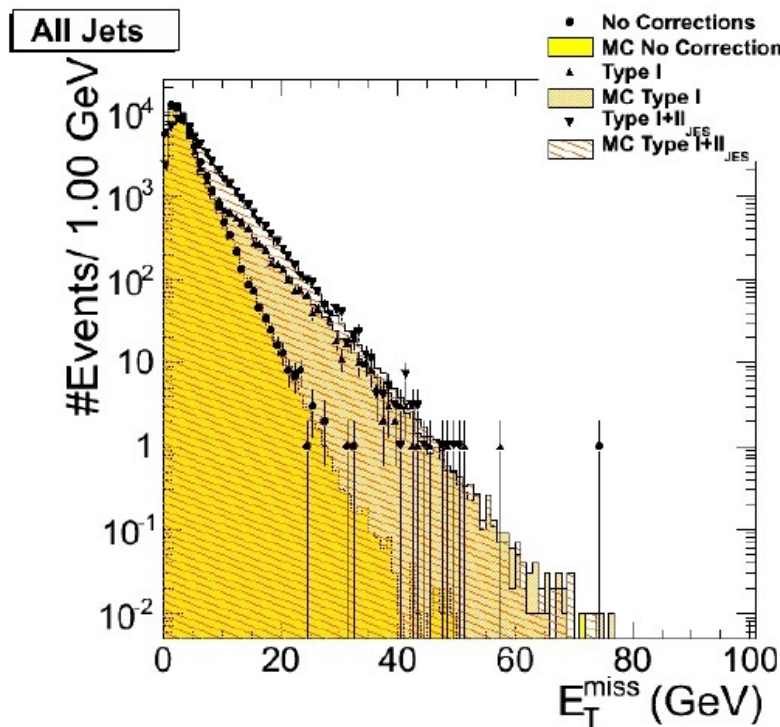- single particle response

Concentrate on Ak5 (Ak7, Kt4, Kt6 also available in RECO)
Check the consistency within different algorithm

K.Kousouris

MET corrections

Type I and type II MET corrections (corrections for JES for Jets and unclustered energy respectively) are being studied on data.

Ulla Gebbert, Dayong Wang

Summary

A (incomplete!) glance of the JetMET activities in the last months and plans for ICHEP

- Hard and productive work until now to improve our understanding of the detector and the data
- Now focussing on studies targeting ICHEP, for a timeline and schedule see:
http://indico.cern.ch/getFile.py/access?contribId=0&resId=1&materialId=slides&confId=87378

- For analyses using jets at 7TeV, some useful recipies:
http://indico.cern.ch/getFile.py/access?contribId=5&resId=0&materialId=slides&confId=87378
- Other activities, related to jets and physics analyses, are getting organized for ICHEP, see for example QCD Jets Task Force:
http://indico.cern.ch/conferenceDisplay.py?confId=89234