

# **(Calo)MET with ECAL cleaning cut and Pile Up study: Update**

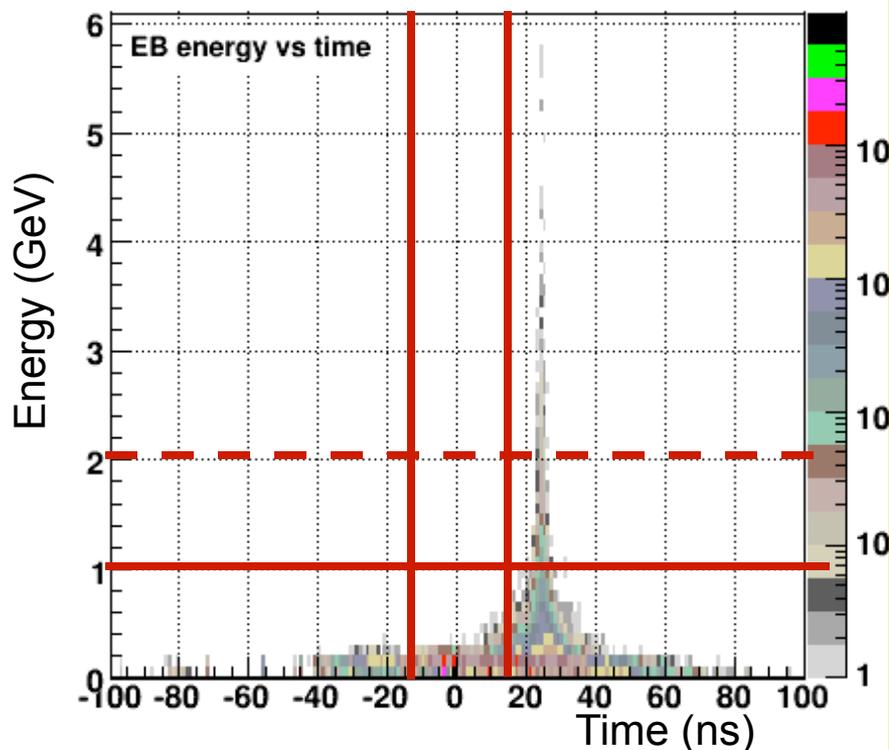
**Suvadeep Bose**

University of Nebraska Lincoln

Mike has produced dedicated OOT samples.

Each file has 1000 events with a fixed 5 interactions per bunch crossing overlaid on single neutrino events. The bunch crossing times are shifted with respect to the in-time interaction by an amount specified in the file name.

eg. `step2_SingleNu_5interactions_RAW2DIGI_L1Reco_RECO_25nsLate.root`



- Looked at the these OOT samples with the timing cut:

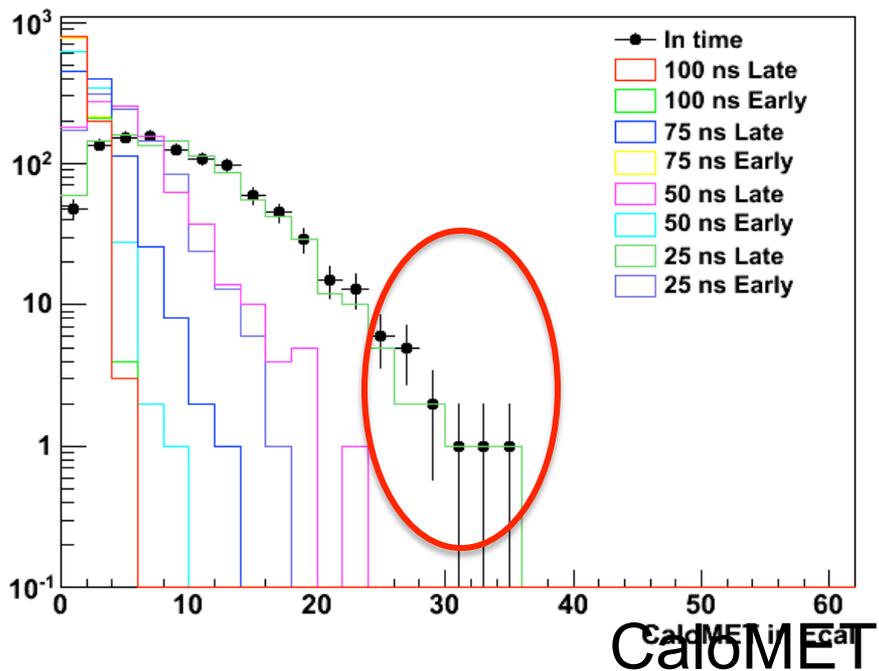
Veto time<sub>rec</sub> > 15 ns  
 for **EB energy<sub>rec</sub> > 2 GeV (1 GeV)**  
 and EE energy<sub>rec</sub> > 2 GeV

Motivation: We may not expect a significant gain by the timing cut for 50ns bunch crossing data, but probably for 25ns which we will face later.

Refer:

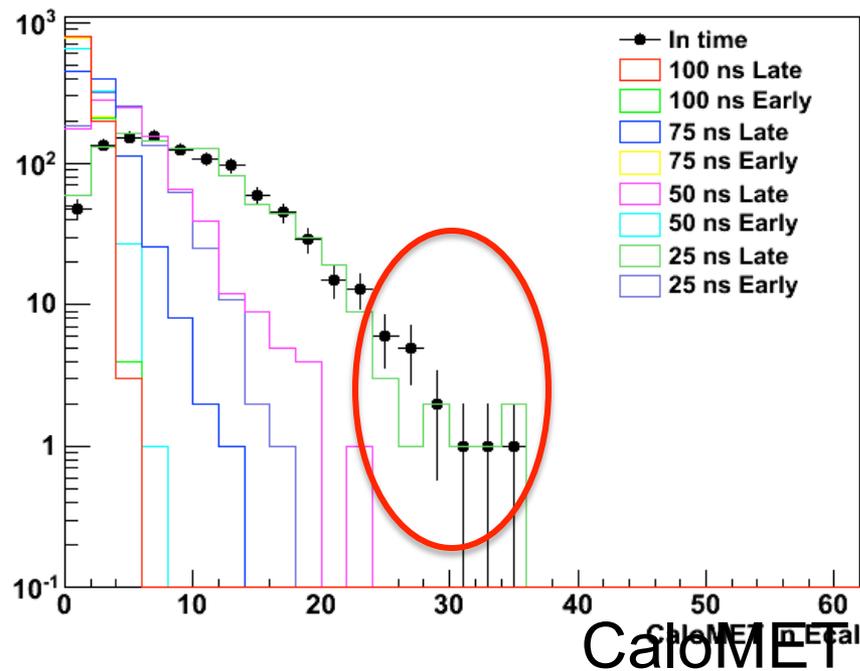
<https://indico.cern.ch/getFile.py/access?contribId=16&resId=0&materialId=slides&confId=134144>

**MET\_CaloMET**



Veto time<sub>rec</sub> > 15 ns  
 for EB energy<sub>rec</sub> > 2 GeV  
 and EE energy<sub>rec</sub> > 2 GeV

**MET\_CaloMET**

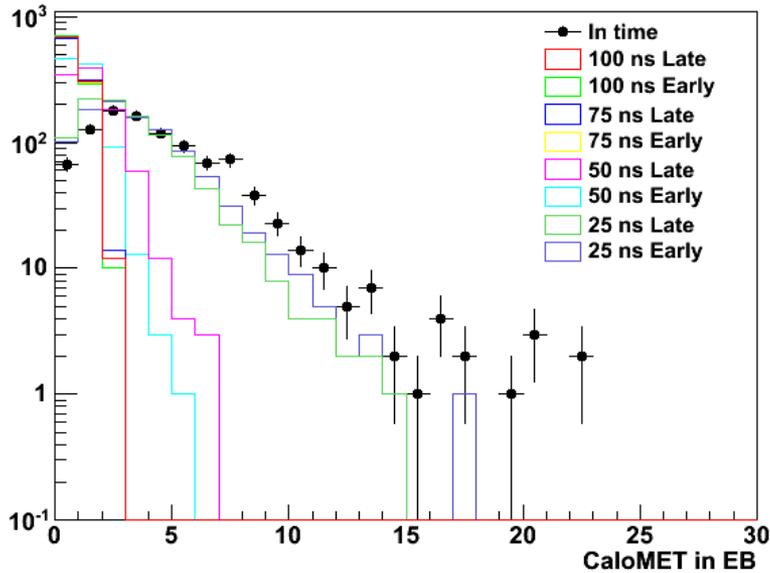


Veto time<sub>rec</sub> > 15 ns  
 for EB energy<sub>rec</sub> > 1 GeV  
 and EE energy<sub>rec</sub> > 2 GeV

❑ The timing cut reduces the MET tail a little bit. Effect suppressed due to Hcal towers being summed with 4 TS

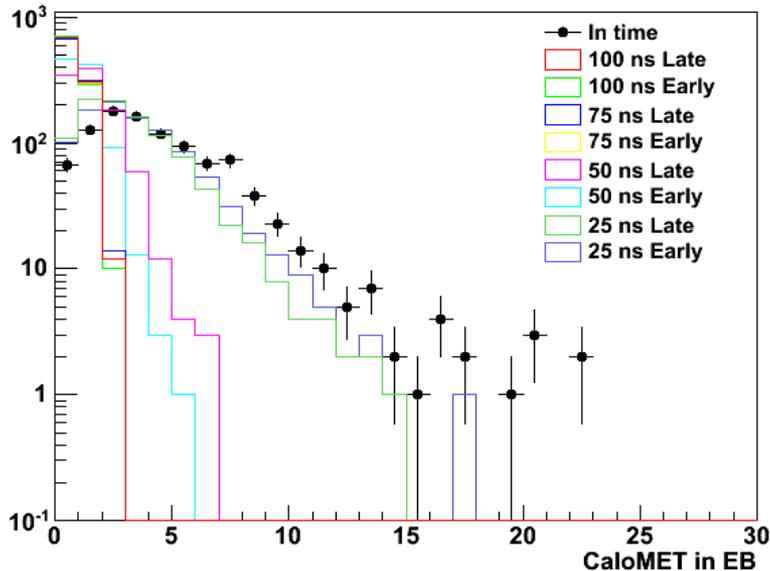
# Comparison plots for CaloMET in EB

CaloMET in EB

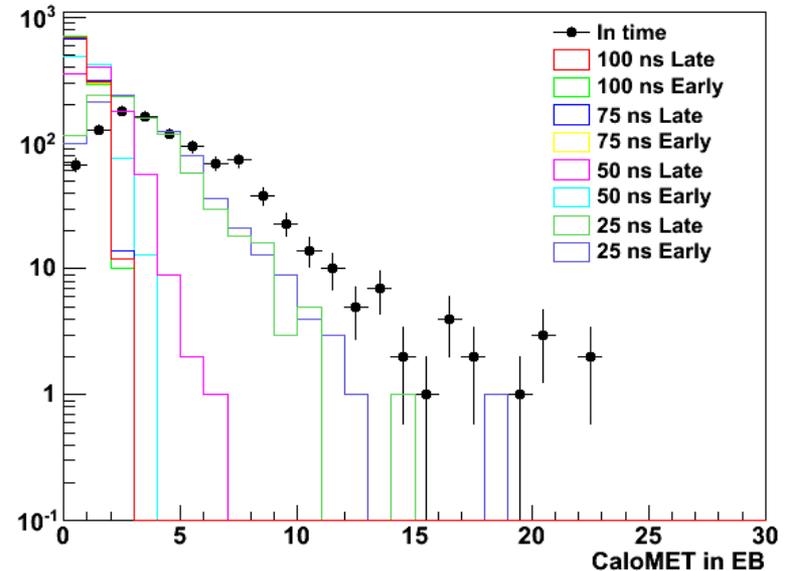


Default cuts	(fig. captions)
Time > 15 ns for EB > 2 GeV	Time > 15 ns for EB > 1 GeV

CaloMET in EB

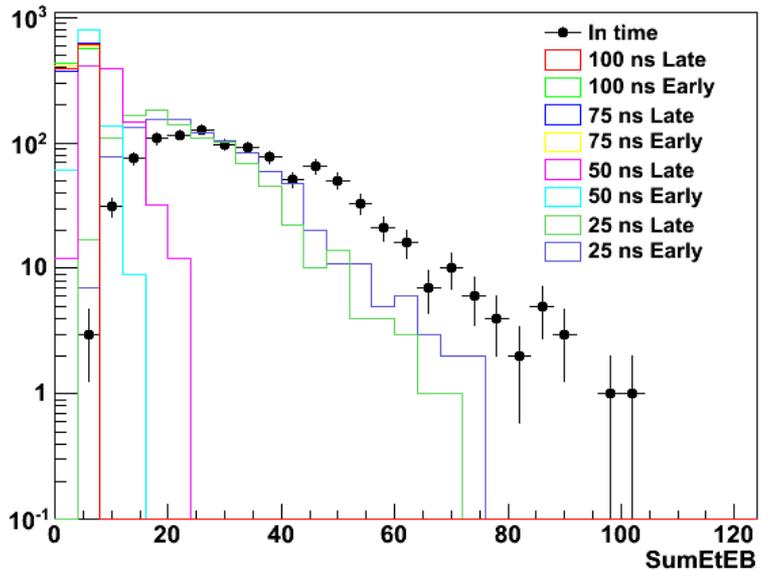


CaloMET in EB



# Comparison plots for SumEt in EB (Calo)

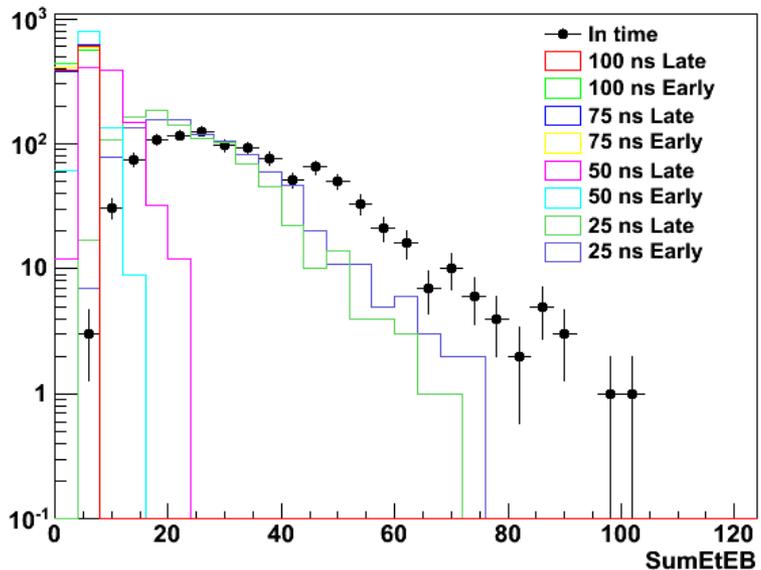
Sumet EB



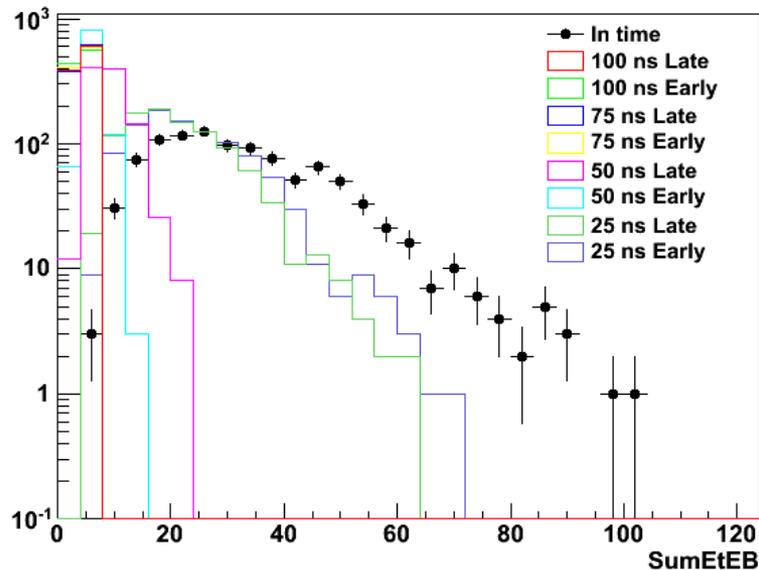
Default cuts	(fig. captions)
Time > 15 ns for EB > 2 GeV	Time > 15 ns for EB > 1 GeV

Default cuts: No time cut, EB/EE > 2GeV

Sumet EB

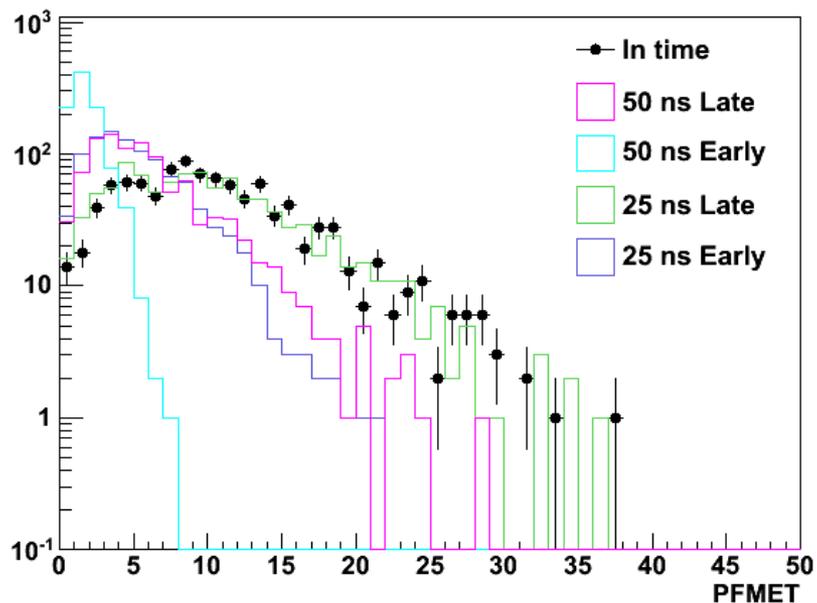


Sumet EB



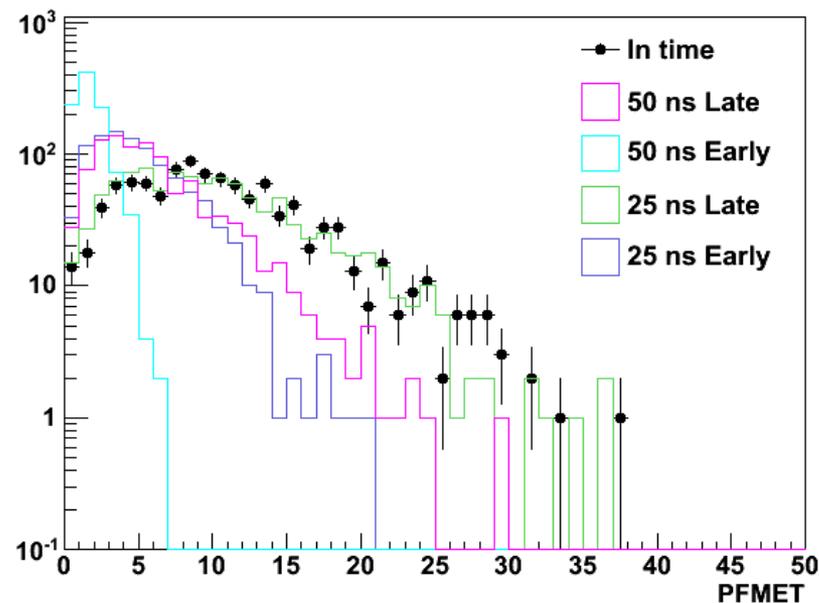
Veto time<sub>rec</sub> > 15 ns  
 for EB energy<sub>rec</sub> > 2 GeV  
 and EE energy<sub>rec</sub> > 2 GeV

MET\_PFMET



Veto time<sub>rec</sub> > 15 ns  
 for EB energy<sub>rec</sub> > 1 GeV  
 and EE energy<sub>rec</sub> > 2 GeV

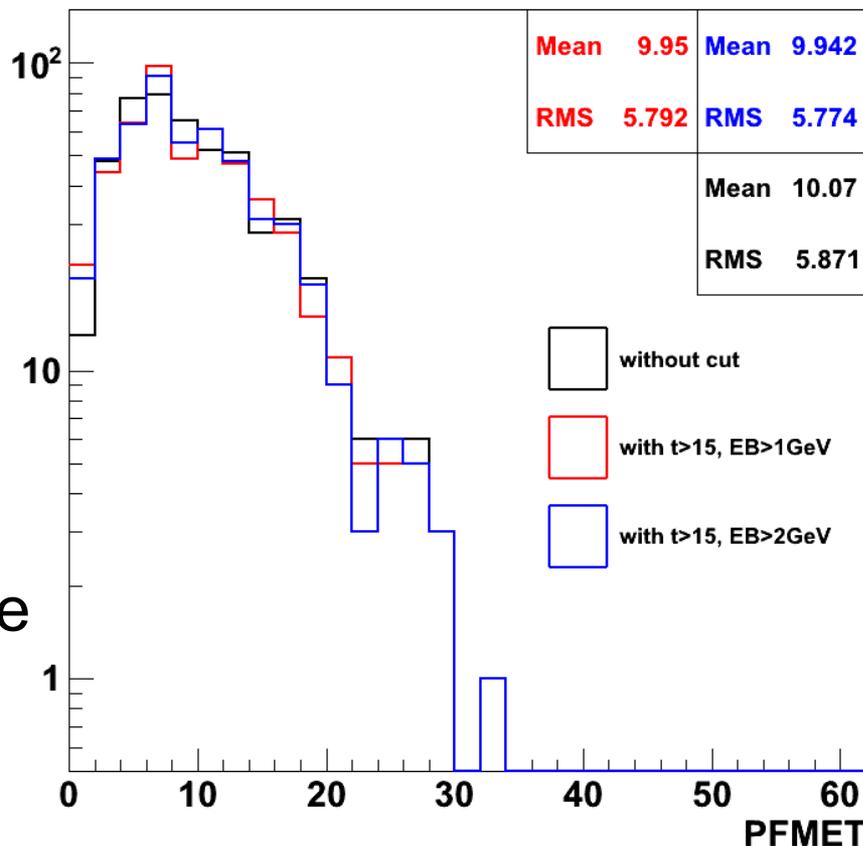
MET\_PFMET



Effect of cleaning small – perhaps have to do similar thing using PFClustersECal and look at MET in EB only!

Study the effect of the ecal timing cut on PFMETs with MinBias data.

The difference is small (visually) but looking at Mean/RMS we see the resolution is slightly better with the cut.

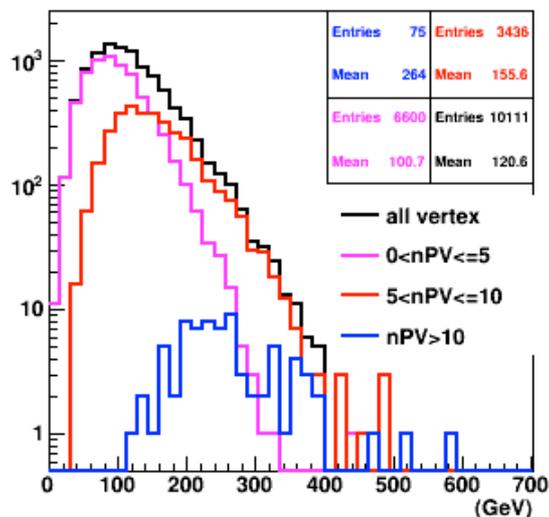


- After applying HLT triggers  
HLT\_L1Tech\_BSC\_minBias\_threshold1\_v1)

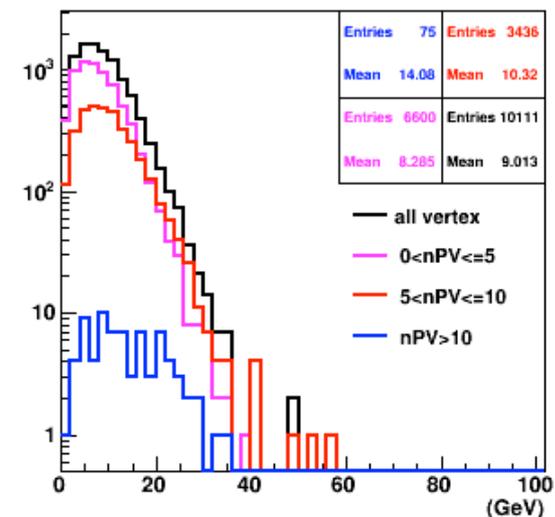
- Plotted SumEt, MET, MEx and MEy for three different pile up regimes (based on no. of PV's).

- MET distributions for different PV regions in the same figure show higher mean values as we go higher PV regions.

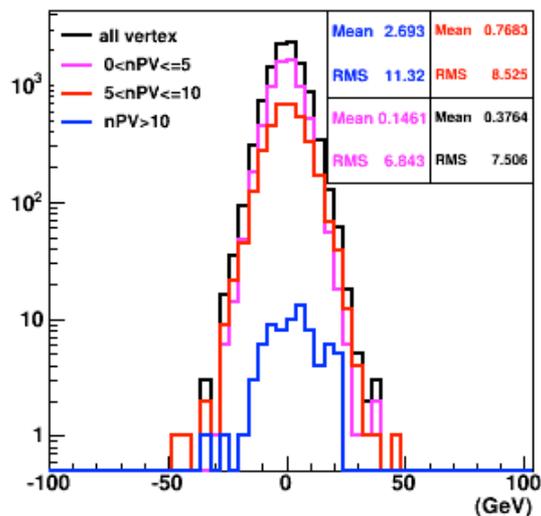
Sum Et



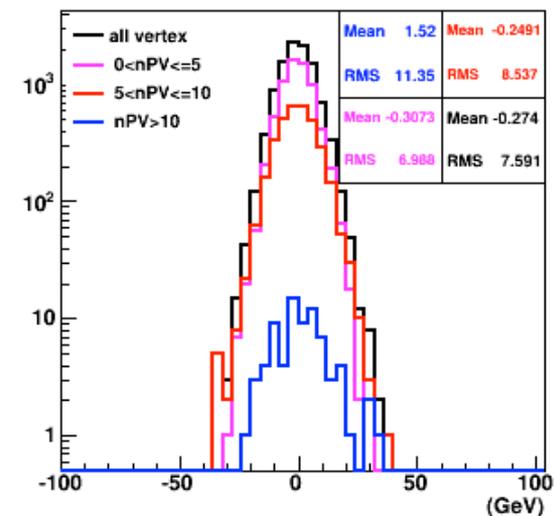
MET



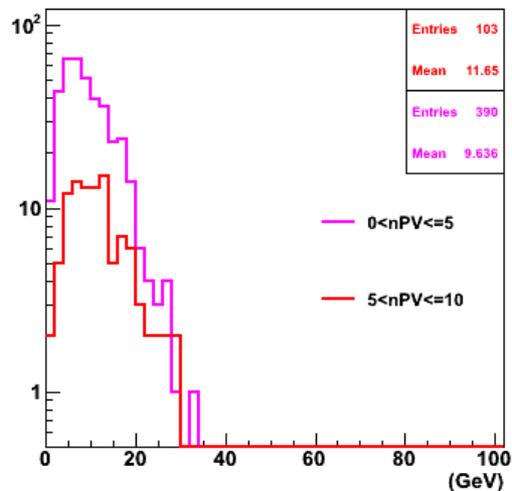
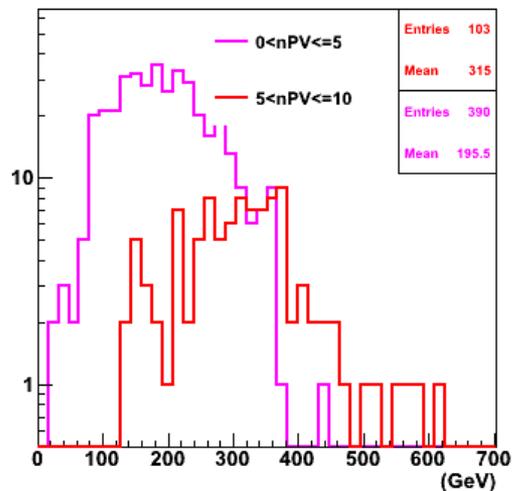
MEx



MEy

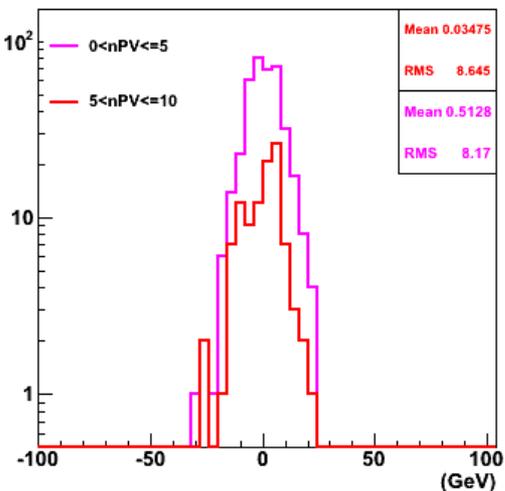


Sum Et      2011 data      MET

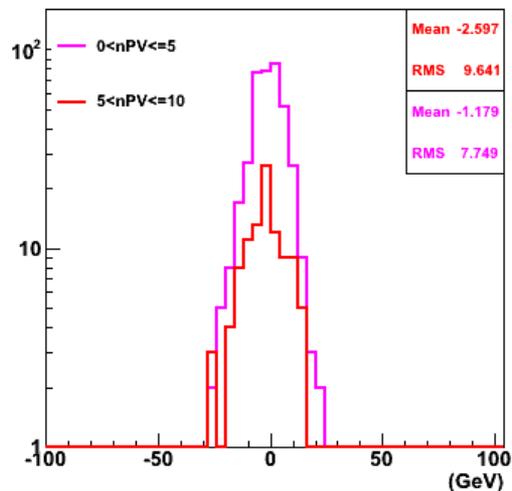


- Run on smaller statistics

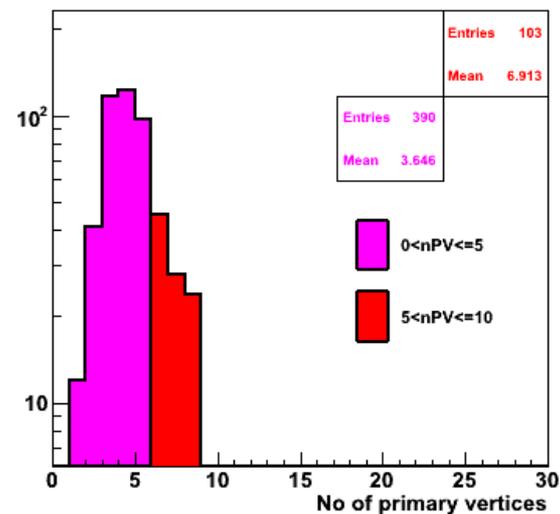
MEx



MEy



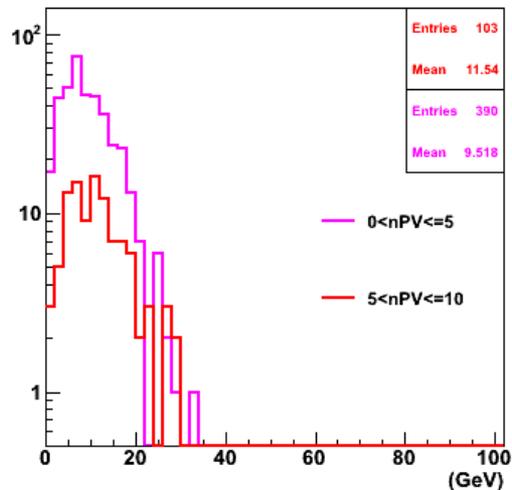
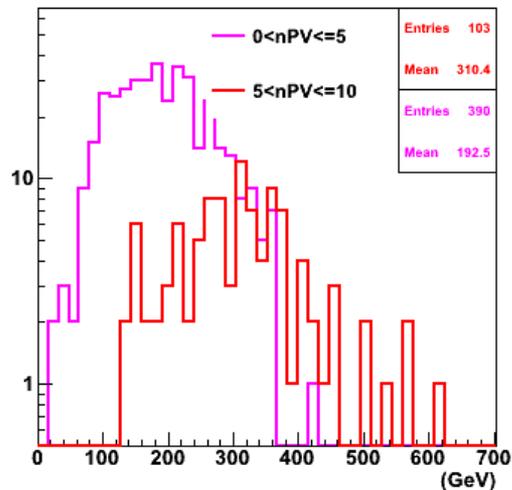
nVtx



Sum Et

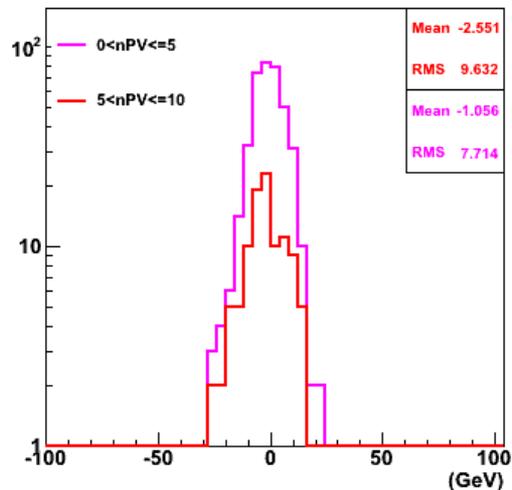
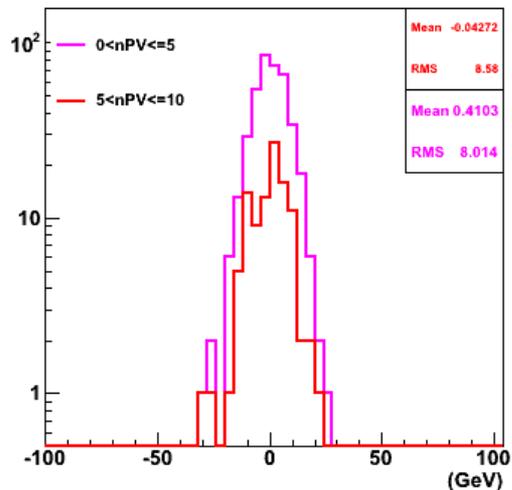
2011 data

MET



ME<sub>x</sub>

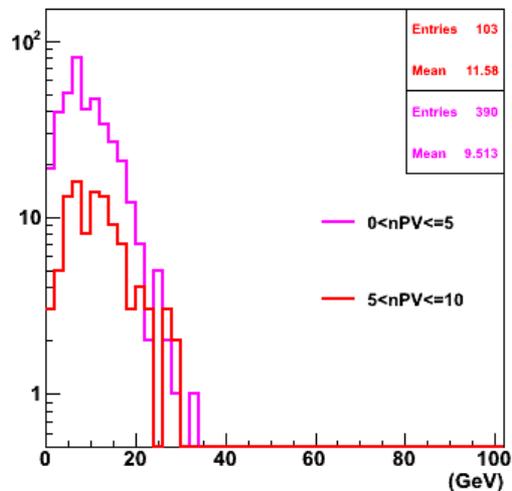
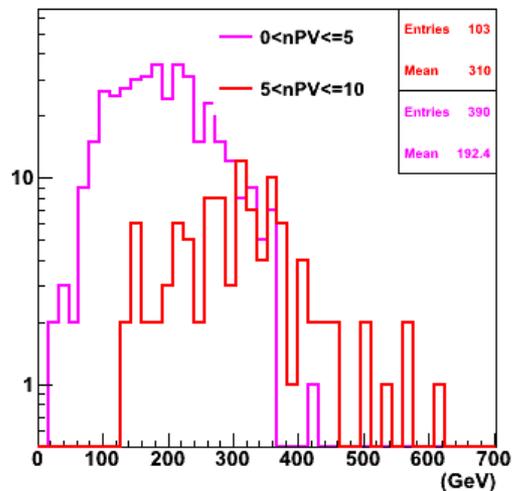
ME<sub>y</sub>



Sum Et

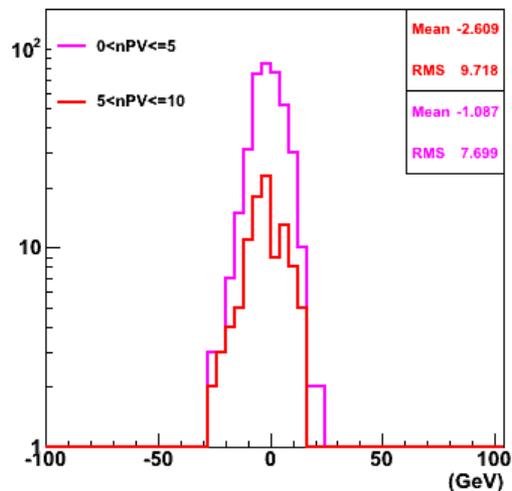
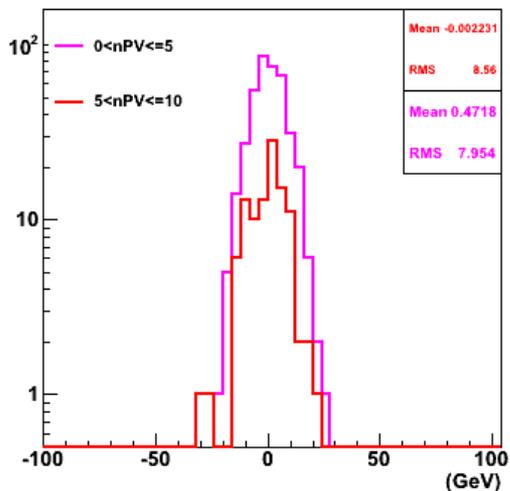
2011 data

MET



ME<sub>x</sub>

ME<sub>y</sub>



- ❑ Re-reconstructed the CaloMET and PFMET with the timing cut from EB and EE RecHit.
- ❑ Looked at various pile up regimes (based on No. of Primary Vertices).
- ❑ METs increase with higher Pile Up.
- ❑ Looked at dedicated Out of Time Pile Up MonteCarlo with a fixed 5 interactions per bunch crossing.
- ❑ The timing cut reduces the tail distribution of the MET in Ecal Barrel, improving the resolution.