Large Scale Analysis: MET With Different Masking

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Outline:

- Goal – Compare the effect of different bad channel masking configurations on Missing ET variables using the December 2008 reprocessed cosmic dataset (81 runs in the DPD_CALOCOMM stream, ~1.5 million events).

  - Give a brief summary of the different masking tools
  - Show distributions for some general MET variables
  - Show preliminary results for the effects of masking on MET

Masking Bad Channels

- The new METCellMaskTool allows for two possible choices for masking bad channels in MET reconstruction.

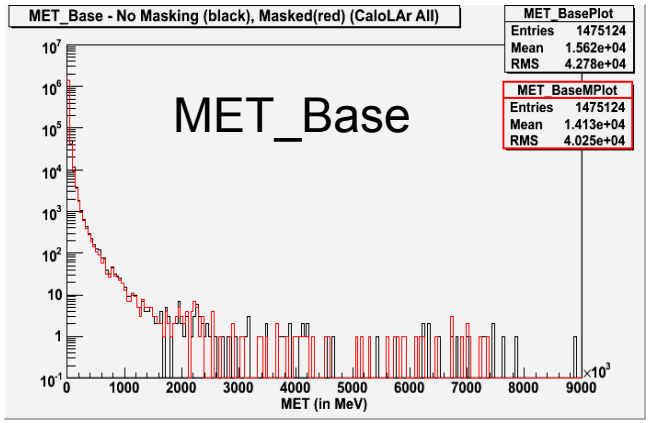
  1. Use the CaloBadChanTool for both LAr and Tile cells.

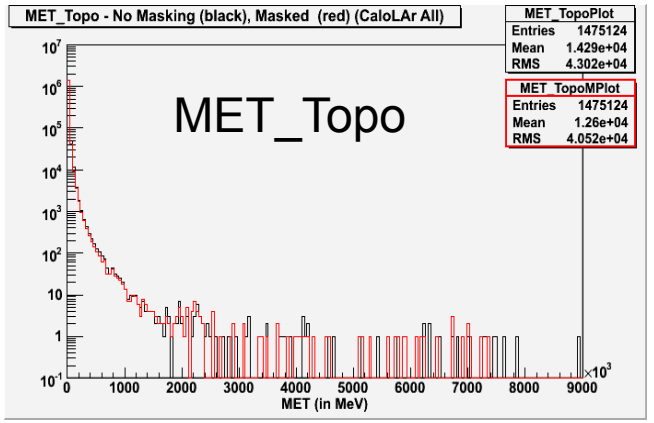
  2. Use the LArBadChannelMasker for LAr cells & CaloBadChannelTool for Tile cells (our results follow this option).

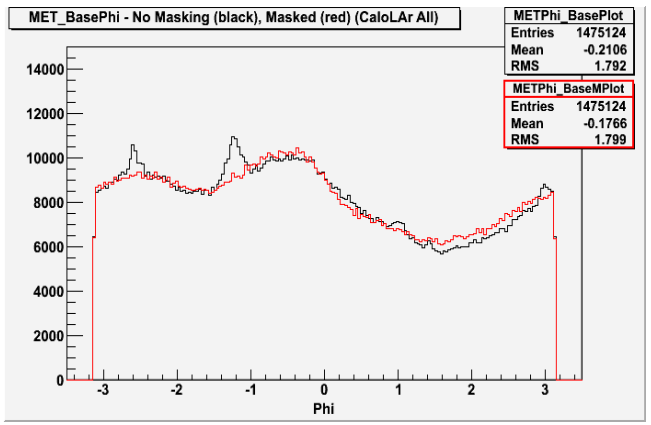
     - **Dead cells:** “deadPhys”, “deadReadout”
     - **Noisy cells:** “highNoiseHG”, “highNoiseMG”, “highNoiseLG”, “unstableNoiseHG”, “unstableNoiseMG”, “unstableNoiseLG”, “sporadicBurstNoise”
     - **Affected cells:** “deadCalib”, “almostDead”, “distorted”, “lowNoiseHG”, “lowNoiseMG”, “lowNoiseLG”, “peculiarCalibrationLine”, “short”, “unstable”, “problematicForUnknownReason”, “missingFEB”, “shortProblem”

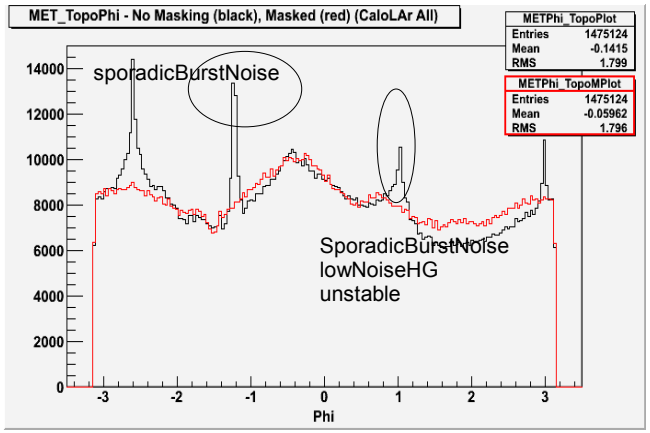
     *already masked in reprocessed data

General Distributions for MET variables





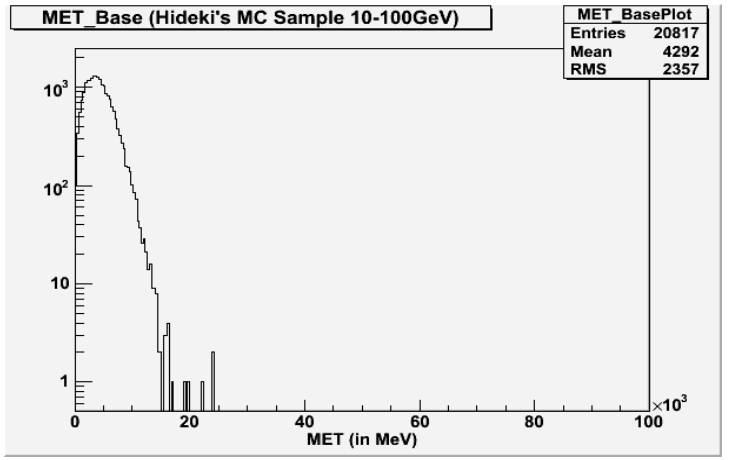




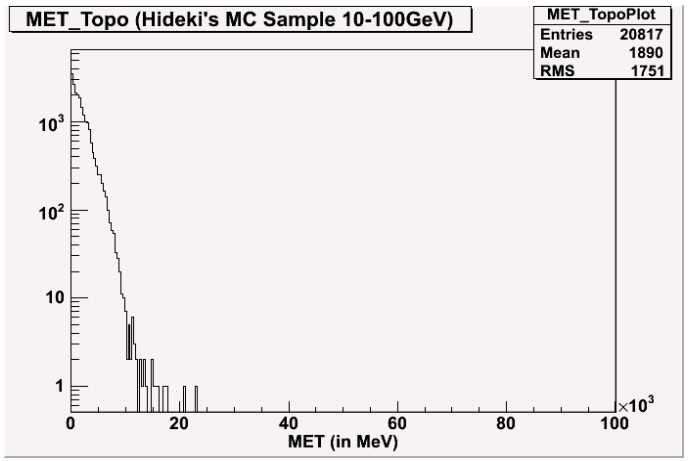
- **The sharp peaks in the MET Phi distribution tends to go away after masking affected and noisy cells**
- **Possible hypothesis for the Phi assymetry that persists after masking include:**
  - **General topology of cosmic events ?**
  - **Detector effects (eg. Pedestal shifts) ?**

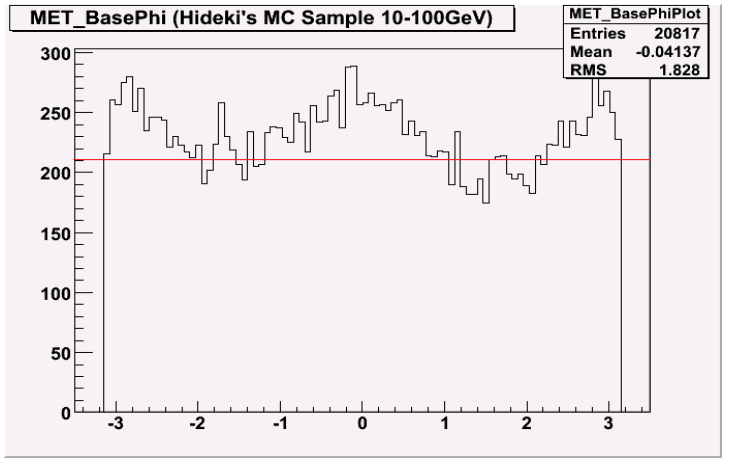
Assymetry in MET Phi Dist'n: MC generated cosmic events 10-100 GeV muons

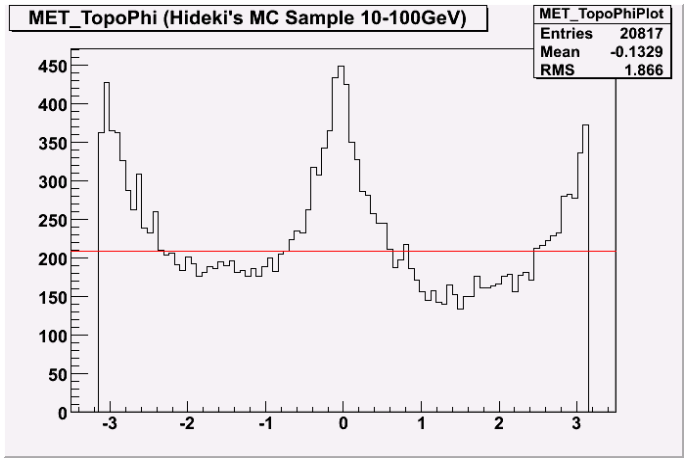
MET_Base



MET_Topo



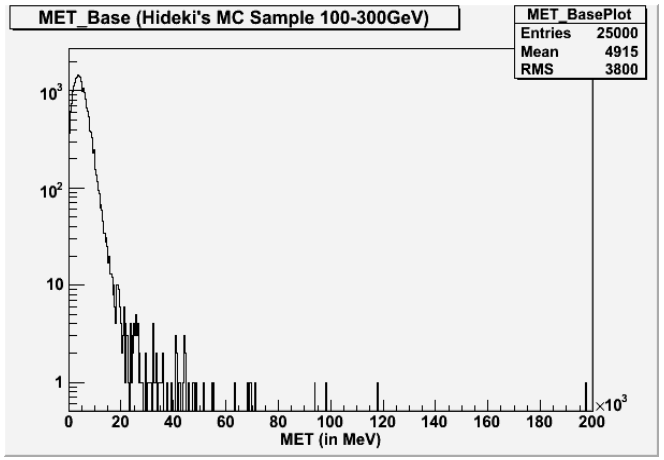




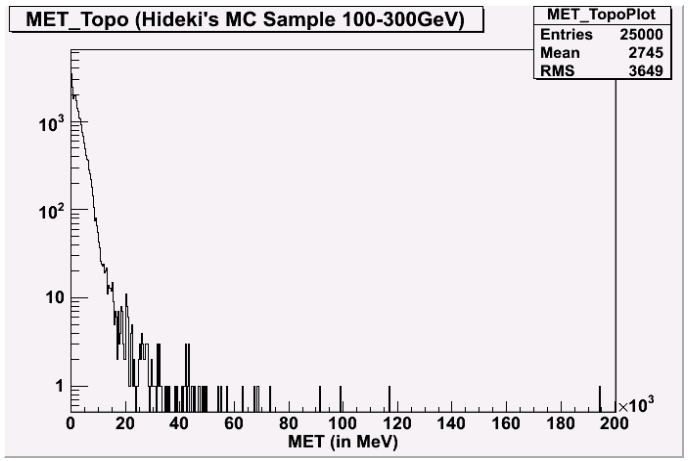
The statistics shown are equivalent to ~1.6 hours of cosmic data taking

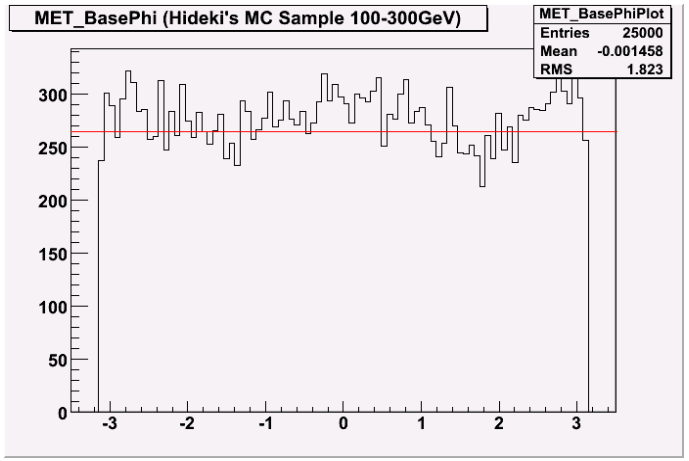
Assymetry in MET Phi Dist'n: MC generated cosmic events 100-300 GeV muons

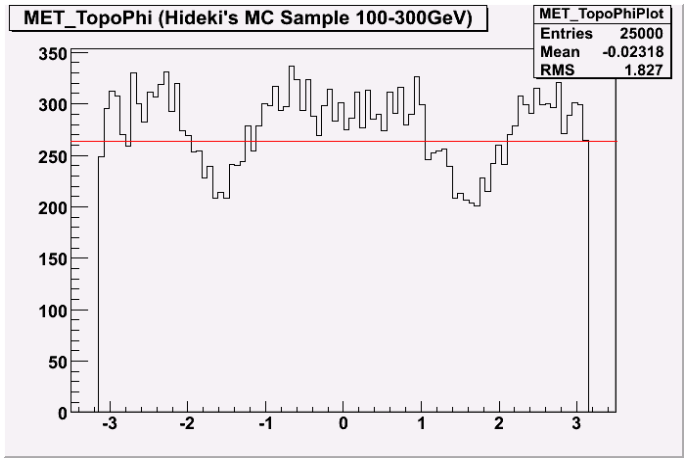
MET_Base



MET_Topo



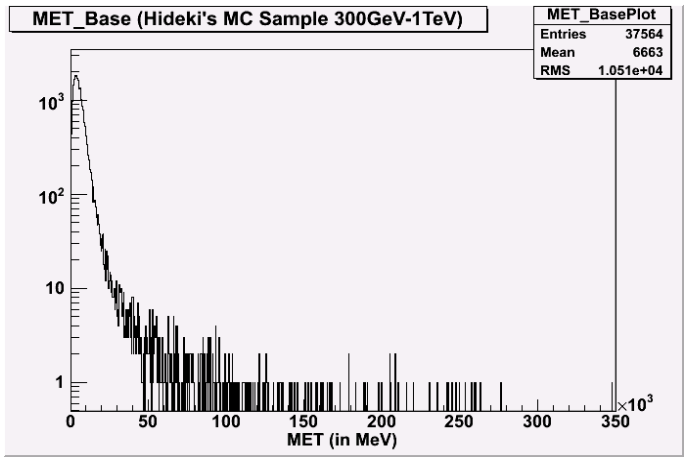


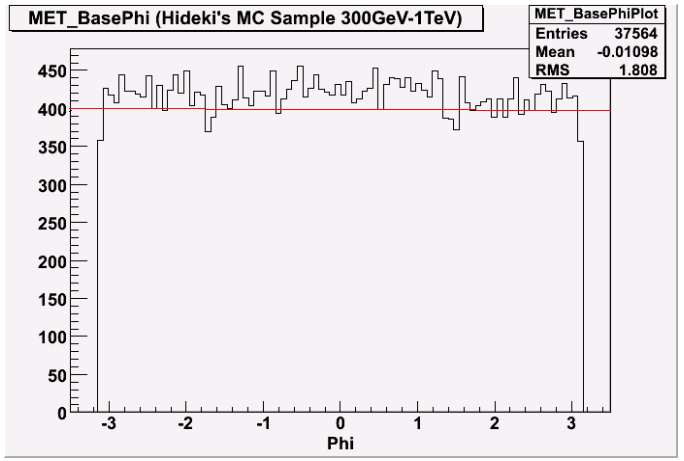


The statistics shown are equivalent to ~17 hours of cosmic data taking

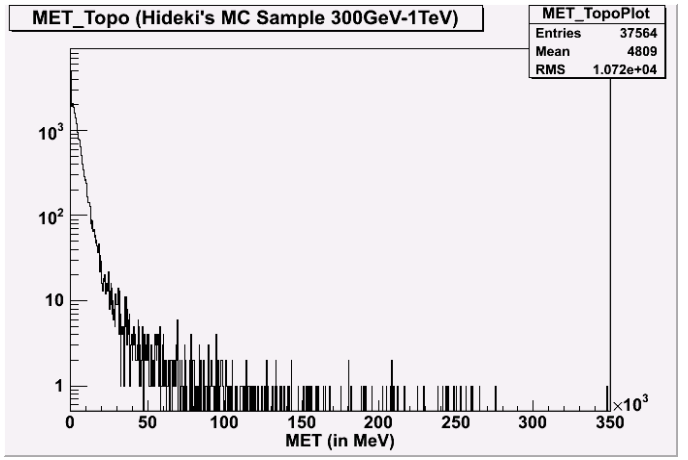
Assymetry in MET Phi Dist'n: MC generated cosmic events 300GeV-1TeV muons

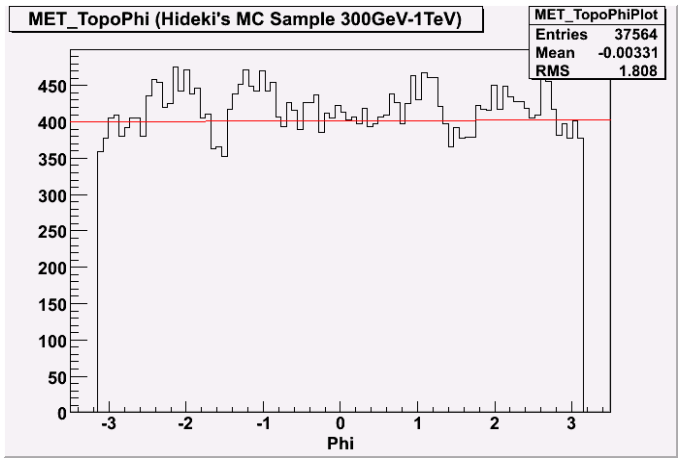
MET_Base





MET_Topo



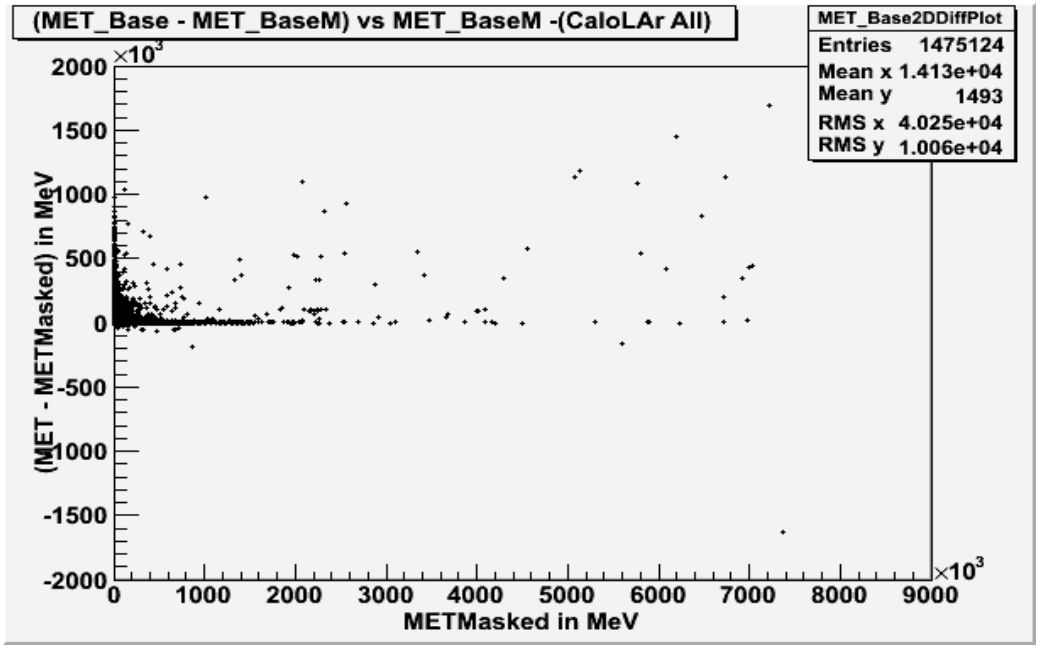


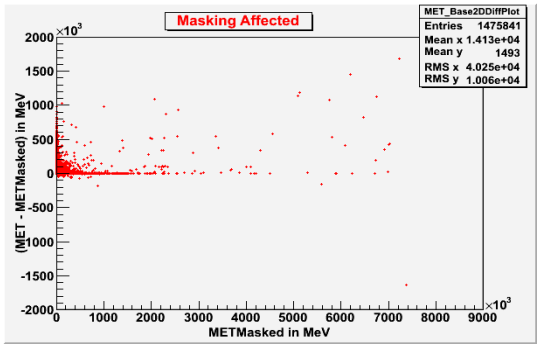
The statistics shown are equivalent to ~11 days of cosmic data taking

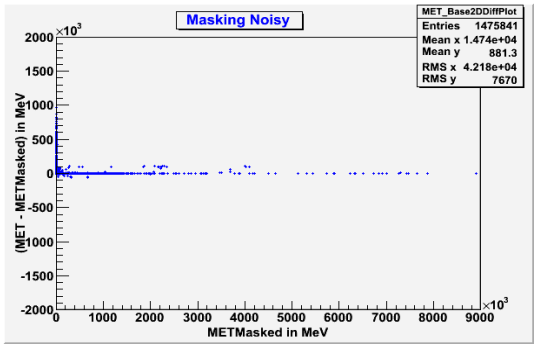
General Remarks about MC generated Cosmic Events

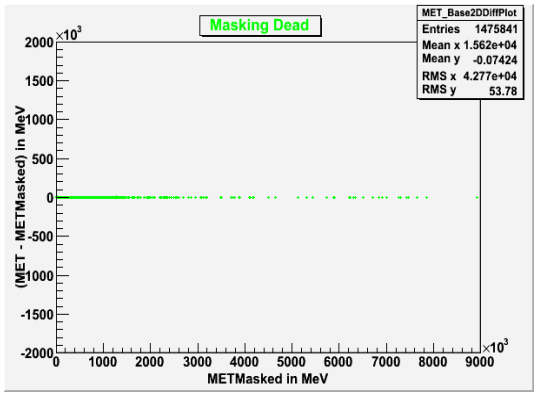
- There appears to be a slight asymmetry in MET Phi distributions for low energy muons
- The dips at Phi ~ ± π/2 tend to go away for higher energy muons
- The observed asymmetries in Phi are not significant enough to provide an explanation for the asymmetry observed in real cosmic data

Difference in MET_Base after Masking









-The Effect of masking is more significant for MET<20GeV

- ~0.4% of above events lie in the region with MET>20GeV and an MET Difference of 10 GeV after masking all bad cells. (~0.4% "Affected", ~0.2% "Noisy", 1 event "Dead")

- Masking of Affected cellshas the greatest effect on MET.

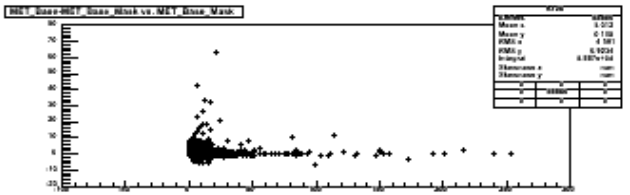
Run 90525 – Effect of Masking Affected Cells at the sub-detector level

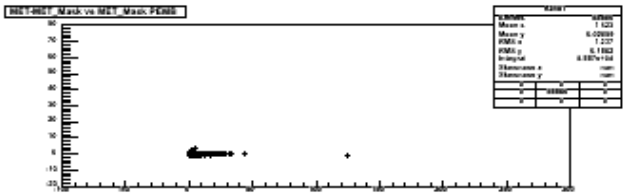
LAr+Tile

EMB

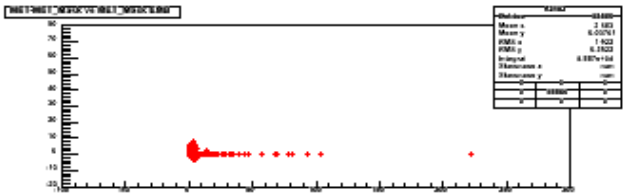
EMEC

HEC

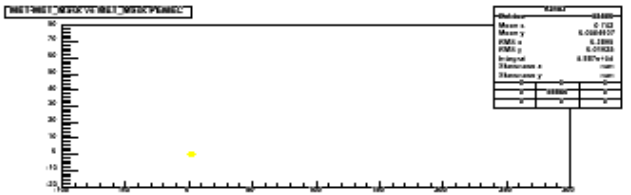




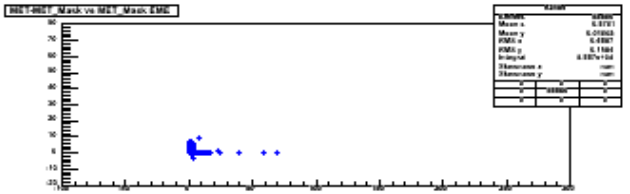
PEMB



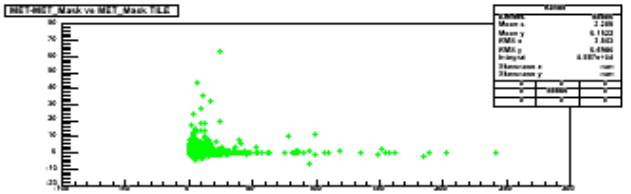
PEMEC

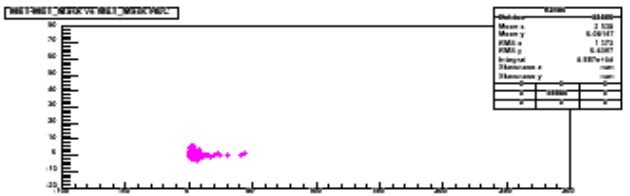


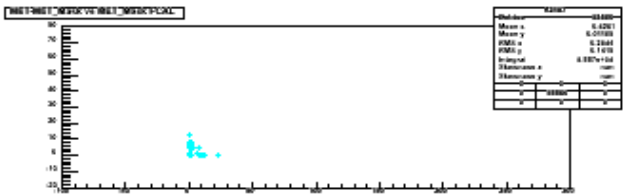
TILE



FCAL







- **Major contributions to shifts in MET after masking seem to come from Tile cells.**
- **Tile cells are either masked or given an isAffected status.**
- **IsAffected in the Tile implies that one of the two channels has a problem, in which case the energy from the second channel is used twice.**

Conclusions:

- **Performed large scale analysis on commissioning DPDs.**
- **Our analysis suggests that masking cells categorized as "Affected" has a very significant effect on MET variables followed by "Noisy" cells.**
- **This effect appears to be most significant in the Tile calorimeter.**

Future Plans:

- This analysis is currently being performed on the March 2009 reprocessed cosmic data.
- We intend to extend the analysis of the full dataset to the subdetector level.
- Find out what types of affected cells are contributing to the large shifts in MET variables for both the Tile and LAr calorimeters.
- Study general calorimeter based pathologies and investigate events with TeV range MET values.