ACD Backsplash Studies

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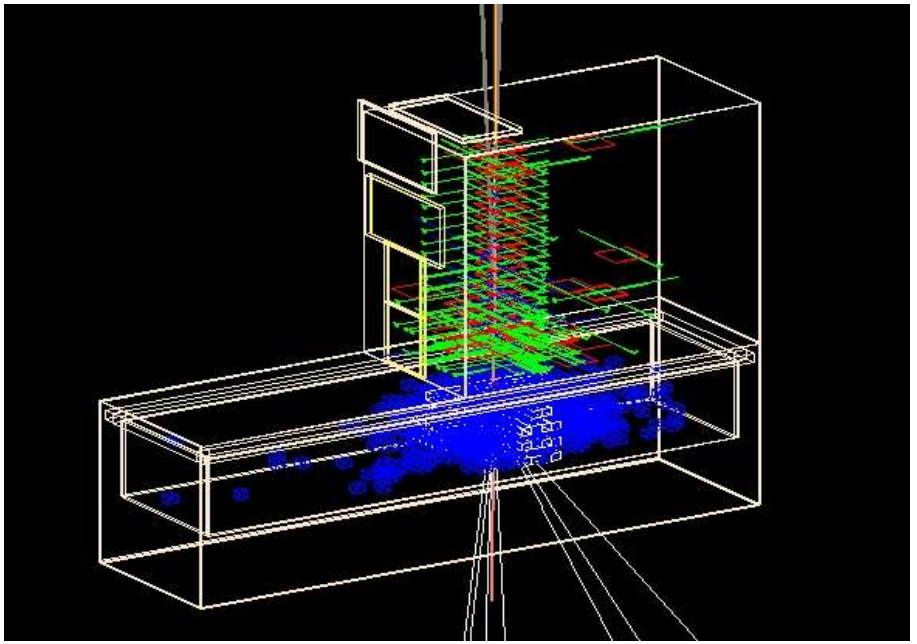
Beamtest Workshop IV

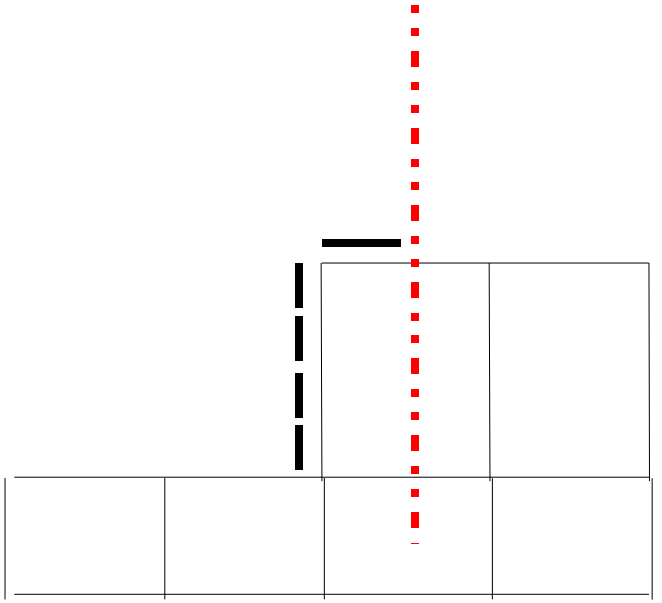


November 15, 2006

Data

Run 700001885:

- Electrons
- 200 GeV
- Table Position (201, 40, -47) with θ=0



Monte Carlo:

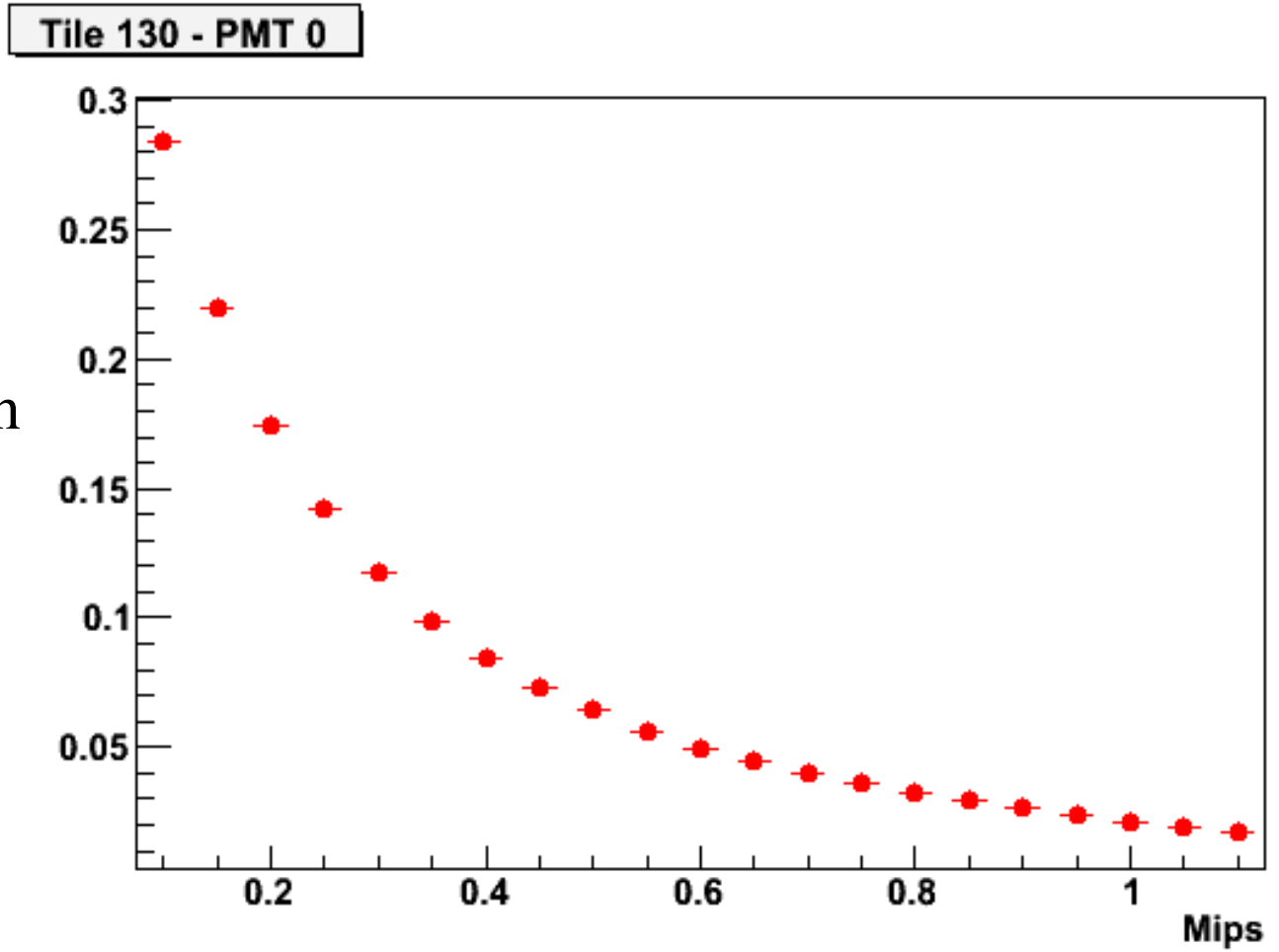
- Clone of BT-0164 (same energy, table position as run 700001885)
- but, reprocessed with new tiles Geometry (xmlGeoDbs v1r36p1)
  (my own run, not from the MC database)

Cuts:

- Tkr1ZDir<-0.99
- Tkr1FirstLayer==17
- Tkr1FirstLayer==0
- Tkr1Chisq<1.5
- Tkr1HDCount<7

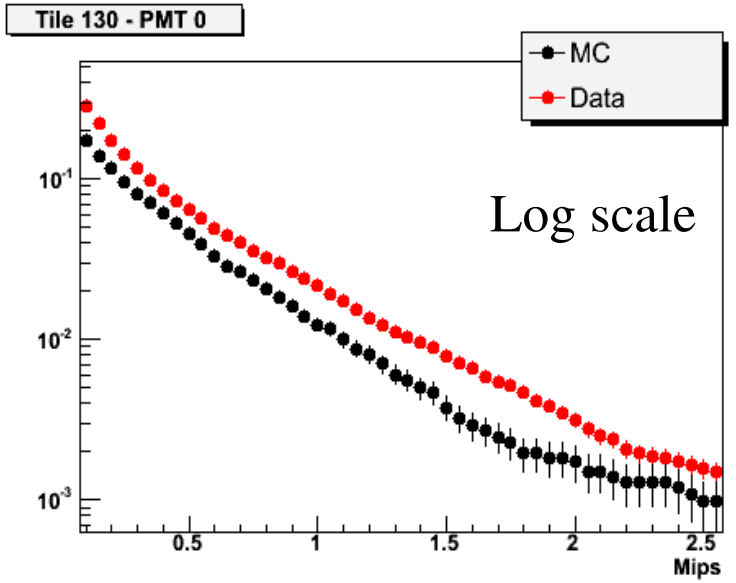
I'm going to be showing this plot a lot... so let's define it:

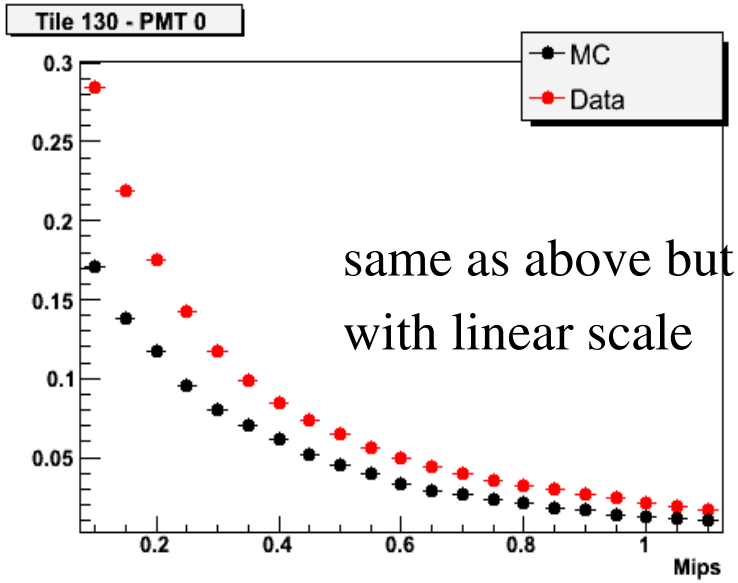
P(>X) in y-axis:
Fraction of events with energy deposition greater than X mips

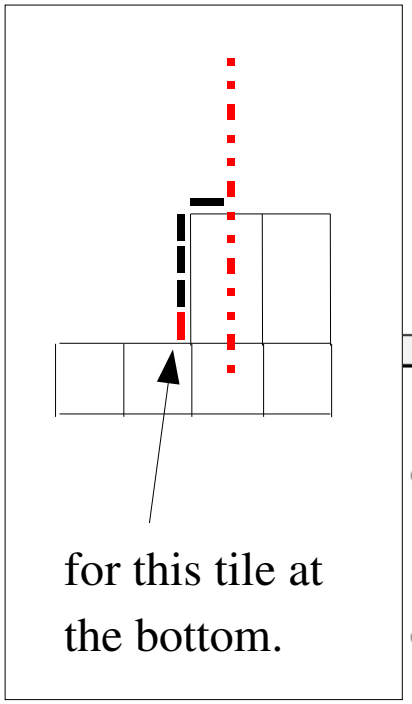


MC vs Data (big improvement with new tiles geometry)

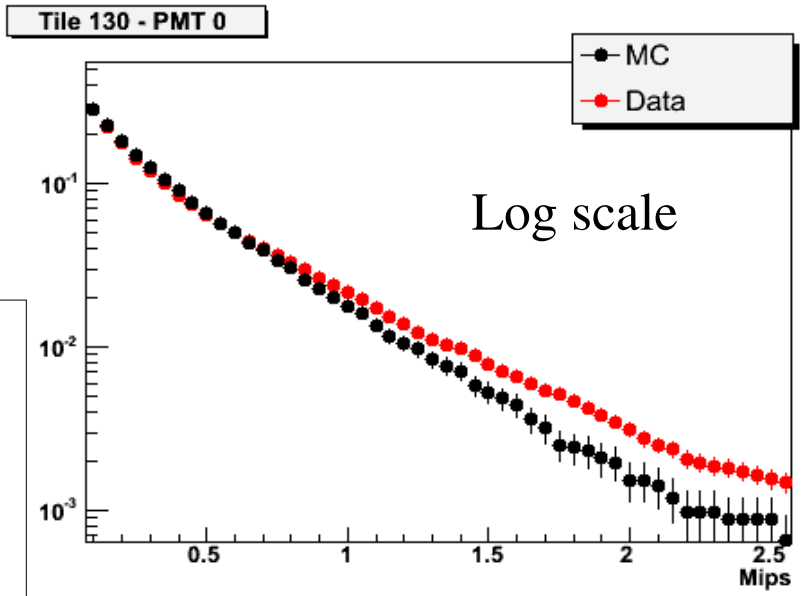
with the old (incorrect) tiles geometry:

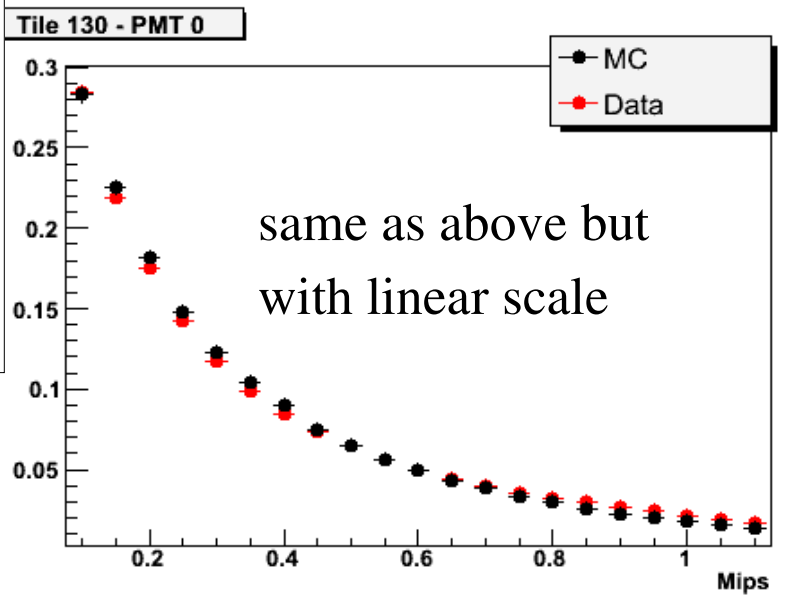




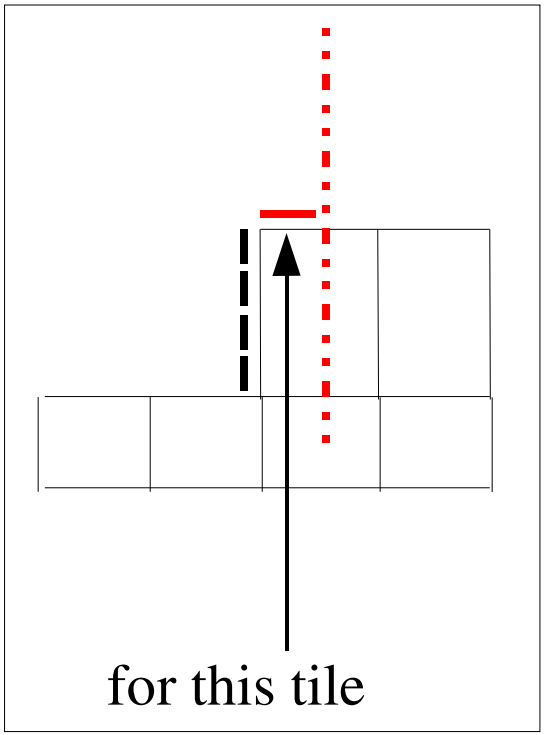


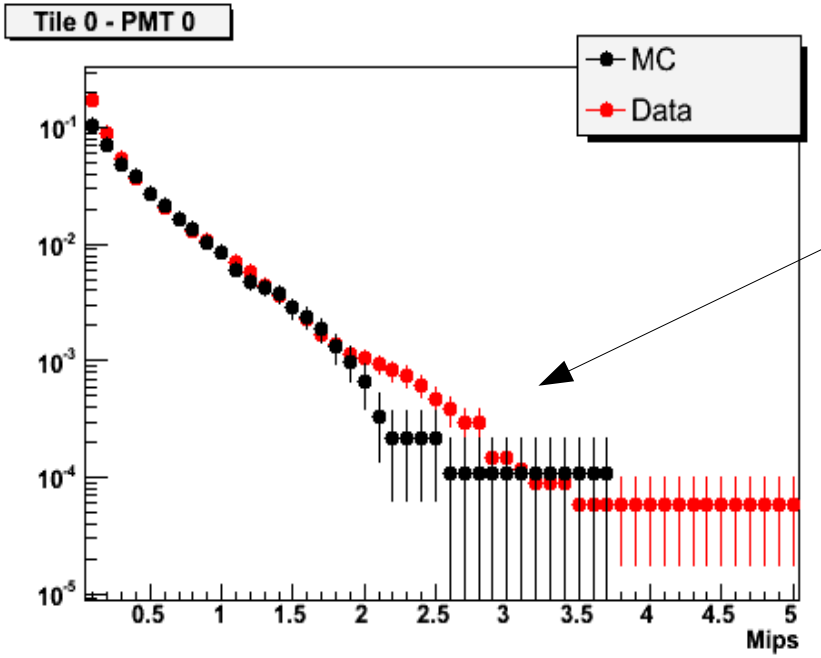
with the new tiles geometry:



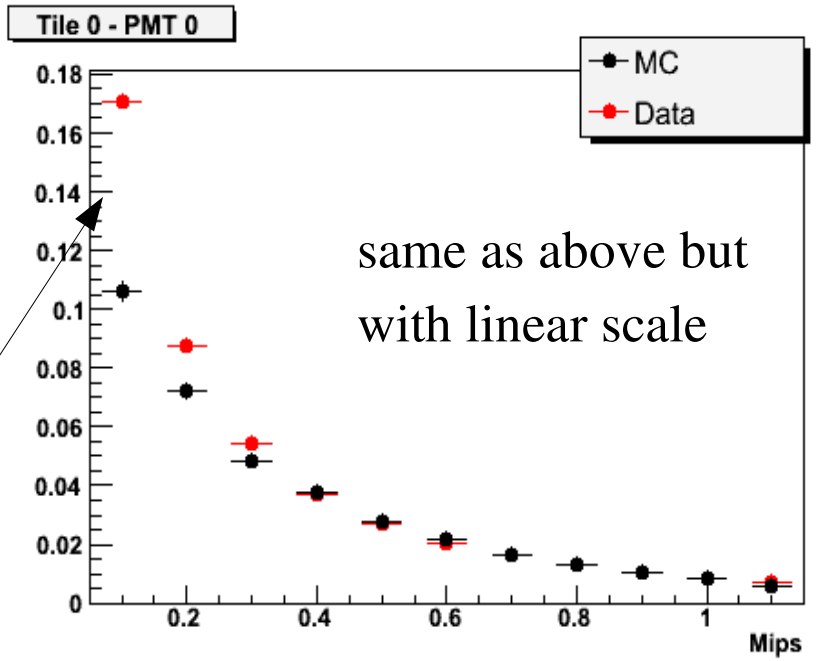


MC vs Data (Tile 0)





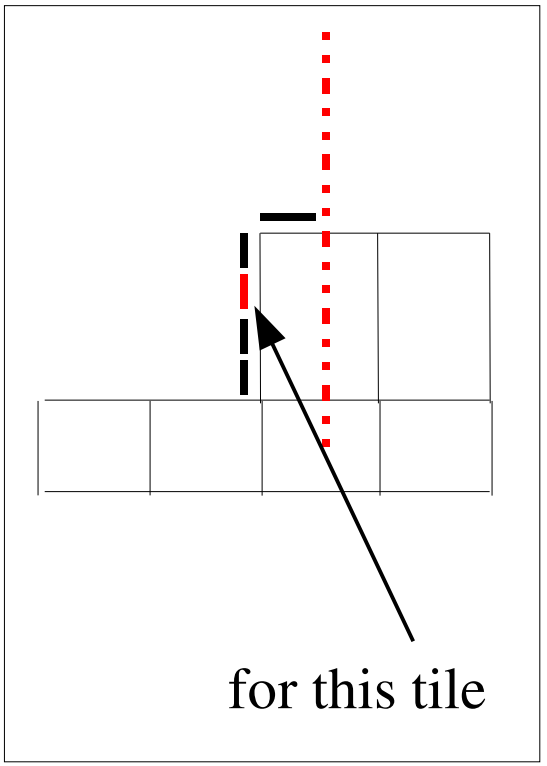
Hints of disagreement at high energy deposition (running out of statistics)

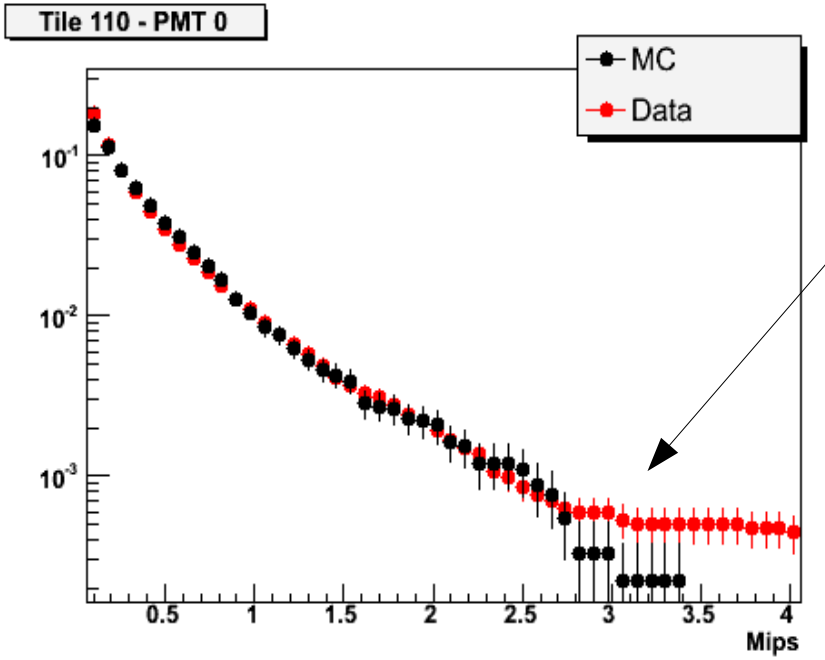


same as above but with linear scale

Significant disagreement a low energy deposition

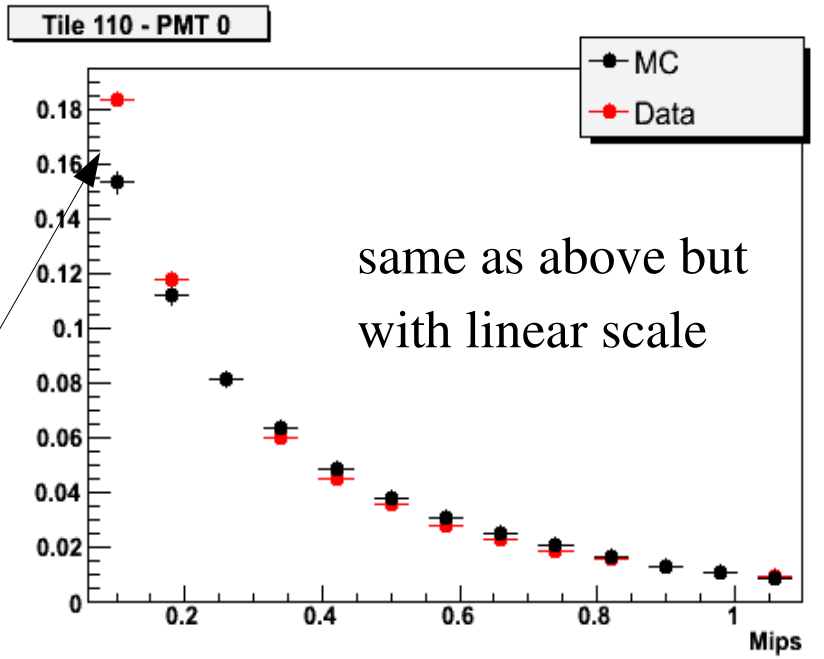
MC vs Data (Tile 110)





Hints of disagreement at high energy deposition (running out of statistics)

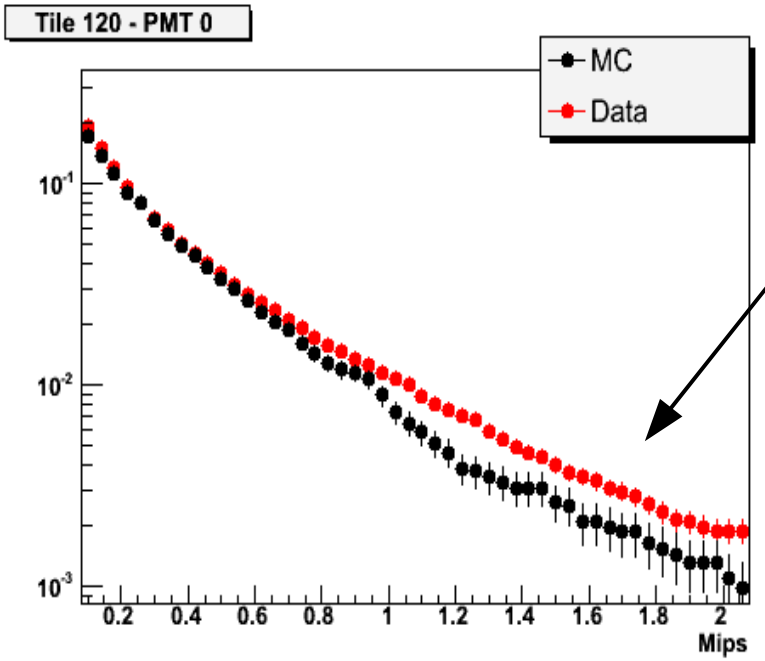
I'm going to skip tile 100 (for now) because of its known problems with the light collecting fibers.



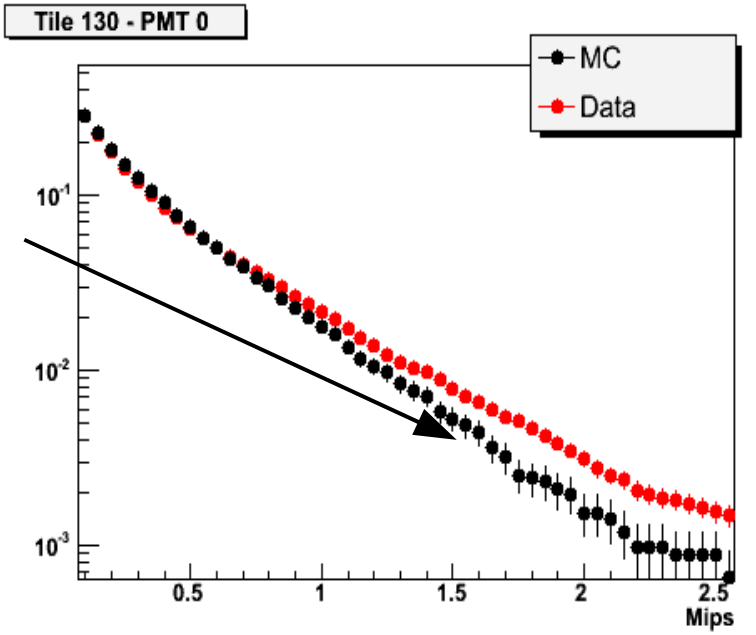
same as above but with linear scale

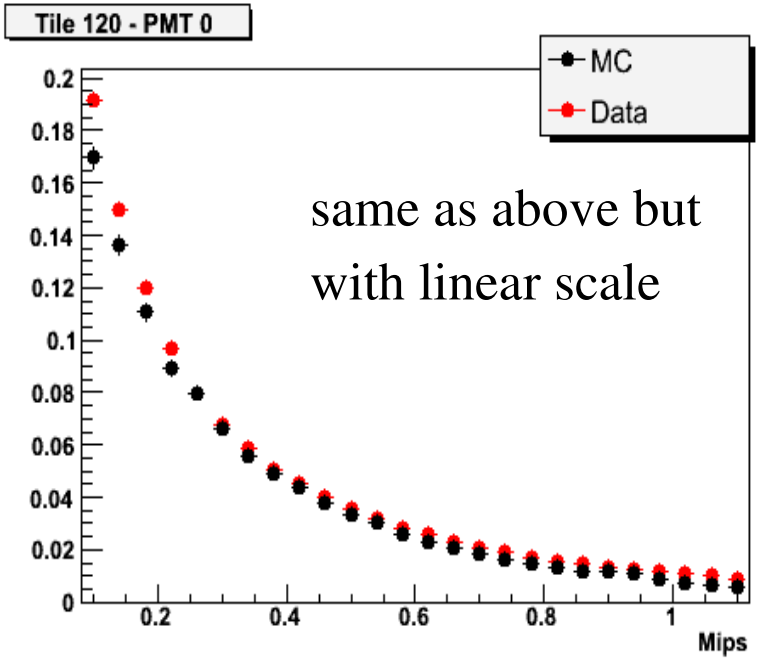
Some disagreement a low energy deposition

MC vs Data (Bottom tiles, closer to CAL)

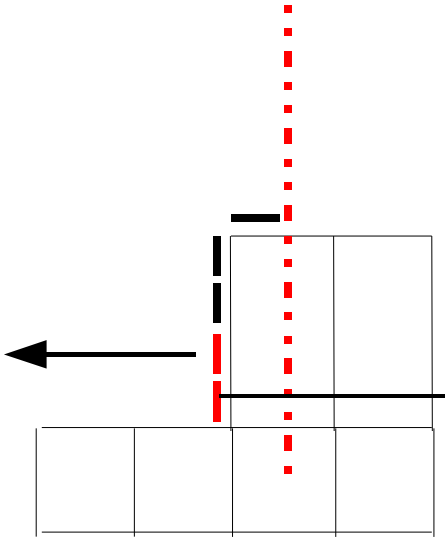


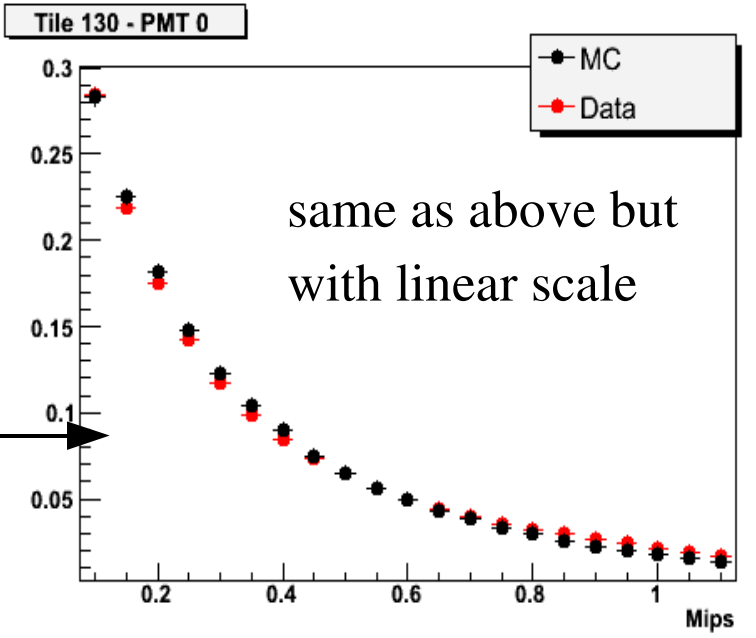
Significant disagreement at high energy deposition





same as above but with linear scale





same as above but with linear scale

MC vs Data - Results

- Agreement between MC and data at this stage of the analysis is encouraging

- However:

  - Significant disagreement between the MC and the data is evident at high energy depositions (> 1.5 MIP).
  - Disagreement at low energy deposition (< 0.3 MIP) is especially significant for the top tile, which is more exposed to (plausible) low energy particles (noise) from the beamline (Alex observed this in a previous beamtest at SPS).

Dealing with the noise (work in progress)

Let's assume that the observed distributions are the result of:

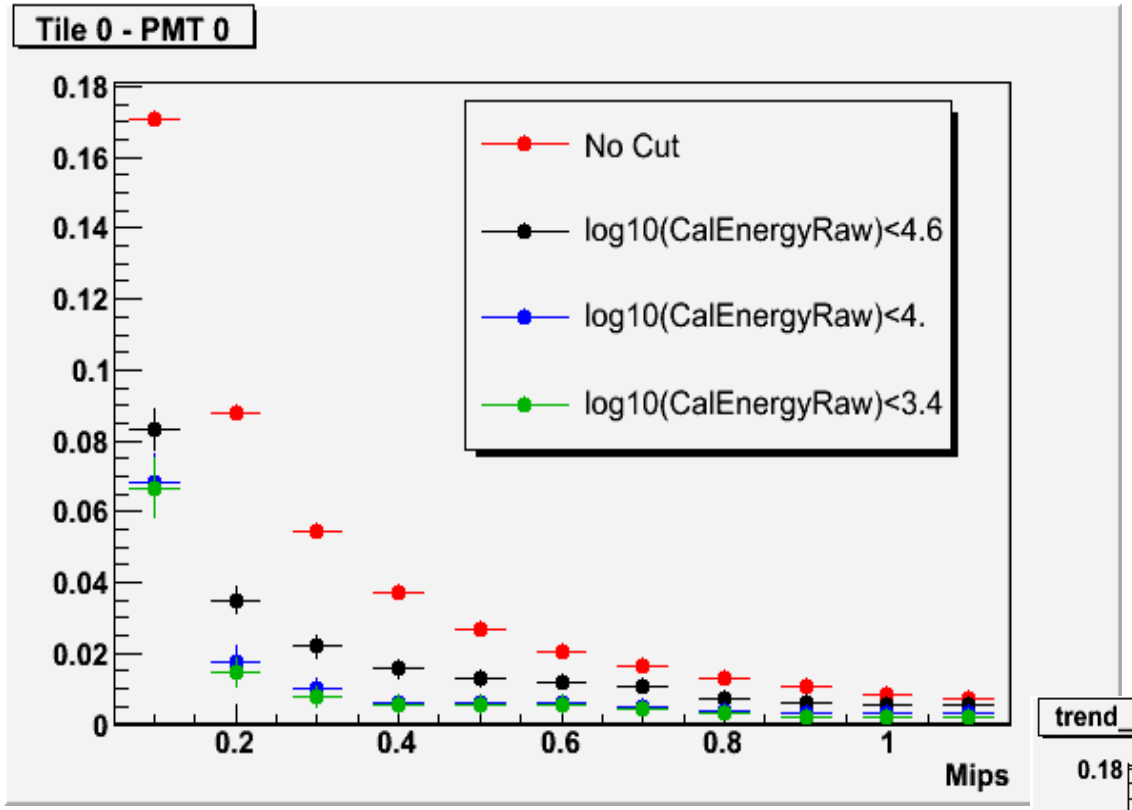
$$P(>X) = P_{backsplash} + P_{noise}$$

$P_{backsplash}$ scales with the raw energy deposited in the CAL, therefore in the limit where

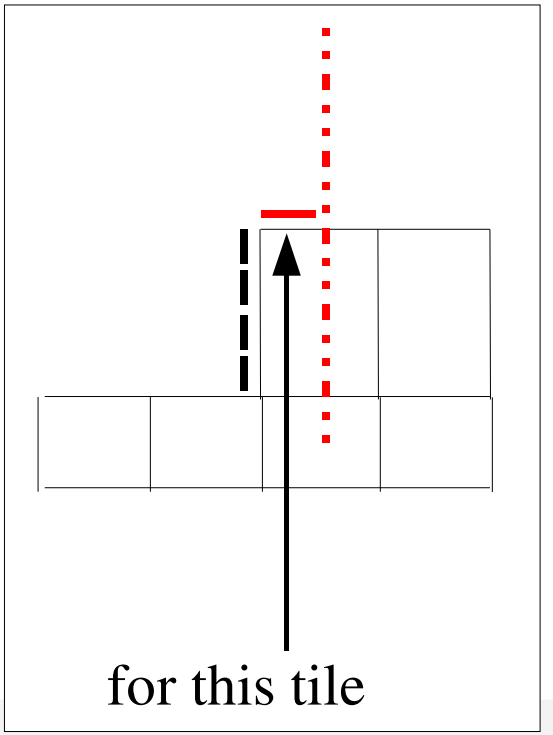
$$CalEnergyRaw \rightarrow 0 \quad : \quad P(>X) \rightarrow P_{noise}$$

To extrapolate to this limit, I'm going to recalculate the distribution with successive cuts of the type: $E_{CAL} < E_{limit}$ (with decreasing E_{limit}) to see if there is any trend.

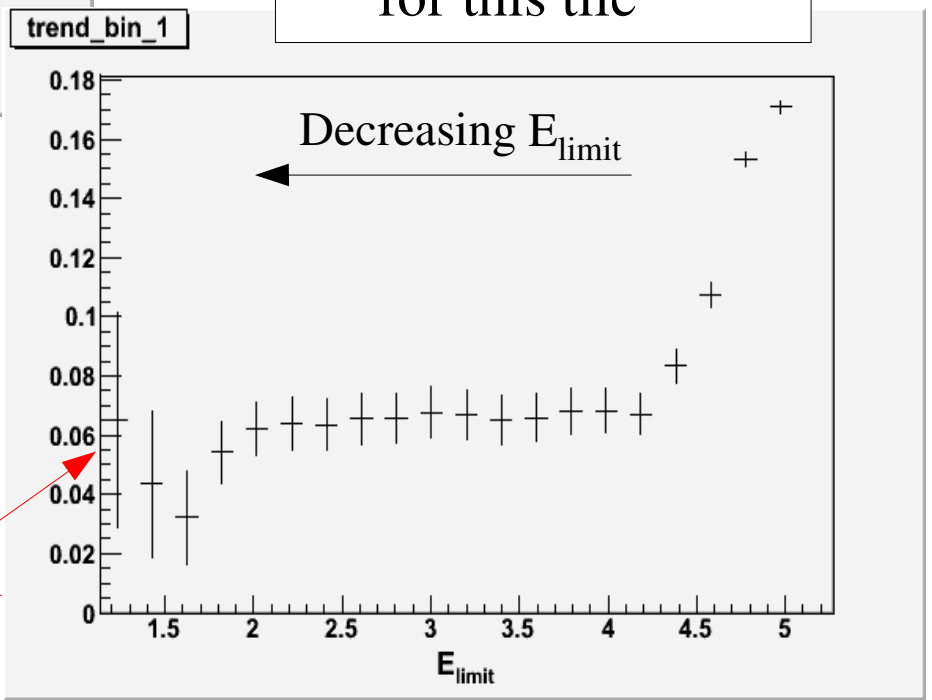
Trend as a function of maximum raw energy in CAL



Decreasing E_{limit}

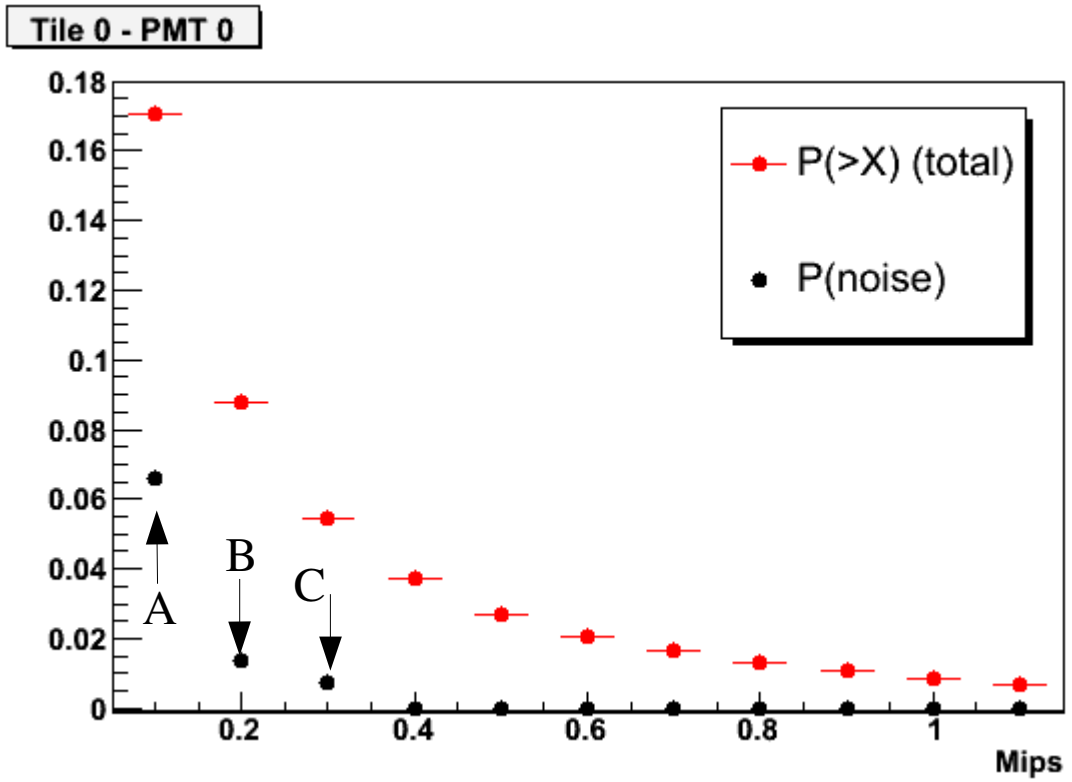


Let's look at the trend of P(> 0.1 MIP) (from 1st bin above) as a function of E_{limit}



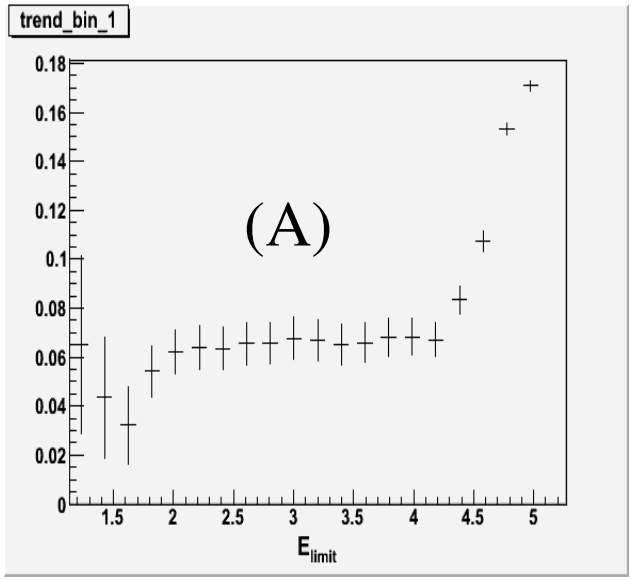
The signal has a plateau that is independent of the raw energy in the CAL (we are going to call this noise)

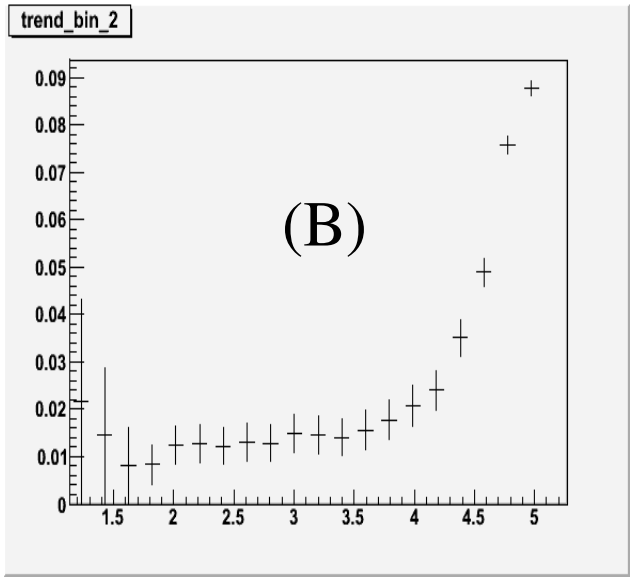
"Noise" Distribution for Tile 0 (top of CU)

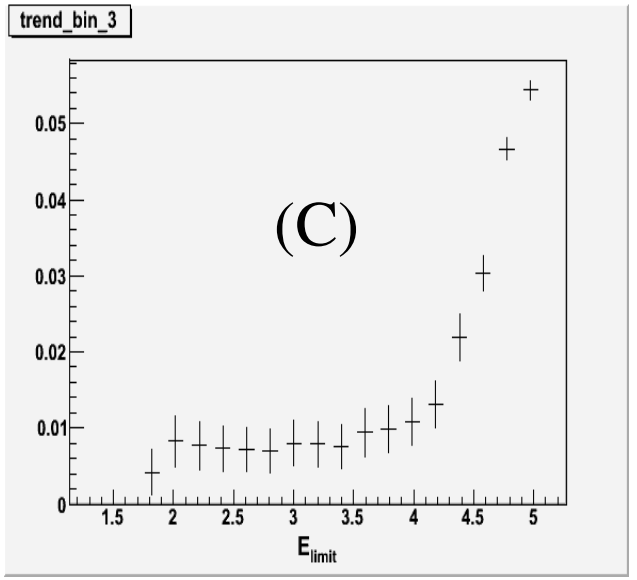


Here we use the plateau values (from A, B, C, etc.) to approximate the noise.

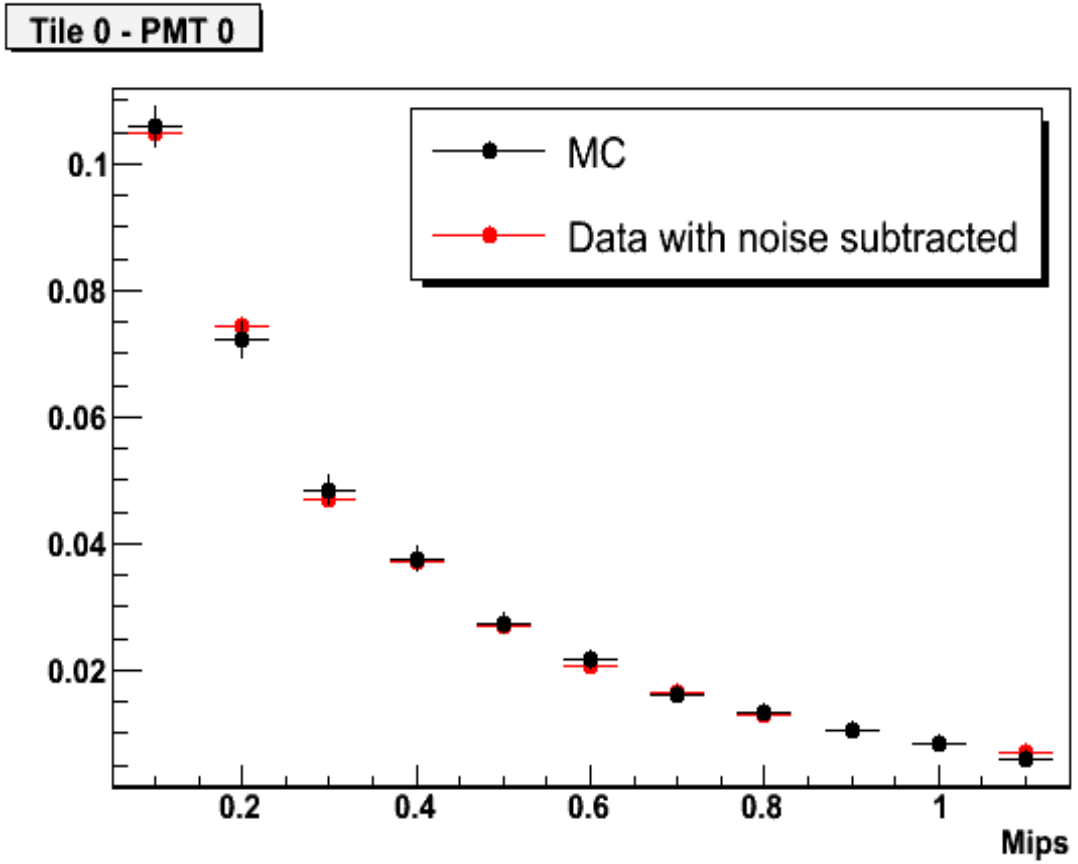
*error bars for noise distribution have not been calculated







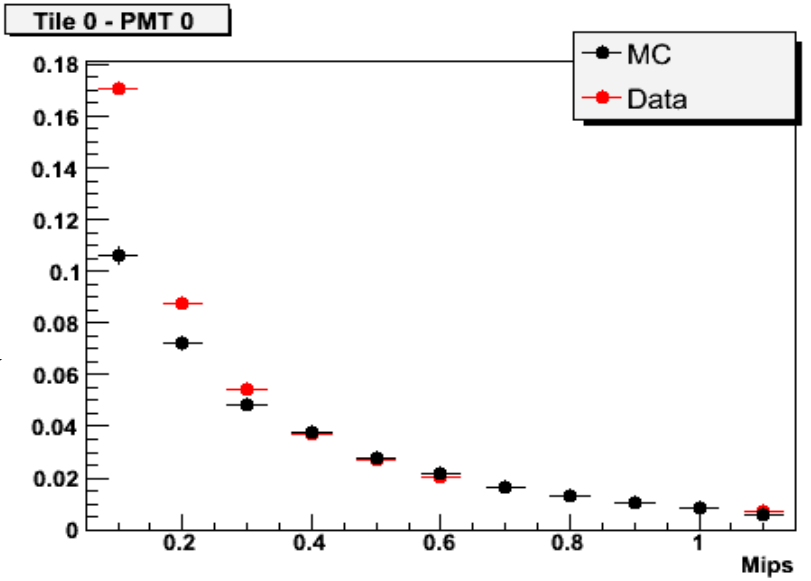
Results for tile 0 with “noise” subtracted



*error bars for noise distribution have not been calculated, nor propagated here.

Great agreement between data and MC!

Before noise was subtracted:



Next Steps

- Repeat the analysis with other runs and configurations.
- What is causing the disagreement between MC and data for high energy depositions in the ACD tiles?
- Plot and parametrize the backsplash probability as a function of angle, distance, etc.