

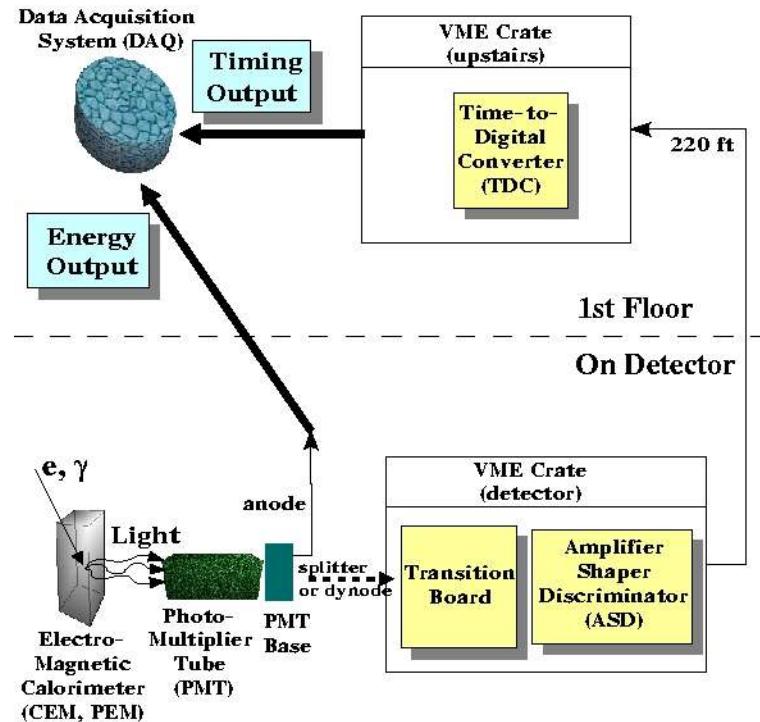
EMTiming

- Overview of the existing system
- Overall Performance
- Beating the time resolution down
- Taking out Beam Halo
- Checking CEM energy
- Conclusion & Things to Do

For physics motivation behind the project, please see
hepr8.physics.tamu.edu/hep/emtiming/talks/EMTiming_Jan2004_Collab.pdf

Overview of the System

CDF EM Timing Project

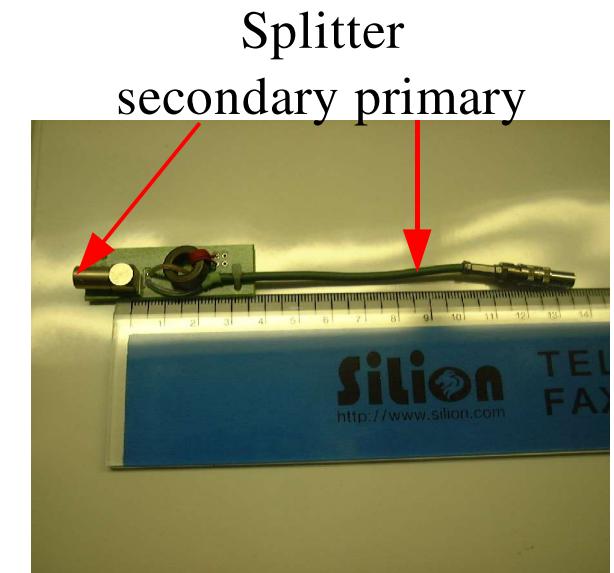


PEM is fully installed

- Towers 10-18

CEM is partially installed

- Wedges 0 & 23



In plug we hooked up to previously terminated PMT dynode.

In CEM we are feeding of the PMT->ADMEM line via splitter:
affecting the energy measurement?

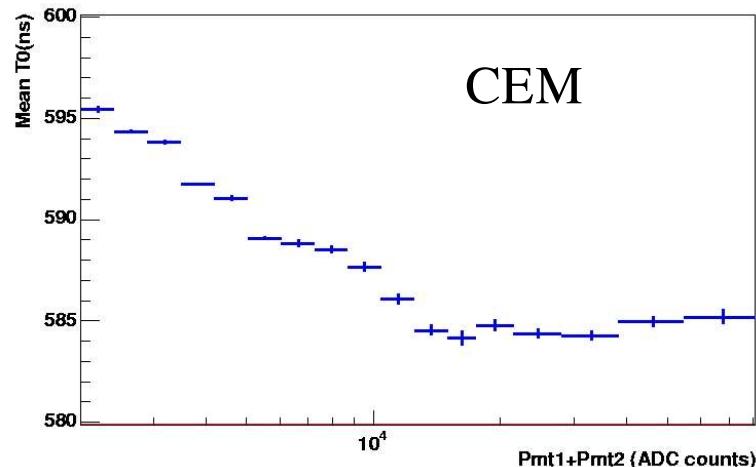
- PMT is a current source
- ADMEM integrates charge over 132 ns
- No physical contact between primary and secondary lines

Overall Performance



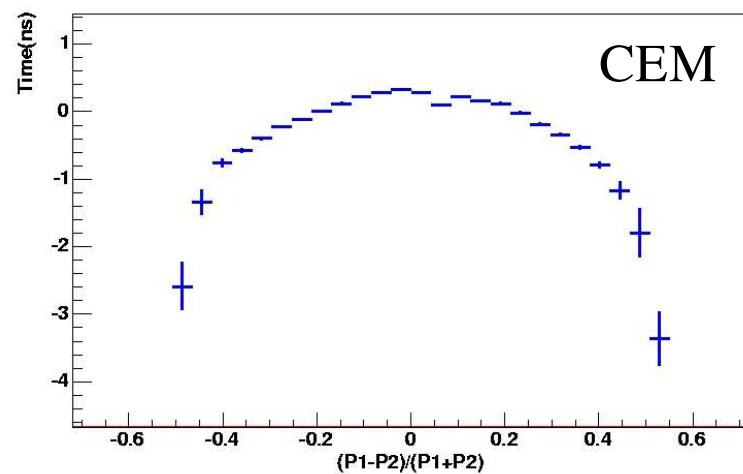
Time Resolution Effects

TDC has minimum timing bin size of 1 ns -> for large statistics the
 $RMS^2 = \langle x^2 \rangle - \langle x \rangle^2 = \int_{-0.5}^{0.5} x^2 dx = 1/12$ ns => lowest RMS ~ 0.3 ns



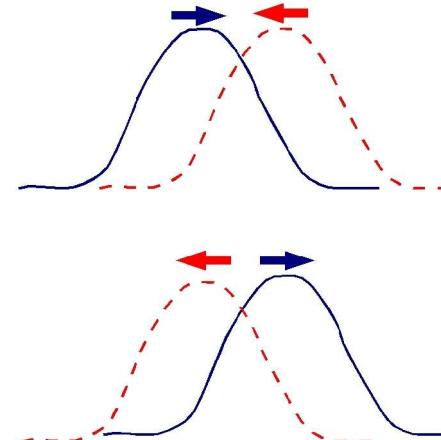
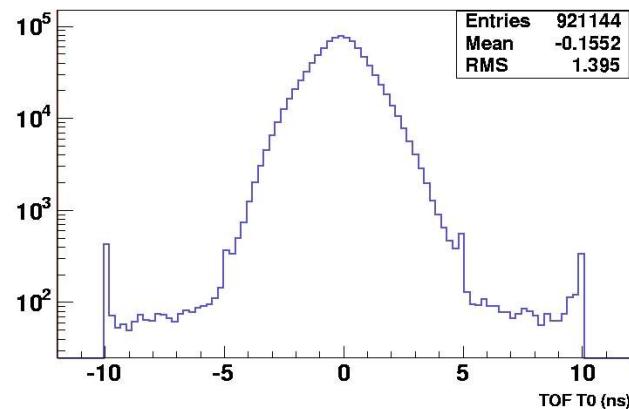
Time vs Energy dependence new threshold is the dominant effect (slewing correction)

After taking out slewing energy asymmetry becomes dominant

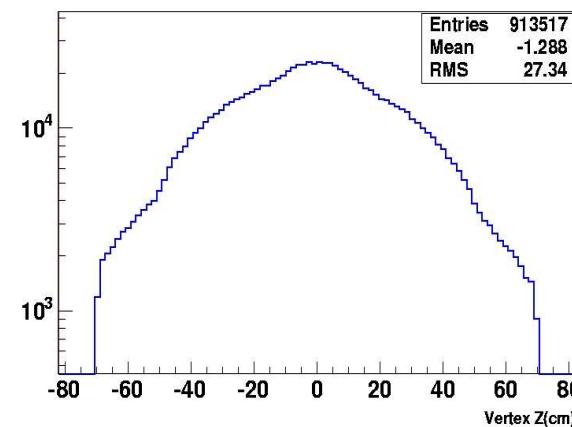
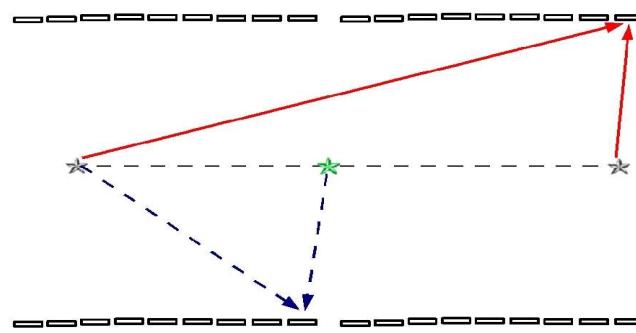


EXTRENAL EFFECTS

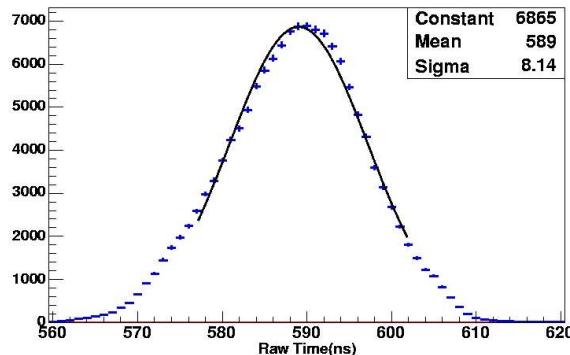
The interaction can happen at different time => use Time Of Flight system



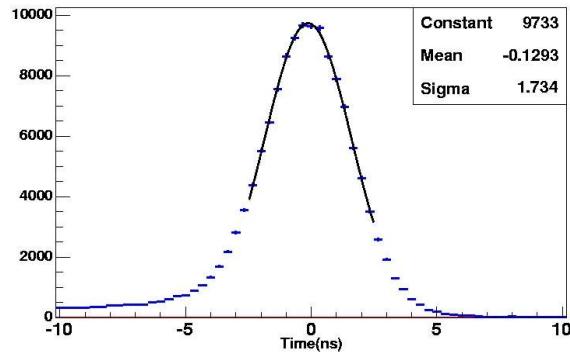
Vertex correction – more significant for the towers with high η



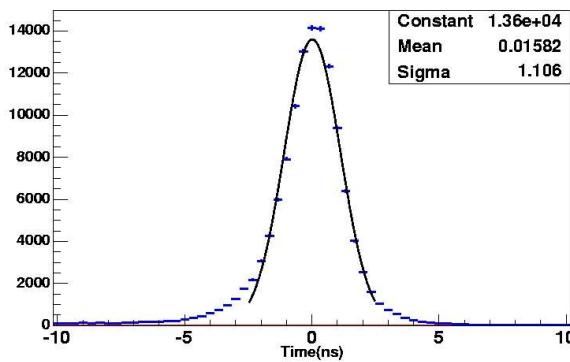
CEM Time Resolution



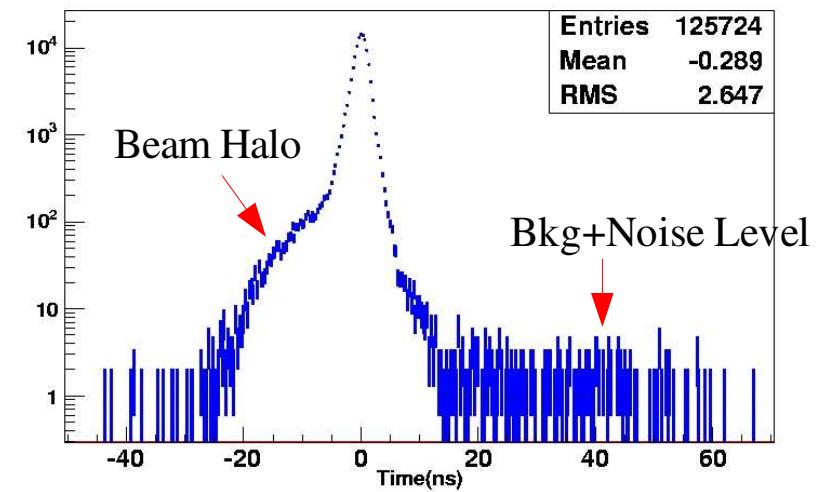
Raw Time, straight from the Bank



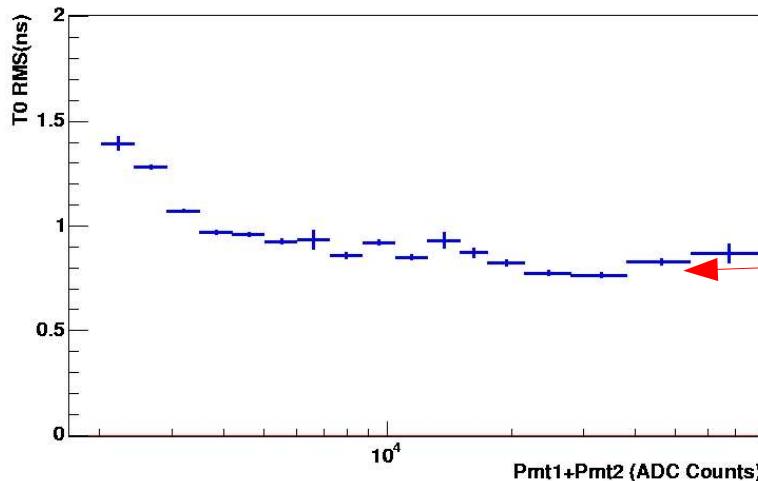
Energy Slewing applied



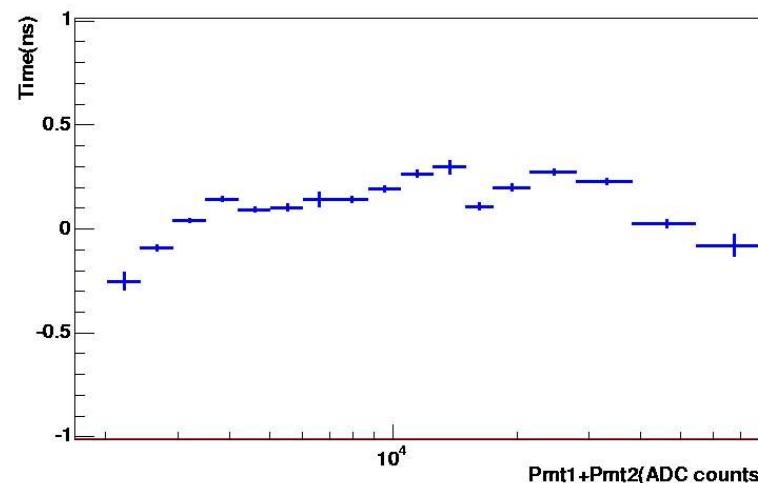
+ TOF & Vertex



CEM Time Resolution



RMS flattens out at Energy \gg Threshold
we are at 0.7 - 0.8 ns now



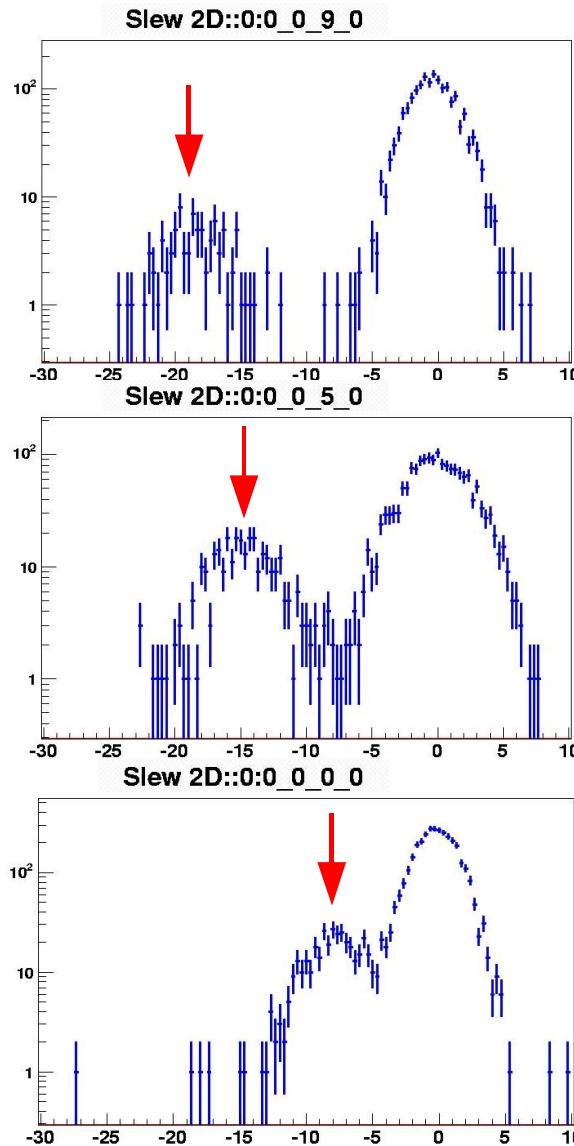
After Slewing correction T0 is flat as a function of energy; systematic error on RMS ~0.3ns

Improvements: apply asymmetry corrections, cut junk below threshold out, improve T0(Enrgy)

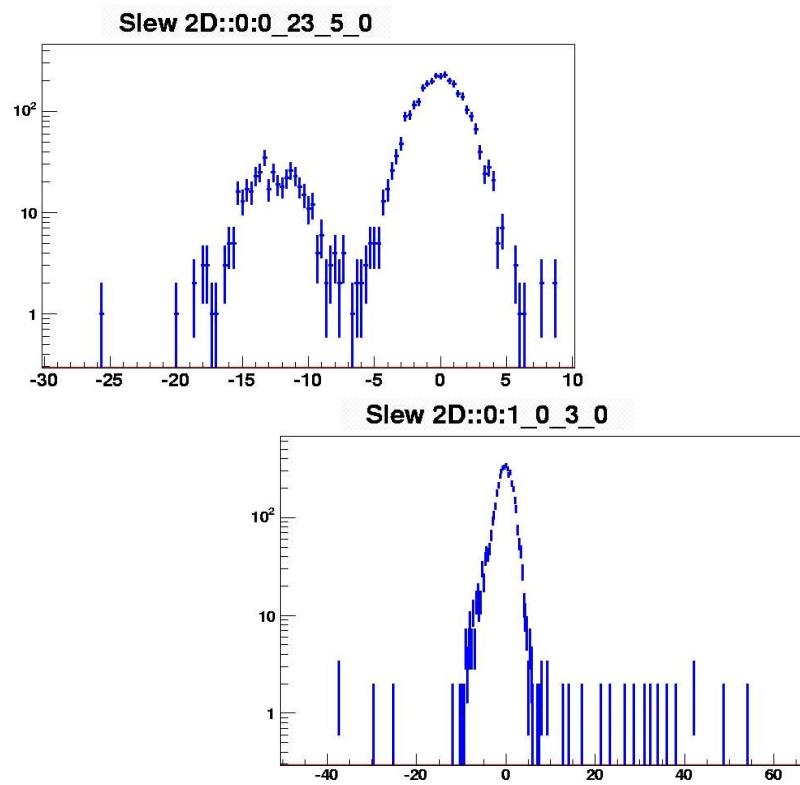
PEM Resolution goes here



Taking out Beam Halo



- High time separation at high rapidity
- Wedges 0 & 23 are alike
- Halo “hides” at towers ≥ 3 on the west side



Checking CEM energy

In principal we could affect the CEM energy

ADMEM collects charge over 132 ns
no physical contact between ADMEM & ASD lines

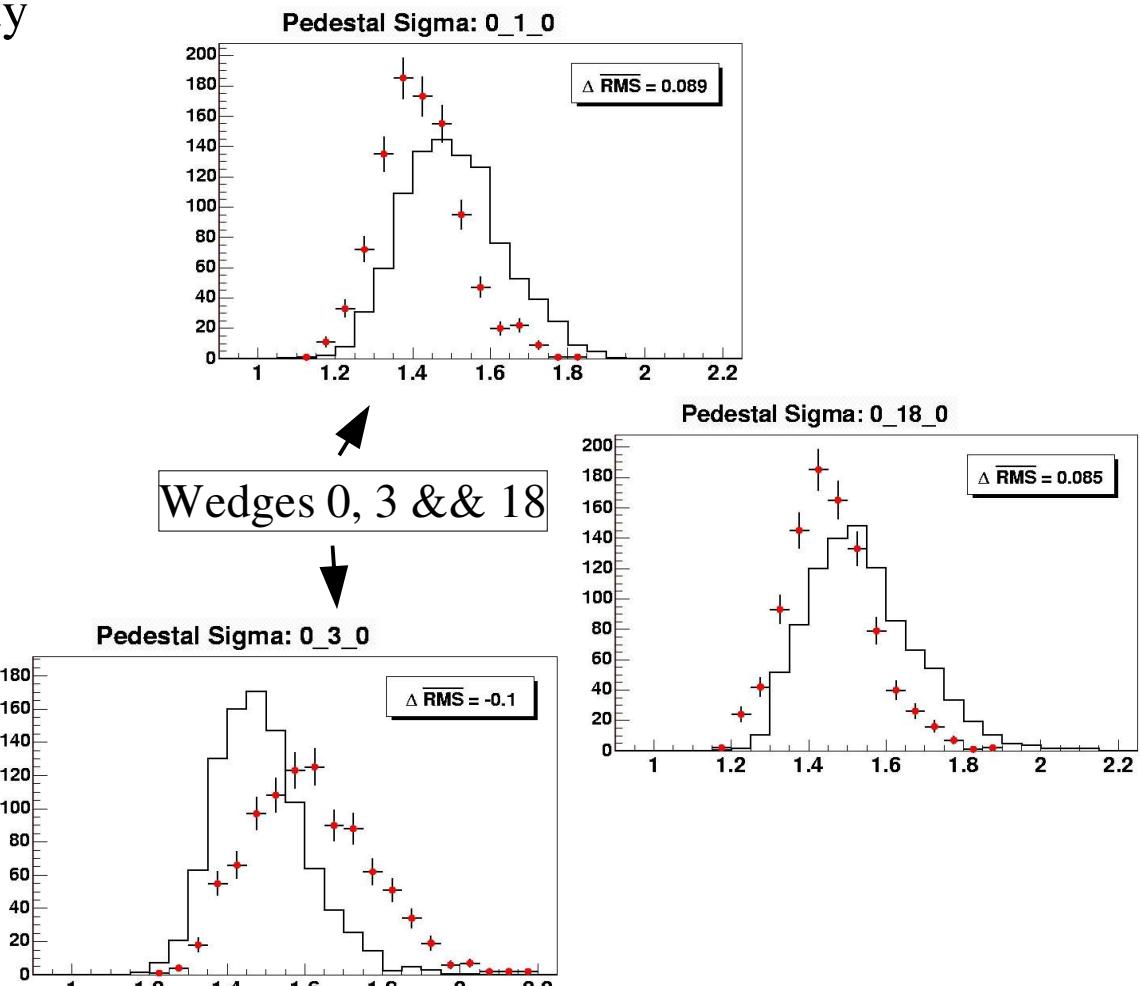
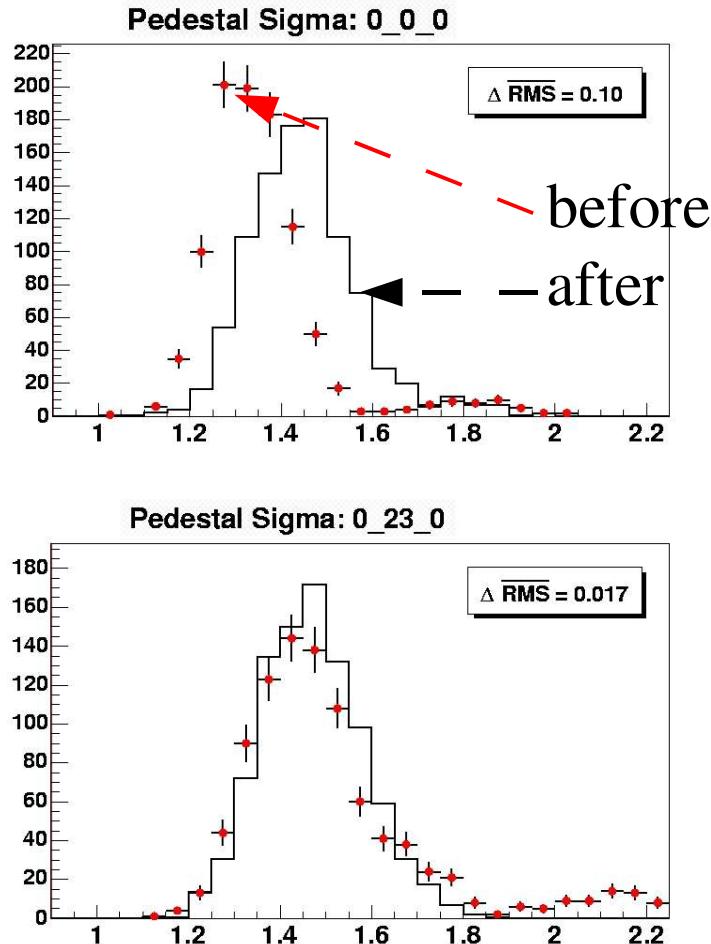
Checks:

look at Z mass for installed wedges
Pedestals and Pedestals RMS

Checking CEM energy

Pedestal RMS -> energy Uncertainty

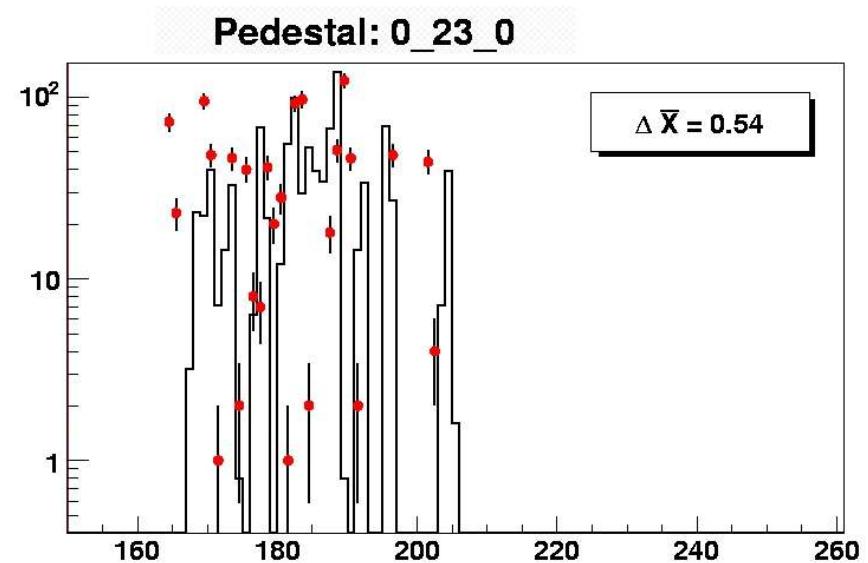
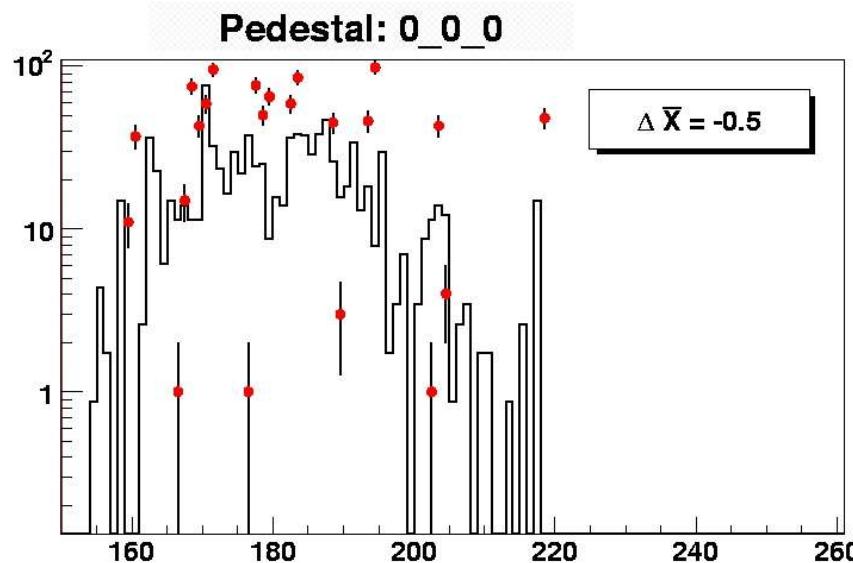
EMT installed in CEM:
wedges 0 && 23



RMS shift is consistent with other wedges
Worst case - RMS increases by 0.1

Checking CEM energy

What about the pedestals?



No Shift in Pedestals

Conclusion & Things to Do
