CalDet Electrons

Tricia Vahle
University of Texas at Austin
January 5, 2002

Outline:

I. Beam Characteristics

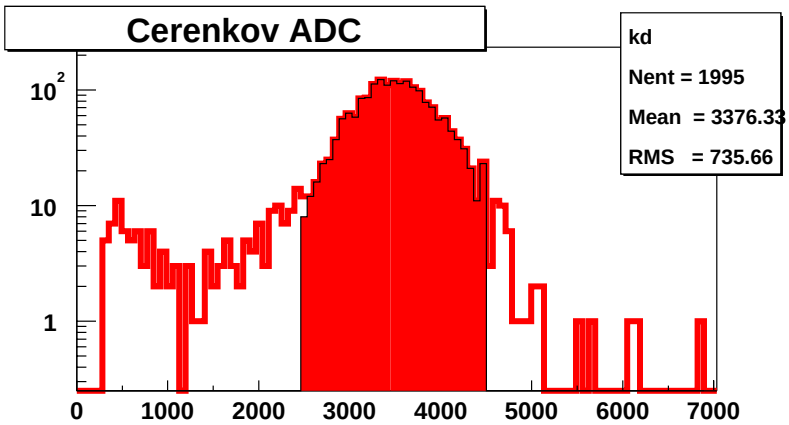
II. Time and Dead Chip Cuts

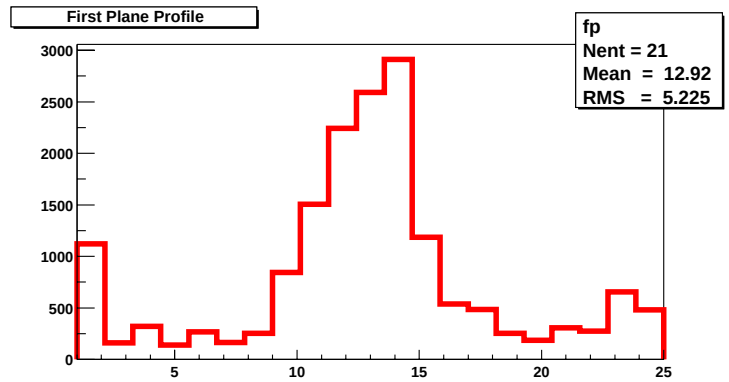
III. Event Characteristics

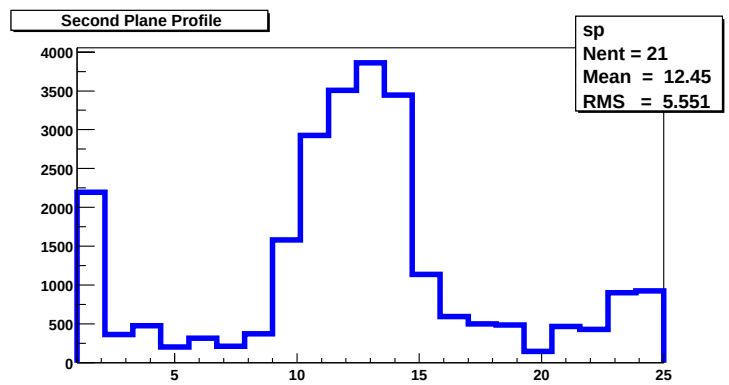
IV. Energy Resolution

V. Future Investigations

Beam Characteristics

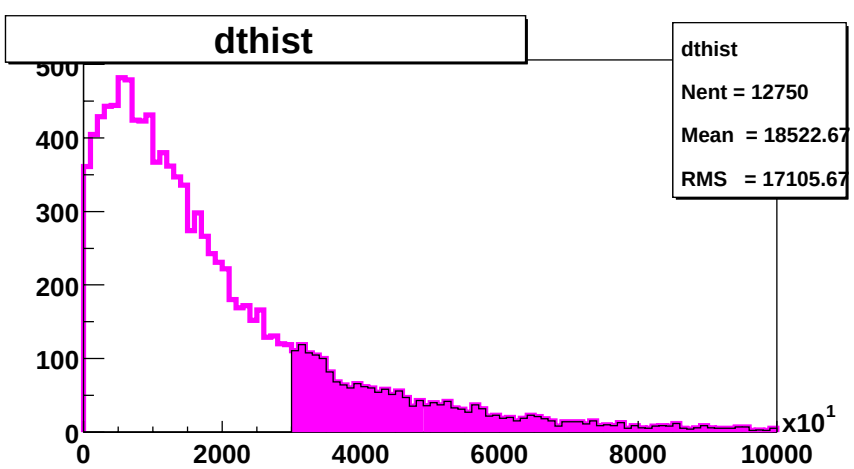






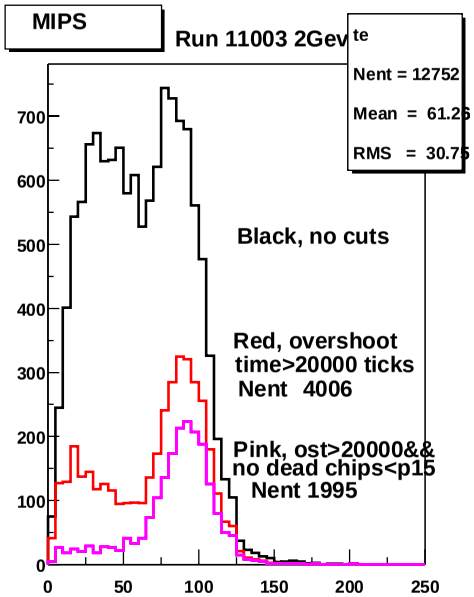
- CO_2 Threshold Cerenkov Detector used to tag electrons, events selected from peak of distribution
- 25-40 PE

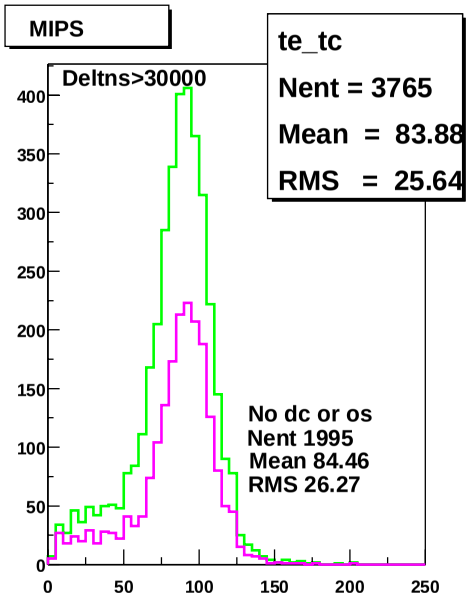
- Beam steered to hit center strip in first(horizontal) and second(vertical) planes

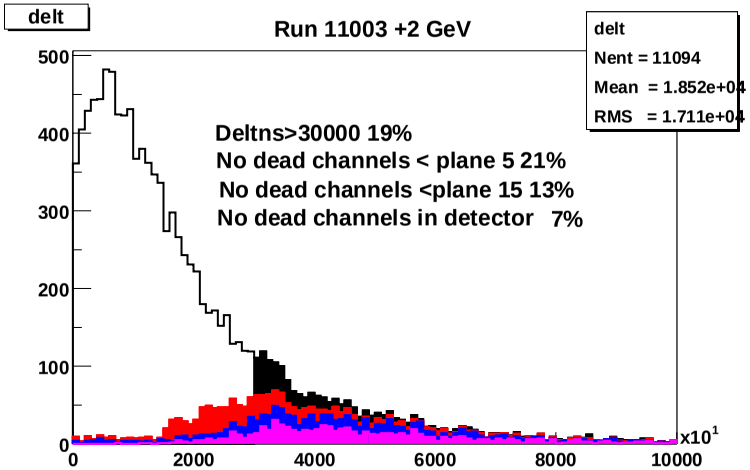


- With an average time of 18.5 μs between plane triggered events, many events were spoiled by dead time effects

Rate Effects



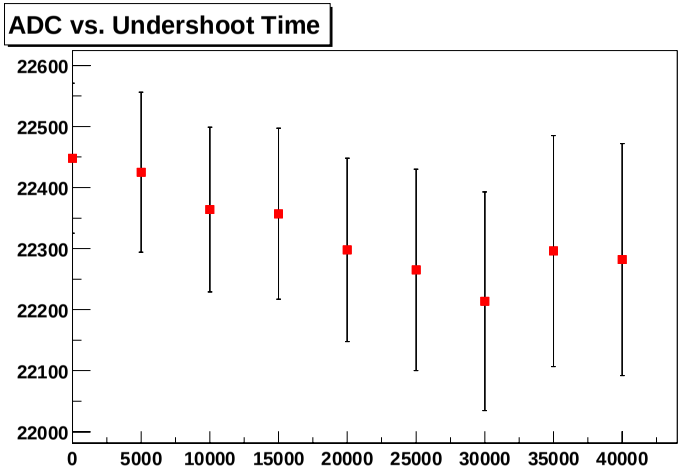




- Dead Chip cuts drastically reduce the sample size

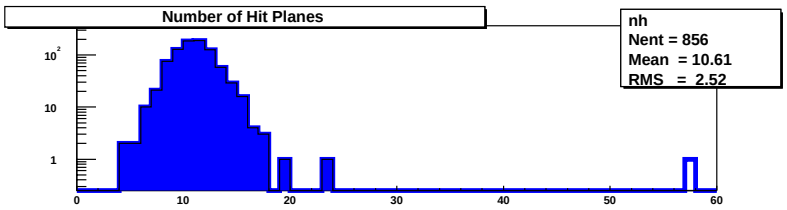
- Dead chips and the undershoot time distort the energy spectrum

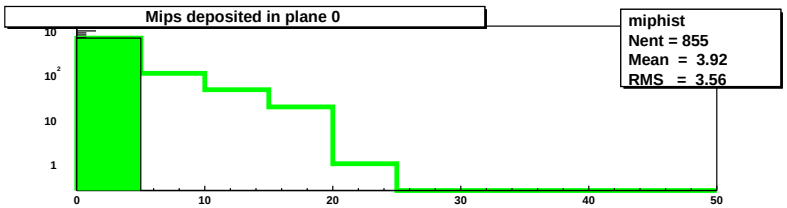
- With the reprocessed BRP files, one can select events with no dead chips less than plane 15 and no undershoot channels, which dramatically reduces the low energy shoulder in the Cerenkov event MIP distribution.



- After removing dead chips, the undershoot of previously hit channels affects the mean by about 1%

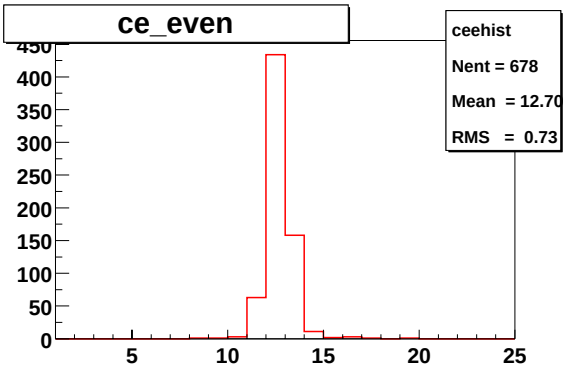
Event Characteristics of a 2 GeV Run

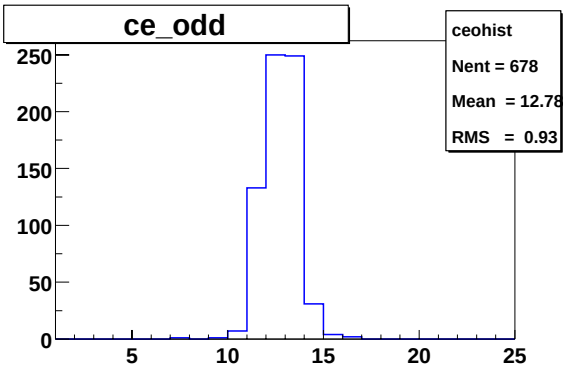


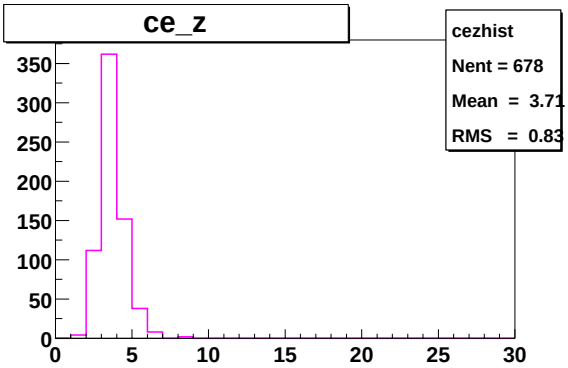


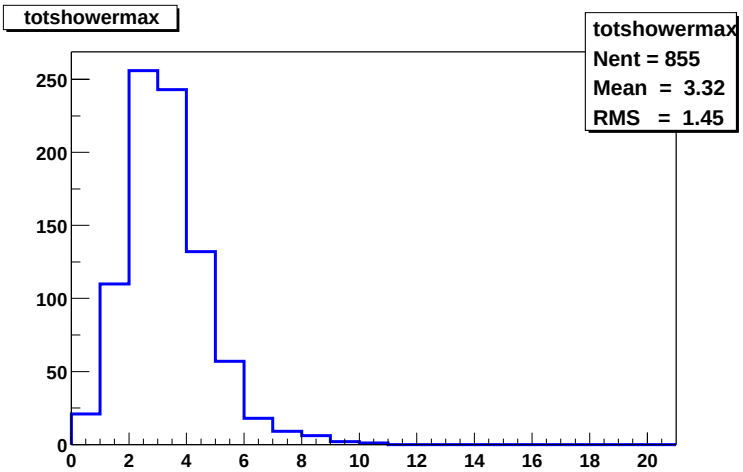
- Average number of planes hit is 10.61 Few electrons hit more than 20 planes

- Distribution of MIPS deposited in plane 0.





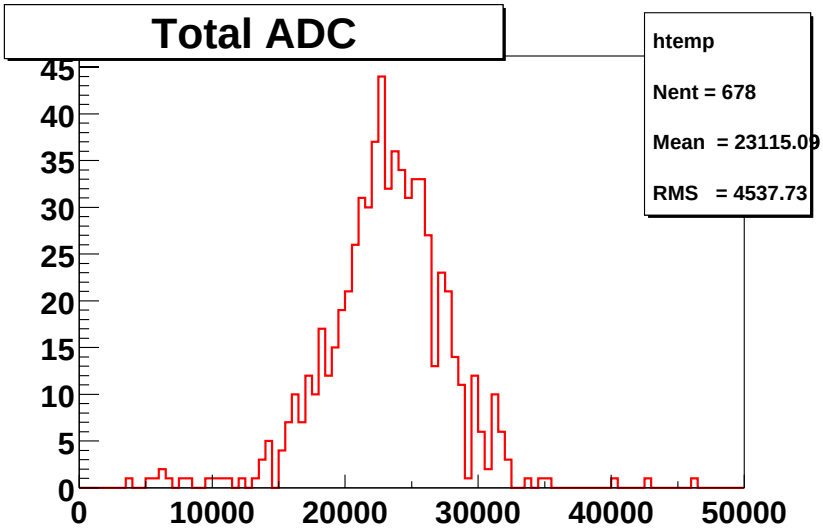




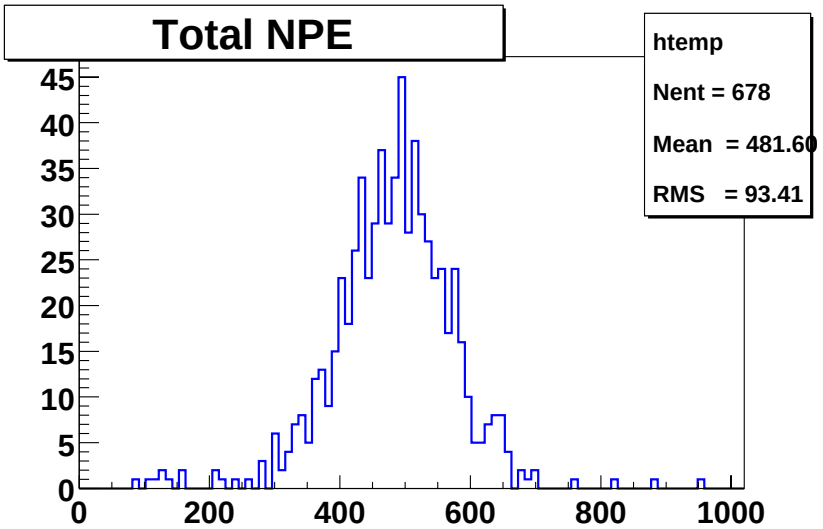
- Shower Maximum at 3.32 planes

- The mip-weighted event center, localized to the the center of the first few planes

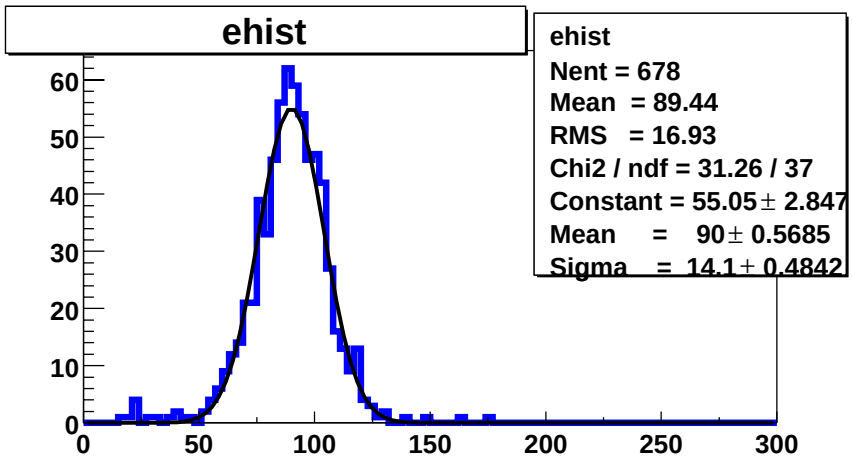
Event Characteristics of a 2 GeV Run



- Total Charge
- Mean 23115
- RMS 4537.7

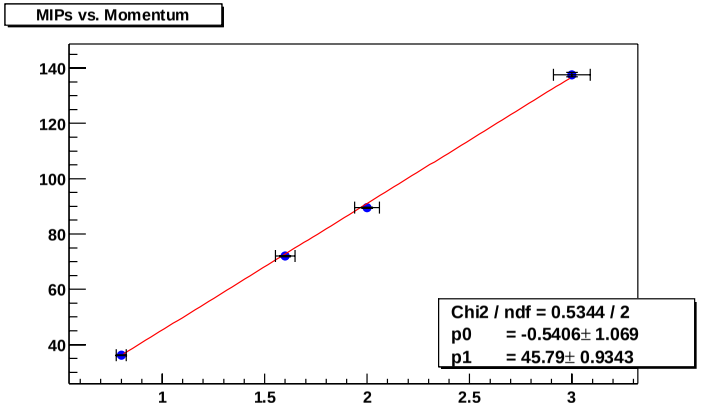


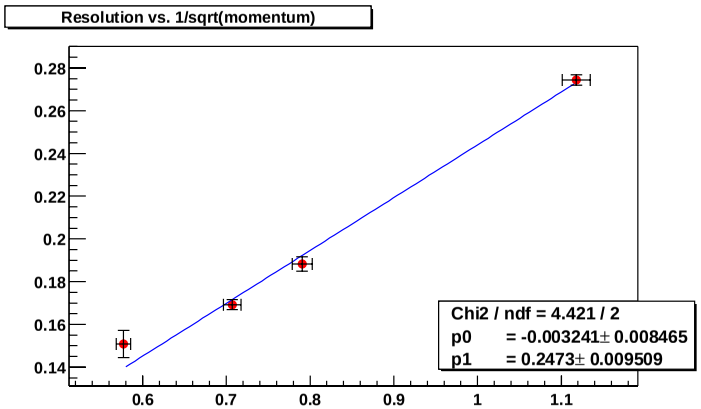
- NPE
- Removes variations in PMT gains
- Mean 481.6
- RMS 93.4



- MIP
- Removes green vs. clear differences, fiber to fiber variations
- Mean 89.44
- RMS 16.93
- Resolution 18.9%

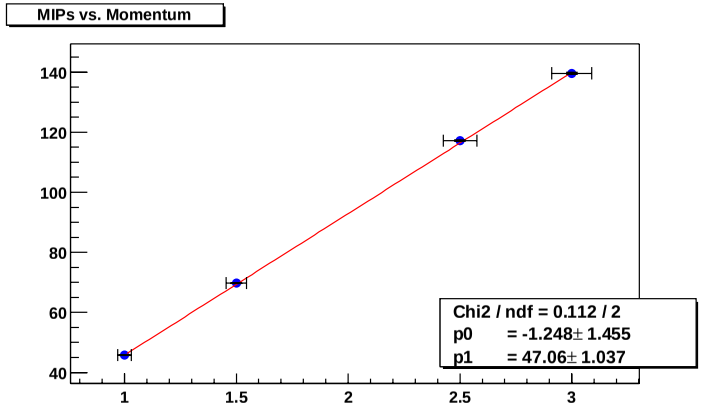
positives

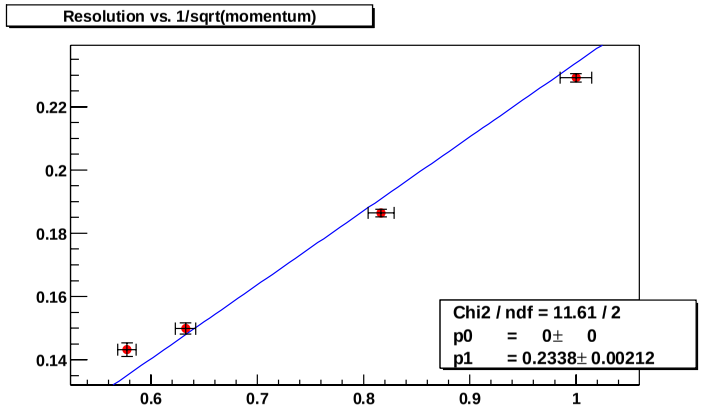




- MIPs and Resolution vs. beam momentum for positrons

negatives





- MIPs and Resolution vs. beam momentum for electrons

- In General, resolution as expected

- 3 GeV run has poorer statistics and higher background

Future Investigations:

- Trigger Efficiency
- Electronics Response
- Comparisons with Monte Carlo
- Event Topology
- CalDet->MINOS

Cut Summary

- Hit in Cerenekov detector, 2-10%
- No Sparsification Errors, Usually 95%, but some runs as low as 28%
- No Faf Errors, 90-100%
- No dead chips in planes less than 15, 13%
- No channels hit less than 20,000 ticks earlier, 75%
- Cerenkov ADC between 2500 and 4500 counts, 90%
- Hit in First Plane, 99%
- Double sided readout in center of First Plane, 48%
- Number of hit planes less than 25, 99%
- Energy deposited in first plane less than 5 MIPs, 80%