Fix for Failed Electronics on Calorimeter Crystal (Tower 4, Layer 2, Crystal 4)

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Mitigation Algorithm

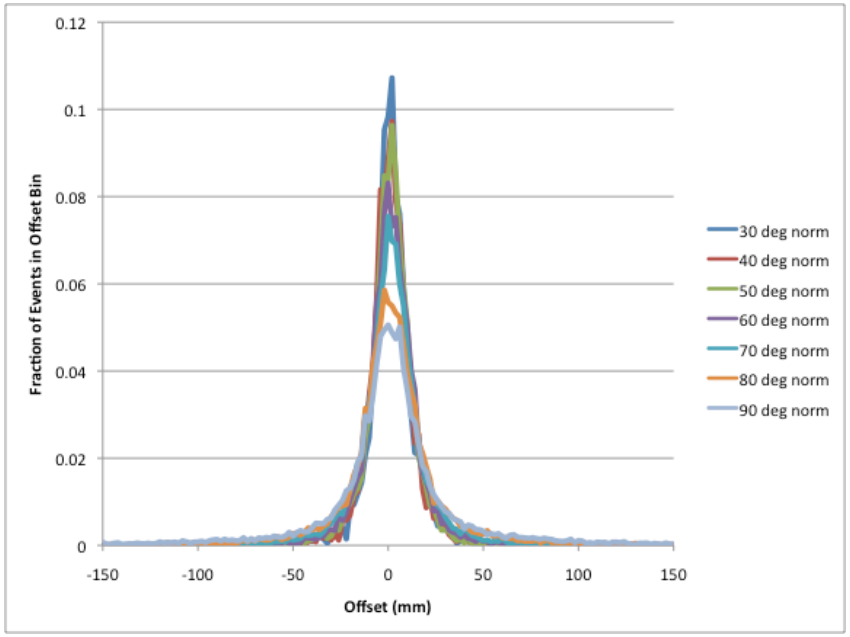
- Determine position of hit in xtal based on CalCluster position and direction information obtained from first pass
  - i.e. use the CAL moments analysis for position of closest approach
- Evaluate asymmetry based on this position to determine the energy
- We apply xtal position correction algorithm (apply to either positive or negative side of xtal) if any of these apply
  - HEX1, HEX8, LEX1, LEX8 all failed
  - HEX1, HEX8 failed and HEX1 or HEX8 is the first range
  - HEX1, HEX8 failed, LEX1 is first range, LEX1 > LEX1 threshold, and autoranging is disabled
- "status bits" have been added to CalXtalRecData to flag application of mitigation algorithm

Performance of Algorithm

- Determined performance of algorithm by testing against working xtals
- Studied effects of offset in position as a function of the following:
  - Cluster direction compared to z-axis
  - Cluster direction compared to direction along xtal
- Results are on following pages...

Offset with Varying z-axis Angle

- Compared offset to angle of shower direction and z-axis
  - 90 deg represents perpendicular to z-axis
    - NOTE: Not necessarily parallel to xtal direction
  - Distributions normalized for direct comparison between angles
  - FWHM at 30 deg (60 deg) = 1.8 (2.0) cm
    - With slope = 1% per cm, FWHM of xtal E is ~1.8-2.0%



Offset with Varying Angle Along Xtal

- Studied effect of having cluster directions running parallel to xtal length
  - 0 deg is parallel with xtal length, 90 deg is perpendicular to xtal