

Electron Test Beam Data Analysis for BGO Crystal Module

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- Test beam data analysis for crystal module.
- 10 GeV muon, 5 GeV electron
- Electronics setup: HG49 LG44 TimingHG230 Shaping87.5ns HoldDelay200ns

Pedestal correction



MIP calibration

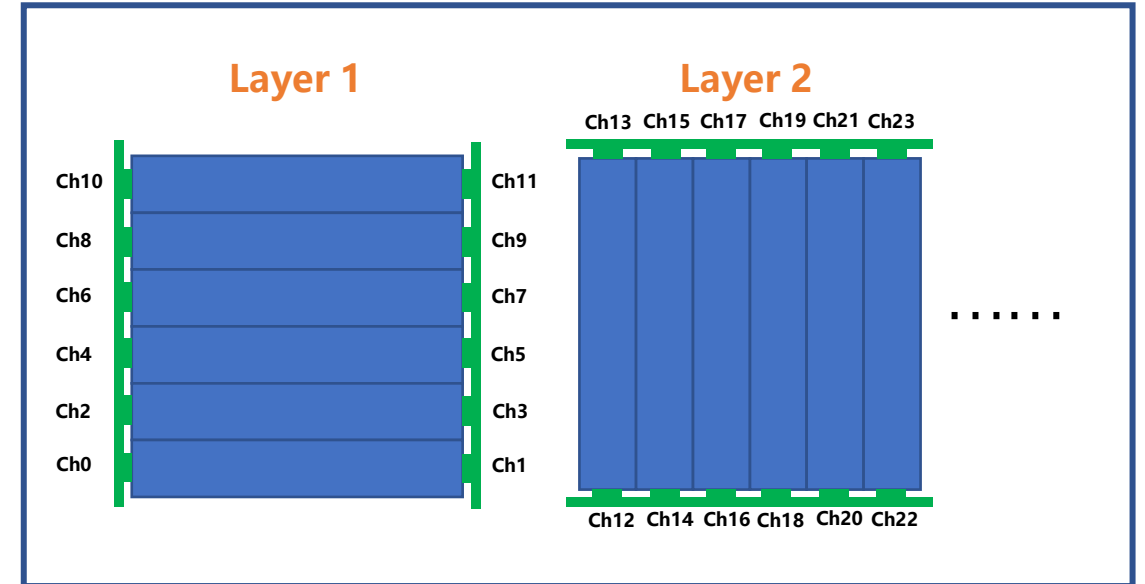
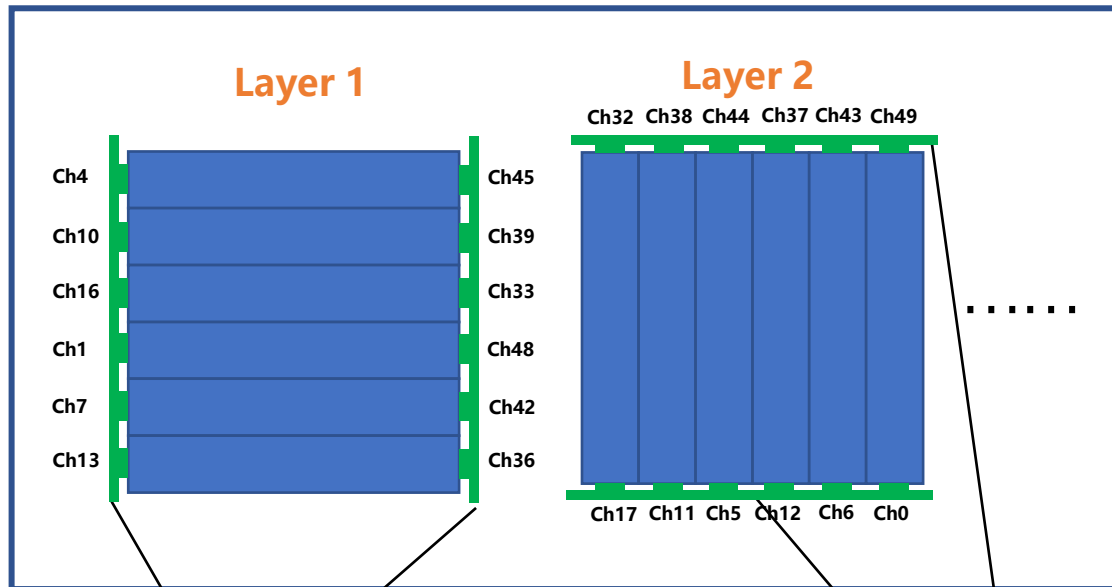


Electron energy

Channel Mapping

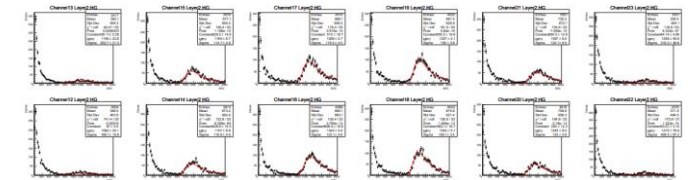
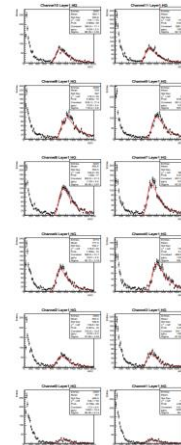
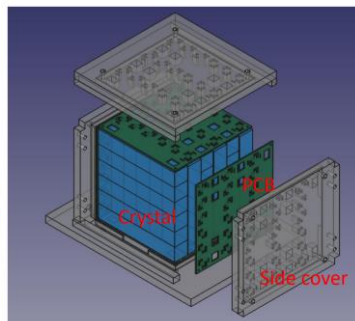


- Map channels for analysis. Channel num grows from left to right, bottom to top.



Board 1

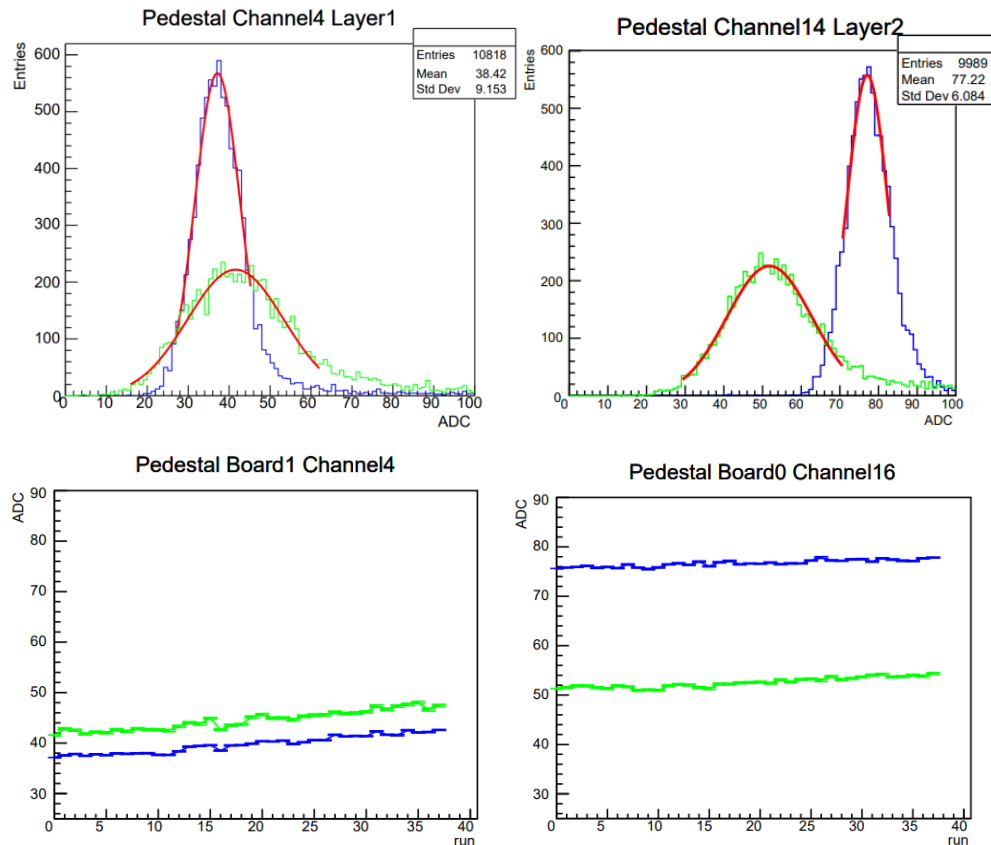
Board 0



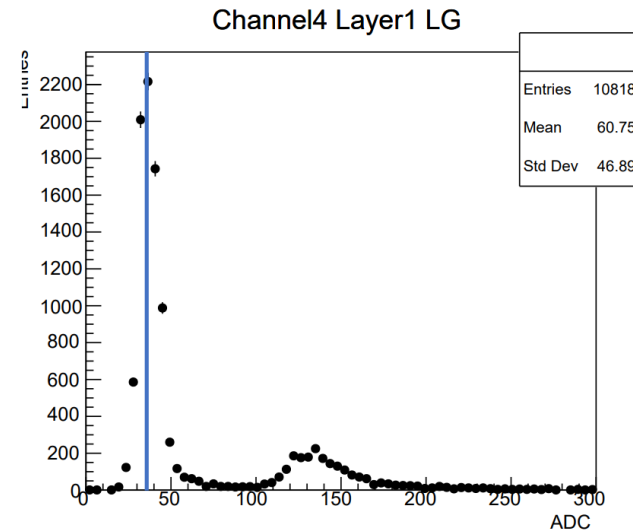
Pedestal Correction



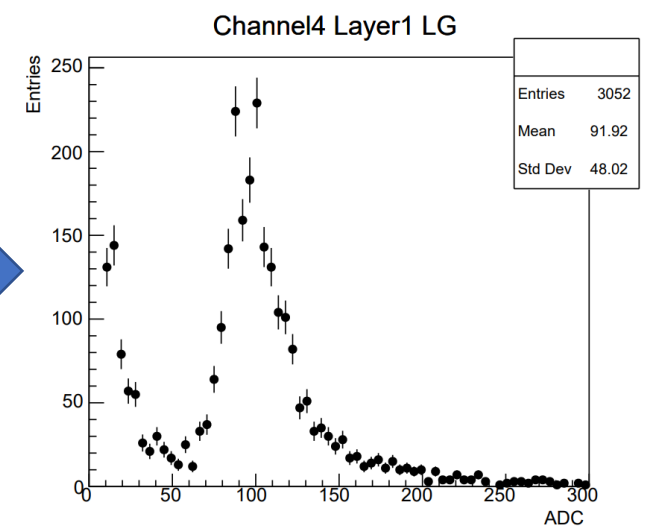
- Fit and shift the pedestal peak to zero channel by channel
- Pedestal fluctuate over time, and it also varies between boards and gain modes



Before correction



After correction

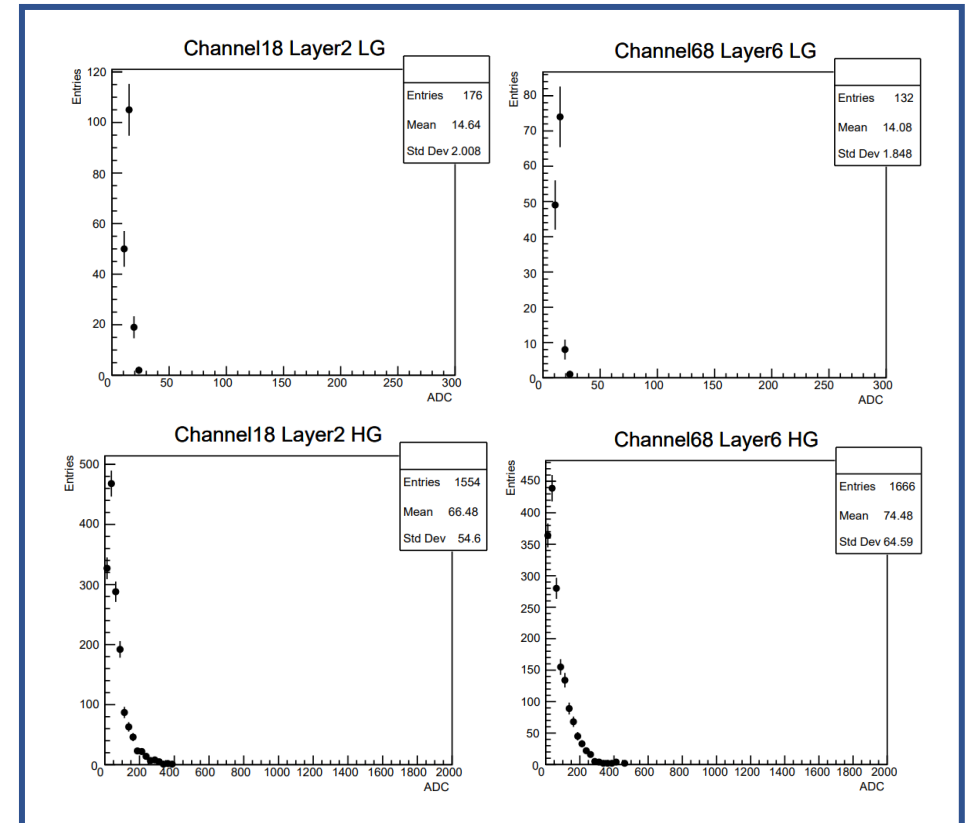
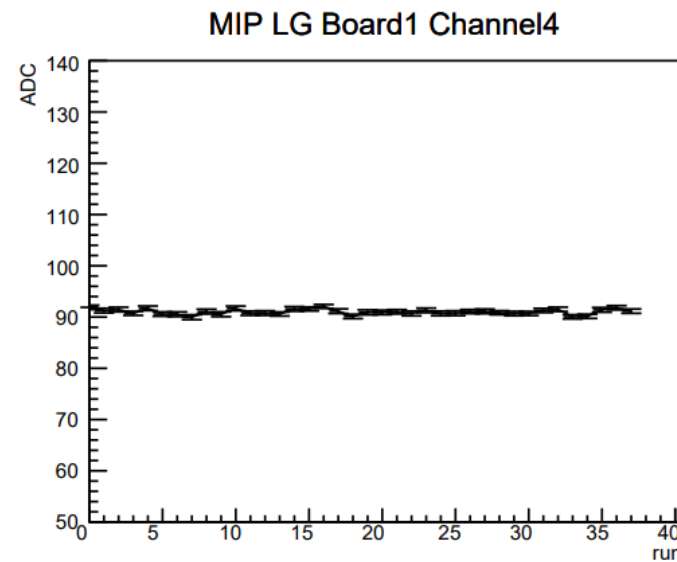
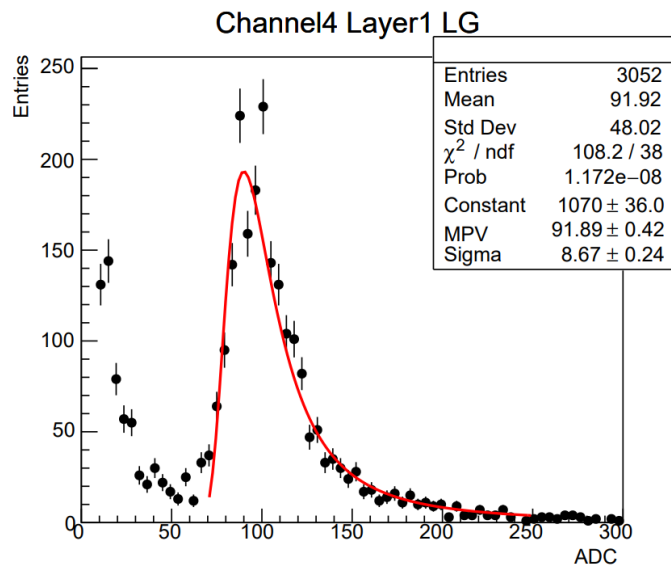


MIP Calibration



- After pedestal correction, MIP distribution becomes stable over time.
- There are two damaged channels with only pedestal. Use the signal of adjacent channels in place of these channels.

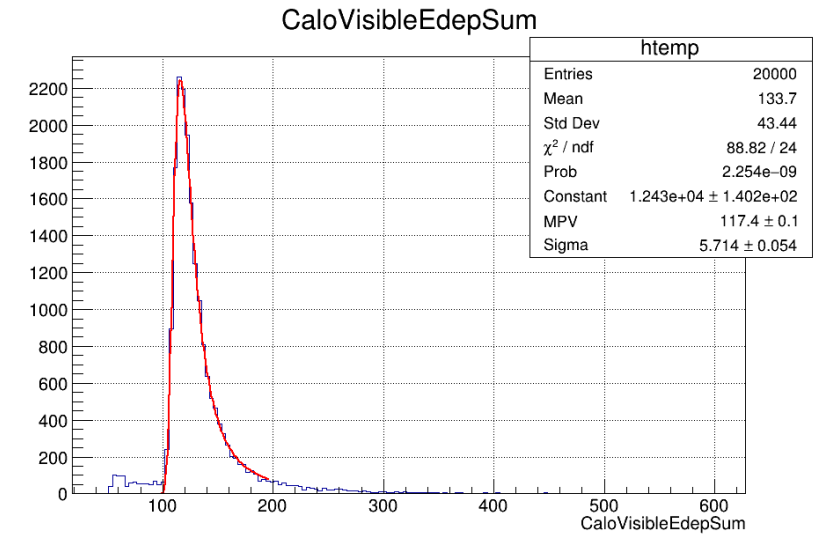
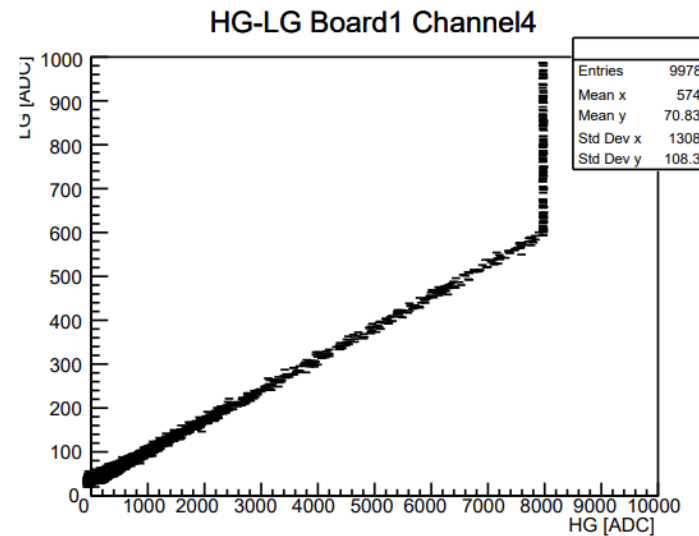
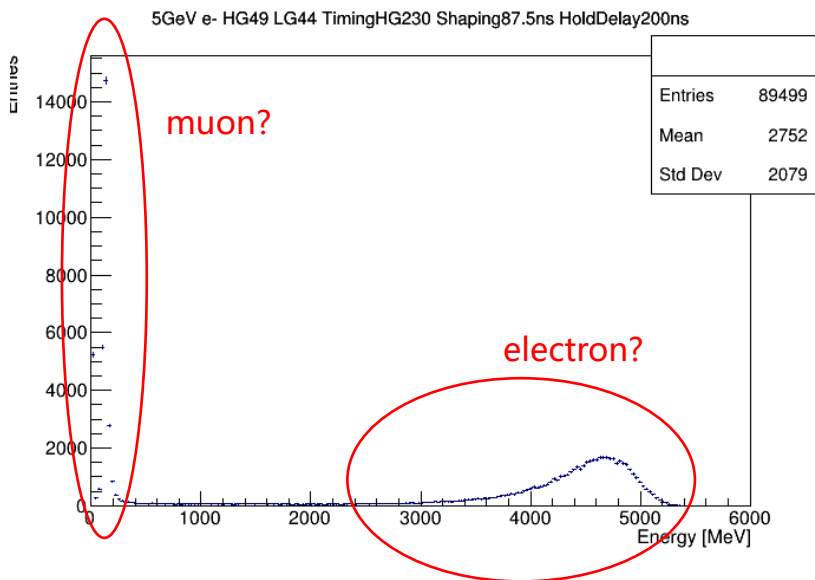
2 damaged channels!



Energy of 5 GeV Electron Beam



- Merge all of data from ten runs (5GeV electron)
- Synchronous events selection: the two boards with different trigger time
- Pedestal correction channel by channel, run by run.
- MIP calibration: 10GeV muon data, $117.4/6/2 \approx 9.78 \text{ MeV}/ch$
- HG/LG threshold: 7800 ADC
- Cut: 0.5MIP

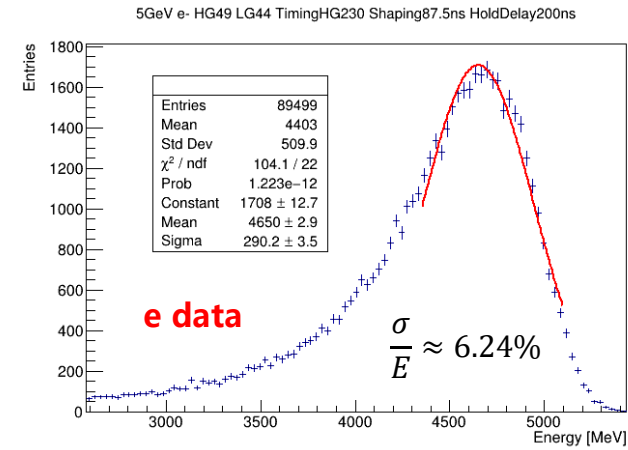
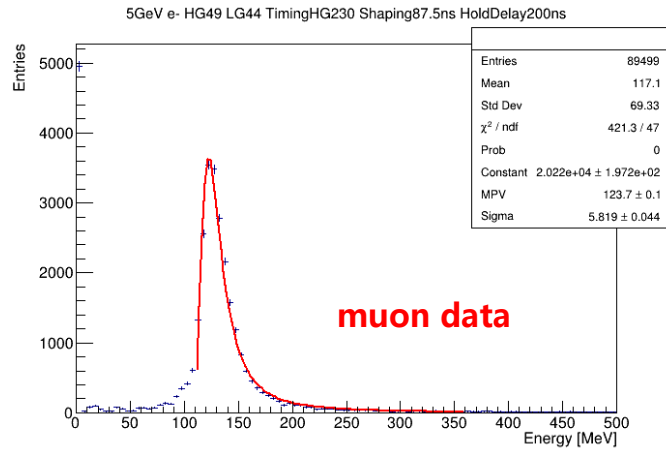


Simu from Baohua
10GeV muon \rightarrow module

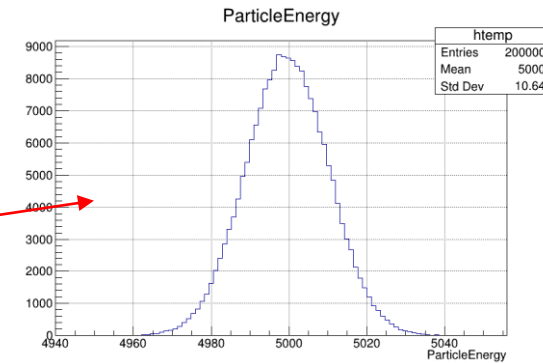
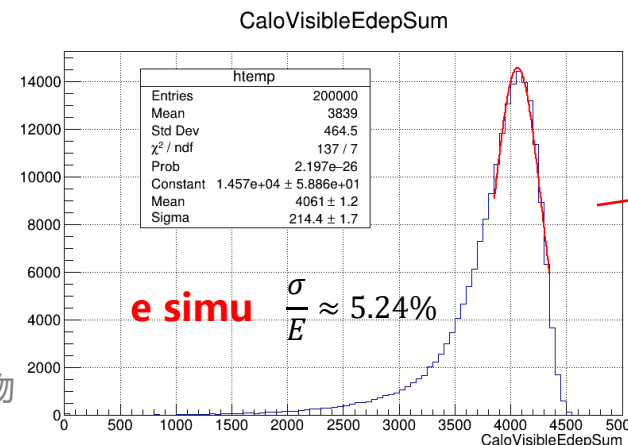
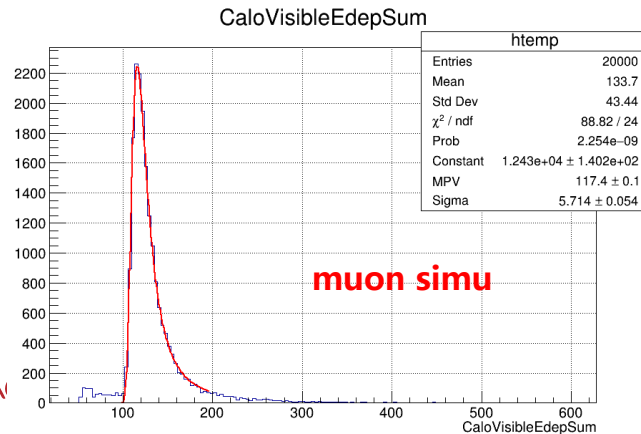
Electron Energy Estimation



- data > simu, both for muon and electron
- Energy and direction of data is not as ideal as simu?



0.5% FWHM energy divergence



- Energy of 5GeV electron beam detected by crystal module is bigger than that in simulation.

And the electron beam is mixed with the muon.

- Check other energy points and gain modes
- Check channel energy
- Simulation optimization
- Damaged channels, why?