BCAL Timing

David Lawrence JLab

Sept. 26, 2011

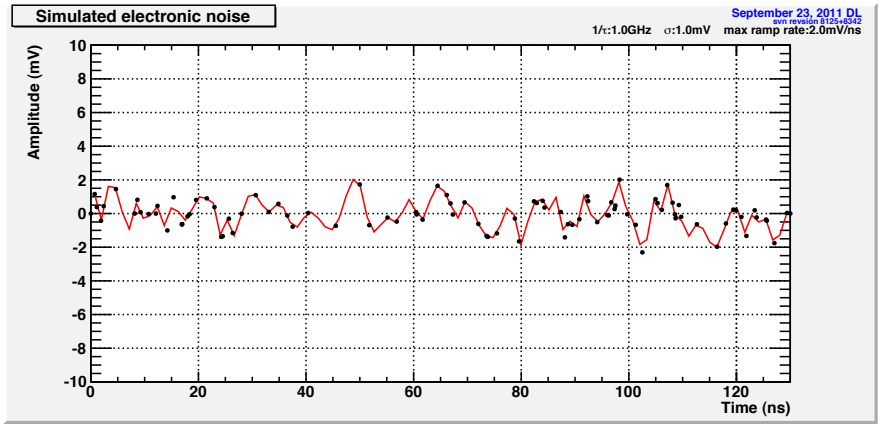
Changes since last time

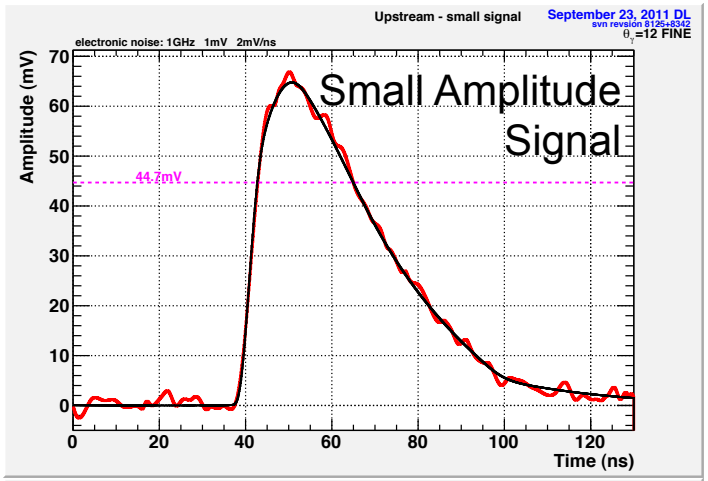
- TDC gain lowered from x10 to x5
- Energy calibration re-done
  - Affects absolute, but not so much relative
- Electronic noise added
  - 1GHz, 1mV
- Energy resolutions extracted
- 244 Segmentation Scheme added

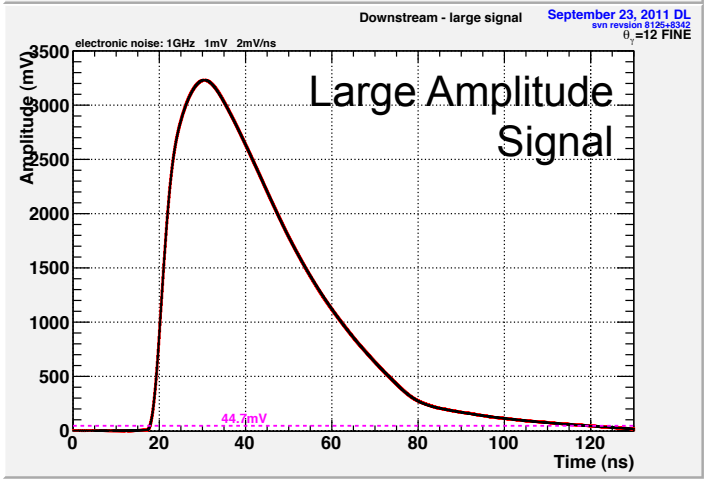
Electronic Noise

Random electronic noise was added to each digitized electronic signal (i.e. *after* any summing)

- Spline with times randomly selected from $e^{-f\Delta t}$ distribution with f=1GHz
- Amplitude of knots randomly selected from Gaussian with σ=1mV
- Limit of 2mV/ns

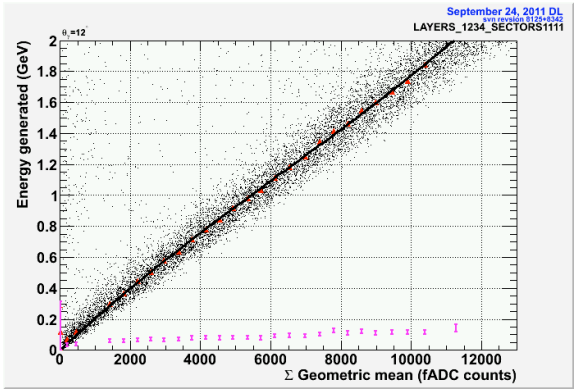


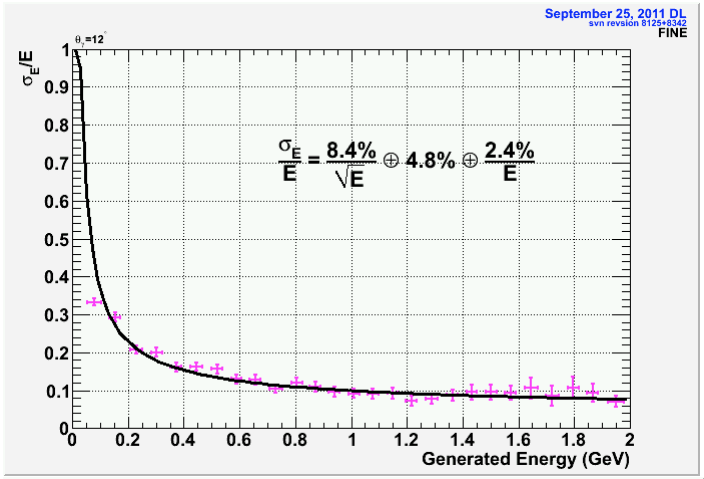


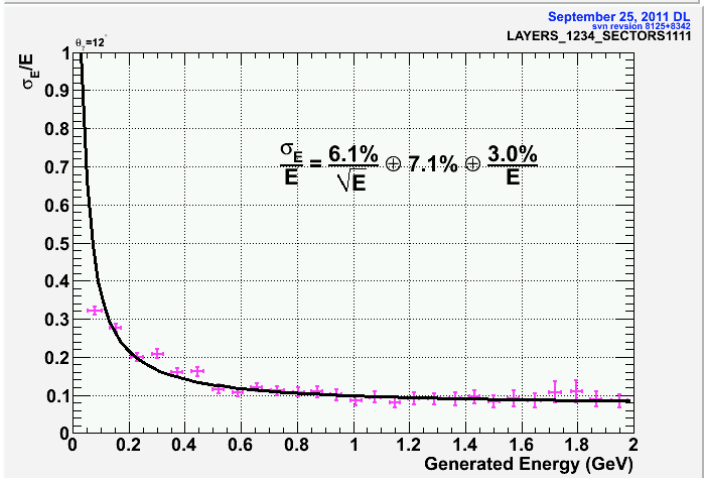


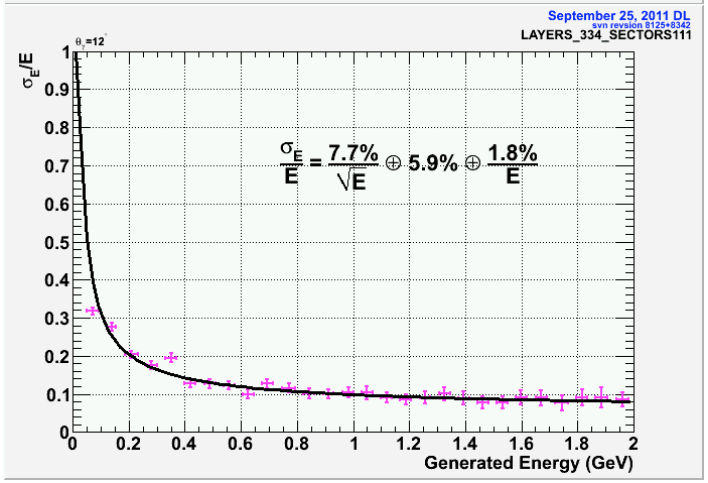
Energy Resolution

Energy resolution calibrated using reconstructed and generated values.

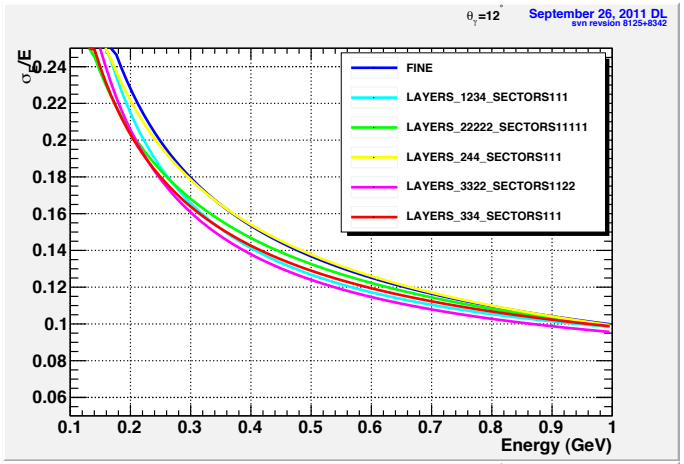


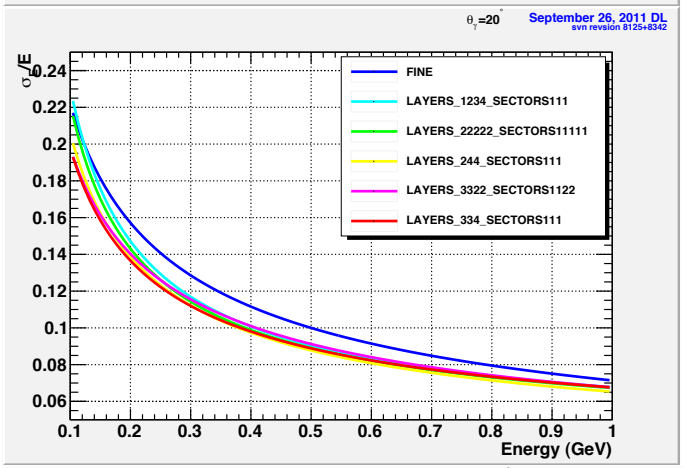


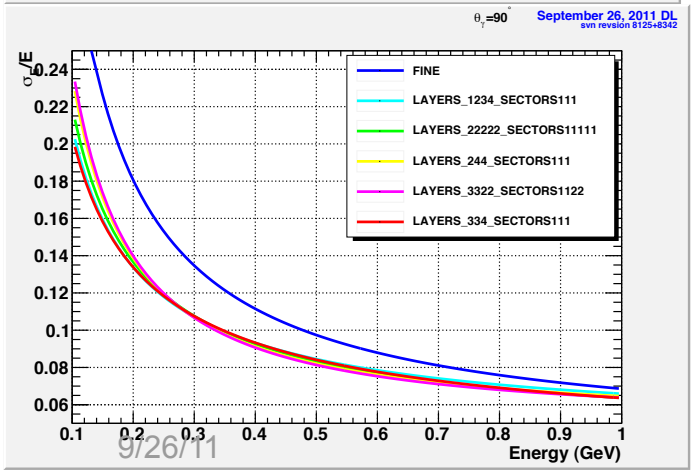




- Calibration done independently for each segmentation scheme and each angle
- Fit to 3rd order polynomial
- Energy resolution largely independent of segmentation scheme
  - Sampling fluctuations and photo-statistics dominate (see 6/17/2011 talk)







Energy Resolution

θ=12°	A	B	C
FINE	8.4%	4.8%	2.4%
1234	6.1%	7.1%	3.0%
334	7.7%	5.9%	1.8%

θ=20°	A	B	C
FINE	7.0%	1.4%	0.0%
1234	5.4%	3.8%	1.5%
334	5.6%	3.7%	0.8%

θ=90°	A	B	C
FINE	5.1%	3.7%	2.7%
1234	4.7%	4.4%	1.4%
334	5.1%	3.6%	1.2%

Summary

- TDC gain lowered (from 10) to x5
- Timing resolutions recalculated after correcting energy calibration
  - Qualitative results unchanged
- Electronic noise added (small overall effect)
- Energy resolution largely independent of segmentation scheme