BCAL Energy Resolutions
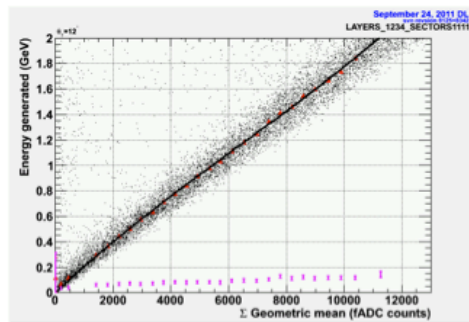
David Lawrence JLab

Oct. 3, 2011

Slide from last week …
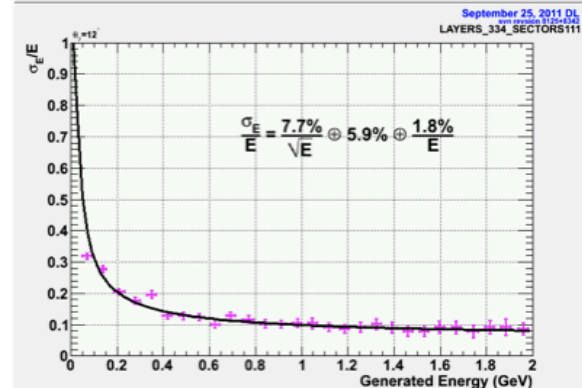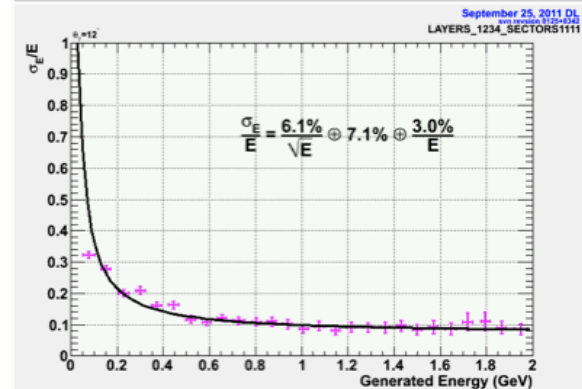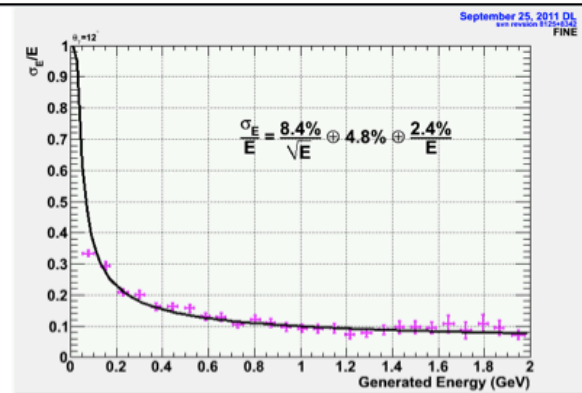
Slide from last week … $\dfrac{\sigma}{E} = \dfrac{A}{\sqrt{E}} \oplus B \oplus \dfrac{C}{E}$
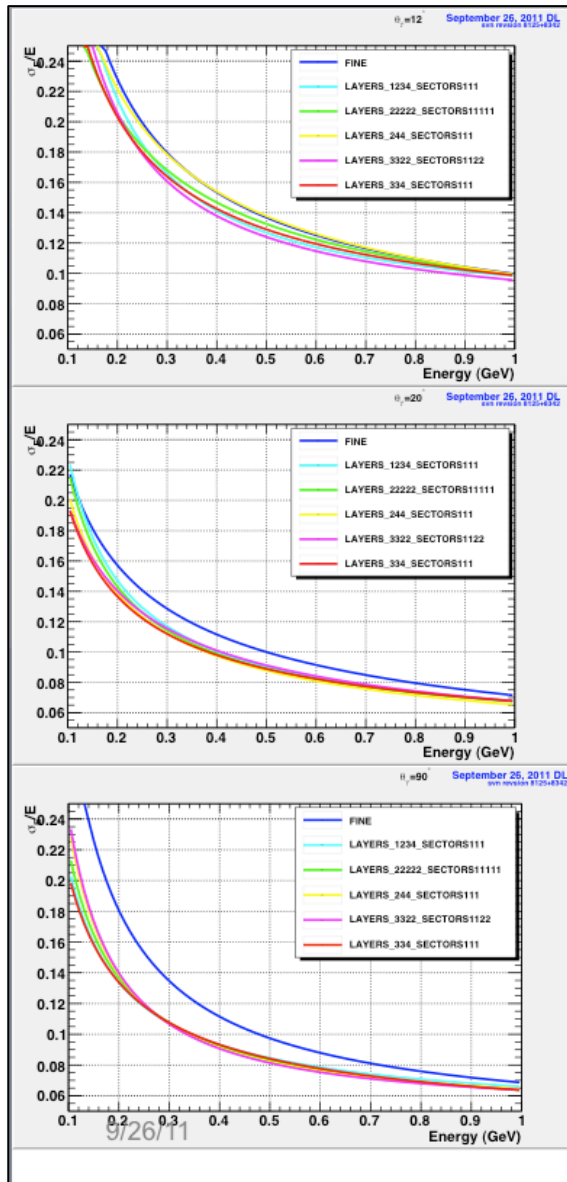
Energy Resolution

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%

9/26/11

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Investigating floor term

Turn off most stochastic effects
in simulation to investigate
origin of large floor terms

Turned off:
- Dark Hits
- Photo-statistics
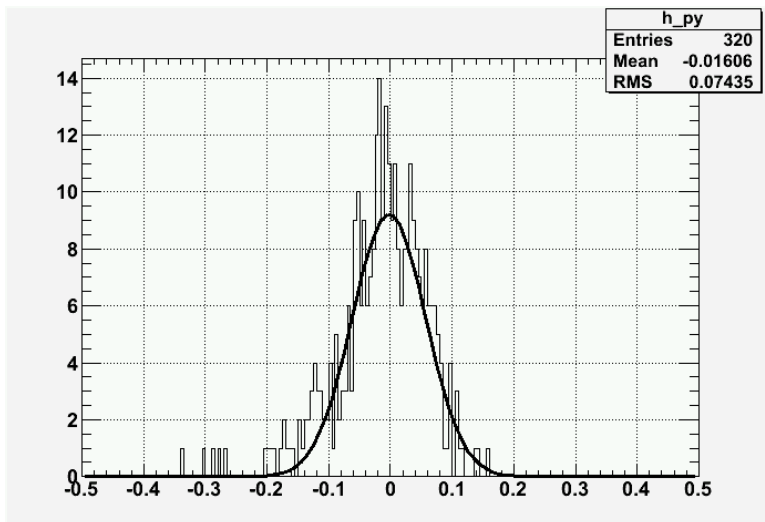- Sampling fluctuations
- SiPM Time jitter

Asymmetric Gaussian:
Same mean and amplitude, different
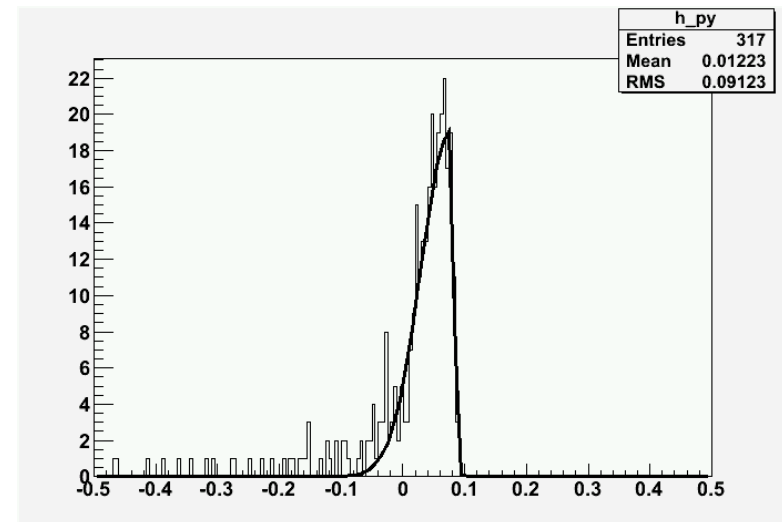σ*'s on left and right sides*

$$\sigma_{tot}^2 = \frac{\sigma_1^3 + \sigma_2^3}{\sigma_1 + \sigma_2}$$

$$\Delta\sigma_{tot} = \frac{3\left(\sigma_1^2 \Delta\sigma_1 + \sigma_2^2 \Delta\sigma_2\right) - \sigma_{tot}^2\left(\Delta\sigma_1 + \Delta\sigma_2\right)}{2\sigma_{tot}(\sigma_1 + \sigma_2)}$$

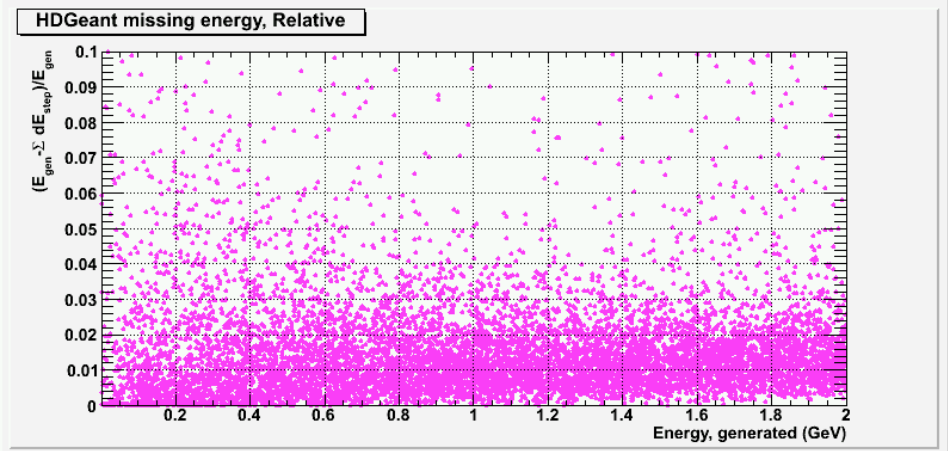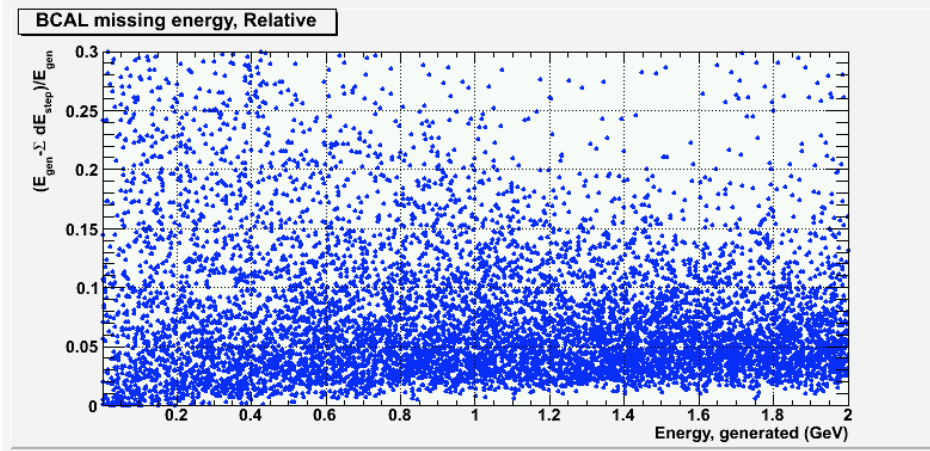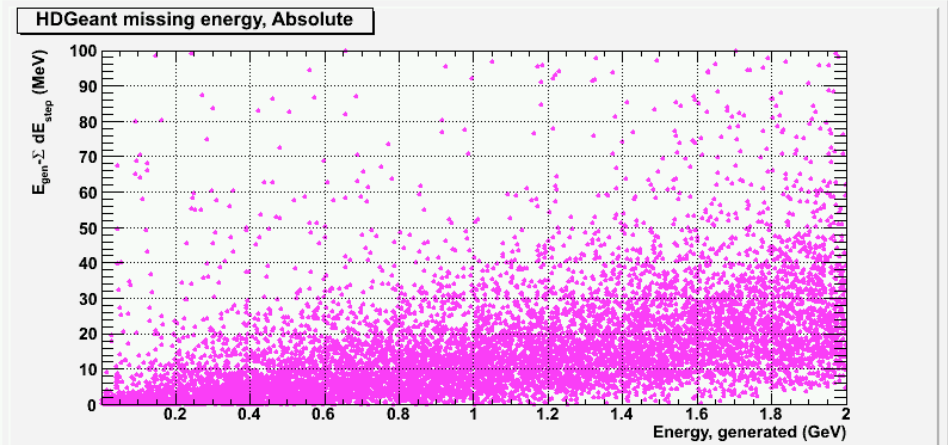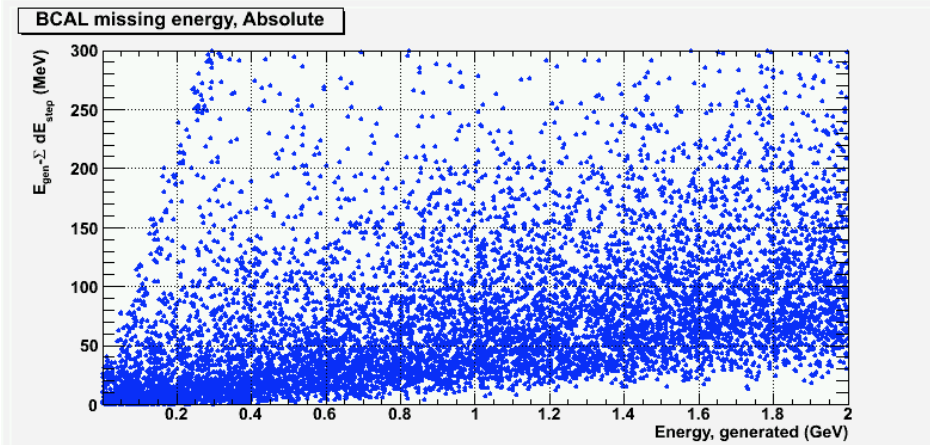*Example of energy residual fit to symmetric Gaussian.*

Example of energy residual fit to asymmetric Gaussian. Energy calibration causes shift to values greater than zero.
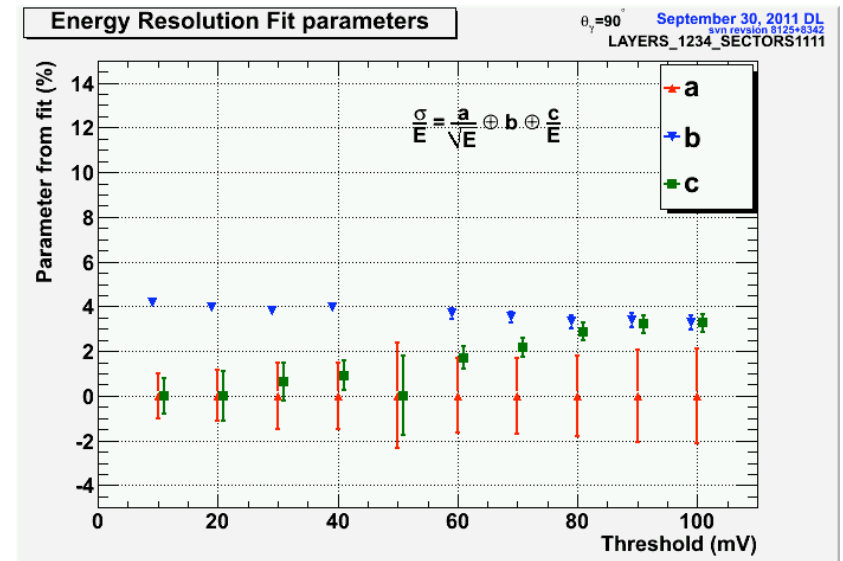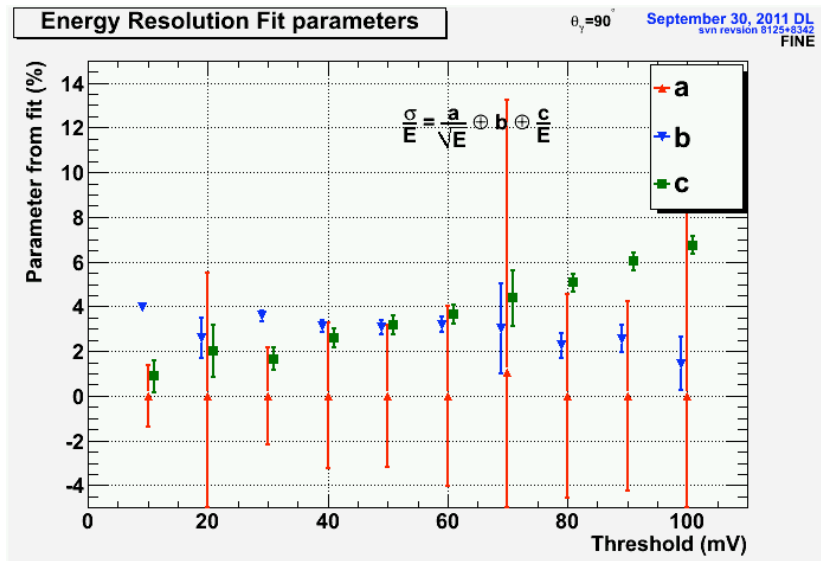
Missing Energy

BCAL loses energy due to leakage and/or pre-shower

GEANT loses energy due ???

Total energy missed by BCAL is around 5%, of which, around 1%-1.5% is missed by gustep/DESTEP altogether

Fit parameters vs. threshold

With most processes turned off, parameter dependence on threshold can be observed.

Threshold is connected with 1/E term.

Floor term ("b") of a few percent still exists, largely independent of threshold.