BCAL Timing Resolutions

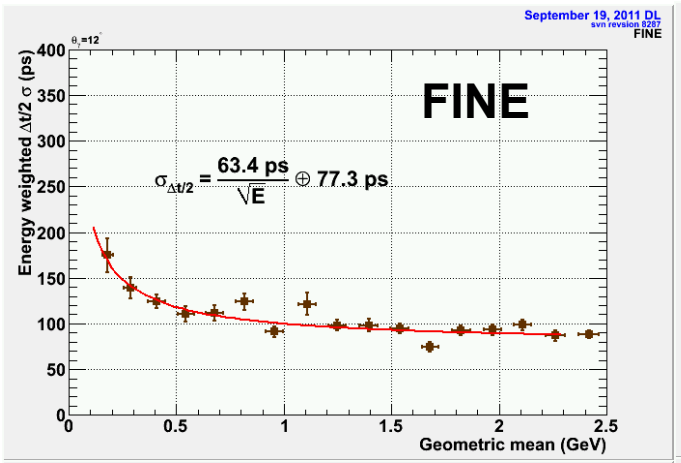
David Lawrence, JLab

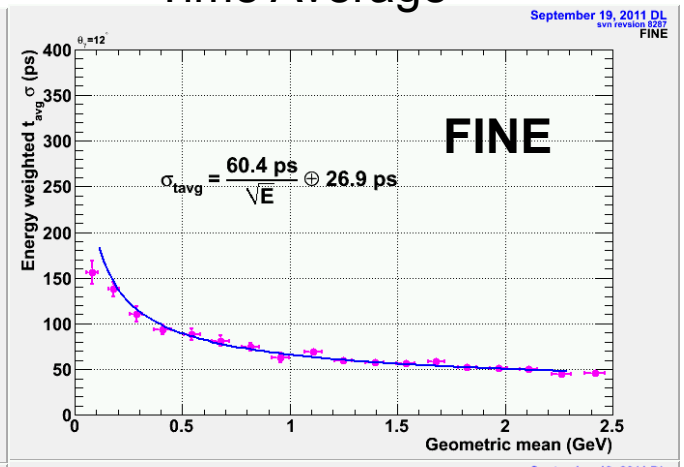
Changes to Simulation

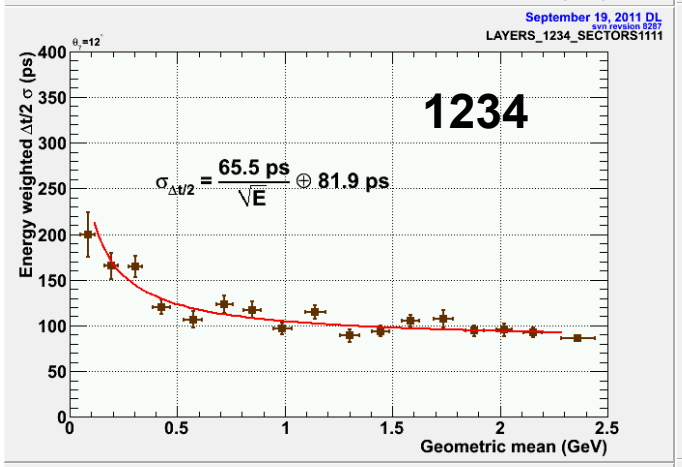
- 75 photons/MeV/side -> 145 photon/MeV/side
  - 290 from GlueX-doc-1474 with factor of 2 due to light guides
- Distributed dark hits
  - Previously, all dark hits and cross-talk piled up at single time
  - Secondary cross-talk pixels added
- Baseline electronic noise added via random σ=2mV fluctuation in threshold
- X-errors added to final resolution fits

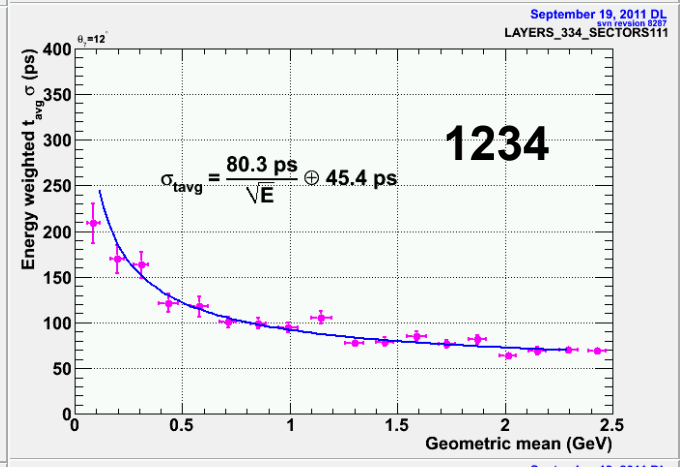
Time Difference

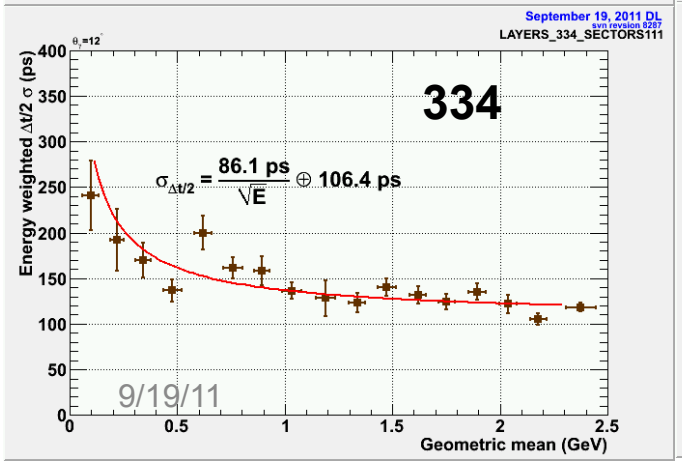
Time Average

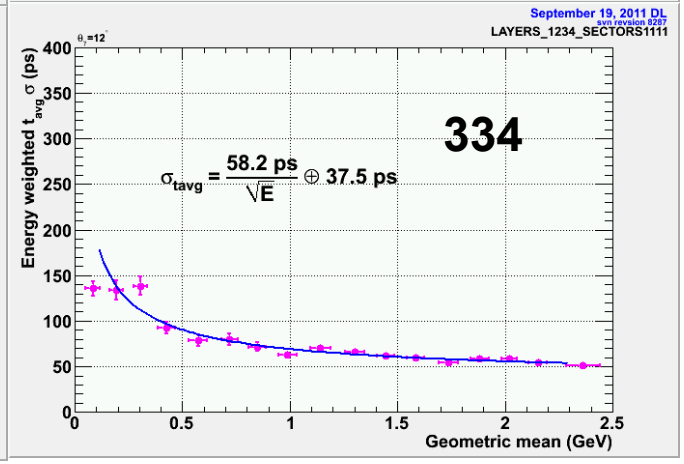




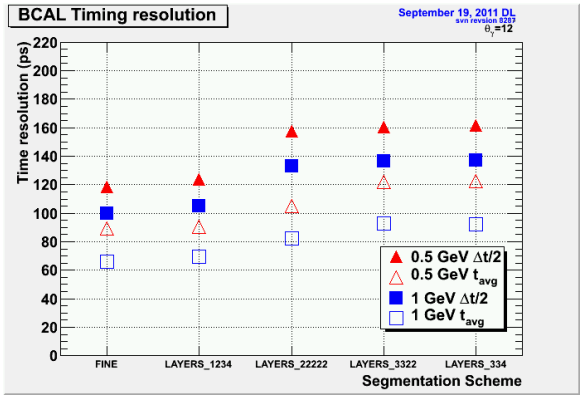


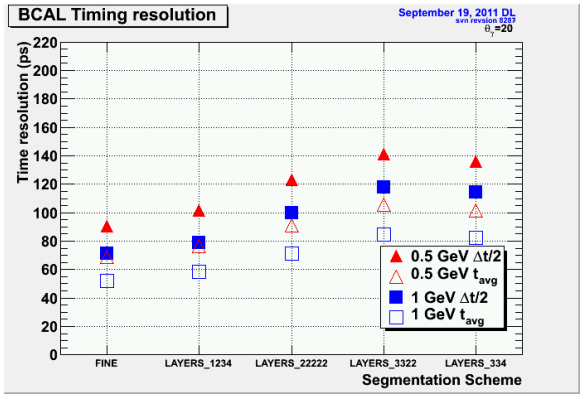


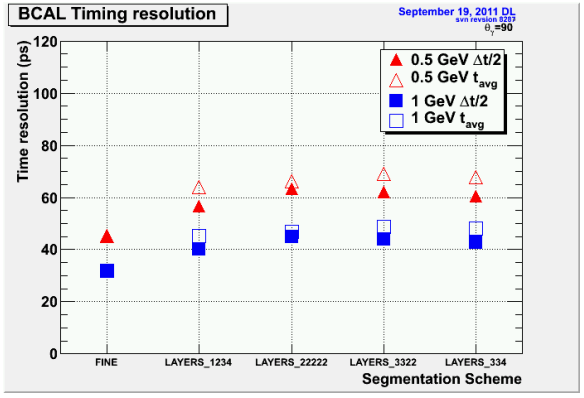




Total Shower Resolutions for θ_γ=12°







Time difference

Table 5: Time difference ($\Delta t/2$) Resolution for $\theta_\gamma = 12°$.

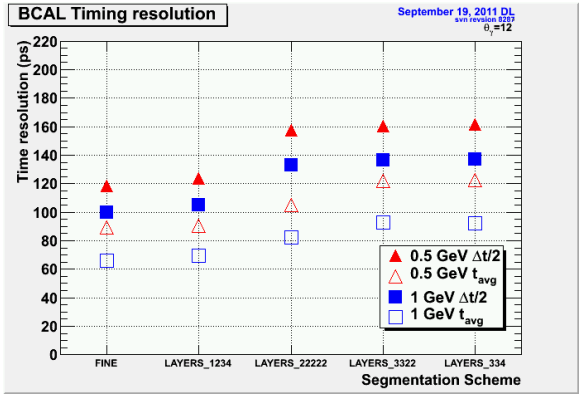
Segmentation Scheme	E=0.5GeV	E=1GeV	% better 0.5GeV	% better 1GeV
FINE	118ps	100ps	26.8%	27.0%
1234	124ps	105ps	23.5%	23.4%
22222	157ps	133ps	2.6%	2.9%
322	160ps	136ps	0.8%	0.3%
334	161ps	137ps	0.0%	0.0%

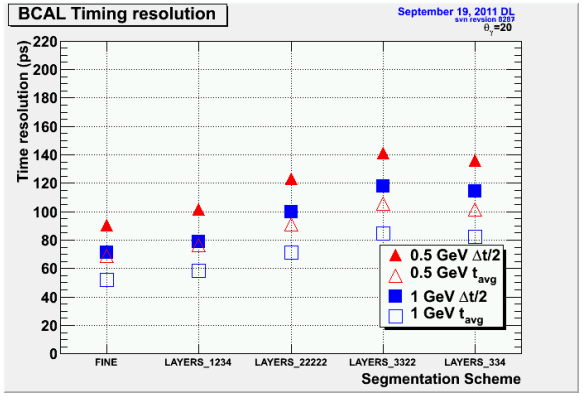
Table 6: Time difference ($\Delta t/2$) Resolution for $\theta_\gamma = 20°$.

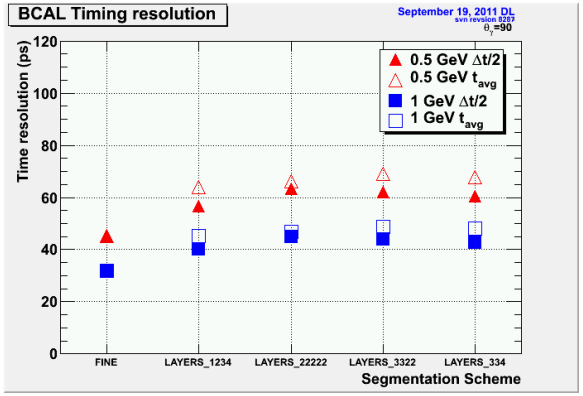
Segmentation Scheme	E=0.5GeV	E=1GeV	% better 0.5GeV	% better 1GeV
FINE	90ps	71ps	33.5%	37.7%
1234	102ps	79ps	25.2%	30.9%
22222	123ps	100ps	9.6%	12.6%
322	141ps	118ps	-3.7%	-3.3%
334	136ps	114ps	0.0%	0.0%

Table 7: Time difference ($\Delta t/2$) Resolution for $\theta_\gamma = 90°$.

Segmentation Scheme	E=0.5GeV	E=1GeV	% better 0.5GeV	% better 1GeV
FINE	45	32	25.9%	25.9%
1234	57	40	6.5%	6.5%
22222	63	45	-4.7%	-4.7%
322	62	43	2.6%	-2.6%
334	61	43	0.0%	0.0%







Time Average

Table 2: Time Average Resolution for $\theta_\gamma = 12°$.

Segmentation Scheme	E=0.5GeV	E=1GeV	% better 0.5GeV	% better 1GeV
FINE	90ps	66ps	26.8%	28.3%
1234	90ps	69ps	26.0%	24.9%
22222	105ps	82ps	14.2%	10.9%
3322	122ps	93ps	0.3%	-0.5%
334	122ps	92ps	0.0%	0.0%

Table 3: Time Average Resolution for $\theta_\gamma = 20°$.

Segmentation Scheme	E=0.5GeV	E=1GeV	% better 0.5GeV	% better 1GeV
FINE	69ps	52ps	31.9%	37.1%
1234	76ps	58ps	24.9%	29.4%
22222	91ps	71ps	10.4%	13.3%
3322	105ps	84ps	-3.7%	-2.3%
334	102ps	82ps	0.0%	0.0%

Table 4: Time Average Resolution for $\theta_\gamma = 90°$.

Segmentation Scheme	E=0.5GeV	E=1GeV	% better 0.5GeV	% better 1GeV
FINE	45ps	32ps	33.5%	33.5%
1234	64ps	45ps	5.8%	5.8%
22222	66ps	47ps	2.5%	2.5%
3322	69ps	49ps	-1.7%	-1.7%
334	68ps	48ps	0.0%	0.0%