

Proto-60

Beamtime february 2009 @ Mainz with tagged γ 's up to 1.5 GeV

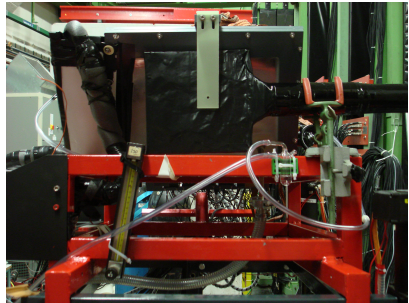
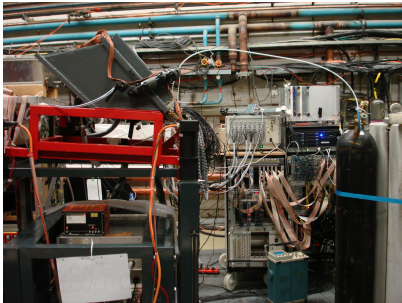
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II. Physics Institute JLU Giessen

16.6.2009

- 1 Experimental set-up
- 2 Beamtime procedure
- 3 Data analysis
 - Calibration
 - Response
 - Multiplicity
- 4 Outlook

Proto-60 @ Mainz with Peak Sensing ADC's



- Accelerator provides tagged γ 's up to 1.5 GeV
⇒ 15 energies by coincidence with tagger and crystal 35
- Beam in 3 positions
⇒ center of crystal 35
⇒ 5mm beside center
⇒ between 2 crystals
- Readout adjusted to 200 MeV dynamic range
⇒ 15db attenuator after preamp crystal 35
⇒ 15db attenuator after preamp crystal 36 except beam in center position.
- Pb-sheet before veto
⇒ simulating barrel DIRC in front of the $\bar{P}ANDA - EMC$
⇒ 2mm Pb approximate 30% X_0
- 2 overnight cosmic runs with/without attenuator (crystal 36)

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Beam in center of crystal 35

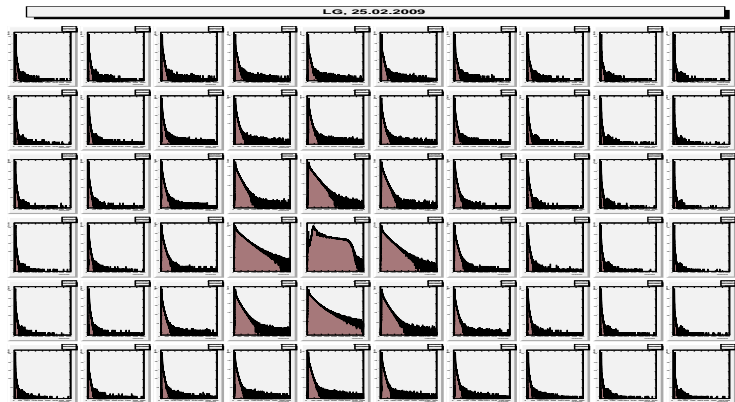


Figure: raw data, hardware-trigger on: tagger and 35, or ped, or cosmics

Crystal 35

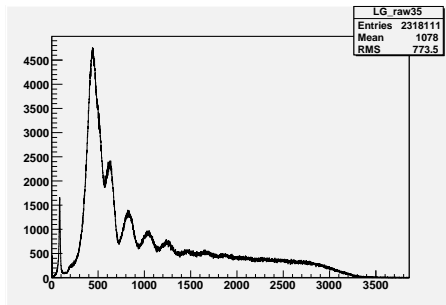


Figure: raw-data

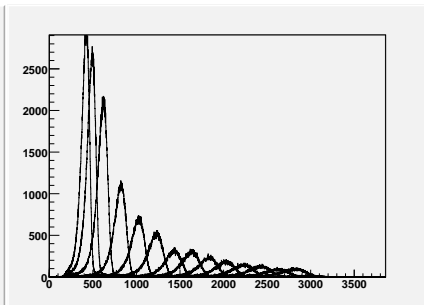


Figure: coincident with tagger

Cosmics crystal 36

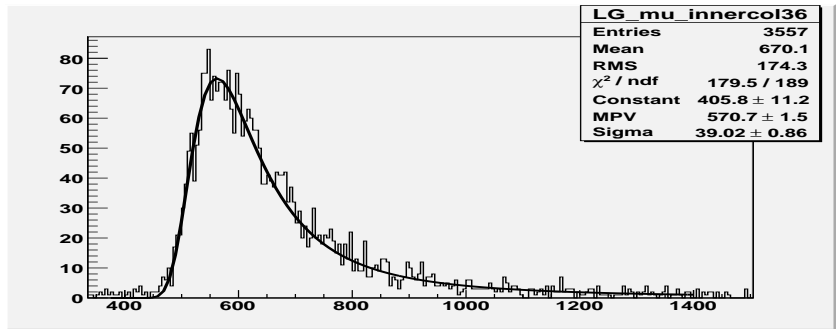
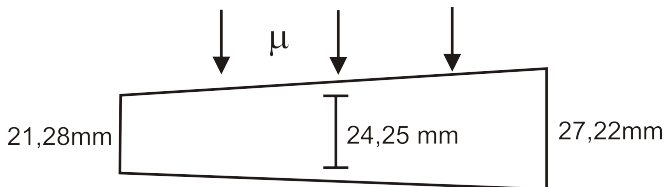


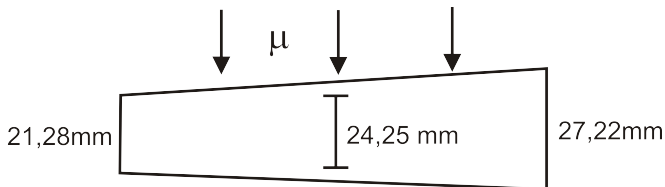
Figure: result of a coincident cosmic trigger of all crystals in a row, fitted with Landau-fkt.

- Proto-60: 6L & 6R crystals



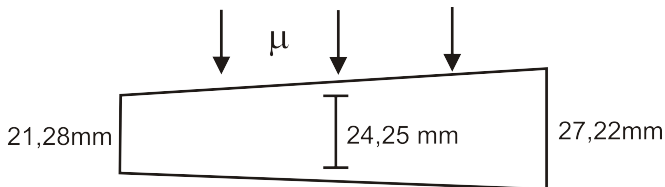
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Pedestal after calibration with cosmics

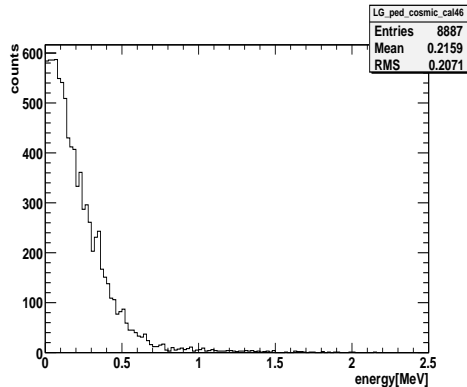


Figure: linear scale

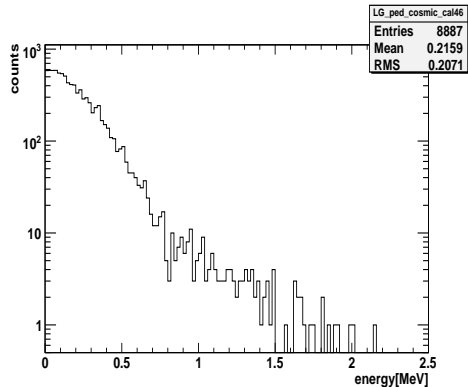


Figure: logarithmic scale

Lineshape, threshold 1 MeV

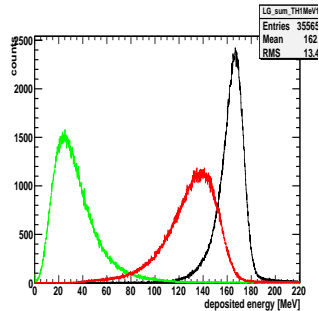


Figure: 158 MeV

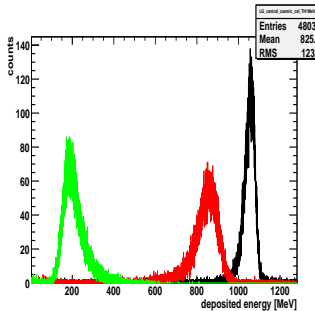


Figure: 1058 MeV

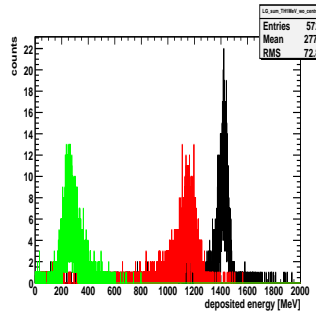
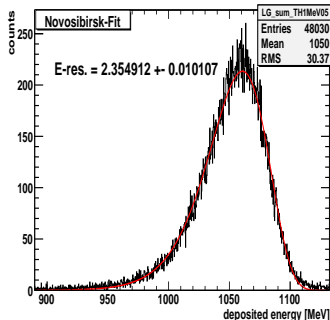


Figure: 1441 MeV

Novosibirsk-Fit

$$f(E) = A \cdot \exp \left[-\frac{1}{2} \left(\frac{\log(1 + \tau(E - \mu)) \frac{\sinh(\tau)}{\sigma \tau \sqrt{\log 4}}}{\tau} \right)^2 + \tau^2 \right]$$

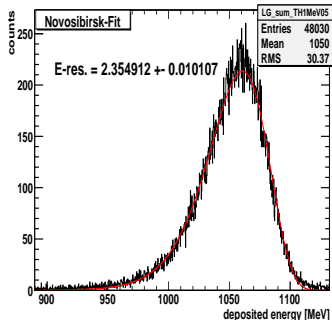
- τ describes tail on either side, positiv: high energy side, negativ:low energy side
- σ FWHM divided by 2.36
- $\tau \rightarrow 0$ function tends to a Gaussian



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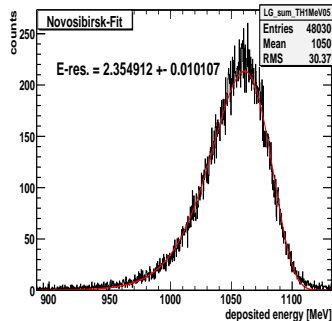
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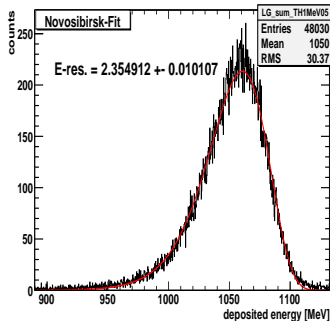
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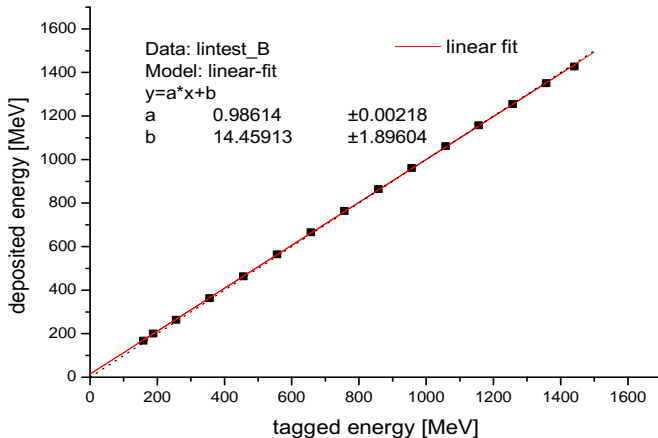
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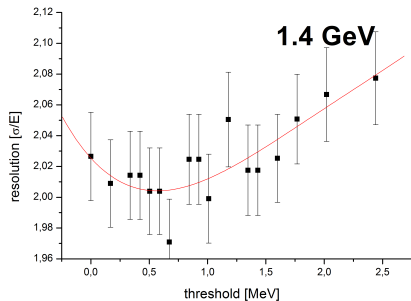
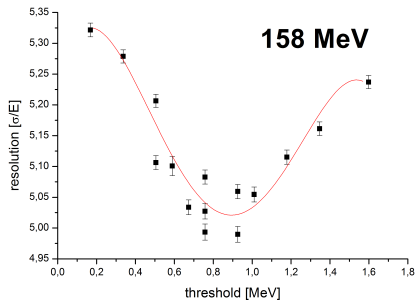
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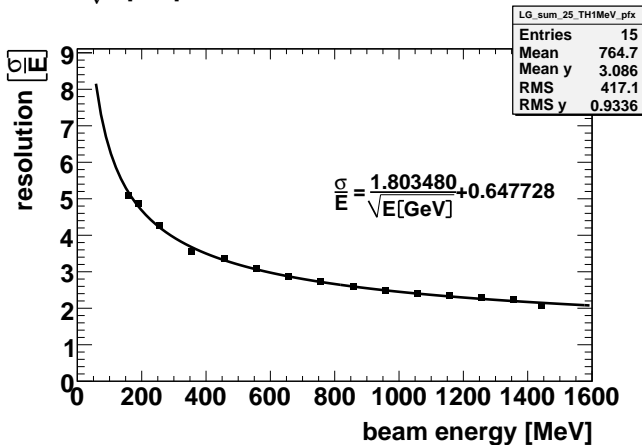
Linearity test, threshold 1 MeV





• PANDA TDR, TH 1 MeV

$$\rightarrow \frac{\sigma}{E} = \frac{a}{\sqrt{E[\text{GeV}]}} + b, \quad a \leq 2\%, \quad b \leq 1\%$$



- 9 crystals:

$$\frac{\sigma}{E} = \frac{2.436}{\sqrt{E[\text{GeV}]}} + 0.307$$

→ 2.743% @ 1 GeV

- 25 crystals:

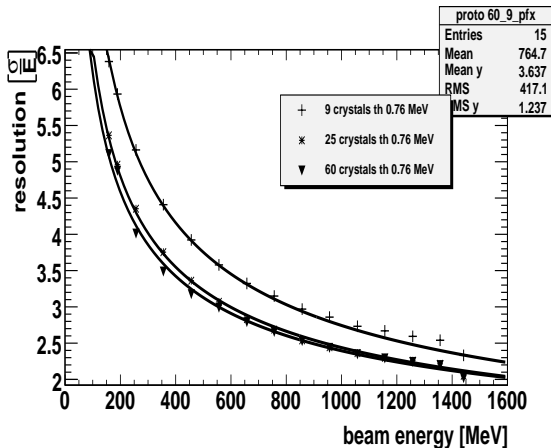
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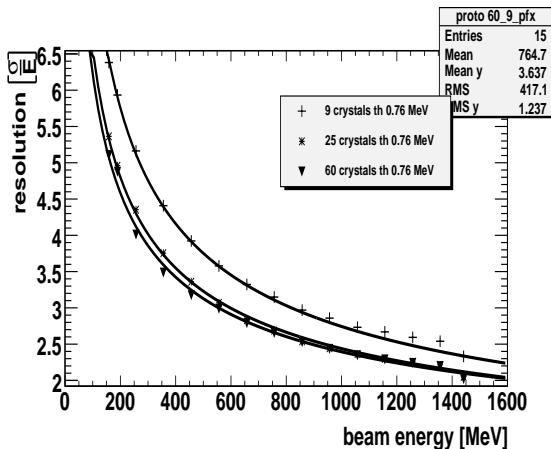
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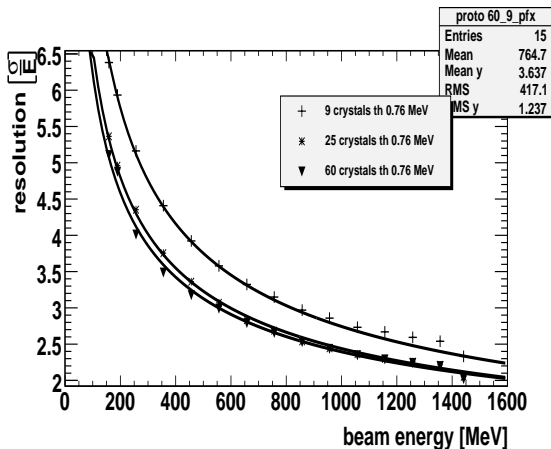
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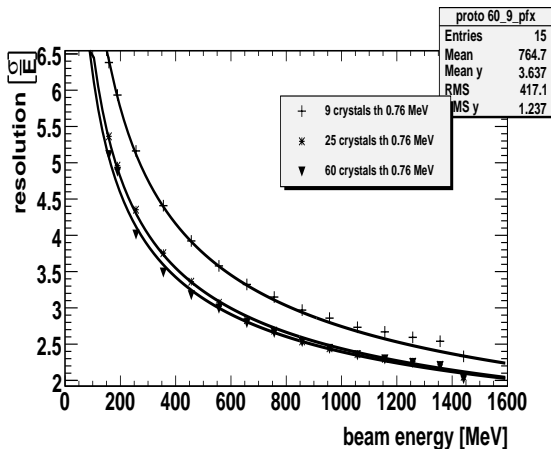
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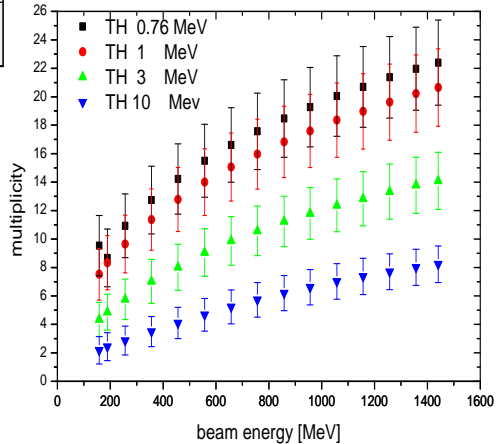
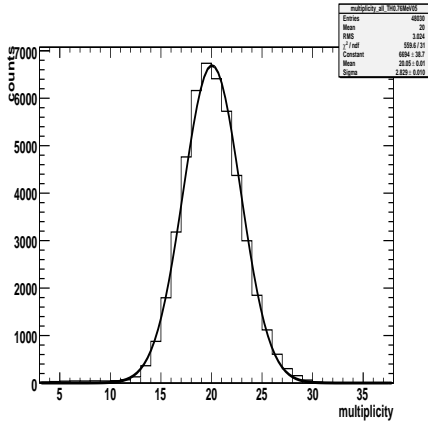


Figure: 1058 MeV, TH 0.76 MeV

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- chance mounting-design for better cosmic calibration

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