

PROTO60 - First Simulation Results

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Outline

Settings

Energy Reconstruction

Position Reconstruction

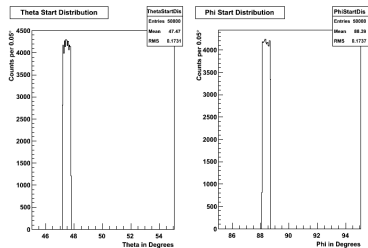
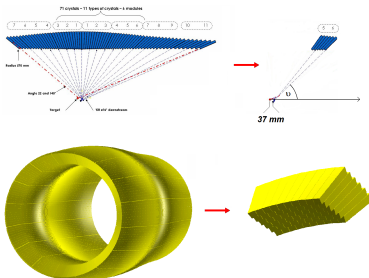
Simulation Settings

Daniel Bremer

Settings

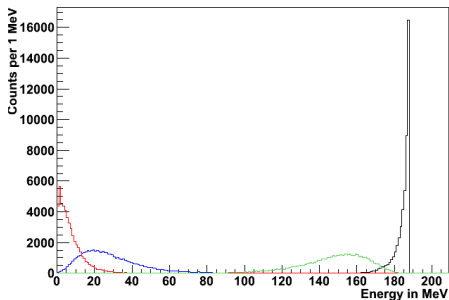
Energy
Reconstruction

Position
Reconstruction



- ▶ Corresponding section of Barrel EMC implemented in PandaROOT was chosen
- ▶ Default settings of Geant4
- ▶ No dead material
- ▶ Pure deposited energy information
- ▶ Analysed with code similar to experiment analysis
- ▶ Single monoenergetic photons in a cone with opening angle $\vartheta = 0.6^\circ$ and homogeneous intensity distribution

Line Shapes

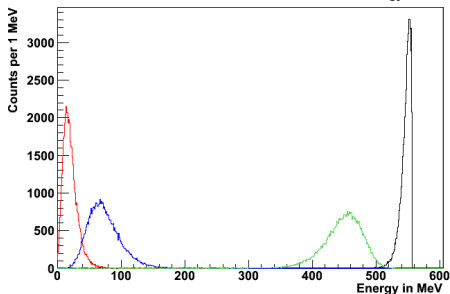


Line shape of:

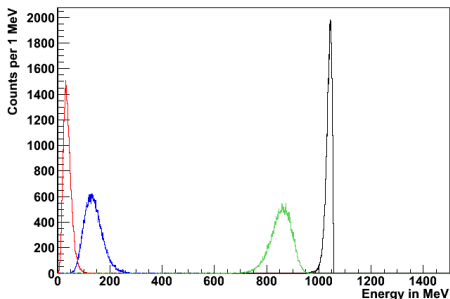
- ▶ Energy sum (black)
- ▶ Central crystal (green)
- ▶ First ring (blue)
- ▶ Second ring (red)

Incident photon energy:

- ▶ **Left:** 188 MeV
- ▶ **Right:** 557 MeV



Line Shapes

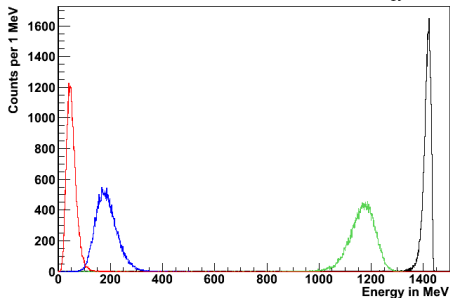


Line shape of:

- ▶ Energy sum (black)
- ▶ Central crystal (green)
- ▶ First ring (blue)
- ▶ Second ring (red)

Incident photon energy:

- ▶ **Left:** 1058 MeV
- ▶ **Right:** 1441 MeV



Lateral Shower Shape

Settings

Energy
Reconstruction

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	Energy in MeV	Ratios in %			
		R_{Center}	R_{First}	R_{Second}	R_{Rest}
EXPERIMENT	1441	81.35	13.88	3.16	0.31
	1058	81.65	13.67	2.87	0.30
	557	82.03	13.10	2.87	0.30
	188	82.36	11.25	1.27	0.49
SIMULATION	1441	82.79	12.35	3.13	0.46
	1058	82.76	12.20	3.03	0.42
	557	82.85	11.68	2.67	0.37
	188	82.94	10.43	0.89	0.64

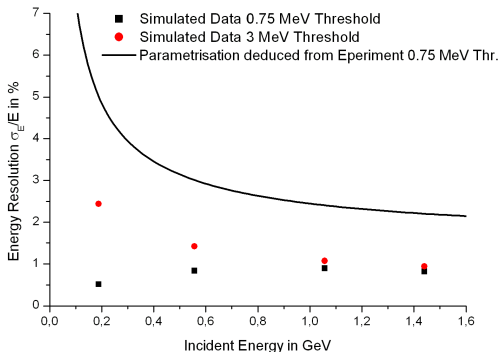
- ▶ Ratios of energy sum and deposited energy in different subarrays
- ▶ Lateral shower shape reproduced well

Ideal Detector Resolution

Settings

Energy
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Reconstruction



- ▶ No digitisation, photon statistics, electronics etc. included
- ▶ No dead material

Position Reconstruction

Settings

Energy
Reconstruction

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SIMULATION				
Energy in MeV	Pencil Beam		Opening Angle	
	y_{cg} in mm	σ_y in mm	y_{cg} in mm	σ_y in mm
1441	-10.8	0.9	-10.8	1.2
1058	-10.8	1.0	-10.8	1.3
557	-10.7	1.4	-10.8	1.6
188	-10.7	2.1	-9.2	2.5
	y_{log} in mm	σ_x in mm	y_{log} in mm	σ_y in mm
1441	-10.9	3.1	-10.9	3.8
1058	-10.8	3.6	-10.8	4.1
557	-10.6	4.6	-10.6	5.0
188	-10.1	6.5	-9.2	6.8
EXPERIMENT				
Energy in MeV	y_{cg} in mm	σ_y in mm	y_{log} in mm	σ_y in mm
1441	-11.7	1.3	-13.4	3.8
1058	-11.7	1.4	-13.3	4.1
557	-11.6	1.7	-13.1	4.9
188	-11.5	2.3	-12.5	6.4

- ▶ Reconstructed position reproduced
- ▶ Shift of y-position with energy caused by staggering?
 - ▶ $Z_{max}^{188 \text{ MeV}} = 2.3 \text{ cm}$ for 188 MeV photons!!!

▶ Thank you for your attention!