A. ALIKHANYAN National Laboratory

Test Beam Prototype Simulations

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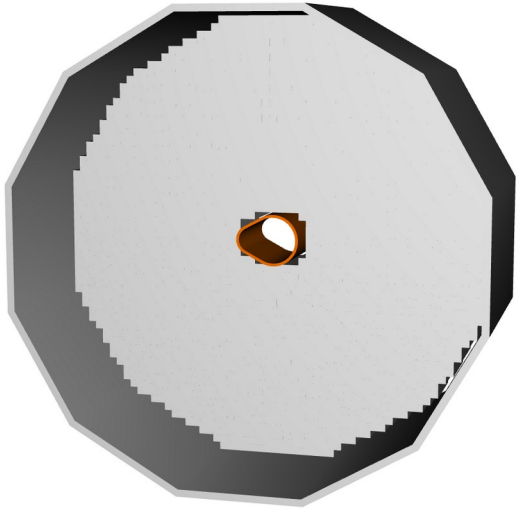
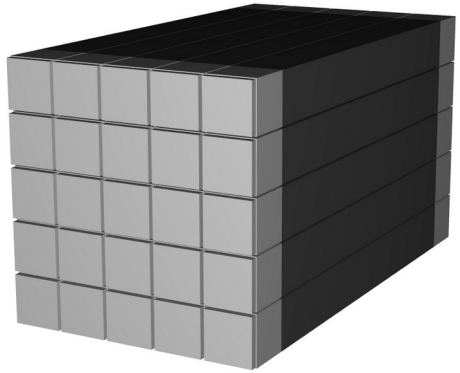
Simulation Setup

https://github.com/eic/epic/tree/main/build/epic_eeemcal_only.xml

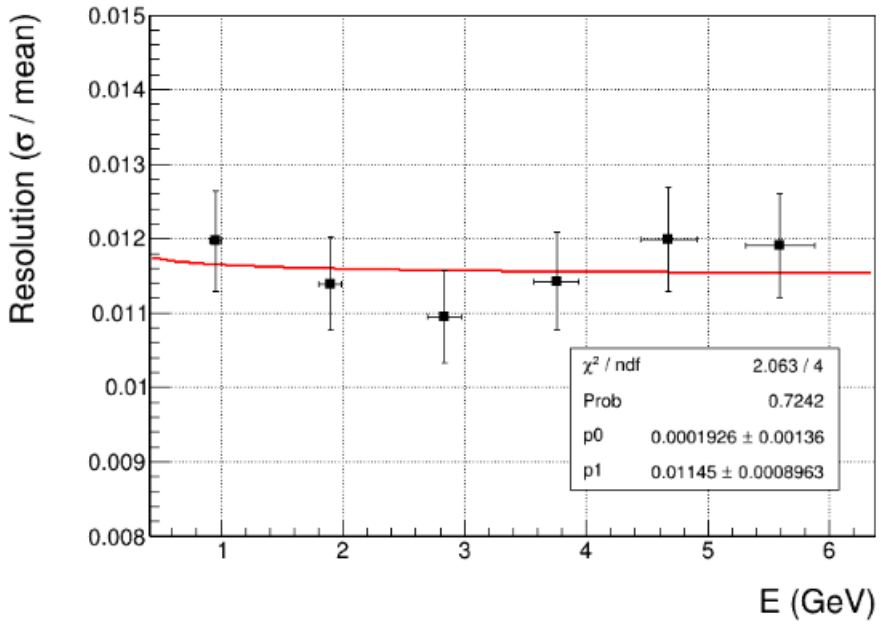


Prototype Simulations



Particle Gun
Position (0,0,-40mm)
Particle - e^-
Energies - 1,2,3,4,6 (Gev)
Energy Spread - 158 (MeV)

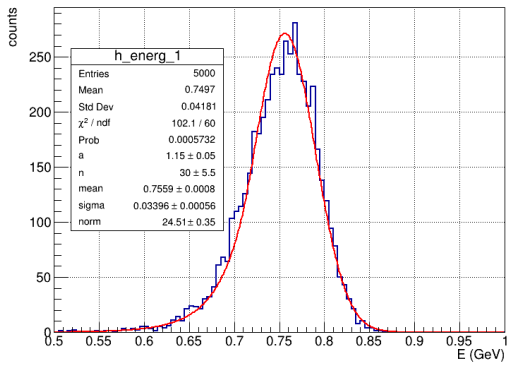
Problem from the last update

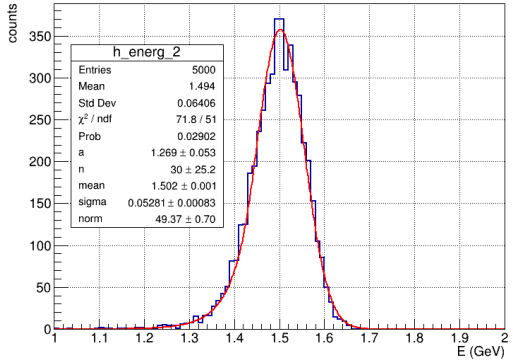


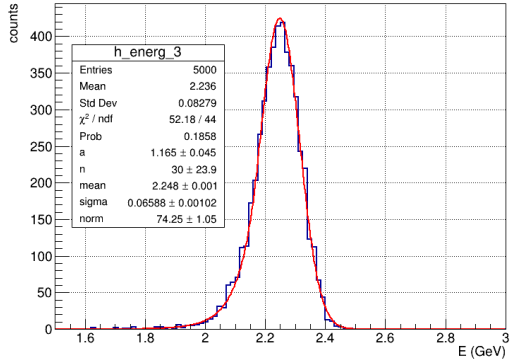
Fixed:

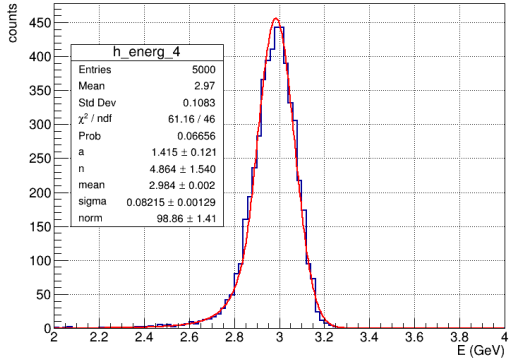
Distance between crystals was more then 1mm

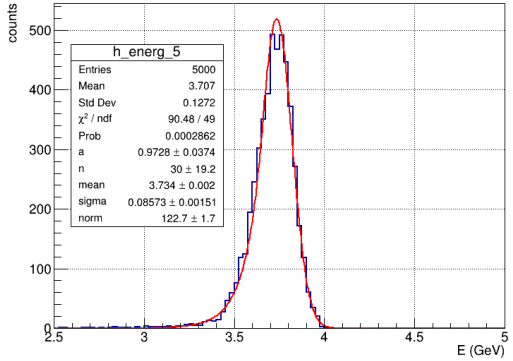
Deposited energy in Mono energetic case 1x1

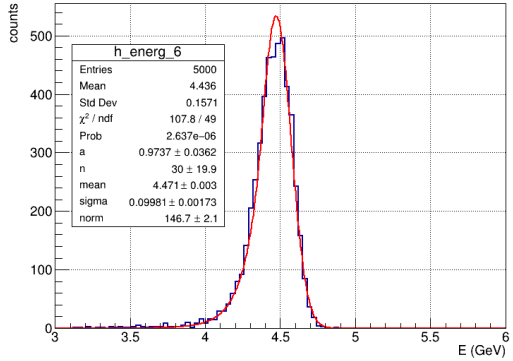




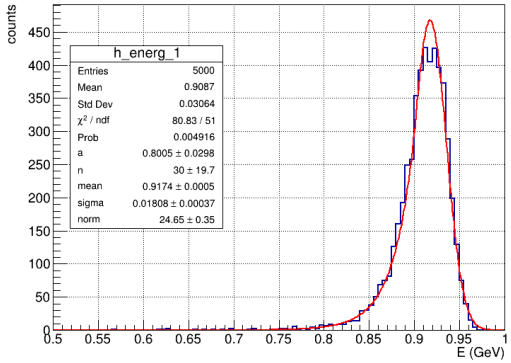


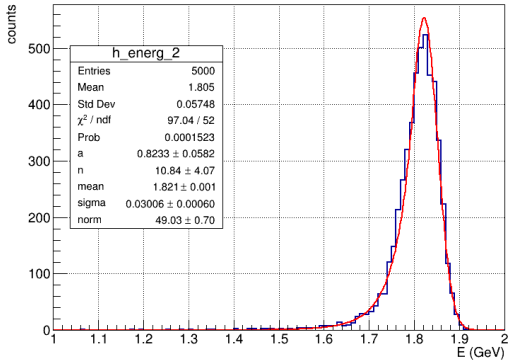


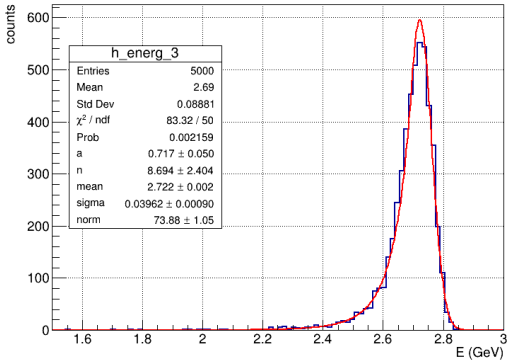


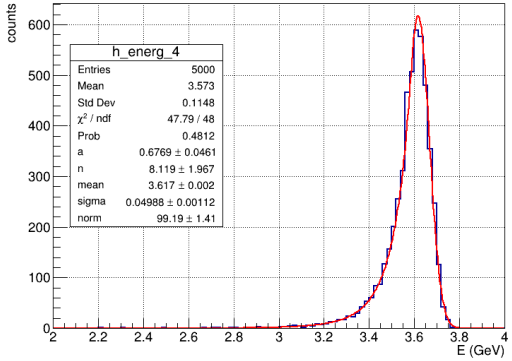


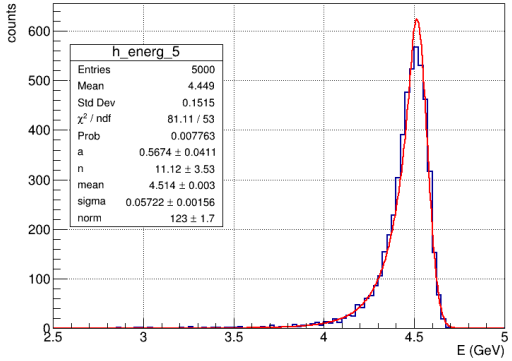
Deposited energy in Mono energetic case 3x3 configuration

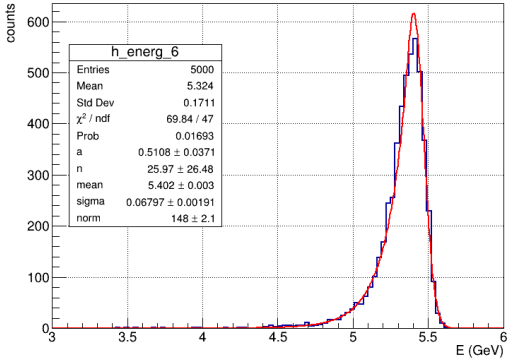






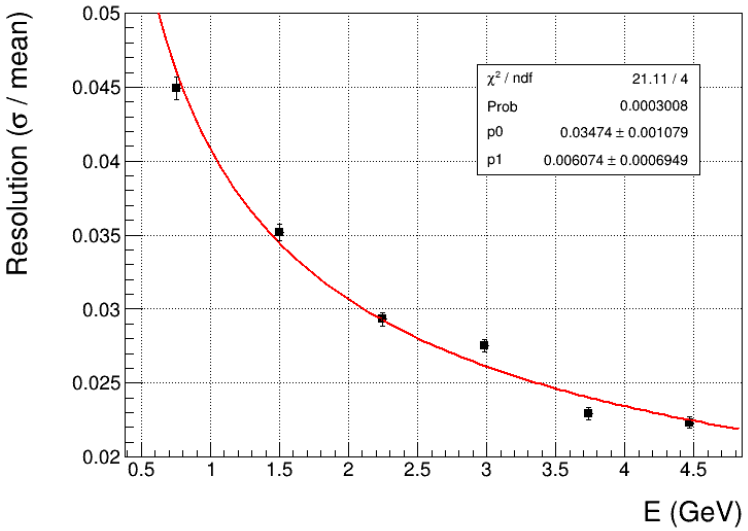




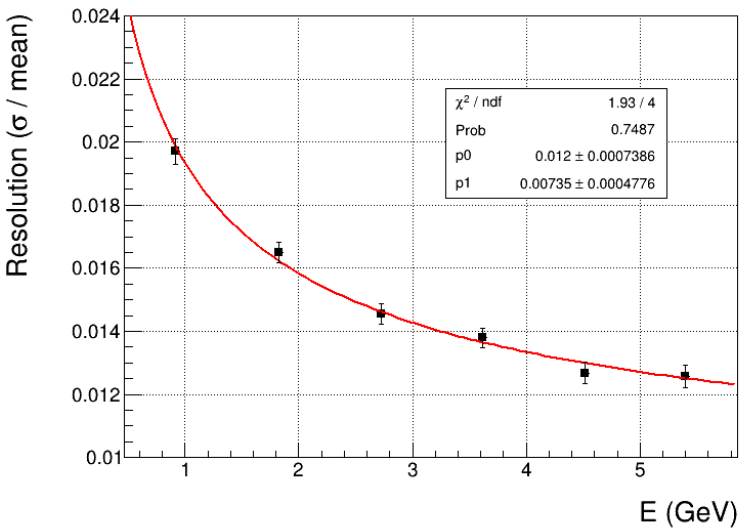


Energy Resolution for Monoenergetic 1x1 vs 3x3 cases

1x1

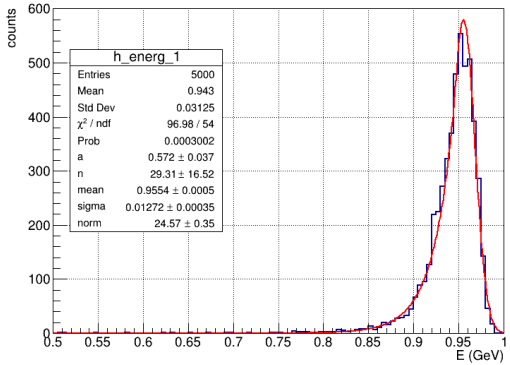


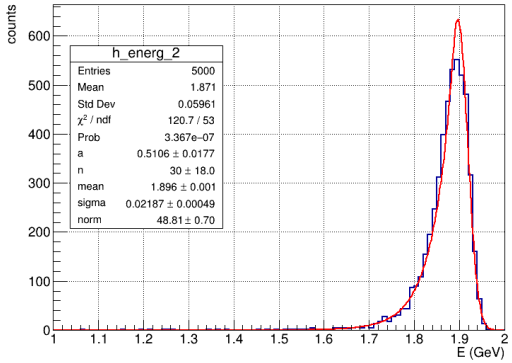
3x3

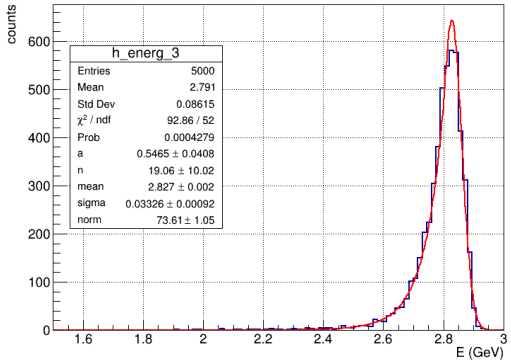


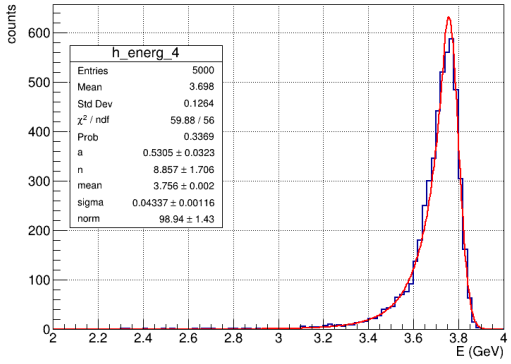
Everything looks normal

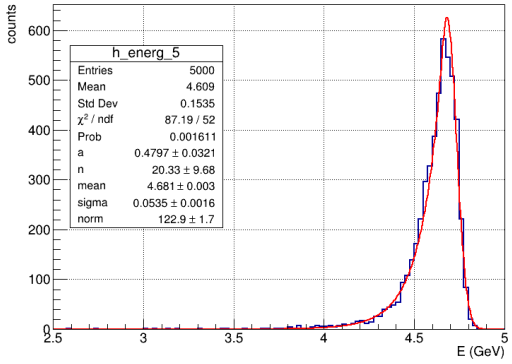
Deposited energy in Monoenergetic case 5x5

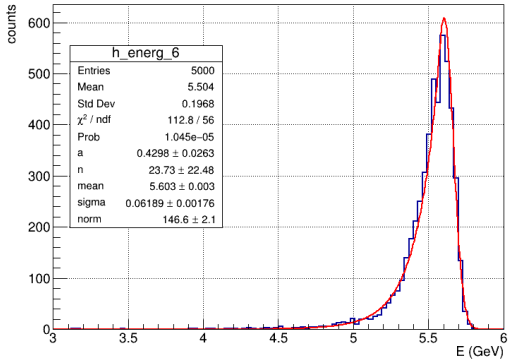






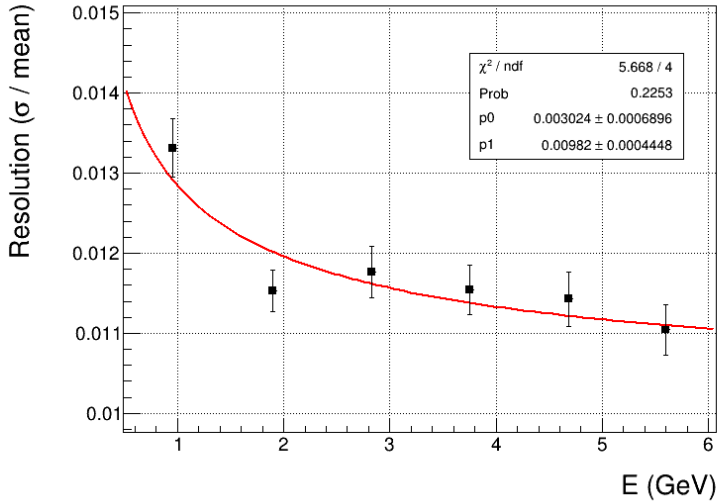




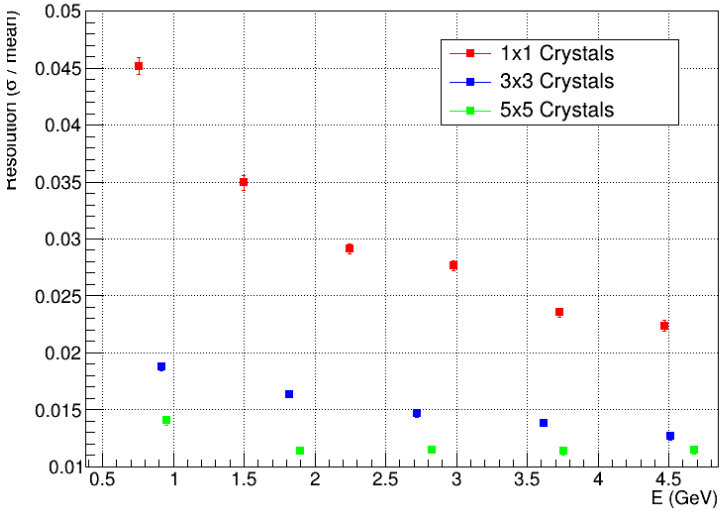


Energy Resolution Plots

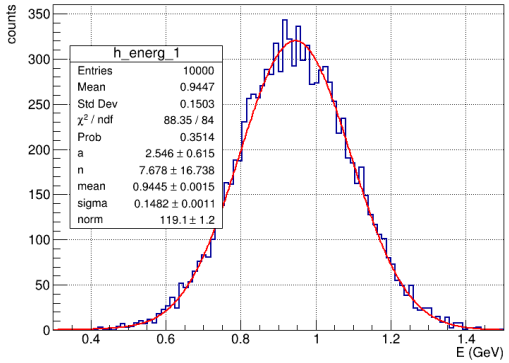
Monoenergetic 5x5

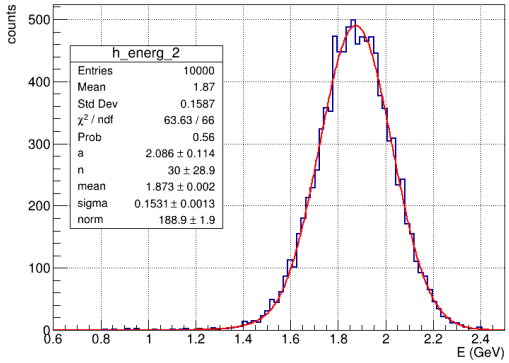


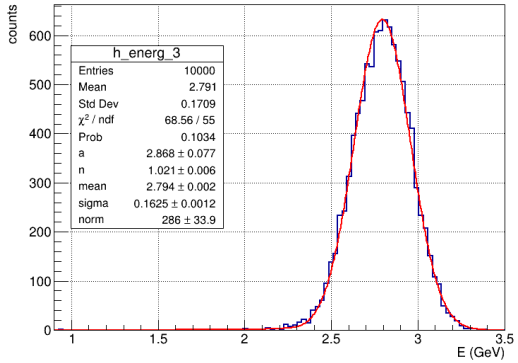
All configurations

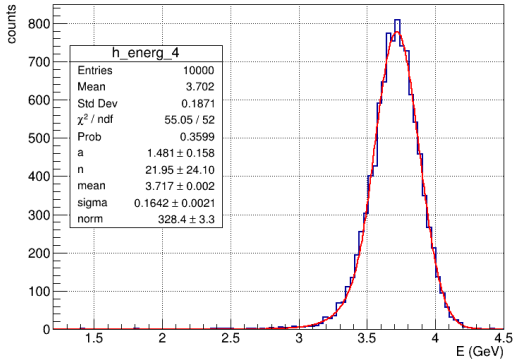


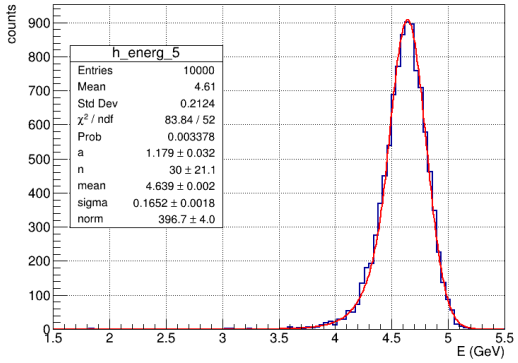
Deposited energy in DESY energetic case 5x5

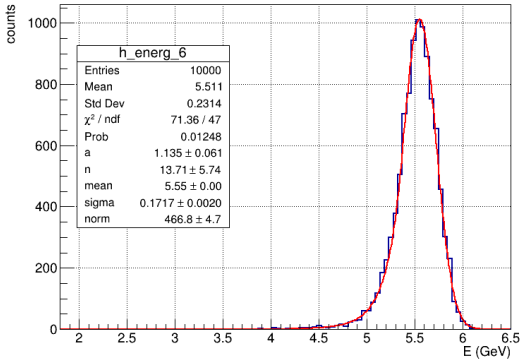




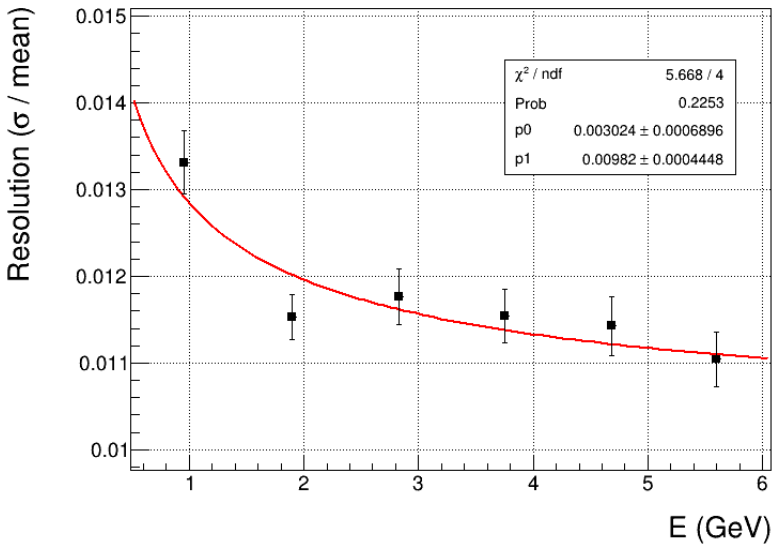


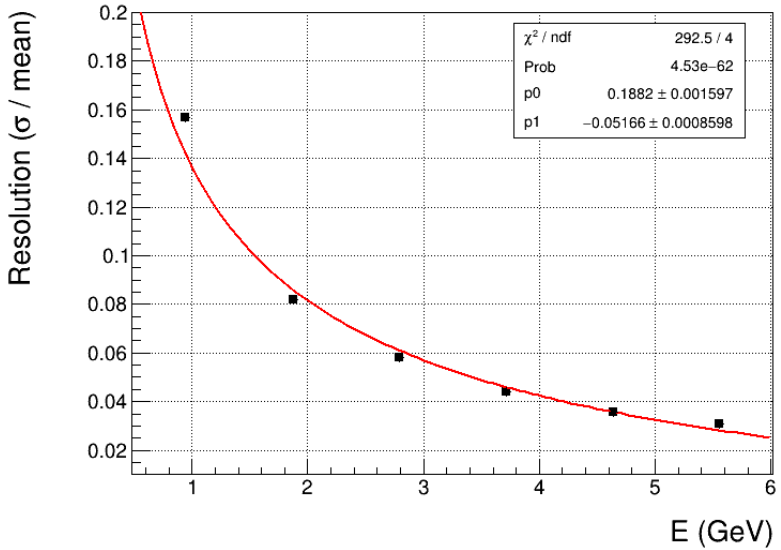






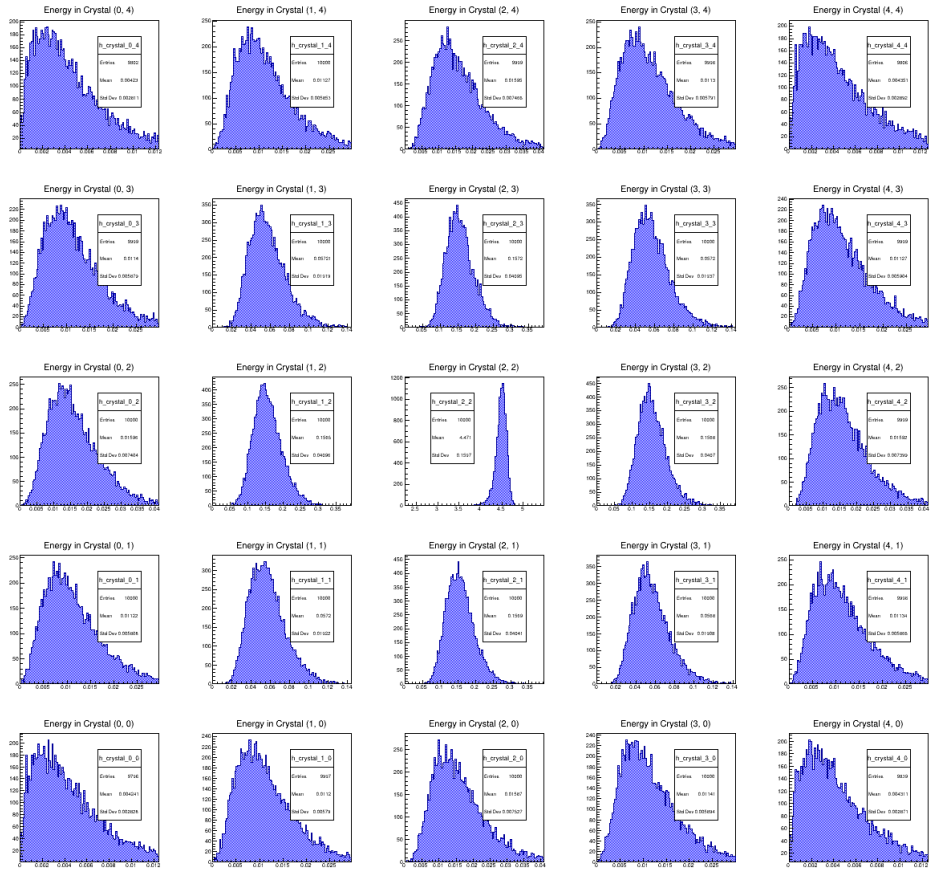
Energy Resolution for Mono vs DESY 5x5 matrices





Big effect for low energies

Smeared by number of Photoelectron



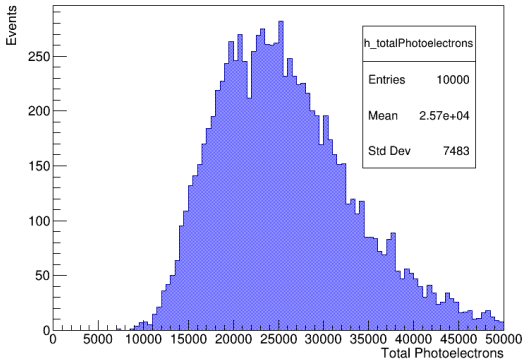
Gaussian Smearing Calculation: For each deposited energy E_i (in GeV)

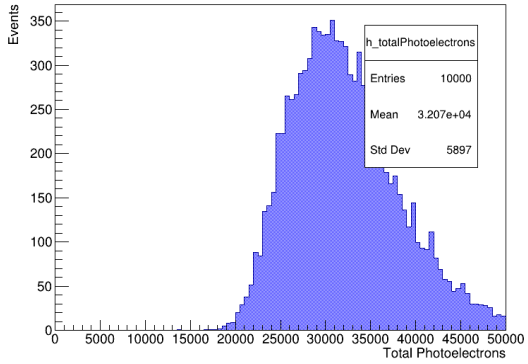
$$\sigma = \frac{1}{\sqrt{10000 \cdot E_i}}$$

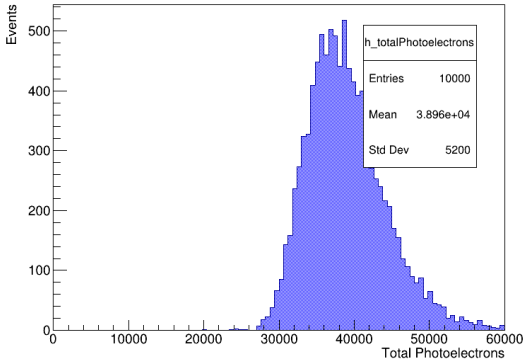
PWO - 30 photo-electrons/MeV

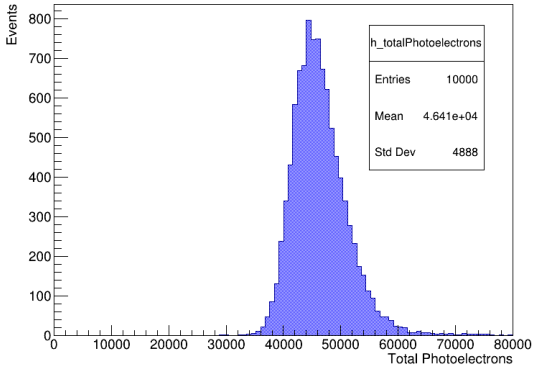
SiPM – 30% efficiency

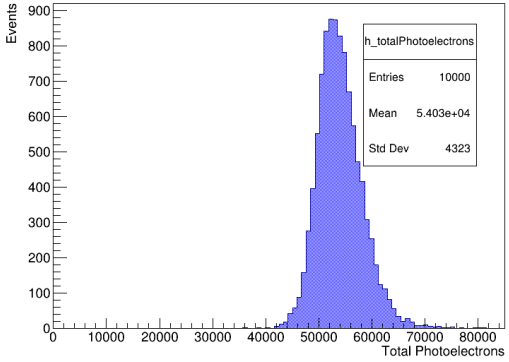
Sum of Photoelectrons for Monoenergetic case

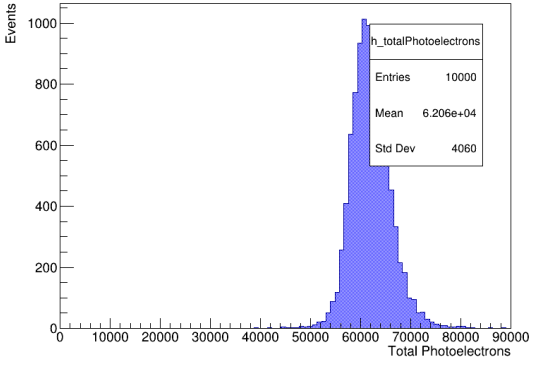




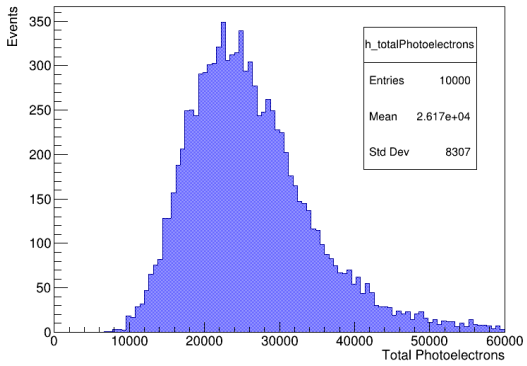


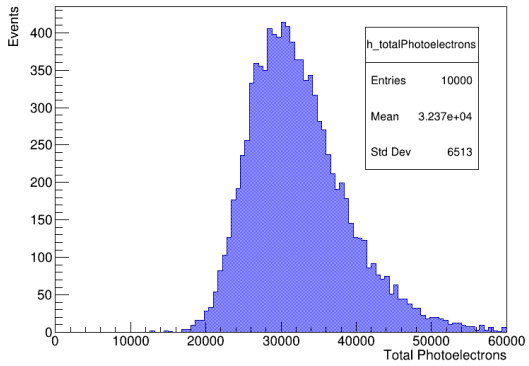


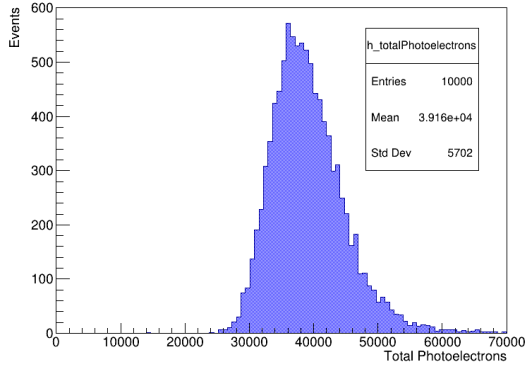


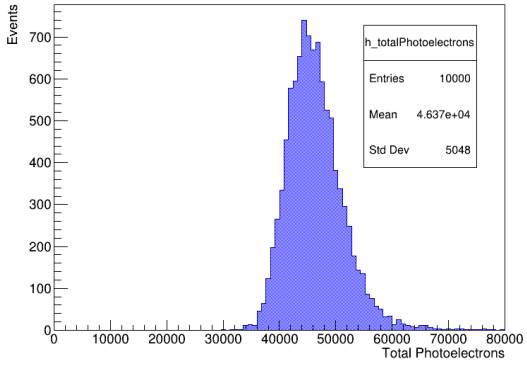


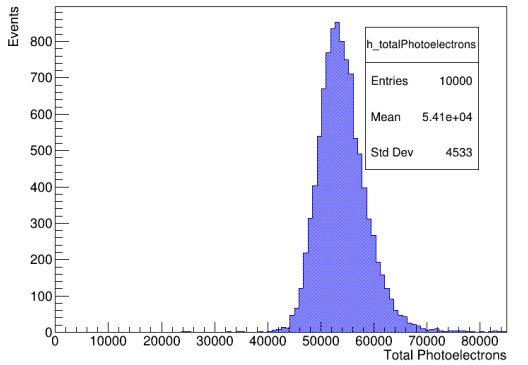
Sum of Photoelectrons for DESY case

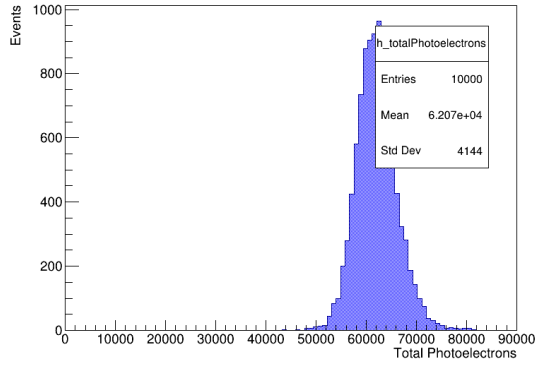




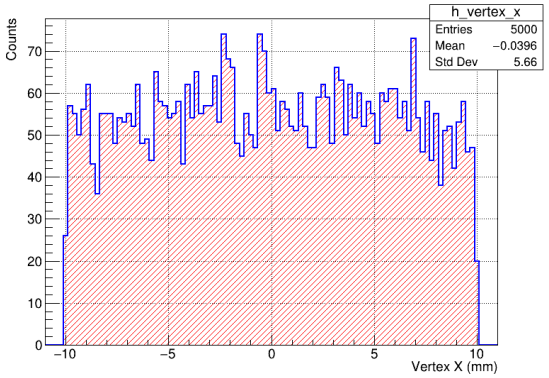








Position Resolution analysis



Uniformly distributed x coordinate over the width of central crystal

Logarithmic weights

$$x = \frac{\sum_i w_i\ x_i}{\sum_i w_i} \qquad w_i = \max\left\{0, \left[W_0 + \ln\left(\frac{E_i}{E}\right)\right]\right\}$$

Rec. vs Gen. X positions