Systematic Studies for the π^0 Calibration of the Crystal-Ball Detector

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The Process

$$\gamma + p \rightarrow \pi^0 + p \rightarrow p + \gamma_1\gamma_2 \tag{1}$$

$$m_{\pi^0} = \sqrt{2E_1E_2(1 - \cos(\alpha))} \tag{2}$$

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- Is there an energy dependency in the CB-Detector and how can it be checked?
  $\rightarrow |E_1 - E_2| < 25\,\text{MeV}$
- What are the reasons for the dependency?

Crystal-Ball-Function / Reduction of the Underground

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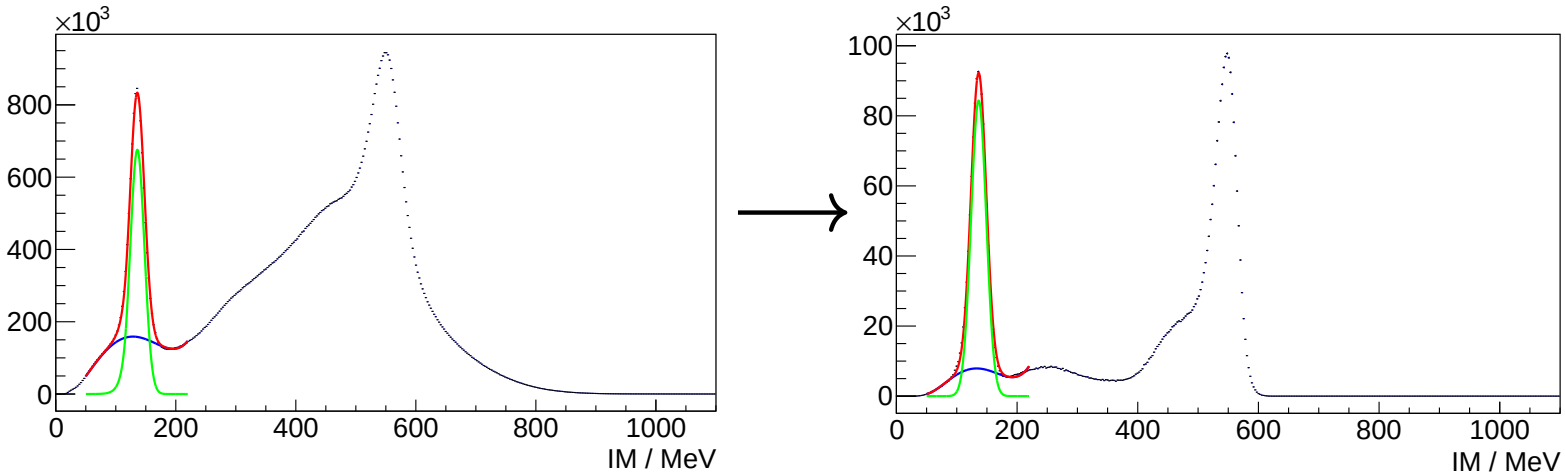

Abbildung: Beamtime: Example for not reduced and reduced underground

Event Generator

Reasons for a new event generator:

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- The condition $|E_1 - E_2| < 25\,\text{MeV}$ is a strong cut
  $\rightarrow$ There is no package with enough events
- Creating a new package with enough events would take to much time (multiple days on blaster)
- It would be better if the same generator is used for all studies
  $\rightarrow$ The generator should be able to simulate MAMI-Beam and isotropic decay

Event Generator

No Additional Cut

- Beamtime October 2014
- No additional cut

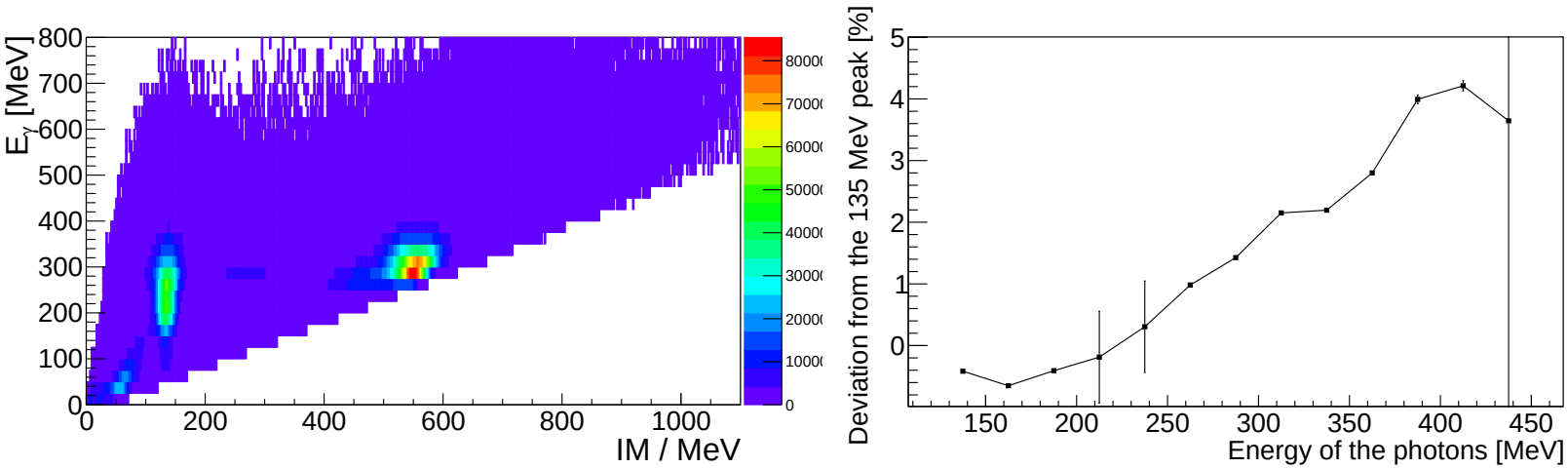

Abbildung: Beamtime: No additional cut

Detectors On At The Edge

- Beamtime October 2014
- Neglect the detectors at the edge

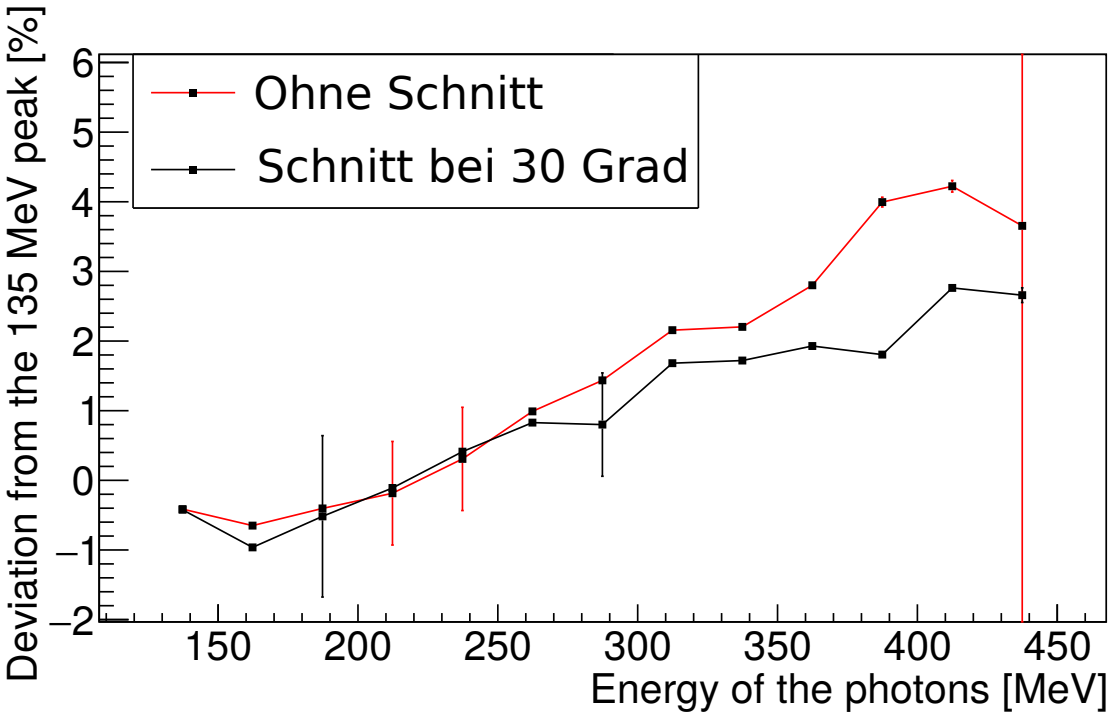

Abbildung: Beamtime: With and without considerations of the detectors on the edge of the beam entrance and exit

Simulation

Hot and Dead Crystals