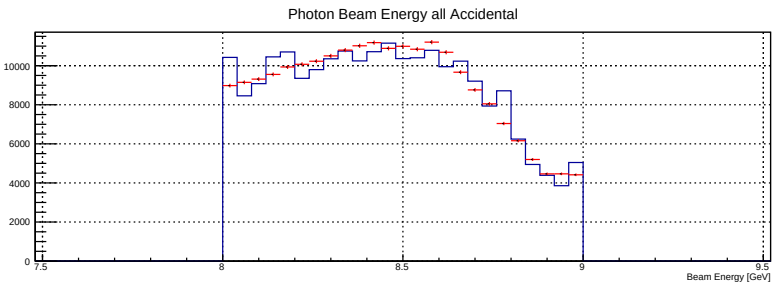
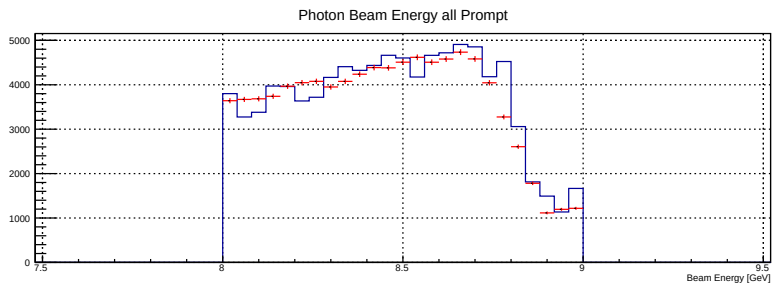
Understanding Beam Photon Spectrum

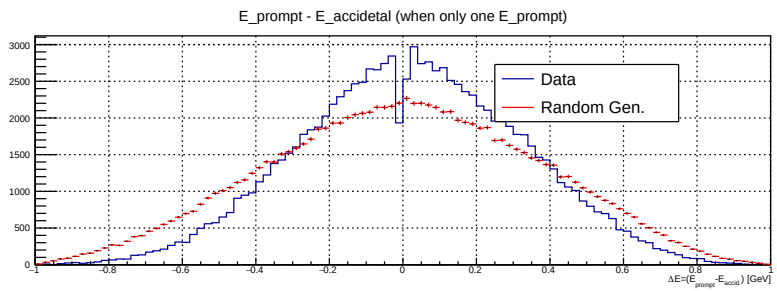
Benedikt Zihlmann

June 1, 2021

Energy Distribution of Beam Photons







- Beam Photon Energy Distribution for all Prompt and Accidentals
- Shapes are different for Prompt and Accidentals
- Model shape with random generator.
- Model random generator will no descibe the Energy difference between Prompt and Accidentals

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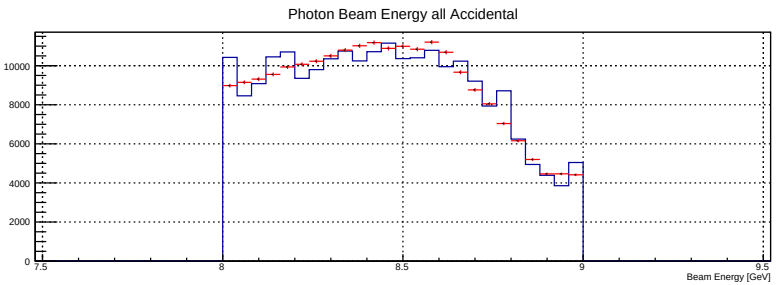

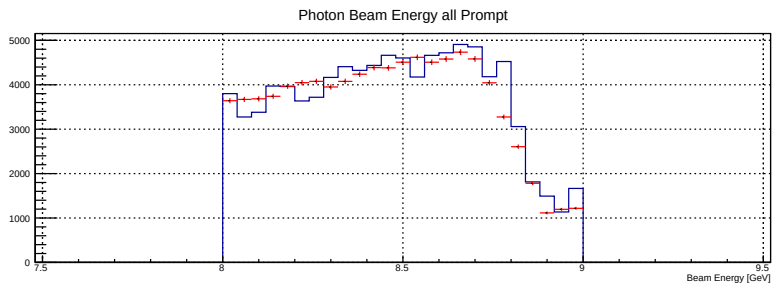

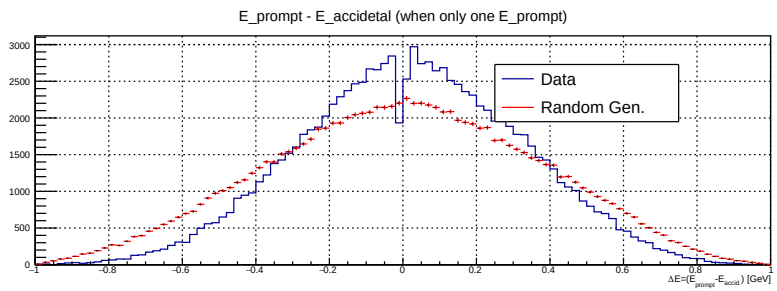

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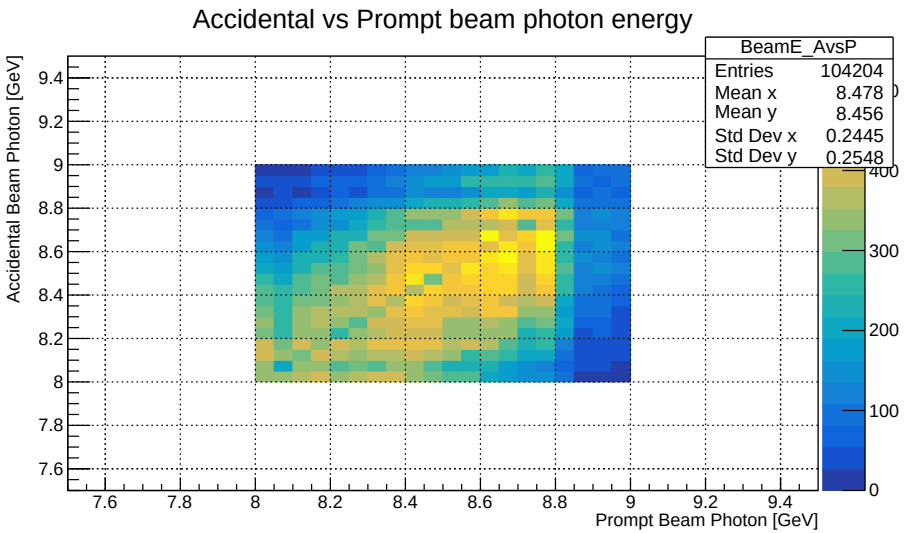
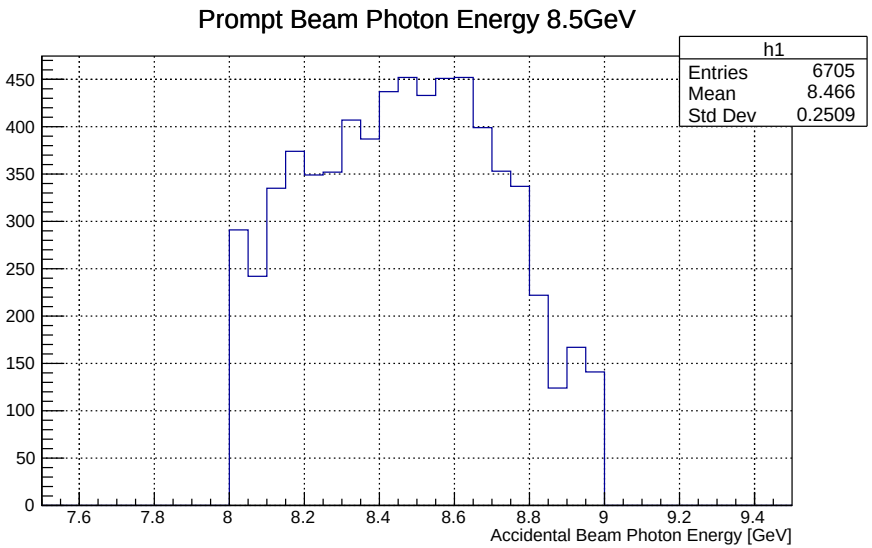
- Shapes are different for Prompt and Accidentals
- Model shape with random generator.
- Model random generator will no descibe the Energy difference between Prompt and Accidentals
- Accidental Distribution DEPENDS ON PROMPT BEAM PHOTON ENERGY
- Need to look at accidental distribution for a given promopt beam photon energy.

Accidental vs Prompt Beam Photon Energy



- Distribution of Accidentals depend on Promopt photon beam energy

Accidental vs Prompt Beam Photon Energy



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- Example 1: $E_{prompt} = 8.5 GeV$

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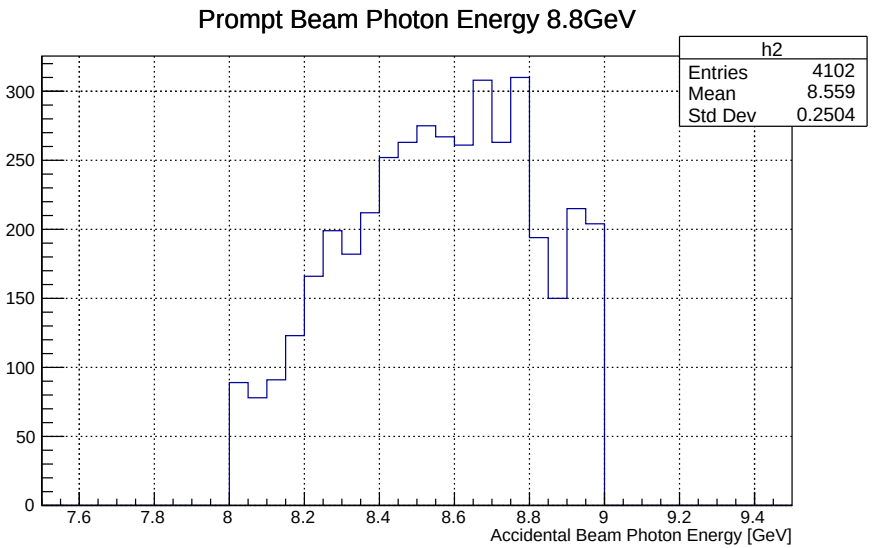

- Distribution of Accidentals depend on Promopt photon beam energy
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- Example 2: $E_{prompt} = 8.8 GeV$

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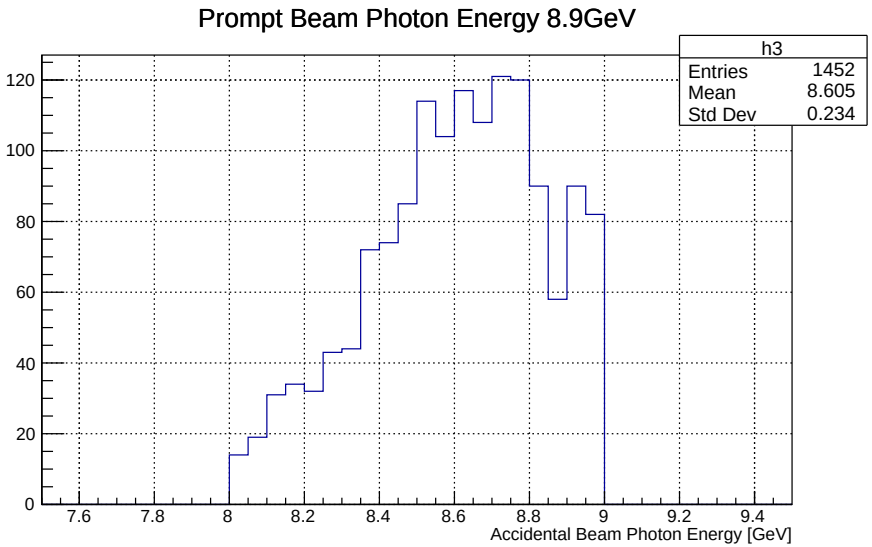

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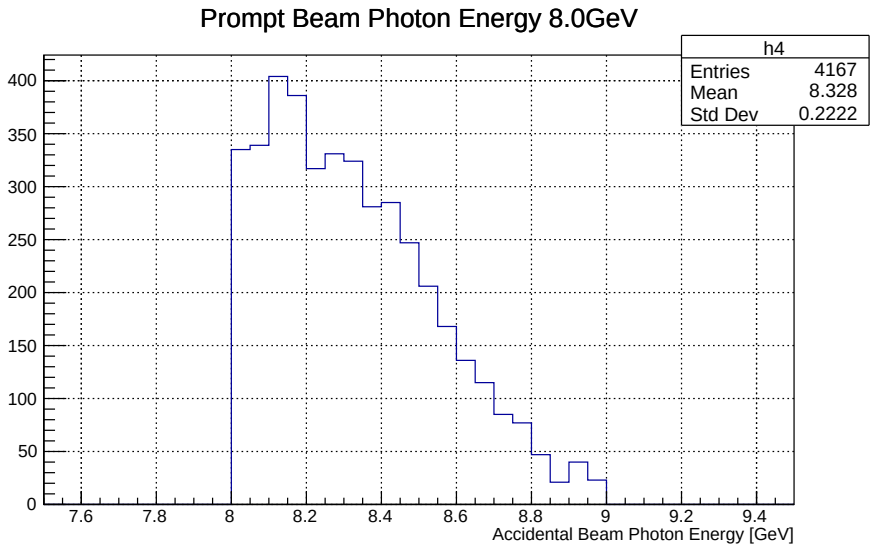

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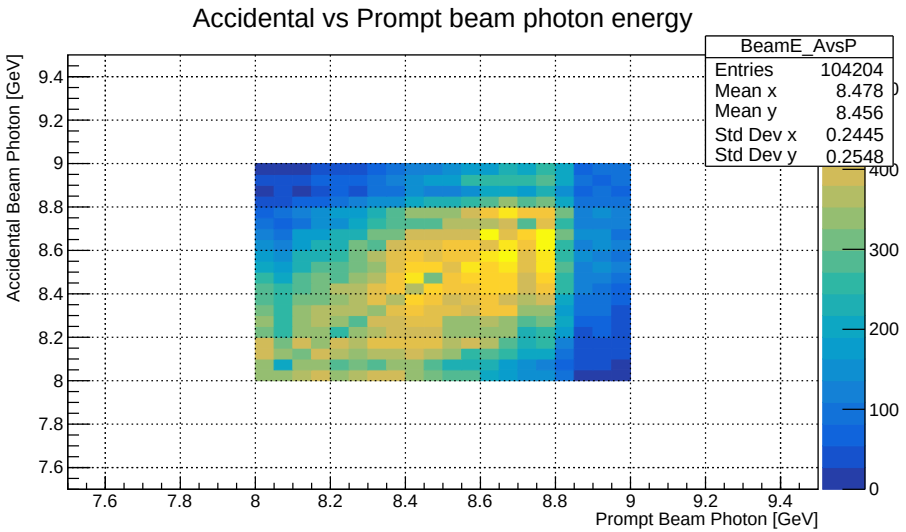

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Accidental Beam Photon Energy distribution is close to a Gaussian shape with the centroid close to the energy of the prompt beam photon

New Model 1 Beam Photon Energy Distribution

Gaussian Model: Model 1

- Fit the accidental photon beam energy distribution for each prompt beam photon energy bin with a Gaussian.
- Using fit results (μ and σ) for Gaussian random generator
- Use mean number of accidentals with binomial random generator to throw N accidentals
- Throw random prompt photon beam energies according to the shape of the energy distribution.
- Calculate energy difference and compare to data.

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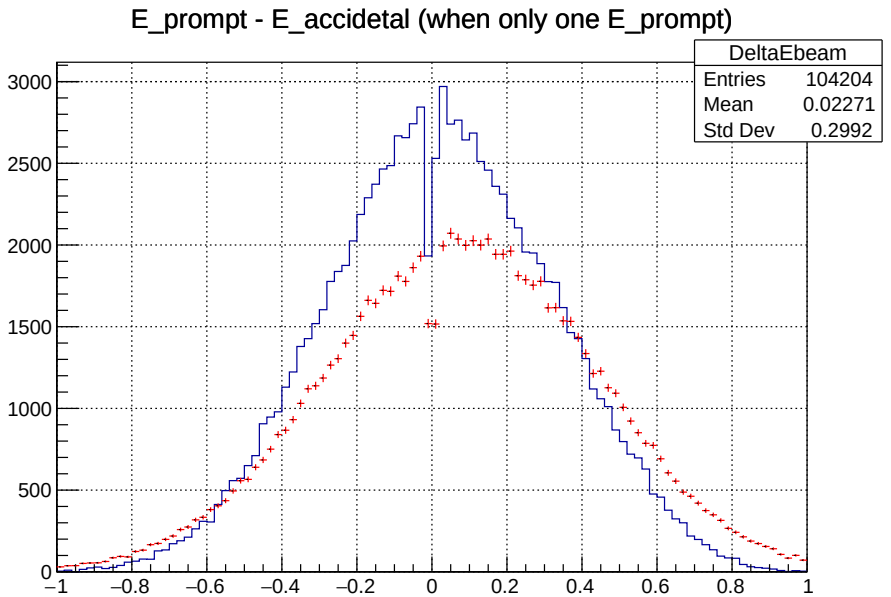
- Blue is data, red is random generator.



New Model 2 Beam Photon Energy Distribution

Gaussian Model: Model 2

- Instead of fit use accidental distribtuion directly for random generator. (Array of histogram)
- Throw random prompt photon beam energies according to the shape of the energy distribution.
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