

$$\eta \rightarrow \pi^0 \gamma \gamma$$

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Thomas Jefferson National Accelerator Facility

for the **GlueX** and **JEF** experiments

17.07.2020

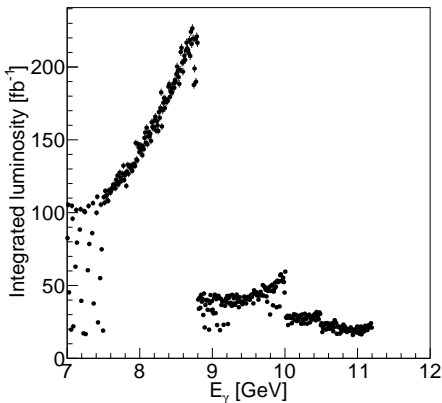
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1 Introduction

2  $\eta \rightarrow \pi^0 \gamma \gamma$

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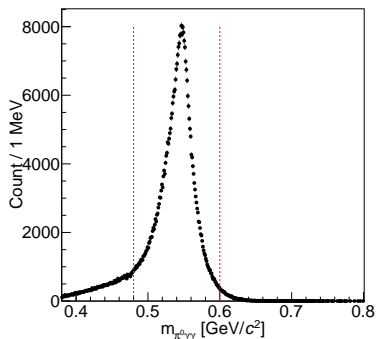
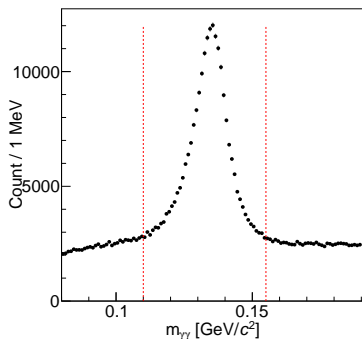
- Create a JEF directory with halld\_recon, halld\_sim, and hdgeant4
- source /work/halld/home/ijaegle/Env/custom\_GlueX\_jef.sh
- Simulate 1M events with MCwrapper and genEtaRegge



- Generator calculates cross-section,  $\sigma = 0.0952976 \mu\text{b}$  at  $E_\gamma = 7 \text{ GeV}$
- Integrated luminosity at  $E_\gamma = 7 \text{ GeV}$  is  $\frac{\text{Photon thrown at } 7 \text{ GeV}}{\sigma \cdot BR(\eta \rightarrow \pi^0 \gamma \gamma)}$
- Overall ratio then applied to other bins, => total integrated luminosity 30.6702 ab<sup>-1</sup>

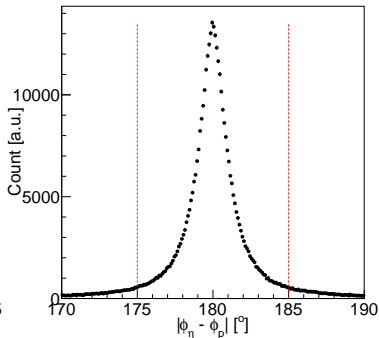
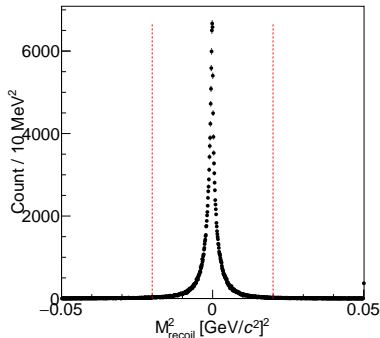
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- Decay channel  $\eta \rightarrow \pi^0 \gamma \gamma$
- Select events with 4 “good” neutral hits in BCAL/FCAL2/CAL
  - ▶ BCAL & FCAL2 cluster energy threshold 150 MeV
  - ▶ CCAL cluster energy threshold 150 GeV
- Invariant mass of photon pair cut on  $\pi^0$  mass
- Select best combination of  $4\gamma$  to  $\pi^0 \gamma \gamma$  by  $\chi^2$ -test
- Use  $\pi^0$  mass as constrain, construct  $\pi^0 \gamma \gamma$  invariant mass

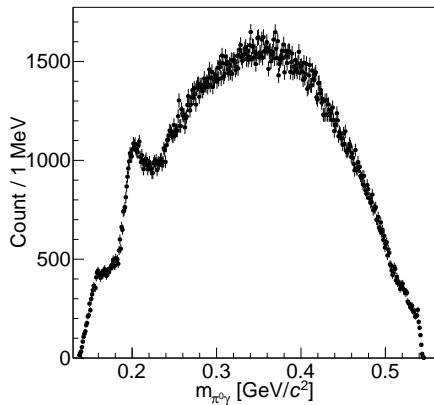
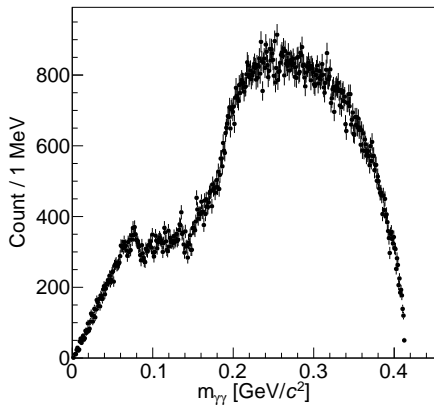


# Reaction identification, $\gamma p \rightarrow \eta p$

- 4 “good” neutral hits and one track
- Missing mass analysis
- Coplanarity check



# S and B' candidates



To continue, next steps look at the signal