Simulation of Hadronic Backgrounds for $\gamma p \rightarrow \eta p$ Reaction

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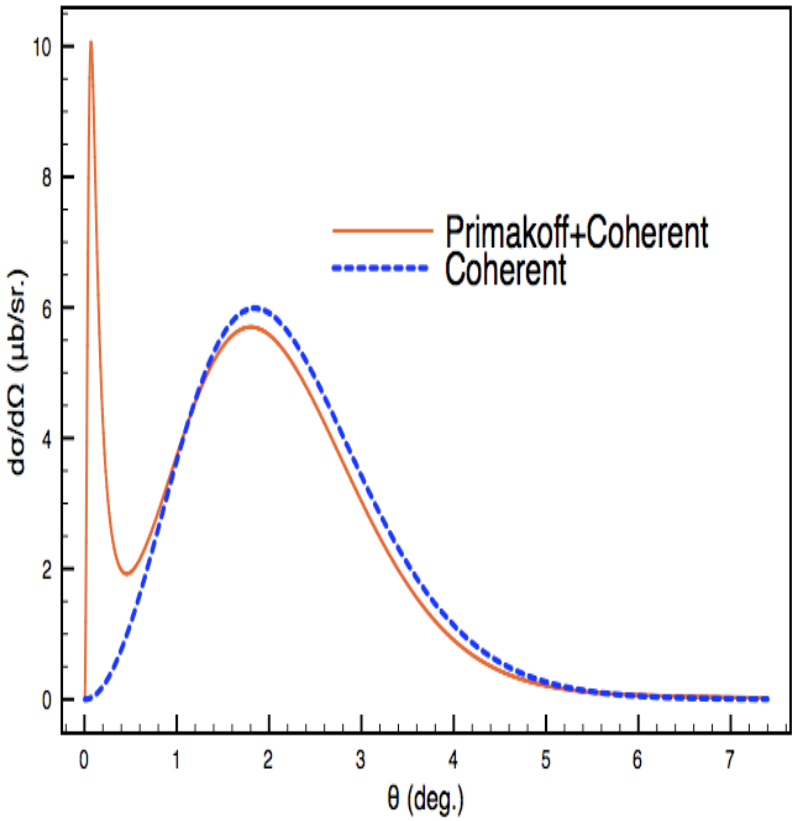
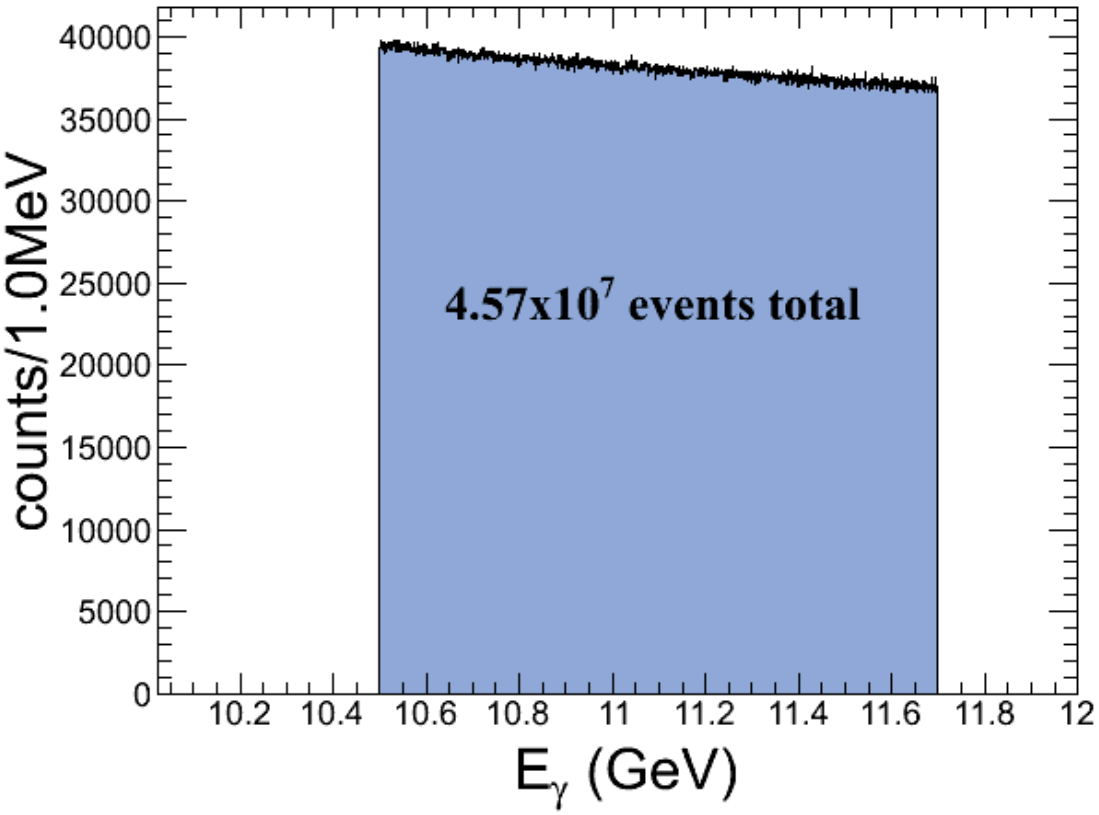
Hadronic Backgrounds for $\gamma p \rightarrow \eta p$



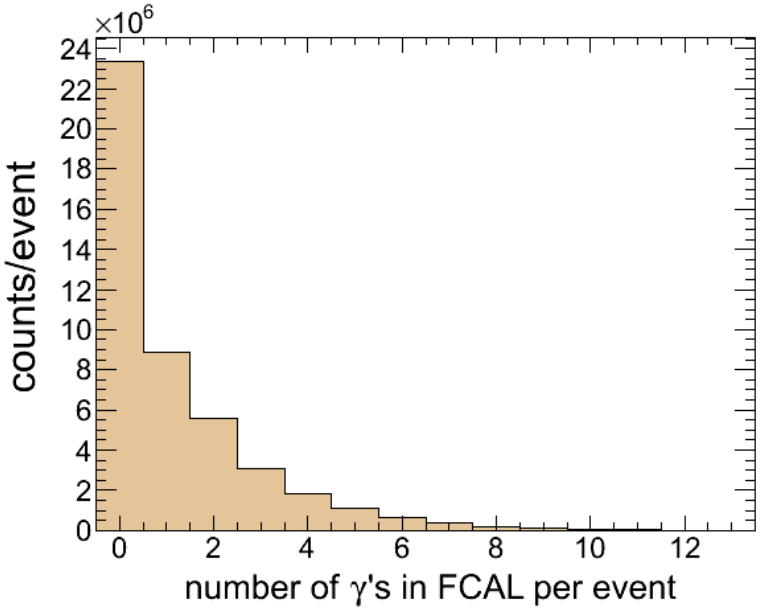
- Use Laget's calculation for $\gamma p \rightarrow \eta p$ channel
- Use PYTHIA/bggen to model everything else

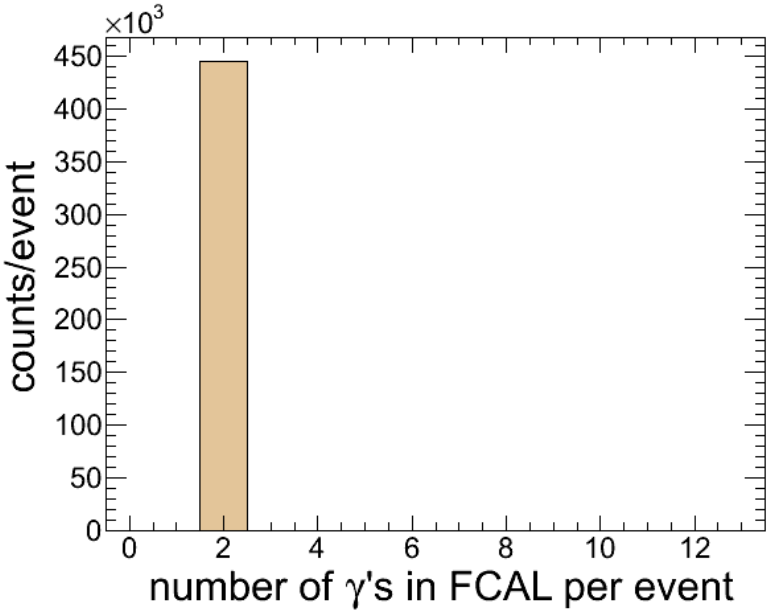
Hadronic Backgrounds for $\gamma p \rightarrow \eta p$



- ~ 4.6x10^7 PYTHIA events generated and passed through HDGeant

2 (only) photons in FCAL



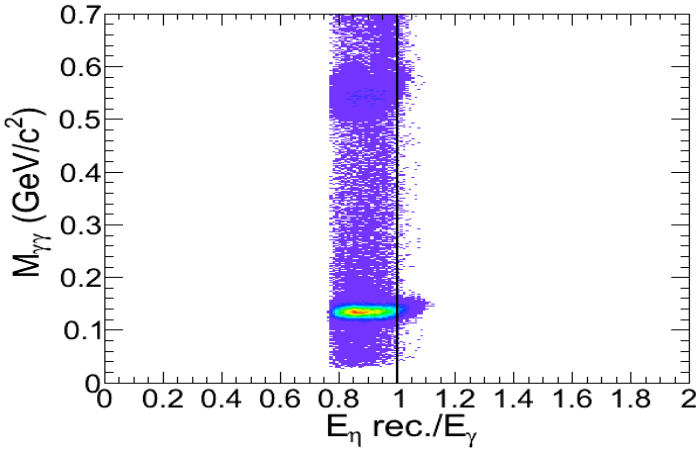


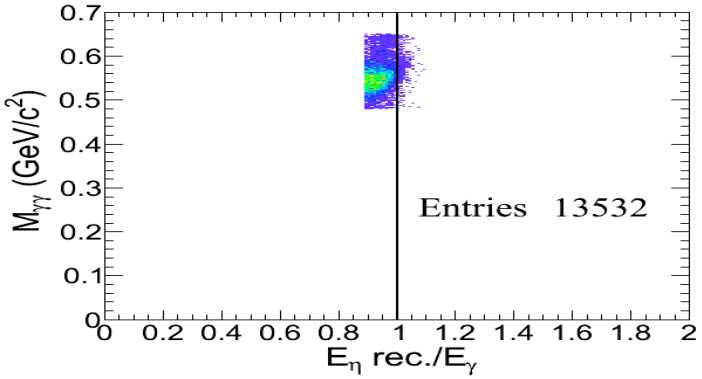
2 (only) photons in FCAL

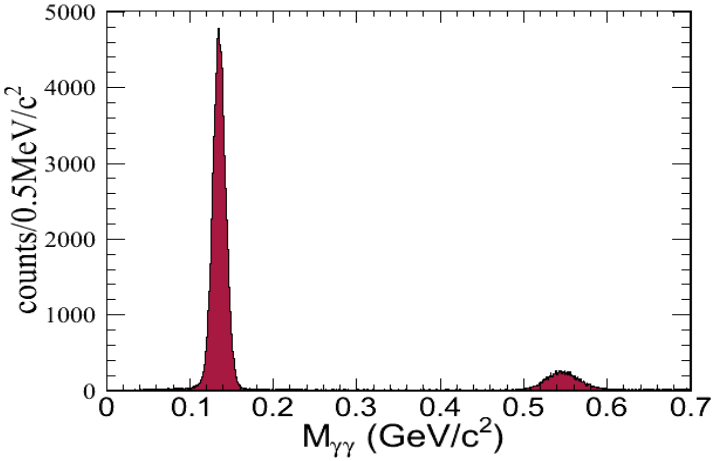
$E_{toal} > 9.0GeV$

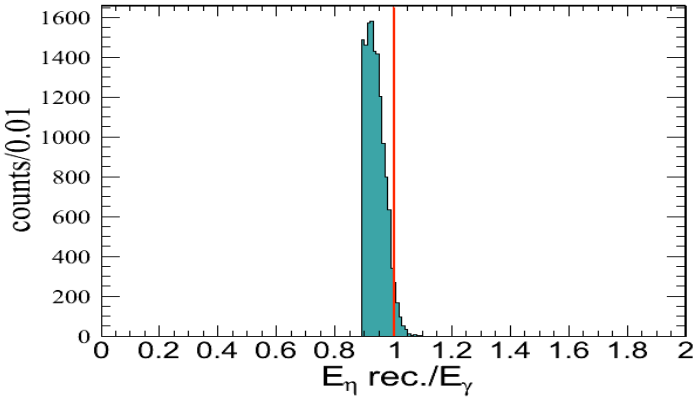
$0.9<E_\eta/E_\gamma<1.11$

$0.48<M\gamma\gamma<0.62$







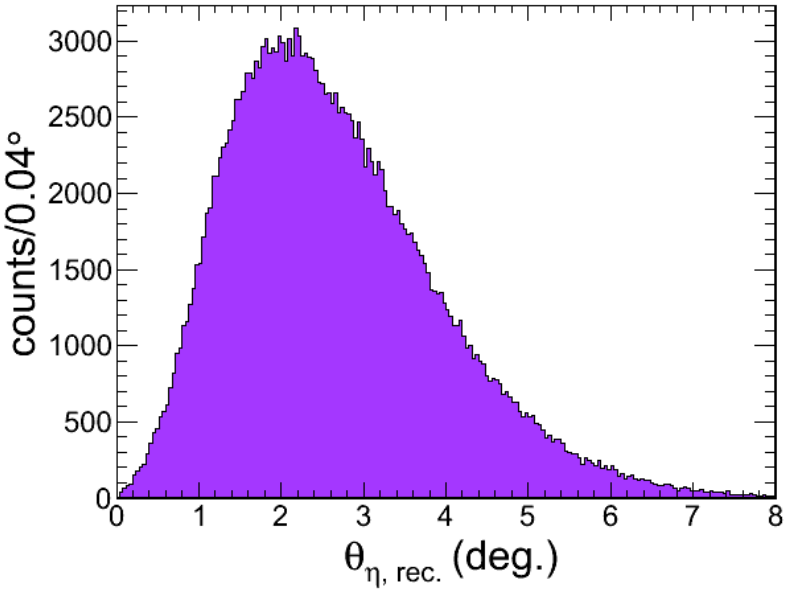


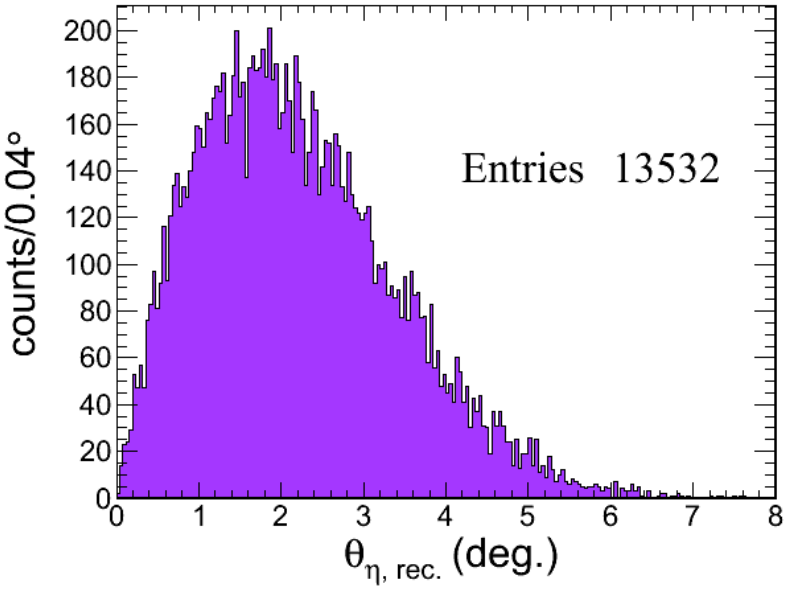
Reconstructed angle

$E_{toal} > 9.0GeV$

$0.9<E_\eta/E_\gamma<1.11$

$0.48<M\gamma\gamma<0.62$





Observed cross-section for the backgrounds

- $\sigma_{\gamma p \to \eta p}$ (0-8°) = 57*nb* (from Laget's calculation)
- $\sigma_{\gamma p \to \eta p}$ (0-0.5°) = 0.72*nb* (Primakoff region)
- $\sigma_{\gamma p \to X} = 122 \mu b$
- A ≈ 0.71 (geometric acceptance)
- B.R. = 0.39 (2γ branching ratio)

2 (only) photons in FCAL

Observed cross-section for the backgrounds

- For $\eta \to \gamma\gamma$ channel one has 1.4×10^4 counts from ~4.6e+07 hadronic events, hence:

$$\frac{1.4 \times 10^4}{4.6 \times 10^7} \times 122 \mu b / 0.71 / 0.39 = 134 nb$$

- For Primakoff region ($0° < \theta < 0.5°$)

$$\frac{6.3 \times 10^2}{4.6 \times 10^7} \times 122 \mu b / 0.71 / 0.39 = 6 nb$$

Major contributing channels (Preliminary)

Reaction	Percentage
$\gamma p \to \pi^0 \eta p$	48%
$\gamma p \to \gamma \pi^0 p$	27%
$\gamma p \to \pi^+ \pi^- \eta p$	6%
$\gamma p \to \pi^+ \eta n$	5%
.....	.....

Valid for $0° < \theta < 8°$

Simmary

- Investigated the backgrounds for $\gamma p \rightarrow \eta p$.
  - PYTHIA/bggen suggests a rate several times (6-7x) larger than the rate for Primakoff η events.
- Preliminary analysis suggests that vetoing the events with charged track ($p_{charged}$>200MeV) and events with clusters in BCAL may reduce the background rate to 1-2 times the Primakoff rate (still too large?).