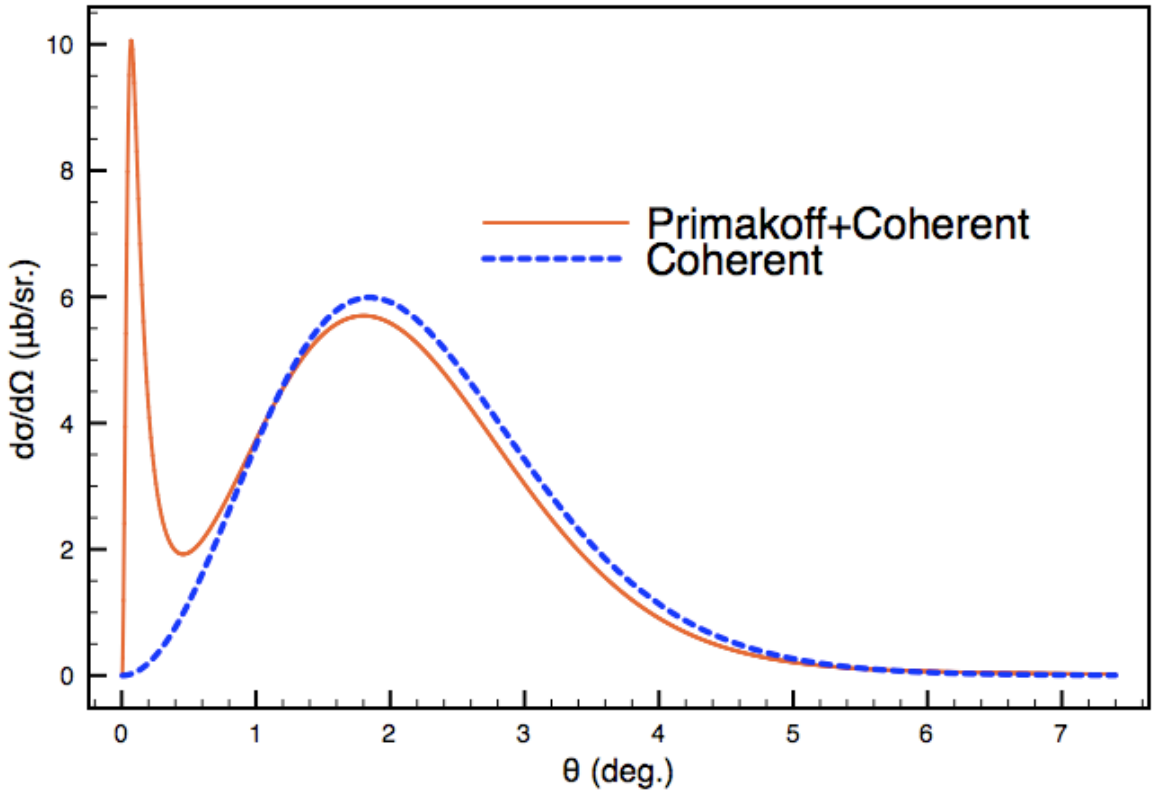
University *of* Massachusetts Amherst

η photo-production simulations (Primakoff)

Aram Teymurazyan

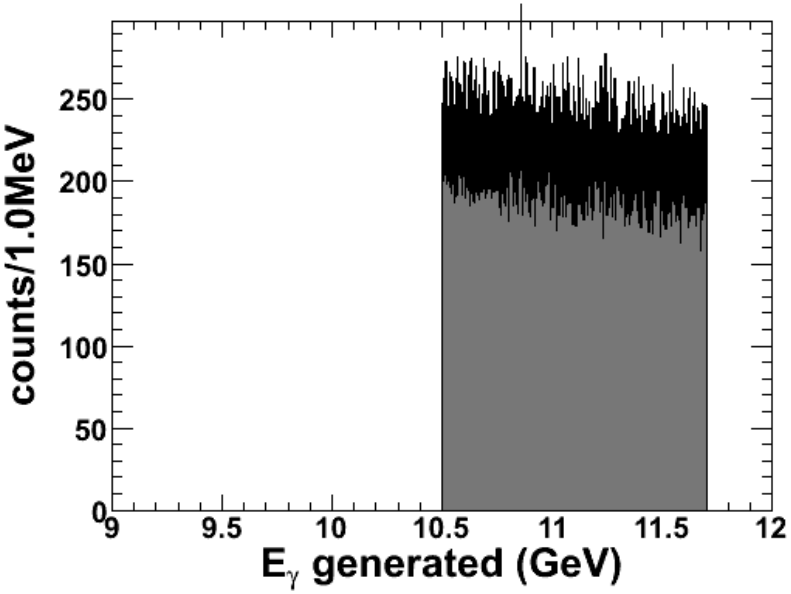
γp->ηp cross-section

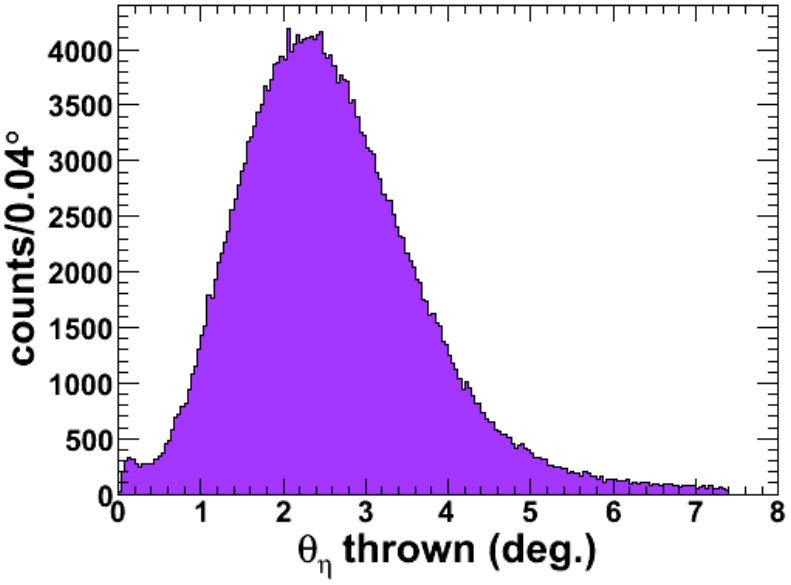
- Due to the negative interference of the amplitudes the Primakoff and coherent events cannot be generated separately

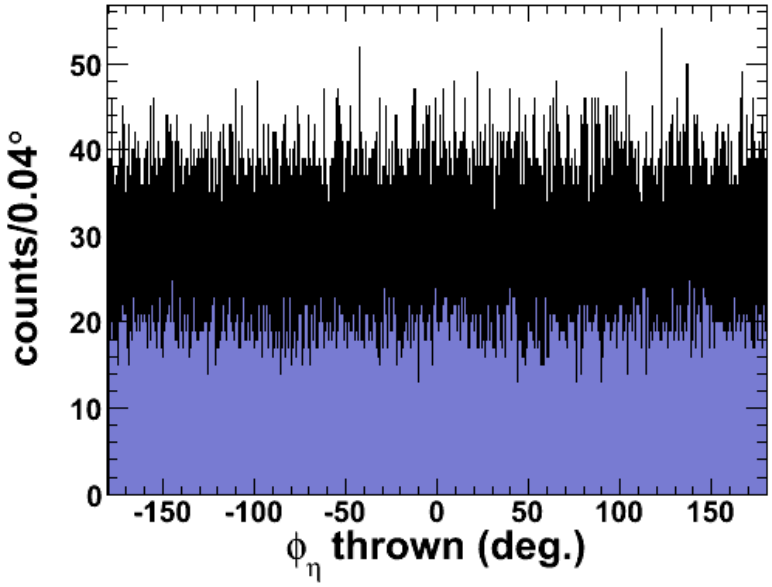


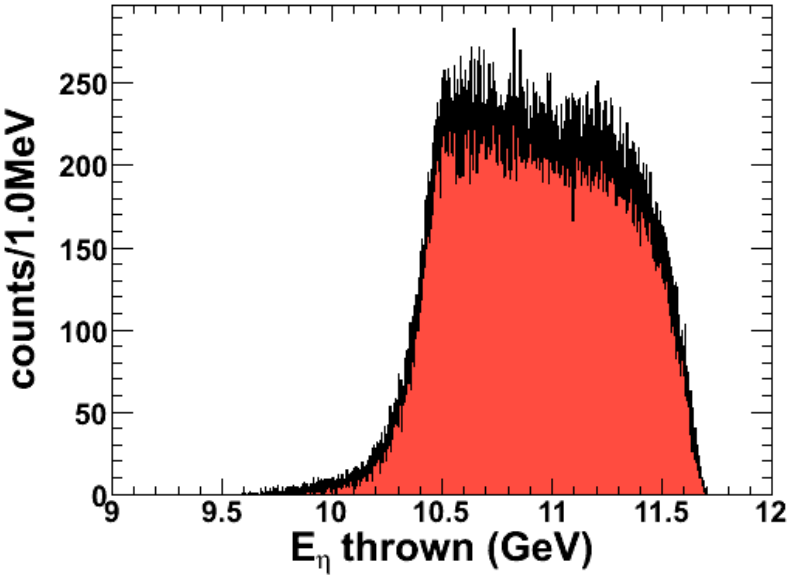
Phys. Rev. C.72. 022202

γp->ηp generator





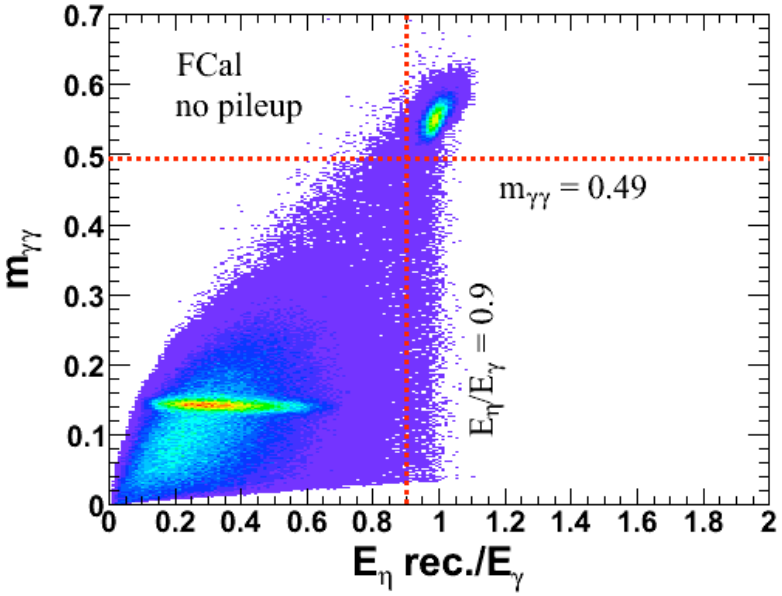


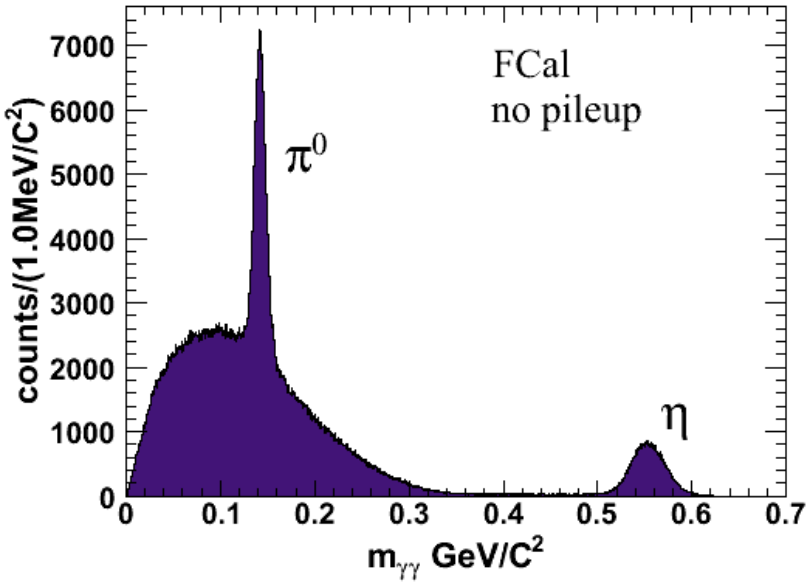


EM background and pileup

- EM background
  - Soft photons from genphoton + HDGenat internal generator (no coherent peak)
- EM pileup
  - HDGeant internal generator (no coherent peak)
- $R_{(E\gamma=0.0012-12.0GeV)}$ = 2.21 GHz
- $R_{(E\gamma=10.7-11.7GeV)}$ collimated = 3.08 MHz
  (*needs to be bumped up at least x4*)

η -signal only (no EM pileup)





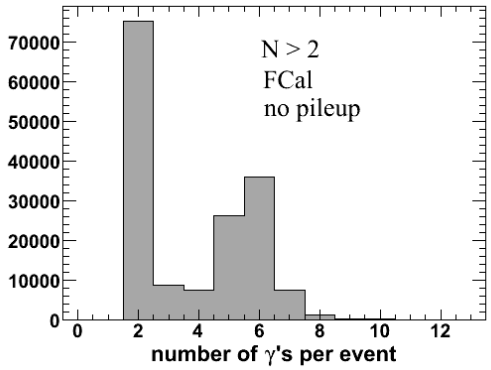
Dominant neutral modes:

$\eta \rightarrow \gamma\ \gamma$ 39.33%

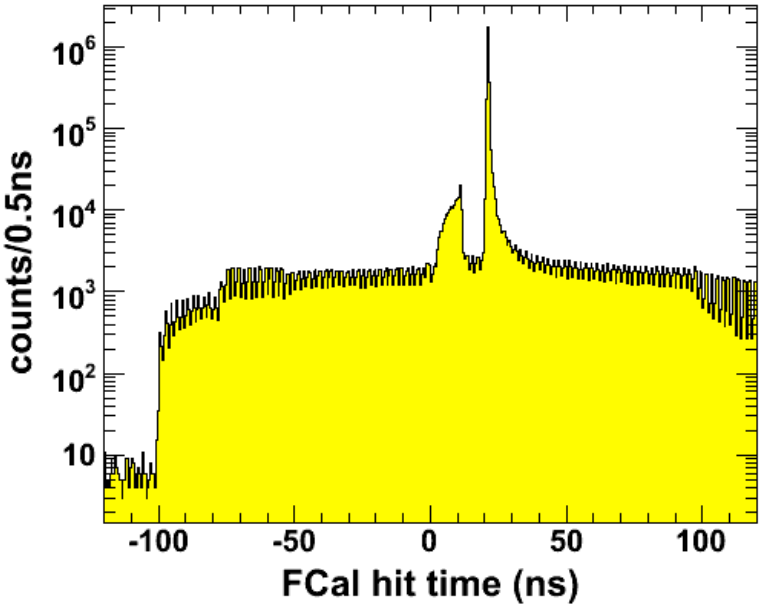
$\eta \rightarrow 3\pi^0$ 32.24%

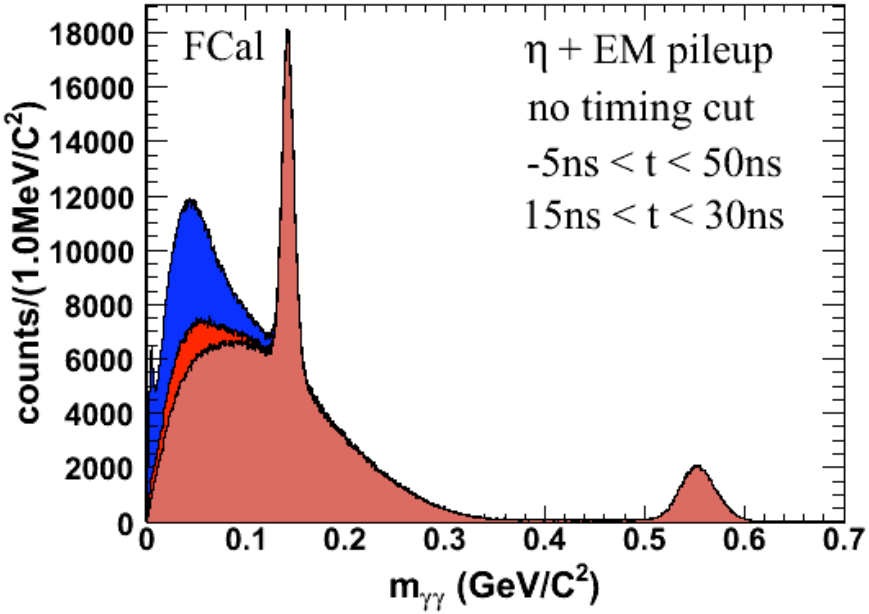
m_η>0.49 GeV/C2

0.120GeV/C^2< $m_{\pi 0}$<0.165 GeV/C2

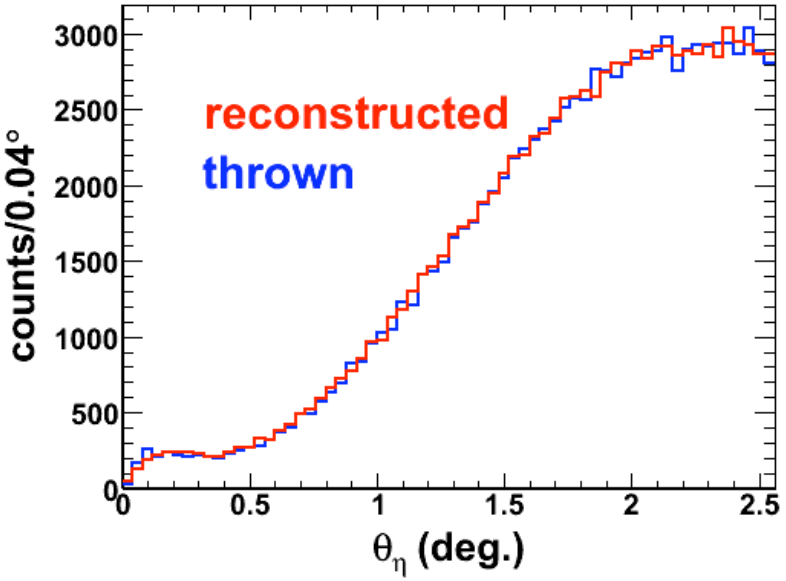


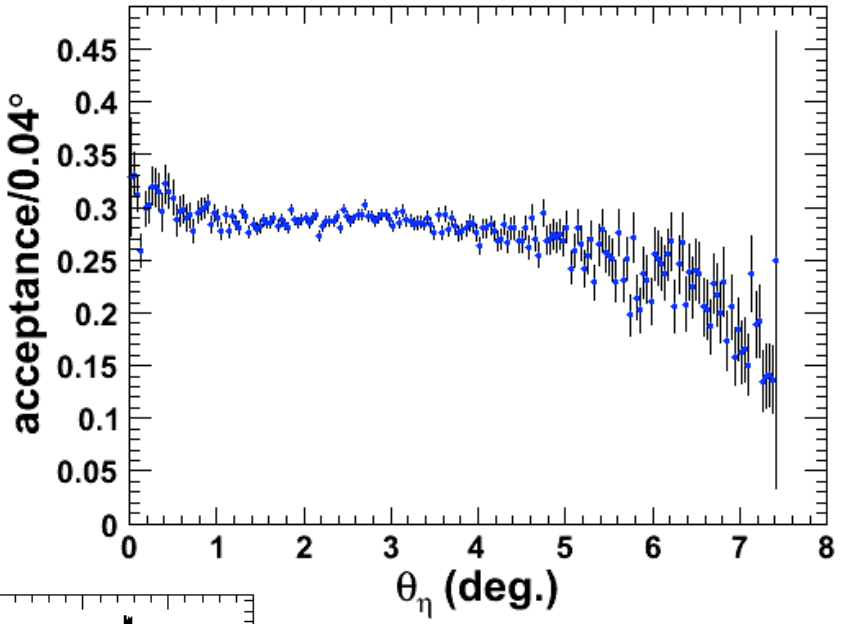
$\eta \rightarrow \gamma\ \gamma$ + EM pileup

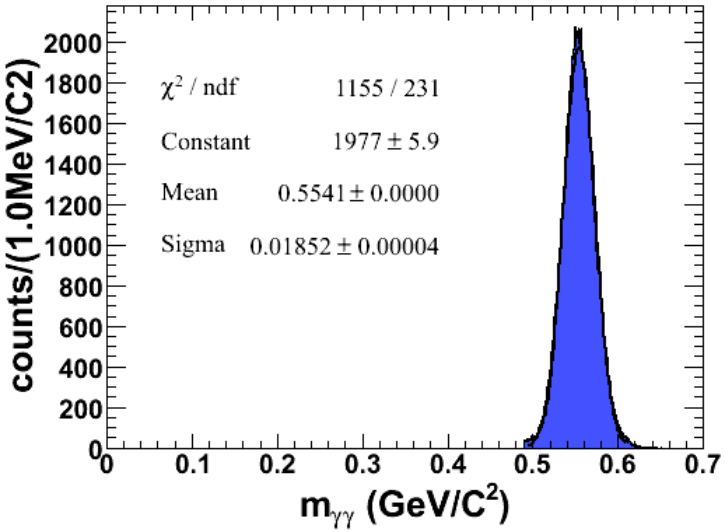




$\eta \rightarrow \gamma\ \gamma$ + EM pileup

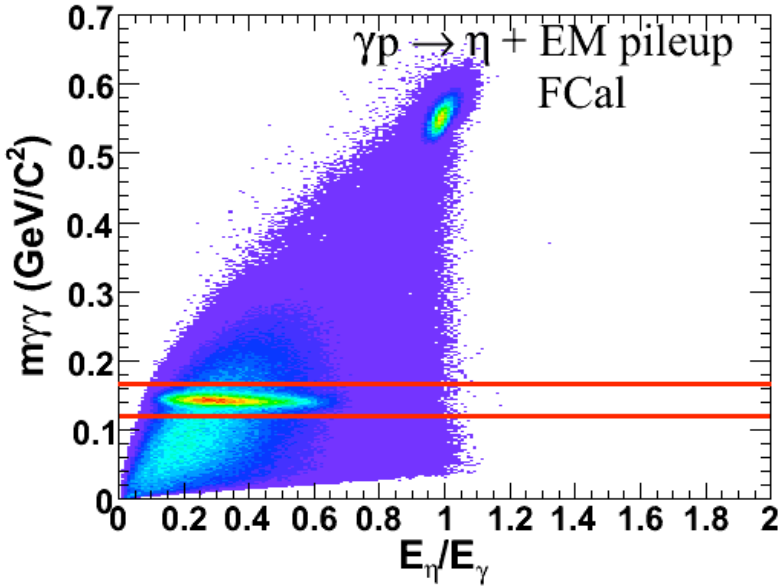


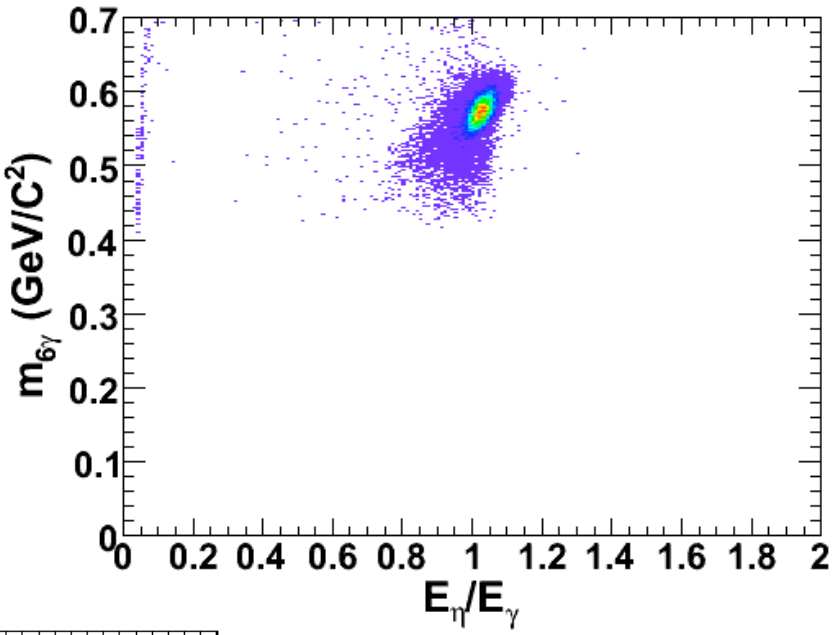


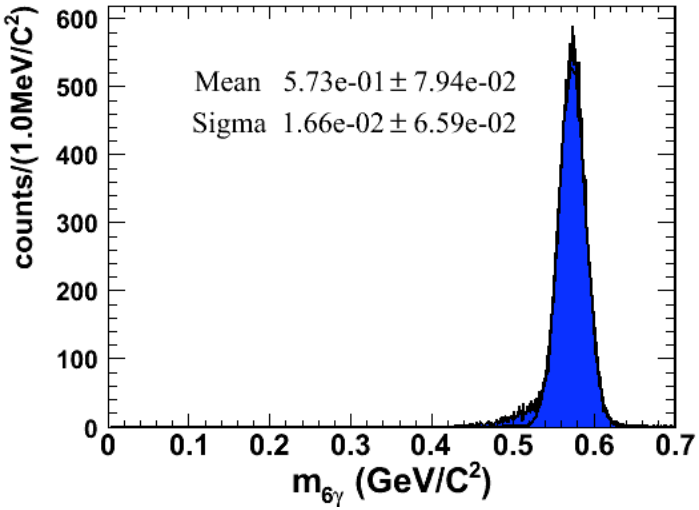


Acceptance for $\eta \rightarrow \gamma\ \gamma$ events ~ 70-75%

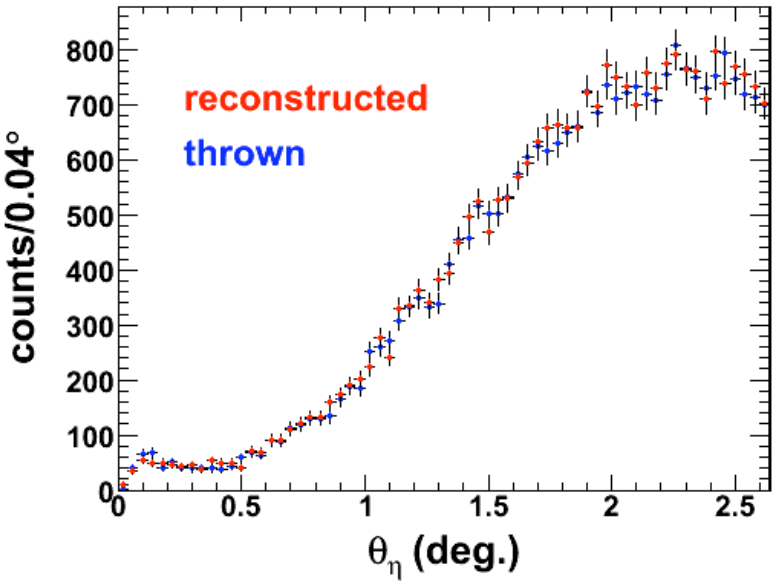
η ->3 π^0 + EM pileup

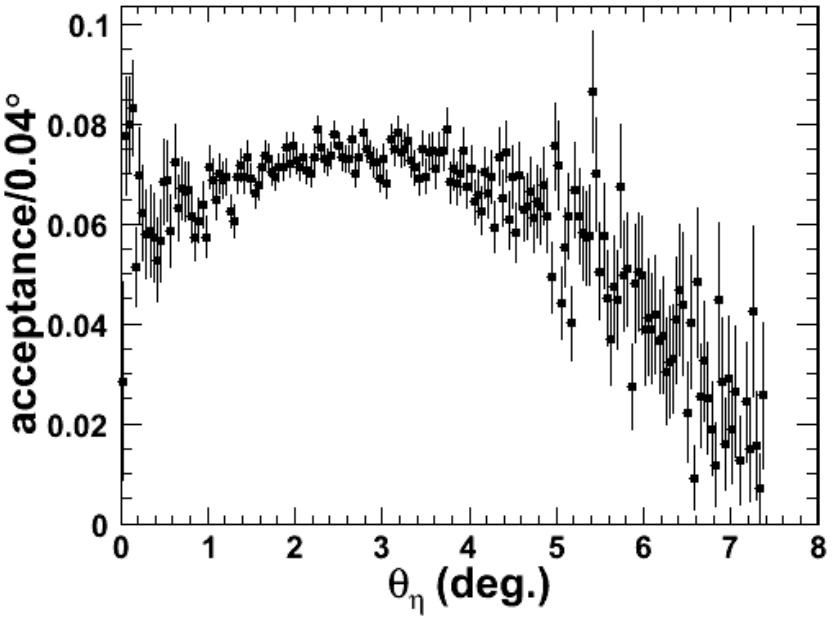






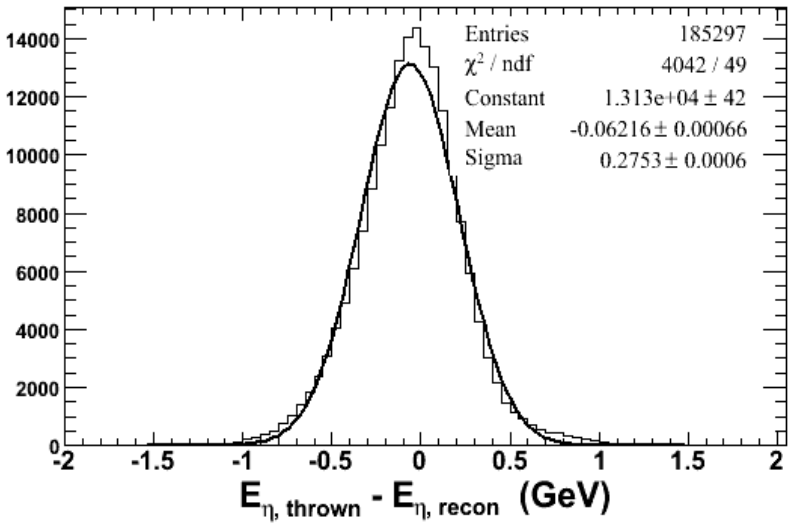
η ->3 π^0 + EM pileup

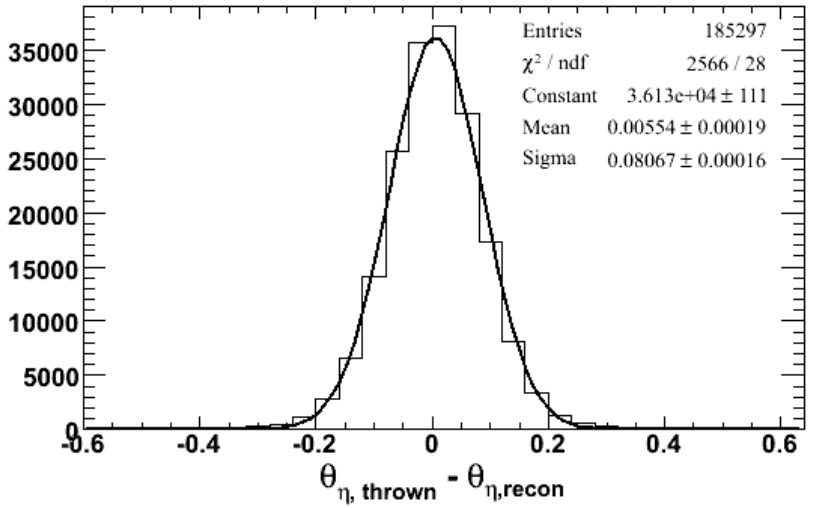


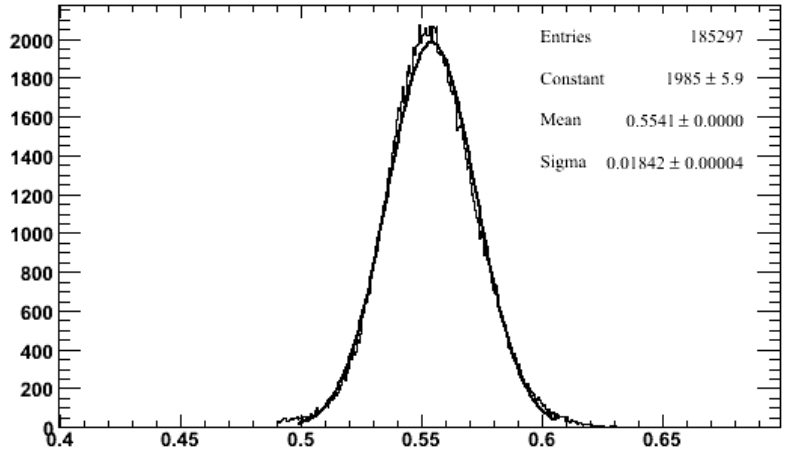


FCAL acceptance for η ->3 π^0 events ~ 22%

FCal resolutions for $\eta \rightarrow \gamma\ \gamma$ events



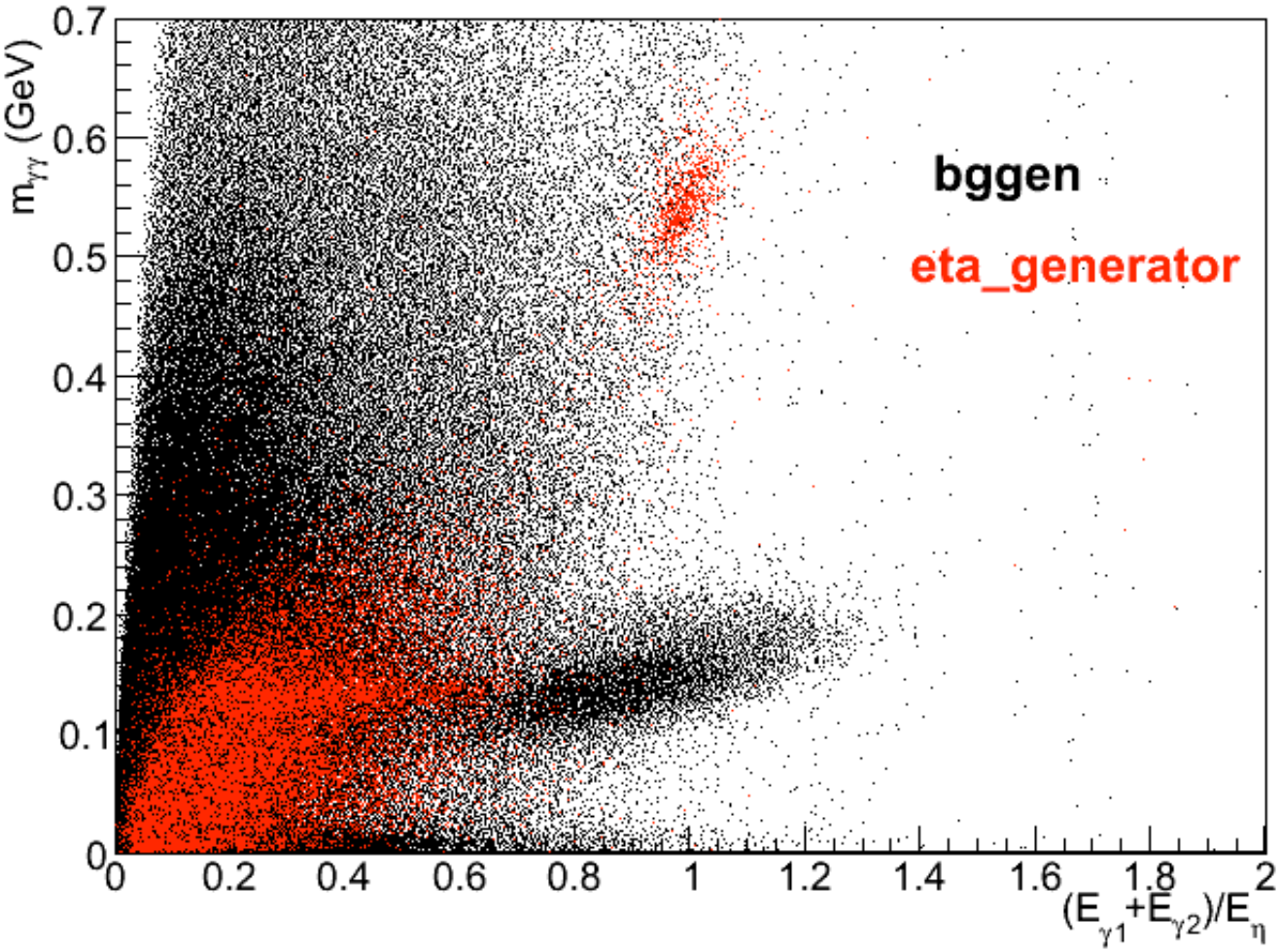




Future plans

- Re-run with higher pile up rate
- Finish accumulating statistics for backgrounds
  - EM background
  - Hadronic

Backgrounds

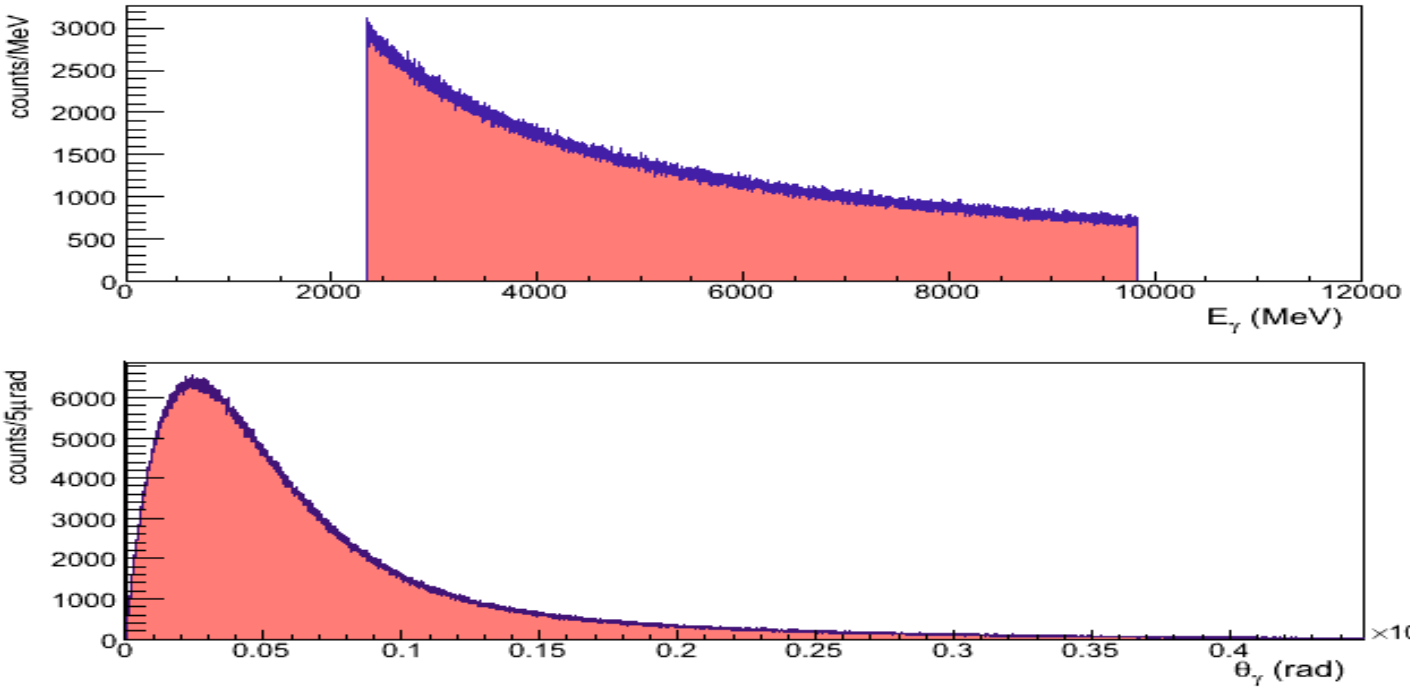


The γ p-> η p events are excluded from the bggen outupt (process type 8)

$\sigma_{\text{hadr.}} \approx 124\,\mu$ b
$\sigma_{\text{Prim.}} \approx 0.00072\,\mu$ b
$\sigma_{\text{Prim.+coh.}} \approx 0.057\,\mu$ b

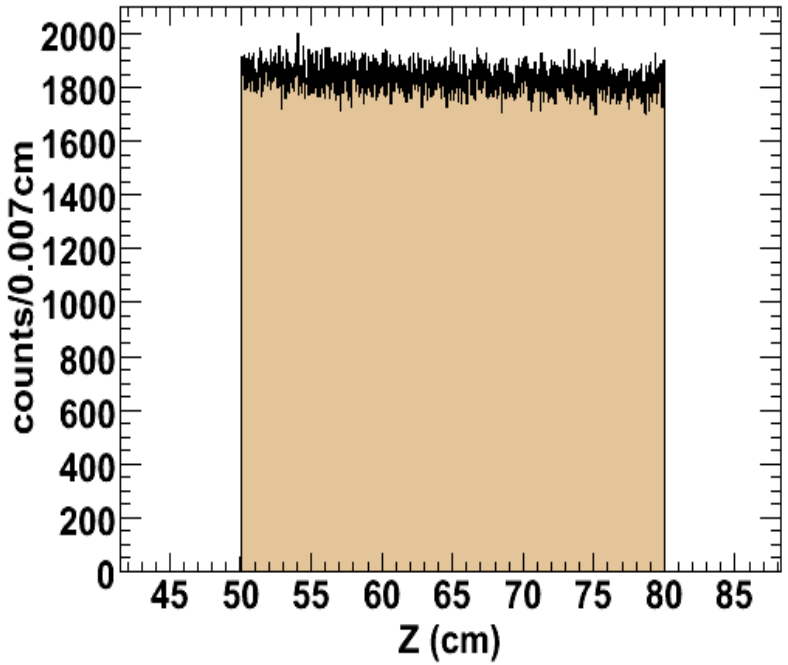
γp->ηp generator

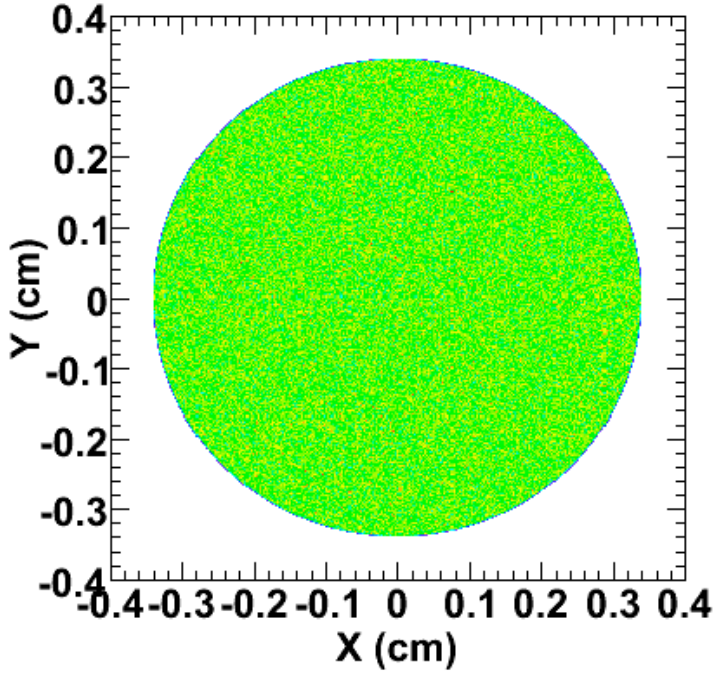
- θ_{γ} and $E\gamma$ - incoherent bremsstrahlung
- θ_{η} - theoretical cross-section
- $\left(E_{\eta}, \vec{p}_{\eta}\right)$ - kinematics
- (X, Y, Z) - in target

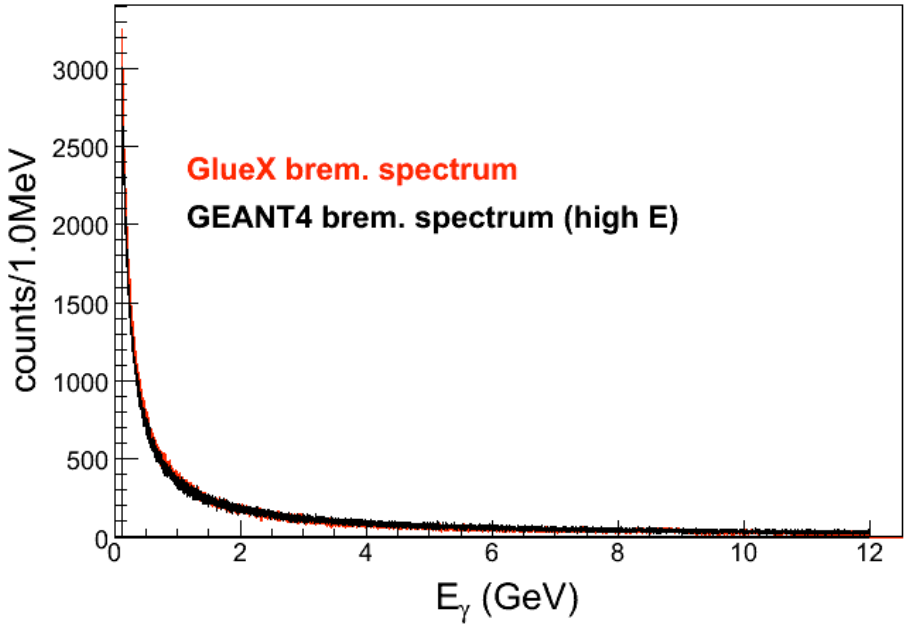


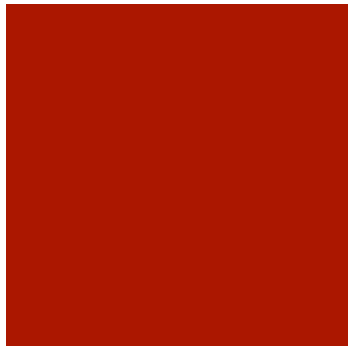
γp->ηp generator, vertex position

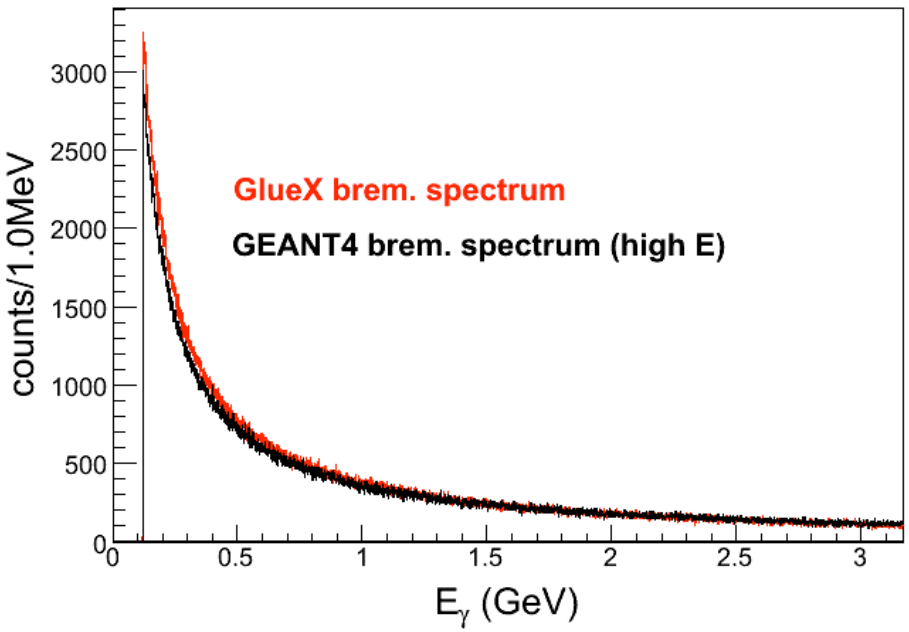
Target:
Length = 30.0 cm, or ~ 3.46% (X_0 = 866 cm)
density = 0.0708 g/cm^3 , or 1.2699x10^{24} prot./cm^2
attenuation length = 81.9672 g/cm^2 ($\sigma_{tot.\ atten.}$ = 1.22x10^{-2} cm^2/g)






GlueX brem. spectrum
GEANT4 brem. spectrum (high E)
counts/1.0MeV
E_γ (GeV)




GlueX brem. spectrum
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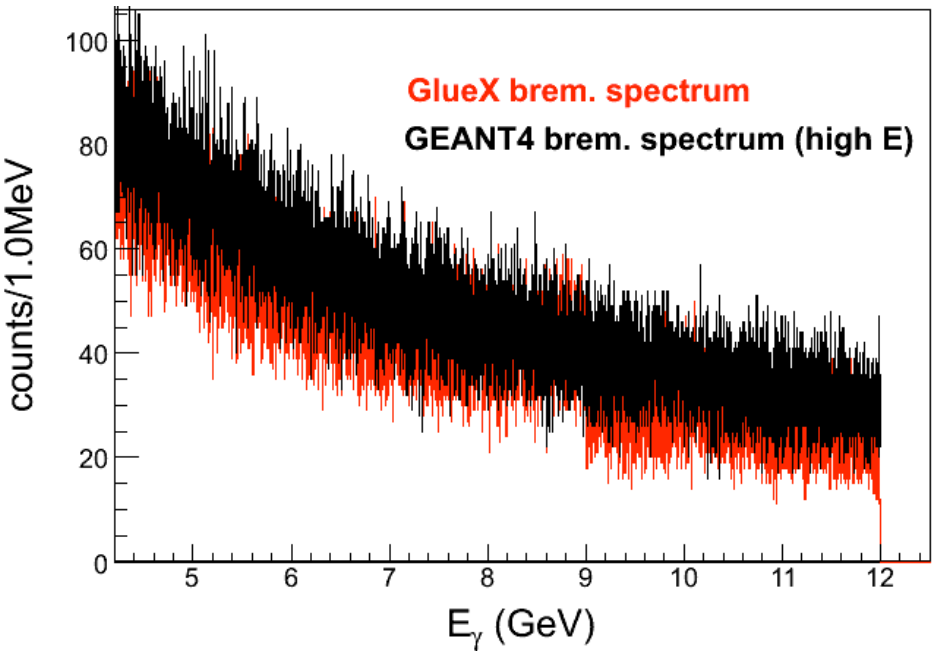
E_γ (GeV)


GlueX brem. spectrum
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counts/1.0MeV
E_γ (GeV)