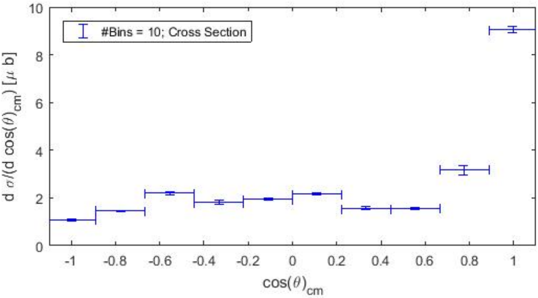
Omega Cross-Section

Martin Sobotzik

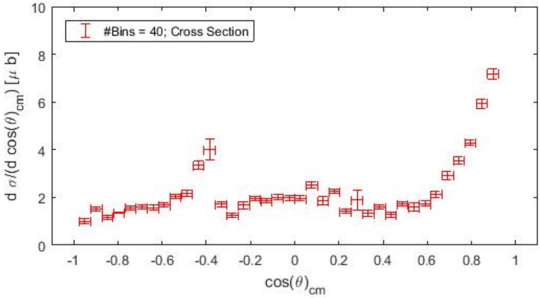
Institute for Nuclear Physics
Johannes Gutenberg University of Mainz

Mainz, March 2019



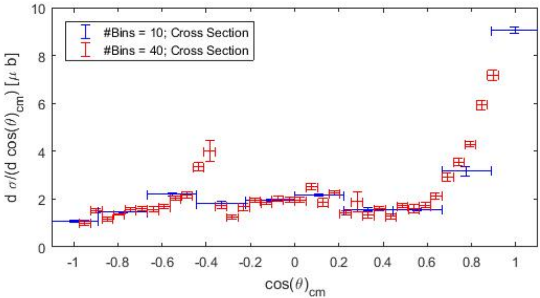
Olis Cross Section; Dip at about $\cos(\theta) = -0.3$

Increasing the Number of Bins

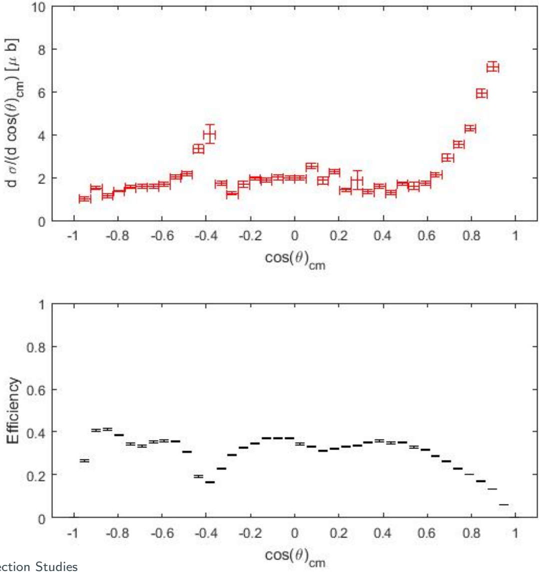


Increased number of bins to 40; now there is still a dip at $\cos(\theta) = -0.3$ but also a peak at $\cos(\theta) = -0.5$

Comparing 10 Bin to 40 Bin Cross Section



Both Cross Sections are shown.



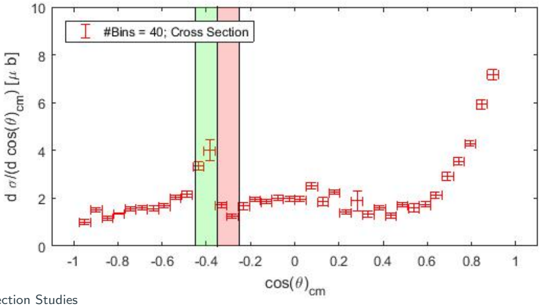
d σ/(d cos(θ)cm) [μ b]
cos(θ)cm
Efficiency
cos(θ)cm

Taking a closer Look

$$\gamma p \rightarrow \omega \; p$$
$$\hookrightarrow \gamma\pi^0$$
$$\hookrightarrow \gamma\gamma$$

Closer look at:

- ω
- Bachelor Photon
- π^0
- $\gamma\gamma$
- Proton

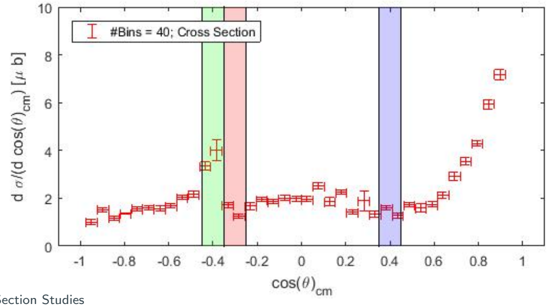


Taking a closer Look

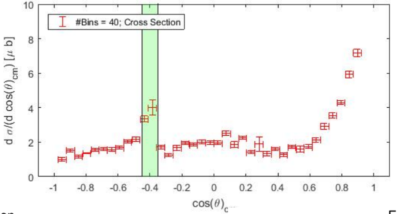
$$\gamma p \rightarrow \omega \; p$$
$$\omega \hookrightarrow \gamma\pi^0, \quad \pi^0 \hookrightarrow \gamma\gamma$$

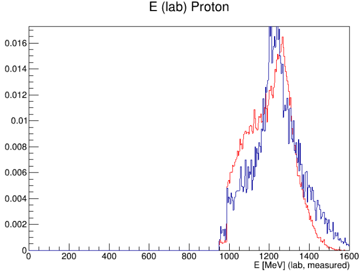
Closer look at:

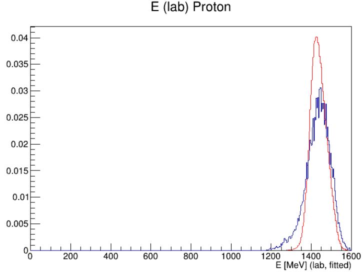
- ω
- Bachelor Photon
- π^0
- $\gamma\gamma$
- Proton



Energy of Proton for $\cos(\theta_\omega) = [-0.45, -0.35]$ (Peak)

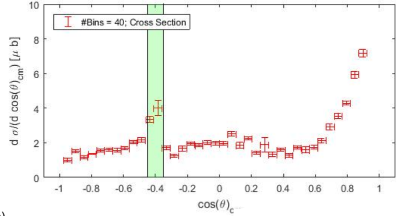


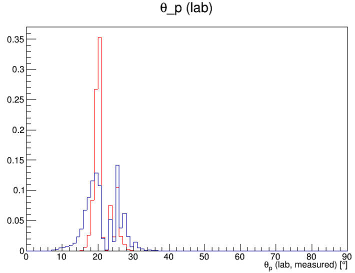


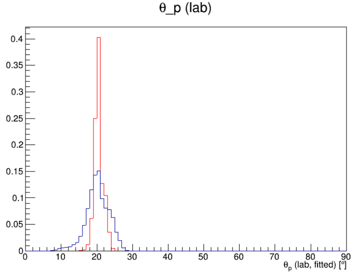


Energy of protons for $\cos(\theta\omega) = [-0.45, -0.35]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

θ of Proton for $\cos(\theta_\omega) = [-0.45, -0.35]$ (Peak)

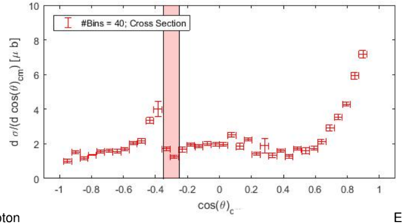


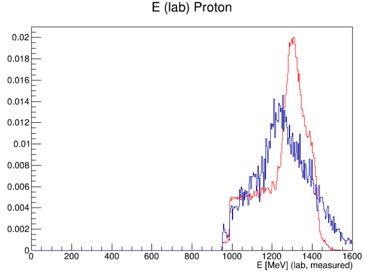


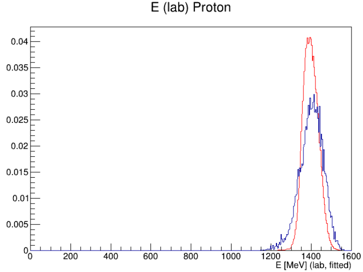


θ of protons for $\cos(\theta\omega) = [-0.45, -0.35]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

Energy of Protons for $\cos(\theta_\omega) = [-0.35, -0.25]$ (Dip)

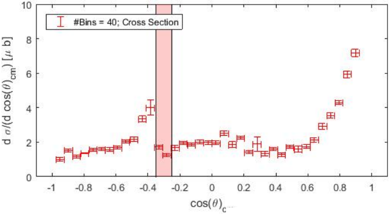


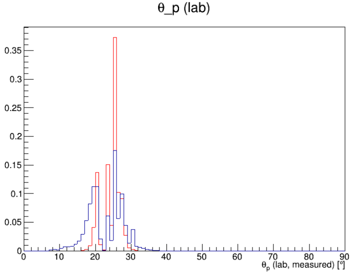


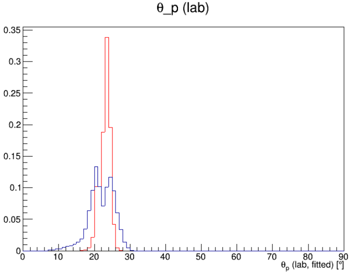


Energy of protons for $\cos(\theta\omega) = [-0.35, -0.25]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

θ of Proton for $\cos(\theta_\omega) = [-0.35, -0.25]$ (Dip)

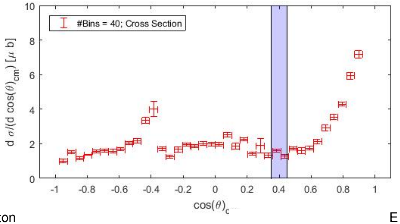


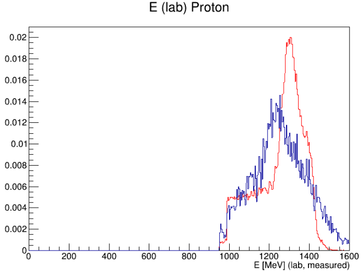


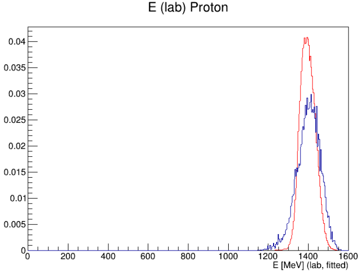


θ of protons for $\cos(\theta\omega) = [-0.35, -0.25]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

Energy of Protons for $\cos(\theta_\omega) = [0.35, 0.45]$ (Good)

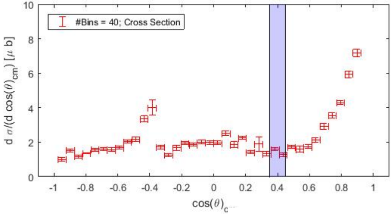


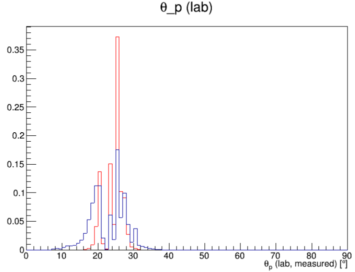


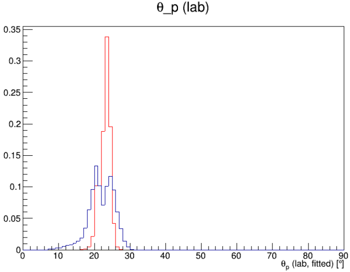


Energy of protons for $\cos(\theta\omega) = [0.35, 0.45]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

θ of Proton for $\cos(\theta_\omega) = [0.35, 0.45]$ (Good)

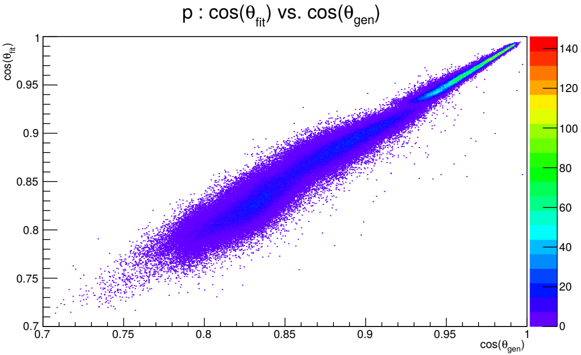






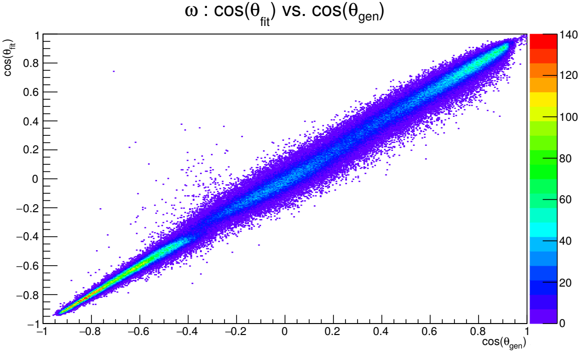
θ of protons for $\cos(\theta\omega) = [0.35, 0.45]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

Proton: θ_{fit} vs. θ_{gen}



$\cos(\theta_{fit})$ vs. $\cos(\theta_{gen})$ for all protons.

ω: θ_{fit} vs. θ_{gen}



$\cos(\theta_{fit})$ vs. $\cos(\theta_{gen})$ for all ω.

Unfolding

Motivation

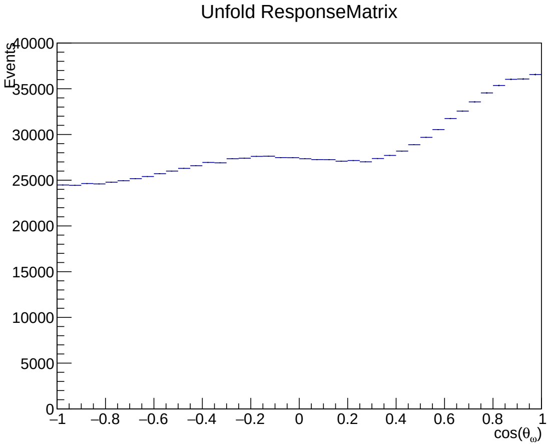
- μ is the *true* distribution given by nature
- detector effects are then described by the response function R. (inefficiencies, bias and smearing)
- This results in the distribution ν.

$$\nu_i = \sum_{j=1}^{M} R_{ij}\mu_j$$

- With infinite statistics, it would be possible to recover the original distribution by inverting the response matrix

$$\mu = R^{-1}\nu$$

Flat ω; Folded MC Data



Flat ω was used. MC fitted data were unfolded.

Conclusion