Omega Cross-Section

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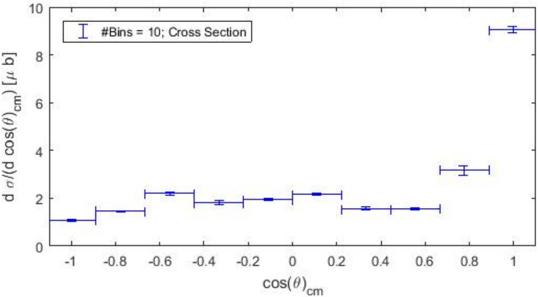
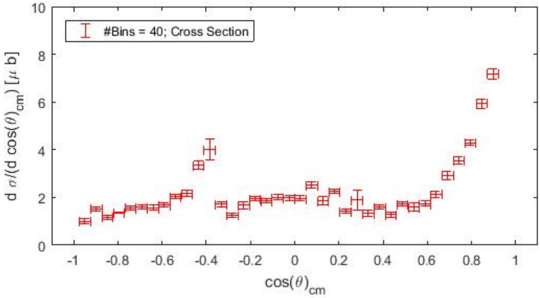
Starting Point



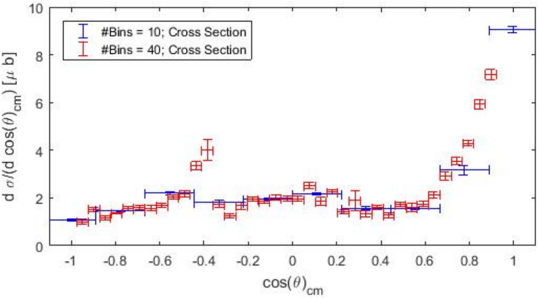
Olis Cross Section; Dip at about $\cos(\theta) = -0.3$

Increasing the Number of Bins



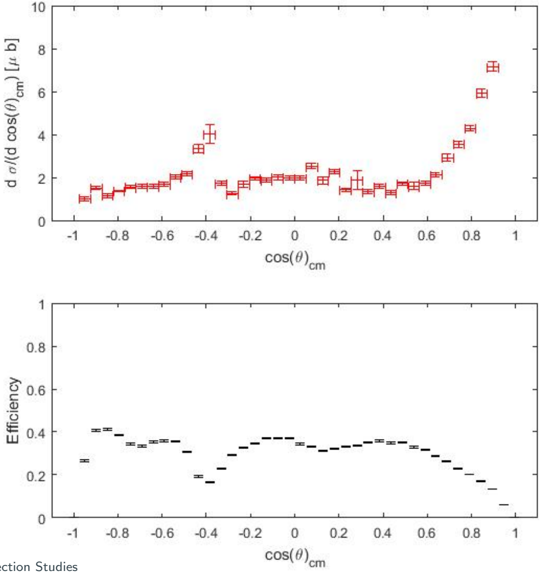
Increased number of bins to 40; now there is still a dip at $\cos(\theta) = -0.3$ but also a peak at $\cos(\theta) = -0.5$

Comparing 10 Bin to 40 Bin Cross Section



Both Cross Sections are shown.

Efficiency

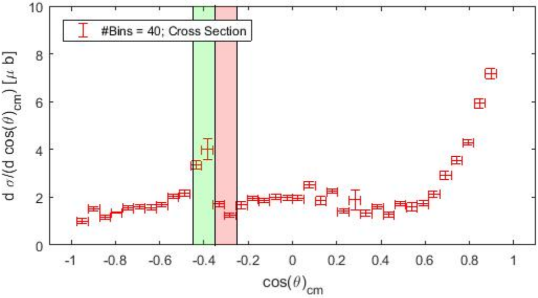


d σ/(d cos(θ)cm) [μ b]
10
8
6
4
2
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
cos(θ)cm
Efficiency
1
0.8
0.6
0.4
0.2
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
cos(θ)cm

Taking a closer Look

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

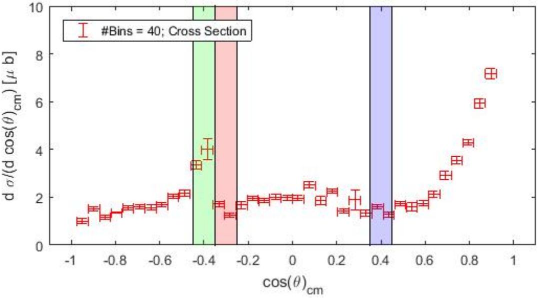
There is a 1:1 correlation between the polar angle of p and ω for fixed $E(\gamma)$!



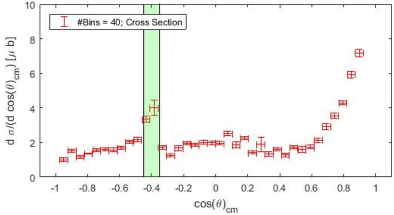
Taking a closer Look

$$\gamma p \rightarrow \underset{\hookrightarrow \ \gamma\pi^0 \ \hookrightarrow \gamma\gamma}{\omega} \quad p$$

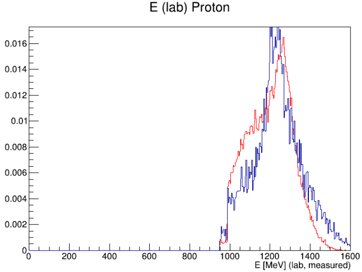
There is a 1:1 correlation between the polar angle of p and ω for fixed $E(\gamma)$!

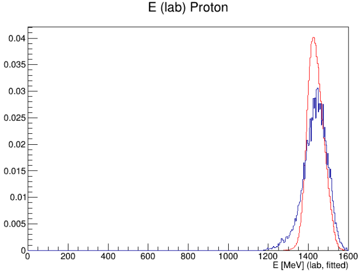


Energy of Proton for $\cos(\theta_\omega) = [-0.45, -0.35]$ (Peak)

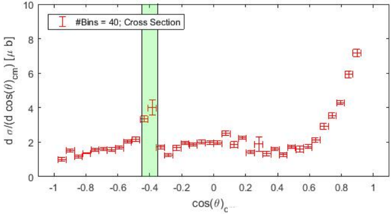


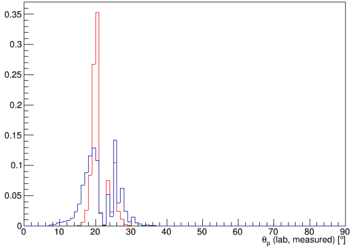
The energy of protons looks similar for MC and Data

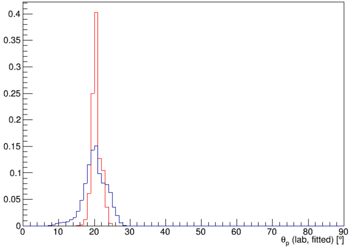




Energy of protons for $\cos(\theta_\omega) = [-0.45, -0.35]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

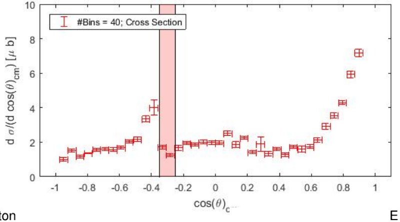


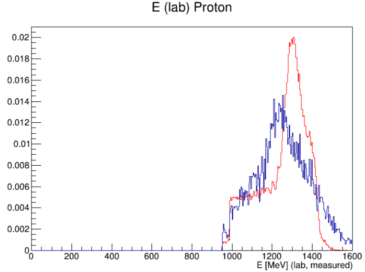


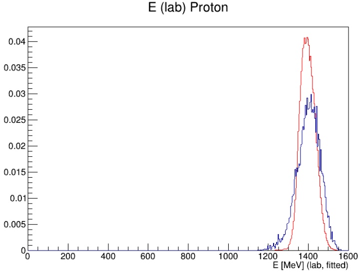


θ of protons for $\cos(\theta_\omega) = [-0.45, -0.35]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

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

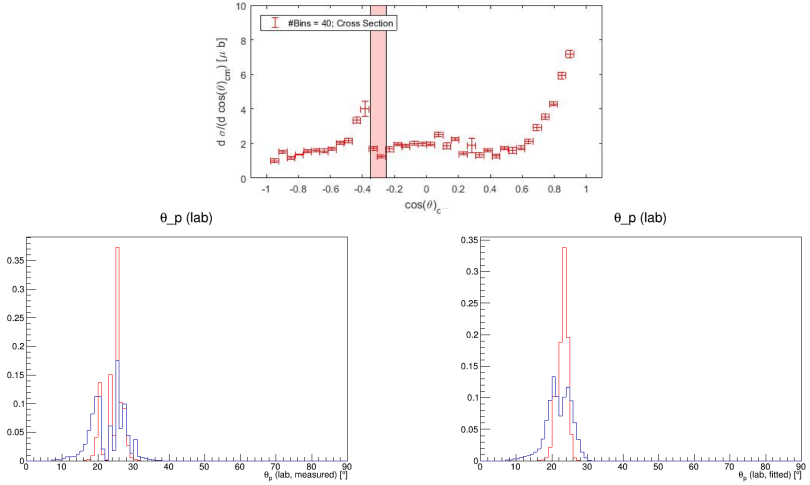






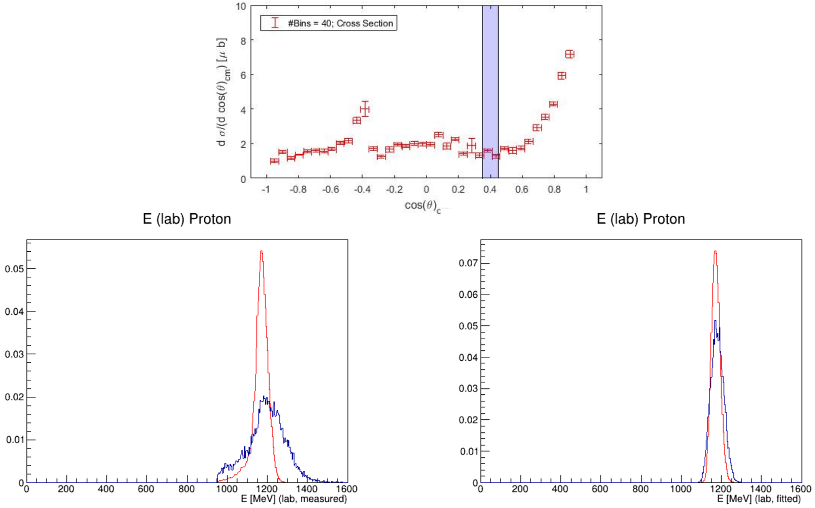
Energy of protons for $\cos(\theta_\omega) = [-0.35, -0.25]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

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



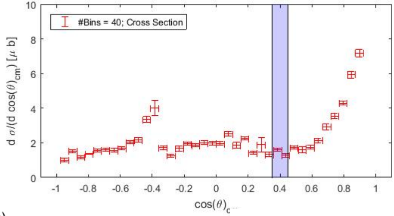
θ of protons for $\cos(\theta_\omega) = [-0.35, -0.25]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

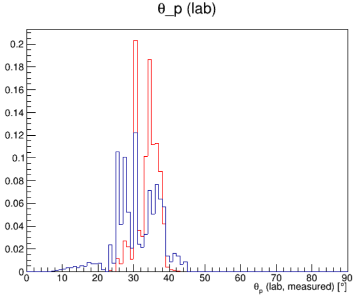
Energy of Protons for $\cos(\theta_\omega) = [0.35, 0.45]$ (Good)

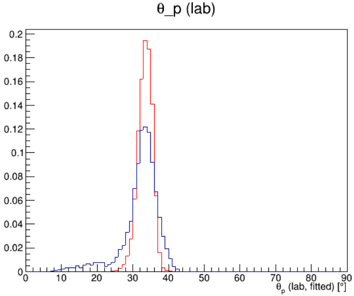


Energy of protons for $\cos(\theta_\omega) = [0.35, 0.45]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

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

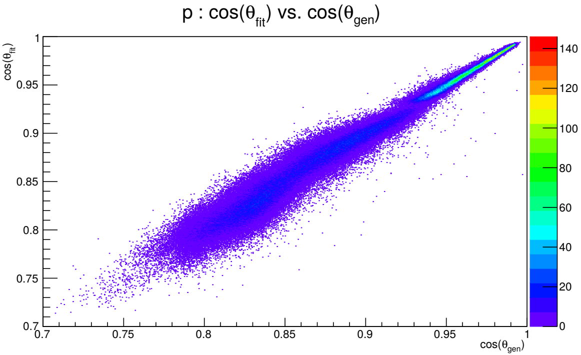






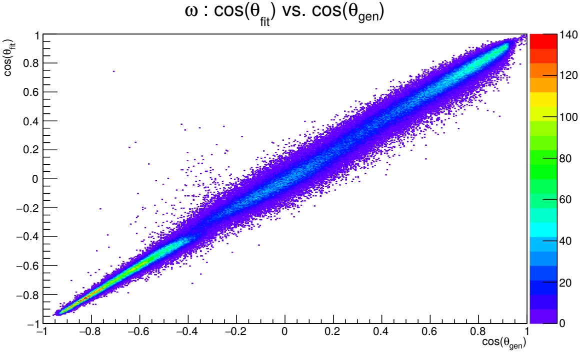
θ of protons for $\cos(\theta_\omega) = [0.35, 0.45]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

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

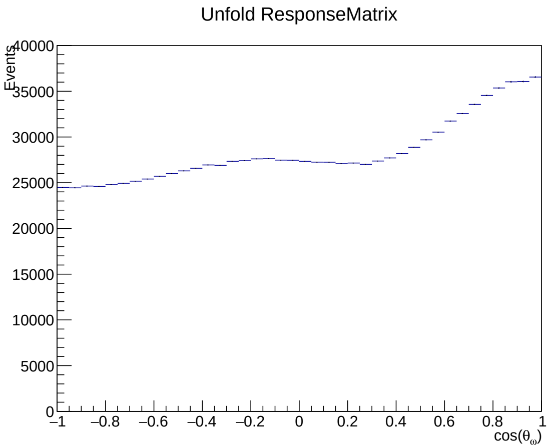
- μ is the *true* distribution given by nature
- detector effects are then described by the response function R. (inefficiencies, bias and smearing)
- This results in the distribution ν.

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

- 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

- Drop in the measured cross section at $\cos(\theta_\omega) \approx -0.35$ is caused by an inefficiency at that region
- Inefficiency is caused by the protons hitting the edge of the CB
- There are differences between MC and Data; Even after KFit
- The differences are too big to make the Unfolding work