Omega Cross-Section

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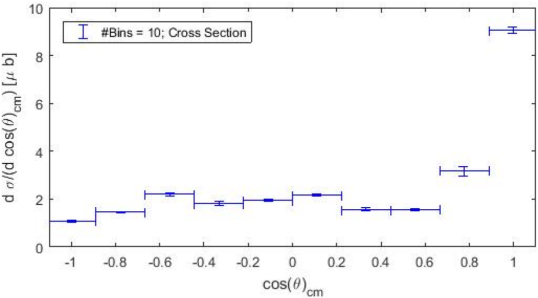
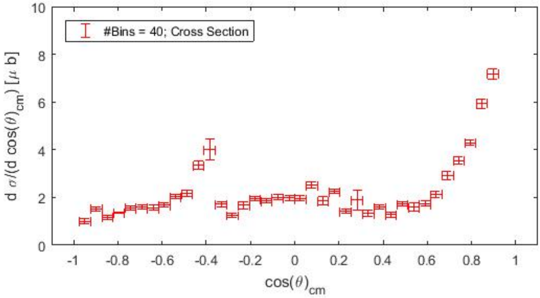
Starting Point

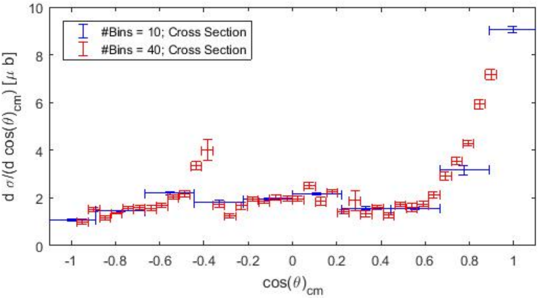


Olis Cross Section; Dip at about $\cos(\theta) = -0.3$

Increasing the Number of Bins

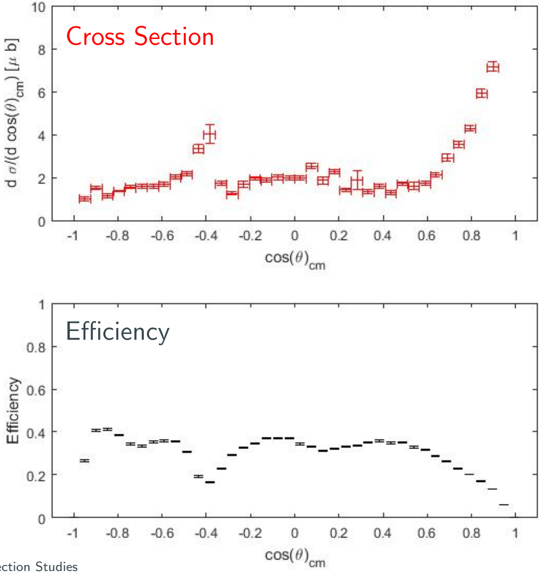


Increased number of bins to 40; now there is still a dip at $\cos(\theta) = -0.3$ but also a peak at $\cos(\theta) = -0.4$



Both Cross Sections are shown.

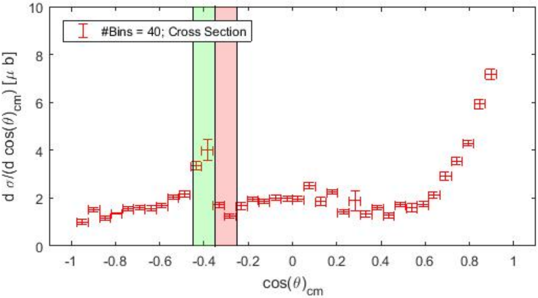
Efficiency



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

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

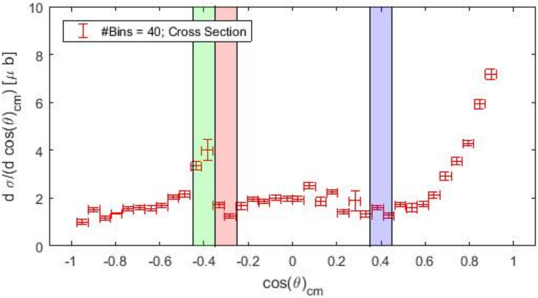
There is a 1:1 correlation between the polar angle of p and ω for fixed $E(\gamma)$!



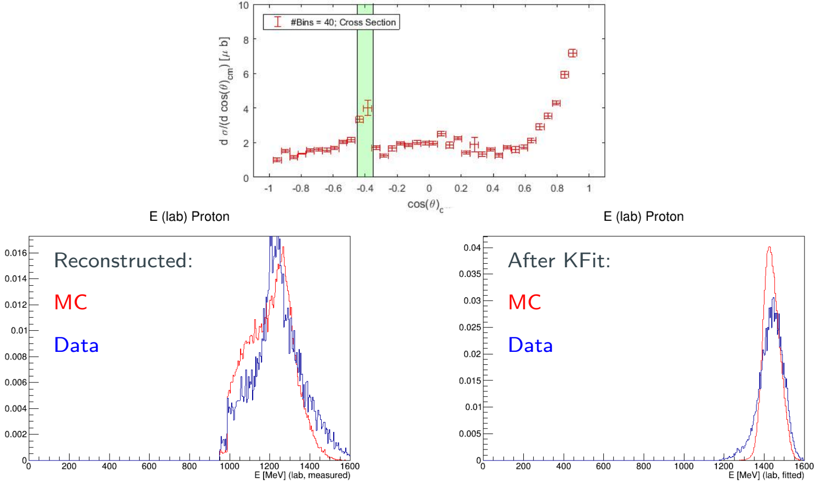
Taking a closer look

$$\gamma p \rightarrow \omega \qquad p$$
$$\hookrightarrow \gamma\pi^0$$
$$\hookrightarrow_{\gamma\gamma}$$

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

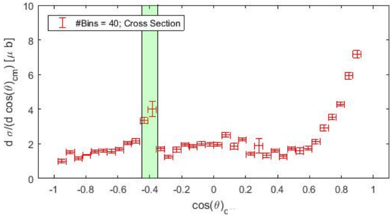


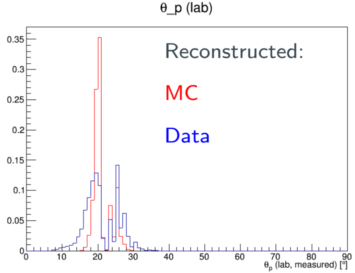
Energy of Proton for $\cos(\theta_\omega) = [-0.45, -0.35]$ (Peak)

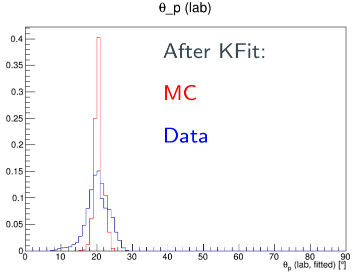


Energy of protons for $\cos(\theta_\omega) = [-0.45, -0.35]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

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







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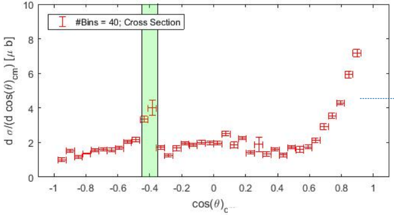

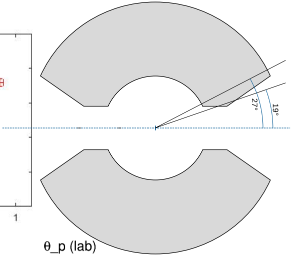

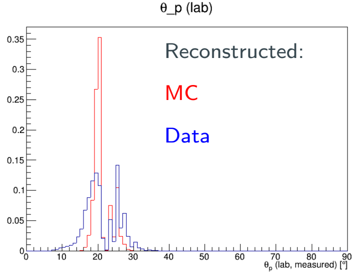

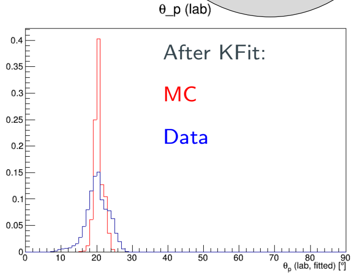

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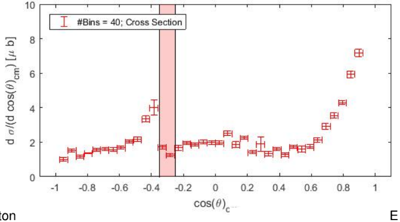
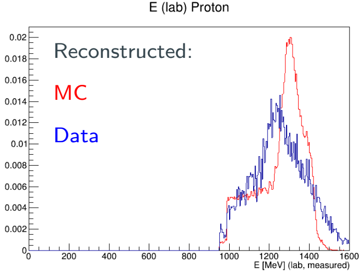
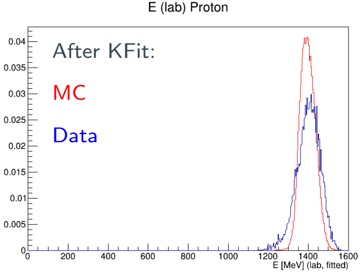
Energy of protons for $\cos(\theta_\omega) = [-0.35, -0.25]$ (Dip)







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.

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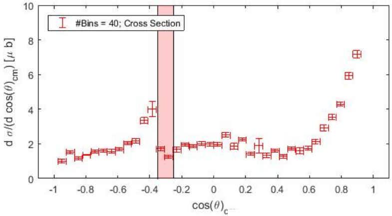
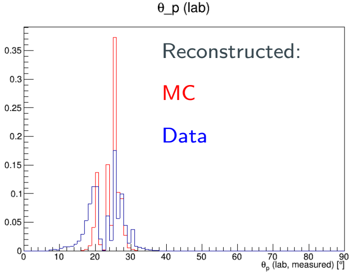
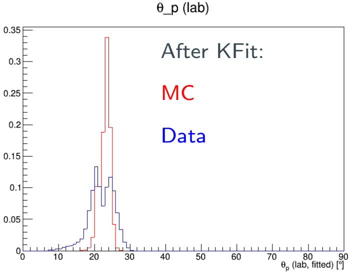
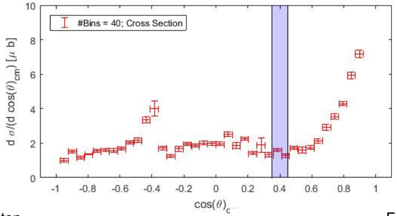


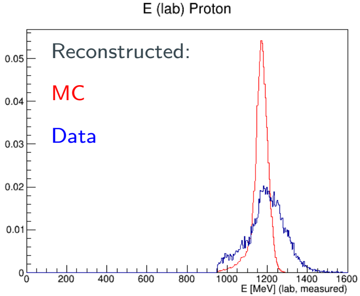


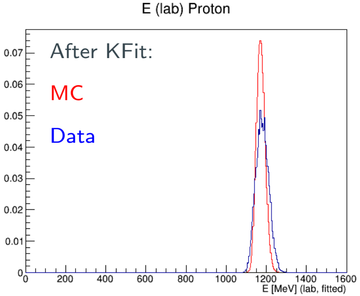


θ of protons for $\cos(\theta_\omega) = [-0.35, -0.25]$. Red are MC and blue are beamtime data. Left side is just measured, right side is after KFit.

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







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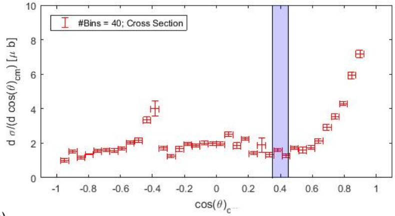

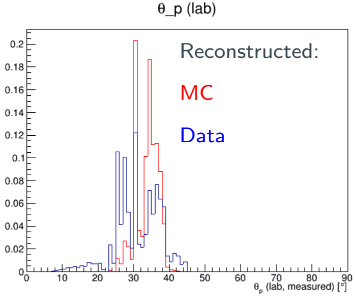

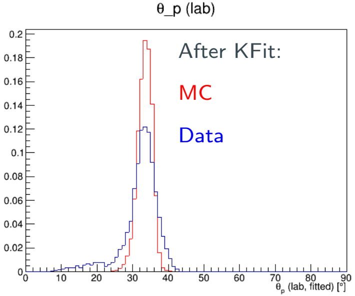

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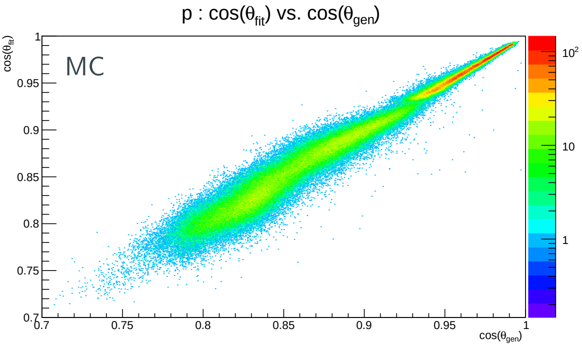
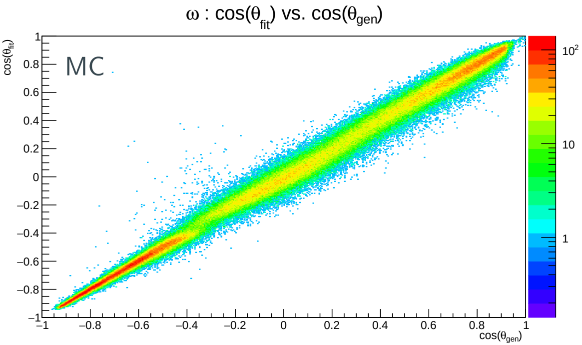
Proton: θ_{fit} vs. θ_{gen}



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

ω: θ_{fit} vs. θ_{gen}



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

Unfolding

Motivation

- μ is the true distribution given by nature
- detector effects are then described by the migration matrix R (inefficiencies, bias and smearing)
- This results in the measured distribution ν

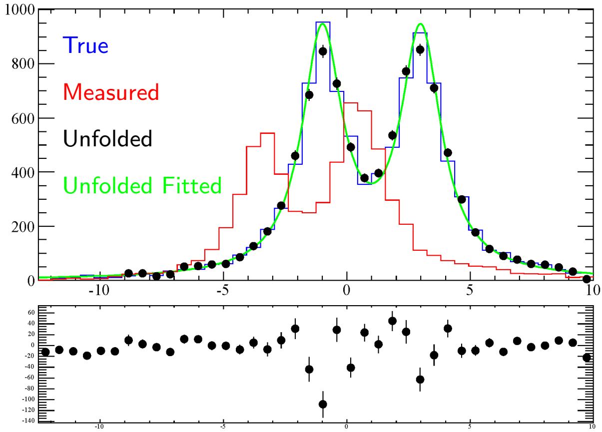
$$\nu_i = \sum_{j=1}^{M} R_{ij}\mu_j$$

- True distribution can be calculated by inverting the migration matrix R

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

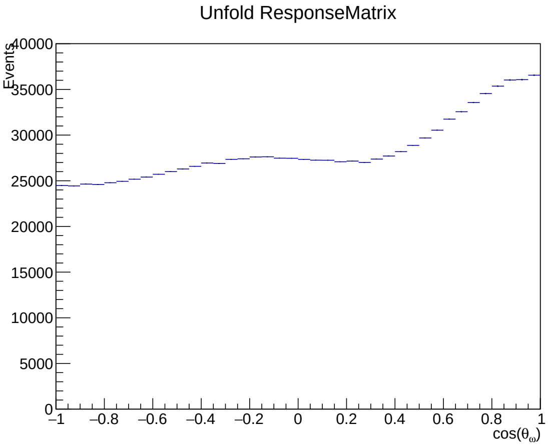
- Use numerical methods to invert the migration matrix

Unfold Example



Example for Unfolding. Blue is true distribution. Red is measured distribution. Black Dots are the unfolded distribution. Green is the fit of the unfolded distribution

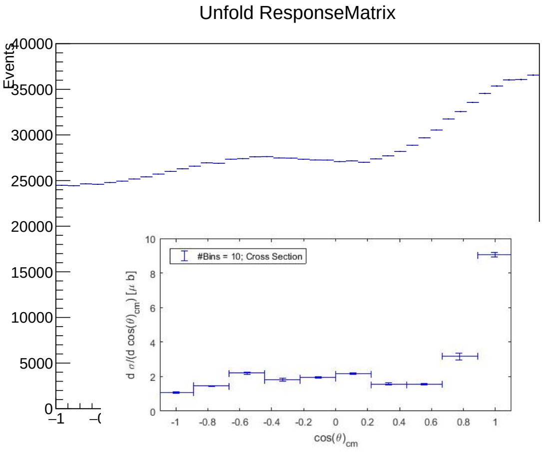
Flat ω; Folded MC Data



- A migration matrix is calculated with a flat ω phase space
- This migration matrix is than used to unfold realistic MC
- $\rightarrow$ Unfolding was unsuccessful

Flat ω was used. MC fitted data were unfolded.

Flat ω; Folded MC Data



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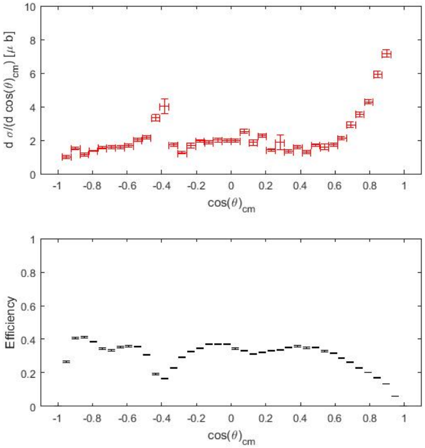
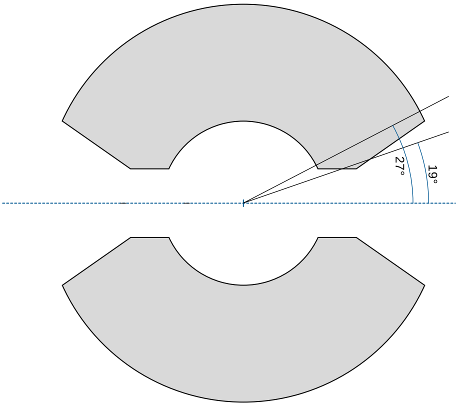
Conclusion

- Drop in the measured cross section at $\cos(\theta_\omega) \approx -0.35$ is caused by a drop in the efficiency



Conclusion

- Drop in the measured cross section at $\cos(\theta_\omega) \approx -0.35$ is caused by a drop in the efficiency
- Inefficiency is caused by the protons hitting the edge of the CB
  $\rightarrow$ They are not reconstructed properly



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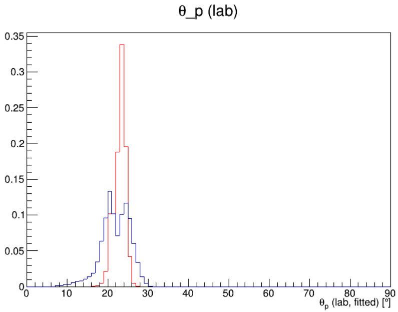
- Drop in the measured cross section at $\cos(\theta_\omega) \approx -0.35$ is caused by a drop in the efficiency
- Inefficiency is caused by the protons hitting the edge of the CB $\rightarrow$ They are not reconstructed properly
- There are differences between MC and data



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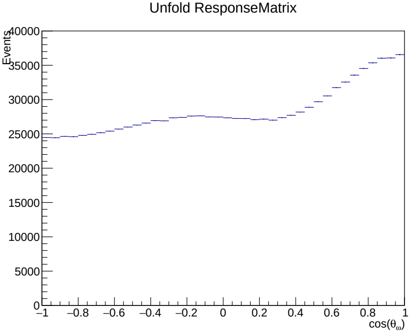
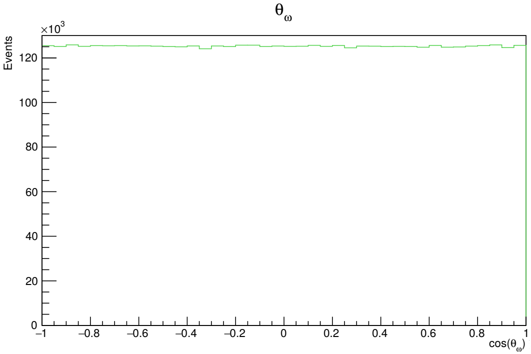
- Inefficiency is caused by the protons hitting the edge of the CB
  $\rightarrow$ They are not reconstructed properly
- There are differences between MC and data
- Unfolding does not work





Flat generated ω