

# Omega Cross-Section

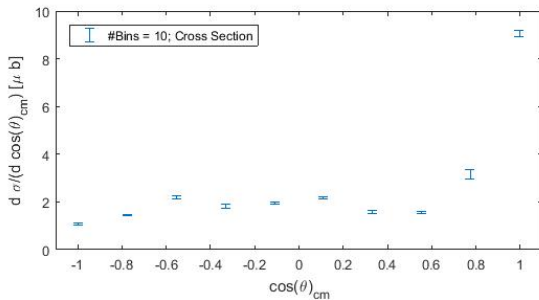
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Martin Sobotzik

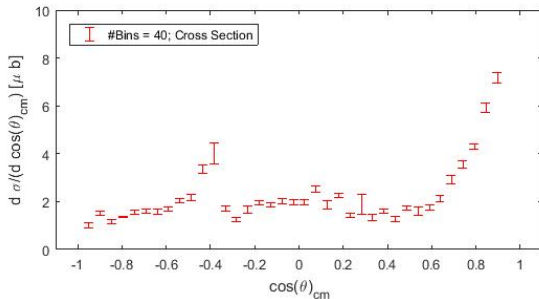
Mainz, March 2019

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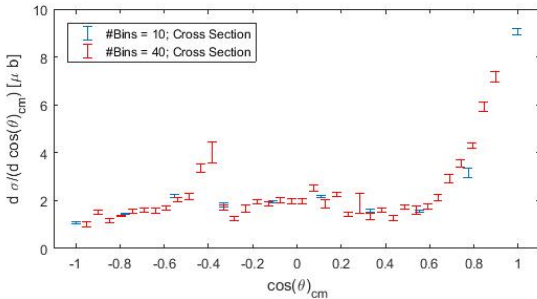




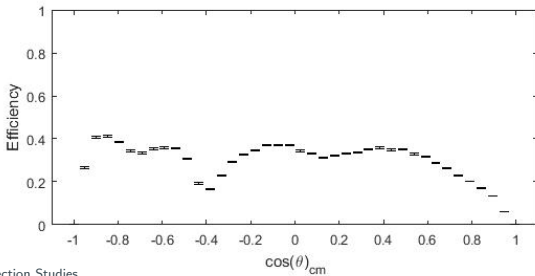
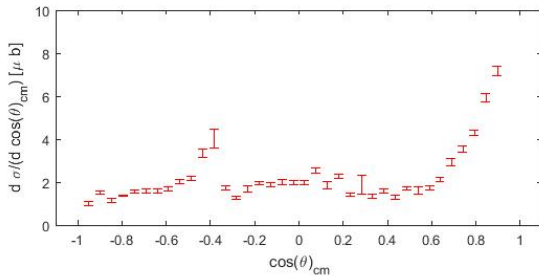
**Figure 1:** Olis Cross Section; Dip at about  $\cos(\theta) = -0.3$



**Figure 2:** Increased number of bins to 40; now there is still a dip at  $\cos(\theta) = -0.3$  but also a peak at  $\cos(\theta) = -0.5$



**Figure 3:** Both Cross Sections are shown.

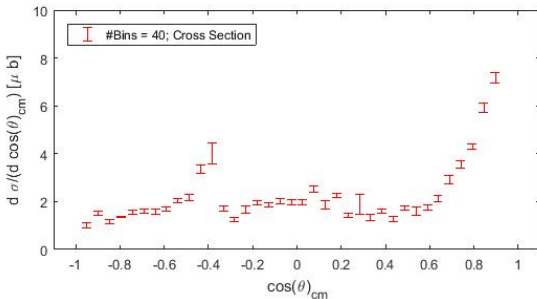


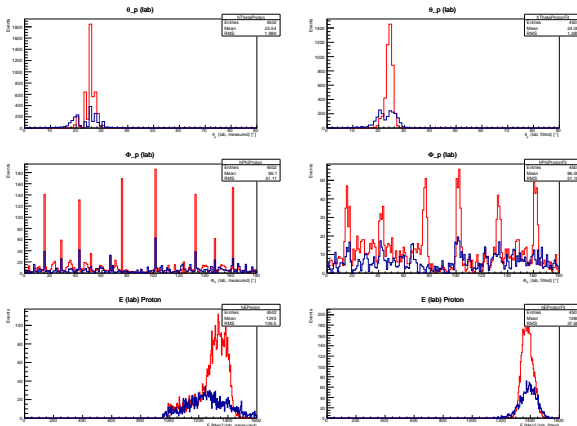
$$\omega \rightarrow \gamma \pi^0$$

$\downarrow$   
 $\gamma\gamma$

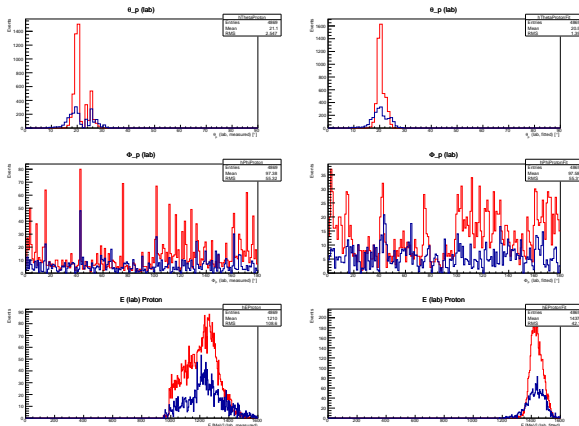
Closer look at:

- $\omega$
- $\pi^0$
- Proton
- Bachelor Photon
- $\gamma\gamma$



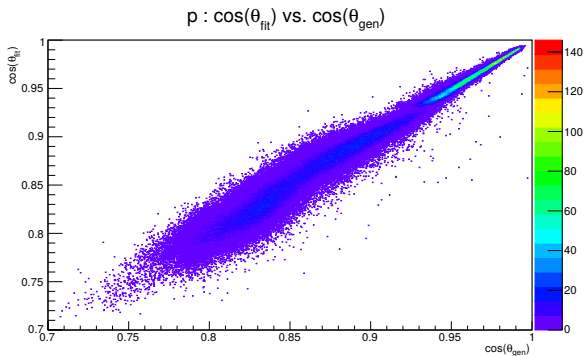


**Figure 5:** Red: MC; Blue Beamtime Data; Protons for  $\cos(\theta_\omega) = [-0.35, -0.25]$ ; Right Side are fitted data



**Figure 6:** Red: MC; Blue Beamtime Data; Protons for  $\cos(\theta_\omega) = [-0.45, -0.35]$ ; Right Side are fitted data





**Figure 7:**  $\cos(\theta_{fit})$  vs.  $\cos(\theta_{gen})$  for all protons.

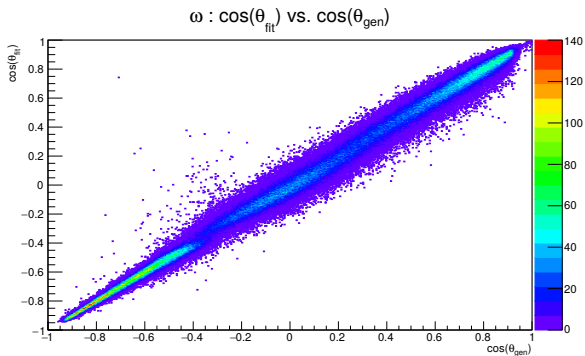


Figure 8:  $\cos(\theta_{fit})$  vs.  $\cos(\theta_{gen})$  for all  $\omega$ .

# Unfolding



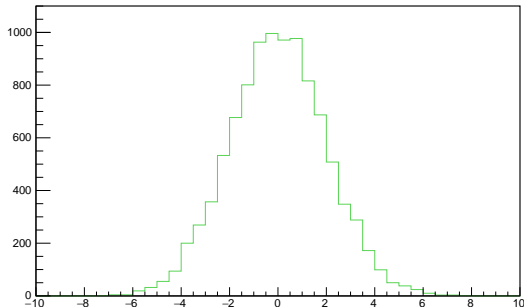
- $\mu$  is the *true* distribution given by nature
- detector effects are then described by the response function  $R$ .  
(inefficiencies, bias and smearing)
- This results in the distribution  $\nu$ .

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

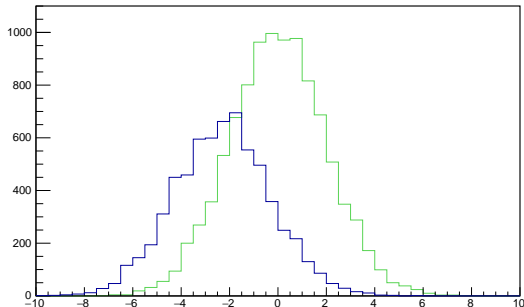
- With infinite statistics, it would be possible to recover the original distribution by inverting the response matrix

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

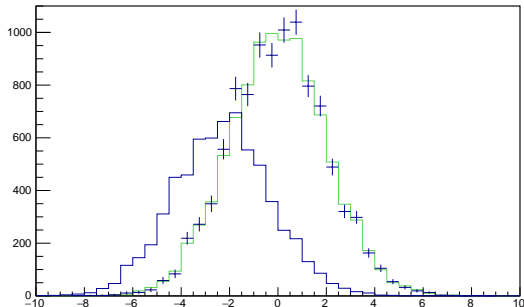
- Using MC we can train the unfolding algorithm
- Create a 2D-Hist with  $\cos(\theta_\omega)$  of all generated and all reconstructed  $\omega$  ( $\omega$  which are generated but not reconstructed are label *miss*)
- Then we can solve for  $\mu$  iteratively



**Figure 9:** Example for a working Unfolding Algorithm



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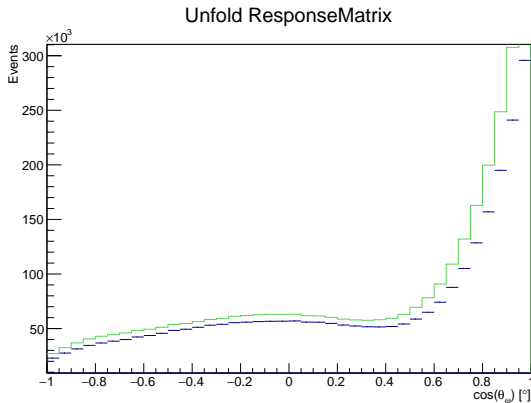
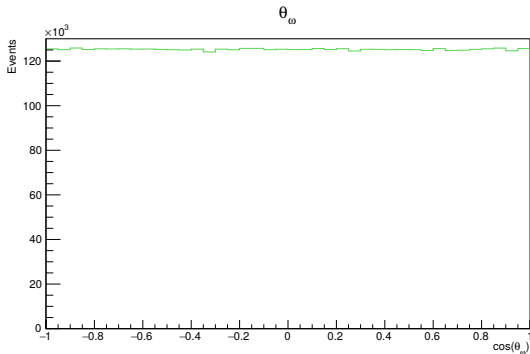
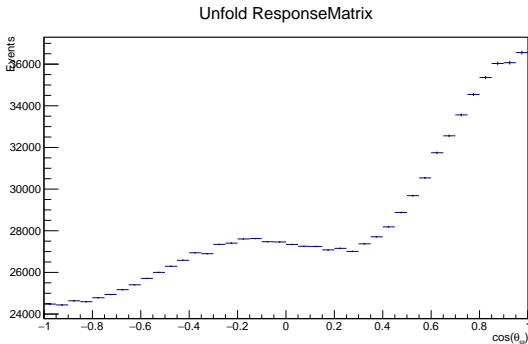


Figure 10: Folded; same cuts



**Figure 11:** Distribution of the  $\omega$  in center of mass frame



**Figure 12:** Flat  $\omega$  was used. MC fitted data were folded.