High Resolution

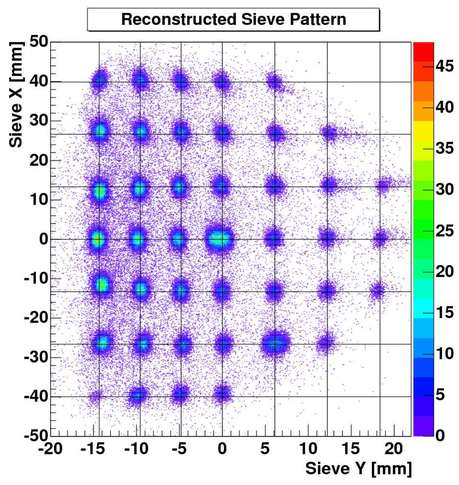
Optics Matrix

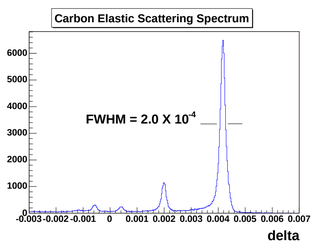
The Optics Matrix connects the detector variables (Focal Plane) and target variables. Typically it can be expressed a set of tensors D_{ijkl},T_{ijkl},Y_{ijkl},P_{ijkl} and the transform is

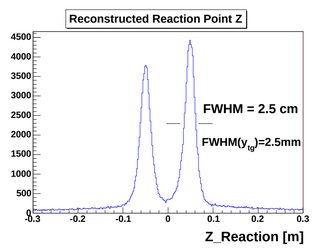
$$\begin{aligned}
\delta_{tg} &= \sum_{i,j,k,l} D_{ijkl}\ x_{fp}^{i}\ \theta_{fp}^{j}\ y_{fp}^{k}\ \phi_{fp}^{l} \\
\theta_{tg} &= \sum_{i,j,k,l} T_{ijkl}\ x_{fp}^{i}\ \theta_{fp}^{j}\ y_{fp}^{k}\ \phi_{fp}^{l} \\
y_{tg} &= \sum_{i,j,k,l} Y_{ijkl}\ x_{fp}^{i}\ \theta_{fp}^{j}\ y_{fp}^{k}\ \phi_{fp}^{l} \\
\phi_{tg} &= \sum_{i,j,k,l} P_{ijkl}\ x_{fp}^{i}\ \theta_{fp}^{j}\ y_{fp}^{k}\ \phi_{fp}^{l}
\end{aligned}$$

Matrix Optimization

To optimized the matrix, elastic scattering data from Carbon and Oxygen targets were used and two sieves in the way of scattered electrons gave us accurate information for angles.



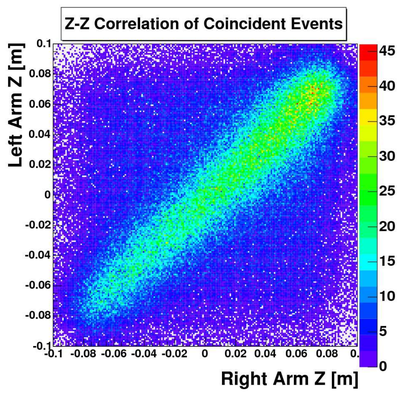




Resolution Obtained (FWHM)

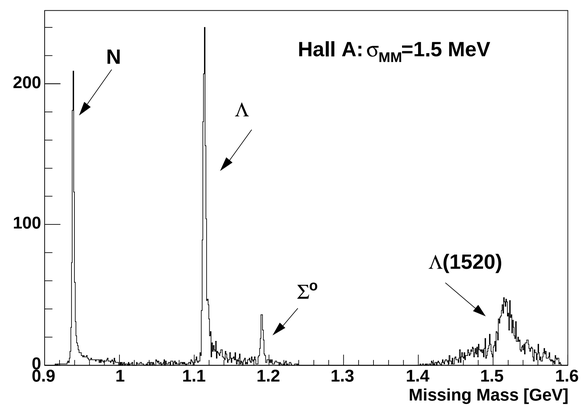
Angle	θ_{tg}	$1.5\ mrad$
	ϕ_{tg}	$4.0\ mrad$
Reaction Point	$Z(6^{\circ})$	$2.5\ cm$
	y_{tg}	$2.5\ mm$
Momentum	δ_{tg}	$2.0 \cdot 10^{-4}$

Interaction Point Correlation



In this experiment, the use of an extended 15 cm LH2 target with reaction point coincidence allows us to reduce accidental background by a factor of 2.

Missing Mass Calibration



A missing mass calibration was performed at the beginning of the experiment using Neutron, $\Lambda^{\circ}(1116)$, $\Sigma^{\circ}(1193)$, and $\Lambda^{\circ}(1520)$. Note that the plot is arbitrarily combined from different kinematic settings, and one setting can only cover around 150 MeV missing mass range, so the scale is meaningless.