Field Off Scattering Studies: Current Status

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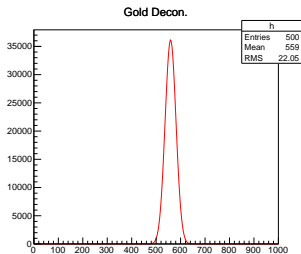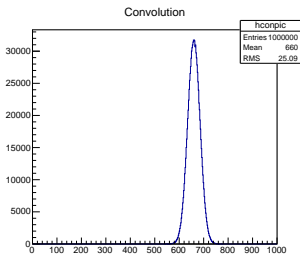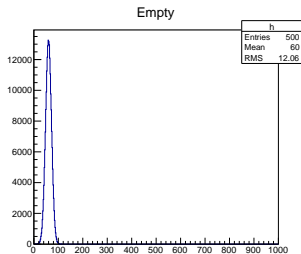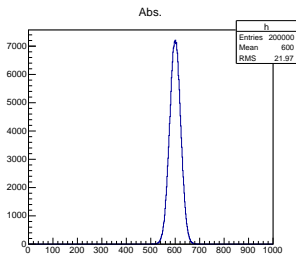
22/2/2019

Job List

- Develop toy model of deconvolution
  - Fill two random gaussian distributions
  - Convolve distributions
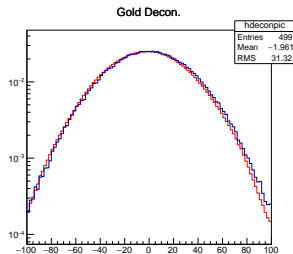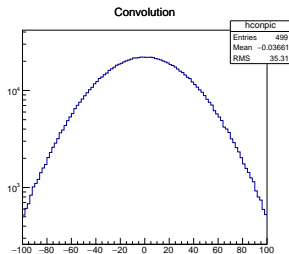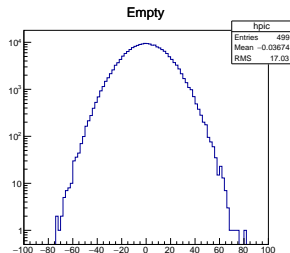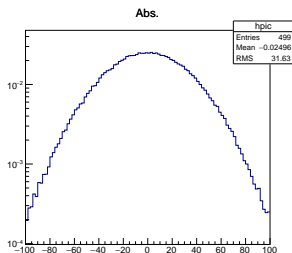 - Deconvolve - test against original
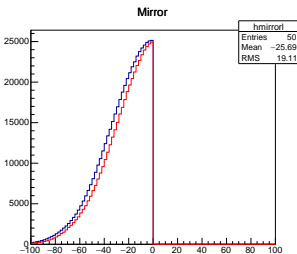
Gold simple

Expects a spectrum

Gold MICE example

- Output is simply an array of values
- Create "scattering-like" distributions
- Read array and place array at origin using arbitrary offset
- The is the way in which the deconvolution was originally implemented in the analysis

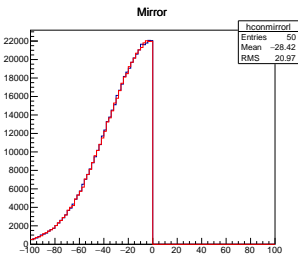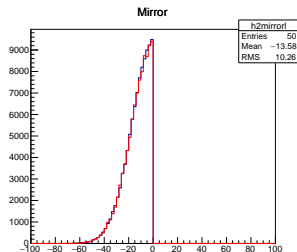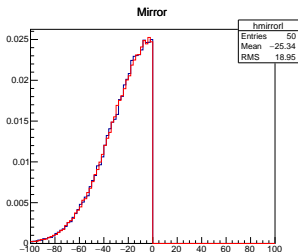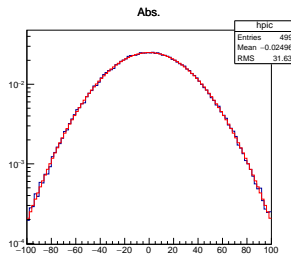# Gold MICE example

Gold MICE example - mirror

Gold symmetric example

- Output is simply an array of values
- Create "scattering-like" distributions
- Read array and place array at origin using arbitrary offset
- The is the way in which the deconvolution is implemented in the Note currently
- Force solution to be symmetric - not entirely statisfactory solution

Gold symmetric example
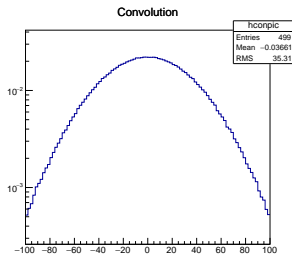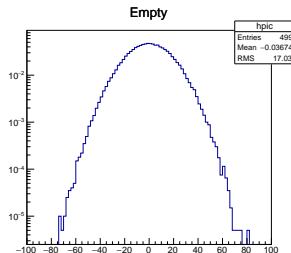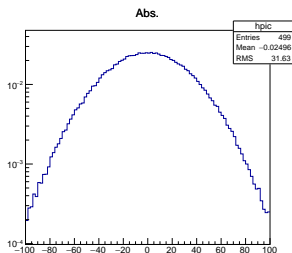
Gold symmetric example - mirror

Gold symmetric example - mirror
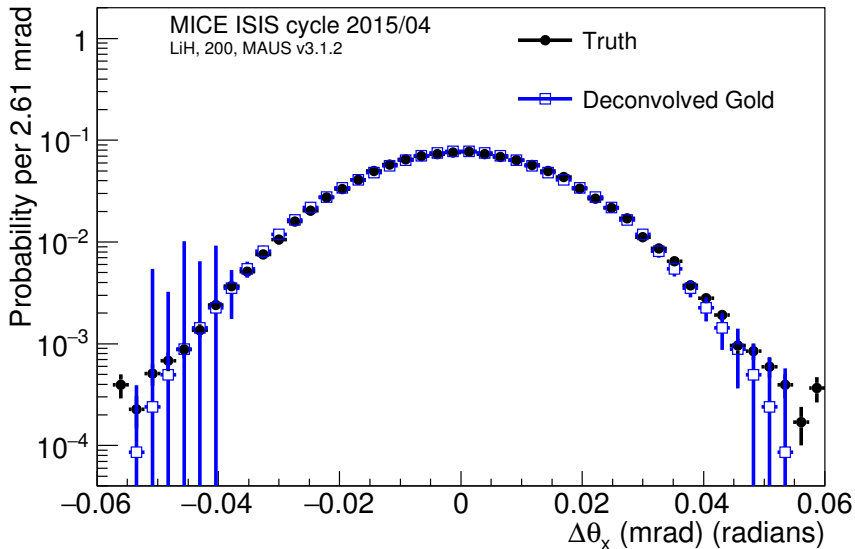
Gold calculate mean example

- Output is simply an array of values
- Create "scattering-like" distributions
- Read array and place array at origin using mean of deconvolved distribution
- The is the way in which the deconvolution is implemented in the analysis
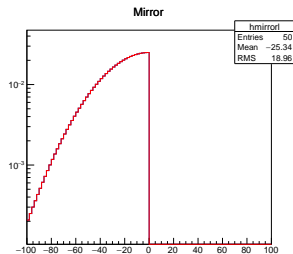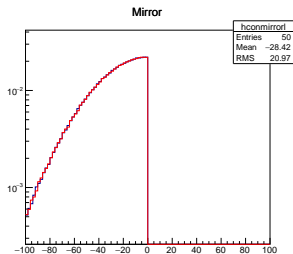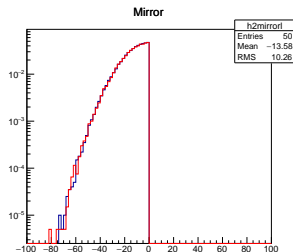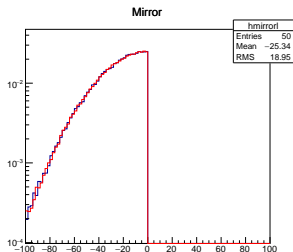- Find mean of distribution in spectrum output and read distribution from there

Gold calculate mean example
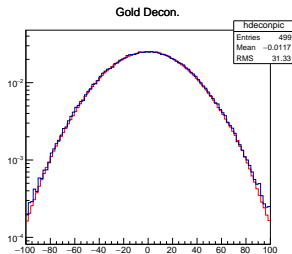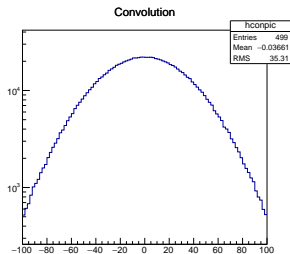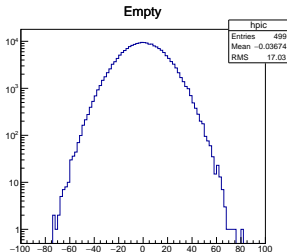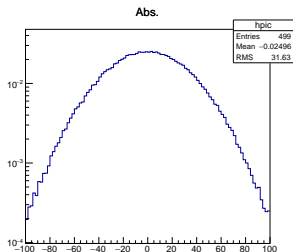
Gold calculate mean example - mirror
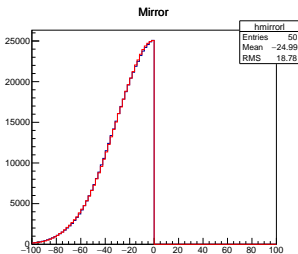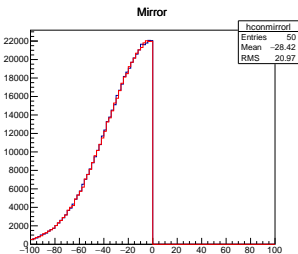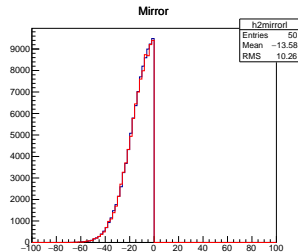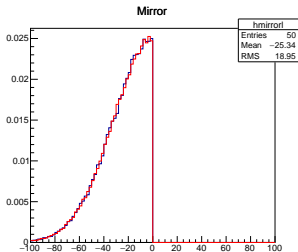
Θ as a Function of Momentum

- Scan across the entire momentum range and measure scattering in both projections in each bin
- Fit is made for $a = \sqrt{\frac{z}{X_0}}(1 + 0.038\ln\frac{z}{X_0})$

Job List

- Review of Note on Monday
- Implement Gold for θ^2_{Scatt}

Track Acceptance

Selection

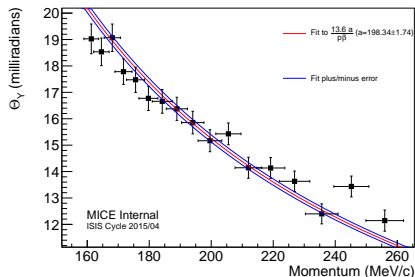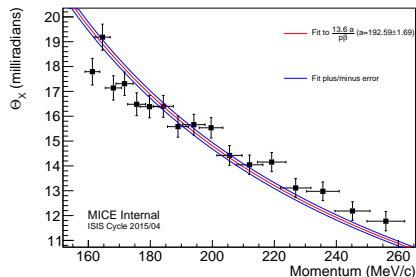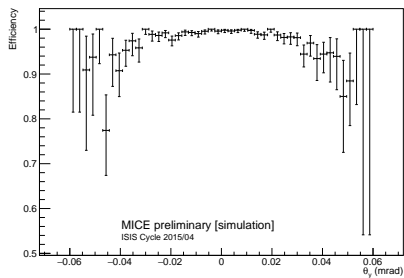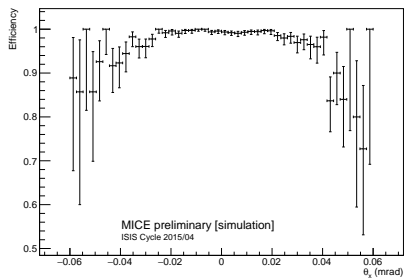| Selection	Description	μ Beams, LiH abs.		
		172	200	240
Upstream track selection	There is one US track and at most one track in the DS tracker (If there is no DS track $\theta_X = \theta_Y = 45^\circ$).	69.13 %	69.13 %	69.13 %
TOF timing selection	Select muons from run at the target momentum.	0.41 %	0.52 %	0.32 %
Fiducial selection	For projected US tracks $\sqrt{x^2 + y^2} < r_0$ at plane 5 of DS tracker, where $x = x_0 + (\frac{dx}{dz}\Delta z)$, $y = y_0 + (\frac{dy}{dz}\Delta z)$ and $r_0 = 90$ mm.	0.08 %	0.11 %	0.08 %
Diffuser cut	US tracks are projected to the diffuser position any track within the radius of the diffuser annuli is rejected	0.07 %	0.1 %	0.07 %
χ^2 cut	χ^2/NDF of track is less than 4 up- & downstream	0.07 %	0.1 %	0.07 %

Scattering Data

Scattering Angle Definitions

- In the top diagram both the solid vectors are in the plane of the square i.e. the plain of the board. The y-axis is coming out of the board

- If both the up- and downstream vector were in the same plane then the subtraction of the simple projected angle would be sufficient

- The bottom figure is a side on view of the top figure. If the up- and downstream vectors are in two different planes then a more consider apporach is required as detailed in `http://www.ppe.gla.ac.uk/`
  `~jnugent/Projected-angles.pdf`
  by John Cobb