

# Field off Multiple Scattering Studies

## Current Status

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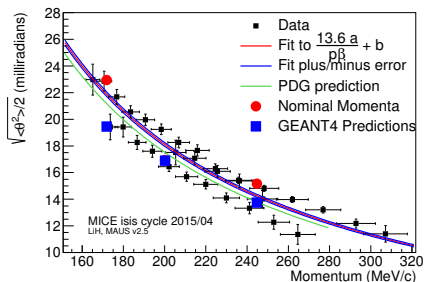
8 February, 2017

# An Outstanding Question

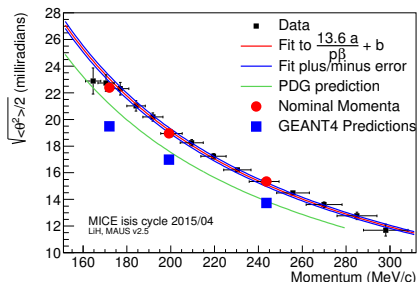
- There is an anomaly in the 200 MeV/c data set
- The deconvolved scattering width is dependent on the fiducial cut
  - hypothesis is that low statistics produces a bias.
  - Is the 200 MeV/c anomaly also due to low statistics?

Data Sets Summed Independently

Data Sets Added Together



•  $a = 247.3 \pm 1.5 \text{ MeV/c}$



•  $a = 248.4 \pm 2.4 \text{ MeV/c}$

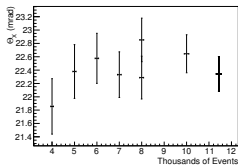
# Test the Effect of Statistics

- Take the integrated set of the straight track data.
- Collect N selected events (where N is between 4000 and the total selected events).
- Fit a Gaussian to  $\theta_X$ ; plot against N
- Calculate the Root Mean Square  $\theta_{Scatt}$ ; plot against N.
- Compare to single data set and combined set.

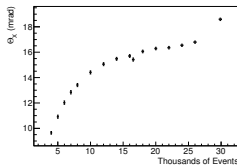
# Fitted Scattering Width vs Stats

- "Momenta" refers to the accumulated data in the corresponding TOF bin.
- Exception: each histogram contains one point that only contains the data for the nominal momentum data set in the corresponding TOF bin.

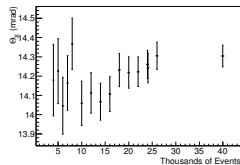
## 172 MeV/c



## 200 MeV/c



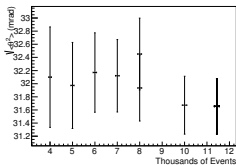
## 240 MeV/c



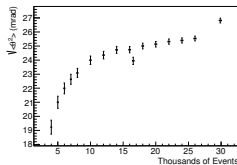
# Root Mean Square Scattering Angle vs. Stats

- "Momenta" refers to the accumulated data in the corresponding TOF bin.
- Exception: each histogram contains one point that only contains the data for the nominal momentum data set in the corresponding TOF bin.

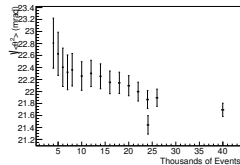
172 MeV/c



200 MeV/c



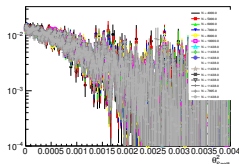
240 MeV/c



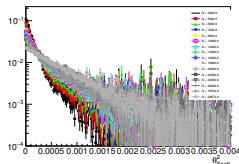
# Square Scattering Distributions

- There is a difference between the scattering FOM as a function of  $N$ .
- Is there a difference in the distributions?

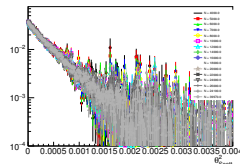
172 MeV/c



200 MeV/c



240 MeV/c



- There is a qualitative difference in the scattering distributions for the three momentum bins (why?)