

# Field off Multiple Scattering Studies

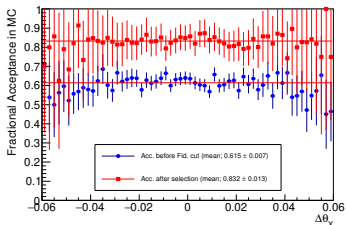
Current Status

Ryan Bayes

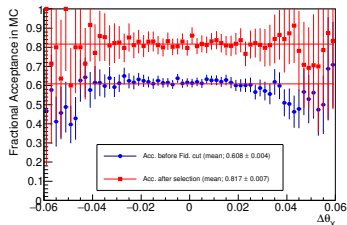
6 January, 2017

# Scattering Acceptance

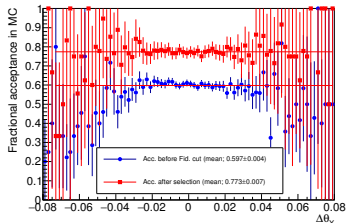
172 MeV/c



200 MeV/c

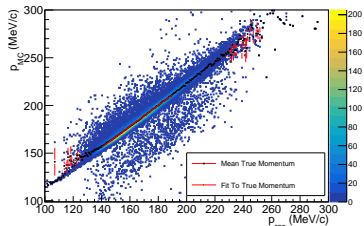


240 MeV/c

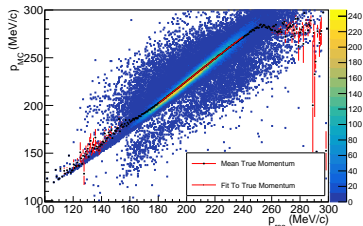


# Momentum Response for Data Sets and Sum

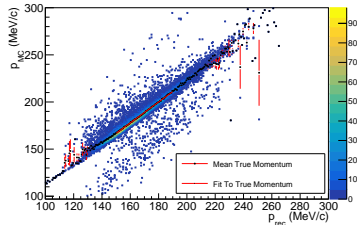
172 MeV/c



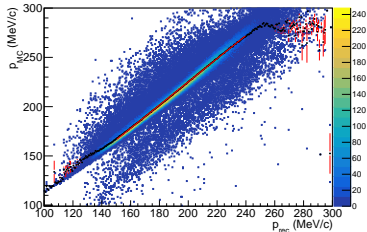
240 MeV/c



200 MeV/c



Sum of Sets



# Results of Linear Fits

## Calibration by Set<sup>a</sup>

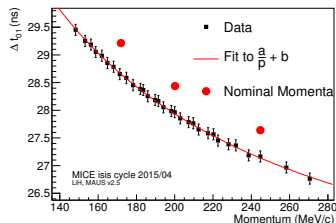
<sup>a</sup>Using fit  $\langle p_{MC} \rangle = ap_{rec} + b$

Set	$a$	$b$ (MeV/c)
172 MeV/c	$1.107 \pm 0.002$	$1.1 \pm 0.3$
200 MeV/c	$1.104 \pm 0.004$	$1.1 \pm 0.7$
240 MeV/c	$1.175 \pm 0.001$	$-9.4 \pm 0.3$
Sum	$1.176 \pm 0.0007$	$-10.0 \pm 0.1$

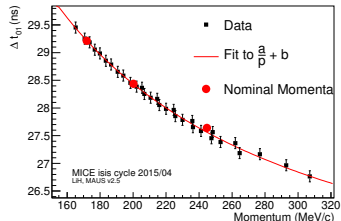
## Nominal TOF bins

$p$ (MeV/c)	$\Delta t_{10}^{min}$ (in ns)	$\Delta t_{10}^{max}$ (in ns)	$p^{min}$ (MeV/c)	$p^{max}$ (MeV/c)
172	29.104	29.304	167.2	173.8
200	28.342	28.542	192.1	202.0
240	27.560	27.760	237.4	252.6

## Without Calibration



## With Calibration



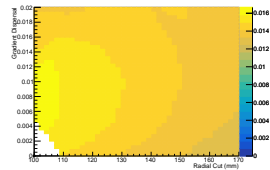
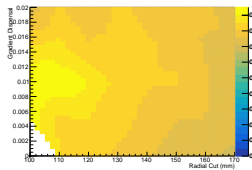
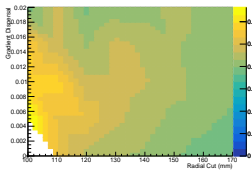
# Fiducial Bin Scans in Width

172 MeV/c

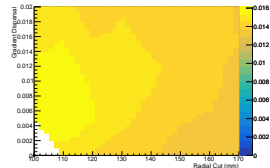
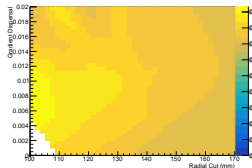
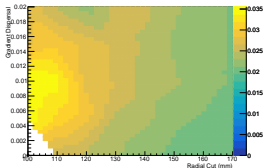
200 MeV/c

240 MeV/c

●  $\Theta_X$



●  $\Theta_Y$

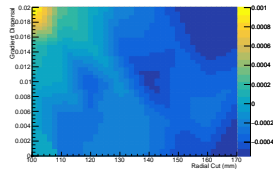
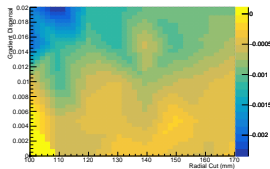
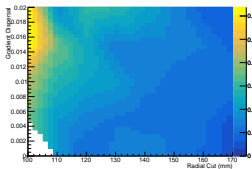
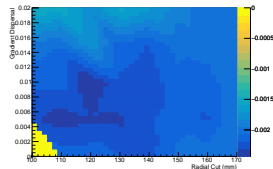
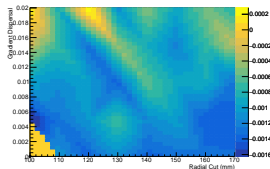
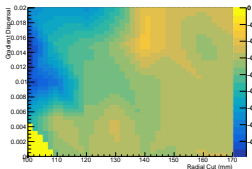


# Fiducial Bin Scans in Mean Scattering Angles

172 MeV/c

200 MeV/c

240 MeV/c

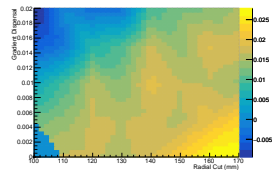
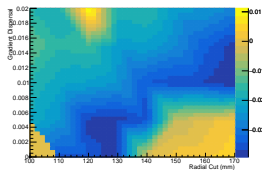
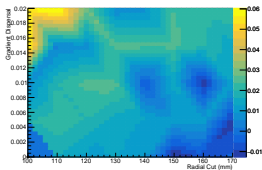
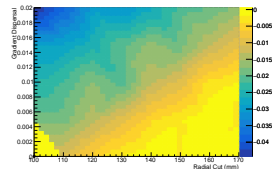
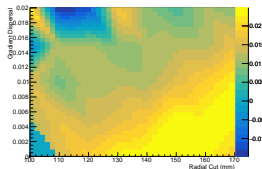
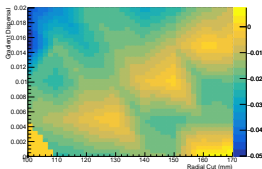
●  $\langle \theta_X \rangle$ ●  $\langle \theta_Y \rangle$ 

# Fiducial Bin Scans in Scattering Tail Asymmetries

172 MeV/c

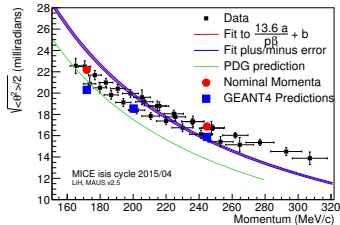
200 MeV/c

240 MeV/c

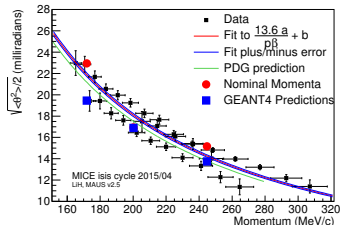
●  $\theta_X$ ●  $\theta_Y$ 

# An Observed Issue with 200 MeV/c Data

## Raw RMS scattering



## Deconvolved RMS



Ryan Bayes ( )

- 200 MeV/c data set has a smaller scattering width for all TOF bins.
- Appears before and after deconvolution
- Investigated whether this is due to fiducial selection (it is not)
- Also appears in the Empty absorber data set

MICE Field off MCS

6 January, 2017

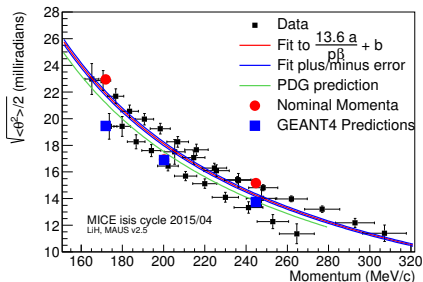
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# Momentum Dependence With and Without Sums

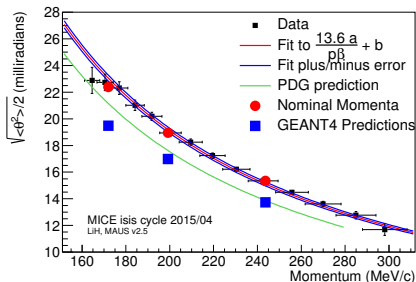
- MC data was always taken in aggregate.
- If 200 MeV/c anomaly is due to low stats; adding all sets will help.
- Add all LiH data together in addition to Zero abs. and MC data.
- $b$  fixed to zero

## Data Sets Summed Independently



●  $a = 247.3 \pm 1.5 \text{ MeV/c}$

## Data Sets Added Together



●  $a = 248.4 \pm 2.4 \text{ MeV/c}$