

MICE VC: Multiple Coulomb Scattering Update

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Intro

- Ryan Bayes has left Glasgow to move to a new position
- I have moved into a new position at Glasgow
- Now working on developing the field off scattering studies - Ryan is keeping in touch and providing direction
- Alan Young continues on the field on analysis
- Was asked to give this talk yesterday, apologies for the rough edges
- Before launching into new developments - want to confirm that code is producing values consistent with last update (✓)
- Implement momentum correction to TOF momentum calculation

Momentum Correction

Taken from John Cobb's Note analysis Note (28/04/17)

- Calculate naive p_0

$$p_0 = \frac{m(s_1 + s_2)}{\sqrt{t_m^2 - (s_1 + s_2)^2}} \quad (1)$$

- calculate $\delta t \rightarrow$ correction to TOF based on energy loss in absorber

$$\delta t = -(s_1 - s_2) \frac{m^2}{p^2 E} \Delta + \frac{1}{2} (s_1 + s_2) \frac{m^2}{p^2 E} \left(\frac{p}{E} + 2 \frac{E}{p} \right) \frac{\Delta^2}{E} \quad (2)$$

- calculate p_c using best estimate of p_0 from 1

$$p_c = p_0 - \frac{1}{s_1 + s_2} \frac{E p^2}{m^2} \delta t \quad (3)$$

should
be -ve
↓

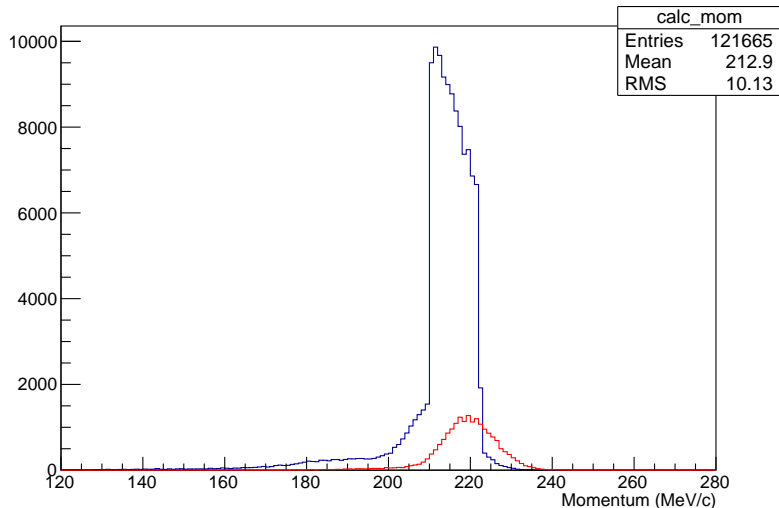
Functions

Cobb P correction

- MCSAnalysis::CalculatePathLength
calculates the path length between TOF1 and TOF2
 - MCSAnalysis::BetheBloch
 - MCSAnalysis::TimeOfFlight
 - MCSAnalysis::CorMomFromTOF
calculates δt based on path length and energy loss, gives corrected P_z
-
- Pulled all MC from MC production page: <http://micewww.pp.rl.ac.uk/projects/analysis/wiki/MCProduction>
 - MC data size comparable to real data
 - Reducing and running to compare with Cobb formula

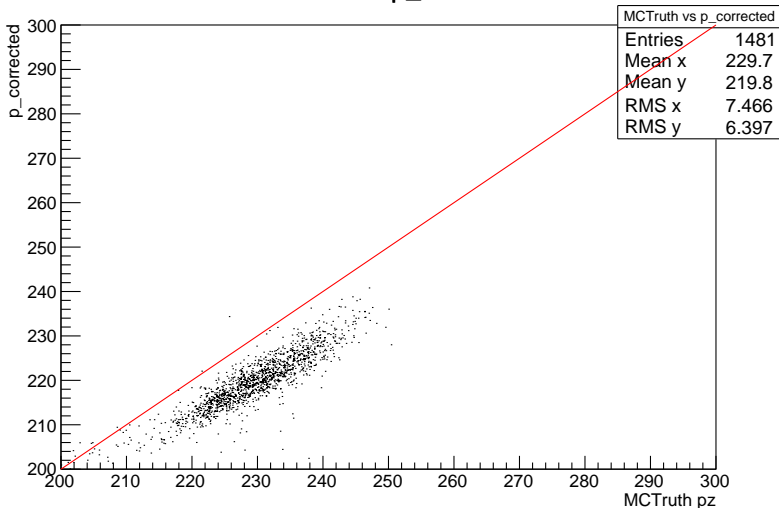
Momentum Correction

Momentum Calculated from TOF



Momentum Correction

MCTruth vs p_corrected



Neon Scattering

- In the last week of 2017/01 ISIS user cycle MICE has taken Neon scattering data and empty channel data
- elog → several alarms but mostly seems to be proceeding quietly
- Physics devil not running → have emailed Chris Rogers
- All data in quick turn around processing with MAUS v2.8.5
- Absorber now empty → running with empty absorber
- Have some first pass plots

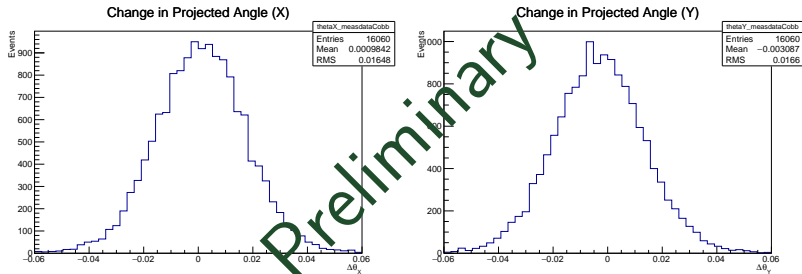
Data Summary

All data that was requested has been taken

Beam line settings (P of beam between TOF1-2 in MeV/c)							
140	240	170	200	240	170	200	140
Zero Absorber				Neon			
9387 9400	9382 9383	9378 9390	9379 9380	9338 9339	9234 9325	9326 9327	9361 9362
9401 9402	9384 9385	9391 9394	9381 9392	9340 9341	9328 9329	9330 9332	9363 9364
9403 9404	9386 9388	9395 9396	9393 9411	9345 9348	9331 9333	9334 9337	9373 9374
9405 9406	9389	9397 93400	9398 9399	9352	9335 9342	9351 9344	9375 9377
9407 9408						9348	
9409 9410							

Beam line settings (P of beam between TOF1-2 in MeV/c)	Absorber	No. of triggers
240	Neon (300 mm)	$\sim 1 \times 10^6$
	Empty channel	$\sim 1 \times 10^6$
200	Neon (300 mm)	$\sim 1 \times 10^6$
	Empty channel	$\sim 1 \times 10^6$
170	Neon (300 mm)	$\sim 1 \times 10^6$
	Empty channel	$\sim 1 \times 10^6$
140	Neon (300 mm)	$\sim 1 \times 10^6$
	Empty channel	$\sim 1 \times 10^6$

Raw Scattering Distributions



- All onrec plots shown by Durga at daily run meetings have been nominal
- 170 MeV/c neon raw (not deconvolved plots)
- Have work to do to deconvolve including generating MC models + tuning selection

Future Plans

- Starting from the place Ryan left off
- Include Neon scattering study in Xenon and LiH analysis
- Momentum correction investigation ongoing
- Moving to latest version of MAUS → reprocess data
- Produce a new iteration of all Note plots in preparation for coming wise person review
- Begin incorporating tracker efficiency information into analysis