

# MCS in $LH_2$ , Field-off



## Content

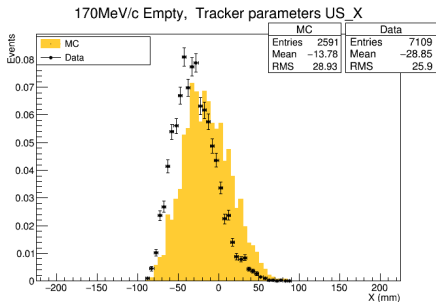
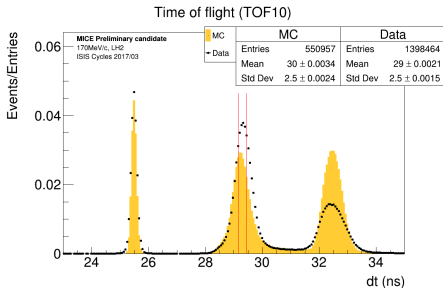
- Beamline magnet scaling

# Beamline magnet scaling



Attempt to optimise beamline magnet settings to:

- Improve match between MC/Data TOF10 distribution
  - Example in top right figure
  - Have considered looking for a  $dI$  AND/OR  $dt$  error
  - A constant  $dt$  shift to account for electron peak mismatch makes sense
  - Also, The produced G4Beamline simulations can be used to assess the effect on scattering
- Improve match of spatial/directional parameters at the UST
  - example in bottom right figure
  - (Although) the effect of the UST differences has been shown to not affect scattering behaviour
  - next slide, overview



# US tracker, ref. plane



Configuration	Mean			
	X	Y	dX	dY
170MeV/c Empty Data	-28.85 ± 0.3072	0.6512 ± 0.3511	0.0063 ± 0.0001061	0.0001015 ± 0.000108
170MeV/c Empty MC Rec.	-13.78 ± 0.5683	-3.372 ± 0.6364	0.002814 ± 0.0001879	0.0009539 ± 0.0001923
170MeV/c Empty MC Truth	-13.8 ± 0.5687	-3.376 ± 0.6367	0.003314 ± 0.0002532	-0.004793 ± 0.0002556
170MeV/c Full Data	-28.34 ± 0.2981	1.35 ± 0.3337	0.006381 ± 0.0001028	-0.0002352 ± 0.0001038
170MeV/c Full MC Rec.	-13.08 ± 0.5836	-3.194 ± 0.6457	0.002813 ± 0.0001898	0.001009 ± 0.0001954
170MeV/c Full MC Truth	-13.11 ± 0.584	-3.162 ± 0.645	0.003179 ± 0.0002567	-0.00508 ± 0.0002657
200MeV/c Empty Data	-2.458 ± 0.439	0.004072 ± 0.4167	-0.0002688 ± 0.0001256	-1.25e-05 ± 0.0001096
200MeV/c Empty MC Rec.	-0.9516 ± 0.7157	-5.432 ± 0.6811	-0.0003786 ± 0.0002104	0.002134 ± 0.0001762
200MeV/c Empty MC Truth	-0.9895 ± 0.7181	-5.393 ± 0.6812	0.0001874 ± 0.000247	-0.003805 ± 0.0002305
200MeV/c Full Data	-2.544 ± 0.4276	0.8684 ± 0.4028	-0.0002074 ± 0.0001215	-0.0002647 ± 0.0001065
200MeV/c Full MC Rec.	-2.022 ± 0.7117	-6.227 ± 0.6817	0.0003276 ± 0.0002029	0.002173 ± 0.0001837
200MeV/c Full MC Truth	-1.916 ± 0.7154	-6.269 ± 0.6846	0.000483 ± 0.0002461	-0.003859 ± 0.0002316
240MeV/c Empty Data	-13.85 ± 0.5078	2.136 ± 0.4506	0.004391 ± 0.0001541	4.442e-05 ± 0.0001269
240MeV/c Empty MC Rec.	-7.256 ± 0.5156	-8.406 ± 0.4653	0.00218 ± 0.000159	0.002039 ± 0.0001303
240MeV/c Empty MC Truth	-7.25 ± 0.5158	-8.429 ± 0.4649	0.002641 ± 0.0001889	-0.004002 ± 0.0001621
240MeV/c Full Data	-12.92 ± 0.4026	1.552 ± 0.3545	0.004525 ± 0.0001214	-0.0002201 ± 9.723e-05
240MeV/c Full MC Rec.	-6.678 ± 0.519	-9.19 ± 0.4665	0.001933 ± 0.0001595	0.001719 ± 0.0001304
240MeV/c Full MC Truth	-6.725 ± 0.5194	-9.212 ± 0.4659	0.002298 ± 0.0001884	-0.004266 ± 0.0001695



## Progress so far

- MAUS v3.3.2 build in new machine, thanks to Paolo & Alan!
- Bulk of required code written
- G4beamline is working, currents used for production MC provided by Dimitrije.
- First batch of G4Beamline simulations produced, D1 scaled +/- 10%
- 5.5-6 mil. particles produced US of Q4 result in 2000 particles after selection downstream
- Each of these 16 hours to produce

## The Plan

- Vary D1 & D2 by +/- 10%
- Vary D1 and D2 (simultaneously) by the same amount
- Run simulation & analysis (selection etc.) and see results at TOF and UST on the selected sample
- Continue with Q123 and the rest of the magnets
- Until a relationship between disagreeing parameters in Data/MC is determined

# Beamline magnet scaling - The problem



Momentum - z, muons

## Legend

- Production MC - Black
- 0.95x - Cyan
- 0.97x - Green
- 0.99x - Yellow
- 1.0x - Gray
- 1.01x - Red
- 1.03x - Dark red

