Field-On Material Physics

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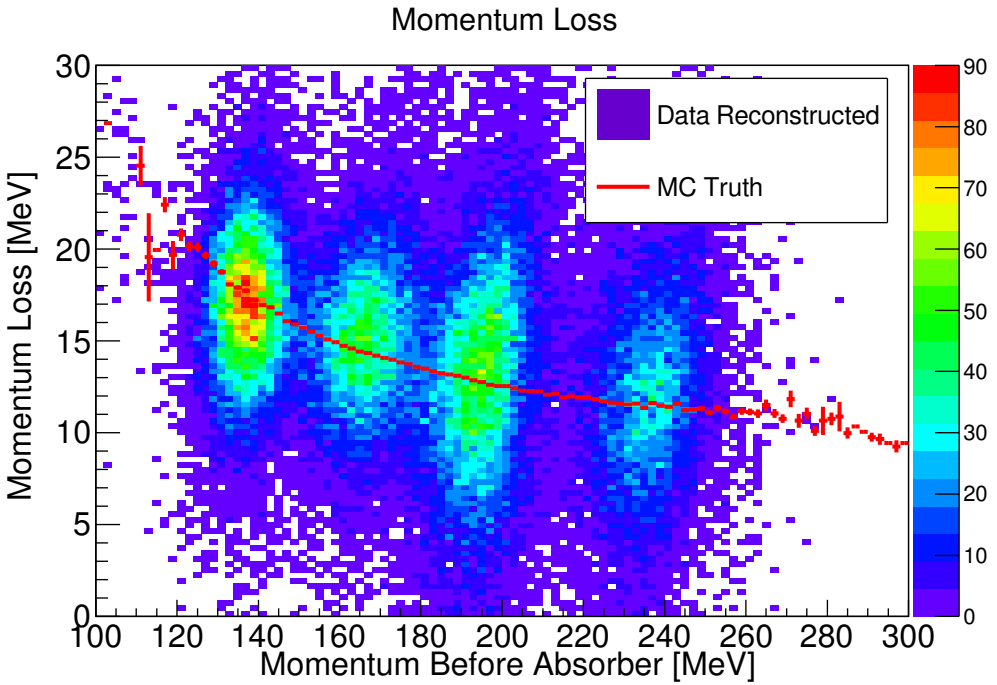
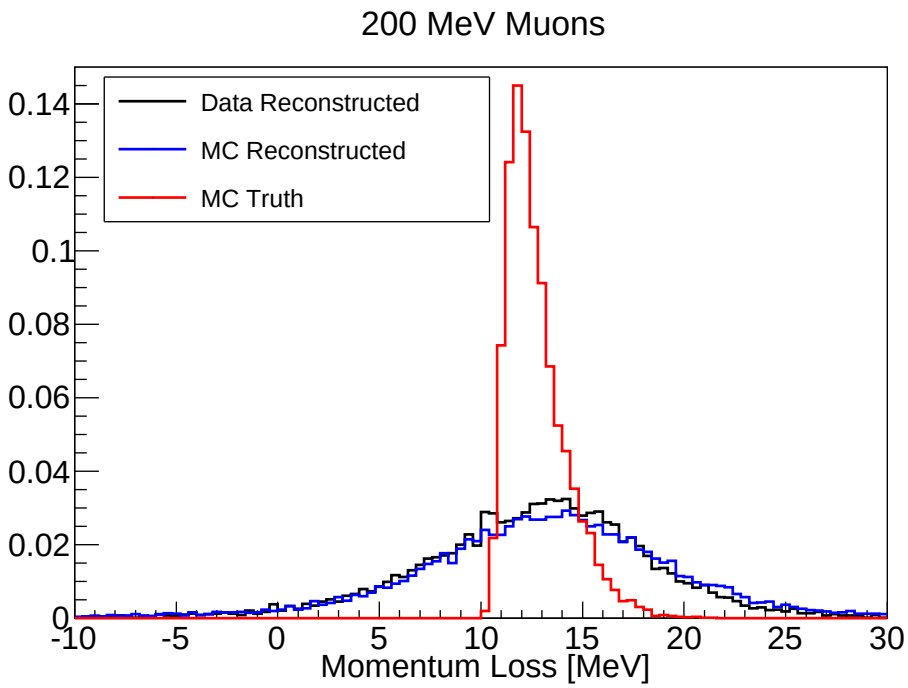
Updates of Previous Analyses

- Energy loss and scattering need to be measured to understand emittance change
- Previous analyses have been done before we had two working trackers
- Recent data give us the opportunity to improve upon those measurements

Momentum Loss Measurement



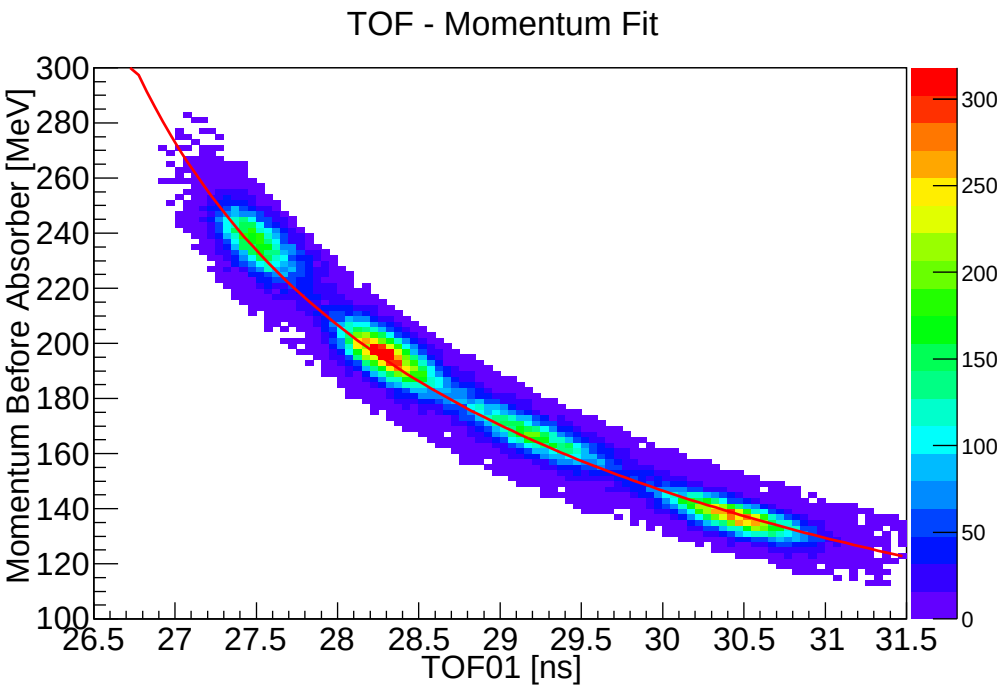


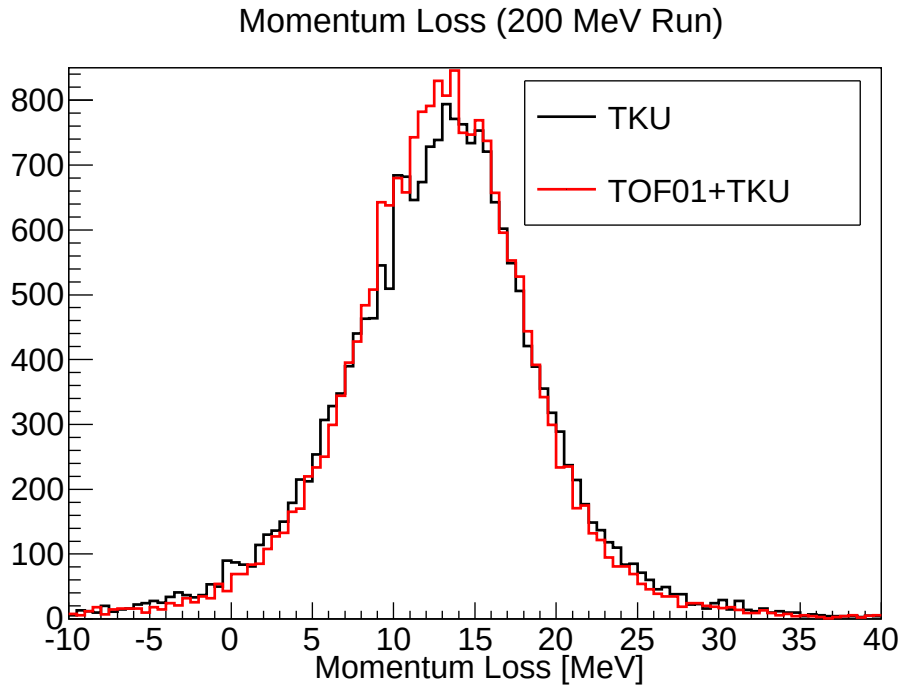
- With two working trackers, simple measurement is easy
- 200 MeV MC: (13.3 ± 5.9) MeV
  200 MeV Data: (12.8 ± 5.3) MeV
- Trying to improve upon the simple measurement

Sample Selection

- Exactly one helical track upstream and downstream
- Loose TOF01 - TKU cut to cut out pions and scraped muons
- $p_T/p > 0.1$ to ensure momentum is well-measured

Adding TOF

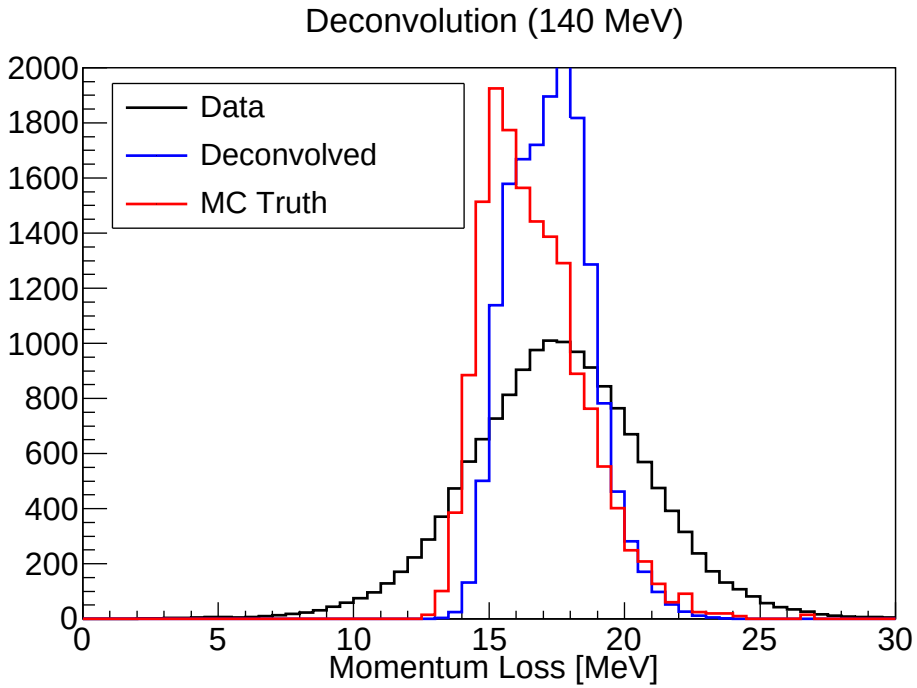


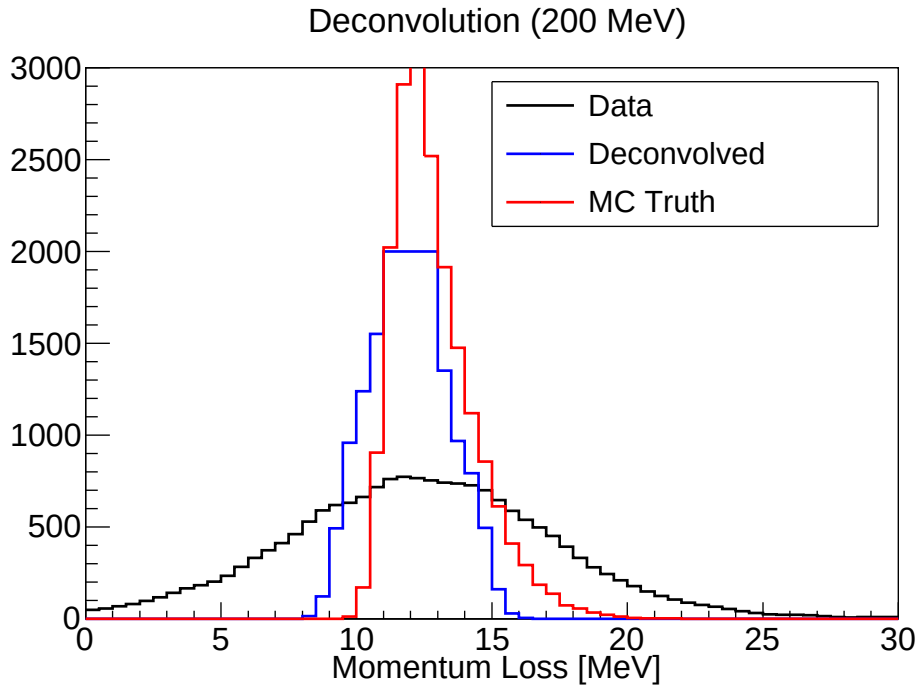


- TOF01 gives a momentum measurement with similar precision to the tracker
- Combining TOF and tracker measurements slightly improves the resolution

Deconvolution

- Measure momentum loss with empty absorber
- Use that to deconvolve momentum loss with absorber





- Successfully extracting some features of momentum loss spectrum
- Width within 15% of MC, asymmetric tail in some momentum bands
- Still work to be done, but it's improving

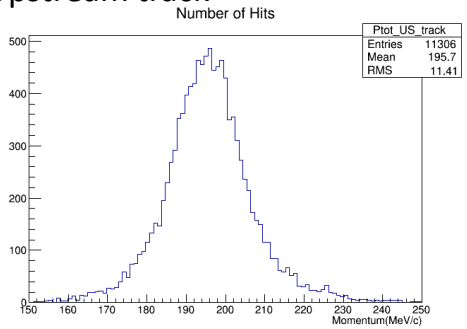
Scattering Analysis with Field on

Motivation

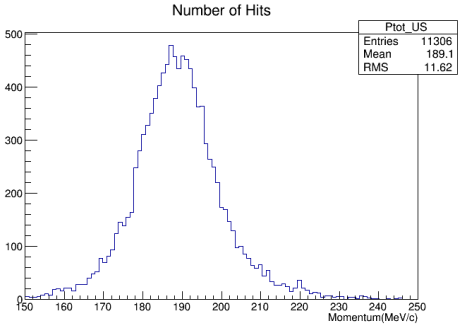
- Multiple Coulomb scattering in the absorber is a source of emittance growth.
- Recent measurements from MuScat experiment indicate that simulation codes are over estimating the emittance growth from MCS.
- A paper is being prepared on MCS in an absorber with no magnetic field and this is presented in another talk.
- Data has now been taken with the tracker solenoid and focus coils active.
- Tools need to be developed to extend the scattering analysis for this data

Momentum plots for run 08468

Upstream track

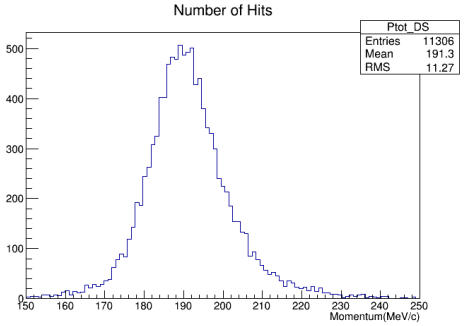


(a) At plane 0, station 1 of upstream tracker

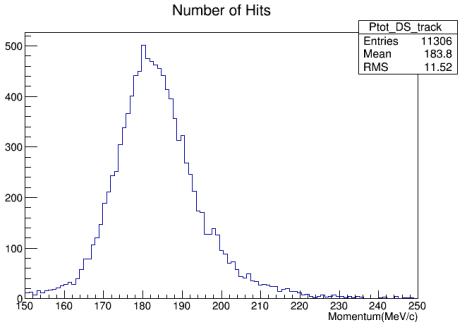


(b) Propagate to centre of absorber from upstream tracker

Downstream track



(c) Propagate to centre of absorber from Downstream traker



(d) At plane 0, station 1 of downstream tracker

- Code exists within MAUS to propagate a given particle to a given axial position.
- This has been used with the data from run 08468.
- Graphs (b) and (c) are predicted momentum distribution at center of absorber from their respective trackers.
- Between these two plots there is a 2.2MeV/C discrepancy in the mean momentum.
- Also the energy change between the trackers and the center of the absorber is asymmetric, even though the model is supposed to be symmetric.