Energy Loss Analysis

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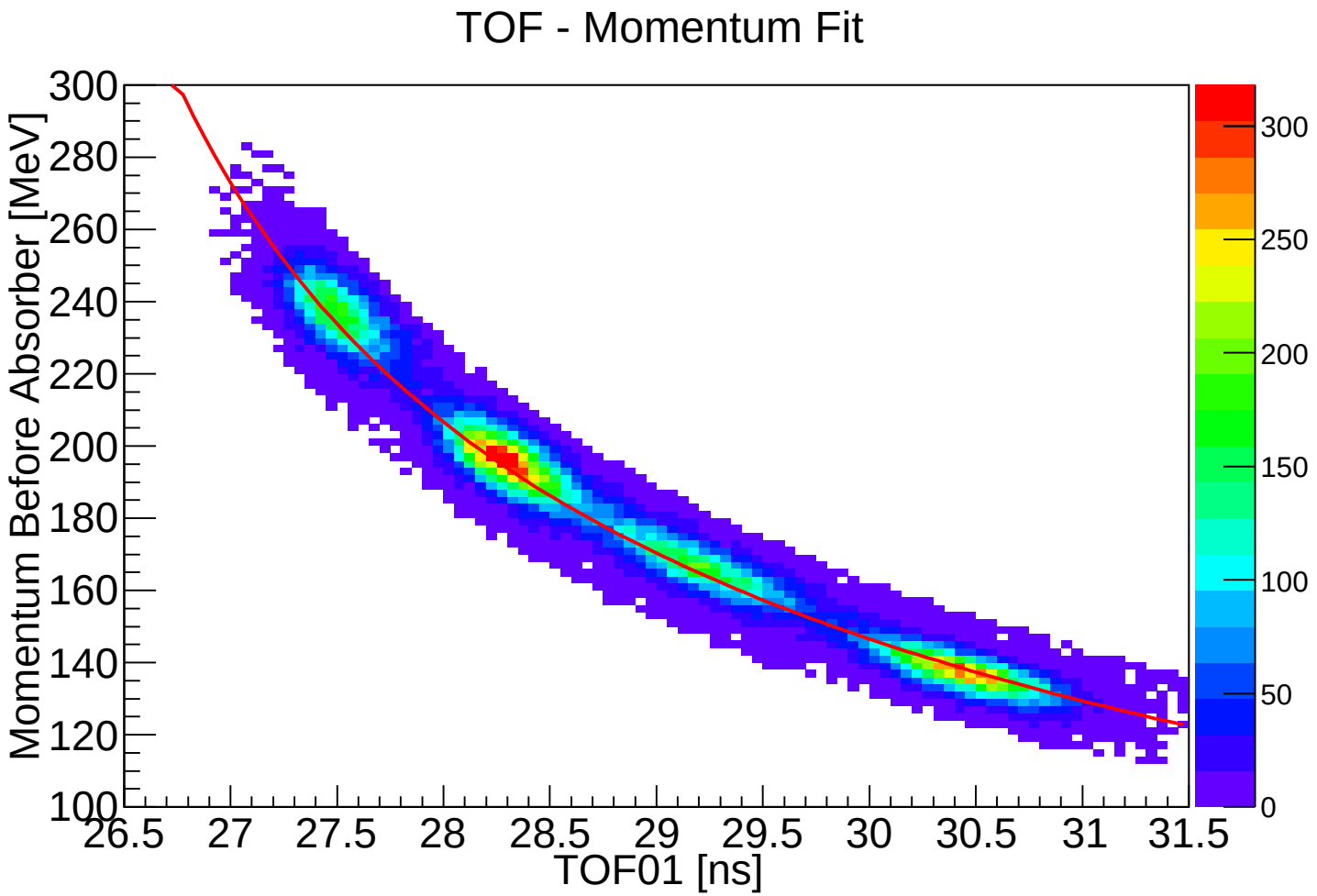
Sample Selection

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

Adding TOF

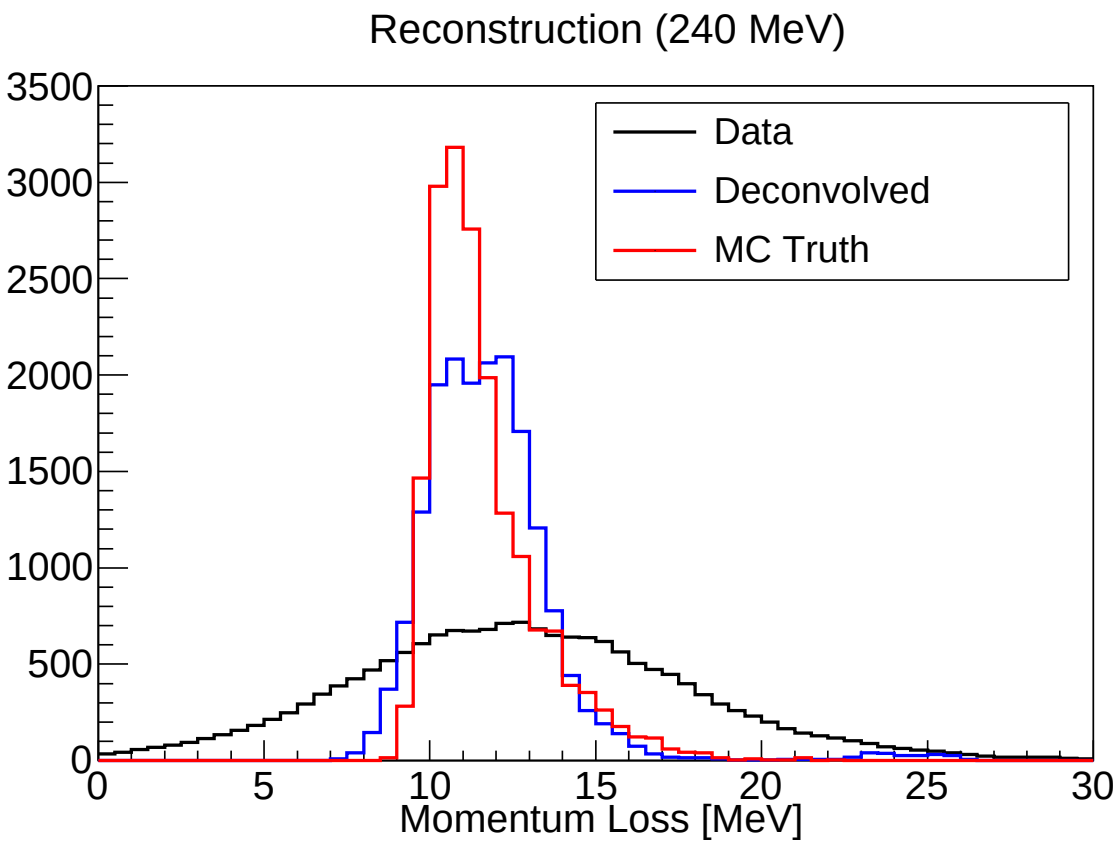


- TOF01 gives a momentum measurement with comparable precision to the tracker
- Combining TOF and tracker measurements improves the upstream resolution
- TOF resolution found by fitting electron peak
- Can then find tracker resolution using TOF01/TKU plot width

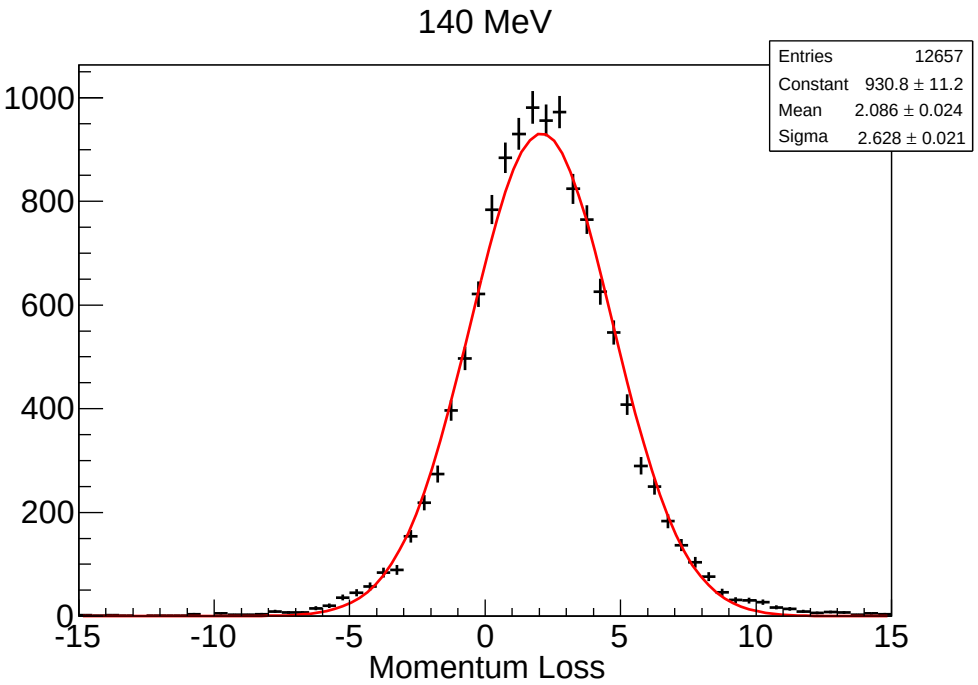
Convolution Fit

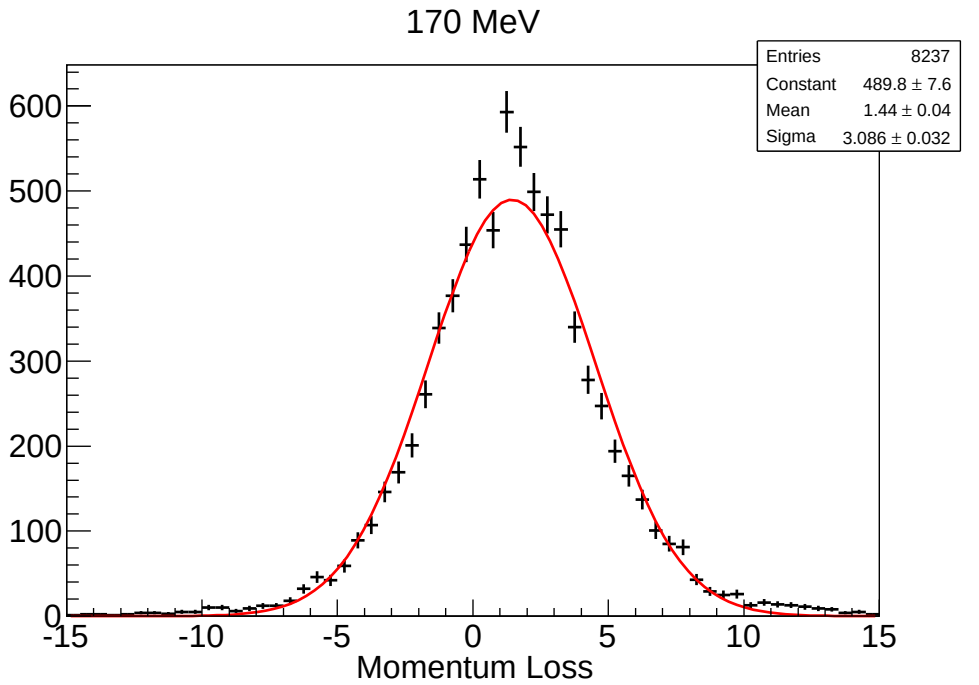
- Fit empty absorber data to find resolution and detector effects
- Fit LiH absorber data to convolution of landau (free parameters) and gaussian (from empty fit)
- Improved results compared to deconvolution

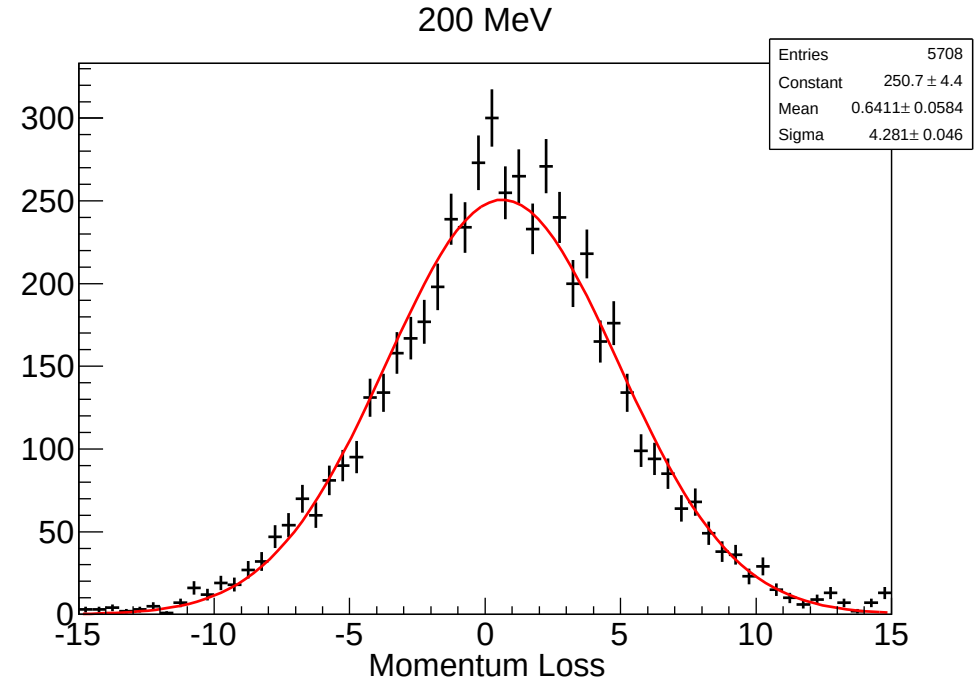
Old:

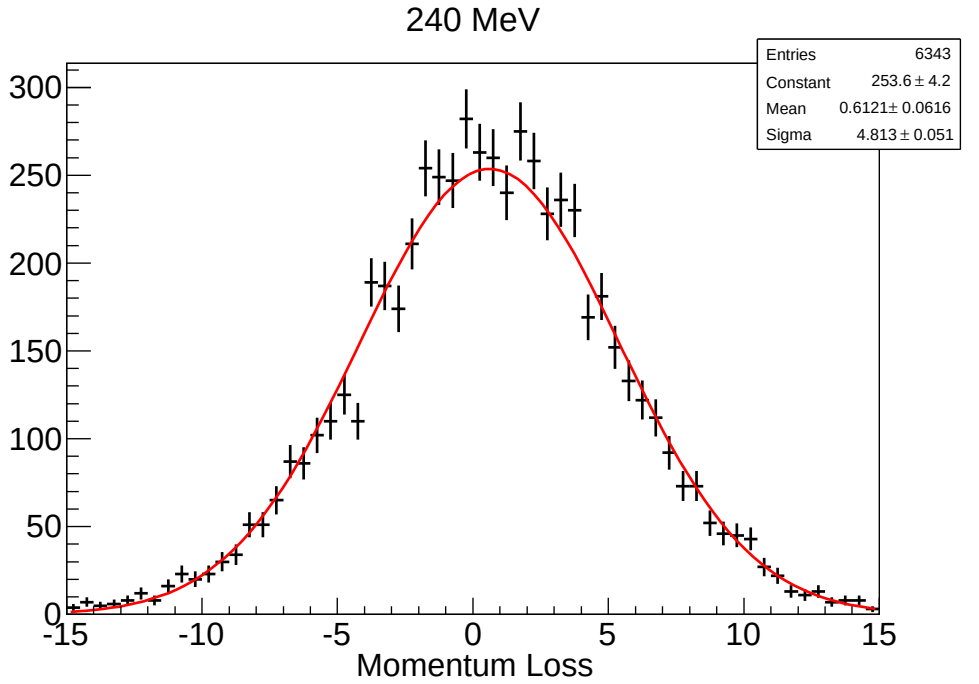


Empty Absorber Fits



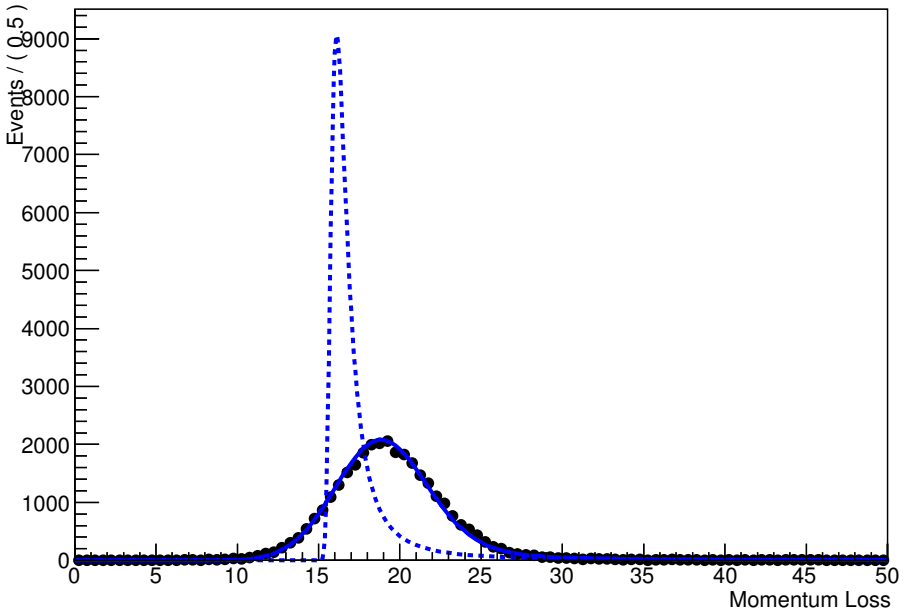




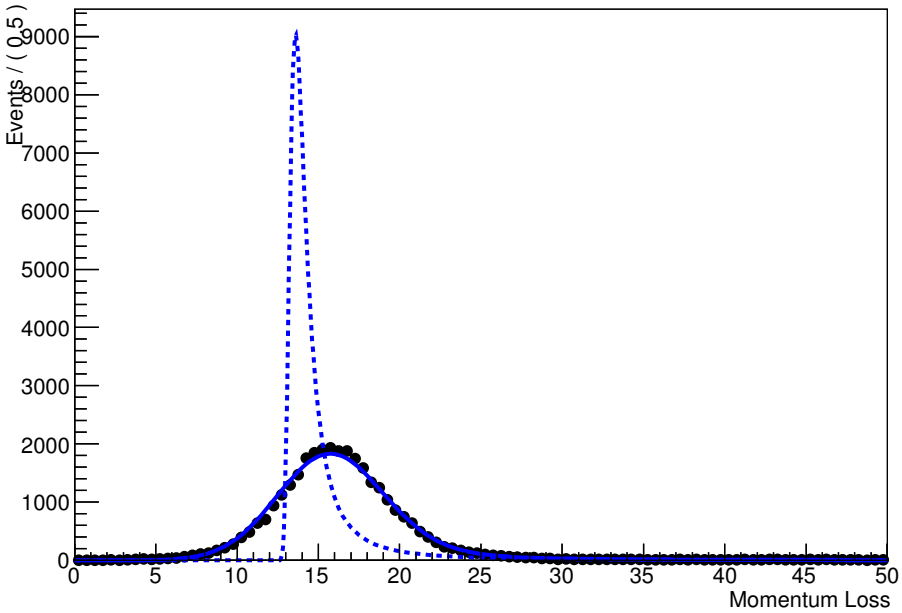


Convolved Energy Loss Fits

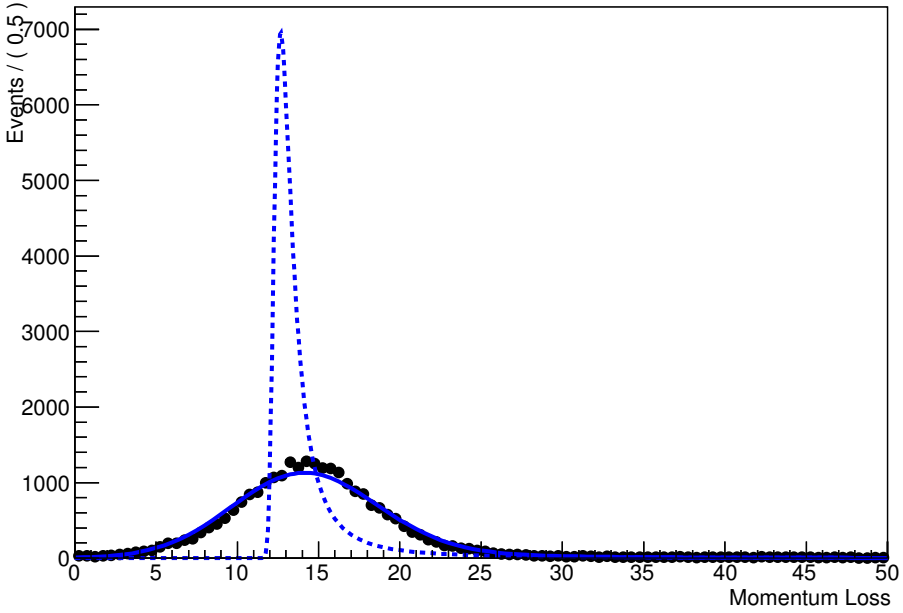
140 MeV



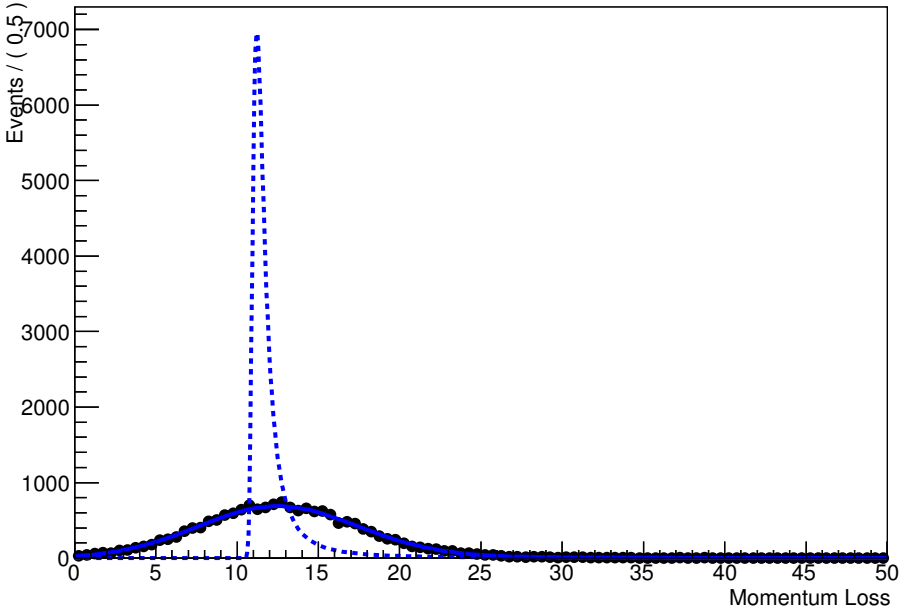
170 MeV



200 MeV



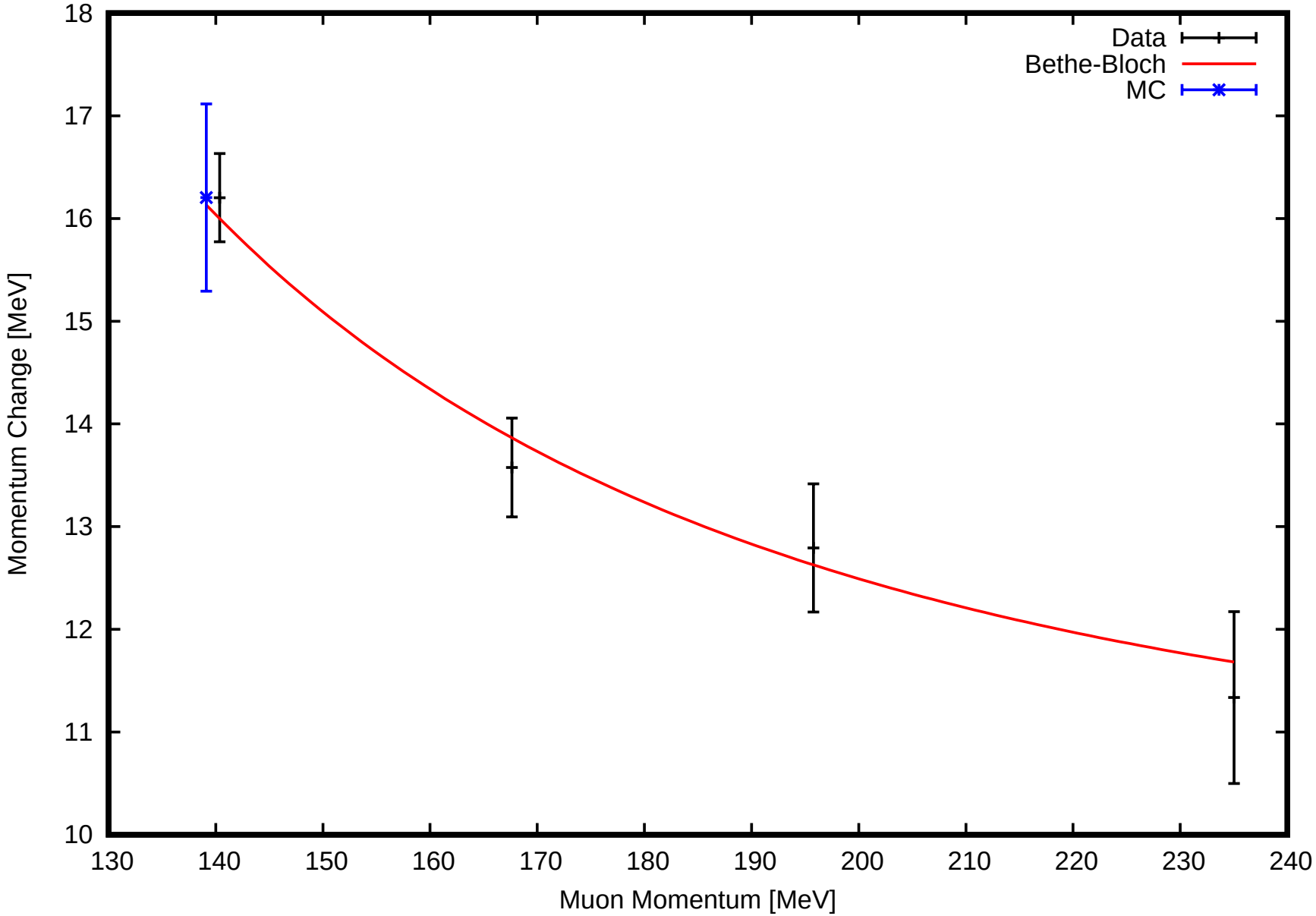
240 MeV



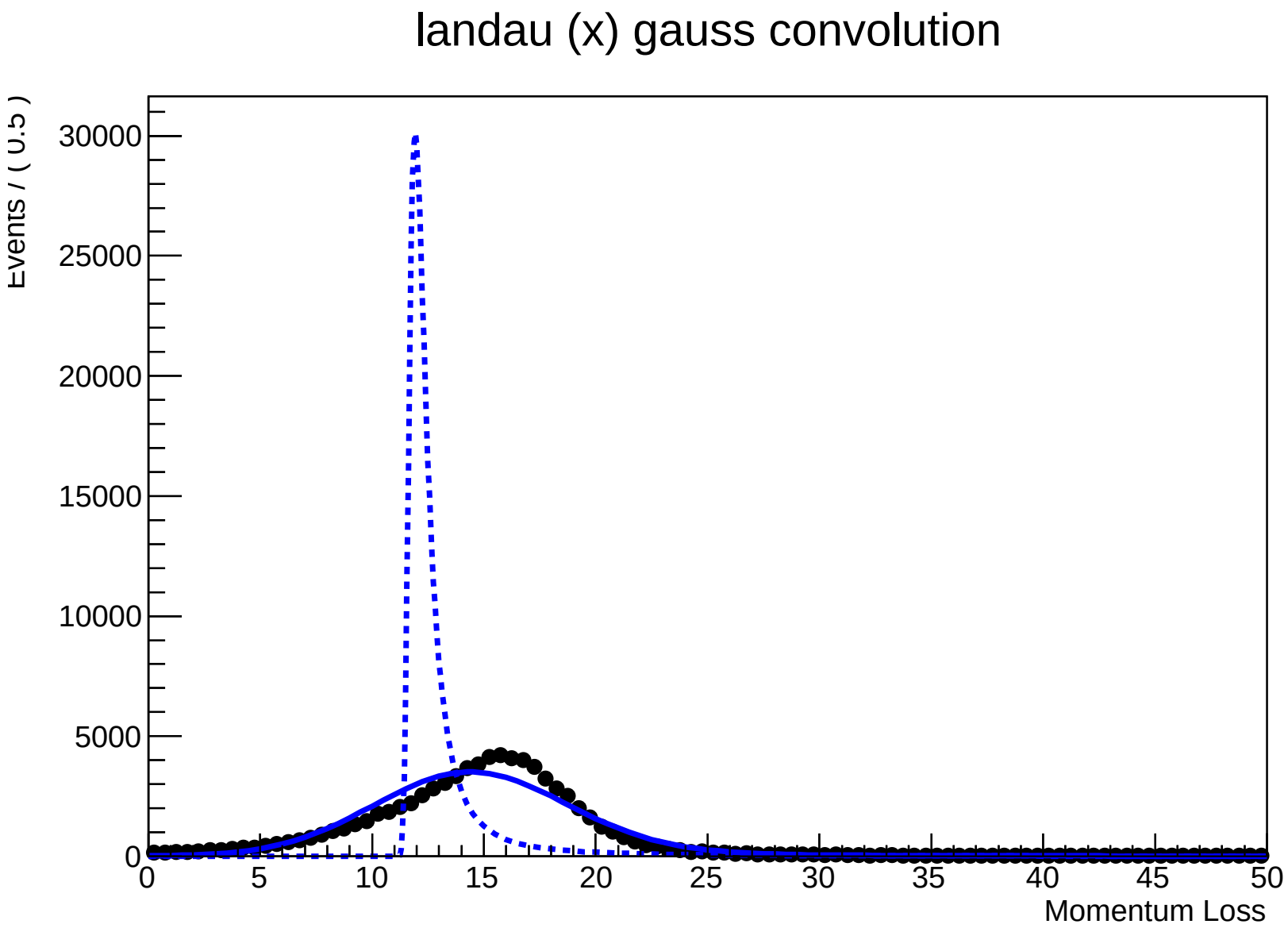
Systematic Uncertainties

- Empty and Full absorber runs have different momentum correction between TOF and tracker
- Using correction from Empty run for measurement in Full run gives different energy loss measurement
- Convolution fit method assumes that the two runs are identical
- Use measurement at different momentum correction as systematic uncertainty (0.59 MeV)
- gives a much smaller uncertainty in LH2 runs – possibly related to the fact that the fits aren't great

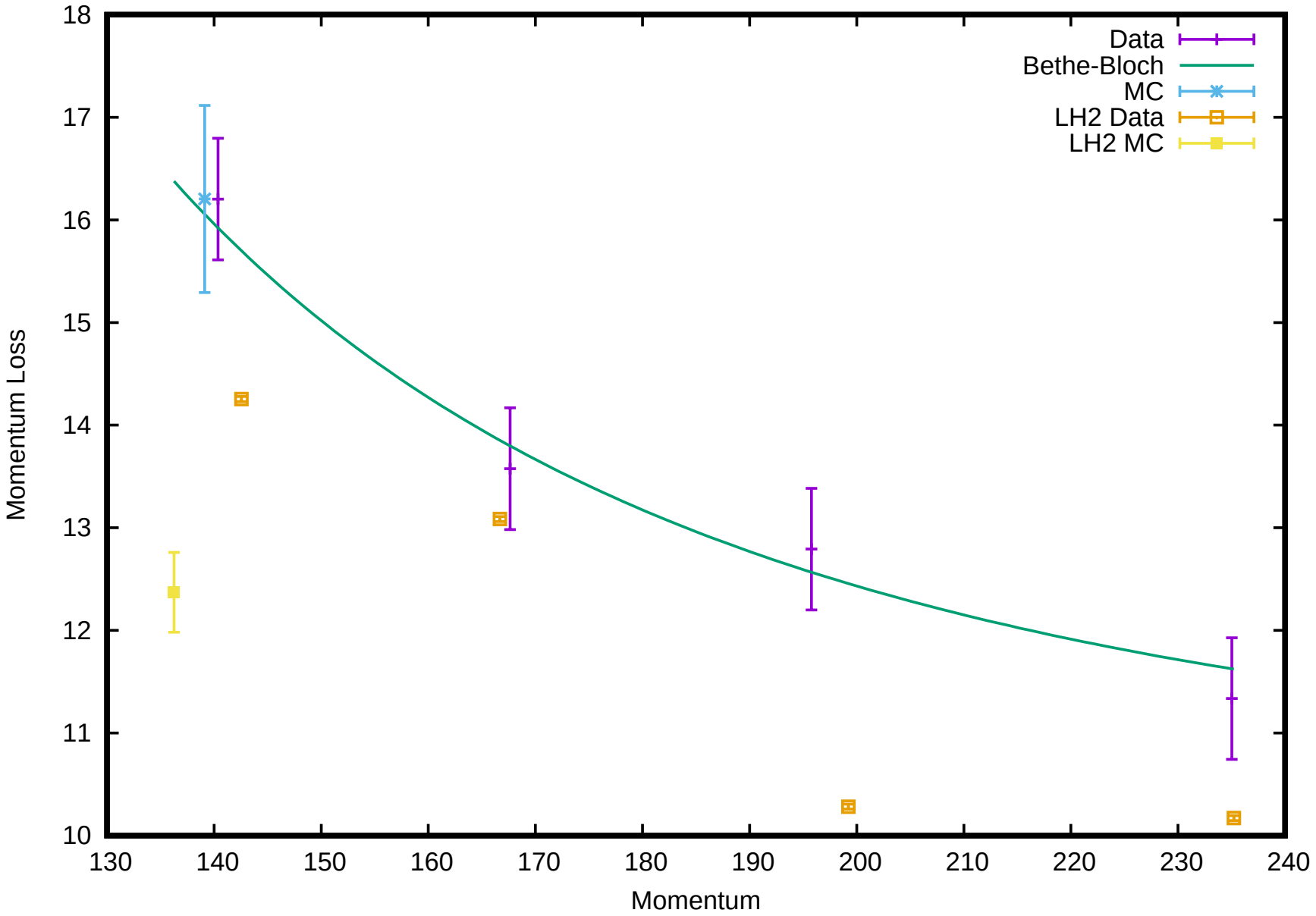
Comparison to Theory



LH2 Issues


landau (x) gauss convolution
Events / (0.5)
30000
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
35
40
45
50
Momentum Loss

LH2 Issues


Data
Bethe-Bloch
MC
LH2 Data
LH2 MC
Momentum Loss
Momentum
18
17
16
15
14
13
12
11
10
130
140
150
160
170
180
190
200
210
220
230
240

Current Work

- Extrapolate LH2 tracks to measure distance in abosrber
  - Hopefully should improve LH2 measurements
- Writing up for the system performance paper