Single Crystal Calibration
With Muons
- Problems Understanding $dE/dx$

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Bethe Bloch Equation

• Implement Bethe Bloch as in PDG04
  – Including the density effect
  – Shell correction not important for high energies (momentum cut: 2 GeV)
  – Coefficients from PDG and Sternheimer 84

• Test plot to ensure consistency ⇒ correct implementation cross-checked!
Compare BB and Monte Carlo

- Study mumu MC:
  - Energy loss in each theta ring (mean of Landau fit to dE/dx distribution of muons)

- Compare with BB:
  - Difference in slope
  - Offset of the order of 20%

- Where does this effect come from?

![Graph showing energy loss in GeV/cm for different theta indices, comparing Bethe Bloch CsI (TI) dE/dx MC with BB.]
dE/dx dependence of momentum:

- Study dEdx in each ring as function of momentum and compare with BB
- We see the same features as in the last plot

![Graphs showing dE/dx dependence for different momenta](image)
Conclusion

• Bethe Bloch equation does not describe $dE/dx$ for muons as measured in the EMC
  → differences on a 20% level for MC
  → 15% difference observed for DATA

• What are we missing?