BCAL Calibration with Pions and Protons

Irina Semenova and Andrei Semenov
(University of Regina)

GlueX Calorimetry Meeting, September 3, 2009

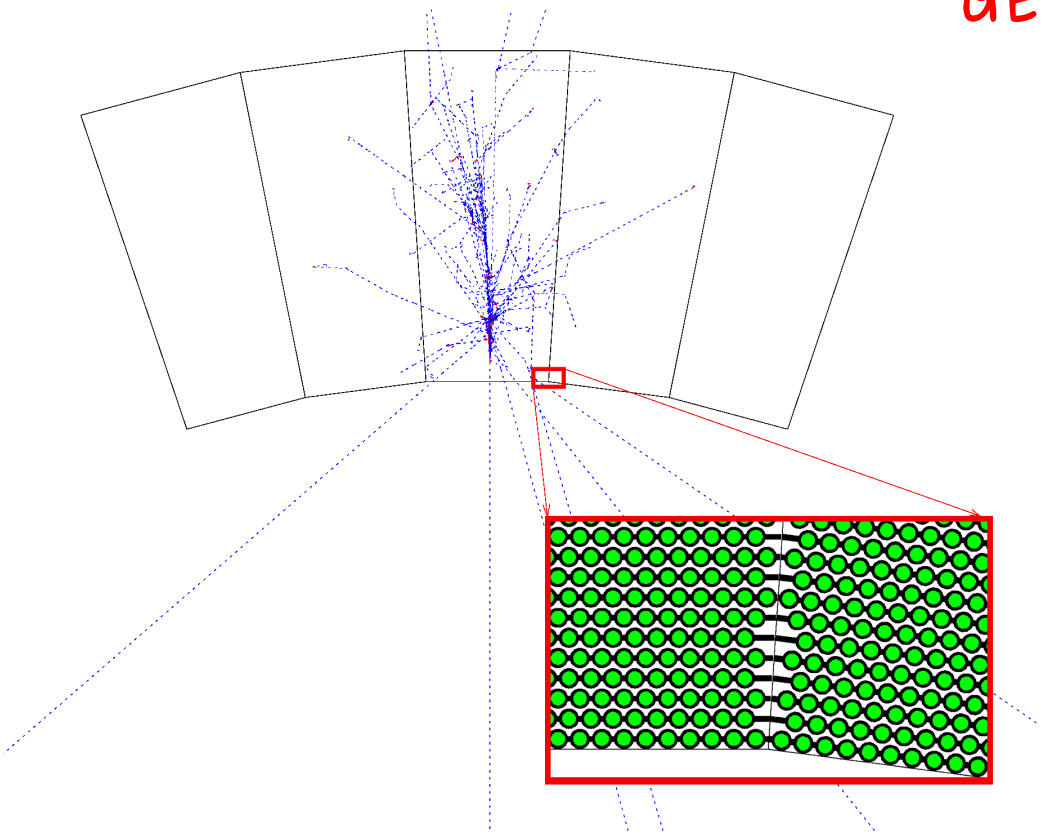
Idea

Simulate energy deposited in the fibers of BCAL readout segments as a function of charged particle type, momentum, azimuthal and polar angles (available from CDC) => Relative and (potentially) absolute calibration of BCAL readout segments

Questions

1. Do we have a reasonable kinematics available?
2. How many events we need to reach a required stat. accuracy?
3. How big are the systematic uncertainties?
4. Though a negative-charge data should be pretty clean (π^-), how precise we need to separate π^+ and protons?

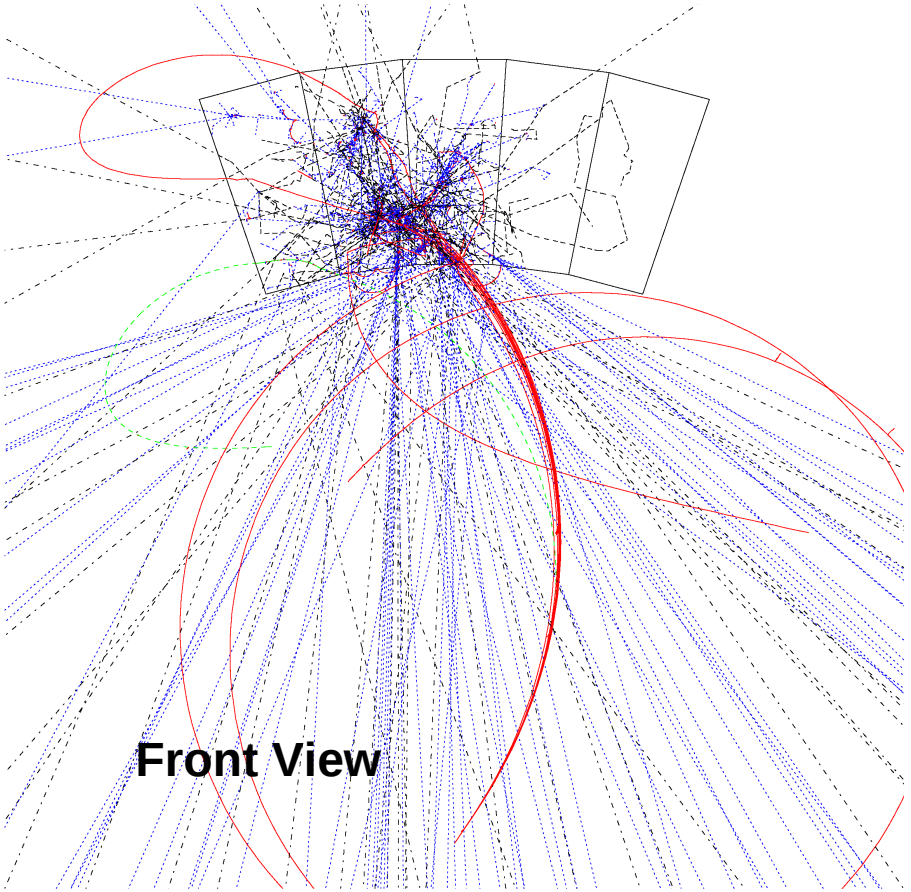
Geometry

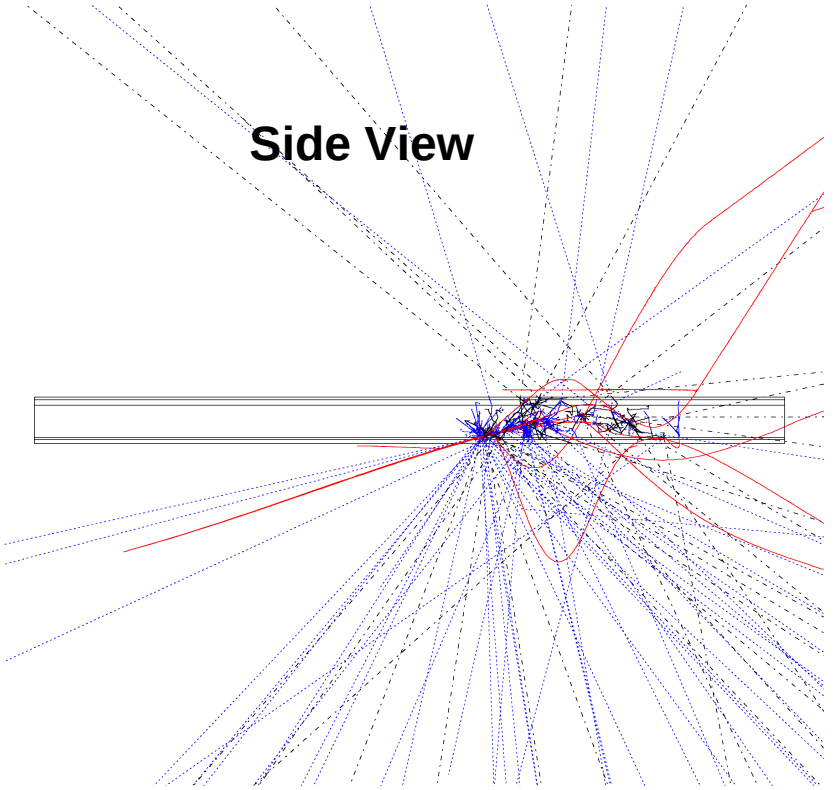


GEANT 3.21 + GFLUKA

Realistic map of
Magnetic field

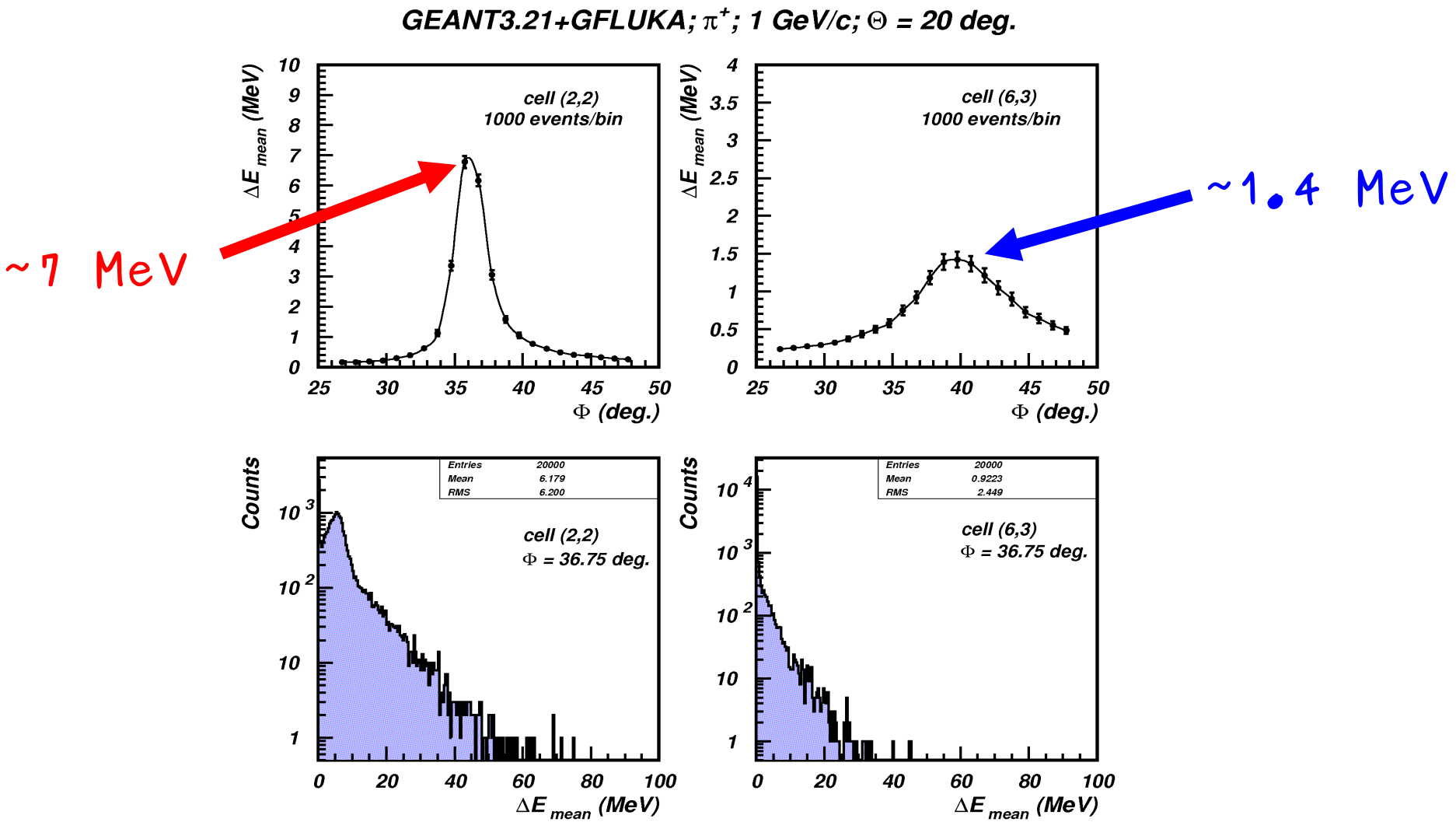
π^+ ; P=1.0 GeV/c; θ=20°



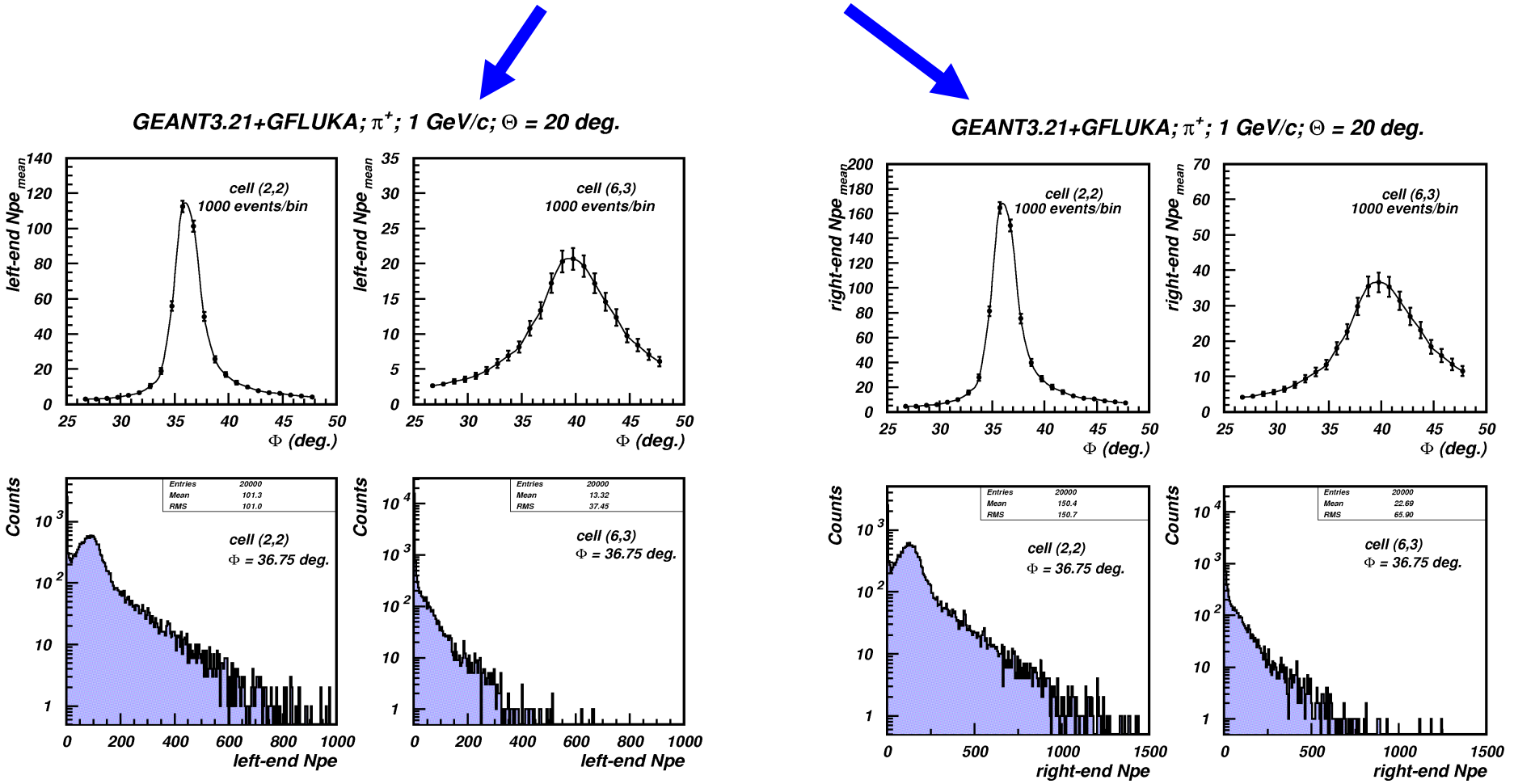


Good kinematics: Energy enough to illuminate whole module + almost central hit

Energy Deposited in the Fibers by Pions



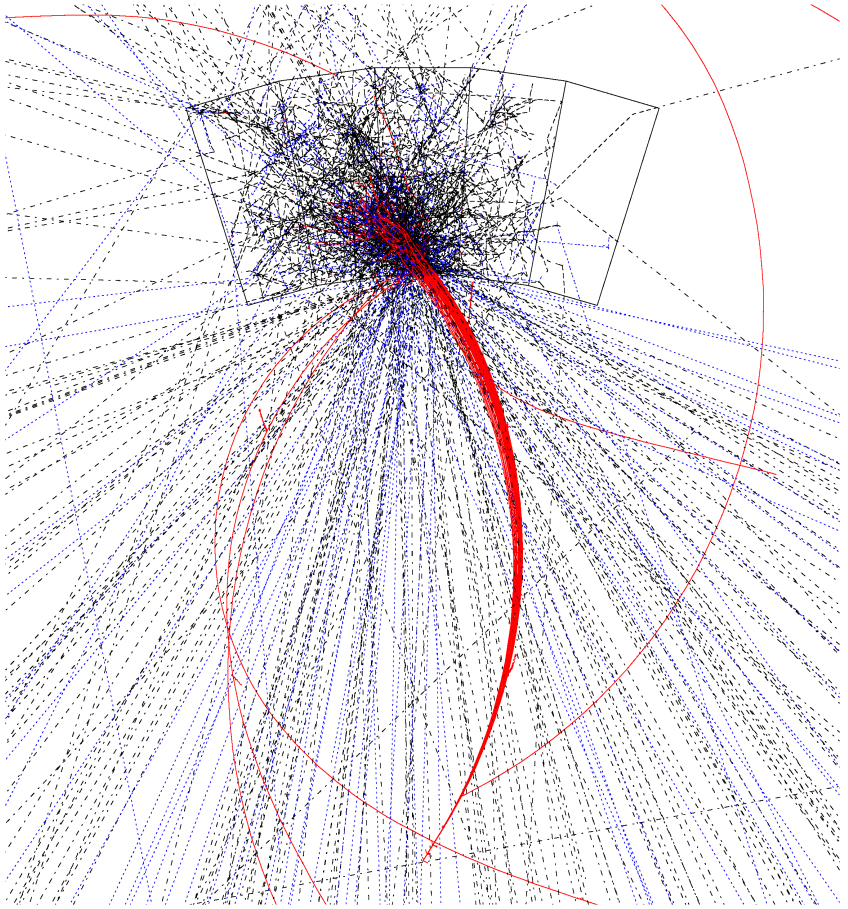
Signals (Npe) from Left and Right Ends of the Module



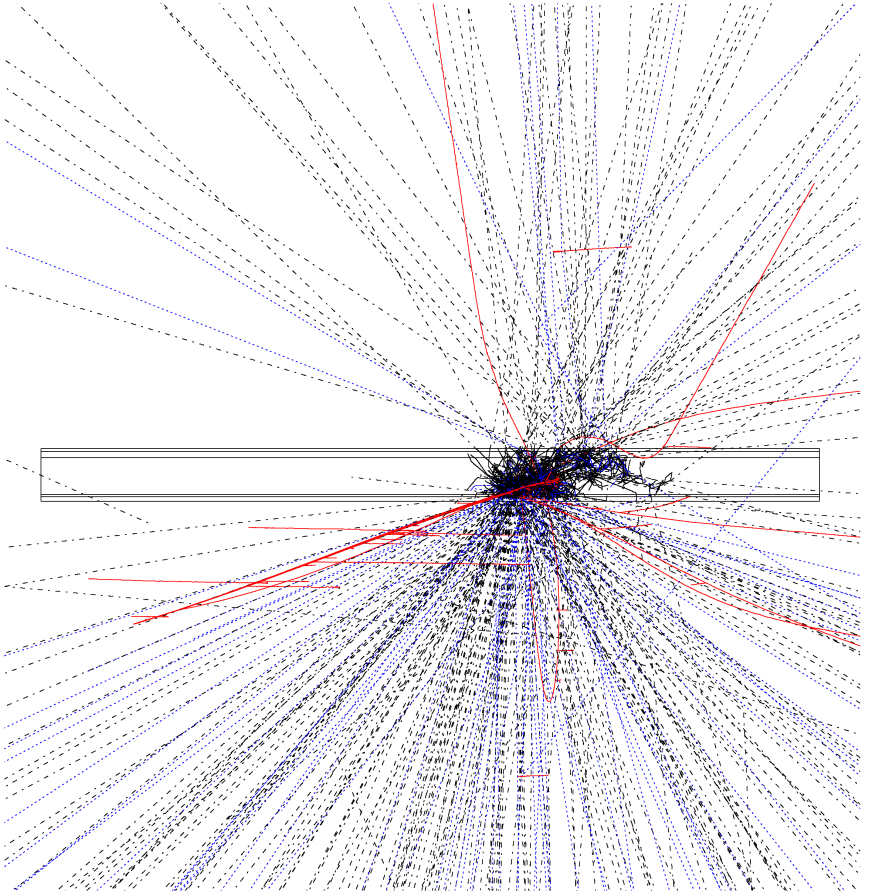
Deposited energy is "attenuated" to the module ends and convoluted with Poisson statistics

Protons: P=1.0 GeV/c; θ=20°

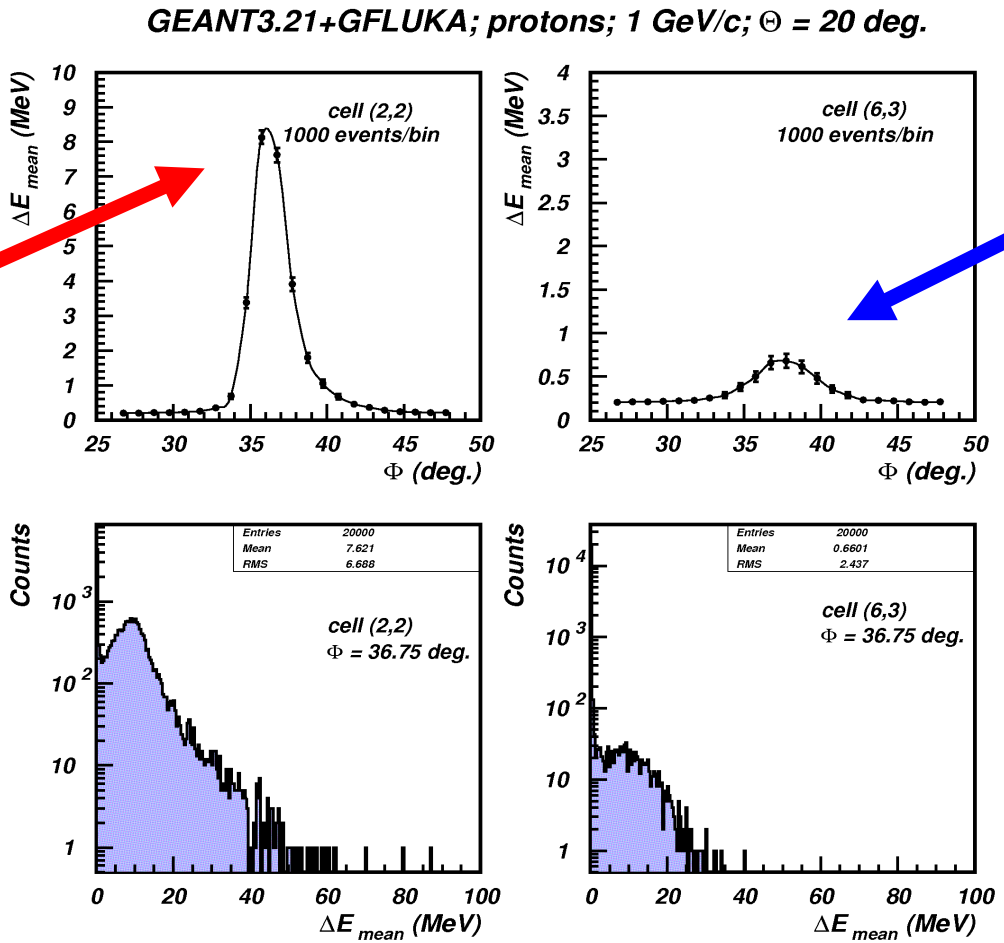
Front View



Side View



Energy Deposited in the Fibers by Protons



~8.2 MeV

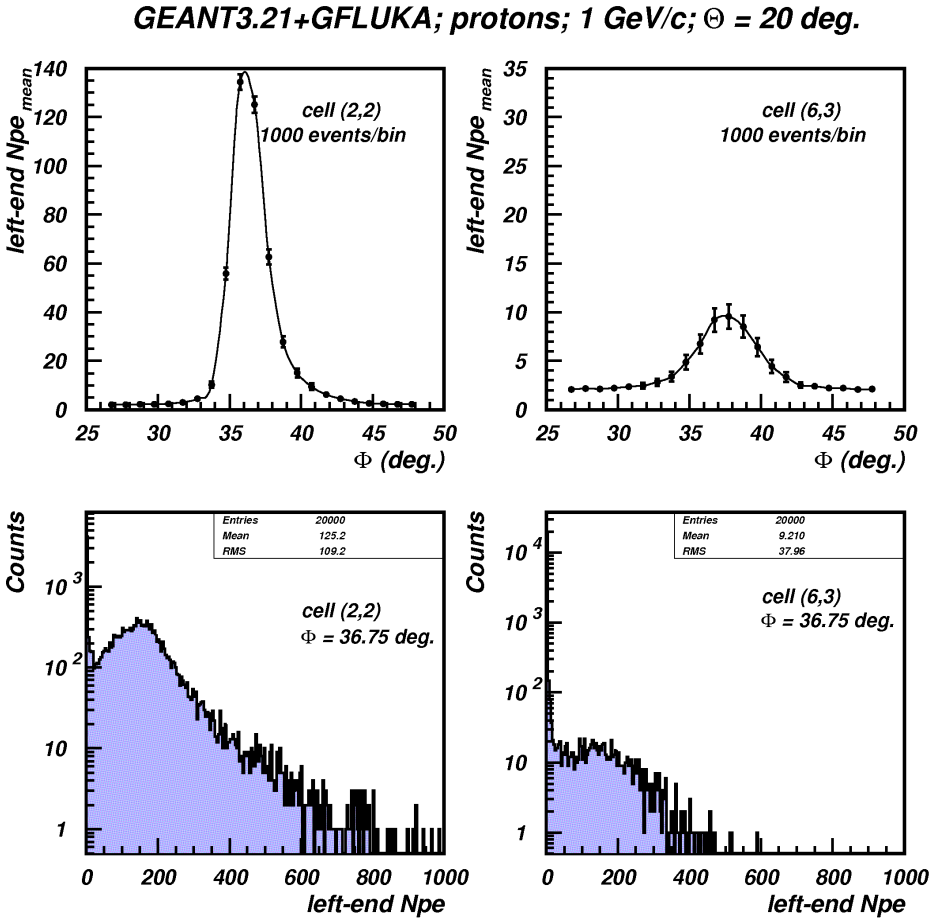
Not very far away from the value with pions

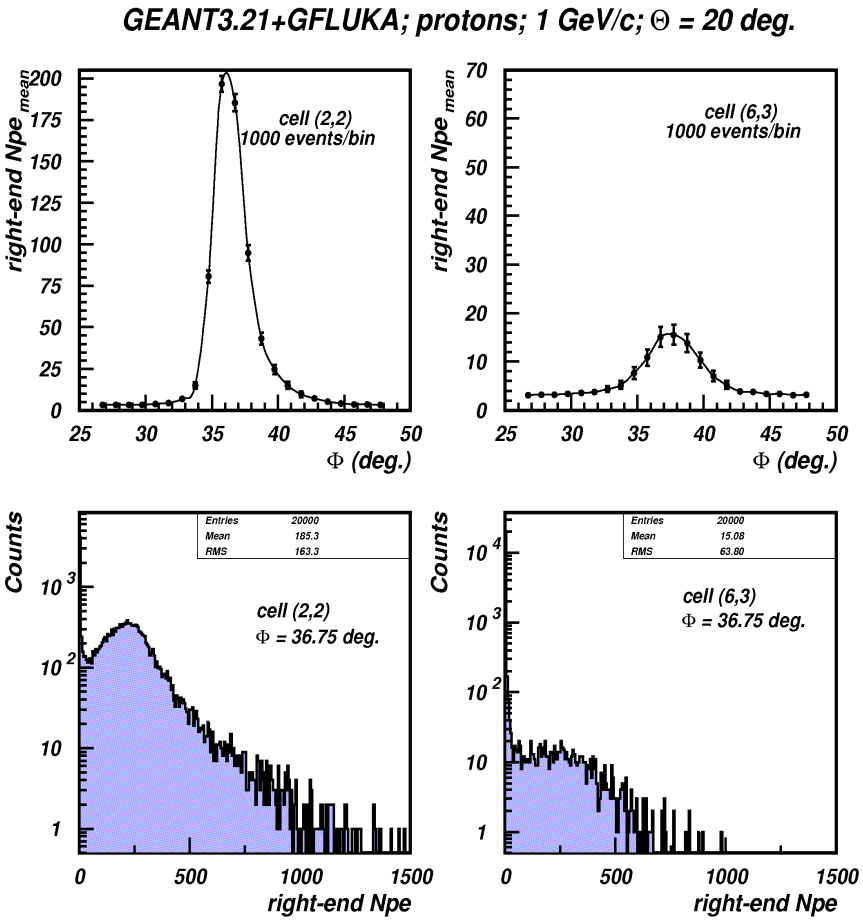
~0.8 MeV

Almost twice smaller...

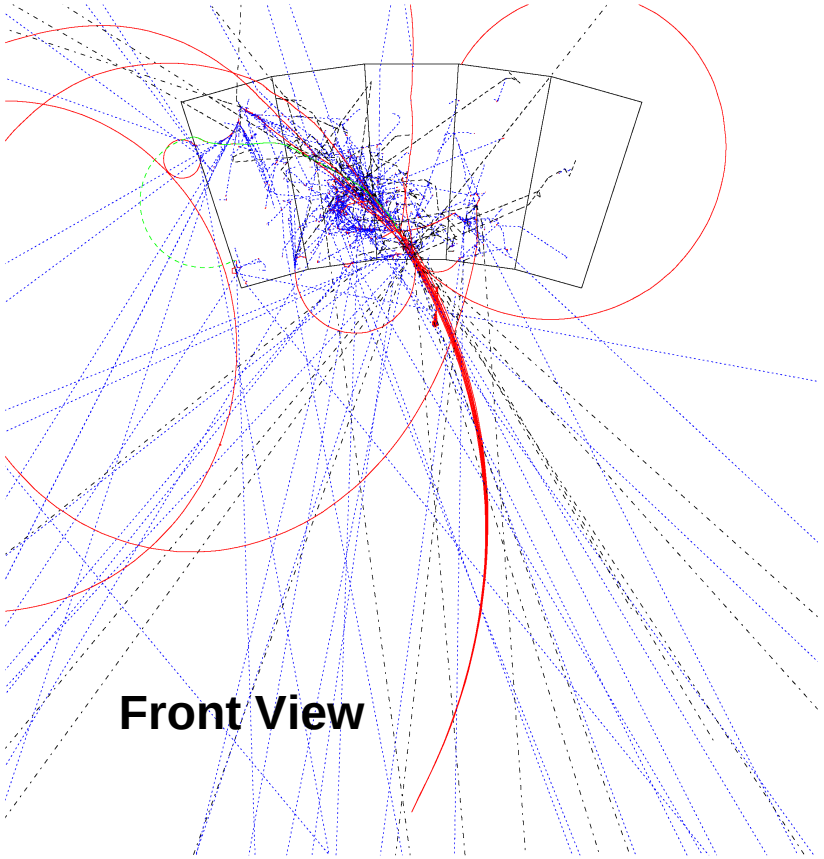
Calibration of inner segments of BCAL is less sensitive to pion/proton ratio

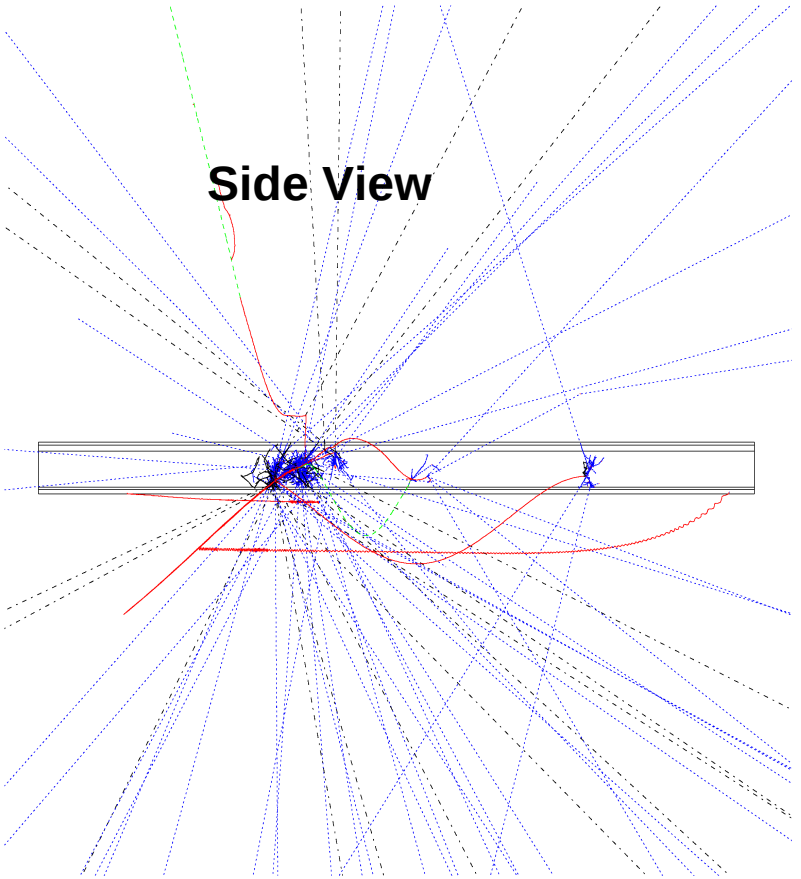
Signals (Npe) from Left and Right Ends of the Module





π^+ ; P=0.6 GeV/c; θ=40°





Protons: P=0.6 GeV/c; θ=40°