



Simulation of the Dual Readout (CCAL02) Detector

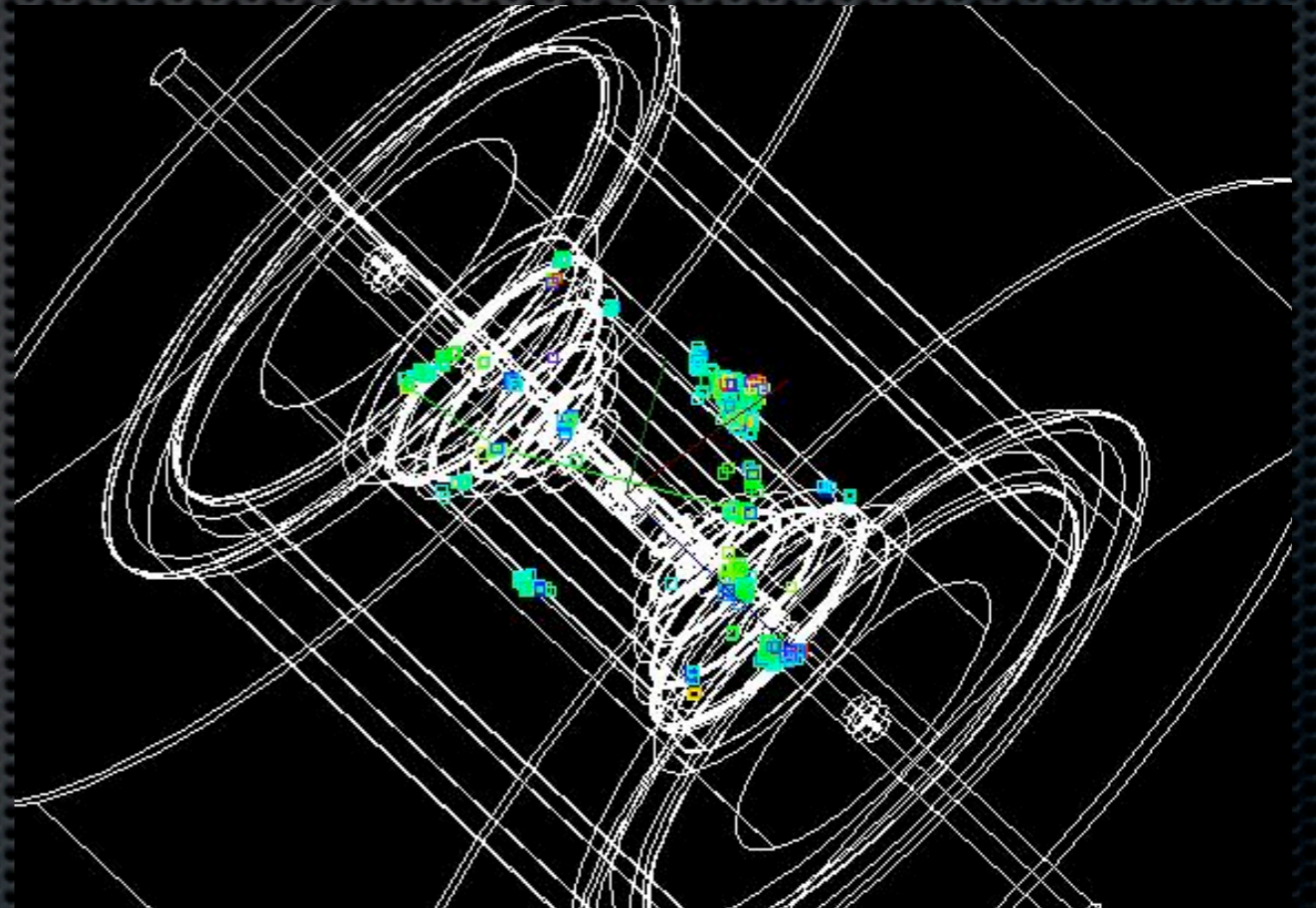
Progress Report: Week 6



Earle Wilson

Advisor: Hans Wenzel

July 20, 2010

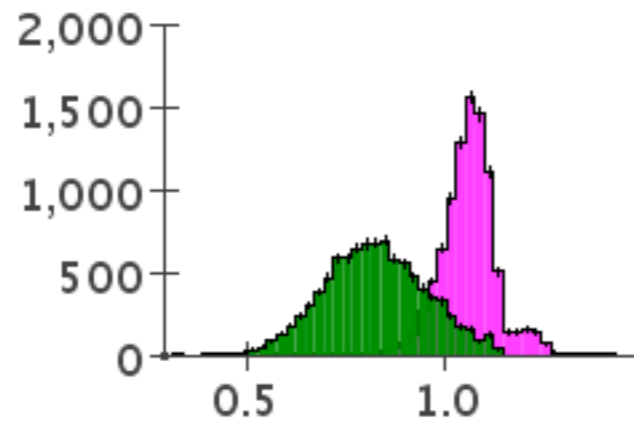


Project Outline

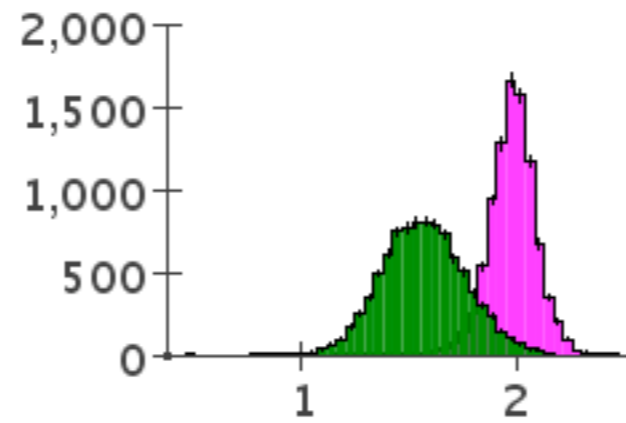
- Analyze simulated events in a total absorption dual read out calorimeter using FTFP_BERT physics list.
- Calibrate energy response using electrons. Found scale factors:
 - $C = c * 7631; S = s * 1.004$
- Obtained dual read out correction function.
- Studied energy dependence of correction function.
- Obtained corrected energy response and energy resolution.
- Compared energy response with the different physics lists.
- Revisited correction function. Explored ways to compensate for leakage.
- Revisited timing and energy cuts. Analyzed raw hits.
- Studied energy distribution of minimum ionizing particle: 15 GeV muon.
 - Analyzed the effect of the digitization cuts.
- Simulated dense BGO with QGSP_BERT physics list.

Scint. Energy Distribution RAW and DIGI hits

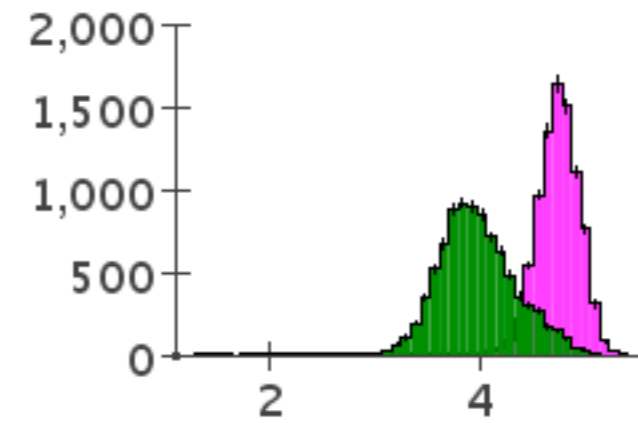
Digi-Raw E-shifts [1 GeV pi-]



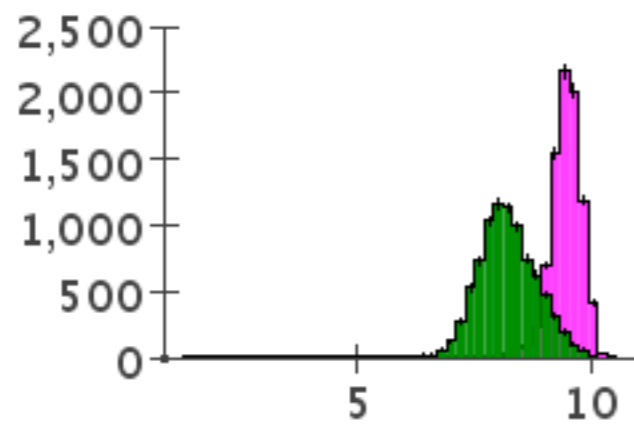
Digi-Raw E-shifts [2 GeV pi-]



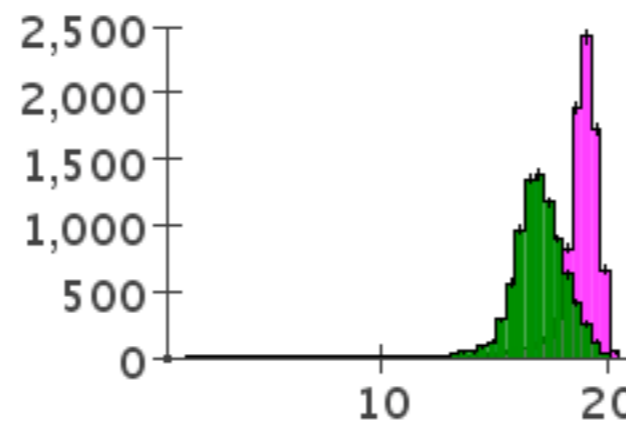
Digi-Raw E-shifts [5 GeV pi-]



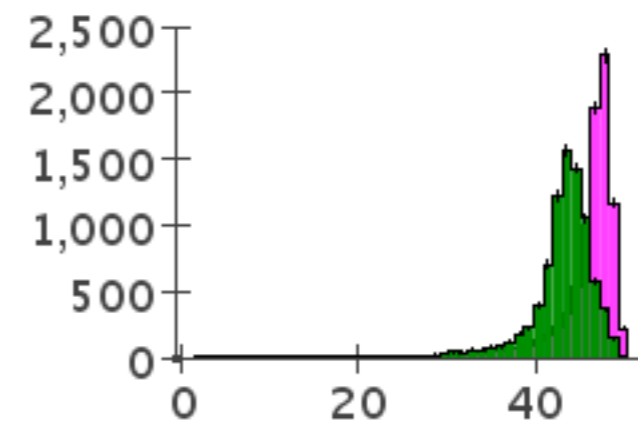
Digi-Raw E-shifts [10 GeV pi-]



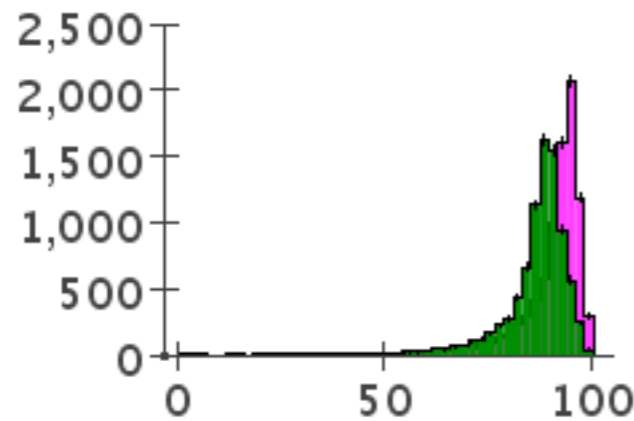
Digi-Raw E-shifts [20 GeV pi-]



Digi-Raw E-shifts [50 GeV pi-]



Digi-Raw E-shifts [100 GeV pi-]



Digis:

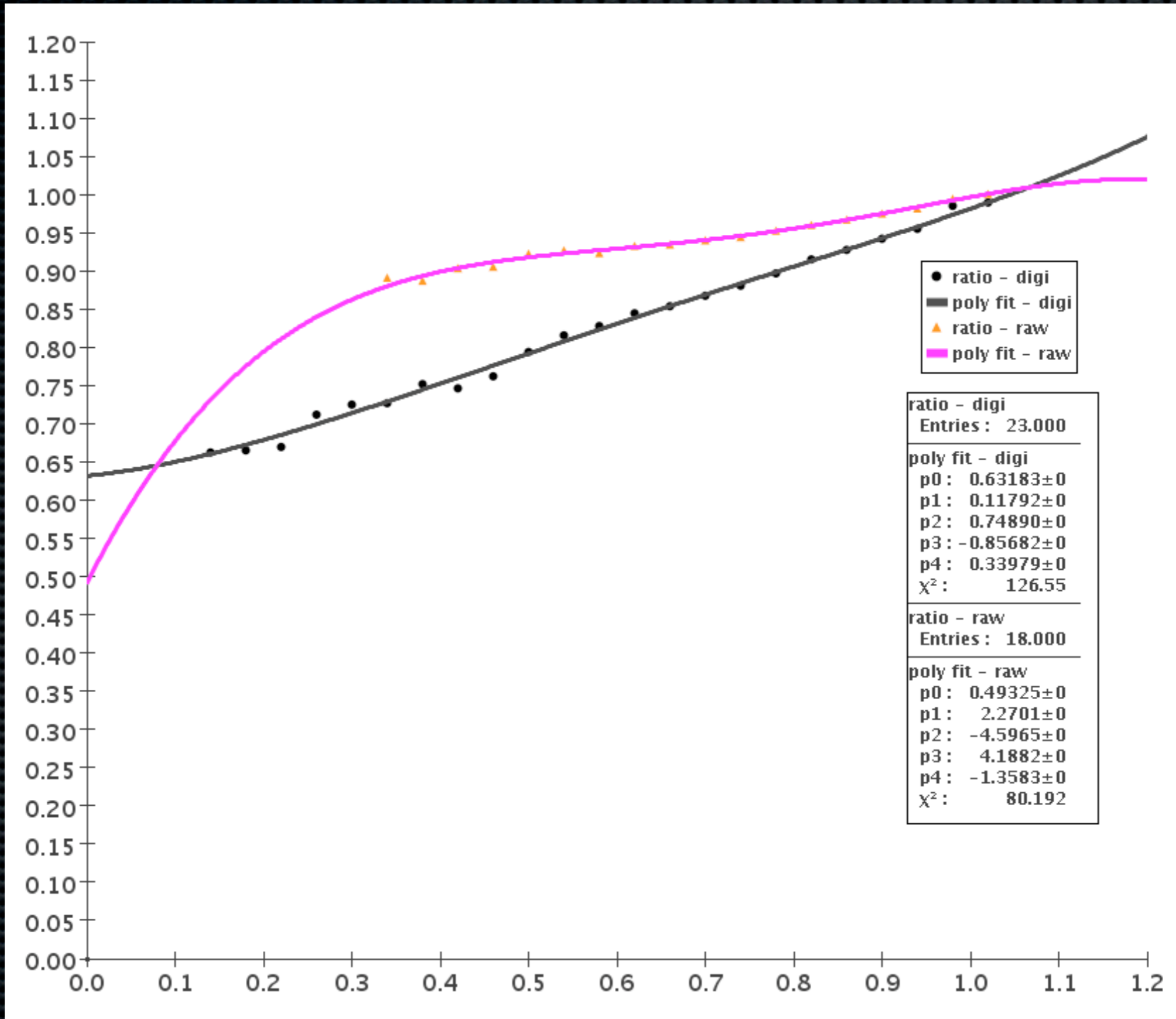
Energy Threshold: 1/50 of mip

Timing threshold: 100ns

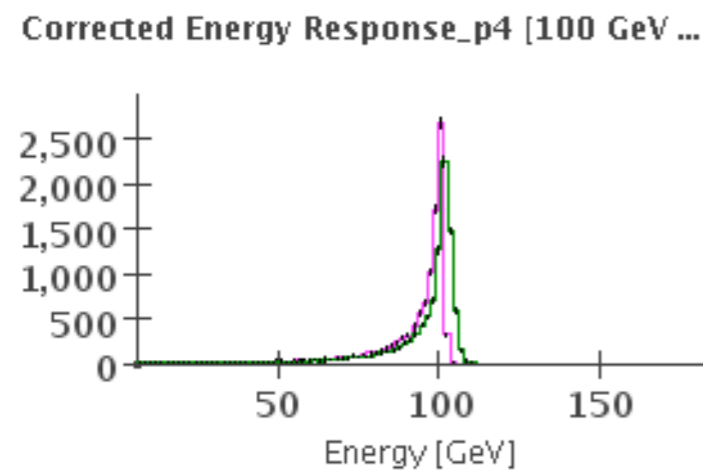
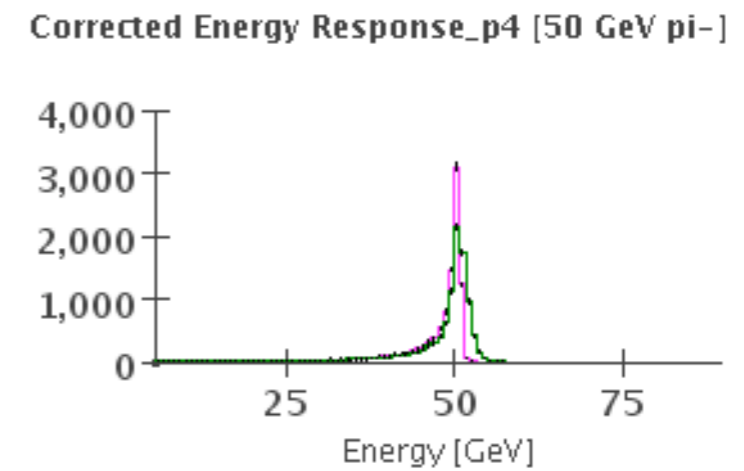
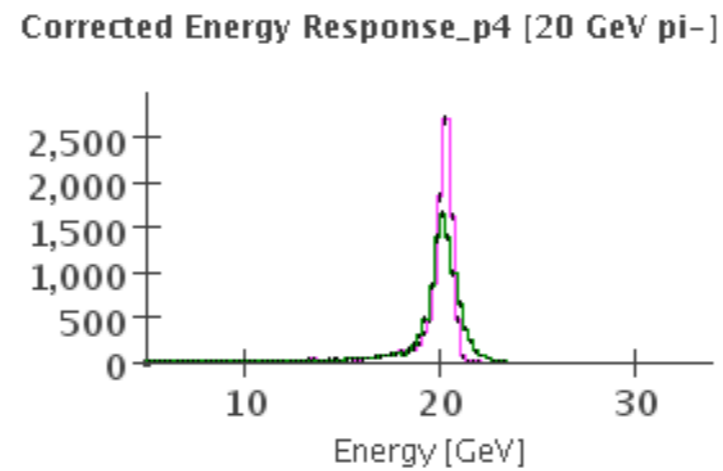
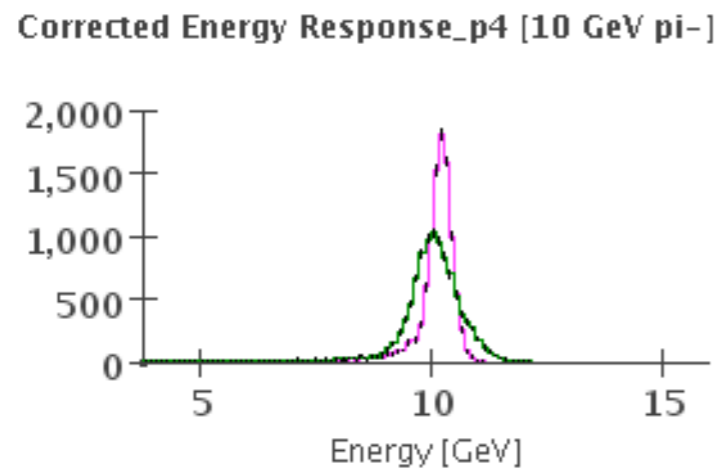
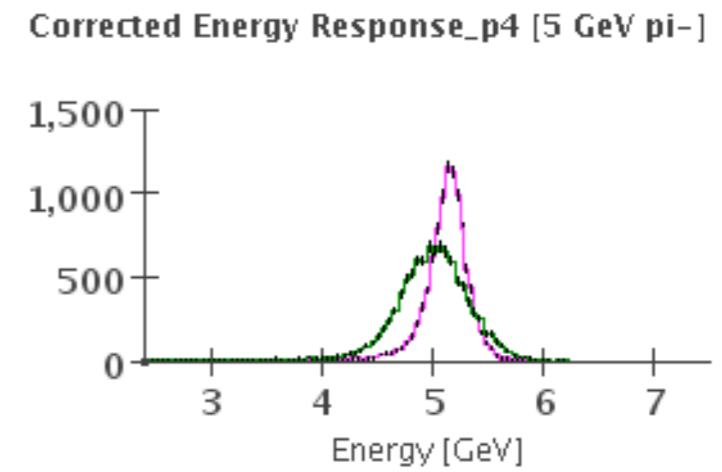
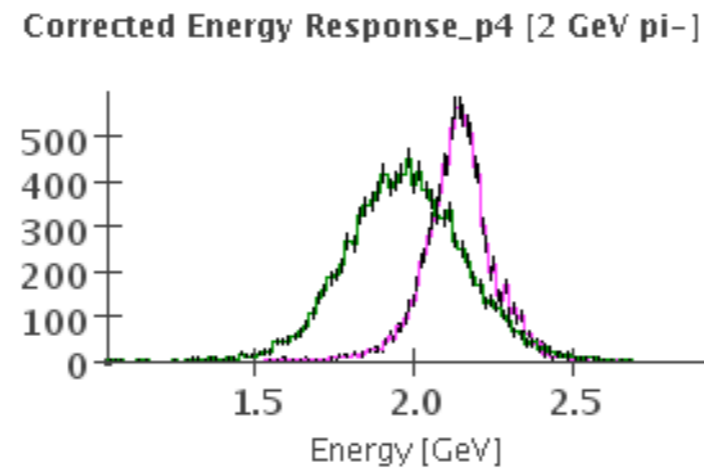
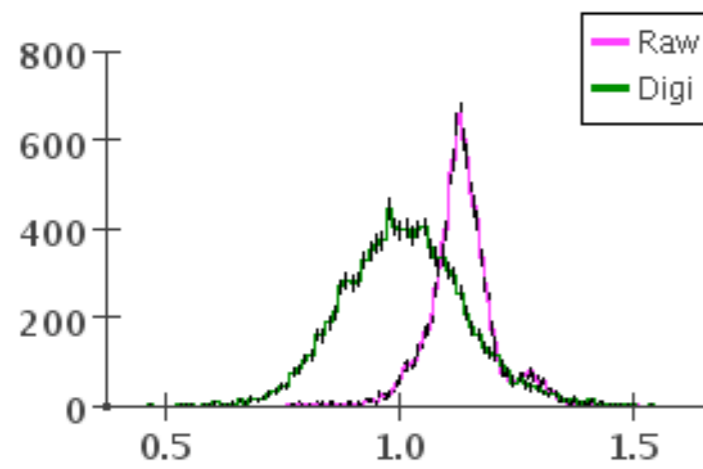
mip ~ 30MeV in Ecal

~ 60MeV in Hcal

Correction function Raw and DigiHits

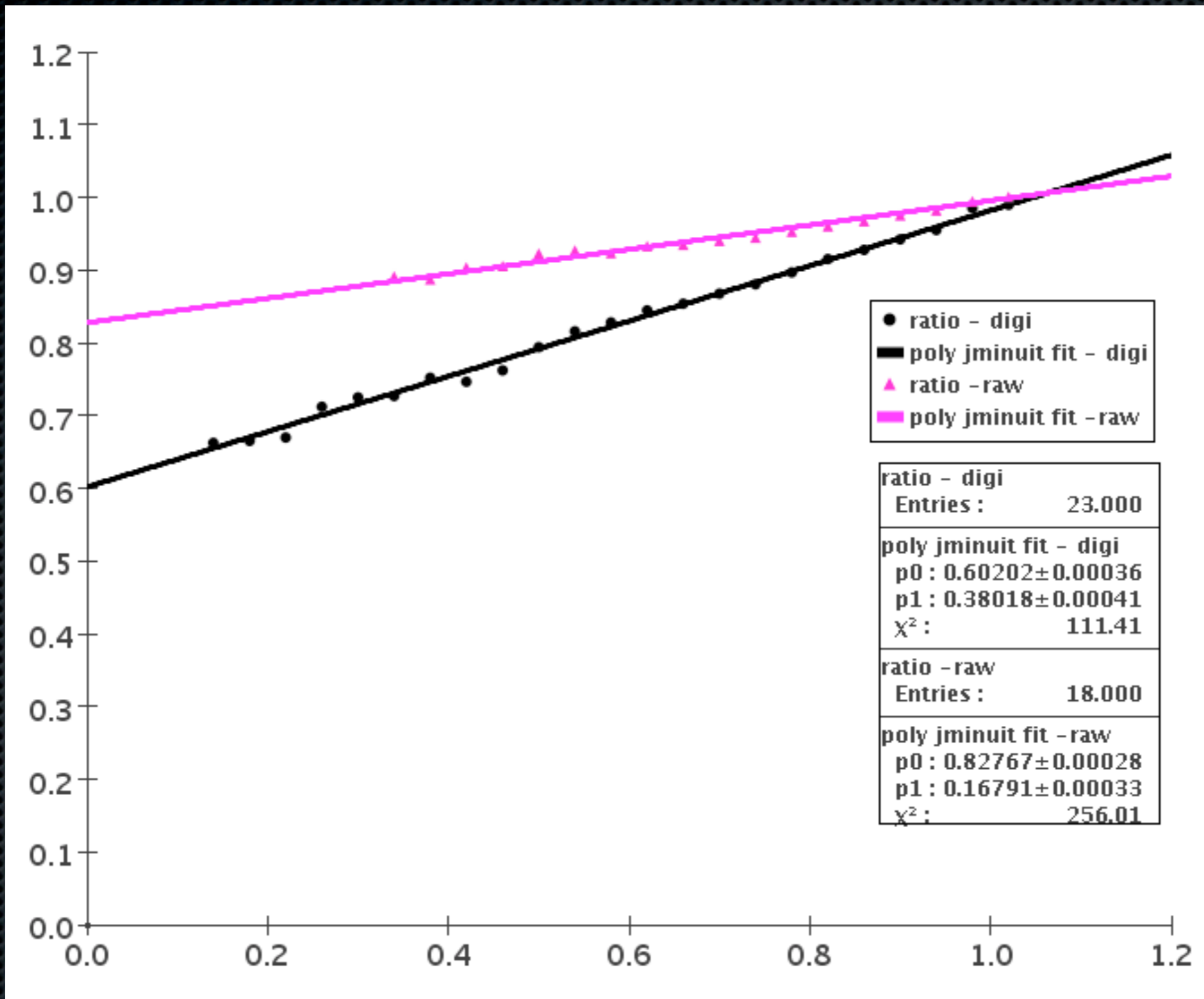


D.R. Corrected Energy Dist. RAW and DIGI hits

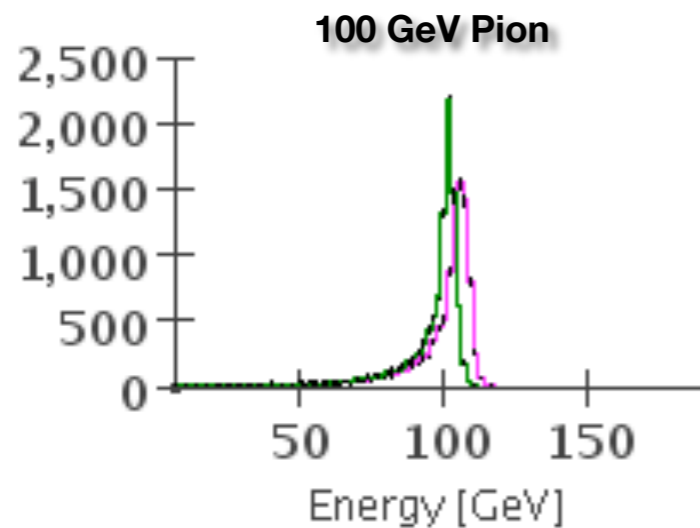
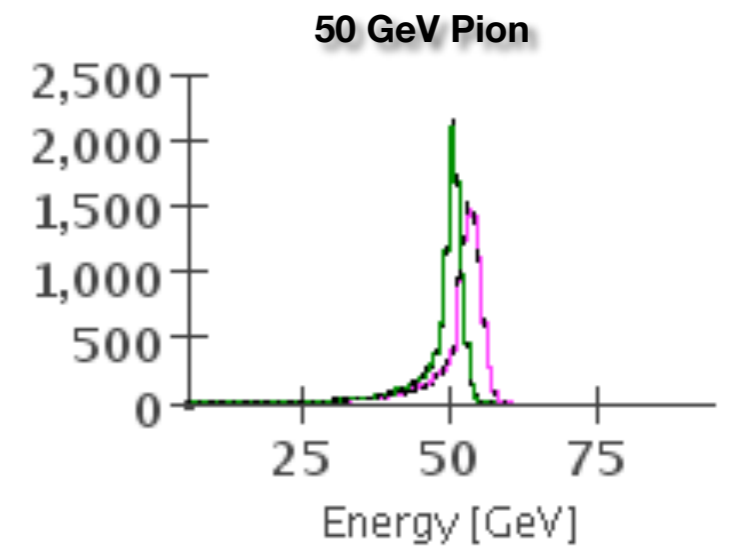
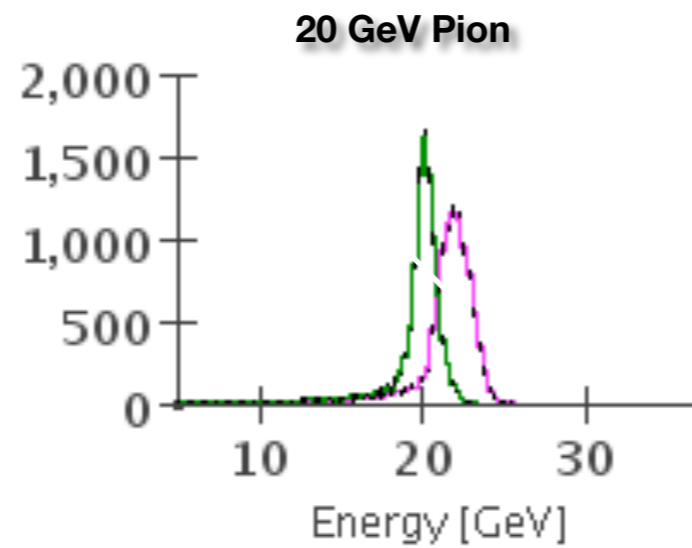
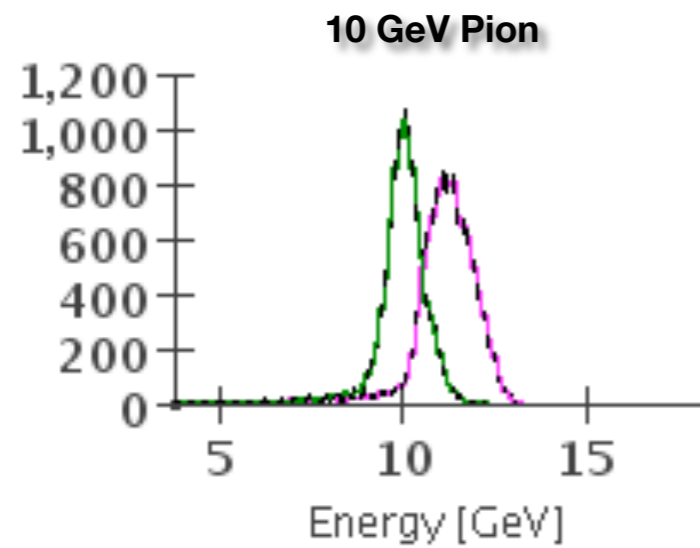
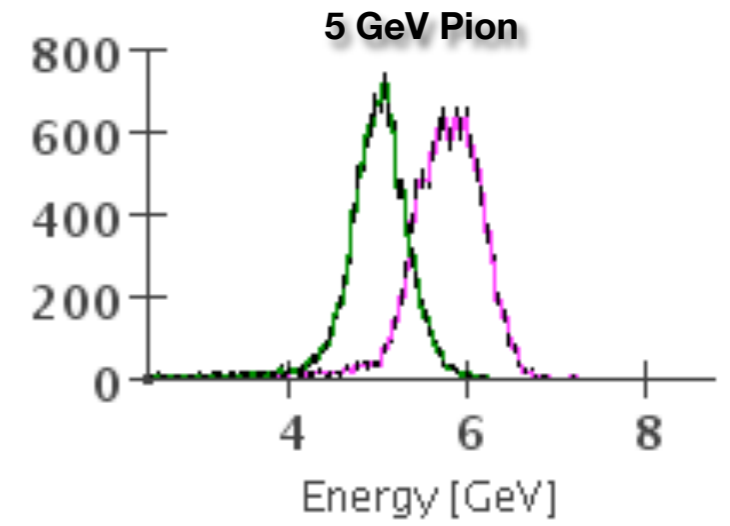
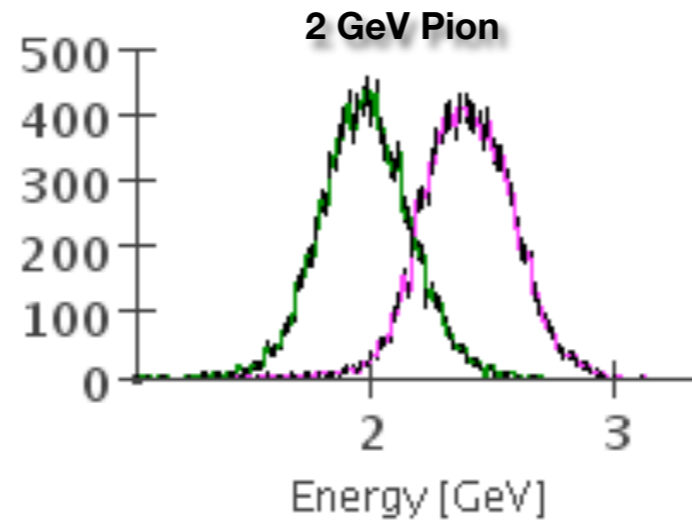
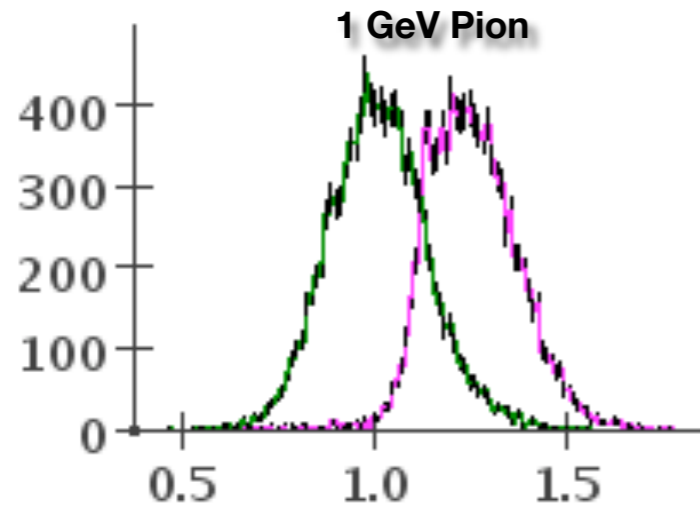


Digis:
Energy Threshold: 1/50 of mip
Timing threshold: 100ns

Correction function Raw and Digi hits



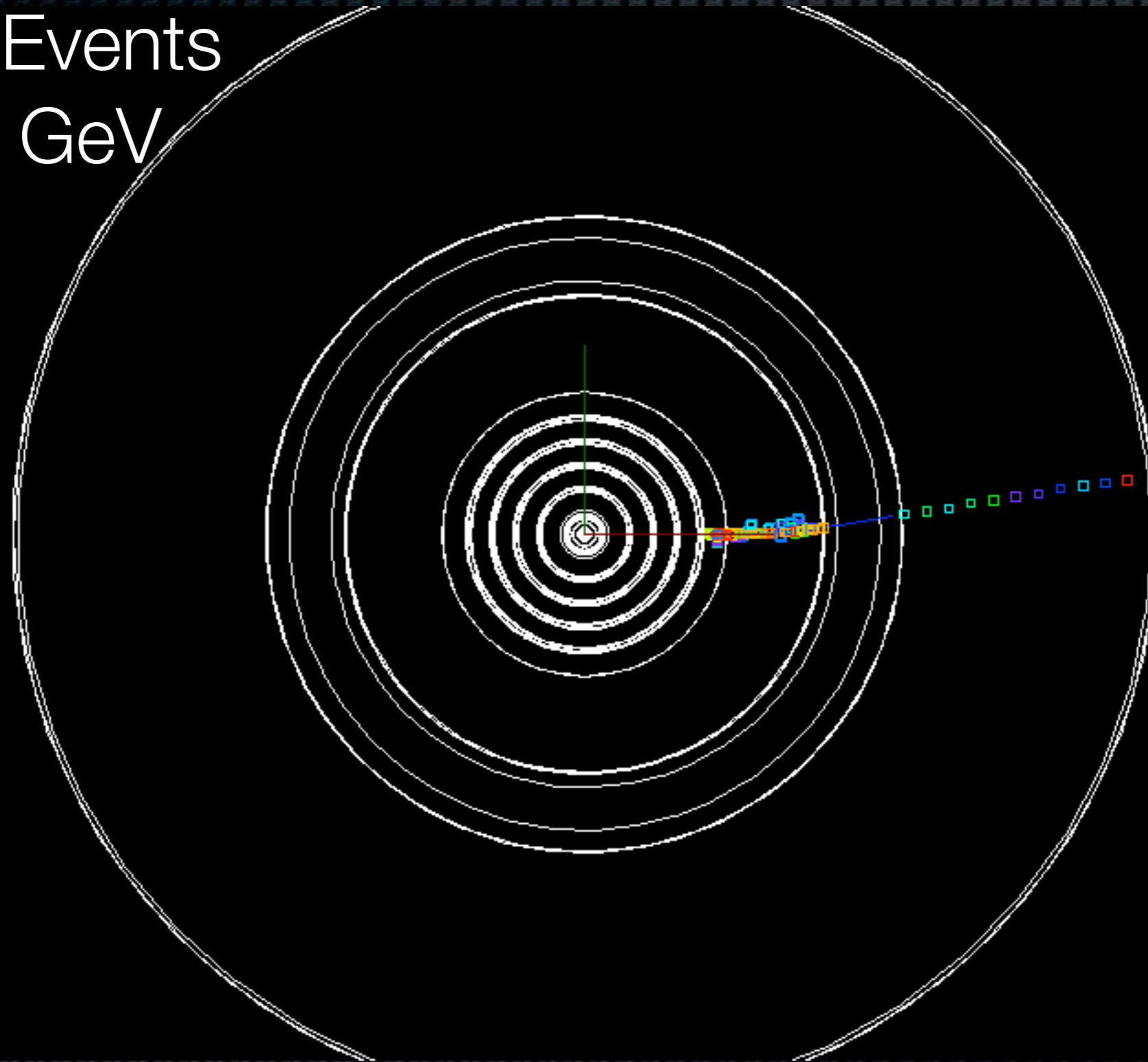
D.R. Corrected Energy Dist. RAW and DIGI hits



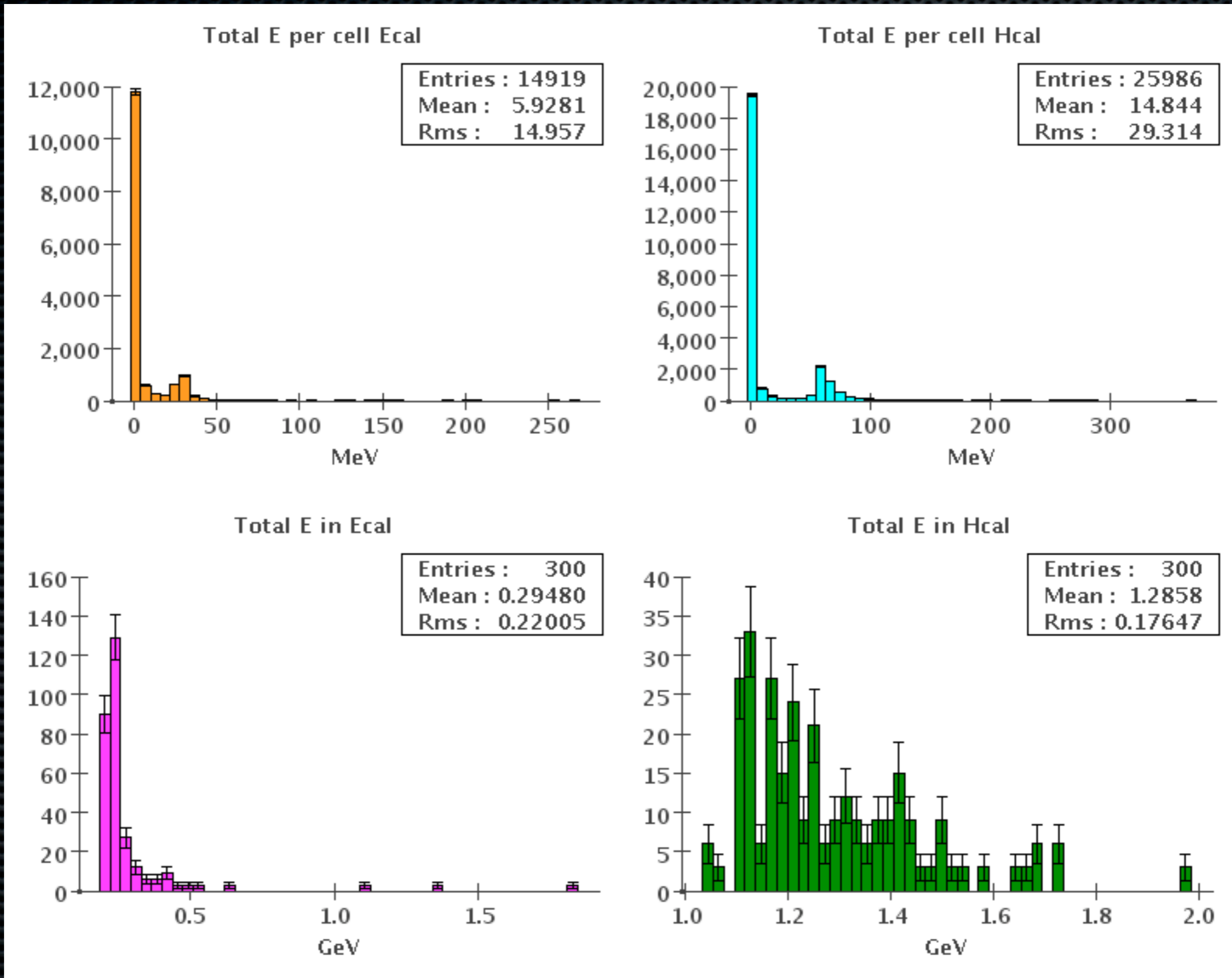
— Raw
— Digi

M.I.P. runs: Muon Simulation

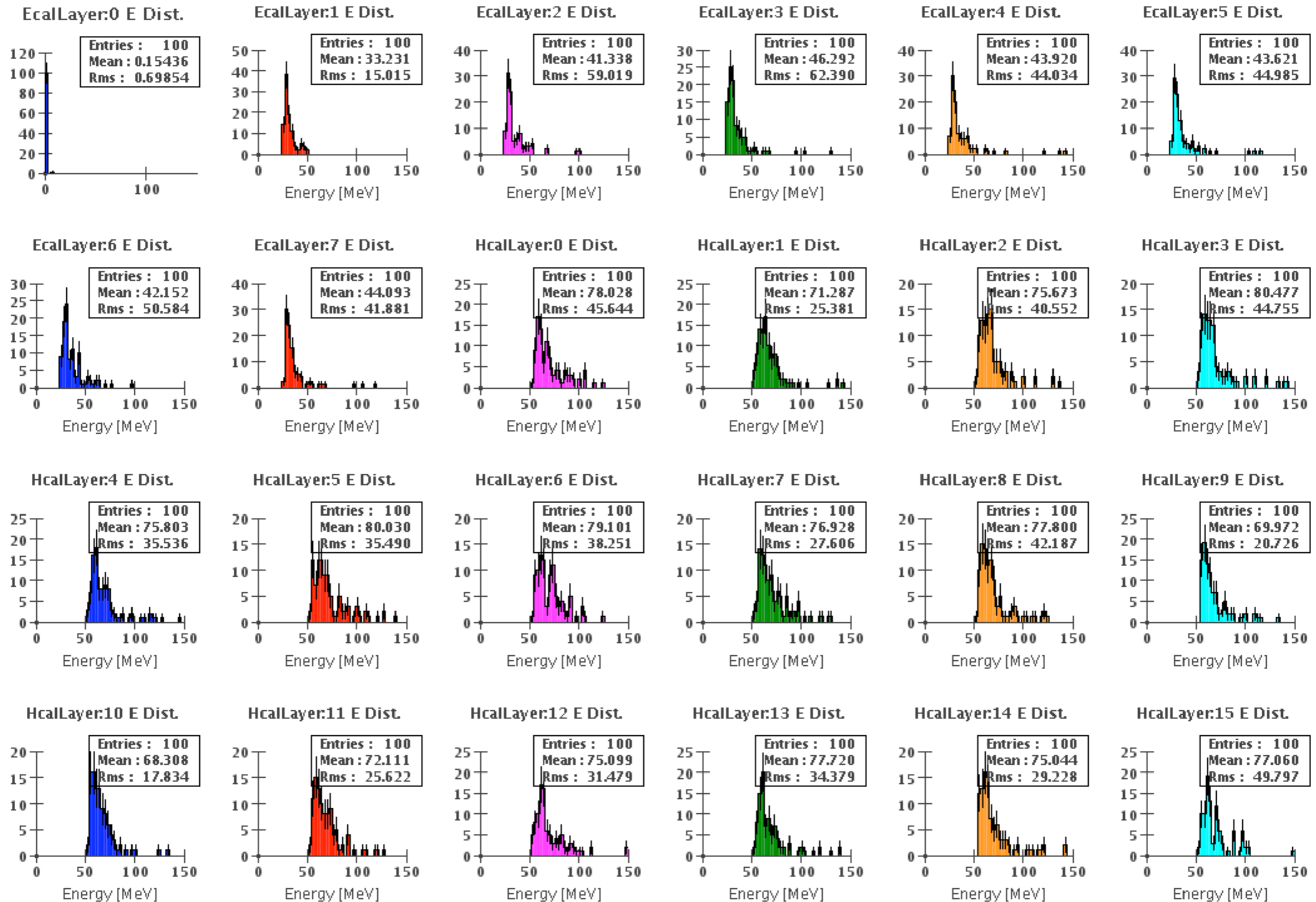
100 Events
15 GeV



Muon Energy Dist. w/o threshold cuts

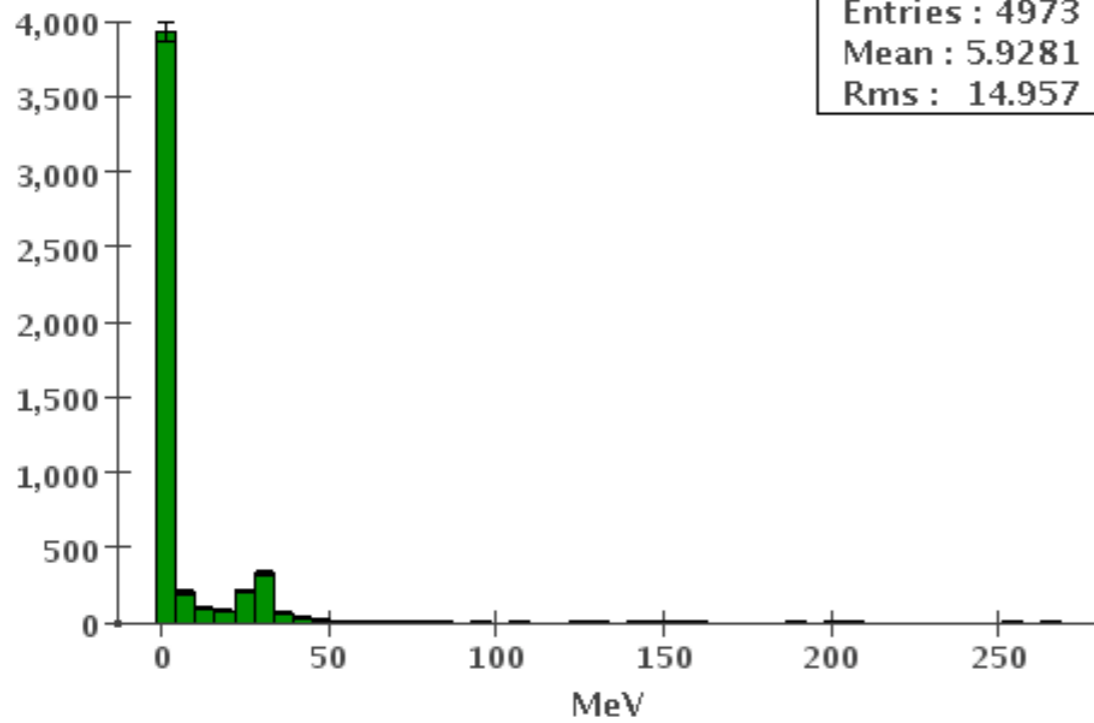


Muon Energy Dist. w/o threshold cuts

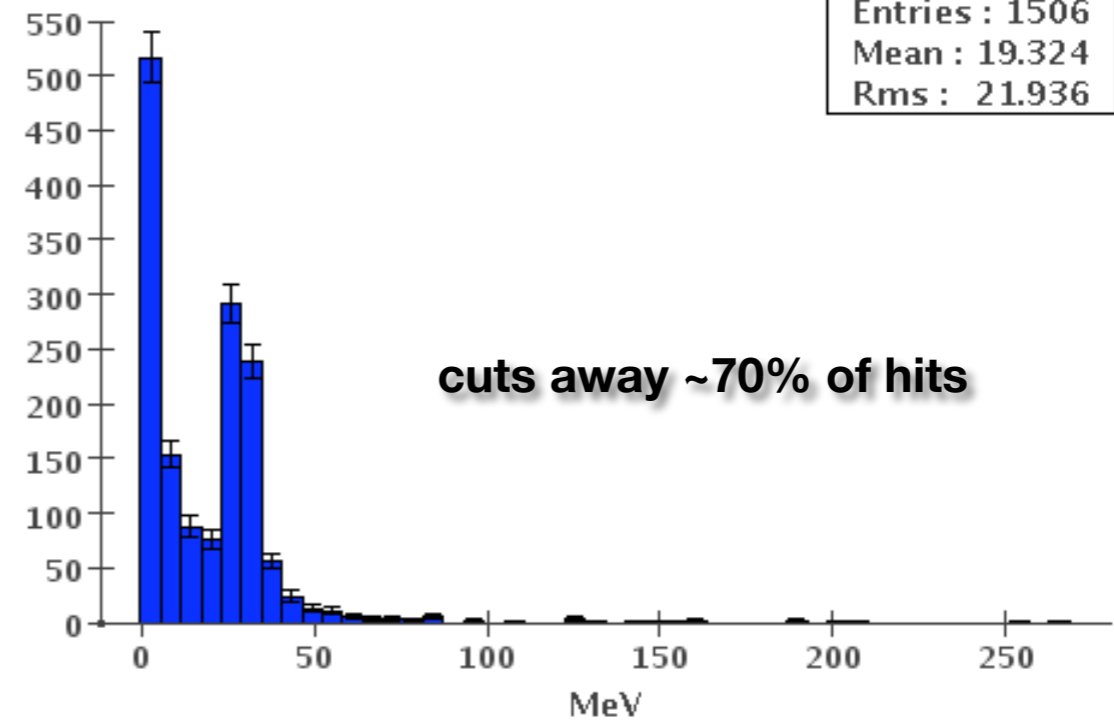


Muon Energy Dist. with threshold cuts

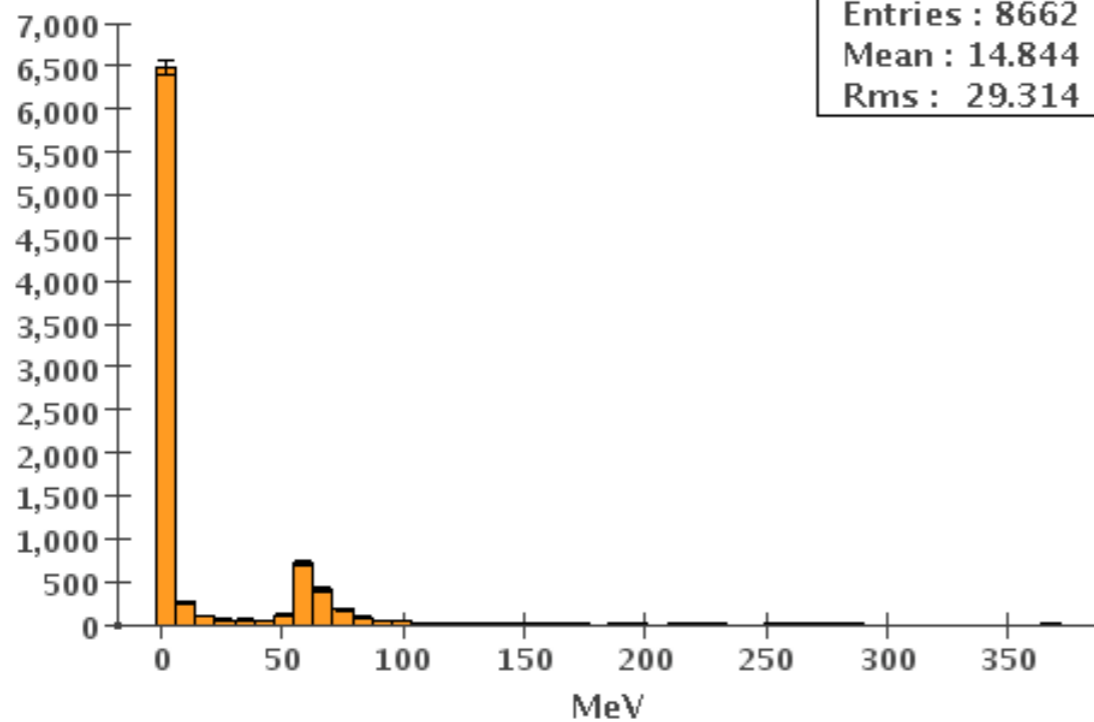
Ecal_Total (raw)



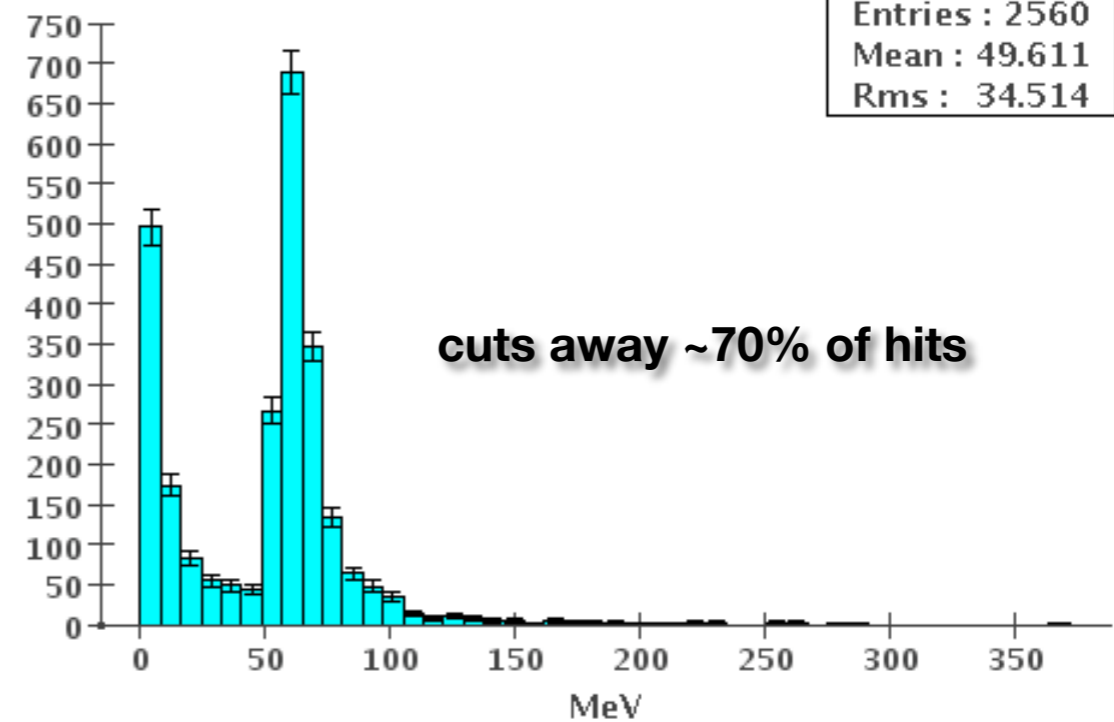
Ecal_Total (1/50 mip, 100ns)



Hcal_Total (raw)



Hcal_Total (1/50 mip, 100ns)



- ✦ Current digi threshold cuts away 70% of mip hits.
- ✦ Vary threshold cuts and see the effect on energy resolution