Wave-Plate Asymmetries and GEANT4 Comparison

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Outline

Current Asymmetries

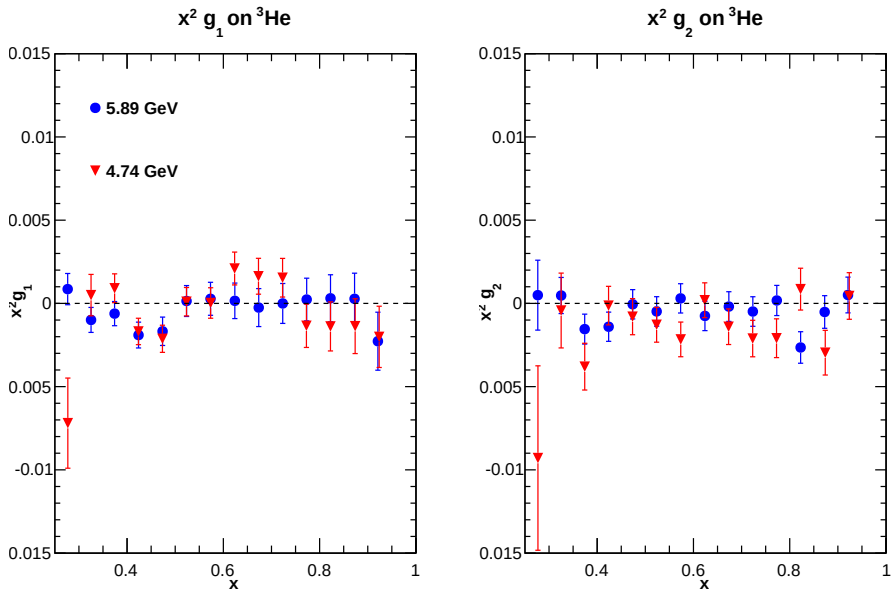
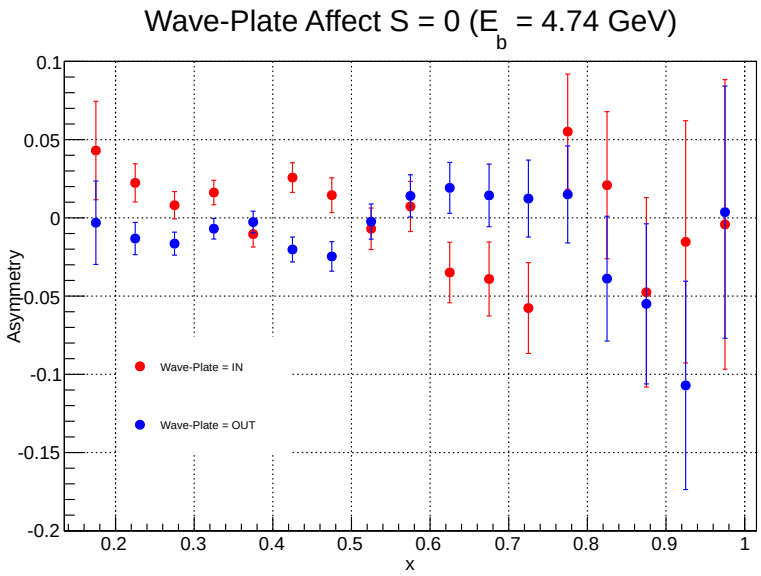


Figure: Preliminary g_1 and g_2 structure functions for 4.74 and 5.89 GeV data sets.

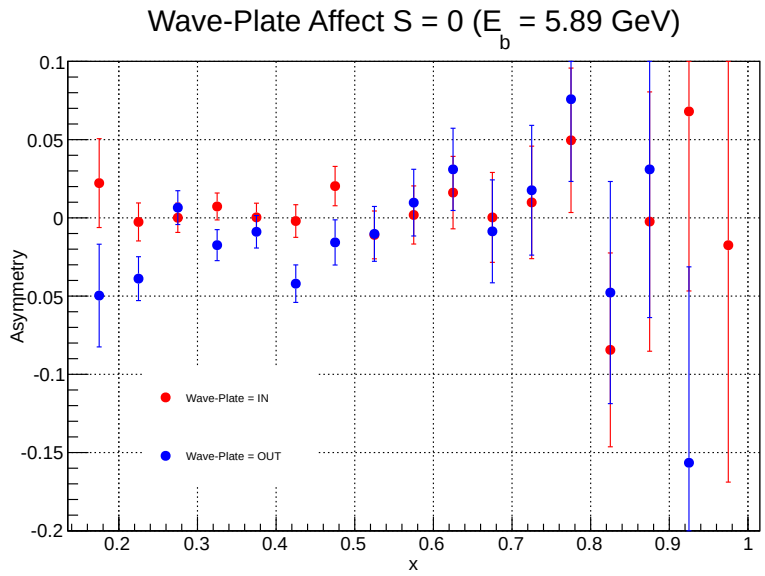
- Why the asymmetry smaller for the 5.89 GeV data set?
- Could the wave plate status be wrong in the 5.89 GeV data?

Total Wave-Plate Asymmetries

Target Spin = 0°



(a) E = 4.74 GeV



(b) E = 5.89 GeV

Figure: Corrected physics asymmetries (except for pair-production) for each wave plate configuration for 4.74 and 5.89 GeV data sets.

Wave-Plate Asymmetries

Target Spin = 0°, x = 0.275

- Compare run by run wave-plate asymmetries
- X-bin x = 0.275 shown here
- Asymmetries are small

Figure: E = 4.74 GeV

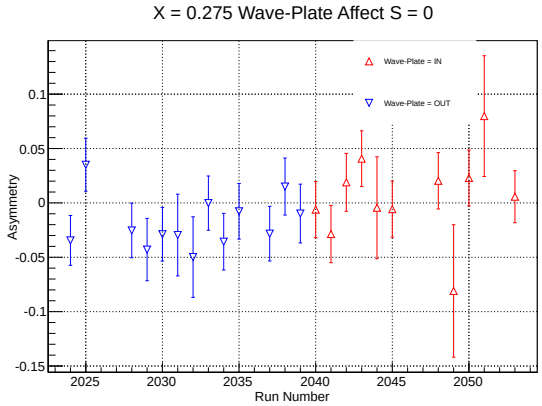


Figure: E = 5.89 GeV, Runs 1532-1552

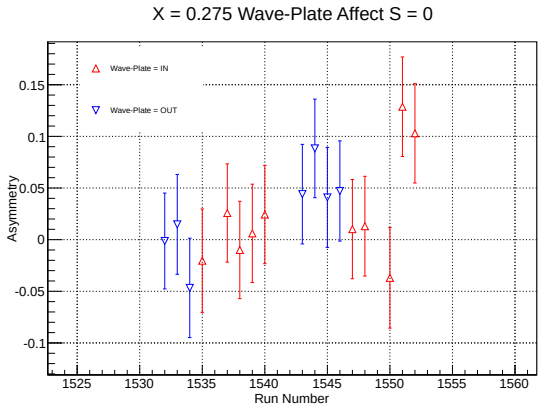
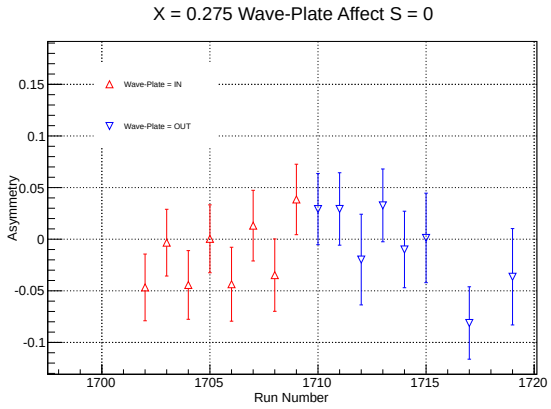


Figure: E = 5.89 GeV, Runs 1702-1719



Compton Wave-Plate Asymmetries

Sub Set of Runs

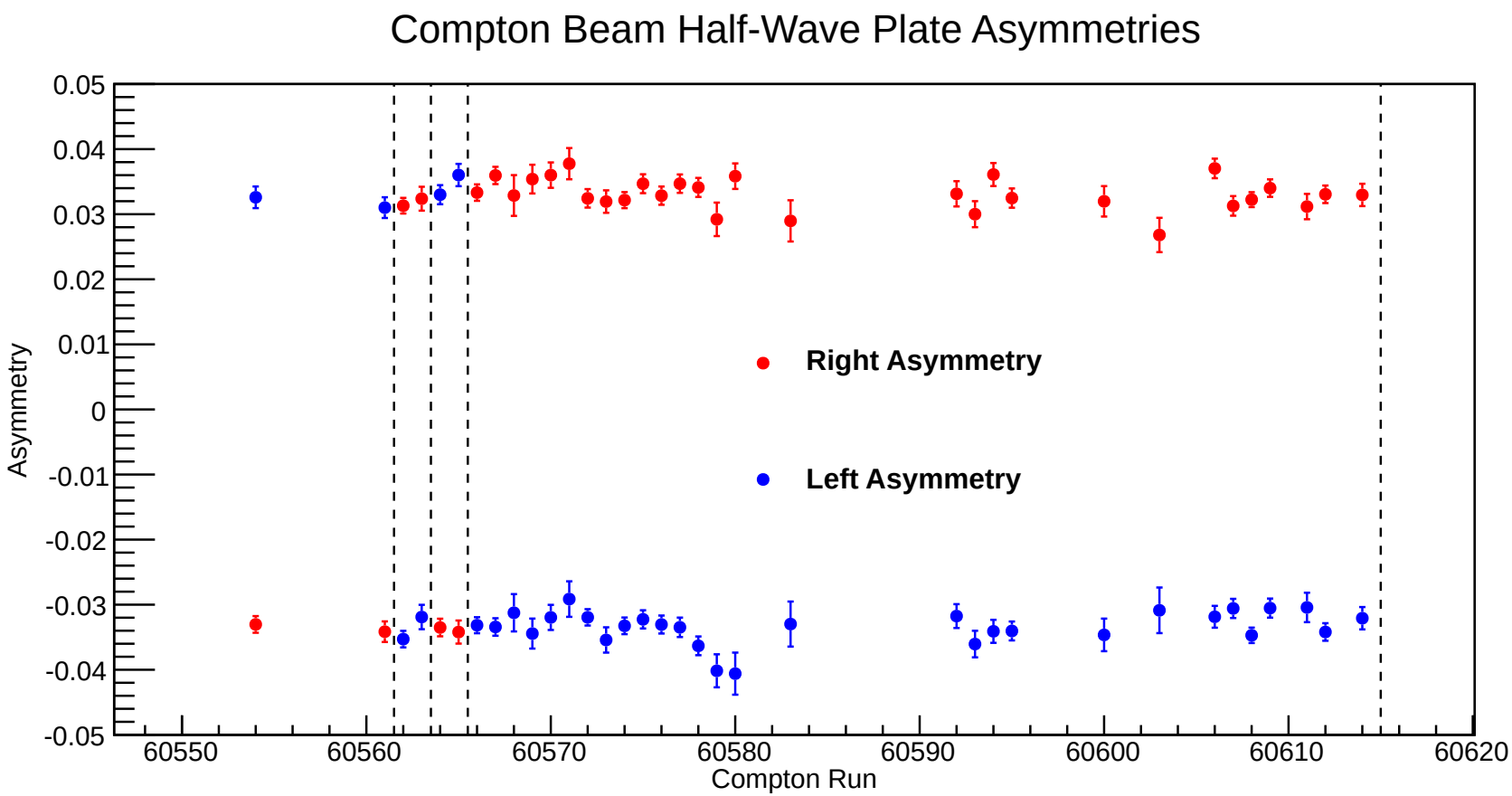


Figure: Sub set of the Compton half wave plate asymmetries. 5.89 GeV S = 0° runs approximately correspond to Compton runs 60560-60570 (BB runs 1532-1552) and 6010-6020 (BB runs 1702-1719). Dashed lines show when BigBite has wave-plate change.

Compton Wave-Plate Asymmetries

Full Run Set

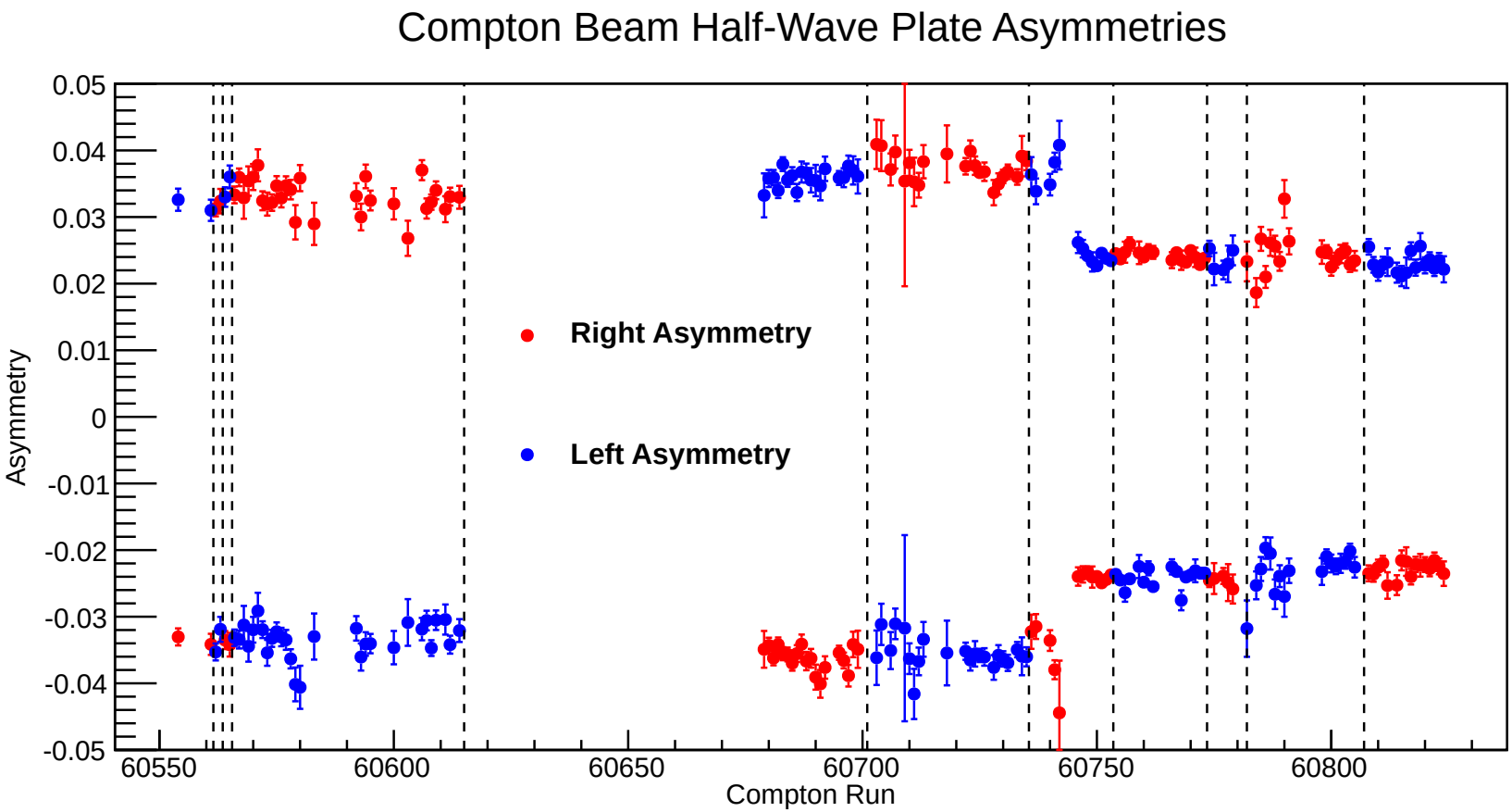


Figure: Full set of the Compton half wave plate asymmetries. Dashed lines show when BigBite has wave-plate change.

Wave-Plate Summary

- Wave plate configuration has been thoroughly checked for all runs
- Asymmetries have the correct wave plate configuration applied
- 5.89 GeV asymmetries are not small due to wave plate configuration

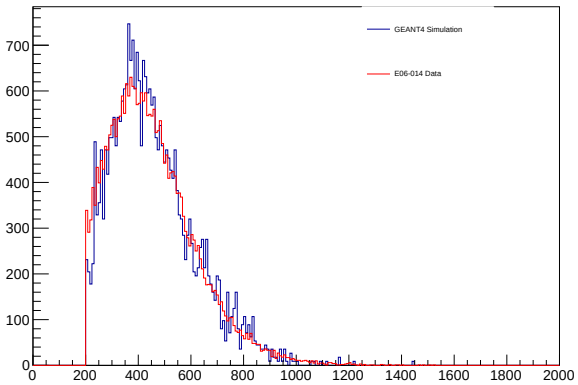
GEANT4 Simulation

- Last time I compared Vahe's BigBite GEANT4 simulation to our data
- There was a discrepancy in the z-vertex and out of plane scattering range
- Fixed by removing hard-coded cut on z-vertex center
- Current comparisons use same cuts as last time (11/29/12)
- Here are some current comparisons to data (run 1535, E = 5.89 GeV and S = 0°)...

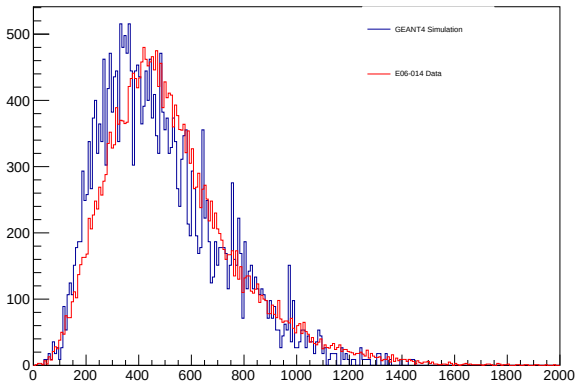
GEANT4 Comparison

Energy

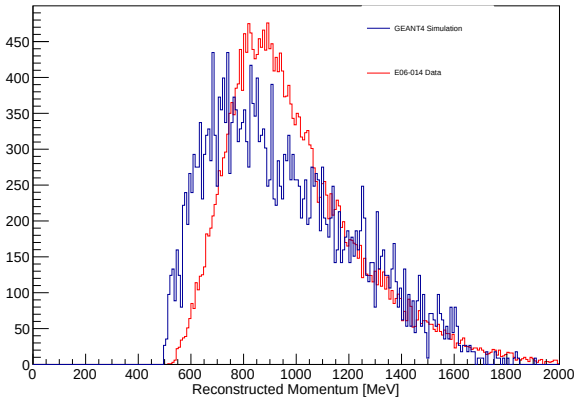
Preshower Comparison



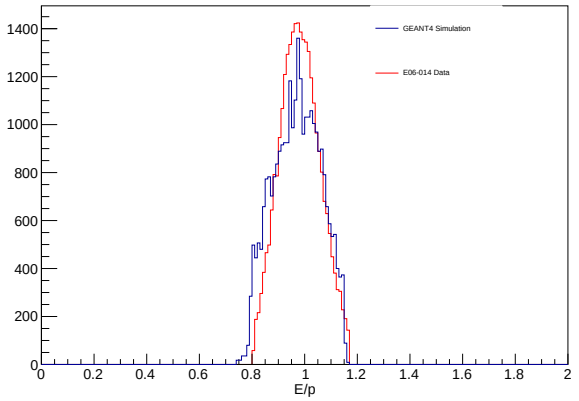
Shower Comparison



Reconstructed Momentum Comparison



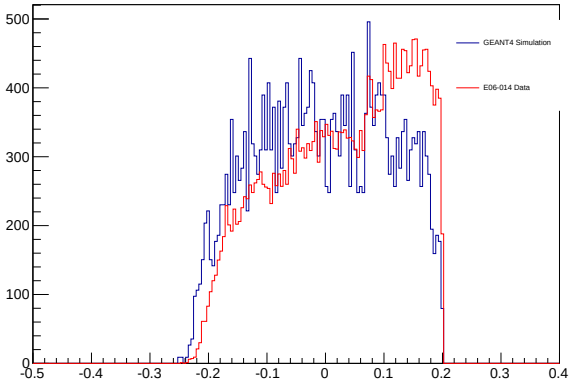
Energy Over Momentum Comparison



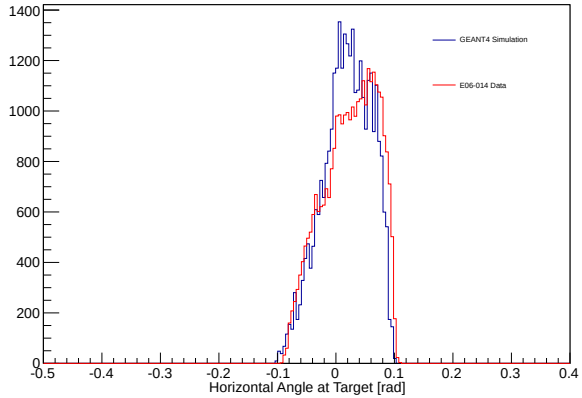
GEANT4 Comparison

Target

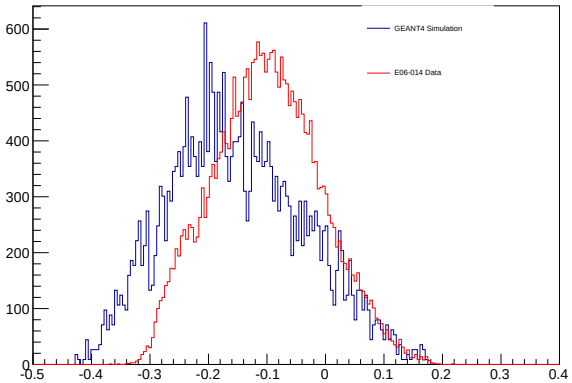
Vertical Target Angle Comparison



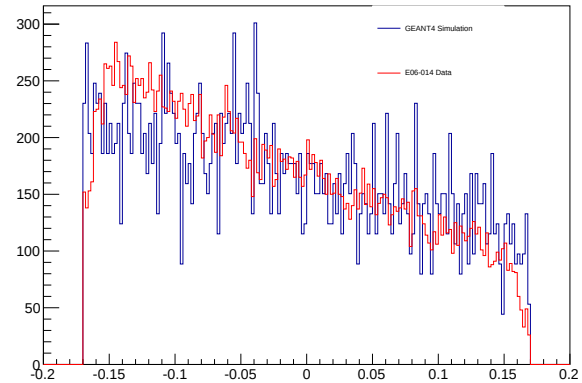
Horizontal Target Angle Comparison



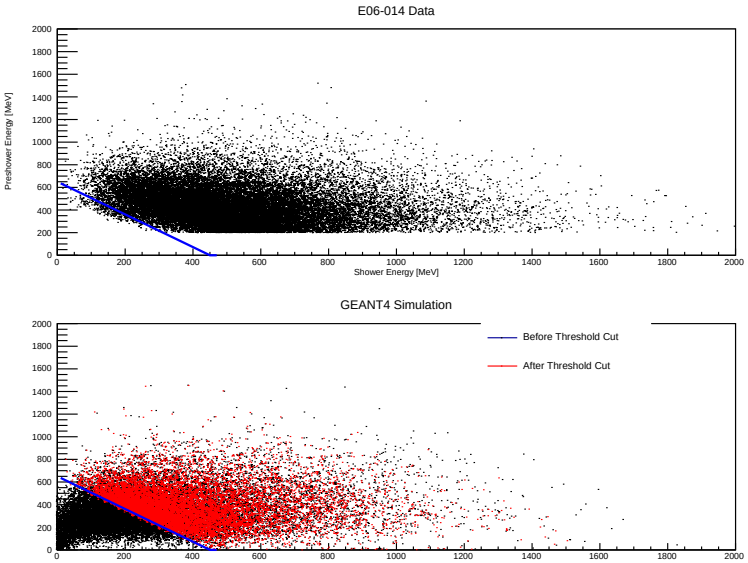
Vertical Angle Comparison



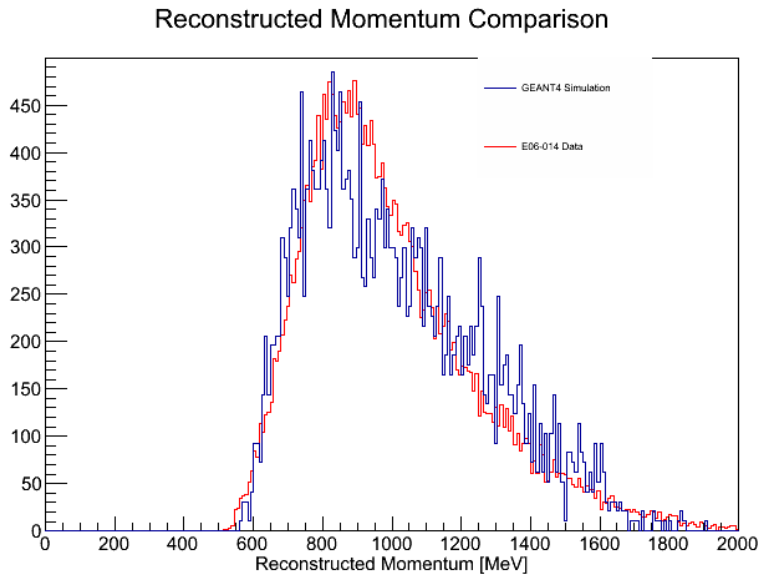
Target Z-Vertex Comparison



GEANT4 Effective Trigger Cut



(a) Cut on shower and preshower energy.



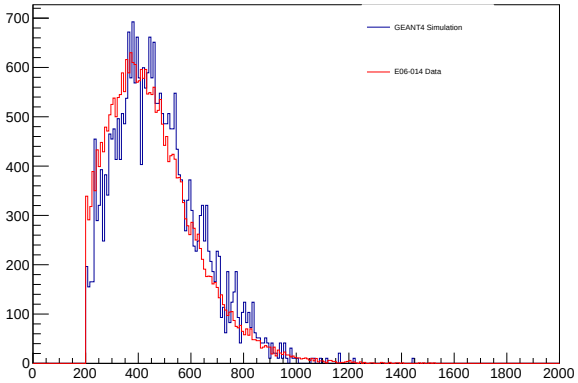
(b) Cut on total shower + preshower energy $>$ 650 MeV.

Figure: Cuts used in GEANT4 simulation to simulate the E06-014 production T2 trigger.

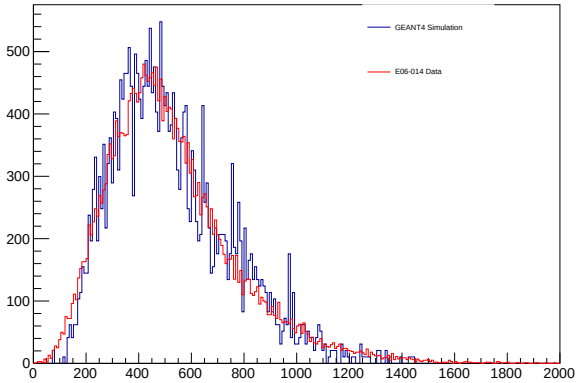
GEANT4 Comparison: After Trigger Cut

Energy

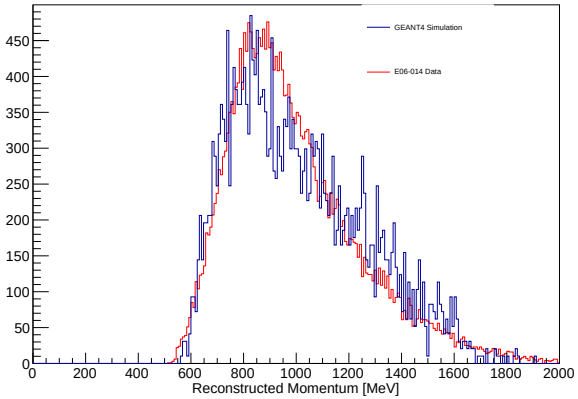
Preshower Comparison



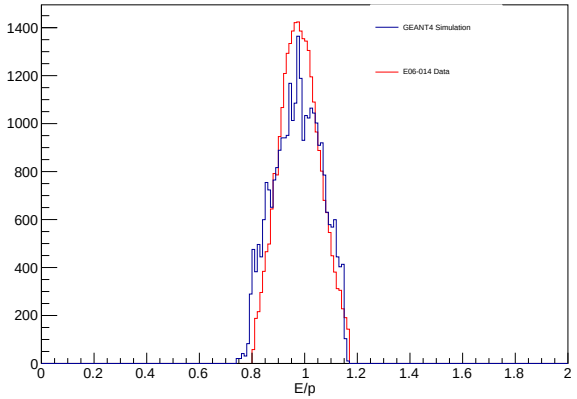
Shower Comparison



Reconstructed Momentum Comparison

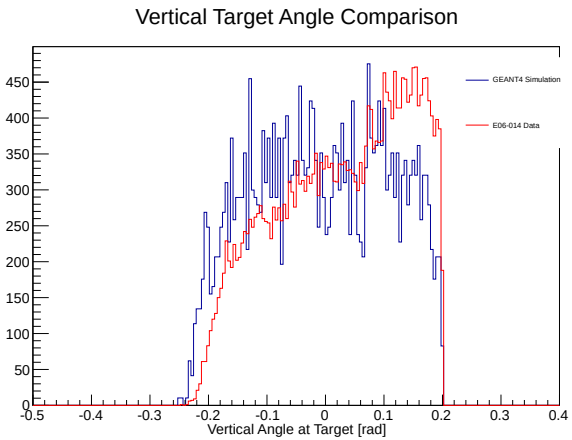


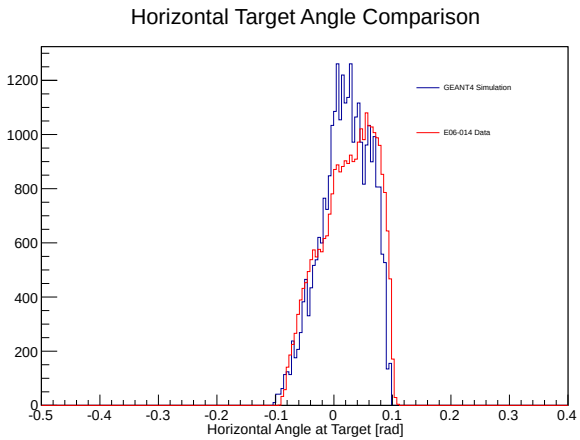
Energy Over Momentum Comparison

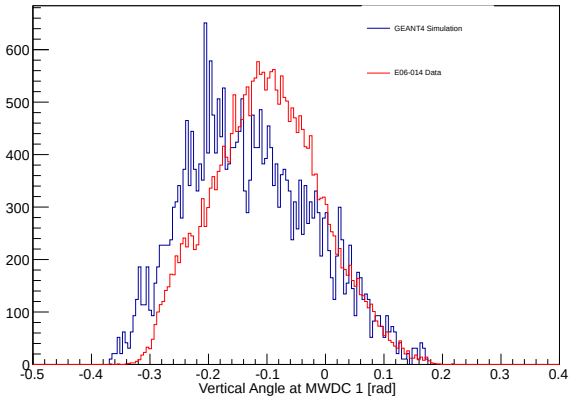


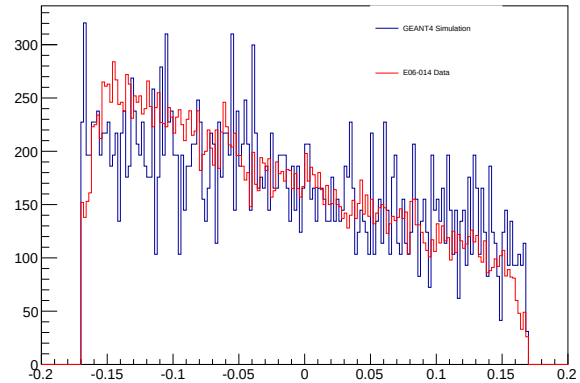
GEANT4 Comparison: After Trigger Cut

Target









GEANT4 Comparison Summary

- Simulation compares fairly well to data
- Effective trigger cut seems to get rid of most energy discrepancies
- Simulation over estimates in the target variables maybe correlated to:
  - BB efficiencies (bad blocks, detector efficiencies etc.)?
  - Less sophisticated tracking reconstruction than the analyzer

What's Next

- GEANT4
  - Look into bend-up e- to bend-down e+ (in progress)
  - Set calorimeter blocks in simulation to 0 that match up to bad blocks in data
- d_2
  - Collect data on ^{3}He/n g_1 and g_2 at x < 0.25
  - Fit collected data and compute $\tilde{d}_2$