

GEANT Simulation of BETA

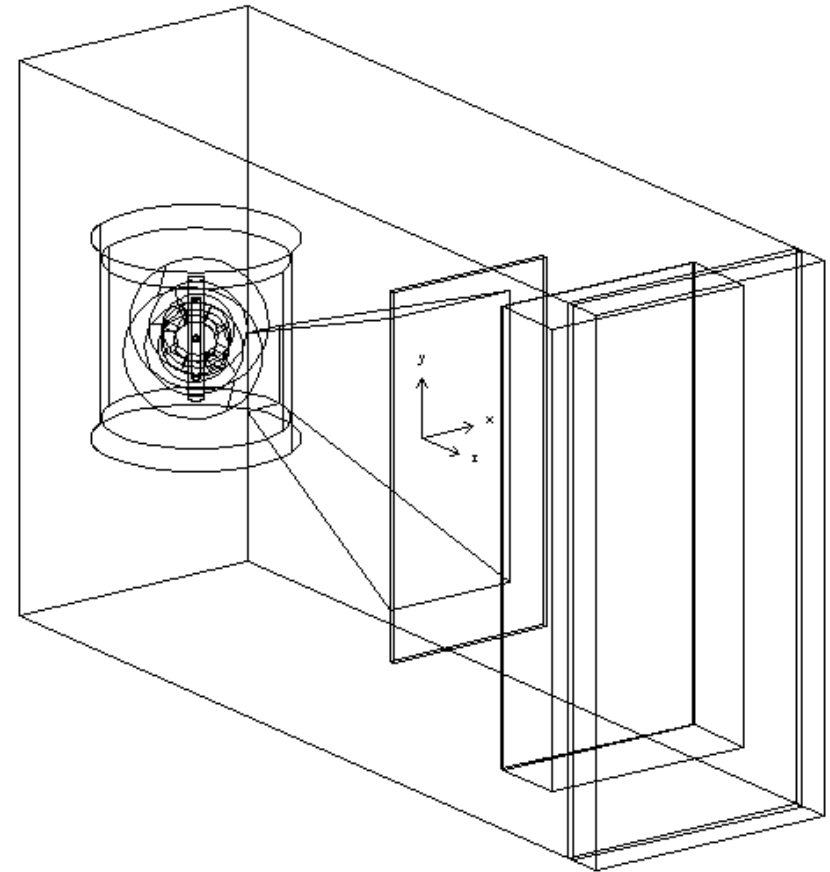
- Work in progress: James Maxwell, Oscar Rondon
- Goals:
 - Personal: Learn GEANT and PAW
 - Resurrect Glen Warren's GEANT 3 simulation of BETA, and get it in working order
 - Long term: Improve this simulation
- Purpose: To provide better understanding of BETA before experiment runs

Simulation Package: a1p and pmc

- BETA simulation is done via GEANT 3 software package called **a1p_mc**, which generates events into target and calorimeter
- **pmc** is the code that processes the simulated response
- Code is working, and we have a few initial results to show

a1p Simulation

- **a1p** is GEANT code that contains all geometry and materials
- Random events are thrown within preset limits of angle and momentum
- Throws different particles, using various cross section models

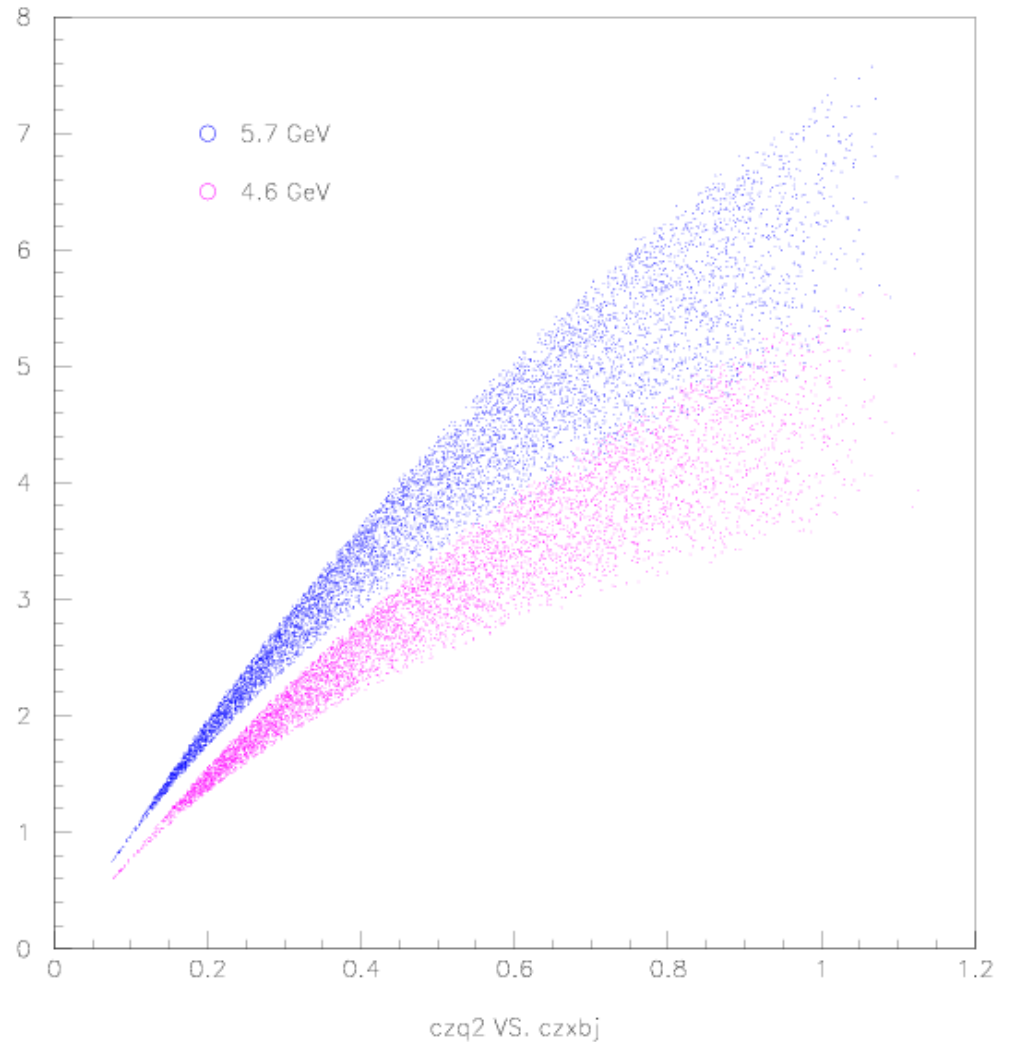


pmc Processing

- Reconstructs simulated events from ntuples made by **a1p**, ignoring info about the type of particle thrown
- In addition to constructing calorimeter cluster info:
 - counts events into kinematic bins
 - finds total rates of various particles in BETA
 - looks for chance of pile-up
 - determines statistical uncertainties

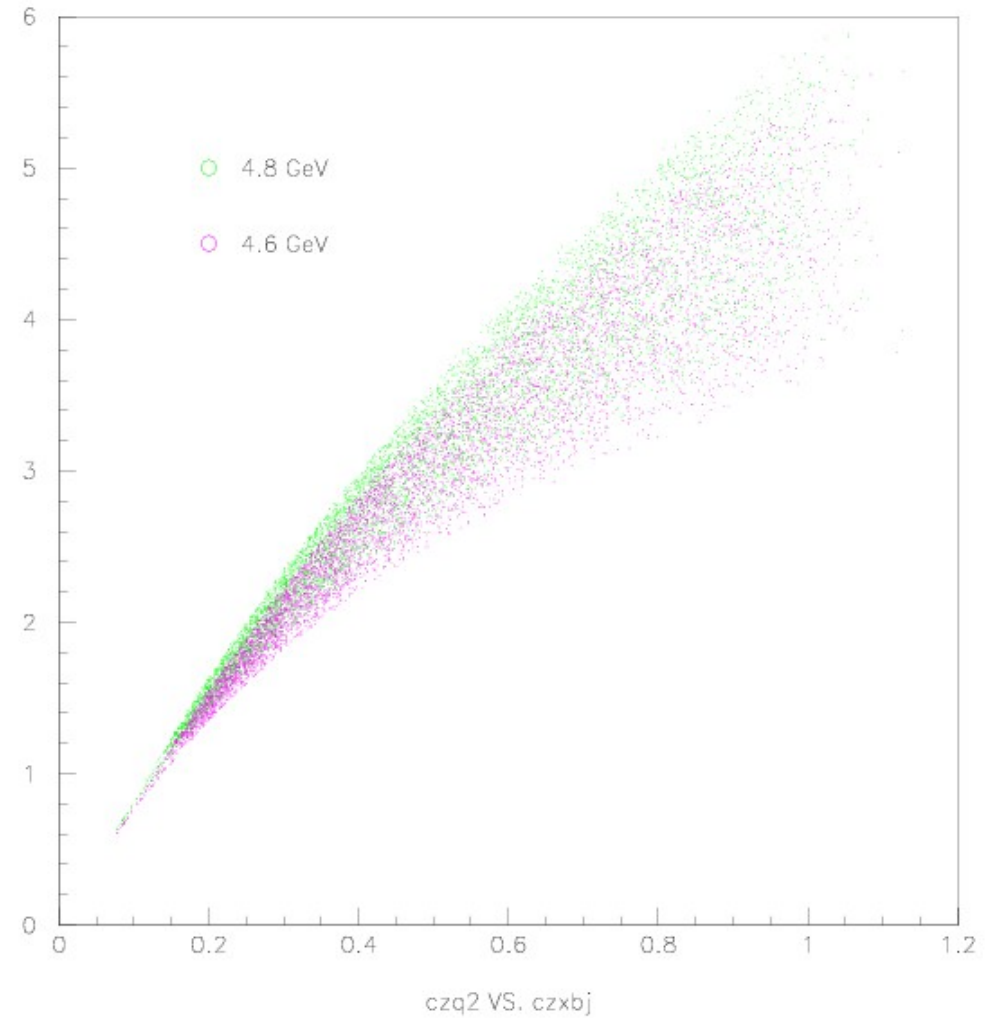
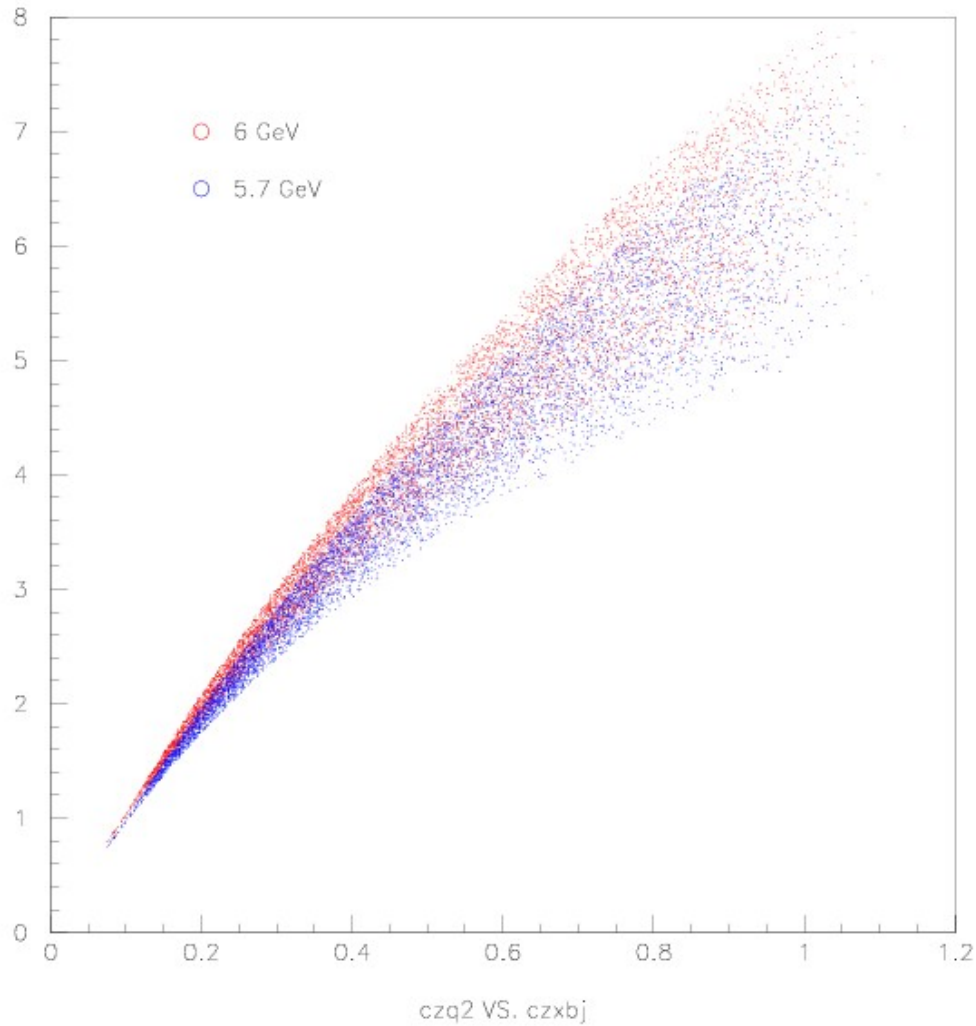
Initial Results

- Runs with 100K events
- Now have extra disk space on /work, running 1M events
- Testing energies of 5.7 and 4.6 GeV



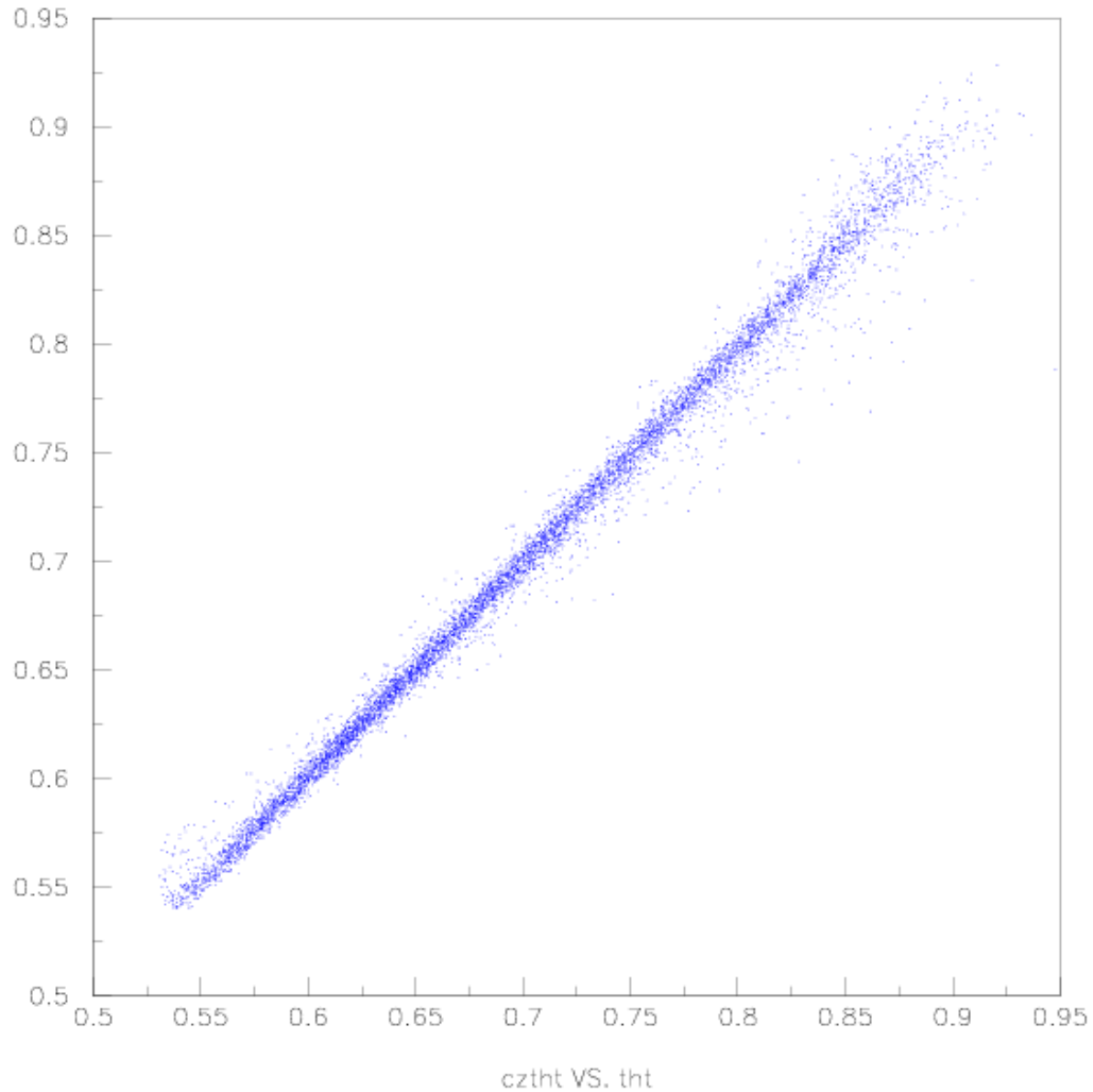
Q^2 (GeV) vs. Bjorken X

6 vs 5.7 GeV and 4.8 vs 4.6 GeV

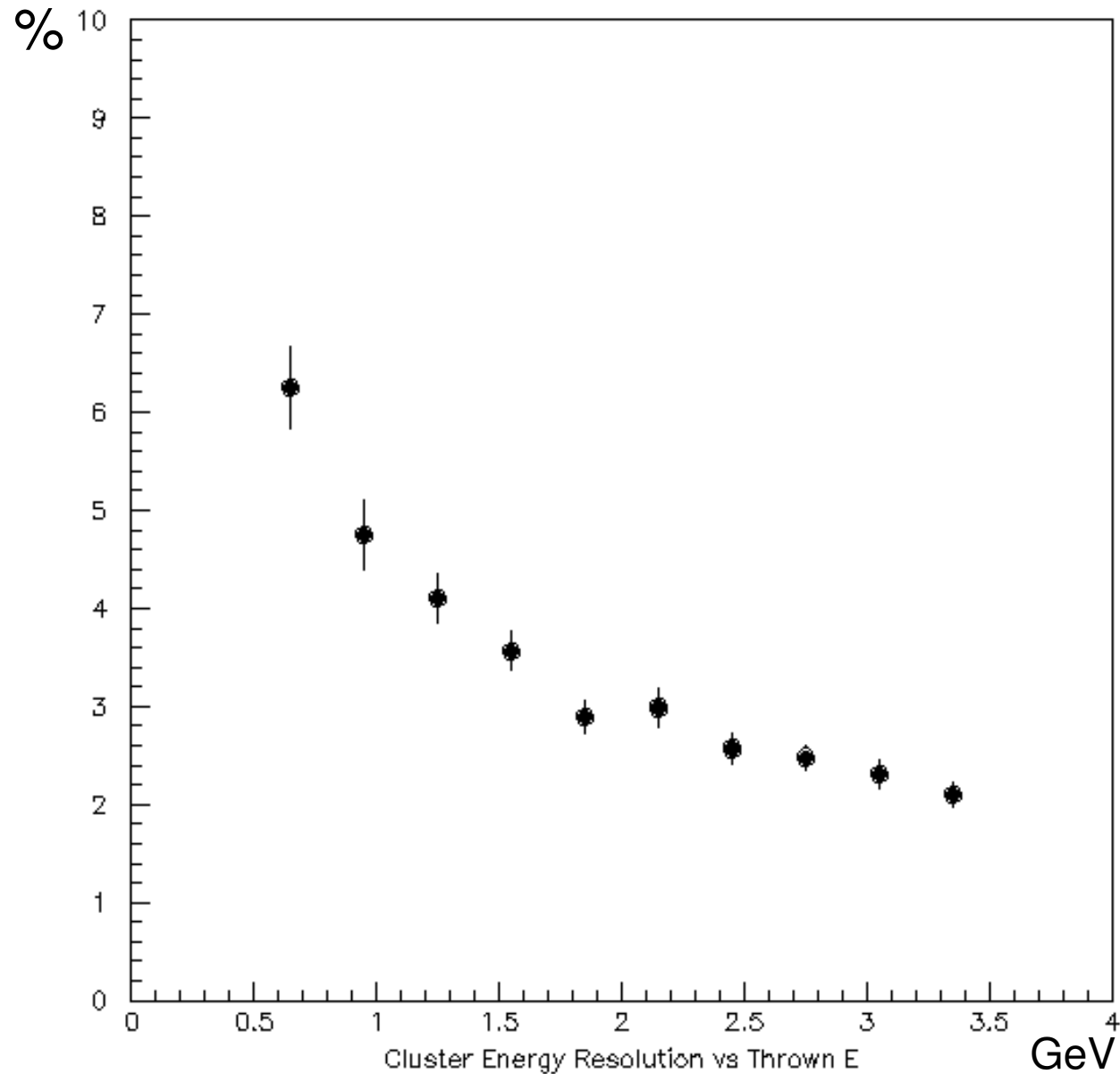


Q^2 (GeV) vs. Bjorken X

Reconstructed vs. Thrown Theta

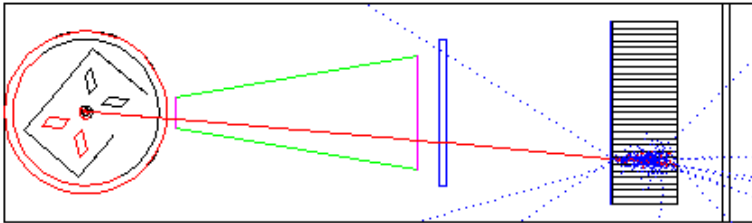


Cluster Energy Resolution v. Thrown E

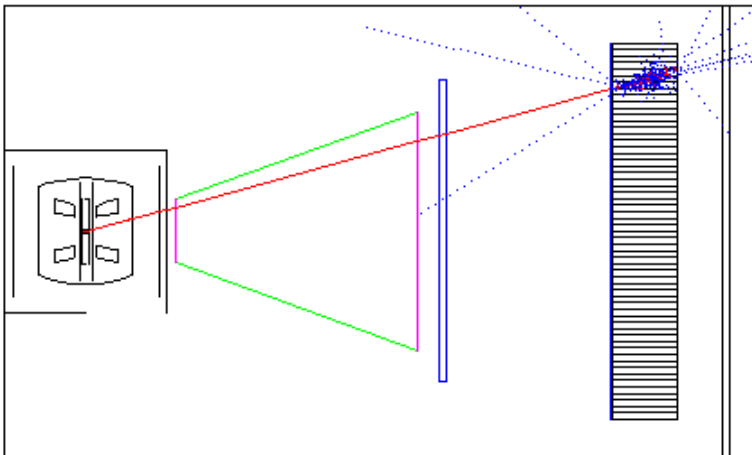


Tracks

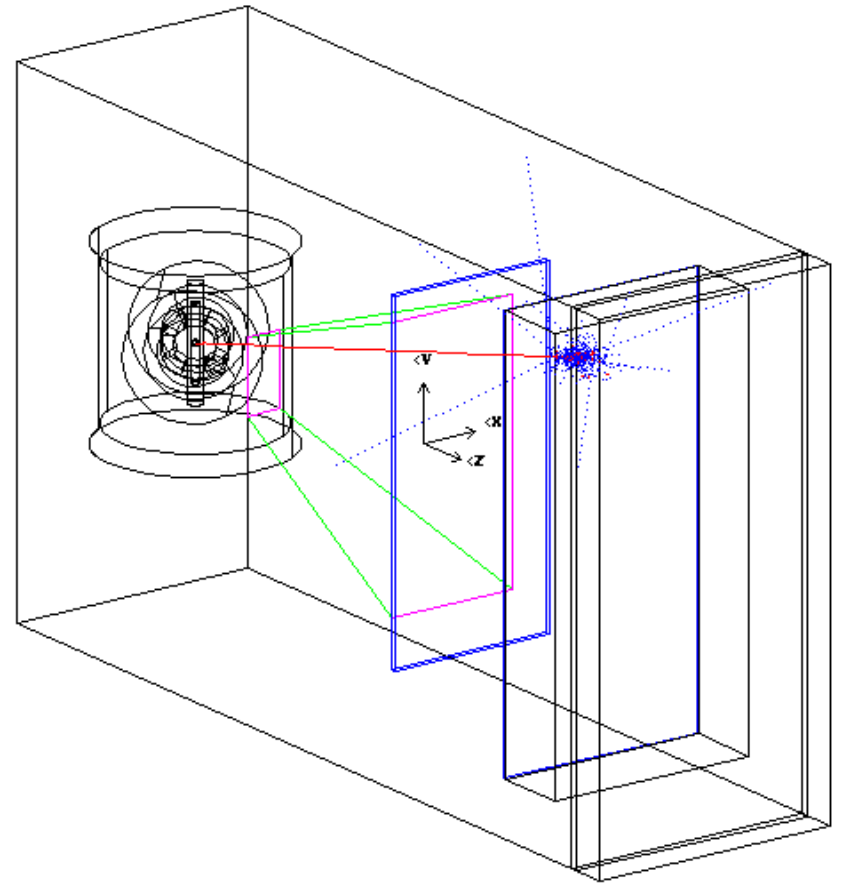
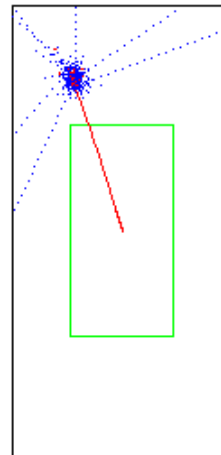
Top View



Side View



Back View



To come...

- Much higher numbers of events per run
- Use more of Glen's kumacs to get the most of the simulation
- Better understanding of GEANT, PAW, Cross Section Models...
- Improvement on Glen's Code:
 - Real gas Cerenkov box
 - Cerenkov light in the Lucite Hodoscope

Conclusions

- **a1p** for simulation and **pmc** for reconstruction are working
- We've used them to take a initial look at the effect on kinematics of reduced beam energies
- Lots to do!