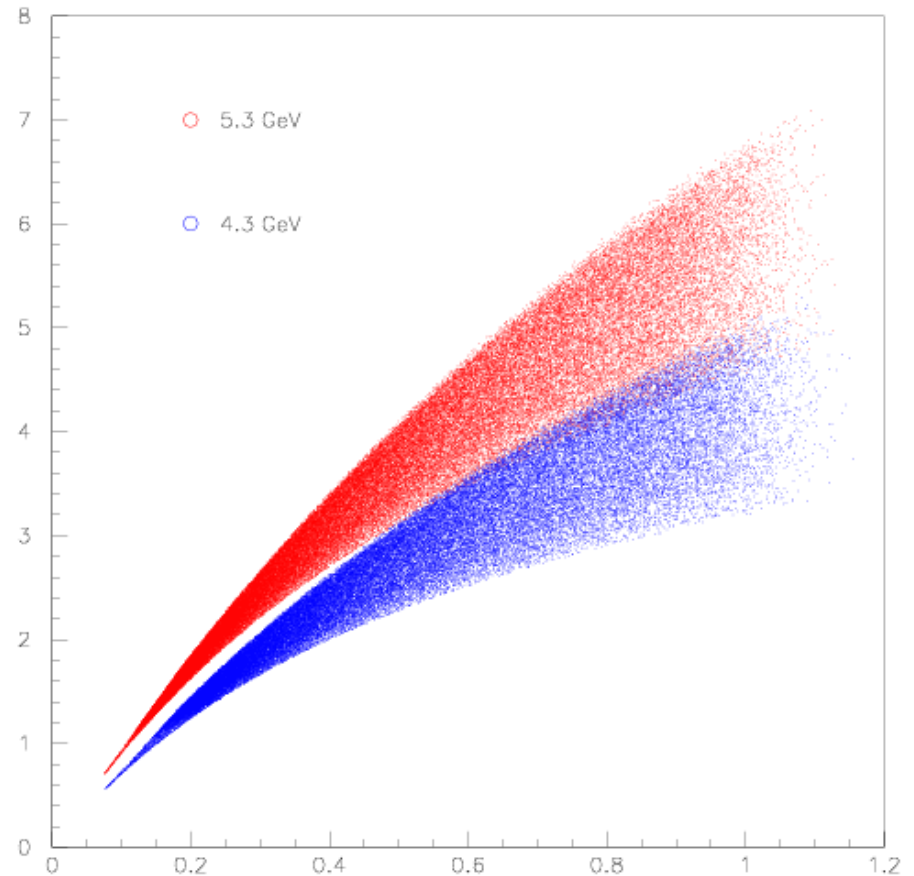


# GEANT Simulation of BETA

- Continuing work with Glen Warren's code
- Since last time:
  - Lowered Beam energies? --> New Kinematics
  - Time Optimizations for Energy, Angle configs
  - B Field considerations for PMTs: Iron Shielding?
  - Taking steps to improve simulation: Magnet

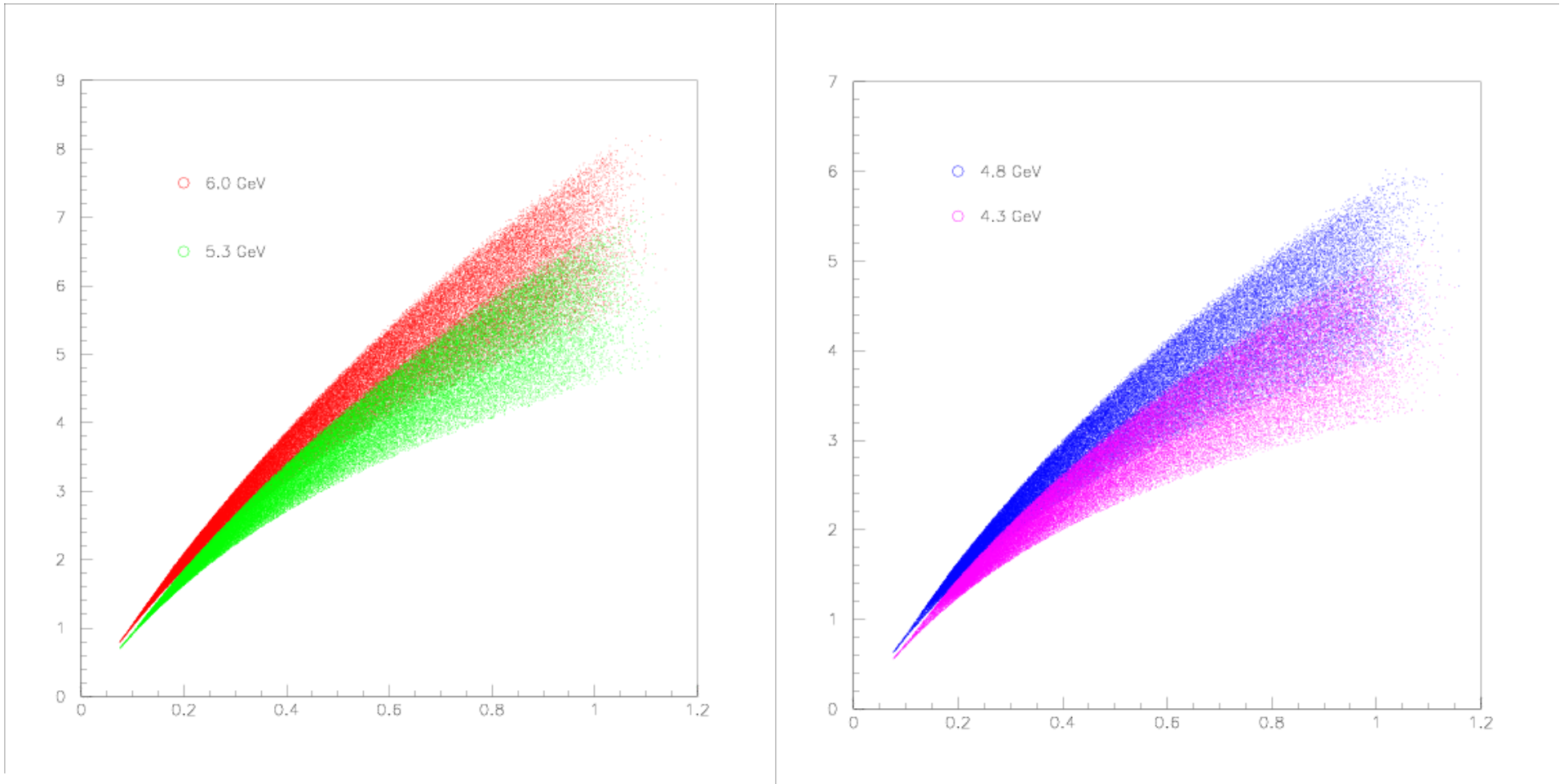
# New Kinematics

- Million event runs for better statistics
- Investigating possible energies of 5.3 GeV and 4.3 GeV



Bjorken X vs  $Q^2$

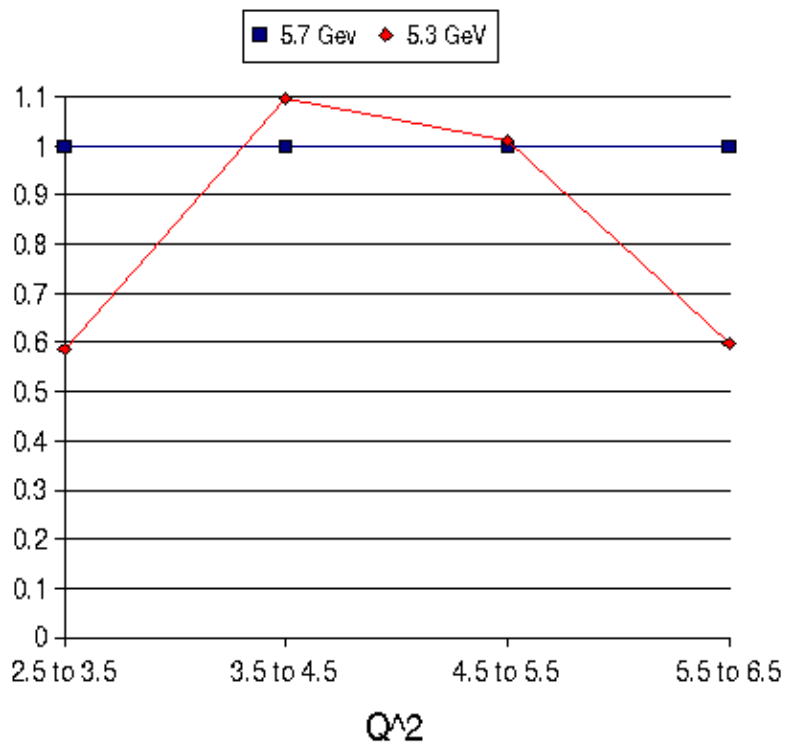
# 6 & 4.8 GeV v. 5.3 & 4.3 GeV



Bjorken X vs Q<sup>2</sup>

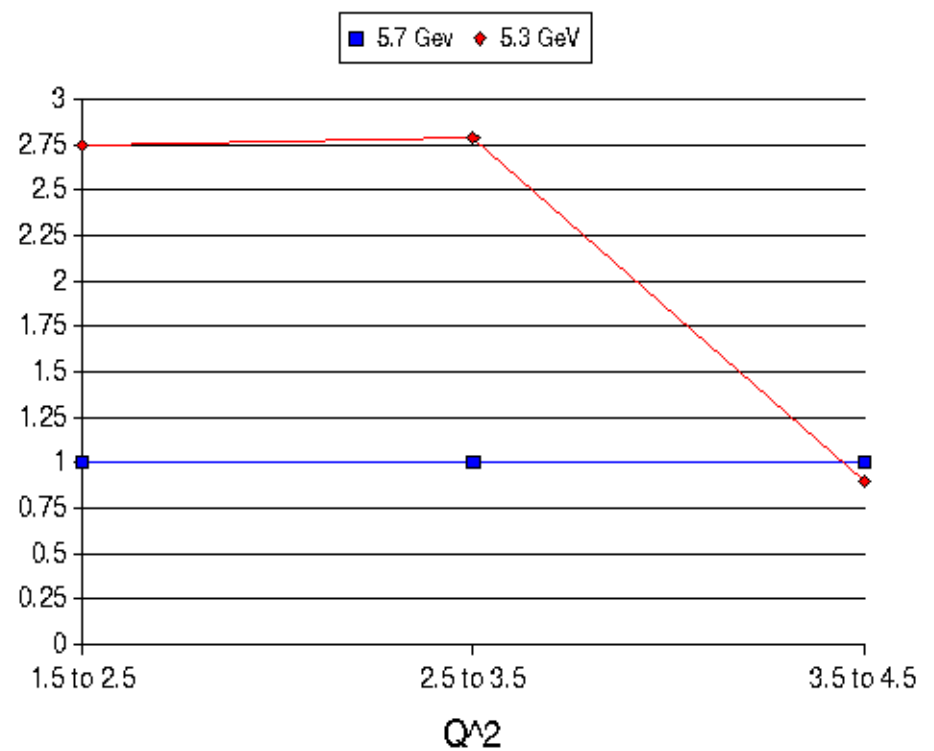
# Changing Errors

Error vs. Q squared for 5.7 & 5.3 GeV



$W > 1.1$

Error of 5.7 & 5.3 GeV



$W > 2$

Error as ratio of 5.7 GeV error

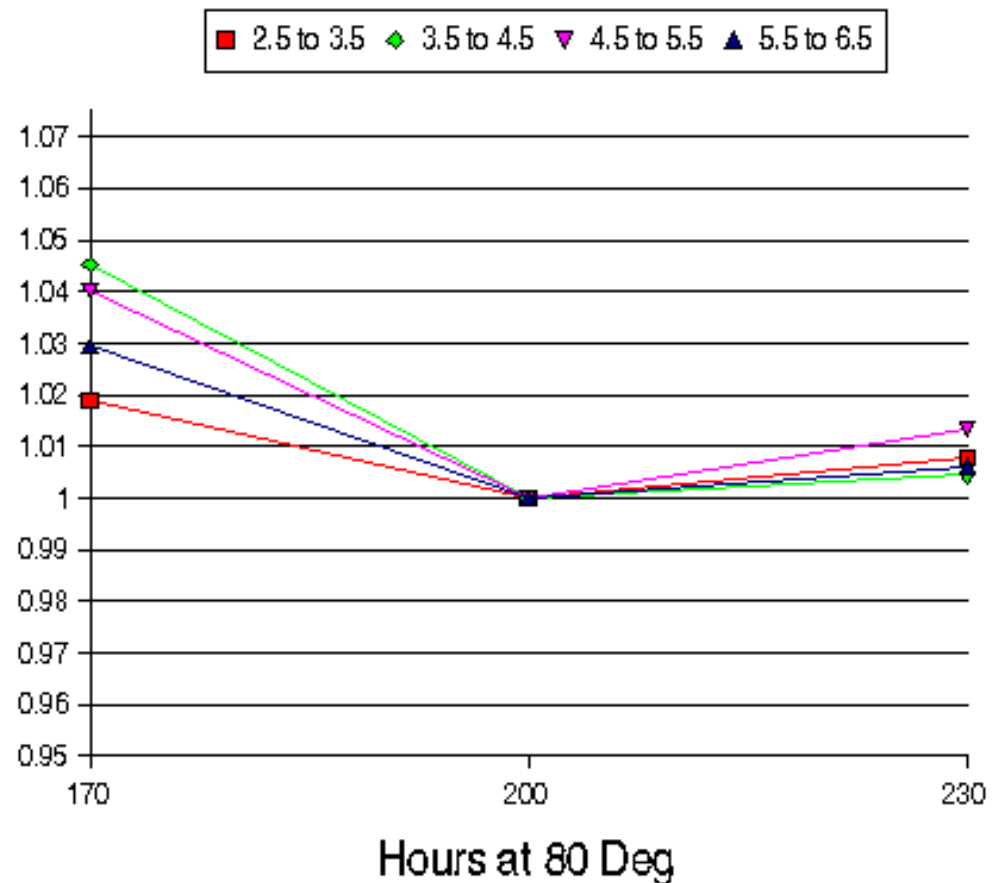
# Time Optimizations

- Studying time spent in different energy and angle configurations
- Kept total time constant, and started with planned hours:
  - 5.7 GeV: 200 hrs @ 80°, 100 hrs @ 180°
  - 4.6 GeV: 130 hrs @ 80°, 70 hrs @ 180°

# Time at Angle Optimizations

- Comparing hours spent at  $180^\circ$  to hours spent at  $-80^\circ$
- Kept ratio of time at 5.7 & 4.6 GeV constant
- Sets are in  $Q^2$ ,  $W > 1.1$

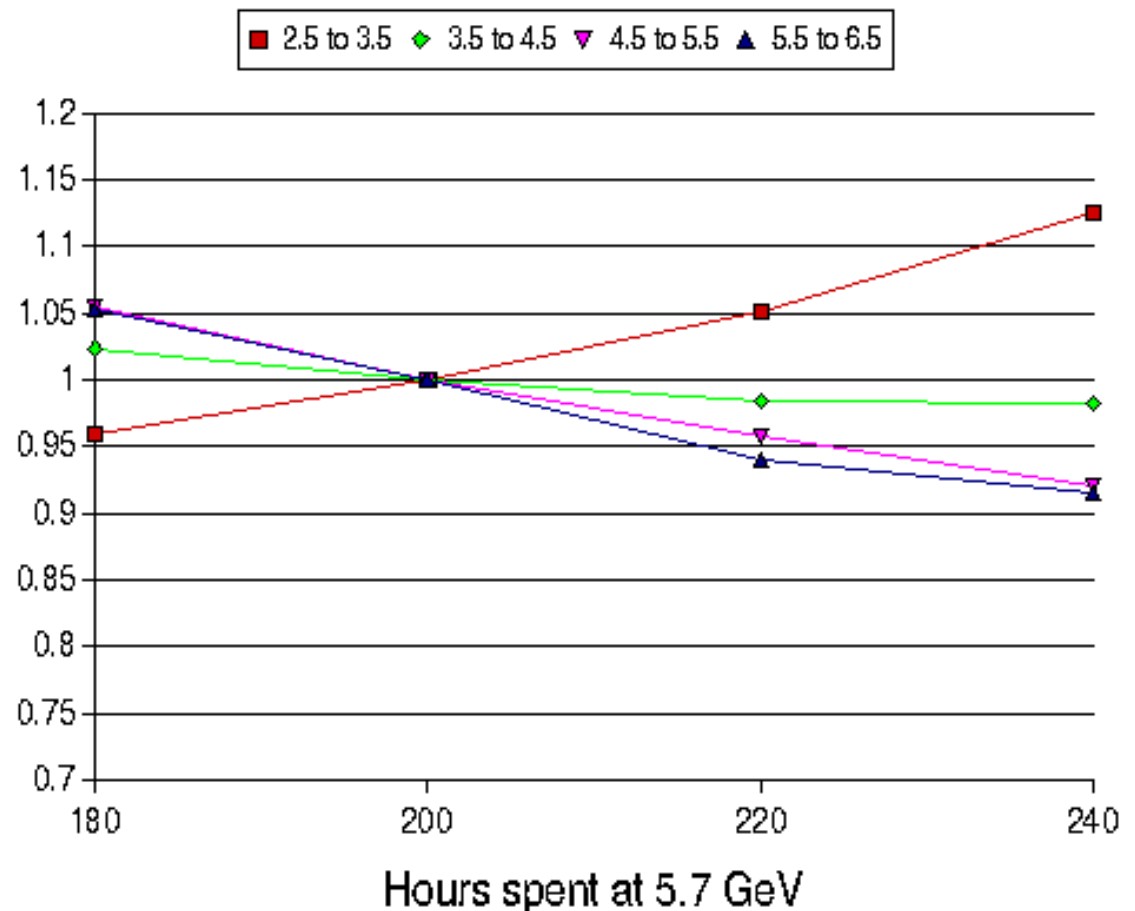
Error vs. Time at 80 Deg



# Time at Energy Optimizations

- Comparing hours spent at 5.7 GeV to hours spent at 4.6 GeV
- Kept ratio of time at  $180^\circ$  &  $-80^\circ$  constant
- Sets are in  $Q^2$ ,  $W > 1.1$

Error vs. Time spent at 5.7 GeV



# B Field and PMTs

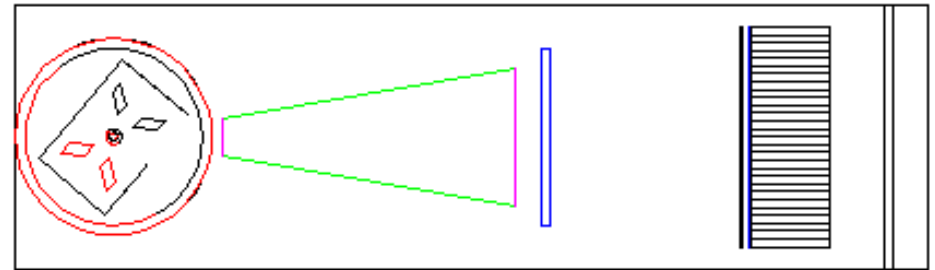
- Iron shielding has been suggested to protect the calorimeter's photomultipliers from the magnetic field
- Studied the effect of an iron shield, 6mm thick in front of the calorimeter on resolution
- Million event runs for 2 configs, with and without



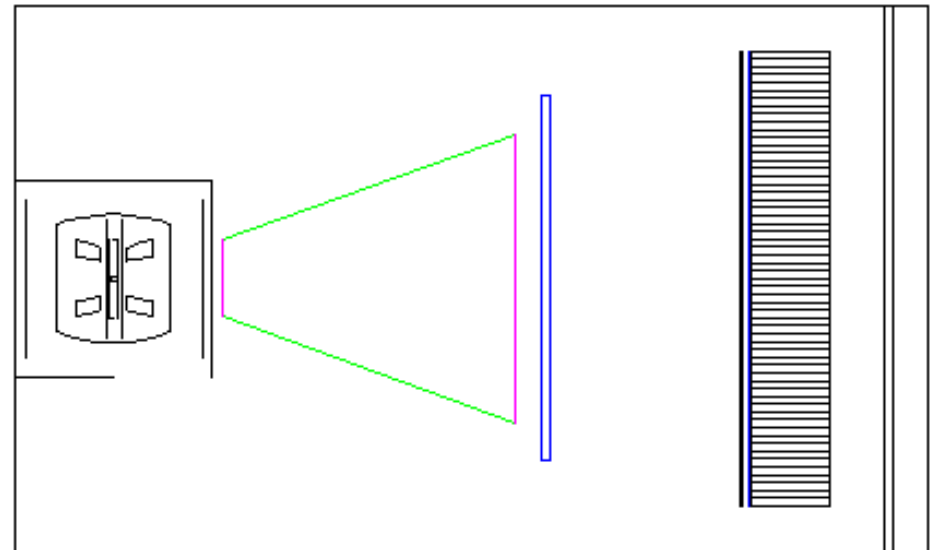
# Iron Shielding

- Put 6mm iron plate in front of calorimeter
- Using million event runs, compared reconstructed  $\pi^0$

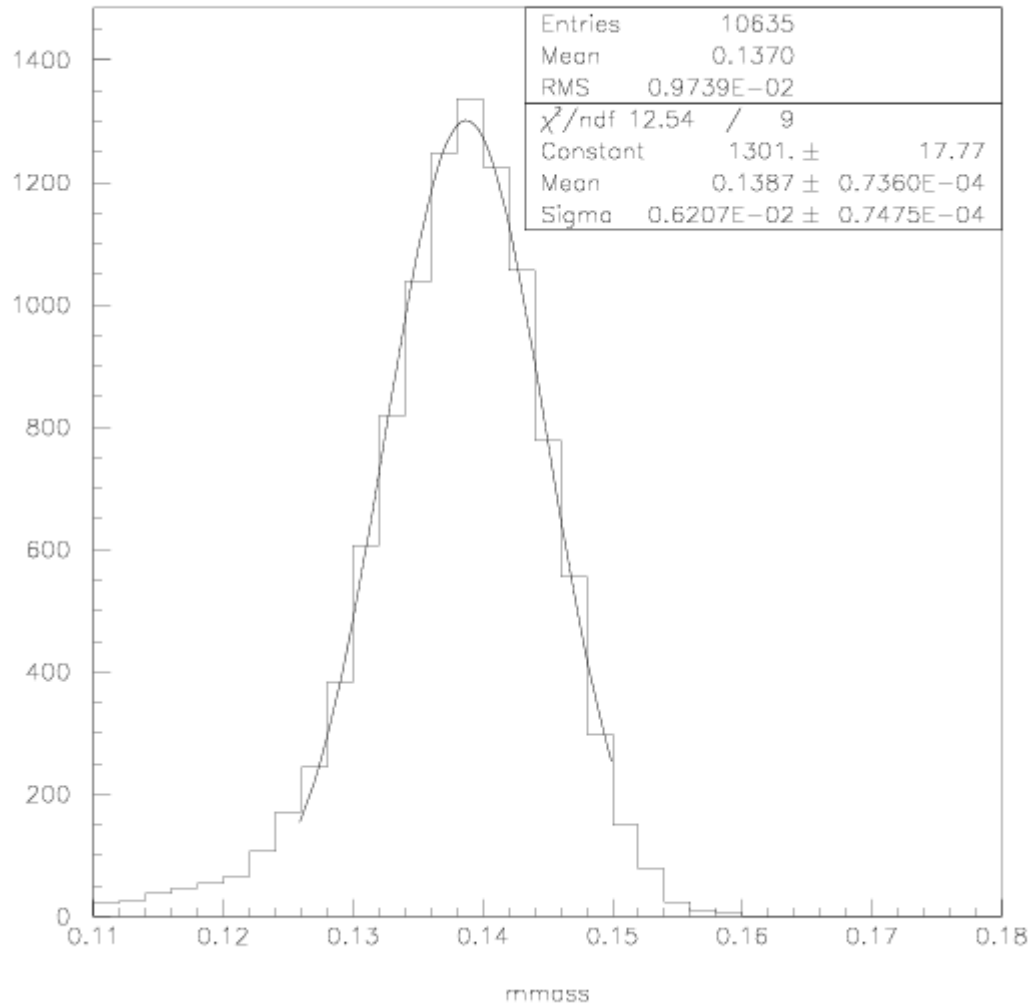
Top View



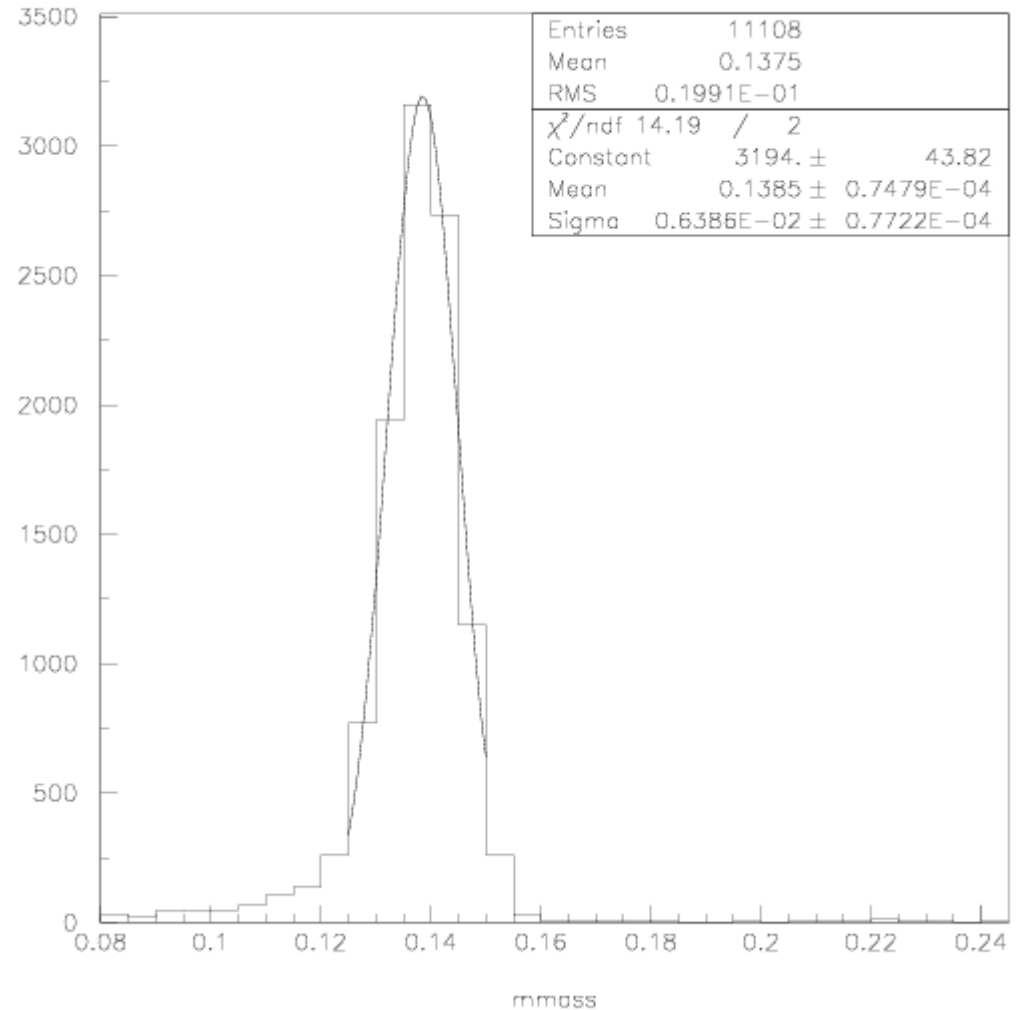
Side View



# Iron Shielding Results



**No Shielding**



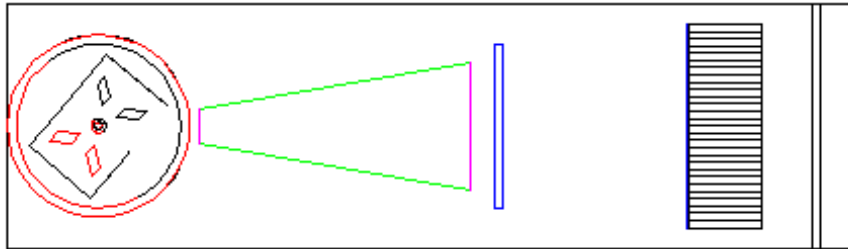
**With Shielding**

# Improving the Simulation

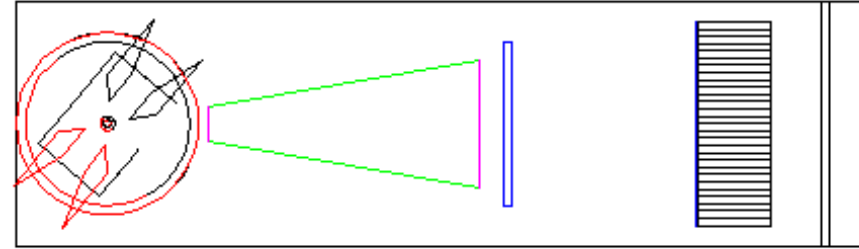
- First steps: Magnet coils and their effect on acceptance
- Current simulation geometry rough approximation
- Possibility of moving BETA to larger angle warrants a better understanding from simulation

# Magnet dimensions

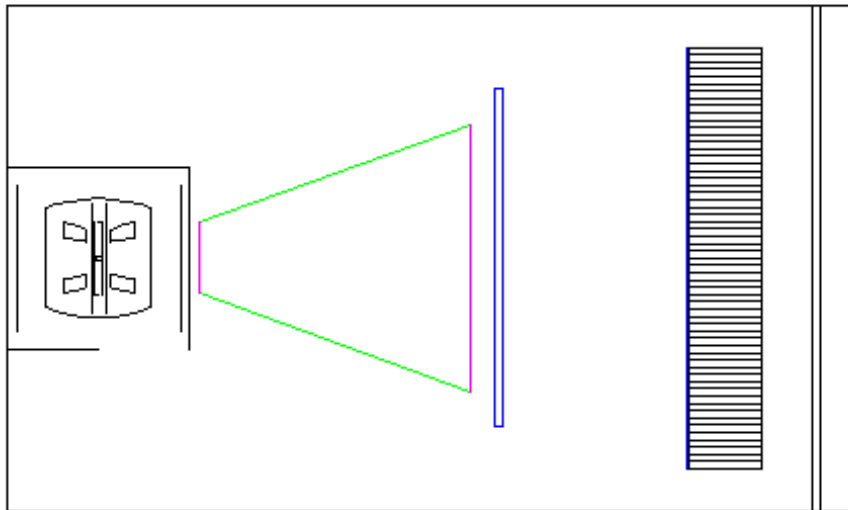
Top View



Top View



Side View



Side View

