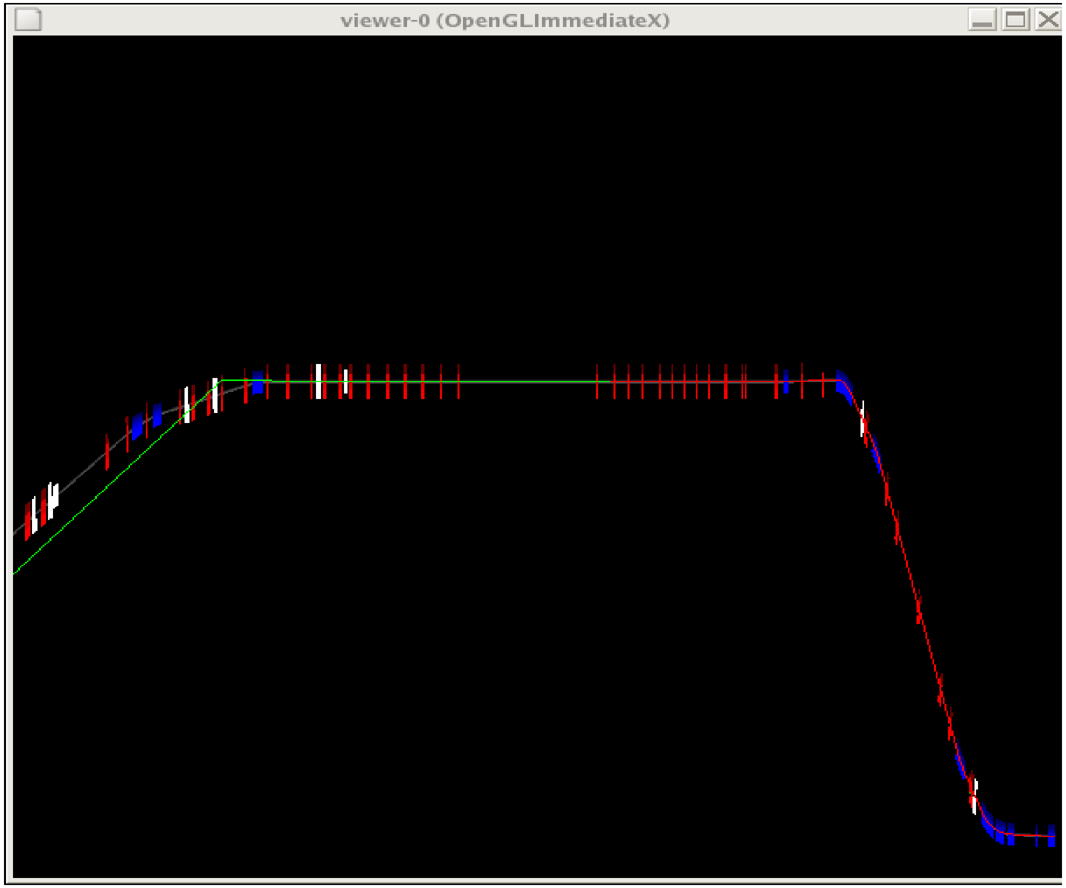
Location of the LW detector-
Simulation of the LW signals



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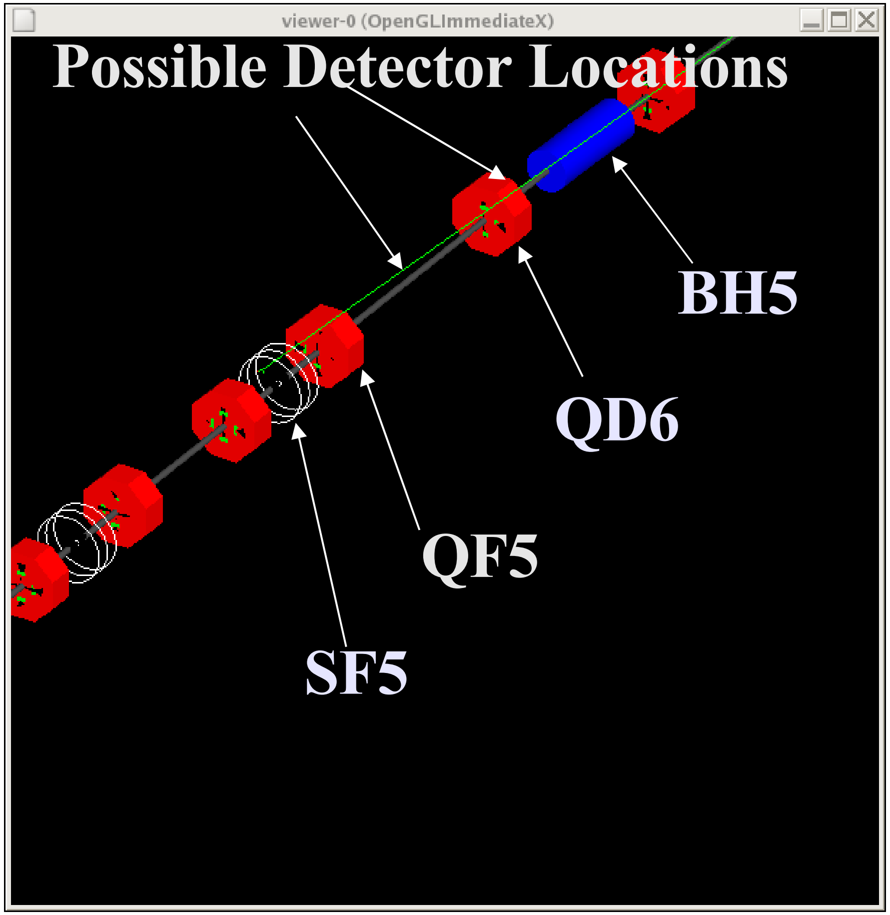
ATF2 meeting August 23rd 2006 KEK

Possible Locations

- Between BH5 and QD6
- Between QD6 and QF5
- Further downstream

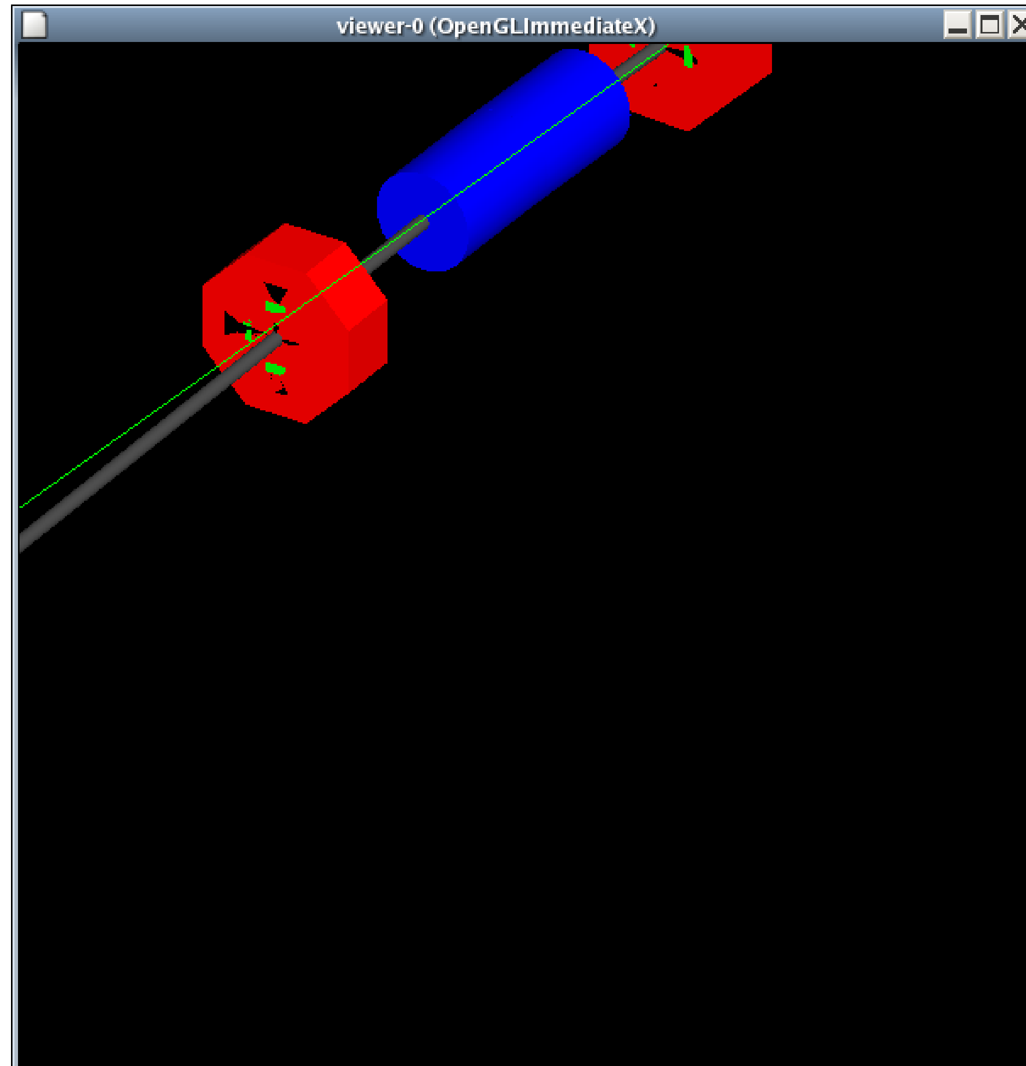
BDSIM screenshots

- Green line is a photon. It passes through QD6 and QF5 and hits SF5.
- BH5 must have a window
- Holes would need to be drilled in yoke of SF5 for detection further downstream. How much would this affect the magnet's performance?



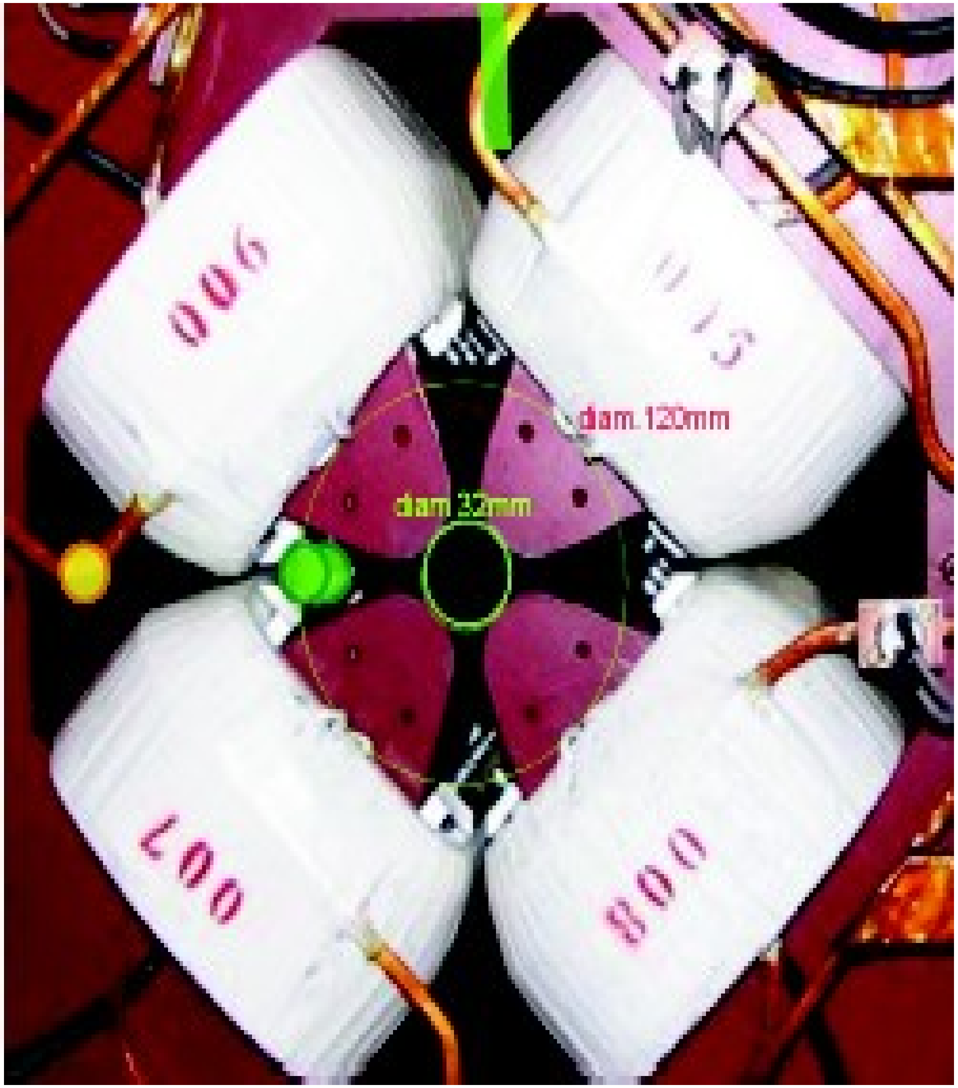
< QD6

- Space is 0.55m
- Could fit aerogel Cerenkhov (detector we are currently using at ATF) if extra mirrors are used to reflect the cerenkhov light hoizontally before it is reflected down into the PMT
- Could not fit current calorimeter in.
- Could limit detector choices.
- Laserwire signal between 2cm and 5cm from the beam line. There may be large background here since it's so close to the beam line. Work on background simulation underway (see my previous talk).



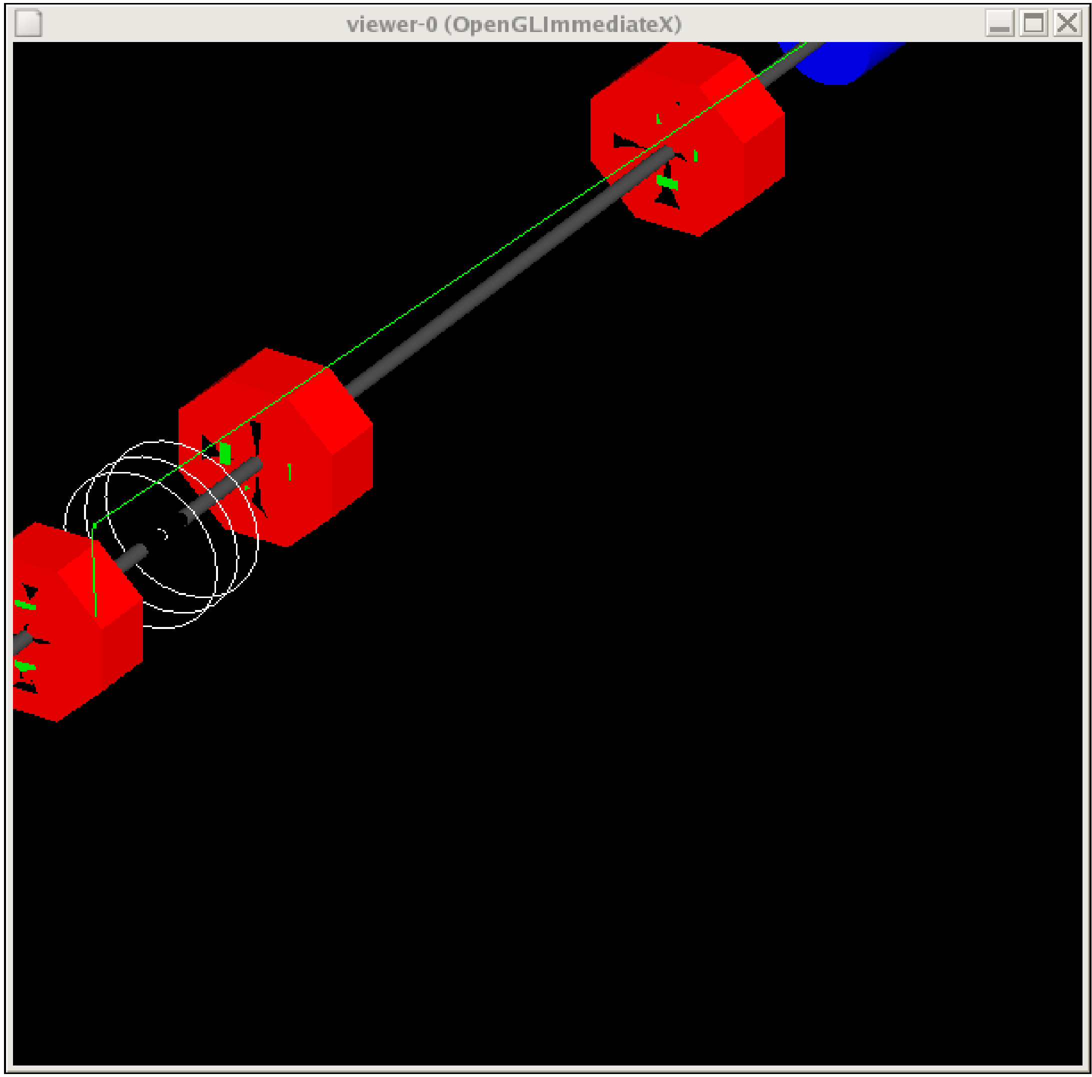
QD6 > QF5

- Laserwire signal would pass through gap between pole tips
- Bolt heads need to be shortened



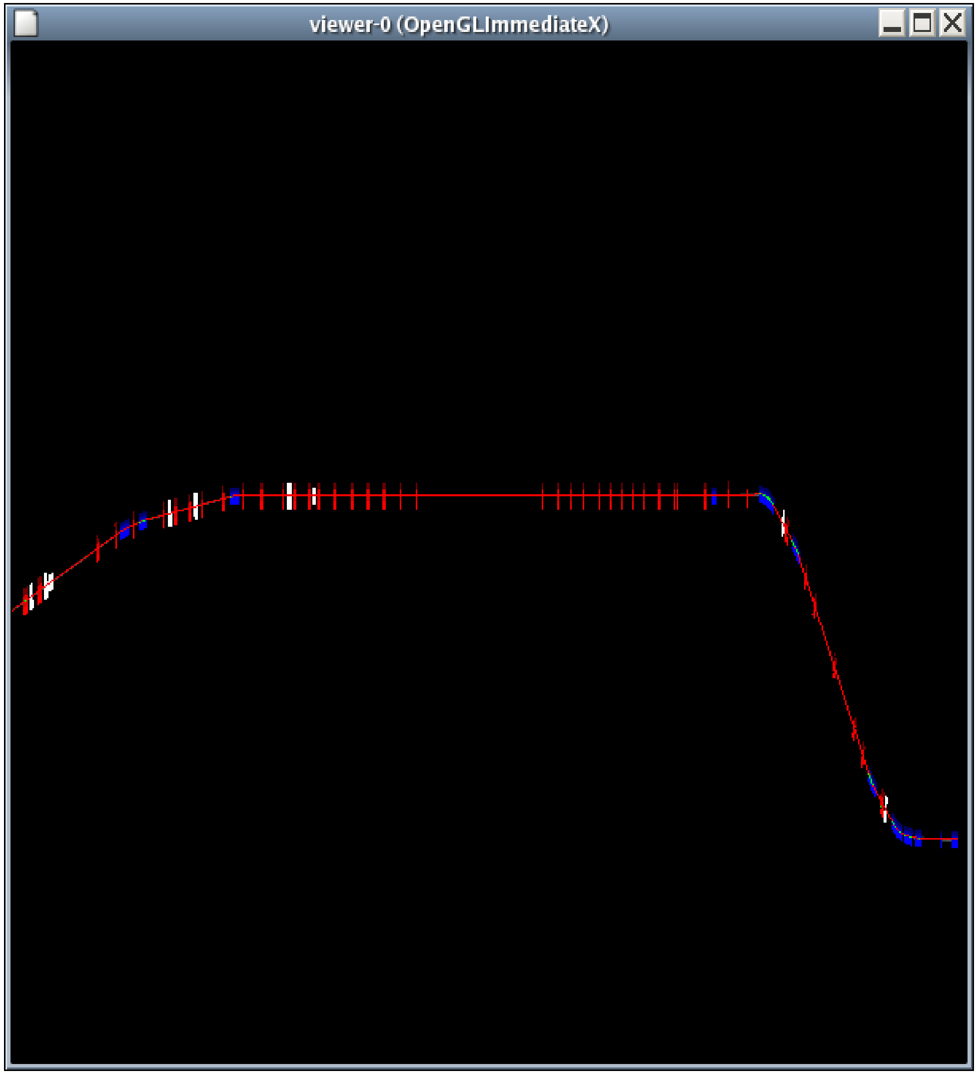
QD6 > QF5

- Space is 1.6m
- Can put larger detectors at this location
- Laserwire signal approx. 15cm from beam line



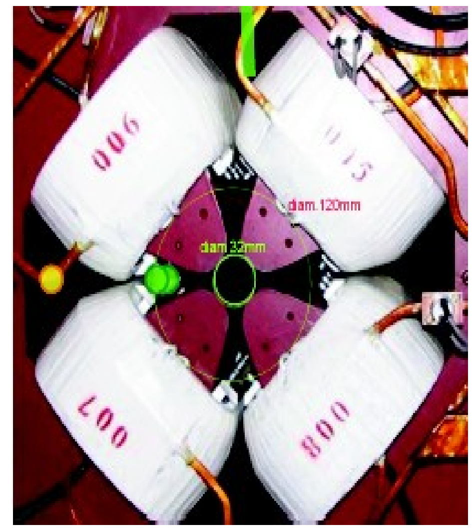
Simulations

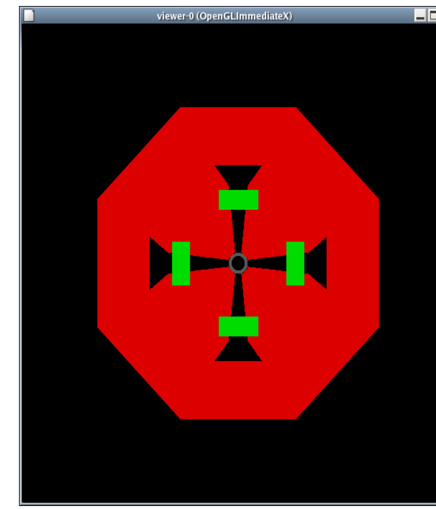
- ATF2 laser wire simulated using BDSIM

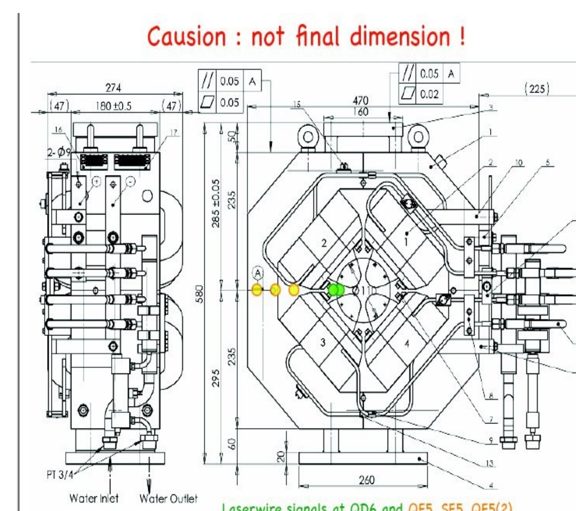


Quadrupole Model

- Modelled in BDSIM as shown
- Red is iron
- Green is copper (part of coils)
- Dimensions match technical drawing





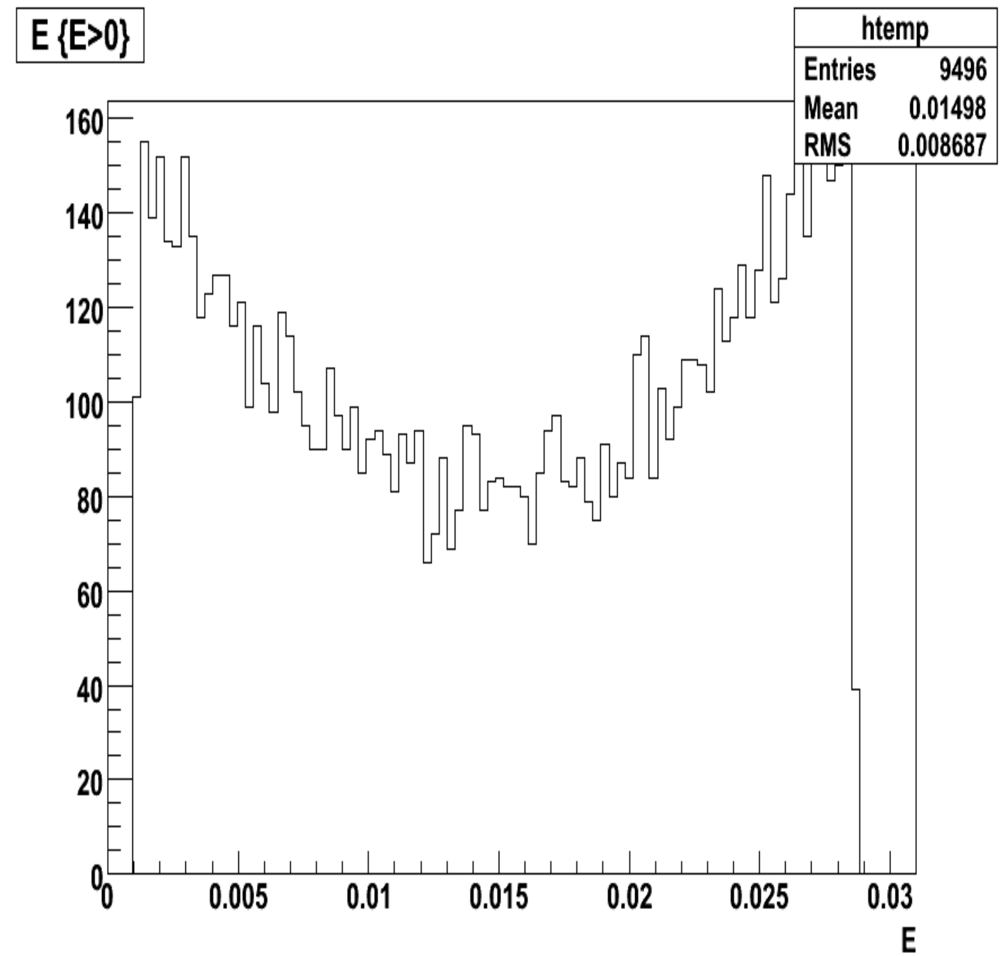


Laser Wire Parameters

- Position: extraction line at MW0X (between QD18X and QD19X)
- Wavelength= 532nm
- Spotsize= 15 microns

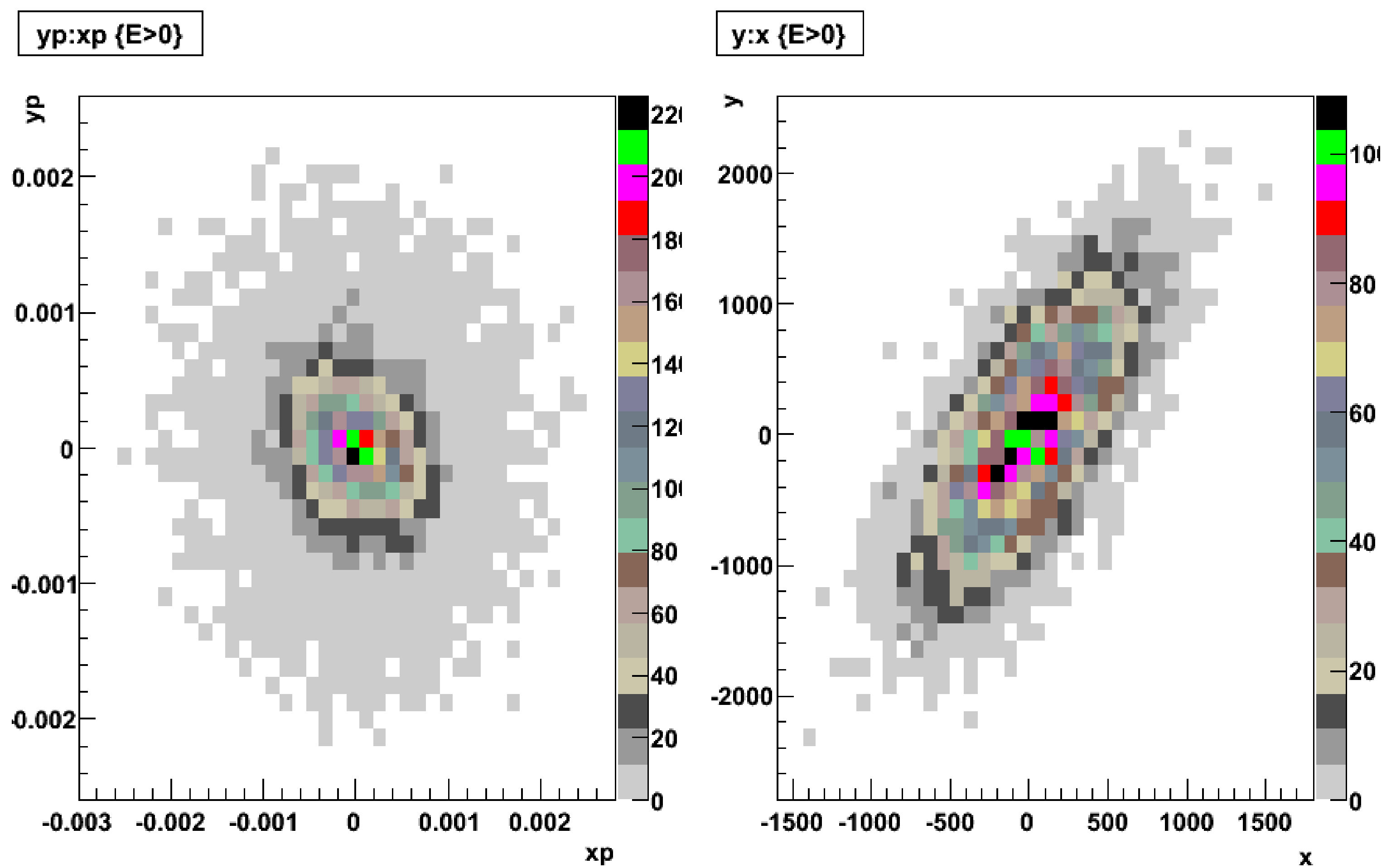
Simulated Compton Scattered Photon Spectrum

- Photon spectum at laserwire IP
- Units: GeV
- High energy cutoff agrees with theory
- Artificial cutoff below 1MeV



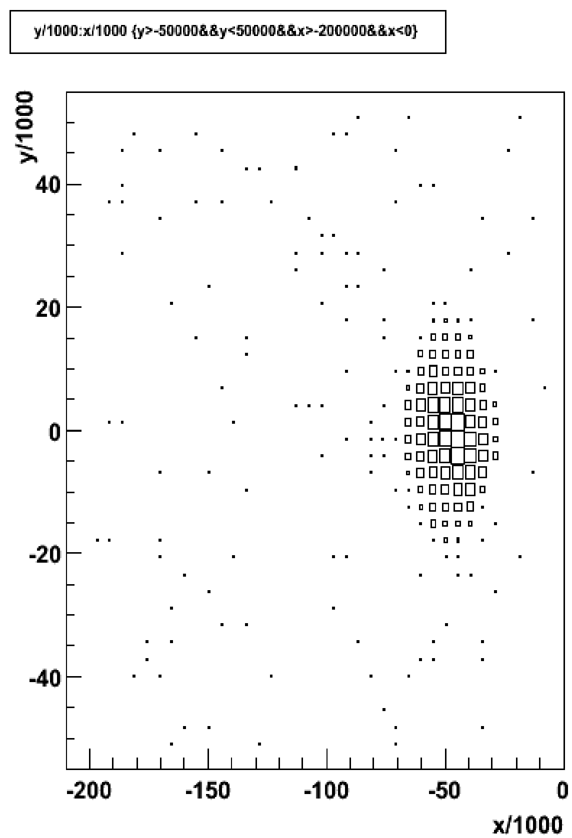
Laserwire Photons at IP

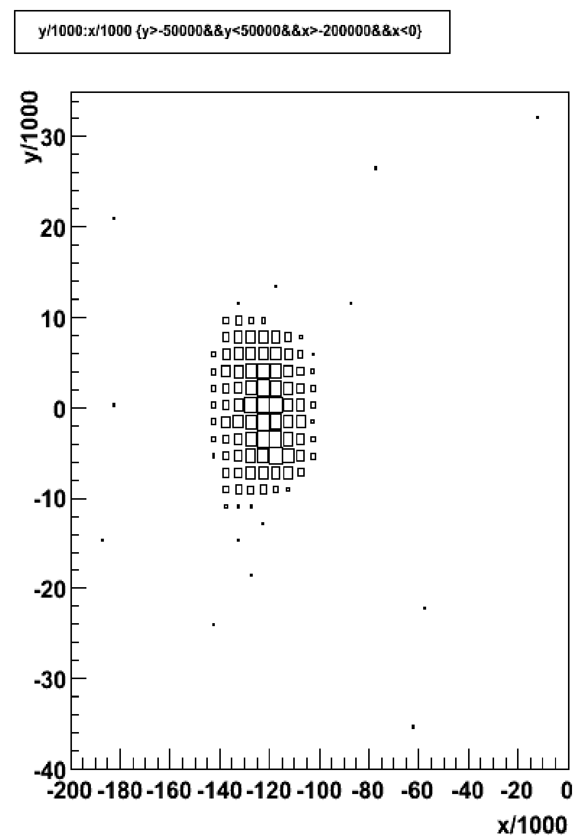
- Left: xp/yp
- Right: x/y



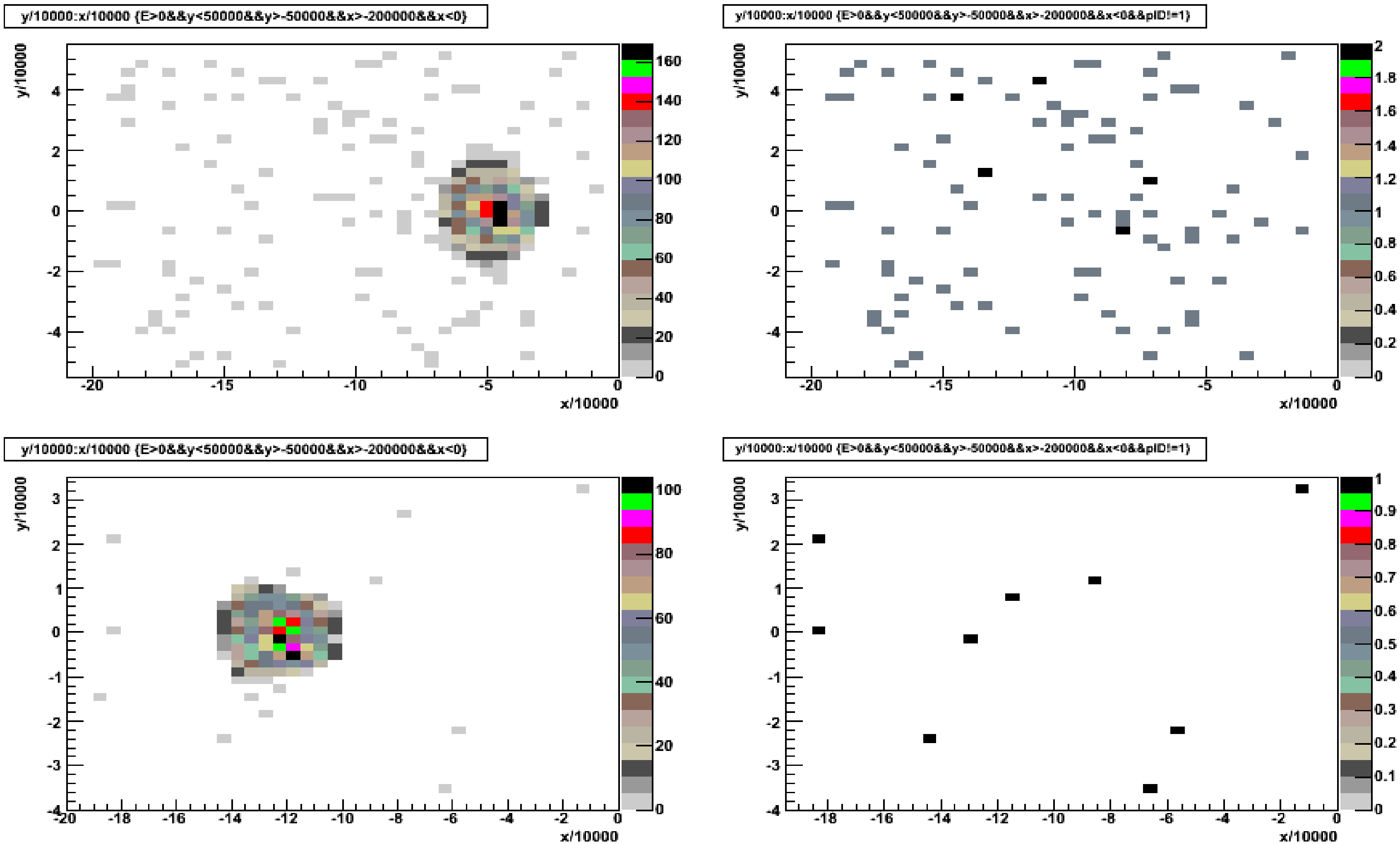
Laser Wire Signal Profile at Detector

- Particle distribution x y
- Left: <QD6
- Right: QD6>QF5
- Going through QD6, diameter is reduced from about 30mm to 20mm





Comparison of Detector Locations



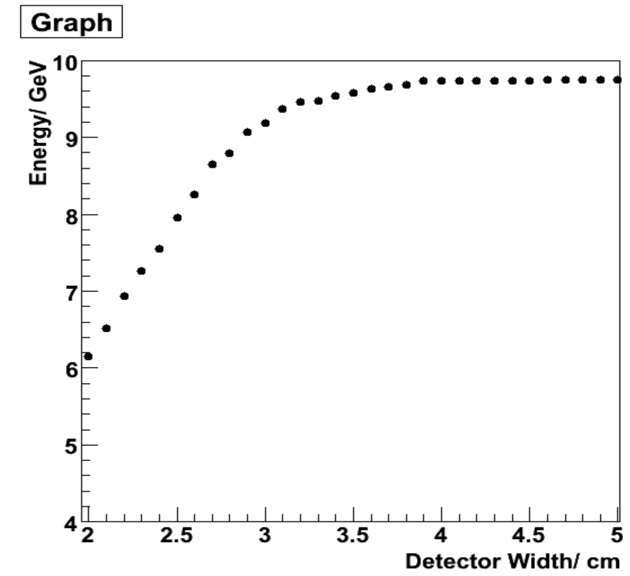
- Left: primary particles Right: other particles
- Top: <QD6 Bottom: QD6>QF5

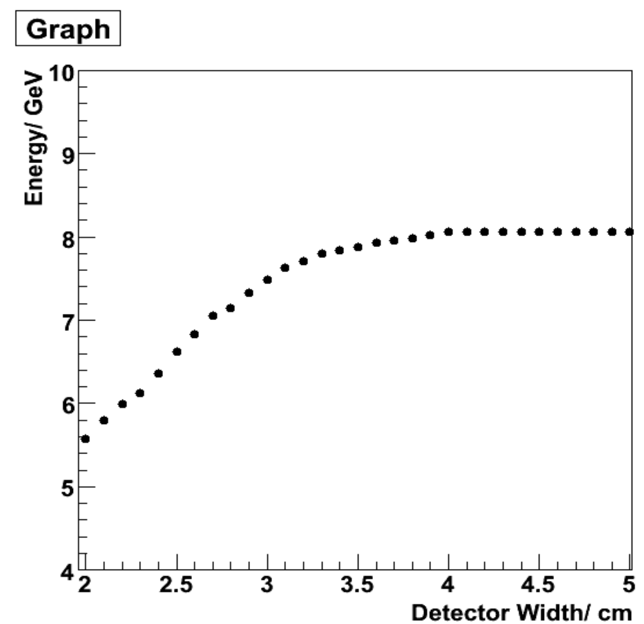
Comparison of Detector Locations

- Secondary particles were scattered over large angles.
- Secondary particle number and energy could fluctuate more than that of primary particles
- Compared energy for different sampler (detector) sizes at both locations and
- Standard deviation in the energy/energy for different sampler sizes at both locations
- Statistics are from 10 shots with 1000 scattered photons each (will be higher with shorter wavelength laser).
- Assumed that detector is uniformly sensitive to edge. Further simulation required to include effects of mirrors etc.

Comparison Of Detector Locations

- Energy per shot/ GeV
- One shot scatters 1000 photons from e- beam. Increases with shorter laser wavelength. May go to shorter wavelength in future.
- Top: at < QD6
- Bottom: at QD6<QF5





Comparison of Detector Locations

- Energy per shot: 9.5Gev at first location and 8 Gev at second location. 16% reduction in signal.
- However, second location has more space: can move further from beam pipe, use different detectors
- Detector area should be 5m by 5cm to maximise signal?

Best Location

- The difference in signal between the two locations is not great
- More space in the second location provides more flexibility
- Laser wire signal is further from beam line at second location so more space is available
- The background at one location could be higher than at the other
- Will bolt heads may need to be shortened in QD6 for second location?

Future Work

- Simulate background
- Test new detector setup