



Scintillator Simulation Update

Stephen Cole

Northern Illinois University

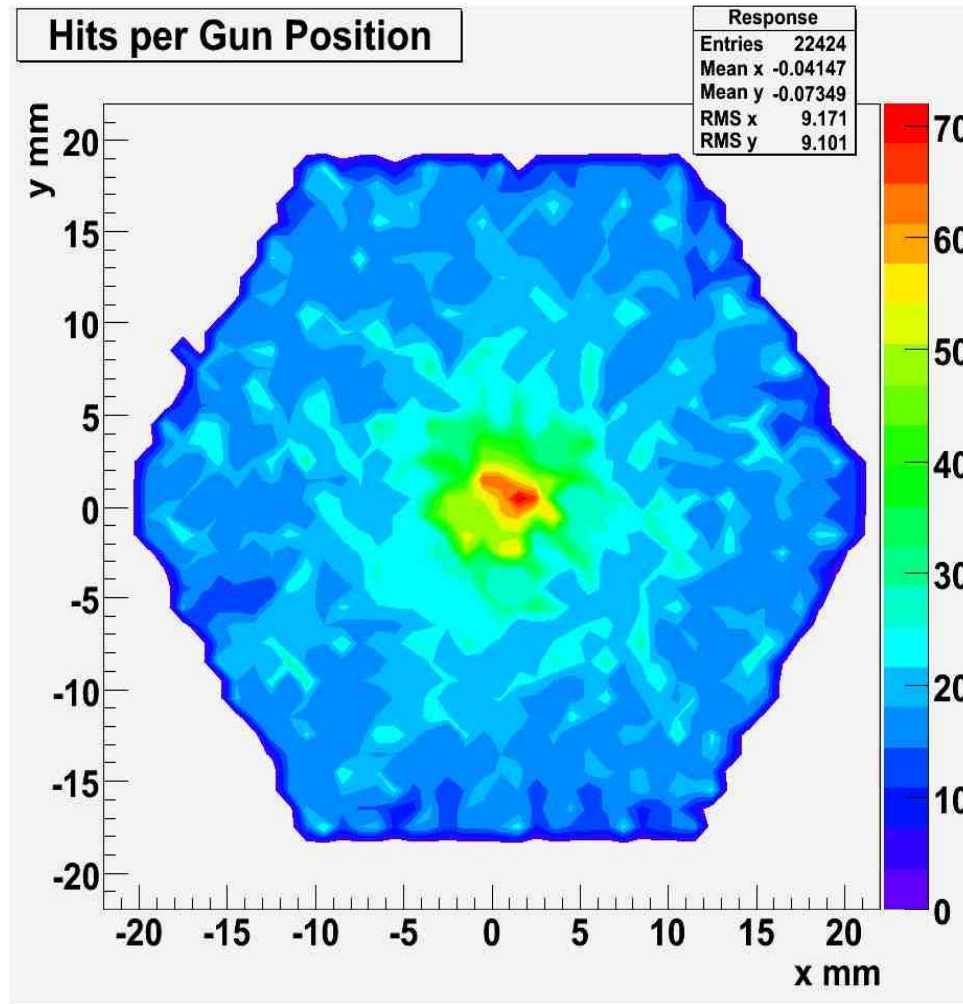


Progress Summary

- Simulation fixes, changes, and additions.
 - The simulation now stores the proper detector number for each hit.
 - It is now possible to instruct the simulation to decrease the size of the dimple on each consecutively placed cell.
- Scans performed:
 - A scan was performed on hexagonal cells with no dimple, a spherical dimple, and a parabolic dimple.
 - A scan of an array of nine cells with varying dimple depths was performed.
 - Current scans display cross talk when the full scintillation yield is used (10,000 photons/MeV).



Cell with No Dimple



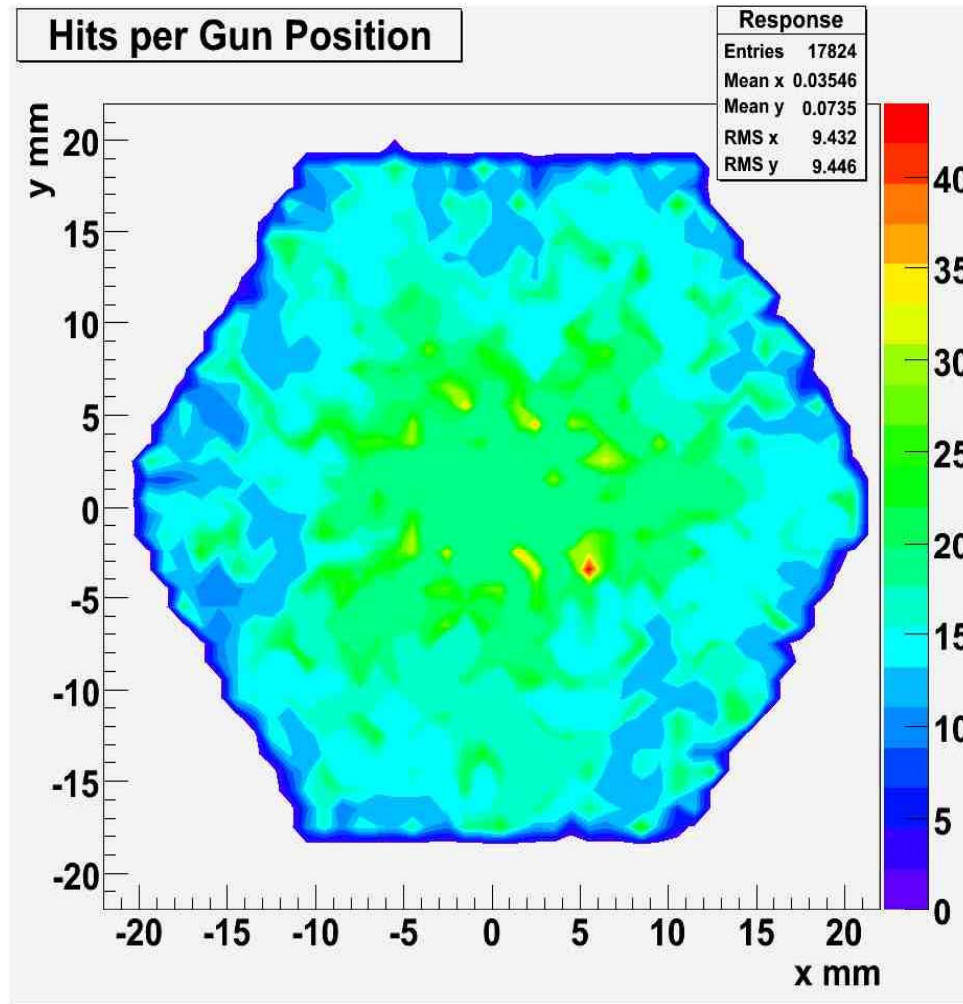
- The cell center to corner distance is 1.86 cm.
- The cell center to side distance is 1.61 cm.
- The cell is 0.5 cm thick.
- The scan was done with 546 keV electrons fired at 1 mm intervals.
- One electron was fired from 1 mm away from the cell face.
- 1681 total points were scanned.

The Scintillating Cell



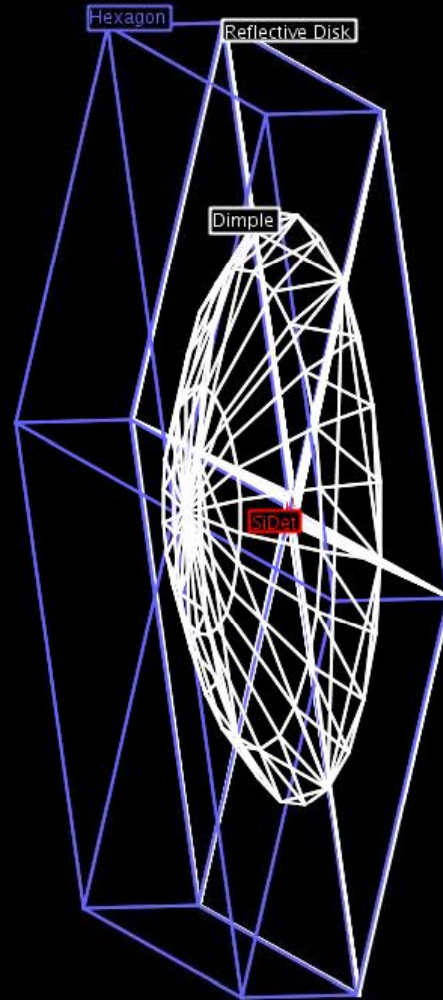


Cell with Spherical Dimple



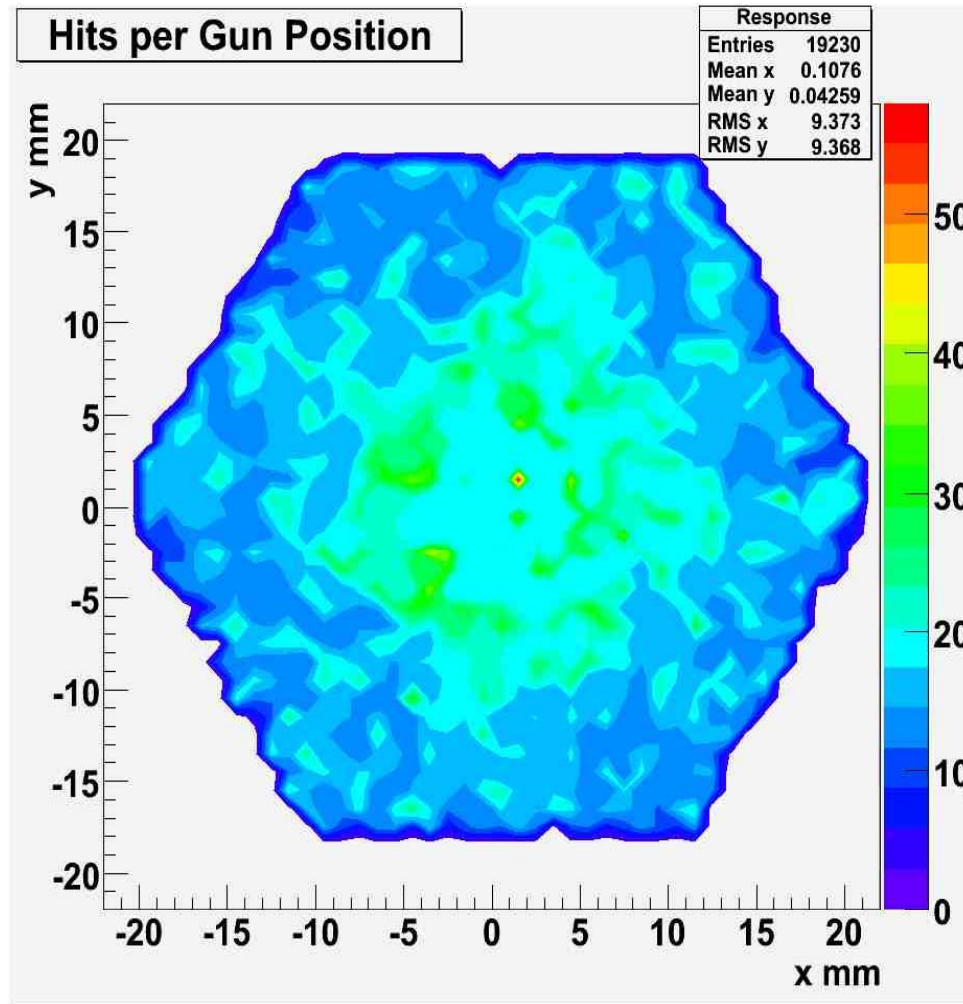
- The depth of the dimple is 0.45 cm.
- The dimple has a radius of curvature of 2.0 cm.
- The cell center to corner distance is 1.86 cm.
- The cell center to side distance is 1.61 cm.
- The cell is 0.5 cm thick.
- The scan was performed the same way as the No Dimple scan.

The Scintillating Cell



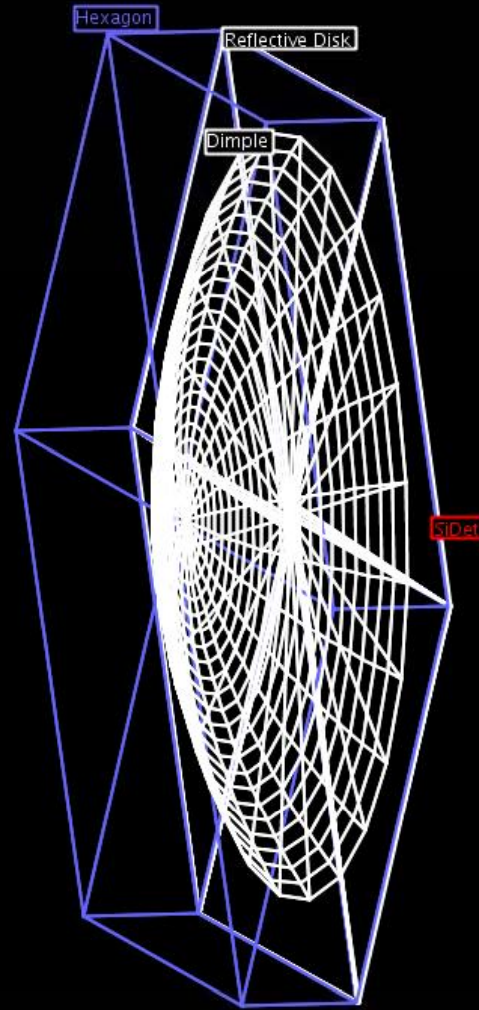


Cell with Parabolic Dimple



- The depth of the dimple is 0.45 cm.
- The dimple has a radius of 1.6 cm at the cell surface.
- The cell center to corner distance is 1.86 cm.
- The cell center to side distance is 1.61 cm.
- The cell is 0.5 cm thick.
- The scan was performed the same way as the No Dimple scan.

The Scintillating Cell

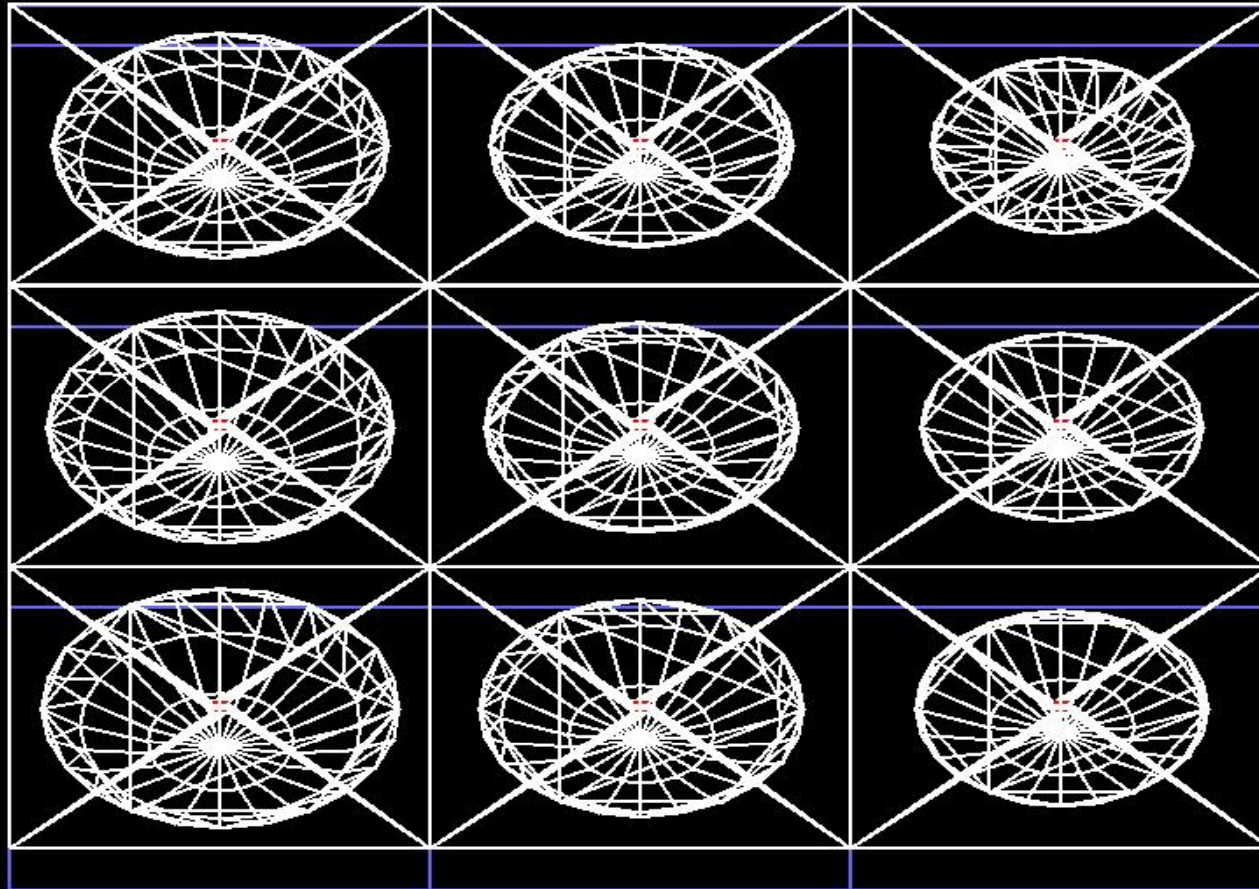


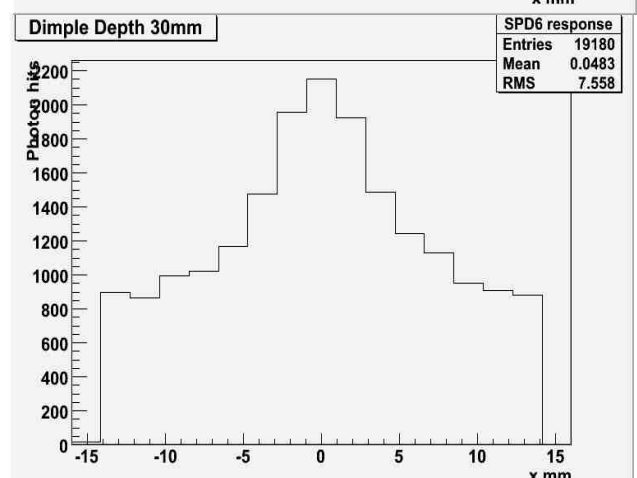
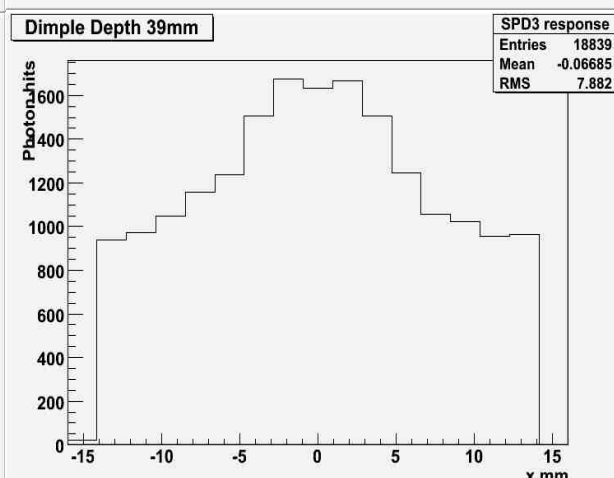
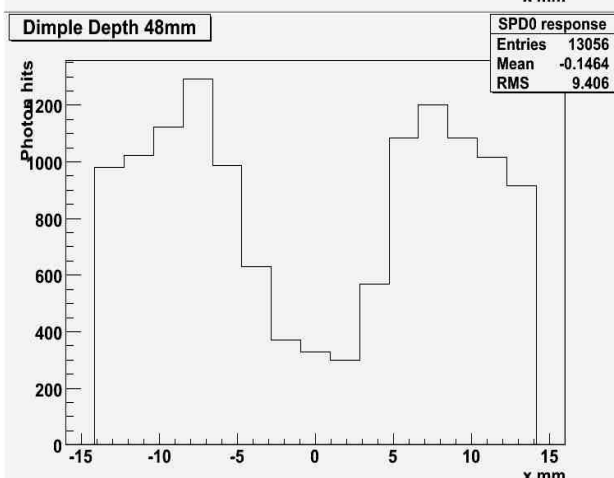
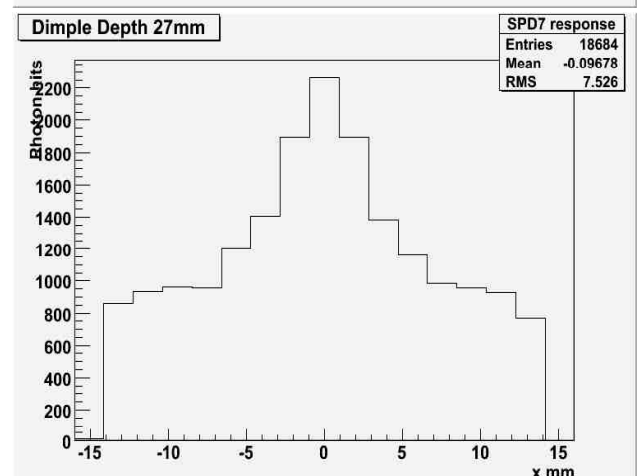
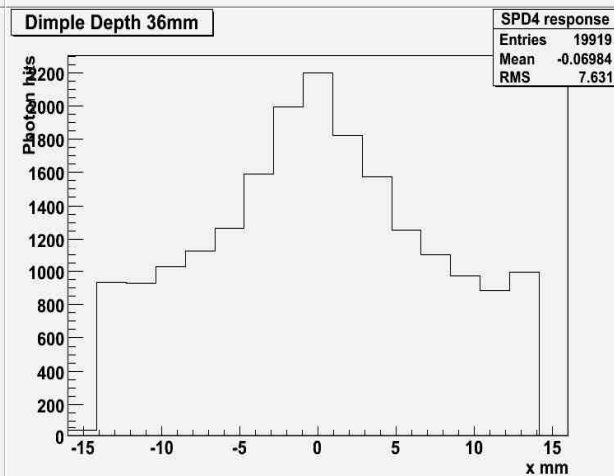
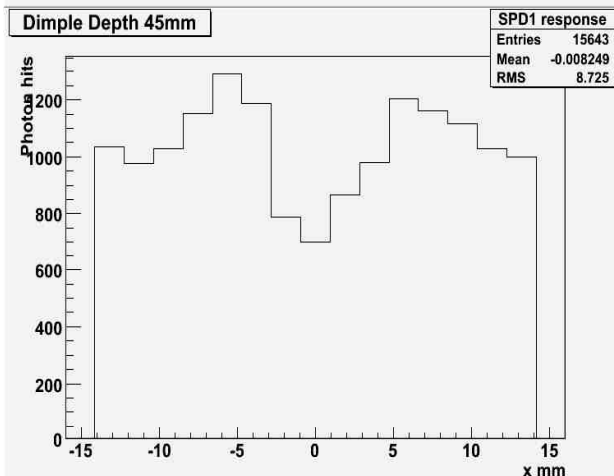
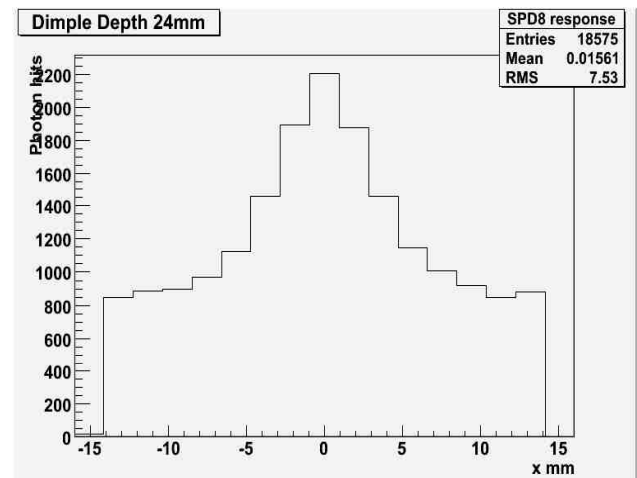
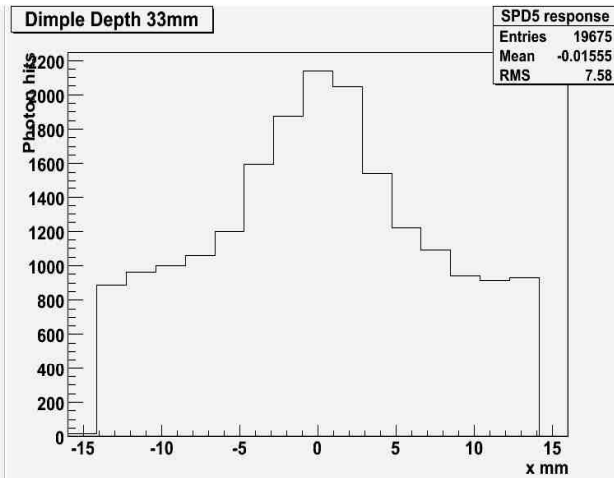
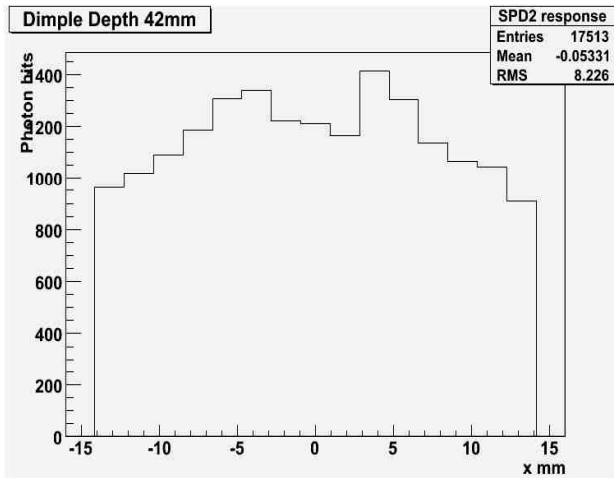


Varied Dimple Depth

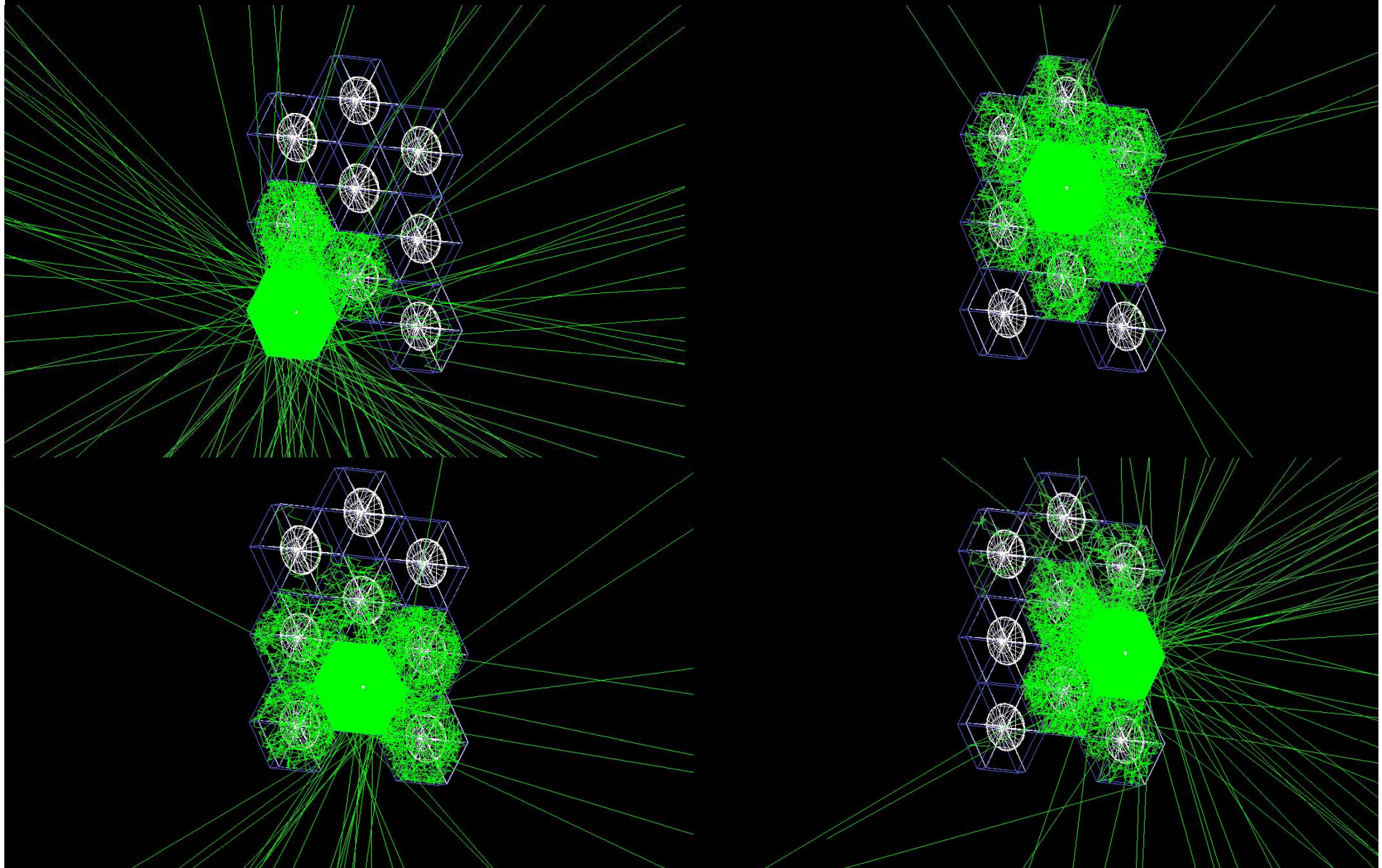
- A square array of 9 box shaped scintillating cells was created.
 - Cell thickness was 5.0 mm.
 - Cell sides were 30 mm by 30 mm.
- Each cell had a spherical dimple with a radius of curvature of 2.0 cm.
- The depth of the dimple was decreased by 0.3 mm after each cell was placed. The depth started at 4.8 mm and ended at 2.4 mm.
- The scan was in 2 mm increments along the centers of the cells in the x direction. The scan was performed 50 times and used a 546 keV electron.

The Array Setup





Cross Talk



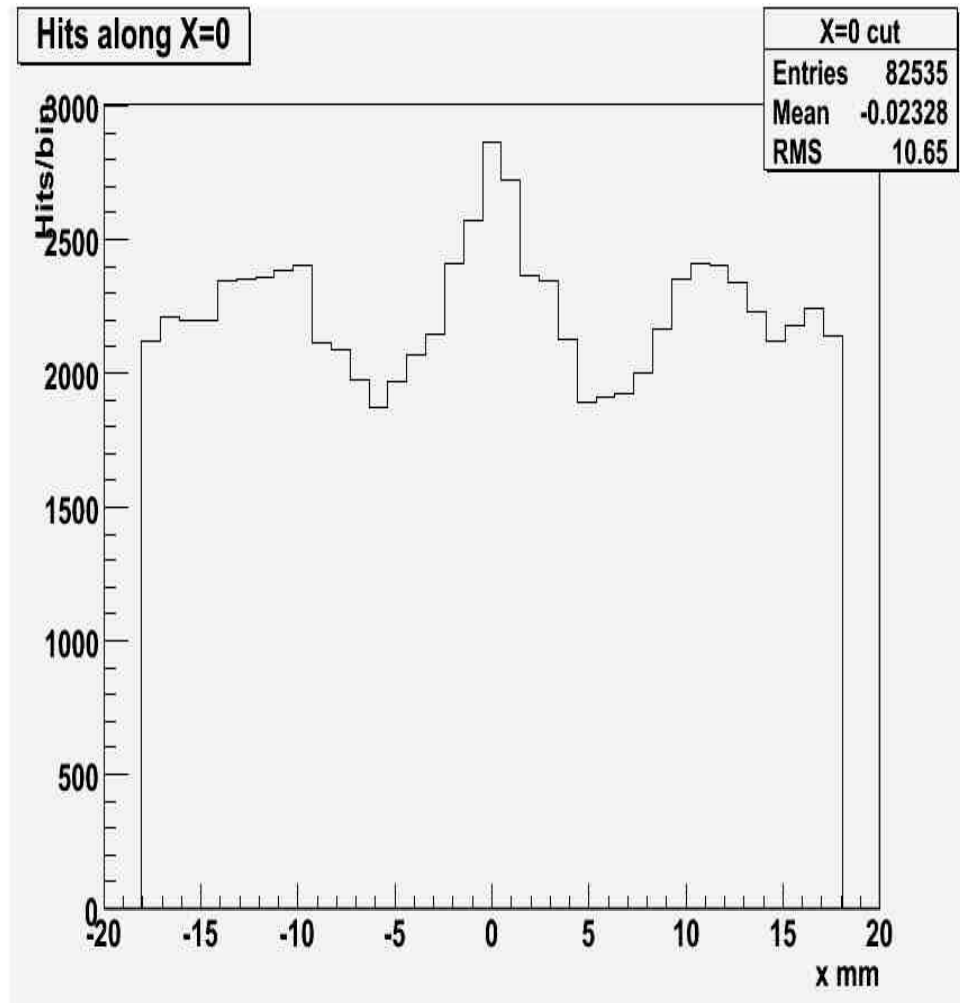


Progress Update

- Simulation fixes, changes, and additions.
 - It is now possible to change the size of the sensitive detector.
 - The reflective disk can now be removed.
 - It is now possible to change the optical boundary properties.
- One additional scan was performed that covered the $x=0$ axis on a hexagonal cell with a spherical dimple.



Latest Scan



- The cell had the same dimensions as the first three scans.
- The dimple had a radius of curvature of 2.0 cm and a depth of 0.3 cm.
- The scan was done with 2 GeV muons fired at 1 mm intervals.
- The scintillation yield was set to 0.2.
- One mu- was fired from 1 mm away from the cell face.
- 20500 total points were scanned along x=0.



Next Steps

- Compare simulated data to real data.
- Continue to fine tune the simulation.
- Perform scans with greater statistics.
- Add user control options when practical and possible.
- Write a paper summarizing my summer activity and describing the simulation I built.

Questions?