



Scintillator Simulation Update

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Progress Summary

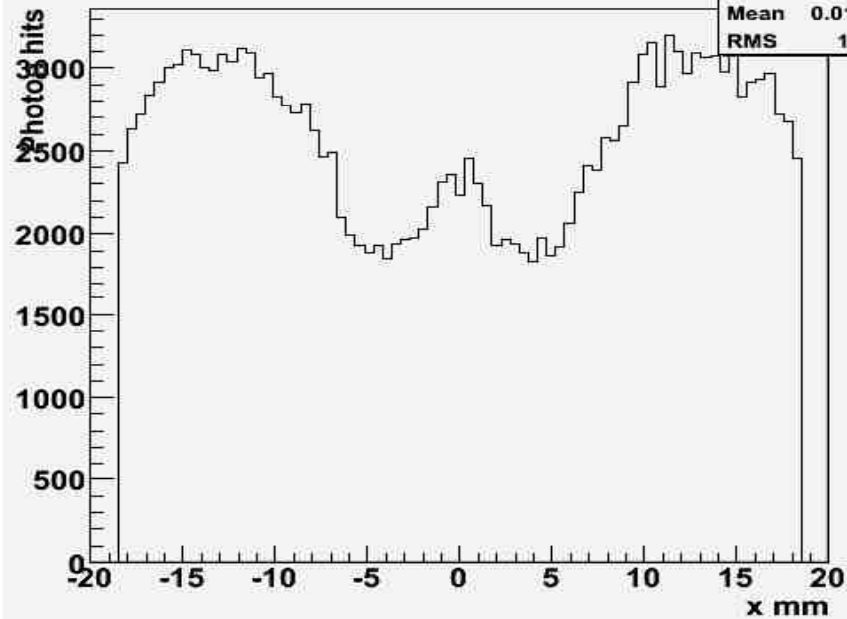
- Simulation fixes, changes, and additions.
 - Fixed a boundary overlap error.
 - Fixed and retooled the commands that change the boundary properties.
 - Added a command allowing the user to change the width of a boundary volume.
 - Added a command that switches the scintillator material between Polystyrene, BGO, and PbWO₄.
- One scan performed with the NIU cluster on a cell with a spherical dimple. Each point along the $X=0$ access was scanned 500 times. The points were in 0.5 mm intervals. Scintillation yield was set to 0.1.



Cell with Spherical Dimple

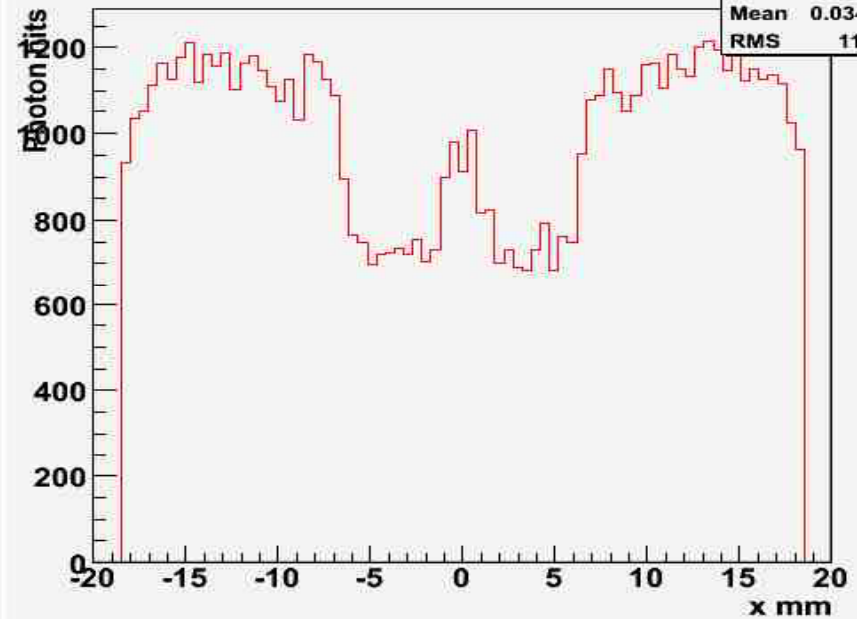
- The depth of the dimple is 0.3 cm.
- The dimple has a radius of curvature of 2.0 cm.
- The cell center to corner distance is 1.86 cm.
- The cell center to side distance is 1.61 cm.
- The cell is 0.5 cm thick.
- 2.28 MeV electrons were used for the scan.

Total hits along X=0



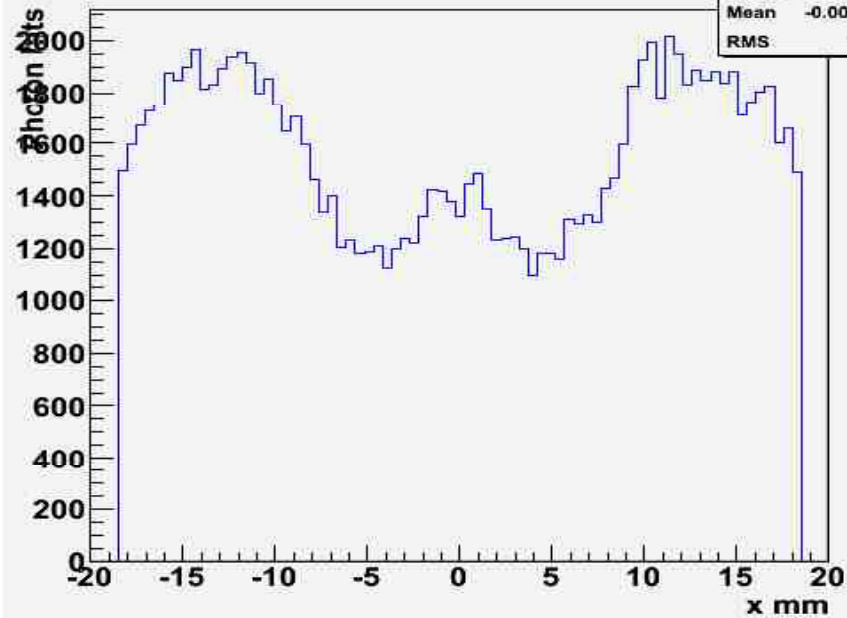
X=0 cut	
Entries	192651
Mean	0.01132
RMS	11.37

Hits vs gun position



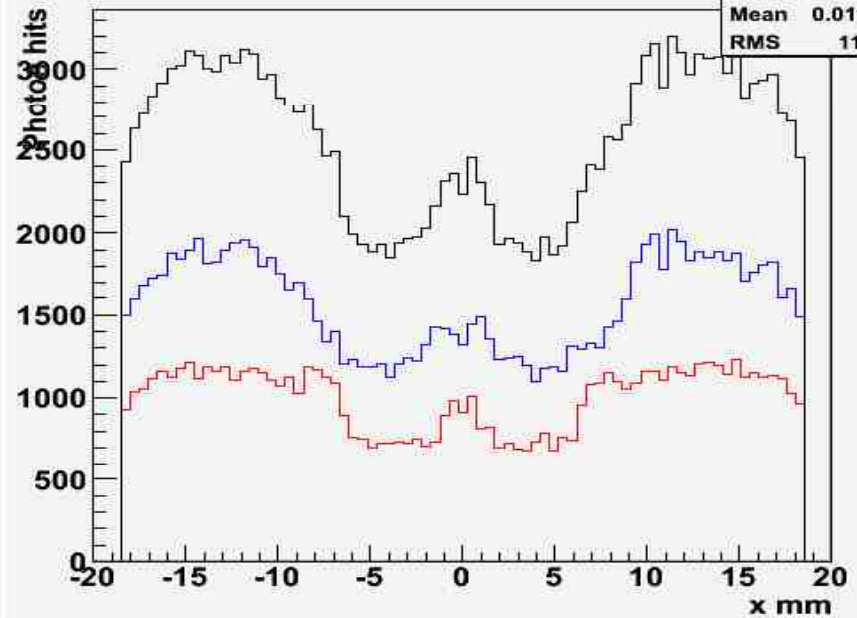
Cherenkov hits	
Entries	75174
Mean	0.03439
RMS	11.35

Hits vs gun position



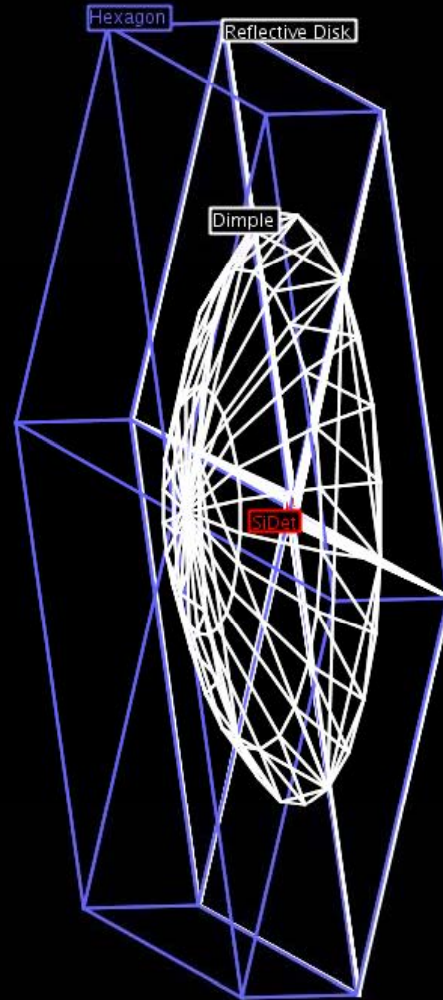
Scintillation hits	
Entries	117477
Mean	-0.003439
RMS	11.38

Total hits along X=0



X=0 cut	
Entries	192651
Mean	0.01132
RMS	11.37

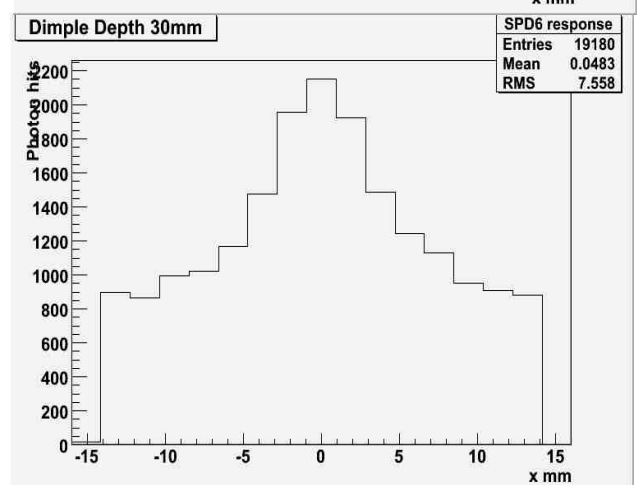
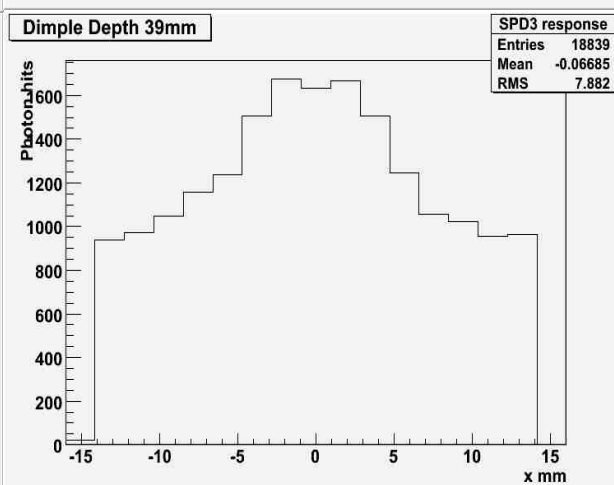
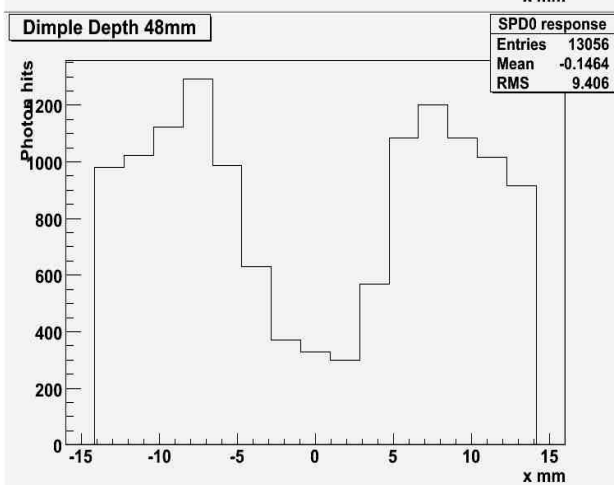
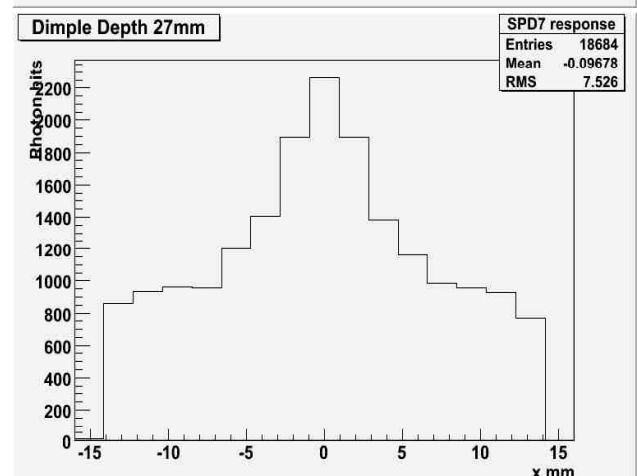
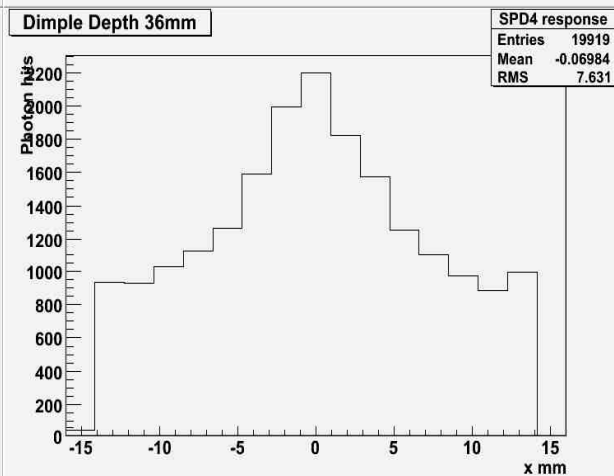
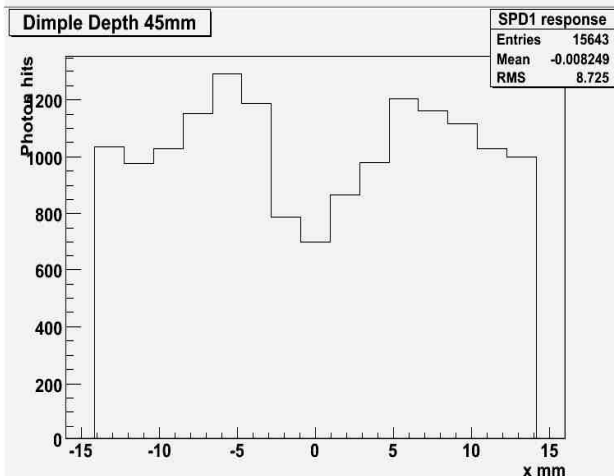
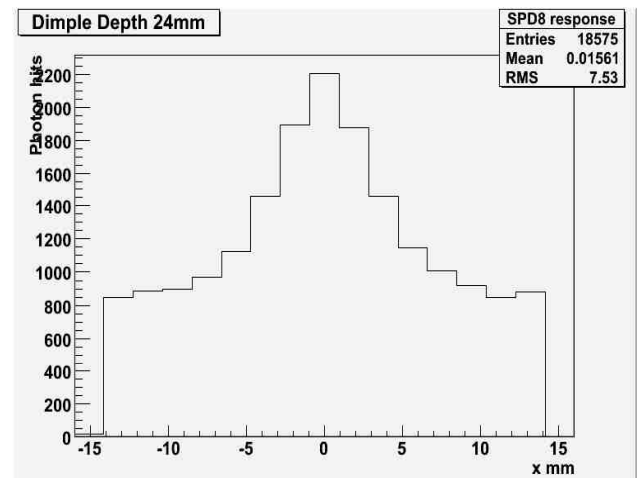
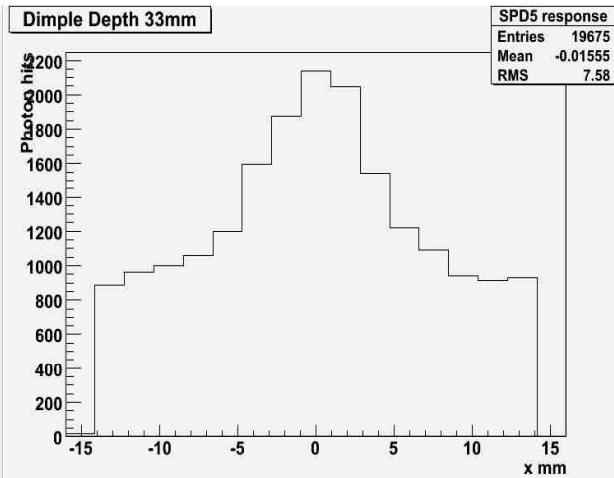
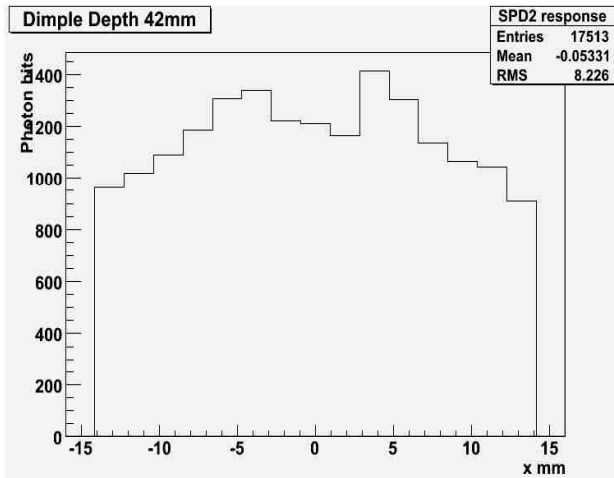
The Scintillating Cell





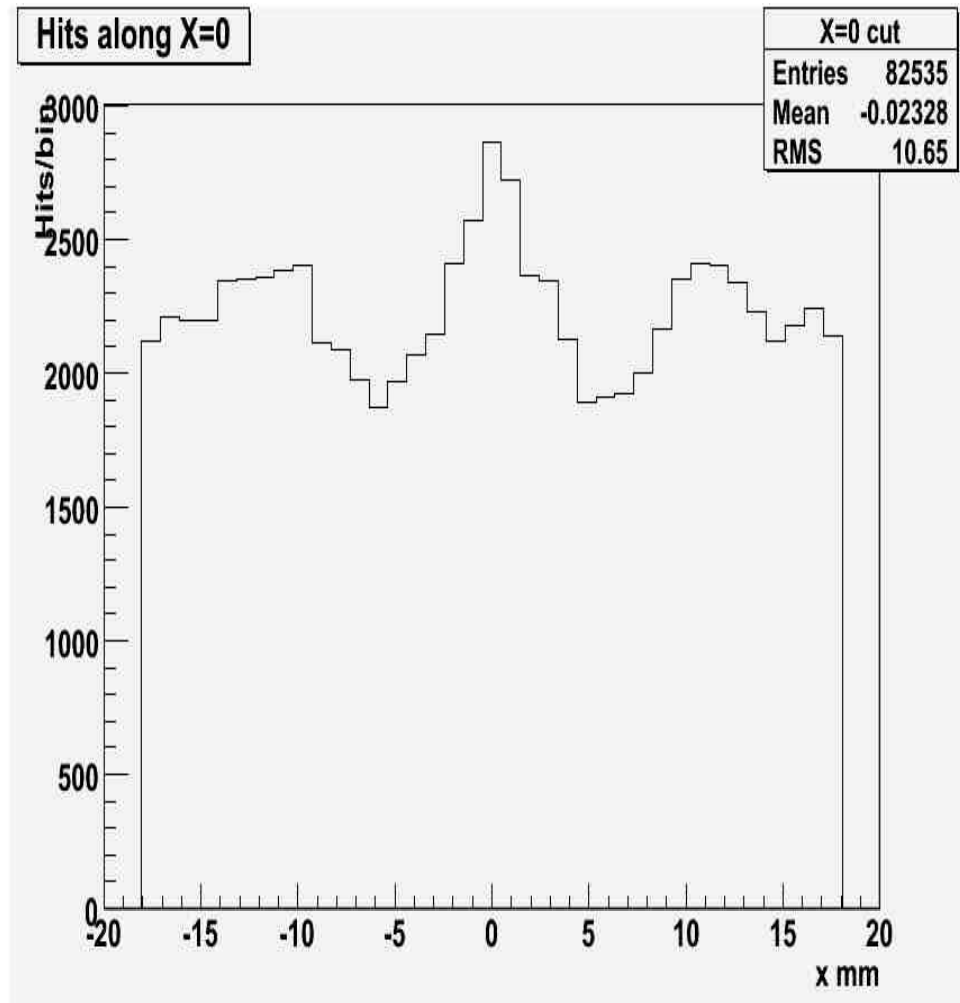
Varied Dimple Depth

- 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.





Mu- 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

- Continue to fine tune the simulation.
- Perform scans with greater statistics.
- Add a command that gives the primary particle a random energy based on a Gaussian distribution with user defined values.
- Write a manual for the simulation I built.

Questions?