SuperB:
DCH Update on FullSim Bkg Studies

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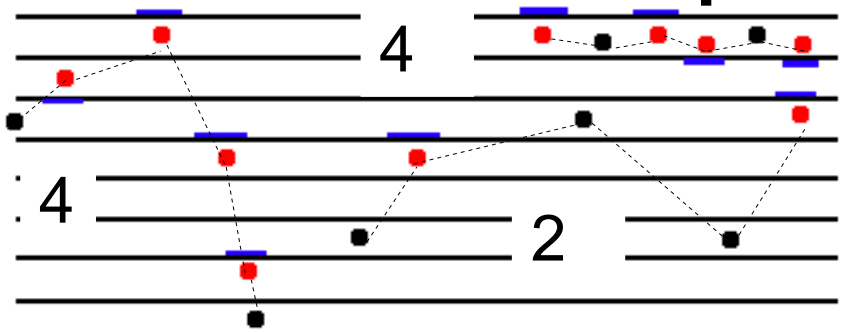
SuperB Workshop - DCH Session
April 4, 2011

Overview

- Latest “CIPE” Production samples:
  Comparison with older samples and step-size

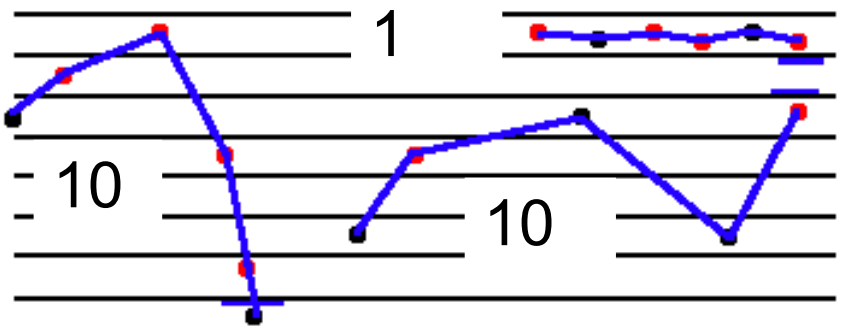
Occupancy Algorithm



Deposited Energy w/o double-counting:

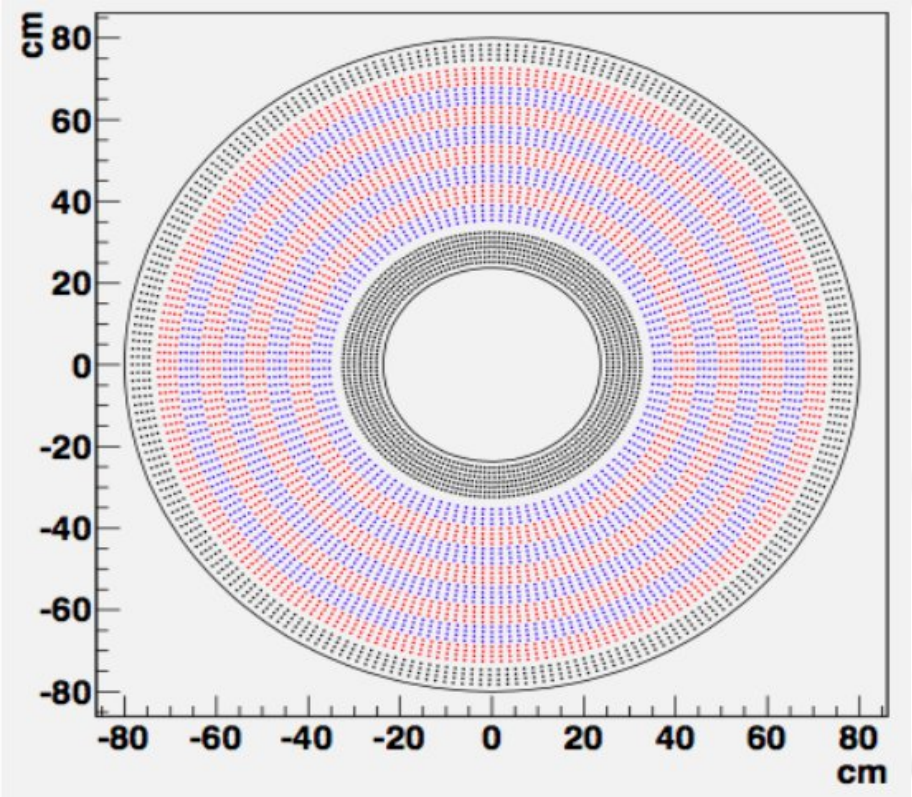
- 1 wire-hit for each hit with deposited E >0
- Uses whichever wire is closest to hit (accounting for phi arrangement)
- Allows only 1 wire-hit per wire per event.
- Does NOT account for stereo wires
- Current “bug”: if hit is closer to boundary than first or last wires, does not count in occupancy
- Doesn't work as well for larger step sizes

- My Bruno occupancies are normalized to ~215 Mhz
- Wire layout is same as Riccardo uses: First superlayer has smaller cell radii

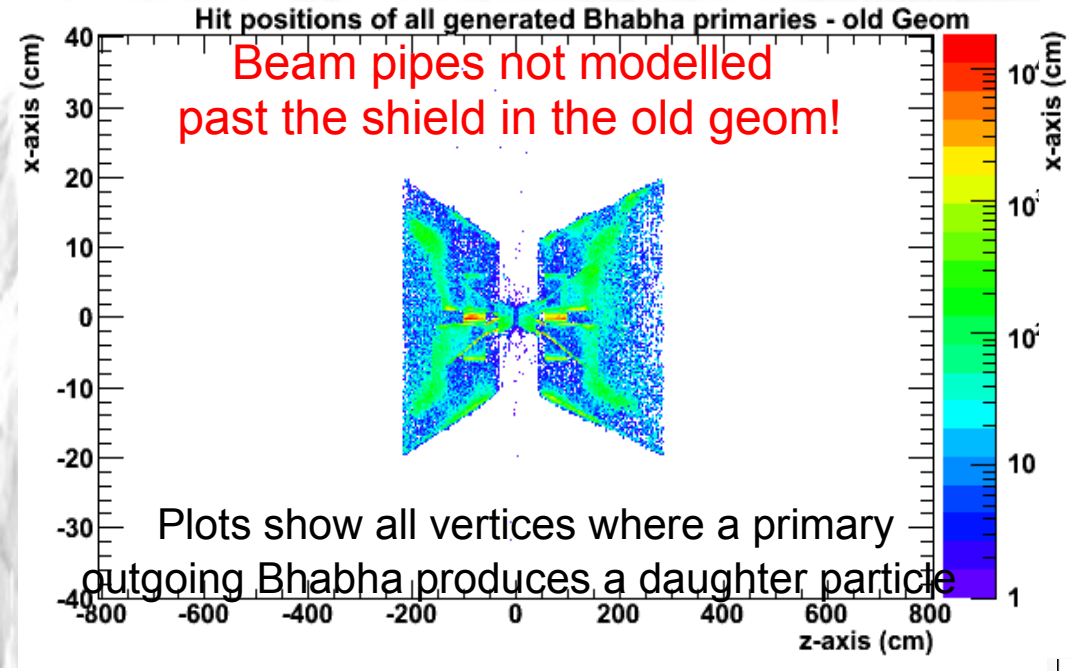


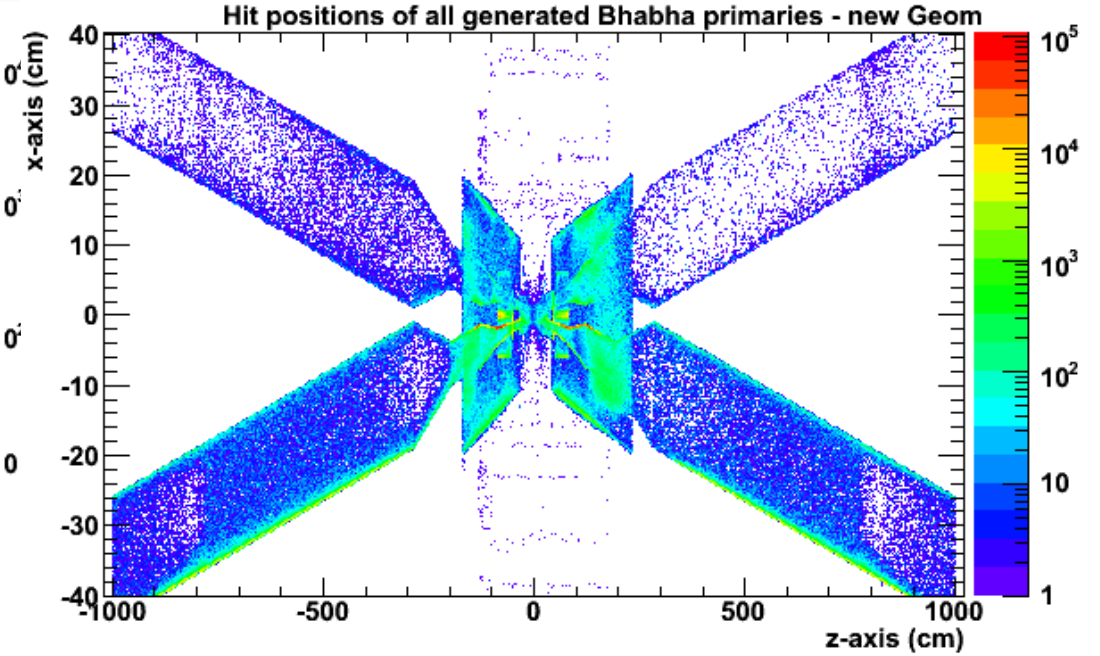
Hit-by-Hit w/o d-c : old method, not used anymore!

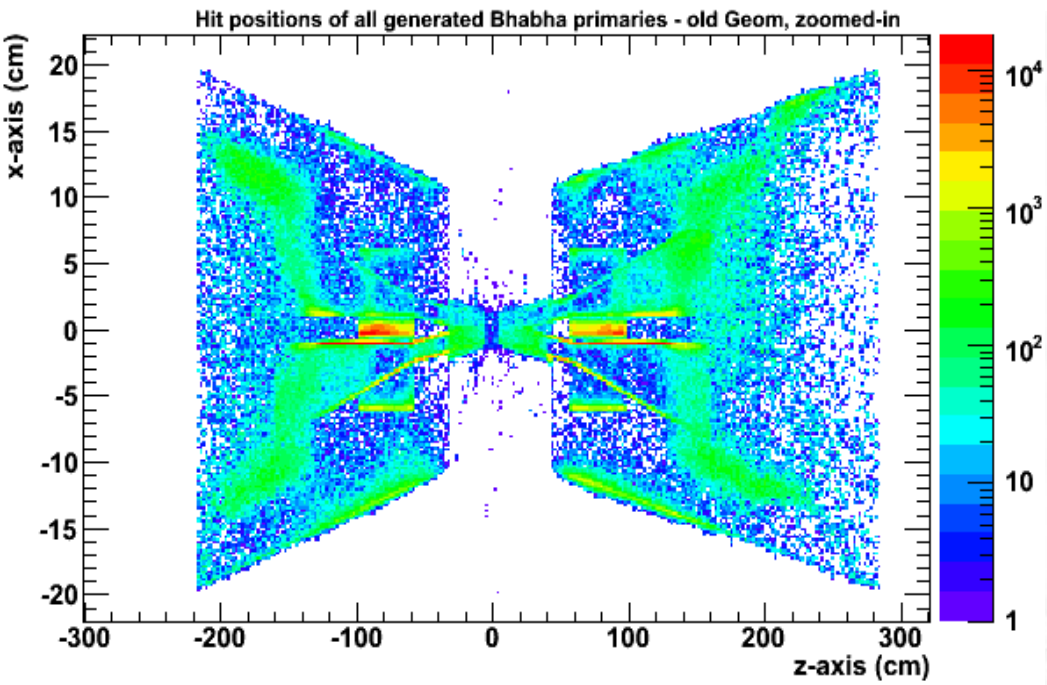
Straight lines between ALL hits
1 wire-hit per crossed wire
If no crossed wires, wire closest to first hit.
Allows only 1 wire-hit per wire per event.

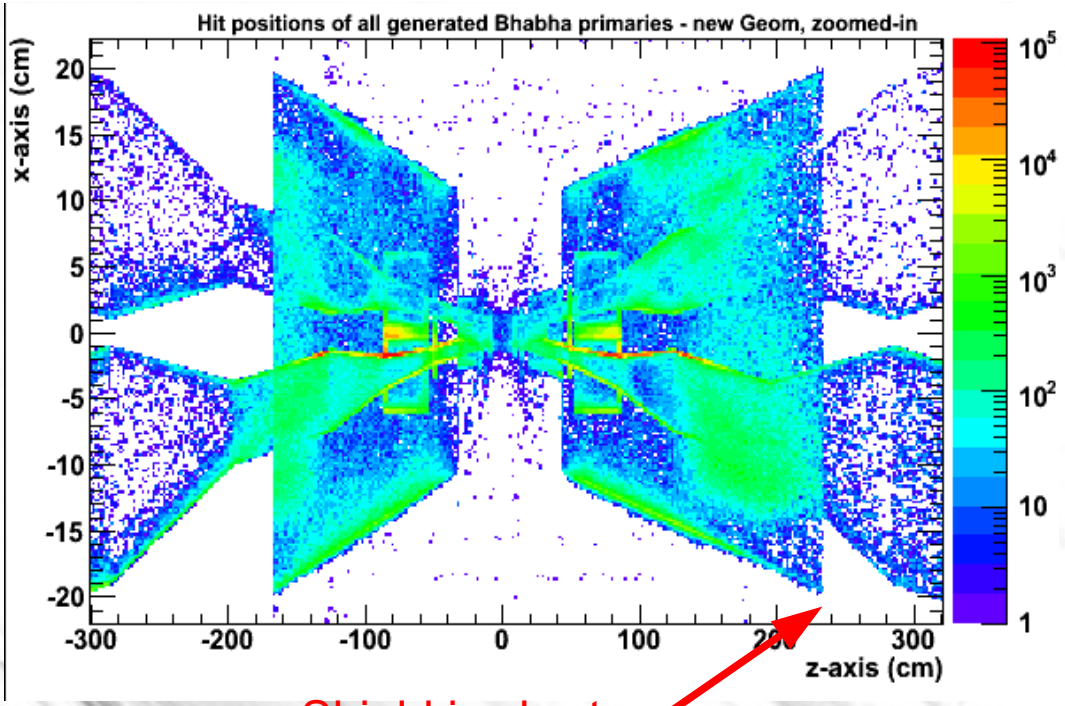


New Vs. Old Prod. Geometries

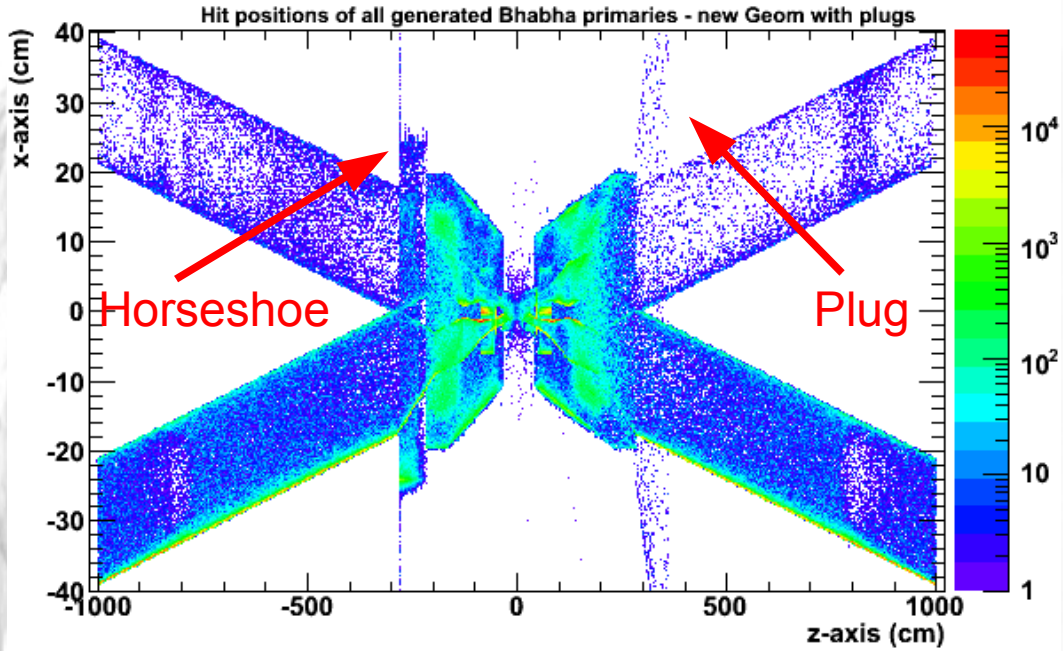






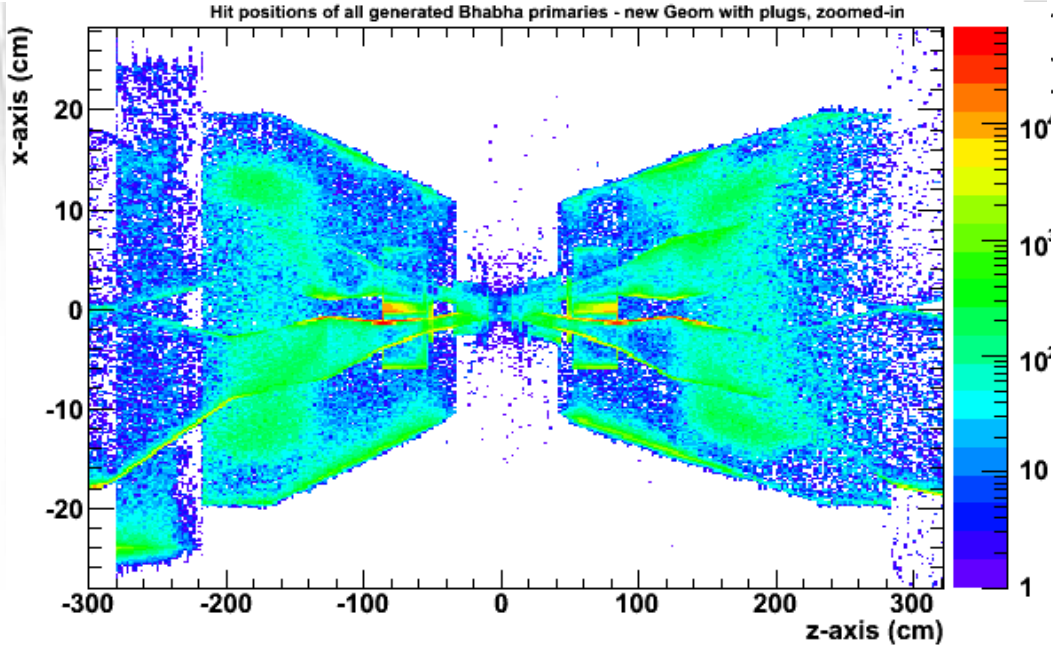


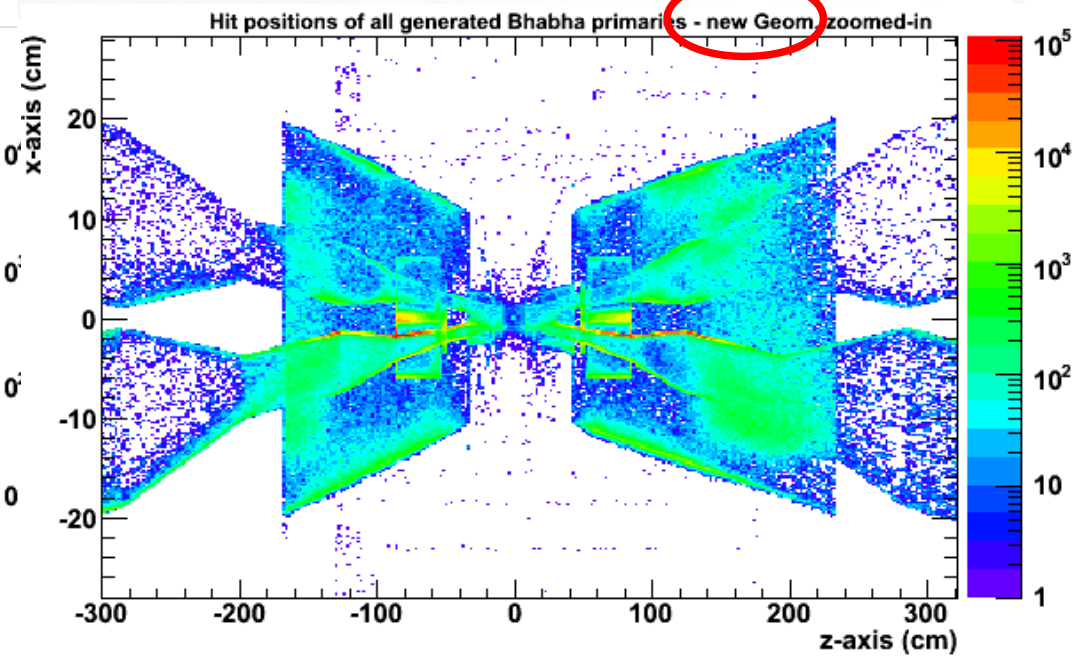
New Geom with Plugs



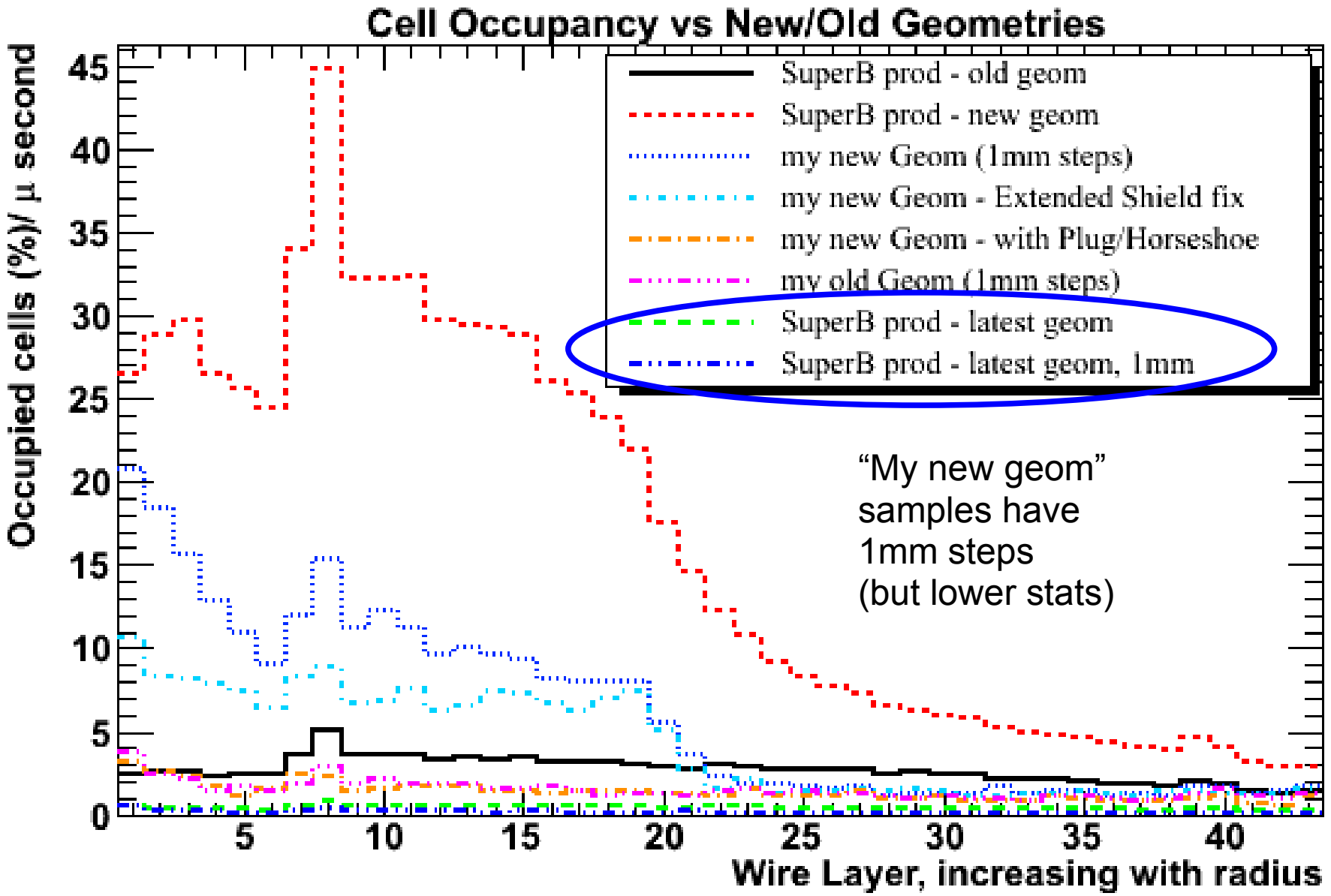
- Extended tungsten shield
- Fwd plug and Bwd Horseshoe
- New FTOF model
- Trimmed back DCH (5cm in forward region)

Latest "CIPE" geometry (not shown here!)
- More realistic Final Focus model using Sullivan's designs, extended to 16m
- Bending magnets after 8m (two bends)
- IFR electronics, improved IFR volume shape, rough model of EMC added
- Model of detector hall, made of concrete & instrumented with silicon layers

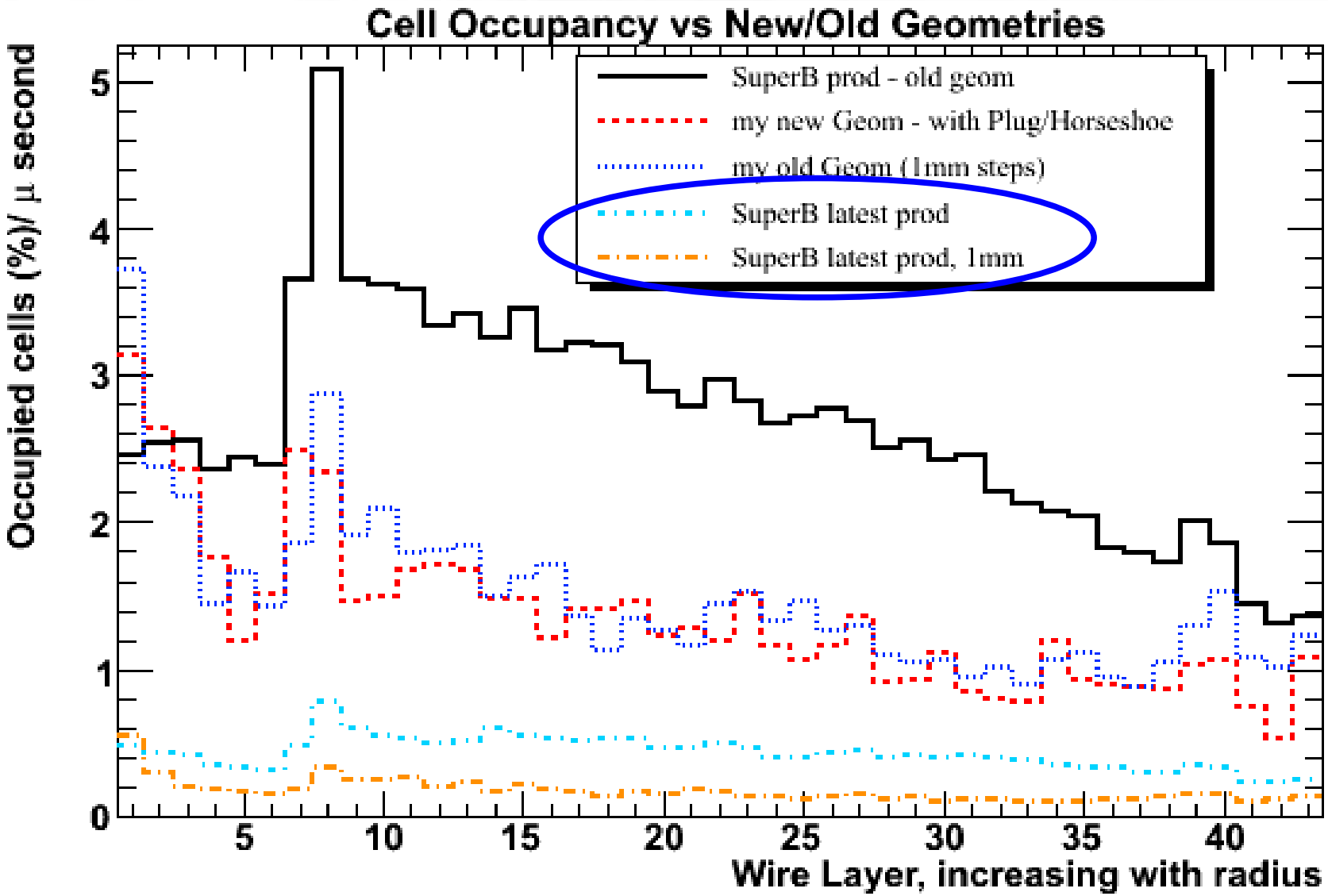




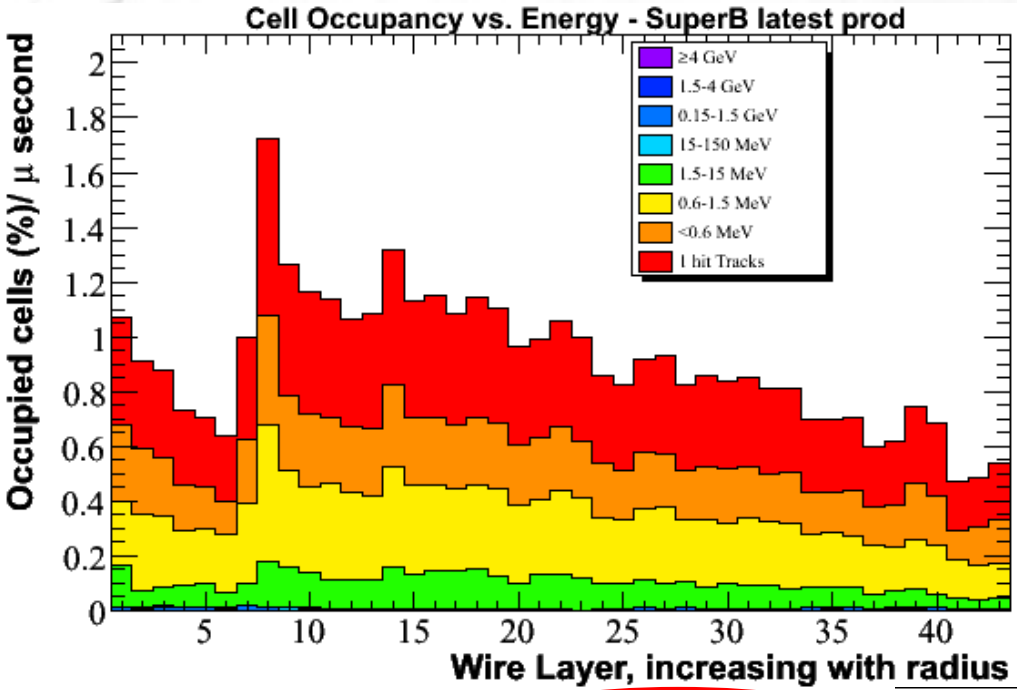
Comparison of Samples (Bruno only)

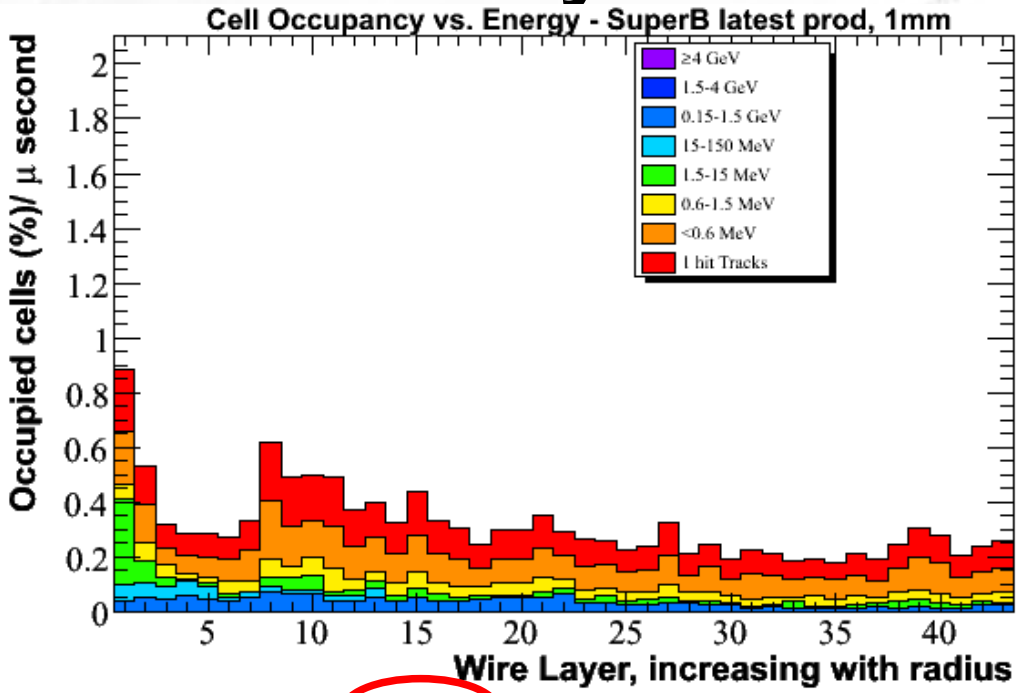


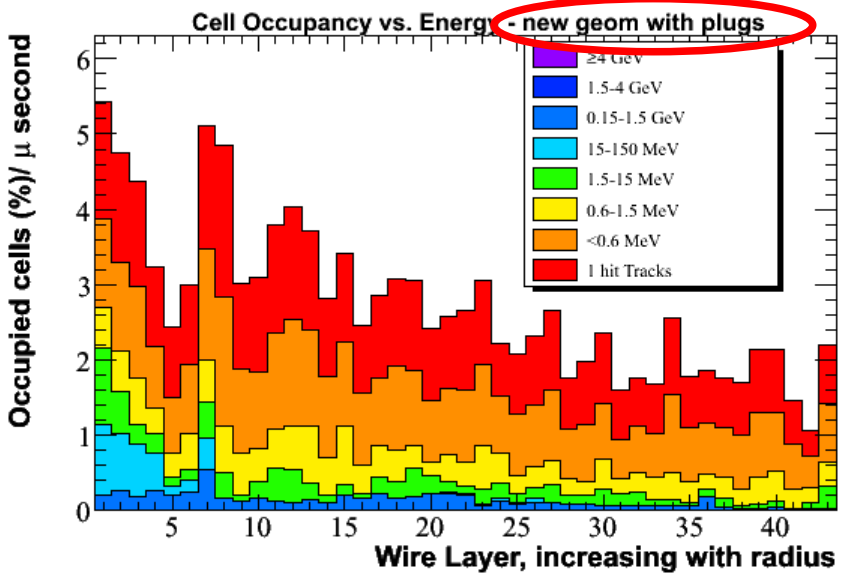
Comparison of Samples (Bruno only)

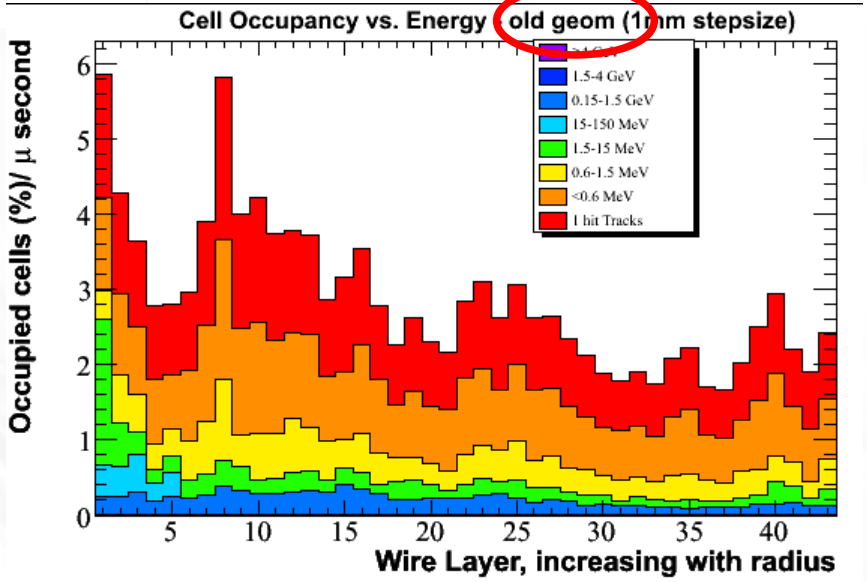


Latest “CIPE” Geometry

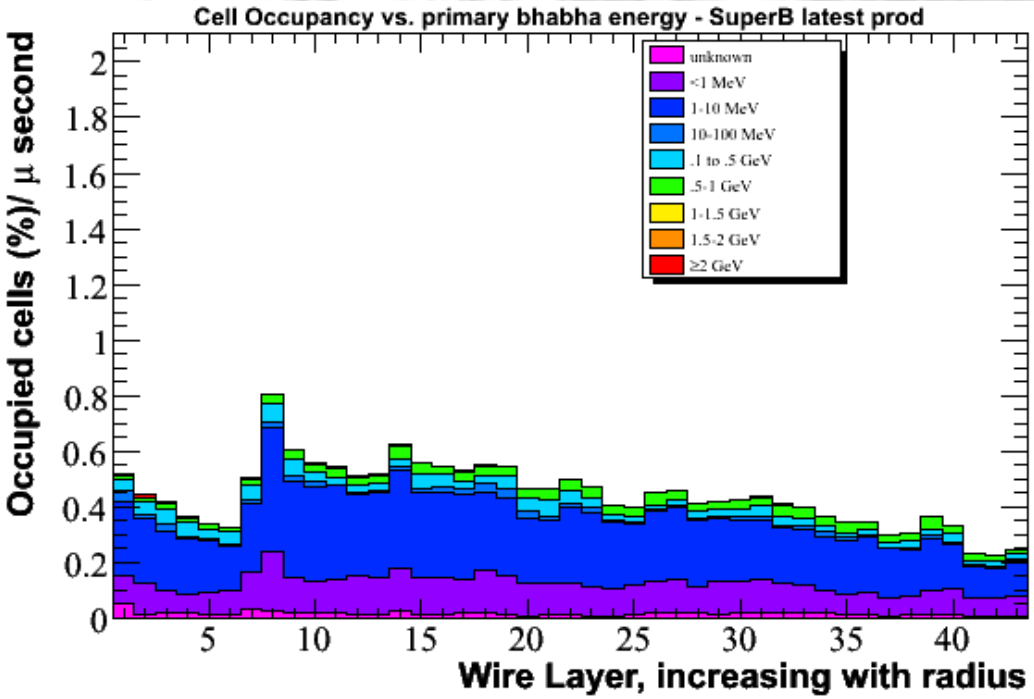


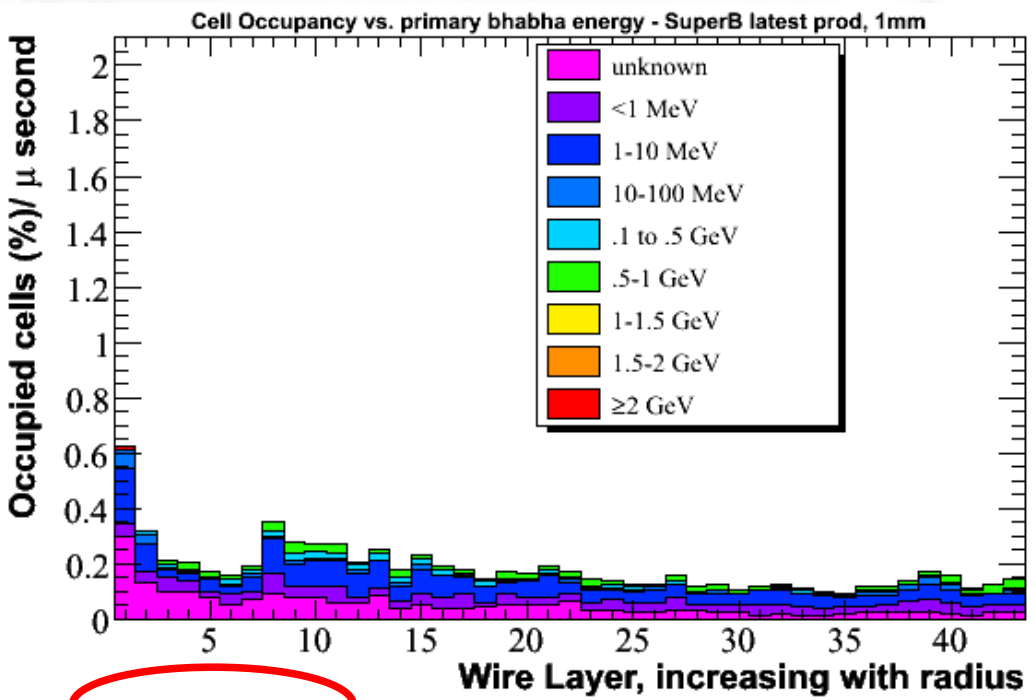


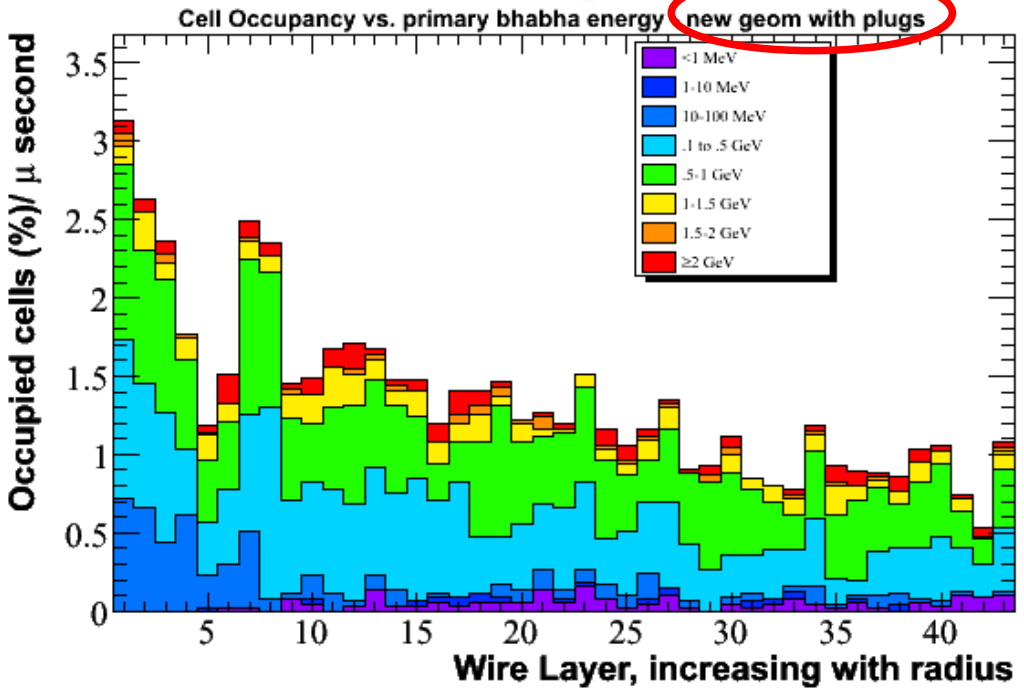




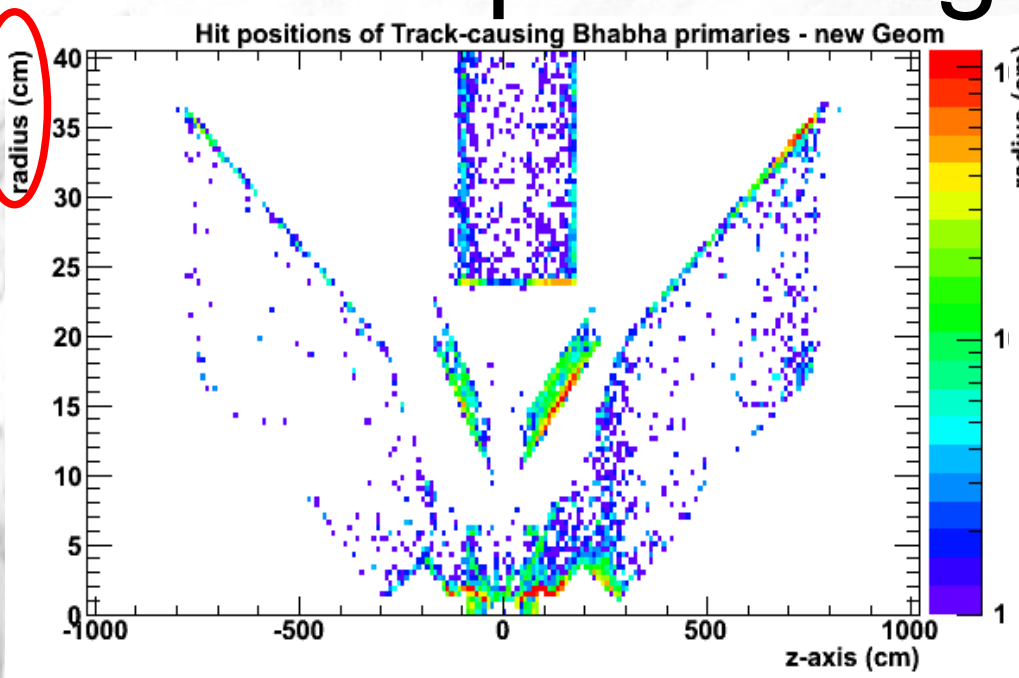
Note: Due to splitting plots into stacked colored “bins”, it's possible for 2 tracks from same event to double count on a wire, resulting in falsely higher occupancies.

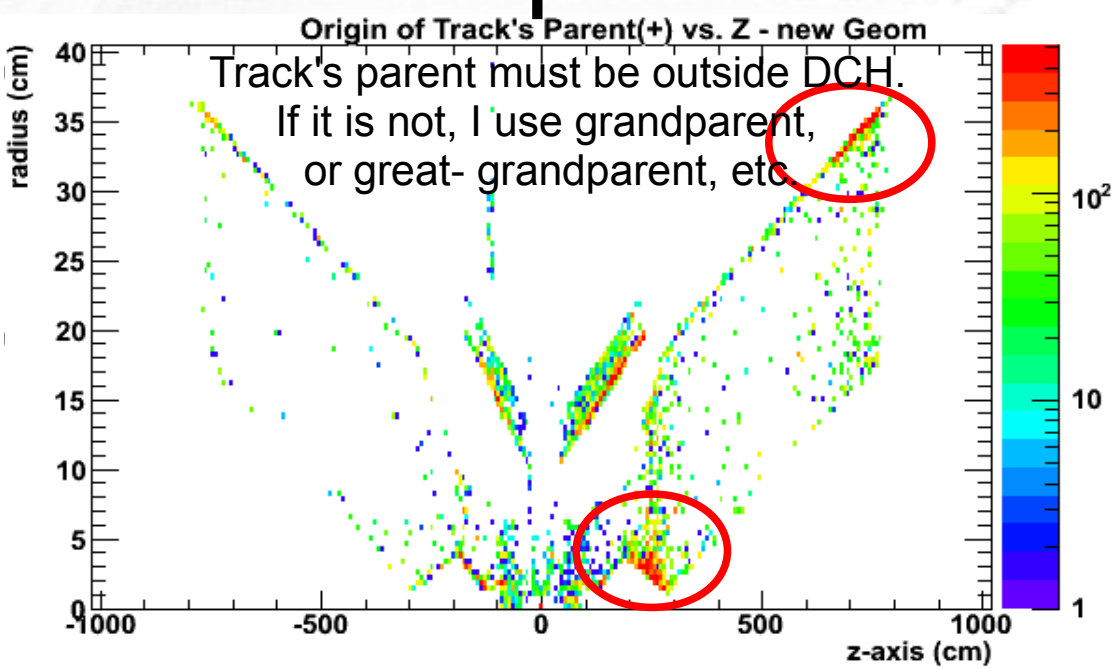

Cell Occupancy vs. primary bhabha energy - SuperB latest prod
Occupied cells (%)/ μ second
Wire Layer, increasing with radius
unknown
<1 MeV
1-10 MeV
10-100 MeV
.1 to .5 GeV
.5-1 GeV
1-1.5 GeV
1.5-2 GeV
≥2 GeV

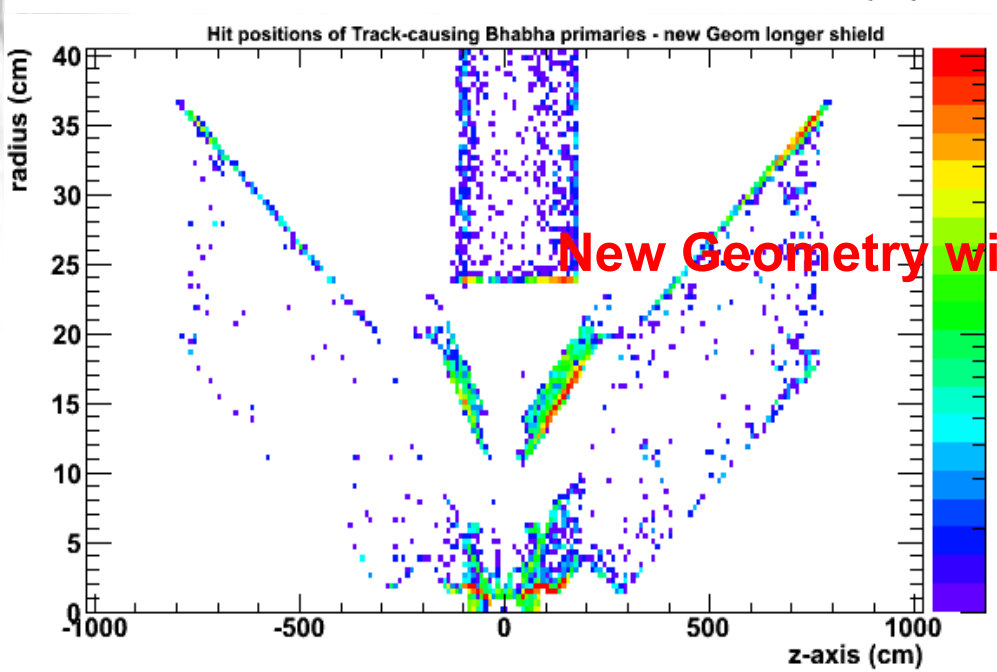

Cell Occupancy vs. primary bhabha energy - SuperB latest prod, 1mm
Occupied cells (%)/ μ second
Wire Layer, increasing with radius
unknown
<1 MeV
1-10 MeV
10-100 MeV
.1 to .5 GeV
.5-1 GeV
1-1.5 GeV
1.5-2 GeV
≥2 GeV


Cell Occupancy vs. primary bhabha energy - new geom with plugs
Occupied cells (%)/ μ second
Wire Layer, increasing with radius
<1 MeV
1-10 MeV
10-100 MeV
.1 to .5 GeV
.5-1 GeV
1-1.5 GeV
1.5-2 GeV
≥2 GeV

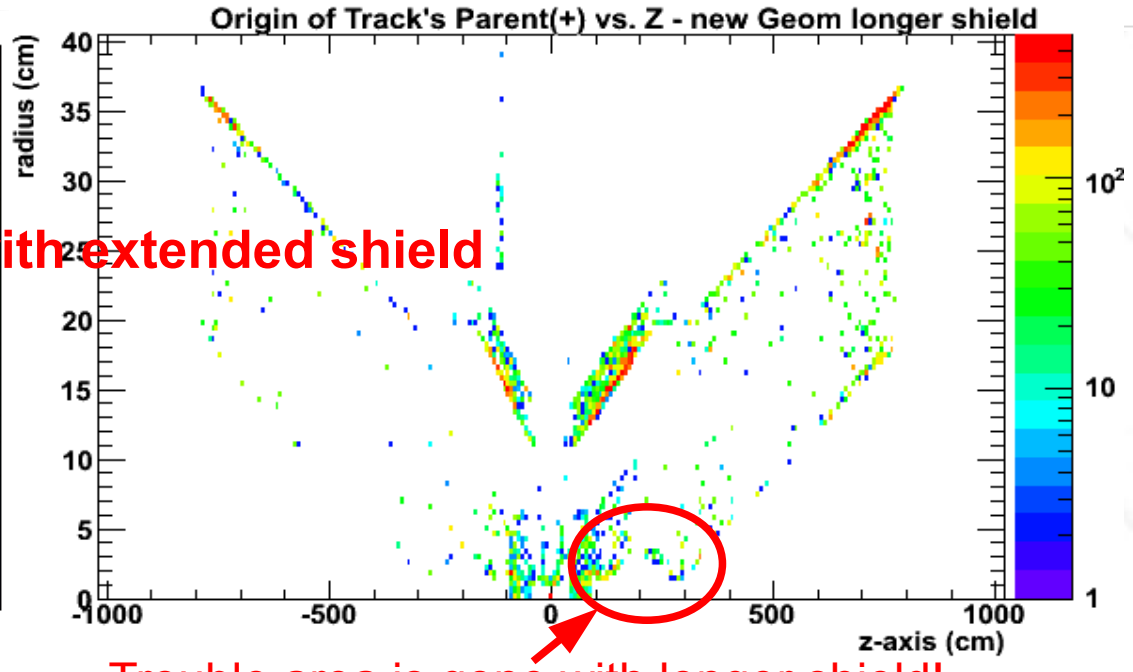
Track-producing Bhabhas/parents





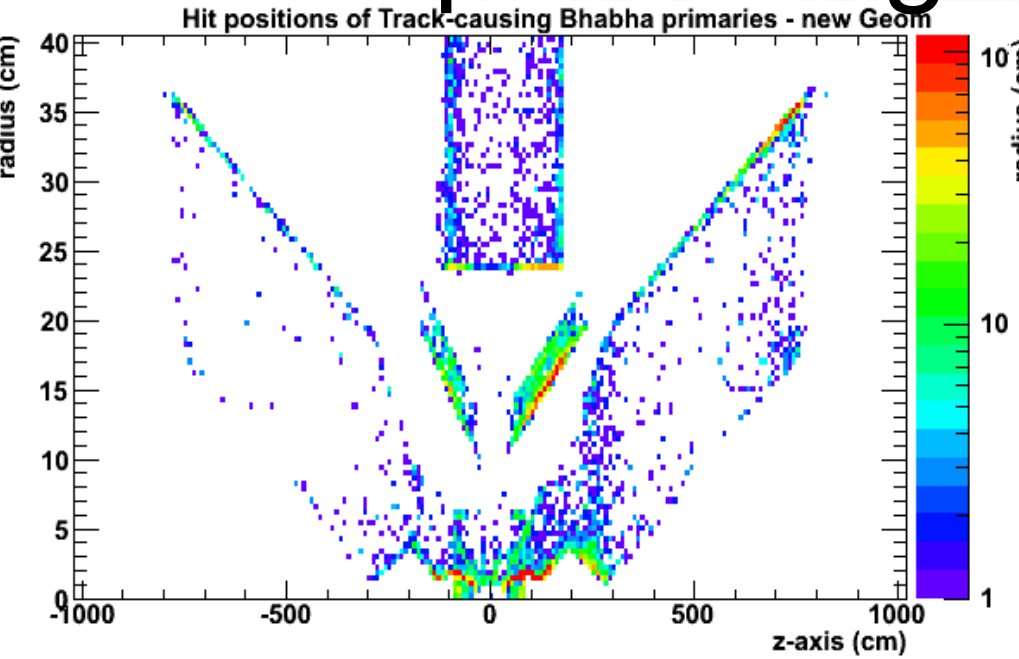


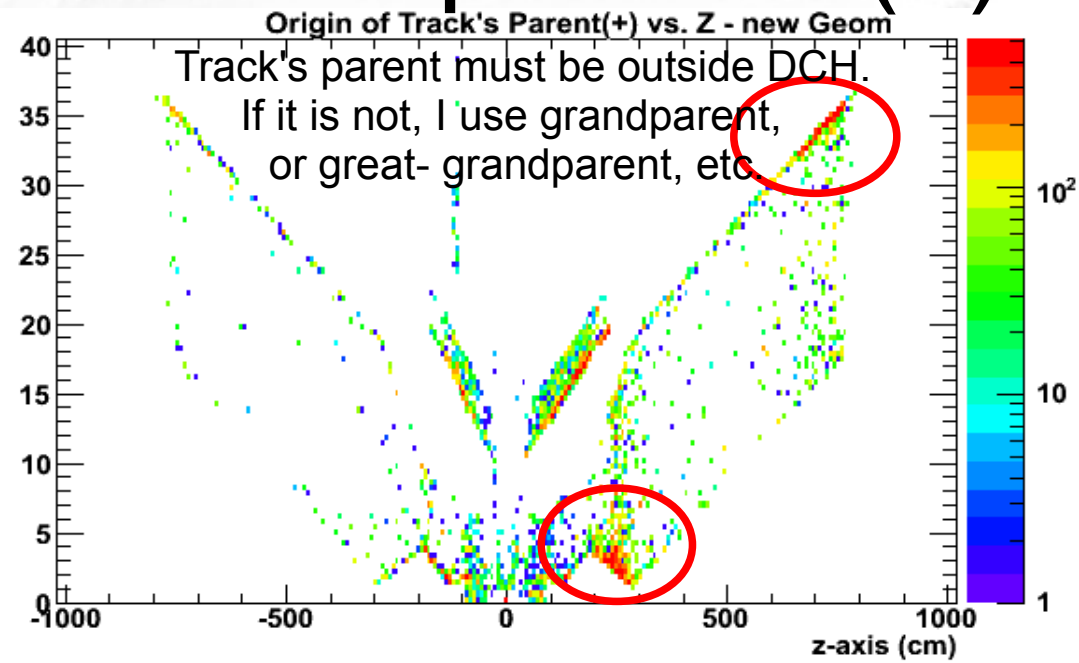
New Geometry with extended shield

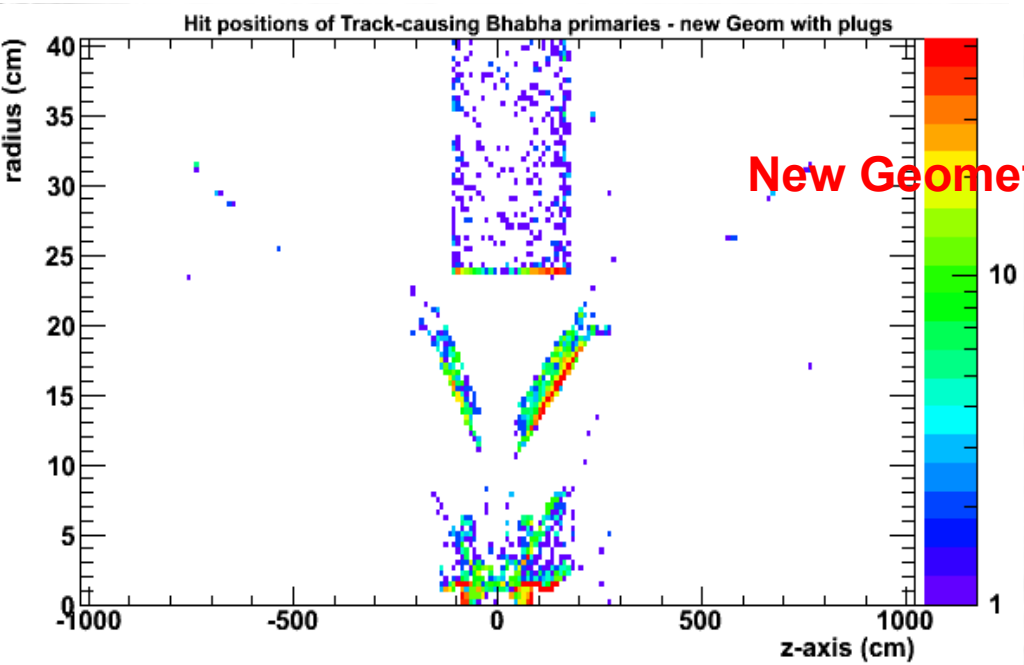


Trouble area is gone with longer shield!

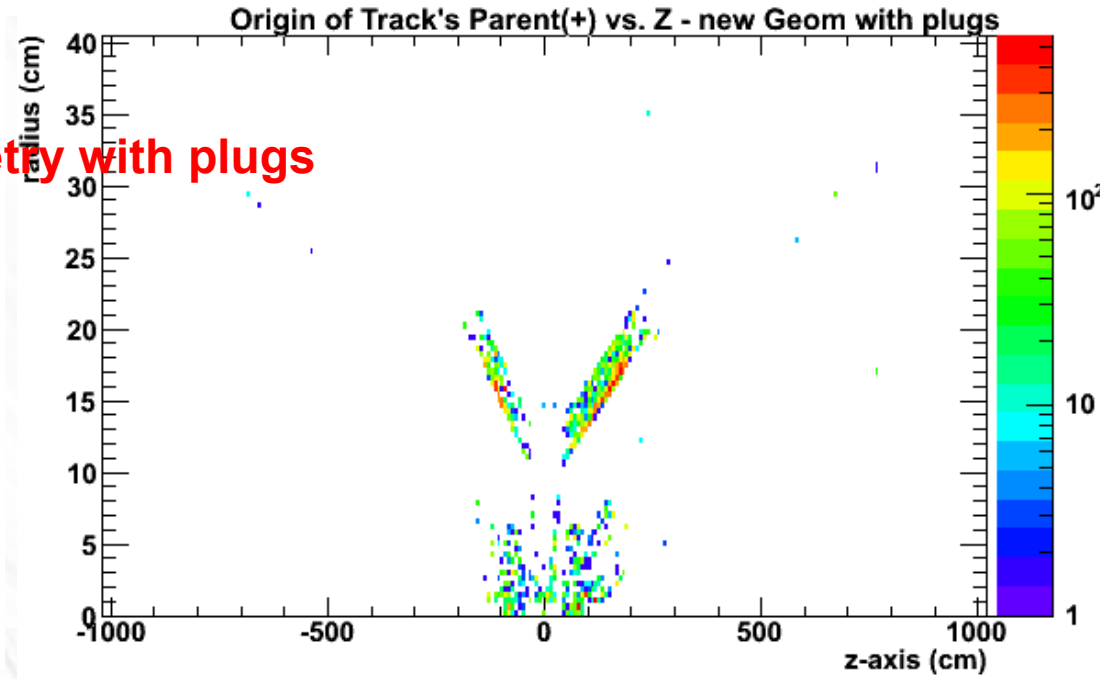
Track-producing Bhabhas/parents (II)







New Geometry with plugs

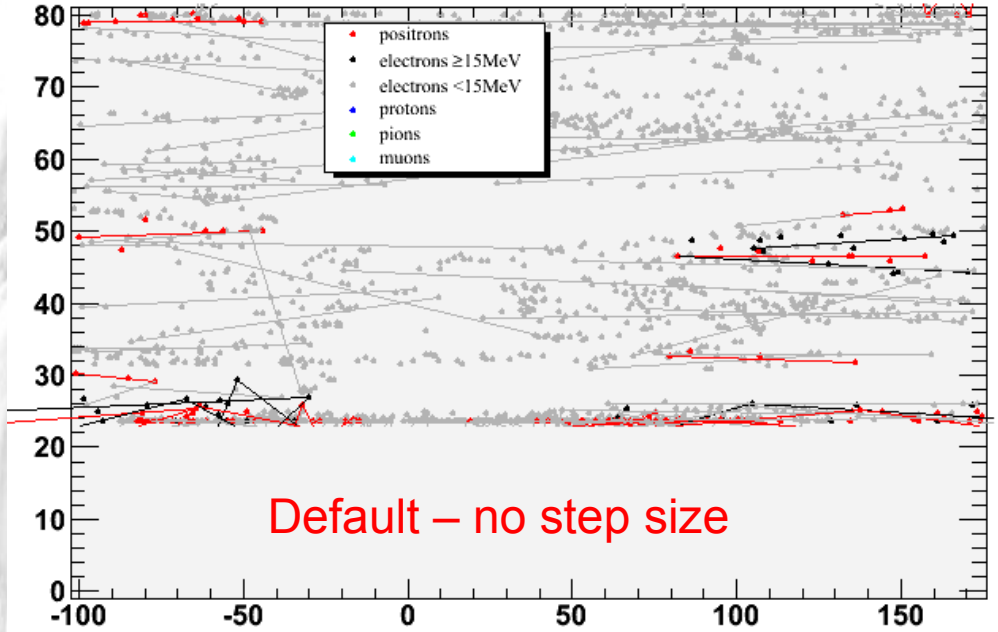


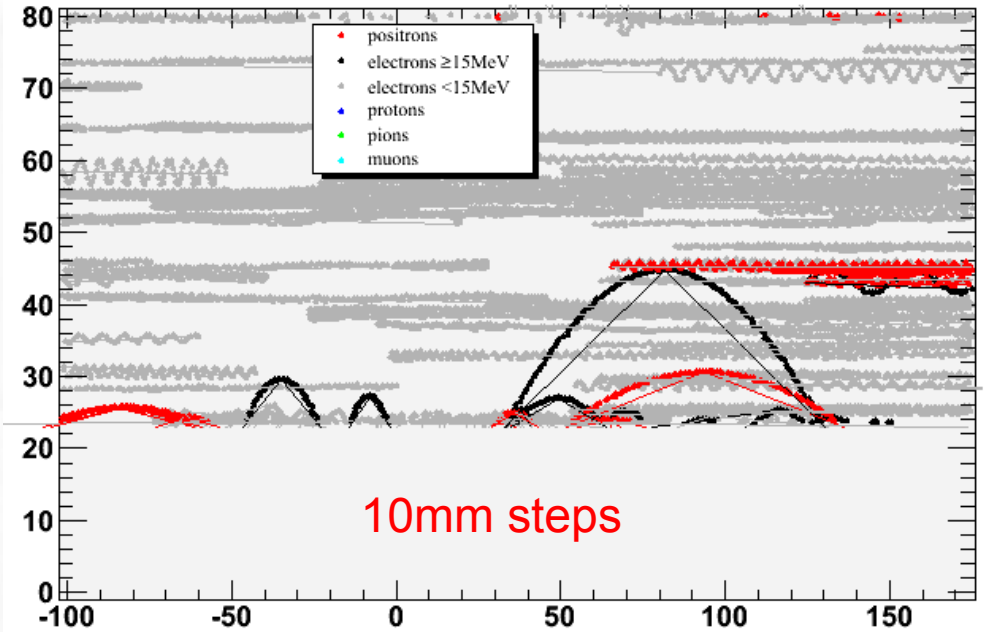
Conclusions

- New Final Focus design shows great improvement in occupancy – almost half!
- More studies necessary, using Truth info, to understand exactly why...

Back-up Slides

Visualization of Step Sizes



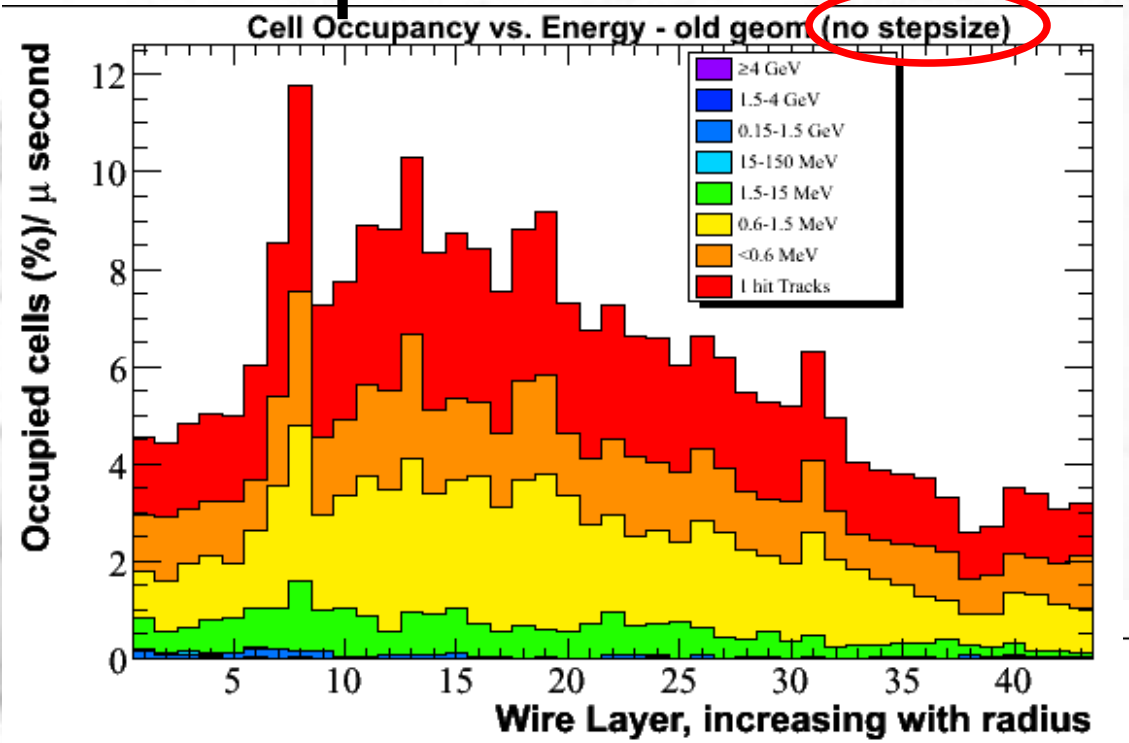


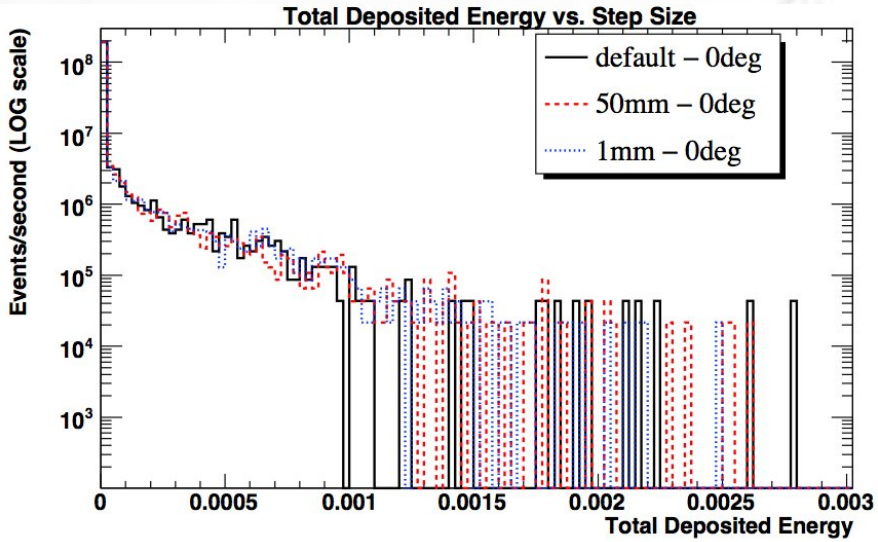
Same 200 events (>5deg) with tracks 1.5MeV < E < 150MeV, hits with deposited E > 0 only

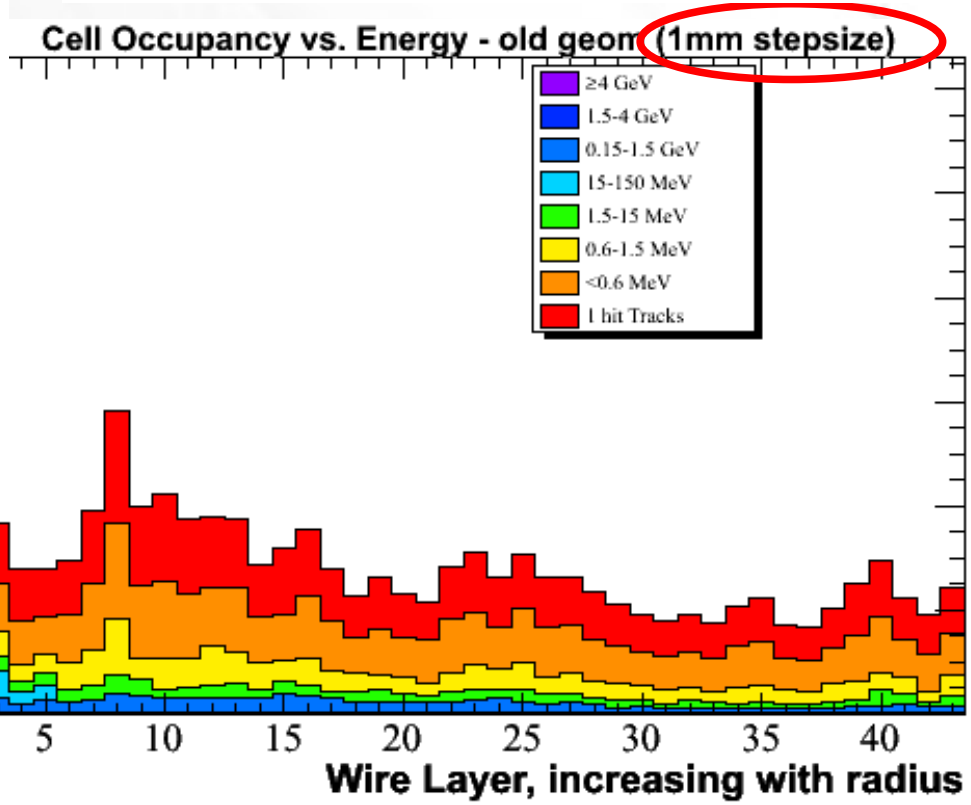
- New occupancy method:

  With smaller step-sizes (1mm Bruno & 10mm Bhwide), each instance of deposited energy counts as one “hit” on whichever wire is closest (axial wires only). Only one hit/wire/event is allowed.

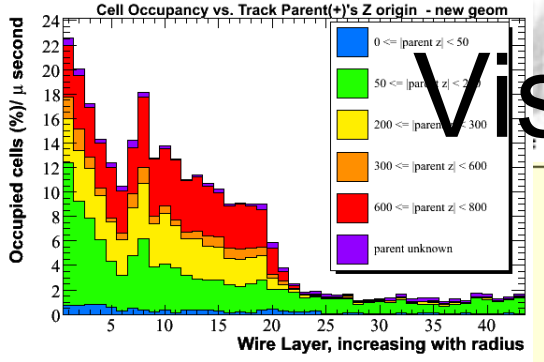
Step Size vs. Occupancy (old geom)

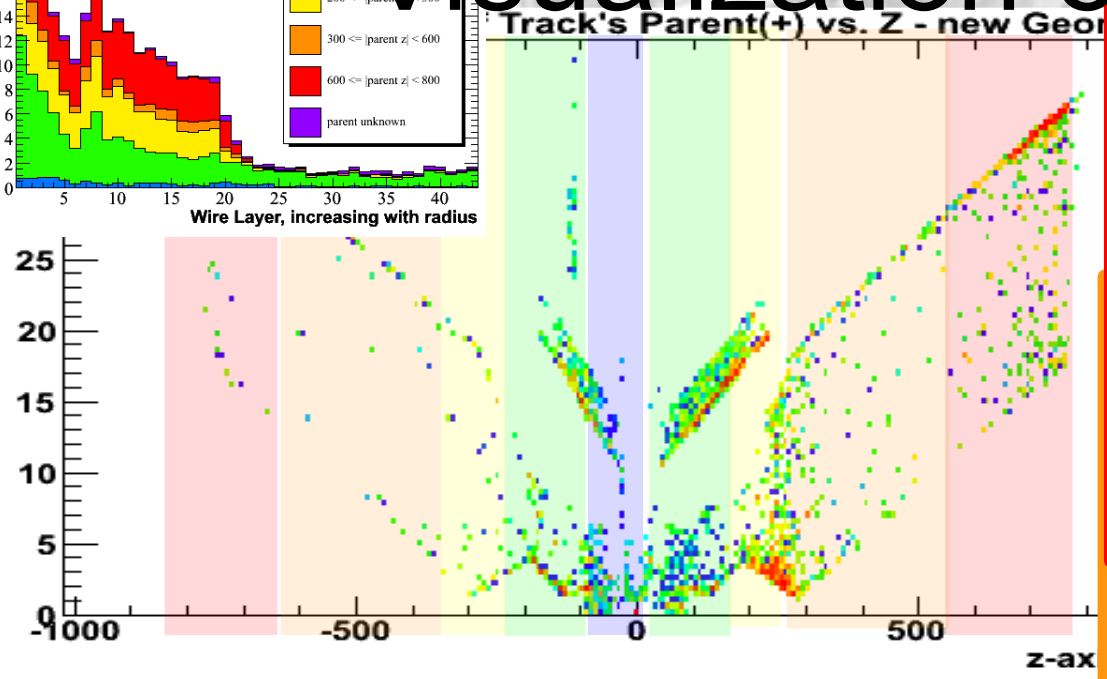


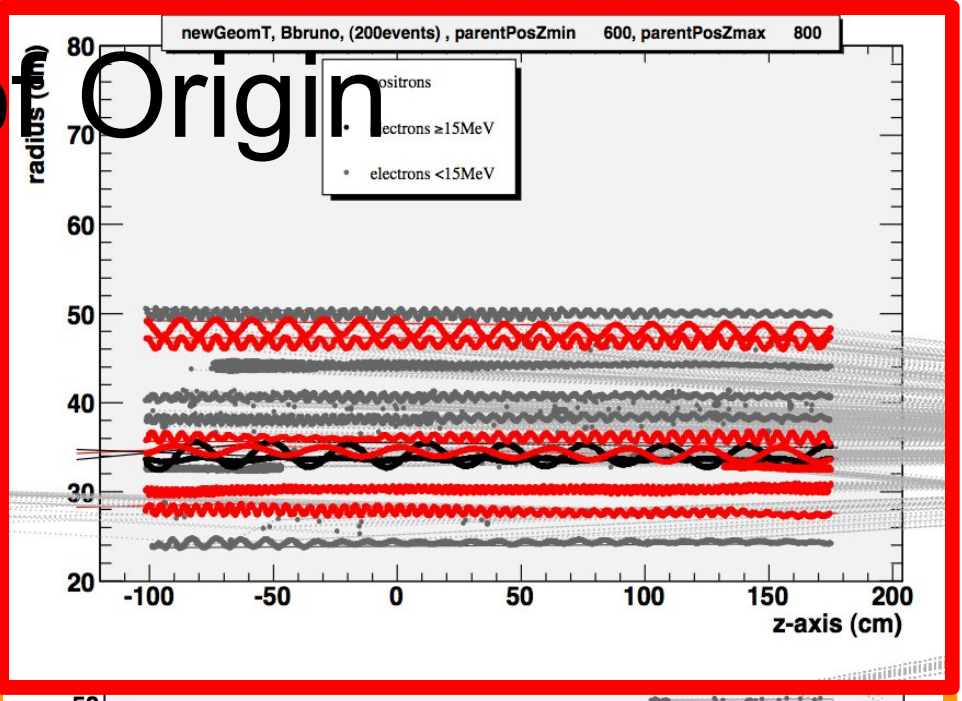


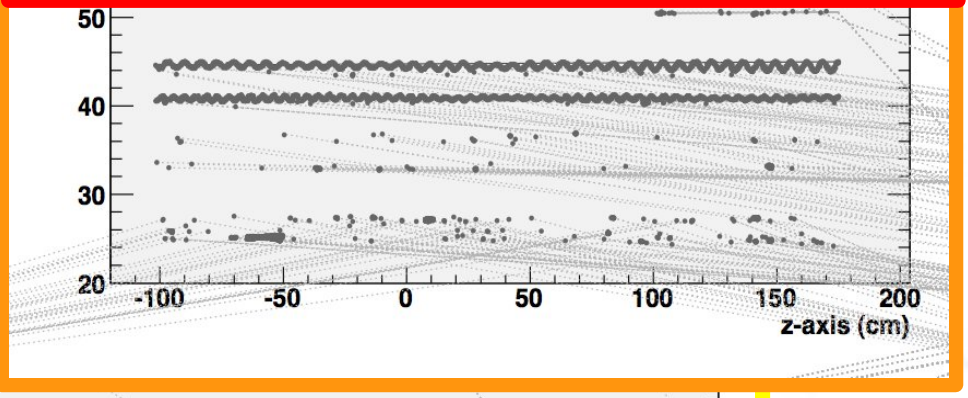


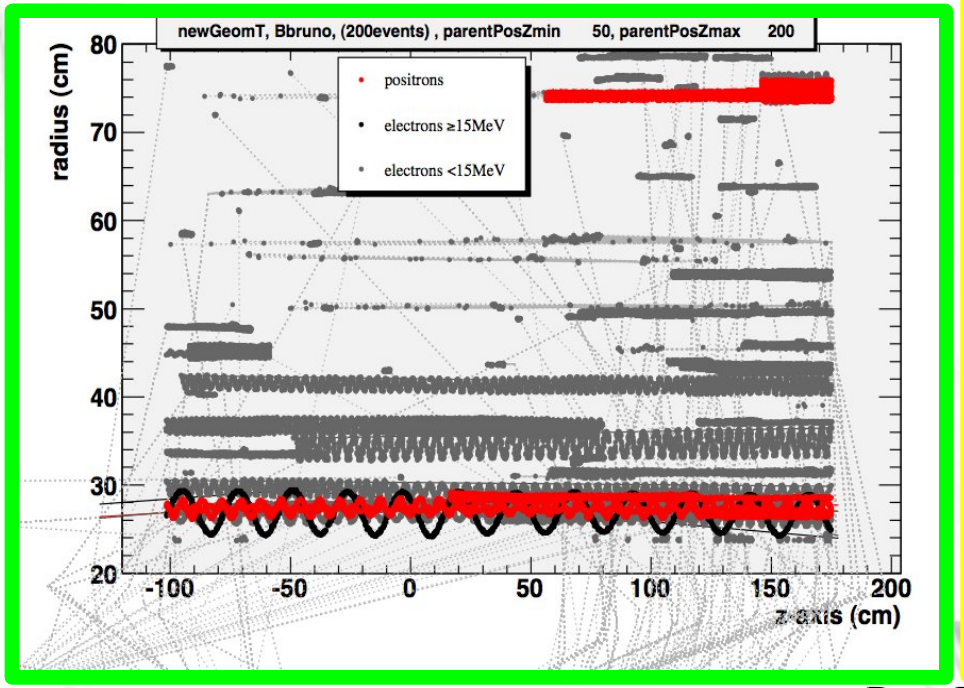
Visualization of Origin

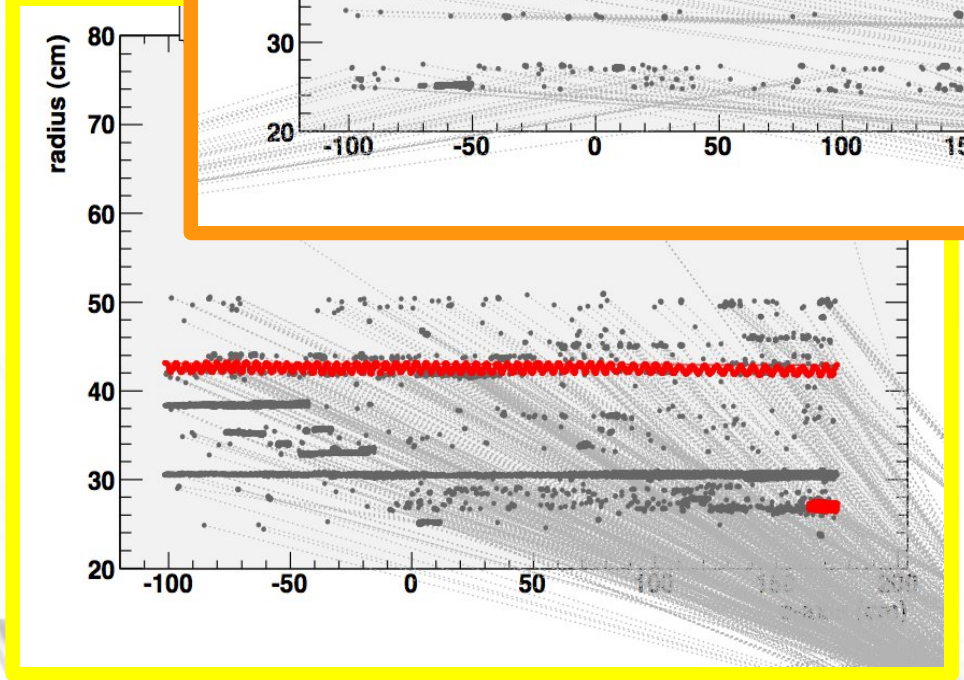




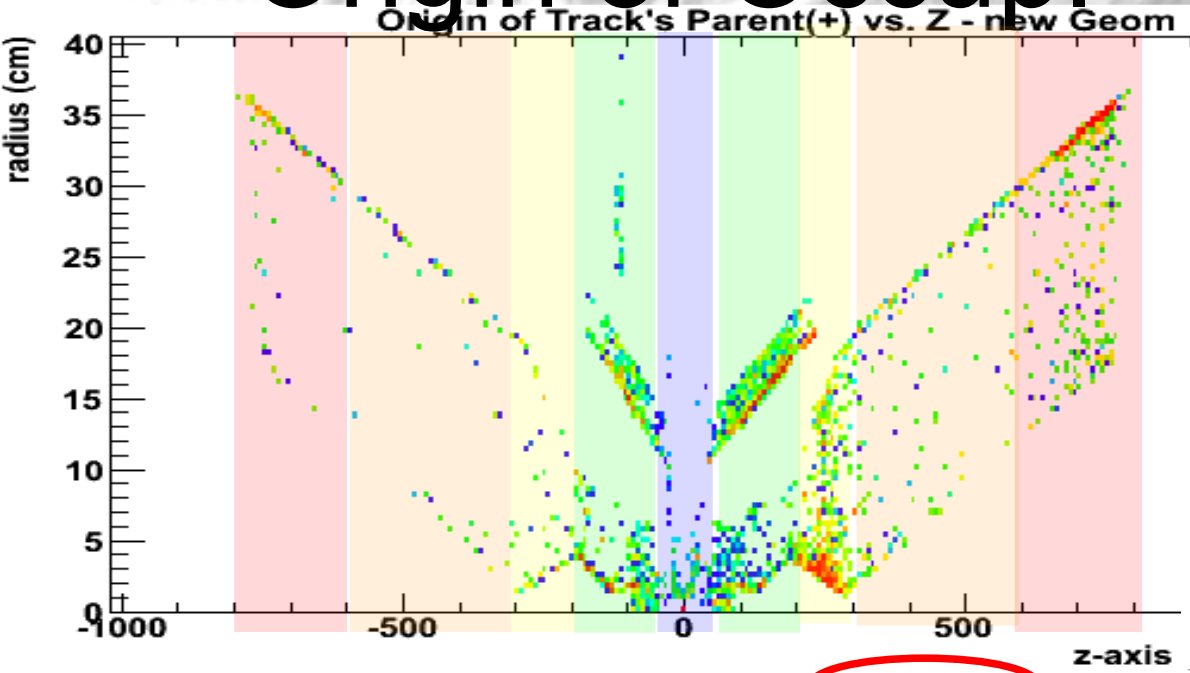


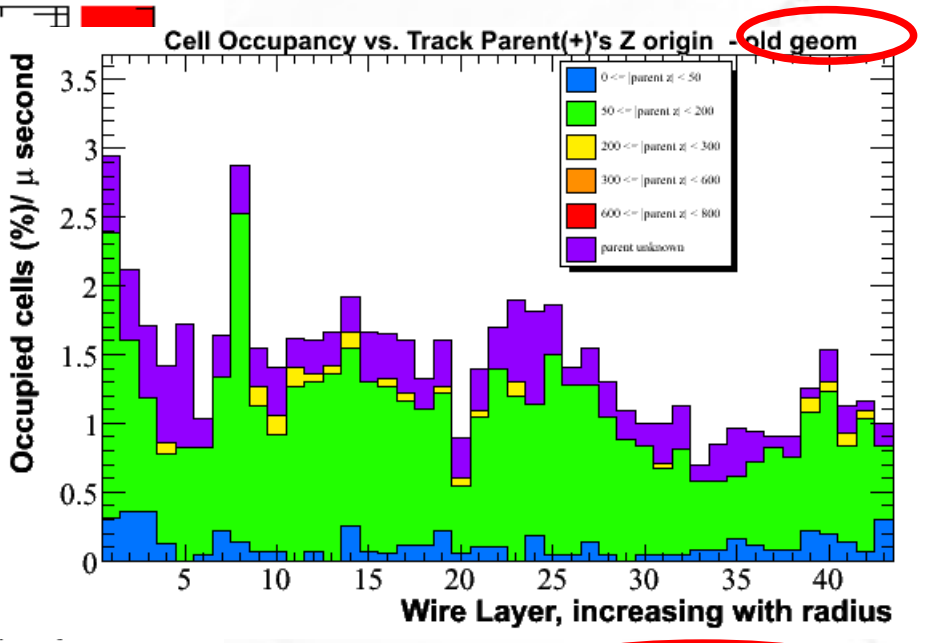


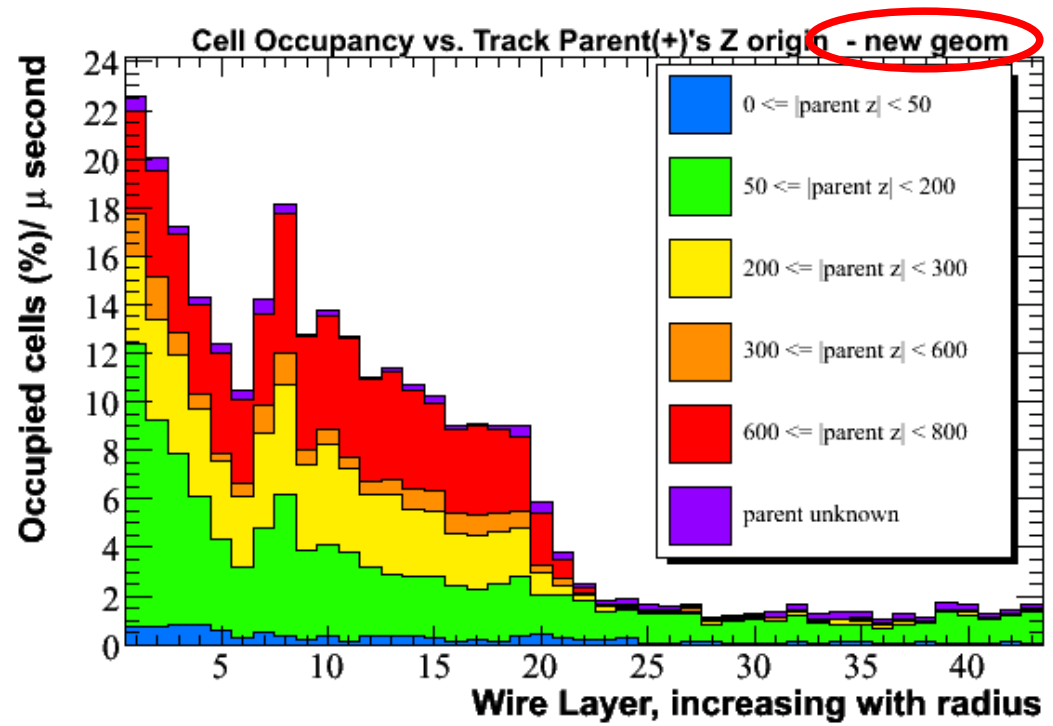


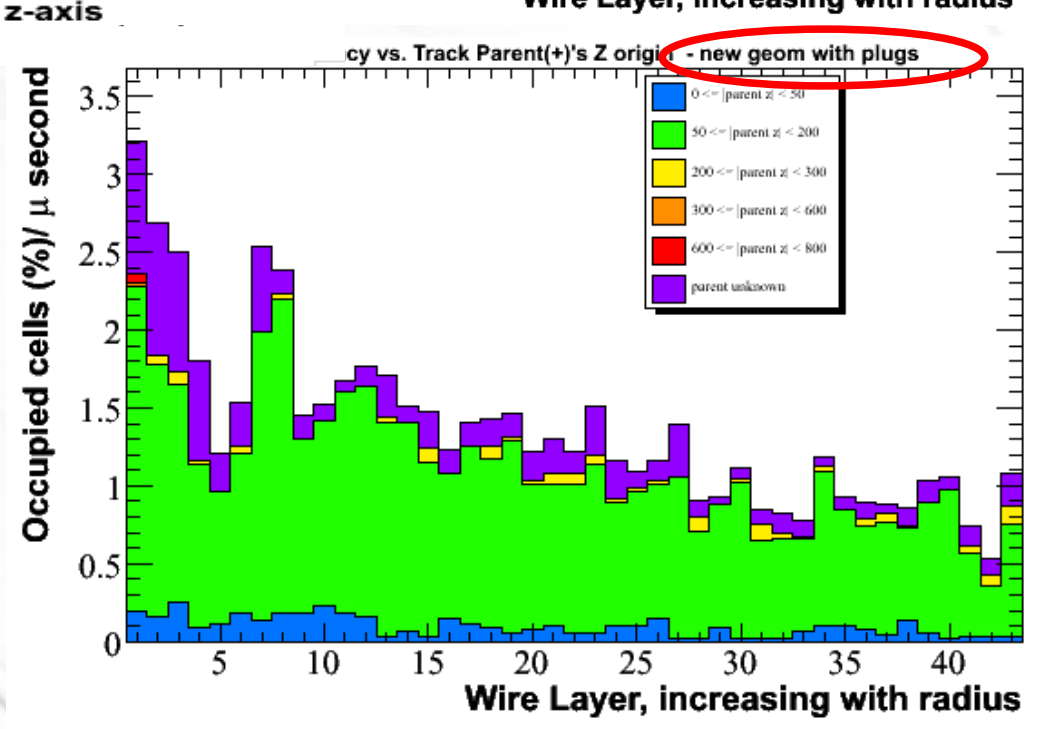


Origin of Occup. – New Geom's

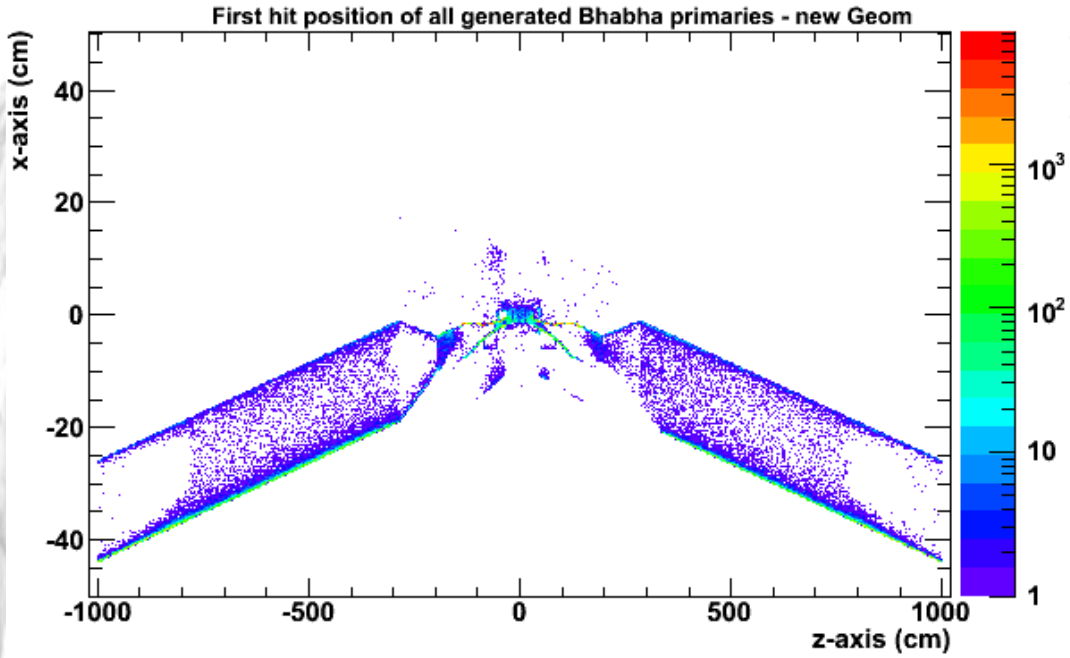


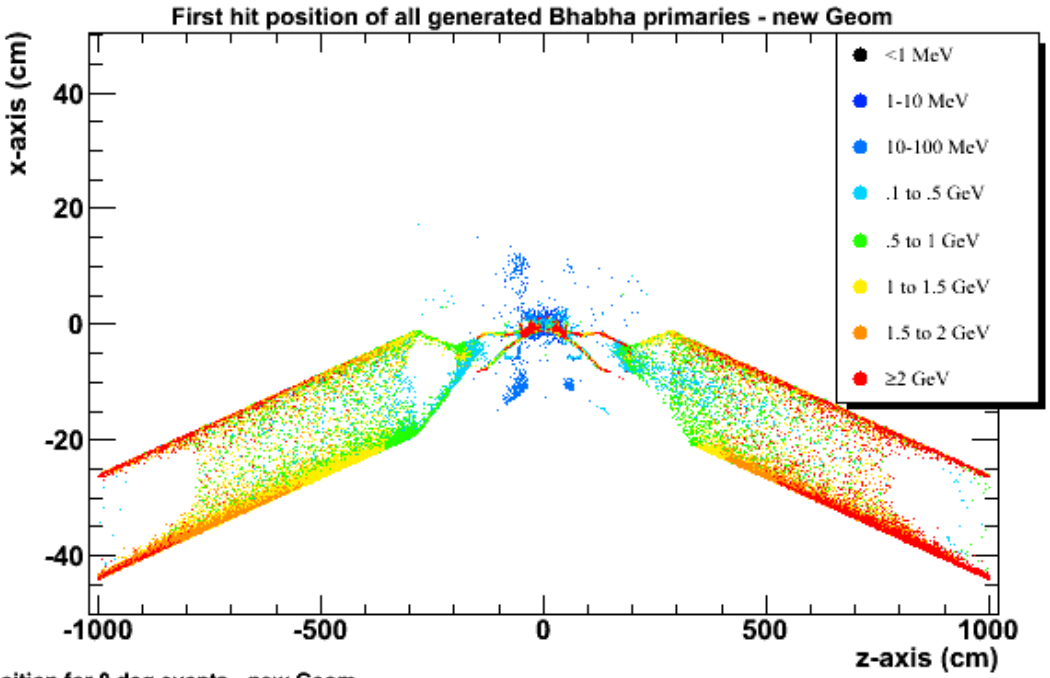


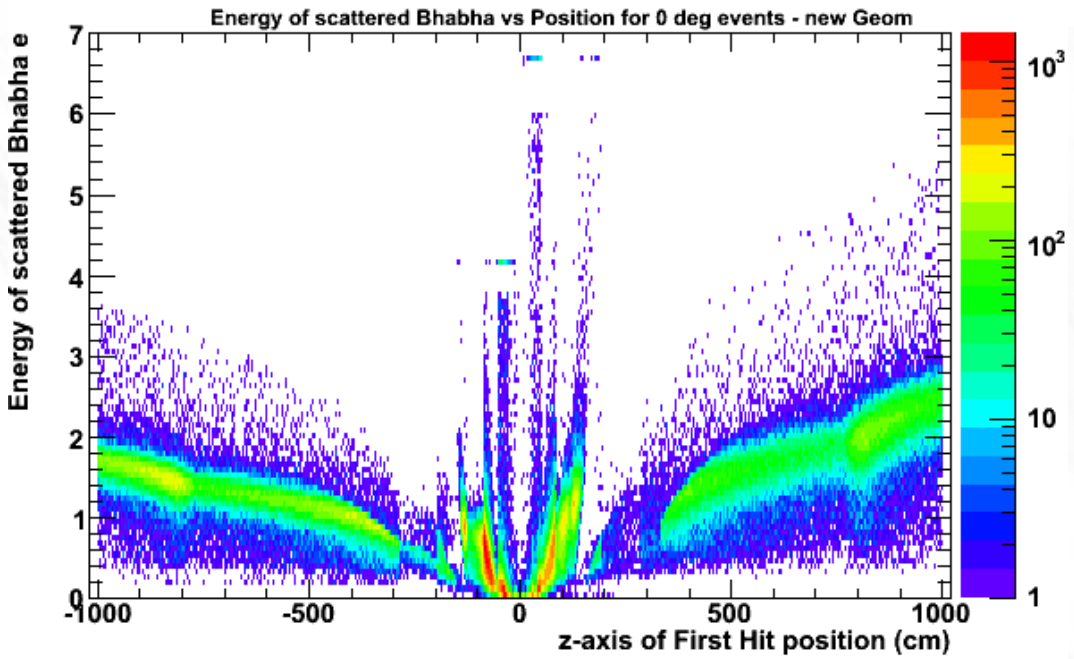




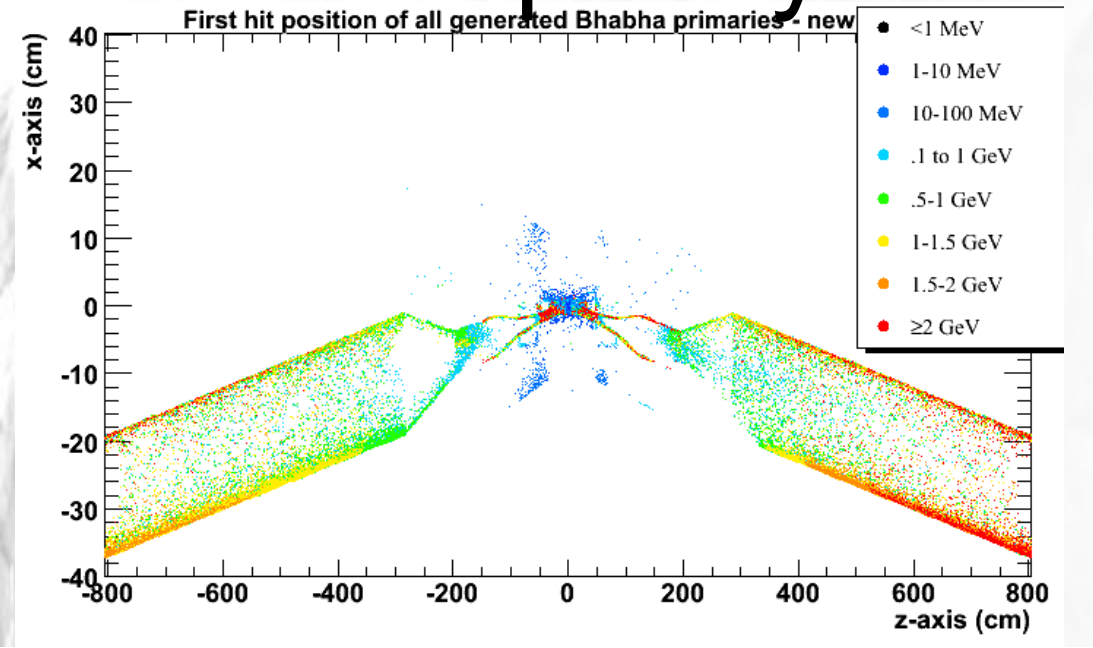
Where Bhabhas First hit the pipe

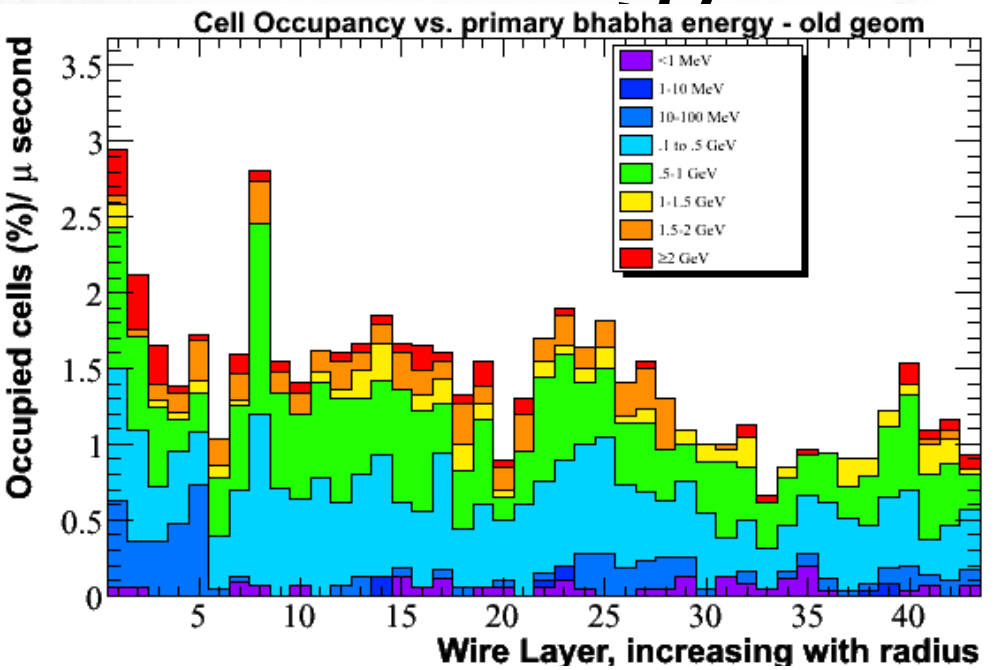


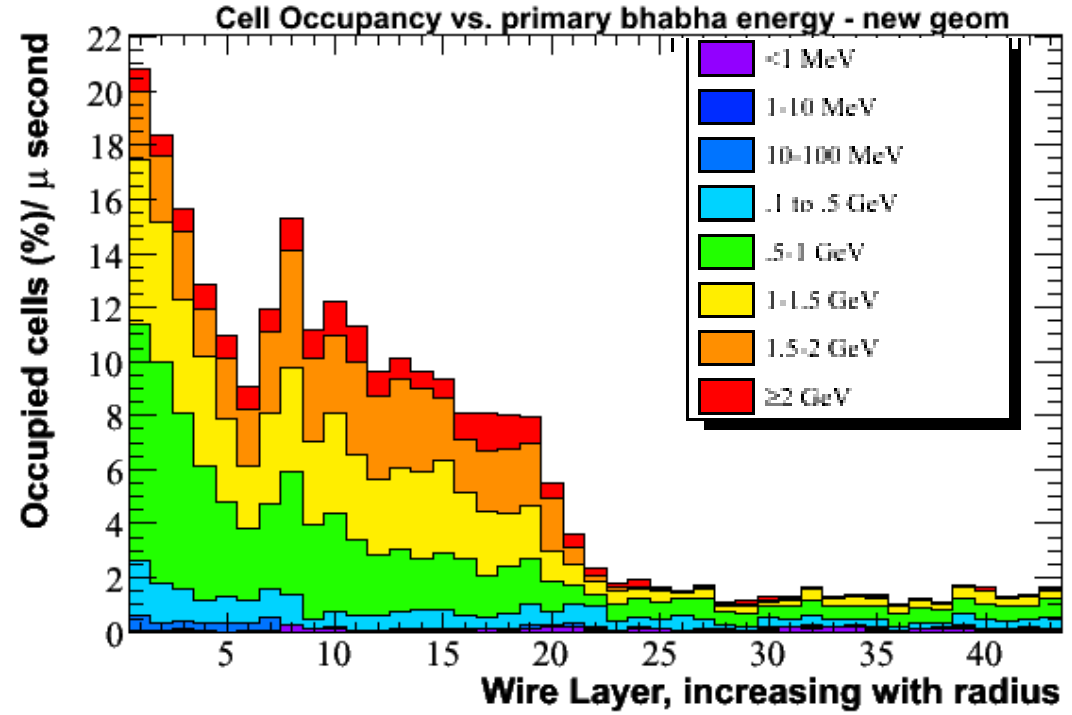


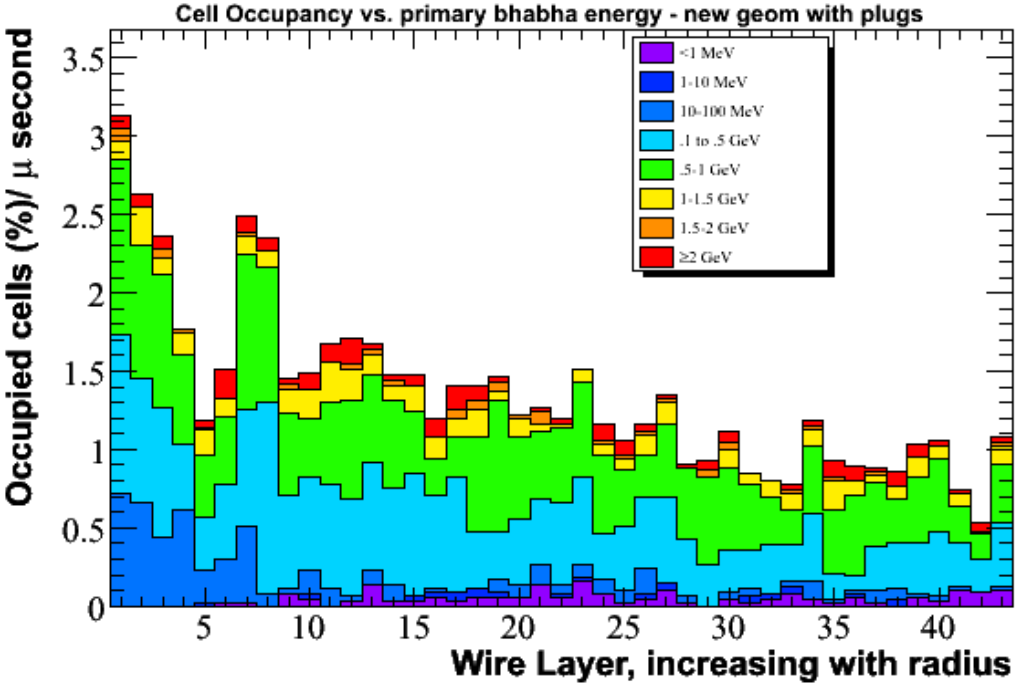


Occupancy vs. Bhabha energy



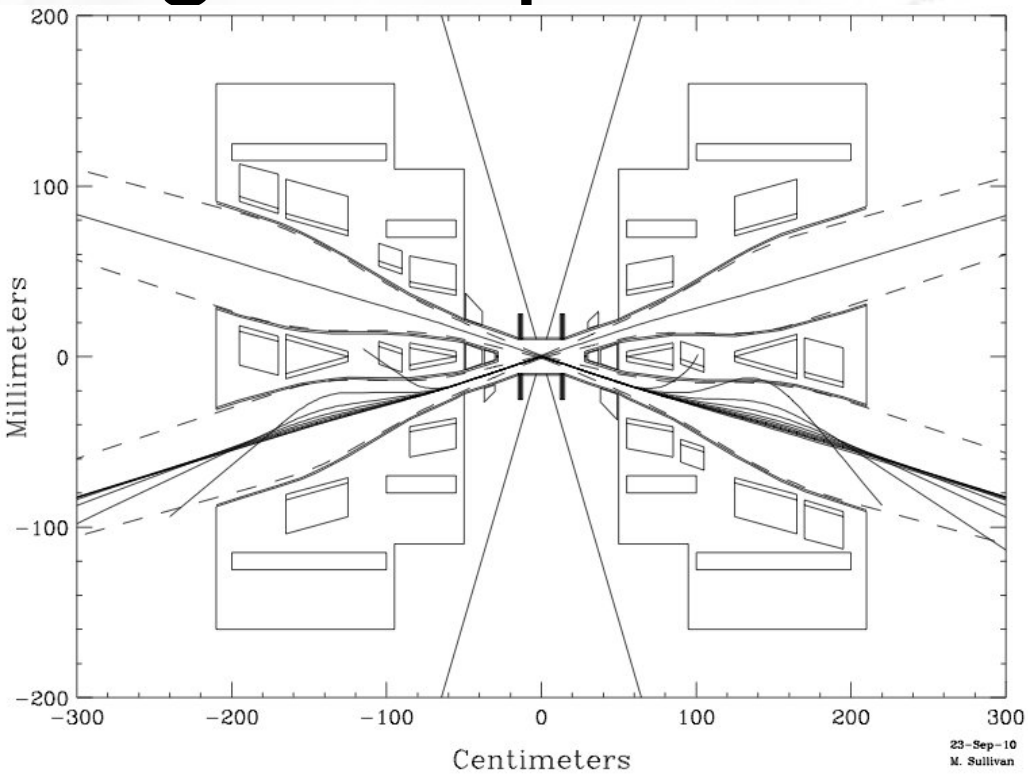


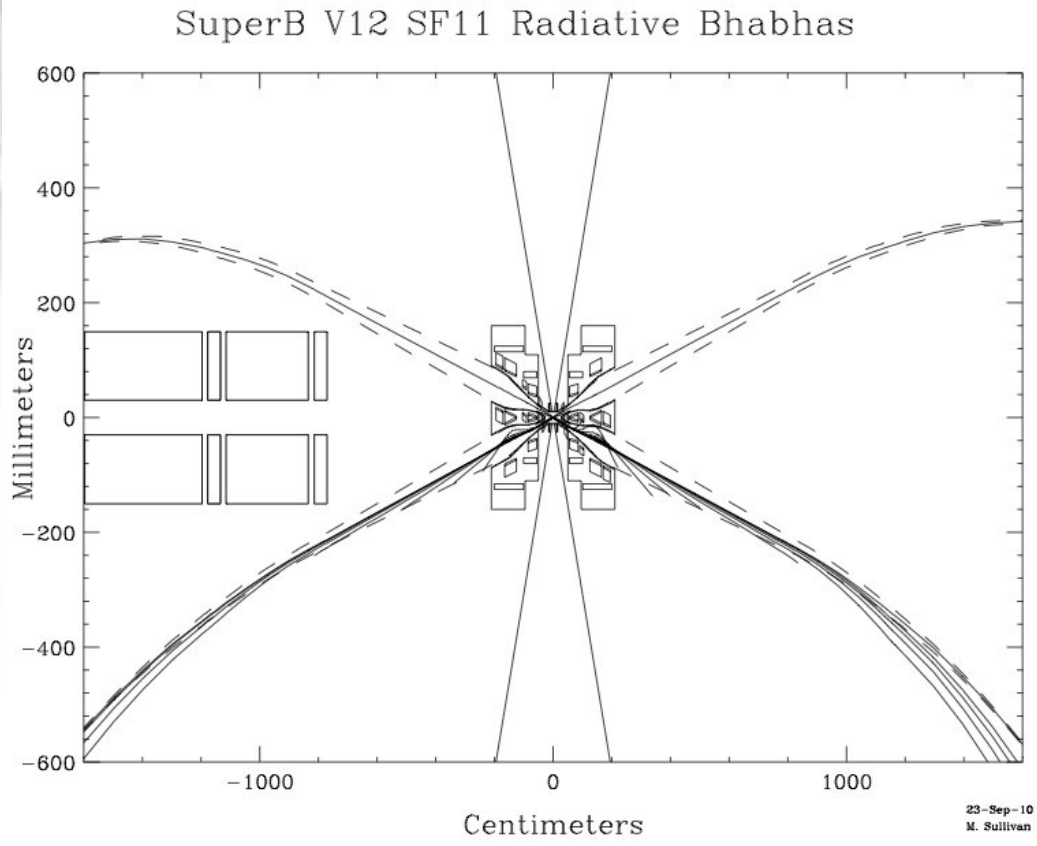




Mike Sullivan's Magbend plots

Plot show 0.5-4 GeV in 0.5 increments





Magbend + My plots