

SuperB:

DCH background studies with FullSim

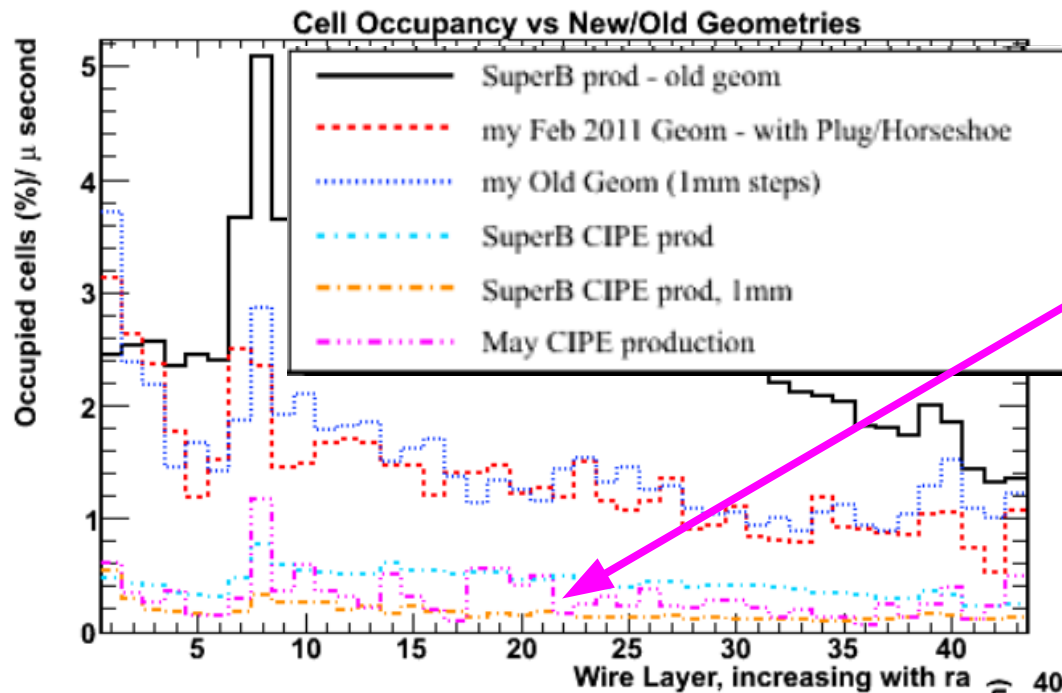


Dana Lindemann - McGill University
SuperB DCH Meeting
May 29, 2011

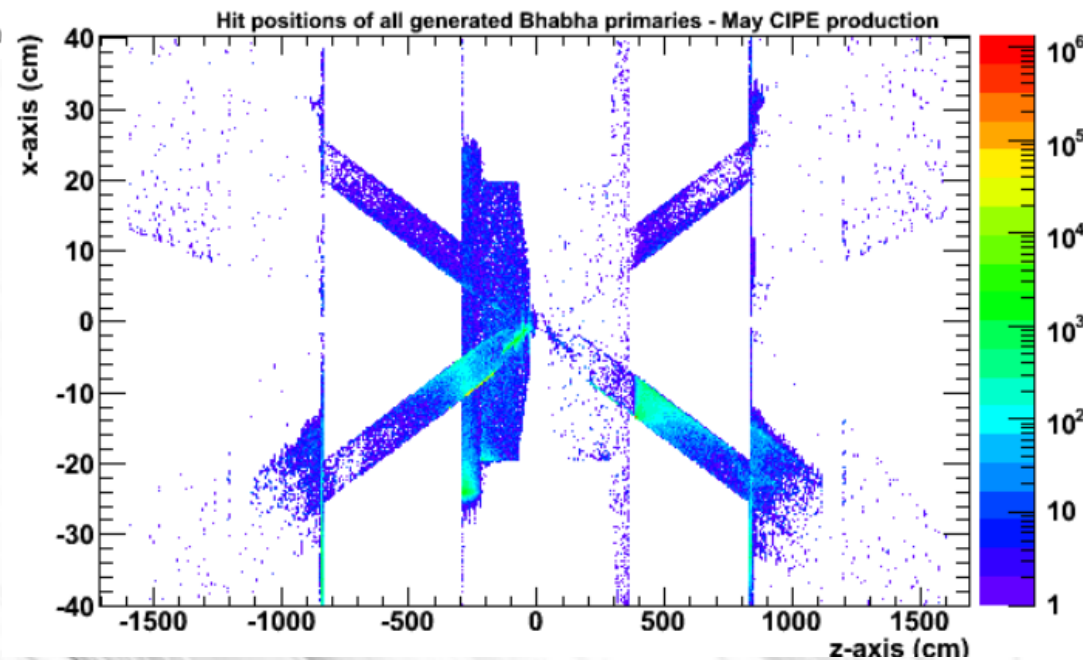
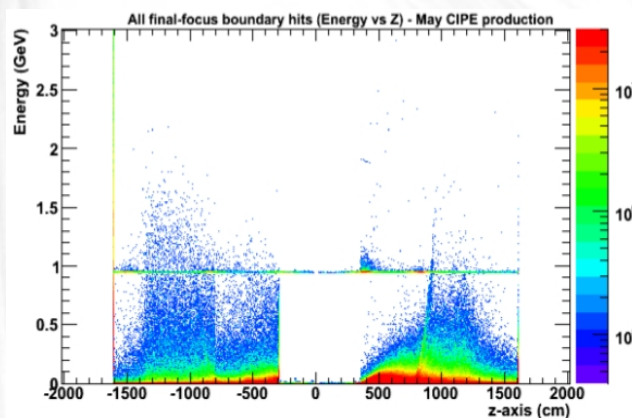
Outline

- Newest Production occupancy results
- Trigger studies

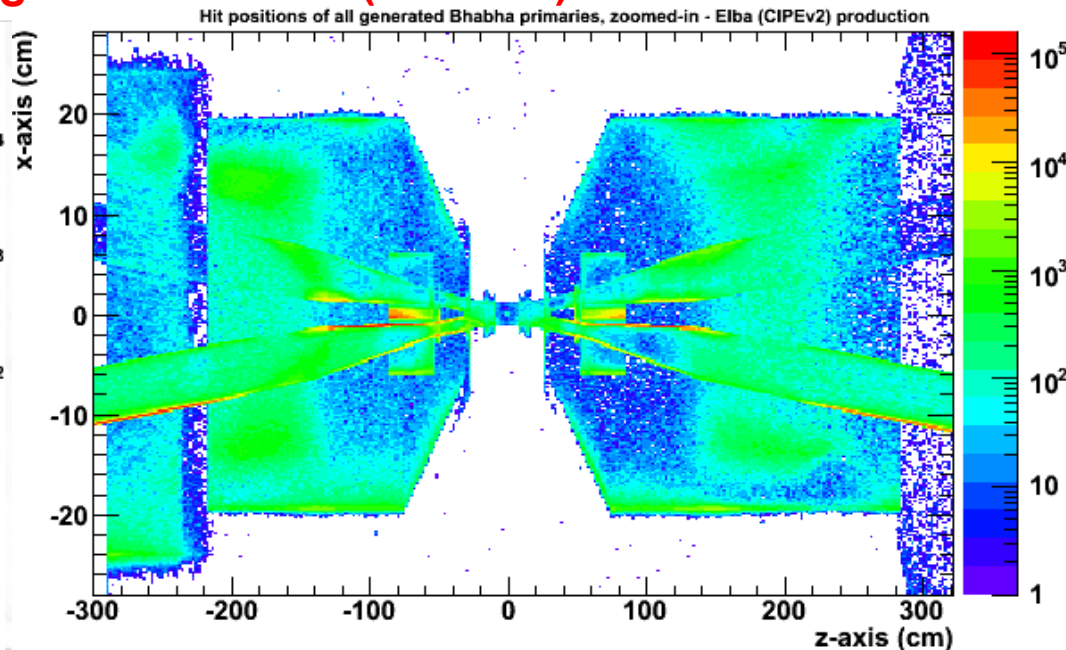
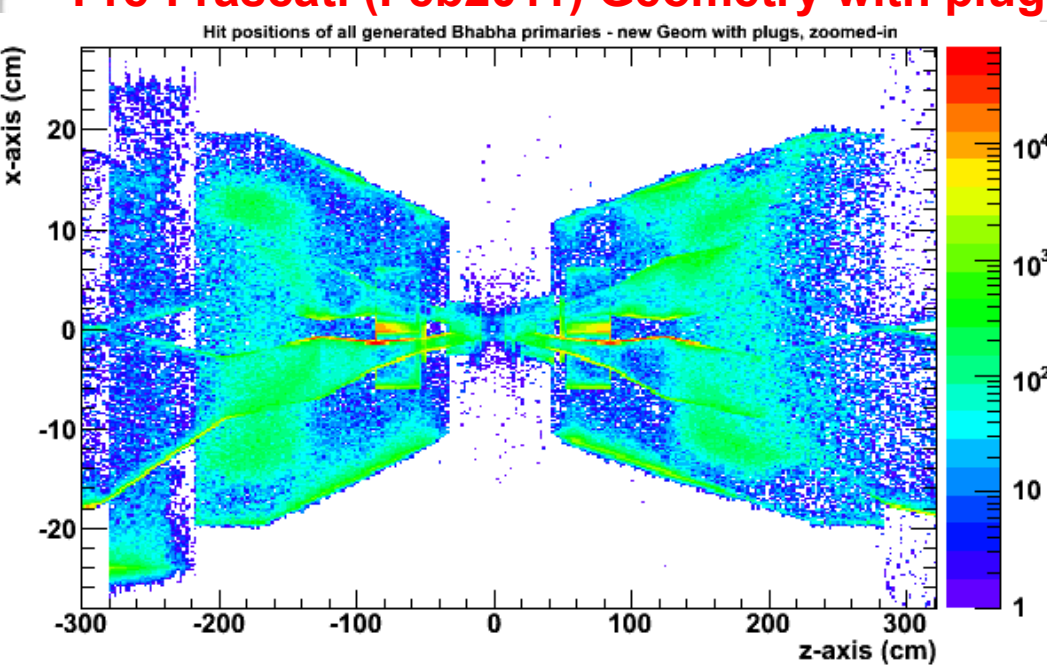
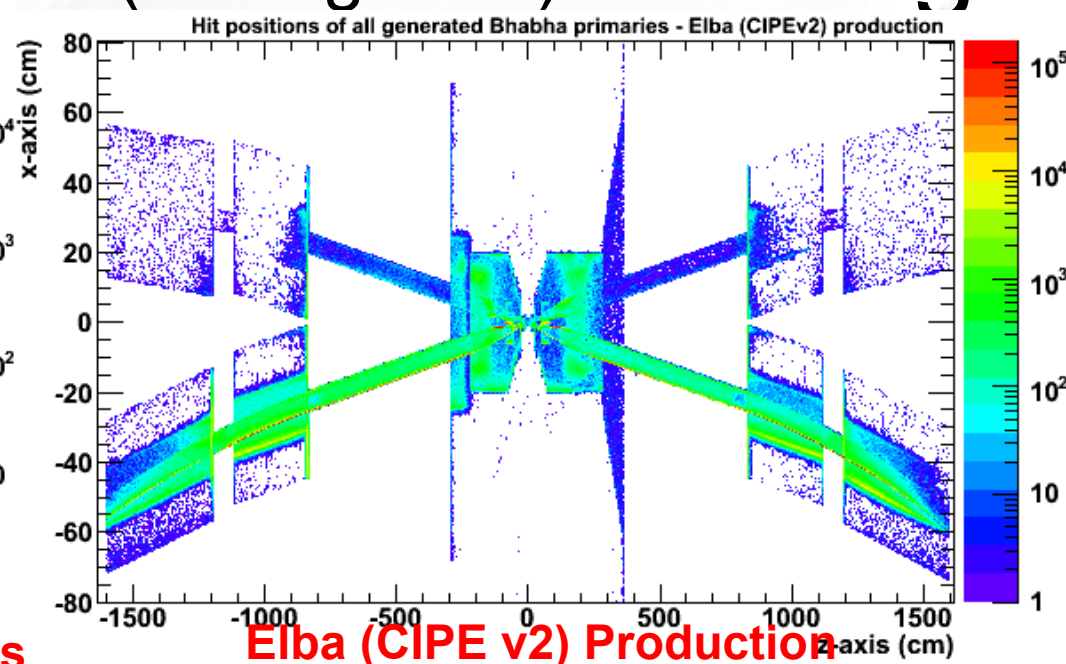
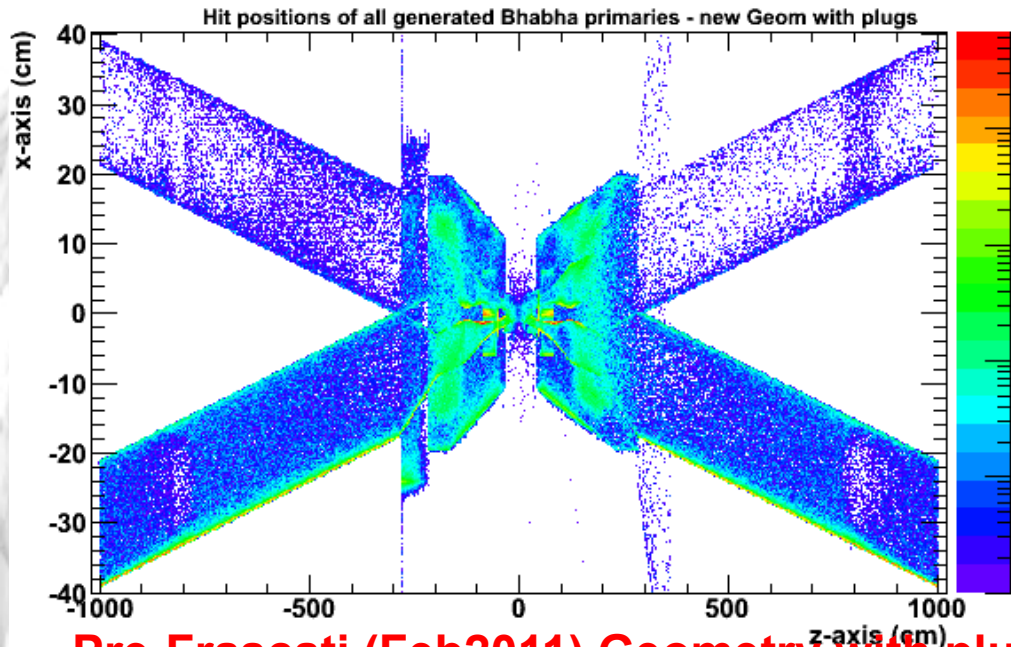
Bug in CIPE v1



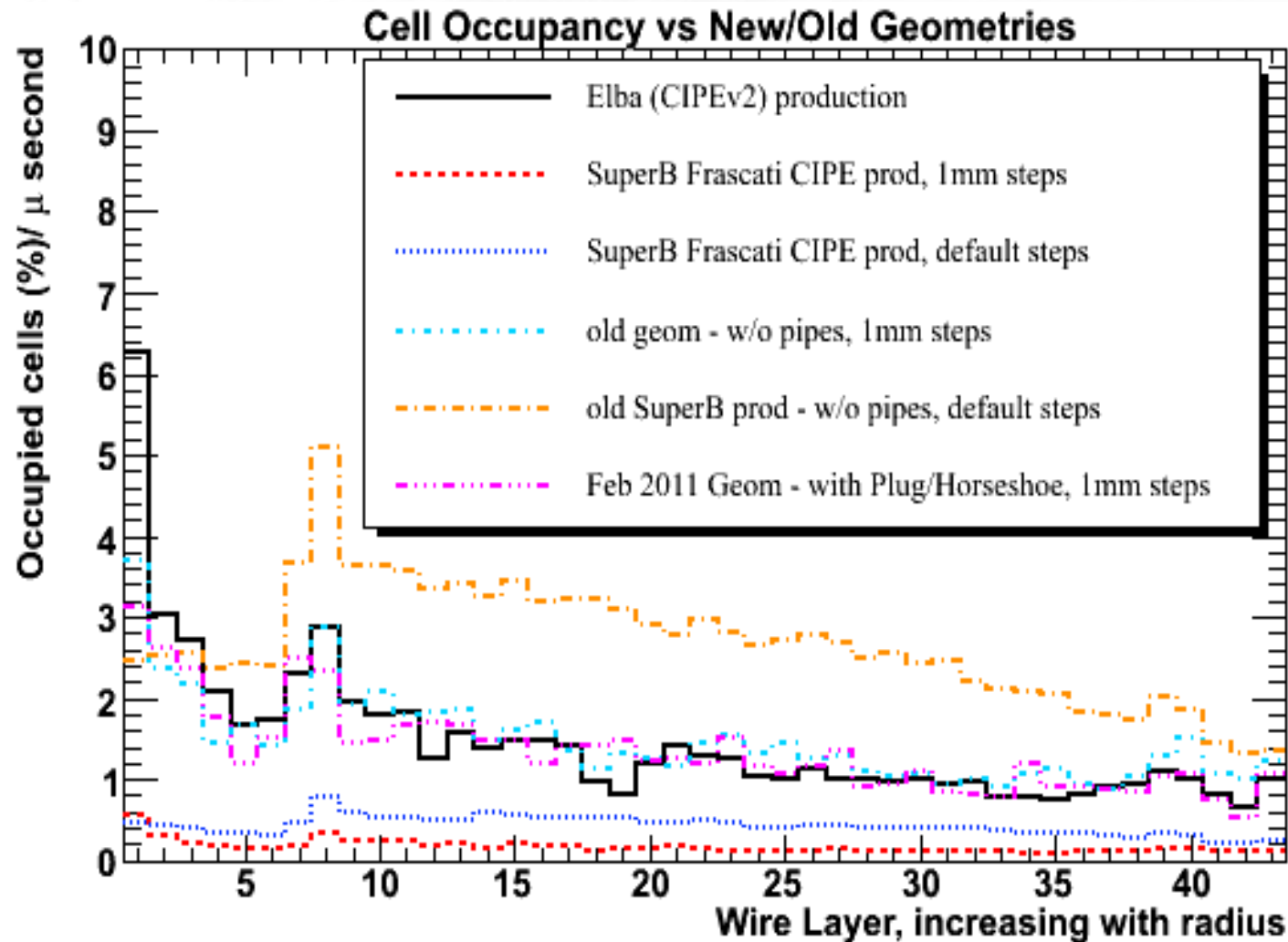
Production from earlier in May – CIPE v2 but before bug fix, and likely same bug as in Frascati...



Elba vs. Pre-Frascati (“new geom”) w/ Plugs

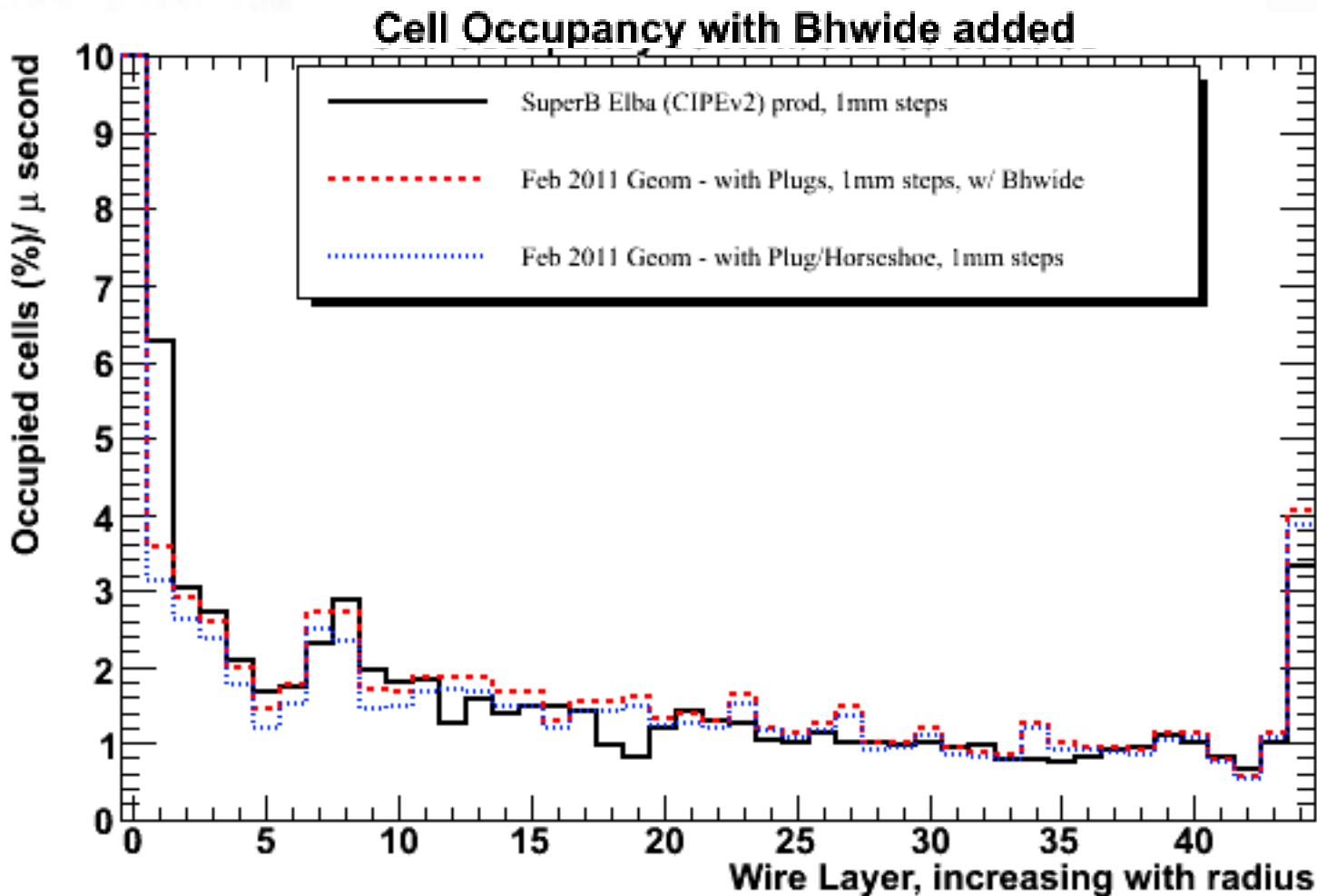


Comparison of Samples



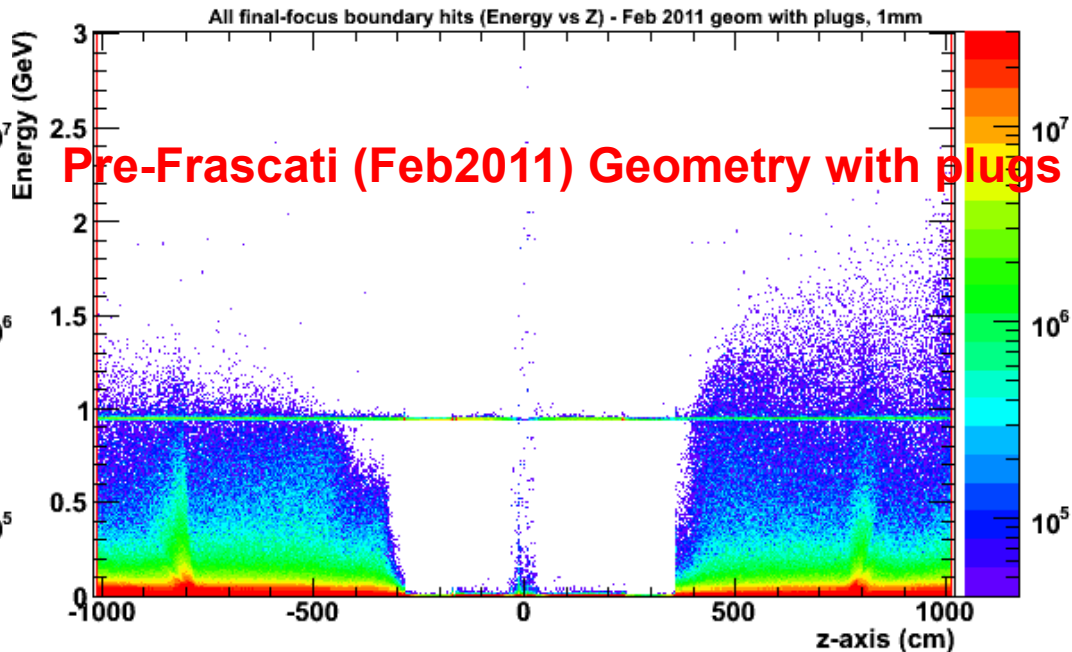
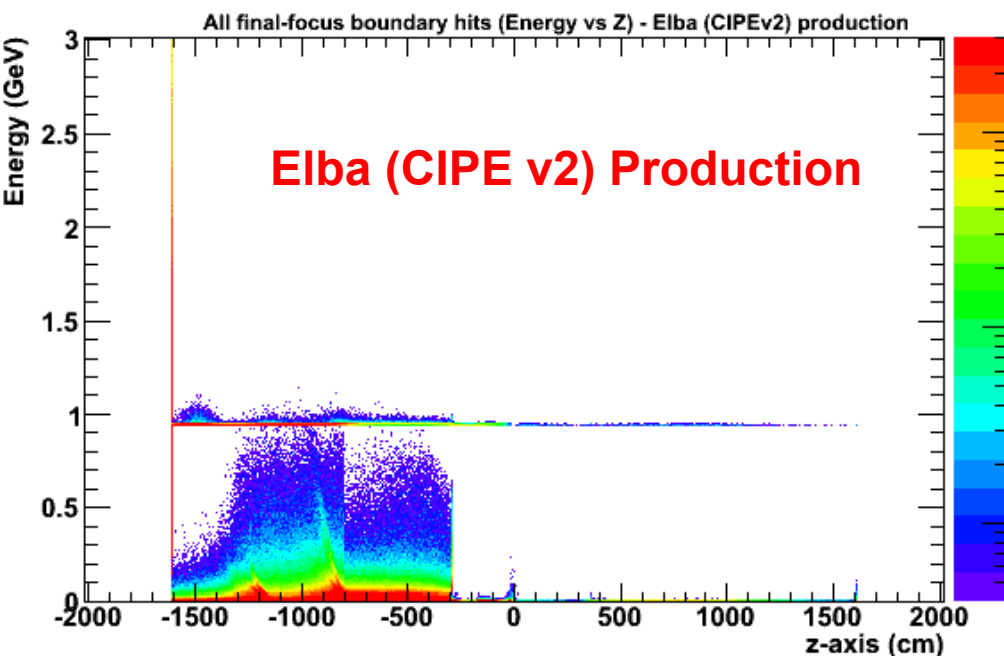
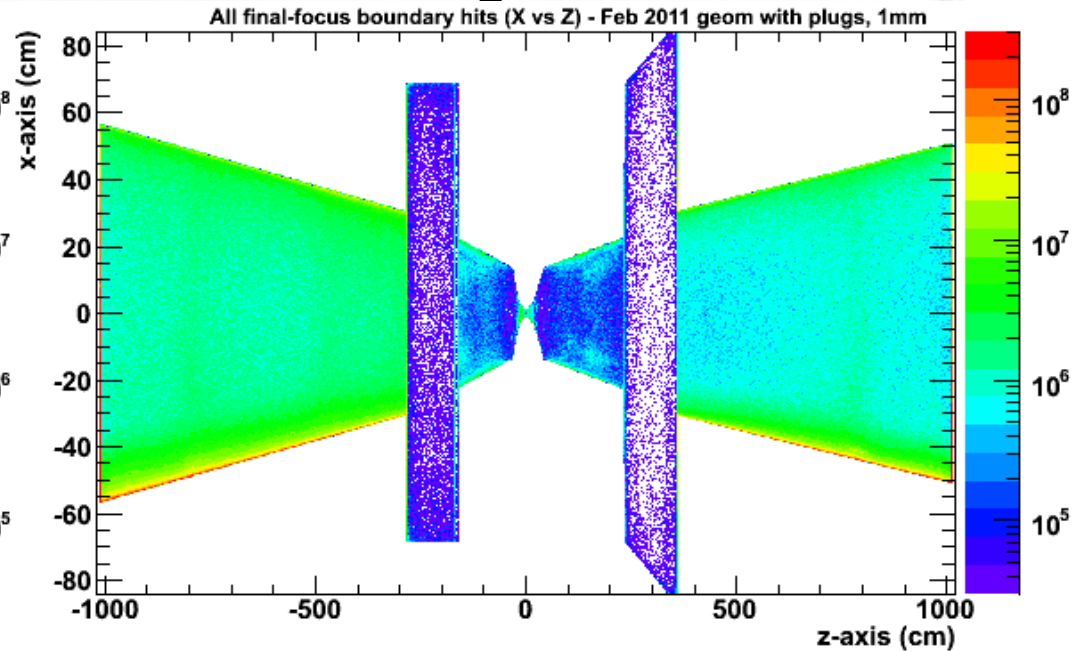
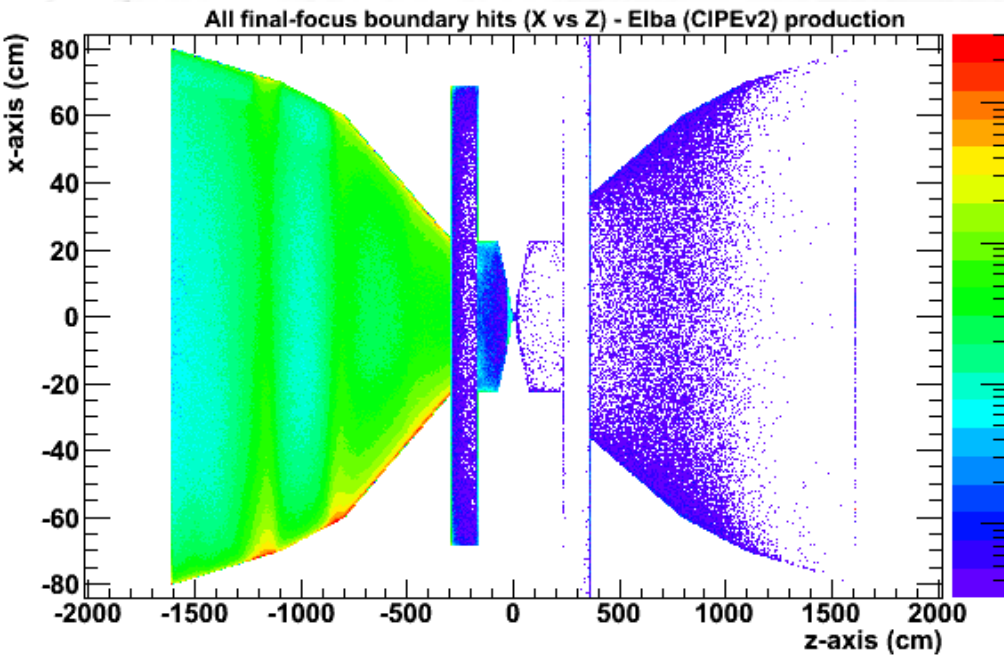
Rise in occupancy likely due to a fix of the bug that caused tracks to get stuck in the final-focus

Adding in Bhwide

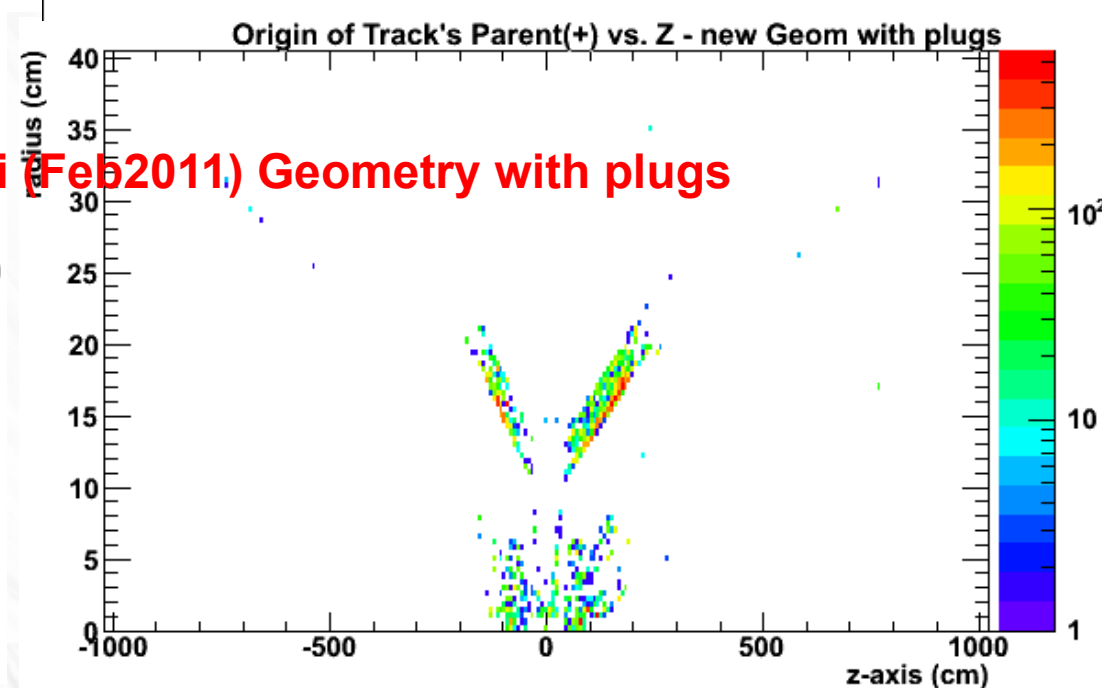
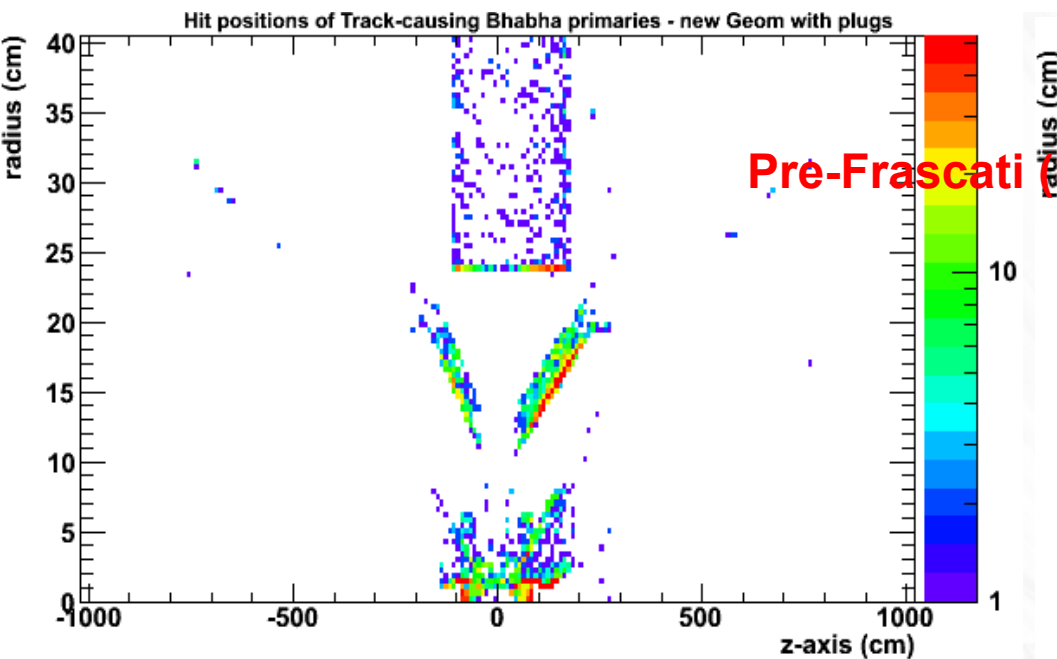
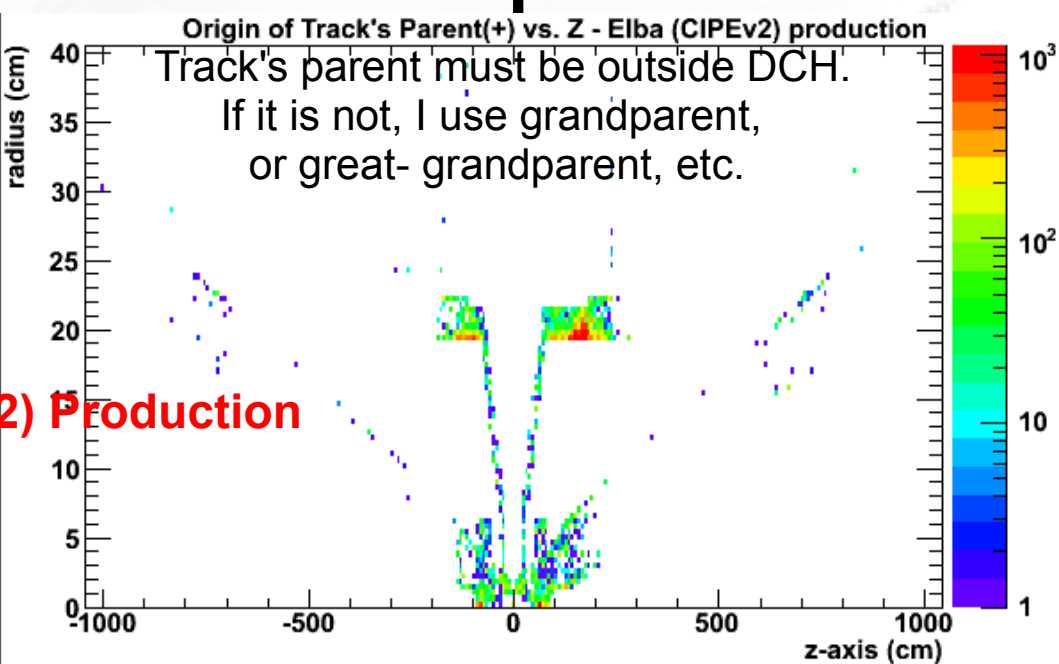
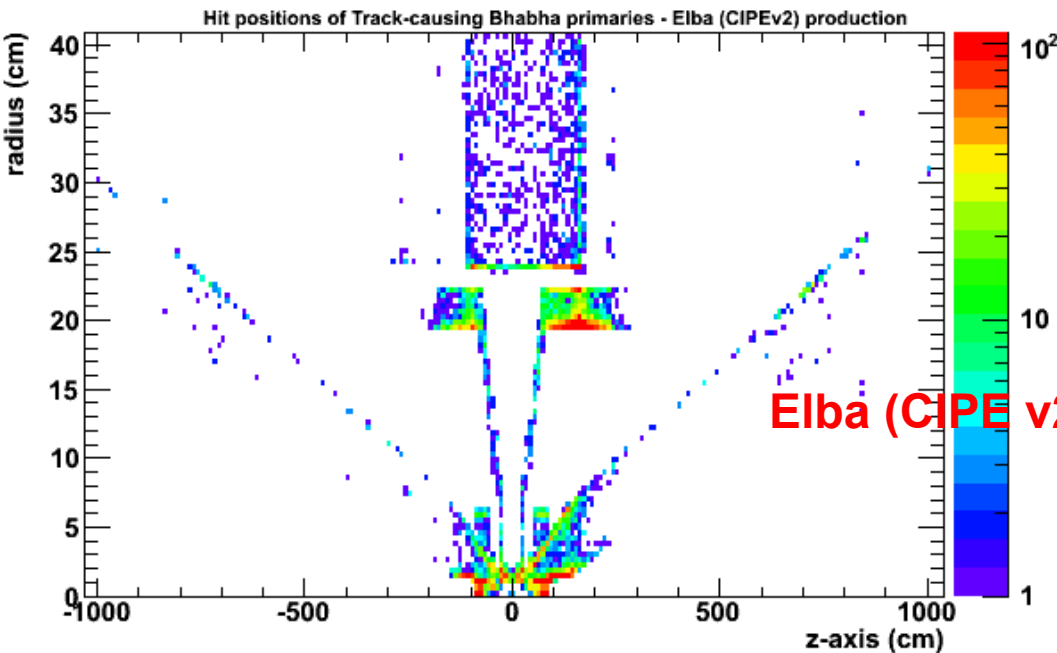


- I couldn't get the CIPEv2 geometry to run, so used next-best geometry...
- Wire 0 (44) represent hits closer to inner (outer) boundary than first (last) wire. (Wire 0 values are 25.0, 22.4, and 21.3% respectively).
Hopefully guard wires will prevent these events from reaching wires?

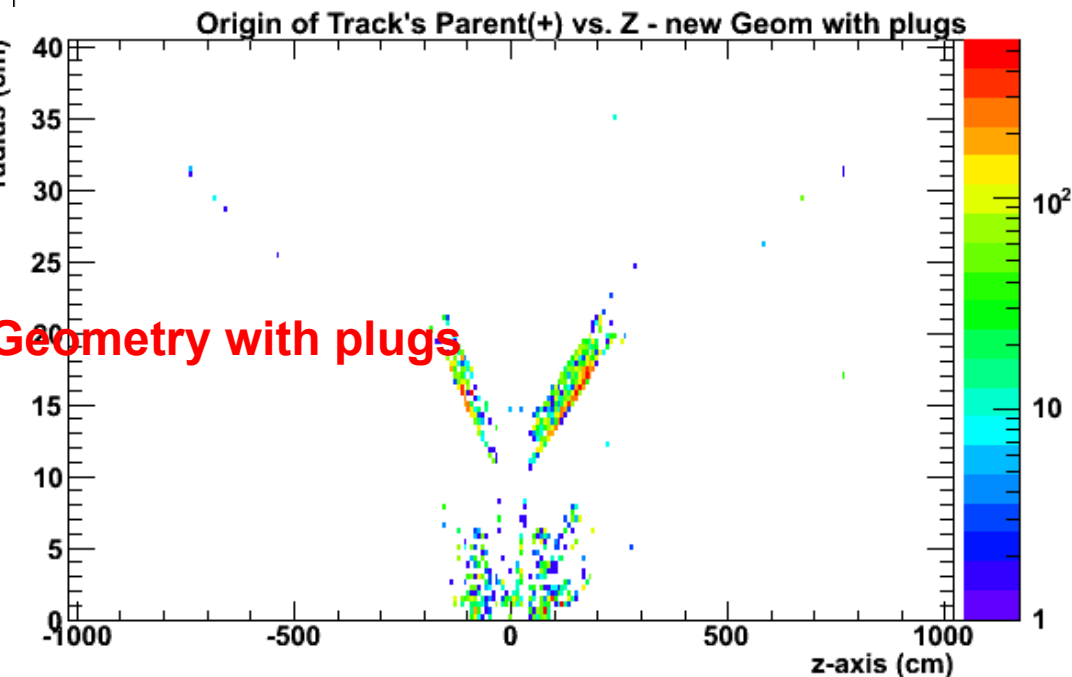
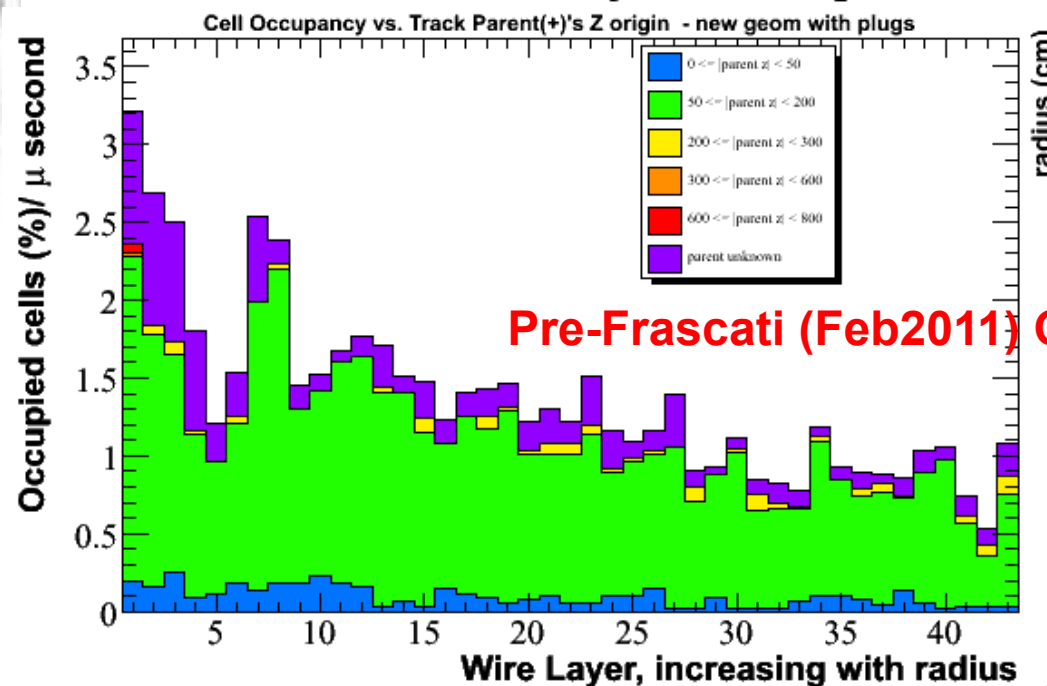
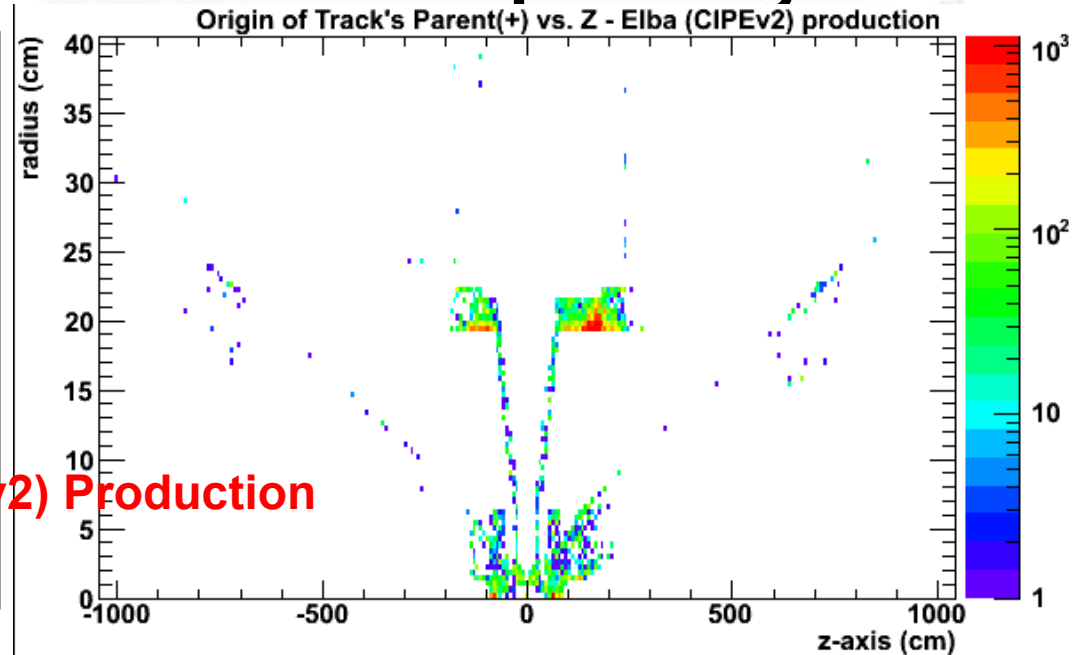
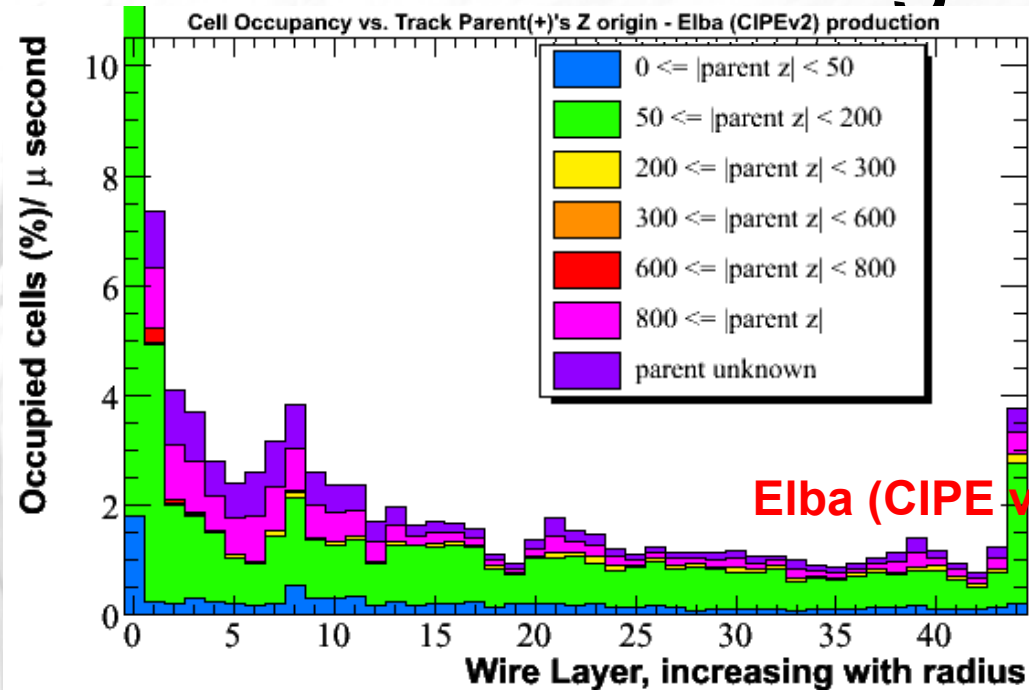
ALL final-focus boundary hits



Track-producing Bhabhas/parents

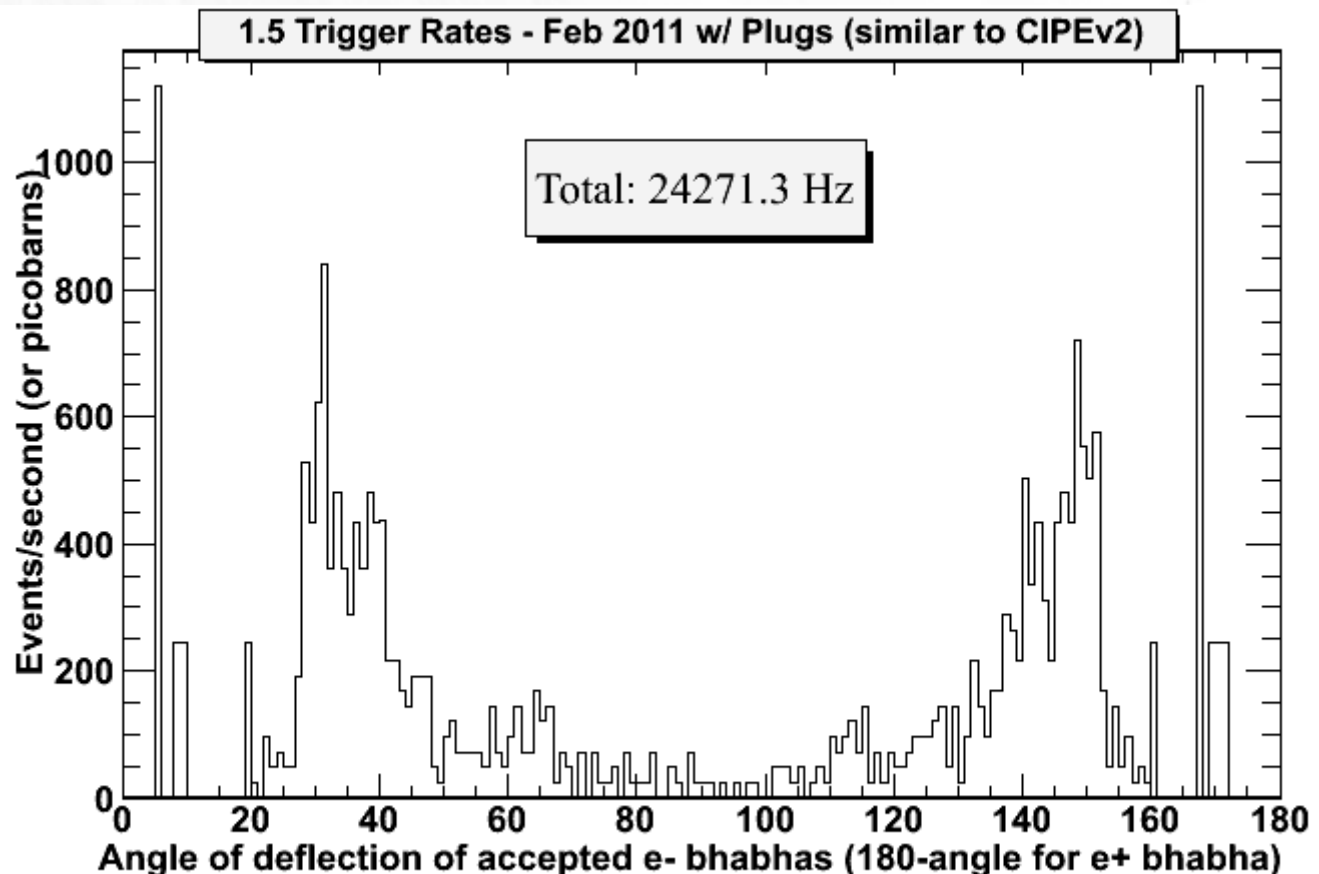


Parent's Z origin vs. Occupancy



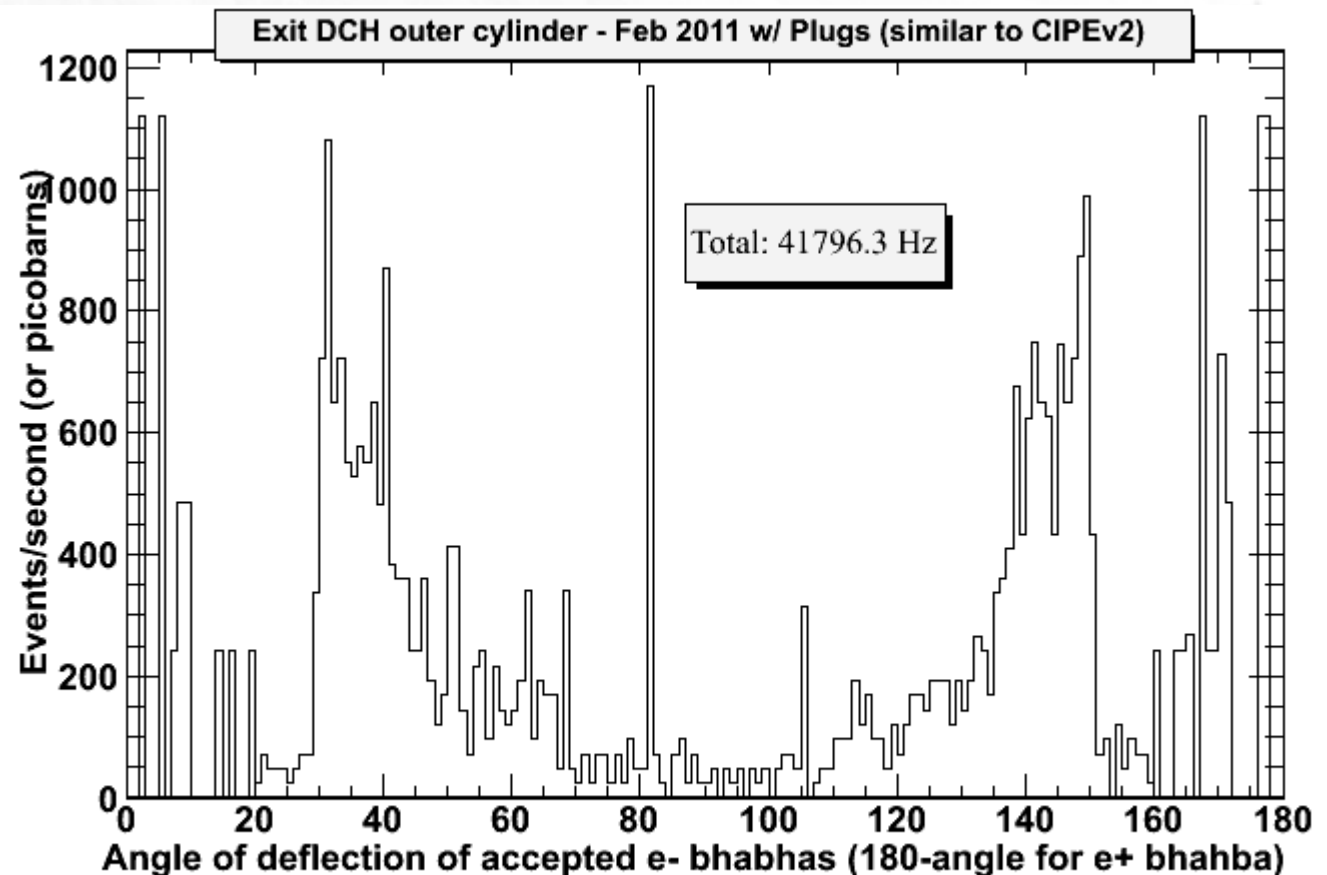
Trigger Studies – 1.5 Tracks

- Both tracks are from same event, both cross first wire, one crosses 40th wire (there are 44 wires in 11 superlayers) and one crosses 20th wire.
 - No requirements on angle separation, transverse momentum, or charge.
 - Assumes 10^{36} luminosity.
 - Combines Bruno (0 angle) + Bhwide (wider angle radiative bhabhas)
- Roughly corresponds to $B^* \rightarrow A \& Z'$ ($n_{B^*} \geq 1$ and $n_A \geq 1$ and $n_{Z'} \geq 1$) in BaBar (z-trigger is irrelevant)
- Requested by Steffen Luitz



Trigger Studies – Enters EMC

- Track crosses first wire and exits the DCH boundary through the outer cylinder (not endplates).
- Roughly corresponds to number of events with at least 1 track in the EMC
- In BaBar, this was about 53nb. Initial SuperB assumption of 50nb. Steffen thinks these results are too low to be believed...



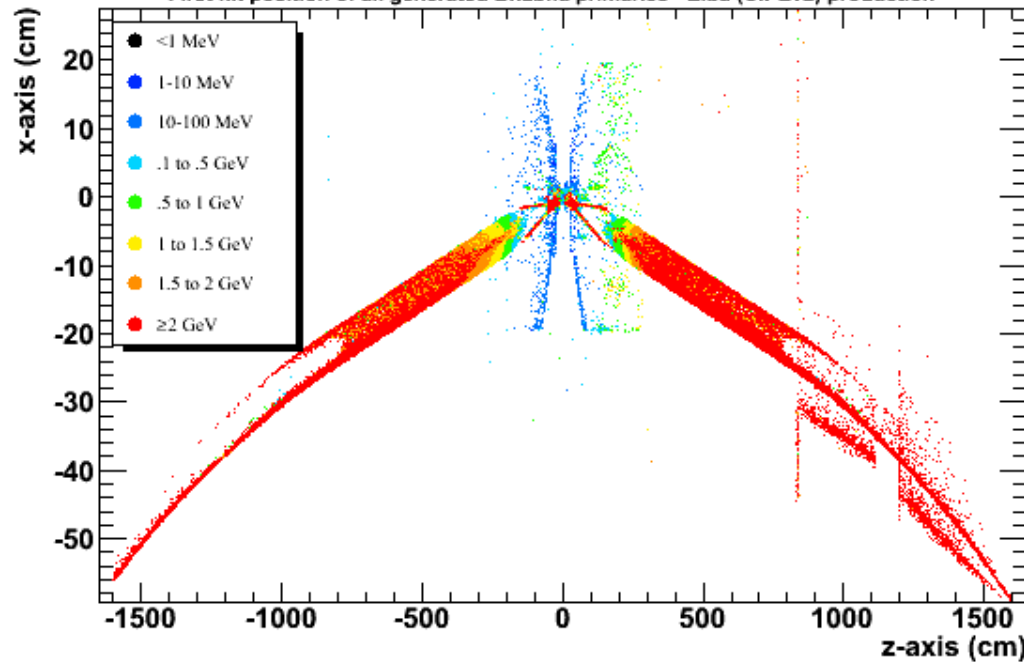
Conclusions

- New Final Focus design shows increase in occupancy back to levels pre-Frascati.
 - But never had Truth info for Frascati samples so best guess is that there was a bug in the production...
- Most of occupancy is coming from the shield's new corner, as typical.

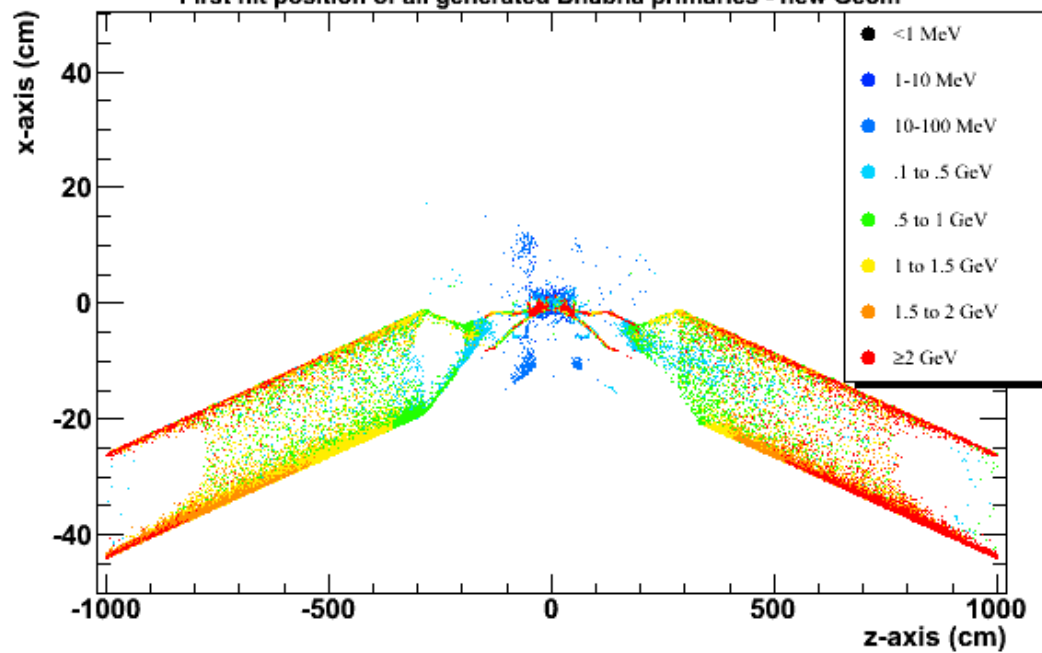
Back-up Slides

Where Bhabhas First hit the pipe

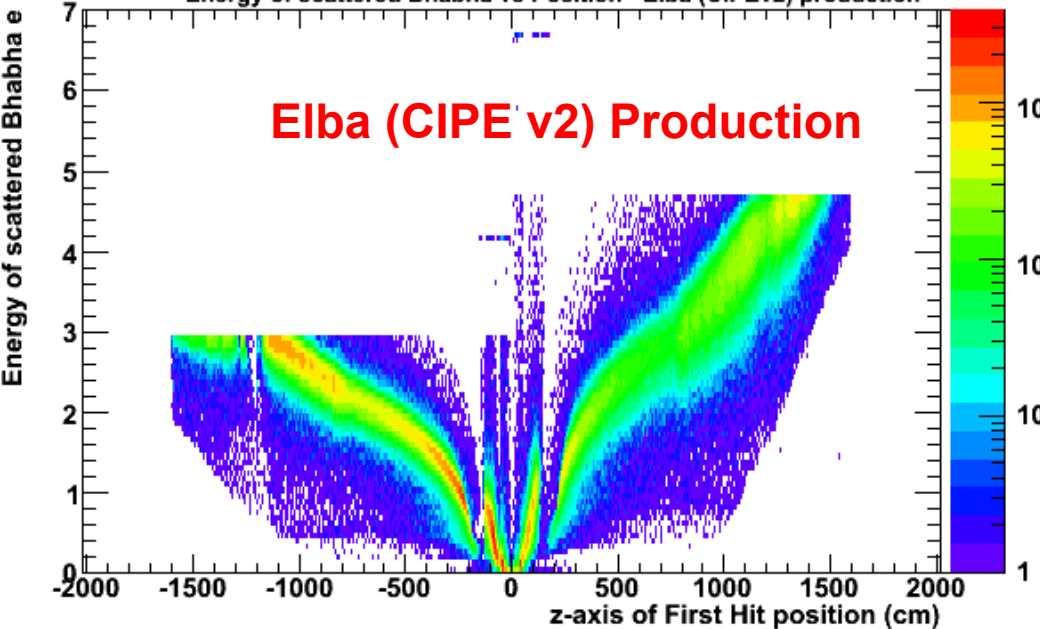
First hit position of all generated Bhabha primaries - Elba (CIPEv2) production



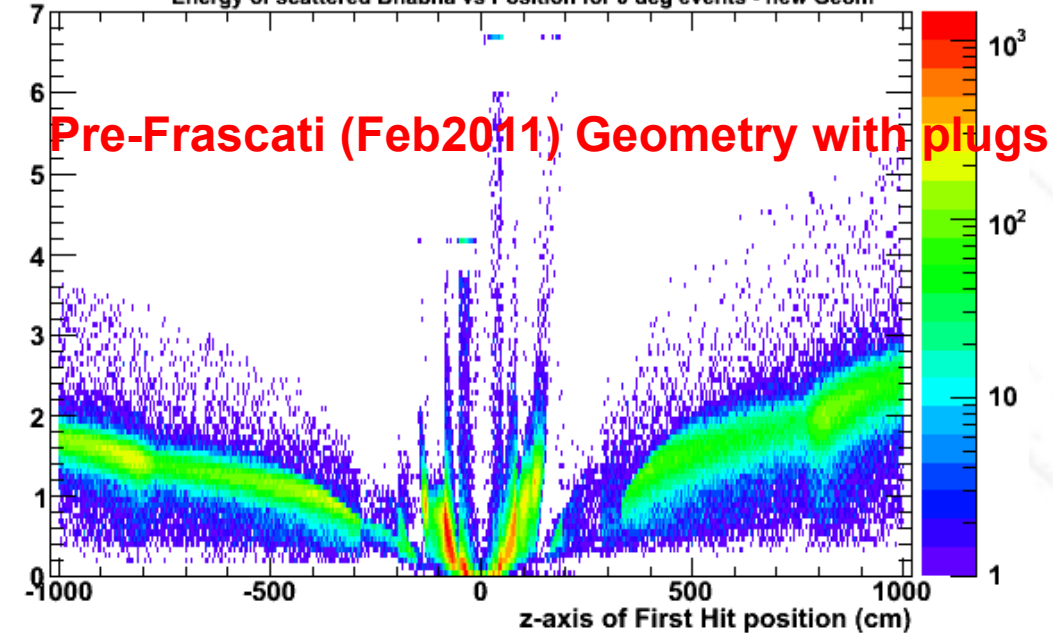
First hit position of all generated Bhabha primaries - new Geom



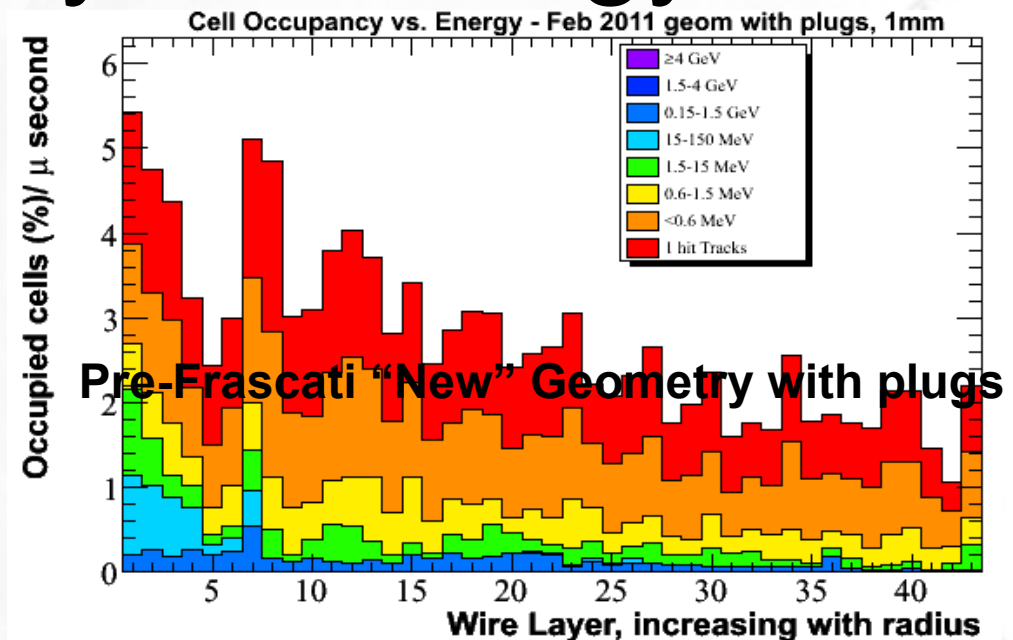
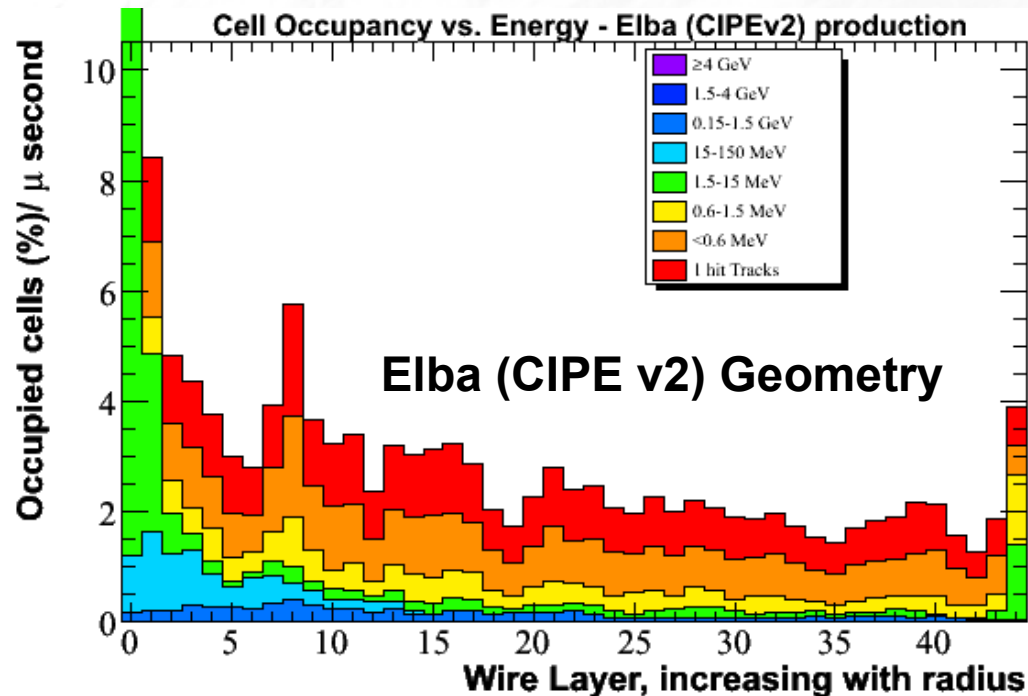
Energy of scattered Bhabha vs Position - Elba (CIPEv2) production



Energy of scattered Bhabha vs Position for 0 deg events - new Geom

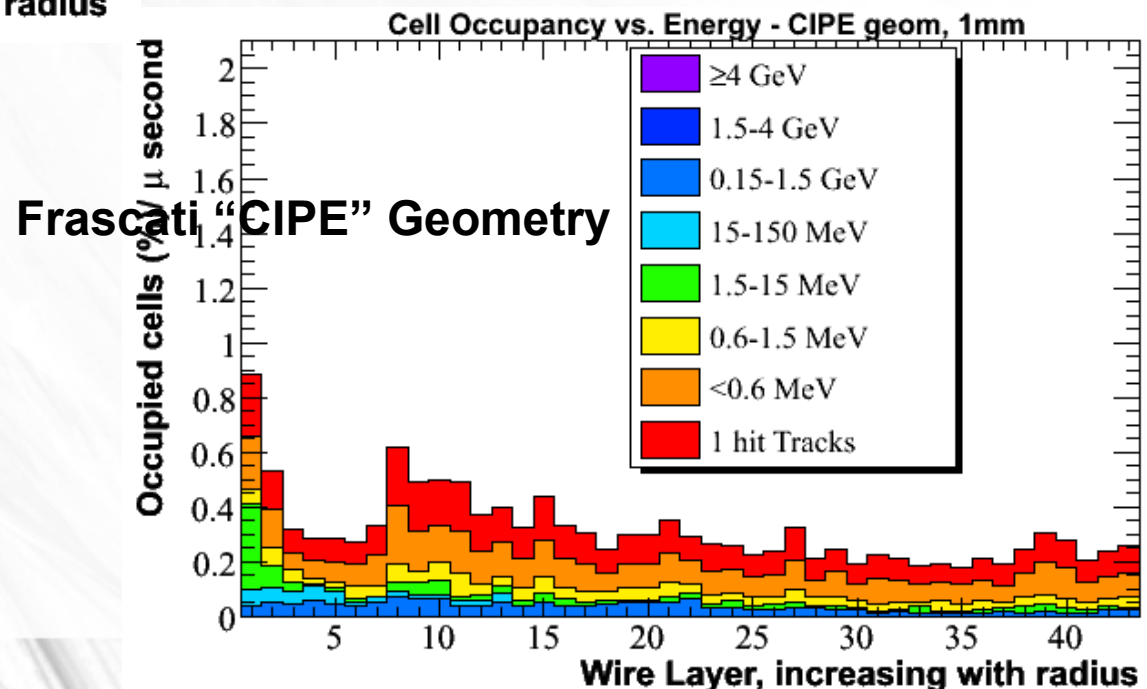


“Elba” Geometry vs. Energy

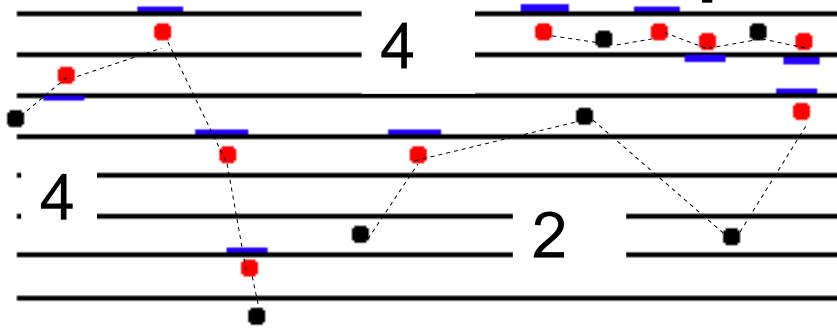


Note: By splitting plots into stacked colored “bins”, falsely higher occupancies are shown.

Wire layer 0 and 44 are actually the DCH boundaries, not wires.



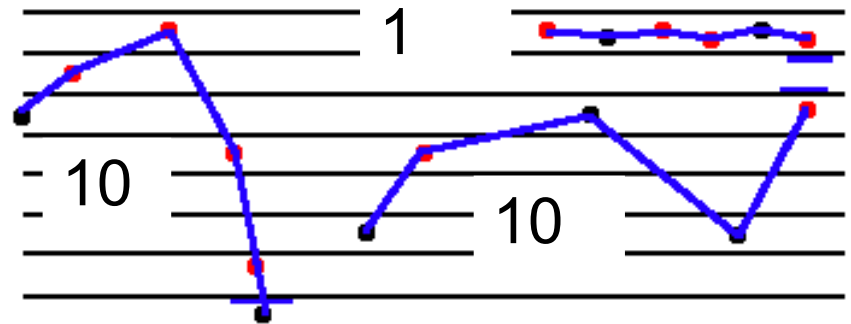
Occupancy Algorithm



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



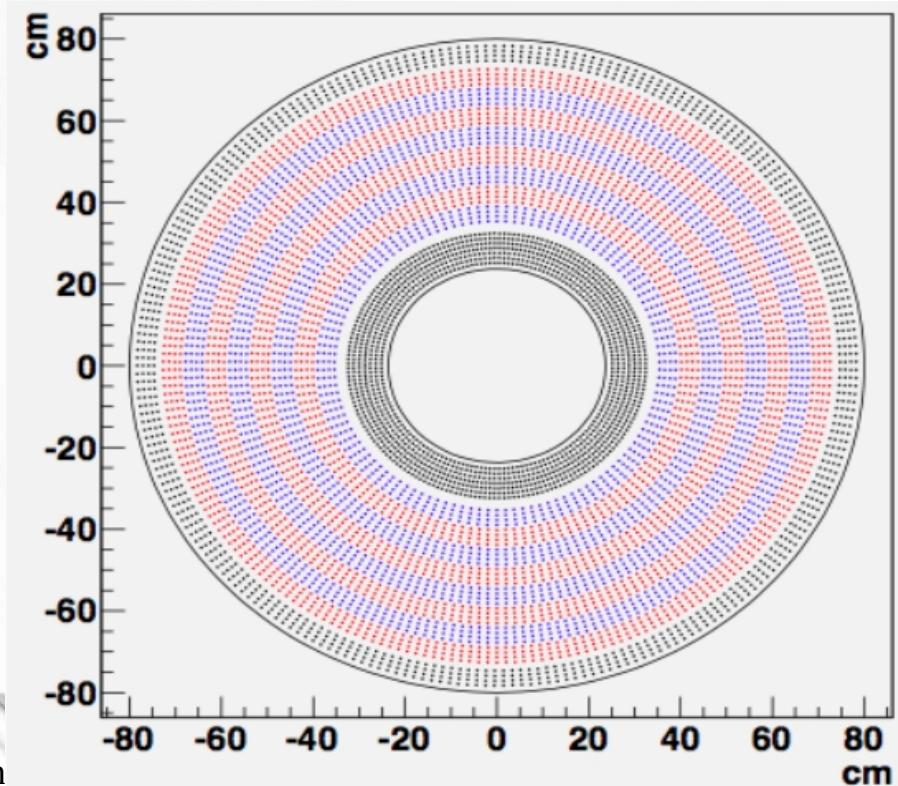
Hit-by-Hit w/o d-c : old method, not used anymore!

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.



Combining Bruno + Bhwide

