Update on DCH Background studies using FullSim

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SuperB Workshop and Kick-Off Meeting

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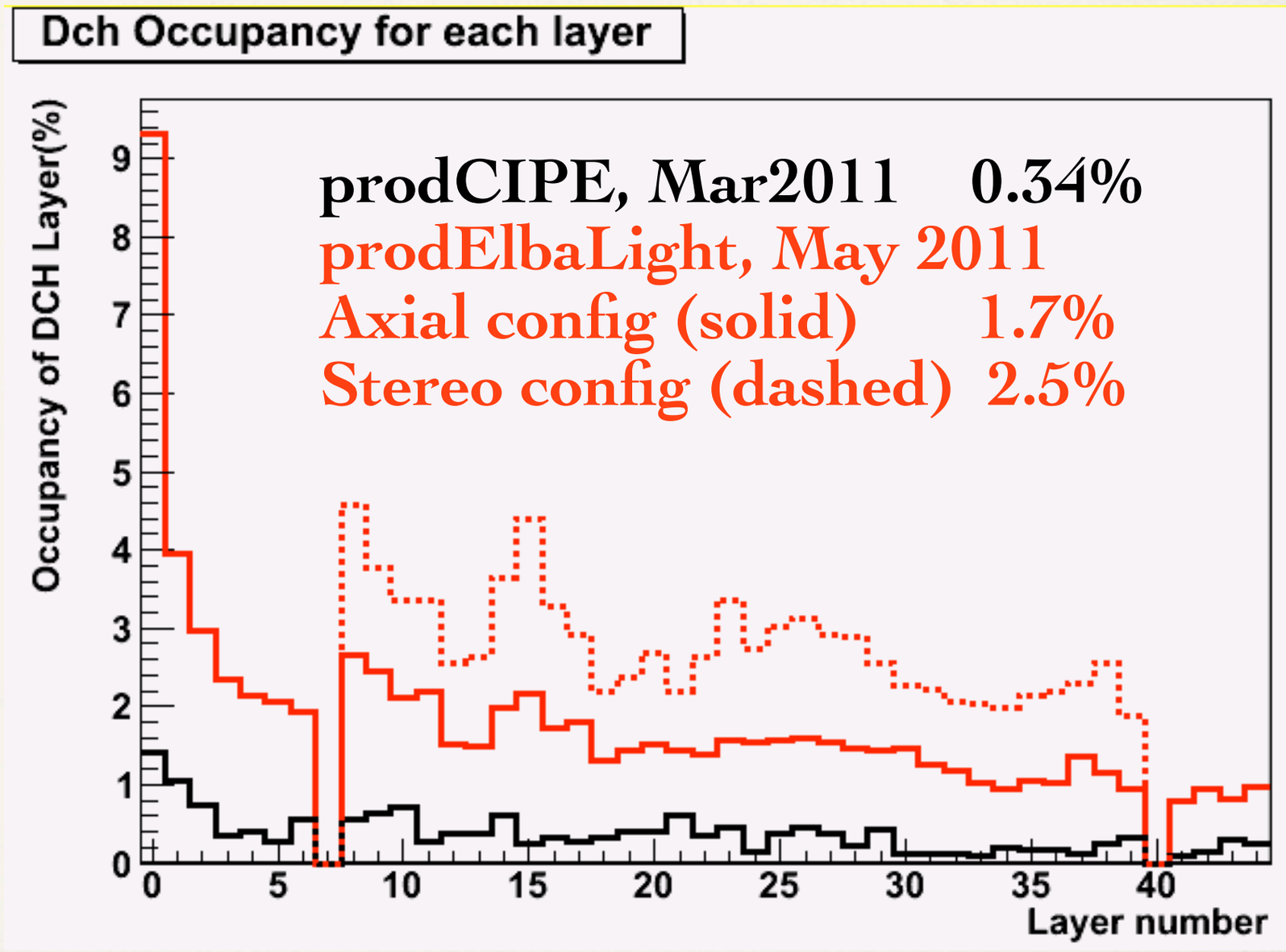
Productions

- New productions
  - **Elba**, RadBhabha (20k evts): new final focus and new magnetic configuration, 1mm step limit for Dch, full Truth Info
    - Issues when processing such a big ntuples, really slow, need to disable some minor features in my macro to run faster, but still slow
  - **Elba-Light**, RadBhabha (10k evts), same configuration but no full Truth, as previous productions
    - All the following plots are made using this production
- Less events than previous productions, but also less background, so statistics is not so great

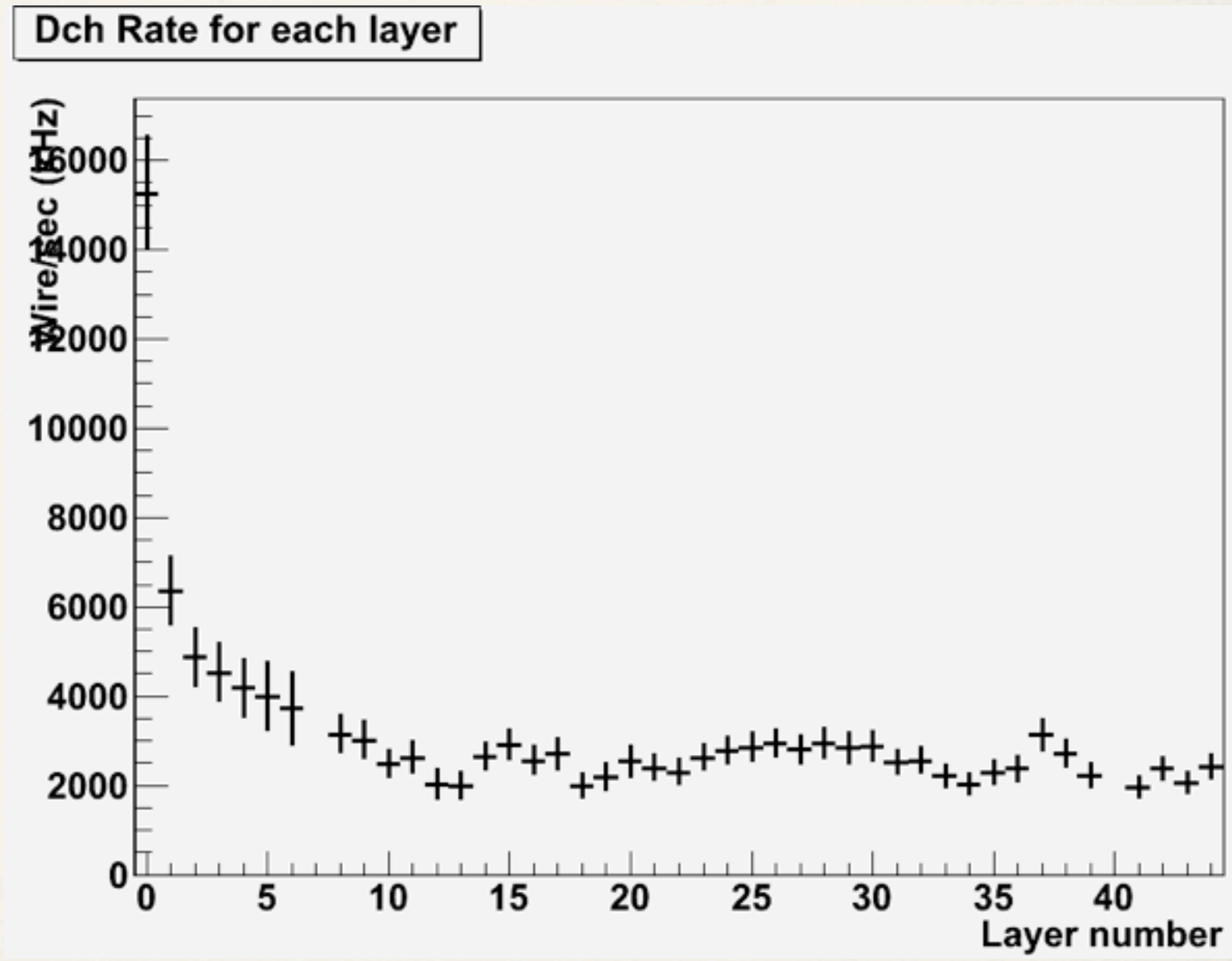
Dch Occupancy

- Comparing only productions with 1mm step limit
- Occupancy back to Dec2010 value (but it was w/o 1mm step limit)
- Bug in simulation was fixed before this prodution
- Stereo contribution is now evident



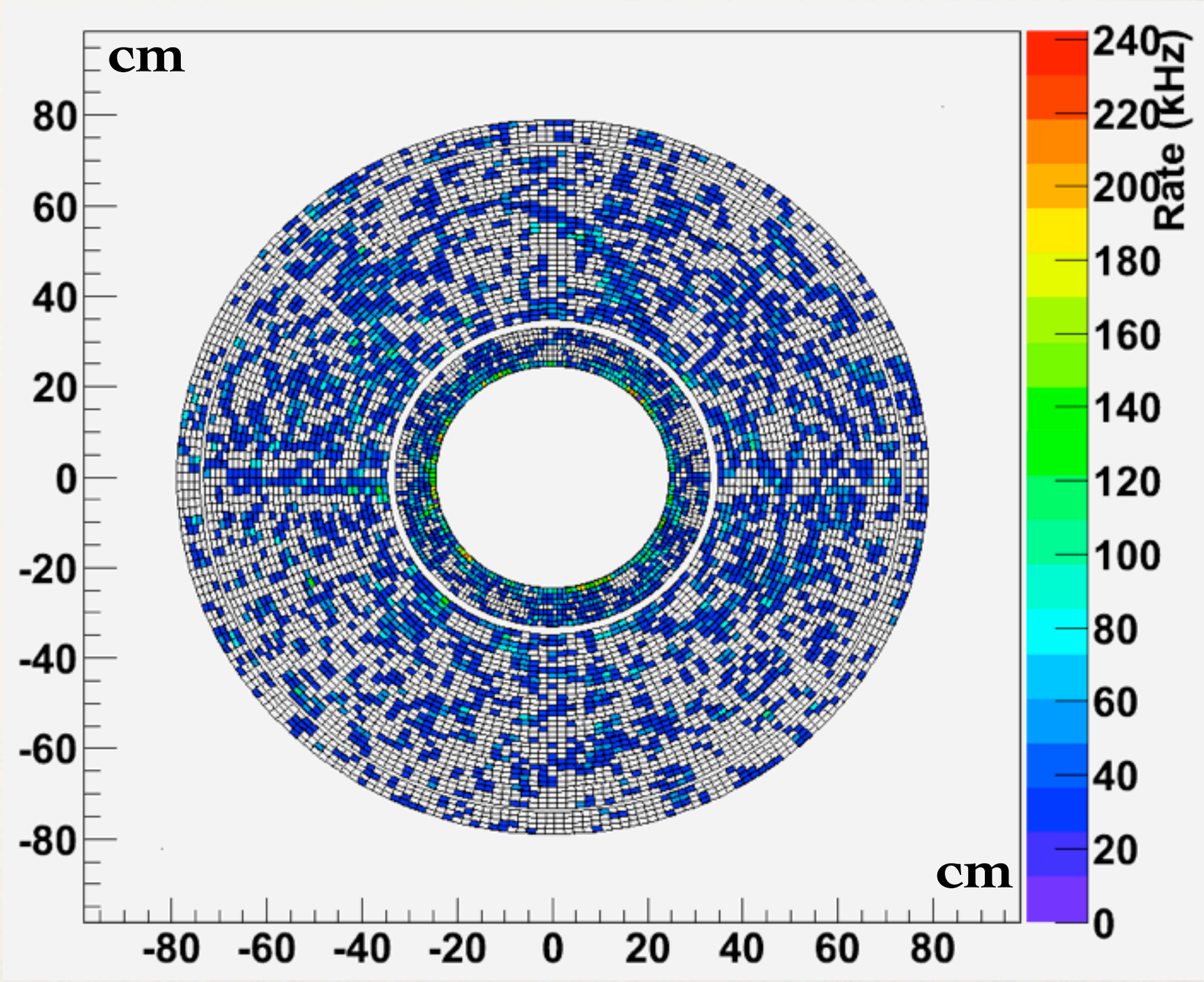
Dch rate

- Rate per layer, all the tracks passing through the layer divided by time
- If we are looking for hot areas, this plot is not easy to read, how we can improve it?



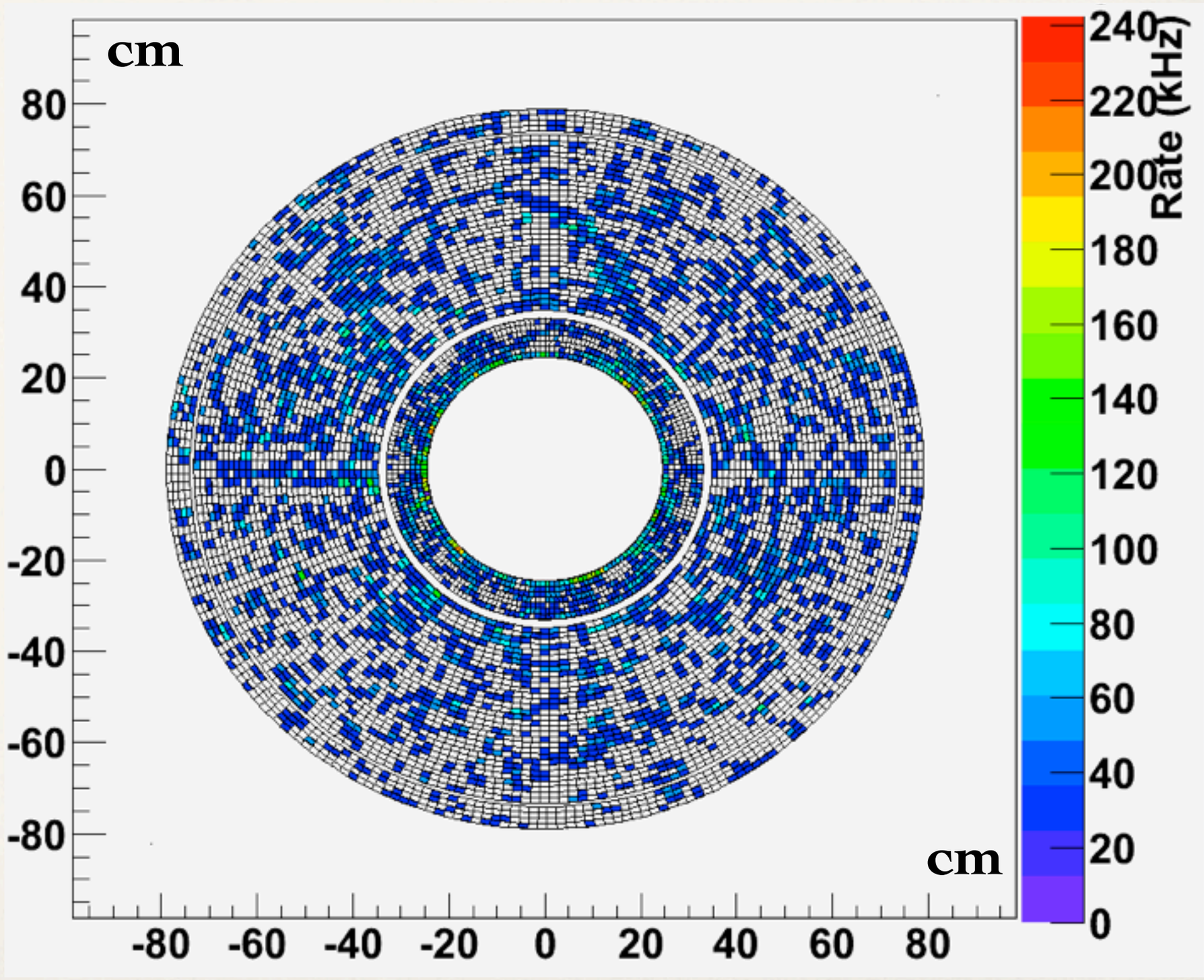
New map for cell rate

- Idea from Darren's plot
- Fill the map with rate for each cell
- Many cells are empty, low statistics:
- 10k evts = 38us
- A cell fired once during 38us = **26kHz**
- Most of the cell are fired only once in this sample
- Higher statistics needed to spot which ones are the hot areas



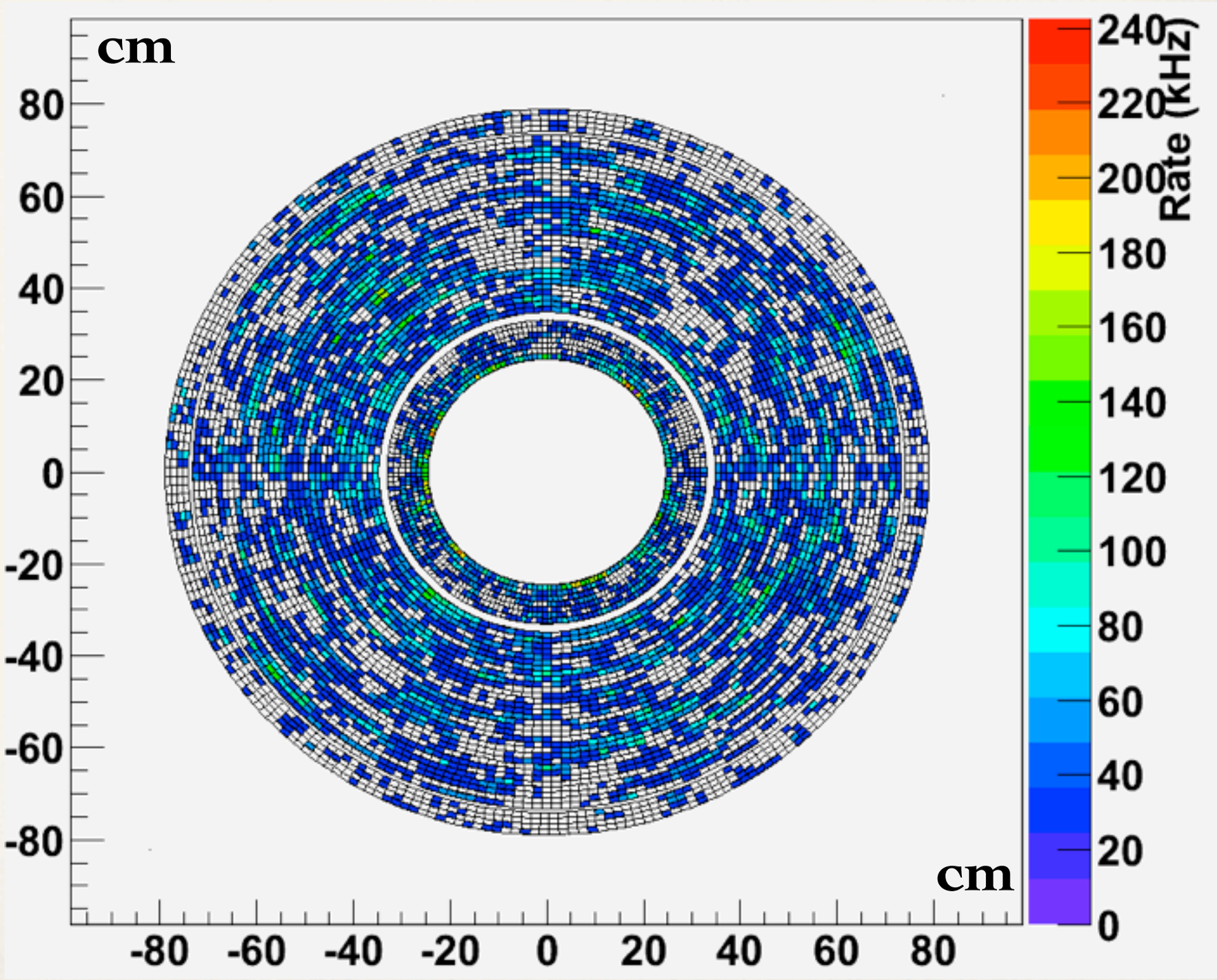
New map for cell rate

- Dch does not distinguish tracks in the same trigger window (1us)
- Rate merging all the hit in the same trigger window
- Small difference, maybe



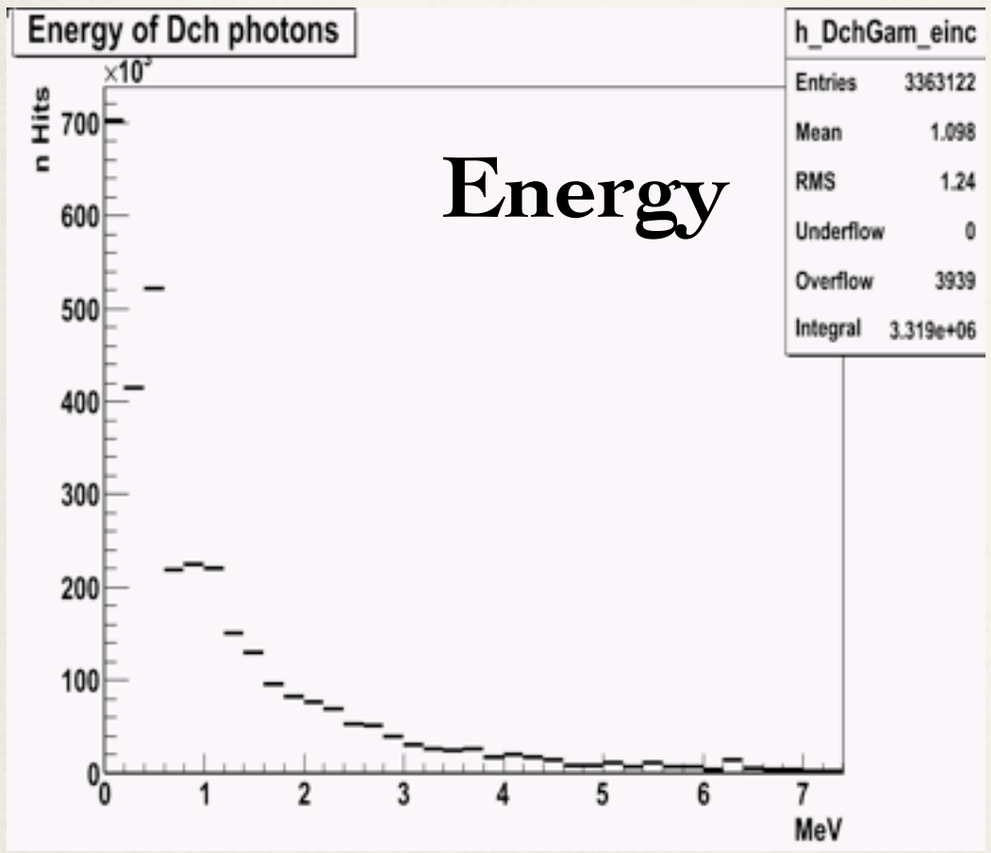
New map for cell rate (stereo)

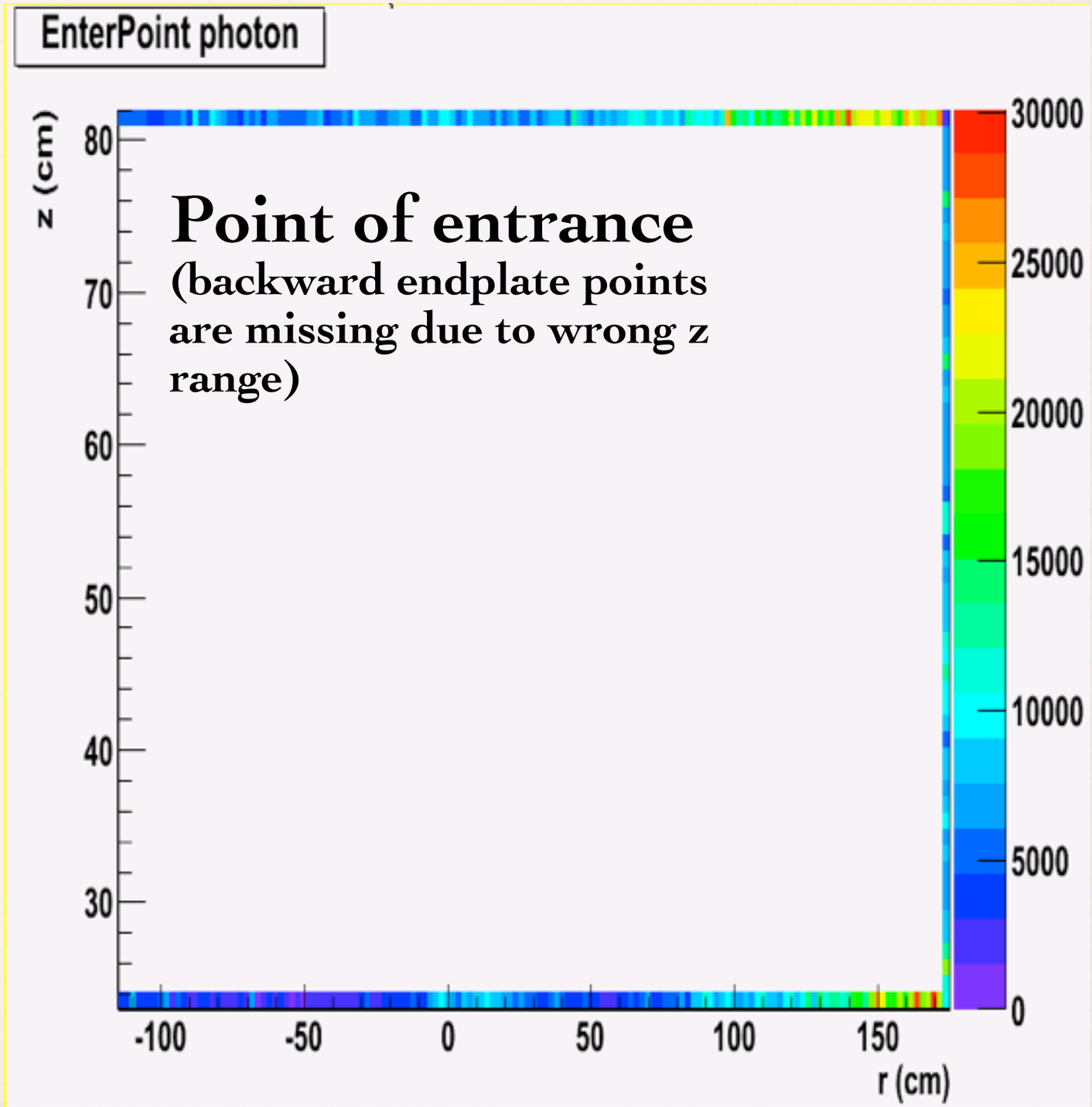
- Stereo configuration
- For stereo layers also neighbor cells are fired, as expected
- Some green areas, higher rate due to overlapping
- Again, more useful having higher statistics



Photon spectrum study

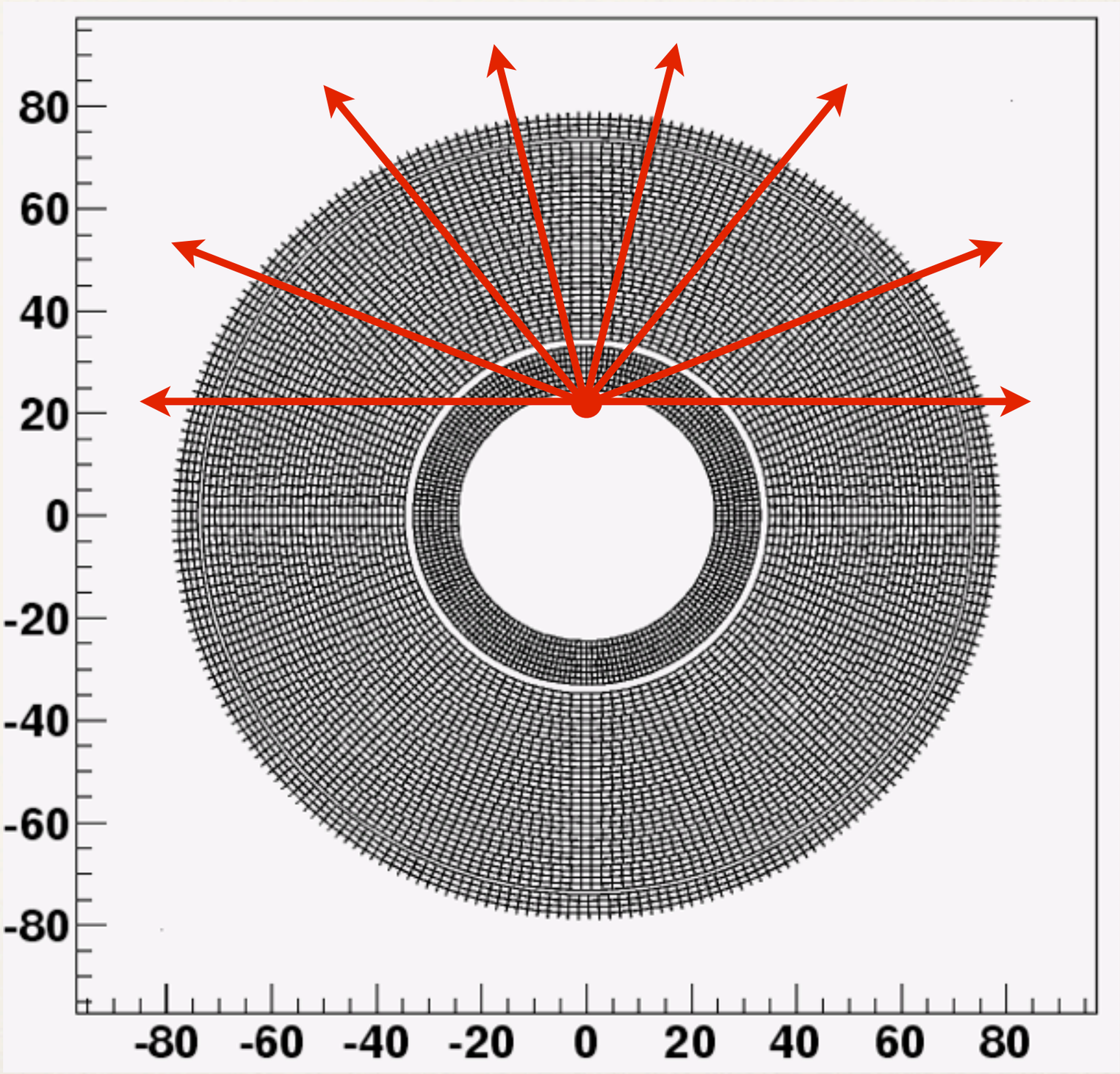
- RadBhabha (10k)
- Boundary particles
- Energy
- Enter point





Photon spectrum study

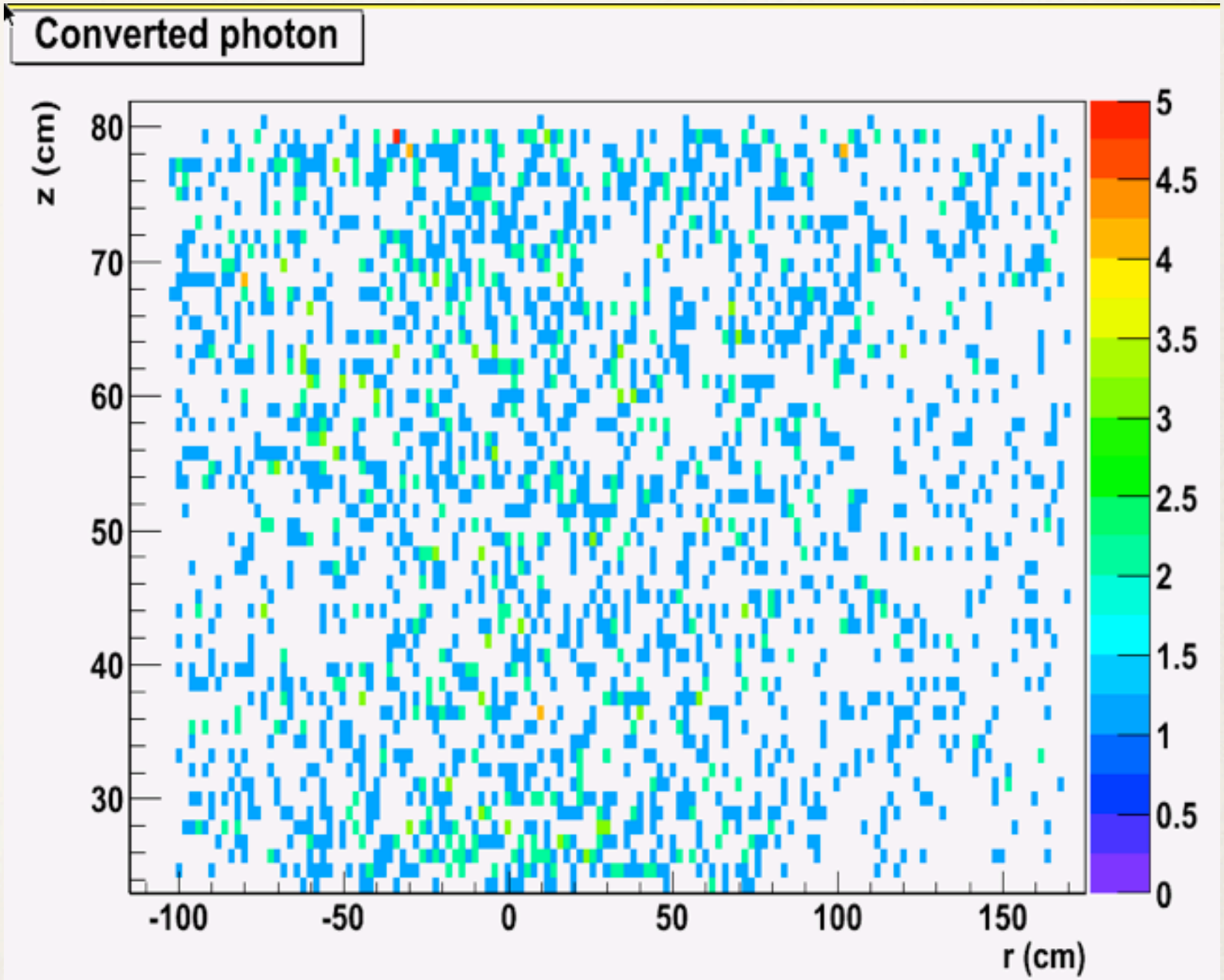
- Single photon
- Position:
  - x=0,
  - y=+22cm
  - z=[-110,175]cm
- Energy:
  - 100 keV
  - 500 keV
  - 2 MeV
  - 10 MeV
- Vector momentum:
  - Phi=[0, pi] (up)
  - Theta=[0, pi]



Photon spectrum study

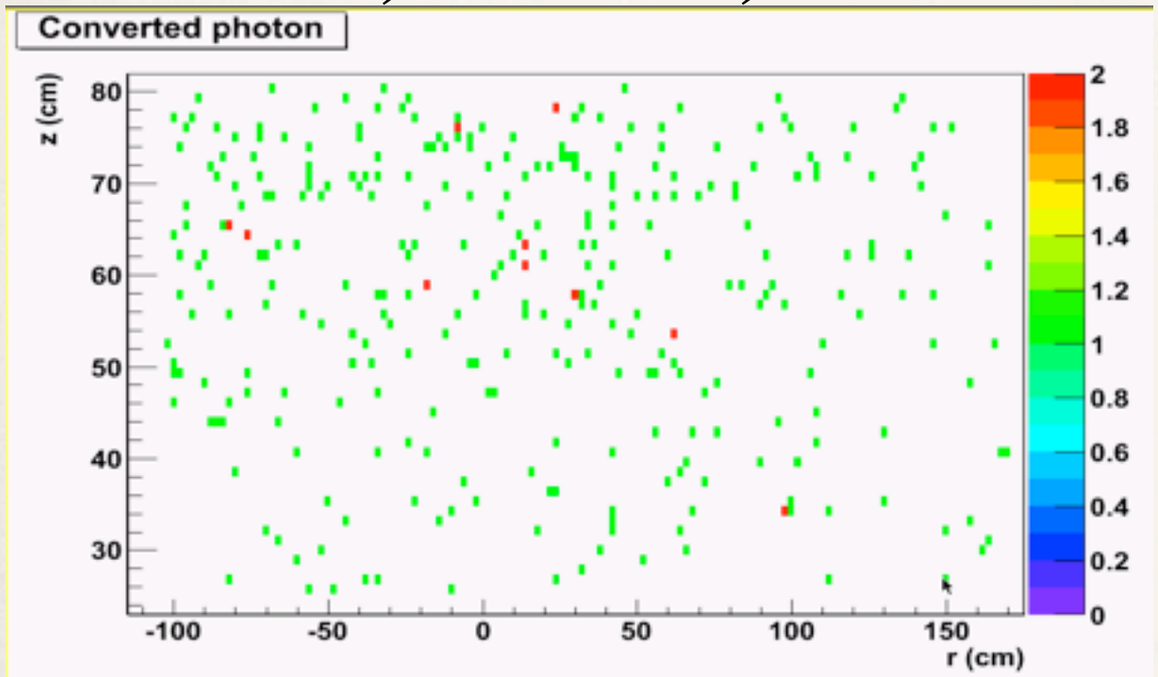
- Looking at photons hits where the photon does not exit the volume
- No information about how the photon disappear, which is the process (Geant4 knows but it is not stored)
- Plot of r-z coordinates of the last hit of the photon before disappearing
- **Disappearing rate** = disappeared photon divided by total number of events

100 keV, 1M evts, 0.25%

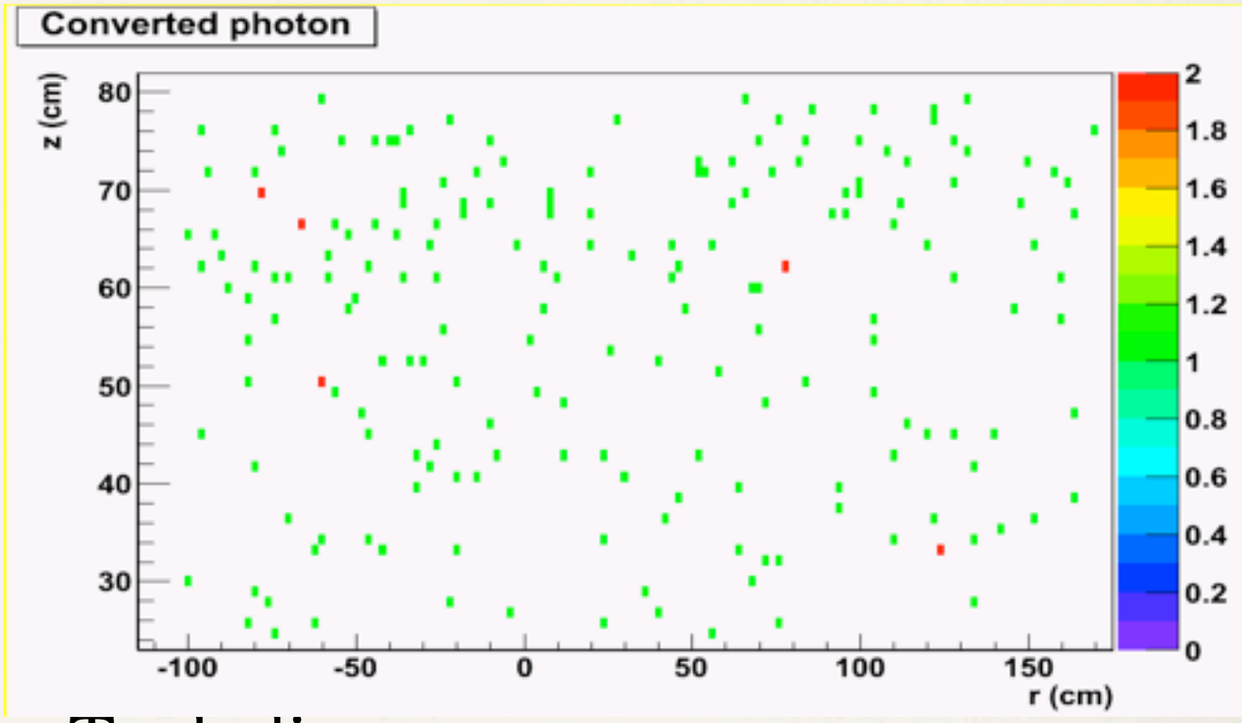


Photon spectrum study

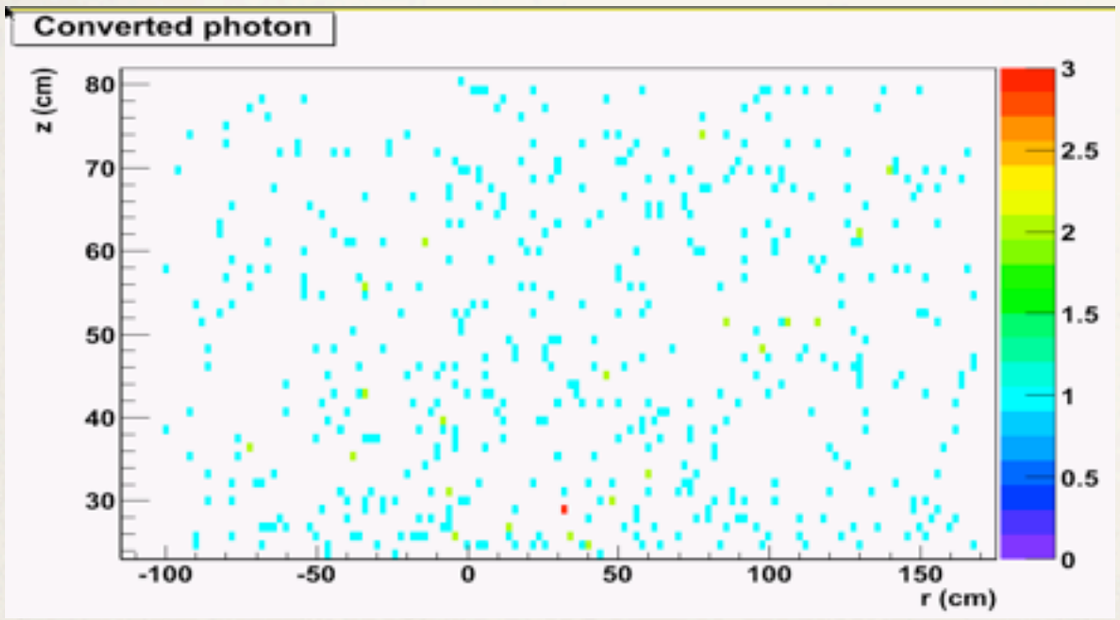
500 keV, 1M evts, 0.03%



2 MeV, 1M evts, 0.02%



10 MeV, 1M evts, 0.05%



- To do list:
- Shoot photons from other position (outside the barrel, end-plates)
- Other energies
- Add information on the process (only for this study)

Conclusions

- Occupancy has increased comparing to previous results
  - Geometry model is detailed
  - Simulation bug was fixed
    - Any other issue or this is the real value?
- New map of Dch rate, useful to spot high rate areas with higher statistics
- Study of photon spectrum and conversion rate has been started