Brief update on DCH Background Study with Bruno

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Updates and issues

- Unfortunately not so many news from the last meeting
- Trying to understand why occupancy depends from G4 simulation max step length
  - New method to estimate the occupancy: additional information to the hits, helix reconstruction offline to obtain all the cells crossed by the track
- The method seems to work fine but results are not consistent

Private mini-production

- RadBhabha, mini-production, samples of 10k evts
  - Default configuration
  - Step length limited at 5cm
  - Step length limited at 1mm
- Available to everyone at CNAF:
  - 500 evts x 20 root files for each sample
  - /storage/gpfs6/cenci/bkg_ntuple/bbbrems/r356/

Occupancy vs max step length

- New method occupancy should be the same for the 3 step limit setting
- The events are not the same for the 3 settings, different number of calls for the random generators
- Tracks passed to the simulation through root file but hits are still different. Why? It seems that the used Physics configuration is not simulating well low energy electromagnetic processes and multiple scattering in low density material (known issue on Geant4 forum)
- Occupancy with limit on particle energy, consistent for Einc > 5MeV

	Old method	New Method	New method Einc > 1 MeV	New method Einc > 5 MeV
Occ (no step limit)	2.9%	4.7%	1.74%	0.50%
Occ (max step 5cm)	2.9%	3.3%	1.07%	0.43%
Occ (max step 1mm)	1.35%	1.36%	0.80%	0.46%

Occupancy vs max step length

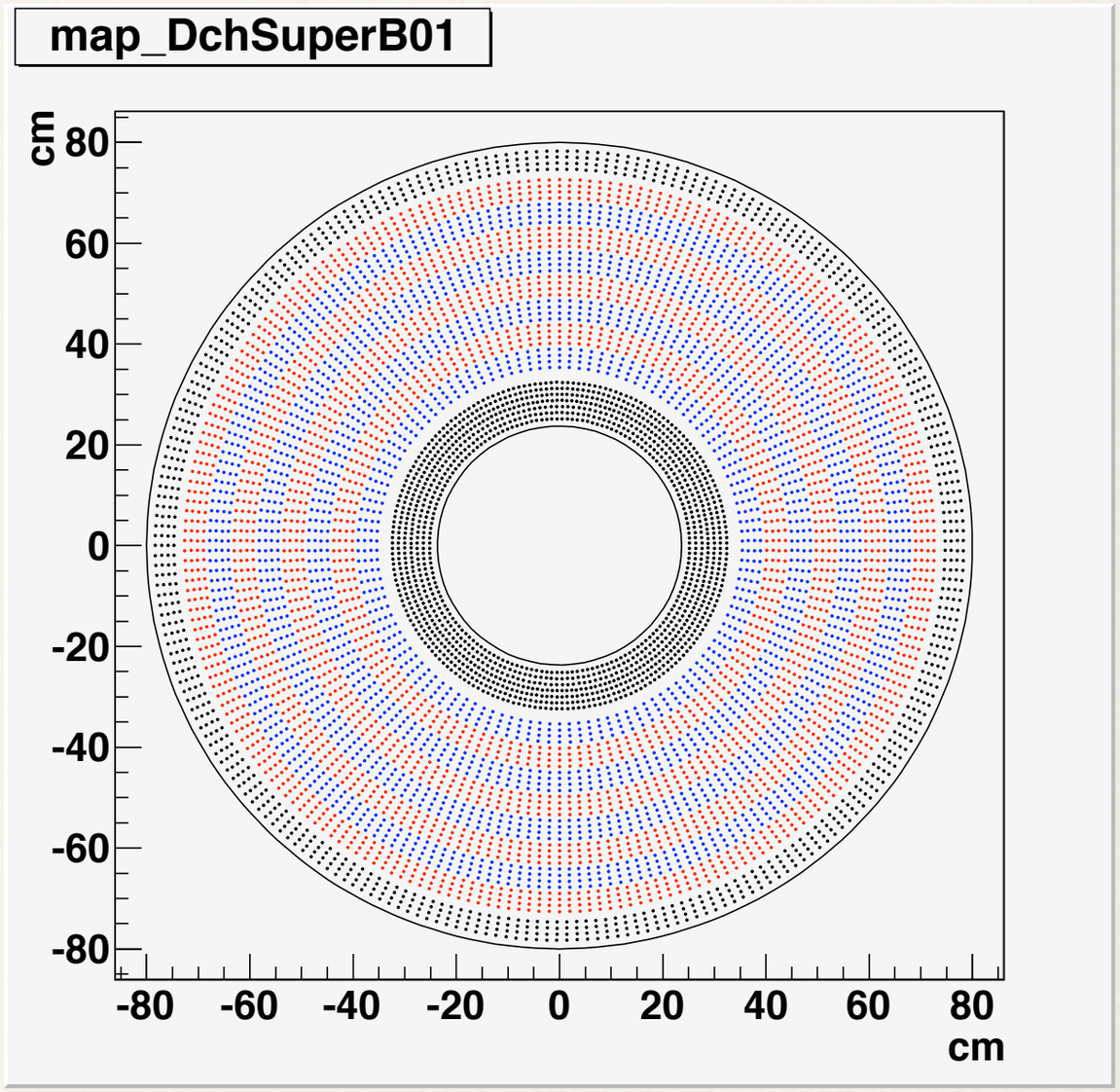
- But this is not a solution...
- Current physics configuration ("QGSP_BERT") is standard for HEP experiment
- Detailed simulation of em low energy processes are really CPU expensive, so probably dedicated production is needed
- Phys config with improved em processes not provided by G4. Better em processes are available but have to be combined in homemade configurations
- Further problems with code:
  - Transition to SL5, now ok
  - While passing 10 evts by root file (generated earlier), simulation crashes often or is much slower

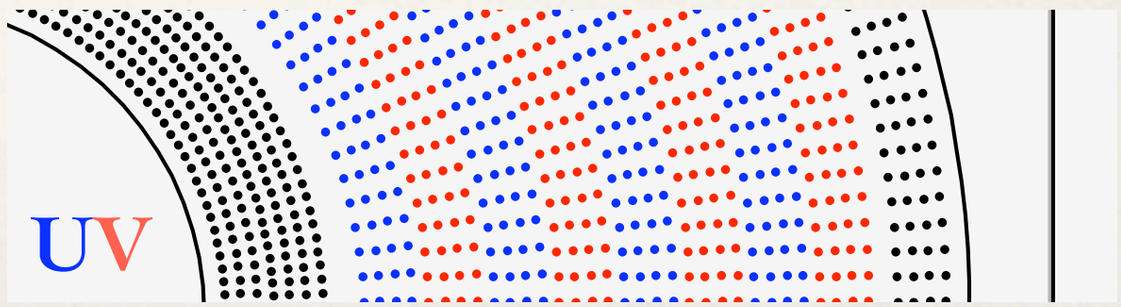
Conclusions

- New method to compute the occupancy has been checked, no problem founded
- Results inconsistency is likely due to approximate simulation of low energy em processes, results are ok using only tracks with Einc > 5MeV
- Work in progress for finding a better Physics configuration with optimal CPU performance
- Still waiting for Touschek bkg evts...

Updated cell configurations

- Dch gas volume:
  - Inner radius: 23.7 cm
  - Outer radius: 80 cm
- Dch cell configuration
  - Inner radius first layer: **24.6 cm**
  - Outer radius last layer: **78.9 cm**
  - **1.2 cm** size on r, variable on phi (**120-250 cells** per layer)
  - 11 Superlayer made by 4 layers (apart first one made by 3)
  - Total of **8k cells**
  - Note: cells are not staggered
- **Superlayer configuration**
  - **Axial01** version
    - AA-AAAAAAAA-A
  - **SuperB01** version
    - AA-UVUVUVUV-A
- Stereo angles like Babar





Axial vs Stereo

- Occupancy using the new configuration, SuperB01 (and new method)
- Again, adding stereo layers does change occupancy too much
- Test on occupancy only from tracks with R < 1cm, zLen > 20cm, still not the expected factor
- Remember: test with single particle along z axis was fine