



# Brief update on DCH Background Study with Bruno

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# Updates and issues

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- Productions with new IP geometry
  - Tungsten beaks removed, real structure for cooling and pinwheeled L0, pipes, flange and bellows
  - 2Photon (aka Pairs): 260 us
    - New macro to produce those events automatically, not embedded in Bruno
  - Rad Bhabha: 2.4 ms
- Due to other commitments, no progress on understanding why occupancy depends from G4 simulation max step length

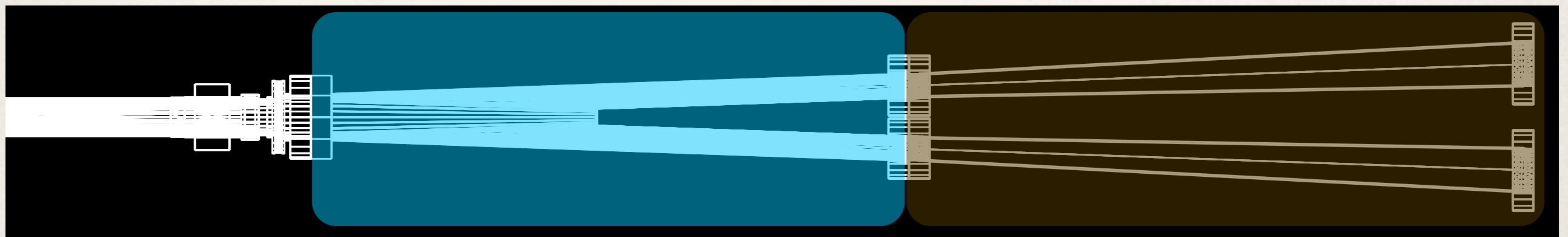
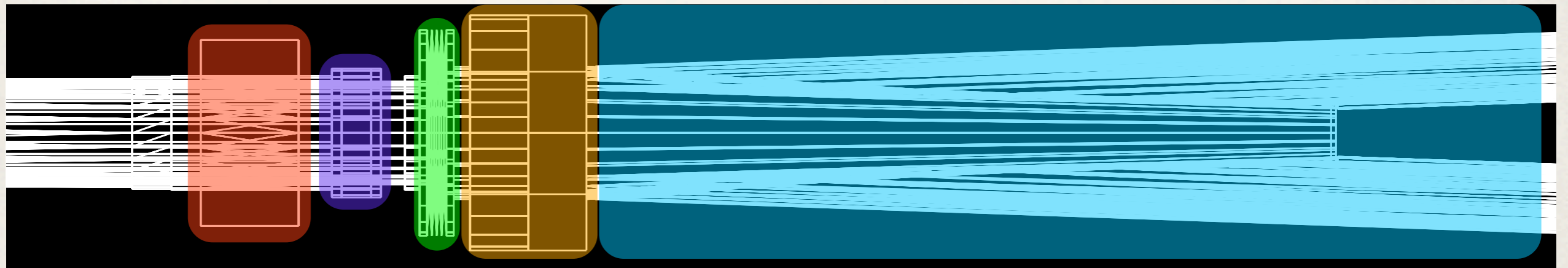
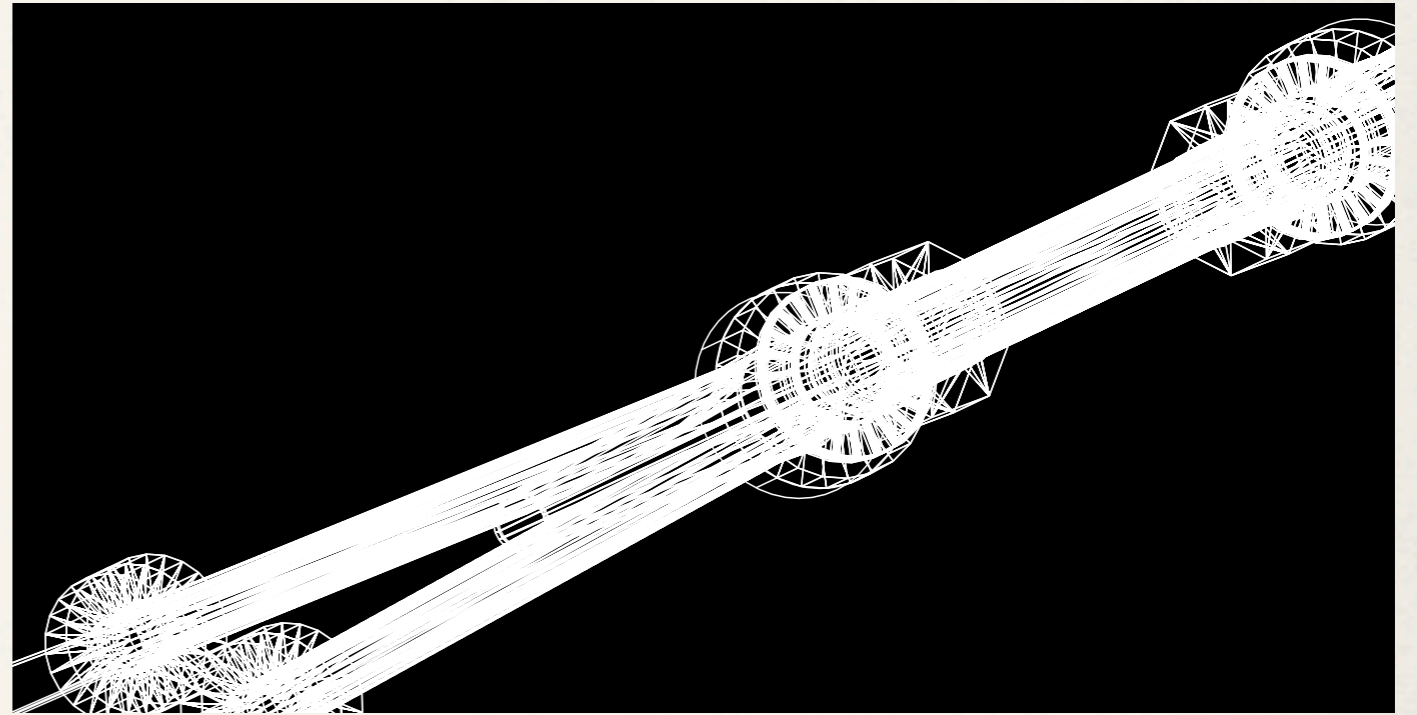
# New geometry around IP

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- Before: cylindrical beam pipe and L0, thick tungsten shield just outside the occupancy
- After: realistic structure around the IP from Filippo B. and Mike S. designs
  - Steel pipes, bellow and flanges until  $\pm 86$  cm on z axis
  - Pinwheeled L0 with cooling, HDIs and support
  - Tungsten shield closest to the IP (beaks) has to be removed

# New geometry around IP

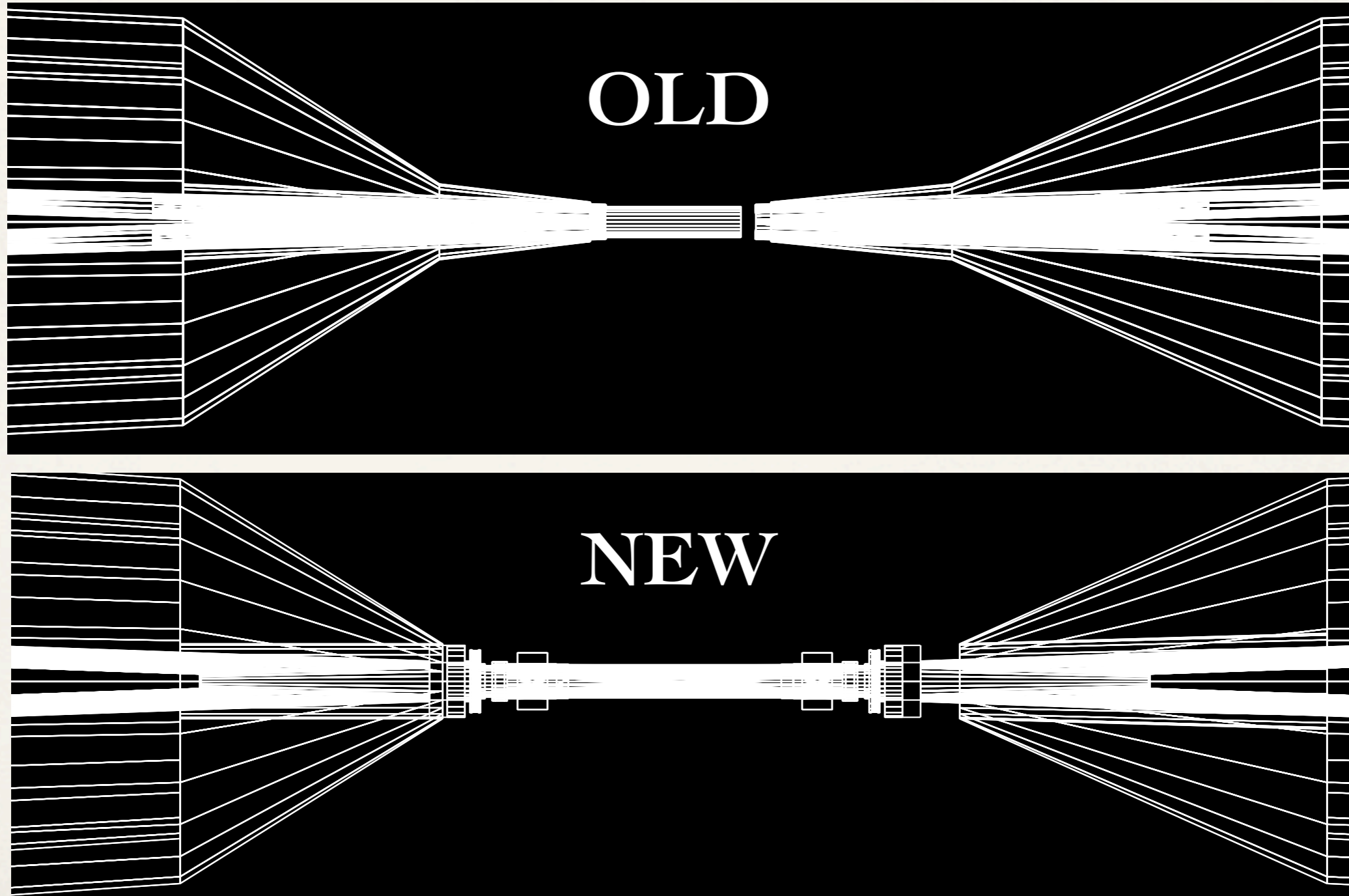
- L0 cooling manifold
- Beampipe manifold
- Bellow
- Flanges
- Split section
- LER/HER pipe



# New geometry around IP

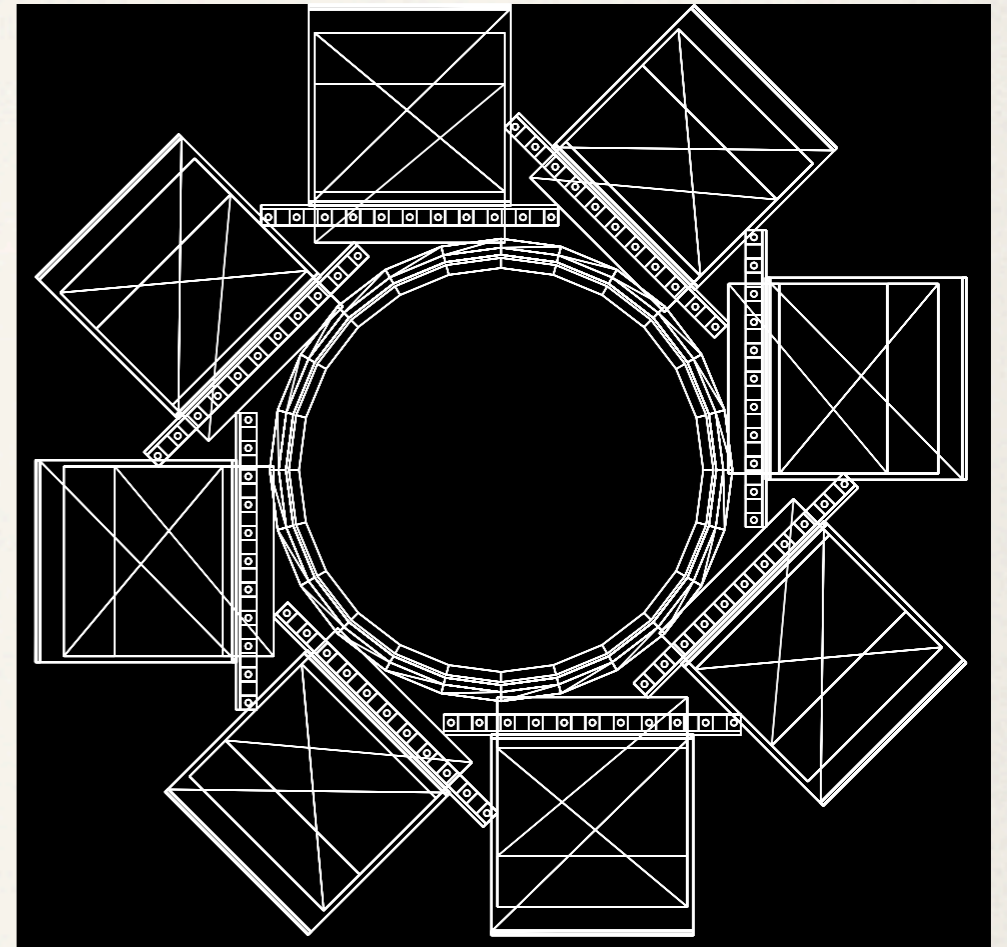
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- Reduced tungsten shielding (beaks removed)



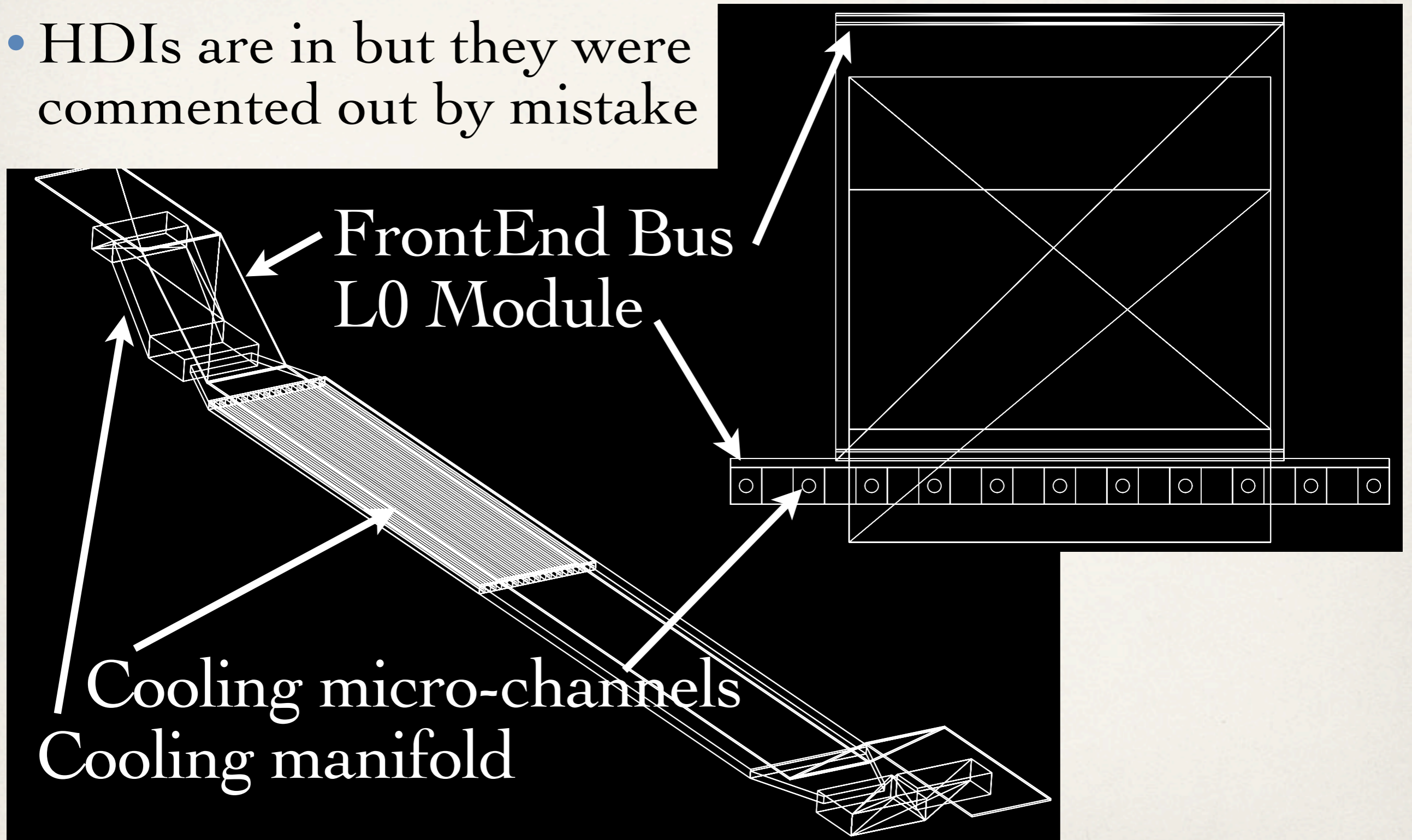
# New geometry around IP

- Pinwheeled L0
- Min radius 13 mm



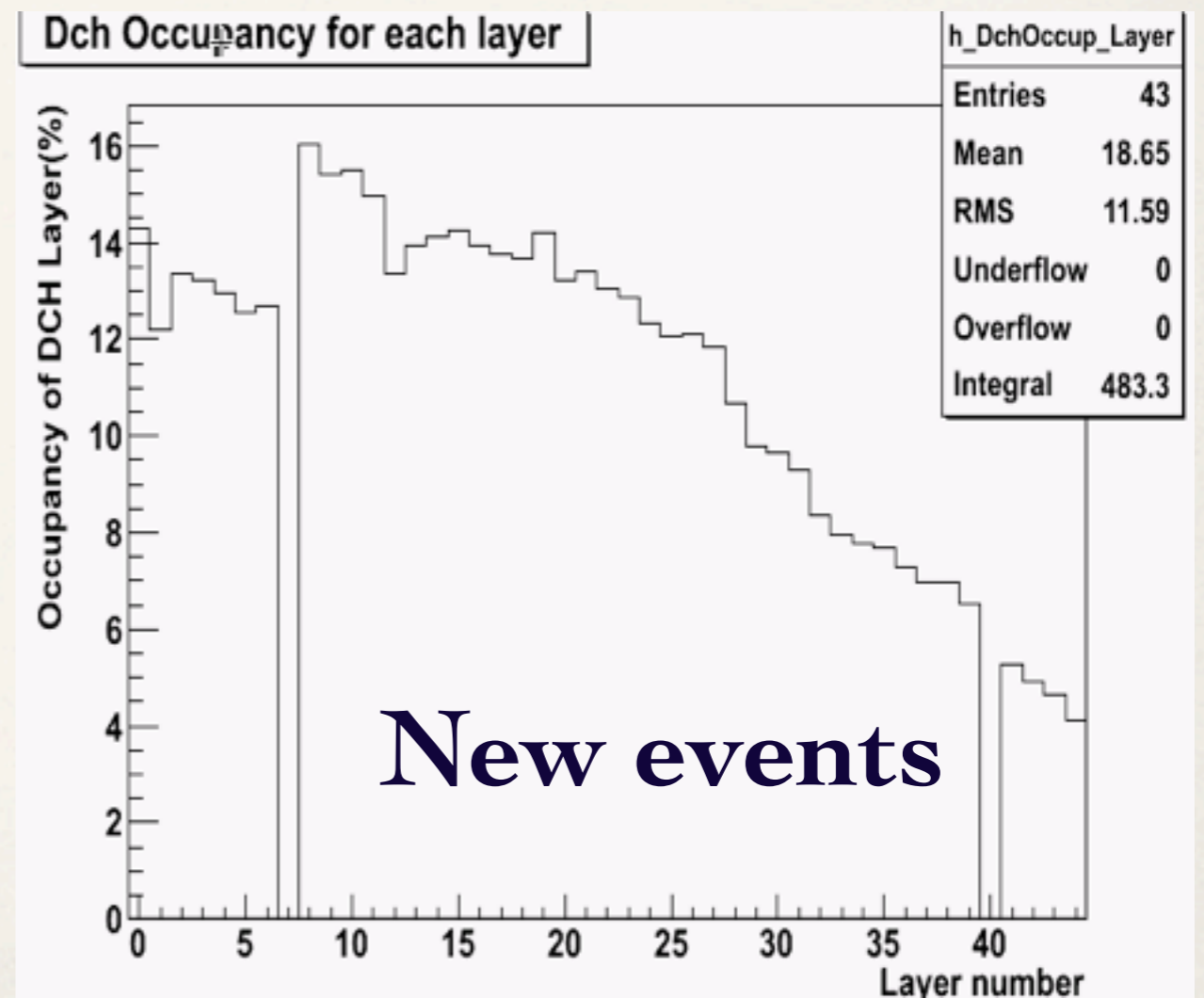
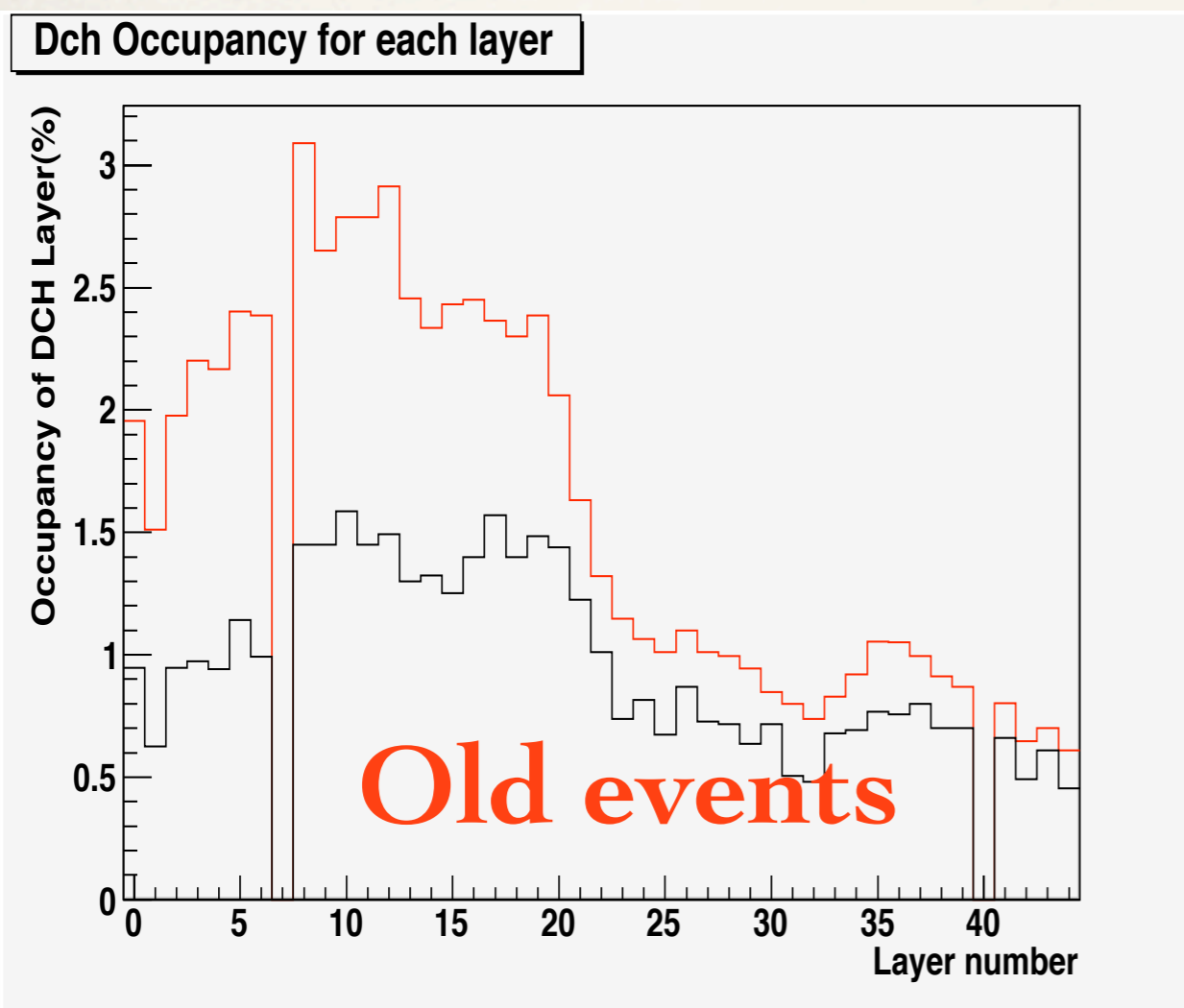
# New geometry around IP

- HDIs are in but they were commented out by mistake



# Dch background: 2photon bkg

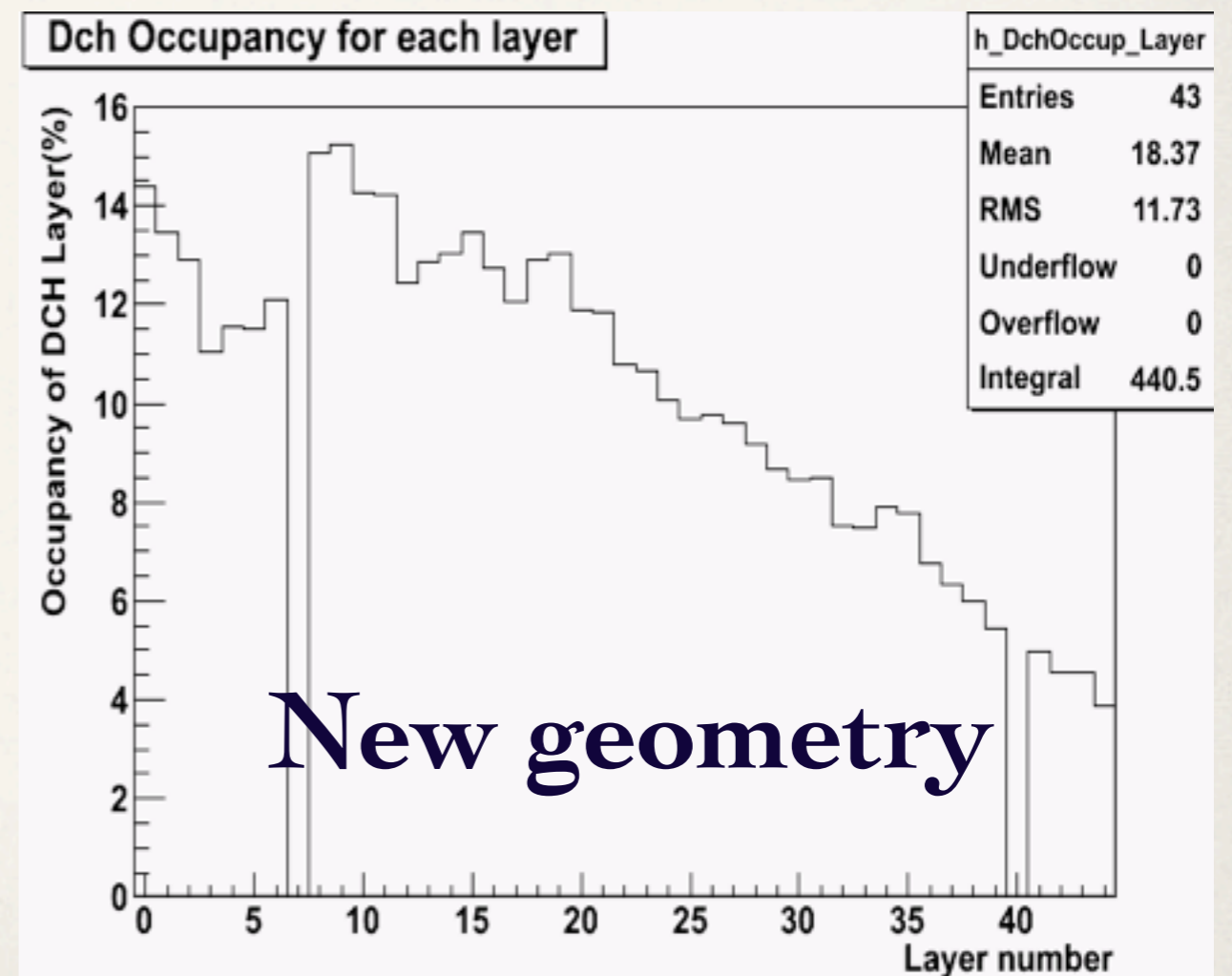
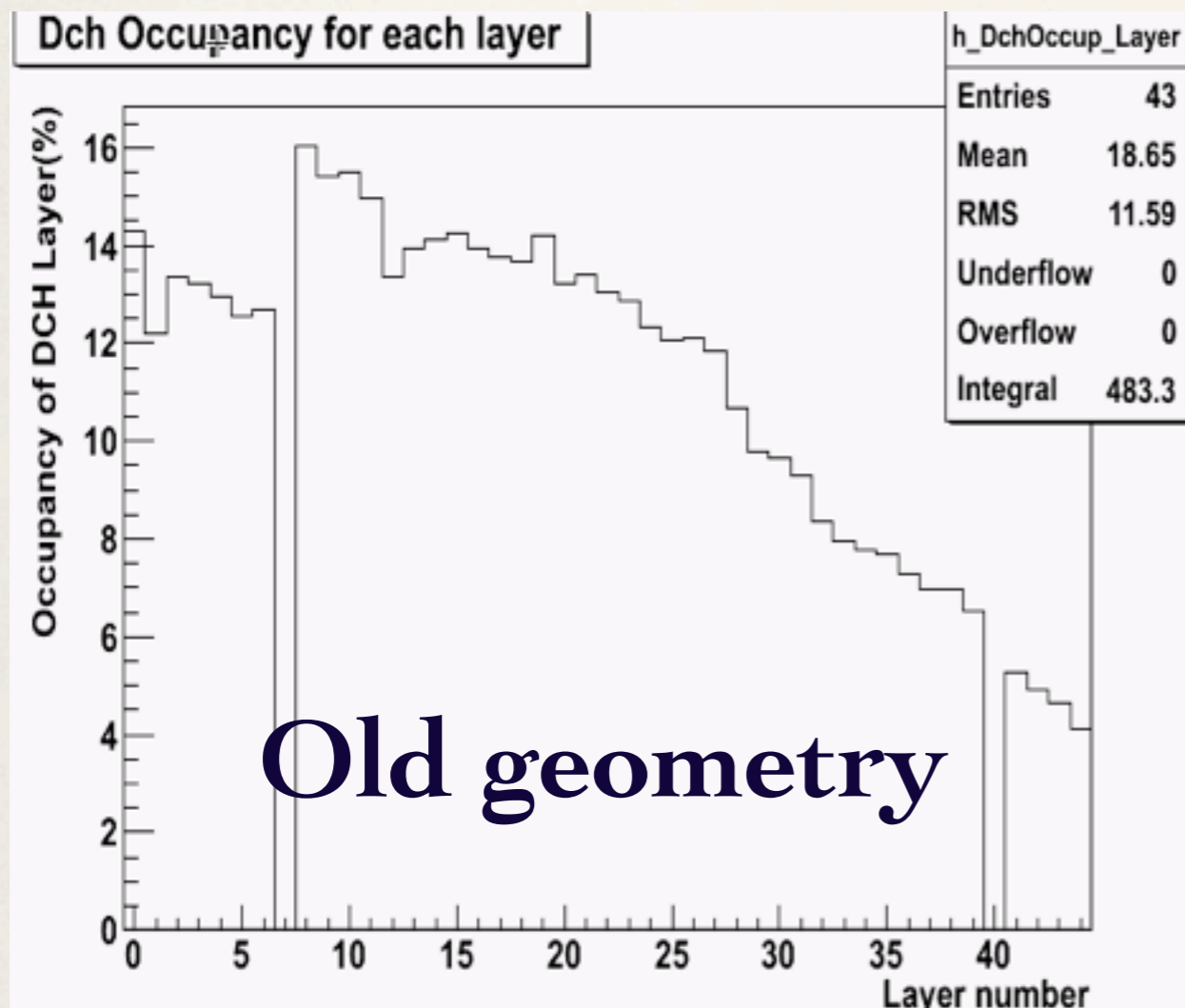
- Very preliminary results (and not validated method to calculate occupancy)
- New events, same geometry:
  - Much higher occupancy: 1.5%  $\rightarrow$  10.5%
  - 2photon events now have lower pT cut





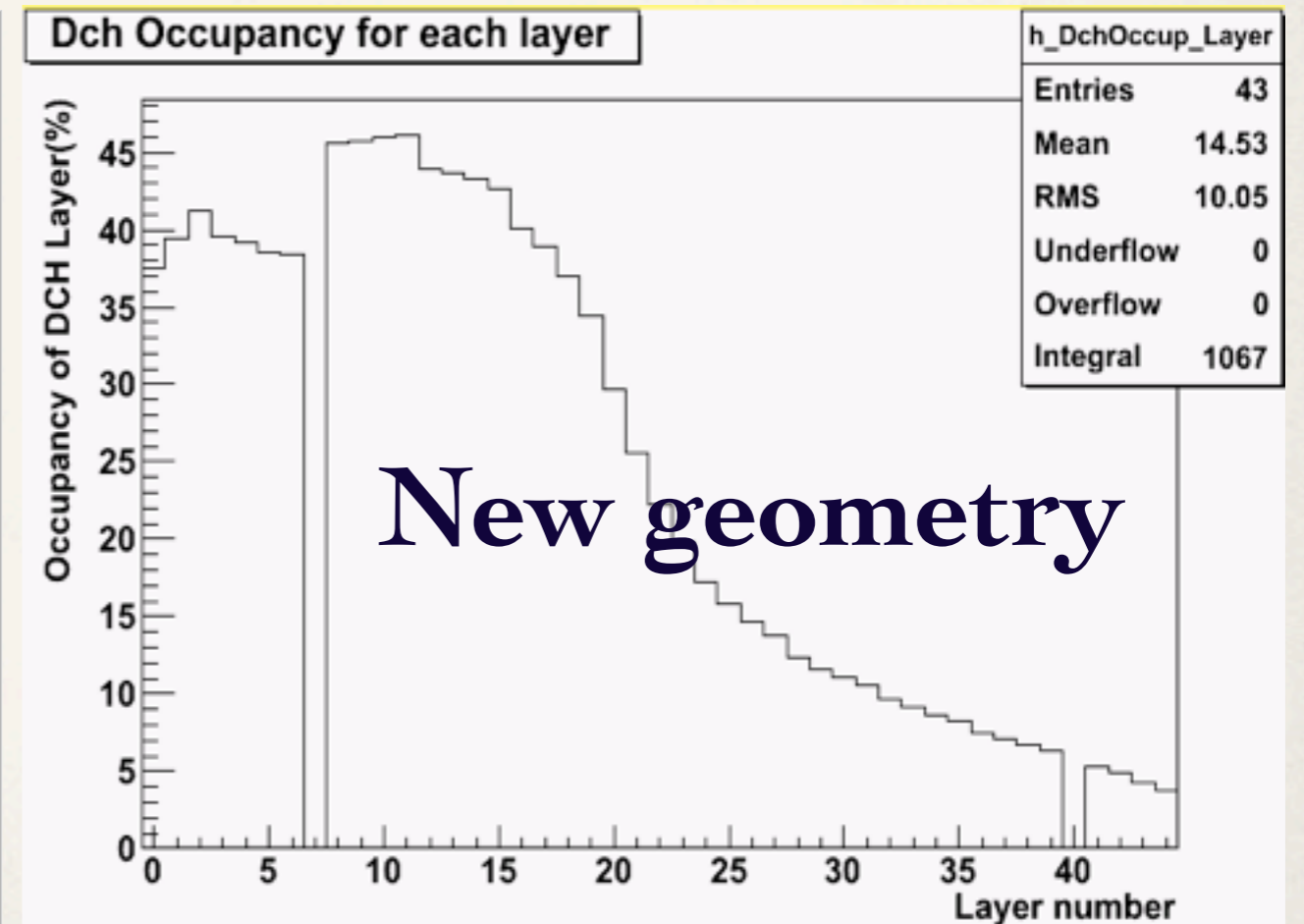
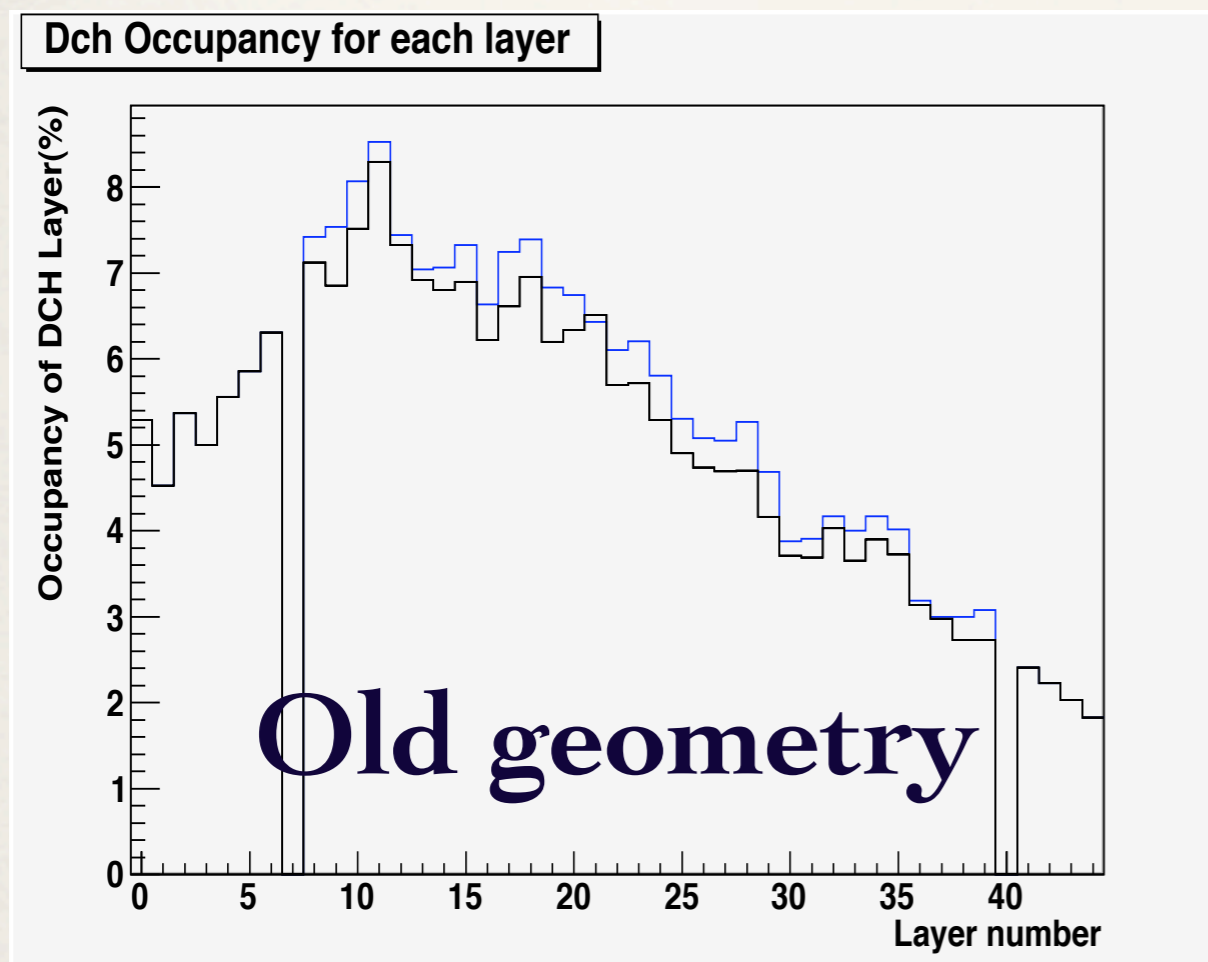
# Dch background: 2photon bkg

- Very preliminary results (and not validated method to calculate occupancy)
- New geometry, occupancy 10.5%  $\rightarrow$  9.6%



# Dch background: RadBhabha bkg

- Huge increase in occupancy, not understood...
- 5% -> 20%



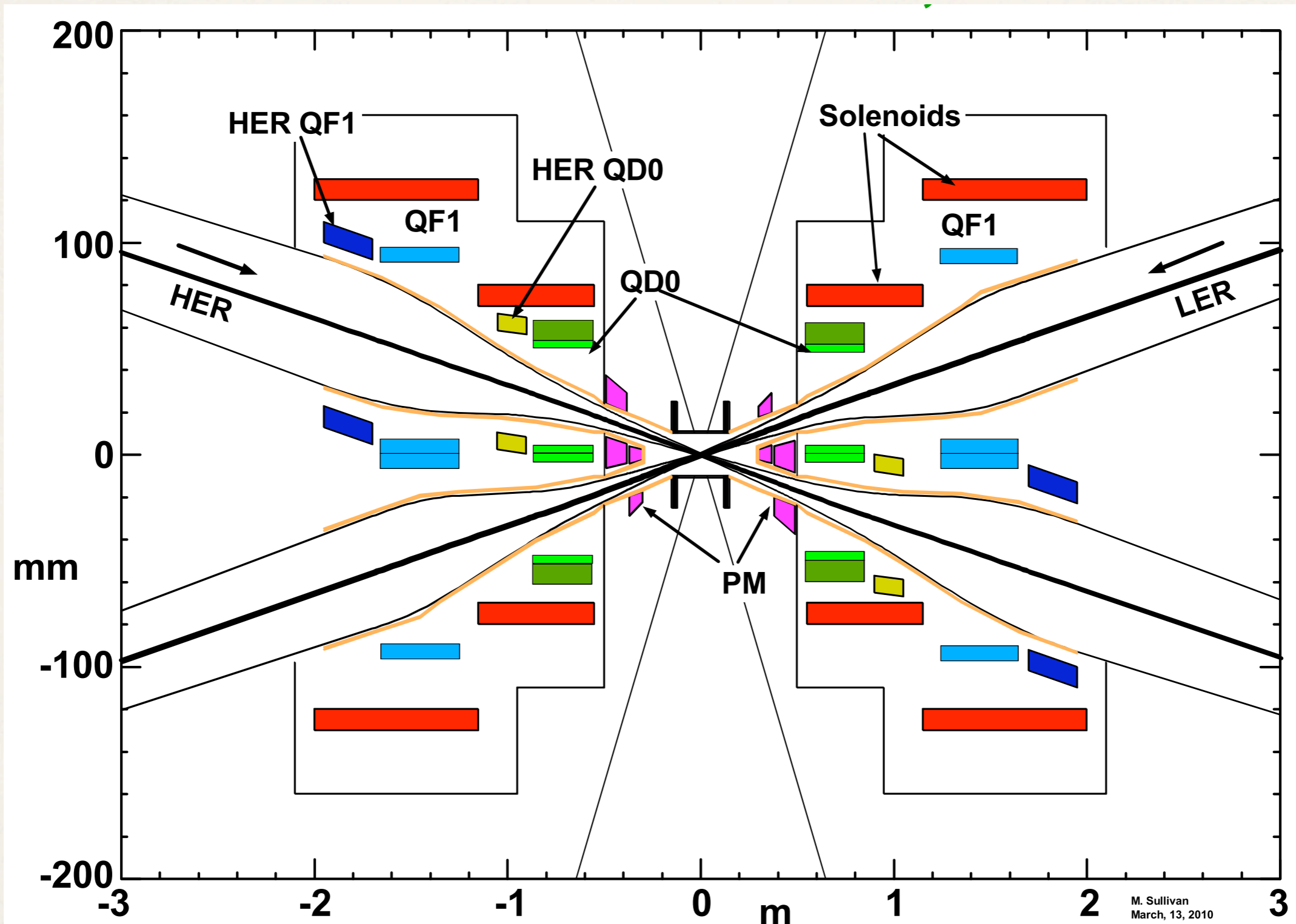
# Conclusions

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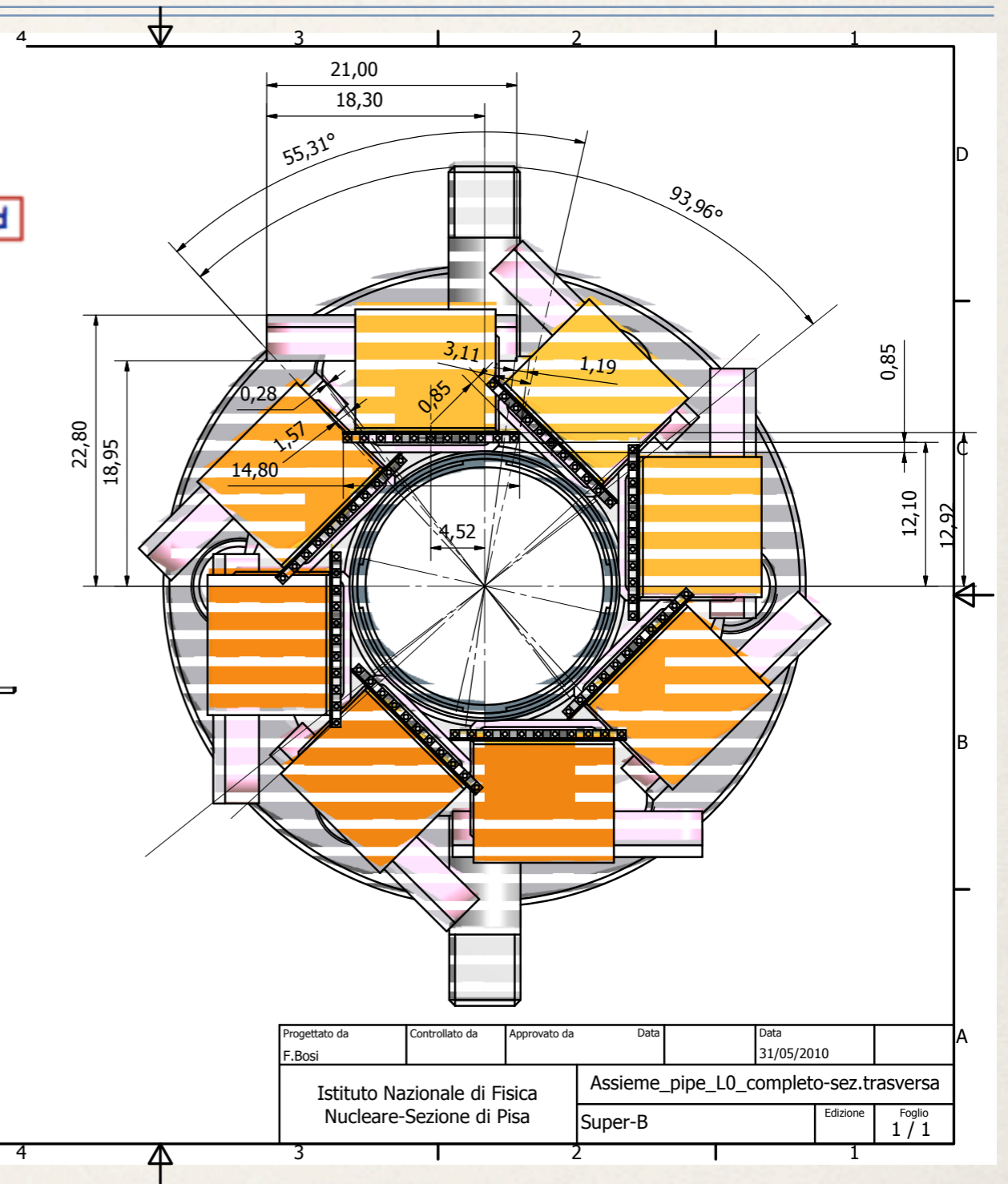
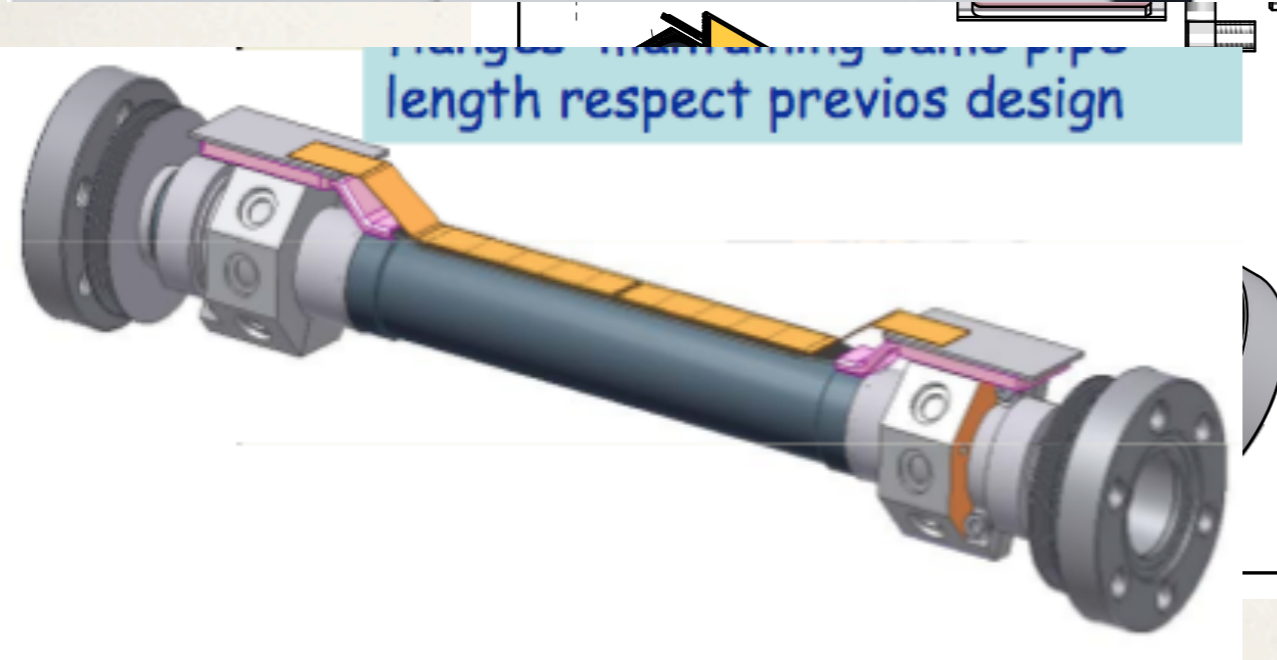
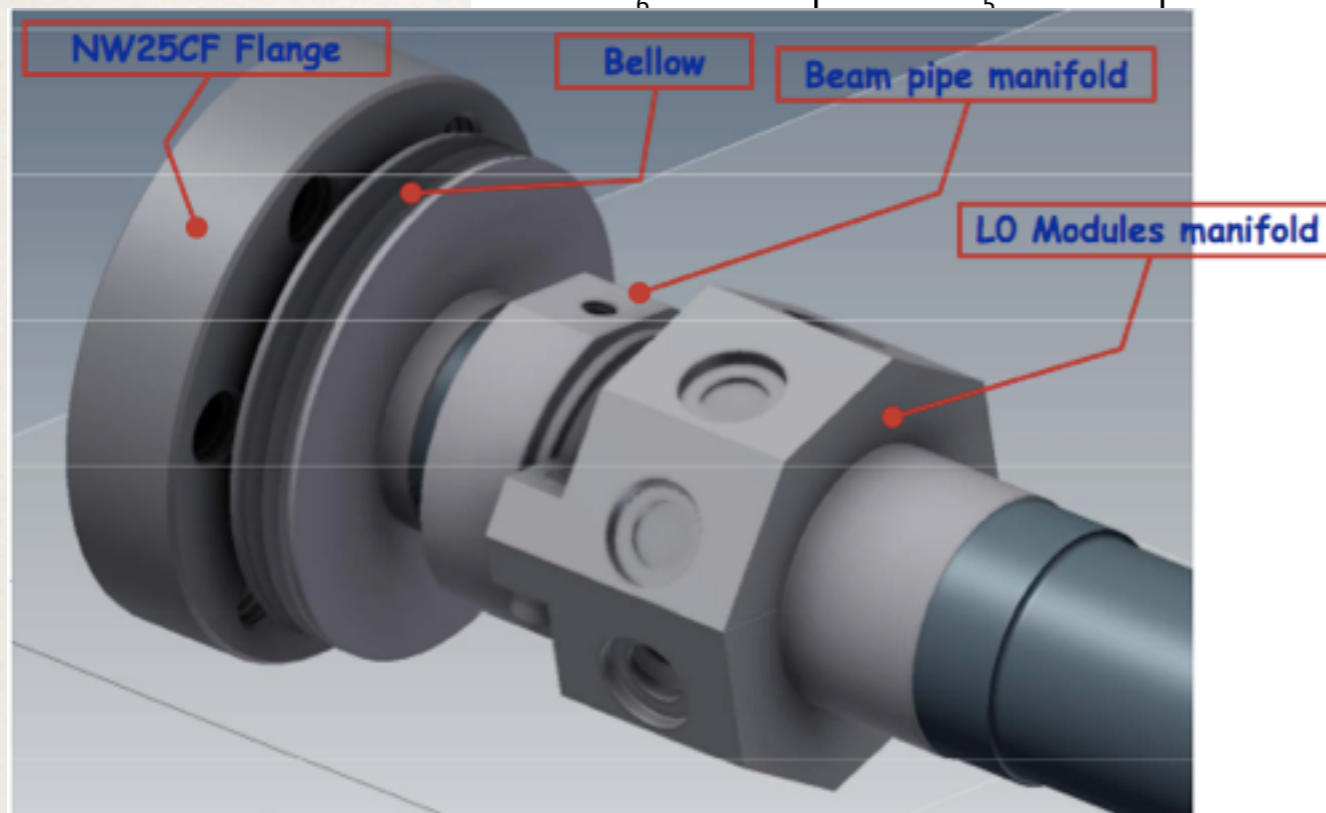
- New method to compute the occupancy has to be validated to solve the step length issue
- 2photon bkg at low  $p_T$  can affect the occupancy
- Preliminary results show that new IP geometry does not matter for 2photon
- RadBhabha, to be understood



# Mike S. design (Frascati Sep 10)

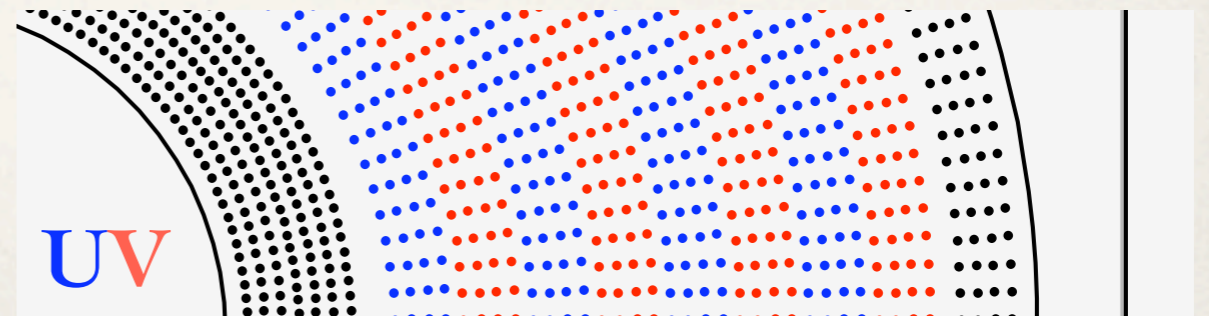
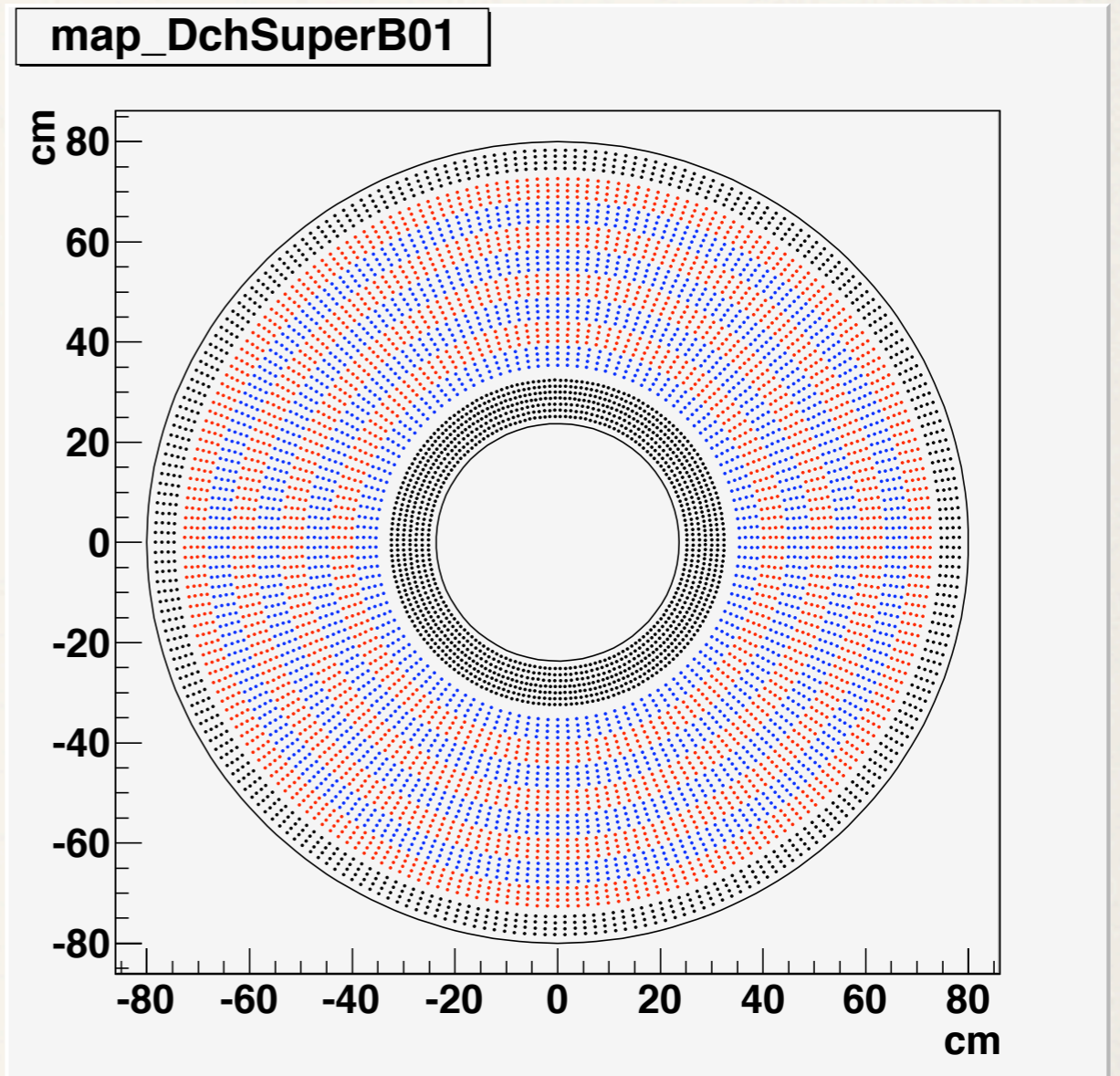


# Filippo Bosi design



# 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-AAAAAAAAAA-A
  - **SuperB01** version
    - AA-UVUVUVUV-A
- Stereo angles like Babar



# 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  $E_{inc} > 5\text{MeV}$

	Old method	New Method	New method $E_{inc} > 1\text{ MeV}$	New method $E_{inc} > 5\text{ MeV}$
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%