Update on Background simulation with Bruno, SVT and DCH

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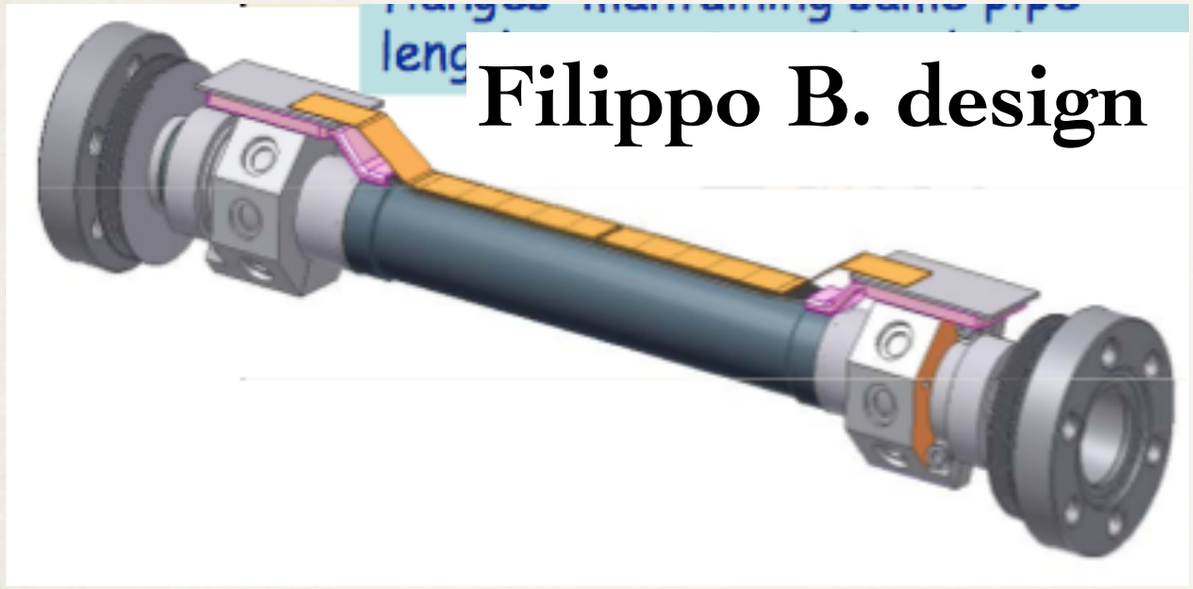
Updates

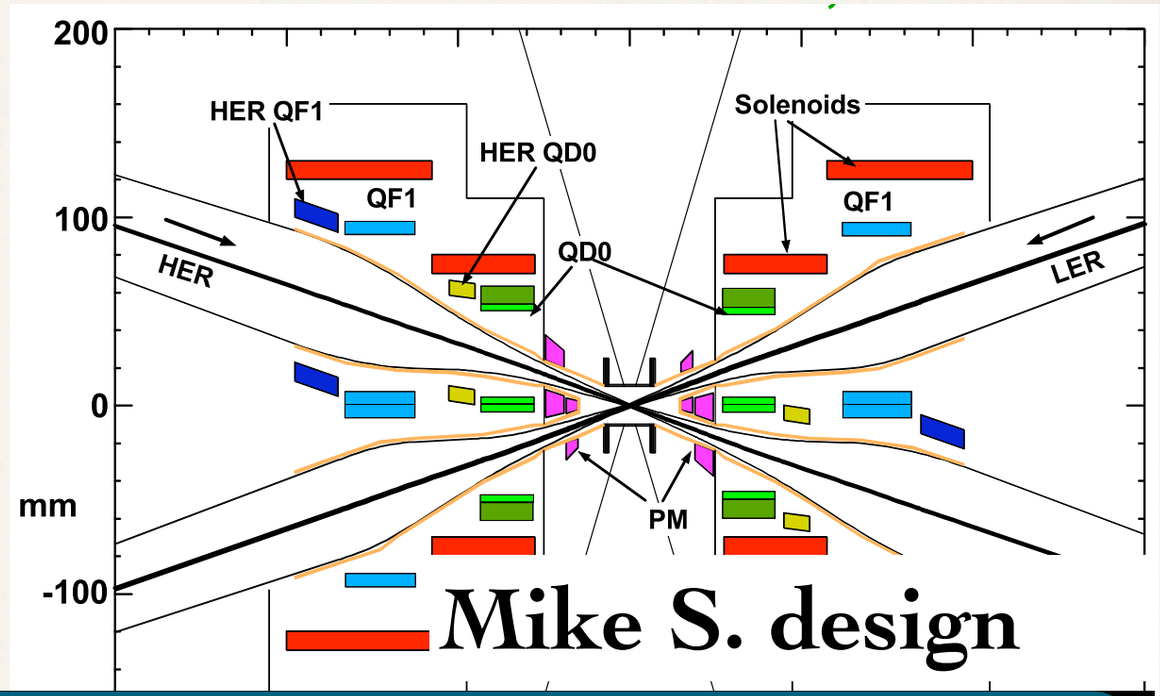
- New test productions:
  - 2Photon (aka Pairs): 260 us (~100k interactions)
    - New macro to produce those events automatically, not yet embedded in Bruno (thanks to Alejandro)
    - Normalization is different: lower cut on pT (excluded before because they did not make to L0, but maybe matters for others)
  - Rad Bhabha: 2.4 ms (~1M interactions)
    - Only with new geometry, no direct comparison with old results

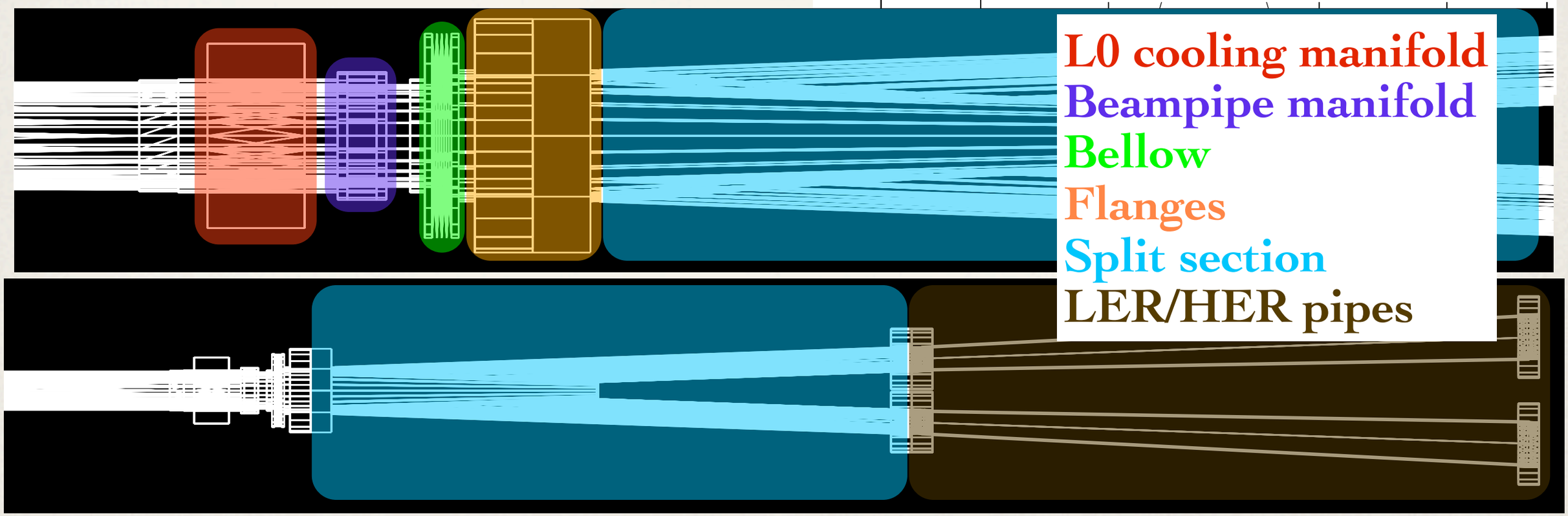
New geometry around IP

- Before: cylindrical beam pipe and L0, thick tungsten shield just outside the occupancy
- Realistic structure around the IP from Filippo B. and Mike S. designs
  - Beryllium beam pipe with cooling and support structure
  - Steel pipes with bellows and flanges until ±86 cm on z axis
    - Pipes simply extended few meters further, not according the design
  - Pinwheeled L0 with cooling, HDIs and support
  - Tungsten shield closest to the IP (beaks) has been removed to allocate cooling and support structure

New geometry around IP (top view)

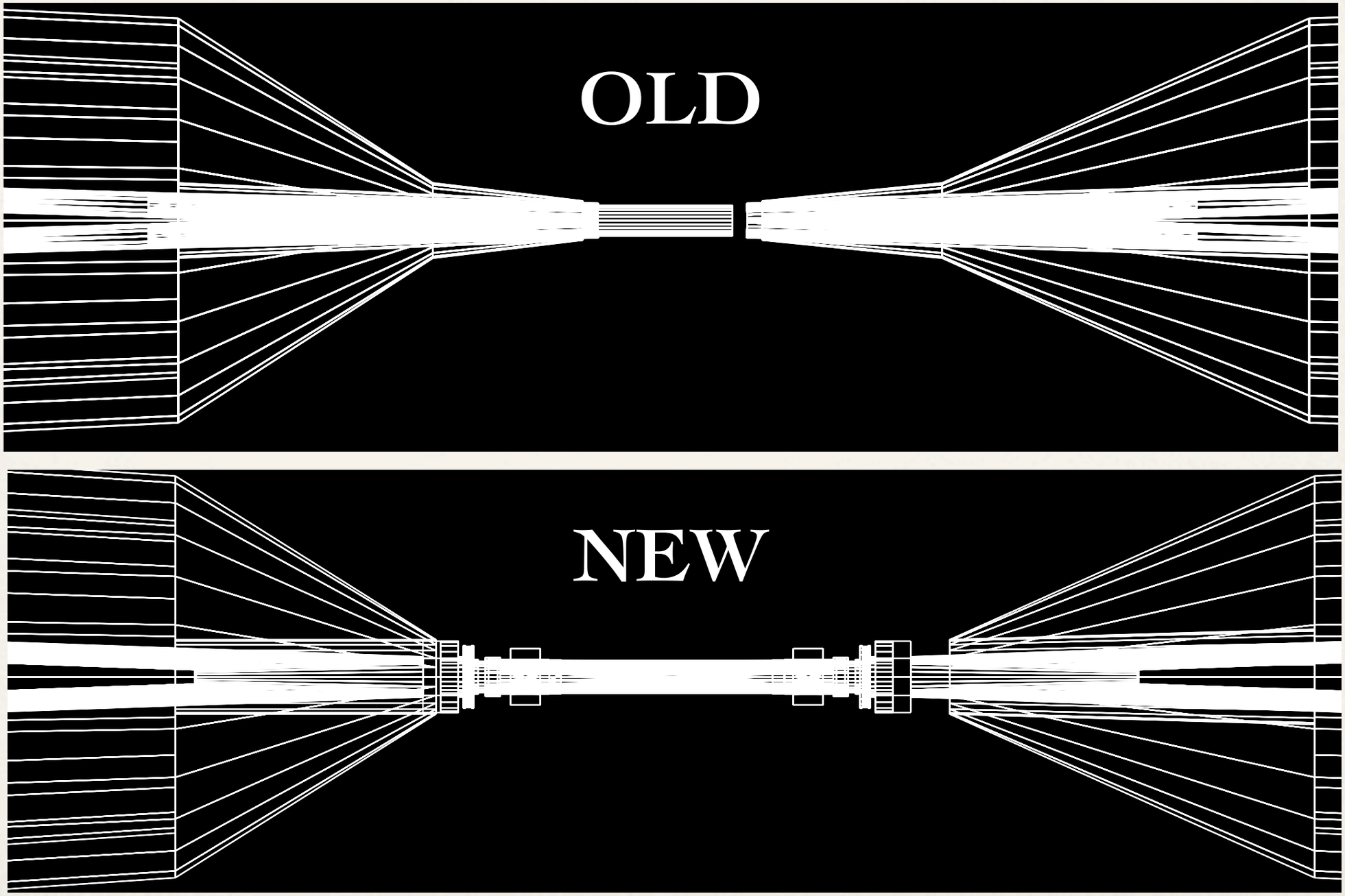






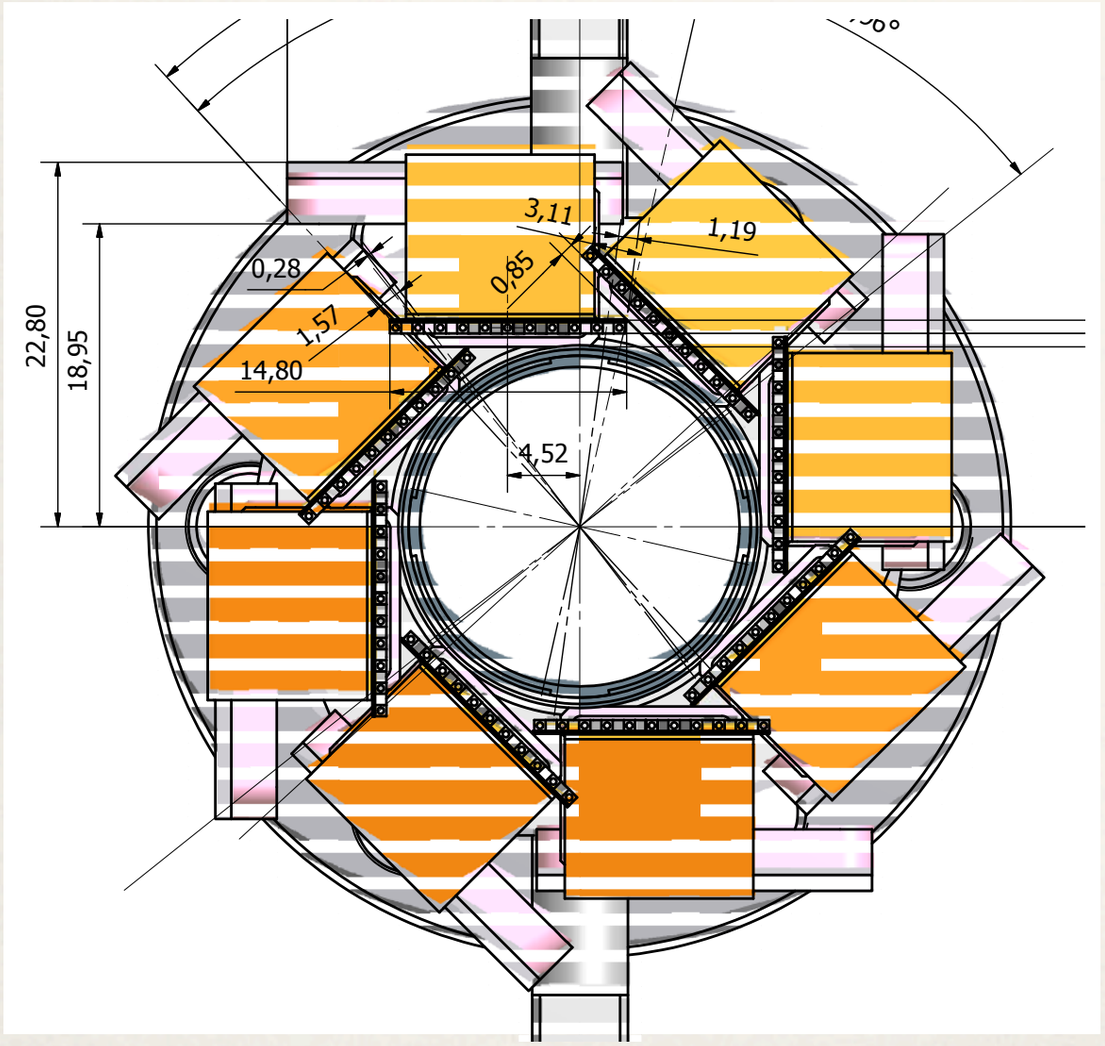
New geometry around IP (top view)

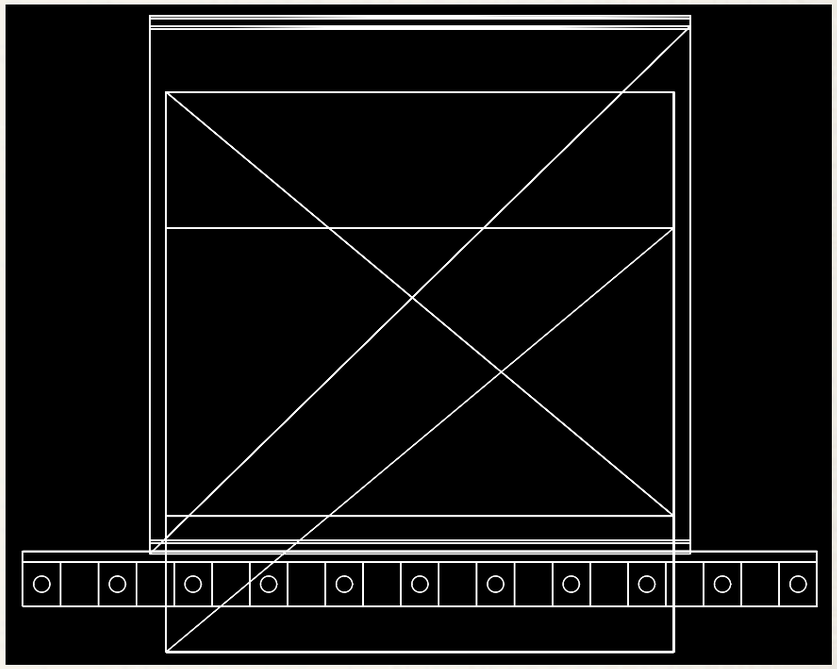
- Reduced tungsten shielding (beaks removed)

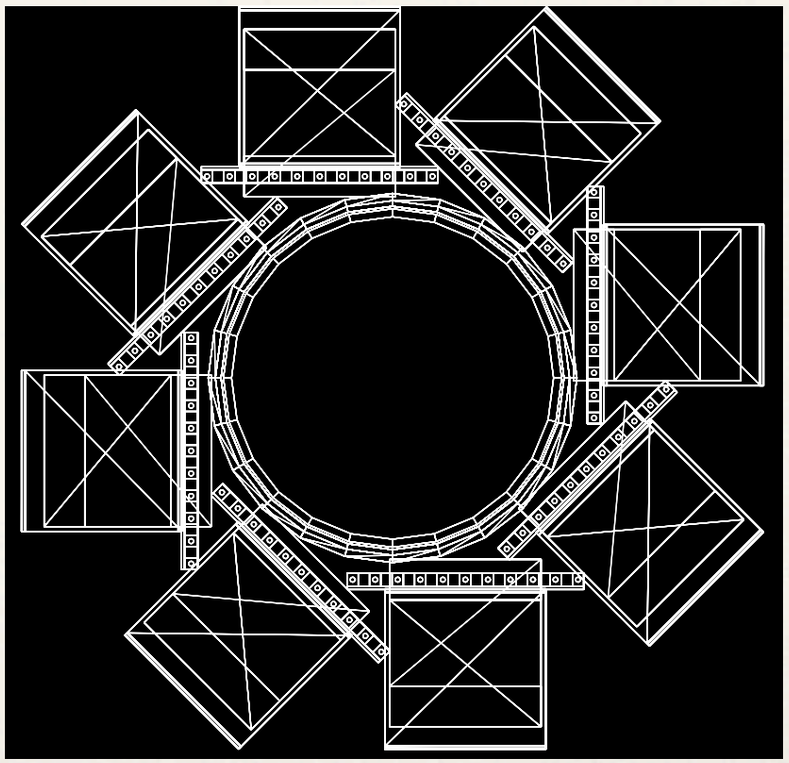


New geometry around IP

- Pinwheeled L0
- Min radius 13 mm, max 18 mm

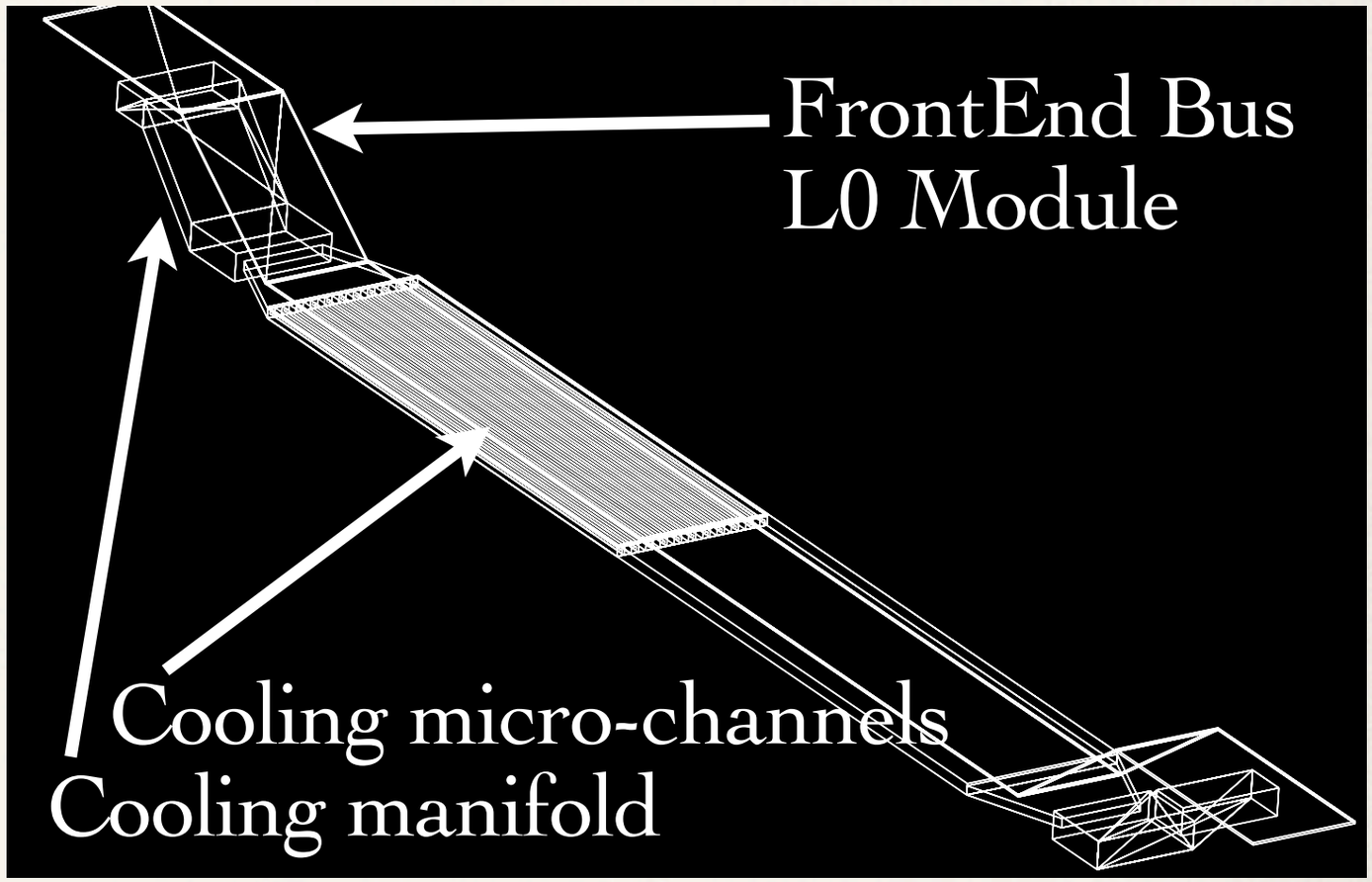






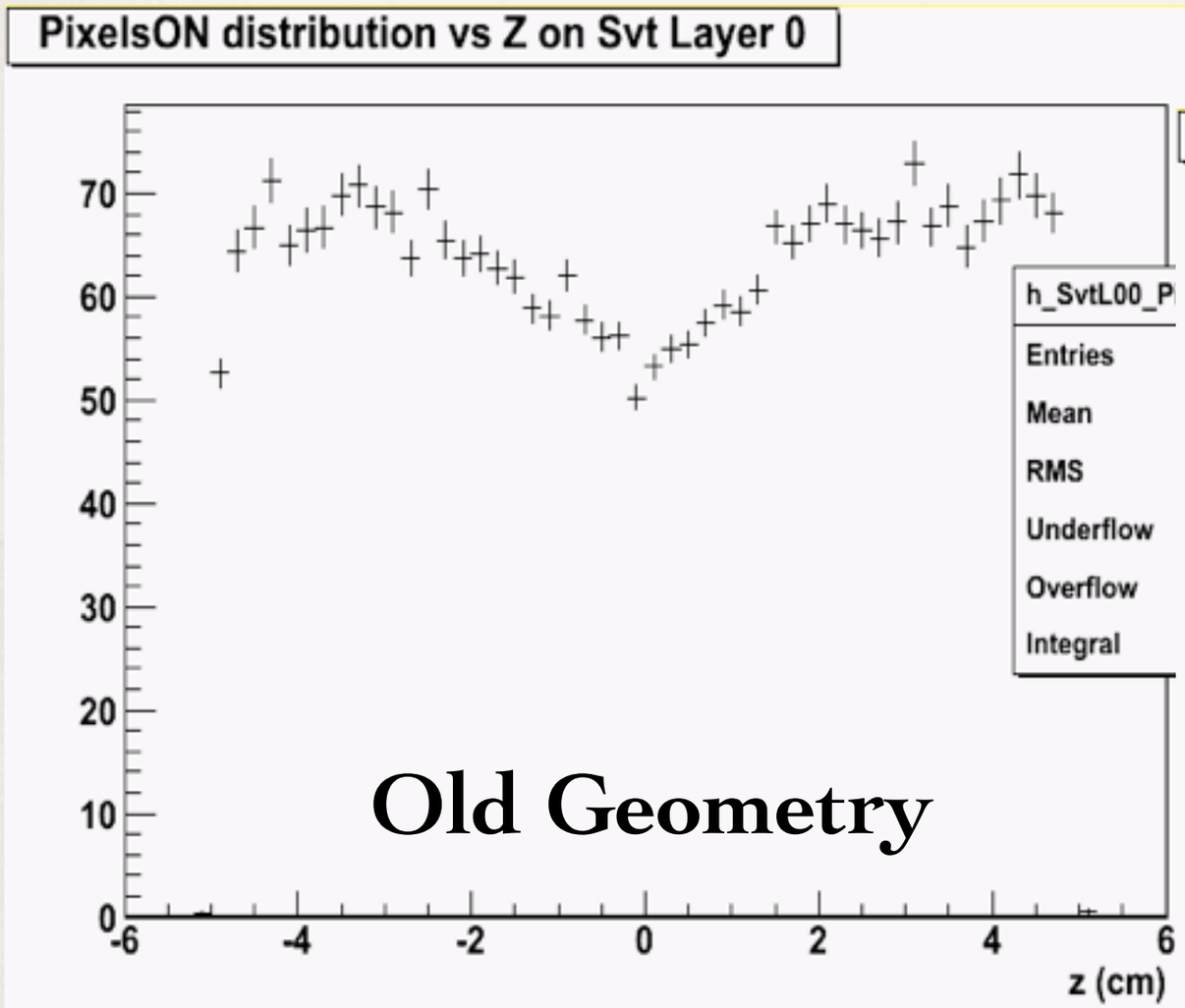
New geometry around IP

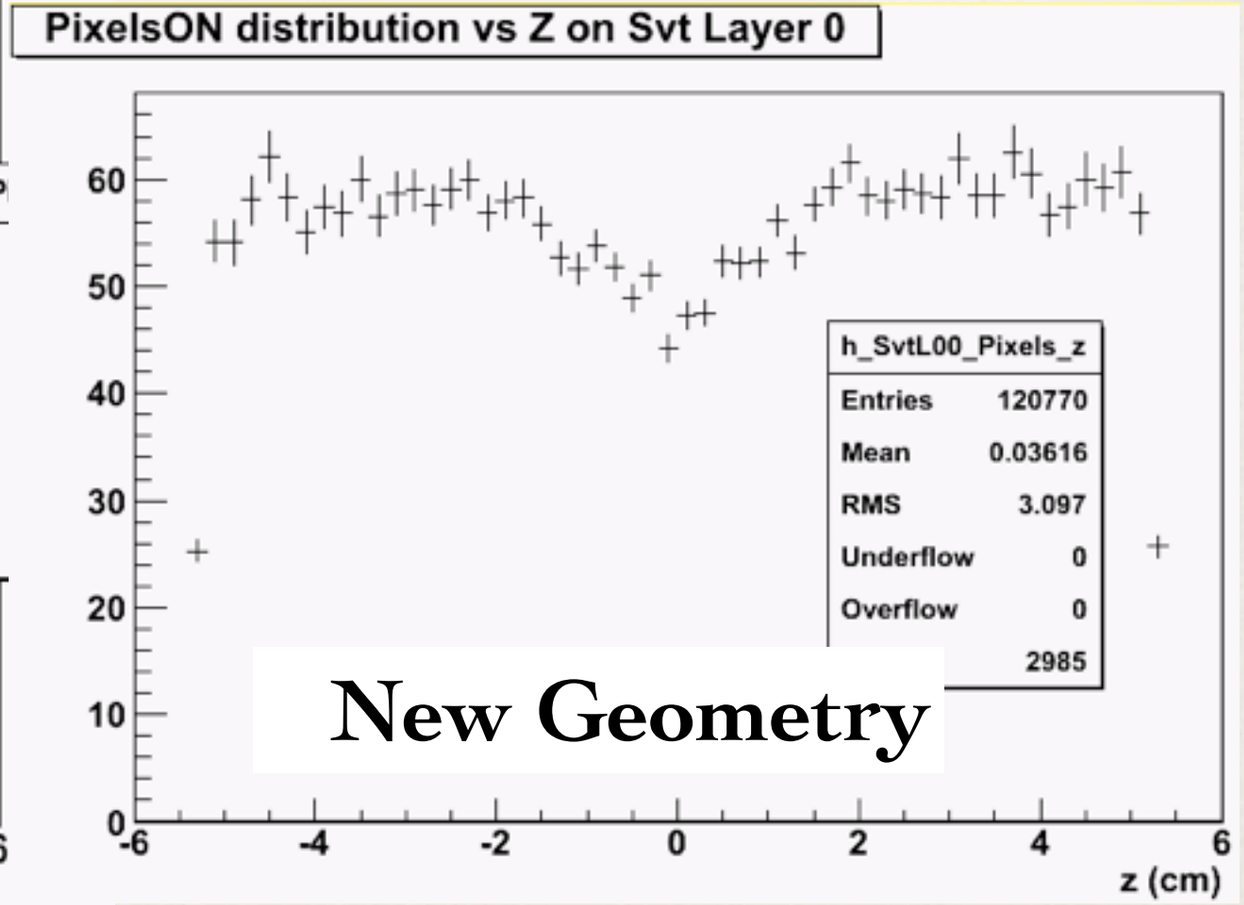
- Hdi implemented but missing in the committed geometry due to a mistake, no new estimation for HDI doses



SVT Background: 2photon

- Confirmed that lower cut on pT for 2photon has no effect on L0 rate
- Rate is slightly decreased but still higher than requested, 56 MHz/cm2 (was 64)
- Shape is the same



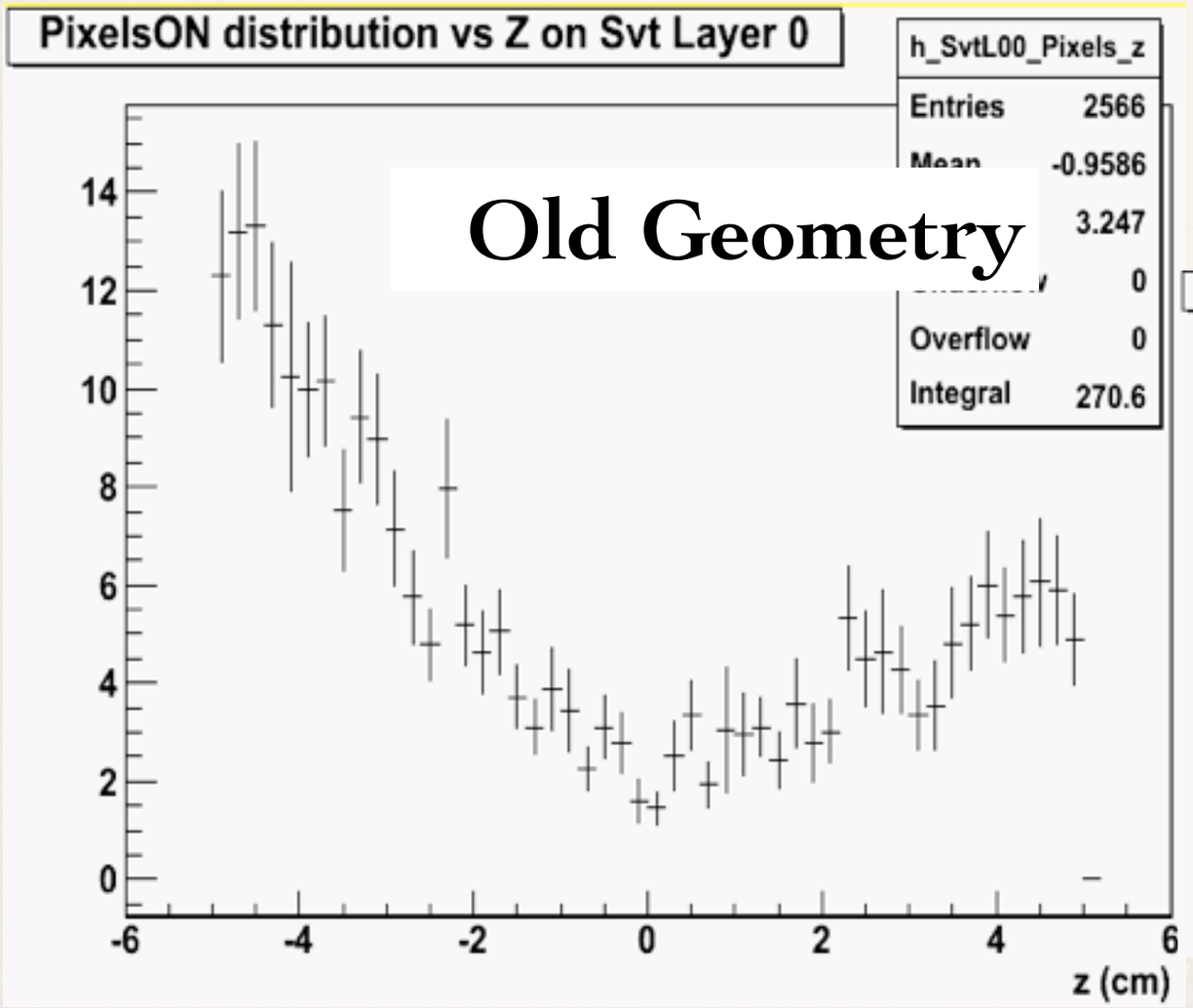


SVT Background: RadBhabha

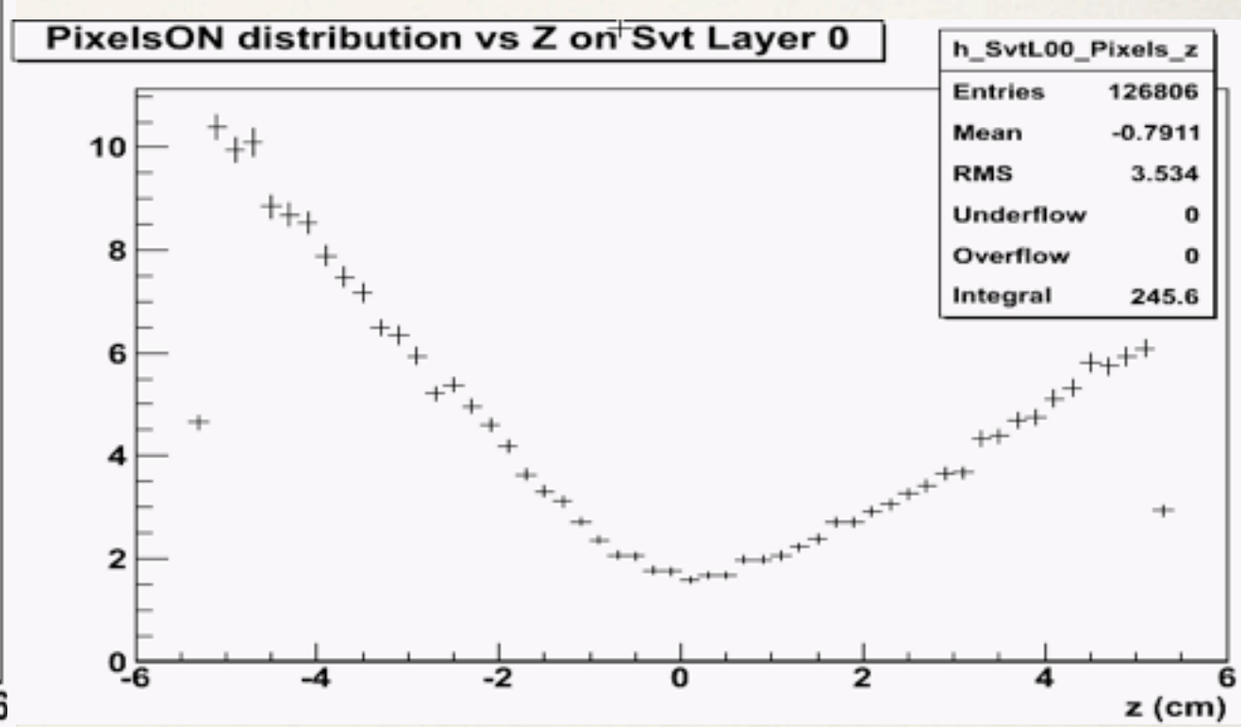
- L0 rate decreased as well, 4.6 MHz/cm2 (was 5.4)
- Shape again is the same

Note: B field Off

Old Geometry

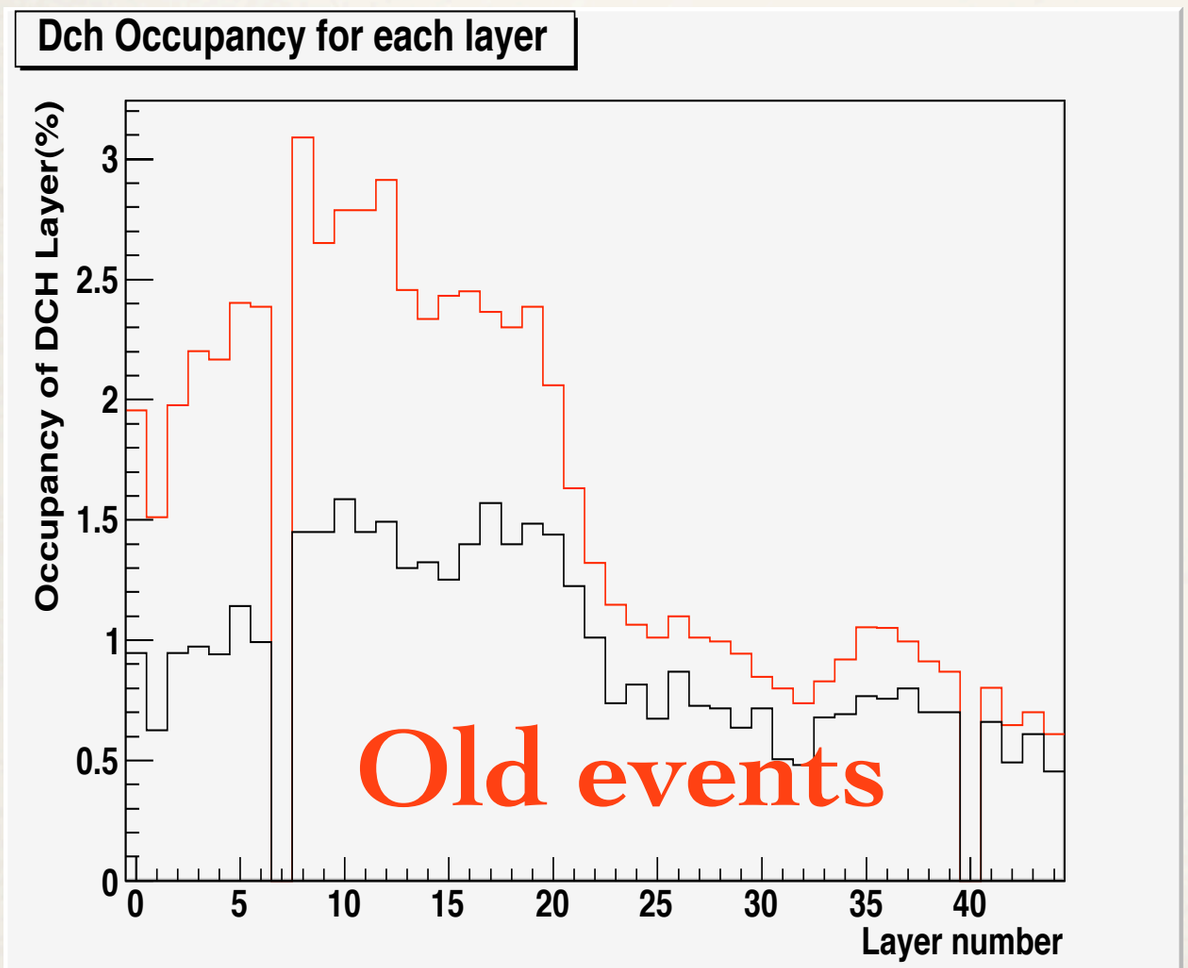


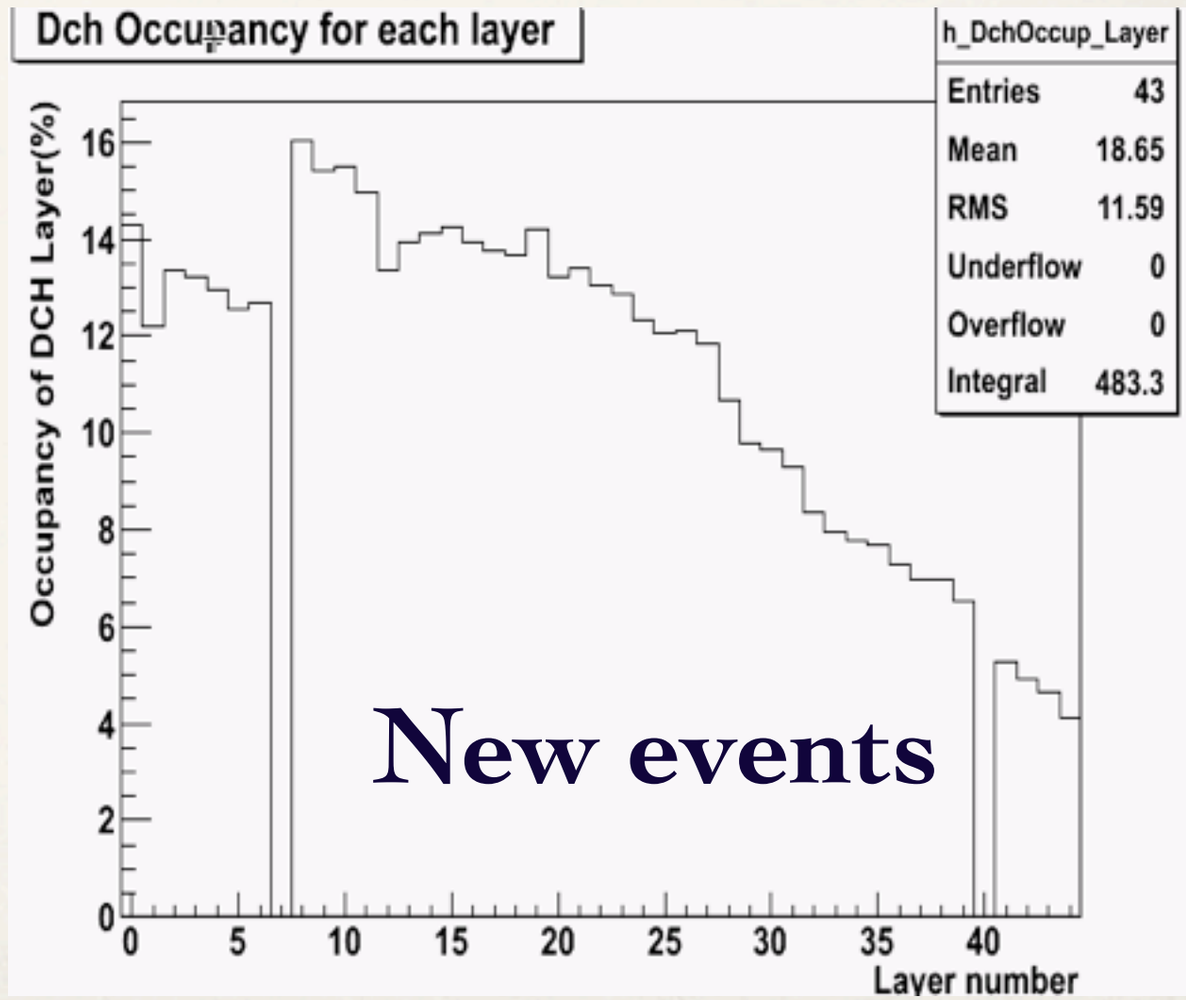
New Geometry



DCH background: 2photon bkg

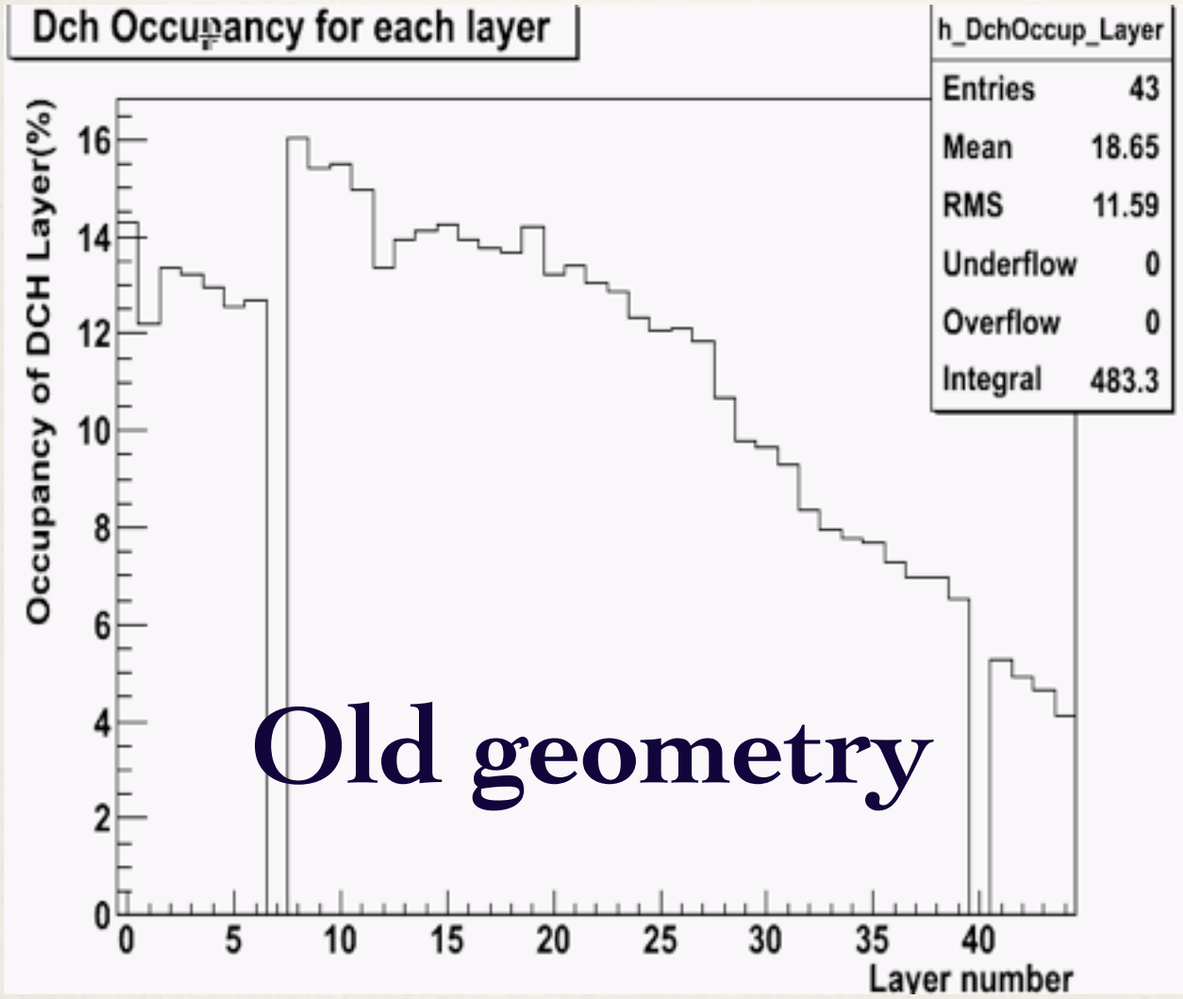
- New events, old geometry: much higher occupancy: 1.5% -> 10.5%
- Lower cut on pT seems to have a big effects on Dch rate, but **Very preliminary results** (aka it could be a bug in my analysis code)
- Keep in mind that method to calculate occupancy is not yet validated

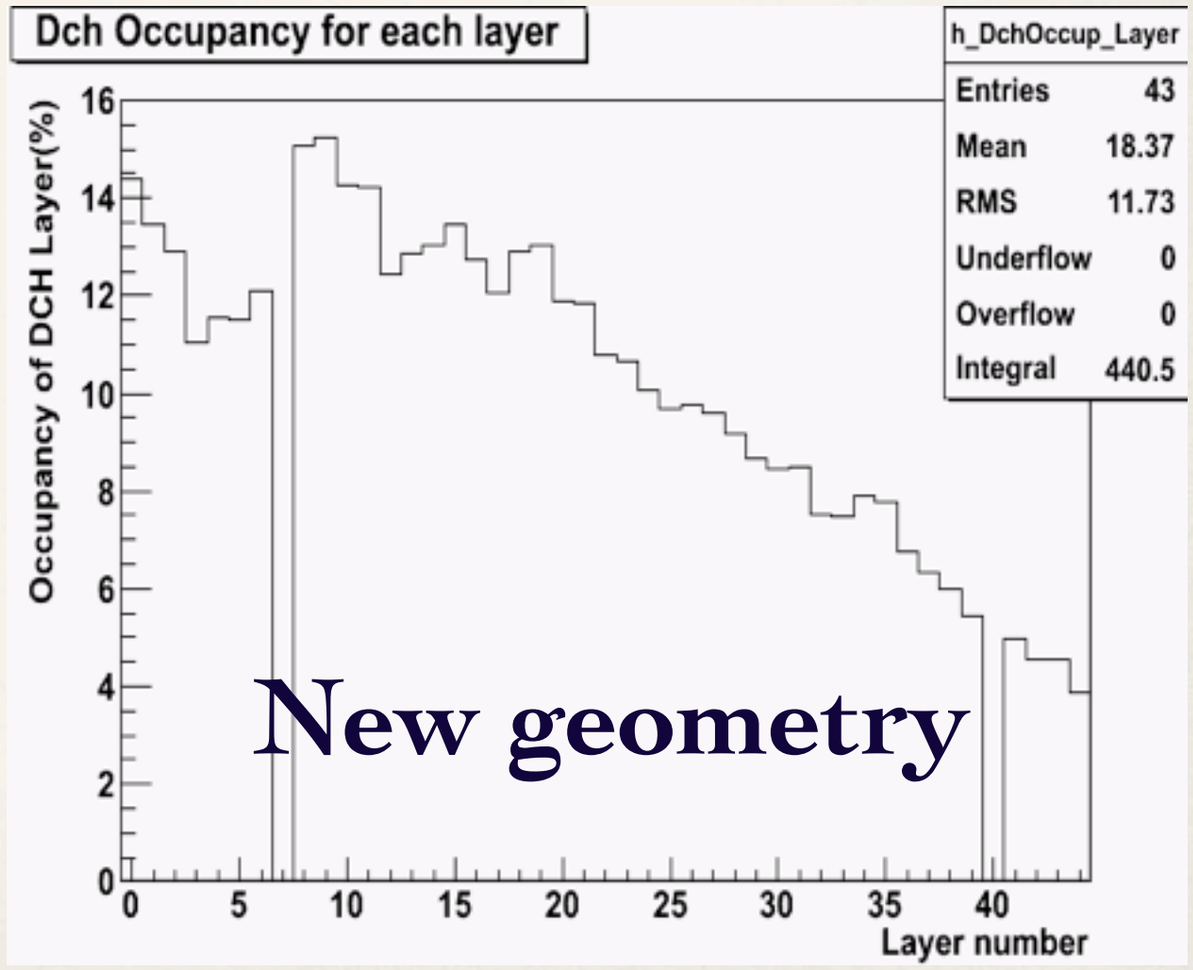




DCH background: 2photon bkg

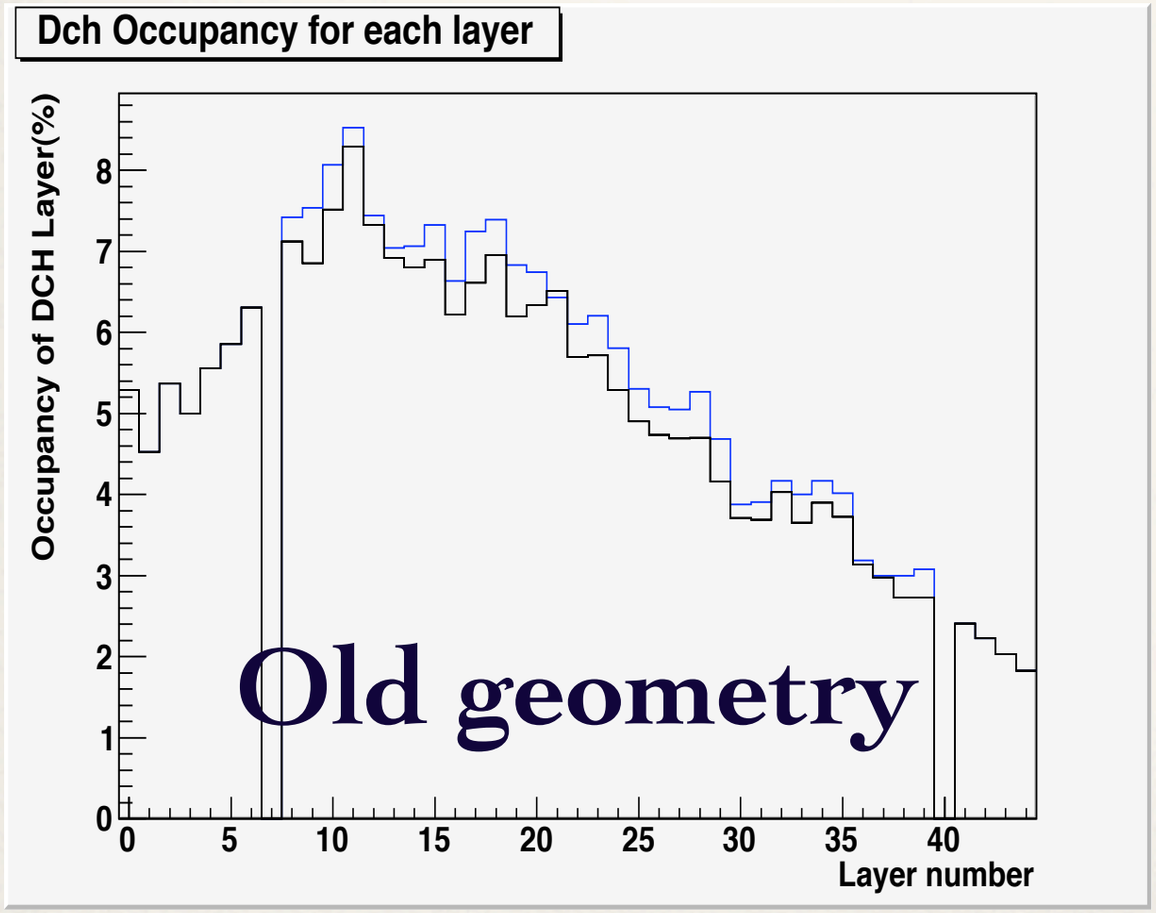
- Just for comparison occupancy with new geometry is slightly better: 10.5% -> 9.6%
- Agree with a previous study from Dana, lower bkg removing the tungsten beaks

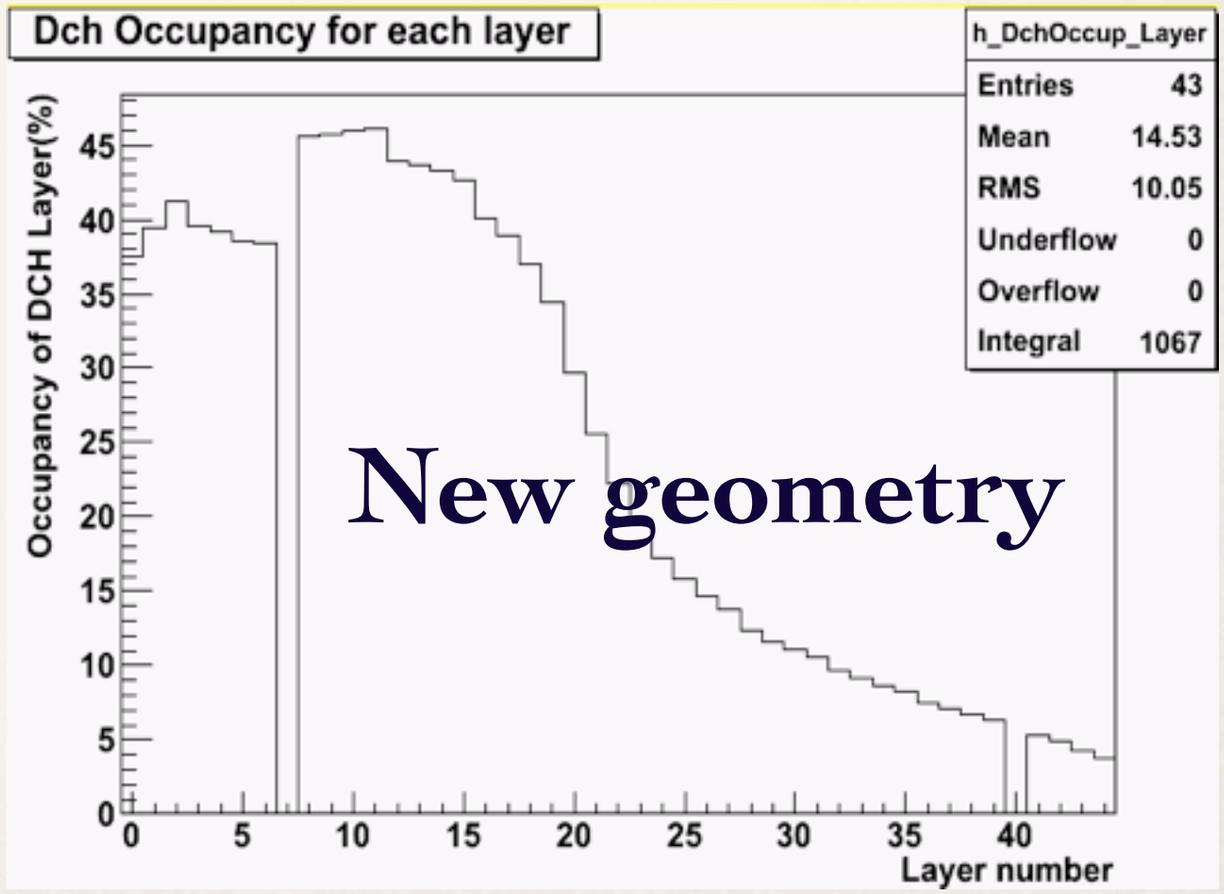




Dch background: RadBhabha bkg

- Again big increase in occupancy, bug in the code can be the culprit again: 5% -> 20%
- Statistics is now enough (1M interactions)
- Still under discussion the DeltaE cut on radiated photon

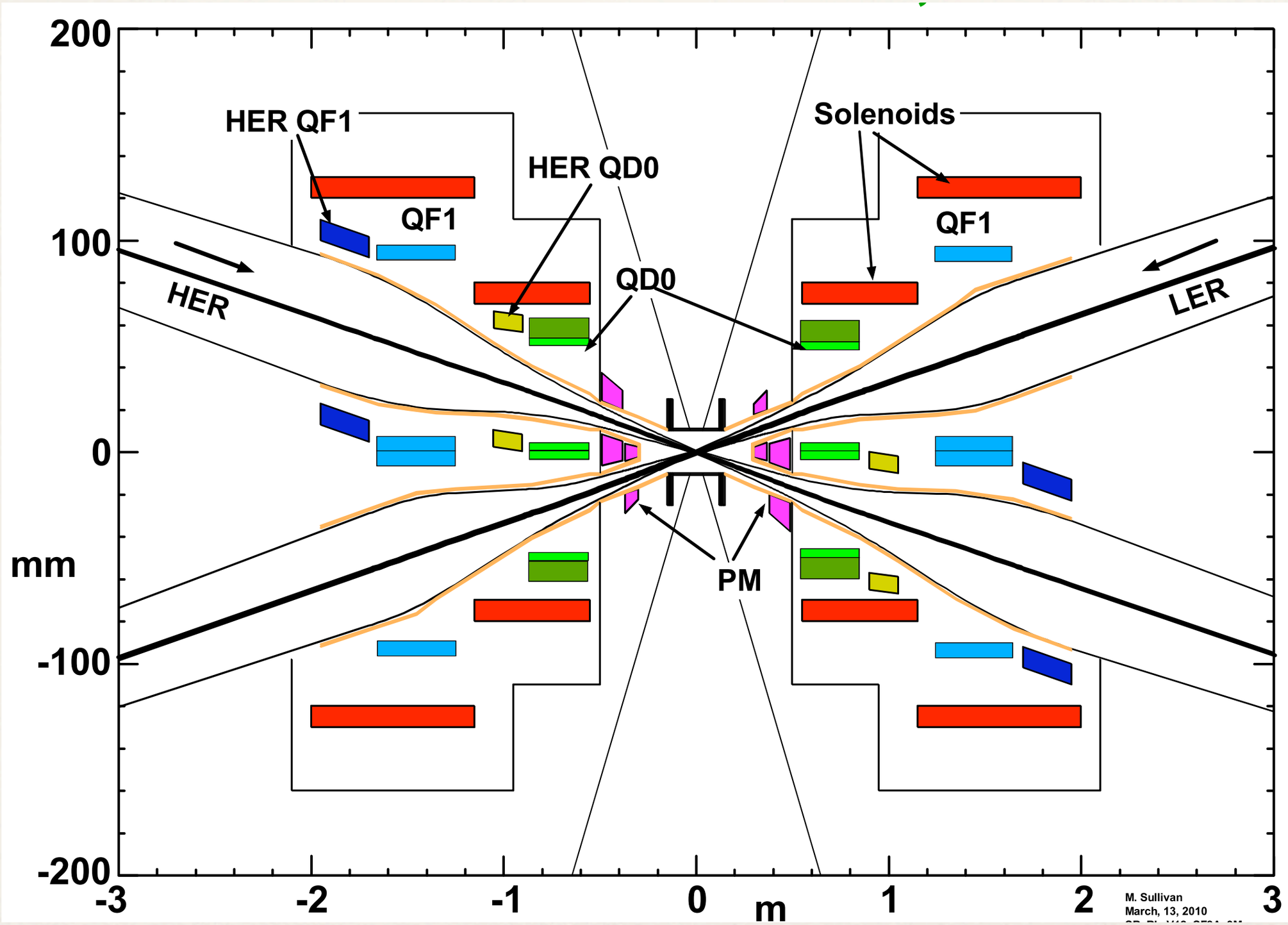
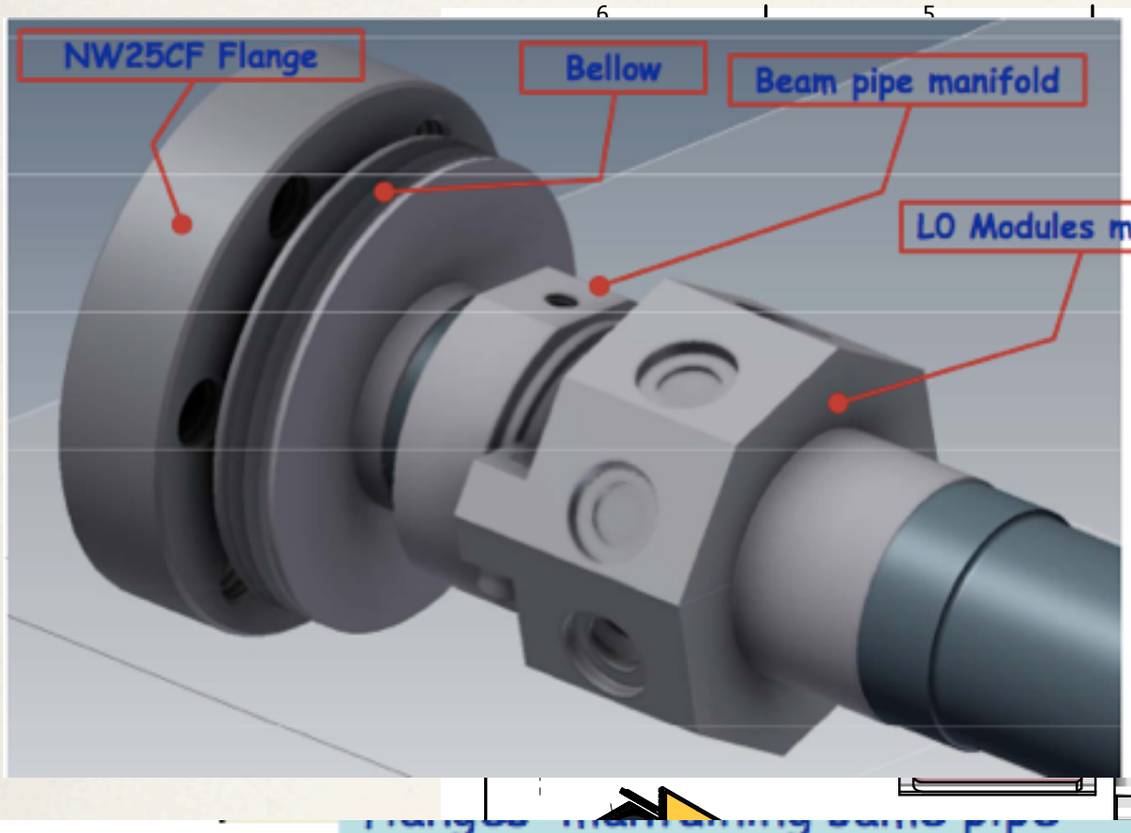
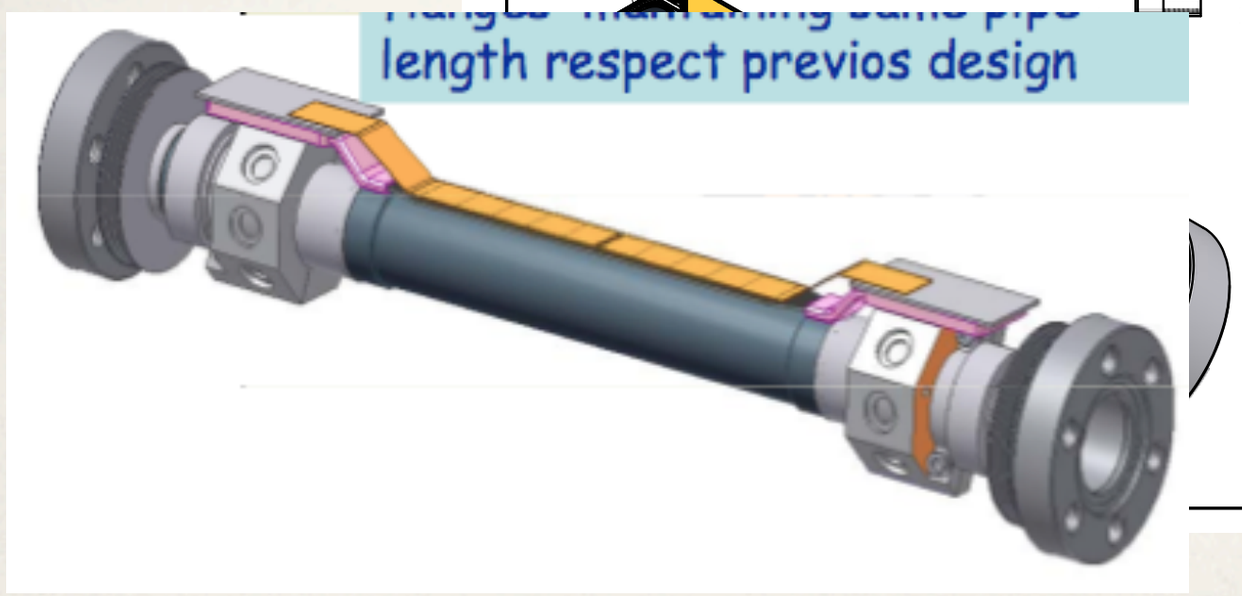
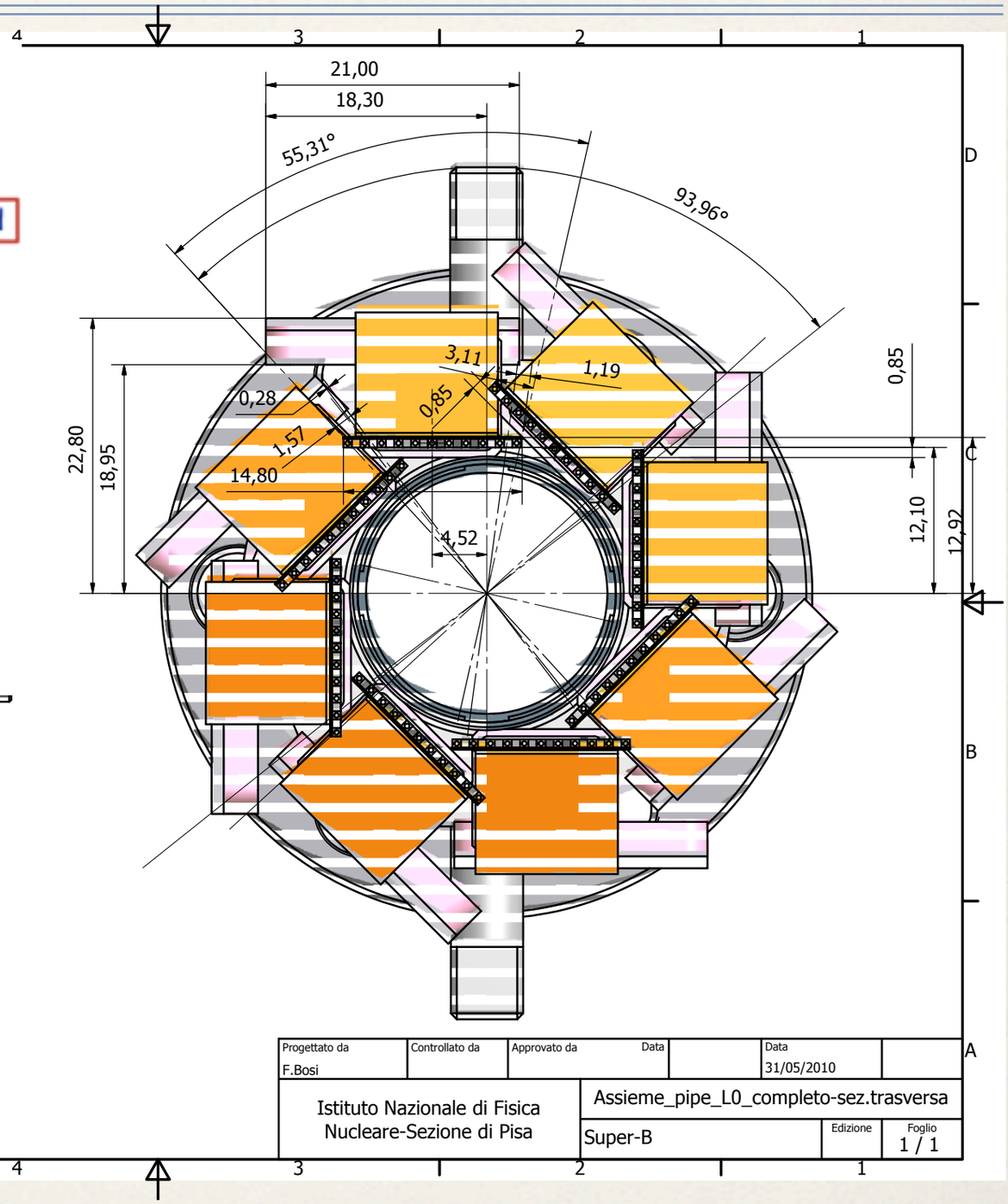




Conclusions

- RadBhabha statistics is enough, but more 2photons events are needed (now easy to produce)
- Implemented new IP and L0 geometry, more realistic and close to present design
- New design has not a big impact on L0 background
- Method to compute the Dch occupancy has to be validated to solve the simulation step length issue
- 2photon bkg at low pT can affect the occupancy
- Dch results have still to be understood

Mike S. design (Frascati Sep 10)



Filippo Bosi design