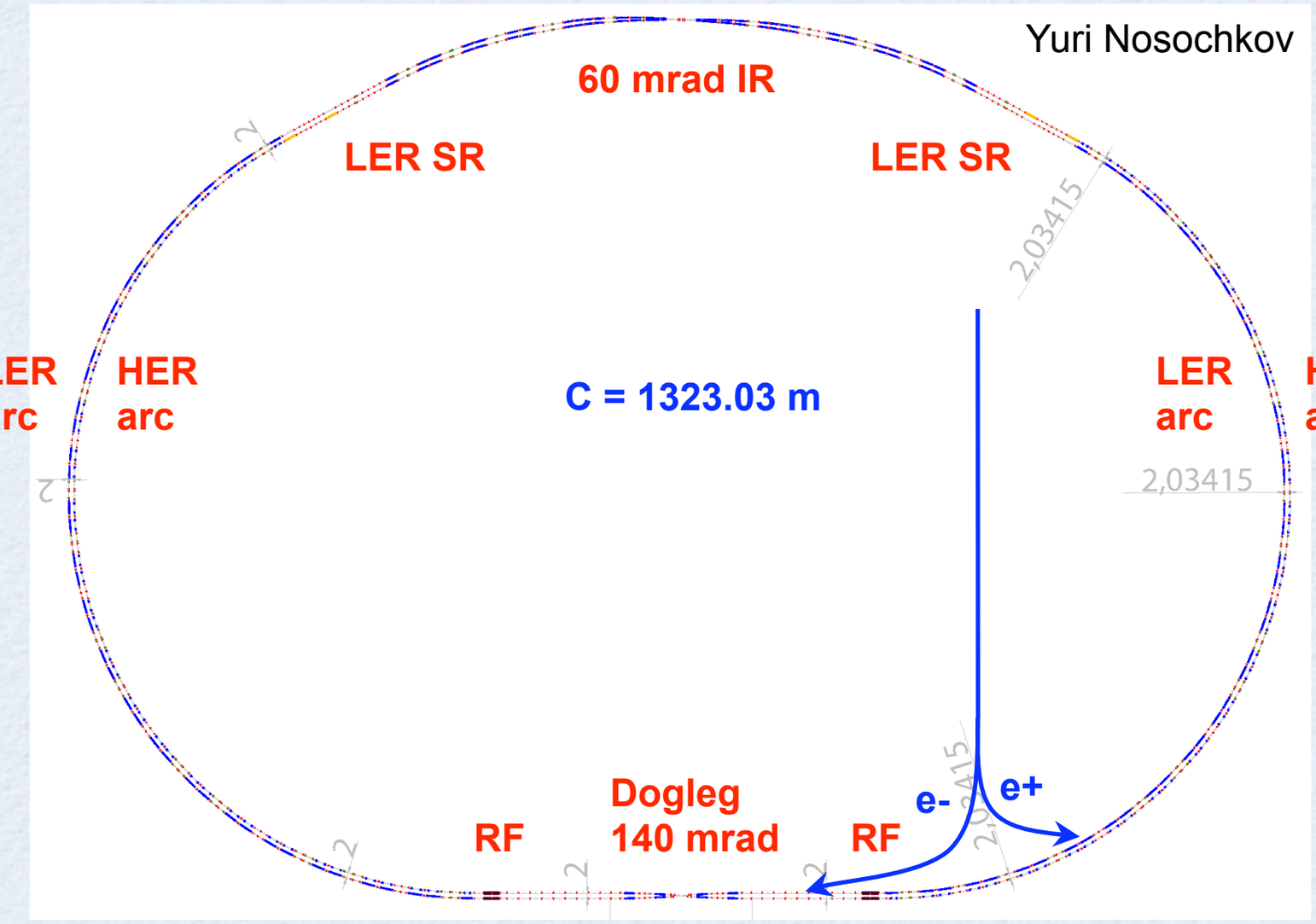
Machine Detector Interface

E.P. INFN & Università di Pisa

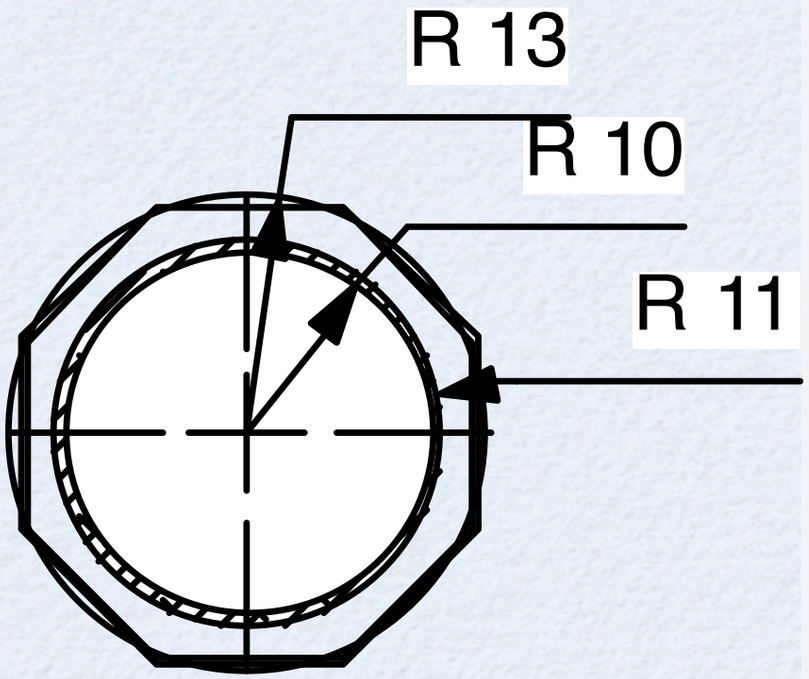
General remark

- Machine design is getting more and more real
- Backgrounds (and their issue) too

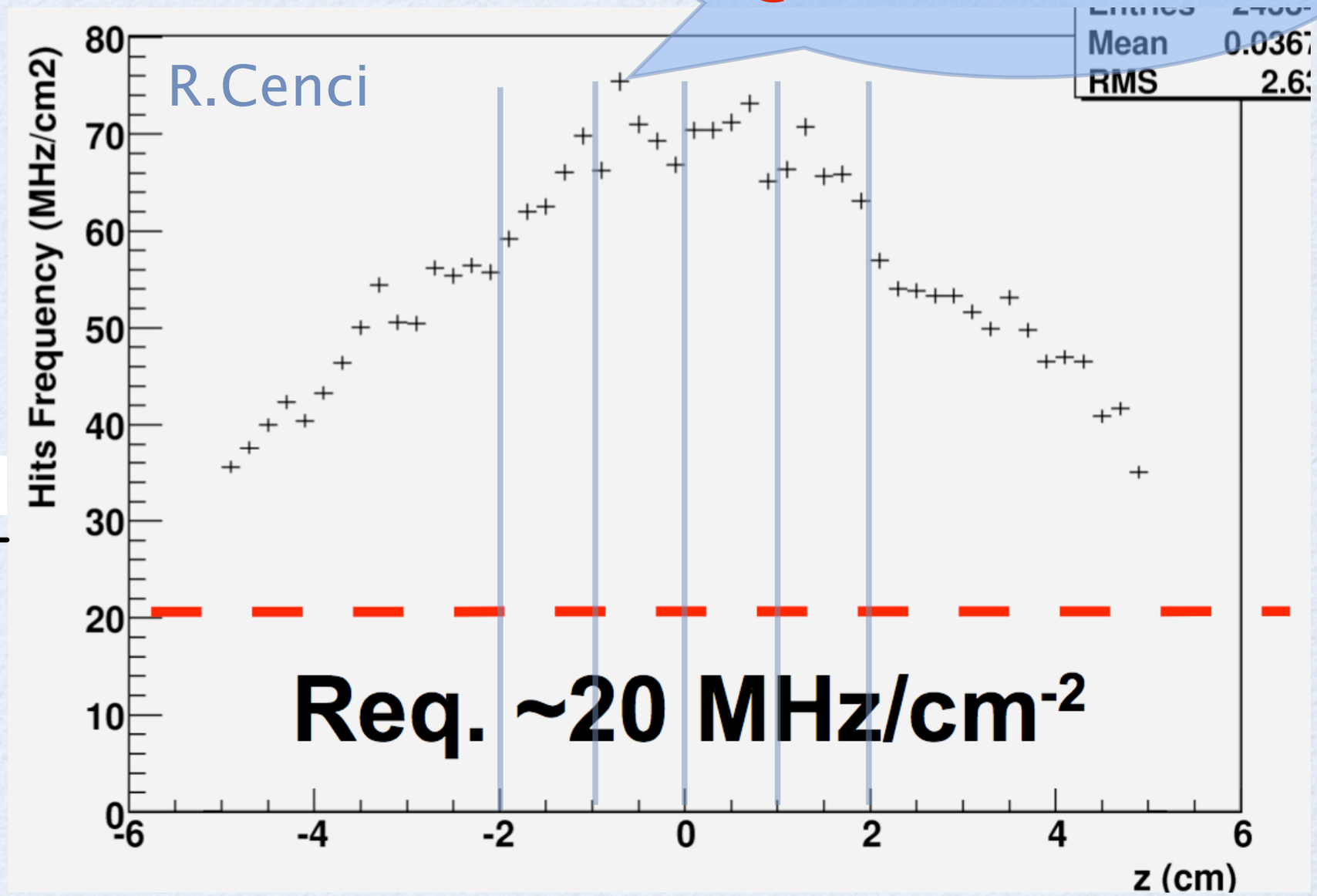


Pairs production

- Baseline configuration:
  - Beam pipe radius 10 mm, Be 1 mm, Au 10 micron
  - L0 radius 13 mm
  - B_z = 1.5 T

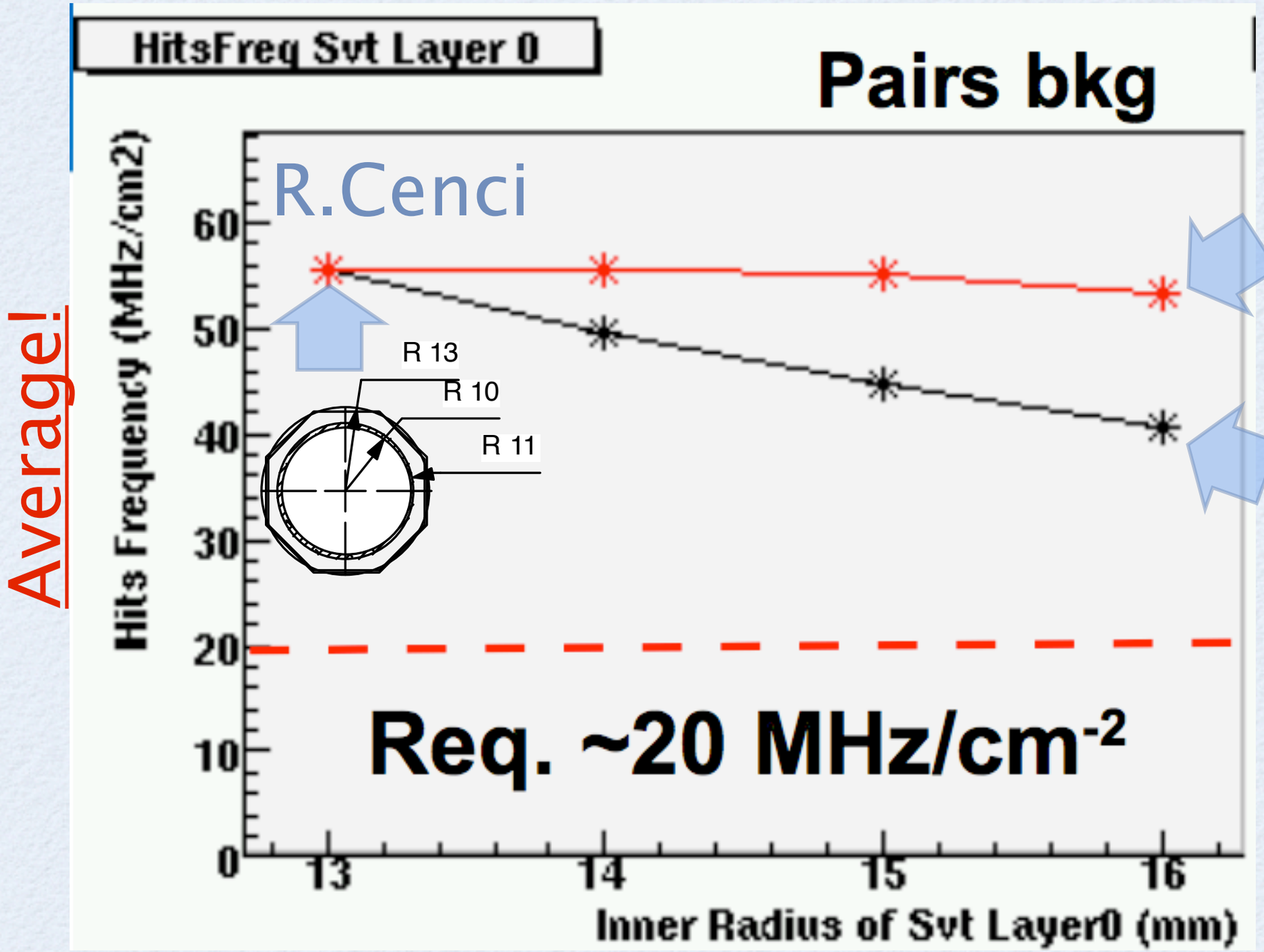


Brick wall
@ 100 MHz/cm²



Lesson learned I

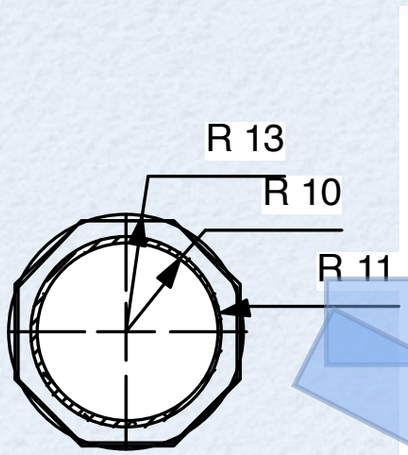
- Beam pipe radius as important as L0 radius

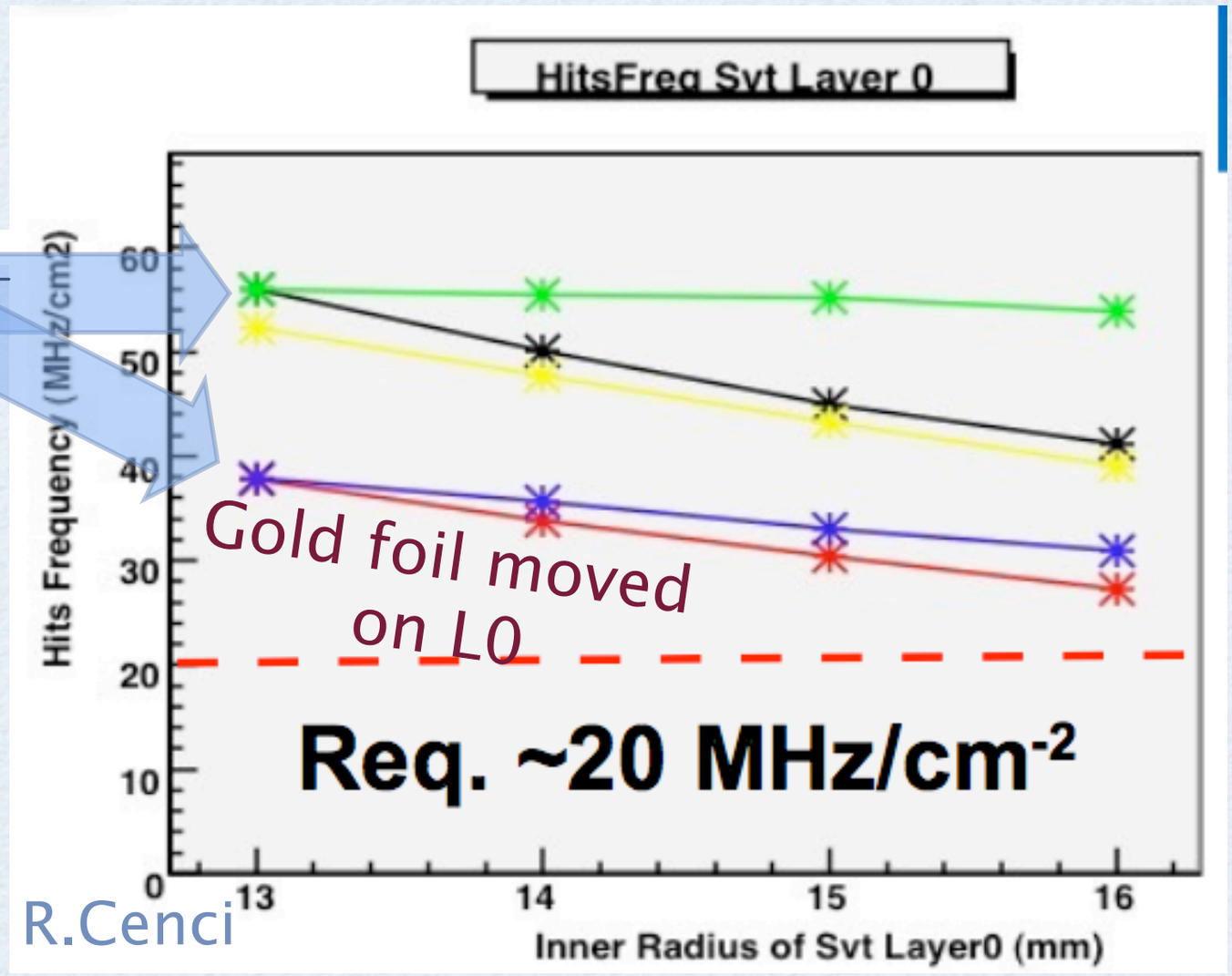


Average!

Lesson learned II

- Thinner better than ticker for pairs background (but you cannot survive without sync. rad. shielding...)



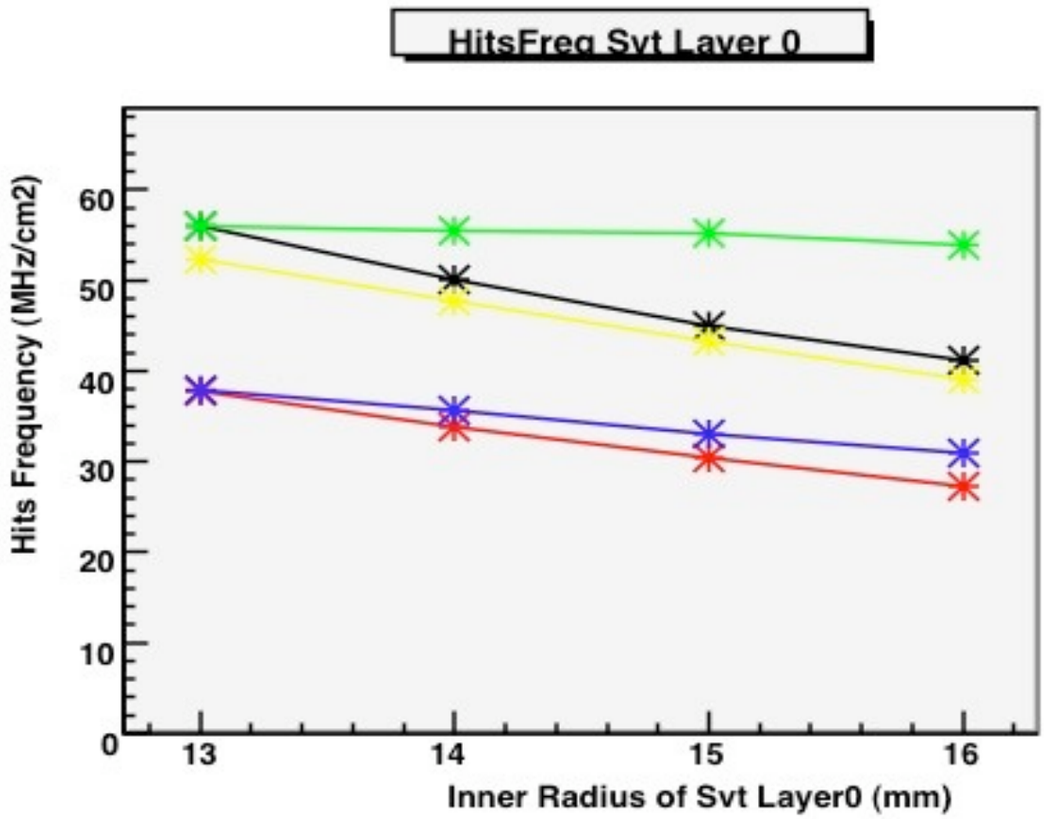


R.Cenci

Pairs production in SVT

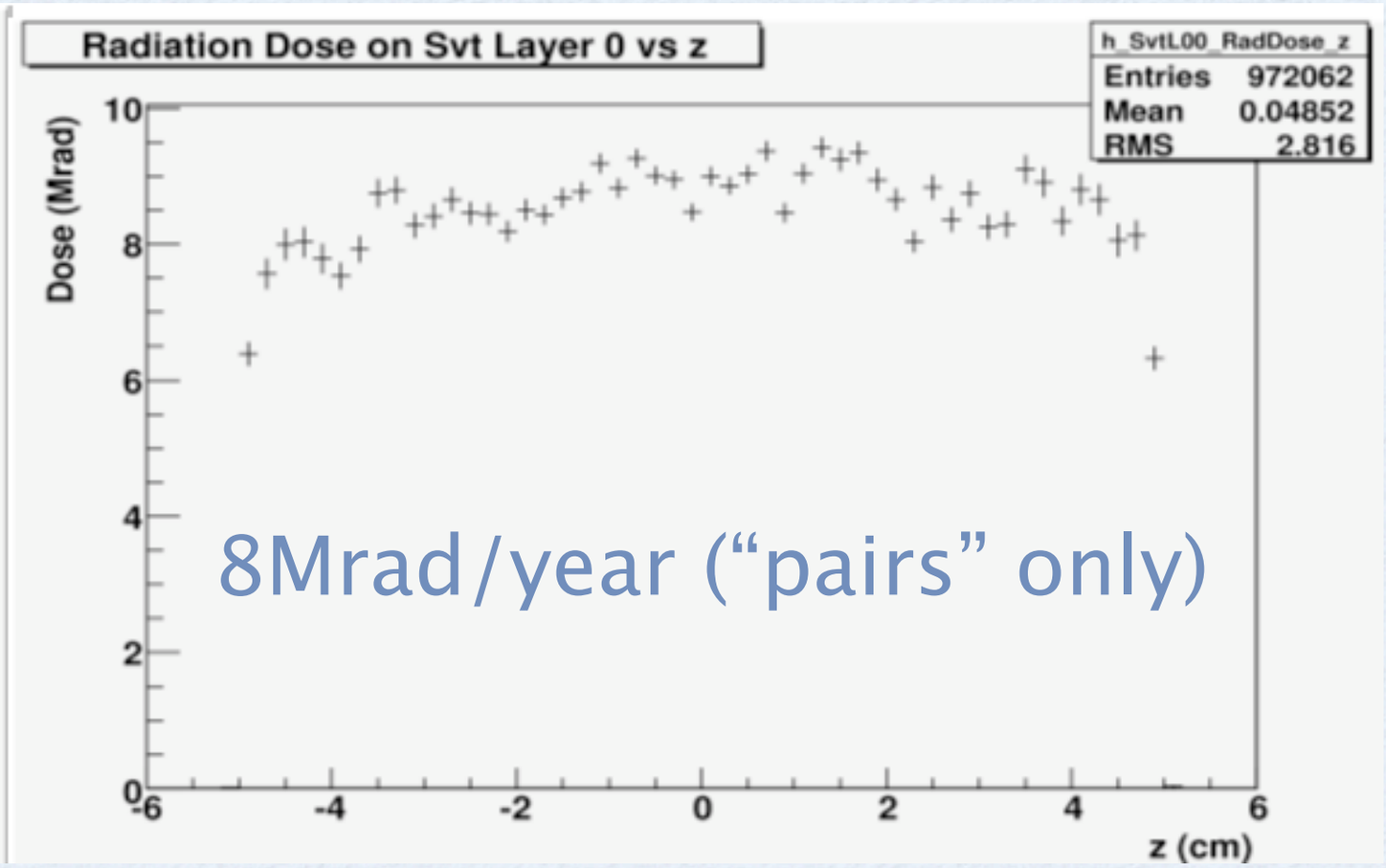
Comments

- Considering only pair production
- Results confirm to keep BP as close as possible to L0 (yellow vs green, not so effective when moving gold foil, blue vs red)



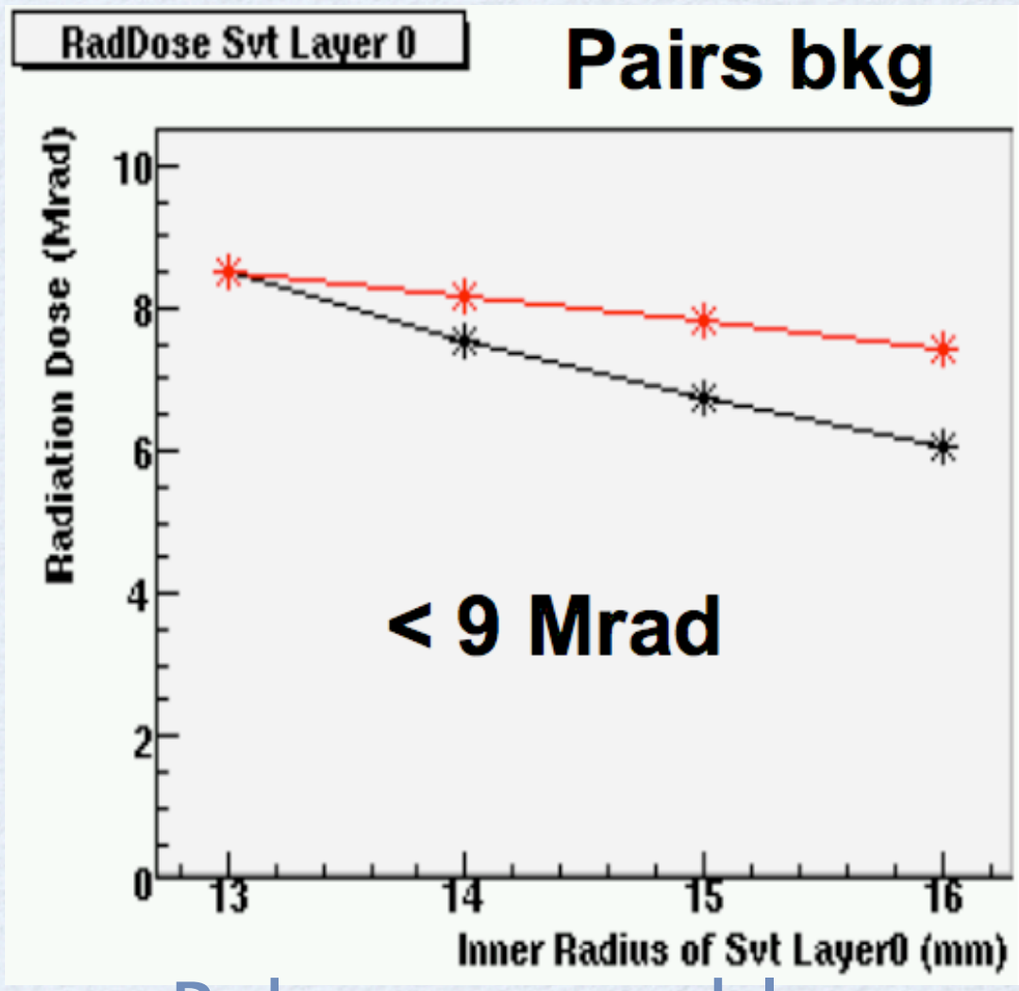
- Moving the gold coating form BP to L0 brings a nice improvement. The effect should be due to particles that arrive on the outer surface of BP: with a gold foil, they can be deflected more and are easy to hit the L0. Need to check if it's feasible technically
- Not useful to put gold coating on both BP and L0
- Omissis

Radiation Damage



8Mrad/year (“pairs” only)

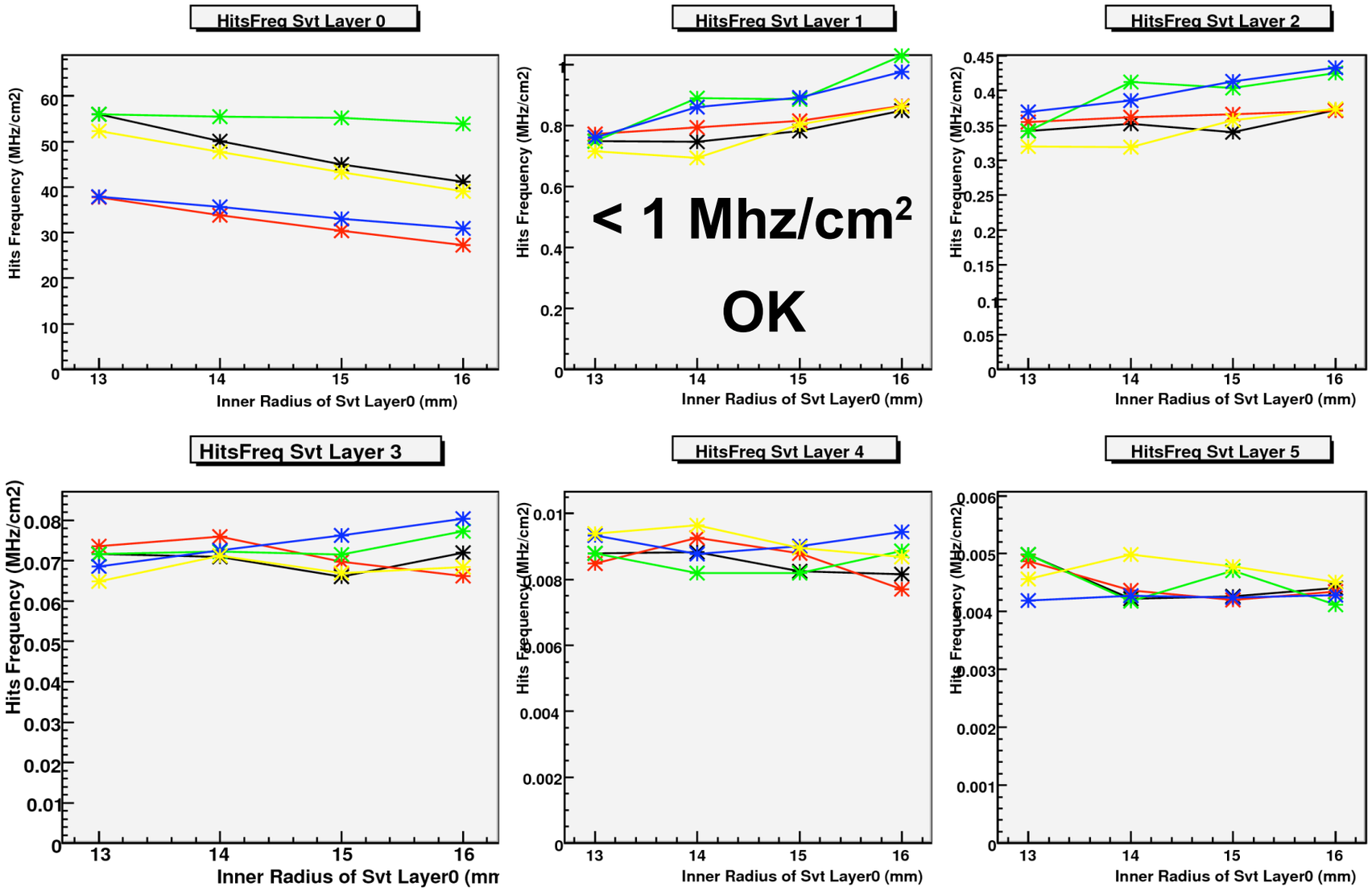
Flat in z



Behaves roughly as hit rates

Outer layers

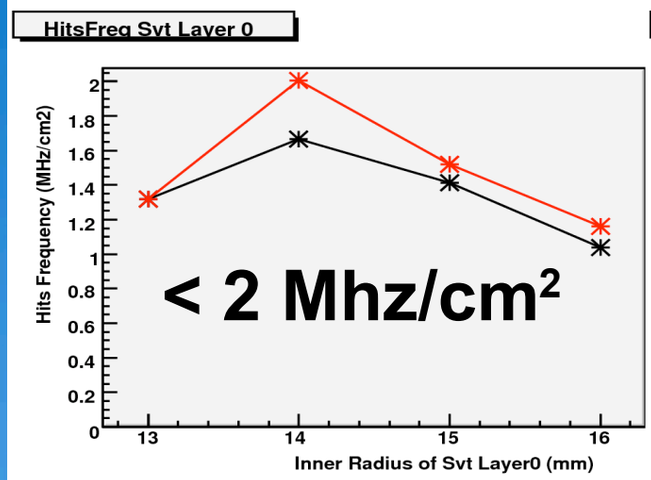
Results for Hits Frequency, outer layers

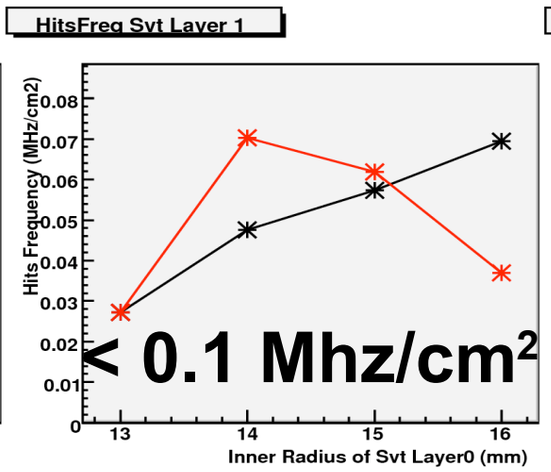


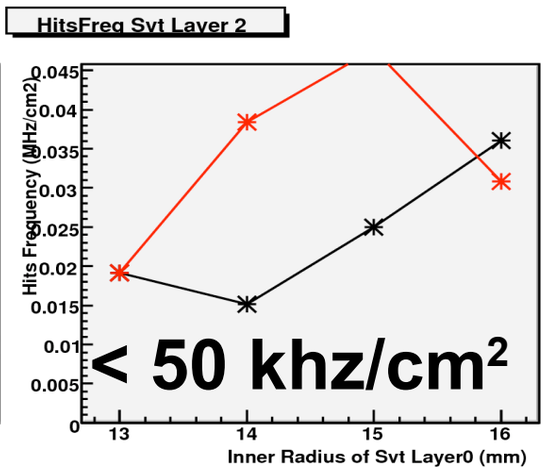
Beam Strahlung

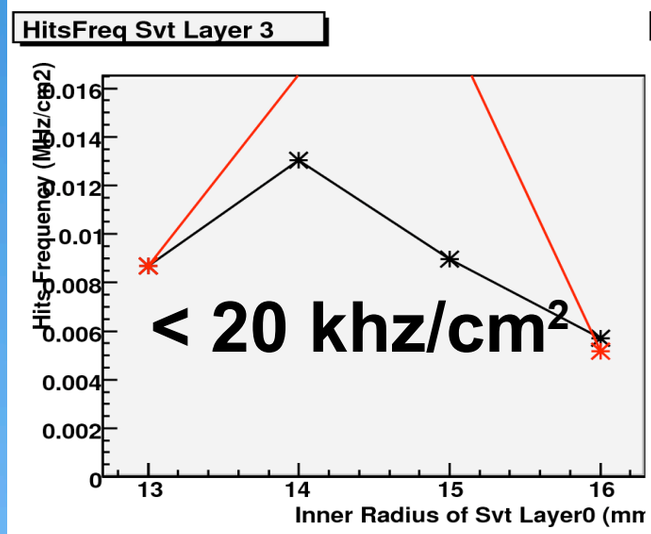
- General remark:
  Beam strahlung == radiative Bhabha

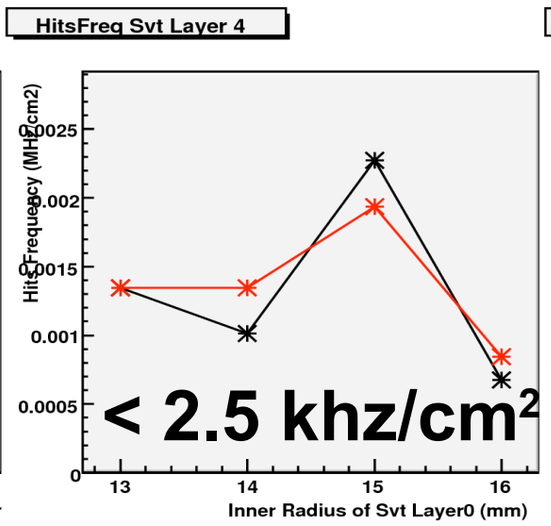
Hits Frequency, bbbrem bkg

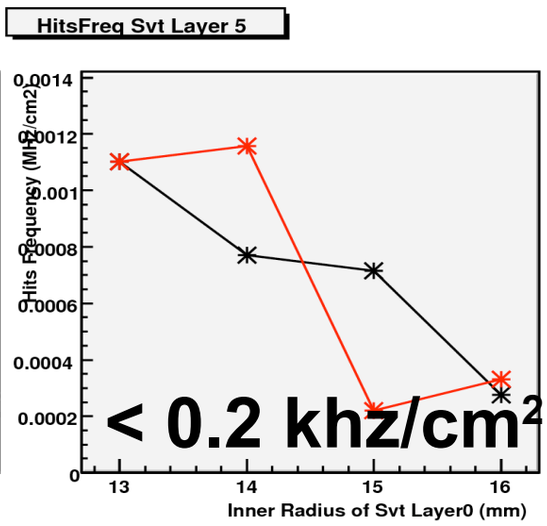








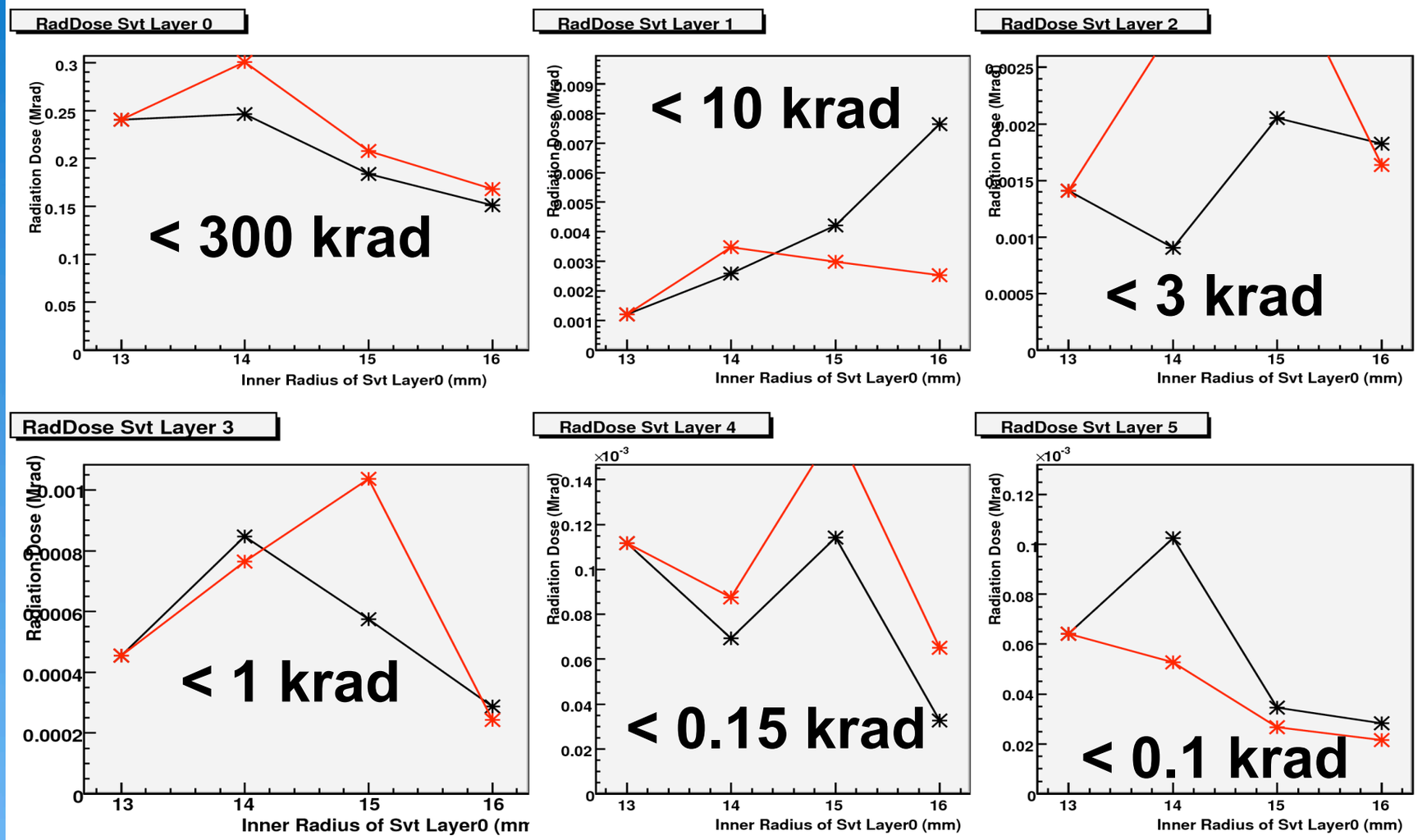




- Fluctuations due to lack of statistics, error bars needed

Beam Strahlung II

Radiation Dose (10^7 sec), bbbrem bkg

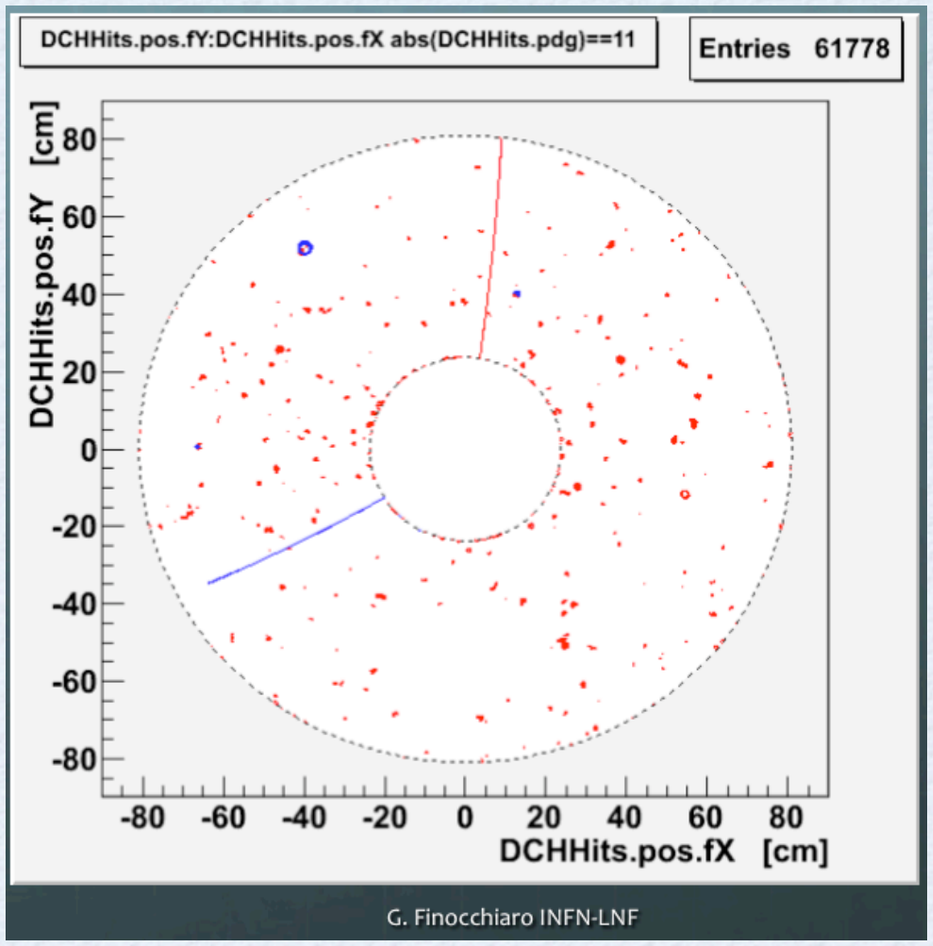


- Fluctuations due to lack of statistics, error bars needed

Drift chamber

- Two analysts (Giuseppe Finocchiaro + Riccardo Cenci) at work: critical mass reached (and sanity checks done)

6.1 microsecond of beamstrahlung

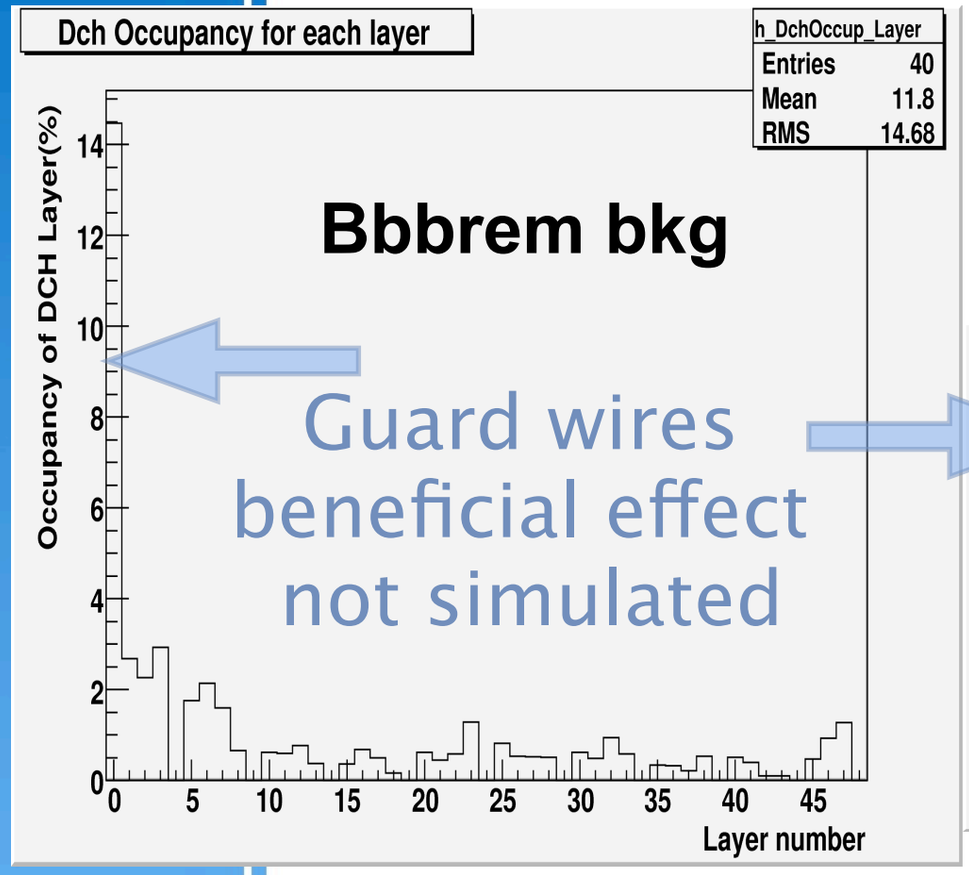


Giuseppe
preliminaries estimates
(3 cm Tungsten shielding)

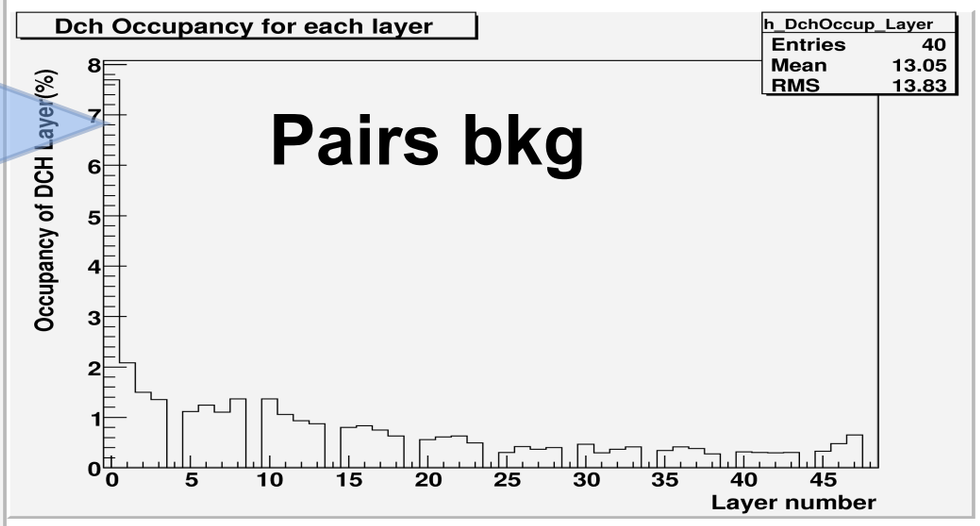
SLs	f_{axial}	$\langle N_{stereo} \rangle$	f_{stereo}
1,2,3	76/1344/6.1=0.93%	2764/18.2*0.051= 7.7	0.93%*7.7 = 7.2%
4,5,6	64/2048/6.1=0.51%	2764/18.2*0.060= 9.1	0.51%*9.1 = 4.6%
7,8,9,10	92/3712/6.1=0.41%	2764/18.2*0.071=10.8	0.41%*10.8=4.4%
1-10	232/7104/6.1=0.54%	2764/18.2*0.051= 9.1	0.54% *9.1=4.9%

Parallel analysis

DCH Occupancy per layer



Guard wires beneficial effect not simulated

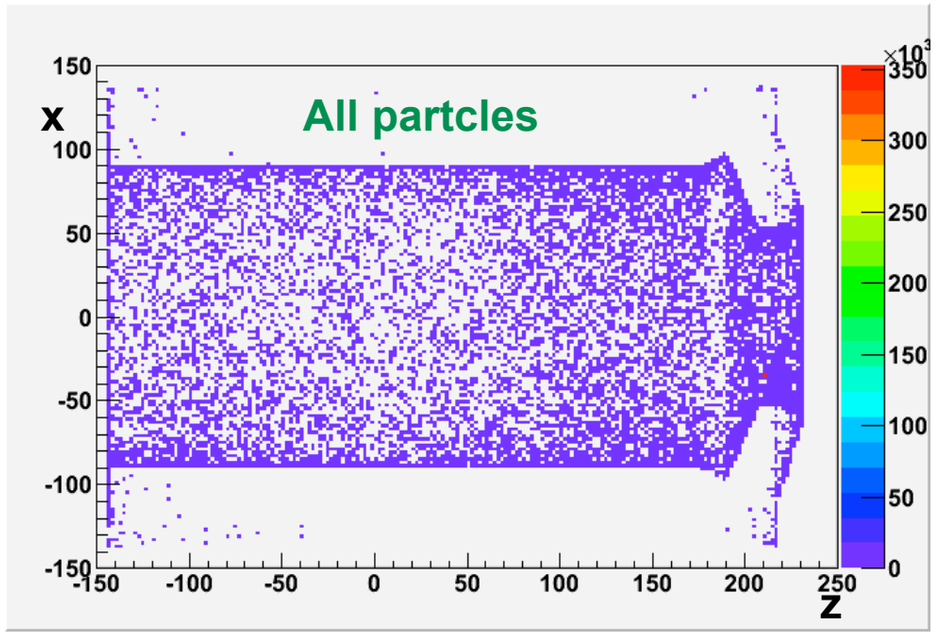


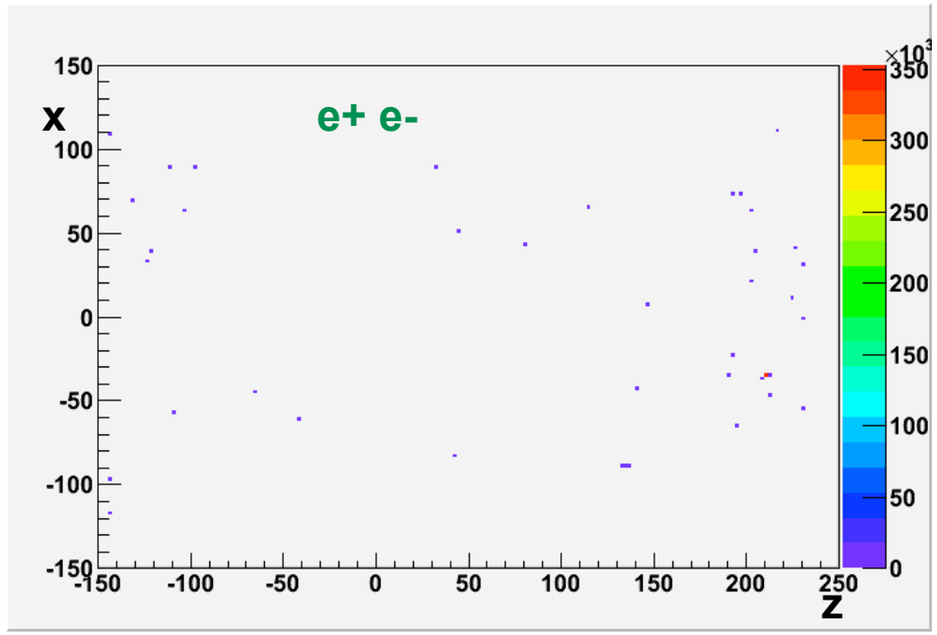
Only axial layers

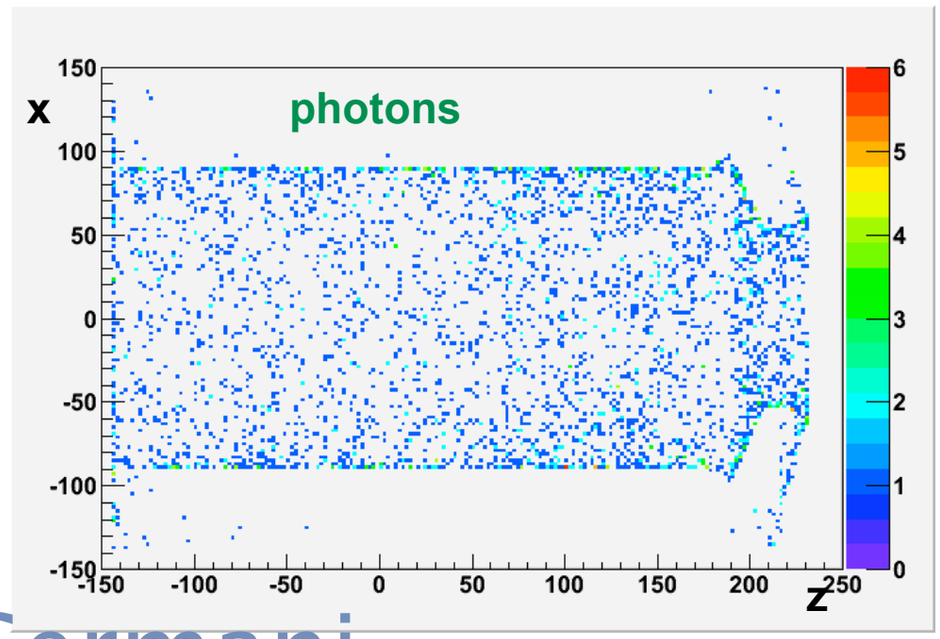
- Occupancy by layer, same y scale
- 22% total on layer 0, it can be shielded by guard wire
- Reasonable occupancy on other layers, correlated with radius

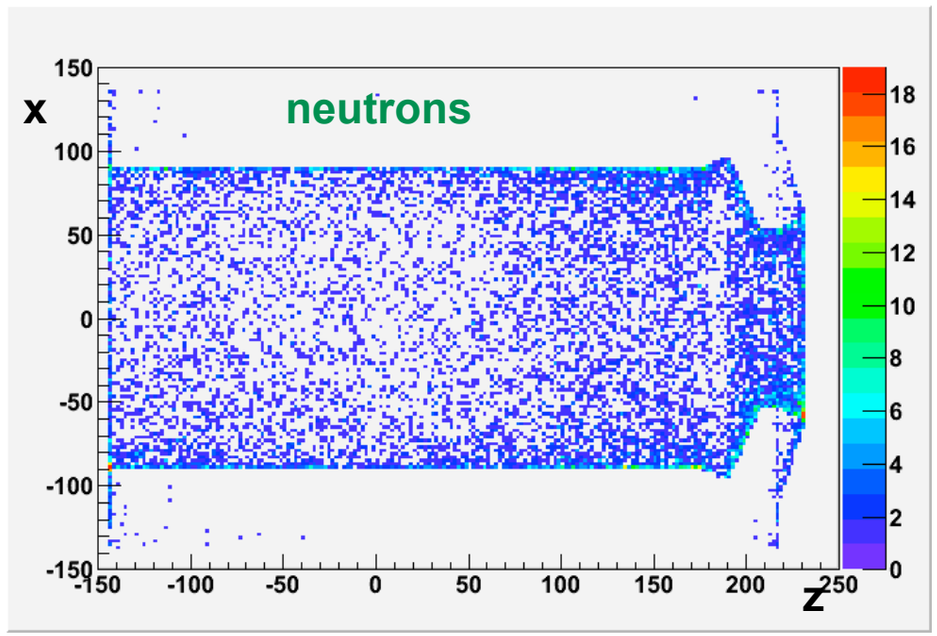
EMC: particle fluxes

Backgrond partcles entering the EMC volume





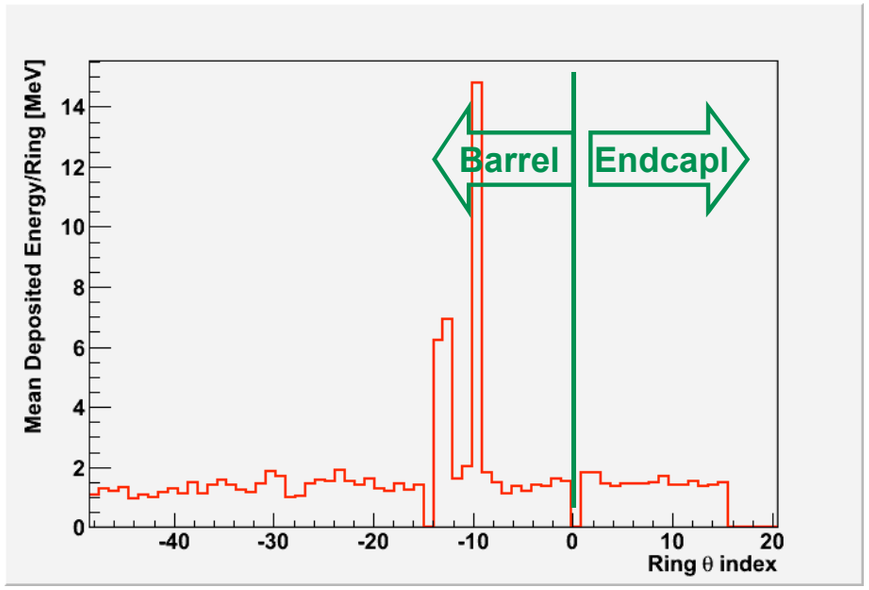




S.Germani

EMC backgrounds

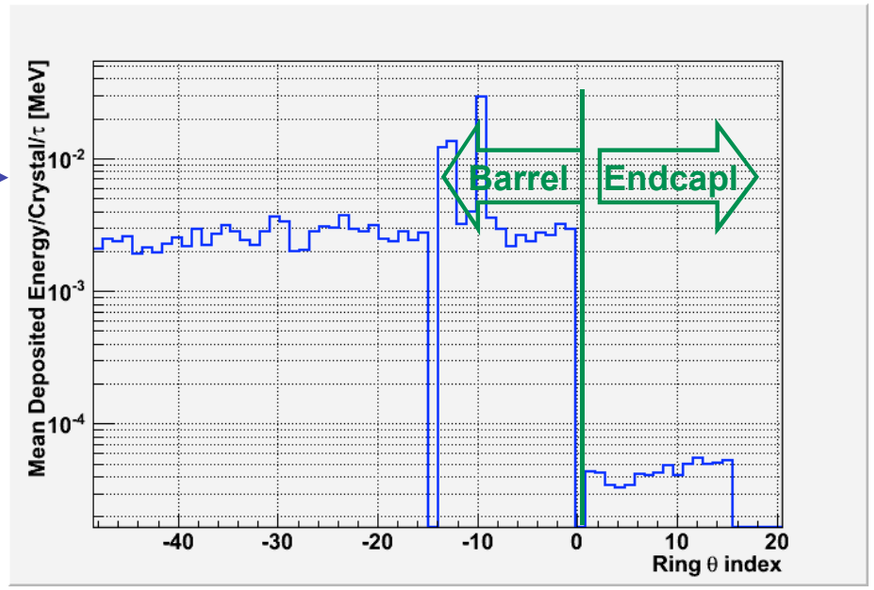
Deposited energy in background events



S.Germani

Mean Energy deposit per crystal in one decay constant

- CsI : 64% 680 ns + 36% 3.34 μs
- LSO 40 ns



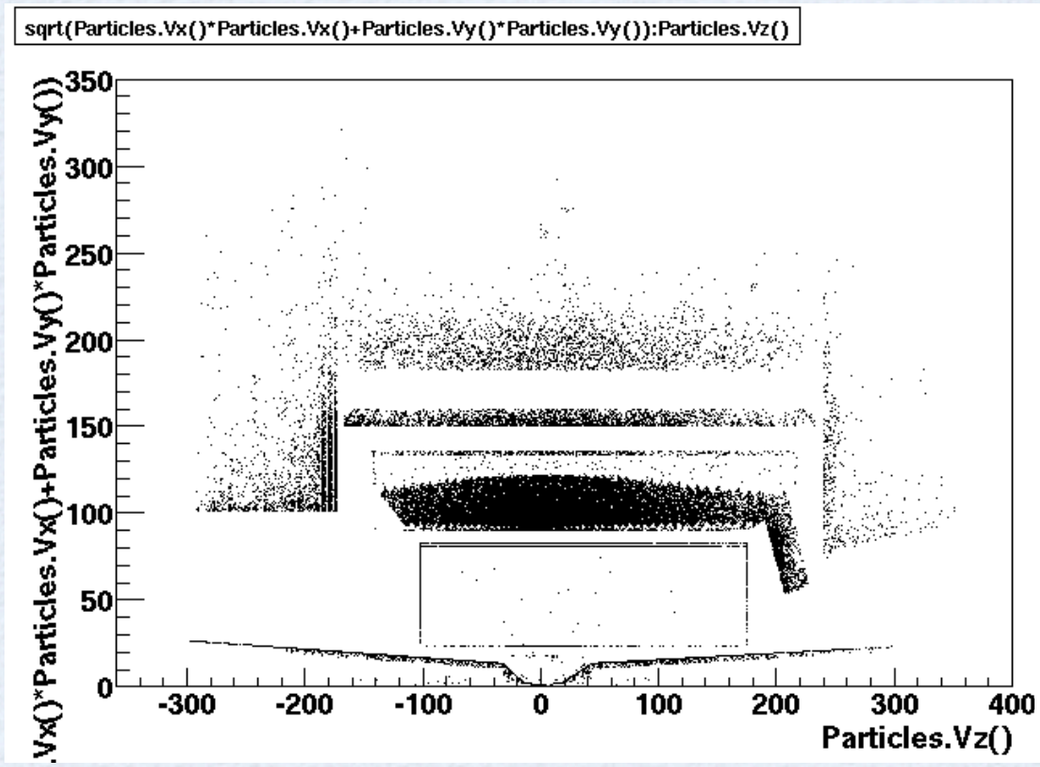
Tools for Full bkg. frames

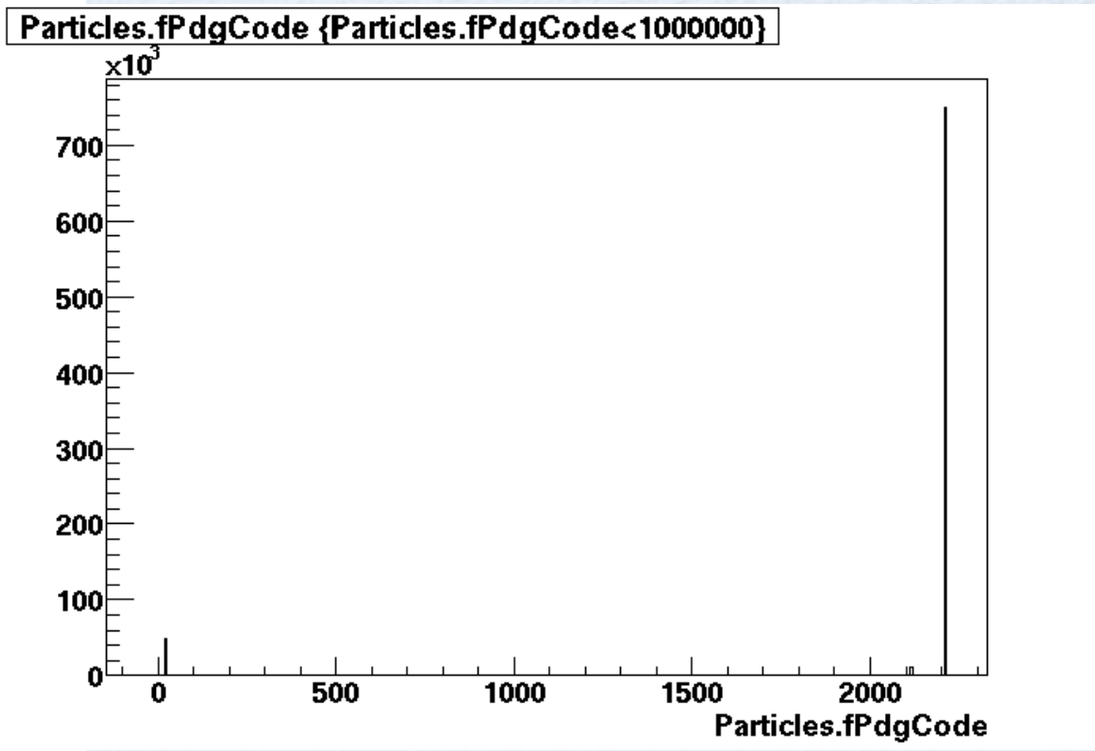
Types of Input Information: summary

- γ and high Pt tracks
  - TParticle
    - Save position and momentum of particles exiting a scoring volume, convert them into GTracks and simulate their passage trough the Fast-Sim detector
- Neutrons in EMC and IFR
  - Energy deposit
    - Use EMC and IFR response to determine the fast sim hits
- Low Pt tracks and neutrons in Tracking volume
  - Fluence
    - Generate random hits according to fluence

Neutrons flux evaluation tools

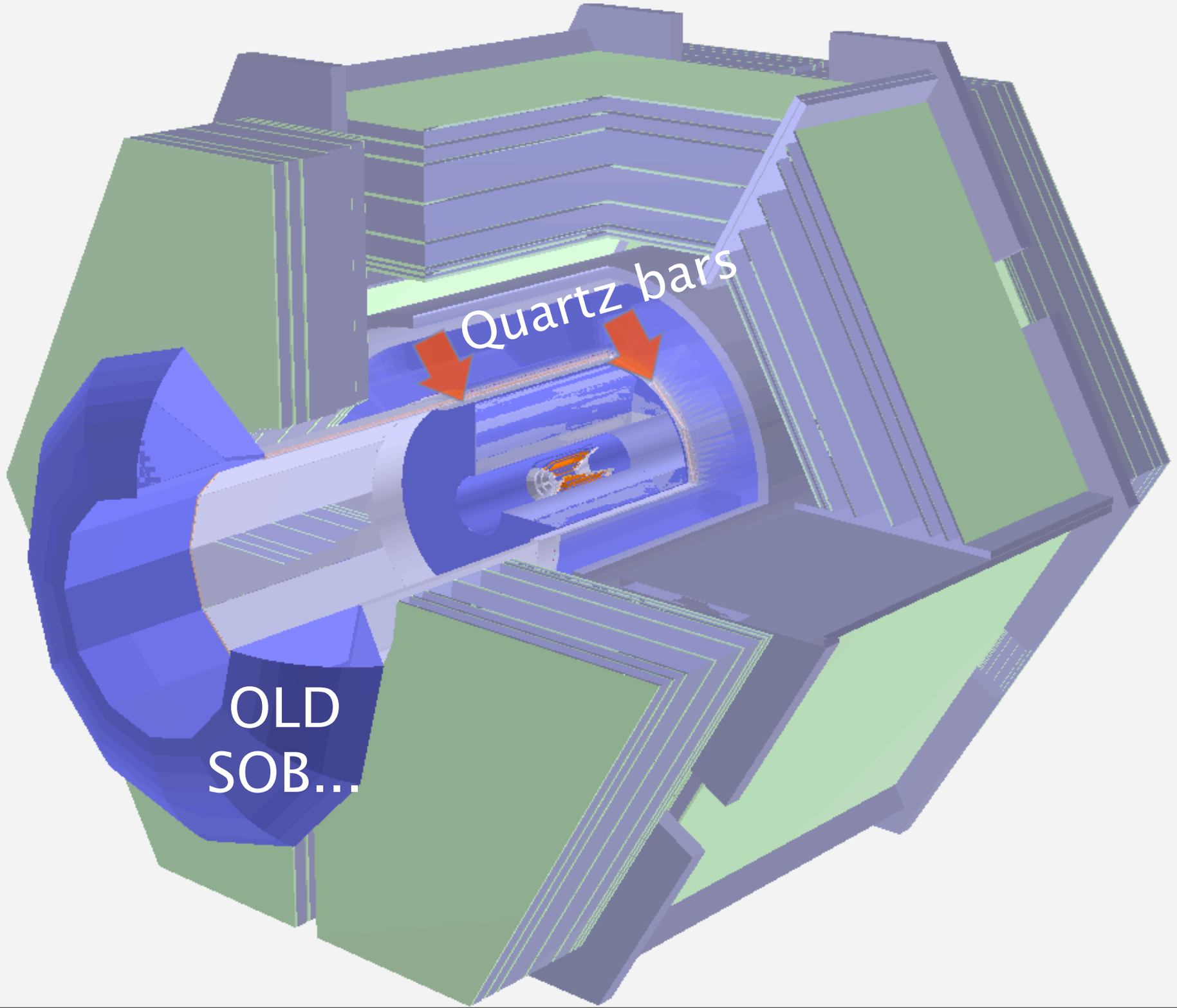
Neutron follower: results





- Left: neutron interaction vertices, as recorded by the neutron follower
- Right: PDG codes of the products of neutron interactions
  - Mostly protons, some neutrons and photons, a few electrons

DIRC slided into SuperB!



Next steps

- Close interaction with the Machine Wizards Team
  - Beam pipe overall thickness and geometry (Radius, X-rays shielding, cooling system) impacts on L0 backgrounds
  - Detector field... how much can we increase it?
    - globally (Iron saturation, SC quenches, PID accept.)
    - locally (tracking people headache/nervous breakdown?)
  - Cryostat outer radius – DCH inner radius limits the wolfram shielding thickness

Man Power issue

- Limited amount of man power, even with the beneficial and very welcome new contributions of Giuseppe and Riccardo

To Do List

- White Paper contribution (E.P., Mike)
- Single beam bkg. studies (Manuela)
  - Neutron halo source for IFR
- L0 bkg. reduction task force (E.P., Mike, K.Bertsche,F.Bosi,Riccardo?)
- DIRC validation analysis: Riccardo(?) small production, Nicolas(?).
- Look up tables for fast simulation (E.P.)