Synch. Radiation in the detector: quick update

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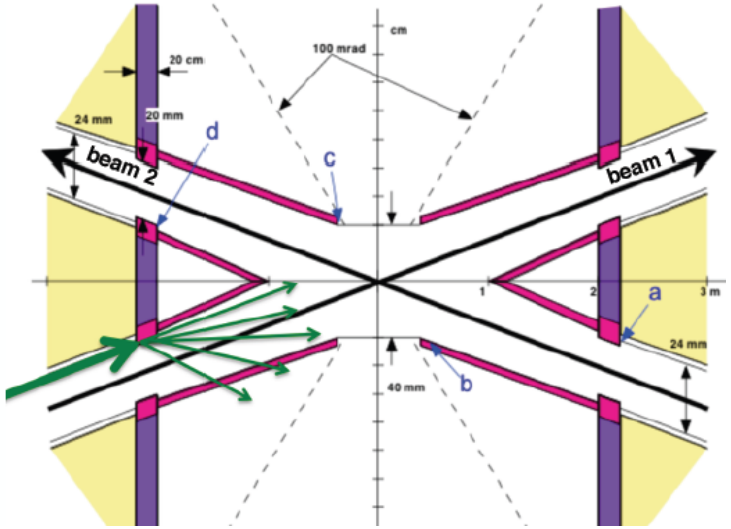
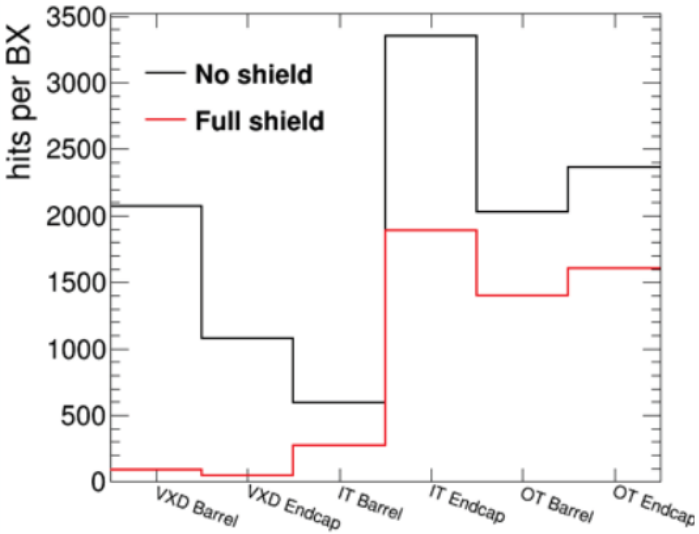
MDI meeting, June 13, 2016

Recap from last presentation:
We get from Mike the 4-vectors of SR photons that forward-scatter on the mask.
We send them through a GEANT-4 simulation of an example detector.

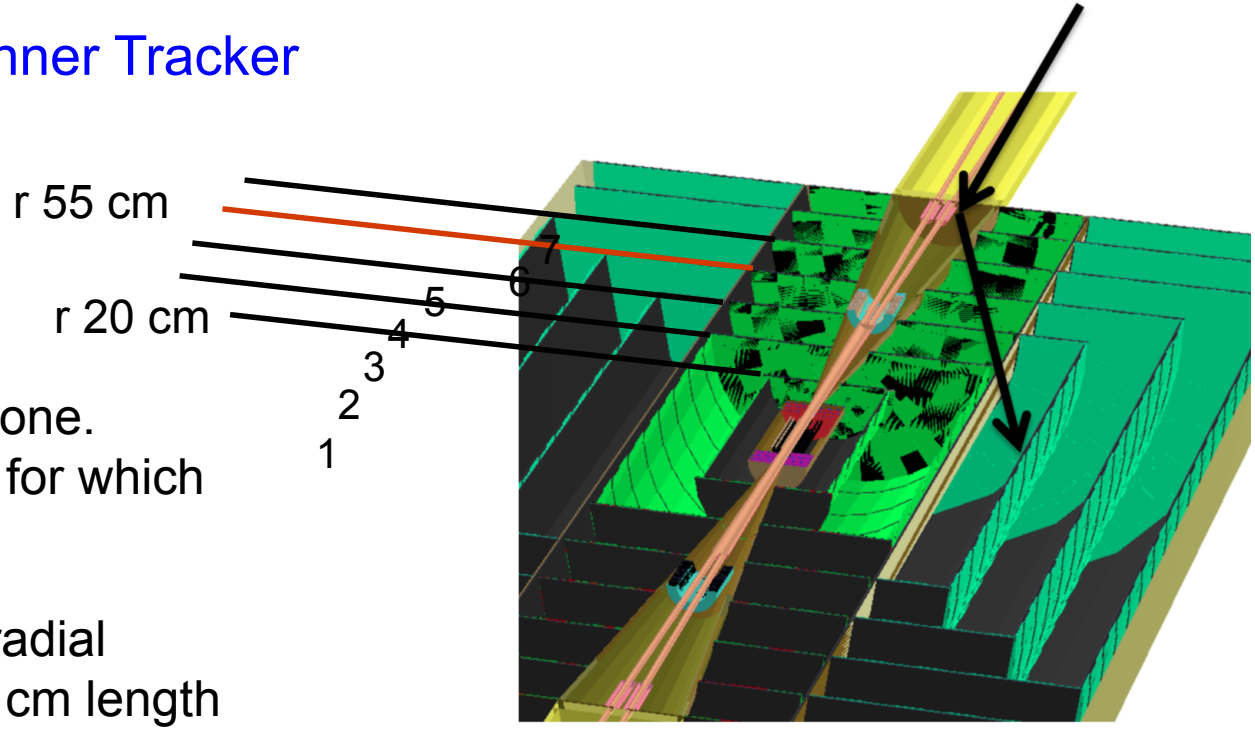




Last time : showed occupancies in the VXD.
Here: occupancies in the forward disks.

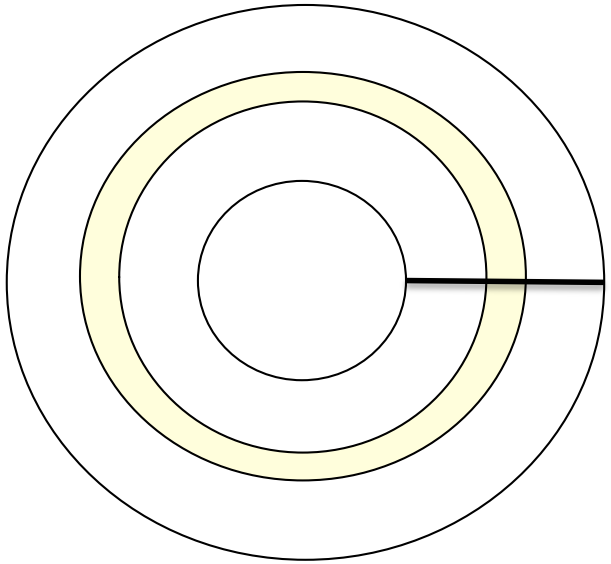
Occupancies due to SR in Inner Tracker

IT shown in light green.
Consists of 7 disks
(+ 2 barrel layers)



Rin corresponds to 100 mrad cone.
Rout = 55 cm except for disk 1 for which
li is 20 cm.

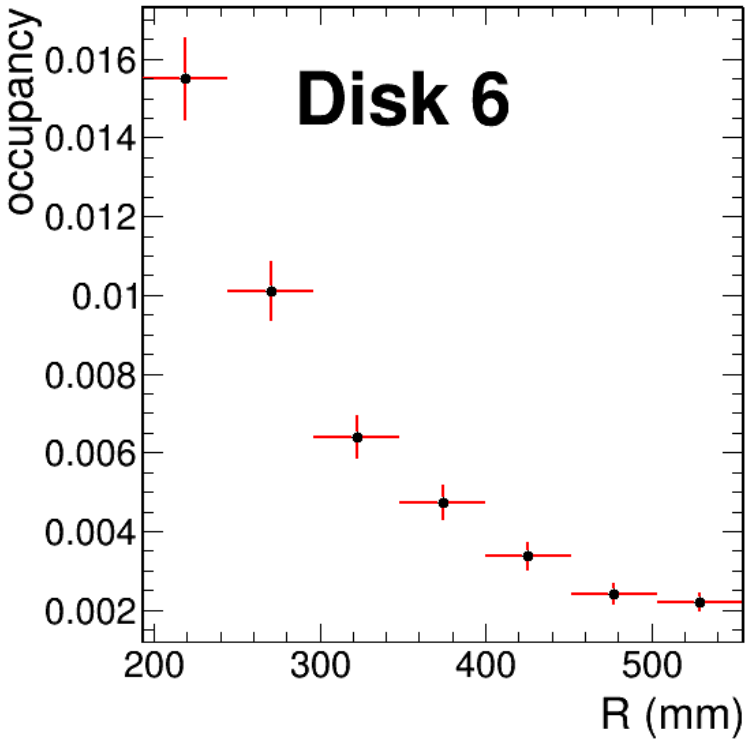
Segment Rin < R < Rout into radial
strips, of e.g. ΔR = 5 cm or 10 cm length
(and e.g. 50 μm in φ)



Definition of the occupancies vs R shown later :

Count the number of hits in annulus of
size ΔR
and divide this number by the total number of strips
in the annulus.
(i.e. some double-counting w.r.t. what the real
strips would see, but small effect here).

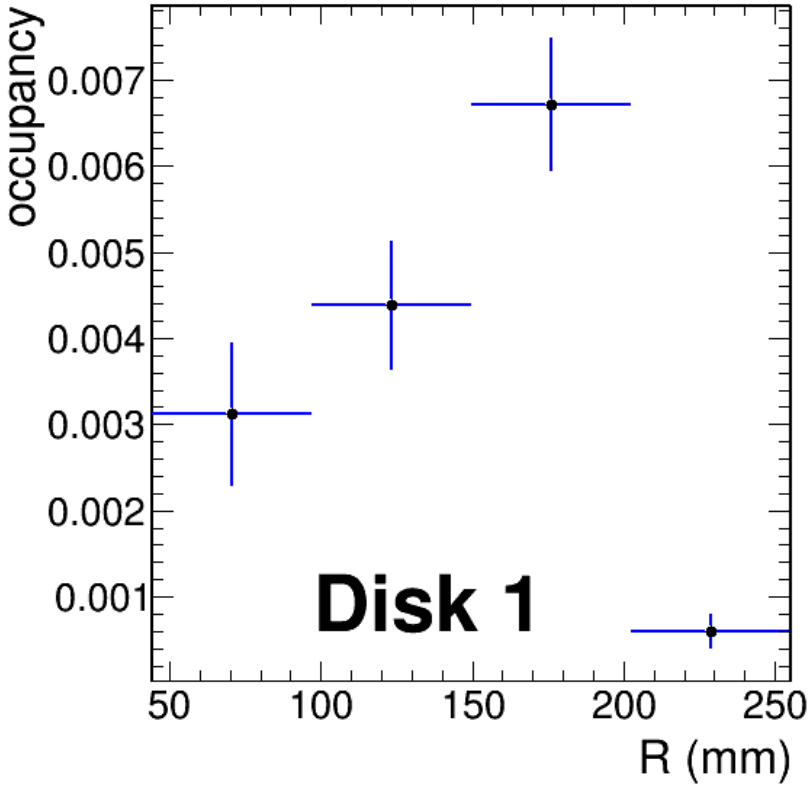
Occupancies (5cm x 50 μm strips) , no BP shielding, bend at 42 m



Disk 6 = at large | z |

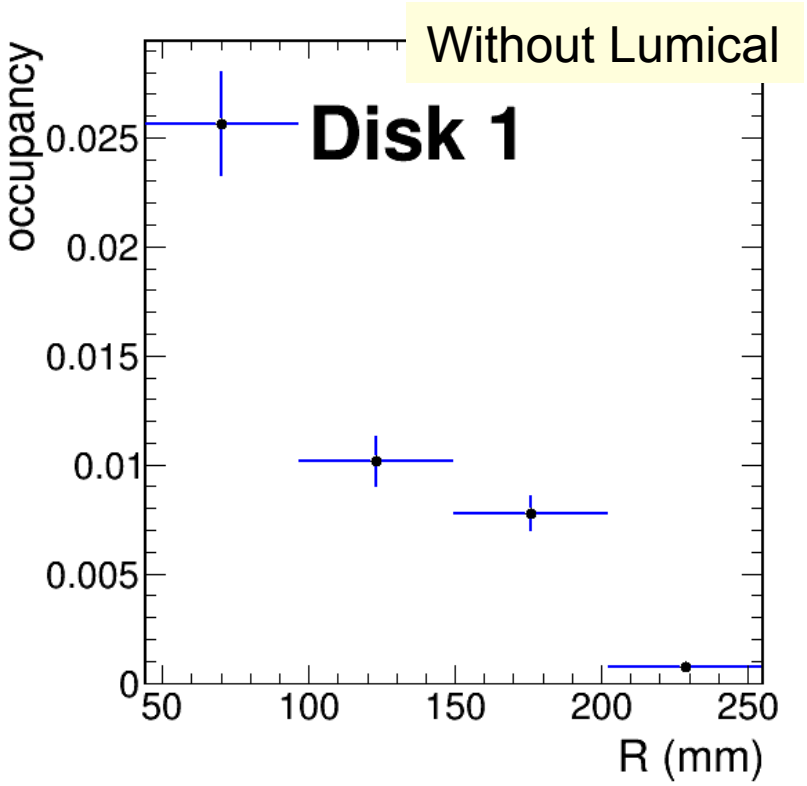
- Decreases with increasing radius, as expected
- reaches O(2%) in the innermost part of the disk

Disk 1 = at low | z |, closest to IP
Occupancies do not decrease with radius.
That's because LumiCal "shields" the innermost part of the disk.

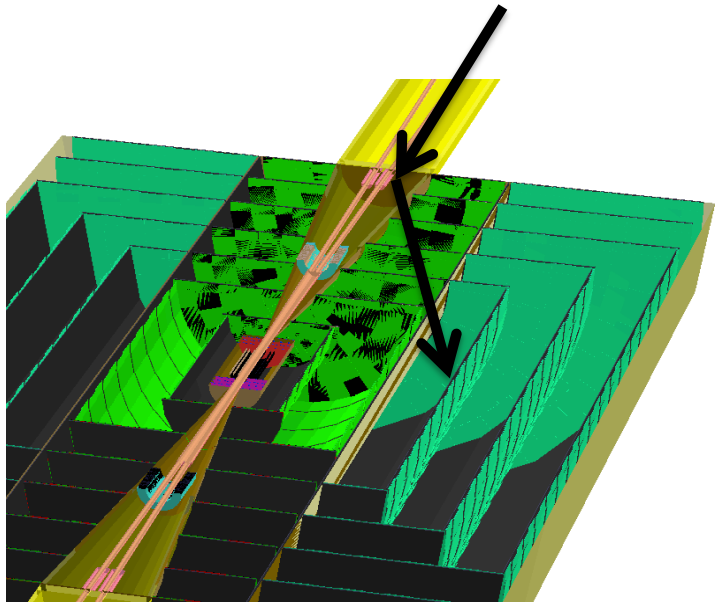


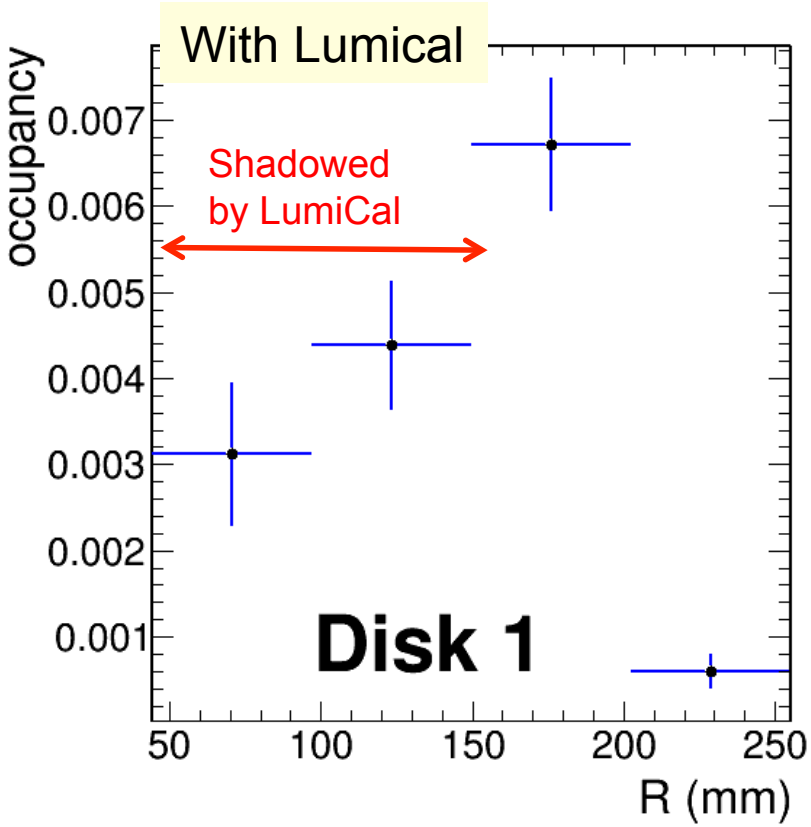
Occupancies, no BP shielding

Checked explicitly by running the same simulation, in which the LumiCal is removed :



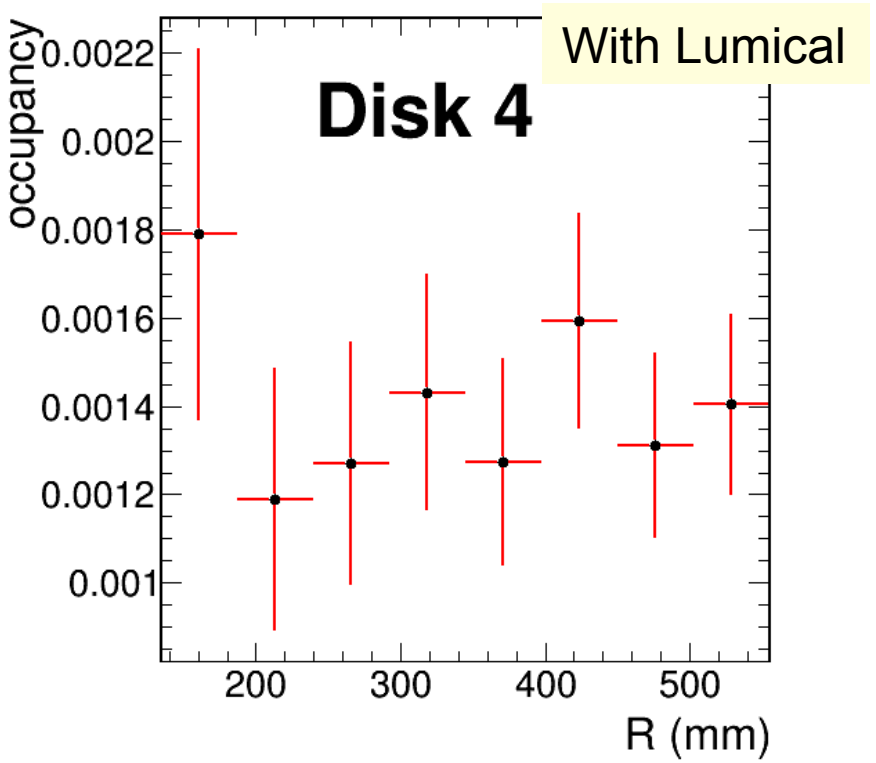
-> OK, understood.

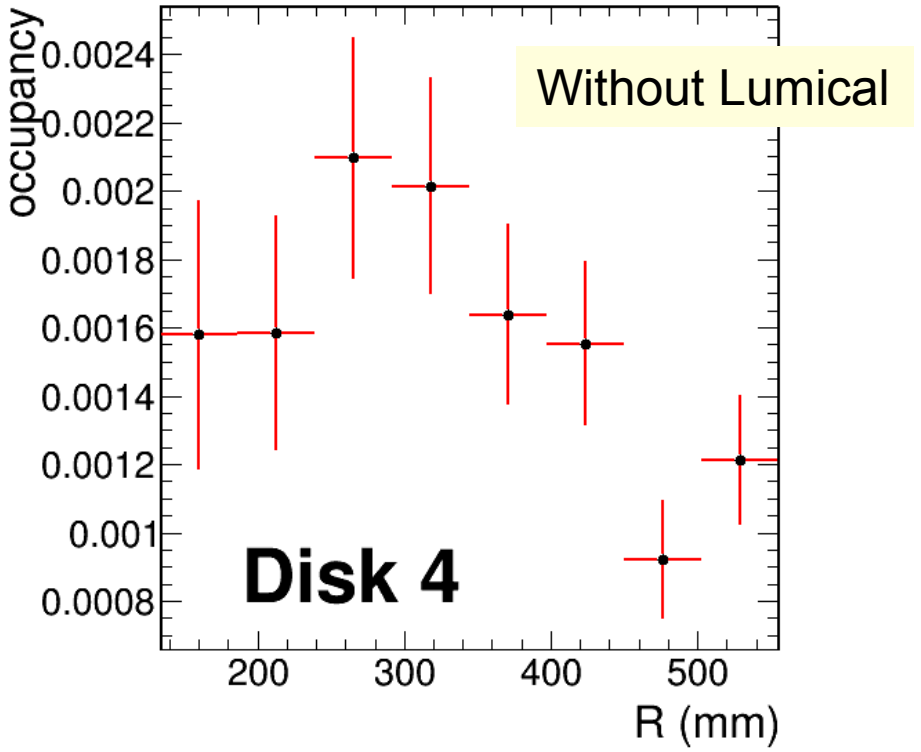




Occupancies, no BP shielding

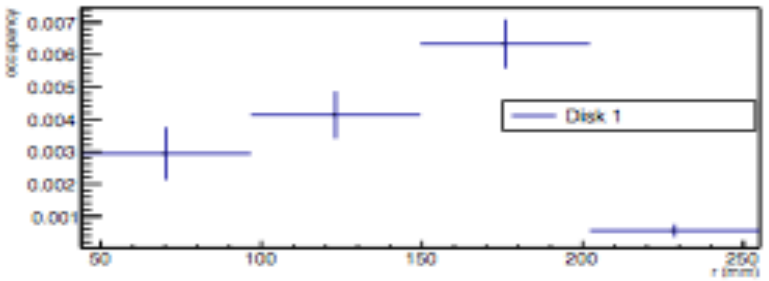
Not understood yet: occupancies in the disk just behind (seen from IP) the LumiCal :

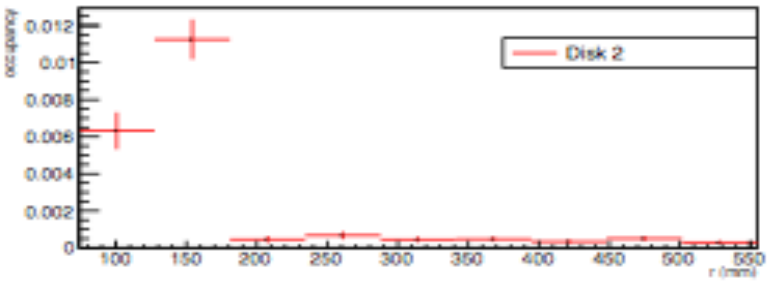


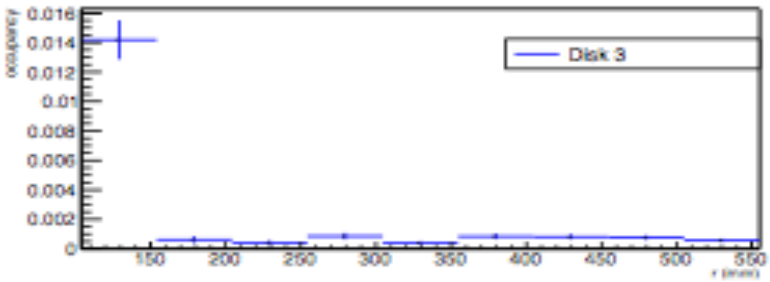


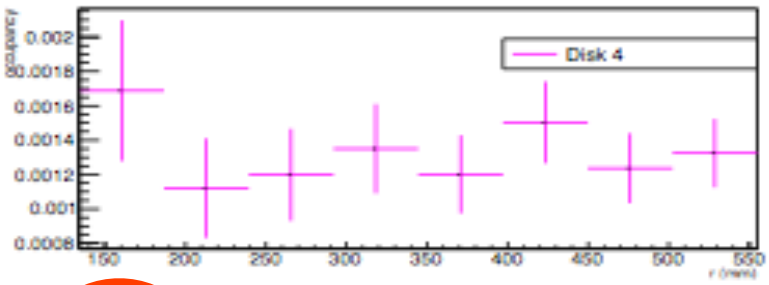
No evidence of backscattering on LumiCal.
No effect seen either when looking at the timing of the hits.

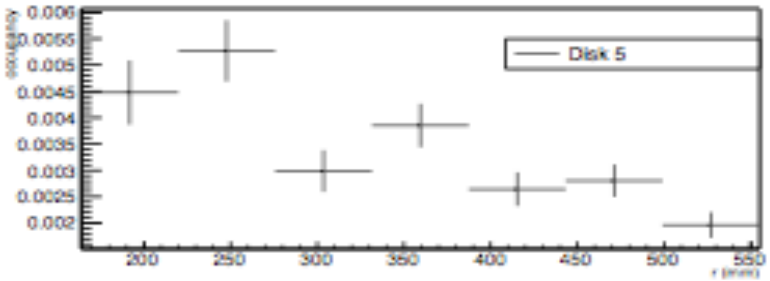
For reference: occupancies in all disks

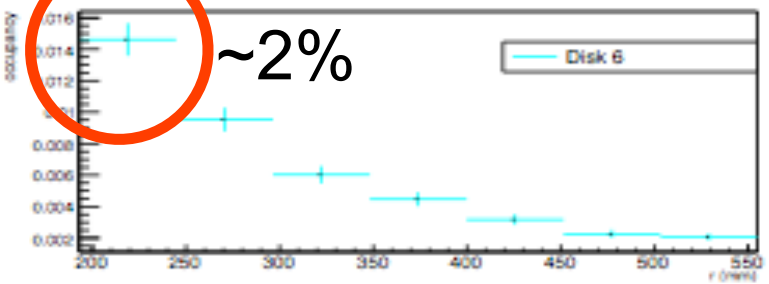




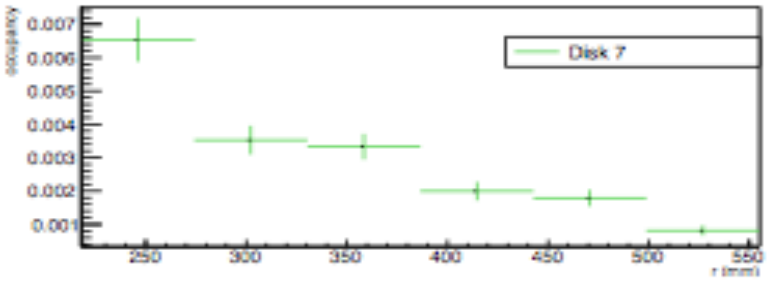








~2%

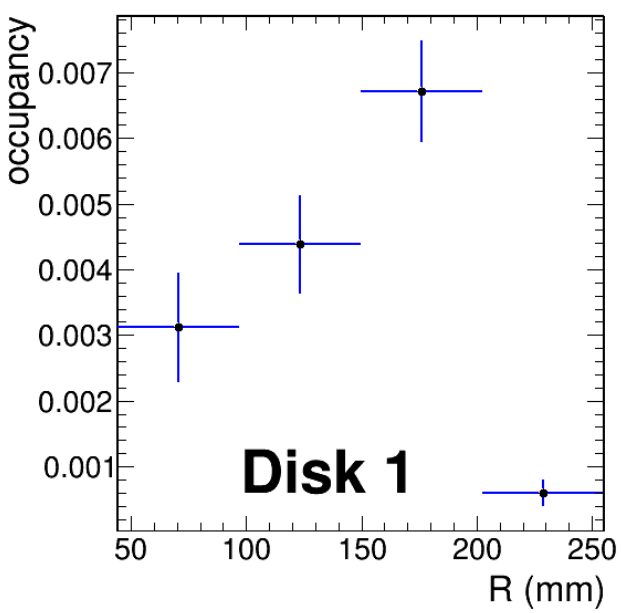


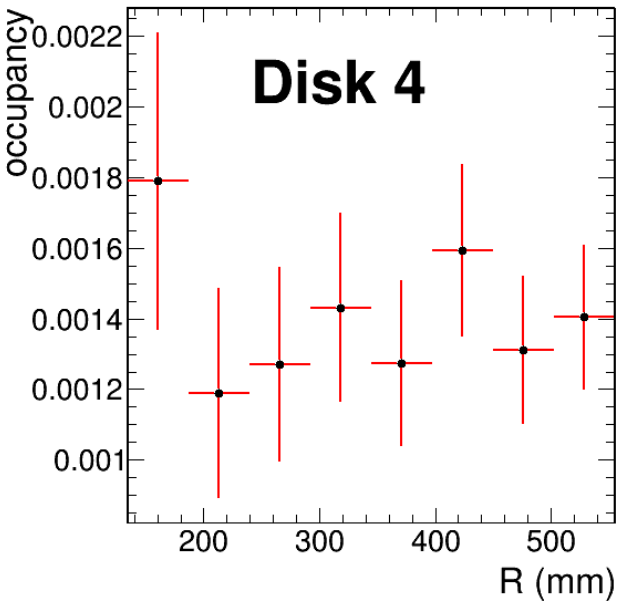
Bend @ 42 m with no shielding
5 cm long strips

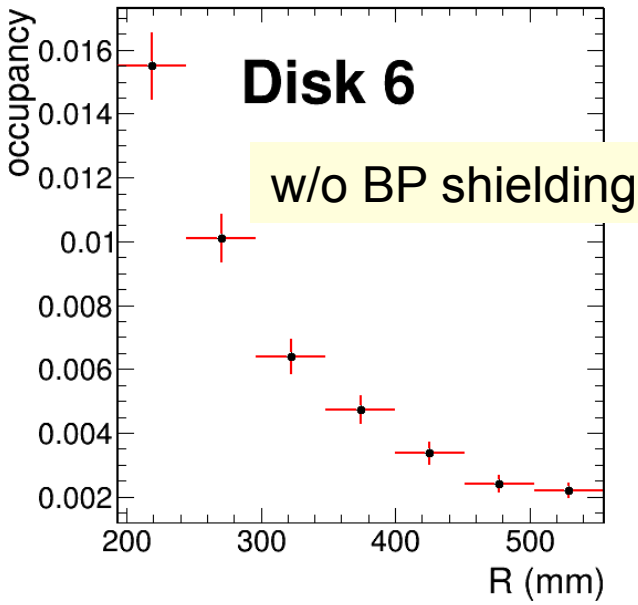
Effect of the beam-pipe shiedling

Reduction more prominent for inner disks – expected.

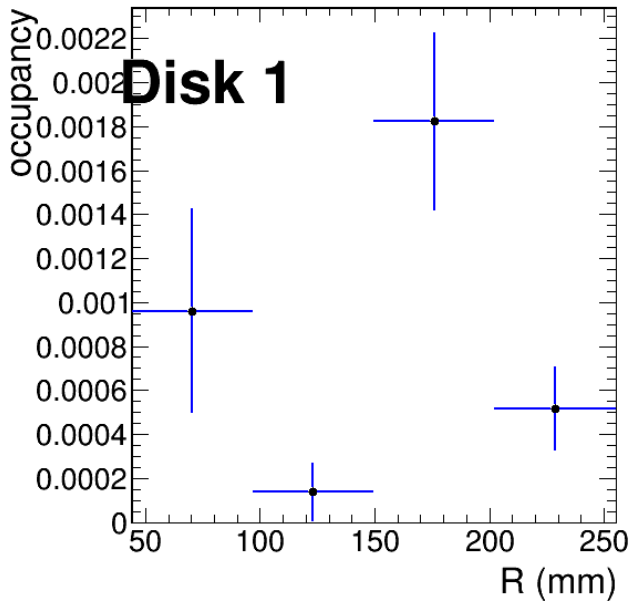
All in all (cf last talk), shielding reduces #hits in IT by O(2).

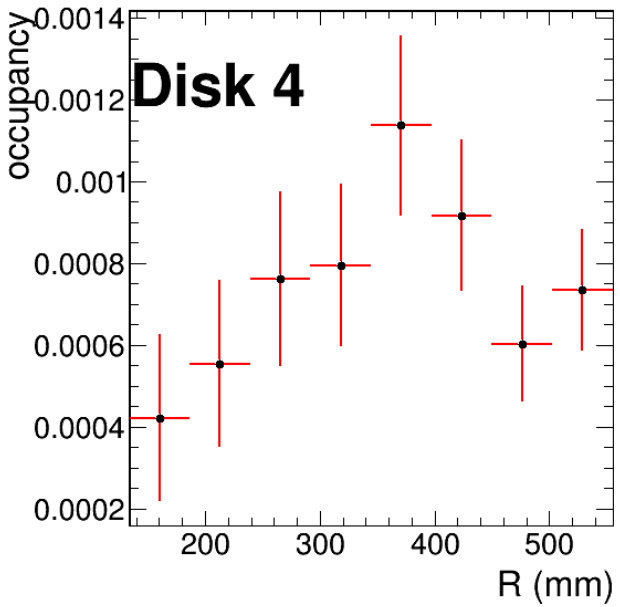


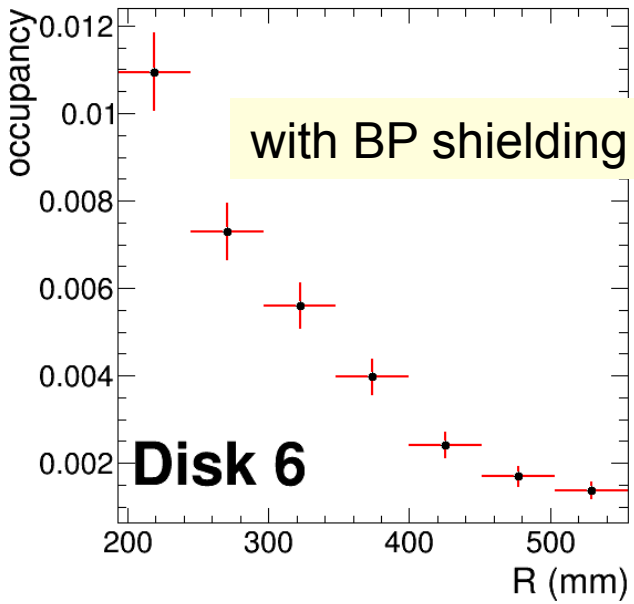




w/o BP shielding

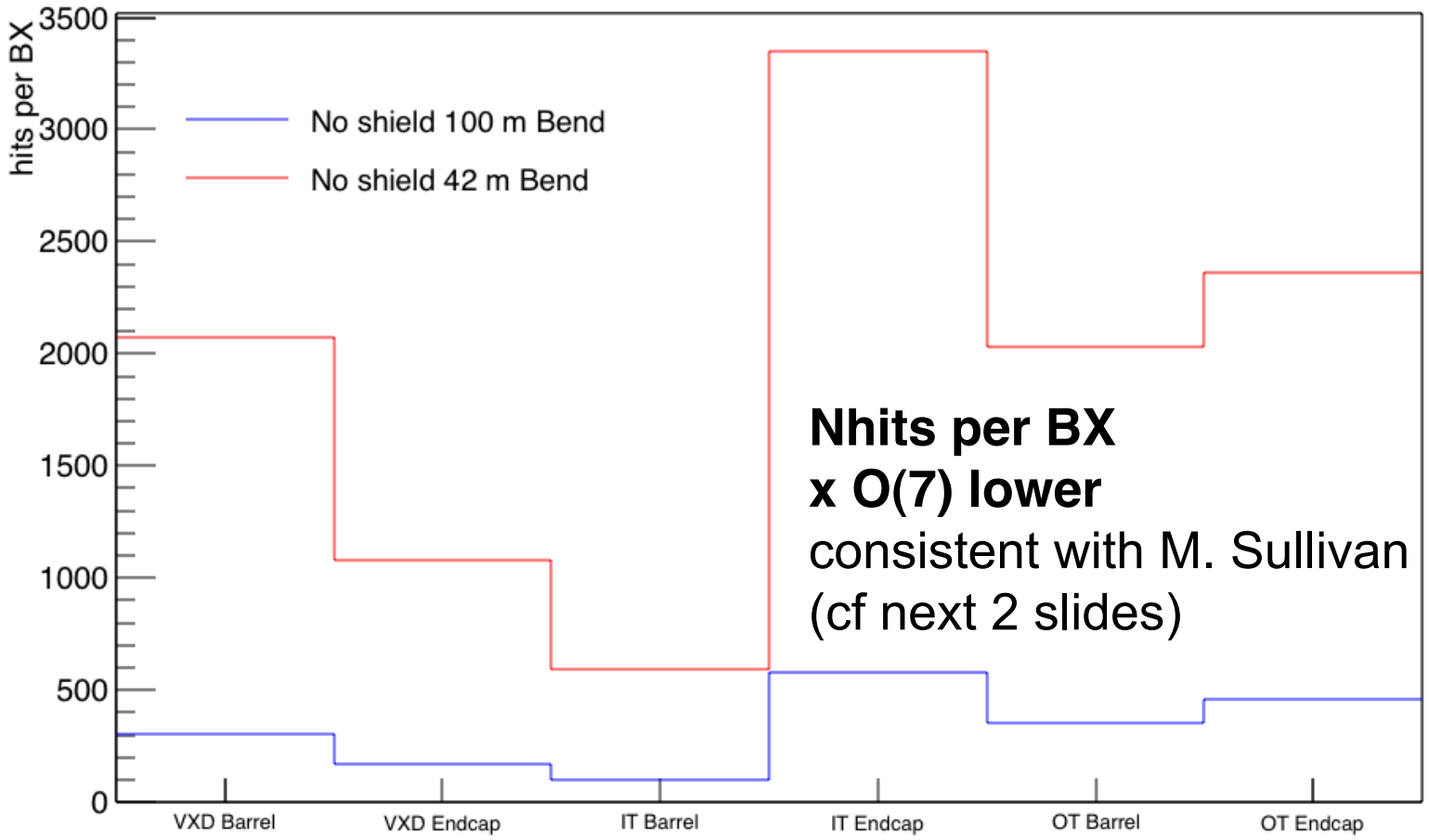






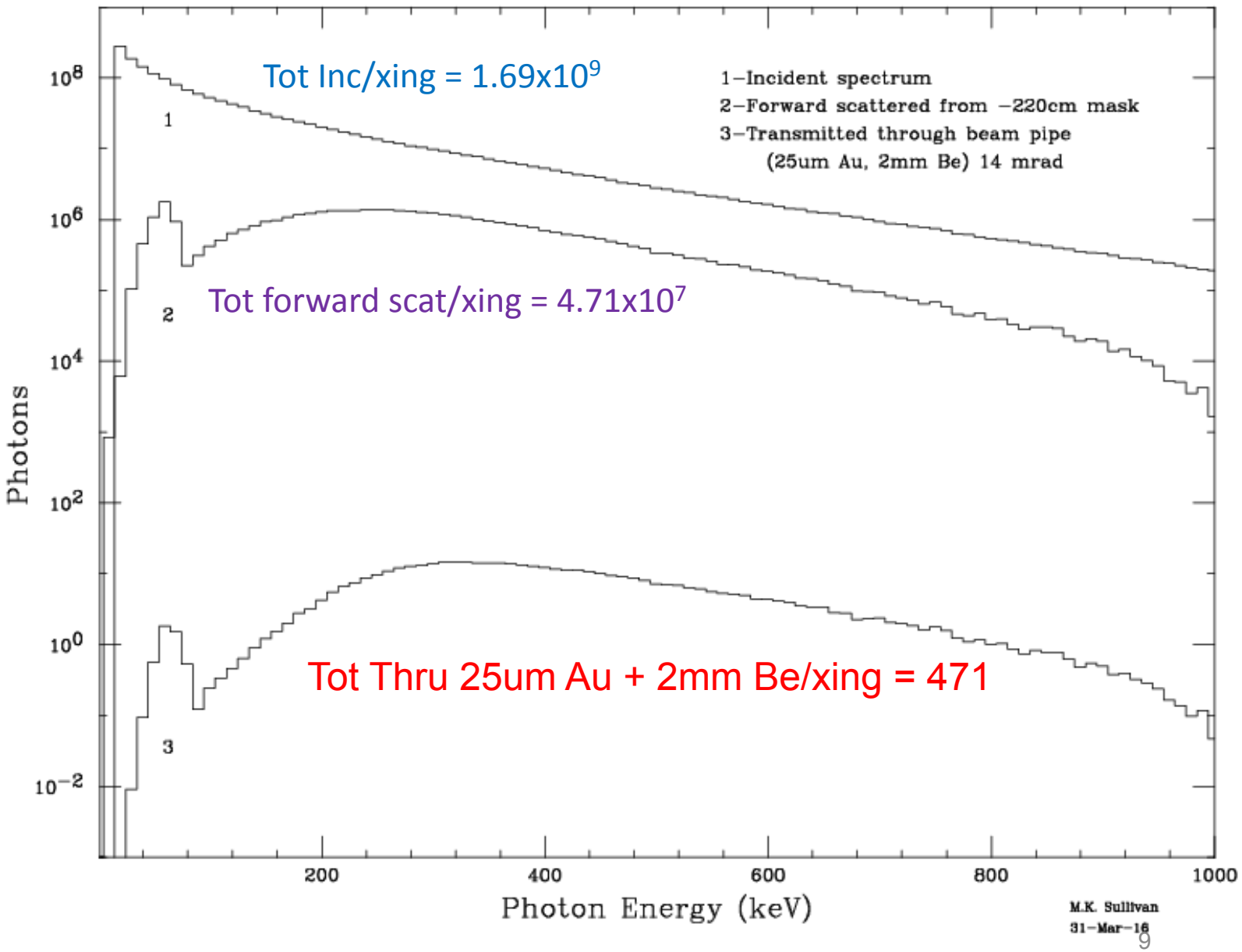
with BP shielding

Comparison of SR on the IR at 42 m vs 100 m final bend

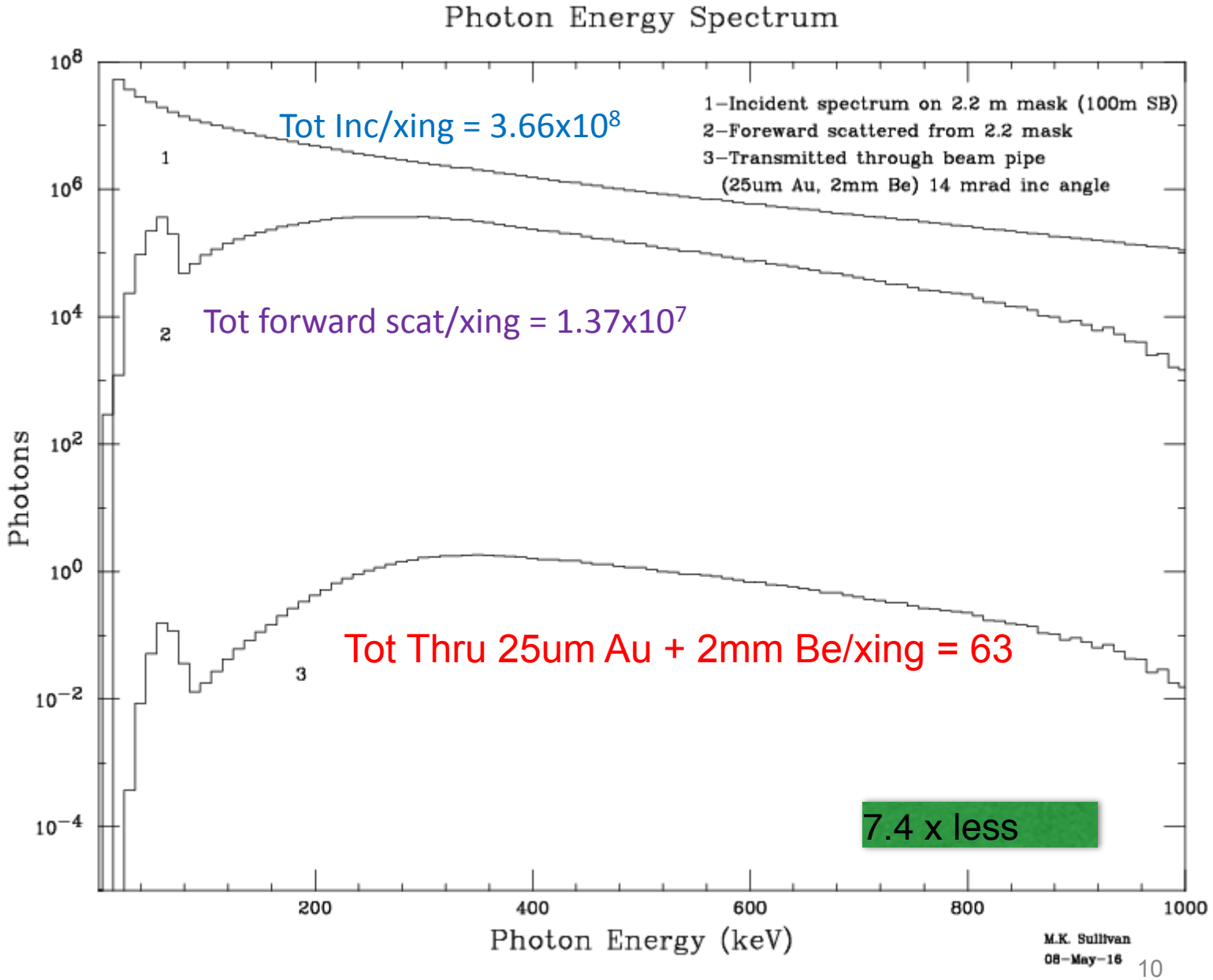


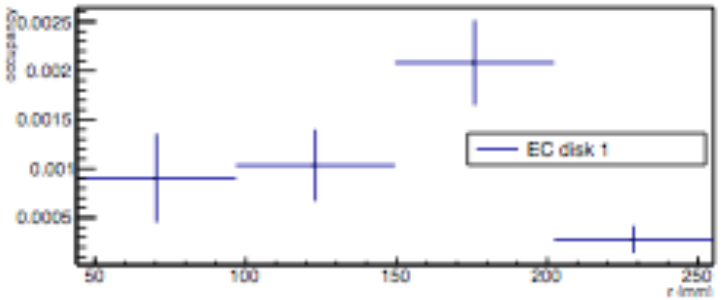
Forward Scattered

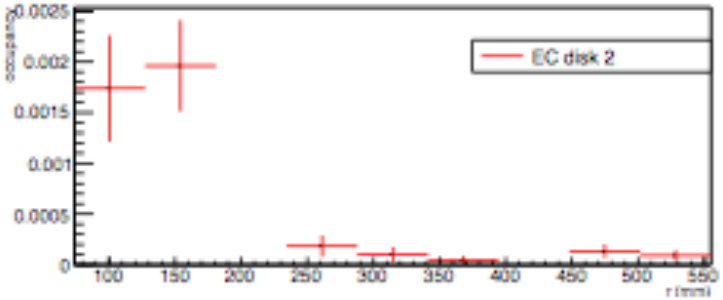
(Bend at 42 m)

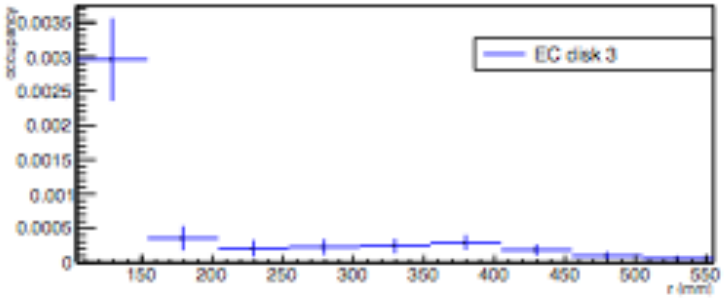


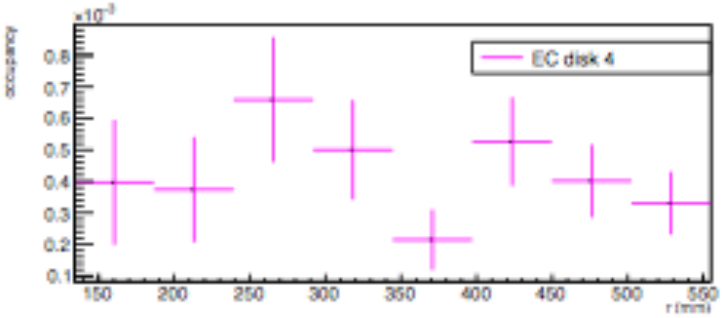
Forward Scattered (100m SB)

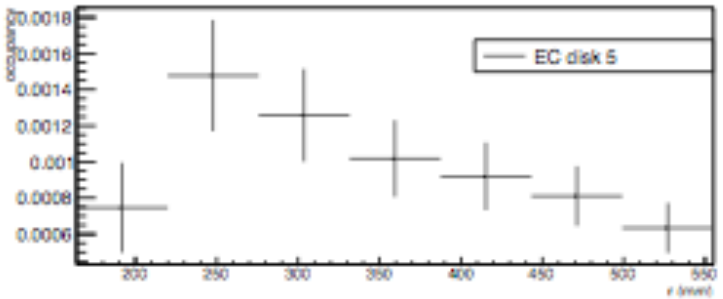


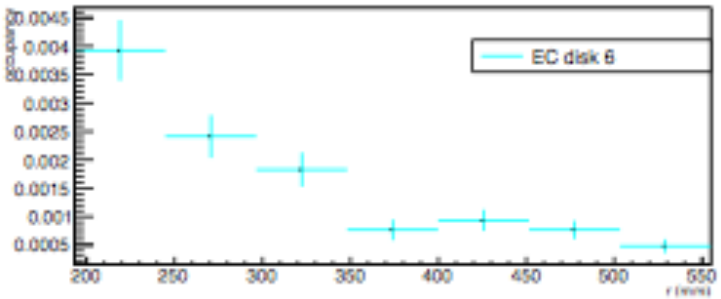


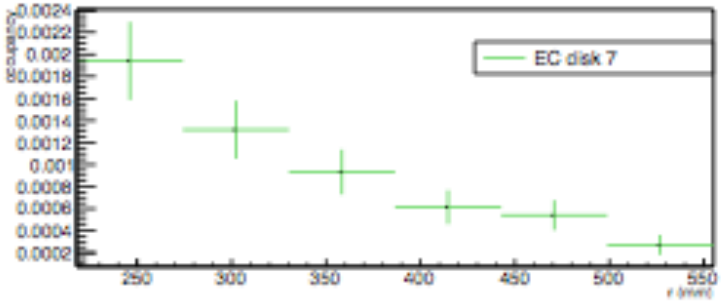












Bend @ 100 m with no shielding
5 cm long strips

Summary

With the bend at 42 m : occupancies due to SR in the forward tracker can reach the % level at some places

- not huge, but only one source of background

With the bend at 100m : occupancies at the per-mil level.