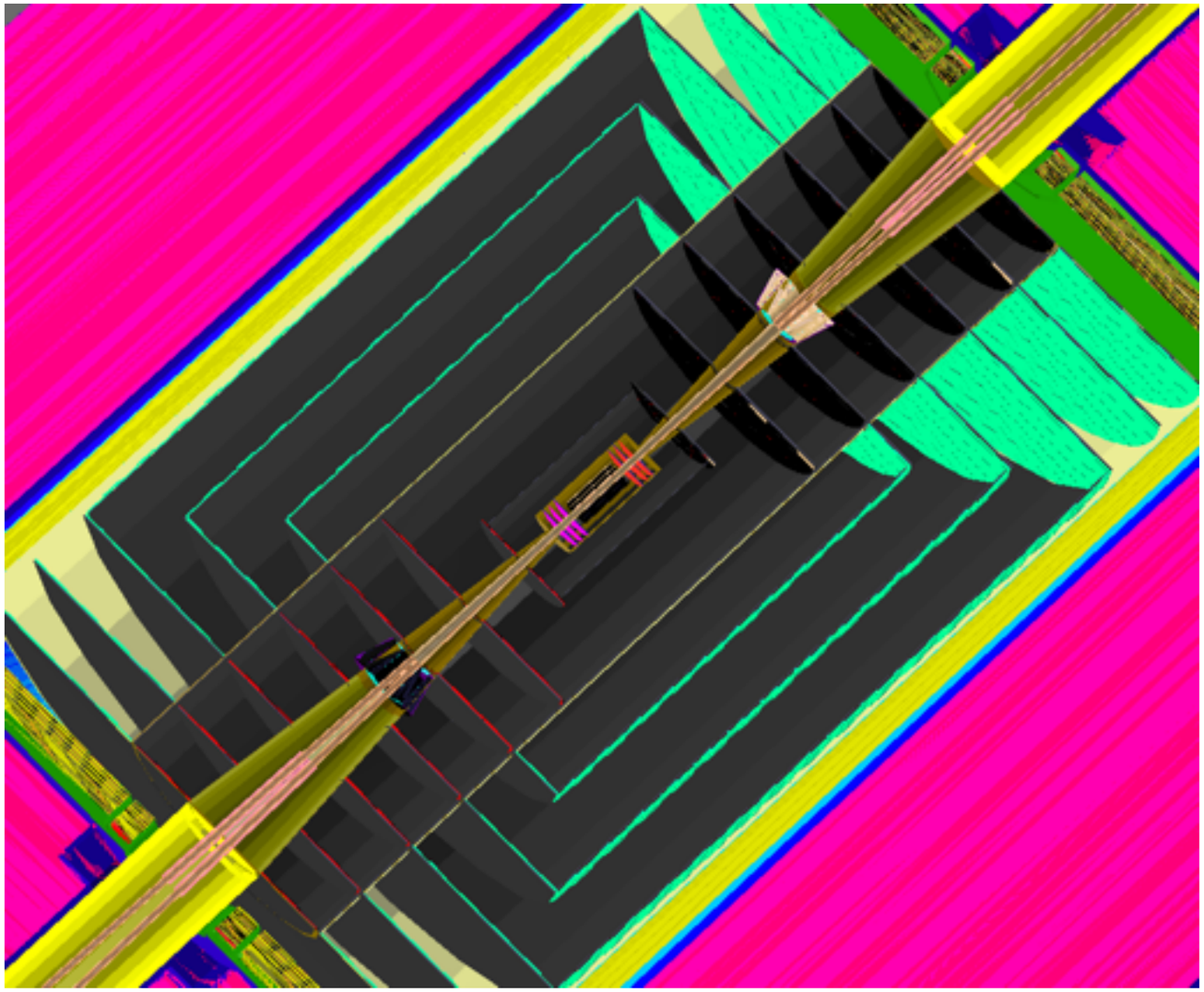
Update on SR impact on the detector - new IR (Research In Progress)

A.M. Kolano

Full detector model of new IR

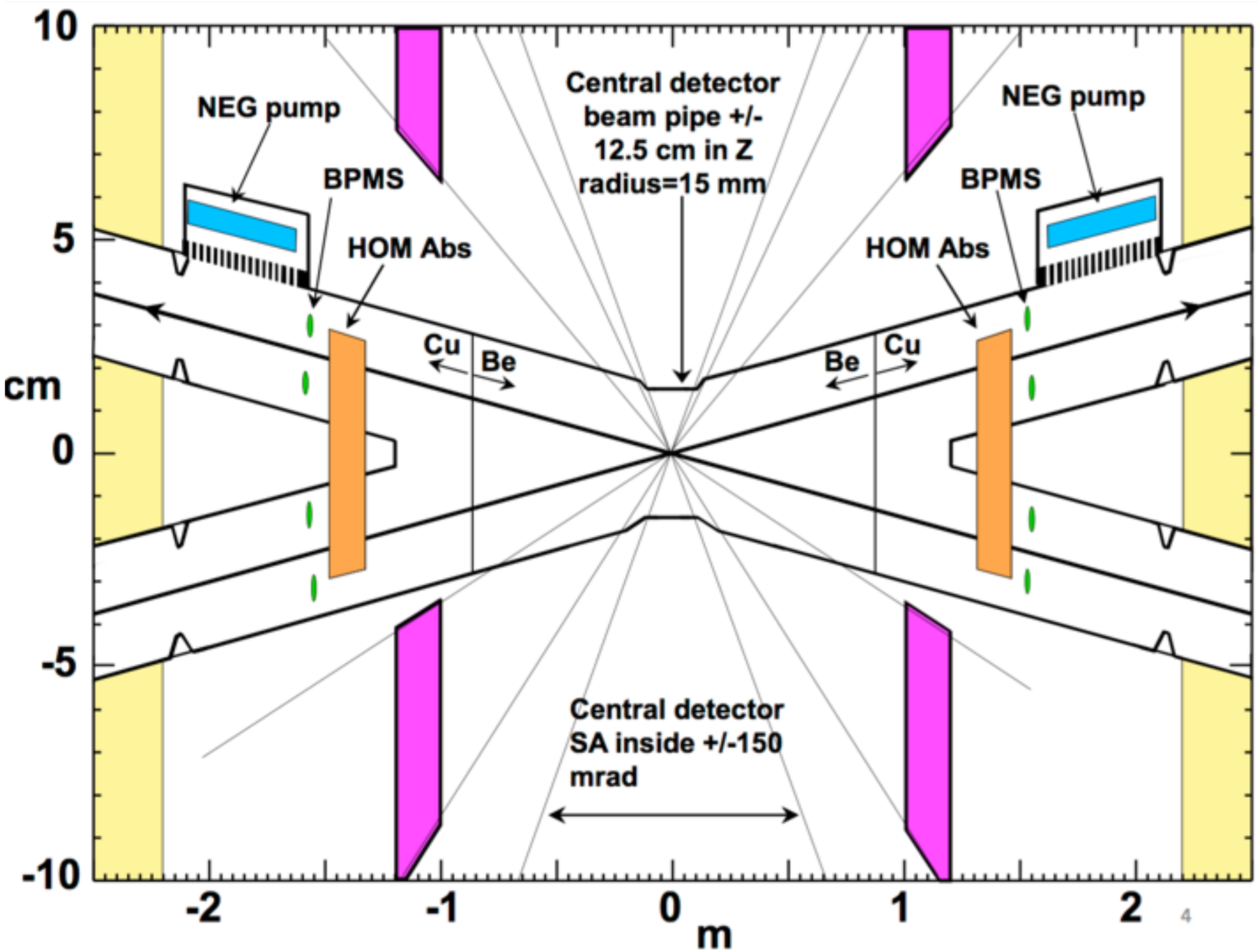
What is new:

- Updated SR files
  - Average energy 206 keV
  - ~10e6 /BX photons
  - Forward scattered from the mask at 212 cm from IP
  - Just last bend photons
- Latest version of ILCsoft (Geant4)
- New IR geometry:
  - **No shielding vs 1cm Ta @ top**



Y. Voutsinas

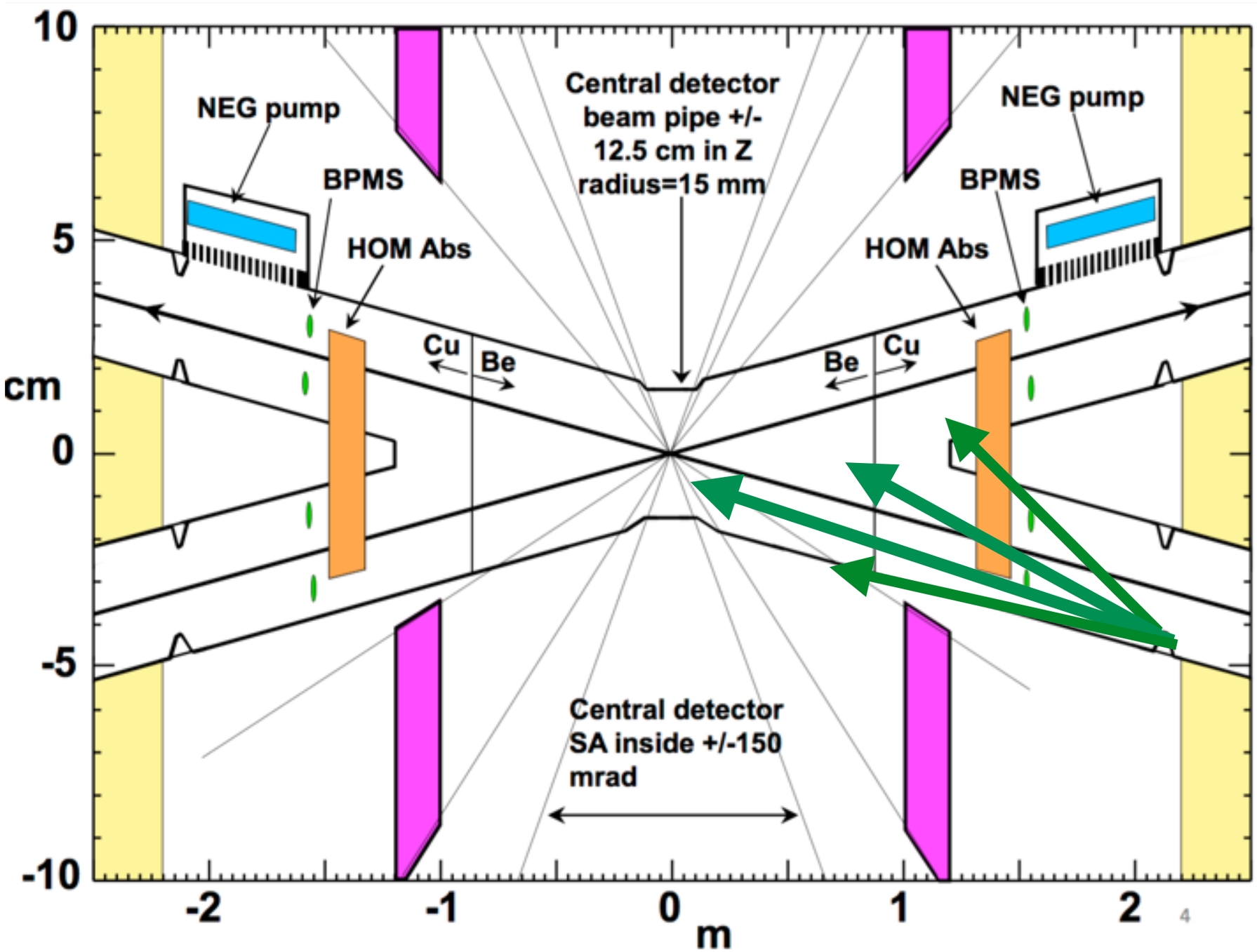
New IR



M. Sullivan

SR- forward scattered from lower mask

New IR



M. Sullivan

SR- forward scattered from lower mask

How many will enter the central beam pipe?

Direct photons on CBP - Analytical

M. Sullivan Simulations:

- From simulation 5 photons directly incident on the central beam pipe
- Per BX-> 20 x 5 = **~100**

Analytical calculation from IR model in Geant:

- **80 photons** hit directly the central beam pipe (CBP) per BX.
- **Direct hits** should not be a problem for the detector @ IP
- If fully shielded so no photons escape the BP along the way-> we avoid "spraying" of photons on the detector

Detector/Geant4 simulation:

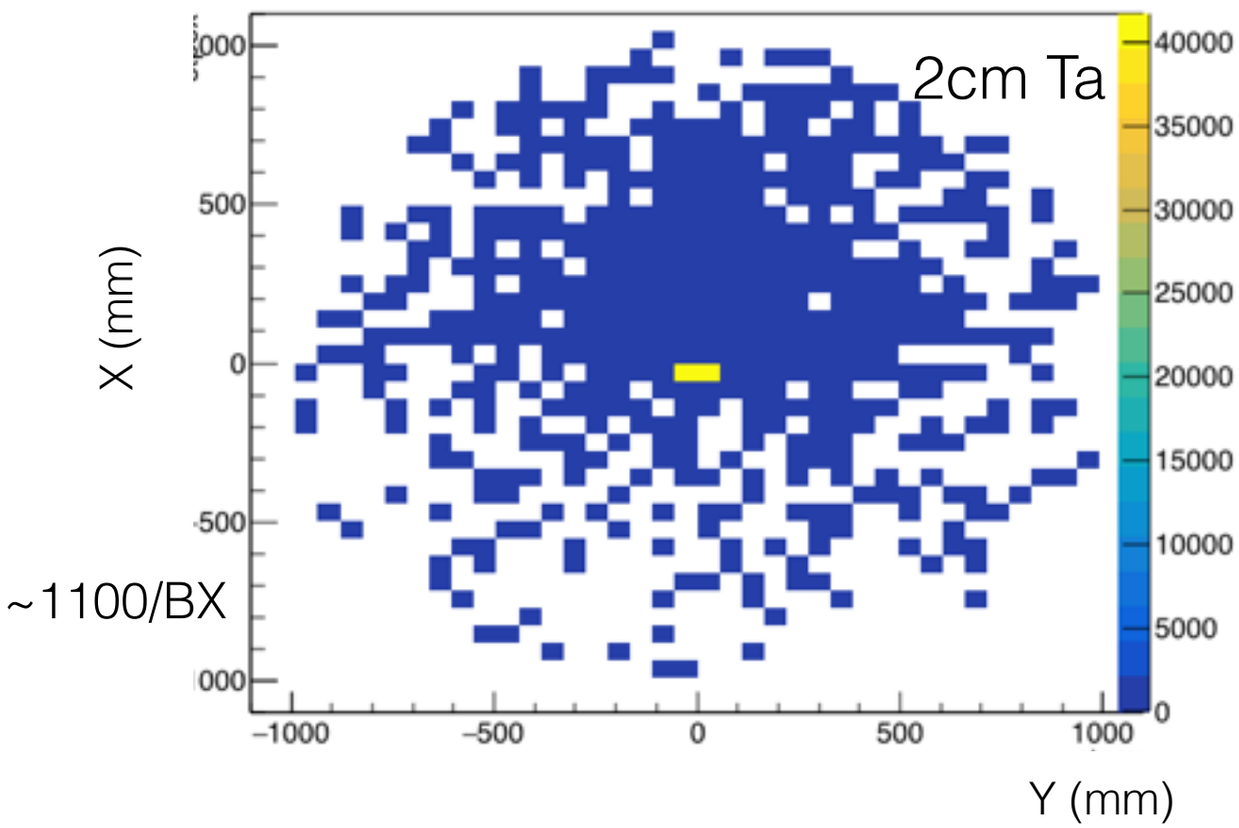
- New geometry & new SR files -> **No shielding vs 1cm Ta**

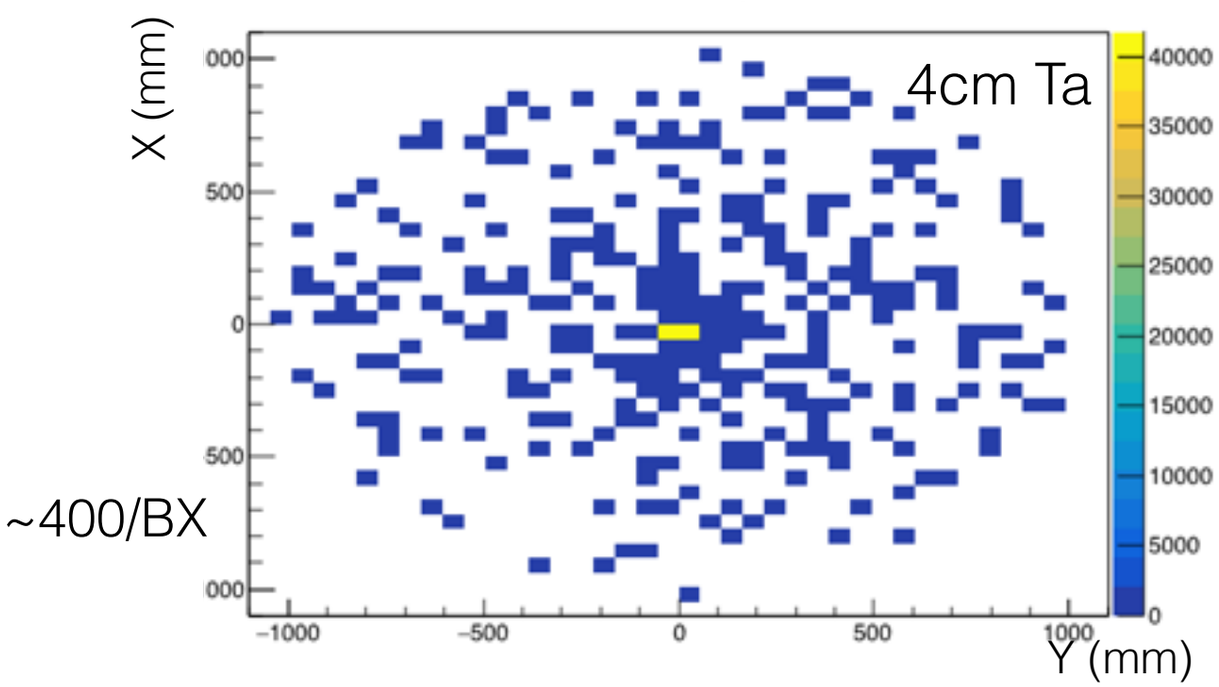
Origin of hits and Ta shield around the "source"

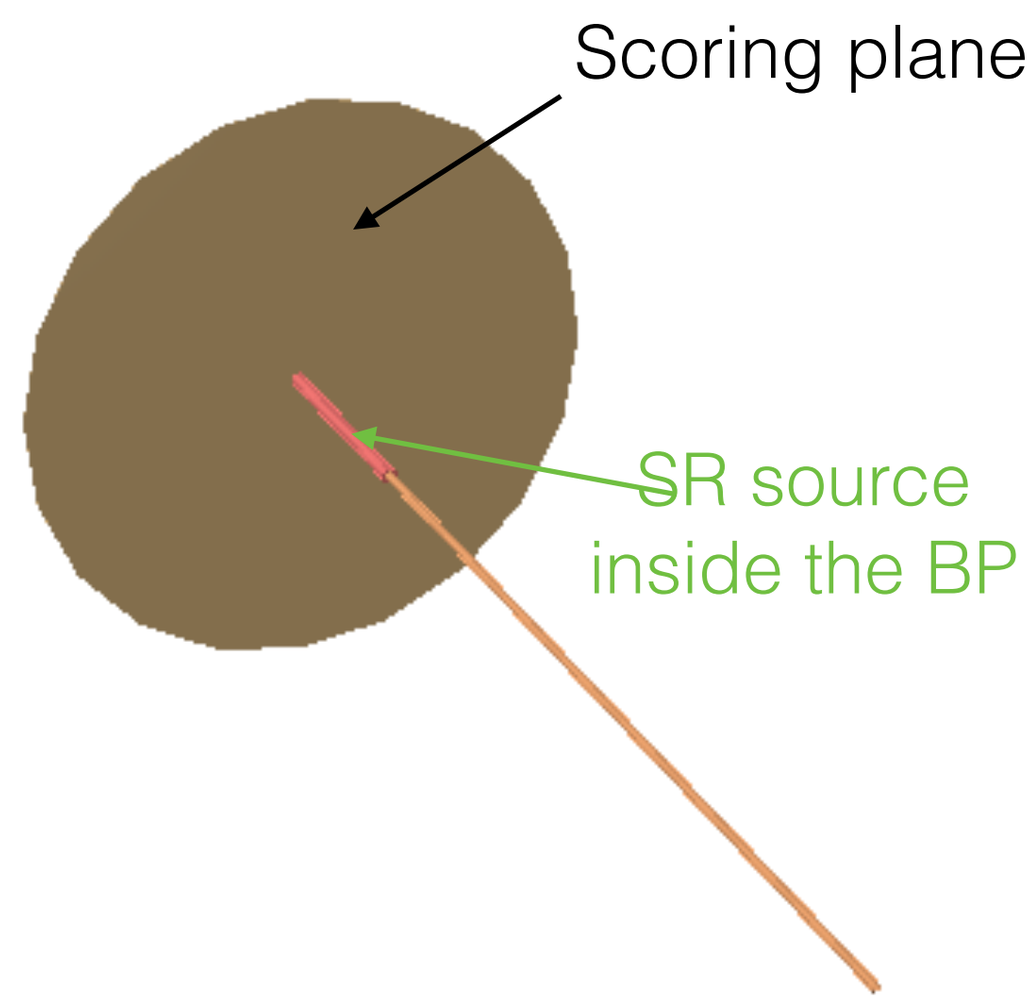
Shielding :

- Many hits originate from around the source
- 1 cm Ta
- Position 250-170 cm from IP (over the mask)
- SR source @ 214 cm from IP (BX ~10e6)
- **Thickness and length** optimisation ->to do
- Just needed downstream
- Otherwise >1cm overlaps

Upstream Ta-Shielding study (Scoring)





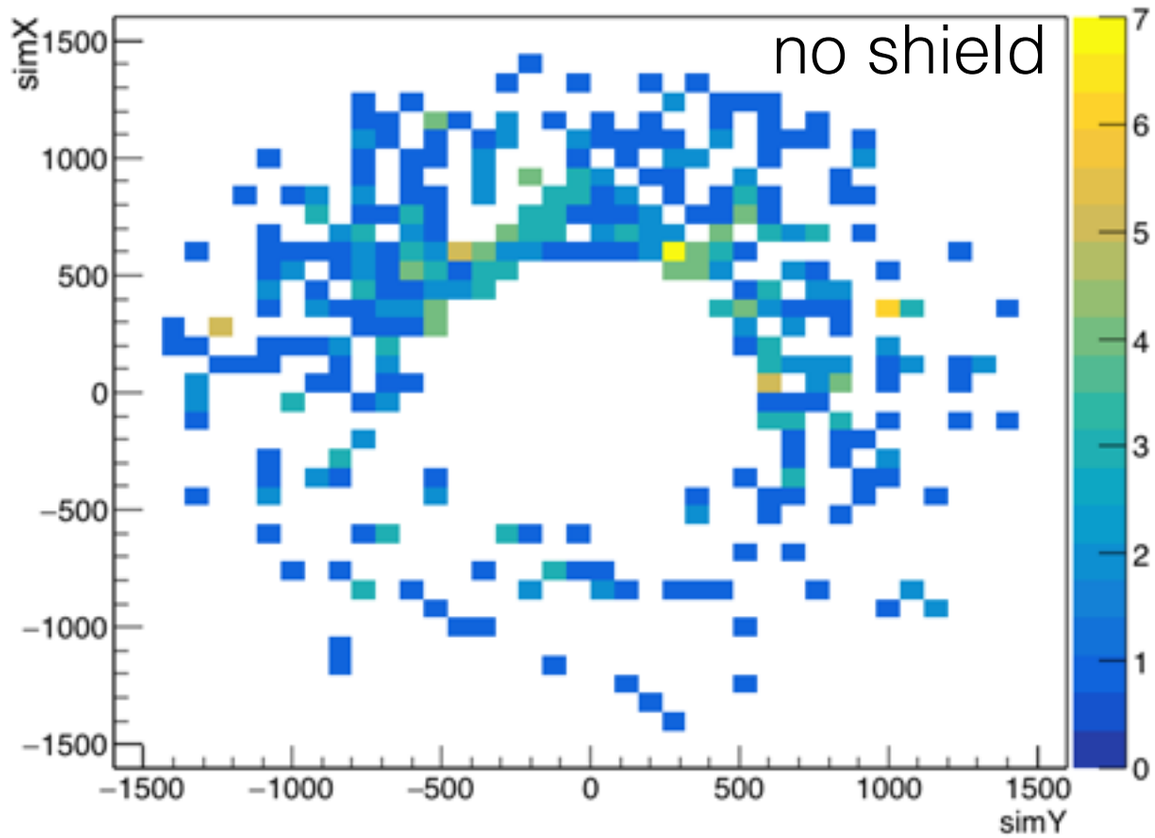


- >6° photons cross BP over the 30 cm length
- These photons "spray" on the detector
- Only small fraction will make a "hit"

New IR ILCsoft simulations -Full detector

Hits recorded on one of the disk (OT D4)

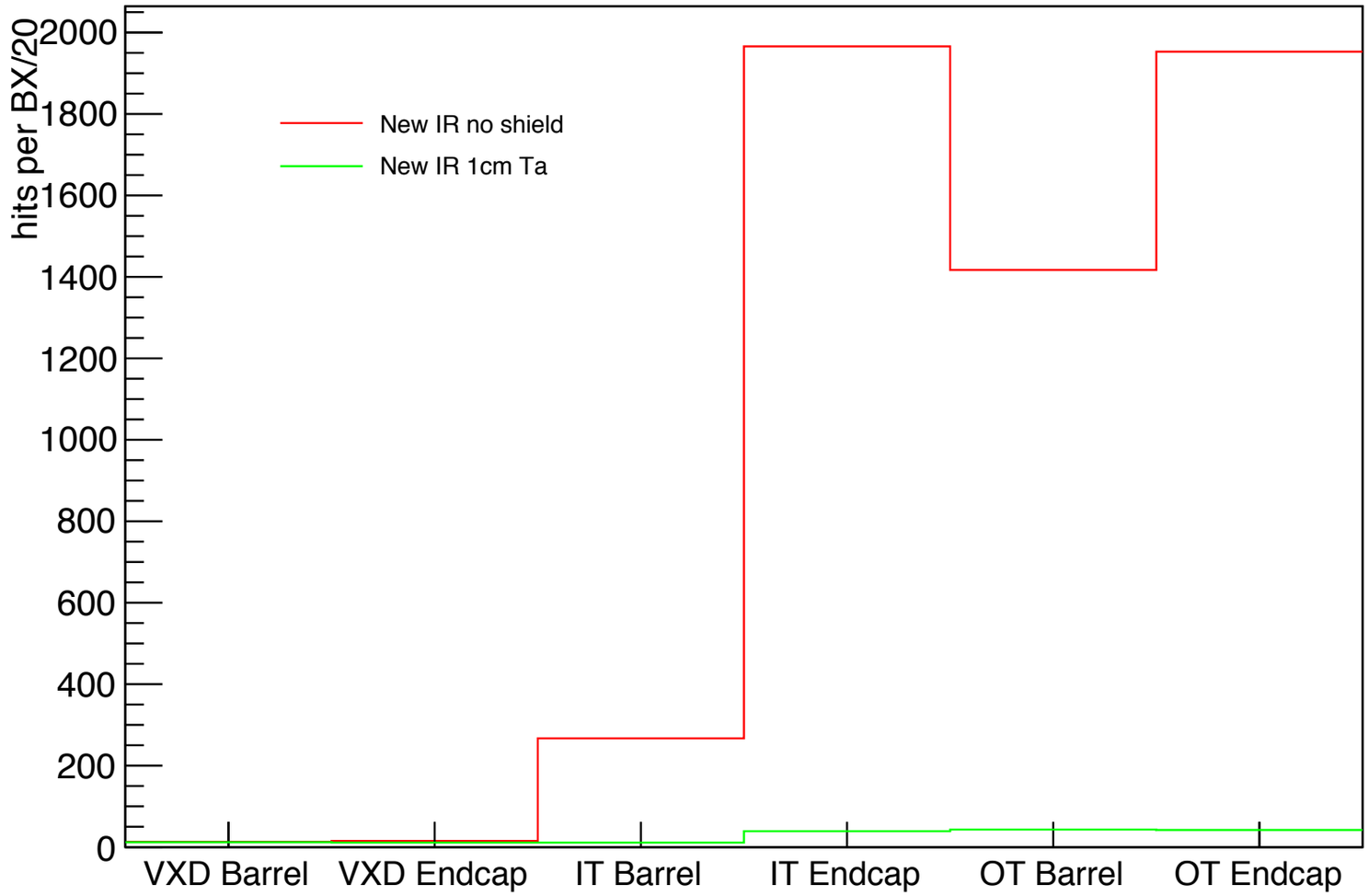
BX/20



Hits:

- Mostly IT/OT Endcaps ->
- SR direction cosines positive X (consistent)
- Spraying of photons consistent with my previous study of Ta thickness

New IR ILCsoft simulations -Full detector



Hits:

- Mostly IT/OT Endcaps
- **1.1% of SR** makes a hit **(no shield)**
- **0.03% of SR** makes a hit **(1cm Ta shield)**
  - **x2 better in VTX** (Barrel ~140/BX and Endcap ~180/BX)
  - **x50 better in ITE**

Summary

New IR and SR:

- 20 cm long 1cm Ta shield over the BP where the mask/source of SR is, can stop most of SR photons
- 1cm thickness is max, due to overlaps-> unless used only on downstream BP
- **recorded "hits" decrease from 1.1% to 0.03%** of total number of incoming SR

Next steps:

- Further analysis
- Extend Ta shield and vary thickness to further reduce hits in VTX detector
- W, H runs