



# Update on Background simulation with Bruno (Svt, Dch and more)

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SuperB General Meeting, Frascati (ITALY)

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*Apr 5<sup>th</sup>, 2011*

# Status and Outline

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- After the December meeting:
  - More realistic IP-SvtL0 geometry
  - Additional bkg sources still missing (Touschek)
- Outline:
  - Svt background at charm threshold
  - Request from ETD: particle rates vs energy on electronics (starting with Svt) for single event upset studies
  - Background in the detector hall
  - Not covered here (see talk in Dch session):
    - DCH High occupancy with Dec 2010 geometry
    - Validation of occupancy algorithm and track simulation in Dch gas (step size limit and single scattering)

# Svt Background at charm threshold

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# Charm threshold events

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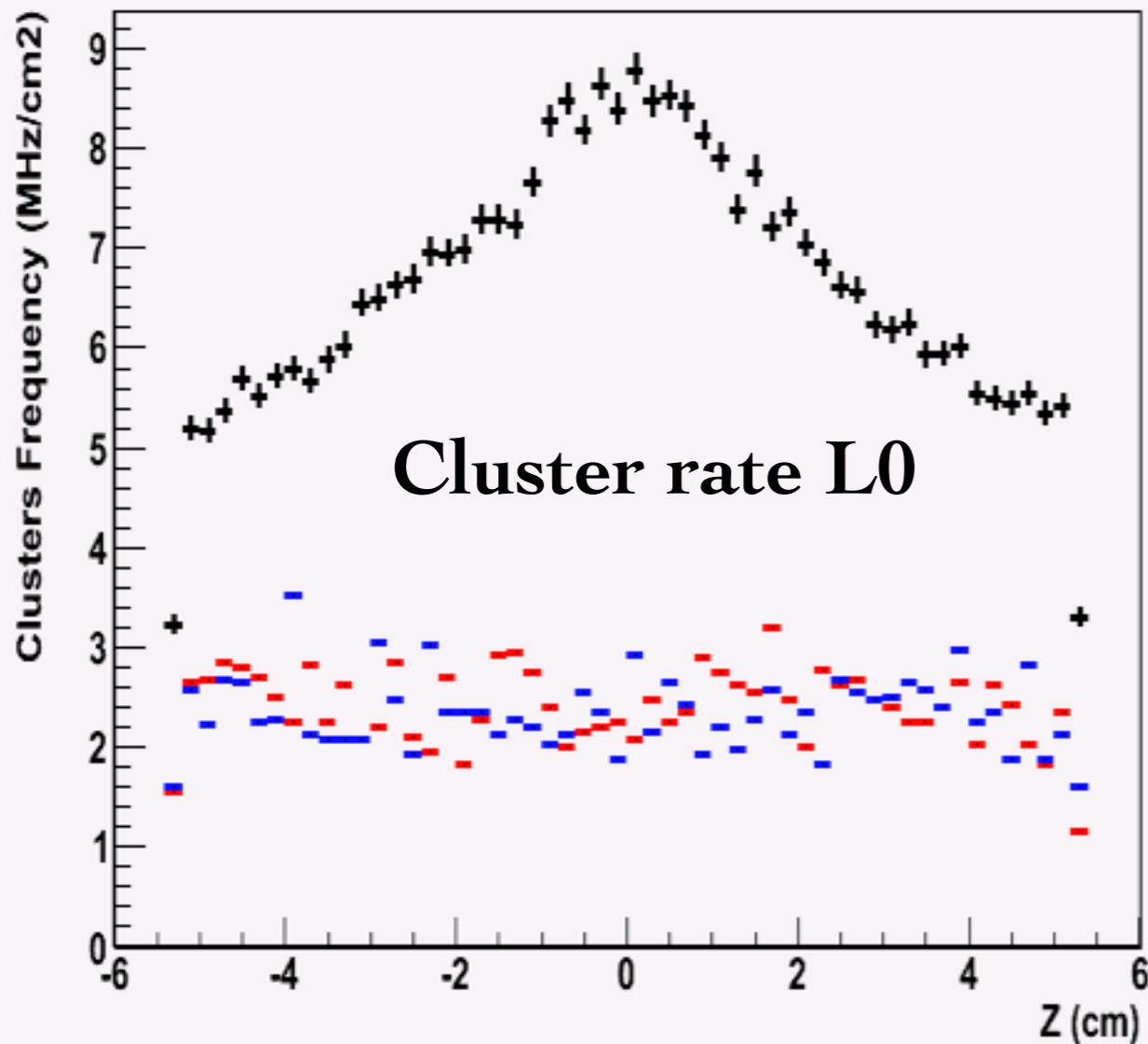
- 2-photon (pairs), ~2M GuineaPig evts prepared by Alejandro
  - $E(\text{CM}) = 3.772 \text{ GeV}/c^2$  and **boost of 0.24**
    - HER (electrons):  $2.388644 \text{ GeV}/c$ , LER (positrons):  $1.490469 \text{ GeV}/c$
  - $E(\text{CM}) = 3.772 \text{ GeV}/c^2$  and **boost of 0.91** (suggested by Pantaleo)
    - HER (electrons):  $4.265335 \text{ GeV}/c$ , LER (positrons):  $0.834682 \text{ GeV}/c$
- For both configuration we assume the same crossing angle as at the Y(4S) threshold (30mrad)
- At the Psi(3770) threshold diag36 estimates the cross section to be 4.9 mbarn , ~1.4 smaller than at Y(4S) threshold (7.3 mb)
- Expected luminosity:  $10^{35} \text{ cm}^{-2} \text{ s}^{-1}$ , **Rate: 490 MHz** (7.3 GHz at Y4S)
- RadBhabha not yet available because they depend from machine configuration

# Charm threshold: rates

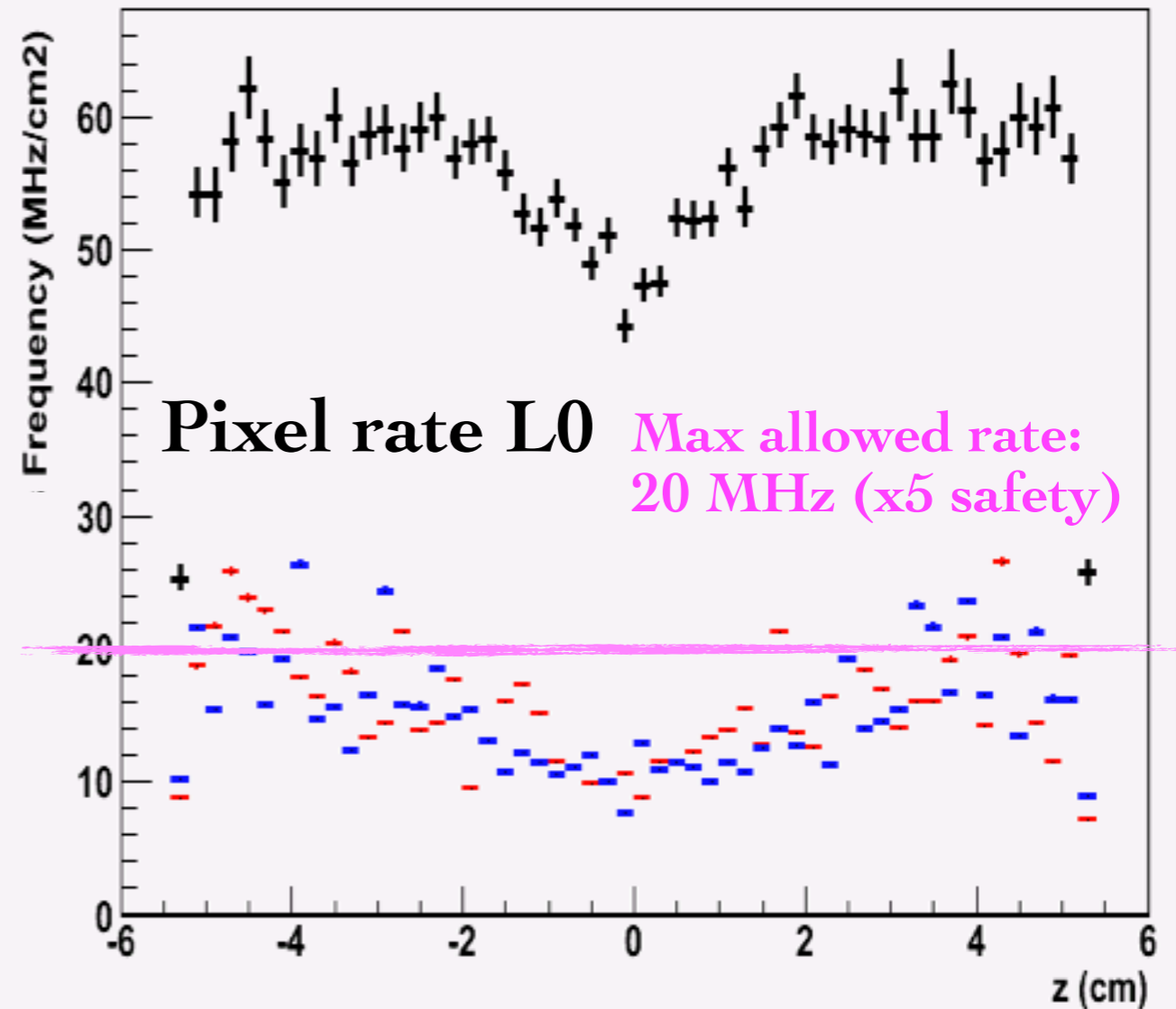
- Bkg lower than Y4S
- Keep in mind: 1/10th of luminosity

**Y(4S) Threshold**  
**Psi(3770), boost 0.24**  
**Psi(3770), boost 0.91**

Clusters2 distribution vs Z and Phi on Svt Layer 0



PixelsON distribution vs Z on Svt Layer 0

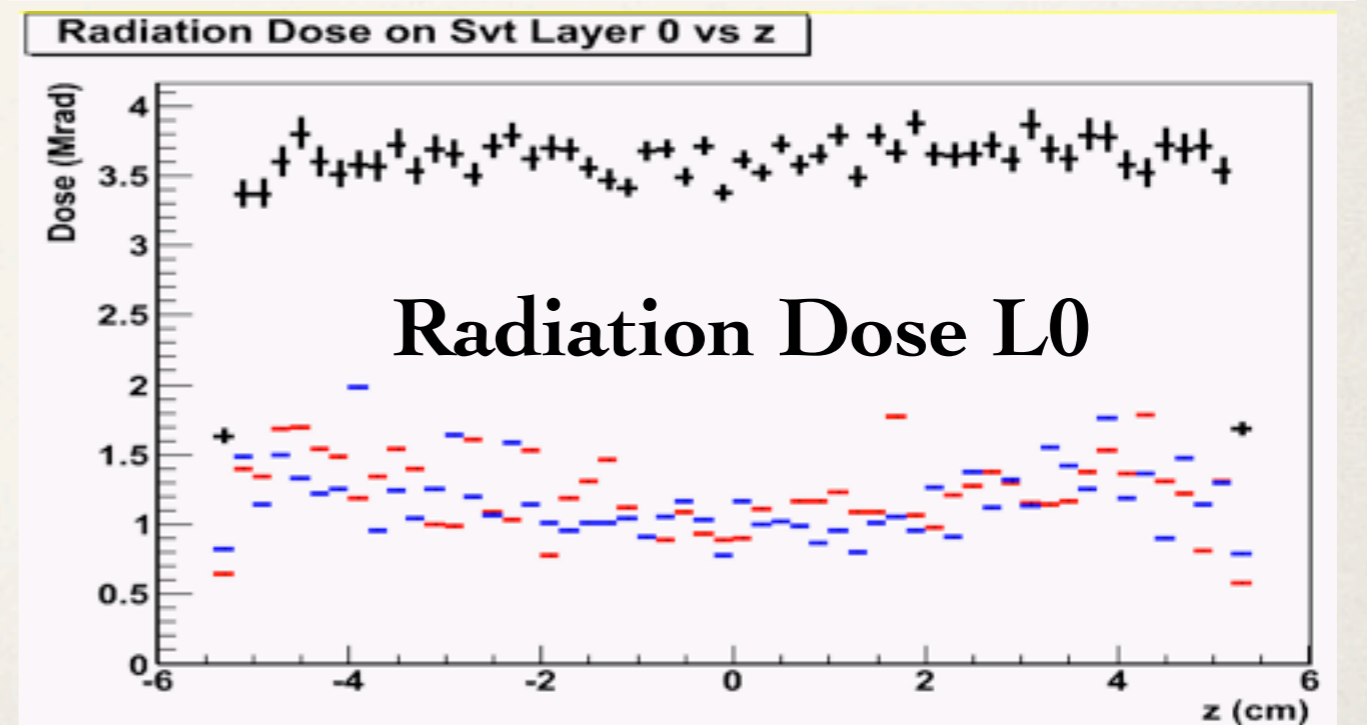
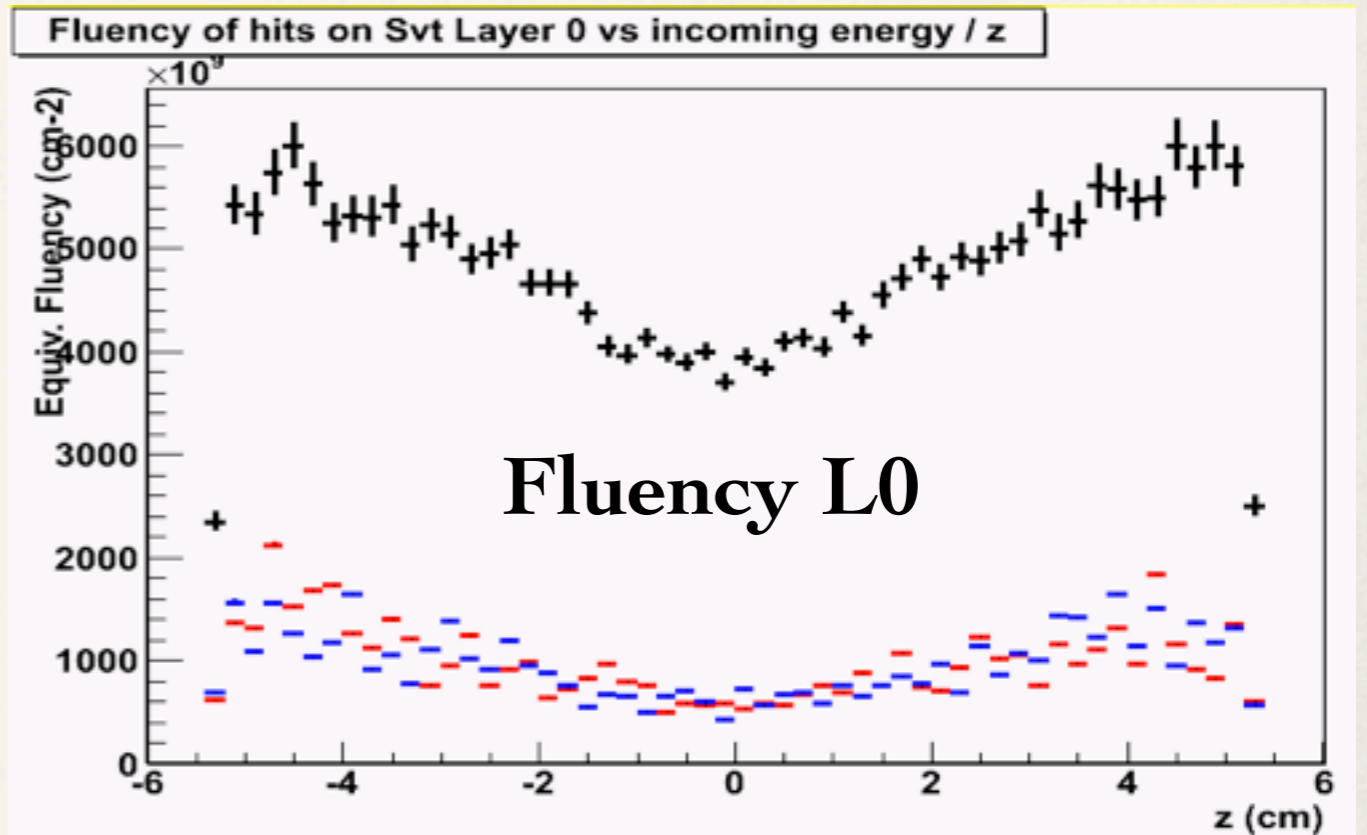


# Charm threshold: rates

Y(4S) Threshold  
 Psi(3770), boost 0.24  
 Psi(3770), boost 0.91

- Same trend for other variables and layers

Rate (kHz cm <sup>-2</sup> )	Y(4S)	Psi(3770) boost 0.24	Psi(3770) boost 0.91
L0	56M	16M	15.4M
L1	911	117	69
L2	476	56	28
L3	131	12	13.5
L4	12	2.5	1.3
L5	6.1	1.5	1.0



# Particle rates vs energy

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# Single event effects on electronics

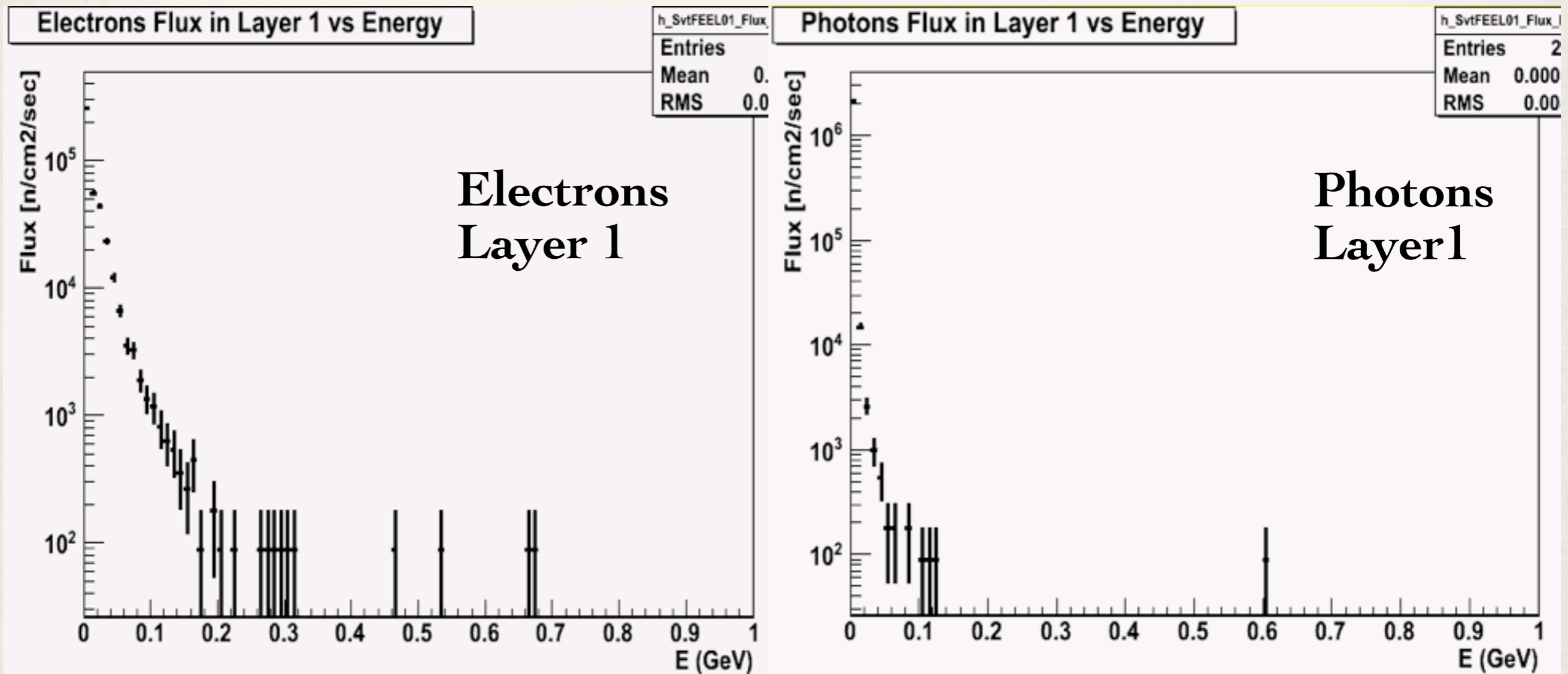
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- Aside from radiation dose, electronics is affected also by **single event upset (SEU, transient)** or **single event latch-up (SEL, permanent)**: configuration losses, data corruption, circuitry damages
- Trying to estimate them using full simulation output: particle rates vs energy for **electrons, photons, neutrons, protons, ions**
  - Request on **May 2010** from Alberto Stabile (Milano), never followed up for lacking of time
  - Second request from ETD people (Dominique)
- Background people will provide distributions (**maps**) and ETD people will use them to estimate the SE(U,L) probability using specific cross-sections



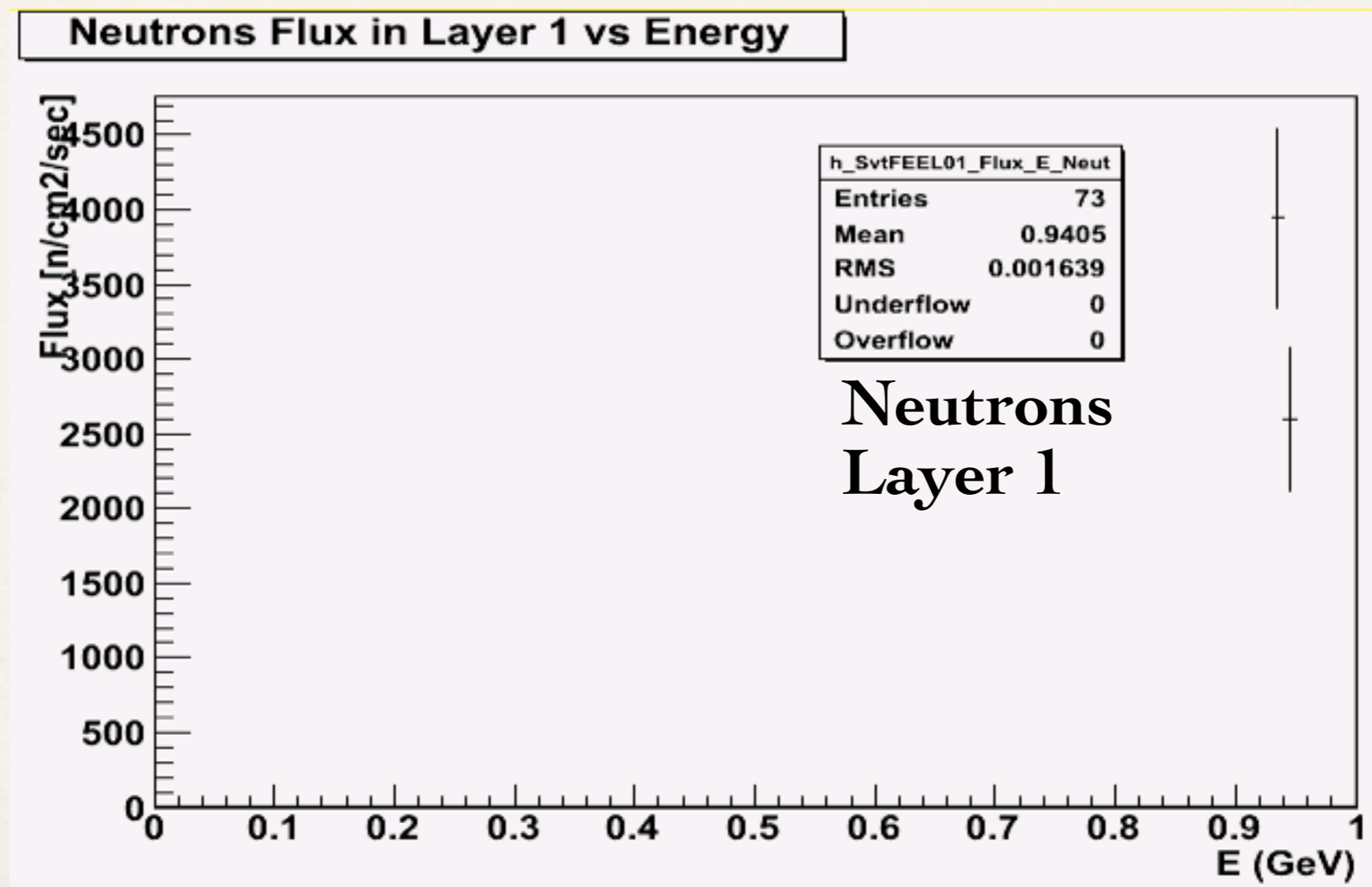
# Particle rates on SVT electronics

- Preliminary version of particle rate maps, **SVT electronics only, 2-photons bkg**
- Energy range: **[0-1] GeV, # of particle / (cm<sup>2</sup> s)**
- When validated, maps can be easily generated for any sensitive volume (mainly subsystem electronics)



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# Background in the detector hall

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# Detector hall

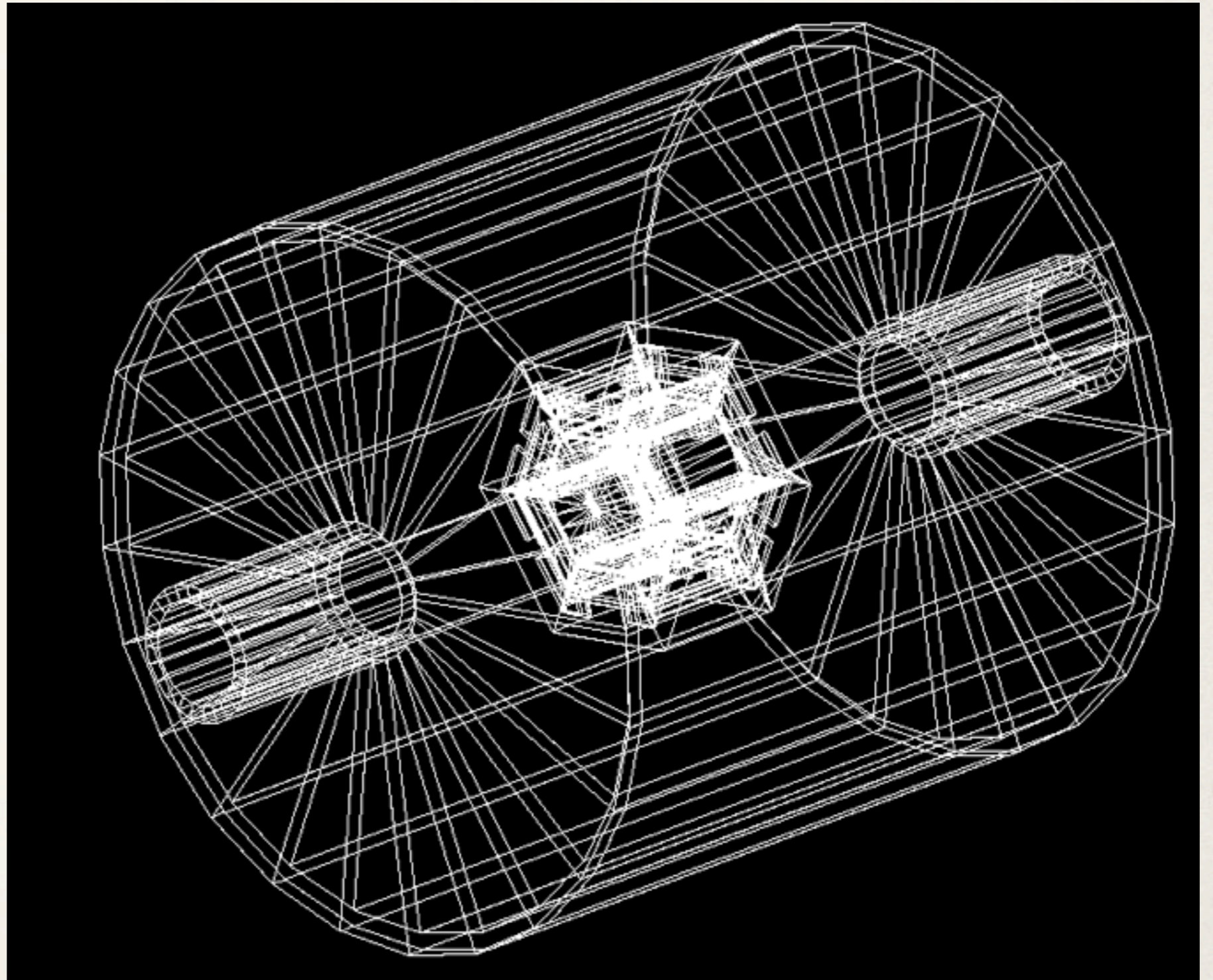
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- Before detector was in a big empty volume called “World” (filled with air)
- Request for adding detailed description of the detector hall:
  - Best location for external crate of electronics
  - Background and shielding from concrete wall, e.g. far pipes are already in the tunnel, less particles can eventually reach the detector
- **Eugenio** implemented a rough model:
  - Cylindrical concrete wall
  - Sensitive volumes for monitoring the radiation: big silicon plates around the detector, step of 1 m, 400um thick

# Detector hall

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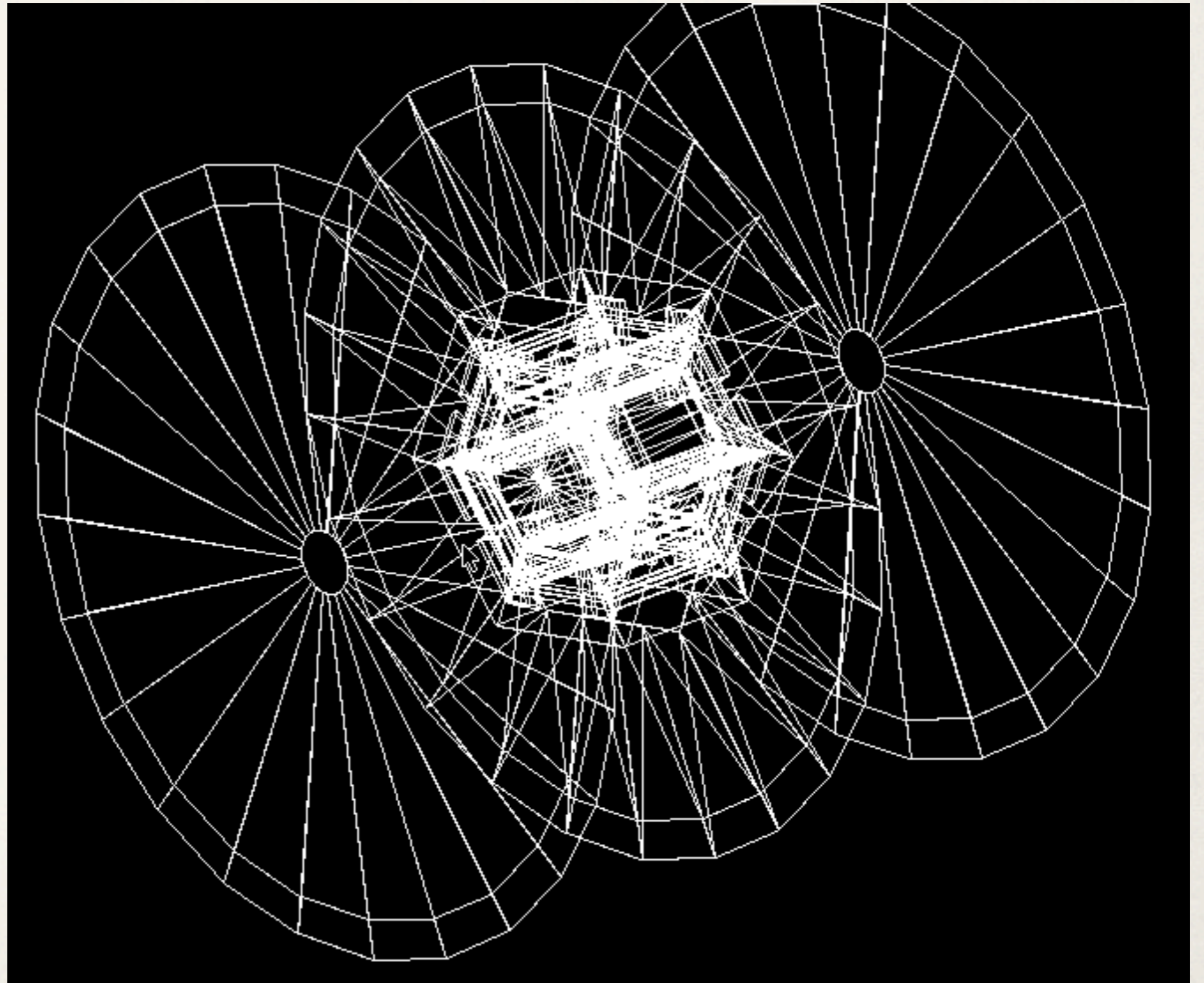
- Concrete cylinder with tunnel pieces
- Inner radius is 10m



# Detector hall

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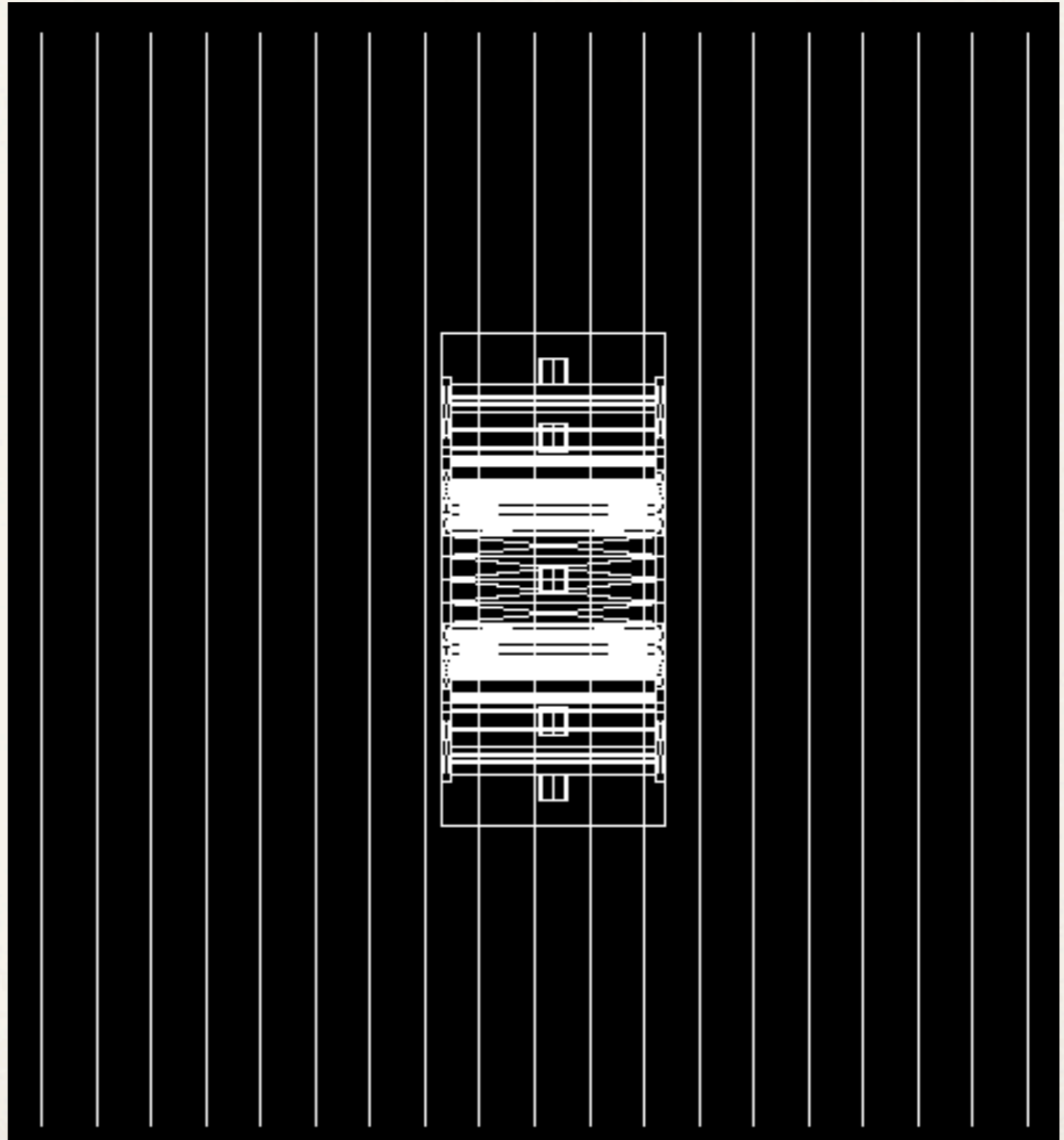
- Silicon plates (not all of them are displayed)



# Detector hall

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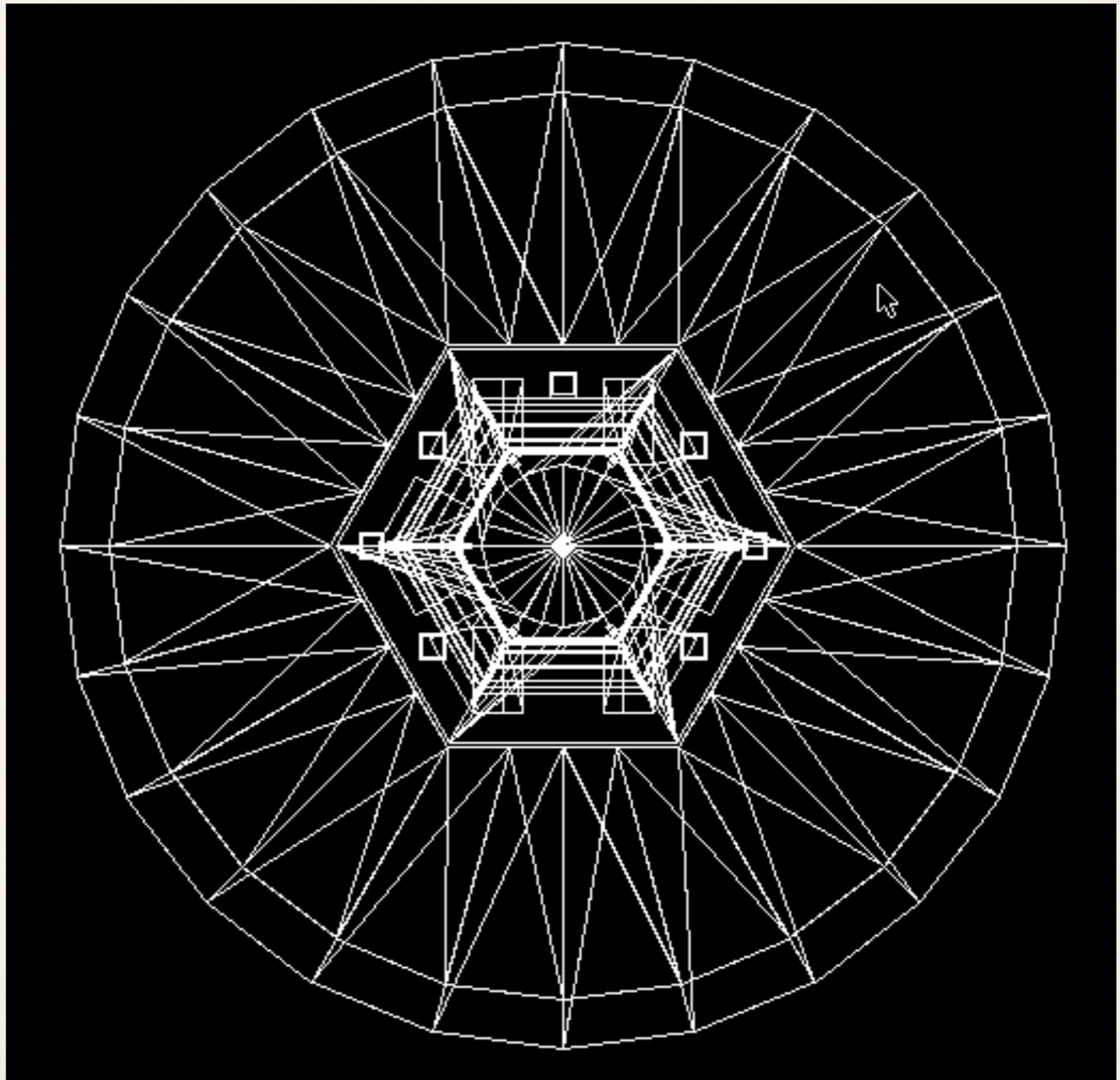
- Top view
- 5 (fwd)  
+ 9 (barrel)  
+ 5 (bwd)  
plates
- Hexagonal  
holes around  
the detector



# Detector hall

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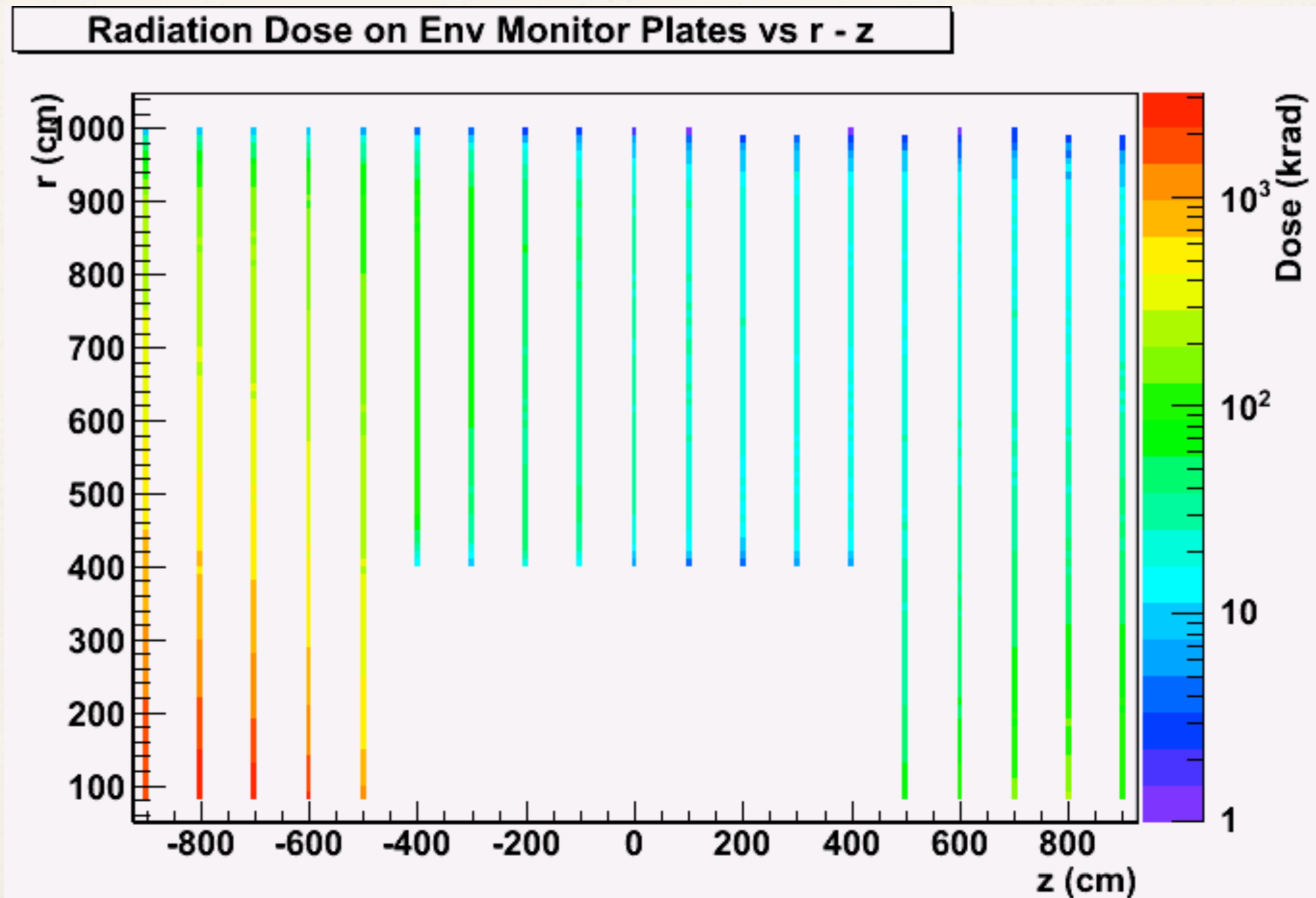
- Beam view





# Radiation dose

- RadBhabha production, Cipe geometry, dose in r-z bins



# Conclusions

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- First estimate of Svt background (2-photon) at charm threshold: lower than  $Y(4S)$ , mainly from 10 times less lumi
- Particle rate maps vs energy, input for ETD people to compute SEE probability, preliminary plot for Svt electronics
- Detector hall: concrete wall and radiation monitoring outside the detector