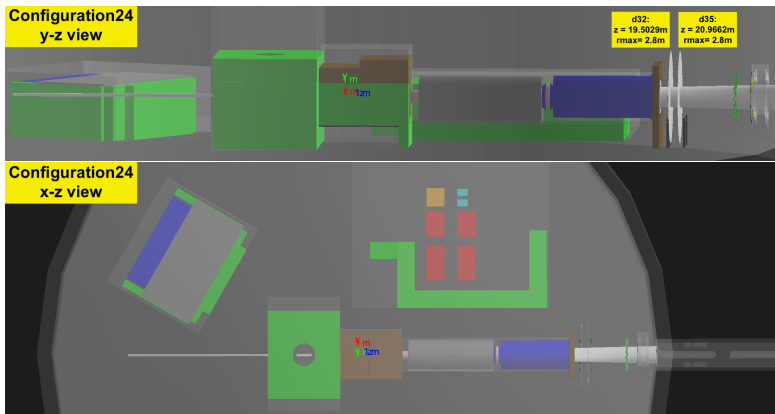


## TID calculations for the GEM1/GEM4 Planes

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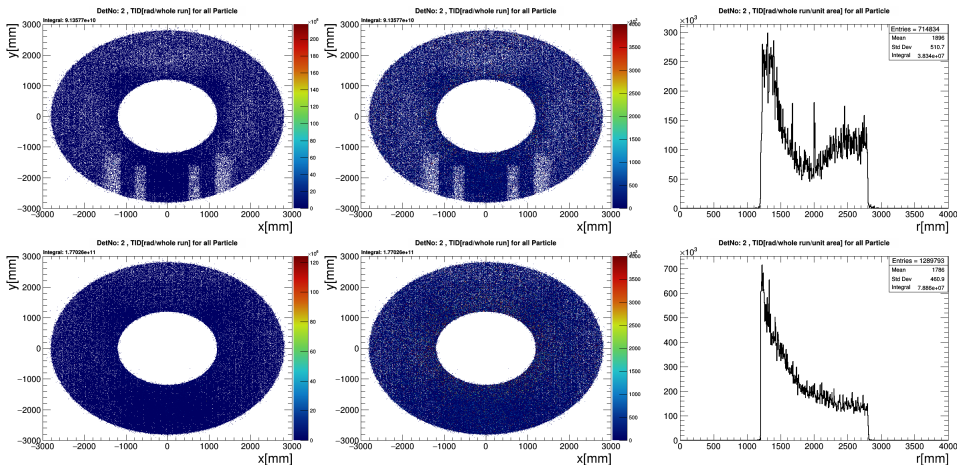
## Updated shielding geometry: Configuration24



- New PS bunker design is implemented.
- We evaluated the TID level for the GEM electronics when in their both measurement and parked positions (APV cards will be at  $r \approx 1.2$  and  $1.8$ , respectively). Used the flux of particles in the following detector planes.
- $z_{d32} = 19.5029\text{m}$ ,  $z_{d35} = 20.9662\text{m}$

# TID calculations for GEM1/GEM4 planes

- Simulation ran with shielding config24 (100M beam generator events).
- The particles are passed through 1cm thick of  $\text{SiO}_2$  plane and deposited energy is evaluated per  $5 \times 5 \text{mm}^2$  block.
- TID is computed by dividing the energy deposition in that block by the mass and the results are integrated over the whole MOLLER run.

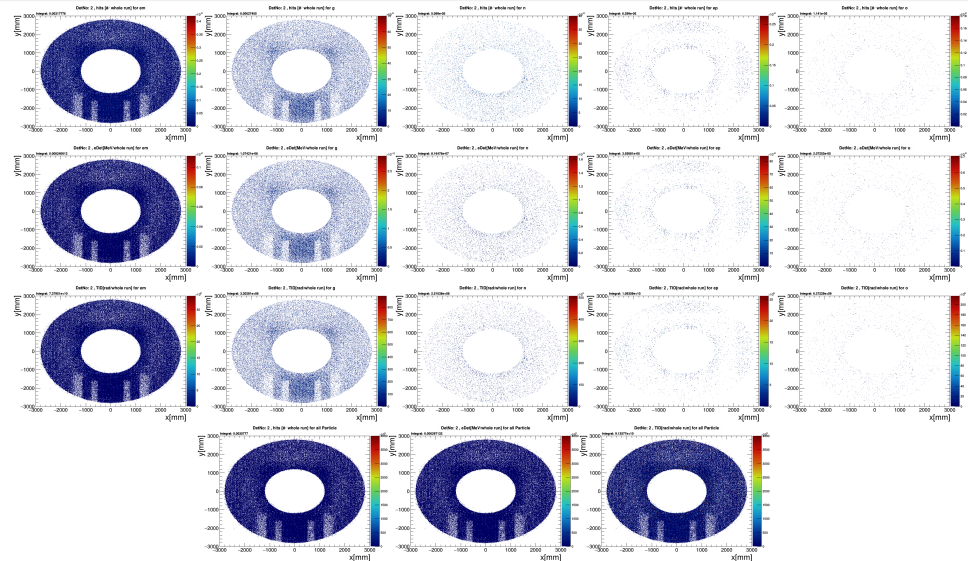


- The average dose corresponds to  $\approx 300 \text{kRad}/700 \text{kRad}$  for GEM1 and GEM4, respectively.

# Backup

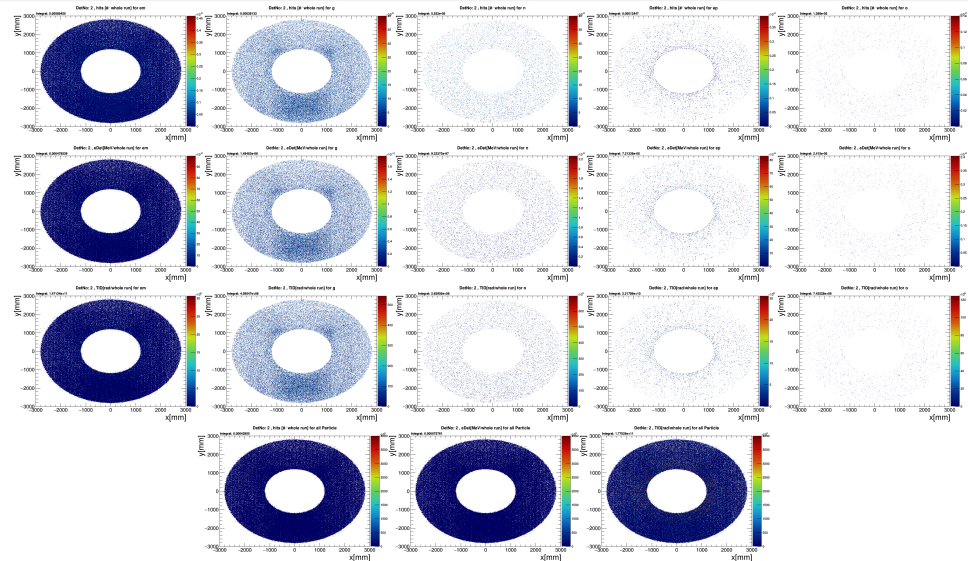
- Skimmed the remoll output files for d32/d35 by using skimTree.C. While doing the analysis, the skimmed root output is produced separately for the  $p_z$  states ( $p_z > 0/p_z < 0$ ) with  $hit.r > 1200\text{mm}$ .
  - det32: 100M beam generator events.
    - $p_z > 0$ : 140360 Events;  $p_z < 0$ : 638572 Events
  - det35: 100M beam generator events.
    - $p_z > 0$ : 263593 Events;  $p_z < 0$ : 827875 Events
  - Then, ran the tid.mac by using the external generator
    - file: Skimmed root file
    - copyRate 1
    - startEvent 0
    - detid: 32/35
    - zOffset:  $-(\pm 10 \text{ the value of } z\text{-position as in mollerParallel.gdml})$
    - run # skimmed events
  - tidAna.C macro is used to analyse this ext. generator root file.
- 1mm/10mm/1mm thick *G4\_SILICON\_DIOXIDE* (density =  $2.32 \text{ g/cm}^3$ ) planes are used in the tid.gdml

# TID calculations for GEM-1 plane



The 2D distributions of the different particle hits in the d32 for without any weight (1<sup>st</sup> row), with deposited energy-weighted (2<sup>nd</sup> row), with radiation-weighted (3<sup>rd</sup> row). The bottom plots are for the sums of the particle species with three different weighting.

# TID calculations for GEM-4 plane



The 2D distributions of the different particle hits in the d35 for without any weight (1<sup>st</sup> row), with deposited energy-weighted (2<sup>nd</sup> row), with radiation-weighted (3<sup>rd</sup> row). The bottom plots are for the sums of the particle species with three different weighting.