Background dose simulation

With magnetic field shielding and lower magnetic field strength

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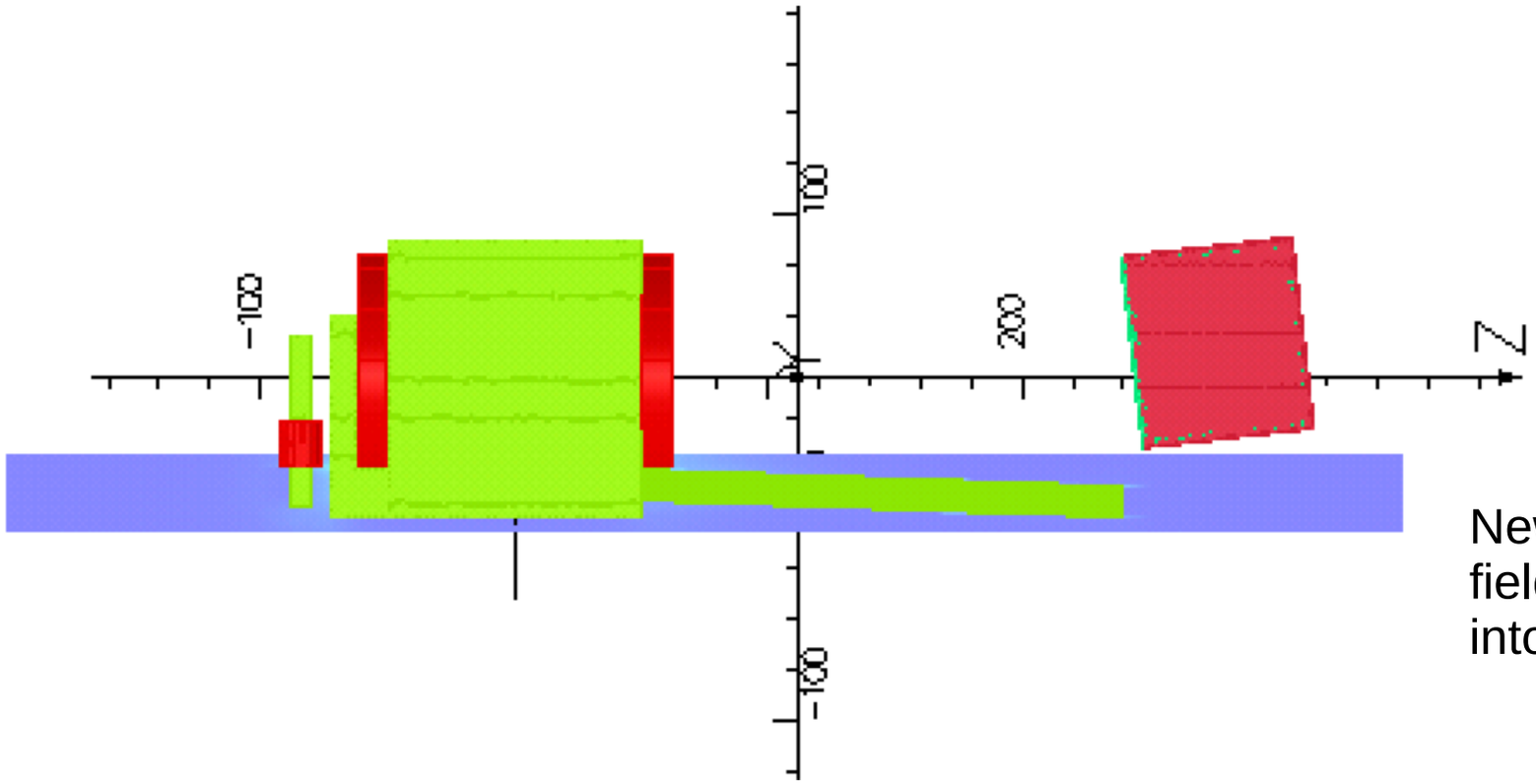
19. Dec. 2019

Background dose calculation setting



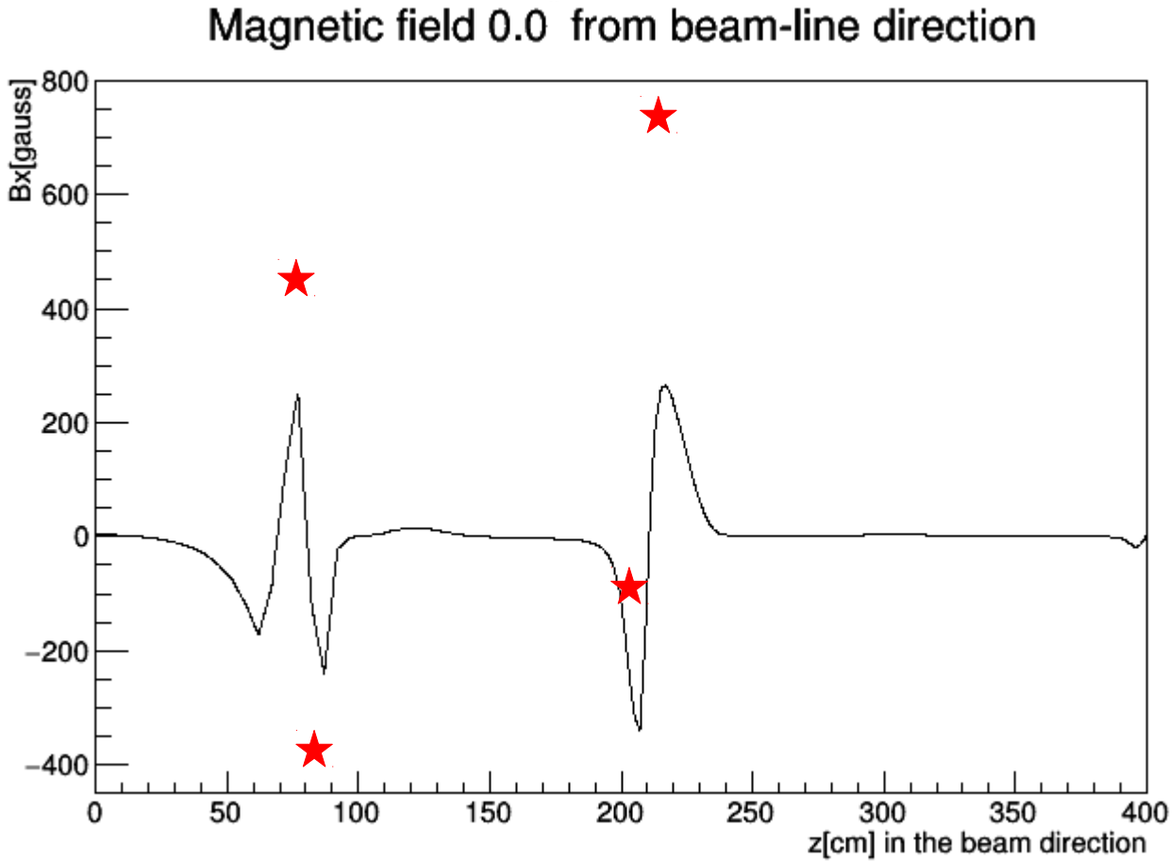
New magnetic field map taking magnetic field shielding on beam-pipe and calorimeter into account.

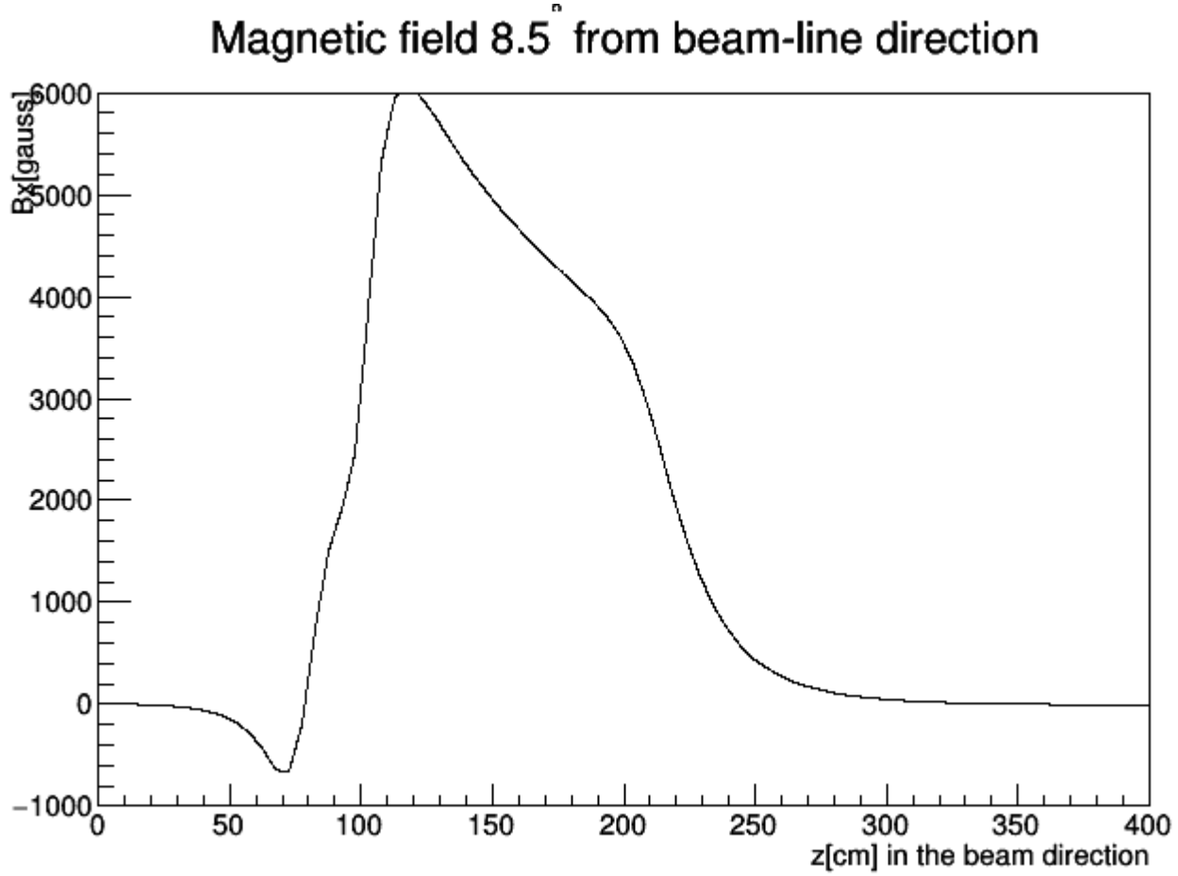
- Magnetic field center : 1.57 m from the target.
- Magnetic field center : 2.2 deg from the beam-pipe
- Physical magnet’s center : 1.6 m from the target.
- Physical magnet’s center : 2.3 deg from the beam-pipe.
- Magnetic field’s z-axis : goes through the target.
- Calorimeter : 4m away from the target.
- Calorimeter : 8.5 deg from the beam-pipe.
- Calorimeter’s magnetic field shielding :

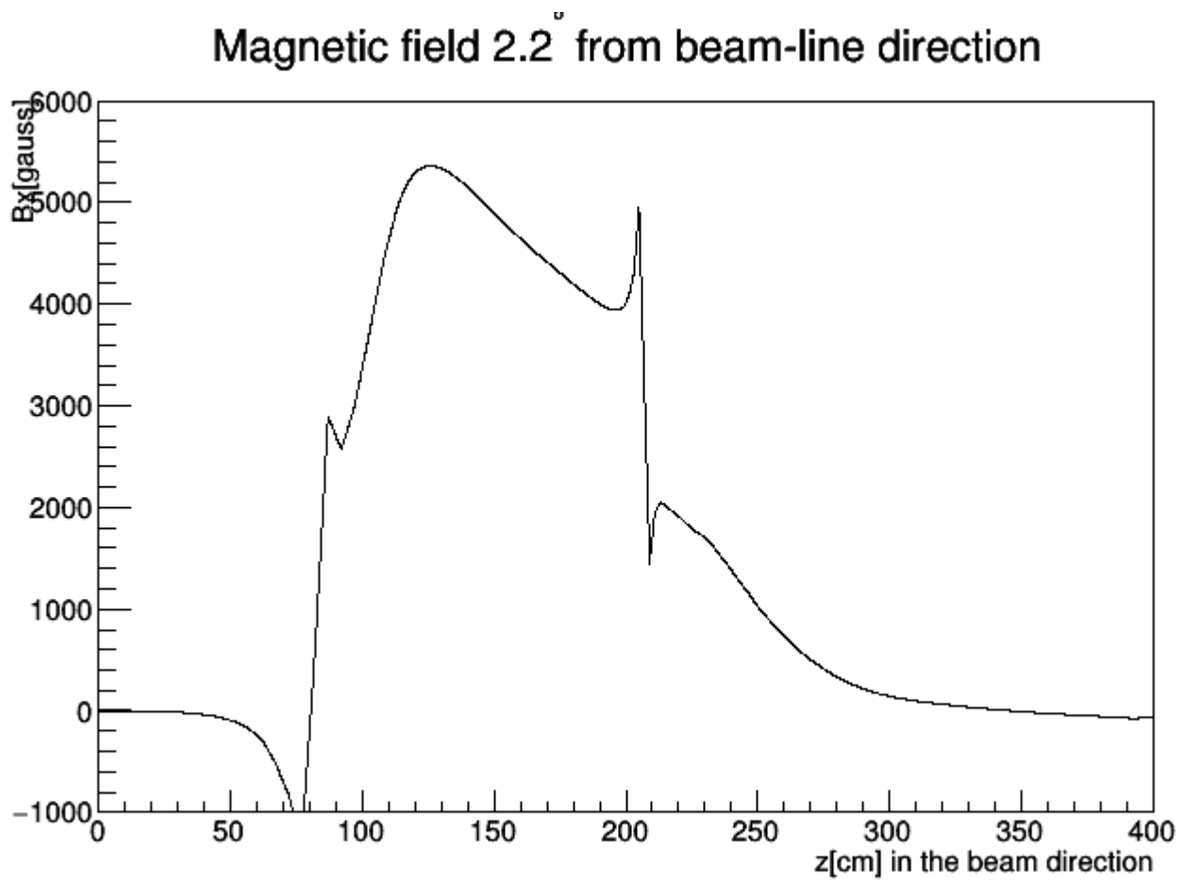
  - iron 1mm + mu-metal 1mm in the front face

  - iron 5mm + mu-metal 1mm in the other 5 faces

Background dose calculation



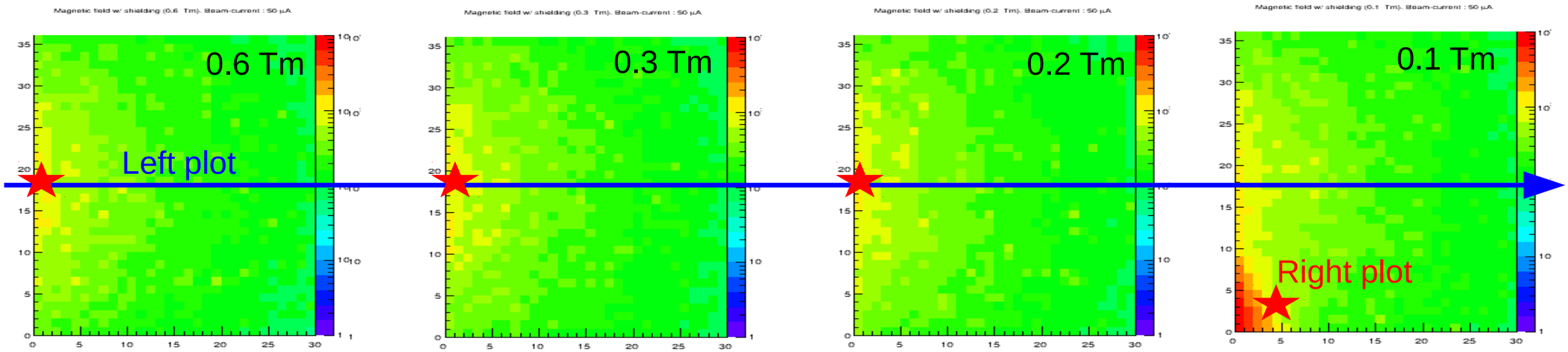


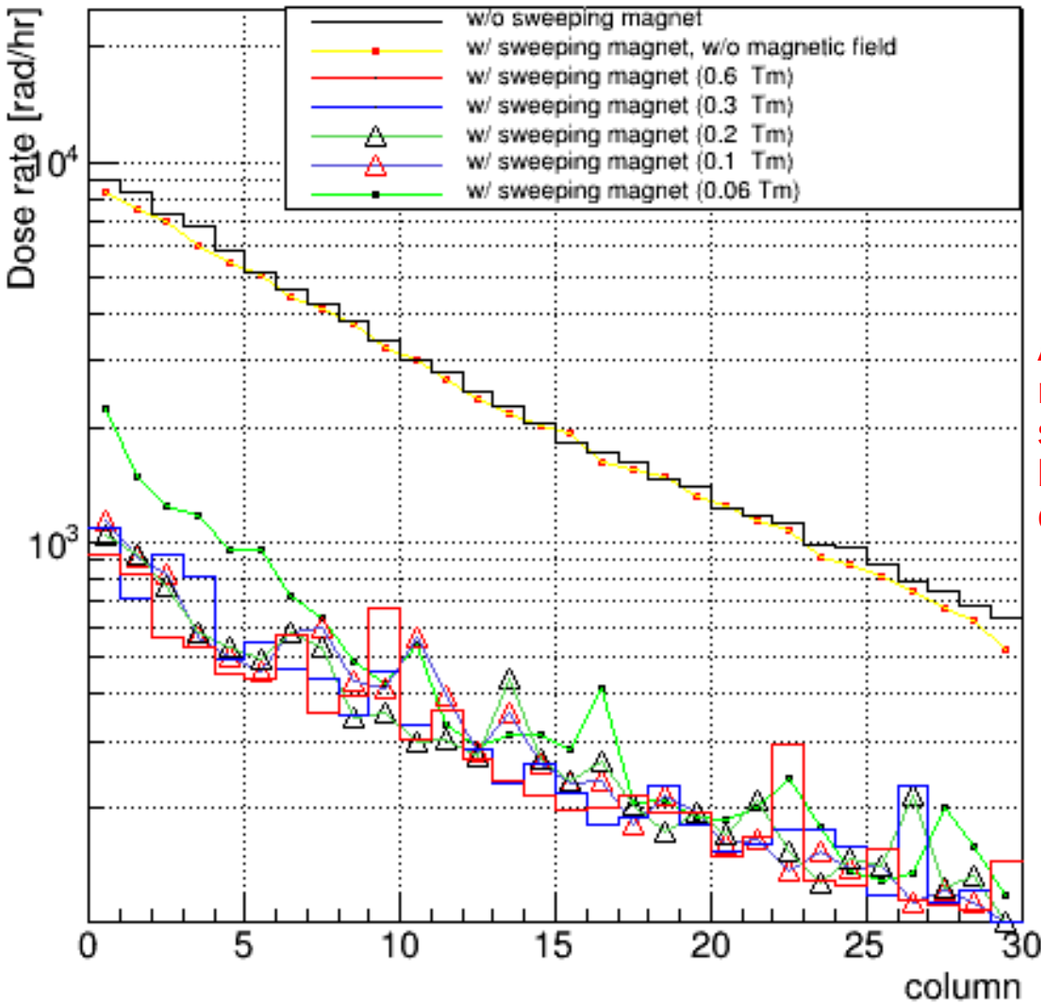


Magnetic field(Bx [gauss]) in several directions

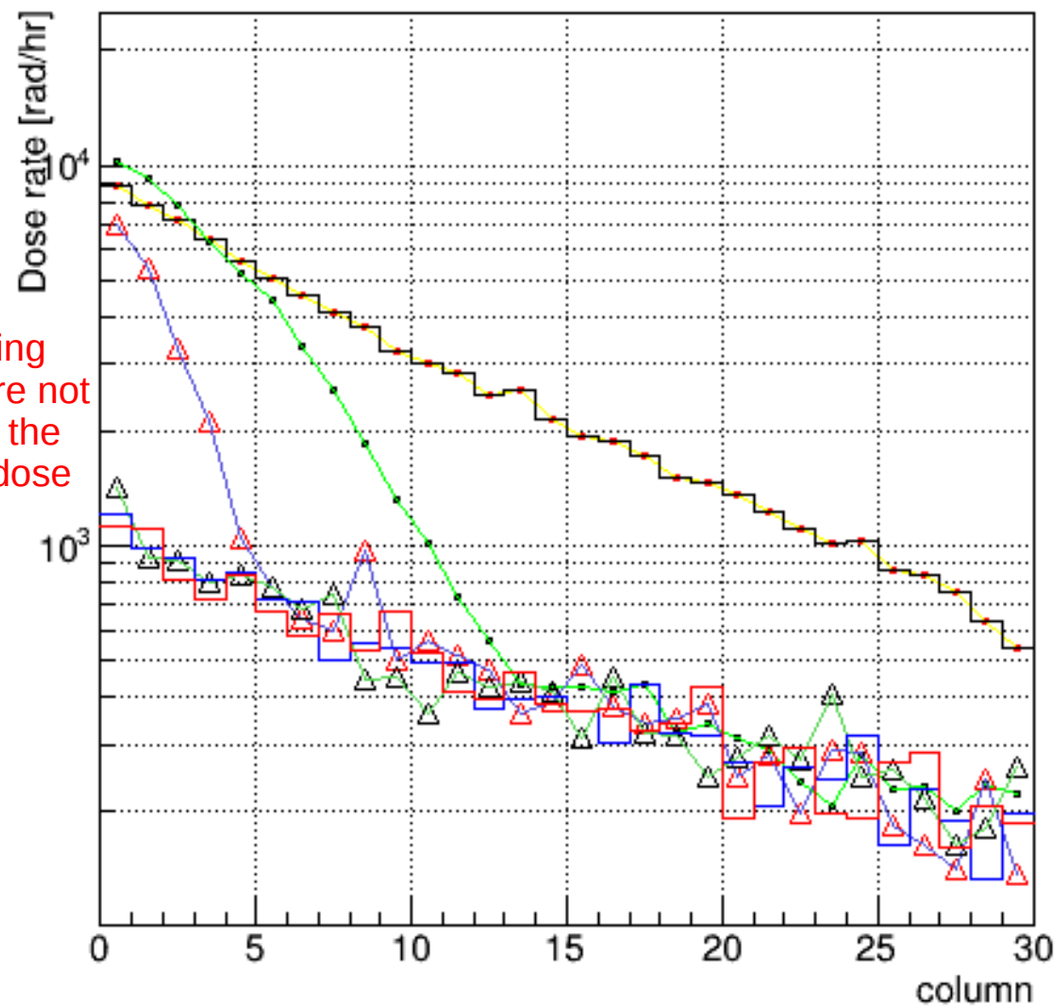
★ Magnetic field values without the shieldings

Background dose calculation with new mag. field map



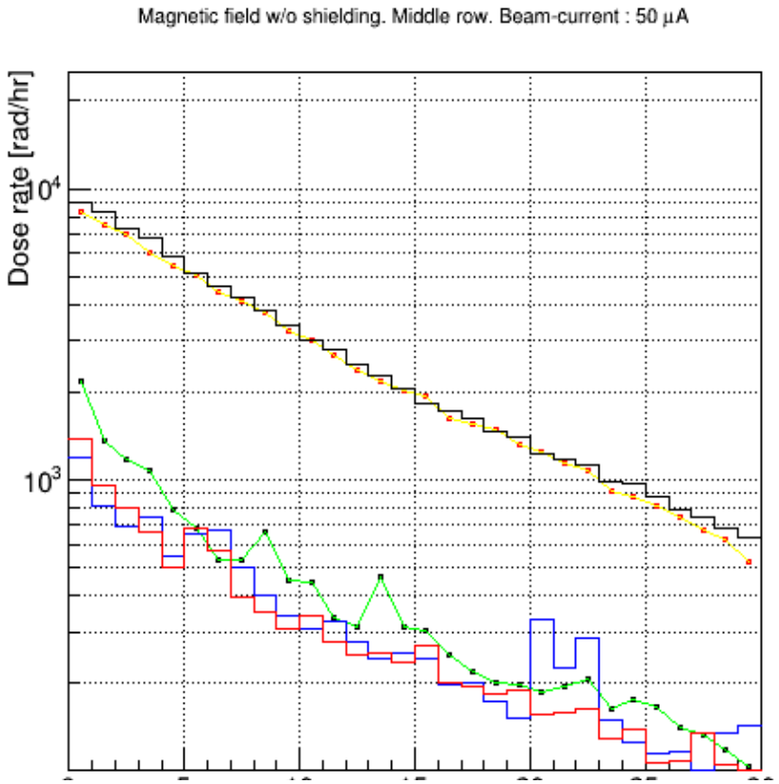


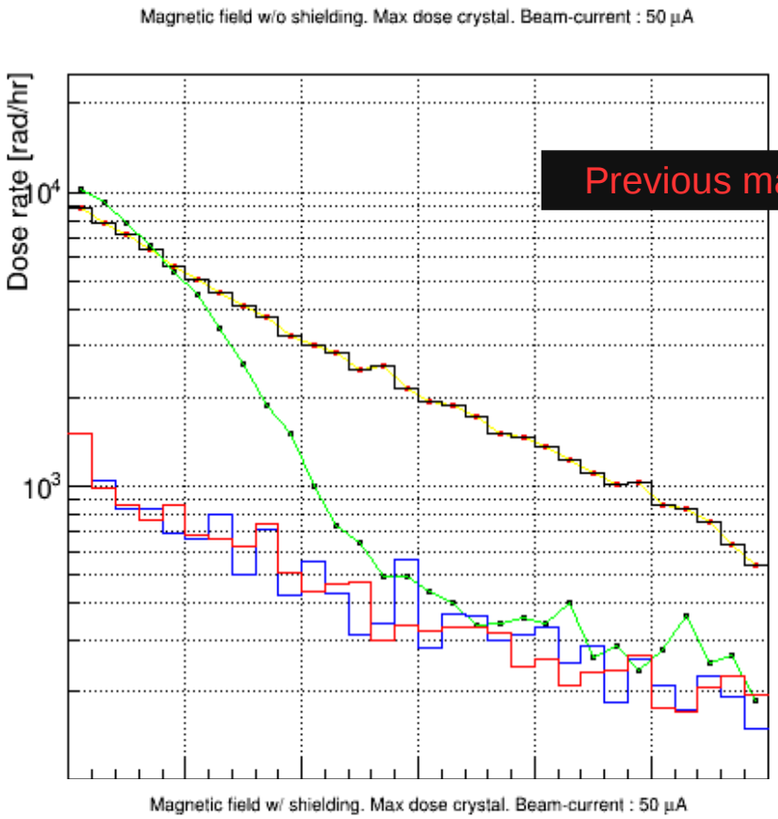
Actual shielding materials were not simulated for the background dose calculation



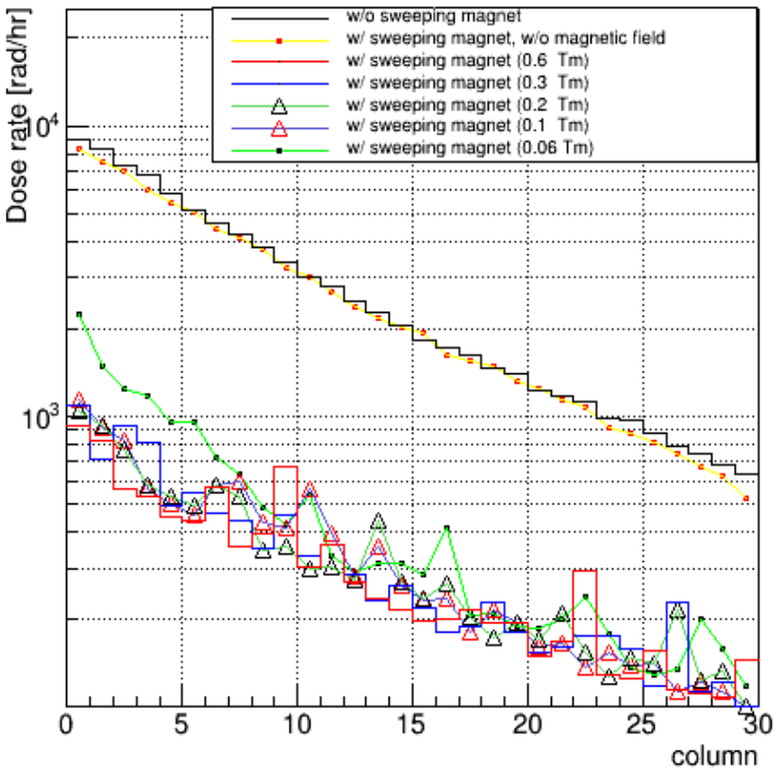
0.2 Tm is sufficient enough to sweep away the charged particles for this setting.

Background dose comparison with and without shielding





Previous magnetic field (No shielding)



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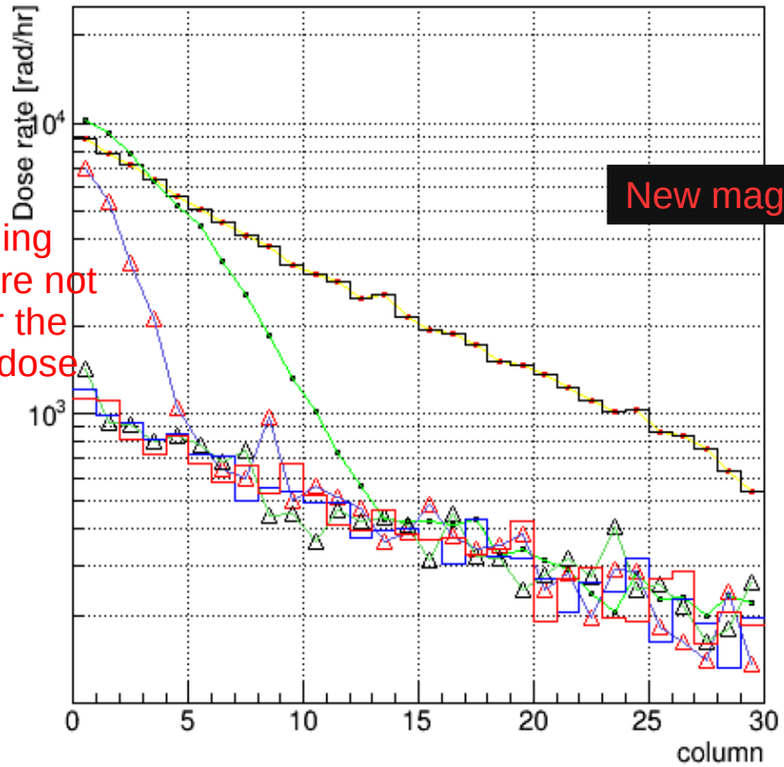

New magnetic field (With shieldings)

No significant difference between the previous magnetic field map (no shieldings) and the new magnetic field map (beam-pipe and calorimeter magnetic field shielding)

Summary

- 0.2Tm is enough to reduce the charged particle backgrounds in the setting shown here.
- No significant difference between the magnetic field maps without the shieldings and with the shieldings.

  - To calculate the background dose for other kinematic settings, new magnetic field maps need to be calculated.

  → Suggestions :

  - low-xB setting : calorimeter 6m away from the target.

    calorimeter 6.3 deg from the beam-pipe

  - larger calorimeter angle setting ?

- Energy and position resolution study with the magnetic field shielding on the calorimeter is on going.