Background source tracking and shielding simulation

Ho San KO
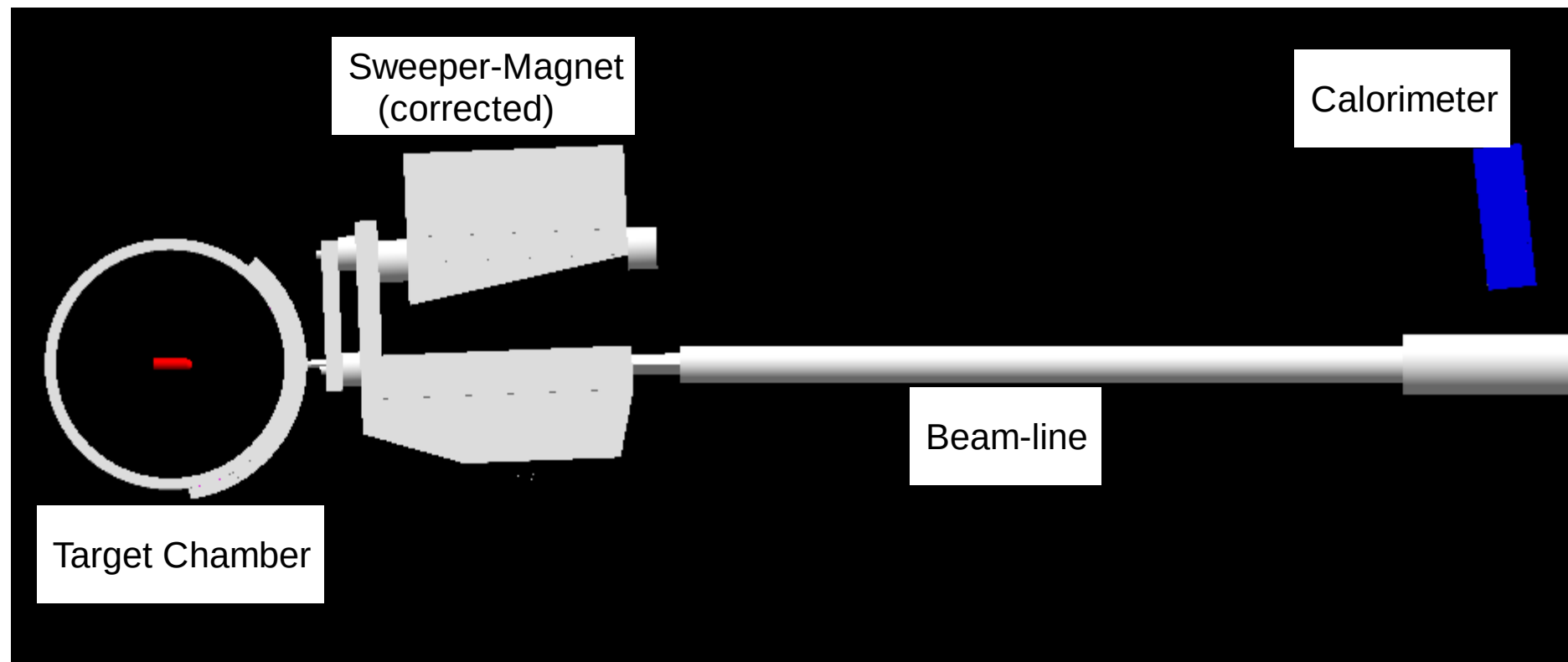
Institut de Physique Nucléaire d'Orsay

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Outline

- Background source tracking

- Dose profile in NPS crystals with energy cut (shielding)
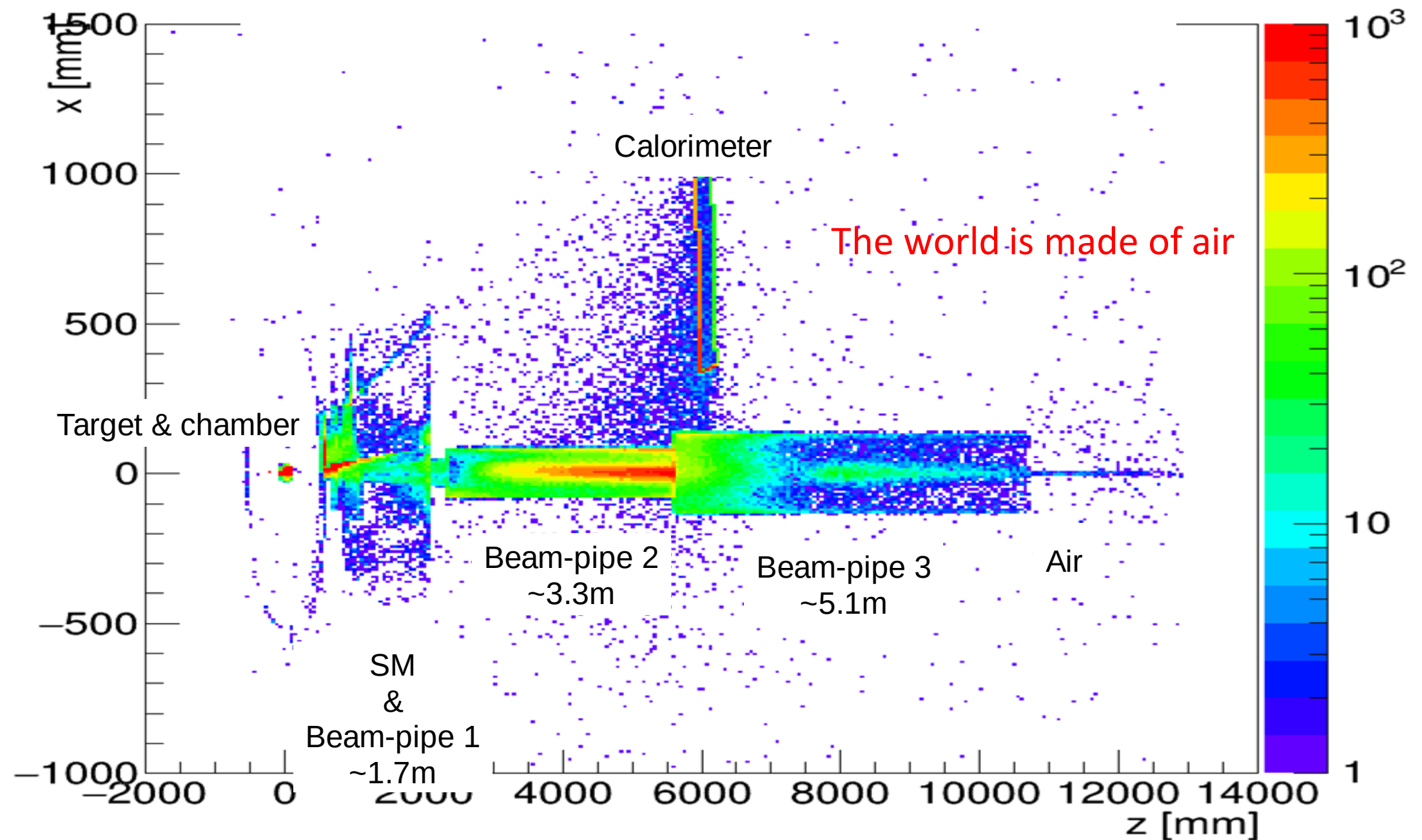
Background simulation geometry

Setting #16 (low-xB) : xB = 0.2, Q^2 = 3.0 GeV^2. Beam-time : 1 day with 11uA

Calorimeter : 6m from the target, 6.3 deg from the beam-line axis

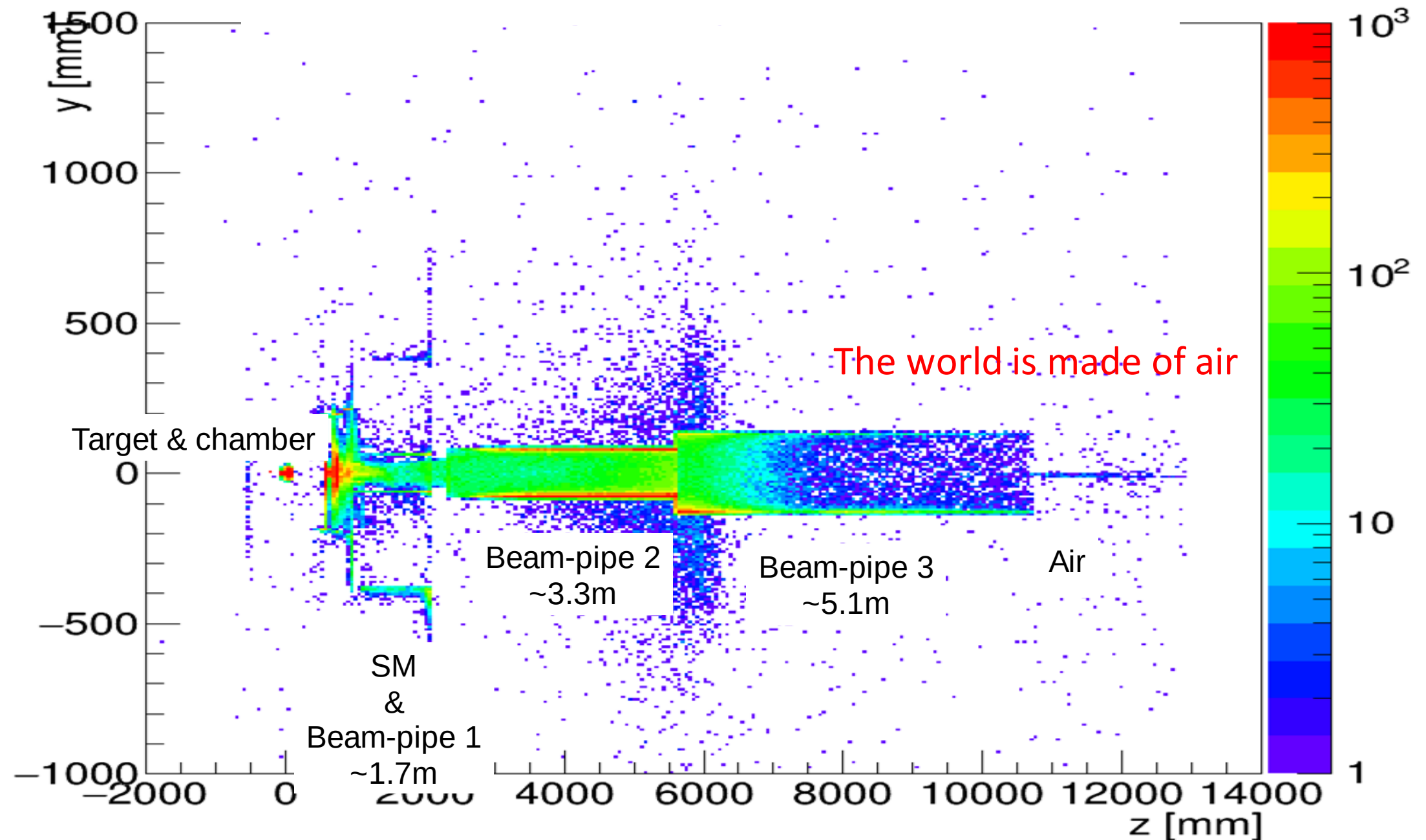Sweeper-Magnet Center : 1.6m (for E12-13-010), 2.3 deg from the beam-line axis(6.3 - 4 deg)

Background source tracking

Particles' vertex position (aerial view) that hit calorimeter
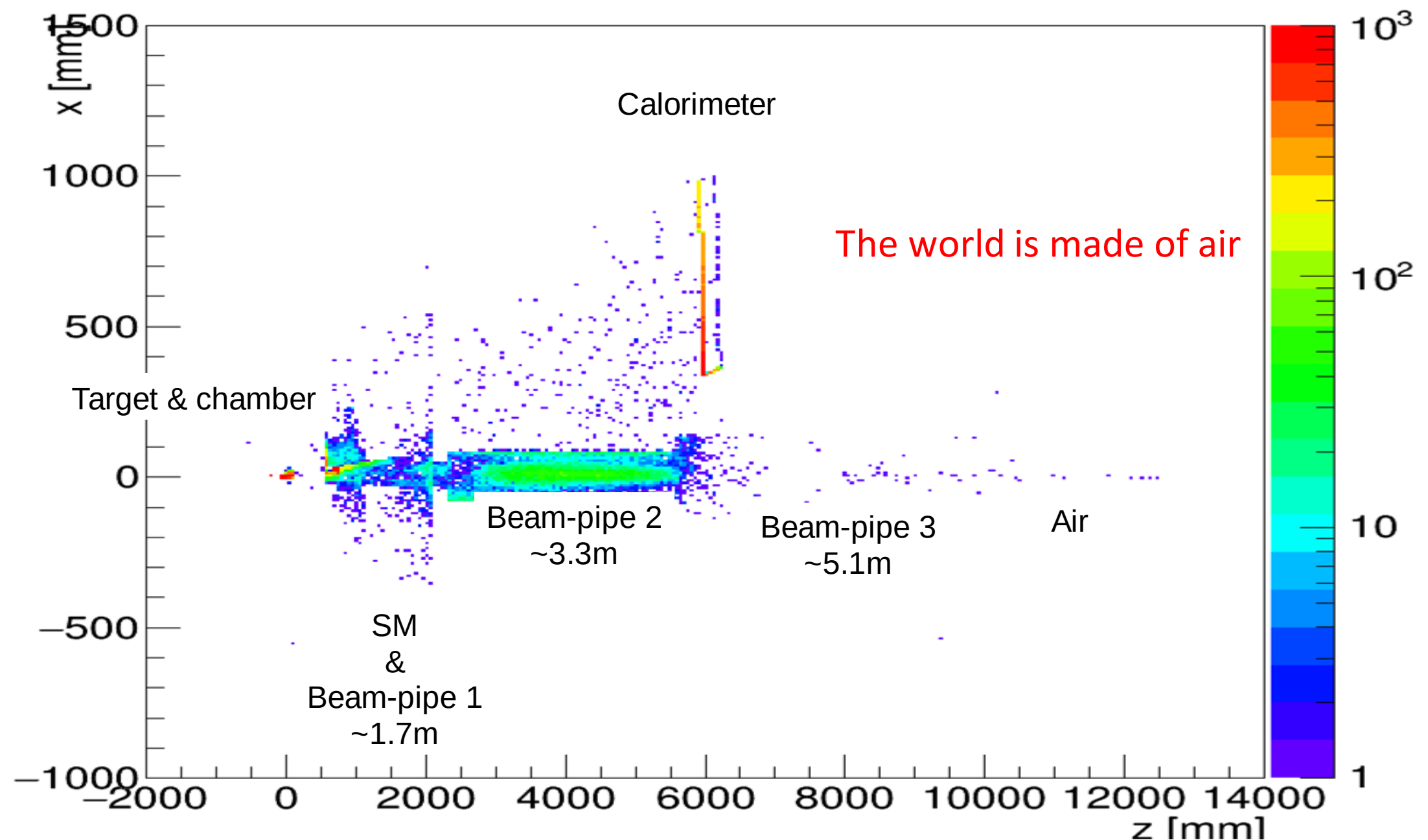
Background source tracking

Particles' vertex position (side view) that hit calorimeter

Main source of the background : target, junction btw chamber & beam-pipe1 , and Beam-pipe2

Asymmetrical particle distribution in beam-pipe 2 (due to magnet)

Background source tracking

Particles' vertex position (aerial view) that hit calorimeter with 10MeV energy cut

Main source of the background : target, junction btw chamber & beam-pipe1 , and Beam-pipe2
Asymmetrical particle distribution in beam-pipe 2 (due to magnet)
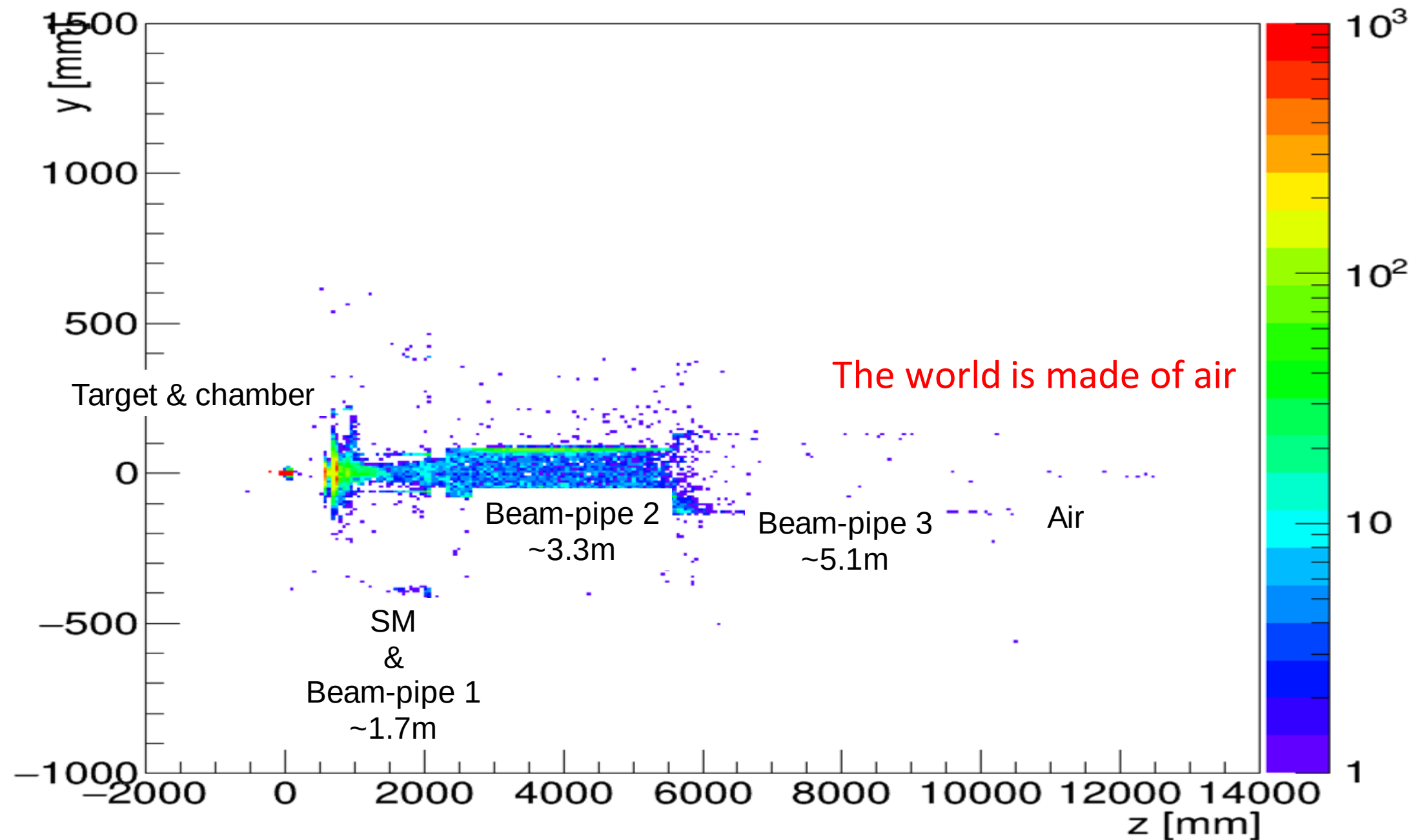
Background source tracking

Particles' vertex position (side view) that hit calorimeter with 10MeV energy cut
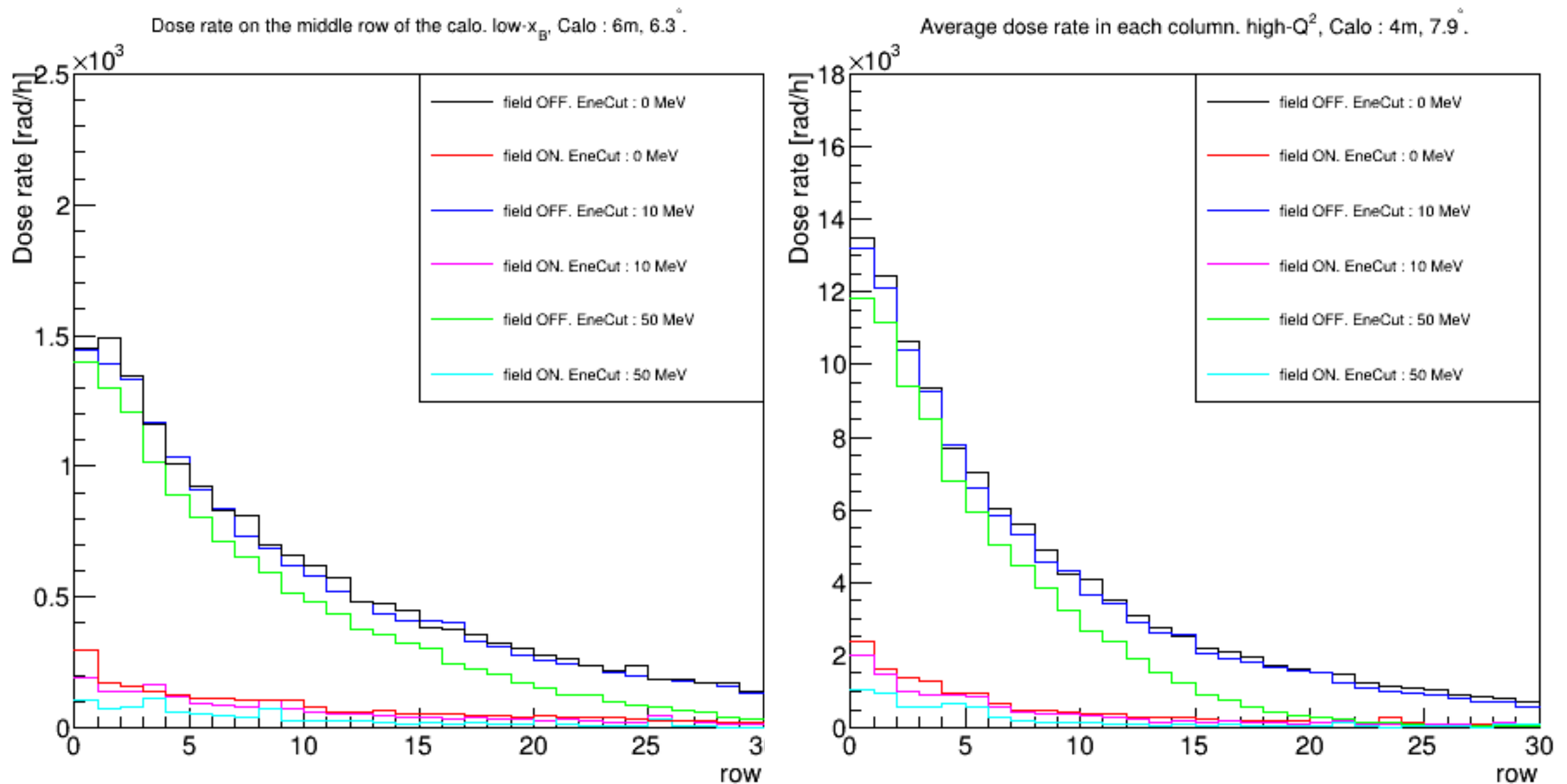

Main source of the background : target, junction btw chamber & beam-pipe1 , and Beam-pipe2
Asymmetrical particle distribution in beam-pipe 2 (due to magnet)
Can we put some shielding around the beam-pipe 2?

Background dose with energy cut (shielding)

Dose rate on the middle row of the calo. low-x_B, Calo : 6m, 6.3°.

Average dose rate in each column. high-Q^2, Calo : 4m, 7.9°.

- field OFF. EneCut : 0 MeV
- field ON. EneCut : 0 MeV
- field OFF. EneCut : 10 MeV
- field ON. EneCut : 10 MeV
- field OFF. EneCut : 50 MeV
- field ON. EneCut : 50 MeV

Even with the Sweeping Magnet, the background dose was considerably high.
Adding extra shielding on the calorimeter was suggested.
Simulated shielding by giving energy cut on the calorimeter.

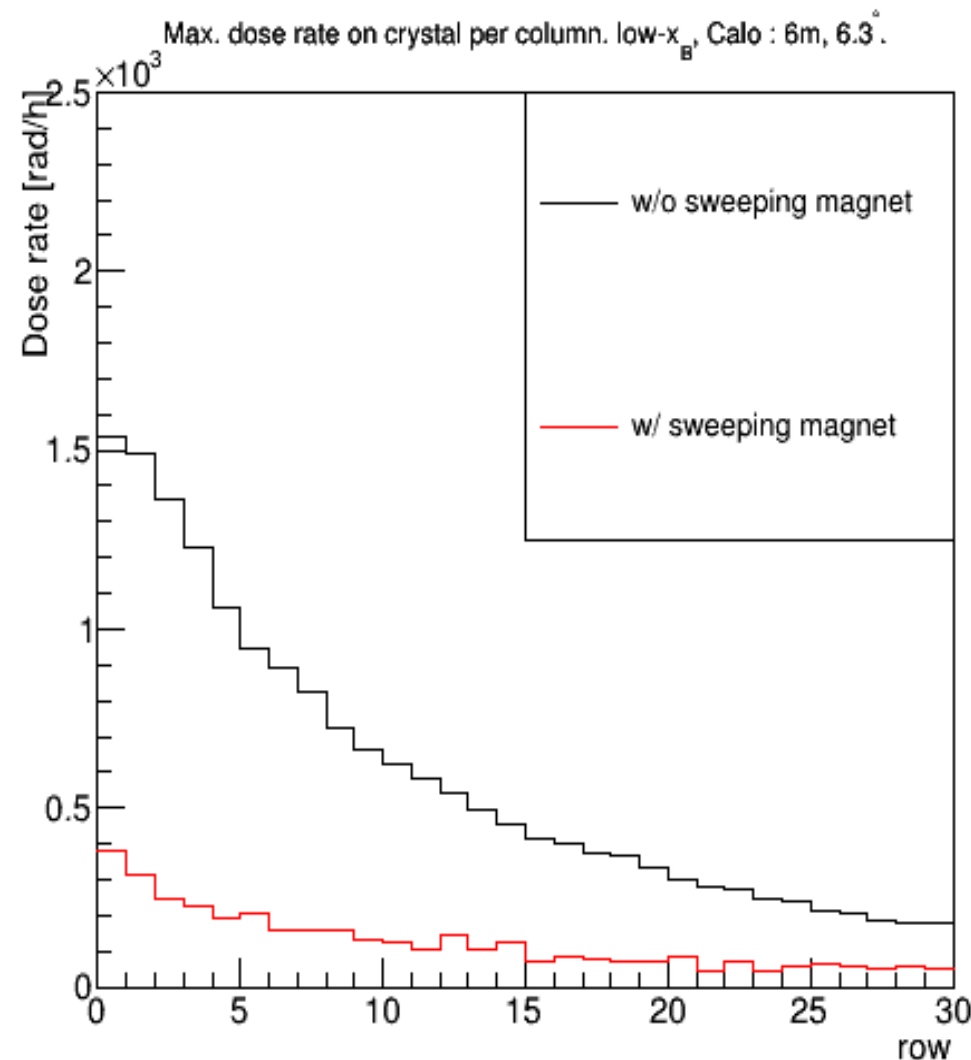10 MeV shielding has no big effect in reducing background.
The background dose is coming from >~10MeV particles
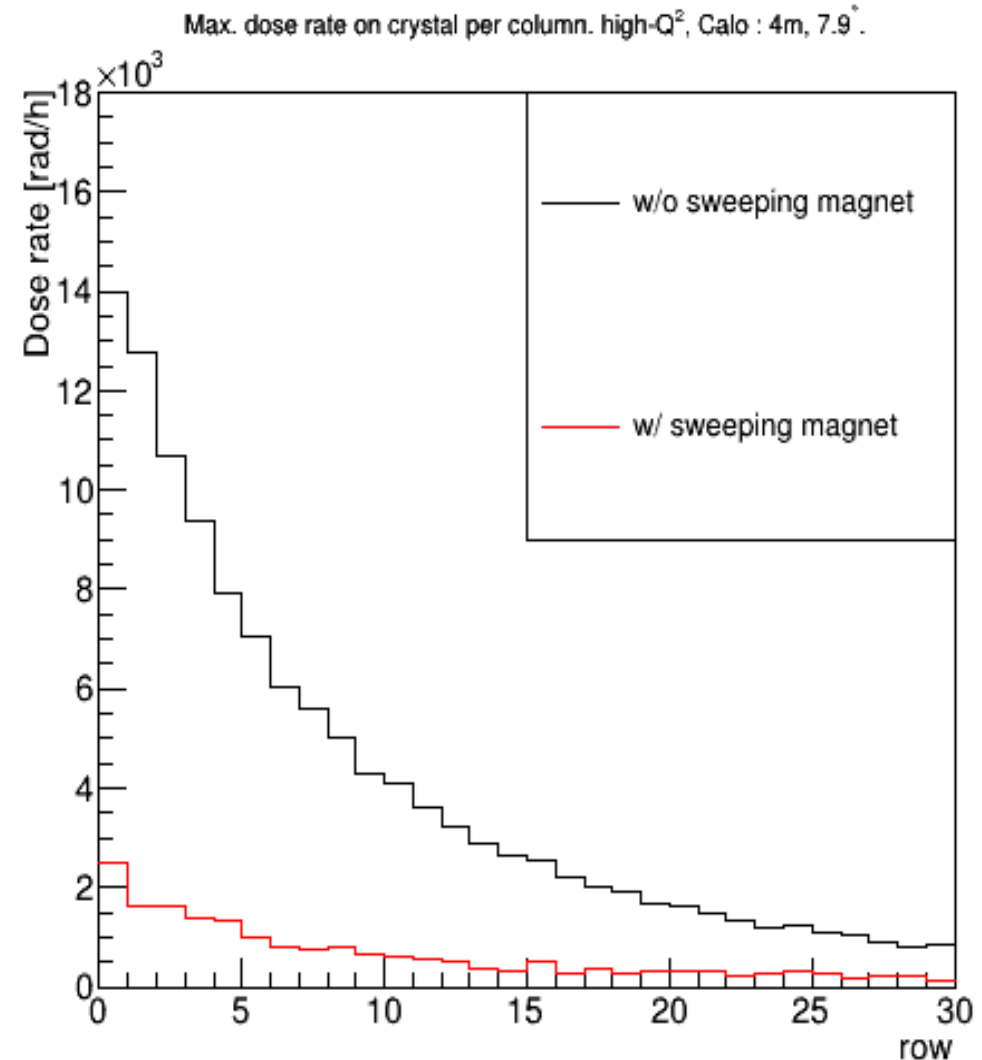
Conclusion & summary

- The background is mainly coming from

- Target & junction btw chamber & beam-pipe 1

- Also, the beam-pipe 2. And its distribution is asymmetrical

- The shielding simulation (reject particles with energy < 10 MeV)

- The shielding does not decrease the background dose drastically (as I hoped)

- Possibility of shielding near the beam-pipe 2 ?

Correction from last time
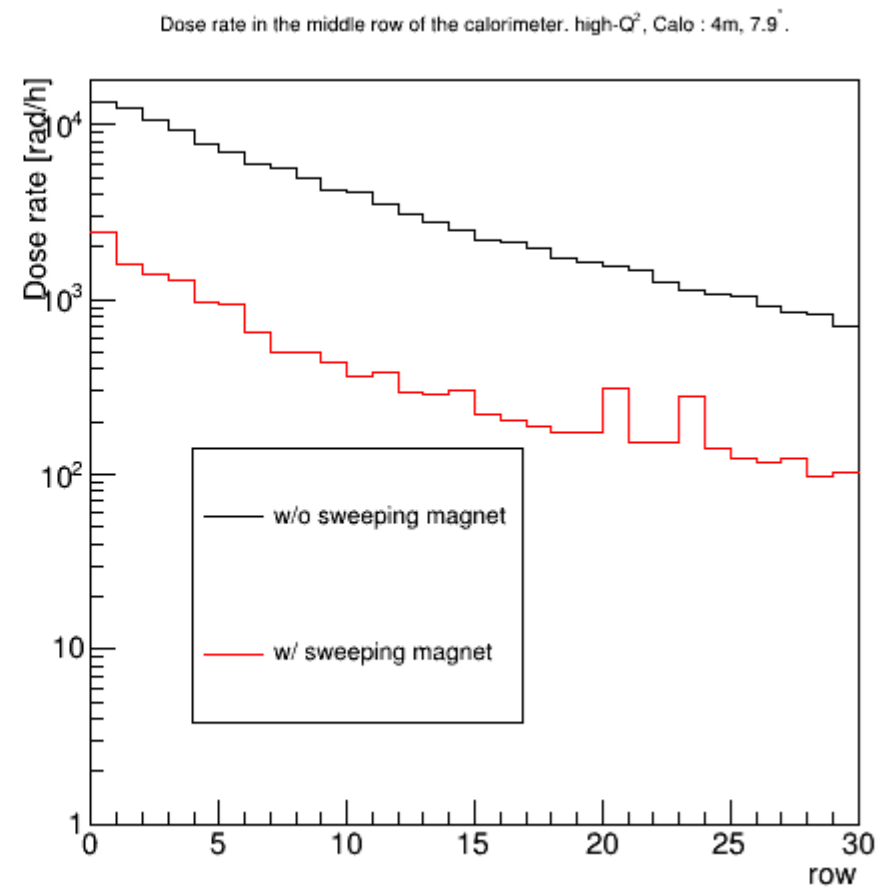
Dose rate calculation from last time...

Max. dose rate on crystal per column. low-x_B, Calo : 6m, 6.3°.

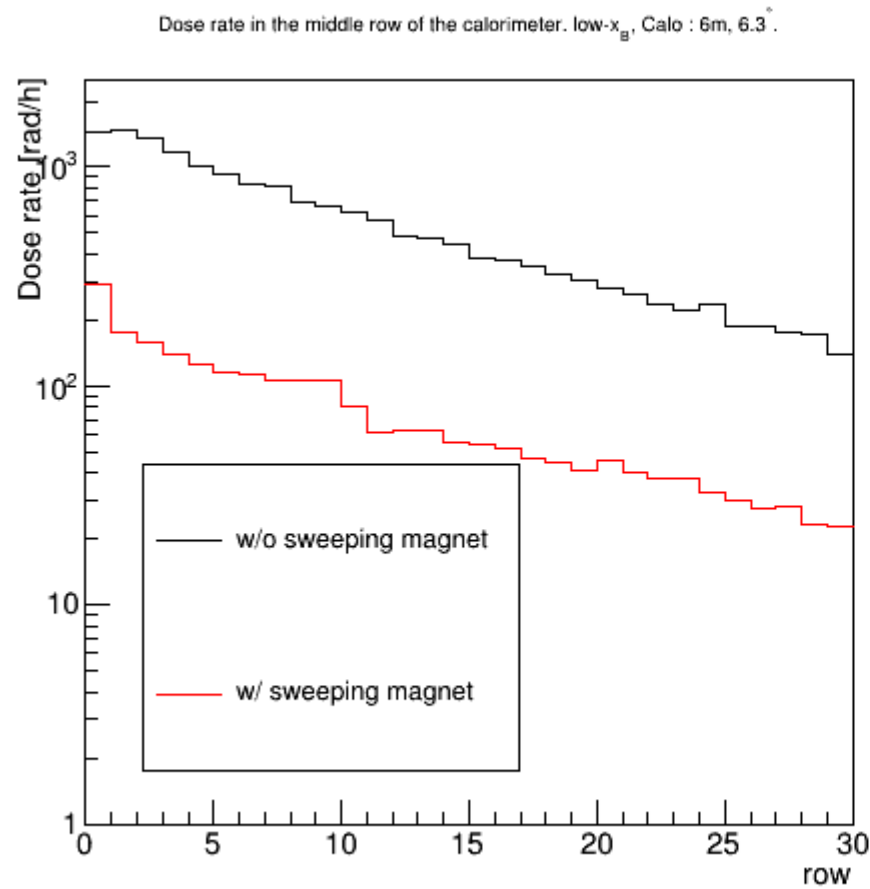Max. dose rate on crystal per column. high-Q^2, Calo : 4m, 7.9°.

These are correct ones

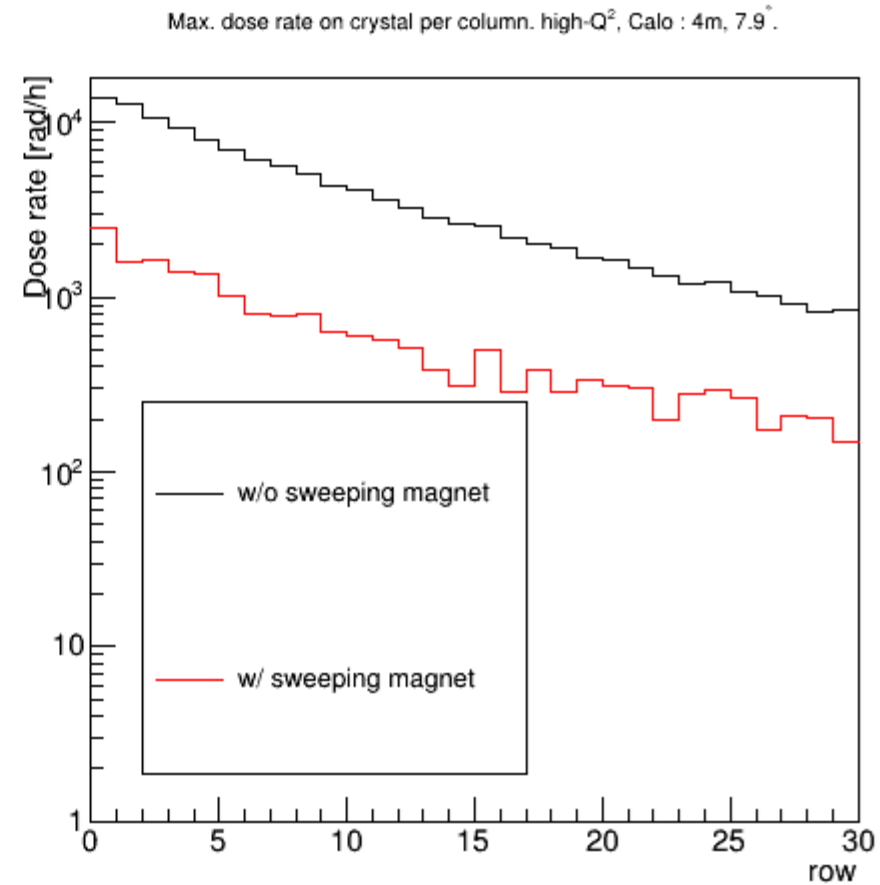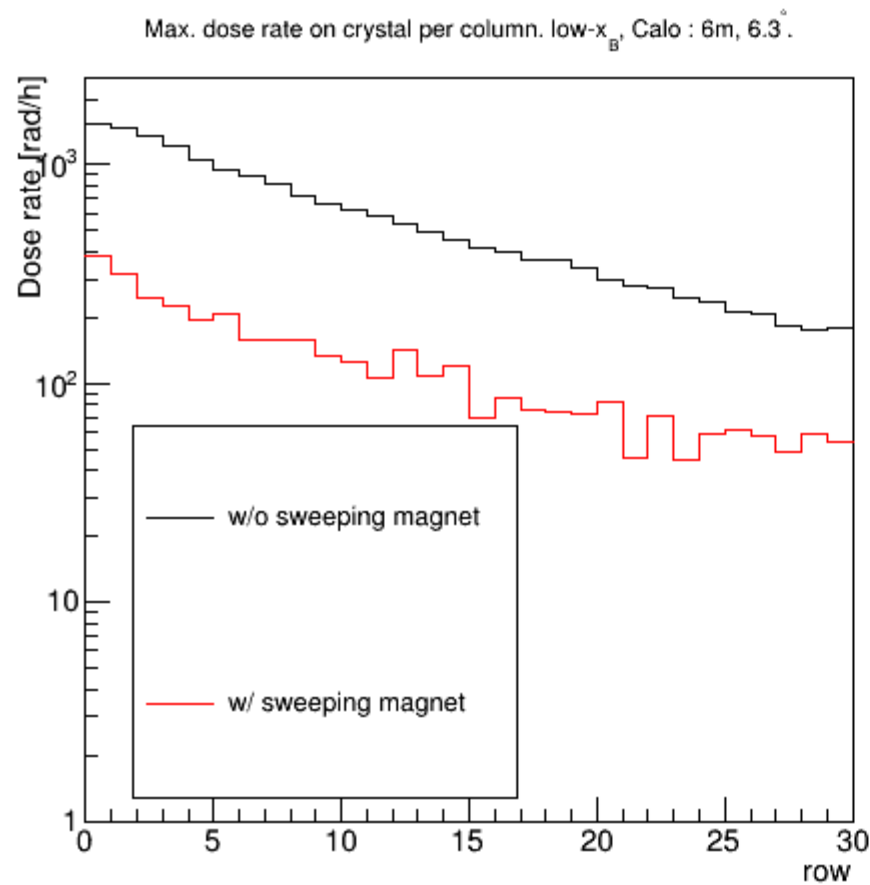The maximum dose rate calculation on each column of calorimeter last time was wrong!

When finding the crystal with maximum dose, I was looking for them for each beam-electron.
Now, after combining the dose after all beam-electron events, I look for the maximum dose crystal.

Energy deposition in the maximum dose crystal per 50ns :
0.25 GeV/50ns and 1.5 GeV/50ns for low-xB and high-Q2, respectively.

Dose rate in the middle row of the calorimeter. low-x_B, Calo : 6m, 6.3°.

Dose rate in the middle row of the calorimeter. high-Q^2, Calo : 4m, 7.9°.

These are correct ones

The magnet reduces the background > factor of 5

Max. dose rate on crystal per column. low-x_B, Calo : 6m, 6.3°.

Max. dose rate on crystal per column. high-Q^2, Calo : 4m, 7.9°.

These are correct ones