Stony Brook University

Center for Frontiers in Nuclear Science

NIEL dose for the SBS Bunker electronics

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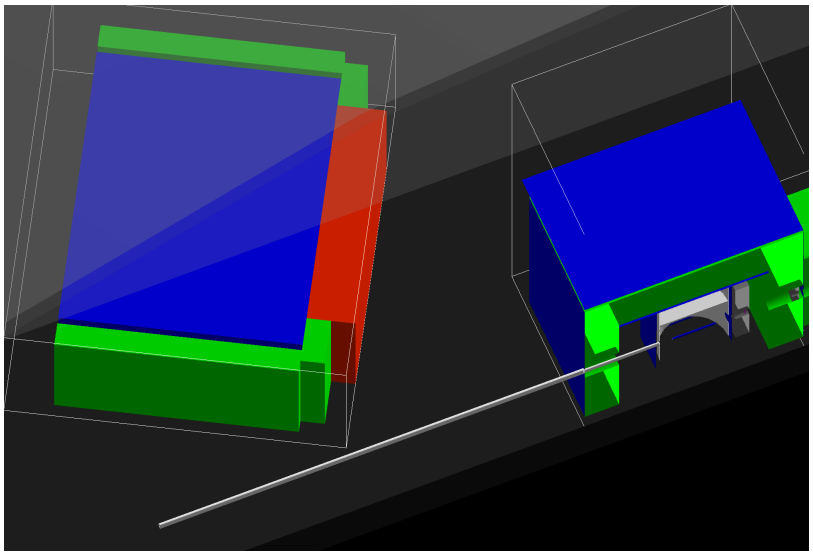
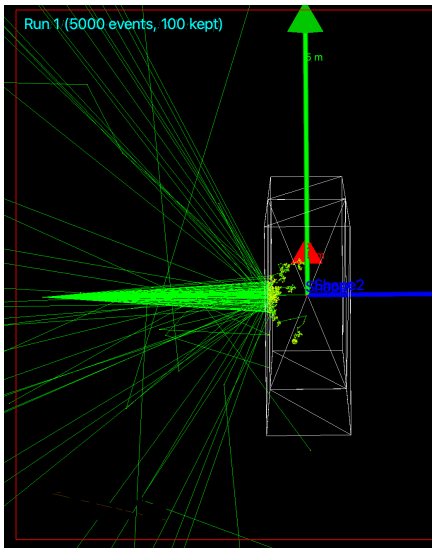
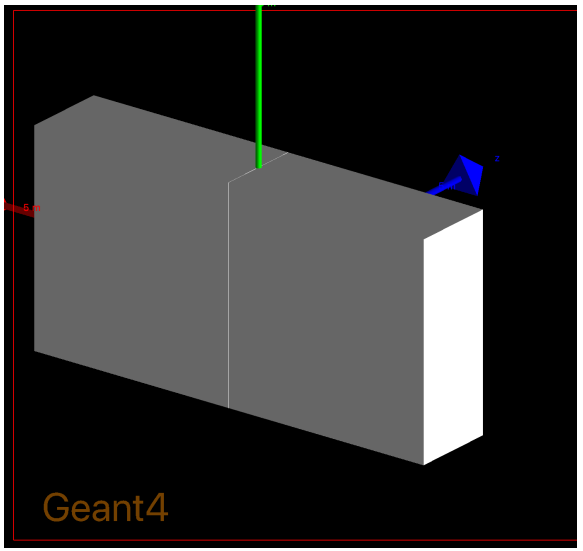
NIEL dose for the SBS Bunker electronics

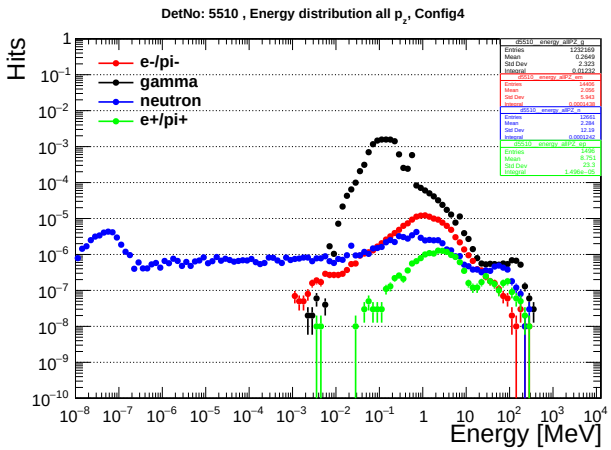
- We evaluate the NIEL factors by looking at different particle species reaching the front/back side of the SBS bunker.
- The front of the SBS bunker (iron block) was simulated at the exact same size by adding vacuum planes to the front and back of the block.
- Simulation ran with 5M e-/e+/gamma/neutron beam generator events.
- Beam generator's energy is taken from the energy distributions of Det5510 in Config4.
  - Redo the same study by adding a 6.35mm crack to the iron block.

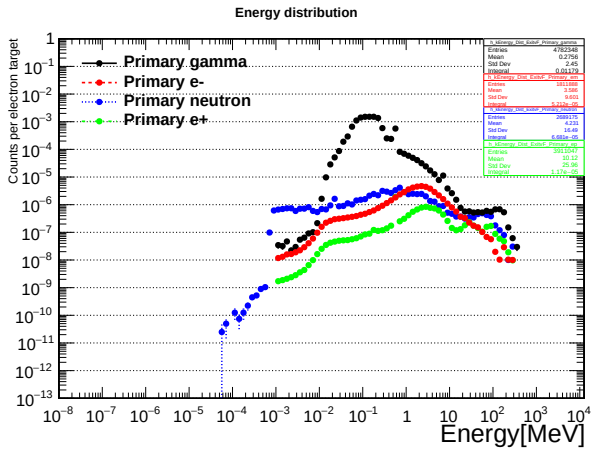


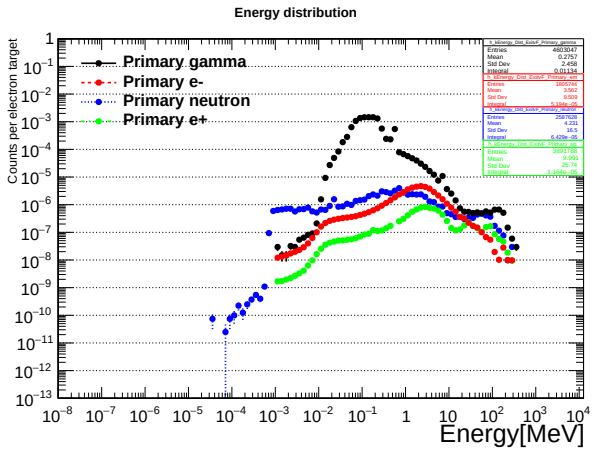


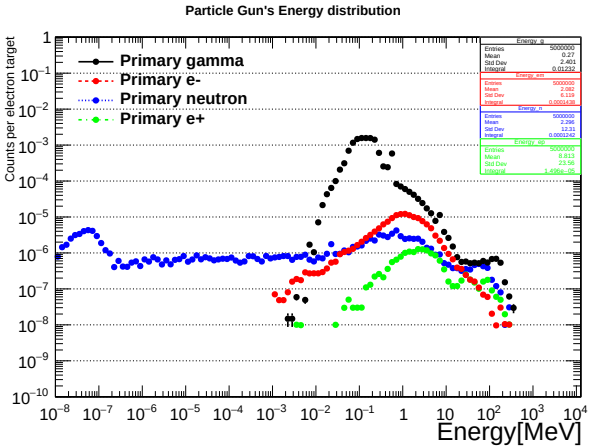


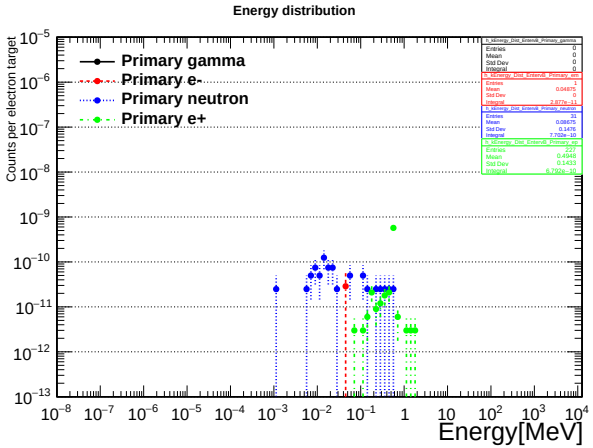
Energy Distributions

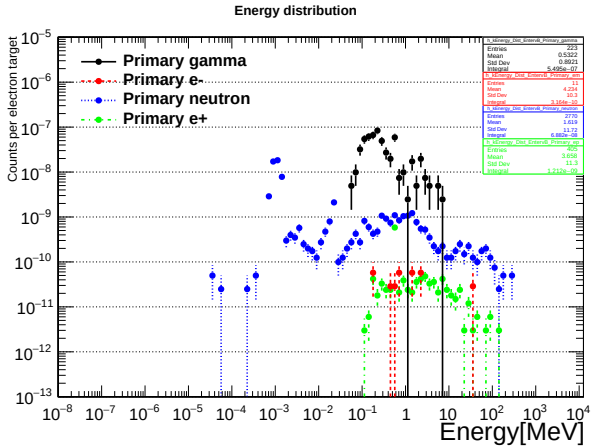






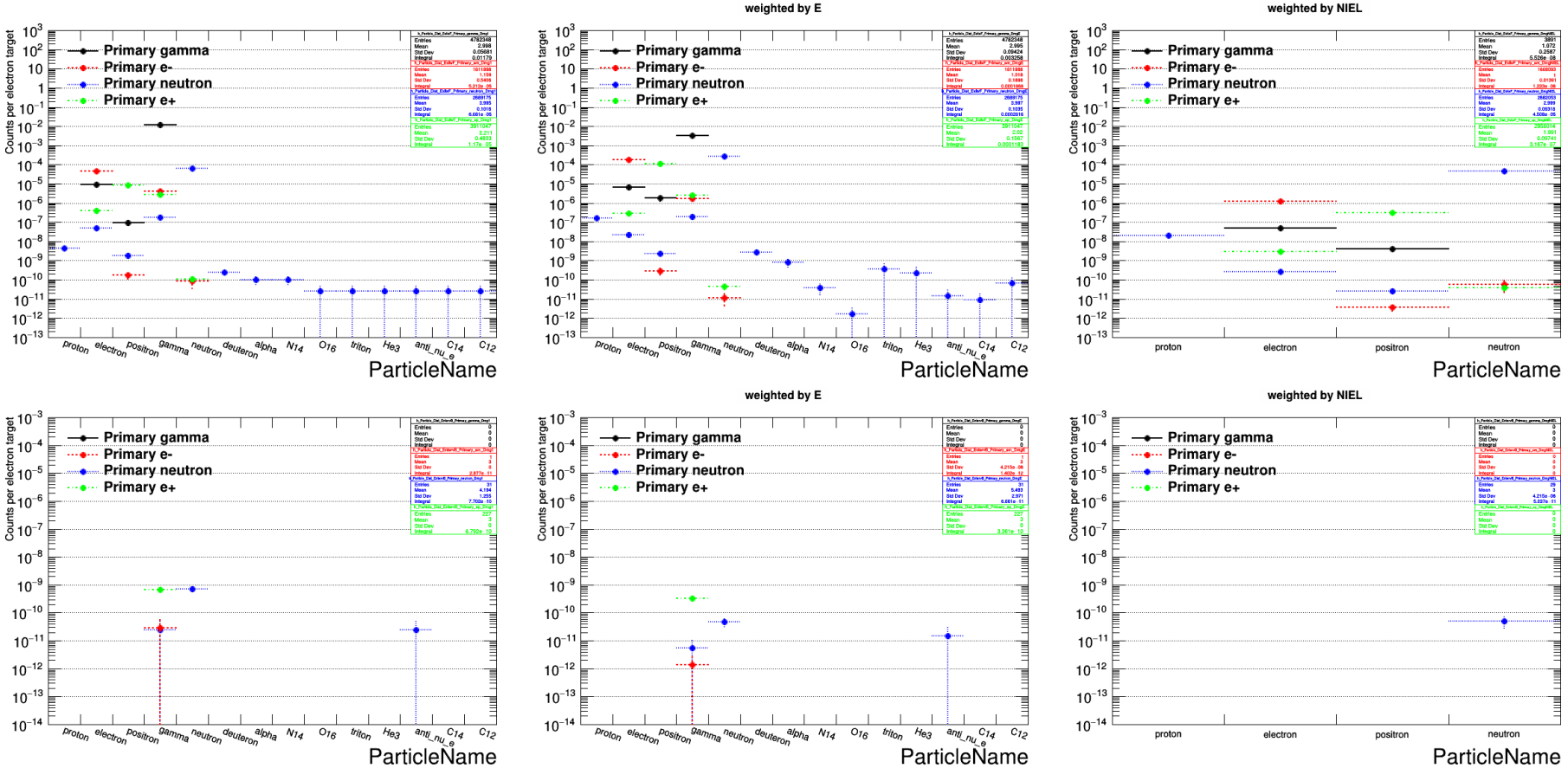






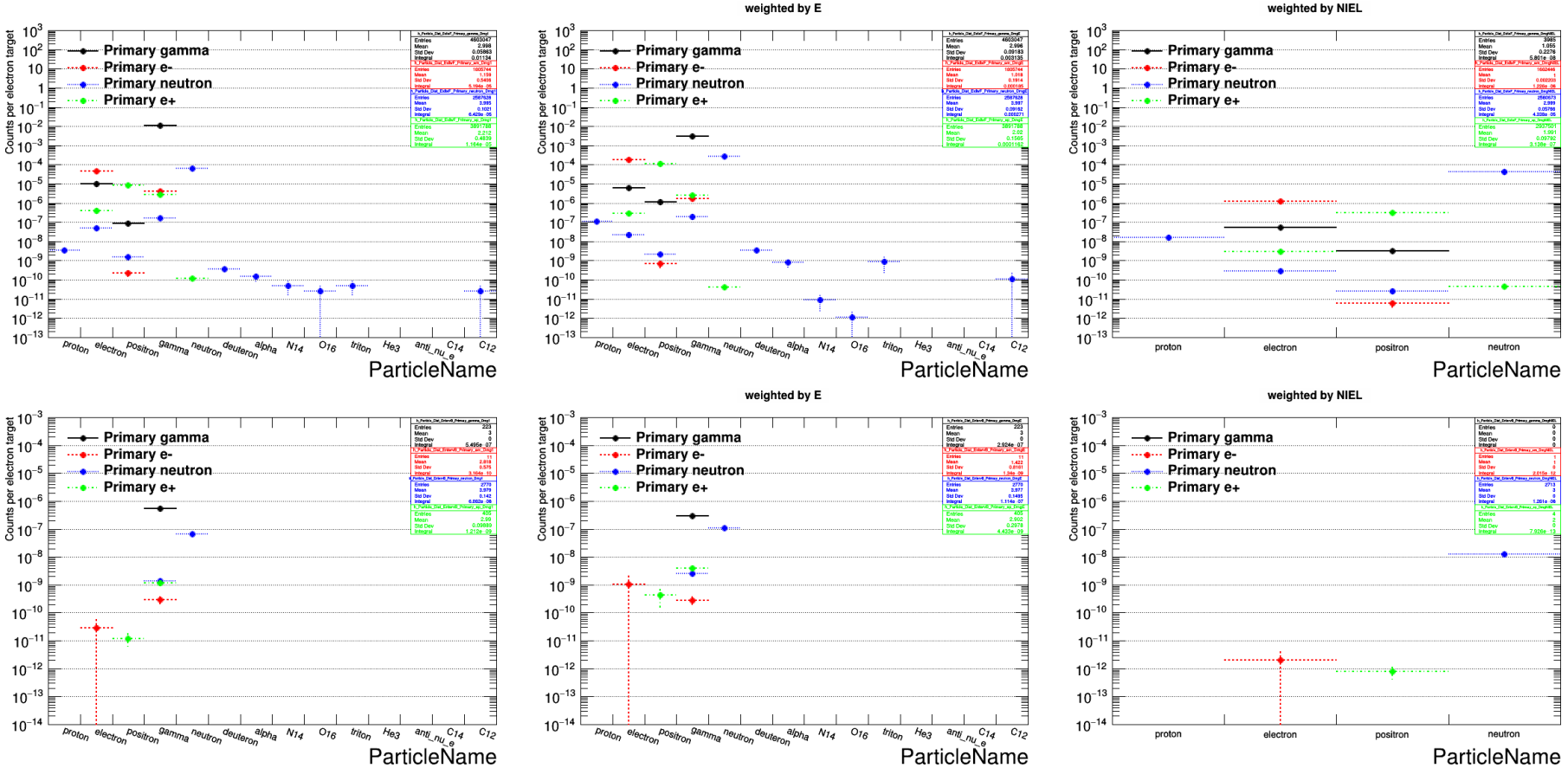
Left: Energy Distr. from remoll-Config4 geometry sim (top). Particle Gun's energy(bottom).
Middle (without 6.35mm crack in the iron block): Energy of primary particles that leave front volume (top). Energy of primary particles that enter back volume (bottom)
Right (with 6.35mm crack in the iron block): Energy of primary particles that leave front volume (top). Energy of primary particles that enter back volume (bottom)
Each distribution is normalized to the integral of the energy distributions of corresponding particle types in remoll sim.

Particle Distributions



Top: Particle distributions for different primary particles that leave front volume.
Bottom: Particle distributions for different primary particles that enter back volume **Each distribution is normalized to the integral of the energy distributions of corresponding particle types in remoll sim.**

Particle Distributions with 6.35mm crack in the iron block



Top: Particle distributions for different primary particles that leave front volume.
Bottom: Particle distributions for different primary particles that enter back volume **Each distribution is normalized to the integral of the energy distributions of corresponding particle types in remoll sim.**

Summary

Particle	NEIL	NEIL Moller	NEIL Moller/Area
Electron	0	0	0
Positron	0	0	0
Neutron	5.03671E-11	6.0944191E+11	2798172.2
Sum	5.03671E-11	6.0944191E+11	2798172.2

Integral values of the distributions without 6.35mm crack

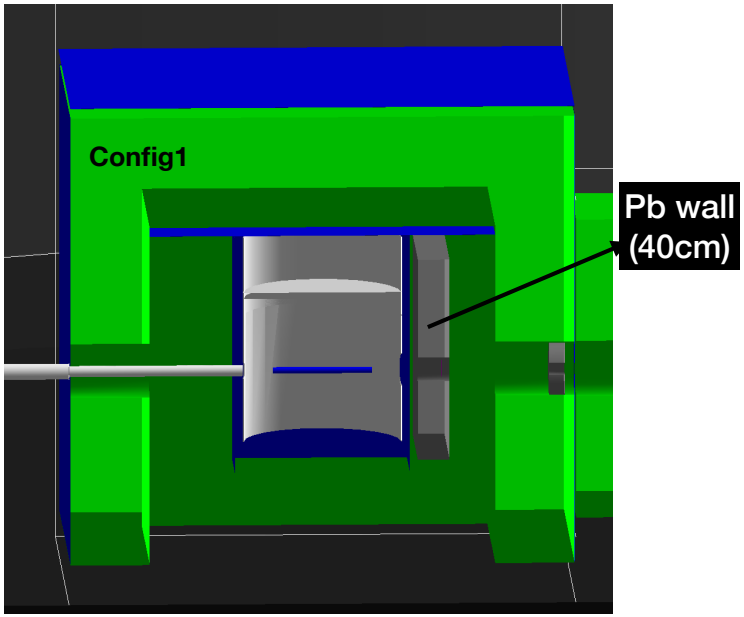
Particle	NEIL	NEIL Moller	NEIL Moller/Area
Electron	2.01451E-12	2.4375571E+10	111917.22
Positron	7.92627E-13	9.5907867E+09	44034.833
Neutron	1.26086E-08	1.5256406E+14	7.0047778E+08
Sum	1.2611407E-08	1.5259802E+14	7.0063370E+08

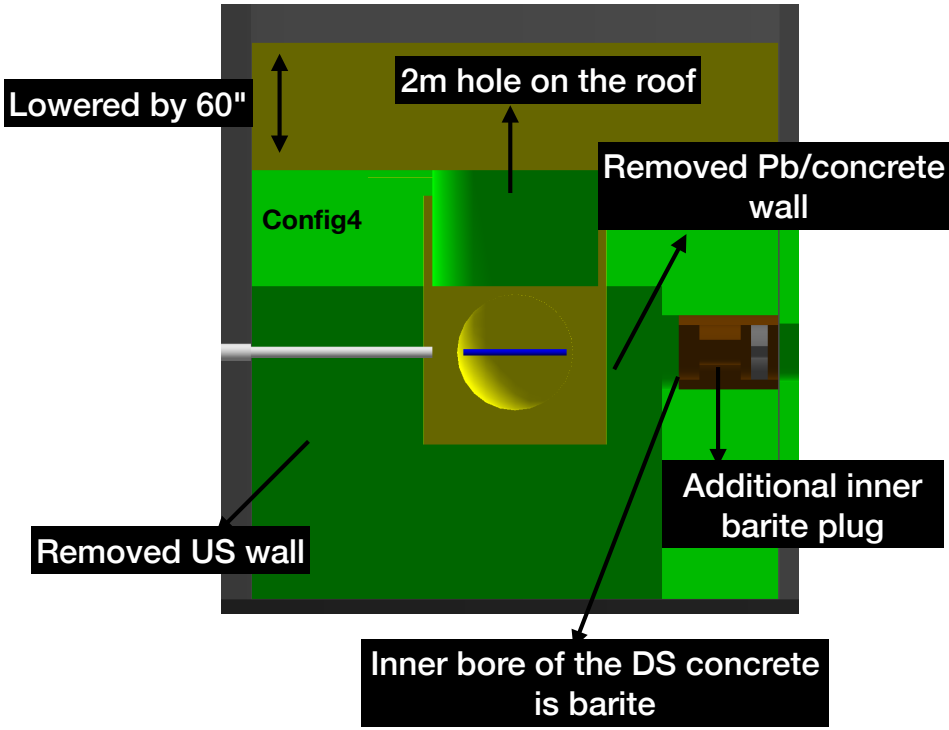
Integral values of the distributions with 6.35mm crack

The total electron on target for MOLLER is 1.21E+22.
Area=217800 cm^2

Backup

MOLLER Target Shielding Redesign

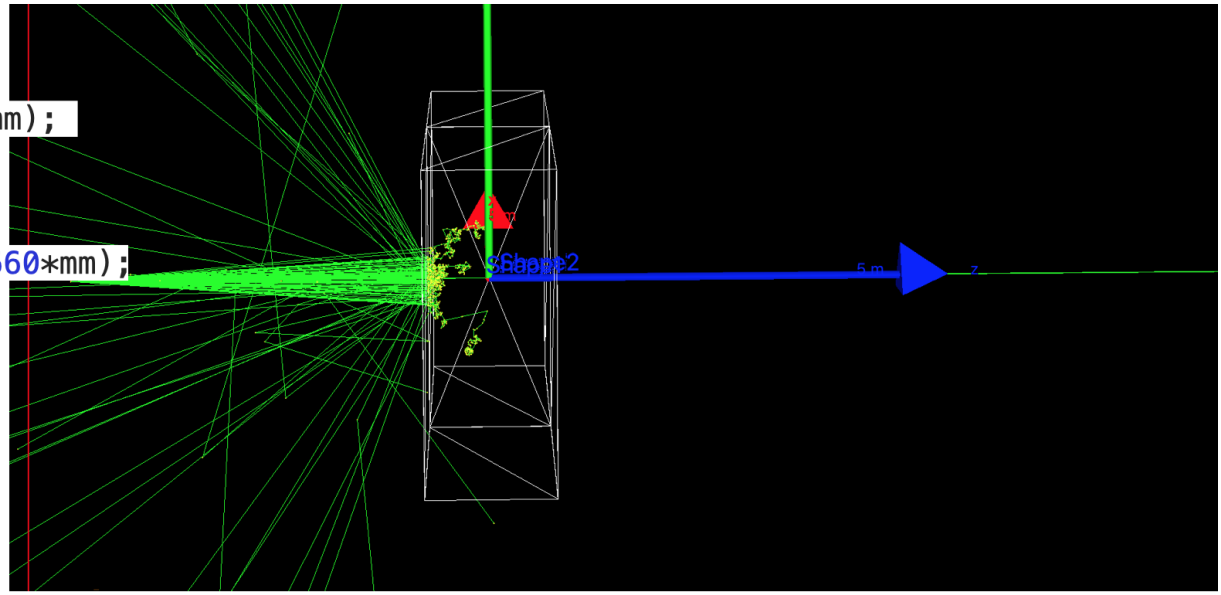




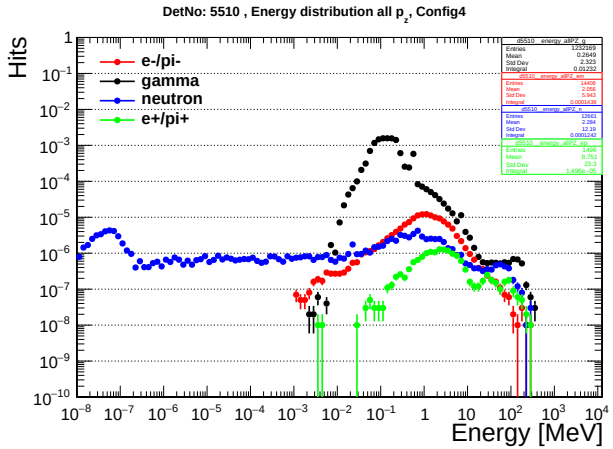
Geometry

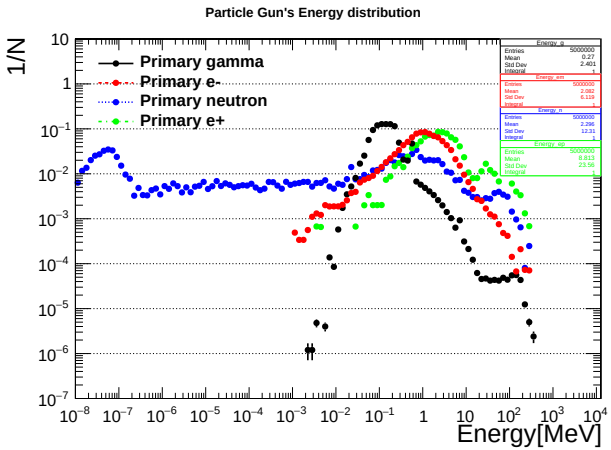
```
G4Box* solidFB =
    new G4Box("solidFB",
0.5*5*1320*mm, 0.5*2.5*1320*mm, 0.5*1*mm);

G4Box* solidMid =
    new G4Box("solidMid",
0.5*5*1320*mm, 0.5*2.5*1320*mm, 0.5*2*660*mm);
```

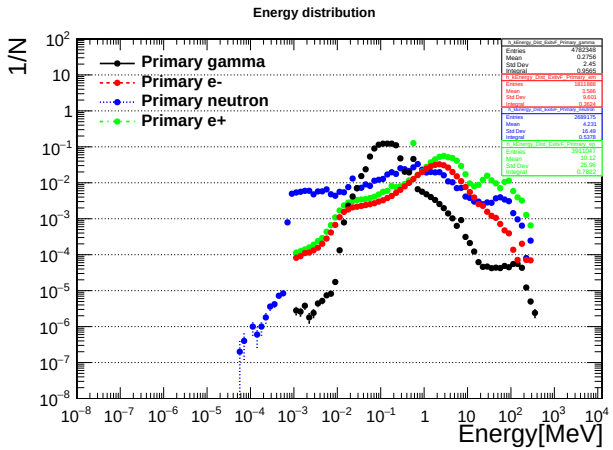
Run(5000events, 100 kept)

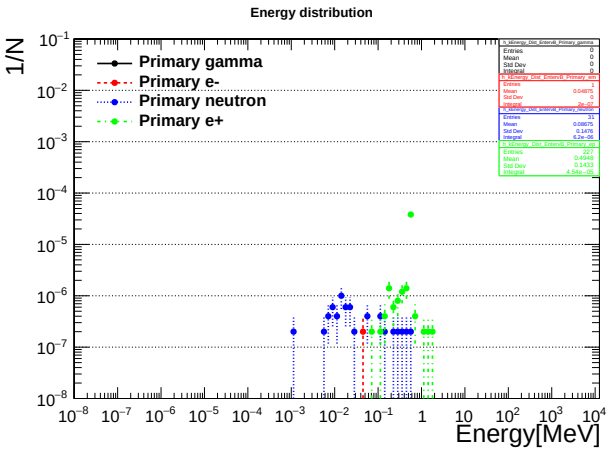


Energy Distributions



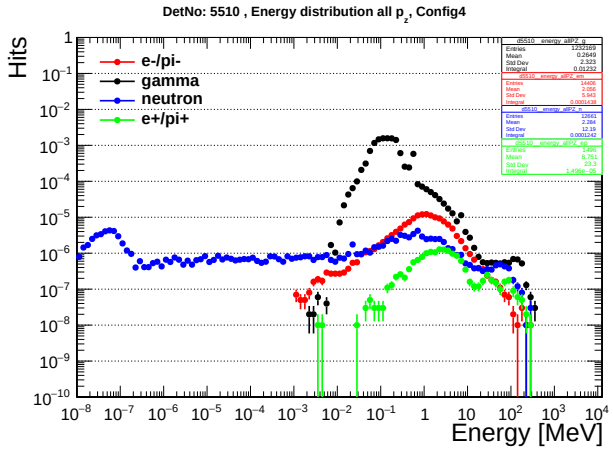


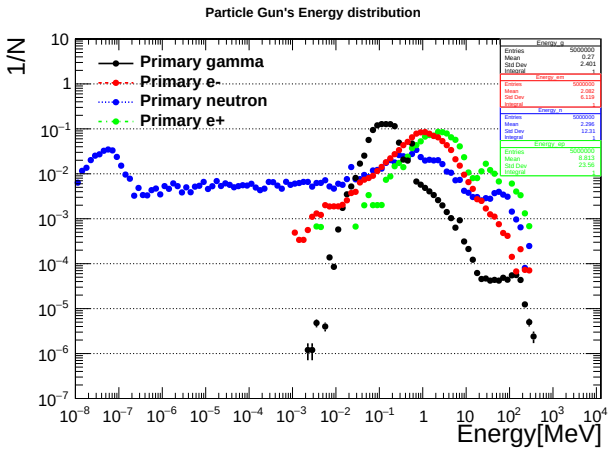


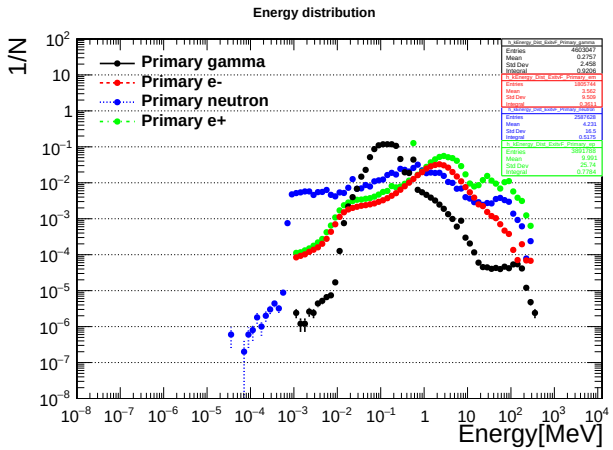


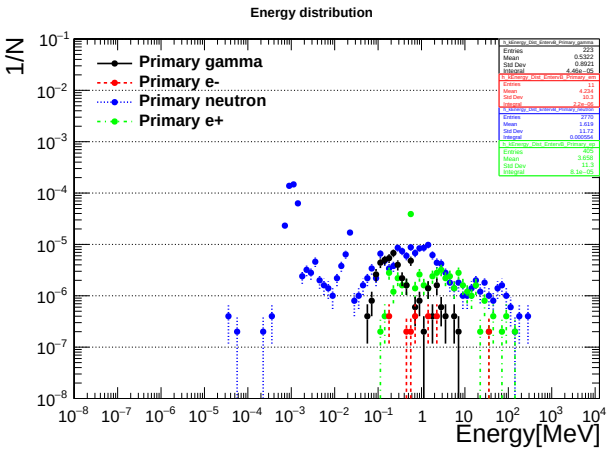
Top: Energy Distr. from remoll-Config4 geometry sim.
Bottom: Particle Gun's energy / Energy of primary particles that leave front volume / Energy of primary particles that enter back volume **Each distribution is normalized to the number of total generated events.**

Energy Distributions with 6.35mm crack in the iron block



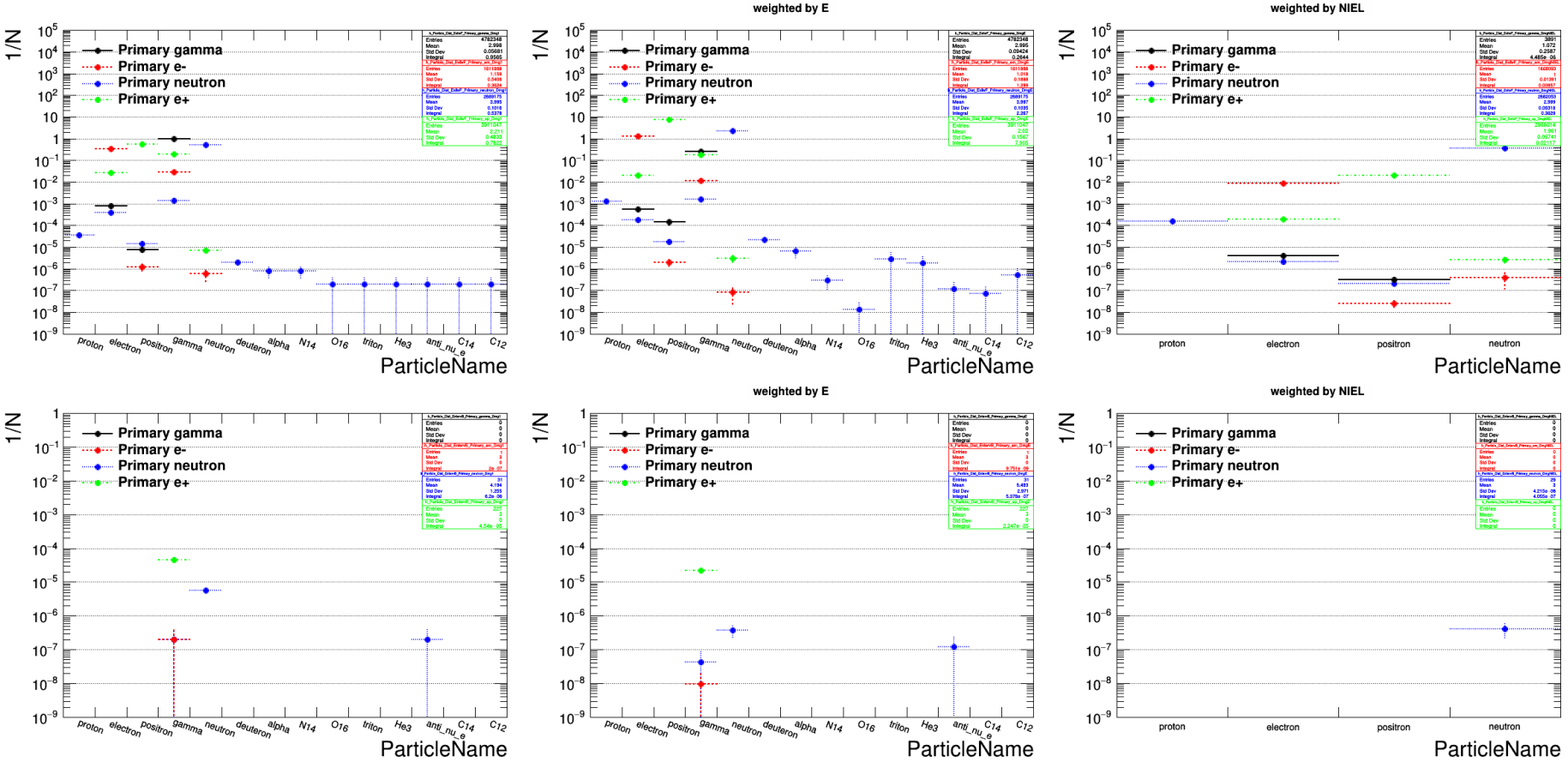






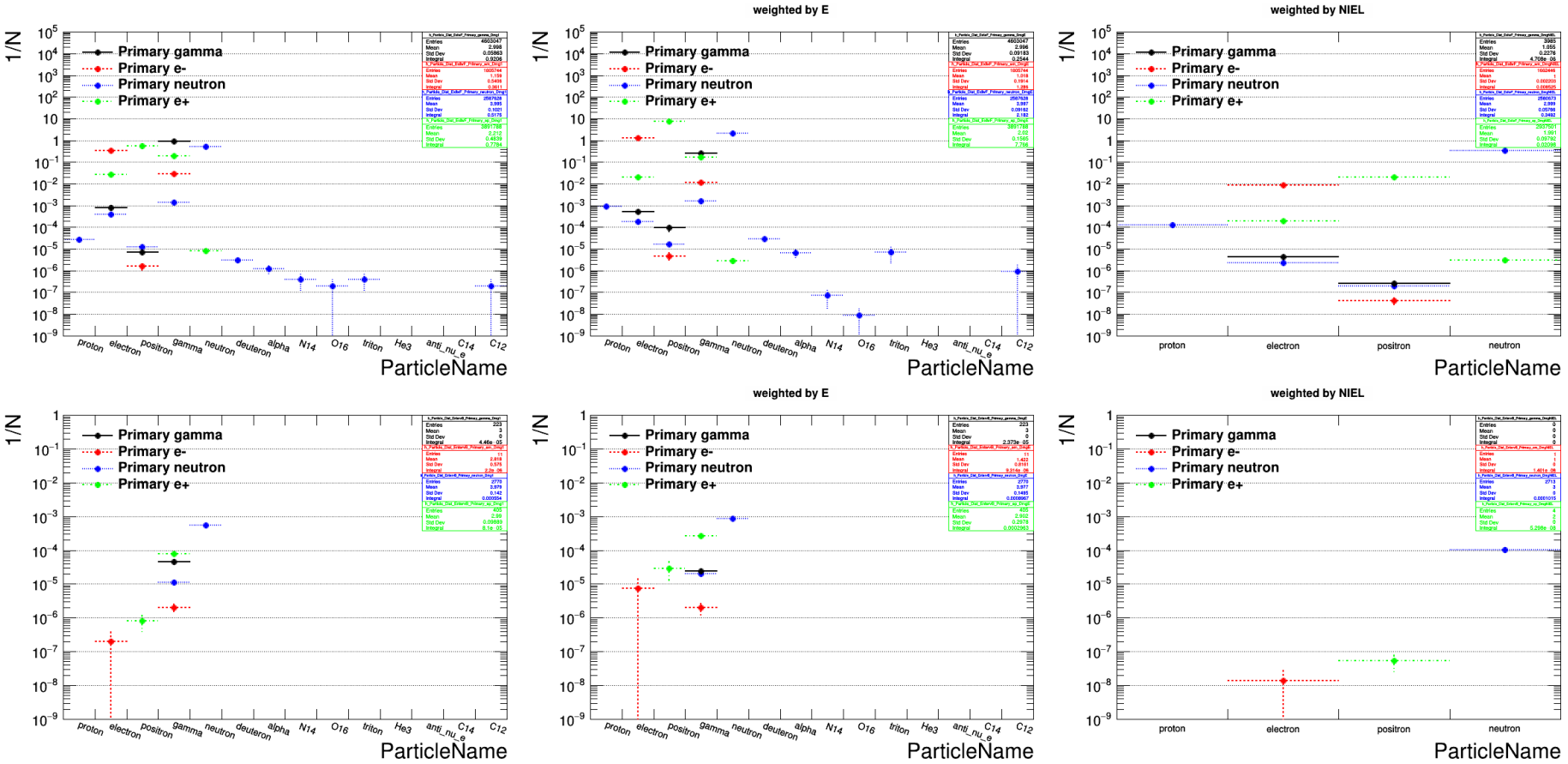
Top: Energy Distr. from remoll-Config4 geometry sim.
Bottom: Particle Gun's energy / Energy of primary particles that leave front volume / Energy of primary particles that enter back volume **Each distribution is normalized to the number of total generated events.**

Particle Distributions



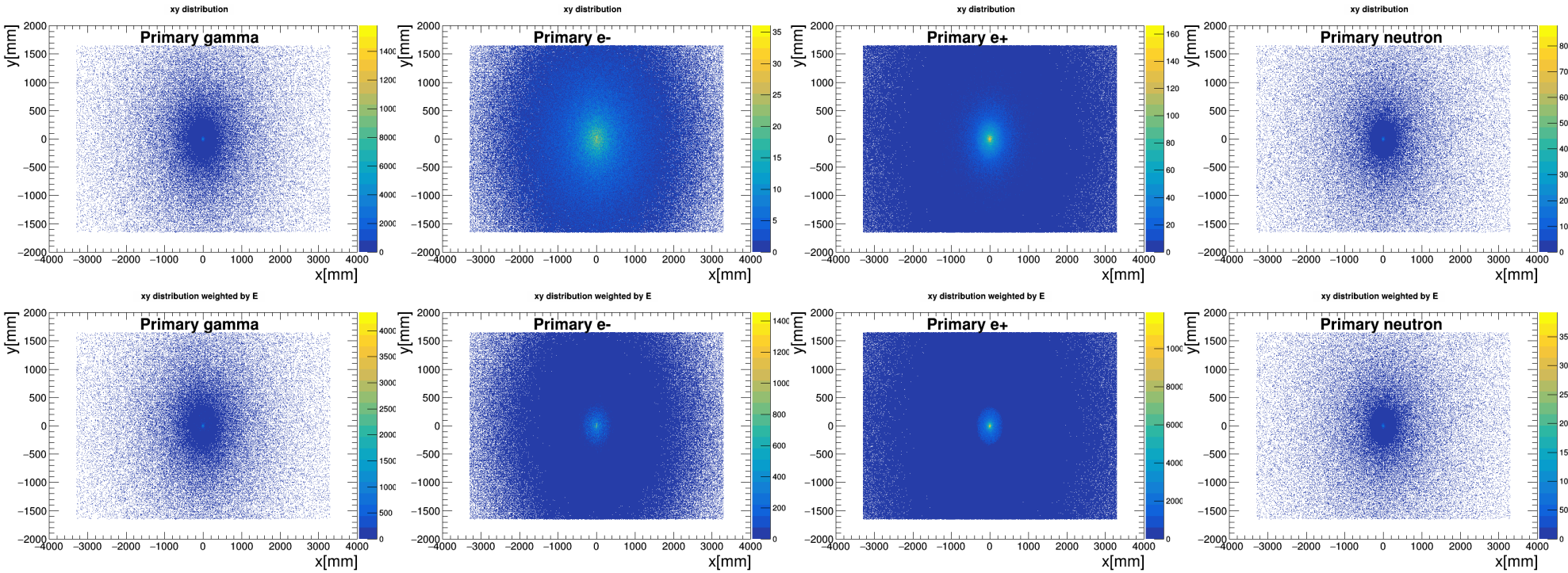
Top: Particle distributions for different primary particles that leave front volume.
Bottom: Particle distributions for different primary particles that enter back volume **Each distribution is normalized to the number of total generated events.**

Particle Distributions with 6.35mm crack in the iron block



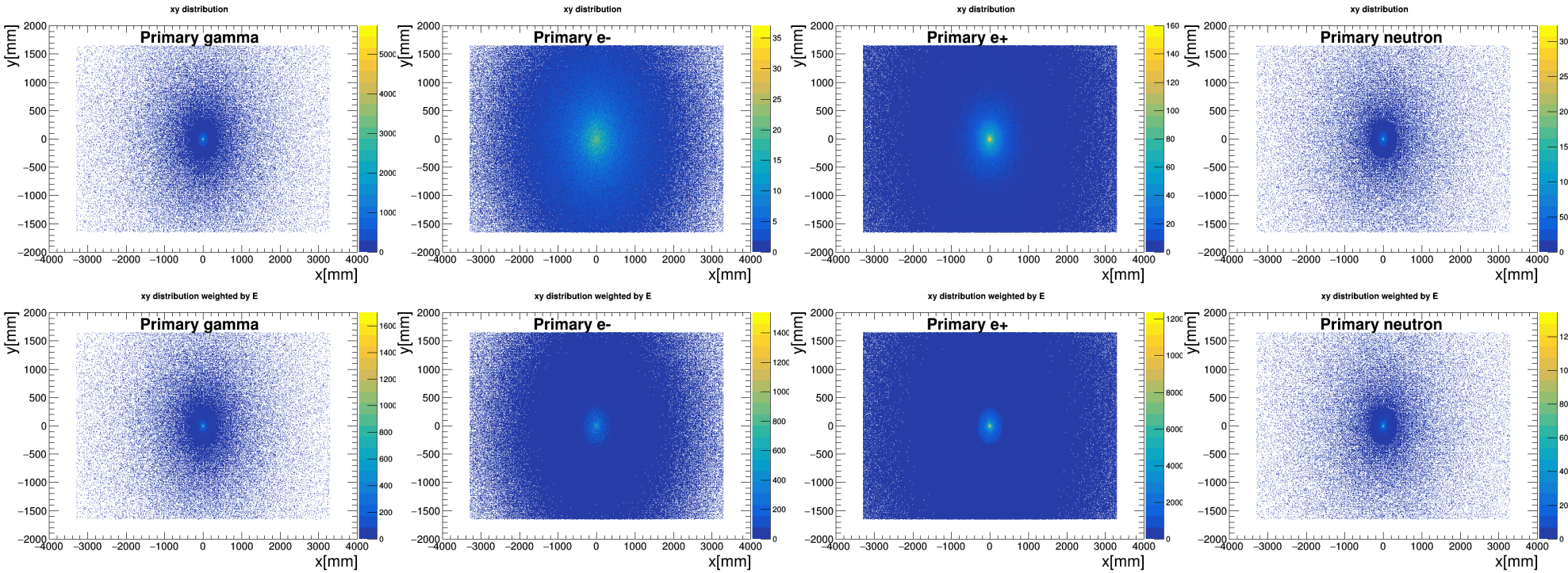
Top: Particle distributions for different primary particles that leave front volume.
Bottom: Particle distributions for different primary particles that enter back volume **Each distribution is normalized to the number of total generated events.**

2D Position XY distributions



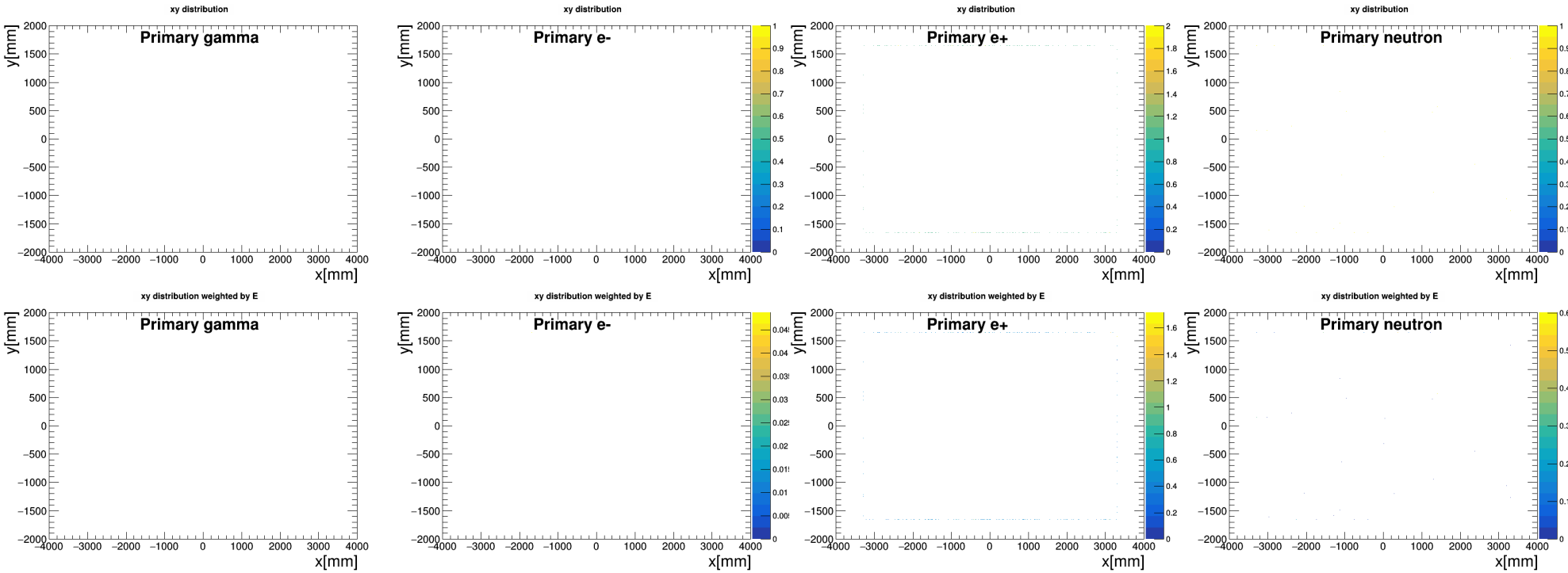
Top: Position XY distributions for different primary particles that leave front volume.
Bottom: Position XY distributions weighted by energy for different primary particles that leave front volume.

2D Position XY distributions with 6.35mm crack in the iron block



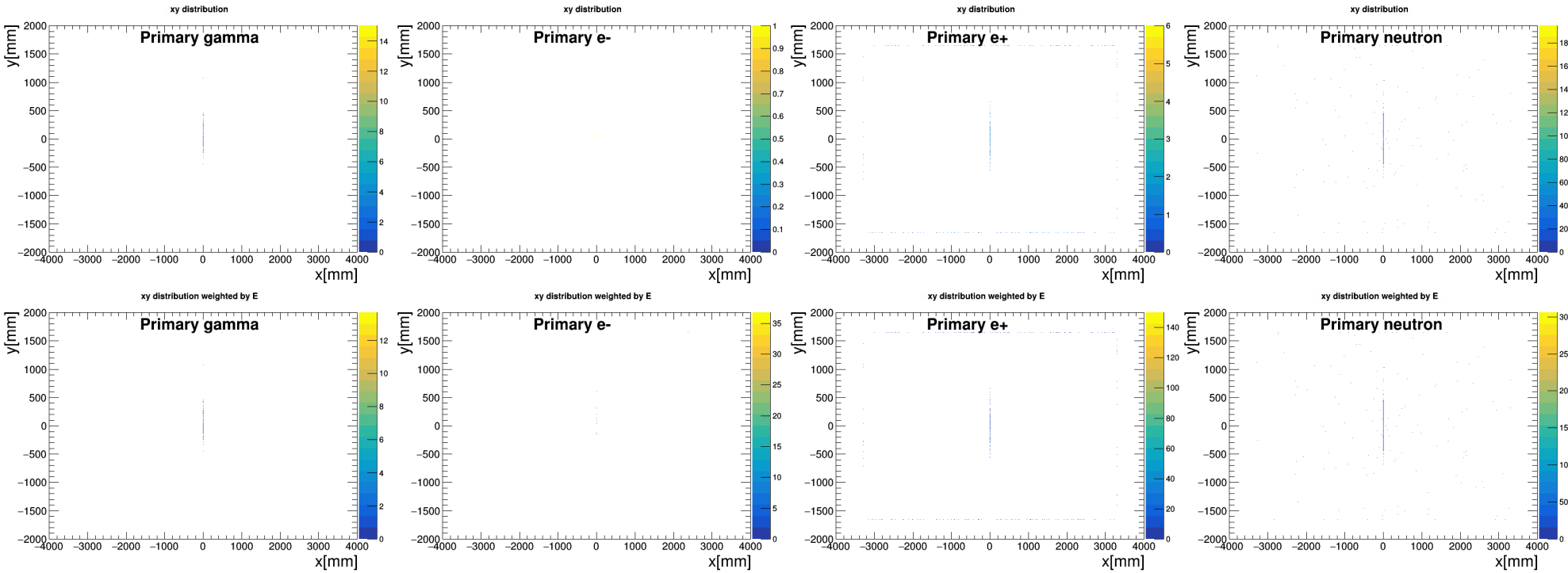
Top: Position XY distributions for different primary particles that leave front volume.
Bottom: Position XY distributions weighted by energy for different primary particles that leave front volume.

2D Position XY distributions



Top: Position XY distributions for different primary particles that enter back volume.
Bottom: Position XY distributions weighted by energy for different primary particles that enter back volume.

2D Position XY distributions with 6.35mm crack in the iron block



Top: Position XY distributions for different primary particles that enter back volume.
Bottom: Position XY distributions weighted by energy for different primary particles that enter back volume.