Stony Brook University
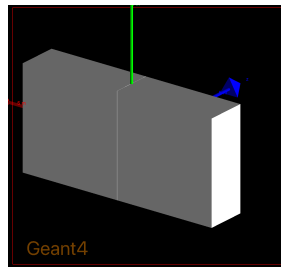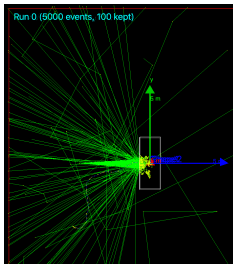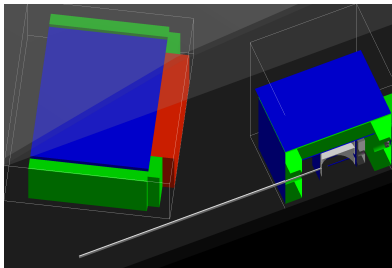
Center for Frontiers in Nuclear Science

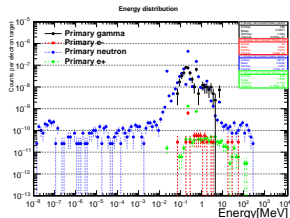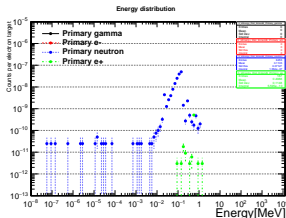# NIEL dose for the SBS Bunker electronics
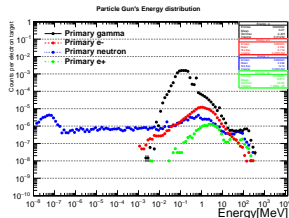
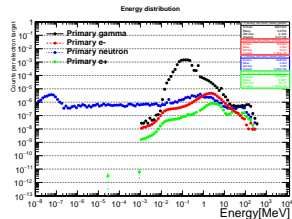Ciprian Gal, Zuhal Seyma Demiroglu

19 Apr, 2021

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.

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.

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.**

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	2.76915E-09	3.3506715E+13	1.5384167E+08
Sum	2.76915E-09	3.3506715E+13	1.5384167E+08

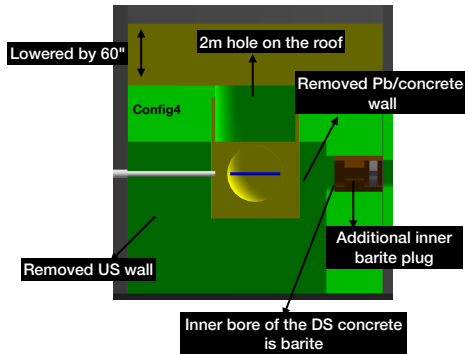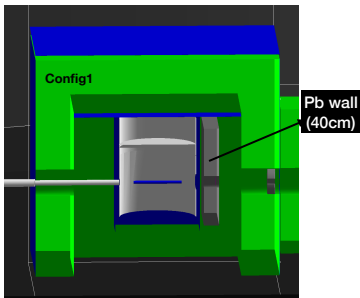NEIL values for the bunker without a 6.35mm crack

Particle	NEIL	NEIL Moller	NEIL Moller/Area
Electron	2.152089E-12	2.6040277E+10	119560.50
Positron	1.254773E-12	1.5182753E+10	69709.610
Neutron	3.8991715E-08	4.7179975E+14	2.1662064E+09
Sum	3.8995122E-08	4.7184098E+14	2.1663957E+09

NEIL values for the bunker with a 6.35mm crack

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

Backup

Config1
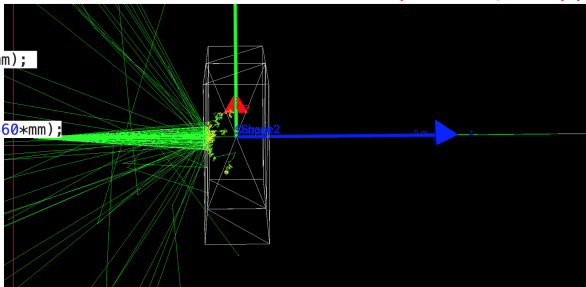
Pb wall
(40cm)

Lowered by 60"

2m hole on the roof

Removed Pb/concrete
wall

Config4

Removed US wall

Additional inner
barite plug

Inner bore of the DS concrete
is barite
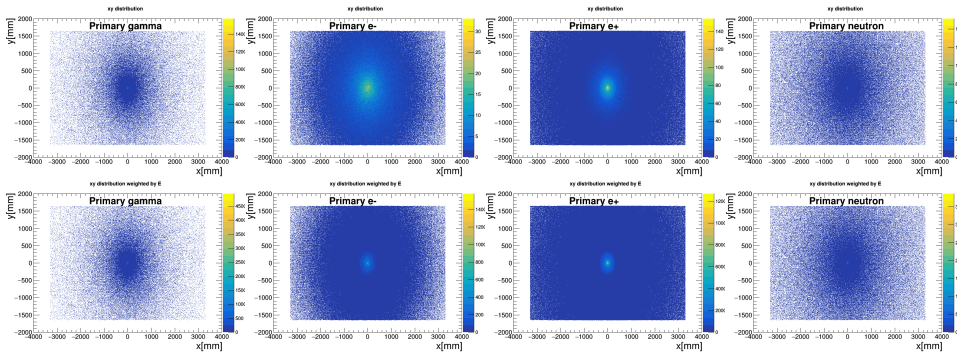
```
  G4Box* solidFB =
     new G4Box("solidFB",
0.5*5*1320*mm, 0.5*2.5*1320*mm, 0.5*1*mm);

  G4Box* solidMid =
     new G4Box("solidMid",
0.5*5*1320*mm, 0.5*2.5*1320*mm, 0.5*2*660*mm);
```
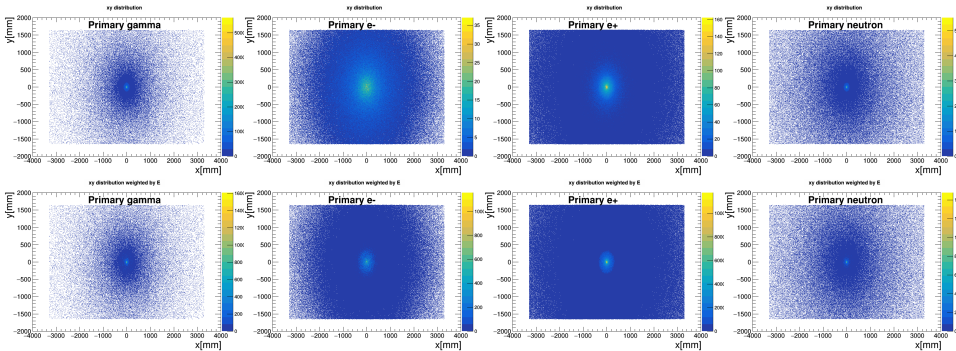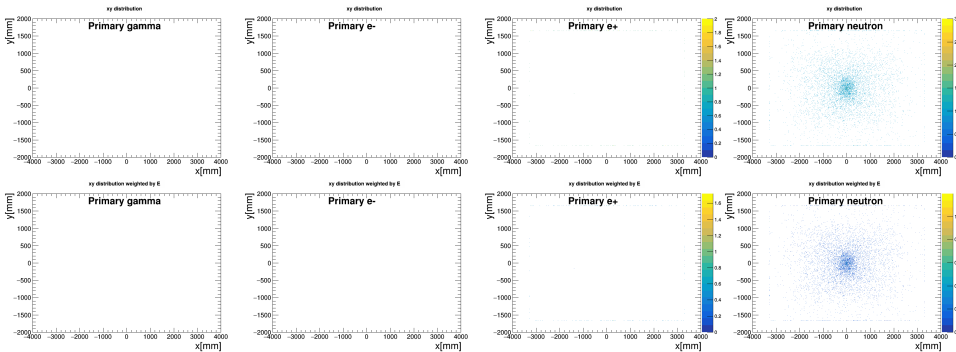
Top: Position XY distributions for different primary particles that leave front volume.
Bottom: Position XY distributions weighted by energy for different primary particles that leave front volume.
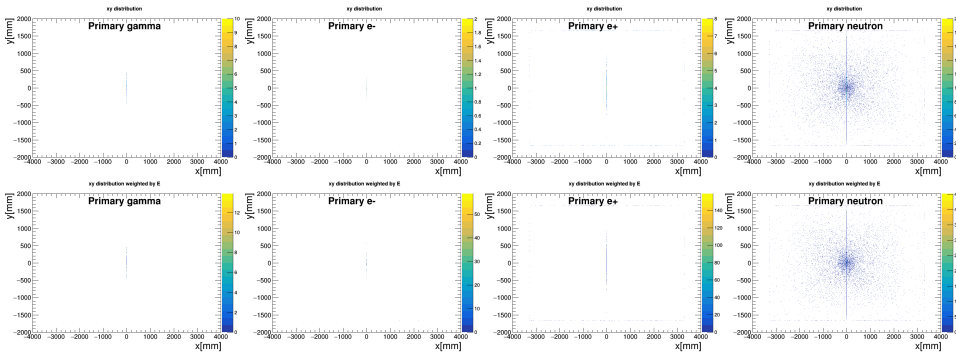
Top: Position XY distributions for different primary particles that leave front volume.
Bottom: Position XY distributions weighted by energy for different primary particles that leave front volume.

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.

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.