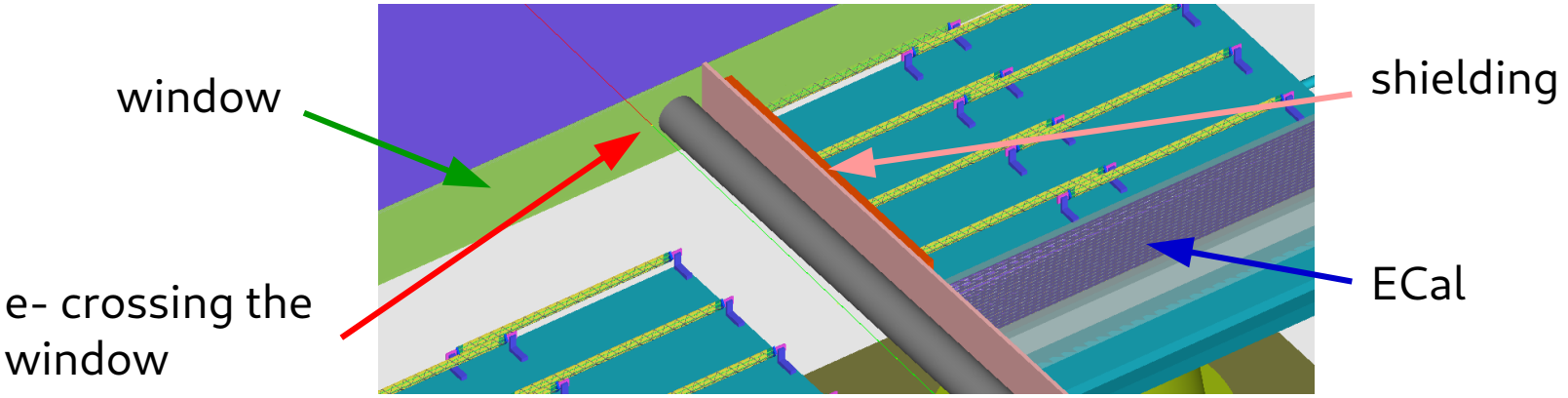
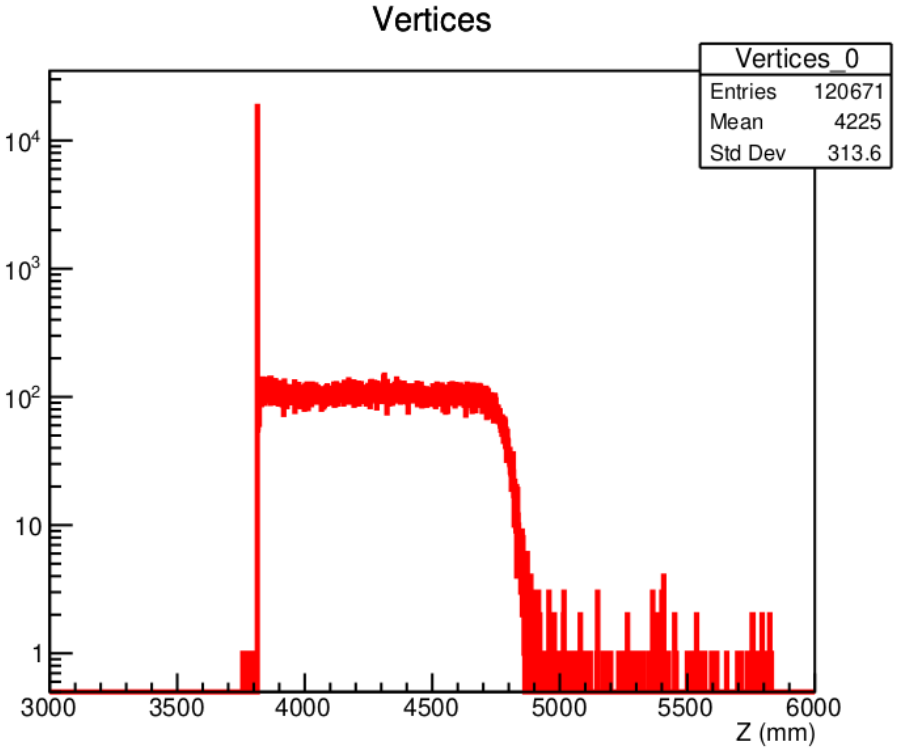
Aluminum vs Diamond (and beryllium) window

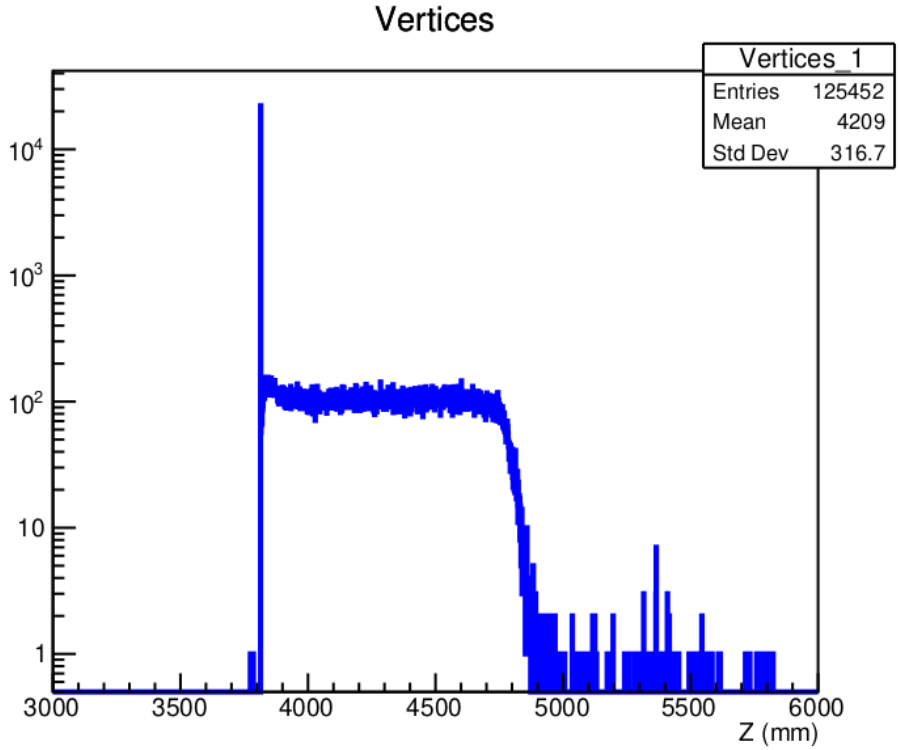
Vertices of particles hitting the shielding



Aluminum window

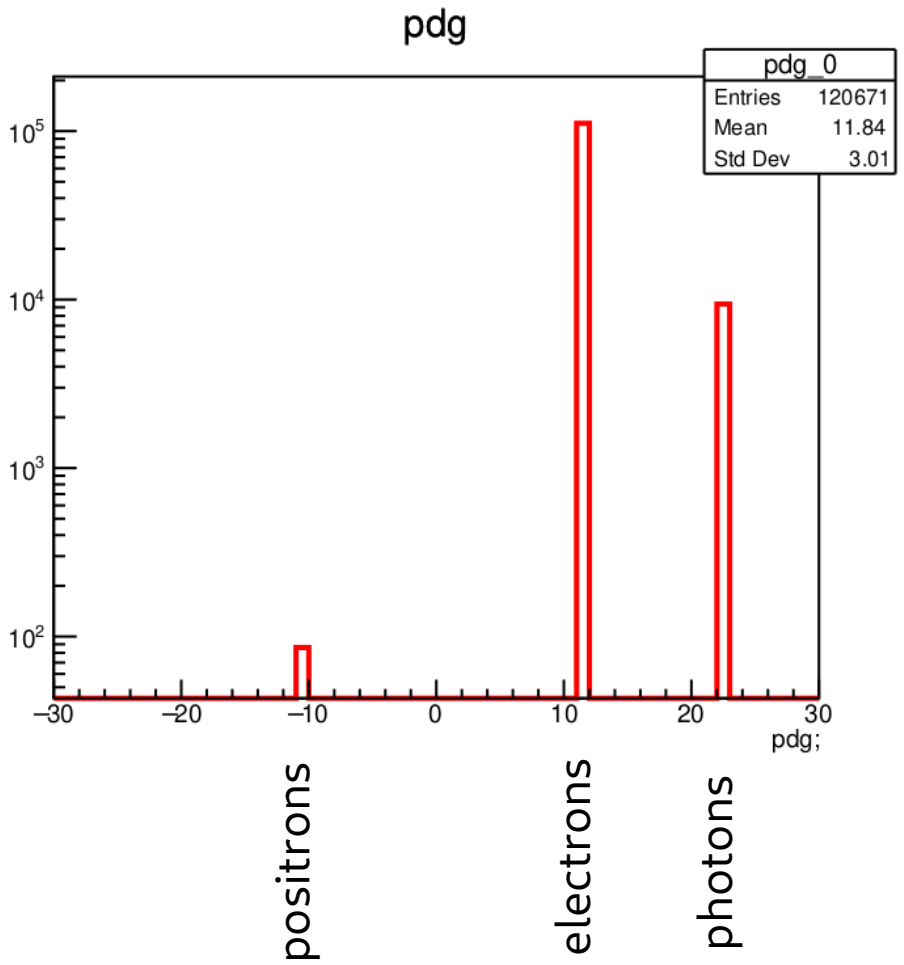


Diamond window

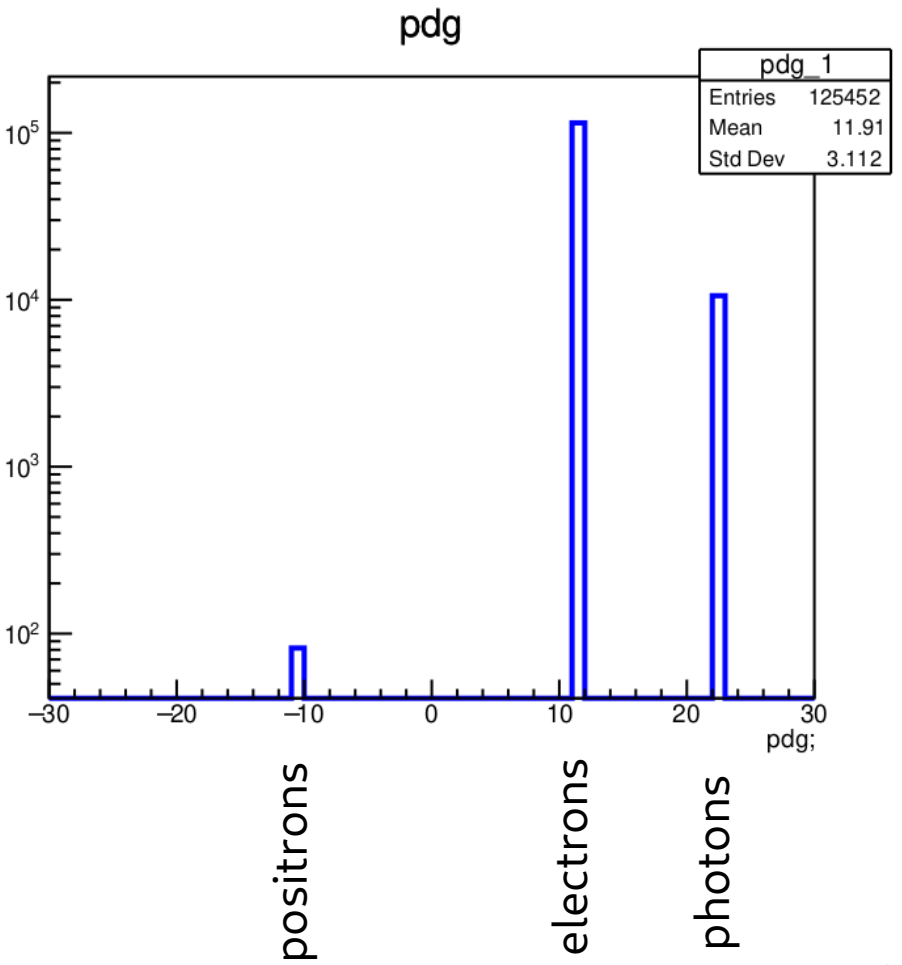


Particle types hitting the shielding

Aluminum window

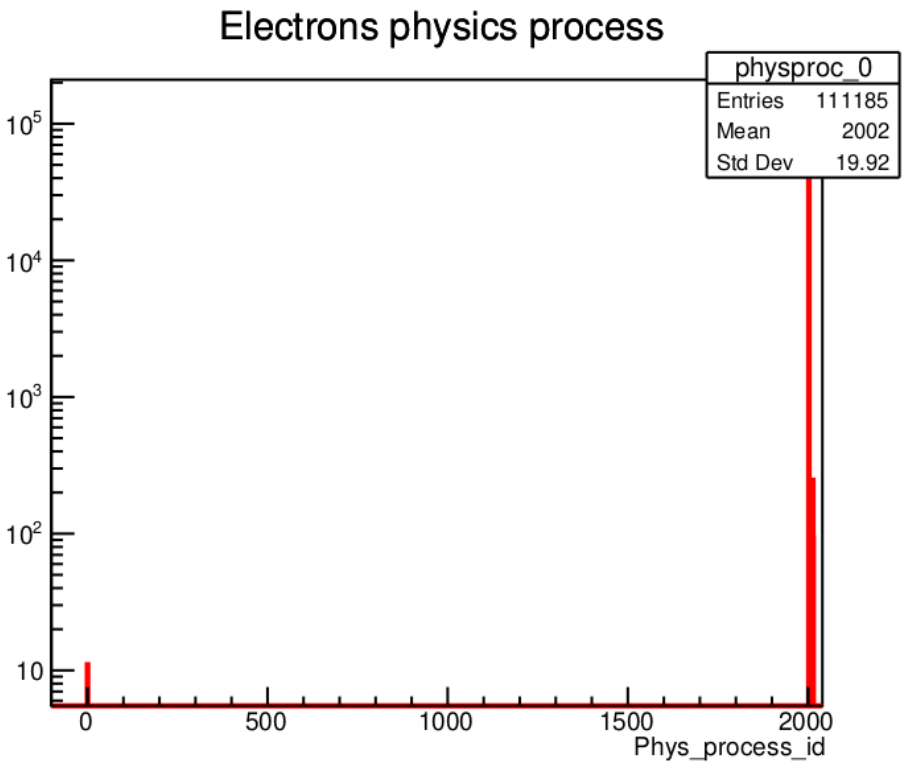


Diamond window



Physics processes which generated electrons

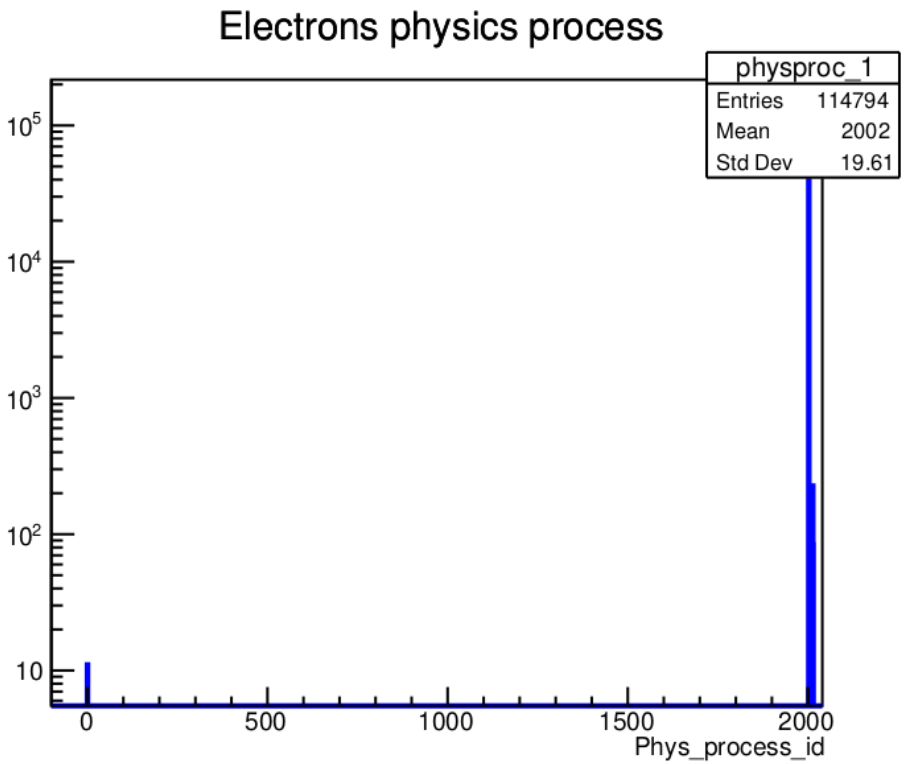
Aluminum window



Primary

Zoom on the next page

Diamond window

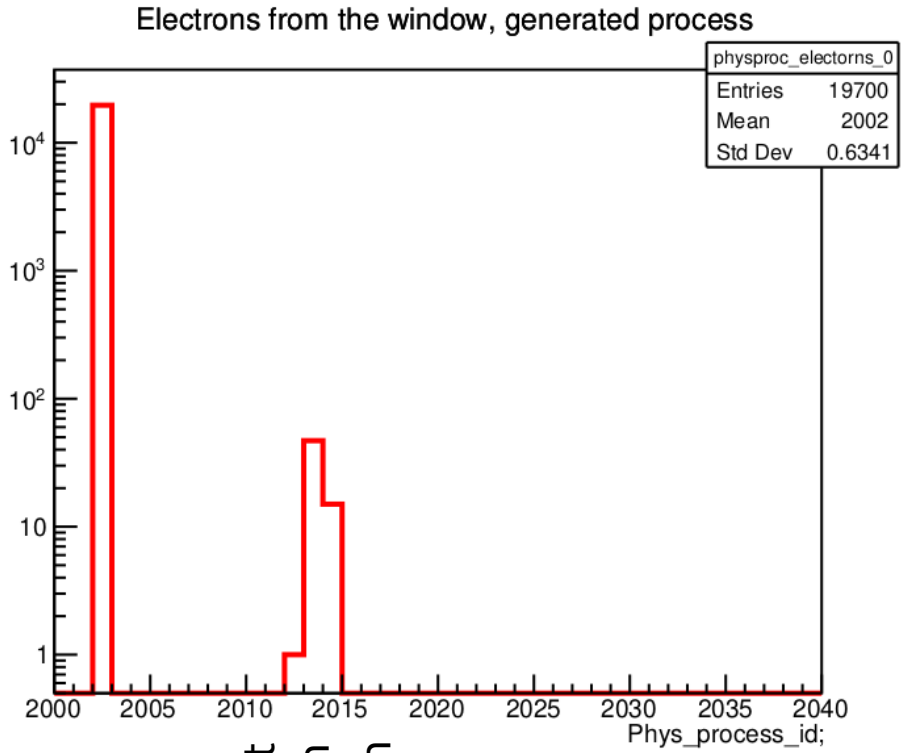


Primary

Zoom on the next page

Physics processes which generated electrons

Aluminum window



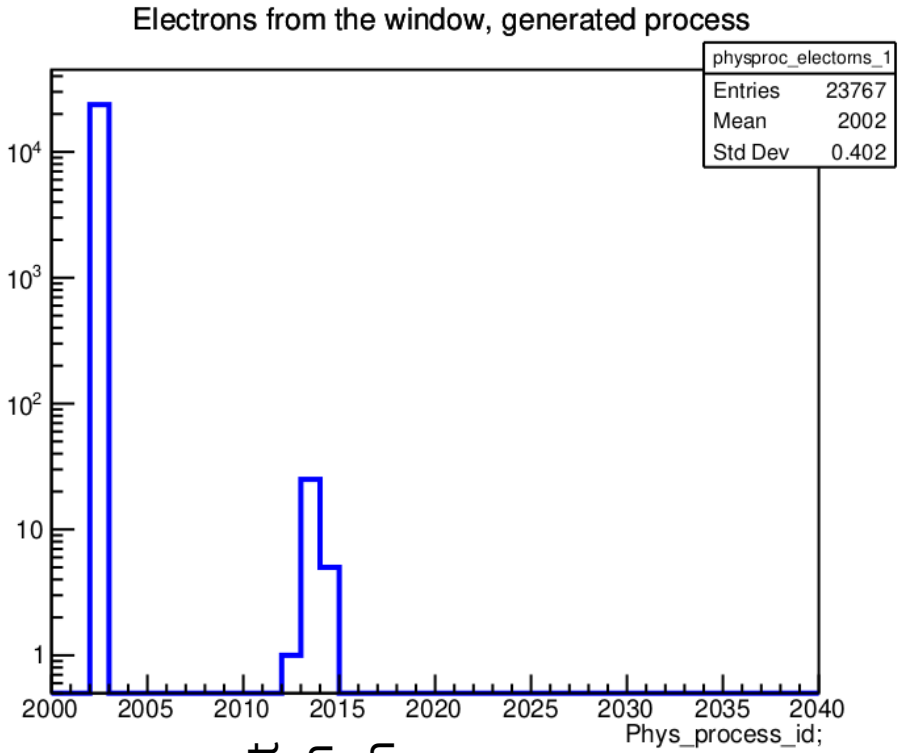
Ionization

Photoelectric effect

Compton

Photon conversion

Diamond window



Ionization

Photoelectric effect

Compton

Photon conversion

Estimating the number of electrons in unit volume

	Al	Diamond	Be	Mg
Z	13	6	4	12
A (g/mol)	27	12	9	24
Density (g/cm3)	2.699	3.52	1.848	1.74
Number of atoms in unit volume (mol/cm3 /NA)	0.1	0.293	0.205	0.073
Number of electrons in unit volume (mol/cm3 /NA)	1.3	1.758	0.82	0.876
Ratio to Al	1	1.35	0.63	0.67

- Because of higher density of the diamond, for the same thickness diamond window contains almost 3 times more atoms then aluminum.
- Though the number of electrons per atom more than twice smaller for diamond, it is not enough to compensate for higher density effect. The number of electrons per volume is about 30% higher for diamond than for aluminum.

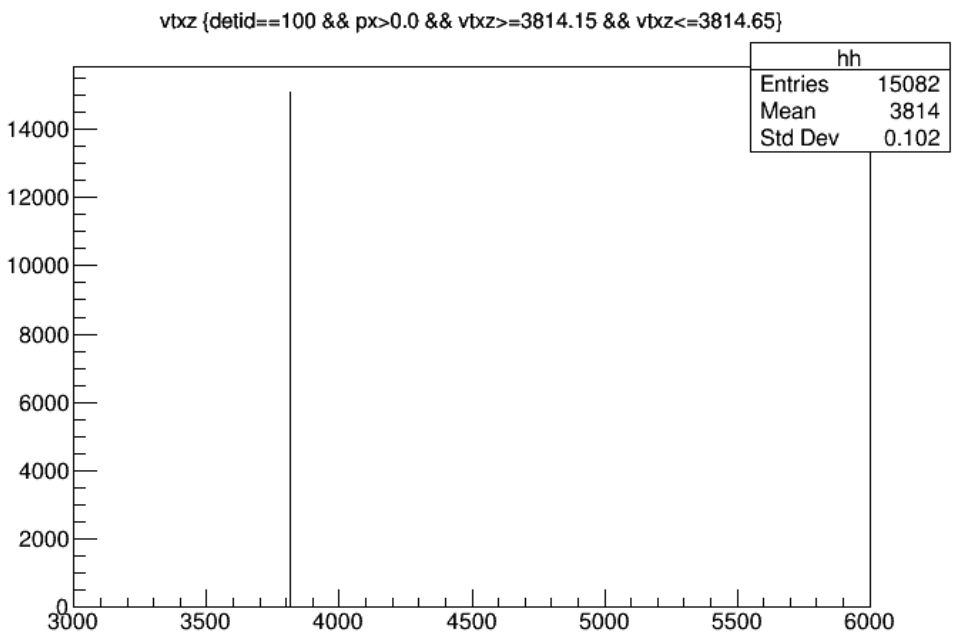
Aluminum vs Beryllium windows

Selection:

- Particles hitting shielding
- vertices inside the window: (3814.4 ± 0.25) mm

10973 / 15082 = 0.73

Aluminum



Beryllium