GEANT4 Simulation of Neutrons in LUXE Ecal. Aluminum window in vacuum chamber.

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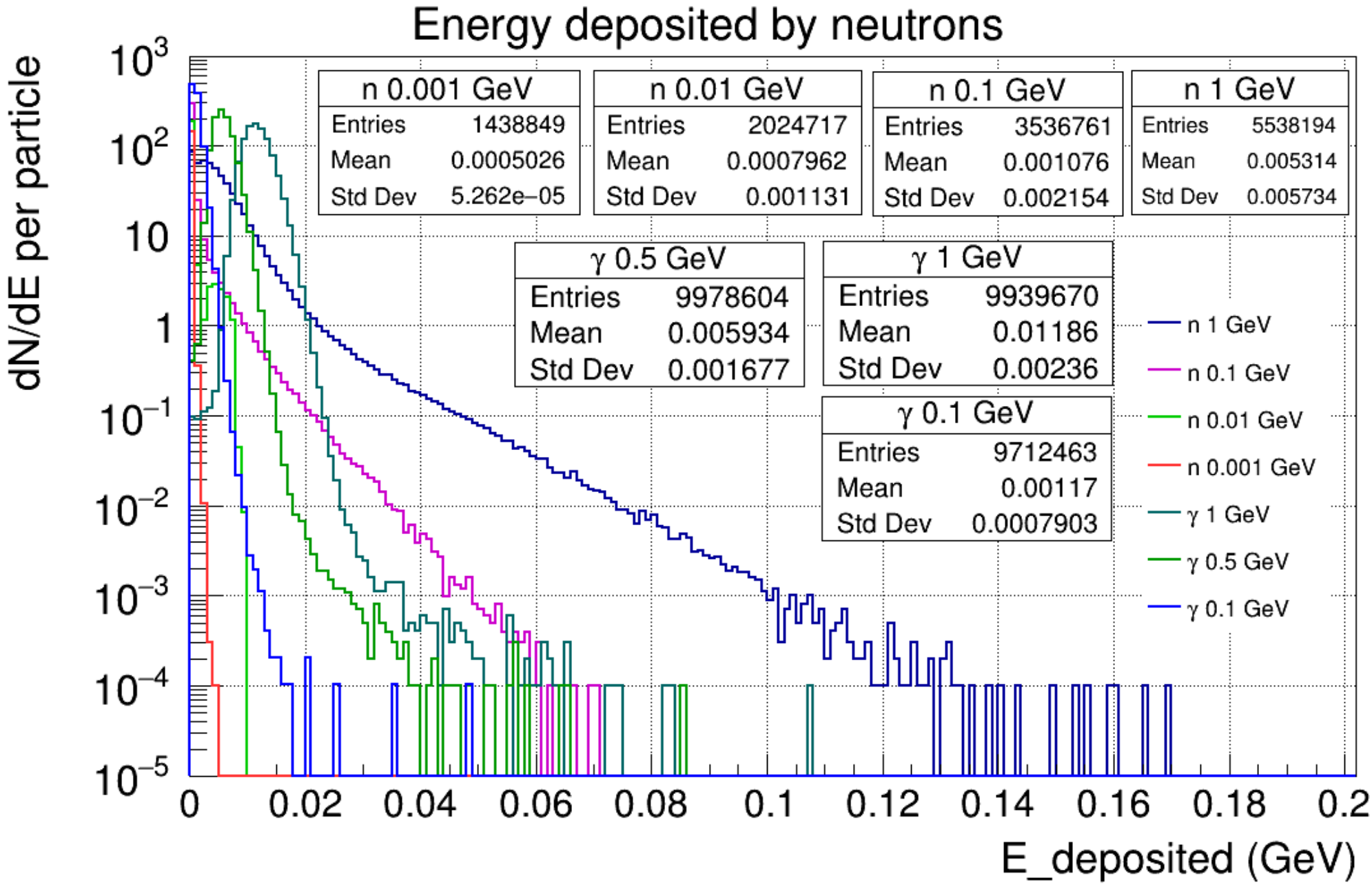
Possible parameters for selections

- Total energy deposit
- Total energy deposit after (noise) threshold
- Number of active pads after (noise) threshold
- Highest single pad energy
- Fraction of energy deposit in EM layers (0-12)
- Transverse shower size.

Energy deposited in Ecal by neutrons and photons



Energy deposited in ECal w/ noise cut

- 320 μm Si sensor MIP: ~90 keV;
- Signal to noise ratio ~8;
- Signal cut: 5*Noise ≈ 60 keV;

arXiv:1812.11426

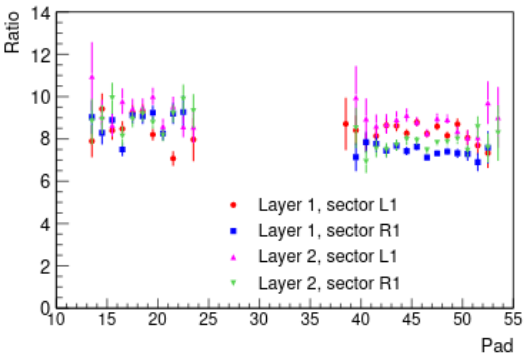
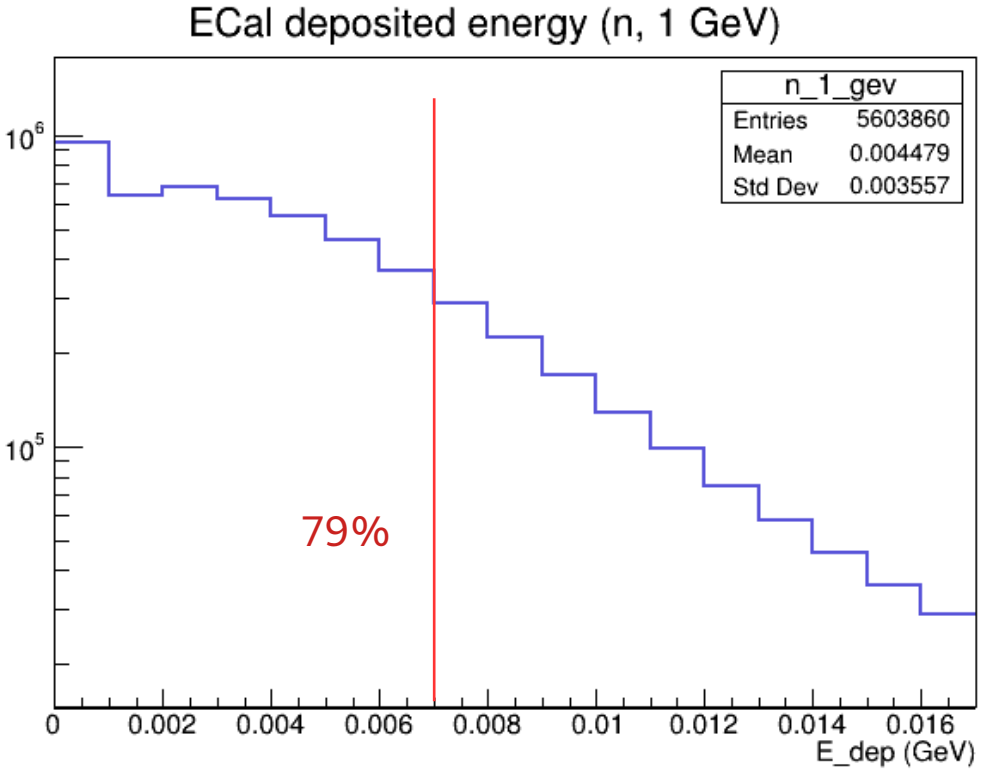
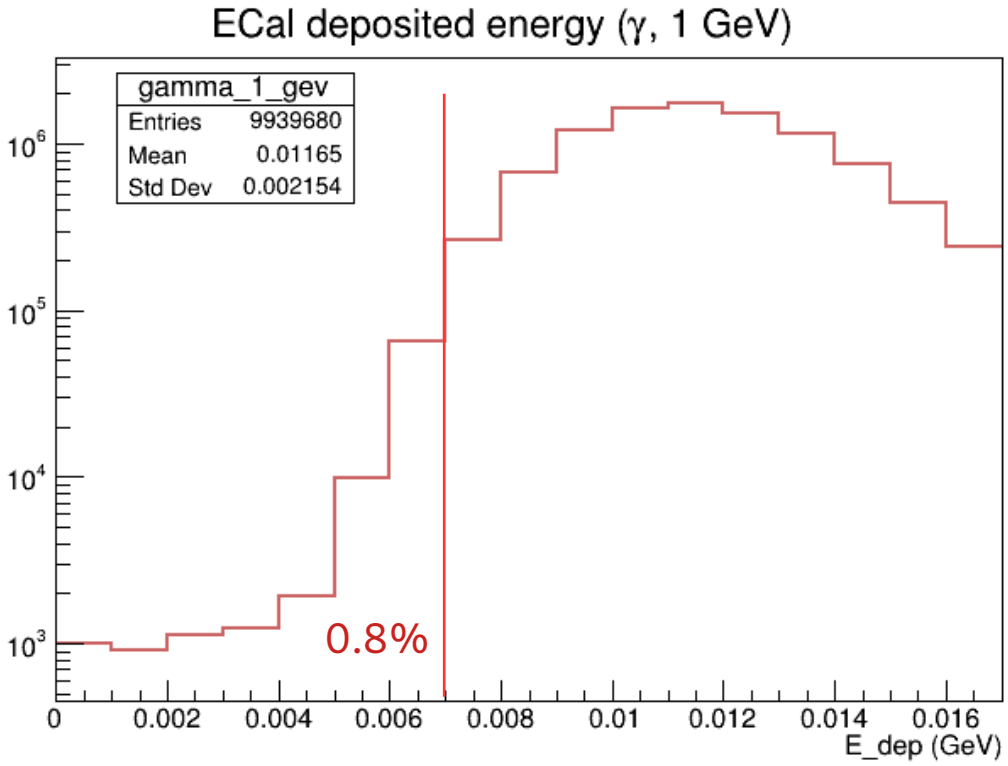
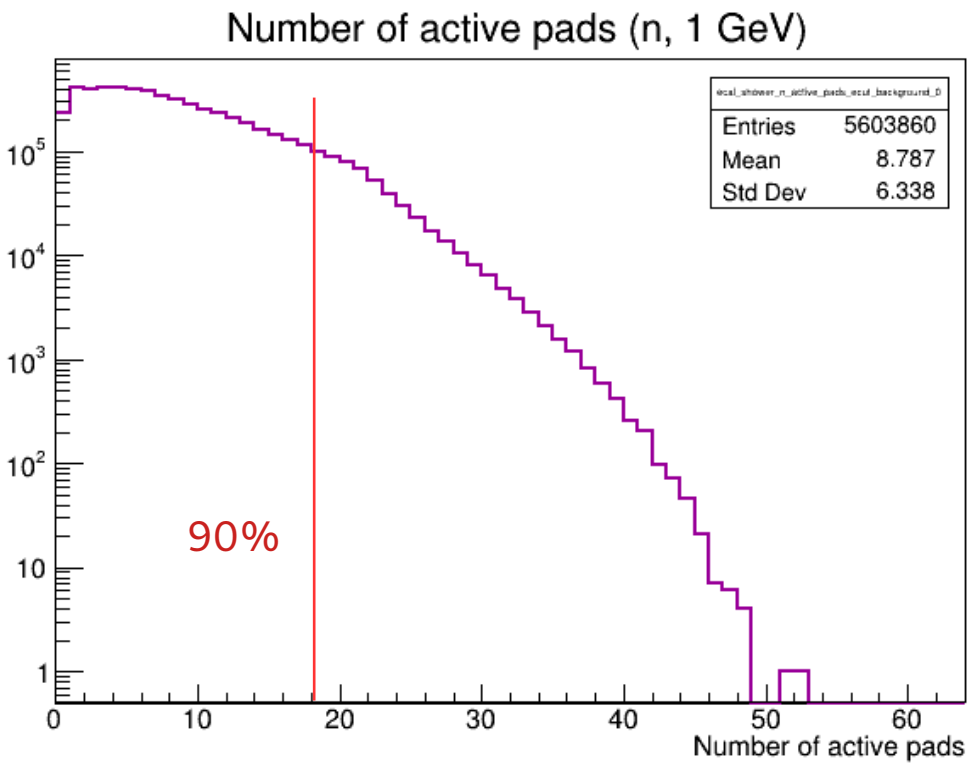


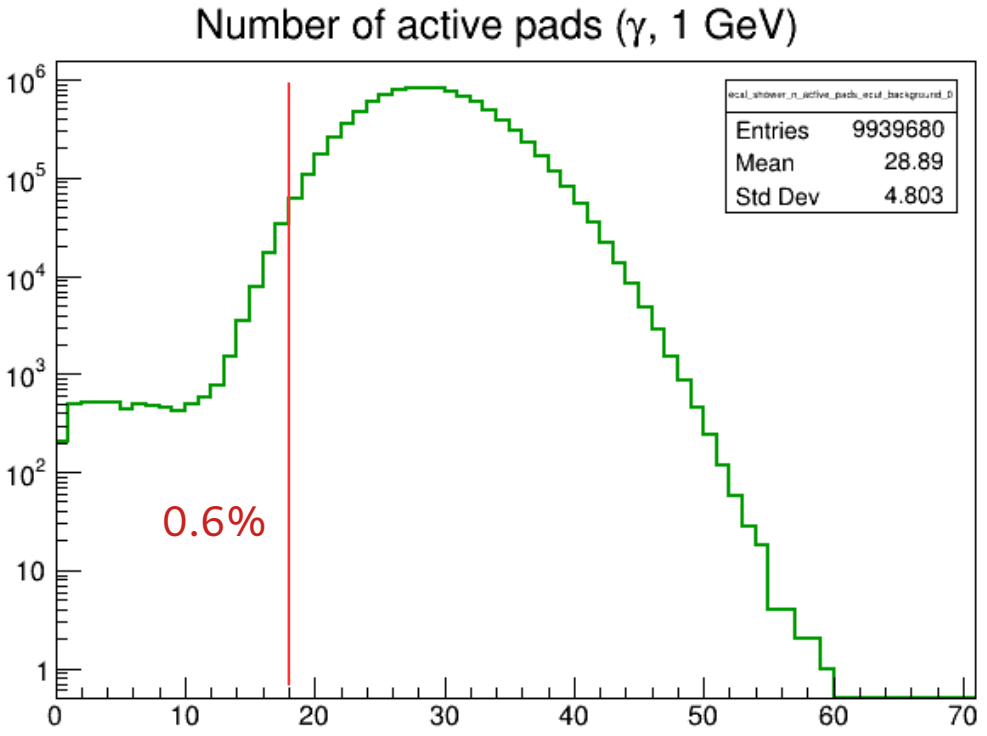
Fig. 11: Signal to noise ratio for the pads of the tracking layers covered by the electron beam of 5 GeV.



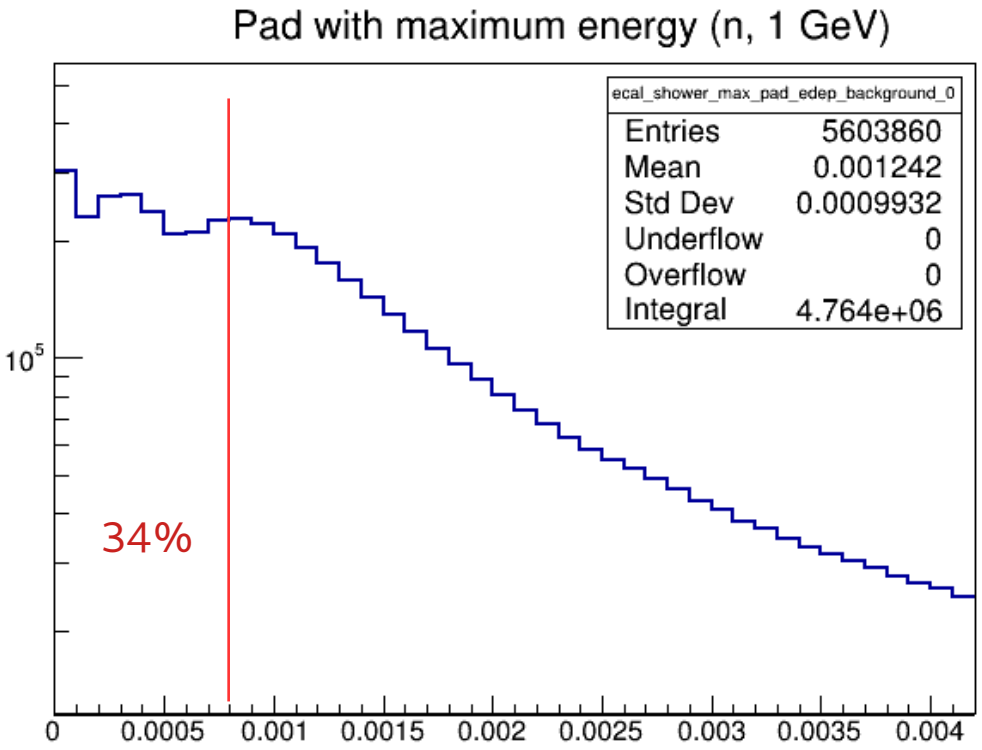


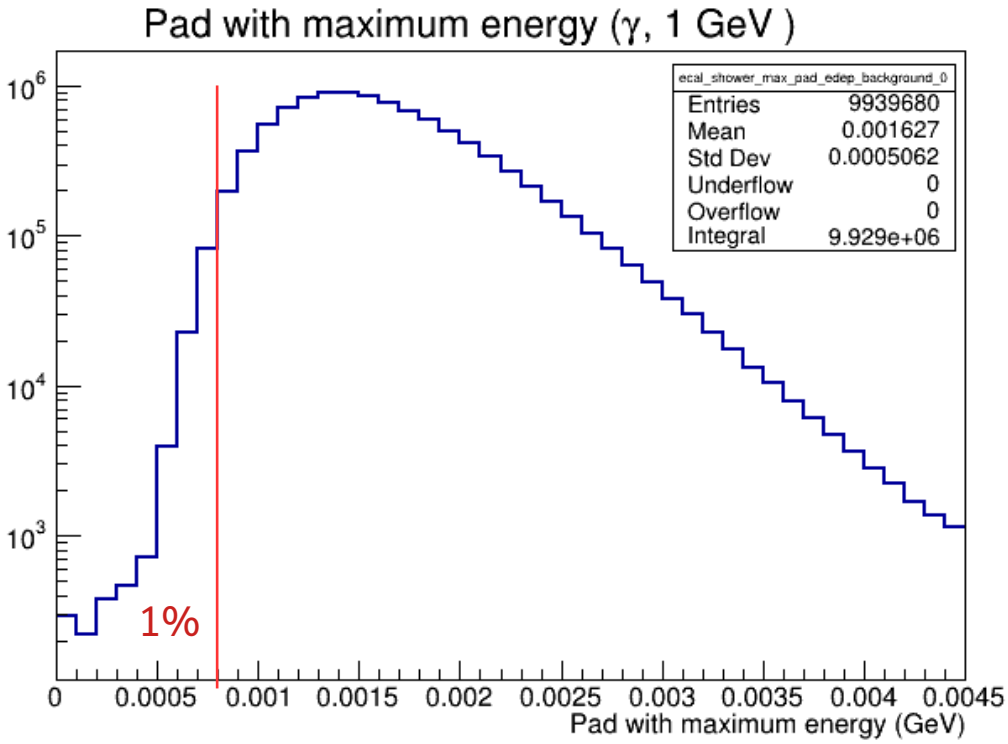
Number of active pads



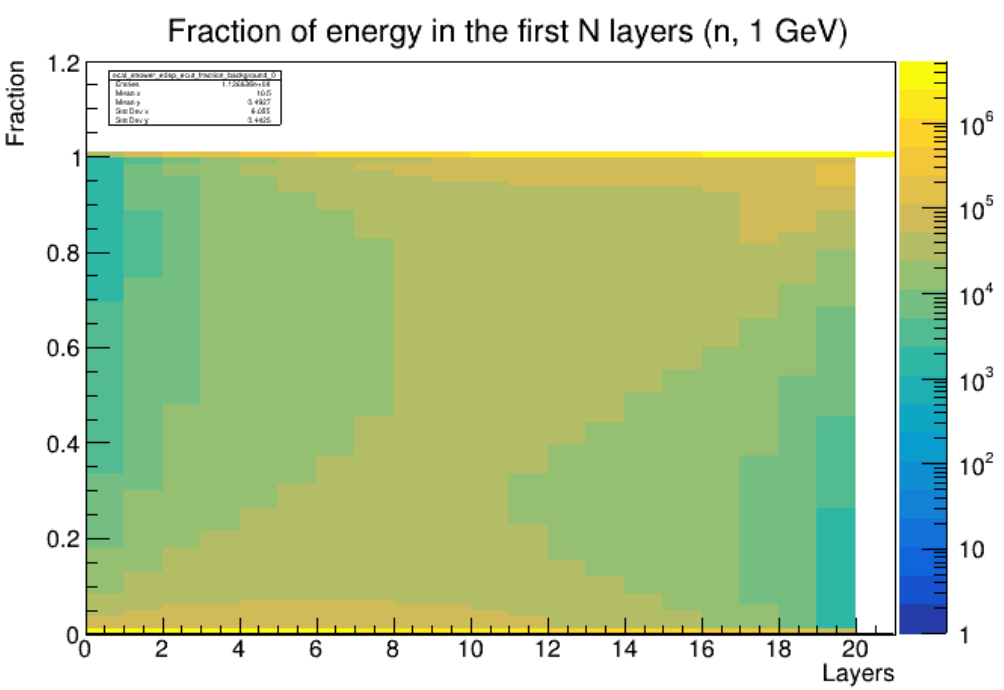


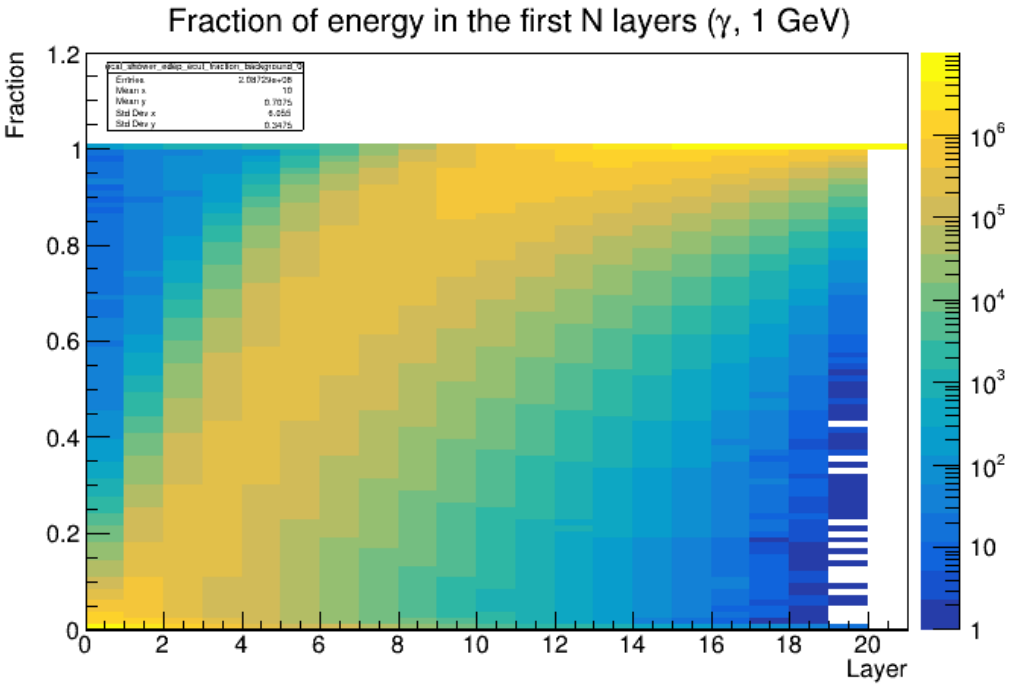
Highest single pad energy

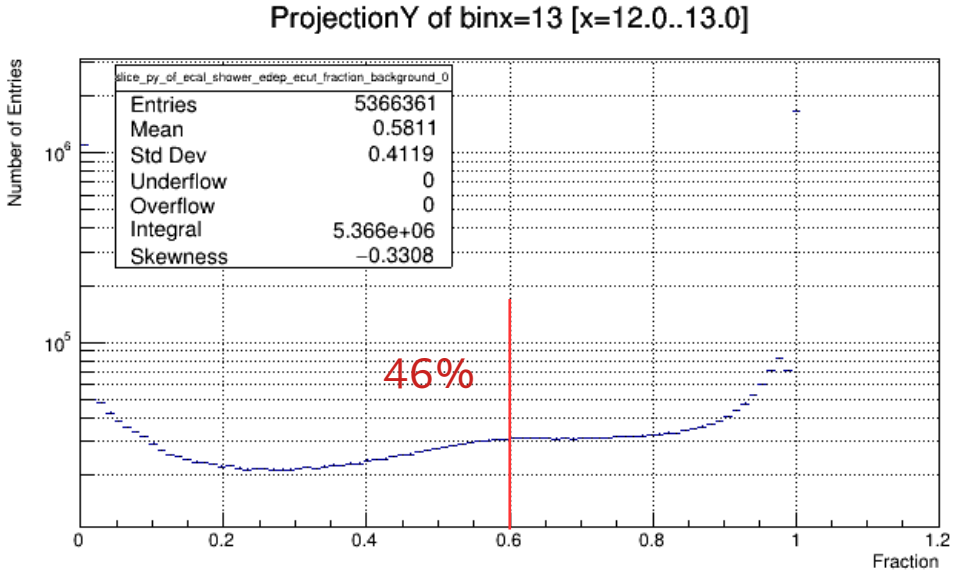


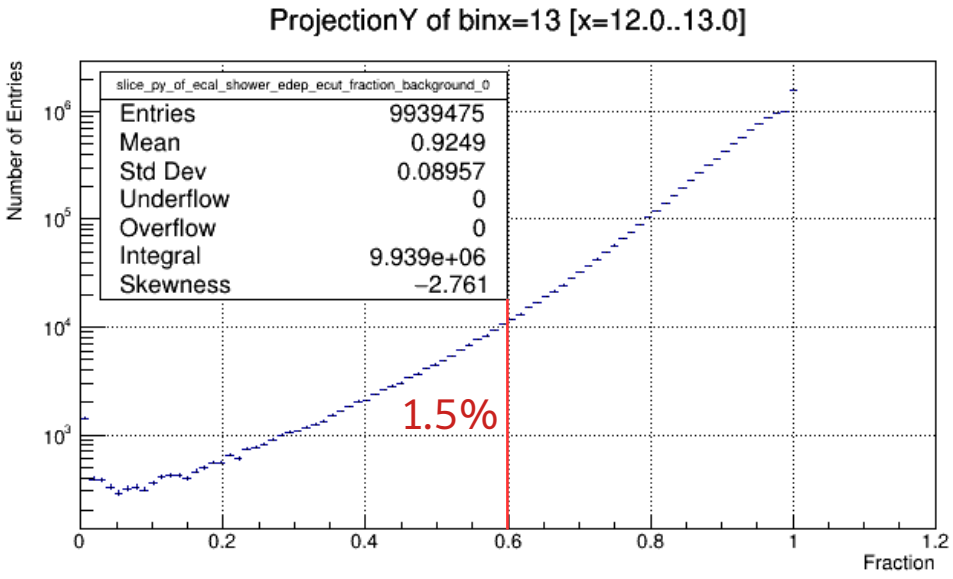


Cumulative energy fraction in first N layers







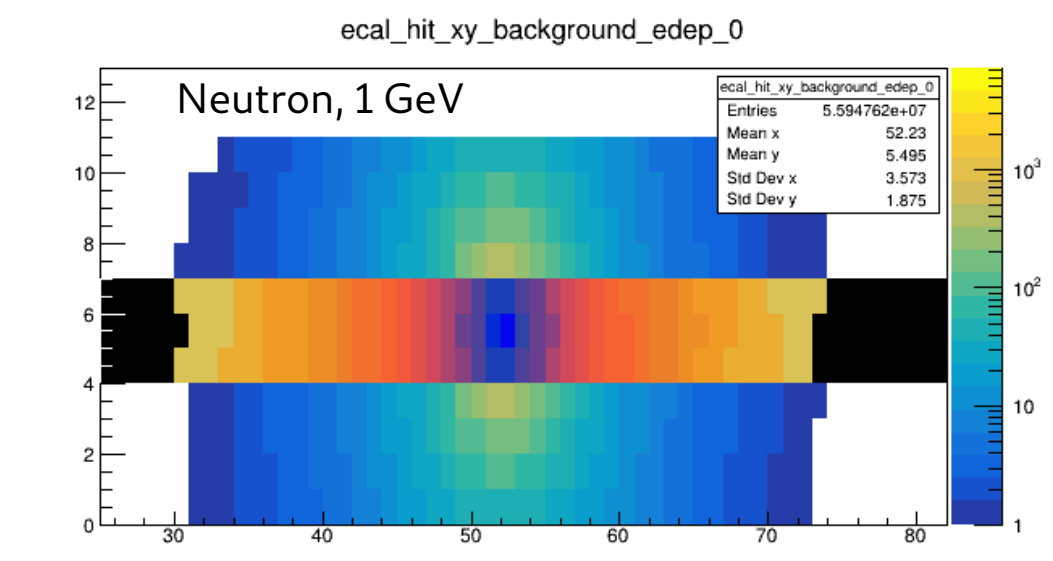


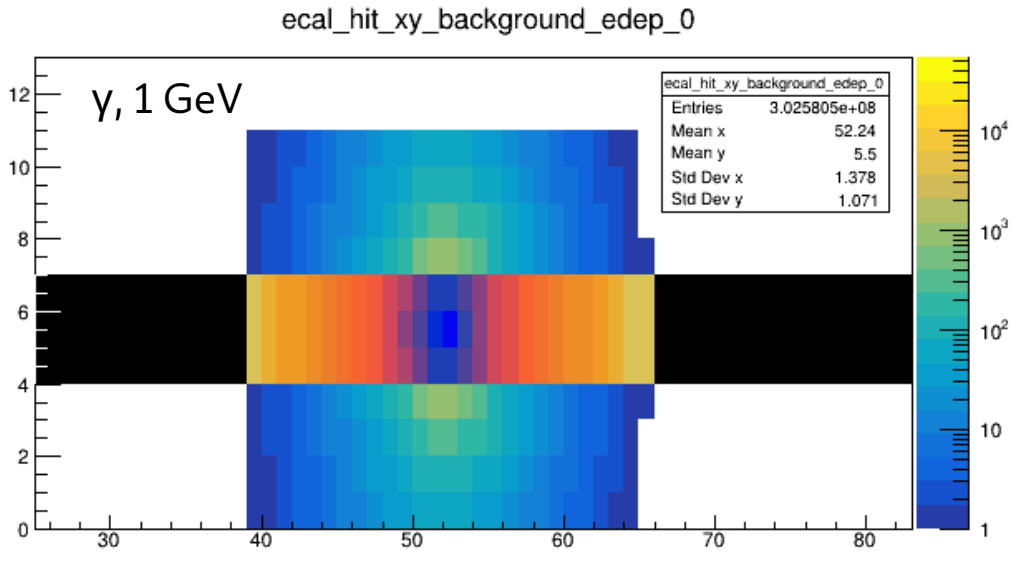
Photon selection

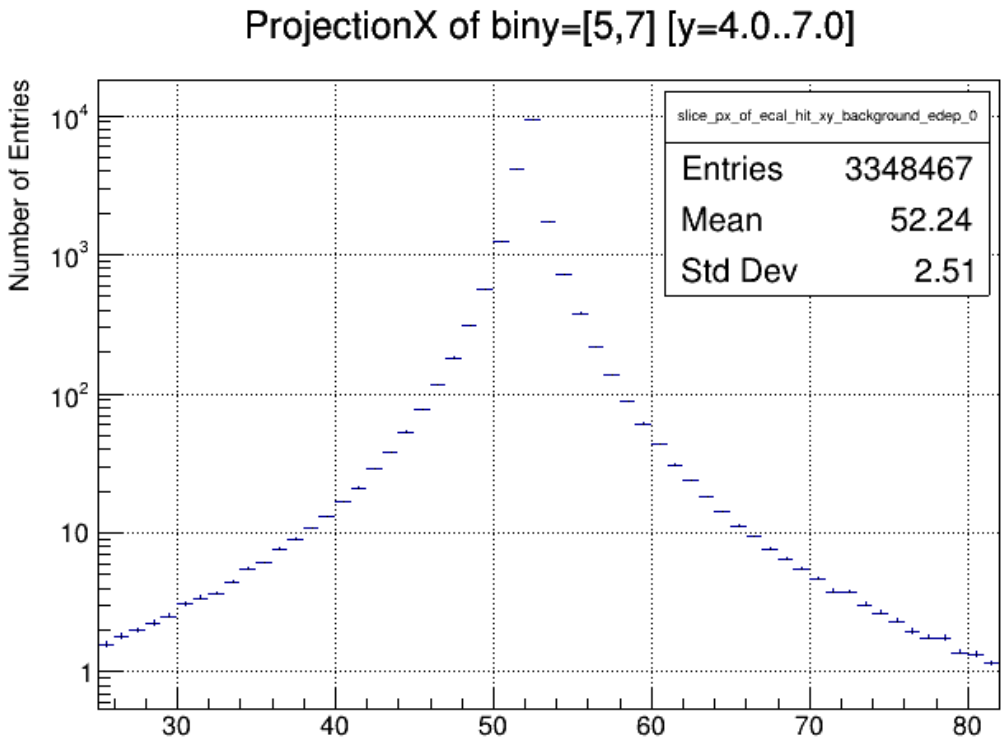
Selection criteria		y, 1 GeV		y, 0.5 GeV		n, 1 GeV	
No		9940000	1	9980000	1	9950000	1
Total energy deposit after (noise) threshold	E > 0.007 GeV	9.86E+06	0.992	2.30E+06	0.230	1.34E+06	0.134
Number of active pads after (noise) threshold	N_active > 18	9.75E+06	0.989	1.42E+06	0.617	258099	0.193
Highest single pad energy	E_pad_max > 8.0e-4	9.66E+06	0.991	1.37E+06	0.969	247139	0.958
Fraction of energy deposit in EM layers (0-12)	Fraction_em > 0.6	9.55E+06	0.989	1.35E+06	0.986	170055	0.688
			0.961		0.136		0.017

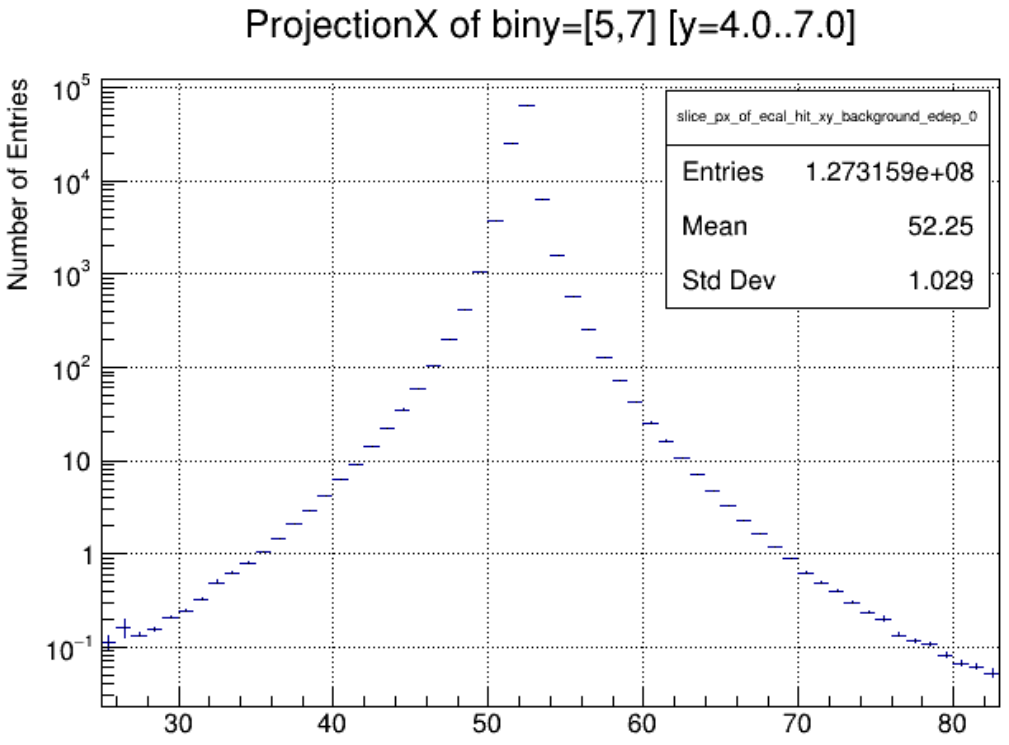
Selection criteria		y, 1 GeV		y, 0.5 GeV		n, 1 GeV	
No		9940000	1	9980000	1	9950000	1
Total energy deposit after (noise) threshold	E > 0.003 GeV	9.94E+06	1.000	9.82E+06	0.984	3.34E+06	0.335
Number of active pads after (noise) threshold	N_active > 10	9.93E+06	1.000	9.57E+06	0.974	1.54E+06	0.461
Highest single pad energy	E_pad_max > 4.0e-4	9.93E+06	1.000	9.56E+06	0.999	1.50E+06	0.978
Fraction of energy deposit in EM layers (0-12)	Fraction_em > 0.6	9.82E+06	0.989	9.44E+06	0.988	905349	0.602
			0.988		0.946		0.091

Transverse shower





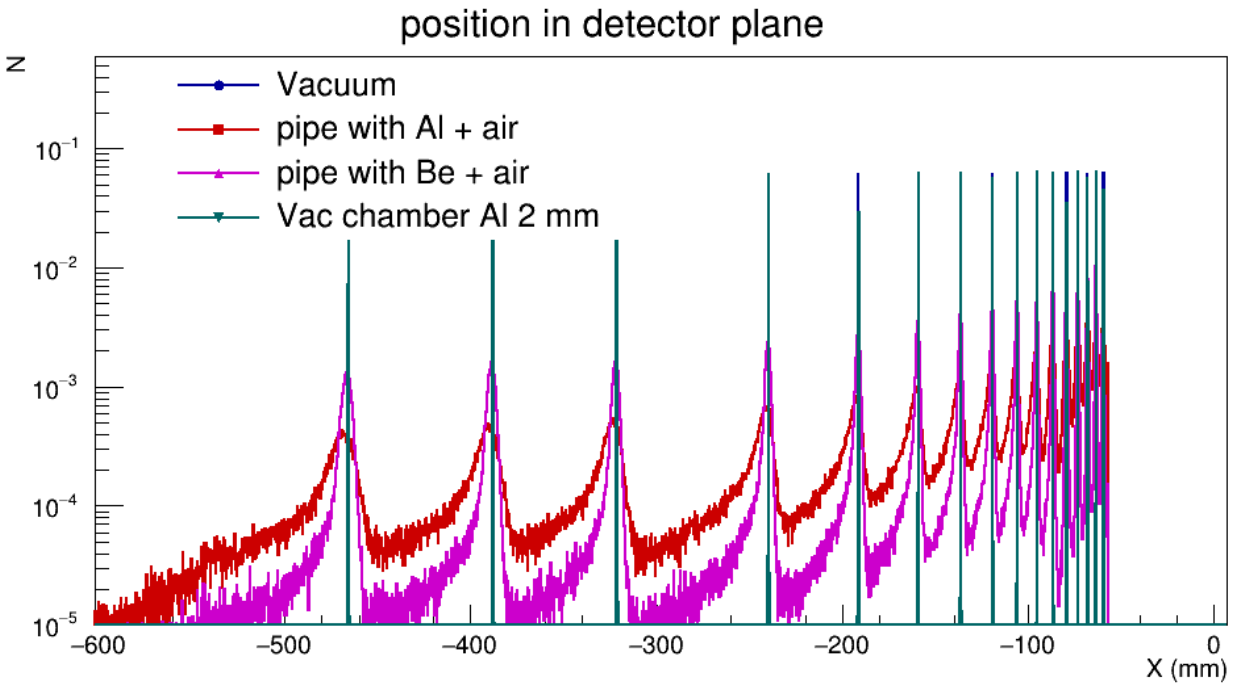


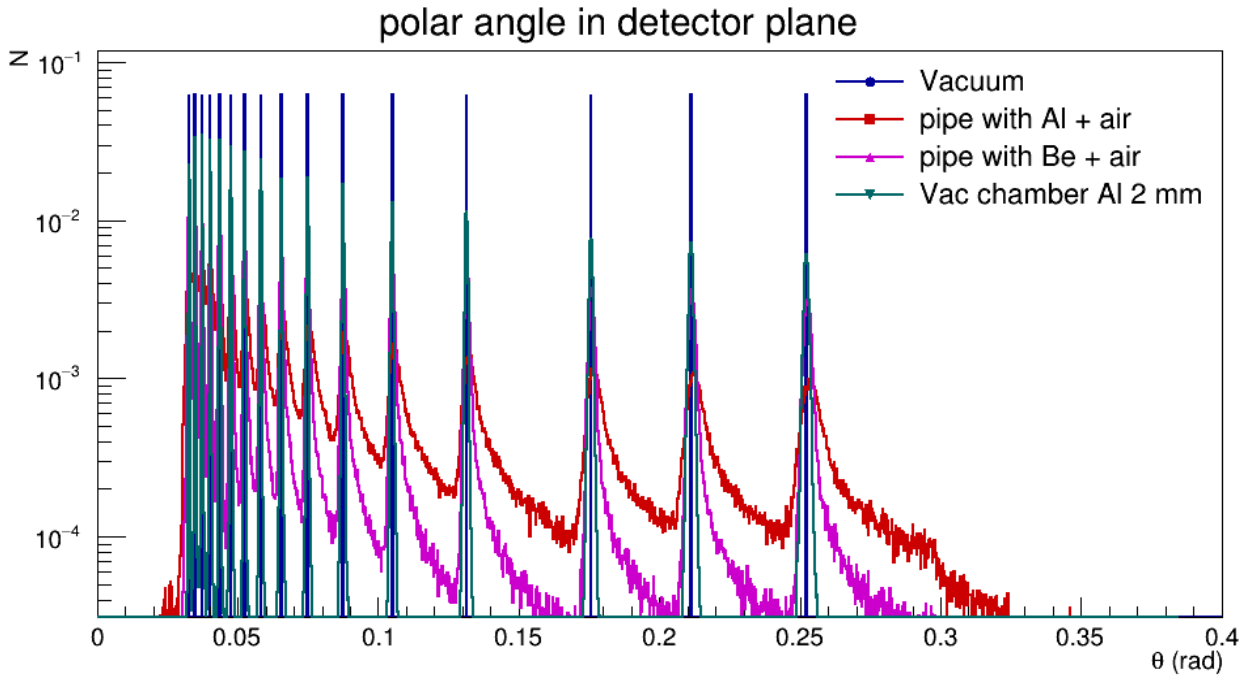


Window material for vacuum chamber

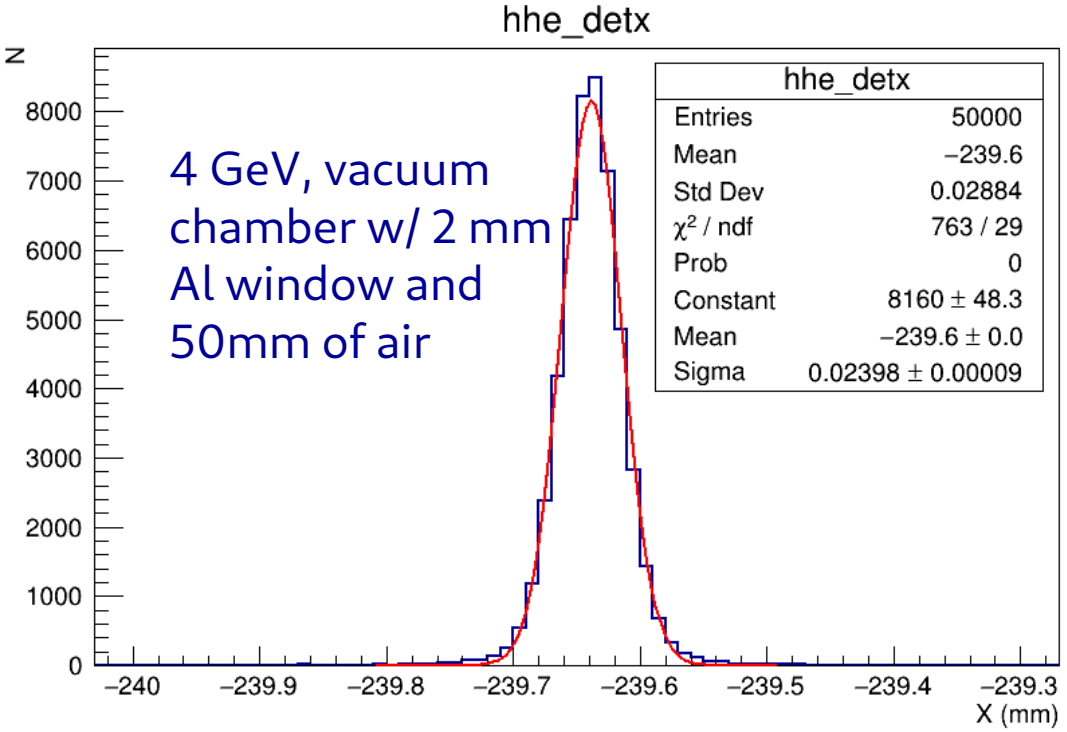
Performance of different IP - detector interfaces

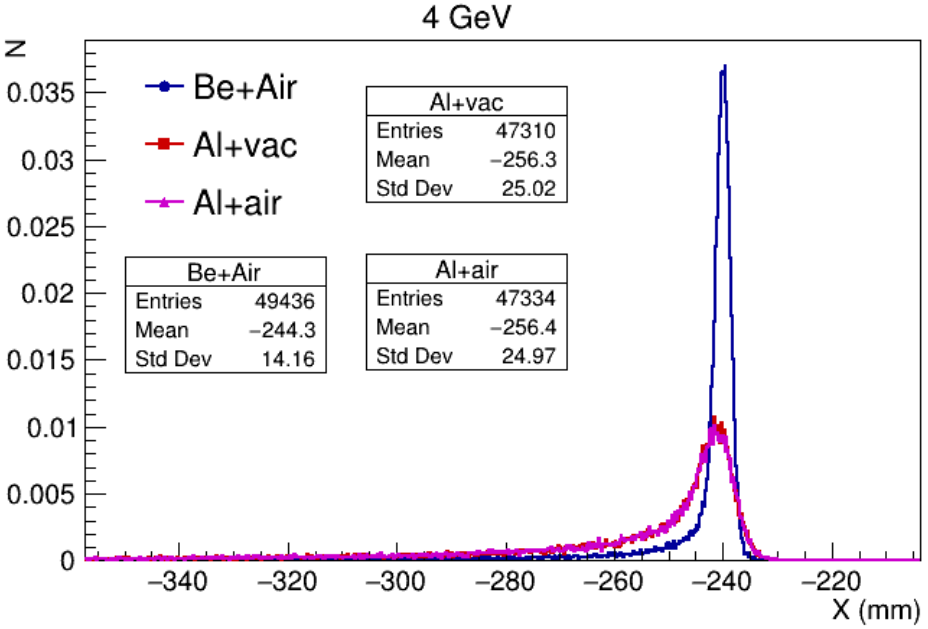
- 50k electrons with energies
- 2.1, 2.5, 3.0, 4.0,... 16.0 (GeV).
- Vacuum;
- Beam pipe with Al windows;
- Beam pipe with Be windows;
- Vacuum chambers with Al windows of 2 mm;
- True MC comparison.

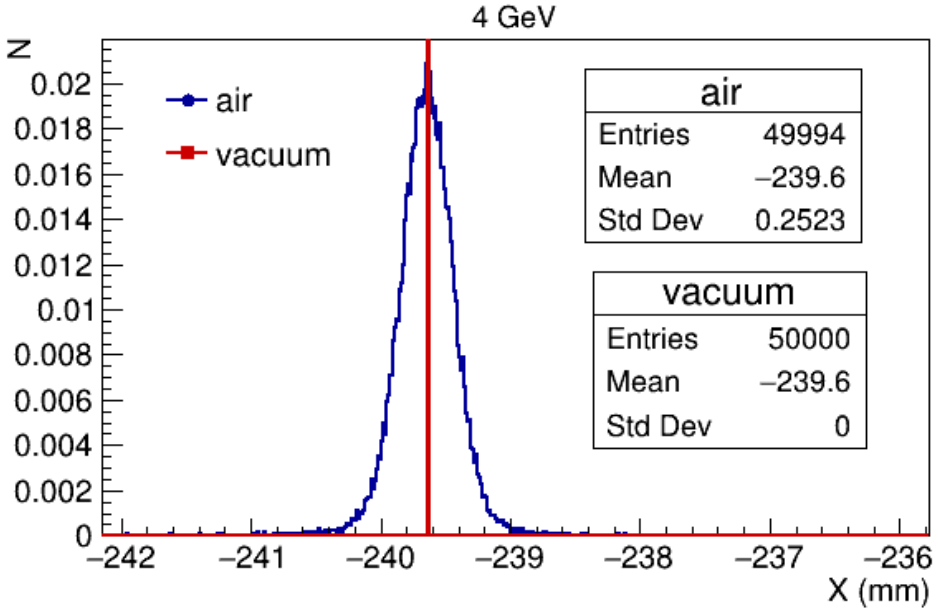


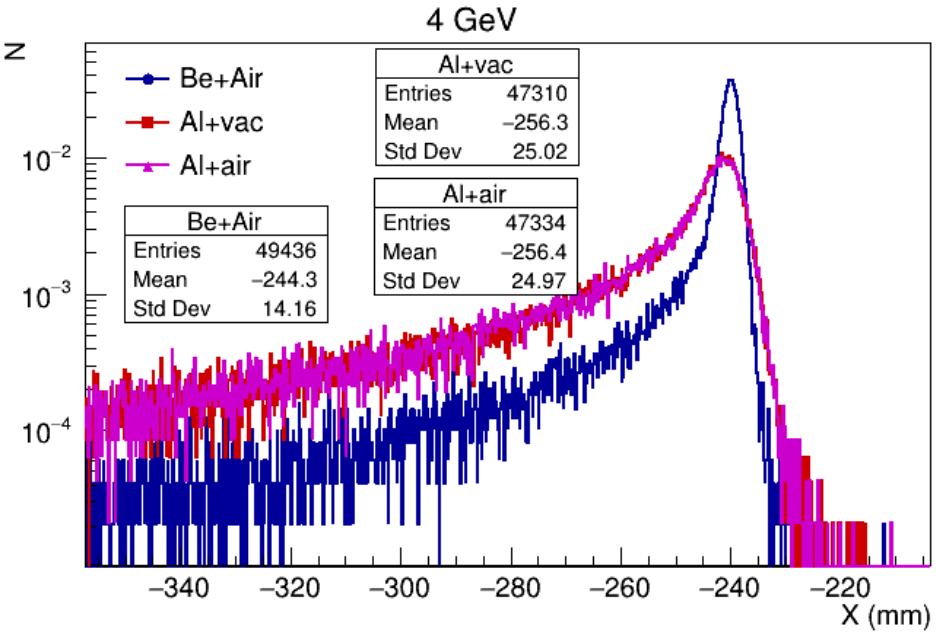


Vacuum, air, Al, Be, vacuum chamber

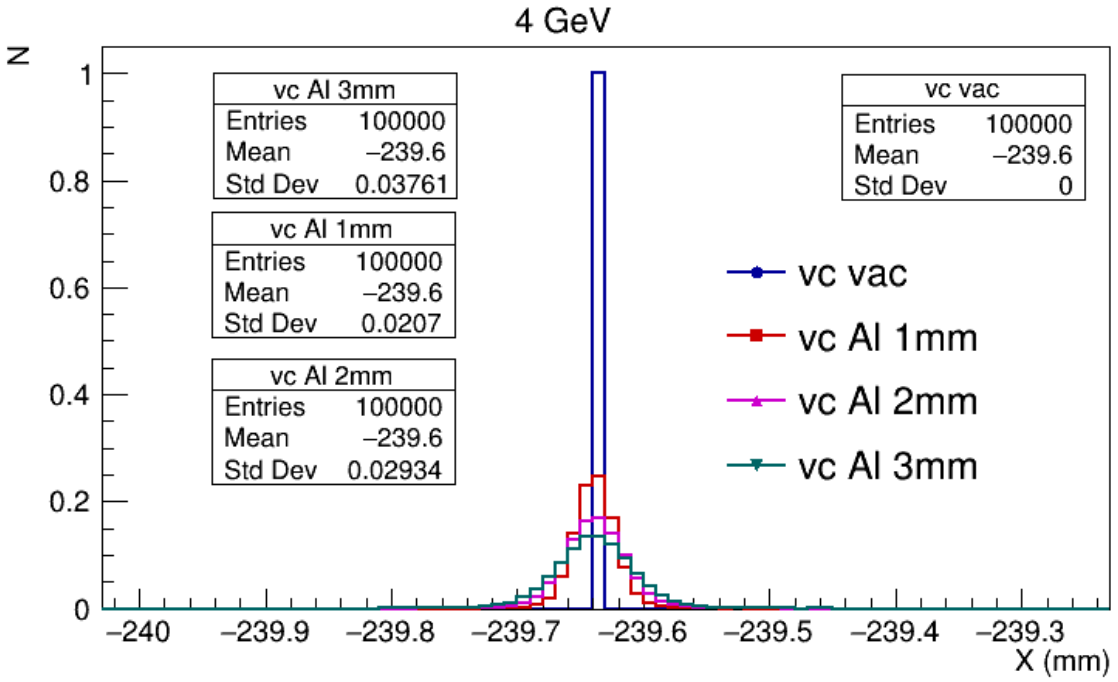




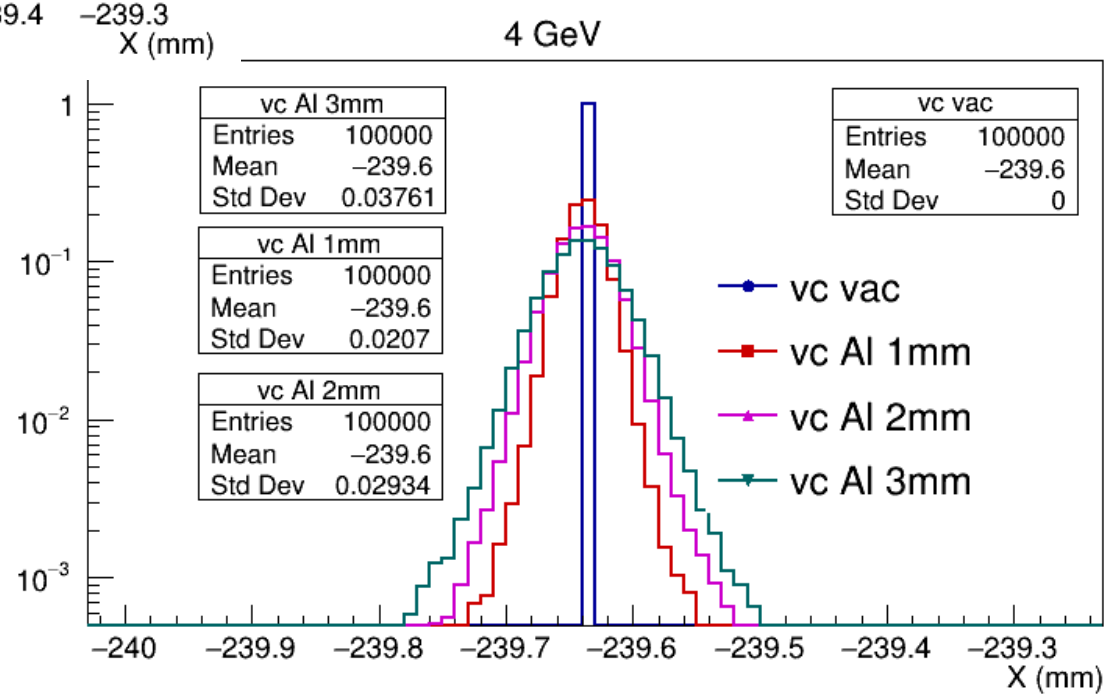




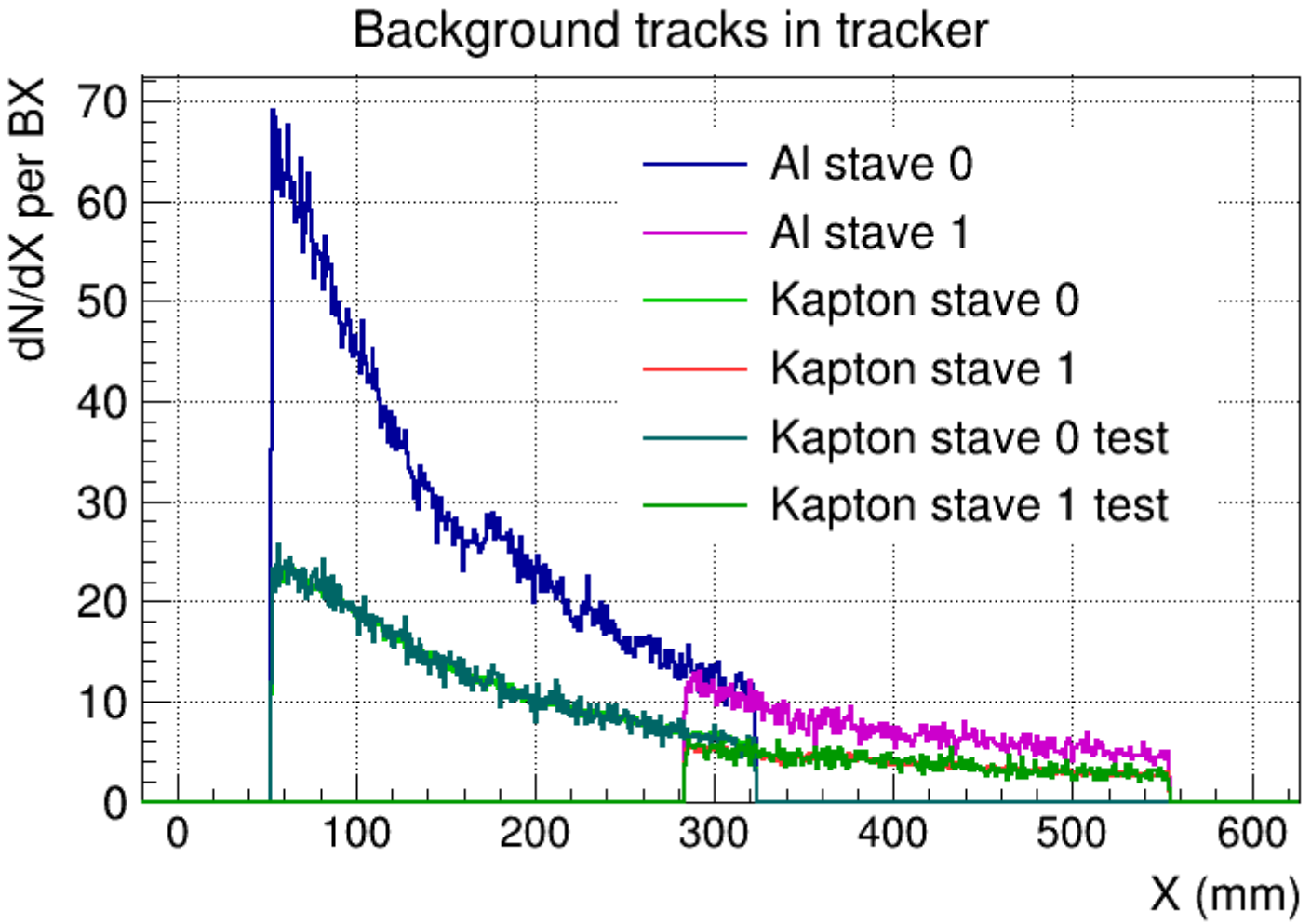
4 GeV, vacuum chamber with different window thickness



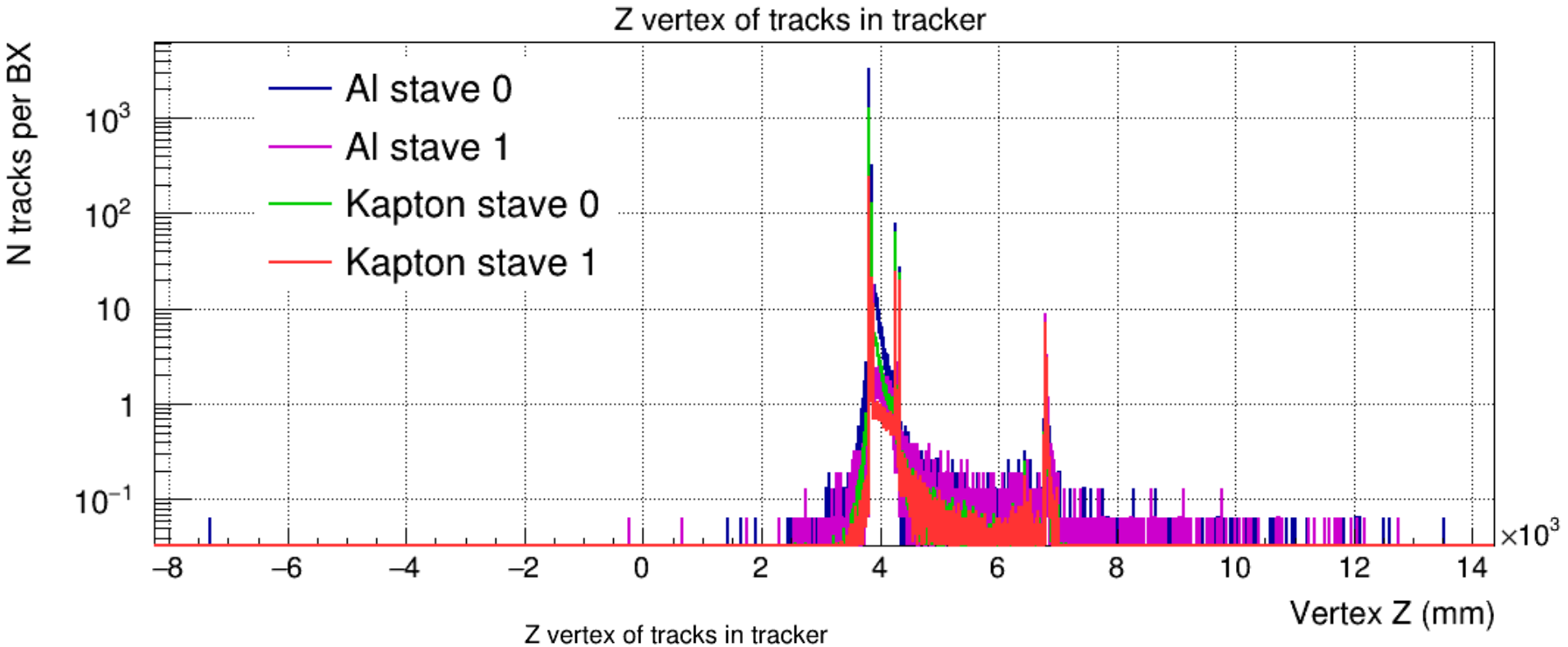
29 μm in position uncertainty at 4 GeV corresponds to 0.5 MeV

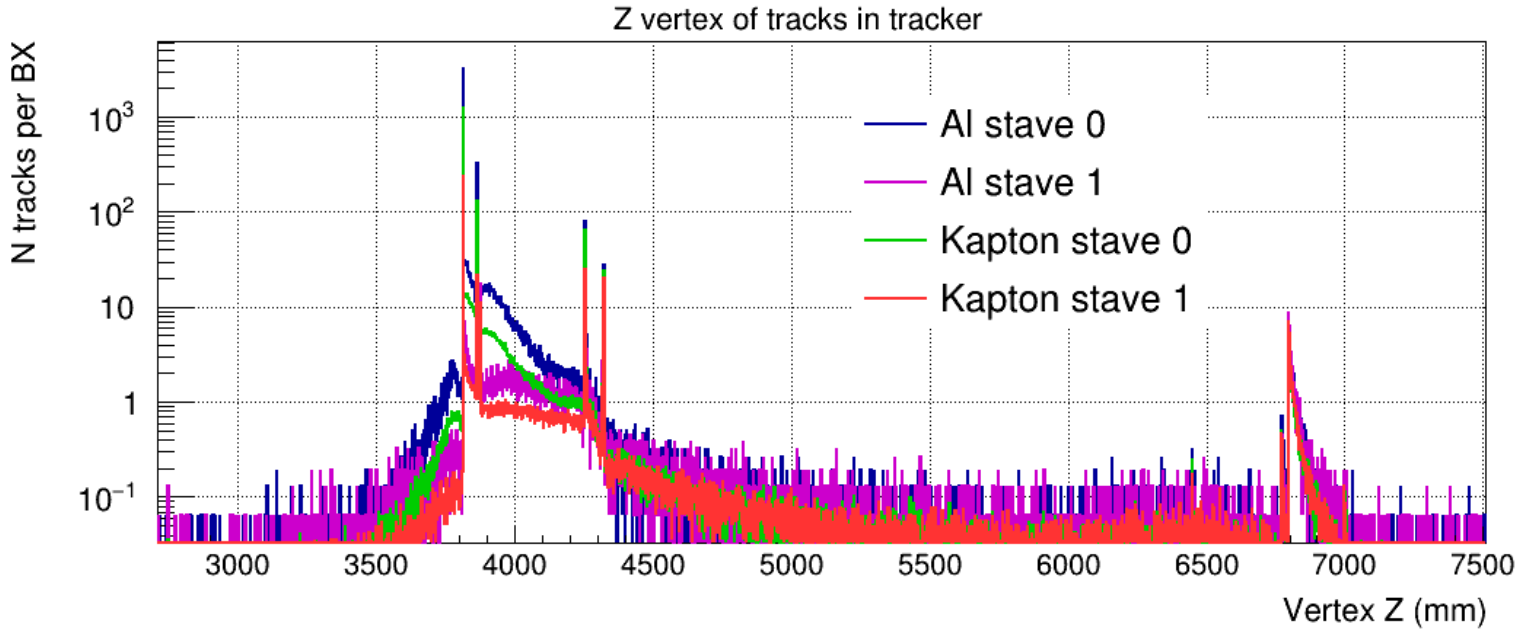


Background tracks in tracker

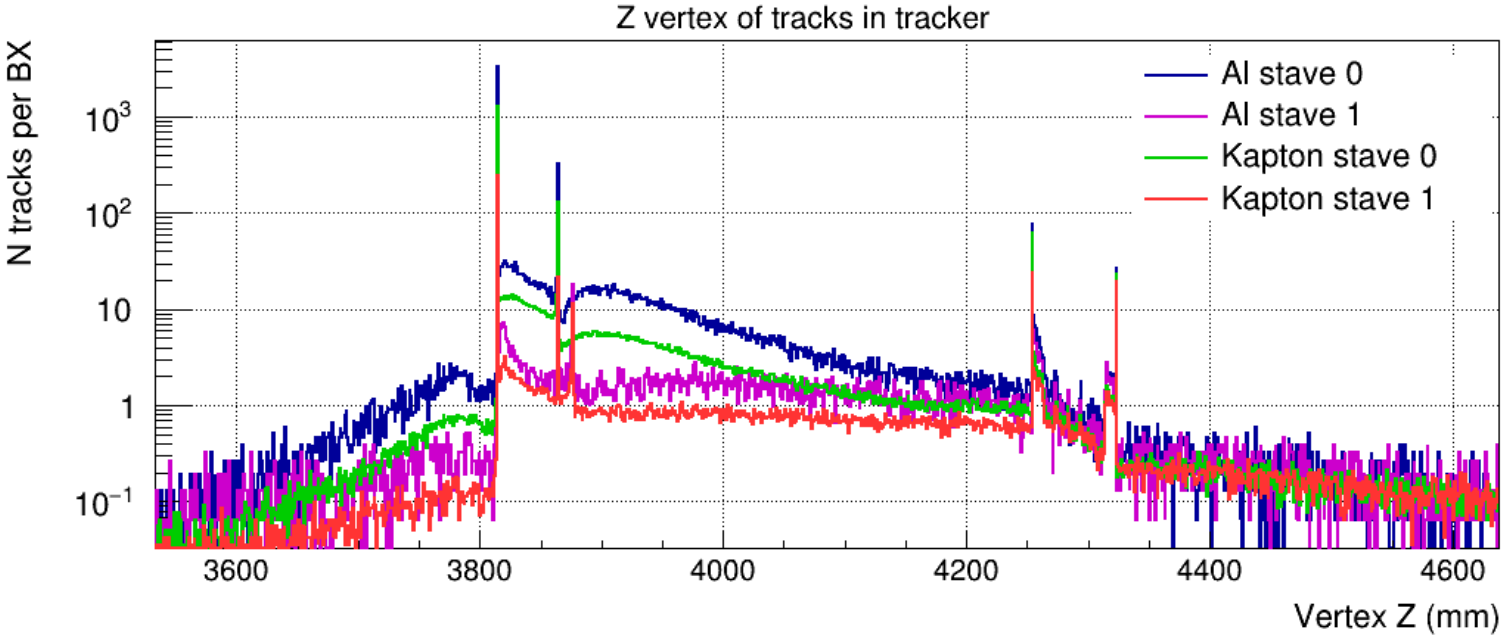


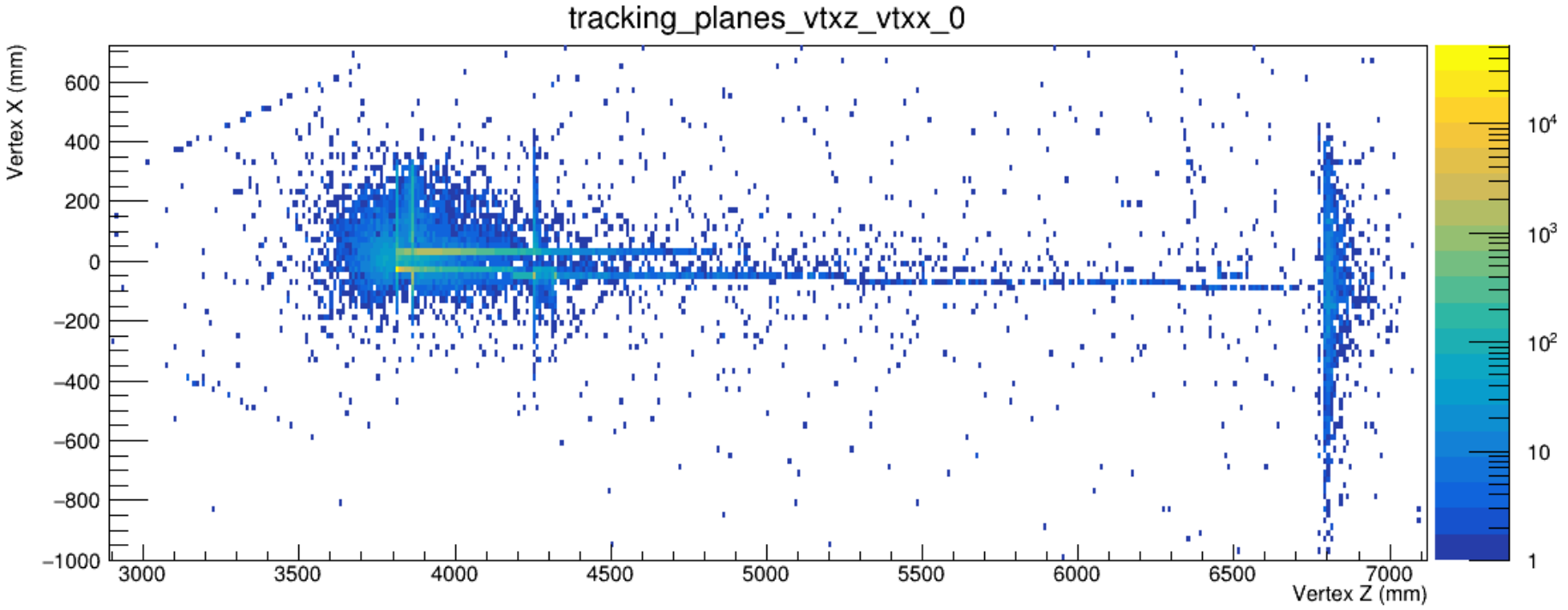
Vertices of tracks hitting stave 0



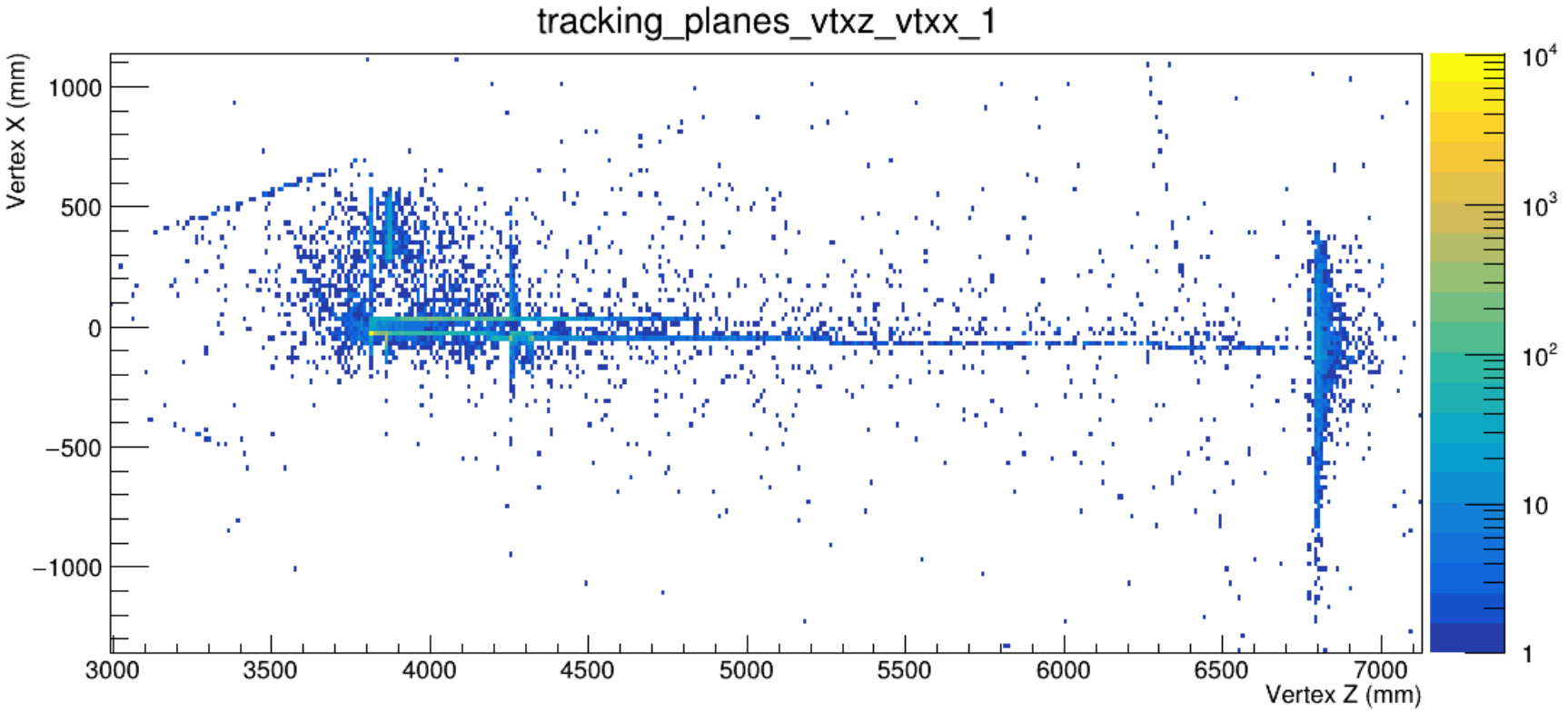


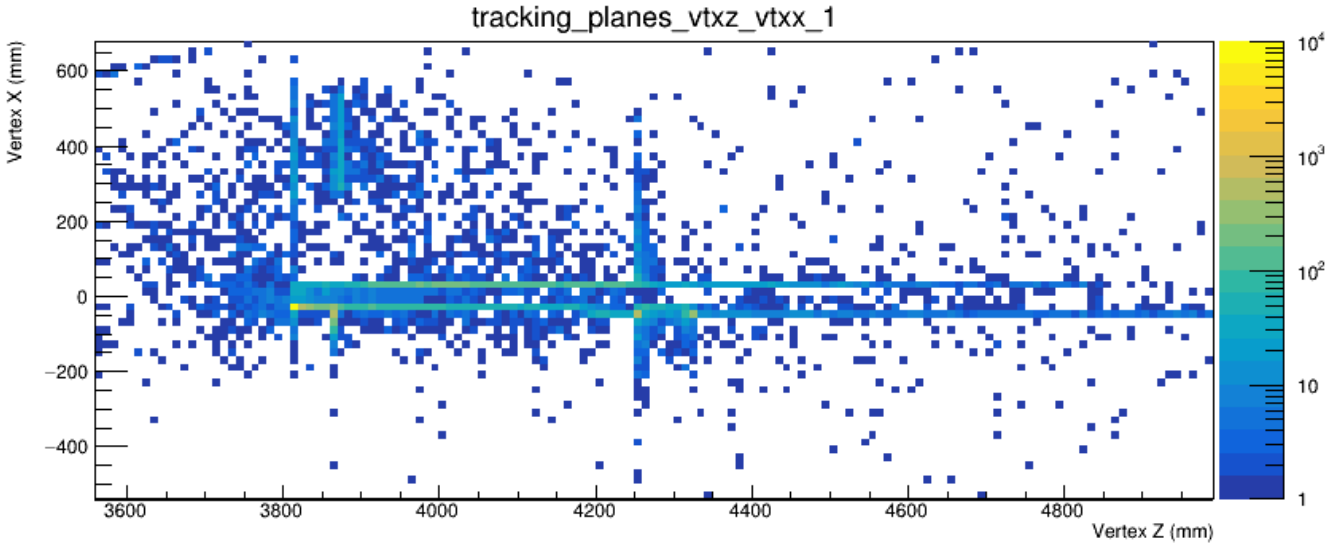
Vertices of tracks hitting stave 0





Vertices of tracks hitting stave 1





LANEX Screen