Plots from the LUXE Background: Tracker System: JETI40 $\omega 0$ 3000nm (Part 4)

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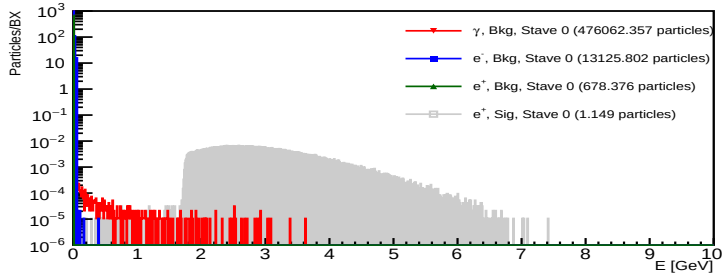
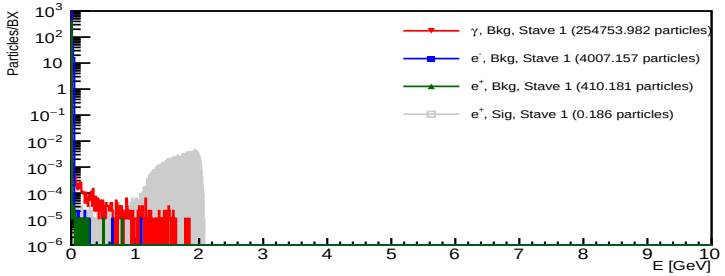
Introduction:

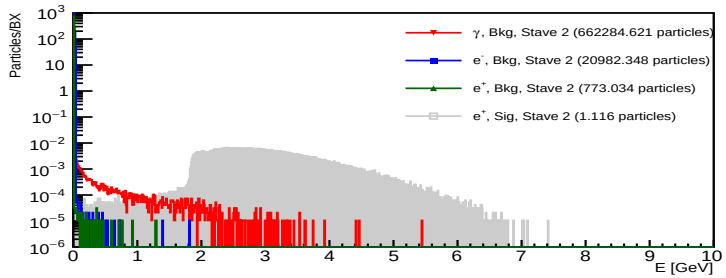
- Made the tracker plots from Sasha's code.
- Ran on the GEANT4 samples available on the DESY (9508 BXs) for w0_3000nm JETI40.
- No cut on vertex position or projection to magnet aperture.
- Prepared separate background and signal plots.

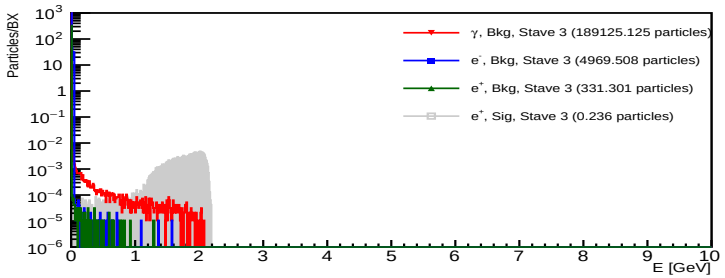
- track energy plots normalized to BX

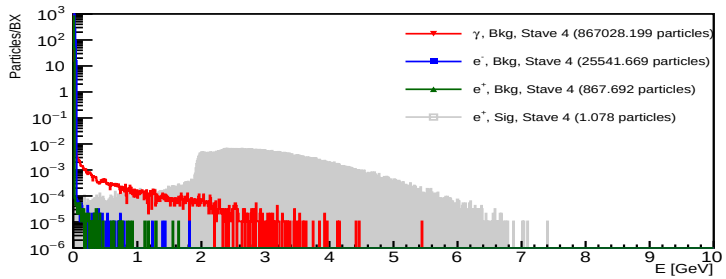
track_e, signal positrons, and all particles for background

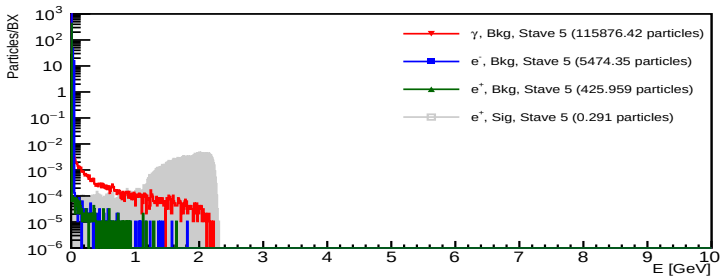


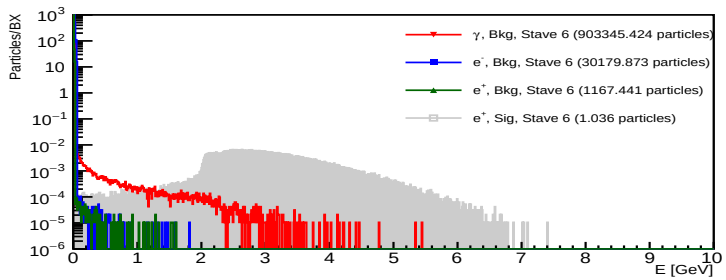


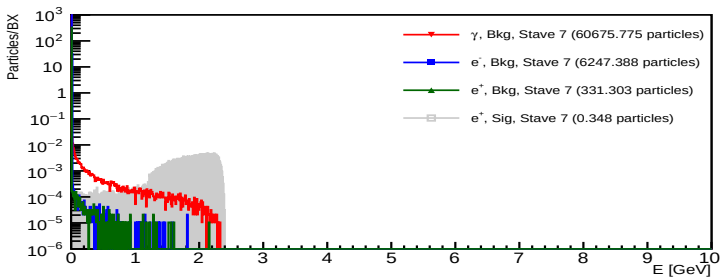




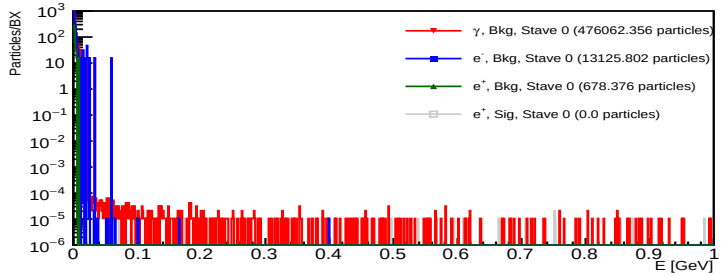


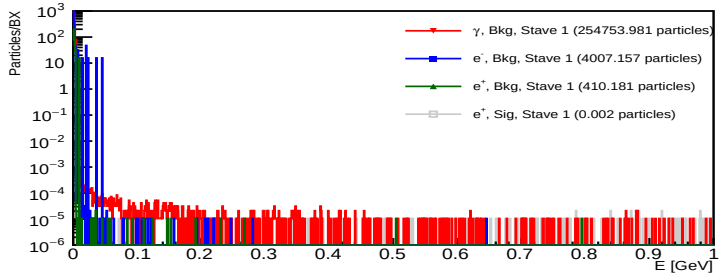


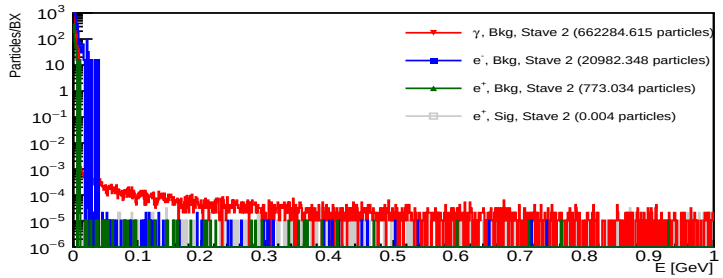


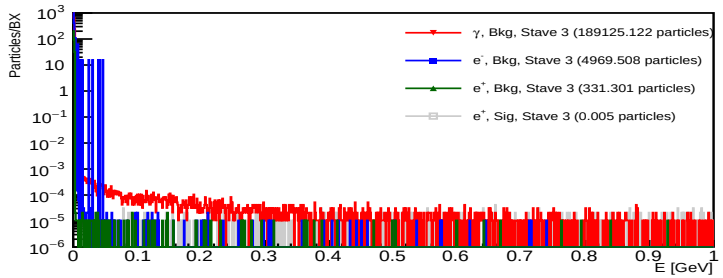


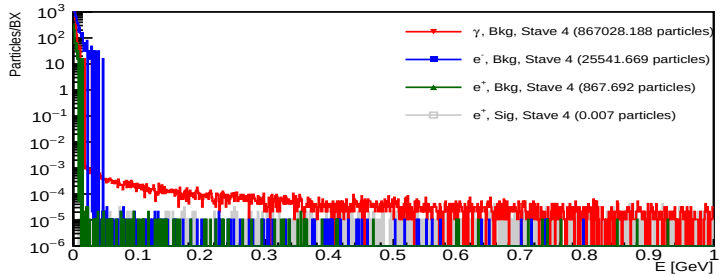
track_e, signal positrons, and all particles for background (zoomed)

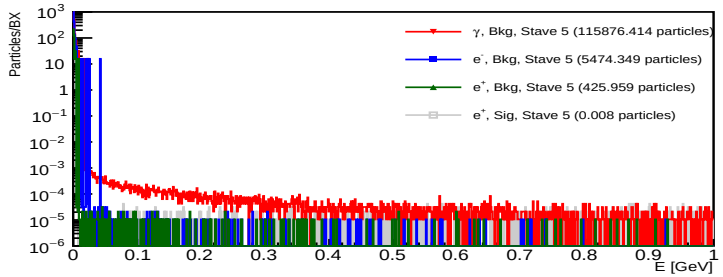


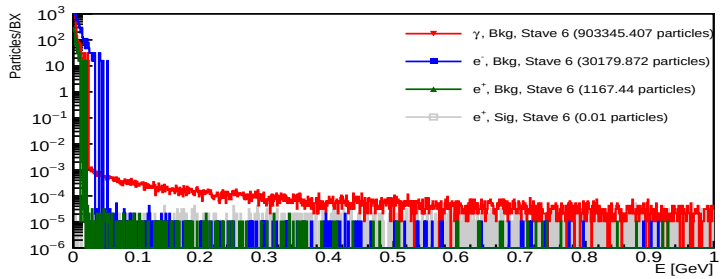


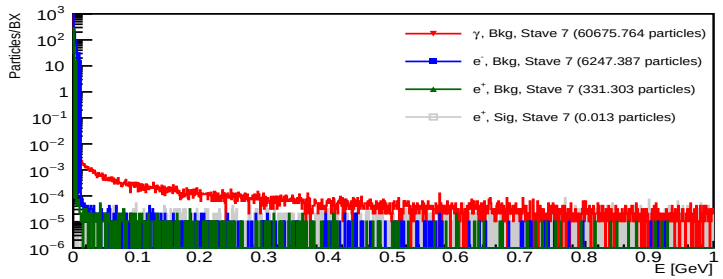




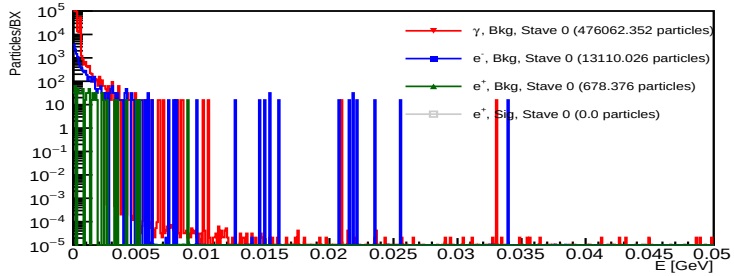


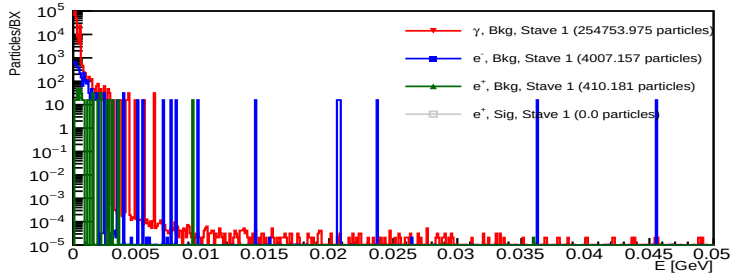


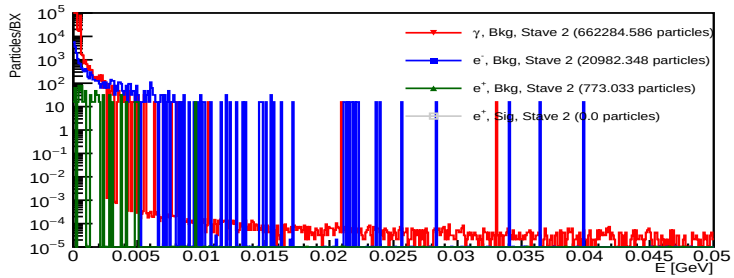


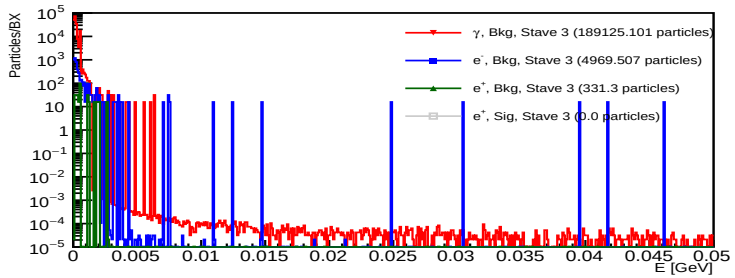


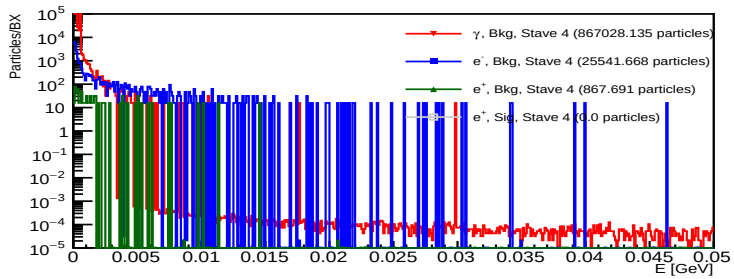
track_e, signal positrons, and all particles for background (more zoomed)

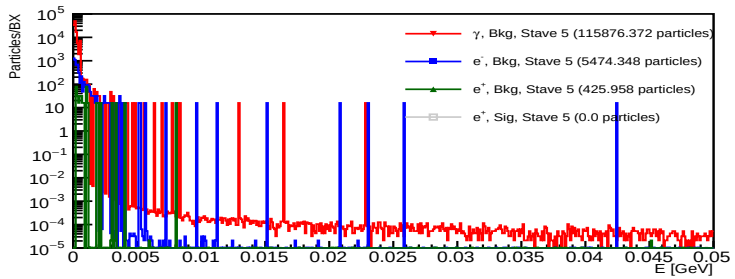


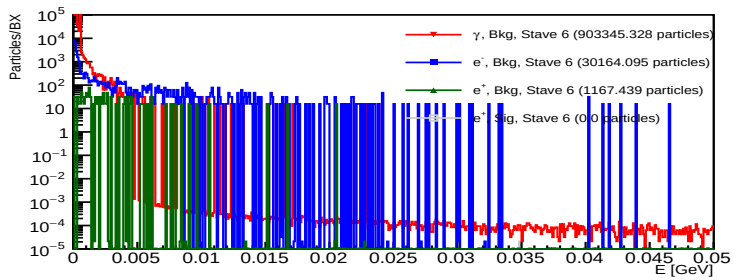


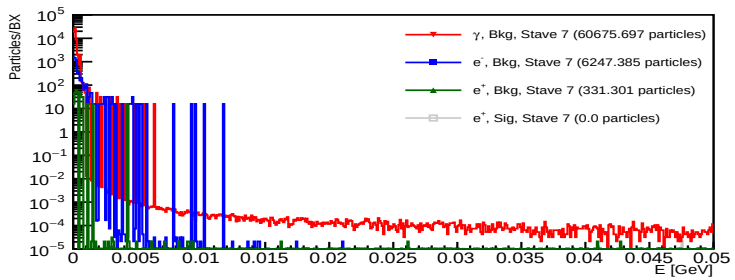




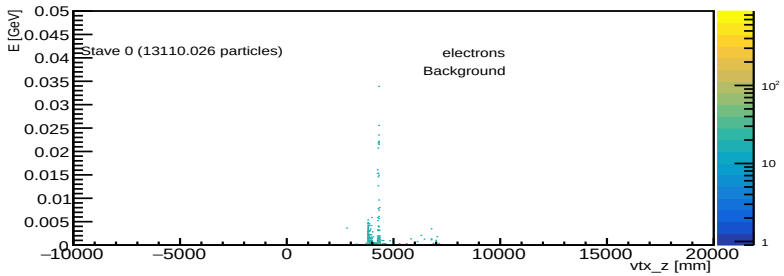


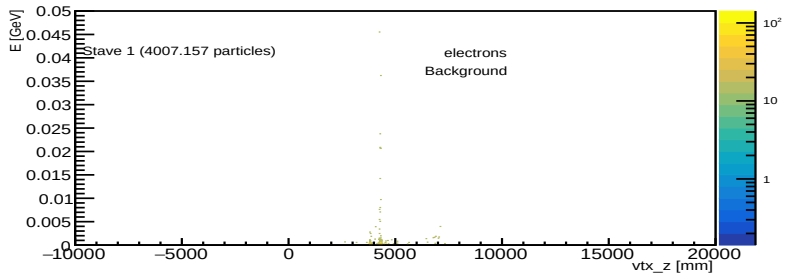


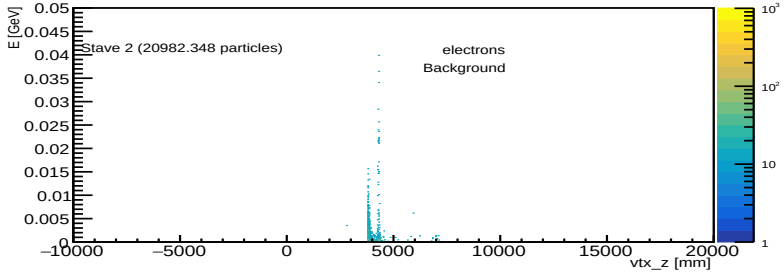


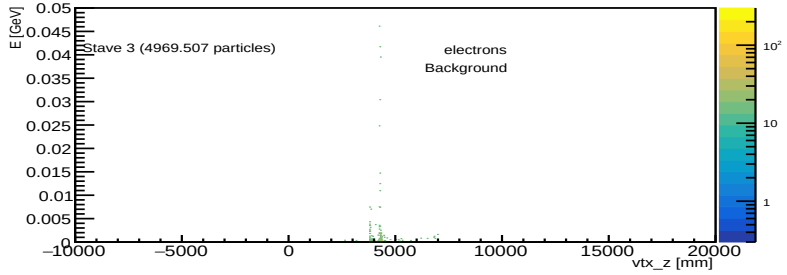


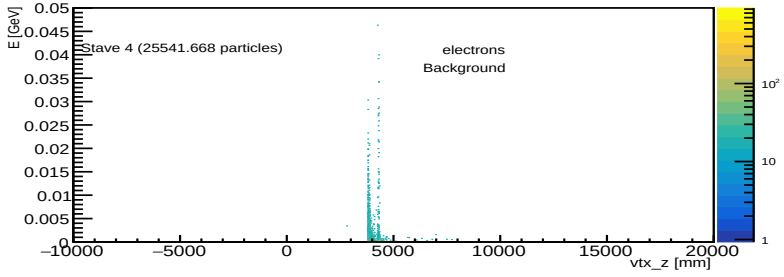
Vertex position of low energy background particles: e^- background

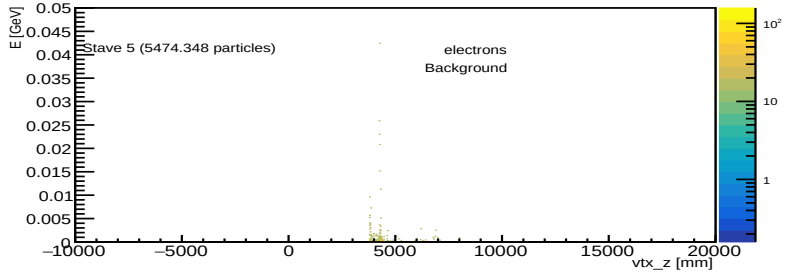


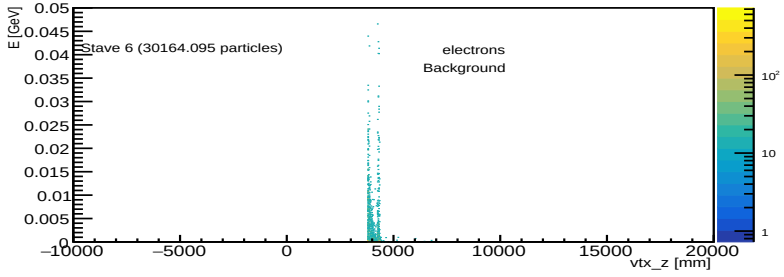


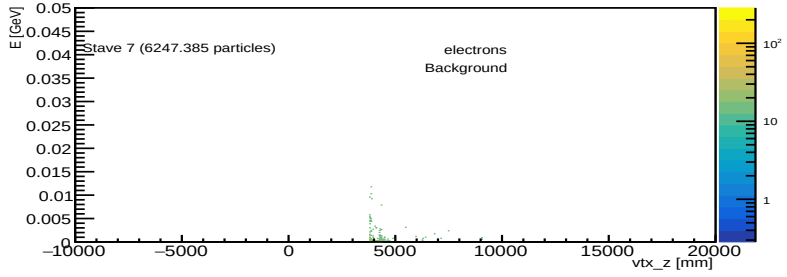




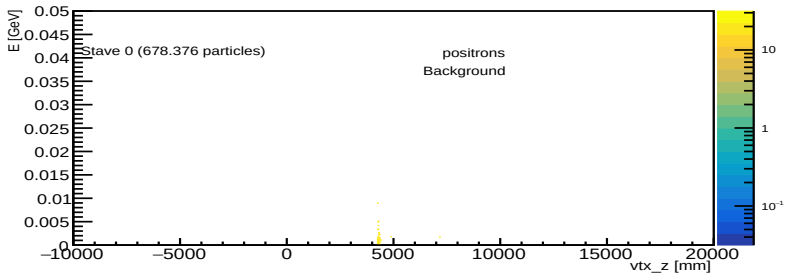


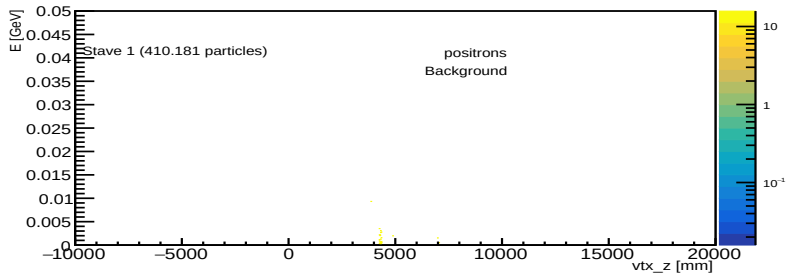


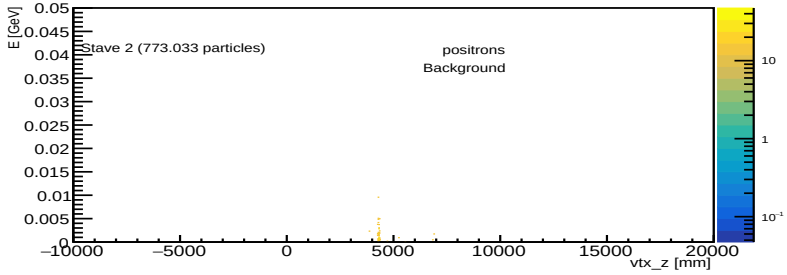


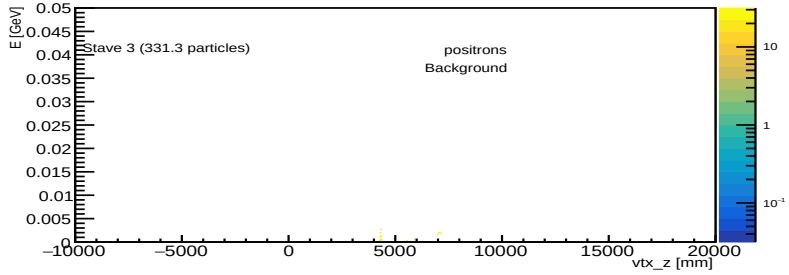


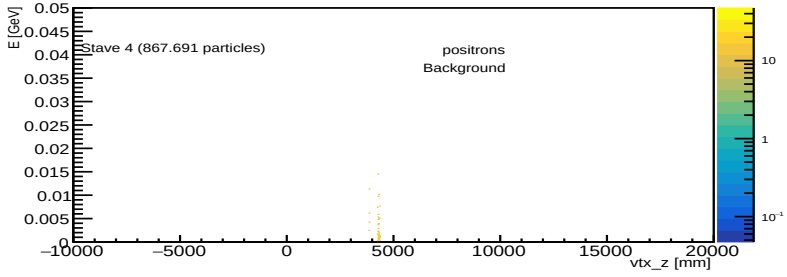
Vertex position of low energy background particles: e^+ background

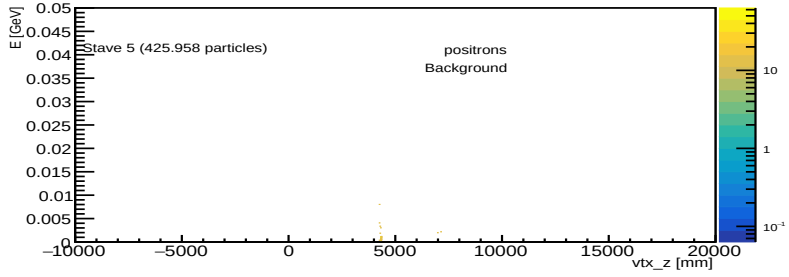


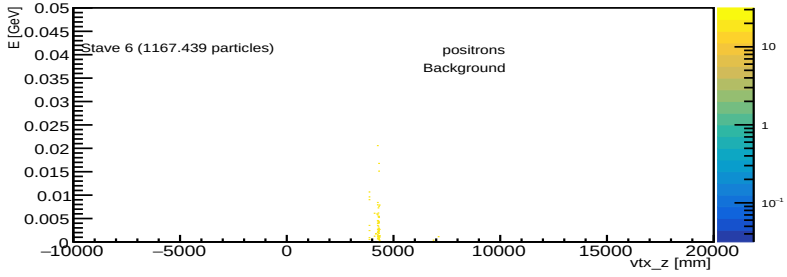


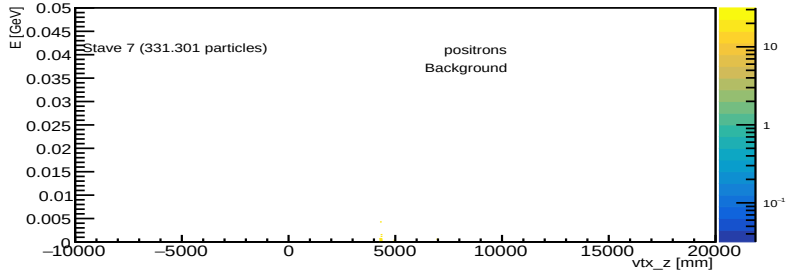




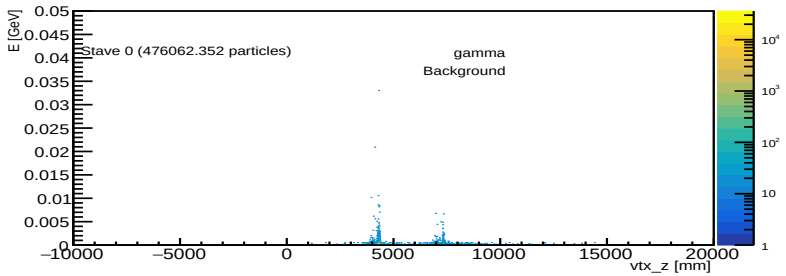


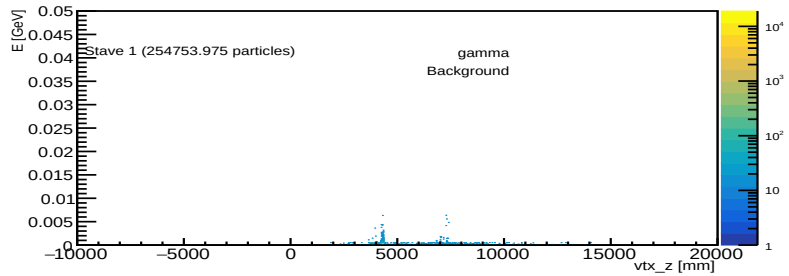


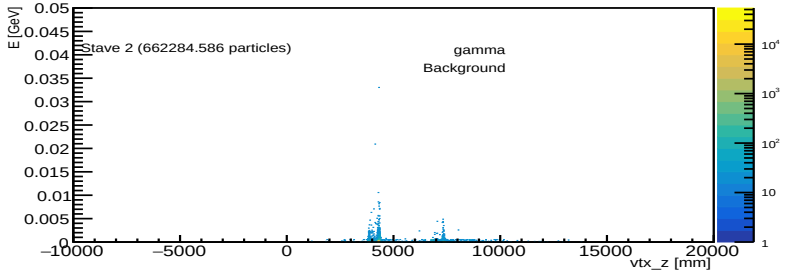


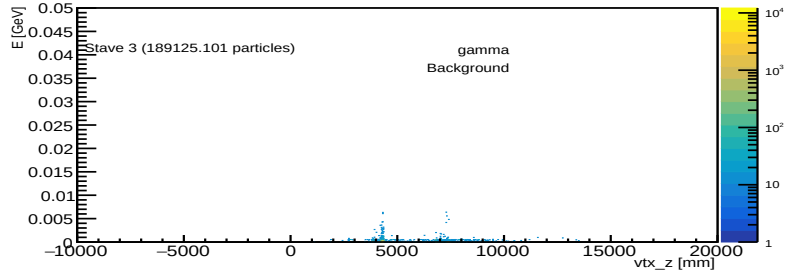


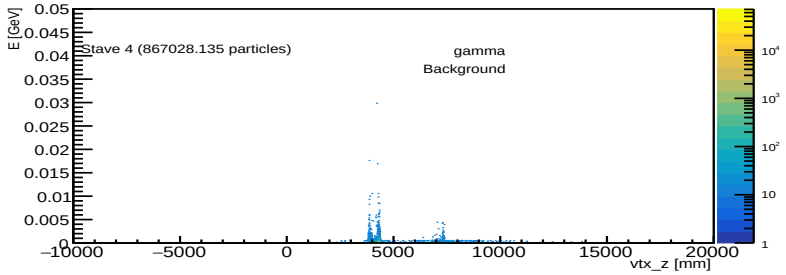
Vertex position of low energy background particles: γ background

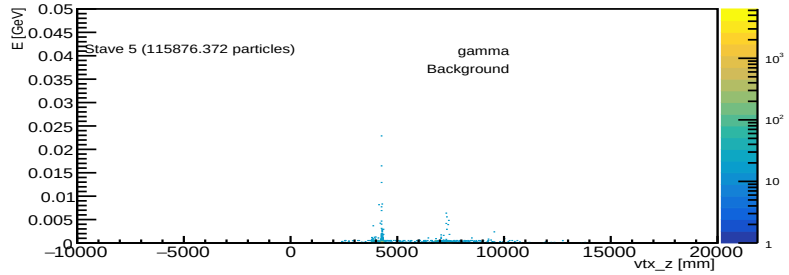


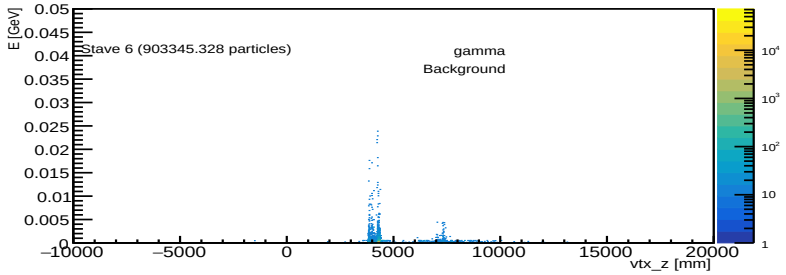


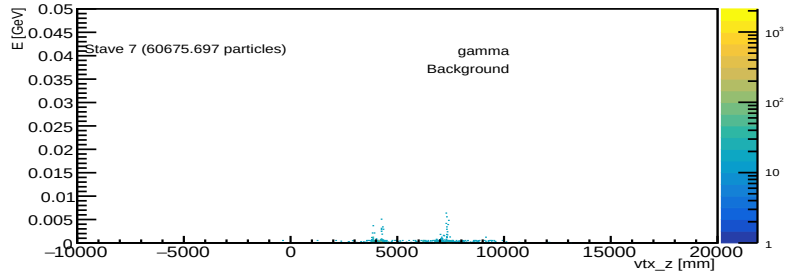












Summary Table of particle numbers

	e^+ sig	e^+ bkg	e^- bkg	γ bkg
stave 0	1.149	678.376	13125.802	476062.357
stave 1	0.186	410.181	4007.157	254753.982
stave 2	1.116	773.034	20982.348	662284.621
stave 3	0.236	331.301	4969.508	189125.125
stave 4	1.078	867.692	25541.669	867028.199
stave 5	0.291	425.959	5474.35	115876.42
stave 6	1.036	1167.441	30179.873	903345.424
stave 7	0.348	331.303	6247.388	60675.775

Table: All energy range

	e^+ sig	e^+ bkg	e^- bkg	γ bkg
stave 0	0.0	678.376	13125.802	476062.356
stave 1	0.002	410.181	4007.157	254753.981
stave 2	0.004	773.034	20982.348	662284.615
stave 3	0.005	331.301	4969.508	189125.122
stave 4	0.007	867.692	25541.669	867028.188
stave 5	0.008	425.959	5474.349	115876.414
stave 6	0.01	1167.44	30179.872	903345.407
stave 7	0.013	331.303	6247.387	60675.764

Table: E $<$ 1 GeV

	e^+ sig	e^+ bkg	e^- bkg	γ bkg
stave 0	0.0	678.376	13110.026	476062.352
stave 1	0.0	410.181	4007.157	254753.975
stave 2	0.0	773.033	20982.348	662284.586
stave 3	0.0	331.3	4969.507	189125.101
stave 4	0.0	867.691	25541.668	867028.135
stave 5	0.0	425.958	5474.348	115876.372
stave 6	0.0	1167.439	30164.095	903345.328
stave 7	0.0	331.301	6247.385	60675.697

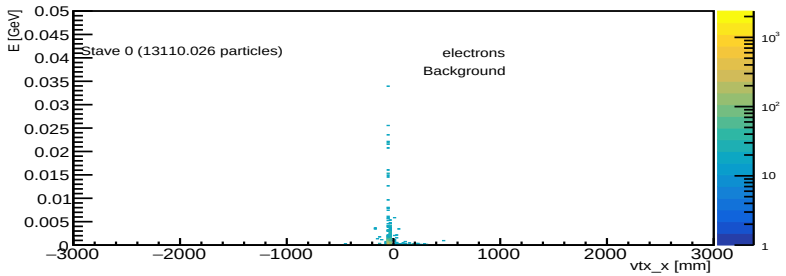
Table: E $<$ 0.05 GeV

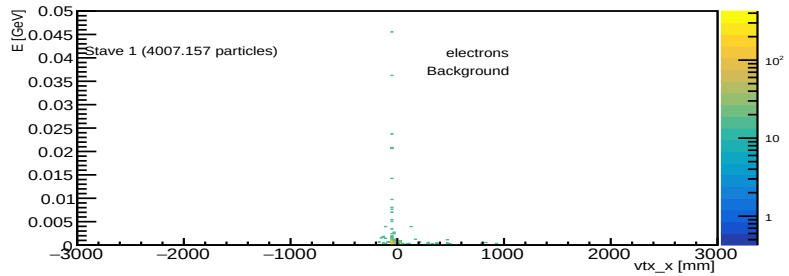
Discussion on the track energy plots

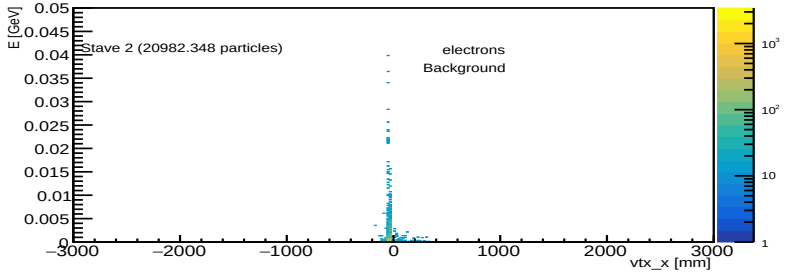
- Most of the background particles (e^+, e^-, γ) are concentrated below 10 MeV.
- Electron backgrounds are from vacuum chamber and calorimeter, positron background is from calorimeter mostly.
- For the photons which come with very little energy (¡10 MeV) we are not so worried from the large numbers because the efficiency to detect these in the (thin!) silicon is very low (less than 1 %).
- Looking at the Hits tree to understand what is the energy deposition for e^+/e^-.
  - Some issues with memory leak!
- We see many electrons with high weights on the positron side, why?
  - Is it because of photons with high weights producing pairs in the material? Otherwise, there cannot be Compton electrons on the positron arm.
- Why don't we see as many positrons as electrons on the positron arm?
- When going from layer 1 to layer 4 (inner staves only, 0,2,4,6):
  - Why do we get more high weight electrons than photons as one goes from layer 1 to layer 4?
  - We see that everything becomes more energetic when one goes from layer 1 to layer 4. Can that be due to the signal positrons actually generating background tracks in the tracker material?

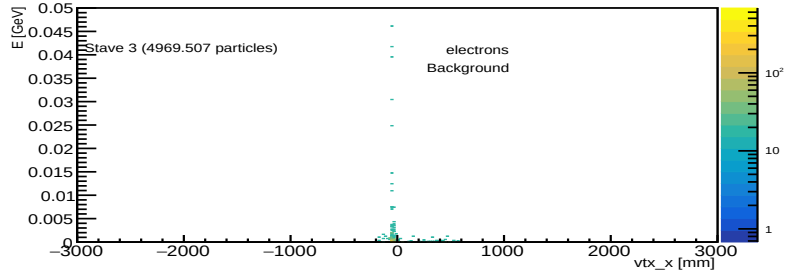
- More plots

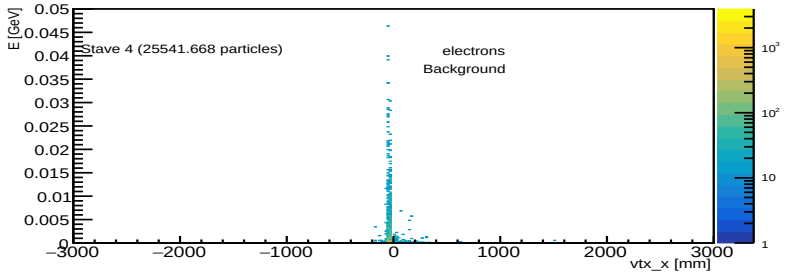
Vertex position of low energy background particles: e^- background

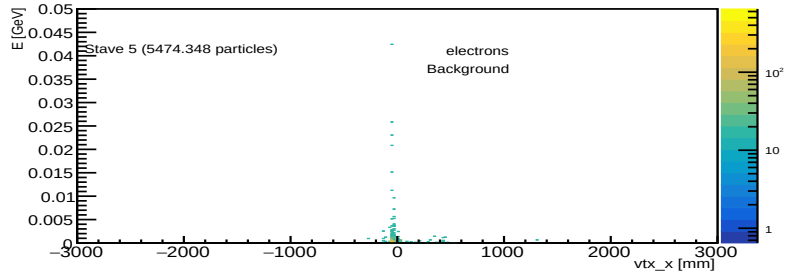


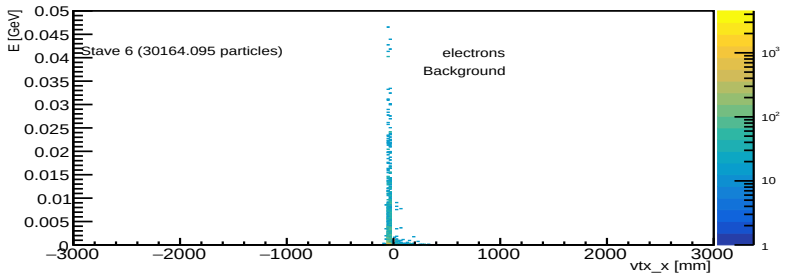


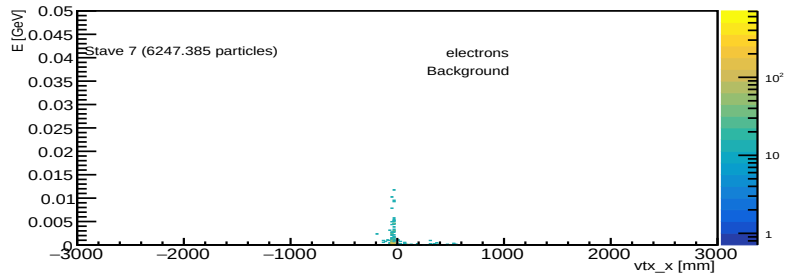




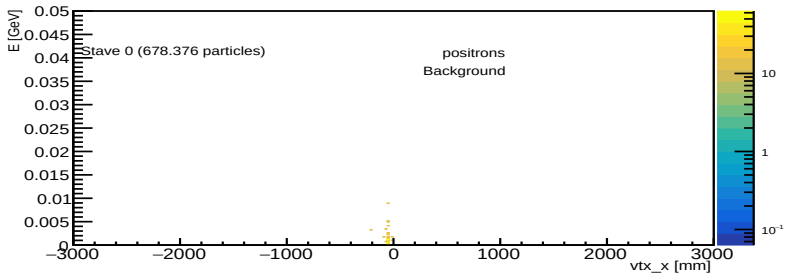


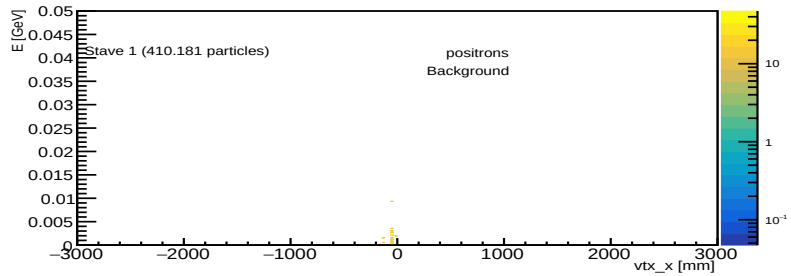


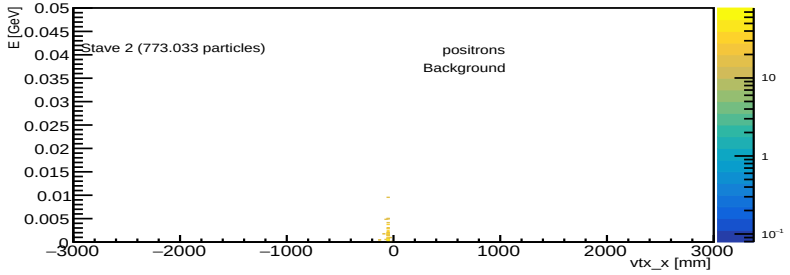


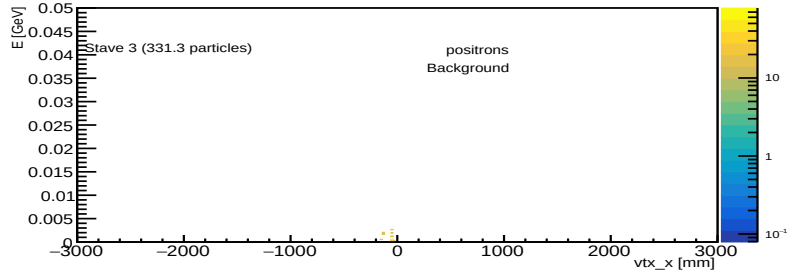


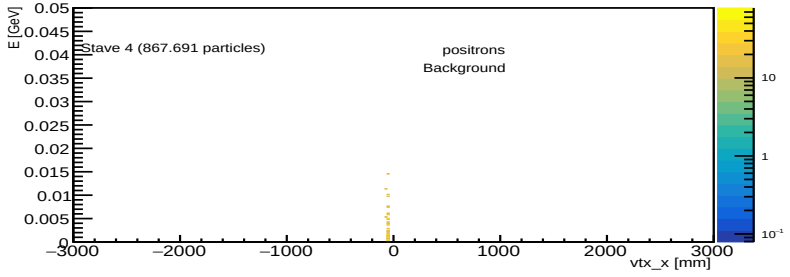
Vertex position of low energy background particles: e^+ background

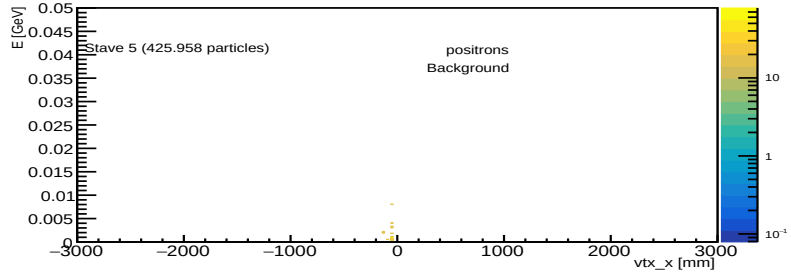


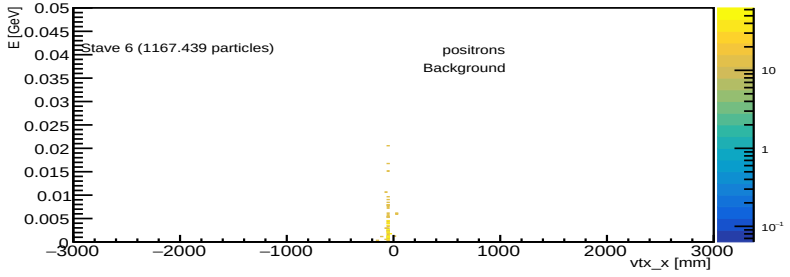


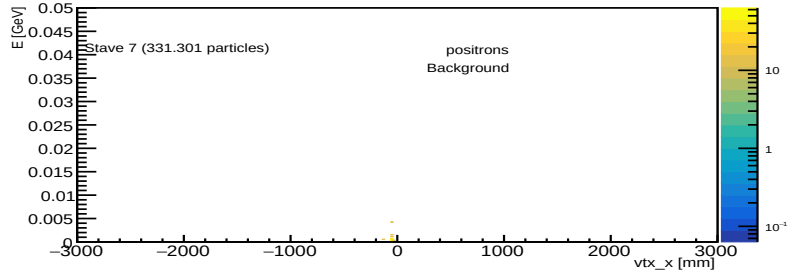




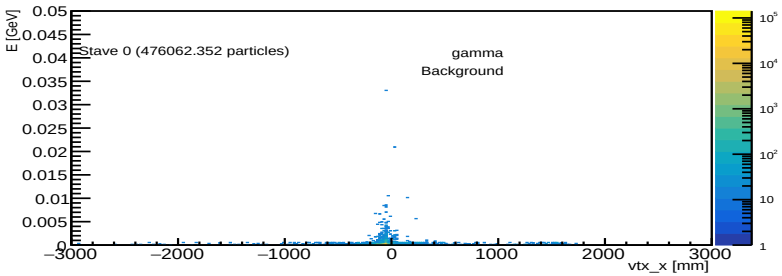


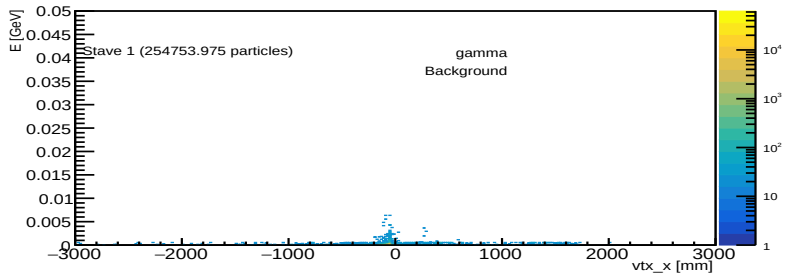


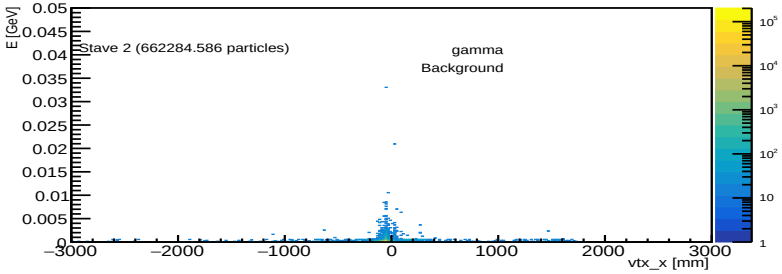


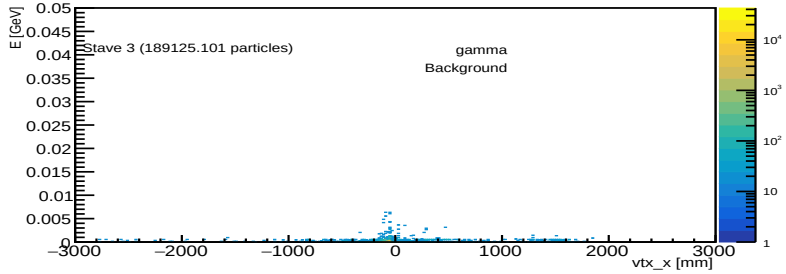


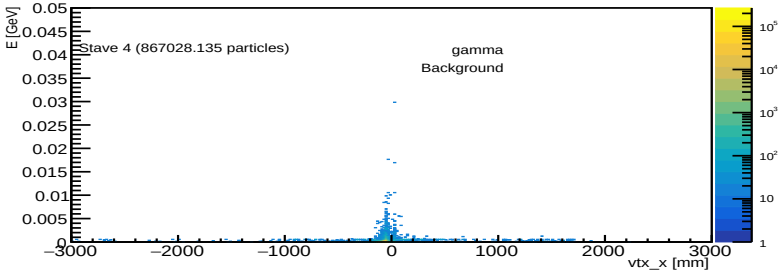
Vertex position of low energy background particles: γ background

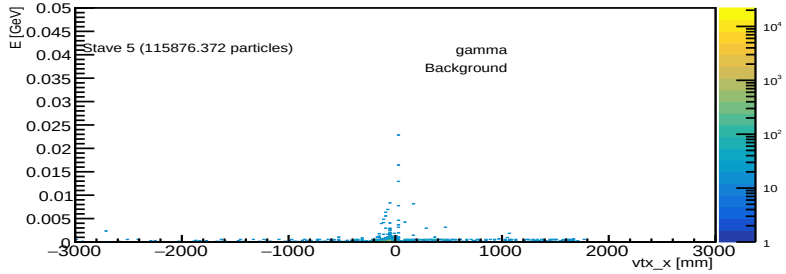


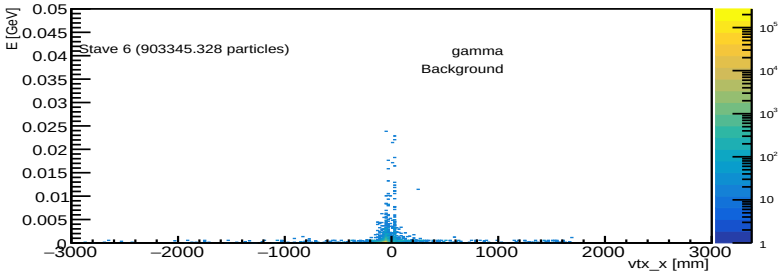


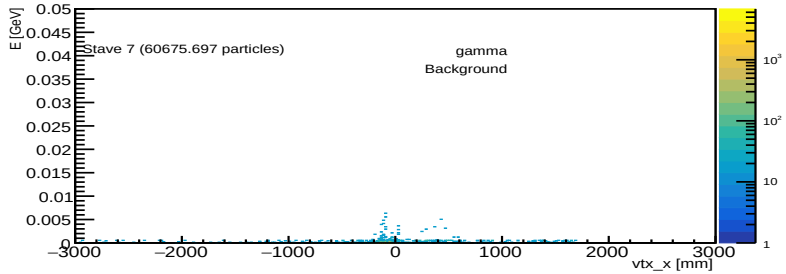






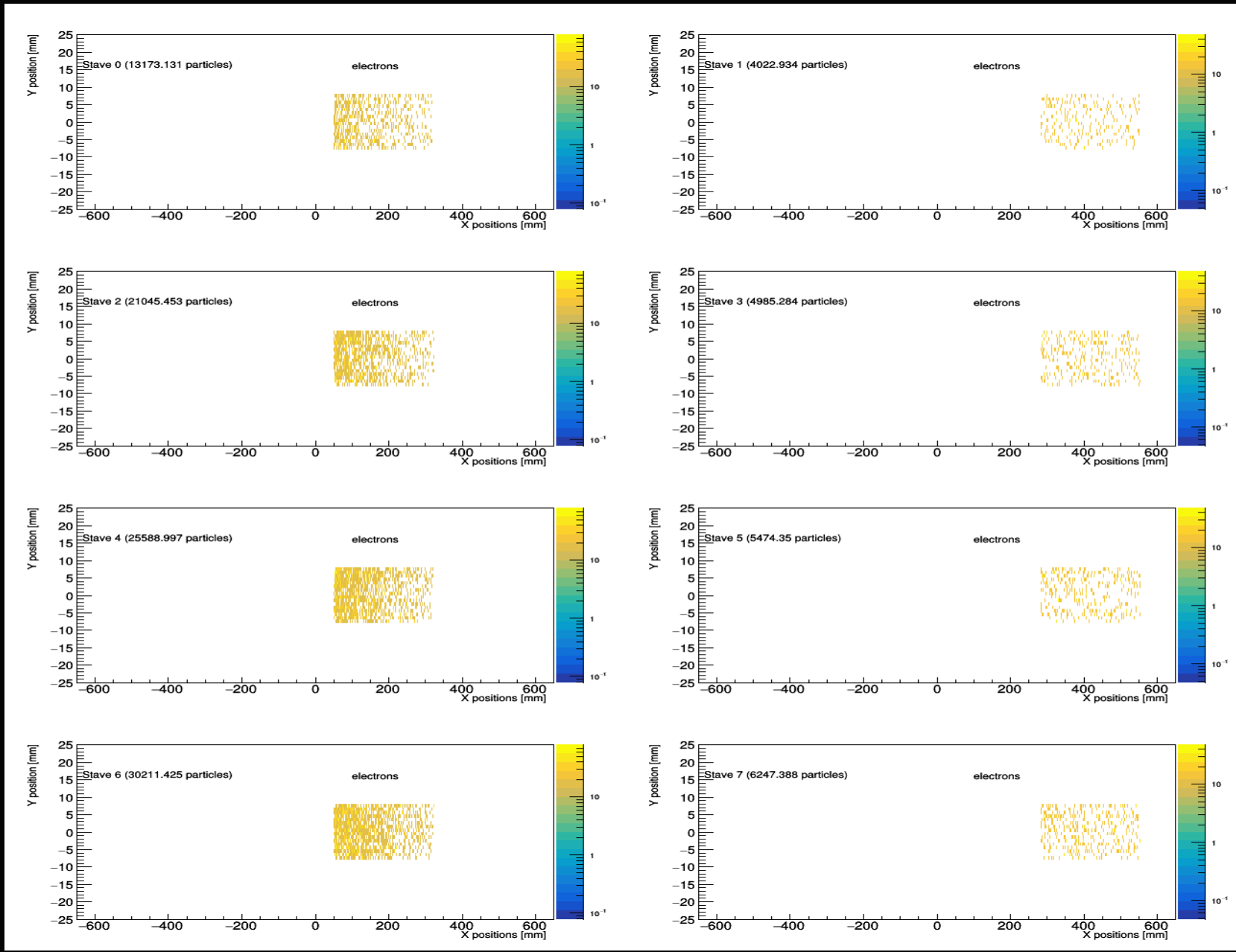




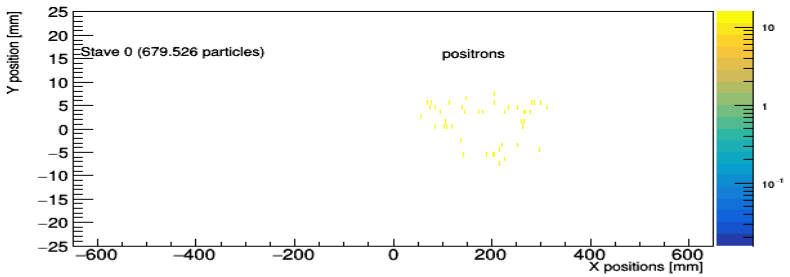


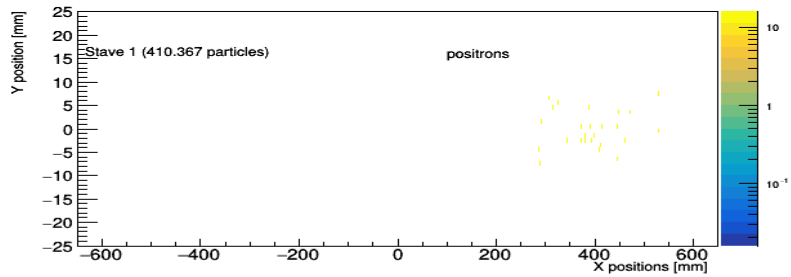
- XY position of tracks, normalized to BX

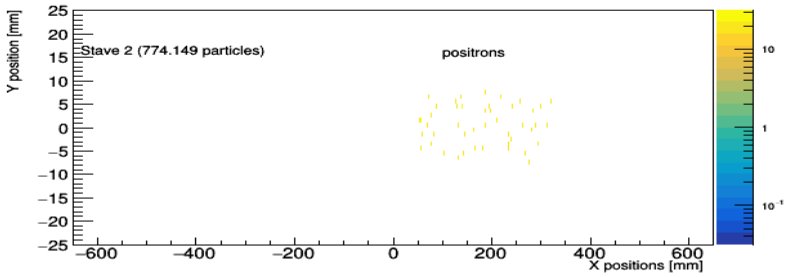
tracking_planes_track_xy_electrons (signal+background)

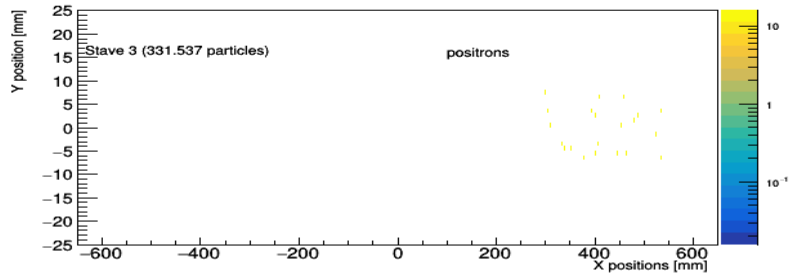


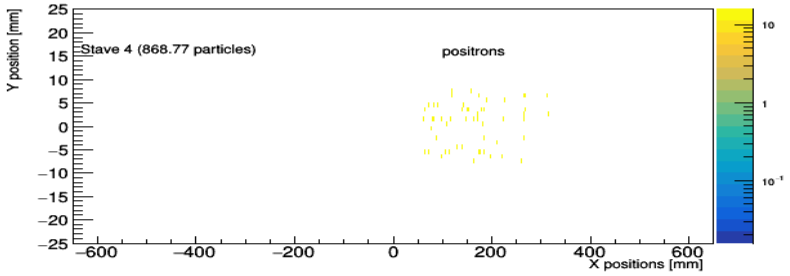
tracking_planes_track_xy_positrons (signal+background)

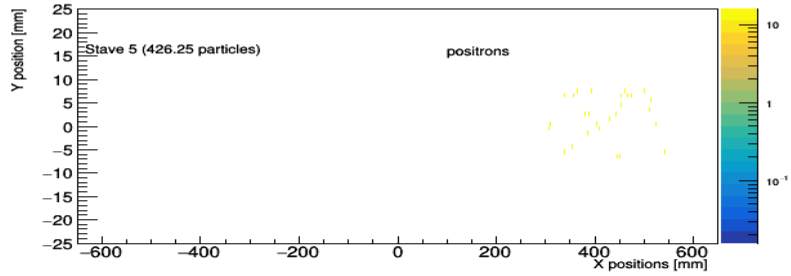


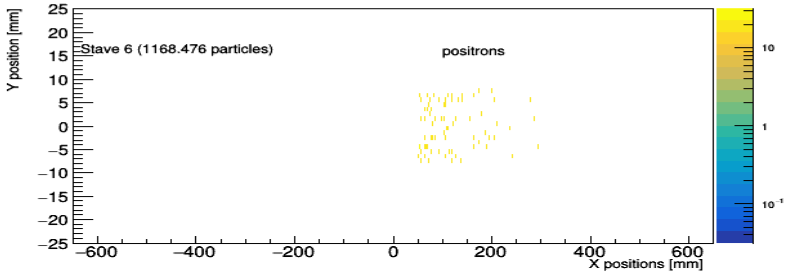


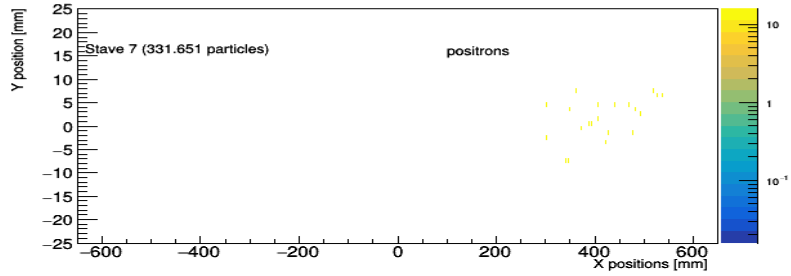




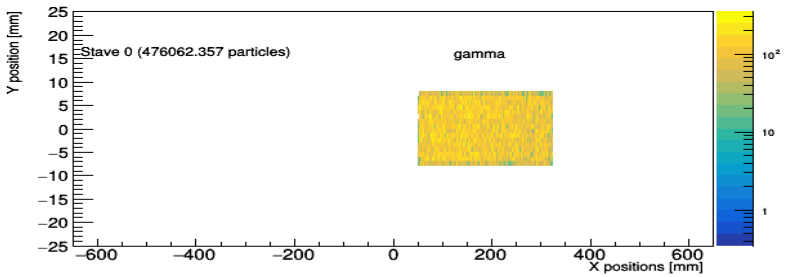


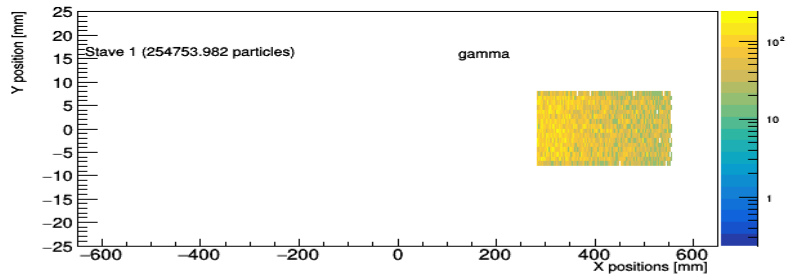


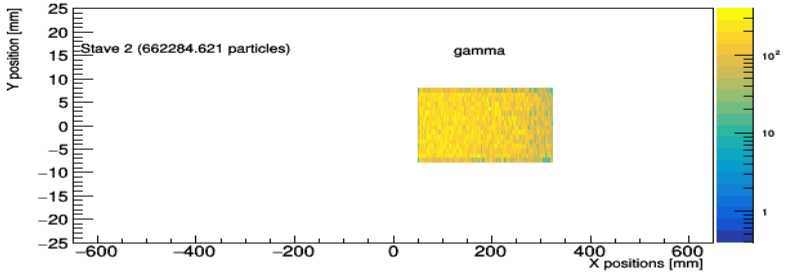


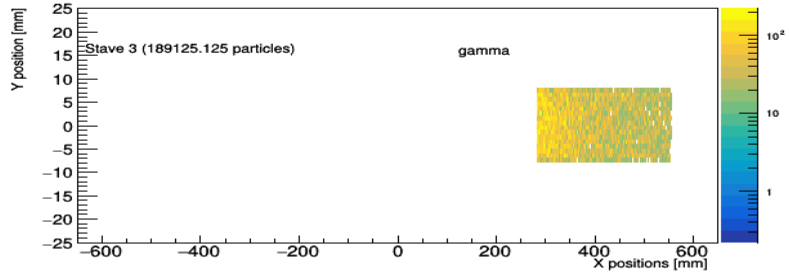


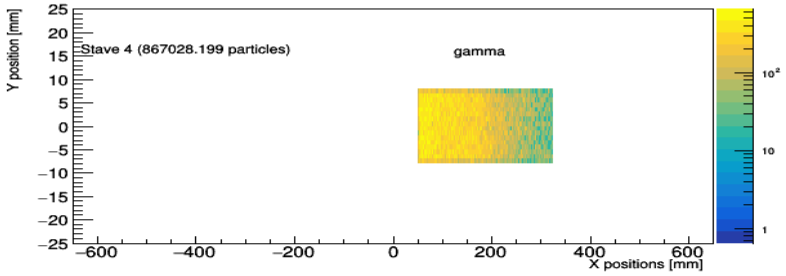
tracking_planes_track_xy_gamma (signal+background)

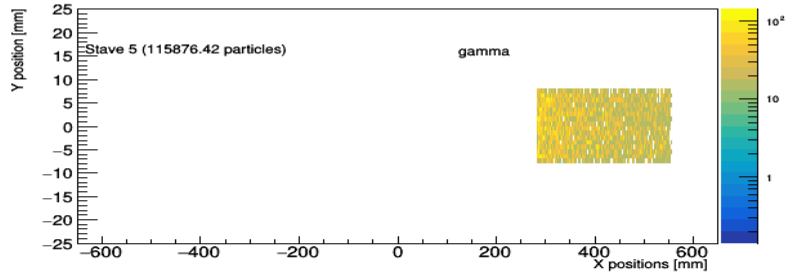


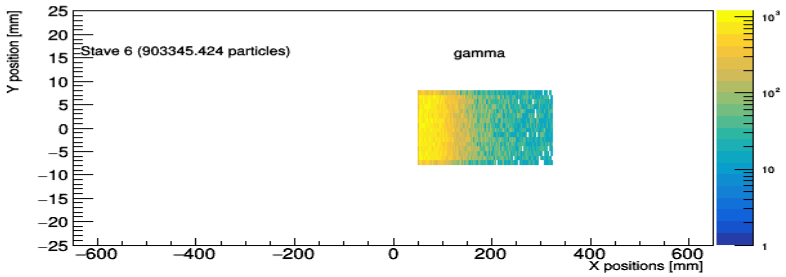


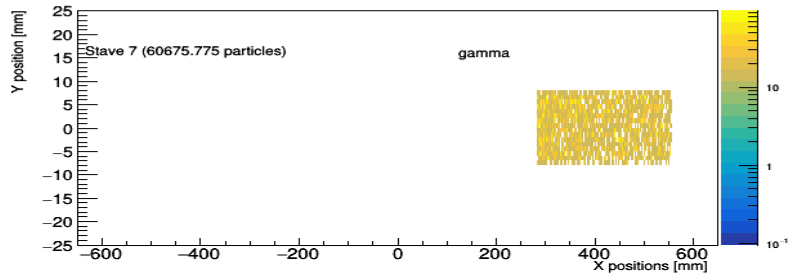






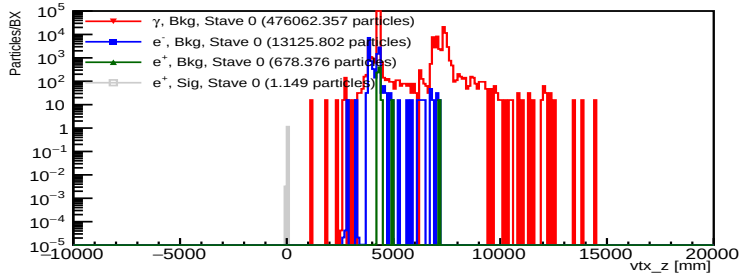


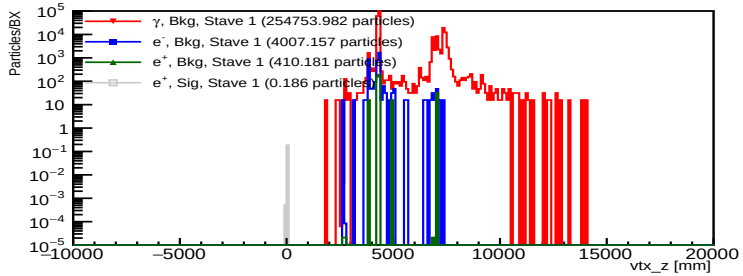


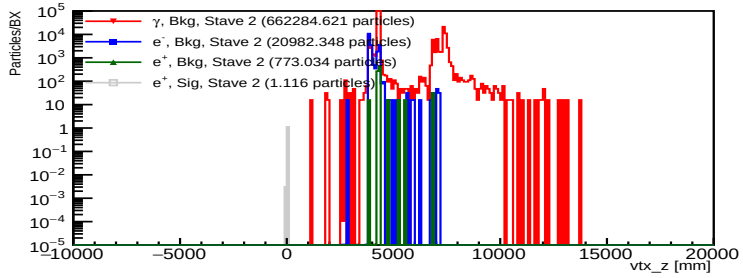


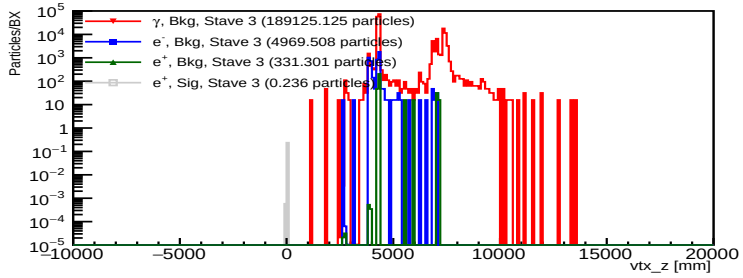
- vtx_z positions, normalized to BX

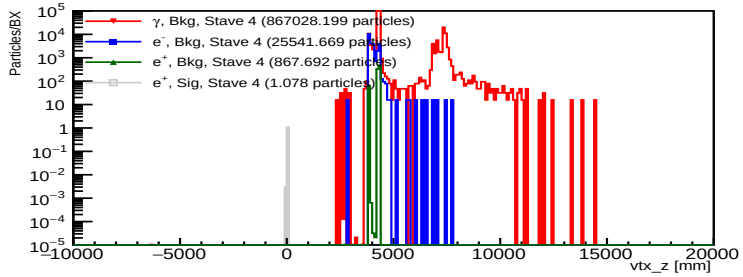
tracking_planes_vtx_z (signal and background)

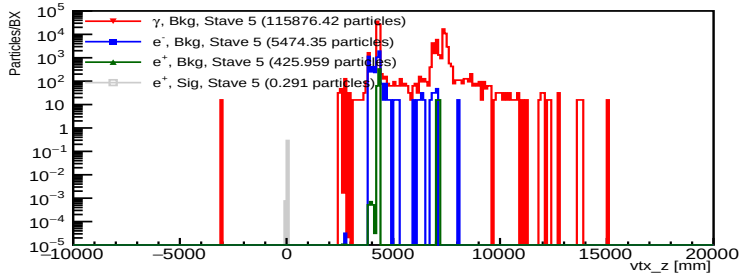


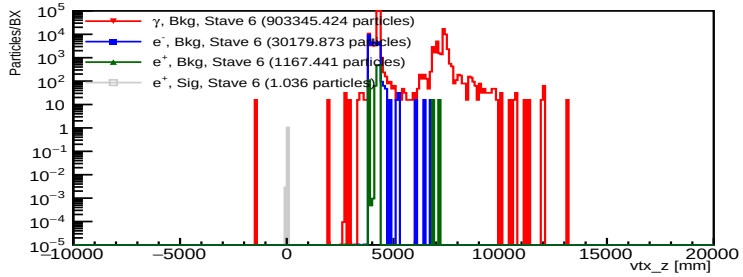


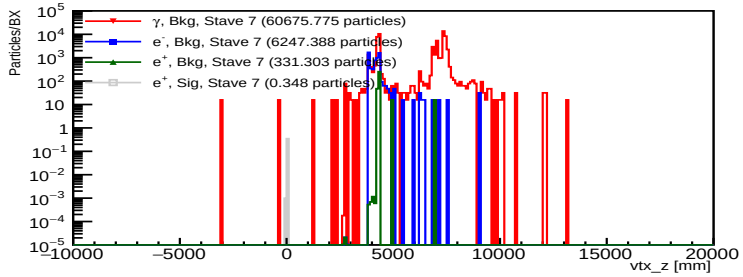






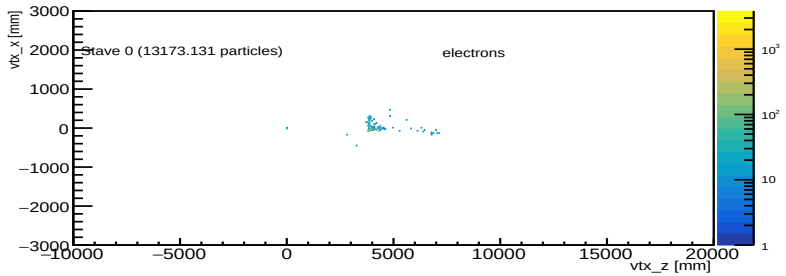


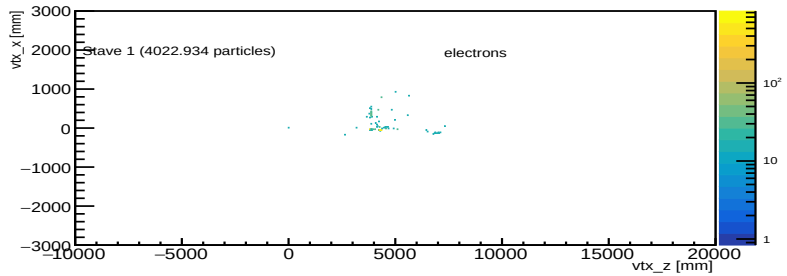


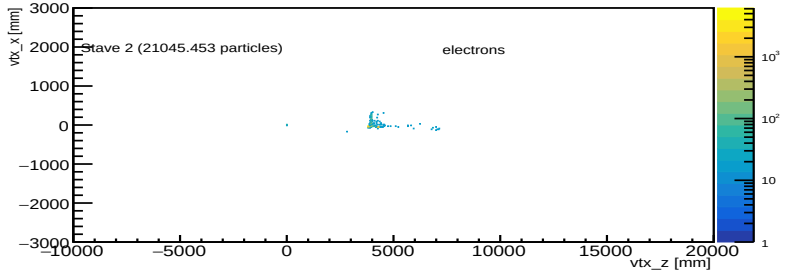


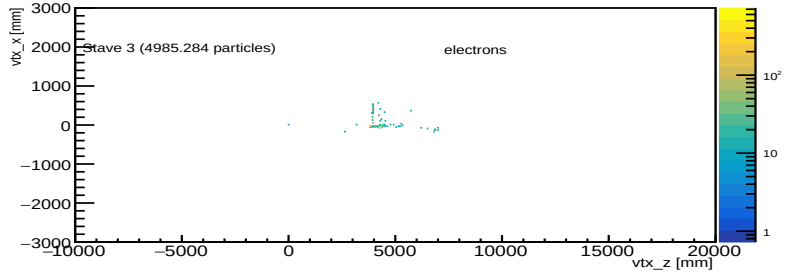
- vtx_x vs vtx_z positions, normalized to BX

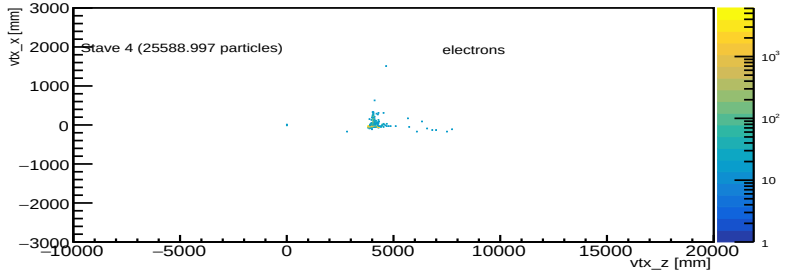
tracking_planes_vtxz_vtxx_electrons (signal+background)

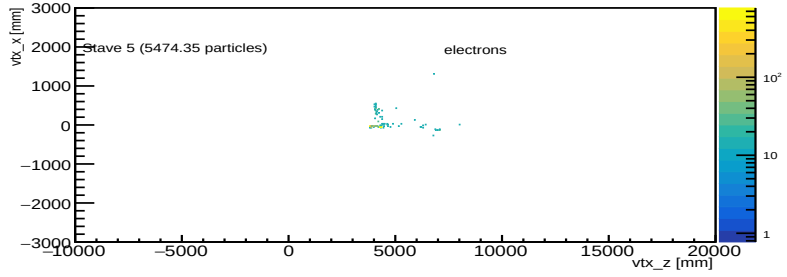


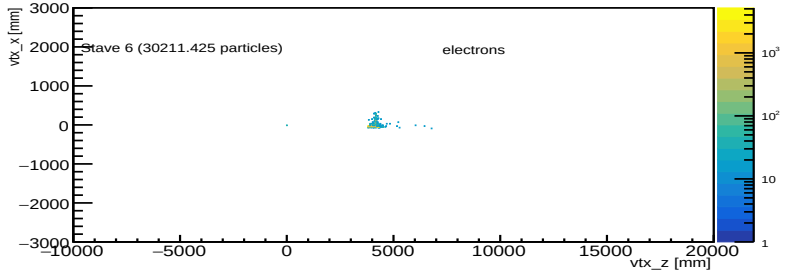


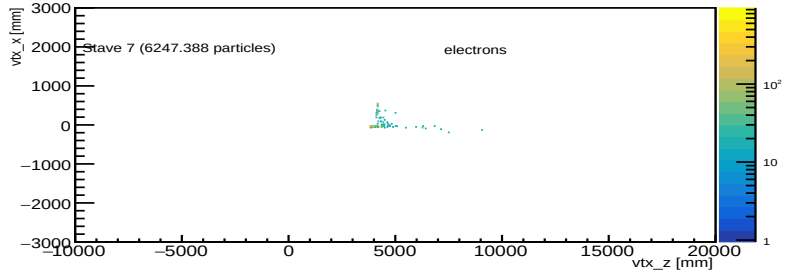




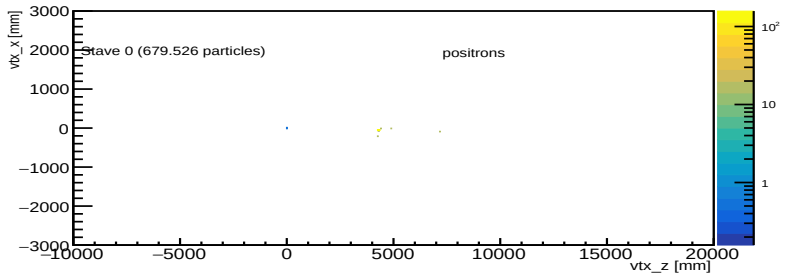


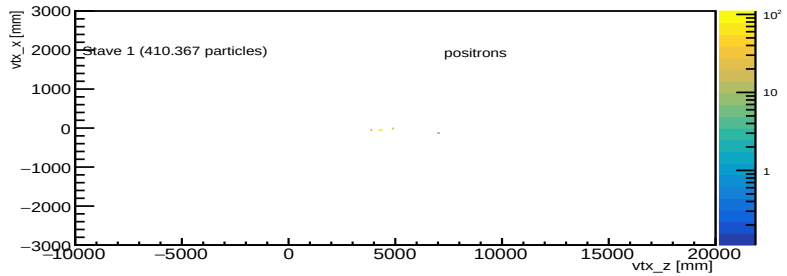


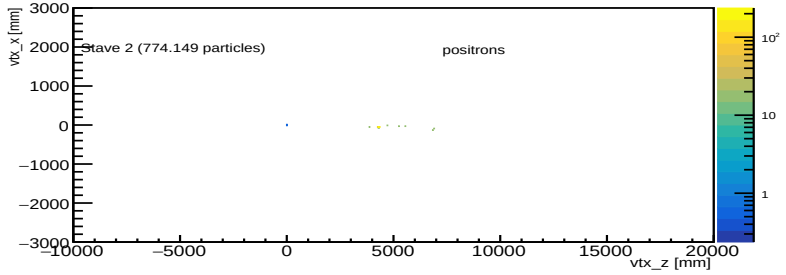


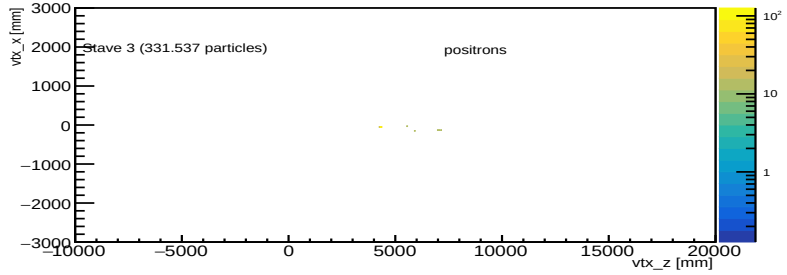


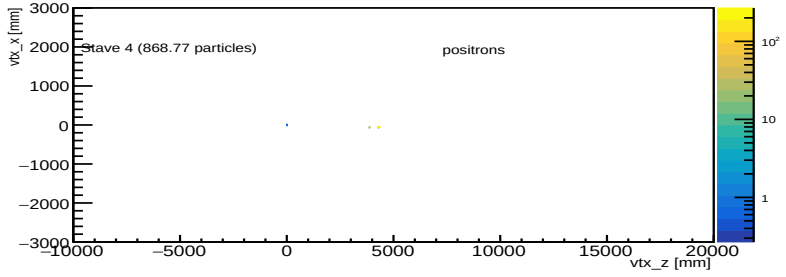
tracking_planes_vtxz_vtxx_positrons (signal+background)

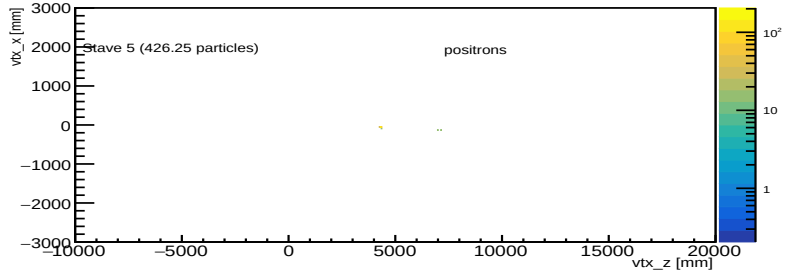


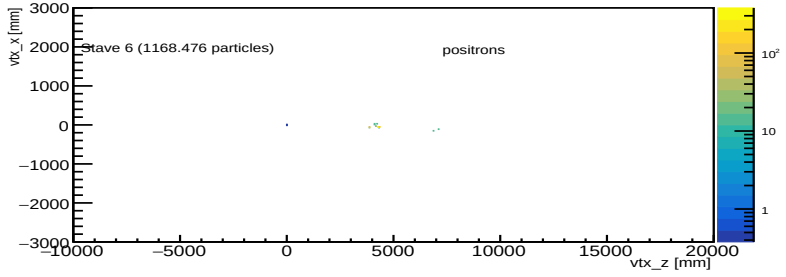


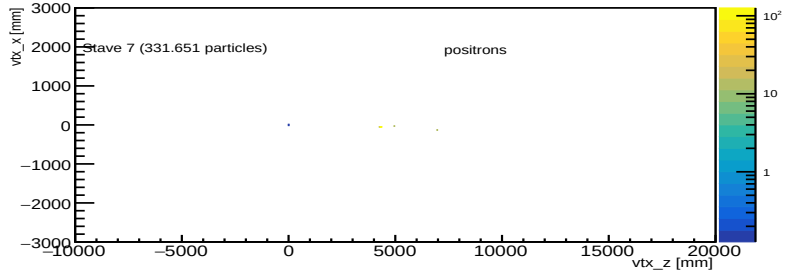




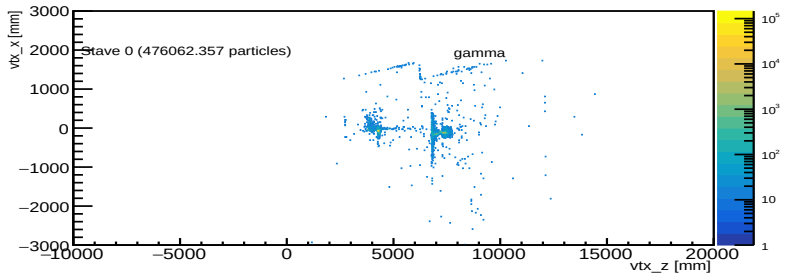


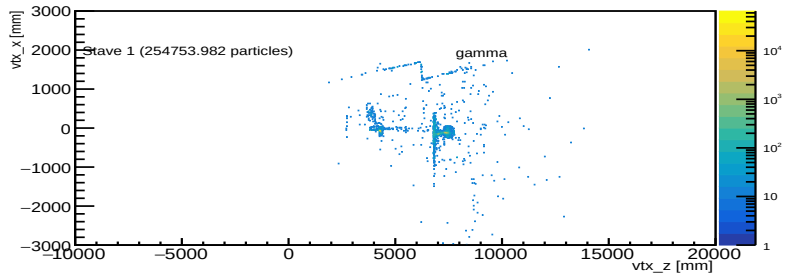


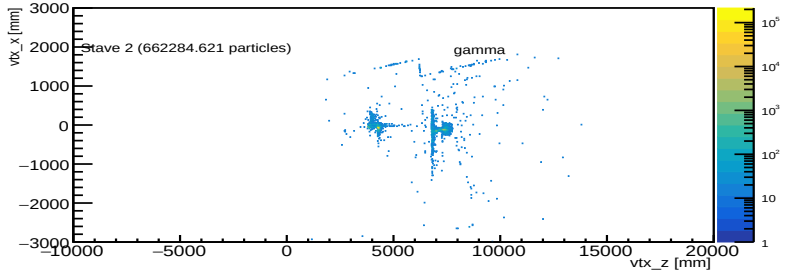


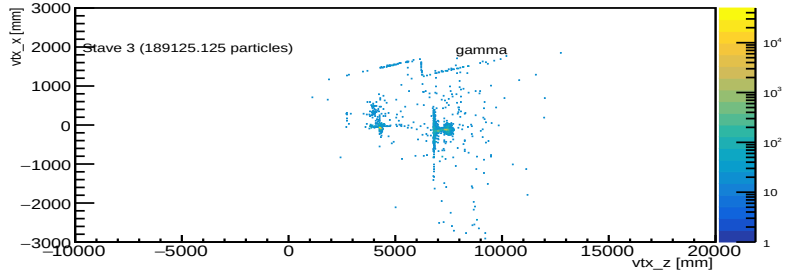


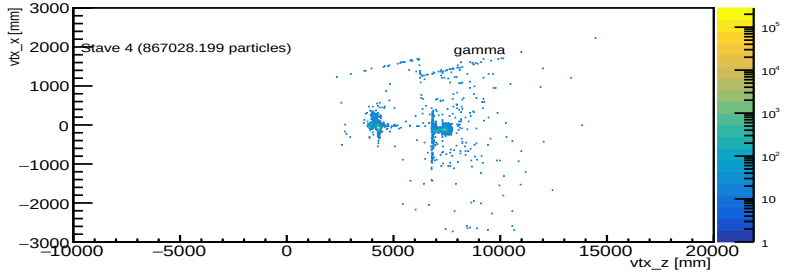
tracking_planes_vtxz_vtxx_gamma (signal+background)

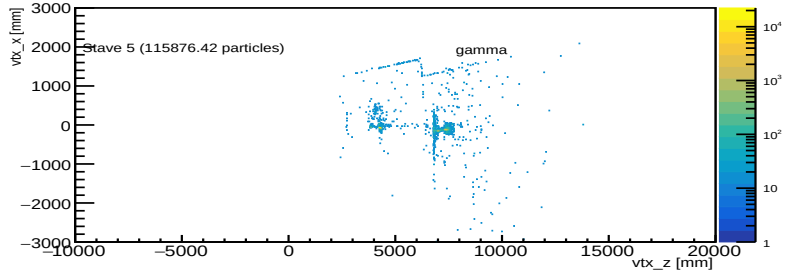


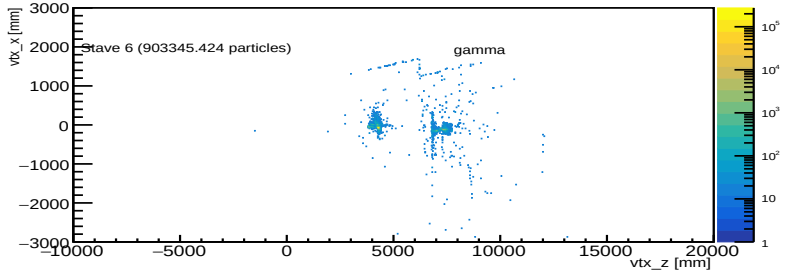


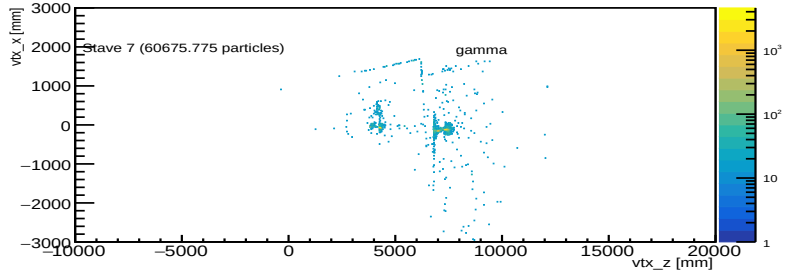






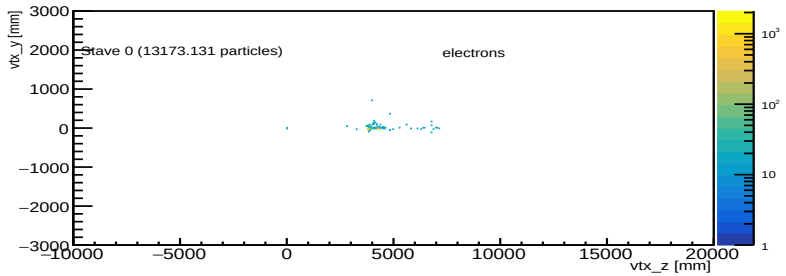


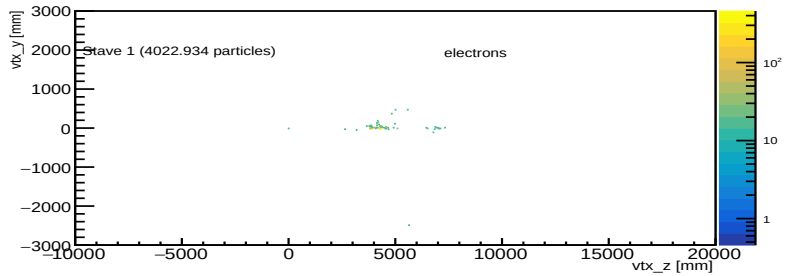


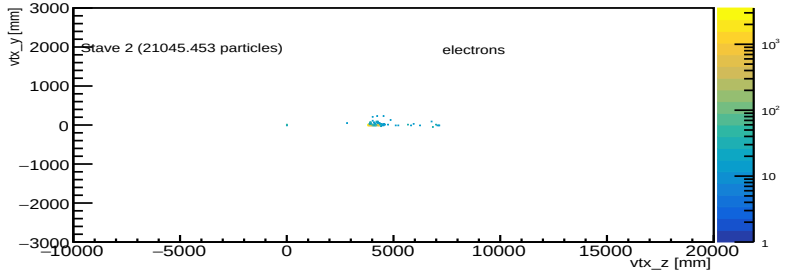


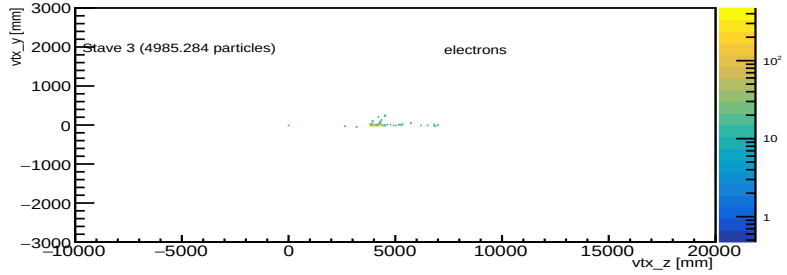
- vtx_y vs vtx_z positions, normalized to BX

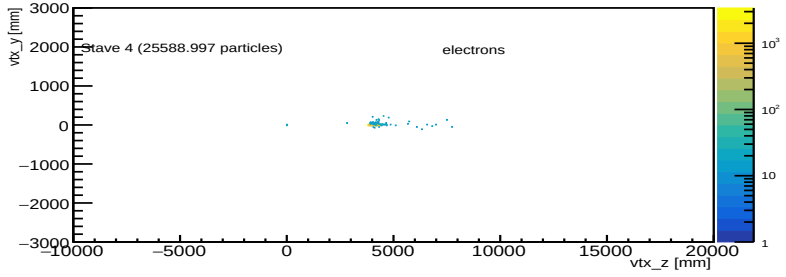
tracking_planes_vtxz_vtxy_electrons (signal+background)

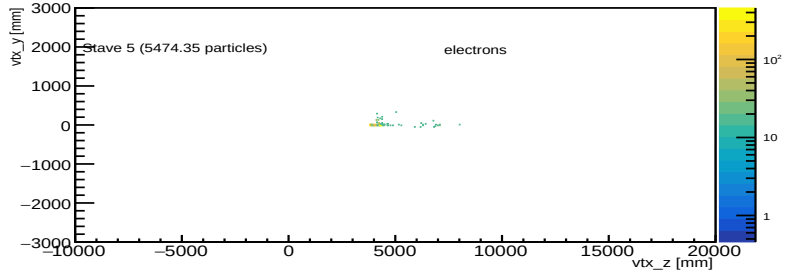


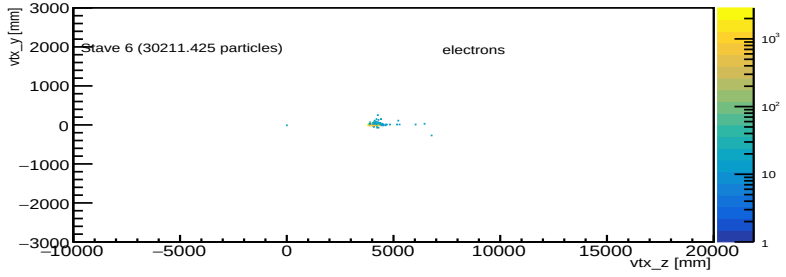


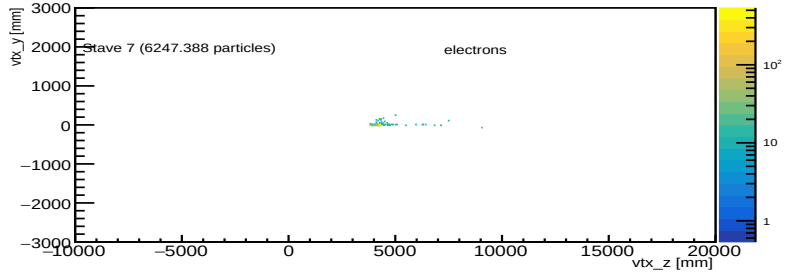




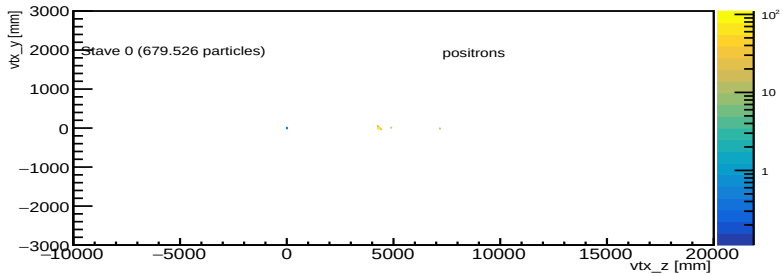


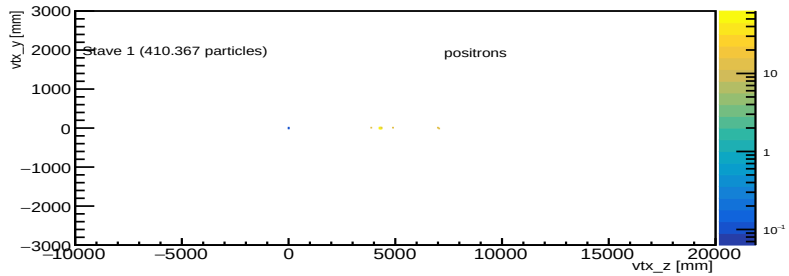


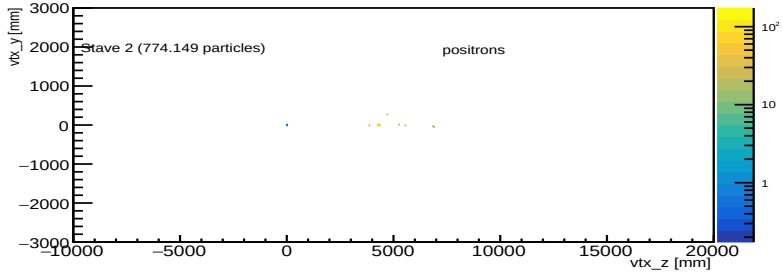


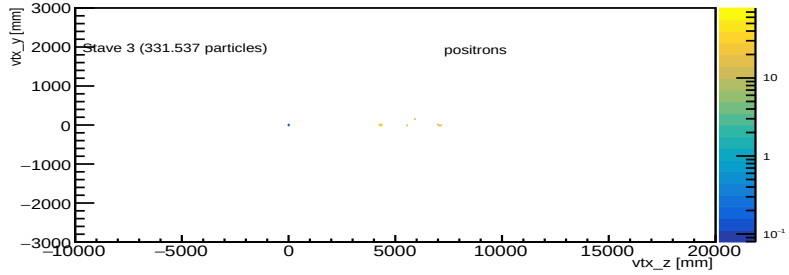


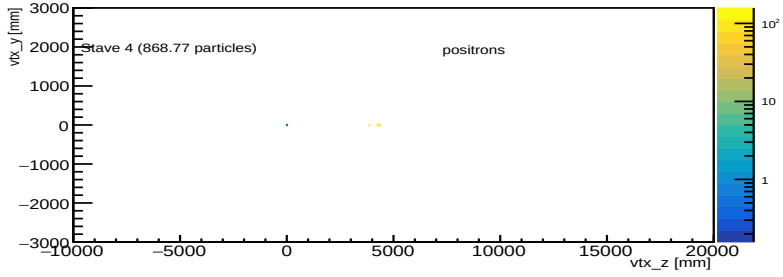
tracking_planes_vtxz_vtxy_positrons (signal+background)

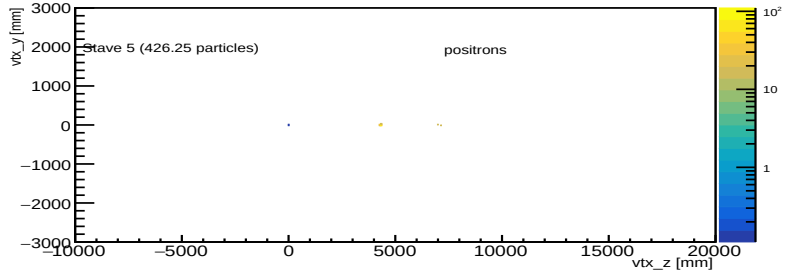


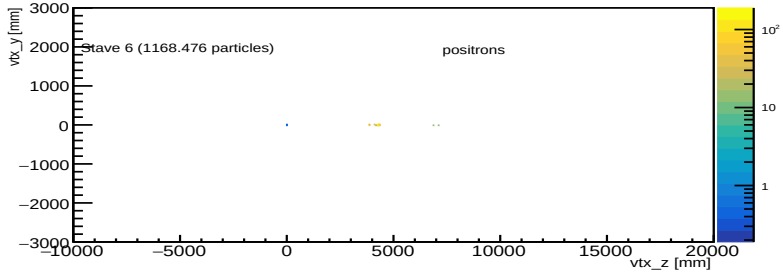


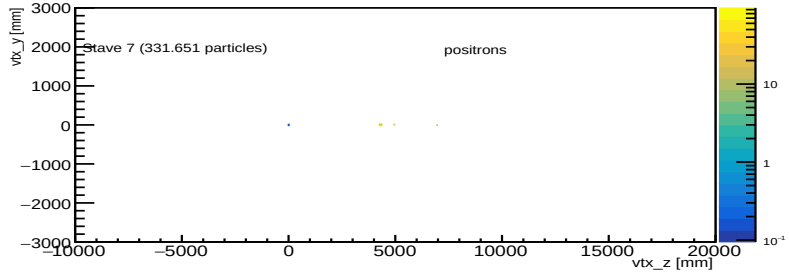




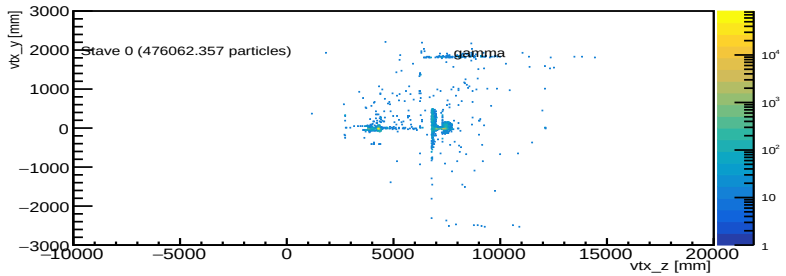


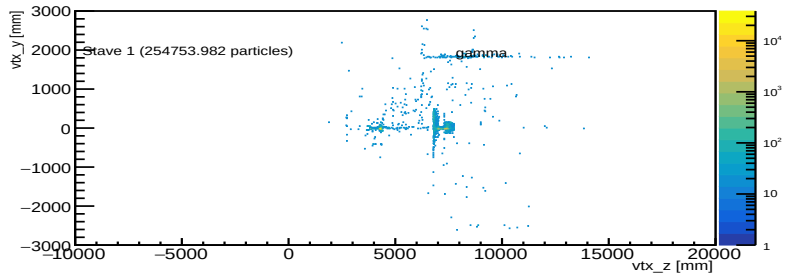


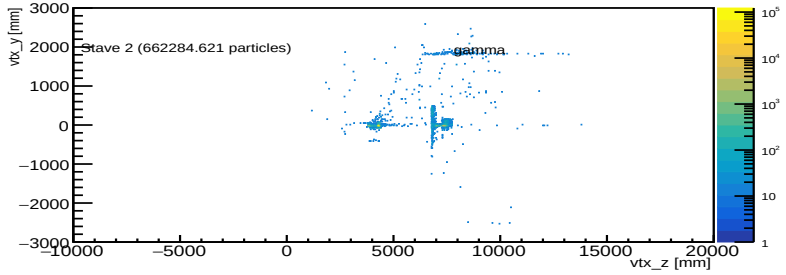


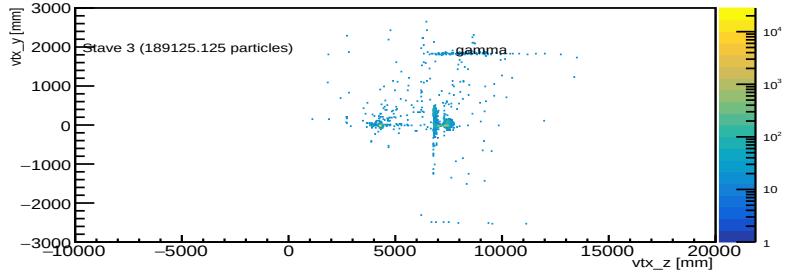


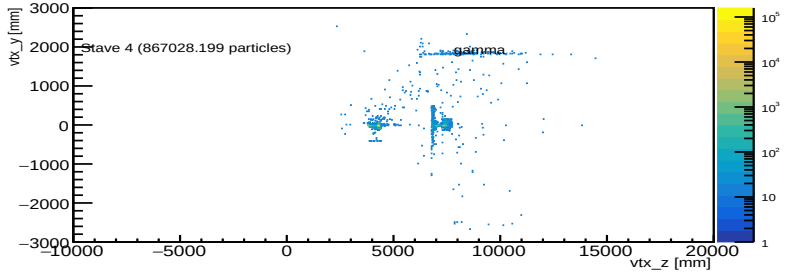
tracking_planes_vtxz_vtxy_gamma (signal+background)

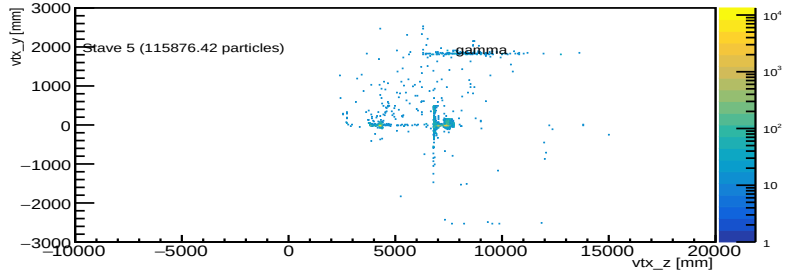


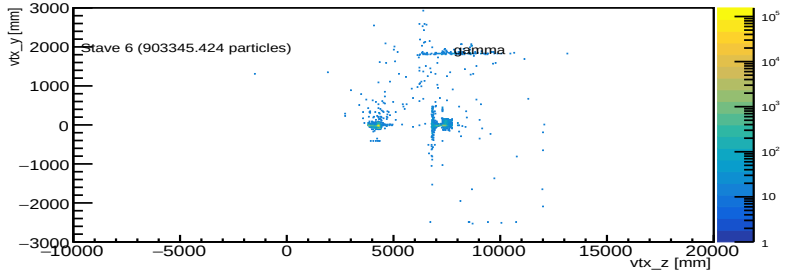


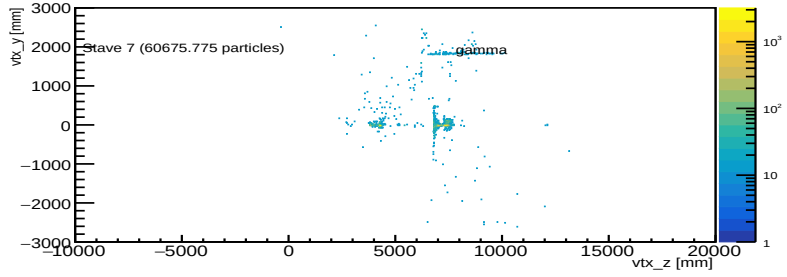






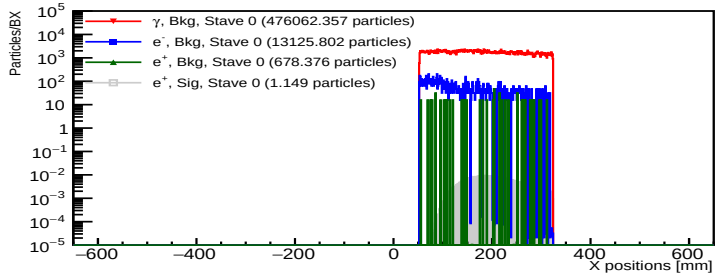


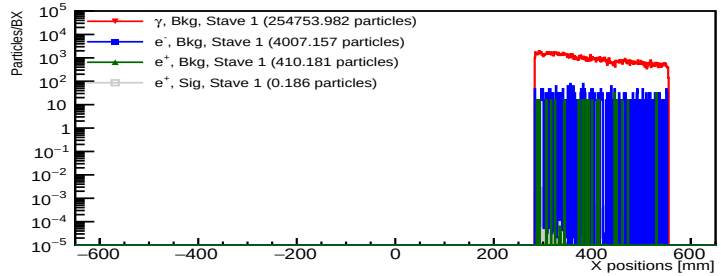


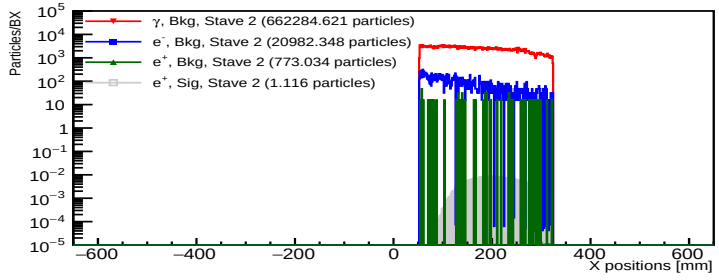


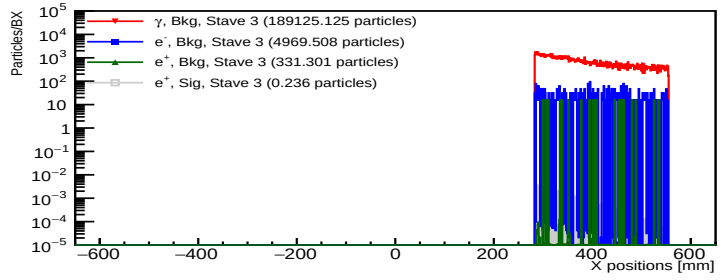
- 1D occupancy plots, in X normalized to BX

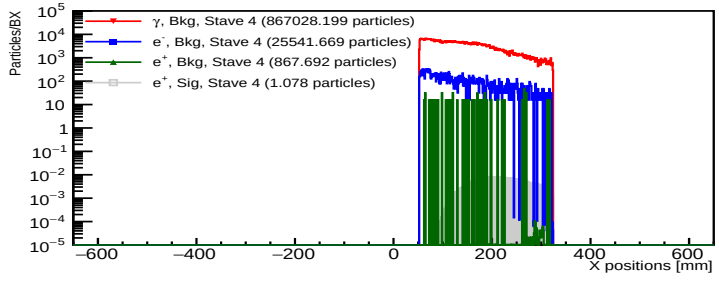
tracking_planes_background_track_x, all particles, signal and background

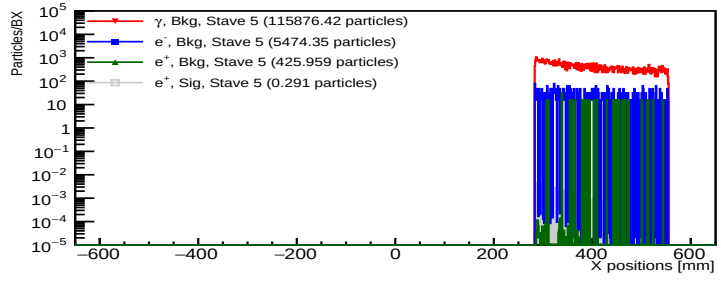


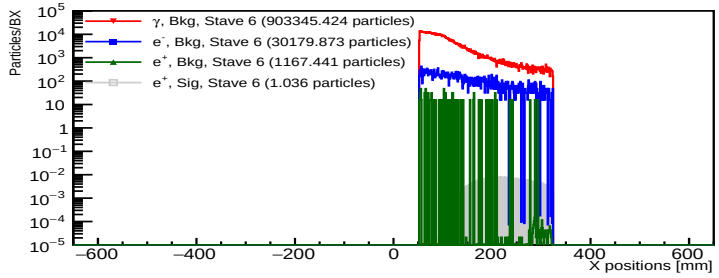


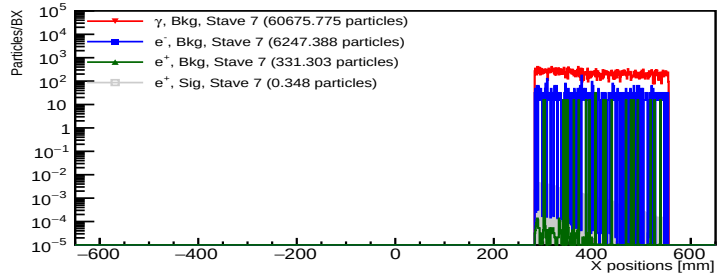












- 1D occupancy plots, in Y normalized to BX

tracking_planes_background_track_y, all particles, signal and background