Background particles in the Tracker Subsystem: γ+laser

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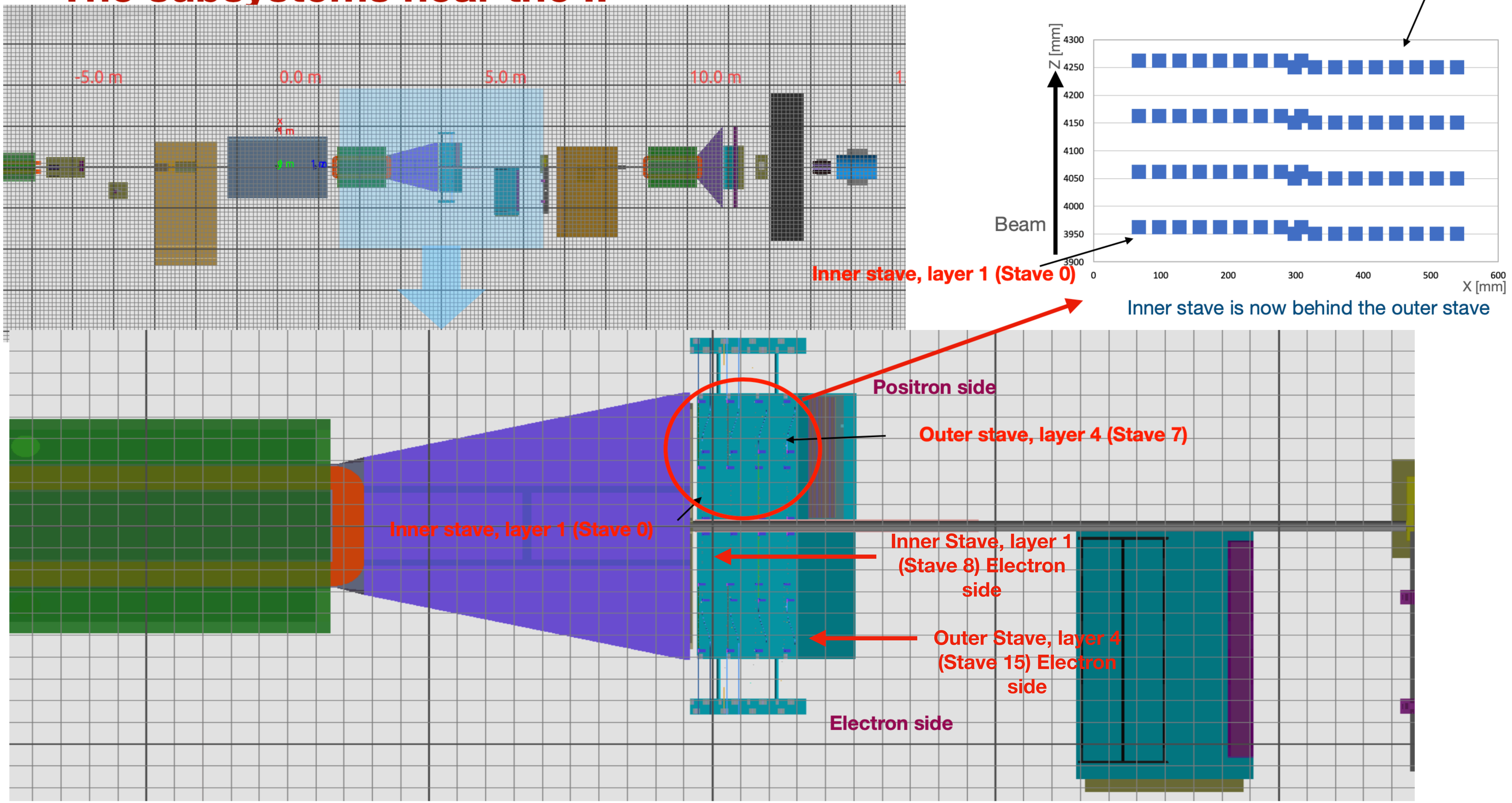
The subsystems near the IP

Plots from Sasha

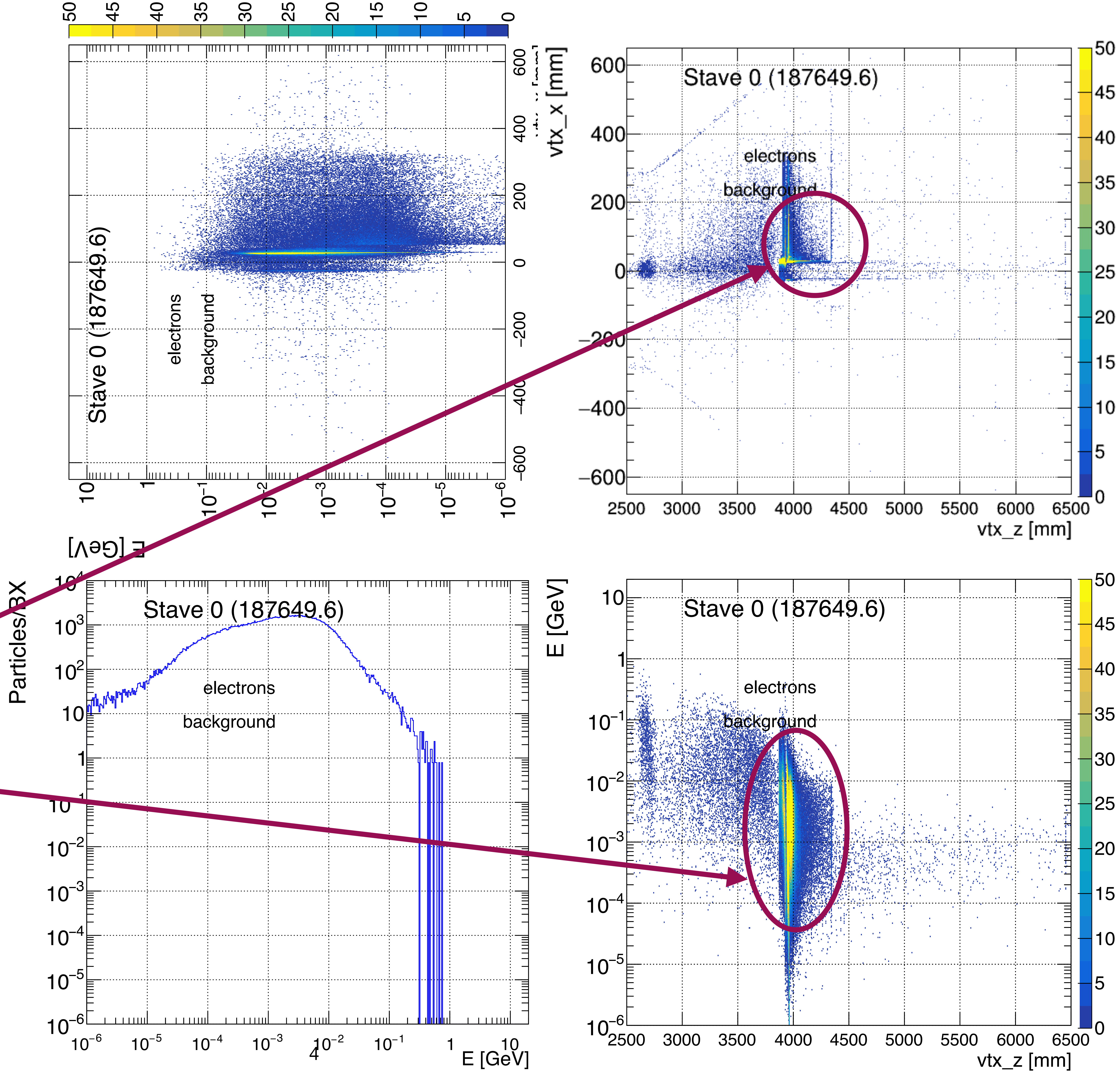


- γ+laser setup
  - 600 um target (CDR had 35 um target).
  - Looked at the background particles:
    - Electrons
    - Photons
    - Positrons
    - Neutrons
    - Protons
    - Pions
  - Plots from 1.27 BX of background, plots normalized to 1 BX.
  - Plots from the tracks intersecting the tracker plane (not necessarily making a hit in the tracker).

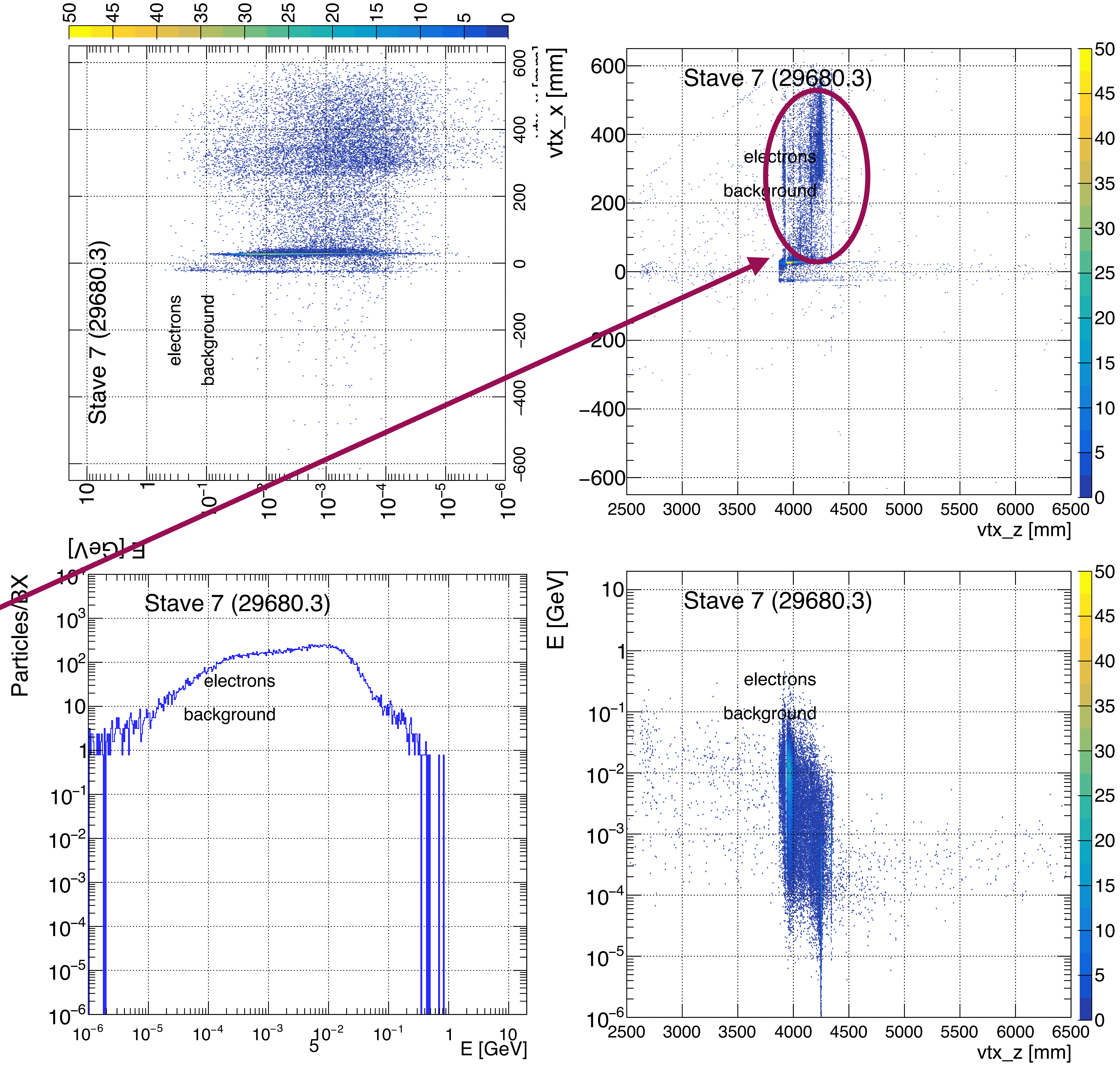
Electrons in Inner Stave, first layer of tracker: positron side

Effective 3D plot in Energy, vtx_x and vtx_z.
1D plot of Energy.

Junction of vacuum exit window and wall separating tracker layers and beam pipe

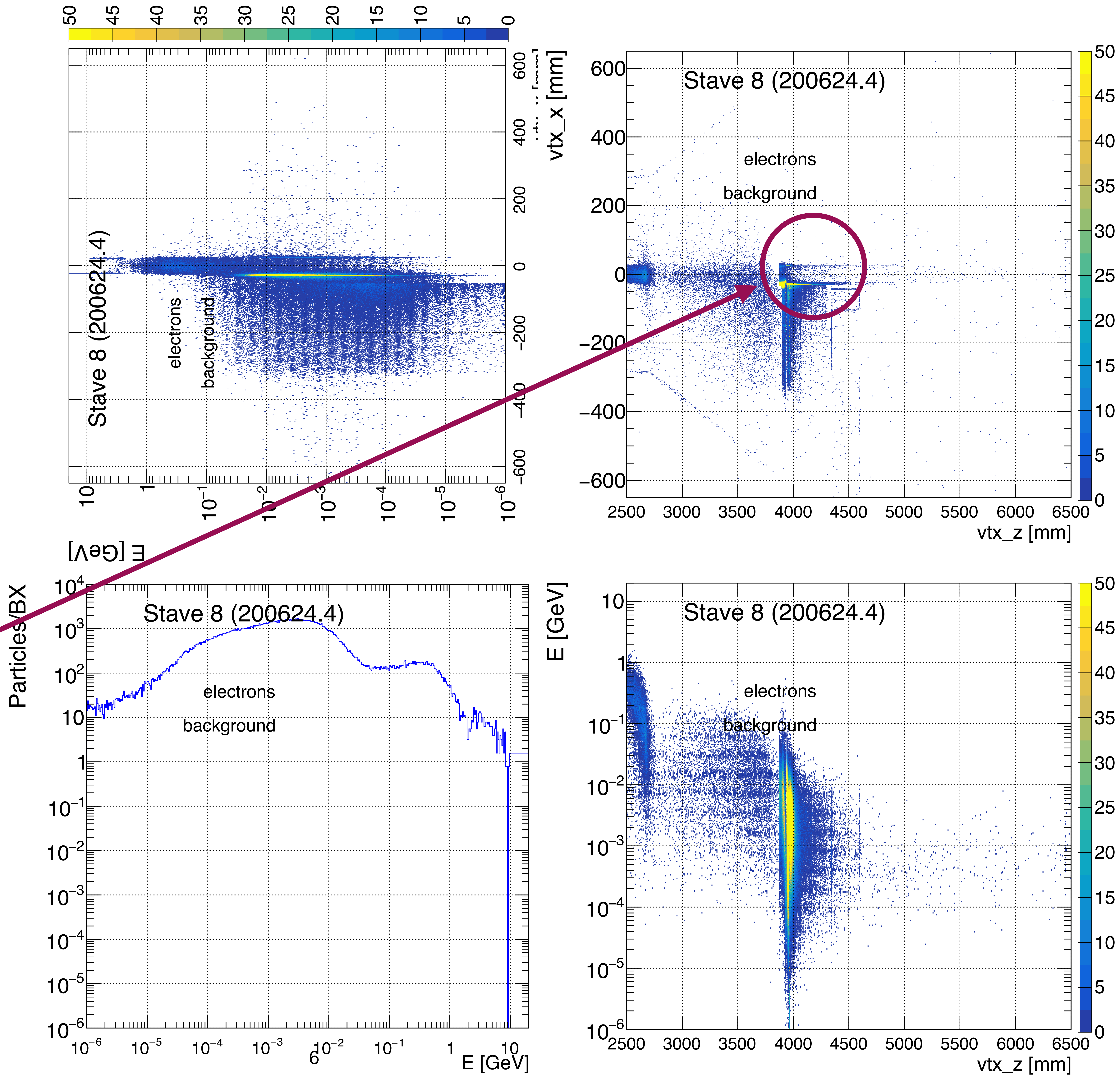


Electrons in Outer Stave, last layer of tracker: positron side



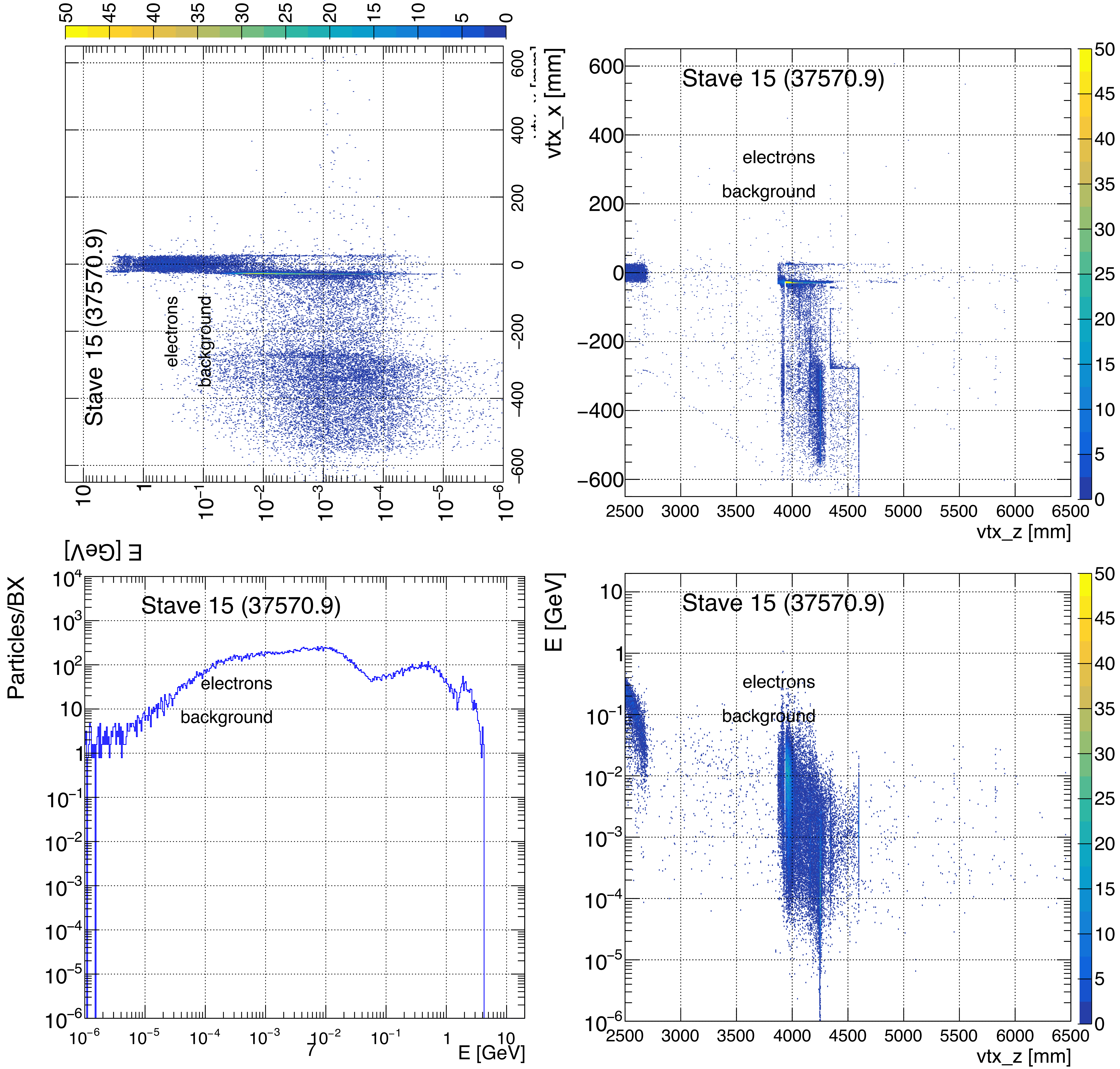
Tracker layers in positron side

Electrons in Inner Stave, first layer of tracker: electron side

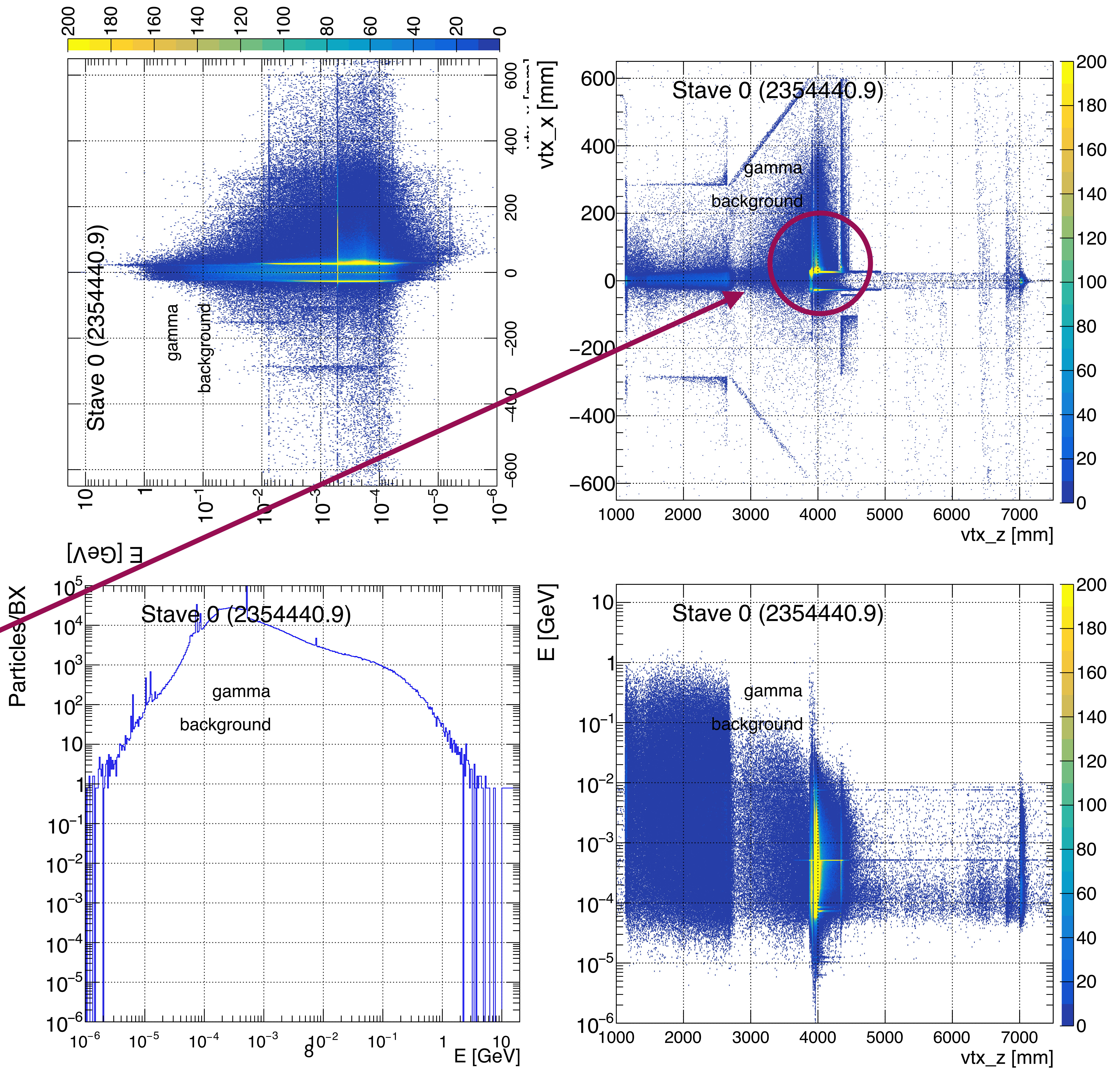


Junction of vacuum exit window and wall separating tracker layers and beam pipe

Electrons in Outer Stave, last layer of tracker: electron side

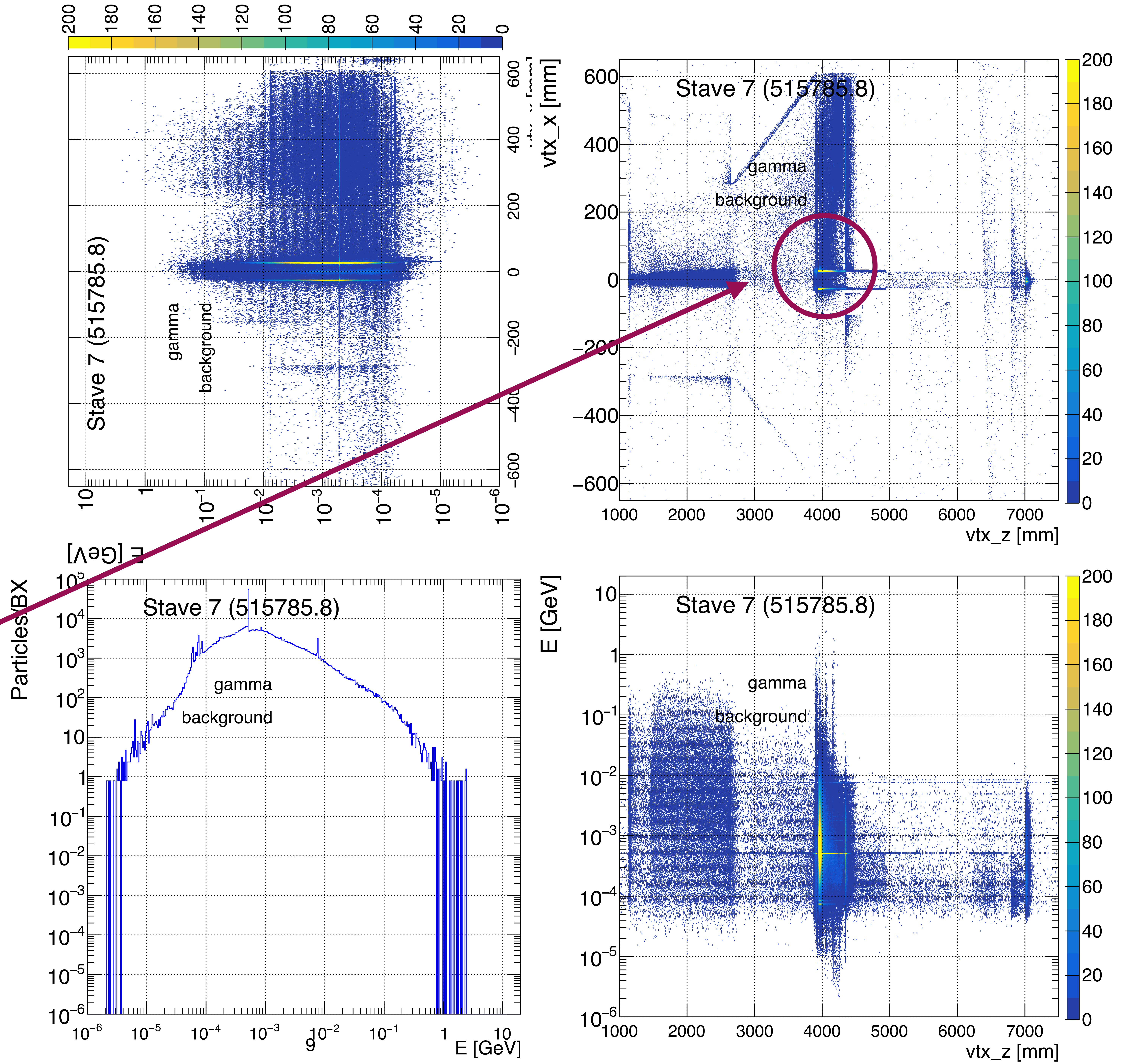


Photons in Inner Stave, first layer of tracker: positron side



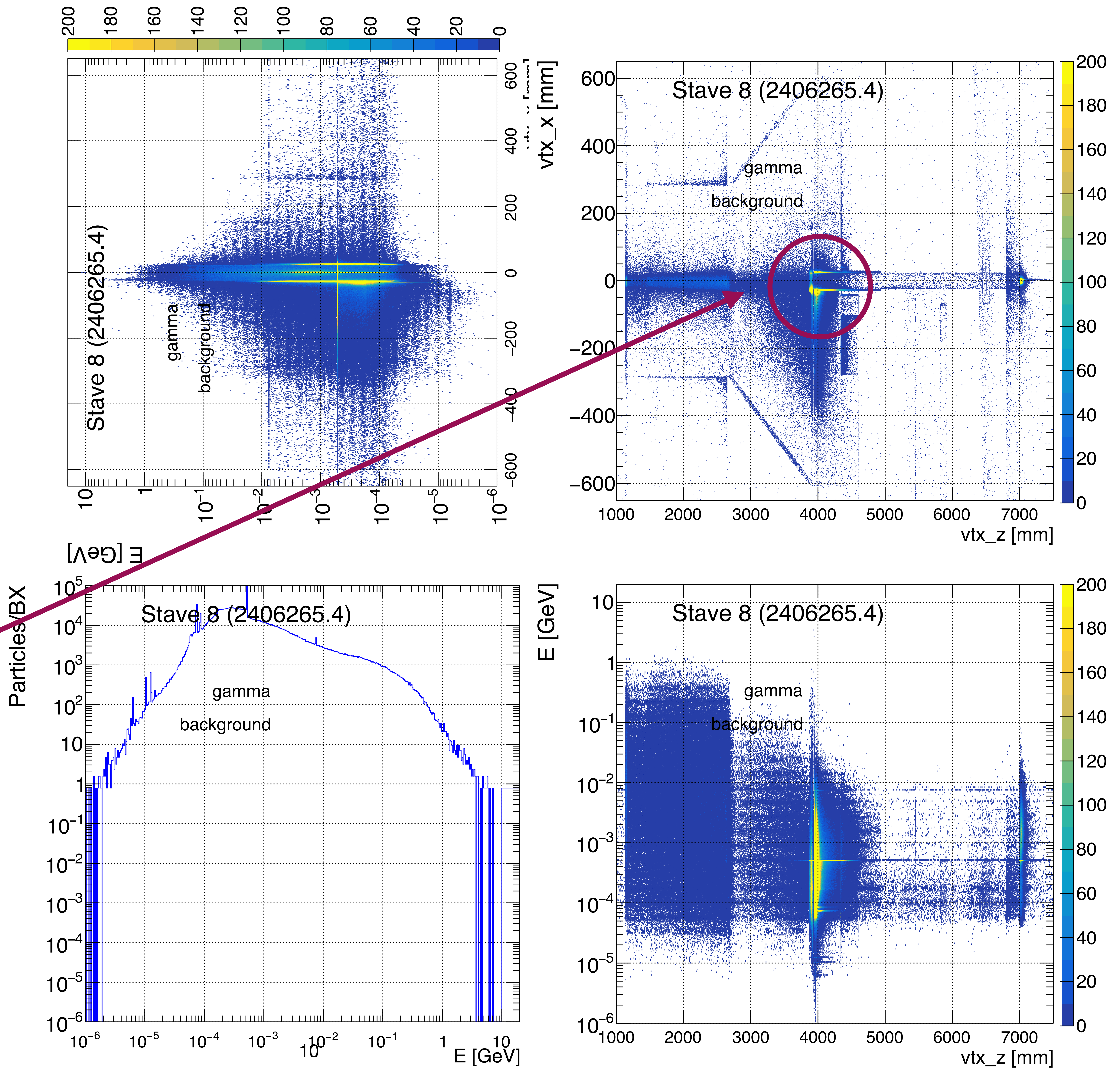
Junction of vacuum exit window and wall separating tracker layers and beam pipe

Photons in Outer Stave, last layer of tracker: positron side



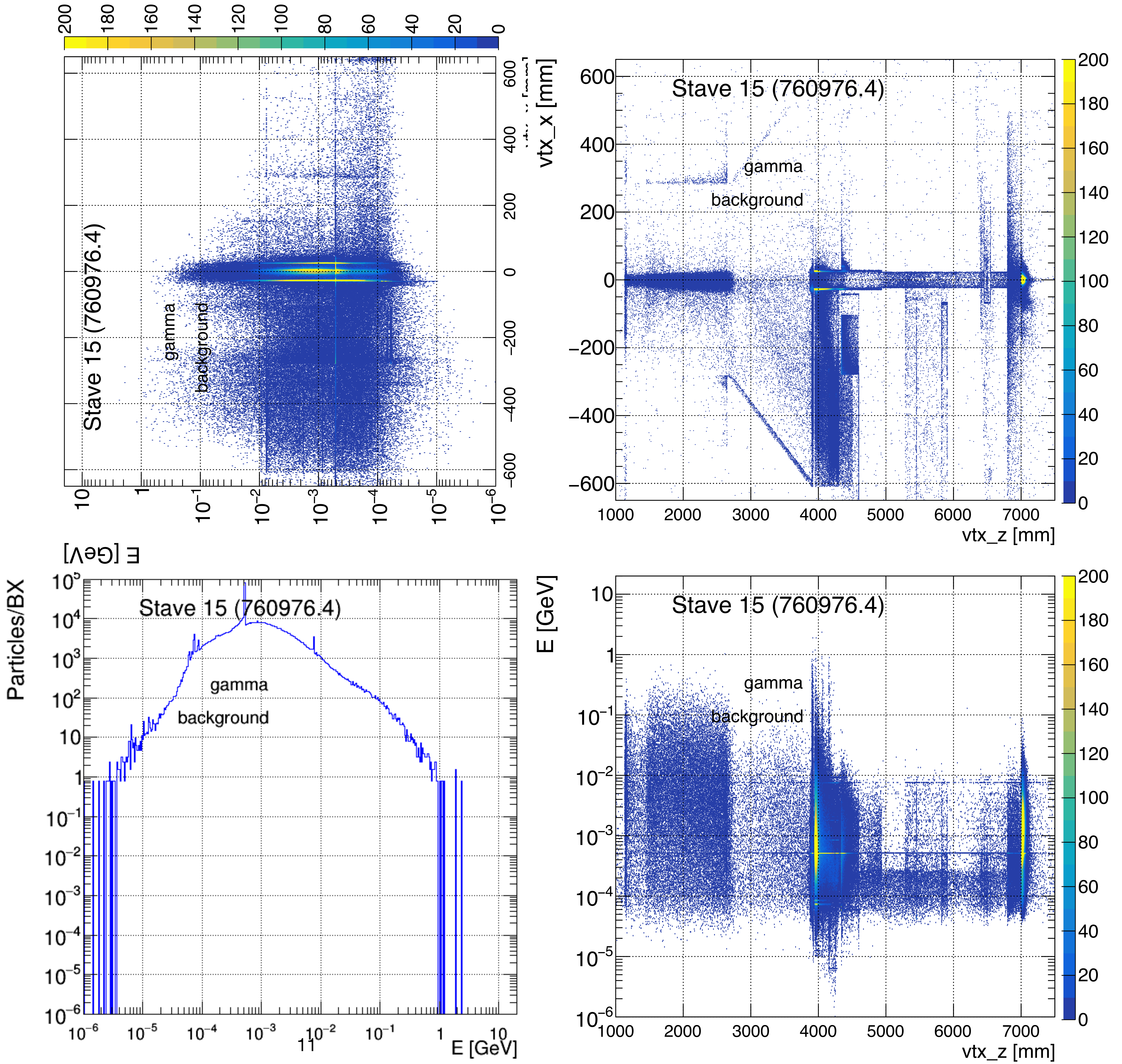
Junction of vacuum exit window and wall separating tracker layers and beam pipe

Photons in Inner Stave, first layer of tracker: electron side

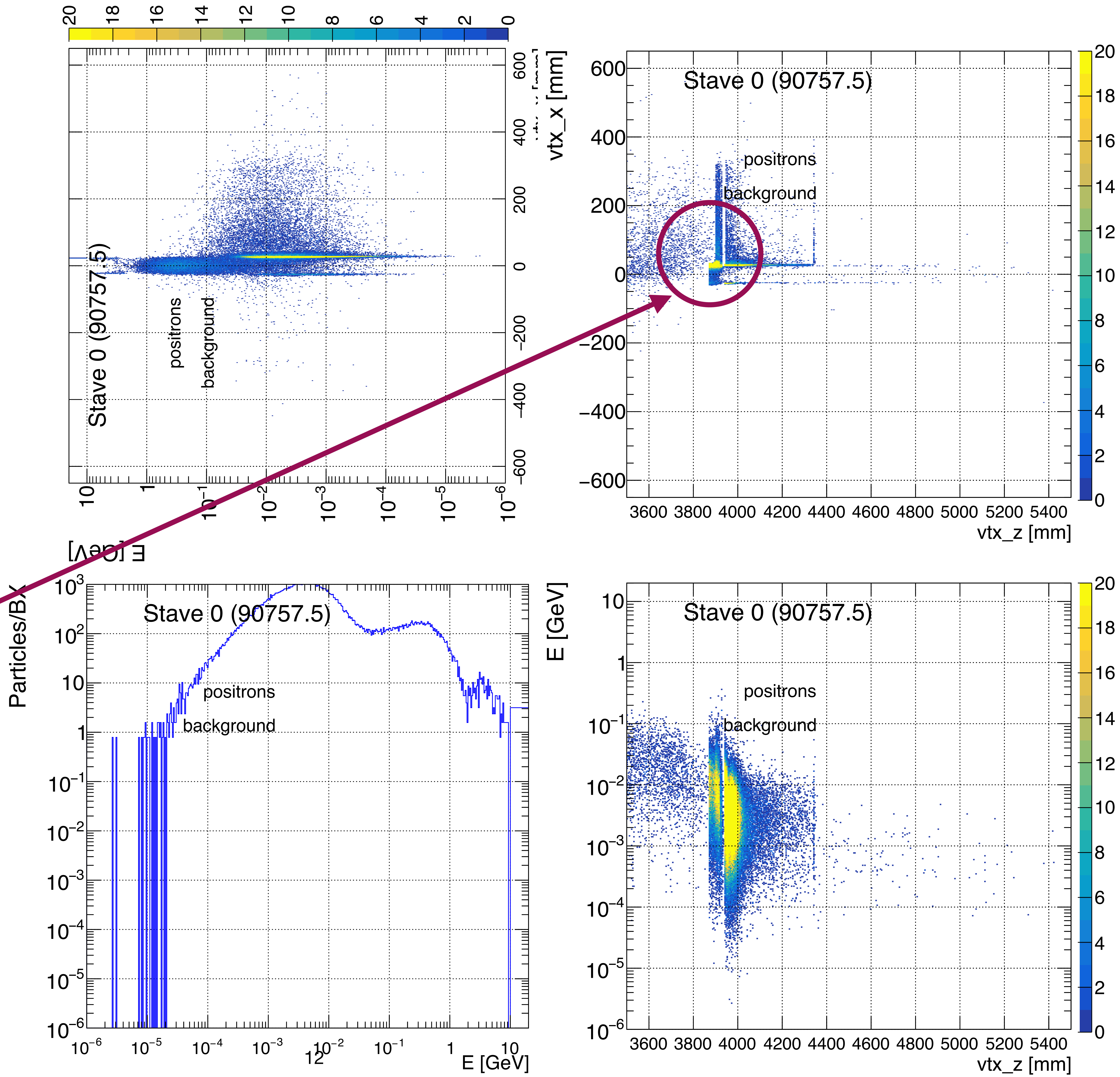


Junction of vacuum exit window and wall separating tracker layers and beam pipe

Photons in Outer Stave, last layer of tracker: electron side

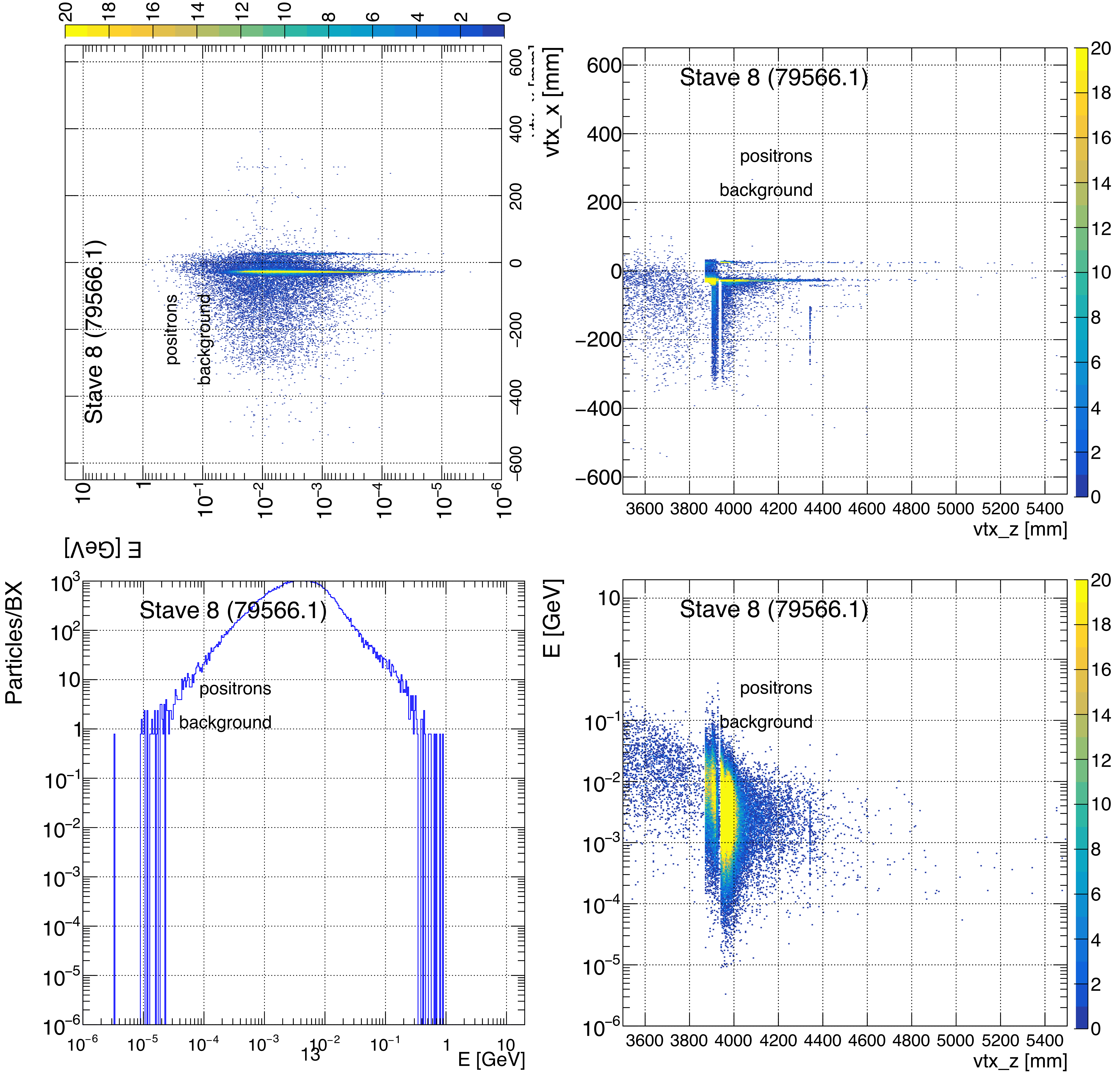


Positrons in Inner Stave, first layer of tracker: positron side

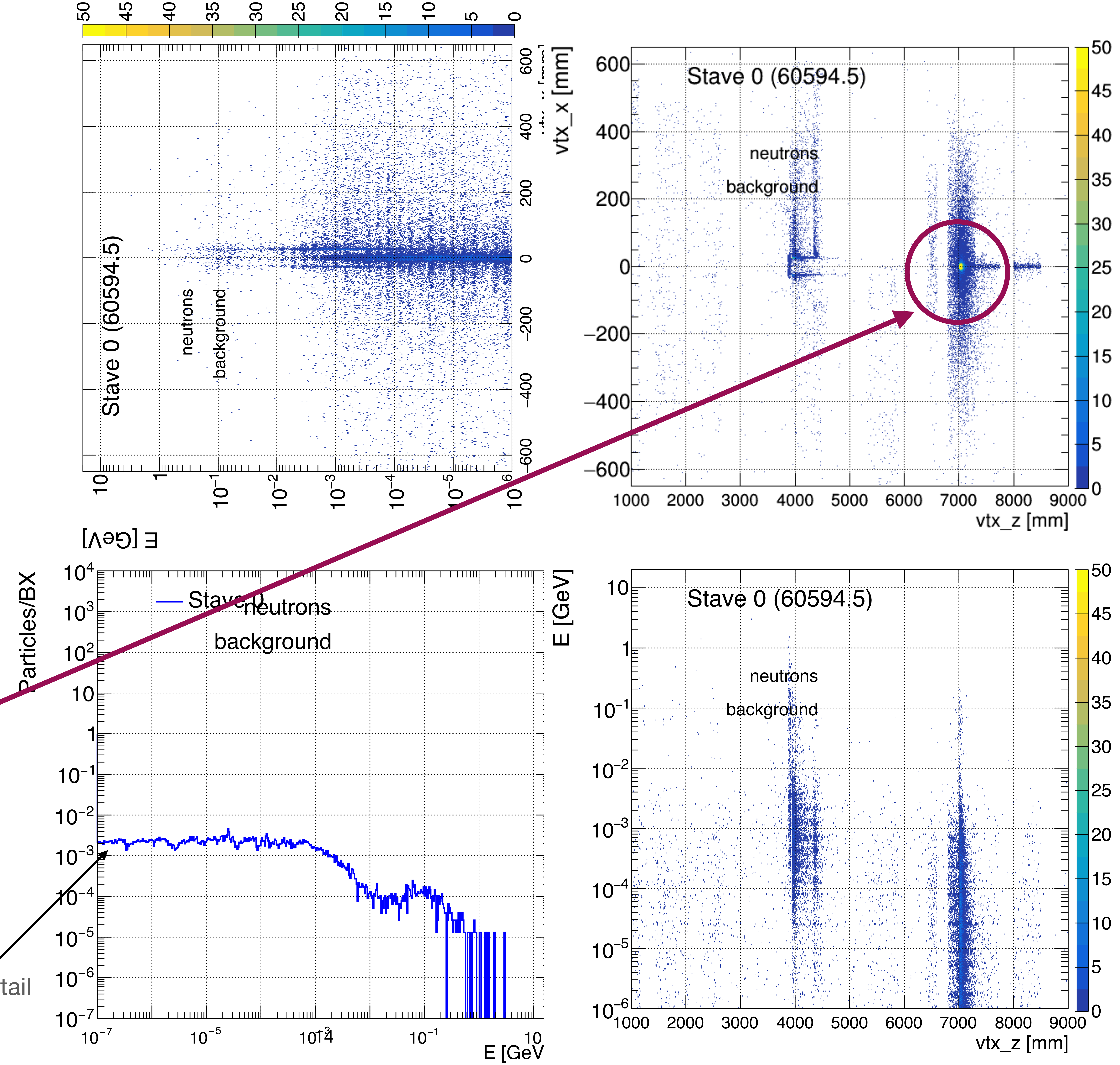


Junction of vacuum exit window and wall separating tracker layers and beam pipe

Positrons in Inner Stave, first layer of tracker: electron side



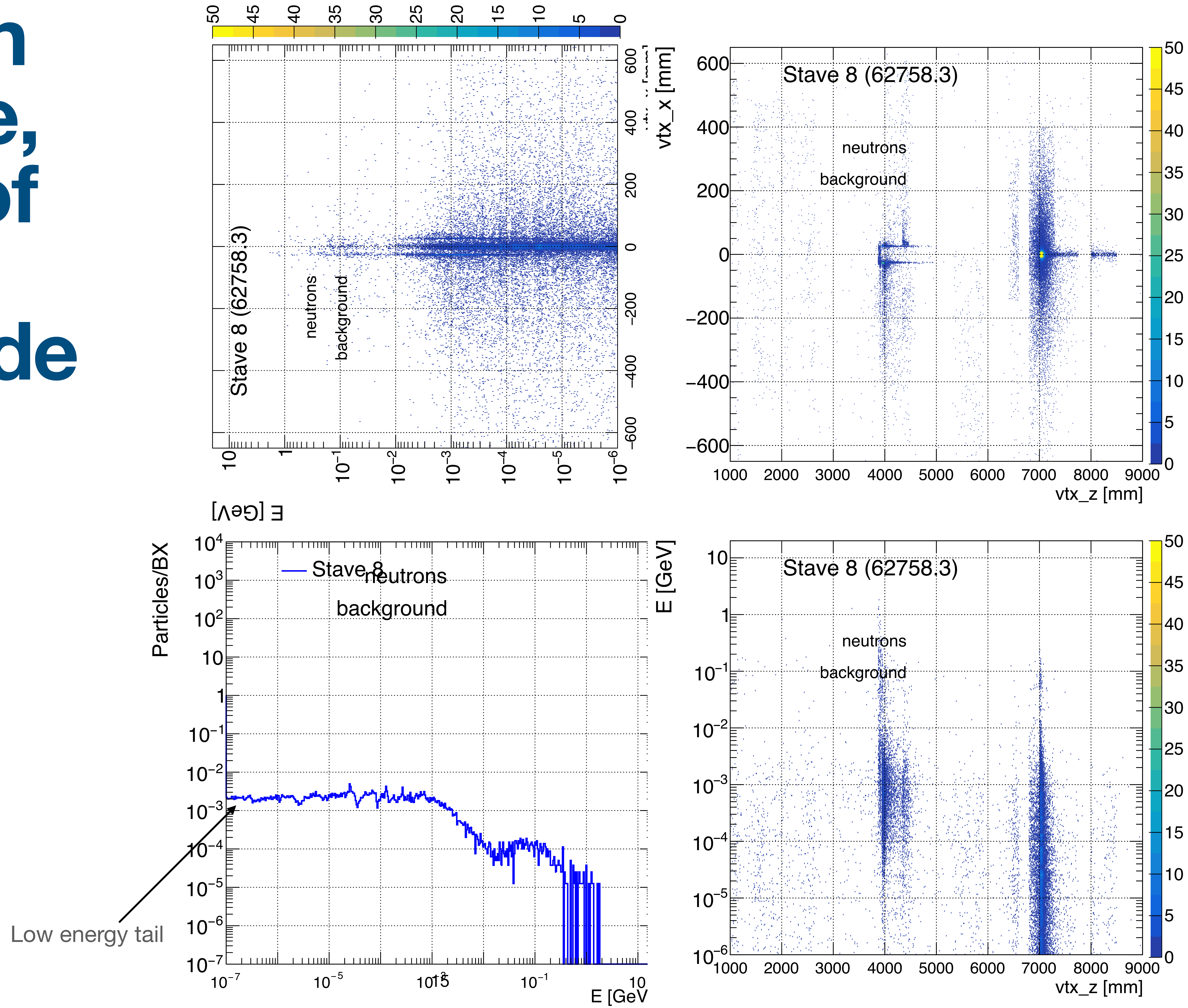
Neutrons in Inner Stave, first layer of tracker: positron side



Beam dump

Low energy tail

Neutrons in Inner Stave, first layer of tracker: electron side



Summary table of the number of background particles

Only photon beam, g+laser	Stave 0 (Inner stave, first layer, positron side)	Stave 7 (Outer stave, last layer, positron side)	Stave 8 (Inner stave, first layer, electron side)	Stave 15 (Outer stave, last layer, electron side)
Electrons/BX	187649.6	29680.3	200624.4	37570.9
Photons/BX	2354440.9	515785.8	2406265.4	760976.4
Positrons/BX	90575.5	20332.3	79566.1	13406.3
Neutrons/BX	60594.5	54752.0	62758.3	81299.2
Protons/BX	122.0	30.7	129.9	33.9
Pions/BX	74	13.4	75.6	17.3

Comparison with CDR samples

g+laser	Electrons/BX (CDR)	Electrons/BX (Now)	Gamma/BX (CDR)	Gamma/BX (Now)
Inner stave, first layer	53.2	187649.6	1347.8	2354440.9
Outer stave, last layer	13.5	29680.3	491.4	515785.8

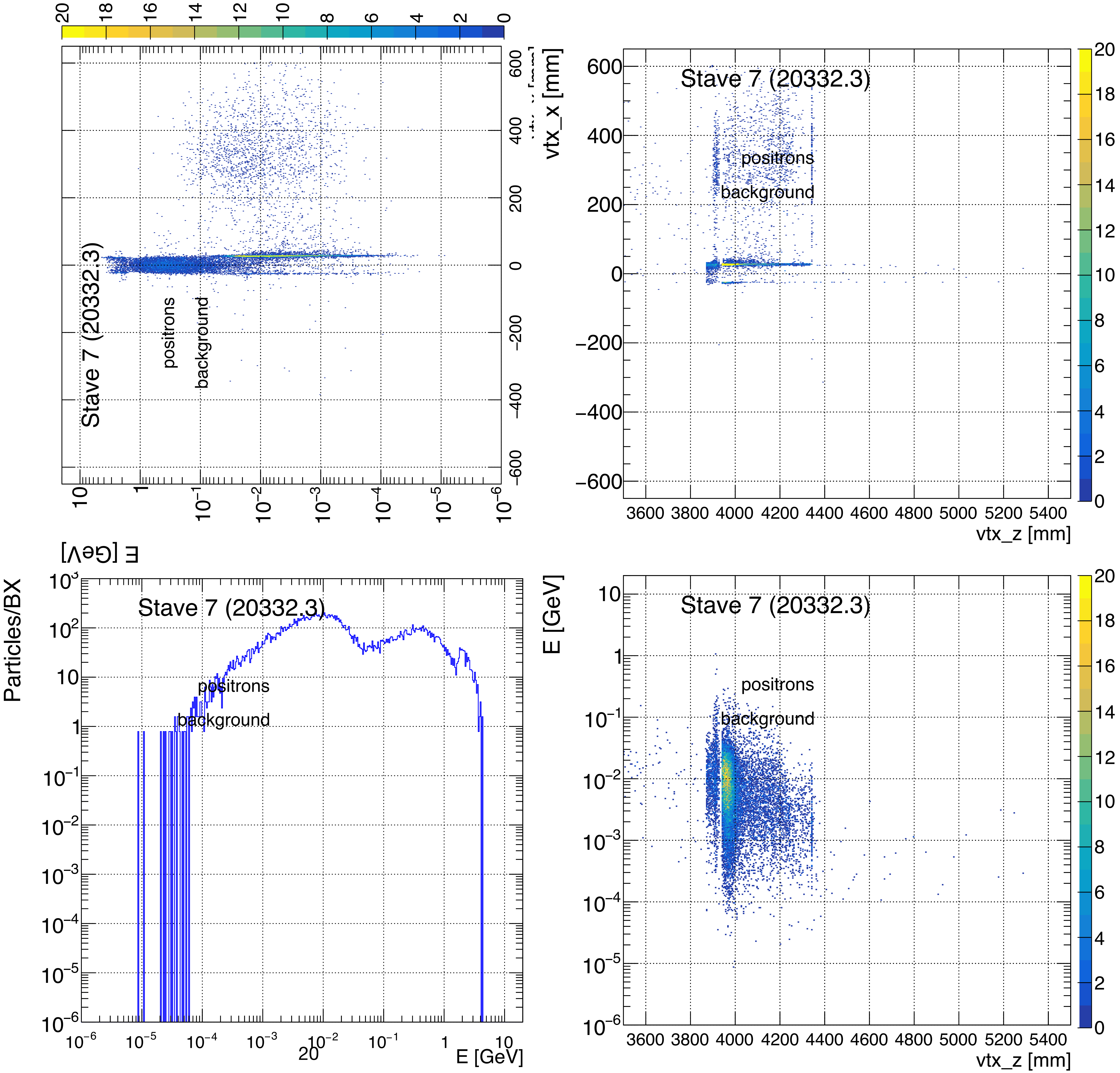
Electrons and photons now are 10^3 times more in number.

Summary

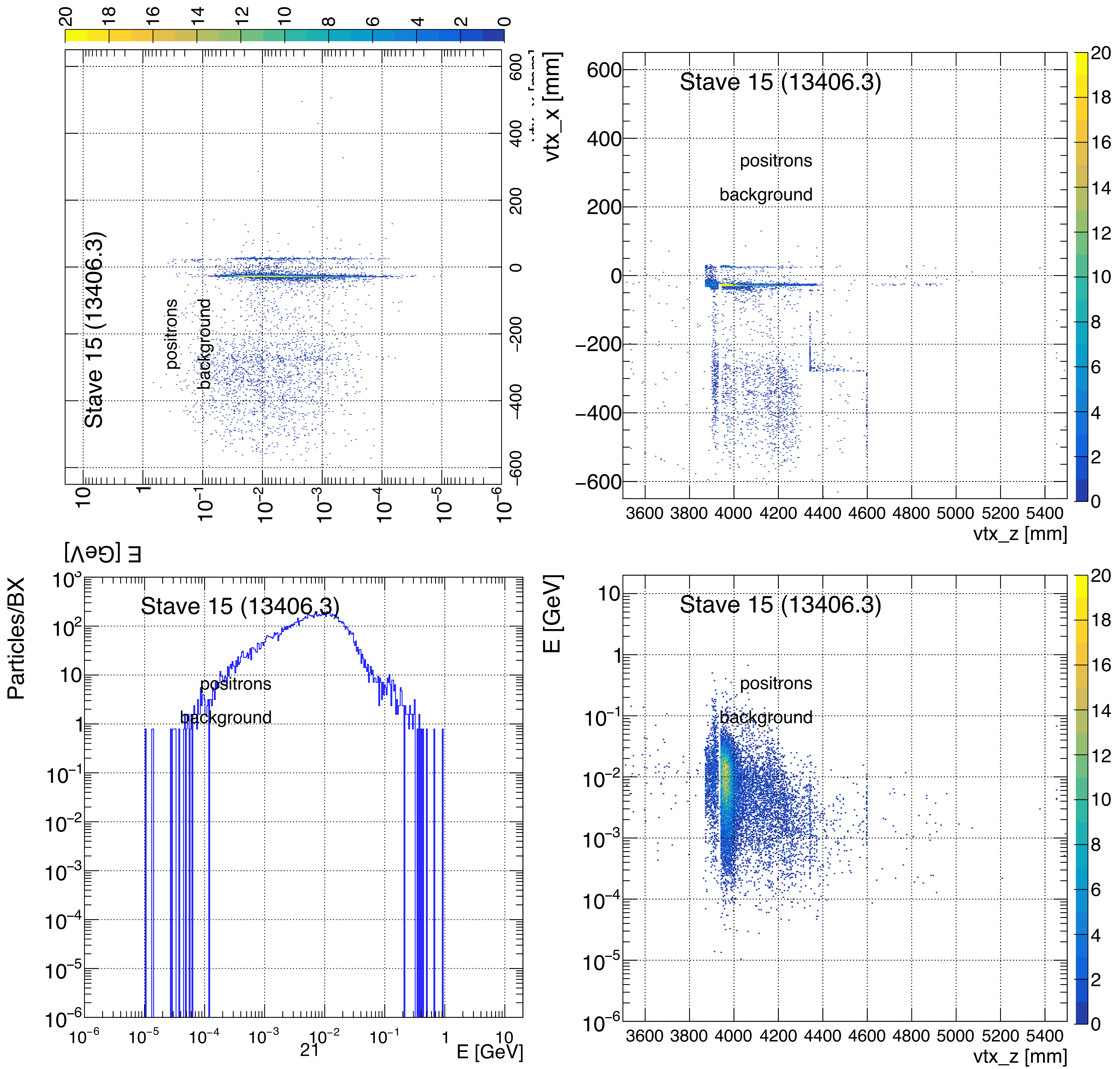
- New samples with 600 um thick target.
  - Electrons are mostly coming from the junction of vacuum window and wall separating tracker layer and beam pipe.
  - Photons are everywhere, but they will not create hits on the tracker layers.
  - Positrons are also coming mostly from the junction of vacuum window and wall separating tracker layer and beam pipe.
  - Neutrons are coming from the dump.
  - Very low number of protons and pions.
- CDR samples (with 35 um thick target) had much lower number of background particles.

Bonus slides

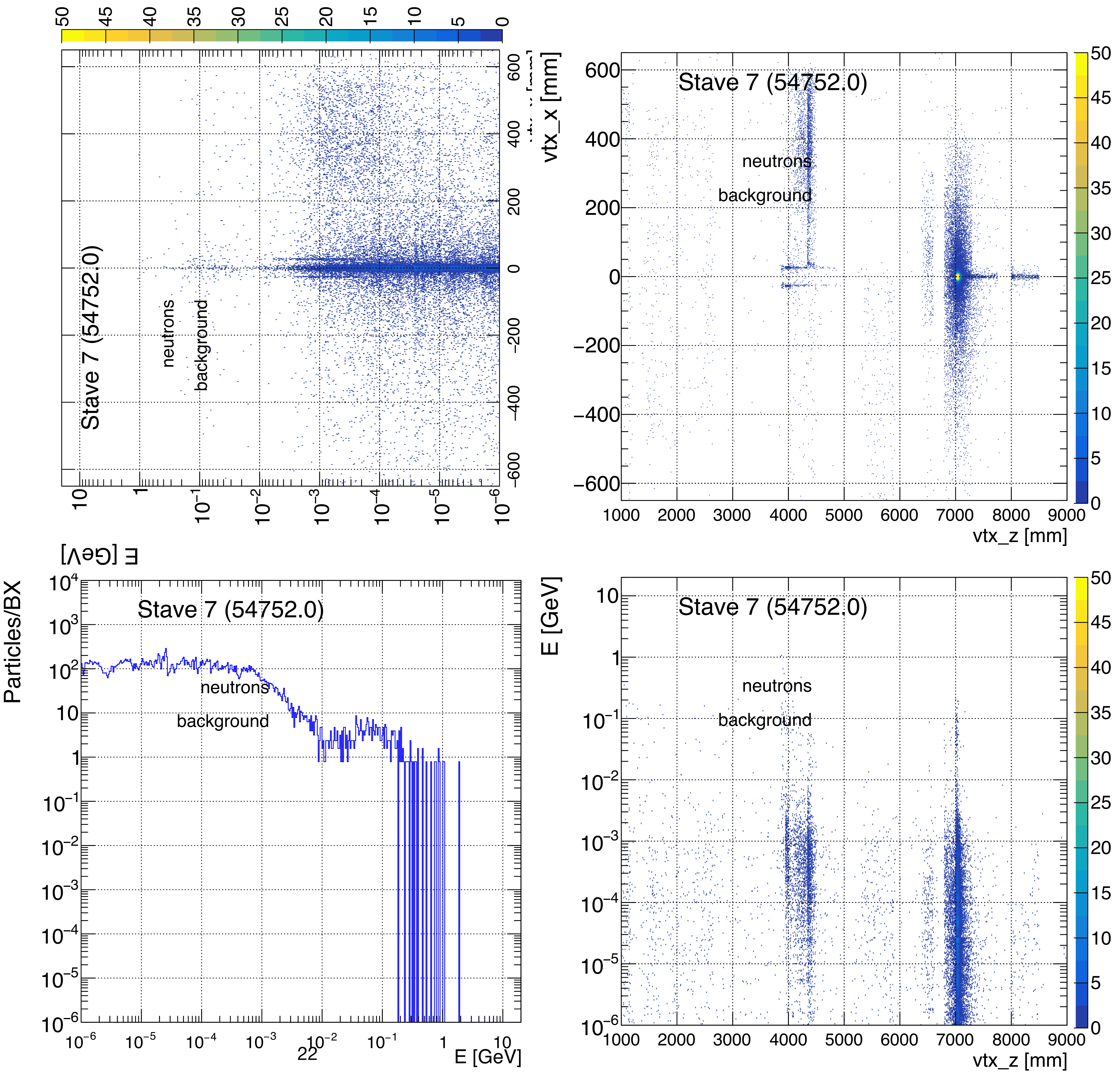
Positrons in Outer Stave, last layer of tracker: positron side



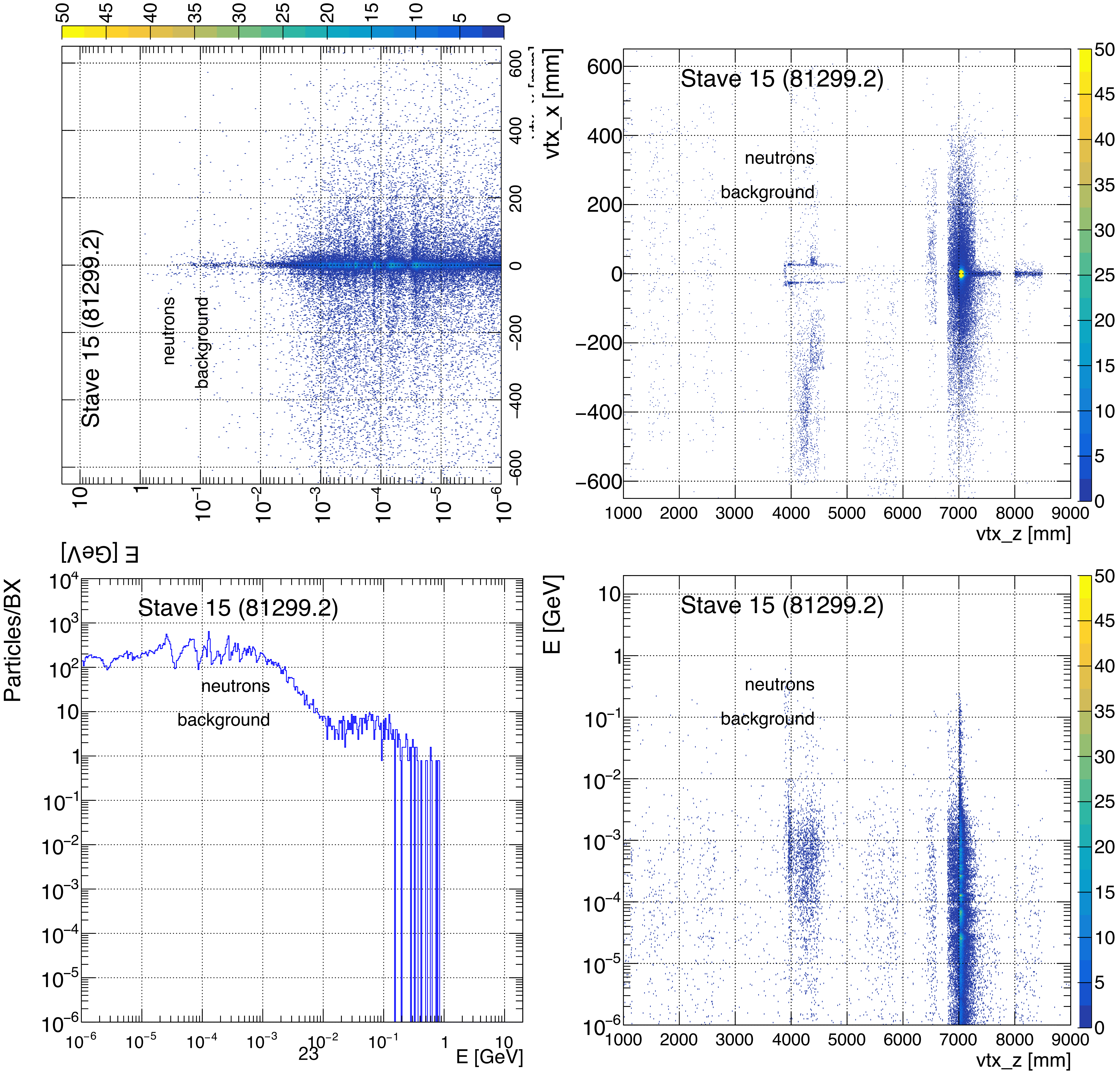
Positrons in Outer Stave, last layer of tracker: electron side

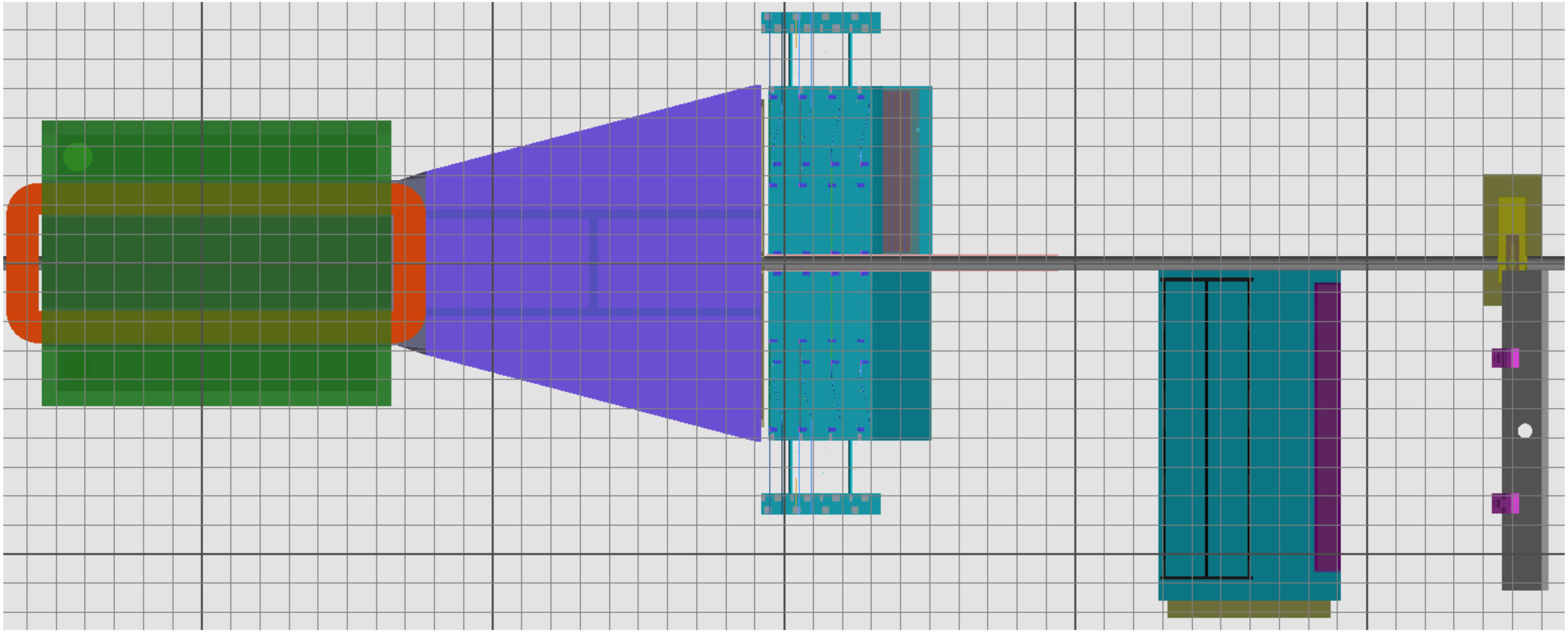


Neutrons in Outer Stave, last layer of tracker: positron side



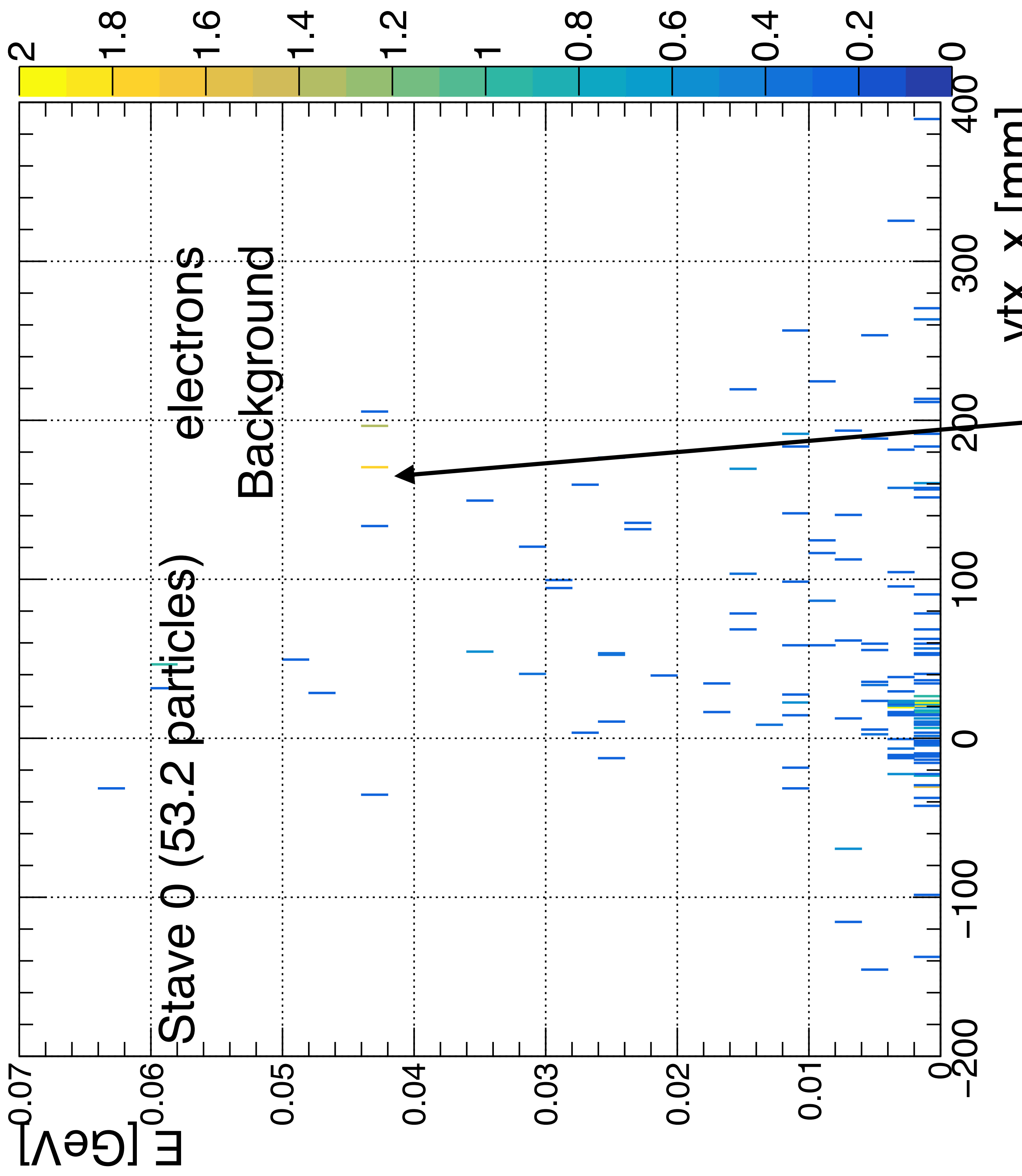
Neutrons in Outer Stave, last layer of tracker: electron side

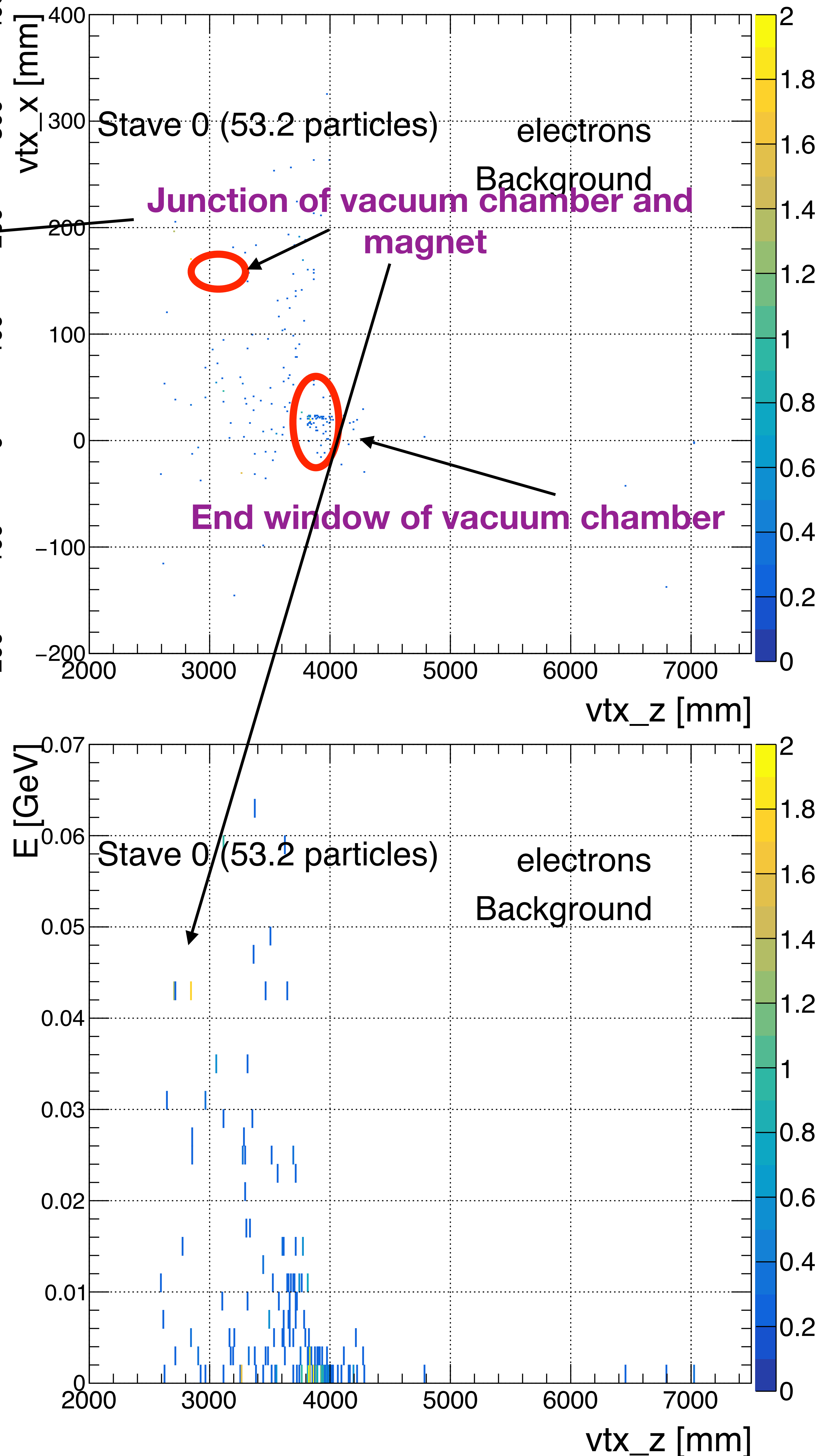




- gamma+laser background (CDR geometry)
  - Samples produced by Sasha
  - Background particles electrons and photons.
  - Plots from the tracks intersecting the tracker plane (not necessarily making a hit in the tracker).

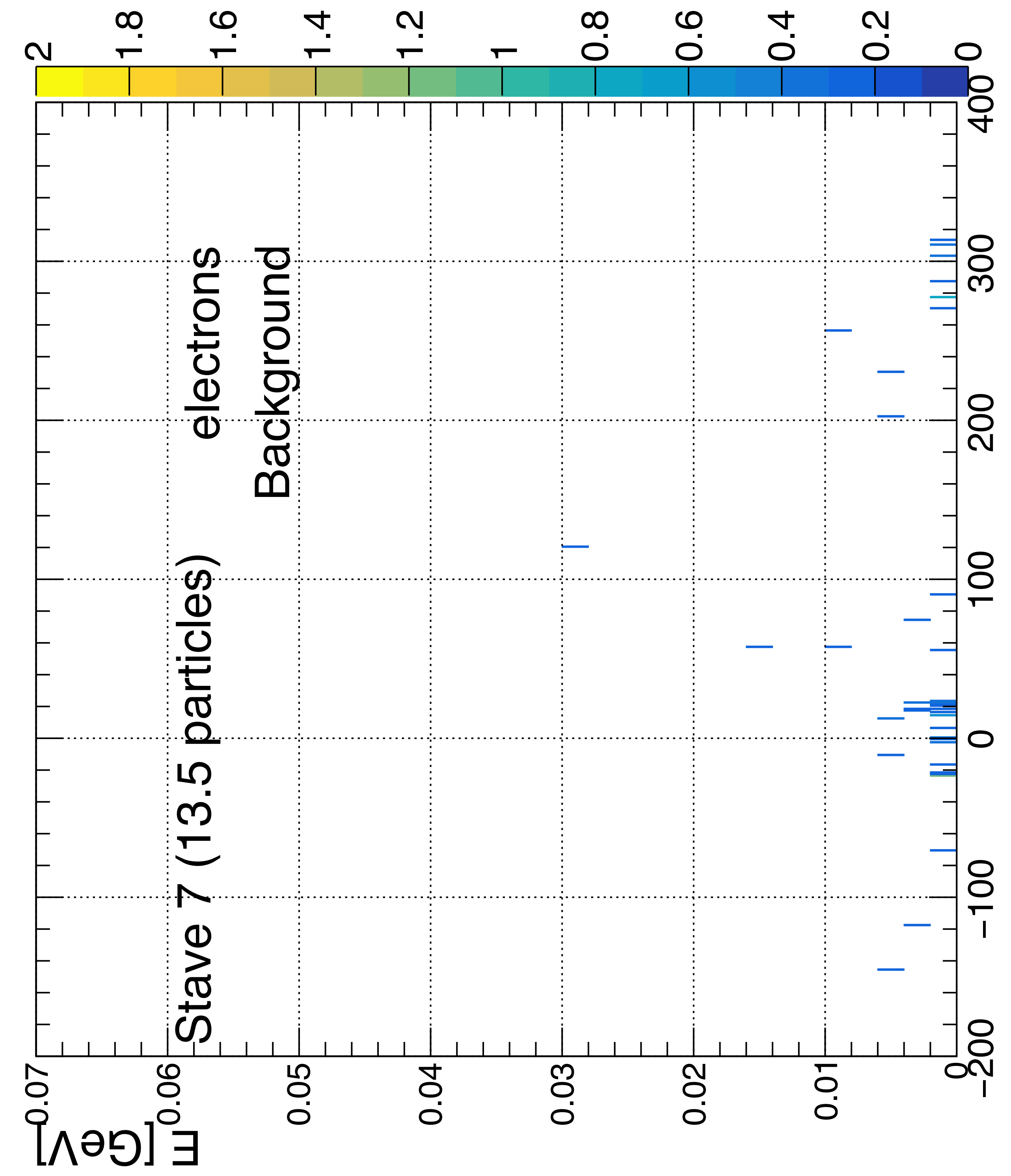
Electrons in Inner Stave, first layer of tracker

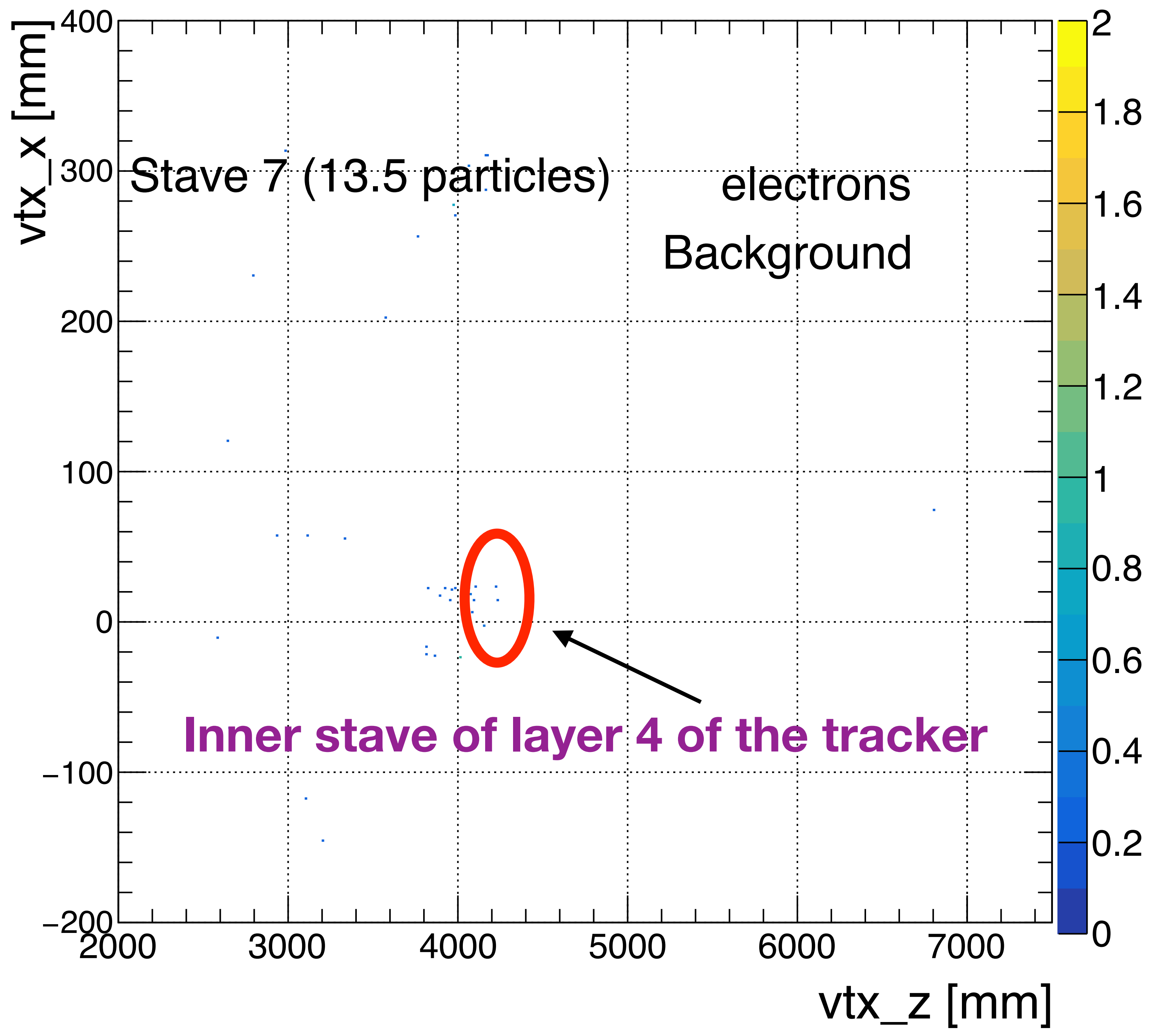




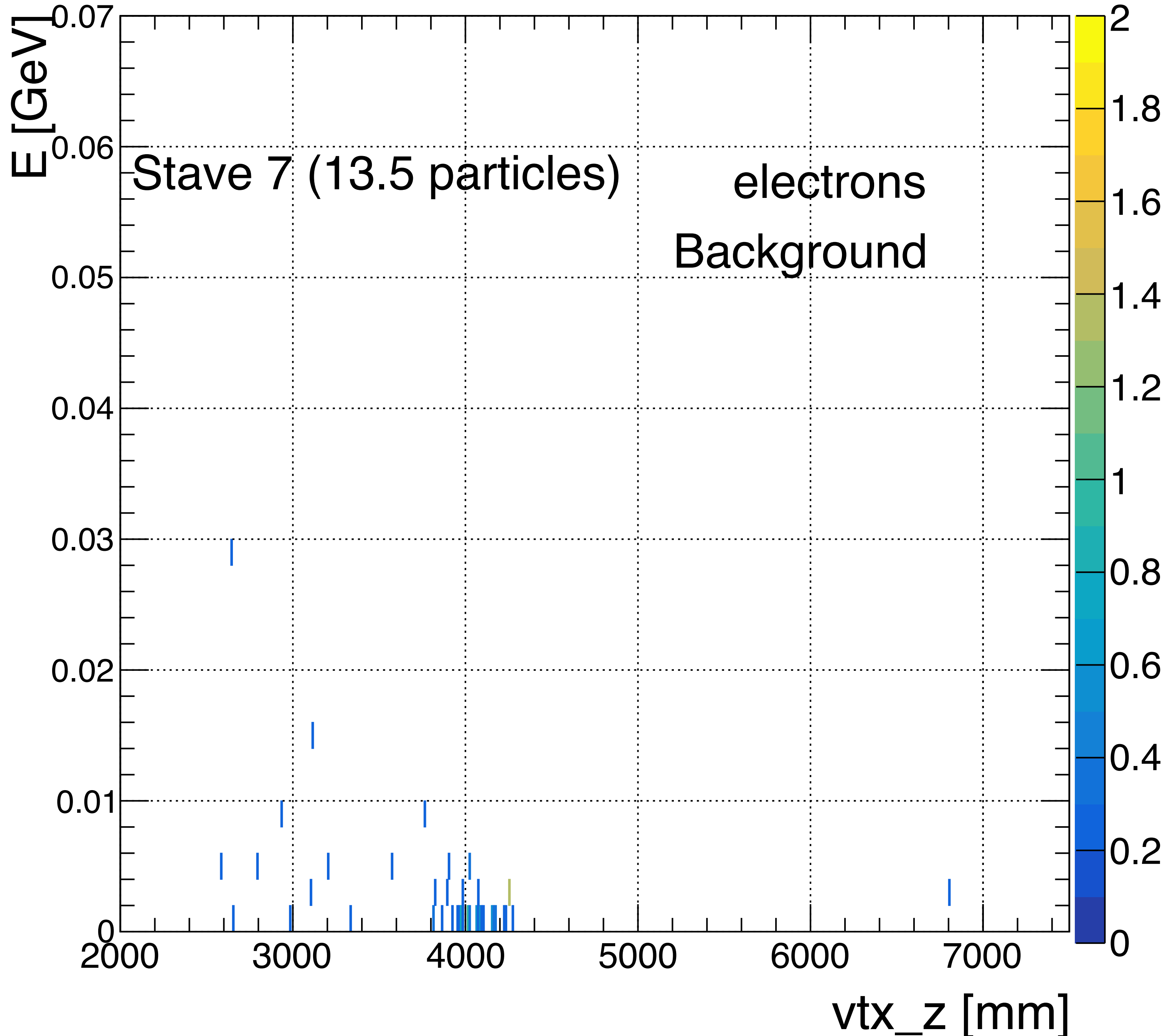
- Very low number of background electrons.
  - E < 2 MeV mostly.
- Maximum electrons are coming from the junction of magnet and vacuum chamber.

Electrons in Outer Stave, last layer of tracker



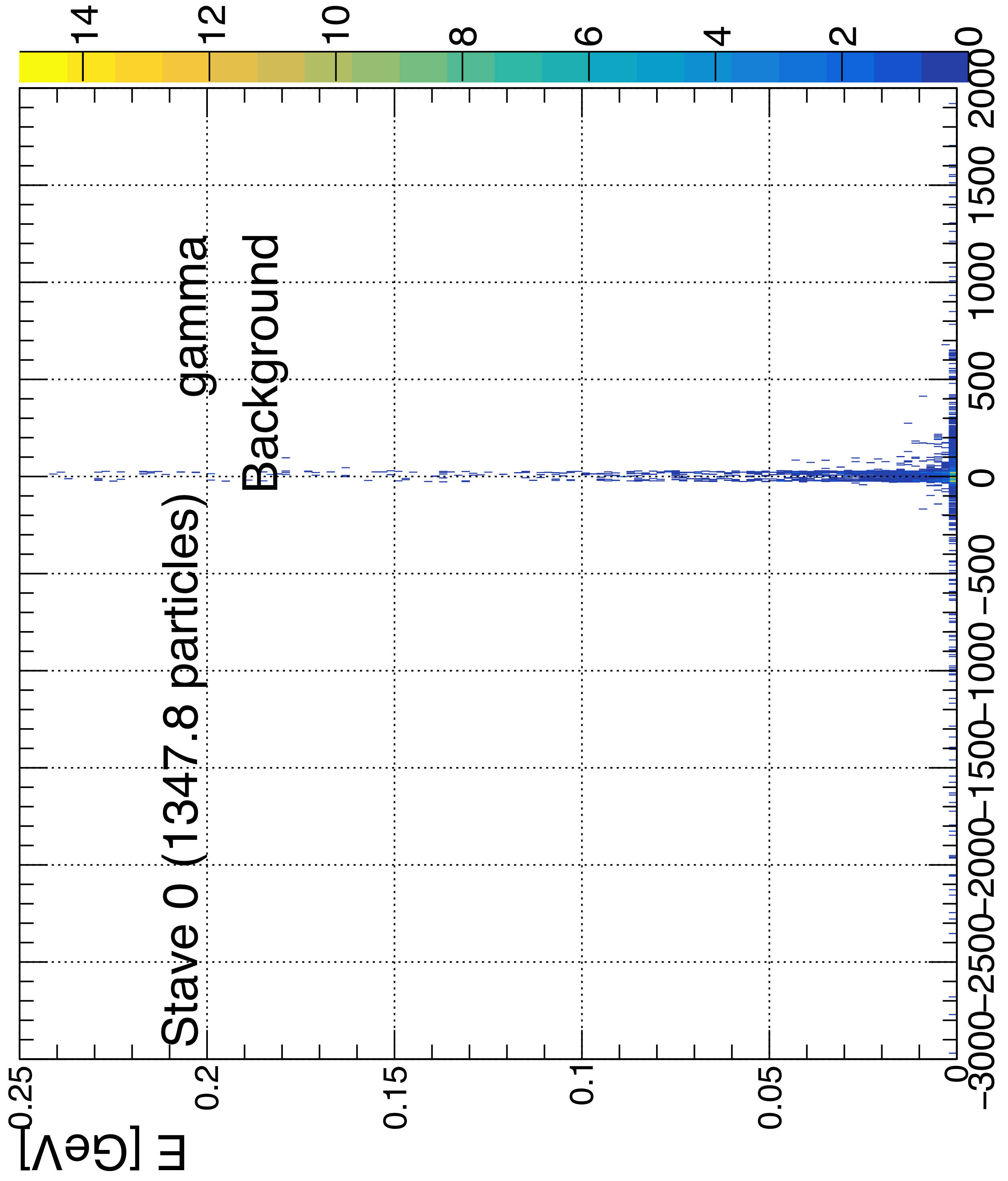


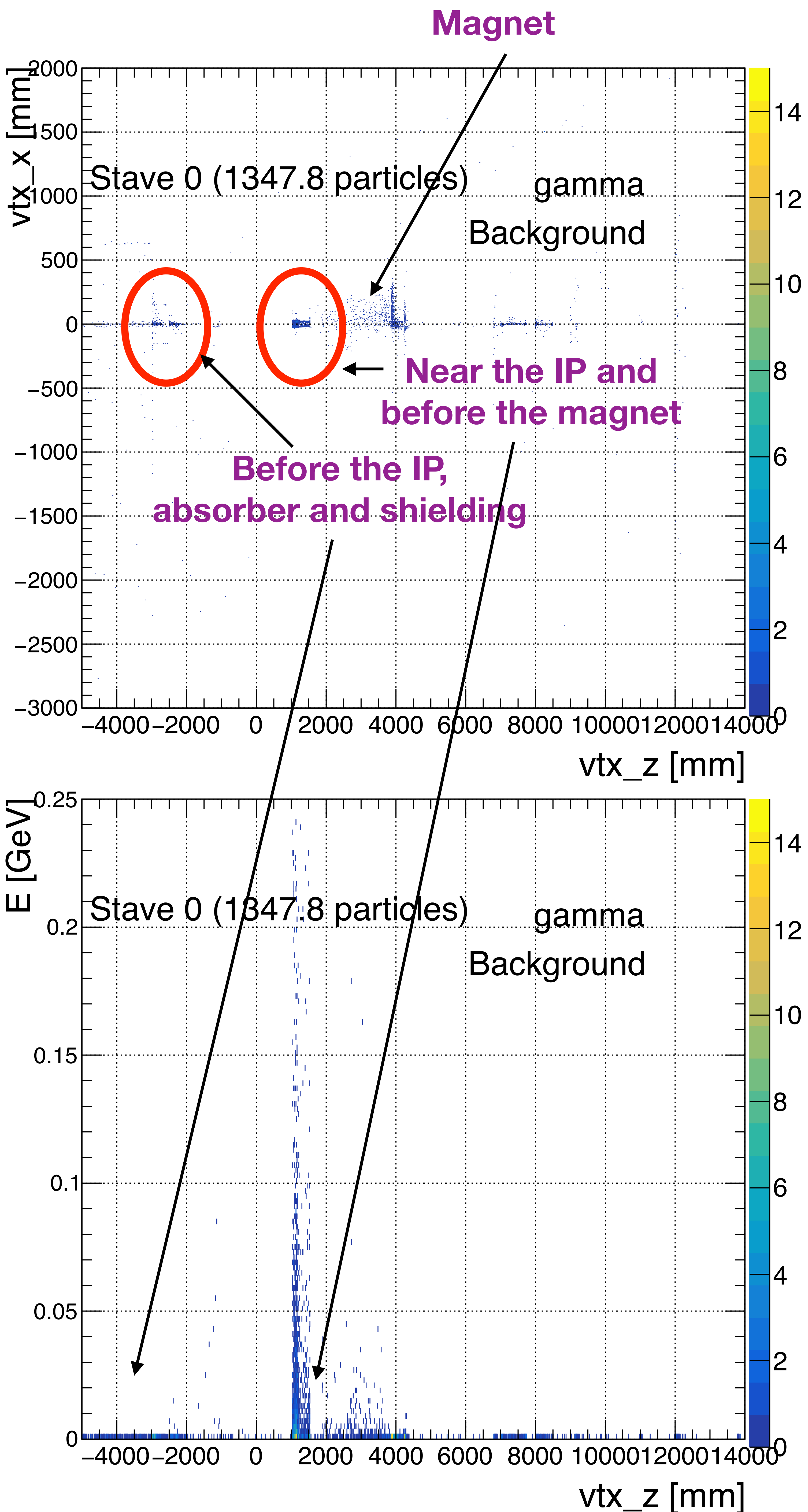
- Very low number of background electrons to see anything conclusive.
  - E < 2 MeV mostly.
- Maximum electrons are coming from the junction of magnet and vacuum chamber.



Photons in Inner Stave, first layer of tracker

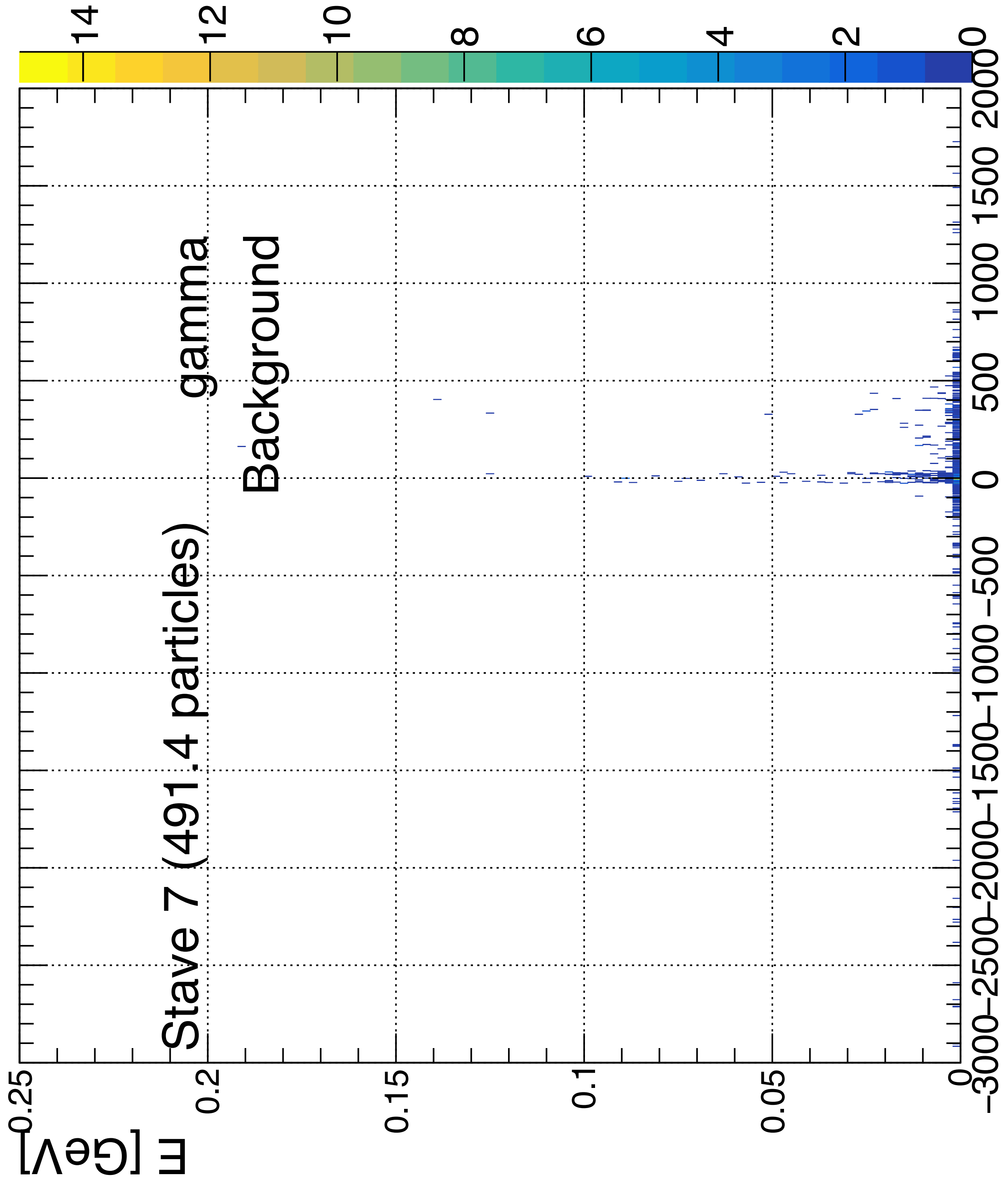
- Again many photons.
  - Many sources of them.

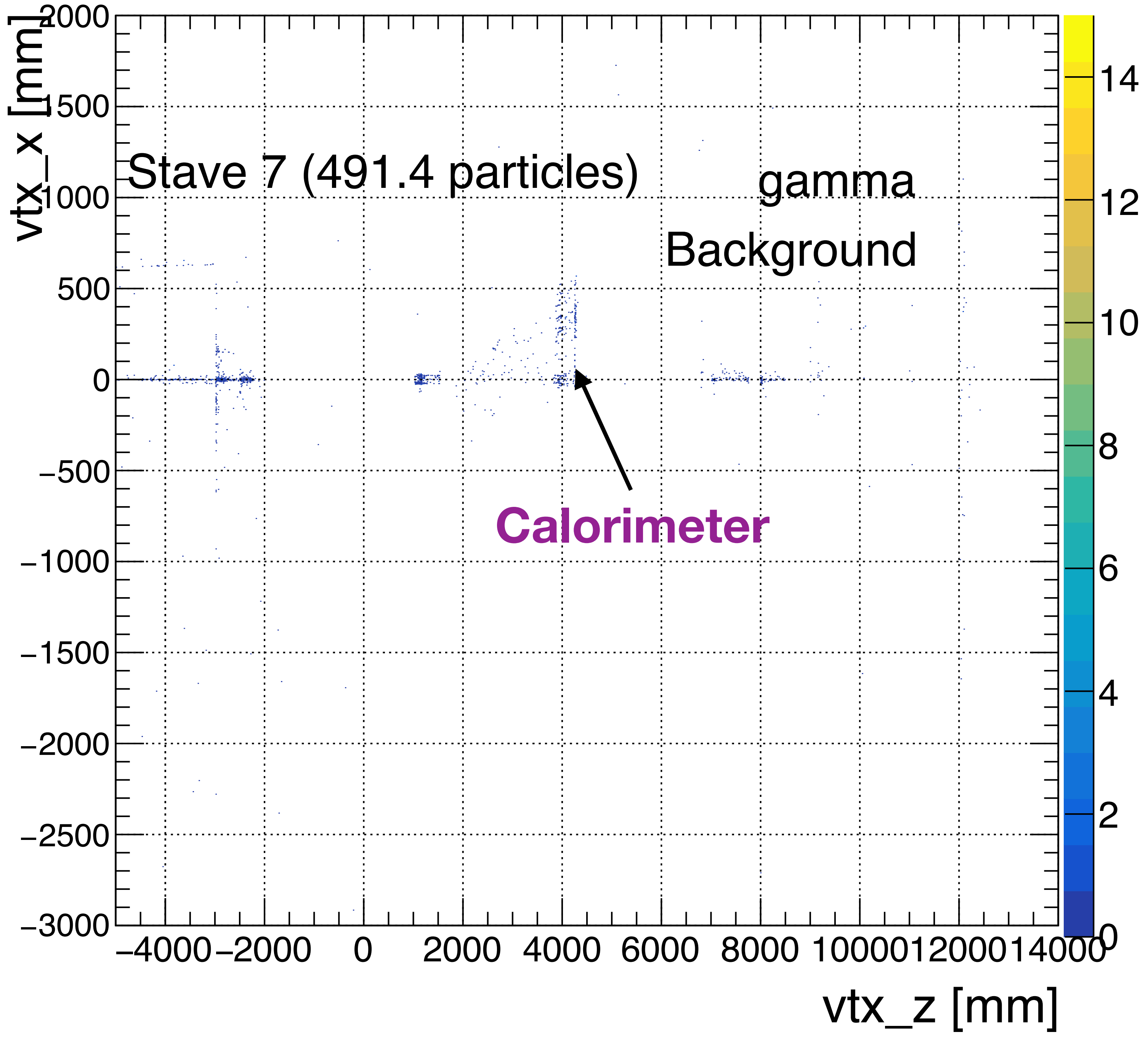


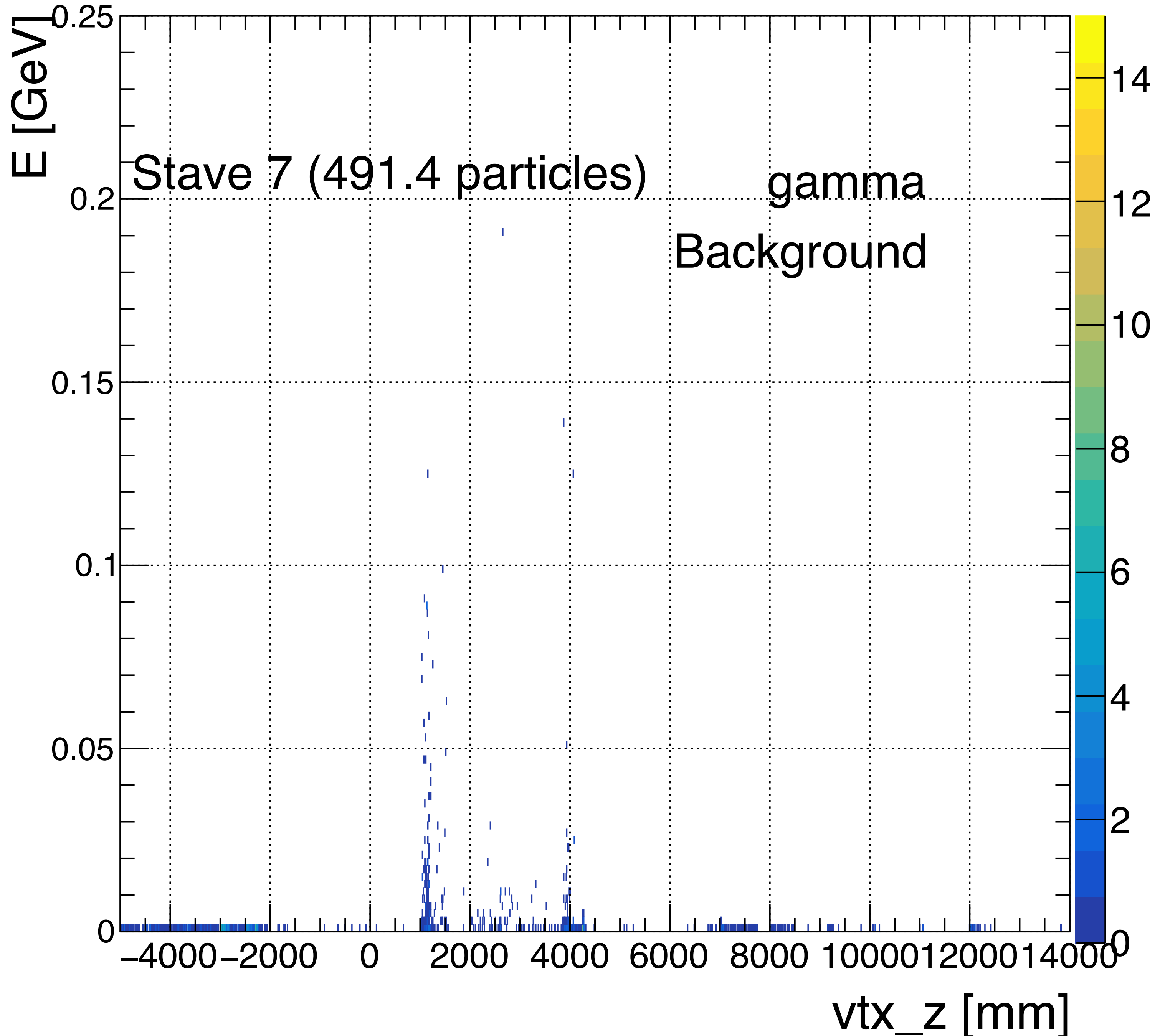


- Some photons from before the IP, but low energetic and low rate.
- High energetic photons are from x=0 and z>1000 and z<1500 mm, after the IP.
- Some are from the magnet.
- Some photons are from the photon converter at z> 8000mm.

Photons in Outer Stave, last layer of tracker







- Not many photons as the first layer.
- Some photons from before the IP, but low energetic and low rate.
- High energetic photons are from x=0 and z>1000 and z<1500 mm, after the IP.
- Some are from the magnet.
- Some photons are from the photon converter at z> 8000mm and shielding at z>7500.