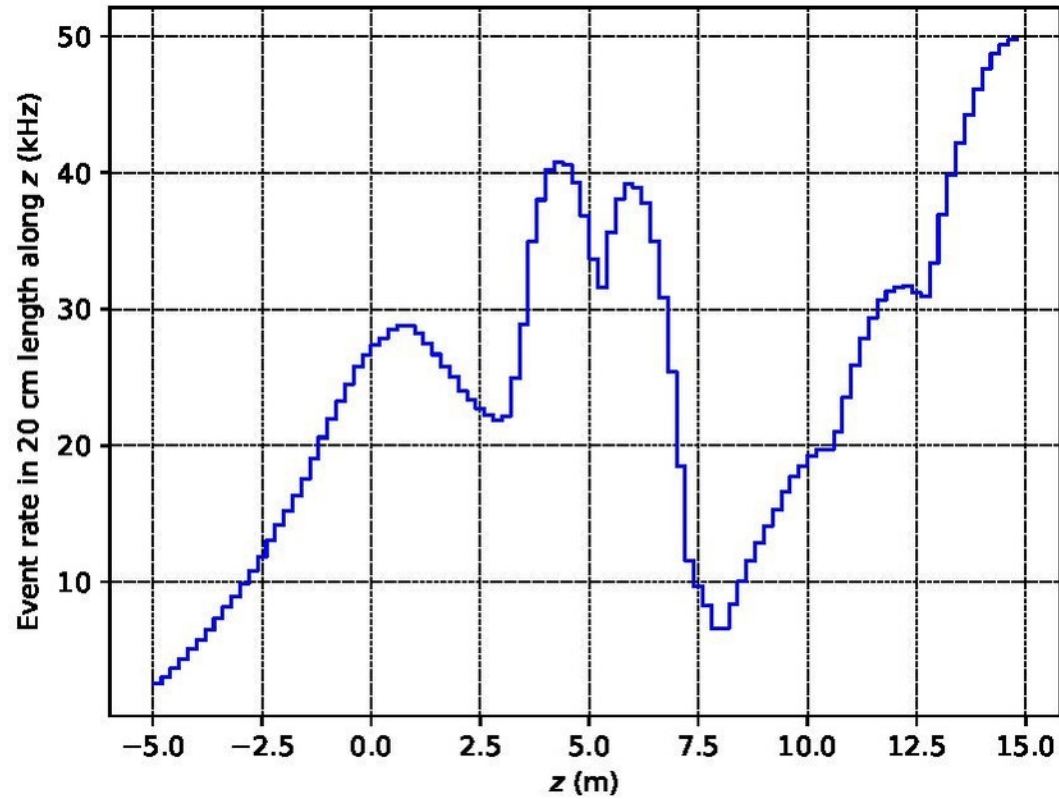


Electron Beam-Gas in EicROOT with a TPC

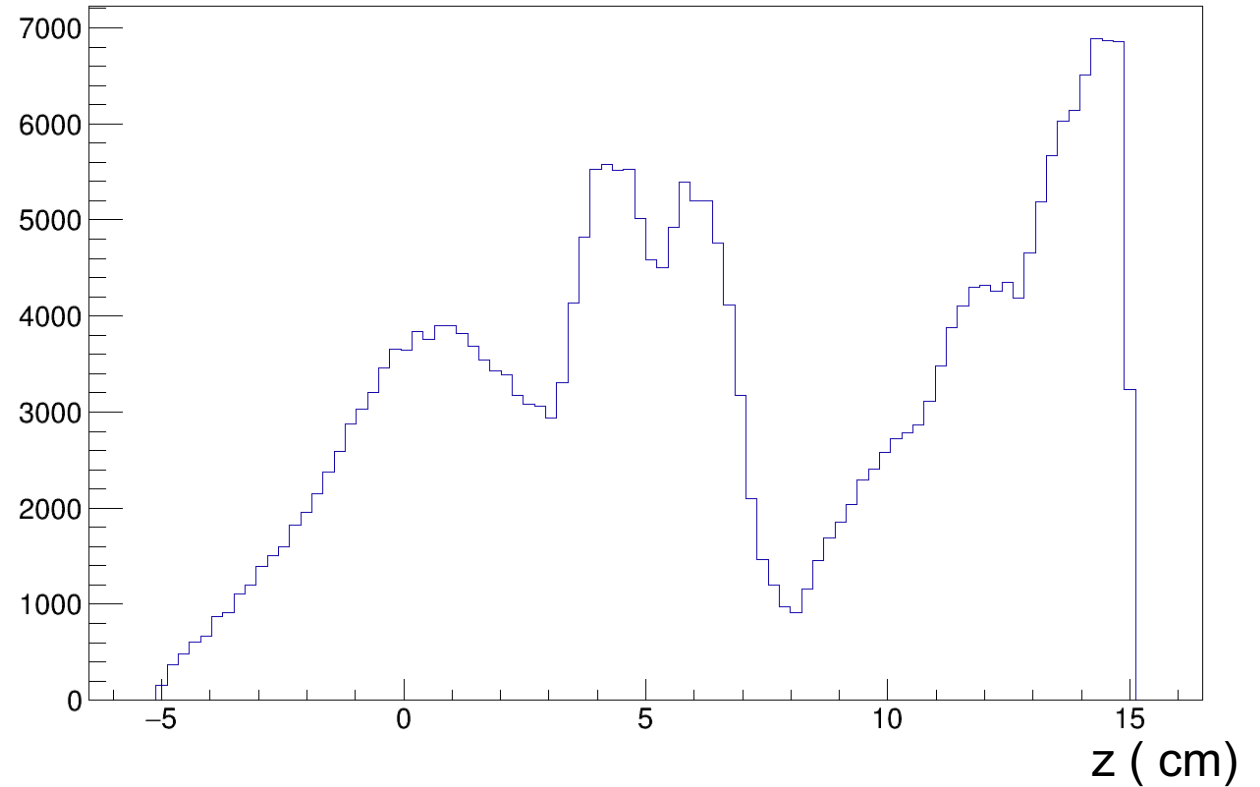
Cheuk-Ping Wong

04-28-2025

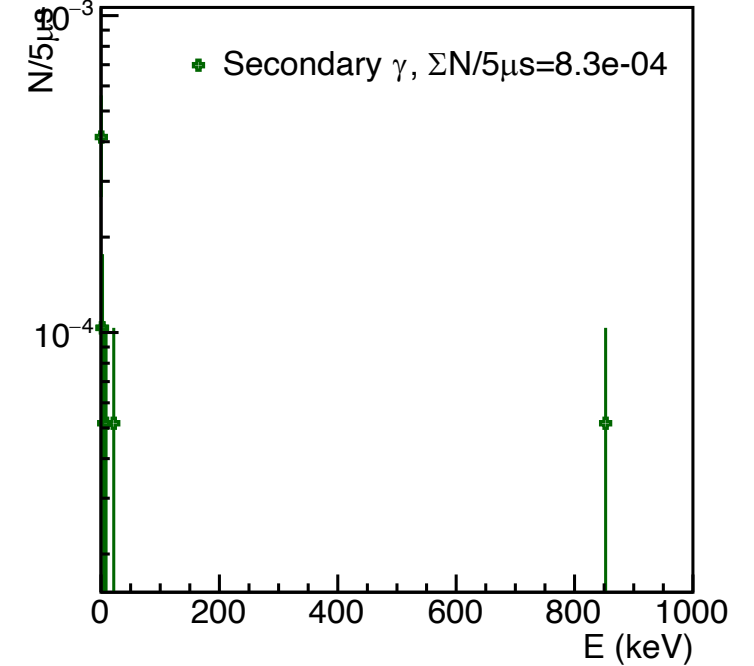
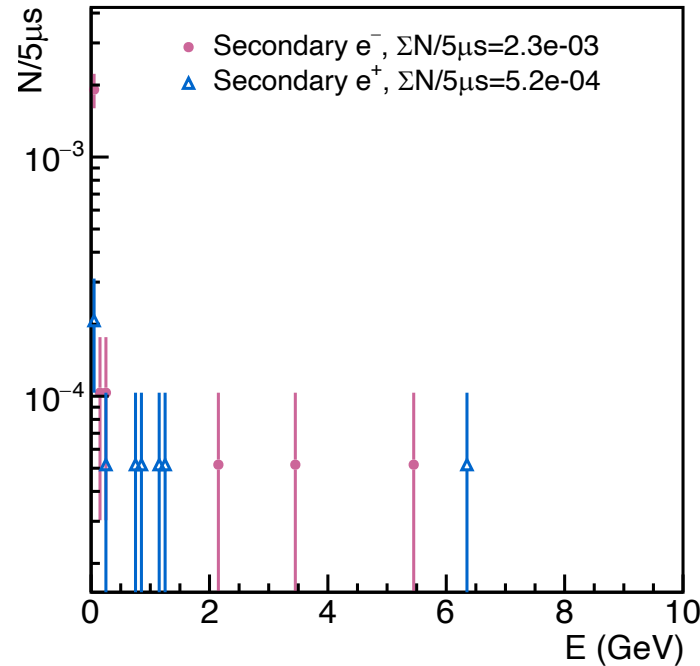
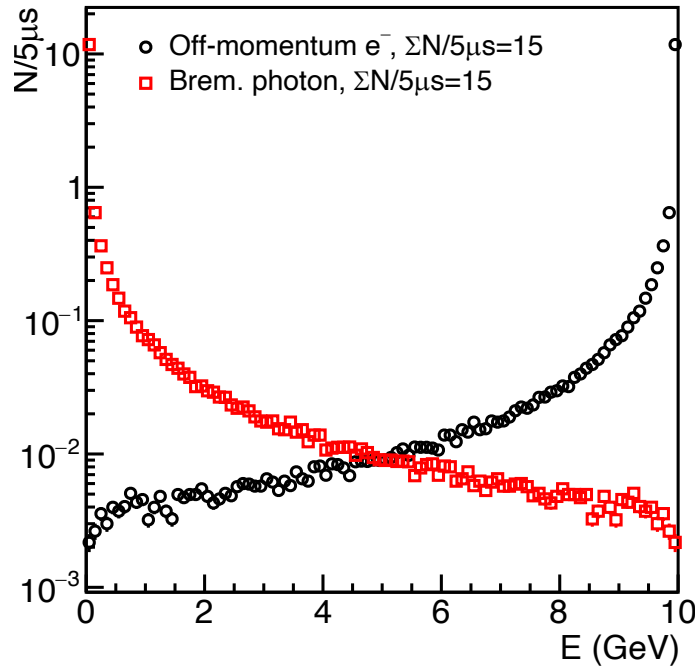
Electron Beam-Gas Vertex z Distribution



Looks good now



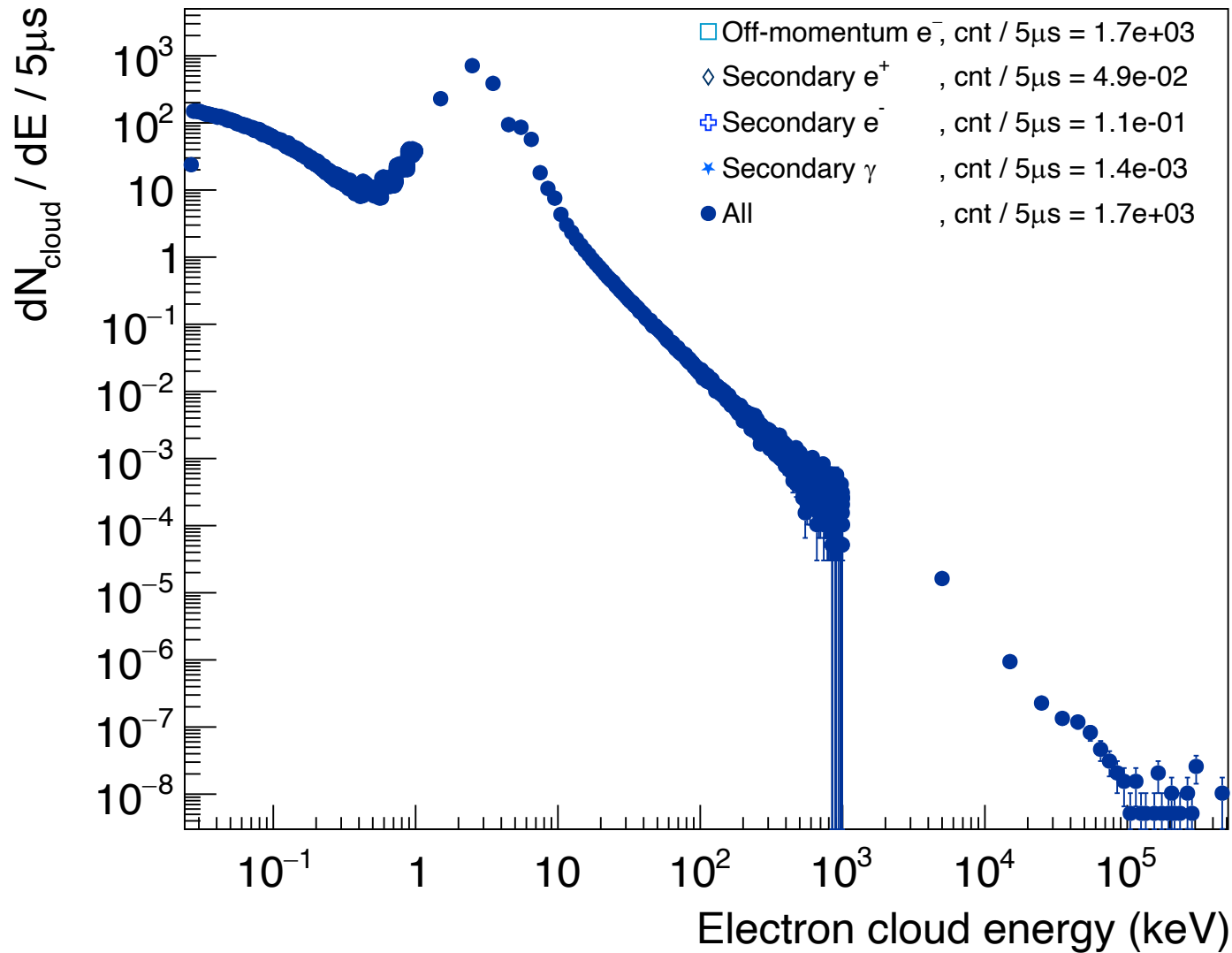
Final Particle Energy Distributions



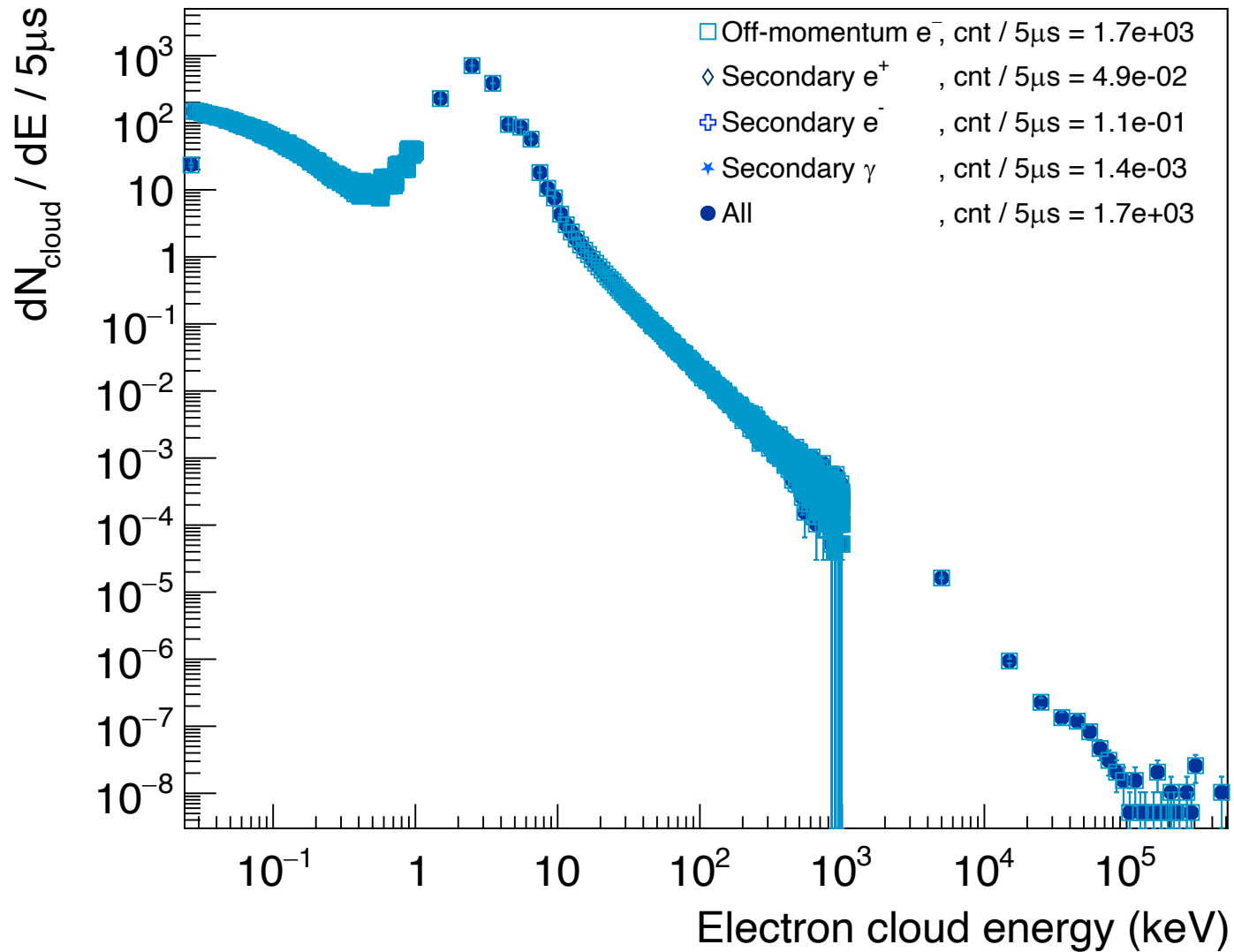
Over $\sim 300k$ events

- Off-momentum electrons generate only 5 secondary photons (0.5 keV -1 MeV)
- Bremsstrahlung photon generate 25 e^+ and e^- (0.5 MeV – 7 GeV)
- Grand daughters: 29 e^- (0.5 - 1.1 MeV) and 11 photon (0.25 – 22 keV)

Electron Cloud Energy Distribution from Electron Beam-gas

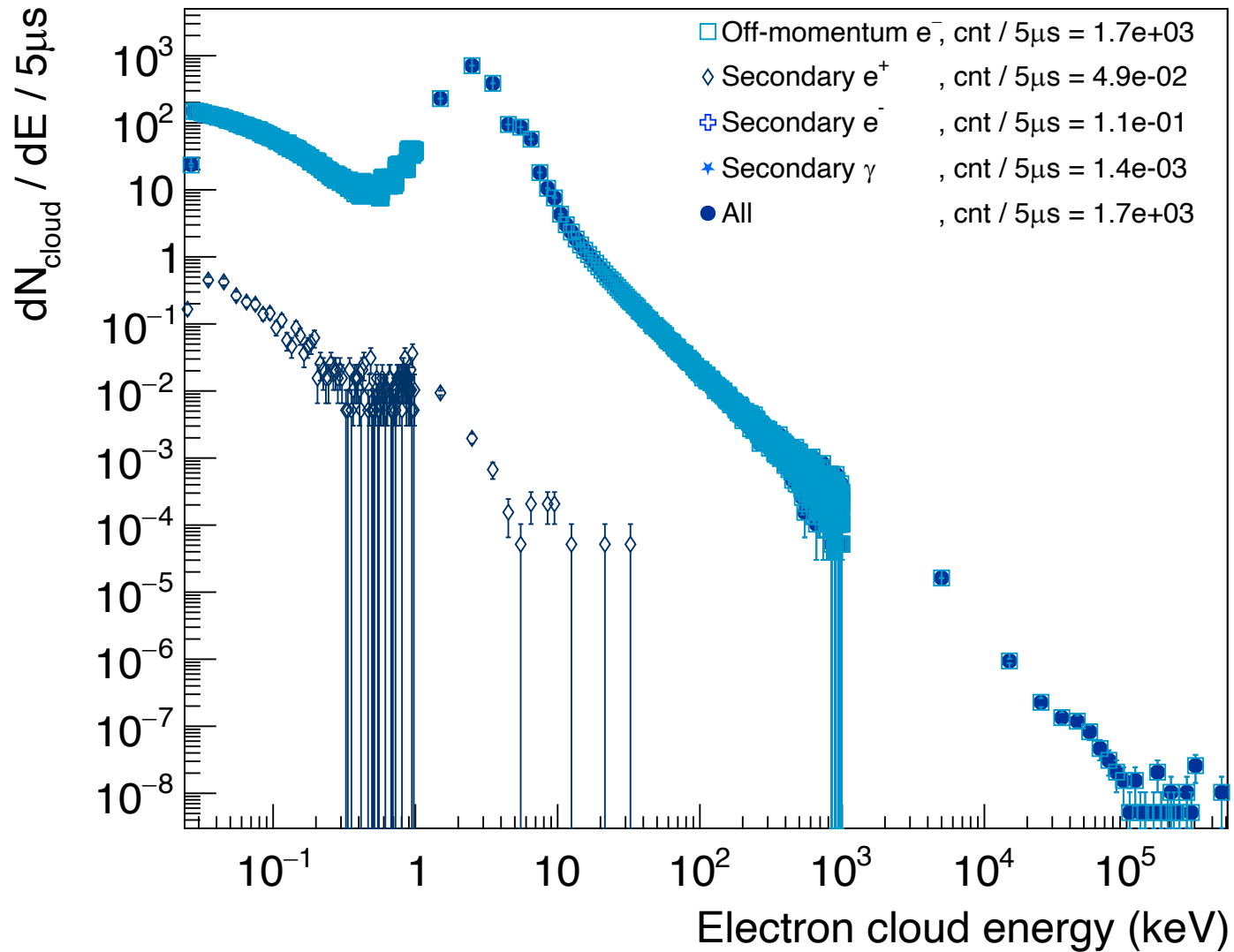


Electron Cloud Energy Distribution from Electron Beam-gas

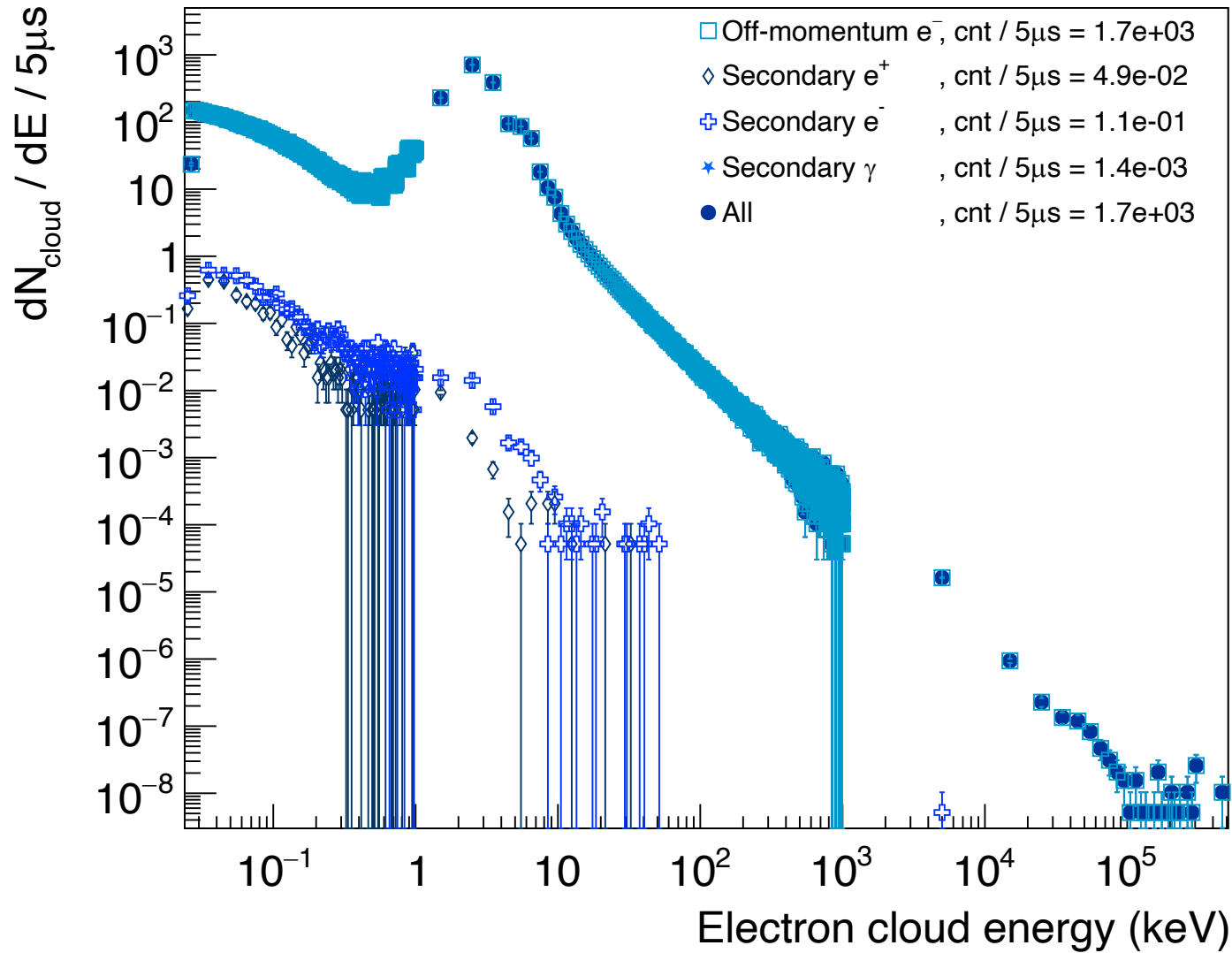


The off-momentum electrons generate the majority of TPC hits

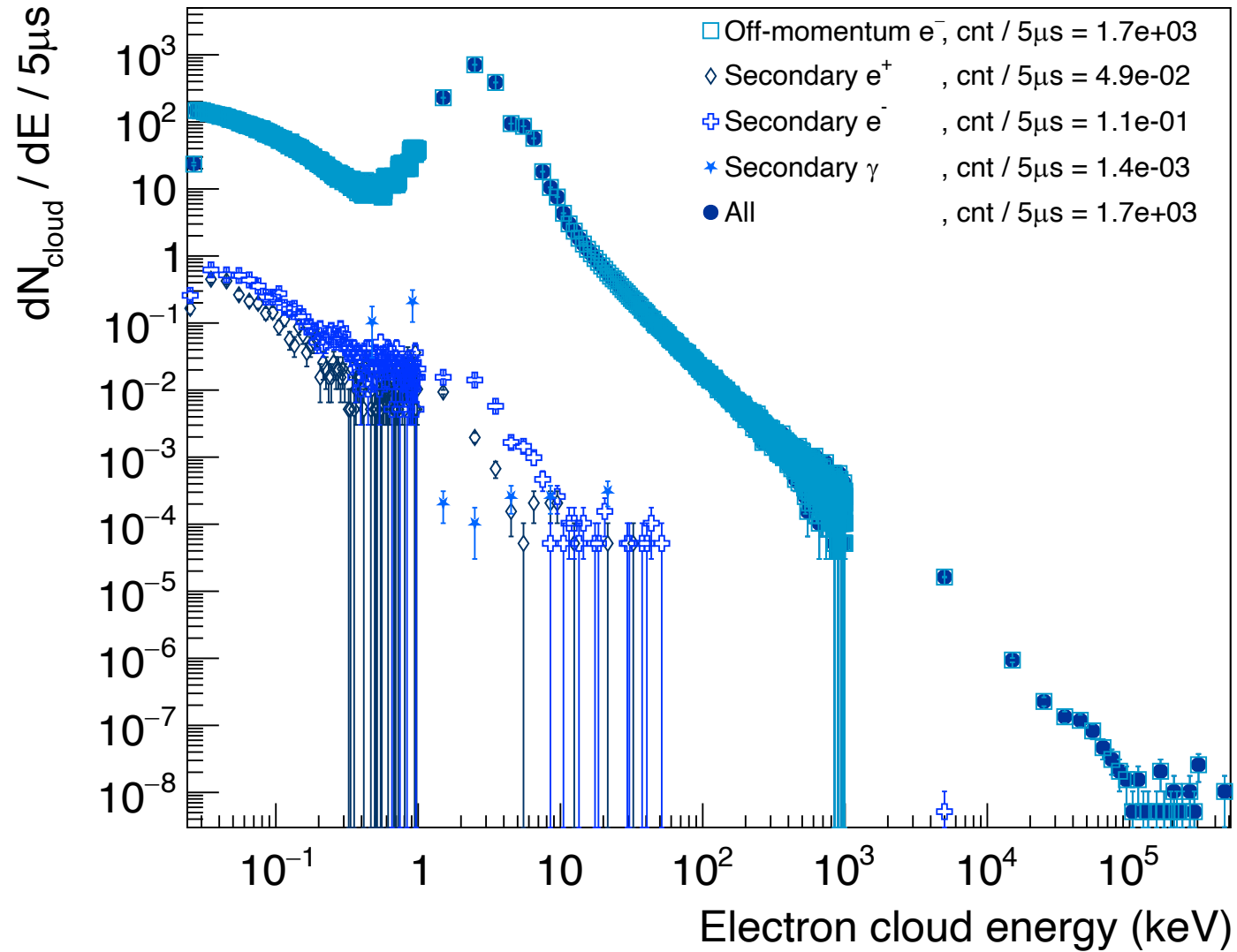
Electron Cloud Energy Distribution from Electron Beam-gas



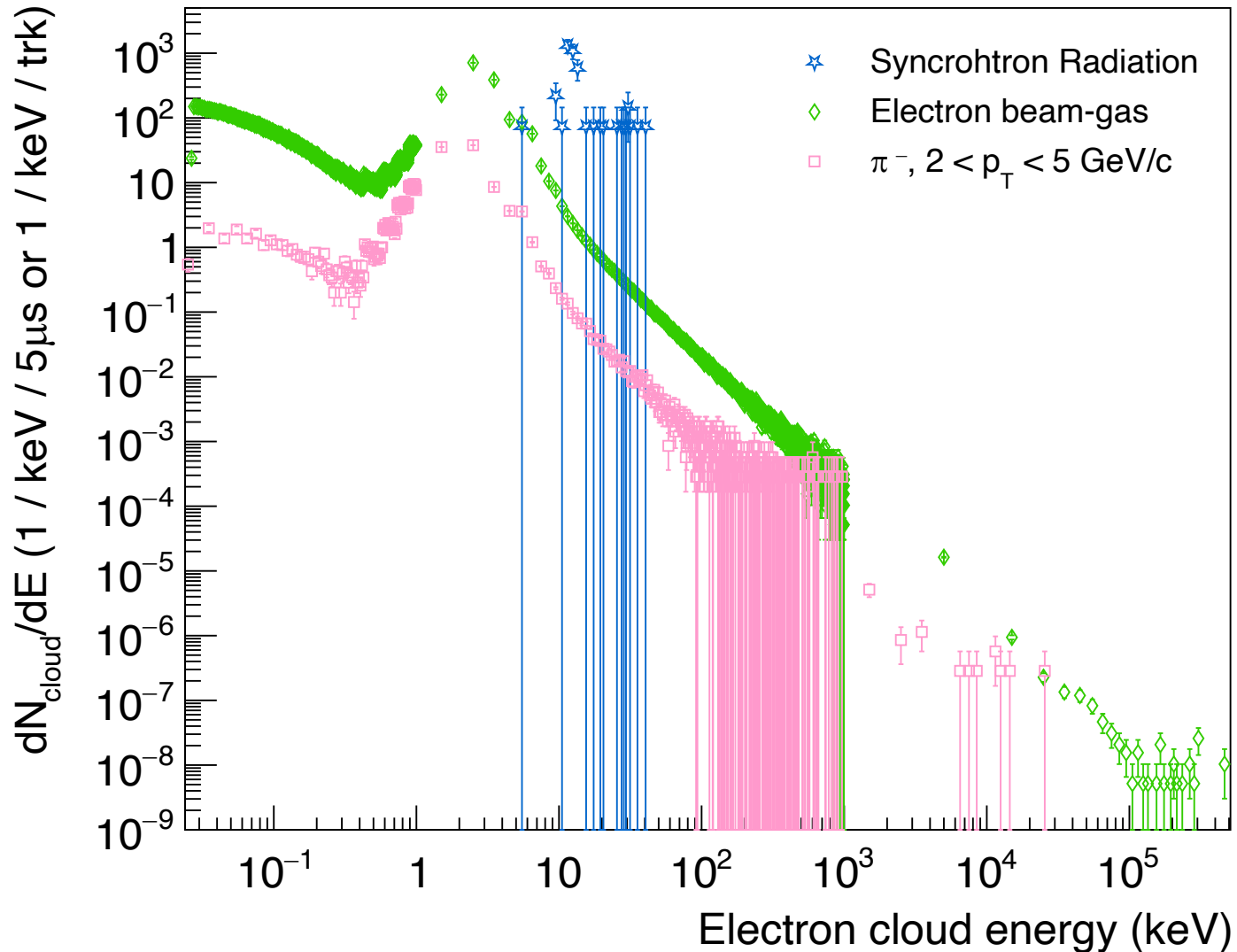
Electron Cloud Energy Distribution from Electron Beam-gas



Electron Cloud Energy Distribution from Electron Beam-gas



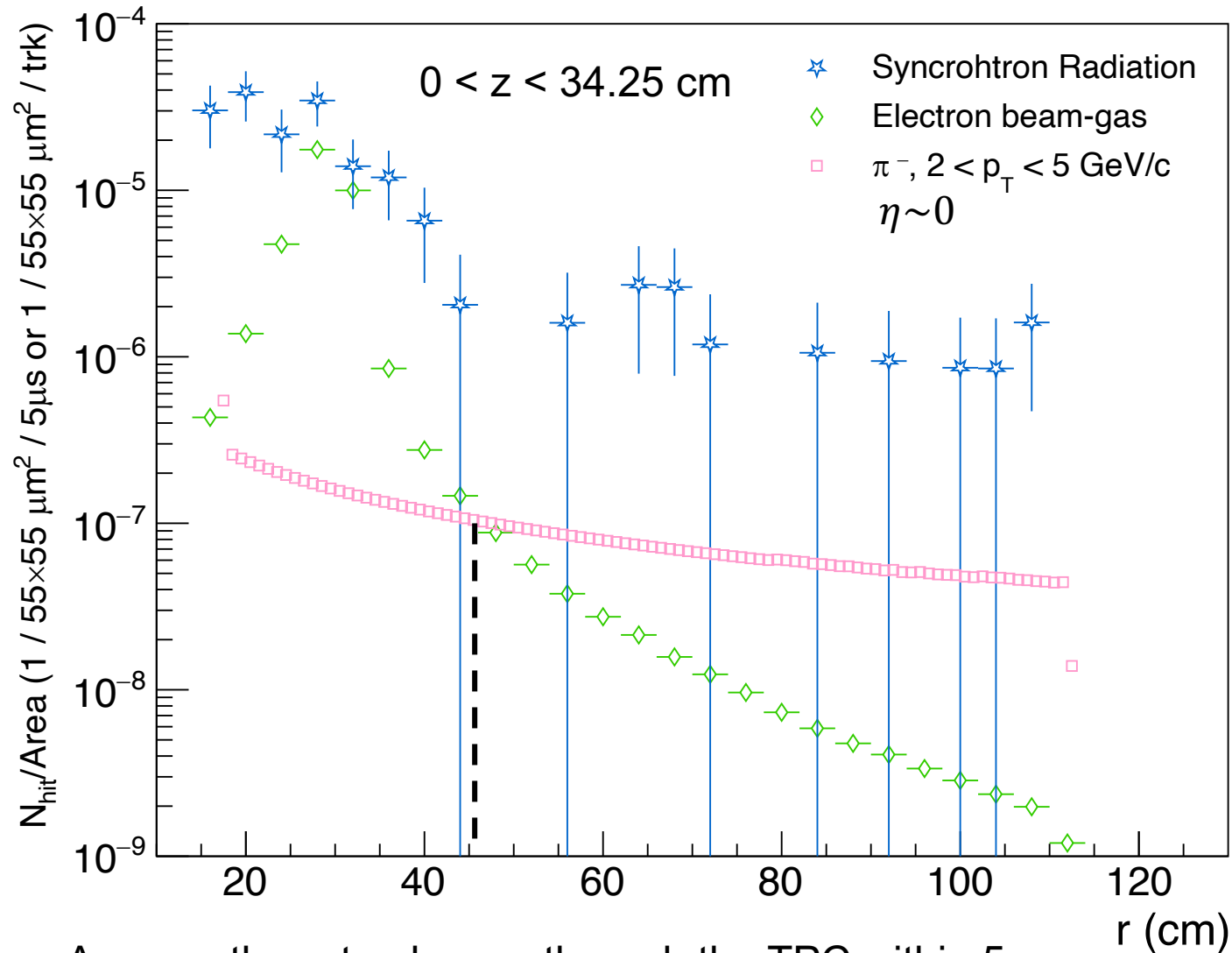
Electron Cloud Energy Comparison



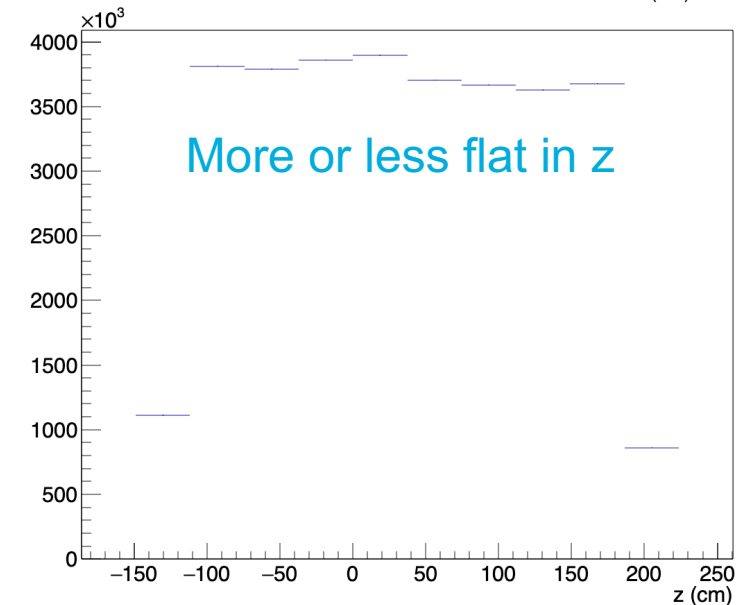
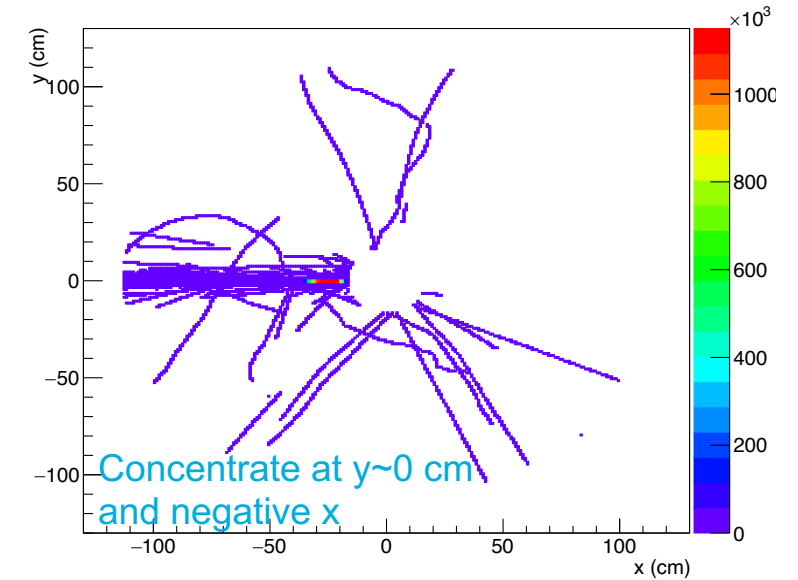
Cloud energy spectrum from electron beam-gas background overlaps with the spectrum from signal

→ Cannot remove electron beam-gas background by excluding certain cloud energy range

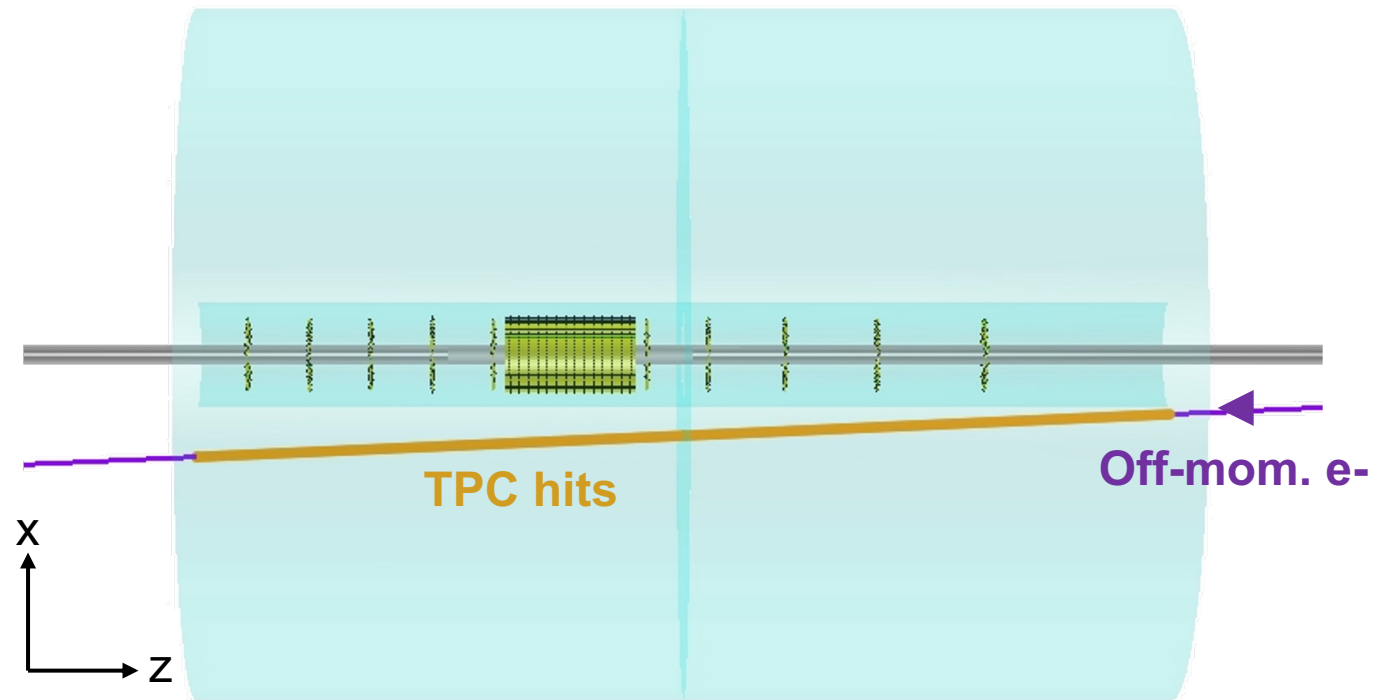
Hit Density Comparison



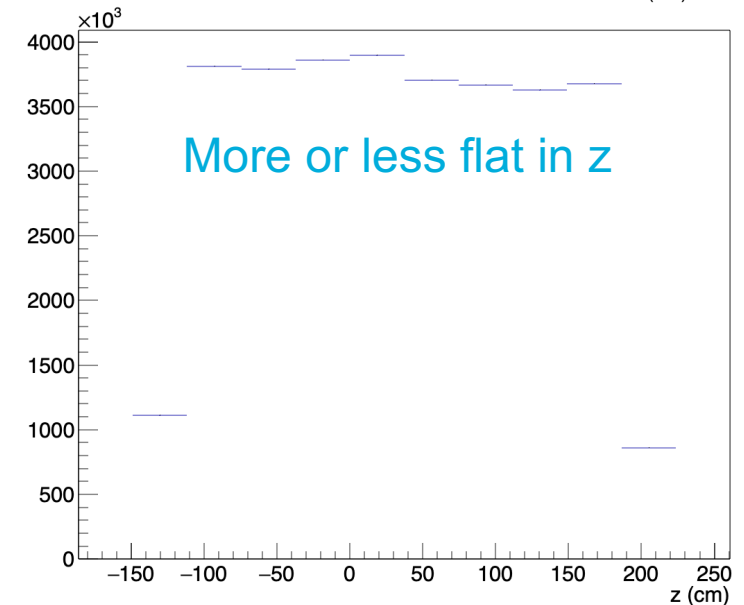
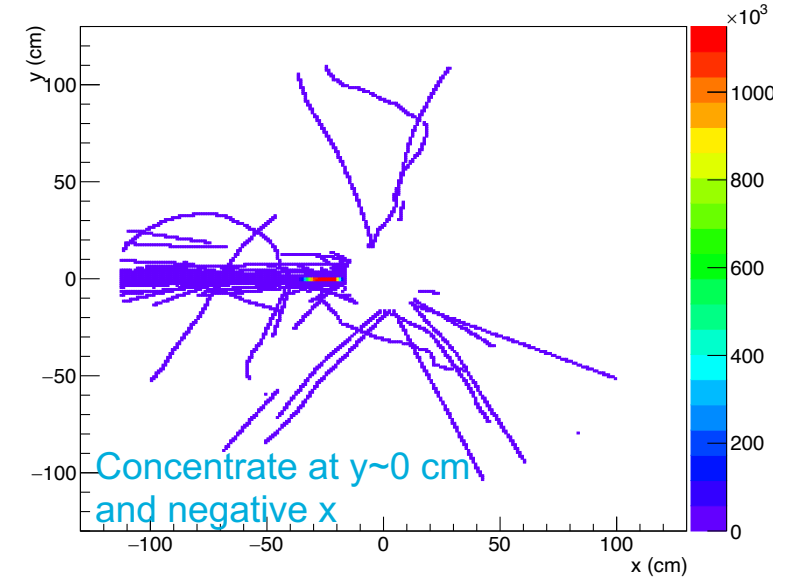
Hit distributions from electron beam-gas



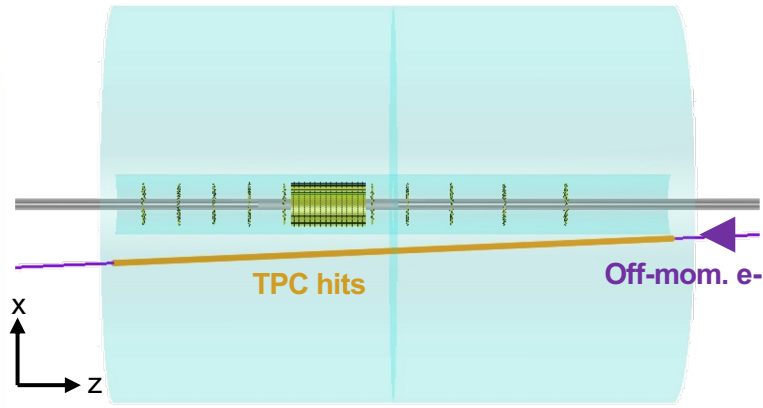
Hit distributions from electron beam-gas



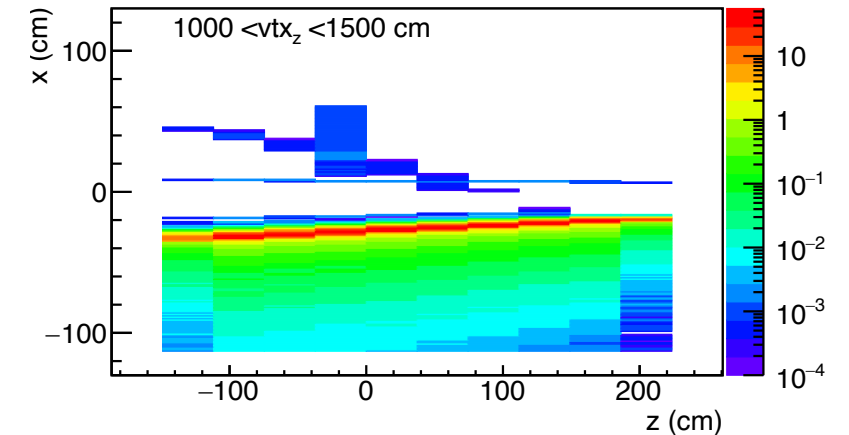
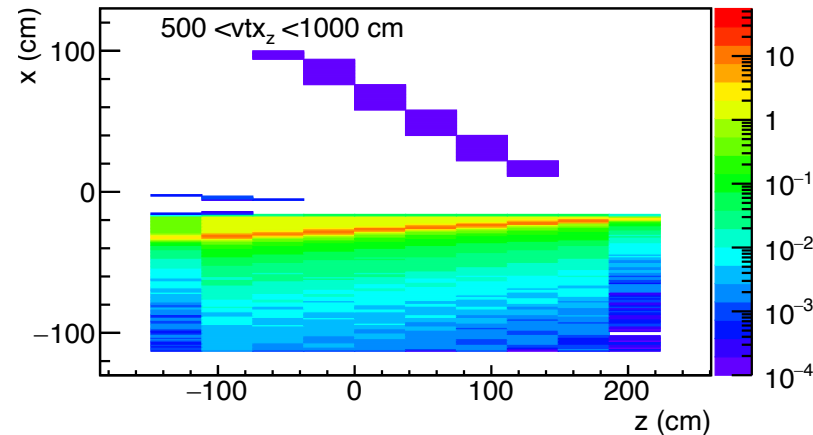
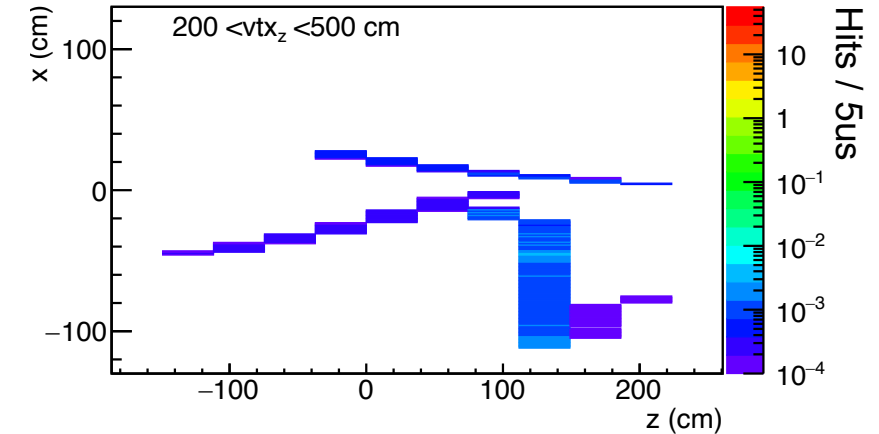
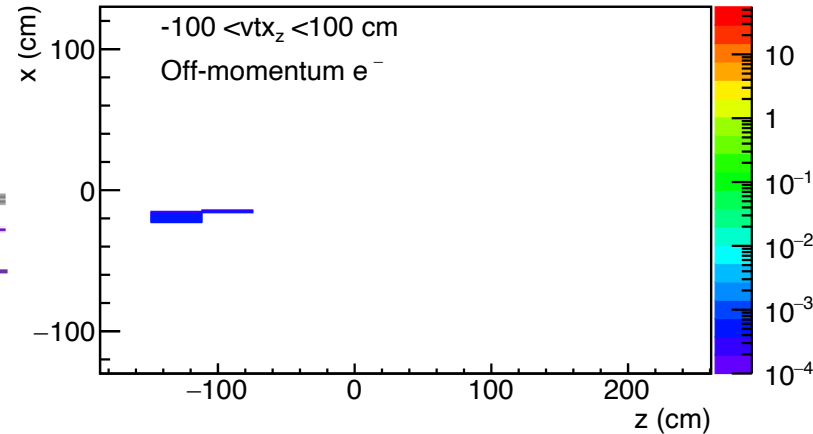
<0.25% of electron beam-gas events have hits in both silicon trackers and the TPC



Hit Maps with Different Beam-Gas Vertex z



- Beam-gas events originated very upstream ($vtx_z > 5$ m) contribute to the majority of TPC tracks

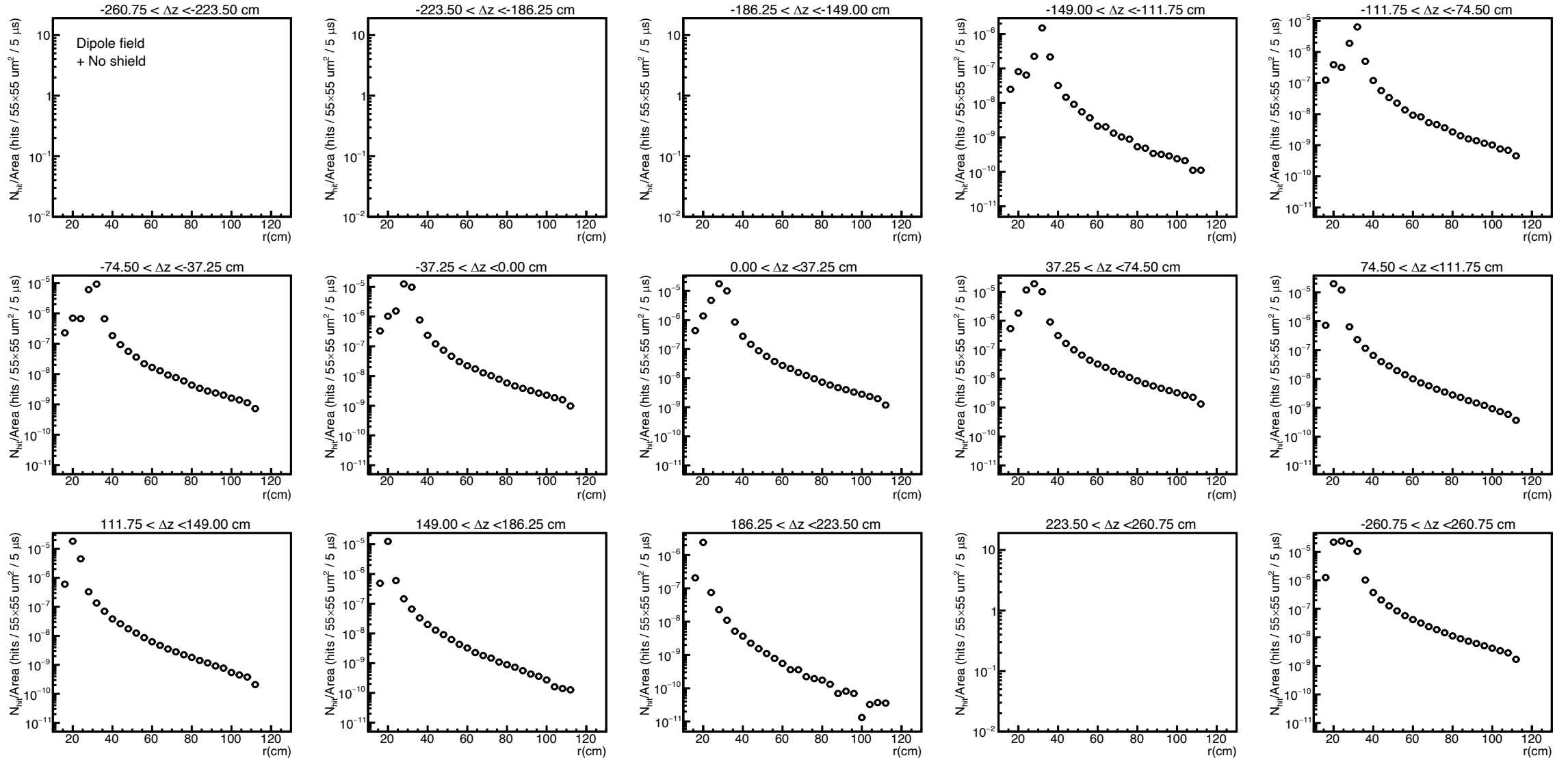


Summary

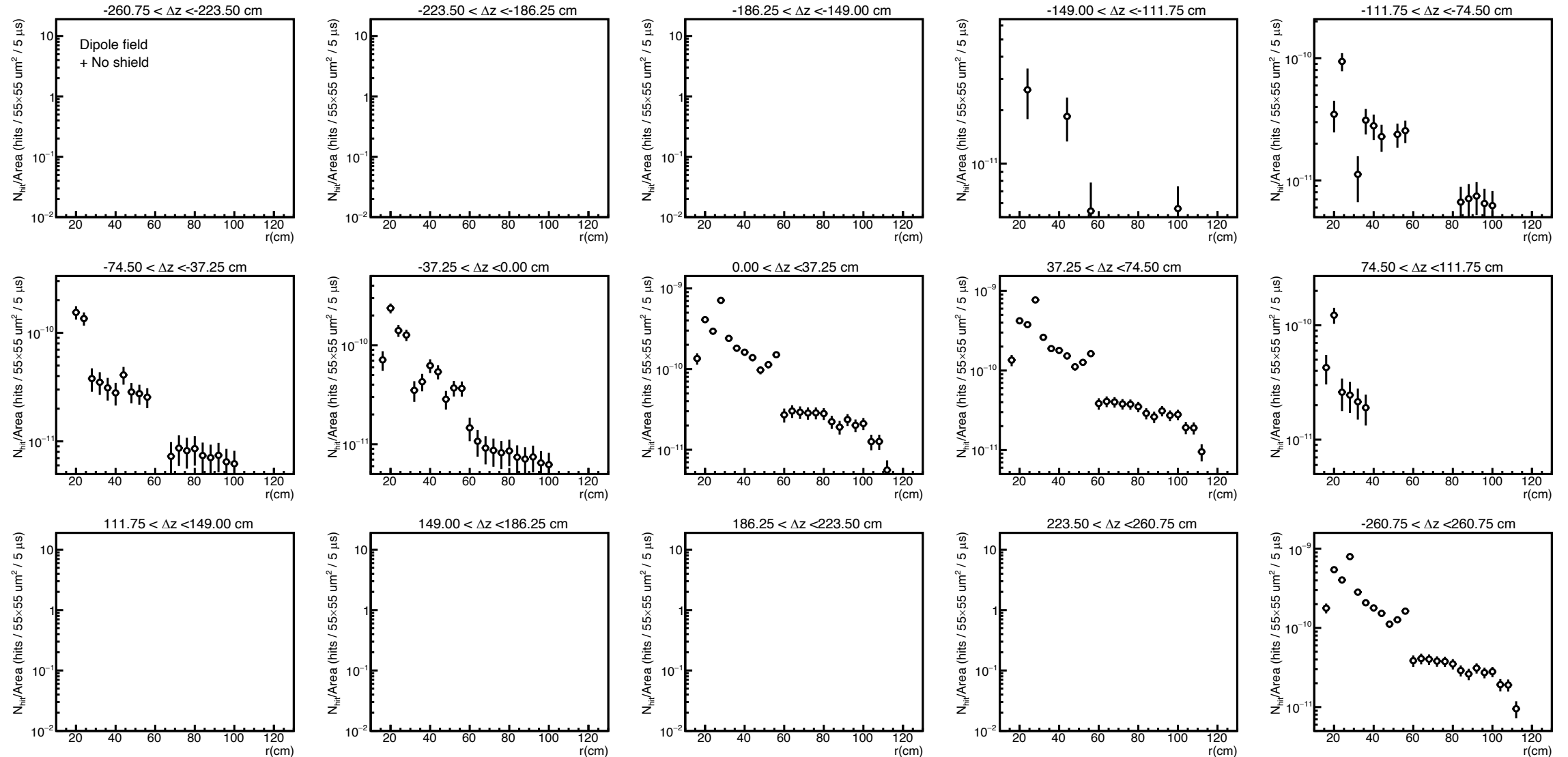
- Electron cloud energy from electron beam-gas events has a similar distribution as single track in GeV scale
- Hit density from electron beam-gas concentrate at small r and peak at $r \sim 30\text{cm}$
- Most of the TPC track from electron beam-gas has a vertex $z > 5\text{ m}$

Back Up

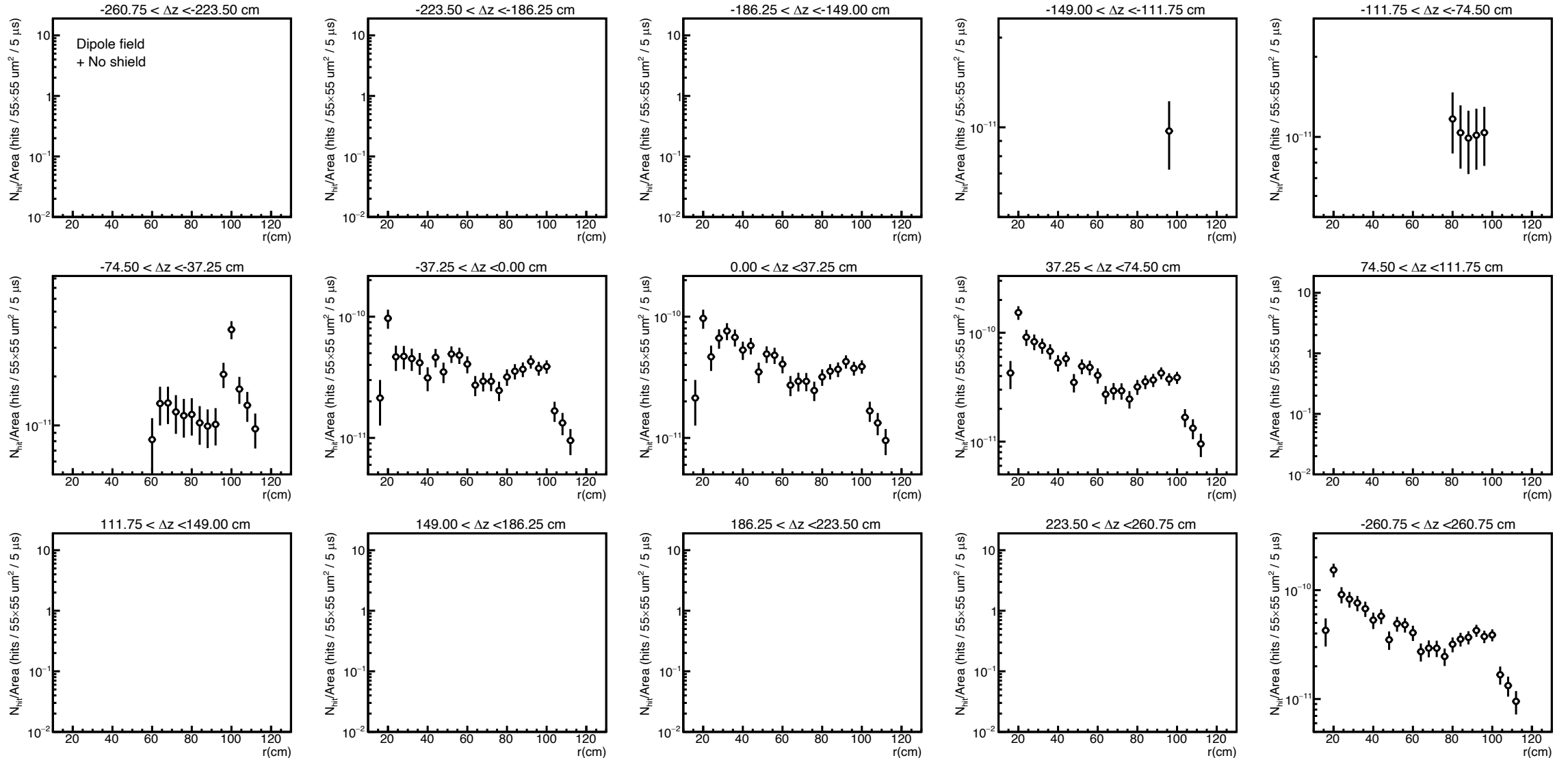
Off-Momentum Electrons



Secondary Electrons



Secondary Positrons



Secondary Photon

