Background frame at EMC (view from FastSim)

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Background frame

- Latest full sim production finished on ~Dec. 1st.
  - Extended final focus model to ±16 m, and, for background frame, to ±8 m (was ±3 m in 2010).
  - Updated physics list in G4.
  - Lowered the neutron interaction energy threshold from 2MeV to less than 1keV.
- 953500 beam crossings are produced (~4.75ms) for RadBhabha.
- Background frame TTree contains two arrays of TParticles
  - “Particles”: any particles that cross the envelope around the beam pipe/final focus.
  - “NeutronInt”: every single neutron step that produces energy deposition in any part of the detector.
- FastSim tracks both sets of TParticles, except neutrons in “Particles”. For “NeutronInt”, each energy deposition entry is converted to photon in FastSim in order to catch all its energy.

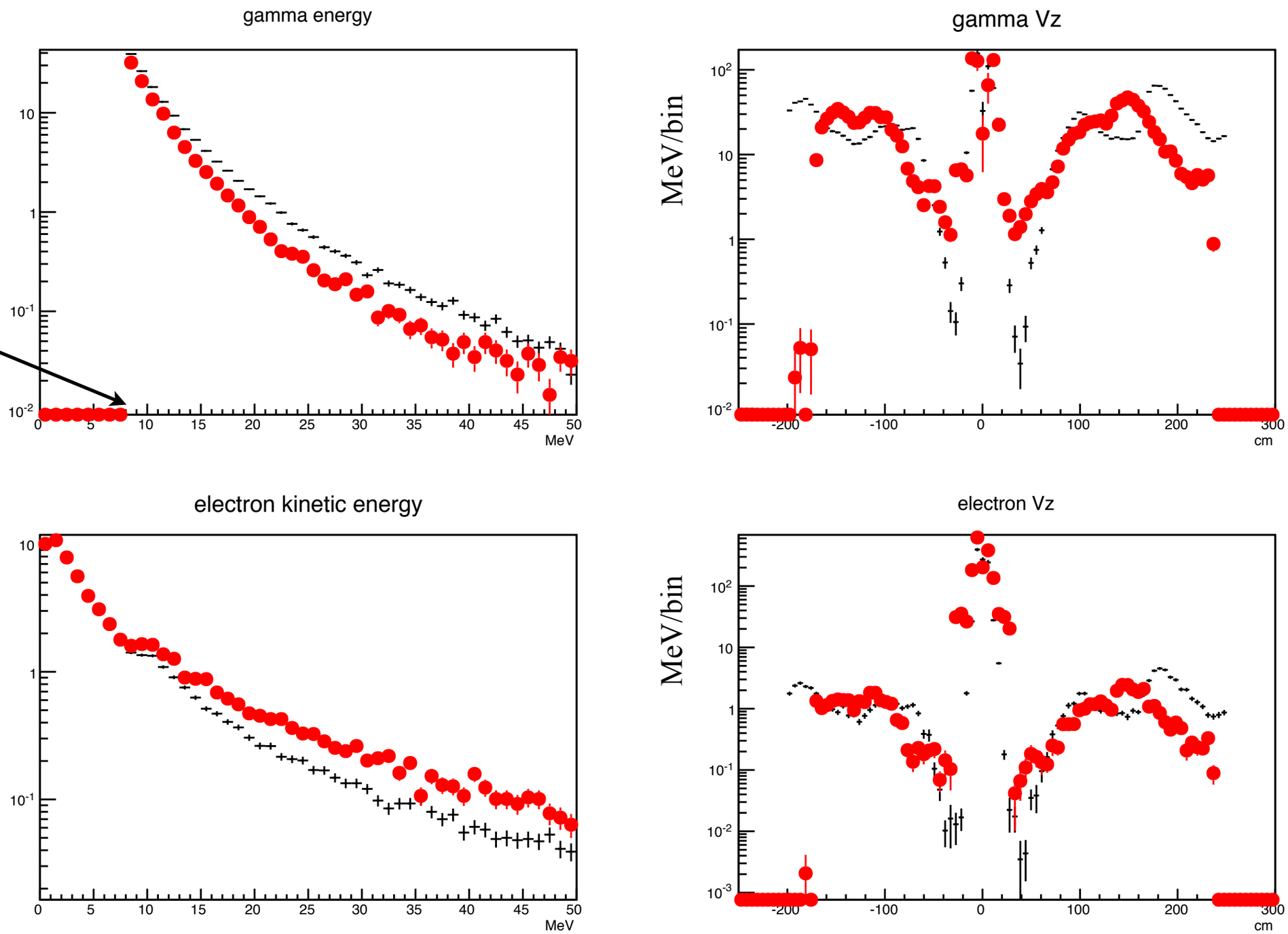
New / Sep.2010 background frames

"Particles" spectrum, normalized to 200 beam crossings

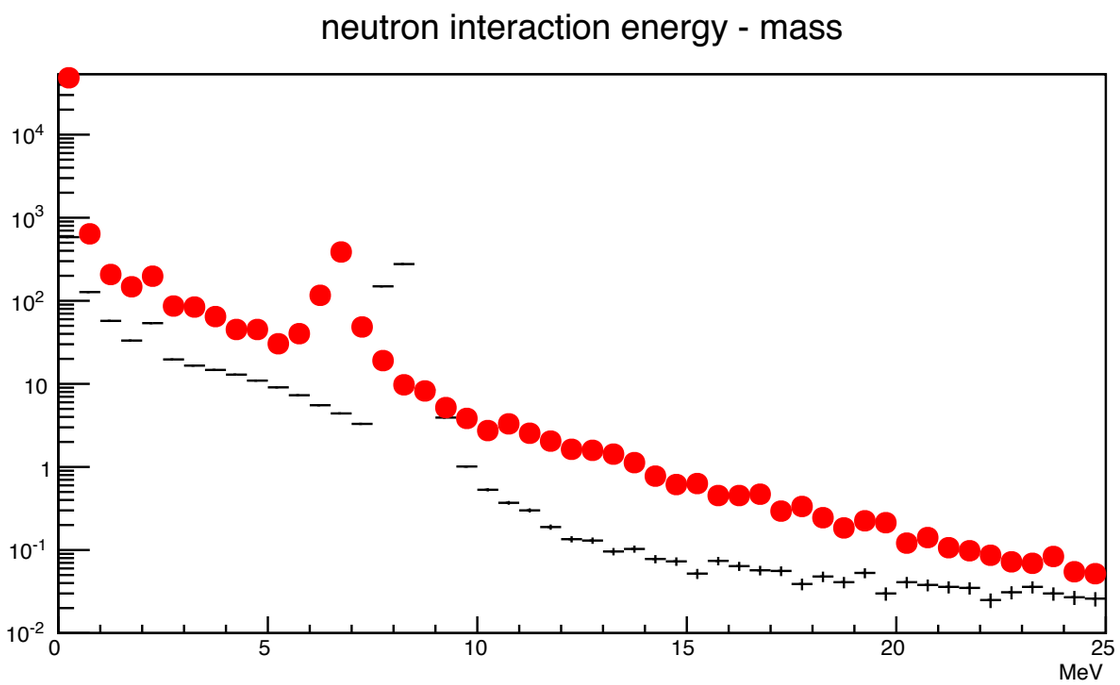
● Nov.2011

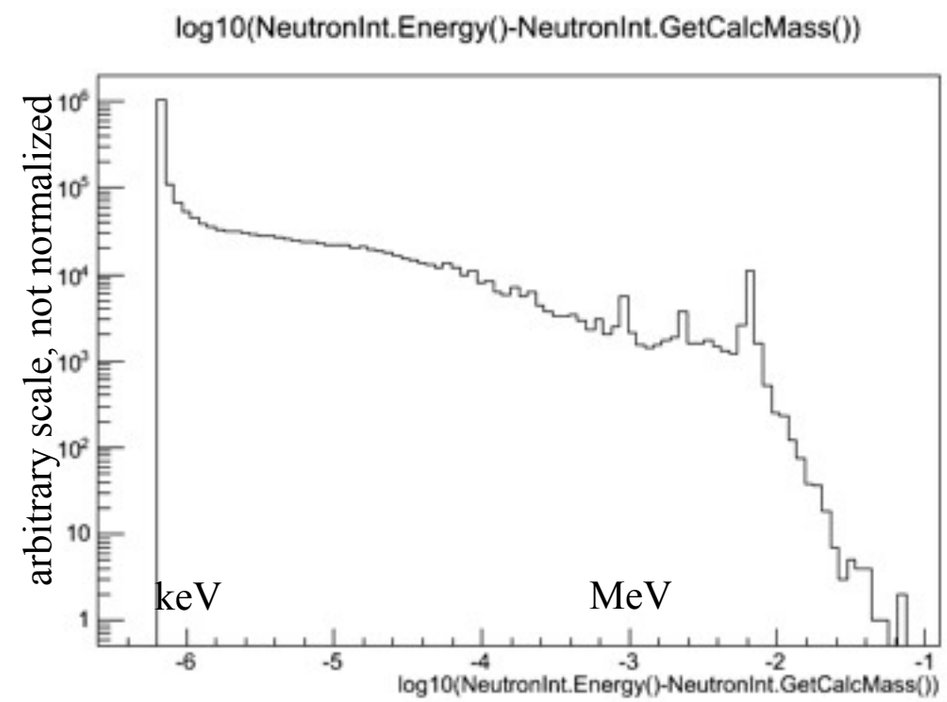
\+ Sep.2010

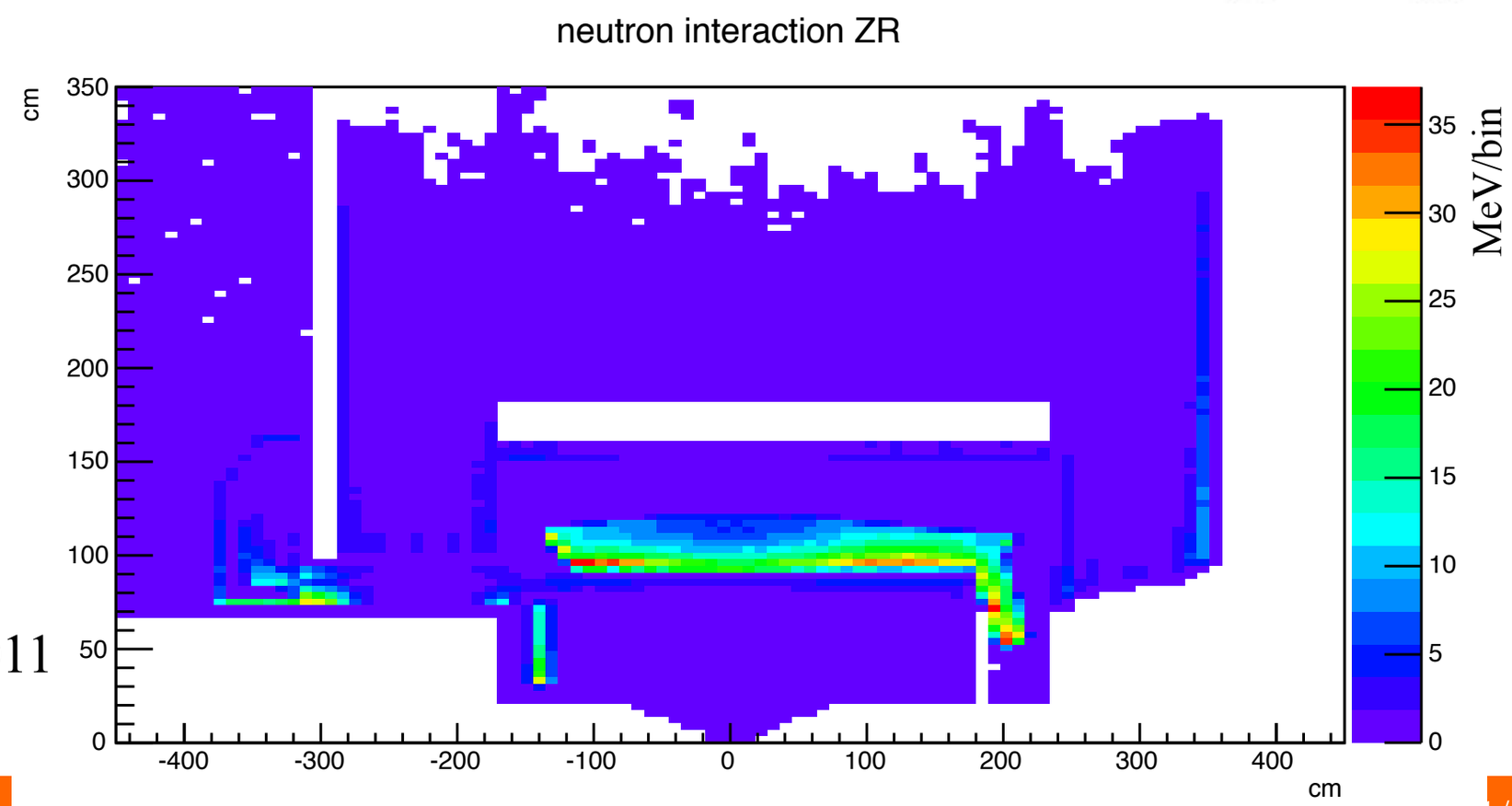
8 MeV, too high?



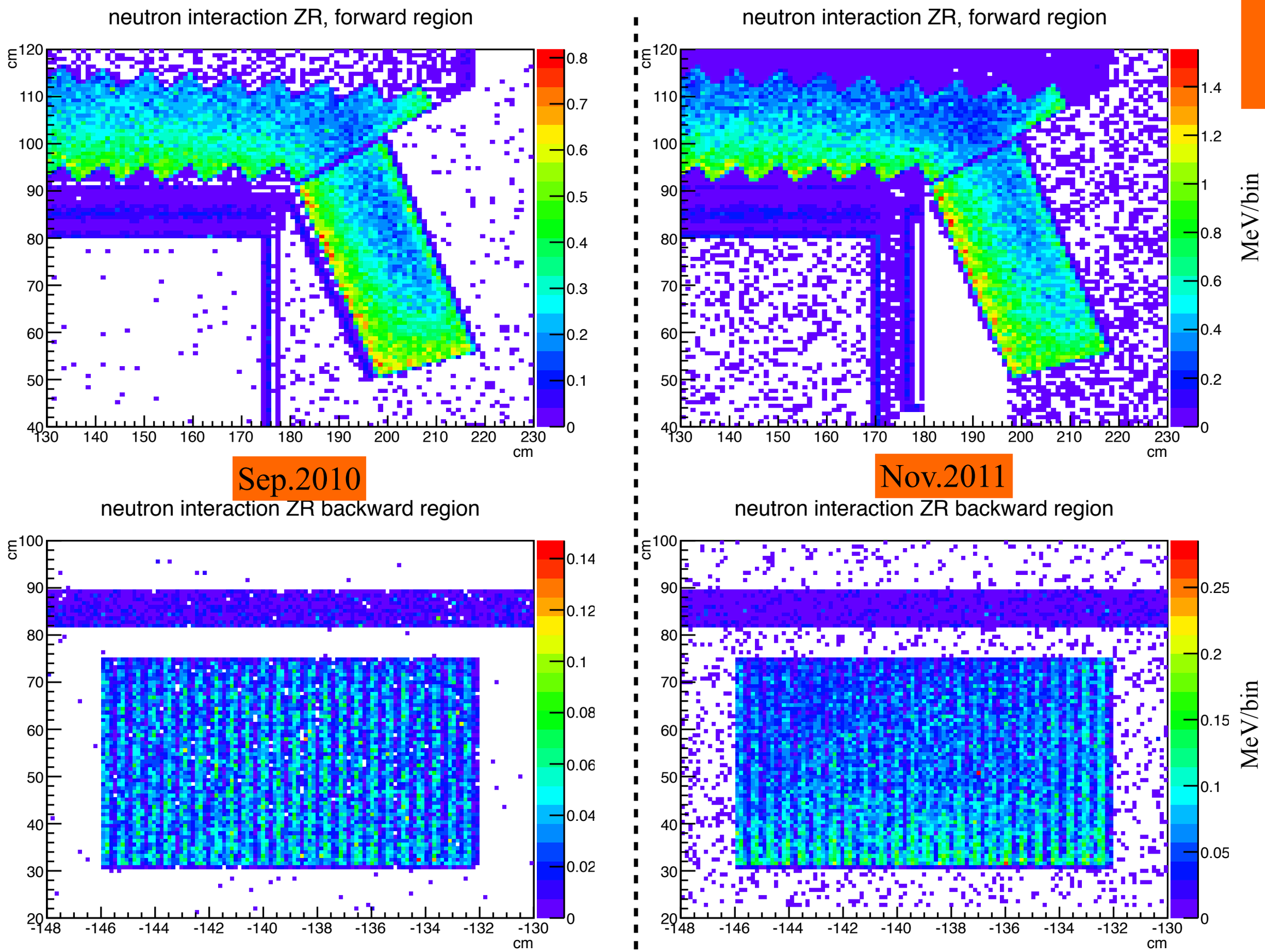
“NeutronInt”







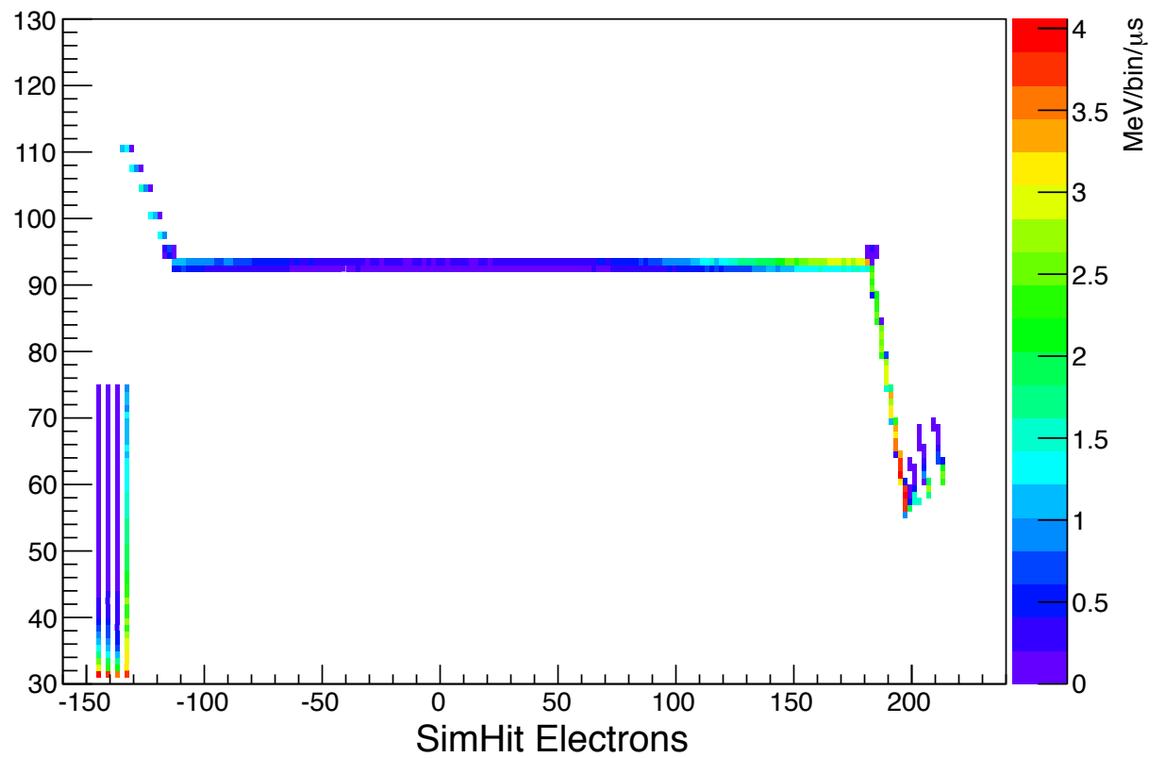
Nov.2011

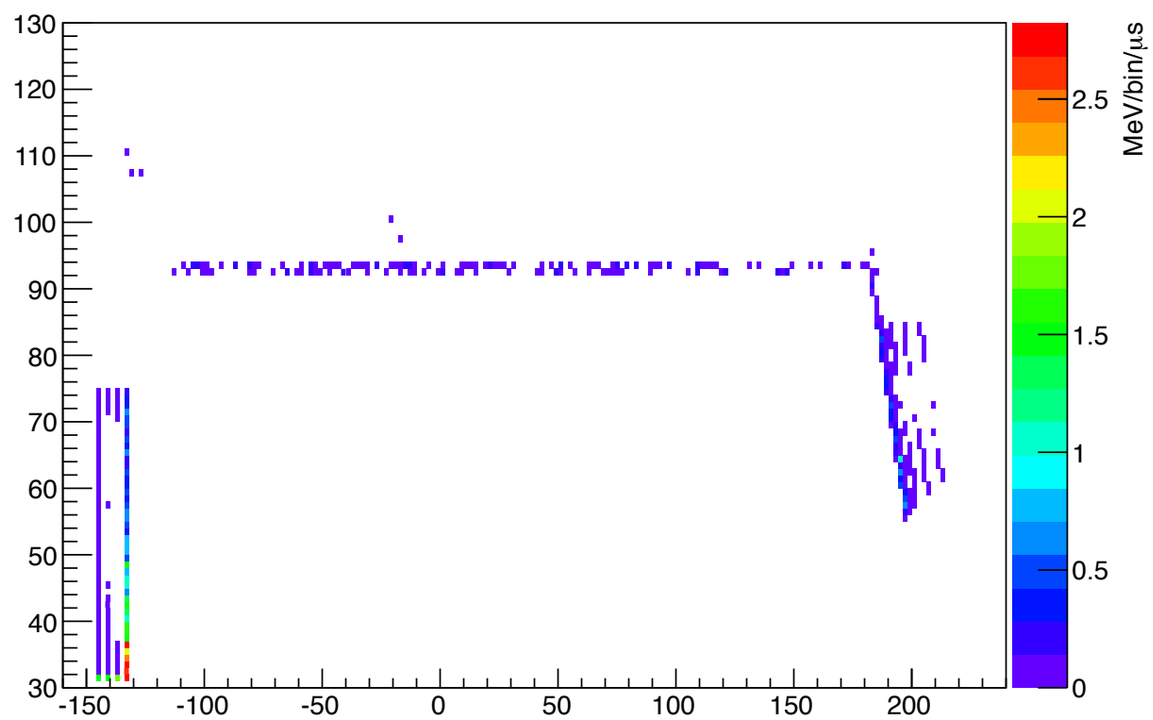

neutron interaction ZR, forward region
cm
cm
MeV/bin
Sep.2010
neutron interaction ZR, forward region
Nov.2011
neutron interaction ZR backward region
neutron interaction ZR backward region
MeV/bin

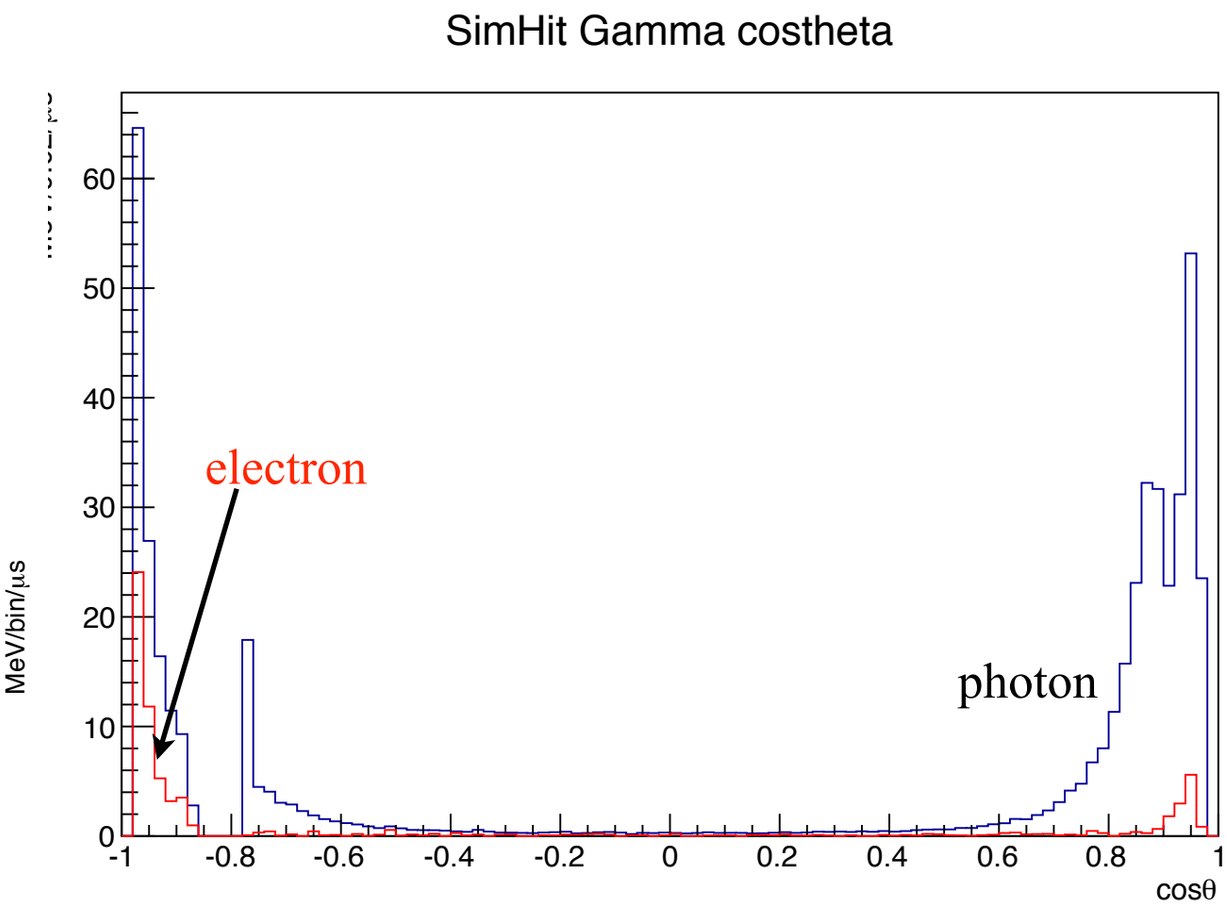
Run through FastSim

- Generate neutrino events, mixing in background frame.
- Accept all particles within 1 micro second window, same for forward, barrel and backward.
- Use the same (~*BABAR*) pulse shape for everybody.
- Neutron kinetic energy threshold = 0.1 MeV.
- Some sub-MeV requirements in crystals when making clusters still apply.
- Separate contributions from “Particles” (photons dominate) and “NeutronInt”.
- Check energy flux using “SimHits” and reconstructed clusters.

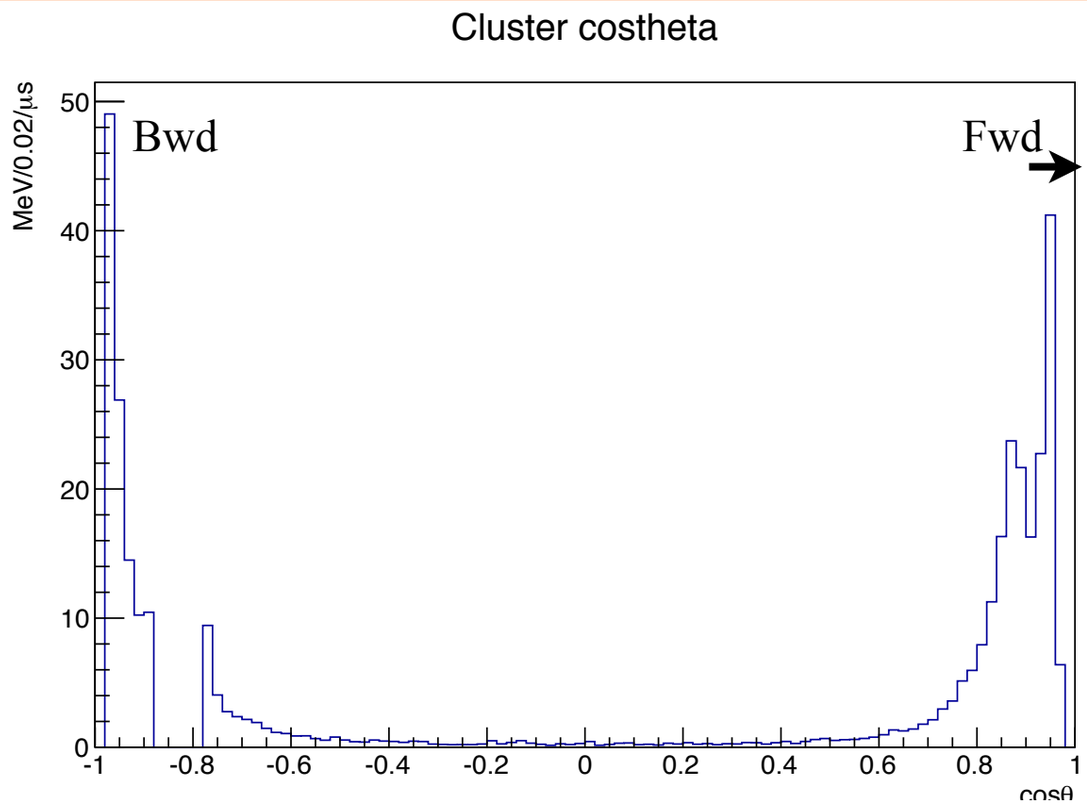
Photons and electrons, SimHit

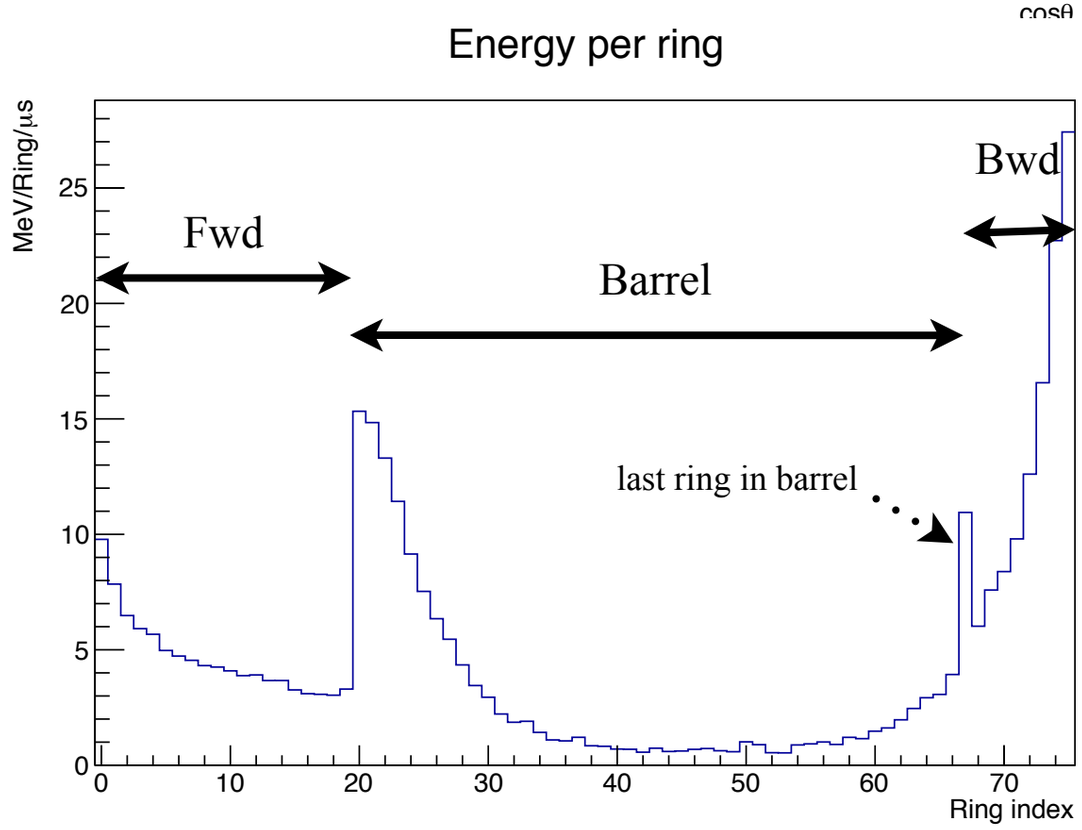


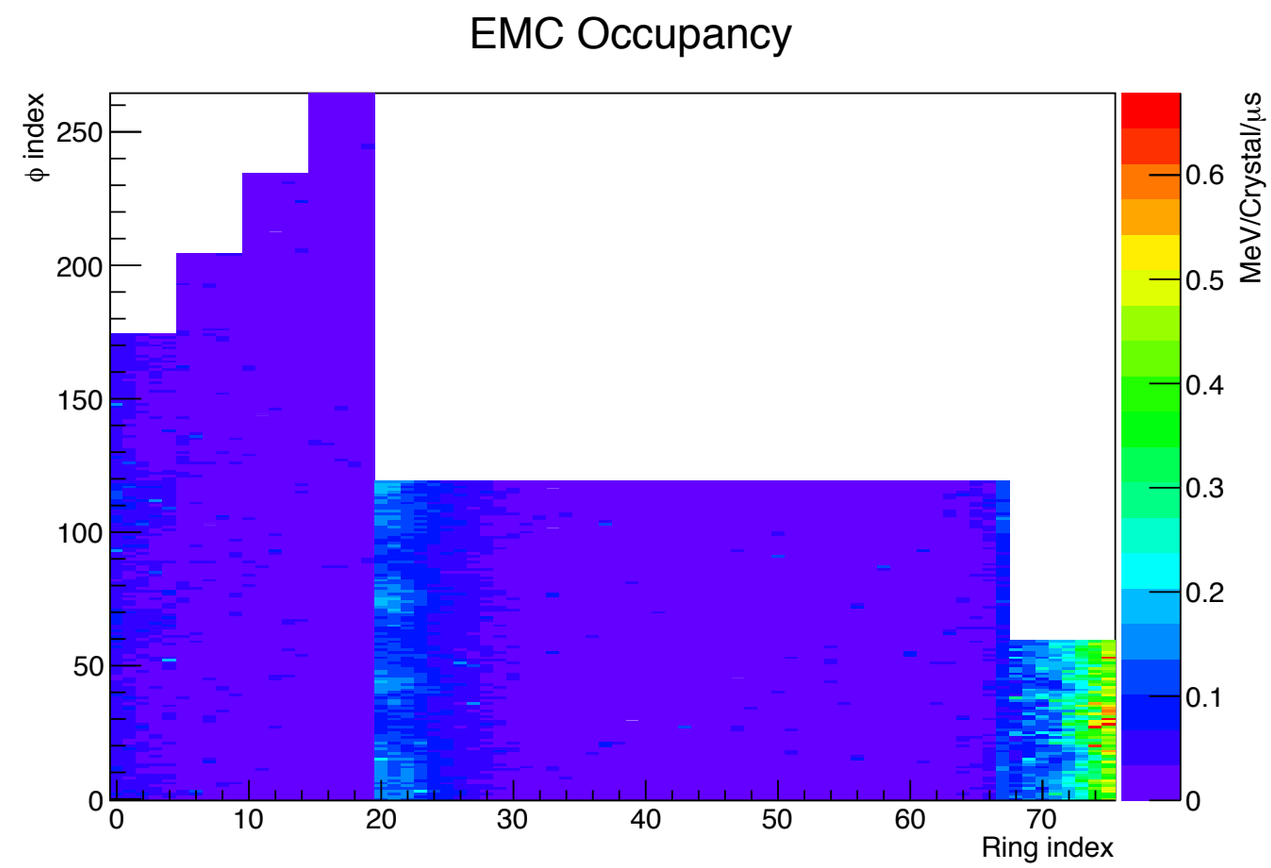




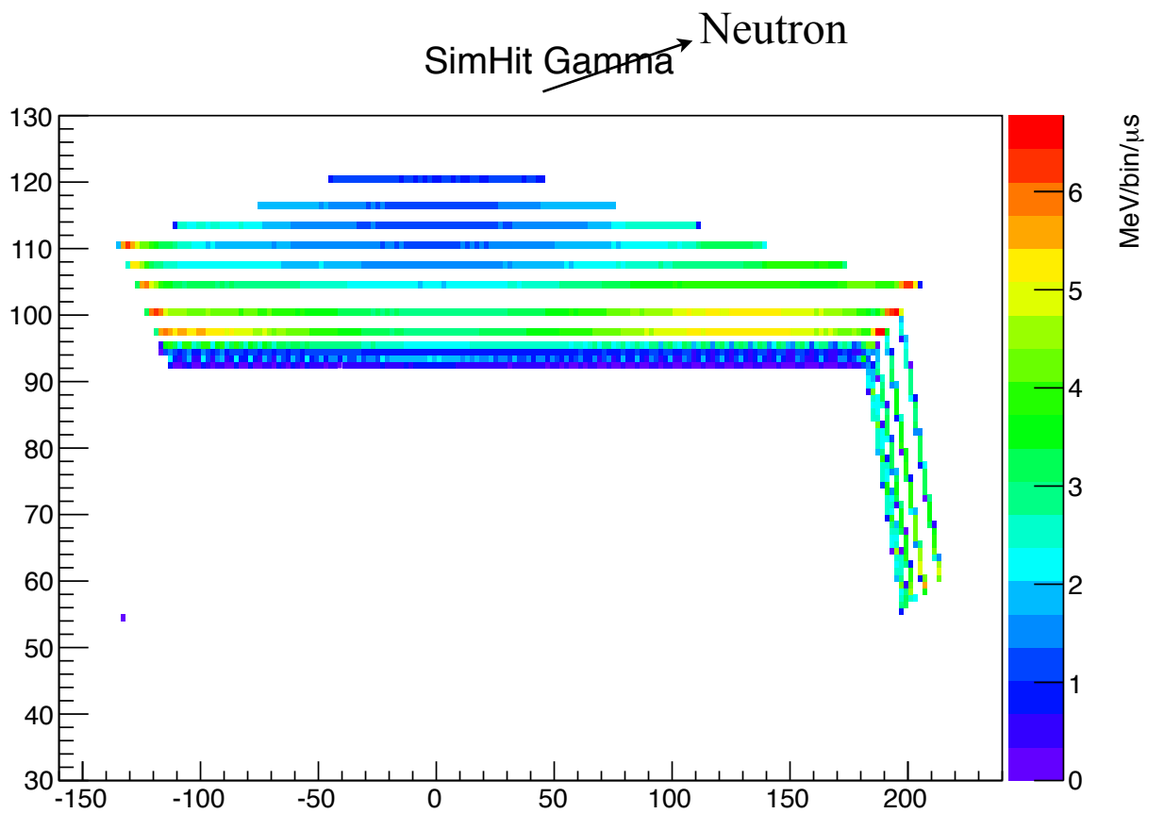
Photons and electrons, cluster

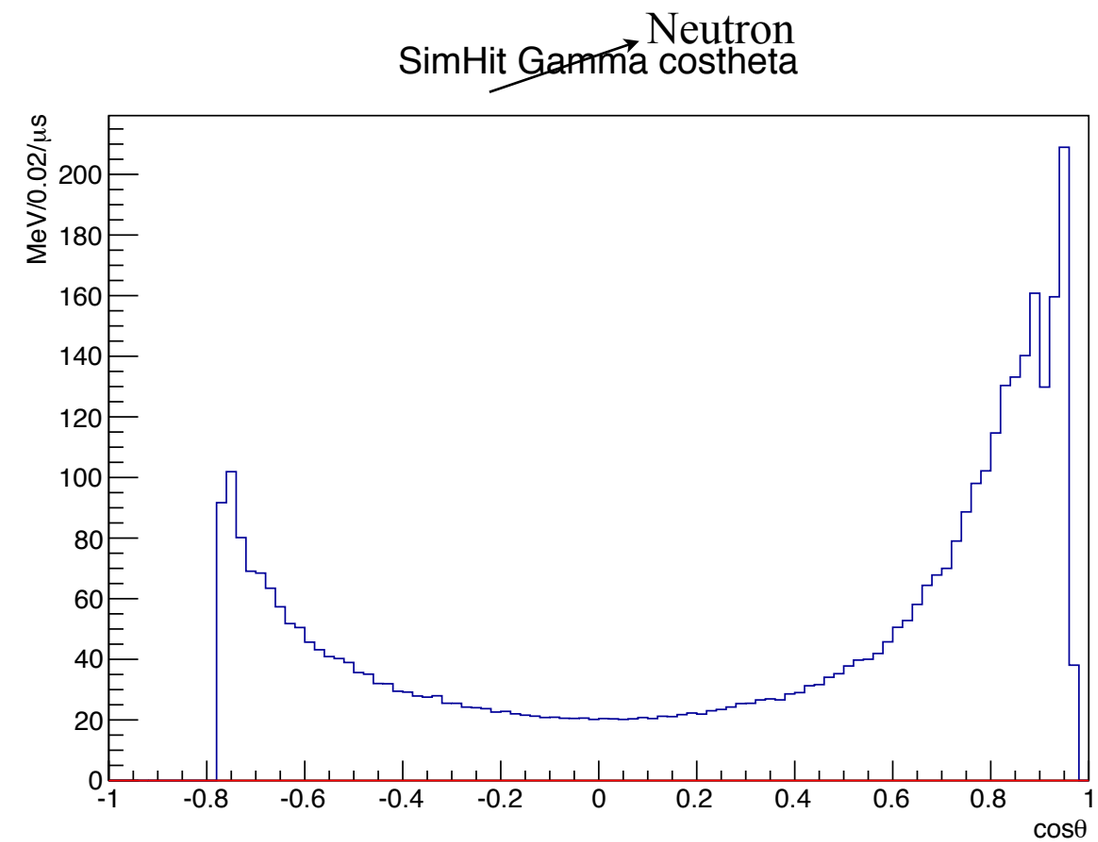






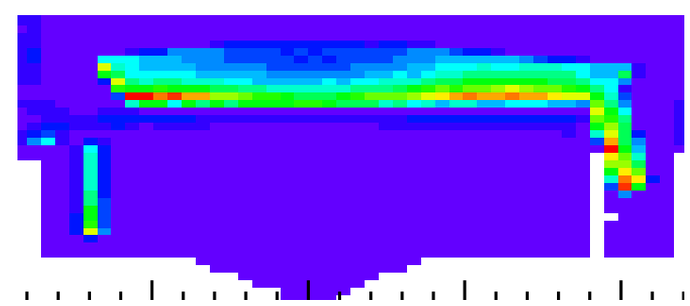
NeutronInt, SimHit



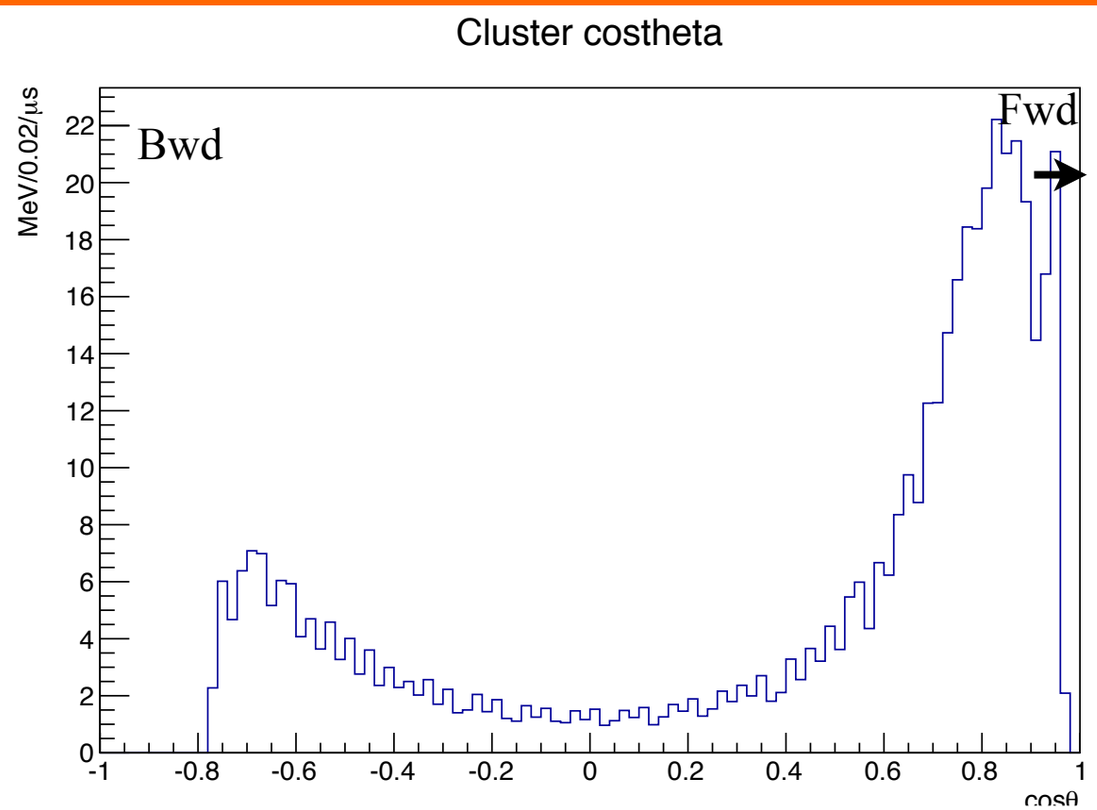


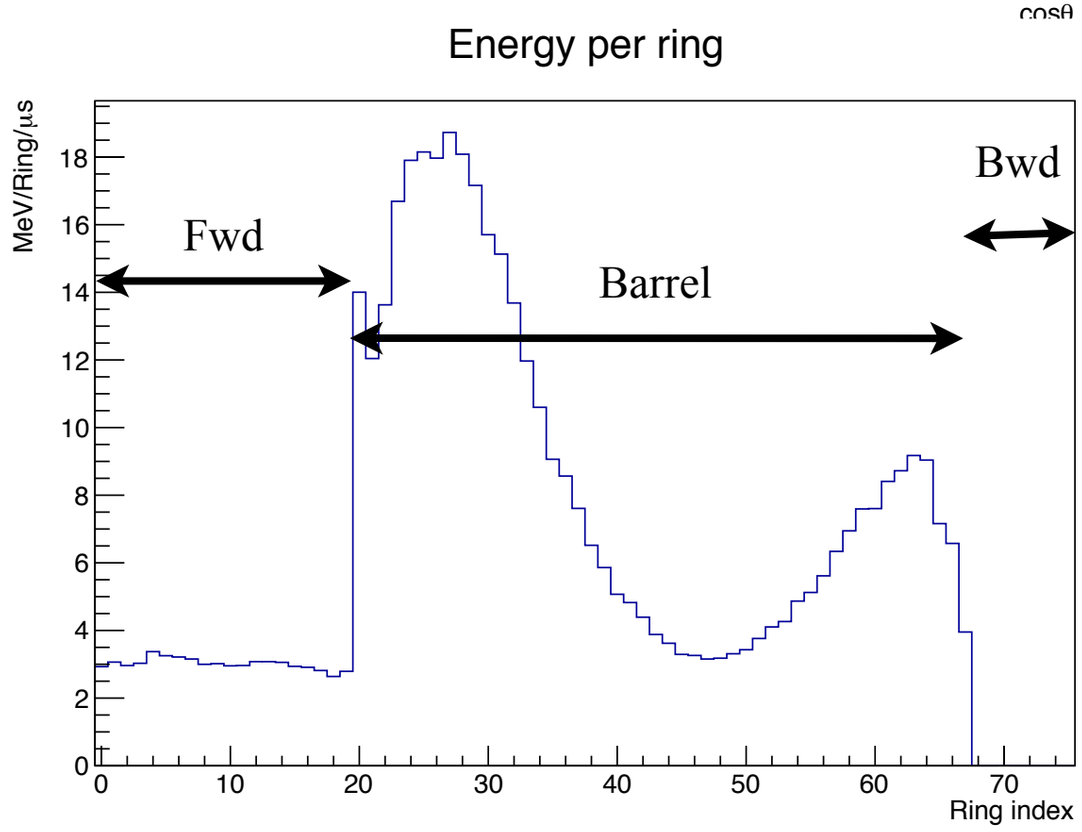
Why are there so few SimHits from neutrons in forward and backward endcaps? There are a lot of neutron entries in the background frame. Why don't they produce hits in the FastSim? Geometry mismatch? The "layers" in the FastSim not dense enough?

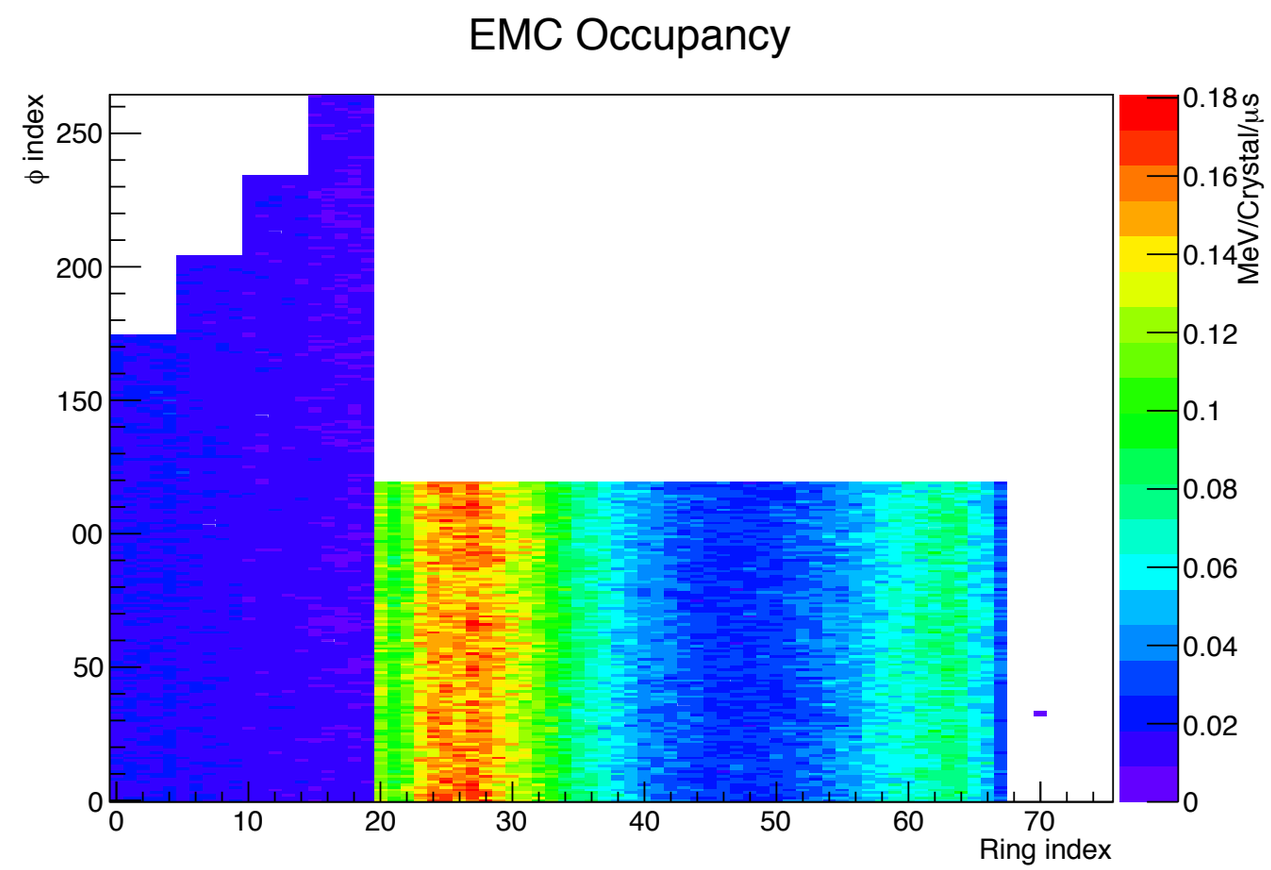
From bgframe file directly



Neutrons, cluster







Conclusions

- Based on FastSim running with radiative Bhabha background frames, the background rate is below 1MeV/crystal/μs everywhere.
- Some thresholds may still be too high, so background may be underestimated.
- Worse parts are forward region of the barrel, and extreme forward and backward endcaps.
- FastSim doesn't seem to do the right thing for neutrons in the forward and backward endcaps. Under investigation.