HPS-SIM Validation

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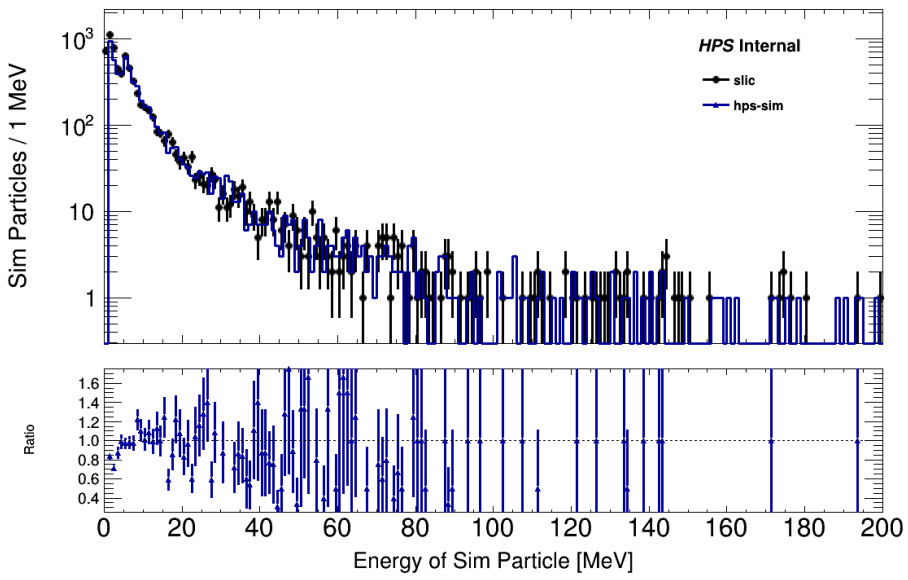
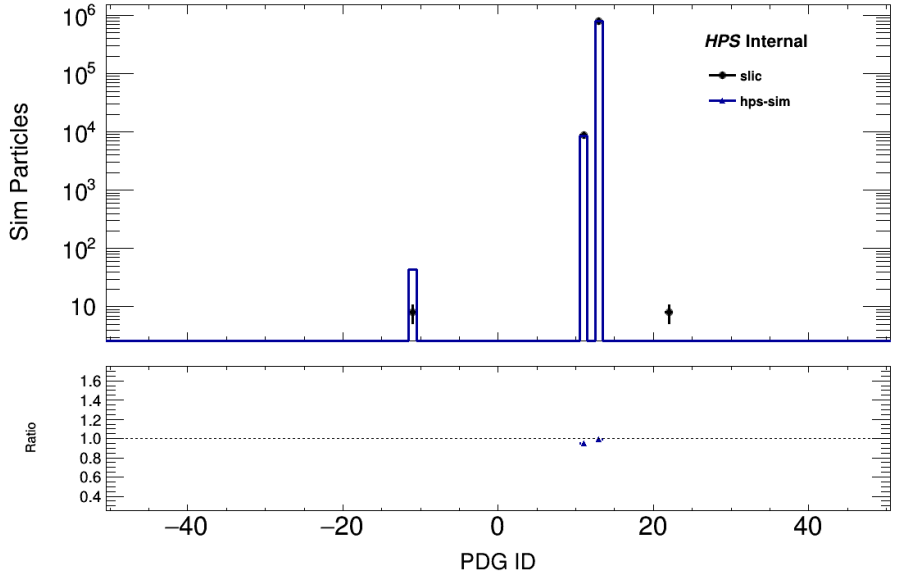
MC Generation

- Reading and running MC code
  - Built G4 macro to use GPS to fire muons and electrons in 4 deg cone
  - Checked that collections from the two are the same
- Added MC objects to hpstr event model
  - Processors to translate to hpstr event model from LCIO
  - AnaProcessor and MCAnaHistos to compare SIM level output
- Started running spacing and readout code
  - Spacing code was pretty straight forward to run
  - Used org.hps.readout.trigger.PulserReadoutDriver to trigger
    - Fixed bug in rate calculation, PR made to JeffersonLab/master
    - Opened up hit level timing cuts, should time in better but this requires adding a feature to spacing driver or pulser trigger driver
- Ran reconstruction, and see at least one track in over 10% of the events

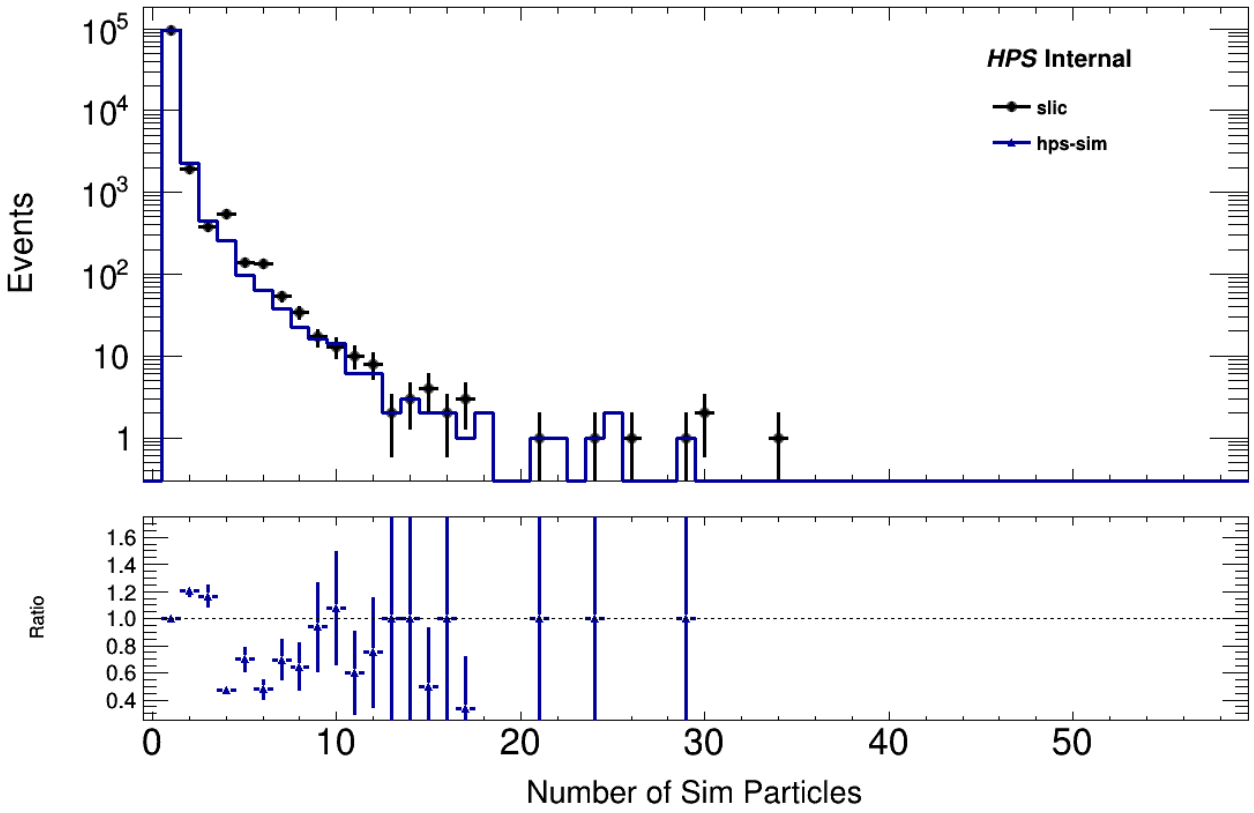
Sim Particle Comparison





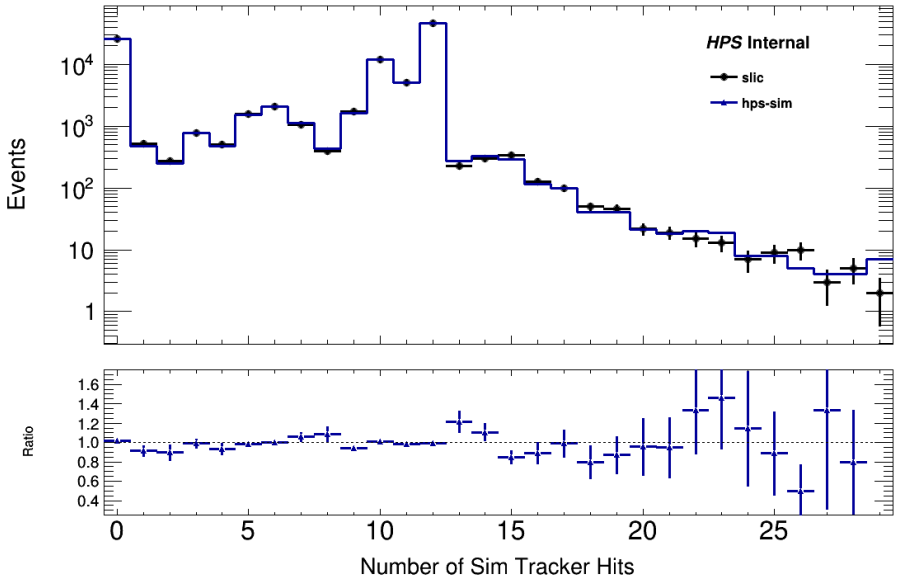
- Comparisons in this talk are using the single muon sample
- Made script to generate comparison plots of histograms from SIM level
- Particle energies match well, slight deviation below 5 MeV
- More photons and less positrons generated by slic compared to hps-sim

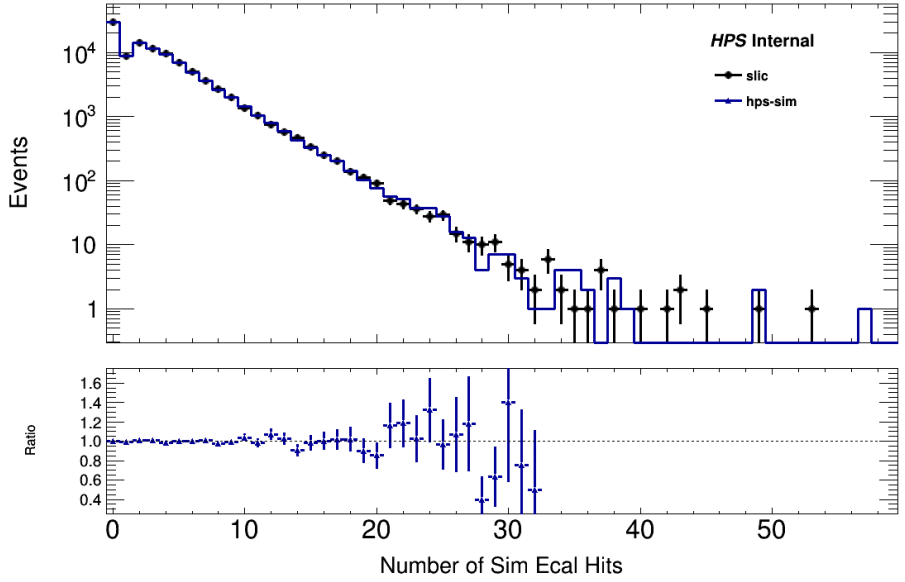
Catching Up



- Validation of hps-sim in the past left off with observation of disagreement of the numbers of sim particles in the events
- Thinking this could be the extra low energy particles seen in previous slide

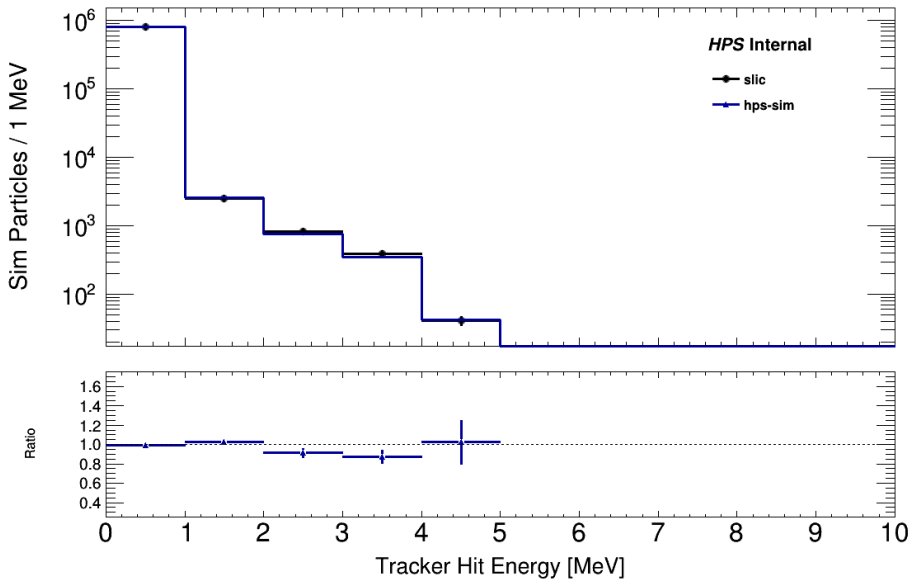
Sim Hit Multiplicities Comparison

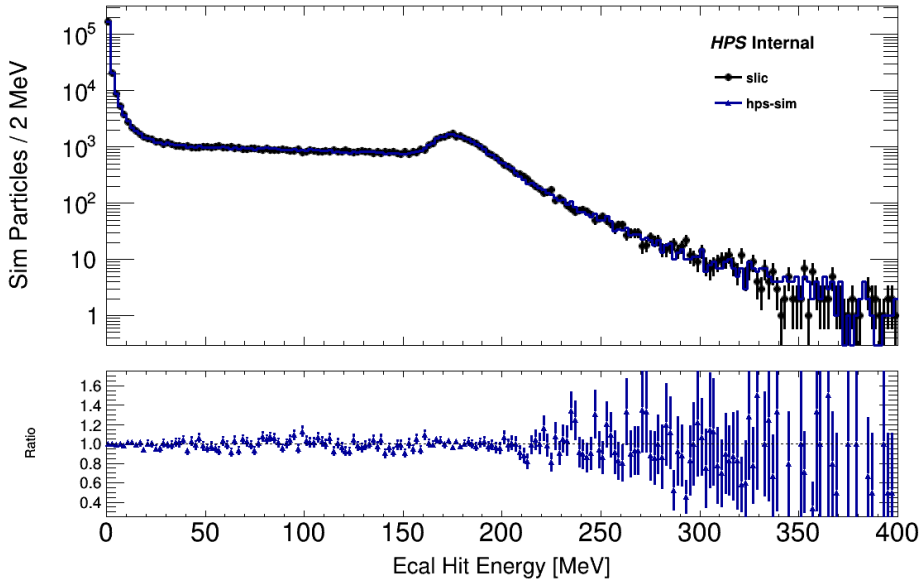




- The hit multiplicities in the SVT and Ecal agree well

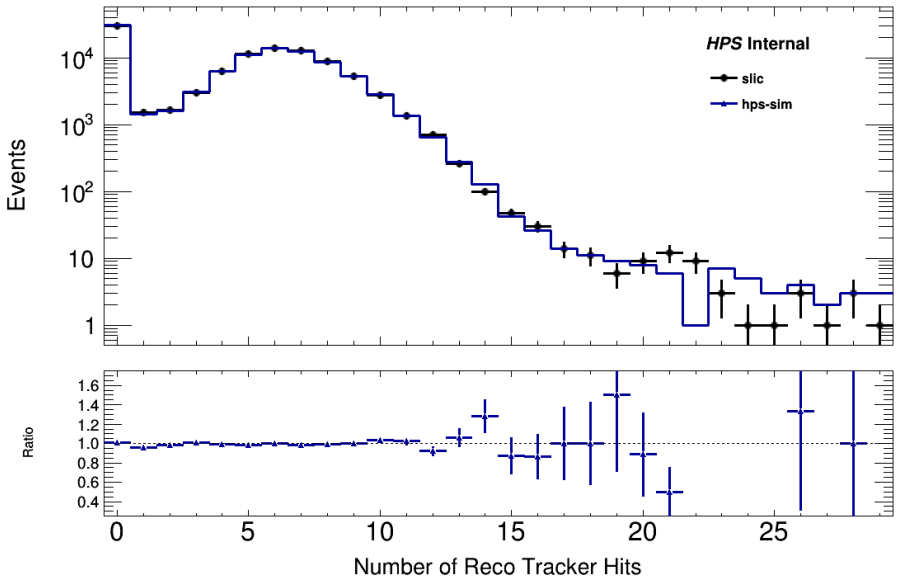
Sim Hit Energy Comparison

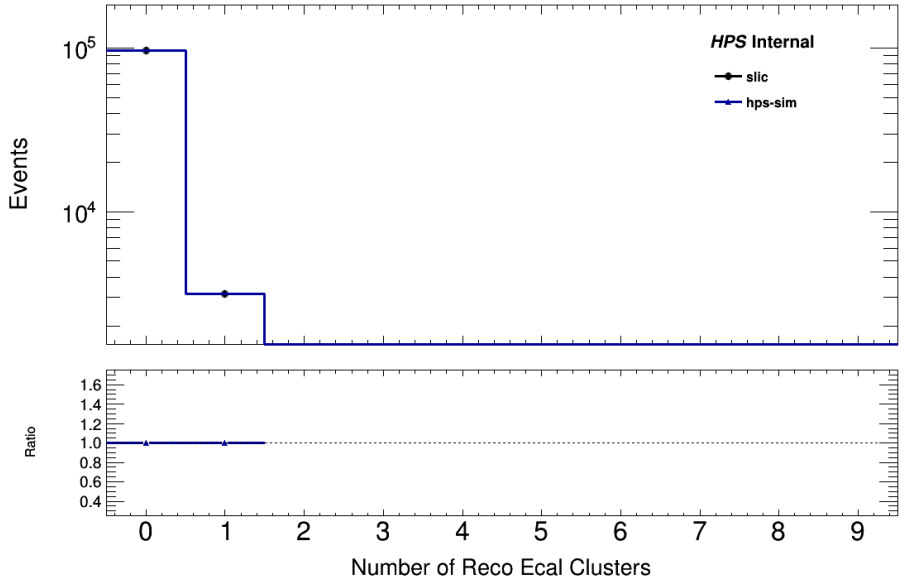




- The energy distributions of the hits agrees well
- My hypothesis is that the difference in particle multiplicities is negligible
  - Should compare reconstructed hits to be fully sure
  - Hps-sim wouldn't need much more work to be a reasonable slic replacement already if this is the case

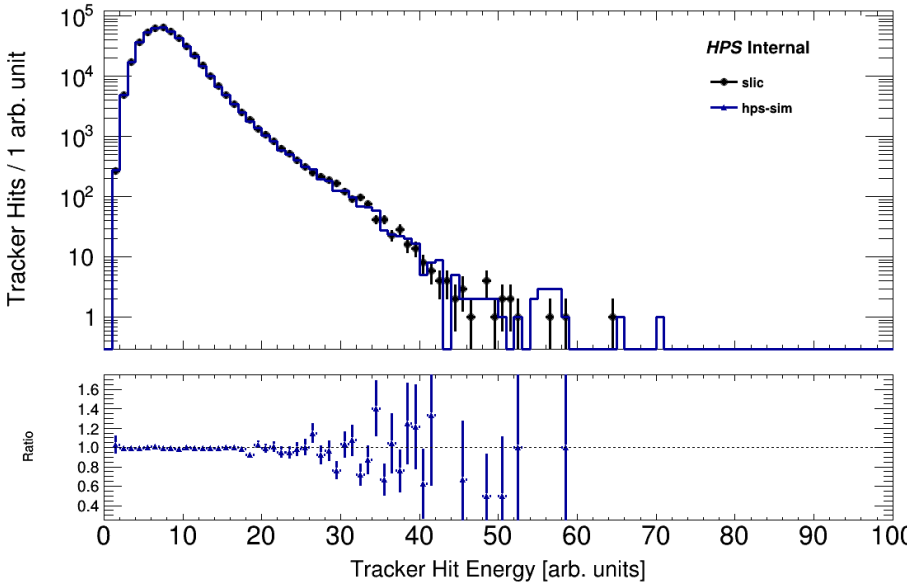
Reco Hit Multiplicity Comparison

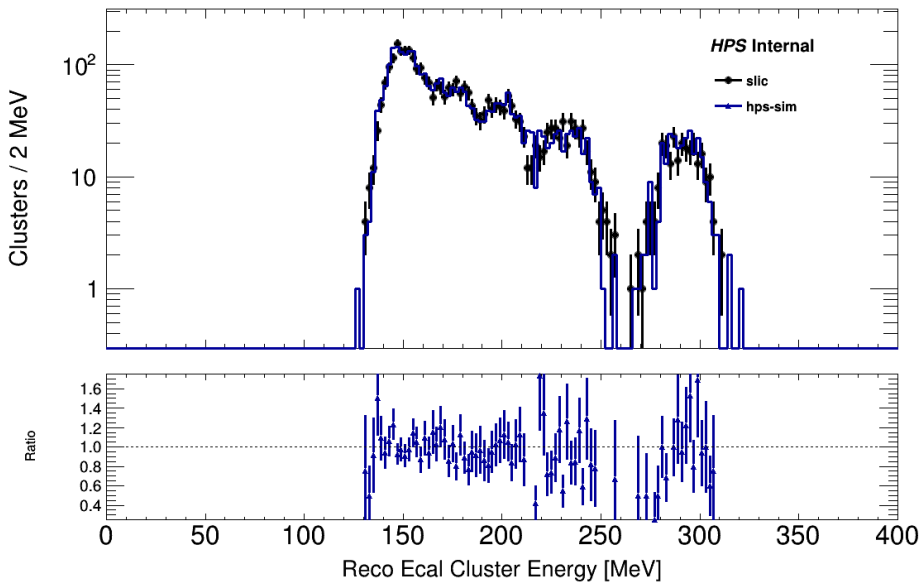




- These agree well overall
  - High tail of tracker hits (3D hits) could be more an artifact of cluster algo
  - Ecal cluster multiplicity is pretty much a perfect match
- The shape of the tracker hit multiplicity worries me, why isn't there a sharp drop after 6?

Reco Hit Energy Comparison





- These agree well
- Extra sim particles in slic seems to be of no concern at the reco level