

LFHCal sims update

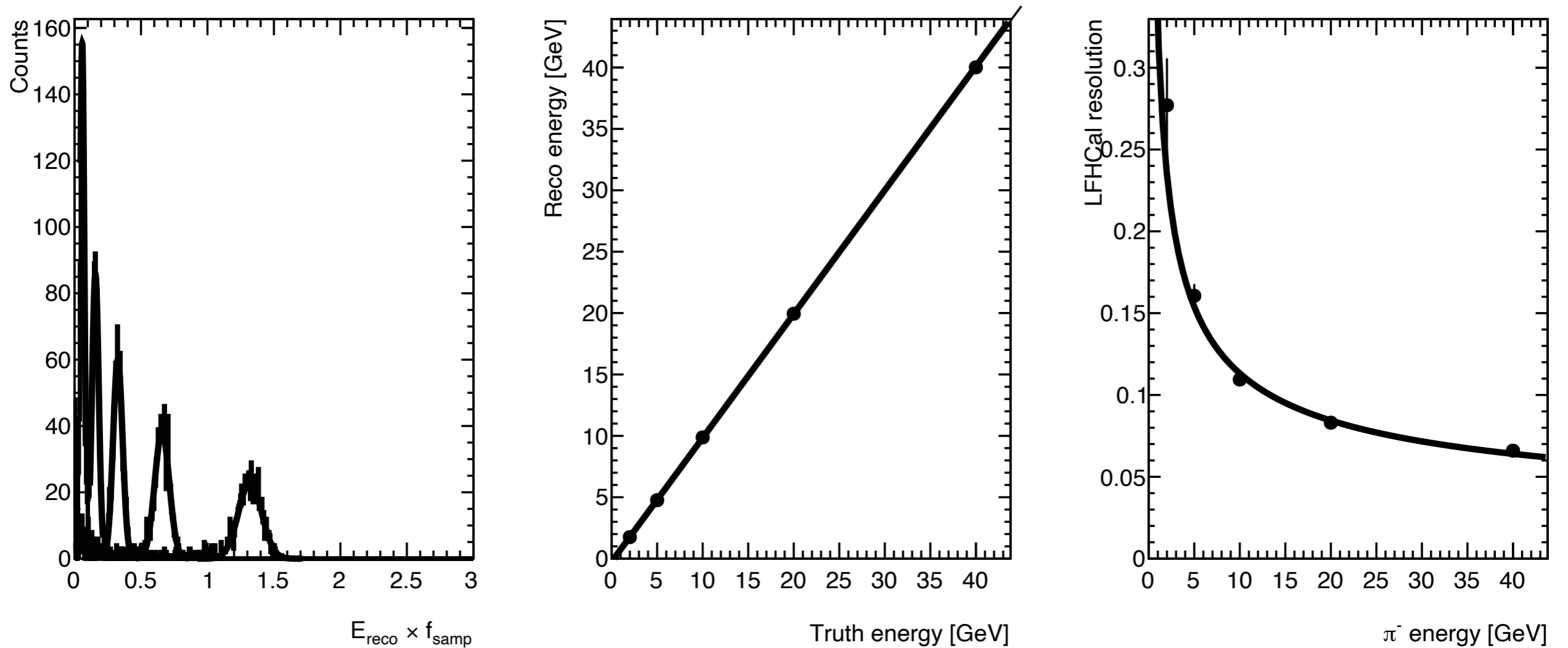
Peter Steinberg, BNL / 16 Nov 2022

thanks to David L, Fredi B, Kong T

Updates

- **Focus in the last week on validating single particle simulations in LFHcal**
- **Running standalone using stripped-down geometry & steering setup from David L**
 - RICH still there but pECal disabled (fix TBD)
- **Ran negative pions at 2,5,10,20,40 GeV with $\theta=14-35$ deg**
 - Eyeballed from acceptance of front face of LFHCal
- **Added Truth/reco association containers (a la EEMC) but they are empty**
 - Ran out of time - working for others?
- **Required me learning (finally) the entire JANA2 reconstruction chain**
 - Simulations - verified $f_{\text{samp}}=3.3\%$
 - Digi/reco steps misconfigured, and even inconsistent with each other (breaks energy scale, cuts out many towers, clips at max ADC...)
 - *Digi: RawCalorimeterHit_factory_HcalEndcapPRawHits.h*
 - *Reco: CalorimeterHit_factory_HcalEndcapNRecHits.h*
 - *Current setup has ADC max = 8096(?) with max energy at 200 MeV*
 - *Interesting question is need for *MeV in that definition since it's scaled by *MeV in CalorimeterHitDigi and Reco (which seems like a bad idea!)*
- **Also learned how to work with RDataFrames**
 - Kong T's example is super helpful to understand the new logic (all analysis algorithms are now .Define's
 - Most time consuming part was surfing around edm4hep and edm4eic and figuring exactly out which types were in the PODIO output
- **Ultimately, this update is just validating basic energy response post reconstruction**
 - Need to check timing, position dependence, clustering (e.g. 3D), etc.

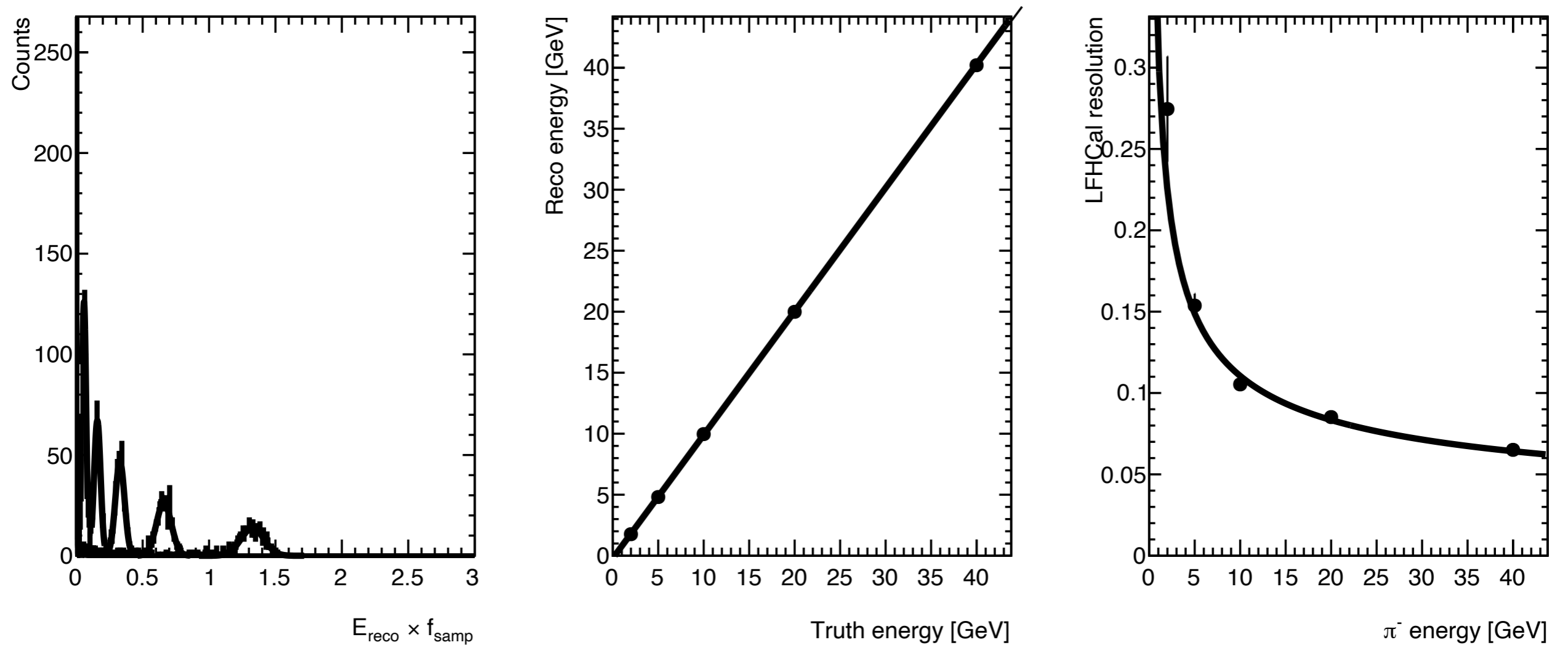
First results - all E_{dep}



Sum all energies in calo after digi/reco. f_{samp} of 3.3% works.

Ideal resolution fit to $30\%/\sqrt{E}$

First results - max cluster energy



A lot of zero energies - inefficiencies introduced in clustering process:
under investigation!