

Wirecell Group Update

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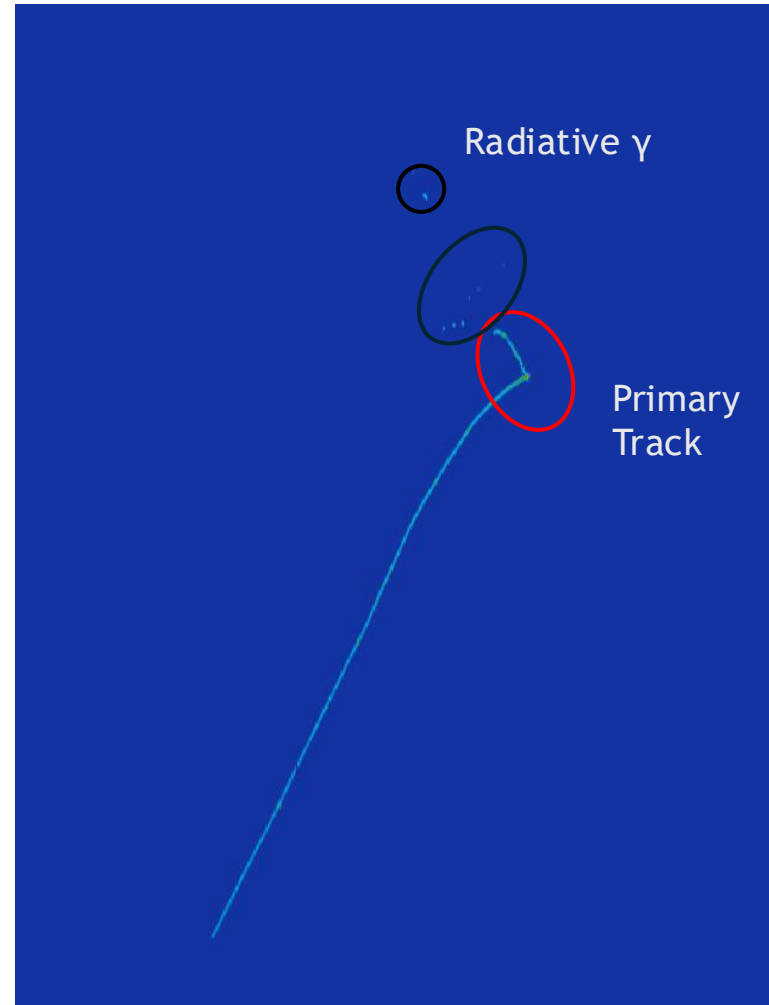
September 24th, 2026

Louisiana State University



Louisiana State University

Energy Reconstruction: Michel Primary Ionization vs Rad Photons

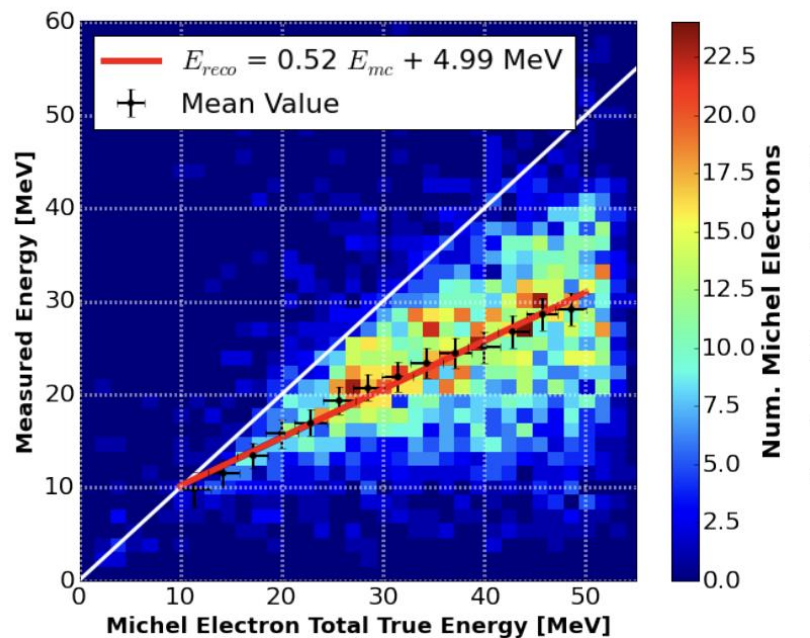


Energy reconstruction: Ionization from primary Michel-e

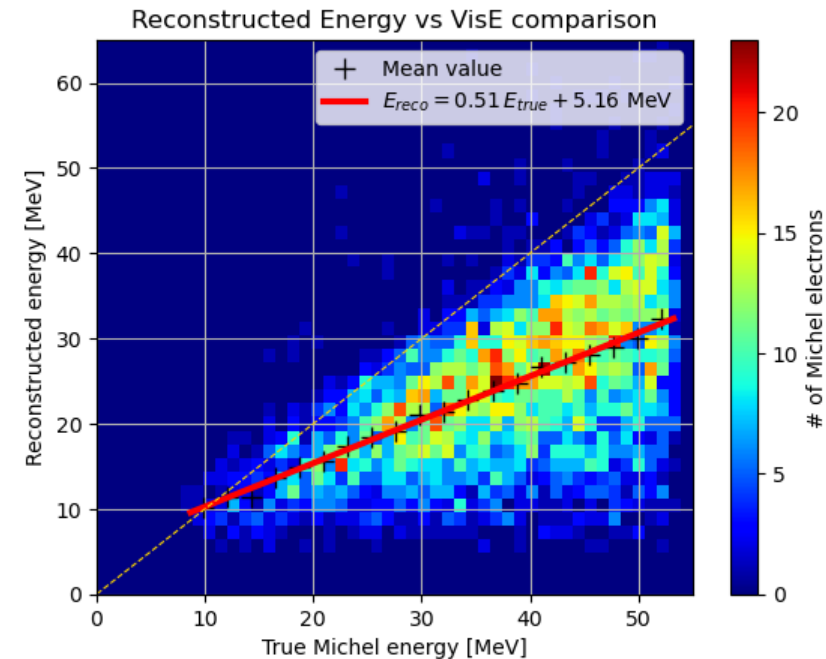
Sample size: ~14k vs ~8200 candidate Michels

MicroBooNE Paper

My result



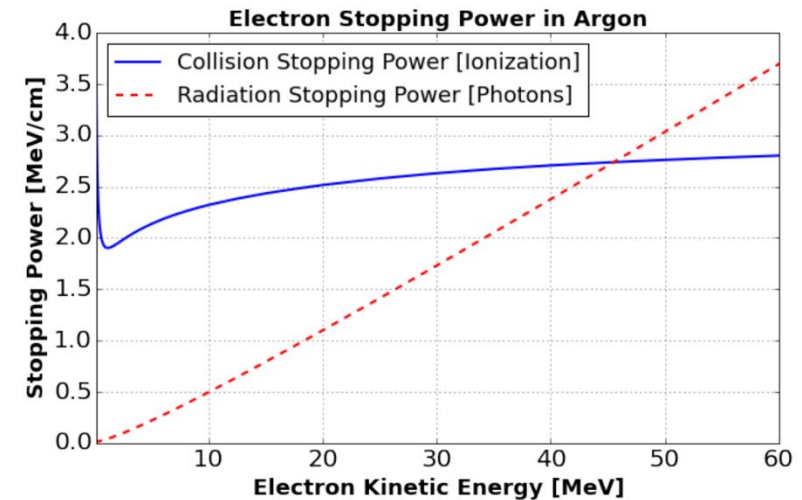
(a)



Good agreement!

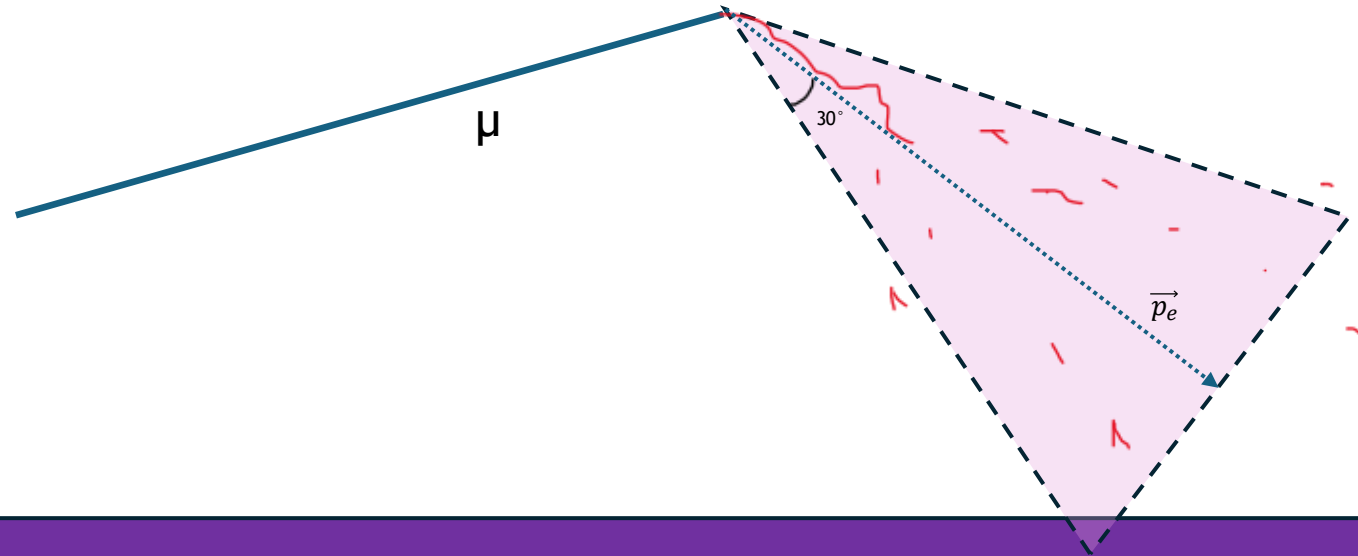
Radiative Photon Ionization Collection/Reconstruction

- As KE grows, more energy gets lost due to bremsstrahlung photons being produced by the Mische
 - Brem. photons can *potentially* be recovered in light info. Not currently looking into this, however, may revisit!
- A new challenge gets introduced: can we & how do we get this energy back?



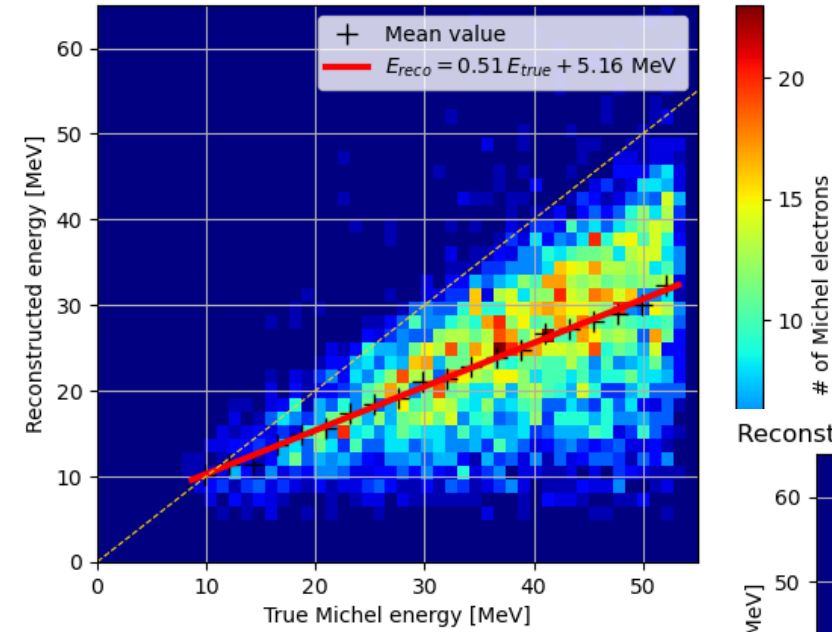
Radiative Photon Ionization Collection/Reconstruction

- Resultant brem. photons can produce additional ions by Compton scattering/pair production in the direction of the Michel's momentum
 - Can draw a "cone" to search for any additional ionization (not belonging to tracks) in the direction of electron's momentum, and collect any hits therein
 - MicroBooNE found that 80% of energy from brem. photons lie within 80 cm and 30° from muon stopping point

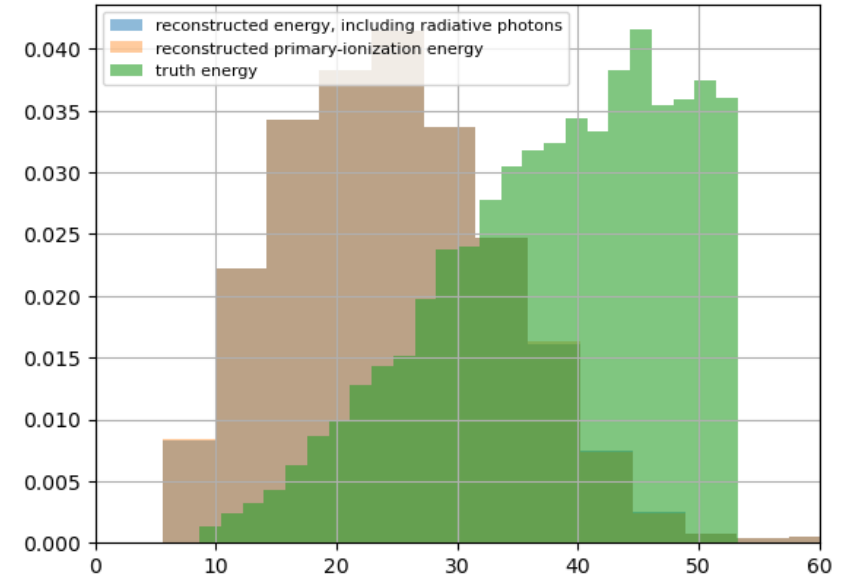
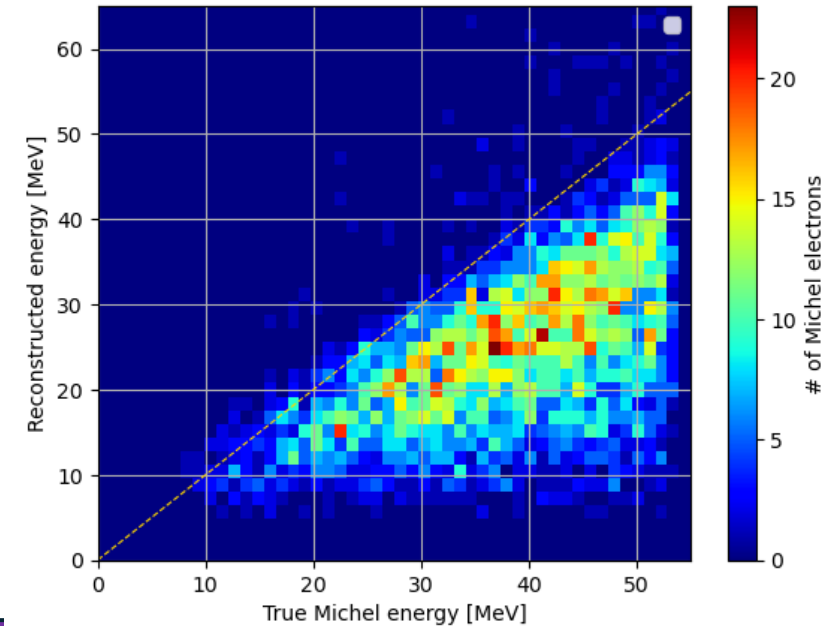


Next to no difference

Reconstructed Energy vs VisE comparison

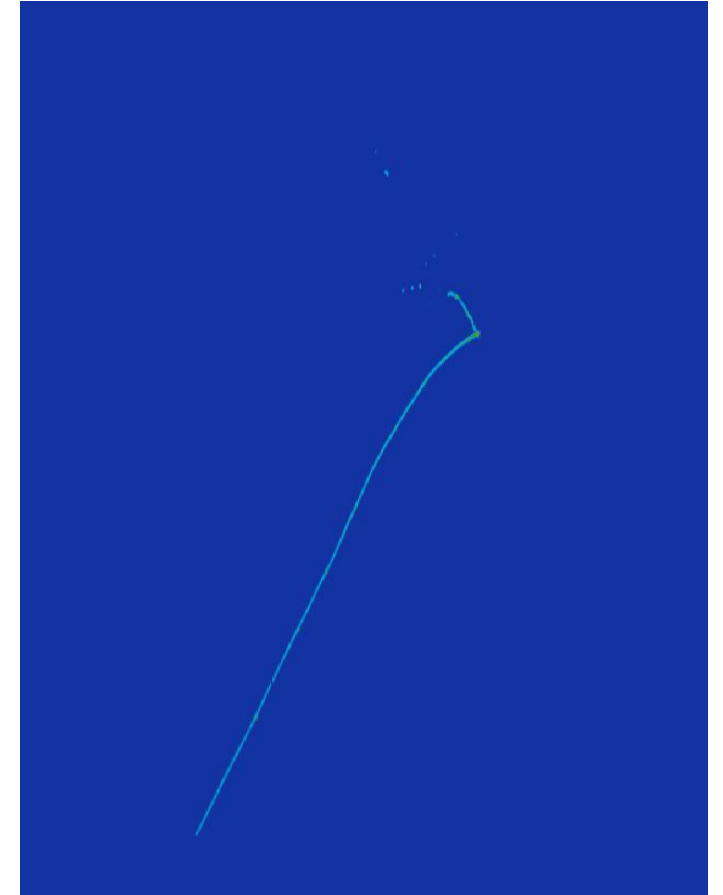
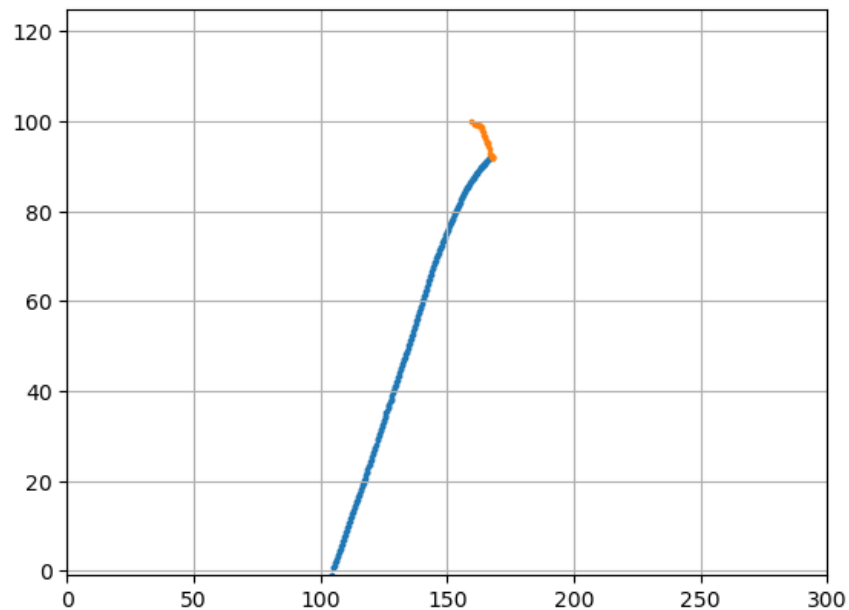


Reconstructed Energy vs VisE comparison, with rad photons



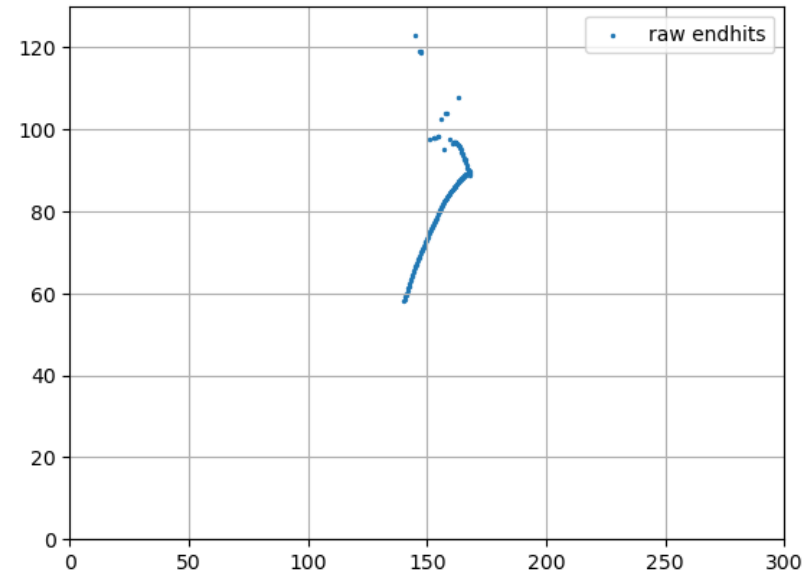
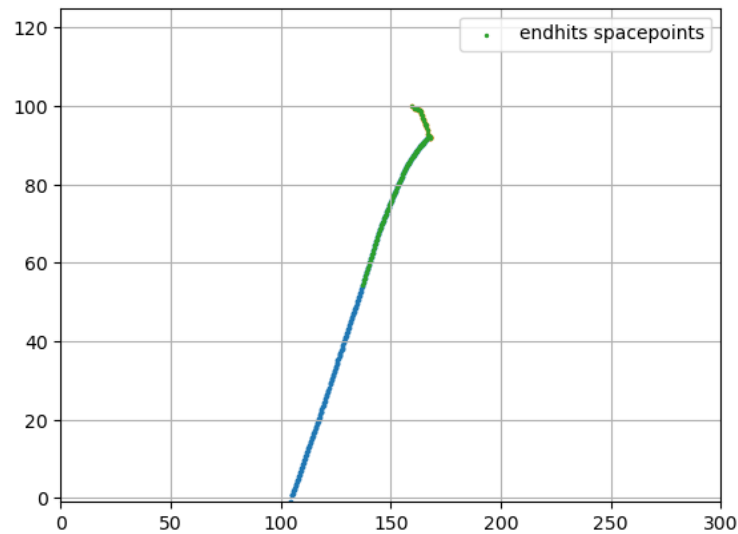
Why is this happening?

- Calibration ntuples of course can't save every track, so some info gets lost
 - In my case specifically, this includes any additional ionization from rad photons



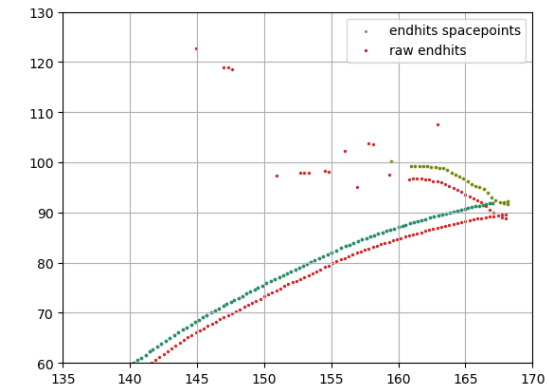
Why is this happening?

- Spacepoints (from endhits or otherwise) still need to be associated to a track
 - Can use raw wire hits, however they need to be aligned, and I need to separate from main Michel hits (work in progress)

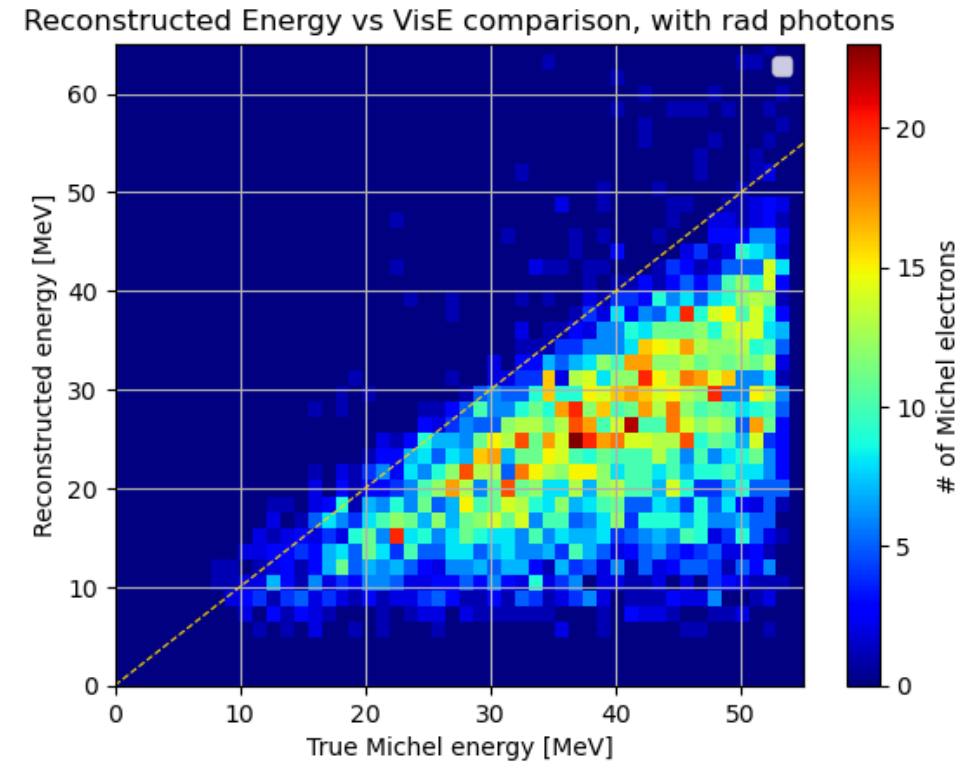
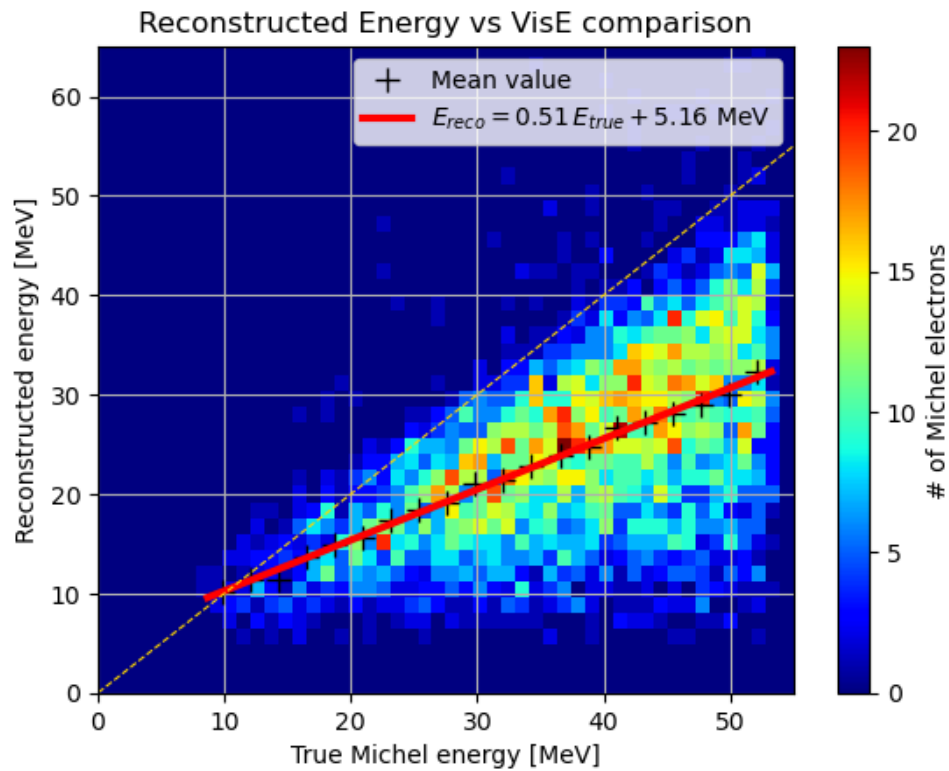


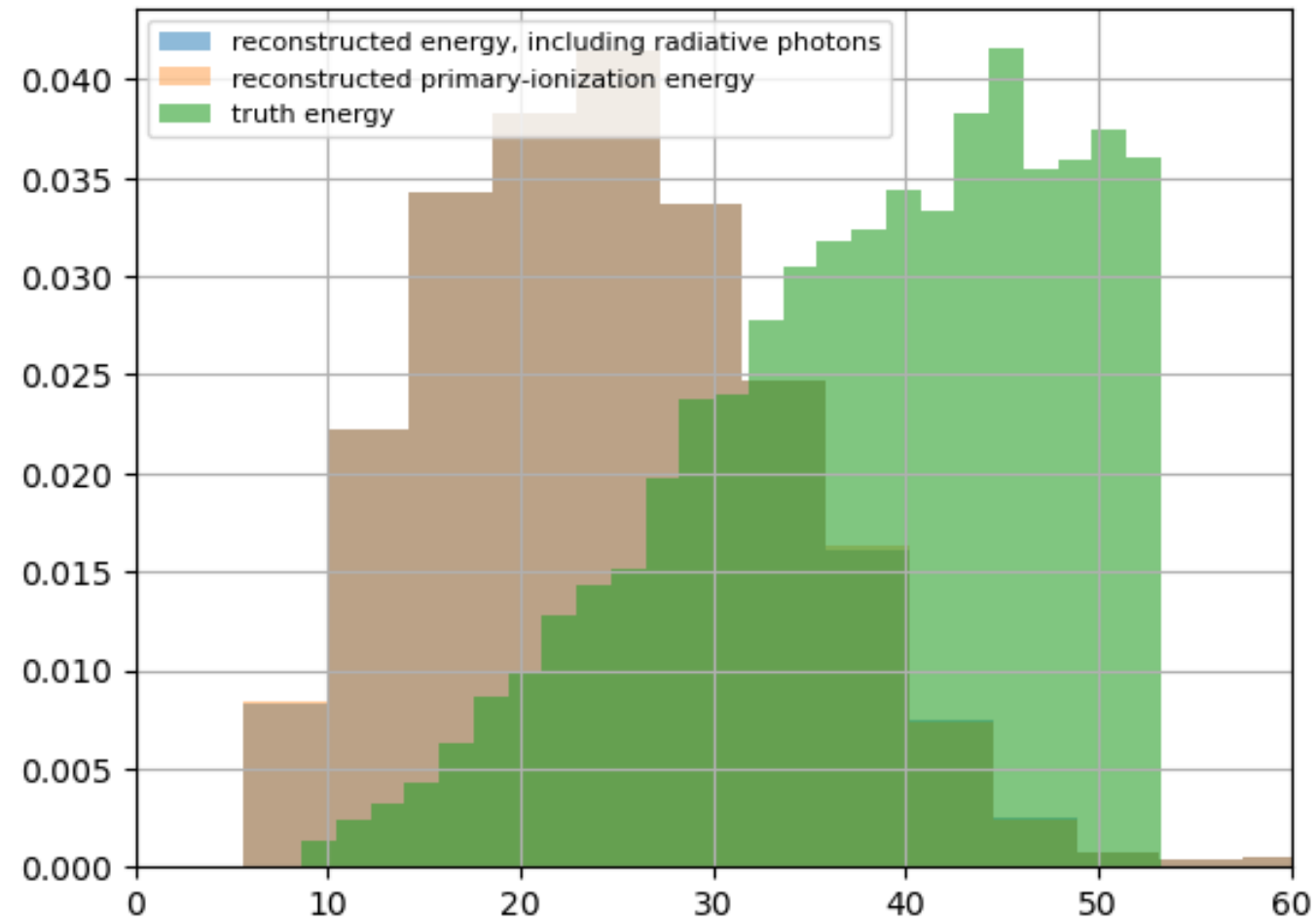
What's next?

- Since these are raw wire hits, I first need to align them spatially before I can do any search on them
 - Luckily, my algorithm already checks for “duplicate” points within some tolerance, so it should filter out previously tagged points
 - Currently in progress!
- Since these hits are low-energy and sparse, they should also be considered “blips” (which has its own branch in ntuples)
 - More of a “plan B”

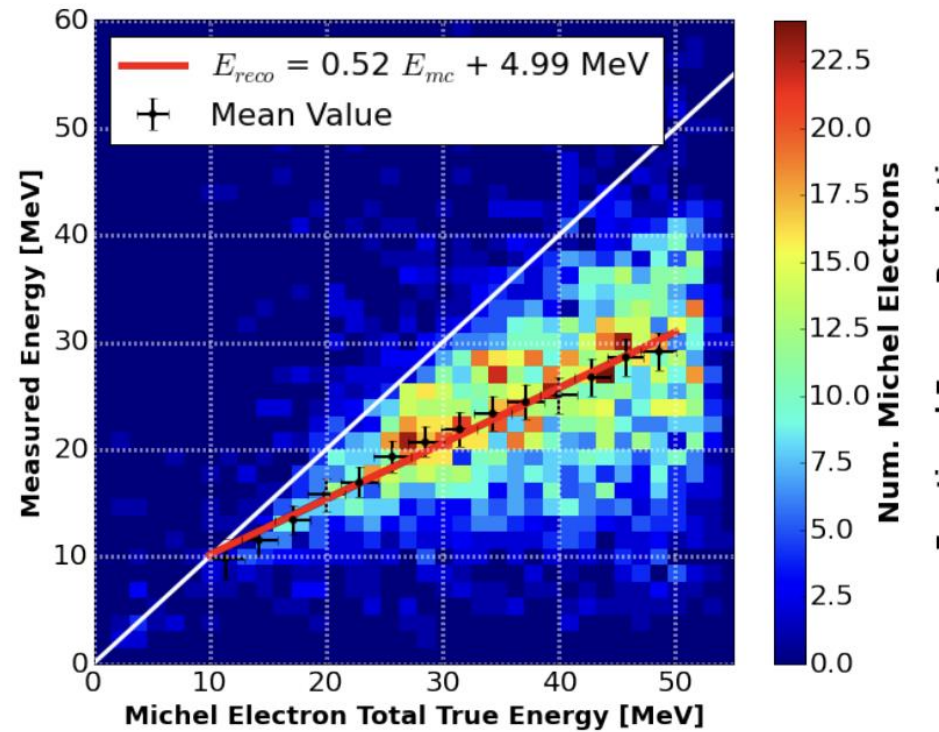


Next to no difference (zoomed comparison)

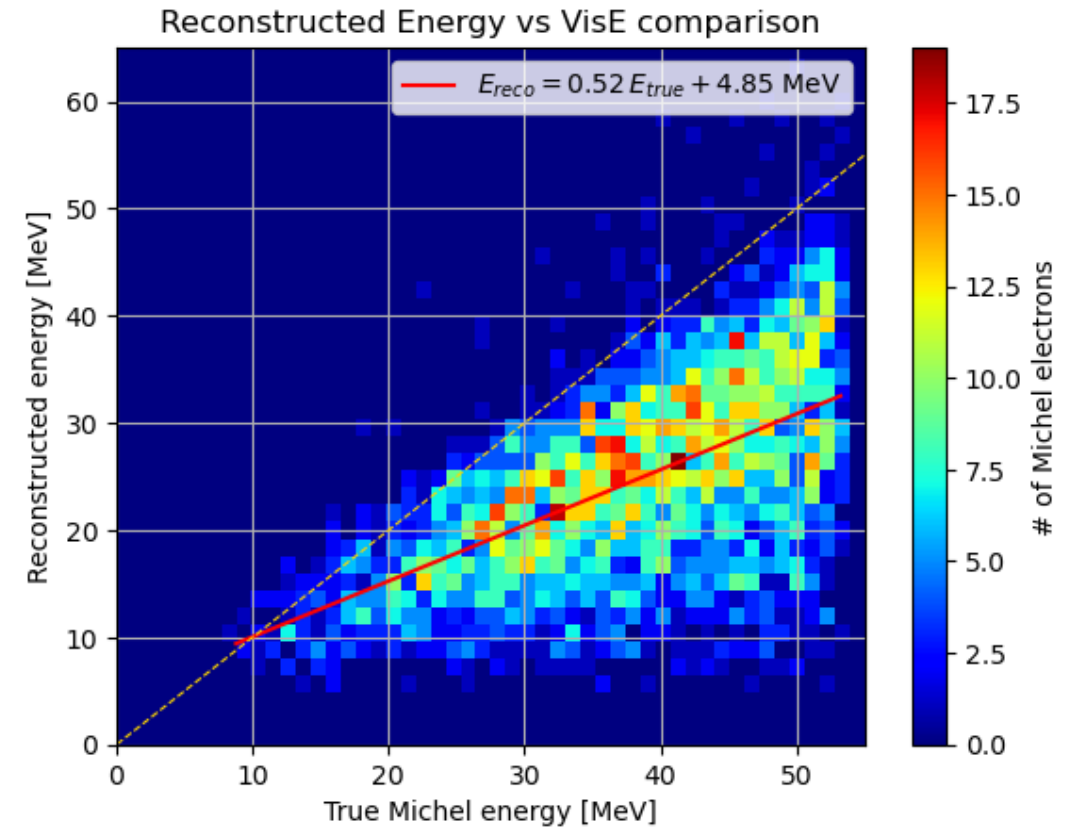




old



(a)



old

