# ECAL Energy Calibration Updates

30 July 2024



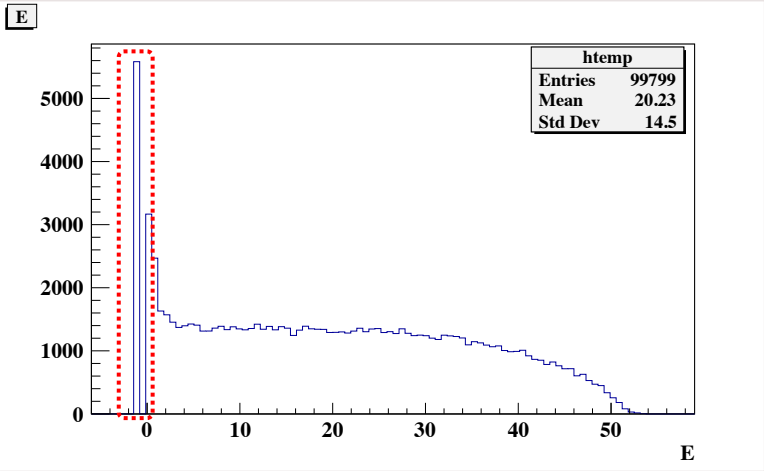
Rose Powers (Princeton/FNAL)

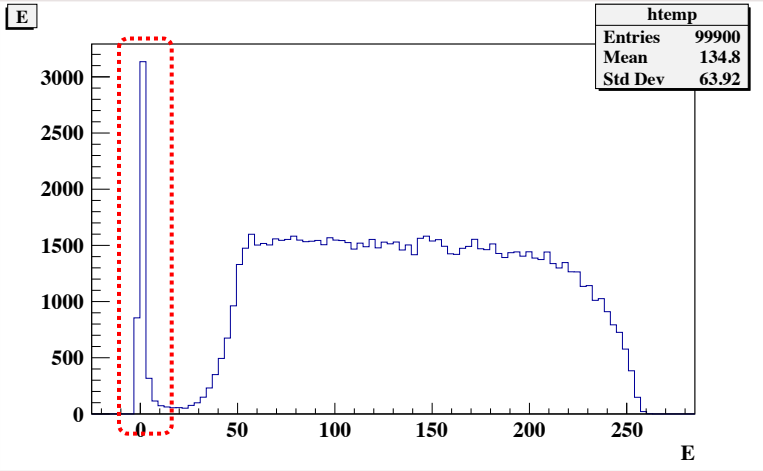
# 2D Calibration Map, Photon Response + Resolution

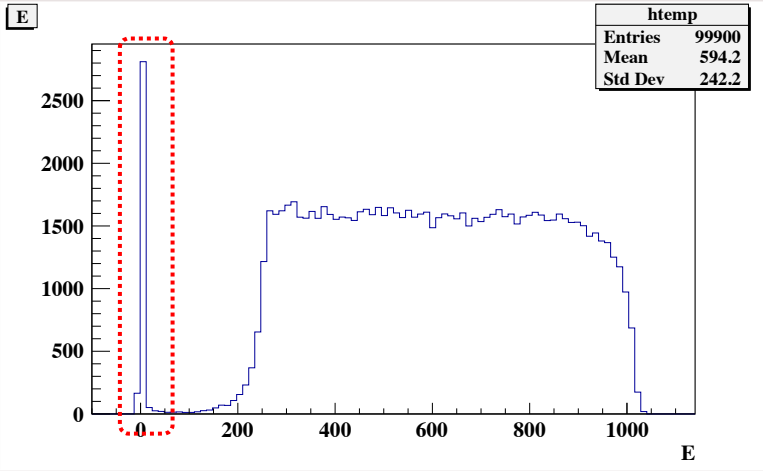
- Goals:
  - Generate 2D map of energy response (E_true/E_reco) for photons across **full range** of theta and true E, inclusive (without outlier removal)
  - Do the same, but **with** outlier removal (exclusive)
  - Use both to assess energy resolution exclusively
  - Understand effects on energy response, measured along E and theta axes

# Better Understanding these “Outliers”

- Took a look at the E_reco distributions for each slice (0-50, 50-250, and 250-1000)
- Found significant **low-energy tails** below the reasonably smeared-out distributions
- Possibly due to particle misidentification or incorrect cluster splitting at reco stage
- New approach to outlier removal/exclusivity: check E_reco for each entry, and if it is below a reasonable threshold for the slice at hand, skip that entry

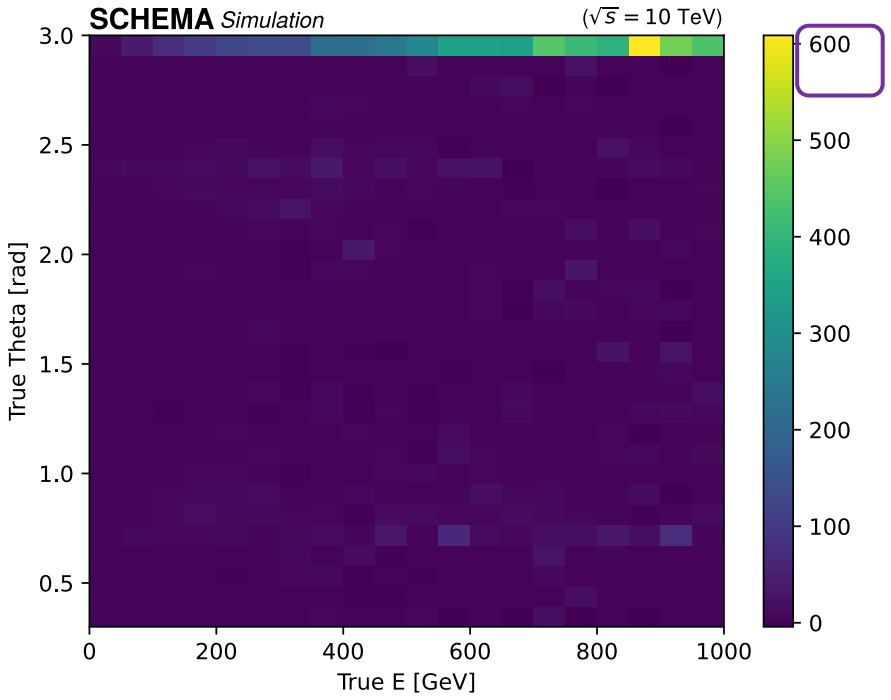


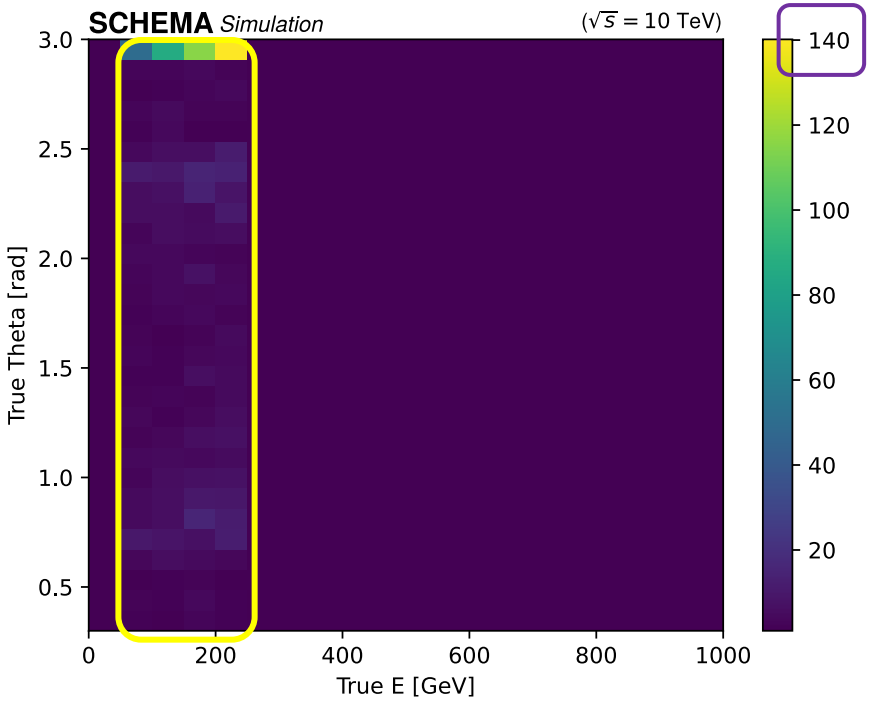



# Calibration Maps, Inclusive and Exclusive

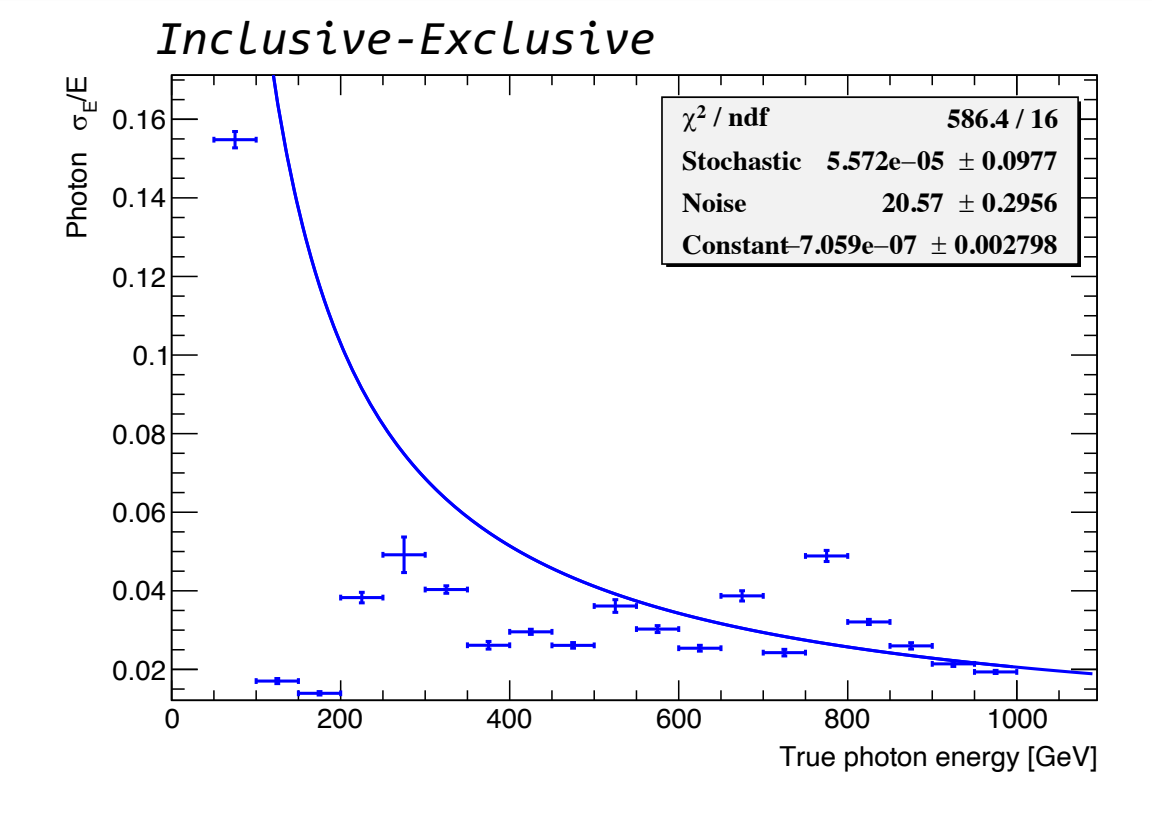
*E_true/E_reco, Inclusive*

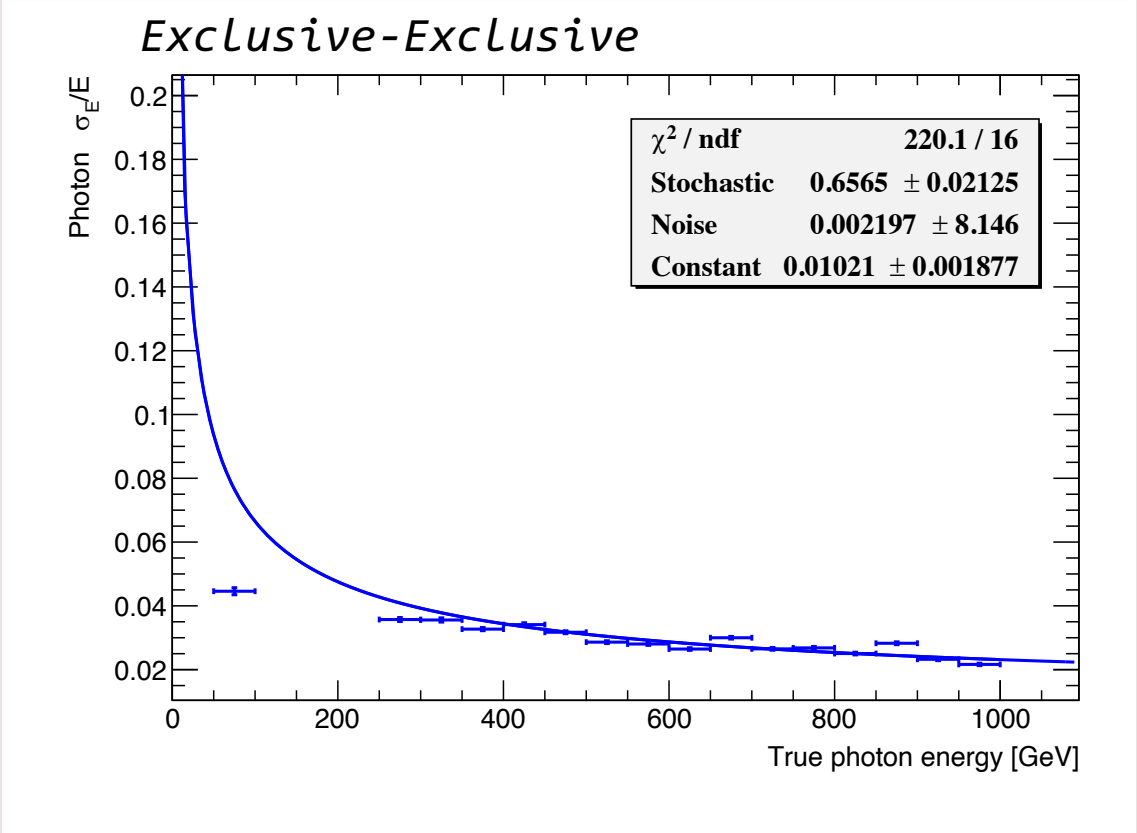



*E_true/E_reco, Exclusive*



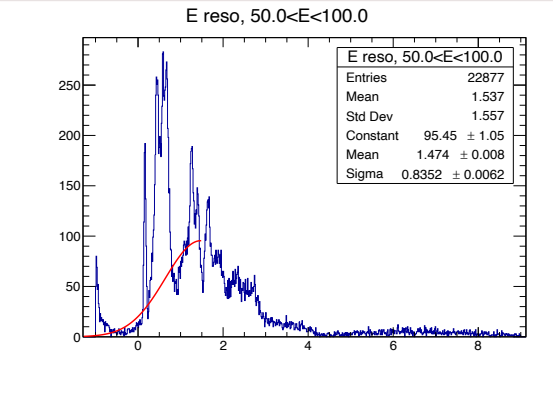
# Resolution

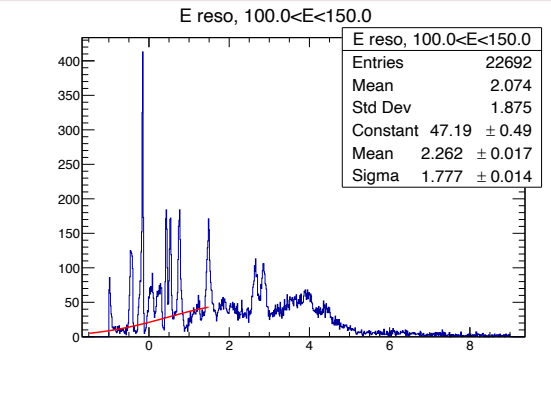


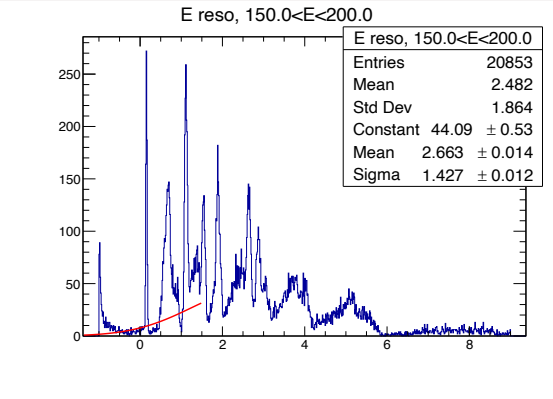



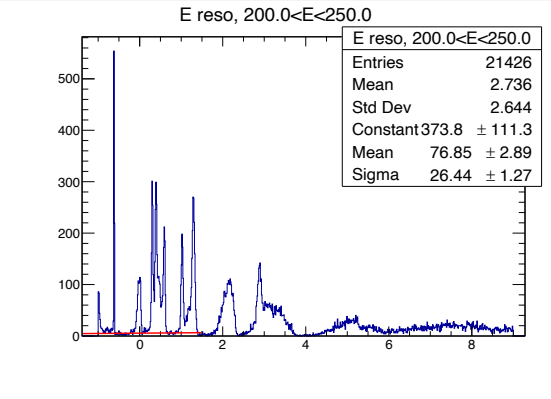

- Neither are ~great~, but excl-excl performs better (especially for E>250 GeV)
- Both chi-squares are hideous, and the noise param for incl-excl (which should be zero), raises questions

# The 50-250 GeV Slice Problem

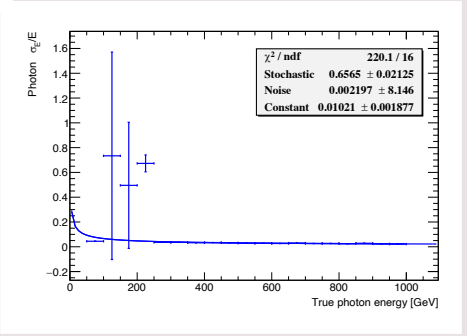


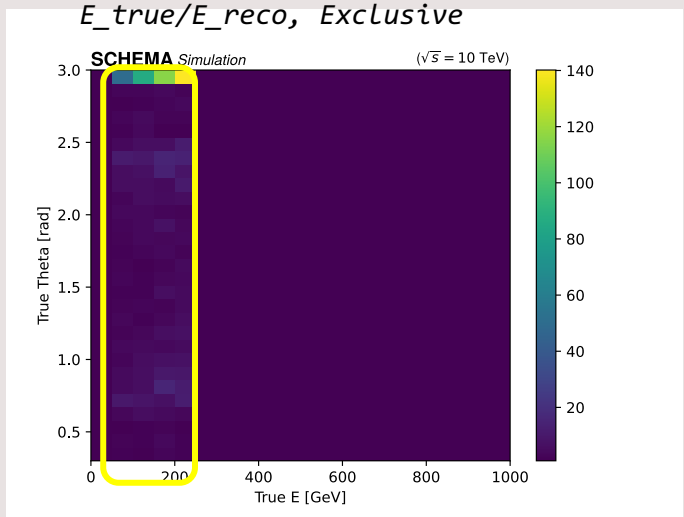



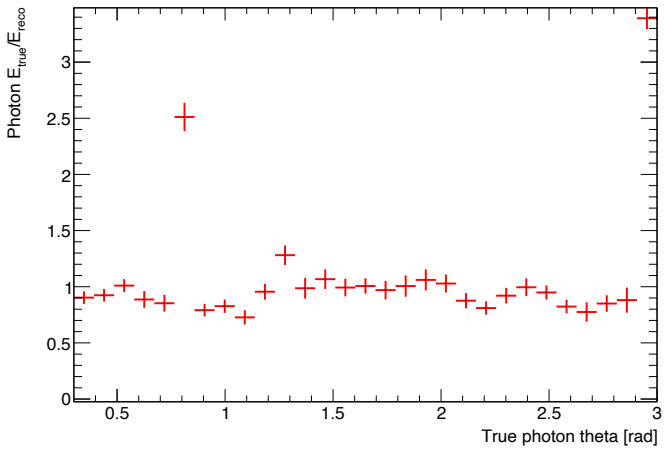

- The only slices that behave that way (everything else is reasonably Gaussian)
- Inclusive/exclusive and Exclusive/exclusive calibrations both yield the same problem
- The data points in this range on the reso plot are therefore kind of bogus (chose an arbitrary peak to fit)

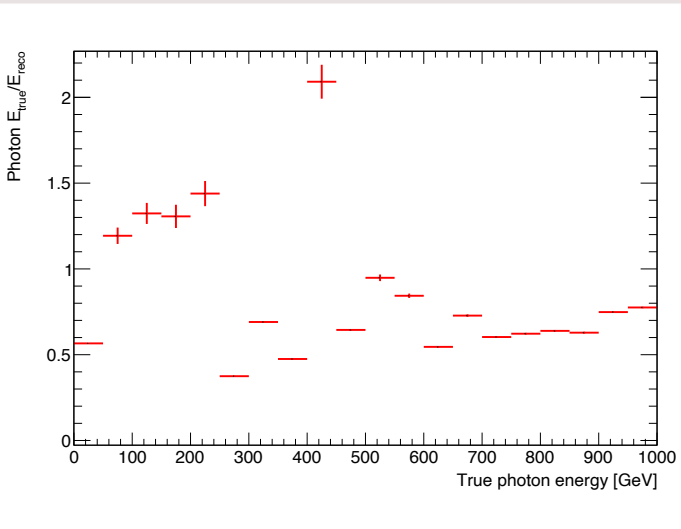


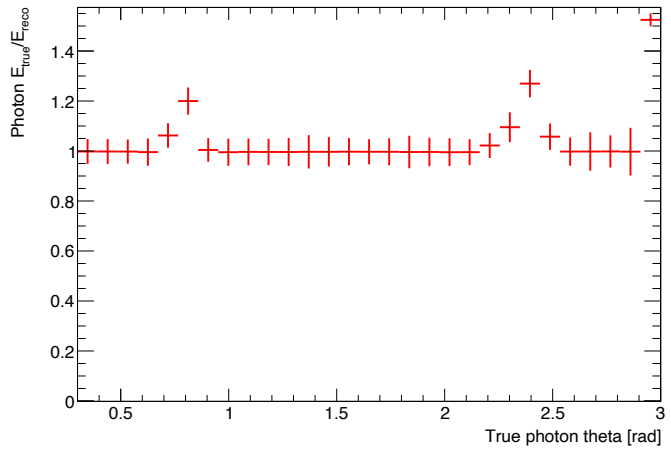
# Response Plots

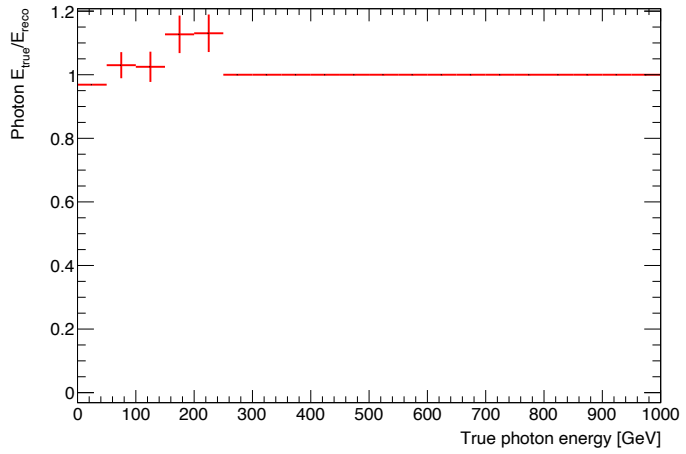
*Inclusive-Exclusive*




*Exclusive-Exclusive*

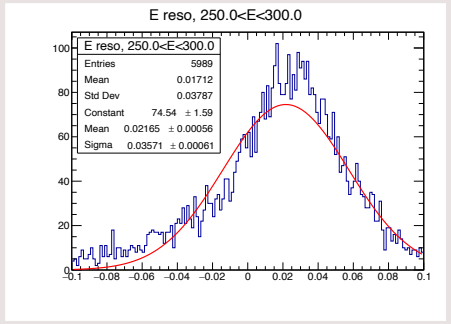


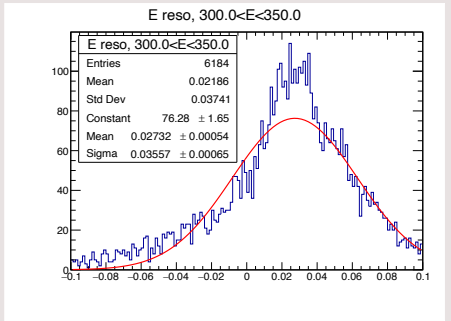



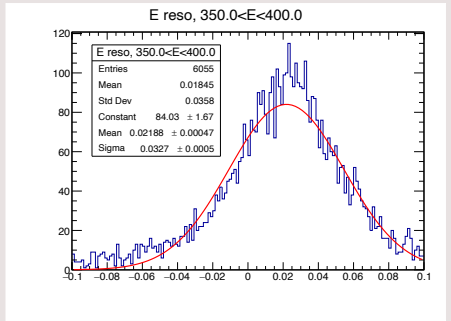

- Another selling point for an exclusive-exclusive calibration
- Here, we see that 50-250 slice acting up
- Aside from that slice and transition regions, we see large improvement in response

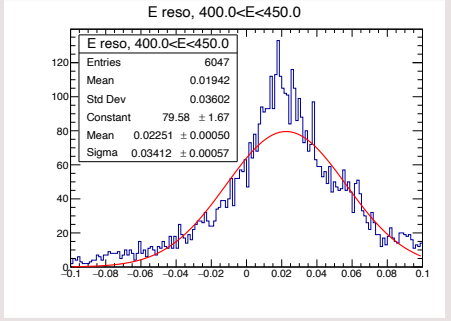
# Plot Dump: Non-Gaussian? Double Gaussian?

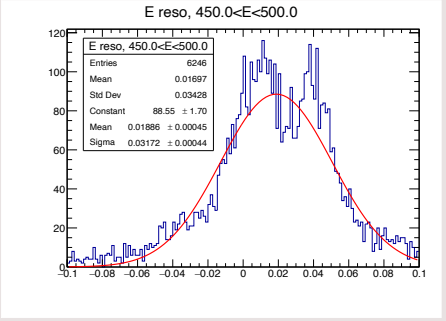
- Even for “well-behaved” slices, some bimodality and what looks like two layered distributions
- Plots below are for exclusive-exclusive calibration, E>250 GeV

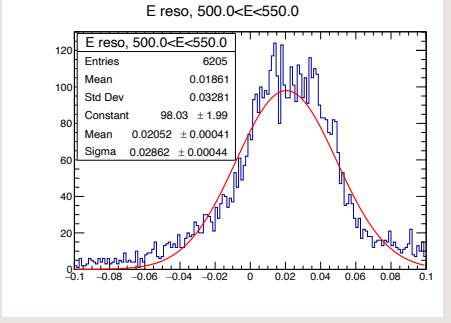


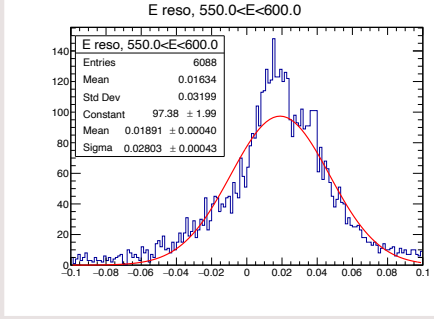



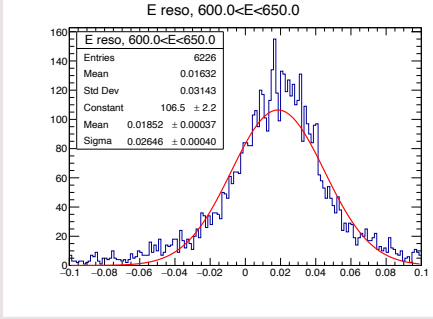



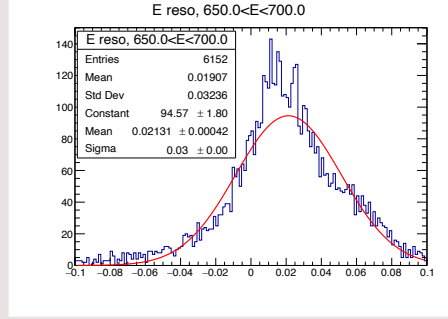



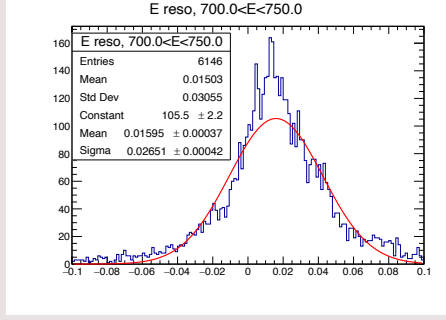



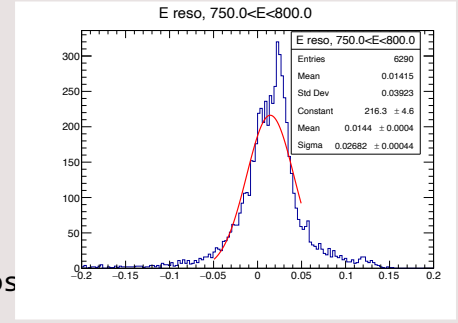



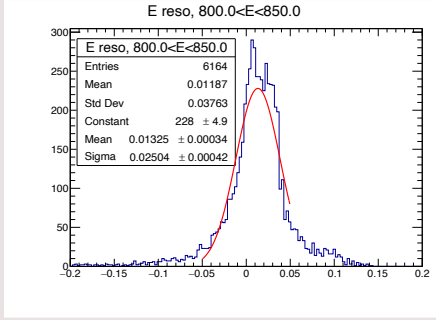



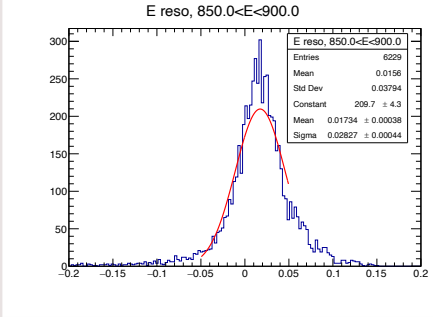



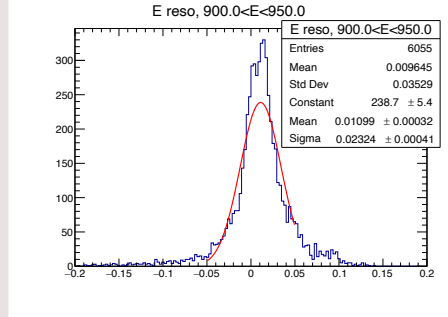



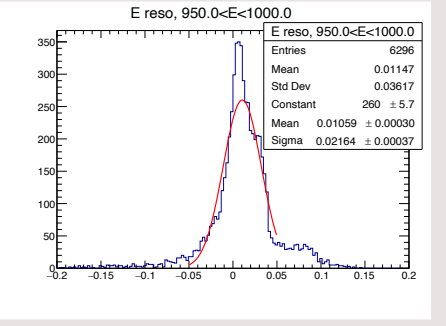



# Next Steps

- Update all plot formats to SCHEMA (huge shoutout to Elise!!)
- Put together poster for USMCC meeting!
- Decide what to do about 50-250 slice
- Generate final plots for the paper