ECAL Energy Calibration Updates

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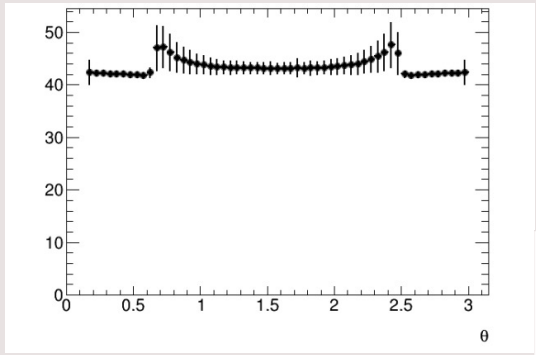
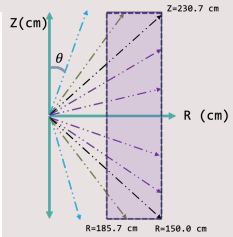
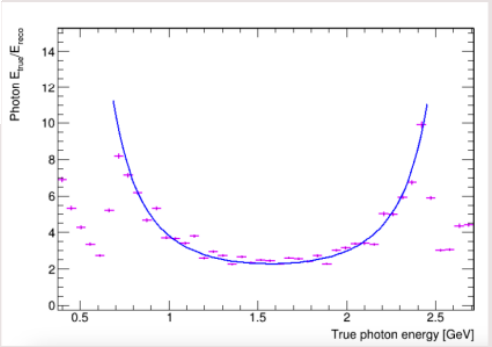
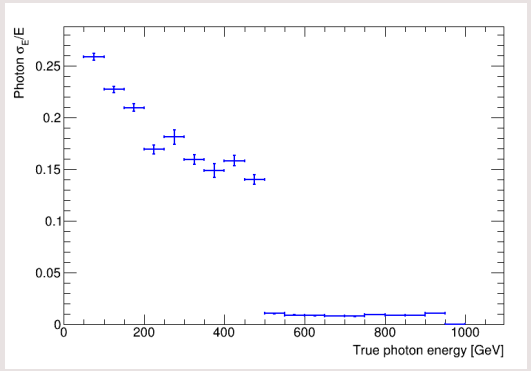
Many calibration attempts: Review

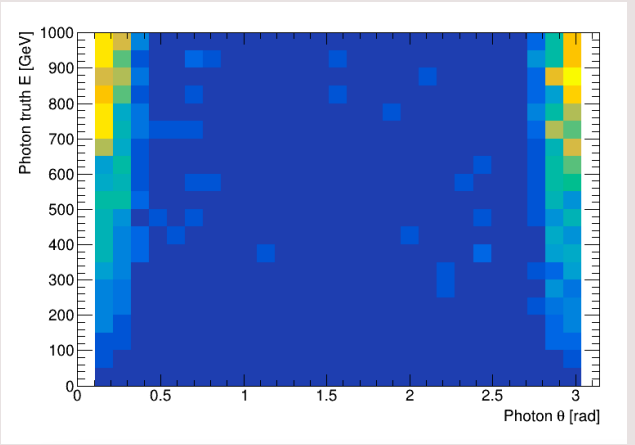
- After confirming both theta-dependence and energy-dependence of photon energy response in latest (v2) samples, tried several calibration strategies
- First, tried an analytical calibration to model energy loss in the solenoid
  + Modeled low energy slices well, but did not account for delayed showering
- Tried a mixed strategy: analytical at low energies (E<450 GeV), average response value at high energies
  + Found that the high energy slices had better resolution
- Then, a super-naïve strategy: manual correction based on 2d binned response





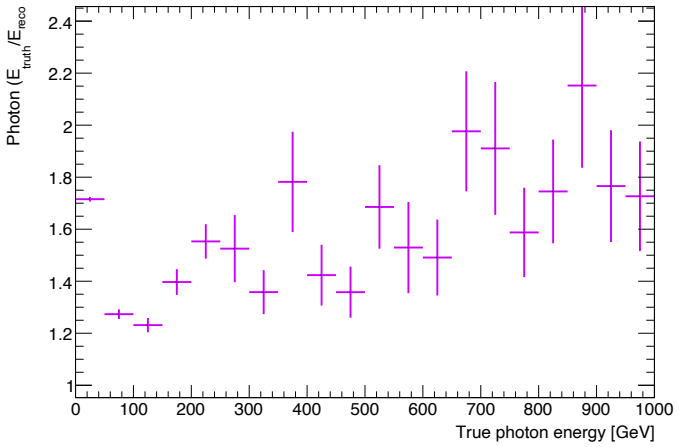


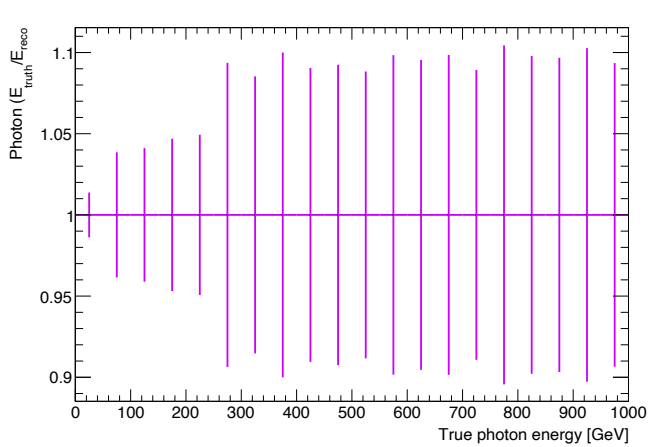


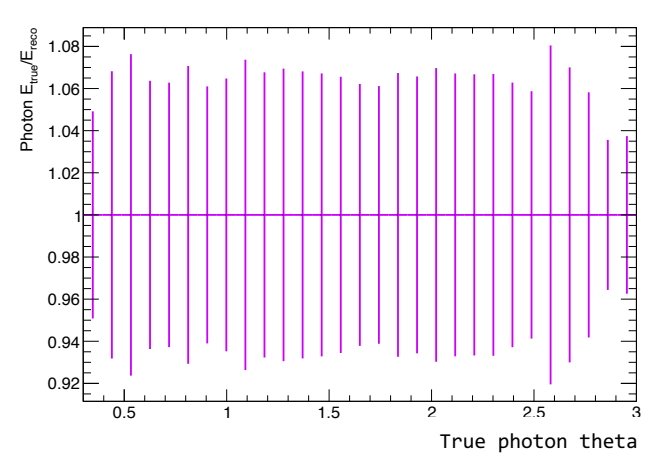


2D Binned Response

- First, used TProfile2D, but a lot of bins were being assigned 0 erroneously
- Went back to first-principles and did a manual 2D response profile
  + Loop over theta and E bins, gather energy response (E_true/E_reco) for each entry in each 2D bin, then take the average
- Used these values as a “correction matrix” that is then applied to the photons’ reconstructed energy
- See below the change in response – avgs to 1, of course, but huge error

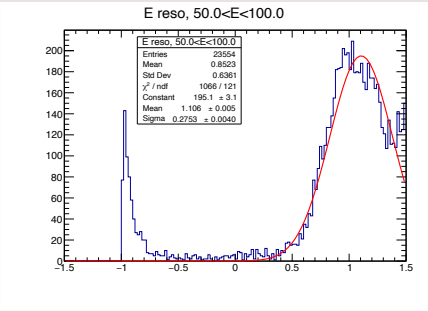


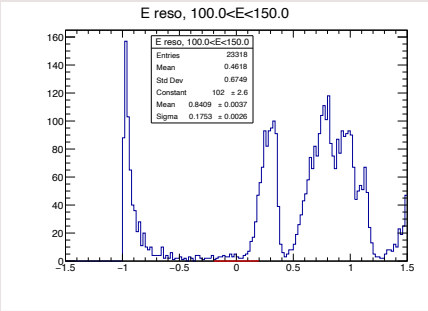


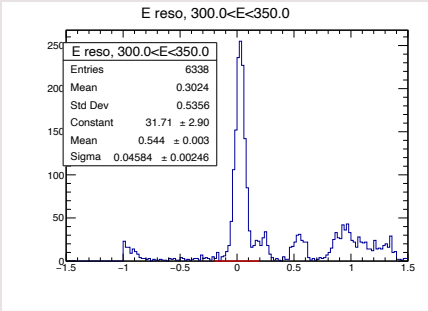


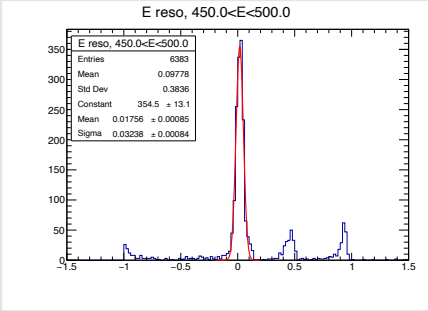
Resolution worsened

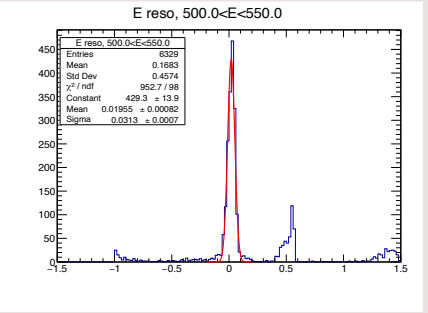
- Resolution individual plots, for lack of better words, a mess
- At energies above ~500 GeV, we do get a Gaussian peak at 0
- Most fits are nonsense
- Evidence of outliers in correction matrix, took a closer look

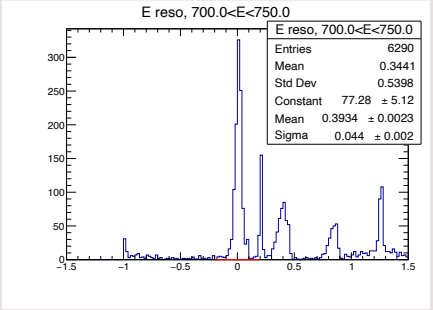


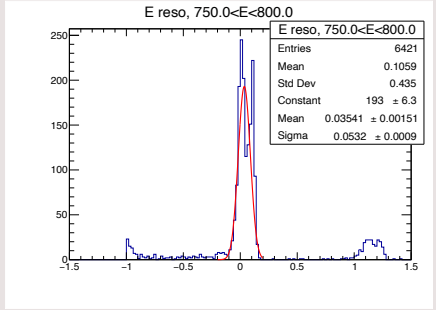


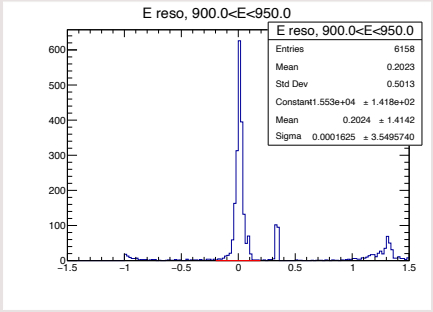


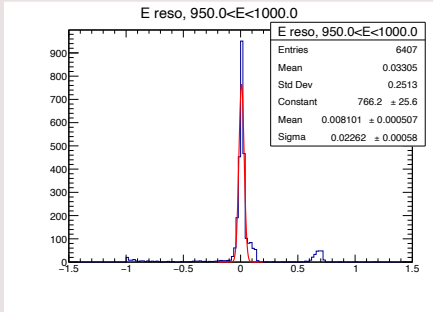






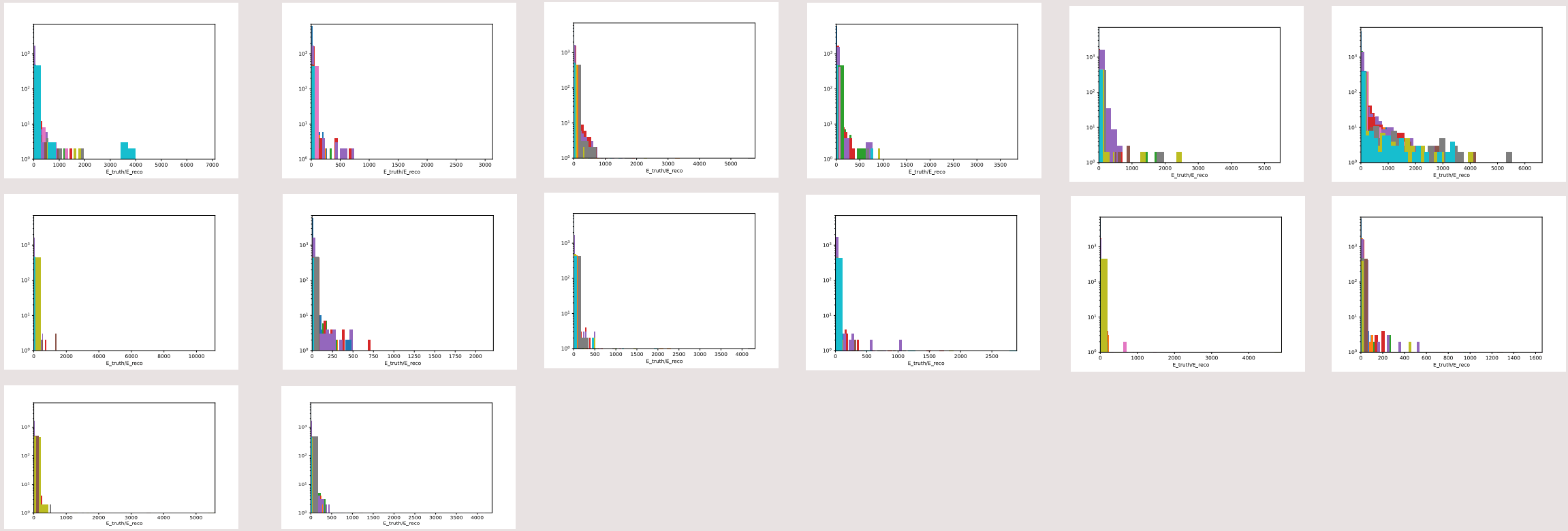






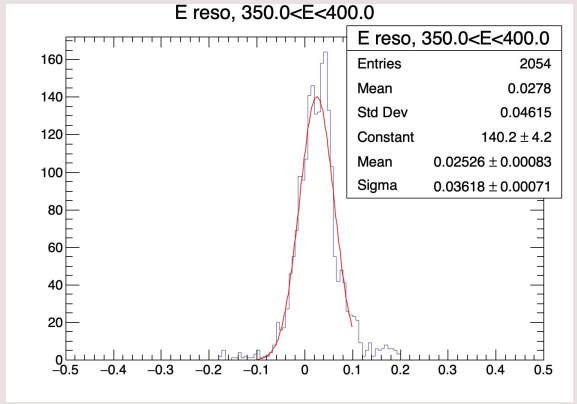
Outlying Correction Values

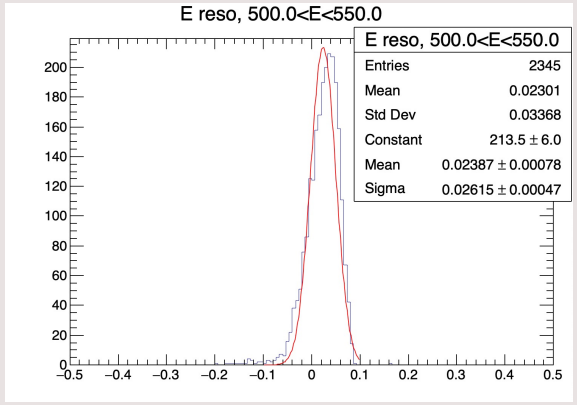
- Histograms displaying E_true/E_reco value for each theta bin (E bins are in different colors, overlaid)
- Note log scale on y-axis, but also wide range for ratio values

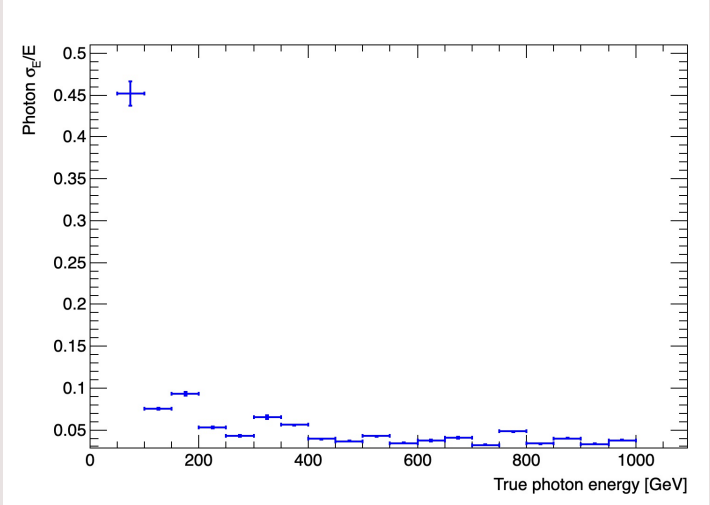


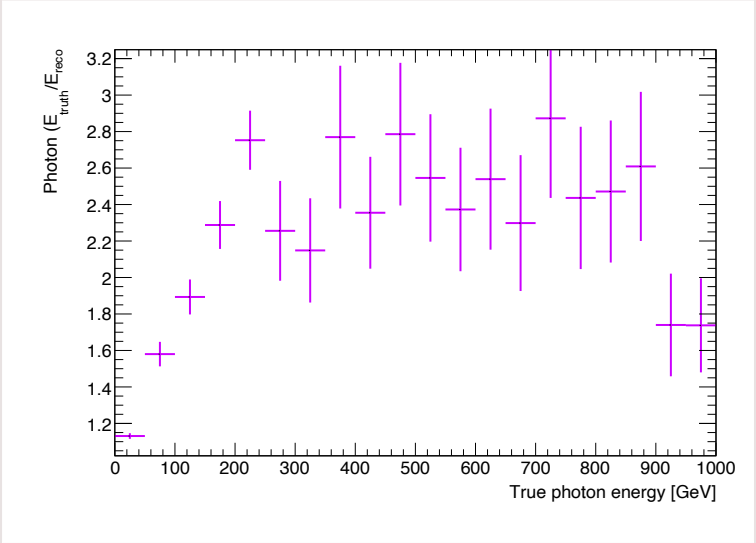
Attempted Outlier Removal

- Set E_truth/E_reco > 50 as arbitrary cutoff for outlying values
- Also narrowed area of consideration for resolution
- Improves resolution, but sabotages response…









Suggestions…?