

EIC Residuals

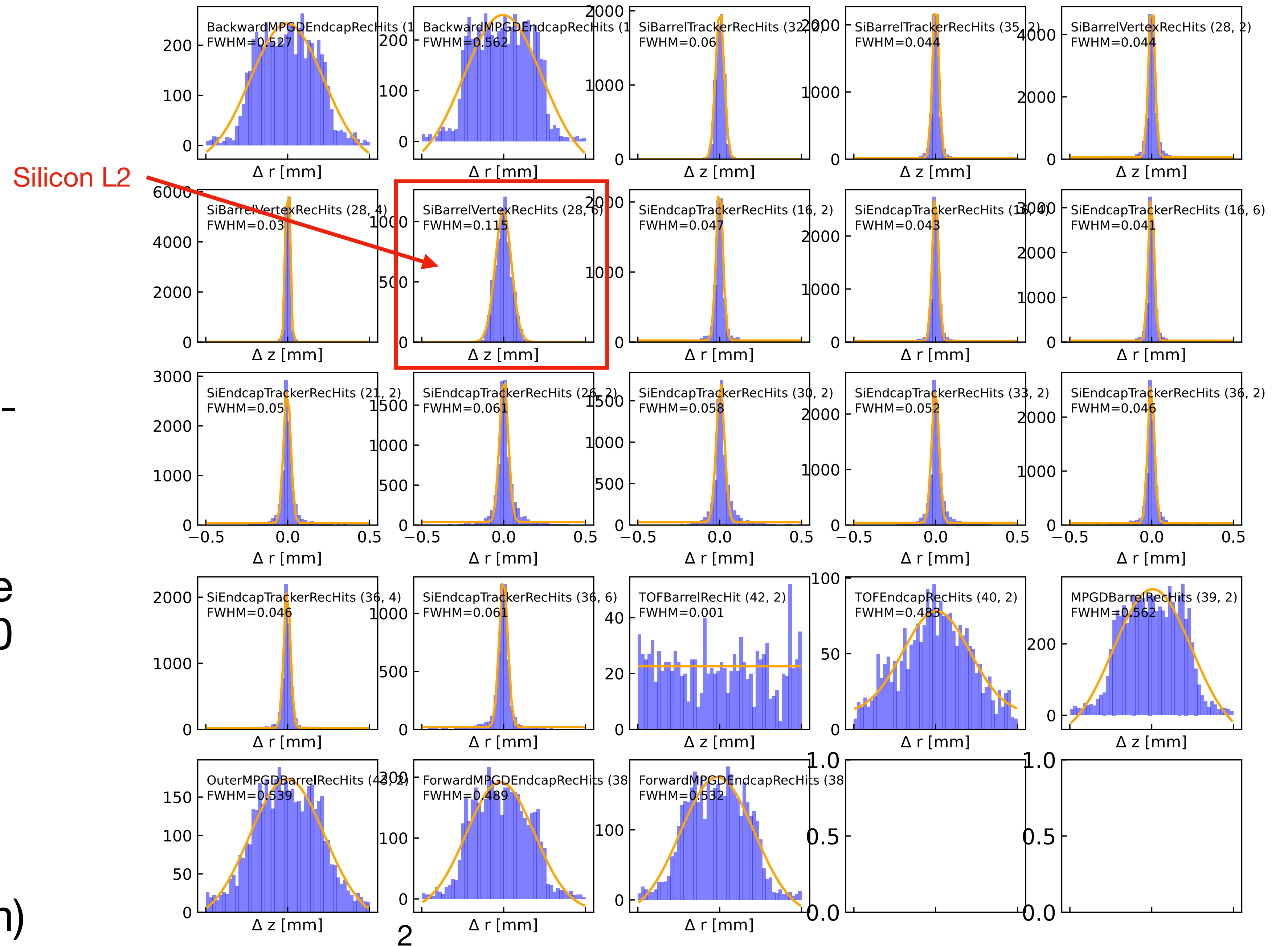
**EIC LBL meeting updates
20 February 2024**

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Reminder: Residuals in different layers

- Realistic seeded, μ^-
- $0.5 < p < 20 \text{ GeV}/c$
- Silicon peaks range from a FWHM of 30 - 115 μm
- (compared to truth seeded: FWHM ranges from 24 - 125 μm)

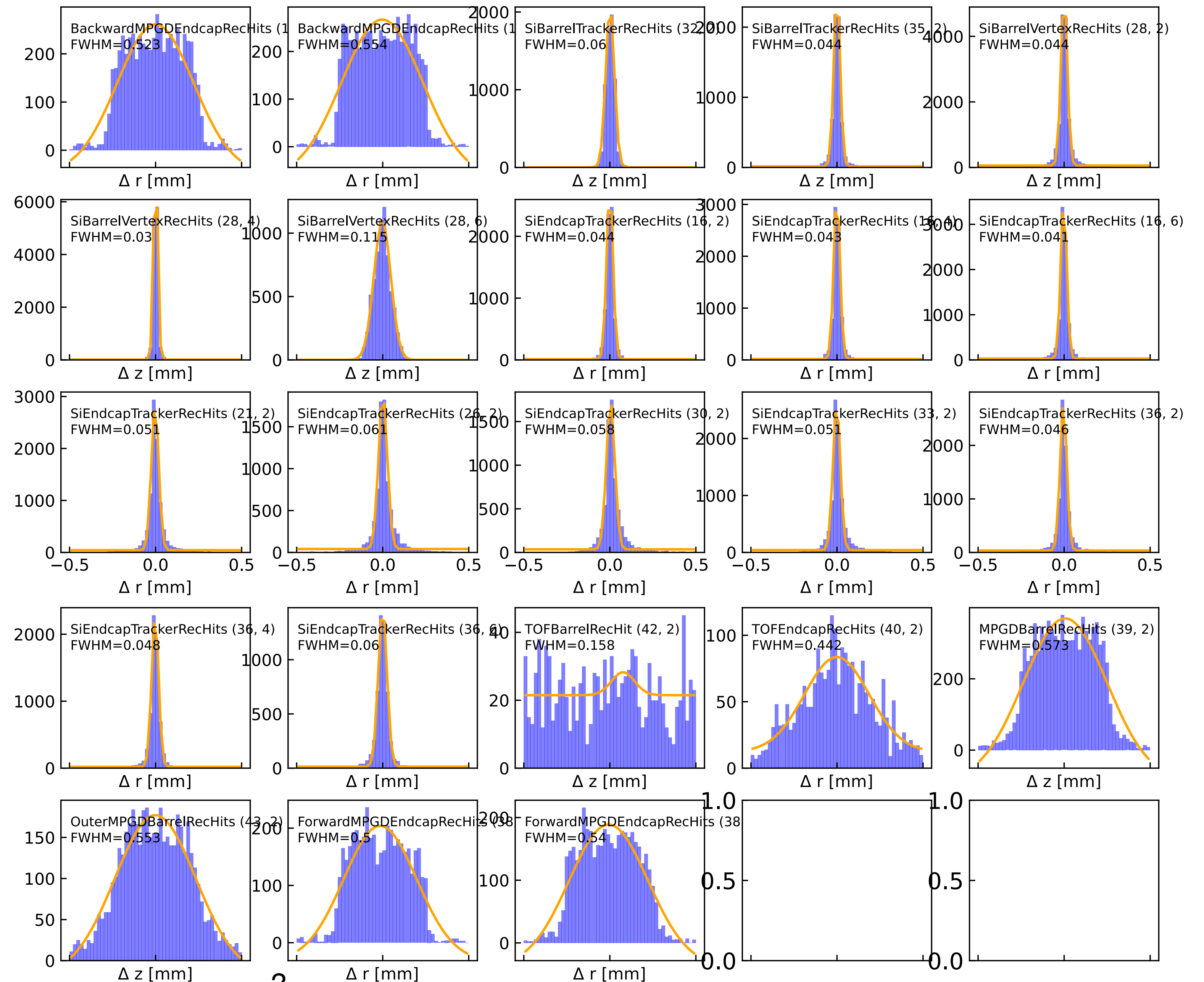
Residuals



Using a new material map

- Material map made by Shujie
- Slight differences in the residuals, but mostly hard to notice

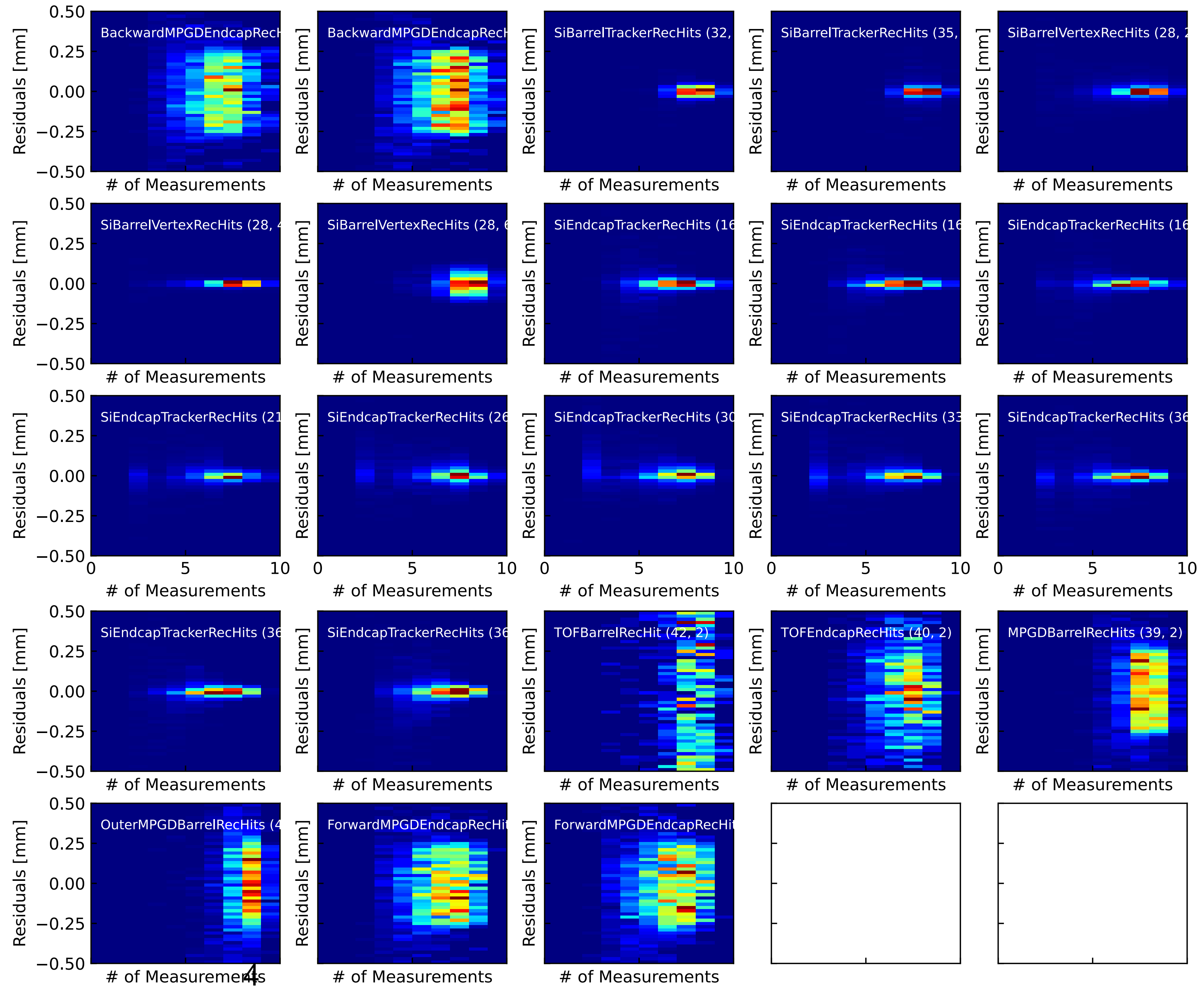
Residuals



Looking at the # of measurements

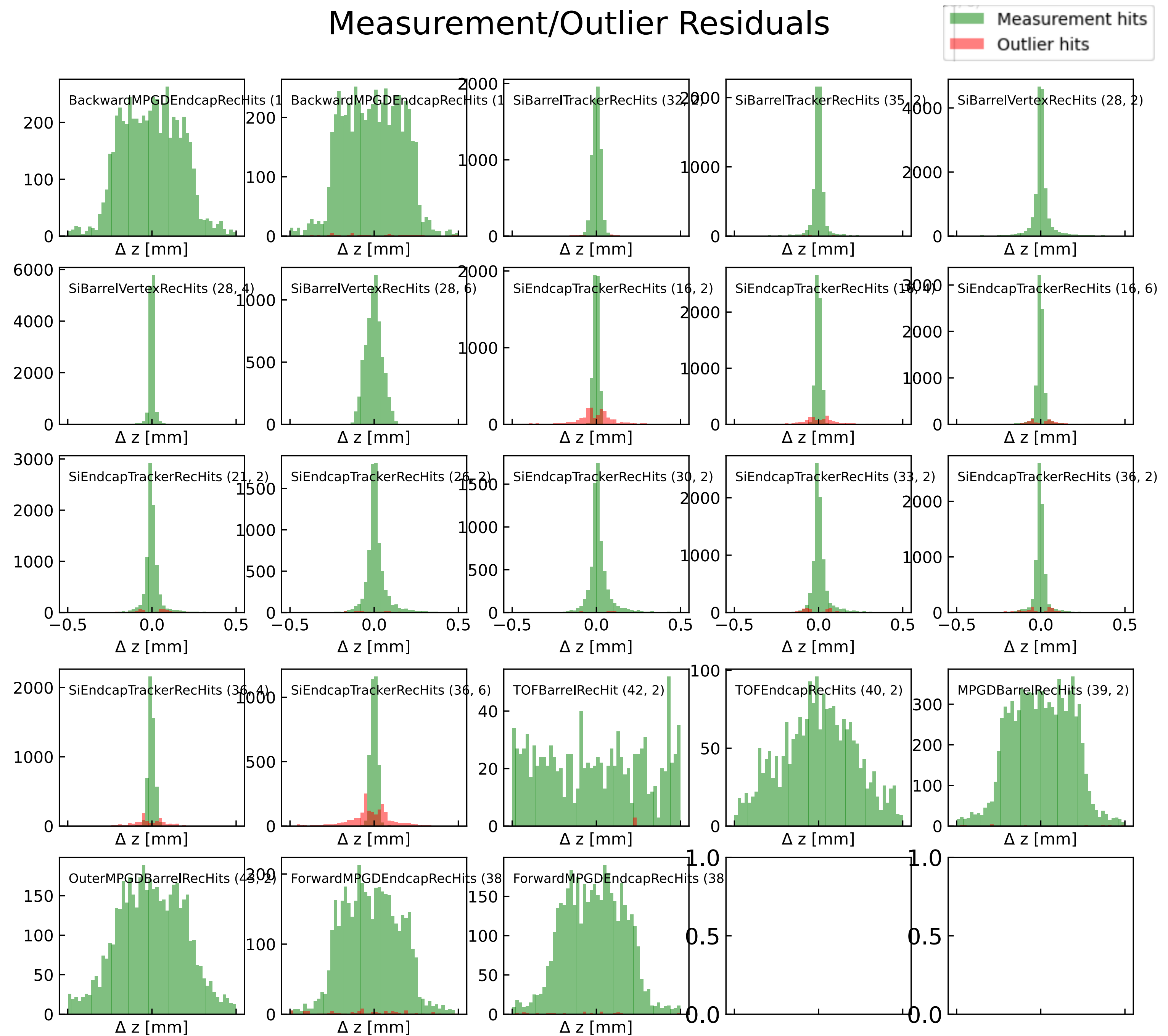
- # of measurements vs residuals
- residuals is a hit quantity, # of meas is a track quantity
- mostly 6-8 hits per track

Measurements vs Residuals



Measurement vs outlier hits

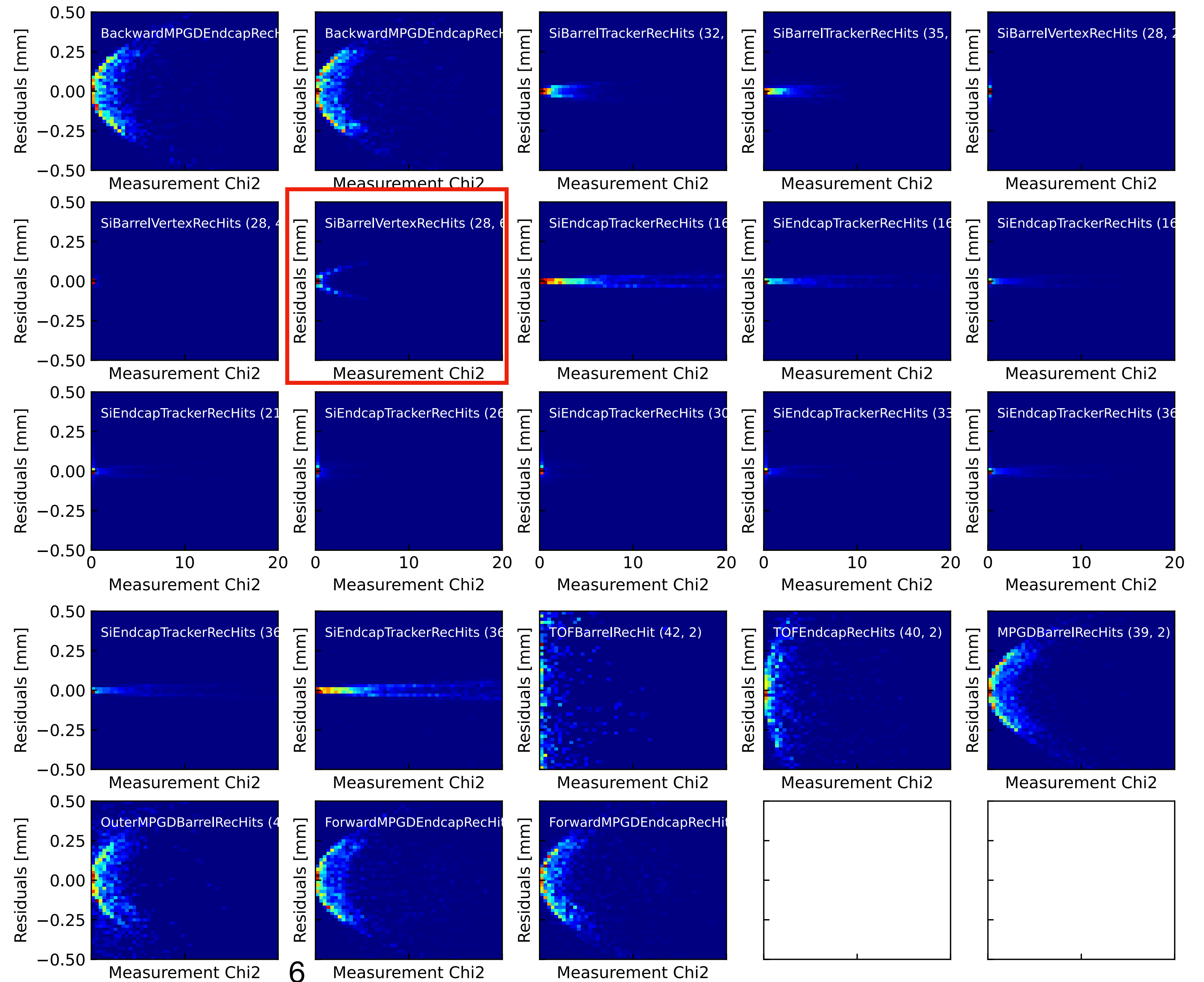
- Wanted to see which hits were used in the final track fit



Measurement Chi²

- See some sort of correlation between measurement chi² and the residual in silicon L2

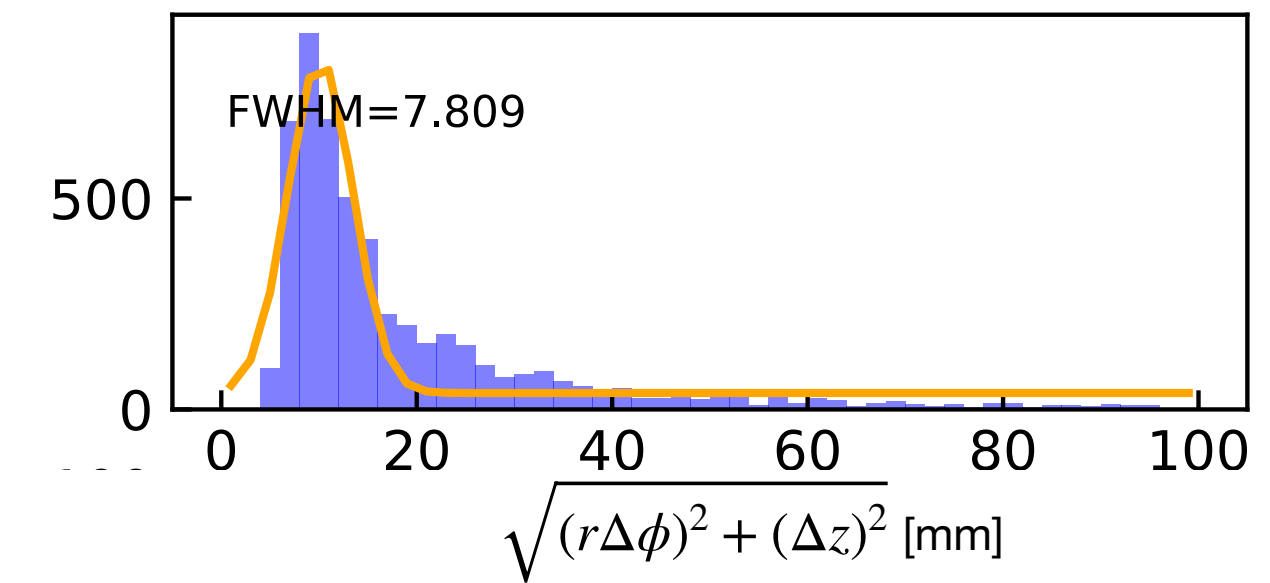
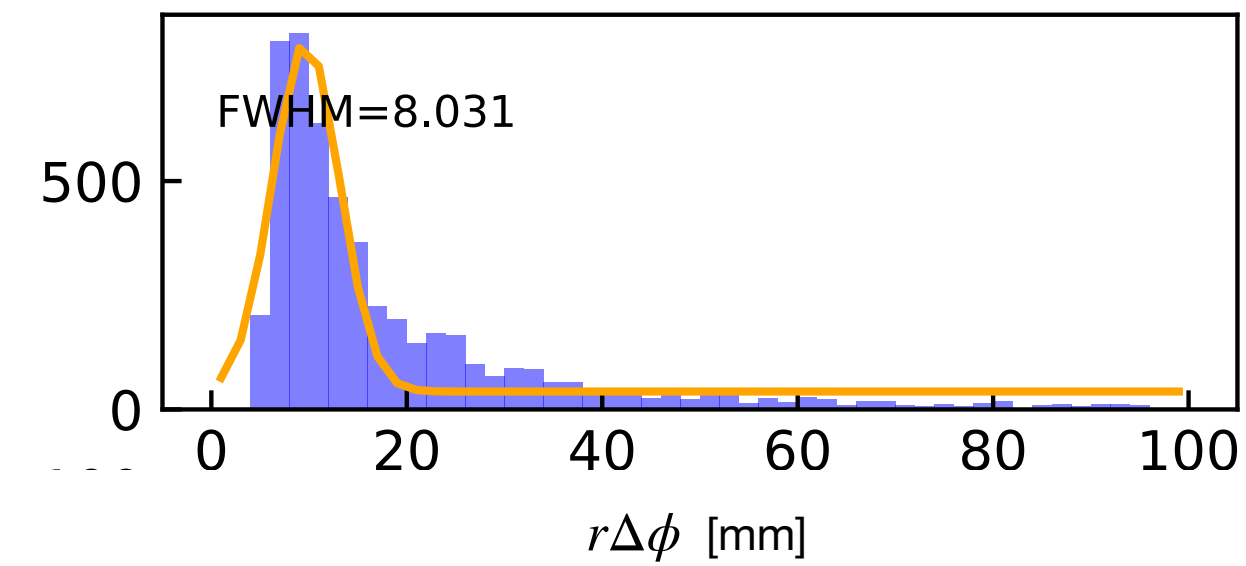
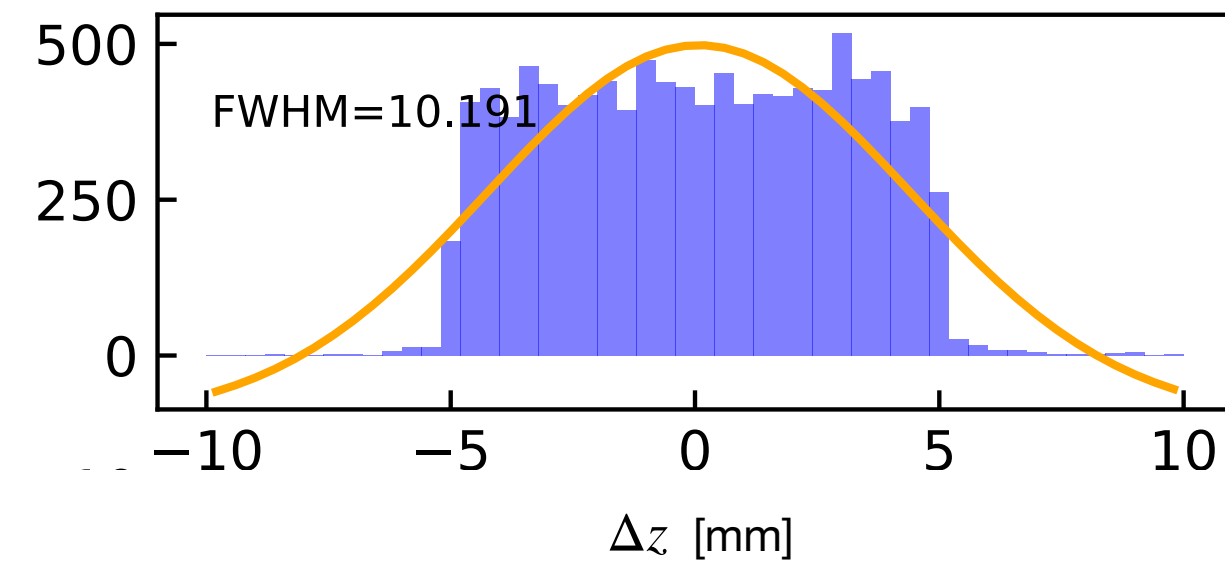
Measurement Chi2 vs Residuals



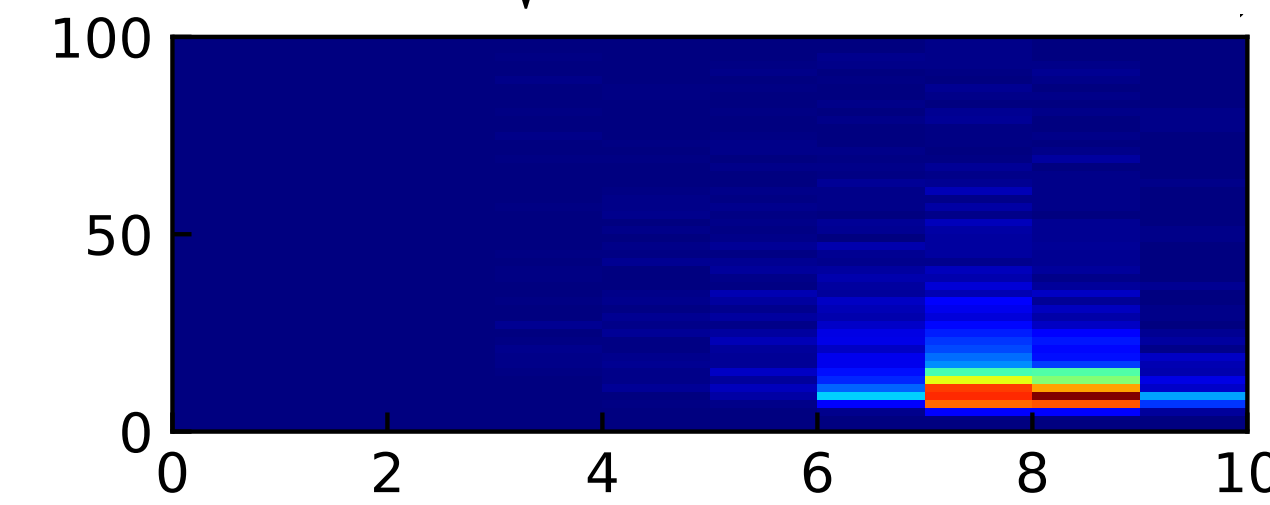
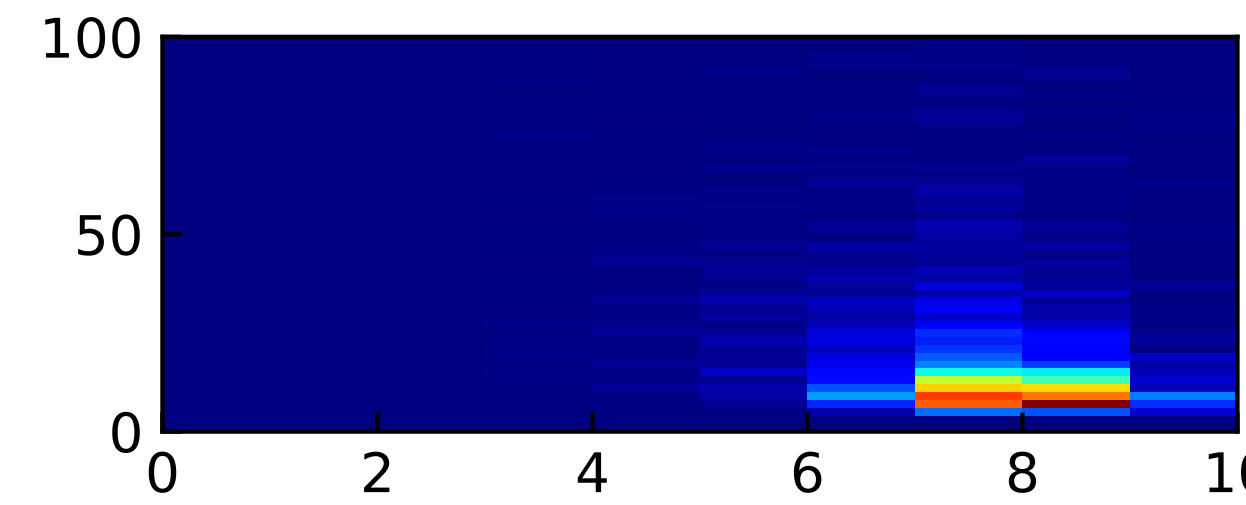
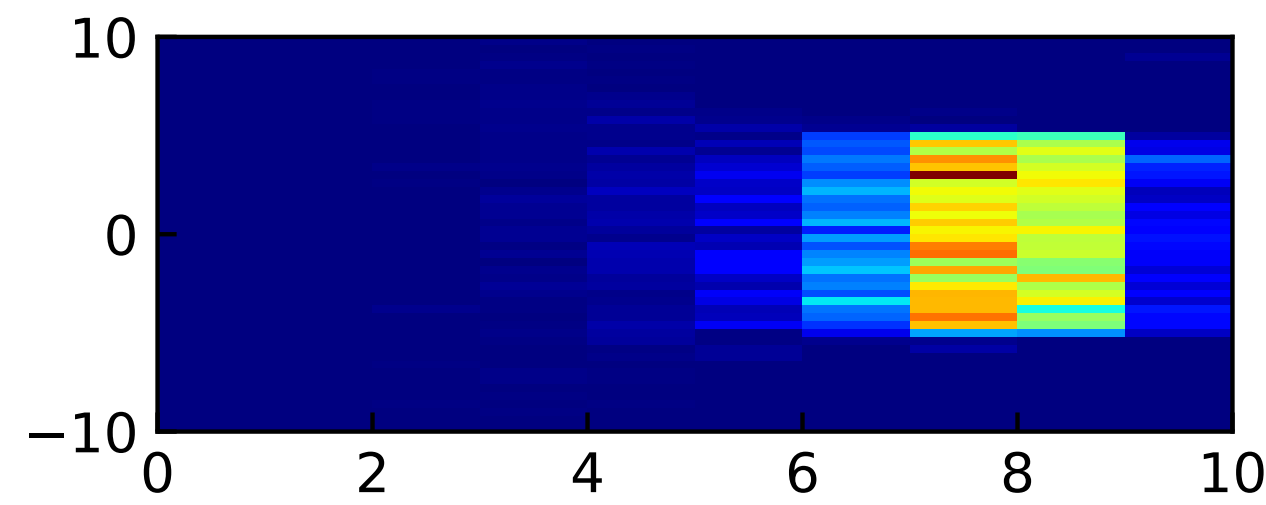
TOF Barrel layer

TOF Barrel Layer

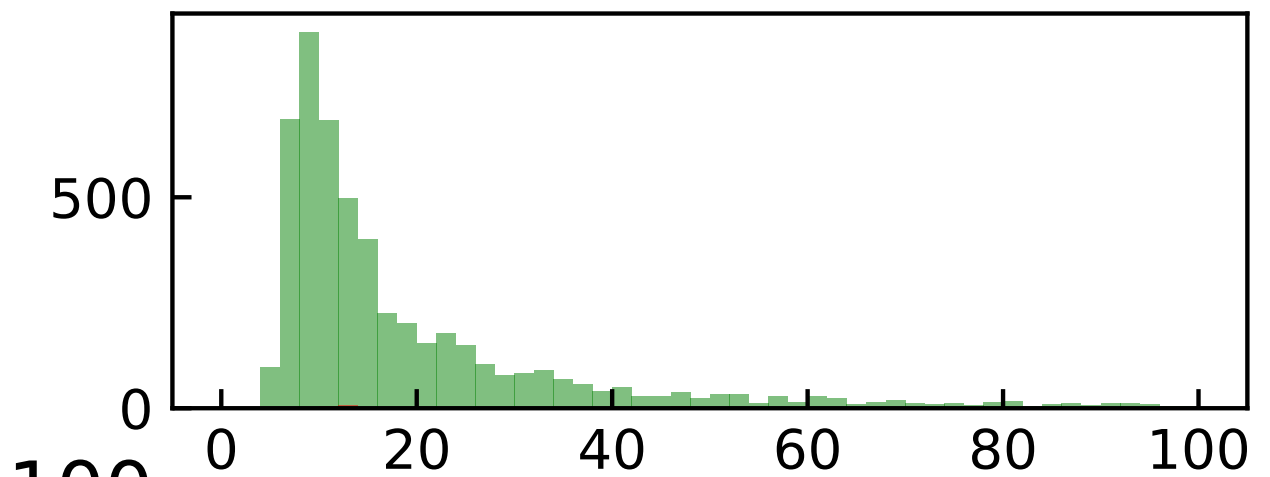
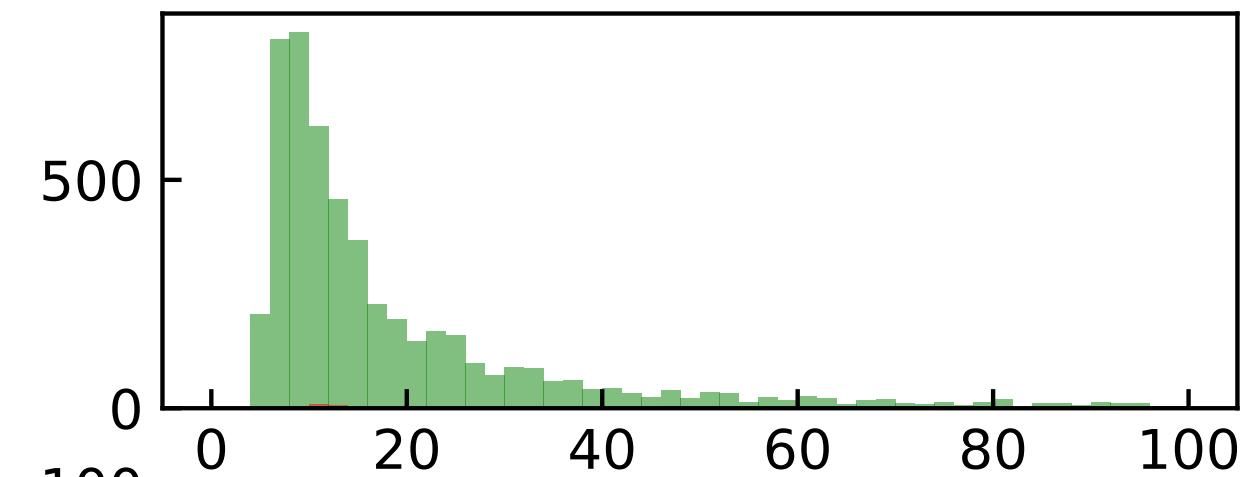
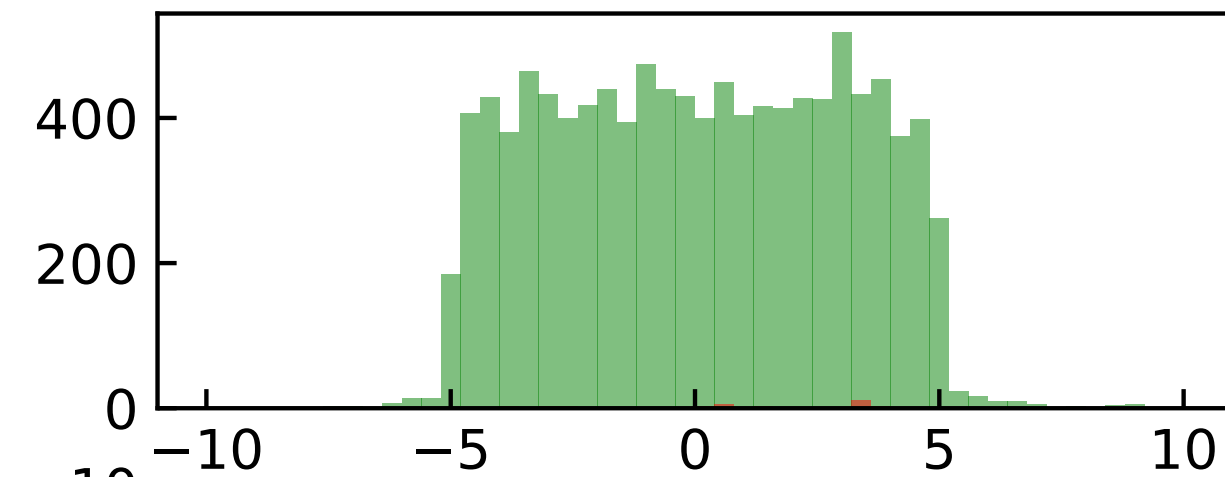
Residuals [mm]:



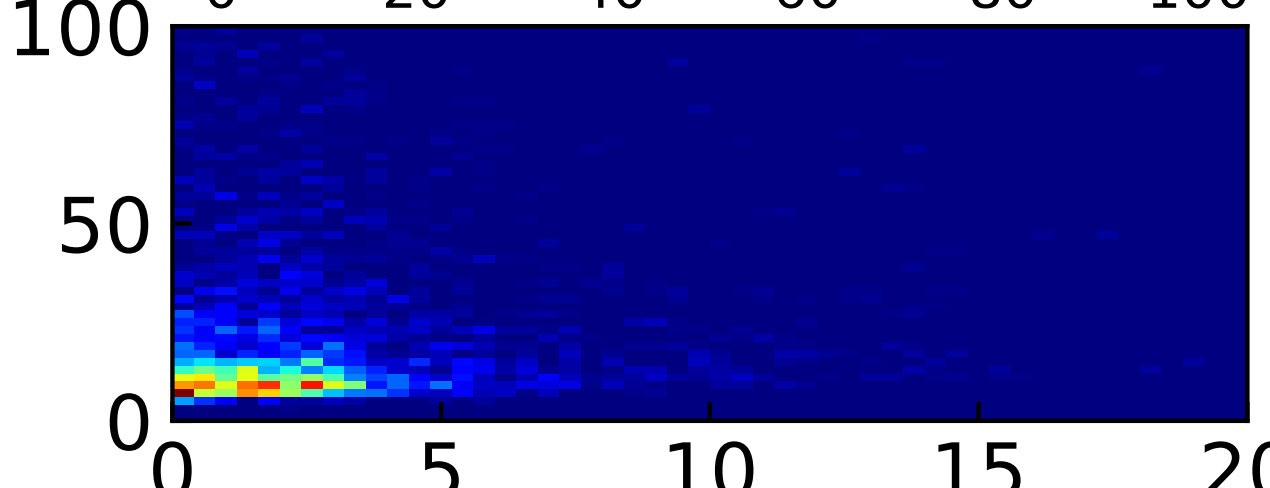
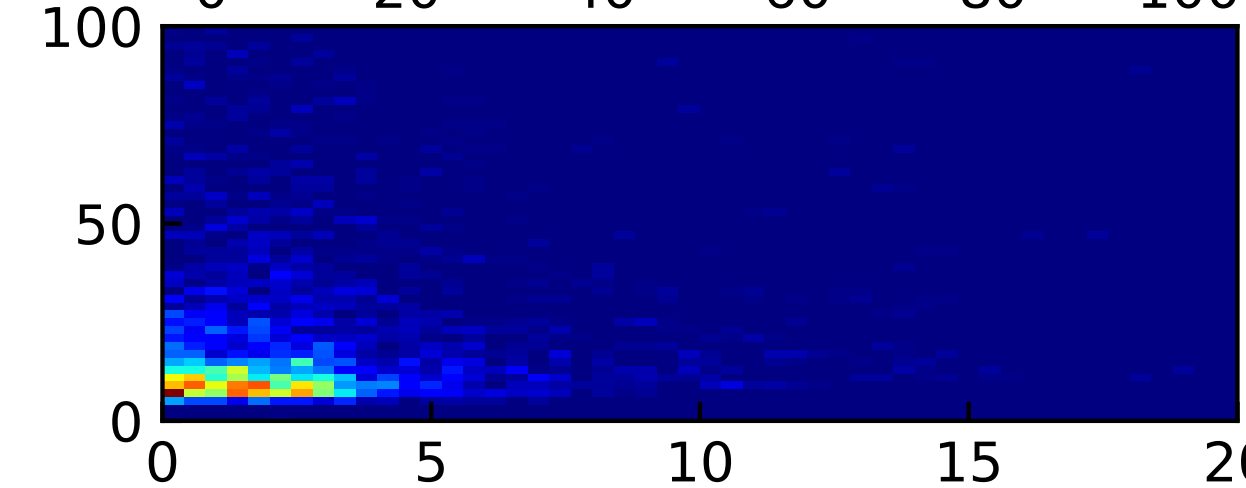
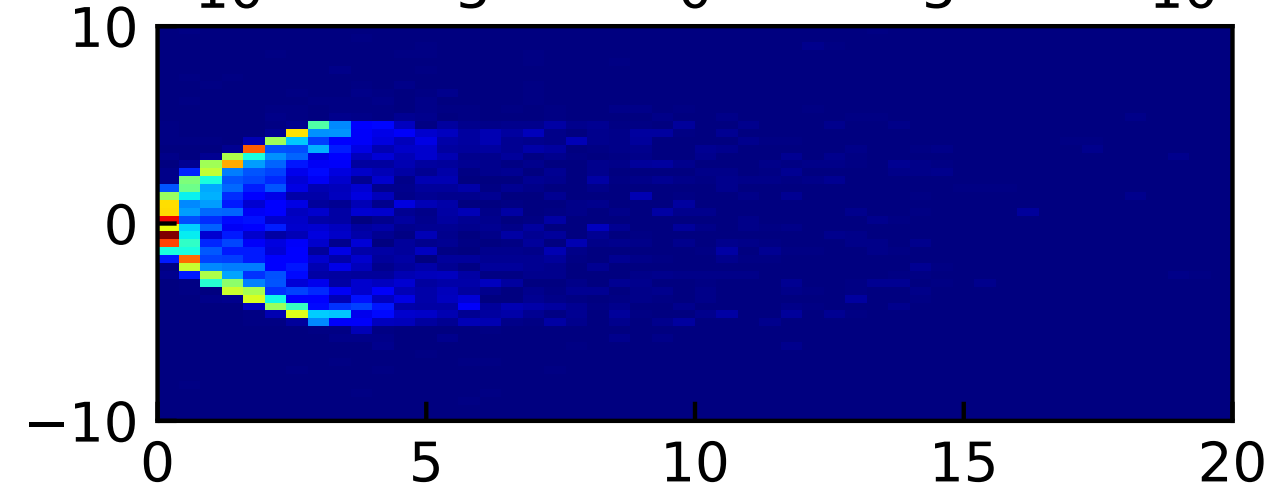
Residuals [mm] vs # of measurements:



Residuals [mm] for measurements vs outliers:

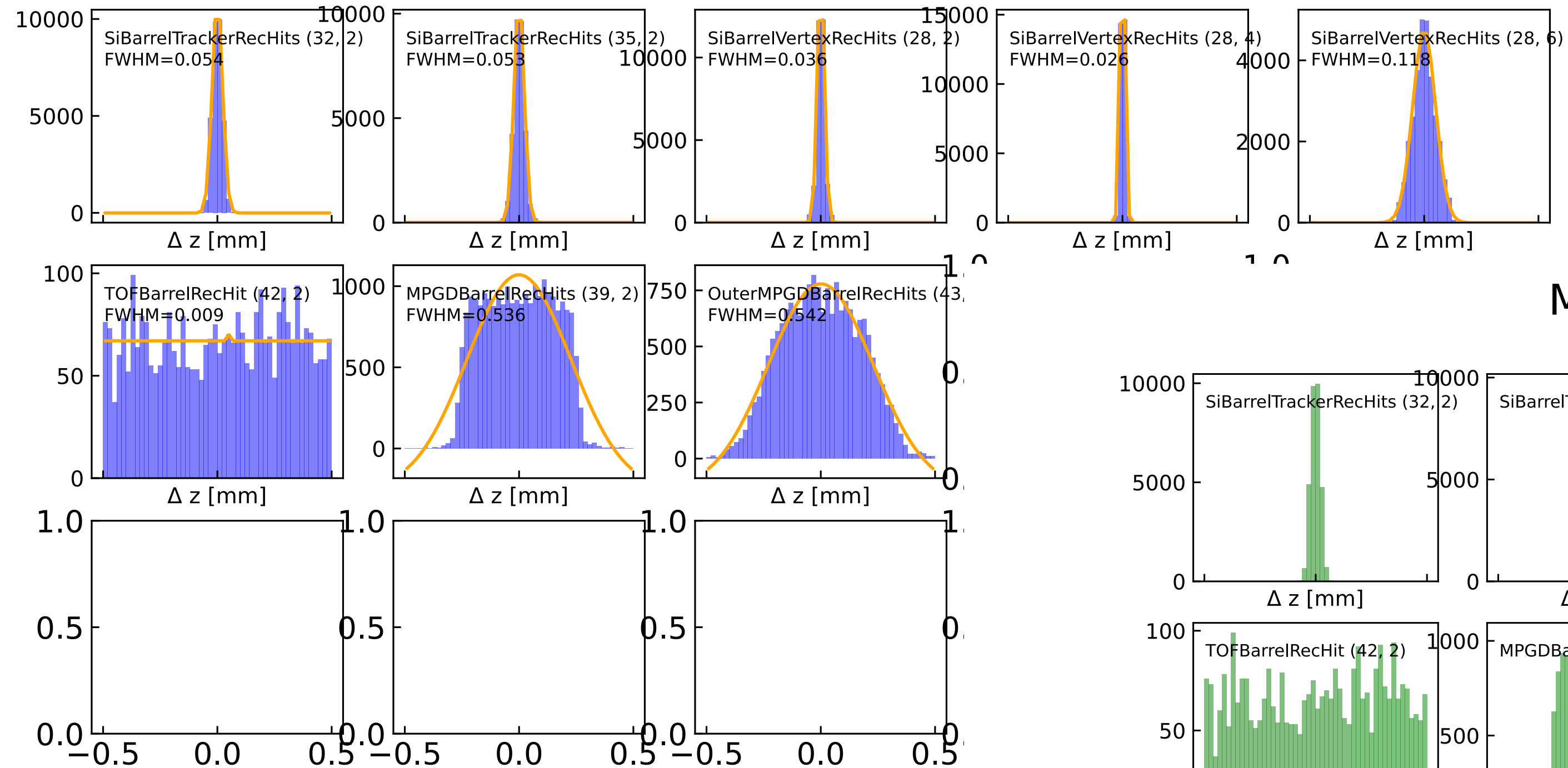


Residuals [mm] vs measurements chi2:

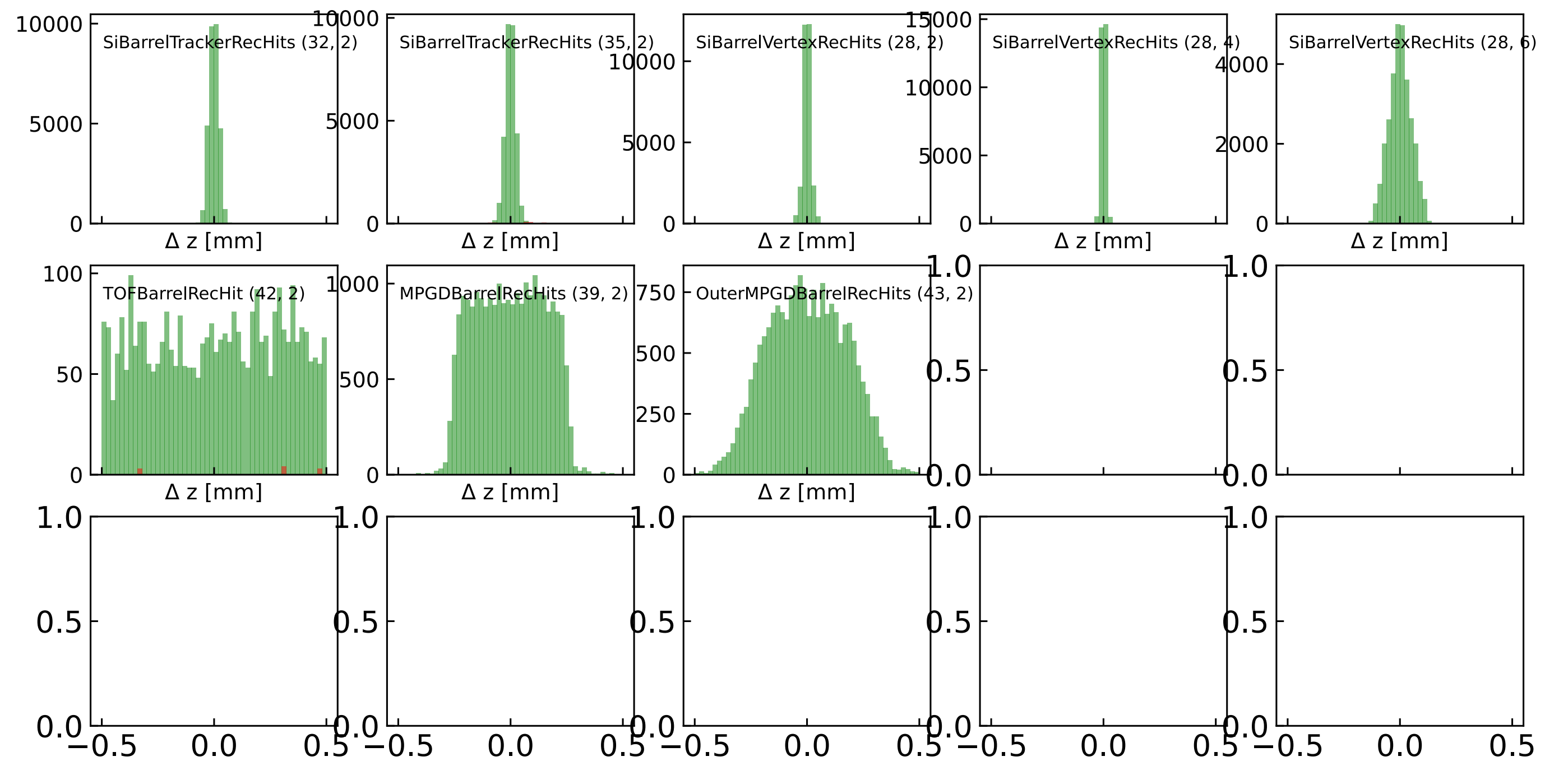


90 degree muons

Residuals



Measurement/Outlier Residuals



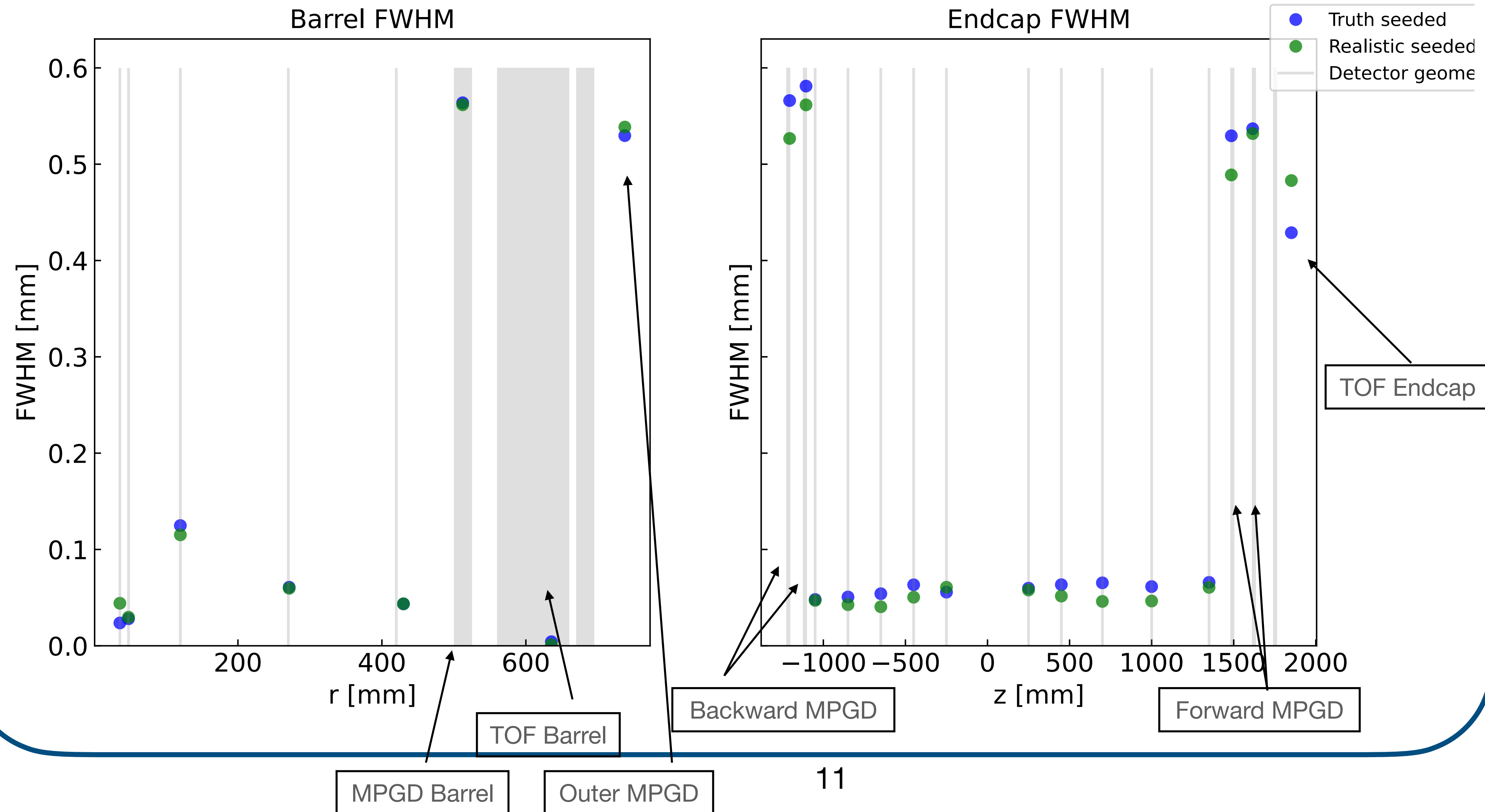
Summary and Next Steps

- Studied some of the correlations between the measurements and the residuals
- Silicon L2 residual does not change with the new material map, or a selection of muons at 90 degrees
- Make unbiased residuals
 - Some functionality in ACTS to do this:
 - <https://github.com/acts-project/acts/commit/c21fc44fbe914473e13880da58798f13dfd542a5>
- Run all residuals with DIS events

FWHM at different layers

*See different TOF endcap coordinates at: <https://eic.jlab.org/Geometry/Detector/Detector-20231031150001.html>

Full Width at Half Max for Different Layers



Single μ^- , full reconstruction

Example of a track

- Reconstructed hits
 - Plotted are both “measurementHits” and “outlierHits”
- Track segment points = the points on a track at each surface
 - Includes calibrated+uncalibrated states

