EIC Residuals
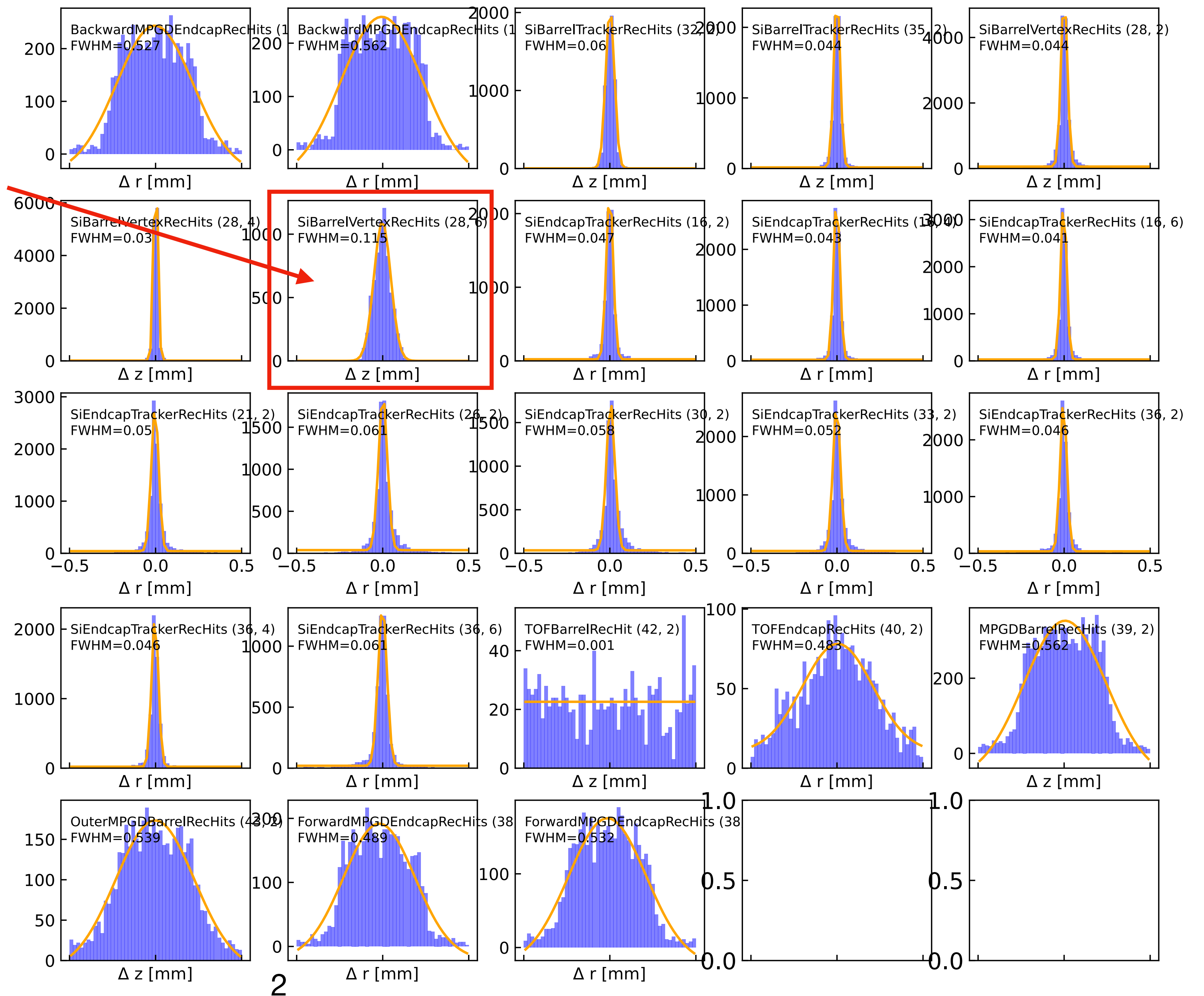
EIC LBL meeting updates
27 February 2024

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Reminder: Residuals in different layers

- Realistic seeded, μ-

- 0.5 < p < 20 GeV/c

- Silicon peaks range from a FWHM of 30 - 115μm

  - (compared to truth seeded: FWHM ranges from 24 - 125 μm)

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Attempted solutions

- Running EICrecon using just the innermost 3 vertexing layers

  - No change to the residuals in those layers

- Changing # of staves in L0-L2

  - Doubled and halved the number of staves (256, 64)

  - Inconclusive results -> would need to update the material map for proper results

- Looking at ACTS "smoothed" tracks

ACTS Track
Predicted, filtered, and smoothed tracks

- 3 optional sets of track parameters from track fitting process

- _Predicting_: determines track state at state k based on previous $k - 1$ measurements

- _Filtering_: adjusts the predicted track state at state k taking into account the measurement at state k

- Smoothing: adjusts the filtered track state with all measurements taken into account

  - Rauch–Tung–Striebel (RTS) smoother

    - Ensures that information from all measurements is included in the track parameter estimate at each measurement

Residuals: filtered tracks

- single muons

- 0.5 < p < 20 GeV

- -4 ≤ η ≤ 4

- realistic seeded

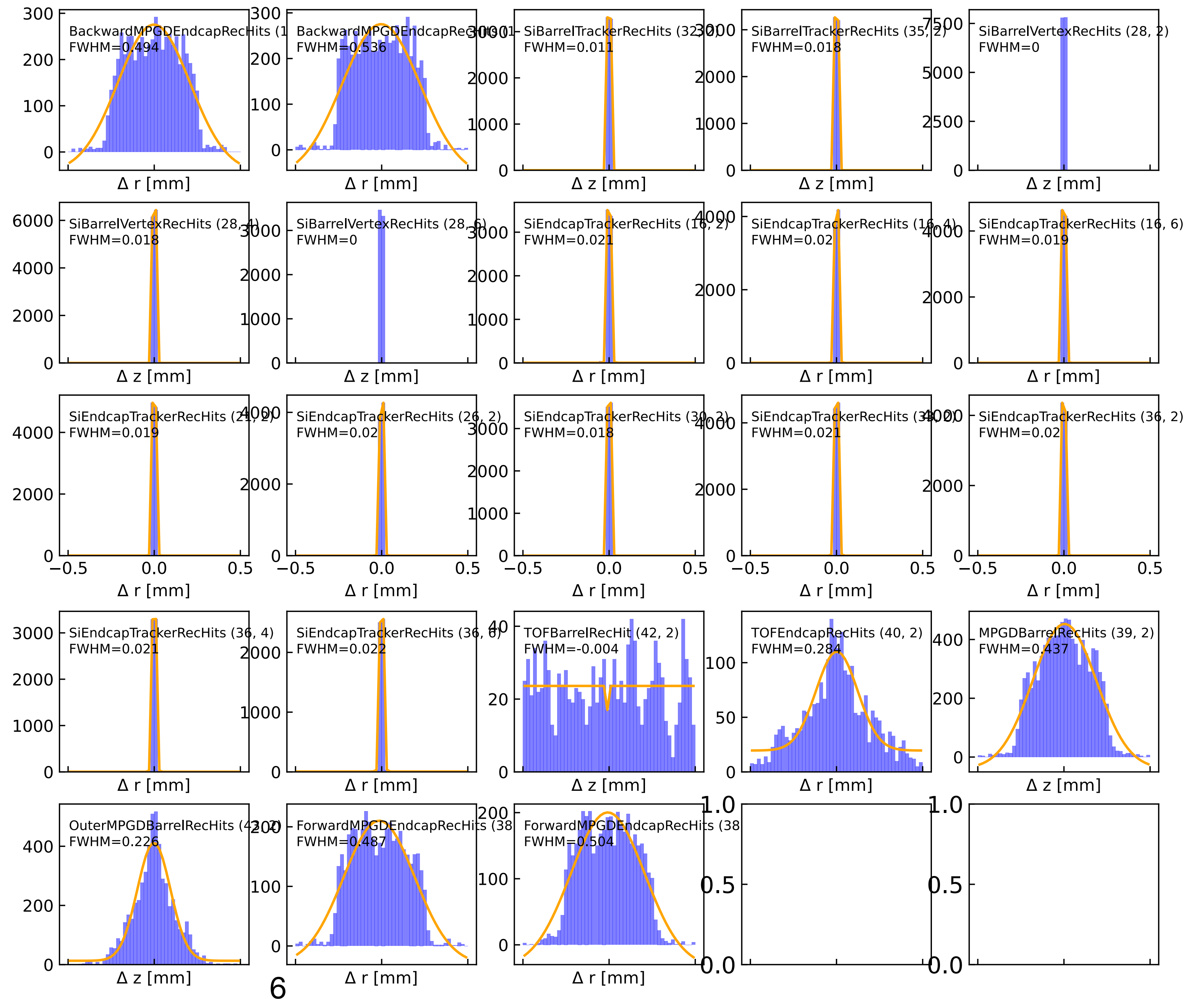Residuals
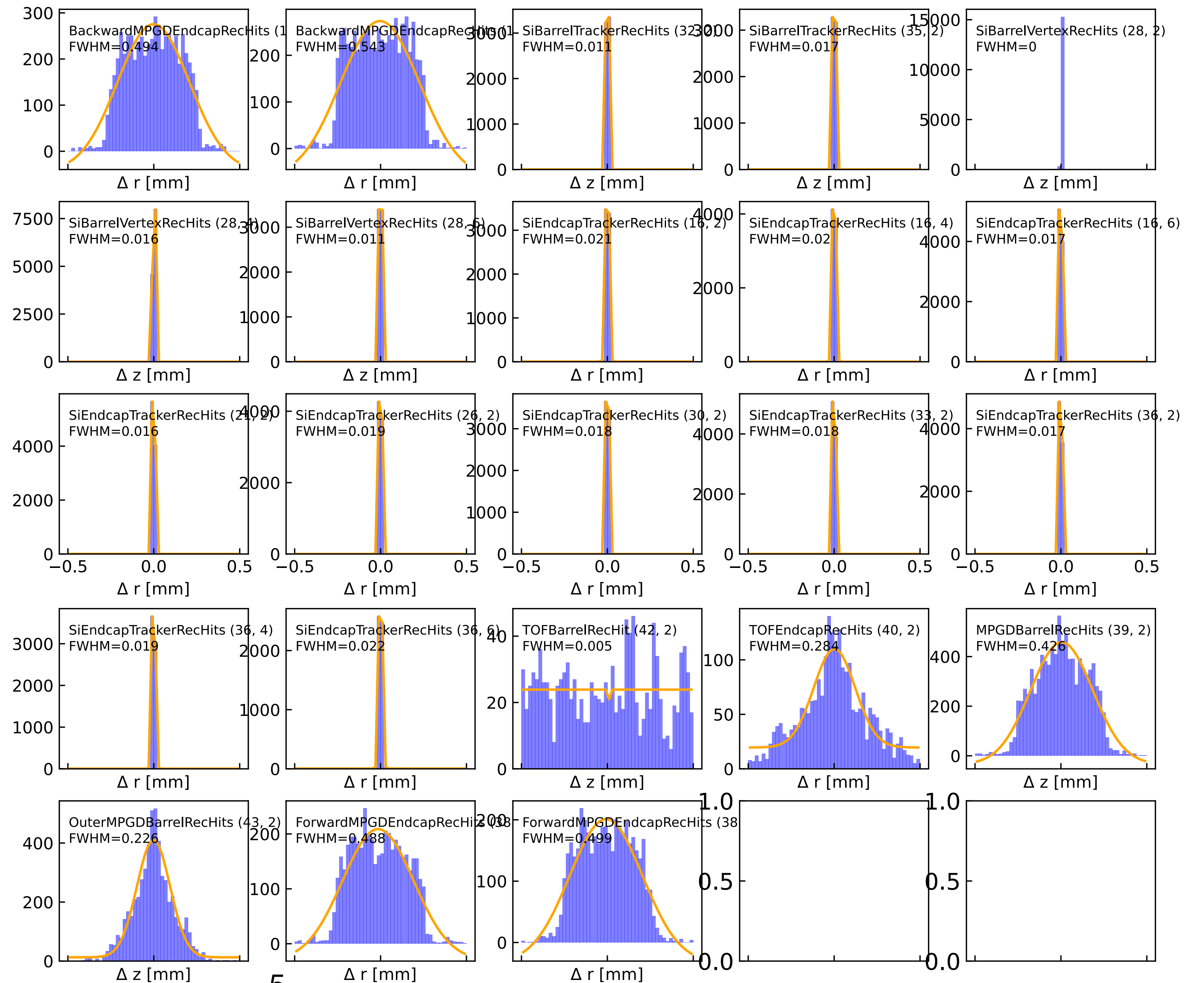
Residuals: smoothed tracks

- single muons

- 0.5 < p < 20 GeV

- -4 ≤ η ≤ 4

- realistic seeded

Summary and Conclusions

- The "CentralTrackSegments" data structure that I use for this study needs to be updated

  - "CentralCKFTrajectories" and "CentralCKFTracks" should be fine

  - Luckily, I think we are the only ones using "CentralTrackSegments"

EICrecon/src/algorithms/tracking/TrackProjector.cc:

```
83                   // get track state parameters and their covariances
84                   const auto &parameter = trackstate.predicted();    smoothed()
85                   const auto &covariance = trackstate.predictedCovariance();  smoothedCovariance()
```

- Silicon layers now show a FWHM on the order of 10-20 μ

- Need to check TOF Barrel azimuthal residuals

- Time to look at unbiased residuals?