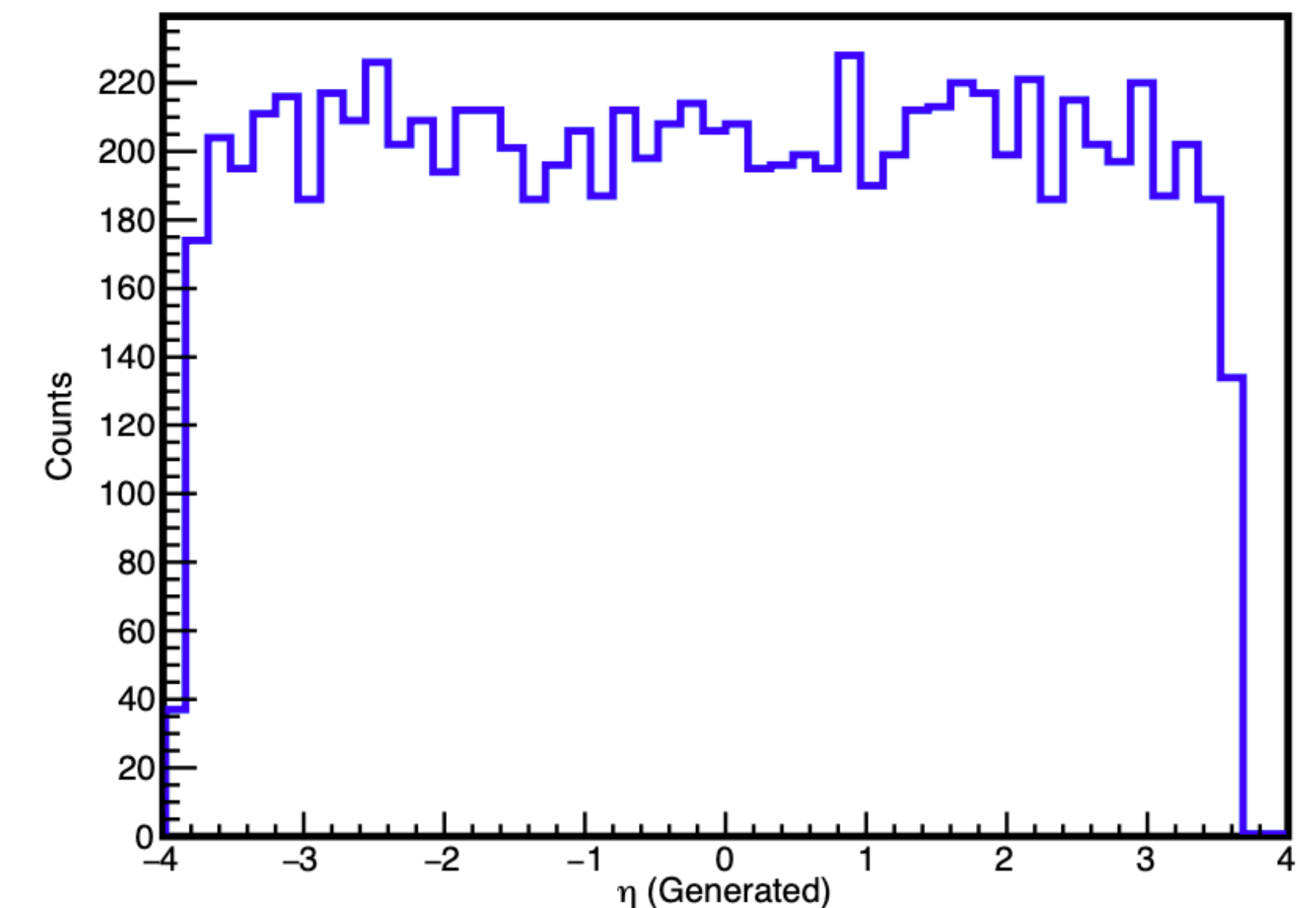
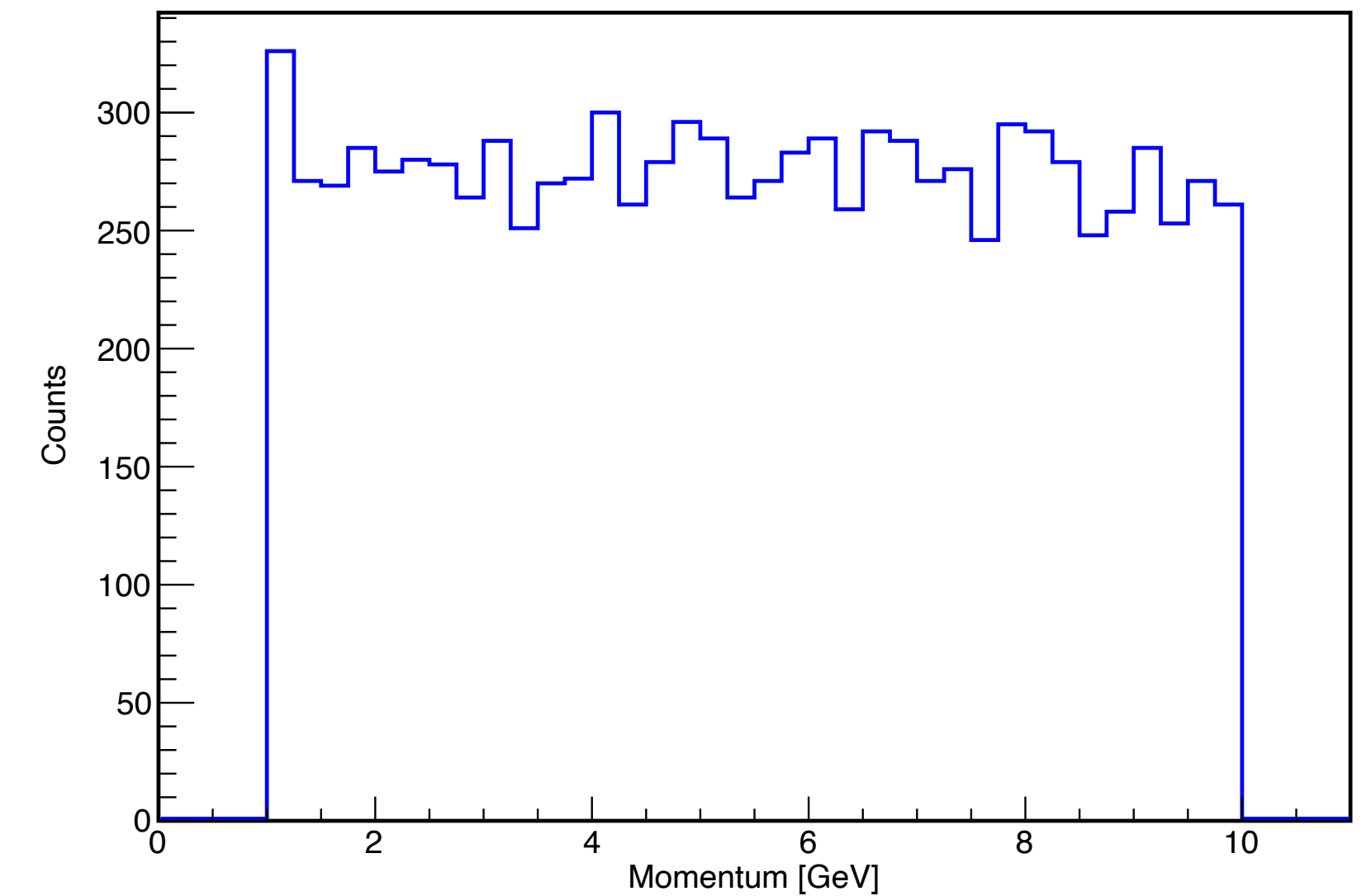


Residuals in EICRecon

Beatrice Liang-Gilman, Barak Schmookler
Track Reconstruction meeting 4/27/2023

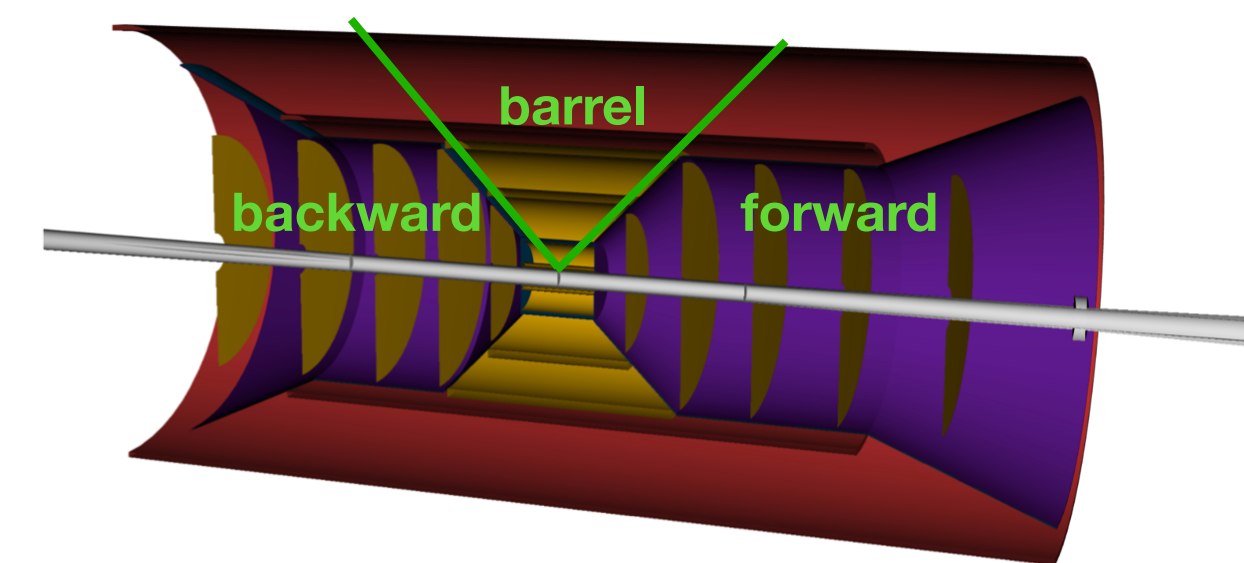
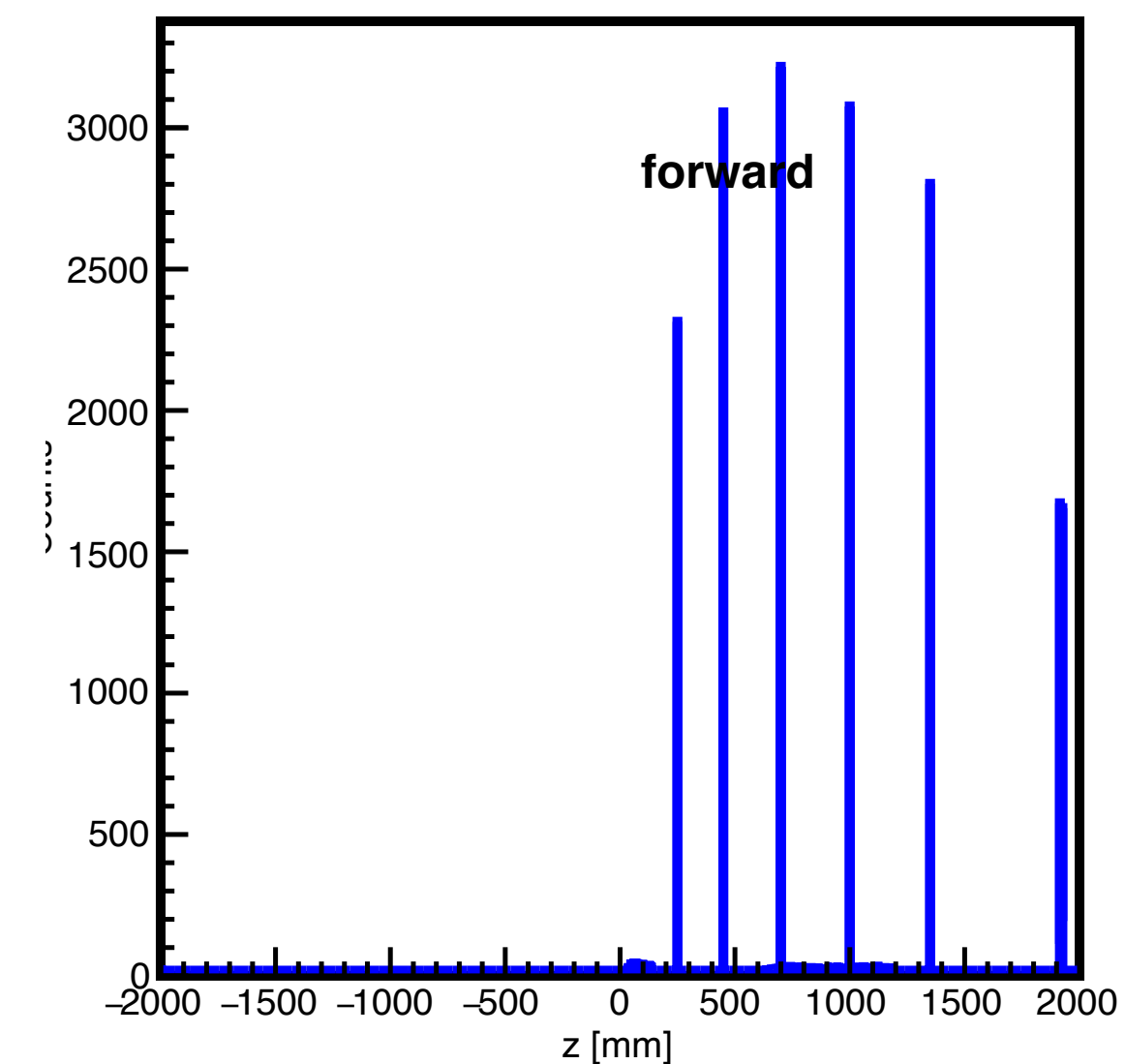
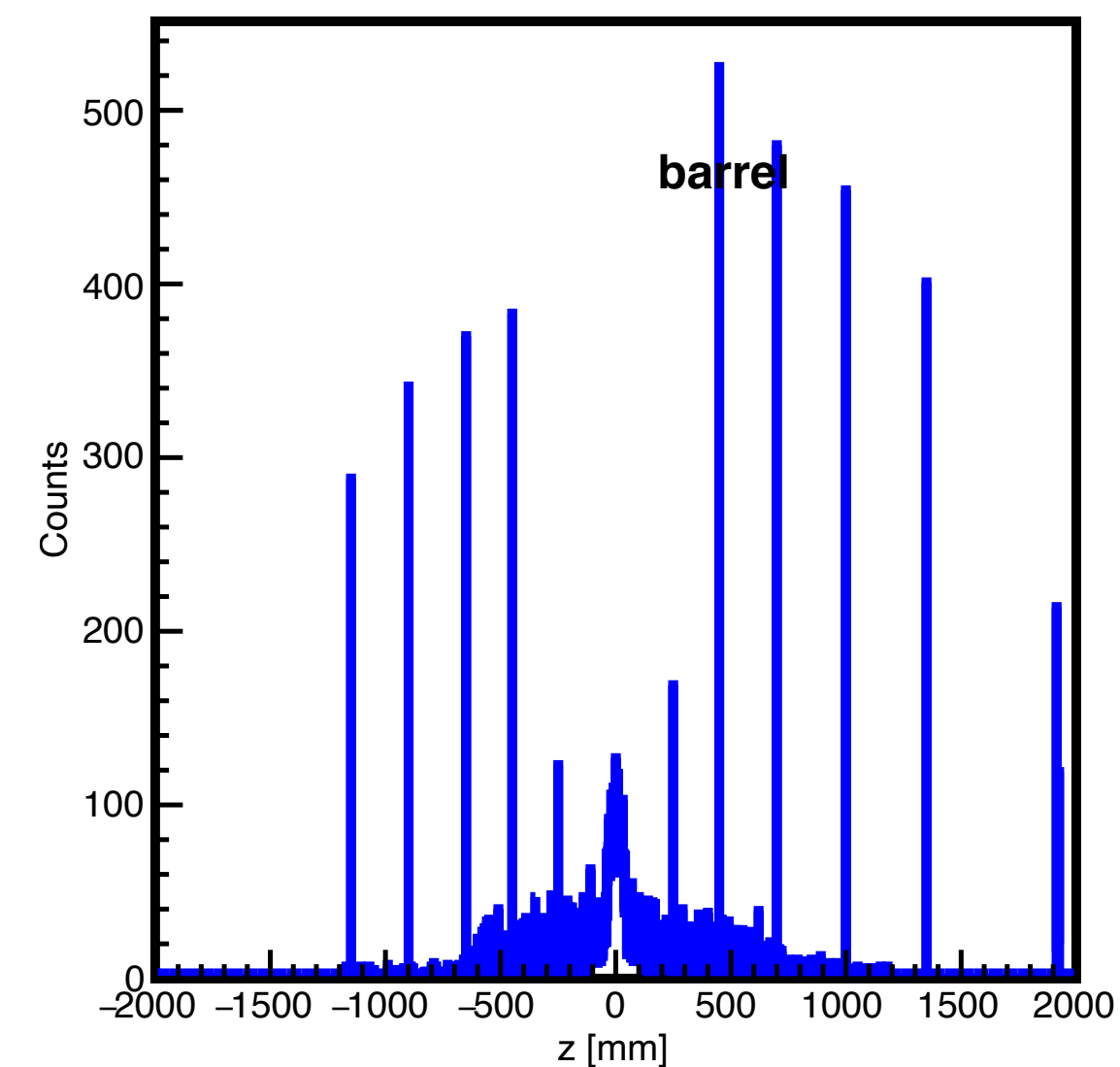
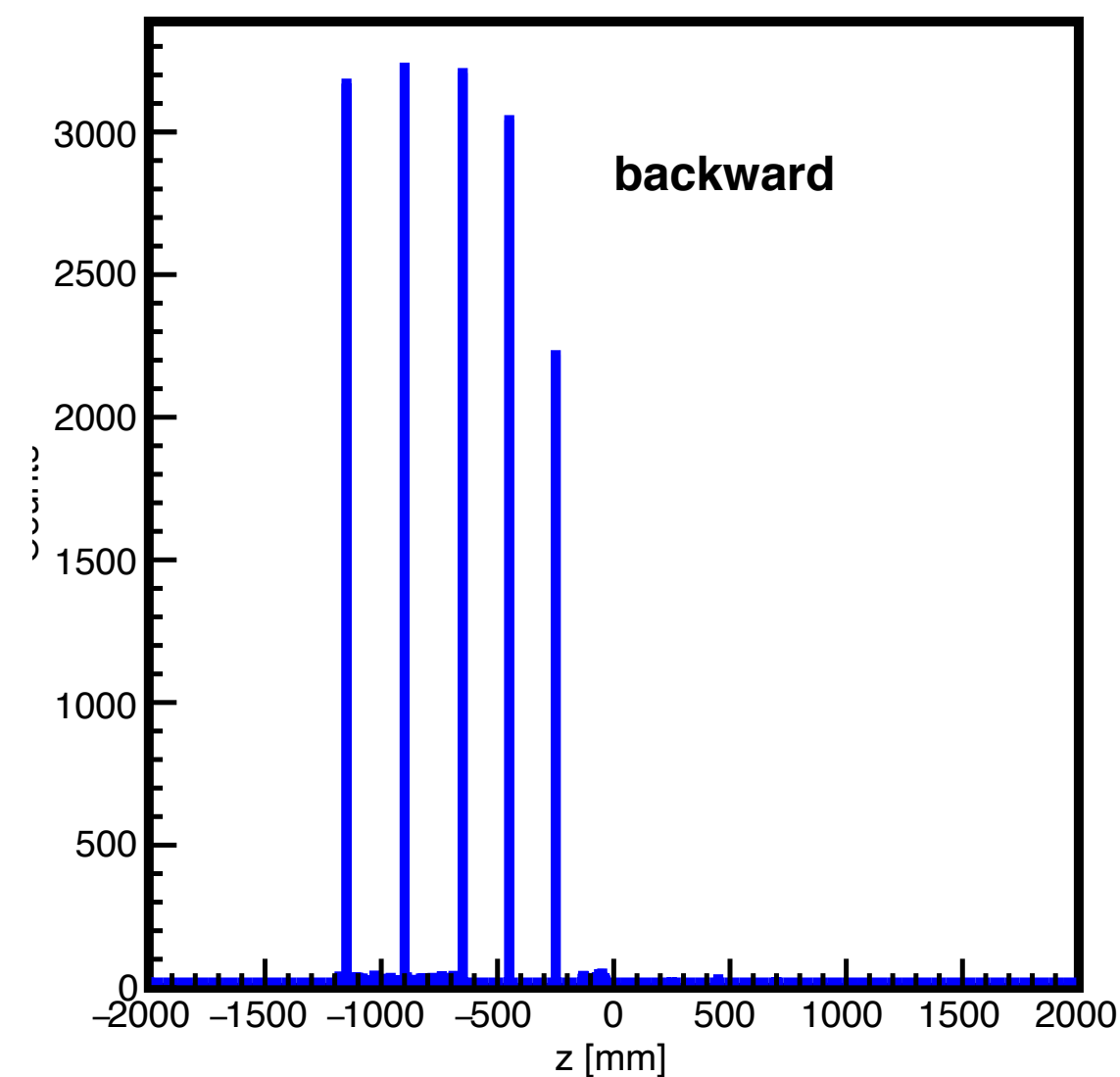
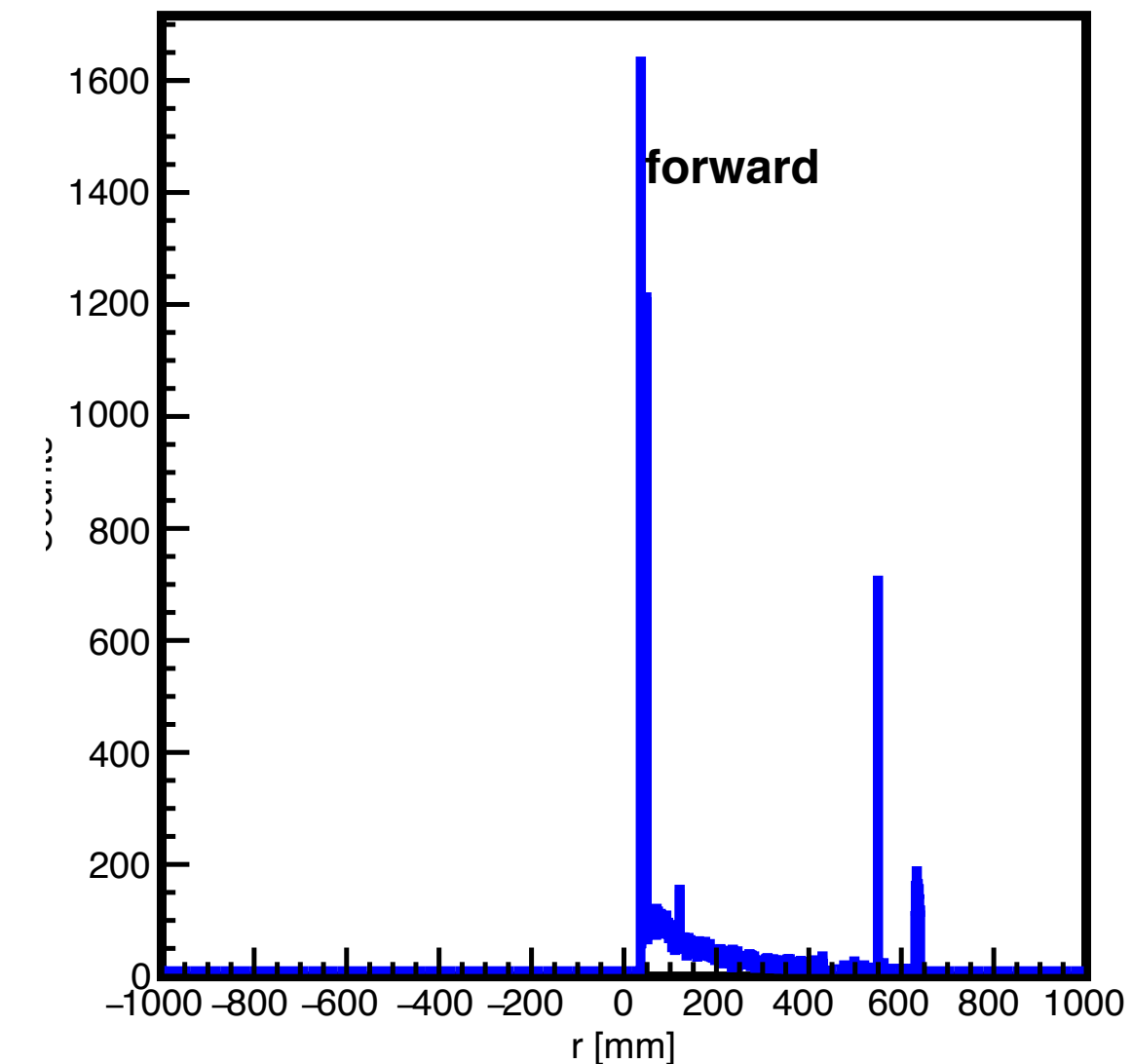
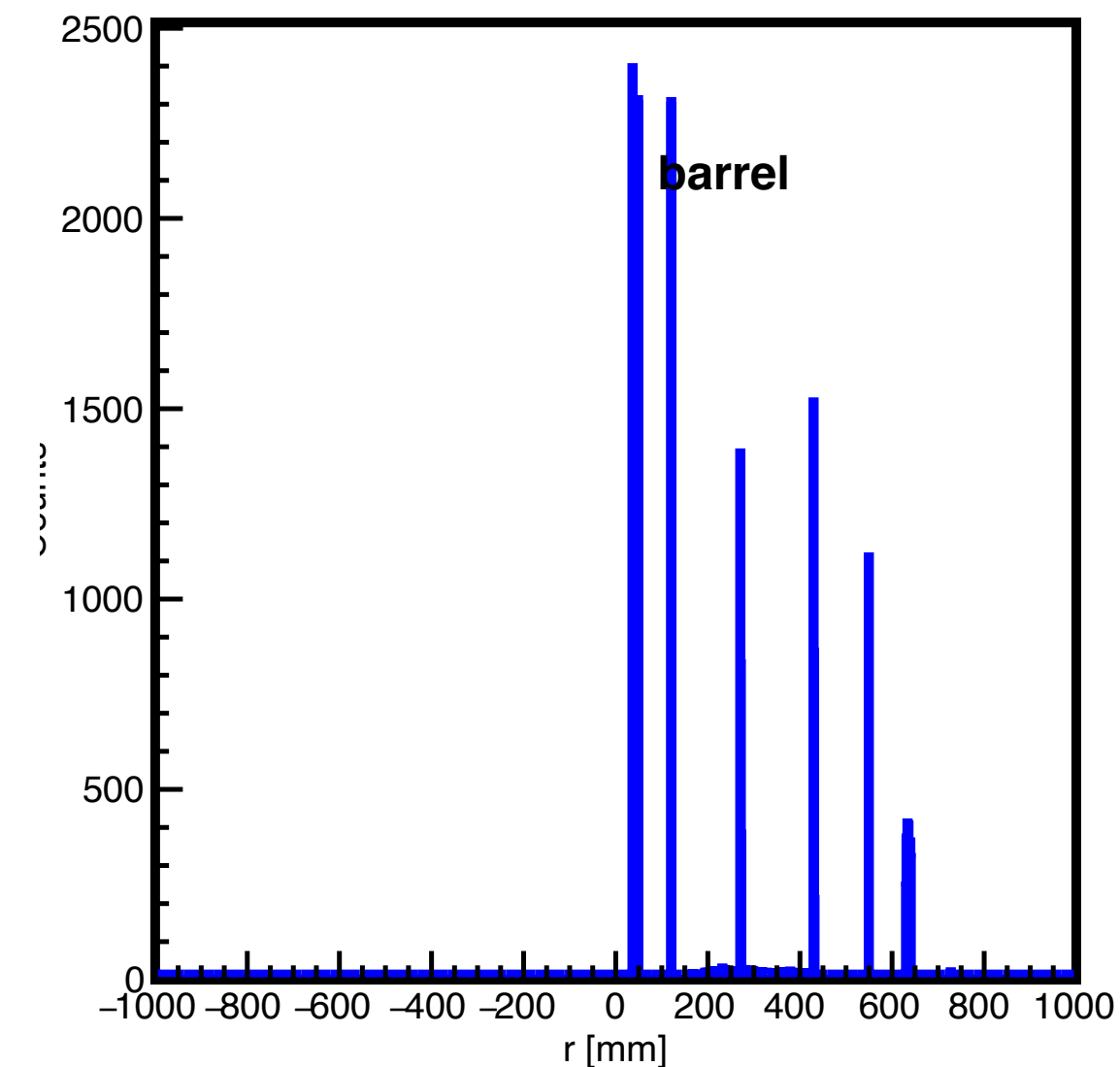
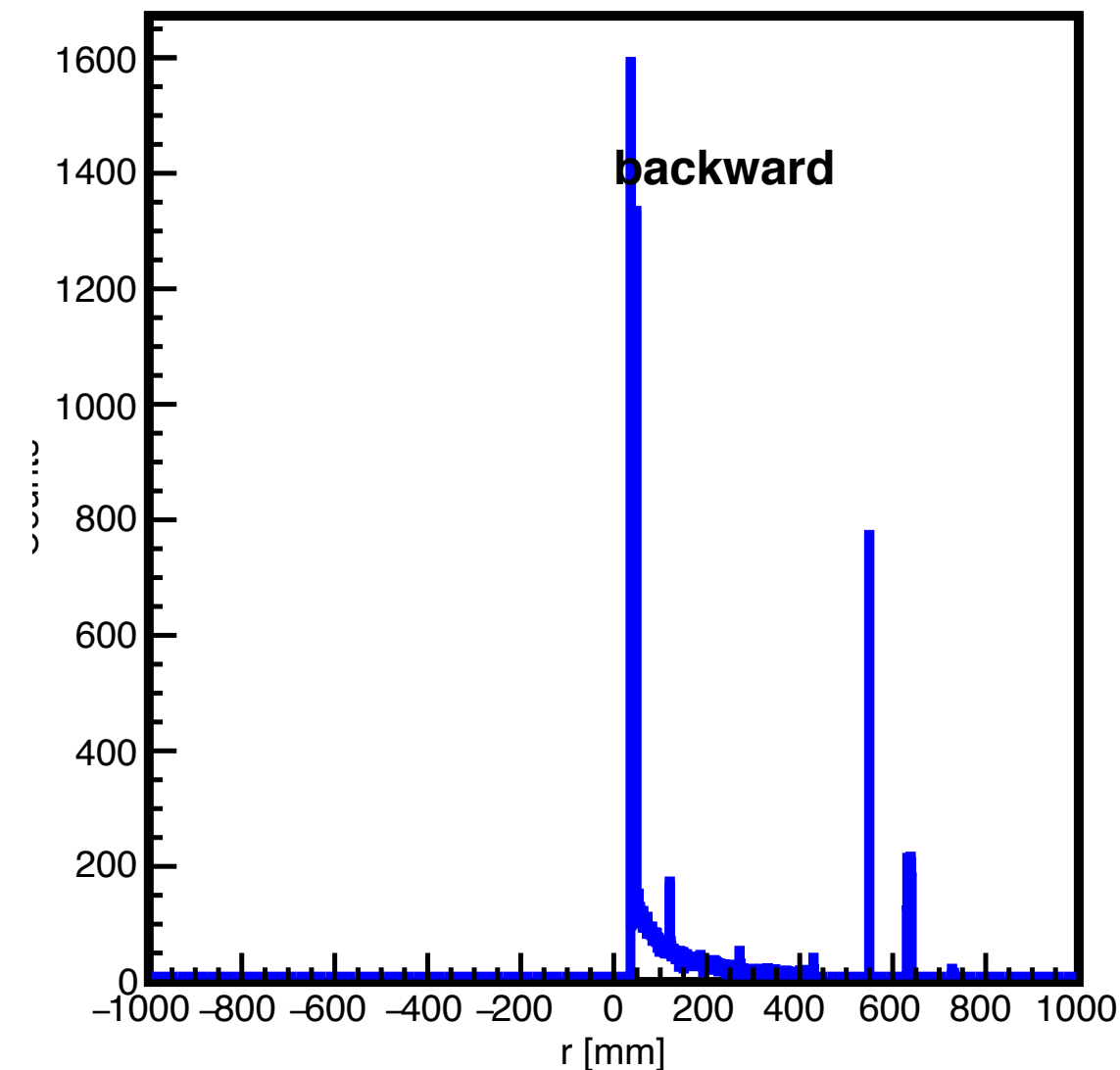
Generated Events

- 10,000 single e^- events
 - $1 < p < 10$ GeV
 - $-4 < \eta < 4$
- Detector geometry: Bryce canyon
- Reconstruction is currently using **truth seeding**



Hit Distributions in r and z

- Backward = $\eta < -0.88137$
- Barrel = $-0.88137 < \eta < 0.88137$
- Forward = $\eta > 0.88137$
- Barrel r positions: 36, 48, 120, 270, 420 mm
- Forward disk z positions: 250, 450, 700, 1000, 1350 mm
- Backward disk z positions: -250, -450, -650, -900, -1150 mm

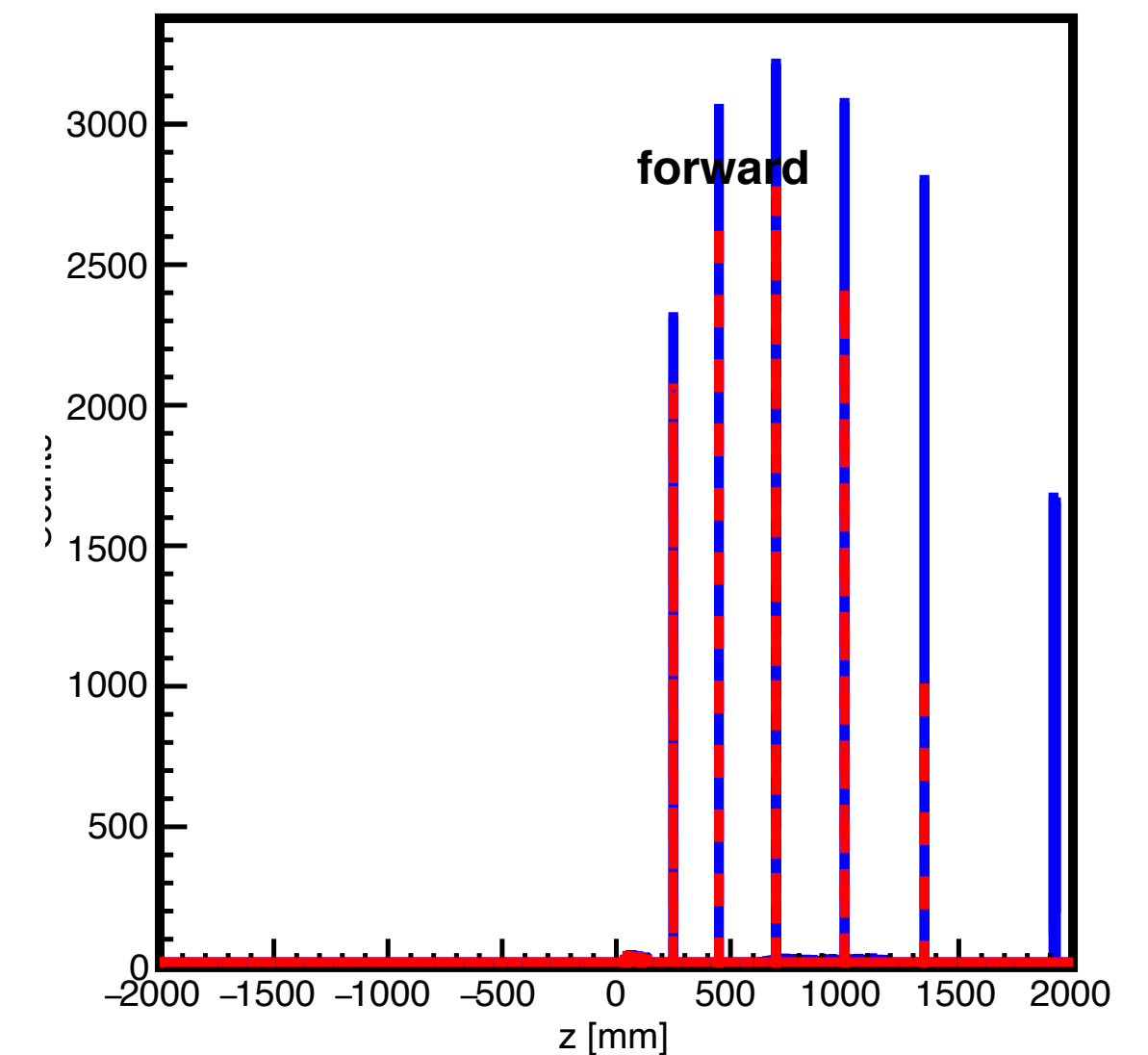
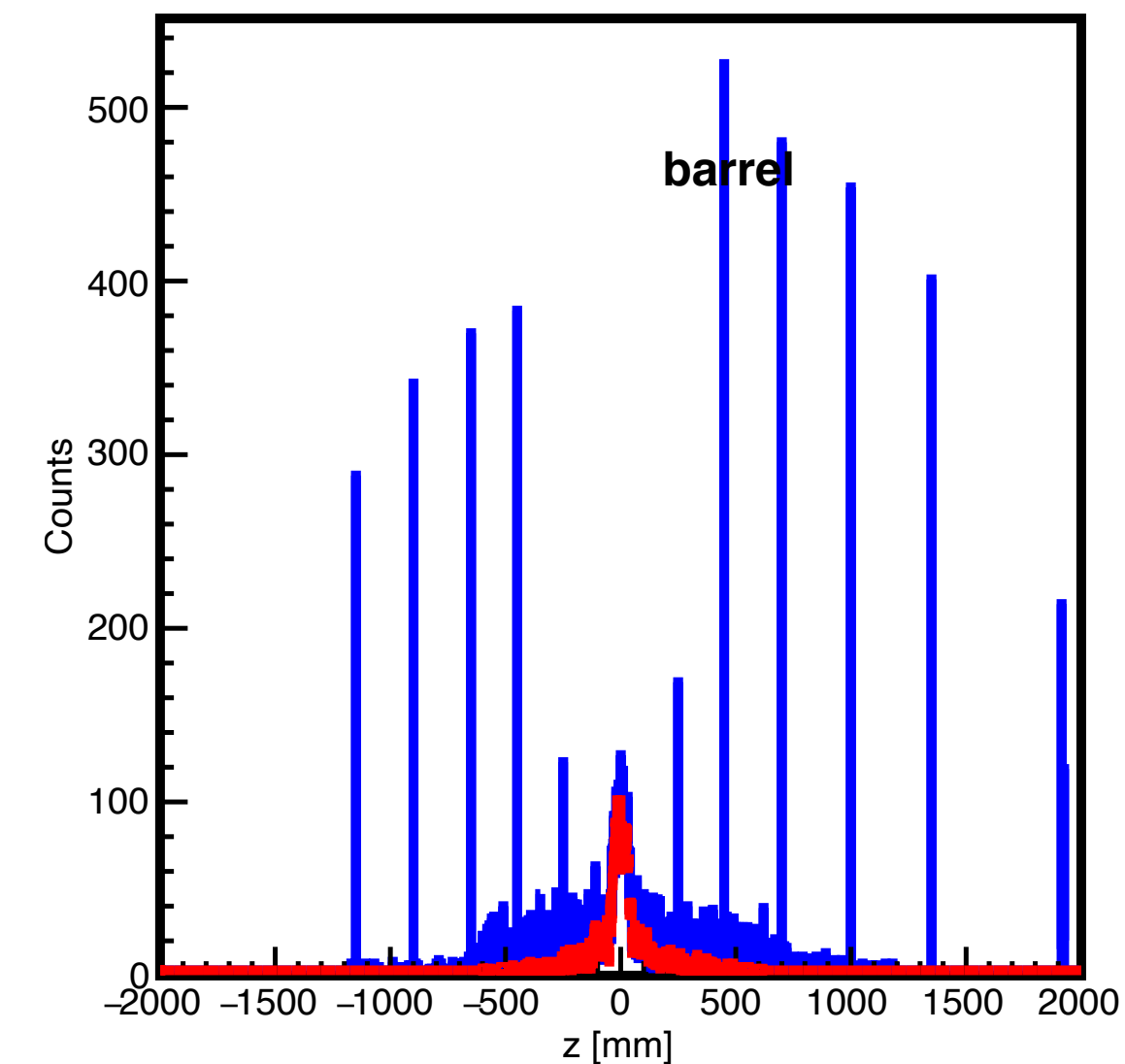
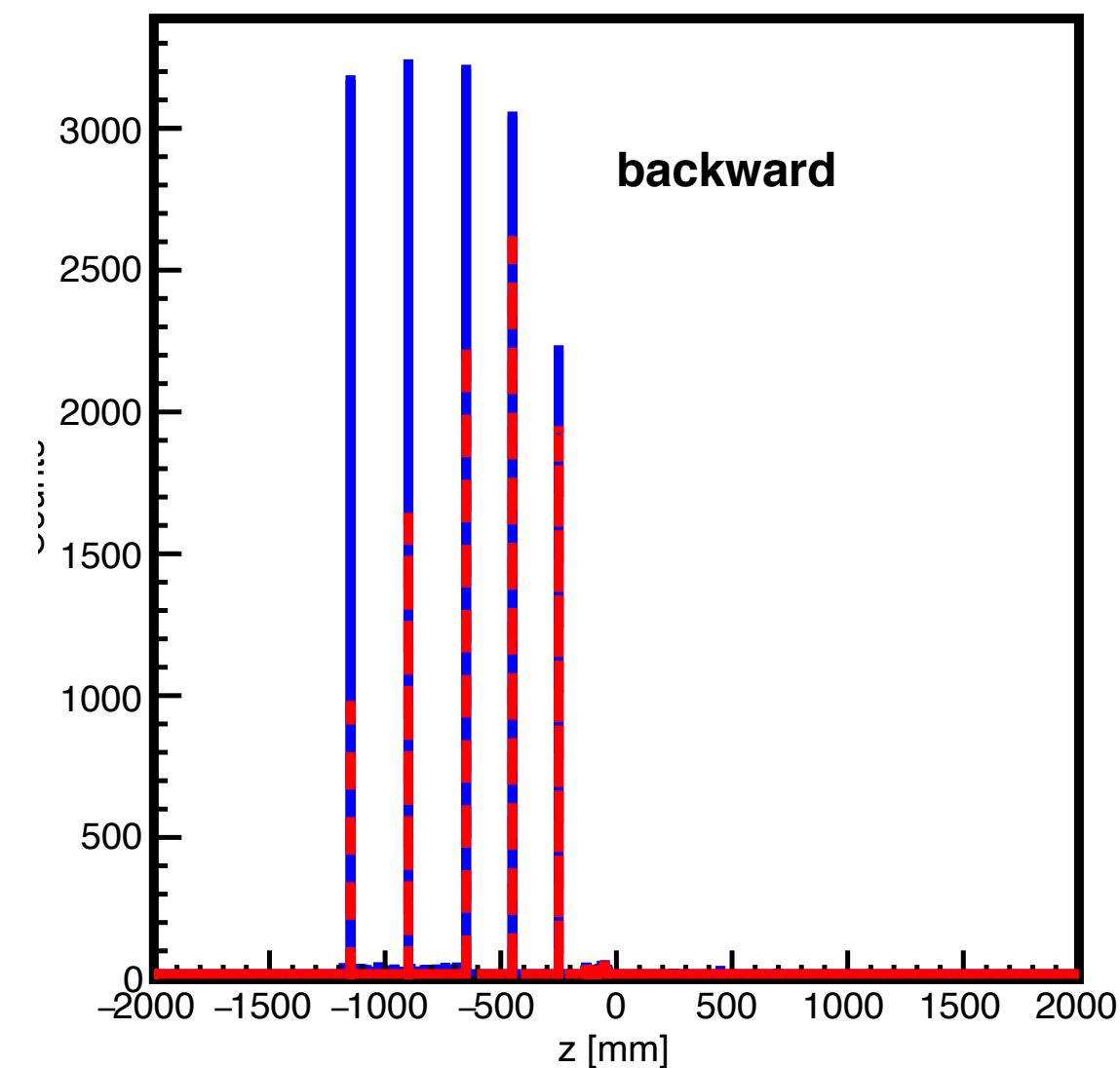
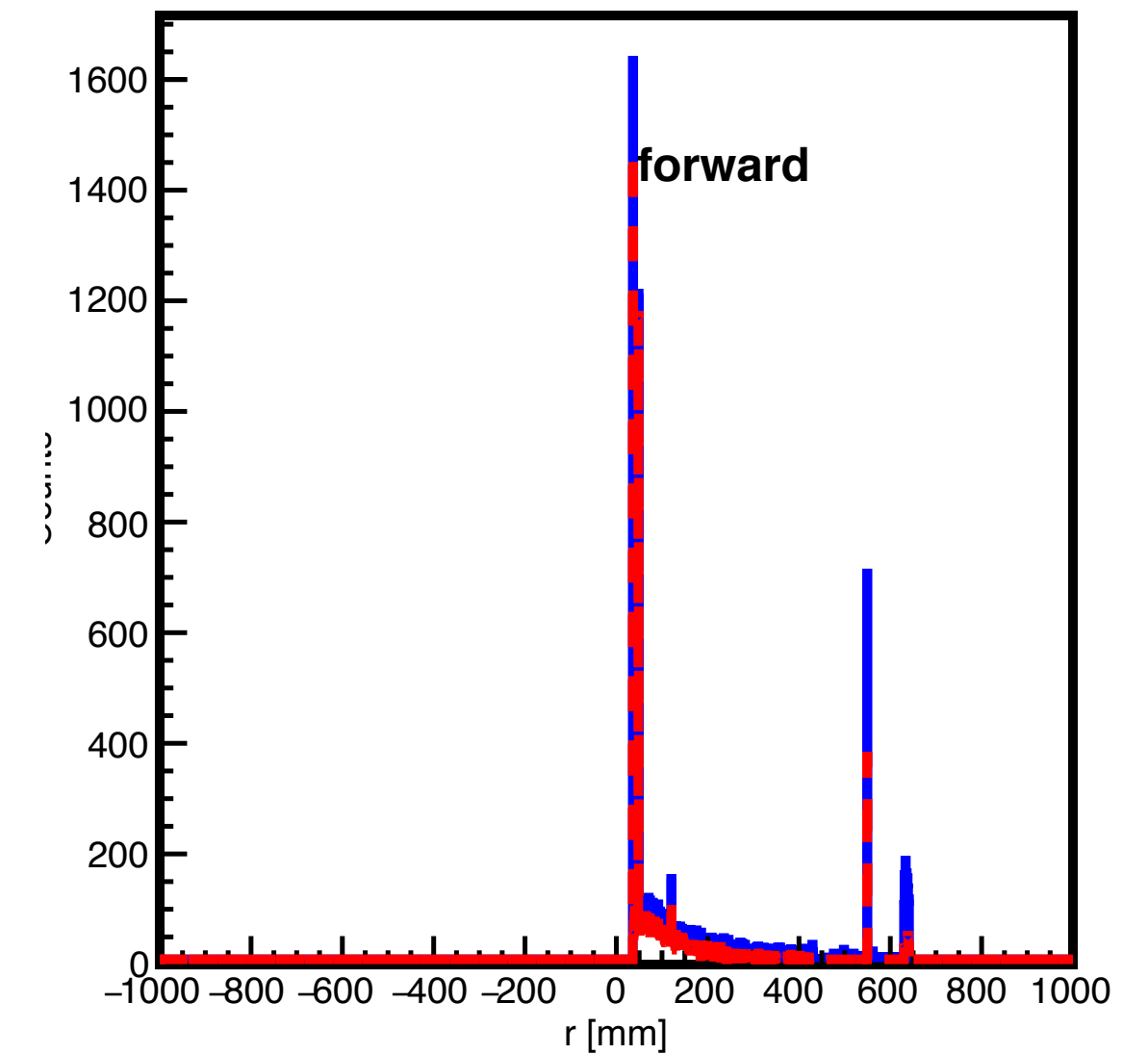
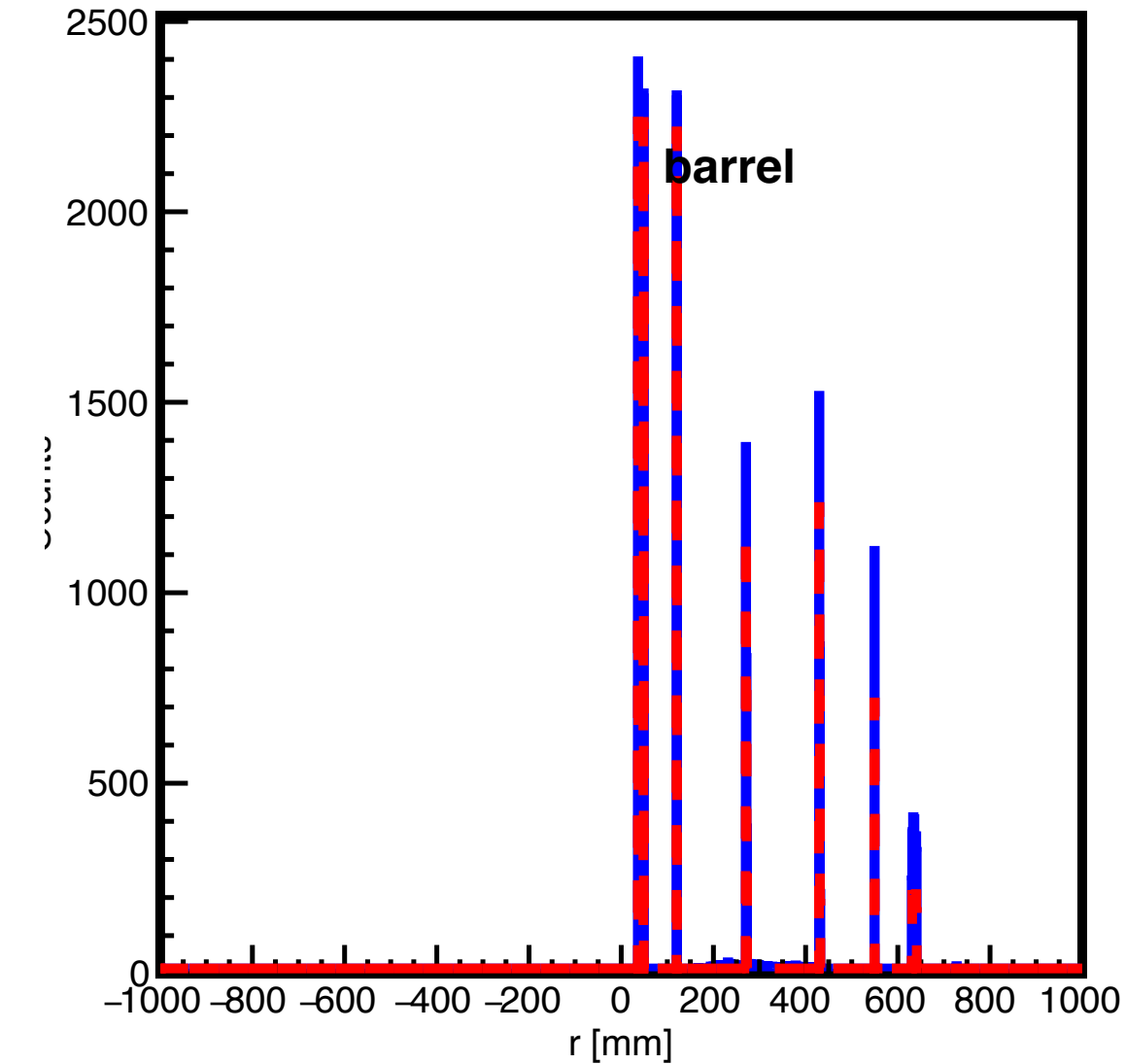
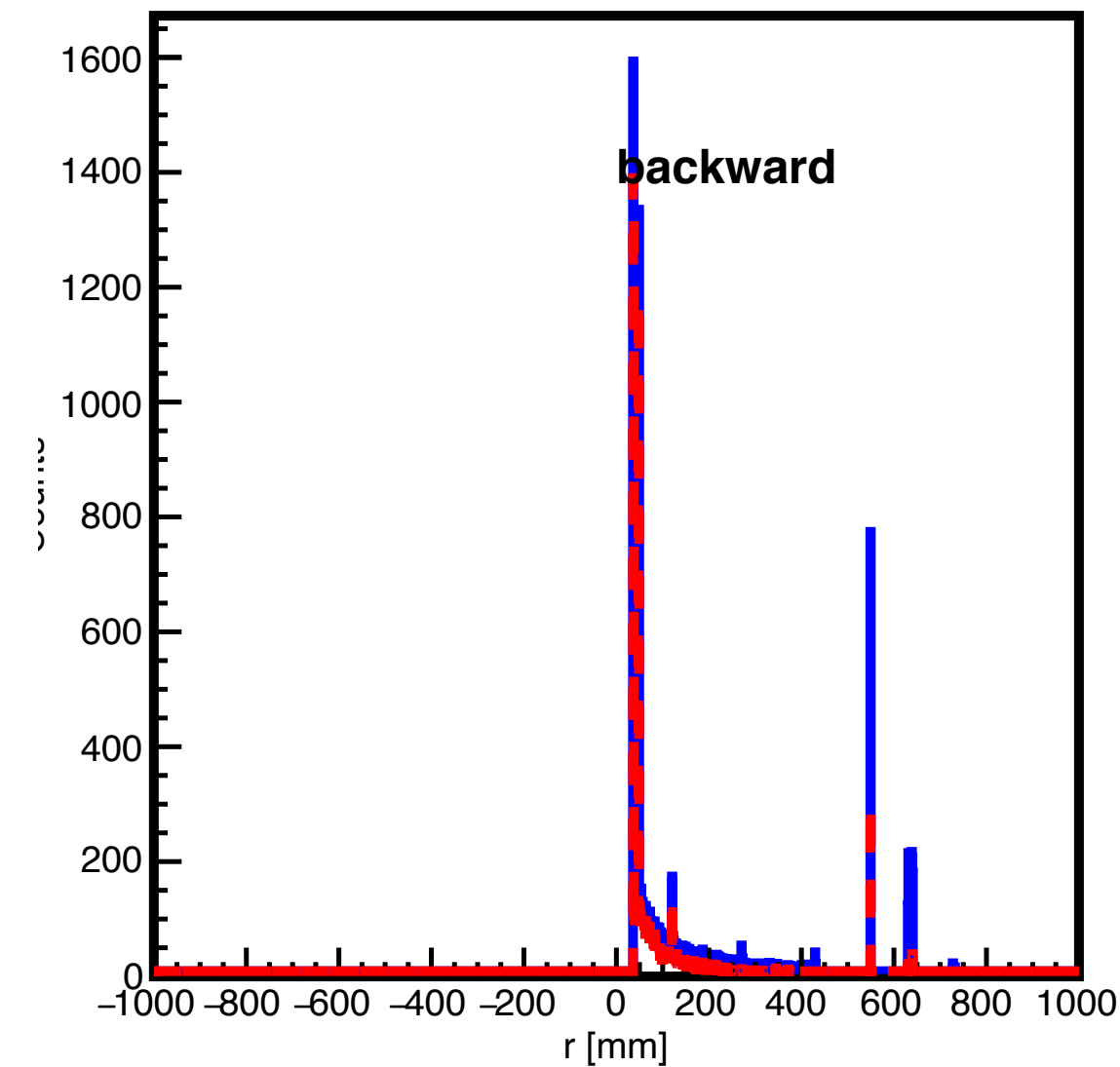


Hit Distributions in r and z

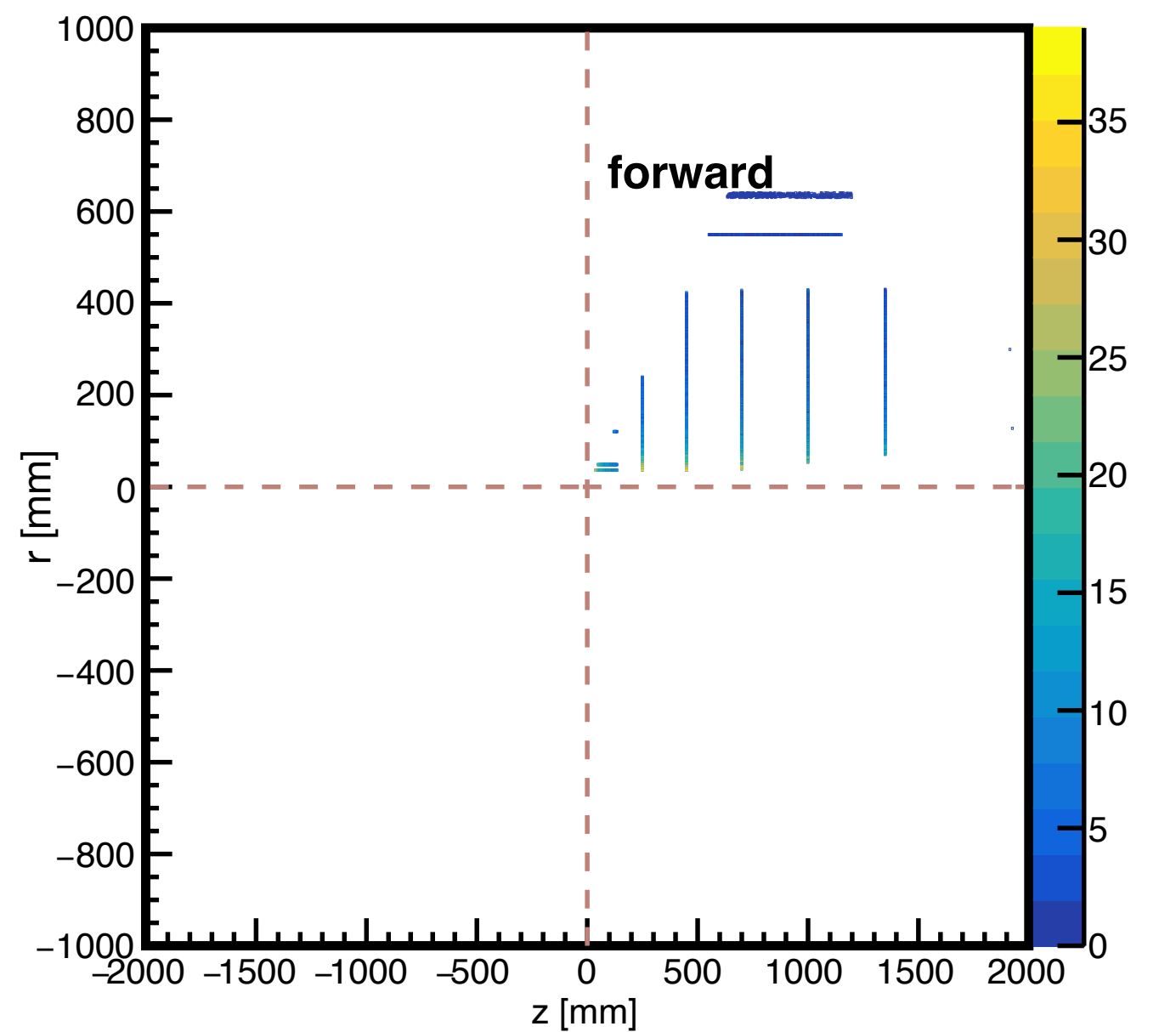
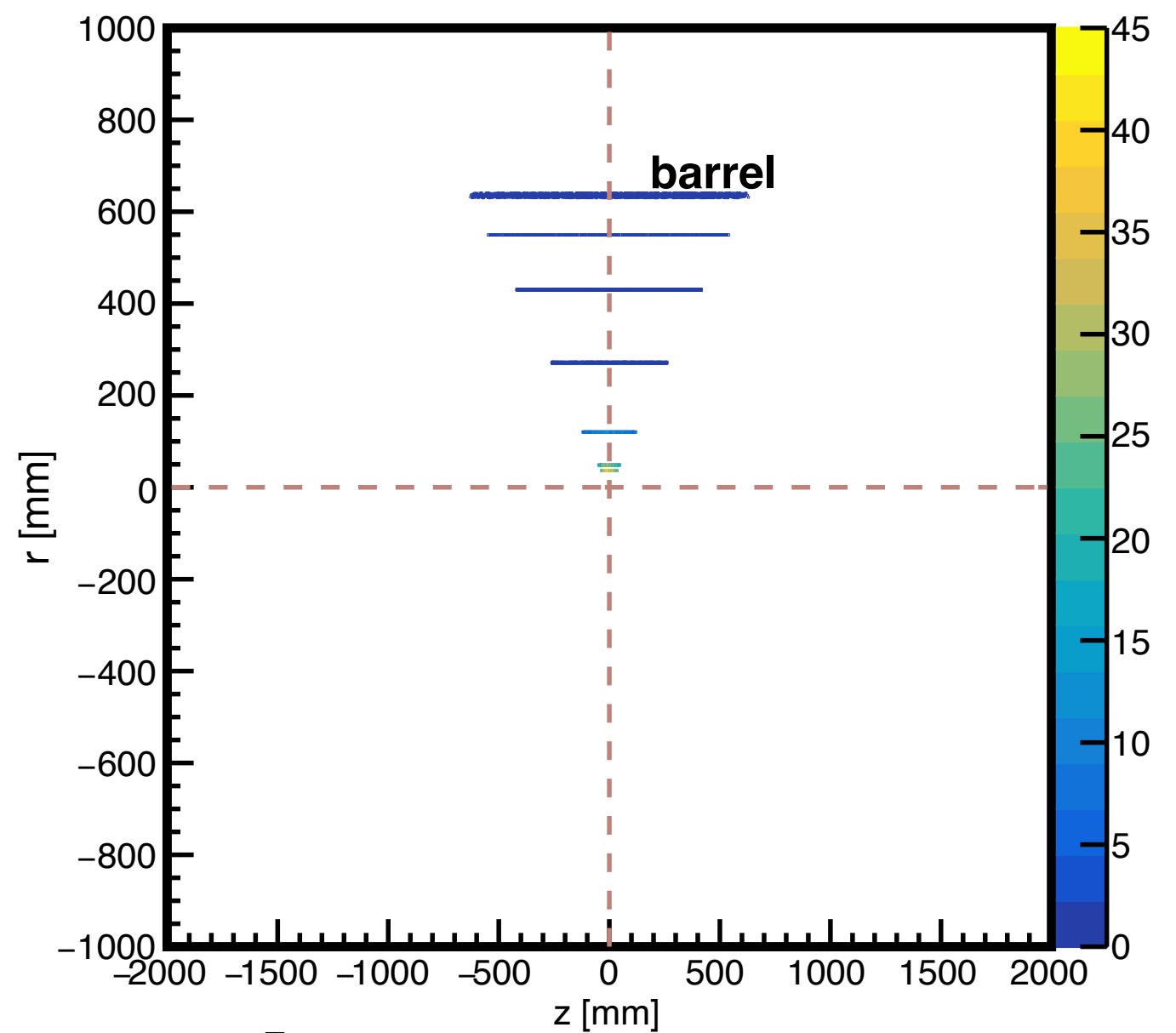
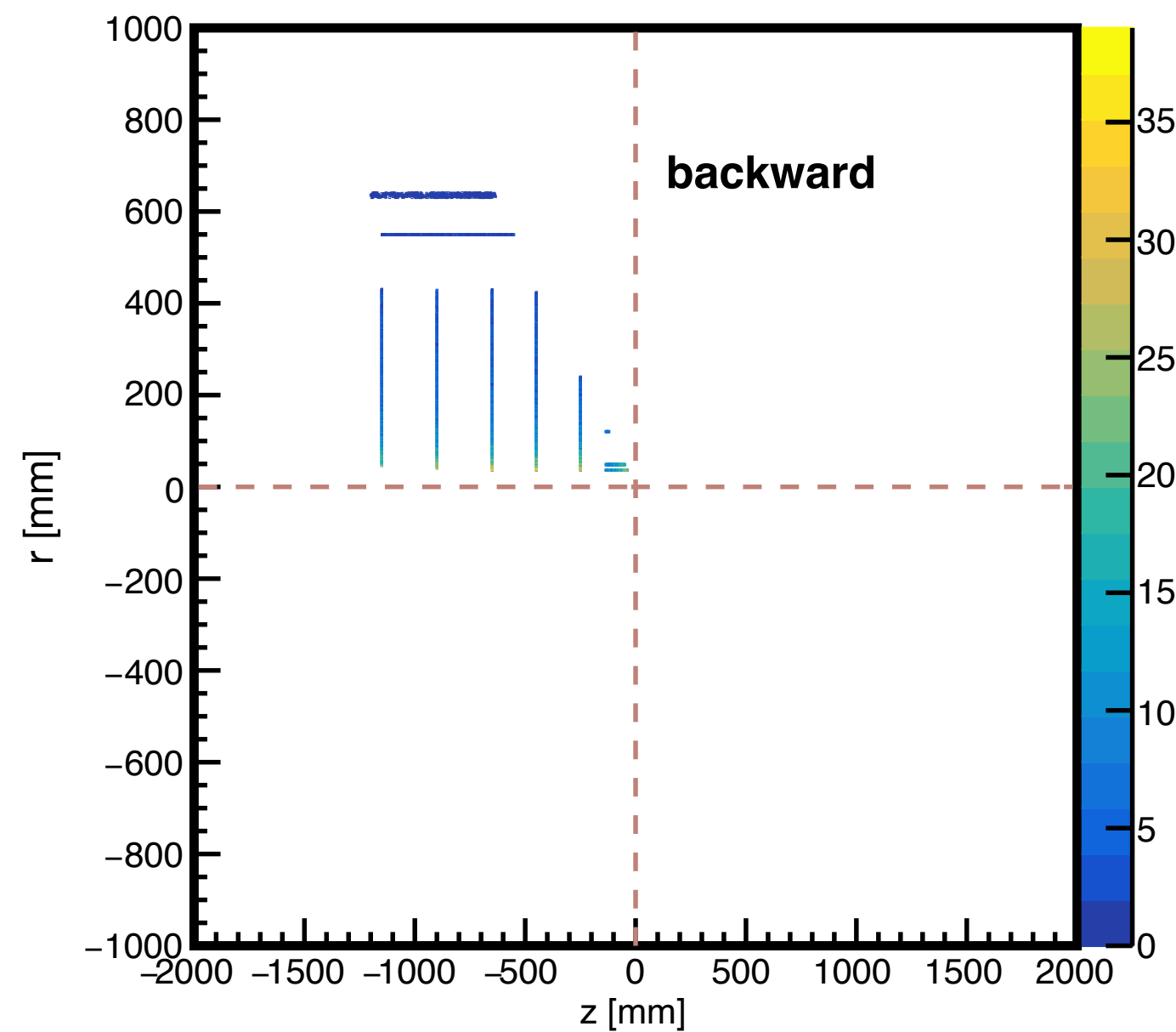
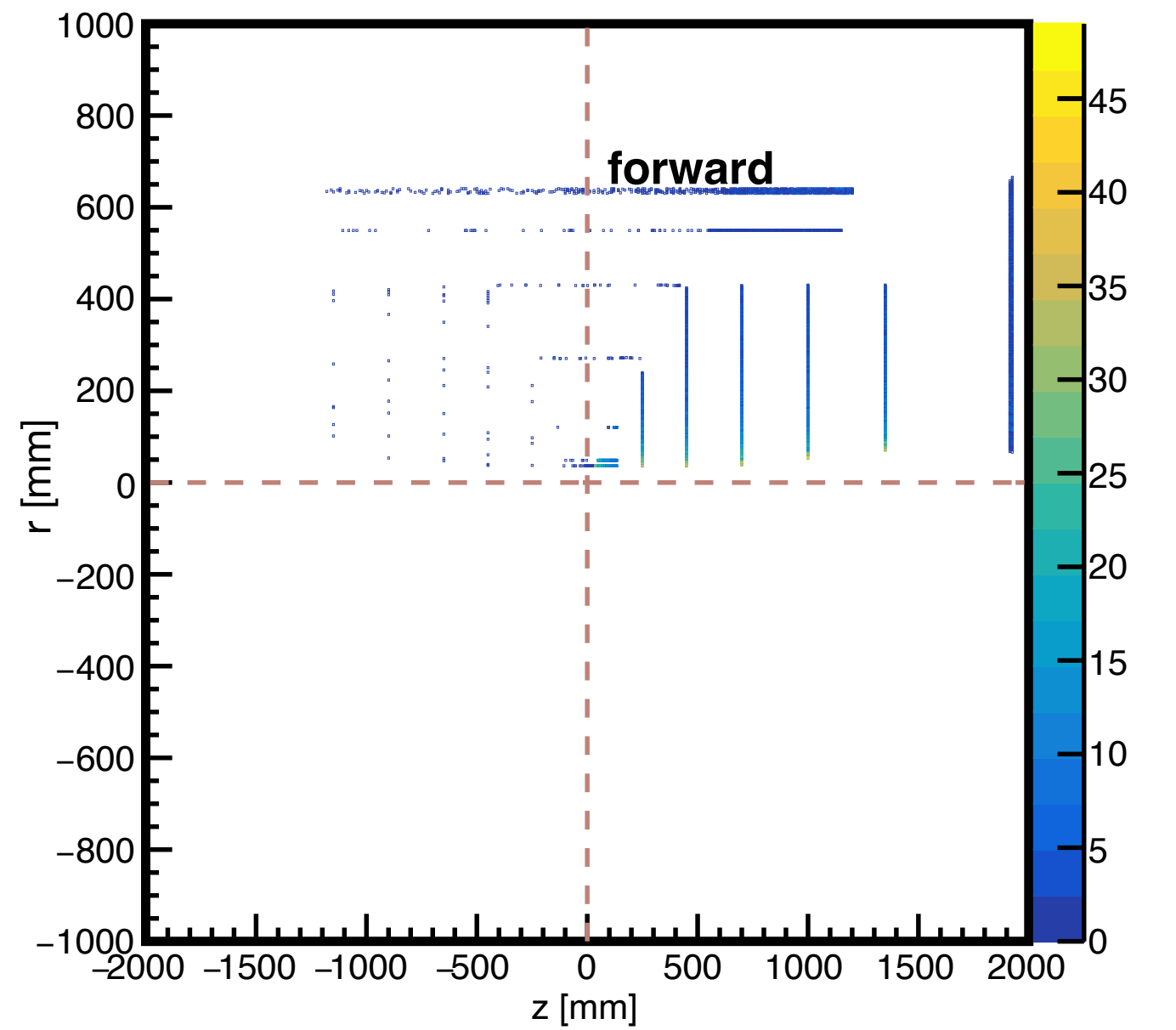
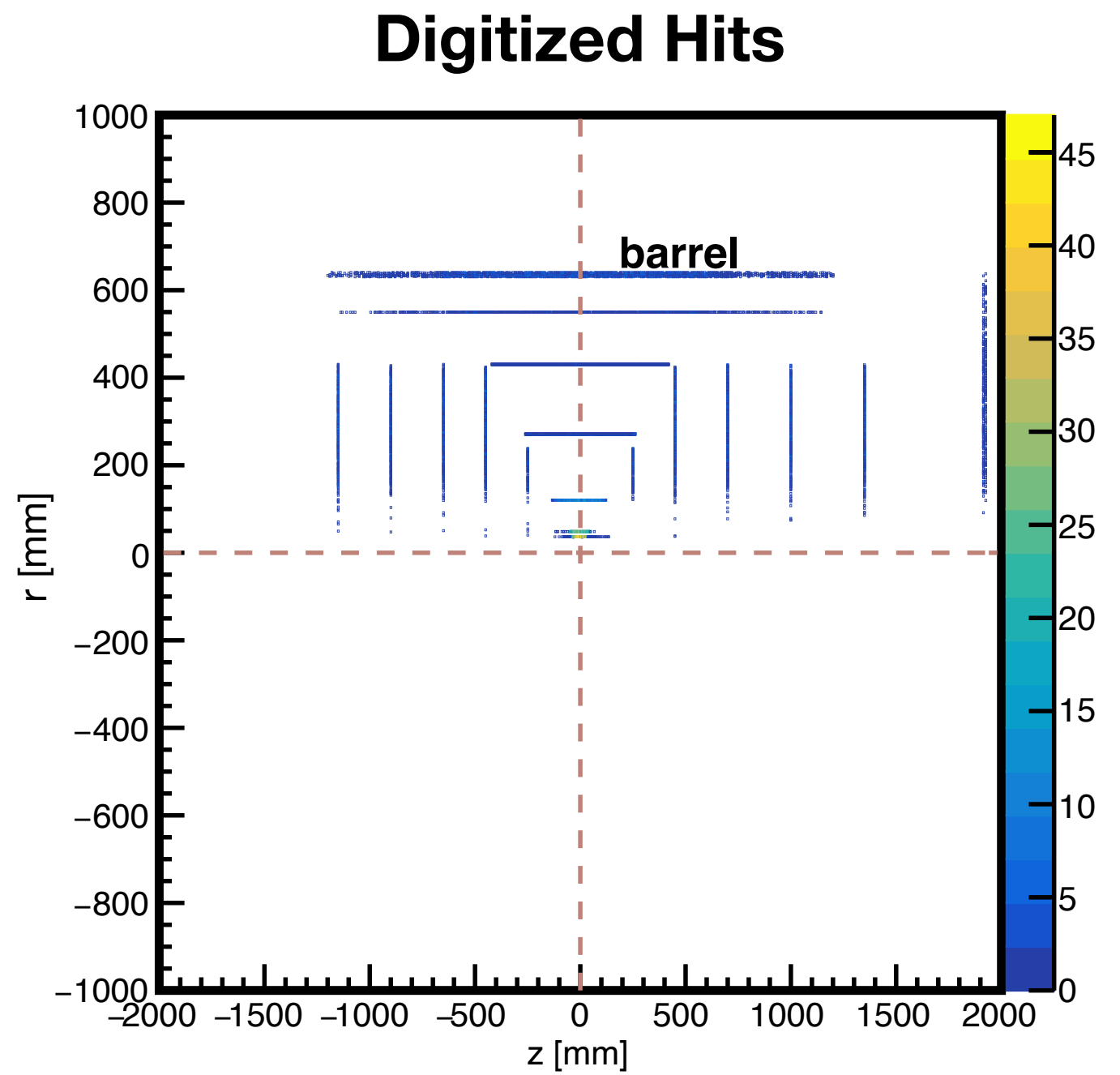
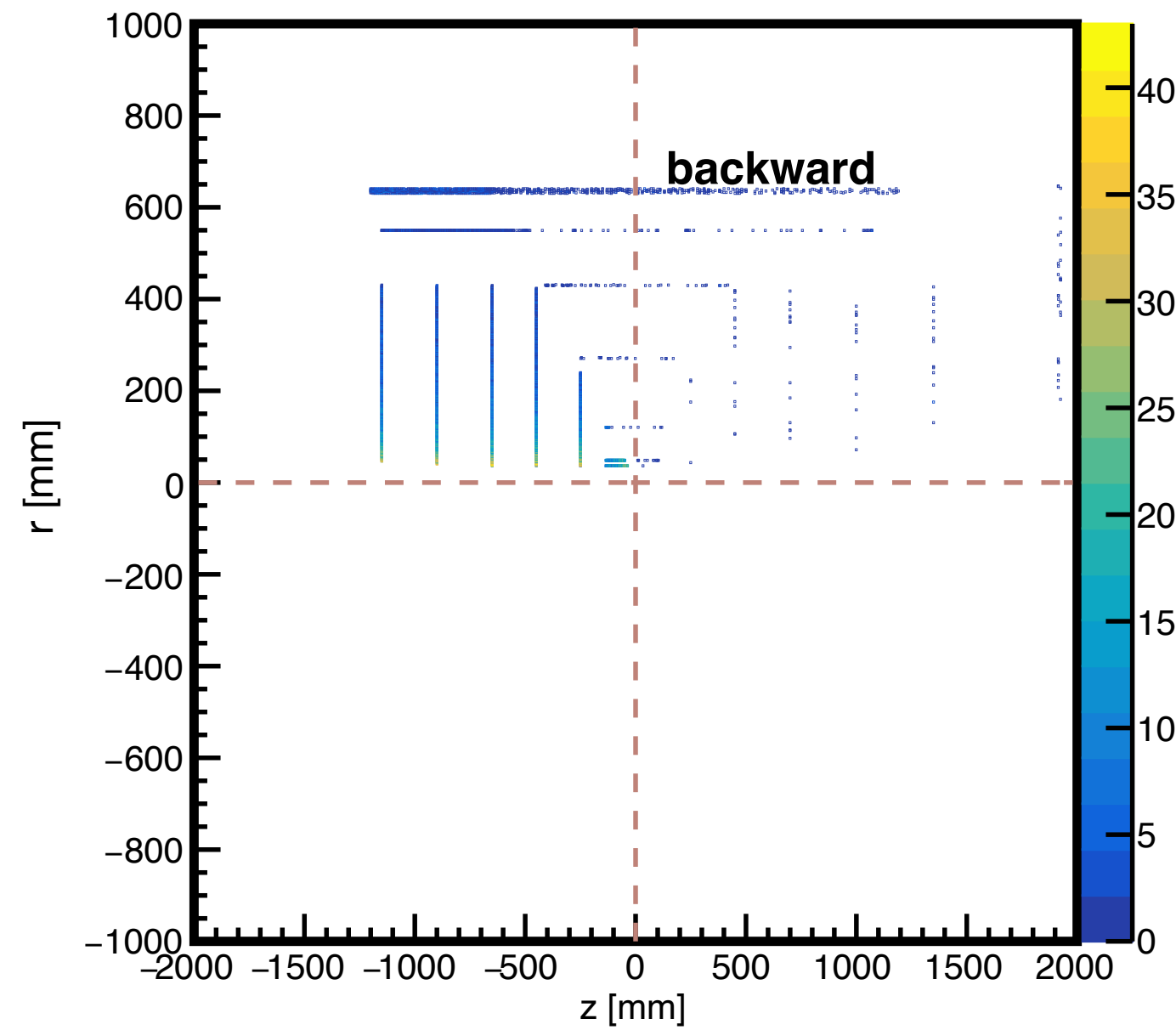
- Backward = $\eta < -0.88137$
- Barrel = $-0.88137 < \eta < 0.88137$
- Forward = $\eta > 0.88137$

- Barrel r positions: 36, 48, 120, 270, 420 mm
- Forward disk z positions: 250, 450, 700, 1000, 1350 mm
- Backward disk z positions: -250, -450, -650, -900, -1150 mm

— Hits
- - - Track states

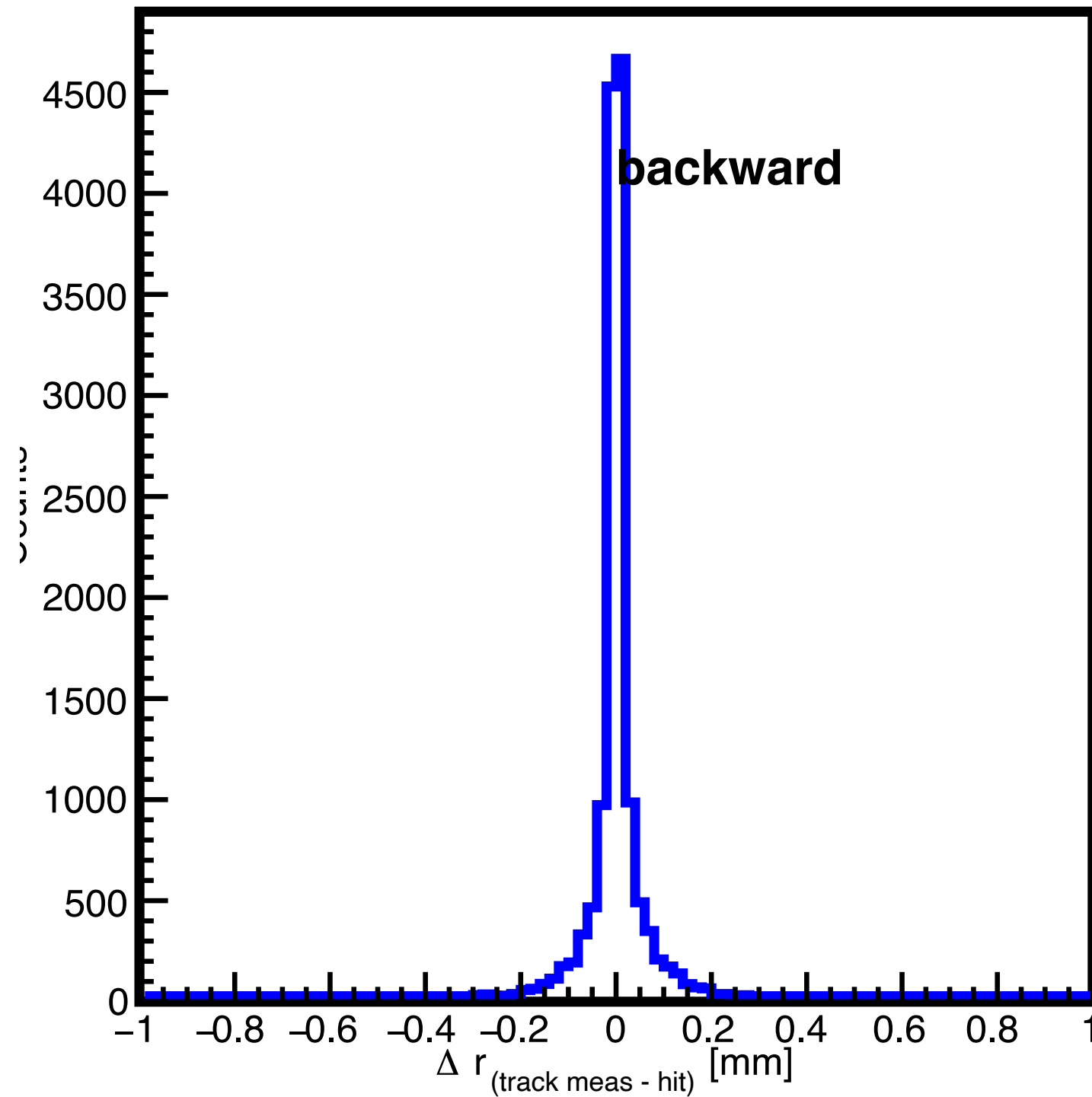


Hit Distribution in r vs z

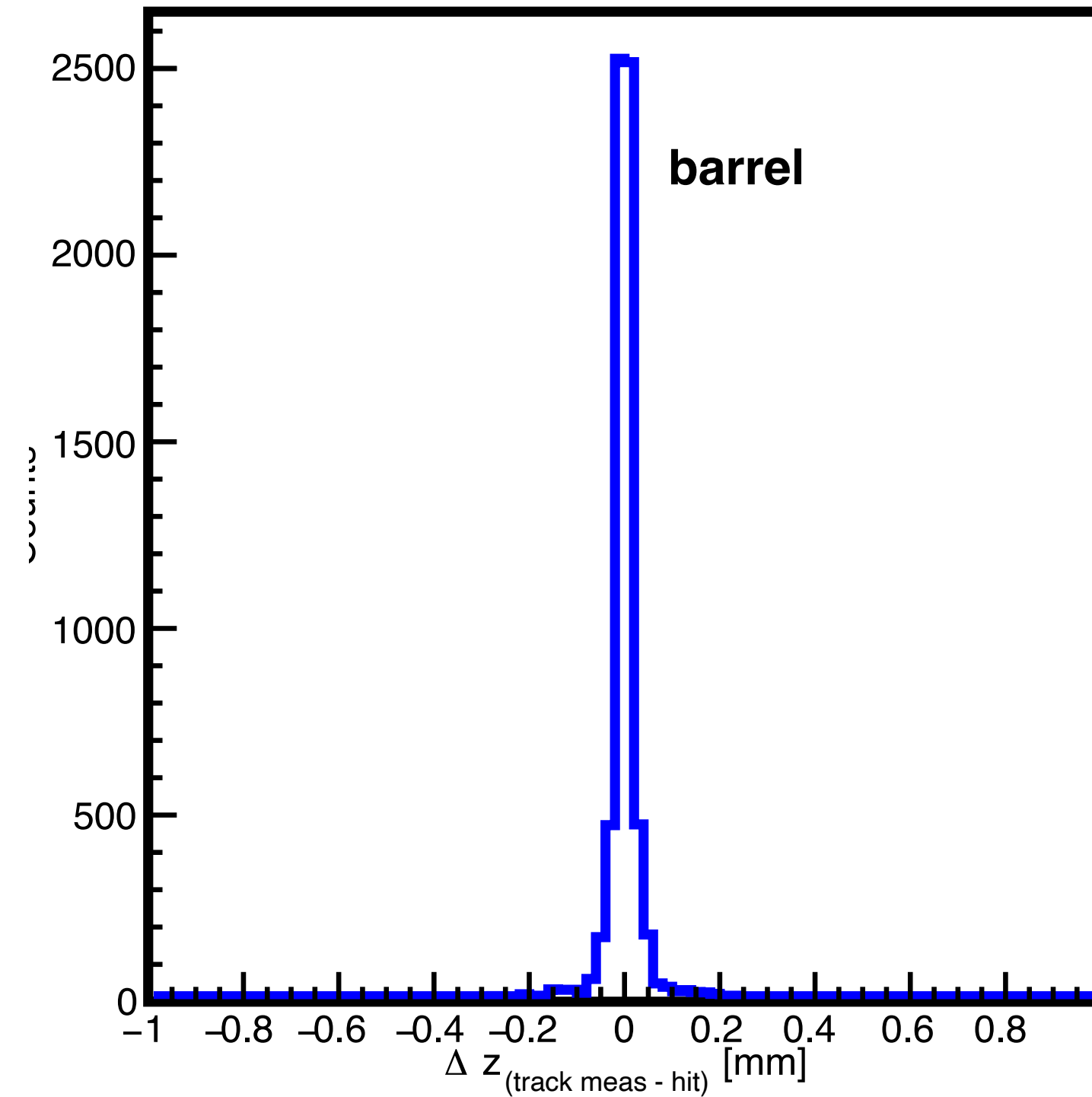


Residuals

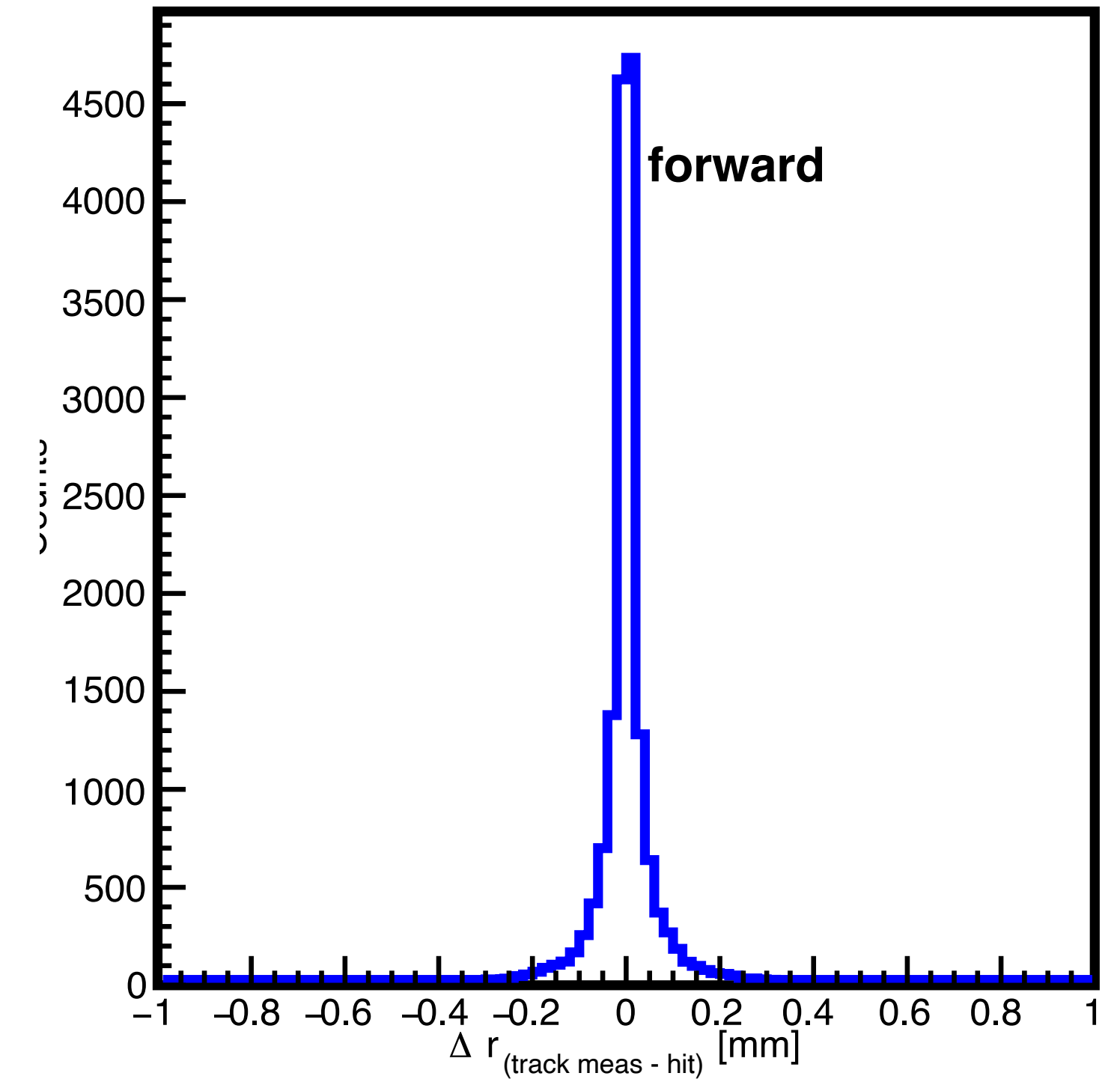
Residuals



Residuals



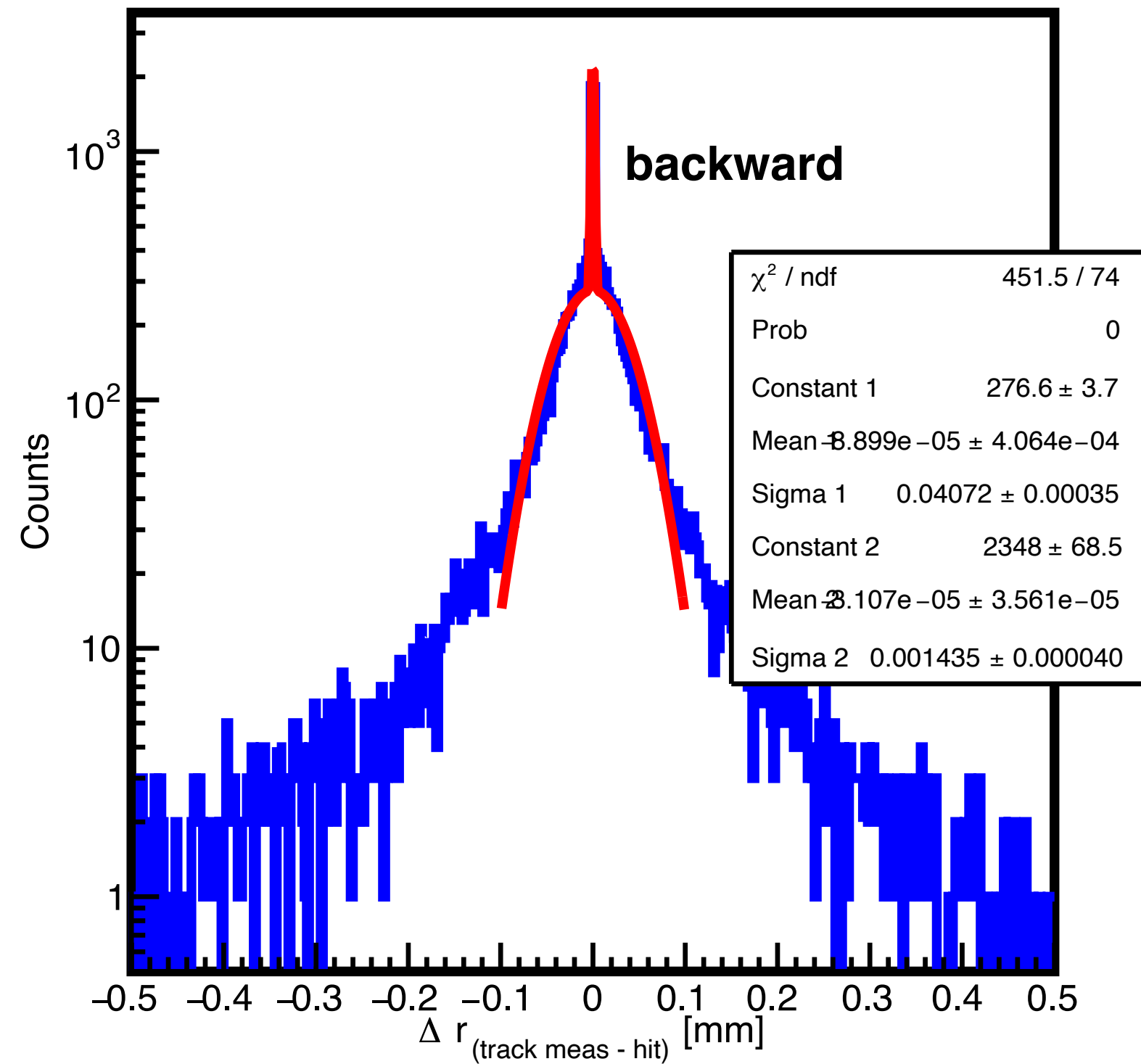
Residuals



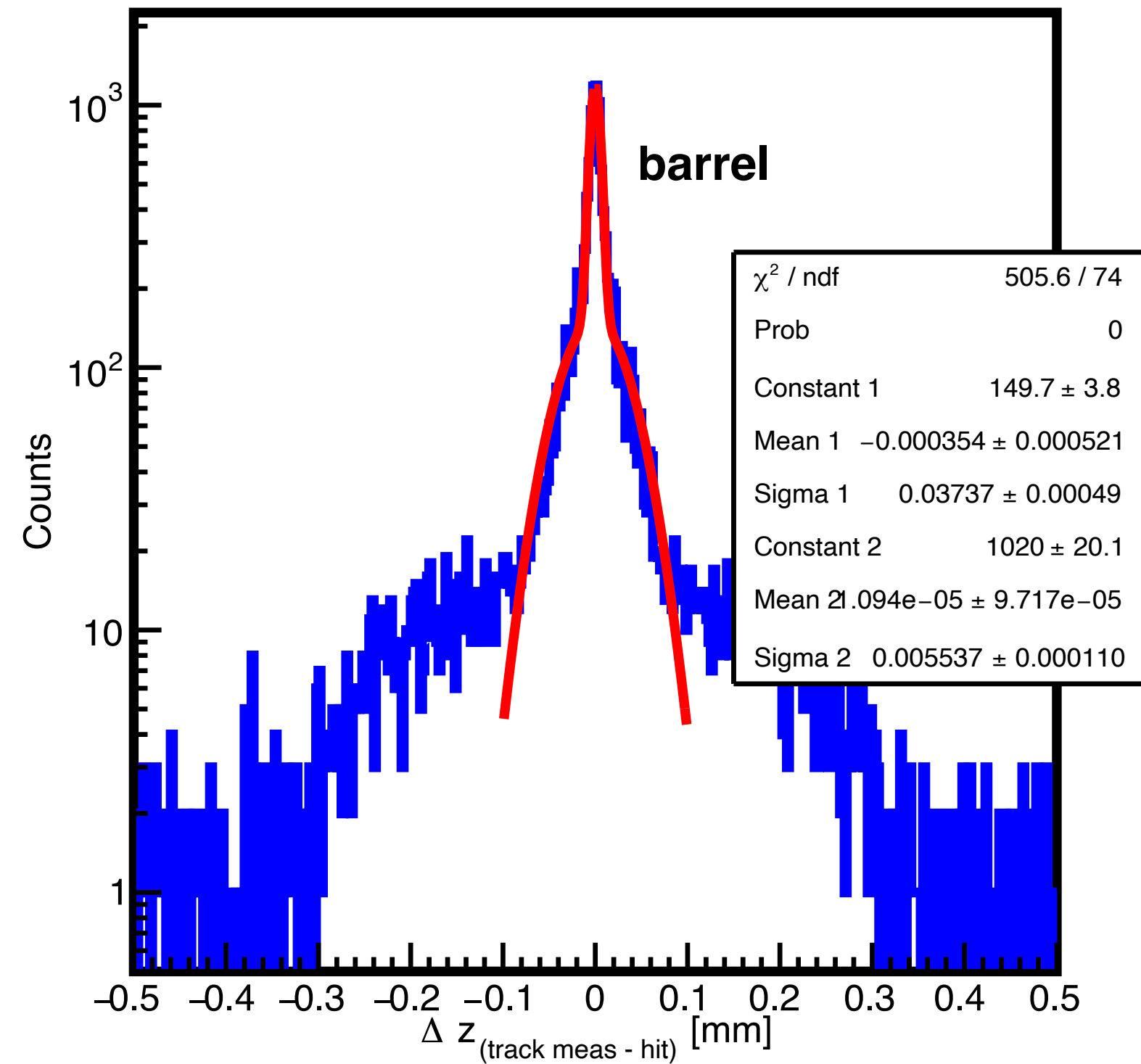
- barrel: constant r , find difference in z
- forward/backward: constant z , find difference in r

Residuals with Fits

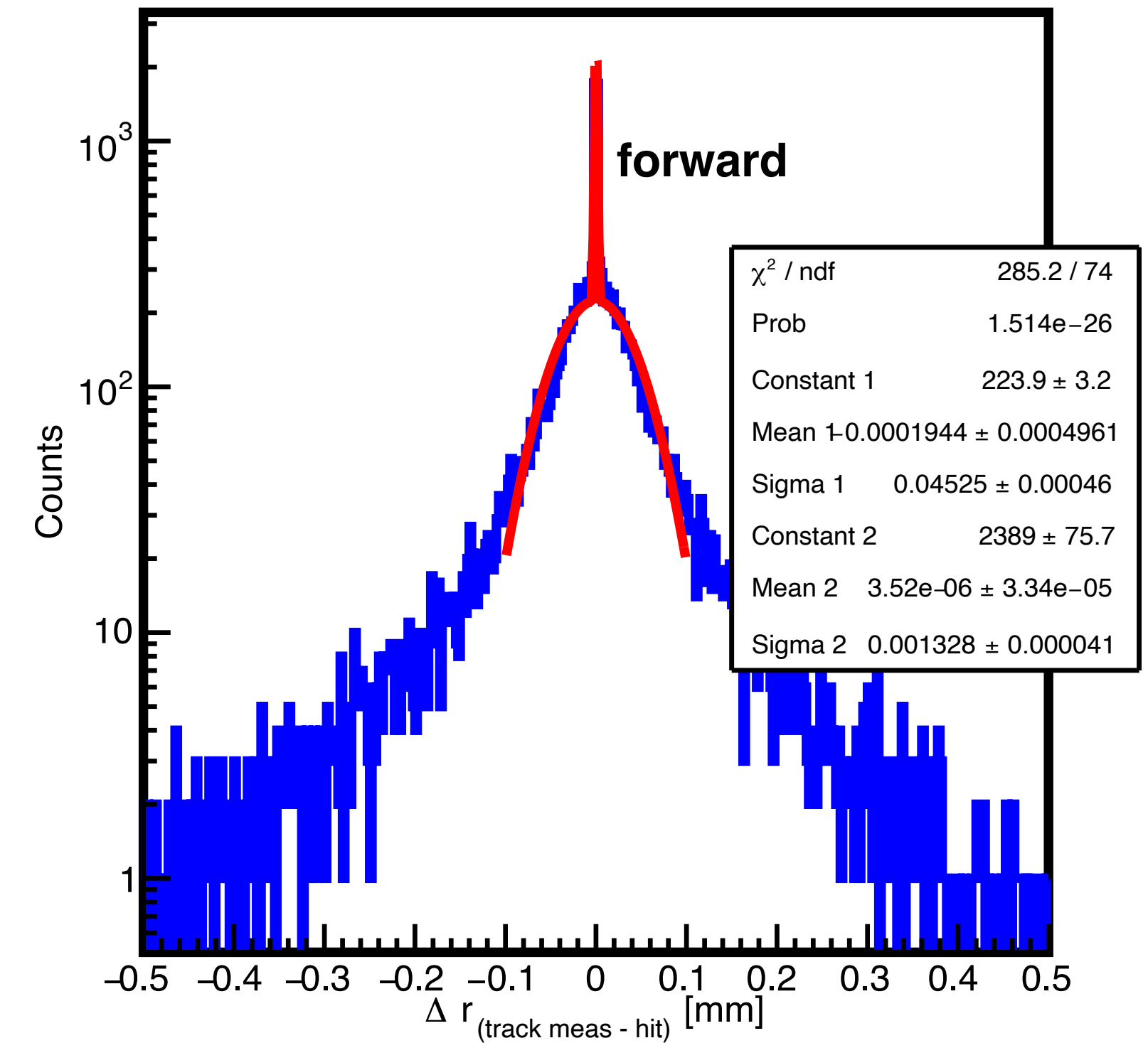
Residuals



Residuals



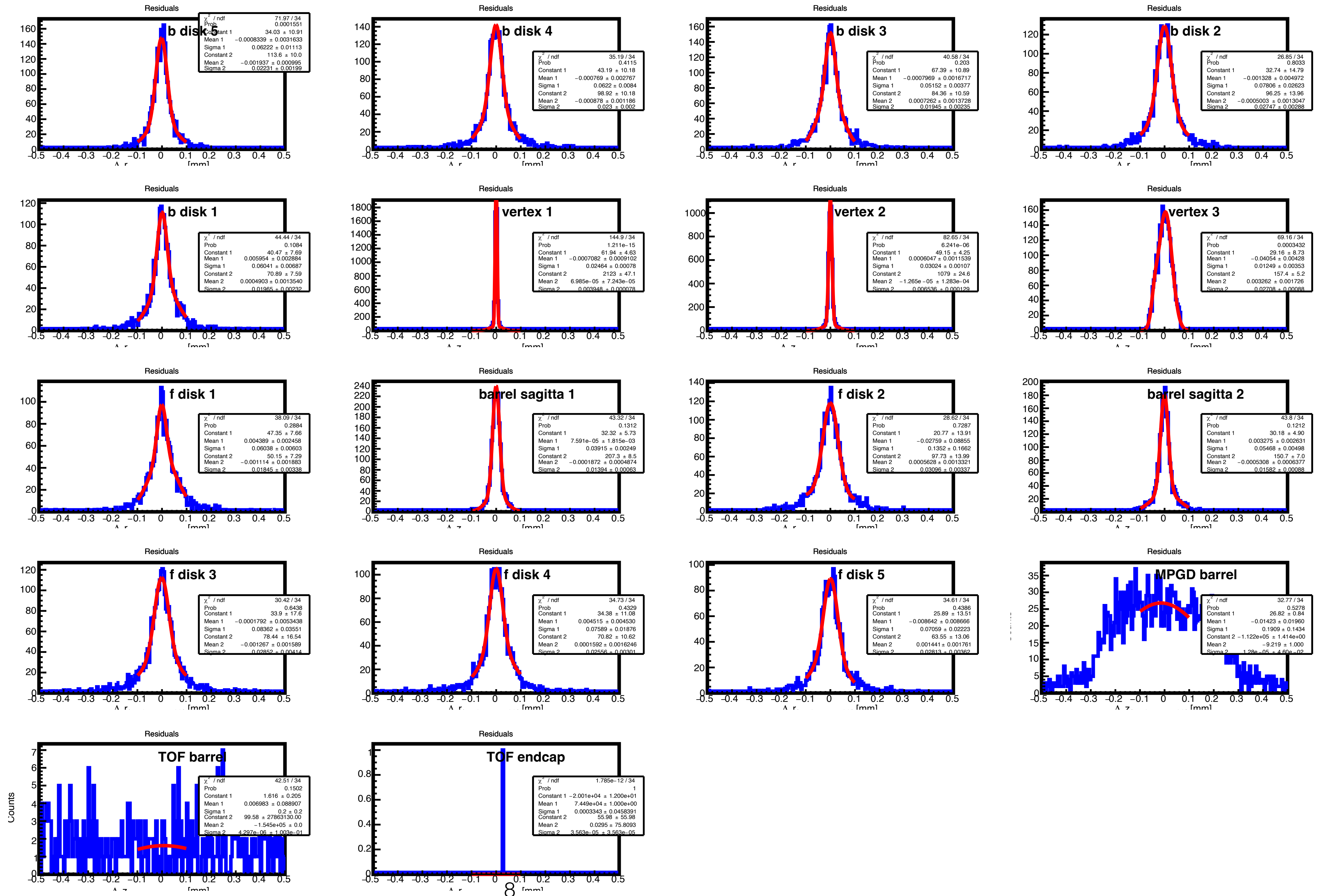
Residuals



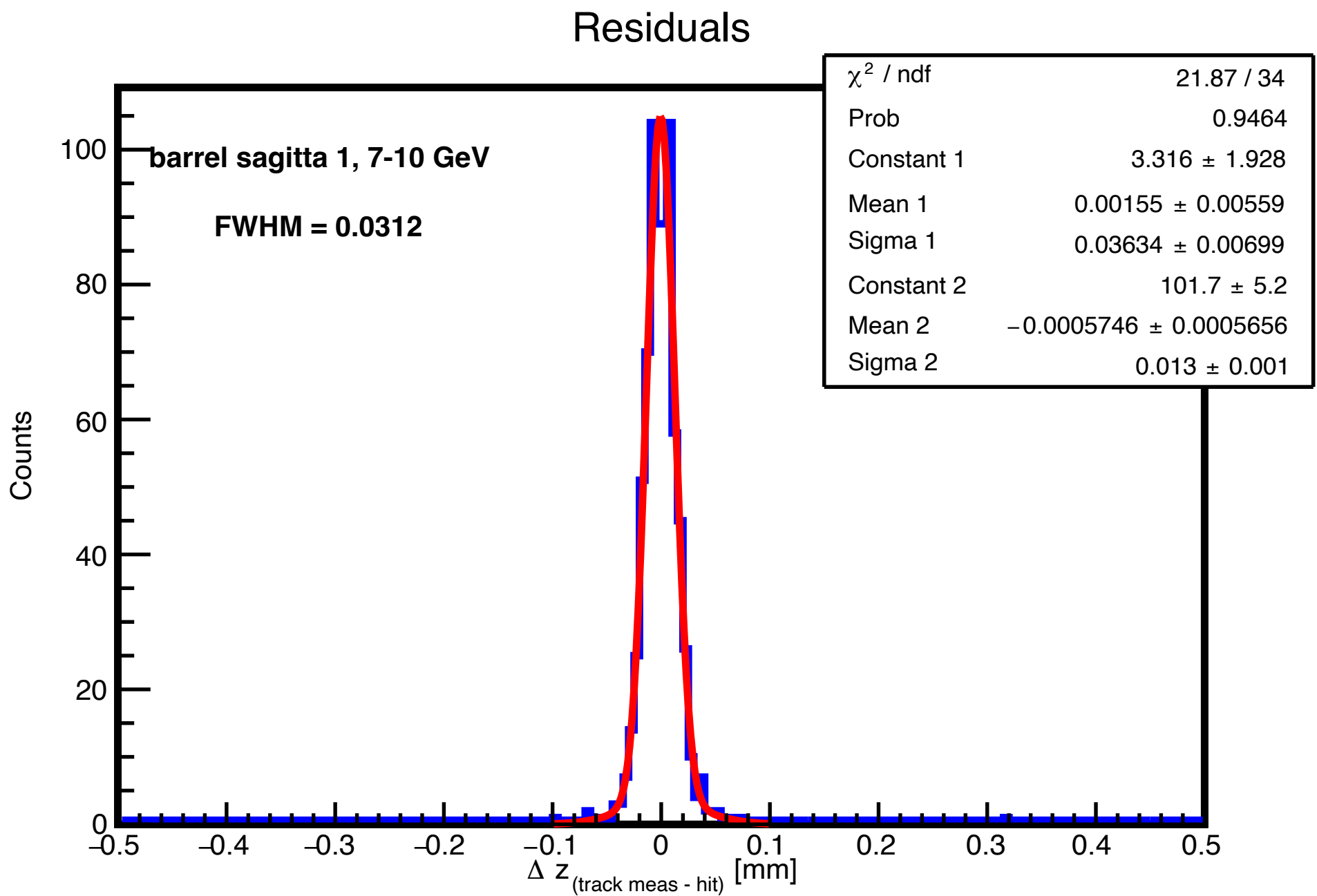
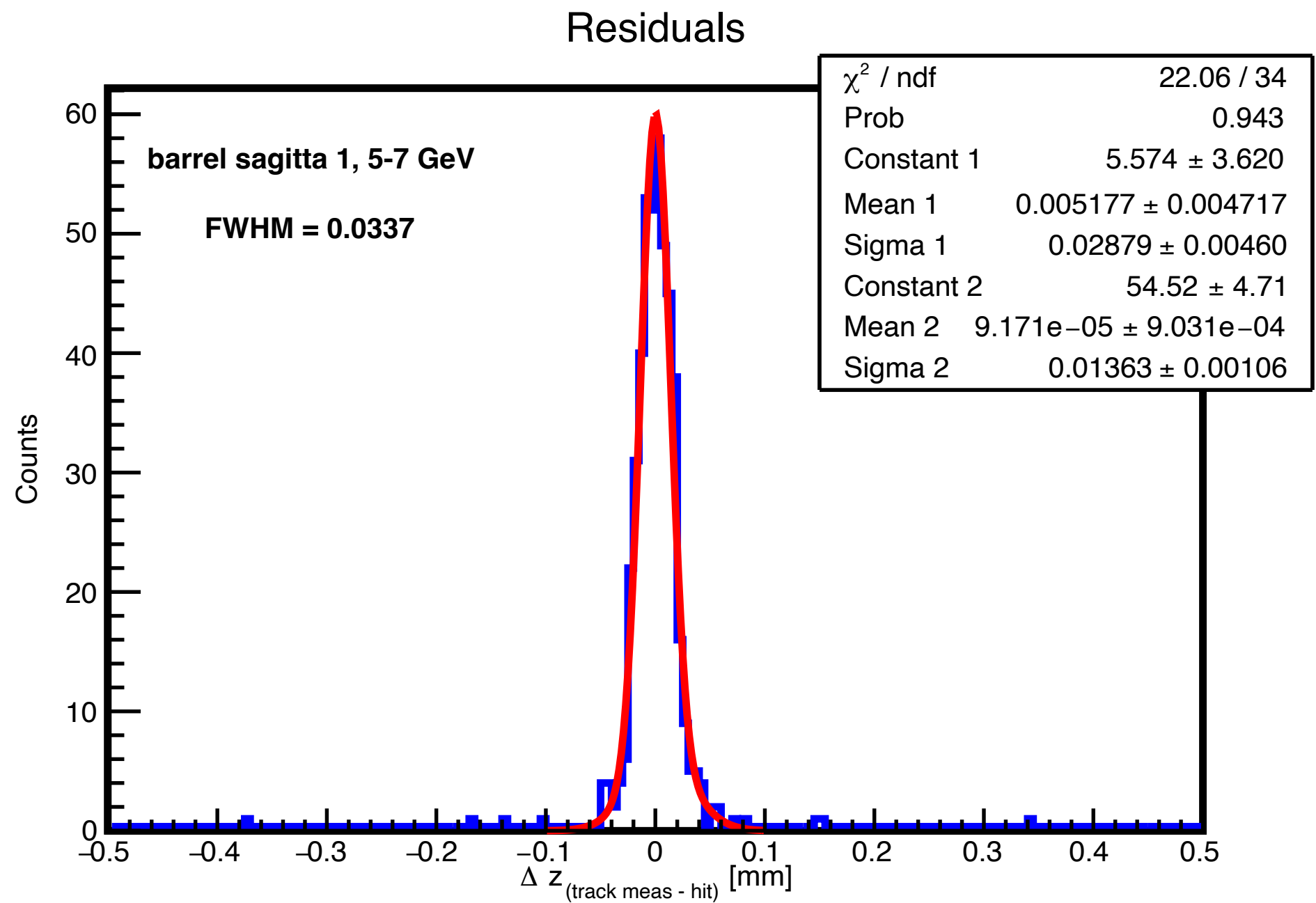
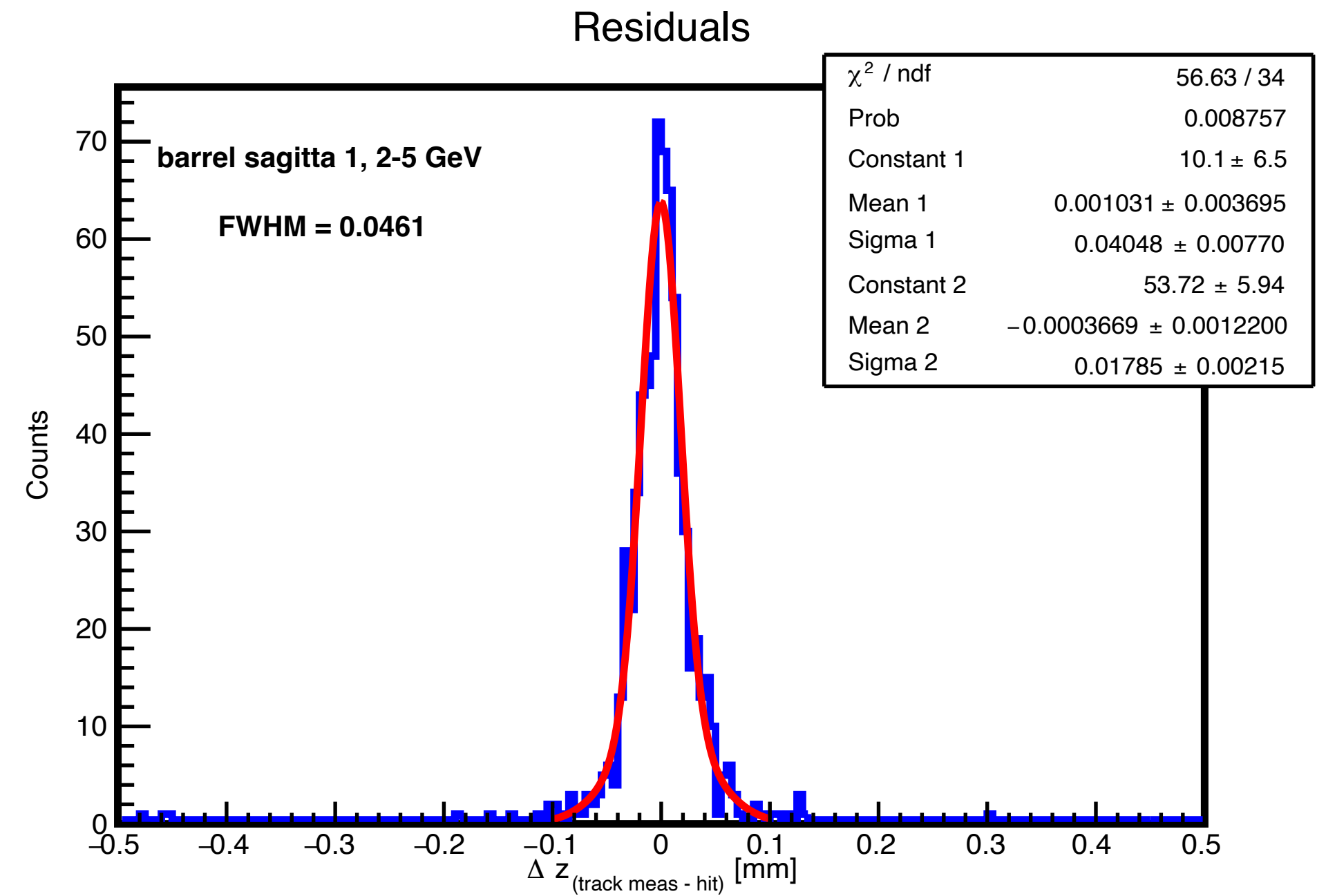
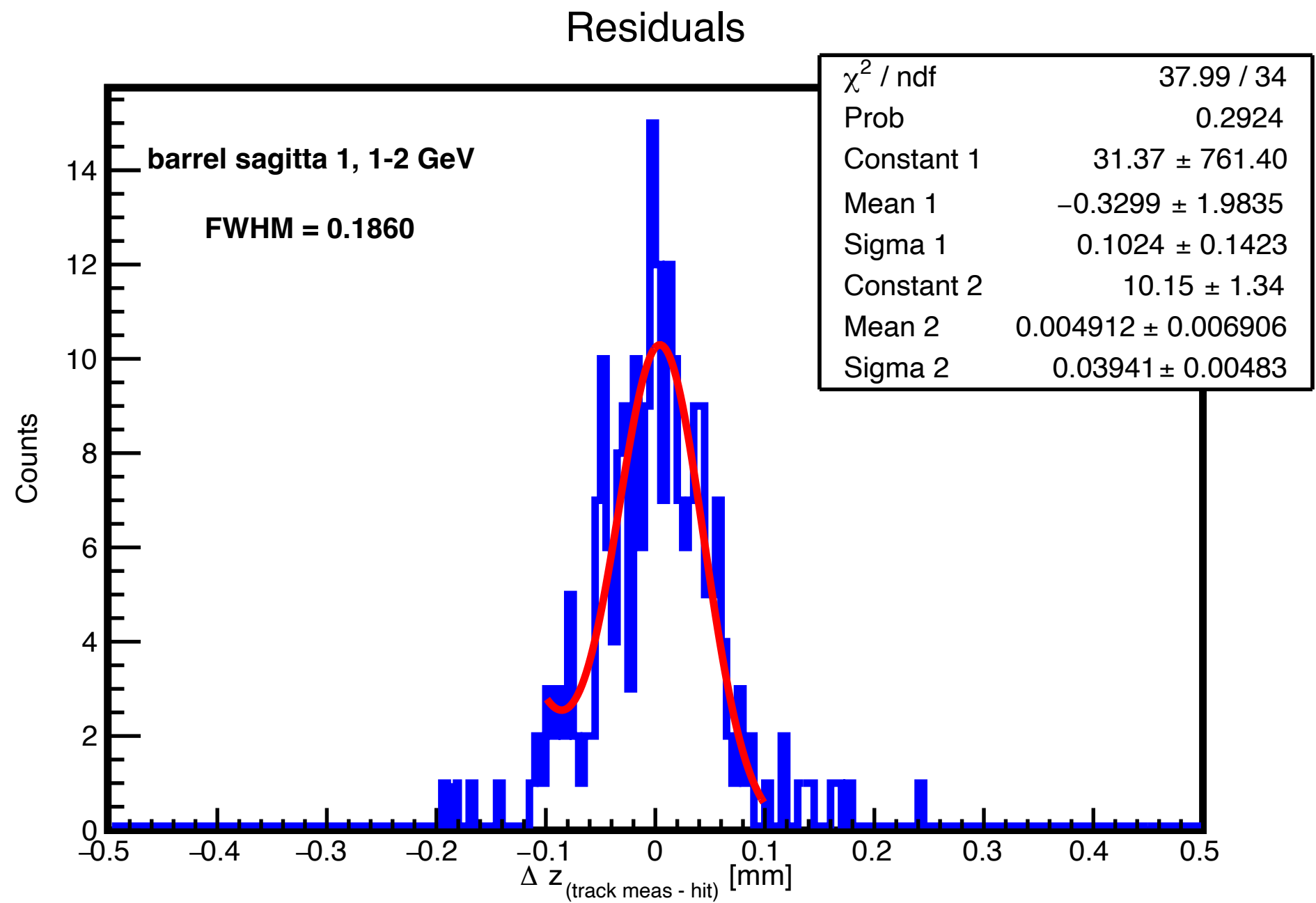
- Double gaussian fits

$$C_1 e^{\frac{-(x - \mu_1)^2}{2\sigma_1^2}} + C_2 e^{\frac{-(x - \mu_2)^2}{2\sigma_2^2}}$$

Residuals in every layer

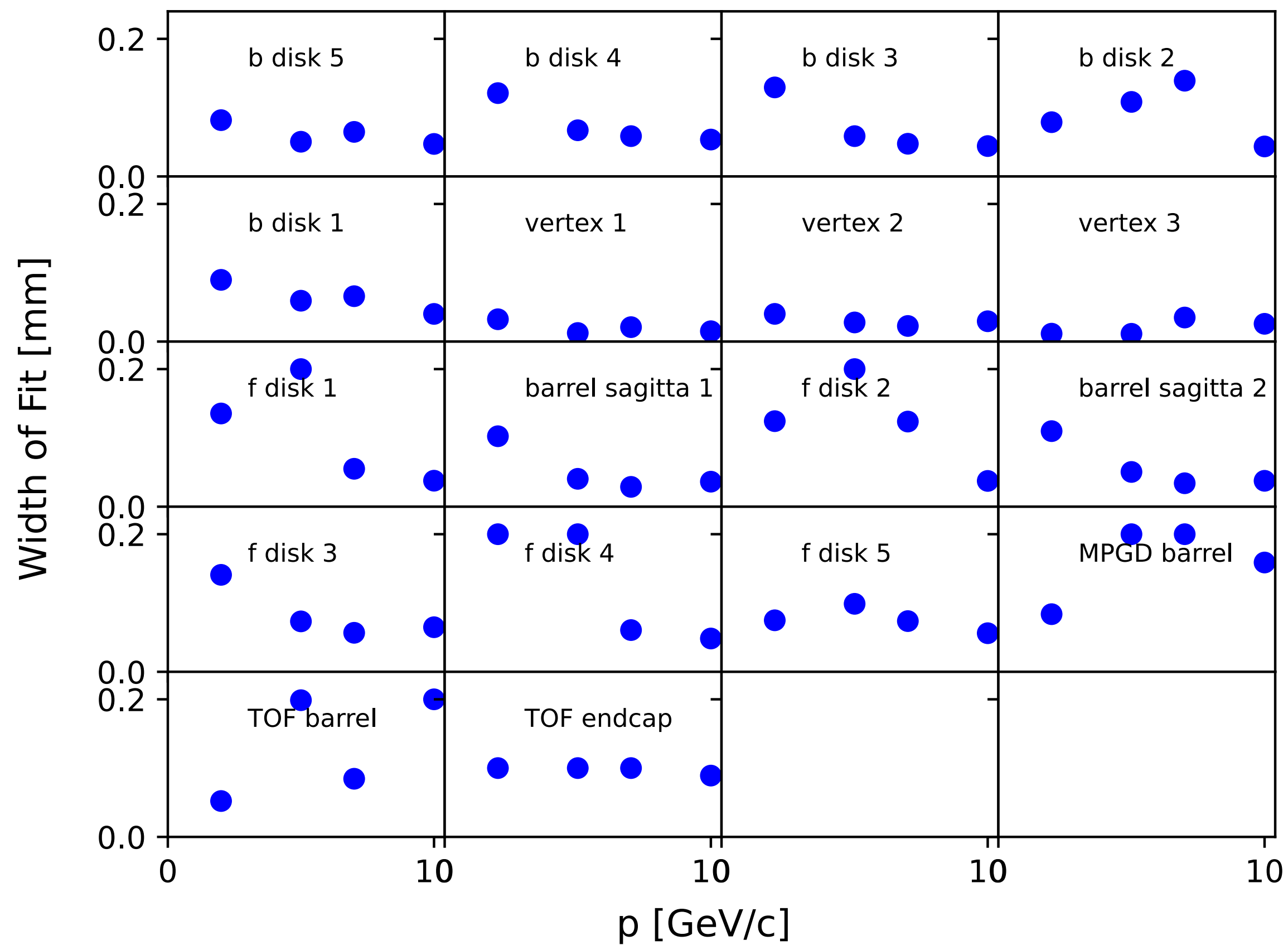


Residuals in
1st barrel
sagitta layer,
binned by
momentum

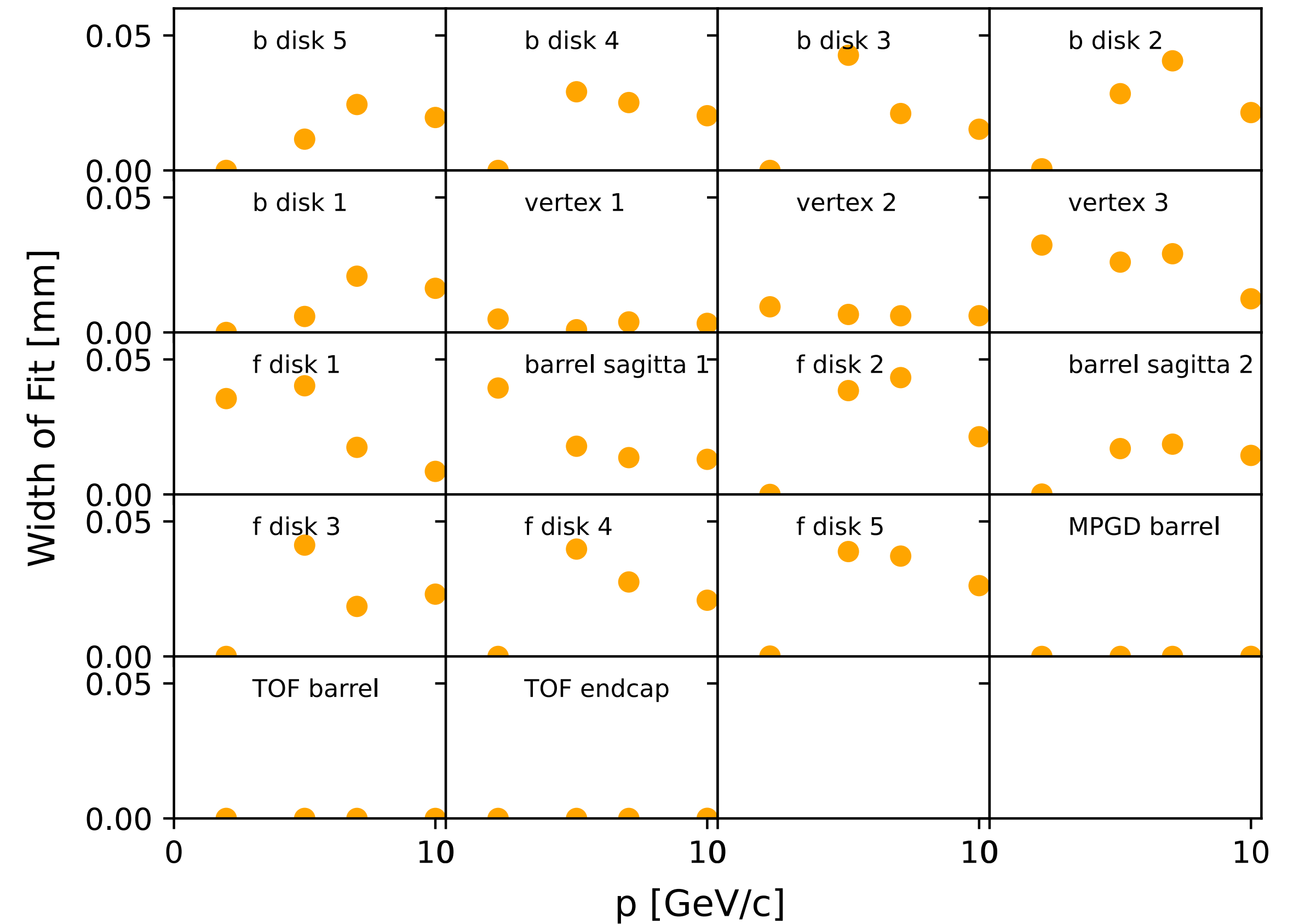


Widths from Double Gaussian Fits

Larger Widths from Double Gaussian Fits



Smaller Widths from Double Gaussian Fits



Summary and Next Steps

- We have preliminary plots of the residuals, with fits

Current work:

- Recalculate residuals by re-running ACTS with the hits from one layer missing, and seeing how close the track is.

```
41 void TrackerHitCollector_factory::Process(const std::shared_ptr<const JEvent> &event) {  
42     std::vector<edm4eic::TrackerHit*> total_hits;  
43  
44     // Just collect hits together  
45     for(auto input_tag: m_input_tags) {  
46         auto hits = event->Get<edm4eic::TrackerHit>(input_tag);  
47         for (const auto hit : hits) {  
48             total_hits.push_back(const_cast<edm4eic::TrackerHit*>(hit));  
49         }  
50     }  
51     Set(total_hits);  
52 }  
53 } // eicrecon  
54
```

https://github.com/eic/ElCrecon/blob/main/src/global/tracking/TrackerHitCollector_factory.cc

Backup

Residuals in every layer (log scale)

