Data vs. Monte Carlo Track Studies Using PrimeVtx

Update from July

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Tracking Meeting

- Method/Data/MC
- Primary Vertex Resolution vs. Z Position
- Track Parameters and Pulls

Data

Using 5.1.0 PrimeVtx with default parameters

☞ Data:

- Entire SumEt sample (4 jets/event)
- Production 4.8.4
- Refit with 4.11.1
  - Alignment table "100035 2 GOOD"

☞ MC:

- Default Inclusive Top MC
- Production 4.9.1
- Refit with 4.11.1
  - Realistic with Perfect Alignment
  - Run 151435

In all plots, blue is data and red is MC

Resolution and Pulls: Method

1. Divide tracks in two independent sets (A and B)
   - Select tracks as in standard PrimeVtx
   - For each pair of selected tracks randomly choose which track goes in which set (A or B)

2. Find vertex using the two independent track sets

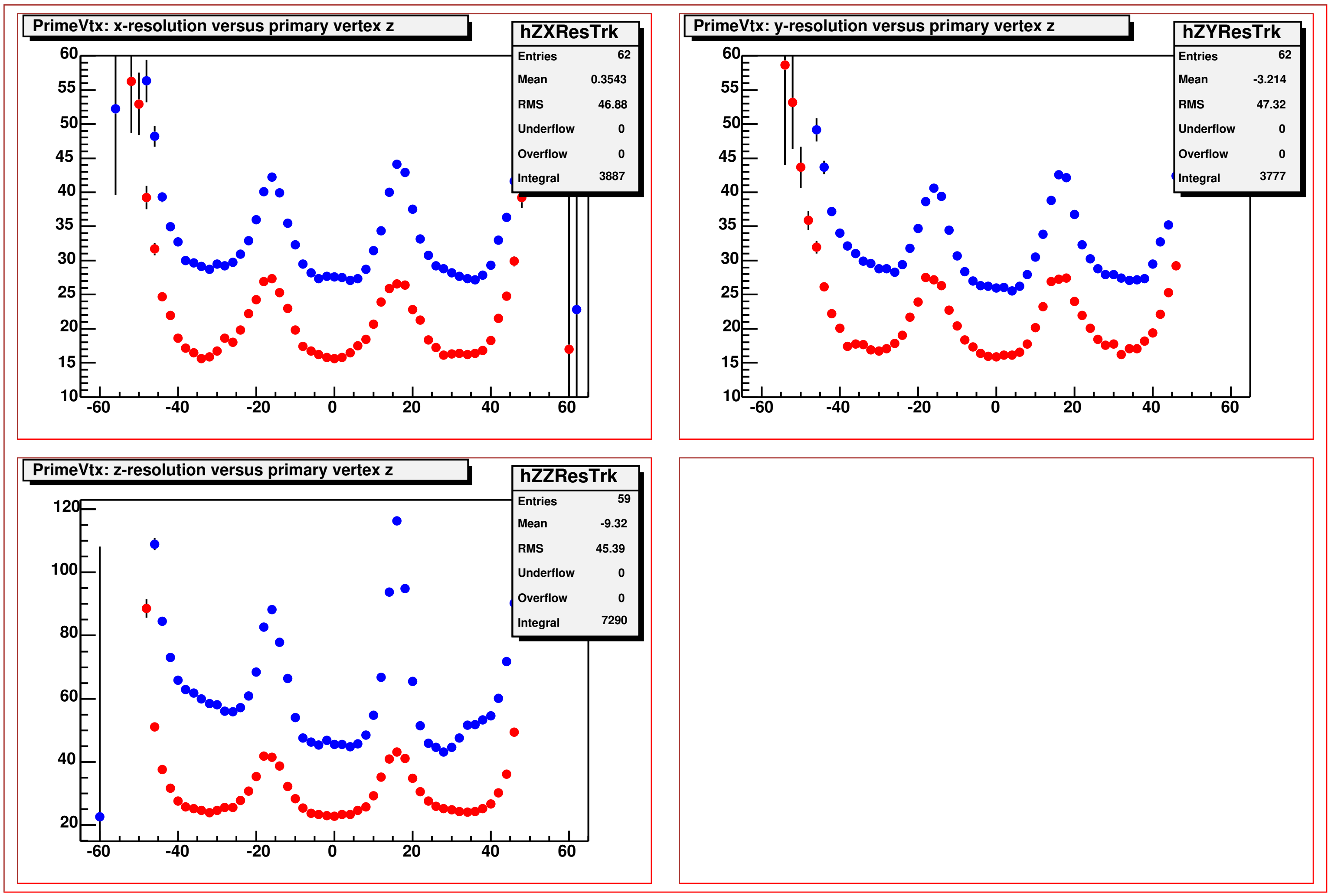
3. Get x, y, z difference between the 2 vertices

4. Resolution:
   - Histogram $x_1 - x_2$
   - Fit gaussian
   - Divide sigma by $\sqrt{2}$

5. Pull:
   - $\frac{x_1 - x_2}{\sqrt{\epsilon_1^2 + \epsilon_2^2}}$
   - Fit gaussian and get sigma

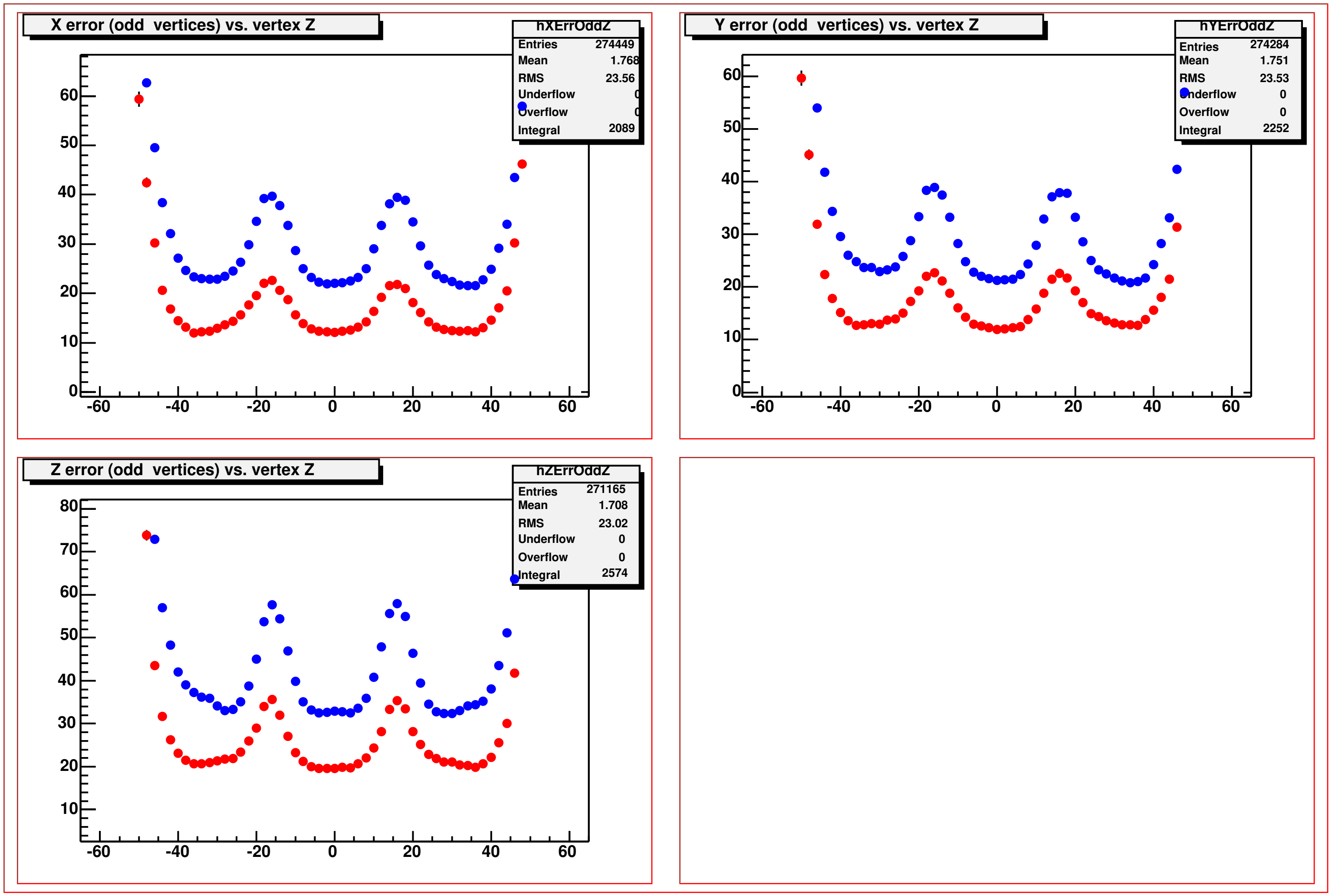
A/B Resolution

- Asymmetry present in data, not MC
- Better MC resolution (at least partially) due to more tracks (about 9 to 7.5)



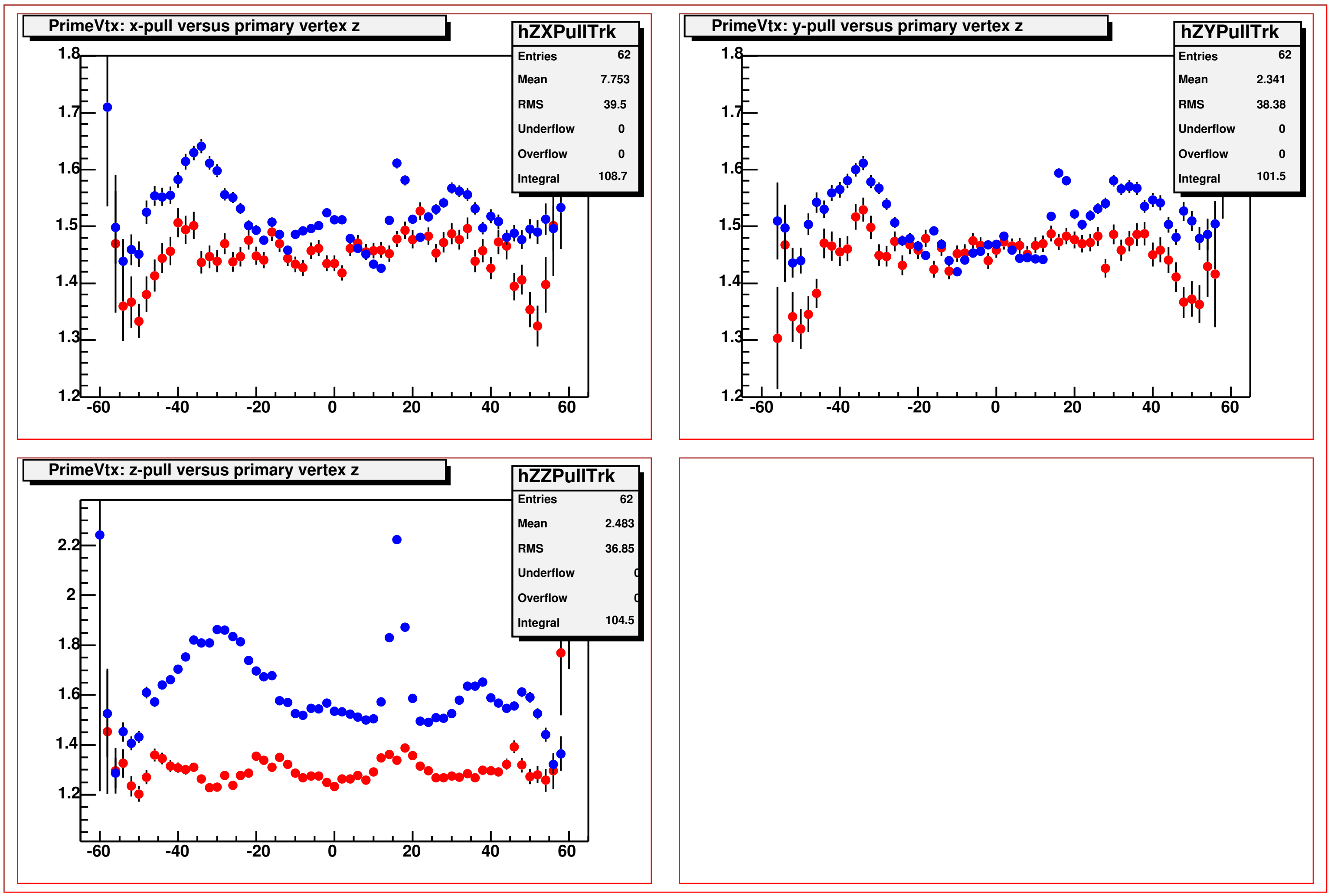
Vertex Error

Errors symmetric and consistent



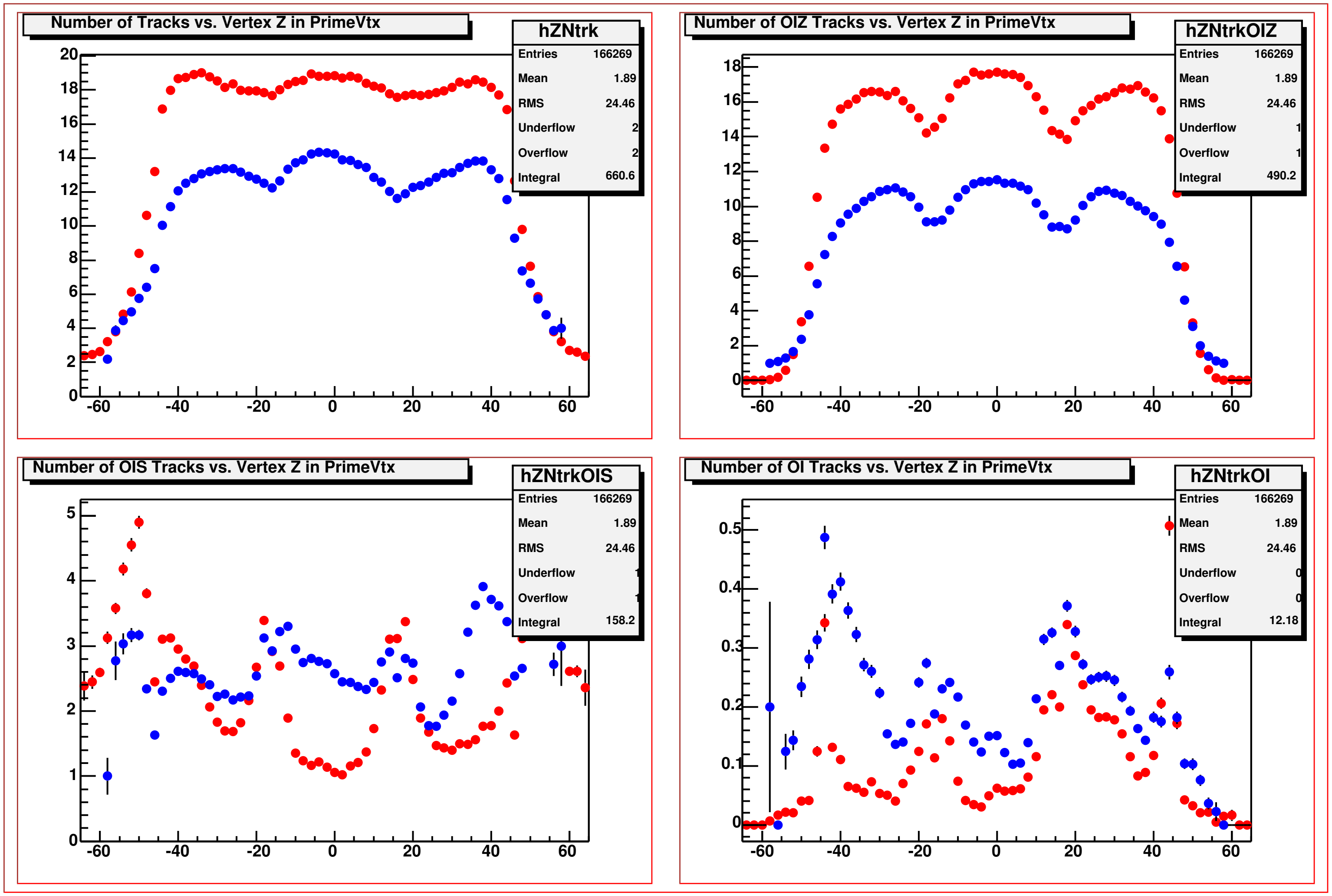
PrimeVtx Pulls

- In data, negative barrel is much higher, plus large spike at 18 cm
- Only MC structure is in Z at the bulkheads



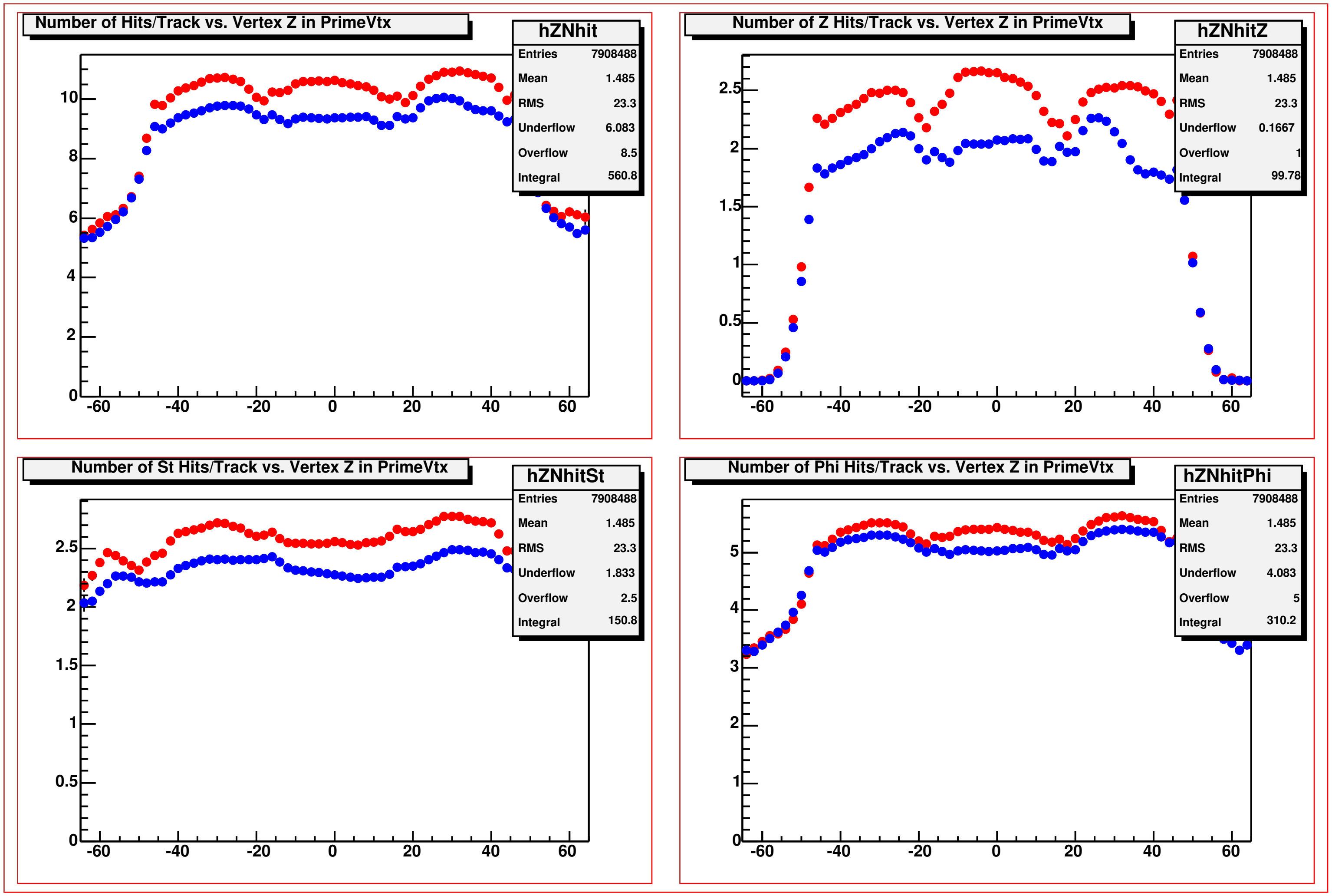
Number of Tracks per Vertex

Structure in OI tracks appears in both, but to different degree



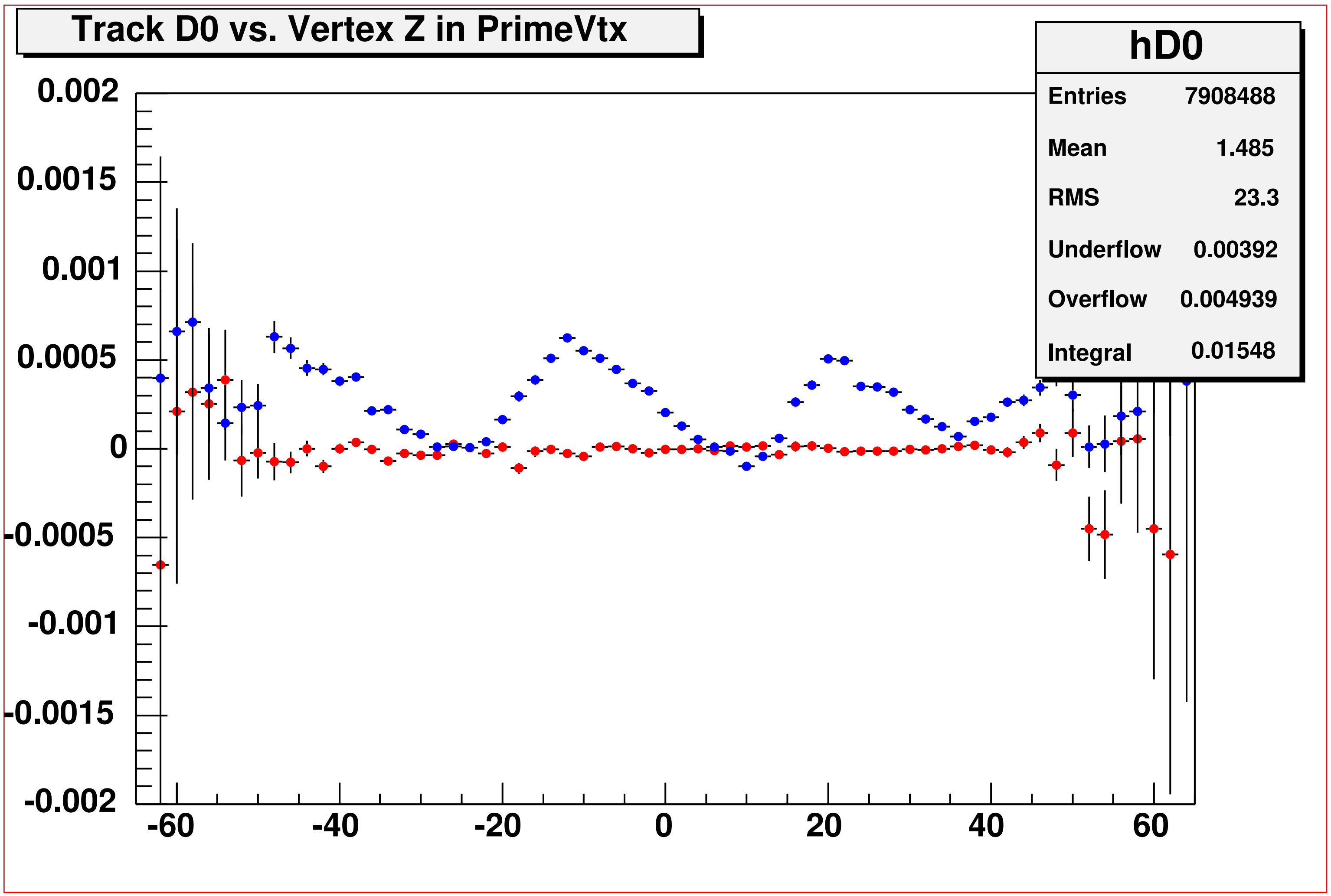
Number of Hits per Track

MC has consistently more hits per track



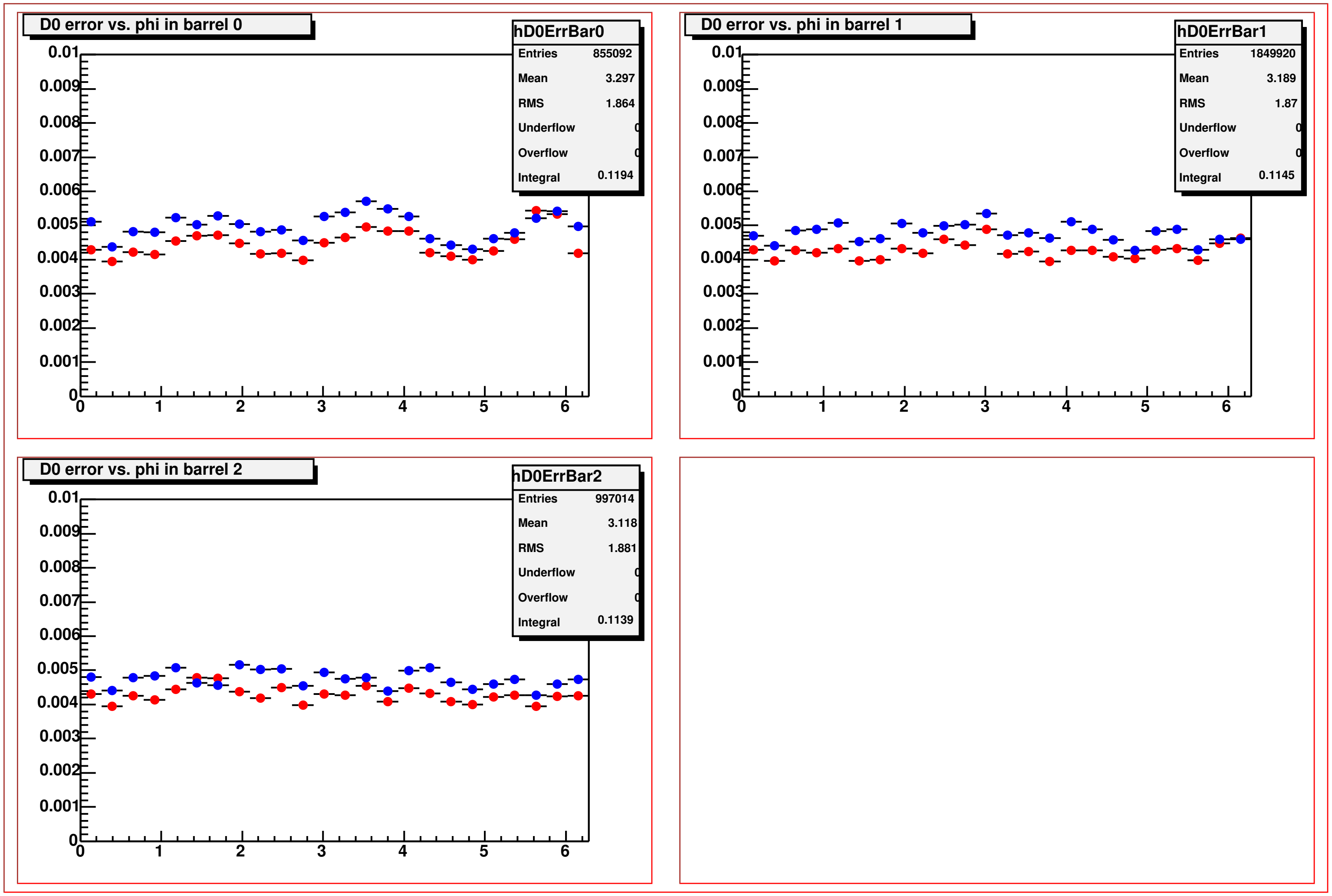
Mean D0

5 micron sawtooth shape only appears in data



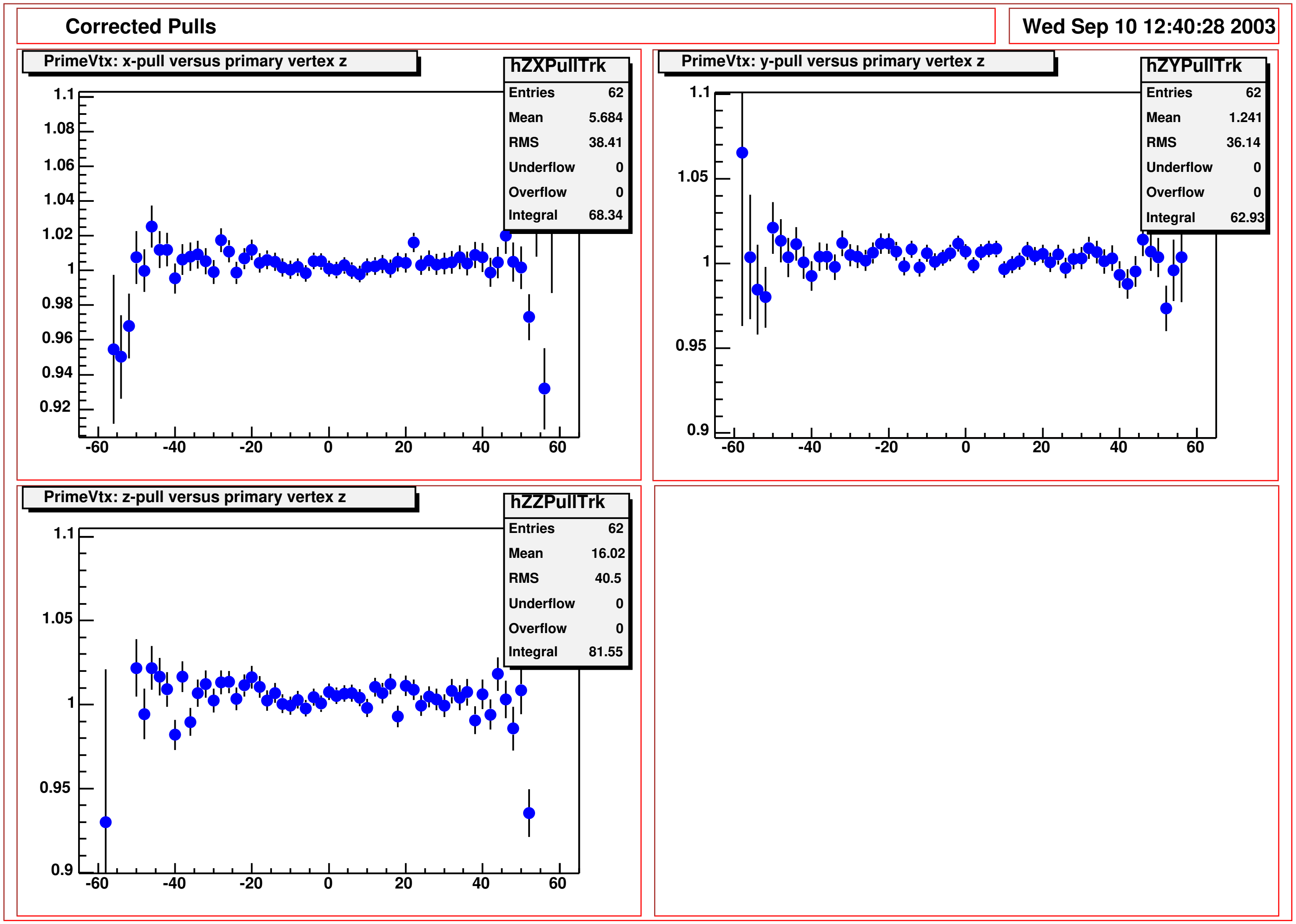
D0 Error in Barrels

Perfectly shaped, but MC always roughly 10% low



Fixed Pulls

Can program PrimeVtx to take pulls into account, but problems not understood



Summary

Questions:

1. Still can not explain large features in pulls (particularly Z)
2. Number of tracks distributions have different shapes in data and MC
3. Hits per track larger in MC
4. Track D0 has 5 micron sawtooth pattern

To Come:

- Code in pulls for MC
- Understand and correct weird features (help?)
  - Alignment
  - Material