TRK-10-005

Primary Vertex Resolution Update at 7 TeV

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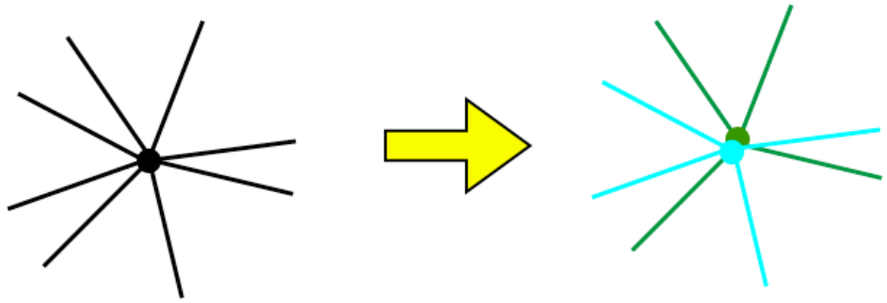
The Two-Vertex Method

- The algorithm has been approved in TRK-10-001
  - Primary vertex resolutions depend on nTracks used and their $< p_T >$
  - Data-driven "two-vertex" method to measure primary vertex resolution



1. Split tracks into two independent sets
2. Run PrimaryVertexProducer (offlinePrimaryVertices) on each trackset
3. Compare the two fitted vertex positions and calculate
   - Resolution: σ of the gaussian fit to $\frac{x_1 - x_2}{\sqrt{2}}$
   - Pull: σ of the gaussian fit to $\frac{x_1 - x_2}{\sqrt{\sigma x_1^2 + \sigma x_2^2}}$

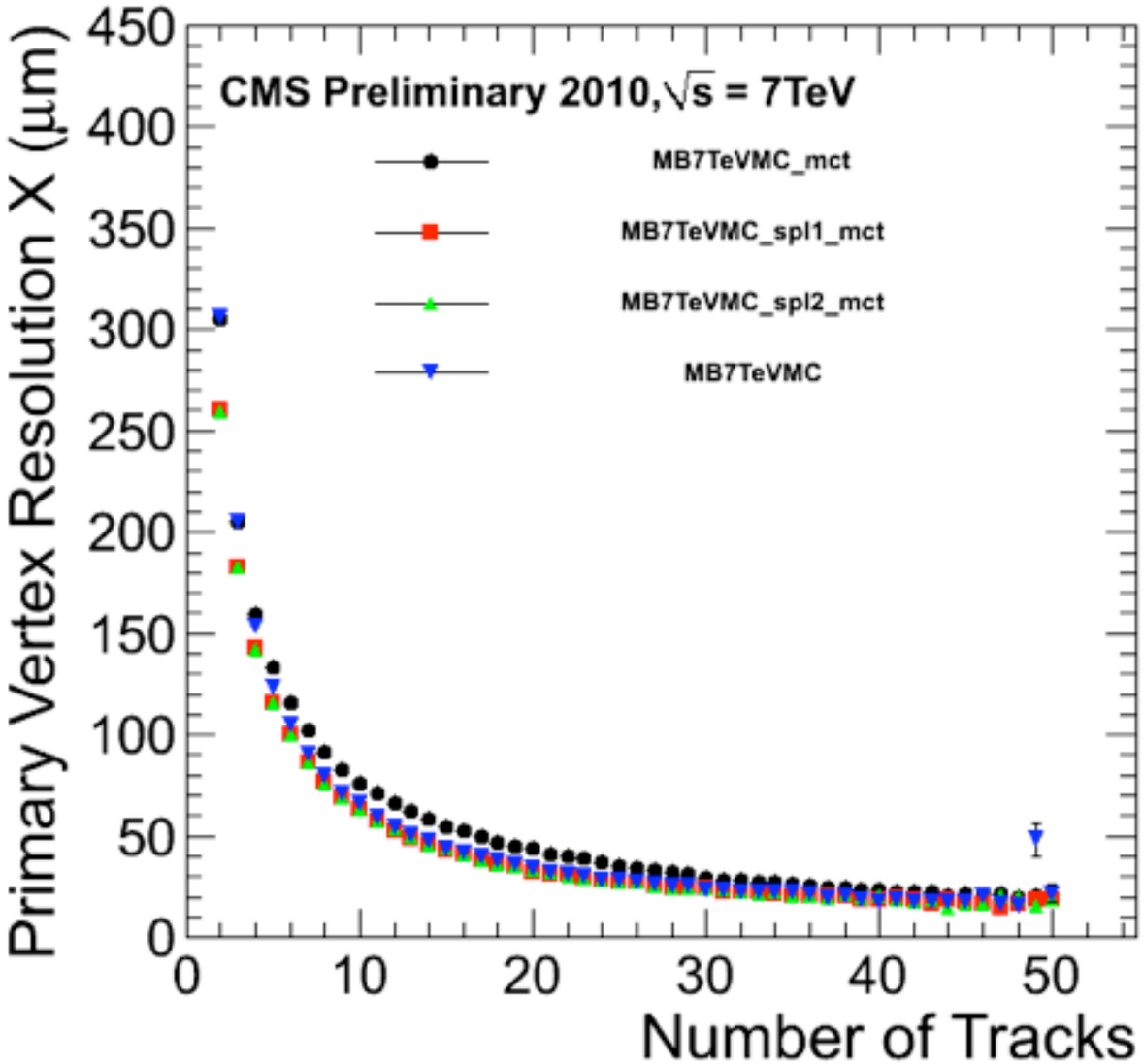
- Now repeat the same procedure in 7 TeV

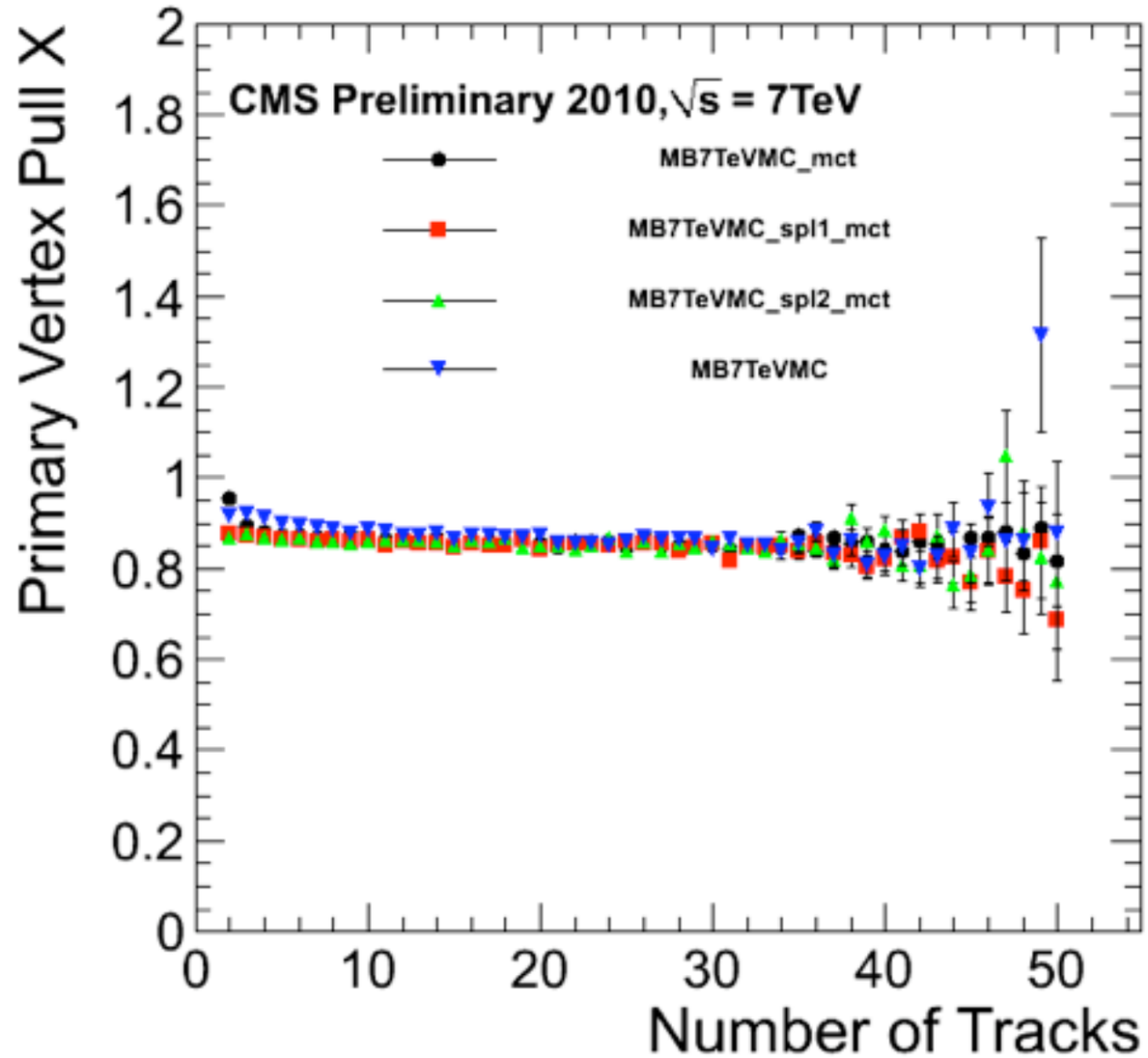
Outline

- Reminder of the Two-Vertex Method
- Priminary Results at 7 TeV
- The proposal and plans for the PAS

Two-Vertex Method Validated on MC Samples (1/3)

- Resolution and Pull in X vs nTracks

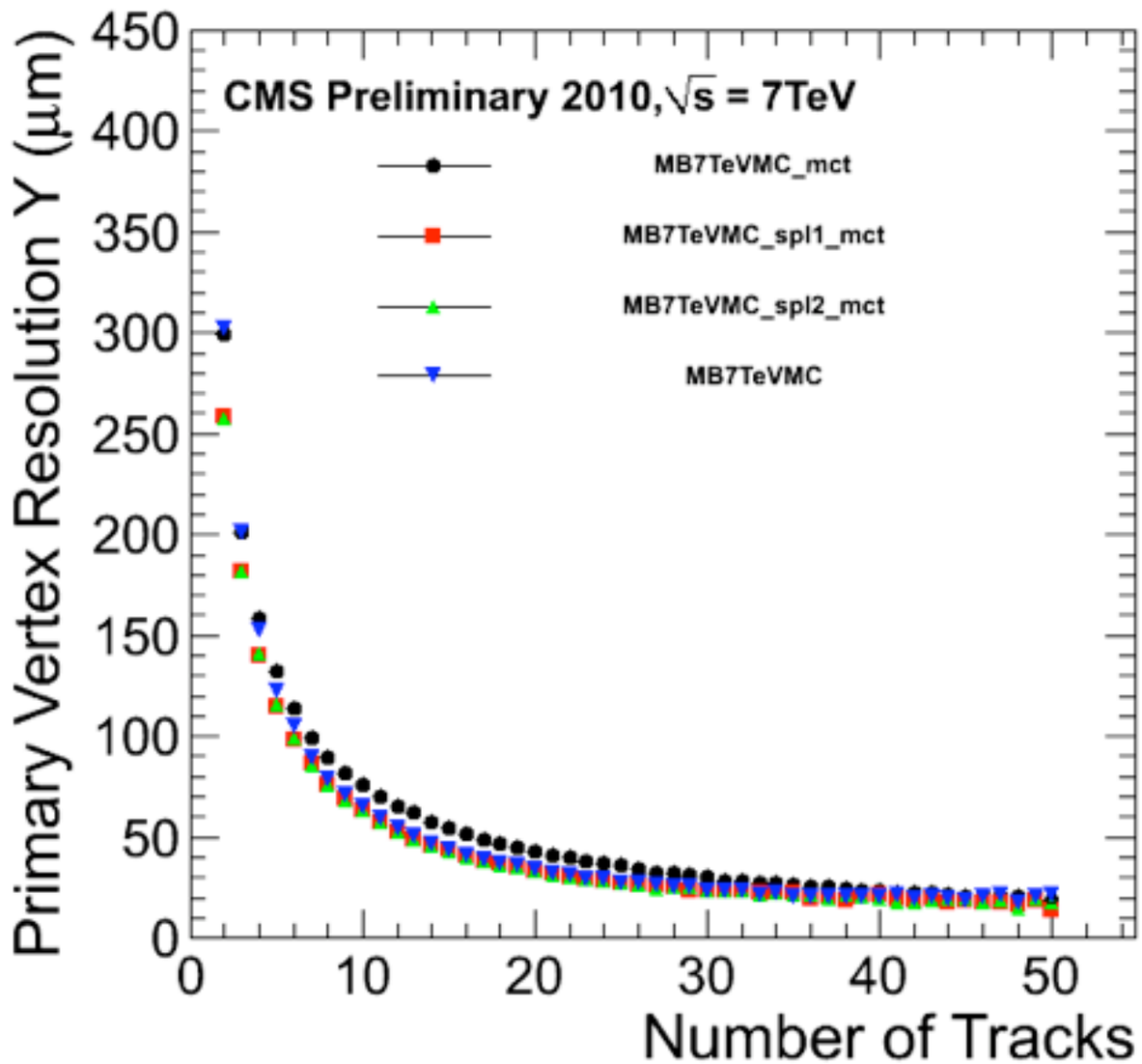


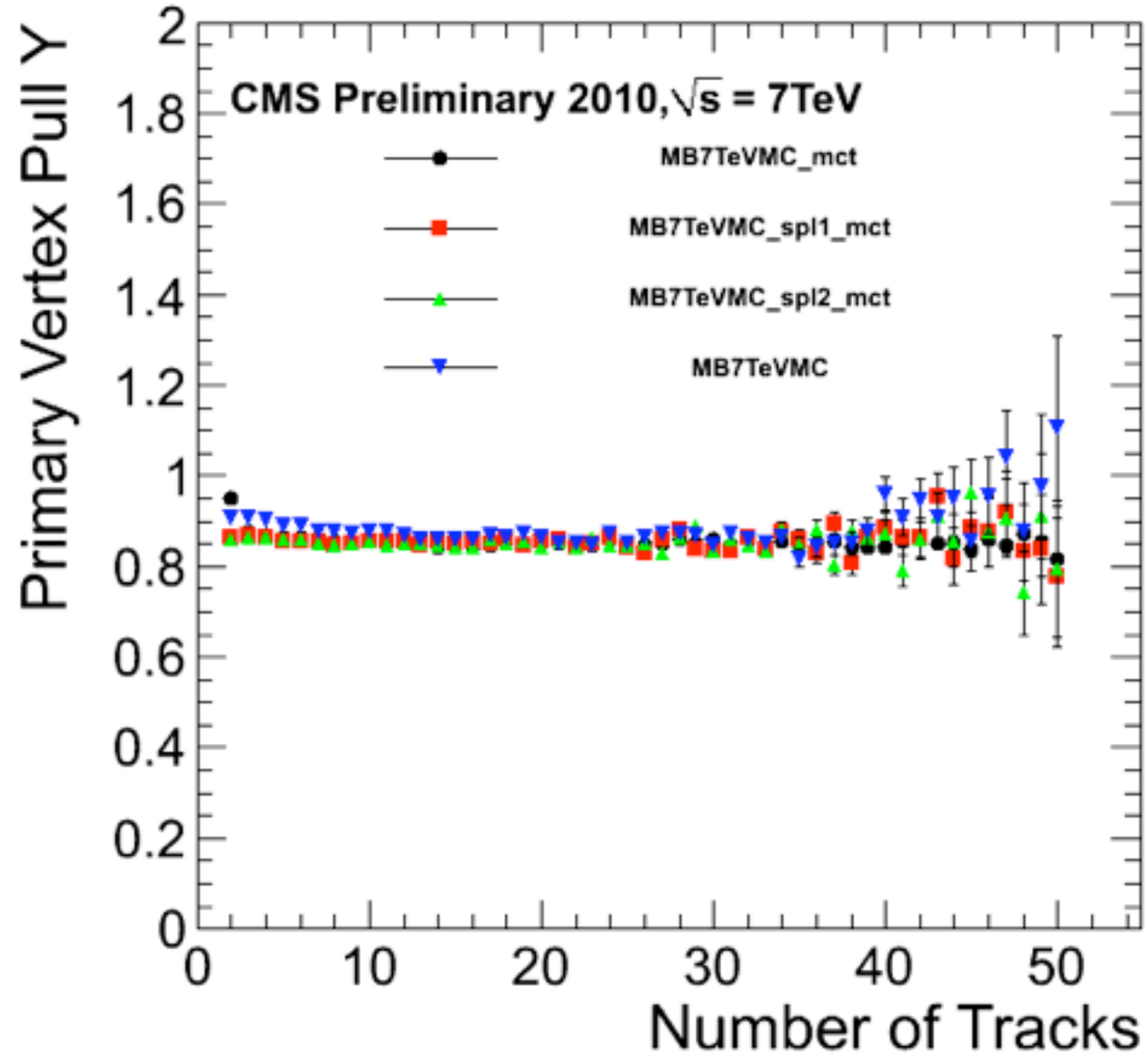


- Need to understand why the MC truth method applied on the unsplit vertex is in general 5-10 mum larger than the others

Two-Vertex Method Validated on MC Samples (1/3)

- Resolution and Pull in Y vs nTracks

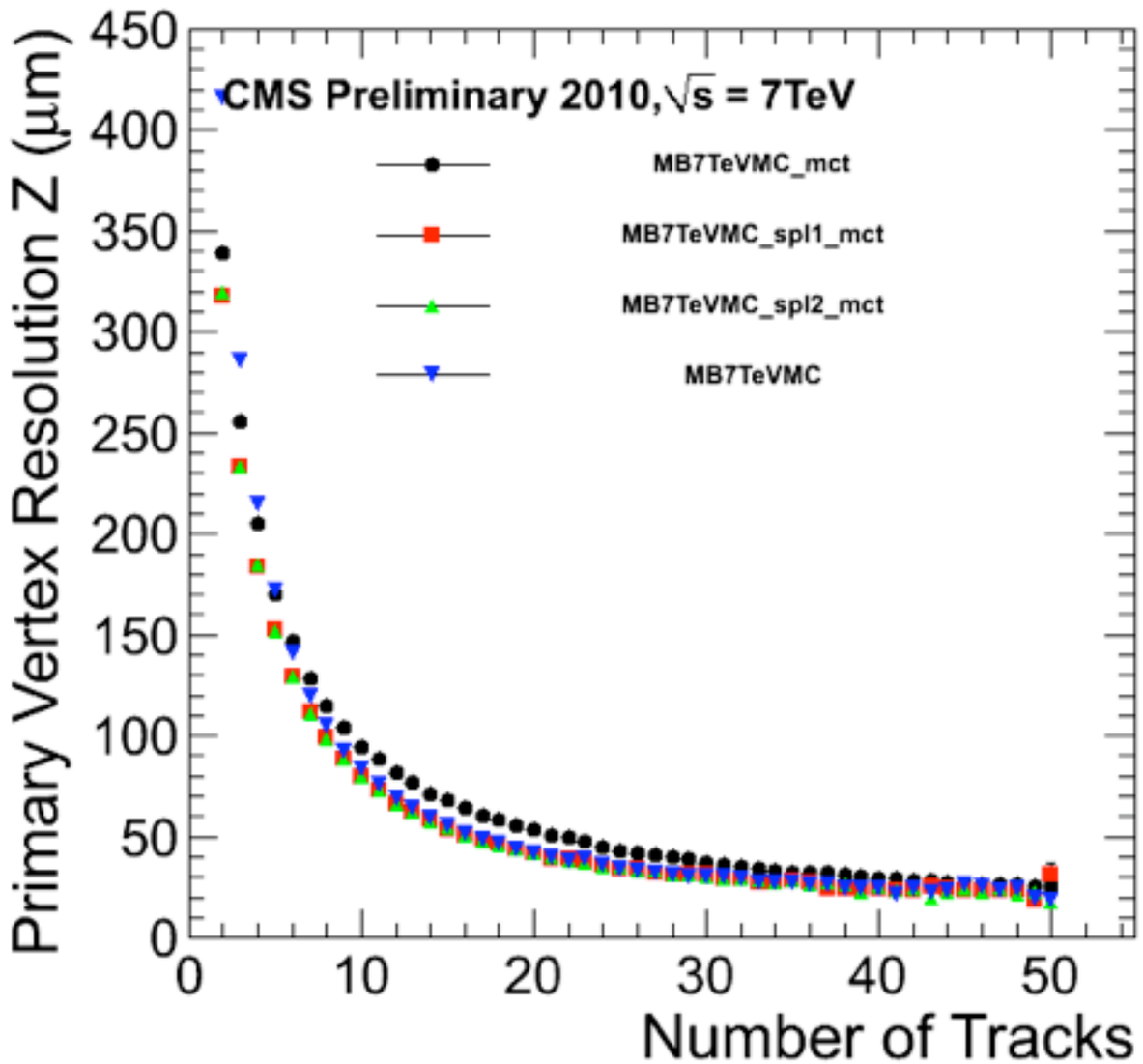


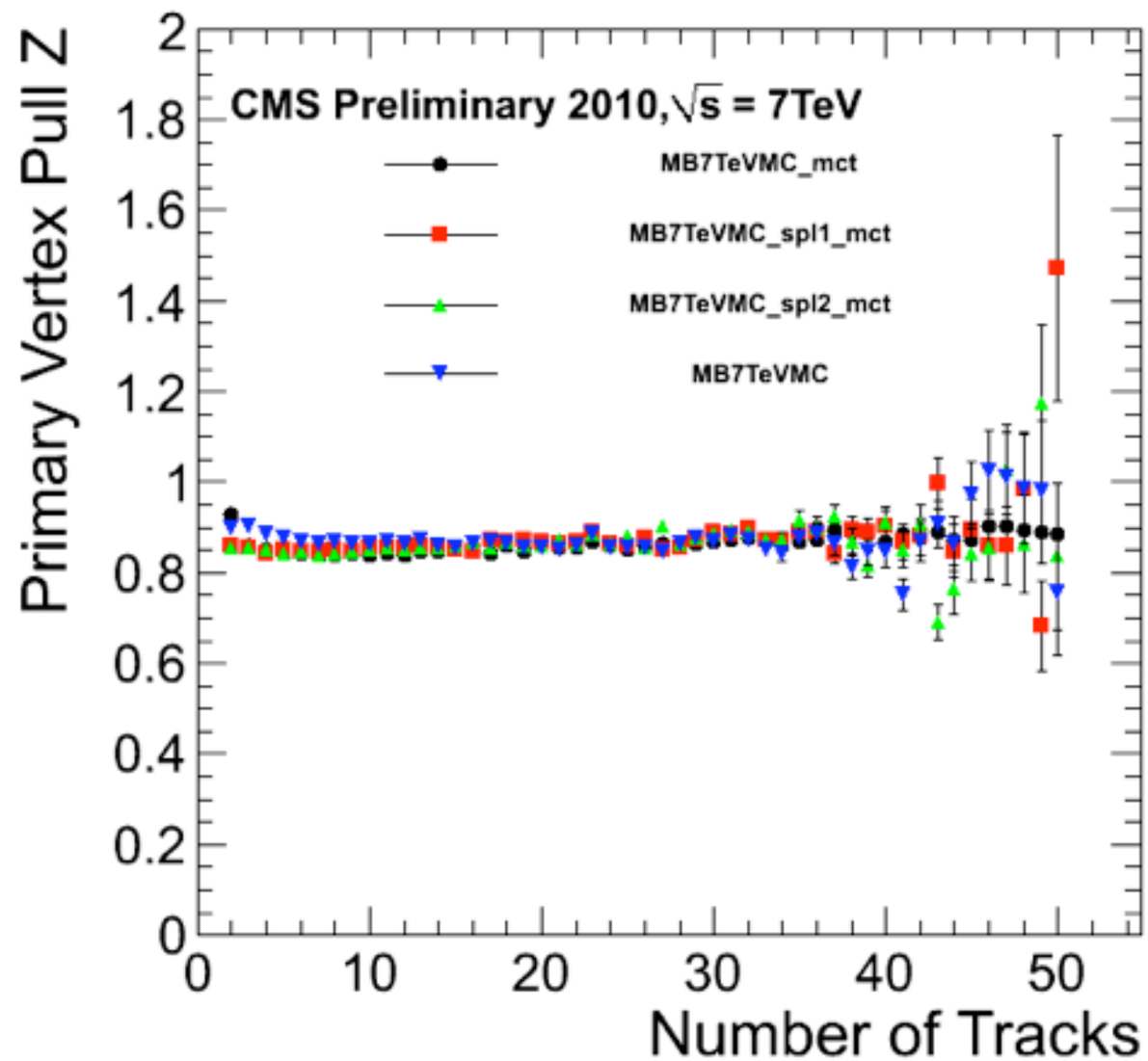


- Need to understand why the MC truth method applied on the unsplit vertex is in general 5-10 mum larger than the others

Two-Vertex Method Validated on MC Samples (3/3)

- Resolution and Pull in Z vs nTracks

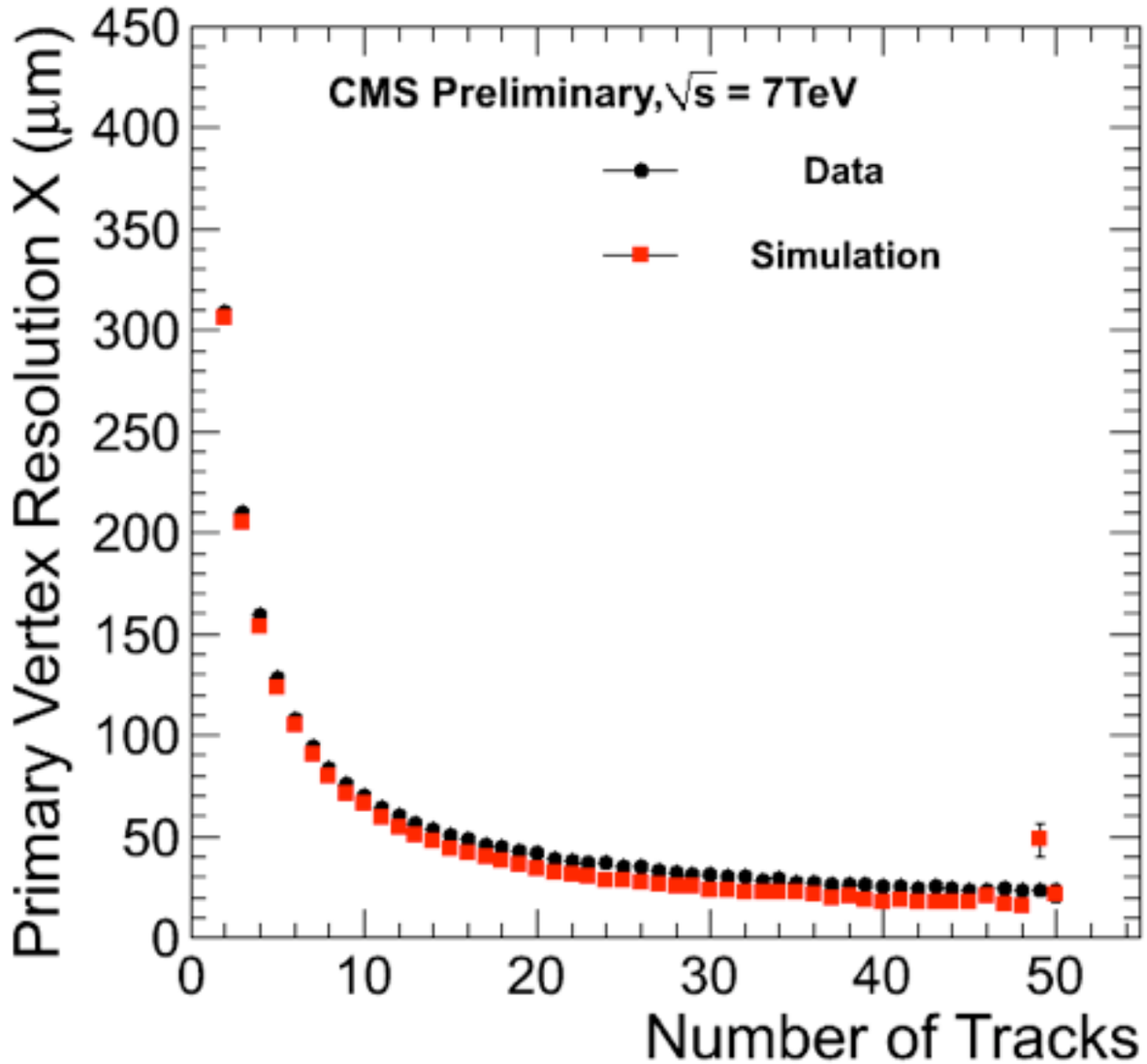


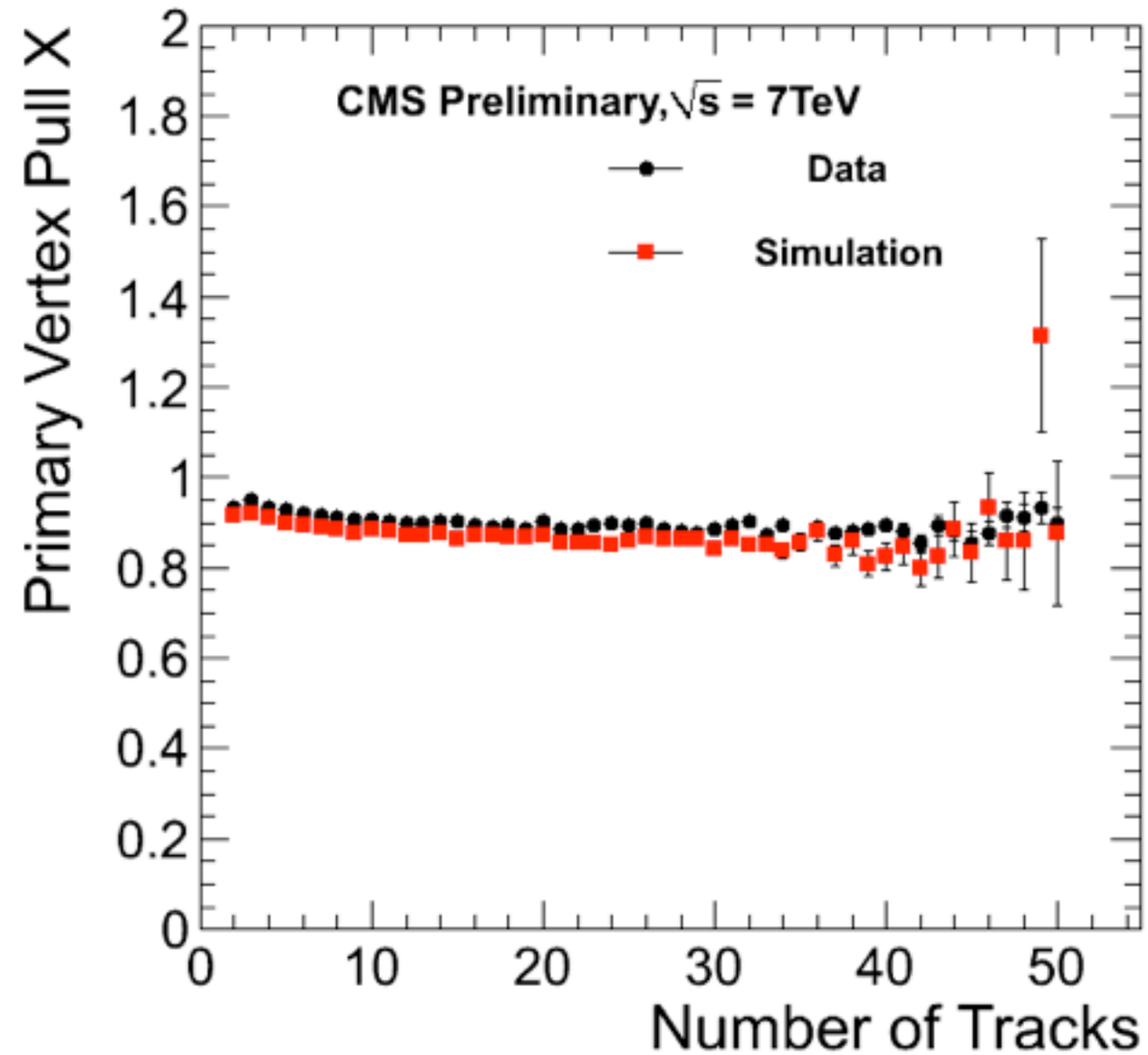


- Need to understand why the MC truth method applied on the unsplit vertex is in general 5-10 mum larger than the others

Data-MC Comparison of Two-Vertex Results (1/5)

- Resolution and Pull in X vs nTracks (To be Included in PAS)

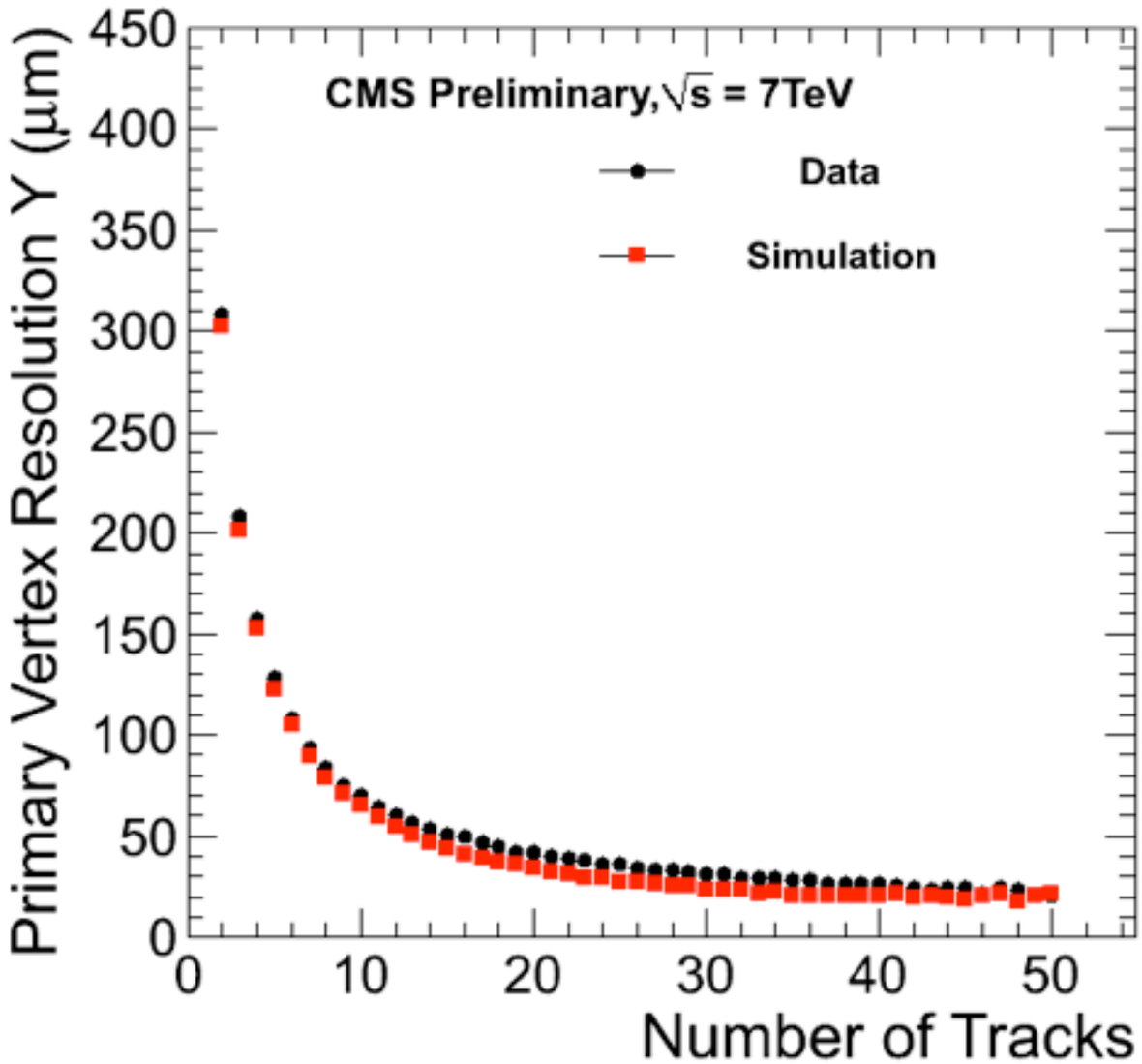


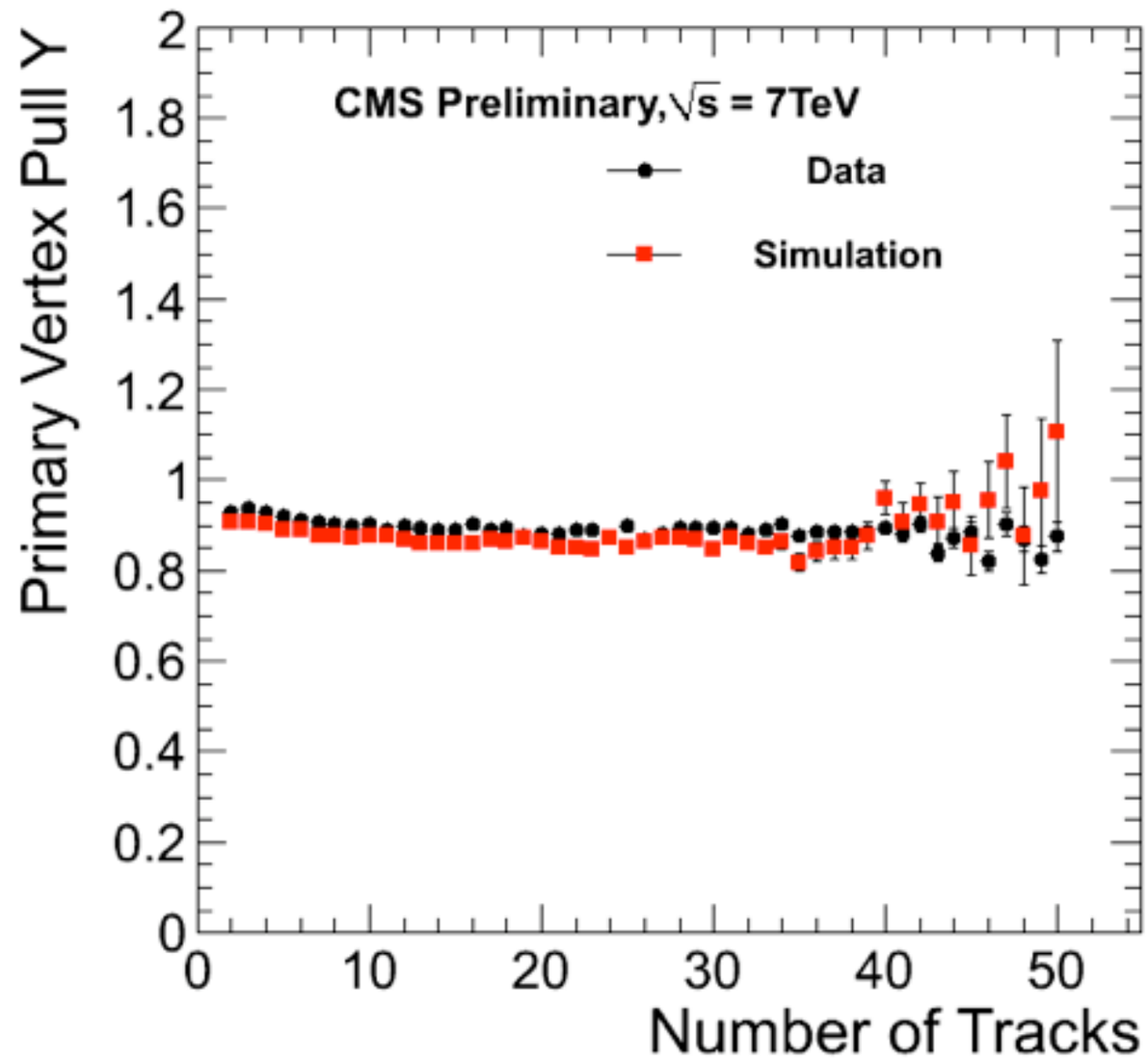


- Overall the data agrees well with MC within 5 mum
- The constant difference is puzzling, could be due to the alignment, waiting for the next re-reco with new alignment

Data-MC Comparison of Two-Vertex Results (2/5)

- Resolution and Pull in Y vs nTracks (To be Included in PAS)

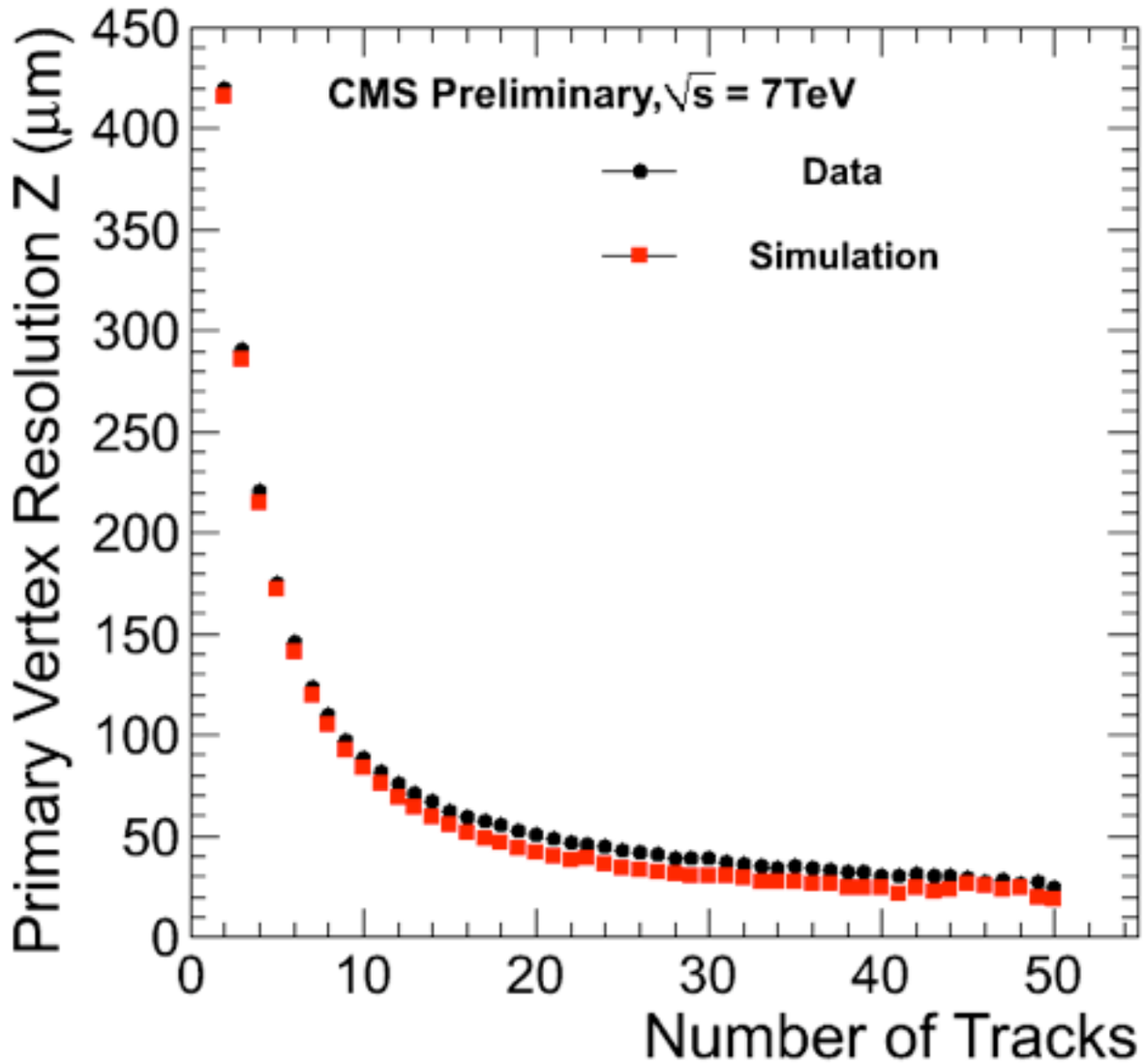


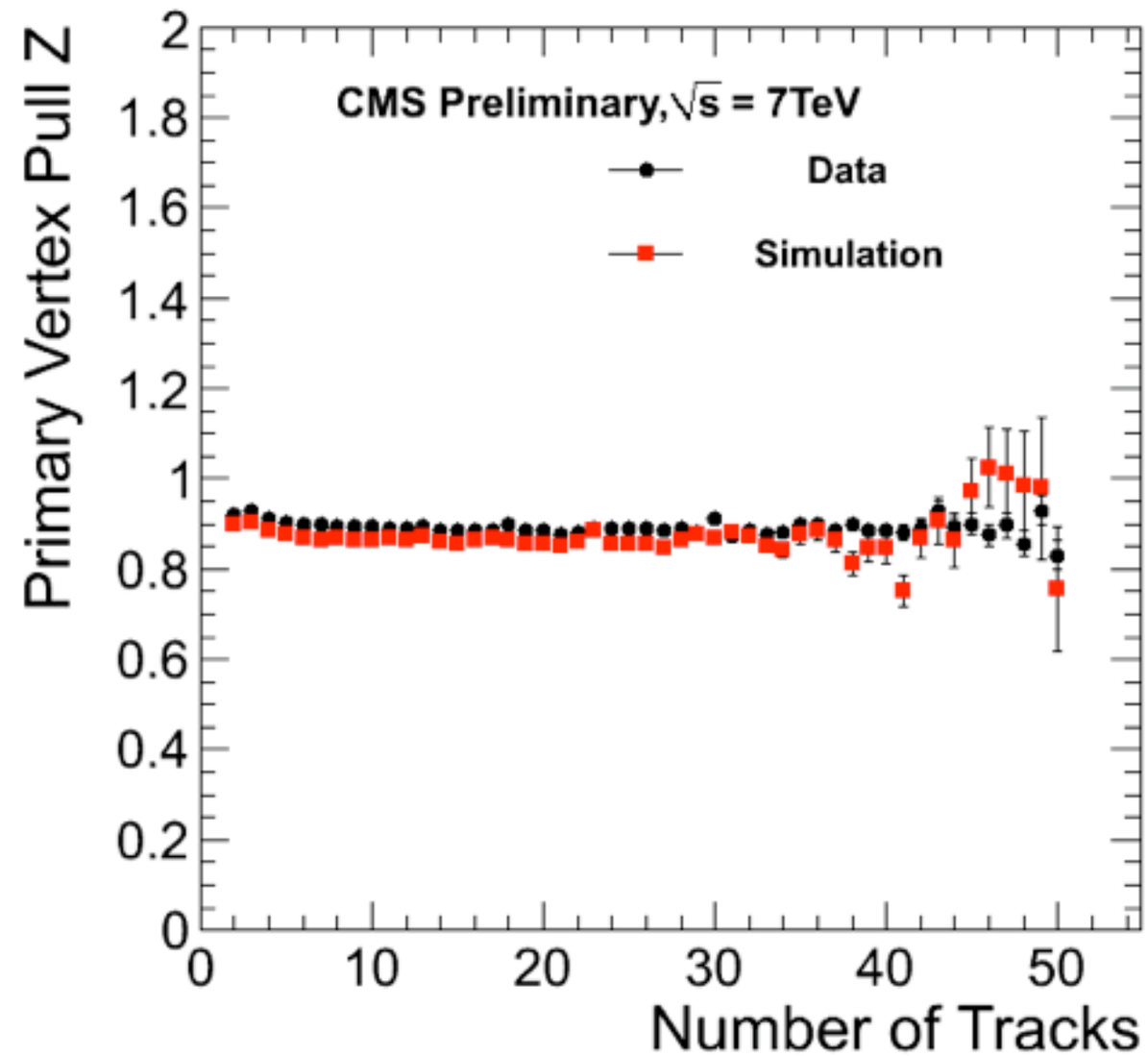


- Overall the data agrees well with MC within 5 mum
- The constant difference is puzzling, could be due to the alignment, waiting for the next re-reco with new alignment

Data-MC Comparison of Two-Vertex Results (3/5)

- Resolution and Pull in Z vs nTracks (To be Included in PAS)

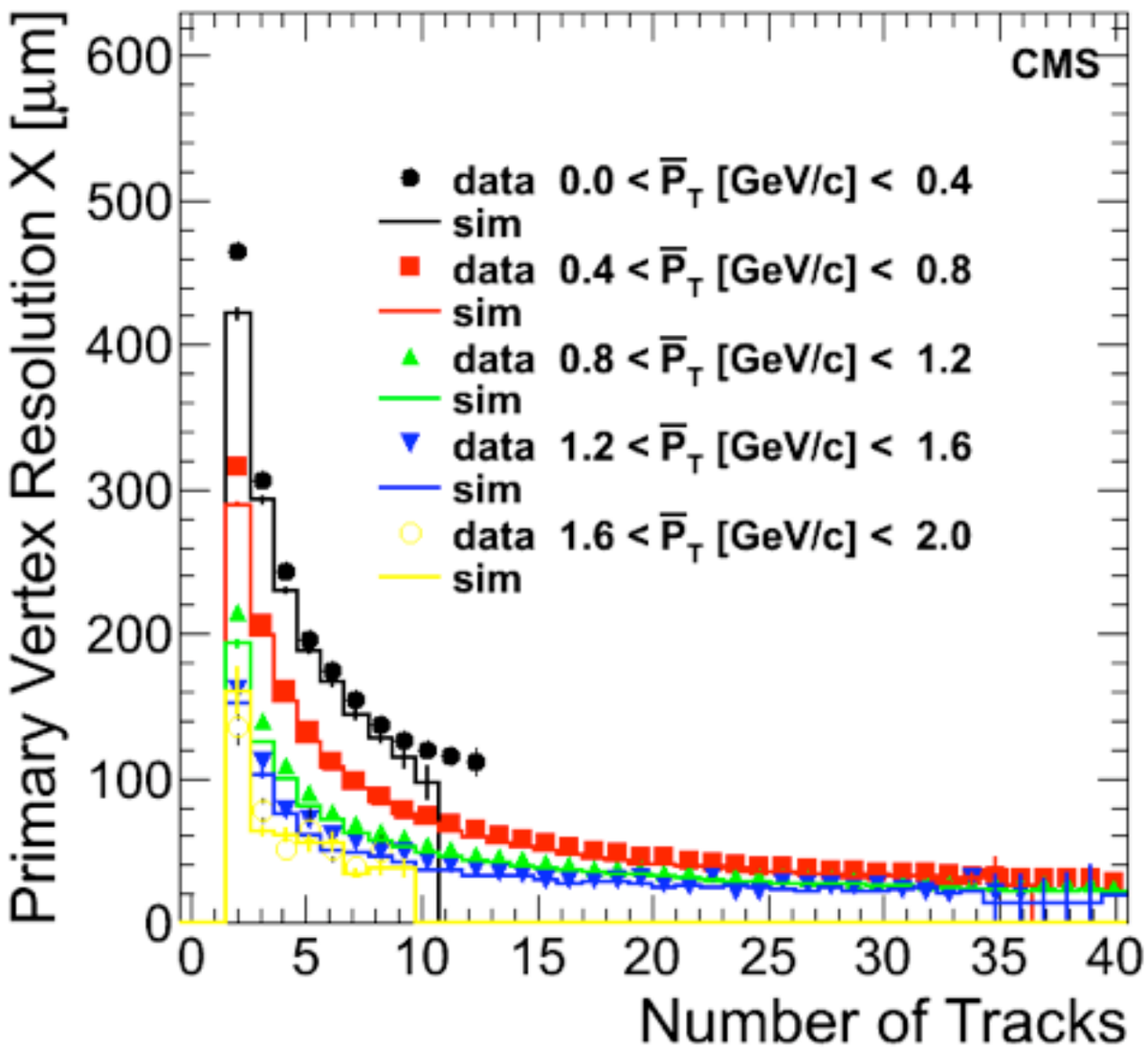


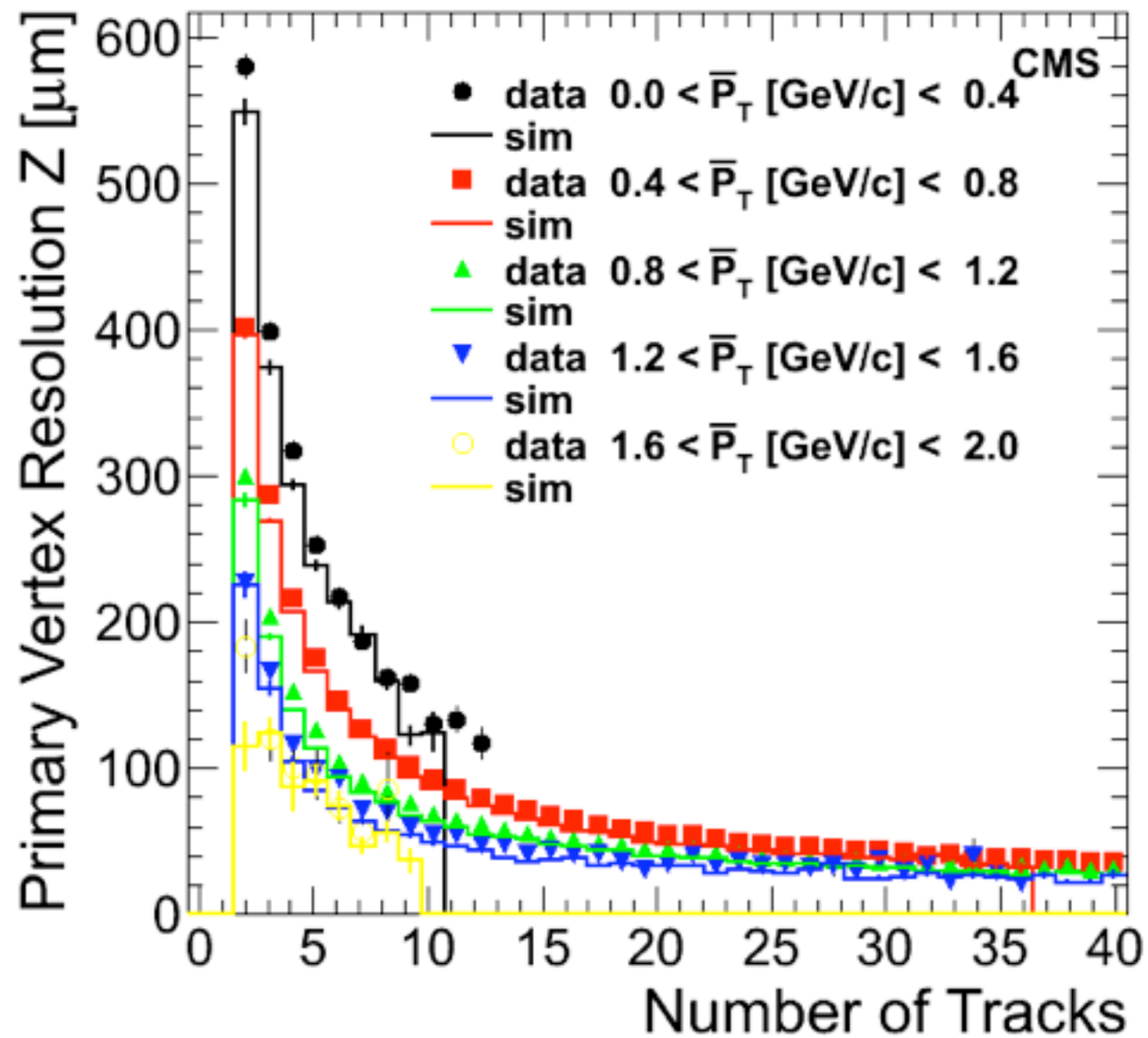


- Overall the data agrees well with MC within 5 mum
- The constant difference is puzzling, could be due to the alignment, waiting for the next re-reco with new alignment

Data-MC Comparison of Two-Vertex Results (4/5)

- Break into different average pT bins (To be Included in PAS)

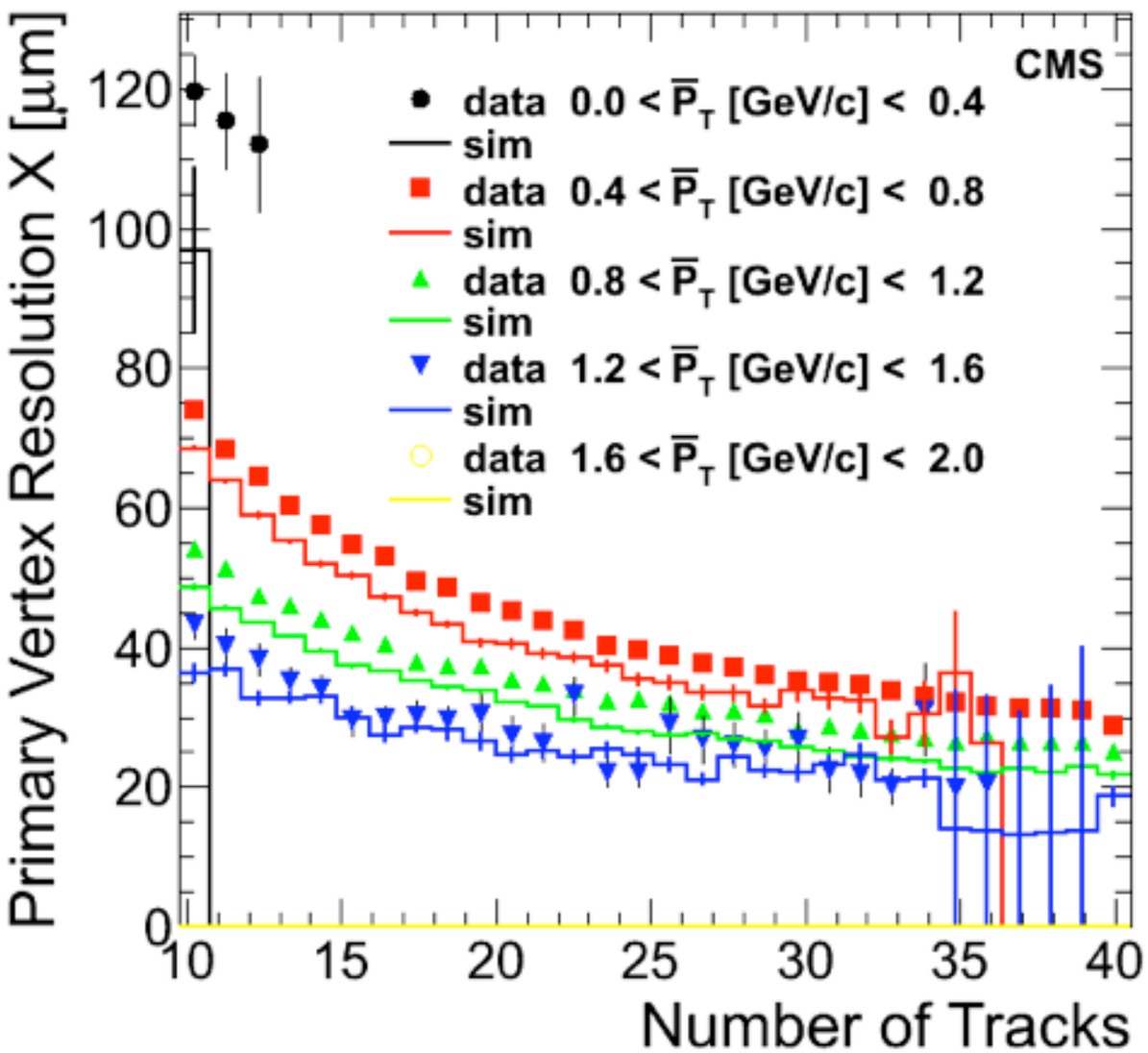


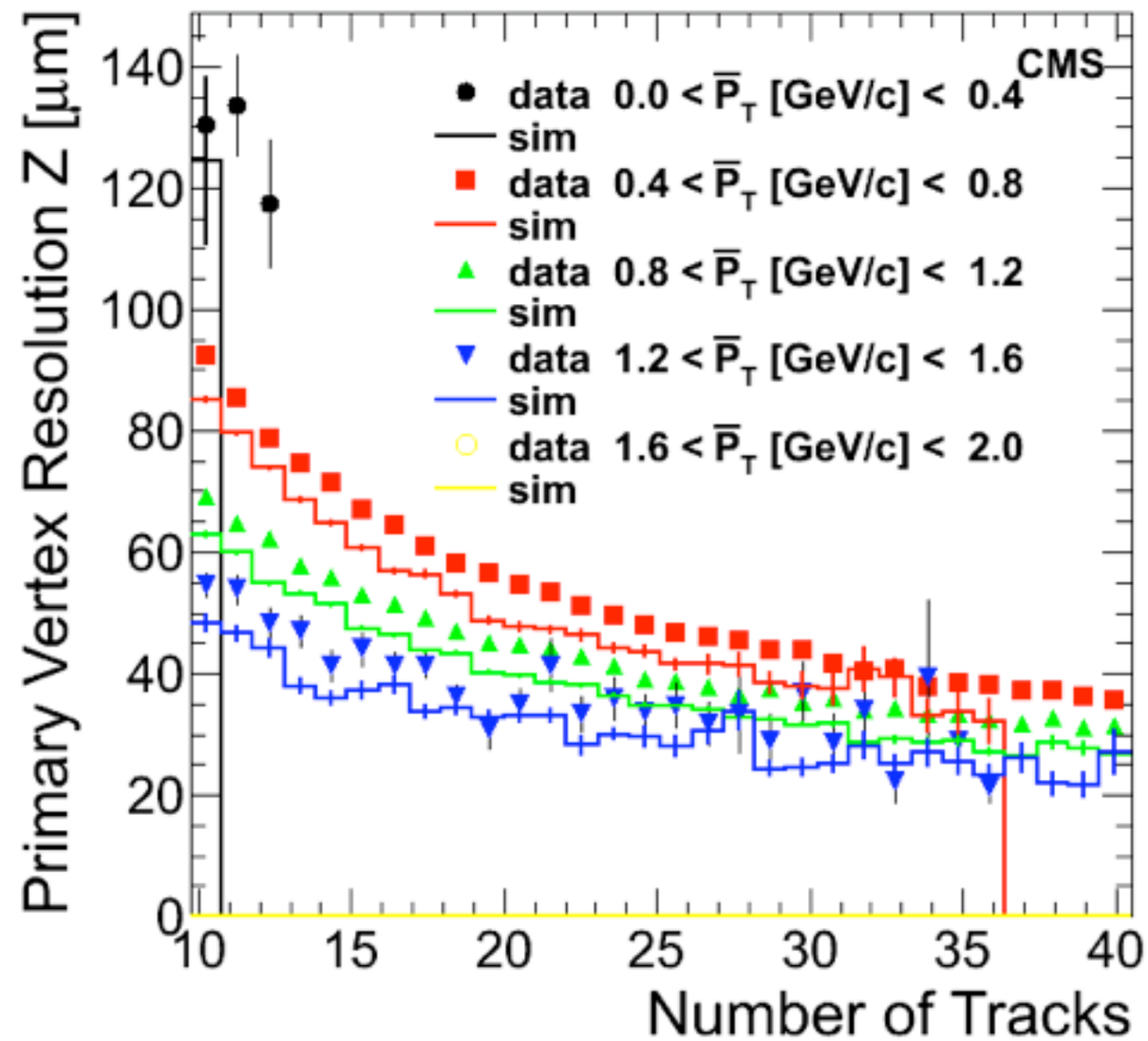


- We will complete the ResY and pulls shortly

Data-MC Comparison of Two-Vertex Results (5/5)

- Zoom in the high nTracks tails:





- See a constant disagreement even in the high average pT bins

Summary and Plans for the PAS

- Summary
  - We measured that the primary vertex resolution dependence on the number of Tracks
  - The resolution reaches roughly 20 mum in X/Y/Z with nTracks > 10
  - Data/MC comparison shows a small difference of < 5 mum
- Proposed Plots for PAS
  - Resolution and Pulls vs number of Tracks (6 plots)
  - Resolution and Pulls vs number of Tracks broken into different average track pT bins (6 plots)
- Plans
  - Investigate the data/mc difference
  - Look into the non-MinBias datasets and roughly estimate systematics

Backup Slides

Release and DataSets

- Release: CMSSW_3_5_7
- Datasets:
  - MC: /MinBias/Spring10-START3X_V26A_357ReReco-v3/
  - Data: /MinimumBias/Commissioning10-Apr20ReReco-v1/
- Trigger Selection:
  - (40 OR 41) AND NOT (36 OR 37 OR 38 OR 39) AND NOT ((42 AND NOT 43) OR (43 AND NOT 42))
- Vertex position:
  - |z| <= 15 cm && position.Rho <= 2 cm
- Scraping cuts
  - fraction of HighPurity tracks > 0.25 if number of tracks > 10