

ProtoDUNE-SP Beam Instrumentation & TPC Track Matching

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ProtoDUNE Analysis Meeting

2019-04-10



Introduction

- **Last week, showed some issues matching beam instrumentation (BI) to TPC tracks**
- **Owen Goodwin pointed out to me that the old BI reco matched better than the new**

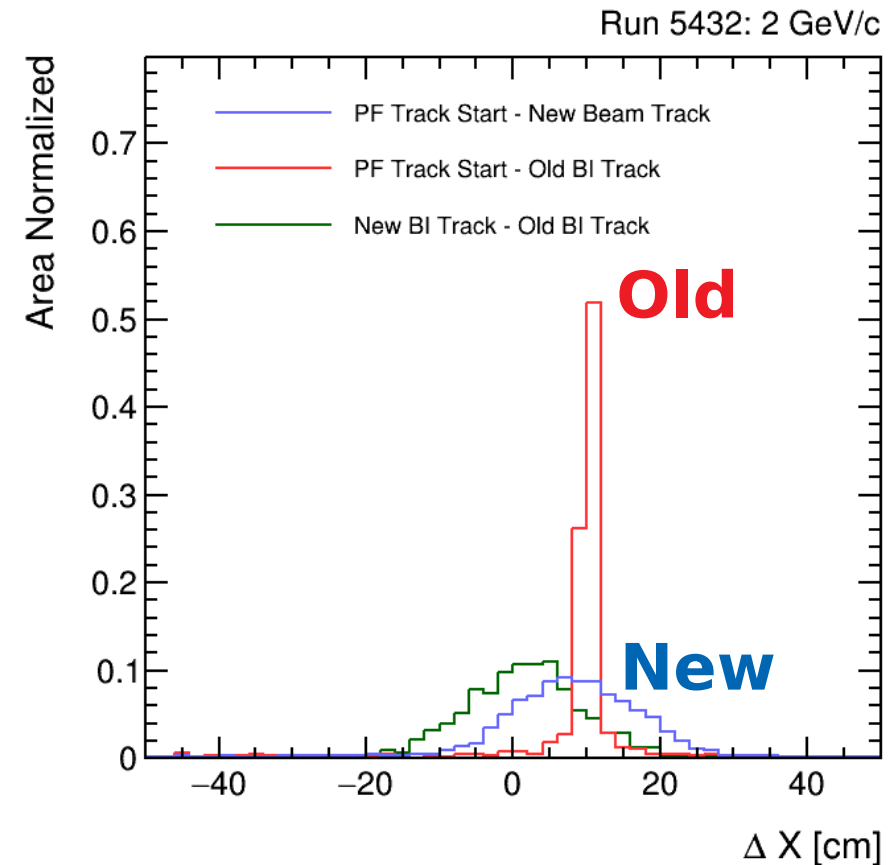
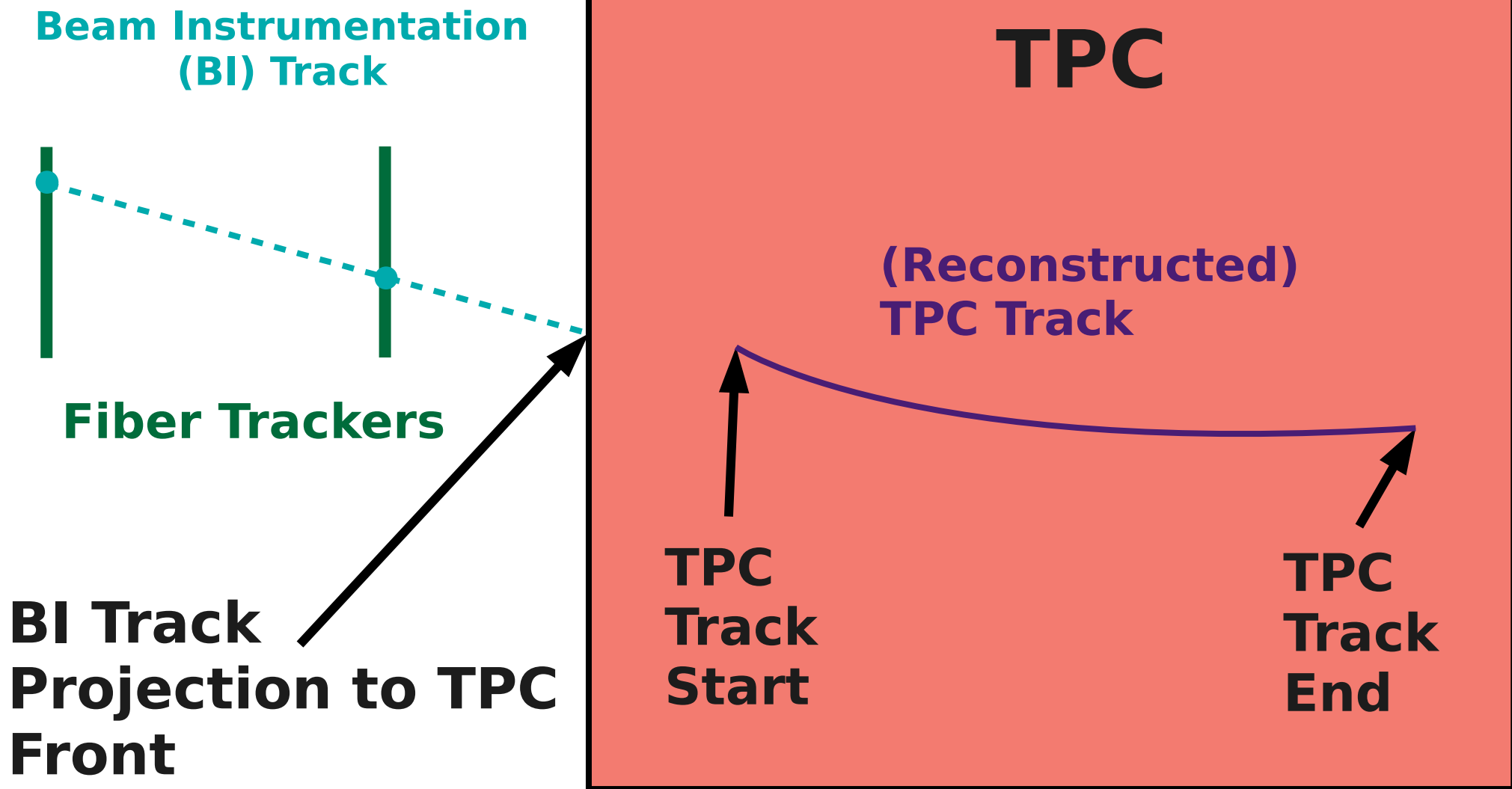
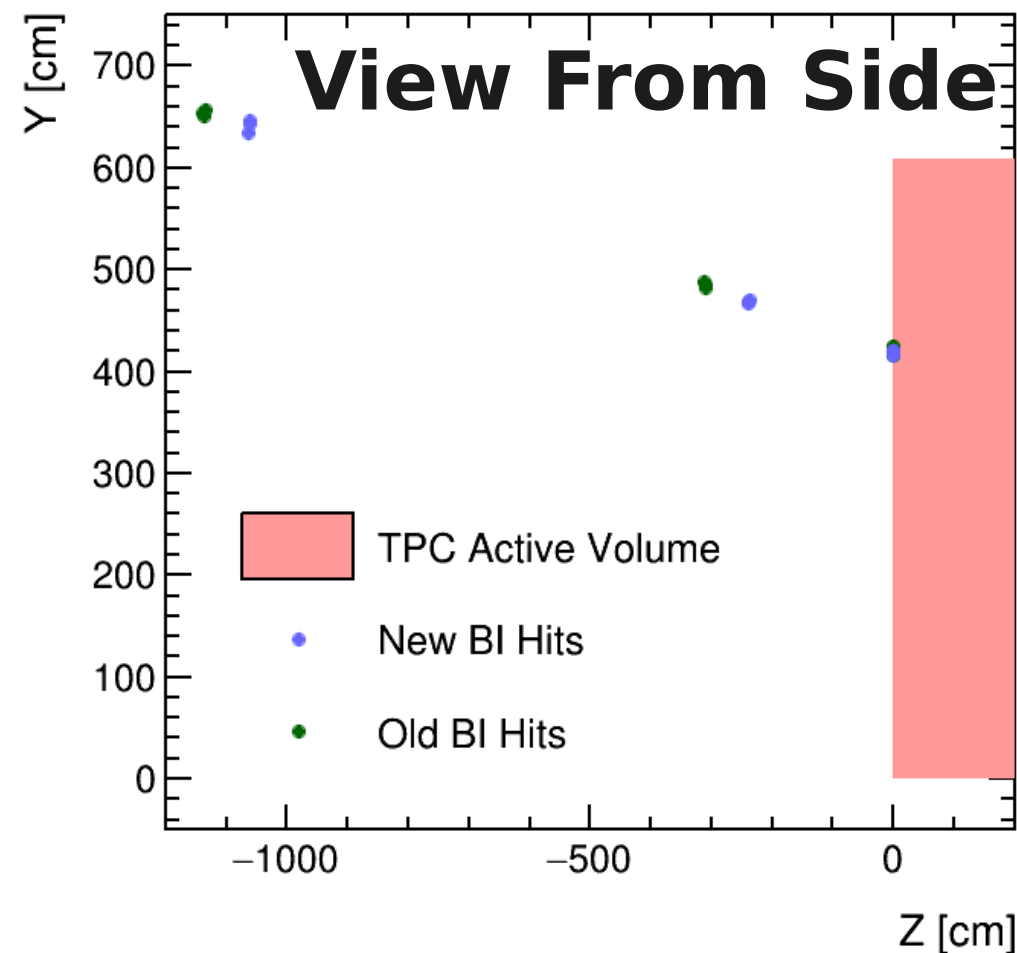
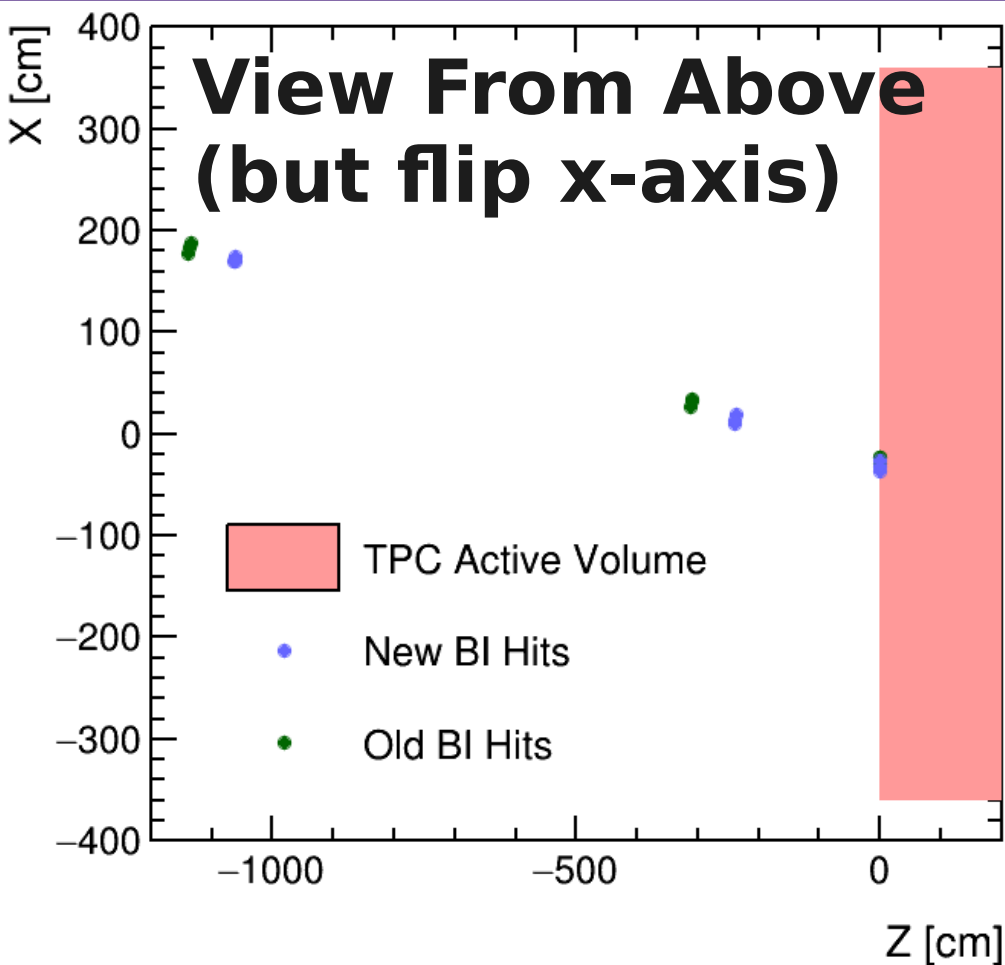


Diagram of Positions

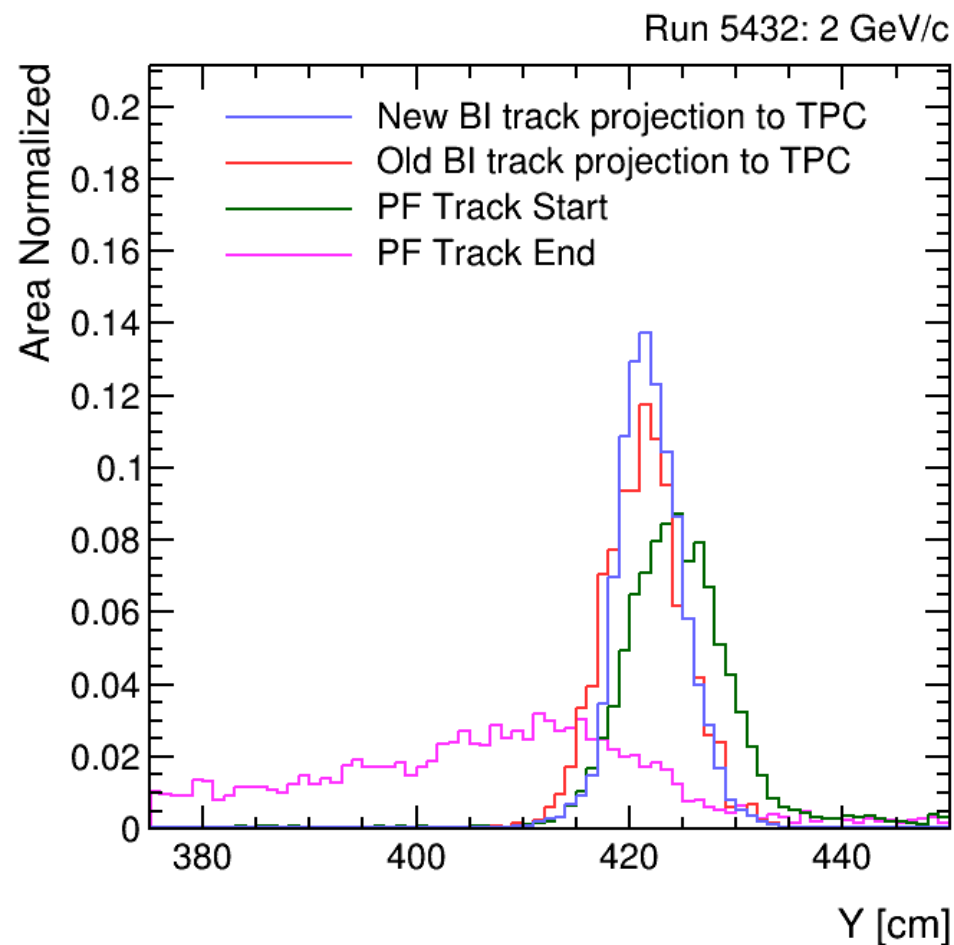
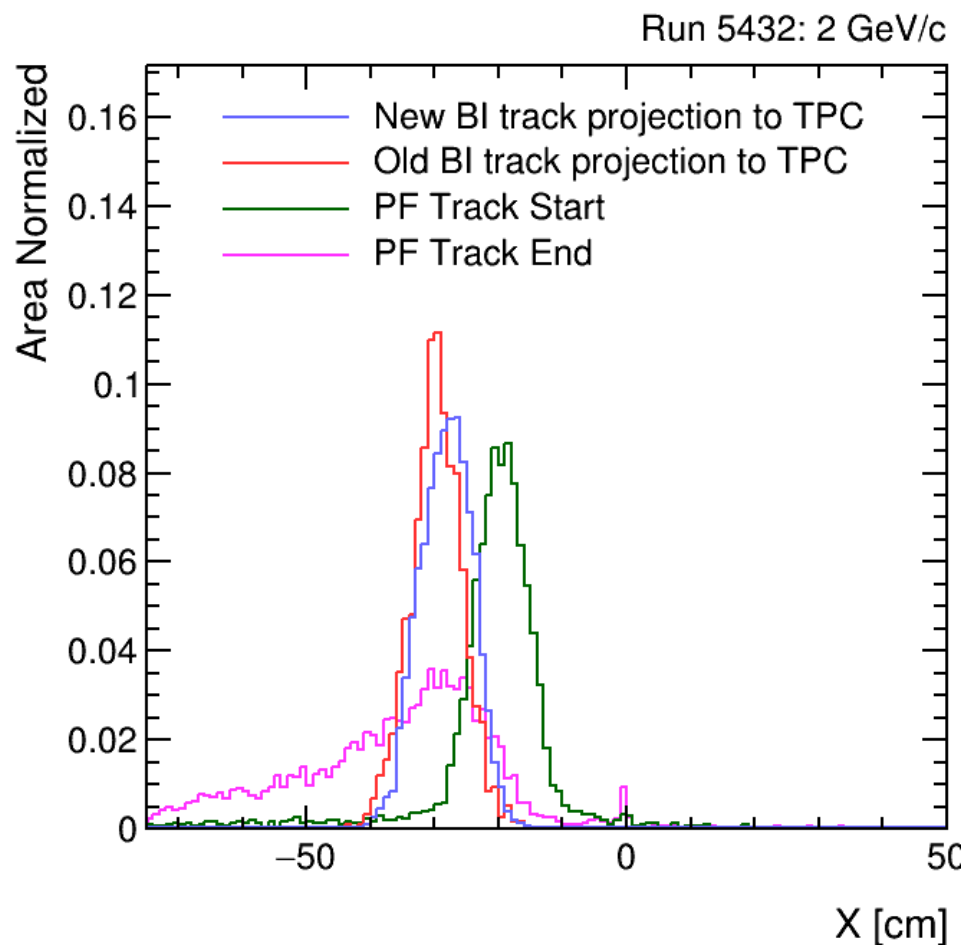


Beam Instrumentation Hit Positions



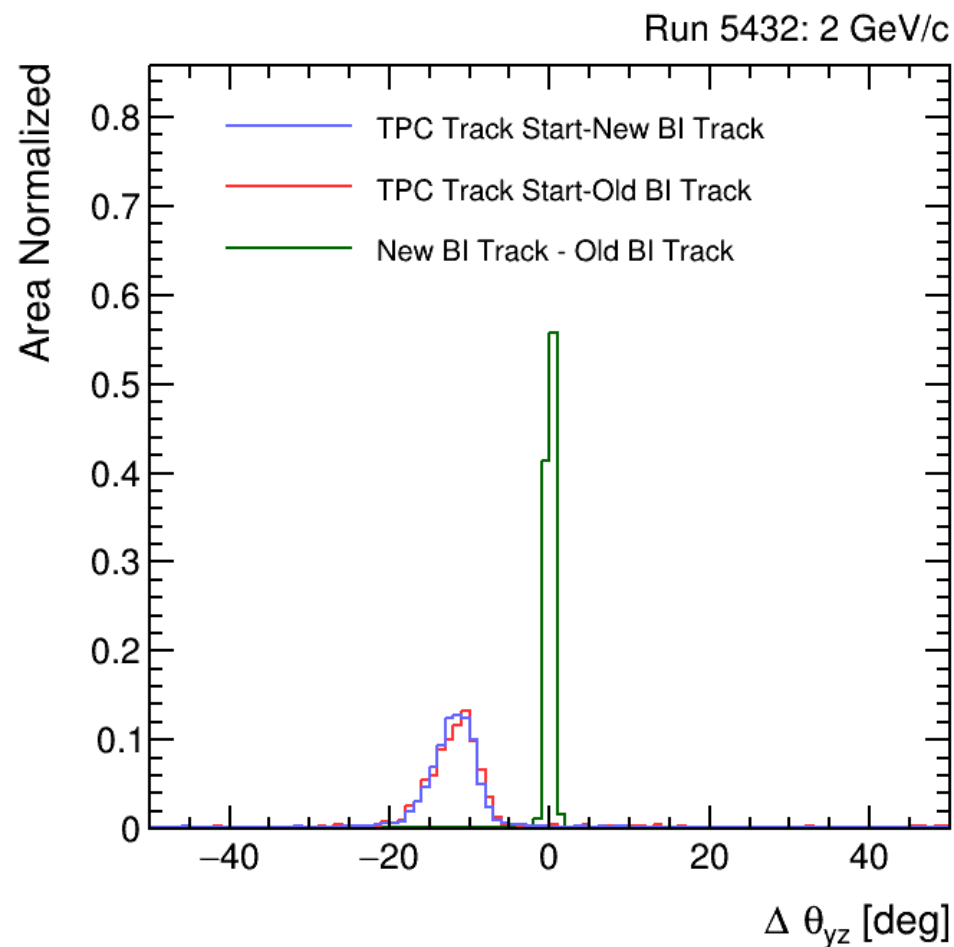
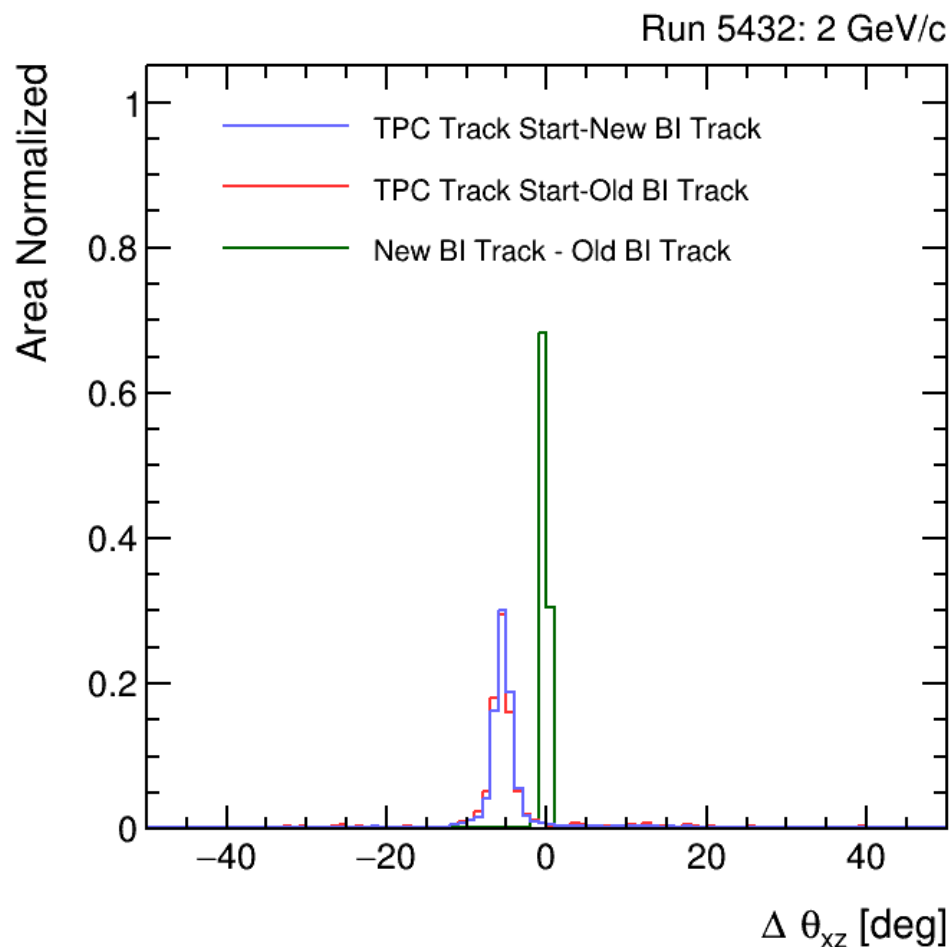
As Jake says, mainly moved trackers away from beam window

Track X and Y Positions



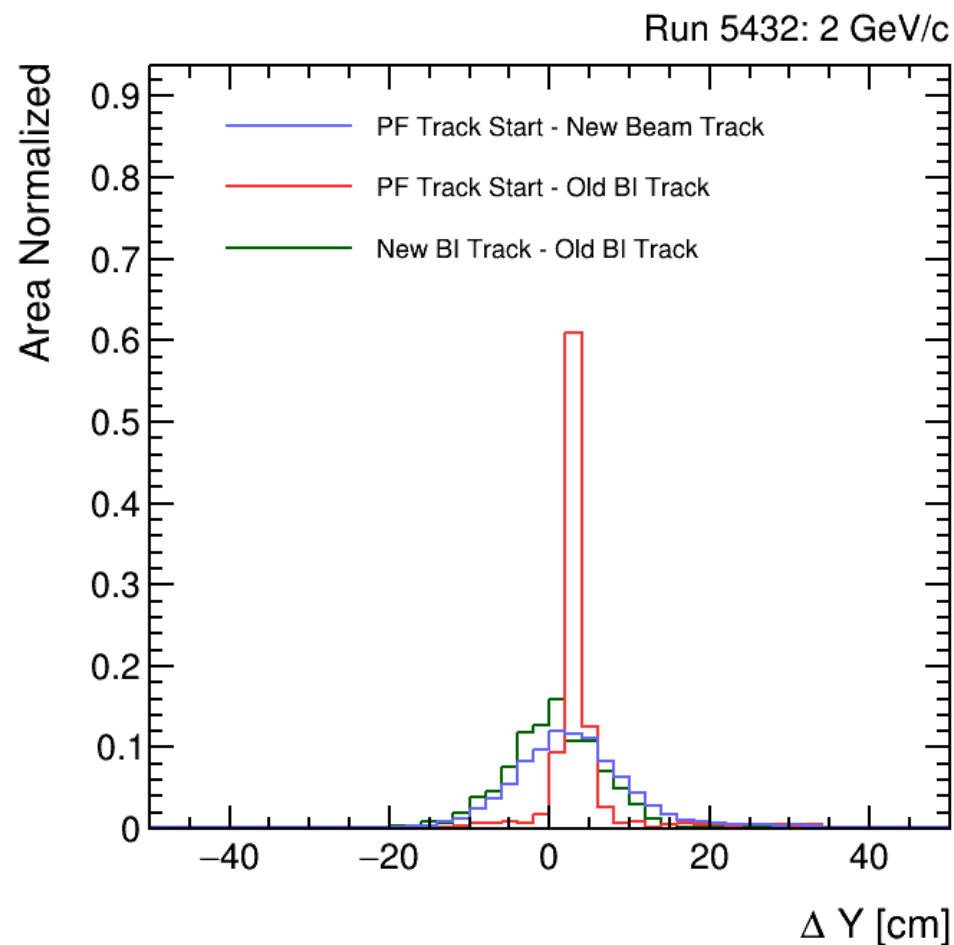
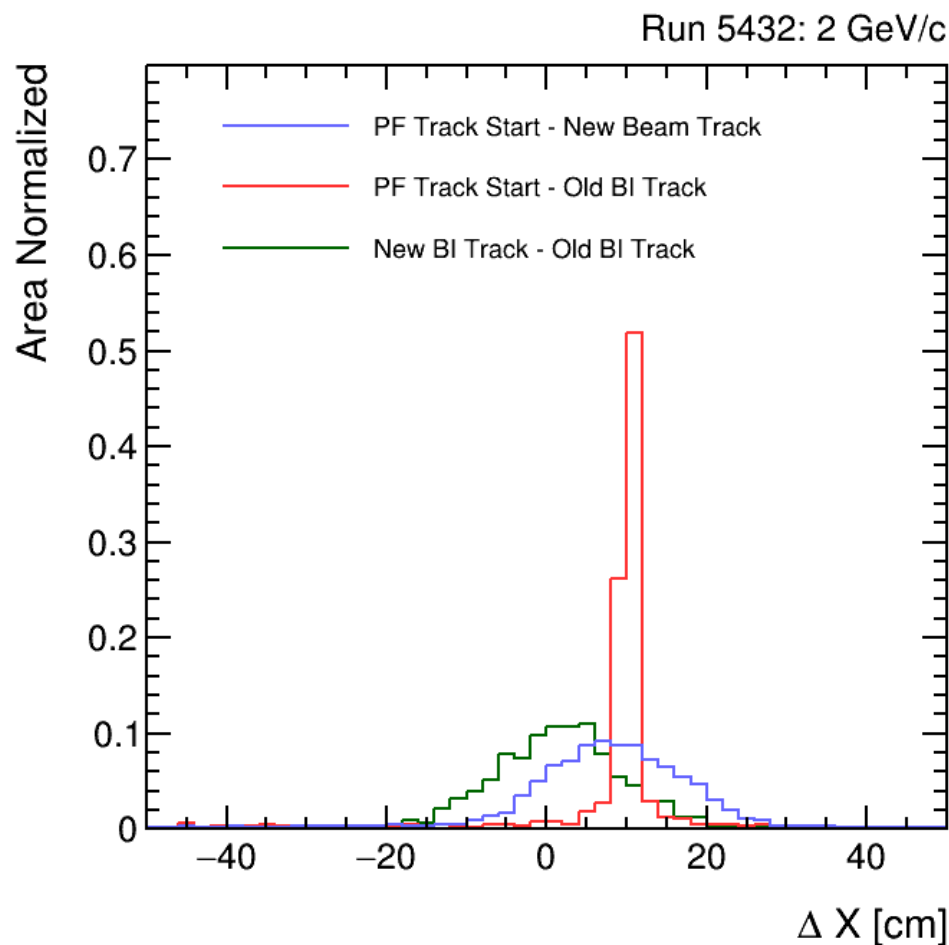
New & Old BI track positions clearly different

Track Angular Distributions



BI Angular change very small

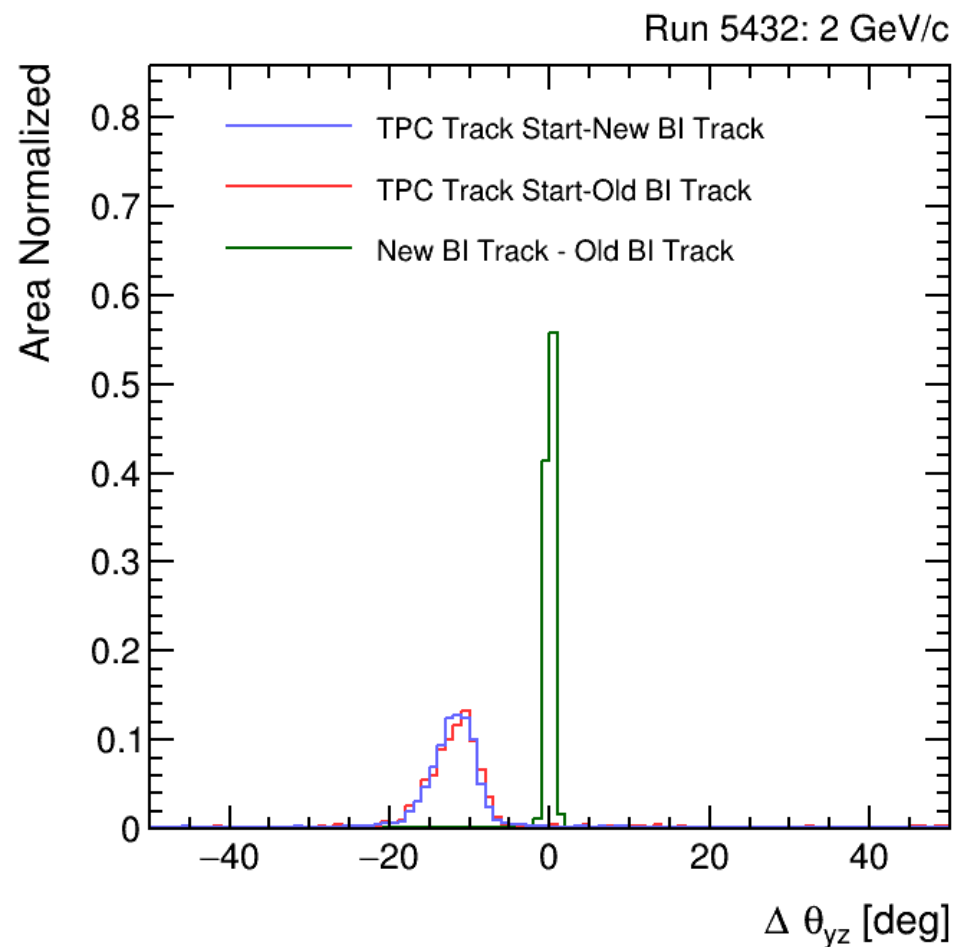
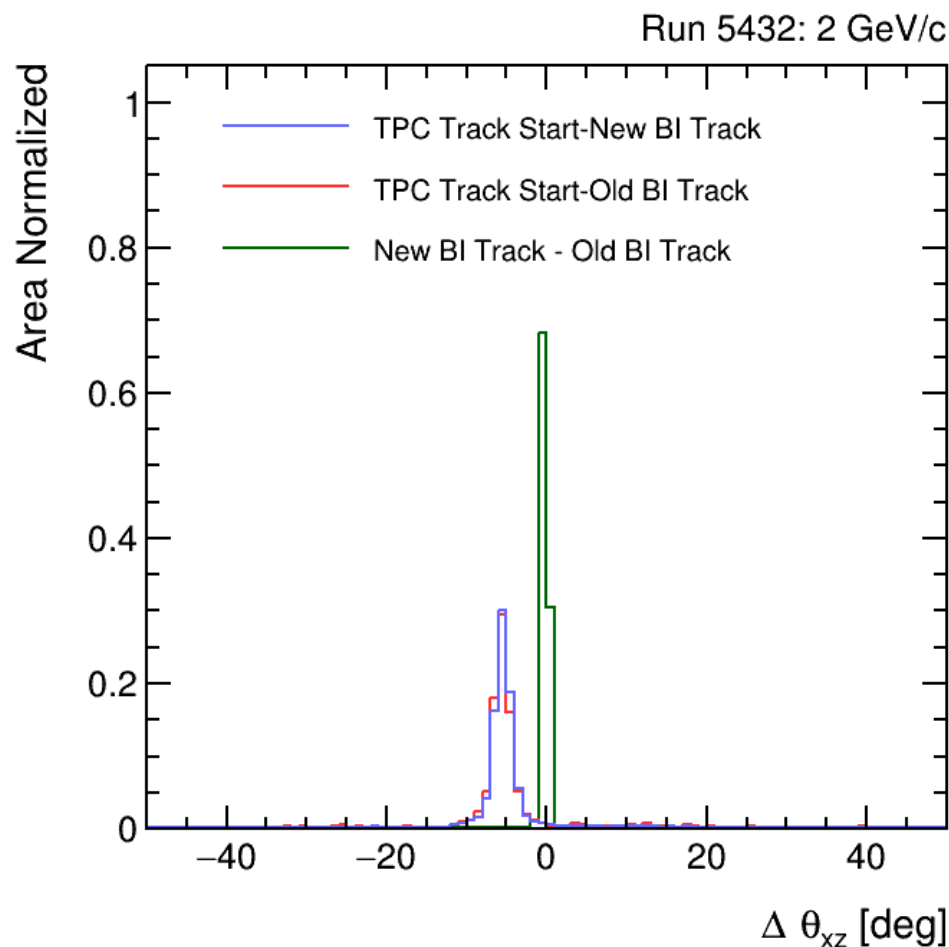
Track Delta X and Delta Y



New and old beam tracks don't seem very related

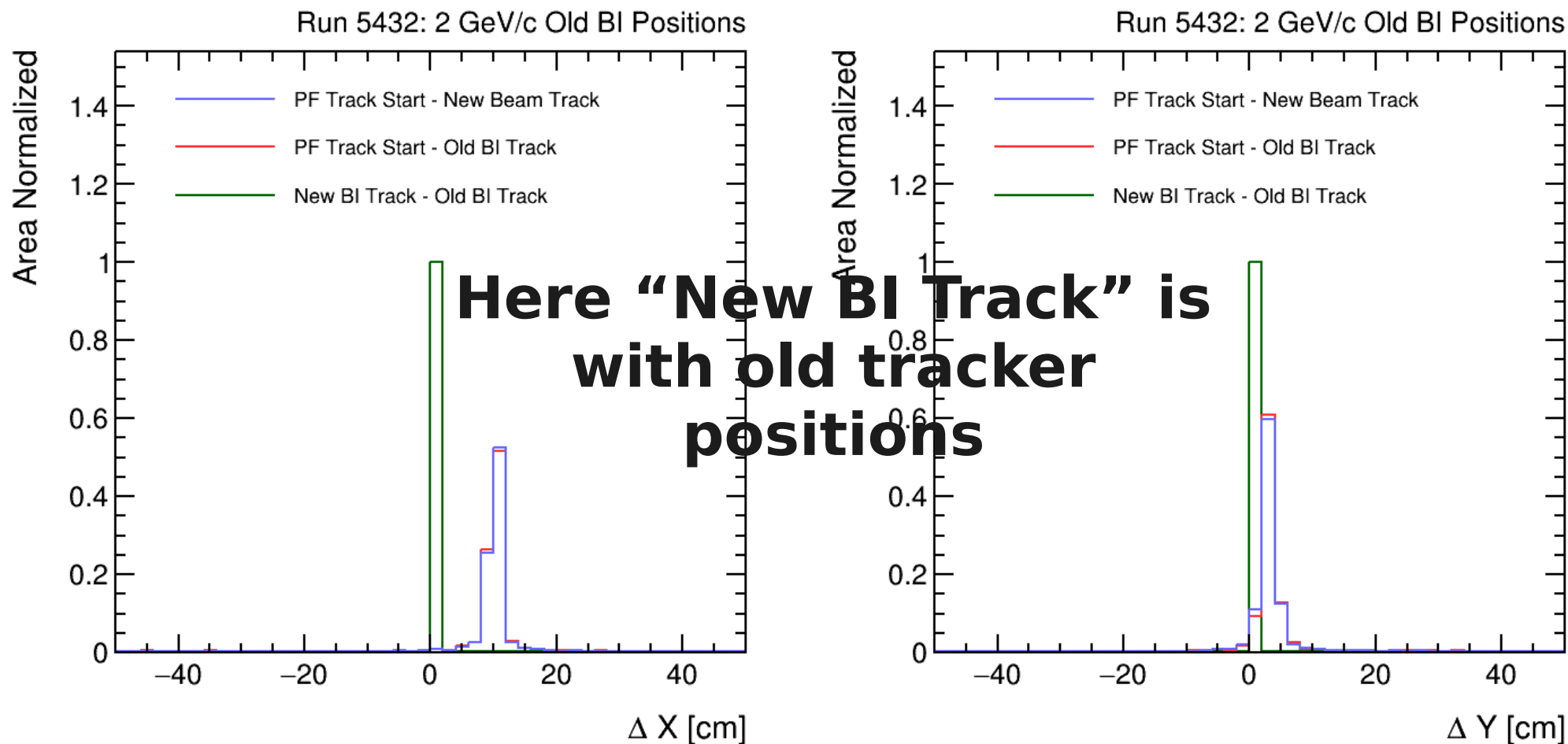
Some more complicated change projected onto this plane

Track Delta Theta



Again, angles seem quite similar

Is the only change BI tracker position?



With old tracker positions, new reconstruction reproduces the old: only positions changed

Conclusions

- **New BI tracker positions cause worse matching with TPC tracks**
 - **Confirmed that it is just the tracker positions causing the change**
- **Need to understand if the BI tracker positions can be improved**

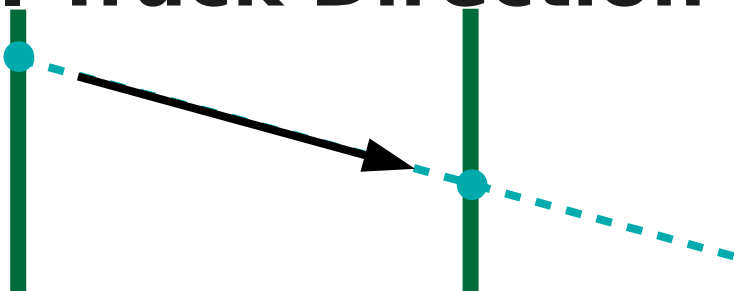
Backup Slides

Beam Pion Selection

- **For data:**
 - **Require good beam instrumentation (BI) event with 1 track and 1 momentum passing pion selection**
 - **Require all beam-side (RaS) FEMBs to be properly readout**
- **For MC:**
 - **Beam primary true particle (starts at $t=0$) PDG = 211 or -13, or -11 for 6 & 7 GeV to match BI**
 - **Require exactly 1 Pandora beam slice**
 - **Require Pandora beam primary particle to be track-like**
 - **Require Pandora beam primary track start $z < 25$ cm**
 - **Require Pandora beam primary track end $z < 650$ cm**
 - **Require Δx and Δy of start of primary track - end of BI track (at $z=0$) to be:**
 - **For data: Δx : [0,20] cm Δy : [10,30] cm**
 - **For MC: Δx : [-5,5] cm, Δy : [0,10] cm**

Diagram of Directions

BI Track Direction



- θ_{xz} : the angle in x-z plane; $\theta_{xz} = 0$ at +z axis
- θ_{yz} : the angle in y-z plane; $\theta_{yz} = 0$ at +z axis

