

Global Track Reconstruction

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MICE Collaboration Meeting 43

Rutherford Appleton Laboratory

Global Track Reconstruction

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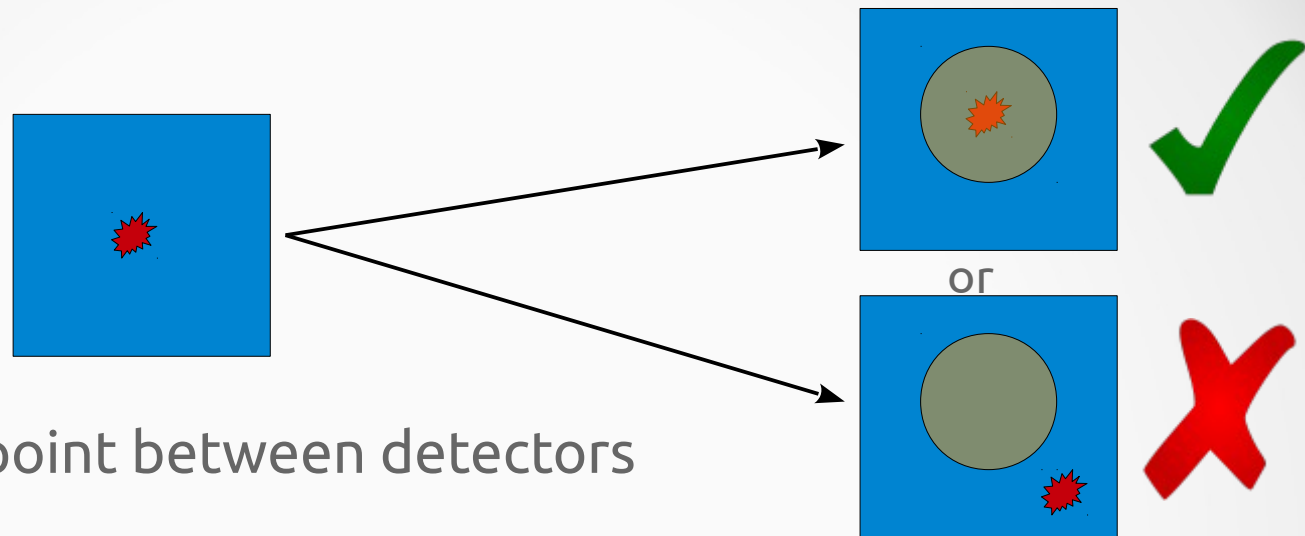
- Track Matching – Determine which detector hits belong to the same track and combine them so that PID (and later analysis) can be run on them
- Track Fitting – Improve the matched trackpoints using information from all detectors as well as provide the possibility of inter- and extrapolation to uninstrumented sections of the beamline

Track Matching

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- Propagate track point between detectors
- Compare agreement between propagated and measured track point
- → Accept / Reject

Track Matching

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- Includes all detectors (excl. Chkov)
- Propagate outwards from trackers, separate for US and DS
- Propagation requires mass and charge to be known, so track matching creates 3 or 6 tracks for each particle tagged with a PID hypothesis. Celeste's PID code then picks out the correct one
- Energy loss has now been implemented resulting in good improvements to propagation - except for TOF0

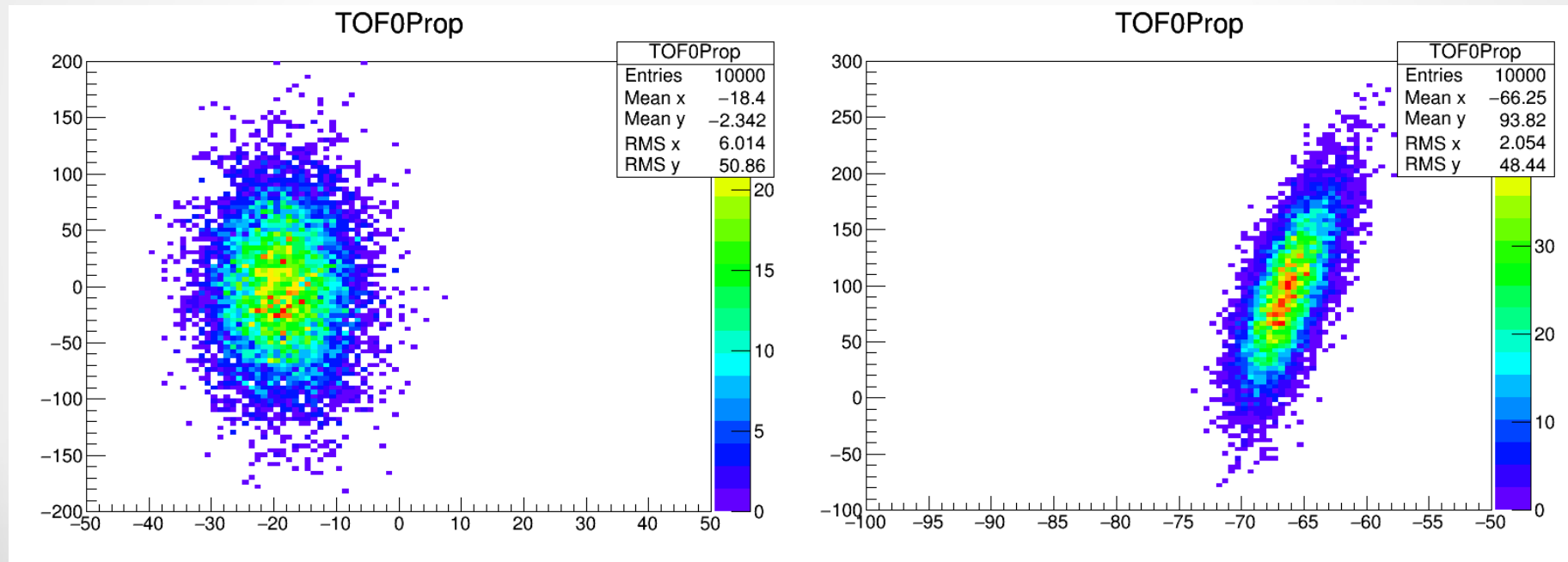
TOF0

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- It was hoped that implementing energy loss into RK4 would make propagation to TOF0 work
- Instead it demonstrated that this is fundamentally impossible



TOF0

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- Instead will match TOF1 to Tracker as before, then match TOF0 to TOF1 by time difference
- Will also be significantly faster, as propagation with energy loss requires small steps so large distances are very performance intensive
- If considered worth the performance cost, might include matching by x position

Through Tracks

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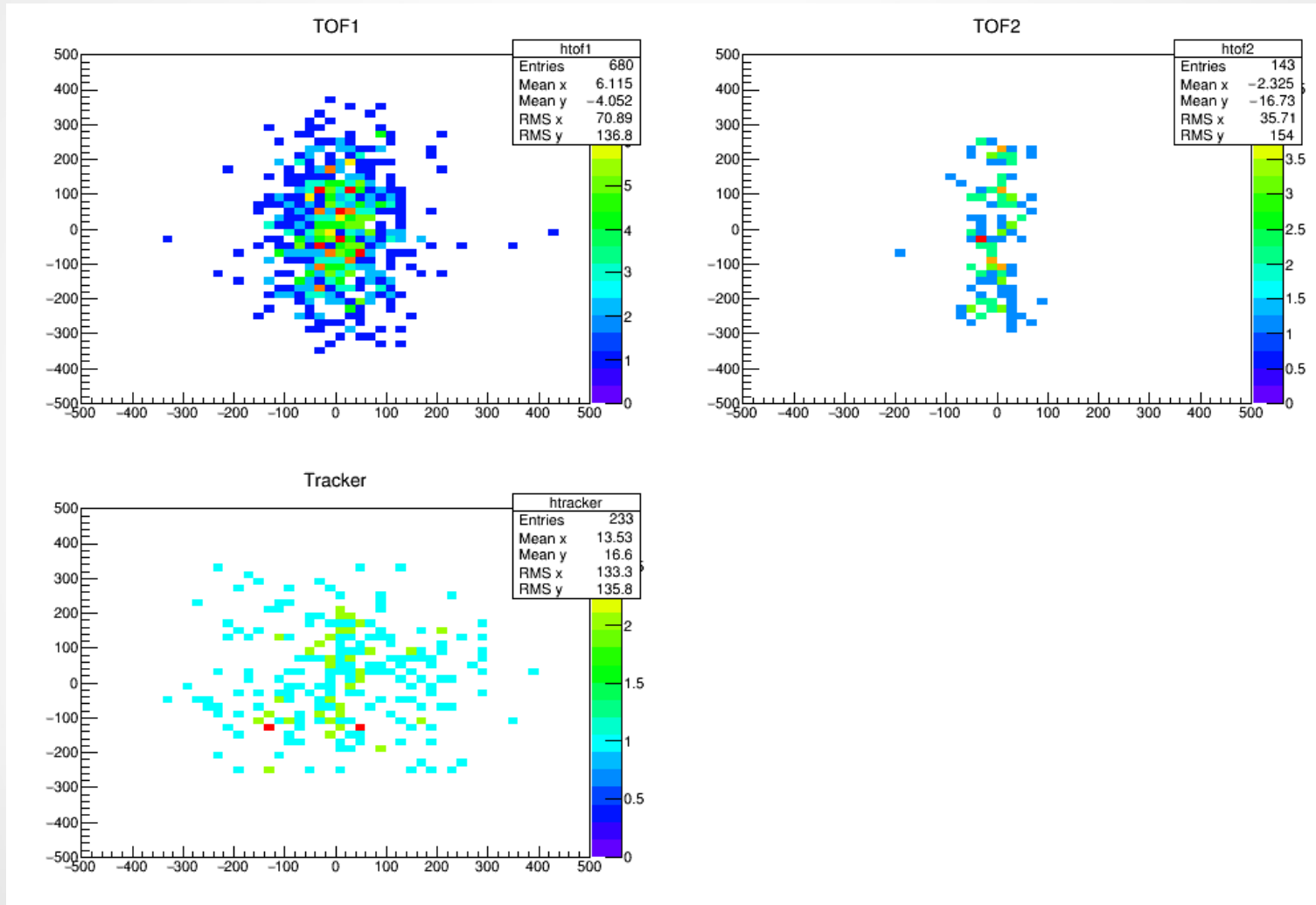
- Two weeks ago was decided to concentrate on getting real data no-field tracks matched and PID'd for CM
- Attempts failed – badly
- Went back to MC – now with CDB geometry and scattering turned on
- Matching still didn't work, so started looking into possible issues with detector mapping by looking for patterns in the residuals

Through Tracks - MC

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Through Tracks - MC

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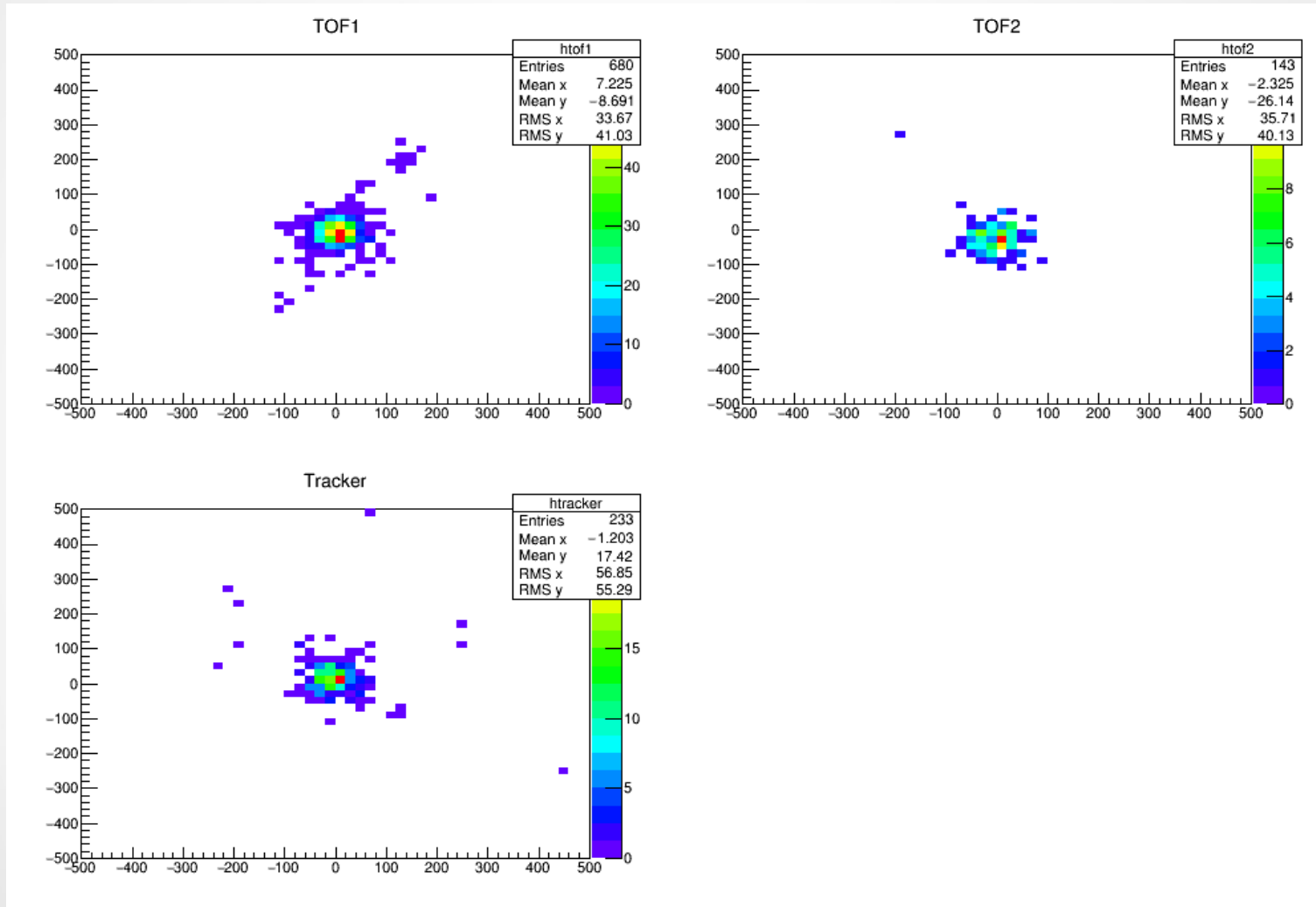
- First issue discovered is a mismatch between sign of momentum and change in position, i.e. negative momentum results in increase in coordinate position as going farther downstream and vice versa
- Pinpointed set of sign issues to:
 - y in both trackers
 - p_x in upstream tracker
 - P_y in downstream tracker

Through Tracks - MC

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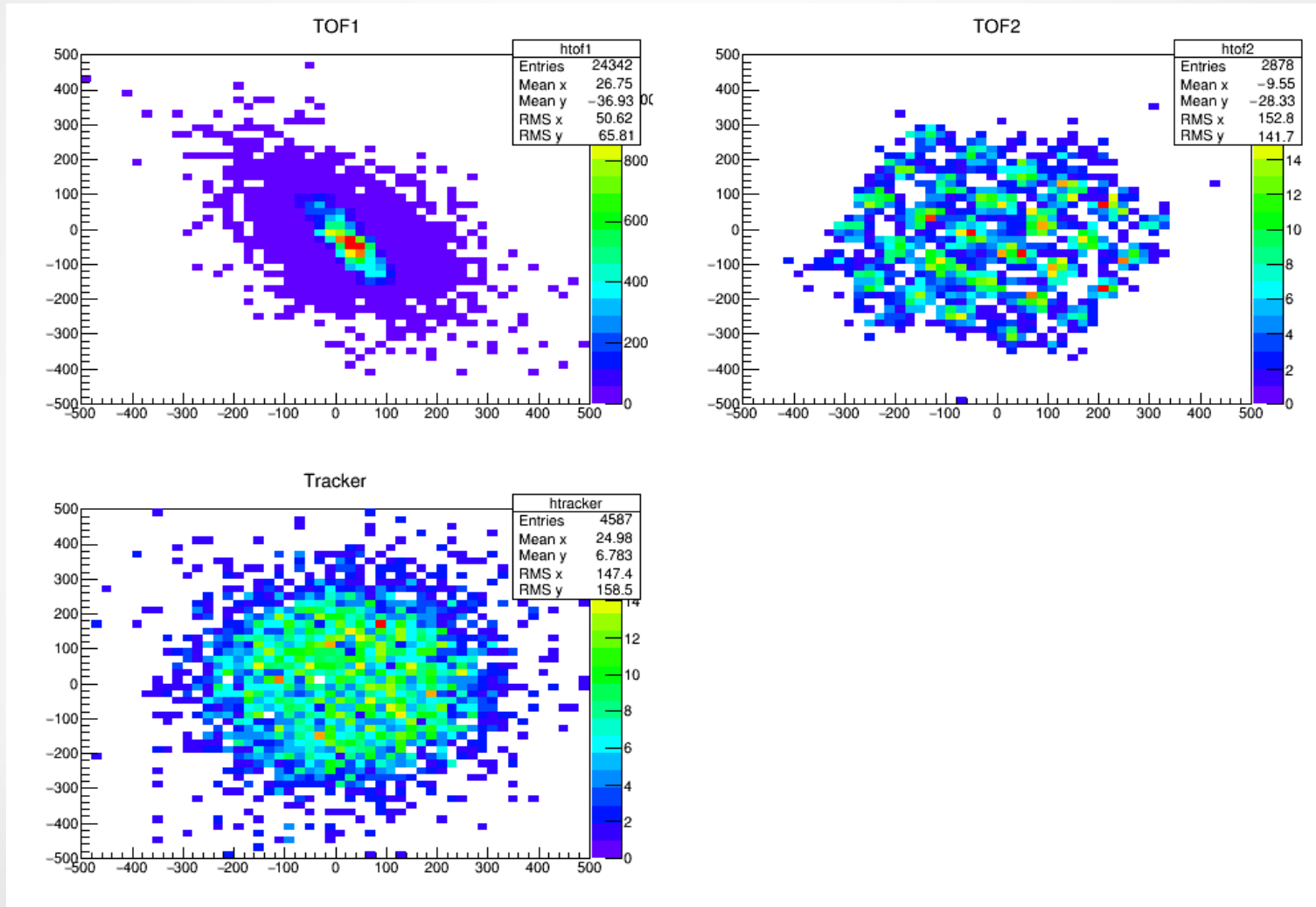


Through Tracks – Back to Real Data

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Through Tracks – Back to Real Data

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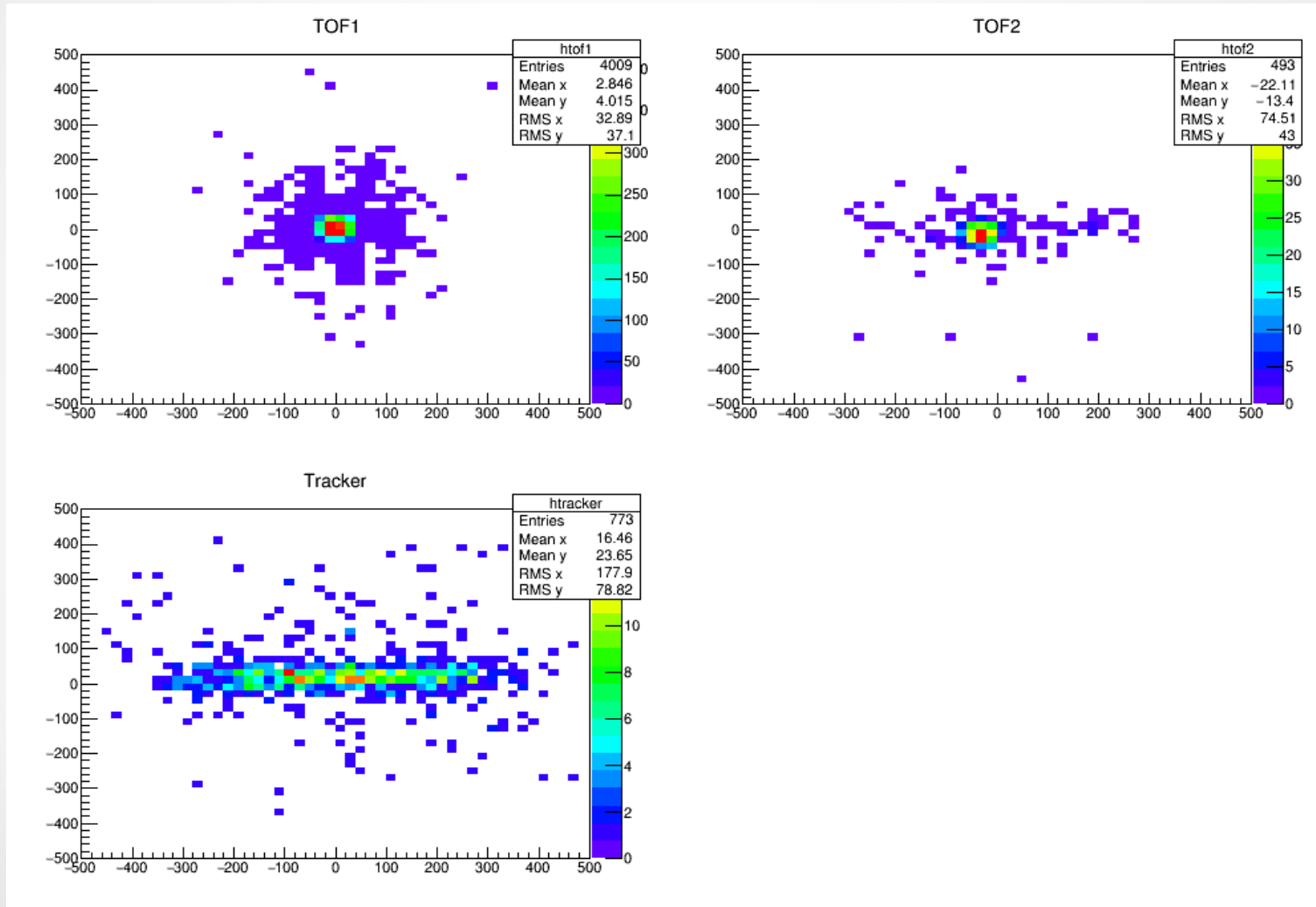
- Further investigations revealed a number of additional necessary transformations
 - 240° rotation in downstream tracker
 - 120° rotation and sign flip in x and px in upstream tracker

Through Tracks – Back to Real Data

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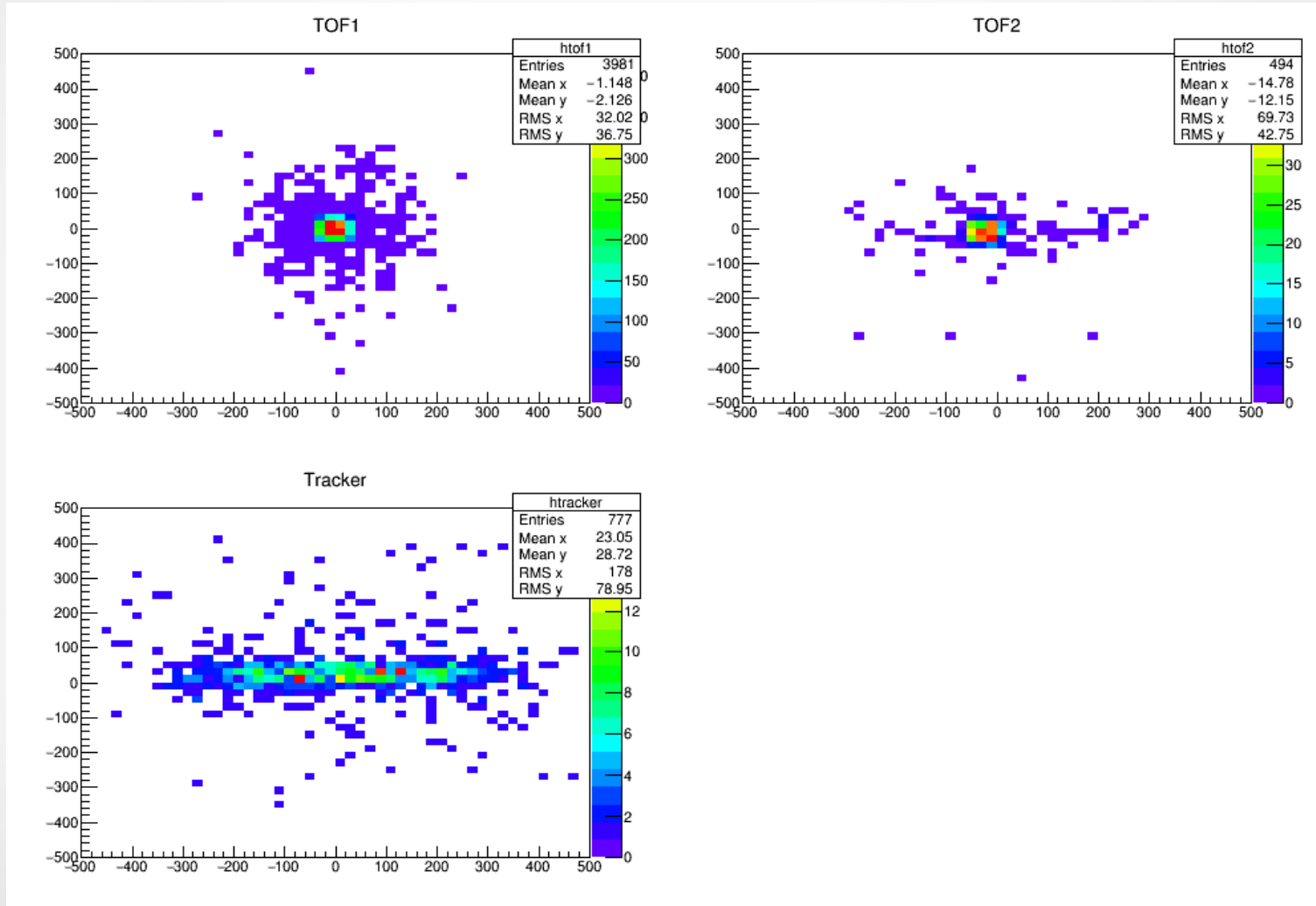


Through Tracks – Geometry Update

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Next Steps

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- Finishing up on real data no-field matching
- Adding in TOF0-1 time-of-flight matching
- Multiple tracks per trigger
- Track Fitting – method still under consideration