Global Track Reconstruction

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MICE Collaboration Meeting 40
Roma Tre University

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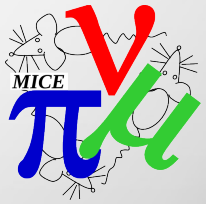
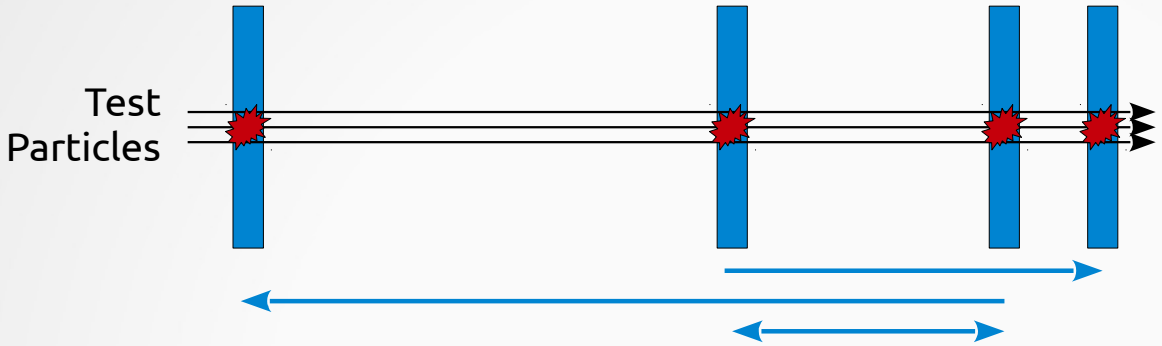
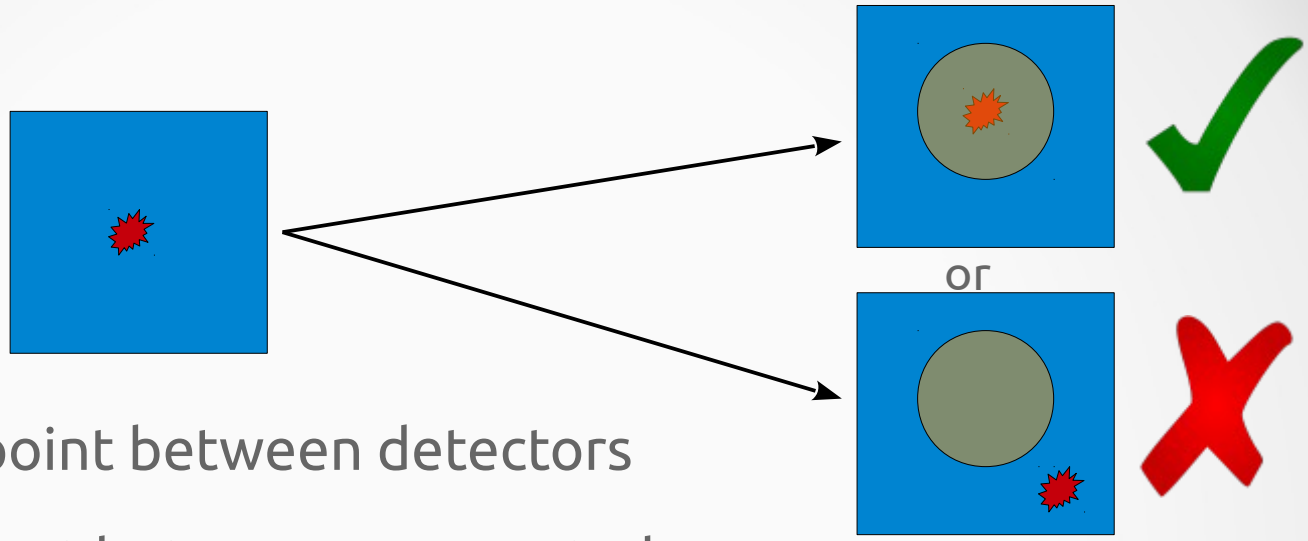


Generating Transfer Maps



- Send a group of particles through the beamline clustered together in phase-space
- Collect hits in virtual planes
- Create transfer maps between virtual planes as needed
  - $C^T = (A^T W A)^{-1} A^T W B$ where A is formed from polynomial expansion of PS vectors at start plane, B from PS vectors at end plane, and W is a weighting based on detector accuracy

Track Matching



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

Track Fitting

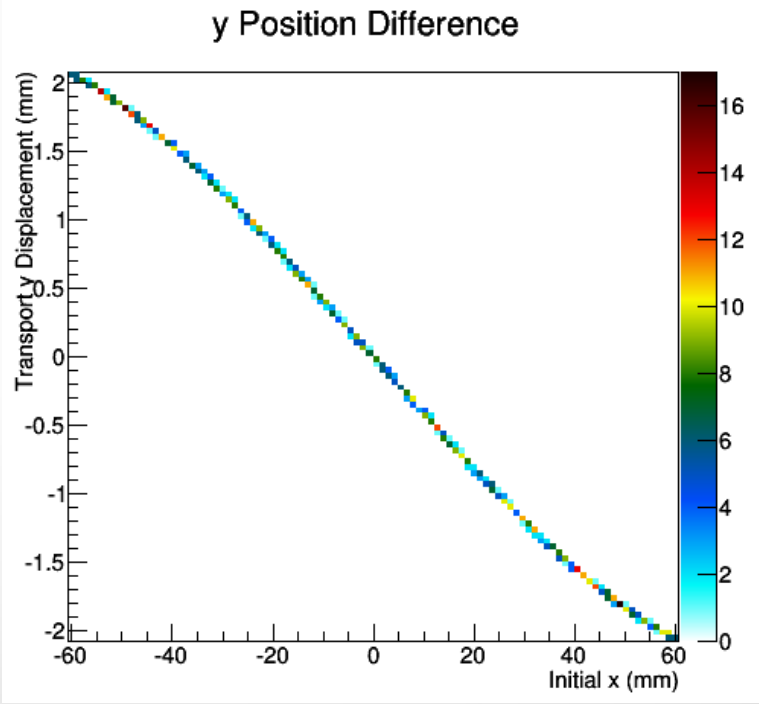
- Direction depends on parameter, e.g. for TOF & Tracker:
  - TOF has poor position resolution, so propagate position backwards from Tracker
  - Tracker has bad or 0 time information, so propagate time forwards from TOF
- χ^2 minimization between propagated and measured track points, later Kalman filter
- Also have track propagation to uninstrumented beamline sections, e.g. just before entering the cooling channel

Current Status

- Data structure rewritten
- Basic track importing currently handled by Celeste's PID code
- Transfer maps provide reasonably good transport
  - *in some cases*
- Issues with scattering in Cherenkovs and diffuser
- TOF0 plane will be treated as located just downstream of TOF0 to avoid light scattering effects turning into large transport errors

Transfer Map Performance

- Vary one coordinate of the initial particle PSV randomly
- Collect hits in two planes, use transfer maps to transport between the two
- Compare transported and MC truth data
- Example:
  Varying x
  Effect on y
  TOF1 to first Tracker Plane



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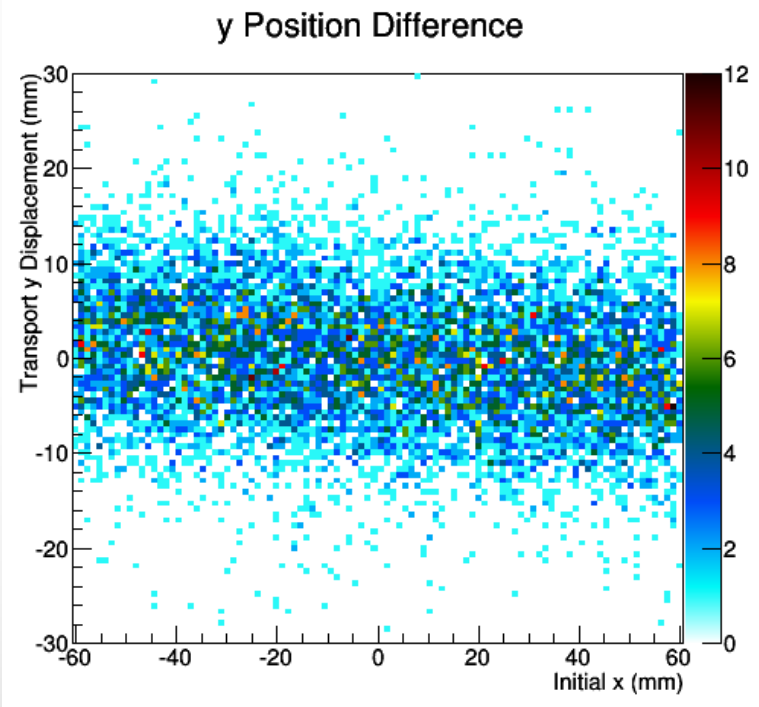

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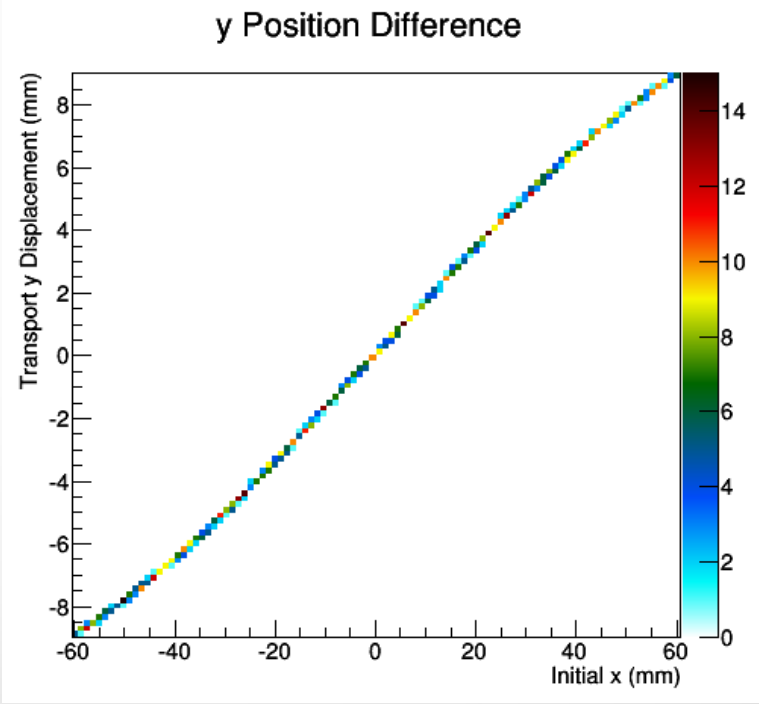

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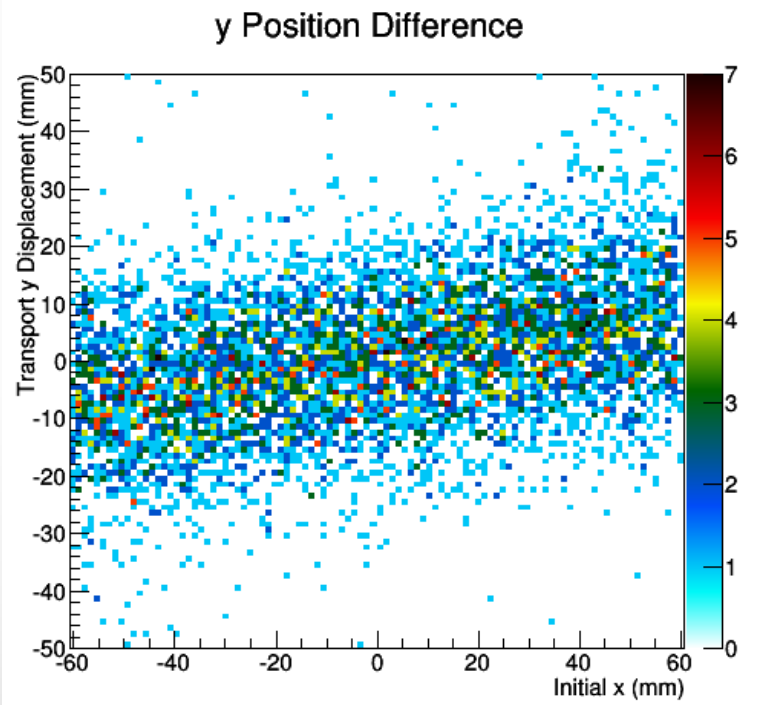

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Next Steps

- Solve issues with backwards tranport
- Basic track fitting
- Advanced track matching using transfer maps
- Kalman fitting

Questions