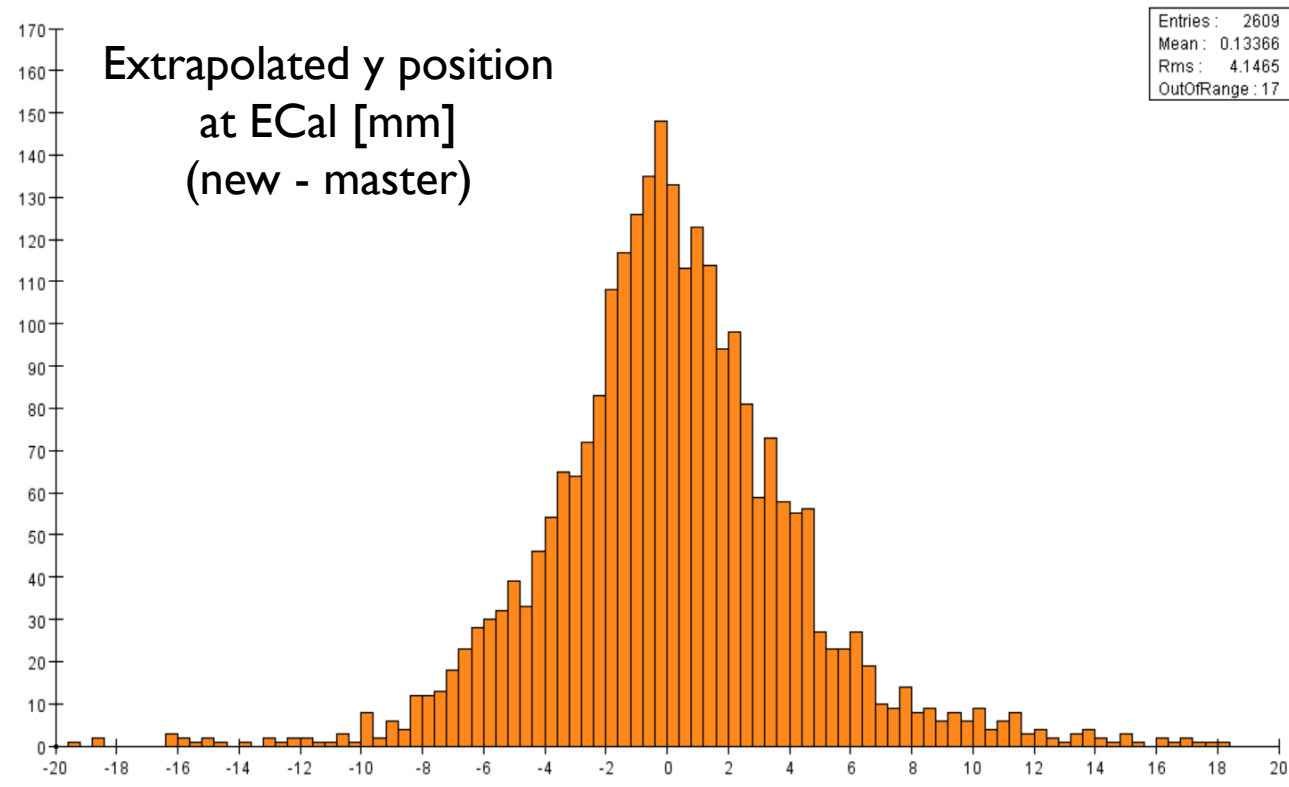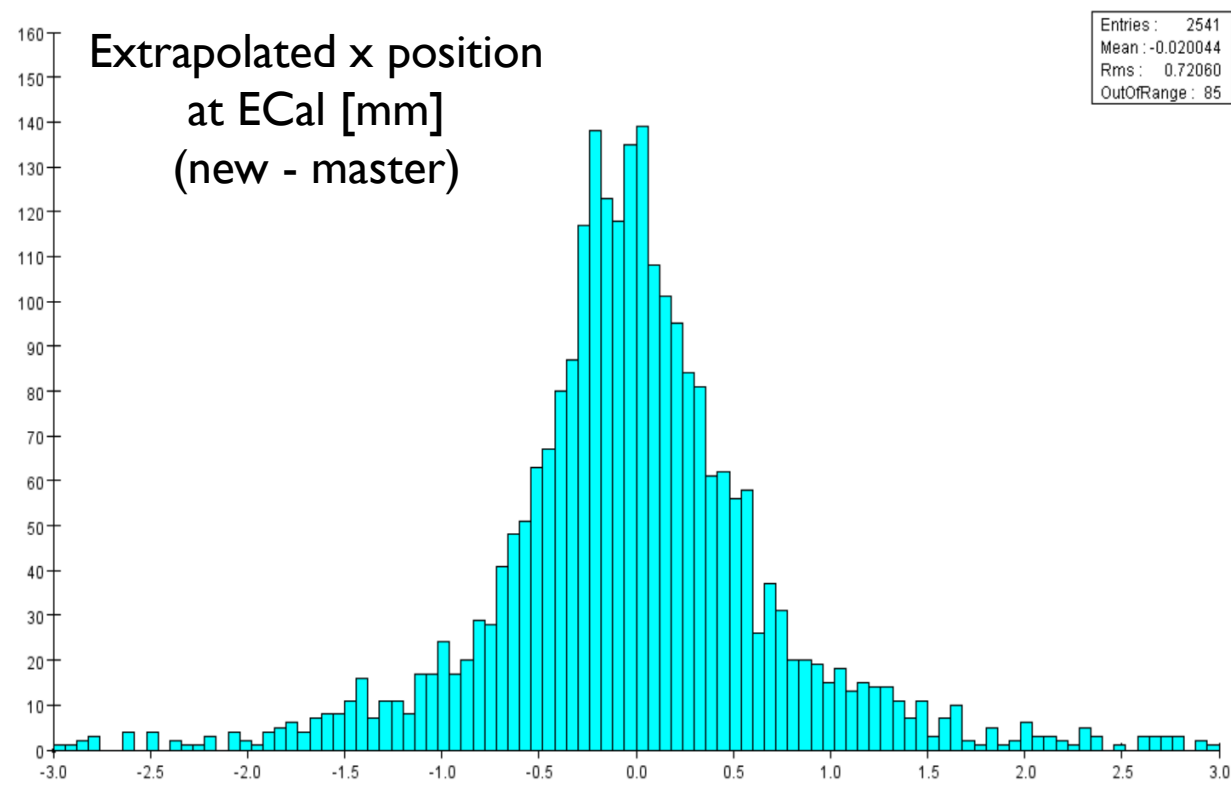# TRACK-CLUSTER MATCHING WITH NEW TRACKSTATES-AT-ECAL

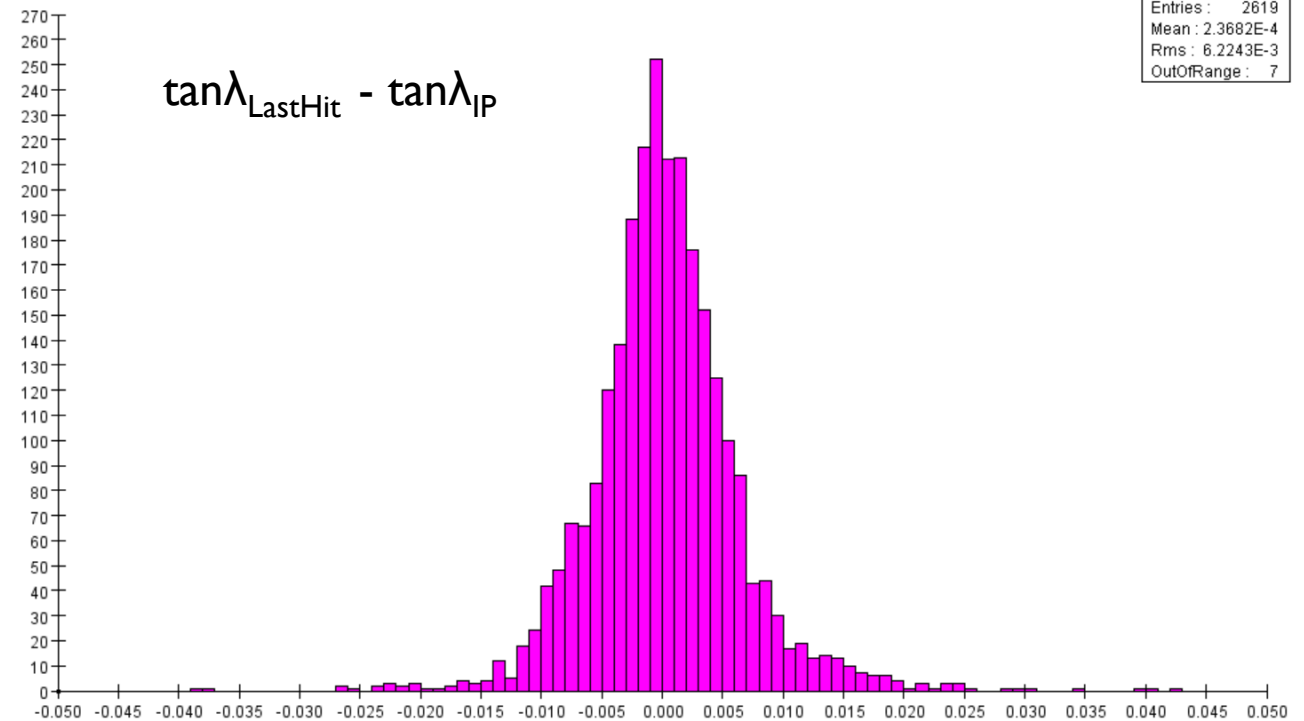MIRIAM DIAMOND

JAN 22 2018

TRACKSTATES-AT-ECAL

- TrackDataDriver uses TrackUtils.extrapolateTrackUsingFieldMap to create new TrackState@ECal for every GBL Track

  - Master extrapolates from TrackState@IP

  - New code extrapolates from TrackState@LastHit

Extrapolated x position
at ECal [mm]
(new - master)

Entries: 2541
Mean: -0.020044
Rms: 0.72060
OutOfRange: 85

Extrapolated y position
at ECal [mm]
(new - master)

Entries: 2609
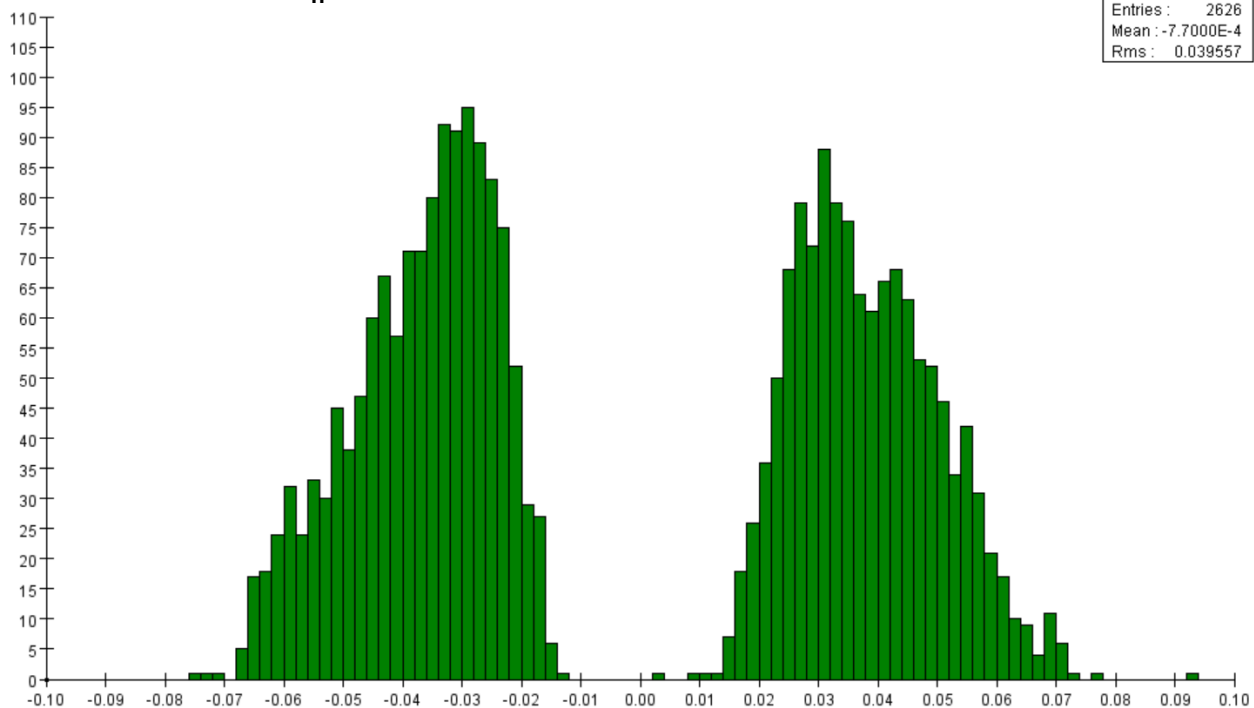Mean: 0.13366
Rms: 4.1465
OutOfRange: 17

TRACKSTATES-AT-ECAL

- Why such a wide spread in extrapolated y position at ECal (new - master)?

- Consider tanλ @LastHit vs @IP

  - ECal z position = 1393mm

  - $\Delta y \approx (z_{ECal}) (\tan\lambda_{IP} - \tan\lambda_{LastHit})$

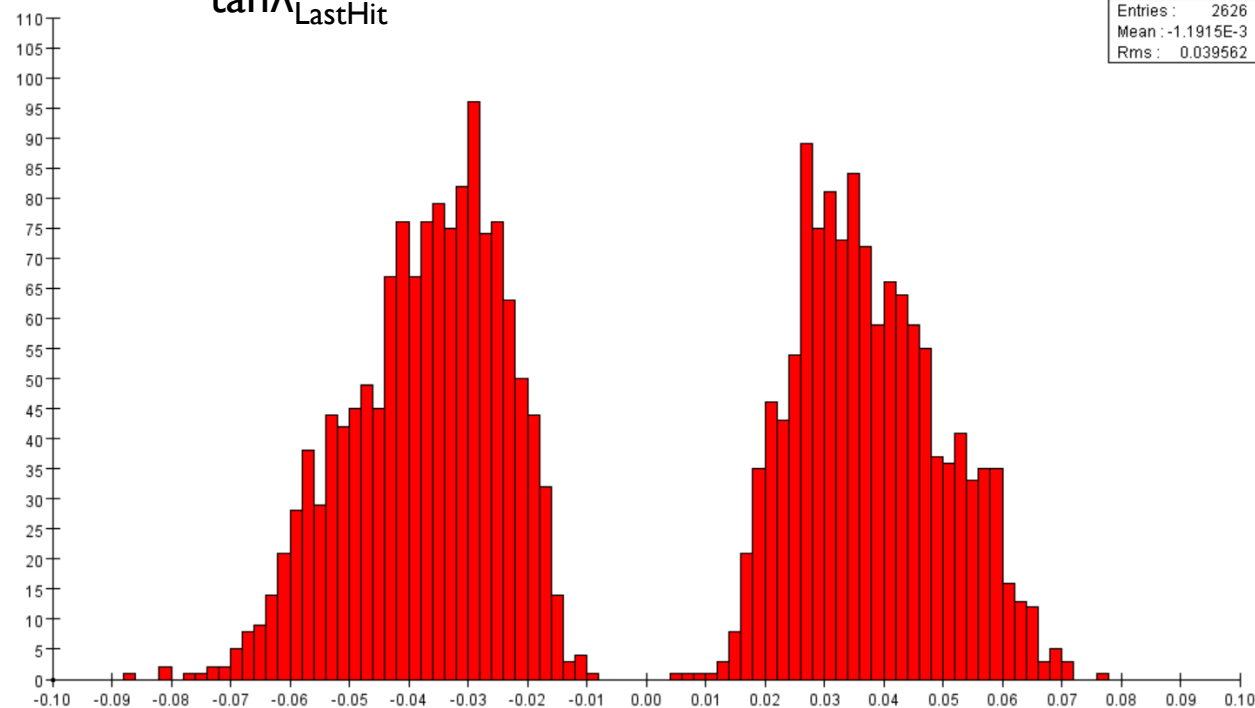So with $\Delta(\tan\lambda) \sim 0.01$, $\Delta y \sim 10$mm is reasonable

$\tan\lambda_{LastHit} - \tan\lambda_{IP}$

Entries : 2619
Mean : 2.3682E-4
Rms : 6.2243E-3
OutOfRange : 7

TRACKSTATES-AT-ECAL

$\tan\lambda_{IP}$

Entries : 2626
Mean : -7.7000E-4
Rms : 0.039557

$\tan\lambda_{LastHit}$

Entries : 2626
Mean : -1.1915E-3
Rms : 0.039562

TRACK-CLUSTER MATCHING

- Track-cluster matching (TrackClusterMatcher, called by ReconParticleDriver) uses TrackState@ECal created by TrackDataDriver

- Matching based on old cluster-track residuals parameterization

- Results don't change with new code, because matching criterion is so loose

- But, could consider tightening criterion and re-doing parameterization

```
hps-recon ▸ 🗂 src/main/java ▸ 🧩 org.hps.recon.utils ▸ 🅖 TrackClusterMatcher ▸

/**
 * These cuts are set at +/- 4 sigma extracted from Gaussian fits to the
 * track-cluster residual distributions. The data used to determine these
 * limits is a pass 2 test file (t2.6) using run 5772.
 */
private double topClusterTrackMatchDeltaXLow = -14.5; // mm
private double topClusterTrackMatchDeltaXHigh = 23.5; // mm
private double bottomClusterTrackMatchDeltaXLow = -19.5; // mm
private double bottomClusterTrackMatchDeltaXHigh = 16.5; // mm

private double topClusterTrackMatchDeltaYLow = -21.5; // mm
private double topClusterTrackMatchDeltaYHigh = 28; // mm
private double bottomClusterTrackMatchDeltaYLow = -28; // mm
private double bottomClusterTrackMatchDeltaYHigh = 24; // mm

/**
 * Rafo's parameterization of cluster-seed x/y position residuals as function of energy.
 *
 * Derived using GBL/seed tracks, non-analytic extrapolation, uncorrected cluster positions,
 * and EngRun2015-Nominal-v4-4-fieldmap detector.
 *
 *   f = p0+e*(p1+e*(p2+e*(p3+e*(p4+e*p5))))
 */
private static final double dxMeanTopPosiGBL[] = { 6.67414,-9.57296, 5.70647, 27.4523,-28.110:
private static final double dxSigmTopPosiGBL[] = { 52.6437,-478.805, 1896.73,-3761.48, 3676.7
private static final double dxMeanBotPosiGBL[] = { 4.13802, 15.8887,-74.2844,-9.78944, 308.54:
private static final double dxSigmBotPosiGBL[] = { 37.6513,-294.851, 1002.15,-1639.08, 1228.0:
```
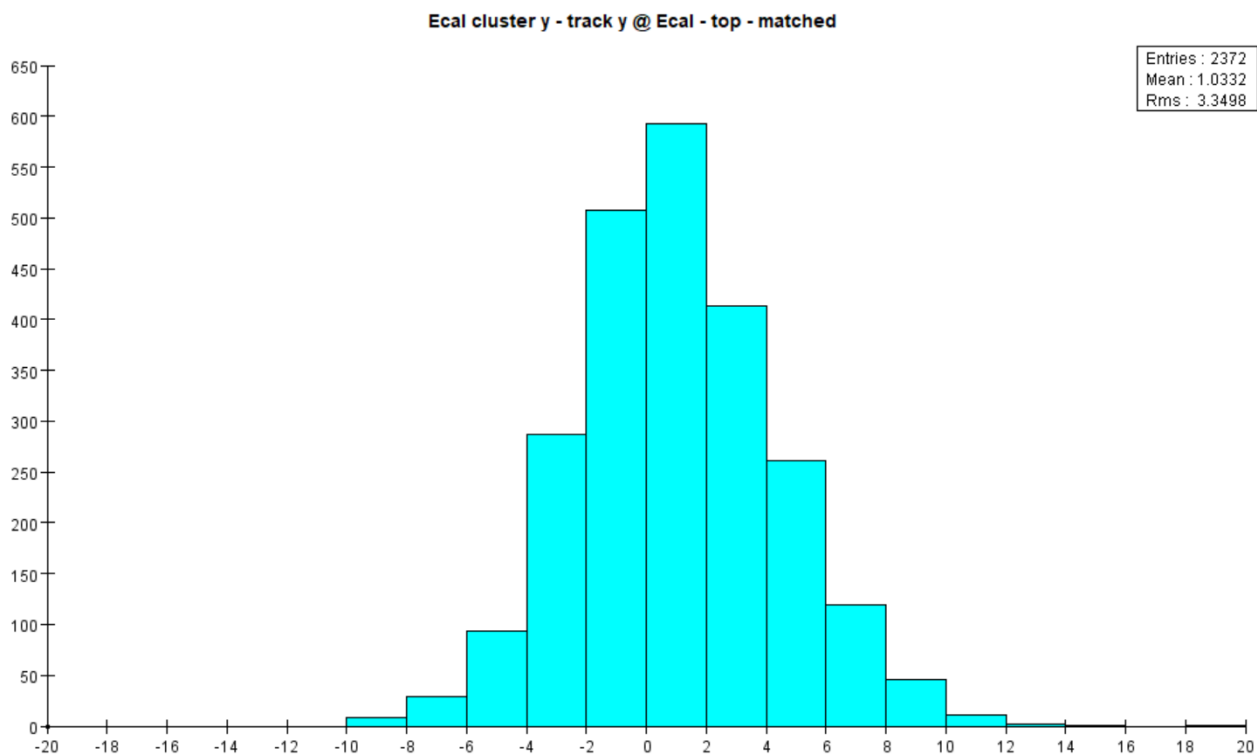
TRACK-CLUSTER MATCHING

master

new