Tracking stuff

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Intro

Observe difference in track residuals for all events and 2-track events

- Shouldn't be a difference…not clear what goes on

- Large residuals are allowed because hit errors are blown up (chi2 is ok)

- Trying to understand why errors are blown up

Some things I found so far…

Non-parallel sensors

StereoHitMaker creates 3D hits from strip cluster objects

HelicalTrackCross::CheckCross() checks for obvious problems

- Colinearity of strips <1% (no stereo hit possible)

- Max separation between sensors in direction normal to one of the sensors < 20.0mm

- Tolerance between the sensor separation and cross separation

- Sensors parallel to <1%

Issue

- Test run geometry only parallel to about ~4%!

Solution

- Increase tolerance?

Track Seeding

Three stereo hits are seeds

- Covariance matrix for hit is calculated using track from origin
- Generally huge initial hit errors => helix fit gets low chi2 but can be really bad
- No MS in first seed fit (I think idea is that it shouldn't fail but just get some starting point which it can improve upon)
- After initial seed is fitted, hit covariance matrix is updated and errors become reasonable

Issue

- If initial fitted helix has certain properties the hit covariance matrix is not updated (in fact it's reset to use the origin)
- Conditions at which it will happen: d(R-Phi), dR, dz is not improved (with 0.01 tolerance)

Solution

- What is important is that it keeps iterating and testing new hits; eventually it should fail chi2…
- Change condition: allowing worse track direction will increase the errors more but allow it to run through and fail
- Could also check for such fits in the track fit loop?

Example

HelicalTrackFitter: Hits that will be used in the fit:
HelicalTrackFitter: hit at poscor=[207.39,   11.603,   -37.767] cov=[0.389,-12.474,-0.636][-12.474,400.504,19.688][-0.636,19.688,1.981]
HelicalTrackFitter: hit at poscor=[305.98,   59.658,   -38.476] cov=[0.389,-12.472,-0.633][-12.472,400.519,19.588][-0.633,19.588,1.966]
HelicalTrackFitter: hit at poscor=[507.96,   -0.094529,   -39.793] cov=[0.376,-12.293,-0.305][-12.293,402.034,9.782][-0.305,9.782,0.500]

HelixFitter: fit succeeded, will eb used as seed, with chi2=0.455 and helix:
HelicalTrackFit:
d0= -162.60423434851435
phi0= 1.147070182854135
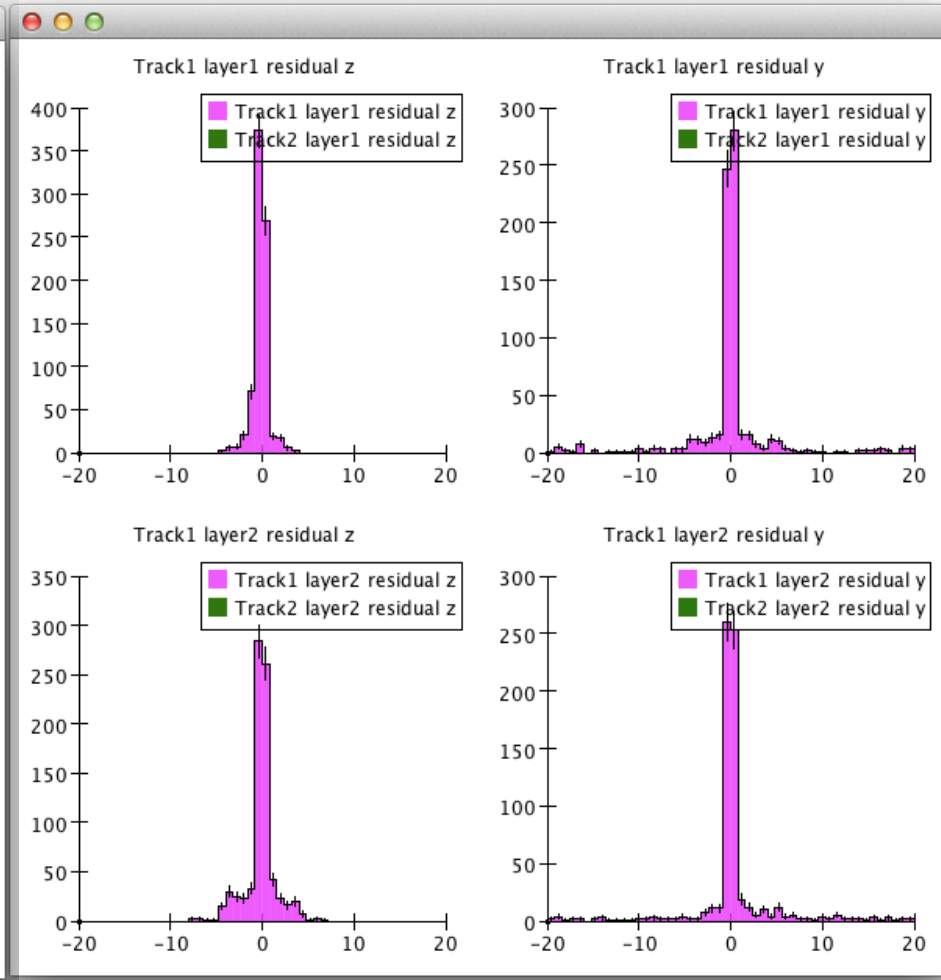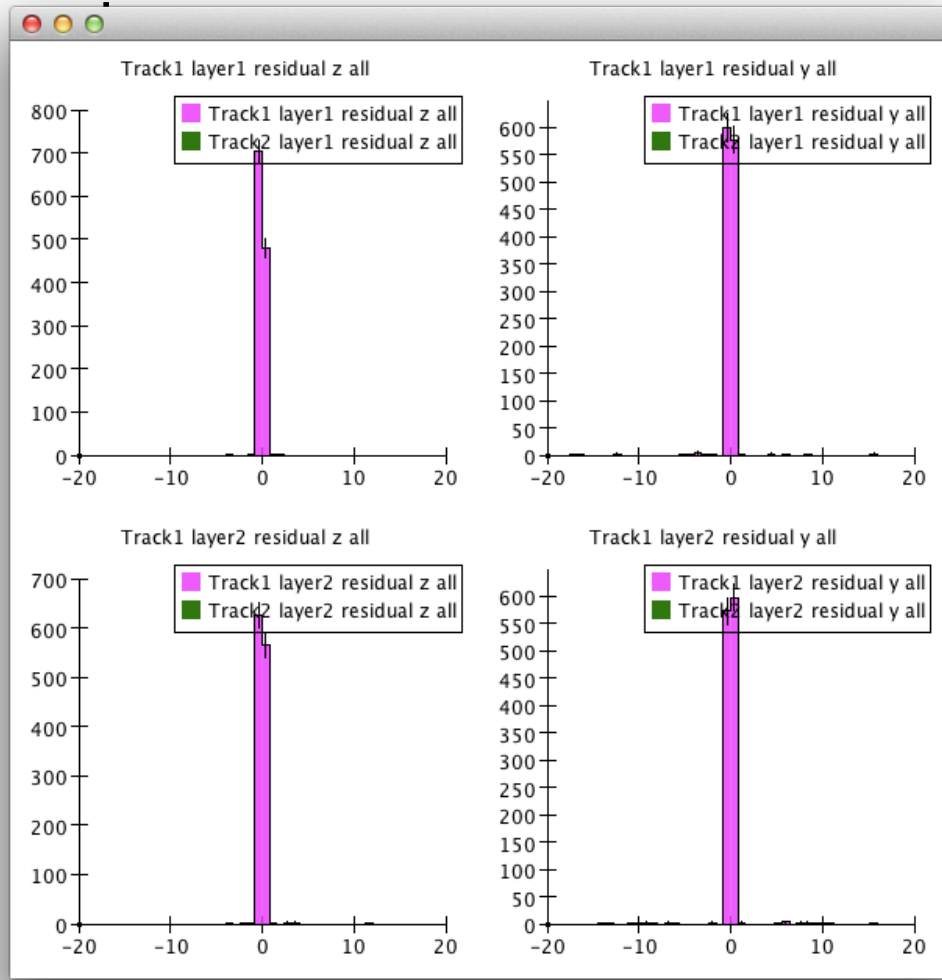curvature: 0.00448913258165662255
z0= -22.27434255169445
tanLambda= -0.029414298632347884

HitUtils: Covariance on helix from trkdir=[0.23160,   -0.97237,   -0.029402]
HitUtils: Covariance on helix became cov=[0.407,-13.970,0.534][-13.970,479.816,-18.941][0.534,-18.941,1.491]
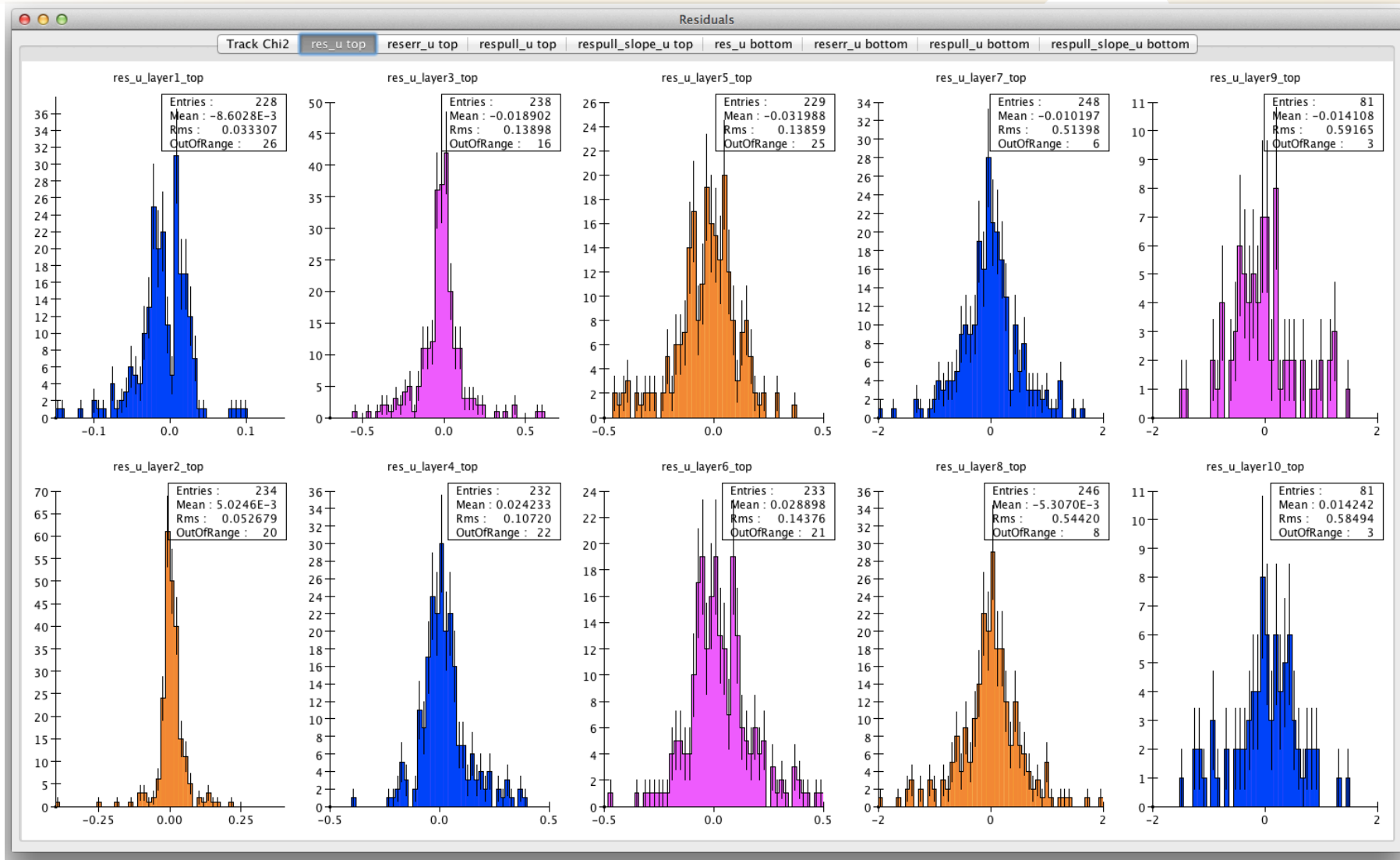
3D residuals events (L1,L2)

All tracks in MC

2-trk evetns in MC

"u" residuals 2trk events

"u" residuals all events