NON-DETERMINISM IN TRACK RECO

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github issue 152

FIXING THE CODE

- **LCIO Raw → Reco: running over same event didn't always yield same result!**
- Why? Track formation by SeedTracker depends upon the order of the elements in the HelicalTrackHit collection
- Quick fix (pull request approved last week): replace some HashMaps in HelicalTrackFitDriver with LinkedHashMaps, to ensure order of elements is the same each time
- Longer-term fix should be implemented, either

1. Sort HelicalTrackHits by some logical metric before passing to SeedTracker
2. Overhaul SeedTracker to make results independent of order

MIN PT CUT IN TRACK SEEDING

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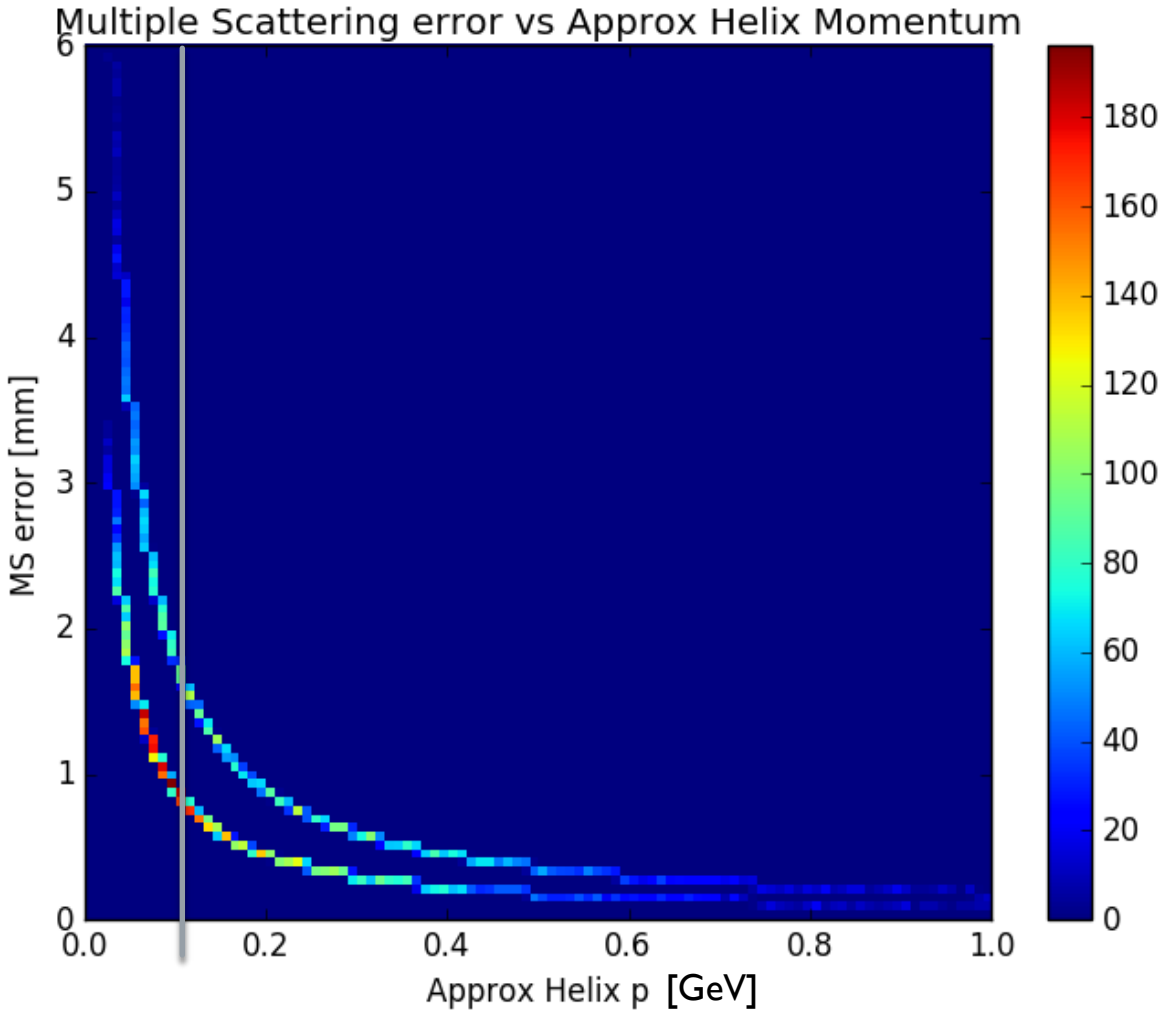
github issue 157

MIN PT CUT IN TRACK SEEDING

- Strategy includes MinPT member
- This should impose min p_T for track seeds … but actually doesn't
- e.g. default Strategy specified MinPT = 0.1 [GeV] , but plot of track seeds shows many with lower P_T



CURRENT CODE

- org.lcsim.recon.tracking.seedtracker.FastCheck converts minPT into Rmin
- Rmin appears as constraint in TwoPointCircleFitter (called by TwoPointCircleCheck), but not in ThreePointCircleFitter
- Each two-seed combination can pass the cut, but end up with three-hit seed that exceeds the cut

```
public boolean ThreePointHelixCheck(HelicalTrackHit hit1, HelicalTrackHit hit2, HelicalTrackHit hit3) {
    …
    _cfit2 = new TwoPointCircleFitter(_RMin);
    _cfit3 = new ThreePointCircleFitter();
    …
    if (!TwoPointCircleCheck(hit1, hit3, null)) return false;
    if (!TwoPointCircleCheck(hit2, hit3, null)) return false;
    …
    boolean success = _cfit3.fit(p[0], p[1], p[2]);
```

FIXING THE CODE

- In ThreePointHelixCheck, add radius check after three-point circle fit

```
boolean success = _cfit3.fit(p[0], p[1], p[2]);
if (!success)
    return false;

//  Retrieve the circle parameters
CircleFit circle = _cfit3.getFit();
double xc = circle.x0();
double yc = circle.y0();
double rc = Math.sqrt(xc * xc + yc * yc);
double rcurv = circle.radius();

// min pT cut
if (rcurv < _RMin)
    return false;
```