TRACK EXTRAPOLATION

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CURRENT EXTRAPOLATION IN NTUPLE

- Track extrapolation in `hps-analysis` ▸ `src/main/java` ▸ `org.hps.analysis.tuple` ▸ `TupleDriver`

```java
for (HpsSiSensor sensor : sensors) {
    double zPos = sensor.getGeometry().getPosition().z();
    Hep3Vector extrapPos = TrackUtils.extrapolateTrack(track, zPos);
```

`hps-tracking` ▸ `src/main/java` ▸ `org.hps.recon.tracking` ▸ `TrackUtils`
```java
public static Hep3Vector extrapolateTrack(Track track, double z) {
    return extrapolateTrack(track.getTrackStates().get(0), z);
}
```

- Room for improvement:

  - Use trackstate-at-sensor from GBL, instead of trackstate at IP

  - Calculate proper intercept with sensor, instead of plane at middle of sensor

    `hps-tracking` ▸ `src/main/java` ▸ `org.hps.recon.tracking` ▸ `TrackUtils` ▸ `getHelixPlaneIntercept`

  - Use fieldmap

   `hps-tracking` ▸ `src/main/java` ▸ `org.hps.recon.tracking` ▸ `TrackUtils` ▸ `extrapolateTrackUsingFieldMap`

Can't do both

IMPROVING EXTRAPOLATION

- We have trackstate-at-sensor from GBL *only if track has hit at that sensor*
  - Then get proper intercept of this trackstate with sensor ("ideal" scheme)
  - Fieldmap effects negligible here
- But… extrapolation often used for tracks missing Layer 1 hit, to determine whether they're in Layer 1 acceptance
- Say we have trackstates at Layer 2 and at IP, but not at Layer 1. Possible schemes:
  - A: extrapolate forward from IP (current master)
  - B: extrapolate backward from Layer2 using fieldmap
  - C: extrapolate forward from IP using fieldmap
  - D: extrapolate backward from Layer2 using accurate sensor intercept
  - E: extrapolate forward from IP using accurate sensor intercept

- Prompt A' MC Study: try each scheme on track that actually has a Layer 1 hit, and compare result to ideal scheme (using trackstate at Layer 1)
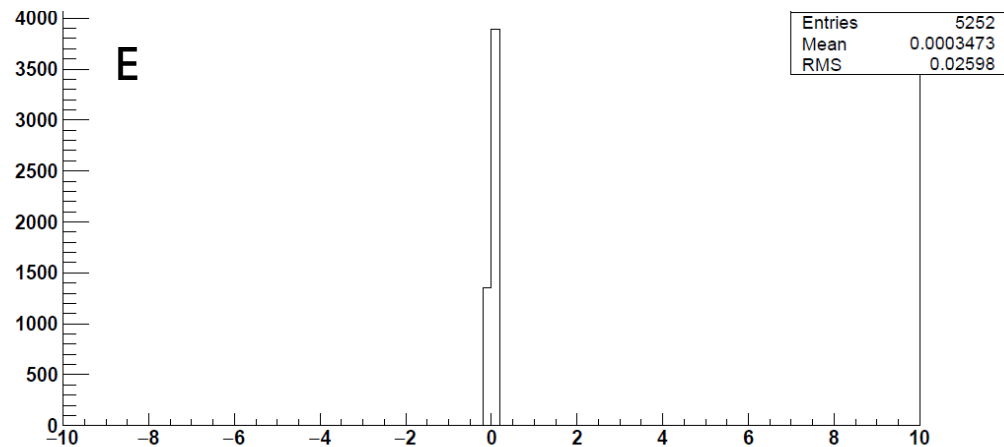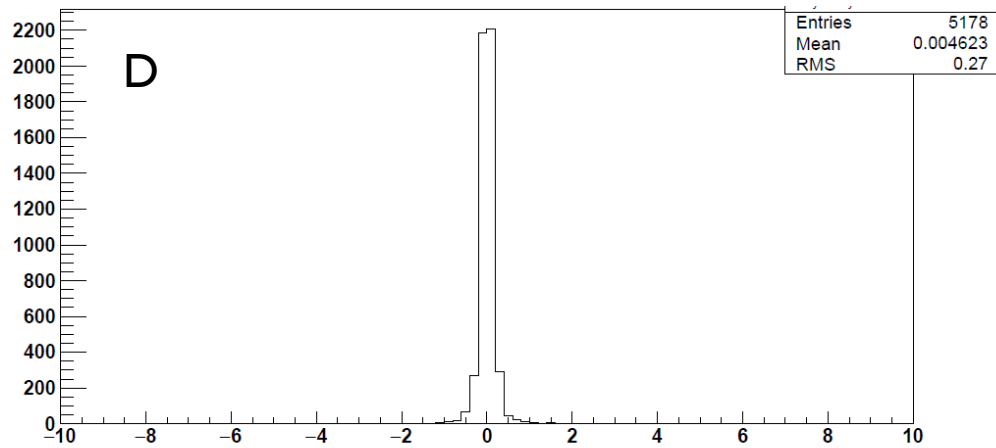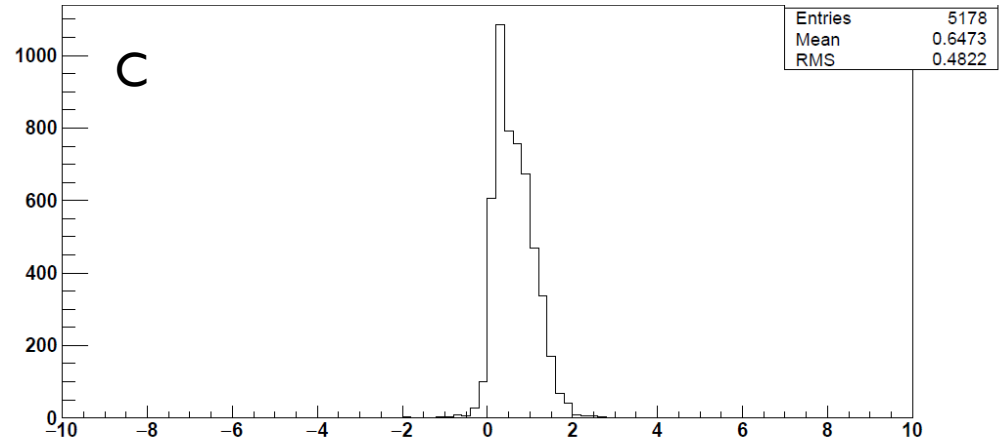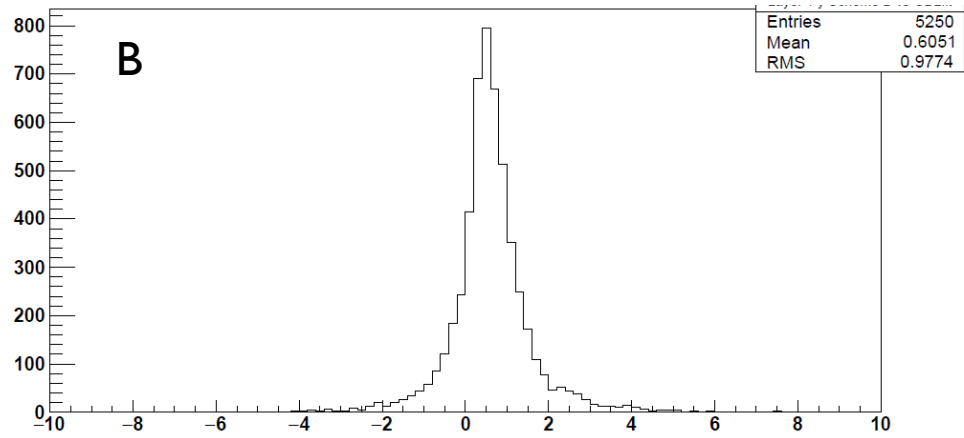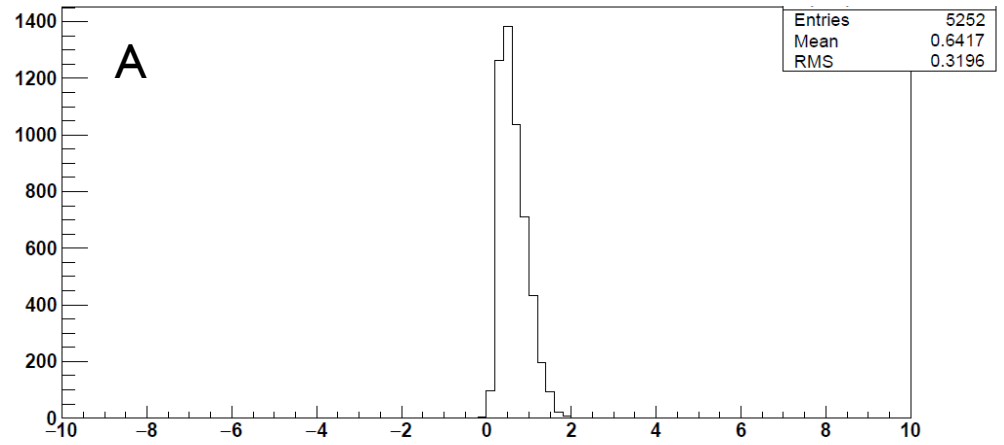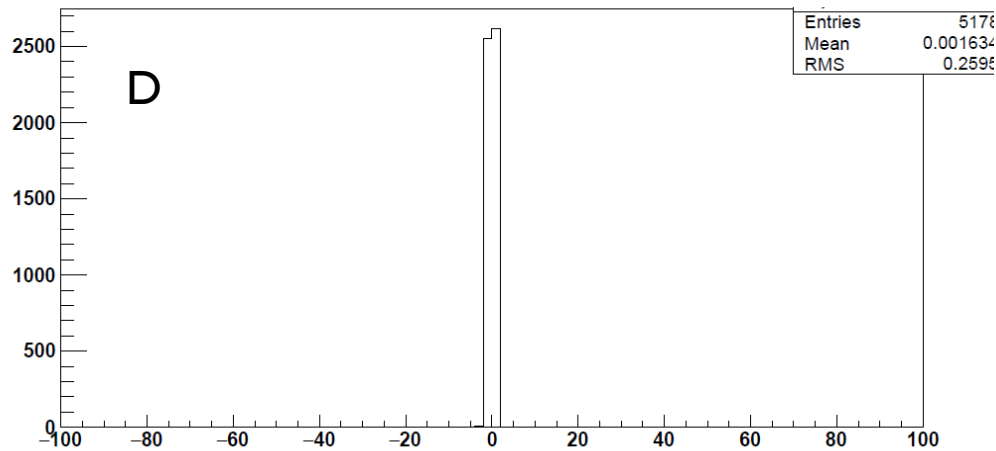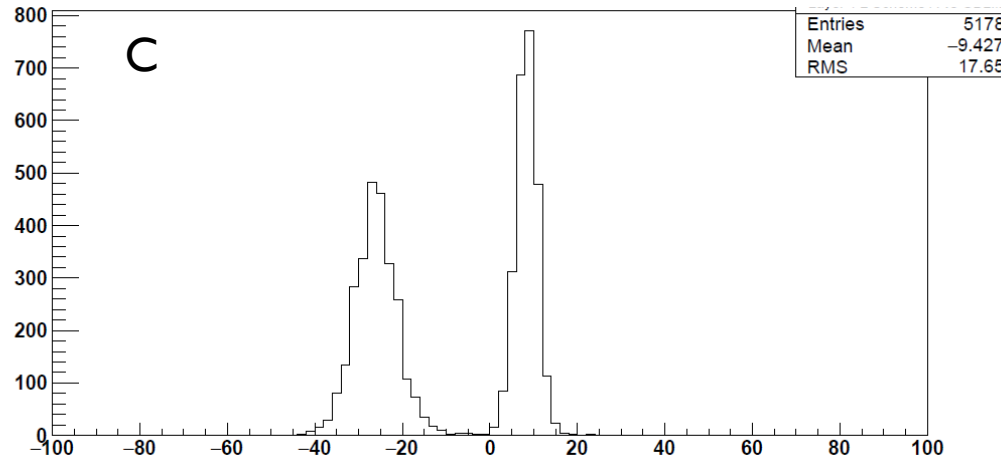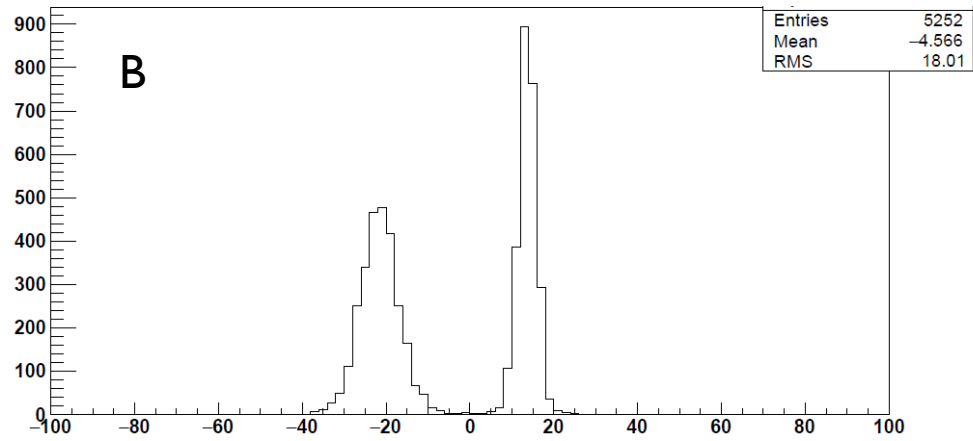
x (mm)
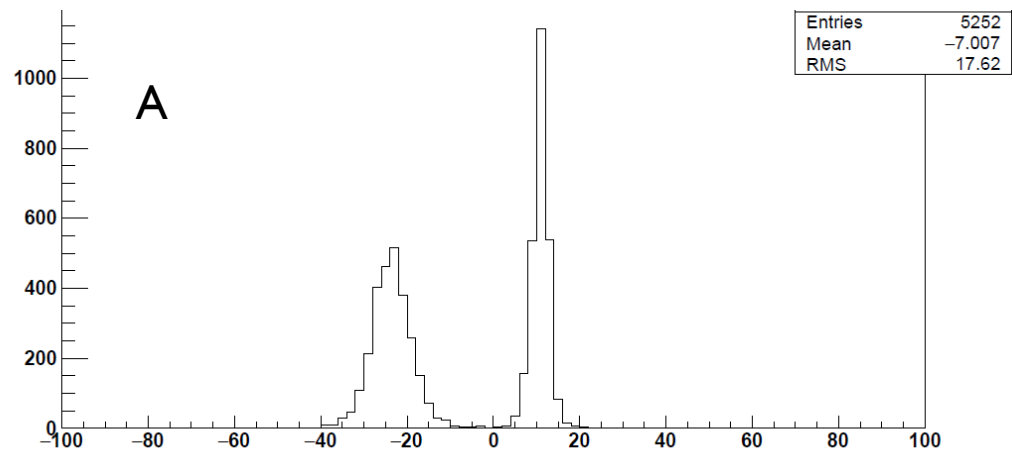Comparison to Ideal Scheme
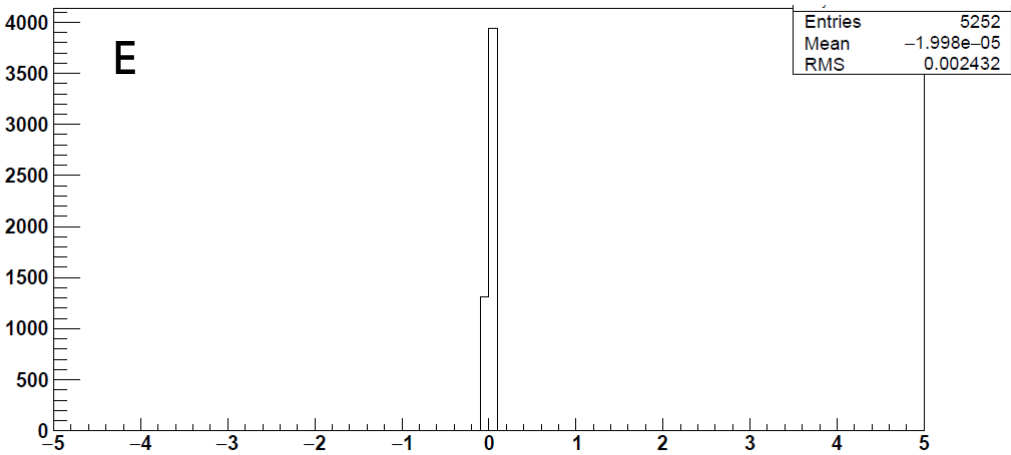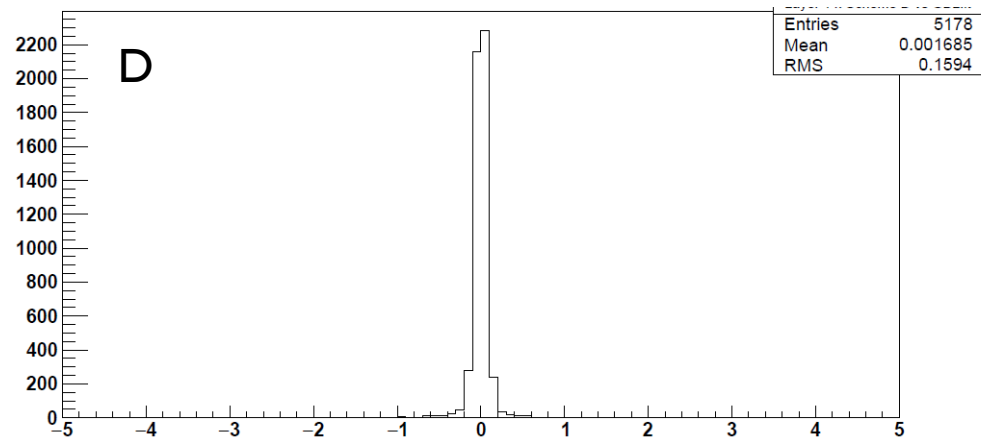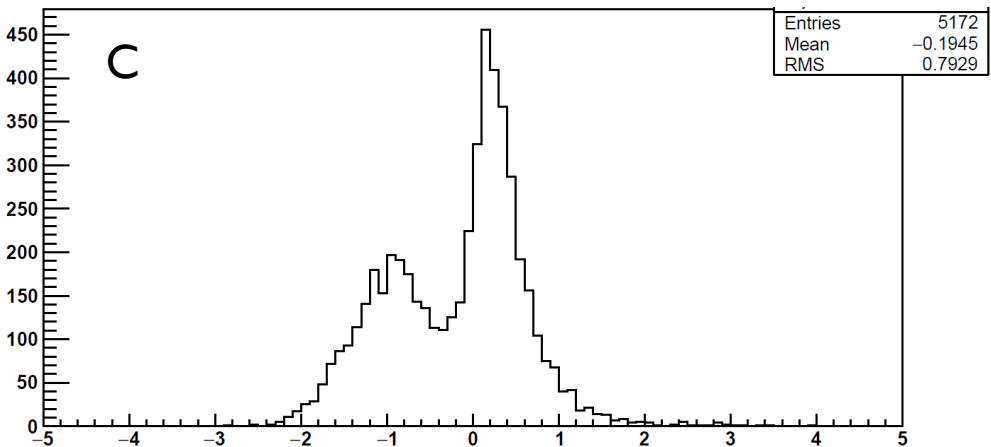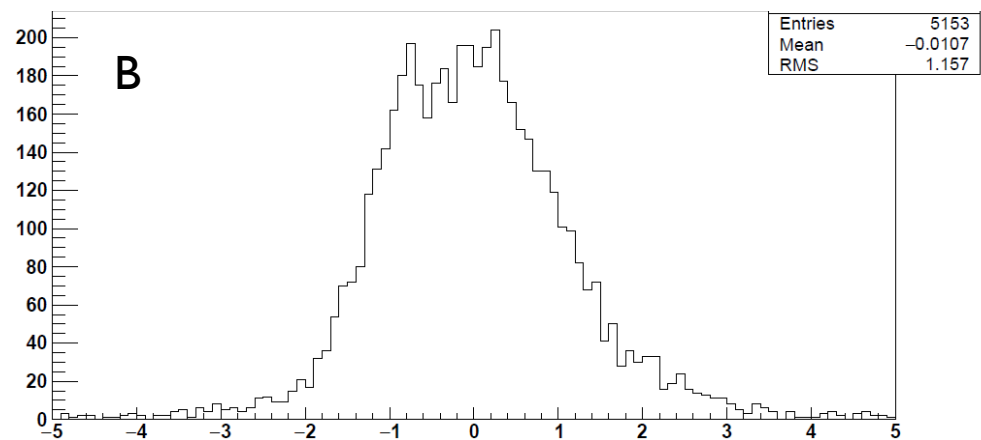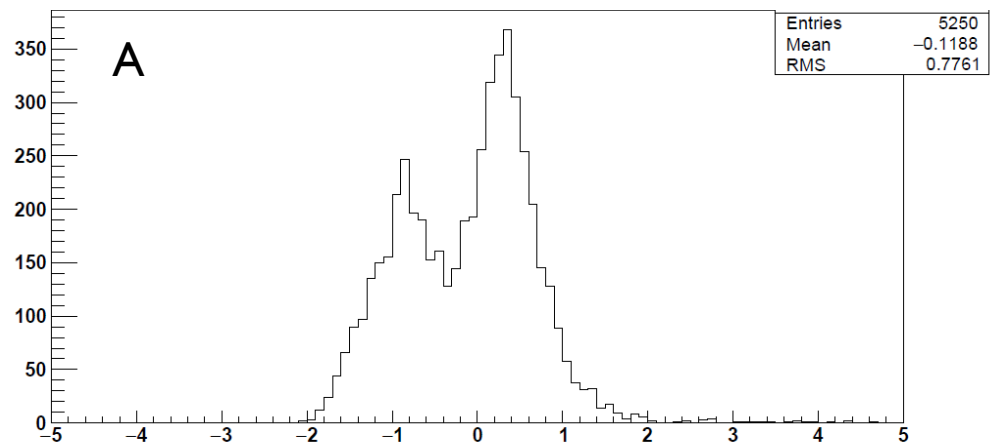
y (mm)
Comparison to Ideal Scheme

z (mm)
Comparison to Ideal Scheme
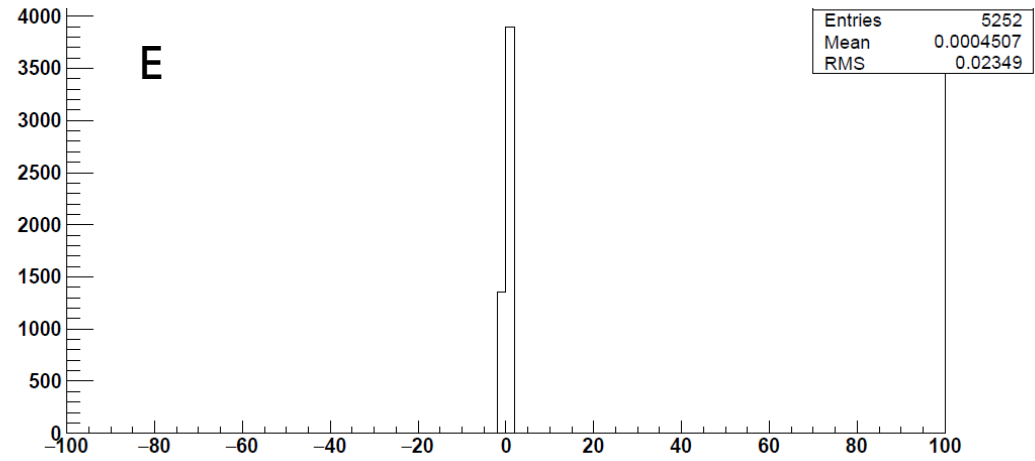
NEXT STEPS

- Is this study worth trying on other types of MC and/or data?

- Other ways of studying the schemes?

- Do we ever need to take into account *both* accurate sensor intercept *and* fieldmap?

  - To extrapolate to Layer 6 from Layer 5?