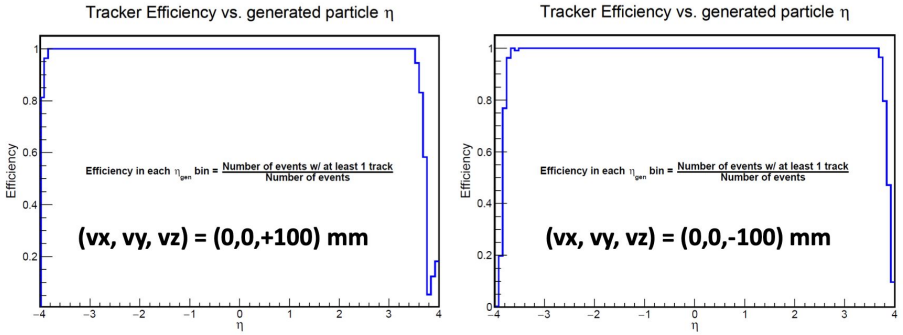
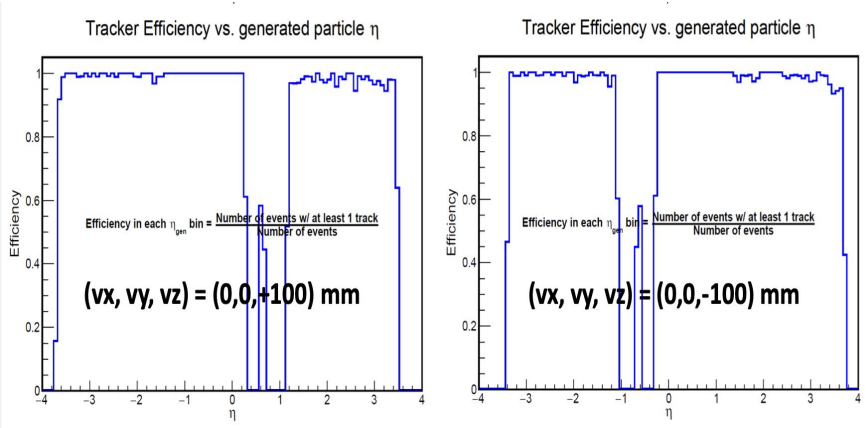
z=100

Jeetendra Gupta,
Barak Schmookler



Truth seeding

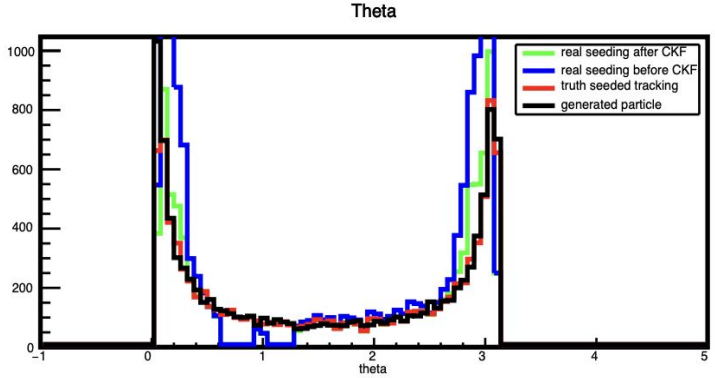


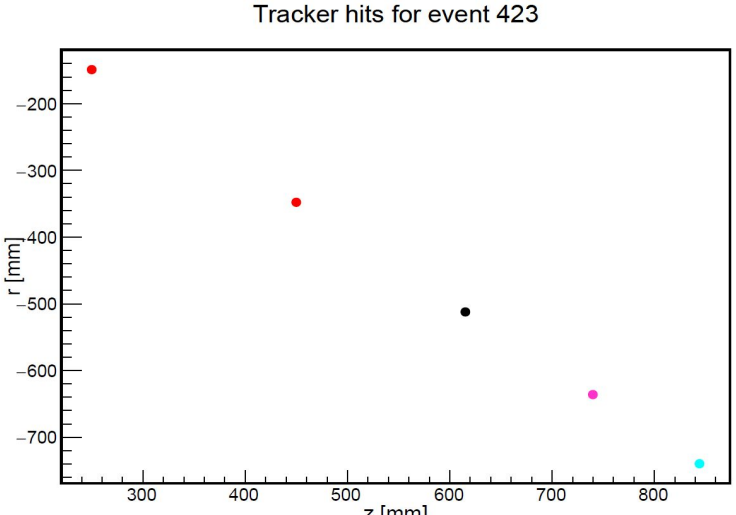
real seeding

Single negative muon generated at z = +-100
P = [0,5, 20] GeV/c

-barak

z=100



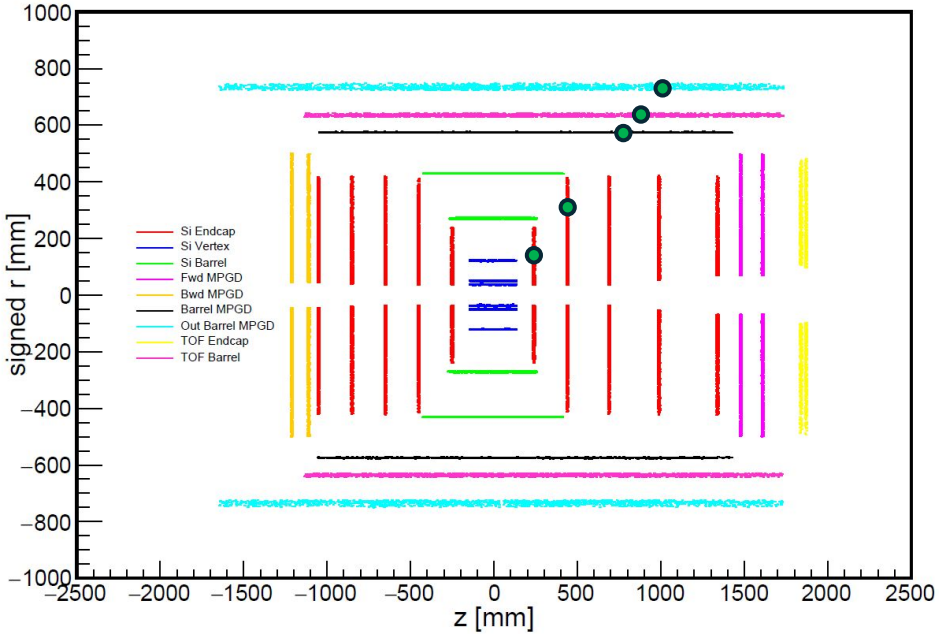


- We found no seeds in certain theta ranges (0.6 rad to 1.3 rad)
- We looked for hits in those theta ranges
- We found only two hits in SVT volume

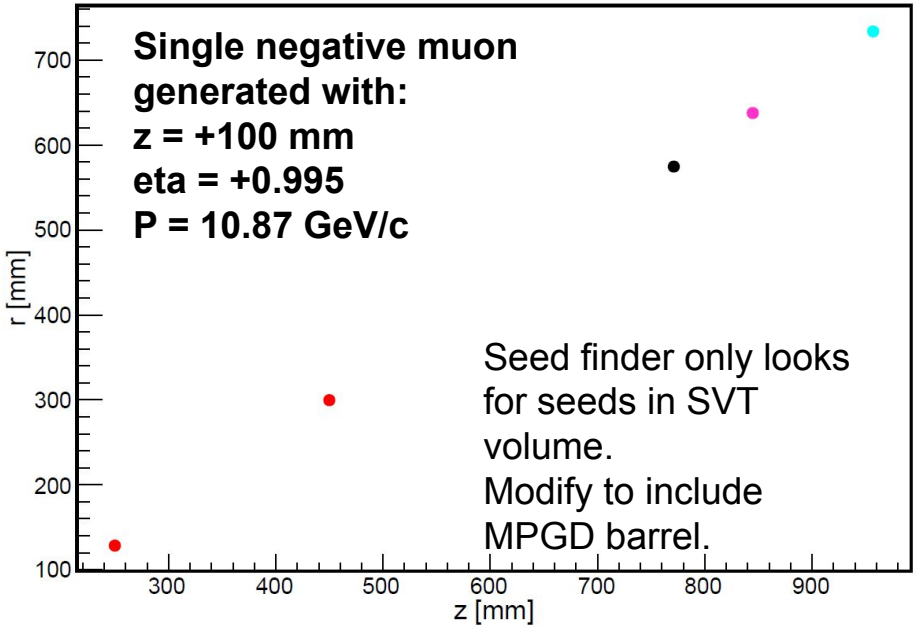
EICrecon/src/algorithm/tracking/OrthogonalTrackSeedingConfig.h
float rMax = 440. * Acts::UnitConstants::mm; // max r to look for hits to compose seeds
float rMin = 33. * Acts::UnitConstants::mm; // min r to look for hits to compose seeds

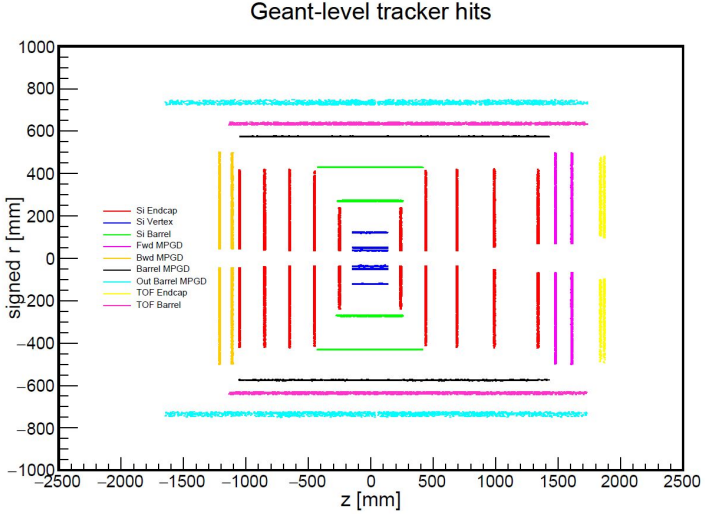
Origin of the single-particle inefficiencies

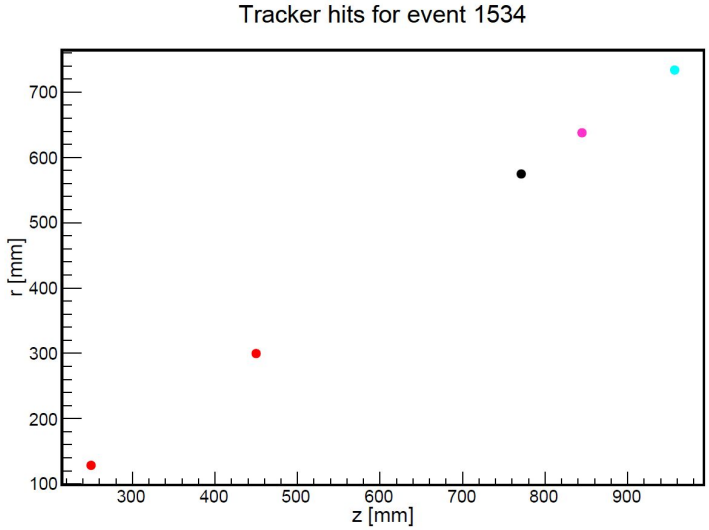
Geant-level tracker hits



Tracker hits for event 1534







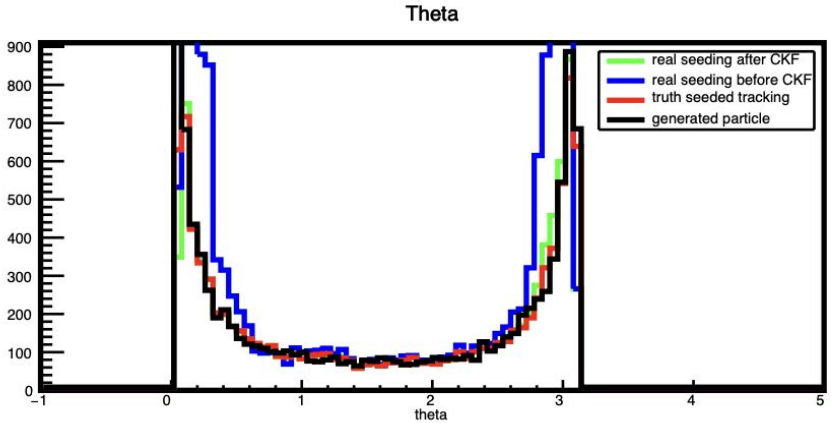
Default setting

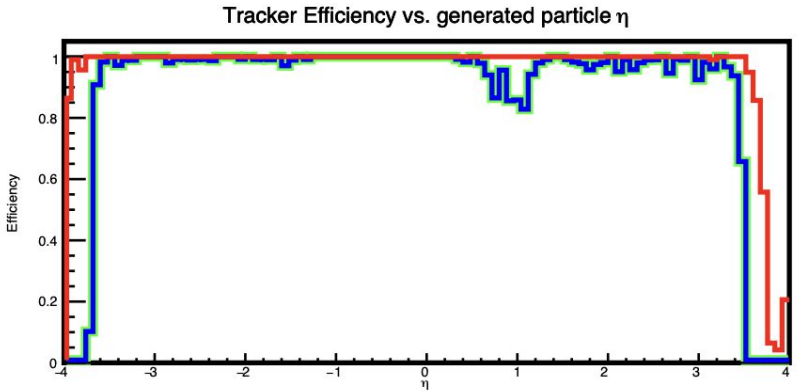
```
////////////////////////////////////////////////////////////////
/// SEED FINDER GENERAL PARAMETERS
float rMax = 440. * Acts::UnitConstants::mm; // max r to look for hi
float rMin = 33. * Acts::UnitConstants::mm; // min r to look for hit
float zMax = 1700. * Acts::UnitConstants::mm; // max z to look for h
float zMin = -1500. * Acts::UnitConstants::mm; // min z to look for
float deltaRMinTopSP     = 10. * Acts::UnitConstants::mm; // Min dis
float deltaRMaxTopSP     = 200. * Acts::UnitConstants::mm; // Max di
float deltaRMinBottomSP  = 10. * Acts::UnitConstants::mm; // Min dis
float deltaRMaxBottomSP  = 200. * Acts::UnitConstants::mm; // Max di
float collisionRegionMin = -250 * Acts::UnitConstants::mm; // Min z
float collisionRegionMax = 250 * Acts::UnitConstants::mm; // Max z f
```

What we propose:

```
float m_rMax = 600. * Acts::UnitConstants::mm;
float m_rMin = 33. * Acts::UnitConstants::mm;
float m_deltaRMinTopSP = 10. * Acts::UnitConstants::mm;
float m_deltaRMaxTopSP = 450. * Acts::UnitConstants::mm;
float m_deltaRMinBottomSP = 10. * Acts::UnitConstants::mm;
float m_deltaRMaxBottomSP = 200. * Acts::UnitConstants::mm;
```

z = 100, new setting

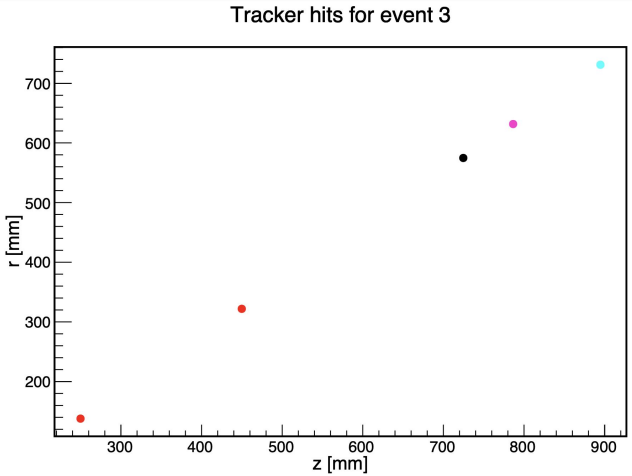




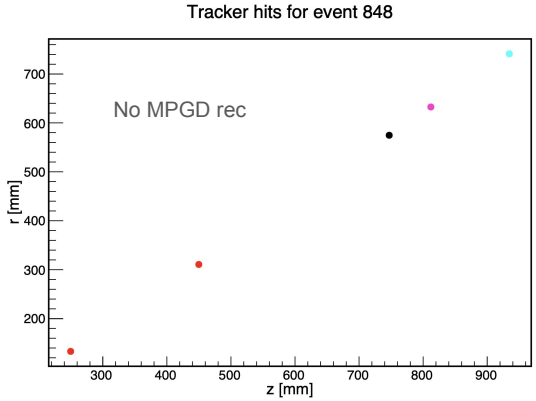
Settings I used for reconstruction:

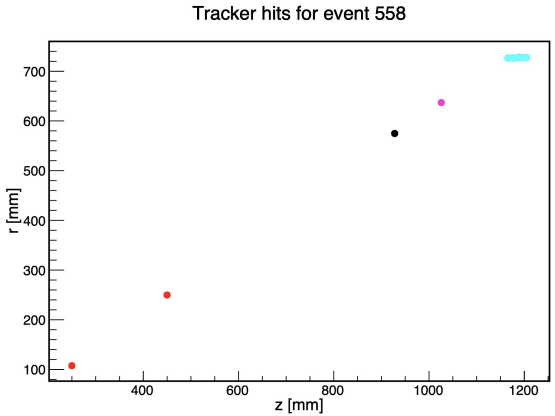
```
Float m_rMax = 600. * Acts::UnitConstants::mm; // max r to look for hits to compose seeds
float m_rMin = 33. * Acts::UnitConstants::mm; // min r to look for hits to compose seeds
float m_deltaRMinTopSP = 10. * Acts::UnitConstants::mm; // Min distance in r between middle and top SP in one seed
float m_deltaRMaxTopSP = 450. * Acts::UnitConstants::mm; // Max distance in r between middle and top SP in one seed
float m_deltaRMinBottomSP = 10. * Acts::UnitConstants::mm; // Min distance in r between middle and bottom SP in one seed
float m_deltaRMaxBottomSP = 450. * Acts::UnitConstants::mm; // Max distance in r between middle and bottom SP in one seed
```

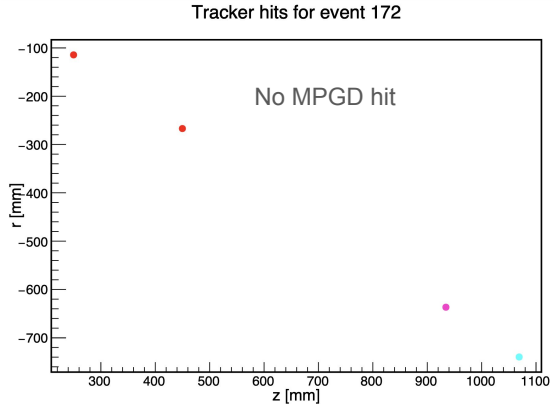
Seed formed

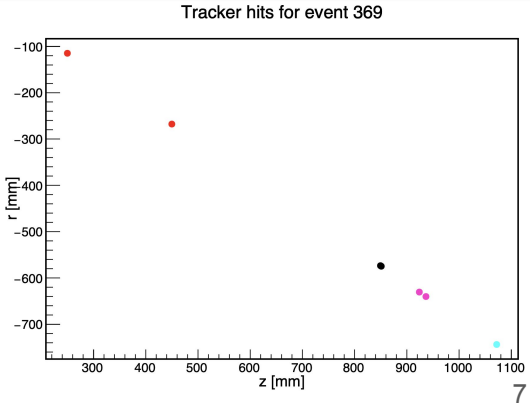


Seed not formed



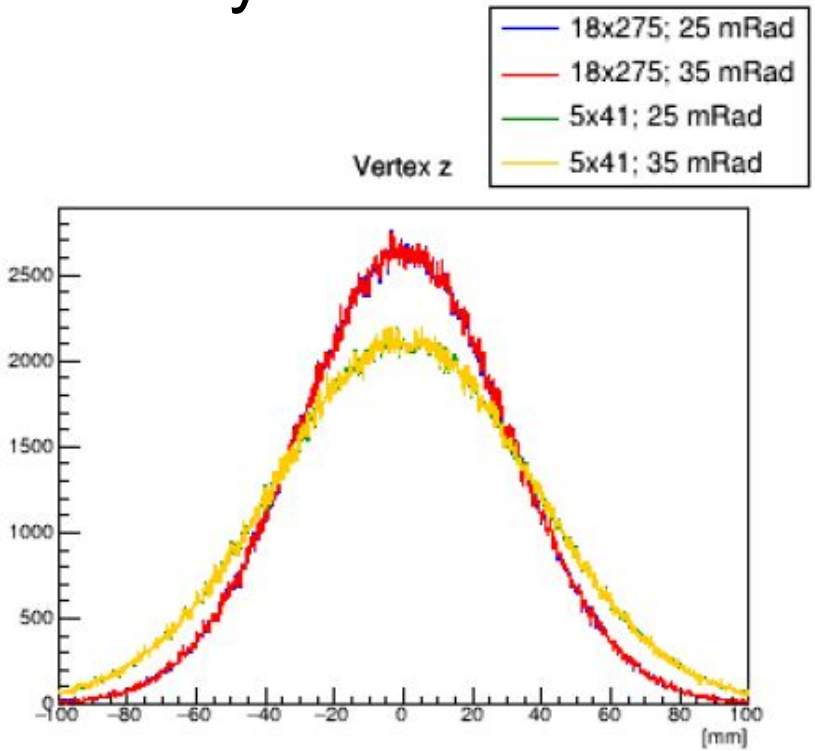




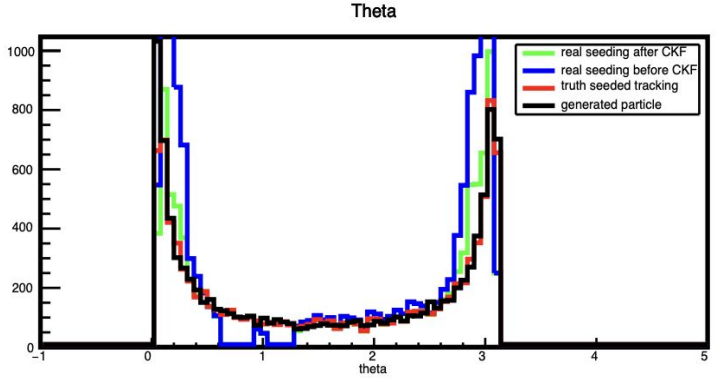


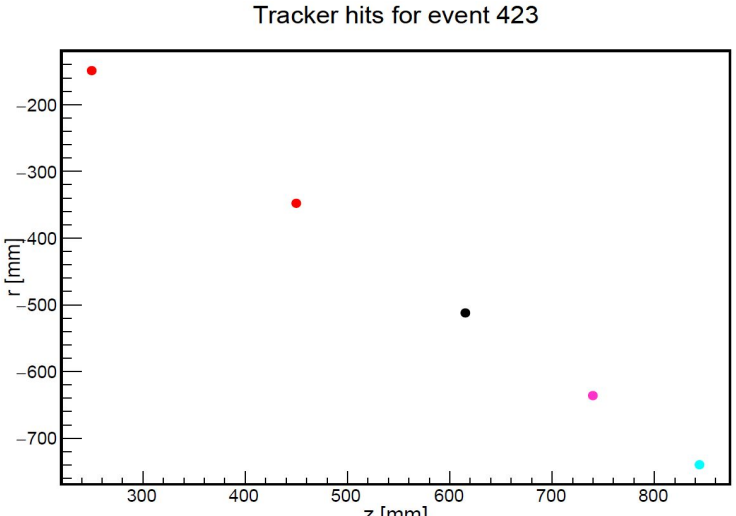
Single-particle summary

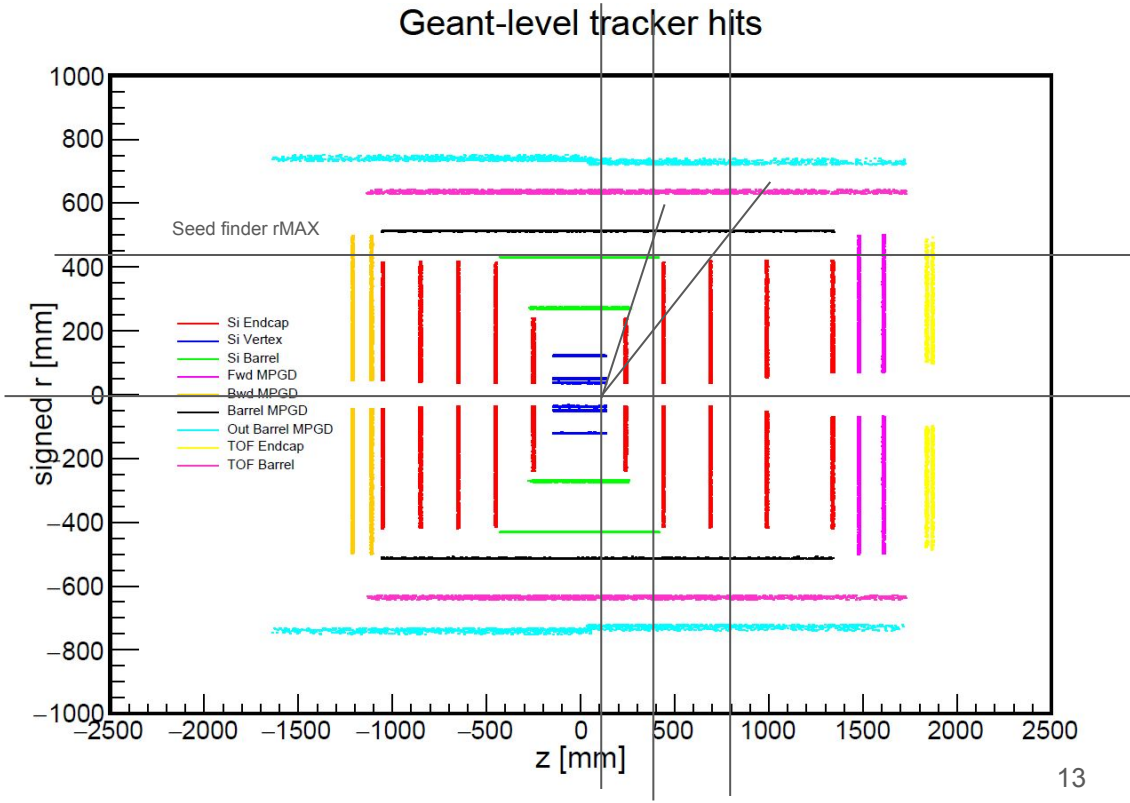
- With modifications to the seed finder, we can largely remove the observed inefficiencies at higher |z| values.
- There are still some inefficiencies at z = +-100 mm, which seem to have several causes. But this should not be too important for DIS events, since it is really near the edge of the beam spot (see plot on right).
- Another consequence of this modification to the seed finder is the addition of another duplicate track in the barrel region.
- We have a branch (https://github.com/eic/EICrecon/tree/seed_finder_update) where this change is made and can make a PR.

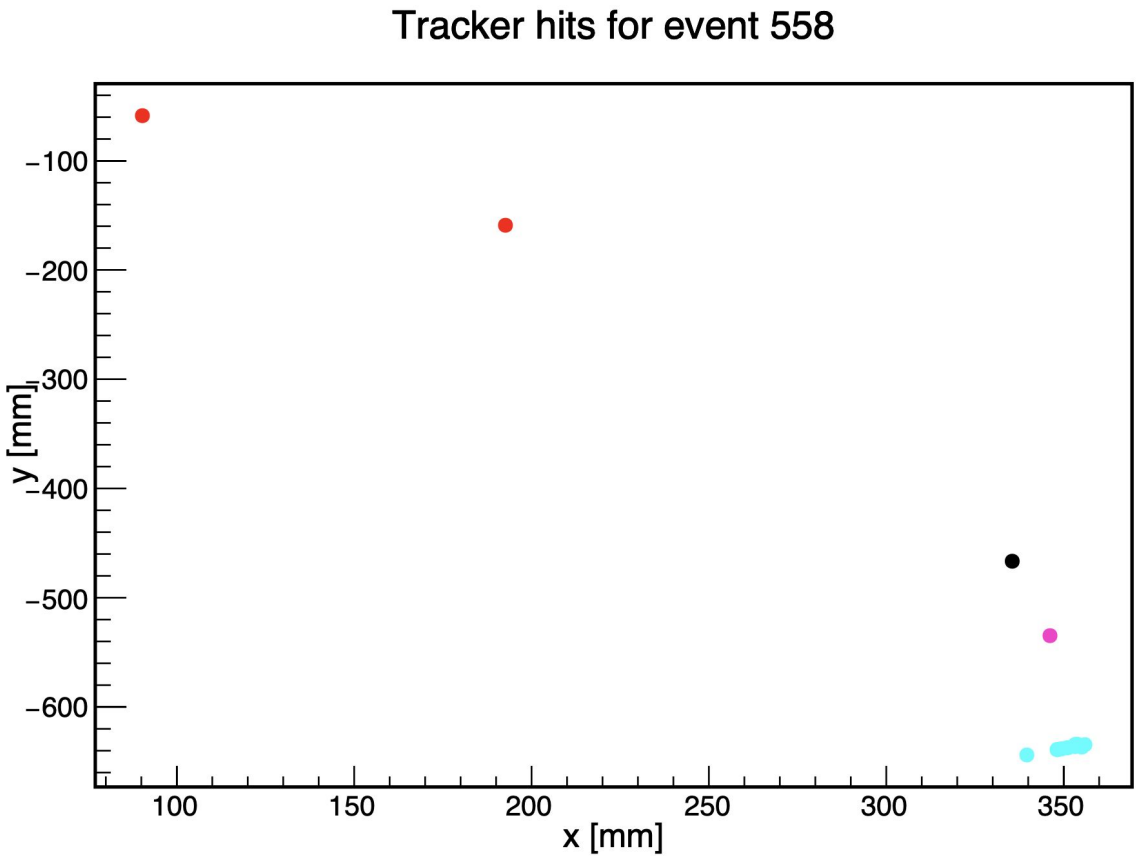


z=100


Theta
real seeding after CKF
real seeding before CKF
truth seeded tracking
generated particle
theta


Tracker hits for event 423
r [mm]
z [mm]


Geant-level tracker hits
Seed finder rMAX
Si Endcap
Si Vertex
Si Barrel
Fwd MPGD
Bwd MPGD
Barrel MPGD
Out Barrel MPGD
TOF Endcap
TOF Barrel
signed r [mm]
z [mm]


Tracker hits for event 558
−100
−200
−300
−400
−500
−600
y [mm]
100
150
200
250
300
350
x [mm]