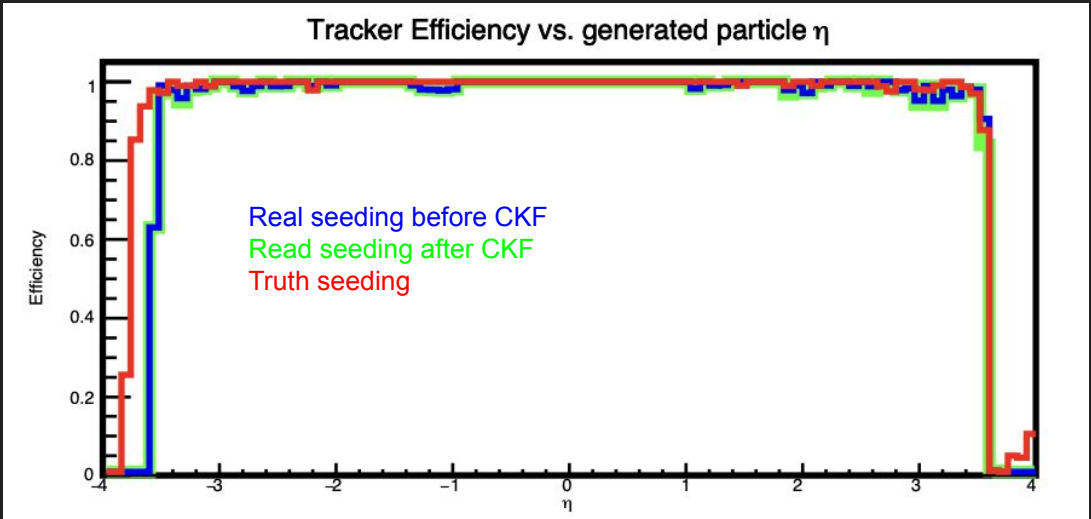
Tracker Inefficiency at low momentum

Jeet
Barak

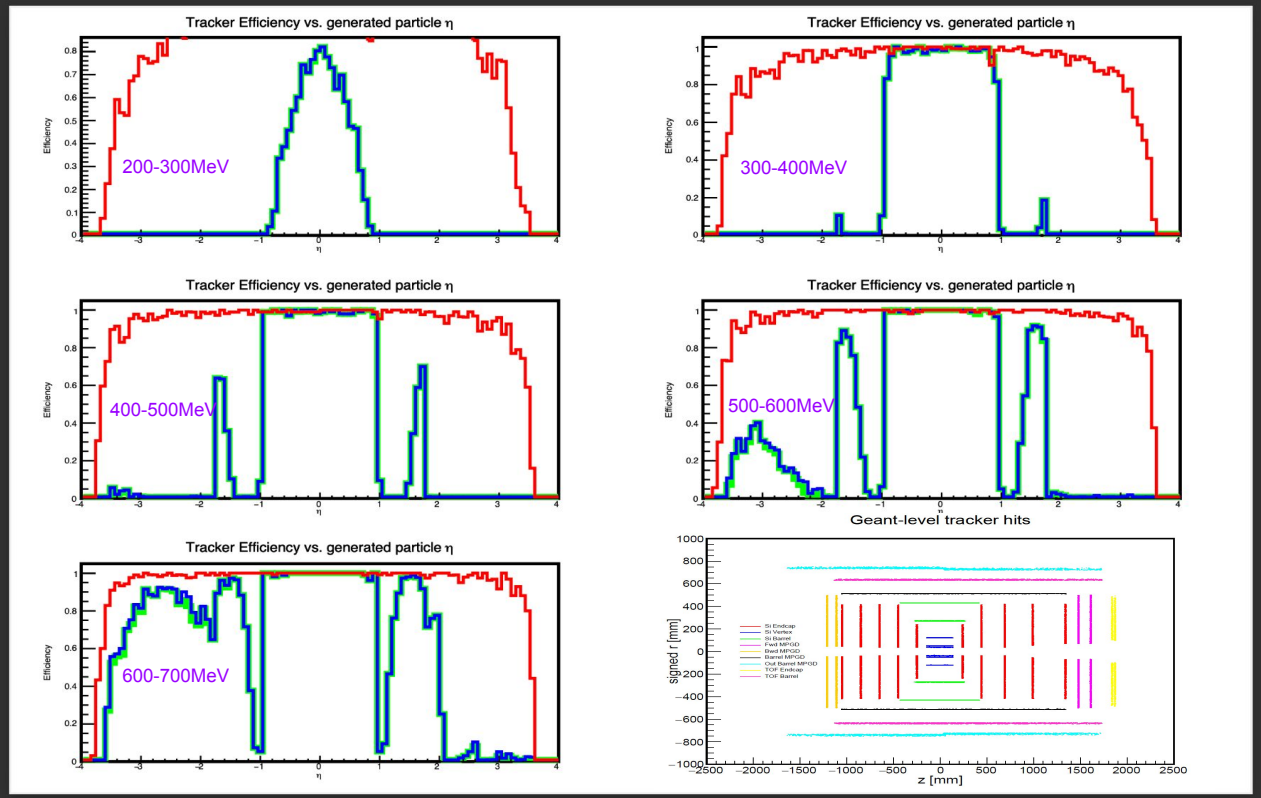


Particle: muons
P range: 0.5 to 20 GeV
Theta: 0.036 to 3.106
Gun distribution : Eta
Vertex: (0,0,0) mm

(new ACTS version)

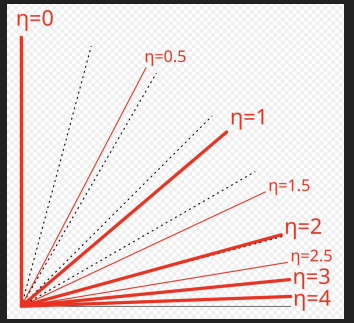
Particle: muons
P range: 200-300, 300-400,...,900-1000 MeV
Theta: 0.036 to 3.106
Gun distribution : Eta
Vertex: (0,0,0) mm

Tracker Efficiency vs eta for low momentum muons

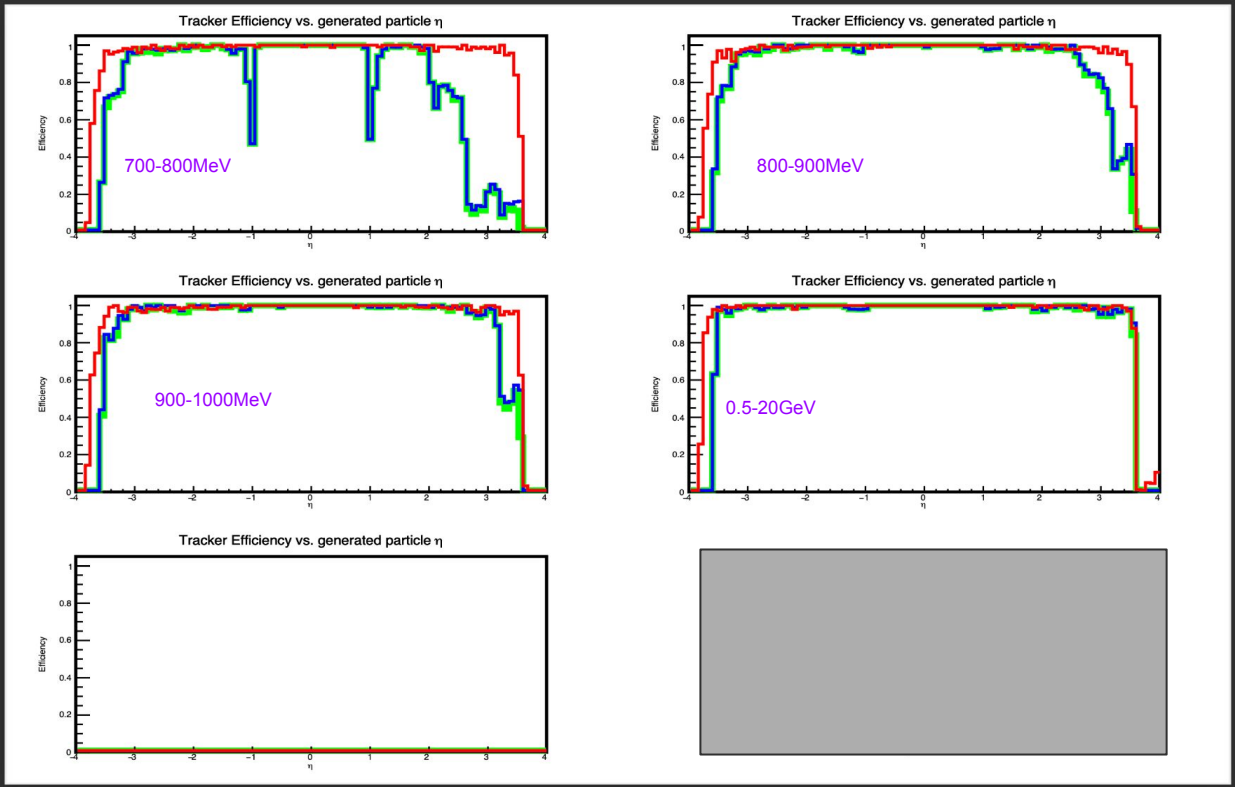


As we increase p range, the efficiency gets better

Negative eta has better efficiency than positive eta. Maybe because of geometry?

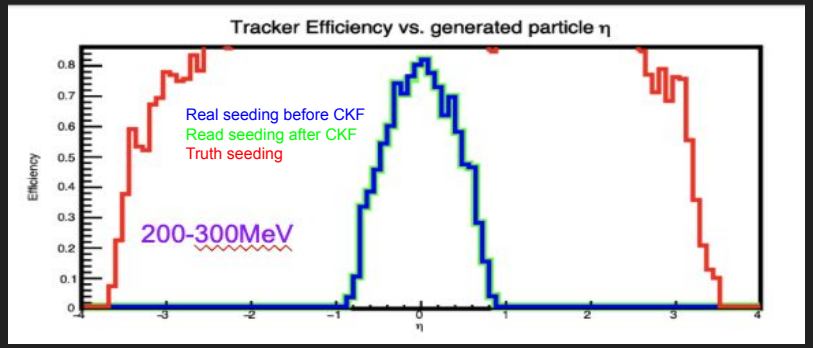


Tracker Efficiency vs eta for low momentum muons



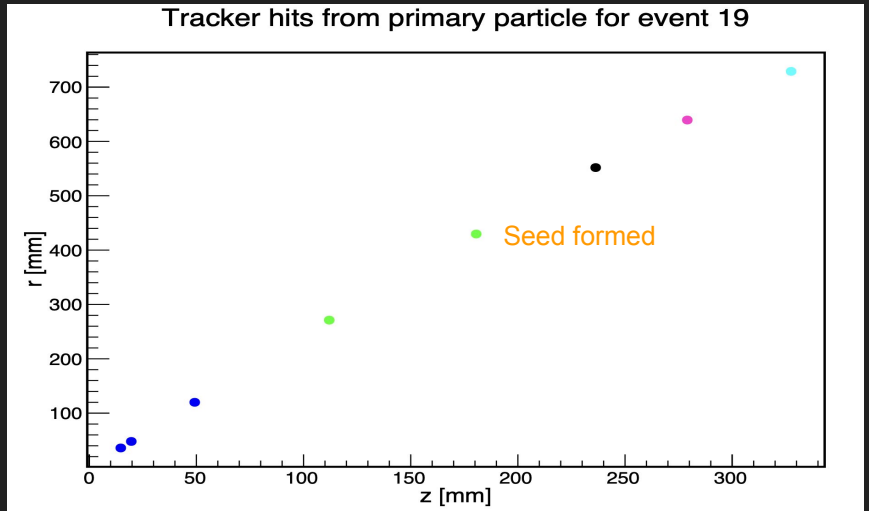
The inefficiency comes for p < 800 MeV

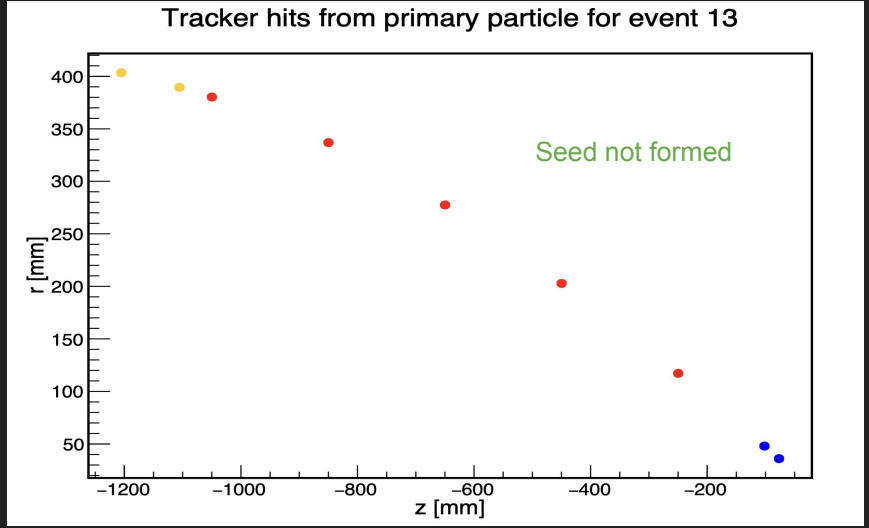
200-300MeV



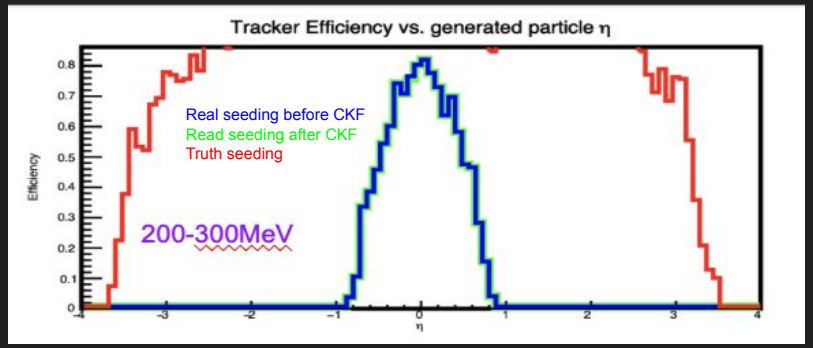
Event 13 meets all the requirements to form a seed!
However, seed is not formed

```
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
    float zMax = 1700. * Acts::UnitConstants::mm; // max z to look for hits to compose seeds
    float zMin = -1500. * Acts::UnitConstants::mm; // min z to look for hits to compose seeds
    float deltaRMinTopSP     = 10. * Acts::UnitConstants::mm; // Min distance in r between middle and top
SP in one seed
    float deltaRMaxTopSP     = 450. * Acts::UnitConstants::mm; // Max distance in r between middle and
top SP in one seed
    float deltaRMinBottomSP  = 10. * Acts::UnitConstants::mm; // Min distance in r between middle and
bottom SP in one seed
    float deltaRMaxBottomSP  = 200. * Acts::UnitConstants::mm; // Max distance in r between middle and
bottom SP in one seed
float cotThetaMax = 1.0 / tan(2. * atan(exp(-4.0))); // Cotangent of max theta angle (based on eta)
float minPt           = (100. * Acts::UnitConstants::MeV) / cotThetaMax;
```



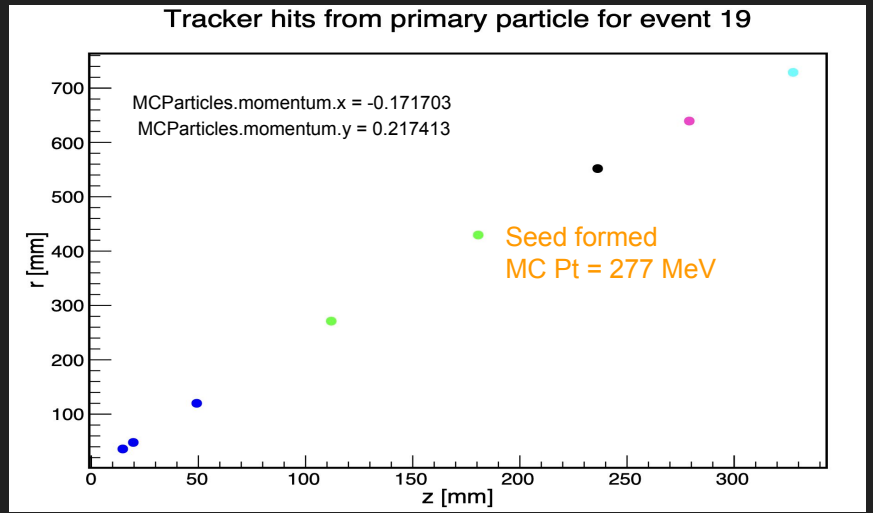


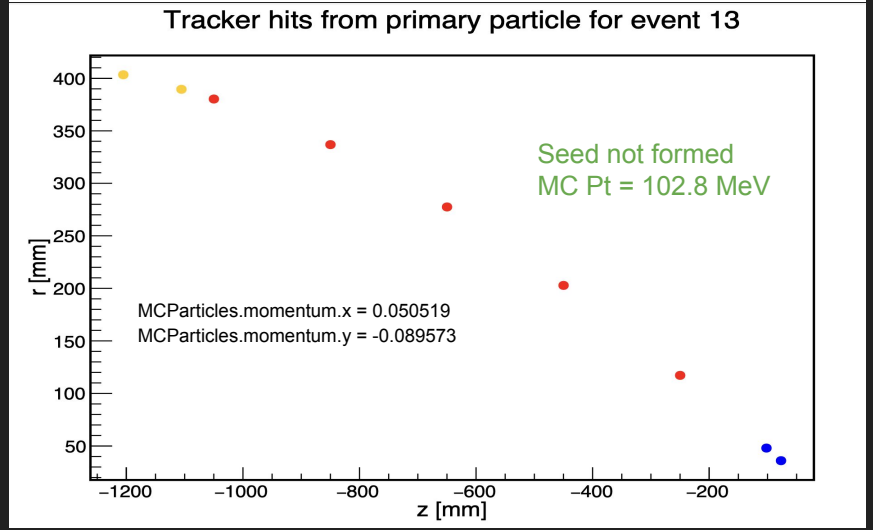
200-300MeV



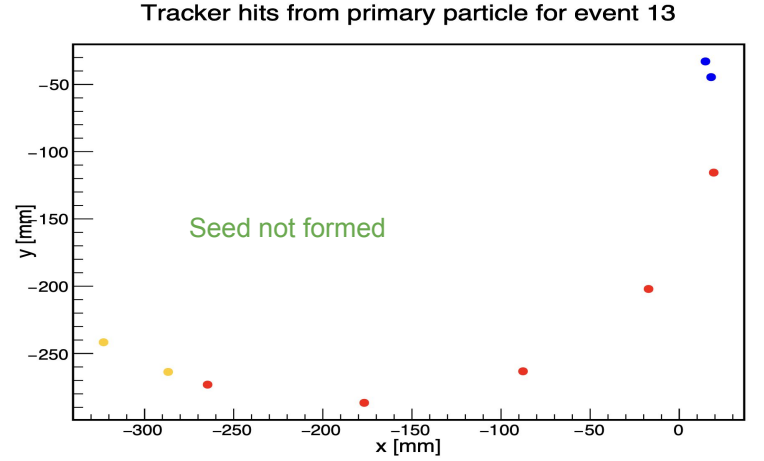
Event 13 meets all the requirements to form a seed!
However, seed is not formed its Pt is low

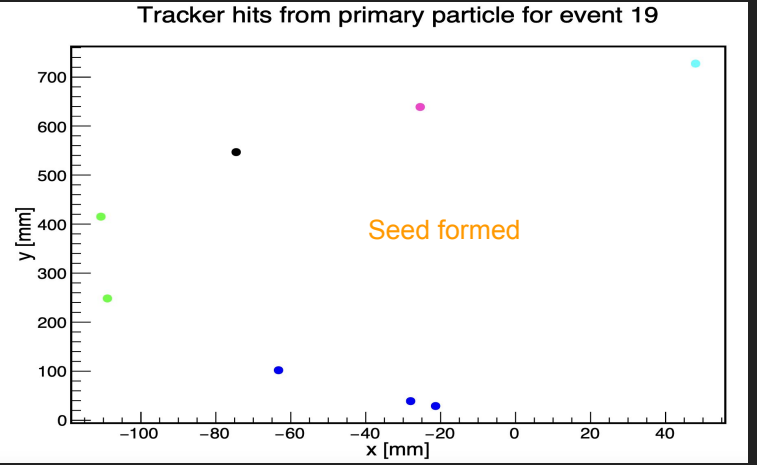
Observation:
Pt is high for seed forming events
Pt is low for seed not forming events





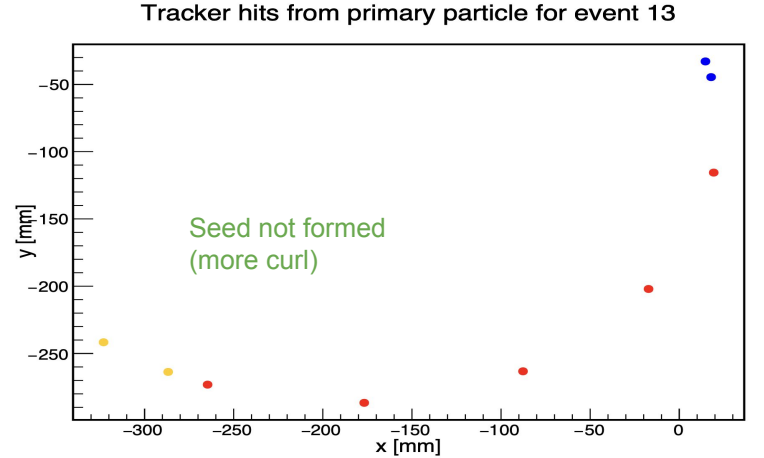
200-300MeV, x-y plot

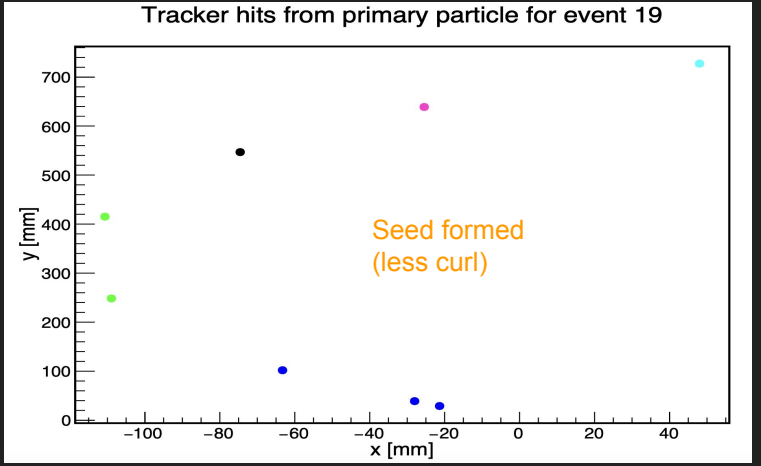


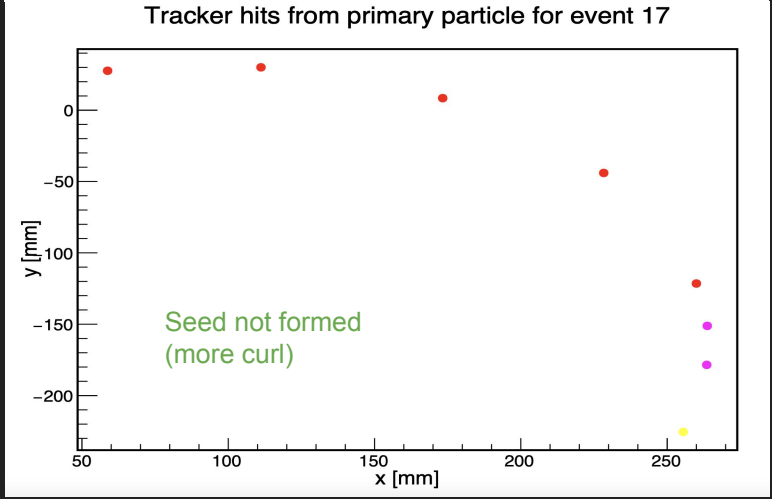


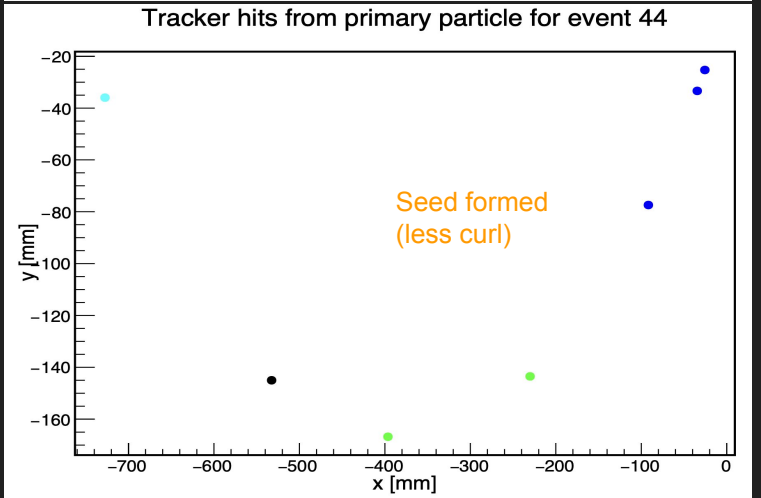
We hope to see if curl (on x-y plane) is also a criteria behind seed forming or not forming
But, curl is dependent on Pt!!
Event 13 (seed not formed) has more curl than event 19 (seed formed) as expected

200-300MeV, x-y plot

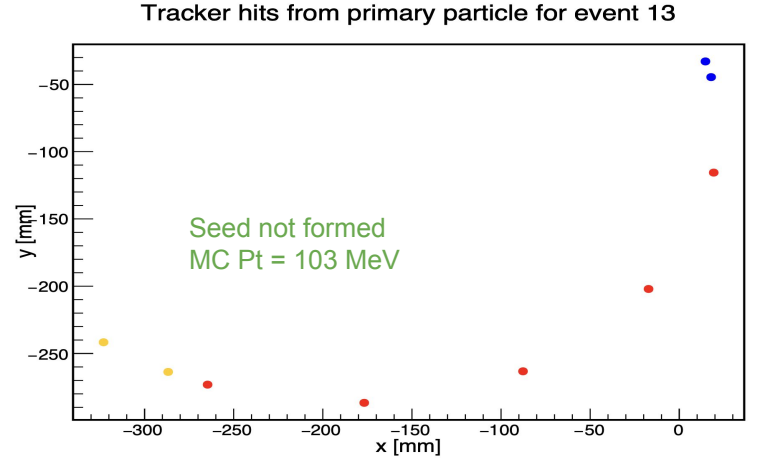


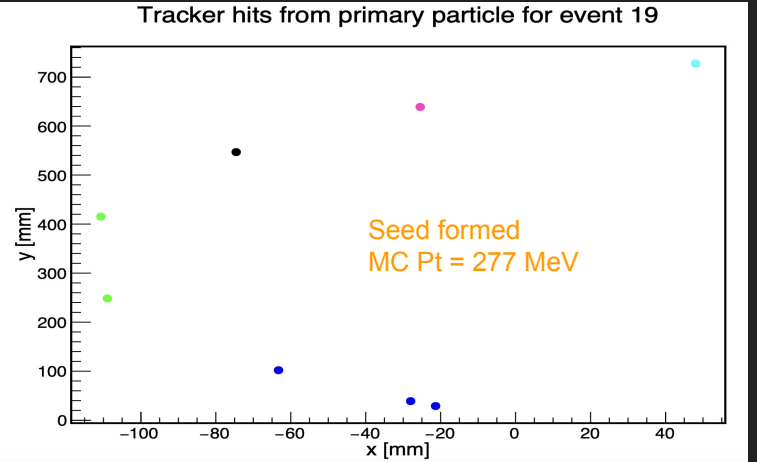


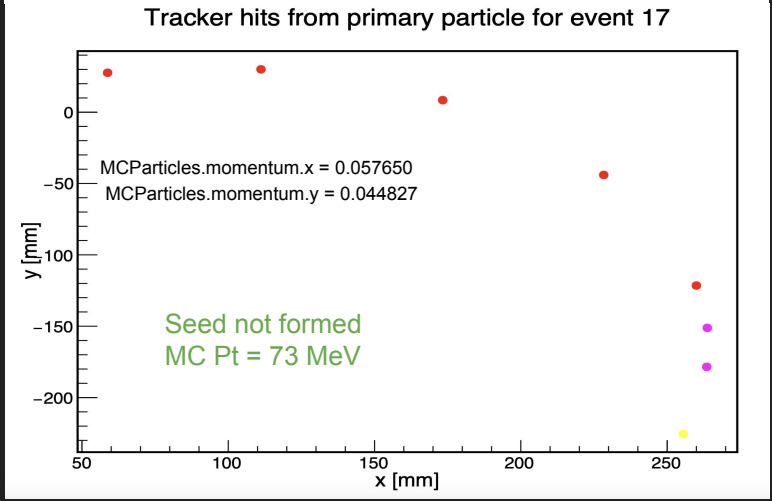


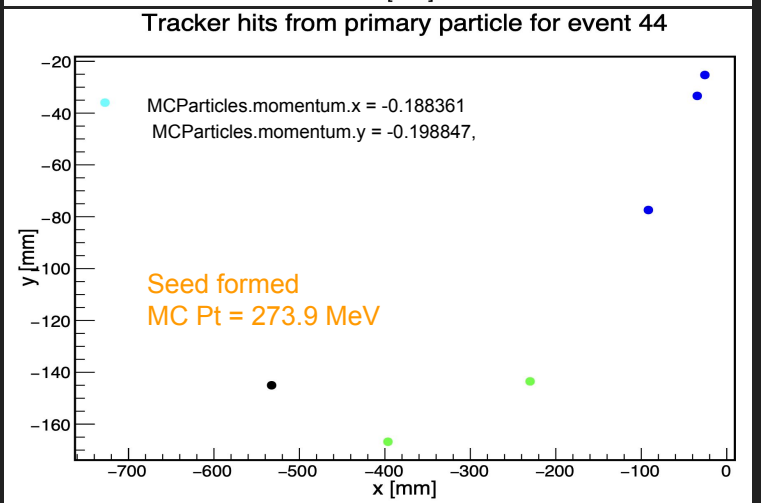


200-300MeV, x-y plot

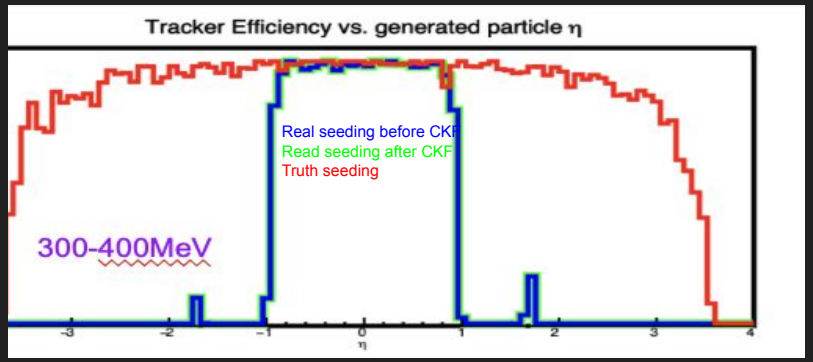


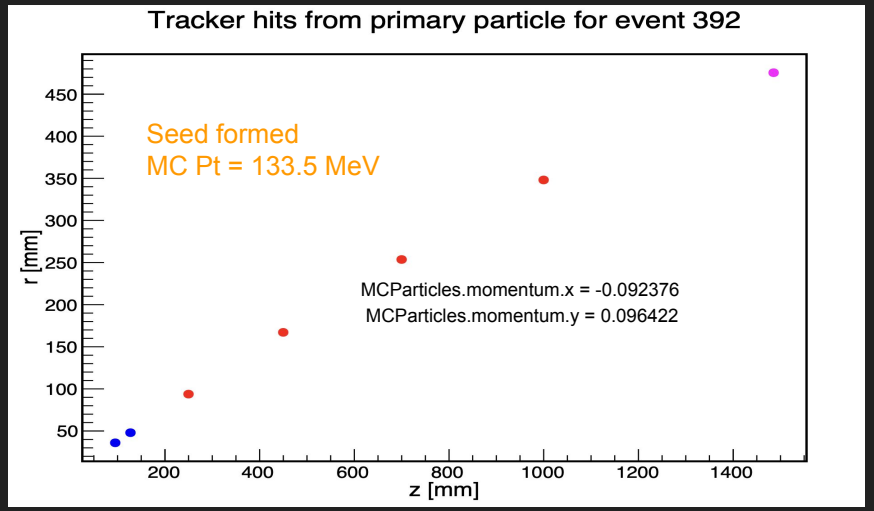




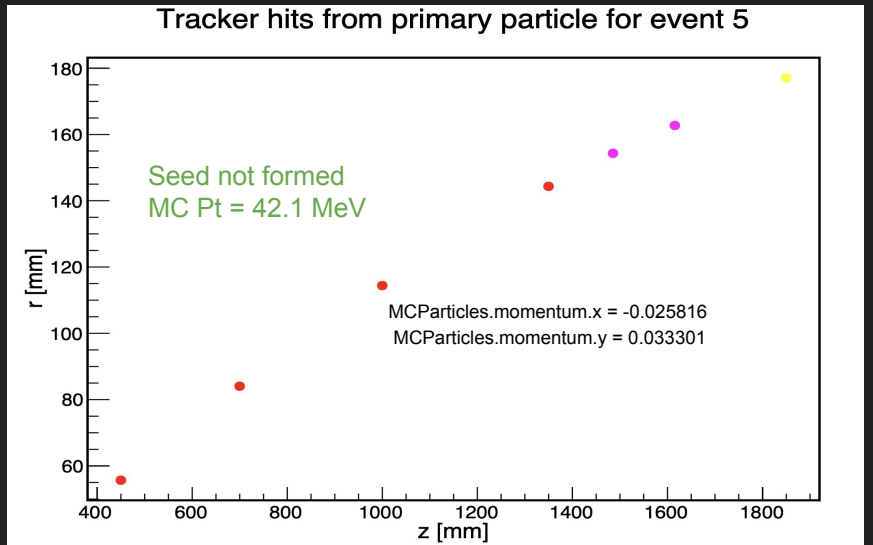


300-400MeV



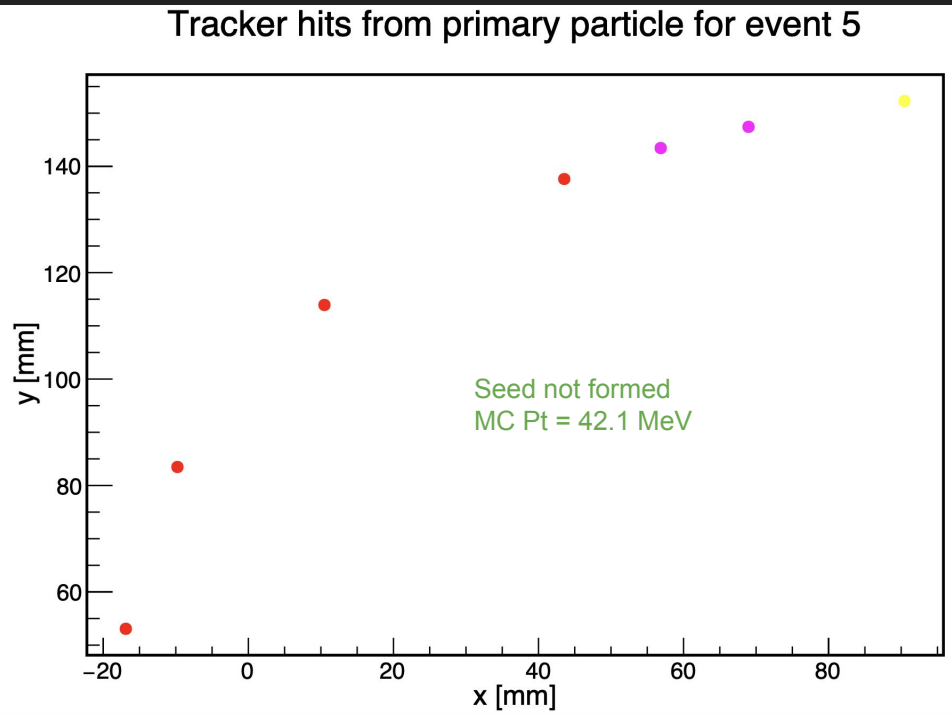


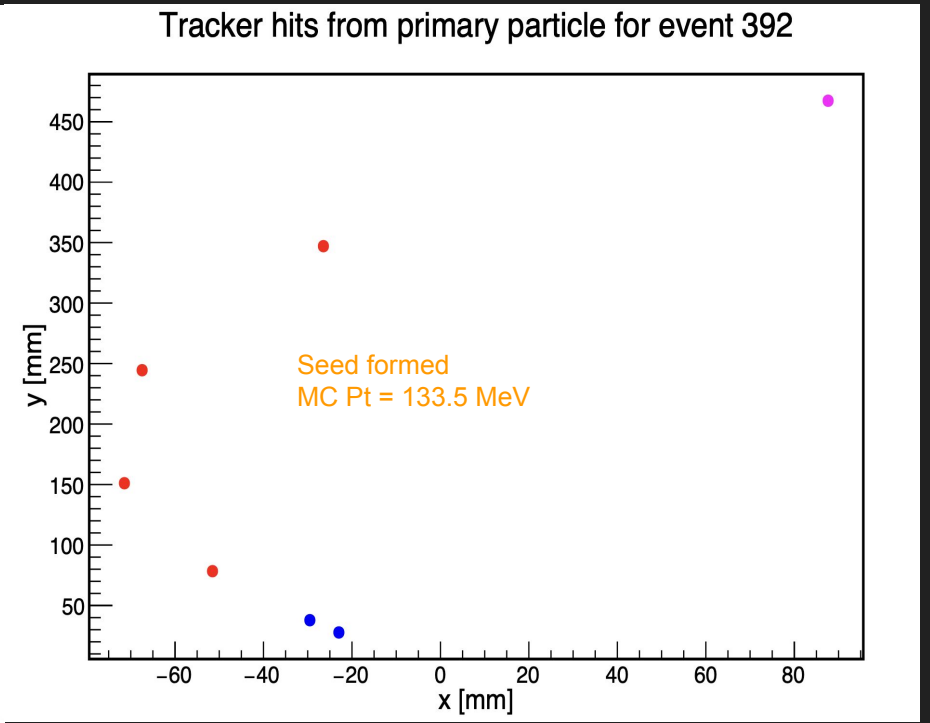
Same observation as before!!
Event 5 meets all the requirements to form a seed!
However,
its Pt is very low



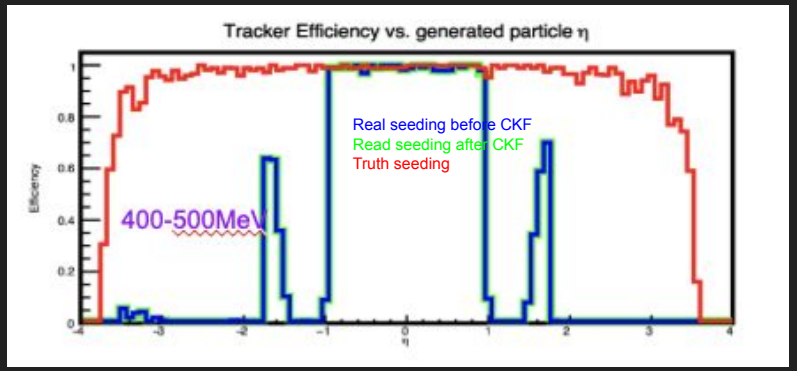
Observation:
Pt is high for seed forming events
Pt is low for seed not forming events

300-400MeV (x-y plot)



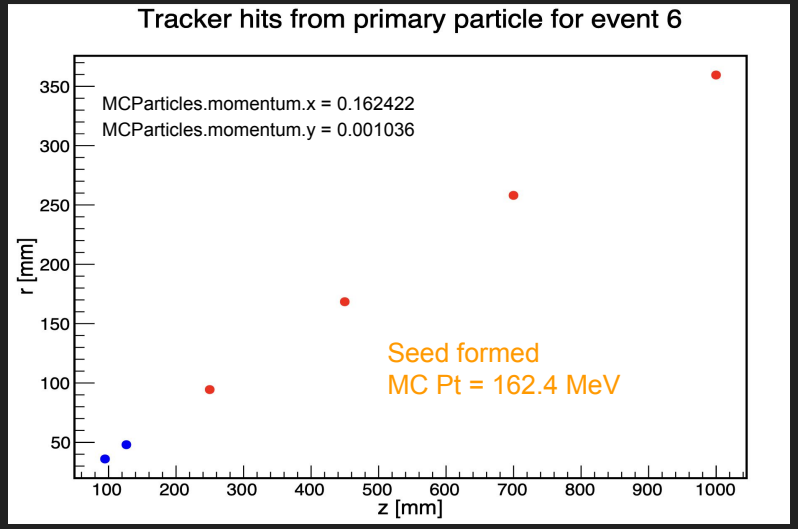


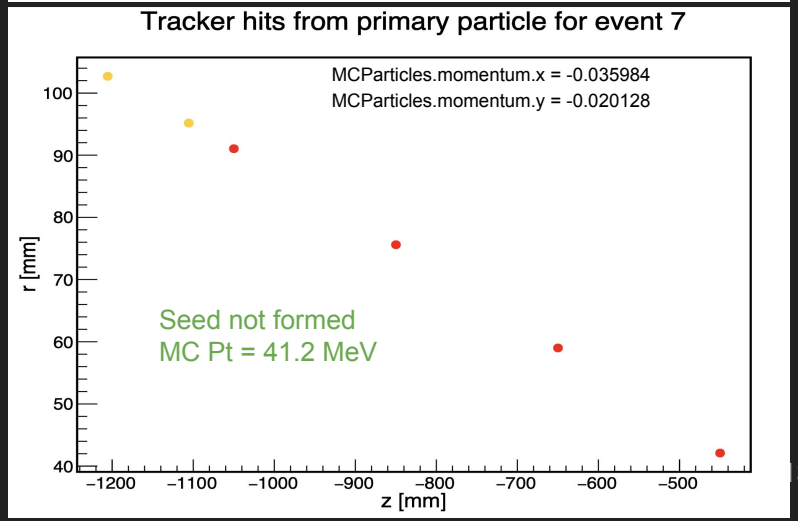
400-500MeV



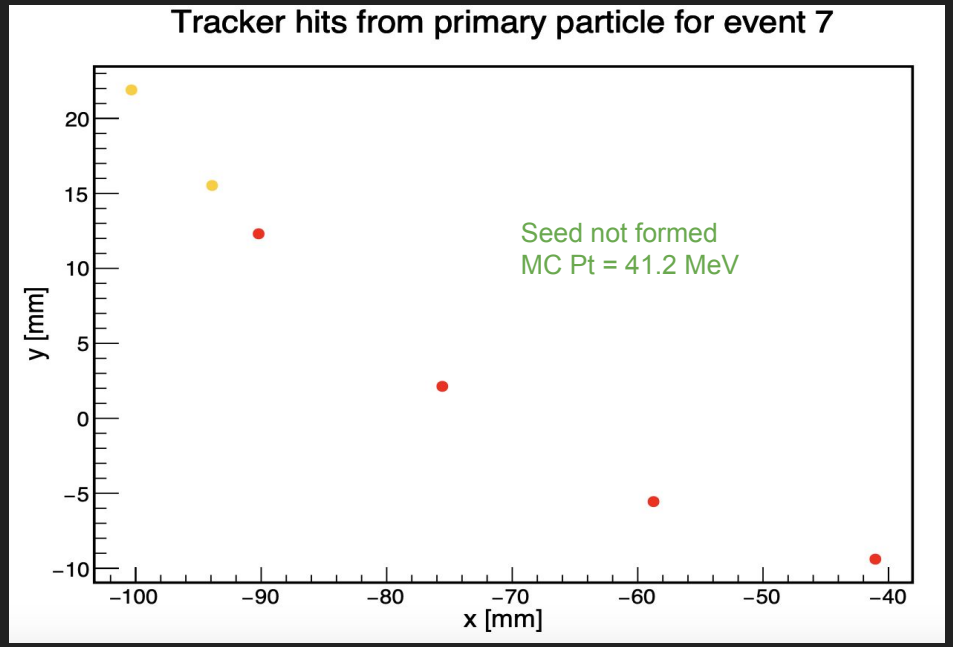
Same observation as before!!
Event 7 meets all the requirements to form a seed!
However,
its Pt is very low

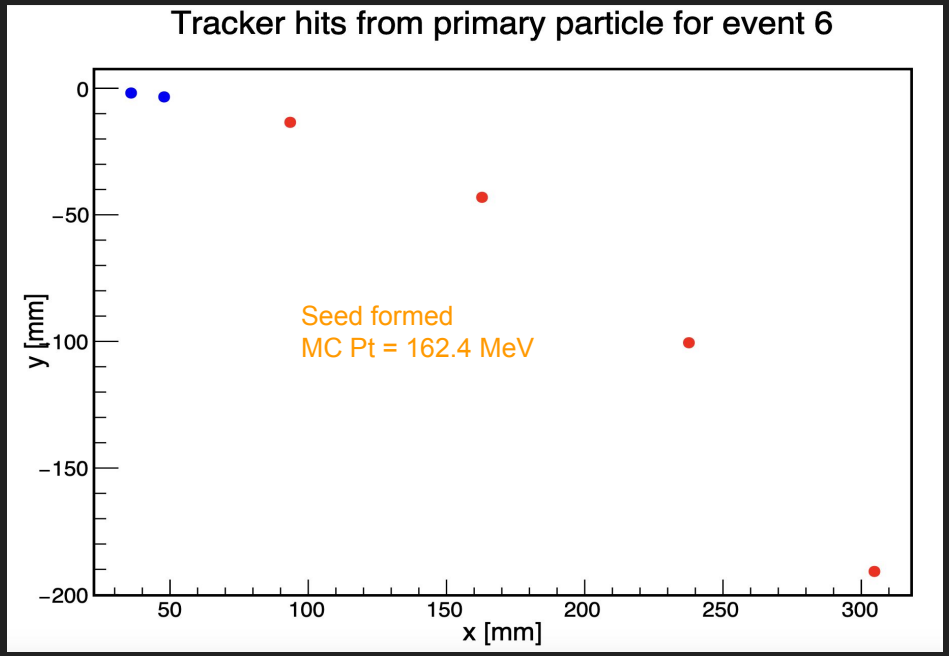
Observation:
Pt is high for seed forming events
Pt is low for seed not forming events





400-500MeV (x-y plot)





Conclusion:

For low momentum particle, it seems that it’s Pt is a defining criteria whether a seed will form or not

Numerically, it seems that if MC Pt < 100, we will not get a seed

Thank you!