

Tracking

Jeet, Barak

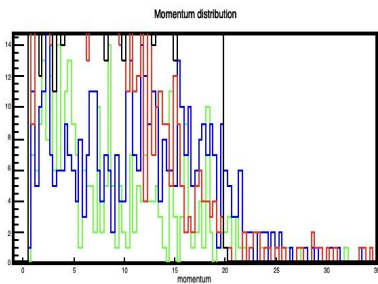
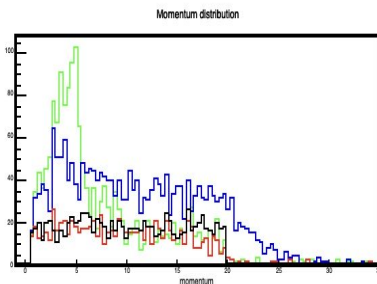
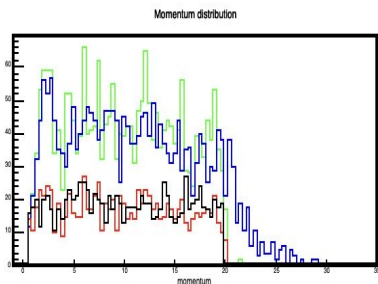
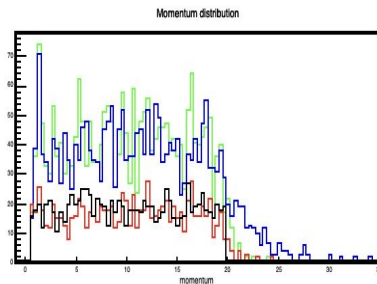
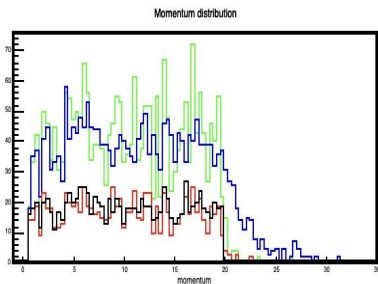
Simulation and Reconstruction of tracks

- Particle: muon
- Eta: -4 to 4
- Momentum Distribution: 0.5 GeV to 20 GeV (uniform)
- Vertex: (0,0,0), (0,0,10), (0,0,-10), (1,0,0), (10,0,0)
- Topics of study : reconstructions - real seeding before CKF, Real seeded tracking, truth seeded tracking
- Parameters studied:
 - momentum distribution, momentum resolution
 - theta distribution, theta resolution
 - phi distribution, phi resolution
 - Efficiency (vs eta, and vs phi)
 - Reconstructed DCA and z (vertices)
 - Number of tracks, charge reconstruction

Observations:

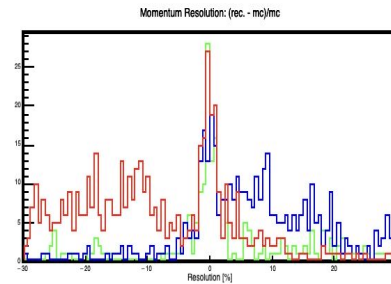
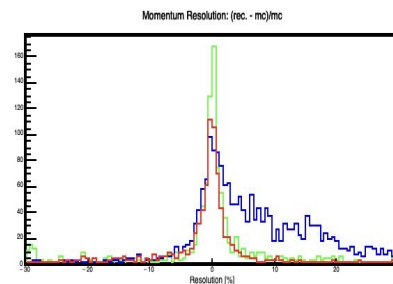
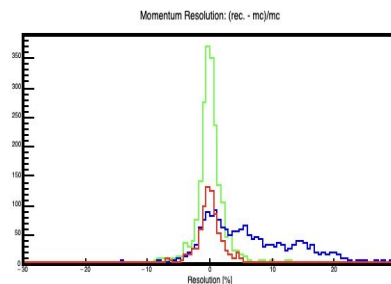
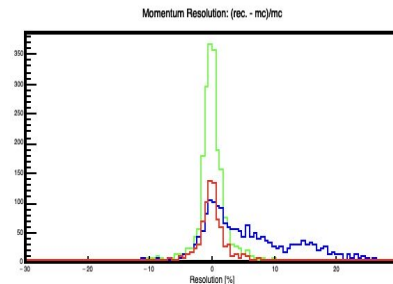
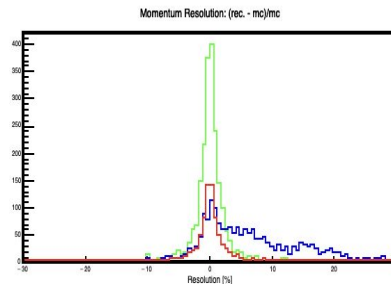
- Observation of momentum outside the input range is observed for real seeding before CKF.
- Phi distribution for real-seeding (before CKF) is asymmetric for $x = 1$, and for $x=10$, it becomes more like discrete.
- Momentum resolution, theta resolution and phi resolution get worse for truth seeded tracking as the vertex gets further away from the beam-axis.
- “Efficiency vs eta” and “Efficiency vs phi” get worse for both real-seeding before CKF, and after CKF.
- Truth-seed tracking trace back to input x values, while Real-seeded tracking trace to DCA.
- The reconstruction of z values gets worse for both real-seeded and truth seeded as the vertex gets further away from beam-axis
- Number of track decreases as vertex gets further away from beam-axis
- Positive charged particles were observed for $x=1$ (real seeding before CKF) and $x=10$ (real seeding before CKF, truth seeded tracking)

Momentum Distribution



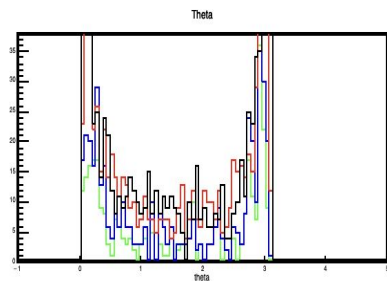
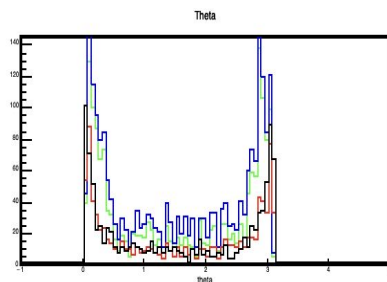
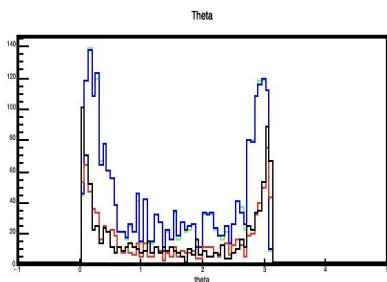
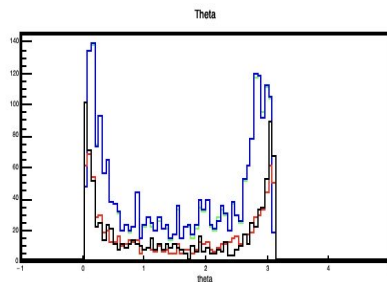
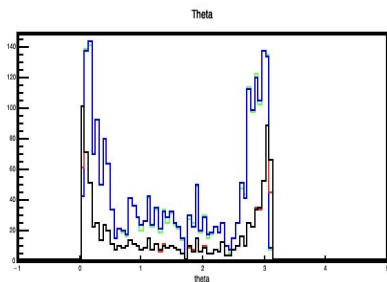
Single μ generated:
 $0.5 \text{ GeV}/c < P < 20 \text{ GeV}/c$
 $-4 < \eta < 4$
 Generated vertex: ... mm
 1) (0,0,0)
 2) (0,0,10)
 3) (0,0,-10)
 4) (1,0,0)
 5) (10,0,0)
 blue = Real seeding, before CKF
 red = Truth seeded tracking
 green = Real seeded tracking
 black = mc particle

Momentum Resolution



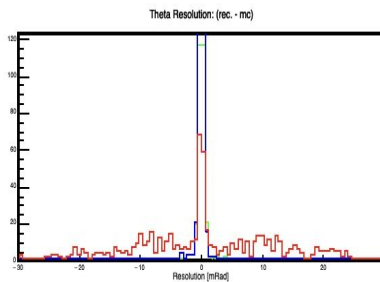
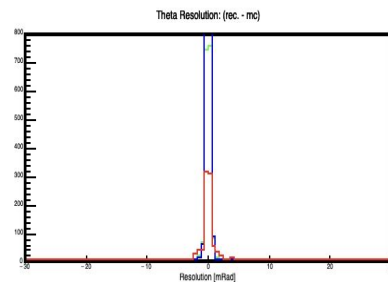
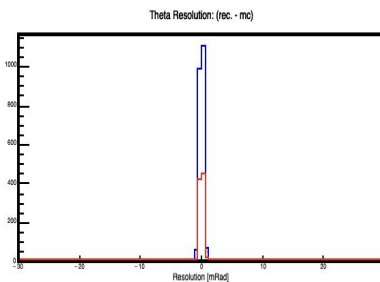
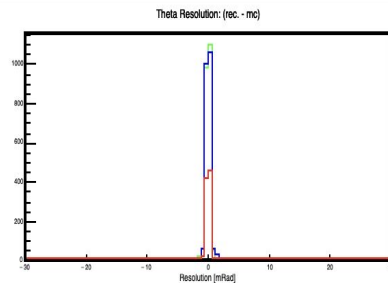
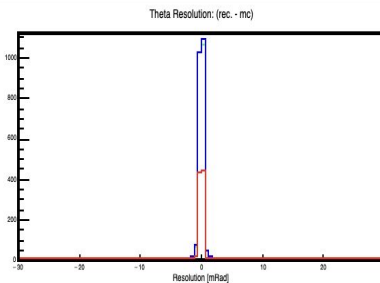
Single μ generated:
 $0.5 \text{ GeV}/c < P < 20 \text{ GeV}/c$
 $-4 < \eta < 4$
 Generated vertex: ... mm
 1) (0,0,0)
 2) (0,0,10)
 3) (0,0,-10)
 4) (1,0,0)
 5) (10,0,0)
 blue = Real seeding, before CKF
 red = Truth seeded tracking
 green = Real seeded tracking

Theta Distribution



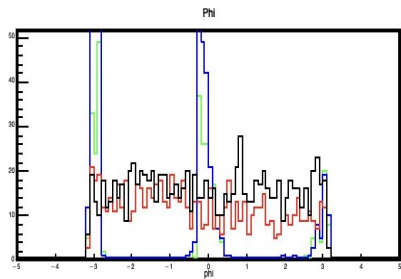
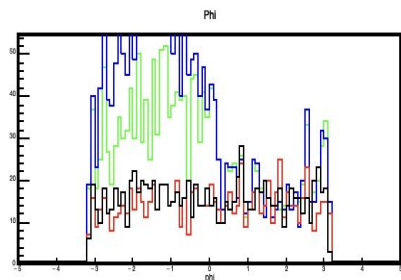
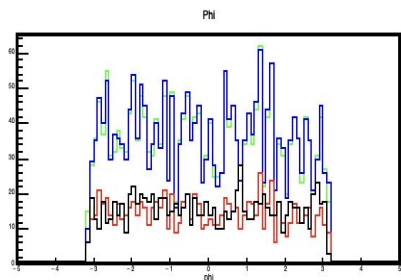
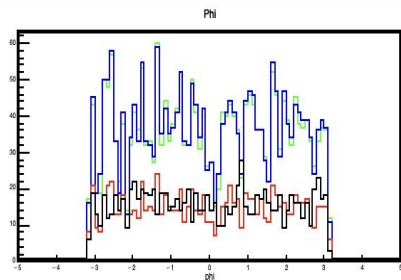
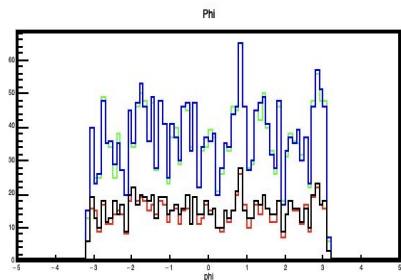
Single μ generated:
 $0.5 \text{ GeV}/c < P < 20 \text{ GeV}/c$
 $-4 < \eta < 4$
 Generated vertex: ... mm
 1) (0,0,0)
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 3) (0,0,-10)
 4) (1,0,0)
 5) (10,0,0)
 blue = Real seeding, before CKF
 red = Truth seeded tracking
 green = Real seeded tracking
 black = mc particle

Theta Resolution



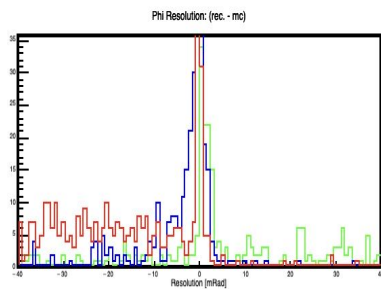
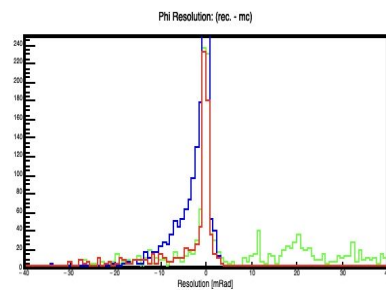
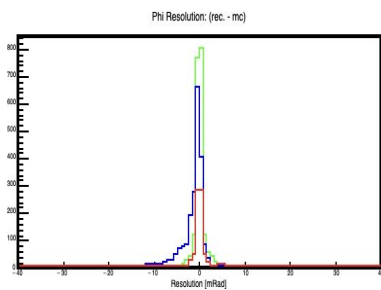
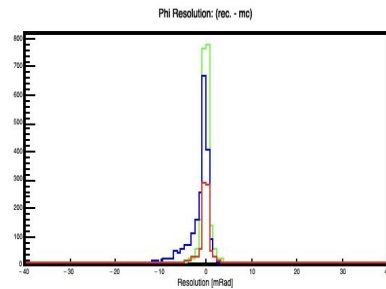
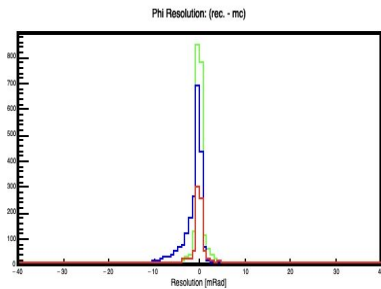
1) (0,0,0)
 2) (0,0,10)
 3) (0,0,-10)
 4) (1,0,0)
 5) (10,0,0)
 blue = Real seeding, before CKF
 red = Truth seeded tracking
 green = Real seeded tracking

Phi Distribution



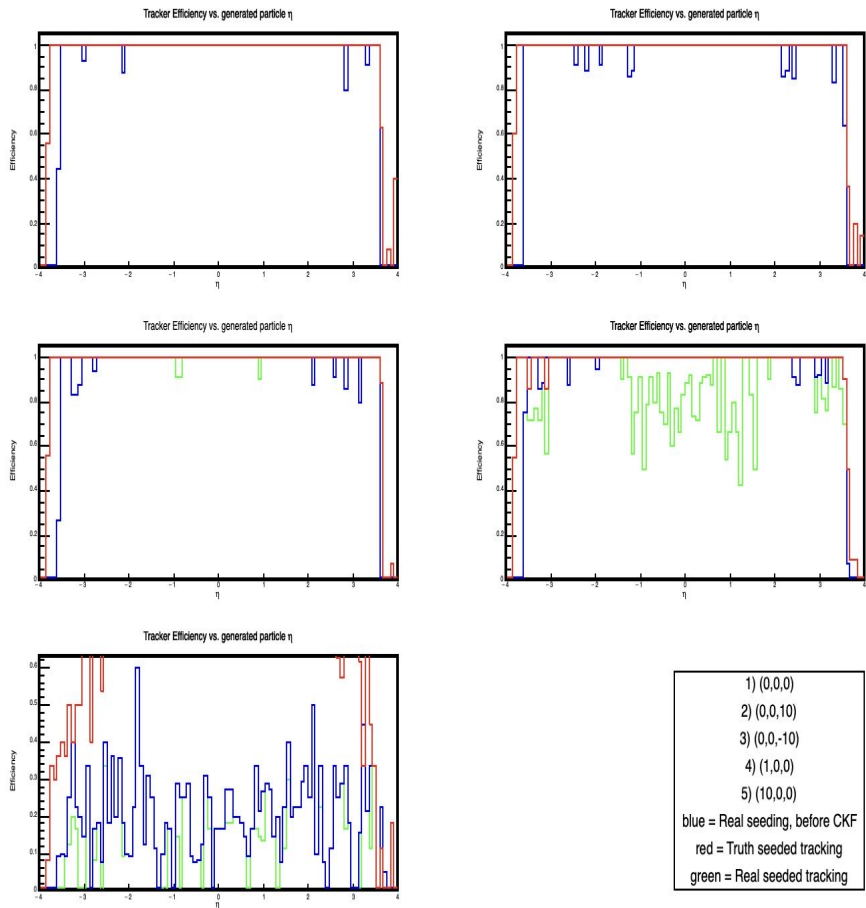
Single μ generated:
 $0.5 \text{ GeV}/c < P < 20 \text{ GeV}/c$
 $-4 < \eta < 4$
 Generated vertex: ... mm
 1) (0,0,0)
 2) (0,0,10)
 3) (0,0,-10)
 4) (1,0,0)
 5) (10,0,0)
 blue = Real seeding, before CKF
 red = Truth seeded tracking
 green = CKF with real seed
 black = Real seeded tracking

Phi Resolution

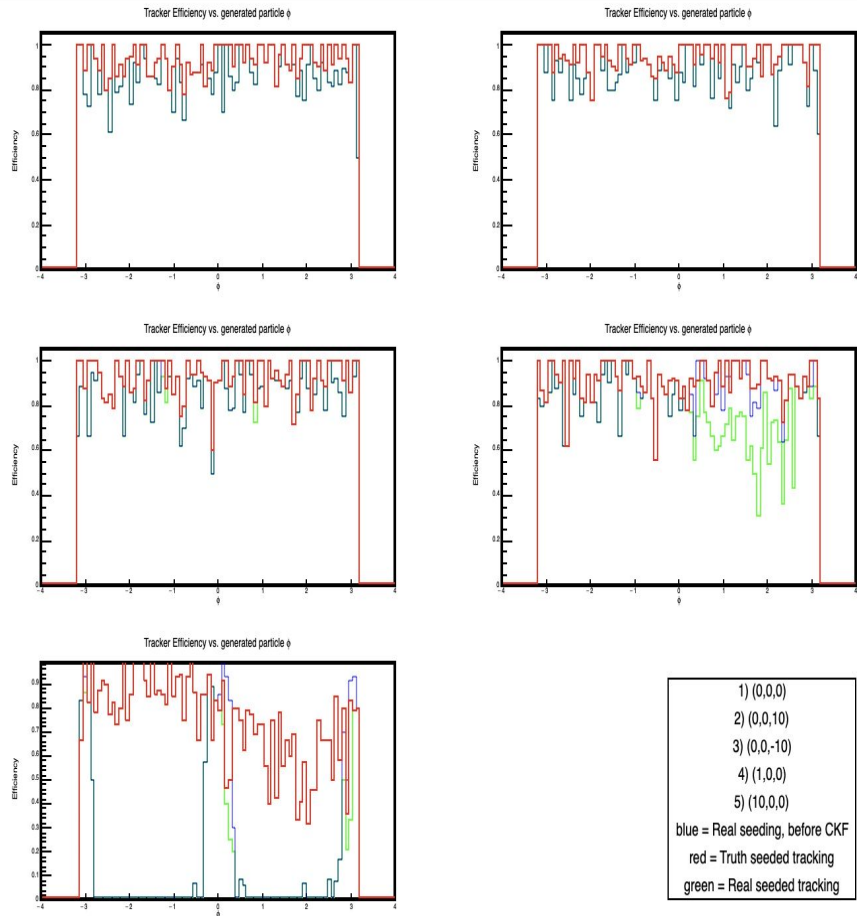


1) (0,0,0)
 2) (0,0,10)
 3) (0,0,-10)
 4) (1,0,0)
 5) (10,0,0)
 blue = Real seeding, before CKF
 red = Truth seeded tracking
 green = Real seeded tracking

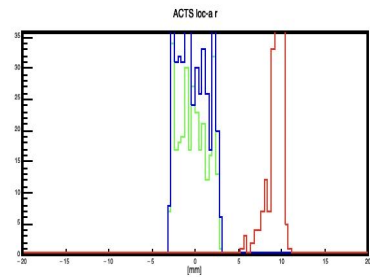
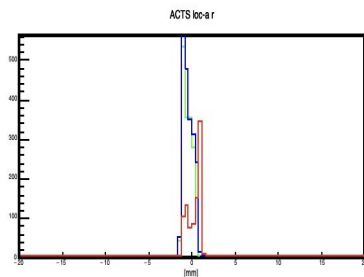
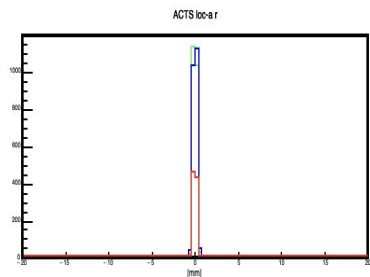
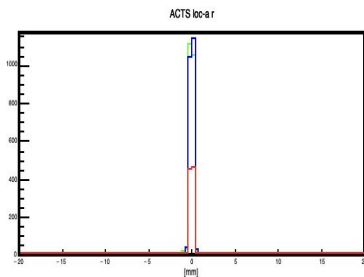
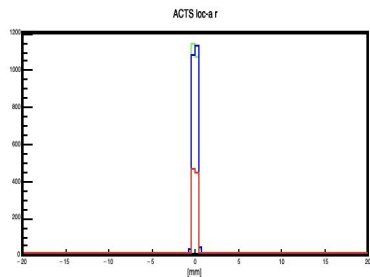
Efficiency vs eta



Efficiency vs phi

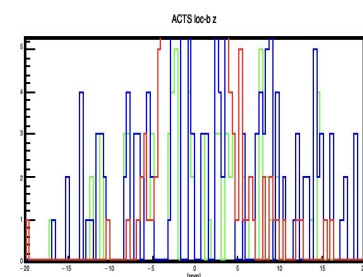
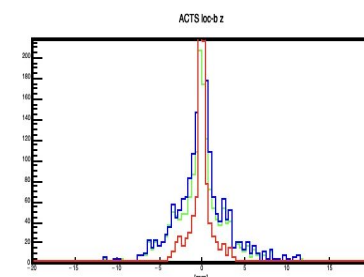
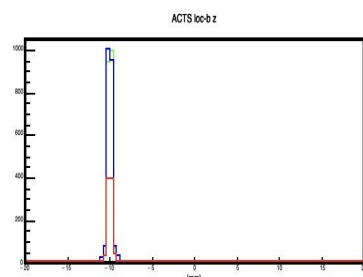
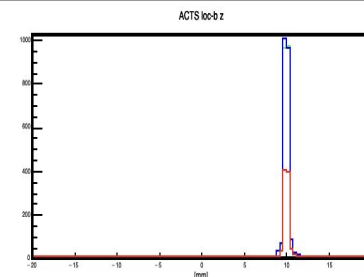
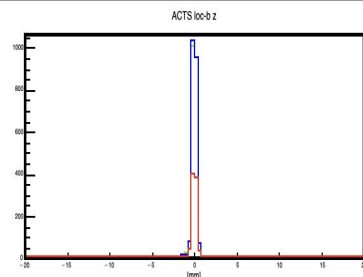


Acts loc-a (DCA, r)



1) (0,0,0)
2) (0,0,10)
3) (0,0,-10)
4) (1,0,0)
5) (10,0,0)
blue = Real seeding, before CKF
red = Truth seeded tracking
green = Real seeded tracking

Acts loc-b (z)



1) (0,0,0)
2) (0,0,10)
3) (0,0,-10)
4) (1,0,0)
5) (10,0,0)
blue = Real seeding, before CKF
red = Truth seeded tracking
green = Real seeded tracking

Other observations..

Number of unique tracks for (n=1000 events)

(0,0,0): 2097 (total = 2330)

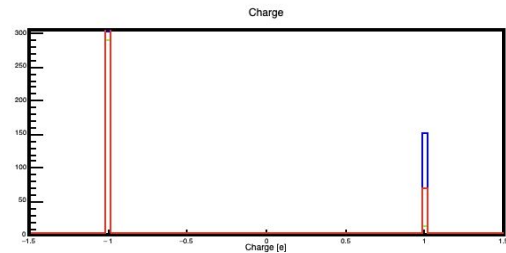
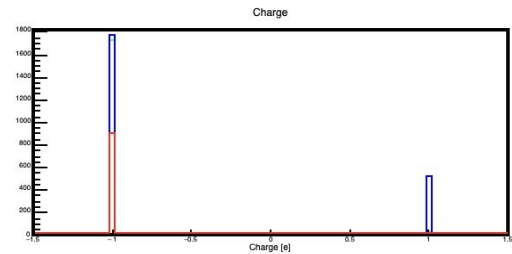
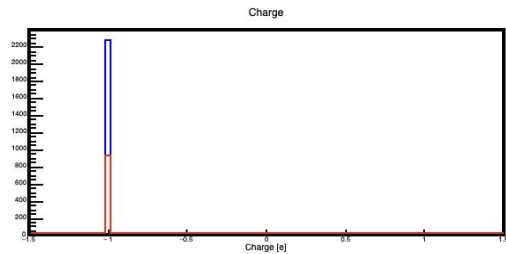
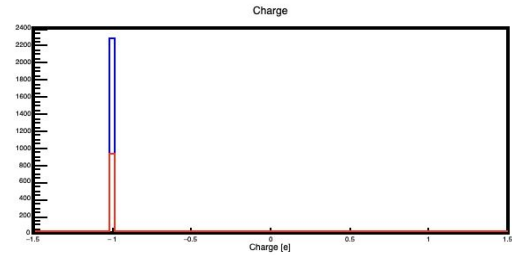
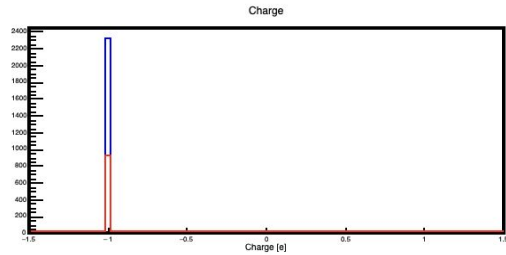
(0,0,10): 2064 (total = 2289)

(0,0,-10): 2065 (total = 2286)

(1,0,0): 719 (total = 1765)

(10,0,0): 106 (total = 304)

Charge reconstruction



1) (0,0,0)
2) (0,0,10)
3) (0,0,-10)
4) (1,0,0)
5) (10,0,0)
blue = Real seeding, before CKF
red = Truth seeded tracking
green = Real seeded tracking