Effects of changing the initial covariance matrix

(trackparam.setLocError({...}))
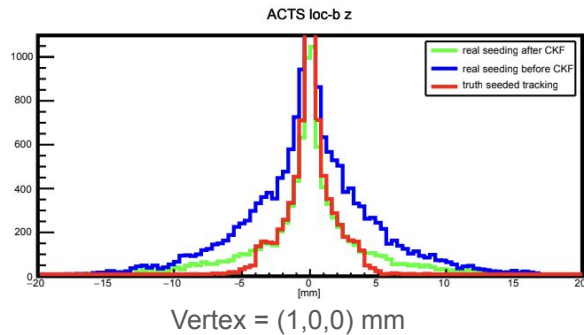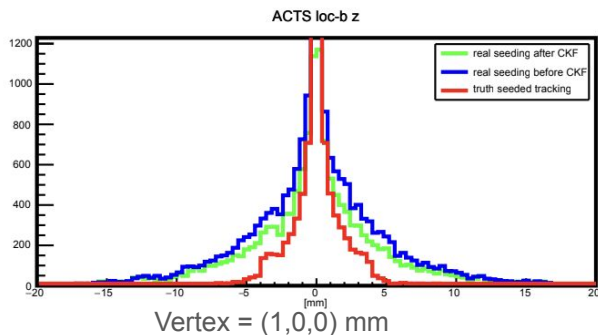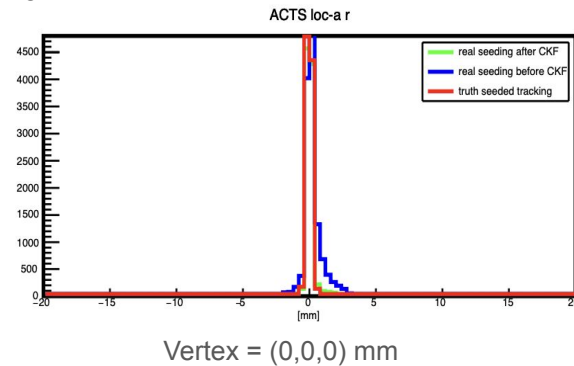
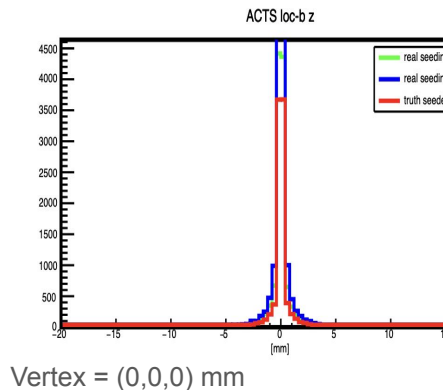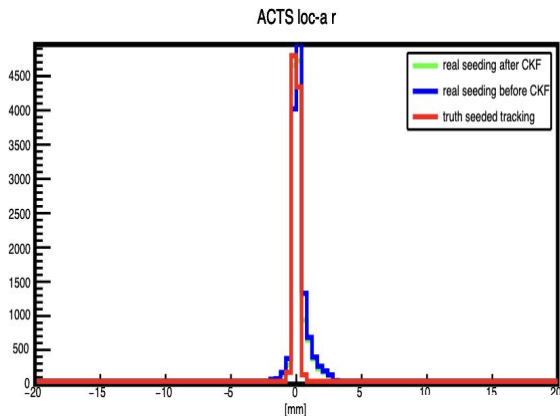Jeetendra Gupta
Barak Schmookler

Particle : muon
# of events = 10k
P = [0,20] GeV/c
Eta = [-4,4]
Phi = [0,2pi]
`epic_craterlake.xml`

Motivation behind studying/changing the covariance matrix (trackparam.setLocError({...}))

trackparam.setLocError({0.1,0.1})
We observe that loc a for real seeding (before and after CKF)
is asymmetric and has a resolution of more than 0.1 mm

trackparam.setLocError({1,1})
By changing the error to 1 mm, we observe a big
improvement in the loc a for real seeding after CKF.
It becomes symmetric and is almost same as that of truth
seeding

Vertex = (0,0,0) mm

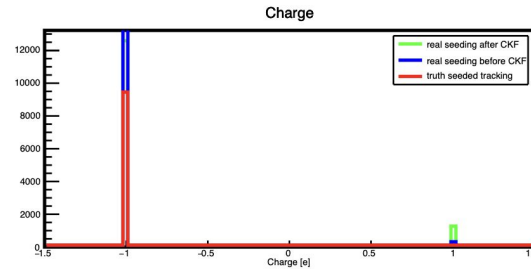Vertex = (0,0,0) mm

Vertex = (1,0,0) mm
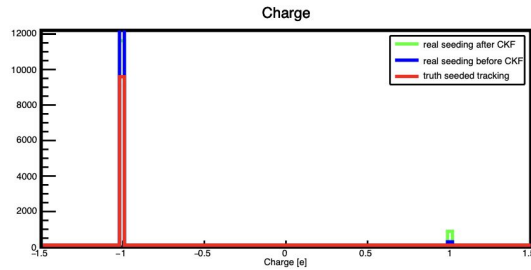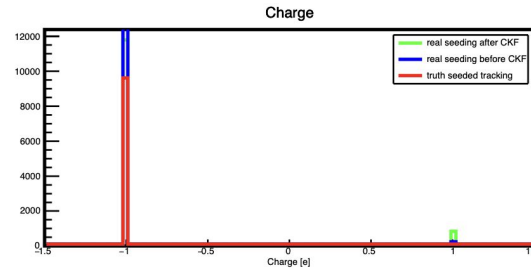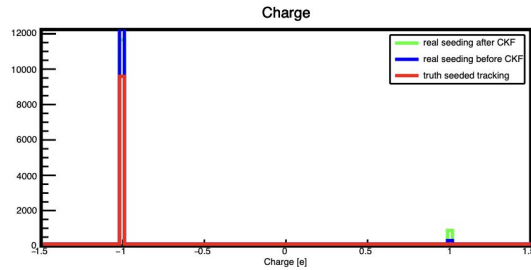

Vertex = (1,0,0) mm

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consequences

1) Improvement in charge calculation for real seeding after CKF

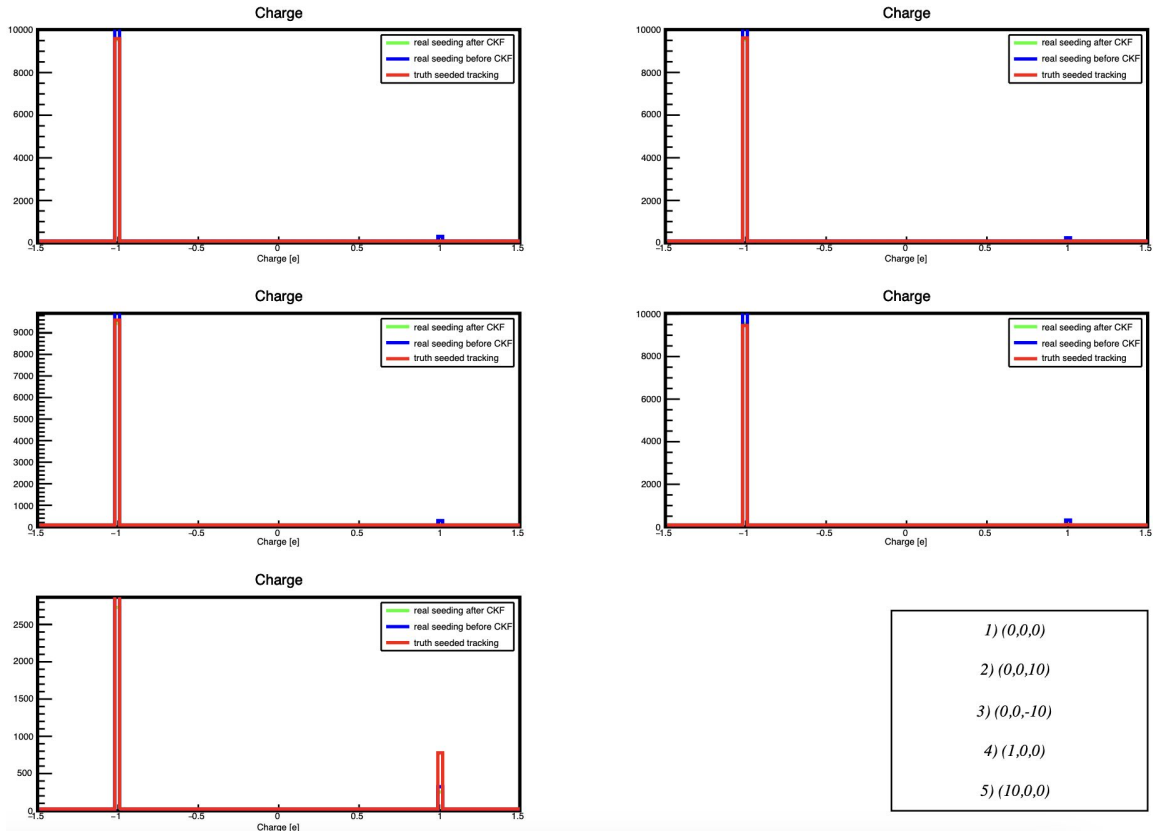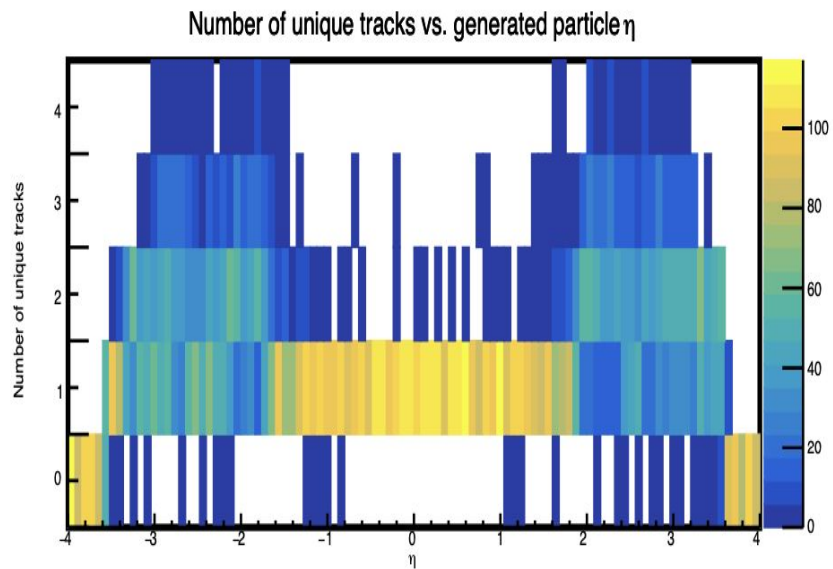wrong charge before and after CKF with two different covariance matrix

- before CKF
- After CKF (trackparam.setLocError({0.1,0.1}))
- After CKF (trackparam.setLocError({1,1}))
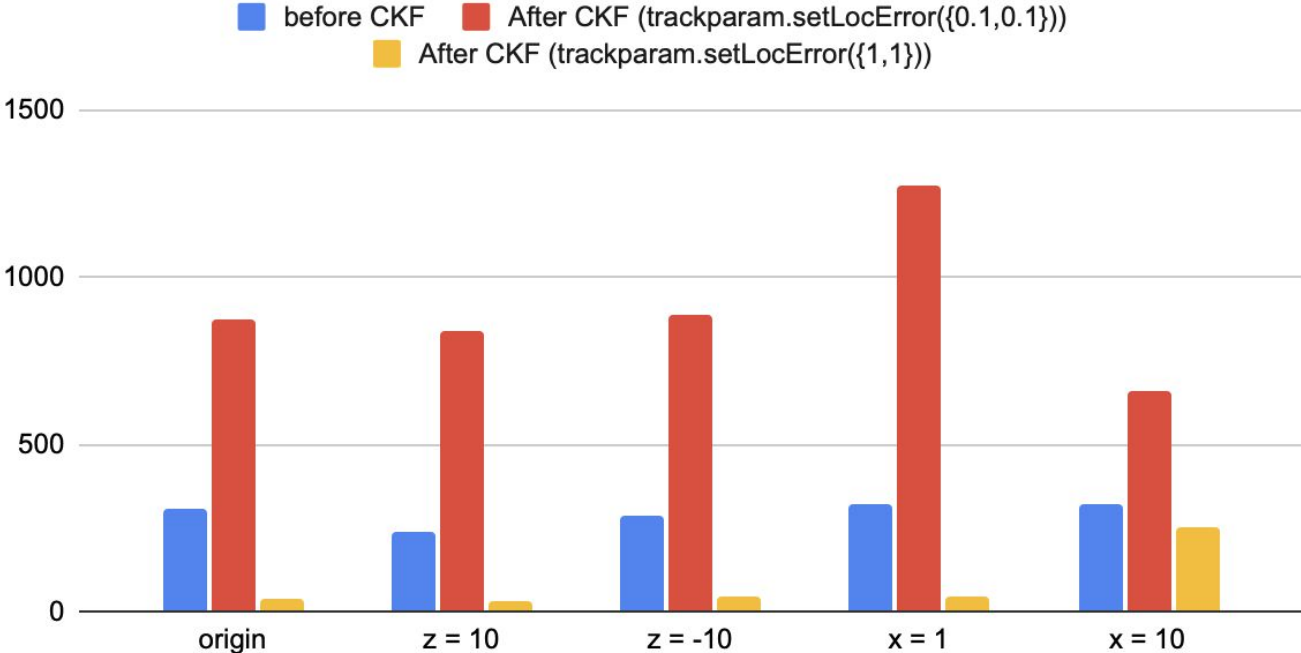
Before changing the covariance matrix
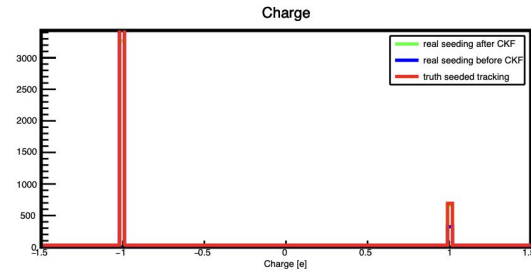
After changing the covariance matrix
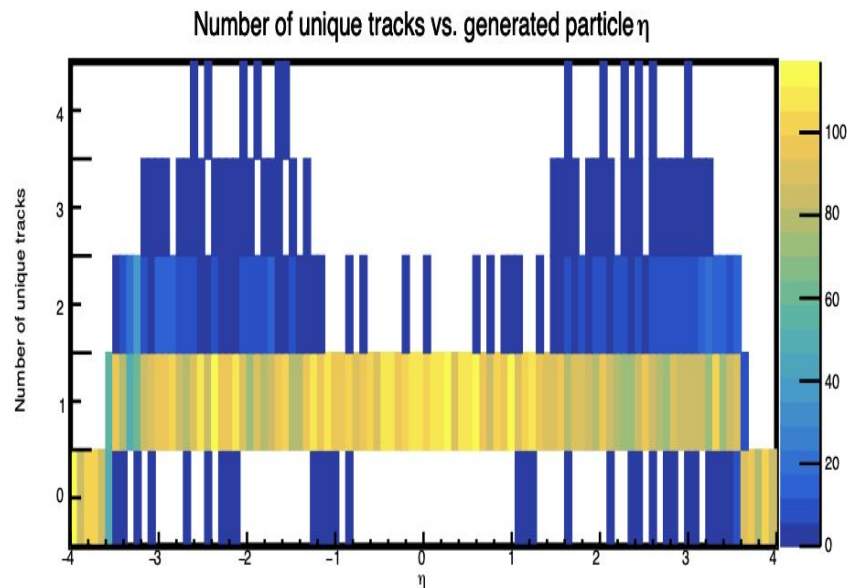
2) Improvement in unique tracks for real seeding after CKF (2 mrad angle cut)

trackparam.setLocError({0.1,0.1})

trackparam.setLocError({1,1})
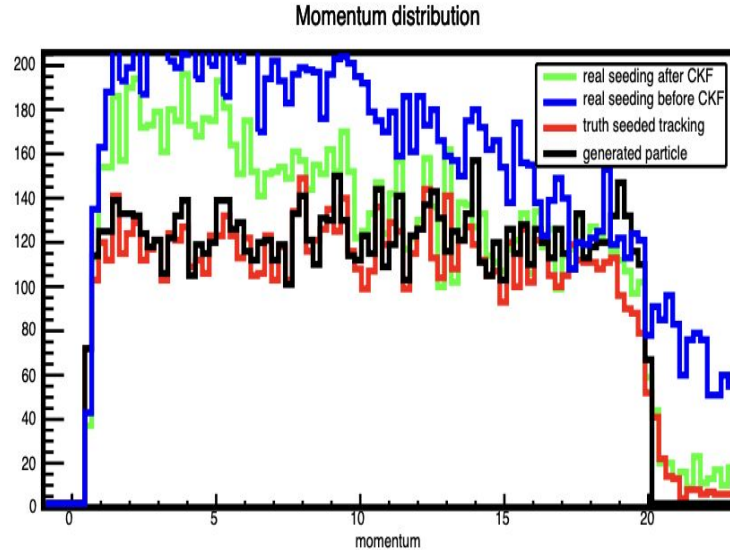More single unique tracks are observed

Vertex = (0,0,0) mm

Vertex = (0,0,0) mm

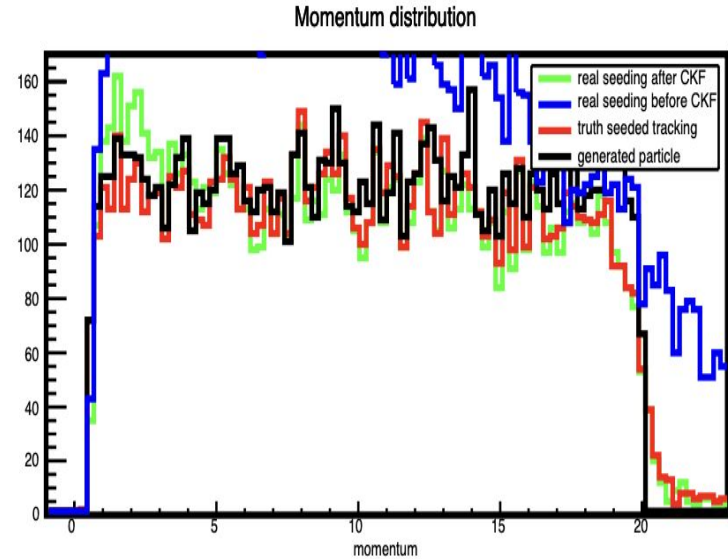# 3) Improvement in Momentum distribution for real seeding after CKF (2 mrad angle cut)

trackparam.setLocError({0.1,0.1})

trackparam.setLocError({1,1})
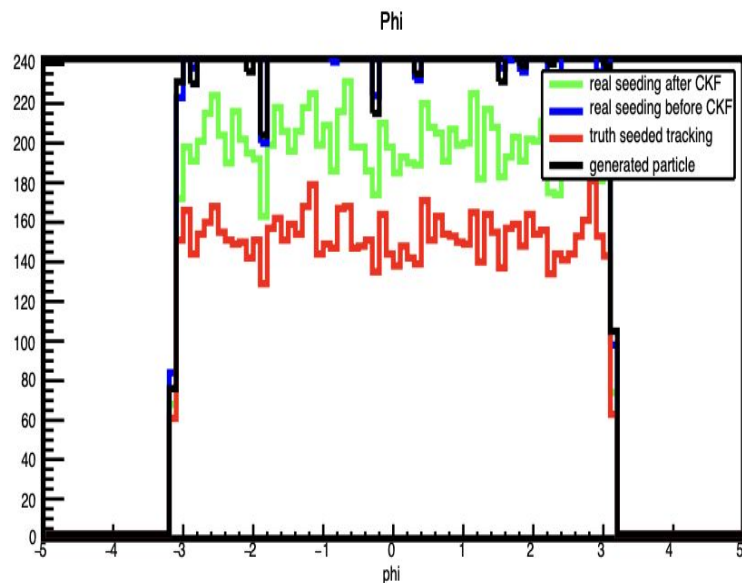Momentum distribution looks more uniform now for real seeding after CKF, especially in low momentum region

Vertex = (0,0,0) mm

Vertex = (0,0,0) mm

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4) Improvement in Phi distribution for real seeding after CKF (2 mrad angle cut)
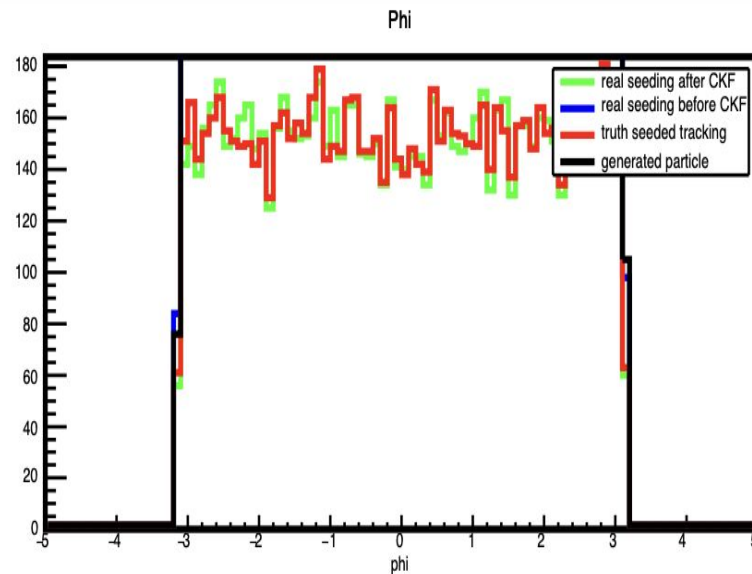
trackparam.setLocError({0.1,0.1})

Vertex = (0,0,0) mm
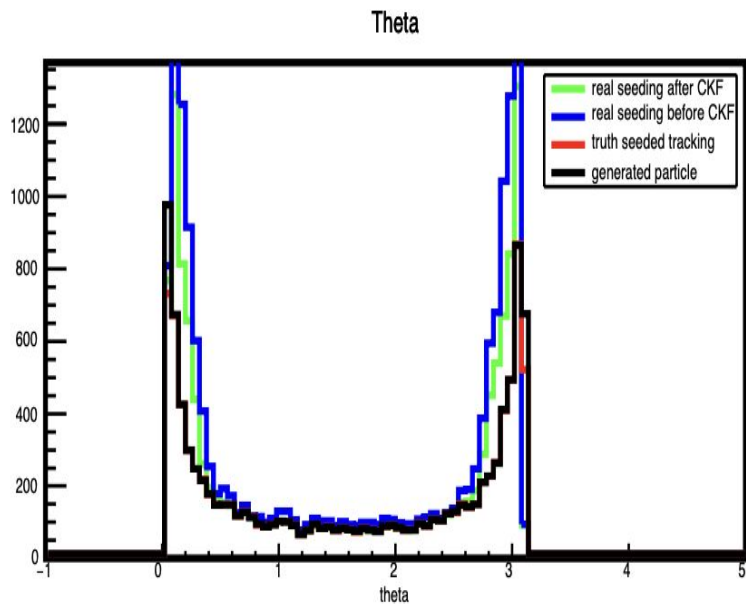
trackparam.setLocError({1,1})
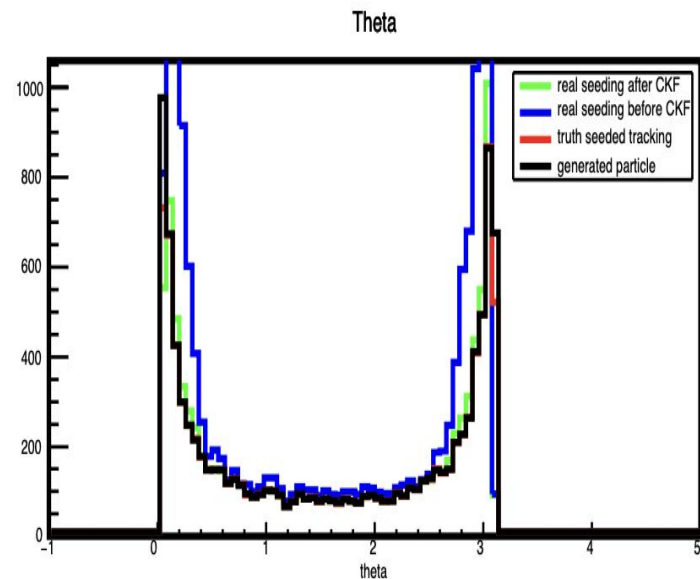Phi distribution for real seeding after CKF also improves

Vertex = (0,0,0) mm

5) Improvement in Theta distribution for real seeding after CKF (2 mrad angle cut)

trackparam.setLocError({0.1,0.1})

trackparam.setLocError({1,1})
Theta distribution also becomes better for real seeding after CKF

Vertex = (0,0,0) mm
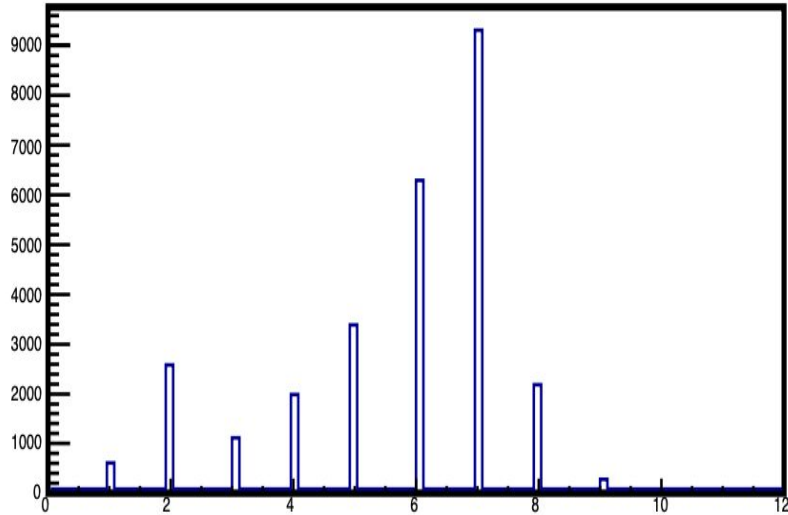
Vertex = (0,0,0) mm

Working progress

trackparam.setLocError({0.1,0.1})
More tracks with 2 measurements are observed
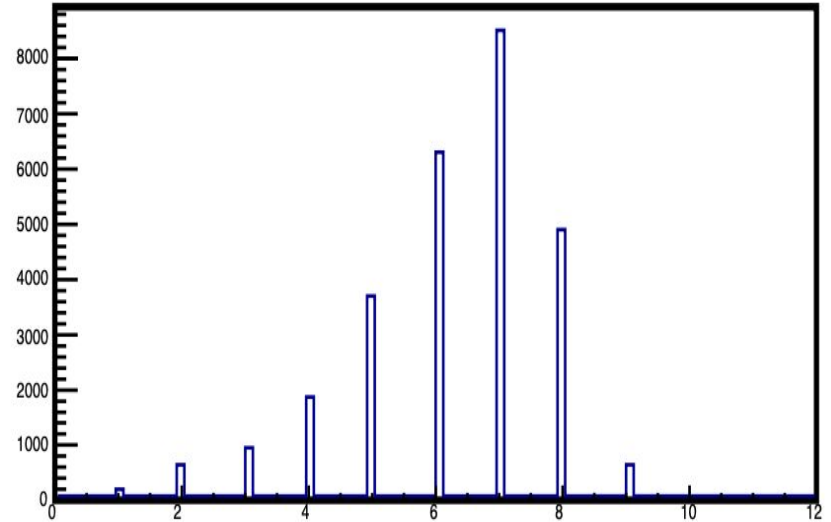
trackparam.setLocError({1,1})
Less tracks with 2 measurements are observed
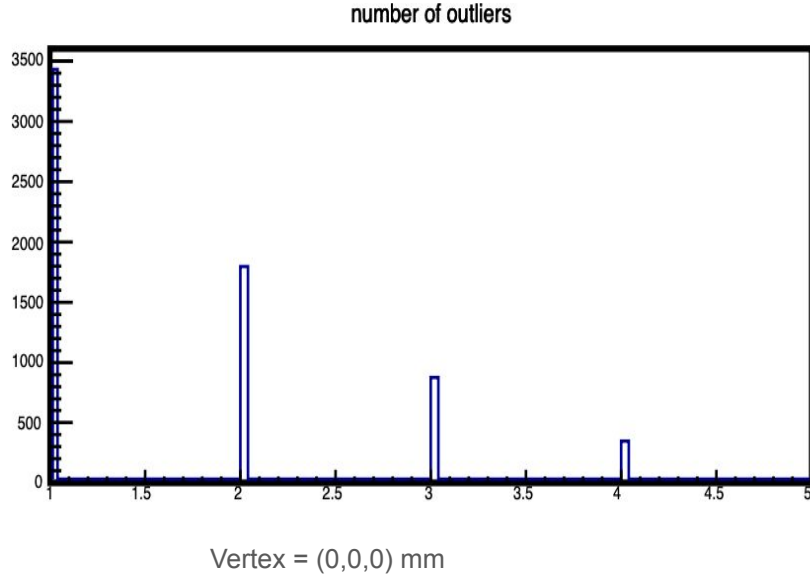

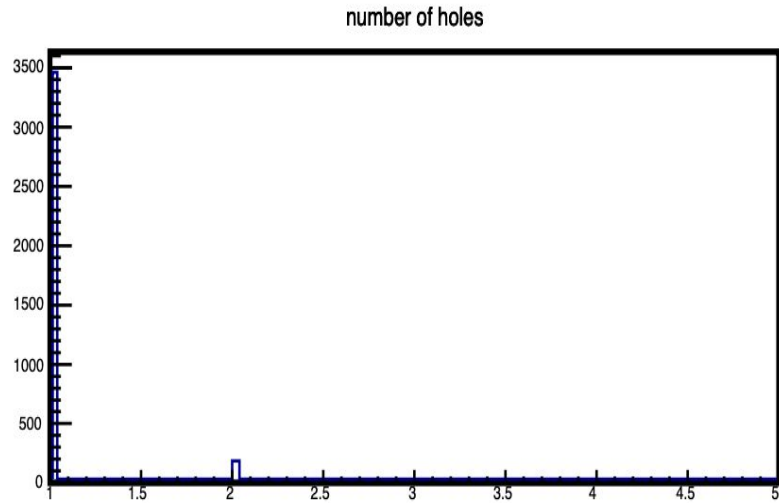number of measurements

Vertex = (0,0,0) mm

number of measurements

Vertex = (0,0,0) mm
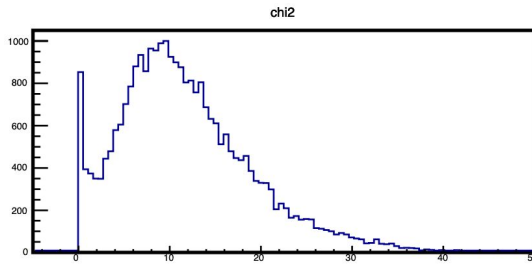
Number of outliers

trackparam.setLocError({0.1,0.1})

trackparam.setLocError({1,1})

Vertex = (0,0,0) mm

Vertex = (0,0,0) mm

trackparam.setLocError({0.1,0.1})

trackparam.setLocError({1,1})

number of holes

Vertex = (0,0,0) mm
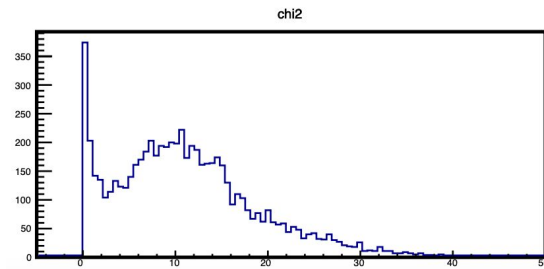
number of holes
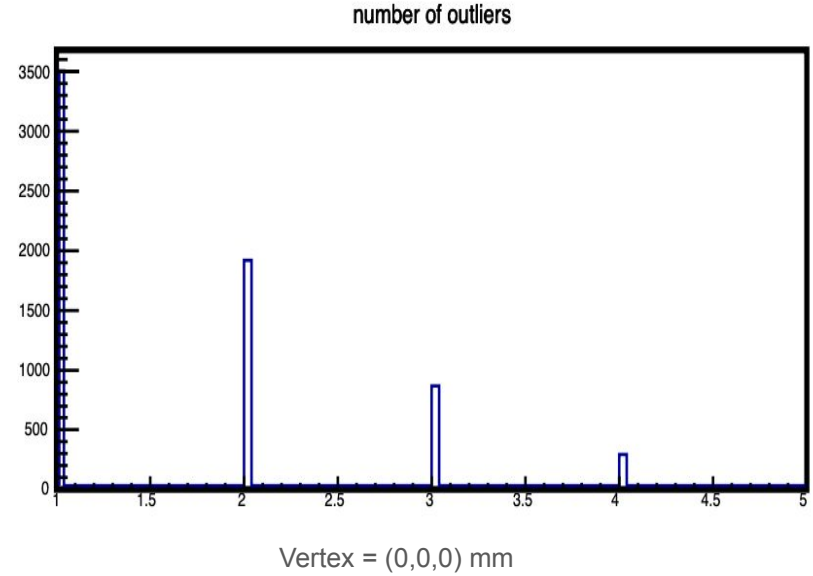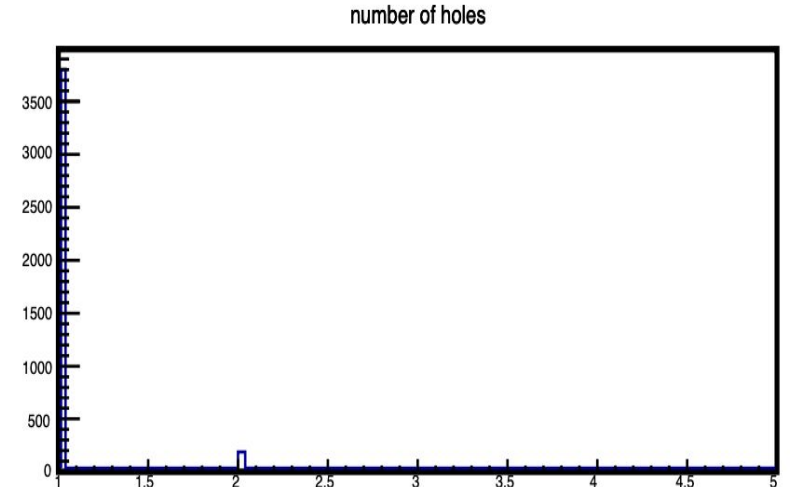
Vertex = (0,0,0) mm

Chi2

trackparam.setLocError({0.1,0.1})
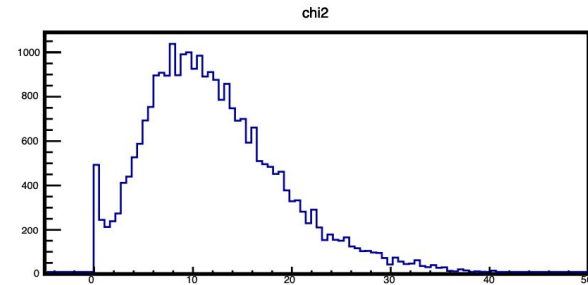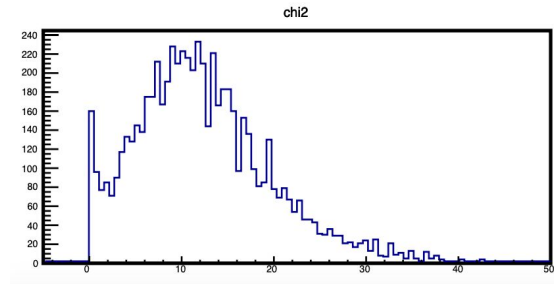

Vertex = (0,0,0) mm

Vertex = (10,0,0) mm

trackparam.setLocError({1,1})

Vertex = (0,0,0) mm

Vertex = (10,0,0) mm

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