Direction calculation fine tuning

2024-10-29

Asa Nehm

Direction calculation in reconstruction

- Direction vector at start

  - Calculated from first to x^{th} hit in full track in reconstruction

    - Currently: 1st to 10th hit

  - Needs to be properly tuned to contain correct information

- Compare this to the true track momentum which yields the direction

- Comparison via direction angles in xz and yz

  - $\theta = \text{atan}(x\,/\,z)$ or $\theta = \text{atan}(y\,/\,z)$
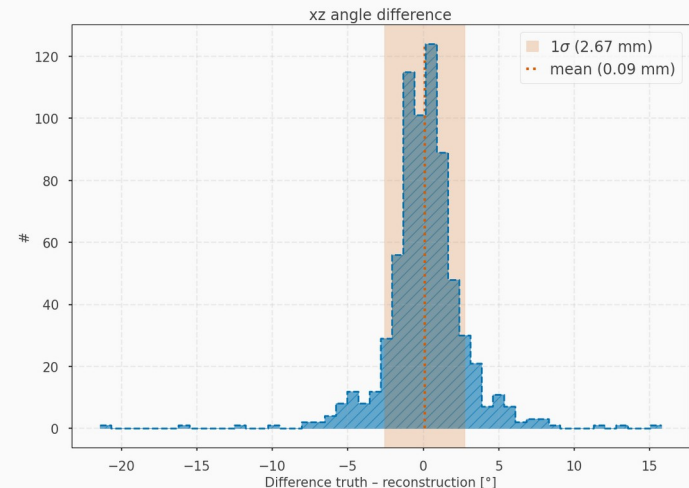
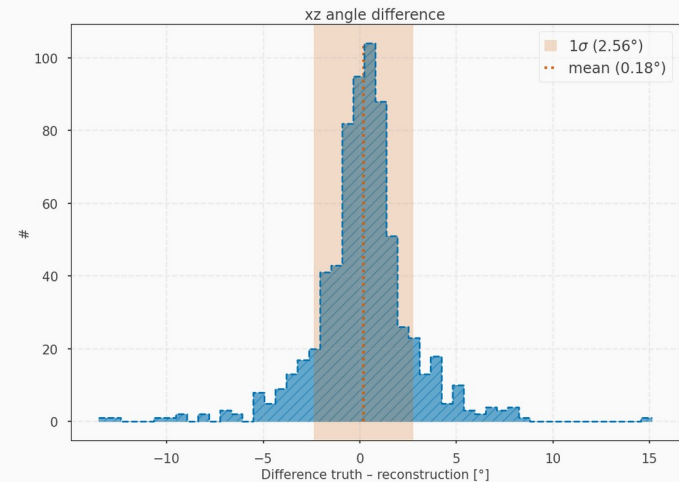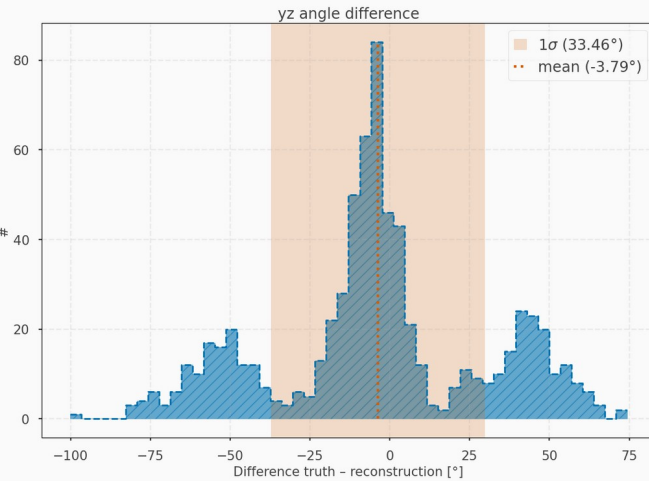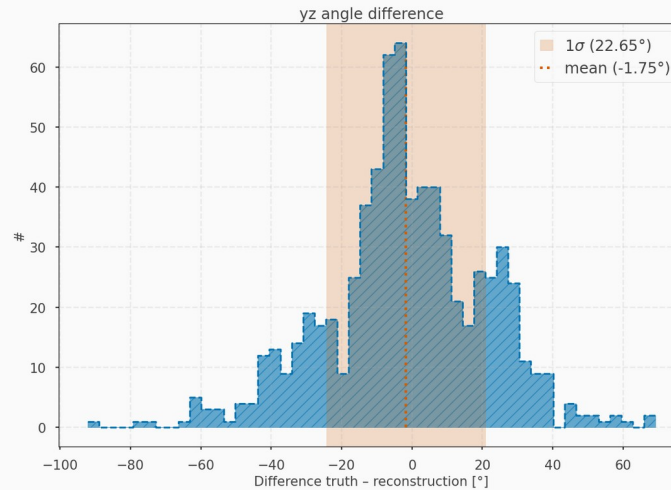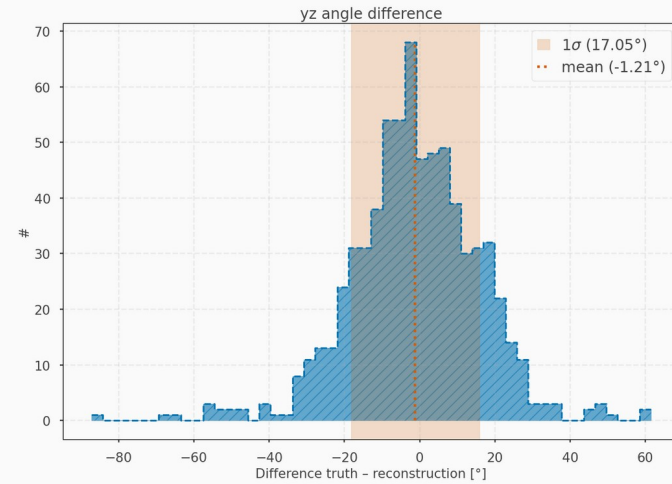# Tuning without Kalman filter

- Run same data set with different values for direction 'distance' and compare mean and spread of difference
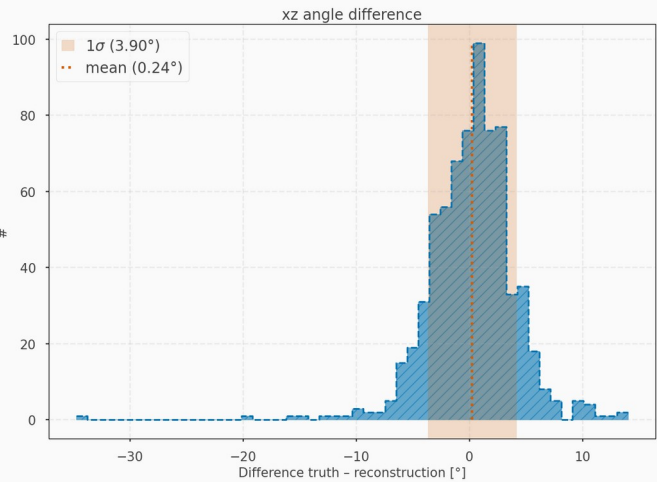
5

10

15

Tuning without Kalman filter

- Run same data set with different values for direction 'distance' and compare mean and spread of difference
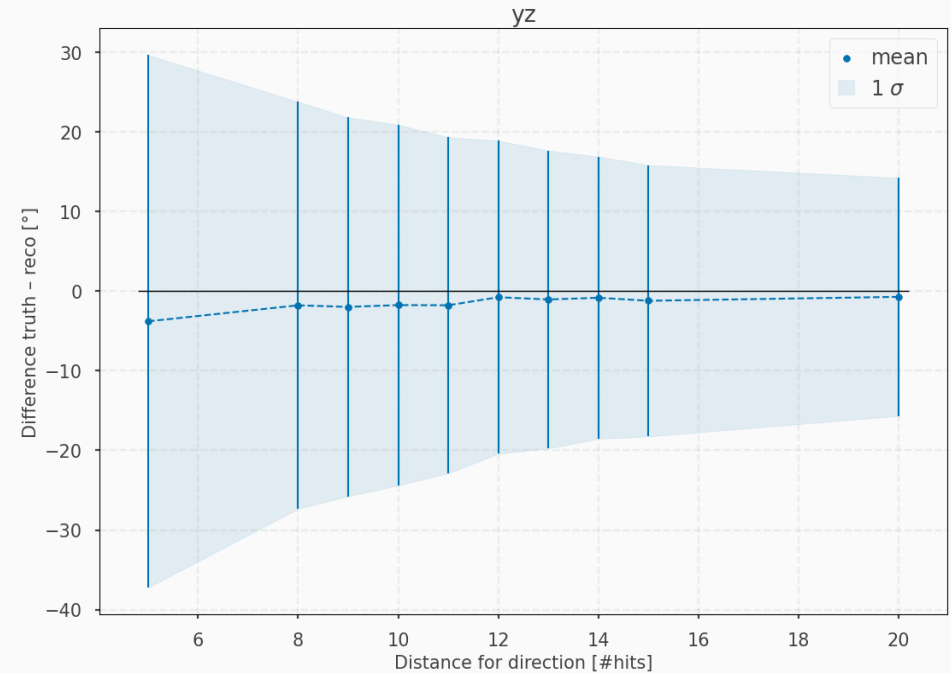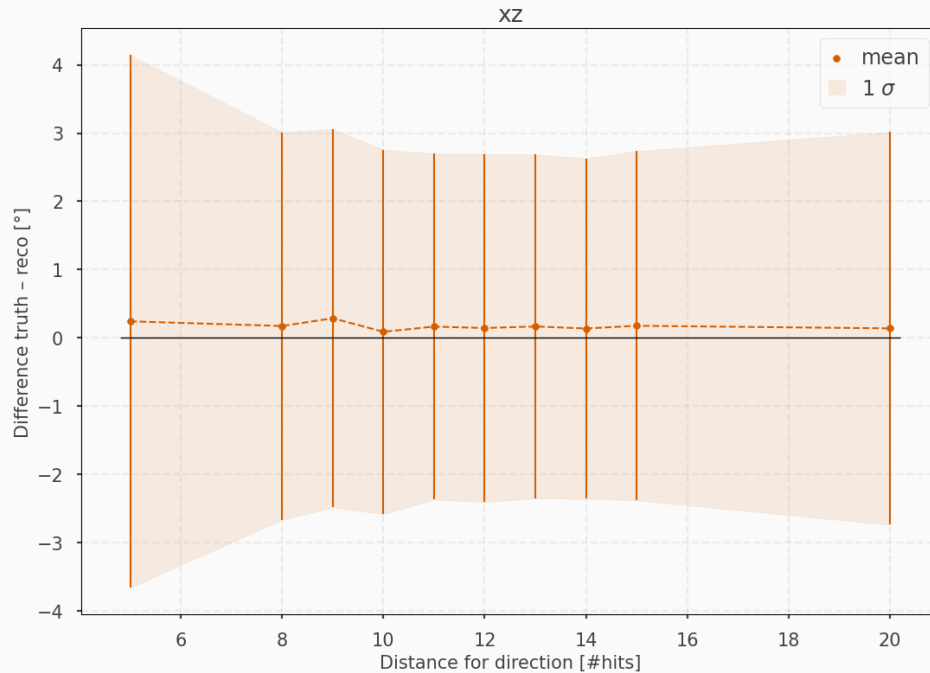
Tuning without Kalman filter

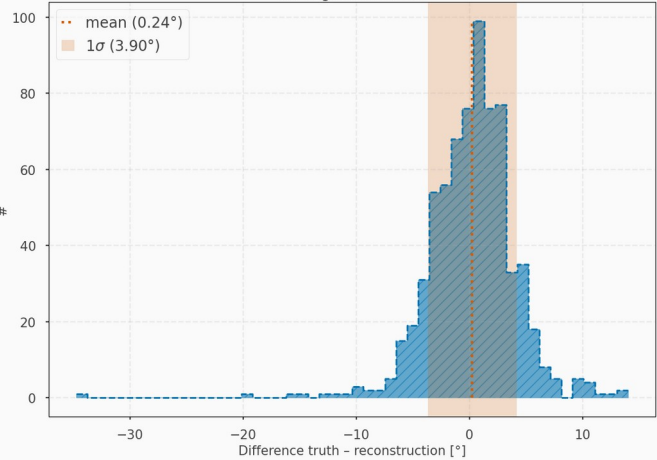- Now compare just mean and spread for 5 → 20 (with some gaps)

Repeat this for with enabled Kalman filter

- Fixing some bugs with the filling of the necessary variables

- Tested 4 values for the distance parameter

  - 5, 10, 15, 20

- For all 4 exact same result, down to the last decimal point → no influence

  - Choose whatever works best for without Kalman filter to be 'safe'

  - xz: (0.763±6.698)°

  - yz: (-0.244±10.925)°

Without Kalman for 14:
xz: (0.137±2.493)°
yz: (-0.828±17.272)°

Check for upcoming track smoothing (Kalman off)
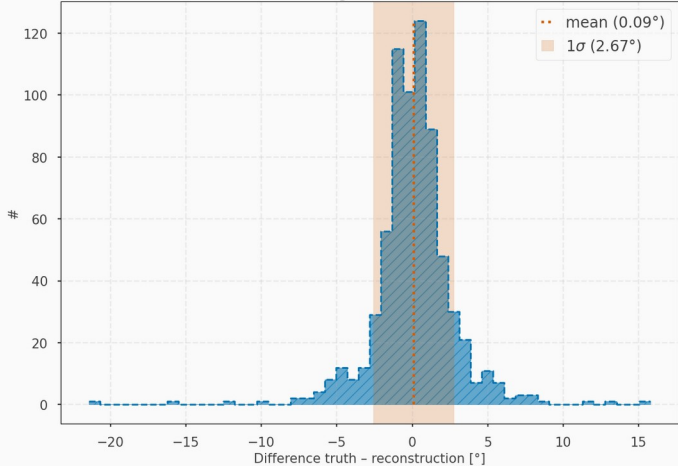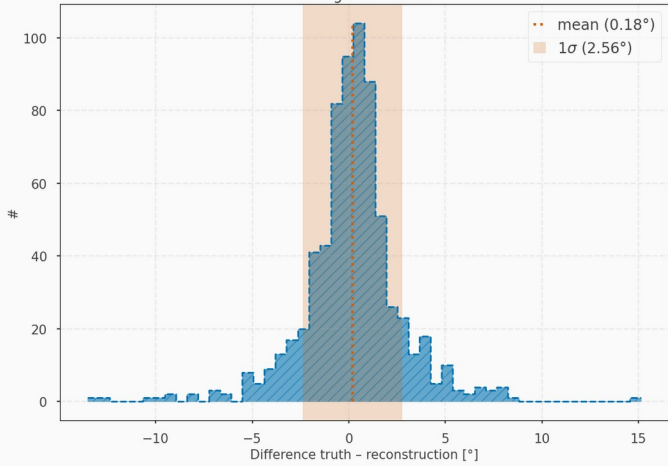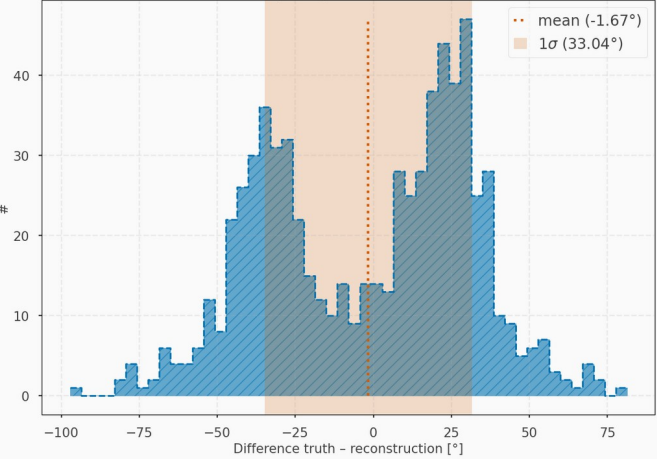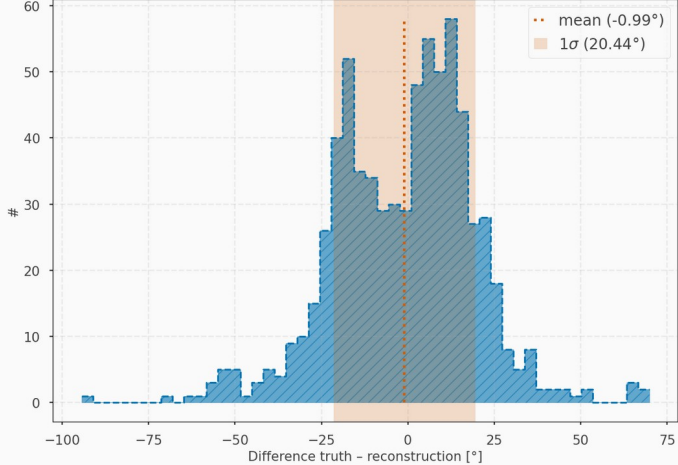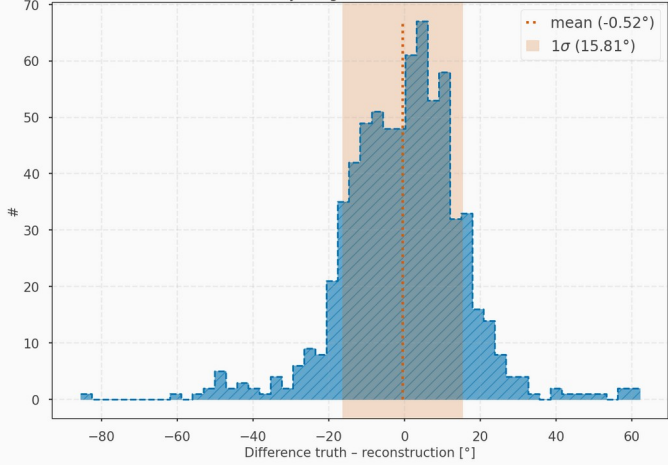
Check for upcoming track smoothing (Kalman off)

- Compare mean and spread again for 5→20 (with some gaps)

2024-10-29   Direction calculation fine tuning | Asa Nehm (they/them)
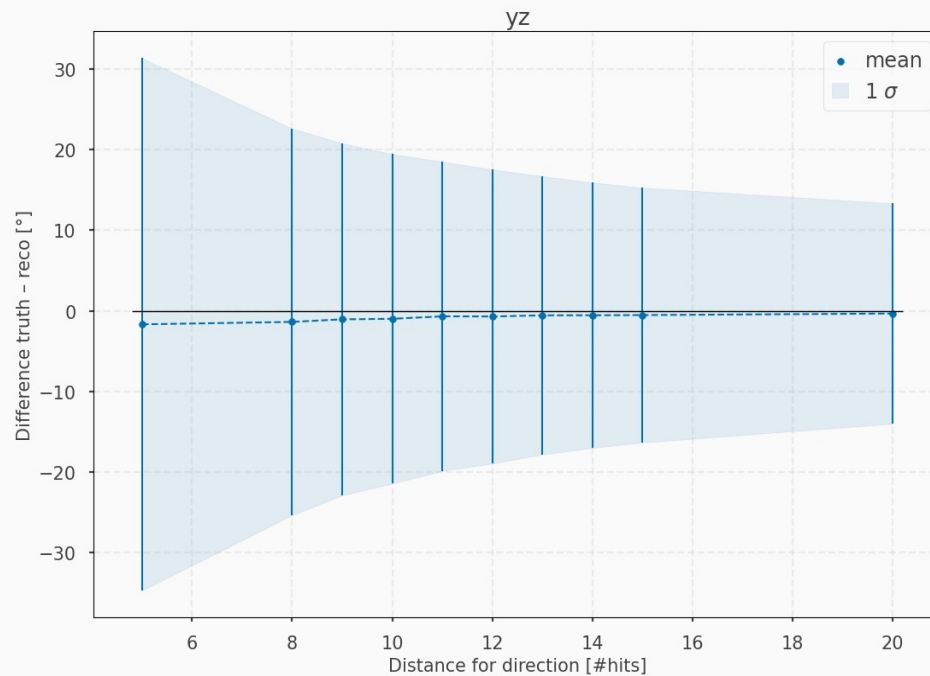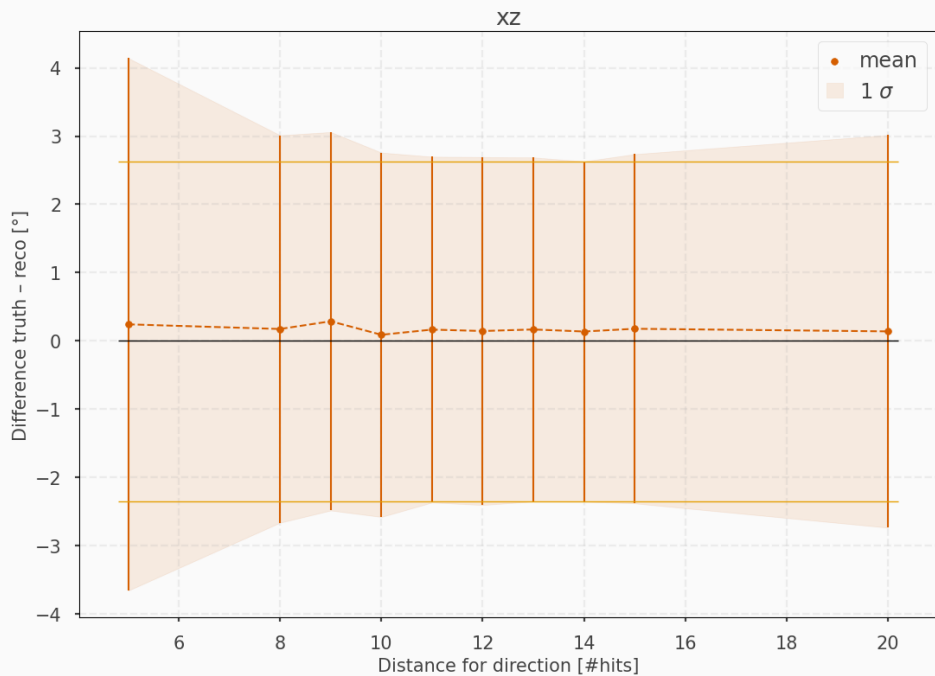
Summary

- 14 as distance for without Kalman filter

- 14 as distance for with Kalman filter, as no difference

  - Most likely no additional method necessary as different distance values made no difference at all

- 14 as distance for track smoothing

- → 14 seems to be a good overall default value

- This will be useful for the geometry optimization. Compare there
  - charge ID per momentum/energy slice
  - endpoint resolution
  - angular resolution

Backup