Kalman Filter Pattern Recognition and Fitting

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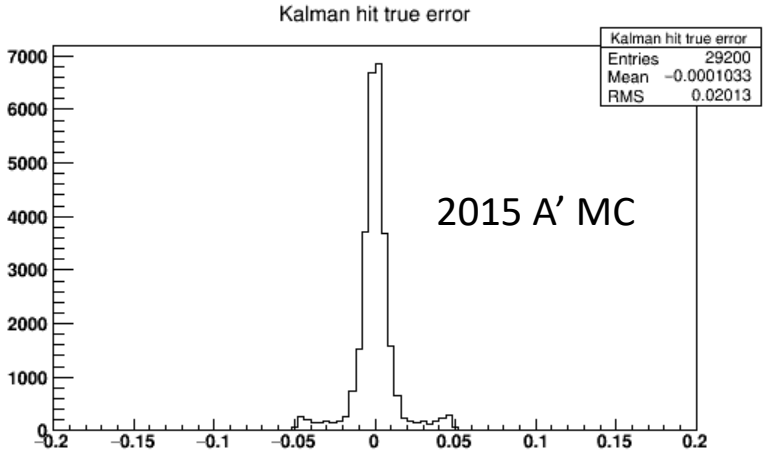
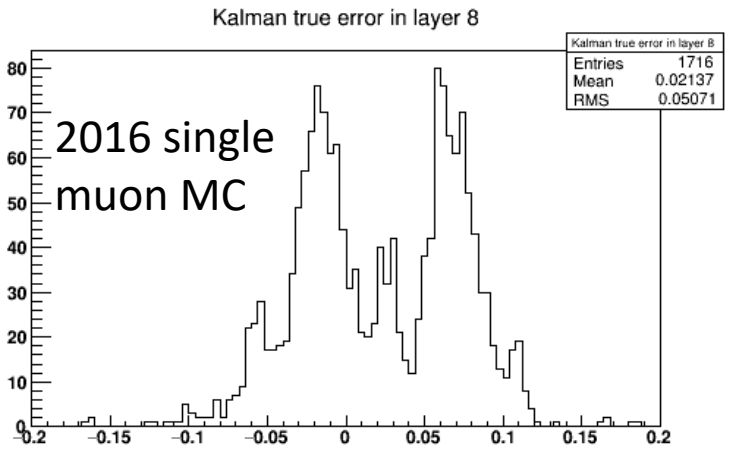
Updates Since the Collaboration Meeting

- I found the problem with coordinate transformations from global to sensor
  - The origin of the sensor system had been taken from
    - inputPlane.origin()
  - Now I am taking it from
    - inputPlane.getSensor().getGeometry().getLocalToGlobal().getTranslation().getTranslationVector()
  - These don't yield quite the same result (who knows why?), e.g.
    - New point on plane in Kalman coordinates: 3.383 96.093 -20.662
    - Old point on plane in Kalman coordinates: 3.383 96.093 -20.502
    - Difference: 0.000 0.000 -0.160
  - The difference is always the same minus 0.16 mm
- Using the new point I can reproduce hps-java transformations between global and sensor systems.
  - This also explains why in the past I was always getting an offset in z0 in my Kalman fits in hps-java (here z is the coord in B field direction)

Updates Since the Collaboration Meeting

- Now that I have the correct transformation, I can transform MC true hits into the sensor frame and look at how they differ from reconstructed hits:

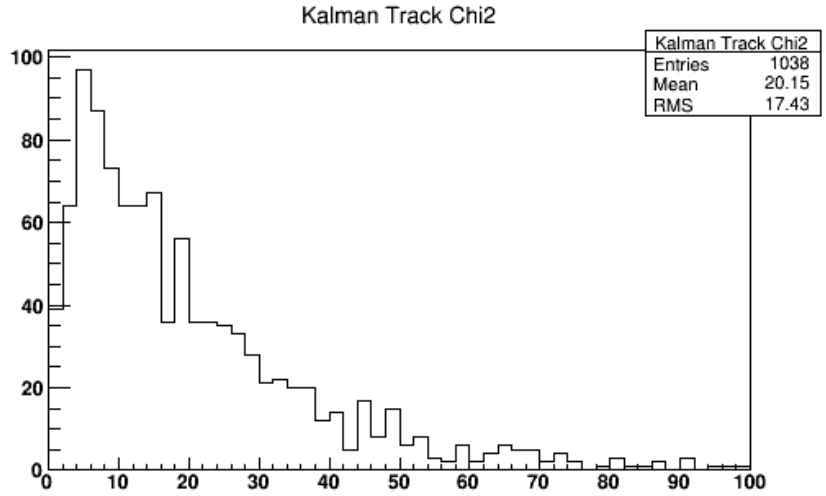




- This explains why I was seeing such horrible chi-squared when fitting the single muons. However, the root of the problem is still unknown.
- The old 2015 MC sample looks reasonable. The core has a sigma of 6.4 microns when fit to a Gaussian.

Updates Since the Collaboration Meeting

- The Kalman fit to the 2005 A’ MC still does not give a great chi-squared distribution, however.



- This result is the same whether I input to Kalman the sim hits (smeared by 6 microns) or the recon hits.
- Hence the deviation from the ideal chi-squared mean of 12 must be related to scattering. I still am unable to histogram for these files the MC true scattering angles, as the necessary information was not saved.

Updates Since the Collaboration Meeting

- The Kalman code in branch iss204d was merged with the master to create branch iss204e.
- PF made a pull request to merge into master.
- PF gave me a list of information needed to apply the GBL algorithm to Kalman tracks
  - I had to modify the code a bit to save the arc length from the previous sensor measurement. Everything else already exists in the Kalman classes.
  - I am working to transform everything to HPS coordinates and store all together with the HPS Kalman track such that it can be written out.