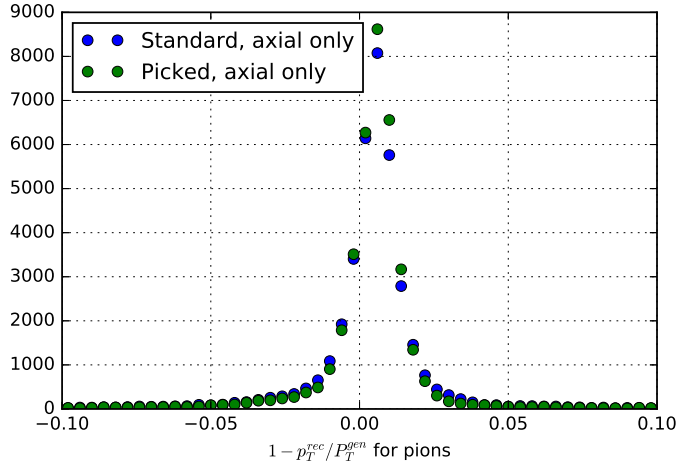
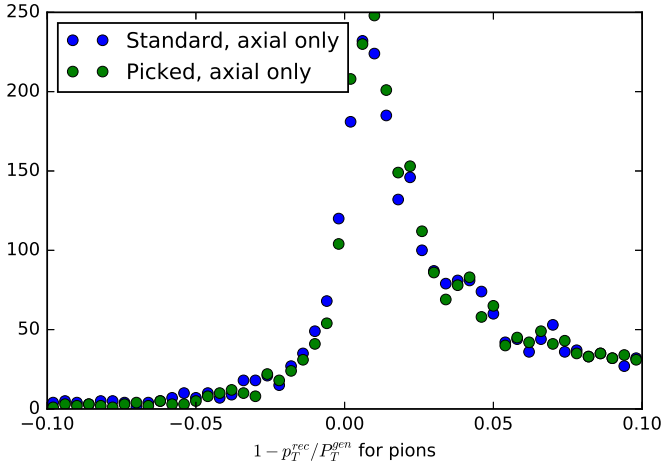
CDC track-reconstruction studies (update)

S. Glazov, Belle tracking group meeting, Apr 7, 2017

Energy loss correction for CDC tracks



Pions

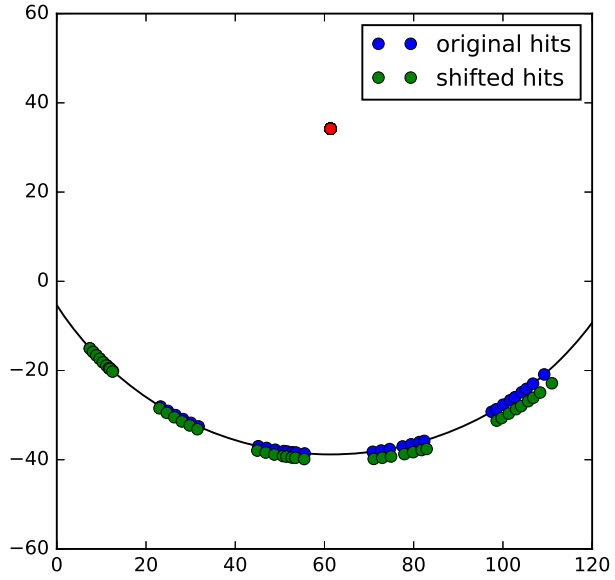


Protons

- From previous studies, of fits using axial CDC hits only, a clear mass-dependent bias observed for reconstructed p_T.
- The bias is due to unaccounted energy loss in the CDC material.
- The bias may affect the following stages: prior and covariance matrix provided to Genfit is not fully correct.

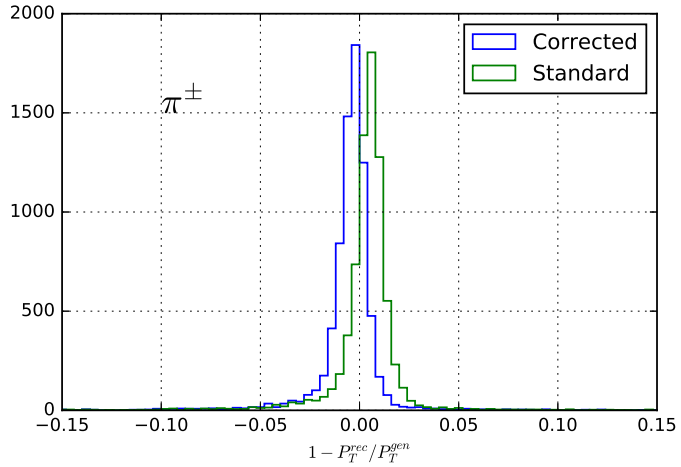
$\rightarrow$ develop a simple algorithm to correct it.

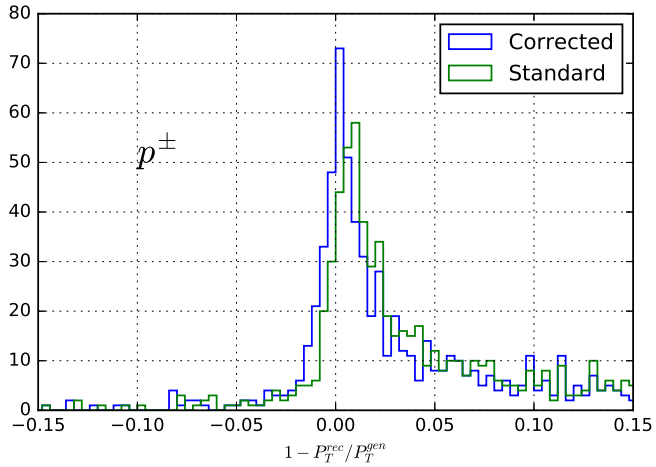
Energy loss correction method

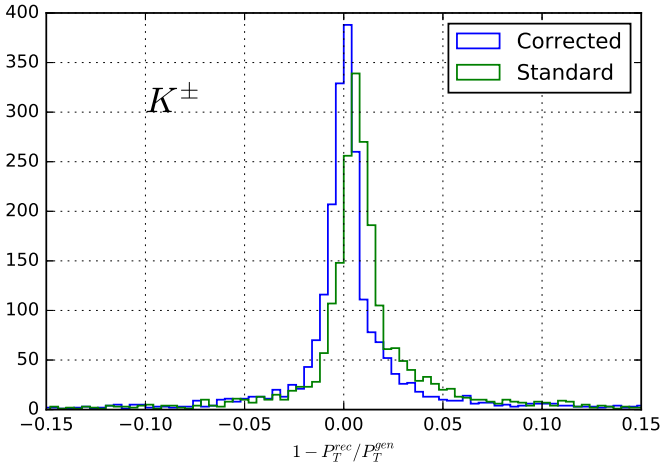


- Energy loss depends on track length s, momentum, mass of the particle. At the moment use simple s-dependent correction, tuned for kaons.
- Apply iteratively: first do standard circular fit, determine path to each hit, determine expected energy loss, based on that shift the hit outward vs the trajectory center. Repeat the circular fit using shifted hits. Given that the correction is small, stop after one iteration.
- Basically no new code, recycling existing functions.

Results: p_T bias (p_T > 0.3 GeV)

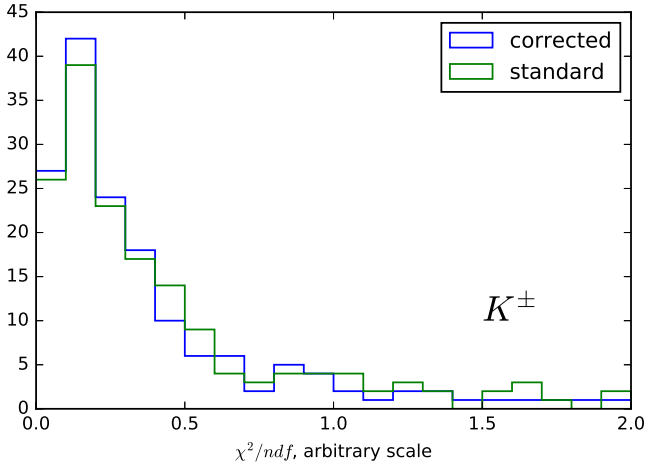


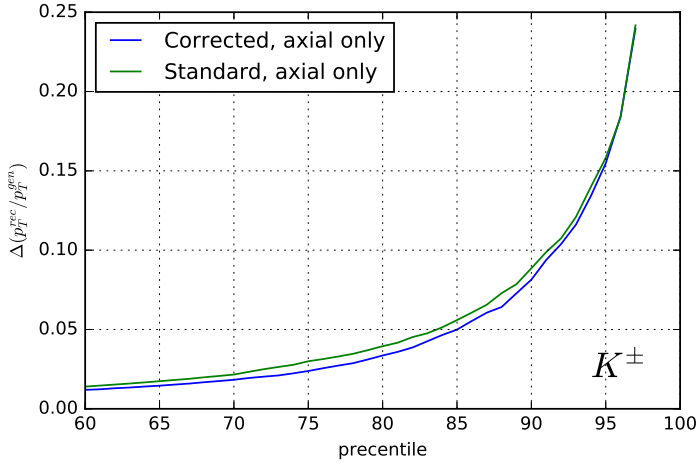




- As expected, the average correction, tuned for kaons, does too much for pions and not enough for protons.
- For kaons, there is an improvement in both mean p_T and p_T resolution.

Fit χ^2 and resolution for $K^{\pm}$





- There is a moderate improvement in χ^2/dof (x-axis units are arbitrary, fit is done with weights equal to unity).
- p_T resolution is also improved after the energy loss correction, especially for moderate percentile range.

Summary

- Simple method to correct for average energy loss in uniform CDC material
- Leads to reduction of p_T bias and improvements in resolution, for a toy setup, which uses axial CDC hits only.

$\rightarrow$

- Add stereo hits.
- Mass, momentum dependent correction.