

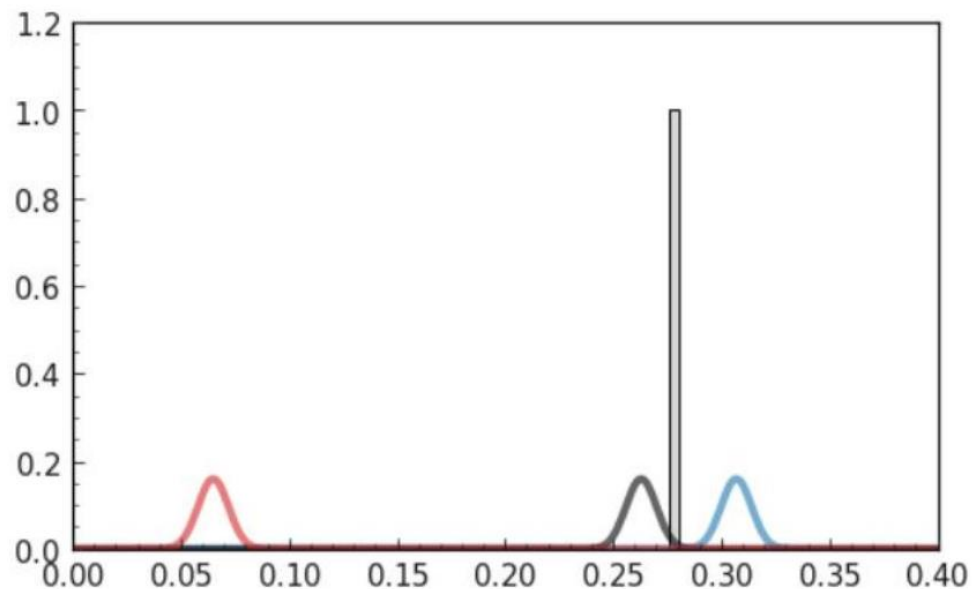
TOF Simulation & Reco

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ORNL is managed by UT-Battelle LLC for the US Department of Energy

TOF Reconstruction Overview

- Need reconstructed **momentum**, **track length** and **hit time**
- From momentum and track length calculate expected hit times of various particle species
- Comparison of expected hit time to measured hit time yields weights/likelihoods for each hypothesis



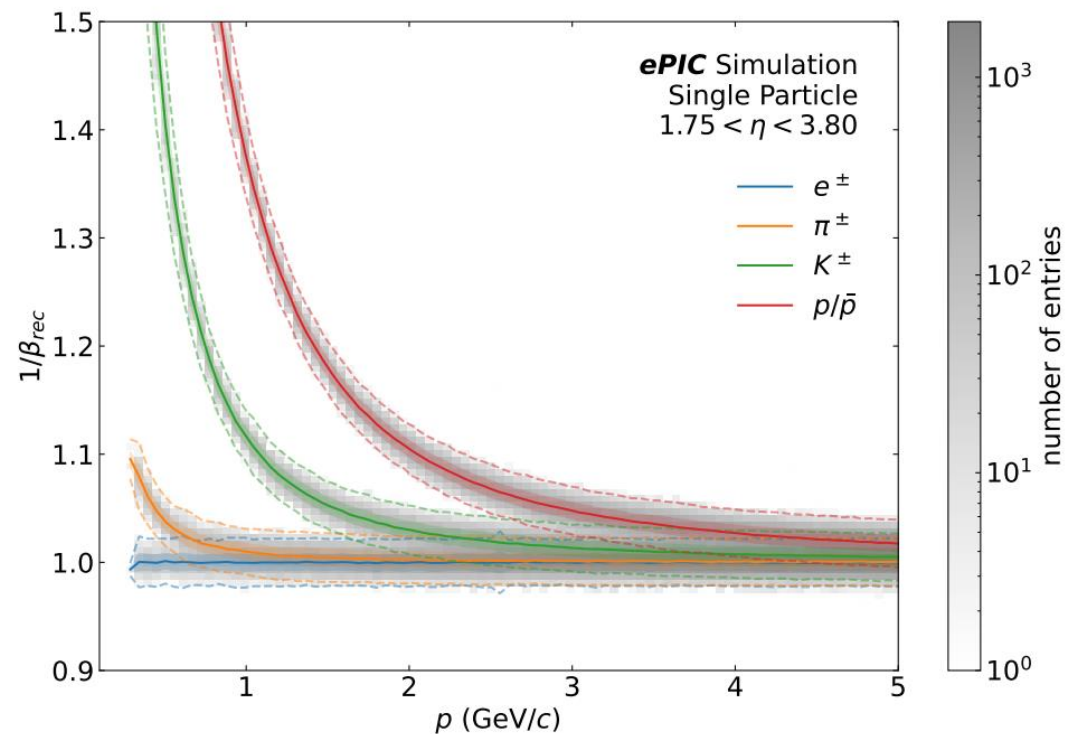
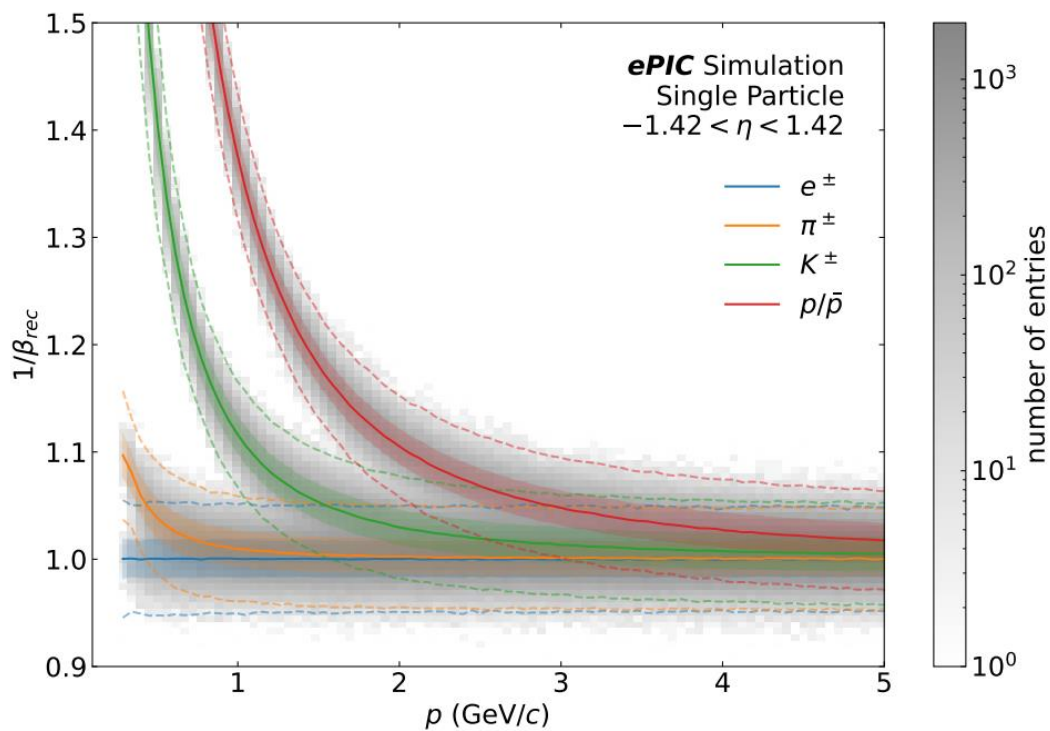
TOF Reconstruction Overview

- Devil in the Details:
 - Need correctly modeled time distributions in simulation: digitization
 - Souvik Paul (Stony Brook) & Prithwish Tribedy (BNL)
 - Need correctly modeled time distributions in reconstruction:
 - Trivial in simulation
 - Need correct assignment of TOF hits to track
 - Currently just placing hard cuts, no beam backgrounds considered yet
 - (ACTS should be able to provide a list of tracker hits used for a given track fit)

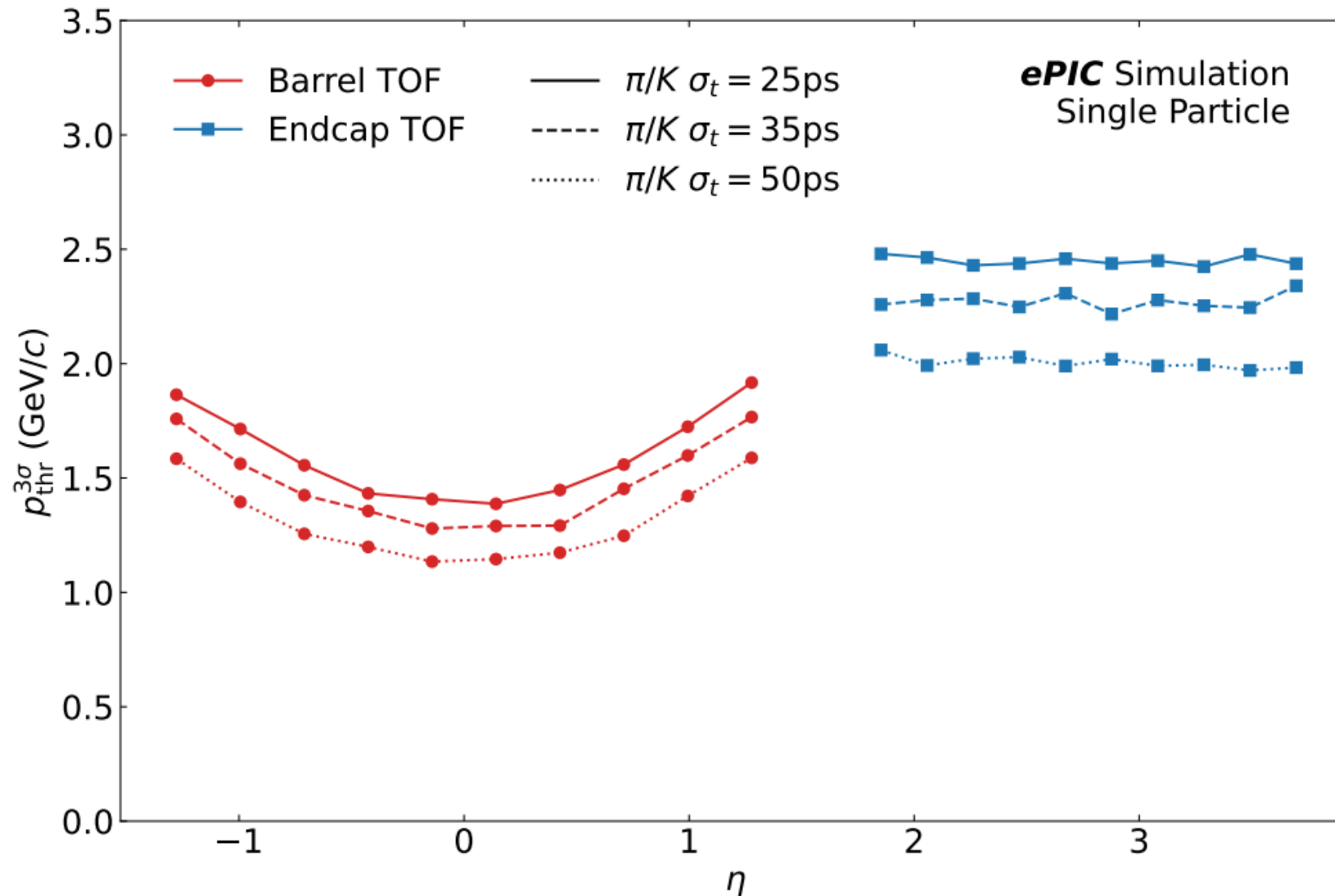
TOF Reconstruction Status

- Currently using full eicsoft simulation software + custom plugin to write out relevant TOF hits, then do external reconstruction in python
- Works well as proof of concept
 - The actual computation is about 5 LoC.

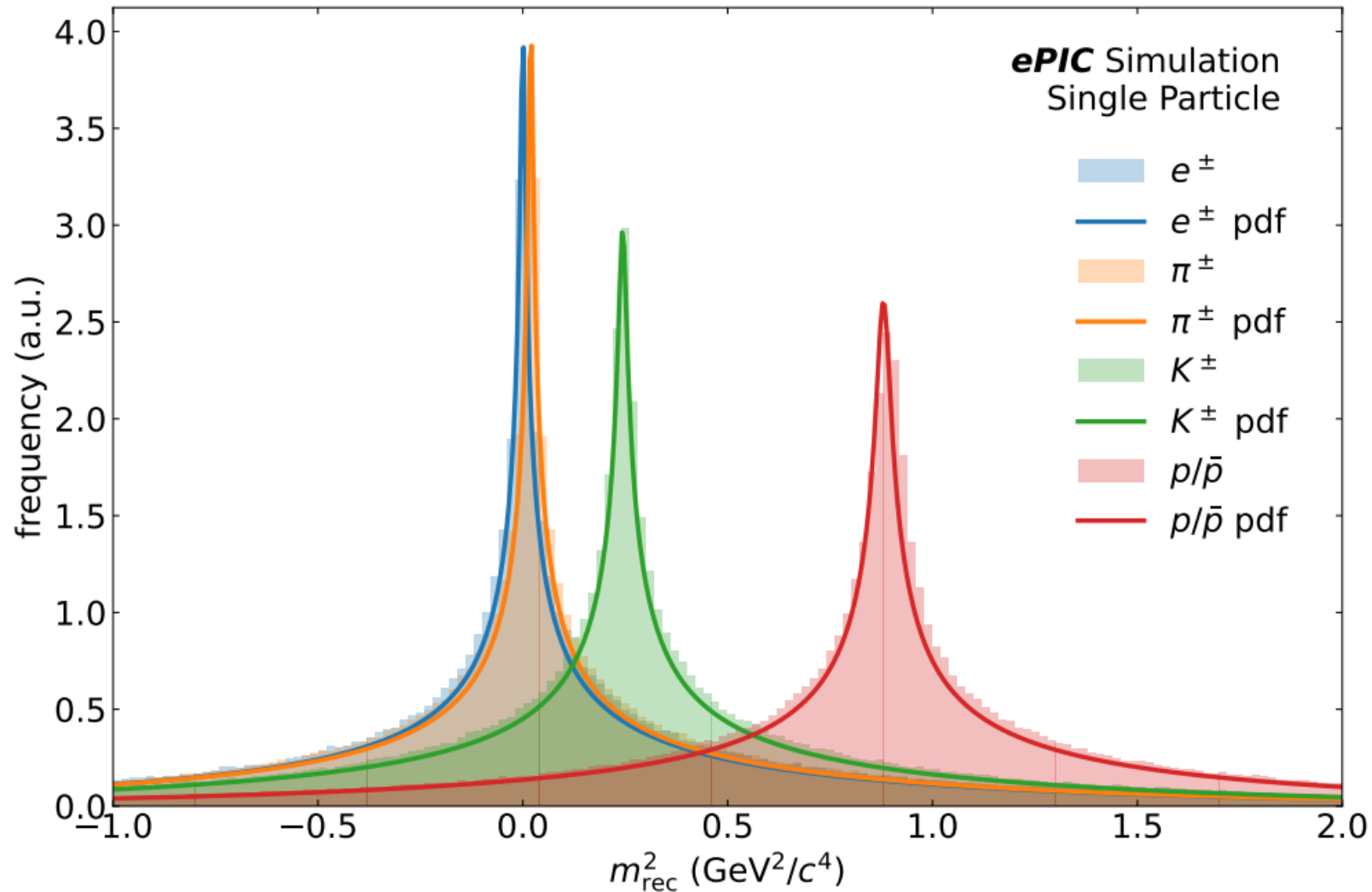
TOF Reconstruction Status



TOF Reconstruction Status

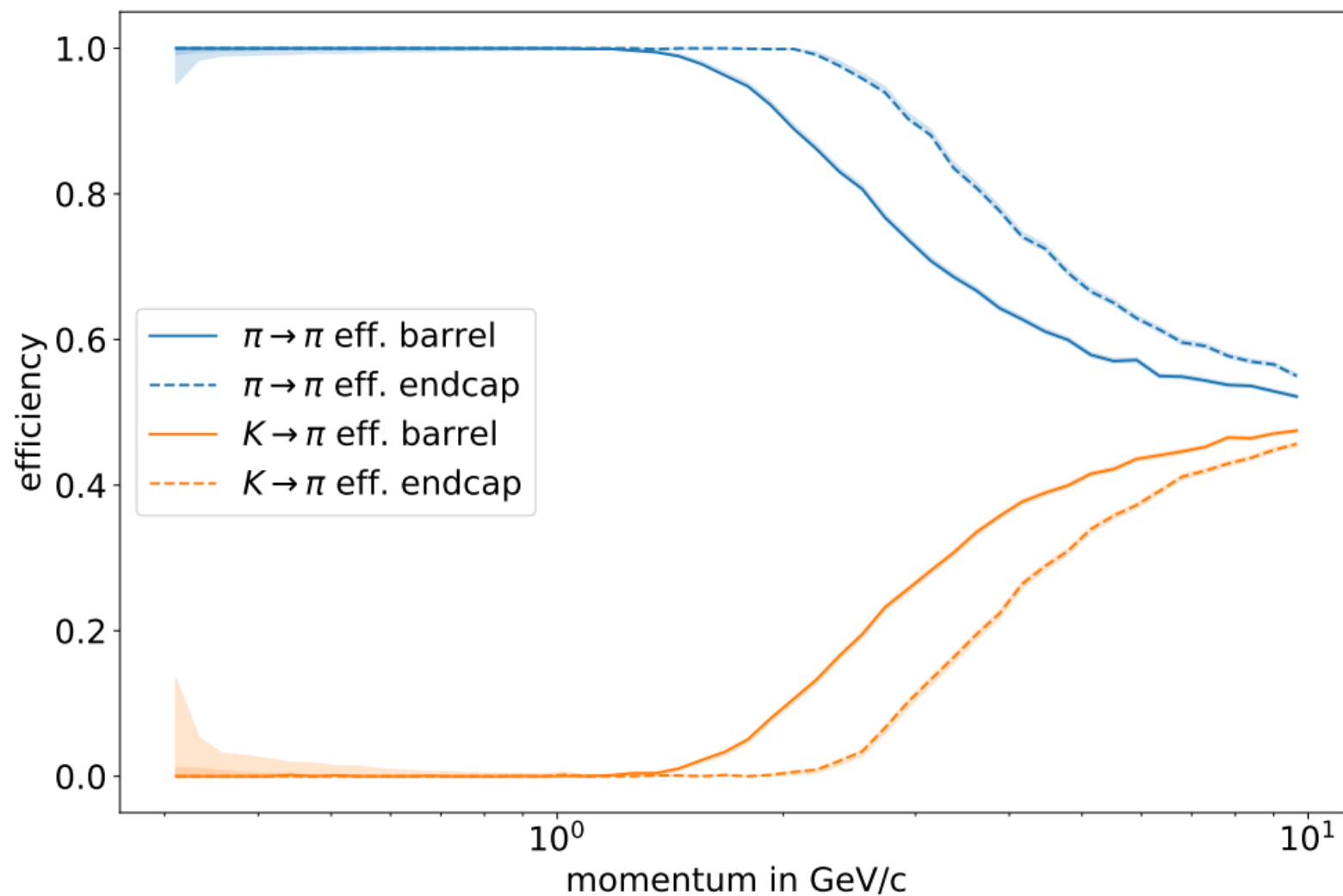


TOF Reconstruction Status



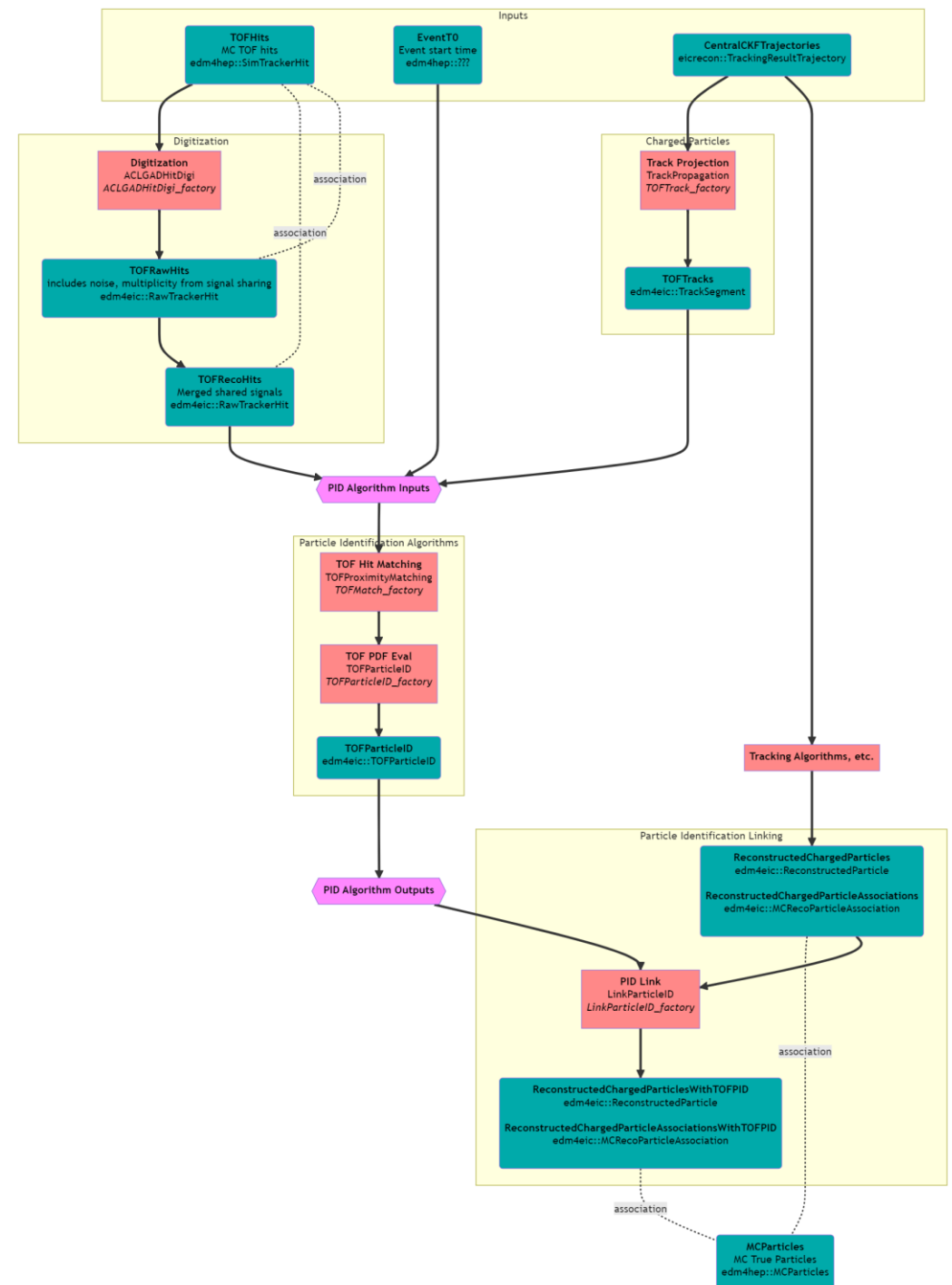
TOF Reconstruction Status

TOF pion efficiency/mis-ID at $p_\pi > 0.5$



TOF Reconstruction Structure

- None of this semi-standalone python code is useful for combined studies
 - Or for real events for that matter.
- We know how we want to implement this into eicsoft
- Based on Chris' Dilks dRICH reco structure
 - Good to agree on general approach to unify architectures
- Can use simplest possible implementations for start, then add as much as we want over time...
- N.b.: Glaring omission: event T0 iteratively depends on TOF reco...
 - Iterative T0 reco exists in ECCE code base, anyone interested?



But... why is it not yet implemented?

- Because **I failed to do it.**
 - Wei Li (Rice) has a new postdoc interested in TOF simulation and reconstruction, will try again with their help...
 - Yano-san et al. at Hiroshima have started TOF tracking simulation studies as well and might be interested?
 - I will be happy to help with concepts and debugging.
- Ultimately need fully integrated PID reconstruction codes for all systems in eicsoft to really go forward with individual and combined studies for the TDR

Executive Summary

- We know **what** to do
- We have shown that **it** works
- We have not **done** it

Towards Combined PID Performance Plot for TDR

