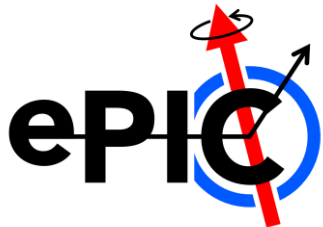


TOF Simulations in ePIC

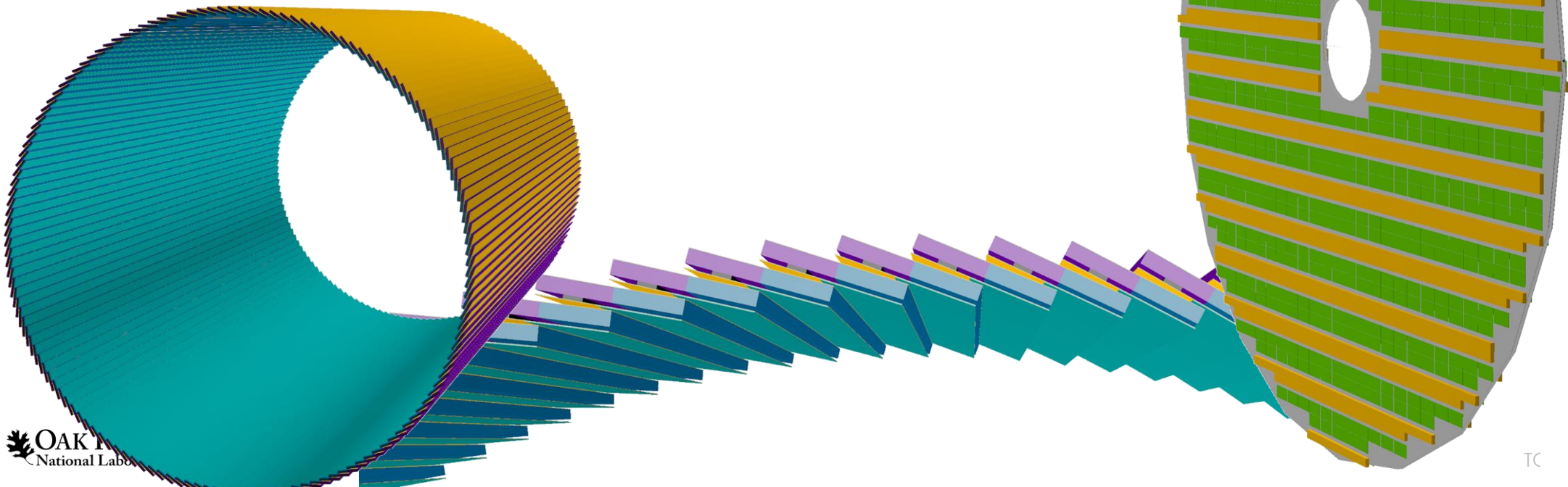
Oskar Hartbrich, Nico Schmidt (ORNL)
For the EIC TOF Group

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



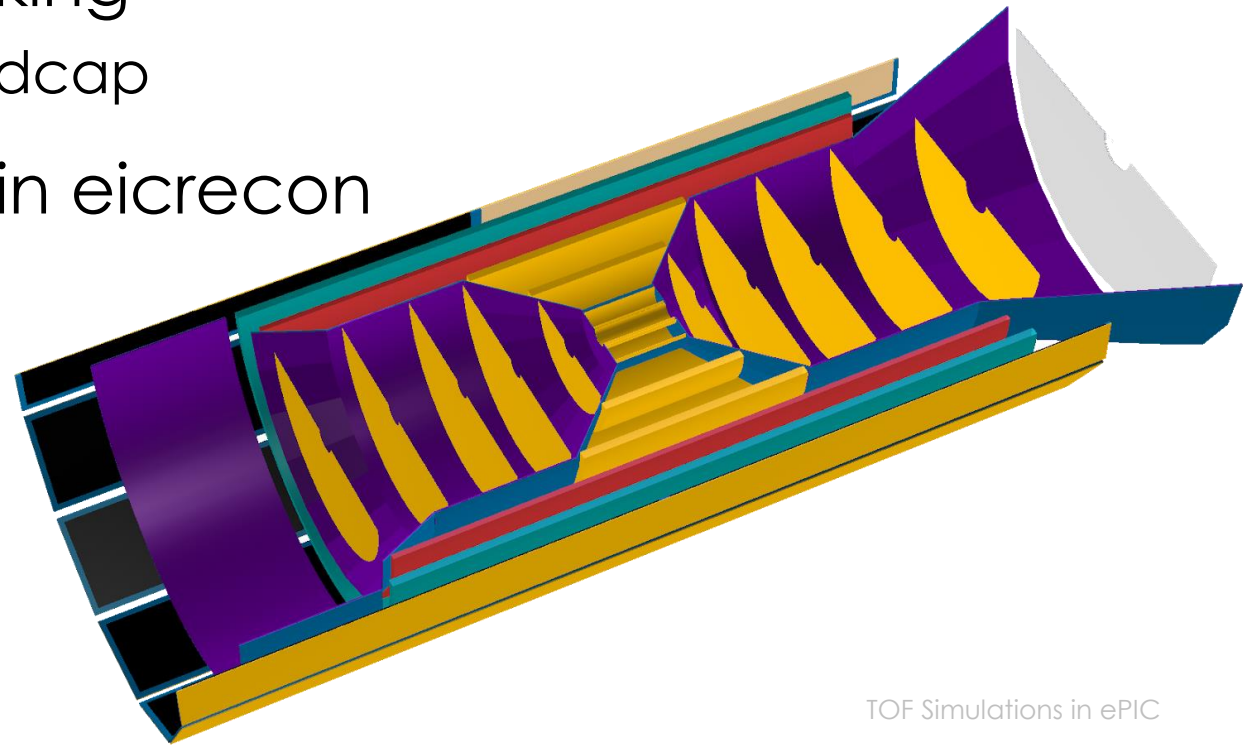
TOF Geometry in ePIC Software Framework

- Implementation based on current engineering plans
 - Including estimated services and mechanics
 - Barrel: $\sim 1\% X/X_0$
 - Forward: $\sim 8\% X/X_0$



TOF Geometry in ePIC Software Framework

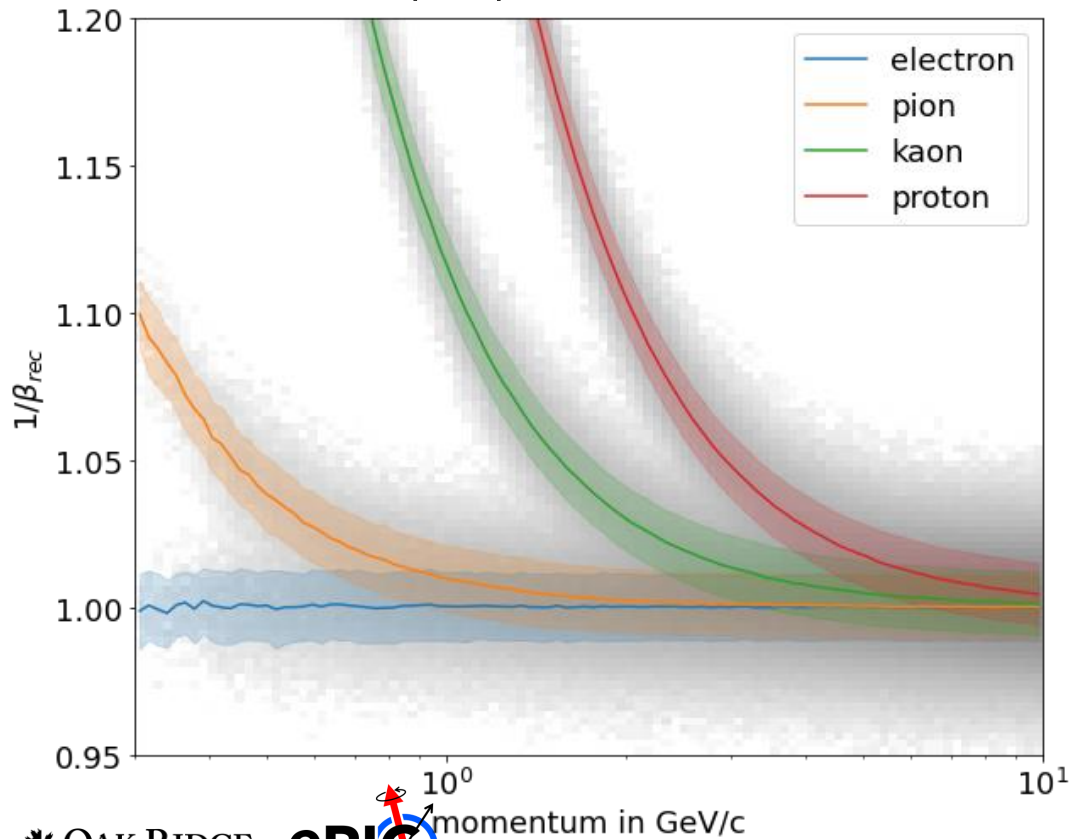
- Detector geometry fully implemented in DD4hep
 - Included in arches and brycecanyon models
- TOF layers integrated in ACTS tracking
 - Some issues with detailed forward endcap
- Digitization infrastructure in place in eicrecon
 - Single MIP time resolution
25ps sensor (\oplus 20ps t_0 offline for now)
 - Position resolution:
Endcap: 30 micron
Barrel: 30 microns x $1/\sqrt{12}$ cm



TOF PID Performance – Single Particle Gun

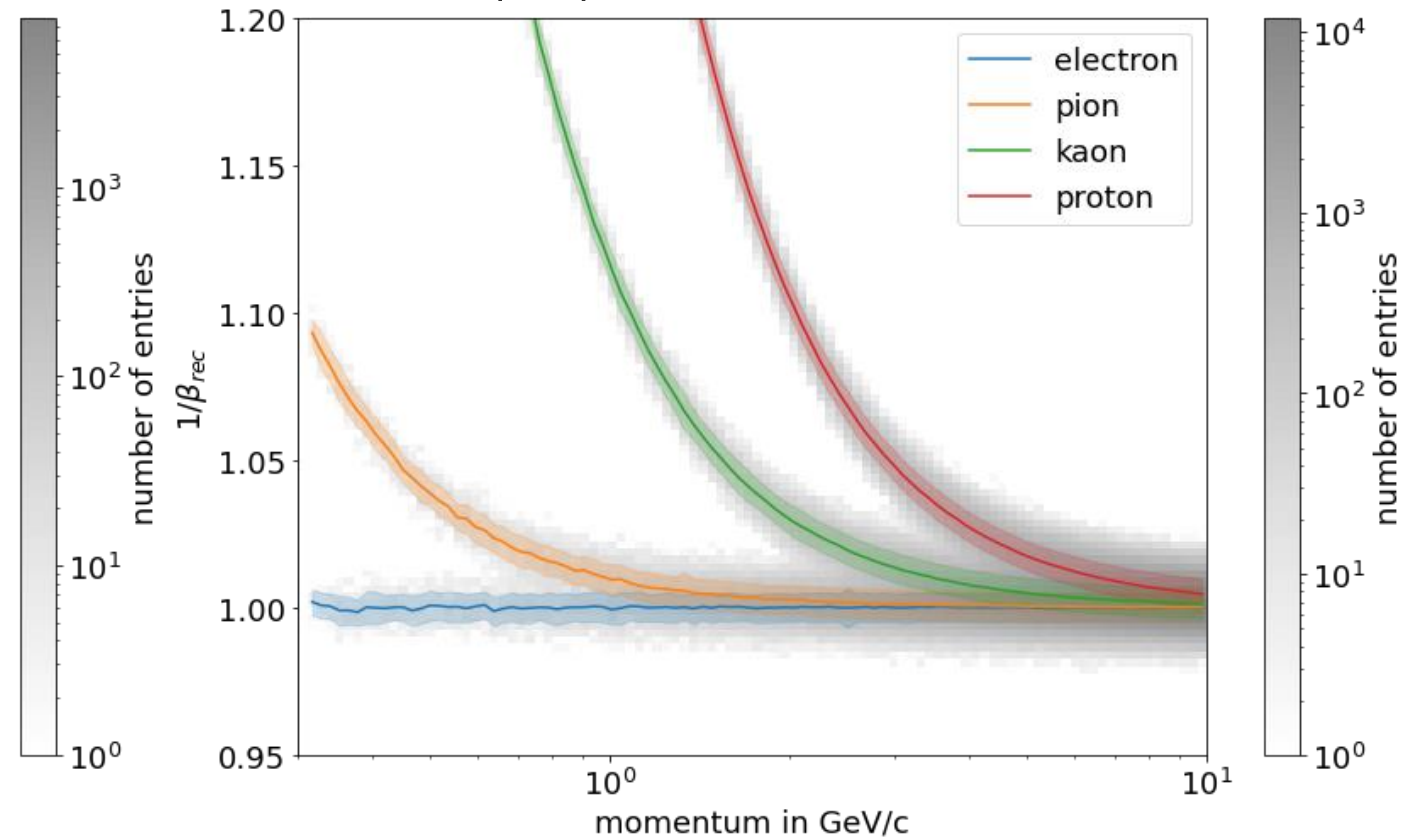
- Barrel Region

- e/pi up to 0.5 GeV/c
- pi/K up to 1.9 GeV/c
- K/p up to 3.1 GeV/c

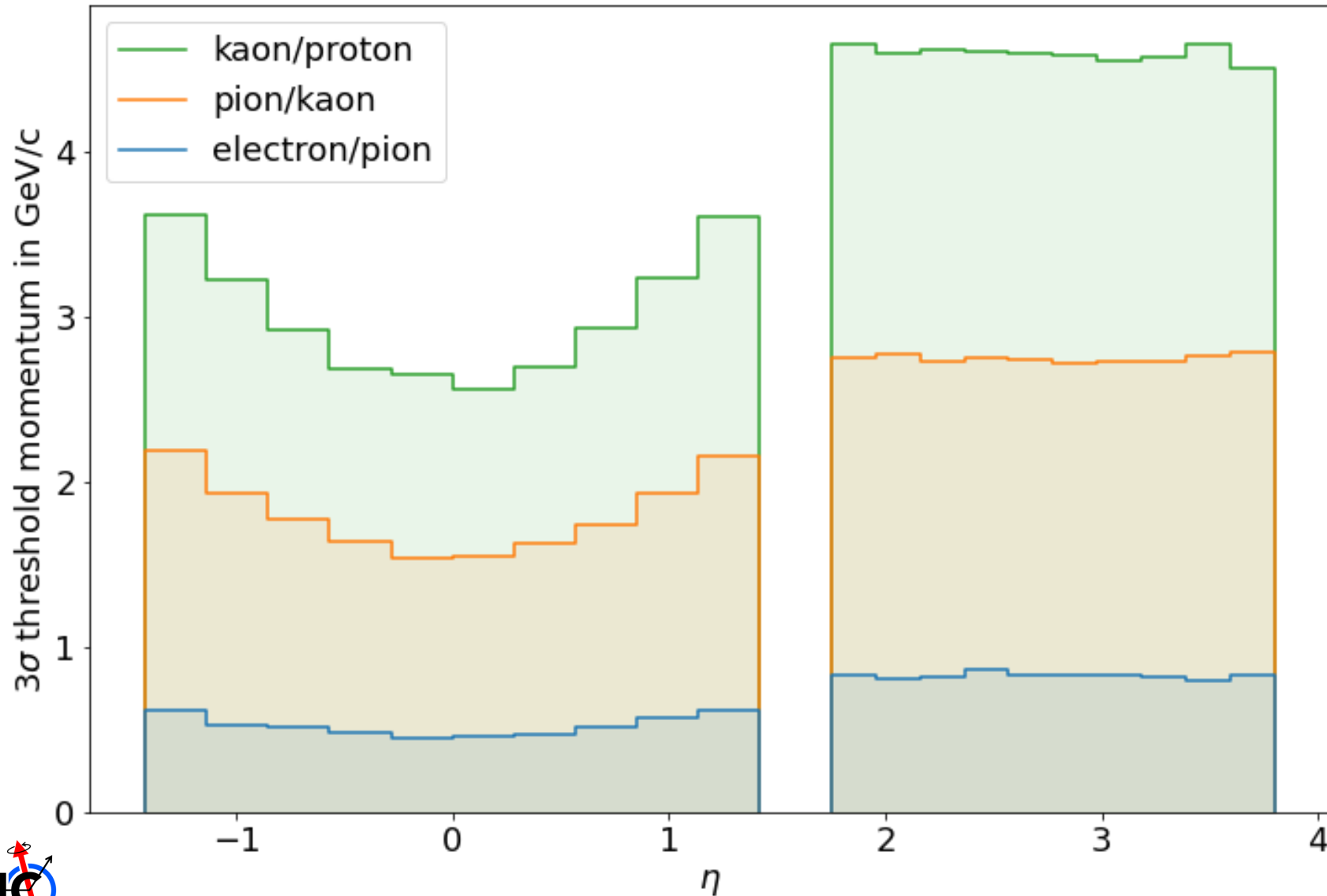


- Endcap Region

- e/pi up to 0.8 GeV/c
- pi/K up to 2.7 GeV/c
- K/p up to 4.6 GeV/c

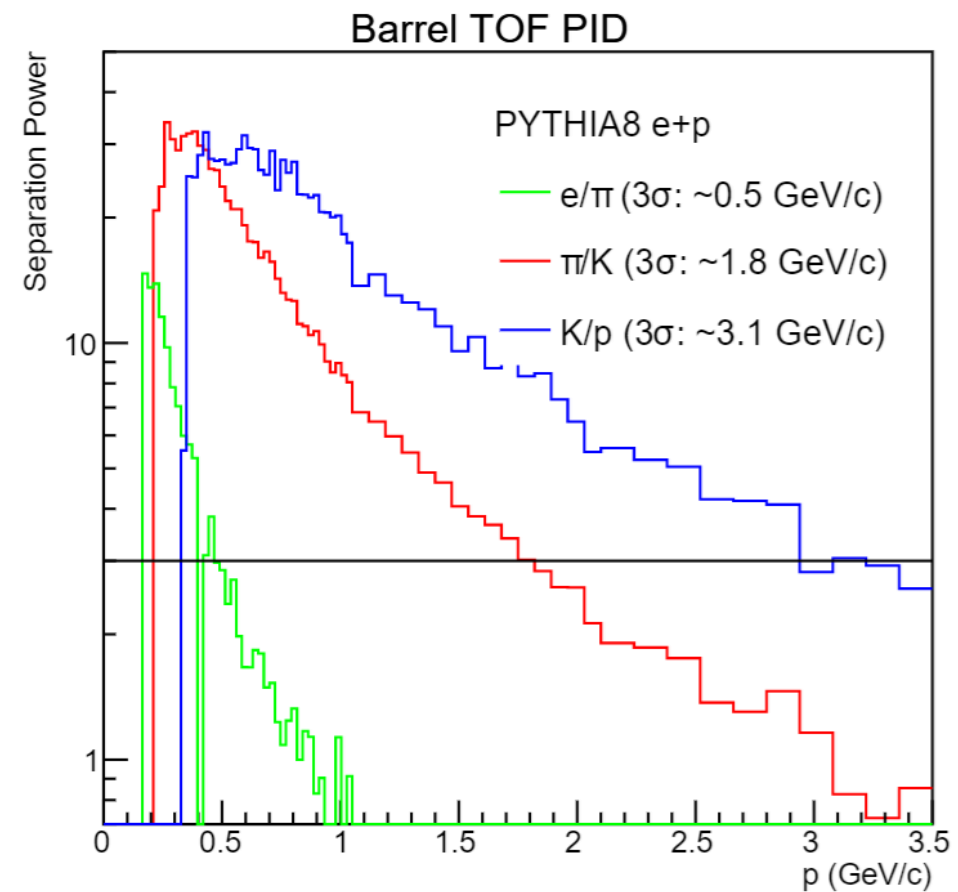
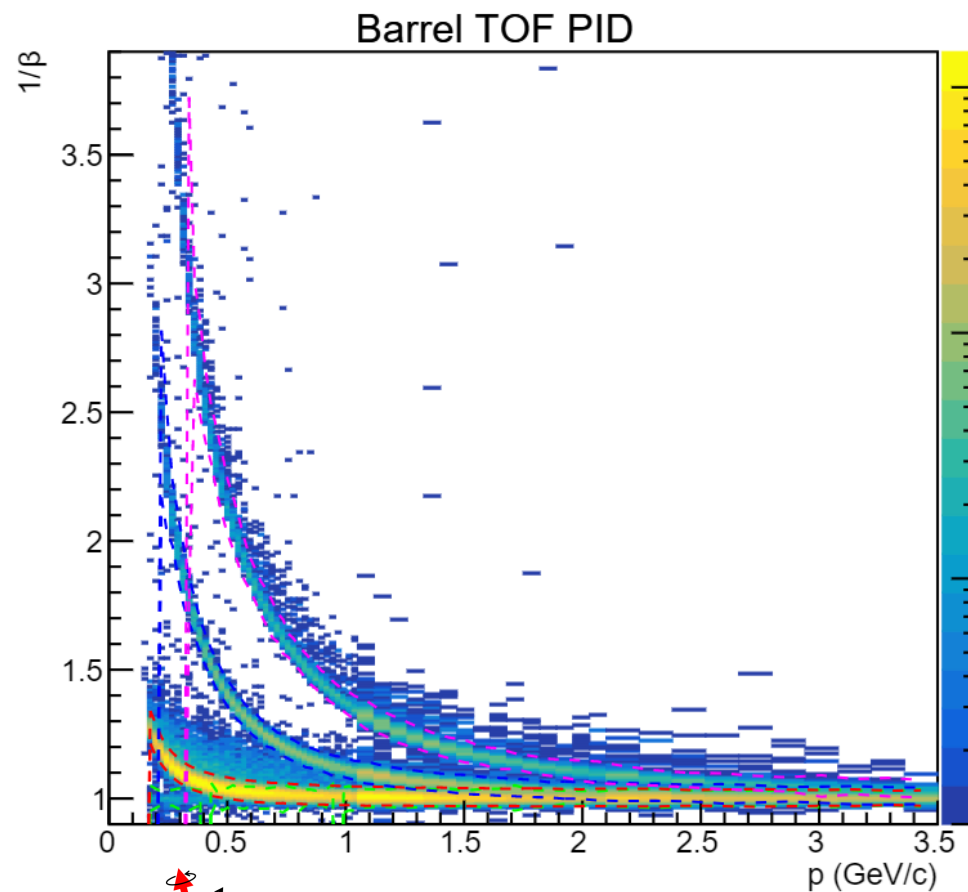


TOF PID Performance – Single Particle Gun



TOF PID Performance – Pythia DIS Events

- Compatible with single particle results
 - Barrel only due to issues in endcap reconstruction



Next Steps and Open Questions

- Some reconstruction porting remaining:
 - TOF reconstruction as dedicated JANA2 factory with user output
 - Event t_0 -estimation + combination with x-t method
- Validate time resolution requirements for PID performance
 - Full DIS events and combined PID of TOF+dRICH/TOF+hpDIRC
- Validate tracking performance and required granularity
 - Start by implementing dark noise estimates
 - Requires realistic tracking + backgrounds
 - Tracking efficiency, angular resolutions for Cherenkov detectors
 - TOF material impact on other detectors

Backup

TOF PID Performance – Efficiencies + mis-IDs

- Full

