Low p PID using TOF in ATHENA software

ATHENA PID meeting (10/11/2021)

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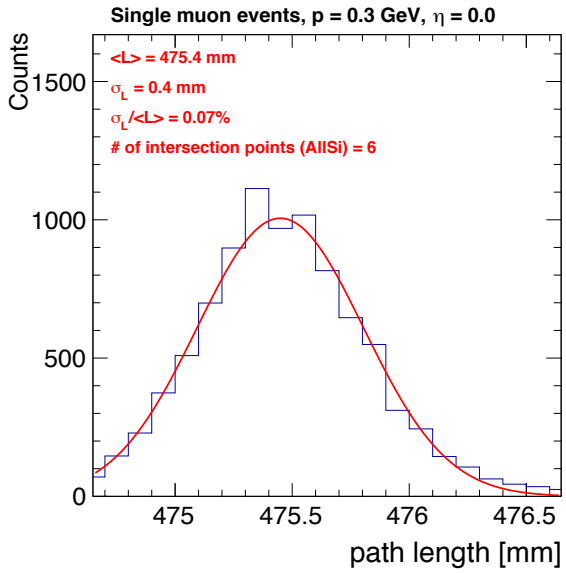
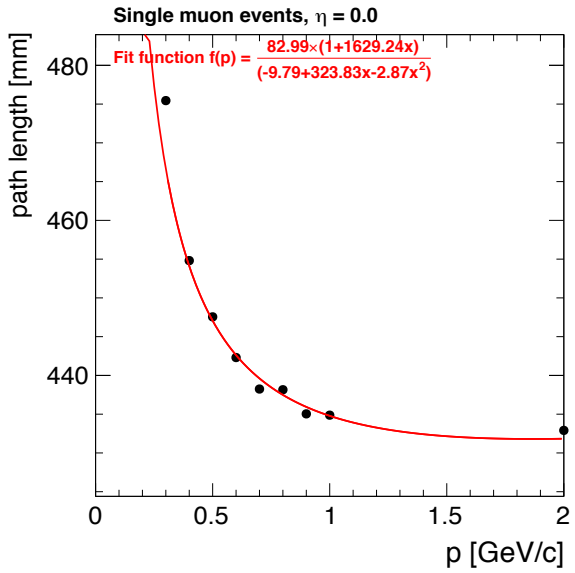
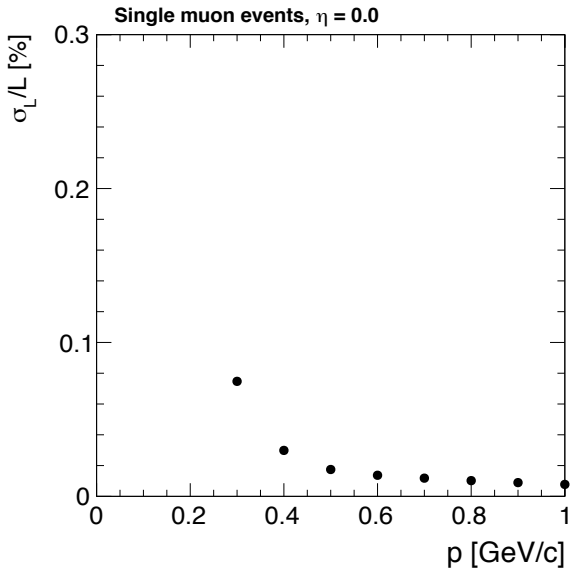
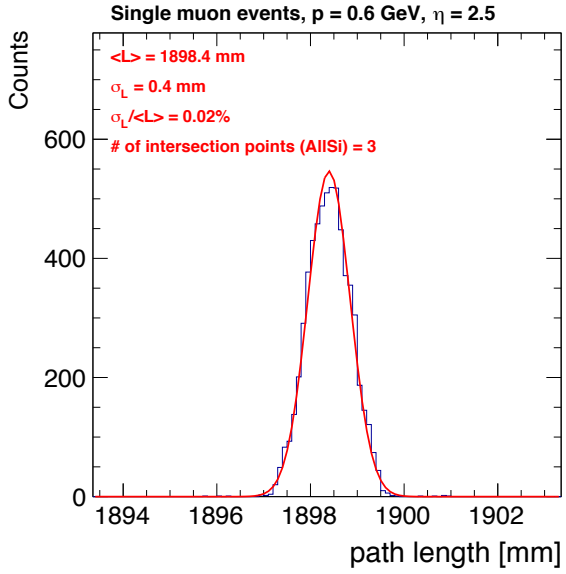
Toy MC to extract the π/K/p separation power

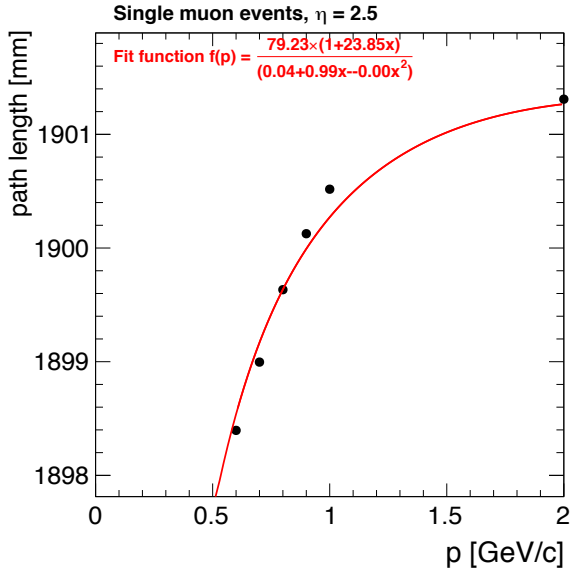
- Extrapolate pathlength and uncertainty as function of p and η
  - Barrel @ 43cm, forward @ 185cm

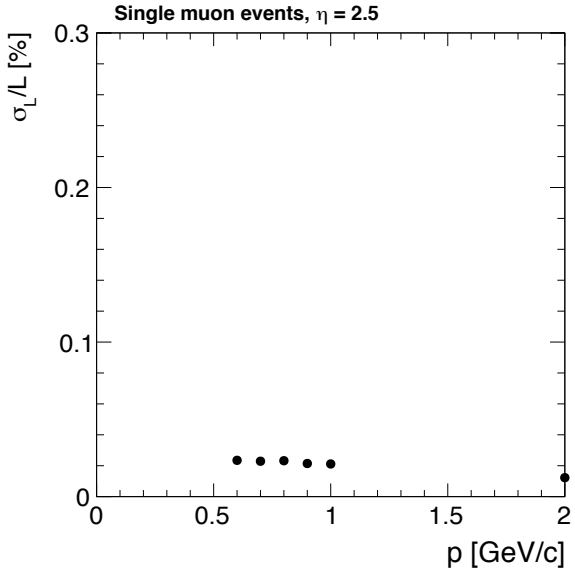






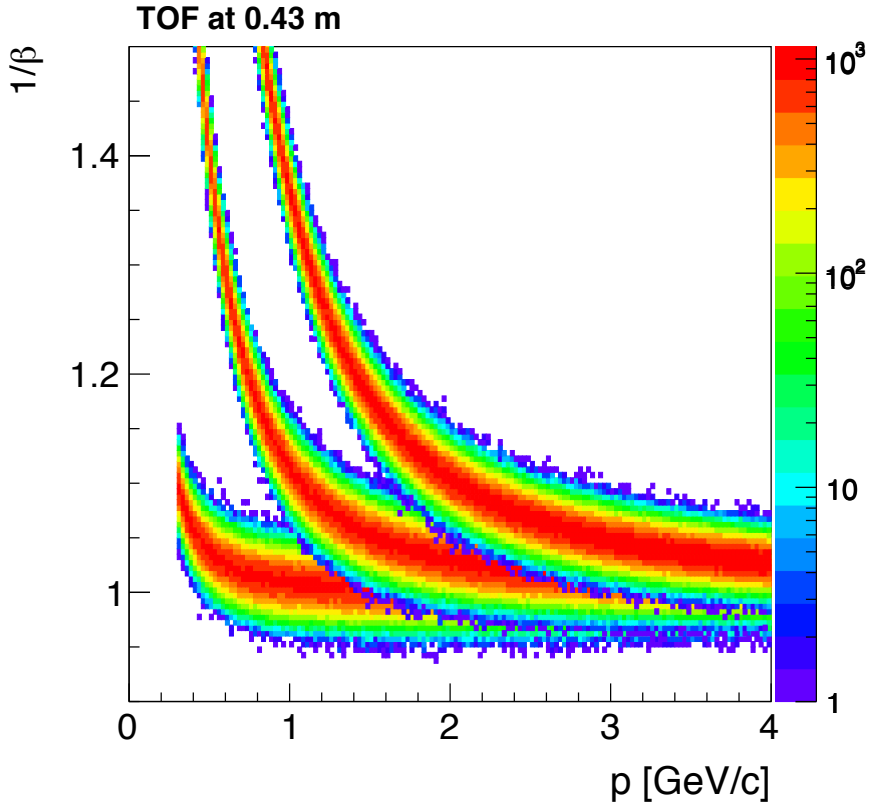






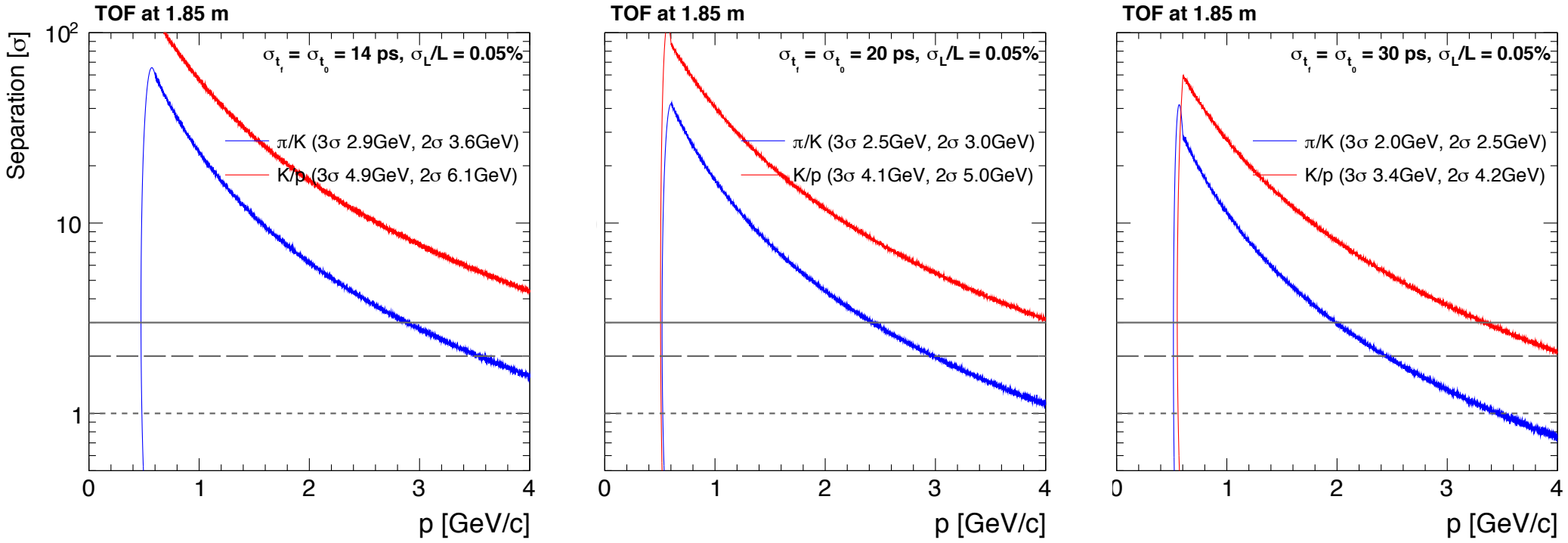
Toy MC to extract the π/K/p separation power

- Extrapolate pathlength and uncertainty as function of p and η
  - Barrel @ 43cm, forward @ 185cm
- Throw particles (π, K, proton) of different p and η
  - Calculate time of flight t_{flight} = L/velocity
  - Truth: $t_0 = 0$, $t_f = t_0 + t_{flight}$ = L/velocity
  - $\beta = L^{reco} / [(t_f^{reco} - t_0^{reco})\cdot c]$ where L^{reco} smear by full sim result
    - ✤ t_f^{reco} : smear t_f by 14, 20, 30, 50 ps
    - ✤ t_0^{reco} : smear t_0 by 14, 20, 30, 50 ps
    - ✤ L^{reco} : smear L by the uncertainties extracted from full simulation
- Extract the high p limit of 3σ separation



Forward TOF

- Areogel firing threshold: 2.0 (π/K), 3.8 (K/p)
- Forward reference z at 185cm (in front of dRICH)



Summary

- Path length saved to reconstruction output
  - JugTrack/src/components/TrajectoryFromTrackFit.cpp
  - outputTrajectoryParameters.length
- At forward direction, one TOF layer at ~185cm can compensate the dRICH momentum coverage