B field impact on forward RICH performance

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dRICH

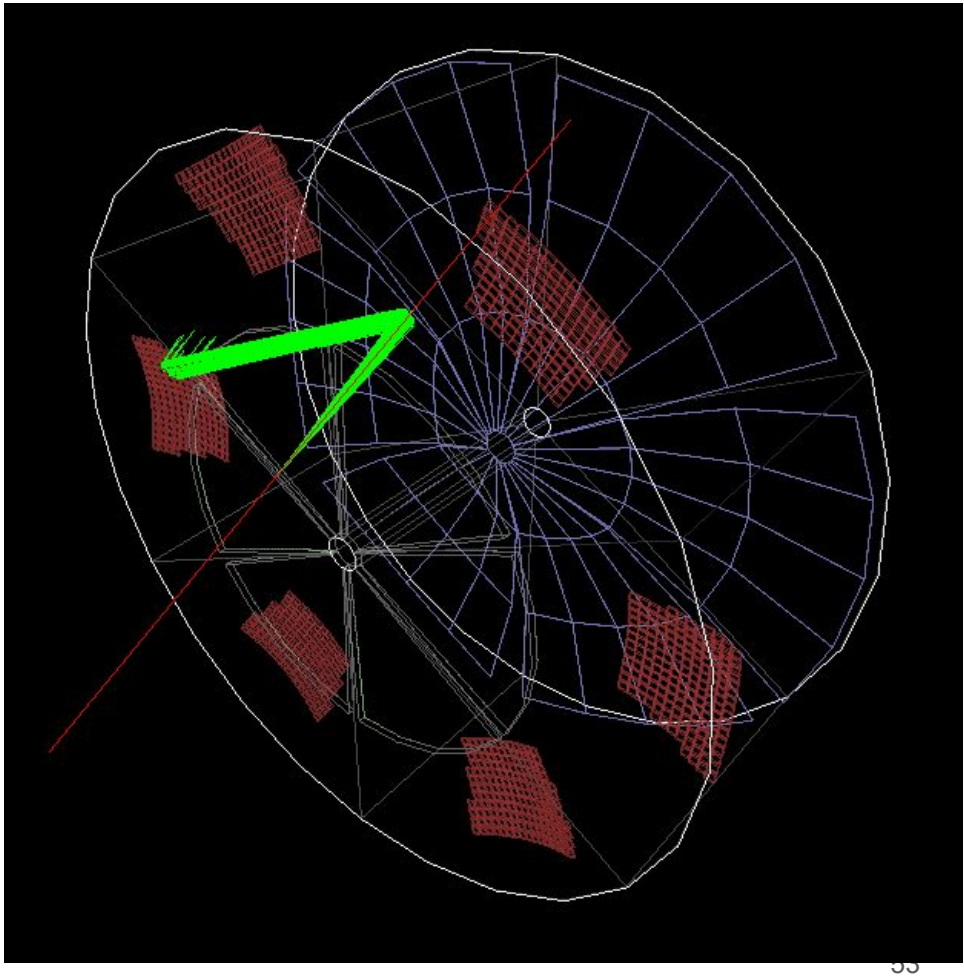
dRICH geometry, materials and optical properties imported (from fun4all developments, see Chris Dilks slides of last week) into the std.alone Geant4 simulation used so far for studies with ideal RICH geometry

dRICH volume positioned at z = + 220 cm from the IP, which corresponds to where it is supposed to be in ATHENA

dRICH geometry and optics is the “legacy” one, vessel is slightly longer (161 cm) than allocated (150 cm) in ATHENA

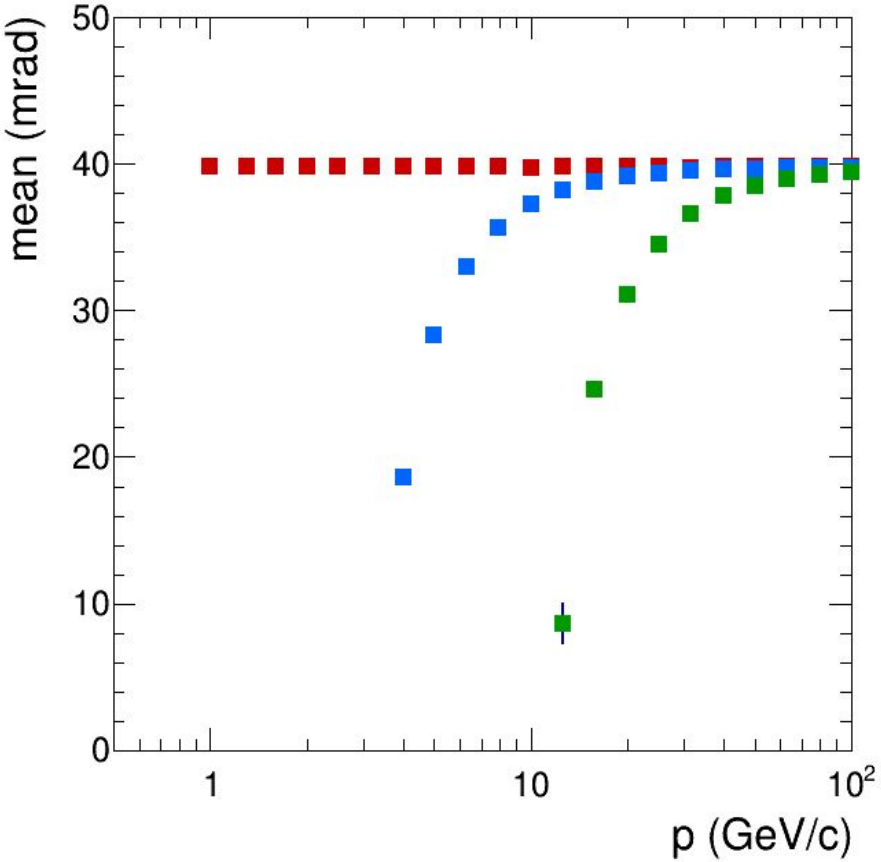
aerogel radiation switched off
pixels via 3 mm / √12 position smearing
no track-reconstruction effects

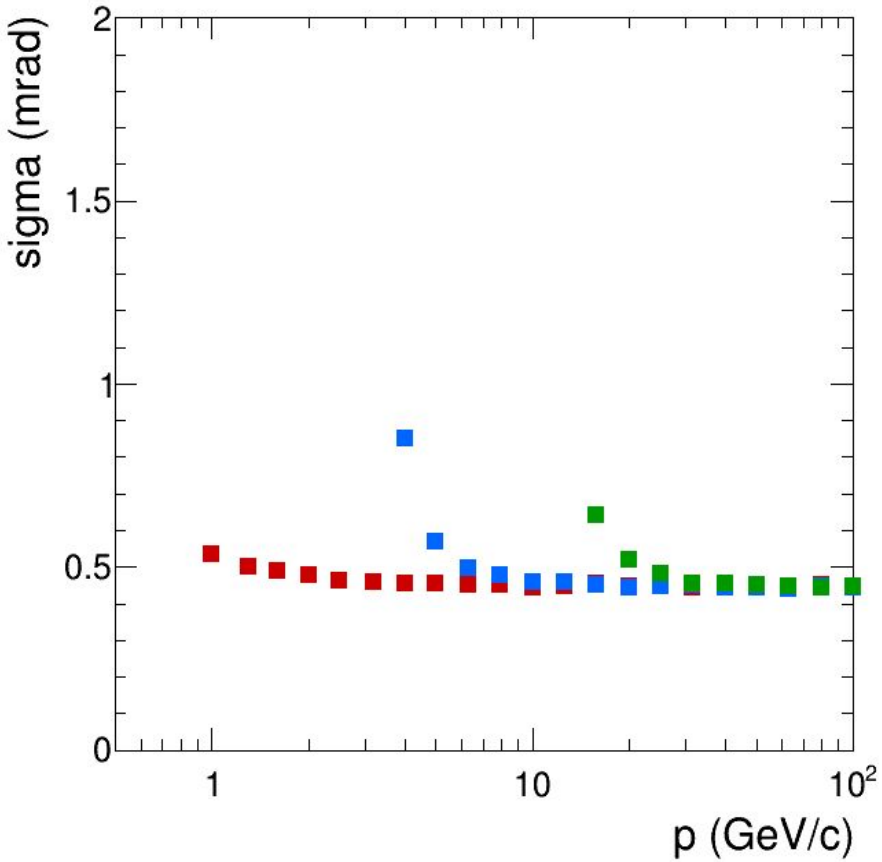
ring reconstruction with inverse ray-tracing algorithm, Cherenkov angle is the average over all detected photon angles (min 3 photons)



Reconstructed angles

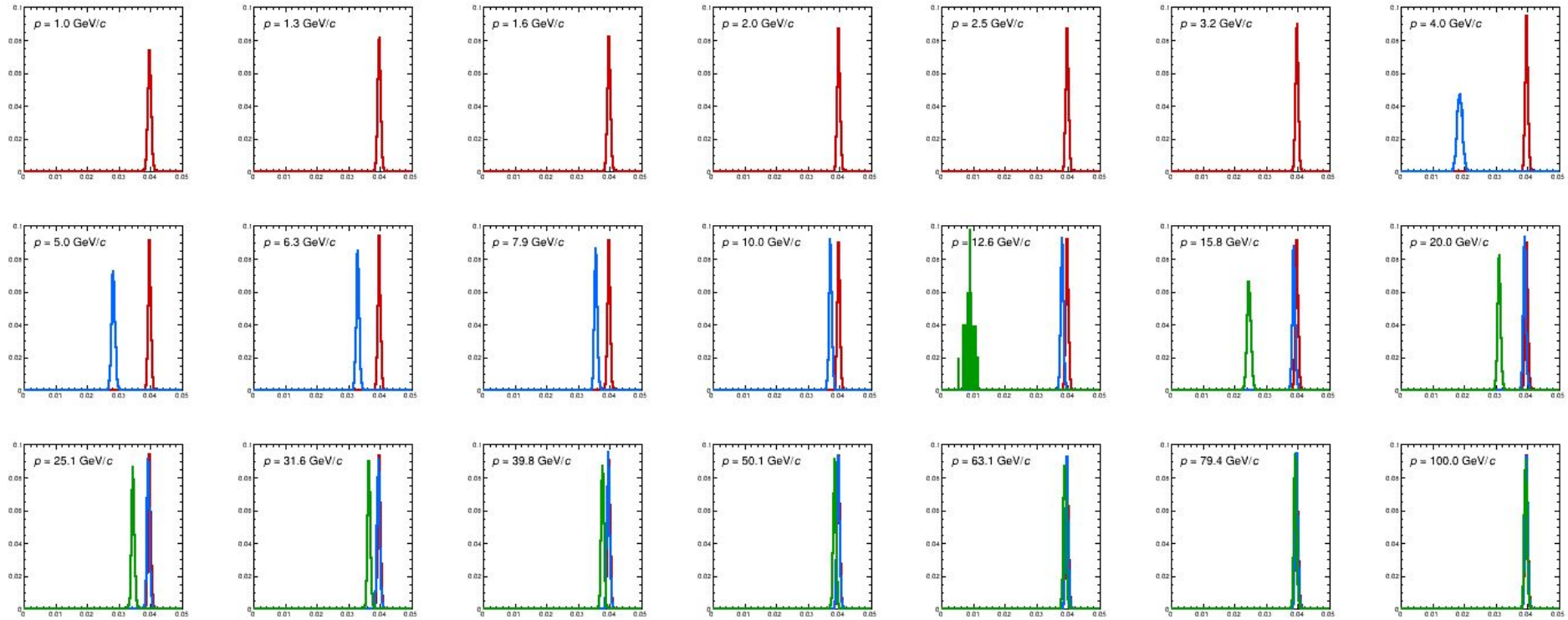
η = 2.0
B = off





Reconstructed angles

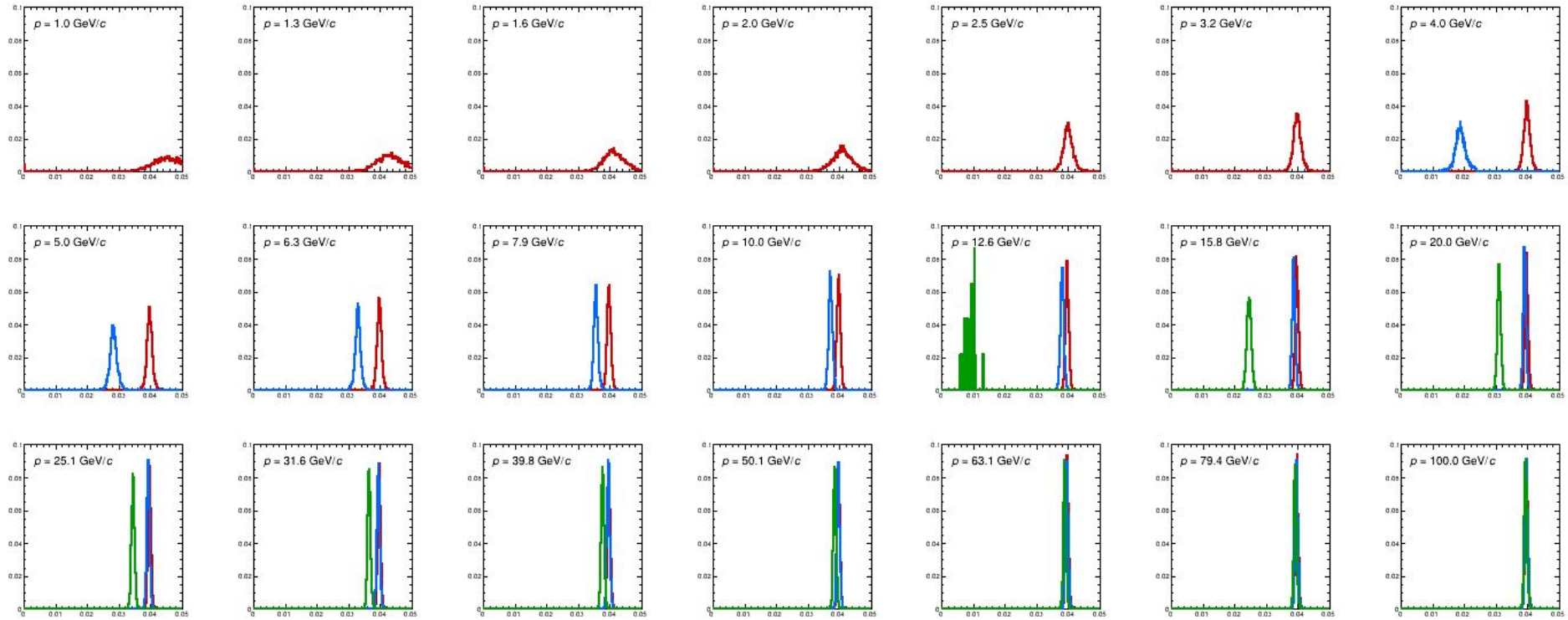
η = 2.0
B = off



electrons
pions
kaons

Reconstructed angles

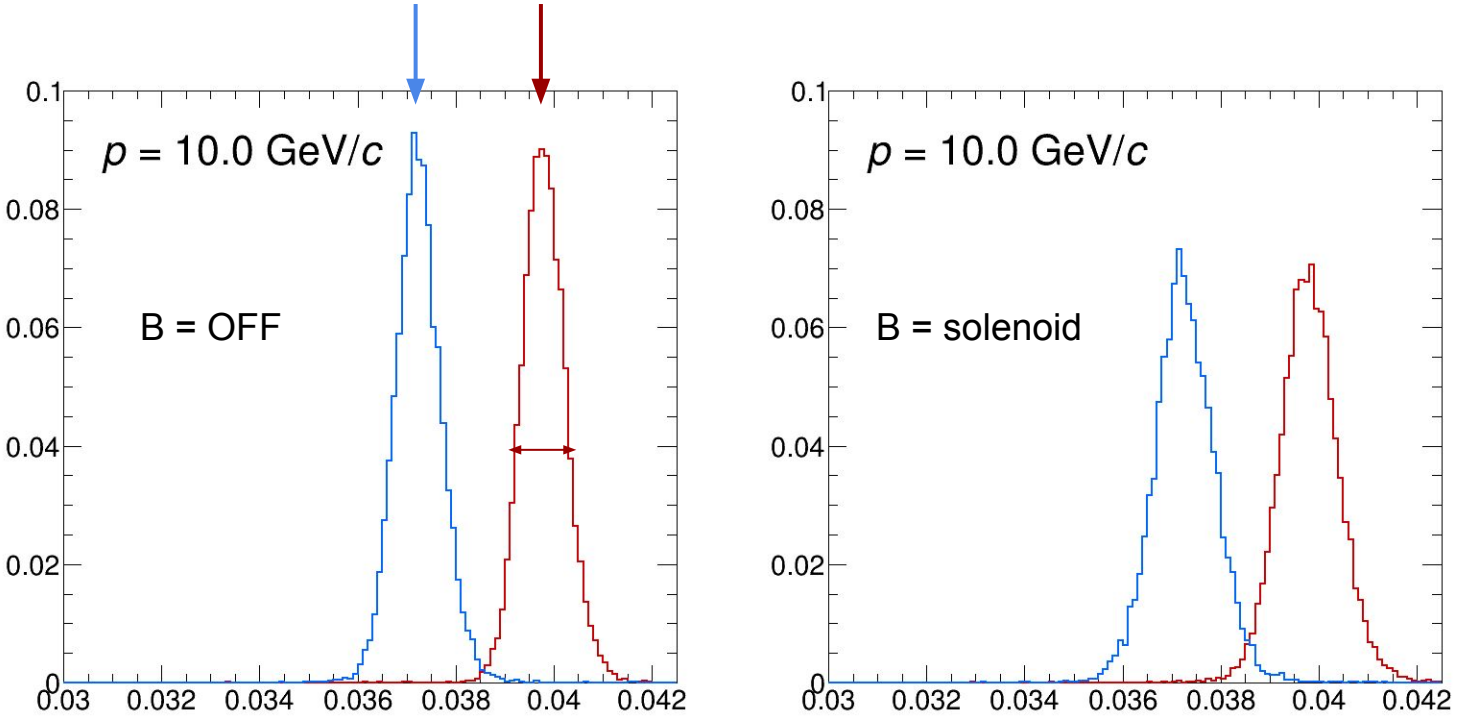
η = 2.0
B = solenoid



electrons
pions
kaons

n-sigma definition

η = 2.0

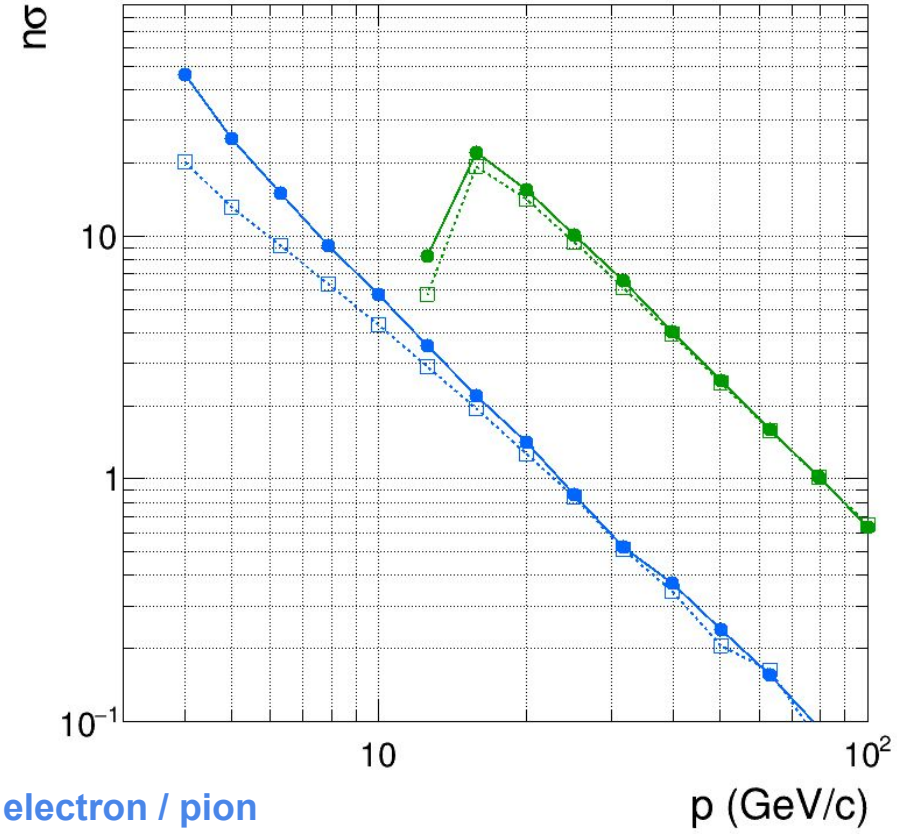


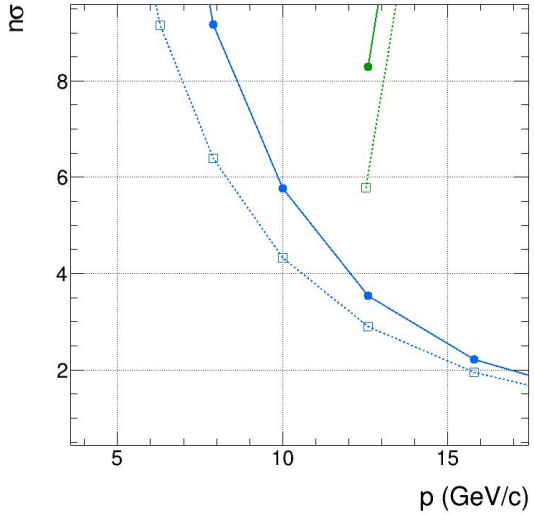
electrons
pions
kaons

n_sigma (e/pi) = (electron_angle - pion_angle) / electron_resolution

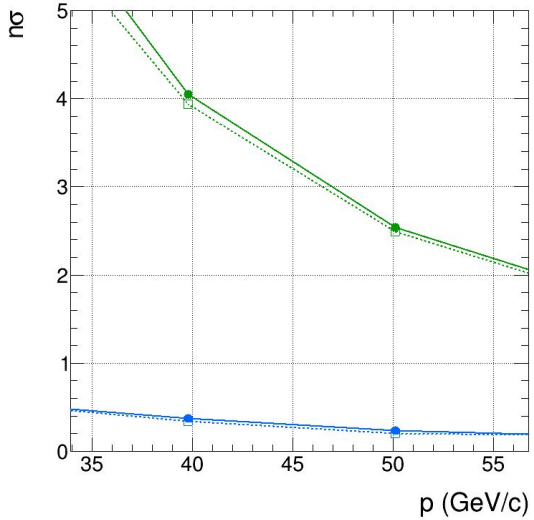
n-sigma separation

full: B = off
empty: B = solenoid





η = 2.0



electron / pion
kaon / pion

Summary

- **warning**
  - this is a very first look into the dRICH geometry and optical description class
  - there is a little mismatch between the average number of photons (~13) in this study and the values obtained by original studies (~21)
  - need to look into the photon absorption in the sensor / efficiency
- **at this level**
  - looks like the outcome is not too far from what obtained with the fast-analytical model
  - needs to be done over the full phase space (only eta = 2.0 today)
  - we still miss the uncertainty from tracking