OAK RIDGE National Laboratory

Hadron PID for (pre-)TDR

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(for the ePIC PID WGs)

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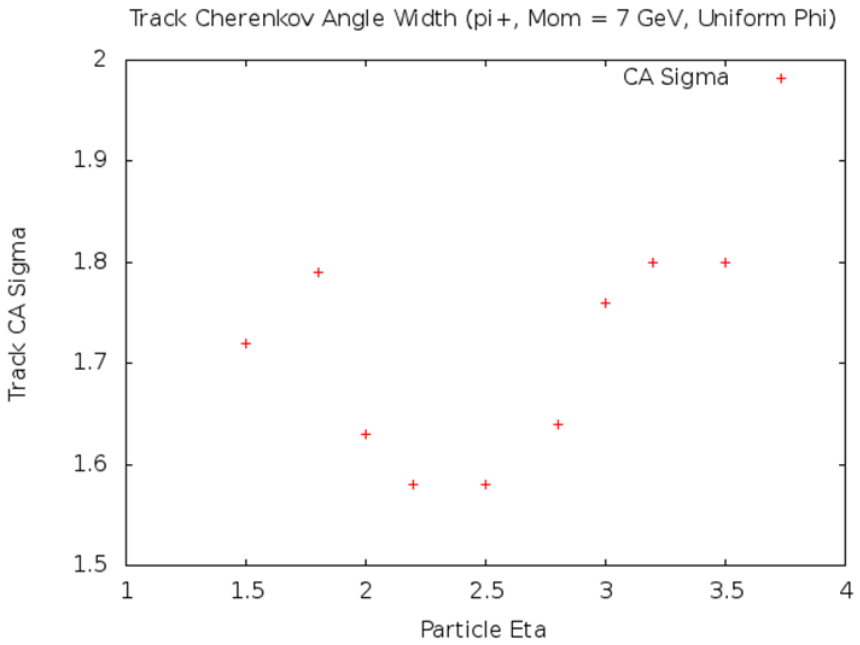
PID in eicrecon

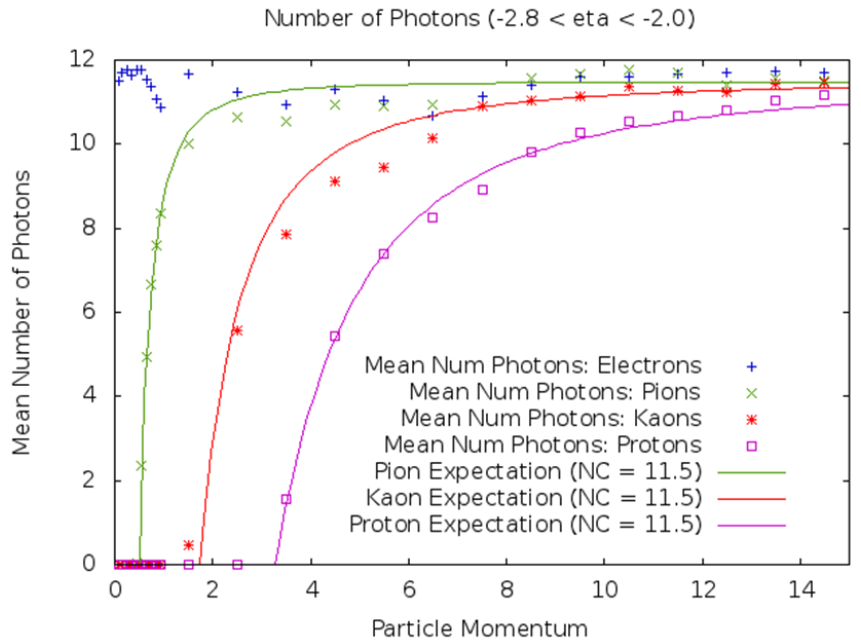
- Full PID reconstructions (largely) not ready in eicrecon
  - Various discussions since collab meeting in Argonne: will provide lookup tables for parametrized PID performance of each subsystem.
  - Each system will provide identification probabilities in bins of phase space
  - Discussion minutes: https://docs.google.com/document/d/1ViIBV0448Vnob0zE_Sm7kQsggsKOJZ9oYdmPp--QPvE
- Executive summary: Provide identification probabilities in bins of: **pdg id, eta, phi, p, q**.
  - Binning will be defined and fixed per subsystem (*)
- Proposed format by Roman Dzhygadlo/hpDIRC:
  - Definition: https://github.com/rdom/fastpid/blob/master/lut.info
  - Example: https://github.com/rdom/fastpid/blob/master/hpdirc_positive.lut
  - (minor modifications under discussion)
- Markus and Nathan will provide eicrecon factory that reads files and "rolls the dice" for each reconstructed track.

pfRICH LUT Status

Provided by Brian Page

- Initial set of pfRICH tables (pi/k/p and e/pi/k/p) submitted on 3/12
  - 4 eta bins [-3.5,-3.0], [-3.0,-2.8], [-2.8,-2.0], [-2.0,-1.5]
  - 25 momentum bins [0.05, 0.1], [0.1, 1.0] in 0.1 steps, and [1.0, 15.0] in 1.0 steps
  - Require > 5 Cherenkov photons to report a PID determination (p > 0.7, 3.0, and 5.0 for pions, kaons, and protons, respectively)
- Strategy: start simple and then refine
  - For March: provide probabilities based on track level Cherenkov angle resolutions (a la ATHENA)
  - Neglect B-field, charge dependence, phi dependence, vertex smearing, and track resolution (do spot checks of B-field and track res to get an idea of importance)
  - Add these effects in subsequent iterations
- Next Steps:
  - Add neglected effects
  - Estimate background effects
  - Obtain probabilities directly from reconstruction





hpDIRC, TOF, dRICH LUT Status

- hpDIRC:
  - Plan for 4(pdg)*2(q)*50(p)*135(eta)*60(phi) (=3.2M) bins
    - Already leveraging symmetries
    - 320MB ASCII file, but <90% compressible.
  - Full LUT draft available now
    - Extracted from full standalone reco
- TOF:
  - Planning for 4(pdg)*1(q)*20(p)*10(eta)*1(phi) (~1000) bins
  - Full LUT draft available soon™
    - Extracted from standalone reco in single particle simulations
- dRICH:
  - Full reconstruction available standalone and in eicrecon
  - Not sure about projected number of bins

Summary

- LUT format defined. No major complaints.
- First subsystem LUTs available, others will be ready soon.
- Software-side implementation work ongoing
- Prototypes ready for April production?