Research and Development for an EIC 2nd Detector KLM

Simon Schneider
simon.schneider@duke.edu
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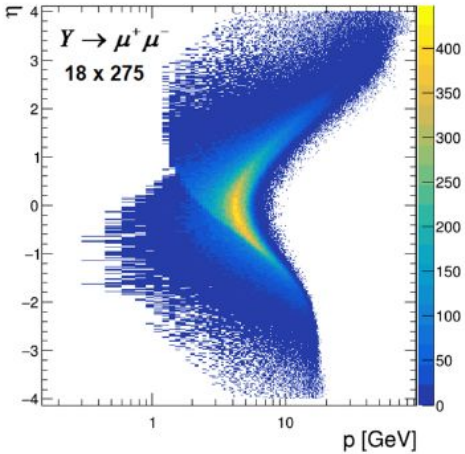
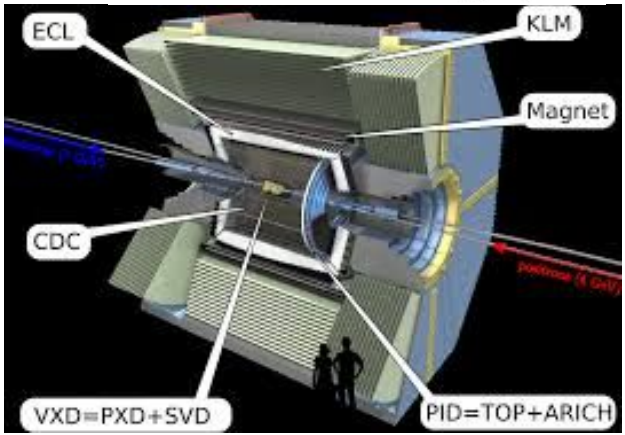
Motivations

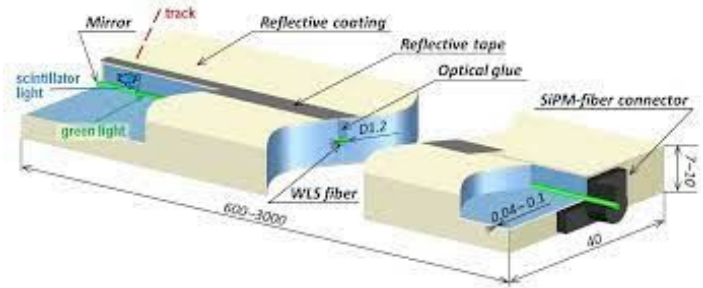
- Importance of good muon ID at a 2nd EIC detector
  - C.f. talks, e.g. yesterday morning by Abhay and Renee
  - Adds to electron channels, quarkonium, etc.
  - Important for the physics case but could also gives 2nd detector specific advantage over 1st
- The case for better neutral hadron detection
  - ⅓ of jets expected to contain neutral hadrons
  - HCal capabilities
- A Belle II style KLM is able to address both needs within the constraints at IR8
  - Compact design integrated into magnet flux return
  - Combined muon and neutral hadron detection
  - Possibilities for additional time-of-flight information and HCal capabilities

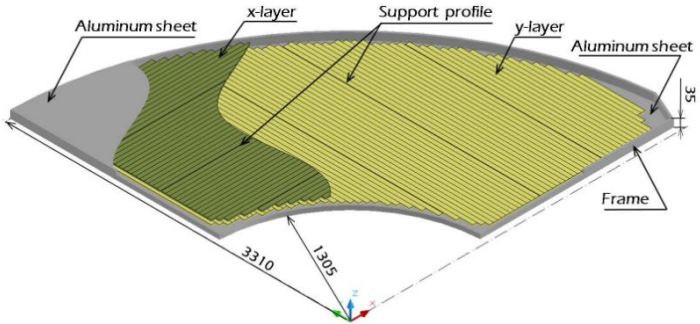




Research and Development Program

- Direct readout to replace WLS fiber
- Neutral hadron response
  - Belle II focus was position -> study response and use for energy measurement
- Improved timing
  - Timing on order of 10s of ps opens possibilities
  - Neutral hadron momentum through time-of-flight information
  - Hit localization within the scintillator
    - Simplified layer structure
    - Simpler, more compact design
- Thin HCal capabilities
- Integration into magnet flux return
- More details:
  - EIC KLM R&D Proposal
  - Talk by Will Jacobs (https://indico.bnl.gov/event/17693/contributions/70916/)





Current work (1st year)

- Funded by the EIC R&D program
- I’m focusing here on the barrel KLM studies
- KLM barrel study now underway at Duke and University of South Carolina
- Building simulation of initial EIC KLM barrel design in DD4hep
  - Focus on radial structure and integration with the flux return
  - Simulating readout based on Belle II experience
- Studying performance in simulation (muID ROC curves etc.)
- Hadron response in simulation
- Setup for readout chain tests (scintillator strips + SiPMs)

Let us know if you have thoughts, suggestions or want to get involved!