UC Berkeley Overview

Barbara Jacak

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UC Berkeley/LBNL Heavy Ion Group

PD: Preeti Dhankher, **Minjung Kim[2], Rey Cruz Torres[1], Wenqing Fan[1]**

Grad students: Dhruv Dixit, Ezra Lesser, **Beatrice Liang Gilman, Tucker Hwang**, Alwina Liu, Anjali Nambrath[3], **Emma Yeats**

Fernando Torales Acosta graduated & went to LBNL/UCR

Undergrad students: **Kyle Devereaux, Richard Lew**, Tingyu Meng, Kirill Naumov, **Remi Seddigh, Benjamen Sterwerf**

Youqi Song is at Yale, Winston deGraw at U. Washington

Project Scientist: Yue Shi Lai[1]

1) LBNL employees

2) Joining the group July 25; will work with Spencer Klein

3) Currently on Fulbright Fellowship in India

Group Works on both ALICE & EIC

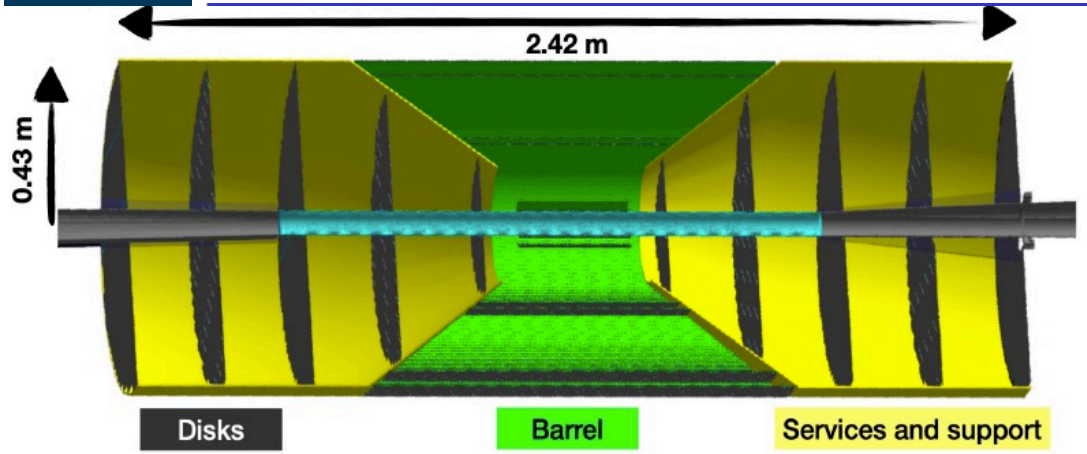
- Physics goals
  - Transport properties of dense QCD matter (hot and cold)
  - Jet evolution and modification in dense matter
  - Hadronization process

- (Current) Favorite observables
  - Jets and jet substructure
  - Heavy flavor jets

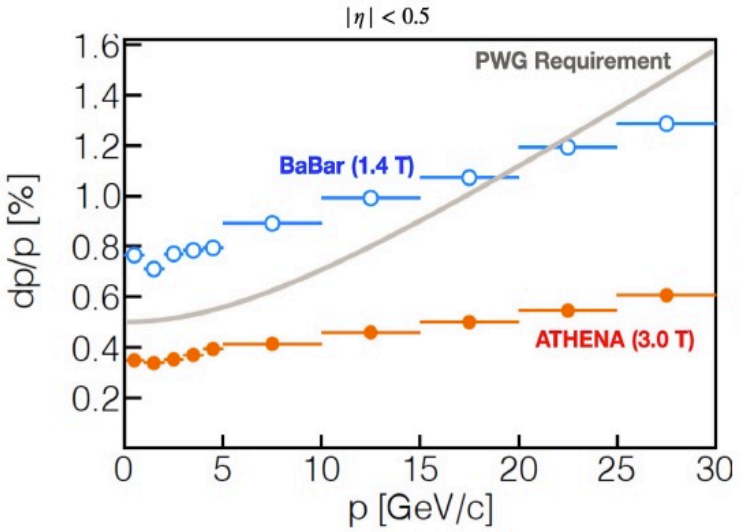
- Our approach is to study with **pp, pPb, Pb+Pb now** and design, build, and analyze EIC experiment to study with **e+A next**

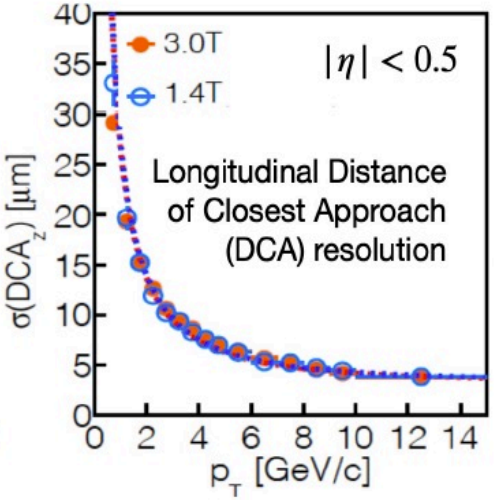
Silicon tracker design for EIC

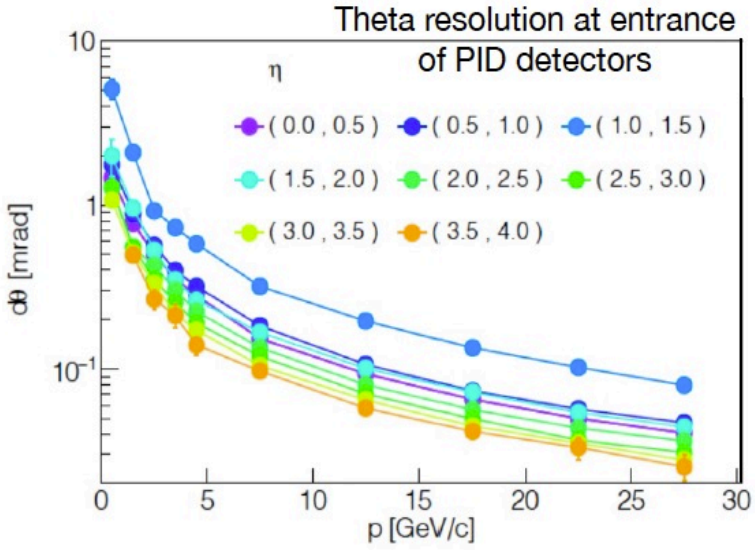
Cruz Torres



- Implementation of tracker geometry in Fun4All
- Quantification of the detector performance (momentum, DCA, angular, … resolutions)
- Quantification of material budget
- Study of magnetic-field effects



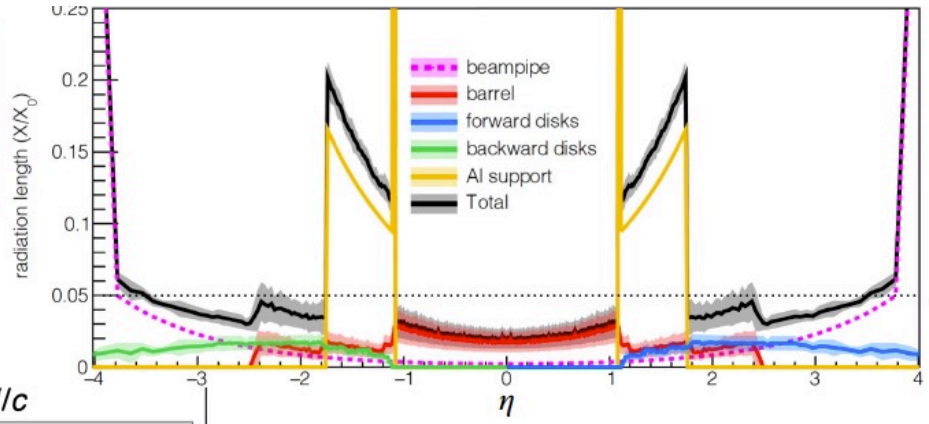




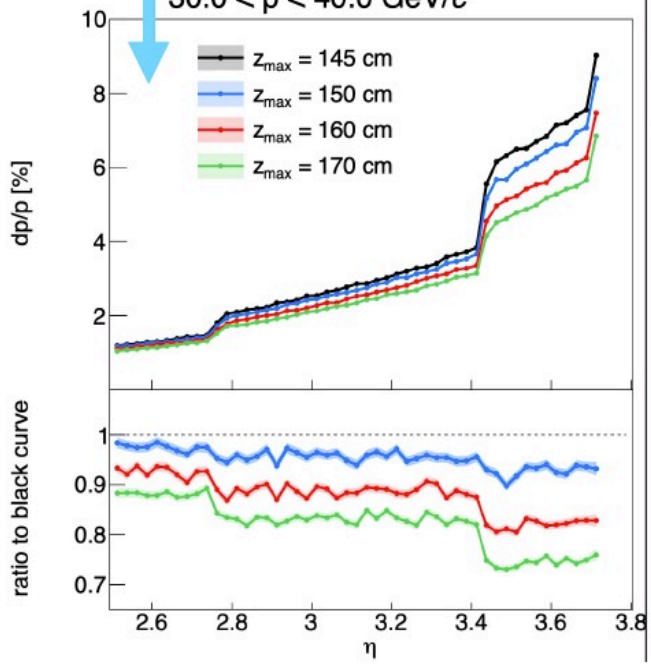
Material, beampipe, crossing angle studies

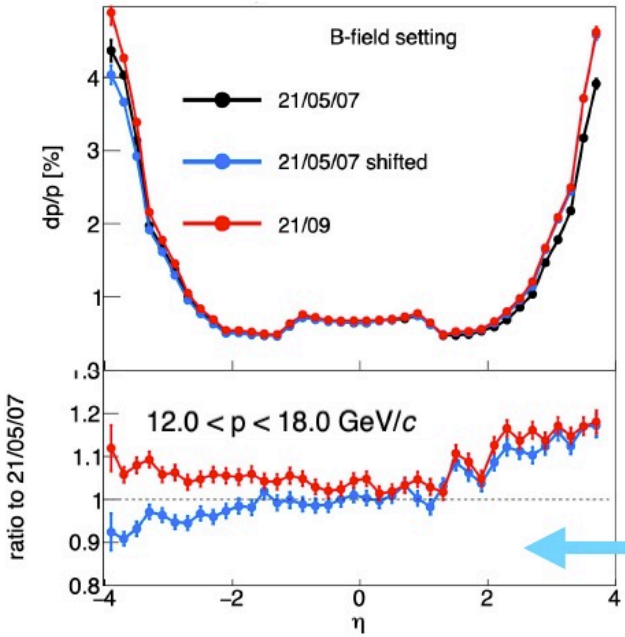
Cruz Torres

Tracking studies from LBL shaped the tracking system in all three proto-collaborations!

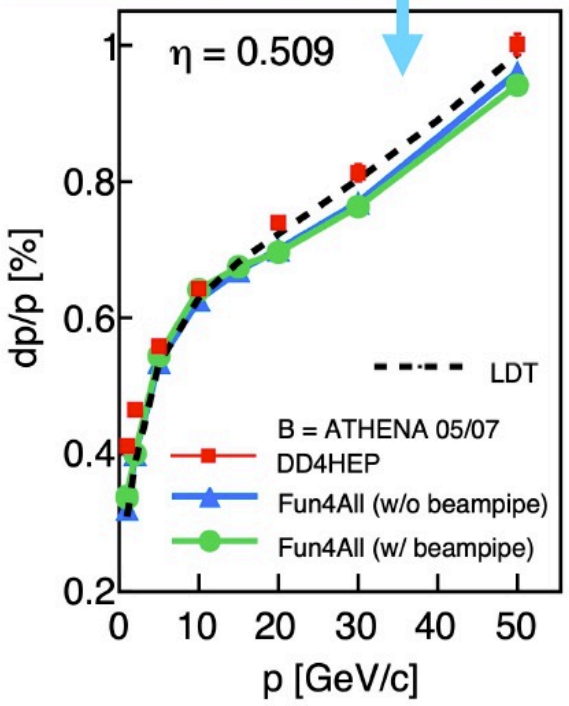


Effect of extending tracking array in forward region





Benchmarks for the ATHENA full-simulation software and fast simulations



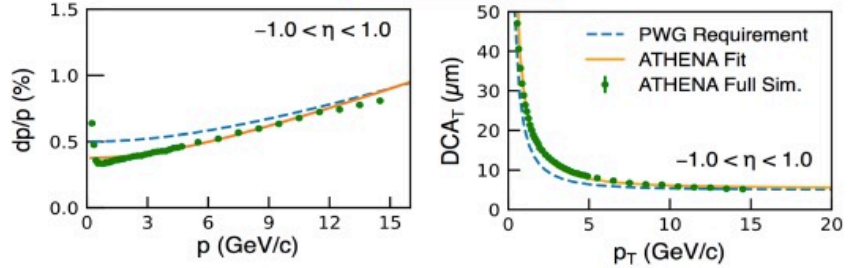
Provided feedback to ATHENA magnet-design group in terms of tracking performance-impact from different magnet concepts

Heavy flavor reconstruction

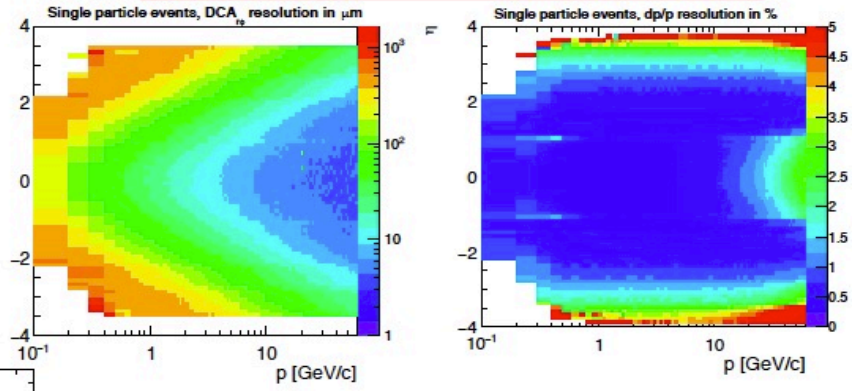
Fan, Devereaux

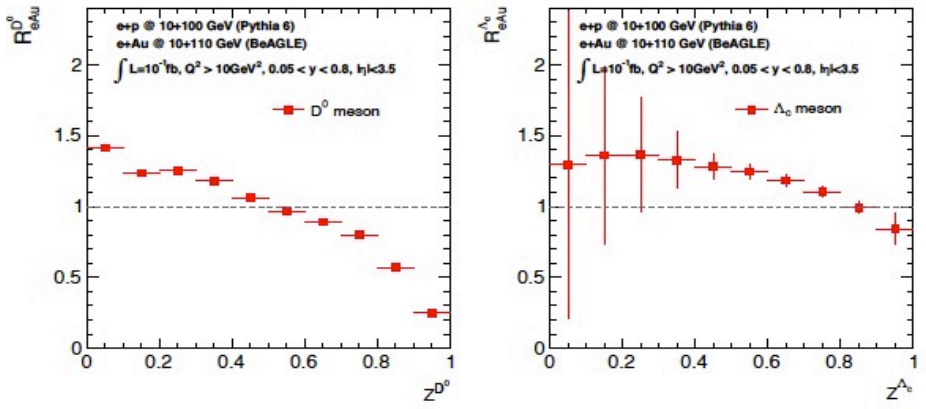
- Tracking performance of the hybrid tracker for ATHENA proposal
  - Contribution to ATHENA tracking software framework (ACTS plugin) and developed extensions to read relevant tracking information
  - Performance study: momentum resolution and pointing resolution (DCA), track projection and pathlength information

1D projection



2D map of tracking and pointing resolution



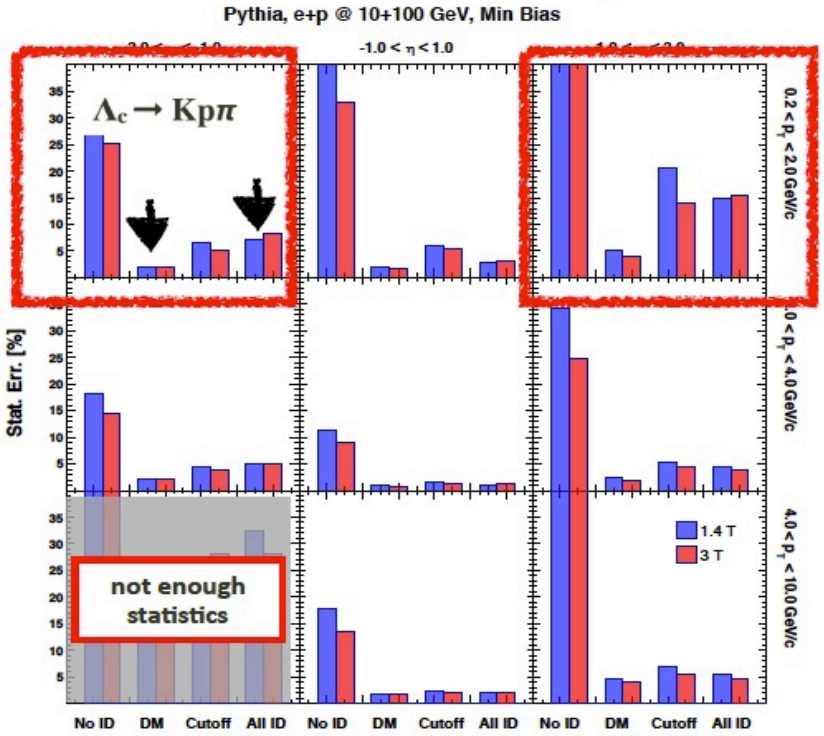


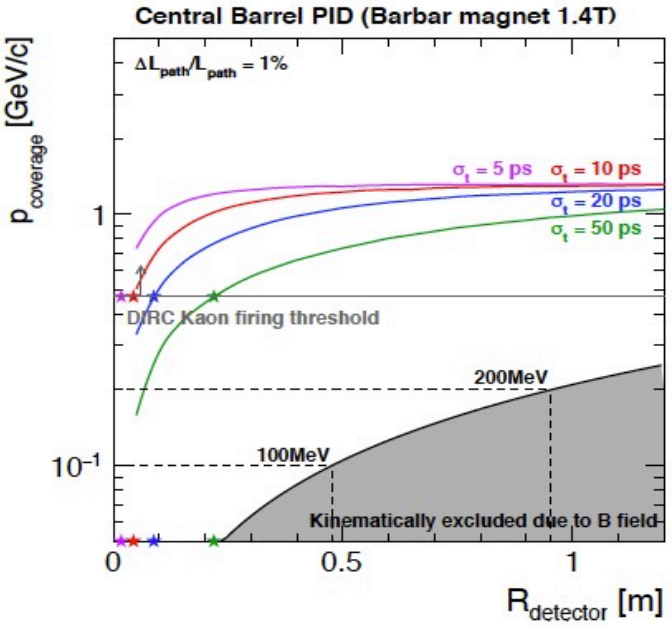
- Heavy flavor hadronization study using BeAGLE
  - Modification of D^0 production in e+Au comparing to e+p (R_{eAu}) obtained from benched-marked fast simulation

PID requirements for heavy flavor

Fan

- Low momentum PID with ps-TOF
  - Studied the impact of different PID scenario on charm hadron (D^0 and Λ_c) reconstruction: the low momentum threshold of Cherenkov detector can impact the accuracy of Λ_c measurement
  - TOF can cover the low p PID (complementary to Cherenkov detector) and we evaluated the location range to put the TOF detector for a full range of PID coverage





Ongoing silicon tracker work

- Synchrotron radiation background (Cruz Torres, Sterwerf)
- Tracking pattern recognition (Lai, Fan, *with Li*)
- Optimization of tracker layout (Cruz Torres, Liang Gilman, Yeats, *with Sichermann, Li*)
- Quantify low p_T PID requirements for Detector 1 (Fan)
- Radiative corrections (Hwang, *with Barak Schmookler**)
- Study sensor cooling strategies (Liang Gilman, Yeats, Seddigh, Lew, *with Apadula, Li*)
- Model tracker mechanics (Yeats, Liang Gilman, *with Apadula)*

➢ *Next: quantify Detector1 jet reconstruction & substructure performance*

** UC EIC Fellow*

LBNL/UCB ALICE Physics topics

- Jet axis differences to probe QCD jet evolution (Cruz Torres)
- Heavy flavor jet substructure (Dhankher, *with Ploskon*)
- Energy-energy correlations to probe hadronization (Fan, *with Ploskon, Mulligan*)
- Jet angularities to probe QCD jet evolution (Lesser, *with Ploskon*)
- Isolated photons in pPb vs. pp for nPDFs (Dixit, Yeats, Lai)
- Gamma-jet correlations in PbPb (Liu)
- Jet energy drop to probe hadronizatin (Liang Gilman, Nambrath, Cruz Torres)