Experimentally EIC Activities BNL

Discussion about BNL contribution to EIC Expressions of Intent

Thomas Ullrich, August 21, 2020

BROOKHAVEN NATIONAL LABORATORY

Scientific Activities

… directly EIC related

Wide Range of Topics

- **DVCS/VMP/GPD/Imaging**
  - Elke Aschenauer, Salvatore Fazio, Alexander Jentsch, …
- **Saturation (eA)**
  - TU, J.H. Lee, ..
- **Diffraction (ep/eA)**
  - TU, Salvatore Fazio, Alexander Jentsch, …
- **Jets, Dijets**
  - Brian Page, Kolja Kauder, Xiaoxuan Chu, Sasha Bazilevsky, Zhengqiao Zhang, …
- **Helicity, Angularity**
  - Brian Page, …
- **Entanglement, SRC, e+D**
  - Alexander Jentsch, Zhoudunming Tu, TU, …
- **Polarimetry**
  - RHIC polarimeter group, Zilong Zhang, Oleg Eyser, Sasha Bazilevsk, Zhengqiao Zhang, …
- **Nuclear breakup, Beagle**
  - Wan Chang, …
- **PDF, nPDF**
  - Xiaoxuan Chu, Salvatore Fazio, …
- **Luminosity monitoring, low-Q2 tagger**
  - Jaroslav Adam, Elke Aschenauer, …
- **Far-forward detectors**
  - Alexander Jentsch
- **Beam-gas background, neutron flux, radiation dose**
  - Jin Huang, Alexander Kiselev

Engagement in R&D Program

eRD1 - Calorimeter Consortium

- BNL Participants (listed on reports and proposals):
  - sPHENIX Group: S. Boose, J. Haggerty, J.Huang, E. Kistenev, E. Mannel, C.Pinkenberg, M. Purschke, S. Stoll and C. Woody
  - Spin, EIC and STAR group: E. Aschenauer, S. Fazio, Y. Fisyak, A. Kiselev, A. Ogawa
  - Tightly connected to BNL: Oleg Tsai
- Projects
  - Scintillating fibers embedded in W-powder composite absorber (O. Tsai et al.)
    - adopted by sPHENIX for EMC (C. Woody et al.)
  - Testing of radiation hardness of SiPMs (O. Tsai)
  - R&D on a Shashlik Calorimeter Using Tungsten Absorbers for EIC (S. Kuleshov, E. Kistenev and C.Woody)
  - Forward Calorimeter R&D (O. Tsai)
    - connected to STAR Forward Calorimeter (FCS) upgrade
  - Simulation support (A. Kiselev)

eRD6 - Tracking Consortium

- BNL Participants (listed on reports and proposals):
  - BNL: C. Woody, B. Azmoun, A. Kiselev, J. Kuczewski, M. L. Purschke, E. C. Aschenauer

- Projects
  - TPC-Cherenkov (TPCC) detector to study the feasibility of performing tracking and PID measurements in common detector volume.
  - MicroTPC (add pointing vector to otherwise simple 2-D detector)
  - Optimizing micro-pattern gaseous detectors (MPGD's) for reading out TPC
    - Zigzag shaped charge collecting anodes
    - See also LDRD of A. Kiselev
  - Investigating various avalanche technologies for a TPC readout including GEMs, Micromegas, a combination of the two, and μRWELL

eRD12 (completed)

- BNL Participants
  - Elke Aschenauer, Richard Petti (left BNL), Alexander Kiselev, William Schmidke

- Project
  - Simulations and development of: polarimeter, luminosity monitor and low Q^2-tagger for electron beam

eRD14 - PID Consortium

- BNL Participants
  - B. Azmoun, M. Chiu, J. Huang, E. Kistenev, R. Pisani, A. Sukhanov, C. Woody

- Projects:
  - High-resolution ToF (M. Chiu) - not funded any more
    - LGAD? (ORNL, Rice initiative?)
    - was eRD10: “(Sub) 10 Picosecond Timing Detectors at the EIC” merged into eRD14
  - Photosensors, LAPPD (M. Chiu, A. Kiselev)

eRD17 - BeAGLE

- BNL Participants
  - Elke-Caroline Aschenauer, Wan Chang, Jeong-Hun Lee, Zhoudunming Tu
  - Affiliated: Mark D. Baker

- Project
  - Simulations/Software related

eRD20 - Software Consortium

- BNL Participants:
  - Elke-Caroline Aschenauer, Alexander Kiselev, Jerome Lauret, Torre Wenaus

- Project:
  - EIC Software & simulations
  - In large obsolete (see EICUG Software WG)

eRD21 - Background Studies

- BNL Participants:
  - Alexander Kiselev

- Project:
  - EIC Software & simulations for EIC background studies and the impact on the IR and detector

eRD23 - DAQ/Streaming

- BNL Participants:
  - J. Huang, M.L. Purschke

- Project
  - Streaming readout for EIC detectors

eRD24

BNL Participants

- E.C. Aschenauer, A.Tricoli, A. Jentsch, S. Fazio, A. Kiselev, G. Giacomini

Project

- A Proposal for Silicon Detectors with high Position and Timing Resolution as Roman Pots at EIC
  - LGAD (AC-LGADs) technology

EIC related LDRD - Lijuan Ruan

- PI: Lijuan Ruan
- Other investigators: Elke-Caroline Aschenauer, Alexander, Kiselev, Jerome Lauret, Rongrong Ma, Victor Perevoztchikov, Gene Van Buren, Jason Webb , Zhangbu Xu, Shuai Yang, Fangang Kong, Changyu Li, Fuwang, Shen, Shuai Wang, Qinghua Xu, Chi Yang, Qian Yang , Chengguang Zhu

- Title: Forward and backward tracking at the EiC using small strip Thin Gap Chamber detector
  - also STAR Forward Upgrade

EIC related LDRD - A. Kiselev

- PI: A. Kiselev Craig Woody
- Other investigators (BNL): Babak Azmoun, Martin Purschke

- Title: Micro-Pattern Gas Detectors for EIC

Summary R&D

Participation

- DAQ
- Calorimetry
- TPC (incl. μTPC, Cherenkov-TPC)
- MPG readout planes
- Photosensors (LAPPD, SiPM rad tests)
- ToF
- Roman pots (LGAD)

No Participation

- Si sensors/trackers
- PID: RICH, DIRC
- Lightweight GEM tracker