



Colloquium

Particle Physics at the BNL Electron Ion Collider (an high-energy physicist perspective)

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Date: 2026/09/15 (Tue)

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Abstract :

High-Energy (HEP) and Nuclear Physics (NP) experiments are becoming more and more similar in so far as accelerator and detector technologies, experimental techniques, scientific programs as well as communities. More specifically, there is a very successful cross-fertilization between the Large Hadron Collider (LHC) and the Electron Ion Collider (EIC) experiments. The EIC at Brookhaven National Laboratory (BNL) is the only major collider experiment planned so far on the US soil and will start operations in the mid-2030s. The LHC will run in parallel at CERN with High Luminosity (HL-LHC) until 2041, while a future Higgs boson factory is expected to start in the mid-2040s. While the EIC physics goals are primarily focused on understanding the constituents of matter and their interactions inside the atoms' nuclei, its program extends beyond that, including measurements of electroweak (EW) processes and searches for new physics (BSM) that are complementary in reach to those at the LHC. I will present some specific examples in the EW and BSM sectors that are under study at BNL. Several experimental techniques developed for the LHC experiments, including for example jet substructure and Machine Learning, will be beneficial for harvesting the EIC data too. Furthermore, the EIC accelerator development will be an important stepping-stone for the CERN's Future Circular Collider with electron and positron beams (FCC-ee) and the detector R&D for the EIC experiments goes hand-in hand with the one for the FCC-ee as well as with the HL-LHC construction. For example some detector technologies that were pioneered for the HL-LHC detectors upgrades will be also applied, modified and improved for EIC experiments, and these are in turn planned to be used at FCC-ee experiments. I will focus specific on the development of the AC-LGAD technology. Because of this interdependence between HEP and NP experiments, the two communities are more and more overlapping. This talk will highlight the physics reach of EIC experiments and the strong links with HEP experiments.