

Czech contribution to The Electron Proton/Ion Collider (ePIC) collaboration at Brookhaven National Laboratory

Tomáš Sýkora,

*Institute of Particle and Nuclear Physics & Department of Low Temperature Physics,
Faculty of Mathematics and Physics, Charles University*

At the beginning, a concise yet comprehensive overview of the physics goals of the Electron–Ion Collider (EIC)—together with their underlying scientific motivations—will be presented. This includes the EIC’s central objectives of imaging the gluon and sea-quark structure of nucleons and nuclei in three dimensions, understanding the emergence of nucleon mass and spin from QCD, and exploring the onset of gluon saturation at small Bjorken- x . The discussion will highlight the connections, complementarities, and points of overlap between the EIC physics program and those of former facilities (ISR, SPS, HERA), currently operating colliders (RHIC, LHC), and planned future projects (FAIR, NICA, HE-LHC, FCC-hh). Relevant fixed-target and collider experiments—such as NA49, COMPASS, STAR, (s)PHENIX, NA61/SHINE, ALICE, ATLAS, and AMBER—as well as major detector R&D collaborations (including eRD and DRD initiatives) will be referenced to illustrate the broader scientific landscape. In this context, the key technical parameters of the EIC—such as beam-energy range, luminosity, species flexibility, and polarization capabilities—will be described and directly compared with those of other facilities to emphasize the unique discovery potential of electron–ion collisions.

Subsequently, the construction and design of the planned detector at one of the two EIC interaction points—being developed by the Electron-Proton/Ion Collider (ePIC) collaboration—will be presented. Particular emphasis will be placed on the contributions and specific research interests of Czech institutions and their teams. These include involvement in physics-performance studies and analysis working groups; development of detector subsystems (such as tracking, calorimetry, luminosity measurement, or forward detectors); software and simulation activities; and ongoing R&D efforts related to advanced technologies for future upgrades. The current status of the ePIC detector construction, integration, and subsystem prototyping, along with the planned next steps in preparation for EIC commissioning, will also be summarized.