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Synergies between a U.S.-based Electron-Ion Collider and European Research in Particle Physics

This document is submitted as input to the European Strategy for Particle Physics Update (ESPPU). The U.S.-based Electron-Ion Collider (EIC) aims at understanding how the complex dynamics of confined quarks and gluons makes up nucleons, nuclei and all visible matter, and determines their macroscopic properties. In April 2024, the EIC project received approval for critical-decision 3A (CD-3A) allowing for Long-Lead Procurement, bringing its realization another step closer. The ePIC Collaboration was established in July 2022 around the realization of a general purpose detector at the EIC. The EIC is based in U.S.A. but is characterized as a genuine international project. In fact, a large group of European scientists is already involved in the EIC community: currently, about a quarter of the EIC User Group (consisting of over 1500 scientists) and 29% of the ePIC Collaboration (consisting of ~ 1000 members) is based in Europe. This European involvement is not only an important driver of the EIC, but can also be beneficial to a number of related ongoing and planned particle physics experiments at CERN. In this document, the connections between the scientific questions addressed at CERN and at the EIC are outlined. The aim is to highlight how the many synergies between the CERN Particle Physics research and the EIC project will foster progress at the forefront of collider physics.

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