A new high-luminosity Electron Ion Collider (EIC) is being developed at Brookhaven National Laboratory (BNL). The conceptual design [1] has recently been completed. The EIC will be realized in the existing RHIC facility. In addition to improving the existing hadron storage ring instrumentation, new electron accelerators that include a 350 keV gun, 400 MeV Linac, a rapid-cycling synchrotron, an electron storage ring, and a strong hadron cooling facility will all have new instrumentation systems. An overview of the conceptual design of the beam instrumentation will be presented.

Abstract

The EIC will be realized in the existing Relativistic Heavy Ion Collider (RHIC) facility. The primary additions will be a chain of electron accelerators and systems that will reside inside the RHIC tunnel and service buildings. The well-established beam parameters of the present RHIC facility are close to what is required for the highest performance of the EIC, except for the total hadron beam current which will be increased by a factor of approximately three by increasing the number of bunches. A strong hadron cooling facility will utilize 100 mA of 150 MeV electrons to reduce the hadron beam emittance and control emittance growth due to intrabeam scattering. Polarized electrons will be generated in a new 350 keV DC gun from a strained superlattice GaAs photocathode and will be accelerated to 400 MeV in an S-band normal conducting Linac. The 3.8 km rapid cycling synchrotron (RCS) then increases the electron energy to 5, 10 or 18 GeV in 100-200 ms. The 3.8 km ESR will provide ~70% polarized electron beams at 5, 10 or 18 GeV for collisions with the polarized protons or heavy ions in the hadron storage ring (HSR) at 41, 100 and 275 GeV. To maintain high spin-polarization, each of the ESR electron bunches will be replaced every one to three minutes.

Introduction

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Conclusion

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References