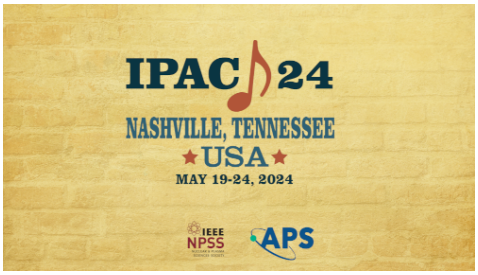

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A preliminary feasibility study on dual cavity cryomodule integration for the Electron Ion Collider energy recovery linac cooler

Tuesday, 21 May 2024 16:00 (2 hours)

The Electron-Ion Collider (EIC) is a cutting-edge accelerator designed to collide highly polarized electrons and ions. For enhanced luminosity, the ion beam is cooled via an electron beam sourced from an energy recovery linac (ERL). The current ERL design accommodates one RF cavity per cryomodule, presenting both beam transport and cost-related challenges. This study investigates the feasibility of reducing the cavity size to accommodate two cavities within a single cryomodule. We analyze two compact cavity design options through frequency scaling, assuming constant loaded quality factor Q and R/Q scaling proportional to the square of the frequency ratio. Our analytical and tracking Beam BreakUp (BBU) model predicts the threshold current for each option. While a smaller cavity footprint is advantageous, maintaining sufficient damping of Higher Order Modes (HOMs) is crucial. We compare the HOM damping effectiveness of the proposed compact design to the existing configuration, which achieves sufficient damping within a slightly larger footprint.

Footnotes

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