



Contribution ID: 1413 Contribution code: MOPS22

Type: **Poster Presentation**

Resistive wall heating and thermal analysis of the EIC HSR beam screen

Monday, 20 May 2024 16:00 (2 hours)

The Electron-Ion Collider (EIC) utilizes the existing Relativistic Heavy Ion Collider (RHIC) rings as a Hadron Storage Ring (HSR) with some modifications. However, this presents significant challenges, primarily due to beam-induced Resistive Wall (RW) heating resulting from a larger radial offset and shorter EIC bunches (up to 10 times shorter than RHIC). Additionally, the formation of an electron cloud further complicates matters. To address these issues and operate the HSR effectively, this paper focuses on the RW heating and thermal analysis of the EIC HSR beam screen. Our approach involves the insertion of a copper-coated stainless steel beam screen with cooling channels and longitudinal slots. We conducted a detailed thermal analysis, assessing piecewise RW losses around the beam screen's profile due to an offset beam, employing the 3D commercial code CST. These losses, along with realistic boundary conditions, were then integrated into another code, ANSYS, to determine the thermal distribution.

Footnotes

Funding Agency

Work supported by Brookhaven Science Associates, LLC under Contract No. DE-SC0012704 with the U.S. Department of Energy.

Paper preparation format

LaTeX

Region represented

North America

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Session Classification: Monday Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D03 Calculations of EM fields
Theory and Code Developments