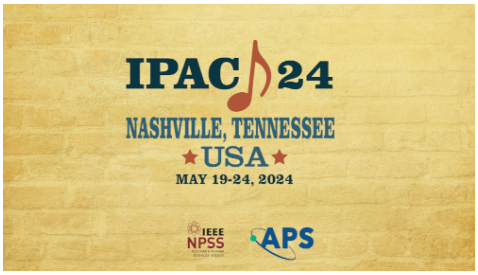


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# The mechanical behavior of the EIC beam screen during a magnet quench

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

As part of the Electron-Ion Collide (EIC) upgrade at Brookhaven National Laboratory (BNL), the development of new beam screens for the vacuum system is underway. The mechanical design of the beam screens received support from CERN, particularly in addressing the mechanical response during a magnet quench, i.e. a resistive transitions in the superconducting magnets. Maintaining an overall elastic behavior in this component is crucial for the efficient functioning of the collider. The mechanical behavior of the EIC beam screen during a quench was initially analyzed using analytical methods and subsequently validated through a Multiphysics FEM model developed for the High-Luminosity LHC (HL-LHC) beam screen. The FEM model underwent an initial verification against analytical formulations in its simpler 2D magnetic-based version. Following this, thermal and mechanical physics were fully coupled with the magnetic model in a 3D framework. Various features, including partial weld penetration, pumping holes, and guiding rings, were then taken into consideration. Additionally, the plastic behavior of the beam screen materials was considered too. The assessment included an analysis of the maximum deformation and stress experienced by the EIC beam screen during a magnet quench, resulting in an overall elastic response for the proposed design.

## Footnotes

## Funding Agency

## Paper preparation format

## Region represented

Europe

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