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Evaluation of the impact of REBCO-coated conductors on the resistive wall impedance of the FCC-hh

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The beam screen for the Future Circular hadron-hadron Collider (FCC-hh) has a baseline design based on a copper (Cu) coating. Calculations have indicated that the resistive wall impedance will be the major contributor to the beam impedance for the FCC-hh at both injection and collision and that Cu might be on the limit to ensure beam stability. To increase the safety margin, it is desirable to reduce the resistive wall impedance. In this contribution, we present an approach to reduce the beam impedance based on the reduction of the surface resistance of the beam screen coating by using High-Temperature Superconductors based on REBaCu3O7-x coated conductors (REBCO-CCs). These HTS-CCs have transition temperatures around 90K, and critical current densities which are high enough even in the presence of strong magnetic field, being therefore good candidates to substitute Cu in the FCC-hh beam screen which will be operating at around 50K and under a magnetic field of 16T. Using experimental data generated on the surface impedance of REBCO-CCs, CST simulations have been performed and the beam impedance has been estimated for an elliptical beam screen with the same vertical dimensions as that of a pure Cu beam screen. A position and REBCO-CCs contribution dependence study to determine the optimum beam screen configuration will be shown. Resistive wall impedance studies using an ellipse is a step forward towards determining the performance of the REBCO-CCs on the FCC-hh beam screen.

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Footnotes

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