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REBa2Cu3O7 coated conductors as a beam screen coating: Using the classical rigid-fluxon model to link surface resistance to microstructure

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In the foreseen Future Circular Collider-hh operating conditions of 40-60K, 16T and 0-1GHz proton bunch frequency, the intended Cu coating of the beam screen might not guarantee an impedance sufficiently low for a stable beam. This motivates the exploration of high-temperature superconducting coated conductors (CC) as an alternative coating.
In this contribution, we present the surface resistance of different commercially available REBa2Cu3O7 CCs as a function of magnetic field up to 9T at 50K and 8GHz. It is shown that the surface resistance's in-field behavior depends strongly on the microstructure of the corresponding superconducting film. We apply the classical rigid-fluxon model to deduce the surface resistance from electrical transport values and demonstrate a good qualitative description of our measurement data. As a first outlook to the behavior at FCC conditons, the classical rigid-fluxon model allows an extrapolation of the surface resistance and suggests the outperformance of Cu by CCs at 50K, 16T and 1GHz. Finally, we confirm the compatibility of CCs with a-C coatings. It permits to mitigate the secondary electron yield while maintaining a low surface resistance.

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