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RF response of REBa2Cu3O7-x coated conductors under high magnetic fields

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Our recent investigations have highlighted REBa2Cu3O7-x (RE = rare earth) Coated Conductors (CCs) as promising candidates to replace copper (Cu) as low surface-impedance coatings in high-energy physics (HEP) RF applications operating under very-high magnetic fields [1, 2, 3].This contribution provides a thorough demonstration of why REBCO CCs as promising solutions for the HEP community, specifically addressing the need for low-surface impedance materials in the GHz range under very high magnetic fields. This study pioneer's advancement in characterizing the surface impedance (Zs) of Coated Conductors (CCs) using a novel Hakki-Coleman dielectric-loaded resonator. The resonator is optimized for TE011, TE012, and TE013 modes, resonating at frequencies of 6.5GHz, 8.1GHz, and 10GHz, respectively. The study is conducted over a broad range of cryogenic temperatures and magnetic fields strengths up to 16T. The results highlight the resonator's pivotal role in ensuring precise multi-frequency measurements, providing crucial insights into vortex dissipation phenomena such as vortex creep. The results underscore that CCs outperform Cu in the desired high-temperature (H-T) region crucial for HEP applications. Additionally, high-frequency vortex parameters are extracted from the Coffey–Clem model, utilizing surface resistance and reactance data, and they are used to extrapolate results under working conditions not accessible via experiments.
References:
[1] T. Puig et al, Supercond. Sci. Technol. 32 (2019)
[2] A. Romanov, et al. Scientific reports 10 (2020)
[3] J. Golm, et al. IEEE Trans. App. Supercon. 32 (2022)

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