

Study of superconducting Tl(1223) coatings for beam impedance mitigation in the FCC

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Among the high-temperature superconductors (HTS) Tl-cuprates stand out due to their very high critical temperatures and upper critical fields. In particular TlSr₂Ca₂Cu₃O_x (Tl(1223)) with a T_c of about 120 K, very high H_{c2} and H_{irr}, and moderate anisotropy is a promising material for the realization of a low surface resistance coating for the FCC beam screen. The main function of the beam screen is of intercepting the synchrotron radiation emitted by the beam where the SC coating should shield the AC field generated by the bundles of charged particles moving through the accelerator. Due to considerations related to vacuum stability and thermal effectiveness, the screen has to be kept at a temperature around 50 K, and it is exposed to the dipole magnetic field of 16 T. Among the known HTS, the extensively studied YBCO can work under these conditions, but the deposition require complex processes and performing it on the inside of a tube would require significant modifications of the fabrication process. Tl(1223) can be grown textured on pure silver by much simpler and cheaper techniques, and has the additional advantage of a potentially lower surface resistance (since $RS \propto R_S \propto \sqrt{H/H_{c2}}$). The feasibility of using this material for coatings suitable for the FCC beam screen is currently being explored by CNR-SPIN, TU Wien, and CERN in a joint project.

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