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Customizing Coated Conductors to Enhance Normal Zone Propagation Velocities

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***Abstract*—Enhancing the normal zone propagation velocity (NZPV) is a critical requirement of $REBa_2Cu_3O_7$ (REBCO) coated conductors (CC), particularly for being used in fault current limiters and magnet applications. The Current Flow Diverter (CFD) and buffer-CFD (b-CFD) concepts are customizations of the CCs that have proven to increase the conductor's robustness against hot-spot regime [1, 2]. The modified CC architecture works by creating a high resistive interface between the metallic shunt and the superconducting REBCO layer either in the central section of a conventional CC tape or in the whole width.**

In this presentation we will present several strategies to customize the contact resistance between the REBCO superconducting layer and the metallic shunt to succeed in enhancing the NZPV. Different approaches to generate high interfacial resistances have been considered, including additional nanolayers or modified metallic shunts (Y_2O_3, AgS, Ag alloys), which minimize the manufacturing changes [3,4]. The success in enhancing the NZPV has been tested through Current Transfer Length (CTL) measurements or by determining the NZPV dependence with the applied current. The experimental effectiveness of the processes was tested using Scanning Hall Probe Microscopy to assure that the critical current homogeneity is preserved while the interfacial electrical resistivity was measured at different temperatures. We have demonstrated that the NZPV value is enhanced by a huge value of a factor 17 when compared to conventional CCs. The advantages and hindrances of the different CFD manufacturing approaches will be discussed in connection to the performance demand of different applications, such as Fault Current Limiters and magnets.

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