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Measurement and Analysis of Normal Zone Propagation in a YBCO coated conductor at temperatures below 50 K

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Measurements of the quasi-adiabatic normal zone propagation velocity and quench energies of a Superpower SCS4050 copper stabilized YBCO superconducting tape are presented over a temperature range of 23-47 K; in parallel magnetic fields of 6, 10 and 14 T; and over a current range from 50% to 100% of I_c . These data are compared to analytical predictions and to one-dimensional numerical simulations. The availability of long lengths of ReBCO coated conductor makes the material interesting for many HTS applications operating well below the boiling point of liquid nitrogen, such as magnets and motors. One of the main issues in the design of such devices is quench detection and protection. At higher temperatures, the quench velocities in these materials are known to be about two orders of magnitude lower compared to LTS, resulting in significantly smaller normal zones and the risk of higher peak temperatures. To investigate whether the same also holds for lower temperatures more extended data sets are needed, both as input and as validation for numerical design tools.

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