

Characterization of Electrical Resistance of HTS Coated Conductors at High Currents Using Ultra-Fast Regulated Current Pulses

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Abstract - This paper focuses on the experimental determination of the electrical resistance (R) of commercial high temperature superconductor (HTS) coated conductors (CC) at currents well above their critical current. The major novelty of this work relies in a unique experimental capability of applying constant current pulses in the sample (up to 1000 A) for durations as short as 15 microseconds, which allows controlling very precisely the amount of energy dissipated in the sample (Joule effect), as well as the resulting temperature rise. By varying finely the applied current and the duration of the pulses, we show that we can achieve a relatively accurate characterization of $R(I, T)$ simply from the measured dynamical $V-I$ characteristics of CCs. The resistance model so-obtained is very important as it is the most fundamental design parameter in many practical HTS applications, especially fault current limiters.

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