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Procedural solutions for determining the temperature dependence of transport critical current in Nb₃Sn superconducting wires using magnetization measurements

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Using magnetization techniques to determine the temperature dependence of critical current in Nb₃Sn wires is attractive. However, there is a known mismatch in the temperature scaling characterizations when using magnetization data compared to transport data. From a practical stand point, it is the latter that matters, as performance prediction, margin calculations, and other aspects of magnet designs rely on the knowledge of the amount of transport current the superconductor can carry in a magnetic field. In this paper, we will identify some of the underlying issues and propose procedural solutions for determining the temperature dependence of transport critical current in Nb₃Sn superconducting wires using magnetization measurements. This way, it becomes possible to combine the simplicity and economy of quick magnetization measurements at different temperatures with accurate prediction of transport properties in extrapolated temperature ranges.

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