

A-15 Inhomogeneity in Nb₃Sn Wires: A Potential Leverage Point for Conductor Improvement

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A recently established collaboration between CERN and TU Wien aims at increasing the critical current density of Nb₃Sn wires under the envisaged operating conditions of the Future Circular Collider by roughly 50% relative to currently available products. One of the leverage points for Nb₃Sn wire optimization is the inhomogeneity of the A-15 phase, which manifests in the form of Sn concentration gradients and a grain morphology transition in PIT-type wires.

We have devised a fast method for obtaining the global Sn concentration gradient in PIT Nb₃Sn wires from AC susceptibility measurements. We present the measurement and evaluation procedure, and compare our initial results to data obtained from high-resolution Sn concentration measurements by means of EDX / EELS as well as to critical temperature distribution data obtained from calorimetry. In addition, we present scanning Hall-probe microscopy examinations of thin wire slices, from which the spatial current distribution can be inferred. This measurement technique complements the AC susceptibility examinations by providing data regarding the spatial variation of the critical current density.

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