

HTS Roebel Cable Research from KIT and Partners

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Abstract — The content of the talk is a review on the research and developments on HTS Roebel cables. In the first part we present the origin of the Roebel idea and the steps how this idea was applied to superconducting cable concepts, in particular the cable on basis on REBCO tapes. The basic properties of the cables are addressed as current anisotropy, current carrying capability, the self-field effects and the behavior in pancake and solenoid windings. Numerical modeling is presented as a powerful tool to describe with very good accuracy the properties of the cables and coils, in particular the AC loss properties. We show the actual topics and activities on advanced cables which are done in cooperation with a couple of external partners. Filament application by laser grooving is a promising modification for further reduced AC losses and we show results on Roebel cables and CORC cables, the competitor for magnet applications. The most important applications of the cables are actually insert dipole magnets developed as a demonstrator in the frame of the EU-project EUcard2 of CERN. We present the status of the cable investigations and optimisations for this special purpose and the proposed and planned magnet designs which allow the application of such cables. Finally a HTS-Rutherford cable with Roebel strands is presented which represents a very successful route for very large magnets as required for the fusion reactor DEMO following ITER. Extrapolation of the current capacity potential of upgraded Rutherford cables meet the required current levels. A final summary shows that the Roebel cable is enabling in particular high field low temperature applications in magnets, the increasing industrial interest in this concept and the technical progress.

Keywords (Index Terms) — HTS Roebel cable, Coated conductors, high field dipole magnets.