

Improvement of superconducting properties in ROEBEL Assembled Coated Conductors (RACC)

W. Goldacker, A. Frank, A. Kudymov, R. Heller, A. Kling, S. Terzieva, C. Schmidt

Abstract — Assembling coated conductors (CC) into flat ROEBEL bars (RACC-cable) is a practicable method to reach high transport currents in a low AC loss cable design being suitable for windings. Electrical machinery as large transformers and generators/motors need a few kAmps. transport current. The aim of the presented work was demonstrating the possibility of a strong increase of the transport current of such RACC-cables, which was so far 1 kAmp. We present a changed cable design with 3-fold layered strands, an unchanged transposition pitch of 18.8 cm and finally application of 45 coated conductors in the cable. A 1.1 m long sample (equivalent to 6 transposition lengths) was prepared. Cu stabilized coated conductors purchased from SuperPower were used for formatting the ROEBEL strands and assembling the new cable. The new cable reached a record transport current of 2628 Amps. at 77 K in self field ($5 \mu\text{V}/\text{cm}$ criterion). A special feature of the cable was the use of 3 slightly different current carrying ($\pm 10\%$) batches of strand material. Although current sharing and redistribution effects could be observed, the behavior of the cable was found as absolutely stable under all operation conditions. The estimation of the self field degradation of the critical currents, being of the order of 60% at 77 K could be modeled satisfactory by means of a Biot-Savart-Law approach.

Index Terms — AC losses, cable, coated conductors, high transport current, ROEBEL bar

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W. Goldacker, A. Frank, A. Kudymov, R. Heller, B. Ringsdorf, A. Kling, S. Terzieva, C. Schmidt are with the Forschungszentrum Karlsruhe, Institut fuer Technische Physik, P.O.Box 3640, 76021 Karlsruhe (corresponding author W.G. phone: +49 7247 824179, fax: +49 7247 825398, email: wilfried.goldacker@itp.fzk.de)

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