

AC Loss of a Model 5m 2G HTS Power Cable Using Wires with NiW Substrates

V. S. Vysotsky, K. A. Shutov, A.A. Nosov, N.V. Polyakova, S.S. Fetisov,
V.V. Zubko and V.E. Sytnikov
Russian Scientific R&D Cable Institute (VNIKP), 111024, Moscow

W. L. Carter, S. Fleshler, A. P. Malozemoff and G. Snitchler
American Superconductor Corporation, Devens, MA 01434 USA

Corresponding Author: V.Vysotsky: vysotsky@ieee.org

Abstract - A model 5 m cable prototype was constructed using American Superconductor second generation (2G) high temperature superconductor (HTS) wires - 344 superconductors, produced with the MOD/RABiTS™ process. The model cable consists of two helically counterwound layers of brass-laminated tapes. Twist pitches were calculated to provide uniform current distribution between the two cable layers. The NiW substrates of the tapes were oriented to face radially inward and radially outward for the inner and outer layers of the cable, respectively, to minimize the spacing between the HTS layers and any effects of the weak substrate magnetism. To verify the calculations and design principles, the model cable was instrumented with potential taps and sensors, including Rogowski coils and Hall probes, to measure the current distribution among layers, voltage – current characteristics and other parameters. AC losses in this cable model have been measured and analyzed by use of digital measurements of current and voltage. At low to intermediate currents, they are in the range of a few tenths of a watt per meter, consistent with the ferromagnetic loss of the substrate. Analysis of the individual contributions of the Ni-W substrate and the superconductor hysteresis loss is given.

IEEE/CSC & ESAS EUROPEAN SUPERCONDUCTIVITY NEWS FORUM (ESNF), No. 11, January 2010
Published in *Journal of Physics Conf. Series (SuST)* 234, 032061 (2010)