Theory of AC Loss in Cables with 2G HTS Wire

J. R. Clem[1] and A. P. Malozemoff[2]

[1]Ames Laboratory, Iowa State University, Ames IA 50011
[2]American Superconductor Corp., 64 Jackson Rd., Devens MA 01434

amalozemoff@amsc.com

Abstract - While considerable work has been done to understand AC losses in power cables made of first generation (1G) high temperature superconductor (HTS) wires, use of second generation (2G) HTS wires brings in some new considerations. The high critical current density of the HTS layer 2G wire reduces the surface superconductor hysteretic losses. Instead, gap and polygonal losses, flux transfer losses in imbalanced two-layer cables and ferromagnetic losses for wires with NiW substrates constitute the principal contributions. Current imbalance and losses associated with the magnetic substrate can be minimized by orienting the substrates of the inner winding inward and the outer winding outward.

IEEE/CSC & ESAS EUROPEAN SUPERCONDUCTIVITY NEWS FORUM (ESNF), No. 11, January 2010
Published in *Supercond. Sci. Technol*. (*SuST*) 23, 034014 (2010)