

## AC Loss in Pancake Coil Made from 12 mm Wide REBCO Tape

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**Abstract**— The design of a superconducting coil from high performance REBCO coated conductors is often complicated because of the complex anisotropy of the critical current density,  $J_c$ . It is important to understand how much in detail this feature must be taken into consideration in the prediction of maximum achievable current and the expected AC loss. We present the results of investigation performed with a small (10 turns, 60 mm inner diameter) coil made from SuperPower tape of 12 mm width. The knowledge of  $J_c(B, q)$  determined on short sample allowed to predict the maximum achievable current of the coil and the AC loss behavior with surprising accuracy. We have also investigated the effect of a tape non-uniformity. Our results confirm that the lateral non-uniformity when  $J_c$  at tape edges is lower than in its centre leads to significant increase of AC loss. A longitudinal non-uniformity, in particular the reduction of critical current in some portion along the tape length is hardly observable in AC loss result. Regarding the achievable coil current only the innermost turn is critical, thus using a piece of tape with lower  $J_c$  there would significantly reduce the maximum current. We present also calculations showing the change in current-voltage curve and redistribution of AC dissipation in the case of non-uniform tape quality.

**Keywords** - superconducting magnets, high-temperature superconductors, AC losses, numerical computations

IEEE/CSC & ESAS European Superconductivity News Forum (ESNF) No. 22 October/November 2012. ESNF Reference No.ST308 Category 6.

The published version of this preprint appeared in *IEEE Transactions on Applied Superconductivity* 23, 5900406 (June 2013).