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Magnetization loss in REBCO Roebel cables with varying strand numbers

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Assembled coated conductors are essential in many high current HTS applications. There are two ways to achieve assembled coated conductors. One way is to vertically stack the coated conductors, and the other is to use continuously transposed Roebel cables. In addition to high current carrying capacity, Roebel cables offer both low AC loss and mechanical flexibility. In this work, we measured magnetization loss in REBCO Roebel cables with varying strand numbers from six to fourteen at 77 K to investigate the number dependence of AC loss characteristics of the Roebel cables. The source material for the Roebel strands are non-stabilized 10 mm-wide Fujikura REBCO wires (FYSC-SC10). The wires were punched into 4 mm-wide Roebel strands, and the transposition length for the Roebel cables is 300 mm. The applied field amplitude, frequency and the angle of the applied field to the wide face of the Roebel cables are varied. Three 10 mm-wide vertical stacks with the conductor number of seven, five, and three were prepared using the same source Fujikura materials to demonstrate the AC reduction effect of the Roebel cables over the vertical stacks. The measured magnetization loss values of the Roebel cables are compared with those of the reference stacks as well as numerical results for the Roebel cables and stacks obtained from COMSOL software.

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