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AC loss measurement and simulation in a REBCO coil assembly utilizing two types of low-loss magnetic flux diverters

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AC loss reduction in HTS coils can help reduce the cryogenic demands and increase the performance of HTS machines. In an HTS coil, most AC loss is generated in the end windings due to the large radial magnetic field in these parts. Therefore, one of the effective methods to reduce AC loss in HTS coils is using ferromagnetic flux diverters to reduce the radial components of the magnetic field in the end windings. In this work, measurement and numerical simulation results of AC loss in an HTS coil assembly comprising four REBCO double-pancake coils with two types of low-loss magnetic flux diverters (MFDs) are presented. One is molypermalloy-powder (MPP) MFD which has a saturation magnetic field of 0.8 T and the other is high flux MFD which has a 1.5 T saturation field. Numerical models for the HTS coil assemblies with the MFDs are built based on the T-A formulation. Experimental results and numerical simulation show that both MFDs can significantly reduce the AC loss in the HTS coil assembly while generating negligible AC loss in themselves. AC loss results in the coil assemblies using both MFDs are compared and discussed.

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