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Wed-Mo-Po3.13-02 [110]: Modelling and Experimental Study on the Magnetization Losses of Tri-axial CORC Cable used in All-Electric Aircraft

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A high temperature superconductor tri-axial CORC cable has been designed for all electrical aircraft. This paper is to study the magnetization loss of this tri-axial cable under time-varying external magnetic field. This cable is wound with ReBCO tapes from SuNAM, Korea. An experimental platform is built to measure the magnetization loss using an electrical method. The tri-axle cable is operated at 77 K in liquid nitrogen. Magnetization loss is studied under two situations: with transport current and without transport current. Under a same external field, the cable with transport current generates more magnetization loss than that without transport current. The influences of field amplitude and frequency on the magnetization loss are also studied in this paper. The magnetization loss increases dramatically with the field amplitude. A 3D finite element method (FEM) model based on T-A formulation is built to calculate the magnetization loss. The results from measurement show a good agreement with that from calculation. Then the distribution of the magnetization loss on different layers of the cable is analysed by modelling. Less magnetization loss happens on the inner layers of the tri-axle cable, due to the field shielding of the outer layers.

Author: ZHU, Zixuan

Co-authors: WANG, Yawei (University of Bath); PEI, Xiaoze (University of Bath); Dr ZHANG, Min (University of Strathclyde); Dr YUAN, Weijia (University of Strathclyde)

Presenter: ZHU, Zixuan

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