Contribution ID: **160** Type: **Contributed Oral**

M3Or4P-04: Understanding and Minimizing AC losses in CORC cables of YBCO superconducting tapes

Wednesday 12 July 2023 17:15 (15 minutes)

AC losses in conductor-on-rounded-core (CORC) cables of the YBCO High-temperature Superconducting (HTS) tapes represent a significant challenge in HTS power applications. Two Finite Element Analysis (FEA) models were employed to understand the AC loss contributions and provide approaches for reducing AC losses in those cables. The FEA model based on T-A formula treated the cross-section of thin superconducting layers as 1D lines and therefore only can predict the AC loss caused by magnetic flux penetrating from the edge of the HTS tapes (edge loss). The model based on H-formulation can be performed on the actual 2D rectangular cross-section HTS tapes to provide the total AC losses caused by flux penetrating from both the edges and surface of HTS tapes, although this model is much more time and memory-consuming. With the actual thickness of YBCO layers in commercial tapes of about 1.5 μm, the T-A model underestimates AC loss by about 5% to 20%, depending on the gap between HTS tapes in the cable. That model, therefore, was used intensively to study effect of cable geometric configurations and operational parameters on AC losses of two-layer CORC cables. The models were also used to calculate the eddy-current losses in normal metal layers of HTS tapes which could play an essential role in high-frequency HTS power applications.

Author: Dr NGUYEN, Linh (Los Alamos National Laboratory, Los Alamos, NM 87544 USA.)

Co-authors: Dr SHIELDS, Nathaniel (VEIR, Boston, MA 02210, USA.); Dr ASHWORTH, Stephen (VEIR, Boston, MA 02210, USA.); Dr NGUYEN, Doan (Los Alamos National Laboratory, Los Alamos, NM 87544 USA.)

Presenter: Dr NGUYEN, Linh (Los Alamos National Laboratory, Los Alamos, NM 87544 USA.)

Session Classification: M3Or4P: Experiment and Modelling of Magnetization and AC Losses in Superconductors