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Mon-Mo-Po1.02-09 [21]: HTS magnetization current simulation using ANSYS iterative algorithm method and user defined element

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Kai Zhang, Sebastian Hellmann, Marco Calvi
Paul Scherrer Institut, Villigen, CH

Lucas Brouwer
Lawrence Berkeley National Laboratory, Berkeley, CA

Abstract – In this work, we will introduce the feasibility of using A-V formula in ANSYS to simulate the magnetization process of HTS bulk materials. The iterative algorithm method (IAM) based on ANSYS APDL is firstly developed to simulate the magnetization current issues in a ReBCO bulk disk based on Bean model. Specifically, we confirm it is feasible to simulate the development of trapped current density in the ReBCO bulk during the process of ramping and damping the external magnetic field. Using IAM, we can update the magnetic field-dependent critical current density for each element in the ReBCO bulk after each load step of electromagnetic analysis. It is also feasible to take the mechanical strain effects into consideration if we update the strain-related critical current density after each load step of electromagnetic-mechanical coupled analysis. Finally, a systematic study of HTS magnetization current issues is performed to test the newly developed ANSYS user defined element (UDE) in which E-J power law is defined. The flux creep effects of the ReBCO bulk during Field Cooling Magnetization (FCM) are investigated when using different n-values. The simulation results of using ANSYS IAM and UDE are compared with the simulation results of using COMSOL.

Primary authors: Dr ZHANG, Kai (Paul Scherrer Institut); Dr HELLMANN, Sebastian (Paul Scherrer Institut); Dr CALVI, Marco (Paul Scherrer Institut); Dr BROUWER, Lucas (Lawrence Berkeley National Laboratory)

Presenter: Dr ZHANG, Kai (Paul Scherrer Institut)

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