Contribution ID: **435** Type: **Contributed Oral**

M3Or3B-05: Tradeoffs Curves and Penalty Functions for AC losses and Je relevant to high-power-density motor applications and their use in comparing various superconductors and normal metal conductors

Wednesday, May 21, 2025 3:00 PM (15 minutes)

To achieve MW class high power-density aircraft propulsion motors, conductors with high ampacity but low overall losses are required. Aircraft powered by such motors are often designed to be zero or low emissions with the use of cryogenic fuel such as liquid hydrogen (LH2) or liquid natural gas (LNG). In this work we consider an operating point of 20 K, enabled by pool boiling LH2, which allows operation of a number of superconducting options, including MgB2, BSCCO 2212, and ReBCO, while also enabling low resistivity cryo-conductors to be used. Previously we created a new metric "total AC loss per length per amp of achievable operating current"W/m/A to accurately compare the performance of cryo-conductors and multifilamentary MgB2 superconductors for this application. We were able to find a global minimum in our metric, which could be viewed as an optimum. However, in reality, a full consideration of the tradeoff surface is required, since different designers of different devices in this space will potentially make different tradeoffs. In this work we consider various conductors and conditions, generating a tradeoff curve in 2-D space, adding in a penalty function to our analysis help define the optimum spot on the tradeoff curve for a specific penalty function weighting. MgB2, Bi:2212, ReBCO, and HPAL conductors are considered.
Work was performed under NASA Phase 1 SBIR

Author: Mr KWON, Jin

Co-authors: COLLINGS, Edward; Dr SUMPTION, Michael (The Ohio State University)

Presenter: Mr KWON, Jin

Session Classification: M3Or3B - AC Loss