Contribution ID: **90** Type: **Poster**

Exploring Metal-Insulation for enhanced quench stability in HTS REBCO tape-based coils: a prototype study

Tuesday, 5 December 2023 14:00 (3 hours)

Metal insulation technology is one of the solutions employed to enhance the quench stability of high-temperature superconductor (HTS) coils. This approach offers several advantages for quench stability. Metal substrate facilitates the detection of quenches by allowing electrical voltage signals to be easily measured across the substrate. This feature is crucial for promptly identifying quenches and preconditioning protective measures against quench-related issues. Also, the mechanism behind technology refers to the self-protection strategy to prevent the damaging effects of a quench by redirecting the electrical current away from the quench region. We are constructing a prototype to investigate and better understand the self-protection mechanism involving metal insulation in HTS coils. This demonstrator features stainless steel as the metal component and HTS REBCO tape as the superconducting material. Using a cryocooler within a dry system and carefully installing the HTS coil, we will systematically conduct controlled experiments. Our primary objective in these experiments is to investigate quench detection and develop effective strategies that can safeguard HTS systems from issues related to quenching events. By carefully studying these mechanisms, we aim to optimize the performance and safety of HTS coils against quenching. This research holds immense importance in advancing the reliability and efficiency of HTS technology.

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Session Classification: Poster Session

Track Classification: Neutron Methods