Contribution ID: **749** Type: **Poster**

Thu-Mo-Po.09-08: Development and evaluation of mechanical reinforcement strategies for REBCO racetrack coils using a custom test rig

Thursday 3 July 2025 08:45 (2 hours)

High-temperature superconducting (HTS) motors have emerged as a compelling alternative to conventional copper-based systems by achieving significantly higher current density and stronger magnetic fields, thereby realizing remarkable increases in torque density. These advantages have spurred intensive research into adopting HTS motors for electric propulsion in aircraft and ships. While cryogenic operation and mechanical stability both present formidable challenges, our work specifically focuses on ensuring the mechanical stability of HTS racetrack coils under high current density—an essential factor for reliable and robust operation.
To systematically address this challenge, we have developed a dedicated evaluation rig designed to investigate the mechanical behavior of racetrack coils and their reinforcement structures. Instead of reproducing Lorentz forces through high background magnetic fields, our method applies external mechanical forces directed radially outward from the coil's innermost region. This setup effectively simulates the loads experienced during actual operation, allowing for direct assessment of coil deformation and effectiveness of reinforcement structures. By centering our research on mechanical stability, we aim to identify and refine reinforcement strategies that enhance the operational reliability of HTS motors at high current densities.

<Acknowledgment>
This work was supported in part by National R&D Program through the National Research Foundation of Korea(NRF) funded by Ministry of Science and ICT(2022M3I9A1073924), and in part by the Applied Superconductivity Center, Electric Power Research Institute of Seoul National University.

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Session Classification: Thu-Mo-Po.09 - Conductor and Coil Measurement/Test Techniques and Facilities II