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# Wed-Mo-Po.09-08: Electro-mechanical and thermal characterization of simply-stacked REBCO flat cable for fusion magnet

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REBCO coated conductors have emerged as a promising option for high-field fusion magnet applications, thanks to their outstanding critical current performance. However, their high aspect ratio tape-like cross-section, anisotropic properties, and susceptibility to various transverse mechanical stresses require careful consideration in cable design, particularly to prevent issues like delamination. In this study, we propose and investigate a flat-shaped REBCO cable, featuring multiple horizontally aligned REBCO substacks, each formed by stacking dozens of individual tapes. aimed at high-current TF (toroidal field) magnets operating at 20 K under a high magnetic field. By reducing the number of tapes in each substack and horizontally distributing multiple substacks close to the bending neutral axis, our design mitigates electro-mechanical strain such as cable bending while preserving high electromagnetic performance.
To validate the feasibility of this approach, we fabricated multiple cable prototypes using tapes obtained from different manufacturers and subjected them to various impregnation schemes—including a dry (non-impregnated) method and a solder-impregnated concept. We then performed comprehensive tests on the electromagnetic, mechanical, and thermal performance of these cables in a 77 K liquid nitrogen environment. Electromagnetic characterization involved measuring the critical current of representative tapes and evaluating interfacial contact resistances. Mechanical performance was assessed by examining how critical current degraded under different cable bending radii. Finally, thermal stability was investigated to analyze the cable' s resilience in quench-prone operational scenarios.

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**Author:** JANG, Wonseok (Seoul National University)

**Co-authors:** LEE, Dongwoo (Department of Electrical and Computer Engineering, Seoul National University); KIM, Geonyoung (Seoul National University); KIM, Jaemin (Standard Magnet Inc., Seoul, 08826, Korea); KOO, Jaheum (Department of Electrical and Computer Engineering, Seoul National University, 08826, Korea); LEE, Jiho (Pusan National University); LEE, Jung Tae (Seoul National University, Republic of Korea); YOON, Sangwon (Seoul National University); HAHN, Seungyong (Seoul National University); Prof. KIM, Woo-Seok (Tech University of Korea); JUN, kyunghan (POWERNIX Co., Ltd.)

**Presenter:** JANG, Wonseok (Seoul National University)

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