MT 26
International Conference on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **918** Type: **Poster Presentation**

# Thu-Mo-Po4.04-02 [25]: Development of CORC® Cable Terminations and Low-loss Joints for use in Magnets for Fusion

*Thursday, 26 September 2019 08:45 (2 hours)*

High-temperature superconductors (HTS) are promising candidates for use in the high-field magnets needed in thermal nuclear fusion reactors. Their high critical temperatures allow them to operate at temperatures far above 4 K and ease requirements on nuclear heat generation and heating during ramping of the magnetic field. Other benefits compared to low-temperature superconductors include higher mechanical strength and the possibility to operate at high magnetic fields, exceeding 16 T. Advanced Conductor Technologies is developing HTS Conductor on Round Core (CORC<sup>®</sup>) cables and wires wound from ReBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> (ReBCO) coated tapes, for use in high-field magnet applications. HTS cables can enable demountable fusion magnets that would allow easier access to the fusion experiment for maintenance and parts replacement. CORC<sup>®</sup> cables are also developed for fusion magnets operating at currents in excess of 80 kA, requiring them to be bundled into a cable-in-conduit conductor (CICC) configuration. Major technical challenges to the use of ReBCO coated conductors in fusion magnets include the need for high current capacity magnet cables and practical, low-resistance cable joints, capable of injecting current uniformly into the many tape layers that make up the cables. Optimization steps on CORC<sup>®</sup> cables have resulted in high current terminations that have a significantly improved contact resistance with even current injection at high ramp rates exceeding 6 kA/s. Several individual joints were constructed and tested in liquid nitrogen and liquid helium to currents up to 9,000 A with contact resistances as low as 96 nΩ at 76 K and 6 nΩ at 4 K. Schemes for bundling multiple cables together into CICC conductors are being explored to enable stable 100 kA-class joints with contact resistances of less than 1 nΩ.

**Primary authors:** WEISS, Jeremy (Advanced Conductor Technologies); VAN DER LAAN, Danko (Advanced Conductor Technologies); MULDER, Tim (CERN / Twente Technical University (NL)); TEN KATE, Herman (CERN); Dr BROMBERG, Leslie (Massachusetts Institute of Technology); MICHAEL, Philip (Massachusetts Institute of Technology)

**Presenter:** WEISS, Jeremy (Advanced Conductor Technologies)

**Session Classification:** Thu-Mo-Po4.04 - Fusion VII: Joints and Terminations