



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

Contribution ID: 779

Type: **Poster Presentation**

## **Mon-Af-Po1.20-01 [74]: Thermal, Electrical and Mechanical Behaviors of Metal-as-Insulation HTS Coils Wound with Commercial REBCO Tapes under High Background Magnetic Fields at 4.2 K**

*Monday 23 September 2019 14:30 (2 hours)*

Recently, several high temperature superconductor (HTS) companies, such as SuperPower, SuperOx, Shanghai Superconductor Technology (SST), and THEVA, succeeded in improving current-carrying performance of their REBCO products under high magnetic field at low temperature. However, except HTS coils made of SuperPower REBCO tape, there are insufficient reports regarding thermal, electrical and mechanical behaviors of HTS coils wound with other REBCO tapes such extreme conditions. Therefore, in this study, two sets of two metal-as-insulation (MI) REBCO double-pancake (DP) coils which have inner joint between top and bottom pancake were fabricated: 1) a set A with two DP coils wound with 140  $\mu\text{m}$  thickness THEVA tape for one pancake and with a 75  $\mu\text{m}$  thickness SuperPower tape for the other pancake, the aim being to use the THEVA tape to use its different a-b plane orientation with regards to the tape surface to accommodate the bending magnetic flux line at the extremity of the assembly ; and 2) a set B of two DP coils wound with a 75  $\mu\text{m}$  thickness SST tape. When winding the DP coils, a sapphire plate was inserted between the single pancakes as a cooling channel inside the DP coils. After each MI DP coil was tested in a bath of LN<sub>2</sub> at 77 K, the DP coils were mounted on a support structure for assembly as MI HTS magnet set A and B. The thermal, electrical and mechanical characteristics of the HTS magnet sets were examined with various ramping conditions under various background magnetic fields at 4.2 K. From these results, current-carrying performance, critical current uniformity, thermal and mechanical stabilities of the MI magnet under back ground fields in range of 0-20 T will be discussed with regards to technical specifications of each company's REBCO tape.

**ACKNOWLEDGMENTS:** The authors acknowledge the support of the LNCMI-CNRS, member of the European Magnetic Field Laboratory (EMFL), and of the French National Research Agency (ANR) through the contracts ANR-10-LABX-51-01 (Labex LANEF) and ANR-14-CE05-0005 (NOUGAT project)

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**Session Classification:** Mon-Af-Po1.20 - Stability of Conductors and Coils I