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

Contribution ID: **1623** Type: **Contributed Oral Presentation**

# Wed-Af-Or13-03: Performance, diagnostic, and quench measurements of a dipole composed of two racetrack coils wound with high temperature superconducting Bi-2212 Rutherford cable

*Wednesday 25 September 2019 17:00 (15 minutes)*

In order to address the needs of next generation particle accelerators, high $J_E$ ($> 1000\ A/mm^2$ at $5\ T$ [1], [2]) HTS Bi-2212, with application of novel quench detection and protection methods is utilized in sub-scale accelerator magnets. A series of racetrack coils (RC 1-6) with the same geometry have demonstrated conductor improvements resulting in a factor of four increase in quench currents, as well as operational advantages of Bi-2212 Rutherford cables including lack of training and predictable quench behavior[3]. Demonstrating all of the key aspects of accelerator technology, a $5.6\ T$ ($6.8\ kA$) sub-scale common-coil magnet will be assembled from two larger LBNL racetrack coils (RC7 & RC8) made with twisted strand cables and an iron-yoke/bladder-and-key pre-loading method. We expect to reach at least $85\%$ of short sample load-line critical current, and are optimistic for more given recent Bi-2212 powder performance. The magnet includes acoustic quench detection instrumentation and will be monitored for capacitance changes during operation and quench. The inclusion of current taps between racetrack layers allows for a comparison of Coupling-Loss Induced Quench (CLIQ) protection configurations. The status of this program including coil fabrication, assembly, test results, and quench analysis will be presented.

[1] J. Jiang, "High performance Bi-2212 wires made with recent powders,"presented at the ASC 2018, Seattle, Wa, 01-Nov-2018.
[2] K. Zhang et al., "Tripled critical current in racetrack coils made of Bi-2212 ...,"Supercond. Sci. Technol., vol. 31, no. 10, p. 105009, Sep. 2018.
[3] T. Shen et al., "Stable, predictable operation of racetrack coils made of high-temperature superconducting Bi-2212 ...,"arXiv:1808.02864 [cond-mat.supr-con], Aug. 2018.

Acknowledgement: This work is funded by the DOE OHEP under the framework of the the U.S. Magnet Development Program. The NHMFL is funded by the NSF (Award No. DMR-1157490), the DOE (Award No. 227011-520-032288), and by the State of Florida. A portion of this work was funded by the U.S. DOE-WDTS-SCGSR program administered by the ORISE for the DOE under contract number DE-SC0014664.

**Primary authors:** DAVIS, Daniel S. (Applied Superconductivity Center, National High Magnetic Field Laboratory, Florida State University); BOGDANOF, Timothy J. (LBL); Dr BOSQUE, Ernesto (Applied Superconductivity Center, National High Magnetic Field Laboratory, Florida State University); CHENG, Daniel W. (LBNL); ENGLISH, Charles L. (Applied Superconductivity Center, National High Magnetic Field Laboratory); GARCIA FAJARDO, Laura (Lawrence Berkeley National Laboratory); HIGLEY, Hugh (Lawrence Berkeley National Laboratory); Dr JIANG, Jianyi (Applied Superconductivity Center, National High Magnetic Field Laboratory, Florida State University); LARBALESTIER, David (National High Magnetic Field Laboratory); MARCHEVSKY, Maxim (Lawrence Berkeley National Laboratory); PRESTEMON, Soren (LBNL); RAVAIOLI, Emmanuele (CERN); REYNOLDS, Matthew A. (LBNL); Dr SHEN, Tengming (Lawrence Berkeley National Lab); SWANSON, James H. (LBNL); Dr TROCIEWITZ, Ulf P. (ASC-NHMFL); TURQUETI, Marcos (Lawrence Berkeley National Laboratory); WANG, Xiaorong (Lawrence Berkeley National Laboratory)

**Presenter:** DAVIS, Daniel S. (Applied Superconductivity Center, National High Magnetic Field Laboratory,

Florida State University)

**Session Classification:** Wed-Af-Or13 - High Field HTS/Hybrid Magnets for Accelerators