Design, Construction and First Testing of a 41.5 T All-Resistive Magnet

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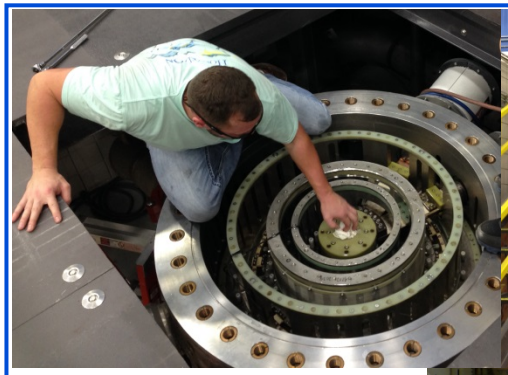
A new resistive magnet has been installed at the NHMFL which has set a world record of 41.5 T in a 32 mm bore. The NHMFL held the record for this class of magnets from 1994 - 2014 and the research done in those established the NHMFL as the premier high field lab worldwide. We expect that this upgraded magnet, with 3 T higher field than any other resistive magnet, and 6.5 T higher than the older NHMFL magnets, will facilitate the NHMFL's continuing leadership in high-field science.

For 25 years the NHMFL used magnet housings designed for 10 MW of power and that allowed for coils of 610 mm outer diameter. The new magnet has an outer diameter of 1000 mm, the same as three competing labs. The magnet employs the Florida-Bitter technology developed at the NHMFL and now used in 6 of the 7 largest labs worldwide. It also uses advanced current-density grading accomplished via a novel stacking technique that facilitates optimal power and stress distribution.

For 17 years, the NHMFL has been the only lab worldwide providing dc field >40 T to the scientific community. This new magnet doubles the number of magnets available in this range and is also able to sweep field continuously from -41.5 T to +41.5 T (within 8 minutes).



Assembly of the coils and support structure in the one meter housing (above-left).

The new 41.5 T all-resistive magnet with completed user platform installed in cell 6 (above-right).

The magnet was tested successfully to full 48 kA of current and generated ~41.4 T peak field for the first time on August 21,2017 (right).

Facilities: Resistive Magnet Program of the NHMFL Magnet Science and Technology Department & DC Field Facility

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