

## Chinese Scientists Develop 27.2 T All-superconducting Magnet

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January 8, 2018 (HP128, STHXXX). Superconducting magnets are widely used in MRI machines in hospitals, and in scientific equipment such as NMR spectrometers, mass spectrometers, fusion reactors and particle accelerators.

Using high-temperature insert magnet technology, Prof. WANG Qiuliang's group from the Institute of Electrical Engineering (IEE) of the Chinese Academy of Sciences developed a 27.2 T all-superconducting magnet with a REBCO insert composed of 15 Double Pancake (DP) coils on November 28, 2017, which is currently the second highest magnetic field with steady operation. It is the third-highest magnetic field ever achieved by all-superconducting magnets. The highest field now is 32 T, obtained at NHMFL on December 8, 2017, and the second highest is 27.6 T, obtained at RIKEN in January 10, 2016.

REBCO (consisting of Rare Earth, Ba, Cu, and O) superconductors are suitable for the winding of high-field superconducting magnets due to their high tensile strength and current-carrying properties under a high magnetic field. However, with the layered structure of REBCO superconductors, a delamination may occur due to a stress concentration in a very high field, which would result in a premature quench and in preventing steady operation. To solve this problem, the group adopted a special binding device to protect the outer conductor of the magnet, adjusted the layered structure of the insert magnet coil to reduce the stress on REBCO conductor, and used a grading design to increase the safety margin as well as the operation margin of the insert magnet.

The 27.2 T all-superconducting magnet lays the foundation for the subsequent development of a 30 T high-field scientific device and a spectrometer magnet at the GHz level. WANG's group developed a 25.7 T all-superconducting magnet this May 11, making China the fourth country in the world to achieve an all-superconducting magnet above 25 T.