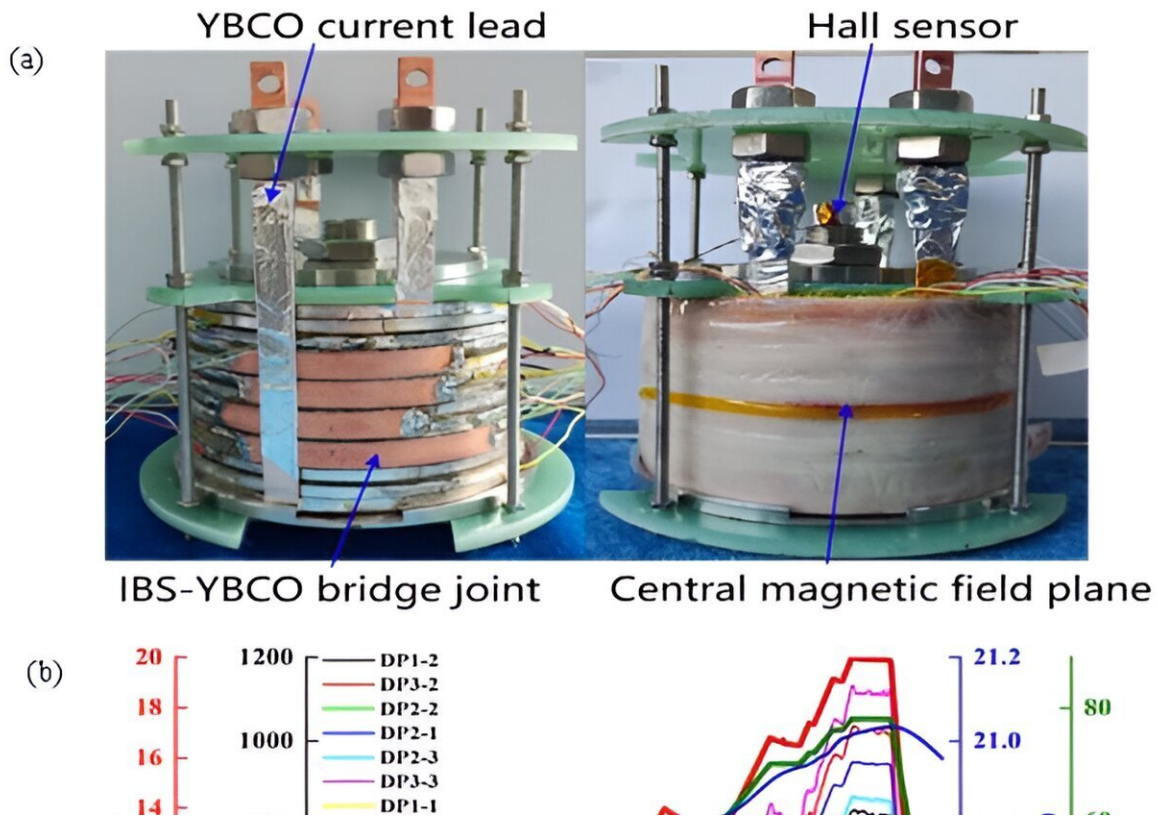# First Tesla class iron-based superconducting coil performs well in high field

December 11 2023, by Zhao Weiwei and Ding Hangwei

(a) The iron-based superconducting high field insert coil (b) The coil charge experiment results in 20 T background magnetic field. Credit: Ding Hangwei

Recently, a research group led by Prof. Chen Wenge from Hefei lnstitutes of Physical Science (HFIPS), Chinese Academy of Sciences

(CAS), along with Prof. Ma Yanwei's research group from the Institute of Electrical Engineering of CAS, developed the first Tesla class iron-based superconducting coil for high field application.

The research results were published in *Superconductor Science and Technology*.

Iron-based superconducting materials are new superconducting materials discovered in the field of superconductors after cupric oxide superconducting materials. Due to their advantages of high upper critical field and low anisotropy, iron-based superconducting materials have been widely used and studied in recent years. The preparation of iron-based superconducting wire/tape and fabrication of iron-based superconducting coil has been studied worldwide.

In this study, researchers designed and optimized the iron-based superconducting high-field insert coil based on the parameters of three 100 m long iron-based superconducting tapes. They explored and perfected the process of coil development, and set up the test system of iron-based superconducting coil in high field.

A higher magnetic field using seven large-sized iron-based superconducting double pancake coils (DPCs) was demonstrated with promising results.

The coil successfully generated a central magnetic field strength of 1.03 T in the 20 T background field of WM3 water-cooled magnet at the High Magnetic Field Laboratory, surpassing all previously reported performance tests of iron-based superconductor coils.
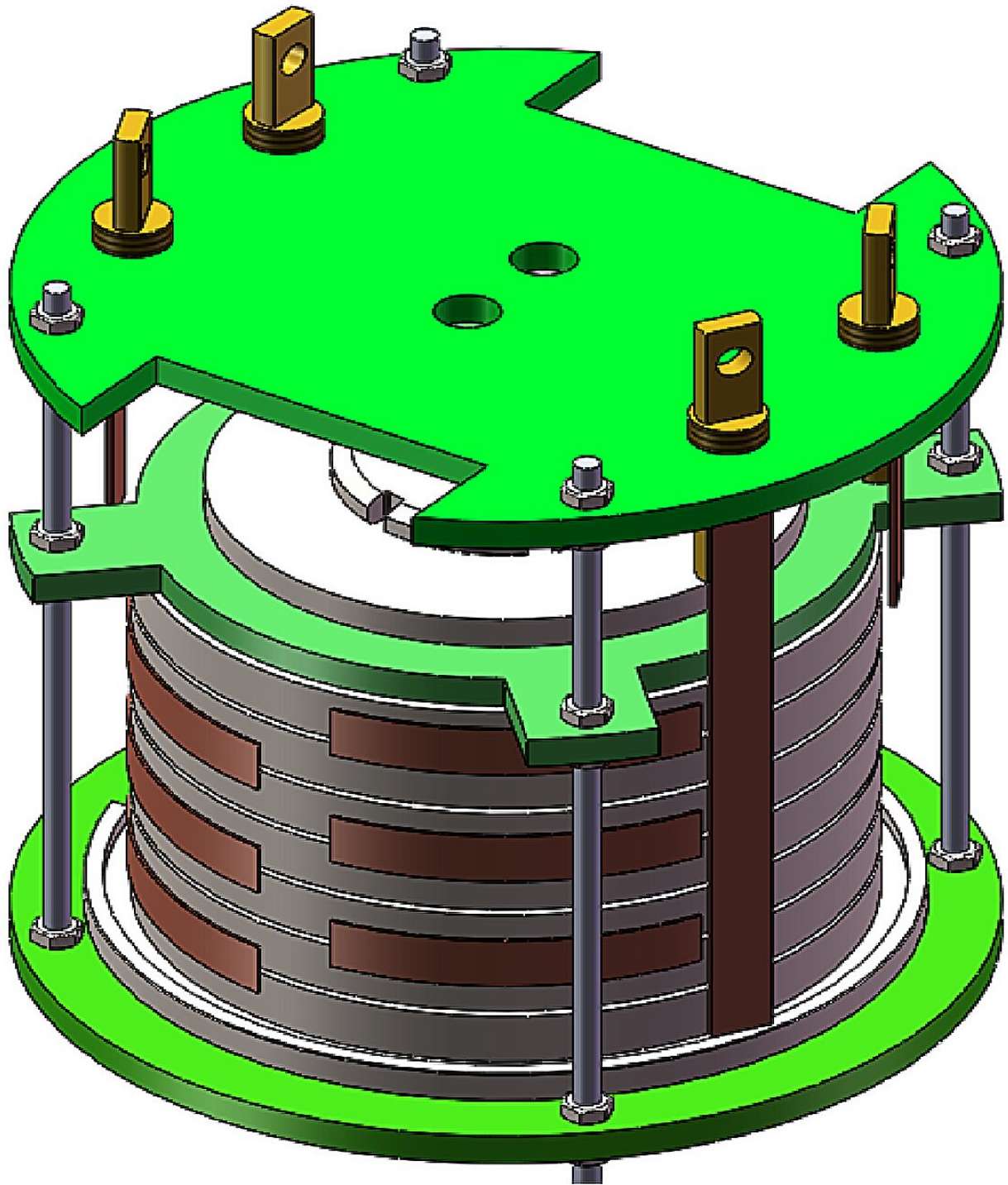
The First Tesla Class Iron-based Superconducting Coil Performed Well in High Field. Credit: Ding Hangwei

"This is the first practical application of iron-based superconducting materials in a high background magnetic field, which greatly promotes the practical progress of iron-based superconducting materials," said Prof. Chen Wenge, who led the team.

More information: Hangwei Ding et al, Development of the first Tesla class iron-based superconducting coil for high field application, *Superconductor Science and Technology* (2023). DOI: 10.1088/1361-6668/acfa29

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