

Helical Fusion Publishes Peer-Reviewed Paper on HTS Magnet Technology Validated Through Collaboration with NIFS

2025 results are now formally published in a peer-reviewed international journal, marking another engineering milestone toward commercially viable fusion power.

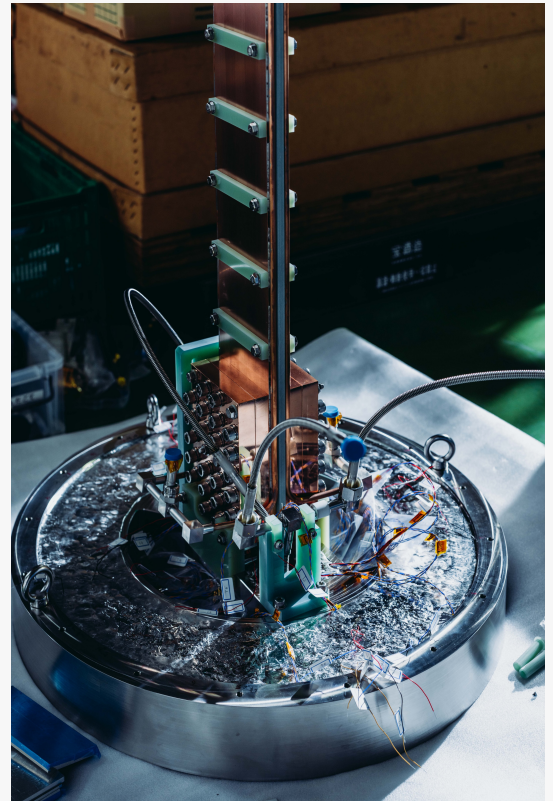
TOKYO, JAPAN, August 26, 2026 /EINPresswire.com/ -- [Helical Fusion](#) Co., Ltd. announces the publication of a peer-reviewed paper describing a key milestone in its high-temperature superconducting (HTS) magnet development program.

The paper, published in the Journal of Physics: Conference Series (IOP Publishing), follows its presentation at the 38th International Symposium on Superconductivity (ISS 2025) and formalizes results that were first announced in 2025. Following peer review, the work has become part of the scientific literature, making the findings accessible to the global fusion research community.

The published paper reports validation results for UROCOIC, Helical Fusion's proprietary HTS conductor developed for Helical Stellarator magnets. The test coil was manufactured by a specialized Japanese manufacturing partner and experimentally evaluated through joint research with the National Institute for Fusion Science (NIFS).

This publication marks the next chapter of a milestone first shared in 2025, reinforcing Helical Fusion's commitment to advancing fusion technology through rigorous engineering and scientific collaboration.

The HTS conductor evaluated in this study is being developed for implementation in both Helix HARUKA, Helical Fusion's Integrated Demonstration Device, and Helix KANATA, the company's



Double-pancake coil wound with flexible armor-protected HTS conductors, impregnated with liquid metal at Metal Technology Co., Ltd.'s facility.

first commercially viable fusion power plant under the [Helix Program](#).

□□Background

High-temperature superconducting magnets are one of the key enabling technologies for commercially viable fusion power plants. Helical Stellarators require superconducting coils with complex three-dimensional geometries while maintaining high current capacity and mechanical robustness under intense electromagnetic loads.

To address this challenge, Helical Fusion developed UROCOIC (Unitized Reinforcing Outer Cover On Internal Components), a proprietary HTS conductor architecture designed specifically for Helical Stellarator applications.

□□Technical Results

The published paper reports the validation of a double-pancake (DP) coil wound with Helical Fusion's proprietary UROCOIC conductor under cryogenic conditions.

Key achievements include stable operation at 40 kA without quench under a 7 T external magnetic field, local magnetic fields up to 8.9 T while withstanding electromagnetic forces of 356 kN/m, and robust no-insulation coil performance during abrupt magnetic-field changes.

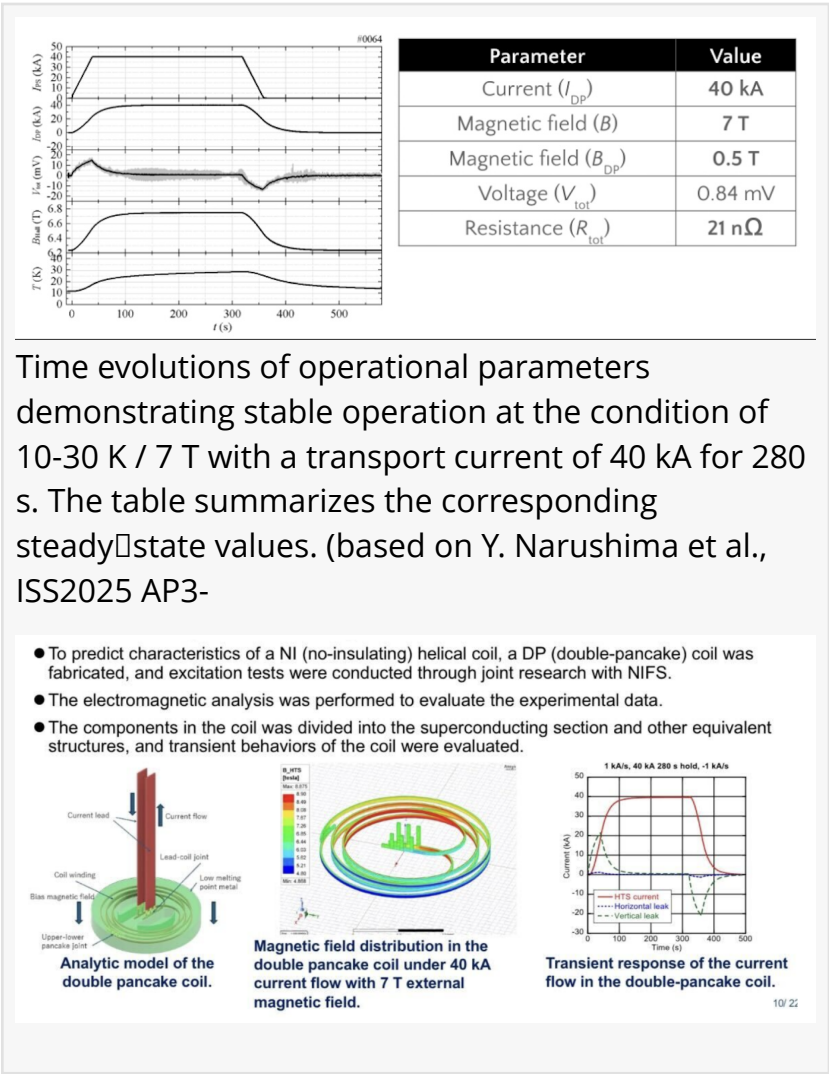
These results represent a significant engineering step toward reactor-scale HTS magnets for commercially viable fusion power.

(Reference) [A peer-reviewed paper on an earlier stage of the development \(U-shaped WISE conductor demonstration\)](#) was published in Plasma and Fusion Research:

https://www.jspf.or.jp/PFR/PDF2025/pfr2025_20-1405043.pdf

□□Summary of the published research

Using an HTS coil fabricated with Helical Fusion's proprietary large scale HTS conductor for



reactor application (*1) (a “double-pancake coil”), the research team conducted cryogenic current-carrying tests under conditions replicating the magnetic environment inside a fusion device (*2).

- Test environment

- Temperature: 10–30 K (–263°C to –243°C); initial temperature: 10 K
- Magnetic field: 7 T (applied by external coils); maximum field experienced by the coil: 8.9 T

- Key results

- Achieved stable 40 kA operation under a 7 T external magnetic field
- Obtained time-constant data and other measurements for characterization as a no-insulation coil

- Helical Fusion’s Business Perspective

Based on these results, Helical Fusion concludes that its proprietary UROCOIC conductor satisfies the necessary conditions to advance toward demonstration in the Integrated Demonstration Device “Helix HARUKA.”

□□Industrial Collaboration and the Helix Program

This achievement reflects Helical Fusion's approach of combining proprietary fusion technologies with Japan's advanced manufacturing ecosystem. The project brought together Helical Fusion's conductor technology, manufacturing by a specialized Japanese industrial partner, and experimentally evaluated through joint research with the National Institute for Fusion Science (NIFS).

The publication represents another engineering milestone for the Helix Program, Helical Fusion's roadmap toward commercially viable fusion power in the 2030s. The company aims to integrate these technologies into the Integrated Demonstration Device, Helix HARUKA, before progressing toward Helix KANATA, its first commercially viable fusion power plant.

□□ Public-Private Partnership

The development of the UROCOIC conductor is being carried out under Japan’s MEXT SBIR Phase 3 program, one of the country’s flagship initiatives supporting deep-tech commercialization.

In addition to this peer-reviewed publication, the project has successfully passed its Stage-Gate Review, demonstrating Helical Fusion’s ability to achieve demanding technical milestones on schedule while meeting the rigorous evaluation standards required for continued government support.

Together with the ongoing collaboration with the National Institute for Fusion Science (NIFS) and Japanese manufacturing partners, this achievement highlights how disciplined execution,

scientific research, industrial manufacturing, and public investment can work together to accelerate commercially viable fusion power.

□□ Why This Publication Matters

While the experimental results were first announced in 2025, publication in a peer-reviewed journal represents an important milestone in their technical maturity. Following peer review, the work is now formally incorporated into the scientific literature, making the findings accessible to researchers and engineers worldwide while contributing engineering knowledge for future HTS magnet development.

□□ Paper Information

- Title: Experiment of a Double-Pancake Coil Wound by UROCOIC Conductor for Application in Helical Fusion Reactors

- Journal: Journal of Physics: Conference Series (IOP Publishing), peer-reviewed conference proceedings

- First Author: Yoshiro Narushima, Assistant Professor, HF Joint Research Group, National Institute for Fusion Science / The Graduate University for Advanced Studies, SOKENDAI

- Paper: <https://iopscience.iop.org/article/10.1088/1742-6596/3278/1/012031>

- Related Release: <https://prtimes.jp/main/html/rd/p/000000047.000089262.html>

□□ About Helical Fusion

Helical Fusion Co., Ltd. is developing the world's first commercially viable fusion power plant based on the Helical Stellarator—a reactor concept capable of continuous, disruption-free operation. Through the Helix Program, the company is advancing plant-scale technologies including HTS magnets, blanket systems, and integrated engineering demonstrations, targeting commercial operation in the 2030s.

□□

*1 This coil is made using advanced high-temperature superconducting (HTS) technology, and it was constructed without electrical insulation. This is the world's first example of testing a coil sample—wound with a large-scale conductor employing no-insulation technology—inside an externally applied magnetic field.

*2 “the magnetic environment inside a fusion device” refers to a setting in which external magnetic fields—separate from those generated by the coil itself—are present, creating complex

electromagnetic interactions between multiple currents through the magnetic field. In future fusion power plants, such environments are expected to include intense radiation, neutron flux, and even stronger magnetic fields.

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