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Comments:

WORLD'S LARGEST SUPERCONDUCTING MAGNET TEST FACILITY NOW OPERATIONAL AT ITER

Successful cooldown to 4 K paves way for testing that will strengthen ITER's risk mitigation and readiness.

ST PAUL-LEZ-DURANCE, France (21 May 2026) — The ITER Organization announced yesterday the start of operations at its Magnet Cold Test Facility following the successful cooldown of the first magnet coil to 4 Kelvin (K), or minus 269 °C. The facility will allow ITER to test selected superconducting magnets at their operating temperature of 4 K and up to full current before installation in the machine.

Following ITER's test campaign, the Magnet Cold Test Facility will be available to other fusion stakeholders as part of the ITER Organization's knowledge-sharing and engagement initiatives with the private fusion sector.

Although no external test can fully reproduce operating conditions inside the ITER machine, the Magnet Cold Test Facility will provide essential information on magnet behaviour, cryogenic performance, electrical interfaces, instrumentation, and the critical joints that connect the layers of wound superconductor inside of the magnet coils.

Integration of the test bench with other ITER plant systems will also provide operational experience with supporting infrastructure, including cryogenics, vacuum, power supply, power feeders, and control-command functions, helping to derisk those functions ahead of integrated commissioning, when interconnected systems are systematically tested and optimized before machine operation.

The first magnet coil to undergo testing in the Magnet Cold Test Facility is a 330-tonne ITER toroidal field coil, wound from niobium-tin (Nb₃Sn) superconductor. Additional toroidal field coils from different manufacturers will follow, along with one ring-shaped poloidal field coil—ITER's smallest, PF1.

The cold testing of magnets as large as ITER's—in excess of 300 tonnes for the toroidal field magnets and 200 tonnes for PF1—requires considerable infrastructure, including a large cryostat (11 m x 20 m), a dedicated power supply, an electrical feeder and associated instrumentation, and connections to one of the cryoplat's large helium refrigeration units.

The ITER Magnet Cold Test Facility has been installed in the building previously used by the European Domestic Agency, Fusion for Energy, to manufacture ITER's four largest poloidal field coils, taking advantage of the building's scale, lift equipment, and proximity to the cryoplat.

“ITER as a first-of-a-kind project requires ingenuity as well as discipline,” said ITER Director-General Pietro Barabaschi. “By repurposing existing infrastructure, using the capabilities of our cryoplat, and mobilizing a multidisciplinary team, we have created a practical way to reduce risk before integrated commissioning. This is important for ITER as well as an example of how ITER can support the wider fusion ecosystem by creating knowledge, infrastructure, and operational experience that others can use.”

The first ITER coil was cooled to 4 K (minus 269 °C) over a 12-day period. The conductor has transitioned to its superconducting state, and high-current testing is expected to begin shortly. Each test campaign is expected to take four to six months per coil.

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The start of operations was marked with a ceremony yesterday attended by members of the Management Advisory Committee of the ITER Council.

Background

ITER's superconducting magnets - The ITER magnet system is the largest and most integrated superconducting magnet system ever built. Eighteen D-shaped toroidal field coils, six ring-shaped poloidal field coils, and the six independent modules of the central solenoid—with a combined stored magnetic energy of 51 Gigajoules (GJ)—will produce the magnetic fields that initiate, confine, shape and control the ITER plasma. Manufactured from niobium-tin (Nb₃Sn) or niobium-titanium (Nb-Ti), the magnets become superconducting when cooled with supercritical helium in the range of 4 Kelvin (-269 °C). Superconducting magnets are able to carry higher current and produce stronger magnetic field than conventional counterparts. They also consume less power and are cheaper to operate, making superconducting magnet technology the only option for ITER's huge magnet systems. Superconductivity can be maintained as long as certain threshold conditions are respected (cryogenic temperatures, current density, magnetic field). Outside of these boundary conditions, a magnet will return to its normal resistive state and the high current will produce high heat and voltage. This transition from superconducting to resistive is referred to as a quench.

Cold testing – The ITER magnet cold testing program was launched in 2023 as part of ITER's revised approach to assembly and commissioning. The main objectives of the tests are to validate high-voltage ground insulation at different temperatures, demonstrate critical quench detection capabilities, and verify coil performance at nominal current (68 kA for the toroidal field coils and 48 kA for PF1). The program will also test instrumentation chains, control logic systems, and key magnet protection functions. Note that the central solenoid modules were cold-tested prior to shipment.

ITER Private Sector Fusion Engagement Project - Drawing on decades of experience in designing and building a fusion reactor, the ITER Organization is actively engaged in sharing and disseminating knowledge that can be useful to the development programs of private sector fusion initiatives from the ITER Members as part of the ITER Private Sector Fusion Engagement ([PSFE](#)) Project. The ITER Magnet Cold Test Facility is one of a number of test facilities that the ITER Organization plans to make available to the fusion community after ITER tests are over.

About ITER

ITER is designed to demonstrate the scientific and technological feasibility of fusion power. Fusion research is aimed at developing a safe, abundant, and environmentally responsible energy source. ITER, the Republic of Korea, the Russian Federation, and the United States contribute equally to the remaining costs. The ITER project is under construction in Saint-Paul-lez-Durance, in the south of France. For more information, visit: www.iter.org.

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