

# Cryogenic facility set up for superconducting accelerator magnets and power transmission lines at INFN

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The Italian National Institute for Nuclear Physics (INFN) is currently involved in technological activities based on superconductivity. Two projects are running into the Test Facility for Large Superconducting Magnets and Superconducting Line at the Physics Department of the University of Salerno (Italy): both are devoted to the test and commissioning of superconducting devices, such as superconducting magnets for synchrotrons, and power transmission line. Presently, the THOR (Test in HORIZONTAL) program is dedicated to the Site Acceptance Tests (SAT) of quadrupole doublets modules (QDM) for the SIS100 accelerator, part of the FAIR facility under construction at the GSI in Darmstadt. The IRIS project (Innovative Research Infrastructure on applied Superconductivity) funded under PNRR/NGE targets the application of superconductivity to the Green Transition: it aims to set a test facility for superconducting power transmission line based on MgB<sub>2</sub> cables long up to 120 m, operating a 25 kV and 40 kA and at a temperature of about 20 K. Both programs rely on cryogenic plants, one fully operating for the THOR project and one under procurement for IRIS, aiming also at strengthen the already existing one. The former is made of a cold box able to supply supercritical He at 4.5 K up to 15 g/s for a total cold power of 200 W at 4.5 K + 500 W at 77 K when in refrigeration mode, the latter will be able to supply up to 22 g/s of pressurized He gas at 20 K, for a total power up to 500 W. The plants have a 190 kW and 135 kW SFC screw compressors for pure He. Both cryogenic systems have the possibility to produce liquid He, having a Joule-Thomson stage and an internal purifier.

The facility will be described in this work, with a focus on the cryogenic operational aspects. We will present the THOR cryogenic plant and discuss on issues and solutions for the optimization of the cryogenic test program of the SIS100 QDM. On the other hand, the design and development advances for the IRIS project will be presented.

## Submitters Country

Italy

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