IEEE-CSC, ESAS and CSSJ SUPERCONDUCTIVITY NEWS FORUM (global edition), Issue No. 60, Sept. 2025

The Grenoble Hybrid Magnet: From Commissioning to First Operation up to 42 T

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***Abstract*–In November 2024, the new Grenoble hybrid magnet achieved a significant milestone, reaching 42 T as a first step in a warm bore diameter of 34 mm. First experimental runs were performed in May-June 2025 up to 42 T with flat top durations ranging from few seconds up to 6-7 hours with no time limitation detected. This allows to finalize the commissioning phase, optimize and fine-tune procedures for routine operation. The specificity of the Grenoble hybrid magnet will be summarized together with the commissioning tests performed. The maximum magnetic field that can be targeted as next steps will also be discussed knowing that the maximum available electric power of LNCMI was increased in 2024 from 12 + 12 MW to 12 + 18 MW, with the implementation of a new distribution line connected to a new dedicated 60 MVA, 225/15 kV transformer. Thanks to all these achievements, new scientific opportunities in high magnetic field science will be possible in near future at LNCMI-Grenoble whether in condensed matter physics or in chemistry, magneto-science, particle physics and cosmology. In parallel, important activities are focused on the increase of the ecological efficiency of the energy use for the production of very high magnetic fields. The objective is also to become one of the best places worldwide in terms of greenhouse gas efficiency for the use and construction of very high field magnets. The Grenoble hybrid magnet platform will be integrated in future in the European Magnetic Field Laboratory (EMFL) infrastructure consortium.**

***Keywords (Index Terms)*– Exceptionally High DC Magnetic Fields, High Magnetic Field Facilities, Hybrid Superconducting-Resistive Magnets, Toward Environmental Footprint Reduction**