Contribution ID: **546** Type: **Contributed Oral**

Sat-Af-Mem1-03: Progress in the Development of the MIT 1.3-GHz NMR Magnet: Separate Testing Results of HTS Insert and LTS Background Magnets

Saturday 5 July 2025 17:00 (15 minutes)

We present an update on the ongoing development of the MIT 1.3-GHz nuclear magnetic resonance (NMR) magnet system (1.3G). The 1.3G consists of a 19.6-T (835-MHz) high-temperature superconducting (HTS) REBCO insert magnet (H835) and an 11.7-T (500-MHz) low-temperature superconducting (LTS) background magnet (L500). These two magnets are coaxially aligned and independently powered to generate a combined magnetic field of 30.53 T (1.3 GHz). The 835-MHz REBCO insert (H835) has been successfully constructed and charged to its target current of 230 A. During standalone testing at operating temperatures ranging from 17 K to 4 K in solid nitrogen, the measured center field strength at 230 A was 19.43 T, which is slightly below the designed value due to the screening current effect. In this paper, we will summarize the design, construction, and test results of H835, including a discussion of the challenges encountered. Additionally, we will present the assembly process and standalone test results of L500. These tests will be conducted in a newly developed solid-nitrogen-cooled cryostat equipped with a 2.5-W@4.2 K pulse-tube cryocooler for the 1.3G system and an NMR-standard 54-mm room-temperature bore. Following the discussion of these separate test results, we will propose the final design, operational parameters, and sequence for the integrated 1.3G system. The integration of H835 and L500 is expected to be completed by the end of 2025, finalizing the 1.3G system.

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Session Classification: Sat-Af-Mem1 - Huub Weijers Memorial: High Field Magnets