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**Condensed Matter NMR under Extreme Conditions: Challenges and Opportunities**

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Advances in resistive magnet and power supply technology have made available extremely high magnetic fields suitable for condensed matter broadline NMR experiments. This capability expands the available phase space for investigating a wide variety of materials using magnetic resonance; utilizing the strength of the field to expose or induce new physical phenomena resulting in better understanding of the physics. Continuous fields up to 45T in NHMFL Hybrid magnet have brought new challenges in designing NMR instrumentation. Field strengths and sample space limitations put constraints on RF pulse power, tuning range, bandwidth, and temperature control. The inclusion of other capabilities, including high pressure, optics, and sample rotation requires intricate probe design and construction, while extremely low milliKelvin temperatures are desired in order to explore energy scales where thermal fluctuations are suppressed. Optimization of these devices has been of paramount consideration in NHMFL Condensed Matter NMR user program. Science achieved at high fields, the new initiatives to develop resistively-detected NMR in 2D electron gas and similar systems, and the current new generation Series-Connected Hybrid magnets for NMR work will be discussed. The NHMFL is supported by the National Science Foundation and the State of Florida.