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Ultra low temperature high magnetic field materials' characterization tool DMITRI PONARIN, ALEX SMIRNOV, WILLIAM HOLTON, NC State University — Development of a Cross-disciplinary Quantum Engineering Laboratory at NCSU for characterization of a wide range of materials for next generation of information devices operating on spin principles is being reported. The tool provides electrical and magnetic resonance measurements for samples subjected to mK temperatures and high magnetic fields to achieve the highest polarization of electronic or nuclear spins. This first-of-its kind instrument operates in cryogen-free mode and comprises of a high homogeneity (10 ppm over 1 cm^3) 9 T superconducting magnet with a wide (89 mm) room-temperature bore to accommodate an independent dilution refrigerator (DR). The tested DR base temperature is below 20 mK and the cooling power exceeds 350 μW a 100 mK. The magnet and the DR are cooled from room temperature by independent pulse-tube cryocoolers in less than 48 hours. The magnet is equipped with an uncoupled +/-600 G sweep coil and a persistent switch. Magnetic field drift of <1ppm/hr is acceptable for high resolution ESR experiments. Flexible design and the short turnaround time makes the tool convenient for conducting a wide range of experiments.

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