

## **A 30mK dilution fridge UHV SP-STM (9/4T) housed in the new SPIN laboratory**

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Unraveling many of the current dilemmas in nanoscience hinges on the advancement of techniques which can probe the spin degrees of freedom with high spatial, energy, and ultimately high temporal resolution. With the development of sub-Kelvin high-magnetic field STM, two complementary methods, spin-polarized scanning tunneling spectroscopy (SP-STs) and inelastic STs (ISTS), can address single spins at the atomic scale with unprecedented precision.

Common cryostat designs for spin-polarized STM sub-Kelvin application are based on <sup>3</sup>He liquifcation, which are limited in base temperature, hold time, and cooling power. To address these limitations, we demonstrate a newly designed 30mK dilution fridge based UHV spin-polarized microscope in a vector magnetic field, capable of atomic spin detection and atomic manipulation. Our design consists of tip/sample exchange at cold temperatures as well as cold material deposition and features extremely low <sup>4</sup>He consumption with a long hold time. To prevent any external perturbation of the measurements, the system is housed in the new ultra-quiet SPIN laboratory (IMM-RU) featuring a 150 ton damped foundation and proper acoustical and RF shielding.