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Scanning tunneling microscopy in high magnetic fields below 1 Kelvin ANDREAS HEINRICH, DONALD EIGLER, CYRUS HIRJIBEHEDIN, MARKUS TERNES, CHRISTOPHER LUTZ, IBM Research — We have developed a scanning tunneling microscope (STM) which operates in a novel range of experimental parameters: ultra-high vacuum, low temperatures and high magnetic fields. Such operating conditions make the Zeeman energy for a typical magnetic system significantly larger than the thermal energy and hence one can resolve spin excitations in individual magnetic systems. In order to achieve temperatures below 4K we employ a pumped 3-He reservoir where we liquefy the 3-He with Joule Thomson expansion (without the use of a pumped 4-He reservoir). We can routinely operate the STM at 0.6K in magnetic fields up to 7T. It turned out to be surprisingly difficult to vibrationally decouple the STM from the high magnetic field, which was achieved only after investigating the low-temperature magnetic properties of all the components of the STM. This machine has been used for about 5 years to study atomic-scale magnetic systems and some examples will be discussed.

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