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Realization of a sub-Kelvin ultra-high vacuum scanning tunneling microscope in high magnetic field XI CHEN, UNGDON HAM, CHI CHEN, WILSON HO, Department of Physics and Astronomy and Department of Chemistry, University of California, Irvine — A sub-Kelvin ultra-high vacuum (UHV) scanning tunneling microscope (STM) in high magnetic field has been designed and developed. The Besocke type scanner is modified to meet the requirements of sub-Kelvin temperature and high magnetic field. The scanner is mounted to the He3 pot of a bottom loading UHV compatible helium- 3 cryostat with a 9 Tesla superconducting magnet. The bottom loading design substantially reduces the distance between experimental and access positions where STM tips and samples can be exchanged without breaking UHV. The helium-3 insert remains at low temperature during tip and sample exchange. The helium-4 reservoirs for the non-bakeable NbTi superconducting magnet and the UHV space are thermally separated in order to achieve UHV condition without overheating the magnet. Two layers of aluminum shields make use of the enthalpy of the cold He4 vapor for radiation shielding without liquid nitrogen. A two-chamber UHV system creates reliable environment for tip and sample preparation, and surface imaging and characterization. Various atoms and molecules can be deposited at room or low temperatures. The STM system has the unique capability to probe matter at very low temperatures, in high magnetic fields, under ultrahigh vacuum conditions, and with spatial resolution below one nanometer.

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