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Development of an Ultra Low Temperature Scanning Tunneling Microscope YOUNG JAE SONG, ALEXANDER OTTE, NanoCenter, University of Maryland, College Park, MD/Center for Nanoscale in Science and Technology, NIST, Gaithersburg, MD, YOUNG KUK, Department of Physics and Astronomy, Seoul National University, Seoul, Korea, JOSEPH STROSCIO, Center for Nanoscale in Science and Technology, NIST, Gaithersburg, MD — In this talk we give an update on the next generation of ultra low temperature, high magnetic field (15T) scanning tunneling microscope (STM). With this system, we plan to extend the capability of STM to include higher energy resolution ($\sim 1\mu$eV) for scanning tunneling spectroscopy (STS) with operation at 20 mK. To realize this energy resolution in STS, we constructed an ultra high vacuum dilution refrigerator (DR) for STM applications. It operates with two independent modes of He3-He4 mixture gas condensation: a traditional 1K pot condenser, or a Joule-Thomson condenser for possible lower noise operation. This eliminates potential vibration problems during operation of the DR. To match the very low limit of thermal noise in this system, our new system includes extensive vibration isolation and RF shielding. Our STM sample holder has five isolated electrical contacts. This allows four-probe macroscopic electrical measurements to be performed simultaneously with microscopic STM measurements. The current progress and performance of this new system will be discussed.

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