

Abstract Submitted
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Design and Implementation of a 4K Cryocooler-Based Scanning Tunneling Microscope¹ RAMYA VISHNUHOTLA, NEAL HARRINGTON, BILL DUSCH, CARRIE GENG, RIJU BANNERJEE, LAVISH PABBI, ERIC W. HUDSON, Pennsylvania State University — Low temperature, ultra-high vacuum scanning tunneling microscopes (STMs) have proved to be excellent tools for the study of electronic properties of complex materials. Unfortunately, with the continuing increase in liquid helium prices, already a dominant cost for operating these systems, their use is becoming exceedingly expensive. Here we describe the design and implementation of a STM cooled by a Cryomech PT407 Remote Motor Cryorefrigerator, allowing us to reach helium temperatures using a closed thermodynamic cycle with zero cryogen waste. Unfortunately, this refrigeration technique is not ultra-high vacuum (UHV) compatible and introduces vibrations. To tackle these problems, we separately house the cryocooler in a high-vacuum (HV) chamber. This provides both a UHV environment for the STM and mechanical isolation to minimize vibrations reaching the instrument. However, it makes for more challenging thermal connections. This last difficulty we solve by introducing a novel coaxial thermal feedthrough between the HV and UHV chambers.

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