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Connecting the Tips of a Millikelvin Dual-Tip STM WAN-TING LIAO, MICHAEL DREYER, CHRISTOPHER LOBB, FREDERICK WELLSTOOD, ROBERT ANDERSON, Univ of Maryland-College Park — We have built a dual tip scanning tunneling microscope (STM) [1] with two niobium tips connected by niobium foil made by laser cutting. Both tips could be Josephson-coupled to a superconducting surface sample to form an asymmetric SQUID loop. Our scheme involves holding one of the tips fixed as a reference junction while the other tip is scanned to image the gauge-invariant phase of superconductors at the atomic scale [2]. The microscope has worked at millikelvin temperature with two independent tips and we are testing the connected-tips setup at room temperature. We will modulate the z voltage of each tip and use two lock-in amplifiers to distinguish the current contribution of each junction allowing us to independently scan two regions of the sample. [1] A. Roychowdhury, et al., Rev. Sci. Inst. **85**, 04.706(2014) [2] “Asymmetric superconducting quantum interference devices for suppression of phase diffusion in small Josephson junctions”, D. F. Sullivan, et al., J. Appl. Phys. **113**, 183905 (2013)

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