Abstract Submitted for the MAR16 Meeting of The American Physical Society

How to simultaneously scan connected tips in a dual-tip STM WAN-TING LIAO, Univ of Maryland-College Park, MICHAEL DREYER, Laboratory for Physical Sciences, JAMES ANDERSON, CHRISTOPHER LOBB, FRED-ERICK WELLSTOOD, Univ of Maryland-College Park — Starting with a dual independent-tip scanning tunneling microscope (STM) design [1], we have connected the two tips by a short (~ 3 mm) flexible Nb foil strip that was patterned by a laser. To enable simultaneous imaging with both tips, we move both tips to within tunneling distance of a surface and modulate one tip's z-piezo at ~ 5 kHz and the other at~10 kHz. The resulting combined tunneling current from the system has modulation at both frequencies, which we detect using two lock-in amplifiers. The two outputs (dI/dz1 and dI/dz2) are feedback to individual STM electronic controllers to allow simultaneous topographic imaging using both tips. We tested our setup at room temperature using Pt-Ir tips on Au/Mica and HOPG samples. The next step is to operate this dual-tip STM at 30 mK on a superconducting sample so that the device forms a novel type of scanning SQUID. Holding one of the tips fixed as a reference junction, the other tip will be scanned to image the gauge-invariant phase difference of a superconductor at the atomic scale [2]. [1] A. Roychowdhury, et al., Rev. Sci. Inst. 85, 04.706(2014) [2]D. F. Sullivan, et al., J. Appl. Phys. 113,183905 (2013)

Wan-Ting Liao Univ of Maryland-College Park

Date submitted: 06 Nov 2015 Electronic form version 1.4