Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Robust High-Resolution Imaging and Quantitative Force Spectroscopy in Vacuum with Tuned-Oscillator Atomic Force Microscopy.[1] UDO SCHWARZ, OMUR DAGDEVIREN, JAN GTZEN, Yale Univ, HENDRIK HLSCHER, Karlsruhe Institute of Technology, ERIC ALTMAN, Yale Univ — Atomic force microscopy and spectroscopy are based on locally detecting the interactions between a surface and a sharp probe tip. For highest resolution imaging, noncontact modes that avoid tip-sample contact are used; control of the tip's vertical position is accomplished by oscillating the tip and detecting perturbations induced by its interaction with the surface potential. Due to this potential's nonlinear nature, however, achieving reliable control of the tip-sample distance is challenging, so much so that despite its power vacuum-based noncontact atomic force microscopy has remained a niche technique. Here we introduce a new pathway to distance control that prevents instabilities by externally tuning the oscillator's response characteristics [1]. A major advantage of this operational scheme is that it delivers robust position control in both the attractive and repulsive regimes with only one feedback loop, thereby providing an easy-to-implement route to atomic resolution imaging and quantitative tip-sample interaction force measurement. [1] O. E. Dagdeviren et al, Nanotechnology 27, 065703 (2016)

[1]Financial support from National Science Foundation through the Yale Materials Research Science and Engineering Center (grant No. MRSEC DMR-1119826) is gratefully acknowledged.

Udo Schwarz
Yale Univ

Date submitted: 11 Nov 2016 Electronic form version 1.4