Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**On recent developments for high-speed AFM imaging**[1] GEORG SCHITTER, GEORG E. FANTNER, JOHANNES H. KINDT, PAUL K. HANSMA, UCSB Physics Dept. — This contribution discusses some key challenges for the next generation of high-speed atomic force microscopes (AFM). For high-speed imaging all AFM components have to be optimized in performance, i.e. the scanning unit, the force sensor and the AFM electronics. i) The three dimensional positioner (scanner) needs not only sub-nanometer resolution and a high bandwidth but also must not show any oscillatory behavior in order to achieve the required position accuracy. To this end a new mechanical design that uses stack piezos for the spatial movement is combined with new control schemes [1] that are designed for highest positioning bandwidth combined with high control performance. ii) The force sensor has to be soft and fast in order to minimize the imaging forces and force variations together with a higher sensor bandwidth. This is achieved by using small cantilevers [2]. iii) For high-speed imaging also the feedback and piezo drive electronics as well as the data acquisition system have to fulfill high bandwidth and timing requirements. Combining all these improvements, the next generation of AFMs will enabling imaging speeds two orders of magnitudes faster than current commercial AFM systems. [1] G. Schitter, F. Allgoewer, A. Stemmer, Nanotechnology 15(1), p.108 (2004) [2] T.E Schaeffer, M. Viani, D.A. Walters, B. Drake, E.K. Runge, J.P. Cleveland, M.A. Wendman, P.K. Hansma, SPIE 3009, p.48 (1997)

[1]NIH GM65354, NASA/URETI BiMAT NCC-1-02037, FWF J2395-N02

Georg Schitter
UCSB Physics Dept.

Date submitted: 01 Dec 2004 Electronic form version 1.4