Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Atomically-resolved surface imaging by low temperature atomic force microscopy using a quartz resonator YUKIO HASEGAWA, TOSHU AN, TAKAHIRO NISHIO, TOYOAKI EGUCHI, M. ONO, KOTONE AKIYAMA, The Insittute for Solid State Physics, The University of Tokyo — We have developed a frequency-modulation atomic force microscope (FM-AFM) using a length-extension quartz resonator as a force sensor. Atomically-resolved images of the Si(111) 7x7 surface were obtained with the AFM in UHV both at room temperature [1] and 5 K. The high resonance frequency ($\sim$1 MHz) of the resonator improves the sensitivity to its deflection. Its self-sensing property eliminates the cumbersome optical alignment, which is usually required in conventional AFMs, and thus it can be easily installed into a low temperature system. The high stiffness of the resonator enables us to operate with a very small oscillation amplitude; less than 0.1nm, and thus to detect a short-range force effectively, such as a covalent bonding force, which is crucial for the highly resolved imaging. For the probe tip, a tungsten wire was attached at the end of the resonator and sharpened by focused ion beam. The native oxide layer covering the tip was removed by *in-situ* field ion microscopy. [1] T. An, T. Eguchi, K. Akiyama and Y. Hasegawa, APL **87**, 133114 (2005).

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Date submitted: 07 Dec 2006 Electronic form version 1.4