

Abstract for an Invited Paper
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Imaging and Beyond with High Speed AFM.¹

PAUL HANSMA, University of California at Santa Barbara

It is now possible to operate Atomic Force Microscopes (AFMs) at speeds of up to 6000 lines per second over scan ranges exceeding 10 microns. For a 100 x 100 pixel image this gives frame rates of 60 frames/second: faster than video rate. This has required small cantilevers, new scanners, new high voltage amplifiers, and a new scan control system. The small cantilevers are from SCL Sensor-Tech (Deutsch-Wagram, Austria). The new scanner is based on a sophisticated system of flexures that constrain the motion of each separate piezo stack to one dimension in a three-dimensional scanner. It has a scan range of 15 microns and a lowest resonance frequency of about 27 kHz. The new high voltage amplifier, built in collaboration with TechProject (Vienna, Austria), can deliver up to 8 amps over the entire output range from 0 to 150 volts with the challenge of having the piezo as a capacitive load. The new scan control system is built around a commercially available DAQ board in a Windows environment. One of the major challenges is now to move beyond imaging to Force-Volume imaging, which involves taking an array of force curves over a sample and then reconstructing a zero force image as well as a map of local mechanical properties.

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