

Abstract Submitted
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High Speed Scanning Property Measurements DAVID SHUMAN, RAMESH NATH, University of Connecticut, RAMAMOORTHY RAMESH, University of California, Berkeley, BRYAN HUEY, University of Connecticut, UNIVERSITY OF CONNECTICUT COLLABORATION, UNIVERSITY OF BERKELEY COLLABORATION — Atomic Force Microscopy (AFM) is a ubiquitous surface science tool, but the slow speed of standard equipment remains a continuing limitation for widespread application. A novel AFM variation is reported here for High-Speed Scanning Property Mapping (HS-SPM), uniquely allowing full-frame nanoscale-resolution image acquisition in <3 seconds with tip speeds >1 cm/sec. Using off-the-shelf commercial equipment, the method combines acoustic and AFM concepts: the sensitivity of AFM-cantilever contact resonances to materials properties, and conversely the insensitivity of these resonances to contact force variations due to rapidly raster scanning an AFM probe. The method is applicable to a broad range of materials and properties, as demonstrated by mechanical property maps of bacterial membrane fragments and integrated circuits; magnetic property maps of domains in magnetic hard drives; and movies of ferroelectric domain reading and writing with sub-second frame rates for dynamic domain nucleation and growth studies. HS-SPM thereby provides a novel yet off-the-shelf solution for both significantly enhanced throughput in nanoscale materials property mapping, as well as dynamic surface studies with previously inaccessible time constants.

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