

Abstract Submitted
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Spring constant calibration of AFM cantilevers with a piezolever transfer standard D. HURLEY, E. LANGLOIS, G. SHAW, J. KRAMAR, J. PRATT, NIST — Accurate determination of forces in the AFM requires knowledge of the cantilever spring constant k_c . We describe a method to measure k_c traceable to SI units. The transfer standard was a commercial piezoresistive cantilever (“piezolever”) calibrated by the NIST electrostatic force balance (EFB). The active piezolever device eliminates the need to measure the optical lever sensitivity. The method does not depend on cantilever geometry and determines k_c under loading conditions. The calibrated piezolever was used to measure cantilevers with nominal values of k_c from 0.2 to 40 N/m. Measured values differed by as much as 300 % from the nominal values. Values of k_c were also obtained with four other methods: thermal noise, geometric (Sader), nanoindentation loading, and direct EFB loading. Differences between the direct EFB and piezolever results ranged from 15-20 % for the stiffest cantilevers to <1 % for the most compliant. Experimental issues critical to accurate measurements with each method will be discussed. Methods will also be compared in terms of implementation in other laboratories.

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