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Quantitative force measurements with intermodulation atomic force microscopy DANIEL PLATZ, DANIEL FORCHHEIMER, CARSTEN HUTTER, ERIK THOLÉN, DAVID HAVILAND, Royal Institute of Technology (KTH), Stockholm, Sweden — Dynamic atomic force microscopy (dynamic AFM) is a key tool for surface characterization on the nanoscale. Operation close to a cantilever resonance increases sensitivity and allows for the measurement of the phase of the cantilever response. This phase is traditionally interpreted as a measure of the energy dissipation due to the tip-sample interaction. However, a full understanding of dissipative processes remains a challenge in dynamic AFM. To address this problem we have developed Intermodulation AFM. With this multi-frequency technique we can tremendously increase the number of information carrying signals close to resonance. Using Fourier analysis and linear algebra we combine the amplitudes and phases of these signals to separately reconstruct the conservative and non-conservative tip-sample interactions. We have tested this method both on simulated and on experimental data. The method works at one tip-surface separation, providing quantitative high resolution maps of surface properties while imaging at normal rates.

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