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Intermodulation Atomic Force Microscopy and Spectroscopy CARSTEN HUTTER, Stockholm University, DANIEL PLATZ, ERIK THOLEN, DAVID HAVILAND, Royal Institute of Technology, HANS HANSSON, Stockholm University — We present a powerful new method of dynamic AFM, which allows to gain far more information about the tip-surface interaction than standard amplitude or phase imaging, while scanning at comparable speed. Our method, called intermodulation atomic force microscopy (ImAFM), employs the manifestly nonlinear phenomenon of intermodulation to extract information about tip-surface forces. ImAFM uses one eigenmode of a mechanical resonator, the latter driven at two frequencies to produce many spectral peaks near its resonace, where sensitivity is highest [1]. We furthermore present a protocol for decoding the combined information encoded in the spectrum of intermodulation peaks. Our theoretical framework suggests methods to enhance the gained information by using a different parameter regime as compared to Ref. [1]. We also discuss strategies for solving the inverse problem, i.e., for extracting the nonlinear tip-surface interaction from the response, also naming limitations of our theoretical analysis. We will further report on latest progress to experimentally employ our new protocol.

[1] D. Platz, E. A. Tholen, D. Pesen, and D. B. Haviland, Appl. Phys. Lett. 92, 153106 (2008).

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