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Novel high-speed AFM modes to study mechanical properties of cells and soft materials at the nanoscale MAXIM DOKUKIN, Department of Mechanical Engineering, Tufts University, Medford, MA, IGOR SOKOLOV, Department of Mechanical Engineering, Department of Biomedical Engineering, Department of Physics, Tufts University, Medford, MA — Here we present two novel and quantitative atomic force microscopy (AFM) modes of operation, which allow studying mechanical properties of biological and soft materials at the nanoscale. The first one, FT-NanoDMA AFM mode is a combination of three different methods: the quantitative dynamic mechanical spectroscopy (DMS), AFM indentation, and Fourier-transform spectroscopy. This new spectroscopy mode is fast and sensitive enough to allow DMS imaging of nanointerfaces and single cells, while attaining about 100x improvements in both spatial (down to 10nm) and temporal resolution (down to 0.7 sec/pixel) compared to the current state-of-the-art. The second mode is an extension of popular sub-resonant oscillatory AFM imaging. It utilizes the signal information from the free resonance oscillations of the cantilever which occur after detaching the probe from a sample surface (ringing). It delivers multiple new imaging channels.

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