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Dual Frequency AFM Using an Analog Processing Module. CONOR DALY-SEILER, None, MIKAIL KOHNA, Student, EDWARD KRAMKOWSKI, Student/Supervisor, PETER HOFFMANN, Lab Administrator — Understanding the distribution of cell receptors on live cells is an important part of understanding how cells interact with their environment. Such understanding can be vital in understanding many diseases, including cancer. Our goal is to efficiently and accurately map a biological cell for both topography and specific binding sites simultaneously. This project focuses on testing the feasibility of dual frequency signal processing using a universal analog signal processing module (UASPM) in tandem with any atomic force microscope (AFM). The scope of this study includes the design, construction, and testing of this universal analog module. This UASPM will first sum the signals from two lock-in amplifiers with minimal noise to produce the desired probe drive signal; the lower frequency will match the resonance frequency of the functionalized cantilever and the higher frequency will be an overtone. The UASPM will then split and wave rectify the photo-diode output from the AFM. Both the wave rectified output and the raw output will then be fed back to their respective lock-in amplifiers for processing: The lower frequency will allow the intermittent contact mode (IC) to map topography while the rectified higher frequency will map specific bonding regions and test quantitatively for bond stiffness. The UASPM should be universal and function in tandem with any AFM setup supporting IC, peak-force, or other AC modes and a BNC pinout.

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