Calibration procedures are always very important for correct quantitative measurements in SPM. In the absence of an interferometer, acquiring an accurate calibration using nc-AFM is complicated. The routine also has to be repeated multiple times for an accurate determination of the amplitude calibration factor which requires a non-negligible amount of time.

We propose a practical and fast way to automate the amplitude calibration of a cantilever. We no longer record Δf vs z curves and manually select point (A_n, z_n) of equal interaction as in Fig. 1, but we optimized the procedure making use of the Nanonis LabVIEW programming interface. In our routine the amplitude of the cantilever is sequentially changed by a factor γ, as in eq. 2, over a selectable range around the initial amplitude. The corresponding Δf has to be changed accordingly to the relation (3) in order to preserve the interaction between the tip and sample [1]. For each set of value (A, Δf) the corresponding z piezo position is read out. Thus, it becomes possible to correlate the z position to the amplitude value and obtain the calibration factor [nm/V] from the linear fit of such a curve.

For increased accuracy, sweeps of A and Δf are performed several times in both directions, and a mean value of the calibration factor is calculated (see Fig. 2). The sweeps must be performed quickly to minimize the drift in the z direction.

You can take advantage of this routine implemented now in the LabVIEW programming interface and you will have an accurate calibration of the amplitude in less than 1 min. The procedure can be applied to other types of sensors with careful choice of the input parameters.

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