

Interferometer Controller Software Module

NANONIS SPMCS-IC-1

The SPMCS-IC-1 is an add-on module to the Nanonis SPM Control System to control interferometers used for the detection of the cantilever oscillations. Figure 1 shows a screen shot of the controller window together with the schematics of the interferometer. A piezo (sometimes called W-piezo) moves the fibre to find the optimum working condition.

Cantilever detection by fiber interferometry is known to have greater sensitivity than laser beam deflection: However, for this to be true, the detection of the cantilever motion has to be done at the optimum operating point (or maximum slope) of the interferometer signal. The Interferometer Controller automates this procedure of finding the optimum working point and integrates it into the control system. That way it becomes straightforward for the user to always use the best sensitivity. To further simplify the procedure the W-piezo calibration is done automatically for a given laser wave length. This is done by sweeping the voltage applied to the W-piezo while reading the interferometer signal: one period corresponds to a quarter of wave length.

The best operating point, i.e. at the maximum slope, is used as setpoint for a dedicated PI controller that controls the optical fiber position.

The deflection can be measured either through the interferometer signal (open loop) or by monitoring the piezo movement (closed loop).

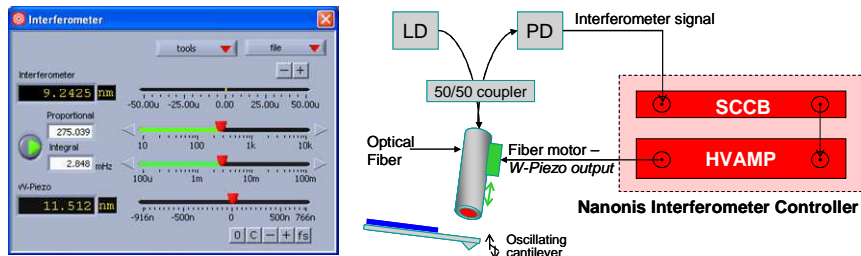


Figure 1: Screen shot of the Interferometer Module and block diagram that illustrates the feedback loop. The cantilever motion is measured by the photo detector (PD) and fed into the digital PI controller that set the fiber position with the W-piezo.

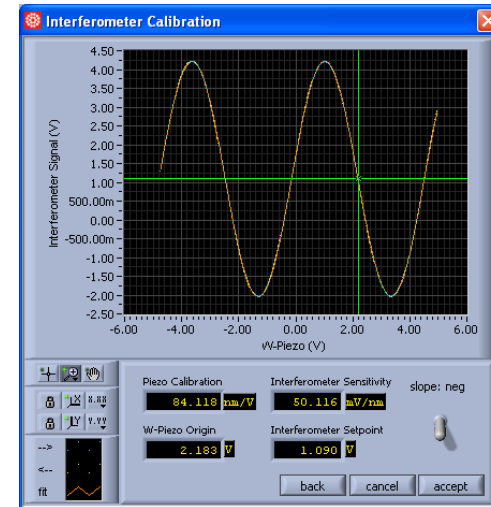


Figure 2: Automatic interferometer calibration: while sweeping the W-piezo the interferometer signal is recorded. The software automatically calibrates the W-piezo and selects the optimum working point for the interferometer.