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Implementing Acoustic Clamp-mode Sensing with MyRio Field-programable-gate-array

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Quartz tuning fork (QTF) has become an important component in Scanning Probe Microscopy due to its robust and low-energy dissipation characteristics. When the QTF interacts with the sample, the mechanical response of the QTF is typically monitored through its electrical response, which, due to the intrinsic capacitance of the QTF, does not fully reflect the mechanical motion. Herein we report Acoustic Clamp-mode Sensing (patent pending) as a new sensing mechanism to characterize the mechanical state of the QTF. Emphasis is given to the automated electronic control of the ACS-SPM using Field Programmable Gate Array, in such a way to make the new system more accessible to large groups of research. In particular we test a NI-MyRIO, containing the Xilinx Z-7010 FPGA, and evaluate its performance while the probe approach and retract from the sample. Detailed technical description and implementation of the FPGA into the ACS-SPM will be provided.

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