NANONIS APPLICATION NOTE

# SINGLE-SCAN KELVIN PROBE TECHNIQUE IN AIR WITH DUAL OSCILLATION CONTROLLER

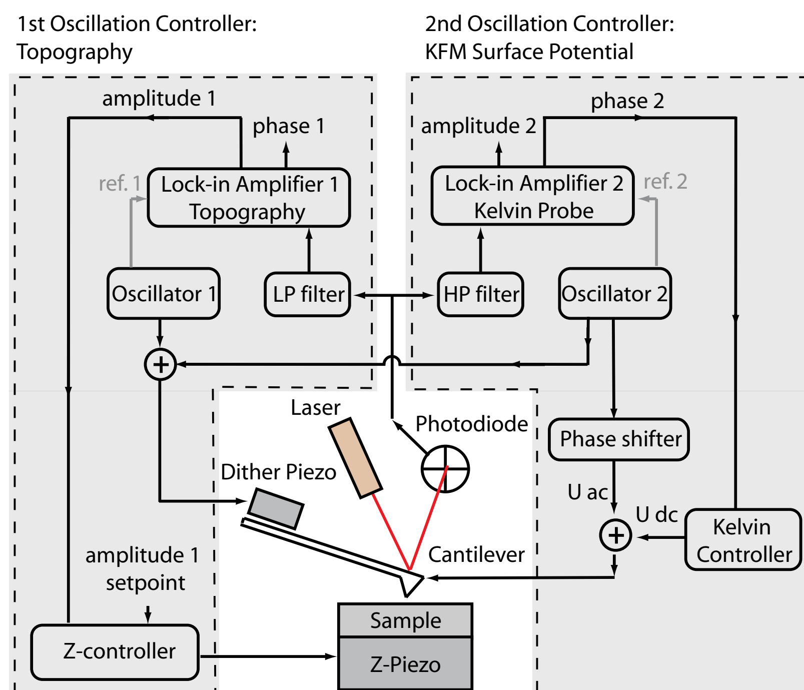
In atomic force microscopy electrostatic forces are usually not discriminated against van-der-Waals forces. Attractive electrostatic forces cause the distance controller to retract the tip from the surface, resulting in erroneous height information in the topography image.

Together with Nanonis we developed a novel solution to this longstanding problem.

We use a combination of two Nanonis Oscillation Controllers that excite the cantilever at two distinct frequencies. The low-frequency component of the cantilever is used for the z-feedback using amplitude control. The high-frequency component is used in a second feedback loop to perform the Kelvin probe measurement. The Kelvin feedback minimizes electrostatic forces such as contact potential differences between tip and sample, and consequently electrostatically induced height errors in topography are automatically cancelled out.

Our microscope is a regular Veeco MultiMode™ instrument. The amplitude control is done close to the first resonance of the cantilever at $f_0$=60kHz. The Kelvin probe measurement runs at the second flexural Eigenmode of the cantilever at $f_1$=275kHz.

A patent on this method is pending.




Schematic of experimental setup.


Reference:

*D. Ziegler et al., Nanotechnology 18, 224404, 2007 (5pp)*



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## Nanonis Modules in Use:

- Base Package
- Two Oscillation Contollers
- Kelvin Controller
- Veeco Adaptation kit

## System:

- Veeco MultiMode AFM


NANONIS
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