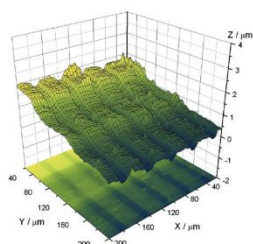


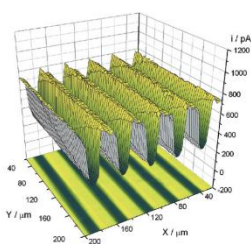
## Shear Force Unit for ElProScan

Conventional constant-height SECM imaging has a major drawback. The measured probe current is a composite signal containing both electrochemical and topographical information of the sample. Samples with high roughness or tilted surface may result in tip-crashing and/or wrong interpretation of recorded images. The HEKA Shear-force Unit is fully real-time controlled and integrated inside the ElProScan ESC Controller. This technology package provides constant distance control of tip-sample separation via the shear force sensing mechanism. In this way, one facile SECM scan in the constant distance scan mode can record up to 7 simultaneous data traces (including probe/sample currents and potentials, Shear force amplitude & phase and surface topographical height, respectively). This unique HEKA solution uses a reliable probe-hopping mode to minimize tip-crashing and/or sample-damage while decoupling topographical complications from SECM signals within one 2D/3D scan.

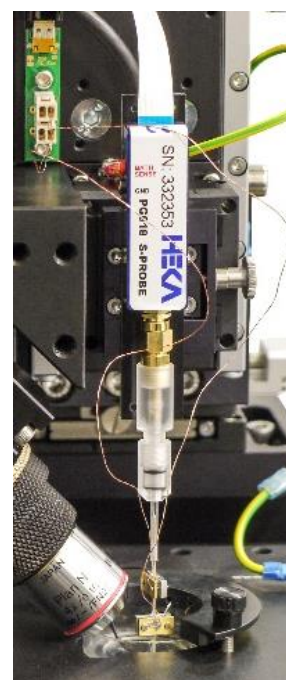
Two Images obtained simultaneously within one scan.



Topography

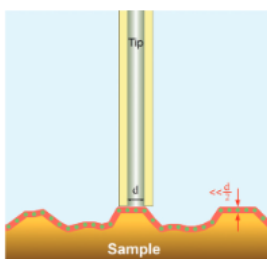
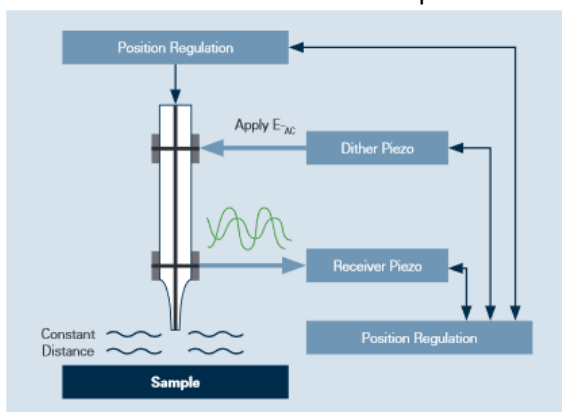


Pure activity



Experimental Set-Up

### HEKA Shear Force Unit Work Principle



Constant Distance Scan

- The micro-probe was first excited into oscillations by applying stimulation voltage at the Dither Piezo.
- The lateral oscillations of the probe tip detected at the Receiver Piezo occur on a range of sensitive frequencies.
- As the oscillating tip approaches the sample surface, the shear-force in the near-field confined medium ( $< 1 \mu\text{m}$ ) alters the tip oscillation due to shear force dampening effect.
- The biggest change in amplitude (or phase shift) occurs at the most sensitive frequency.
- For scan regulation the probe tip is controlled at a "constant distance" predefined by a dampening set-point on shear force tuning curve.

For more information contact HEKA at [sales@HEKA.com](mailto:sales@HEKA.com) or visit [elproscan.com](http://elproscan.com).

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