



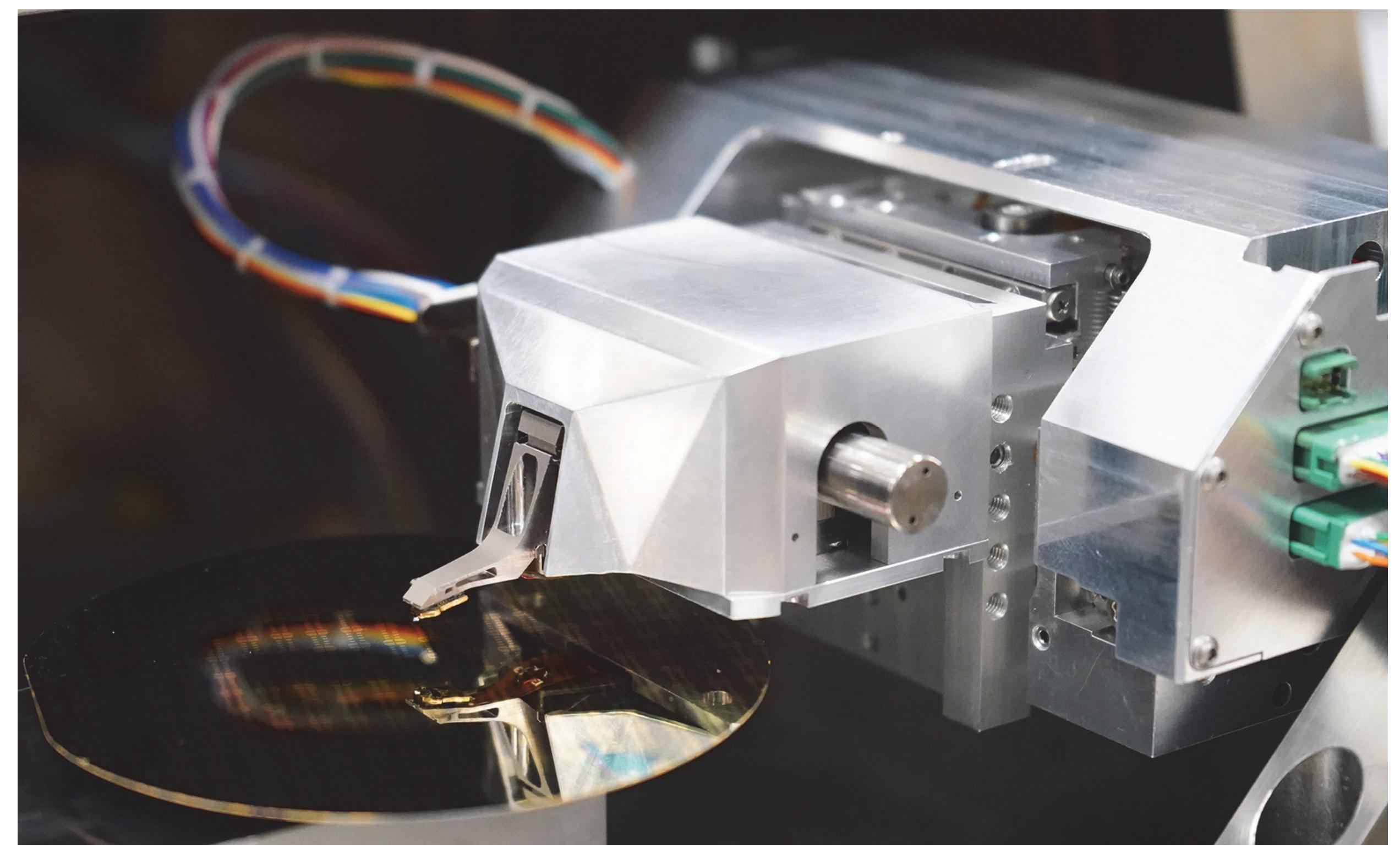
Correlative AFM-SEM Platform Enabling Unique Characterization of Samples

H. Alemansour¹, J. Diederichs¹, S. Mitchell¹, A. Alipour¹, W. Neils¹, J. Gardiner¹, S. Spagna¹, C. Schwalb², H. Frerichs², L. Stühn², and M. Wolff²

1. Quantum Design Inc., San Diego, CA 92121

2. Quantum Design Microscopy GmbH, Pfungstadt, Germany

AFSEM® Concept



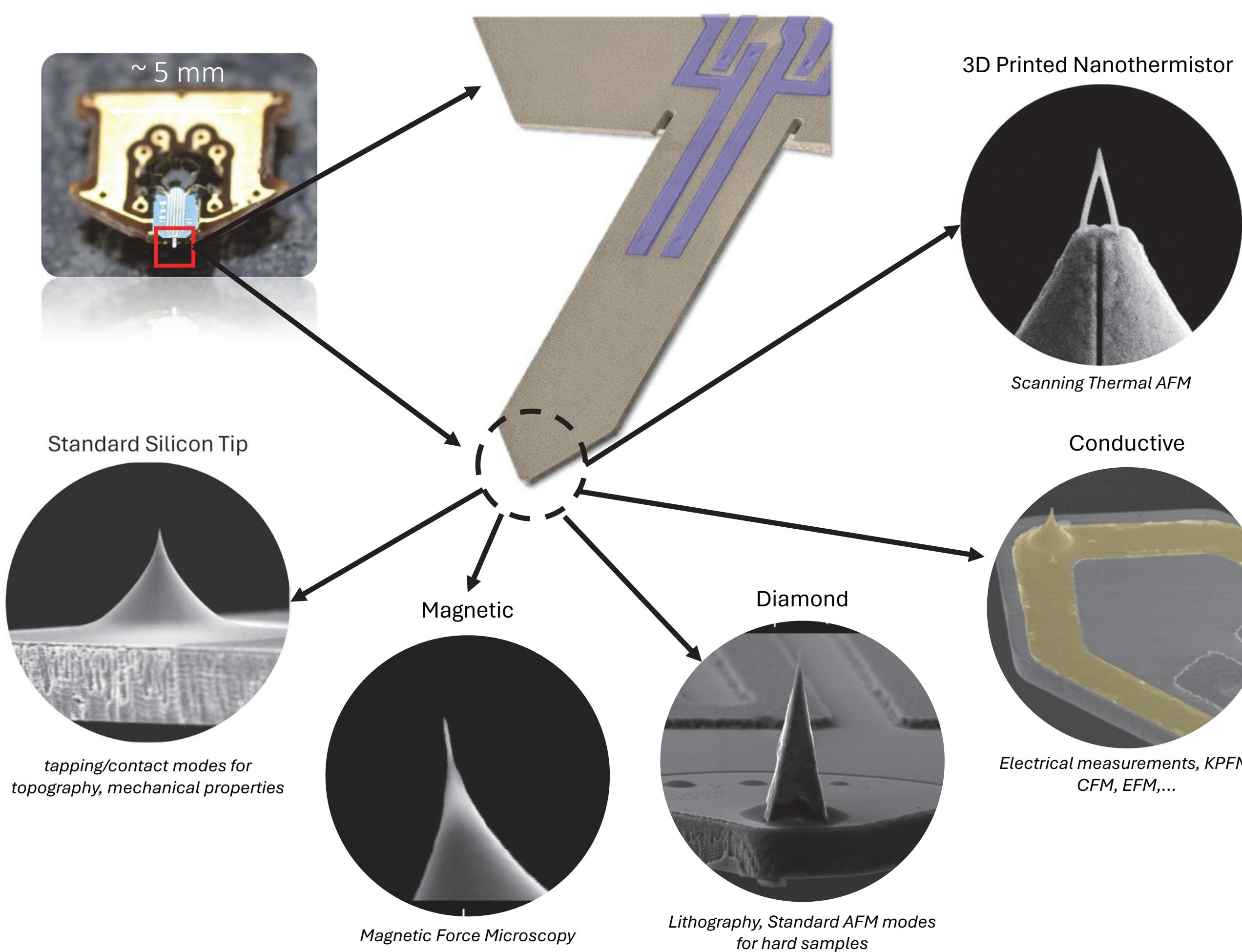
AFSEM Correlated Microscopy

AFSEM is a novel Atomic Force Microscope (AFM) designed and developed for integration into a Scanning Electron Microscope (SEM) or Dual Beam. It enables simultaneous acquisition of complimentary data of a sample by combining these two technologies into one instrument and presents a unique opportunity to gather novel insights into the micro- and nano-world.

Key Features:

- Compact size
 - Compatible with most SEMs/FIBS
 - Ease of use with self-sensing cantilevers
 - Offers multiple measurement modes
 - Powerful controller

Self-Sensing Cantilever Technology



AFSEM® Controller

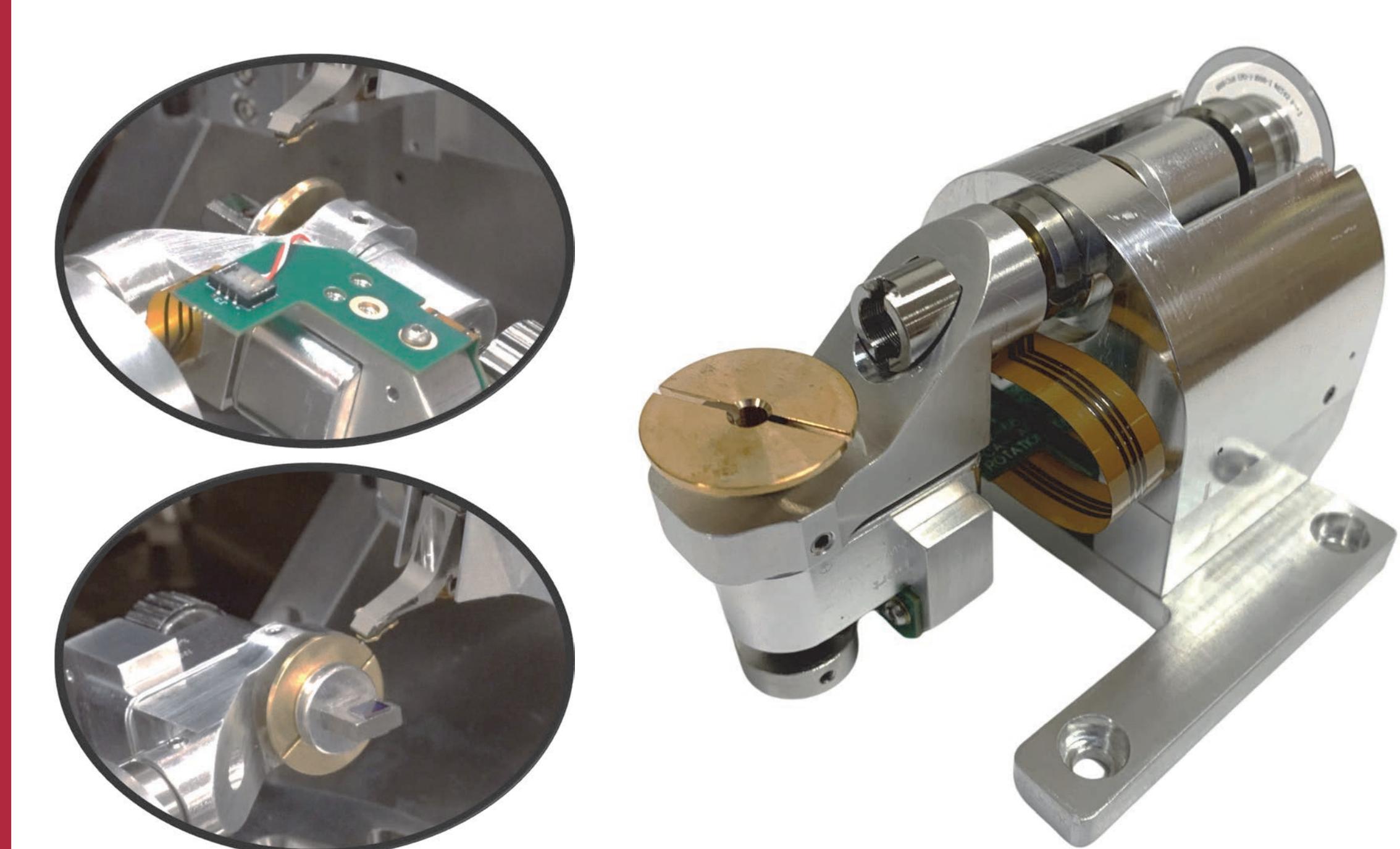


AFSEM controller consists of the Open Hardware Controller, a project started by EPFL, as well as the AFSEM Interface Unit. This controller opens a world of possibilities to implement novel ideas, thanks to auxiliary analog IOs and easy to program open-source LabView-based environment.

Key Features:

- Access to all important signals, e.g., all cantilever signals, as well as LV and HV piezo signals
 - Open source LABVIEW based software
 - HV amplifiers for the AFM piezo stage
 - Stick-slip piezo motor driver for the coarse positioner stage

Tilt Rotation Stage and Controller

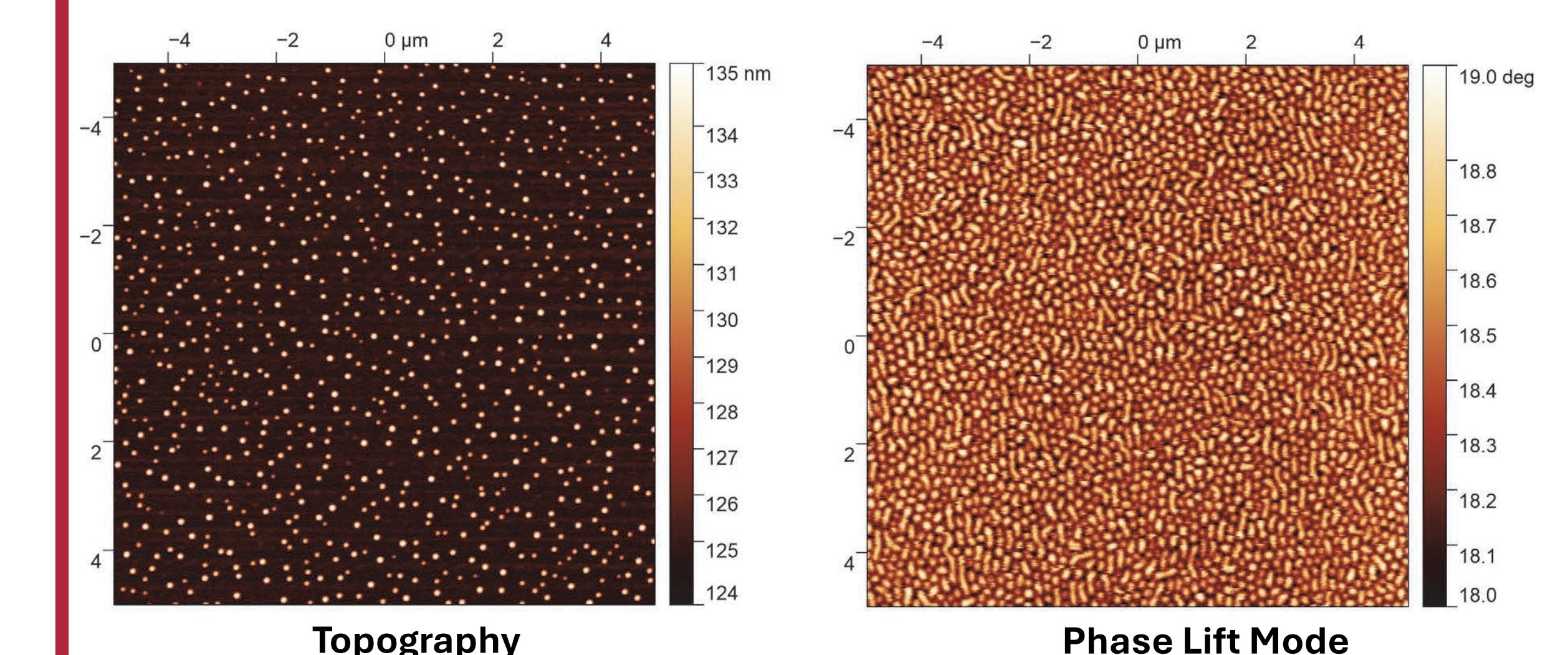


The tilt rotation stage can be integrated inside an SEM. This stage can be incorporated to position hard-to-reach areas of a sample under an AFM tip. It can have full range rotations and a tilting range of -90° to 90°. This enables imaging of a sample from all sides.

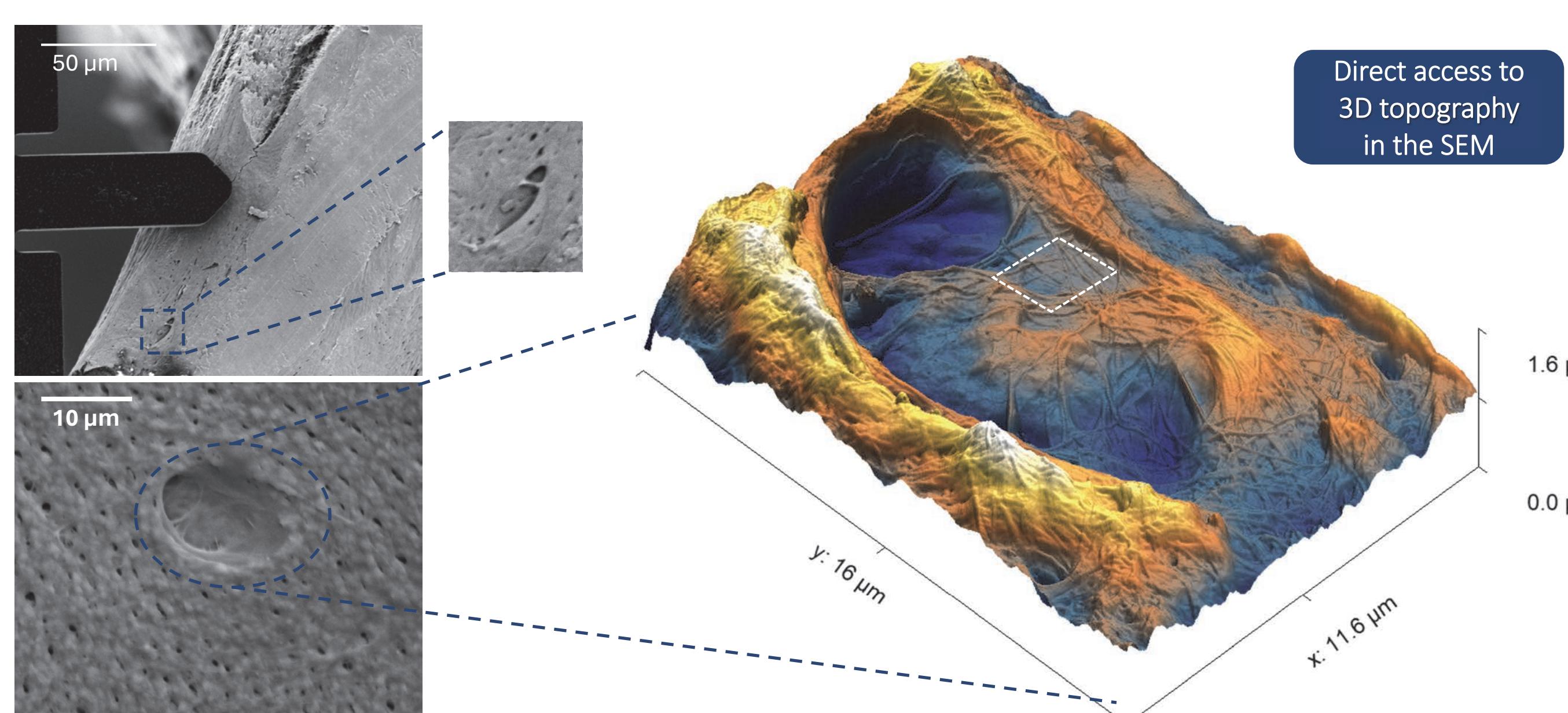
Key Features:

- Closed-loop positioning control
 - Tilt positioning resolution of 0.36°
 - Rotation positioning resolution of 3°

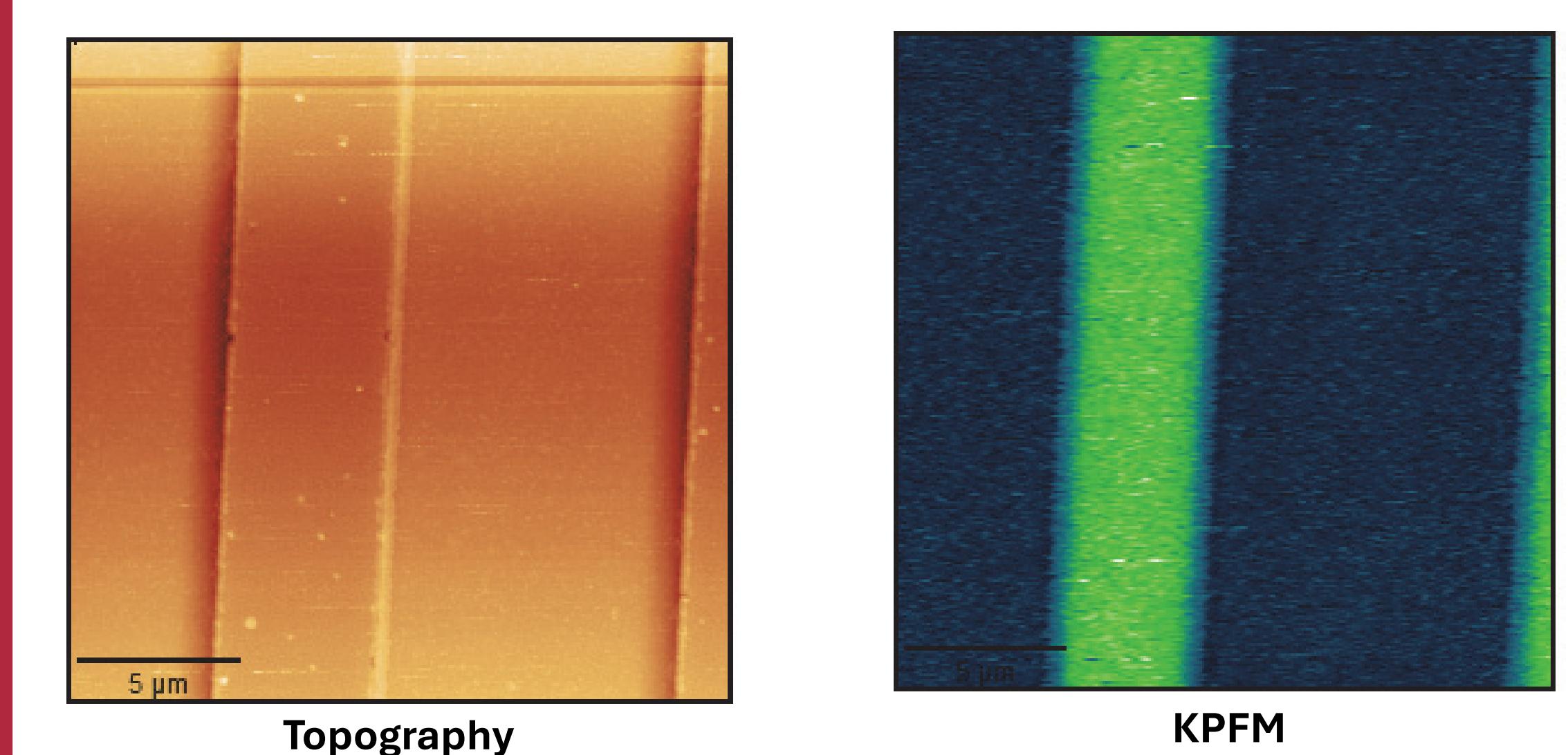
In-Situ Magnetic Analysis of Samples



Interactive Correlative SEM/AFM Analysis of Bone Tissue



In-Situ KPFM Analysis of Samples



Data courtesy: Prof. Georg Fandler, Marcos Penedo, and Prabhu Swain; EPFL