Scanning Near-Field Optical Microscope (NSOM, SNOM)

Instrument description

SNOM is a microscopic tool, which breaks the far-field light resolution limit by mapping the near-field light (evanescent waves) distribution of nanostructures. In order to achieve this, there is a very sharp optical probe (detectors/illuminators), which has an aperture of tens of nanometers. This scans the sample surface at a distance much smaller than the wavelengths of the light interacting with it. The optical resolution and structure size resolution is limited by the probe size, not by the wavelength of the incidental light (resolution ~100 nm). This technique provides for the capabilities of the basic experimental setup – illumination by a SNOM probe set to collect interacting light in reflection or transmission; to illuminate a sample in transmission or reflection and collection the interacting light via a SNOM probe.

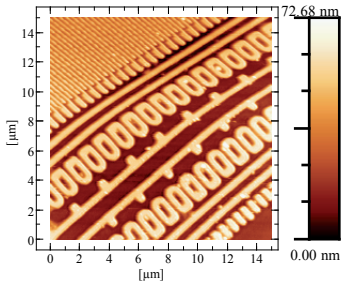
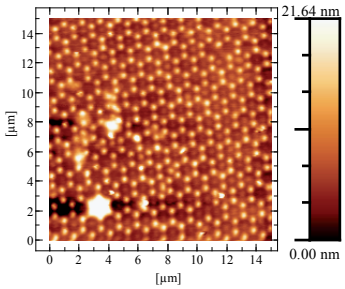
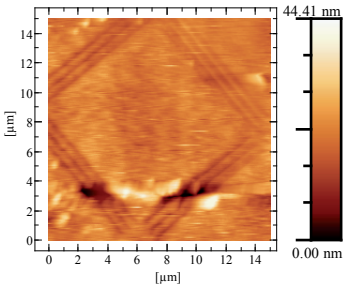
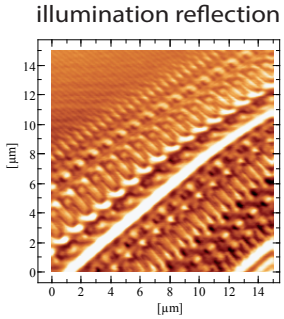
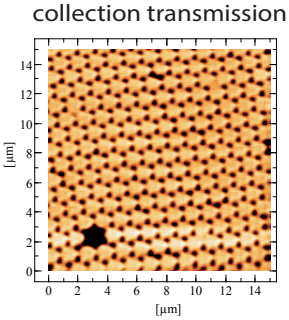
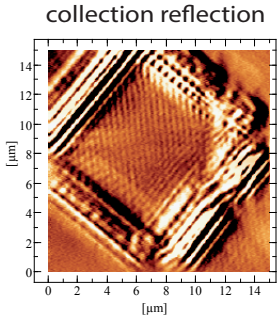
Instrument: Nanonics MultiView 4000

multi-probe independent Scanning Probe Microscope (SPM) fully integrated with upright and inverted optical microscope

Features:

- SPM techniques - SNOM, Atomic Force Microscopy (AFM), conductive AFM, Scanning Tunneling Microscopy (STM)
- two-independent probe scanning system, sample scanning
- combined SNOM collection, illumination with reflection and transmission modes
- probes - bent optical fibres on tuning fork according to applications
- liquid cell
- optical and acoustic hoods

Application

	Lithographic structure	Hexacomb structure	Square of three slits structures
Topography images			
SNOM images	illumination reflection  interaction of near-field illumination with nanometer scale structure	collection transmission  binary sample - transparent (centers) opaque (corners) features	collection reflection  four-way evanescent waves interaction

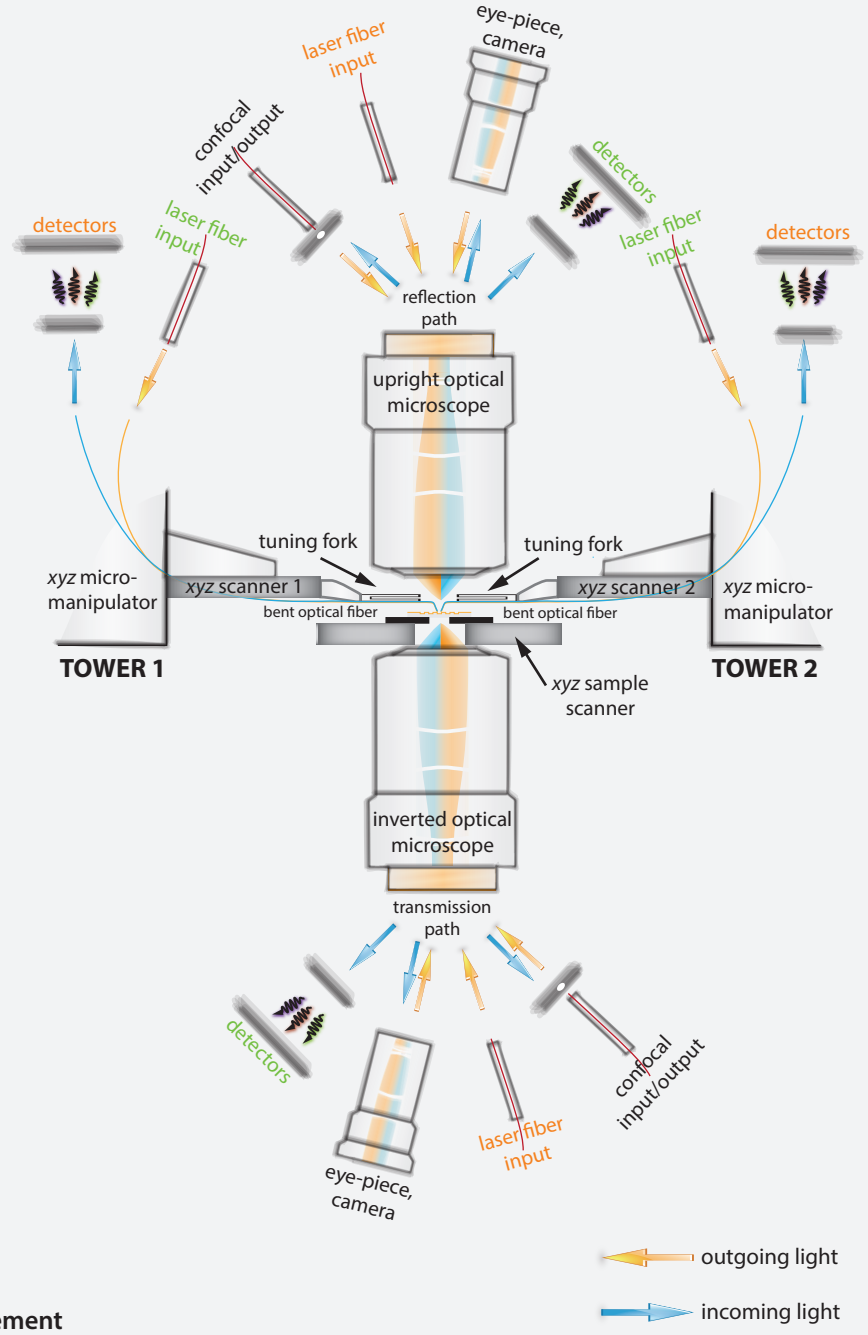
Technical specification

SNOM modes:
illumination transmission/reflection
collection transmission/reflection

AFM non-contact mode
AFM conductive
STM

Lasers:
fiber coupler + bandpass filters
Nd:YAG λ = 532 nm - green,
power 20 mW, PGL-020-11-A
HeNe λ = 632.8 nm - red,
power 10 mW, JDSU 1135/P

Detectors:
Avalanche PhotoDiode (APD)
- SPCM-AQR-14 Perkin Elmer
- λ∈<400, 1100> nm
- photoncounting mode
PhotoMultiplier Tube (PMT)
- MP942 Perkin Elmer
- λ∈<165, 650> nm
- photoncounting mode



Optical microscopes:
upright - Olympus BXFM
inverted - Olympus BXFM
objectives - 50x NA 0.45, 10x
confocal input/output module - pinhole 50 µm
Attenuated Total Reflection module

Manipulators:

xyz scanner 1:	40 µm x 40 µm x 30 µm
xyz scanner 2:	40 µm x 40 µm x 30 µm
xyz sample scanner:	80 µm x 80 µm x 30 µm
xyz micromanipulators:	5 mm x 5 mm x 10 mm

fiber probes optimized for selected measurement

Contact

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