The MultiView 2000™

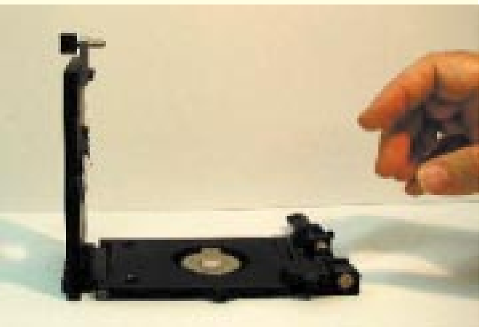
Formerly The NSOM/SPM-2000™

The First Tip and Sample Scanning Probe Microscope

Using Two Award Winning Nanonics 3D Micro/Nano Flat Scanners™

- Top plate tip scanner
- Bottom plate sample scanner
- Unobstructed optical axis
- Transparent integration with any optical microscope, including dual microscopes
- Complete freedom of optical microscope nose piece rotation
- Odd size and large samples including hanging samples (shown inside)
- Confocal imaging provided

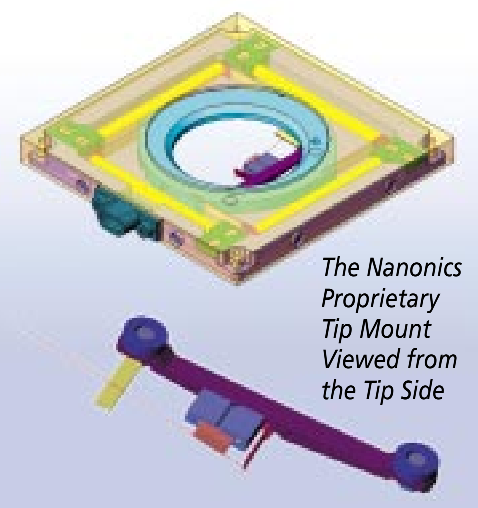
NANONICS IMAGING Ltd.



MultiView 2000™ Tip Mount

Mechanical Design & Scanning

- Double the z scanning breakthrough achieved with one 3D Flat Scanner™ in the MultiView 1000™
- Up to 0.120 mm z scanning for ease of approach
- Samples with surface roughness from nanometers to more than one hundred microns
- Hundreds of microns deep imaging with Nanonics Deep Trench™ probes and 3D Flat Scanners™
- Complete integration with confocal microscopic 3D optical sectioning
- Laser tweezers applications
- Roughly scan samples in x-y over millimeters
- Double the conventional x-y fine motion with two scanning stages - one for tip and one for sample
- Extreme compactness and closed loop mechanical design for sample stability
- Noise floor < 1nm
- Flexible mounting geometries for all near-field optical elements

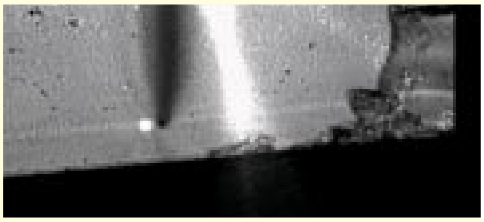


The Nanonics Proprietary Tip Mount Viewed from the Tip Side

Breakthrough in Tuning Fork Feedback

- High resonance frequencies
- High Q factors

Tuning forks were pioneered in scanned probe microscopy by K. Karrai and M. Haines US Patent Number 5,641,896. The work of Karrai and coworkers was patented for straight near-field optical/AFM elements with highly restricted geometries of tip attachment and movement. Nanonics extends this technology in two directions: First, the use of proprietary, simple, mounting techniques that maintain resonance frequencies and Q factors and resolve problems with tuning fork feedback, as noted previously [D. N. Davydov, K. B. Shelimov, T. L. Haslett and M. Moskovits, Appl. Phys. Lett. 75, 1796 (1999)]; and second, applying these mounting techniques to cantilevered near-field optical and AFM elements to provide performance at the limits attainable with scanned probe techniques.



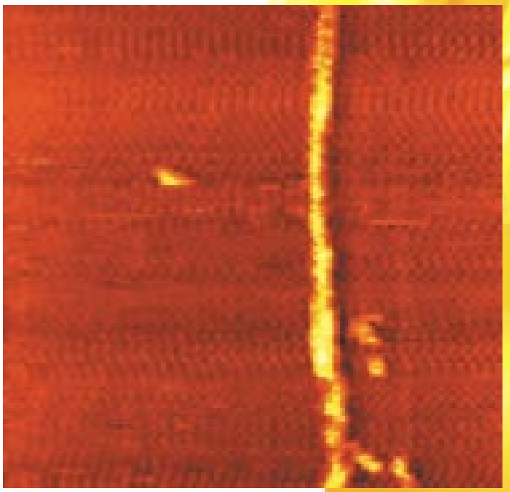
Tip Scanning

Waveguide characterization highlights the utility of having tip and sample scanning available in a single system. The distribution of light emanating from the edge of a waveguide can be best imaged by collection mode tip scanning. In this case, the light is injected into the bottom of the waveguide through an inverted microscope objective or an input fiber. The geometry of the light source and waveguide must be kept stationary throughout the measurement, and sample scanning would disturb the injection of light into the waveguide. Thus, tip scanning collection mode is preferred in this case and in similar experiments.

Using an on-line optical microscope allows simultaneous viewing of the edge of a hanging planar waveguide and the NSOM/AFM cantilevered tip as it is positioned to inject light into the waveguide (top left image). The waveguide is hung on the bottom plate of the sample scanner while the tip is mounted on the top plate, the tip scanner (bottom left image).

Sample Scanning

Many experiments are performed best using sample scanning. For example, one might want to monitor, with ultra high resolution, index of refraction variations along the edge of the waveguide together with AFM topography. Light emitted from the NSOM tip and reflected off the edge of a waveguide is collected by a high numerical aperture (NA) microscope objective. In such an optical measurement, tip scanning relative to a high NA objective destroys the axial symmetry of the optical system and can result in image artifacts. Tip artifacts have to be avoided to reach the ultimate in these super resolution reflection measurements of index of refraction that can monitor alterations of <1/1000.



Soft Sample Imaging of a Fibril of Associated Protein Molecules

The MultiView 2000™ Series also includes the LT Low Temperature systems that Nanonics provides.

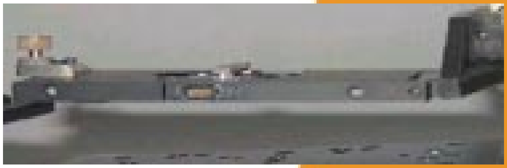
The MultiView 2000™ Series builds on the standards of modularity, flexibility, and full system performance that were established by the MultiView 1000™. Present owners of a Nanonics MultiView 1000™ can upgrade to the Nanonics MultiView 2000™ Series.

The MultiView 2000™ L (Large Samples)

- Integrate Alpha Step, AFM, and optical information
- Tip scanning
- Large sample stage
- Customer specified stage sizes and accuracy

The MultiView 2000™ C (Confocal Imaging)

- Tip scanning
- Add to any existing optical microscope, including UV confocal microscopes
- On-line viewing with lens and tip for imaging and callibration
- Resolve optical image and AFM registration in semiconductor applications
- Ultra-high resolution thin film measurements



Accessories for liquid and electrochemical cells, odd-shaped sample mounts, and environmental control systems

With the MultiView 2000™ Series, Nanonics Imaging has reaffirmed its position as the complete supplier in this unique interface between scanned probe and optical microscopy. At Nanonics Imaging, both the optical microscope and the scanned probe imaging system are given equal importance. No other manufacturer of scanned probe or optical microscopes can provide for such effective solutions in both these growing areas of imaging. The result is the ultimate degree of integration in imaging methodologies.

MultiView 2000™ Technical Specifications

Modes of Operation

Near-field Optical Microscopy	Transmission, reflection, collection, fluorescence
Atomic Force Microscopy	Tuning fork
Feedback Mechanism	Tuning fork (resonance frequency approximately 32 kHz)
Confocal Microscopy	Transmission, reflection, fluorescence

Sample or Tip Scanning

Scanner	Two piezoelectric flat scanners (both 7 mm thick) Sample scanning or tip scanning Scan Range: 120 μ Z-range, 70 μ XY-range (30 and 10 μ on request) Maximum Load: 75 g
Resolution	< 5 nm in XY, < 1 nm in Z
Sample Positioning	Inertial piezo motion (6 mm range, accuracy 1 μ)
Maximum Sample Size	16 mm diameter, custom mounts for larger samples available upon request

Probes

NSOM Probes	Cantilevered or straight, pulled optical fiber probes
AFM Probes	Cantilevered, pulled glass probes or any commercially available AFM probes
Specialized Probes	Cantilevered probes for electrical or thermal measurements
Custom Probes	Available upon request

Optics

Viewing/Detection Optics	Free optical access to the sample from top and bottom for optical observation of the sample (all conventional far-field modes of operation are available) and for detection of the NSOM signals with any optical microscope (upright, inverted, dual) or other optics
Detectors	Photomultiplier Tube (PMT), Avalanche Photodiode Detector (APD), InGaAs Detector for IR, CCD
Lasers	A large variety of laser systems can be used (UV, VIS, IR)
Video System	Optional CCD camera

Optical Resolution

Confocal Microscopy	Diffraction limited
Near-field Microscopy	From 50 nm upwards, depending on the aperture size of the NSOM probe used
Controller	Nanonics/Topaz (Digital Instruments, RHK, Park Scientific and Topometrix controllers can also be used to control the MultiView 2000™ microscope)
Software	Quartz software for Nanonics/Topaz controller (Win 95/98 and NT) Real time image display, image acquisition (up to 8 channels) and analysis, 3D rendering

Options

Environmental Chamber	Control the measurement environment (humidity, gas composition, vacuum)
Electrical Measurements	Options for resistance, thermal measurements
Nanochemical/Gas Delivery	Deliver a chemical via the nanopipette/AFM tip to the sample surface

NANONICS IMAGING Ltd.

Manhat Technology Park, Malcha
Jerusalem 91487, Israel
Tel: +972-2-6789573
Fax: +972-2-6480827
US Toll-free: 1-866-220-6828
www.nanonics.co.il
email: info@nanonics.co.il