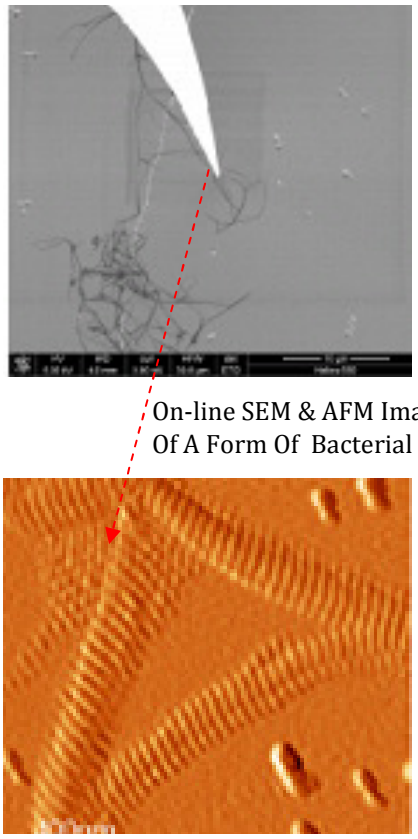

On-line SEM & AFM Imaging
Of A Form Of Bacterial Collagen

SEM & FIB Integration With Scanning Probe Microscopy

A NanoToolKit™ Of Singular Highly Exposed Full View™ Probe Tips Provide Extreme Precision in Probe Placement In A SEM

From The Pioneers in SPM With SEM/FIB Integration And Other Integrated Microscopic Solutions

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Jerusalem 91487, Israel

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www.nanonics.co.il
info@nanonics.co.il

The Pioneers of SPM Integration With SEM & FIB

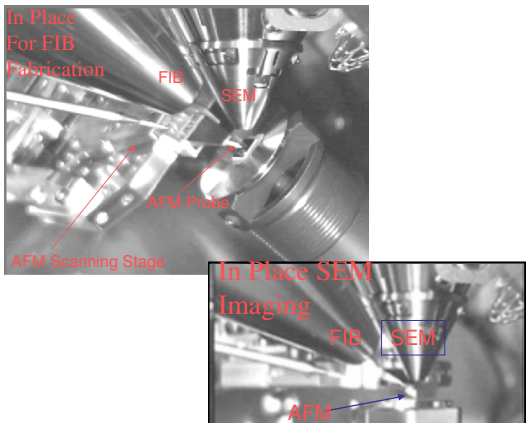
Nanonics pioneered scanned probe microscope (SPM) integration into SEM & SEM/FIB systems with the first such integration occurring a decade ago. Nanonics provides the largest variety of system choices that were designed not only in terms of the scanned probe microscope (SPM) itself but also in terms of the probe being a critical component. Thus, a NanoToolKit™ of probes have been designed with full exposure and *Complete View* of the probe tip. This variety of probes brings unique probe features with singular capabilities to the SEM/FIB such as optical, thermal and other functional properties with full SEM/FIB integration.

The first adopters led the way to what is being realized, only within the last year, as an important new avenue of previously unachievable capabilities for all electron and ion beam users that view these tools as critical in their arsenal of measurement and fabrication options.

Nanonics realizes that this is the start of a new era and works actively with such customers to achieve new directions in this developing field so that the combined capabilities of having an SPM in a SEM/FIB offer the user much more than the sum of having a stand alone AFM or SEM/FIB. Thus, Nanonics customers have been the first to demonstrate electron beam excitation of devices while probing a functional property of the device with an appropriately chosen SPM probe..

The SPM DB

The System



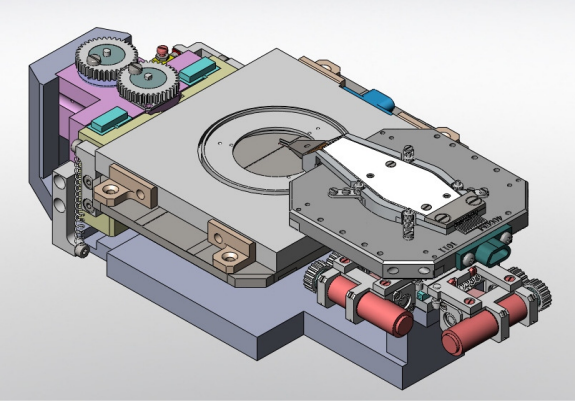
SPM DB door mounted on the sample stage of the Dual Beam (DB) and rotated from the FIB to the SEM without any interference of DB components. Full View™ SPM probe tips either pointing down for imaging and sensing or pointing up for fabrication.

SPM DB

- Probe scanning (Stage mounted)
- X, Y and Z range 35 µ
- No interference with injectors, detectors or other Dual Beam Components
- Any sample size capable of being placed on sample stage of Dual Beam
- Full rotation with Dual Beam stage

The SPM 4000 DB

The System



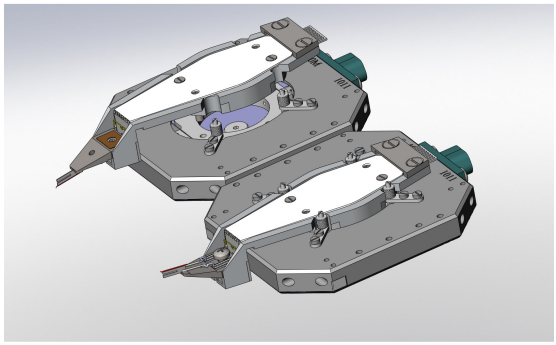
SPM Probe and Sample Scanning With Rough XY In Tip or Sample or Both

SPM 4000 DB is an extremely modular system that is very compact in design. It can either be mounted on the stage of the Dual Beam or door mounted on the stage bracket. And, as needs change it readily can be reconfigured for simply probe scanner mounting. as with The SPM DB. In all configurations there is no interference with any of the DB injectors, detectors or other Dual Beam components at any

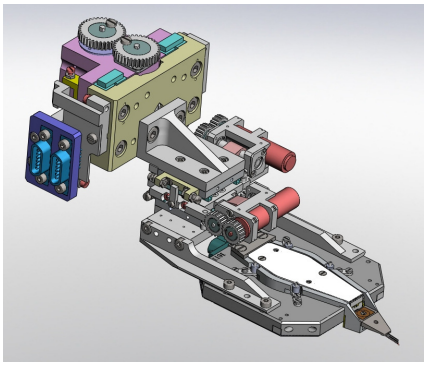
SPM 4000 DB

- Probe or stage scanning (Sample stage or door mounted on sample stage bracket)
- X, Y and Z sample stage range 85 µ fine scanning
- X, Y and Z probe scanning 35 µ
- Rough scanning 5 mm in probe or sample or both
- No interference with injectors, detectors or other Dual Beam Components
- Sample size 10 cm
- Full rotation with Dual Beam stage

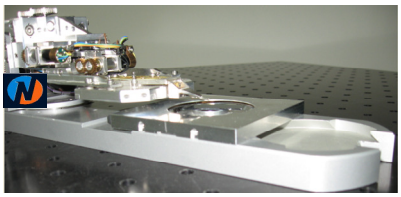
The Unique Nanonics Flat Scanning™ Technology Allows For Modular Reconfigurations In Other Non-Interfering SPM DB Integrations



Allowing The SPM Probe To Be Placed Either With The Tip Pointed Upwards For Fabrication or Pointed Downwards For Imaging



The Second Probe Can Modularly Be Added

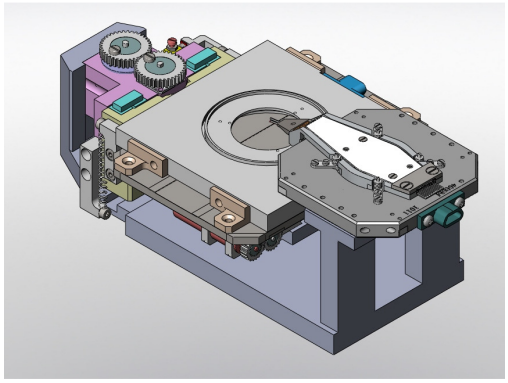


Closed Loop Options Available

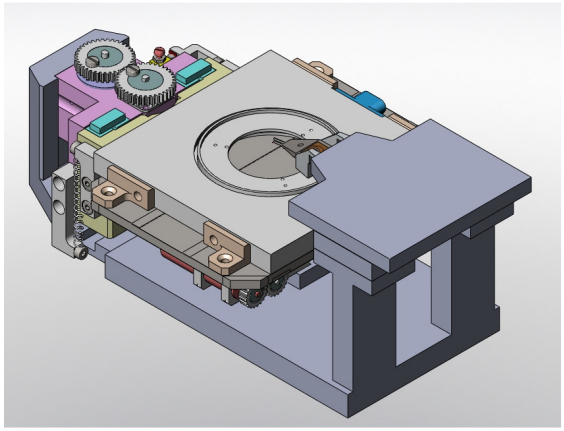
The Modularity Allows For Numerous Options Depending on Need Or For Future Reconfigurability As Needs Change

Complete Modularity

Probe Scanner of The SPM 4000 DB Can Be Reconfigured In The Field In A "Lego Like" Fashion For Remounting On The Dual Beam Stage Door Bracket As With* The SPM DB *For Scanning Large Samples Placed On The Dual Beam Stage

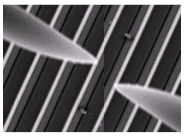


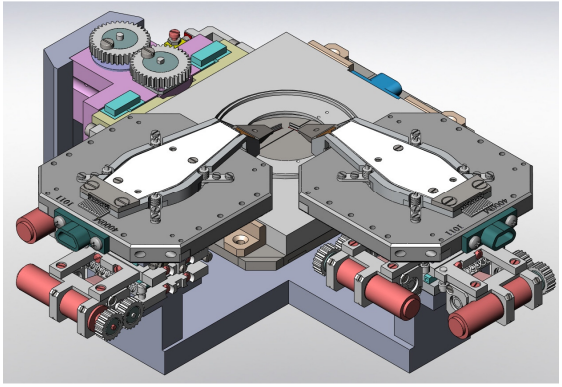
X, Y & Z Sample Rough and Fine Scanning with Probe Fine Scanning Only



X, Y & Z Fine and Rough Scanning Only In The Sample Stage

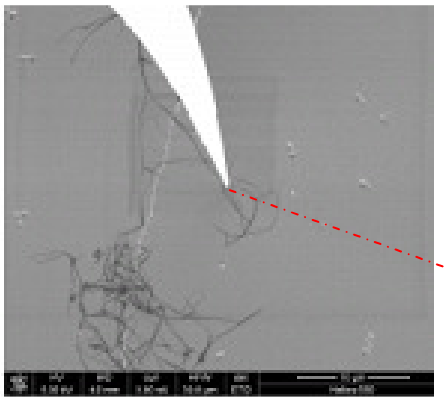
Alternate MultiProbe Options

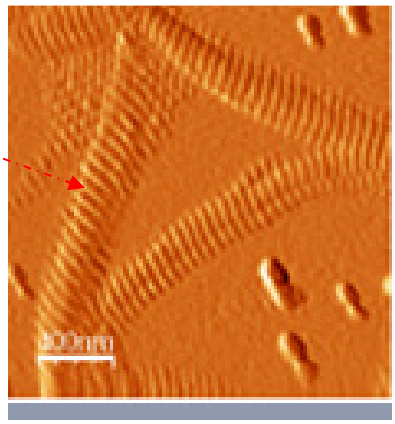




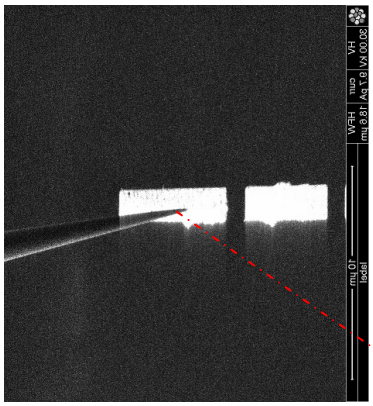
Full View™ Probes With Standard & Unique Imaging Capabilities

Singular Highly Exposed Full View™ Probe Tips



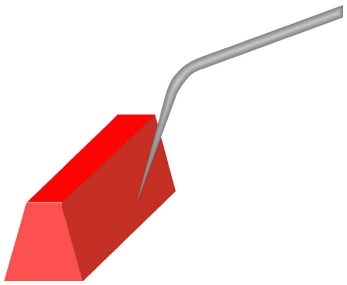


Bacterial Collagen AFM in a DB

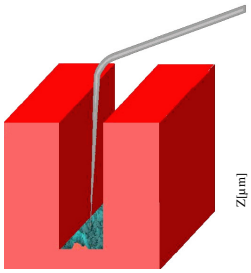


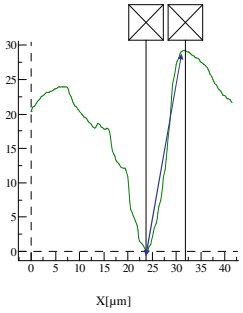
Elasticity in a DB

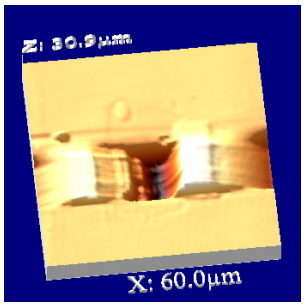
Exposed Tip Side Wall Imaging

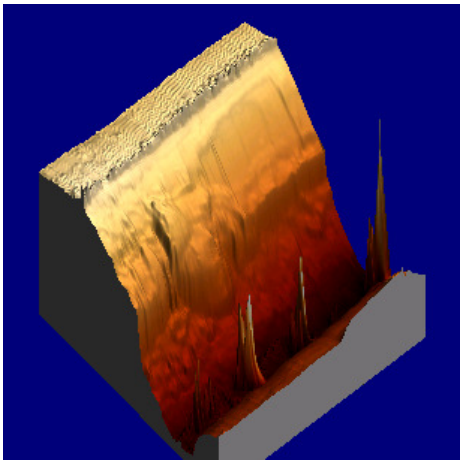


Deep Trench Imaging of FIB Etched Structures

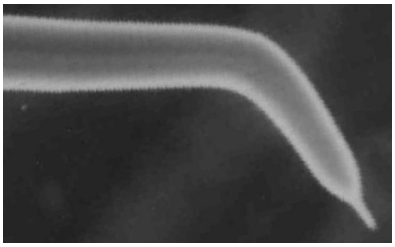


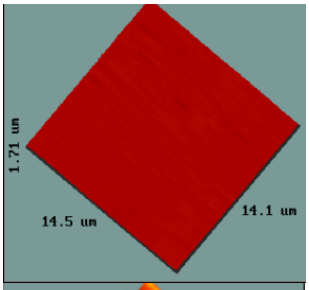




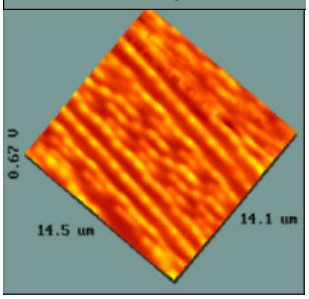


Full View™ Probes With Standard & Unique Functional Capabilities



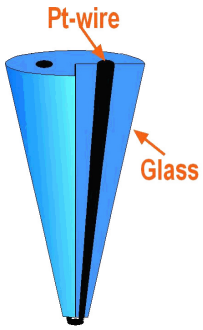


AFM Polished Silicon Wafer

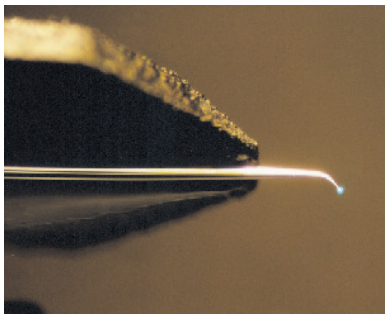


Thermal Conductivity Underlying Layers Sensed

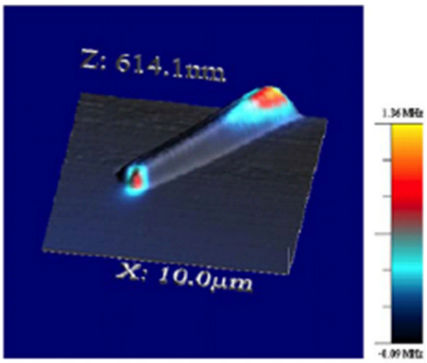
Full View™ Thermal Conductivity or Thermocouple Probes



Full View™ Nano Optical Probe



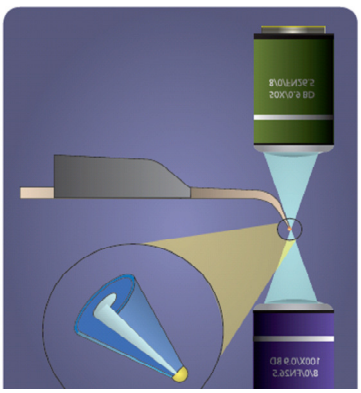
Nano Optics In SEM & FIB



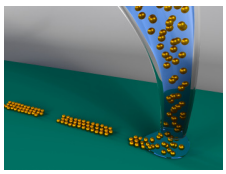
E Beam Induced (Upper Right—Yellow Dot) Electron Propagation Imaged Simultaneously With Near- field Optics and AFM; Image Shows Collage Of AFM & Near-field Optical Image (Colors) Illustrating Carrier Diffusion Cathodoluminescence. Also Seen Is A Waveguiding Effect To The End Of GaN Rod

Full View™ Single Metal Nanoparticle Probes

Single Nanoparticle Probes of Gold (For Plasmonics) & Co or Ni For Ultrasensitive Magnetic Force Microscopy

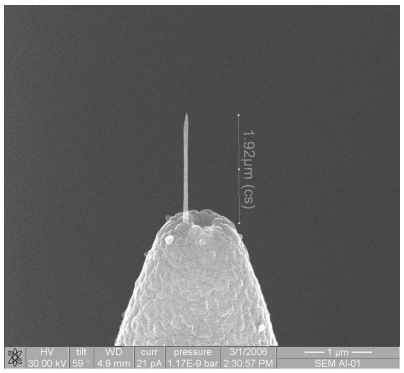


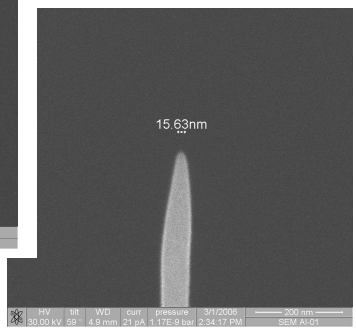
Nano Deposition



Full View™ Probes For FIB NanoManipulation

FIB Metallic Addition Of A Variety of Metals

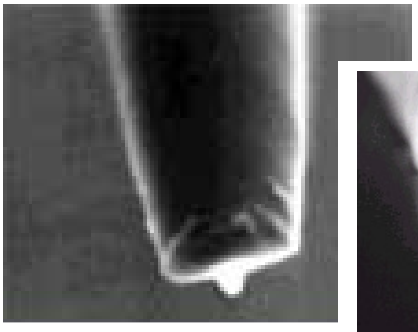


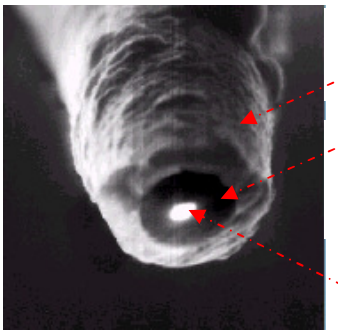


Single Platinum Wire Full View Probes with a Range of Controlled Sizes

Single Platinum or Gold Wire That Protrudes From The Tip For FIB Manipulation

Can Be Provided As A Coax For Low Electrical Noise With A Coating On The Glass Insulator





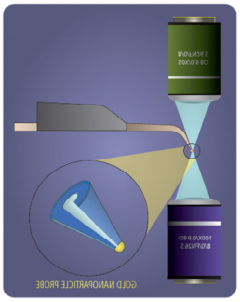
Metallic Coating

Glass Insulator

Platinum Inner Wire

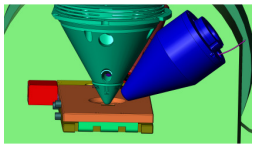
Single Metal NanoParticle Probes

Single Nanoparticles of Gold, Silver, Cobalt, Nickel, Platinum, Copper etc with sizes controlled from 10 nm to 1 µ or larger



The MV 2000 SDB

The System



Excellent For SEM Imaging
Limited Tilt Options In Dual Beam

With the first installation in 2005 this SEM/FIB SPM system allows for complete manipulation of the sample or the probe and can be used with the probe tip either pointing up or down since it has a completely free axis. The system provides easy and rapid movement from one SEM model to another as demonstrated by customers in the field.

MV 2000 SDB

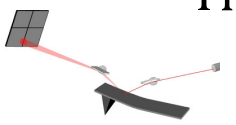
- Stage Mounted
- Probe & Stage Scanning
- X & Y range 170 µ
- Z range 170 µ
- Sample Z autofocus to keep tip & sample in E beam focus
- Tuning Fork Feedback
- Unique electron/ion beam friendly cantilevers & NanoToolKit™ of SEM/FIB optimized probes with a variety of functionalities from electrical to thermal to near-field optical
- Tilted sample and probe view

The Probes

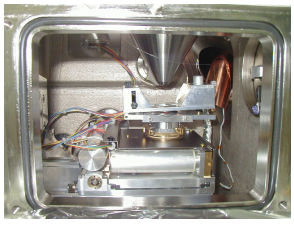
All probes as noted above for SPM DB & SPM 4000 DB

The MV 1000 SDB

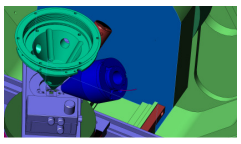
The System



Or



Excellent For SEM Imaging
Limited Tilt Options In Dual Beam



With the first installation in 2002 this SEM/FIB SPM system allows for use of either beam bounce or tuning fork feedback. It allows for a completely free axis with probe tip pointing up or down. The system provides easy and rapid movement from one SEM model to another

MV 1000 SDB

- Only stage scanning not probe scanning
- X & Y range 85 µ
- Z range 85 µ
- Sample Z autofocus to keep tip & sample in E beam focus
- All Standard AFM Beam Bounce Feedback Probes & Specialized Probes As In The SPM DB and MV2000 SDB
- Tilted sample and probe view

The Probes

All probes both those for beam bounce feedback or as noted above the tuning fork probes as for The SPM DB