TII TOKYO INSTRUMENTS, INC.

AIST-NT

Advanced Integrated Scanning Tools for Nano-Technology

Nanofinder ® 30 - AIST-NT™

Confocal Raman / AFM combined system

www.tokyoinst.co.jp

Nanofinder ® 30 - AIST-NT™

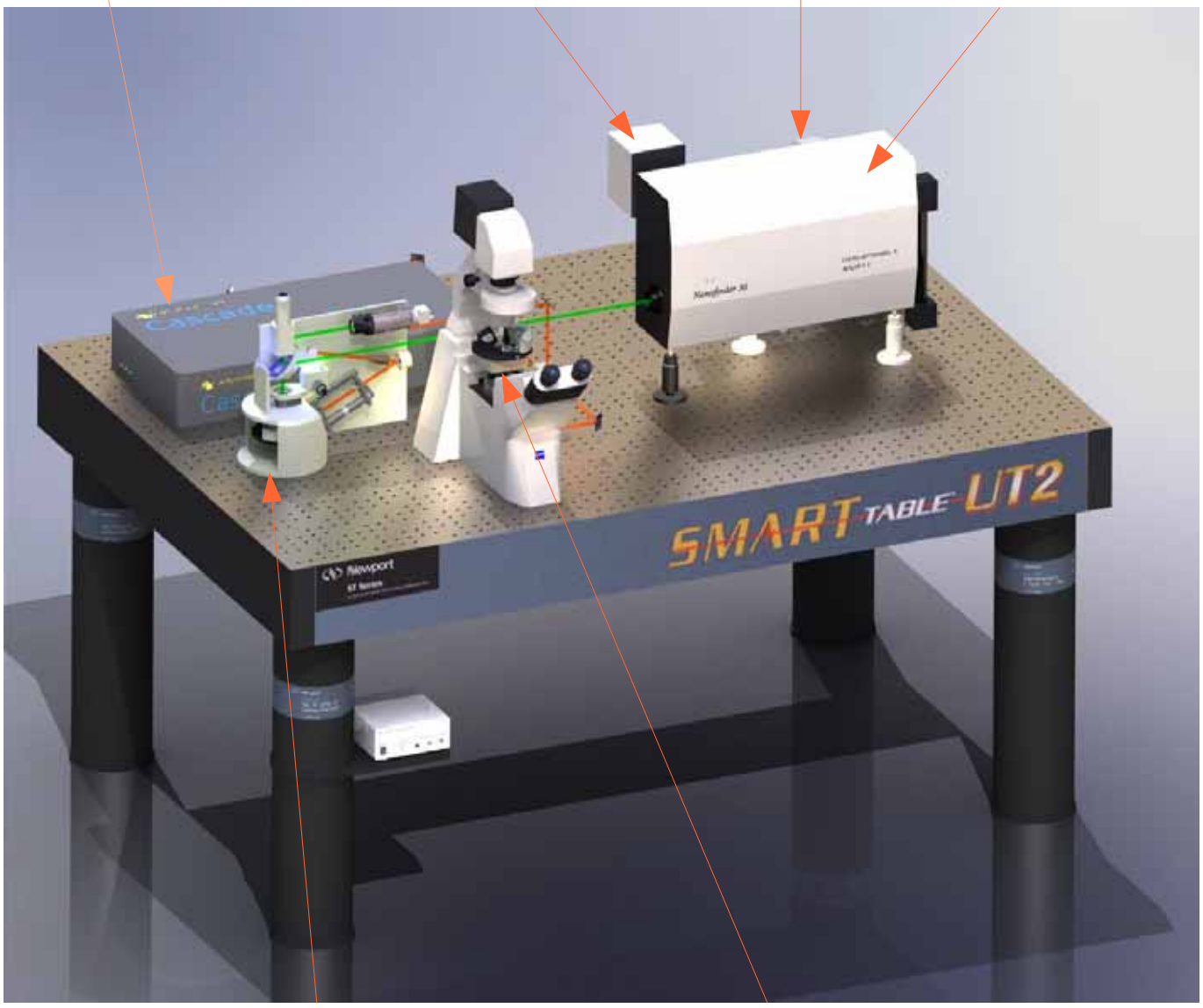
Confocal Raman / AFM combined system

Excitation lasers.

Laser Confocal Microscope unit

CCD detector

Raman Confocal microscope

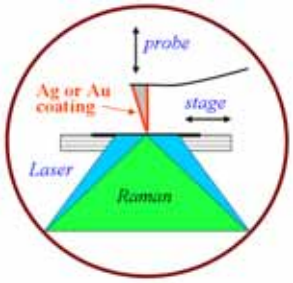


AFM for Reflection & Side configuration: Upright microscope

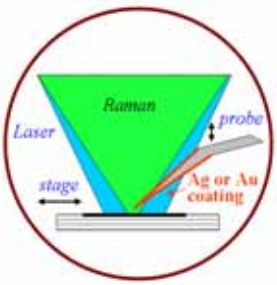
AFM for transmission configuration: Inverted microscope

For all TERS geometries

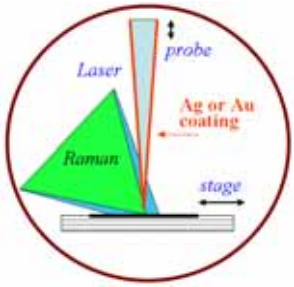
Transmission



Reflection

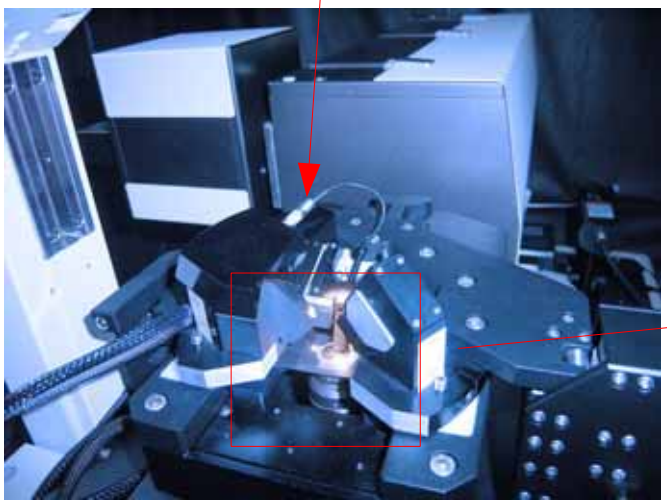


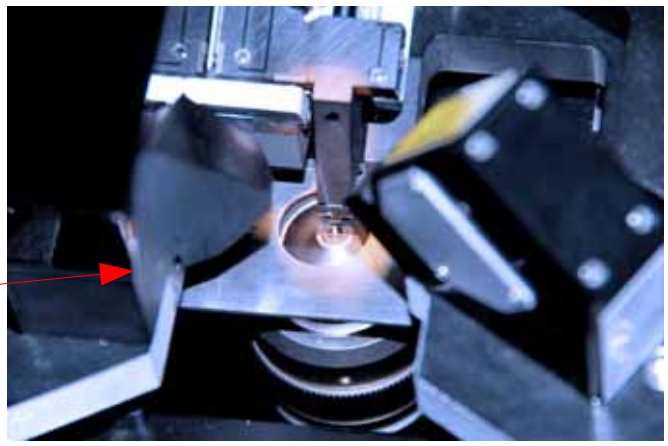
Side illumination



Nanofinder ® 30 - AIST-NT™

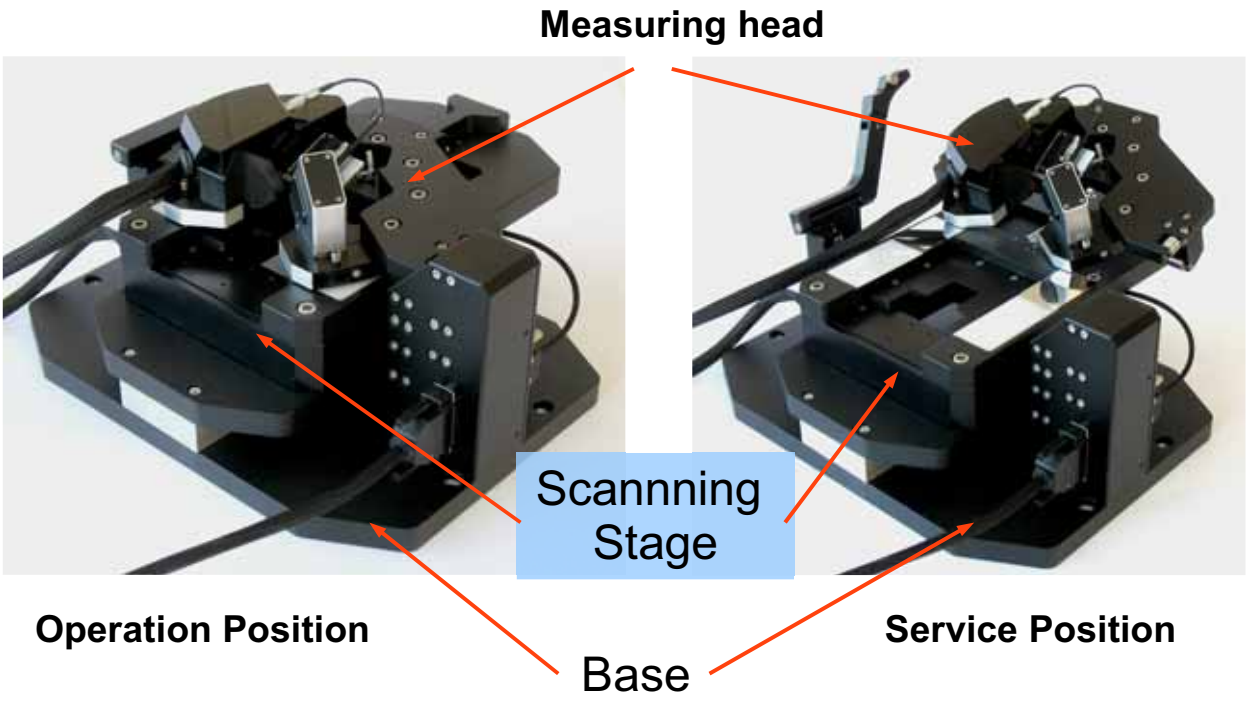
Confocal Raman / AFM combined system





Transmission configuration

AFM Head configuration for *transmission geometry*



Sample scanning range 100x100x20 μm.

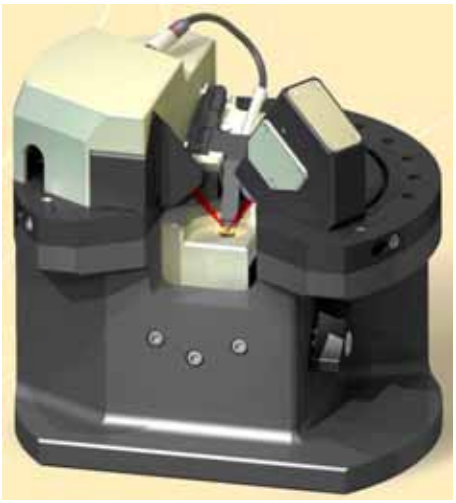
Sample positionning range is 25x25 mm.

The measuring head is fixed during the sample positionning.

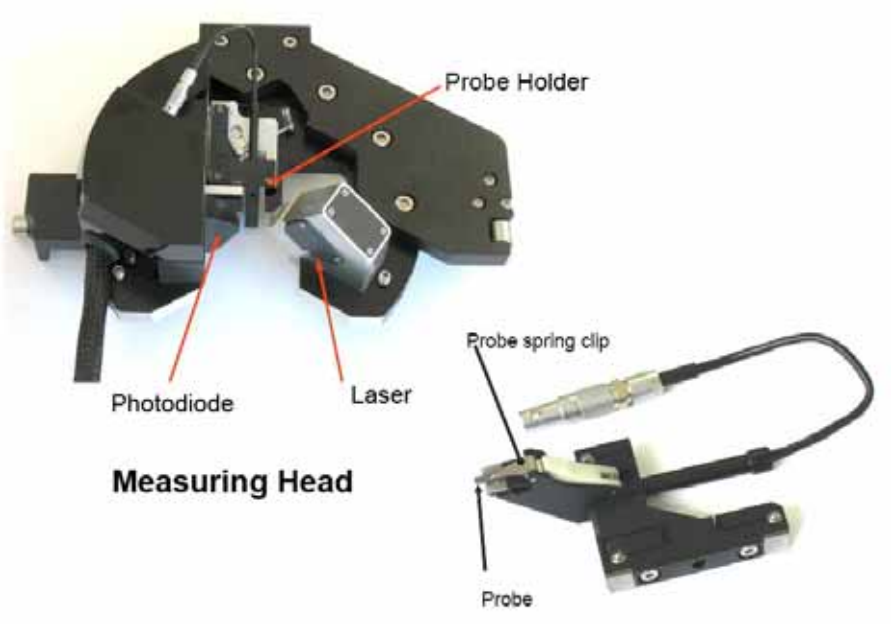
Transition of the measuring head into the service position for the sample replacement/adjustment affects neither the microscope objective lens nor the condensor.

AIST-NT™ AFM

AFM head configuration
for Upright and side
laser illumination geometry



No interference with spectroscopic measurements	Laser wavelength 1300nm*
Registration system noise	<0.03nm
Automated laser self alignment	4 step motors for tip and PD movement
Top, bottom and side TERS experiments	Available
High speed scanning	XY resonance frequency 7kHz Z resonance frequency 15kHz
True Non-Contact mode	with fast DSP controller



Confocal Raman microscope Nanofinder ® 30

Raman Confocal Unit is fully motorized and computer controlled.

System configuration (excitation laser wavelength, laser power, laser beam diameter for microscope objective lens matching, excitation and detection polarisation, bandpass filter selection, pinhole size and focusing conditions, grating and central wavelength in spectrometer, detector type, etc.) is saved in computer memory.

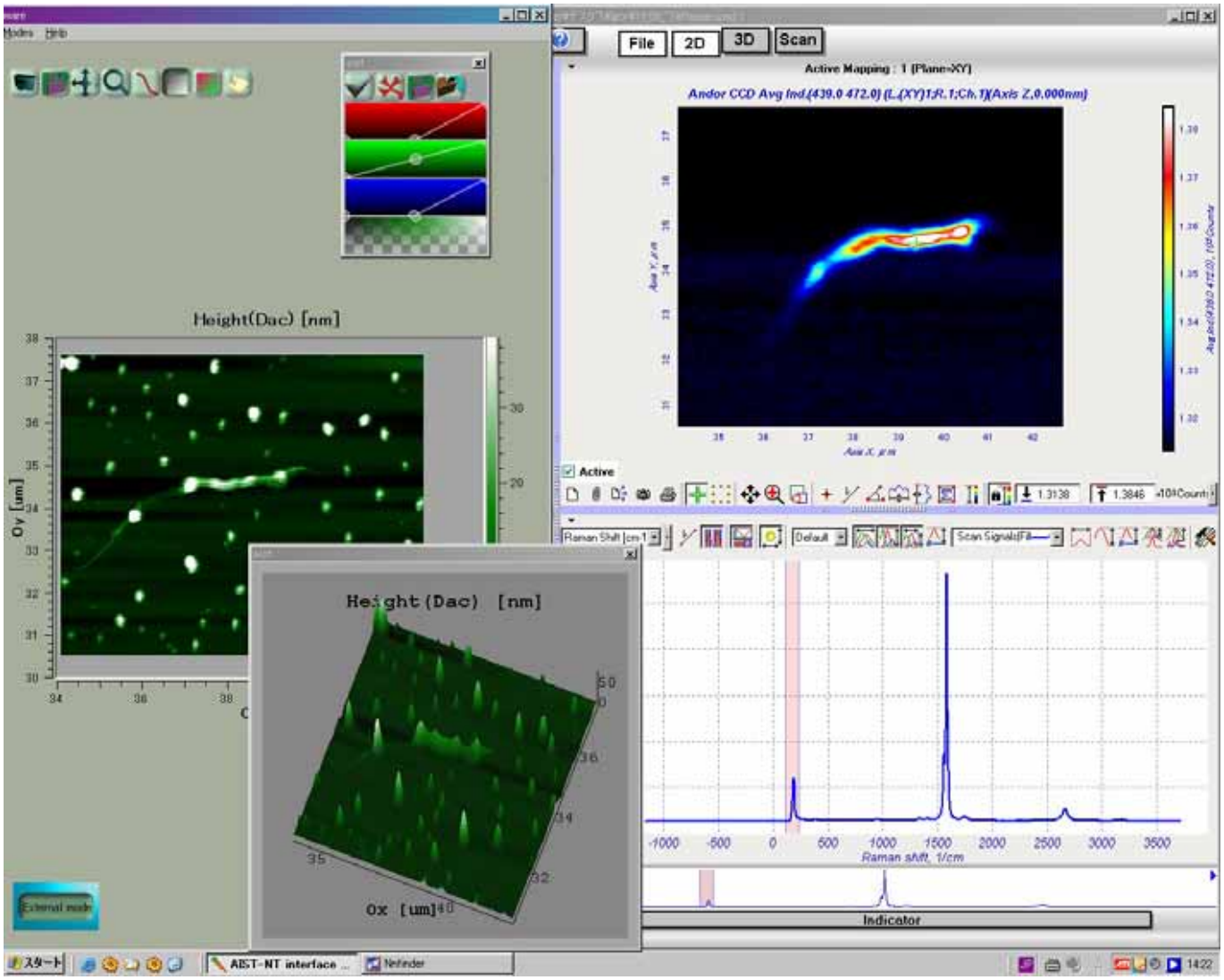
User change the system configurations with a single computer knob click.

Confocal Raman microscope Nanofinder ® 30

Wavelength range
Excitation/Detection
VIS-NIR 473-785 / 473 – 1050 nm
UV-VIS-NIR 363-785 / 363-425 + 473 – 1050 nm
Laser excitation wavelength (example): 363.8, 488, 532, 632.8, 785 nm
(Other lasers on request, up to 3 lasers can be installed for fully motorised operation)
Detection range
Edge or Notch filter <100 cm^{-1} to >4000 cm^{-1}
Maximum confocal resolution (depends on excitation laser wavelength)
Lateral <150 nm
Axial <500 nm
Polarisation optics
Illumination channel Glan-Taylor prism, λ/2 retardation plates (up to 3)
Detection channel Glan-Taylor prism, motorized
Pinhole
Motorized 0-1500 μm
Monochromator/Spectrograph
Ports 1 input, 2 output
Focal length 520 mm
Stray light 1x10-5 (20 nm from 633 nm laser line)
Resolution 1.1 cm^{-1} (per 1 CCD pixel of 26 μm with grating 1800 g/mm at 500 nm)
Gratings (maximum 4 gratings can be installed), example:
150 g/mm, blaze 500nm
600 g/mm, blaze 600nm
1200 g/mm, blaze 600nm
1800 g/mm, blaze 500nm
Echelle grating option for super high spectral resolution (below 0.4 cm^{-1} at 500 nm)
Detectors:
CCD camera
Up to 2.5MHz controller
Number of effective pixels 1024x128
Pixel dimensions 16 or 26 μm
Cooling up to -100 C^0
Photon counting PMT or APD
Fully motorized and computer controlled
Automatical shutters, motorized ND filter, zoom beam expander, change retardation waveplate, rotate retardation waveplate, edge filter, polariser in detection channel, pinhole size, change grating and central wavelength in spectrometer, change spectrometer exit port, etc.
Laser confocal microscope option
Operation at excitation laser wavelength simultaneously with Raman confocal microscope

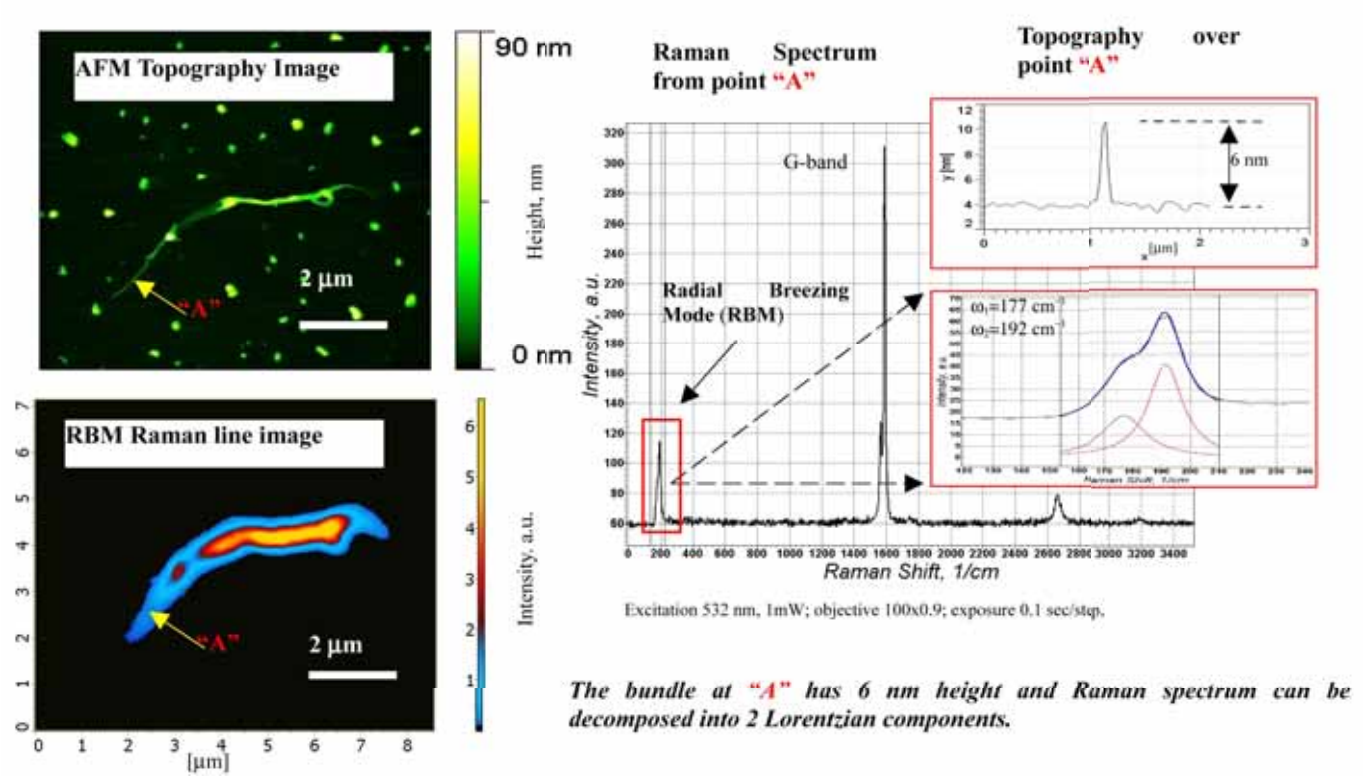
AIST-NT and TII Software Integration

AFM Raman



- User-friendly interface
- Modular architecture
- 2D/3D image processing
- Built-in macrolanguage
- Full spectral data saving
- FemtoScan™ extra image processing software

Carbon nanotubes: Raman and AFM topography images from the same sample area

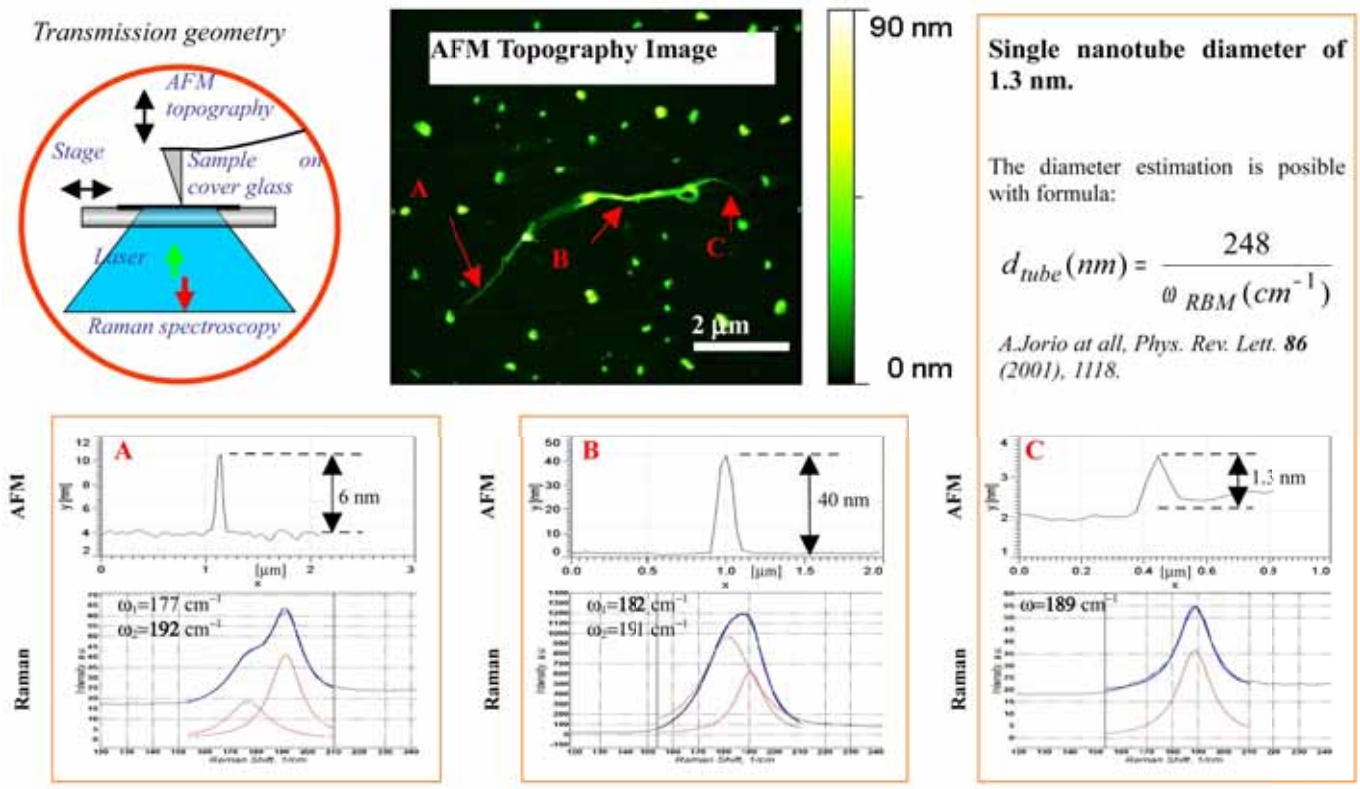


The bundle at "A" has 6 nm height and Raman spectrum can be decomposed into 2 Lorentzian components.

* Data obtained with DEMO system at TII office (Tokyo)

"Nanofinder ® 30 - AIST-NT" is a noble tool for nanoscale characterization of CN along the bundles with high spatial and spectral resolution.

Carbon nanotubes: AFM topography and Lorentzian RBM spectral line fitting

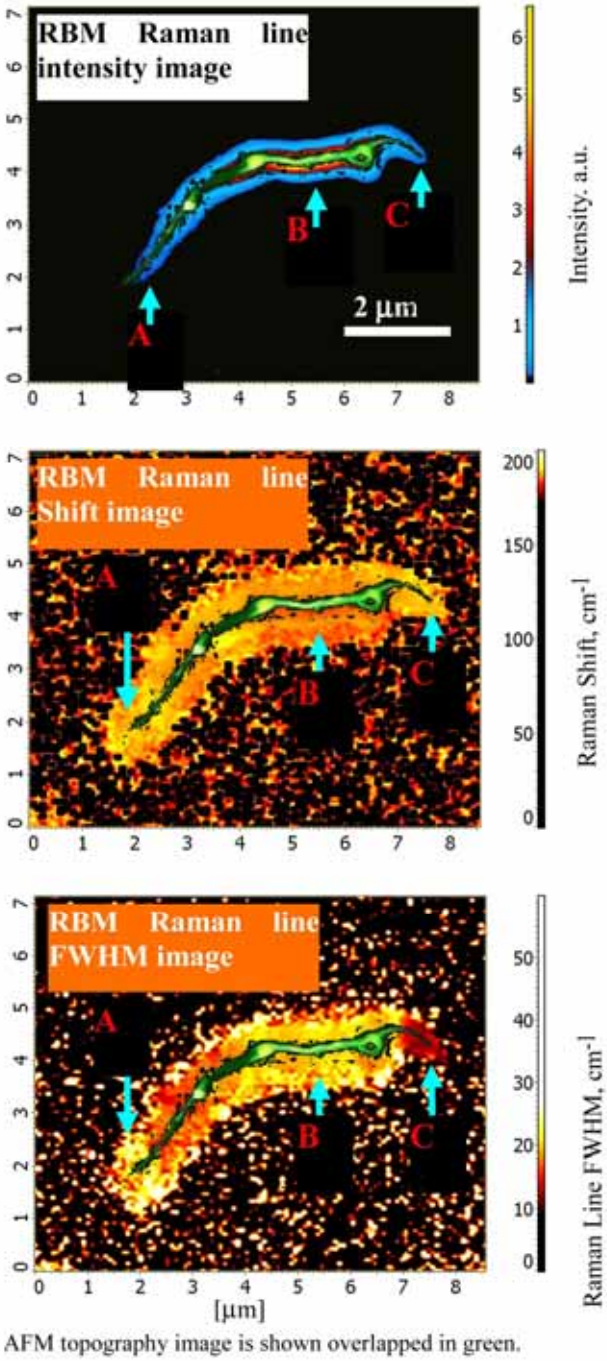


* Data obtained with DEMO system at TII office (Tokyo)

The bundle height and RBM spectrum at respective locations. The composition of RBM spectrum depends on location.

Carbon nanotubes: spatial distribution analysis

Mapping image was done with full spectrum saving in every point with consequent software processing (*Single Lorentzian curve fitting*).



AFM topography image is shown overlapped in green.

Carbon Nanotubes spatial distribution.
Brighter area "B" shows higher density of CNs.

CN diameter is related with RBM peak frequency:

$$d_{tube}(nm) = \frac{248}{\omega_{RBM}(cm^{-1})}$$

Brighter areas "A" and "C" (larger Raman Shift) show predominance of CNs with smaller diameters.

Areas with CNs of different diameters have wide RBM line FWHM.

Areas with single nanotube or similar nanotubes have narrow RBM line FWHM.

Dark area (narrow RBM line) "C" shows location of single or similar nanotubes with the same diameters.

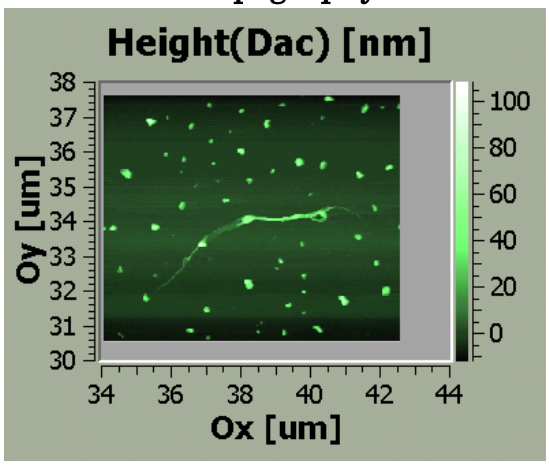
** Data obtained with DEMO system at TII office (Tokyo)*

Correlation between CN bundle topography and RBM Raman line intensity, shift and width is clearly observed.

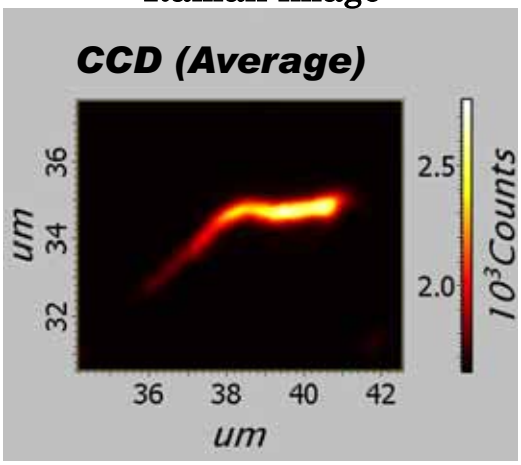
Day-to-day sample location reproducibility

Yesterday

AFM topography

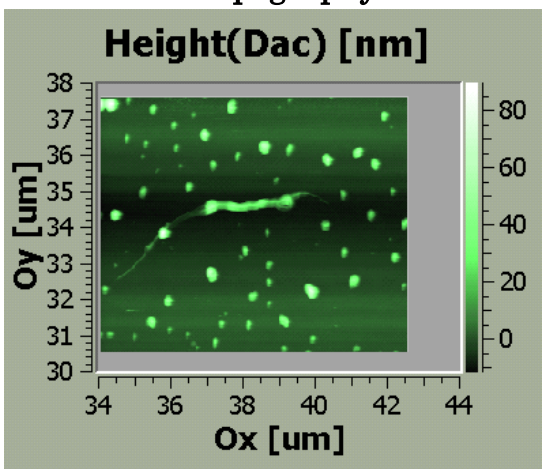


Raman image

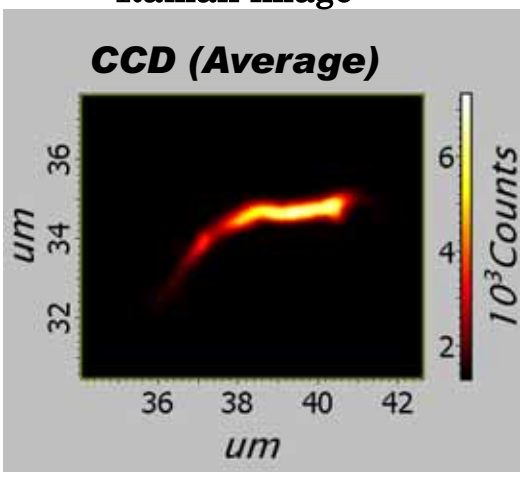


Today

AFM topography



Raman image



** Data obtained with DEMO system at TII office (Tokyo)*

With rigid system design software and hardware "remember" location of your sample. It is easy to continue your experiment next day.

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