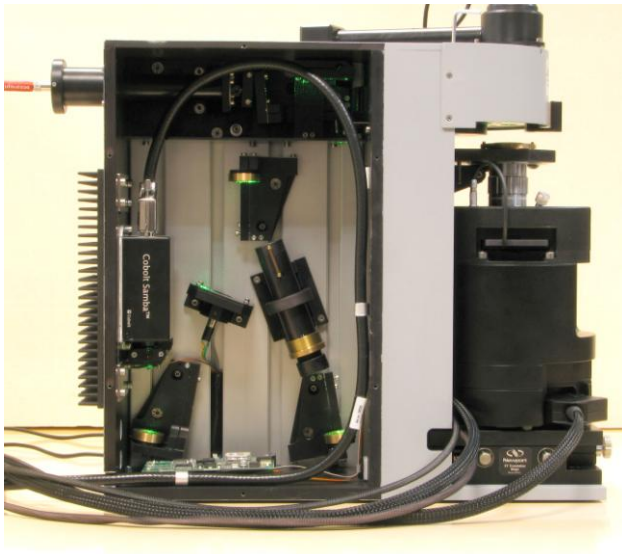


OmegaScope SL - AFM / Raman Microscope

Newest modular cost effective solution

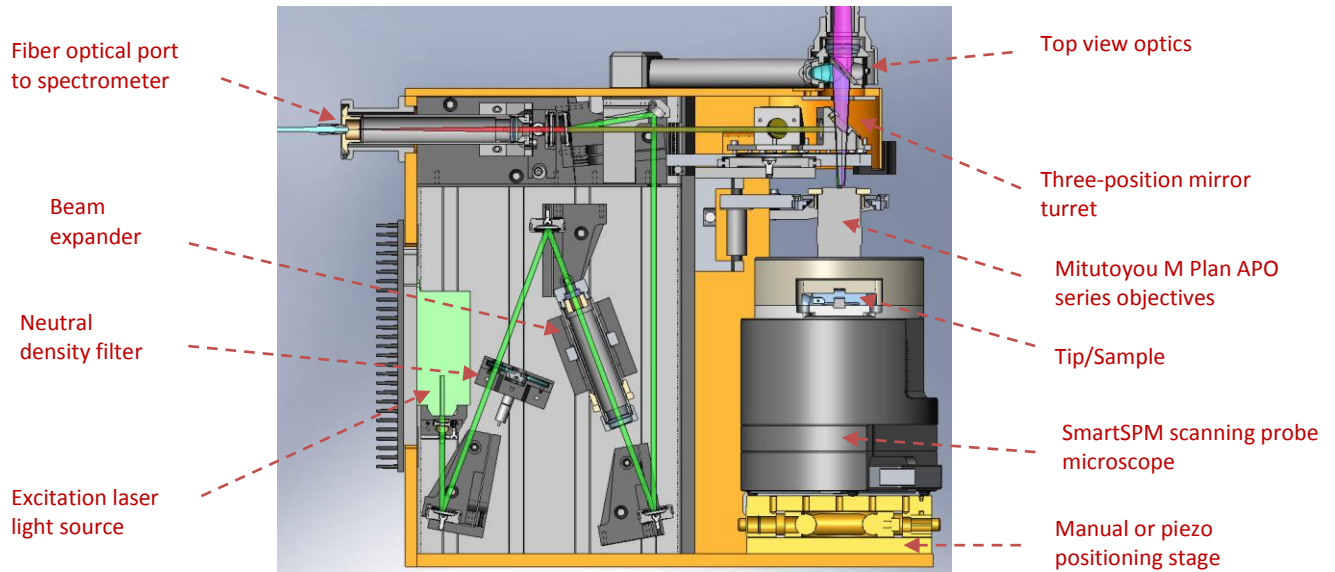
The AIST-NT OmegaScope SL is the first Raman microscope specially developed to be integrated with a scanning probe microscope. The OmegaScope SL is a precision tool that fits on a laboratory table and combines the analytical power of scanning probe microscopy and microRaman measurements. Its rigid robust construction combining laser excitation and sample scattering detection channels with the scanning probe microscope provides the maximum stability of positional relationship between optical excitation point and AFM probe. The direct channel of optical excitation without any fiber coupling guarantees the efficient control of excitation light polarization. AIST-NT offers a number of spectroscopic equipment configurations for detection of scattering light to meet the needs of the user. However, since the instrument has a fiber coupling with a spectrometer, it makes it possible to integrate the OmegaScope SL system with the user's spectroscopic equipment.



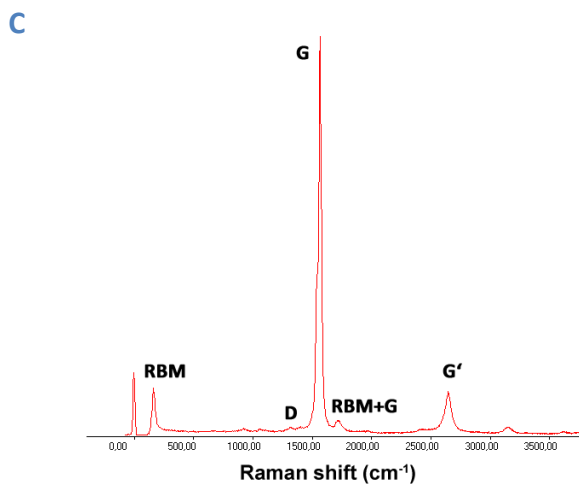
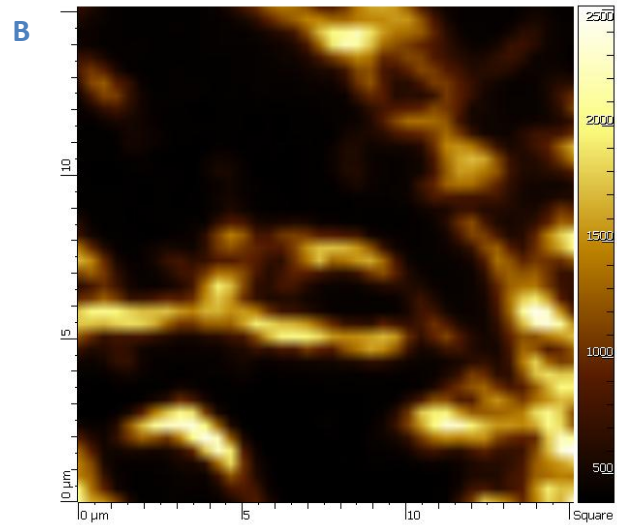
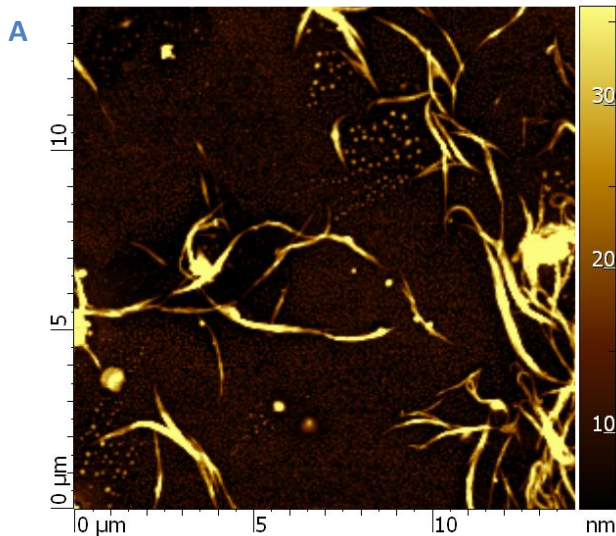
Key features

- Excitation light source is a built-in single mode SLM DPSS laser which provides high stability and spectral resolution with the minimum level of heat emission;
- Built-in beam expander perfectly fills the apertures of objectives used in the system and guarantees the submicron resolution;
- PC-controllable neutral density filter allows the user to reduce excitation laser power down to 10000 times;
- Z-focusing mechanism is PC-controllable and provides a very high precision with Mitutoyou M Plan APO series objectives;
- Manual three-position mirror turret (100% mirror, 50% mirror and aperture) allows the user to precisely select the area of interest on his sample, align the scanning probe microscope with spectroscopy measurements and provide the maximum light transmission during Raman signal detection;
- Built-in top view optics so that the user may view the tip/sample region from above. The optical microscope is based on CCD camera and Keller's type light illuminator and provides 0.4 μm optical resolution with Mitutoyo M Plan APO 100x objective;
- Fiber optical port (SMA or FC connector on customer's request) for connecting different spectrometers;
- Communications between the Raman microscope controller and computer utilize a USB 2.0 interface, enabling future computer upgrades without the need to purchase a special computer or data acquisition card.

System layout



Simultaneous AFM-Raman measurement of carbon nanotubes



A) AFM topography of CNT, Non-contact AFM mode, Scan size - 15x15 microns;

B) 2D Raman image of CNT (at G-band $\sim 1593 \text{ cm}^{-1}$)

C) Raman spectrum of CNT

Standard system configuration

Spectrometer – 303 mm imaging spectrometer ANDOR Shamrock SR-303I

Czerny-Turner arrangement with imaging toroidal optics

Aperture	f/4
Focal Length (mm)	303
Focal plane size (mm, W x H)	28 x 14
Mechanical scan range (nm)	0 to 1450
Reciprocal dispersion (nm/mm, nominal)	2.6
Stray Light (measured at 20nm from 633nm laser line)	1.5x10 ⁻⁴
Wavelength accuracy (nm)	± 0.2
Wavelength reproducibility (nm)	± 0.05
Wavelength resolution (nm)	0.1 (<0.2nm with 26µm pixel CCD detector)
Gratings Size	68 x 68 mm
Mount Type	Interchangeable triple grating turret



Spectroscopic CCD camera – ANDOR iDus 420A CCD camera

Active Pixels	1024 x 255
Pixel Size (WxH; mm)	26x26
Image Area (mm)	26.6 x 6.7
Digitization	16-bit
Pixel Well Depth (e-, minimum) [OE]	300,000 [200,000]
(typical) [OE]	465,000 [395,000]
Register Well Depth (e-, typical)	1,000,000
Max spectra per sec (Full Vertical Binning)	75
Read Noise (e-, typical)	4 @ 33 kHz
Cooling: Minimum Temperature (C°)	-100



Excitation laser – solid-state diode pumped single mode laser (SLM DPSS Laser) Cobolt Samba 532 nm DPSSL

Wavelength	532 nm
Output power	50 mW
Spatial mode	TEM ₀₀ , M ₂ <1.1
Polarization ratio	>100:1 linear

A wide range of customized configurations

AIST-NT offers the OmegaScope SL series instruments in your choice of excitation laser wavelength ranging from NUV to NIR (i.e. from 473 nm to 785 nm). For precise alignment of the SPM tip and excitation light field in such experiments like TERS and Scattering SNOM, the OmegaScope SL can be supplied with a nanometer resolution piezo positioning stage and laser light polarization control devices.