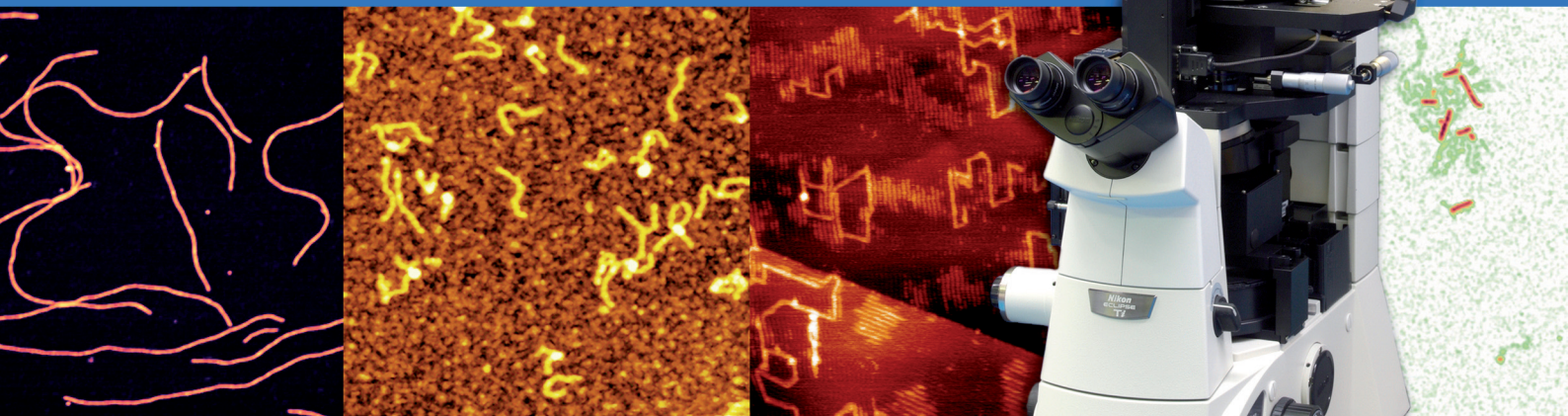


CombiScope™

PERFECTLY COMBINES THE BENEFITS OF
INVERTED LIGHT MICROSCOPY AND SPM



- Extraordinary productivity and easy operation
- Top level scanner
- 1300 nm AFM laser
- Solutions for working in liquid
- All operating modes (including STM and SNOM) in one single instrument
- Integration with Raman

CombiScope Scanning Probe Microscope

Advanced research instrument that provides the entry path for researchers in biology, spectroscopy and photonics. If you work with transparent samples either in air or in liquid towards nano-scale structures and (near-field) nano-optical properties investigation, the CombiScope 1000 is the right solution for you. It perfectly combines inverted optical and atomic force microscopies and unleash all the power of both techniques providing the instrument adjustment and measurement automation, high resolution and high speed only available from AIST-NT. Plus it can be easily upgraded to our OmegaScope AFM-Raman system.

EXTRAORDINARY PRODUCTIVITY AND EASY OPERATION

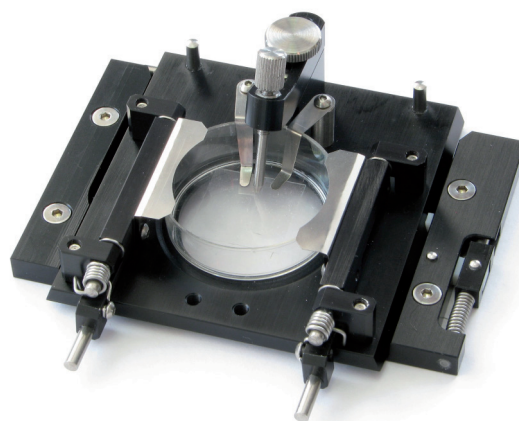
CombiScope is equipped with the fully motorized cantilever holder and photodiode positioning that provides the automated click-on-a-button laser-to-tip alignment. This option dramatically simplifies the entire system adjustment process and provides the highest level of system adjustment reproducibility. In addition, after you installed a new cantilever of the same or even different type, the same spot (within a few microns repeatability) on your sample surface can be easily found and scanned without any extra searching steps.

TOP LEVEL SCANNER

The CombiScope utilizes the closed loop, high-dynamics, 3-axis piezo-nanopositioning scanner from the leader in precision motion control, Physik Instrumente. The top level scanner is the heart of the system which enables it to achieve very high levels of linearity, highest possible stiffness and extremely high precision motion.

1300 NM AFM LASER

The use of 1300nm AFM laser eliminates any interference with VIS light-sensitive biological and semiconductor samples. It also makes it possible to perform simultaneous AFM and fluorescence or Raman scattering measurements without any crosstalk for most popular UV-VIS-NIR (364-830 nm) excitation lasers.



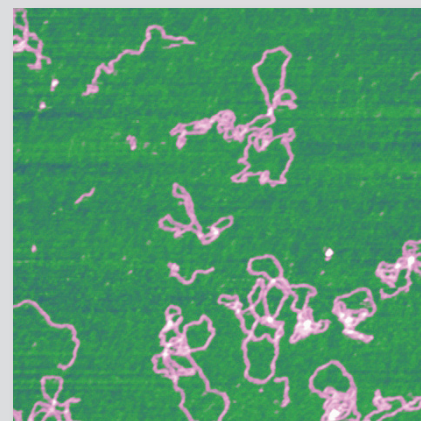
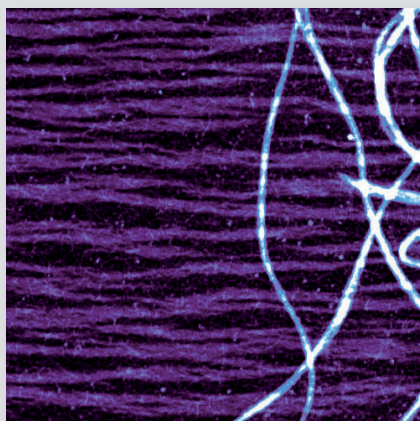
Liquid cell (35mm Petri dish)

SOLUTIONS FOR WORKING IN LIQUID

The standard CombiScope's sample holders accommodates all common sample substrates, including slides, cover slips and 35mm Petri dishes. The specially design liquid cell with heating and liquid perfusion capabilities enables for biological samples to be delicately maintained in their physiological environment and at temperatures up to 60°C.

APPLICATIONS

- Biology
- Photonics
- Spectroscopy
- Seamless integration with SNOM/Raman /TERS techniques



ALL OPERATING MODES IN ONE SINGLE INSTRUMENT

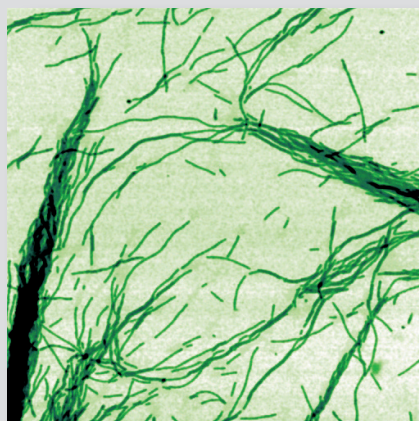
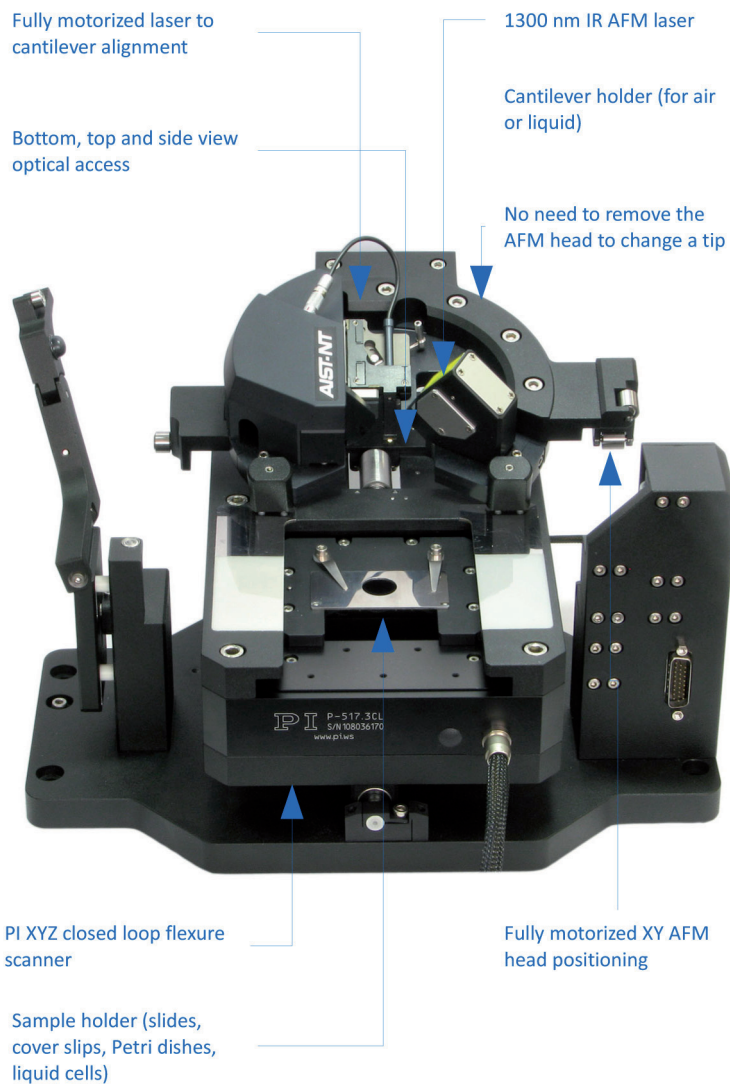
The CombiScope comes with all modern AFM operating modes in one single instrument, without any extra costs and units, including such application-specific modes as force and electric nanolithographies, piezoelectric force microscopy (PFM), Kelvin Probe Microscopy and frequency modulation AFM (dynamic force microscopy with built-in PLL). In addition, the scanning tunneling microscopy (STM) head and Conductive AFM unit operating in the range 100fA ÷ 10uA (with 1nA, 100na and 10uA subranges software switchable and current noise of 60fA RMS for 1nA subrange) and near-field optical microscopy (SNOM) head are available as the options. Such exceptional versatility of the instrument makes it a perfect solution for nanoscience.

INTEGRATION WITH OPTICS

Besides integrated inverted optical microscope such as Nikon Eclipse Ti-U and Olympus IX-71 with Phase Contrast and DIC, the CombiScope can be equipped with the head which provides the top and side simultaneous optical access with planapochromat objectives (100x, NA=0.7 and 10x, NA=0.28 respectively). This option opens up the way to combine the upright and transmission configurations to study transparent as well as non-transparent samples with optical, Raman and scanning probe microscopy techniques.

ABOUT AIST-NT

AIST-NT's R&D team is a solid team of 20 experts with over 300 years combined experience in SPM design. They are extremely specialized and possess unprecedented know-how. No group in the world is more knowledgeable in the SPM market. They have created virtually compromise-free SPM performance. This is the key to AIST Nano Technologies' success in the marketplace.



SUPERIOR RESULTS (FROM LEFT TO RIGHT):

- Topography image of collagen (type I) absorbed on mica from buffer solution. 2.5 x 2.5 µm scan.
- Plasmid DNA. Semicontact AFM mode in buffer solution. 1.4 x 1.4 µm scan.
- Bacillus Cereus vegetative cells. Amplitude image overlaid on topography, 36 µm scan, Z range 700 nm.
- Virus-like particles (VLP) formed by coat protein Alternanthera mosaic potex virus (AltMV) in the absence of RNA. Sample courtesy of Prof. O. V. Karpova and Dr. M. V. Arhipenko, Lomonosov Moscow State University, Faculty of Biology.

Technical Specifications

SPM MEASURING MODES

STANDARD:

- Contact AFM (in air&liquid)
- Semicontact AFM (in air&liquid)
- Non-contact AFM
- Phase Imaging
- Lateral Force Microscopy (LFM)
- Force Modulation
- Magnetic Force Microscopy (MFM)
- Kelvin Probe (Surface Potential Microscopy)
- Capacitance and Electric Force Microscopy (EFM)
- Force curve measurements
- Piezo Response Force Microscopy
- Dynamic AFM
- Nanolithography & Nanomanipulation

OPTIONAL:

- Conductive AFM
- STM
- Photocurrent Mapping
- Volt-ampere characteristic measurements.

SCANNER AND BASE

Scanning range: 100 μm x 100 μm x 20 μm (+/-10%);

Scanning type: by sample;

XY non-linearity: 0.05%;

Z non-linearity: 0.05%;

Noise level:

- 0.1 nm RMS in XY dimension in 100 Hz bandwidth with capacitance sensors on;
- 0.02 nm RMS in XY dimension in 100 Hz bandwidth with capacitance sensors off;
- <0.1 nm RMS Z capacitance sensor in 1000 Hz bandwidth;

Digital closed loop control for X, Y, Z axes;

Manual sample positioning: range

25x25mm, positioning resolution 1 μm ;

Motorized SPM measuring head positioning:

1.6x1.6mm, positioning resolution 1 μm ;

Motorized approach: 1.3 mm;

Sample holder for standard slides and cover glasses;

Optional sample holders:

Maximum sample size: 50.8x50.8 mm,

5 mm height with capability to choose

measuring area 25x25mm in any quadrant of

50.8x50.8 mm area or in center of sample;

Maximum sample size: up to 100 mm width, more

than 100 mm length and up to 15 mm height with

capability to choose measuring area 25x25mm

in any part of centre cross with width 25 mm.

AFM HEAD (HE001)

Laser wavelength: 1300 nm;

Registration system noise: <0.03 nm.

Fully motorized: 4 stepper motors for cantilever and photodiode automated alignment

LIQUID CELL (OPTIONAL)

Sample positioning range: 10x10 mm;

Positioning resolution: 1 μm ;

Holder for Petri dish: dia. 35 mm;

Volume of liquid: 3 ml;

Capability of liquid exchange;

Autoclave and ultrasonic cleaning of cell parts.

LIQUID CELL WITH TEMPERATURE CONTROL (OPTIONAL)

Heating: up to 60°C;

Cooling: 5°C below room temperature;

Sample positioning range: 5x5 mm;

Positioning resolution: 1 μm ;

Volume of liquid: 3ml;

CONDUCTIVE AFM UNIT (OPTIONAL)

Current range: 100 fA \div 10 μA ;

3 current ranges (1 nA, 100 nA and 10 μA) switchable from the program.

OPTICAL ACCESS

With AFM head HE001:

Capability to use simultaneously top and side planapochromat objectives (10x, NA=0.28 and 20x, NA=0.42 respectively);

Field of view: from 900 μm to 140 μm ;

Optical resolution: 1 μm ;

Bottom optical access with dry and immersion objectives.

COMPATIBILITY WITH INVERTED OPTICAL MICROSCOPES

- No interference with optical imaging due to infrared laser;
- Capability to install on:
 - Nikon Ti-E, Ti-U, Ti-S, TE2000;
 - Olympus IX-71, IX-81.

CONTROLLER ELECTRONICS

- Modular fully digital expandable controller;
- High speed DSP 300 MHz;
- USB 2.0 interface;
- High speed 500 kHz 18-bit ADC, 20 channels;
- 5 MHz frequency range registration system;
- 2 lock-in amplifiers with 5 MHz frequency range;
- 6 digital 32-bit generators 5 MHz

frequency range, 0.01 Hz resolution;

- Software controlled modulation possibilities for probe, X, Y and Z scanners, Bias voltage and two external outputs;
- HV amplifiers -5 ... +120v, 0.4 ppm HV noise;
- AC, DC Bias Voltage -10 ... +10v, 2 MHz frequency range;
- 7 stepper motors control;
- Digital inputs/outputs for integration with external equipment;
- Analog input/outputs for integration with external equipment;
- Integrated Phase Locked Loop (PLL) up to 5 MHz.

SOFTWARE

- Automatic alignment of registration system;
- Automatic configuration and presetting for standard measuring techniques;
- Automatic cantilever resonance frequency adjustment;
- Capability to work with force curves;
- Macro language Lua for programming user functions, scripts and widgets;
- Capability to program controller with DSP macro language in real time without reloading control software;
- Capability to process images in coordinate space including making cross-sections, fitting and polynomial smoothing up to 8 degree;
- FFT processing with capability to treat images in frequency space including filtration and analysis;
- Nanolithography and nanomanipulation;
- Processing up to 5000x5000 pixel images.

Specifications are subject to change without notice.

AIST-NT

Integration, Automation and Performance at the Nano scale

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Cover page images (from left to right):

- Alternanthera mosaic potex virus. Scan size: 2 μm .
- DNA-Nucleosome complexes immobilized on functionalized mica. Scan size: 550 nm.
- ss-DNA deposited on HOPG modified with 1-Octadecylamine. Scan size: 500 nm.
- Ribonucleoprotein complexes. Scan size: 1.6 μm .