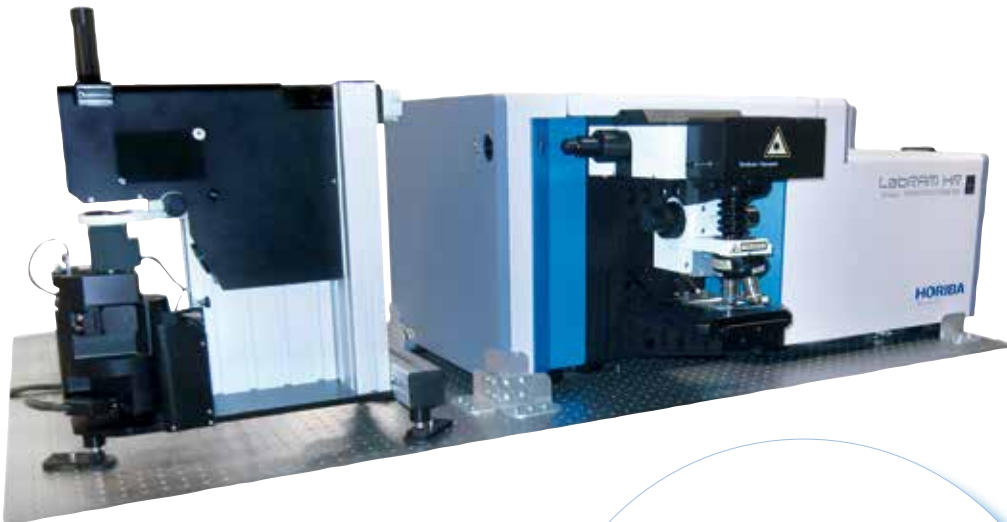
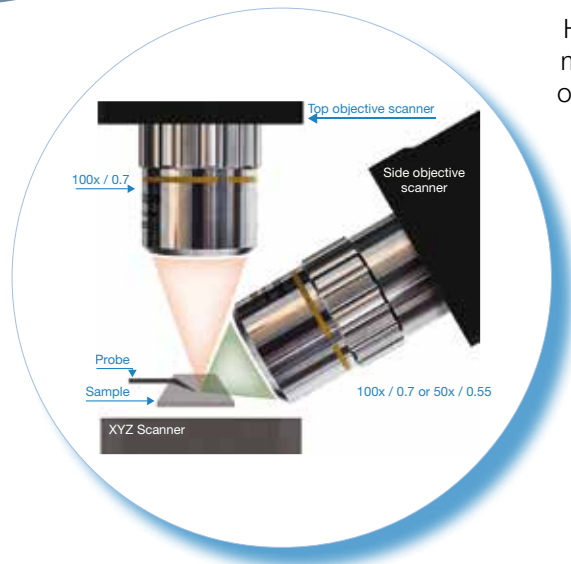


## HR Evo Nano

Fully integrated system based on AIST-NT SmartSPM state of the art scanning probe microscope and HORIBA LabRAM HR Evolution compact and fully automated Raman micro-spectrometer



High NA for TERS measurement with oblique illumination



High NA for co-localized measurements from top-down

## SmartSPM Scanner and Base

Sample scanning range	100 $\mu\text{m}$ x 100 $\mu\text{m}$ x 15 $\mu\text{m}$ ( $\pm 10\%$ )
Scanning type by sample	XY non-linearity 0.05 %; Z non-linearity 0.05 %
Noise	<ul style="list-style-type: none"><li>• 0.1 nm RMS in XY dimension in 200 Hz bandwidth with capacitance sensors on</li><li>• 0.02 nm RMS in XY dimension in 100 Hz bandwidth with capacitance sensors off</li><li>• &lt; 0.04 nm RMS Z capacitance sensor in 1000 Hz bandwidth</li></ul>
Resonance frequency	<ul style="list-style-type: none"><li>• XY: 7 kHz (unloaded)</li><li>• Z: 15 kHz (unloaded)</li></ul>
X, Y, Z movement	<ul style="list-style-type: none"><li>• Digital closed loop control for X, Y, Z axes</li><li>• Active elimination of XY phase lag, overshooting &amp; ringing results in fast scanning without any dynamic image distortion</li><li>• Motorized Z approach range 18 mm</li></ul>
Sample size	Maximum 40 x 50 mm, 15 mm thickness
Sample positioning	Motorized sample positioning range 5 x 5 mm
Positioning resolution	1 $\mu\text{m}$

## AFM Head

Laser wavelength	1300 nm, non-interfering with spectroscopic detector
Registration system noise	Down to < 0.1 nm
Alignment	Fully automated cantilever and photodiode alignment
Probe access	Free access to the probe for additional external manipulators and probes

## SPM Measuring Modes

<ul style="list-style-type: none"><li>• Contact AFM in air/(liquid optional)</li><li>• Semicontact AFM in air/(liquid optional)</li><li>• Non -contact AFM</li><li>• Phase imaging</li><li>• Lateral Force Microscopy (LFM)</li><li>• Force Modulation</li></ul>	<ul style="list-style-type: none"><li>• Conductive AFM (optional)</li><li>• Magnetic Force Microscopy (MFM)</li><li>• Kelvin Probe (Surface Potential Microscopy, SKM, KPFM)</li><li>• Capacitance and Electric Force Microscopy (EFM)</li><li>• Force curve measurement</li><li>• Piezo Response Force Microscopy (PFM)</li></ul>	<ul style="list-style-type: none"><li>• Nanolithography</li><li>• Nanomanipulation</li><li>• STM (optional)</li><li>• Photocurrent Mapping (optional)</li><li>• Volt-ampere characteristic measurements (optional)</li></ul>
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## Spectroscopy Modes

Confocal Raman, Fluorescence and Photoluminescence imaging and spectroscopy	Tip-Enhanced Fluorescence (TEFS)
Tip-Enhanced Raman Spectroscopy (TERS) in AFM, STM, and shear force modes	Near-field Optical Scanning Microscopy and Spectroscopy (NSOM/SNOM)

## Conductive AFM Unit (optional)

Current range	<ul style="list-style-type: none"><li>• 100 fA <math>\div</math> 10 <math>\mu\text{A}</math></li><li>• 3 current ranges (1 nA, 100 nA and 10 <math>\mu\text{A}</math>) switchable from the software</li></ul>
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## Optical Access

Capability to use simultaneously top and side plan apochromat objectives	<ul style="list-style-type: none"><li>• Up to 100x, NA = 0.7 from top or side</li><li>• Up to 20x and 100x simultaneously</li></ul>
Closed loop piezo objective scanner for ultra stable long term spectroscopic laser alignment	<ul style="list-style-type: none"><li>• Range 20 <math>\mu\text{m}</math> x 20 <math>\mu\text{m}</math> x 15 <math>\mu\text{m}</math></li><li>• Resolution: 1 nm</li></ul>

## Spectrometer

Fully automated high resolution LabRAM HR Evolution micro-spectrometers, functional as stand-alone micro-Raman microscope	
Wavelength range	50 $\text{cm}^{-1}$ to 4000 $\text{cm}^{-1}$ or down to 10 $\text{cm}^{-1}$ with Ultra Low Frequency (ULF) filter option
Gratings	<ul style="list-style-type: none"><li>• Selection of gratings from 150 g/mm to 3600 g/mm</li><li>• 2 gratings on computer controlled turret, kinematically mounted and easily exchangeable</li></ul>
Optical design	Achromatic spectrograph and achromatic coupling optics
Automation	Fully motorized, software controlled operation

## Detection

Full range of CCD detectors and EMCCDs and InfraRed detectors: InGaAs array, single channel extended InGaAs, InSb, CdTe,...
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## Laser Sources

Wavelengths	Full range of wavelengths from DUV (229 nm) to IR (up to 2.2 $\mu\text{m}$ )
Typical wavelength	532 nm, 638 nm, 785 nm
Automation	<ul style="list-style-type: none"><li>• Fully automated laser and filter switching for up to 3 simultaneous lasers</li><li>• Laser polarization selection and spectral analyzer options for all wavelengths</li></ul>

## Software

Integrated software package including full featured SPM, spectrometer and data acquisition control, spectroscopic and SPM data analysis and processing suite, including spectral fitting, deconvolution and filtering, optional modules include univariate and multivariate analysis suite (PCA, MCR, HCA, DCA), particle detection and spectral search functionalities.



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