Integrated bio-AFM NanoWizardIII and Raman LabRam HR

Biological Atomic Force Microscope (Bio-AFM) – NanoWizardIII of JPK

NanoWizardIII is intended to image various samples with nanometric resolution, down to 1 nm in lateral direction (XY) and down to 0.1 nm (1 angstrom) in height (Z). Specifically, the machine is dedicated to image biological samples (cells, bacteria, DNA, chromosomes, liposomes, etc.) in liquids and to address specific biological questions such as local sample response to applied force, local sample elasticity, studying protein unfolding, etc.

The system features two independent XYZ scanners (by tip and by sample), of 100x100x15 μm^3 and 100x100x10 μm^3 respectively.

In addition, other modes such as Kelvin Probe and heating/cooling sample stage (with the temperature range of 15^{o}C to 60^{o}C) are available. Advanced sophisticated software algorithm (DirectOverlay^{TM}) allows for precise correlation between optical images and AFM, which is critical for biological applications. Finally, the system is specially designed (by introducing special TAO^{TM} module) to be combined with Raman spectrometer to obtain Raman spectra correlated with AFM images and to allow TERS (Tip-Enhanced Raman Scattering) mode.

It is a newly released (launched July 2010) development of JPK, featuring extremely low electronic noise and drift and fast signal processing. It also features newly developed HyperDrive^{TM} mode allowing for obtaining super-resolution in imaging very soft biological samples in liquids, with extremely low interaction force between tip and sample.

The system is a top-level machine available on the market for super-resolution microscopy.

Raman Spectrometer – LabRam HR of Horiba Jobin Yvon

LabRam is intended to obtain Raman spectra from various samples, as well as to obtain Raman images (mapping) of sample regions. It allows revealing valuable information on sample chemical composition and molecular structure.

The spectrometer works with 3 laser lines (532, 633 and 785 nm) and features excellent resolution and sensitivity (spectrometer focal length = 800 mm) and fast scanning option (SWIFT^{TM}) for Raman mapping. Fully achromatic design requires no change in optics when changing the spectral range.

SWIFT^{TM} mode allows for very fast Raman mapping for the samples with strong Raman signals, allowing to reach less than 5 ms per point during the Raman map acquisition.

In addition, the Raman spectrometer is equipped with heating/cooling stage with the temperature range from – 196^{o}C to 600^{o}C.

Also, the spectrometer is specially designed to be compatible with AFM microscope to obtain Raman spectra correlated with AFM images and to allow TERS (Tip-Enhanced Raman Scattering) mode. In particular, it incorporates radial polarization component changing the polarization state of the excitation light to make it optimal for TERS.

All this makes the spectrometer a state-of-the-art machine available on the market for multi-disciplinary scientific research.