

# Nano-Observer

## Atomic Force Microscope



CSI  
Nano-Observer

Y Travel

- HD-KFM™
- RESISCOPE™
- Soft ResiScope
- Quality measurements
- Environmental control
- EZ TEMPerature (up to 200°C)
- EZ Liquids
- Ease of use



# Nano-Observer AFM

## The best price/performance AFM

The Nano-Observer is the result of many years of collaboration with different AFM players and laboratories.

Based on 20 years of experience in this field, we created this product to definitively open the access of a real Research tool to any laboratory. Now getting an affordable high performance AFM microscope is becoming a reality...

Our AFM performs with all the major modes but also works in advanced applications for a very competitive value.

Designed to achieve the best of AFM measurements.

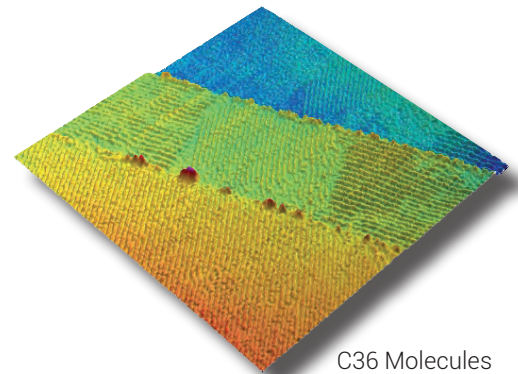
The Nano-Observer is a clever compromise between analog and digital electronics and premium components to offer the lowest noise and best accuracy on a robust and flexible instrument.



“Designed to achieve the best of AFM measurements.”

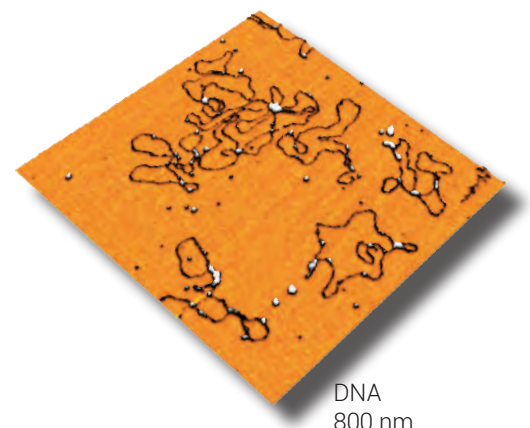
## High Resolution AFM

The Nano-Observer uses an advanced flat scanning stage to avoid well known defects of the piezoelectric tube scanner such as bow, X-Y crosstalk etc. A low noise feedback control delivers reliable and high performance. A patented flexure stage with 3 independent low voltage piezoelectric devices mounted in a massive platform and combined with a low noise laser and electronics achieves high resolution measurement at atomic scale.



## Quality Measurements

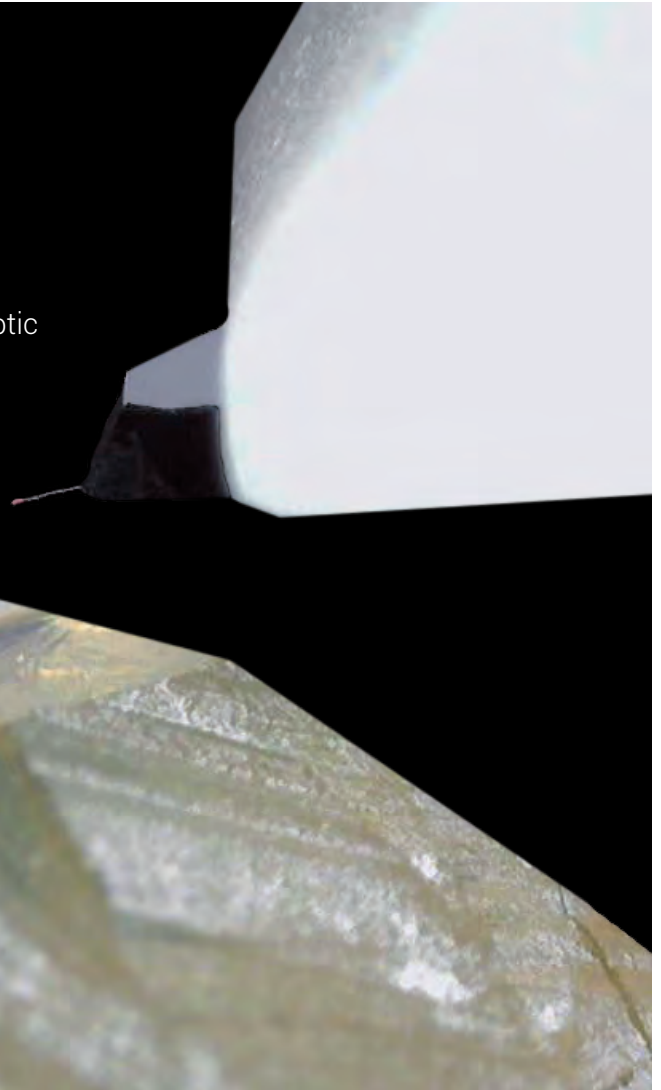
Through a smart choice of analog and digital processing, each signal is enhanced to avoid addition of noise and perform a fast feedback. The scanner is controlled by 24-bit D/A converters providing high precision scan to the AFM. A built-in lock-in for accurate topography, phase or MFM/EFM/KFM and PFM measurements is coupled with low noise electronics to acquire highly resolved images and spectroscopy



## Ease of use

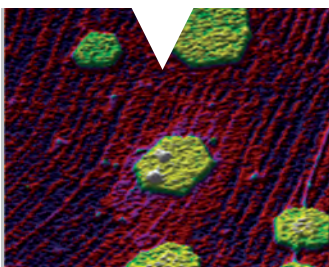
### »» Quick and easy control

Top and side view, Intuitive software, High performance optic

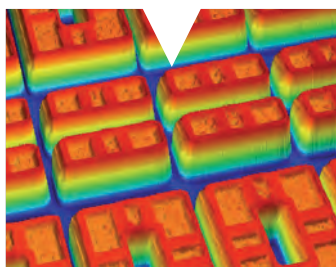


## The ultimate in electrical measurement

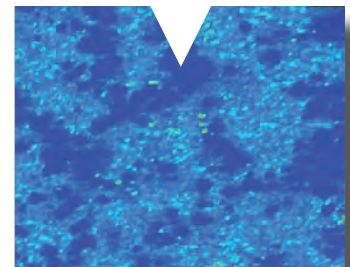
### »» HD-KFM™ High Definition KFM



### »» ResiScope™ Electrical characterization over 10 decades

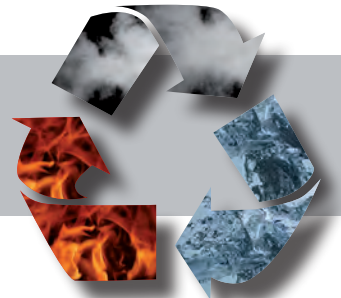


### »» Soft ResiScope Electrical characterization on delicates samples



## Expand your capabilities for different environments

The design of the Nano-Observer is made in anticipation of future developments and may receive additional modules for more advanced studies on the same sample. Such as environmental control, EZ temp and EZ liquids...

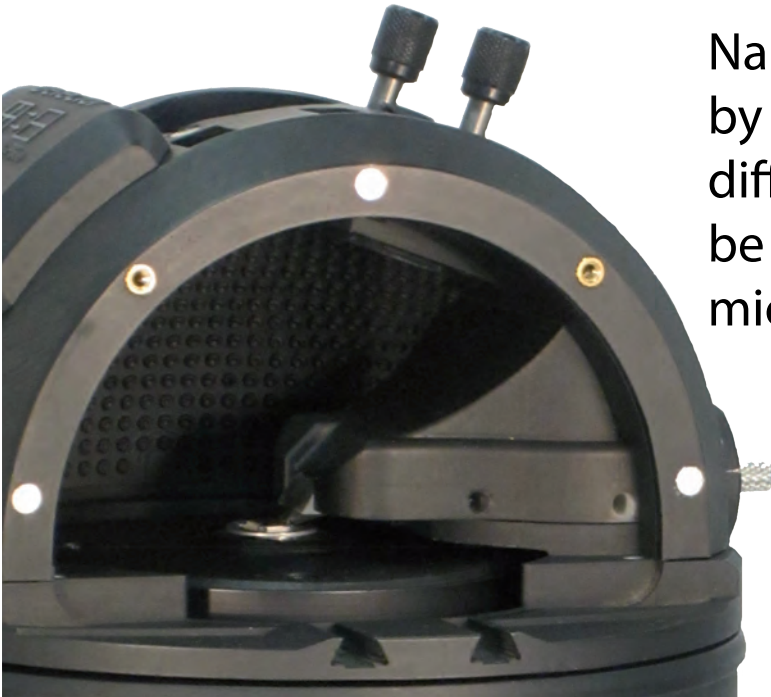




# Complete configuration

The Nano-Observer performs all main AFM modes to offer the best characterization from atomic scale to scan up to 100µm providing the best affordable research solution for laboratory or industry. It has been designed with powerful technologies to offer a great flexibility through a low noise controller, a top/side camera view and intuitive software to make its use easier than ever.

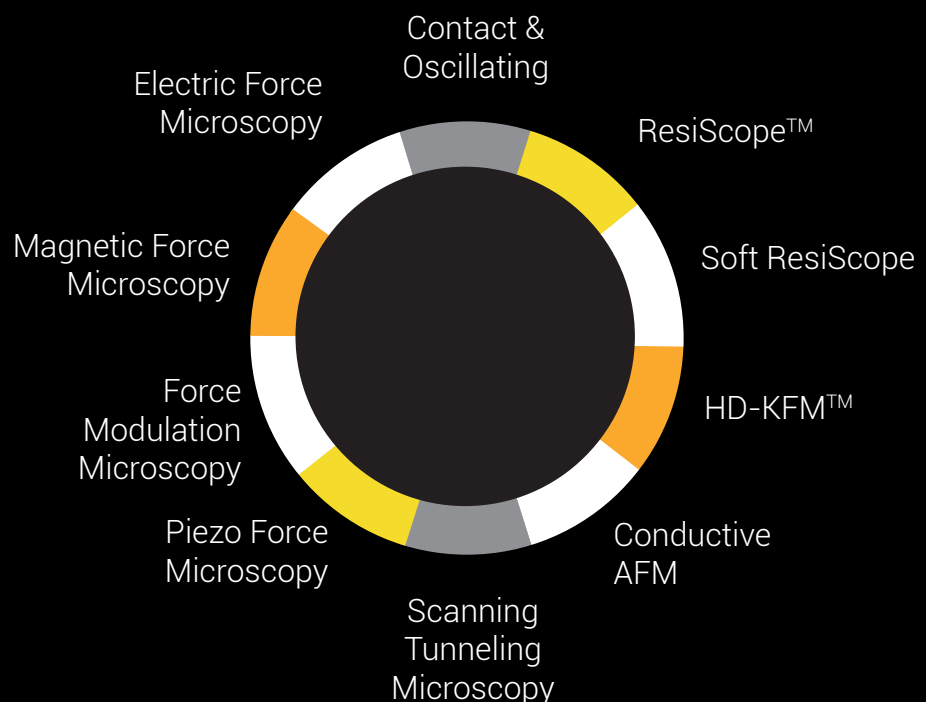
“The uniqueness of Nano-Observer is defined by its versatility in allowing different types of analysis to be performed with a single microscope.”



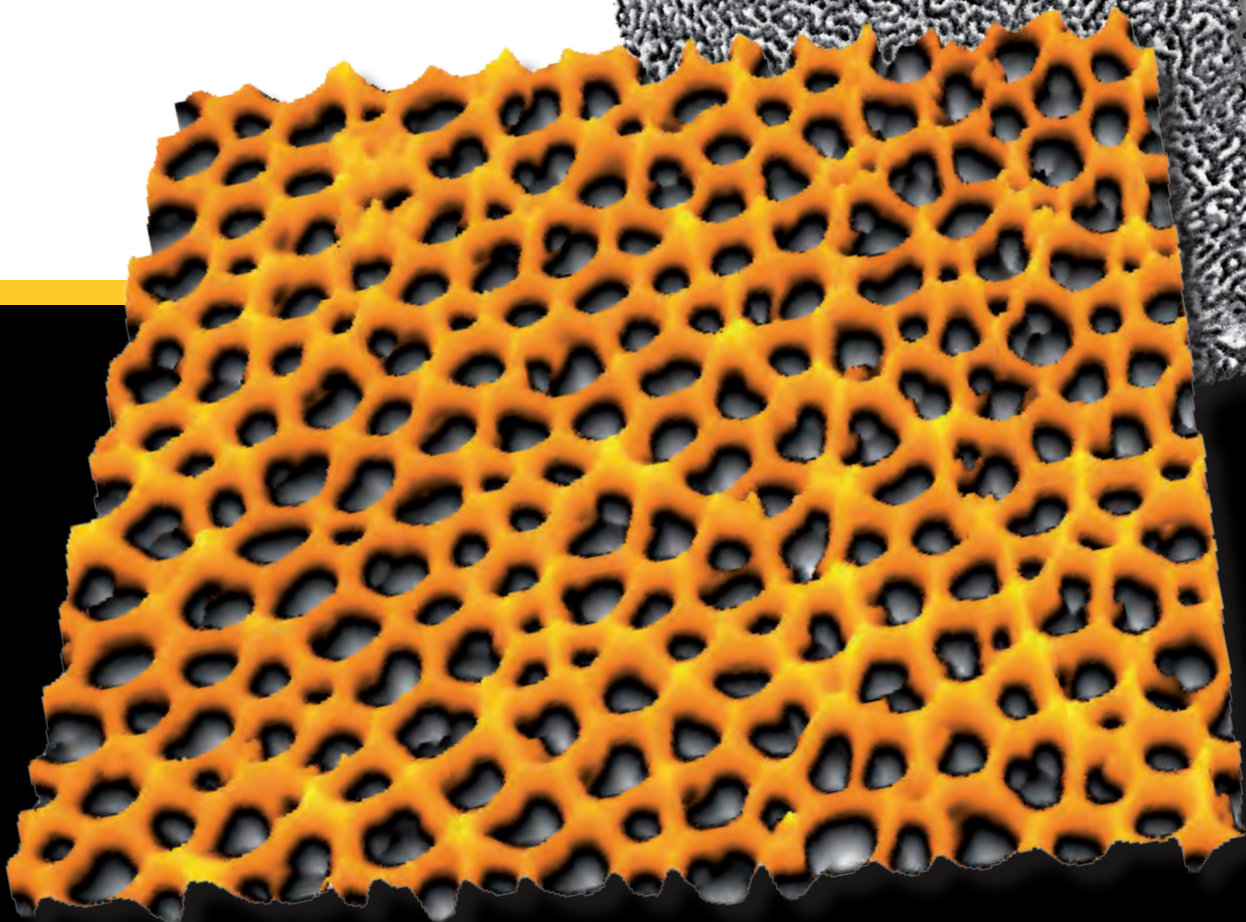
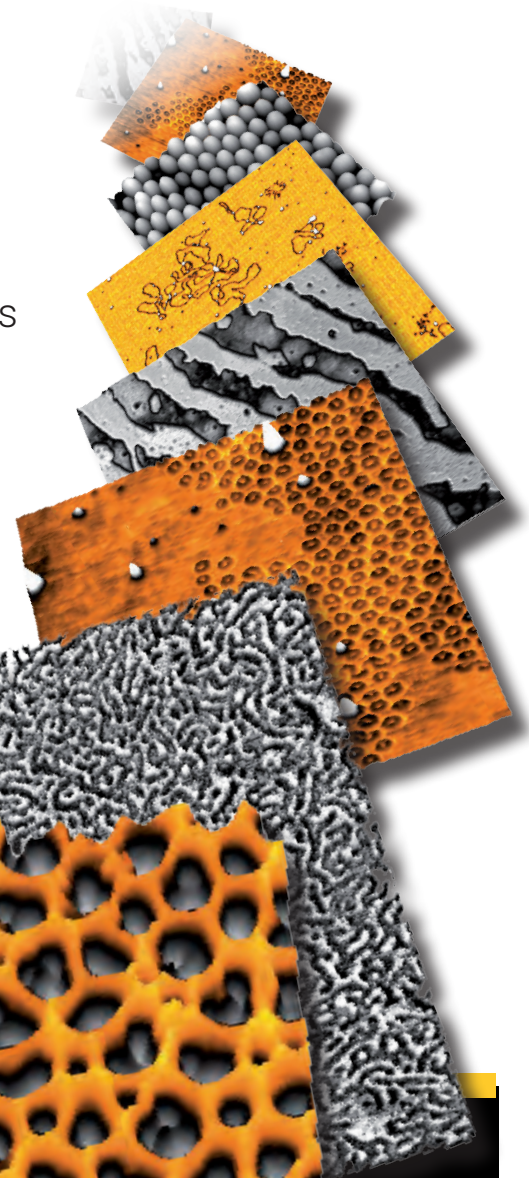
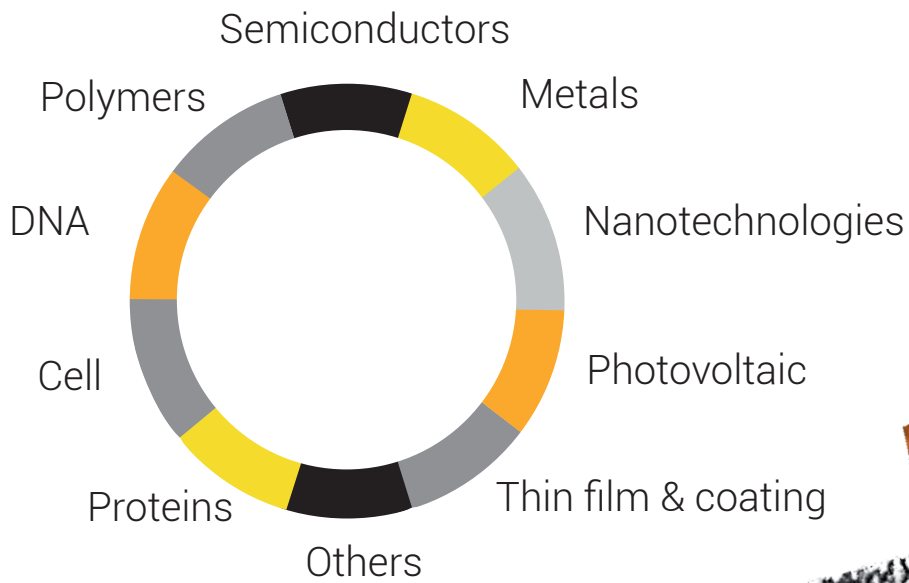
## Multiple modes

### » Advanced capabilities

In addition to performance, the Nano-Observer is capable of several advanced modes which expand your field of investigation. Beside contact/LFM and Oscillating/Phase imaging, several modes are available to characterize mechanical viscoelasticity, adhesion of your samples as well as electrical properties (CAFM, ResiScope™), electric and magnetic fields (MFM/EFM) and surface potential (standard KFM or HD-KFM™). 8 real-time image channels are available to increase capability of analysis.



# Various applications



“ The must to expand your field of investigation

## Ease of use

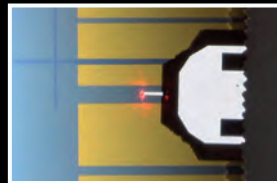
Compact and robust, the Nano-Observer fulfills the requirements for advanced users or beginners. It avoids laser alignment with the pre-positioned tip system. A top and side view of the tip/sample, combined with vertical motorized control, makes the pre-approach easy. Simple positioning can be done by combining the optical access with the X-Y translation stage.

### » Top and side views

A video color camera is provided with the AFM offering a helpful view from the top for tip/sample positioning or side view to make the tip/sample approach easier.

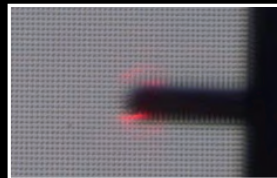
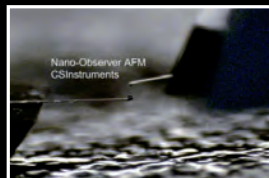


- » Sample/tip visibility
- » Ease of use
- » Avoids damaging sample or tip
- » Better contrast by lateral illumination



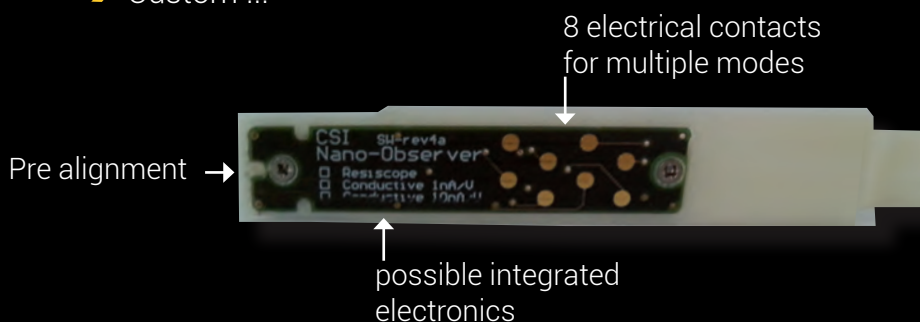
### » High performance optic

A high performance optic (option) is also available to localize small features on your sample.

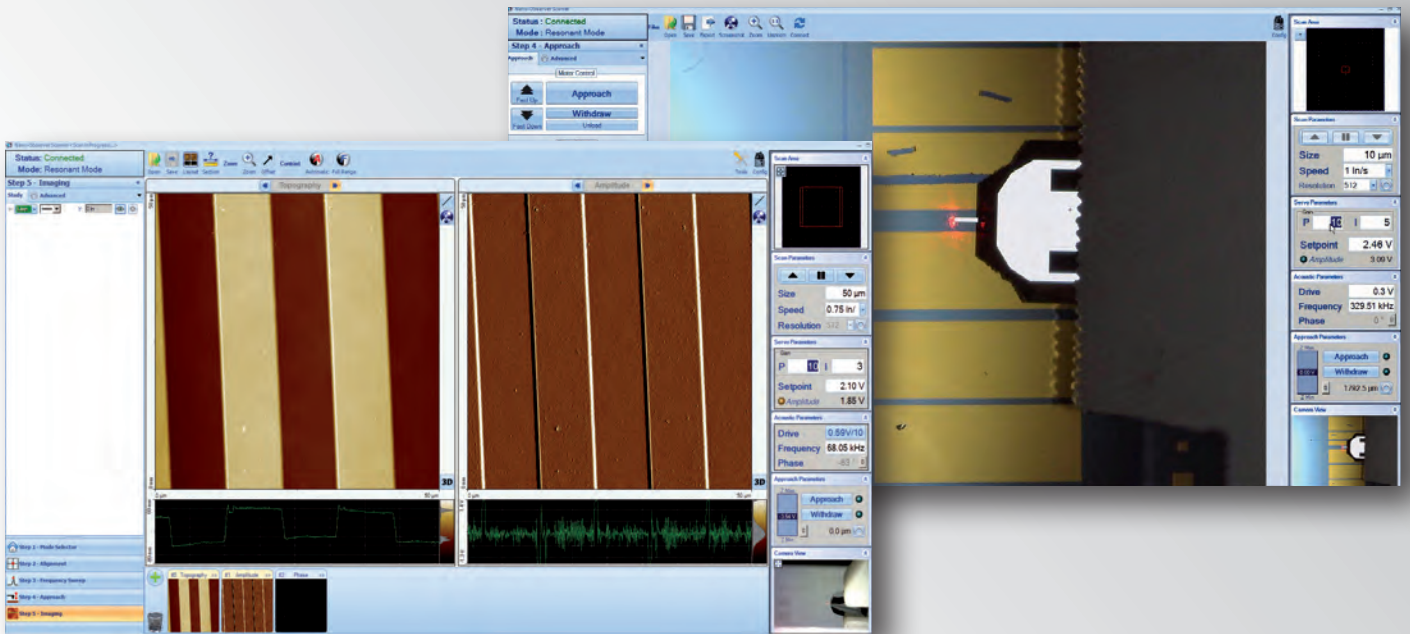


## Tip Holders

- » Liquid tip holder
- » Thermal tip holder
- » Conductive tip holder
- » Pre-alignment tip holder
- » Custom ...







## NanoSolution Intuitive software

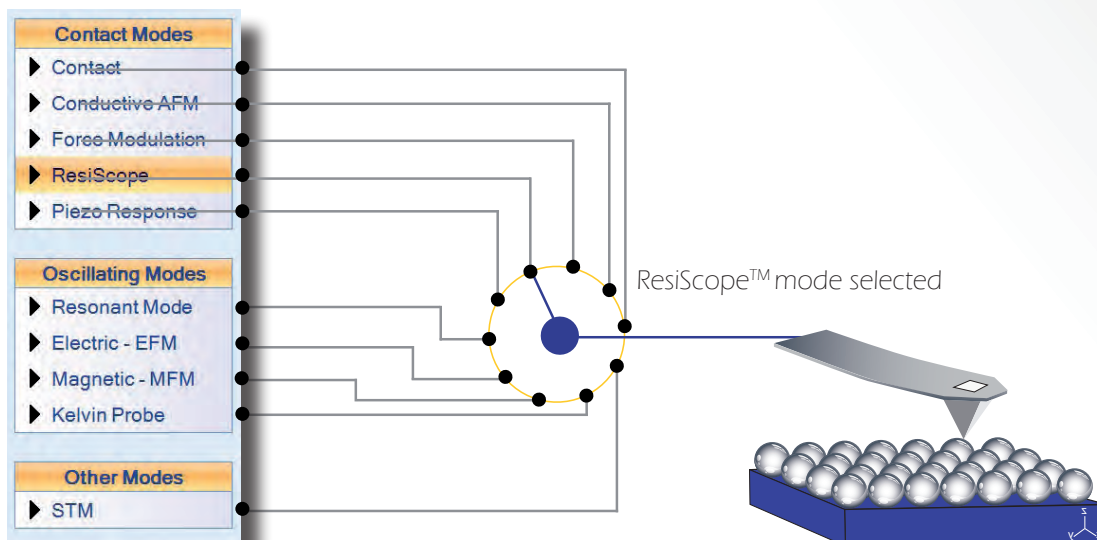


The SPM software drives the user by pre-configured modes to simplify the equipment setup. A large choice of modes and channels gives users a wide range of possibilities to characterize their sample. Quality and resolution are delivered by images up to 4096 x 4096 pixels. A real time control is provided by a fast USB link to the SPM controller.

“ Intuitive AFM to simplify all AFM measurements

## » Pre-configured Modes

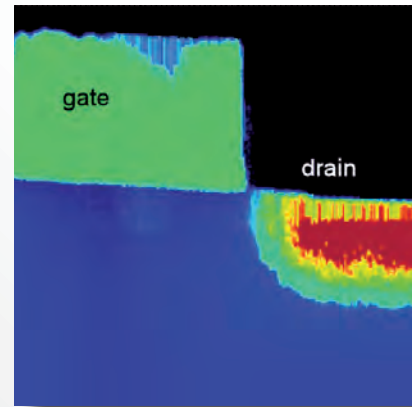
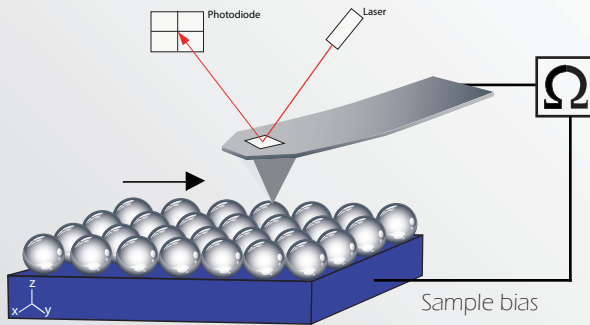
No more need to add modules or connections to achieve the desired measurement. By simply selecting the AFM mode, the software drives and connects the electronics to the appropriate devices... No more mistakes or damage. By a simple click you can switch between all the AFM modes



# ResiScope™

## Electrical characterisation over 10 decades

The ResiScope™ II is a unique system able to measure Resistance over 10 decades with a high sensitivity and resolution. It can be combined with several dynamic modes as MFM/EFM or KFM providing several sample characterization on the same scan area.



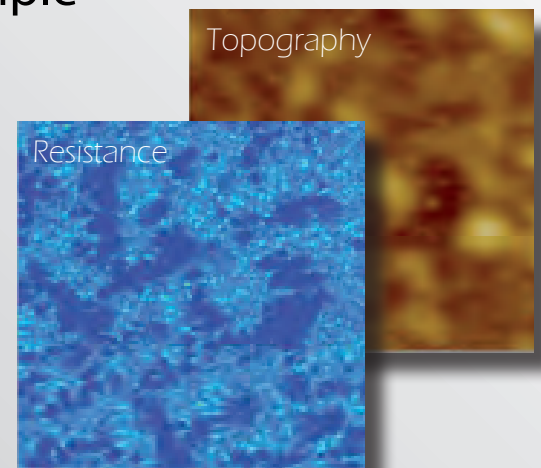
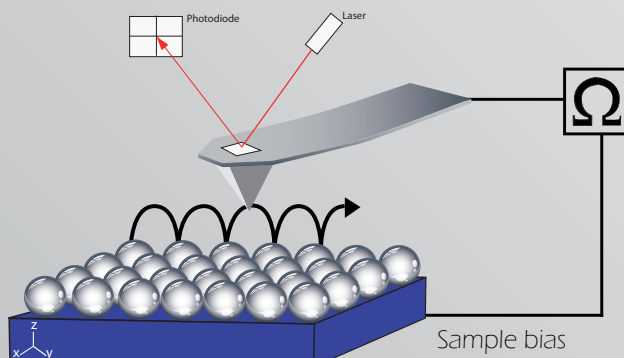
P-MOS-transistor, scan size 1.5  $\mu\text{m}$

“The World’s Greatest Performance for AFM Electrical Characterization

# Soft ResiScope

## Electrical characterisation on soft sample

The Soft ResiScope principle is based on intermittent contact. The lack of friction and the constant force of the tip on the sample provide quantitative measurements without damaging the surface of delicate samples. This is an unique and innovative AFM mode able to expand the fields of applications.



P3HT, organic solar cell, scan size 3  $\mu\text{m}$



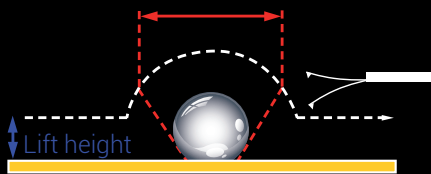
# HD-KFM™

## High Definition KFM

In addition to standard KFM, the Nano-Observer can offer High Definition KFM mode to highly enhance the resolution and increase the sensitivity of the surface potential.

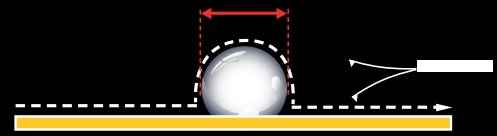
### » Standard KFM mode

Longer distance with lift mode = Less sensitivity  
Larger feature with lift mode  
= Less resolution

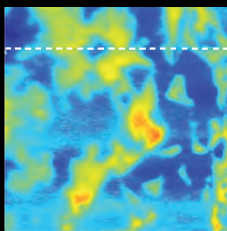


Typical lift height separation: 10-50 nm  
 $F_{\text{electrical}}$  up to 100 times weaker on traditional KFM

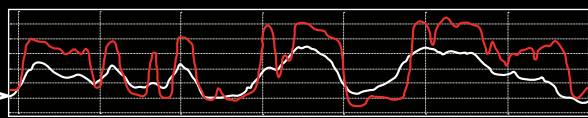
### » HD-KFM™ mode



Typical minimum separation: 0.1 nm - 0.3 nm  
 $F_{\text{electrical}} \sim 1/\text{distance}^2$

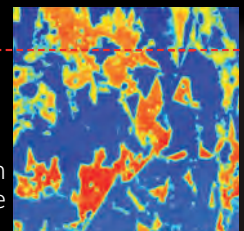


Graphene Sample 8µm scan  
Standard KFM mode



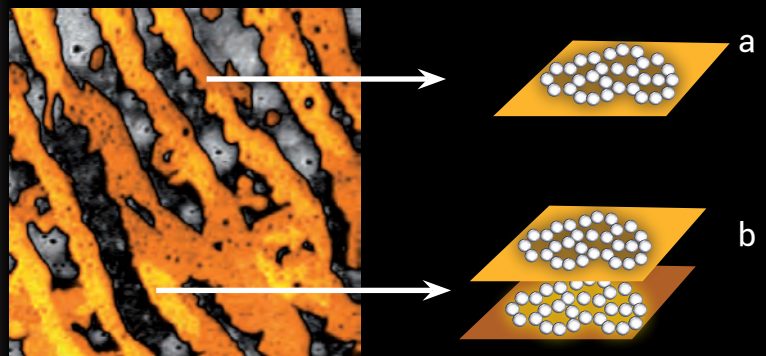
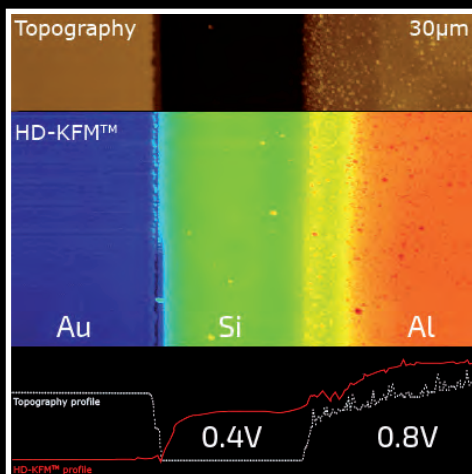
Graphene Sample 8µm scan  
HD-KFM™ mode

Much higher sensitivity & resolution



# HD-KFM™

## Applications



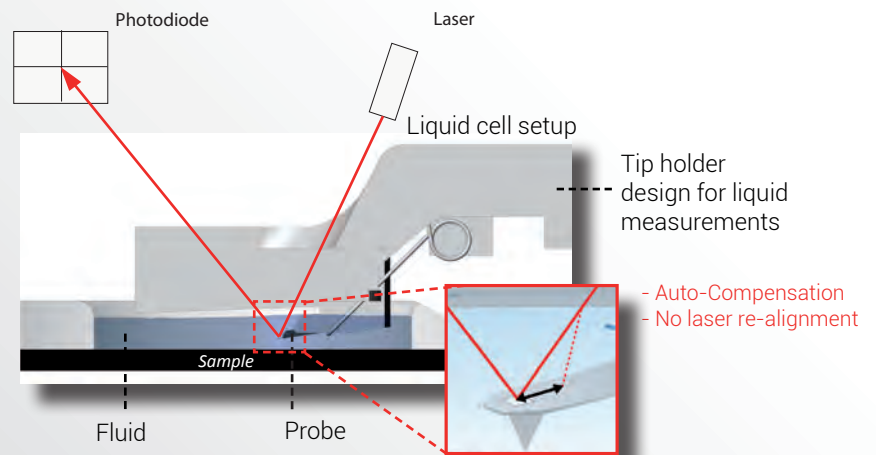
Graphene on SiC, surface potential signal, HD-KFM™ mode, scan size 7 µm,  
a) Graphene monolayer, b) Graphene bilayer,

# Environments

“ Perform your field of investigation

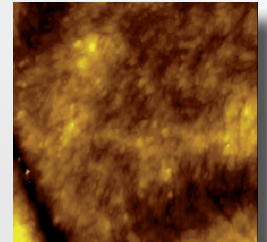
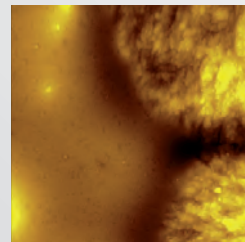
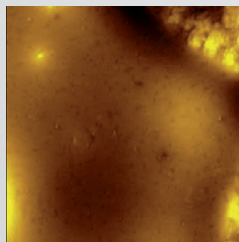
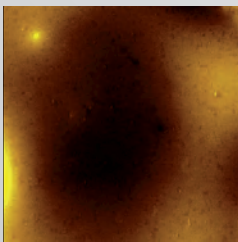
## » EZ liquids : Liquid measurements

A liquid cell and tip holder is available for imaging in solution or force spectroscopy. An optical correction system avoids laser re-alignment when tip is into liquid solution.



## » EZ TEMPerature : Temperature control

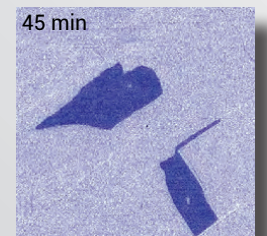
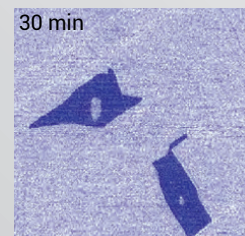
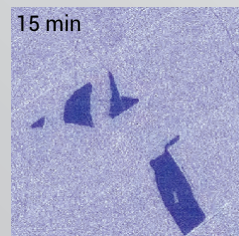
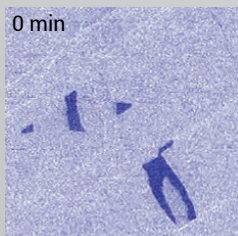
The temperature control is developed to deliver precise temperature control and imaging during temperature changes. It is compatible with all AFM modes. A heating sample stage is available to study phase changes on polymers, materials or biological samples. From ambient to 200°C



Real time acquisition, polymer crystallization under temperature control, 10 µm

## » Atmosphere control : Environmental control

The Nano-Observer is designed to offer environmental control (gases, humidity...) to improve your Electrical measurements or protect your sample from oxidation.

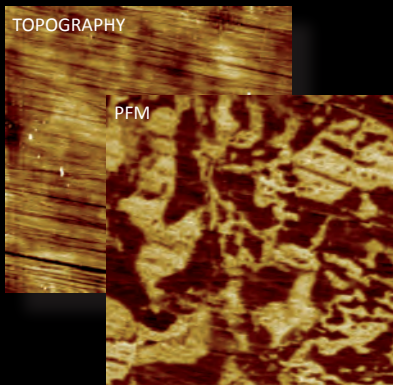


HD-KFM™ on HOPG sample, 15 µm, humidity control

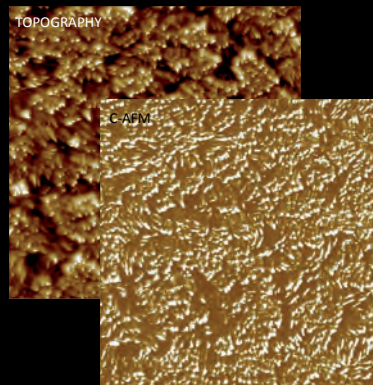
# Versatile equipment

## To Covers a wide range of applications

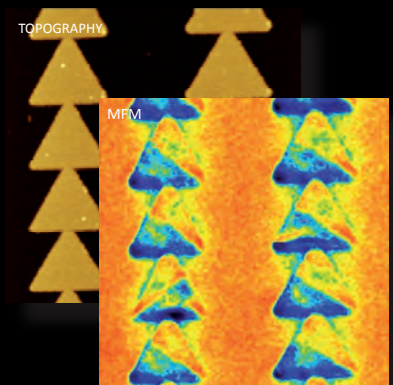
The uniqueness of Nano-Observer is defined by its versatility in allowing different types of analysis to be performed with a single microscope (MFM, EFM/KFM, PFM modes...) or Conductive AFM mode (C-AFM). Advanced modes can be used to cover wider applications which is made possible by ResiScope™ mode (current, resistance over 10 decades) or HD-KFM™.



Piezoresponse Force Microscopy mode (PFM), PZT sample, topography 25  $\mu\text{m}$ , PFM 10  $\mu\text{m}$ .



C-AFM mode, ITO sample, Scan size 2  $\mu\text{m}$

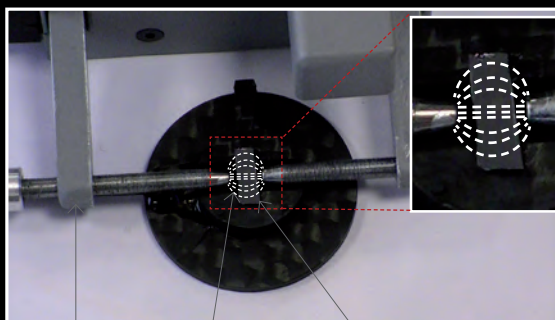


MFM mode, Magnetic triangles structures, Scan size 4.5  $\mu\text{m}$ ,

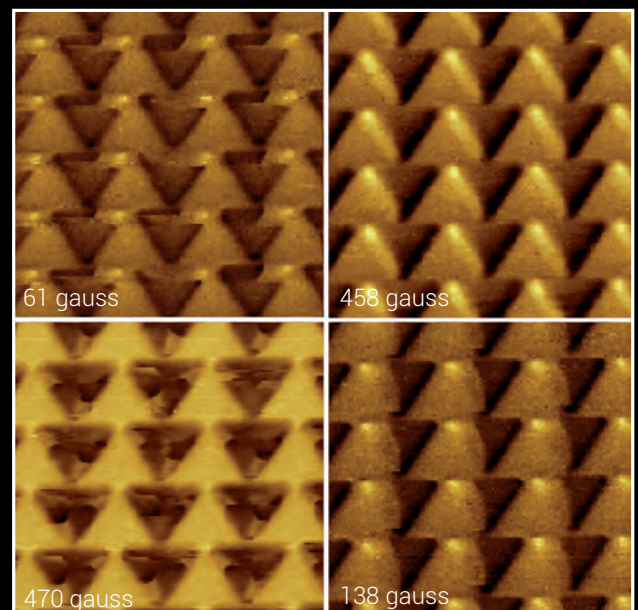
# MLFM feature

## Magnetic Lateral Field Module

- MLFM mode
- MFM measurement under magnetic field
- In-situ magnetic field control



MLFM System      Magnetic field      Sample

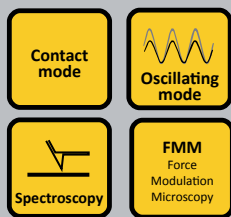


Structures under different magnetic fields, MFM signal, MLFM mode, scan size 5  $\mu\text{m}$ , Sample courtesy of P. Vavassori

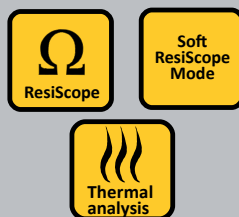


# Multiple modes

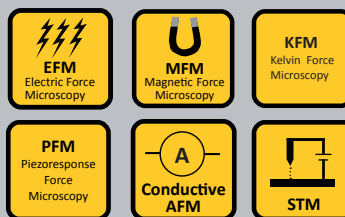
## Standard modes



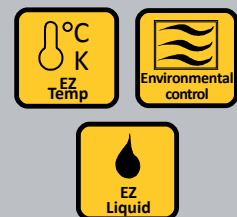
## Additional modules



## Additional modes



## Environments

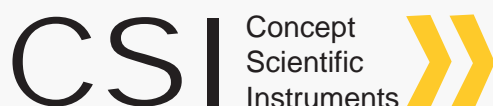


# Controller specifications

XY scan range	100 µm (tolerance +/- 10%)
Z range	10 µm (tolerance +/- 10%)
XY drive resolution	24 bit control - 0.06 Angströms
Z drive resolution	24 bit control - 0.006 Angströms
Ultra low noise HV	Typ : <0.01 mV RMS
6 DAC Outputs	6 D/A Converters – 24 bit (XYZ drive, bias, aux...)
8 ADC Inputs	8 A/D Converters – 16 bit
Data points	Up to 4096
Integrated Lock-in	Up to 6 MHz (software limited) 2nd lock-in (6 MHz-optional)
Interface	USB (2.0 - 3.0 compatible)
Controller Power	AC 100 – 240 V - 47-63 Hz
Operating System	Windows XP, 7, 8 or 10

# Accessories

- Liquid cell
- Temperature plate
- Thermal analysis
- Environmental chamber
- EFM/MFM plate
- Magnetic field generator
- Others...



CSInstruments is a French scientific equipment manufacturer specialized in the conception of Atomic Force Microscopes and options designed for existing AFM. The company was founded by a team of experts working in the AFM field for more than 20 years, starting as pioneer with some historical manufacturers. Taking the best of this experience to create the Nano-Observer, a high quality research AFM giving life to an affordable solution for any research laboratory or industry...



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