

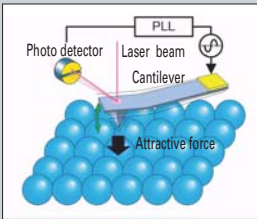
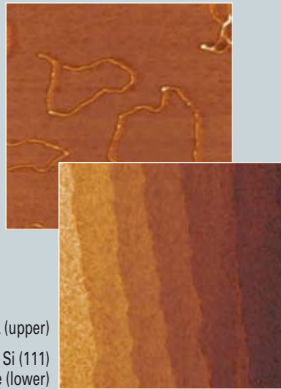
# Various Measurement Modes Provide a Wealth of Data

In air and vacuum

Standard configuration

## Non-Contact Mode AFM

Non-Contact mode AFM detects forces between the cantilever and sample by measuring an attractive force between them. In this mode, the cantilever vibrates by itself. High-resolution topographic images can be obtained without the cantilever contacting and damaging the sample. The FM detection method is used.



Topographic image, frequency image, V-F

In air, vacuum and liquid

: indicate the observable sample environment.

Topographic image, phase image... : indicate the obtainable information.



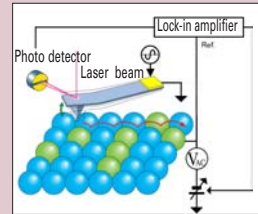
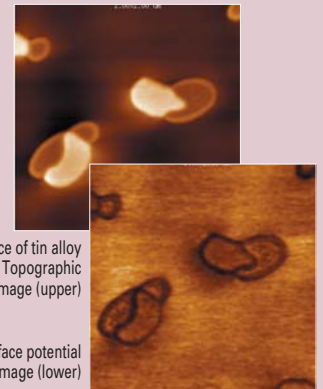
Option

The Extended Lock-in Amplifier allows the JSPM-5200 to offer four measurement modes of SKPM, LM-FFM, VE-AFM and SCFM.

In air and vacuum

## SKPM Scanning Kelvin Probe Microscope

The Kelvin method is applied to SPM. SKPM allows the measurement of the potential distribution on the sample surface as a function of spatial position.



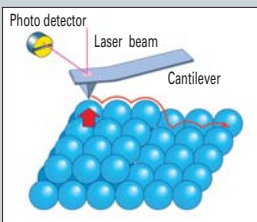
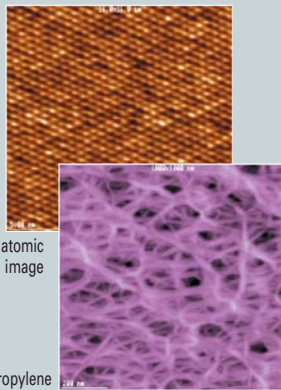
Topographic image, surface potential image

In air, vacuum and liquid

Standard configuration

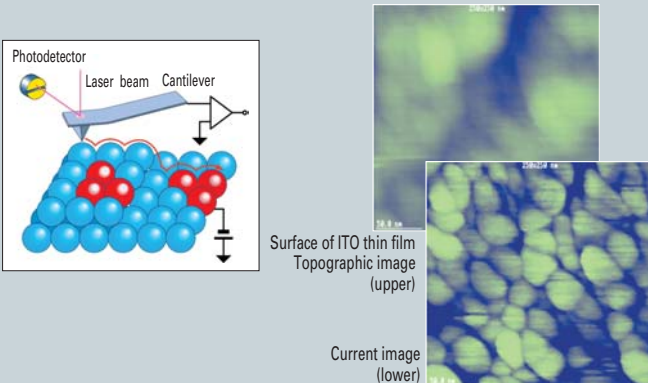
## Contact Mode AFM

Contact mode AFM detects forces between the cantilever and sample by scanning the sample surface while keeping a repulsive force constant, enabling a topographic image to be obtained. This method is useful for both conductive and insulating samples.



### Contact Current Measurement

This method is used to obtain not only the topography and but also local conductivity (current image) of the sample surface by applying a bias between the cantilever and sample. The conductivity distribution of the surface and leakage points can be measured.

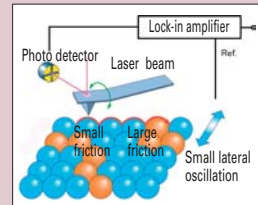
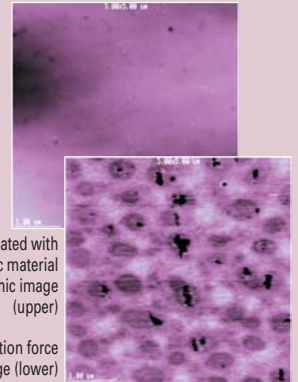


Topographic image, force image, contact current image, force curve, friction force curve, CITS, I-V, SPS mapping

In air, vacuum and liquid

## LM-FFM Lateral Modulation FFM

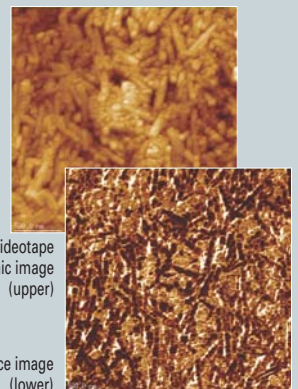
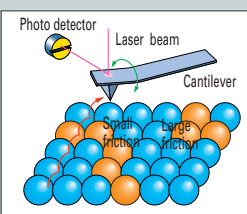
LM-FFM is very similar to standard FFM except that a small lateral oscillation is applied to the scanner. This oscillation removes the imaging artifacts caused by topographic features in standard FFM, enabling a high-accuracy friction force image to be obtained.



Topographic image, friction force image

### Friction force microscopy (FFM)

The cantilever is scanned on the sample in such a way as to allow lateral torsion of the cantilever due to friction forces. A distribution image of frictional variations is obtained. The topography and friction force data are acquired simultaneously.



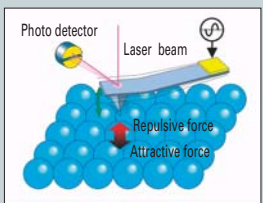
Surface of videotape Topographic image (upper)  
Friction force image (lower)

**Standard configuration**

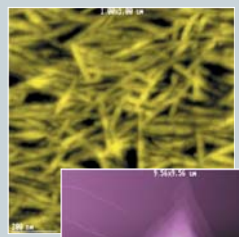
**In air, vacuum and liquid**

**AC Mode AFM**

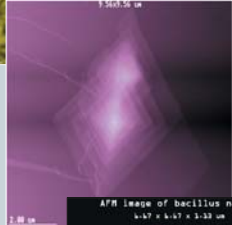
AC mode AFM detects forces between the cantilever and sample by measuring changes in the amplitude of an oscillating cantilever beam. A topographic image is obtained by keeping one of the quantities constant while scanning the sample with respect to the cantilever. This mode is useful for soft samples. The amplitude detection method is used.



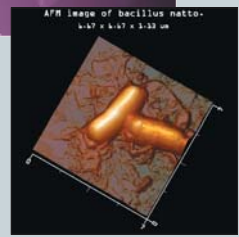
Polyvinylidene chloride



Polyethylene single crystal



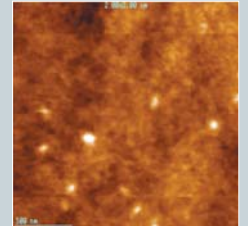
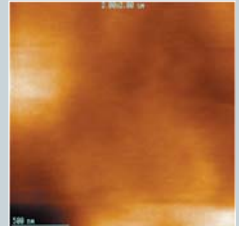
Natto bacteria



**Topography image, Amplitude image, Phase image**

**Phase image measurement**

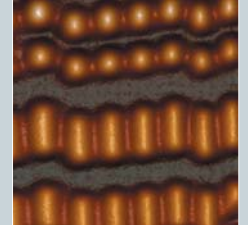
A phase image is obtained by sampling the oscillation and phase changes of the cantilever beam. A very small change in force can be measured with high accuracy.



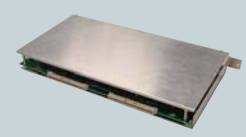
Images of PET film under heating  
Topographic image (left) Phase image (right)

**Magnetic force microscopy (MFM)**

The cantilever is coated with magnetic material and scanned on the sample in such a way as to obtain the phase that is a little distant from the sample surface. Thus, the distribution of the magnetic force above the surface is measured.



Images of MO disk  
Topographic image (left) Magnetic force image (right)



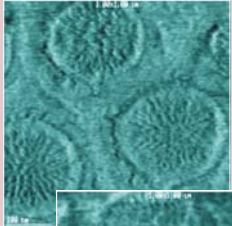
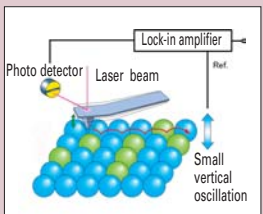
**Option**

By adding the MFM board, the JSPM-5200 extends its MFM function.

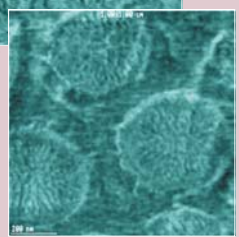
**In air, vacuum and liquid**

**VE-AFM Micro Viscoelasticity**

VE AFM applies a small vibration in a direction normal to the sample surface while scanning the cantilever. The changes in the amplitude and phase of the cantilever beam are measured to obtain both elasticity and viscosity images of the sample.



Cured face of adhesive  
Elasticity image (upper)



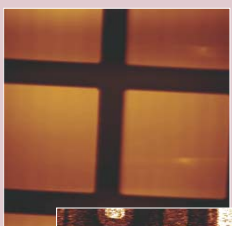
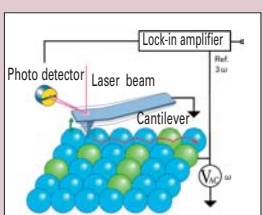
Viscosity image (lower)

**Topographic image, elasticity image, viscosity image**

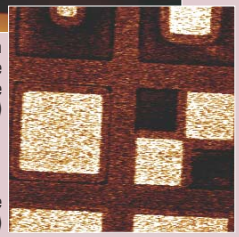
**In air and vacuum**

**SCFM Scanning Capacitance Force Microscope**

SCFM applies AC voltage between the cantilever and sample to generate the sample capacitance. A capacitance force to the cantilever from the sample surface is measured.



Si pn patterns on substrate  
Topographic image (upper)



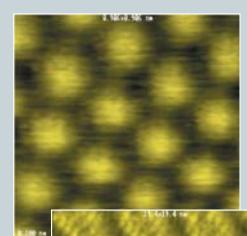
SCFM image (lower)

**Topographic image, capacitance image**

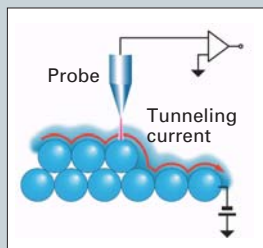
**In air and vacuum**

**STM Scanning Tunneling Microscope**

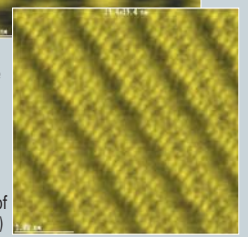
STM utilizes a bias between a conductive probe and sample to generate a tunneling current. By scanning the sample with respect to the probe and maintaining the tunneling current constant, high-resolution topographic images can be obtained.



HfO<sub>2</sub> atomic image



Molecular image of liquid crystal (8CB)



**Topographic image, current image, CITS, I-V, S-V, I-S**

**Standard configuration**