



## Atomic Force Microscope (AFM)

### How It Works:

An Atomic Force Microscope is a method of measuring surface topography on a scale of Angstroms to 100 microns. This technique uses a probe or tip on the nanometer scale to raster across a surface. Information is obtained from the interaction of the tip with the surface.

### Tool Operation:

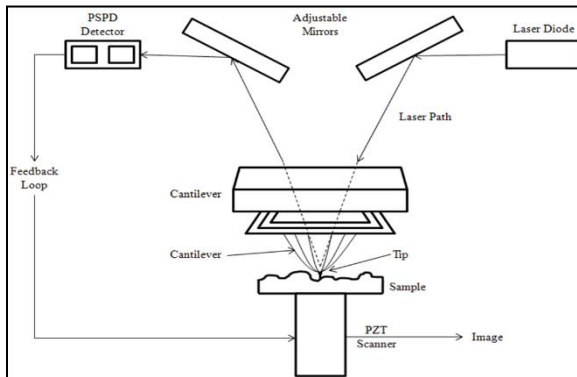
**Contact Mode** – Measures sample topography by scanning the tip directly across the surface. (Popular)

**Non-Contact Mode** – Measures Van der Waals forces between the probe tip and the sample surface. (Low Resolution)

**Tapping Mode** – The cantilever moves at a resonant frequency (15-500 kHz). As it approaches the surface the attractive forces increase, leading to change in resonant frequency.

### Material / Applications:

The Atomic Force Microscope is suitable for conductors, as well as insulators, as long as the surface is relatively flat. Vertical sensitivity depends on the cantilever length. Sharper tips provide better resolution. The end radii of available tips confines atomic resolution to flat period samples.



## Inova

### System Configurations

Probe Head:

Operates in C-AFM, NC-AFM, IC-AFM, LFM, and STM modes. Operation in other modes (FMM<,SthM) requires purchase of optional toolkits.

### Measurement Performance Standard

Scanner:

Large Area (~90  $\mu\text{m}$ ) piezoelectric scanner

Scan range:

Maximum lateral scan range ~90  $\mu\text{m}$ . Maximum vertical scan range ~7.5  $\mu\text{m}$

Control solution:

Maximum DAC lateral resolution = 0.0013  $\text{\AA}$ . Maximum DAC vertical resolution = 0.009  $\text{\AA}$ .

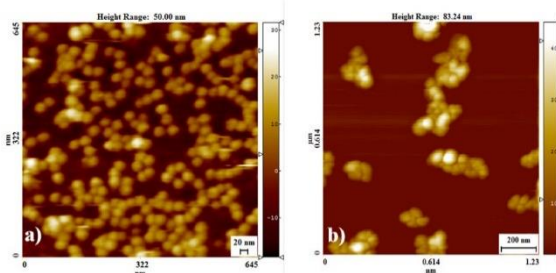


Figure 1: AFM Au Nanoparticles

### Microscope Stage

Translation range:

8 mm x 8 mm

Sample size:

50 mm (w) x 50 mm (l) x 20 mm (h).

Tip-sample approach:

Automatic with 3 independent stepper motors

Optical microscope:

On-axis microscope with color video monitor for probe tip and sample view. 5:1 zoom, up to 3,500X magnification. Standard 20X objective.

Acoustic isolation:

Optical acoustic isolation chamber.

### Workstation

AEM:

20-bit DACs for x, y, and z axes.