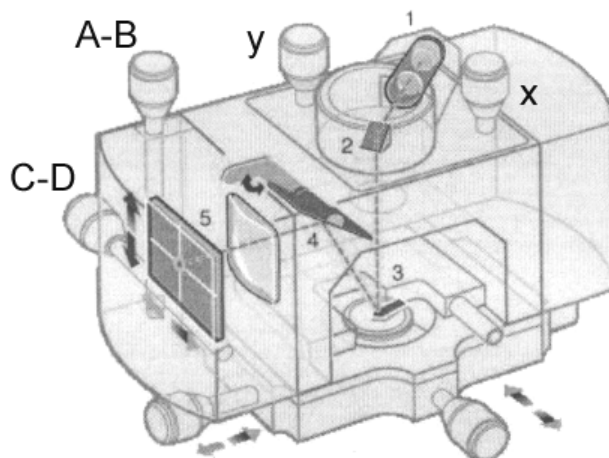


Procedure for the Use of Digital Instruments Nanoscope III AFM

1. Select appropriate cantilever for desired imaging mode
Contact: Silicon Nitride (NP)
Tapping: Single Silicon Crystal (TESP)
2. Mount a cantilever into the proper **cantilever holder (dry cell or liquid cell)**. Make sure it is firmly seated and the back end is in contact with the end of the probe groove.
3. Mount **sample puck** to the magnetic sample holder.
4. Verify that the AFM head is sufficiently raised to clear the sample with the probe (justified by the fact that the sample plane is lower than the plane defined by three balls). If more clearance is needed, use the **Up** toggle switch to raise the head.
5. Carefully place **cantilever holder** onto the three **balls** to gently rest in place.
6. Rotate **clamping screw** located on the back of AFM head (**counter-clockwise**) to secure the cantilever holder.
7. Turn on optical microscope **light source** located on left side of the AFM.
8. Turn on all monitors.
9. Adjust **focusing knob** of the optical microscope (located above AFM head) to focus onto the cantilever tip.
10. Use the **x- and y- laser adjustment knobs** to align laser spot roughly onto the tip of cantilever.



Labels:

1. Laser
2. Mirror
3. Cantilever
4. Tilt mirror
5. Photodetector

11. Insert small **slip of paper** into the laser beam path to perform **fine laser alignment**. Carefully adjust the **laser adjustment knobs** in both directions to achieve a solid rectangle bar-shaped pattern reflected onto the slip of paper.
12. **Maximize SUM** signal using the **Photodetector mirror lever** located on the back of the head. The maximized Sum value should be approximately **5.0-9.0 volts**. Typical values are **> 7.2 volts**.
13. To ensure that the laser signal is centered on the photodiode, zero out the **photodiode detector signals** using the mirror adjustment knobs located on the top and back of the head. **Top of head:** Adjusts vertical deflection (A-B); **Rear of head:** Adjusts horizontal deflection (C-D)
14. Select imaging mode using the **mode selector switch** located on the left side of AFM base: AFM/LFM and TM-AFM
15. Focus onto the **sample surface** and move to a focal plane above the sample surface. Gradually drop down the cantilever until it is in focus with the defined plane a bit above the sample surface.
16. Adjust signal settings and software parameters for the particular imaging mode the will be performed. Make sure correct mode has been selected on both AFM base and software.

Contact Mode Settings:

Digital Display:

Vertical Deflection: -2.0 V

Horizontal Deflection: 0.0V

Software Settings:

Scan Controls Box		Feedback Controls	
Scan size	Set desired scan size (E scanner = 15 µm, J scanner = 100 µm max)	Integral Gain	2.00
Aspect Ratio	1 to 1 (default)	Proportional Gain	3.00
X Offset	0.00 nm	Setpoint	1.00 V
Y Offset	0.00 nm		
Scan Angle	0.00°		
Scan Rate	1 Hz		
Tip Velocity	Depends on scan size and scan rate		
Samples/line	512 (for maximum resolution)		
Lines	512		
Slow Scan Axis	Enabled		

Tapping Mode Settings:*Digital Display:*

Vertical deflection: 0.0V

*Software Settings:**(Before beginning tapping mode the cantilever must be tuned to ensure correct operation.)***Click** on **Cantilever Tune** icon.**Click Auto Tune** button.The computer will enter the tuning procedure automatically setting such parameters as **Setpoint** and **Drive amplitude**.

Scan Controls Box	
Scan size	Set desired scan size (E scanner = 15 μ m, J scanner = 100 μ m max)
Aspect Ratio	1 to 1 (default)
X Offset	0.00 nm
Y Offset	0.00 nm
Scan Angle	0.00°
Scan Rate	1 Hz
Tip Velocity	Depends on scan size and scan rate
Samples/line	512 (for maximum resolution)
Lines	512
Slow Scan Axis	Enabled

Feedback Controls	
Integral Gain	0.50
Proportional Gain	0.70

17. Once all parameters are set, Click **Engage** to start engaging cantilever to sample surface and to begin image acquisition.
18. Click on Raw signal scope to ensure trace and retrace overlap with each other by adjusting **Setpoint** value.
19. Click on the **Capture** to grab images. Be sure to restart **Capture** to grab a new image after making any changes in the scan and feedback parameters.
20. Disengage the cantilever and make sure that cantilever is in Secure Mode before you move cantilever to the other spots or change to another sample.
21. After the experiments, turn off the three monitors and the power of light source.
22. Sign out in blue book and Excel log sheet.