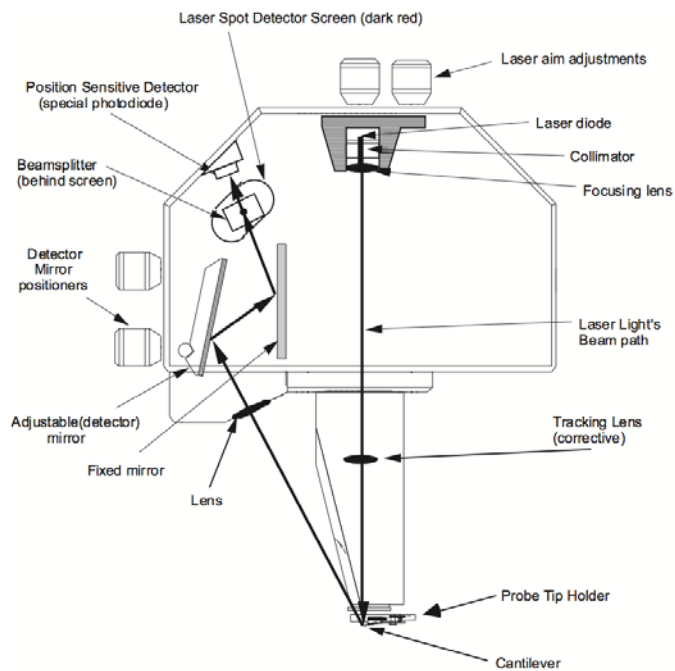


# Bruker ICON3 AFM (Tapping Mode) Instruction

## Golden Rules

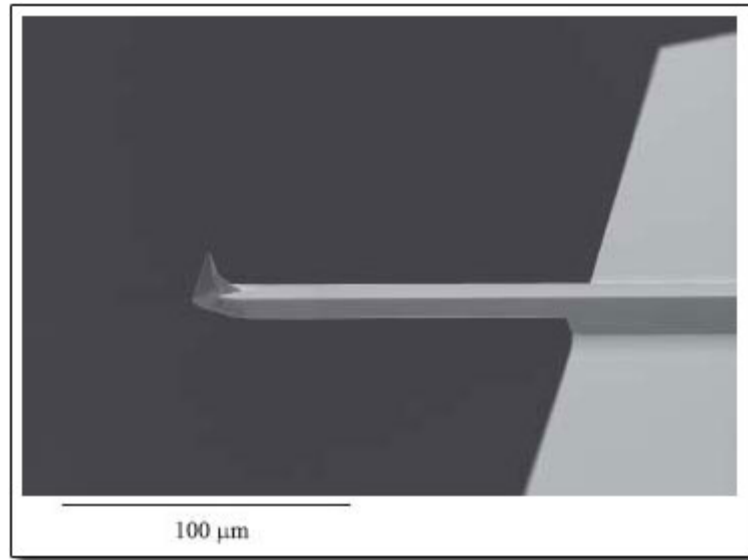
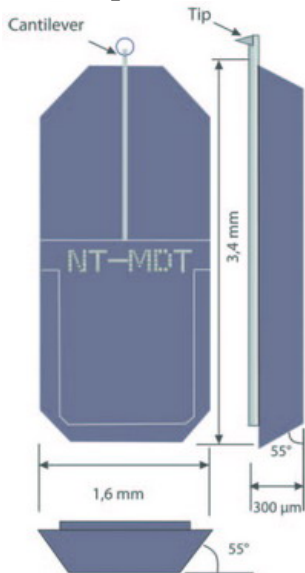
1. Check the comments about the microscope status left by the previous user in the logbook.
2. Never do tasks other than data acquisition and data transfer on the computer.
3. Never guess. If you are not sure what's going on, ask somebody who knows. Most mistakes are easy to spot by an experienced user, and you will save yourself valuable time while keeping the microscope healthy.
4. Be Careful to Hold the Scanner during the setup of tip holder.

## The Scanner



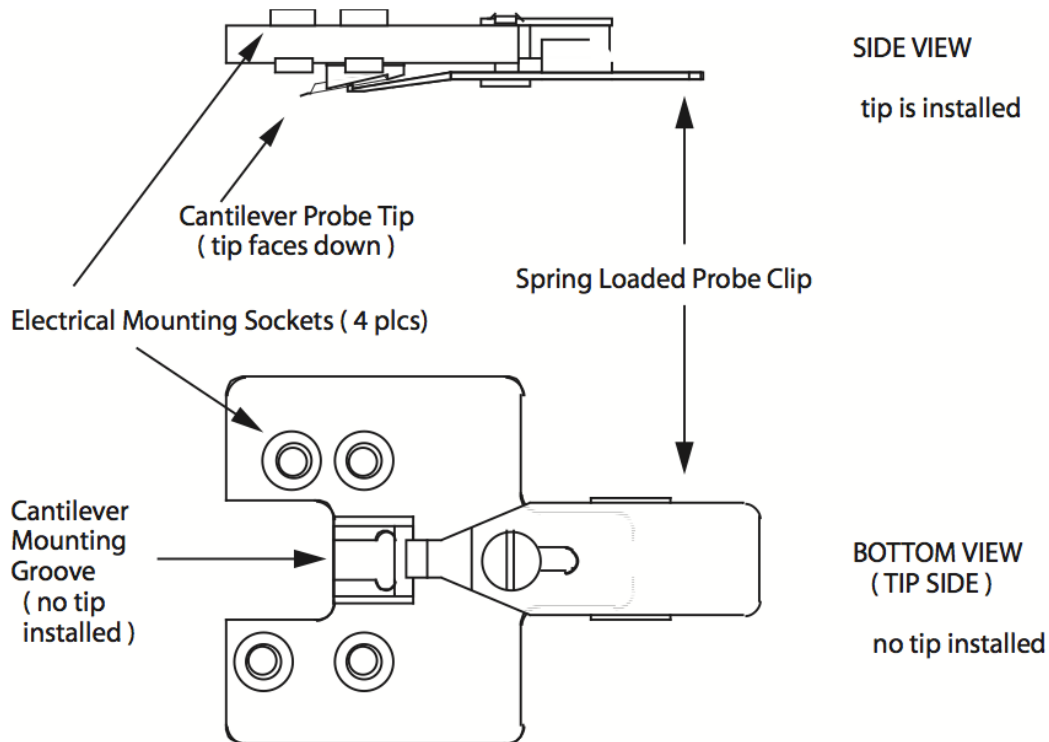
There are four knobs on the scanner – 2 for laser aim adjustments (x and y) and 2 for detector mirror position adjustments (x and y). The tip holder is mounted on the bottom of the scanner.

## AFM Tip



The AFM tip/cantilever locates at the end of the alignment mark on a probe chip. Always face the alignment mark up or the tip/cantilever will be destroyed.

## Tip Holder

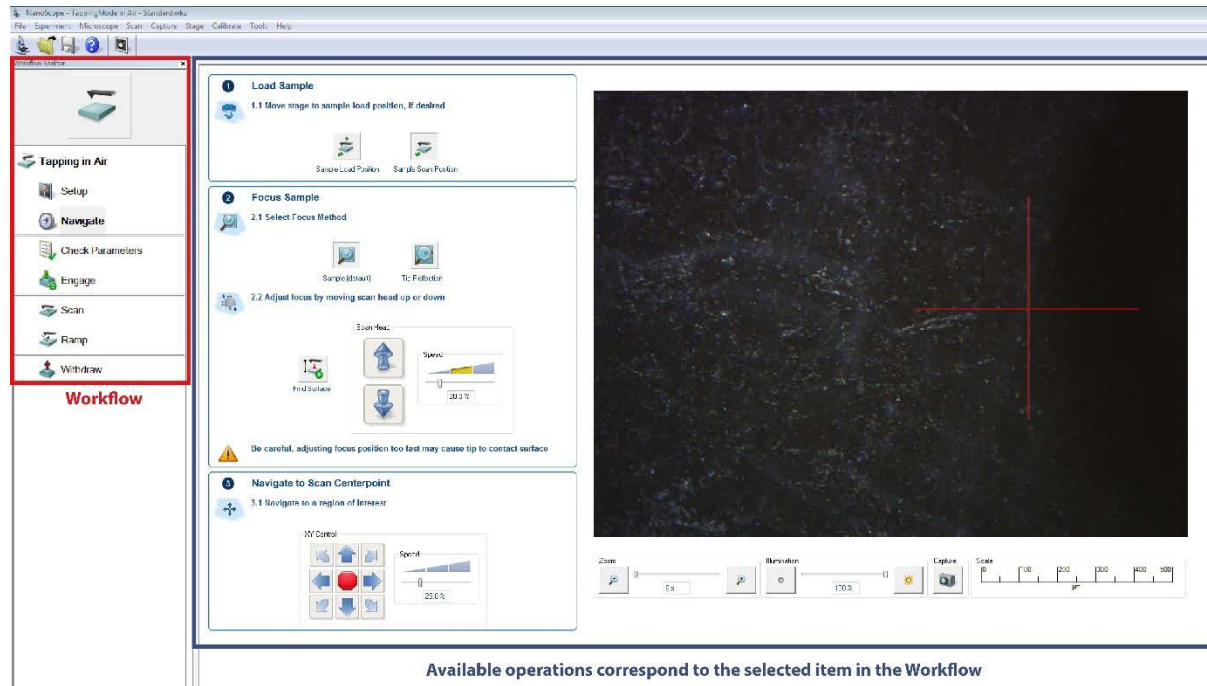


Note | The electrical mounting sockets are not equally spaced. Only one particular orientation is allowed for holder mounting. Do not force the holder to be mount in a wrong orientation or it will be broken. The holder is not cheap (\$630USD)

# Bruker ICON3 AFM (Tapping Mode) Instruction

Note:

The user interface (Nanoscope) is enhanced for the ICON3 AFM, but the operation procedures are similar to the Dimension AFM. The operation steps are listed in the Workflow displayed on the left-hand side of the program as shown in **Figure 1**.



**Figure 1:** Operation procedures of an AFM experiment are listed in the *Workflow* located on the left-hand side of Nanoscope. Detailed descriptions of each procedure are displayed on the right-hand side of Nanoscope.

## I. Setting up an experiment in Nanoscope

1. Open the Nanoscope program located on the desktop
2. Select a desired experiment preset as shown in **Figure 2**
3. Select *Tapping Mode in Air – Soft Tapping* for a session in tapping mode
4. Mount an AFM chip to a tip holder (same procedure as in the Dimension AFM)
5. Mount the tip holder to the scanner (same procedure as in the Dimension AFM)
6. Lock/unlock the scanner to the microscope by rotating the screw on the microscope

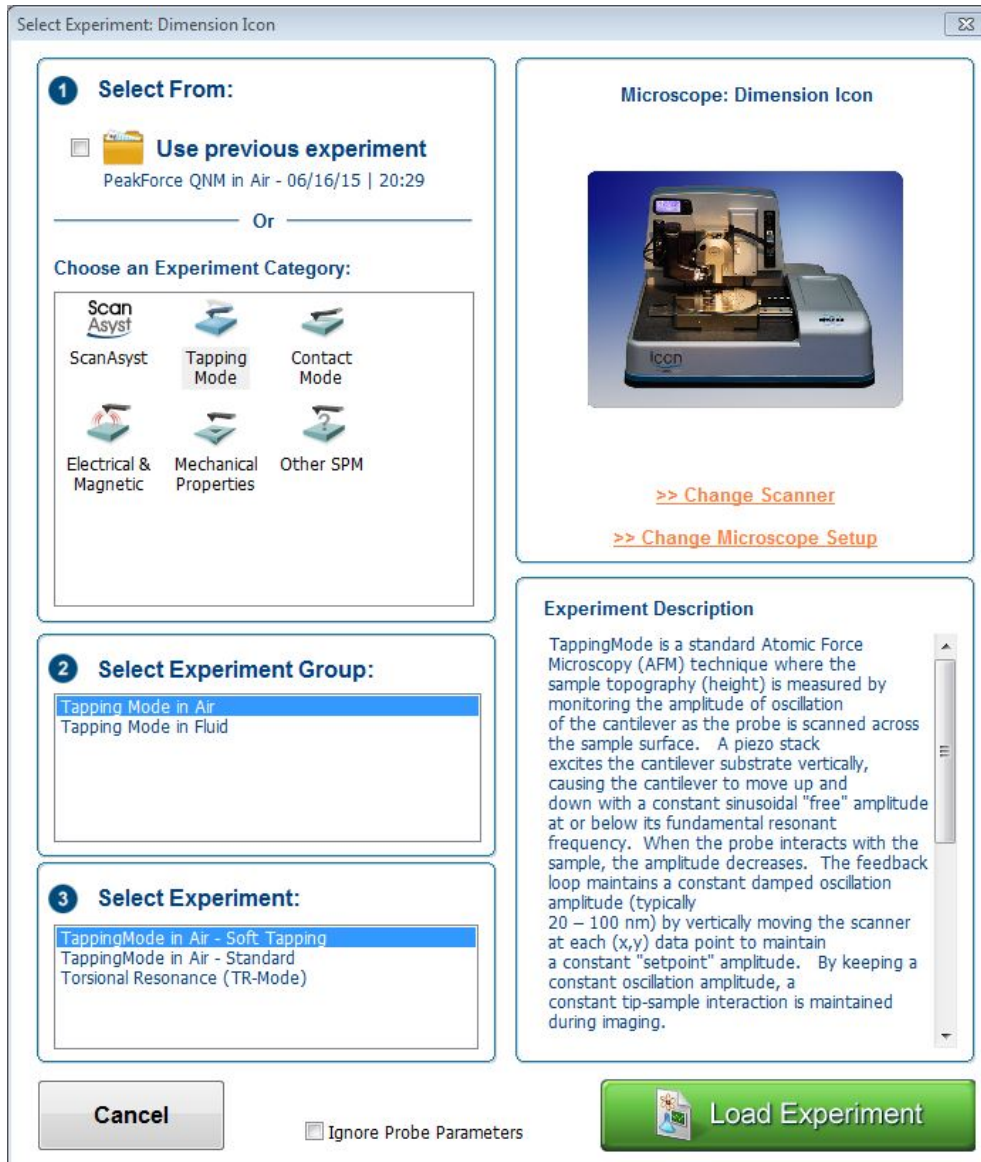
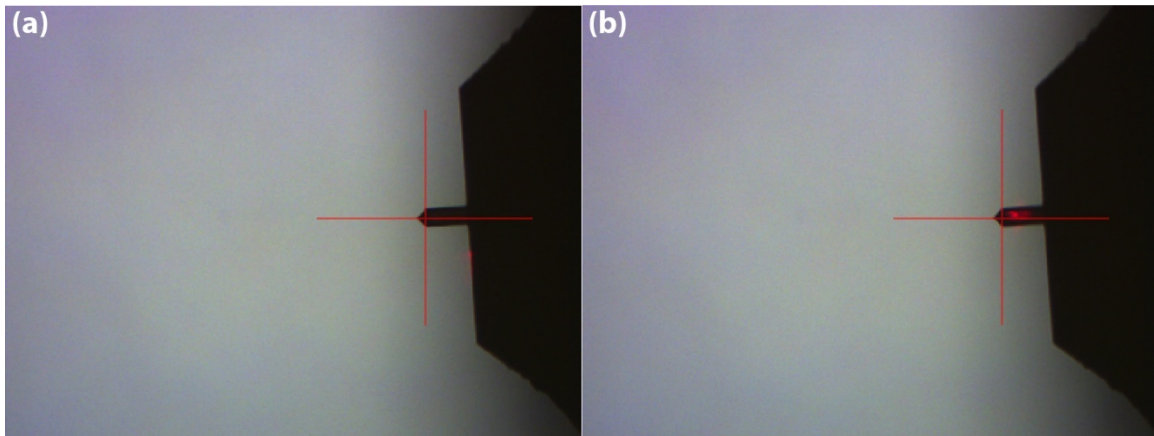


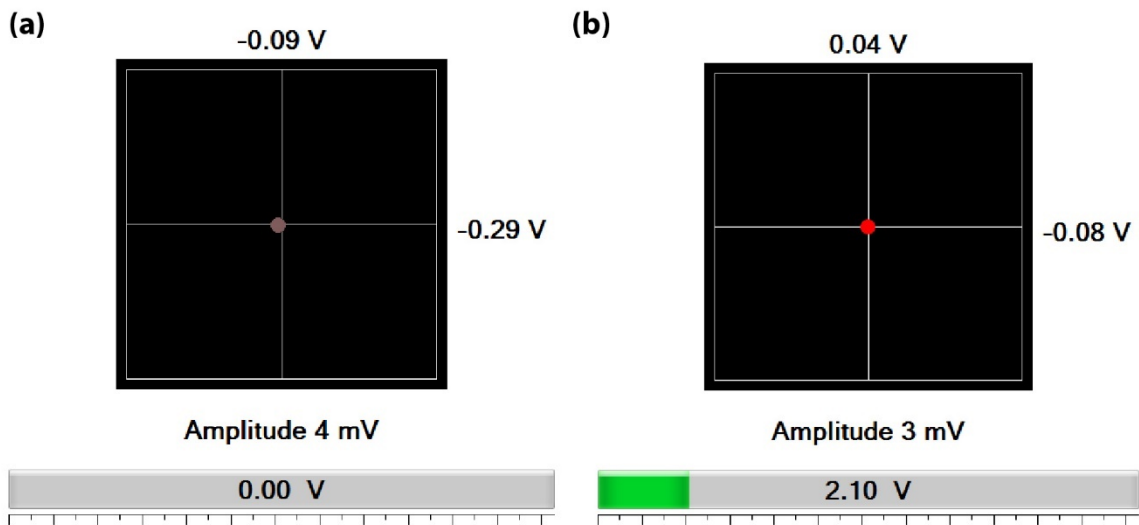
Figure 2: Select a desired experiment once the Nanoscope is opened

## II. Setting up an AFM tip and the laser and photodetector positions

1. Select *Setup* in the Workflow
2. Click on *Move to Alignment Station* to move the stage to its laser alignment station. The laser should be visible in the video feed on the right-hand side of the screen. Align the laser position to the AFM cantilever as shown in **Figure 3**.
3. Align the photodetector position such that the laser is in the center of the detector as shown in **Figure 4**.
4. Click on *Manual Tune* and enter the desired tuning range to tune the cantilever as shown in **Figure 5**.
5. Click on *Return from the Alignment Station* to move the stage back to experiment position. Use the *Focus Controls* to focus the cantilever if necessary.



**Figure 3:** Use the two laser positioning knobs located at the top of the scanner to move the laser position to the cantilever. (a) laser not on the cantilever. (b) laser on the cantilever

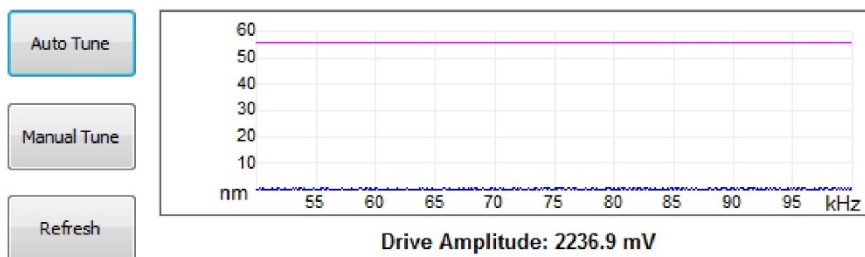


**Figure 4:** (a) No signal is detected on the photodetector if the laser is away from the cantilever. (b) Use the two detector positioning knobs located on the left-hand side of the scanner to position the detector such that the signal is in the center.

#### 4 Tune Cantilever



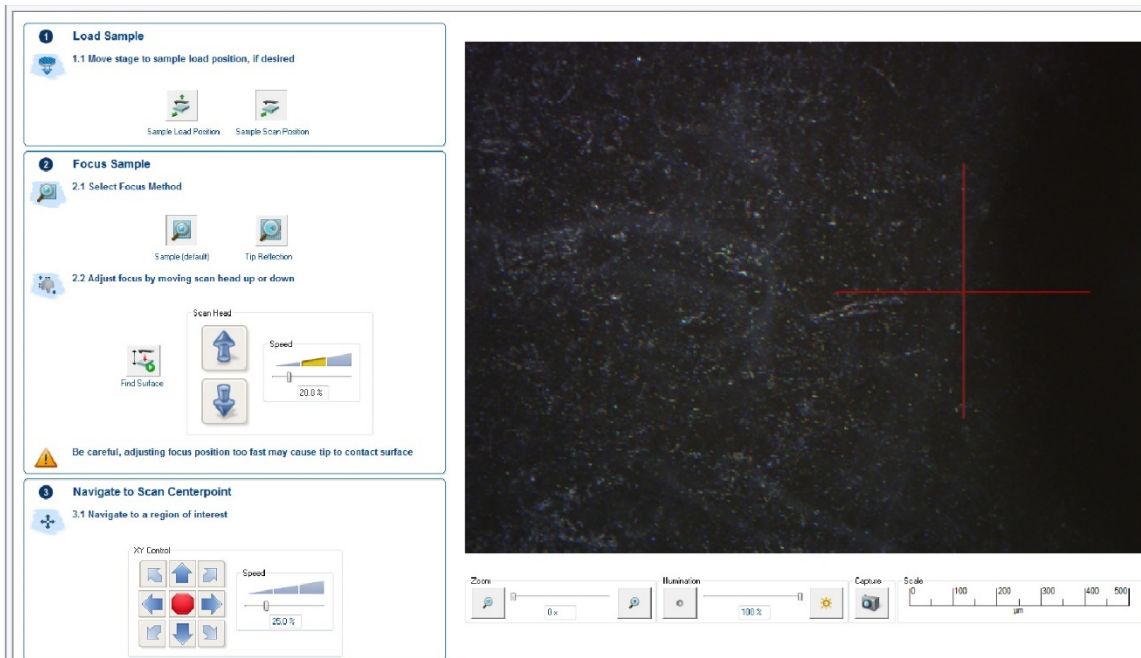
##### 4.1 Configure cantilever drive frequency and amplitude



**Figure 5:** Click on *Manual Tune* to tune the cantilever

### III. Mounting your sample

1. Place the sample either on the magnetic holder or directly on the stage.
2. Make sure there is sufficient clearance between the AFM tip and the sample surface before moving the sample under the tip location.
3. Click on *Navigate* on the Workflow as shown in **Figure 6**.
4. Use *XY Controls* to position the sample under the scanner.
5. Use *Scanner Head* control to move the scanner towards or away from the sample surface.

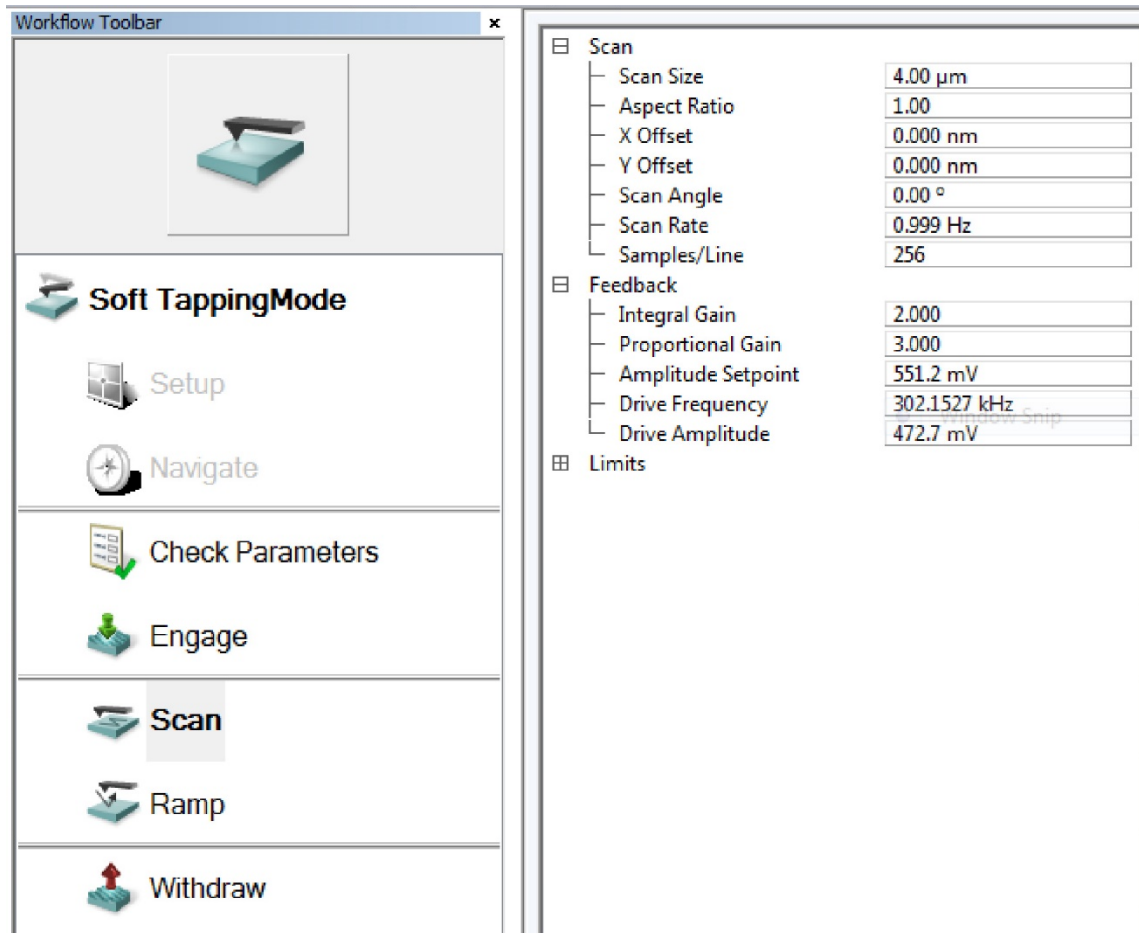


**Figure 6:** Adjust the scanner and sample positions in *Navigate*. Select *Sample Focus Method* and approach the scanner to the sample surface until the sample surface is in focus in the video feed.

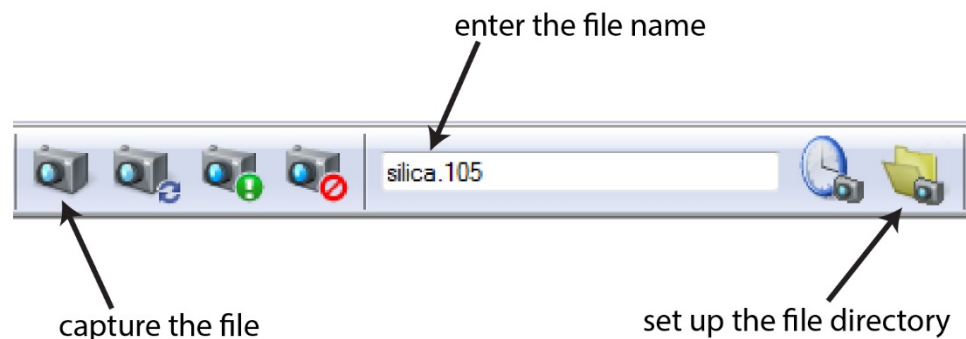
### IV. Setting up a scan and data acquisition

1. Click on *Engage* in the Workflow
2. *Scan* will be activated once the tip is engaged as shown in **Figure 7**. Set up the scan parameters as usual.
3. Set up the file directory and file name located in the upper right of Nanoscope as shown in **Figure 8**.
4. Click on the camera icon to capture the file.





**Figure 7:** Scan parameter list will be available once the tip is in contact with the sample's surface.



**Figure 8:** Set up the file directory and name once the scan is ready to record. Click on the camera icon to capture the file.

## V. Ending the session

1. Click on *Withdraw*
2. Select *Navigate* in the Workflow and move the scanner all the way to its topmost position
3. Remove the sample from the stage
4. Close the Nanoscope

5. Log out from the system

#### VI. Data Analysis

1. Nanoscope is available in every computer in the computer cluster.
2. Download and install Gwyddion if you would like to analyze the files on your personal computers.

### **Emergency Information**

#### **Medical emergency:**

Contact 911 or Public Safety (609) 258-1000

#### **Facility emergency:**

Contact Public Safety (609) 258-1000

#### **Instrument related emergency:**

1. Contact IAC Staff
2. Close the program
3. Power off the controller

#### **Audible/Siren Emergency Alerts:**

Follow previous steps 2 & 3 and leave the building

#### **IAC Contact Information**

Name	Office Phone	Cell	email
Nan Yao	609-285-6394	908-922-2236	<a href="mailto:nyao@princeton.edu">nyao@princeton.edu</a>
John Schreiber	609-258-0034	215-431-4670	<a href="mailto:js51@princeton.edu">js51@princeton.edu</a>
Paul Shao	609-258-3851	847-721-0861	<a href="mailto:pshao@princeton.edu">pshao@princeton.edu</a>
Denis Potapenko	609-258-7956	-----	<a href="mailto:denisp@princeton.edu">denisp@princeton.edu</a>
Daniel Gregory		302-542-3182	<a href="mailto:daniel.gregory@princeton.edu">daniel.gregory@princeton.edu</a>