ScanAsyst

This chapter covers procedures for operating the Dimension Icon Scanning Probe Microscope (SPM) using ScanAsyst™. It is assumed that the operator has previously prepared a ScanAsyst probe and aligned the laser per instructions provided in Chapter 7 of this manual. Specific information regarding tip preparation is also provided in Chapter 6.

Note: ScanAsyst is not available on the Dimension Icon-PI microscope.

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- **Probe Selection:** Section 9.3
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  - **Align Laser:** Section 9.4.4
  - **Adjust Photodetector:** Section 9.4.5
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  - **Focus Surface:** Section 9.4.7
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  - **Image the sample:** Section 9.4.10

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- **Optimizing a ScanAsyst image:** Section 9.7
- **Advanced Atomic Force Operation:** Section 9.8
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New technology: Please pay attention

9.1 Introduction

ScanAsyst™ is the world's first imaging mode with automatic image optimization technology for atomic force microscopy (AFM). This patent-pending innovation frees researchers from the task of adjusting scan parameters, such as setpoint, feedback gains, and scan rate. Intelligent algorithms continuously monitor image quality to make appropriate parameter adjustments. This makes imaging as easy as simply selecting a scan area and scan size for almost any sample in either air or fluid.

ScanAsyst is based on Veeco's patent-pending, new general-purpose imaging mode, Peak Force Tapping™. This proprietary mode performs a very fast force curve at every pixel in the image. The peak force of each of these curves is then used as the imaging feedback signal. Unlike TappingMode™, where imaging force is a complex function of the setpoint and other variables, Peak Force Tapping provides direct force control. This allows it to operate at even lower forces than TappingMode, which helps protect delicate samples and tips. Together, these capabilities make ScanAsyst the most powerful and productive way to use AFM.

Peak Force Tapping mode modulates the Dimension Icon Z-piezo at ~2 kHz with a default **Peak Force Amplitude** of 150 nm (0-peak).

Because Peak Force Tapping mode does not resonate the cantilever, cantilever tuning is not required. This is particularly advantageous in fluids.

Peak Force Tapping mode includes auto-optimization (called ScanAsyst) of scanning parameters, including gains, setpoint and scan rate. This enables users to rapidly obtain high quality images. ScanAsyst is intended to be the first choice imaging mode for NanoScope version 8.10 and later software.

Because Peak Force Tapping mode controls the applied force, tip wear is reduced.

Peak Force Tapping mode imaging increases the resolution by controlling the force that the tip applies to the sample thereby decreasing the deformation depths; this decreases the contact area between the tip and sample. Because the deformation depths and lateral forces are small, there is minimal damage to the probe or sample.

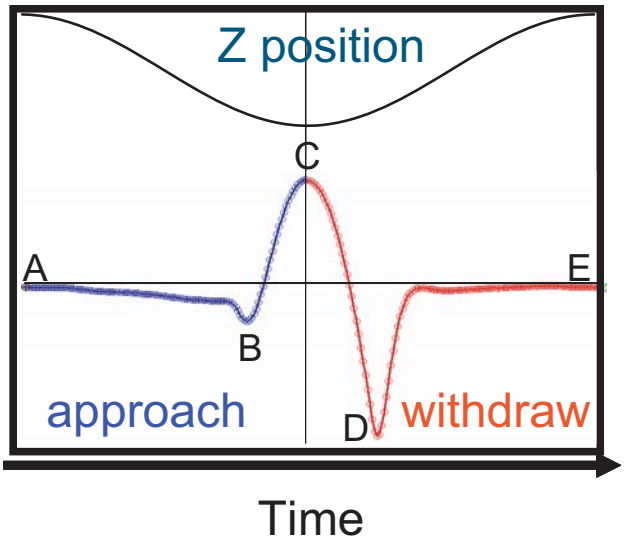
9.2 ScanAsyst Principles of Operation

Peak Force Tapping mode, the core technology behind the ScanAsyst mode, performs a very fast force curve at every pixel in the image. The peak of each of these force curves is then used as the imaging feedback signal. Peak Force Tapping mode modulates the Dimension Icon Z-piezo at ~2 kHz with a default **Peak Force Amplitude** of 150 nm (0-peak).

9.2.1 The "Heartbeat"

The **Force vs. Time** display, shown in Figure 9.2a is referred to as the "heartbeat." The initial contact of the probe with the sample (B), peak force (C) and adhesion (D) points are labelled.

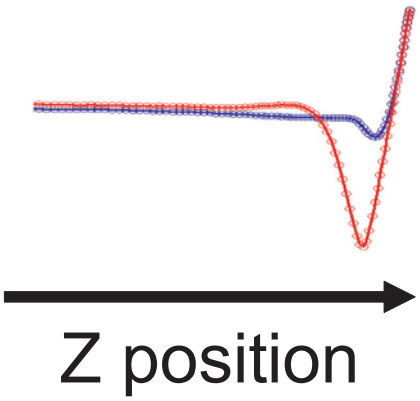
Figure 9.2a The "heartbeat." Blue indicates approach while red indicates retract.



9.2.2 Force curves

Using the Z-position information, the heartbeat is transformed into a force curve, shown in Figure 9.2b. The force curve plot is analyzed, on the fly, to produce the peak interaction force as the control feedback signal and the mechanical properties of the sample (**Adhesion**, **Modulus**, **Deformation**, **Dissipation**).

Figure 9.2b Force curve



9.3 Probe Selection

Veeco recommends ScanAsyst probes for the ScanAsyst/Peak Force Tapping mode:

- ScanAsyst-Air (k ~ 0.4 N/m, tip radius < 10 nm)
- ScanAsyst-Fluid (k ~ 0.7 N/m, tip radius < 10 nm nominal, max. = 15 nm)
- ScanAsyst-Fluid+ (k ~ 0.7 N/m, tip radius < 20 nm nominal, max. = 60 nm) These probes have a SiNx coated tip.

You may purchase these probes from http://www.veecoprobes.com.

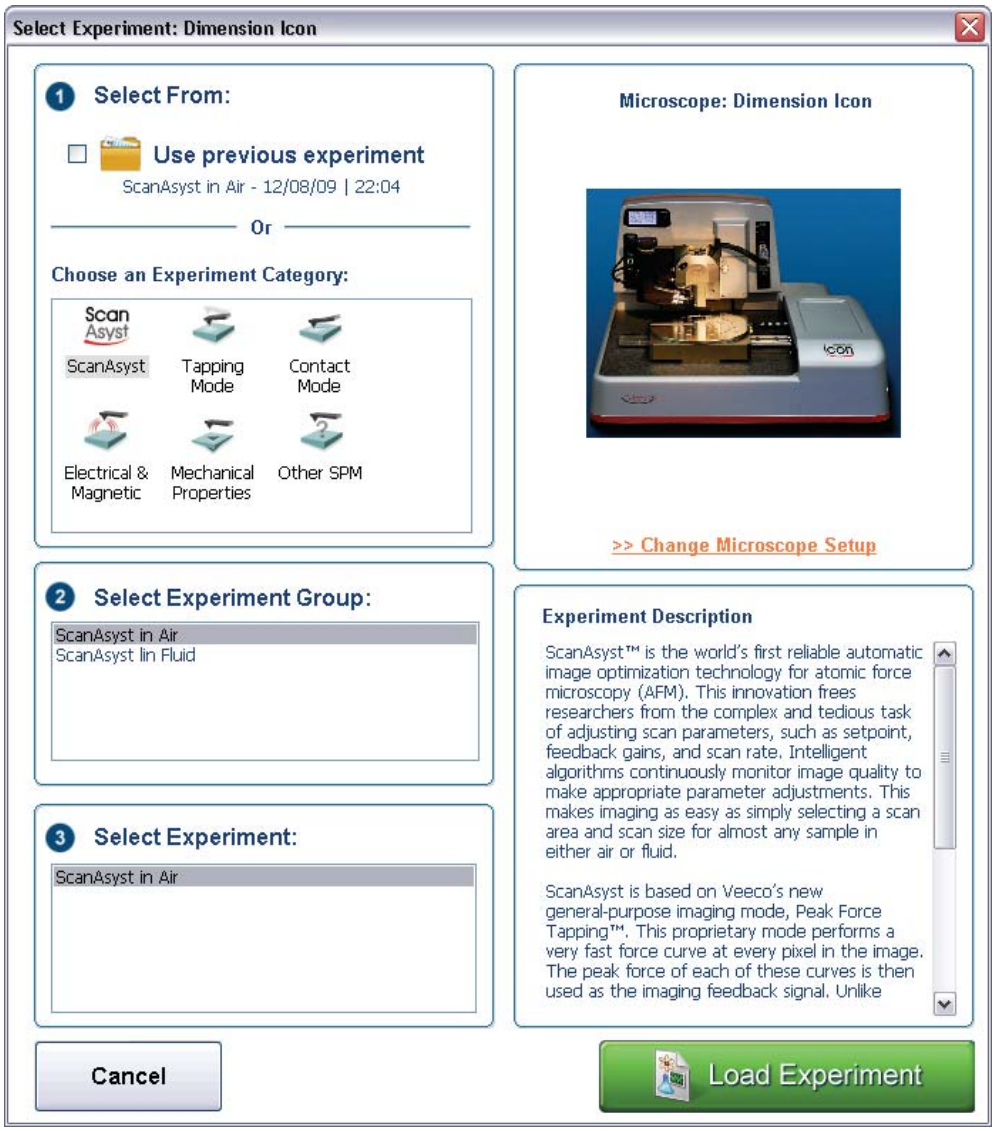
9.4 Basic ScanAsyst AFM Operation

This section shows you how to perform a simple ScanAsyst experiment. Later sections will discuss Peak Force Tapping parameters and their influence on the measurements.

9.4.2 Select Mode of Operation

1. Click the **SELECT EXPERIMENT** icon. This opens the **Select Experiment** window, shown in Figure 9.4a.

Figure 9.4a The ScanAsyst **Select Experiment** window



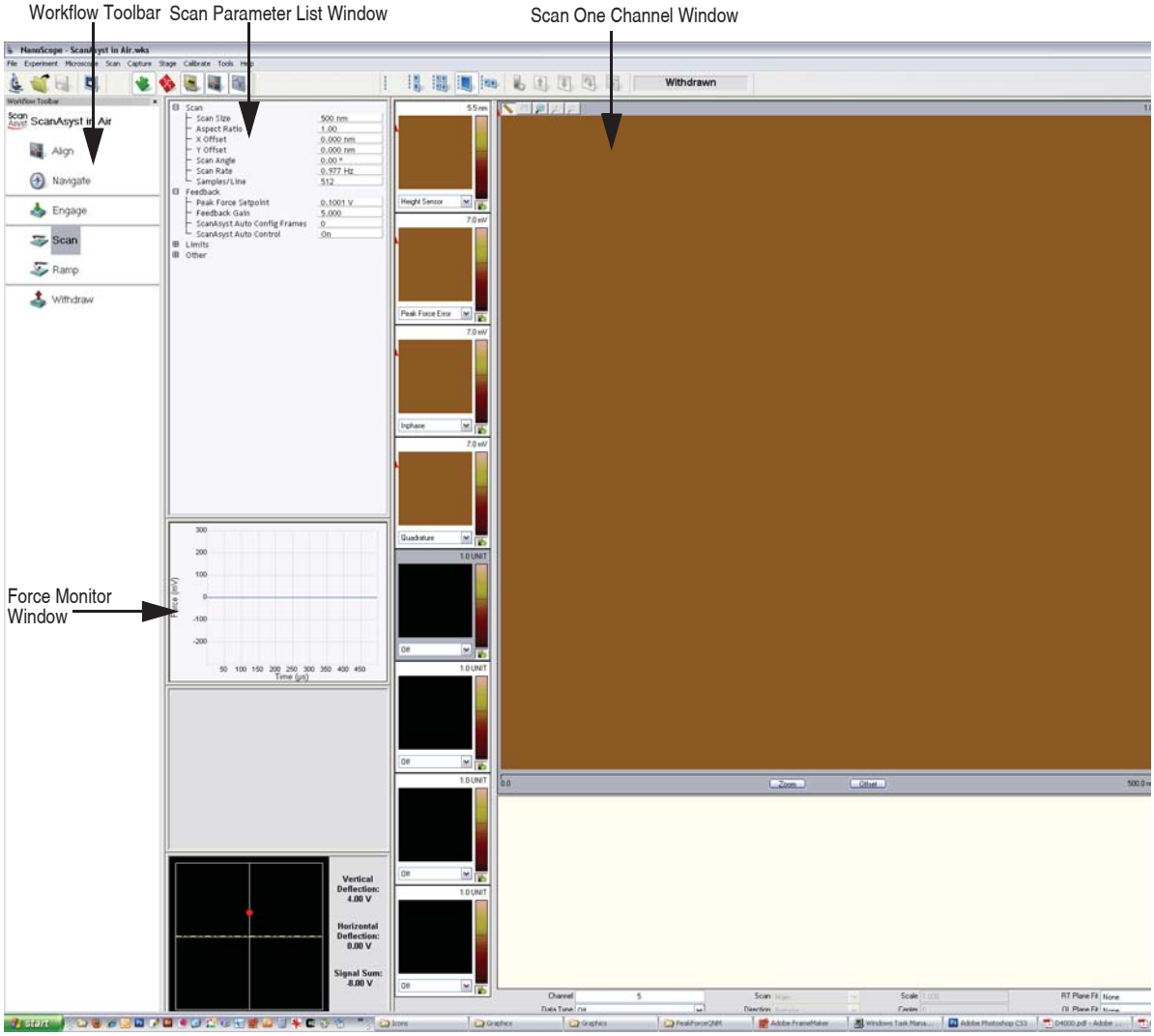
2. Select **SCANASYST** in the **Choose an Experiment Catagory** panel.

3. Select either **SCANASYST IN AIR** or **SCANASYST IN FLUID** in the **Select Experiment Group** panel.

4. Select **SCANASYST IN AIR** in the **Select Experiment** panel and click **LOAD EXPERIMENT**.

5. This opens the **Workflow Toolbar**, the **Scan One Channel** window, the **Force Monitor** window and the **Scan Parameters List** window, shown in Figure 9.4b.
   Please select the first tab on the left: **Align**

Figure 9.4b ScanAsyst Mode in Air (Simple Mode) configuration

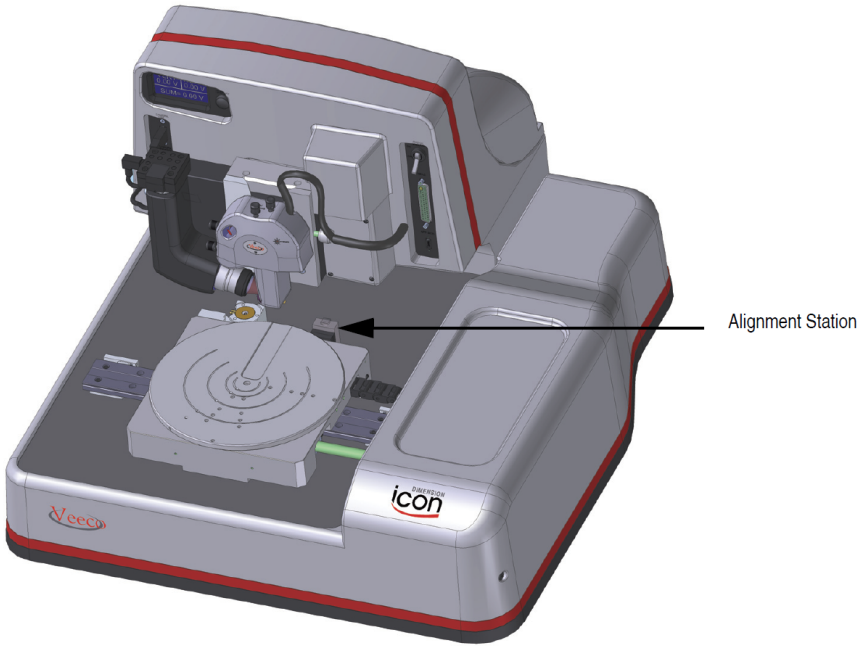


- The **Alignment Station** panel, shown in Figure 5.2g, moves the stage to position the head over a mirrored surface, shown in Figure 5.2h, mounted to the Dimension Icon stage. In many cases finding the laser reflection is easier if a mirrored surface replaces the sample.

See the attached video for how does the alignment station move automatically with the "move to laser alignment station"

Figure 5.2g The **Alignment Station** panel

Figure 5.2h The Dimension Icon alignment station

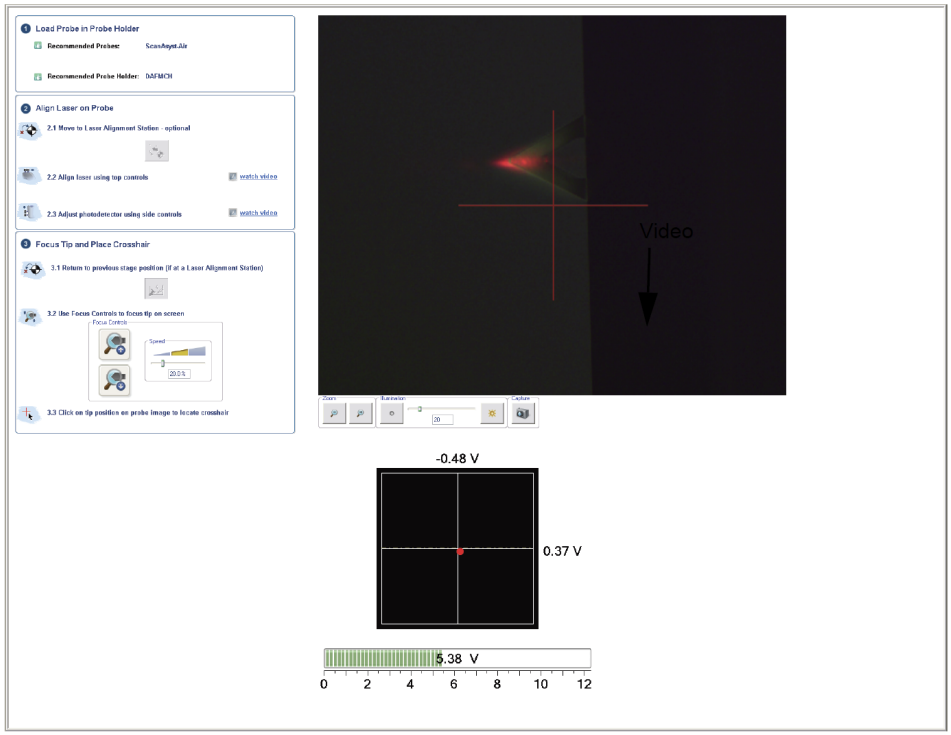


4. New Dimension users will probably find the laser alignment procedure easier by clicking **ALIGNMENT STATION** icon. This will move the stage so that the Dimension Icon head is positioned over the Alignment Station mirror and select the **TIP REFLECTION** option in the **Focus Select** panel.

Align

1. Click the **ALIGN** icon in the **Workflow Toolbar**. This opens the **Align** window, shown in the Figure

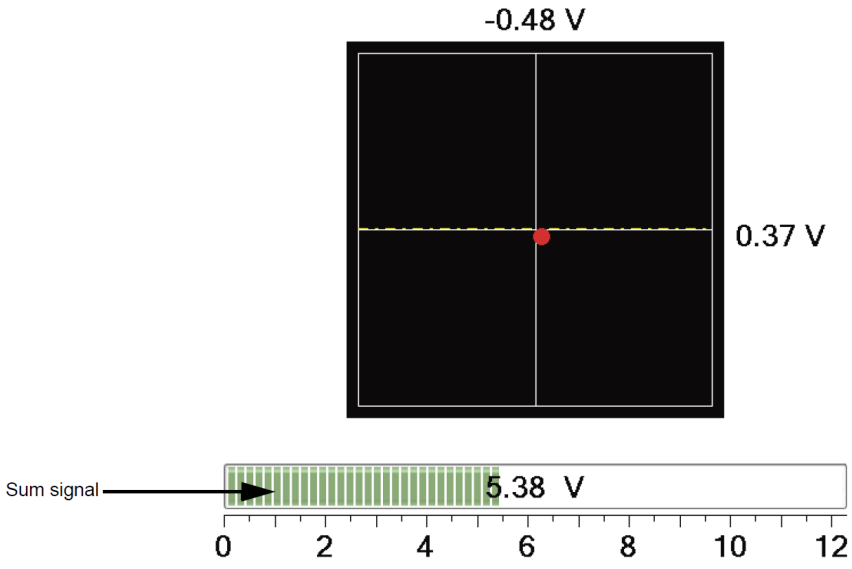
Figure The **Align** Window



Several panels in the **Align** window help you through the process:

- The **Video** panel, shown in Figure 5.2a, displays an image of the area around the cantilever.
- The **Meter** panel, shown in Figure 5.2b, displays the signals on the quad photo detector and the laser sum signal.

Figure 5.2b The Meter panel in the **Align** window



- The align instruction video, accessable through the **Align Laser on Probe** panel (Fig Figure 5.2c) and shown in Figure 5.2d, plays a short instructional movie showing the effects of moving the laser and photo detector alignment knobs.

Figure 5.2c Watch Video Commands in the Align Panel

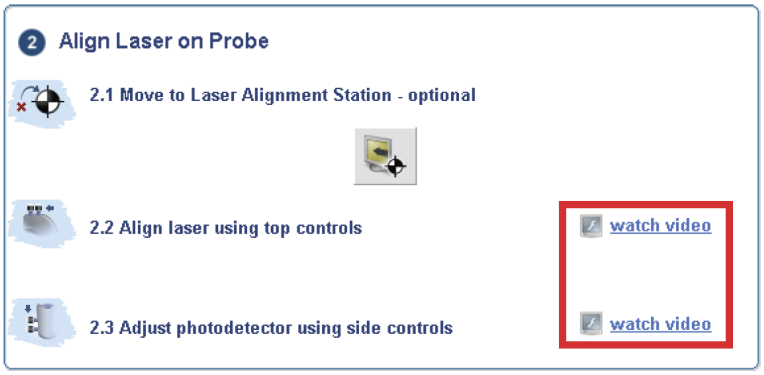
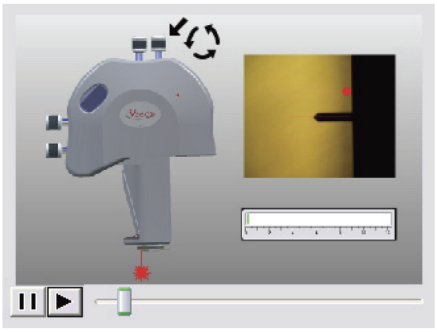


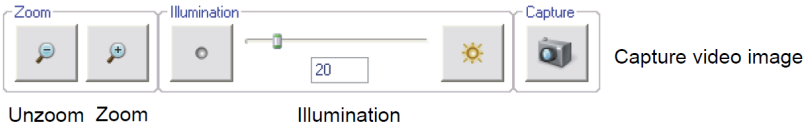
Figure 5.2d The align instruction movie window



Refer to Chapter 7 for additional detail about adjusting the laser and photo detector mirror on your Dimension Icon head.

- The **optics** panel, shown in the Figure below has buttons to zoom or unzoom the camera and buttons to adjust the sample illumination LED. Zooming out may aid in locating the tip.

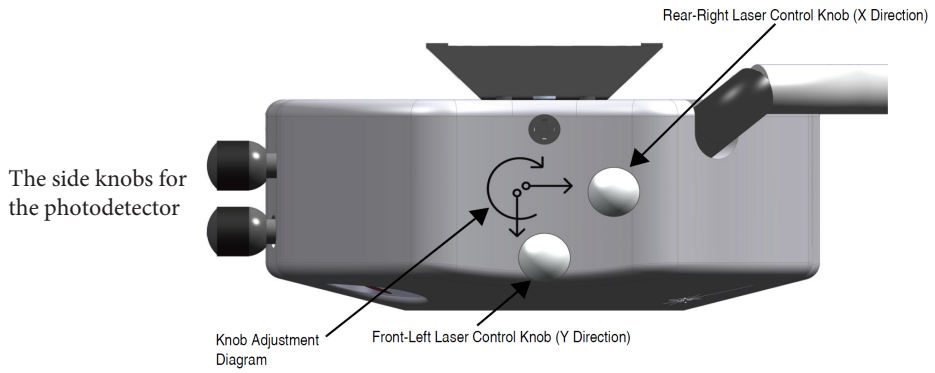
Figure The optics panel



9.4.4 Align Laser

1. Align the laser using the laser control knobs. See **Align Laser:**

2. Verify the laser beam is positioned on the back of the cantilever, with a spot visible in the Dimension head filter screen and a sum signal of **4-6V**.

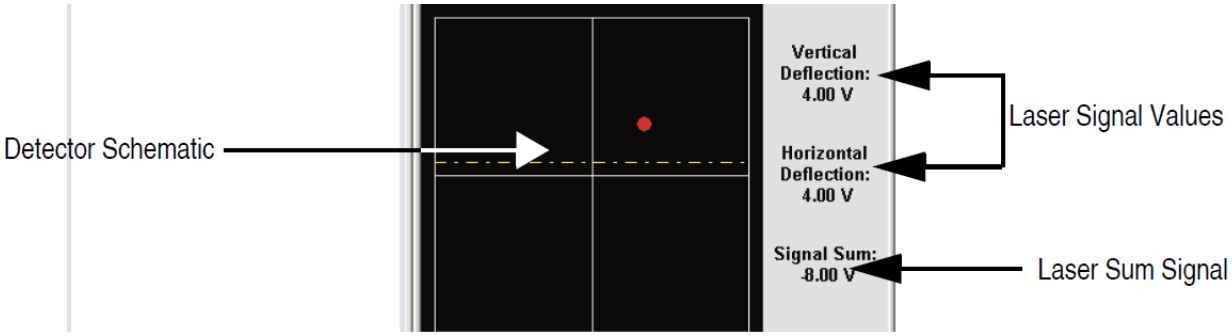


9.4.5 Adjust Photodetector

1. Adjust the photodetector so that the red dot moves toward the center of the Dimension head filter screen using the two photodetector adjustment knobs located on the side of the Dimension head. Please see the image of the laser head above .

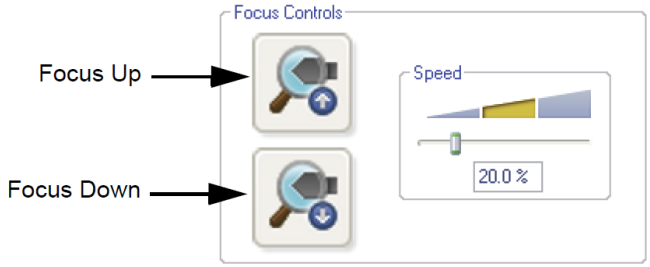
2. Verify that the red dot is centered and elliptical in shape in the Dimension head filter screen.

3. Set the **Vertical Deflection** to **-2V**.



- The **Focus Controls** panel, shown in the Figure below focuses the optics on the probe tip and thus knows the Z position of the probe tip. This knowledge is needed to successfully engage the probe tip onto your sample.

Figure The **Focus** panel



Please pay extra attention for the step 3. How to do tip focusing and place the cross-hair. If you do not do the tip focusing you will not be able to engage the tip.

Navigate

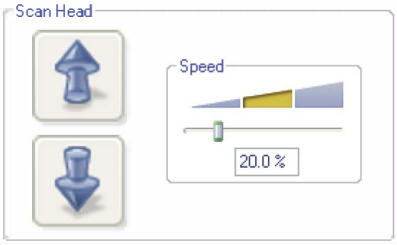
1. When the tip is in focus and centered in the field of view, click the **NAVIGATE** icon in the **Workflow Toolbar**. This opens the **Navigate** window, shown in Figure 5.2i. If you haven't load the sample onto the stage, please press *sample load position* button and wait for the stage movement stop. Please load the sample with vacuum ON. Press the *Sample scan position* button now and now the stage is ready for the movement with the Joystick as well as the navigation arrows. But before moving the stage rotate the stage to make the sample position closer to the probe. Now move the stage with the joystick or the navigation arrows at step 3.

Please see the attached video for how to move the sample under the probe with a o stic

Figure. The **Navigate** Window

2. Focus the optics on the tip reflection using either the trackball or the **Scan Head** arrows, shown in Figure 5.2j, in the **Navigate View**. If you have used the Alignment station, the stage will prompt you before moving back to the sample position.

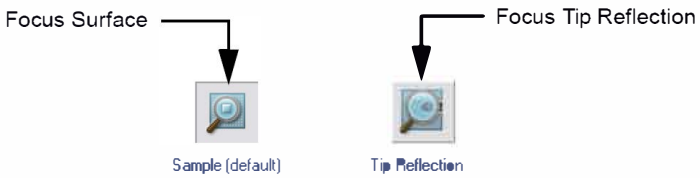
Figure 5.2j Focus: Z Motor Controls



3. To use the track ball, roll the trackball up or down while holding down the bottom-left button. To use the **Z Motor** arrows, click and hold them down. You can use the speed controls in the **Z Motor** area to adjust the speed. This adjustment raises or lowers the Z stage on which the SPM and optics are mounted.

4. To focus on the sample **SURFACE** (not recomended) or the **TIP REFLECTION recomended** (for the reflecting samples), change the **Focus Select** parameter accordingly.

Figure 5.2k The **Navigate Focus Select** Panel



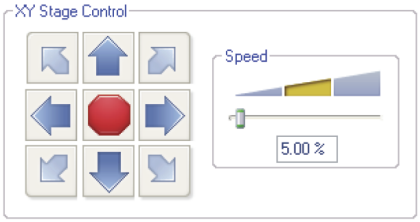
Note: For reflective or semi-reflective samples, the tip reflection is easier to bring into focus than the surface, especially if the sample is very flat or clean.

CAUTION: When moving the SPM stage up and down, it is possible to crash the tip into the surface. To prevent a crash while focusing on the surface, watch the optical image **and** tip-to-sample proximity. The sample should be in focus when the tip is 1mm (1000µm) above the surface.

5. For samples which are difficult to bring into focus, move to an edge of the sample, which is easy to find in the optical image, and bring the top of the edge into focus.

6. Move the X-Y stage to align the desired location on the sample under the crosshairs either by using the trackball without holding down any buttons or by using the **XY Stage Control** arrows, shown in Figure 5.2l, in the **Navigate View**.

Figure 5.2l XY Stage Controls



7. Verify that the surface remains in focus.

5.2.3 Load/Unload Sample

The **Load/Unload Sample** function, available in the **Navigate** window, first lifts the Dimension Icon head then indexes the stage to a preprogrammed location (usually front-center) where samples may be rapidly reloaded.

1. To load a sample from the stage, click the **SAMPLE LOAD POSITION** icon.

2. This raises the head to the **Load/Unload** height (see **Stage Parameters:** Section 7.3.1), the stage indexes to the front-center position and displays a corresponding message, shown in Figure 5.2m.

Figure 5.2m Moving the Stage to Load/Unload position

3. To release the vacuum chuck's hold on the sample, use the toggle switch at the upper-right corner of the microscope, shown in Figure 1.4b. When the vacuum is released, remove the sample.

4. Verify that the stage and vacuum chuck are clean and free of debris. If debris is present, clean the stage using a lint-free wipe and isopropyl alcohol. Dispose of wipes in an appropriately labelled solvent-contaminated waste container.

5. Place the new sample on the stage.

6. Verify that the sample is centered and seated flat against the chuck's contact points.

7. Activate the vacuum chuck by toggling the chuck vacuum switch.

8. Click the **SAMPLE SCAN POSITION** icon.

9. The stage moves back to the sample analysis position and displays a corresponding message, shown in Figure 5.2n.

Figure 5.2n Moving the Stage to Load position

9.4.7 Focus Surface

1. Click the **NAVIGATE** icon in the **Workflow Toolbar**.

2. Focus on the surface by clicking the **Focus Surface** icon in the **Navigate** window.

3. Focus on the sample surface either with the Focus: Z Motor arrows, or by rolling the trackball up or down while pressing the bottom-left button. This adjustment raises or lowers the vertical engage stage on which the SPM and optics are mounted.

4. To move long distances hold both left trackball buttons down simultaneously and roll the trackball with high speed to lock the peak speed of motion. Release these two buttons to stop the motors. be careful when performing this in the downward direction. Focus on the sample surface using the trackball with the bottom-left button depressed.

CAUTION: Because the command **Focus Surface** moves the scanner vertically, be careful when making this adjustment to ensure that the tip does not hit the sample surface.

9.4.8 Set Initial Scan Parameters

Scan Panel

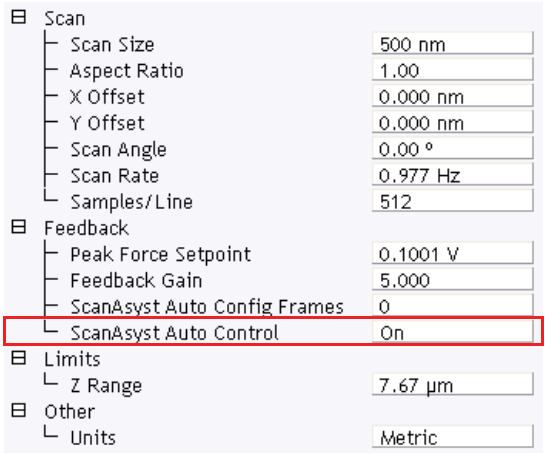
In the **Scan** panel of the **Scan Parameters List**, set the following initial scan parameters (see Figure 9.4c).

1. Set the **Scan Size**.
2. Set the **Scan Angle**.

Feedback Panel

1. Set **ScanAsyst Auto Control** to **On** (see Figure 9.4c).

Figure 9.4c ScanAsyst in Air (Simple Mode) Parameters Panel



Channels 1, 2, 3 and 4

The default **ScanAsyst** channel settings are listed below:

1. **Channel 1 Data Type** is **HEIGHT SENSOR** (see Figure 9.4d).
2. **Channel 2 Data Type** is **PEAK FORCE ERROR**.
3. **Channel 3 Data Type** is **INPHASE**.
4. **Channel 4 Data Type** is **QUADRATURE**.
5. Set **Data Scale** to a reasonable value for the sample or click the **AUTOSCALE** icon after engaging.

   Note: For example, for a 200nm step height calibration sample, a reasonable **Data Scale** setting is 300nm initially.

6. Set **Line direction** to either **TRACE** or **RETRACE**.

Figure 9.4d Default Channel Settings

Channel	1	Scan	Main	Scale	50.00 nm	RT Plane Fit	Line
Data Type	Height Sensor	Direction	Retrace	Center	0 nm	OL Plane Fit	None
Channel	2	Scan	Main	Scale	24.58 V	RT Plane Fit	Offset
Data Type	Peak Force Error	Direction	Retrace	Center	0 V	OL Plane Fit	None
Channel	3	Scan	Main	Scale	1.000 V	RT Plane Fit	Line
Data Type	Inphase	Direction	Retrace	Center	0 V	OL Plane Fit	None
Channel	4	Scan	Main	Scale	1.000 V	RT Plane Fit	Line
Data Type	Quadrature	Direction	Retrace	Center	0 V	OL Plane Fit	None

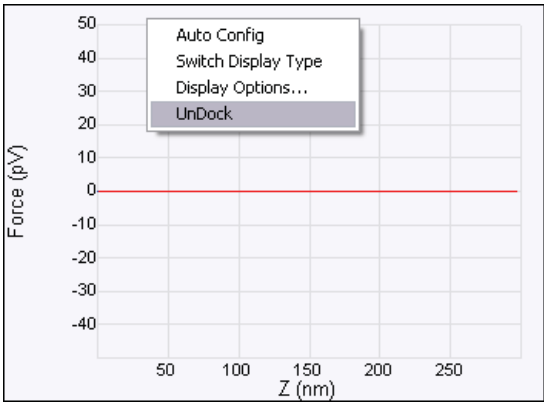
9.4.9 Engage

1. Select **Microscope** > **Engage** or click the **ENGAGE** icon on the Workflow Toolbar. A pre-engage check begins, followed by Z-stage motor motion.
2. To move to another area of the sample, execute a **Withdraw** command to avoid damaging the tip and scanner.
3. Move the stage using the trackball to the next area of interest on the sample.

9.4.10 Image the sample

1. If needed, right-click in the **Force Monitor** window and click **UNDOCK**. See Figure 9.4e. You may **DOCK** the undocked **Force Monitor** window by right-clicking in it and clicking **DOCK**.

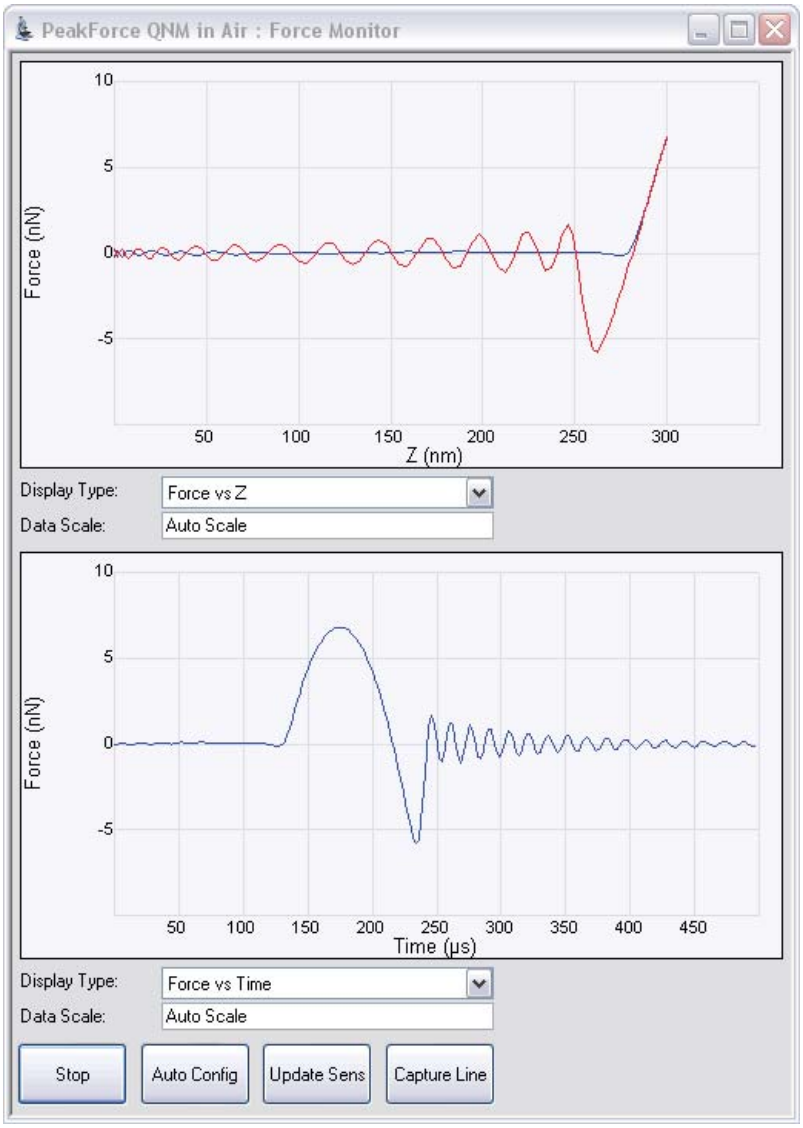
Figure 9.4e Undock the Force Monitor window



2. Select one plot to be **FORCE VS. TIME** and the other to be **FORCE VS. Z**.

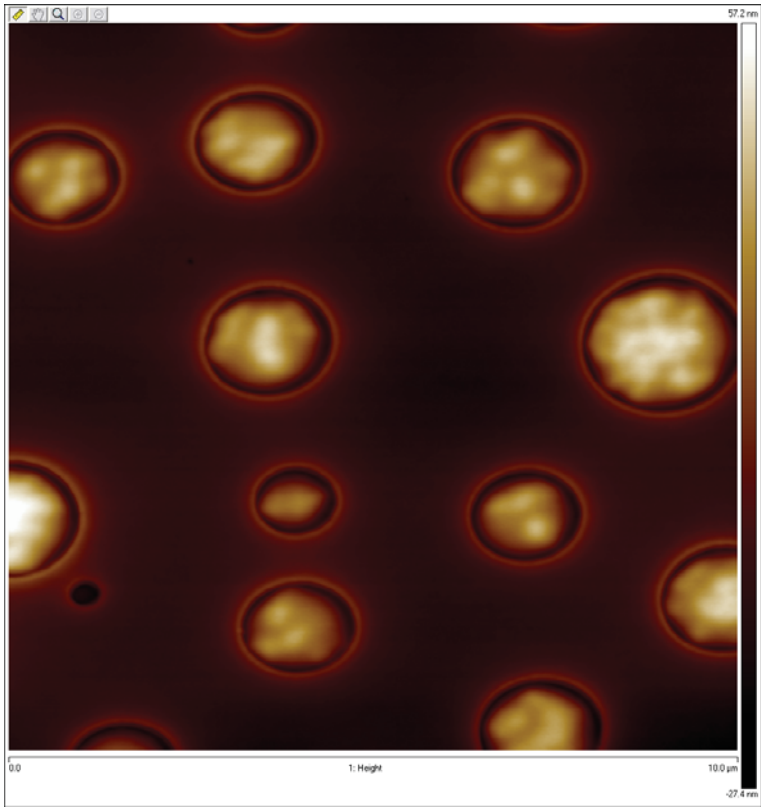
3. Once scanning, the **Force Monitor** window, shown in Figure 9.4f, should display a **Force vs. Z** plot and a "heartbeat" (**Force vs. Time**) plot.

Figure 9.4f The **Force Monitor** window



4. The **HEIGHT** channel in the **Scan** window, shown in Figure 9.4g, will display a topographical image of your sample.

Figure 9.4g Height Image of a PS + LPDE blend.



9.5 ScanAsyst and Peak Force Tapping Mode Parameters

9.5.1 Feedback Parameters

Peak Force Setpoint

The setpoint for peak force. If the deflection sensitivity is calibrated, the force (in Newtons) will be displayed.

When the **ScanAsyst Setup** is **ON**, **Peak Force Setpoint** is automatically controlled by NanoScope software. Under some conditions, you may desire to control the **Peak Force Setpoint** manually. A **Peak Force Setpoint** that is too high can either damage the sample or wear the tip. It is generally desirable to reduce the **Peak Force Setpoint** to as small a value as possible. However, in order to achieve accurate Elastic modulus measurement, sufficient sample deformation is needed. If the deformation is less than 2nm, increase the **Peak Force Setpoint** to achieve sufficient sample deformation.

Note: When performing **AUTO CONFIG** operations with a small **Peak Force Setpoint** (less than ~20mV), the tip may drift out of contact with the surface and will be unable to return and track the surface. It is therefore recommended using a relatively large **Peak Force Setpoint** while performing **AUTO CONFIG** operations and reducing the **Peak Force Setpoint** later if necessary.

Feedback Gain

The gain of the Peak Force Tapping feedback control loop.

Note: Both **Peak Force Setpoint** and **Feedback Gain** are dynamically and automatically controlled when **ScanAsyst Auto Control** is set to **ON**.

Note: A **Feedback Gain** that is too large will cause oscillation of the system and increase noise, while too small a **Feedback Gain** will result in poor sample tracking.

Low Pass Deflection Bandwidth

The low pass filter is used to reduce deflection noise. Lower bandwidths will reduce noise but will distort the force curve and introduce errors in quantitative nanomechanical property measurements.

Range and Settings: 10 kHz - 65.56 kHz (*Default value*: 40 kHz).

ScanAsyst Setup

Range and Settings: **NEVER**: Does not allow ScanAsyst Auto Control.

ALLOW: Allows ScanAsyst Auto Control.

Note: **SHOW ALL**, discussed in the *NanoScope Software Version 8 User Guide*, must be enabled to view and edit this parameter.

ScanAsyst Noise Threshold

ScanAsyst Noise Threshold is linked to the **Feedback Gain** and is used to tune it. Larger **ScanAsyst Noise Thresholds** will result in better sample tracking but increased oscillation noise. Lower **ScanAsyst Noise Thresholds** will result in a cleaner image but the sample tracking will suffer.

Range and Settings: 0.5 nm is appropriate for most samples while 1 nm is appropriate for rough samples and 0.05 nm may be appropriate for very flat samples.

Note: When **ScanAsyst Auto Z Limit** control is turned **ON**, the **ScanAsyst Noise Threshold** parameter is automatically set by the program and cannot be changed.

ScanAsyst Auto Config Frames

At the end of every N frames, an **AUTO CONFIG** operation is performed.

Range and Settings: 0 - 100. If **ScanAsyst Auto Config Frames** = 0, periodic **AUTO CONFIG** operations are not performed.

ScanAsyst Auto Control

Range and Settings: **OFF**: Turns ScanAsyst Auto Control **OFF**.

ON: Turns ScanAsyst Auto Control **ON**.

INDIVIDUAL: Allows individual control of **ScanAsyst Auto Gain**, **ScanAsyst Auto Setpoint**, **ScanAsyst Auto Scan Rate** and **ScanAsyst Auto Z Limit**.

ScanAsyst Auto Gain

ScanAsyst Auto Gain allows NanoScope to dynamically control **Feedback Gain**.

Range and Settings: **OFF**: Turns **ScanAsyst Auto Gain OFF**.

ON: Turns **ScanAsyst Auto Gain ON**.

ScanAsyst Auto Setpoint

ScanAsyst Auto Setpoint allows NanoScope to dynamically control the **Peak Force Setpoint**.

Range and Settings: **OFF**: Turns **ScanAsyst Auto Setpoint OFF**.

ON: Turns **ScanAsyst Auto Setpoint ON**.

Note: This option is very useful for users who want to change the **Peak Force Setpoint** manually to achieve adequate deformation on the sample while leaving **ScanAsyst Auto Gain ON**.

ScanAsyst Scan Auto Scan Rate

ScanAsyst Scan Auto Scan Rate allows NanoScope to control the **Scan Rate**.

Range and Settings: **OFF**: Turns **ScanAsyst Scan Auto Scan Rate OFF**.

ON: Turns **ScanAsyst Scan Auto Scan Rate ON**.

ScanAsyst Auto Z Limit

ScanAsyst Auto Z Limit allows NanoScope to control the **Z Limit**. The **ScanAsyst Auto Z Limit** function will detect if the surface is sufficiently smooth to allow reduction of the **Z Limit** and thus avoid bit noise in the **Height** and **Height Sensor** channel. This will be effective after a whole frame of the image is scanned. If the **Z Limit** needs to be reduced, the **ScanAsyst Noise Threshold** will automatically be reduced to 0.15 times the original **ScanAsyst Noise Threshold** to reduce the oscillation noise for smooth samples.

Range and Settings: **OFF**: Turns **ScanAsyst Auto Z Limit OFF**.

ON: Turns **ScanAsyst Auto Z Limit ON**.

9.5.2 Peak Force Tapping Control Parameters

Peak Force Amplitude

The zero-to-peak amplitude of the cantilever drive in the Z axis (Z modulation). Increasing **Peak Force Amplitude** will reduce the contact time during each tip tapping cycle on the sample and help tracking the rough and/or sticky sample by avoiding a situation where the tip is unable to pull off from the sample. Reduced **Peak Force Amplitude** is desired in liquid on flat samples. Less **Peak Force Amplitude** results in less hydrodynamic force disturbance.

Lift Height

The distance that the Z-piezo is retracted from the sample during an **AUTO CONFIG** operation.

Note: Changing the **Lift Height** will automatically start the **AUTO CONFIG** function (see **Optimizing a ScanAsyst image:** Page 192) and retract the Z piezo to the specified **Lift Height**. Clicking **AUTO CONFIG** will automatically calculate the **Lift Height** and perform an **AUTO CONFIG** operation.

9.5.3 Limits Parameters

Z Limit

Permits attenuation of maximum allowable Z voltage and vertical scan range to achieve higher resolution (smaller quantization) in the Z direction.

Range or Settings: 8.33 V (~0.241 μm) to 309.3 V (~9 μm).

Note: **SHOW ALL**, discussed in the *NanoScope Software Version 8 User Guide*, must be enabled to view and edit this parameter.

Z Range

Permits attenuation of the range of the Z piezo as measured by the Z sensor to achieve higher resolution (smaller quantization) in the Z direction.

Range or Settings: 0.2 nm to ~7.42 microns.

Deflection Limit

Use this parameter to attenuate the maximum allowable deflection signal to achieve higher resolution. If this value is too small, saturation of the **Deflection** channel will occur.

Range or Settings: 4.096V - 24.58V.

9.5.4 Parameter Visibility

The visibility of various parameters depends on the selected mode. Table 9.5a shows parameter visibility as a function of microscope mode.

Table 9.5a Parameter Visibility

Panel	Parameter	Simple Mode	Expanded Mode	Show All	Other Dependencies
Feedback	**Peak Force Setpoint**	Yes	Yes	Yes	
	Feedback Gain	Yes	Yes	Yes	
	Low Pass Deflection Bandwidth	No	Yes	Yes	
	ScanAsyst Setup	No	No	Yes	
	ScanAsyst Noise Threshold	No	Yes	Yes	
	ScanAsyst Auto Config Frames	Yes	Yes	Yes	
	ScanAsyst Auto Control	Yes	Yes	Yes	
	ScanAsyst Auto Gain	Yes	Yes	Yes	ScanAsyst Auto Control
	ScanAsyst Auto Setpoint	Yes	Yes	Yes	ScanAsyst Auto Control
	ScanAsyst Scan Auto Scan Rate	Yes	Yes	Yes	ScanAsyst Auto Control
	ScanAsyst Auto Z Limit	Yes	Yes	Yes	ScanAsyst Auto Control
Limits	**Z Limit**	No	No	Yes	
	Z Range	Yes	Yes	Yes	
	Deflection Limit	No	Yes	Yes	

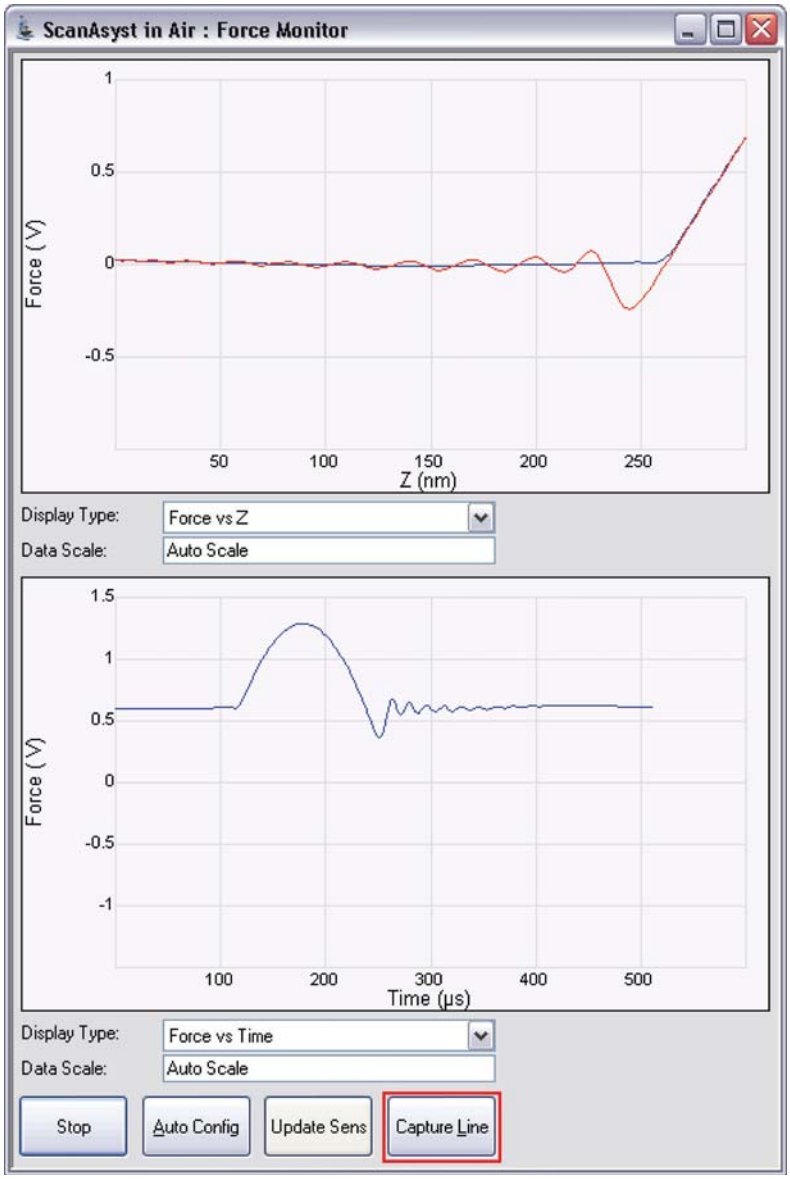
9.6 Capture buttons

The capture buttons allow you to collect data for use with the NanoScope Analysis off-line analysis software.

1. Start to collect a ScanAsyst/Peak Force Tapping image.

2. When you are in a region of interest, click the **CAPTURE LINE** button, shown in Figure 9.6a, to capture a scan line.

Figure 9.6a CAPTURE LINE button



3. The **High Speed Data Capture** window, shown in Figure 9.6b, will open and the **Status** will change when the data has been captured. **UPLOAD DATA** to the PC when the capture is complete. When **CAPTURE LINE** is used this way, the off-line NanoScope Analysis software will correctly associate the capture line of the high speed data capture with the line in the image.

Figure 9.6b High speed data capture is complete. However, the data is not immediately transferred to the PC.

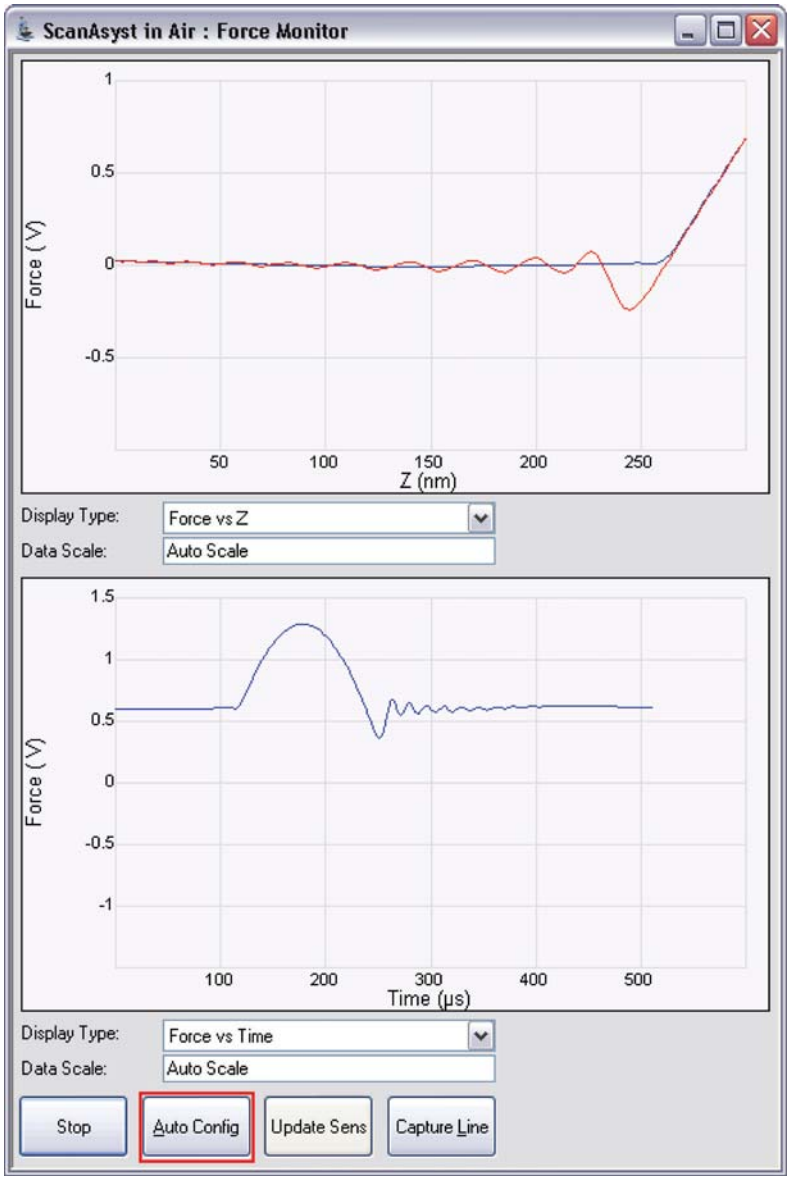
4. Click the **UPLOAD DATA** button to transfer the captured data to the computer. While the data transfer process takes place, the scan data will look corrupted because the DSP time is shared between PeakForce QNM properties computation and data transfer.

9.7 Optimizing a ScanAsyst image

If your force curves show background noise or otherwise need improvement, click **AUTO CONFIG** to invoke the real-time pattern analysis algorithm that removes parasitic deflection.

Note: Clicking **AUTO CONFIG** will automatically calculate the **Lift Height** and perform an **AUTO CONFIG** operation.

Figure 9.7a The **AUTOCONFIG** button



9.8 Advanced Atomic Force Operation

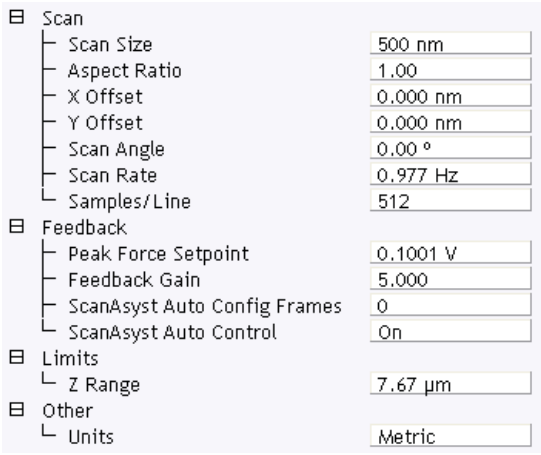
9.8.1 Displaying Parameters

You can adjust the number of parameters shown in the **Scan Parameter List** using several methods.

Simple Mode

1. The default **SIMPLE MODE**, intended for novice users and shown in Figure 9.8a, displays the minimum number of parameters needed to make an image.

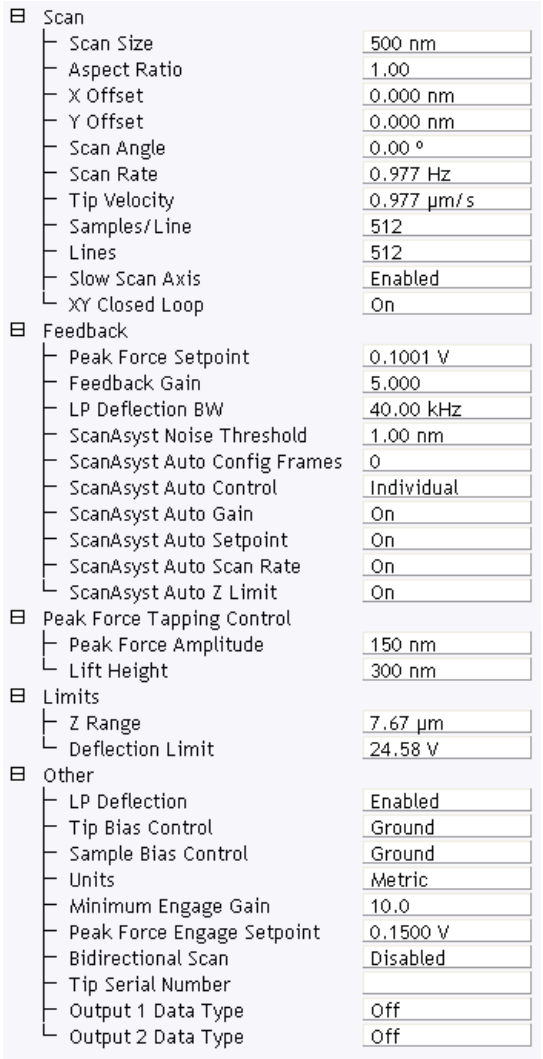
Figure 9.8a The **SIMPLE MODE** view of the **Scan Parameter List** for **ScanAsyst in Air**



Expanded Mode

1. The **EXPANDED MODE** view, shown in Figure 9.8b, increases the number of displayed parameters enabling expert users to fine tune an image.

Figure 9.8b The **EXPANDED MODE** view of the **Scan Parameter List** for **ScanAsyst in Air**



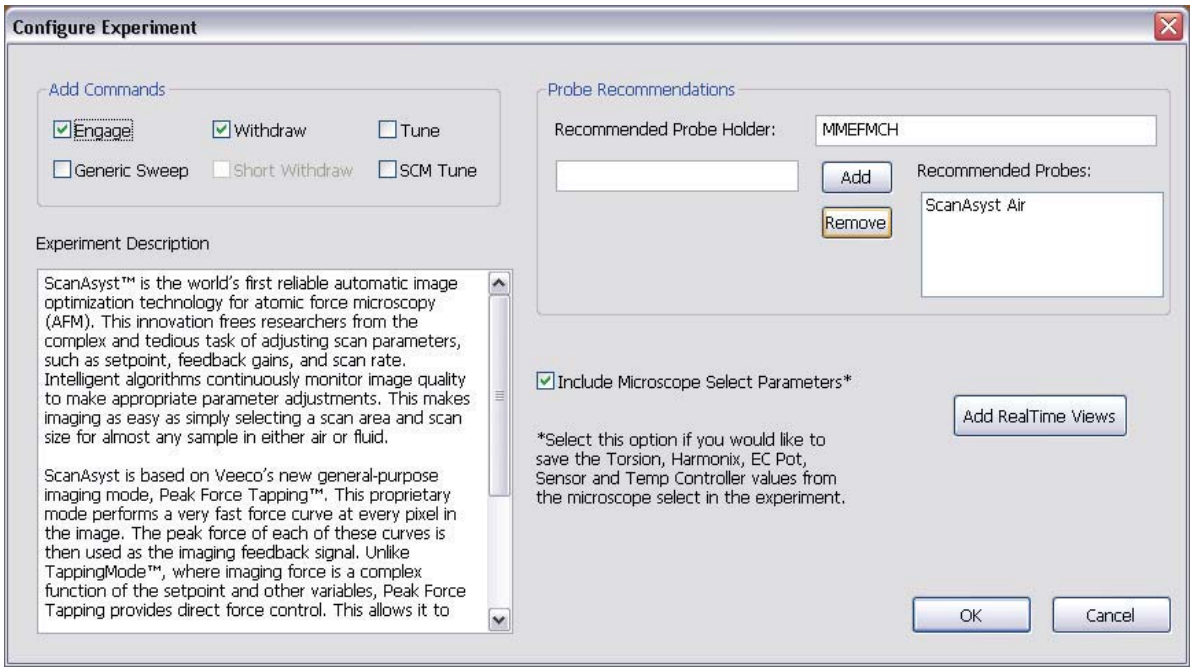
Show All

1. From the Menu bar, click **EXPERIMENT** > **CONFIGURE EXPERIMENT**. This opens an information window, shown in Figure 9.8c.

Figure 9.8c The Configure Experiment information window

2. Click **OK** to open the **Configure Experiment** window, shown in Figure 9.8d.

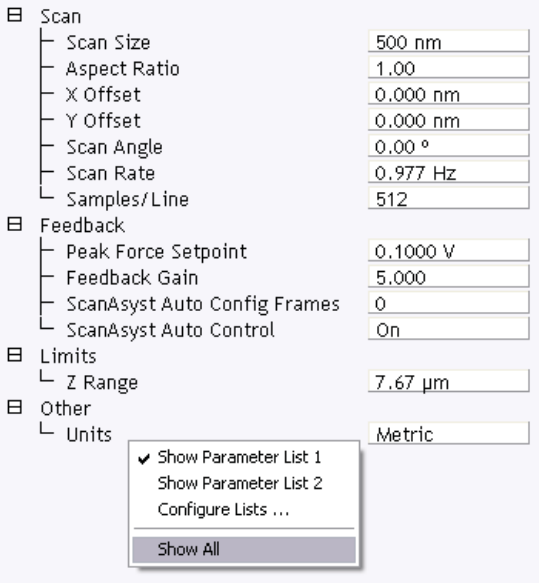
Figure 9.8d The **Configure Experiment** Window



3. Click **CANCEL** which will close the **Configure Experiment** window.

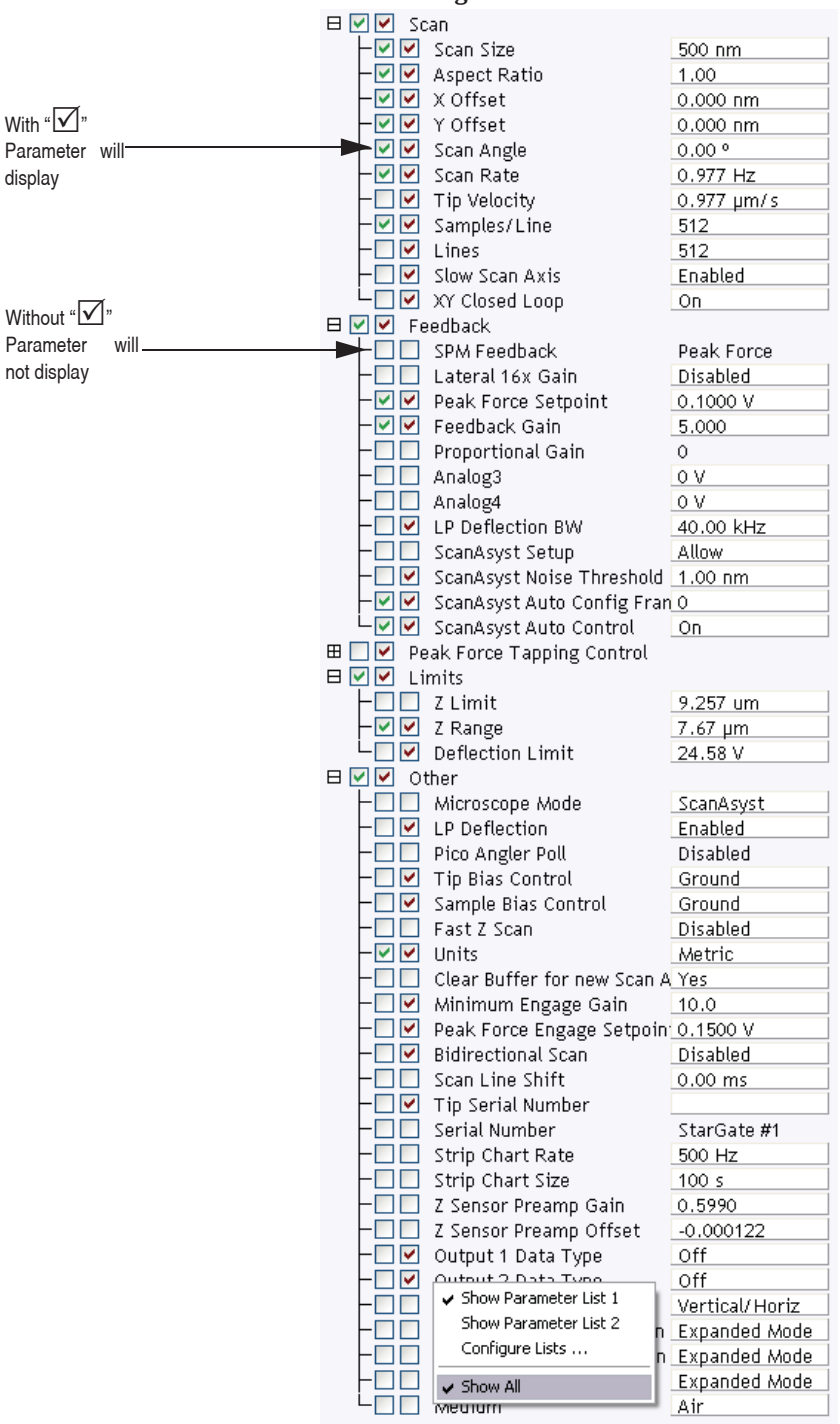
4. Right-click in the **Scan Parameter List** panel and select **SHOW ALL**, shown in Figure 9.8e.

Figure 9.8e Select **SHOW ALL** items



This makes all **Scan Parameters** visible along with two check boxes, the left, green, check box for the **SIMPLE MODE** and the right, red, check box for the **EXPANDED MODE**. See Figure 9.8f.

Figure 9.8f Enable Parameters



The checked ☑ parameters display in normal Real-time mode while those parameters without a ☑ will not display in normal Real-time mode.

Check the parameters that you want displayed and right-click in the **Scan Parameter List** and select **SHOW ALL** items to hide the unchecked parameters. The panel will once again appear in normal Real-time mode.