Updated 4/12/2023 by R. Hilger

Acquiring Force Curves with the Asylum Cypher AFM

These instructions are intended to be carried out immediately after acquisition of a topographical image in either acoustic or contact mode. Instructions for topographical imaging are not presented here.

1. If not already done, remove the tip from the surface of the sample by clicking *Engage panel* → *Withdraw* then *Move to Pre-Engage*

2. Put the microscope in contact mode by clicking *Master panel* → *Imaging Mode* → *Contact*

3. Calibrate tip:

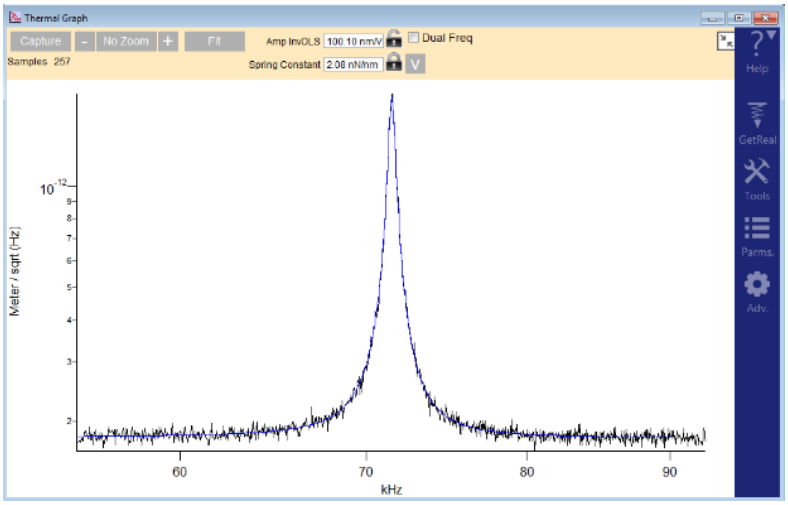
    a. Click *Thermal* button along bottom of software to open the *Thermal Graph* window

    b. Click *GetReal* on right side of *Thermal Graph* window

    c. Enter the data for your probe (length, width, frequency, etc.) in *Probe* window

    d. Click *Thermal Graph* window → *GetReal Calibration* (may have to press it twice if it gives you an error). Your calibration results should resemble the figure below.

    e. Close *Thermal Graph* window



4. Set up the force curve display by clicking *Master Panel* → *Force* tab → *Channels*

    a. Under *Graph1*, select *ZSensor* for *X* and *Force* for *Y*. Also make sure *Force* is checked in the *Save* column.

b. Uncheck any other *Y* values under *Graph1*

c. click *Do it* in *Graph1* column

5. Set maximum force applied to sample:

   a. Click *Master Panel* → *Force tab* → *Trigger Channel* → select *Force*

   b. *Master Panel* → *Force tab* → *Trigger Point* is max force; default value depends on tip calibration

6. Put tip back on the surface by clicking *Engage Panel* → *Start Tip Approach*

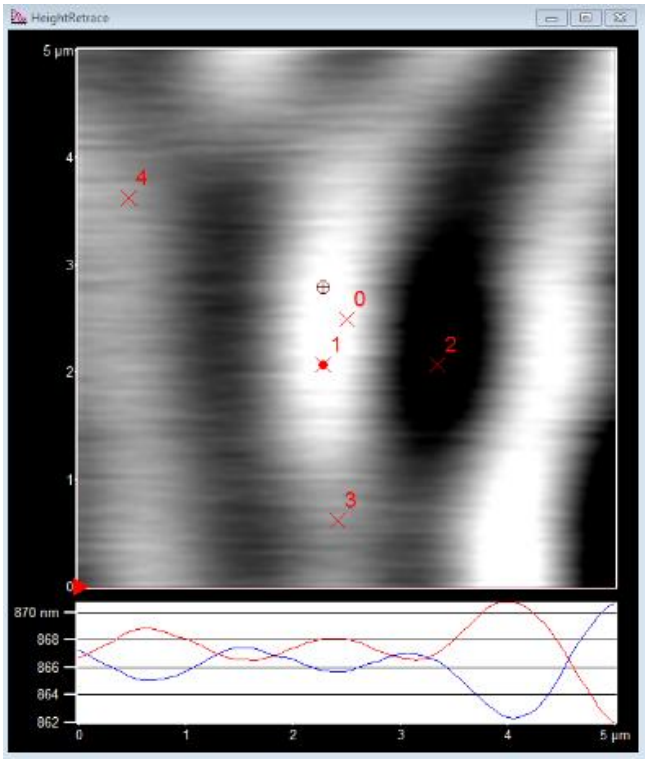
7. Select point(s) on image to acquire force curves:

   a. Click *Master Panel* → *Force* tab → *Go There* tab → Check *Show Markers*

   b. Drag the crosshair marker on the image to the location where you would like to acquire a force curve (see figure below)

   c. Click *Master Panel* → *Force* tab → *Go There* tab → *Pick Point*

   d. Repeat b and c for all additional points on the image where you want to collect force curves. Note: after you pick the first point, the *Pick Point* button changes to *That's it!*



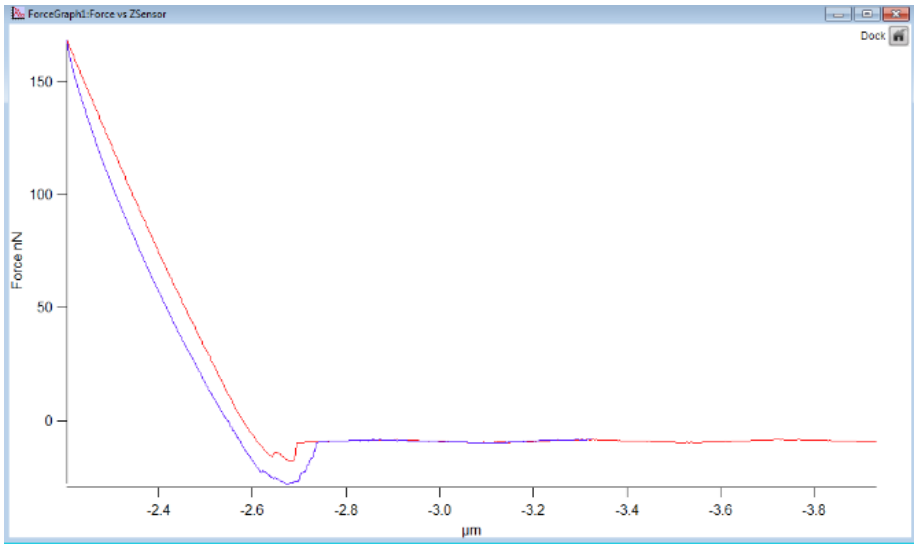
8. Acquiring force curves:

    a. Select the location where you want to acquire a force curve by clicking *Master Panel* → *Force* tab → *Go There* tab → *Spot Number*

    b. Move the AFM tip to the selected location by clicking *Master Panel* → *Force* tab → *Go There* tab → *Go There*. The location of the AFM tip is indicated by the red dot on the image.

    c. To acquire a force curve, click *Master Panel* → *Force* tab → *Go There* tab → *Single Force*. An example of a force curve is shown below.

    d. Repeat a-c for all locations where you want to acquire force curves



9. Fitting force curves to elasticity models:

    a. Click Menu bar → *AFM Analysis* → *Master Force Panel*

    b. Select your data folder in the window that pops up

    c. On the *Display* tab, click one of the force curves to open it

    d. On the *Elastic* tab, click the tab that corresponds to your desired model: Hertz, DMT, JKR, or Oliver-Pharr. On the *Force Review Graph*, the dashed black line shows the model's fit to the data.

    e. Enter the *Model Assumptions*. The tip geometry and sample poisson are of particular importance. The results are shown on the right side of the *Master Force Panel*

10. Exporting force curve data:

    a. Click *Force Review Graph* → *Edit* then click on the table that opens

    b. Click *Menu bar* → *File* → *Save Table Copy*

11. Acquiring force maps (force curves in a grid pattern over a surface):

    a. Click *Master Panel* → *Fmap* → *Scan* tab and set the desired parameters including *scan size*, *XY velocity*, *force points* and *force lines*. Enter a *Base Name* for your map.

    b. Click *Do FMap* button to acquire the map.