Thermal K – Cantilever's Spring Constant Measurement

August 15, 2007
3pm – 5pm
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[Objective]

1. Able to use the thermal K software and measure the spring constant of a cantilever.

[Schedule]

3:00 pm – 3:15 pm Brief demo
3:15 am – 5:00 pm Hands-on measurements for each group

[Material used in the lab]

- TR800PSA or other used cantilevers
- Cantilever spring constant calibration module (N9470A-FG)
- 5500 AFM with a small scanner

[Recommended sample standard]

- Mica for sensitivity measurement

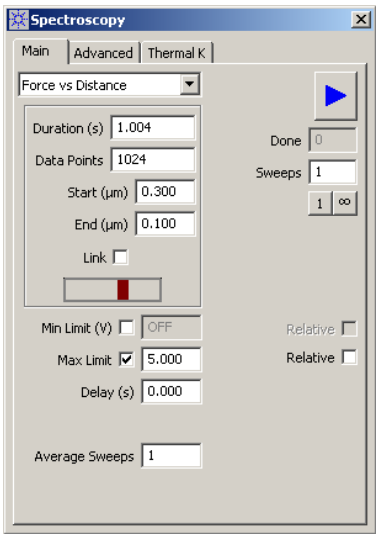
[Lab]

Spring constant measurement

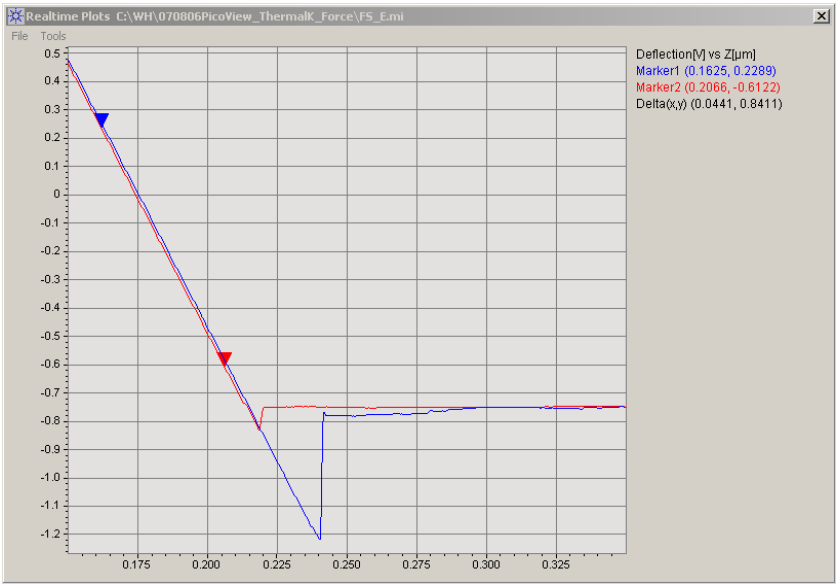
Get familiar with measuring cantilever's spring constant using PicoView software.

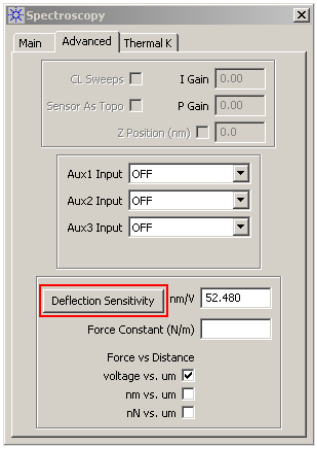
Basic procedures

1. Measuring deflection sensitivity



After engage the tip, open Spectroscopy window. Select Force vs Distance. Enter Start and End points, Duration, Data points, and Max Limit. Click on Start (the blue arrow). A force curve should appear in the Realtime Plots window, as shown below. Move the two cursors on the contact part of the approach (red) curve. Click on Advanced tab in the Spectroscopy window, and then click Deflection Sensitivity. A calculated sensitivity is automatically entered.



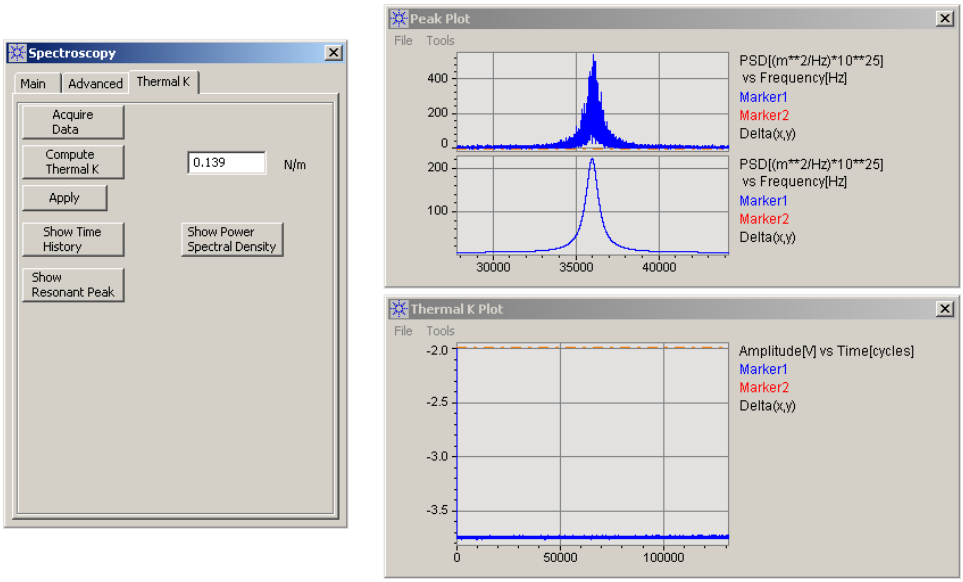


2. Withdraw the tip 50 to 100 µm away from the surface.

3. Measuring the spring constant

Click on Thermal K tab in the Spectroscopy window, and then on Acquire Data. After acquisition is finished, Thermal K Plot window and Peak Plot window open up automatically. In thermal K Plot window, a thermal spectrum over the entire frequency range is plotted. In the Peak Plot window, the thermal peak raw data is

shown on the top, and a best-fit peak profile is plotted at the bottom. Click on Compute Thermal K in the Spectroscopy window. A calculated spring constant of the cantilever should be entered automatically.



Tips and hints

Because the contact mode force curve is required in order to obtain sensitivity, it is better to measure the cantilever's spring constant after all data acquisition with the same cantilever is finished.

Because the measured spring constant is strongly affected deflection sensitivity, a reliable sensitivity measurement is very important in getting reasonable spring constant.