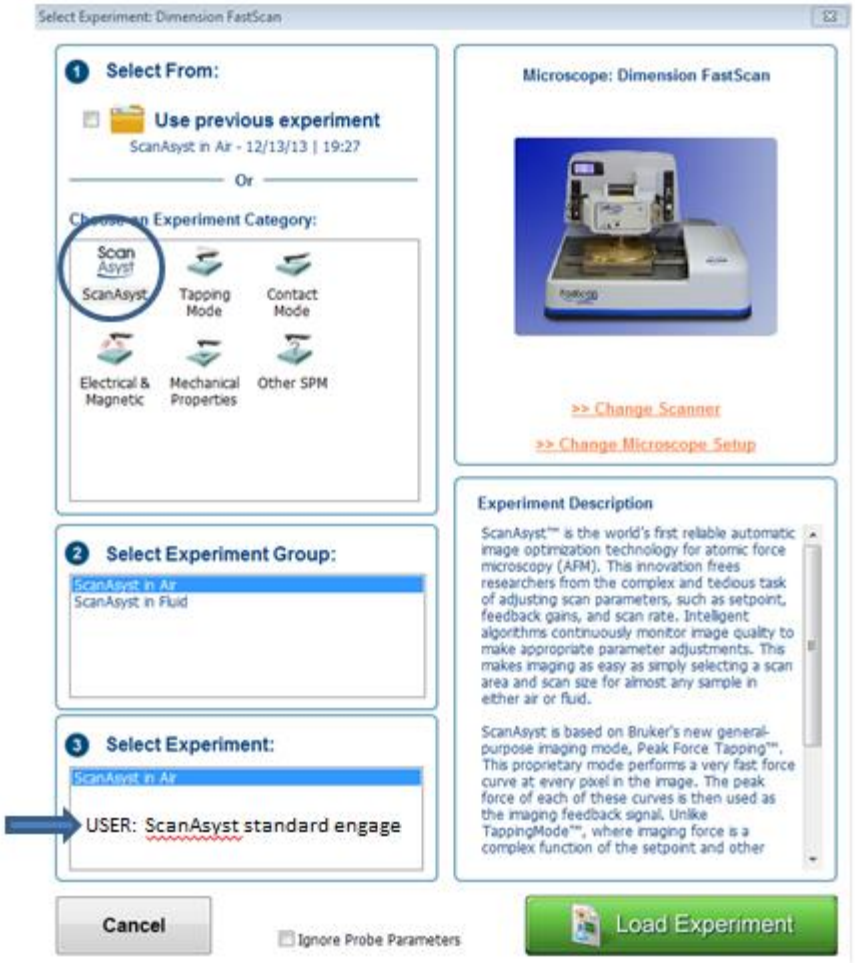
FASTSCAN AFM CHEAT SHEET

If you are starting from the Windows desktop, look for the “NanoScope” program in the task bar at the bottom of the screen. Otherwise, fire up the control program from the icon found at the upper-left of the desktop.

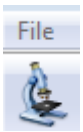
Choose your “experiment” which typically will be ScanAsyst (in part 1), ScanAsyst in Air (part 2), and “… standard engage” in part 3.

If the tip holder is not attached then you’ll get an error message box that says, “Warning: The Z Scanner is not attached…” You can dismiss this box and attach the tip later.

Be sure to choose “…standard engage”

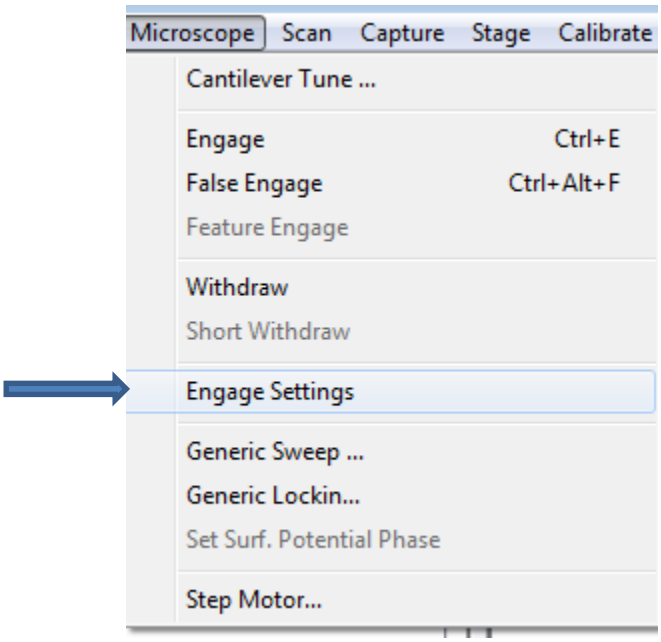


IF THE CONTROL PROGRAM IS ALREADY RUNNING then you can get to this experiment selection box by clicking on the microscope icon in the upp-left corner:



CHECK THAT THE ENGAGE SETTINGS ARE CORRECT

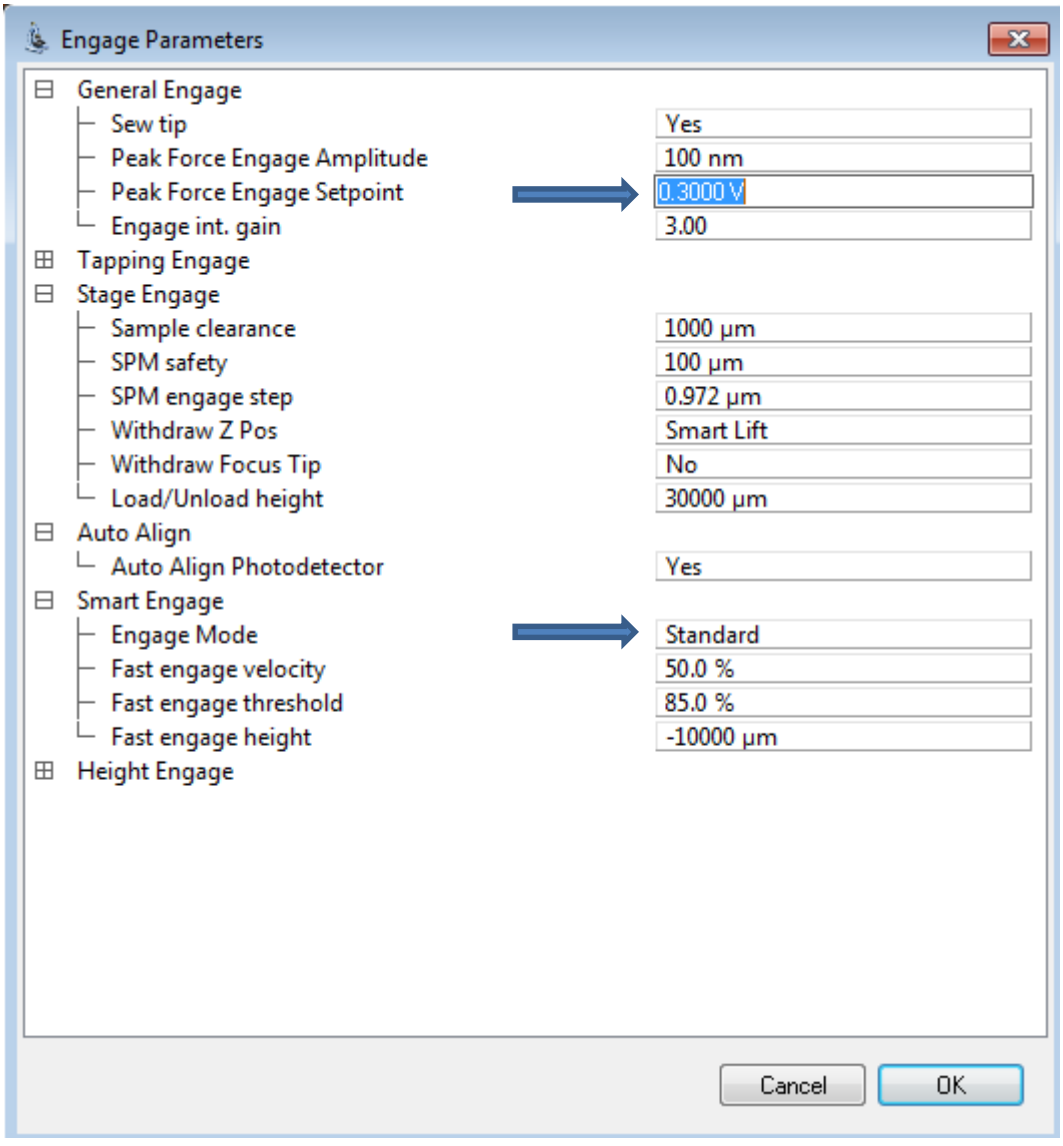
From microscope→engage settings,



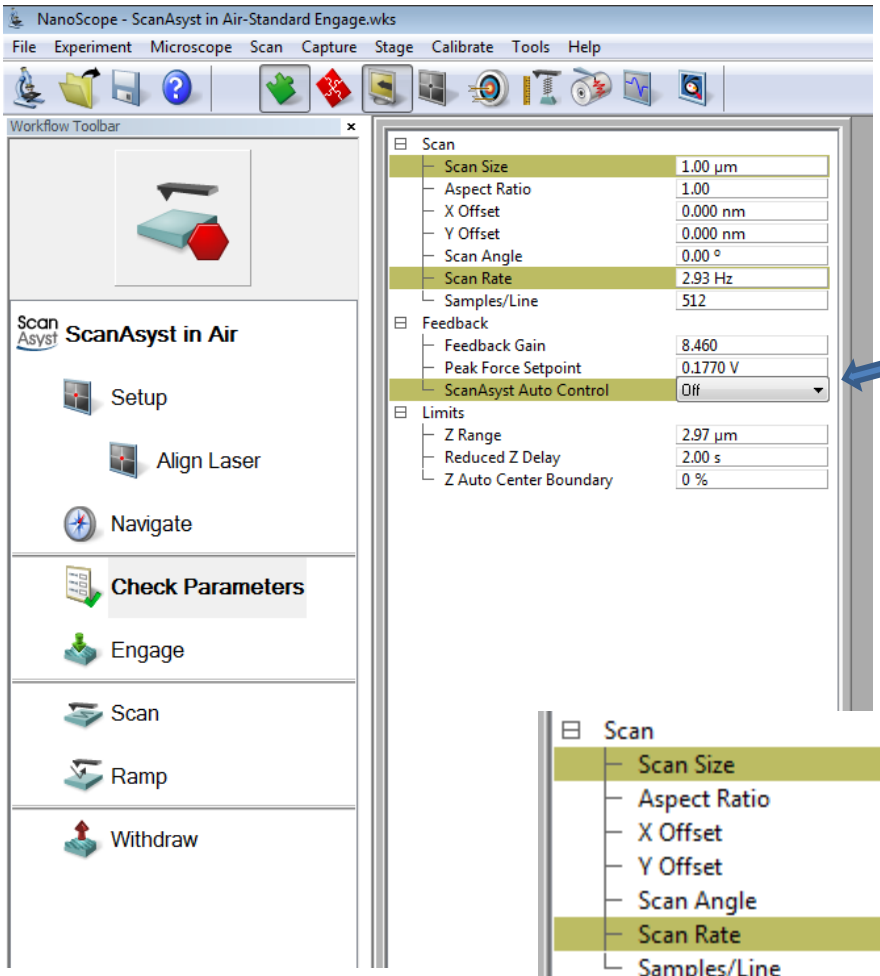
Change the peak force engage setpoint to 0.3V if you want to press a bit harder. 0.15V is also fine.

Set the engage mode to "standard".

The default engage mode is "smart", which is not actually smart at all.

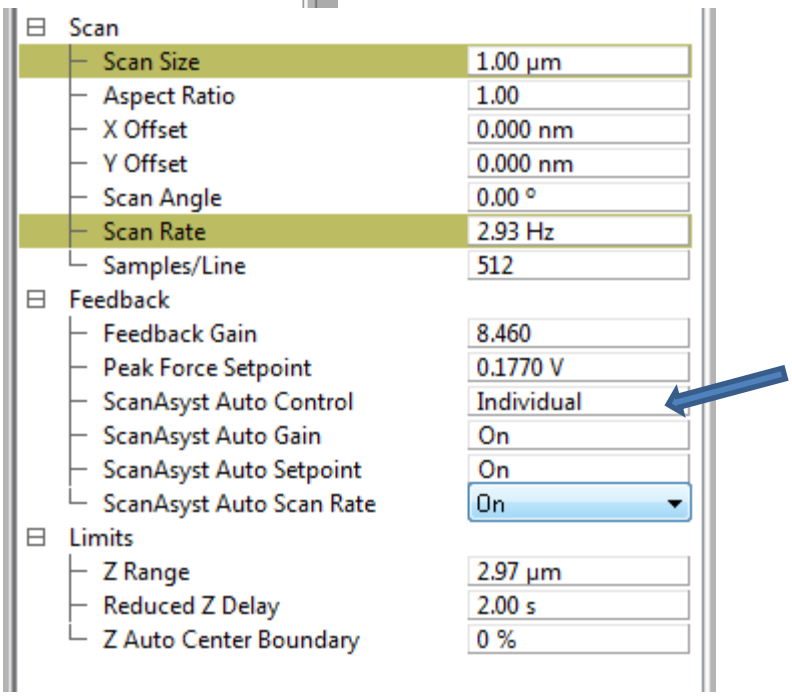


MAKE SURE FEEDBACK AUTO CONTROLS ARE ALL **ON**



From “Check Parameters”, look at “Feedback → ScanAssyt Auto Control”. Make sure it is set to “on” or “individual”.

Here we see it was set to “off”, which is bad.

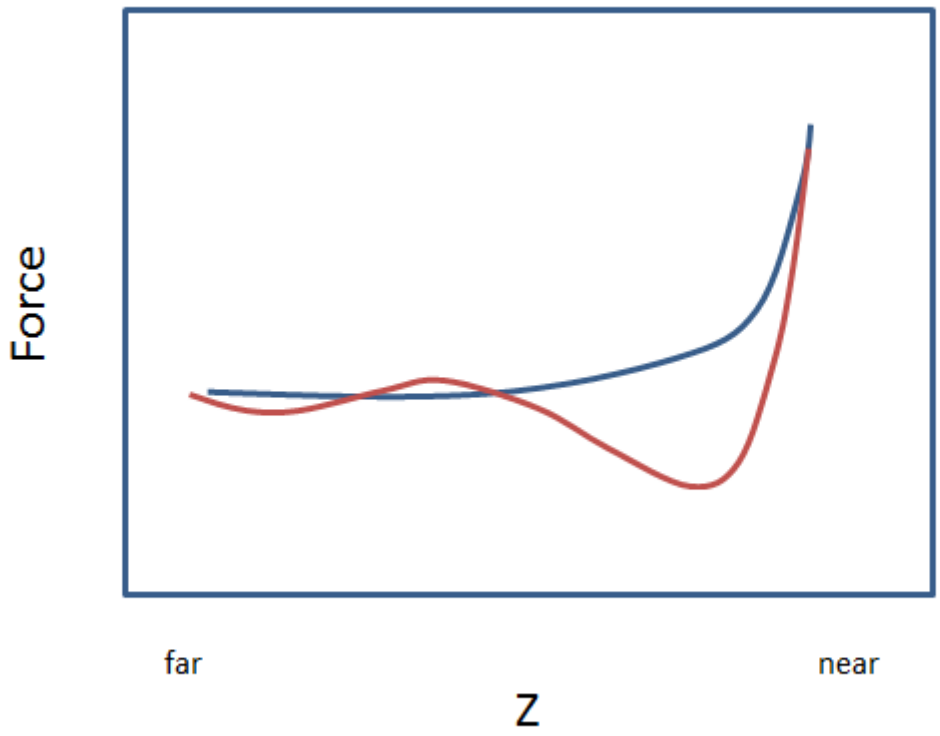


Set “ScanAsyst Auto Control” to “Individual” and then set “Auto Gain”, “Auto Setpoint” and “Auto Scan Rate” all ON.

Later you might decide to turn them off so that you can use manual control, but for now set them on.

ONCE THE TIP IS ENGAGED,

WE HOPE THE FORCE CURVE WILL LOOK SOMETHING LIKE THIS:



TIPS FOR USING NANOSCOPE ANALYSIS

CONTRAST & BRIGHTNESS

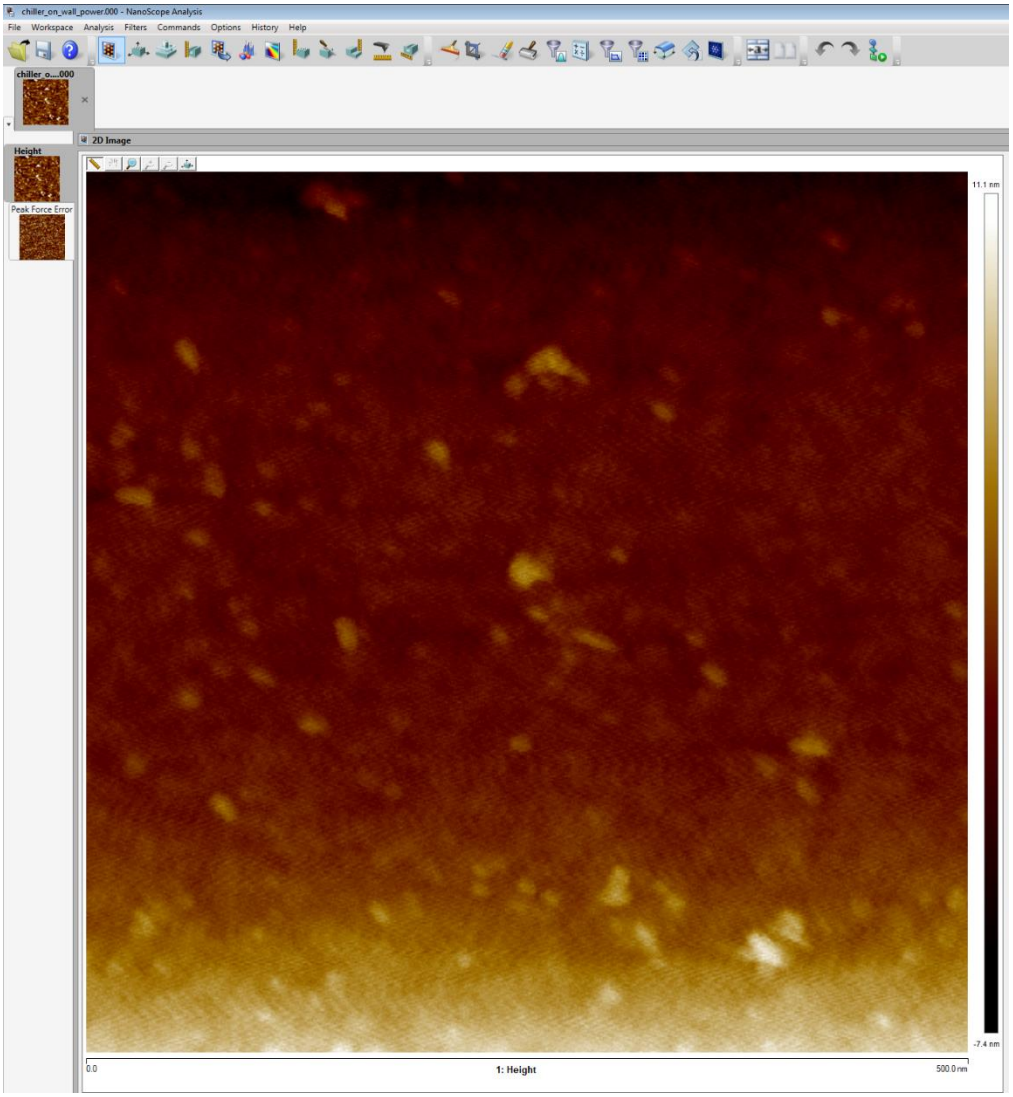
Commands → Adj image color scale → modify data scale

SAVE JPEG OR TIFF

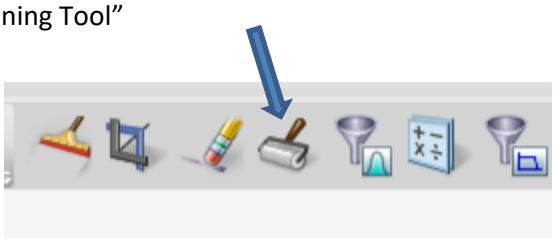
Analysis → Journal quality export

IMAGES ARE AUTOMATICALLY LEVELED WITH A 2D PLANE FIT

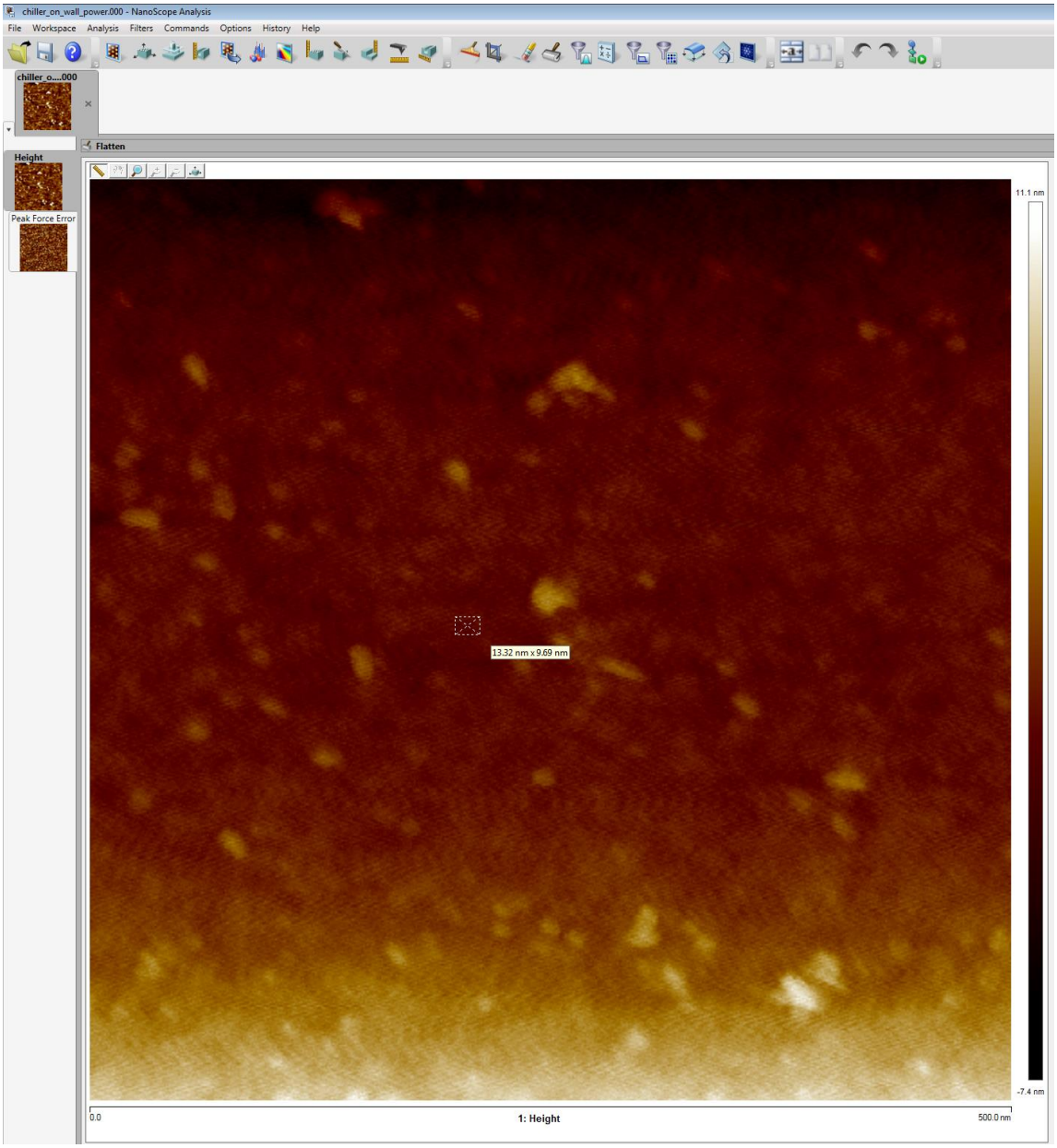
BUT SOMETIMES THIS LEVELLING IS BAD, LEAVING A CURVE ON THE IMAGE; FOR EXAMPLE:



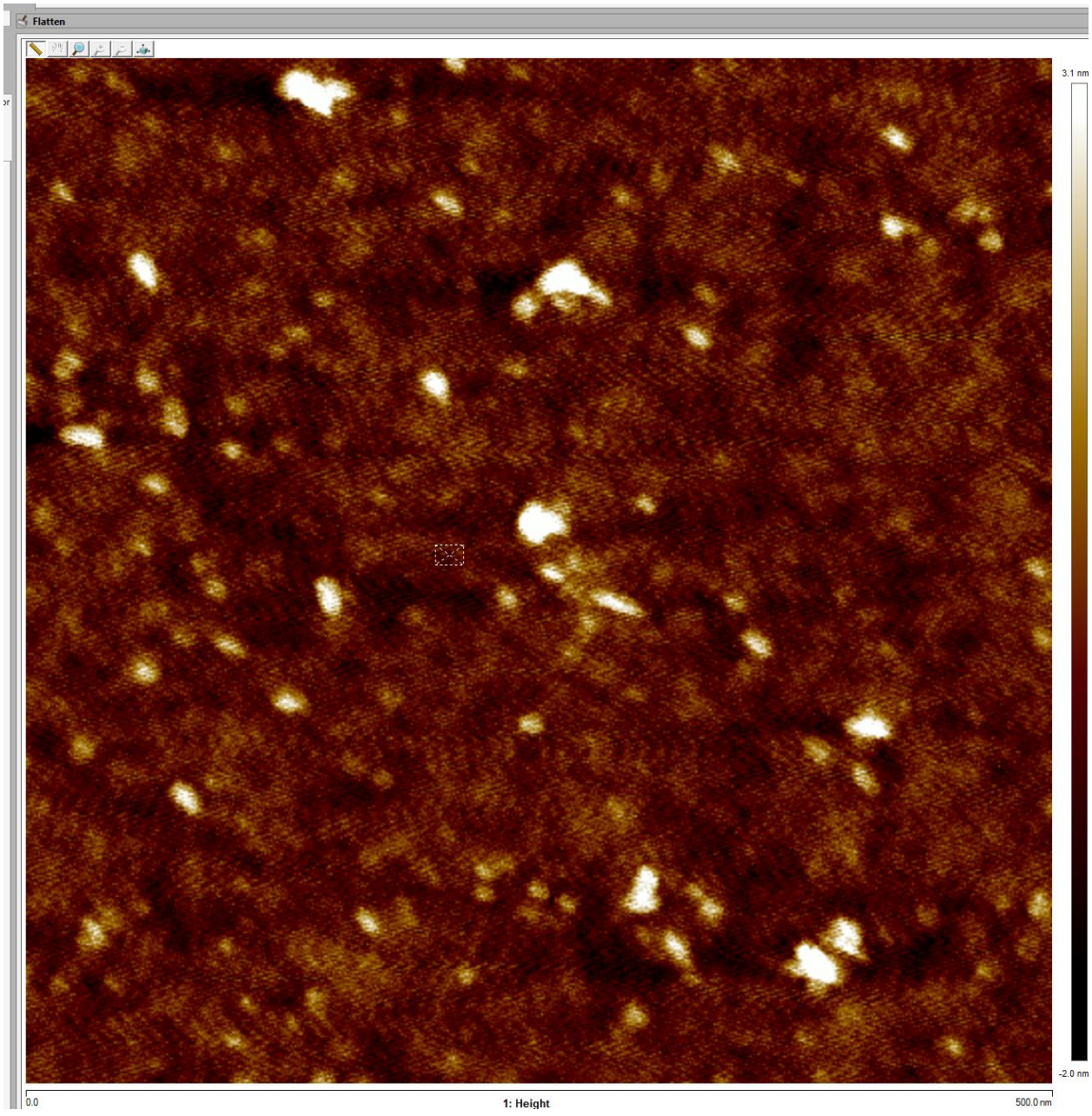
You can re-do the levelling by choosing the “Flattening Tool”



Draw a SMALL box on the image, and then click “Execute”



The image now looks like this:

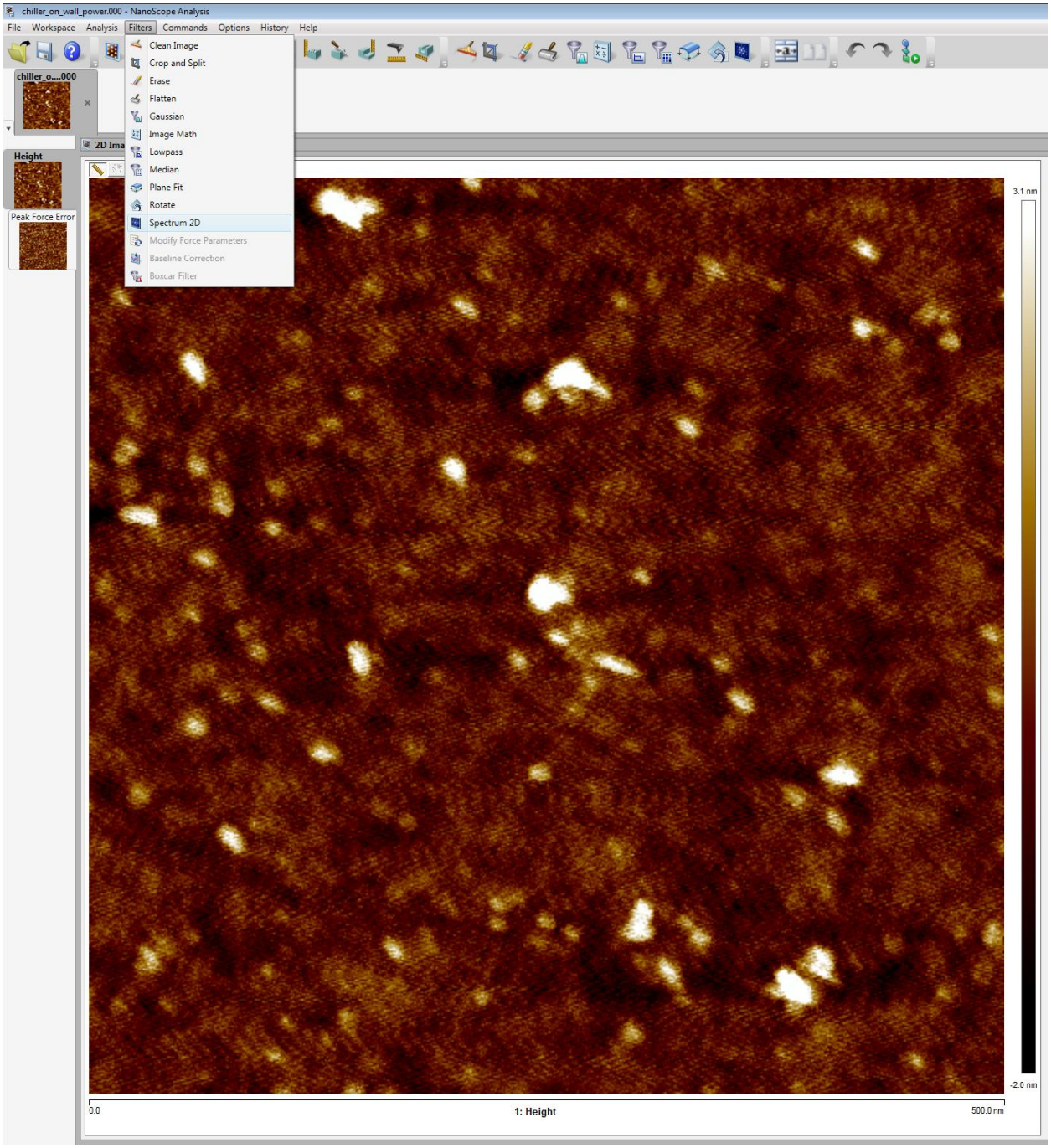


Finally, get rid of that little box by clicking on the 2D image button at the upper-left of the screen.

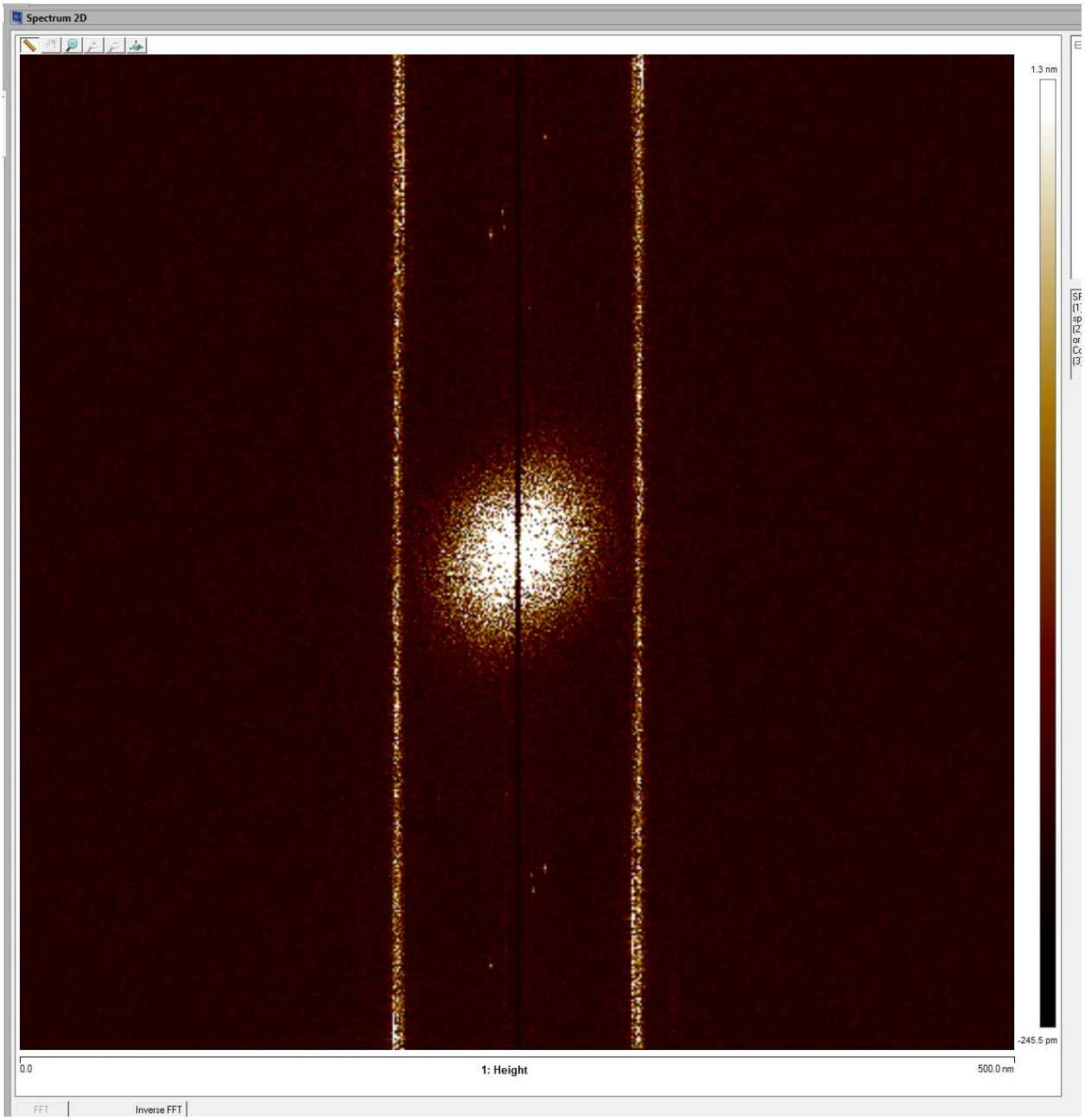
Very nice so far, but this image has some nasty noise at 60 and 120 Hz. Now let's see how we can…

FILTER NOISE OUT OF AN IMAGE

Choose Filters → Spectrum 2D

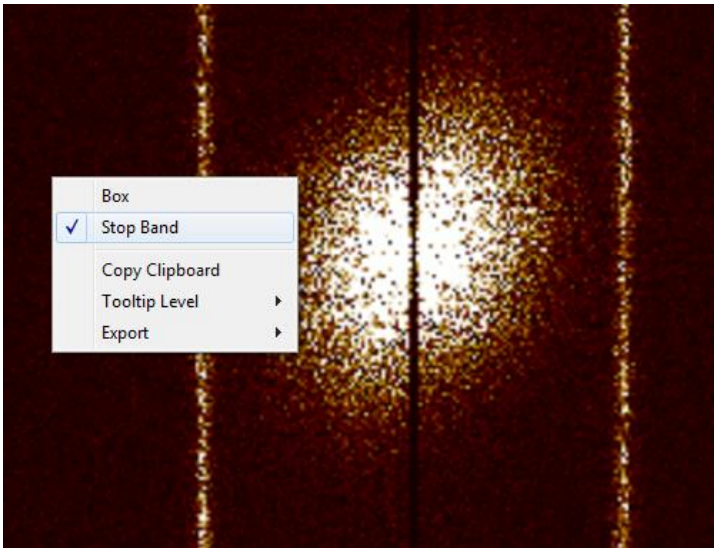


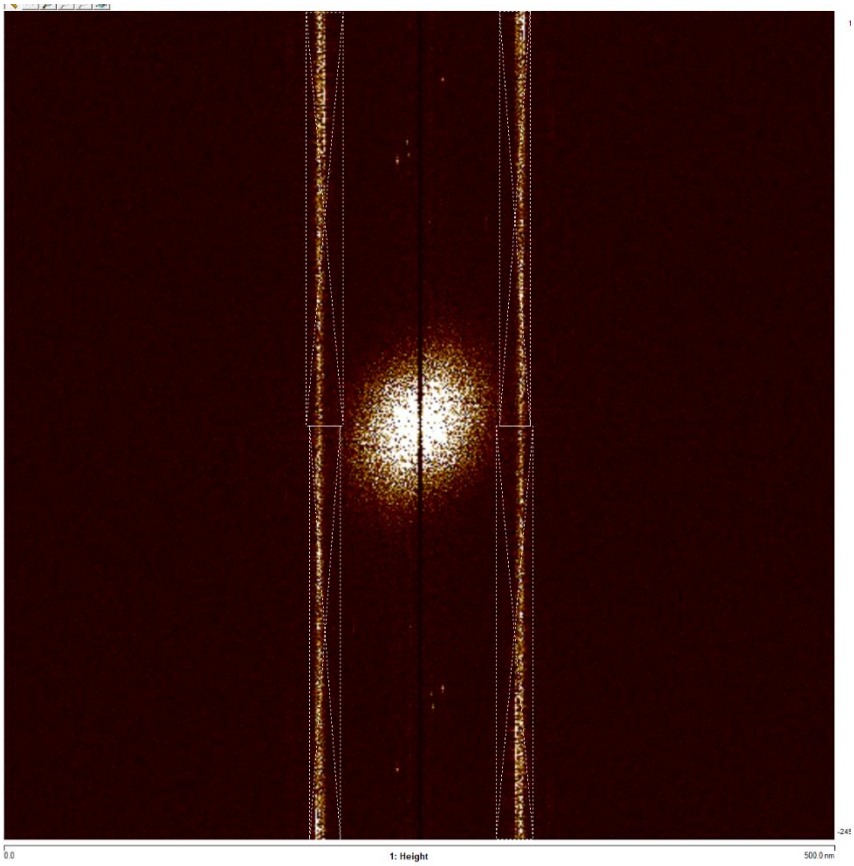
Then click on “FFT” at the bottom of the image to see the Fourier transform:



We want to get rid of those vertical bands, which in this example are at 120 Hz. If you set the scan rate to a lower value (e.g. 1 Hz) then these bands will move farther away from the center.

Now we define a “stop band” filter. First RIGHT click on the Fourier transform to make sure the filter type is set to “Stop Band”



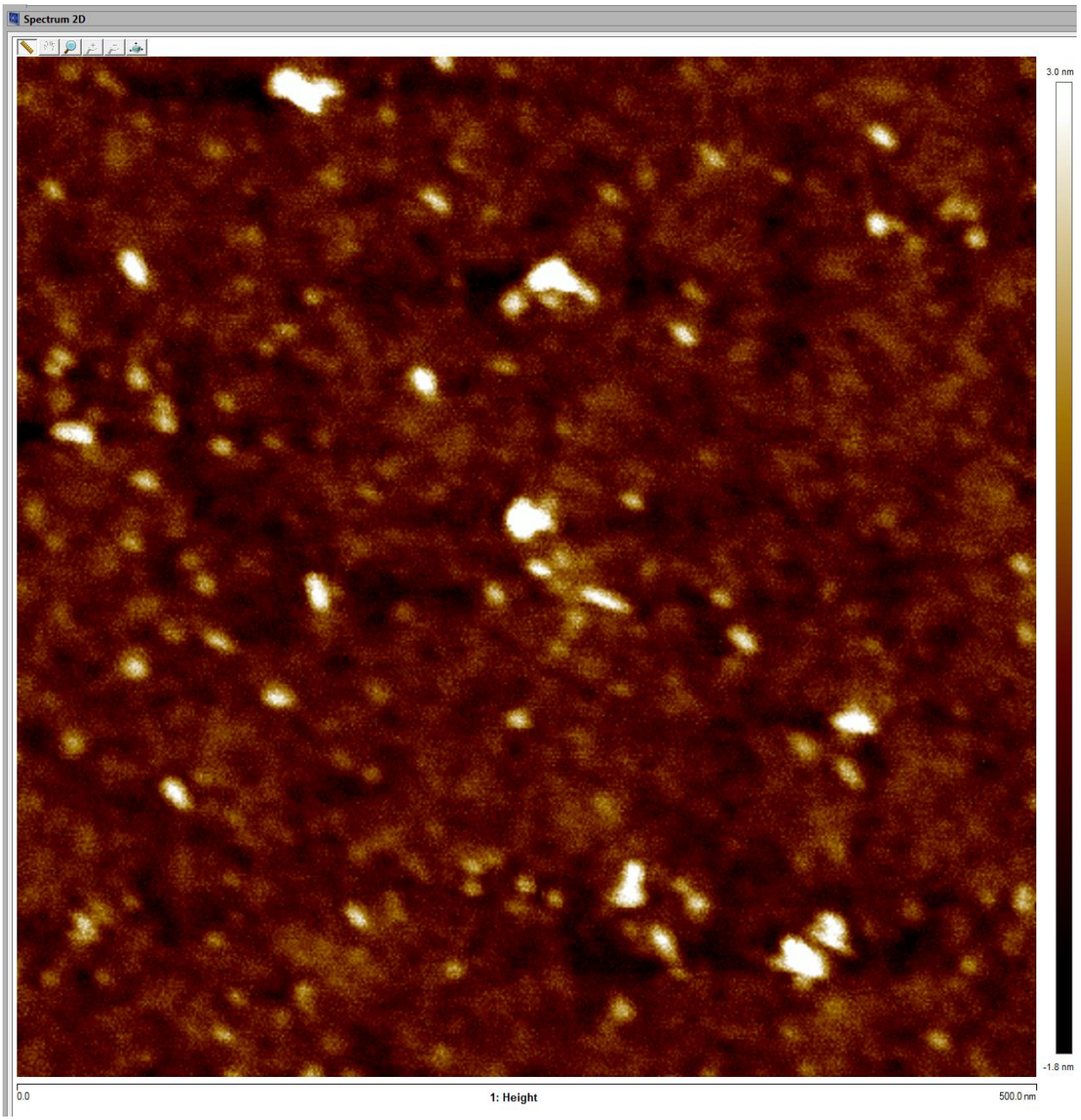


Next, draw rectangles around those vertical stripes. The program will automatically copy your rectangle to the other side of the FFT, just to be helpful – the transform is symmetric and redundant.

You will have to draw at least two rectangles to cover both of those vertical noise bands.

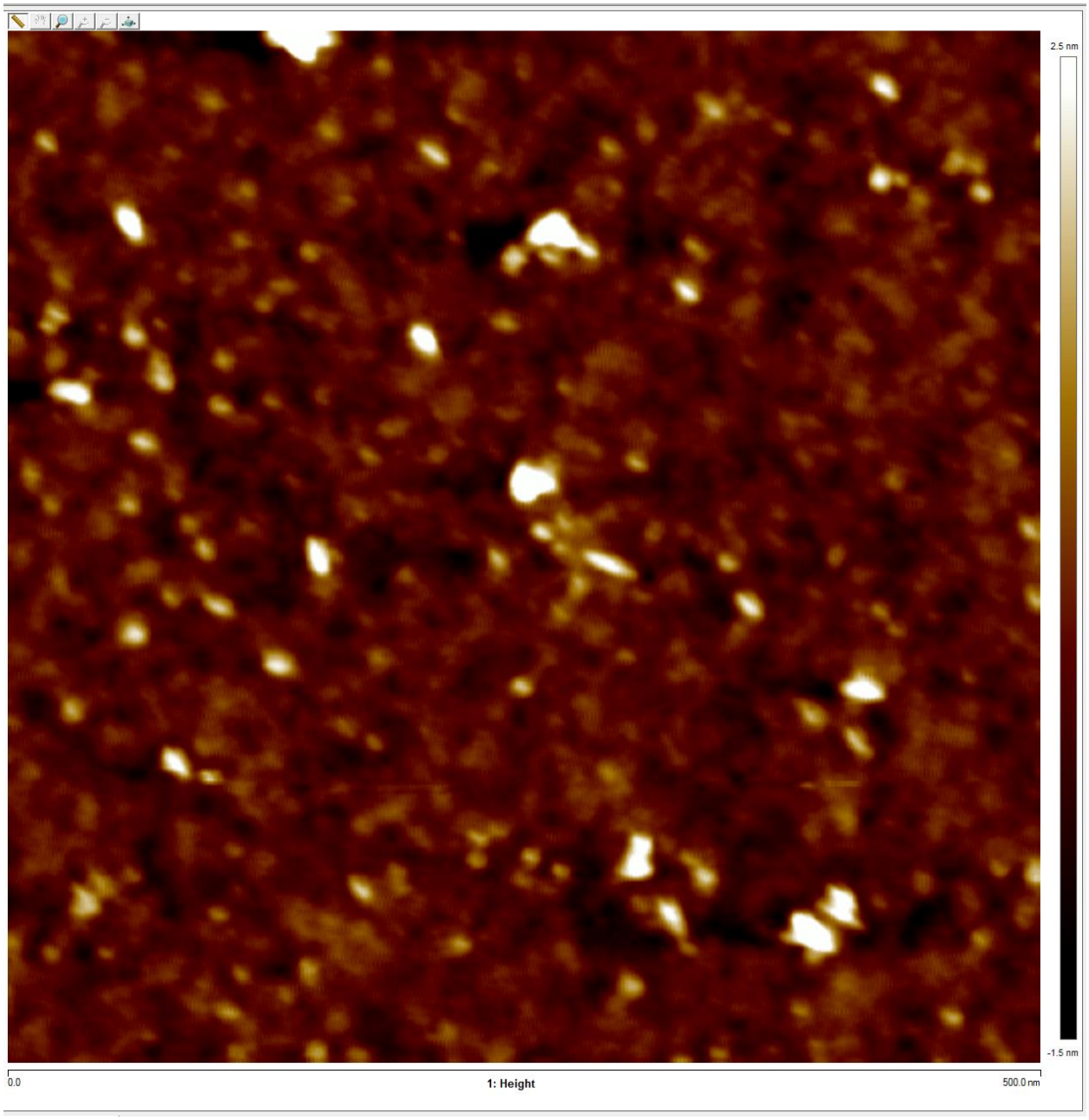
Now click on “Inverse FFT” at the bottom, to see the filtered image.

After clicking on “Inverse FFT” this image looks like this:



Very nice, but this is not the only way you can get a cleaner image.

Alternatively, you could use a much lower scan rate; for example 0.5 Hz. Then the 120 Hz noise will appear much farther away (in spatial frequency) from the rest of the image, and so you can simply apply a low-pass filter (from the “Filters” menu of course).



It took a lot longer to get the image, but it’s much nicer.

By the way, these are images of a glass microscope slide. It’s amazing that this material is optically transparent! Glass is remarkable.