JPK NanoWizard III

Cantilever loading manual

General cantilever handling

Care needs to be taken when handling cantilevers as they are obviously very fragile. Most general-purpose cantilevers cost around $AUS 20-30 if brought in bulk, and if handled carefully can last over quite a few scans, depending on scanning parameters.

Cantilevers or probes are common terms usually indicating the measuring device as a whole, but there are specific parts, as shown in Figure 1. The chip is the largest part and is the section that is handled with tweezers. The cantilever is the measuring probe which can be seen on the end of the chip if you have very good eyesight or use a magnifying glass. The tip which contacts the sample is very close to the end of the cantilever.

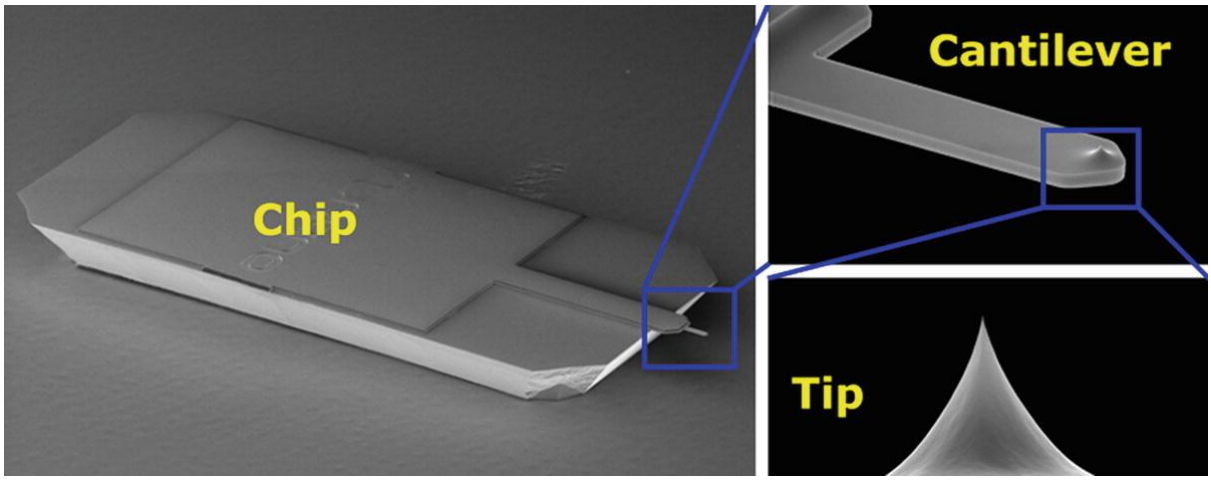

Figure 1: Chip, cantilever, and tip [An, Y., Manuguri, S.S. and Malmström, J., 2020. Atomic Force Microscopy of Proteins. In *Protein Nanotechnology* (pp. 247-285). Humana, New York, NY].

Handling the chip should always be performed with care, handling the sides of the chip with tweezers and not fingers, Figure 2 (a). There are two reasons for this, the device is generally too small to be handled properly, and you risk putting contaminants on the surface which can affect performance. Use undamaged needle tip tweezers (ends not bent) for proper handling, as shown in Figure 2 (b). To avoid damage to tweezer tips they should be placed on any surface as shown in Figure 2 (b) and not tip down to avoid blunting.

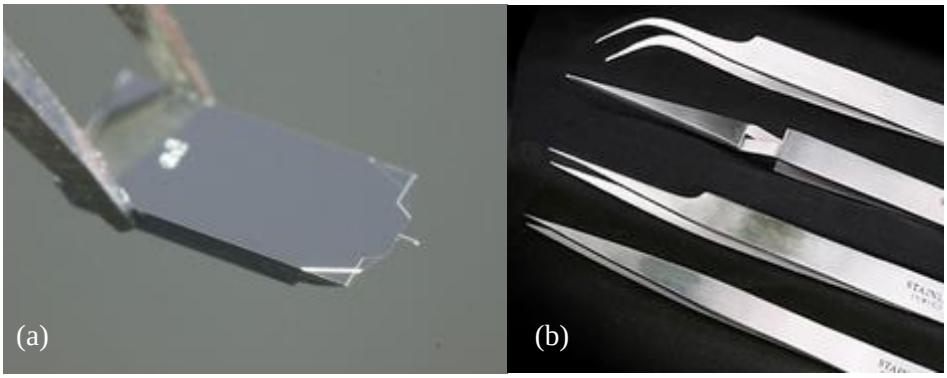

Figure 2: (a) Proper chip handling, (b) Different needle tip tweezers for AFM chip handling [http://probe.olympus-global.com/en/product/omcl_ac240tm_r3/ as of 04/03/20, https://eyelashlab.com/products/tweezer-set as of 04/03/20]

Cantilever loading steps

This is designed for standard cantilever loading in air. Setting up for liquid, electrochemical, Kelvin Probe Force Microscopy, electromagnetic, or specialist set-up consult the main user manual or the Instrument manager.

-Step 1: Place glass cantilever holder in the cantilever changing tool, turn cantilever holder a ¼ turn, and secure with the locking clips. Figure 1.

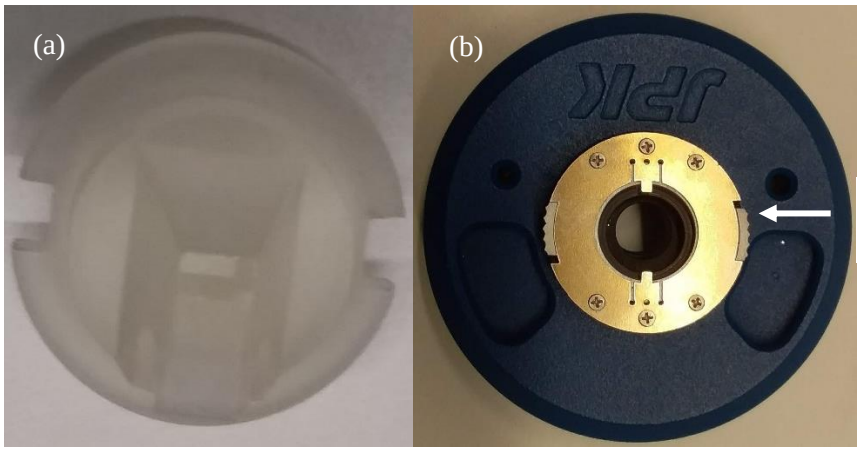

Figure 1: (a) Glass Cantilever Holder, and (b) Cantilever changing tool.

Ensure cantilever holder is facing the right way so that it is level, as shown in Figure 2 (a), and not at an angle as shown in Figure 2 (b) as your cantilever may slide off the holder.

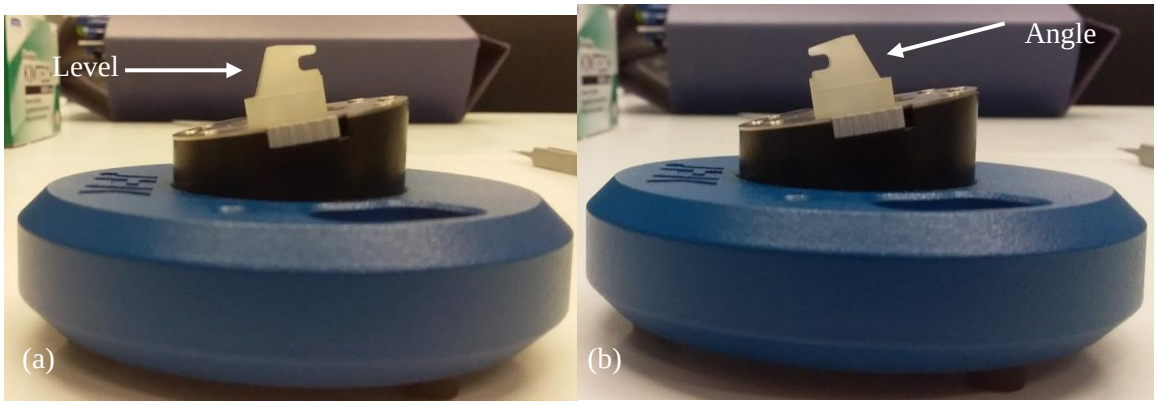

Figure 2: Cantilever holder position (a) correct level position, (b) incorrect angled position.

-Step 2: Place cantilever on top of glass cantilever holder, ensuring cantilever is within optical window, Figure 3.

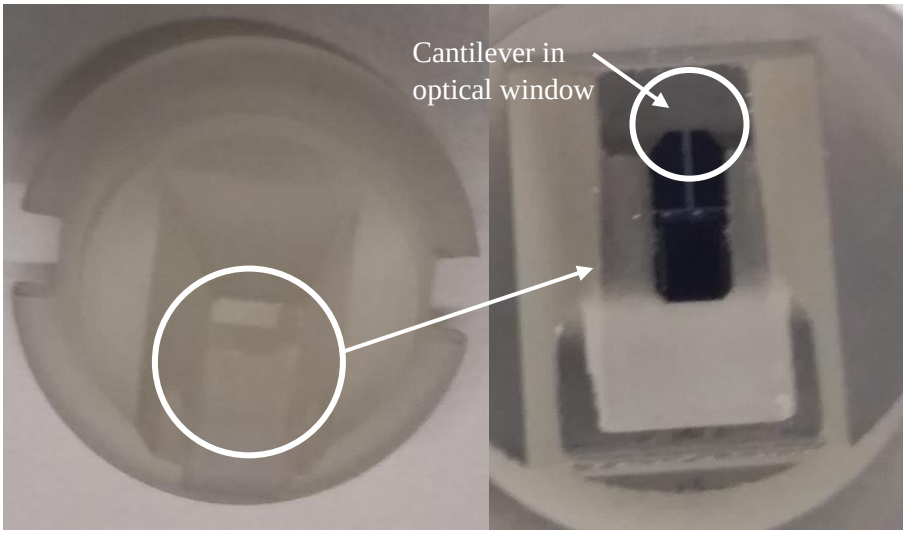

Figure 3: Silicon cantilever on glass cantilever holder, cantilever is placed within optical window.

-Step 3: Using tweezers, hold the cantilever spring clip as shown in Figure 4 (b). This allows you to flex the clip open to place it on the rear of the cantilever holder to clamp the cantilever. Shown in Figure 5.

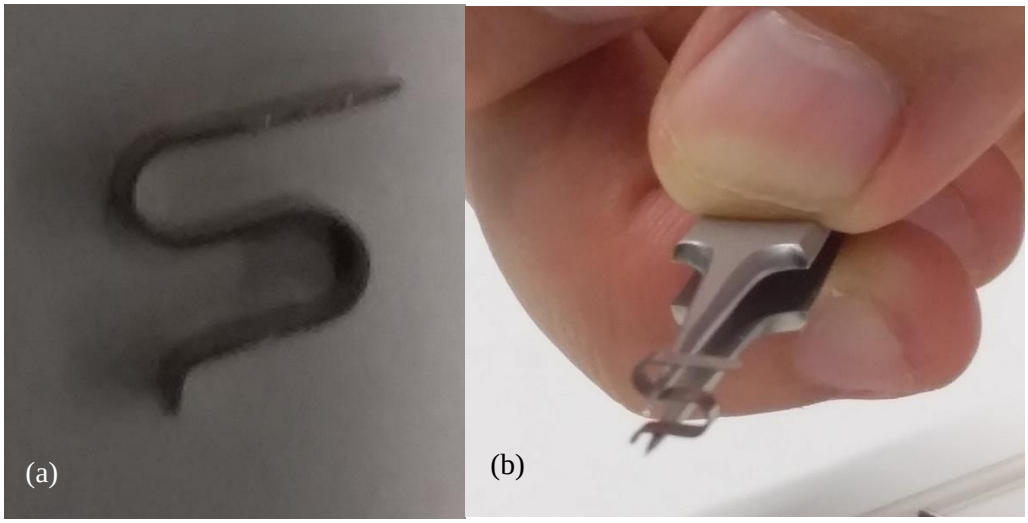

Figure 4: (a) Cantilever spring clip, (b) how to hold the cantilever spring clip.

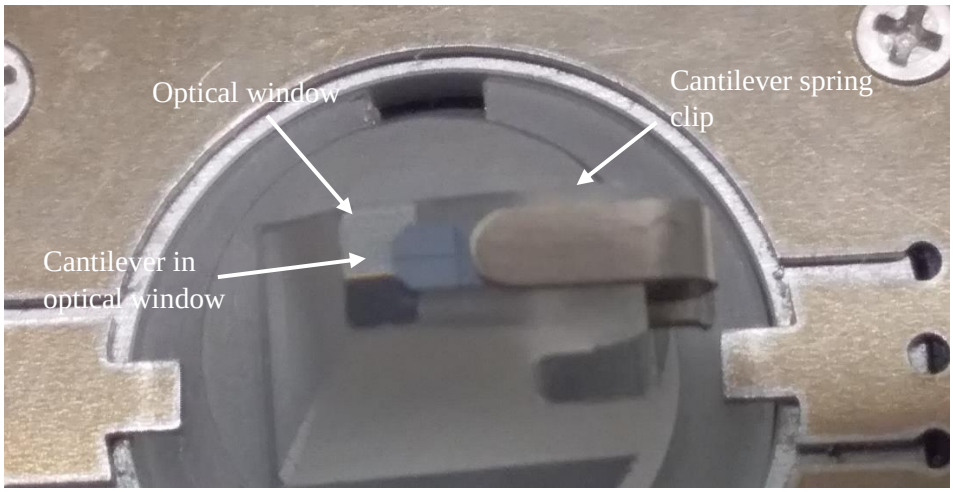

Figure 5: Cantilever on cantilever holder, held in position by cantilever spring clip.

-Step 4: Place glass cantilever holder into AFM Head Unit with cantilever facing up, then turn cantilever holder to the right a quarter turn. The cantilever and cantilever holder should look like Figure 7. Secure the cantilever holder with the locking clips.

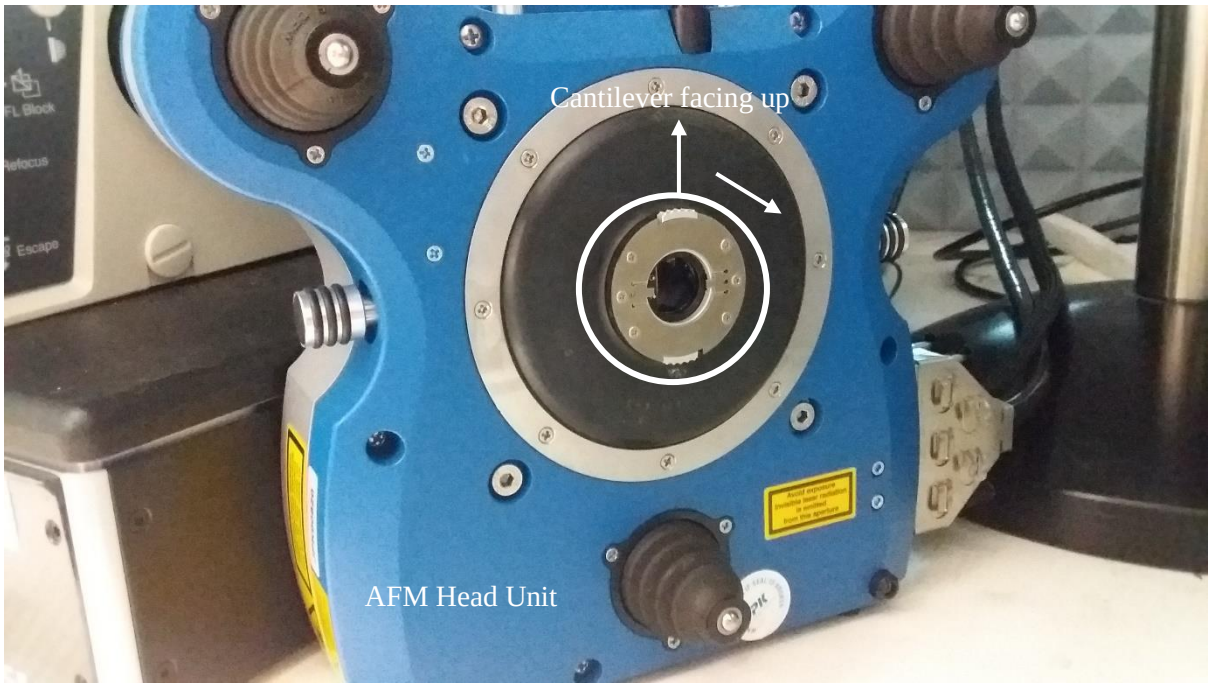

Figure 6: The AFM Head Unit placed on its side.

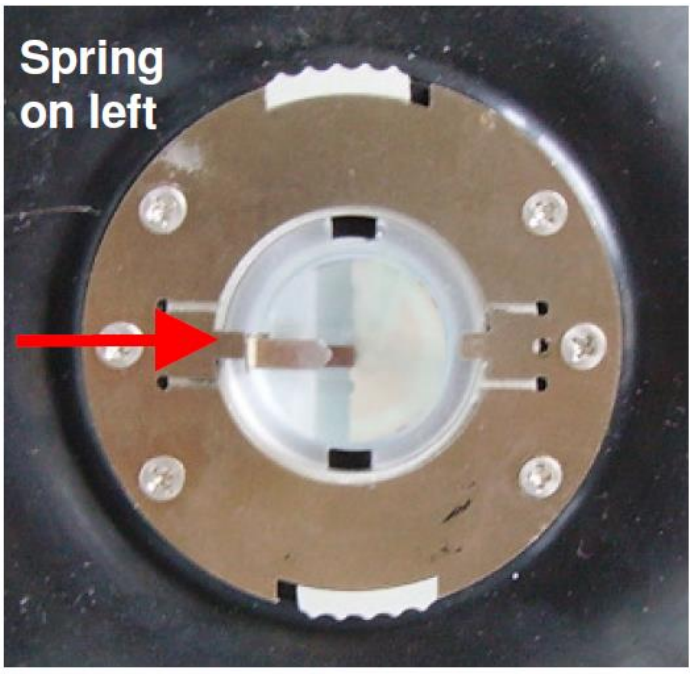

Figure 7: Zooming in to the direction that the cantilever holder should be in.

-Step 5: Place a glass microscope slide onto the X-Y stage and secure with the two metal clips. Place the AFM Head Unit with the cantilever holder secured onto the X-Y Stage, Figure 8. Place the AFM Head Unit rear leg down first, Figure 9, then the right front leg into the gold hole, Figure 10. While

watching the cantilever holder, lower the left front leg ensuring that there is a at least a couple of millimetres spacing, Figure 11.

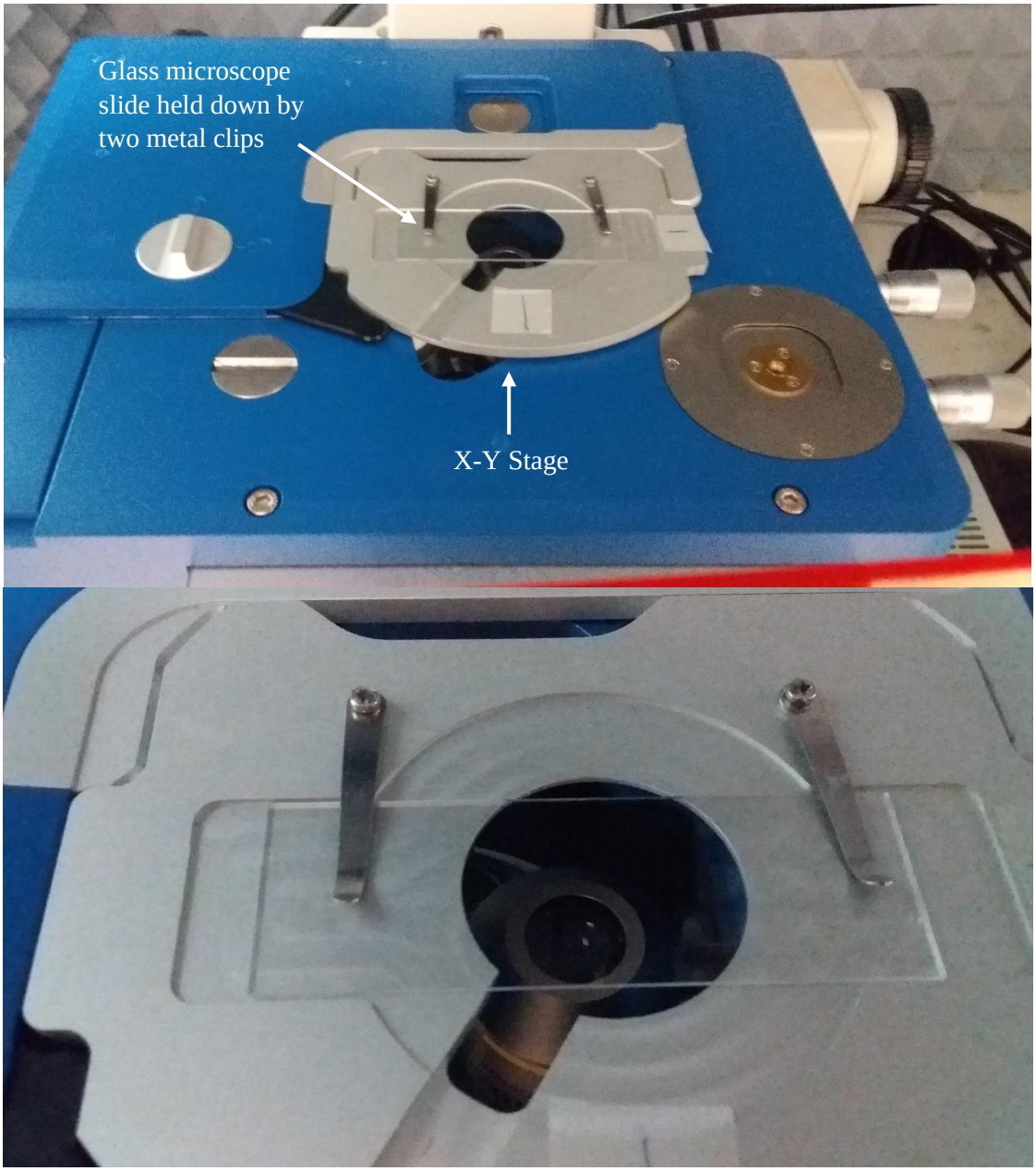

Figure 8: (a) The AFM X-Y stage, (b) Glass microscope slide held down by two metal clips.

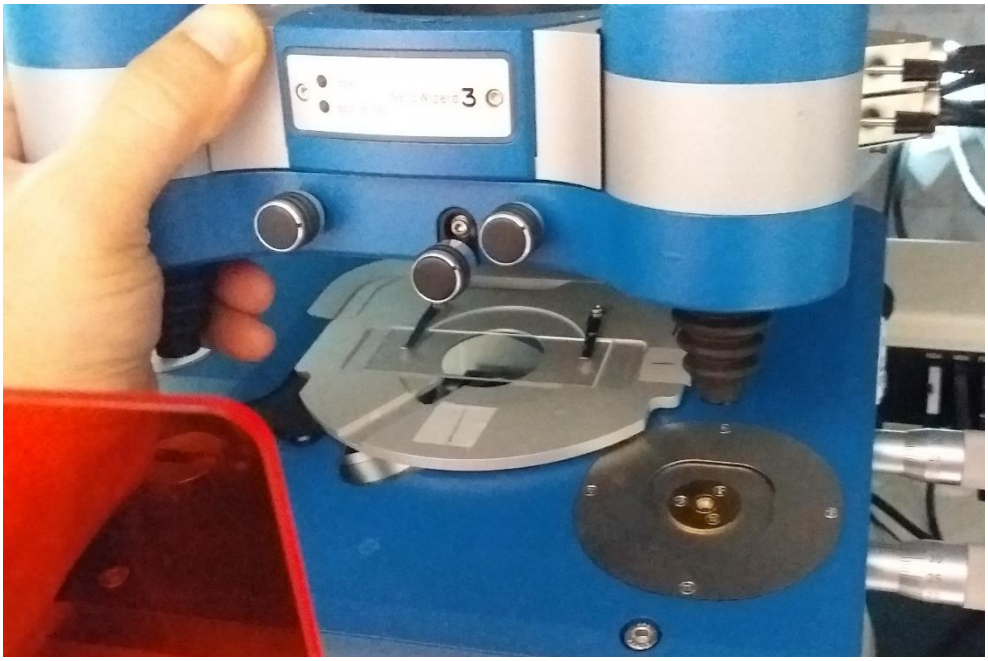

Figure 9: Place the AFM Head Unit rear leg down before the two front legs.

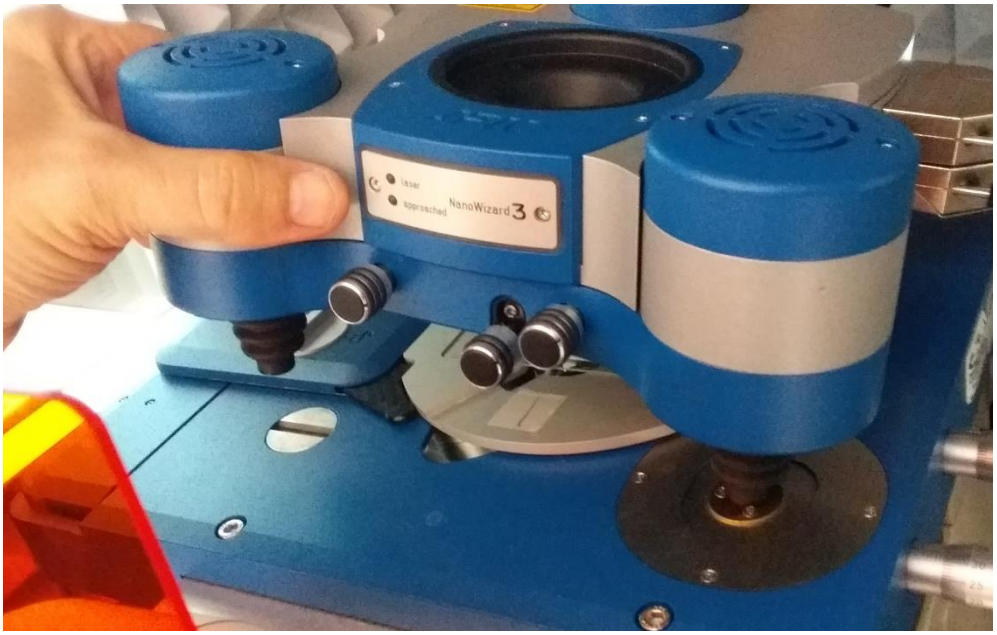

Figure 10: Place the left front leg down last, watching that the cantilever doesn’t hit the glass slide.

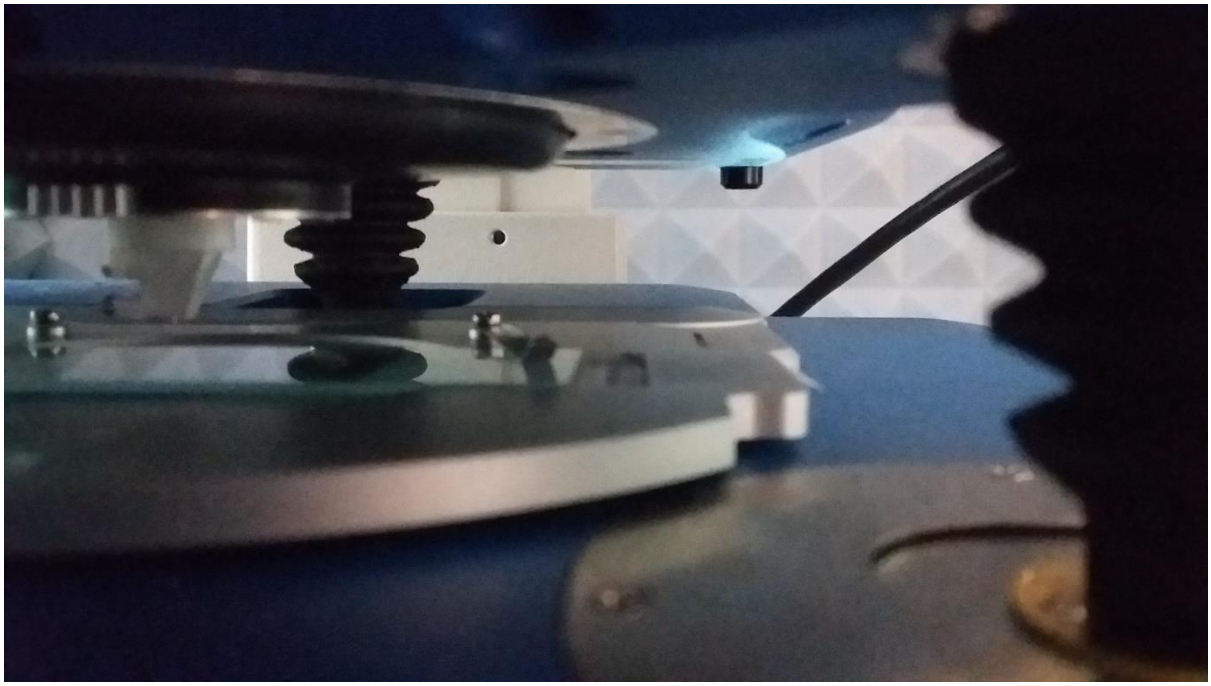

Figure 11: Ensure spacing between the cantilever and glass slide/sample when placing Head Unit on X-Y Stage.