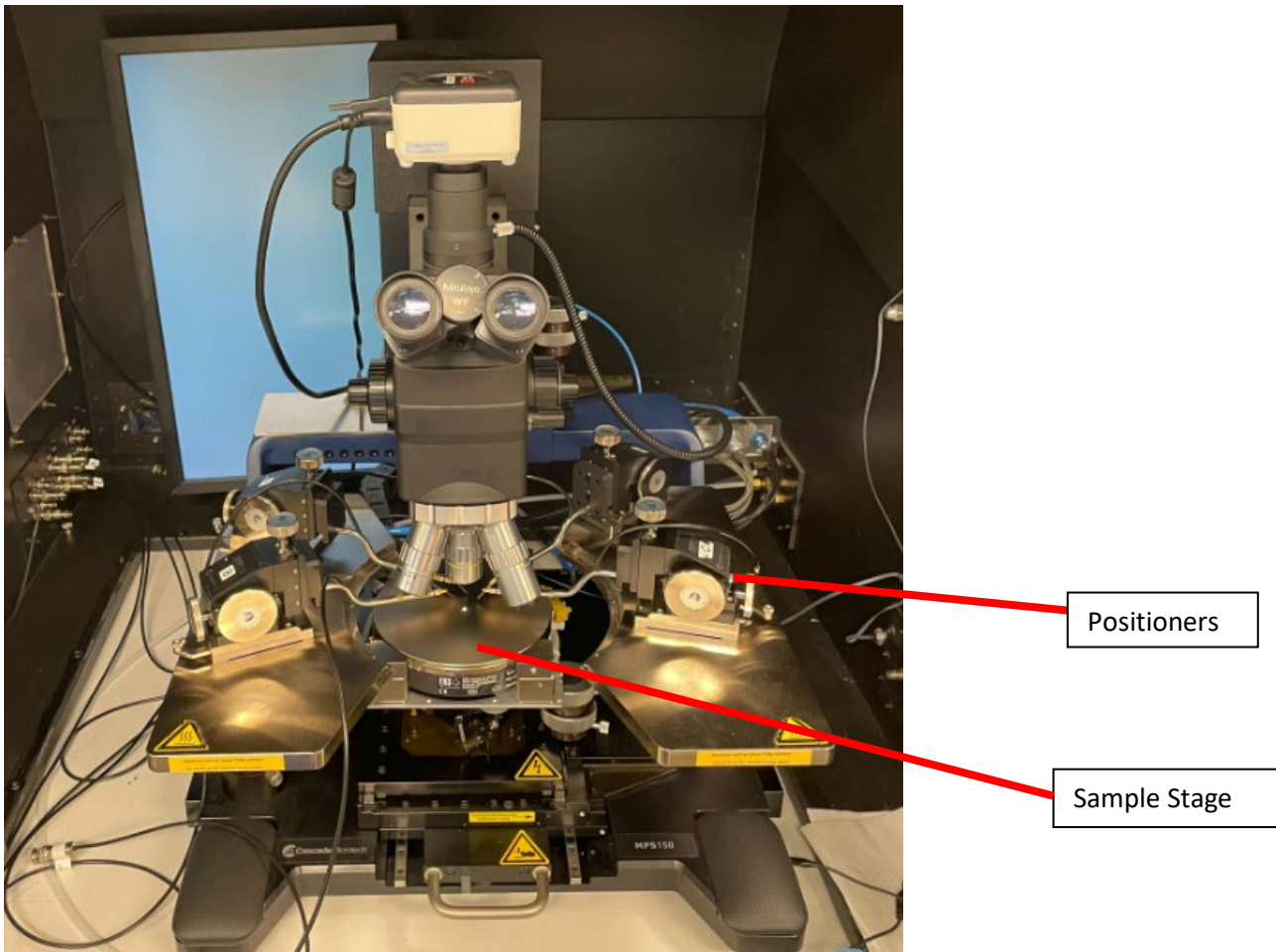


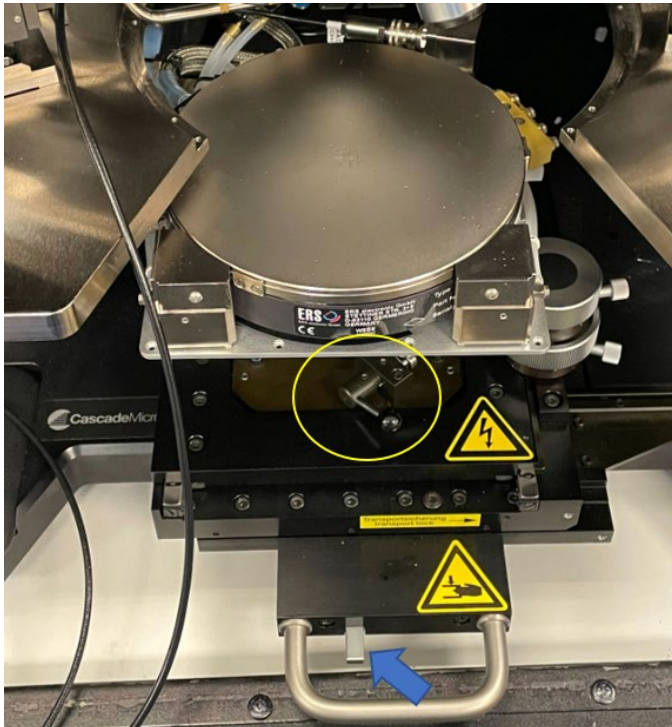
# “Probe 1” Cascade MPS150 probe station

## Standard Operating Procedure

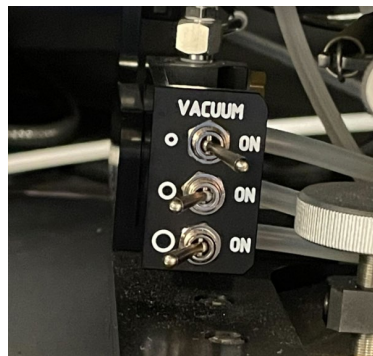
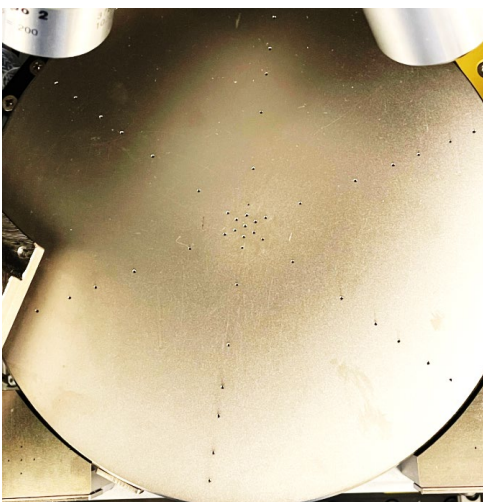


1. Activate your session on iLab.
2. Decide which electronics you will be using for measurements, usually the lower K4200A-SCS with the CVU and 4x SMUs is chosen. We will assume that unit is being used here, but other electronics like RF impedance analyzers, ferroelectric P-E testers, or oscilloscopes can be used. Please see the staff in charge if before using any new electronics.
3. Check the state of the cabling from the electronics to the feedthrough panel on the left of the probe station, look for loose connections or cable damage. Usually 3-lug triax cables are used for I-V measurements (C-V measurements use the red SMA-terminated co-ax). Then check the signal train continuing on the inside of the feedthrough panel: the triax connections and cables to the positioners
4. Check the state of the tips themselves. You may wish to bring your own tips to ensure you have a clean and sharp tip contact, otherwise FormFactor PTT-250 (Tungsten, 25  $\mu\text{m}$  tip radius) tips are usually used. If you provide your own probe tips, the holders in the DPP210 positioners are designed for 0.5mm shaft diameter and hold the tip at 45 degrees by screwing a knurled nut onto a collar that clamps the tip. (picture needed)

5. If you care about the state of the tips, you should use the camera and light source (see instructions later for using those) to inspect them carefully. If needed, install your tips at this point.



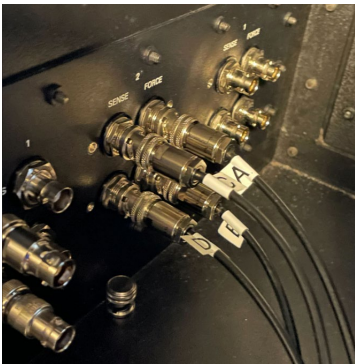
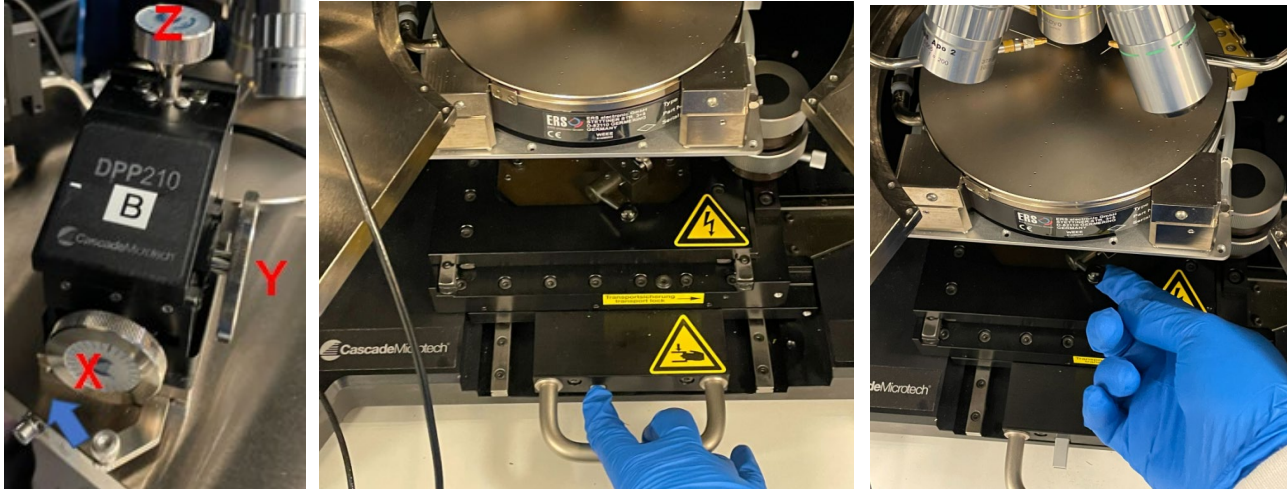
6. To load a sample, first lower the stage (yellow circled lever), then bring it forward by pressing down on the release (blue arrow) and pulling it out. There will be some resistance in the slide, you need to pull firmly.
7. Put sample on the center of the stage using clean tweezers, noting the inner/middle/outer sets of holes for vacuum.
8. Select the controls on bottom left of probe station for the different vacuum holes based on the size of the sample. Usually only the inner set of holes is used (see pic) since many samples are small coupons. Then turn on the chuck vacuum (top switch) from the bottom right controls.





9. POSITIONERS: To move the positioners out of the way, first unlock the magnetic clamp by pushing the lock lever to the left (blue arrow) to OFF position, then you can more easily move the base. Then raise the height (Z) of the positioners using the top dial and turn in indicated direction for UP so that the tips are well out of the way of the stage and sample when it comes in (remember the stage will raise). Note the X and Y dials on the sides.

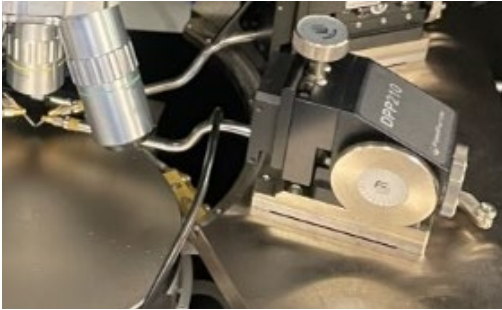
10. Slide the stage back in position until it clicks, then raise it up.



11. Make the wire connections of the positioners with side panel and side panel with Keithley according to your measurements.



12. Turn on the camera by using the + button on the light source on top of the probe station. Focus on the sample using the black knobs the side of the microscope and move the camera around in X and Y by the silver knobs. For the X/Y motion, adjust tension on the set screws on the side of the knobs to keep the camera from drifting, but not so much that it is hard to move in X/Y.



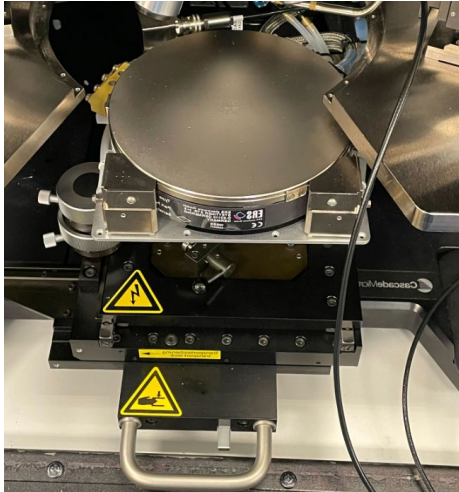
13. Move the positioners to the sample by adjusting the x-y-z positions and bring the tips close to the sample.



14. Once in place, lock the positioners.
15. To land the tips, bring it down in height until the tip “skates” a small distance across the sample contact – we recommend skating by no more than about one tip radius. When you lift the tip, you will see a scratch on Au surface pads.
16. Set up the project and parameters in Keithley.
17. When finished, lift the tips by several turns of the top dial of each positioner.



18. After completing the measurements, turn off the light by using the – button.



19. Move stage down and front.



20. Turn off vacuum and remove sample.

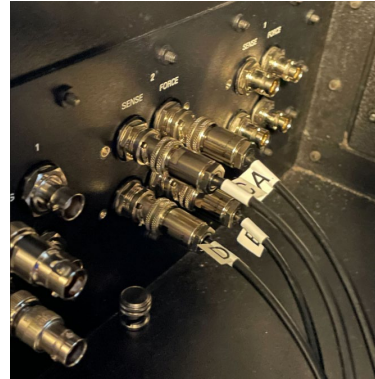
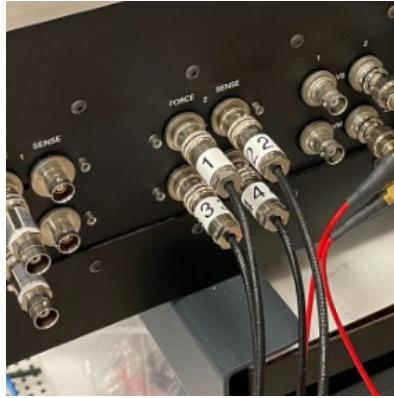
21. End session on ilab.

## Four probe measurements - Example

Use force and sense of two SMUs. On the SMU, the FORCE is the lower triax, while SENSE is the upper.

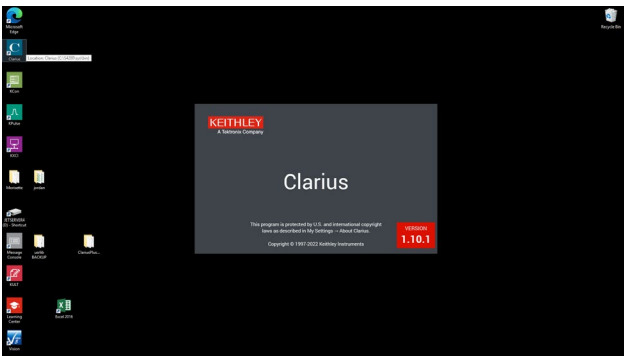
In this example, we choose to use SMU3 FORCE/SENSE and SMU4 FORCE/SENSE.

The photos show the connections at the SMU (left), outside of probe station (middle) and inside probe station (right).



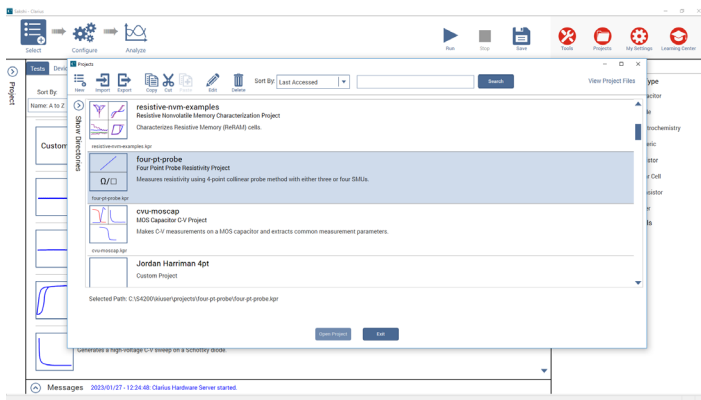
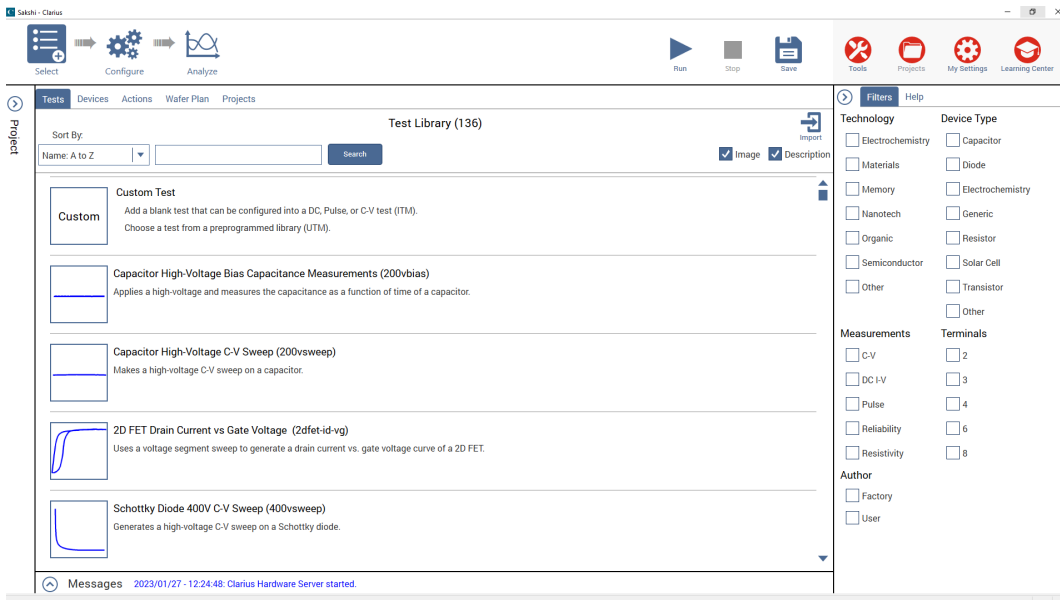
## CLARIUS

Open the Clarius software

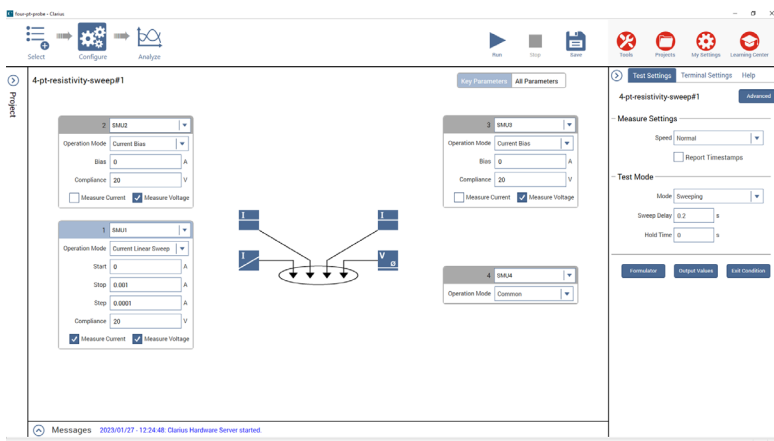


Click on Projects to select the measurement type.

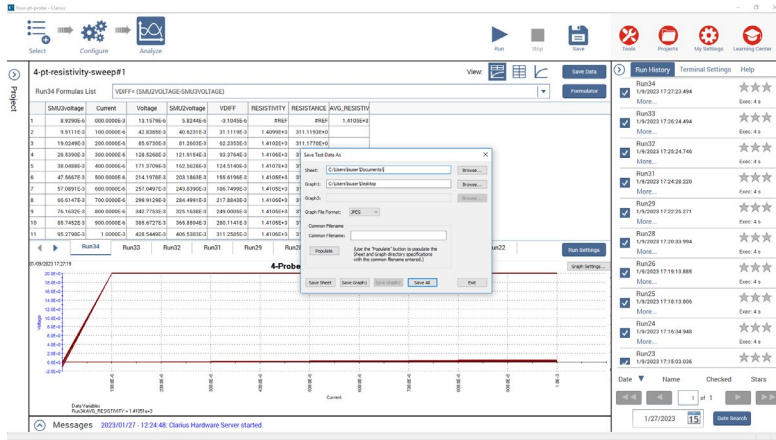




## Select Open Project



In Configure section, select the correct SMUs according to the wire connections and set the parameters. Click run to start the measurement.



Select Save Data. Put the location of Sheet/Graph, save it and then exit.