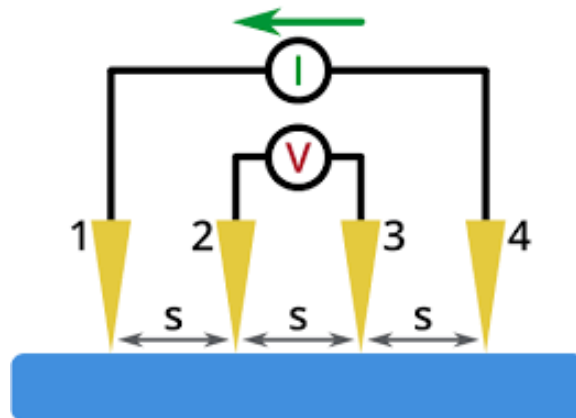


SOP of SES 4 Probe system

Introduction:

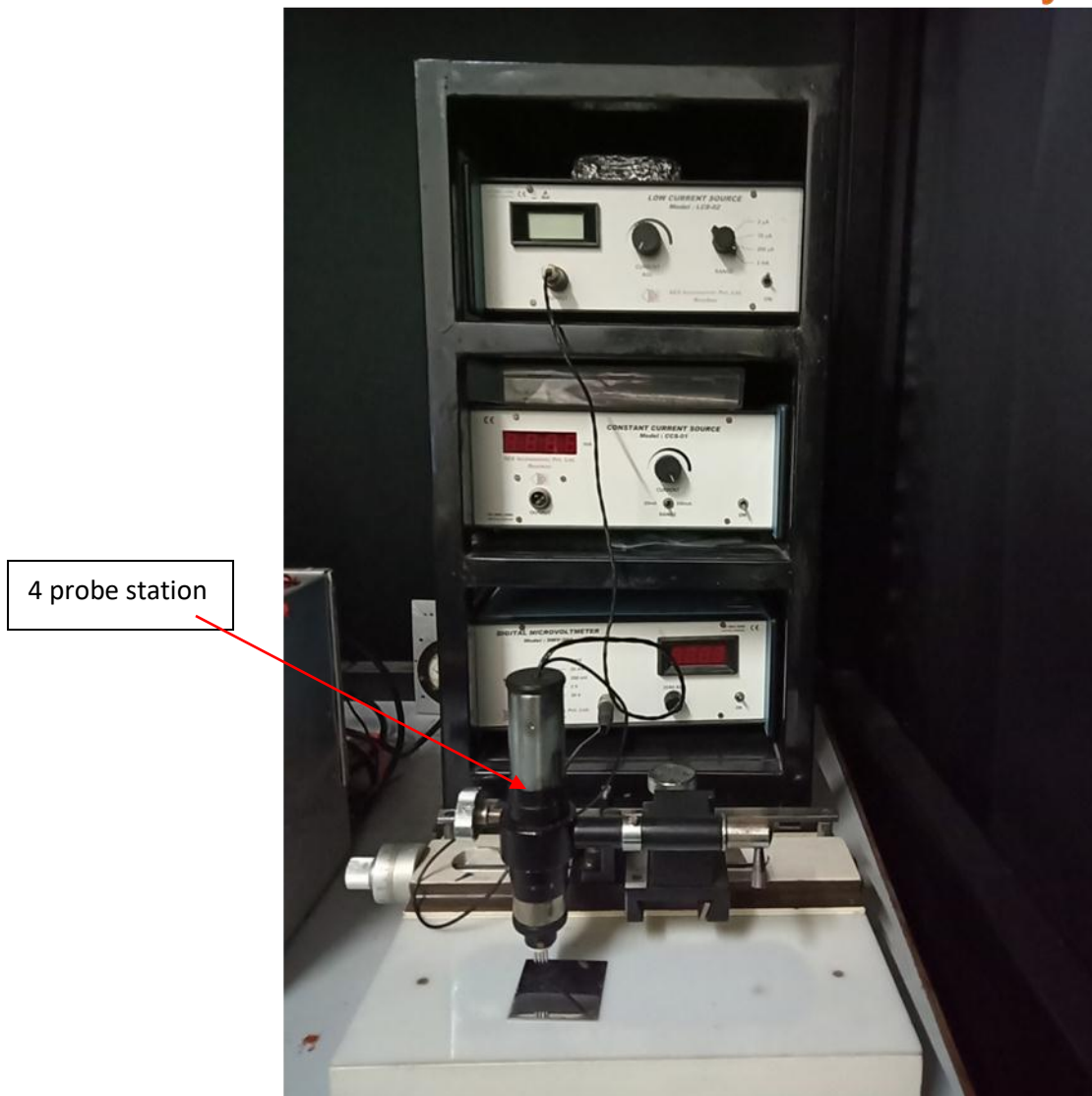
Four Probe measurement is a device which is used to measure the Sheet Resistance of a sample. The sample can be any conductor. There are four probes in the set up. Out of 4 probes, outer most two are used to pass current through the sample and the inner two are connected to a voltmeter to measure the voltage. The current passing probes are connected to current source, through which we can adjust the current accordingly.



The required value of current is set through the sources. As current is passed through the two probes (say probe 1 and probe 4) a voltage respective to the current is produced in the other two probes (say probe 2 and probe 3). The voltage is measured through the voltmeter connected across the probes (say probe 2 and probe 3).

The spacing between two probes is 2mm.

Four Probe measurement system



Procedure: -

1. The four probe station has 2 cables connect these cables to the respective current source and voltmeter.
2. Turn on the power for the current source and voltmeter

3. Switch 'ON' the switches of the sources and voltmeter provided on the instrument.
4. First check it for offset in voltage. For that we have a metal piece as shown in the figure. Keep it on surface that is below the four probe system.
5. Lower the probes gently onto the sample
6. Pass 0.5mA current through current source. If voltmeter is not showing zero; set it to zero with the help of "Zero adjustment knob". This is also for check that the electronics is working properly.
7. Once the zero is aligned raise the probes
8. Place the sample to be measured on a lint free cloth on the stage. (the lint free cloth is to ensure the back surface of the sample is clean.)
9. Lower the probes on the sample. The probes are spring loaded. If the springs are half way in, then it will ensure good contact.
10. Once it is half way 'IN', the voltmeter will start showing some values.
11. Set current through the current source to zero. Voltmeter will show zero if not note this value as zero error.
12. Now take the values of the Voltage (V) with respect to Current (I). Calculate the resistance and sheet resistivity as shown in table below

$\text{Resistivity} = (V/I) * 4.53$ for a wafer thickness of 250 micron

Bulk Resistivity= resistance * 0.125

mA	mv	R in ohm	Ωcm
0	-0.1		
0.1	2.01	20.1	2.51
0.5	9.9	19.8	2.48
1	19.77	19.77	2.47
1.5	29.5	19.67	2.46

Diffused wafer resistivity =
 $(V/I)*4.53$

mA	mv	R in ohm	cm/ \square
0	-0.1		
0.1	0.8	8	36.48
0.5	4.7	9.4	42.86
1	9.5	9.5	43.32
1.5	14.4	9.6	43.78

15. Once readings are taken, raise the probes upwards.
16. Take out the sample.
17. Switch off the switches of the instruments.
18. OFF the switches of the power board.

Maintenance /Equipment cleaning:

- The Four point tips can be cleaned with IPA using the lint free cloth. Do not touch the Tips of probes.
- Low current source is working on 4 number of 9 volt batteries. So avoid keeping it unattended for longer time
- If the battery is discharged we will get erratic reading so for accurate results do not take measurement during “Low battery” indication. Replace the batteries and then take the measurements.
- **References:** <https://www.ossila.com/pages/sheet-resistance-theory>
- https://en.wikipedia.org/wiki/Four-terminal_sensing