SoP for I-V System

Part - 1

SUN 3000 SOLAR SIMULATOR

ABET Technologies

Introduction:

The solar cell I-V measurement system can measure current-voltage (I-V) of cells under both, dark and illuminated condition as per international standard. It extracts the important solar cells parameters (I_{SC}, V_{OC}, IMAX, VMAX, PMAX, FF, efficiency, RSH, RS) as per IEC 60891/87 standard. The system consists of solar simulator, I-V measurement units and custom-made solar cell probe station for measuring I-V of different types of solar cells.

Salient features:

- Class AAA solar simulator.
- DC Xenon arc lamp.
- Illumination up to 155 mm × 155 mm.
- Tune light intensity from 700 to 1000 W/m ^{2}.
- Current capability ± 10A.
- Voltage capability ± 20V.
- Temperature control -20°C to +85°C.
- Probe micro contacts.
- Custom-made probe station.
- Measure I-V of various cell structures.

Settings:

Main Screen:

The main screen contains of five main areas:

Menu tabs

The menu is organized in a so called Ribbon. This ribbon has multiple tabs that all have their own functionality:

1. Home - project management, updates, printing and help

2. Measurement - measurement control

3. Analysis - elaboration of measured data

4. Hardware - control of instruments connected to the computer

5. Options - everything else

Measurement overview table

In this table all measured data is shown. All data can be exported from here. This will be the main part where you do all your work.

Graph collection

All available plots

Detailed data

Data of the currently selected measurement in the measurement overview table

Status bar

Summary of program status

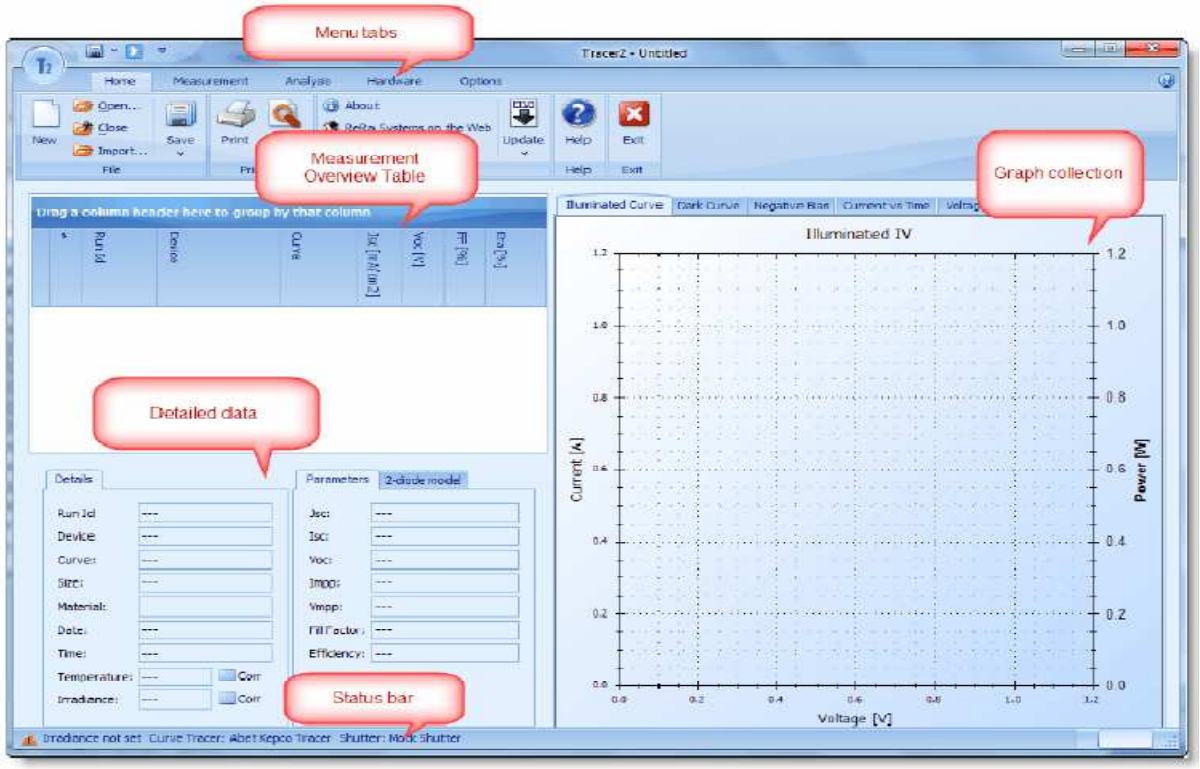
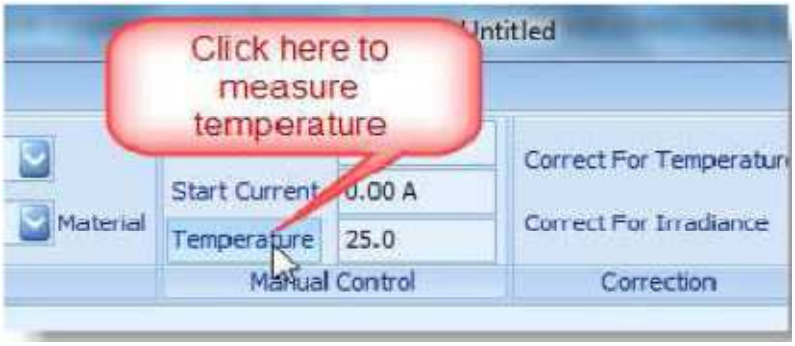


Fig: Main Screen

Temperature Sensor:

On the hardware page select the DirectTemp temperature sensor.

On the measurement page click the temperature button to read the current temperature of the chuck.



Keithley 2600 Series Settings & Working:

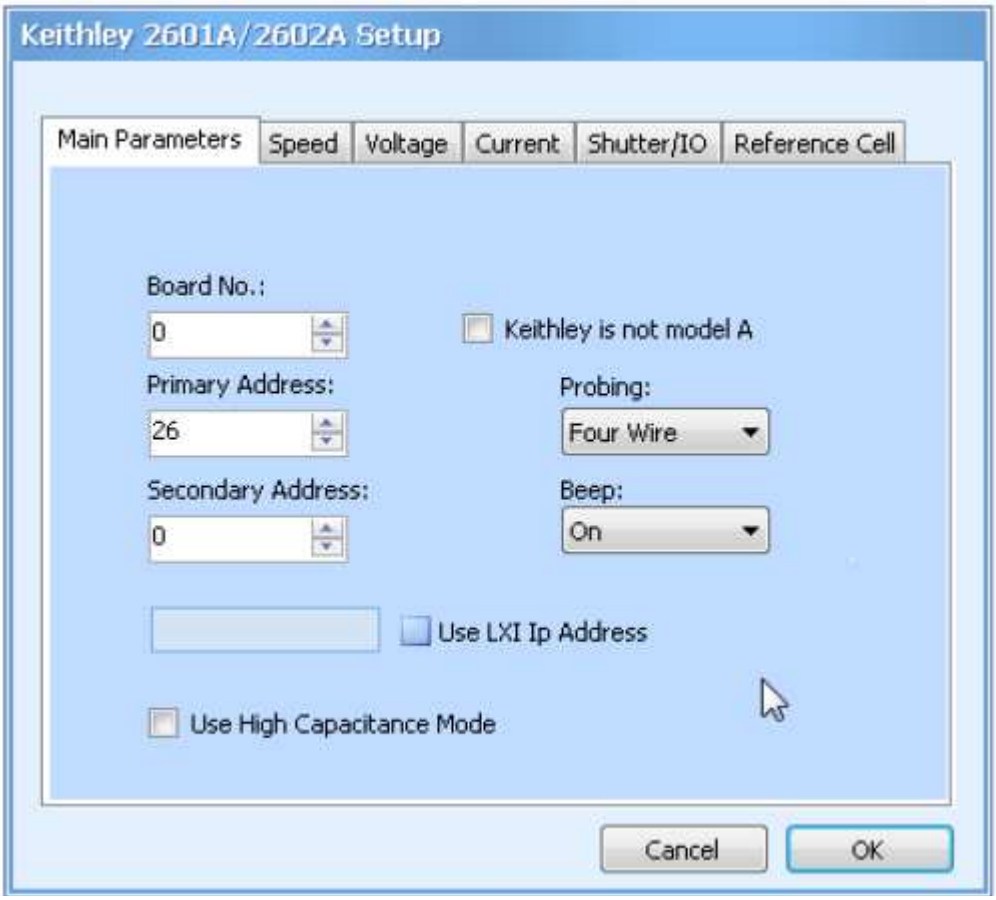


Fig: Keithley parameter setting dialogbox

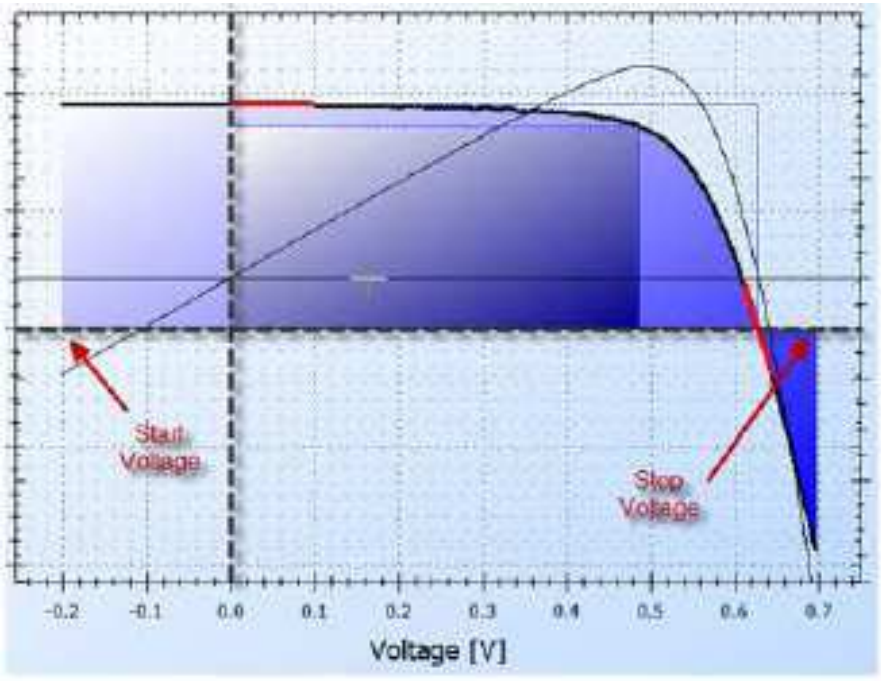
Use of High Capacitance Mode

Enables the internal high capacitance mode. This is required for measuring solar cells with high capacitances. If strange effects are observed near Isc in the IV-curve, try to enable this.

The Measurement Tab

Voltage Range

In this section the start and stop voltages of the IV curve are selected. In the next figure the start and stop voltages are defined:



Start [V] The start voltage of the curve

Stop [V] The stop voltage of the curve. Note: If the stop voltage is higher than the start voltage, the sweep will be in reverse direction.

Step [mV] Here you can set the stepsize. If you do not set anything here, it will automatically set (Stop - Start)/Points. If you set a value here, the amount of points will be adjusted.

Range Here you can select the current range for the Keithley. Depending on the model used, the right ranges are shown here. Setting the ranges to Auto is not always the best way to measure. If the curve would start at 110mA and then drops down, you can see some strange artifacts at 100mA. It would then be better to set the range to 1A.

Auto Sweep Range When this button is pressed the Voc is measured and the correct sweep boundaries will be determined.

Curve

Points This number defines the amount of points that will be measured. If this number is changed it will automatically change the Step size.

Start Trace Pressing this button will bring up the "new measurement" dialog. From here you can start a measurement.

Measurement Selector This dropdown menu will define the type of measurement to be performed. There are 5 measurement types.

· Illuminated Curve

· Dark Curve

· Negative Bias

· Current vs Time

· Voltage vs Time

Material The selected material will use the temperature coefficients to correct the Illuminated Curve for temperature. If "none" is selected, then the temperature coefficients are set to 0. For each material a default start and stop value for the sweep can be set in the Material Dialog. If a material is selected these values are copied to the Start and Stop voltage.

Manual Control

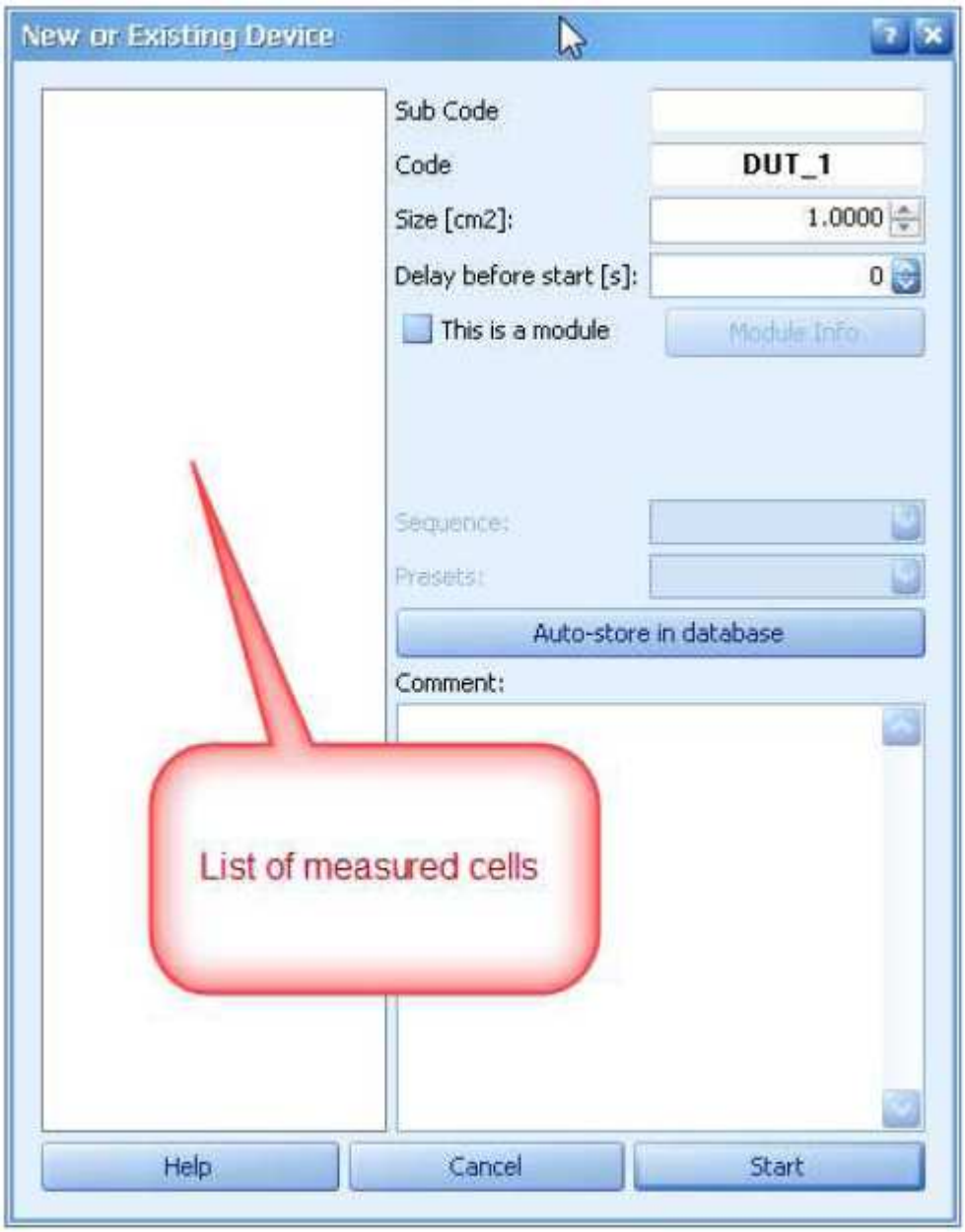
Measure Voc Pressing this button will measure the open voltage under illumination.

Measure Isc Pressing this button will measure the short circuit current under illumination.

Temperature This button will measure the temperature if a temperature readout device is connected.

New Measurement:

This dialog is shown before every measurement. It gives you the possibility to input all required data for the solar cell to be measured.



List of measured cells In this list the lst cells measured are collected. Simply selecting one of these devices will indert the corresponding values in the rest of the dialog. The list is cleared

Sub Code A label that can be used to store a short comment.

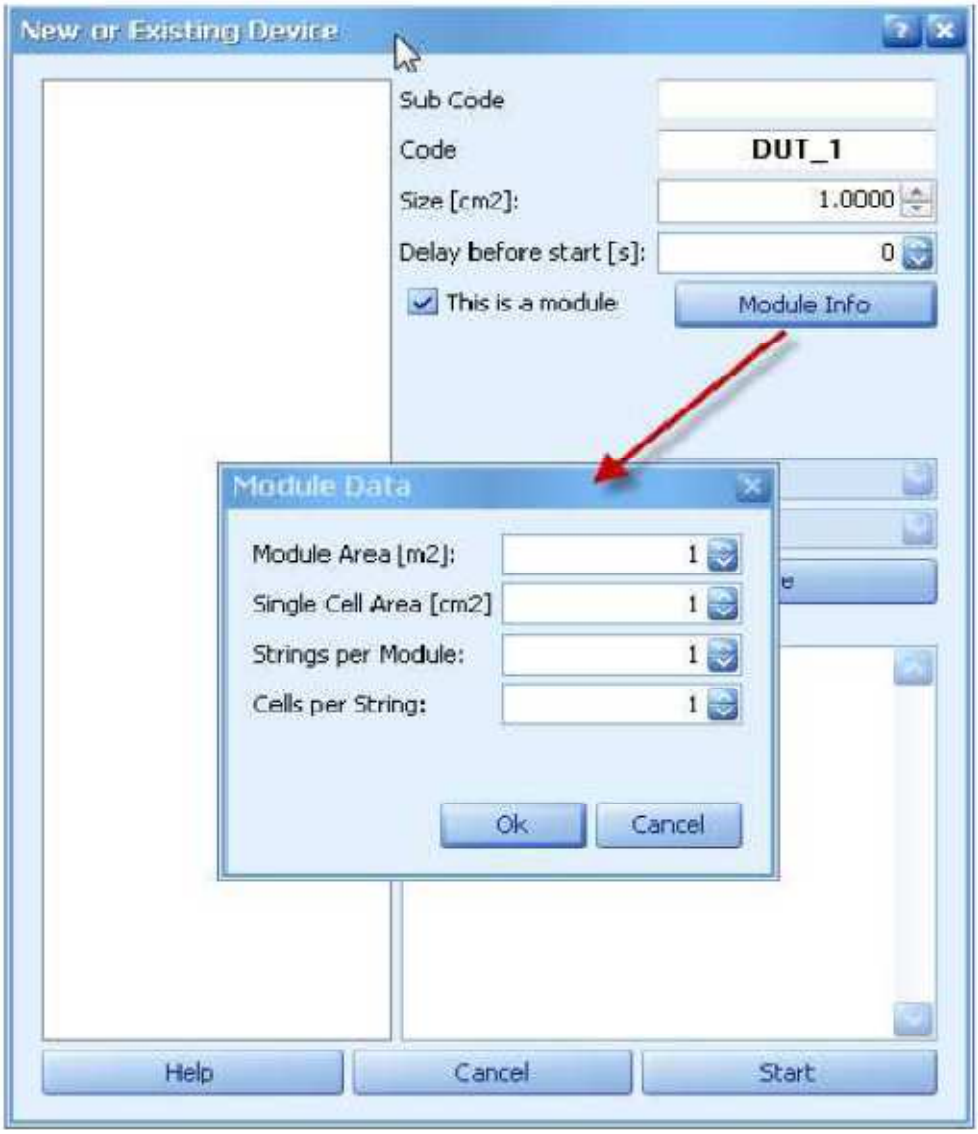
Code The unique device code. This code will appear after the measurement in the list on the left. If an underscore before a number is used, then auto numbering is activated. For example DUT_1 will automatically increase the number after each measurement to DUT_2, DUT_3, etc...

Size Solar cell area.

Delay before start Time in seconds to wait after opening the simulator shutter to start the measurement.

<u>This is a module:</u>

If this checkbox is selected the device is treated as a module. The module data can be inserted by pressing the "Module Info" button. This will open the following window:



Sequence:

This is the currently selected sequence when a multiplexer is used and a sequence is started. Look here for more info on sequence usage.

Preset:

This is the currently selected preset when a multiplexer is used and a sequence is started. Look here for more info on sequence usage.

Auto-store in database:

If an external database is setup, this will enable autostorage in the database.

Comment: Room for any comments

Help This will open this help document.

Cancel Closes the dialog without any changes.

Start This will start the measurement.