PASAN
MEASUREMENT SYSTEMS

Training Manual
Module: Basic Operation

SunSim 3b/3c

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1 Learning Objectives

The trainee can name the different parts of the SunSim, he can start the equipment and perform a standard measurement of a module.

2 Security

Never open the lamp housing while the power cable is still connected to the lamp. Risk of sever eye injury and electrocution. High voltage inside.

Never open the flash generator cabinet. Risk of electrocution. High voltage inside.

Never touch the contactors for the module while a measurement is taking place. Risk of electrocution . High voltage can be applied during the measurement.

Never look towards the flash lamp while a flash can occur. Risk of eye injury.

Always switch off the flash generator cabinet when approaching the lightning side of the flash lamp closer than the distance that you have between the module and the flash lamp (SunSim 3c →5.5m, SunSim 3b →8m). Risk of severe eye injury.

3 Parts of the equipment

The SunSim can be distinguished into four physical units. These are connected together and intercommunicate. This measurement system is called a module tester, flasher or we refer to it with our product name: SunSim.

These four units are: the flash generator cabinet (generator), the electronic load (e-load), the light box and the measurement PC with the Pasan Software SPROD.

3.1 Flash generator

The flash generator (Fig 1) is the power supply unit for the lamp. The cabinet holds several high voltage capacitors that together store the energy that is needed to perform a flash.

A regulating electronic supplies the flash tubes with a stable amount of electrical energy while a discharge is taking place. The electronic cards will control the charge and discharge of the capacitors and are furthermore part of the regulation loop. On these electronic cards the actual voltage of the capacitors is shown on a LCD display. Leds give information on the status of the flash generator. Red LED indicate a problem within the flash generator cabinet. There is also a red warning light, that will come on after switching off the generator. This indicates, that there is a remaining high voltage on the system, even if the flash generator is powered off.

The flash generator is connected to the e-load with a control cable (Fig 3).

The light box is connected to the flash generator by the - so called - anaconda cable (Fig 2) and by a control cable.

Fig 1: Flash generator

Fig 2: Anaconda cable

Fig 3: Flash control cable

3.1.1 Electronic cards of the flash generator

Fig 4: electronic cards on the flash generator

The electronic cards are named. The name begins with “BV” and is followed by a number.

From left to right:

- BV 77-4: Power supply card
- BV 77-1: Power supply card, On/Off switch and power on indicator lamp
- BV 85-4: control card for discharge and temperature control
- BV 85-1: charge control card, display for capacitors actual voltage, alarm and charge indicator lamp, this card is connected to the e-load via the flash control cable (Fig: 3)
- BV 85-81: control card for the flash intensity regulation, this card is connected to the lamp with a control cable (only needed if measurements will be made with masks or spectral filters

3.2 Light Box

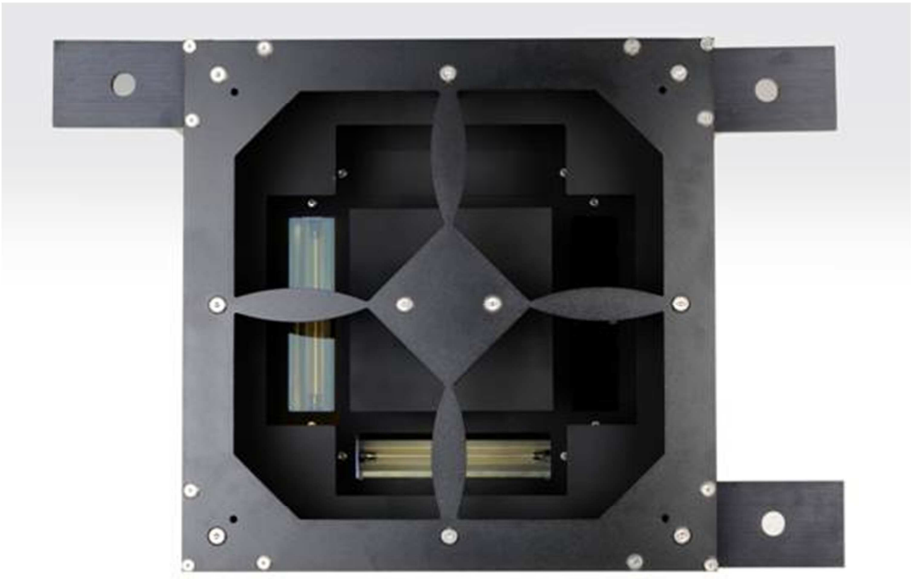

Fig 5: Standard Light Box

On Fig. 5 a standard light box for the SunSim 3c can be seen. The light box holds the flash tubes and will emit the flash light that is needed to perform a measurement. The light box assembly consists of:

- Two flash tubes for the SunSim 3c
- Four flash tubes for the SunSim 3b
- For each tube an interferential filter
- A star shaped uniformity mask that guarantees the uniform distribution of the light towards the testing device
- A unit that can measure the irradiance via fibre optics and photodiodes.

3.3 Electronic load

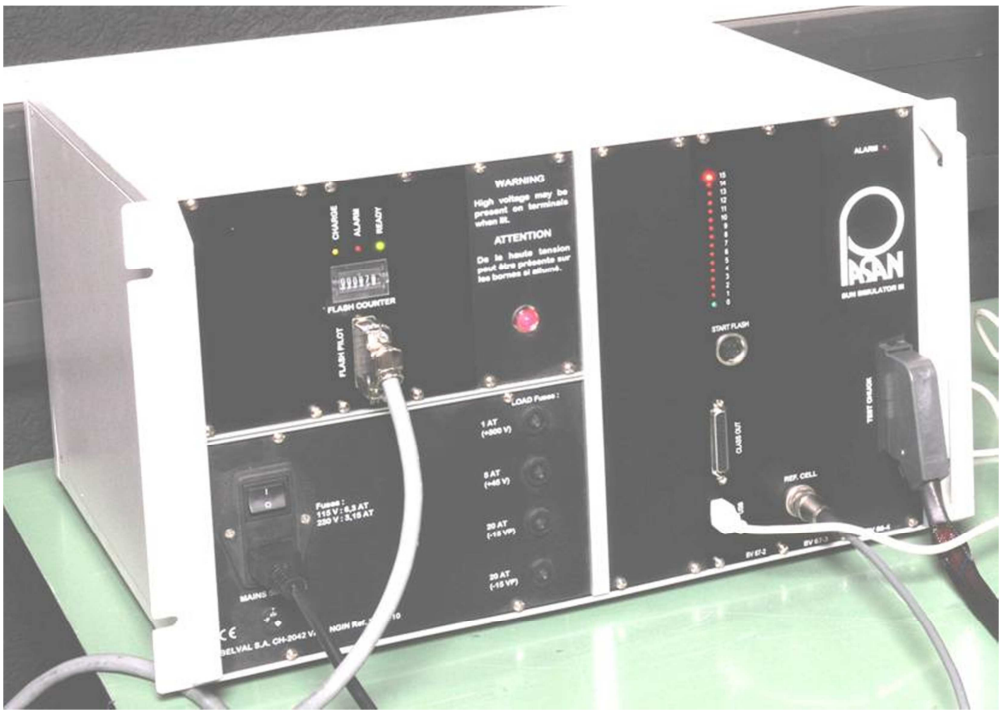

Fig:6 Electronic load

The electronic load (Fig.6) is the measurement device of the SunSim. It is connected to:

- the flash generator cabinet via the flash control cable
- the measurement PC via an USB cable
- to the monitor cell
- to the module via the measurement cable
- optionally to a second temperature sensor

The e-load holds several electronic cards. These are named at their bottom and their name starts with BV – followed by a number. The bottom left part of the e-load holds the power supply and some fuses. These cards are fastened by screws to the rack. Single cards can be removed and replaced by spare cards in case of a mal function.

- BV 66-9: Flash control card. It communicates with the flash generator via the flash control cable. It is part of the control loop for the flash light stability, further it has a flash counter and the three status lights: ready, charge and alarm.
- BV 67-2. Commonly referred to as the USB card. It stores the measurement data and communicates with the measurement PC via an USB cable. It is the logic card for the measurement control. A pedal (to initiate a flash) can be connected to this card.
- BV 67-3. Referred to as the voltage measurement card. It will measure the voltage on the module and the voltage we obtain on the monitor cell while a flash is happening. It also records the temperature measured by the monitor cell. The monitor cell is directly connected to this card.

- BV 66-4. The current measurement card. It will supply the voltage ramp that is applied to the module by the e-load during the measurement. During the measurement it will also read the current that the module generates while it is exposed to the flash light.

3.3.1 Monitor cell

The monitor cell (MC) records the amount of received light at its position.

It is the device that measures the irradiance. Irradiance is in units of W/m2. This corresponds to the voltage drop that is measured over a 1 Ohm shunt resistance, which is build within the monitor cell. Every monitor cell has its characteristic sensitivity, given in mV. The MC needs to be located within the illuminated area and close to the same pane as the device under test (DUT). The MC also works as a sensor for the regulation loop of the light. Together with the BV 66-9, BV 85-81 it forms the control loop. It is connected to the electronic load card BV 67-3.

Fig 7: Monitor cell is located near the DUT and measures the received irradiance.

The monitor cell should be cleaned on a regular basis. The sensitivity that is written on the monitor cell's label is a guidance value only. It's real value is determined by using a customer's reference panel.

3.3.2 Measurement cable

The measurement cable connects the DUT to the BV 66-4 card of the electronic load. Through this cable the voltage ramp is applied to the module and the generated current is measured. The imposed voltage is also read back. The thin wires are used to read the voltage, the 6mm2 cables are for the current measurement. The ends of these cables are equipped with crocodile clamps. These should be replaced by suitable contactors by the customer. When a measurement is done, there can be a high voltage on the terminals, maximum up to 300V!

4 The Software

The PASAN measurement software is called SPROD/SLAB, the same software carries two names, for laboratory use we call it SLAB, for production use it is named SPROD. Different versions exist and it is possible to upgrade to a newer version without losing the custom data. In this chapter I will use the term SPROD to name the software. SPROD communicates with the electronic load via an USB cable. The software can be started via the desktop or the start menu.

4.1 The main program window

The main window shows the last measured IV-curve, information about the classification, the machine status and the measurement results. In the top part there are fast access buttons and the menu. Information about which measurement recipe, monitor cell and measurement mode are used is also displayed.
When the status line shows "READY" a measurement can be performed. Therefore the currently selected recipe will be used.
In case the selected recipe doesn't correspond to the DUT, another fitting recipe can be selected by hitting the Lst button or via the menu: →Config→Modules.

A list opens and the appropriate module can be selected. It must then be confirmed by the button USE.

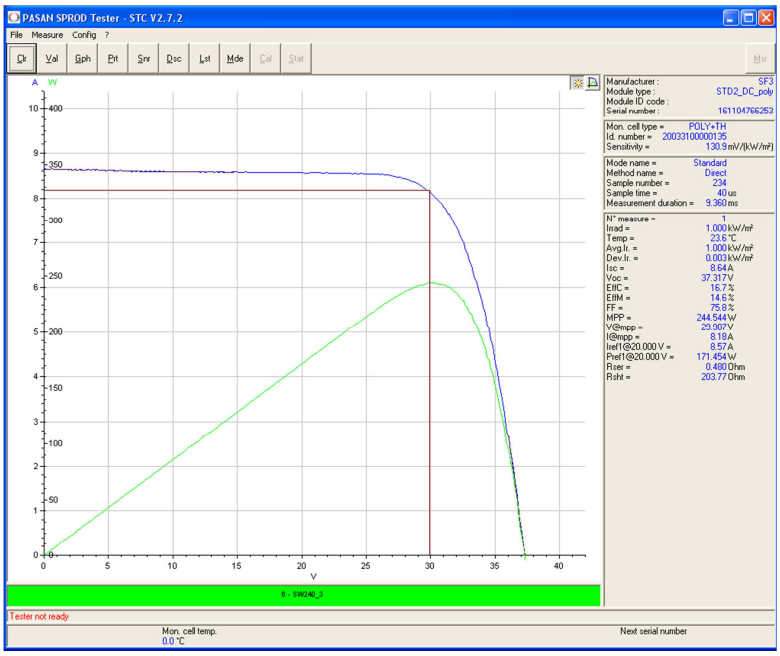

Fig 8: The main window of SPROD. In the shown state, the electronic load is switched off and no communication is taking place. This can be noted in the bottom status line "Tester not ready"

4.2 Performing a measurement

In case that all the equipment is turned off. follow this order: First switch on the flash generator, then the electronic load. Make sure the device you want to test is connected. Open the SPROD software. Validate that the right module recipe is selected, otherwise choose the fitting one. Hit the measurement button (Msr) in the top right corner. A flash will occur and the results of the measurement will then be displayed.

A valid measurement will be marked with a green beam below the graph which is showing the IV-curve of the measurement. An error will be signalised by a read beam with its error code.

To turn off the equipment, follow the reverse order. First shut down the software, then turn off the electronic load and last the flash generator.

Remarks: