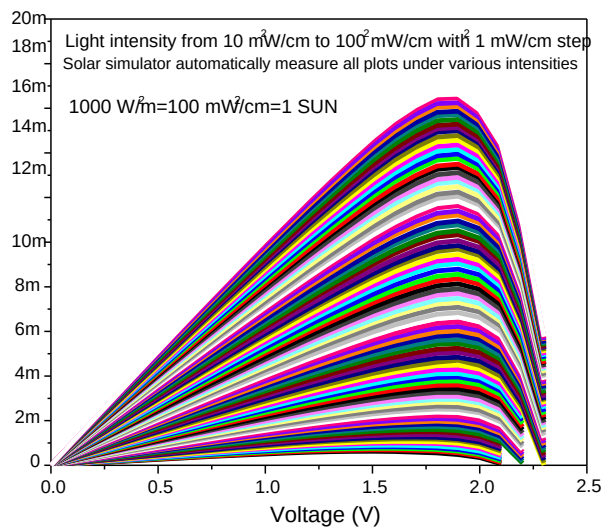# FULL AUTOMATIC SOLAR SIMULATOR
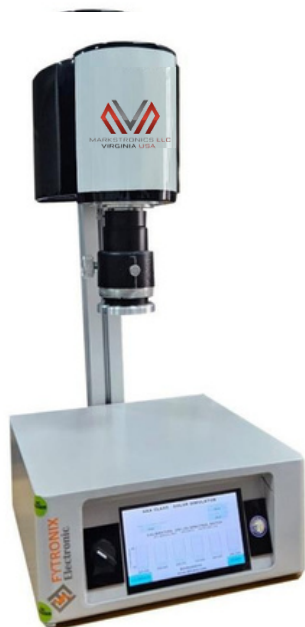
MOTORIZED STAGE

10X
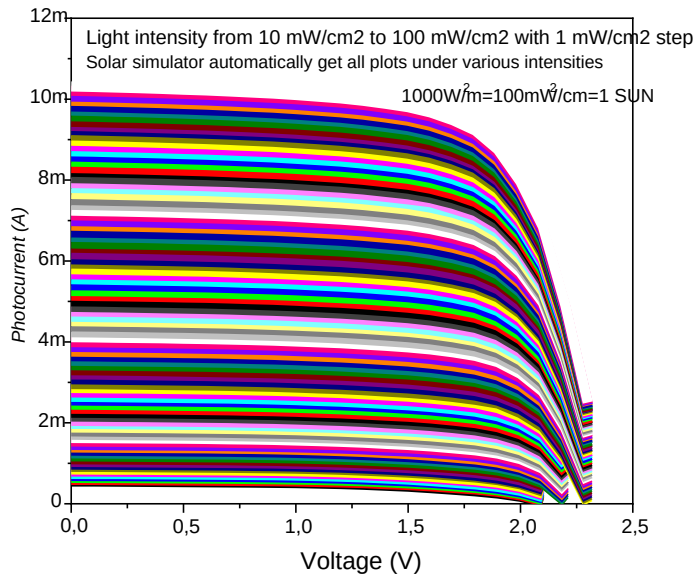
Light intensity from 10 mW/cm2 to 100 mW/cm2 with 1 mW/cm2 step
Solar simulator automatically get all plots under various intensities

$1000 W/m^2 = 100 mW/cm^2 = 1$ SUN

Light intensity from 10 mW/cm to 100 mW/cm with 1 mW/cm step
Solar simulator automatically measure all plots under various intensities
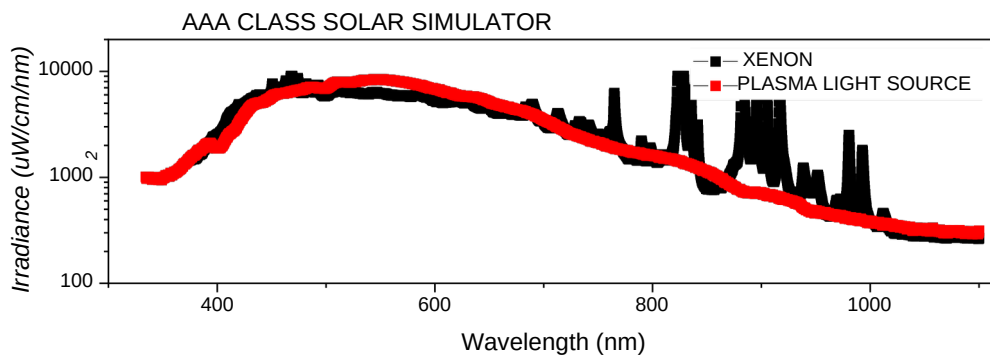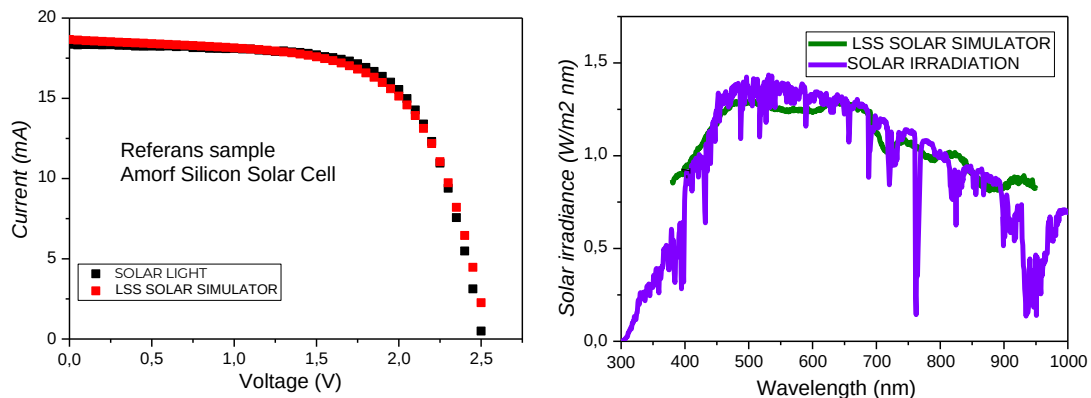
$1000 W/m^2 = 100 mW/cm^2 = 1$ SUN

Solar Simulator system automatically measures power-voltage (P-V) under various light intensities from 0 to 2 SUN

TECHNICAL DATA AND CALIBRATION RESULTS

PHOTOVOLTAIC I-V TEST RESULTS

LSS SOLAR SIMULATOR SPECTRAL SOLAR IRRADIANCE MATHING

SPECTRAL SOLAR IRRADIANCE OF LSS SOLAR SIMULATOR

SOLAR SIMULATOR

☐   Testing of solar cells.

SPECIFICATIONS

☐   AAA class solar simulator
☐   Ligt source: Plasma light
☐   Life time: 4000-8000h (it is longer than Xenon lamp: 1000-1500h)
     Standards: EN 60904-9, ASTM9712
☐   Spectral match (each interval): 0.75 – 1.25 (class A)
☐   Irradiance Spatial Non uniformity: <2% (class A)

- Temporal instability: <2% (class A)
- effective irradiance: 0- 2000 W/m² (2 SUN)
- Calibration range: 400 - 1100 nm according to IEC and ASTM standards
- irradiance aperture: 40 mm dia and illumination area: 40 mm
- Cooling system: internal fan
- power supply adapter: input 230 VAC, 50 Hz, output 12 VDC, 5A
- Light controller: The light is dimmable from 0 to 1000 W/m²
- Touch screen solar controller (automatically calibrate intensity on screen)

LED Solar Simulator provides illumination approximating natural sunlight (AM1.5G) in the wavelength range of 400 to 1100 nm. It assures controlled and repeatable laboratory conditions of spectral content, spatial uniformity and temporal stability for photo-electrochemical experiments meeting class AAA specification. Unlike traditional solar simulator based on Xenon short-arc lamp and metal halide discharge lamp, this concept is using high-power LED technology. The sun spectrum is matched using 6 LED wavelengths, sufficiently spaced apart to provide a uniform light.

SOLAR IV CHARACTERIZATION SYSTEM has the following capabilities

SOLAR SIMULATOR

I-V CHARACTERIZATION SYSTEM, SOURCEMETER

SAMPLE HOLDER

CONNECTIONS

SOFTWAREs

Solar IV characterization Software

Solar Life-Time Software

Transient photocurrent software

Photovoltaic mechanism analysis software

Solar Cell I-V Characterization System

This system analyze all photovoltaic and photoconducting characteristics of all solar cells such Dye sensitized solar cells, Quantum dots solar cells, Organic solar Cells,

Perovskite Solar Cells, Solar Silicon Solar cells, Thin films solar Cells under various

solar light intensities from 0.1 W/cm2 to 1500 W/m2.

This system is a complete current-voltage (I-V), current-time (I-t) and power-voltage (P-V) measurement environment.

The system contains the following elements:

- Maintenance Free Solar Simulator (FSS)

I-V system, source meter

Light source: Plasma light

Voltage range: -20 V to +20 V

Current range: 50 pA to 250 mA

- Software I: Iv and P-V characteristics under various light intensities

-Software II: Photo transient measurements

Photocurrent-time measurements

Photoresponse-time measurements

Photoresponsivity-time measurements

Photodedectivite-time measurements

- Calibrated Reference solar cell

LSS solar simulator generates a continuous light spectrum corresponding to a class AAA spectrum. This system is designed to illuminate any type of solar cell up to 25 x 25 mm or more. LSS solar simulator generates a continuous light spectrum whose intensity varies from 1 W/m2 to 1000 W/m2. The simulator and I-V measurement system are controlled by the computer.

Common Measurements made in I/V Characterization of photovoltaic devices

Dark I/V measurements are commonly used to analyze the electrical characteristics of solar cells. Dark I/V measurements are more sensitive than light I/V measurements in determining parameters such as series resistance, shunt resistance, diode factor, and diode saturation currents.

Solar simulator automatically determine the photovoltaic parameters as follows
Open circuit voltage (Voc)
Short Circuit current (Isc)
Fill factor (FF)
Voltage at Pmax (Vmax)
Current at Pmax (Imax)
Maximum power output (Pmax)
Shunt resistance (Rsh) •
Series resistance (Rs) •
Characteristic resistance of solar cell (Rch) •
Photoreponse (RR)
 Solar cell efficiency (n)
Solar simulator automatically determine the photovoltaic mechanism like monomolecular recombination mechanism, supra linear mechanism and etc.

**LSS SOLAR SIMULATOR SYSTEM measures the followings**

Solar Simulator system is controlled automatically by computer

Solar Simulator system adjusts automatically the intensity of light 0.1 W/m2 -1000 W /m2 by any step, for example from 1 W/m2 to 1000 W/m2 with 1 W/m2.

Solar Simulator system automatically measures current-voltage (I-V) under various light intensities

Solar Simulator system automatically measures power-voltage (P-V) under various light intensities

Solar Simulator system automatically analyses photovoltaic mechanism (I-V) under various light intensities
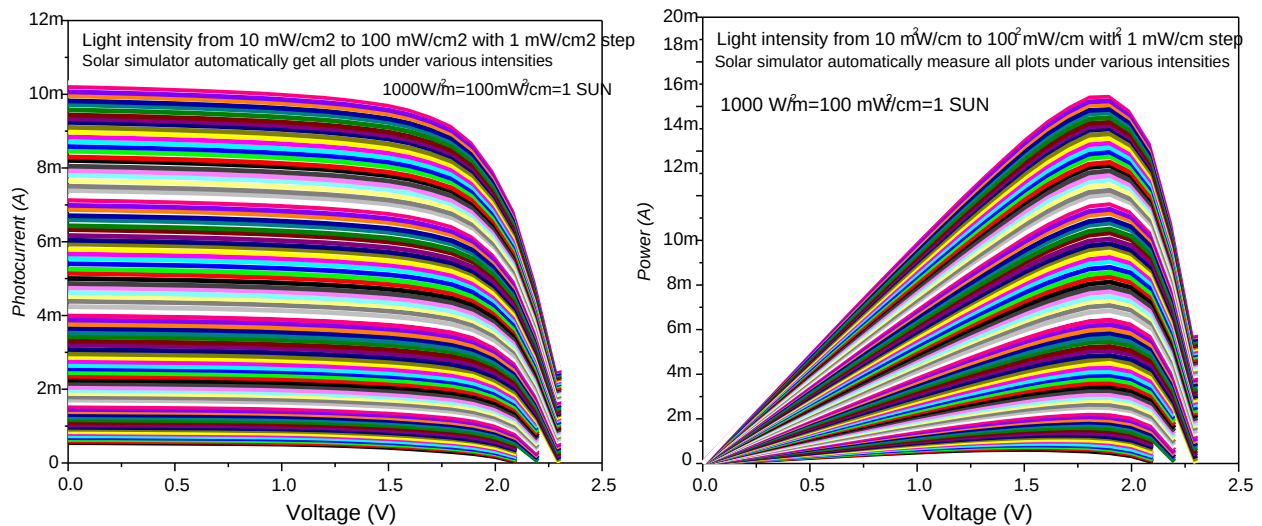
SOFTWARE OF THE SYSTEM

System has two software, first characterize all photovoltaic parameters

Software measure all photovoltaic parameters of solar cells by computer. The system determine all photovoltaic parameters. Software of Solar Simulator system determine the following photovoltaic parameters such as short circuit current Isc, open circuit voltage Voc, maximum power Pmax, maximum current Imax, maximum voltage Vmax, efficiency □, shunt resistance Rsh and series resistance Rs.

Also ,system analyze the automatically the photovoltaic mechanism analysis.