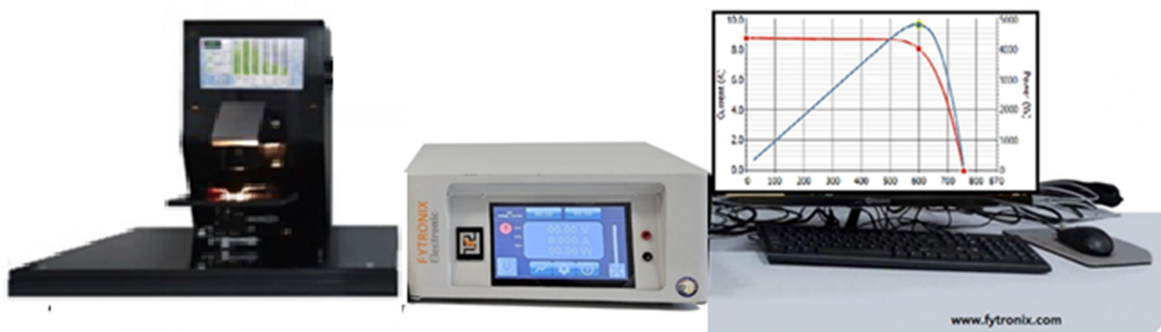


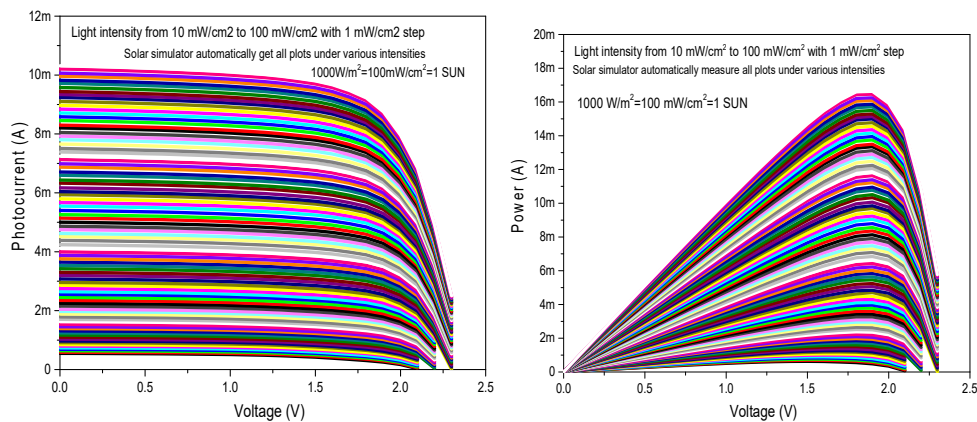
Full Automatic Solar Simulator IV Characterization System

SM-9000

The **SM-9000** is a **fully automatic AAA-class solar simulator IV characterization system** designed for high-precision **I-V, P-V, and photovoltaic mechanism analysis** of all types of solar cells. The system provides **computer-controlled operation**, automatic light intensity adjustment, and fully automated measurement of **key photovoltaic parameters** under variable illumination conditions.



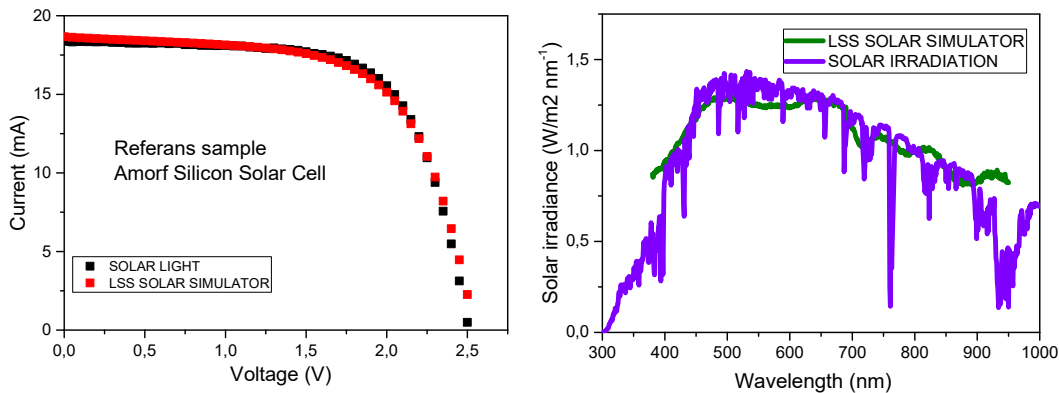
SOLAR SIMULATOR LSS 9000 IV CHARACTERIZATION SYSTEM



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

TECHNICAL DATA AND CALIBRATION RESULTS

PHOTOVOLTAIC I-V TEST RESULTS



LSS Solar Simulator IV Characterization System

Spectral Solar Irradiance Matching – AAA Class

System Overview

The **LSS Solar Simulator IV Characterization System** is a complete **photovoltaic characterization platform** for advanced laboratory and research applications. Designed for accurate and repeatable measurement of **I–V**, **I-t**, and **P–V characteristics**, it supports a wide range of solar cell technologies including:

- Dye-Sensitized Solar Cells (DSSC)
- Quantum Dot Solar Cells (QDSC)
- Organic Solar Cells (OSC)
- Perovskite Solar Cells
- Silicon Solar Cells
- Thin-Film Solar Cells

The system operates under **adjustable solar light intensities** from **0.1 W/cm² to 1500 W/m²**, providing a fully controlled environment for **current-voltage, current-time, and power-voltage measurements**.

System Components

1. **AAA Class Solar Simulator** – Maintenance-free, high stability, factory-calibrated for AM1.5G spectral match
2. **Precision Sourcemeter** – Voltage range: **-7 V to +7 V**, Current range: **10 nA to 30 mA**
3. **Solar Light Controller** – Ensures precise and stable irradiance output

4. **Automatic IV Measurement Controller** – For programmable measurement sequences
 5. **Calibrated Reference Solar Cell** – Factory calibrated for intensity and spectral match
 6. **Sample Holder** – Adjustable for multiple orientations, including 0°–90° rotation
 7. **Software Suite**
-

Software Suite

The system includes multiple software modules for complete photovoltaic analysis:

- **Solar IV Characterization Software** – Automated I–V and P–V measurements
 - **Solar Life-Time Software** – Long-term solar cell stability analysis
 - **Transient Photocurrent Software** – Time-resolved photocurrent measurements (I-t)
 - **Photovoltaic Mechanism Analysis Software** – Detailed analysis of PV mechanisms
-

Key Features

- **Universal Solar Cell Compatibility:** DSSC, QDSC, OSC, Perovskite, Silicon, Thin-Film
 - **Irradiance Range:** 0.1 W/cm² to 1500 W/m²
 - **Illumination Area:** 2" x 2" at 1 Sun
 - **PV Cell Placement Indicator:** Ensures precise alignment
 - **Adjustable Orientation:** Can be mounted pointing up, down, or sideways with 90° rotational accessory
 - **Temperature-Controlled Simulator:** Stable output under varying laboratory conditions
 - **USB Communication:** Easy interface with control software
 - **Standards Compliance:** Class AAA for **IEC 60904-9**, **JIS C 8912**, and **ASTM E 927**
 - **Easy Light Adjustment:** Fine-tune solar intensity with the controller
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Electrical & Measurement Specifications

- **Voltage Range:** -7 V to +7 V
- **Current Range:** 10 nA to 30 mA
- **Measurement Capabilities:**
 - I–V (Current-Voltage)
 - I-t (Current-Time / Transient Photocurrent)
 - P–V (Power-Voltage)
- **Calibration:** Factory-calibrated reference solar cell for AM1.5G spectral match and irradiance intensity

Applications

- Research & development of advanced solar cells
 - Photovoltaic device quality control
 - Laboratory teaching & experiments
 - Stability and lifetime studies of solar cells
 - Comparative studies of emerging photovoltaic technologies
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LSS Automatic Solar IV Characterization System

Class AAA Solar Simulator – High-Precision Photovoltaic Characterization

System Overview

The **LSS Solar Simulator System** generates a continuous **AAA-class light spectrum** for precise characterization of all types of solar cells. The system is capable of illuminating devices up to **25 × 25 mm or larger**, with adjustable light intensity ranging from **1 W/m² to 1000 W/m²**.

The **solar simulator and I–V measurement system** are fully **computer-controlled**, enabling automated measurement, analysis, and reporting of photovoltaic parameters and mechanisms.

Key Measurement Capabilities

I–V Characterization

- Dark and illuminated I–V measurements for analysis of series resistance, shunt resistance, diode factor, and saturation currents
- Light I–V measurements for standard photovoltaic characterization

Power-Voltage (P–V) Measurement

- Simultaneous acquisition of **current-voltage** and **power-voltage curves** under variable illumination

Photovoltaic Mechanism Analysis

- Automatic determination of mechanisms including **monomolecular recombination**, **supra-linear mechanisms**, etc.
- Real-time identification of the dominant mechanism on the computer screen

Photovoltaic Parameters Measured Automatically

- Open Circuit Voltage (**Voc**)
- Short Circuit Current (**Isc**)
- Maximum Power Output (**Pmax**)
- Voltage at Pmax (**Vmax**)
- Current at Pmax (**Imax**)
- Fill Factor (**FF**)
- Series Resistance (**Rs**)
- Shunt Resistance (**Rsh**)
- Characteristic Resistance of Solar Cell (**Rch**)
- Photoresponse (**RR**)
- Conversion Efficiency (**η**)

System Automation Features

- Computer-controlled **automatic solar simulator**
- Automatic intensity adjustment from **0.1 W/cm² to 1000 W/cm²** with **1 mW/cm² steps**
- Automatic measurement of:
 - I–V curves
 - P–V curves
 - I–sc vs. solar light intensity
 - Photovoltaic mechanism analysis
- Automatic data analysis and real-time display of mechanism type

Technical Specifications

Feature	Specification
Solar Simulator Control	Fully computer-controlled
Light Intensity Range	0.1 W/cm ² – 1000 W/cm ² , adjustable in 1 mW/cm ² steps
Measurement Modes	I–V, P–V, Isc-Light Intensity, Photovoltaic mechanism analysis
Source Meter	Voltage: -7 V to +7 V Current: 1 nA – 30 mA (or higher)
Automatic Shuttering	Light intensity automatically adjusted 1–1000 W/m ²

Feature	Specification
Software	Complete measurement, data acquisition, and analysis
Sample Size	Up to 25 × 25 mm
Installation & Training	Included

Applications

- Laboratory-scale photovoltaic research and development
 - Characterization of Dye-Sensitized, Quantum Dot, Organic, Perovskite, Silicon, and Thin-Film Solar Cells
 - Long-term stability and lifetime testing
 - Advanced photovoltaic mechanism studies
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System Highlights

- **AAA-class spectrum** for accurate AM1.5G simulation
 - **Continuous light spectrum** with adjustable irradiance
 - Fully **automated I–V and P–V measurements**
 - Automatic **photovoltaic mechanism identification**
 - User-friendly **software interface** for real-time analysis
 - Suitable for **research labs, universities, and industrial R&D**
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System Software

The **LSS Solar Simulator System** is equipped with two advanced software modules for **complete photovoltaic characterization**:

1. Photovoltaic Parameter Characterization Software

This software automates the measurement and calculation of **all key photovoltaic parameters** of solar cells. The system performs measurements and determines the following parameters:

- **Short Circuit Current (I_{sc})**
- **Open Circuit Voltage (V_{oc})**
- **Maximum Power (P_{max})**
- **Current at Maximum Power (I_{max})**
- **Voltage at Maximum Power (V_{max})**
- **Conversion Efficiency (η)**
- **Shunt Resistance (R_{sh})**
- **Series Resistance (R_s)**

The software provides **real-time plotting**, data acquisition, and export functions for laboratory and research applications.

2. Photovoltaic Mechanism Analysis Software

This software module **automatically analyzes the photovoltaic mechanisms** of the solar cell under test. It can identify dominant mechanisms such as:

- Monomolecular recombination
- Supra-linear recombination
- Other device-specific recombination processes

Results are displayed directly on the computer interface, enabling **fast, automated analysis** and **mechanism classification** without manual intervention.