Spectral Photoresponse & Photodevice Measurement System



SOLAR-METRIX ULTRA

Multi-Wavelength Spectral Photoresponse & Photodevice Measurement System

Next-Generation Solution for I-V, I_{ph}-λ, and Phototransient Analysis

The **SOLAR-METRIX ULTRA** is a fully integrated measurement platform designed to determine both the **steady-state** and **time-dependent (transient)** optoelectronic properties of solar cells, photodiodes, and photosensors.

1. Advanced Measurement Modules & Software Infrastructure

The system comprises three core software and hardware layers:

- **I-V Software Module:** Fundamental electrical characterization.
- **Photo-Transient Software:** Time-resolved characteristic analysis.

- **Photocurrent-Wavelength (I_{ph}- λ) Software:** Spectral sensitivity and responsivity analysis.

2. Spectral Characterization & LED-Based Monochromator

Unlike conventional monochromators, the system features a high-speed, high-precision **LED-based monochromator** unit.

- **Wavelength Range:** 370 nm – 1010 nm (Expandable to various wavelengths upon request).
- **Standard Wavelengths (nm):** 370, 380, 390, 400, 410, 430, 450, 460, 520, 570, 610, 620, 690, 750, 760, 820, 860, 960, 980, 1010.
- **Electronic Pulse Generator:** Capability to generate precise light pulses ranging from **200 microseconds**to seconds.

3. Automated Measurement & Analysis Capabilities

A. I-V and Power Characteristics

Automatic mapping of electrical performance under various wavelengths:

- **I-V & Photo-I-V:** Dark and illuminated current-voltage curves.
- **P-V (Power-Voltage):** Calculation of Maximum Power Point (P_{max}), Fill Factor (FF), efficiency, and other photovoltaic parameters.
- **ln I - V:** Analysis of diode ideality and saturation parameters.
- **I_{sc} - Intensity:** Variation of short-circuit current with light intensity.

B. Phototransient (Time-Dependent) Measurements

Speed and response analysis based on light Switch On/Off states:

- **Photocurrent-Time (I_{ph}-t):** Current response across different wavelengths.
- **Photoresponse-Time:** Rise and fall time (t_{rise} / t_{decay}) analysis.
- **Photodetectivity & Photoresponsivity-Time:** Temporal stability of sensor performance.

C. Spectral Photoresponse Analysis

- **Iph} - λ:** Wavelength-dependent photocurrent measurements.
- **Photodetectivity (D) & Photoresponsivity (R):** Wavelength-specific detector performance figures of merit.

4. Hardware & System Specifications

Parameter	Technical Specification
Source Meter Voltage Range	-9 V to +9 V
Source Meter Current Range	1 nA to 30 mA
Wavelength Control	370 nm - 1050 nm (Fully Automated) or extendable
Pulse Width	100 ms - 5000 ms
Control System	Computer Controlled (RS232 / USB Interface)
Scalability	Upgradable architecture based on customer requirements

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5. System Components & Standards

- **High-Precision Source Meter (I-V Unit).**
- **Integrated Sample Holder & LED Driver Unit.**
- **Data Analysis Station:** 19" All-in-One Computer.
- **Certification: ISO 9001:2015** (Certified for Scientific Instrument Manufacturing) and Industrial Registry Certificate.

6. Why SOLAR-METRIX ULTRA?

The system is far more than a standard I-V meter; it is an **all-in-one research station** providing a vast range of data—from the response speed of photodiodes to the spectral analysis associated with the quantum efficiency of solar cells. The system is highly **customizable**, allowing for an increased number of channels or wavelengths to meet specific research needs.