Research Lab for Studying Solar Cells' Parameters and Characteristics

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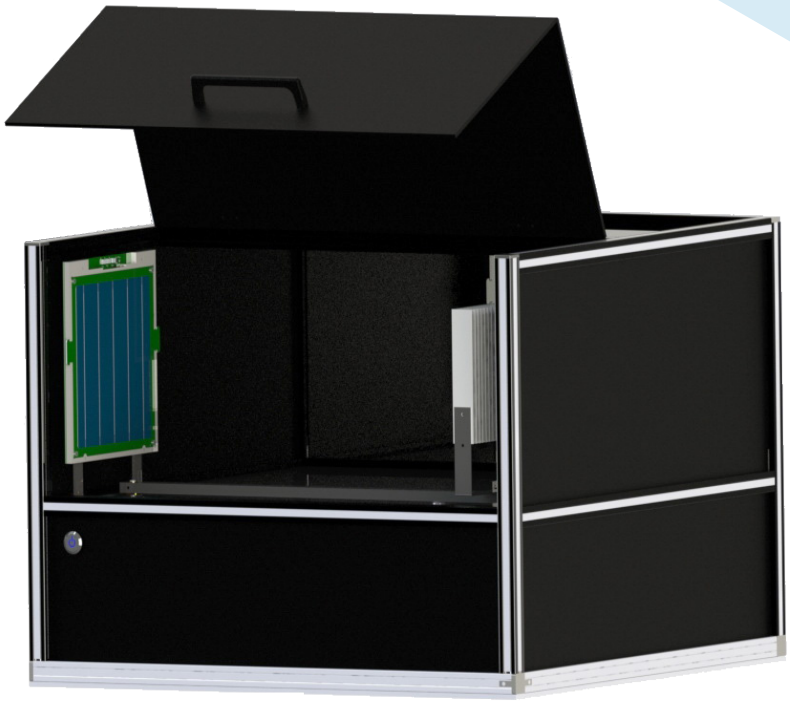

Overview

The laboratory stand is designed for studying physical processes of solar and light emission conversion into electrical energy. The lab stand allows students to gain practical skills in working with solar cells and explore their main parameters and characteristics.

Structurally the lab stand is a desktop box in which LED panel and a solar cell holder are installed. The LED-panel is equipped with a swivel mechanism, which makes it possible to adjust the angle of incidence of rays on the solar cell surface. LEDs with a different spectrum are used as light emission sources which allows to research and study the spectral sensitivity of the solar cells. There is also possibility to control the intensity of the light source.

Due to the uniqueness and versatility of the design, as well as a set of sensors, the stand allows studying of the technical characteristics of solar cells both for practical training sessions and research groups. The laboratory stand can be useful for postgraduate and undergraduate students studying in the field of semiconductor instrumentation and thin-film energy.

As a control and measurement device NI myRIO-1900 controller from National Instruments is used. The software of the stand developed in the NI LabVIEW graphical programming environment.

Features

- Light source based on LEDs from 400 nm to 1100 nm wavelength
- Possibility to control the spectrum emission and the intensity of the light source
- Measuring of the solar cells parameters and characteristics depending on beams angle of incidence
- Measuring of the solar cells parameters and characteristics depending on load resistance
- Illuminance and solar cells temperature measurement by means of luxometer and temperature sensor
- Solar cells characteristic analyzing depending on environment temperature
- Air cooling of solar cells
- Monocrystalline, polycrystalline and amorphous solar cells as a testing samples

Hands-on Works

1. Dependence of the no-load voltage on the radiant flux density and solar cells angle of inclination.
2. Dependence of the short circuit current on the radiant flux density and solar cells angle of inclination.
3. Solar cell spectral sensitivity research.
4. Solar cell spectral sensitivity dependency on the temperature.
5. Solar cell volt-ampere response and fill factor calculation.
6. Dependence of the volt-ampere response on the radiant flux density and solar cells angle of inclination. Fill factor calculation.
7. Dependence of the volt-ampere response on the solar cell temperature. Fill factor calculation.

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