

## Press Information

*„LumiSolarCell“-*

*Novel High Power LED based  
Photoluminescence Inspection System  
for Solar Cells and Wafers*

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## 1 Introduction

The LumiSolarCell system utilizes the photoluminescence or alternatively the electroluminescence phenomena to image micro cracks, cell failures and inhomogenities of photovoltaic cells which are extremely difficult to detect visually. The equipment allows performing detailed quality control of single cells. It was developed for research and off-line industrial inspection.

The system consists mainly of a highly sensitive greateyes CCD-Camera and an innovative HighPower LED light source. The novel light source and the measurement technique were developed during a research project by Humboldt-University and greateyes. The LED based light source has a number of advantages compared to a laser which is used typically as an illumination source for photoluminescence measurements. The High Power LED source is more cost-effective, smaller and there are no special safety requirements to operate it. Furthermore no extensive cooling is necessary.

## 2 Electroluminescence and Photoluminescence

The system allows measuring the photoluminescence of solar cells primarily but it is also capable of imaging the electroluminescence of photovoltaic cells. In the following a short overview of both types of measurements is given:

### **Electroluminescence:**

An external current is applied to the cell or module using its electrical contacts. The invisible electroluminescence radiation emitted by the cell or module is detected by a highly sensitive Camera.

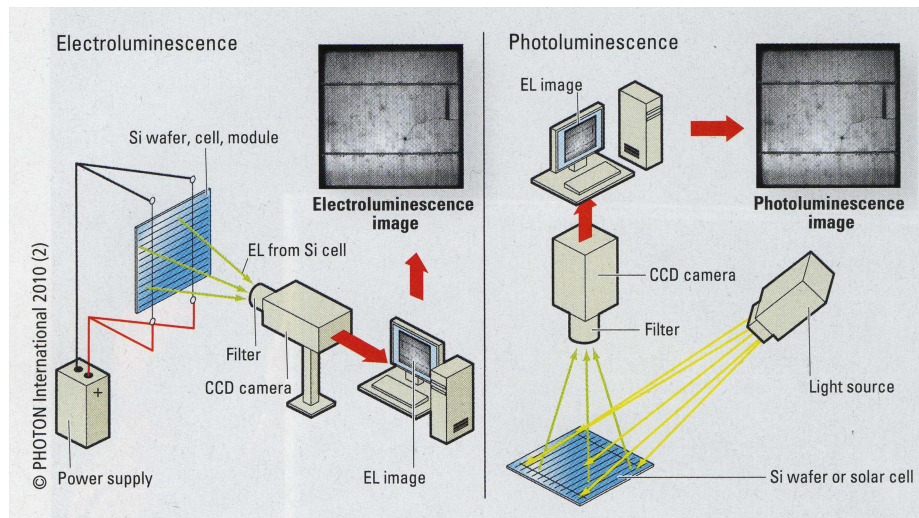


Figure 1 Electroluminescence and Photoluminescence Measurement Principle (Figure has been taken from the Photon International Magazine)

## Photoluminescence

The solar cell or module is excited by an intensive light source. No electrical connections to the solar cell are necessary. The invisible photoluminescence radiation emitted by the cell or module is detected by a highly sensitive Camera.

## 3 LumiSolarCell System

The LumiSolarCell consists of a highly sensitive greateyes CCD-Camera, an innovative HighPower LED light source and control electronics. It is a complete off-line system to inspect mono-crystalline and poly-crystalline Silicon Solar cell up to a size of 160mmx160mm.

The Camera and light source is integrated in a light-tight enclosure. A door allows placing a solar cell into the chamber and characterizing the cell by photoluminescence or alternatively electroluminescence measurement.

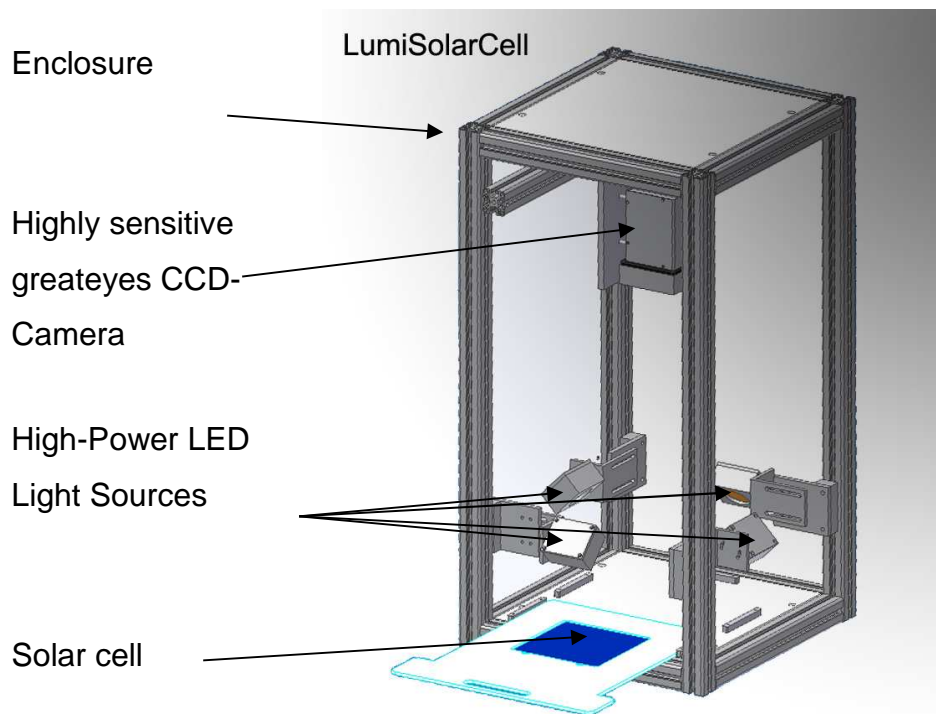


Figure 2 Schematic of the LumiSolarCell System

A software for Windows controls the system and visualizes the images. There are no special requirements for the operating PC or laptop.

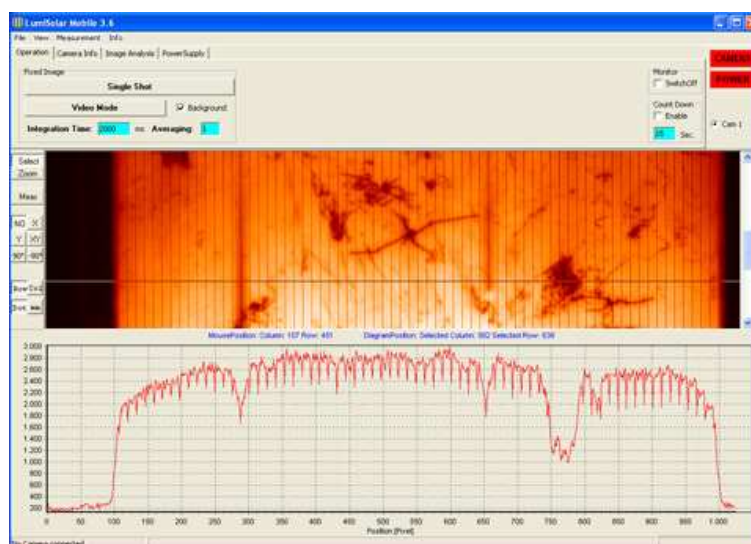


Figure 3 Software of the LumiSolarCell System

## 4 Example Measurements

### LumiSolarCell System

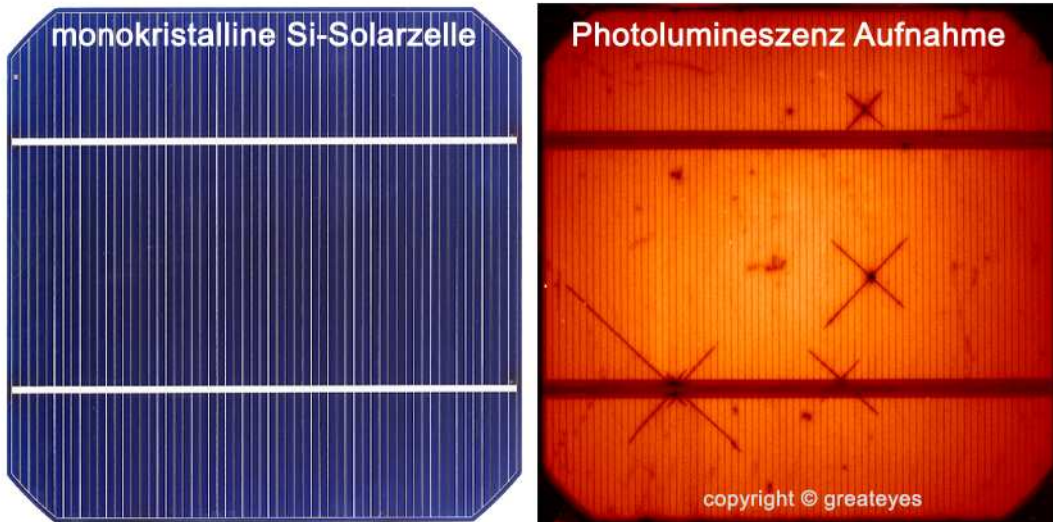


Figure 4 left: Image of a Solar Cell, right: Photoluminescence Image of the Cell

### LumiSolarCell: Photo- and Electroluminescence of Solar Cells

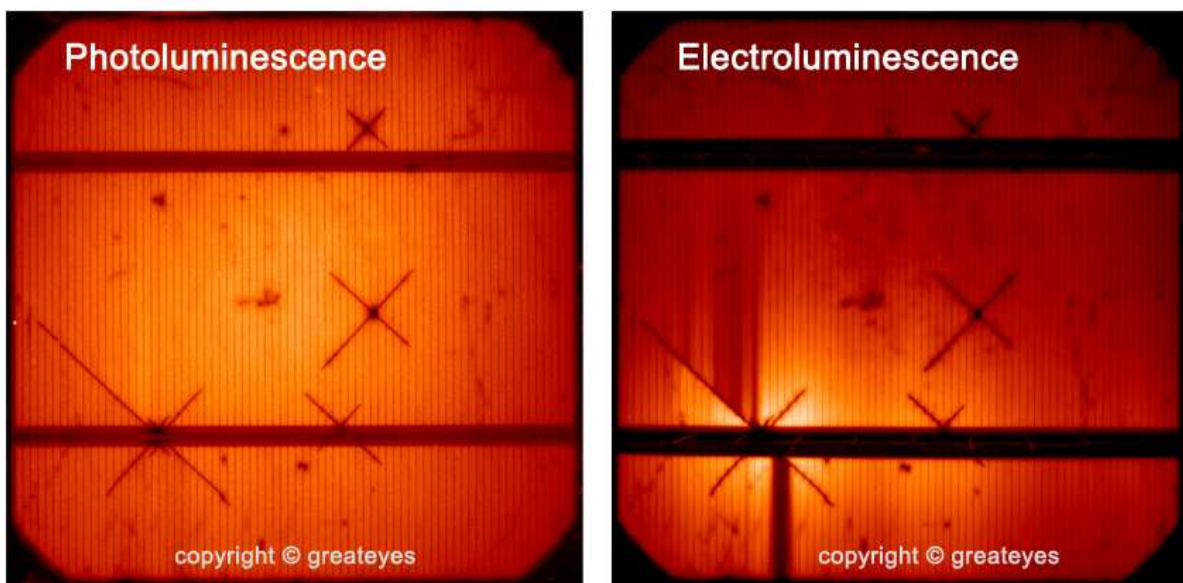


Figure 5 Photoluminescence and Electroluminescence of a mono-crystalline Solar Cell



## LumiSolarCell: Photo- and Electroluminescence of Solar Cells

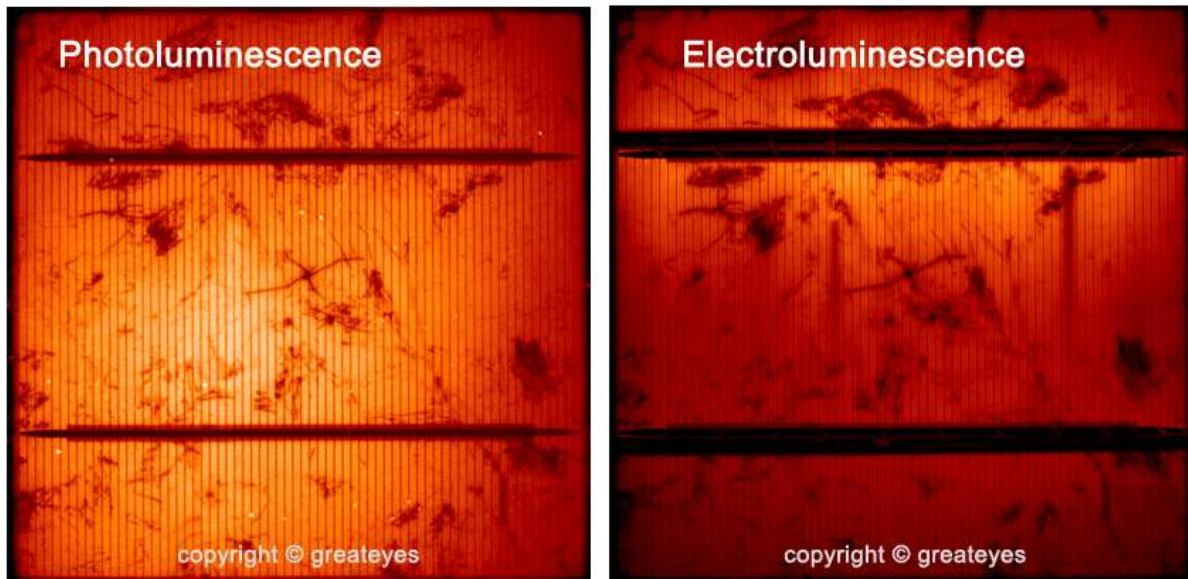


Abbildung 6 Photoluminescence and Electroluminescence of a poly-crystalline Solar Cell

## 5 Appendix

greateyes will provide demo images for publication in case authors are interested. We are looking forward to introduce the system to potential customers. Thank you for studying this press release.

*Martin Regehly*

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Managing Director