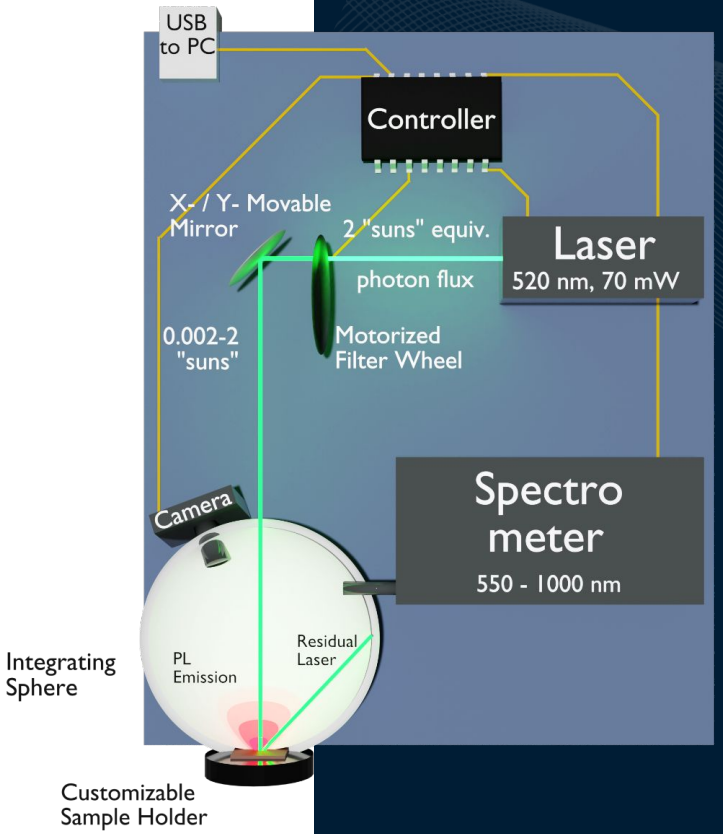
QUANTUM YIELD BERLIN

LuQY

The Absolute Luminescence Quantum Yield System: Plug and Play PL, PLQY & QFLS Measurements

When developing opto-electronic devices, such as LEDs or solar cells, it is essential to improve their radiative efficiency. This requires precise techniques to determine the luminescence quantum yield. The LuQY is an easy-to-use, non-invasive and versatile system with unparalleled compactness to swiftly quantify absolute photoluminescence fluxes of thin film absorbers, layer stacks or complete devices under various operating conditions.

System & Layout



Swift quantification of **Absolute, Spectrally Resolved Photon Fluxes** from photoluminescence (**PL**) of semiconductor thin films & devices

USB-"Plug & Play": the included software records emission spectra & directly calculates **PL Quantum Yield & QFLS** (quasi-Fermi level splitting)

Small & Portable Layout allows flexible usage e.g. in gloveboxes

One-Click & High-Throughput Measurement

- Absolute number of photons from steady-state PL spectra (550–1000 nm)
- Automated, continuously adjustable laser intensity from 0.002-2 "Suns"
- PLQY sensitivity range: 1E-3%

Software & Applications

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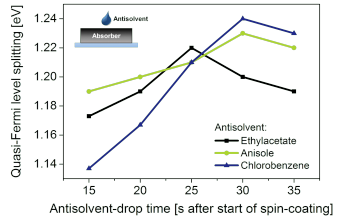
1. **Absolute photon flux measurement**
   Records single or multiple PL spectra for pre-set laser intensity and voltage bias

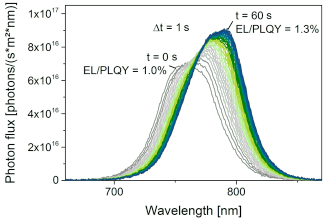
2. **Immediate calculation of PLQY & QFLS**

3. **Automated measurement sweeps**
   Directly constructs pseudo-JV and ideality factor plots by sweeping Laser intensity or bias voltage and determining the QFLS at each operating point.



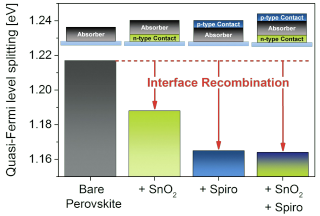
Quality Assessment

Quality assessment for rapid **Process Control** after each fabrication step or for **Accelerated Material and Process Parameter Screenings.**



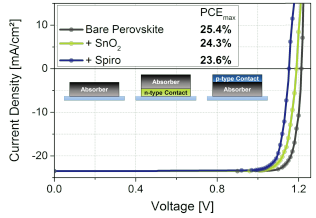
Transient Effects

Fast Acquisition resolves **Shifts in Emission Spectrum & Intensity** as well as **PLQY and QFLS** on timescales from 10 ms to several hours.



Resolve Bulk & Interface Recombination

Quantifying Bulk and Interface Recombination Losses in semiconductor thin films, layer stacks or complete devices such as solar cells or LEDs.



Efficiency Potentials & Loss Mechanisms

In-depth analysis of efficiency potentials and loss mechanisms in semiconductor thin films, layer stacks or full devices, e.g. determine **Ideality Factors and Pseudo-JV Curves from Laser Intensity Dependent PLQY & QFLS**.

Technical Specifications & References

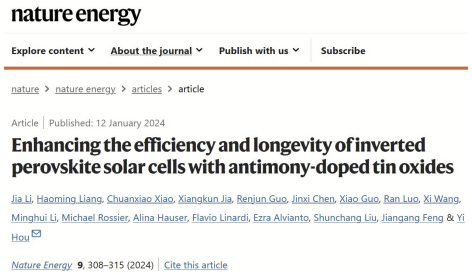
Technical Specifications

Laser	
Photoexcitation intensity (continuously adjustable)	0.002 – 2 “Suns”
Photoexcitation wavelength	520 nm
Photoexcitation spot size	0.5 cm²
Spectrometer	
Spectral detection range	550 - 1000 nm
Quantum yield sensitivity range	10-3 – 100%
Corresponding min. resolvable iVoc for 1.6 eV absorber band gap	1.06 eV
Spectrometer integration time	1 ms – 35 min
Signal to noise ratio	600:1
Housing	
Dimensions (L x W x H)	220 x 390 x 130 mm
Weight	6.1 kg
Connectors	1x DC, 1x USB 3.0

References

>10 publications using the LuQY Pro in renowned journals e.g.:

- Nature Energy
- Joule
- Advanced Energy Materials
- ACS Applied Energy Materials
- Advanced Functional Materials
- Progress in Photovoltaics
- Solar RRL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Enhancing the efficiency and longevity of inverted perovskite solar cells with antimony-doped tin oxides

Jia Li, Haoming Liang, Chuanxiao Xiao, Xiangkun Jia, Renjun Guo, Jinxi Chen, Xiao Guo, Ran Luo, Xi Wang, Minghui Li, Michael Rossier, Alina Hauser, Flavio Linardi, Ezra Alvianto, Shunchang Liu, Jiangang Feng & Yi Hou

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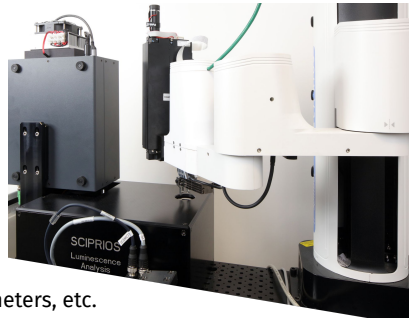

The LuQY can be integrated into SCIPRIOS’ automated deposition systems e.g. the SpinBot. This allows high throughput screening and direct luminescence analysis of semiconductor stoichiometries, contact layers, deposition parameters, etc.

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