

# Solira

## Time-Resolved Photoluminescence Microscope

- Two excitation ports for confocal and/or wide spot modes available
- Up to 8 lasers channels (Prima, LDH Series)
- Laser excitation from 355 to 1064 nm
- Up to 12 detector channels (SPADs, Hybrid-PMTs and others)
- Spectral resolution via FlexLambda or FluoTime coupling
- Detection range from 400 nm to 1550 nm
- Up to three scanners available: a 3D piezo objective scanner, a wide-range sample scanner and a carrier diffusion scanner
- Integrated power meter for excitation power control



### Supported Methods

#### At Points of Interest:

- Steady-state photoluminescence (PL)
- Time-resolved photoluminescence (TRPL)
- Time-resolved emission scan (TRES)
- Excitation power/intensity-dependent measurements
- Temperature-dependent measurements
- Polarization-resolved emission
- Time-trace measurements (blinking)
- Correlation measurements like Photon Antibunching  $g(2)(t)$
- Steady-state electroluminescence (EL)

#### By Scanning:

- TRPL imaging
- Time-resolved emission mapping (TREM)
- Carrier diffusion mapping (CDM)
- Excitation power/intensity-dependent imaging
- Fluorescence lifetime imaging (FLIM)
- Phosphorescence lifetime imaging (PLIM)
- Polarization-resolved emission imaging
- Temperature-dependent imaging

Solira is an upright microscope that can operate in confocal and wide spot excitation modes for the characterization of a wide variety of samples using steady-state and time-resolved photoluminescence methods with single-emitter sensitivity. Its newly optimized design makes it an ideal tool for studying the properties of samples such as wafers, semiconductor films, nanostructures, 2D materials, crystals, or even complete devices (e.g., displays, micro-LEDs, or solar cells).

The system is based on a new type of upright microscope body that provides easy access to a broad range of sample geometries and sizes, while supporting many different characterization methods. Solira is highly upgradeable and can be expanded in the future, allowing it to be configured in different versions for optimal performance across various materials, methods, and applications.

A wide selection of excitation sources is available, covering wavelengths from 355 nm up to 1064 nm, alongside detector combinations with high sensitivity across the 400 nm to 1550 nm spectral range.

Solira can be equipped with either a manual sample stage, a motorized sample scanner and/or a 3D piezo objective scanner, enabling spatial resolution from the nanometer to millimeter scale.

**Flexible excitation subsystems:**

- Two laser excitation ports for confocal and/or wide spot excitation
- Easy switching between the two excitation ports
- Excitation by stand alone picosecond laser with up to three wavelengths
- Excitation by software-controlled laser driver for smart laser control with up to 8 wavelengths
- Different picosecond LDH laser heads with pulses in the lower picosecond time regime
- Different operation modes are available e.g., pulsed, continuous wave (CW) and burst mode
- Broad range of excitation wavelengths from 355 nm up to 1064 nm
- Excitation sources can be fiber or free-space coupled to one of the two laser ports
- Integrated excitation sources along with multiple optical components in one laser combining unit (LCU)

**Special designed detection subsystem with single photon sensitivity:**

- Exchangeable pinholes
- Exchangeable major dichroics
- High light collection efficiency (single emitter sensitive)
- Integrated camera for sample positioning and focusing
- Extra camera port
- Back-reflection–assisted focusing for homogeneous samples
- Up to three flexible emission exit ports
- Three available scanning modes: wide-range, piezo objective, and carrier diffusion
- Configuration allows up to 12 detectors in different combinations
- Additional optical switches for further extensions and addons are available too
- Detectors can be coupled to the microscope either directly or via fiber coupling
- Broad variety of sensitive detectors, which are optimized for wavelengths, signal brightness, or photophysical attributes like after-pulsing free detection

**Photon counting electronics:**

- Available as single-channel detection or multi-channel detection version
- Based on the Time-Correlated Single Photon Counting (TCSPC) method
- Including coincidence correlations and event timing
- Lifetime detection from few picoseconds up to milliseconds
- TTTR data acquisition used for standard lifetime measurements (TRPL) or different imaging (TRPL, FLIM, PLIM, etc.) and correlation methods ( $g(2)$ )

Options	
Transmission illumination	Electrical excitation/biasing capability
Second excitation and/or second emission port	Coupling with wavelength selection unit or spectrometer
Cryostat integration	Carrier diffusion mapping
Temperature-controlled stages	Laser combining unit (LCU)
Exchangeable pinholes set	Emission polarization control
Exchangeable major dichroics set	Wide-spot and/or confocal illumination

## Specifications

Excitation Sources				
Picosecond diode laser wavelength	355 - 1064 nm			
Repetition rate	Down to single shot up to 40 MHz, (optional up to 80 MHz or 100 MHz, depending on the laser source)			
Detectors				
Type <sup>1</sup>	PMA Hybrid Series	SPAD (PDM Series)	SPAD (Excelitas Series)	NIR-PMT 1400
Spectral range <sup>2</sup>	< 300 - 900 nm	< 400 - 1000 nm	< 400 - 1070 nm	< 900 – 1400 nm
Dark counts (at 20 °C, typ. value)	< 250 cps	< 250 cps	< 100 cps	< 10 000 cps
Transit time spread (FWHM)	typ. < 150 ps	typ. < 50 ps	typ. < 250 ps	typ. < 50 ps
Data Acquisition				
Type	MultiHarp 150 N / P	MultiHarp 160	PicoHarp 330	HydraHarp 500 S / M
Numbers of independent detection channels	4 / 8 / 16	16 / 32 / 48 / 64	up to 4	up to 8 / up to 16
Time resolution (bin width)	80 ps / 5 ps	5 ps	1 ps	1 ps
Dead time	< 650 ps	< 650 ps	< 680 ps for edge trigger, < 4.2 ns with CFD	< 680 ps for edge trigger, < 6.8 ns with CFD
Timing precision	Typ. < 28 ps rms	Typ. < 28 ps rms	Typ. 3.0 ps rms	Typ. 3.5 ps rms
Maximum number of time bins	65 536	65 536	65 536	65 536
Scanning				
Type	3D XYZ Piezo objective scanner	Piezo wide-range scanner	Carrier diffusion scanner	
Scanning range <sup>3</sup>	80 × 80 × 100 μm	128 × 86 mm	22 × 22 mm <sup>4</sup>	
Min. step size	1 nm	40 nm	20 nm	
Positioning accuracy	< 10 nm	< 400 μm	< 200 nm	
Supports spiral scan (automated large-area imaging)	No	Yes	No	
Operation & Electrical				
PC specifications	CPU: Intel® Core™ i7, 5.6 GHz, RAM: 32 GB, SSD: 1 TB, dedicated graphics card, operating system: Windows™ 11			
Operating environment	Room temperature range 15 - 25 °C, Room temperature stability ± 1.5°C (recommended), Room humidity < 60 %			
Power consumption	6 A at 230 V AC (typ. EU) 11.5 A at 110V AC (typ. USA)			
Operating voltage	220/240 or 110/120 V AC @ 50/60 Hz			
Altitude	Guaranteed performance up to 2000 m above sea level			

<b>Solira Software</b>	
Operating system	Windows™ 11
GPU-based programming	OpenGL
Context based workflows for easy acquisition and analysis	For steady-state PL and TRPL point measurements, TRPL imaging, anisotropy imaging, carrier diffusion mapping, TRES, and time-trace measurements, g(2)
<b>Dimensions</b>	
Microscope unit	750 × 500 × 600 mm (w × d × h) (standard) / 750 × 500 × 800 mm (w × d × h) (extended height)
Weight (typical configuration)	130 Kg

<sup>1</sup> other detectors upon request

<sup>2</sup> manufacturer detector-specified range

<sup>3</sup> manufacturer scanner-specified range

<sup>4</sup> effective imaging range depends on the specific system configuration



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