

Solira

Time-Resolved Photoluminescence Microscope

- Two excitation ports for confocal and/or widefield 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 ¹ | PMA Hybrid Series | SPAD (PDM Series) | SPAD (Excelitas Series) | NIR-PMT 1400 |
| Spectral range ² | < 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 ³ | 80 × 80 × 100 μm | 128 × 86 mm | 22 × 22 mm ⁴ | |
| 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 requirements | CPU: Intel® Core™ i7, 5.6 GHz, RAM: 32 GB, SSD: 1 TB, 8 GB graphic card, operating system: Windows™ | | | |
| Operating environment | Room temperature range 15 - 25 °C, Room temperature stability ± 1.5°C (recommended), Room humidity < 60 % | | | |
| Operating environment | 6 A at 230 V AC (typ. EU) 11.5 A at 110V AC (typ. USA) | | | |
| Power consumption | 220/240 or 110/120 V AC @ 50/60 Hz | | | |
| Operating voltage | 220/240 or 110/120 V AC @ 50/60 Hz | | | |
| Altitude | Guaranteed performance up to 2000 m above sea level | | | |

| Solira Software | |
|---|---|
| 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) |
| Dimensions | |
| Microscope unit | 750 × 500 × 600 mm (w × d × h) (standard) / 750 × 500 × 800 mm (w × d × h) (extended height) |
| Weight (typical configuration) | 140 Kg |

- ¹ other detectors upon request
- ² manufacturer detector-specified range
- ³ manufacturer scanner-specified range
- ⁴ effective imaging range depends on the specific system configuration



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