# Luminosa NEW

## Single Photon Counting Confocal Microscope

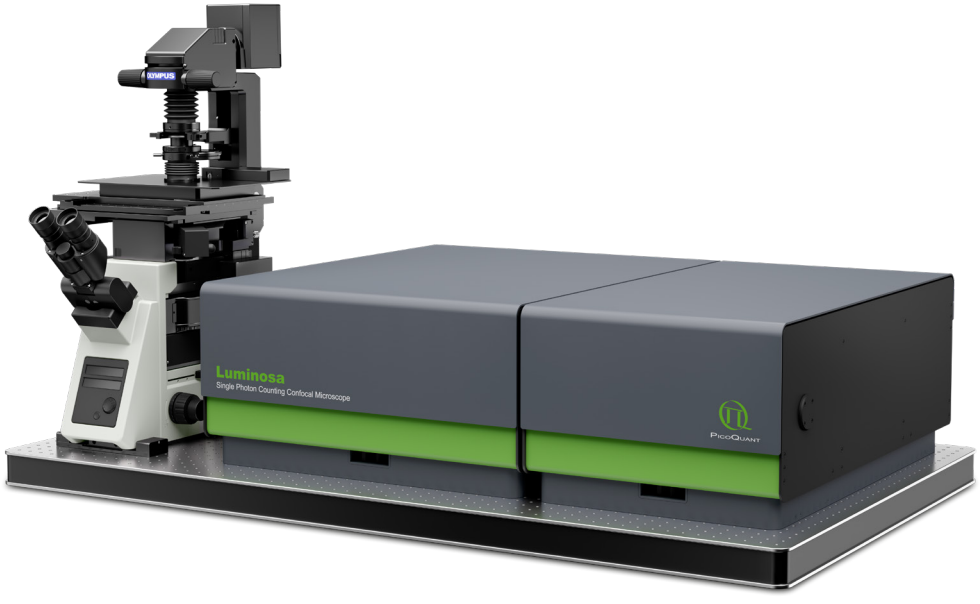
- Software-controlled confocal system based on an inverted microscope
- Versatile excitation system with laser wavelengths from 375 to 1064 nm
- VarPSF: fine-tuned observation volume for FCS and single molecule FRET experiments
- Motorized positioning table for “tiling and stiching” in transmission and FLIM mode
- Scanning options: FLIMBee galvo scanner and piezo objective scanning
- Up to 6 truly parallel detection channels with SPAD and/or Hybrid PMTs
- < 700 ps dead time per channel and 5 ps time bins
- One click autoalignment for consistent optimal performance
- Fast results with minimal user interaction thanks to GPU accelerated algorithms and context-based workflows for FCS, FLIM, and single molecule detection

### Core methodologies

- Single molecule FRET (burst and time trace analysis)
- Fluorescence Lifetime Imaging (FLIM)
- Fluorescence Correlation Spectroscopy (FCS)
- FLIM-FRET
- rapidFLIM$^{HiRes}$ for fast processes
- Anisotropy Imaging
- DIC imaging

### Application areas

- Dynamic structural biology
- Studying cellular mechanisms driven by phase separation
- Enviromental sensing and marker multiplexing
- Mapping dynamics and structure of cellular membranes
- Characterizing functional nanovesicles
- Studying chemical reactions at the single molecule level
- Characterizing advanced materials



# Specifications

| **Feature highlights** | |
|---|---|
| LumiFinder | Automated detection and measurement of immobilised emitters |
| FRETcompass | Automated determination of correction factors used in single molecule FRET experiments based on the benchmark study published in 2018 (Hellenkamp et al. Precision and accuracy of single-molecule FRET measurements—a multi-laboratory benchmark study. Nat Methods 15, 669–676 (2018)) |
| InstaFCS | Online FCS fitting with automatic suggestions for model and paramters |
| InstaFLIM | • Provides first suggestions for FLIM species separation without user interaction<br>• Suggested parameters can be fine-tuned<br>• Simultaneous TCSPC and phasor analysis options for ROI determination |
| Sample-Free Auto-alignment (SFA) | • One-click auto-alignment without any sample required<br>• Ensures optimal performance for every measurement, even the most challenging ones |
| CalEx* | • Excitation laser power calibration allows setting and displaying excitation intensity in µW<br>• No external power meter required |
| VarPSF* | Switch between diffraction limited and larger observation volume to:<br>• Increase observation time window to check for dynamic transitions between states<br>• Study diffusion properties of larger particles, 3-6 times larger volumes are achieved (depending on wavelength) |
| Luminosa Full-Access Mode (LFA) | Fully accessible optical unit with dichroics and filters that can be easily exchanged, no special tools required |
| **Excitation** | |
| | 1 - 8 lasers with choice of wavelengths from 375 - 1064 nm<br>optional: 2 additional exit ports available for coupling additional lasers |
| Commonly used wavelengths | 405, 440, 485, 532, 560, 595, and 640 nm |
| Individual laser operation modes | pulsed and continuous wave<br>(continuous mode availability depends on the laser model) |
| Repetition rates | 1 - 40 MHz, for specific wavelengths up to 80 MHz |
| Laser driver | 8 channel Sepia PDL 828L |
| Supported multi line operation | Pulsed Interleaved Excitation (PIE) or simultaneous emission modes (for specific wavelengths Alternating Excitation mode (ALEX) in µs and ms time scales also available) |
| Motorized main dichroic wheel | 6 positions available for 18 × 25 × 3 mm single, dual, triple, quad-band dichroics |
| **Microscope** | |
| | inverted Olympus IX73 body (partially motorized) |

| | | |
|---|---|---|
| Objectives types | UPLSAPO 60x PlanApochromat, NA 1.2, water immersion, 400 - 900 nm<br>UPLSAPO 100x PlanApochromat, NA 1.4, oil immersion, 400 - 850 nm<br>other oil immersion, apochromatic correction, air spaced, IR-enhanced or long working distance objectives available | |
| Observation modes | confocal, transmission<br>optional: epi-widefield illumination, Differential Interferometric Contrast (DIC) | |
| Oculars | Yes | |
| Camera | Optional CCD camera at the left side port | |
| Sample holder | Multi-functional sample holder compatible with several standard sizes of microscope coveslips and petri dishes<br>96-well plate sample holder | |
| Compatible with cage incubator | Yes | |
| **Positional stability** | | |
| Axial drift (typical values) | • For 15 minutes measurement: 50 ± 10 nm<br>• For 2 hour measurement: 100 ± 20 nm | |
| **Detection** | | |
| | • Parallel detection with up to 6 point detectors in the spectral range of 300 - 1064 nm<br>• Additional exit ports for customised detection path | |
| **Detector options** | | |
| | • Single Photon Avalanche Diodes (SPAD) for low dark-counts and maximum detection efficiency<br>• Hybrid photomultiplier tubes (PMA-Hybrid-40) for optimum timing performance and when working at high count rates | |
| **Type** | **SPAD (SPCM-AQRH)** | **PMA Hybrid - 40** |
| Spectral range | 400 - 1000 nm | 300 - 720 nm |
| Dark counts (at 20 °C, typ. value) | < 250 cps | < 700 cps |
| Photon detection efficiency | 50 % at 550 nm | 45 % at 500 nm |
| Timing response | 200 - 400 ps (depending on wavelength) | 100 ps |
| Spectral separation | Fluorescence filters (25 mm in diameter) and 25 × 36 × 1mm dichroics | |
| Polarisation separation (optional for anisotropy imaging) | Polarising beamsplitting cube | |
| **Data acquisition** | | |
| | • based on Time-Correlated Single Photon Counting (TCSPC) in Time-Tagged Time Resolved (TTTR) measurement mode<br>• simultaneous data acquisition with up to 6 channels<br>• new dynamic binning format for FLIM imaging | |
| **TCSPC Unit** | **MultiHarp 150 8P** | |
| Time resolution (bin width) | 5 ps | |
| Dead time | < 0.65 ns | |
| Timing precision | < 32 ps rms | |

| Scanning and positioning | |
|---|---|
| FLIMbee XY galvo scanner | Min. pixel dwell time: 0.5 µs,<br>Min. pixel size: 17 nm (60x objective)<br>Up to 5.2 frames per second for a 512 x 512 pixel image<br>Max. scan field: 200 x 200 µm (60x objective)<br>Possibility to by-pass the FLIMbee galvo scanner for point measurements |
| XY objective scanning | Min. pixel dwell time: 0.2 ms<br>Min. pixel size: 1 nm (independent of objective)<br>Max. scan field: 80 x 80 µm (independent of objective) |
| XY - scanning combined option | Combination of FLIMbee and objective scanning on the same system with software-controled change between the two scanning modalities |
| Piezo-based Z-scanning | Min. step size: 50 nm<br>Overall range: 100 µm |
| Positioning stage with Spiral scan mode, creating overview map by tiling and stitching | Overall range: 121 x 81 mm<br>Max speed: 300 mm/second<br>Positioning repeatability < 0.15 µm |
| **Luminosa software** | |
| Operating System | Windows 11 |
| GPU – based programming | OpenGL |
| Context based workflows for easy acquisition and analysis | For single molecule FRET burst analysis, single molecule imaging, FCS in vitro, FCS in cells, FLIM, FLIM-FRET, steady-state FRET, anisotropy imaging |
| **General info** | |
| Operating environment | Room temperature range 15 - 25 °C<br>Room temperature stability ± 1.5°C (recommended)<br>Room humidity < 60% |
| Optical table dimensions | For 1-4 detectors: 1500 × 900 mm<br>For 5-6 detectors: 2000 × 900 mm |
| Power consumption | 6 A at 230 V AC (typ. EU)<br>20 A at 110V AC (typ. USA) |
| Operating voltage | 115 or 230 V AC |
| Altitude | guaranteed performance up to 2000 m above sea level |

* Feature available only for PicoQuant lasers

PicoQuant GmbH
Rudower Chaussee 29 (IGZ)
12489 Berlin
Germany

Phone +49-(0)30-1208820-0
Telefax +49-(0)30-1208820-90
Email info@picoquant.com
Web www.picoquant.com