# XPER FLIM

The only system of choice for fluorescence lifetime imaging of both value and performance
by NANO**BASE**
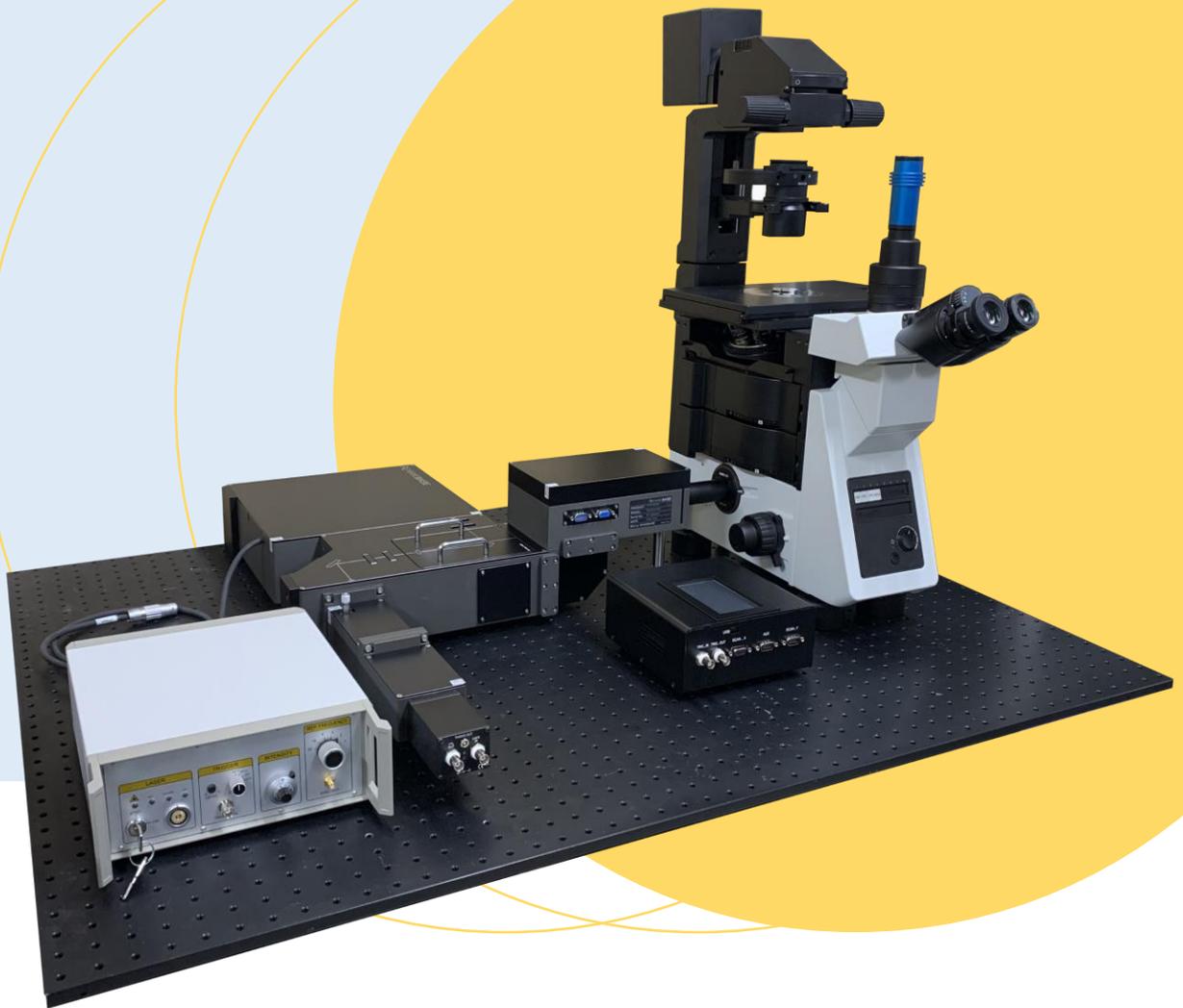
Time-Correlated Single Photon Counting

Fluorescence lifetime imaging microscopy or FLIM is an imaging instrument type for producing an image based on the differences in the exponential decay rate of the fluorescence from a fluorescent sample.

Fluorescence lifetime imaging yields images with the intensity of each pixel determined by τ, which allows researchers to view contrast between materials with different fluorescence decay rates, and also produces images which show changes in other decay pathways.

Fluorescence lifetimes can be determined in the time domain by using a pulsed source. When a population of fluorophores is excited by an ultrashort or delta pulse of light, the time-resolved fluorescence will decay exponentially.

Time-correlated single-photon counting (TCSPC) is usually employed as a measurement method because it compensates for variations in source intensity and single photon pulse amplitudes. More specifically, TCSPC records times at which individual photons are usually detected by a single photon avalanche photo diode (SPAD) with respect to the excitation laser pulse.

The recordings are repeated for multiple laser pulses and after enough recorded events, researchers are able to build a histogram of the number of events across all of these recorded time points. This histogram can then be fit to an exponential function that contains the exponential lifetime decay function of interest, and the lifetime parameter can accordingly be extracted.

Xper-FLIM is equipped with the single-photon avalanche diode (SPAD)-TCSPC FLIM system and can offer options of detection channels at low-cost, realizing super fast analysis for FLIM researchers. Xper-FLIM is also available in either an inverted microscope or an upright microscope to meet a recently growing number of various application needs.

APPLICATIONS

Biology/Medical Research

- Molecular biological analysis
- Biochemical analysis

Semiconductors

Monitoring and analysis of wafer quality

**Photoelectron Materials**

Efficiency analysis of LED, OLED

Solar Cells

Efficiency analysis of injection

Intensity

Time

< Fluorescence lifetime >

<Fluorescence lifetime image>

Timing electronics

Fluorescence intensity

Time count start

Pulse laser

Single photon detector

Optical filter

Laser scanning system

Beamsplitter

Objective lens
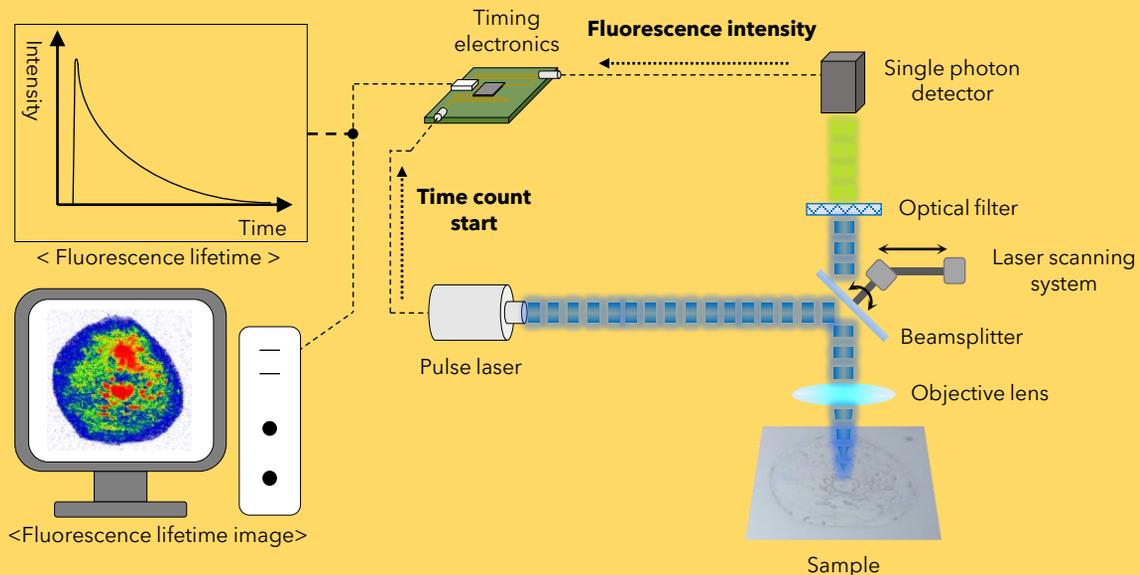
Sample

3-dimensional fluorescence intensity*
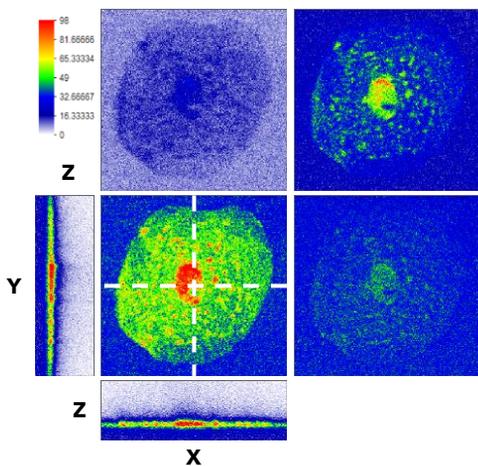
Raman intensity mapping image*
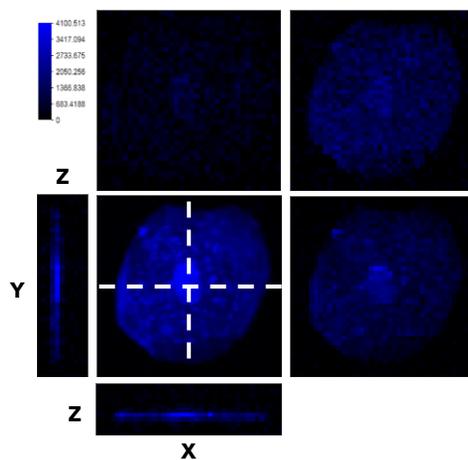
Lifetime decay of nucleus area*

Model	ExpDec2	
Equation	y = A1*exp(-x/t1) + A2*exp(-x/t2) + y0	
Plot	Normalized1	
y0	0.07349	?8.14577E-4
A1	0.77047	?0.00492
t1	0.7077	?0.0087
A2	0.14832	?0.00423
t2	5.35918	?0.20572
Reduced Chi-Sqr	9.07907E-5	
R-Square(COD)	0.99374	
Adj. R-Square	0.99372	
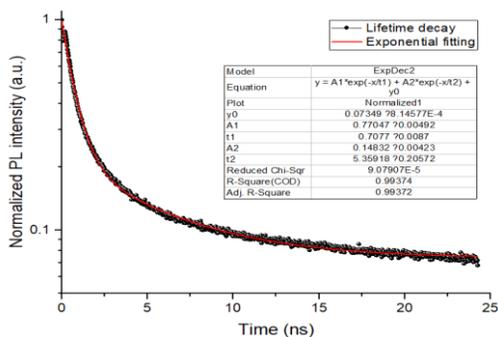
Averaged Raman spectrum*

1004 cm⁻¹ Phenylalanine

1445 cm⁻¹ C-H deformation

1651 cm⁻¹ Amide I

2930 cm⁻¹ CH₃ stretching

glass

Target area of mapping
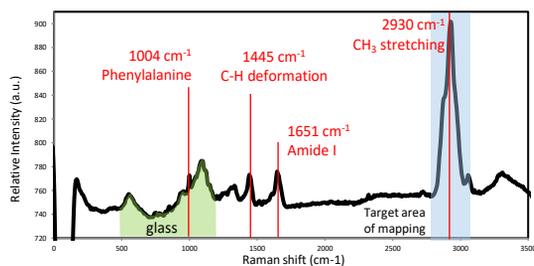
* Sample : Single oral epithelial cell

Microscope	- Reflected LED illuminator for bright field
	- Mechanical X-Y stage with right-hand control
	- Automatically controlled Z-axis position
	- Includes main frame, stage plate, control box, interface cable, power cable
	- 40X objective (other options : 10X, 20X, 50X, and 100X)
	- Upright or inverted microscope

Laser Scanning Module
- Wavelength range: 400~1000 nm
- Laser scanning mode: Raster scan
- Scanning area: 200 μm ×200 μm (when using a 40X objective lens)
- Includes a 6 MP camera for optical image acquisition (FOV: 220 μm ×150 μm when using 40X)
- A controller is included (USB1.1)
- Maximum scan speed: >100 lines/s

Laser
Picosecond pulsed diode laser and driver
- Wavelength: 390 ~ 700 nm
- Freespace / Fiber coupling selection (optional)

Optical Filter
Choose filters corresponding to laser wavelength
- Wavelength range: 390 ~ 700 nm
- Interchangeable in a filter box for corresponding lasers

System Platform
- 1 slot to connect a laser neutral density (ND) filter or a polarizer
- 2 slots to connect polarizers or waveplates
- 1 slot to connect an interchangeable filter set
- Up to 3 lasers are installable.
- Fiber coupling port is installable.
- Provides a robust platform for stable beam alignment

Detector
Photon detection efficiency
- 24 % at 400 nm
- 49 % at 550 nm
- 37 % at 650 nm

- Active area diameter : 50 μm
- Dark counts: <250, <100, <50, <25 cps (depending on grade of detector)
- NIM timing output: 50 ps
- After-pulsing probability: <3%

Laser Driver
- Repetition rate: 31.25 kHz ~ 80 MHz
- Trigger: Level -1 to +1 V (adjustable)
- Frequency range: 10 Hz ~ 80 MHz
- Synchronization output: Amplitude <0.8 mV into 50 Ohms

Electronics
Time-tagging electronics
- Detection channels: 1 or 2
- Time range: 25 ps
- Trigger: 0~ -1200 mV
- Count rate: 40 MHz
- Marker: TTL x4

NanoSpectrum Software Suite
- Fluorescence lifetime acquisition & imaging
- Spectrum data export format: .txt, .csv
- 2D mapping data export format: .spm, .csv

Specifications are subject to change without notice.

Xper-FLIM
- **Cat. No. : XPER-FLIM**
- Functionalities : FLIm (TCSPC) analysis only

XperRF
- **Cat. No. : XPERRF**
- Functionalities : FLIm (TCSPC) + Raman analysis

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