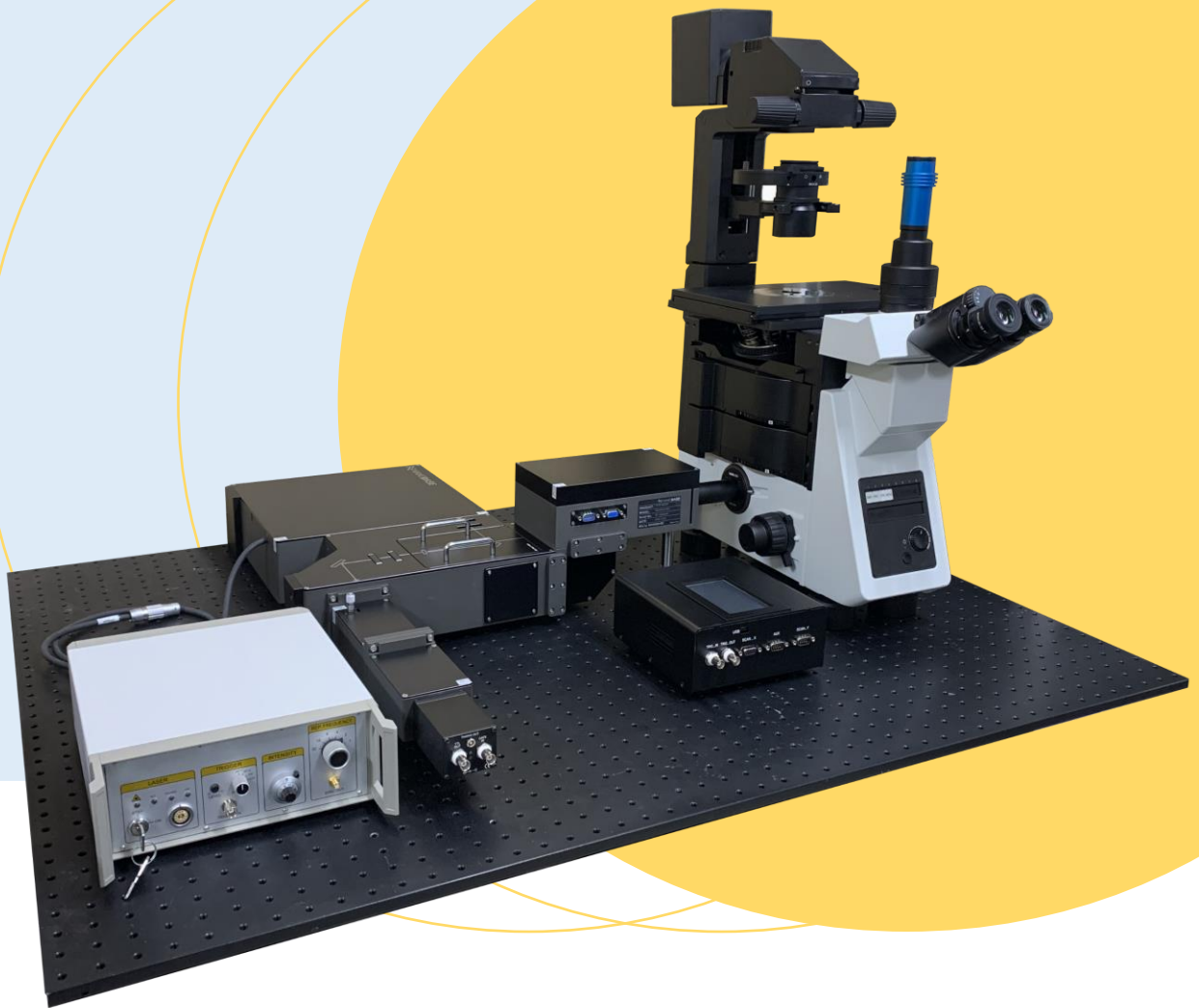


# XPER FLIM

The only system of choice for  
time-resolved photoluminescence of  
both value and performance  
by **NANOBASE**



# What is TRPL, FLIM, and TCSPC?

Time-Resolved Photoluminescence (TRPL) is a general term while Fluorescence Lifetime Imaging (FLIM) or Time-Correlated Single Photon Counting (TCSPC) are special techniques to achieve TRPL.

Fluorescence lifetime imaging (FLIM) yields images with the intensity of each pixel determined by  $\tau$ , 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) and the time tagging electronics and can offer options of detection channels at a low-cost, realizing super fast analysis for TRPL 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.



## Biology/Medical Research

- Molecular biological analysis
- Biochemical analysis



## Semiconductors

Monitoring and analysis of wafer quality



## Photoelectron Materials

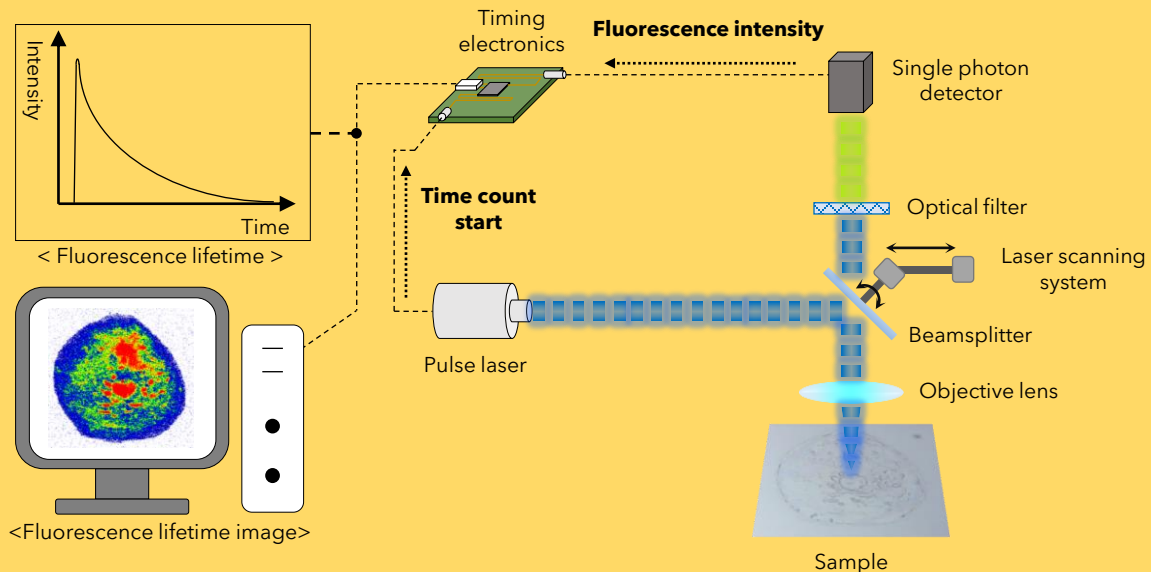
Efficiency analysis of LED, OLED



## Solar Cells

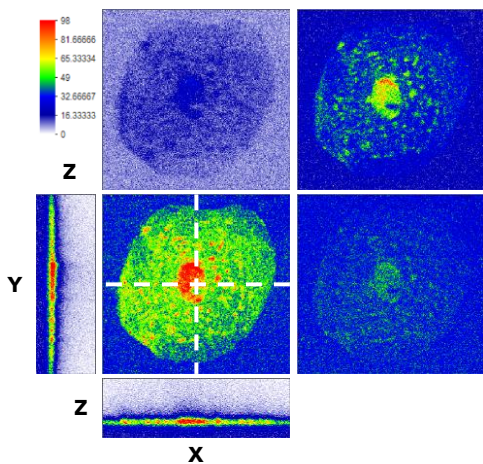
Efficiency analysis of injection

# SCHEMATIC DIAGRAM OF XPER-FLIM OPERATION

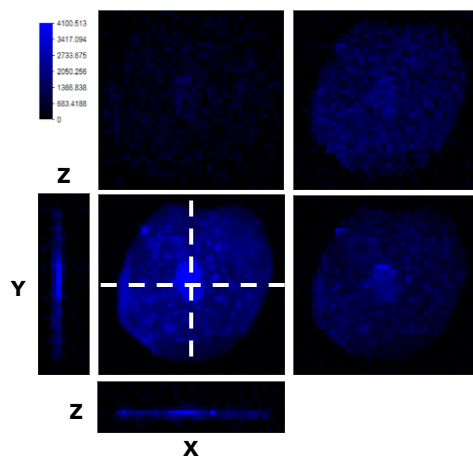


# ANALYSIS DATA FROM XPER-FLIM & XPERRF

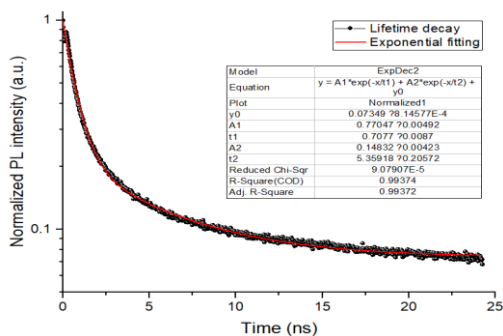
3-dimensional fluorescence intensity\*



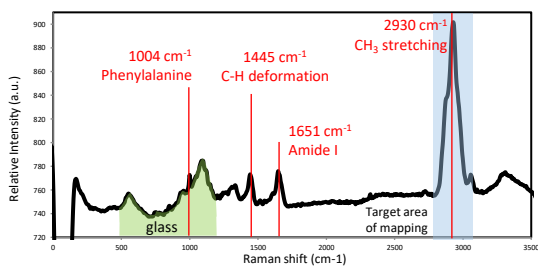
Raman intensity mapping image\*



Lifetime decay of nucleus area\*



Averaged Raman spectrum\*



\* Sample : Single oral epithelial cell

Microscope	<ul style="list-style-type: none"> <li>- Reflected LED illuminator for bright field</li> <li>- Mechanical X-Y stage with right-hand control</li> <li>- Motorized control of Z-axis position (optional)</li> <li>- Includes main frame, stage plate, quintuple revolving nosepiece, and control box</li> <li>- 40X objective (other options : 10X, 20X, 50X, and 100X)</li> <li>- Upright or inverted microscope</li> </ul>								
Laser Scanning Module and Vision Camera	<ul style="list-style-type: none"> <li>- Wavelength range: 400~1000 nm</li> <li>- Laser scanning mode: Raster scan</li> <li>- Scanning area: 200 <math>\mu</math>m <math>\times</math> 200 <math>\mu</math>m (when using a 40X objective lens)</li> <li>- Includes a 6 MP camera for optical image acquisition (FOV: 330 <math>\mu</math>m <math>\times</math> 220 <math>\mu</math>m when using 40X)</li> <li>- A controller is included (USB)</li> <li>- Maximum scan speed: &gt;100 lines/s</li> </ul>								
Laser	<p><u>Picosecond pulsed diode laser and driver</u></p> <ul style="list-style-type: none"> <li>- Wavelength: 390 ~ 700 nm</li> <li>- Freespace / Fiber coupling selection (optional)</li> </ul>								
Optical Filter	<p><u>Choose filters corresponding to laser wavelength</u></p> <ul style="list-style-type: none"> <li>- Wavelength range: 390 ~ 700 nm</li> <li>- Interchangeable in a filter box for corresponding lasers</li> </ul>								
System Platform	<ul style="list-style-type: none"> <li>- 1 slot to insert a laser neutral density (ND) filter or a polarizer</li> <li>- 2 slots to insert polarizers or waveplates</li> <li>- 1 slot to insert an interchangeable filter set</li> <li>- Up to 3 lasers are installable.</li> <li>- Fiber coupling port is installable. (optional)</li> <li>- Provides a robust platform for stable beam alignment</li> </ul>								
Detector	<p><u>Photon detection efficiency</u></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">- 24 % at 400 nm</td> <td style="width: 50%;">- Active area diameter : 50 <math>\mu</math>m</td> </tr> <tr> <td>- 49 % at 550 nm</td> <td>- Dark counts: &lt;250, &lt;100, &lt;50, &lt;25 cps (depending on grade of detector)</td> </tr> <tr> <td>- 37 % at 650 nm</td> <td>- NIM timing output: 50 ps</td> </tr> <tr> <td></td> <td>- After-pulsing probability: &lt;3%</td> </tr> </table>	- 24 % at 400 nm	- Active area diameter : 50 $\mu$ m	- 49 % at 550 nm	- Dark counts: <250, <100, <50, <25 cps (depending on grade of detector)	- 37 % at 650 nm	- NIM timing output: 50 ps		- After-pulsing probability: <3%
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- 37 % at 650 nm	- NIM timing output: 50 ps								
	- After-pulsing probability: <3%								
Laser Driver	<ul style="list-style-type: none"> <li>- Repetition rate: 31.25 kHz ~ 80 MHz</li> <li>- Trigger: Level -1 to +1 V (adjustable)</li> <li>- Frequency range: 10 Hz ~ 80 MHz</li> <li>- Synchronization output: Amplitude &lt;0.8 mV into 50 Ohms</li> </ul>								
Electronics	<p><u>Time-tagging electronics</u></p> <ul style="list-style-type: none"> <li>- Detection channels: 1 or 2</li> <li>- Time range: 25 ps</li> <li>- Trigger: 0~ -1200 mV</li> <li>- Count rate: 40 MHz</li> <li>- Marker: TTL x4</li> </ul>								
NanoSpectrum Software Suite	<ul style="list-style-type: none"> <li>- Fluorescence lifetime acquisition &amp; imaging</li> <li>- Spectrum data export format: .txt, .csv</li> <li>- 2D mapping data export format: .spm, .csv</li> </ul>								

Specifications are subject to change without notice.

Xper-FLIM	<ul style="list-style-type: none"> <li>- <b>Cat. No. : XPER-FLIM</b></li> <li>- Functionalities : TRPL measurements only</li> </ul>
XperRF	<ul style="list-style-type: none"> <li>- <b>Cat. No. : XPERRF</b></li> <li>- Functionalities : TRPL + Raman measurements</li> </ul>