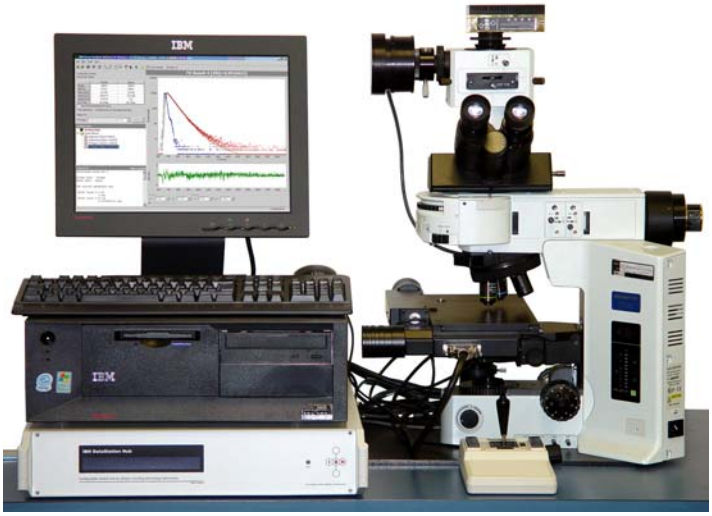
Fluorescence Lifetime Microscopy for Bio- and Nanotechnology

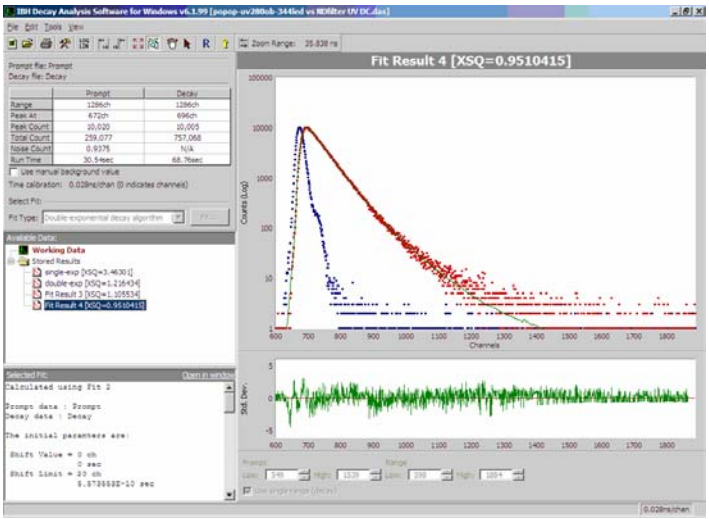
TCSPC Confocal Microscope



Time-resolved microscopy is the ultimate tool for investigating any dynamic events in cells and subcellular structures, such as energy-transfer and molecular binding. HORIBA Jobin Yvon, the leader in fluorescence spectroscopy, offers an advanced system to apply time-resolved fluorescence spectroscopy on the micron-scale. We have adapted IBH TCSPC components for use with a microscope to achieve the best sensitivity for fluorescence-lifetime measurement. Light sources are interchangeable pulsed-diode sources, including the first deep-UV diodes: 280 nm and 340 nm LEDs. With the 280 nm LED, you can measure fluorescence lifetimes of proteins with tryptophan directly from tissue samples. The system can measure lifetimes from 100 ps up to 100 µs with TCSPC, and phosphorescence lifetimes (>10 µs) with MCS using the state-of-the-art IBH TBX-04 PMT detector and electronics.

Features

- Spatial mapping of fluorescence lifetimes and intensity
- Standard detector sensitive from 185 to 850 nm
- Expandable to spectral mapping and fluorescence lifetimes for UV to near-IR (240–1700 nm)
- Lifetime acquisition in seconds to minutes
- Picosecond pulsed-diode sources (280–830 nm)
- Optional objectives for deep-UV excitation
- Single-photon sensitivity
- Fully programmable *x-y-z* mapping stage
- Selectable pinholes for variable spatial resolution
- Programmable temperature-control compatibility



The screen-capture shows the fluorescence decay of POPOP in methanol (red). Single-exponential fitting (green) gives a fluorescence lifetime of 1.32 ns. The excitation pulse is shown in blue.

Uses for the TCSPC Confocal Microscope

- Intrinsic protein fluorescence (tyrosine, tryptophan)
- Fluorescent proteins (GFP, YFP, CFP, RFP, phycoerythrin), DNA and molecular beacons
- Fluorescent dyes and probes (rhodamine, fluorescein)
- Nanoparticles (quantum dots and carbon nanotubes)
- Fluorescence Resonance Energy Transfer (FRET)
- Stern-Volmer fluorescence quenching
- Hair, skin, and thin films
- Porphyrins and chlorophyll
- Humic-acid fluorescence

Specifications

- Wide wavelength-coverage, from 280–1700 nm
  - Standard UV-visible (340–850 nm) with standard objectives and detector
  - 240-850 nm optional with UV objective and optics in microscope
  - Extendable to near-IR (up to 1700 nm) via fiber-optic coupling to emission monochromator with near-IR detectors and near-IR microscope optics
- Confocal option with pinhole turret on emission side and Olympus pinhole accessory on the excitation side
- *x-y-z* scanning with automated stage: resolution 1 µm (< 1 µm in UV)
- Excitation sources: NanoLEDs from 280–830 nm
- Lifetimes: TCSPC is 100 ps–100 µs; MCS is > 1 µs

NanoLED with adapter for bright-field port on the microscope

TBX detector and C-adapter for the microscope

HORIBA Jobin Yvon, maker of The World's Most Sensitive Spectrofluorometer.

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