EDINBURGH INSTRUMENTS

FLS1000

Sample holders

Accessories Guide

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Contents

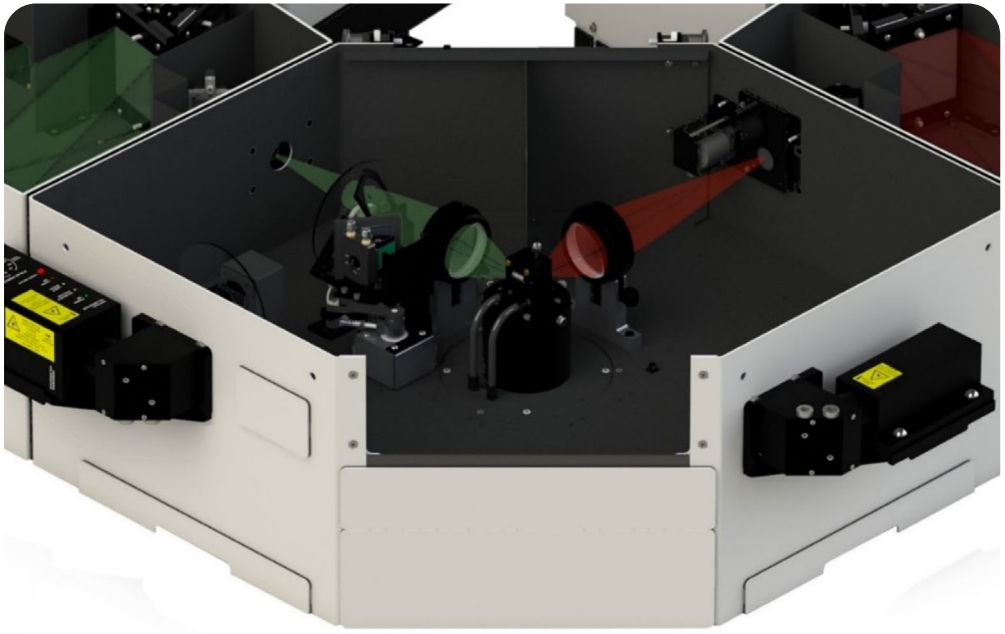
Sample Holders

Introduction

Sample holders are available for every application of the FLS1000 spectrometer.

The FLS1000 Photoluminescence Spectrometer supports a comprehensive range of quick-exchange sample holders designed for rapid reconfiguration between experiments. The sample chamber accommodates accessories such as integrating spheres, environmental chambers, and cryostats directly within the instrument. For microscopy and remote measurements, fibre-optic and liquid-light-guide coupling accessories are available.

For research with unique requirements, custom solutions can be developed in collaboration with our engineering team.

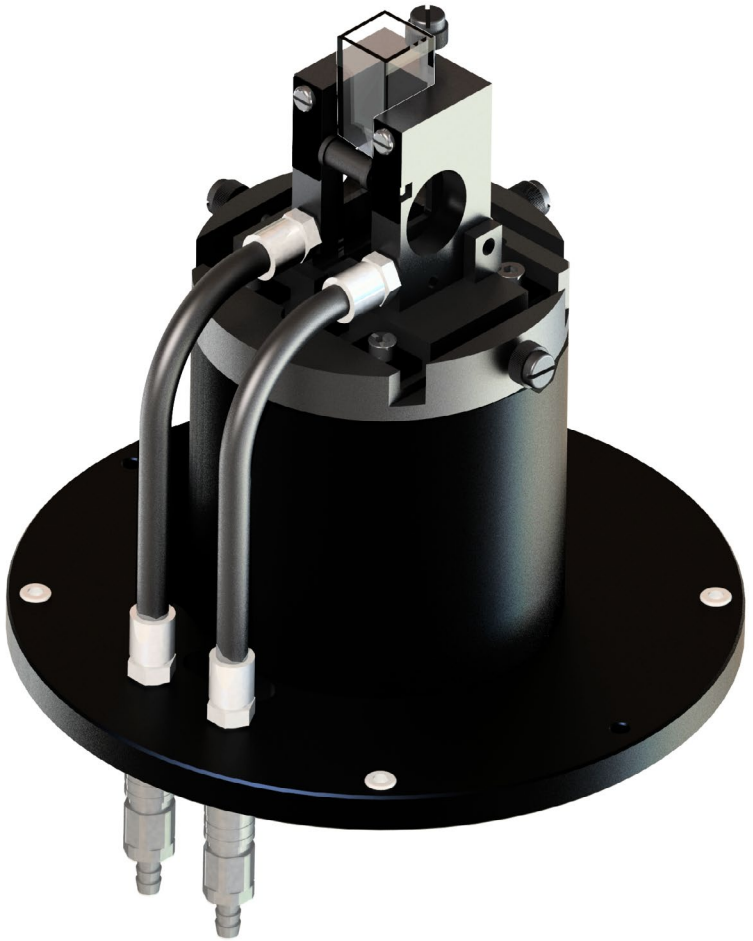


N-J01 Standard Cuvette Holder

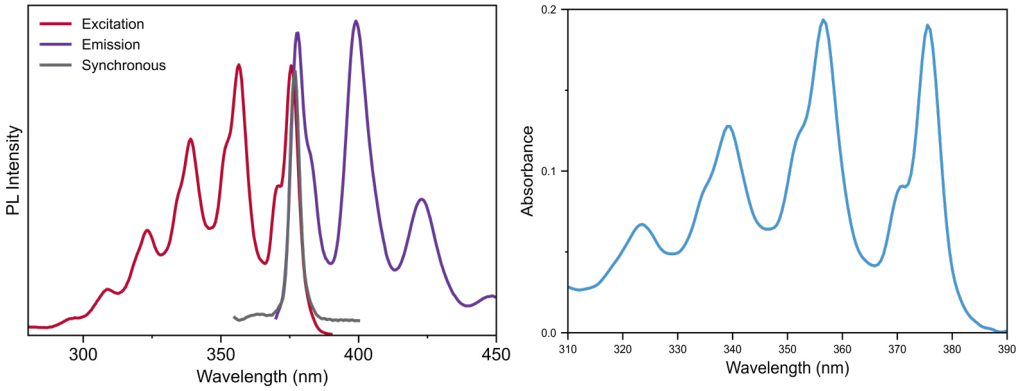
N-J01 is the standard sample holder for 10-mm path length cuvettes. It enables photoluminescence and transmission (if detector present) measurements of liquid samples. Sample temperature can be adjusted by water/coolant circulation (thermostatic bath circulator not included).

Features:

- Z height is 15mm (distance from base to beam)
- Includes slots for 50mm x 50mm filters
- Operating temperature from +5 °C to +80 °C (external bath required)
- Software monitored temperature with 0.1 °C operating temperature resolution



Measurement Examples



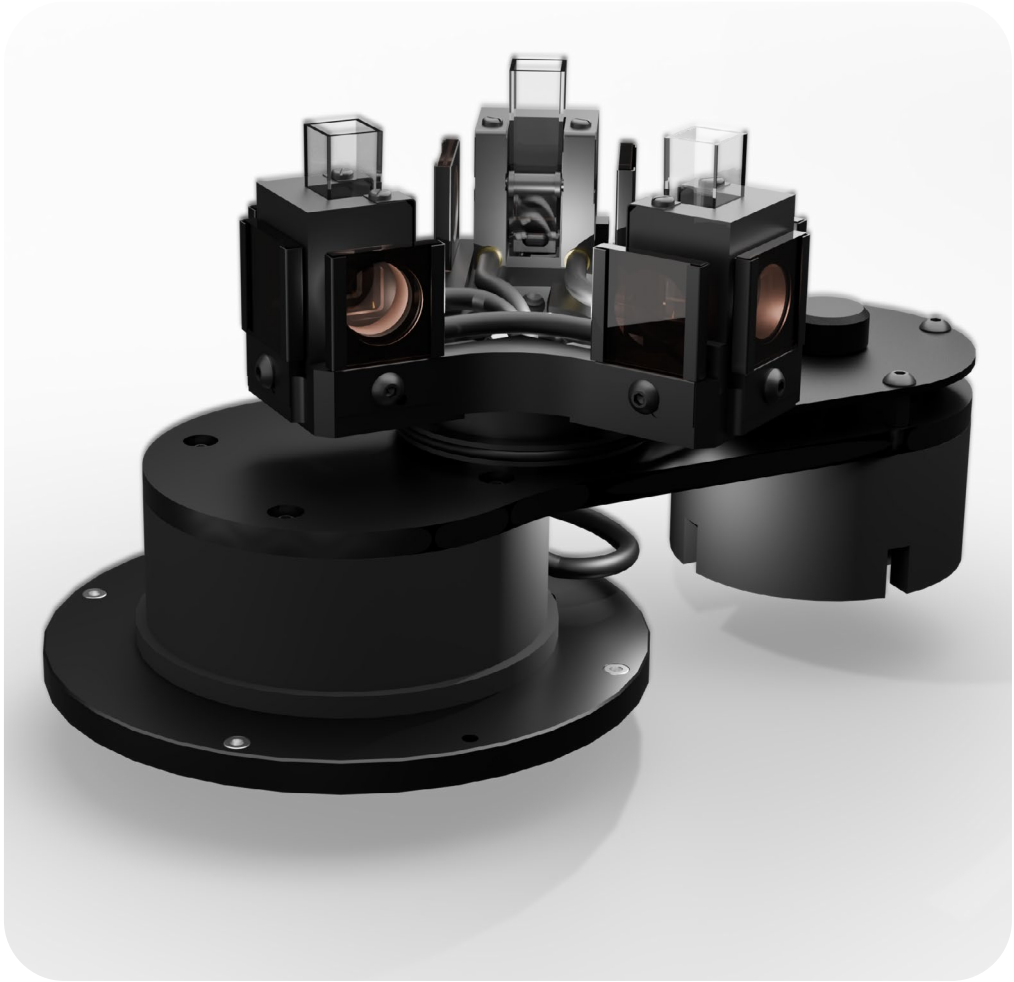
Left: Excitation, synchronous and emission photoluminescence spectra of anthracene in cyclohexane.
Right: Absorption spectrum of anthracene in cyclohexane acquired with the transmission detector accessory.

N-J02 Three-Position Sample Turret

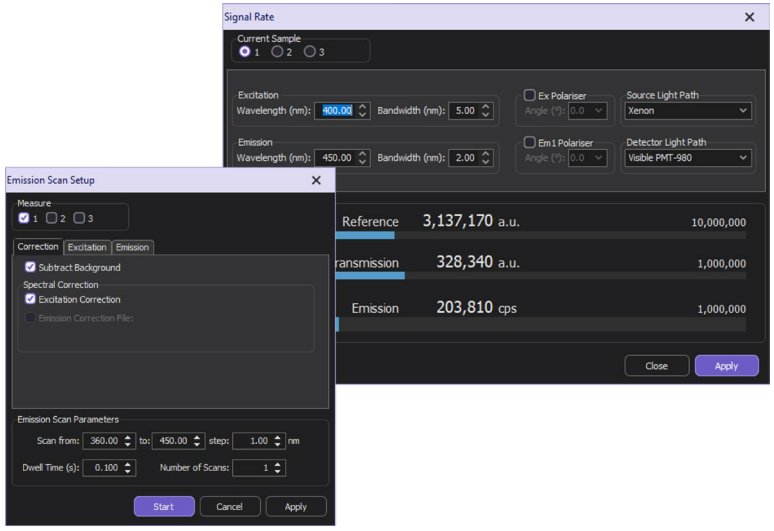
Measure up to three samples in sequence with the N-J02 cuvette turret. Sample position is fully controlled by Fluoracle® software saving time in the lab. This accessory is suitable for L- and T-geometry systems (X-geometry requires collimated laser excitation).

Features:

- Cuvette path length = 10 mm, Z height = 17 mm
- Three 25 mm x 25 mm filter positions and magnetic stirrer for each cuvette
- Operating temperature from +5°C to +80°C (external bath required)
- One cuvette position equipped with software-read temperature sensor



Measurement Examples



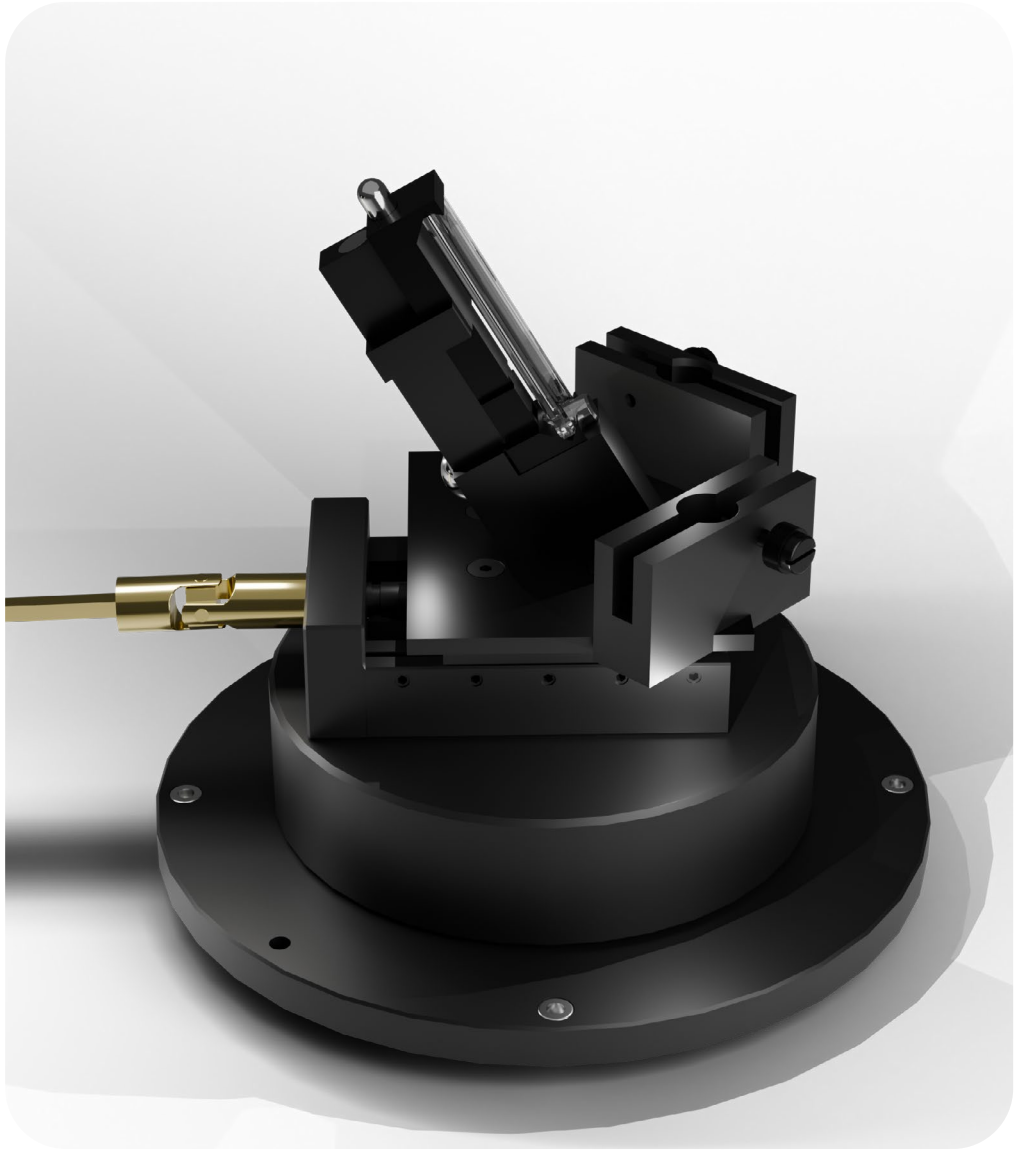
Measurement setup for multiple samples.

N-J03 Front-Face Sample Holder

Designed for optimal photoluminescence measurements in front-face configuration, the N-J03 is the go-to option for solids and powders, as well as highly absorbing liquids. Its tilted design minimises direct reflections of the excitation beam, ensuring the lowest possible background.

Features:

- Translation control from outside the sample chamber enabling live signal optimisation
- Two 50 mm x 50 mm filter slots provided
- Compatible with L- and T-geometry; 90° or in 30° (mirror optics) configuration



Supplied with three inserts:

- N-J03lng: Spring clamp with quartz demountable cuvette for powders (35 mm x 7 mm x 1 mm)

- N-J03shrt: Spring clamp for slides with at least one dimension of 25 mm

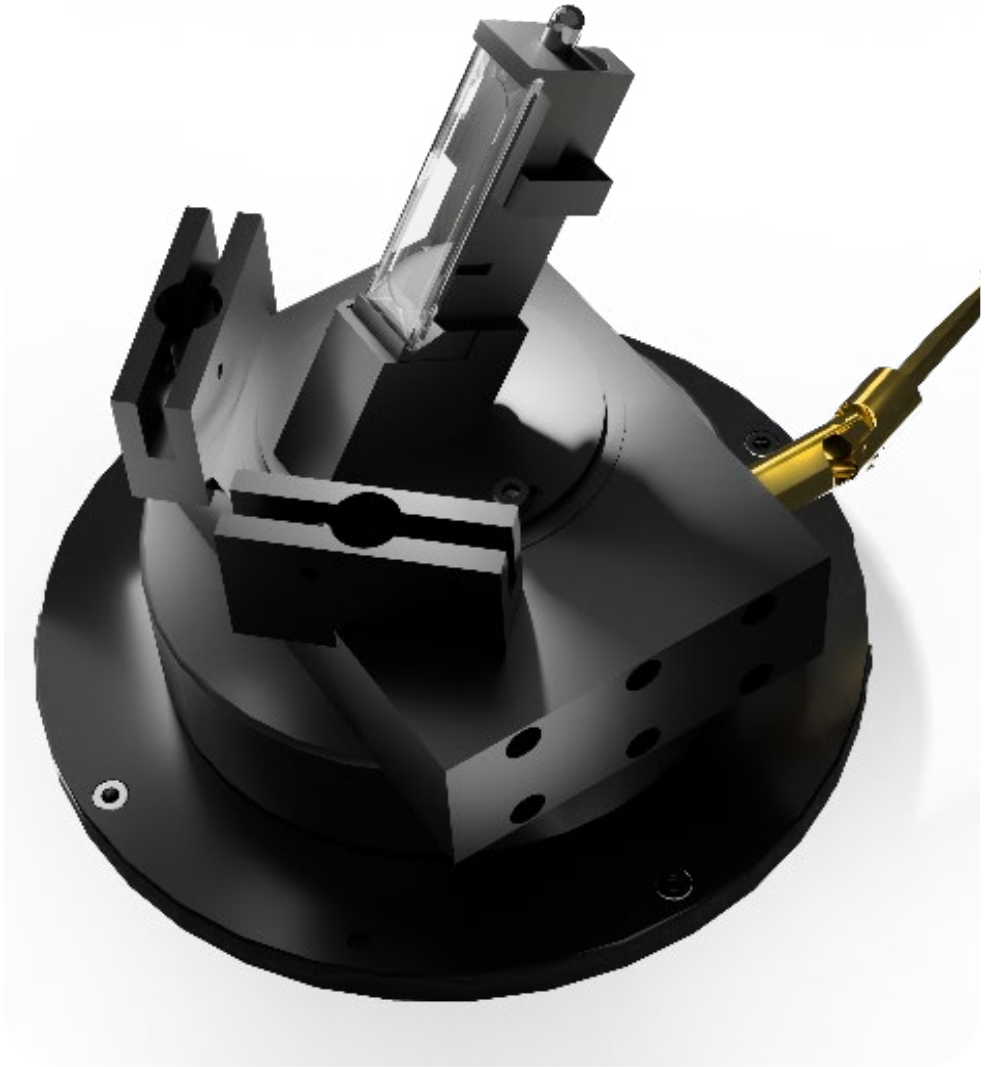
- Adjustable screw clamp for holding small samples (max. 10 mm x 10 mm, min. 2 mm x 2 mm)

N-J04 Front-Face Sample Holder on Rotational stage

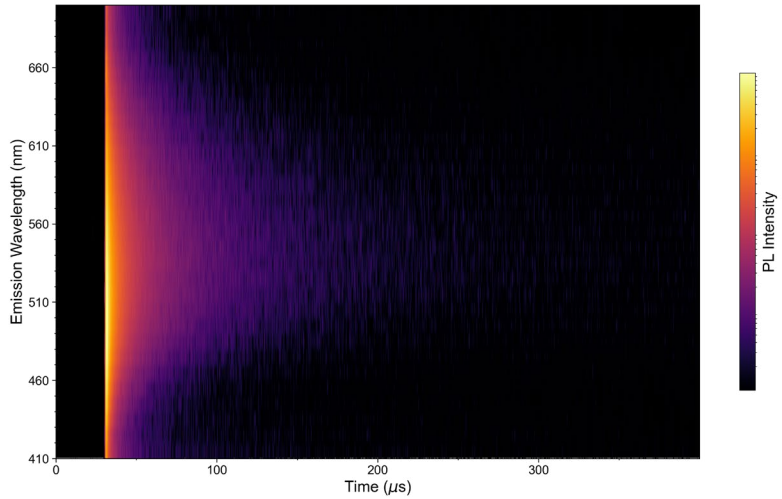
Control the angle of a sample accurately with the N-J04 holder, which accommodates solids and powders in cuvettes. The rotational angle can be easily adjusted from outside the sample chamber, allowing real-time signal monitoring.

Features:

- Rotation control from outside the sample chamber enabling live signal optimisation
- Angle marked on rotational stage with a resolution of 1°
- Two 50 mm x 50 mm filter slots provided



Measurement Example:



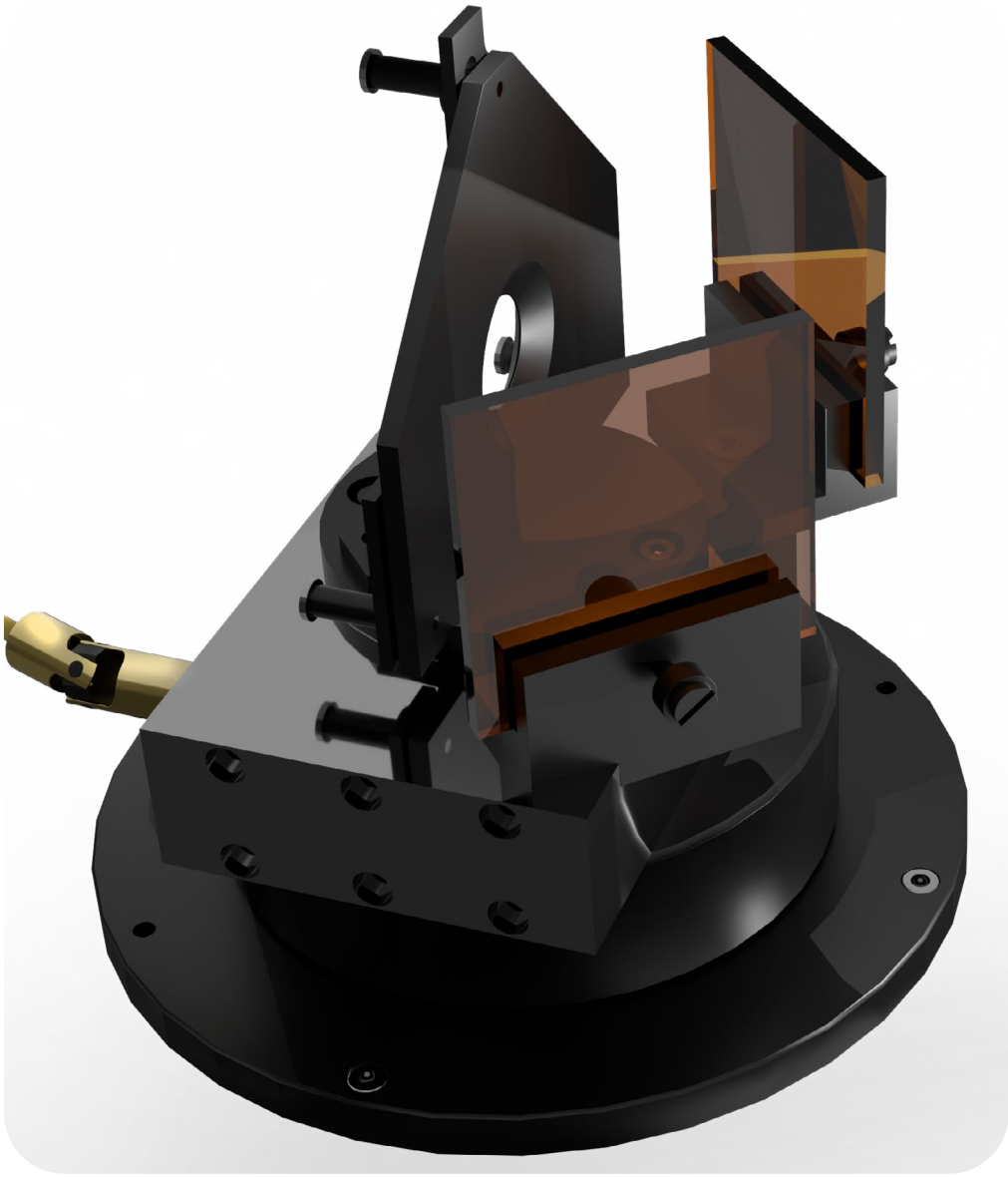
Above: Photoluminescence Time-Resolved Emission Spectrum of TiO_2 measured in a front face sample holder using an EPL-375 for excitation.

N-J05 Front-Face Clamp on Rotational stage

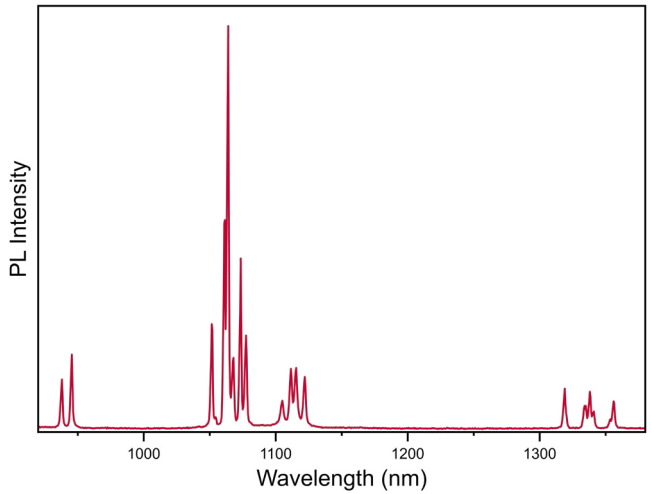
This rotational holder is suitable for thin samples (films, slides, cuvettes with thickness ≤ 5 mm). A spring-loaded plate secures the sample between two vertical plates and its rotational angle is controlled from outside the sample chamber. N-J05 allows absorption measurements if the spectrometer is equipped with a transmission detector.

Features:

- 20-mm sample aperture compatible with transmission detector
- Externally adjustable rotation with angle markings on holder
- Two 50 mm x 50 mm filter slots provided



Measurement Example:



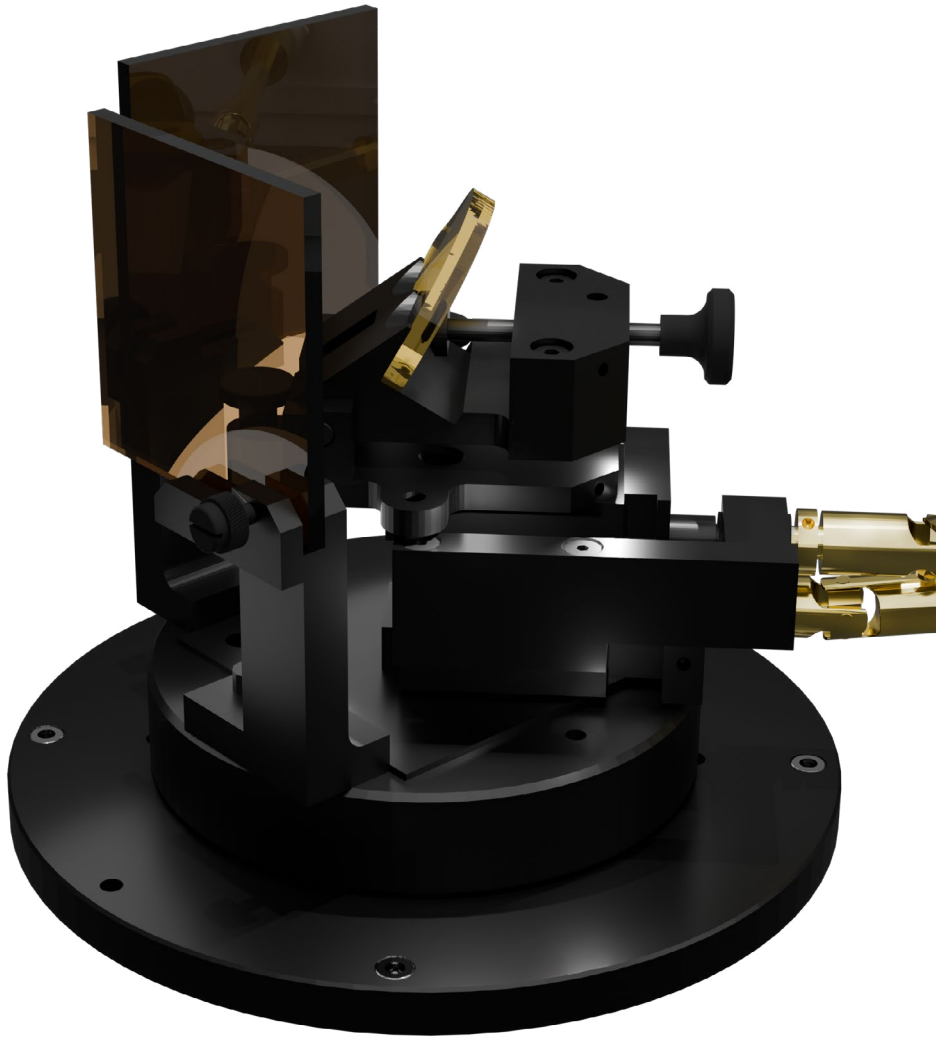
Above: Photoluminescence emission spectrum from a slide of Nd:YAG. Excitation at 355 nm from the standard Xe lamp and detection with a PMT-1700 detector.

N-J06 Front-Face Sample Holder on XY Stage

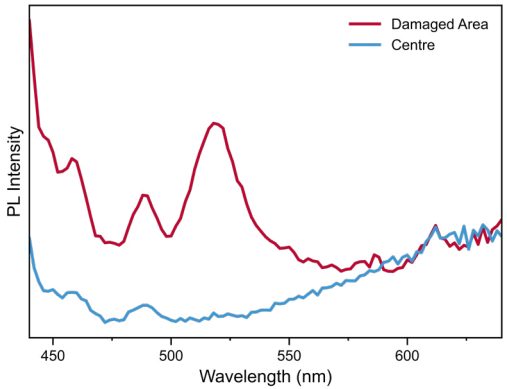
The N-J06 is optimal for inhomogeneous samples, offering full control of the position of the excitation spot on the sample. Solid samples with width ≤ 30 mm and depth < 13 mm are held with a spring-loaded plunger at an angle to avoid interference from directly scattered excitation light.

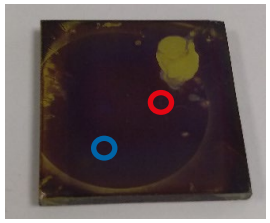
Features:

- XY translation control from outside the sample chamber while monitoring signal
- Sample held at 30° to avoid direct scattering
- Two 50 mm x 50 mm filter slots provided



Measurement Example:





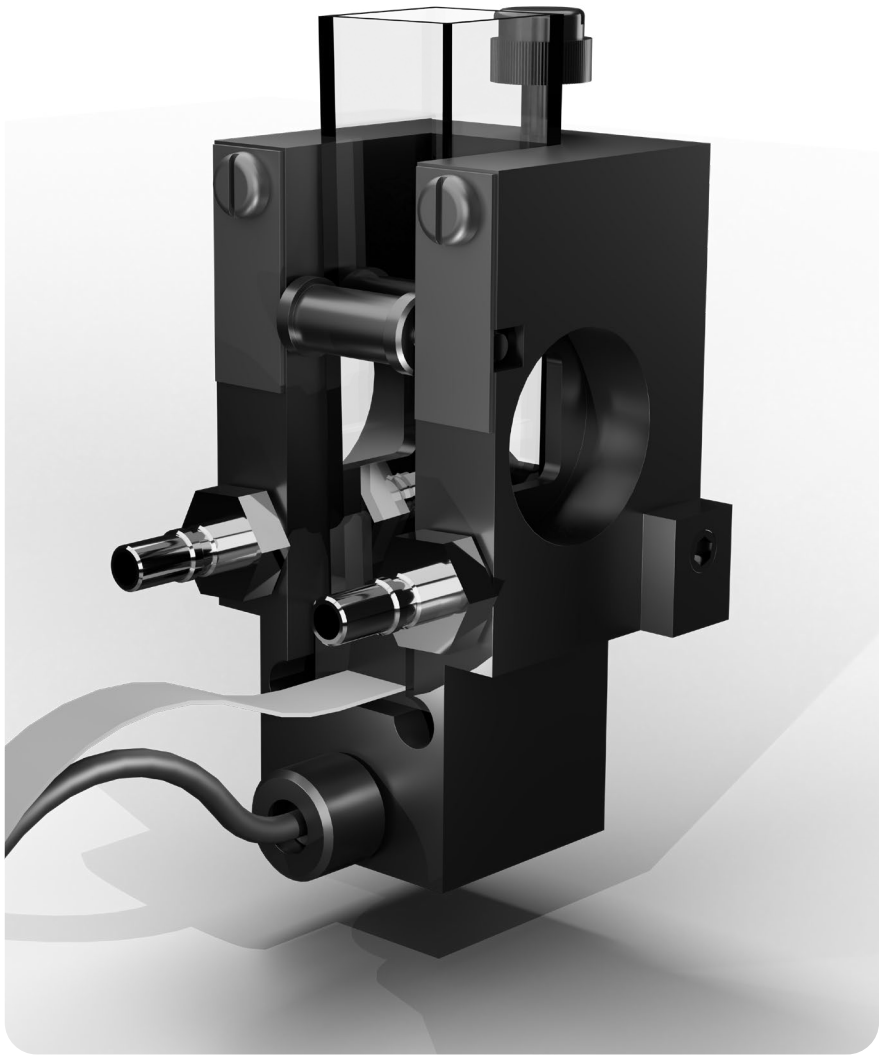
Above: Photoluminescence emission spectrum from perovskite acquired in the centre of the slide (blue) and in an area exposed to water (red).

N-J07 Magnetic Stirrer

Enhance the standard cuvette holder, N-J01, with the N-J07 Magnetic Stirrer. N-J07 fits into the base of N-J01, allowing software-controlled stirring of solutions.

Features:

- External controller integrated into Fluoracle software
- Software-controlled operation allowing to control the stirring speed
- 10 different stirring speeds available

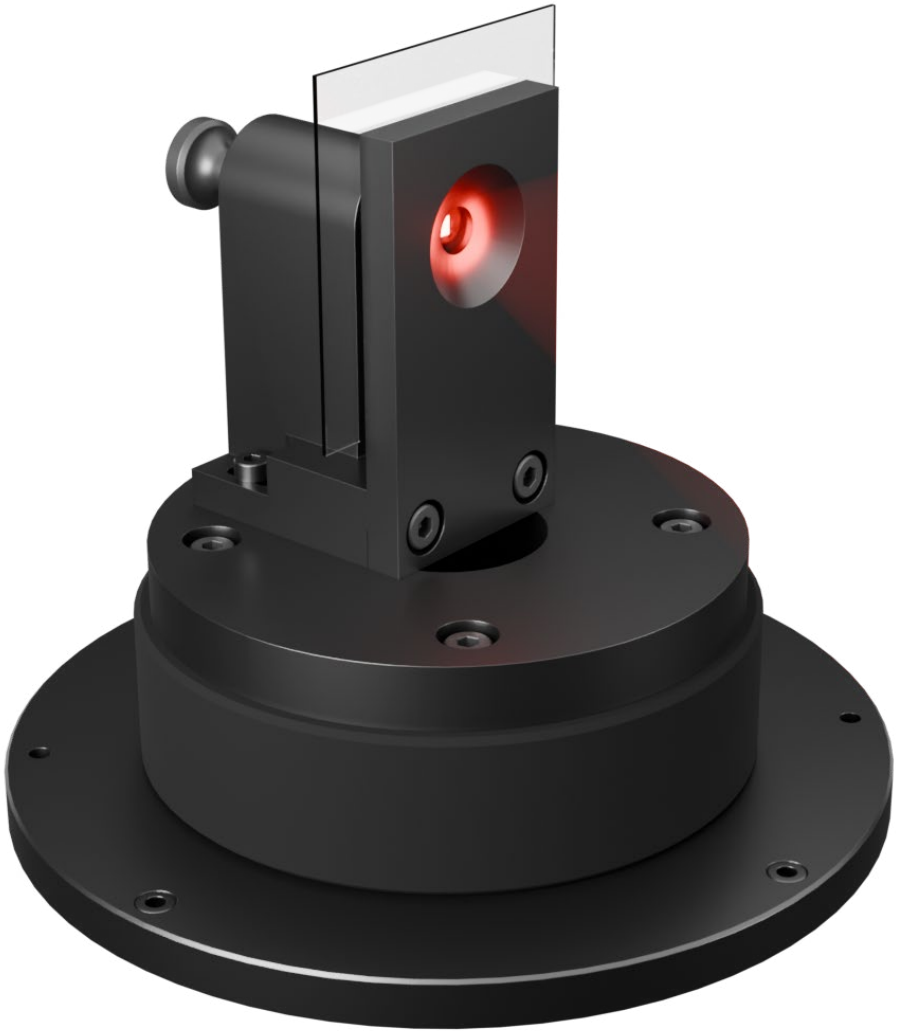


N-J08 Electroluminescence Sample Clamp

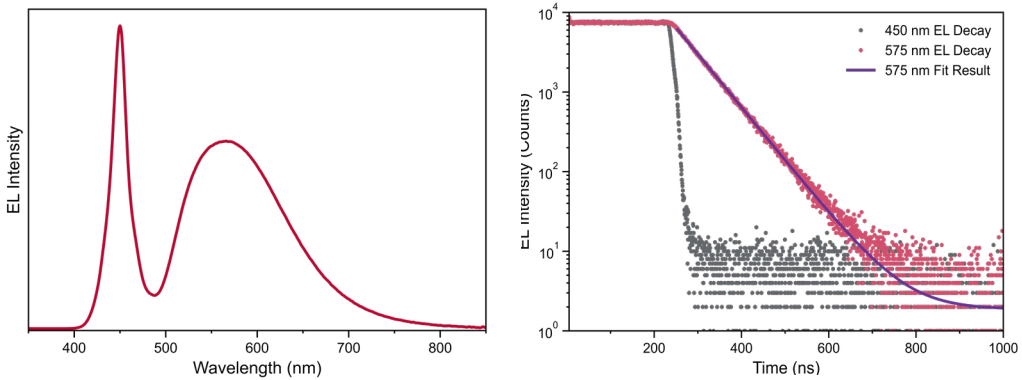
A dedicated solution for electroluminescence offering higher signal than standard solid holders, the N-J08 fully orients the sample towards the detection arm of the spectrometer. Samples are held in place by a spring-loaded plunger and must have minimum dimensions 20 x 20 mm, maximum thickness 4.8 mm. Electrical connections must be provided by the user.

Features:

- Feedthroughs for electrical wires into the sample chamber
- Range of continuous and pulsed electrical sources available



Measurement Example:



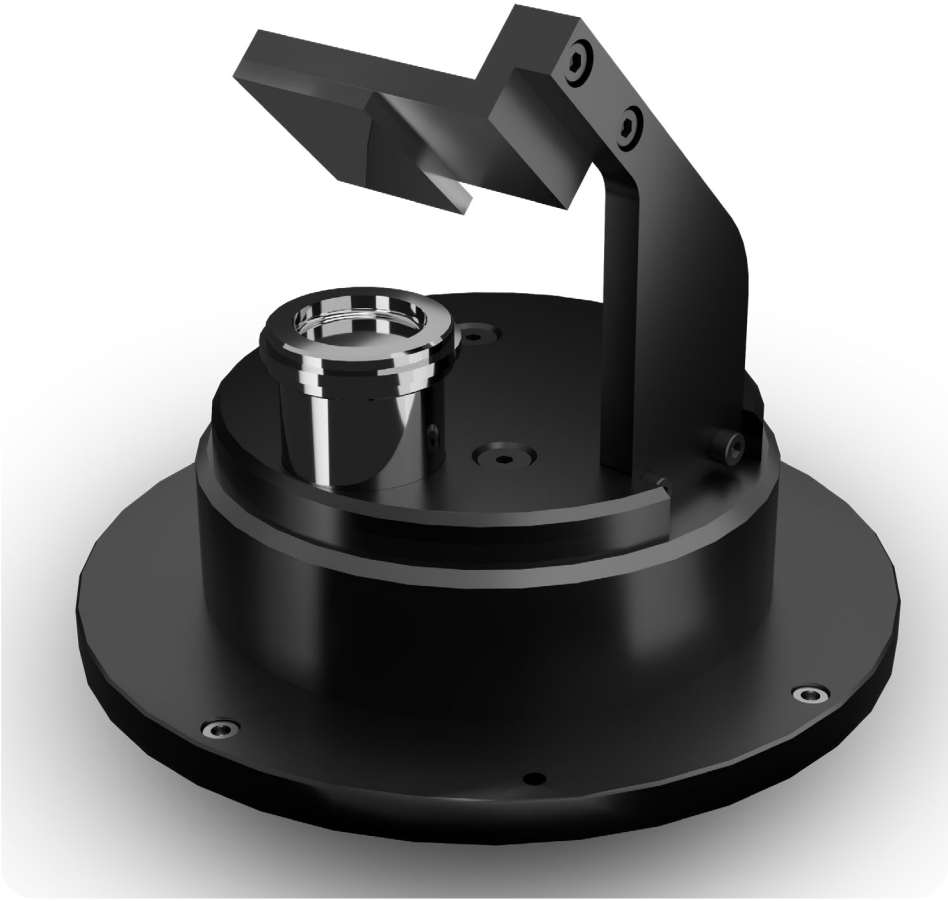
Left: Steady-state electroluminescence spectrum of a white light InGaN LED at a drive current of 20 mA (3.4 V).
Right: Time-resolved electroluminescence of white light InGaN LED, measured at 450 nm and 575 nm using TCSPC.

N-J09 Vertical Excitation Powder Holder

Choose the N-J09 sample holder for samples that require vertical excitation. A removable powder tray with 25-mm diameter enables easy measurement of powders without a quartz cuvette.

Features:

- Quasi-vertical excitation and collection of light
- Requires the sample chamber mirror optics option (N-F03)



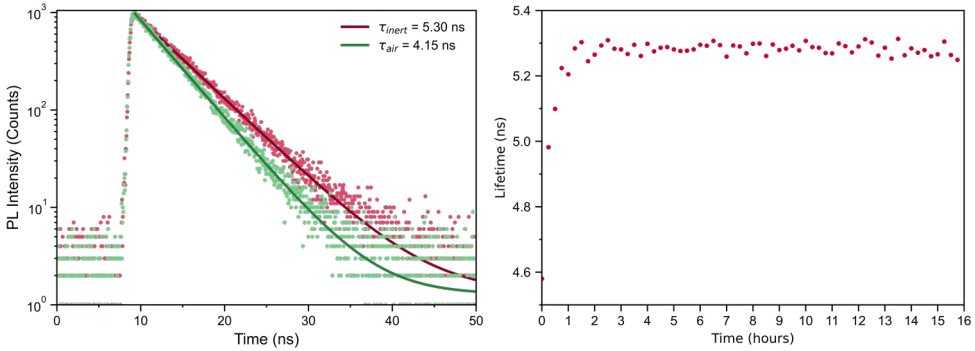
N-J11 Inert Gas Sample Chamber

Air-sensitive samples are easy to measure with the N-J11 accessory. Solid or liquid samples can be transferred to the holder and sealed inside a glove box before installing it in the spectrometer. It maintains an inert atmosphere for hours, but it is also possible to circulate gas through it for even longer experiments.

Features:

- Holds the sample under inert gas for >8 hours (inert gas not included)
- Solid sample holder and cuvette holder included
- Glove box compatible
- Purge ports included as standard (4 mm inner diameter tubing required)

Measurement Example:



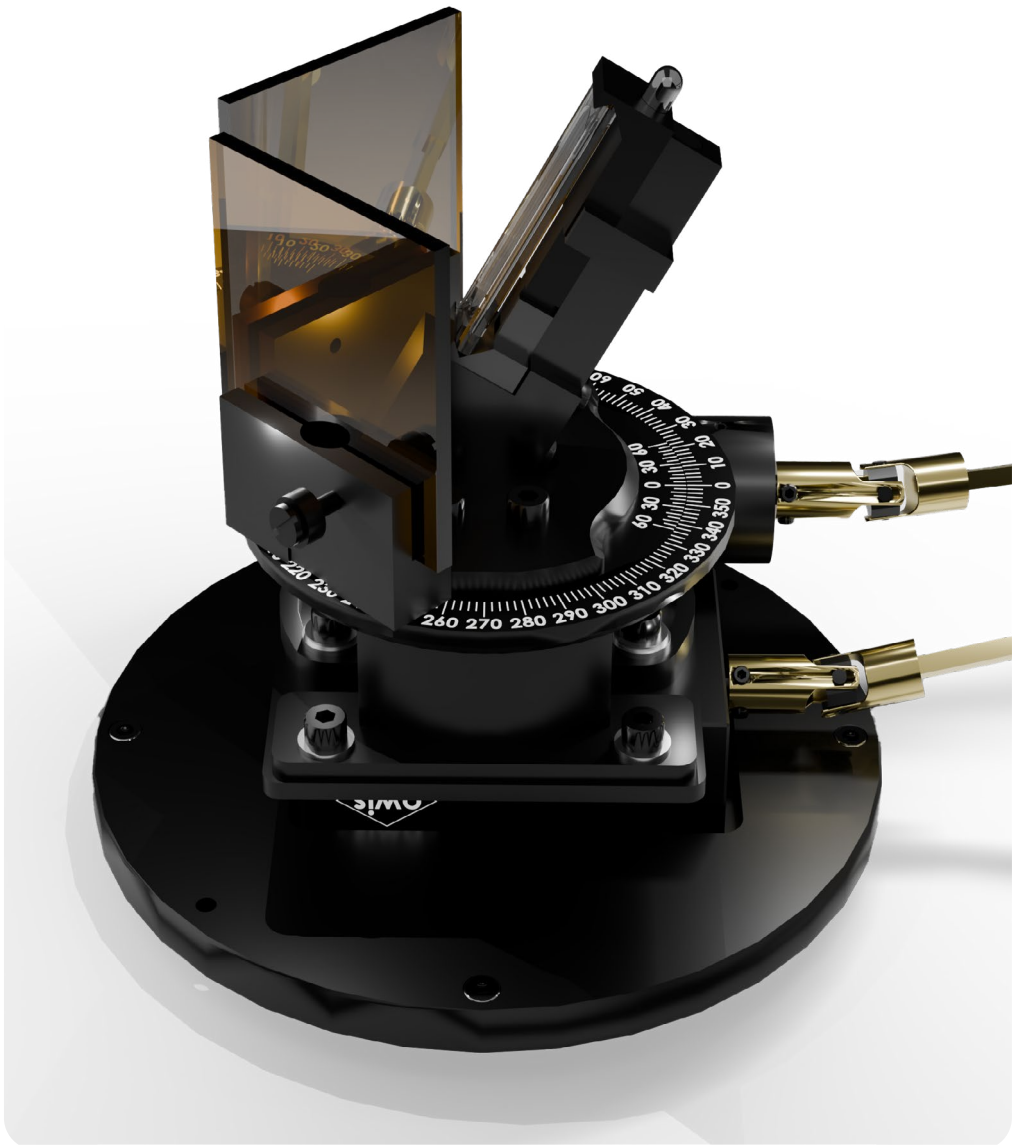
Left: Photoluminescence Lifetime decay of anthracene in cyclohexane under air or under nitrogen.
Right: Anthracene lifetime upon flushing the chamber with nitrogen for ~1 hour and sealing it, showing that an inert atmosphere is maintained overnight.

N-J12 Front-Face Rotation and Translation Holder

The N-J12 enables linear translation and rotation of samples in a single accessory controlled from outside the sample chamber. It is compatible with solid samples, powders in suitable cuvettes, or highly absorbed liquids in front-face configuration. This holder can be used in L- or T-geometry and in 90° or in 30° (mirror optics) position.

Features:

- Translation and 360° control from outside the sample chamber enabling live signal optimisation
- Two 50 mm x 50 mm filter slots provided
- Tilted sample configuration avoids direct reflection



Supplied with three inserts:

- N-J03lng: Spring clamp with quartz demountable cuvette for powders (35 mm x 7 mm x 1 mm)

- N-J03shrt: Spring clamp for slides with at least one dimension of 25 mm

- Adjustable screw clamp for holding small samples (max. 10 mm x 10 mm, min. 2 mm x 2 mm)

N-K02 TE-Cooled Sample Holder

TE-cooled sample holders enable variable-temperature measurements in a 10-mm cuvette. Fluoracle controls the sample temperature with high precision, automatically generating spectral or lifetime temperature maps. A "set temperature" option is available in FluoAuto. Standard, low range, and extended options are available.

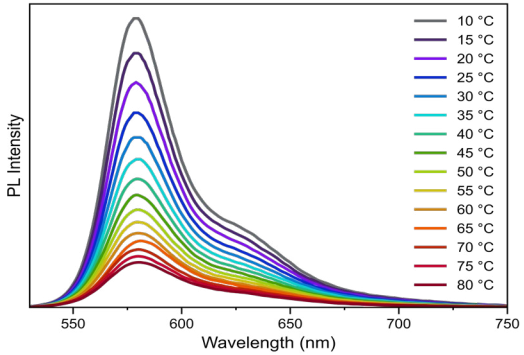
Features:

- Sample temperature is controlled from the software with ±0.02°C precision
- Includes controller, cooling water circulator, gas inlet, and 50 mm x 50 mm filter slots
- Magnetic stirrer controlled from software
- Z height = 15 mm

Specifications

Temperature Range (°C)	N-K02lw*: - 50°C to +150°C N-K02†*: -35°C to +105°C N-K02exd† : -35°C to +150°C
Temperature Stability (°C)	± 0.02
Stirrer Control	400 – 4000 RPM
Temperature Control	Automatic (controlled and recorded by Fluoracle)

*Operation below the dew point (~5°C) requires dry gas purging.
†Operation below -10°C requires cooled circulating fluid in addition to dry gas purging. Operation below -20°C requires a windowed jacket (N-K02J) in addition to cooled circulating fluid and dry gas purging.



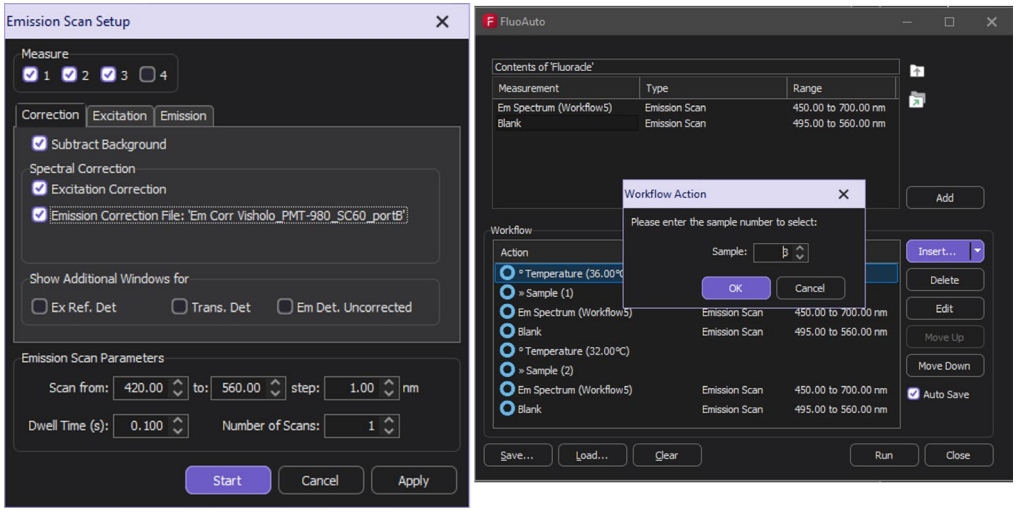
Left: Temperature map of Rhodamine B emission acquired in 5°C intervals.

N-K03 Four-Position TE-Cooled Sample Holder

Measure up to four 10-mm cuvettes with accurate temperature control with the N-K03 holder. Heating, cooling and cuvette position are controlled controlled by the software which can generate maps of photoluminescence as a function of temperature.
It is possible to set parameters independently for each cuvette and change position using FluoAuto.

Features:

- Temperature control from -15°C to +105°C (dry gas flow required below 5°C)
- Automated temperature maps with ±0.02°C precision
- Includes controller, cooling water circulator, magnetic stirrer, and gas inlet
- Z height = 15 mm



Multiple sample emission scan set up and FluoAuto workflow with sample and temperature changes

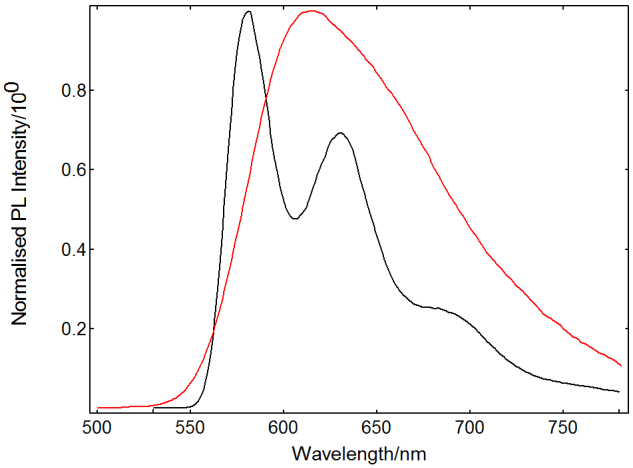
N-K04 Liquid Nitrogen EPR Dewar

Suitable for liquid and powder samples, N-K04 is a cost-effective option for measurements at 77 K. A liquid nitrogen Dewar contains the sample in an EPR tube, allowing data acquisition at both room and liquid nitrogen temperatures.

Features:

- Holds temperature for 1 hour after a liquid nitrogen fill
- Two quartz EPR supplied with dimensions: 4.97 mm external diameter, 4.20 mm internal diameter, and 250 mm length.

Measurement Example:



Above: Emission spectrum of tris(bipyridine)ruthenium(II) chloride [$Ru(bpy)_3$]Cl_2 in 4:1 ethanol/methanol acquired at 77 K (black) and room temperature (red) with the N-K04 holder

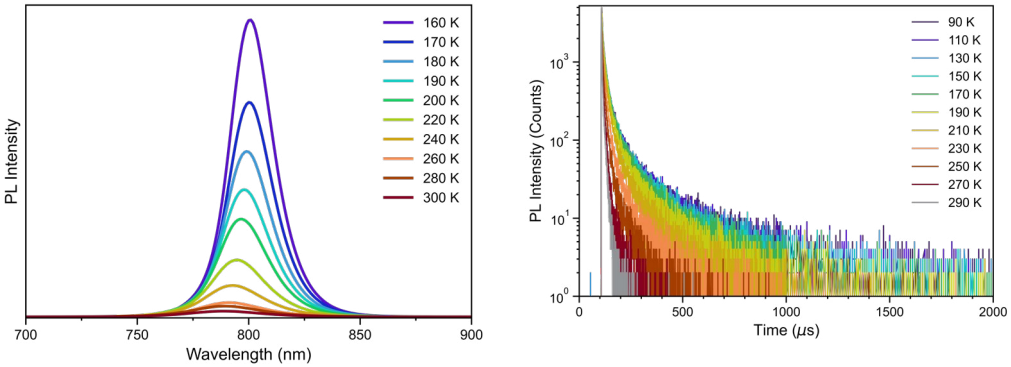
N-K05 Liquid Nitrogen Cryostat

A range of liquid nitrogen cryostats can be mounted in the sample position and easily exchanged for other holders. Temperature ranges from 77 K to 300 K (standard version), or from 77 K to 500 K (extended version) are achievable. A turbomolecular pump is recommended for operation.

Features:

- Temperature stability ±0.1 K
- Hold time 15 hours without refill
- Cuvette (12 x 12 x 55 mm^3), plain (19 x 30 mm^2) and optical (19 x 30 mm^2) with Ø15 mm aperture holders included
- Powder sample holder available (N-SK05-PWD)

Measurement Example:



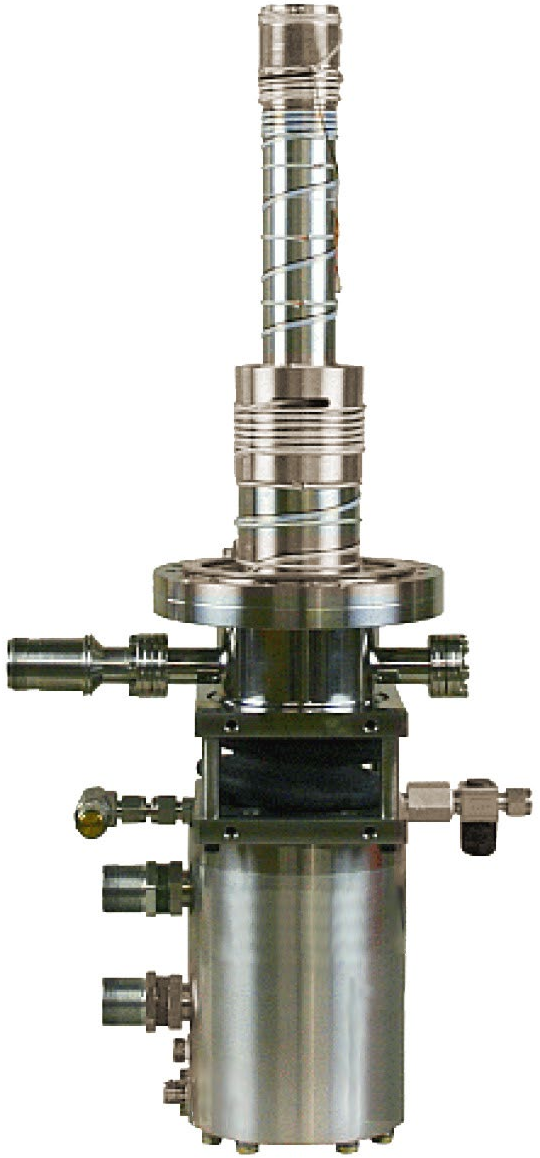
Left: Spectral temperature map of photoluminescence from MAPI perovskite acquired with liquid nitrogen cryostat.
Right: MCS temperature map of GaN thin film acquired with liquid nitrogen cryostat.

N-K06/07 Liquid Helium and Closed Cycle Cryostats

For experiments requiring liquid helium temperatures, the N-K06 and N-K07 cryostats integrate directly into the FLS1000 sample chamber. Open- or closed-cycle operation supports measurements from 2.3 K to 800 K, including automated temperature mapping. A turbomolecular pump is recommended.

Features:

- Closed cycle cryostats eliminate the need for cryogenic liquid
- Sample holders for cuvettes and solids available
- Other third-party cryostat models and custom mounts are available



Options Summary

Model	Type	Temperature Range	Notes
N-K05DAX	Closed cycle, air cooled	3 K – 300 K	Suitable for solid samples (no liquids)
N-K05DWX	Closed cycle, water cooled	3 K – 300 K	Suitable for solid samples (no liquids)
N-K06	Liquid helium	3.4 K – 300 K	Requires pressurised He storage vessel
N-K06exd	Liquid helium	3.4 K - 500 K	Requires pressurised He storage vessel
N-K06exdlw	Liquid helium	2.3 K - 500 K	Requires pressurised He storage vessel
N-K07-10350	Closed cycle	10 K – 350 K	Mounted through base of sample chamber
N-K07-10500	Closed cycle	10 K – 500 K	Mounted through base of sample chamber
N-K07-10800	Closed cycle	10 K – 800 K	Mounted through base of sample chamber
N-K07-4350	Closed cycle	4 K – 350 K	Mounted through base of sample chamber
N-K07-4500	Closed cycle	4 K – 500 K	Mounted through base of sample chamber
N-K07-4800	Closed cycle	4 K – 800 K	Mounted through base of sample chamber

N-Link Temperature Stage Holder

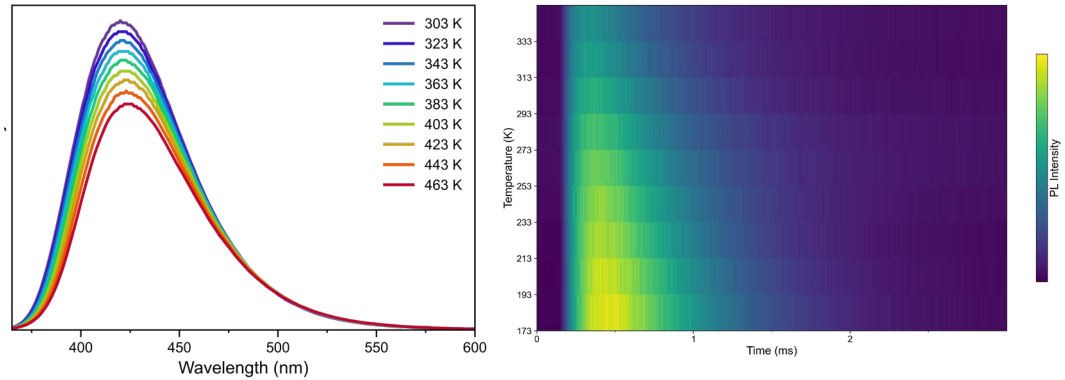
Connected to the spectrometer via easily swapped fibre bundles, the N-Link stages allow temperature control of thin films and powders from -196 °C to 600 °C (model dependent). They are fully controlled from Fluoracle software enabling temperature maps of spectra and lifetimes.

Features:

- Temperature stability < 0.1 °C
- Includes controller, liquid nitrogen pump and Dewar, external mount, fibre bundles
- Fibre UV (200 nm -1200 nm) or VIS (300 nm - 2400 nm) range to be specified at the time of order

Options Summary

Fibre Launcher	Required. Sales code N-L09
Laser Adapter	Required if exciting with Edinburgh Instruments Pulsed Laser/LED (N-linkam-EPL) or CW Laser (N-Linkam-CW)



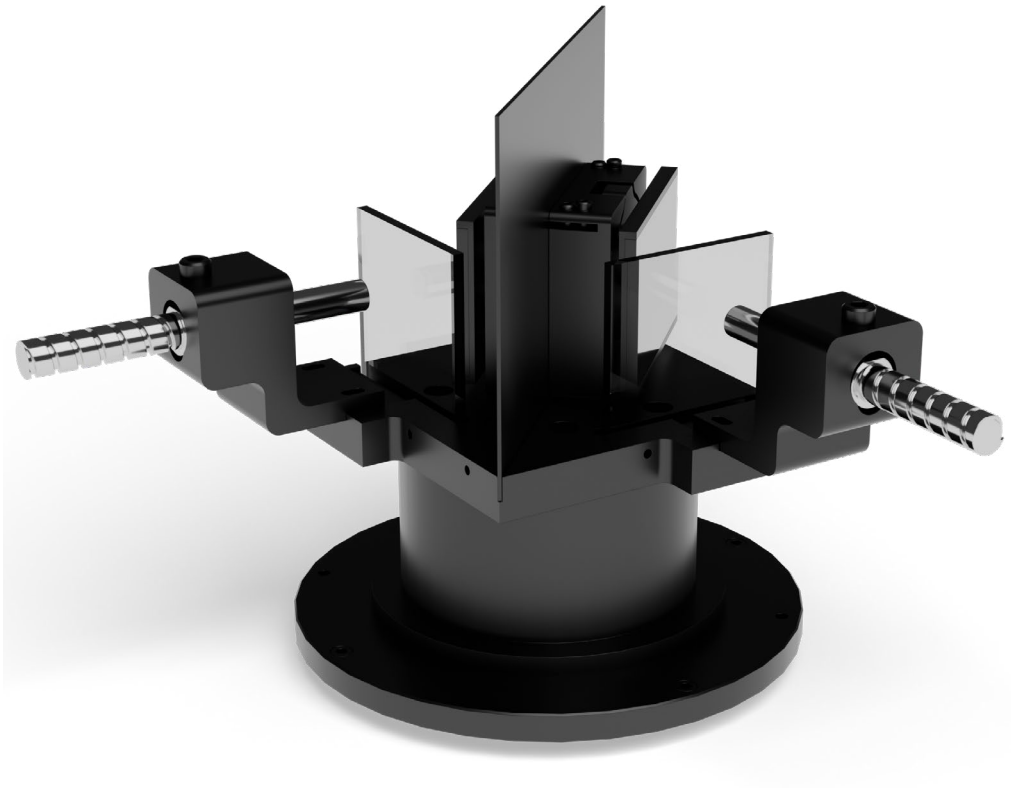
Left: Spectral temperature map of photoluminescence from sodium salicylate measured in N-Link accessory.
Right: MCS temperature map of $NaY_{0.77}Yb_{0.20}Er_{0.03}F_4$ acquired with N-Link.

N-L0X Fibre Coupling Module

Acquire photoluminescence outside the spectrometer with the N-L0X fibre or liquid light guide coupling modules. These options expand the functionality of the FLS1000 by enabling measurements with remote probes or coupling to accessories such as MicroPL.

Features:

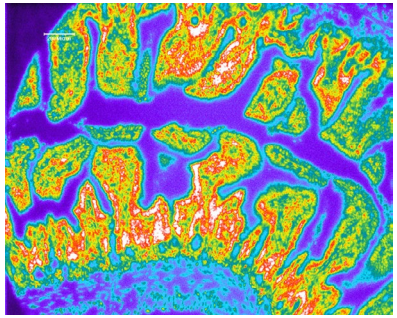
- Couple individual fibres (SMA/FC), fibre bundles (individual or bifurcated), or liquid light guides
- Fibres ordered separately and available from Edinburgh Instruments



Fibre and Light Guide Options

N-L01	2 m bifurcated fibre bundle, 250 nm – 900 nm
N-L01exd	2 m bifurcated fibre bundle, 400 nm – 2000 nm
N-L03	2 m fibre bundle, 250 nm – 900 nm
N-L03exd	2 m fibre bundle, 400 nm – 2000 nm
N-L06UV	2 m liquid light guide, 300 nm – 650 nm
N-L06VIS	2 m liquid light guide, 340 nm – 800 nm
N-L06NIR	2 m liquid light guide, 420 nm – 2000 nm

Measurement Example:



Slice of a mouse intestine stained with Sytox green imaged in a microscope with excitation light from the FLS spectrometer.

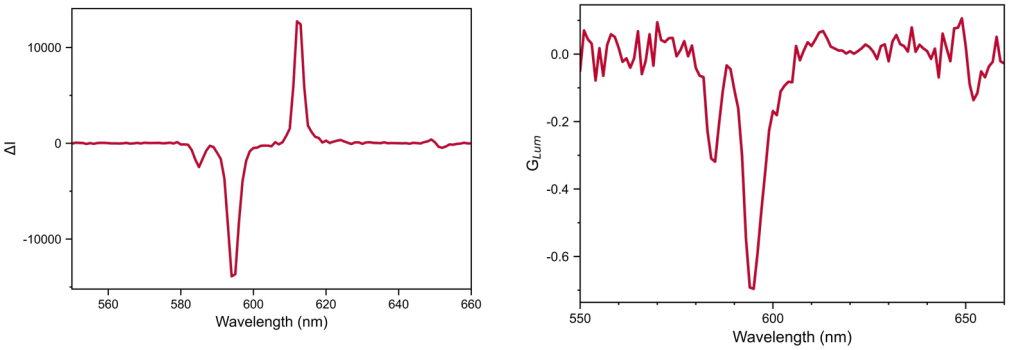
N-CPL Circularly Polarised Luminescence

Easily carry out circularly polarised luminescence (CPL) studies with the N-CPL accessory. A photoelastic modulator and lock-in amplifier provide automatic acquisition of ΔI (= I_L-I_R) and G_{lum} values for CPL-active samples in solution.

Features:

- A measurement with G_{lum} = 0.1 typically requires 10 minutes acquisition
- Wavelength range 200 nm – 900 nm
- Requires emission polariser N-F06EM (not included)

Measurement Example:



Left: ΔI from europium(III) tris[3-(trifluoromethylhydroxymethylene)-d-camphorate] acquired with the circularly polarised luminescence accessory.
Right: G_{lum} from europium(III) tris[3-(trifluoromethylhydroxymethylene)-d-camphorate] acquired with the circularly polarised luminescence accessory.

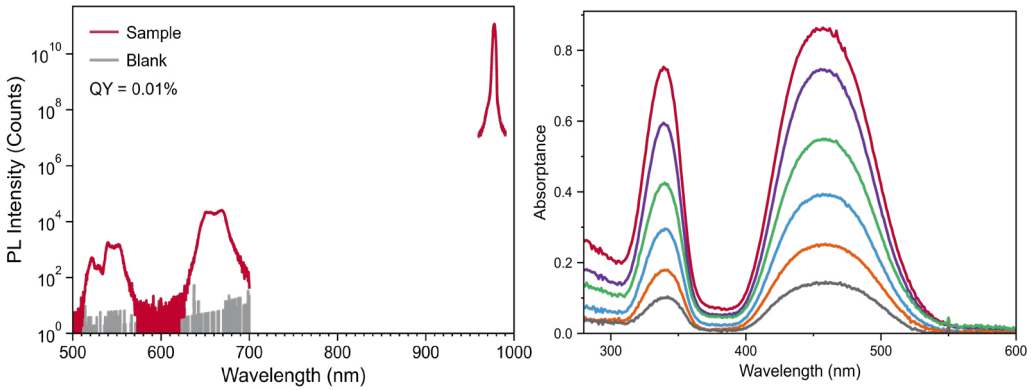
N-M08 QYPro Integrating Sphere

QYPro is an integrating sphere for absolute photoluminescence quantum yield measurements. Its mechanised sample loading design minimises contamination, ensuring accurate, repeatable results. Quantum yield and reflectance measurements of solutions, films, and powders are supported from 250 nm to 2500 nm.

Features:

- Includes cuvette and solid sample holders, powder tray, reference scattering plug, purge ports, and ND filter
- Quantum yield and reflectance software wizards included
- Optional sample holder for electroluminescence
- Direct and indirect excitation possible for solid samples

Measurement Example:



Left: Photoluminescence quantum yield measurement of upconversion nanoparticles in QYPro
Right: Normalised absorptance of YAG:Ce in $BaSO_4$ at various concentrations (20% to 100%) measured in QYPro

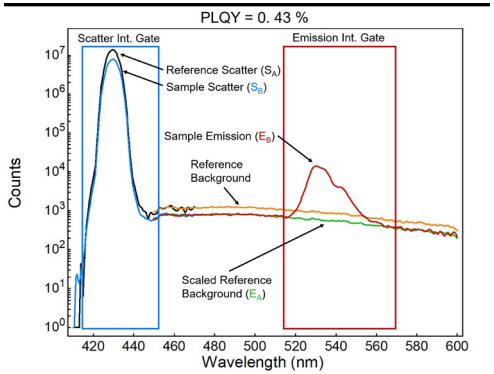
N-M01T Cryosphere

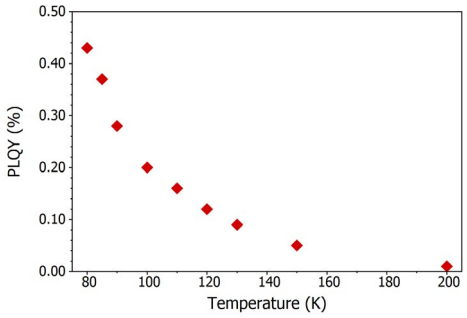
Choose the Cryosphere for photoluminescence quantum yield studies as a function of temperature, where the sample exhibits thermally-dependent absorption.
The Cryosphere is software-controlled and coupled to the spectrometer by fibre bundles. A turbomolecular pump is required. Bundles and launcher should be ordered separately (N-L03T).

Features:

- Temperature range from 77 K to 500 K
- Compatible with powder and opaque solid samples with <10 mm diameter and <2 mm thickness
- Direct and indirect excitation positions available
- Includes liquid-nitrogen cooled cryostat, controller, 5 L Dewar, gas flow pump

Measurement Example:





Left: Photoluminescence quantum yield of $CsPbBr_3$ at 80 K measured in the Cryosphere accessory.
Right: Variation of photoluminescence quantum yield of $CsPbBr_3$ with temperature characterised in Cryosphere.

N-M02 Titration Module

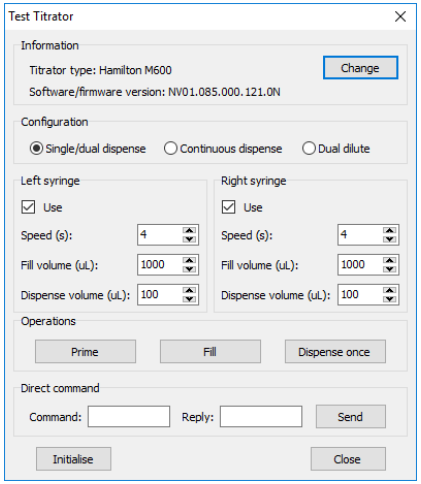
Fluorescence titration experiments are facilitated by the N-M02 module, featuring an external dual-syringe titrator controlled from the software. You can perform kinetic measurements with manual or automated titration, and automated multiple spectral scans.

Features:

- Comprises two 1 mL syringes as standard (other volumes available), connecting tubing, and flow cuvette
- Feedthrough into the FLS1000 sample chamber included

Specification

Syringe Volumes	10 µL	100 µL	1 mL (standard)
Syringe Accuracy	<3%	<3%	<1.2%
Syringe Precision	<2%	<1.5%	<0.5%
Flow Rate (µL/s)	0.003 – 6.5	0.03 – 66.5	0.3 - 665



Left: Setup of titration parameters in Fluoracle software. The fill volume, dispense volume, and dispensing speed can be controlled independently for each syringe.

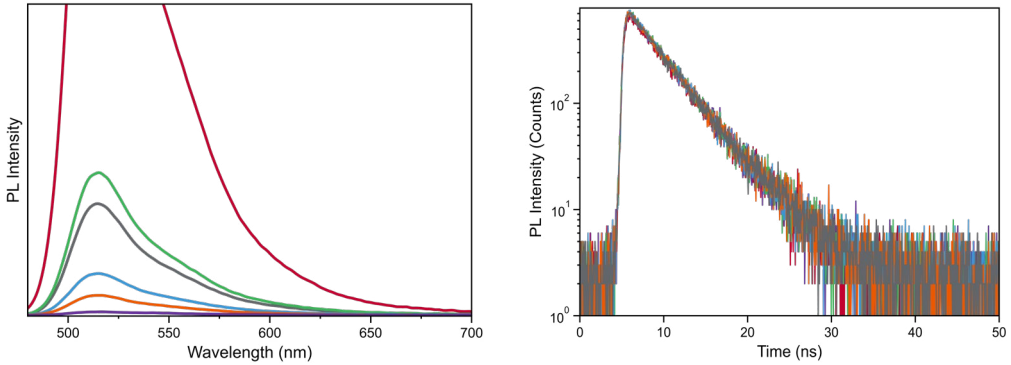
N-M03 PR2 Plate Reader

Measure the photoluminescence spectra and/or lifetimes of hundreds of samples automatically with the N-M03 PR2 Plate reader. Perfect for high-throughput screening with high sensitivity, the accessory connects to the spectrometer via a bifurcated fibre bundle (N-L02, must be ordered separately).

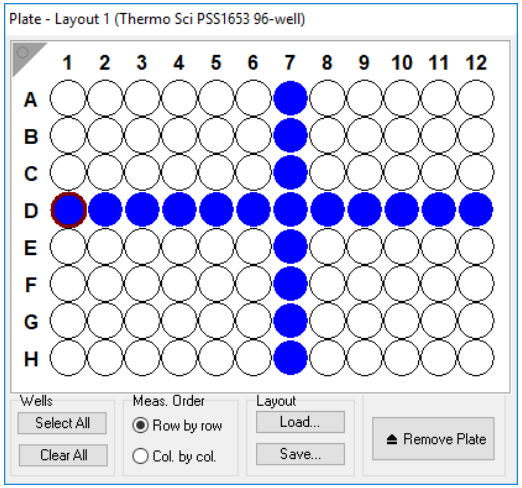
Features:

- Automatic spectral and lifetime measurements (TCSPC and MCS) of each well
- Supports microplates with a format of up to 384 wells
- Custom well geometries can be defined and saved for later use
- Interlocked hatch included

Measurement Examples



Left: Emission spectra from fluorescein in PBS at different concentrations measured in adjacent wells. The lowest concentration is 10 pM.
Right: TCSPC lifetime measurements of sample in adjacent wells, acquisition time = 5 seconds/well



N-M04 Stopped Flow Accessory

Acquire reaction kinetics with ms time resolution with the stopped flow accessory, which includes a quartz cuvette with 10-mm path length and a feedthrough into the spectrometer sample chamber.

Features:

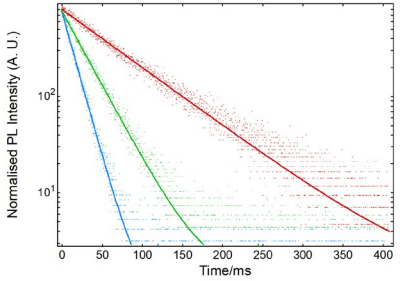
- Includes three multimixing 2.5 mL injection syringes
- Manual injection with 10 ms resolution (kinetic scan)
- Compatible with N-J01 and N-K02

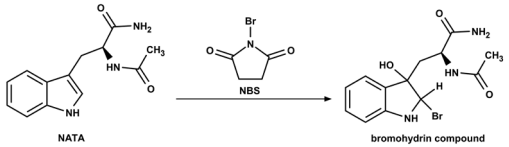
Specification

Dead Time (ms)	<10
Dead Volume (µL)	350 (micro-volume version) or 700 (standard)
Volume per shot (µL)	100 per reactant
Mixing Ratio	1:1 to 20:1
Chemical Resistance	Very high. Silica and PTFE construction.
Temperature Range (°C)*	5 to 80

* Temperature Control is provided by N-J01 or N-K02.

Measurement Examples





Above: PL kinetic of NATA quenching by N-bromosuccinimide (scheme above) at different concentrations. λ_{ex} = 280 nm, λ_{em} = 360 nm. The decays were fit with a single monoexponential using Fluoracle.

N-XS1 X-Ray Sample Chamber

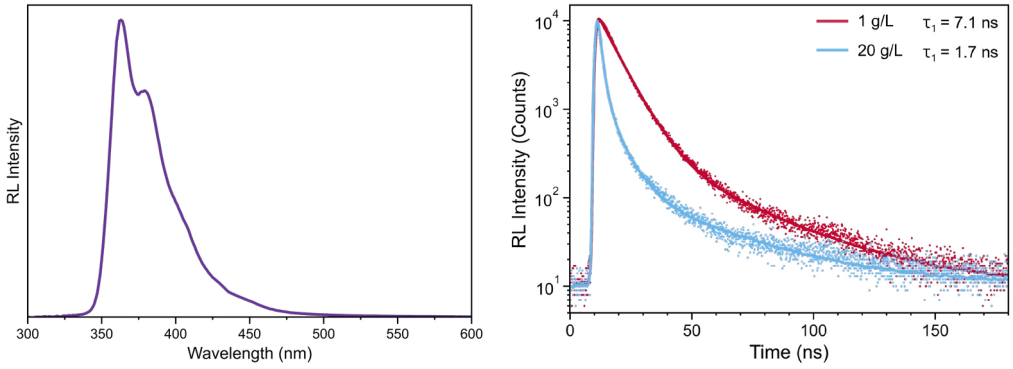
With XS1, you can easily acquire radioluminescence spectra, lifetimes or both with your spectrometer. This versatile accessory couples to the sample chamber via fibres and is compatible with powders, thin films, and cuvettes.

Features:

- Continuous and/or pulsed X-ray excitation of samples
- Standard emission range is 340 – 800 nm; UV and NIR options available
- Direct optical excitation option

N-XS1-CW	CW X-ray source (60 kV, 12 W)
N-XS1-P	40 kV X-ray source triggered by HPL-450 laser X-ray pulses of ~100 ps or wider, compatible with TCSPC Mount for second source (simultaneous excitation of the sample)
N-XS1-PCW	CW and pulsed sources from N-XS1-CW and N-XS1-P Easy swap between sources

Measurement Examples



Left: X-ray excited luminescence spectrum of LAB/PPO liquid scintillator.
Right: X-ray excited luminescence decay of LAB/PPO measured at two concentrations.

Sample Holders

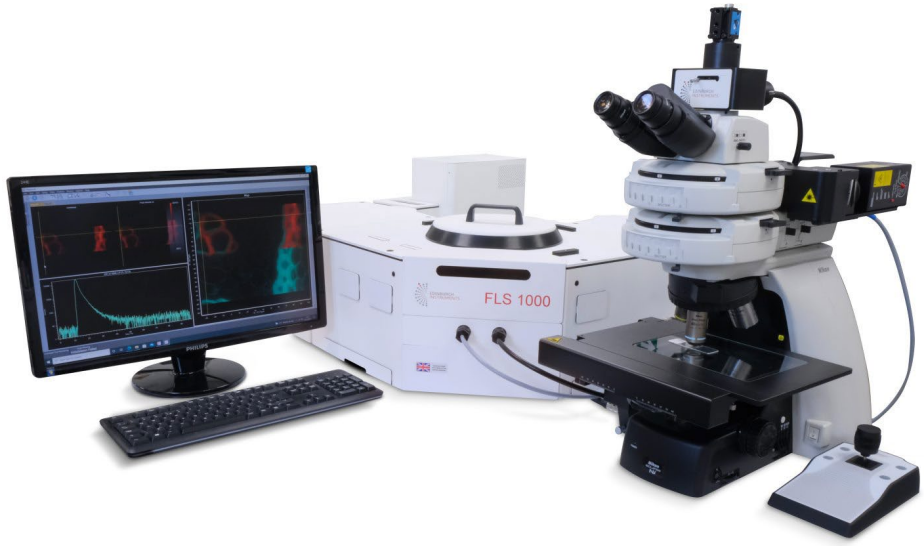
Powders (Standard) | Film (Standard) | 10 mm cuvette (Standard) | Powder/Crystal (Optional) | 1 mm cuvette (Optional)

MicroPL Microspectroscopy Upgrade

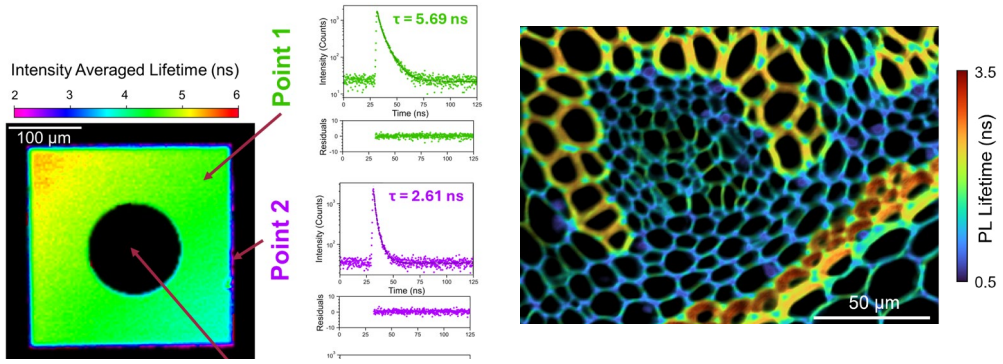
Transform your FLS1000 into a combined spectrometer and microscope system with the MicroPL upgrade, which allows the study of spectral or time-resolved photoluminescence at the µm scale. The microscope connects to the instrument via fibres which are easily exchanged with other sample holders (requires fibres and N-L0X coupling module).

Features:

- Widefield and/or point excitation
- FLIM and PLIM options with advanced features such as 3D and surface maps
- Analysis of spectral and lifetime maps included in software



Measurement Examples:



Left: FLIM map of AlInGaP/GaAs LED chip.
Right: FLIM map of stained convallaria.

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