

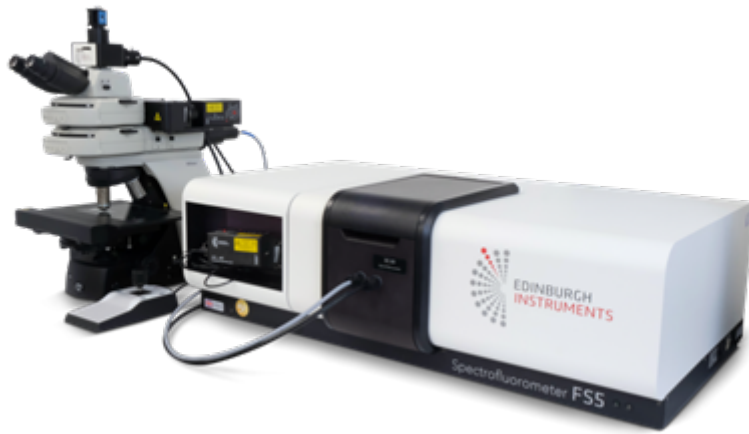
По вопросам продаж и поддержки обращайтесь:

Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Россия +7(495)268-04-70

Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Киргизия +996(312)-96-26-47

Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Казахстан +7(7172)727-132

Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93



MicroPL Upgrade

The MicroPL Upgrade for Edinburgh Instruments Photoluminescence Spectrometers, the FLS1000 and FS5, allows the study of spectral or time-resolved photoluminescence of samples in the microscopic scale.

Highlights:

- **Spectral and Time Resolved:** Suitable for any type of photoluminescence experiment
- **Customisable:** Tailored to any application and upgradable in the future
- **Plug & Play:** Easy to swap between MicroPL and FLS1000 Photoluminescence Spectrometer or FS5 Spectrofluorometer standard sample holders
- **All-In-One Software:** Including data acquisition, analysis and presentation

Other Key Features

Excitation Flexibility

- Widefield Excitation – tunable continuous source from spectrometer (steady state)
- Point Excitation – EPL/HPL/VPL pulsed lasers (TCSPC or MCS)

lifetime) and CW laser (steady state)

FLIM Add-on

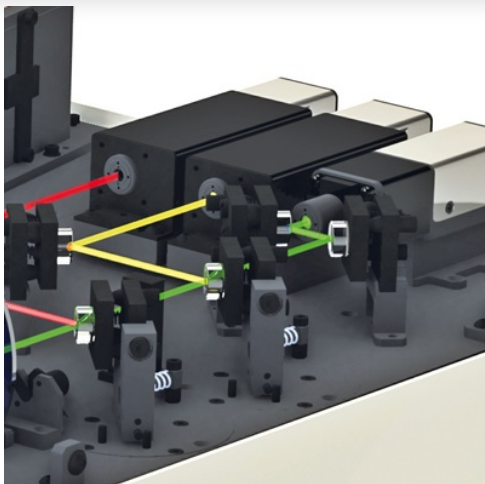
- Computer controlled XYZ stage
- Unlock advanced Fluoracle software options



RMS1000 Upgrades

The upgrade options are modifications or additions to the main body of the RMS1000. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

Lasers



The RMS1000 is built with flexibility in mind. A choice of excitation lasers (internal or external to the system) and associated laser rejection filters (both edge and notch) are available. Additionally picosecond pulsed diode lasers (EPL series) can be added if fluorescence measurements are required.

Spectrographs



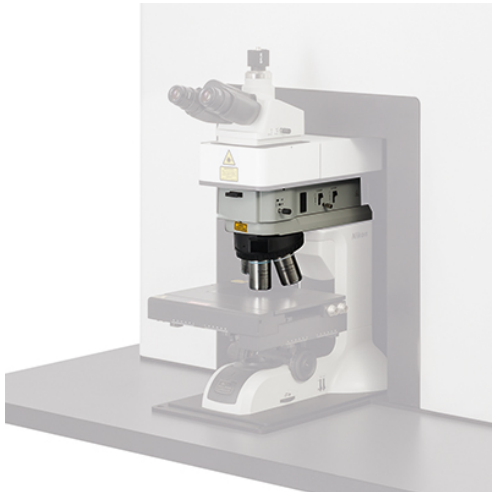
The RMS1000 can be fitted with both standard and long focal length spectrographs. This allows the system to be configured for ultimate spectral resolution, maximum optical throughput, low wavelength and ultraviolet spectral ranges, or for highly sensitive measurements.

Detectors



A choice of CCD, EMCCD and InGaAs detectors are available with a maximum of 4 detectors being integrated per system. For fluorescence lifetime measurements, single photon counting detectors can also be integrated.

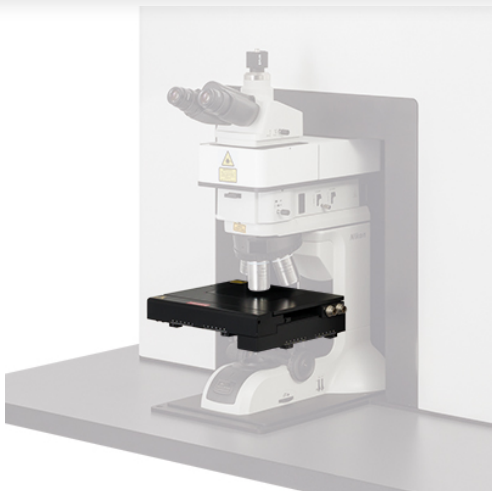
Microscope Accessories



The RMS1000 uses either an upright or inverted microscope platform which is compatible with all standard microscopy applications.

Brightfield, darkfield, polarised light, differential interference contrast (DIC) and fluorescence accessories are all available. A large choice of high-quality microscope objectives, high-performance visualisation cameras, collimators and illuminators can be added to the microscope at any time.

Sample Stages



Manual or motorised stages are available. The motorised stage allows automated XYZ Raman and fluorescence maps to be obtained and generated through Ramacle. Autofocus and heating/cooling of samples is also available.

Accessories and Laser Safety



Other accessories such as a polarisation kit, cuvette holder, and a Class I laser safety enclosure are also available to further expand the capabilities, flexibility and safety of your RMS1000 system. Coupling to other fluorescence spectrometers is also possible.



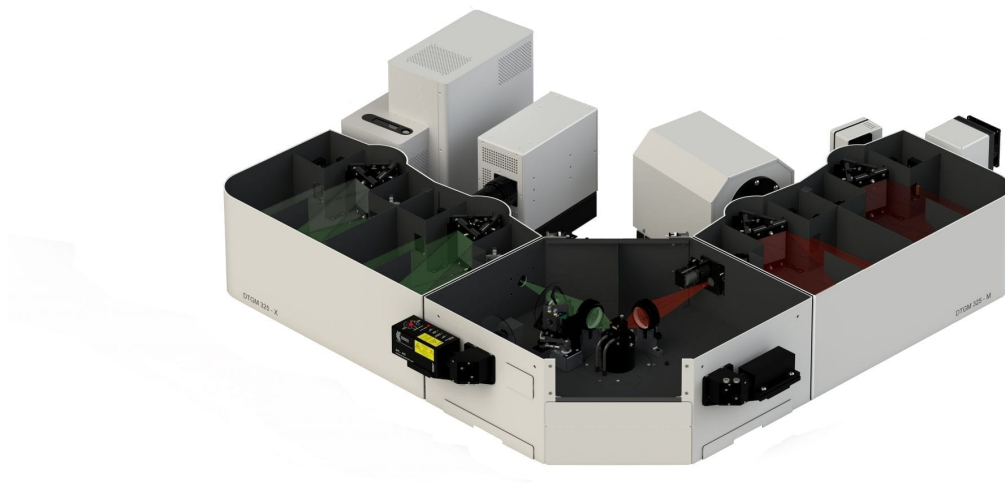
FLS1000 Upgrades

The upgrade options are modifications or additions to the main body of the FLS1000. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

Configuration Upgrades

Double Monochromators

Our systems can be equipped with double monochromators on excitation and emission arms. Double monochromators are recommended for highly scattering, low emissive samples as they improve the systems stray light suppression and increase the signal-to-noise ratio. A double monochromator in the emission arm allows for up to three detectors mounted simultaneously with software-based selection; two detectors can be fitted after the double monochromator and one after the first of the two monochromators. All monochromators are 325 mm focal length.



Geometries

If further detectors are required, the system can be configured in a T-geometry (pictured above) by the addition of a separate emission monochromator. This configuration can also be useful to provide a digital detection arm and an analogue detection arm.

Light Source Upgrades

Xenon Lamps

450 W continuous wavelength lamps for steady state measurements. The excitation range is typically 230 nm to >1700 nm. Ozone generating lamps may be used to increase the lower range to 180 nm.

Microsecond Flashlamp

μ F1 and μ F2: 5 W or 60 W pulsed xenon microsecond flashlamps producing short microsecond pulses for phosphorescence decay measurements. The excitation range is typically 230 nm to 1000 nm.

Ultrafast Nanosecond Flashlamp

nF980: ultrafast nanosecond flashlamp for time-resolved fluorescence studies with decays of 100 ps – 50 μ s. The excitation range is gas dependent.

Picosecond Pulsed Diode Lasers and LEDs

We manufacture a range of picosecond pulsed laser diodes (EPL Series) and pulsed LEDs (ELED Series) for Time Correlated Single Photon Counting (TCSPC) measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, eliminating the need for additional driver boxes and feature true “plug-and-play” usability.

Continuous Wave (CW) Lasers

Various continuous wave lasers for use with the FLS Series and FS5 are available. Some CW laser sources may also be pulsed by the spectrometer to allow, for example, upconversion decays with 808 nm and 980 nm excitation to be measured.

Monochromator Options

Diffraction Gratings

The monochromators have triple grating turrets allowing up to three diffraction gratings to be permanently mounted within the monochromator. Standard gratings are generally chosen to cover the wavelength range of the detector. However, should you have more stringent requirements, such as requiring finer linear dispersion or an extended wavelength range, other diffraction gratings are available.

We can offer diffraction gratings with a groove density of 150 g/mm up to >1800 g/mm which allows us to cover the range 200 nm – 8000 nm.

Detector Options

Photomultiplier Tubes (PMTs)

Single photon counting detectors comprise a single photon counting photomultiplier, together with an optimised dynode chain, mounted in

a light tight cooled or un-cooled housing. The detectors include the coupling flange with the adaptive optics for direct compatibility with all of Edinburgh Instruments' spectrometers.

The following PMTs are available: Standard PMTs up to 1010 nm, High speed PMTs up to 850 nm, MCP-PMT up to 850 nm, NIR-PMTs up to 1700 nm and gated PMTs.

Analogue Detectors

Analogue detectors are used either for high light level applications with the requirement for high dynamic range, or as alternative detectors in spectral ranges where photomultipliers are unavailable or too expensive. Depending on the required application, the analogue detectors come in a variety of housings with a variety of cooling options. Analogue detectors find application either in the FLS or the LP spectrometers to extend the spectral coverage into the NIR to 5.5 μm .

We offer detector assemblies that are supplied with PIN diodes with an active area of 3 mm. For steady state fluorescence applications the diode is mounted in a two stage TE cooled housing with collection/focusing optics chopper and lock-in. For time-resolved fluorescence or time-resolved phosphorescence applications, the diode is supplied in a two stage TE-cooled housing and with a digitising oscilloscope for data collection and averaging. The spectrometer's software automatically downloads the data to allow automated measurements such as TRES and for further analysis and fitting.

Fluorescence Lifetime Upgrades

TCSPC Electronics

The TCC2 is an electronics module with USB interface, which incorporates all the electronic modules required for Time-Correlated Single Photon Counting (TCSPC) and Multi-Channel Scaling (MCS). This includes constant fraction discriminators, variable delays, time to amplitude converter and a large memory for multi-channel analysis.

- TSCPC time range: 2.5 ns – 50 μ s full scale, MCS time range: 10 μ s
- 200 s full scale

- Time resolution from 305 fs/channel with ultra-low time jitter of 20 ps

Phosphorescence Lifetime Upgrades

MCS Electronics

The CB1 multichannel scaler.

- 100 MHz counter for spectral measurements (up to 3 channels)
- 10 ns minimum bin width in time-resolved measurements
- variable threshold settings

Sample Holder Options

Liquids

Single Cuvette Holder: Temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Magnetic Stirrer: Magnetic Stirrer to be fitted to single cuvette holder or 3-position sample turret. The stirrer comprises three stirrer bars and a stand-alone stirrer controller.

Powders, Thin-Films and Solids

Front-Face Sample Holders: A range of single position front-face sample holders are available for powders, thin-films and solids. These include linear staged holders, rotational holders and clamps.

Multiple Position Holders

3-Position Sample Turret: Computer-controlled 3-Position Cuvette Holder on rotational stage. All three positions temperature adjustable by water/coolant circulation, with an integrated temperature probe for sample temperature monitoring by spectrometer operating software.

Temperature Control Options

Bath/Refrigerator (-10°C – +100°C): Closed cycle water/coolant bath to be used with water-cooled sample holders. The temperature range is -10°C to +100°C. The unit comprises digital display of set and measured temperature. The temperature range at the sample position can be reduced depending on the length and the insulation of the coolant pipes used.

EPR Dewar (77 K): Liquid nitrogen dewar (quartz) in mounting collar for FLS1000 sample chamber with light tight seal, directly compatible to the sample chamber access flange. The dewar housing has a removable lid and built-in filter holders. Two individual EPR quartz sample rods supplied. Sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77K.

Liquid Nitrogen Cryostat (77 K – 300 K): Oxford Instruments liquid nitrogen cryostat, OptistatDN. The assembly comprises the cryostat head, the temperature controller, and a mounting flange and pedestal, directly compatible to the FLS1000 sample holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and Fluoracle® software.

Note: Special cryostat versions with windows arranged in T- or X-geometry are available on request.

Liquid Helium Cryostat (3.4 K – 300 K): Oxford Instruments liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the temperature controller, transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the FLS1000 holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and Fluoracle software.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Liquid Helium Cryostat Extended Temperature Range (3.4 K – 500 K): Oxford Instruments extended temperature range liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the ITC503 temperature controller, the LLT600 transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the FLS1000 holder socket. All other inclusions as the standard liquid helium cryostat.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Closed Cycle Cryostat Options: (4 K – 300 K, 10 K – 325 K, 6 K – 800 K): Includes helium compressor and hoses, sample exchange time is approximately 2 hours. 1st and 2nd stage cooling down to 10 K. Mounting flange and pedestal that is directly compatible to the FLS1000 holder socket are included.

TE Cooled Sample Holder Standard Range (-10°C – +105°C): Thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -10°C to +105°C (-10°C with dry gas flow, 5°C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer operating software Fluoracle.

TE Cooled Sample Holder Extended Range (-40°C – +150°C): Extended range thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -40 °C to +150 °C (-10 °C with dry gas flow, 5 °C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. The temperature range can be extended below -10°C and above +150°C with a special cover in place and for temperatures below -10°C chilled coolant fluid will be required. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer operating software Fluoracle.

Standard Range (220 nm – 900 nm): Glan Thompson polarising prism. Spectral range 220 nm – 900 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Extended Range (240 nm – 2300 nm): Glan Thompson polarising prism. Spectral range 240 nm – 2300 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Integrating Sphere

The integrating sphere is a demountable accessory for the measurement of fluorescence quantum yields. It is 120 mm in diameter and has an inner surface coated with BenFlect to enable efficient scattering of light over a wide wavelength range. With the integrating sphere, the measurement of fluorescence quantum yields by an absolute method, as well as reflection measurements, are possible on solutions, film and powder samples. Holders for both direct and indirect excitation is provided. Two cuvettes and two powder trays are supplied as part of the sphere accessory.



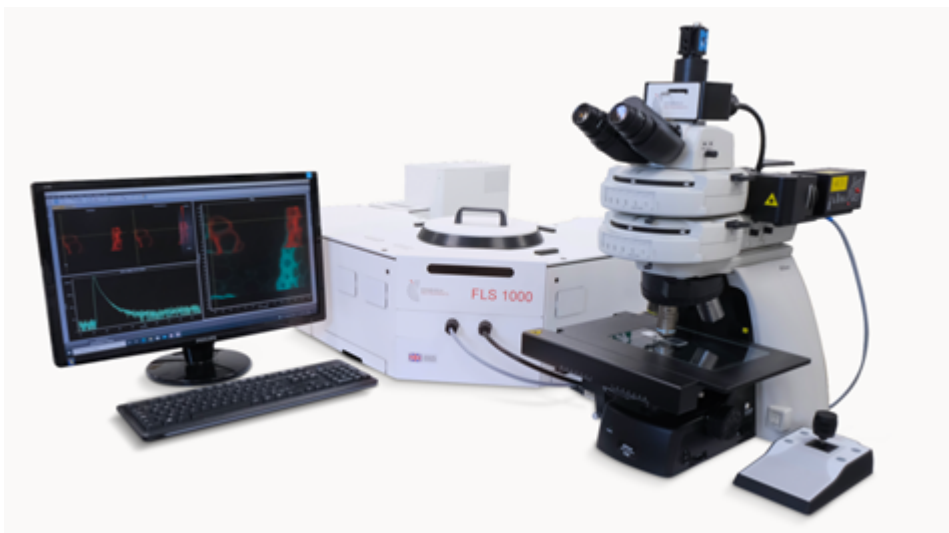
Software Upgrade

The standard Fluoracle software package can be upgraded to include the FAST software package. This is used for advanced fluorescence lifetime analysis and includes features such as lifetime distribution

analysis and exponential components analysis.

MicroPL Upgrade

The MicroPL upgrade allows spectral and time-resolved photoluminescence measurements of samples in the microscopic scale. The FLS1000 is upgraded with a microscope so you can finely tune both the excitation light (illumination) and the detected emission, using widefield or point excitation. The microscope can be supplied as either an upright and inverted microscopes. Imaging cameras are available spanning the spectrum from the visible to the near-infrared, up to 1700 nm. Excitation can be provided by halogen lamps (wide field excitation), picosecond pulsed diode lasers (EPL Series, HPL Series) and pulsed LEDs (EPLD Series), supercontinuum sources and Nd:YAG lasers (lasers and semiconductor sources provide point source illumination). Steady state emission spectra and fluorescence lifetime measurements can be obtained from specific spots on your sample, when using appropriate lasers. Lasers can achieve a spot size of $\sim 2 \mu\text{m}$ (objective dependent). The optional FLIM add-on includes a computer-controlled XYZ stage and unlocks special features in the Fluoracle software including advanced analysis options for maps, such as multi-component decay fitting algorithms. Download the MicroPL Datasheet.



Other Upgrades

Multiwell Plate Reader

The multiwell plate reader is an external module that is attached to the FLS1000 to perform spectral or time-resolved measurements on multi-well plates. The multiwell plate reader module is coupled to the FLS1000 by means of a bifurcated optical fibre. The control of the module is fully automated from the **Fluoracle** software, temperature near the well plate is recorded. Spectral range depends on spectrometer configuration and bifurcated fibre assembly. 96 well and 384 wells are available.



Titration Module

The titration accessory is based on a dual syringe Hamilton titrator (ML635) that is connected to the computer by RS232. The accessory comprise of two 1 ml syringes, connecting tubing, a flow cuvette and a light tight feed-through into the FLS1000 sample chamber. Titration is controlled through the Fluoracle software. Kinetic measurements with manual or automated titration steps and automated multiple spectral scanning are possible.

Stopped-Flow Accessory

Rapid kinetic accessory for multi-mixing capabilities. Comprises sample handling unit, fitted with three 1 ml drive syringes, 600 mm long umbilical, pneumatic drive system and square mixing/observation cuvette with standard dimensions (10 mm). Includes slotted sample chamber lid to allow the cuvette to be fitted to the spectrometer. Manual control.



FS5 System Upgrades

The upgrade options are modifications or additions to the main body of the FS5. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

All the standard features of the FS5 are retained when an upgrade option has been added. Many of the options can be combined allowing for outstanding flexibility for an instrument of this class.

Time-Resolved Measurement Upgrades

FS5 – MCS The instrument has all the features of the standard FS5, plus the capability to measure sample decays with lifetimes of over one microsecond (**phosphorescence**, lanthanide decays). The changeover between the standard continuous xenon light source and the pulsed xenon flash lamp is software controlled and the acquisition mode automatically changes from standard photon counting to time resolved photon counting. The software incorporates fitting and reconvolution analysis for lifetime evaluation. The instrumental response function (IRF) of this instrument is 2 microseconds. Lifetimes from $<10 \mu\text{s}$ to $>10 \text{s}$ can be accurately measured.

FS5 – TCSPC The instrument has all the features of the standard FS5, plus the capability of **fluorescence lifetime measurements** in the picosecond, nanosecond and the lower microsecond ($<50 \mu\text{s}$) time range. The FS5-TCSPC version requires picosecond pulsed diode

lasers and LEDs for excitation, which are simply attached to the FS5-TCSPC housing and are compatible to all sample holder options. The software is fully compatible with all measurement options and offers numerical reconvolution and curve fitting. Note that the picosecond diode lasers (**EPL series**) and the picosecond pulsed LEDs (**EPLED series**) come with different output wavelengths. More than one of these picosecond pulsed light sources may be required to cover your range of applications. TCSPC lifetime measurements with the standard FS5 detector will have an instrumental response function (IRF) of approximately 800 ps (FS5-TCSPC), enabling <100 ps lifetimes to be resolved. The exact value depends on which EPL or EPLED model is used. For challenging applications the IRF can be improved by fitting a SECOND, faster detector (FS5-TCSPC+). Using an EPL as an excitation source in this configuration will result in an IRF of <200 ps, enabling approximately 25 ps lifetimes to be resolved (depending on the source used).

Spectral Range Upgrades

FS5 – NIR This is a unique upgrade route that is only available to the FS5. The FS5-NIR has a SECOND detector fitted to expand the operating spectral range without sacrificing the performance of the standard instrument. There are two NIR versions available: FS5-NIR is fitted with an extra-cooled side window PMT and selected grating for sensitivity up to 1010 nm; FS5-NIR+ is fitted with a TE cooled NIR-PMT and NIR-grating for sensitivity up to 1650 nm. Both options are based on single-photon counting electronics for maximum sensitivity and compatibility with any of the lifetime options, should they be added.

Polarisation Upgrade

FS5 – POL This upgrade comprises the standard FS5 with fully computerised polarisers in both excitation and emission arms. The polarisers enable polarised fluorescence and fluorescence anisotropy studies. Automated measurements and generation of anisotropy curves, both raw and G-factor corrected, are supported by the software. If combined with the TCSPC option, time-resolved fluorescence anisotropy measurements and analysis will also be possible. FS5-POL uses Calcite polarising prisms with an operational range of 240 nm – 2300 nm for both excitation and emission.

This ensures compatibility with the NIR options FS5-NIR and FS5-NIR+.

Sample Holders / Cassette Upgrades

We have measurement modules available for practically all applications. These can be purchased at any time and can be easily installed by the user. The installation takes no more than a few seconds. The **Fluoracle software** automatically recognises which of the measurement modules is in use. This reduces the complexity in the user interface and ensures ease of operation.

Sample Cassettes (SC) available include:

SC-05: Standard Cuvette Holder

SC-10: Solid Sample Holder (upright/tilted sample)

SC-15: Solid Sample Holder (horizontal sample)

SC-20: Thermostatic Sample Holder (water bath regulation)

SC-25: TE-Cooled Sample Holder (-40°C to +105°C)

SC-26: TE-Cooled Sample Holder (-50°C to +150°C)

SC-27: 4-position TE-Cooled Sample Holder (-40°C to +105°C)

SC-28: Heated Sample Holder for Powders (up to 300°C)

SC-30: Integrating Sphere

SC-41: 384 Micro-well Plate Reader

SC-50: Optical Fibre Launcher (liquid light guides, SMA, FC)

SC-60: Calibration Kit

SC-70: Liquid Nitrogen EPR Dewar

SC-80: Liquid Nitrogen Cryostat



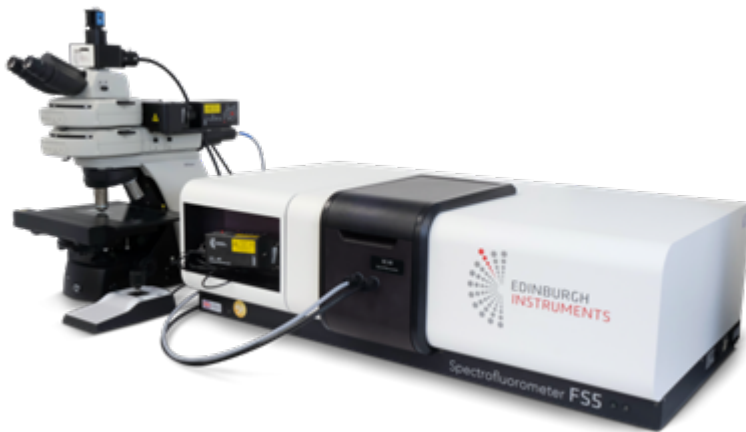
MicroPL Upgrade

The MicroPL upgrade allows spectral and time-resolved photoluminescence measurements of samples in the microscopic scale. The FS5 is upgraded with a microscope so you can finely tune both the excitation light (illumination) and the detected emission, using widefield or point excitation.

The microscope can be supplied as either an upright and inverted microscopes. Imaging cameras are available spanning the spectrum from the visible to the near-infrared, up to 1700 nm. Excitation can be provided by halogen lamps (wide field excitation), picosecond pulsed diode lasers (EPL Series, HPL Series) and pulsed LEDs (EPLD Series), supercontinuum sources and Nd:YAG lasers (lasers and semiconductor sources provide point source illumination). Steady state emission spectra and fluorescence lifetime measurements can be obtained from

specific spots on your sample, when using appropriate lasers. Lasers can achieve a spot size of $\sim 2 \mu\text{m}$ (objective dependent).

The optional FLIM add-on includes a computer-controlled XYZ stage and unlocks special features in the Fluoracle software including advanced analysis options for maps, such as multi-component decay fitting algorithms.



Software Upgrade

The standard **Fluoracle software** package can be upgraded to include the **FAST software** package. This is used for advanced fluorescence lifetime analysis and includes features such as lifetime distribution analysis and exponential components analysis.

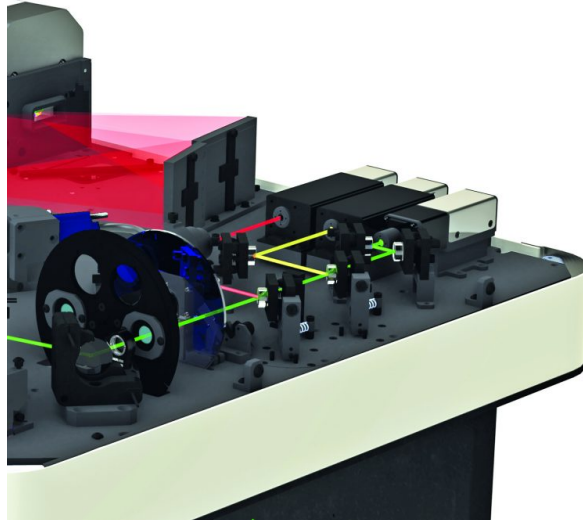


RM5 Upgrades

The upgrade options are modifications or additions to the main body of the RM5. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

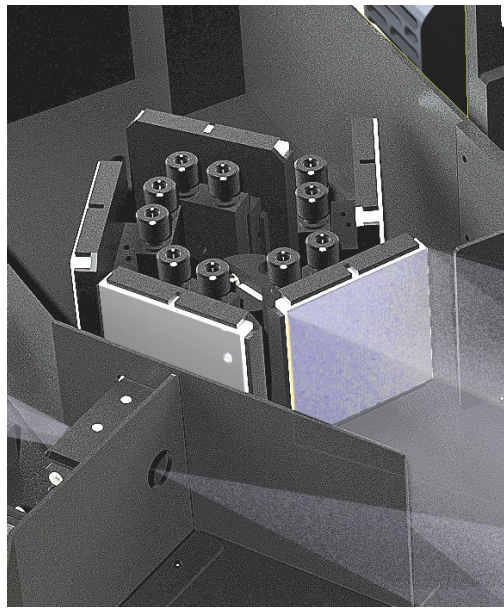
Lasers

The RM5 is built with flexibility in mind. A choice of excitation lasers and associated laser rejection filters (both edge and notch) are available depending on application requirements.



Gratings

Gratings are chosen for optimum resolution for each laser excitation, with up to a maximum of five gratings per system.



Detectors

A choice of CCD, EMCCD and InGaAs detectors are also available dependent on requirements, with a maximum of two detectors being integrated per system.



Accessories and Laser Safety

Other accessories such as a polarisation kit and a Class I laser safety enclosure are also available to further expand the capabilities, flexibility and safety of your RM5 system.

Microscope

The RM5 uses one of the most modern microscopes on the market for first class Raman microscopy. You can use the microscope beyond pure Raman microscopy; the RM5 has been designed to maintain the full capability of the microscope allowing all the necessary tools to be added for exceptional visualisation and contrast of your samples.

Brightfield, darkfield, polarised light, differential interference contrast (DIC) and fluorescence are all available. Alongside a choice of high quality microscope objectives, a high performance camera can be added to the microscope to ensure pictures of your samples (and associated Raman maps) are captured with excellent quality and resolution.

Sample Stages

A choice of microscope stages, including manual and an XYZ motorised stage which allows ease of navigation around your samples and stage area. Automated Raman maps can be obtained and generated through Ramacle. Heating/cooling of stages is also available.

LP980 Upgrades

The upgrade options are modifications or additions to the main body of the LP980. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

All the standard features of the LP980 are retained when an upgrade option has been added. Many of the options can be combined allowing for outstanding flexibility for an instrument of this class.

Emission Kinetics and Spectra Upgrade

Intensified Charge-Coupled Device (ICCD) Camera

The generation of spectra in kinetic mode by successive measurement at different wavelengths requires many excitation flashes. This can be problematic due to photo-degradation and stability of the sample over time. This can be overcome by upgrading to spectral mode and fitting an ICCD onto the instrument.



The ICCD detector has a high dynamic range and an ultra-low readout noise and can be controlled by the [L900 software](#).

Spectral Range: 180 nm – 850 nm (W-AGT photocathode)

Minimum Optical Gate Width: 7 ns

CCD Camera Specification

Full Number of Pixels: 1024 x 256

Number of Active Pixels: 960 x 255

Active Area: 25 mm x 6.7 mm

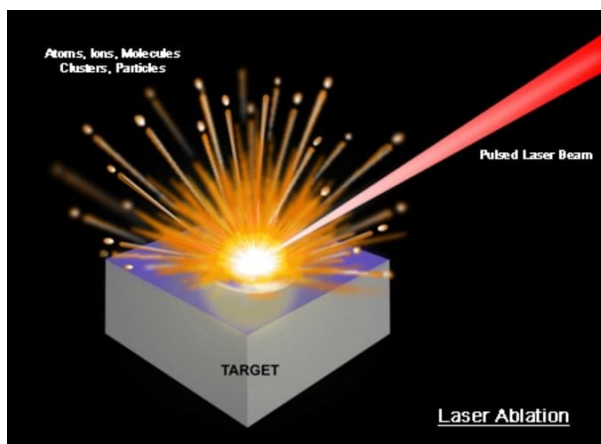
Cooling: -30°C (-40°C with additional coolant circulation)

Measurement Techniques Upgrades

Laser-Induced Breakdown Spectroscopy (LIBS)

Sample holder for LIBS measurements. The sample holder consists of an additional internal sample chamber with a horizontal sample mount. The laser is directed down onto the sample and the resultant signal is collected with additional optics and directed towards the emission monochromator.

Note: An ICCD is required for LIBS measurements and is not included as standard with the LIBS upgrade.



Ground and Excited-State Raman

The Raman upgrade adds the ability to measure time-resolved Raman measurements, by using a Q-switched laser operating at 532 nm. An ICCD is used to measure the Raman spectrum to $<100 \text{ cm}^{-1}$. Optical delays (or two synchronised lasers) may be used to measure excited state Raman spectra.

Note: A laser source and an ICCD are required for Raman measurements and are not included as standard with the Raman upgrade.

Sample Holder Options

Liquids

Cross-Beam Geometry: Standard sample holder of the LP920. Laser beam and probe beam intersect perpendicular at the sample position. The sample holder is designed to accept standard fluorescence cuvettes. Cuvettes can be positioned so that the probe beam passes through the centre of the cuvette or close to the surface of the incoming laser beam. The sample can be cooled by an external water circulator.

Solids and Powders (non-transparent)

Diffuse Reflectance: A sample holder for solid, non-transparent samples to be measured in Laser Flash Photolysis. This option requires samples to show significant diffuse scattering.

Gases and Low Density Liquids

Quasi Co-Linear Optics: A sample holder for low density liquid samples or gas samples to be measured in Laser Flash Photolysis. Laser beam and probe beam intersect in the sample in an angle of 3 degrees.

Stop-Flow Accessory

Rapid kinetic accessory for manual multi-mixing of samples capabilities. Comprises sample handling unit fitted with three 1 mL drive syringes, 600 mm long umbilical, manually operated drive, square mixing/observation cuvette with standard dimensions (10 mm path way). The stop-flow accessory can be computer-controlled as an option.

Note: This accessory can be used only with the halogen lamp as this is designed for ultimate long-term stability compared to arc-lamps.

Temperature Control Options

Bath/Refrigerator (-10°C – +100°C): Closed cycle water/coolant bath to be used with water-cooled sample holders. The temperature range

is -10°C to $+100^{\circ}\text{C}$. The unit comprises digital display of set and measured temperature. The temperature range at the sample position can be reduced depending on the length and the insulation of the coolant pipes used.

Liquid Nitrogen Cryostat (77 K – 300 K): Oxford Instruments liquid nitrogen cryostat, OptistatDN. The assembly comprises the cryostat head, the temperature controller, and a mounting flange and pedestal, directly compatible to the LP980 sample holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows are used. Cryostat can be fully controlled by computer and [L900 software](#).

Liquid Helium Cryostat (3.4 K – 300 K): Oxford Instruments liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the temperature controller, transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the LP980 holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows are used. Cryostat can be fully controlled by computer and [L900 Software](#).

Liquid Helium Cryostat Extended Temperature Range (3.4 K – 500 K): Oxford Instruments extended temperature range liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the ITC503 temperature controller, the LLT600 transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the LP980 holder socket. All other inclusions as the standard liquid helium cryostat.

TE Cooled Sample Holder Standard Range (-10°C – $+105^{\circ}\text{C}$): Thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -10°C to $+105^{\circ}\text{C}$ (-10°C with dry gas flow, 5°C without gas flow). The temperature can be held constant with $\pm 0.02^{\circ}\text{C}$ precision and can be rapidly changed. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer [operating software L900](#).

TE Cooled Sample Holder Extended Range (-40°C – $+150^{\circ}\text{C}$): Extended range thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples

from -40 °C to +150 °C (-10 °C with dry gas flow, 5 °C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. The temperature range can be extended below -10°C and above +150°C with a special cover in place and for temperatures below -10°C chilled coolant fluid will be required. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer [operating software L900](#).

Spectral Range Upgrades

Extended Range PMTs

Extended Red-Sensitive Photomultiplier (200 nm – 1010 nm): photomultiplier in standard LP920 housing. Detector response width of 7 ns, integrated with high voltage power supply.

InGaAs Detectors (NIR Range)

A range of InGaAs detectors are available that cover the range 900 nm – 2050 nm.

Software Upgrade

The standard [L900 software](#) package can be upgraded to include the [FLASH software](#) package. This is used for advanced transient absorption curve fitting and includes features such as lifetime distribution analysis and exponential components analysis.



LifeSpec II Upgrades

The upgrade options are modifications or additions to the main body of the LifeSpec II. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

All the standard features of the LifeSpec II are retained when an upgrade option has been added. Many of the options can be combined allowing for outstanding flexibility for an instrument of this class.

Lasers & LEDs Upgrades

Excitation Sources

Picosecond Pulsed Diode Lasers and LEDs: We manufacture a range of picosecond pulsed laser diodes (**EPL Series**) and LEDs (**EPLED Series**) for **Time-Correlated Single Photon Counting (TCSPC)** measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition

frequencies. The driver electronics are built into the light sources, making them easier to share between colleagues.

Ti:Sapphire Laser Integration: Radiation of Ti:Sapphire lasers with frequency doubling/tripling and pulse picker can be used for sample excitation. A trigger pick-up accessory can also be supplied. A Ti:Sapphire laser for TCSPC measurements can provide a short pulse width, high repetition rate (~80 MHz) and tunability.

SuperContinuum Laser Integration: A supercontinuum laser can be fitted with a special wavelength selection package that allows computer controlled wavelength and spectral bandwidth selection. This package also has an integrated and optimised laser synchronisation trigger pick-up.

Sample Holder Options

Liquids

Single Cuvette Holder: Temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Powders, Thin-Films and Solids

Front-Face Sample Holders: A range of single position front-face sample holders are available for powders, thin-films and solids. These include linear staged holders, rotational holders and clamps.

Multiple Position Holders

3-Position Sample Turret: Computer-controlled 3-Position Cuvette Holder on rotational stage. All three positions temperature adjustable by water/coolant circulation, with an integrated temperature probe for sample temperature monitoring by spectrometer operating software.

Temperature Control Options

Bath/Refrigerator (-10°C – +100°C): Closed cycle water/coolant bath to be used with water-cooled sample holders. The temperature range is -10°C to +100°C. The unit comprises digital display of set and measured temperature. The temperature range at the sample position can be reduced depending on the length and the insulation of the coolant pipes used.

EPR Dewar (77 K): Liquid nitrogen dewar (quartz) in mounting collar for LifeSpec-II sample chamber with light tight seal, directly compatible to the sample chamber access flange. The dewar housing has a removable lid and built-in filter holders. Two individual EPR quartz sample rods supplied. Sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77K.

Liquid Nitrogen Cryostat (77 K – 300 K): Oxford Instruments liquid nitrogen cryostat, OptistatDN. The assembly comprises the cryostat head, the temperature controller, and a mounting flange and pedestal, directly compatible to the LifeSpecII sample holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and **F980 software**.

Note: Special cryostat versions with windows arranged in T- or X-geometry are available on request.

Liquid Helium Cryostat (3.4 K – 300 K): Oxford Instruments liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the temperature controller, transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the LifeSpec II holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and **F980 software**.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Liquid Helium Cryostat Extended Temperature Range (3.4 K – 500 K): Oxford Instruments extended temperature range liquid helium

cryostat, OptistatCF. The assembly comprises the cryostat head, the ITC503 temperature controller, the LLT600 transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the LifeSpec II holder socket. All other inclusions as the standard liquid helium cryostat.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

TE Cooled Sample Holder Standard Range (-10°C – +105°C):

Thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -10°C to +105°C (-10°C with dry gas flow, 5°C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer [operating software F980](#).

TE Cooled Sample Holder Extended Range (-40°C – +150°C):

Extended range thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -40 °C to +150 °C (-10 °C with dry gas flow, 5 °C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. The temperature range can be extended below -10°C and above +150°C with a special cover in place and for temperatures below -10°C chilled coolant fluid will be required. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer [operating software F980](#).

Detector Upgrades

Photomultiplier Tubes (PMTs)

Single photon counting detectors comprise a single photon counting photomultiplier, together with an optimised dynode chain, mounted in a light tight cooled or un-cooled housing. The detectors include the coupling flange with the adaptive optics for direct compatibility with all of Edinburgh Instruments' spectrometers.

The following PMTs are available: Standard PMTs up to 1010 nm,

High speed PMTs up to 850 nm, MCP-PMT up to 850 nm, NIR-PMTs up to 1700 nm and gated PMTs.

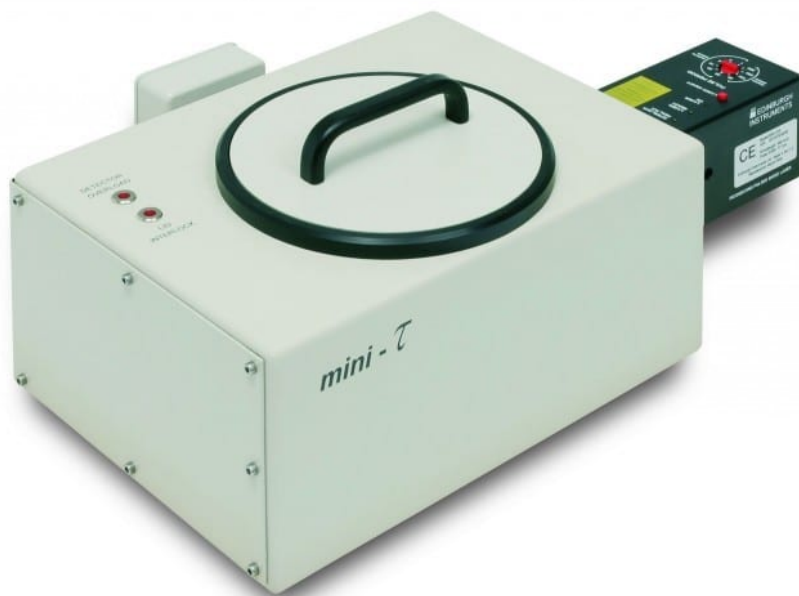
Polarisation/Anisotropy

Standard Range (220 nm – 900 nm): Glan Thompson polarising prism. Spectral range 220 nm – 900 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Extended Range (240 nm – 2300 nm): Glan Thompson polarising prism. Spectral range 240 nm – 2300 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Software Upgrade

The standard **F980 software** package can be upgraded to include the **FAST software** package. This is used for advanced fluorescence lifetime analysis and includes features such as lifetime distribution analysis and exponential components analysis.



Mini-tau Upgrades

The upgrade options are modifications or additions to the main body of the Mini-tau. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

All the standard features of the Mini-tau are retained when an upgrade option has been added. Many of the options can be combined allowing for outstanding flexibility for an instrument of this class.

Lasers & LEDs Upgrades

Excitation Sources

Picosecond Pulsed Diode Lasers and LEDs: We manufacture a range of picosecond pulsed laser diodes (**EPL Series**) and LEDs (**EPLED Series**) for **Time-Correlated Single Photon Counting (TCSPC)** measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, making them easier to share between colleagues.

Sample Holder Options

Liquids

Single Cuvette Holder: Temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Powders, Thin-Films and Solids

Front-Face Sample Holder: Single position front-face sample holder. This sample holder is suitable for measuring front-face emission on cuvettes. Two additional inserts are supplied. Insert for holding films/slides, and insert comprising demountable cuvette.

Polarisation/Anisotropy

Standard Range (220 nm – 900 nm): Glan Thompson polarising prism. Spectral range 220 nm – 900 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Anisotropy measurements are possible if both excitation and emission polarisers are present.

Software Upgrade

The standard **F980 software** package can be upgraded to include the **FAST software** package. This is used for advanced fluorescence lifetime analysis and includes features such as lifetime distribution analysis and exponential components analysis.



FLS980 Upgrades

The upgrade options are modifications or additions to the main body of the FLS980. All upgrades are best installed at the time of manufacture, but they can also be retro-fitted by a qualified service engineer during an on-site visit.

Configuration Upgrades

Double Monochromators

Our systems can be equipped with double monochromators on excitation and emission arms. Double monochromators are recommended for highly scattering, low emissive samples as they improve the systems stray light suppression and increase the signal-to-noise ratio. A double monochromator in the emission arm allows for up to three detectors mounted simultaneously with software-based selection; two detectors can be fitted after the double monochromator and one after the first of the two monochromators. All monochromators are 300 mm focal length.



Geometries

If further detectors are required, the system can be configured in a T-geometry (pictured above) by the addition of a separate emission monochromator. This configuration can also be useful to provide a digital detection arm and an analogue detection arm.

Light Source Upgrades

Xenon Lamps

450 W continuous wavelength lamps for steady state measurements. The excitation range is typically 230 nm to >1700 nm. Ozone generating lamps may be used to increase the lower range to 180 nm.

Microsecond Flashlamp

μ F1 and μ F2: 5 W or 60 W pulsed xenon microsecond flashlamps producing short microsecond pulses for phosphorescence decay measurements. The excitation range is typically 230 nm to 1000 nm.

Ultrafast Nanosecond Flashlamp

nF920: ultrafast nanosecond flashlamp for [time-resolved fluorescence](#) studies with decays of 100 ps – 50 us. The excitation range is gas dependent.

Picosecond Pulsed Diode Lasers and LEDs

We manufacture a range of picosecond pulsed laser diodes ([EPL Series](#)) and pulsed LEDs ([EPLED Series](#)) for Time Correlated Single Photon Counting (TCSPC) measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, eliminating the need for additional driver boxes and feature true “plug-and-play” usability.

Continuous Wave (CW) Lasers

Various continuous wave lasers for use with the FLS Series and FS5 are available. Some CW laser sources may also be pulsed by the spectrometer to allow, for example, upconversion decays with 808 nm and 980 nm excitation to be measured.

Monochromator Options

Diffraction Gratings

The monochromators have triple grating turrets allowing up to three diffraction gratings to be permanently mounted within the monochromator. Standard gratings are generally chosen to cover the wavelength range of the detector. However, should you have more stringent requirements, such as requiring finer linear dispersion or an extended wavelength range, other diffraction gratings are available.

We can offer diffraction gratings with a groove density of 150 g/mm up to >1800 g/mm which allows us to cover the range 200 nm – 8000 nm.

Detector Options

Photomultiplier Tubes (PMTs)

Single photon counting detectors comprise a single photon counting photomultiplier, together with an optimised dynode chain, mounted in

a light tight cooled or un-cooled housing. The detectors include the coupling flange with the adaptive optics for direct compatibility with all of Edinburgh Instruments' spectrometers.

The following PMTs are available: Standard PMTs up to 1010 nm, High speed PMTs up to 850 nm, MCP-PMT up to 850 nm, NIR-PMTs up to 1700 nm and gated PMTs.

Analogue Detectors

Analogue detectors are used either for high light level applications with the requirement for high dynamic range, or as alternative detectors in spectral ranges where photomultipliers are unavailable or too expensive. Depending on the required application, the analogue detectors come in a variety of housings with a variety of cooling options. Analogue detectors find application either in the FLS or the LP spectrometers to extend the spectral coverage into the NIR to 5.5 μm .

We offer detector assemblies that are supplied with PIN diodes with an active area of 3 mm. For [steady state fluorescence](#) applications the diode is mounted in a two stage TE cooled housing with collection/focusing optics chopper and lock-in. For [time-resolved fluorescence](#) or [time-resolved phosphorescence](#) applications, the diode is supplied in a two stage TE-cooled housing and with a digitising oscilloscope for data collection and averaging. The spectrometer's software automatically downloads the data to allow automated measurements such as TRES and for further analysis and fitting.

Fluorescence Lifetime Upgrades

TCSPC Electronics

The TCC2 is an electronics module with USB interface, which incorporates all the electronic modules required for Time-Correlated Single Photon Counting (TCSPC) and Multi-Channel Scaling (MCS). This includes constant fraction discriminators, variable delays, time to amplitude converter and a large memory for multi-channel analysis.

- TSCPC time range: 2.5 ns – 50 μ s full scale, MCS time range: 10 μ s
- 200 s full scale

- Time resolution from 305 fs/channel with ultra-low time jitter of 20 ps

Phosphorescence Lifetime Upgrades

MCS Electronics

The CB1 multichannel scaler.

- 100 MHz counter for spectral measurements (up to 3 channels)
- 10 ns minimum bin width in time-resolved measurements
- variable threshold settings

Sample Holder Options

Liquids

Single Cuvette Holder: Temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Magnetic Stirrer: Magnetic Stirrer to be fitted to single cuvette holder or 3-position sample turret. The stirrer comprises three stirrer bars and a stand-alone stirrer controller.

Powders, Thin-Films and Solids

Front-Face Sample Holders: A range of single position front-face sample holders are available for powders, thin-films and solids. These include linear staged holders, rotational holders and clamps.

Multiple Position Holders

3-Position Sample Turret: Computer-controlled 3-Position Cuvette Holder on rotational stage. All three positions temperature adjustable by water/coolant circulation, with an integrated temperature probe for sample temperature monitoring by spectrometer operating software.

Temperature Control Options

Bath/Refrigerator (-10°C – +100°C): Closed cycle water/coolant bath to be used with water-cooled sample holders. The temperature range is -10°C to +100°C. The unit comprises digital display of set and measured temperature. The temperature range at the sample position can be reduced depending on the length and the insulation of the coolant pipes used.

EPR Dewar (77 K): Liquid nitrogen dewar (quartz) in mounting collar for FLS980 sample chamber with light tight seal, directly compatible to the sample chamber access flange. The dewar housing has a removable lid and built-in filter holders. Two individual EPR quartz sample rods supplied. Sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77K.

Liquid Nitrogen Cryostat (77 K – 300 K): Oxford Instruments liquid nitrogen cryostat, OptistatDN. The assembly comprises the cryostat head, the temperature controller, and a mounting flange and pedestal, directly compatible to the FLS980 sample holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and **F980 software**.

Note: Special cryostat versions with windows arranged in T- or X-geometry are available on request.

Liquid Helium Cryostat (3.4 K – 300 K): Oxford Instruments liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the temperature controller, transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the FLS980 holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and **F980 software**.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Liquid Helium Cryostat Extended Temperature Range (3.4 K – 500 K): Oxford Instruments extended temperature range liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the ITC503 temperature controller, the LLT600 transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the FLS980 holder socket. All other inclusions as the standard liquid helium cryostat.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Closed Cycle Cryostat Options: (4 K – 300 K, 10 K – 325 K, 6 K – 800 K): Includes helium compressor and hoses, sample exchange time is approximately 2 hours. 1st and 2nd stage cooling down to 10 K. Mounting flange and pedestal that is directly compatible to the FLS980 holder socket are included.

TE Cooled Sample Holder Standard Range (-10°C – +105°C): Thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -10°C to +105°C (-10°C with dry gas flow, 5°C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer **operating software F980**.

TE Cooled Sample Holder Extended Range (-40°C – +150°C): Extended range thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -40 °C to +150 °C (-10 °C with dry gas flow, 5 °C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. The temperature range can be extended below -10°C and above +150°C with a special cover in place and for temperatures below -10°C chilled coolant fluid will be required. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer **operating software F980**.

Standard Range (220 nm – 900 nm): Glan Thompson polarising prism. Spectral range 220 nm – 900 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Extended Range (240 nm – 2300 nm): Glan Thompson polarising prism. Spectral range 240 nm – 2300 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Integrating Sphere

The integrating sphere is a demountable accessory for the measurement of fluorescence quantum yields. It is 120 mm in diameter and has an inner surface coated with BenFlect to enable efficient scattering of light over a wide wavelength range. With the integrating sphere, the measurement of fluorescence quantum yields by an absolute method, as well as reflection measurements, are possible on solutions, film and powder samples. Holders for both direct and indirect excitation is provided. Two cuvettes and two powder trays are supplied as part of the sphere accessory.



Software Upgrade

The standard **F980 software** package can be upgraded to include the **FAST software** package. This is used for advanced fluorescence lifetime analysis and includes features such as lifetime distribution

analysis and exponential components analysis.

MicroPL Upgrade

The MicroPL upgrade allows spectral and time-resolved photoluminescence measurements of samples in the microscopic scale. The FLS1000 is upgraded with a microscope so you can finely tune both the excitation light (illumination) and the detected emission, using widefield or point excitation. The microscope can be supplied as either an upright and inverted microscopes. Imaging cameras are available spanning the spectrum from the visible to the near-infrared, up to 1700 nm. Excitation can be provided by halogen lamps (wide field excitation), picosecond pulsed diode lasers (EPL Series, HPL Series) and pulsed LEDs (EPLLED Series), supercontinuum sources and Nd:YAG lasers (lasers and semiconductor sources provide point source illumination). Steady state emission spectra and fluorescence lifetime measurements can be obtained from specific spots on your sample, when using appropriate lasers. Lasers can achieve a spot size of $\sim 2 \mu\text{m}$ (objective dependent). The optional FLIM add-on includes a computer-controlled XYZ stage and unlocks special features in the Fluoracle software including advanced analysis options for maps, such as multi-component decay fitting algorithms.



Other Upgrades

Titration Module

The titration accessory is based on a dual syringe Hamilton titrator

(ML635) that is connected to the computer by RS232. The accessory comprise of two 1 ml syringes, connecting tubing, a flow cuvette and a light tight feed-through into the FLS980 sample chamber. Titration is controlled through the [F980 software](#). Kinetic measurements with manual or automated titration steps and automated multiple spectral scanning are possible.

Stopped-Flow Accessory

Rapid kinetic accessory for multi-mixing capabilities. Comprises sample handling unit, fitted with three 1 ml drive syringes, 600 mm long umbilical, pneumatic drive system and square mixing/observation cuvette with standard dimensions (10 mm). Includes slotted sample chamber lid to allow the cuvette to be fitted to the spectrometer. Manual control.



LP920 Upgrades

The LP920 Laser Flash Photolysis / Transient absorption spectrometer is now discontinued. However, we still fully support all upgrades, parts and replacements, servicing and maintenance for existing LP920 systems and customers.

The upgrade options are modifications or additions to the main body of the LP920. All upgrades are now retro-fitted by a qualified service engineer during an on-site visit.

Emission Kinetics and Spectra Upgrade

Intensified Charge-Coupled Device (ICCD) Camera

The generation of spectra in kinetic mode by successive measurement at different wavelengths requires many excitation flashes. This can be problematic due to photo-degradation and stability of the sample over time. This can be overcome by upgrading to spectral mode and fitting an ICCD onto the instrument.



The ICCD detector has a high dynamic range and an ultra-low readout noise and can be controlled by the [L900 software](#).

Spectral Range: 180 nm – 850 nm (W-AGT photocathode)

Minimum Optical Gate Width: 7 ns

CCD Camera Specification

Full Number of Pixels: 1024 x 256

Number of Active Pixels: 960 x 255

Active Area: 25 mm x 6.7 mm

Cooling: -30°C (-40°C with additional coolant circulation)

Sample Holder Options

Liquids

Cross-Beam Geometry: Standard sample holder of the LP920. Laser beam and probe beam intersect perpendicular at the sample position. The sample holder is designed to accept standard fluorescence cuvettes. Cuvettes can be positioned so that the probe beam passes through the centre of the cuvette or close to the surface of the incoming laser beam. The sample can be cooled by an external water circulator.

Solids and Powders (non-transparent)

Diffuse Reflectance: A sample holder for solid, non-transparent samples to be measured in Laser Flash Photolysis. This option requires samples to show significant diffuse scattering.

Gases and Low Density Liquids

Quasi Co-Linear Optics: A sample holder for low density liquid samples or gas samples to be measured in Laser Flash Photolysis. Laser beam and probe beam intersect in the sample in an angle of 3 degrees.

Stop-Flow Accessory

Rapid kinetic accessory for manual multi-mixing of samples capabilities. Comprises sample handling unit fitted with three 1 mL drive syringes, 600 mm long umbilical, manually operated drive, square mixing/observation cuvette with standard dimensions (10 mm path way)

Option: Computer-controlled

Note: This accessory can be used only with the halogen lamp as this is designed for ultimate long-term stability compared to arc-lamps.

Temperature Control Options

Bath/Refrigerator (-10°C – +100°C): Closed cycle water/coolant bath to be used with water-cooled sample holders. The temperature range is -10°C to +100°C. The unit comprises digital display of set and measured temperature. The temperature range at the sample position can be reduced depending on the length and the insulation of the coolant pipes used.

Liquid Nitrogen Cryostat (77 K – 300 K): Oxford Instruments liquid nitrogen cryostat, OptistatDN. The assembly comprises the cryostat head, the temperature controller, and a mounting flange and pedestal, directly compatible to the LP920 sample holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows are used. Cryostat can be fully controlled by computer and [L900 software](#).

Liquid Helium Cryostat (3.4 K – 300 K): Oxford Instruments liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the temperature controller, transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the LifeSpec II holder socket.

Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows are used. Cryostat can be fully controlled by computer and [L900 Software](#).

Liquid Helium Cryostat Extended Temperature Range (3.4 K – 500 K): Oxford Instruments extended temperature range liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the ITC503 temperature controller, the LLT600 transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the LP920 holder socket. All other inclusions as the standard liquid helium cryostat.

TE Cooled Sample Holder Standard Range (-10°C – +105°C): Thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -10°C to +105°C (-10°C with dry gas flow, 5°C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer [operating software L900](#).

TE Cooled Sample Holder Extended Range (-40°C – +150°C): Extended range thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -40 °C to +150 °C (-10 °C with dry gas flow, 5 °C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. The temperature range can be extended below -10°C and above +150°C with a special cover in place and for temperatures below -10°C chilled coolant fluid will be required. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer [operating software L900](#).

Spectral Range Upgrades

Extended Range PMTs

Extended Red-Sensitive Photomultiplier (200 nm – 1010 nm): photomultiplier in standard LP920 housing. Detector response width of 7 ns, integrated with high voltage power supply.

InGaAs Detectors (NIR Range)

A range of InGaAs detectors are available that cover the range 900 nm – 2050 nm.

Software Upgrade

The standard [L900 software](#) package can be upgraded to include the [FLASH software](#) package. This is used for advanced transient absorption curve fitting and includes features such as lifetime distribution analysis and exponential components analysis.



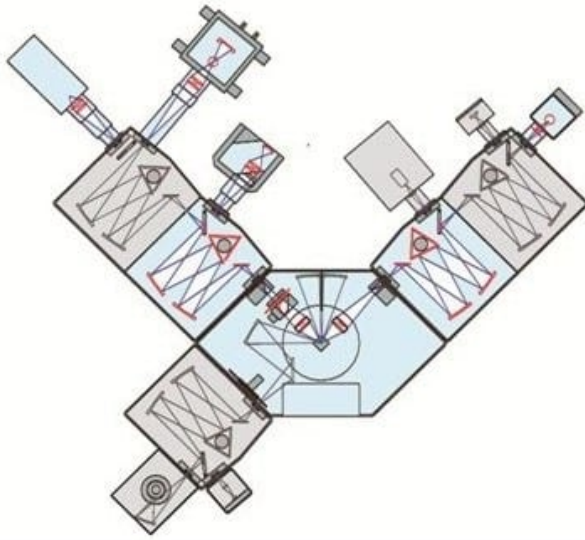
FLS920 Upgrades

The FLS920 Fluorescence Spectrometer is now discontinued. However, we still fully support all upgrades, parts and replacements, servicing and maintenance for existing FLS920 systems and customers.

Configuration Upgrades

Double Monochromators

Our systems can be equipped with double monochromators on excitation and emission arms. Double monochromators are recommended for highly scattering, low emissive samples as they improve the systems stray light suppression and increase the signal-to-noise ratio. A double monochromator in the emission arm allows for up to three detectors mounted simultaneously with software-based selection; two detectors can be fitted after the double monochromator and one after the first of the two monochromators.



Geometries

If further detectors are required, the system can be configured in a T-geometry (pictured above) by the addition of a separate emission monochromator. This configuration can also be useful to provide a digital detection arm and an analogue detection arm.

Light Source Upgrades

Xenon Lamps

450 W continuous wavelength lamps for steady state measurements. The excitation range is typically 230 nm to >1700 nm. Ozone generating lamps may be used to increase the lower range to 180 nm.

Microsecond Flash Lamp

μ F1 and μ F2: 5 W or 60 W pulsed xenon microsecond flashlamps producing short microsecond pulses for phosphorescence decay measurements. The excitation range is typically 230 nm to 1000 nm.

Ultrafast Nanosecond Flash Lamp

nF980: ultrafast nanosecond flashlamp for [time-resolved fluorescence](#) studies with decays of 100 ps – 50 us. The excitation range is gas

dependent.

Picosecond Pulsed Diode Lasers and LEDs

We manufacture a range of picosecond pulsed laser diodes ([EPL Series](#)) and pulsed LEDs ([EPLED Series](#)) for Time Correlated Single Photon Counting (TCSPC) measurements. Diodes are available over the UV-VIS spectrum starting at 250 nm and are pre-set with a range of repetition frequencies. The driver electronics are built into the light sources, eliminating the need for additional driver boxes and feature true “plug-and-play” usability.

Continuous Wave (CW) Lasers

Various continuous wave lasers for use with the FLS920, FLS980 and FS5 are available. Some CW laser sources may also be pulsed by the spectrometer to allow, for example, upconversion decays with 808 nm and 980 nm excitation to be measured.

Monochromator Options

Diffraction Gratings

The monochromators have triple grating turrets allowing up to three diffraction gratings to be permanently mounted within the monochromator. Standard gratings are generally chosen to cover the wavelength range of the detector. However, should you have more stringent requirements, such as requiring finer linear dispersion or an extended wavelength range, other diffraction gratings are available.

We can offer diffraction gratings with a groove density of 150 g/mm up to >1800 g/mm which allows us to cover the range 200 nm – 8000 nm.

Detector Options

Photomultiplier Tubes (PMTs)

Single photon counting detectors comprise a single photon counting photomultiplier, together with an optimised dynode chain, mounted in a light tight cooled or un-cooled housing. The detectors include the coupling flange with the adaptive optics for direct compatibility with all of Edinburgh Instruments' spectrometers.

The following PMTs are available: Standard PMTs up to 1010 nm, High speed PMTs up to 850 nm, MCP-PMT up to 850 nm, NIR-PMTs up to 1700 nm and gated PMTs.

Analogue Detectors

Analogue detectors are used either for high light level applications with the requirement for high dynamic range, or as alternative detectors in spectral ranges where photomultipliers are unavailable or too expensive. Depending on the required application, the analogue detectors come in a variety of housings with a variety of cooling options. Analogue detectors find application either in the FLS or the LP spectrometers to extend the spectral coverage into the NIR to 5.5 μm .

We offer detector assemblies that are supplied with PIN diodes with an active area of 3 mm. For [steady state fluorescence](#) applications the diode is mounted in a two stage TE cooled housing with collection/focusing optics chopper and lock-in. For [time-resolved fluorescence](#) or [time-resolved phosphorescence](#) applications, the diode is supplied in a two stage TE-cooled housing and with a digitising oscilloscope for data collection and averaging. The spectrometer's software automatically downloads the data to allow automated measurements such as TRES and for further analysis and fitting.

Fluorescence Lifetime Upgrades

TCSPC Electronics

The TCC2 is an electronics module with USB interface, which incorporates all the electronic modules required for Time-Correlated Single Photon Counting (TCSPC) and Multi-Channel Scaling (MCS). This includes constant fraction discriminators, variable delays, time to

amplitude converter and a large memory for multi-channel analysis.

- TSCPC time range: 2.5 ns – 50 ms full scale, MCS time range: 10 ms – 200 s full scale
- Time resolution from 305 fs/channel with ultra-low time jitter of 20 ps

Phosphorescence Lifetime Upgrades

MCS Electronics

The CB1 multichannel scaler.

- 100 MHz counter for spectral measurements (up to 3 channels)
- 10 ns minimum bin width in time-resolved measurements
- variable threshold settings

Sample Holder Options

Liquids

Single Cuvette Holder: Temperature adjustable by water/coolant circulation, fitted with integrated probe for sample temperature monitoring by spectrometer operating software. Filter slots provided for holding 50 mm square filters. This sample holder is included as part of the standard system.

Magnetic Stirrer: Magnetic Stirrer to be fitted to single cuvette holder or 3-position sample turret. The stirrer comprises three stirrer bars and a stand-alone stirrer controller.

Powders, Thin-Films and Solids

Front-Face Sample Holders: A range of single position front-face sample holders are available for powders, thin-films and solids. These include linear staged holders, rotational holders and clamps.

Multiple Position Holders

3-Position Sample Turret: Computer-controlled 3-Position Cuvette Holder on rotational stage. All three positions temperature adjustable by water/coolant circulation, with an integrated temperature probe for sample temperature monitoring by spectrometer operating software.

Temperature Control Options

Bath/Refrigerator (-10°C – +100°C): Closed cycle water/coolant bath to be used with water-cooled sample holders. The temperature range is -10°C to +100°C. The unit comprises digital display of set and measured temperature. The temperature range at the sample position can be reduced depending on the length and the insulation of the coolant pipes used.

EPR Dewar (77 K): Liquid nitrogen dewar (quartz) in mounting collar for FLS920 sample chamber with light tight seal, directly compatible to the sample chamber access flange. The dewar housing has a removable lid and built-in filter holders. Two individual EPR quartz sample rods supplied. Sample rod, containing the sample, will be immersed into the liquid nitrogen bath thus cooling the sample to 77K.

Liquid Nitrogen Cryostat (77 K – 300 K): Oxford Instruments liquid nitrogen cryostat, OptistatDN. The assembly comprises the cryostat head, the temperature controller, and a mounting flange and pedestal, directly compatible to the FLS920 sample holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and **F980 software**.

Note: Special cryostat versions with windows arranged in T- or X-geometry are available on request.

Liquid Helium Cryostat (3.4 K – 300 K): Oxford Instruments liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the temperature controller, transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the FLS920 holder socket. Includes heater and sensor, cuvette holder, optical sample holder and sample rod. Spectrosil B quartz windows in L-geometry are used. Cryostat can be fully controlled by computer and **F980 software**.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Liquid Helium Cryostat Extended Temperature Range (3.4 K – 500 K): Oxford Instruments extended temperature range liquid helium cryostat, OptistatCF. The assembly comprises the cryostat head, the ITC503 temperature controller, the LLT600 transfer tube and SV12 adaptor, VC31 gas flow controller, GF4 pump, and a mounting flange and pedestal that is directly compatible to the FLS920 holder socket. All other inclusions as the standard liquid helium cryostat.

Note: Special cryostat versions with windows arranged in T or X-geometry are available on request.

Closed Cycle Cryostat Options: (4 K – 300 K, 10 K – 325 K, 6 K – 800 K): Includes helium compressor and hoses, sample exchange time is approximately 2 hours. 1st and 2nd stage cooling down to 10 K. Mounting flange and pedestal that is directly compatible to the FLS920 holder socket are included.

TE Cooled Sample Holder Standard Range (-10°C – +105°C): Thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -10°C to +105°C (-10°C with dry gas flow, 5°C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer **operating software F980**.

TE Cooled Sample Holder Extended Range (-40°C – +150°C): Extended range thermoelectrically cooled 4-window cuvette holder with controller that enables stable temperature control of samples from -40 °C to +150 °C (-10 °C with dry gas flow, 5 °C without gas flow). The temperature can be held constant with $\pm 0.02^\circ\text{C}$ precision and can be rapidly changed. The temperature range can be extended below -10°C and above +150°C with a special cover in place and for temperatures below -10°C chilled coolant fluid will be required. A magnetic stirrer (without stirrer bars) is included. The TE cooled sample holder is fully controlled by the spectrometer **operating software F980**.

Standard Range (220 nm – 900 nm): Glan Thompson polarising prism. Spectral range 220 nm – 900 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Extended Range (240 nm – 2300 nm): Glan Thompson polarising prism. Spectral range 240 nm – 2300 nm. The polariser can be manually moved into or out of the beam. The position is recognised by the computer. When in the beam, the polarisation angle is fully computer controlled. Automated anisotropy measurements are possible if both excitation and emission polarisers are present.

Integrating Sphere

The integrating sphere is a demountable accessory for the measurement of fluorescence quantum yields. It is 120 mm in diameter and has an inner surface coated with BenFlect to enable efficient scattering of light over a wide wavelength range. With the integrating sphere, the measurement of fluorescence quantum yields by an absolute method, as well as reflection measurements, are possible on solutions, film and powder samples. Holders for both direct and indirect excitation is provided. Two cuvettes and two powder trays are supplied as part of the sphere accessory.



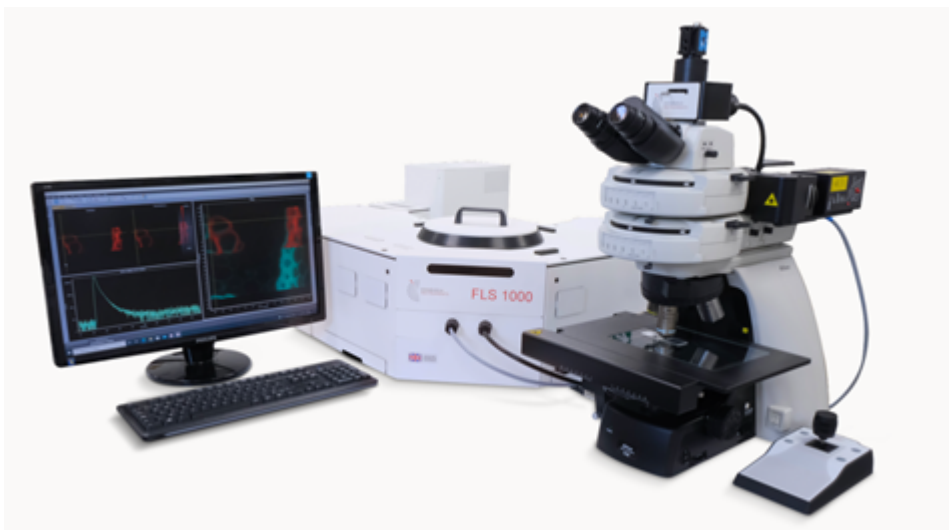
Software Upgrade

The standard **F980 software** package can be upgraded to include the **FAST software** package. This is used for advanced fluorescence lifetime analysis and includes features such as lifetime distribution

analysis and exponential components analysis.

MicroPL Upgrade

The MicroPL upgrade allows spectral and time-resolved photoluminescence measurements of samples in the microscopic scale. The FLS1000 is upgraded with a microscope so you can finely tune both the excitation light (illumination) and the detected emission, using widefield or point excitation. The microscope can be supplied as either an upright and inverted microscopes. Imaging cameras are available spanning the spectrum from the visible to the near-infrared, up to 1700 nm. Excitation can be provided by halogen lamps (wide field excitation), picosecond pulsed diode lasers (EPL Series, HPL Series) and pulsed LEDs (EPLLED Series), supercontinuum sources and Nd:YAG lasers (lasers and semiconductor sources provide point source illumination). Steady state emission spectra and fluorescence lifetime measurements can be obtained from specific spots on your sample, when using appropriate lasers. Lasers can achieve a spot size of $\sim 2 \mu\text{m}$ (objective dependent). The optional FLIM add-on includes a computer-controlled XYZ stage and unlocks special features in the Fluoracle software including advanced analysis options for maps, such as multi-component decay fitting algorithms.



Other Upgrades

Multiwell Plate Reader

The multiwell plate reader is an external module that is attached to

the FLS920 to perform spectral or time-resolved measurements on multi-well plates. The multiwell plate reader module is coupled to the FLS920 by means of a bifurcated optical fibre. The control of the module is fully automated from the [F980 software](#), temperature near the well plate is recorded. Spectral range depends on spectrometer configuration and bifurcated fibre assembly. 96 well and 384 wells are available.



Titration Module

The titration accessory is based on a dual syringe Hamilton titrator (ML635) that is connected to the computer by RS232. The accessory comprise of two 1 ml syringes, connecting tubing, a flow cuvette and a light tight feed-through into the FLS920 sample chamber. Titration is controlled through the [F980 software](#). Kinetic measurements with manual or automated titration steps and automated multiple spectral scanning are possible.

Stopped-Flow Accessory

Rapid kinetic accessory for multi-mixing capabilities. Comprises sample handling unit, fitted with three 1 ml drive syringes, 600 mm long umbilical, pneumatic drive system and square mixing/observation cuvette with standard dimensions (10 mm). Includes slotted sample chamber lid to allow the cuvette to be fitted to the spectrometer. Manual control.

По вопросам продаж и поддержки обращайтесь:

Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Россия +7(495)268-04-70

Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Киргизия +996(312)-96-26-47

Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Казахстан +7(7172)727-132

Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93