

phoenix

Upgrade Packages for SLM
Model 4800/48000/8000/8100
Spectrofluorometers



Phoenix: The Upgrade Packages for SLM Model 4800/48000/8000/8100 Spectrofluorometers

The Phoenix Upgrade Packages are designed to modernize the instruments manufactured by SLM Instruments, using the state of the art ISS hardware and software for instrument control, data acquisition and data analysis. Two types of upgrades are available:

A: Upgrade to a steady-state instrument. The upgraded instrument will be capable of acquiring excitation and emission spectra, synchronous spectra, polarization (anisotropy) measurements, measurements of intensity at single points and measurements of kinetics using the *Vinci Multidimensional Fluorescence Spectroscopy Analysis* software for WindowsME/XP acquiring data in photon counting mode on two or three independent channels.

B: Upgrade to time-resolved fluorescence instrument. The upgraded instrument will be capable of multifrequency operations using the ISS proprietary Fast-Fourier-transform frequency-domain data acquisition technology. The instrument will be capable of multiple decay times resolution, the measurement of rotational correlation times and the determination of time-resolved spectra with picosecond resolution.

A variety of options are available for the SLM spectrofluorometer. For example, a computer-controlled sample compartment and a computer-controlled shutter can automate the data acquisition; additionally, a third photomultiplier tube can be added for simultaneous data acquisition on two emission channels. Finally, the SLM spectrofluorometer can utilize a variety of fluorescence accessories designed by ISS for the most unique fluorescence applications.

Upgrade to Steady-State Fluorescence Operations

When this upgrade package is implemented, the SLM data acquisition unit and the monochromator's controller are replaced by ISS electronics and the circuitry of each PMT housing is replaced by a modern-design voltage divider. The resulting instrument features 100 MHz pre-amplifier discriminators giving the instrument a high dynamic range in photon counting acquisition mode.



FIGURE 1

SLM spectrofluorometer equipped with ISS data acquisition and processing electronics, as well as ISS xenon arc lamp and power supply.

Data acquisition is performed with the *Vinci Multidimensional Fluorescence Spectroscopy* software and the PCMC data acquisition card using a personal computer. The table on the following page lists the components included in the Steady-State Upgrade Package. Also listed are some of the optional components that can be added to the SLM spectrofluorometer.

	UNIT	DESCRIPTION
Required Components	PX01	The signals from the photomultipliers are diverted into this unit, which includes the preamplifier discriminators. The unit outputs both a TTL signal which is directed into the PCMC card, and an analog signal which is directed to the A2D analog card.
	HB-16	The HB-16 is a stepper motor controller. It controls the movements of the SLM monochromators, polarizers, shutters and sample compartment.
	PCMC Data Acquisition Card (version 2)	The card is for data acquisition in photon counting mode of up to three (3) independent channels. Some of the card's features are: five 16-bit counters, one A/D converter, and I/O ports for automatic control of the instrument. The PCMC card allows the user to acquire fast kinetics in photon counting mode (in conjunction with a stopped-flow device).
	PMT Housings	The SLM housings are replaced with the ISS housings for PMTs that feature a voltage divider with a higher dynamic range.
	Computer	A Pentium-2 GHz Personal Computer, with 128 MB RAM, 20.0 GB EIDE hard drive, one 1.44 MB 3.5" floppy drive, one CD-ROM drive, and a high-resolution color VGA monitor.
	The Vinci Multidimensional Fluorescence Spectroscopy Analysis software for WindowsME/XP	Vinci controls the instrument's automation and its interface to computer-controlled external devices such as a titrator, a temperature bath, or a pressure pump. Vinci includes routines for the automatic acquisition of unidimensional data files (excitation and emission spectra; polarization and anisotropy spectra; synchronous luminescence spectra; slow and fast kinetics studies) and multidimensional data files (intensity and polarization versus excitation and emission wavelengths, time, temperature, lifetime). Raw data is stored in ASCII format along with the experimental parameters. The analysis portion of the software includes data manipulation (operations between spectra, smoothing, correction, derivative and integration). The graphical display allows for 2D and 3D plots as well color display of user defined functions with zooming and rotation capabilities, statistical operators, and plot export to popular formats (metafile, bitmap).
Optional Components	Replacement of xenon arc lamp and lamp power supply	The lamp and the power supply are replaced with ISS components.
	Computer-controlled two-cuvette sample compartment	Replaces the original SLM sample compartment.
	Computer-controlled three-cuvette sample compartment	Replaces the original SLM sample compartment.
	Accessories for Fluorescence applications	The accessories list includes: the High Pressure cell; the TIRF cell; vacuum chamber, Dewar.

TABLE I: Components of the Steady-State Upgrade Package.

Upgrade to Time-Resolved Fluorescence Operations

This Phoenix upgrade package includes the units required for the steady state portion and the units specific to the lifetime mode of operation. The SLM spectrofluorometer becomes a Multifrequency Phase and Modulation fluorometer equipped with Fast-Fourier-transform data acquisition, which enhances the instrument's sensitivity. Table II below lists the components included in the time-resolved upgrade package. The optional components that can be integrated into the SLM are also listed.

	UNIT	DESCRIPTION
Required Components	DCA2D200K Data Acquisition Card	The ISS-DCA2D200K acquisition card for Fast-Fourier-Transform acquisition of frequency domain data operating with computer selectable cross-correlation frequency up to 15 KHz and variable-bandwidth digital filter. It features two acquisition channels, with 16-bit A/D converters and on-board DSP. The package includes the electronics and acquisition software.
	Vinci and Global Analysis Software	The complete software package includes routines for the acquisition and determination of multiple fluorescence decay times; the acquisition and determination of rotational correlation times in isotropic, anisotropic and hindered rotators; the measurement of time resolved spectra with picosecond resolution.
Optional Components	Replacement of frequency synthesizers	The standard ISS frequency synthesizers, working in the range 9 KHz up to 1.2 GHz, replace the signal generators supplied with the instrument.
	Replacement of RF amplifiers	ISS RF amplifiers for the Pockels cell and the PMT replace the original RF amplifiers.
	Computer-controlled two-cuvette sample compartment	Replaces the original SLM sample compartment.
	Computer-controlled three-cuvette sample compartment	Replaces the original SLM sample compartment.

TABLE II: Components of the Time-Resolved Upgrade Package.



FIGURE 2

ISS Monochromators controller and data processing unit for the SLM spectrofluorometer. The unit provides both a digital output (photon counting) and an analog output (fast kinetics and lifetime determinations).

Optional Upgrades and Fluorescence Accessories for SLM Spectrofluorometers

The Optional Upgrades available for the SLM spectrofluorometers are user friendly and designed to boost the instrument's performance and sensitivity. The compact ISS xenon arc lamp increases the sensitivity of the instrument as it delivers a higher intensity than the original 450 W SLM lamp. Moreover, the linear power supply allows the user full control of the light intensity irradiating the sample.

The instrument can be automated for the acquisition of lifetime measurements with the addition of a computer-controlled sample compartment and shutter. The standard ISS modulation electronics widen the frequency response of the instrument that can be equipped with mode-locked lasers.

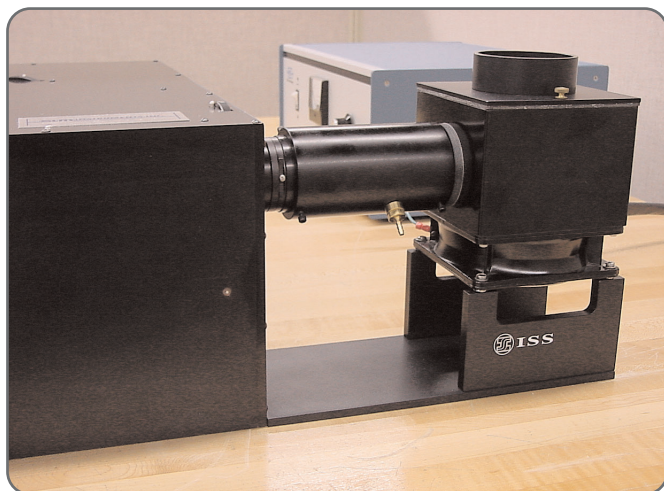
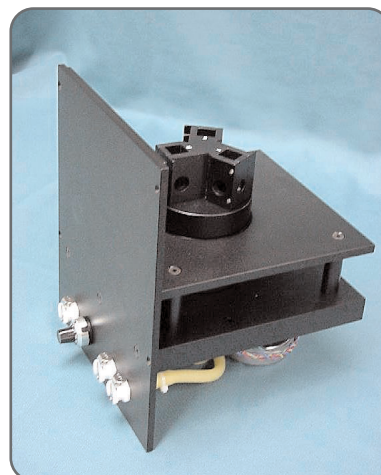


FIGURE 3

The ISS lamp and power supply replace the original components. The collimated beam of the ISS xenon arc lamp increases the sensitivity of the instrument.

FIGURE 4

The ISS three-cuvette sample compartment. The sample compartment can be utilized for any lifetime or steady-state measurement. The primary use for the three-position sample compartment is to perform an automated blank subtraction routine during lifetime measurements.



ISS provides a variety of accessories for fluorescence applications that are readily integrated in any SLM spectrofluorometer. A list of the accessories includes special sample holders, PMT housings, polarizers and fiber optics.

Sample Compartments and Sample Holders

- One-cuvette, Peltier-controlled, sample compartment.
- Two-cuvette, computer-controlled sample compartment with flow through system for temperature control.
- Three-cuvette, computer-controlled sample compartment with flow through system for temperature control.
- Four-cuvette, Peltier-controlled, sample compartment.
- Dewar flask for liquid nitrogen temperatures.
- Vacuum chamber.
- High pressure cell.
- Total Internal Reflection Fluorescence (TIRF) Flow Cell.
- Variable-angle, front surface sample holder for solid and high-turbidity samples.
- Variable-angle coverslip holder for the study of cells that adhere to the glass surface of a coverslip.

PMT Housings

- Housing for PMT, for steady-state, high-sensitivity photon counting detection and for frequency domain fluorometry applications. The housing includes the high voltage power supply with manual/automatic voltage control.
- Cooled housing for side-on PMT. Includes power supply, thermo-electric cooling unit with related electronics, circuit for external liquid circulation (requires a bath circulator).

Polarizers

- UV Glan-Thompson prism polarizers, 10x10 mm aperture.
- UV Glan-Taylor prism polarizers, 14x14 mm aperture.

Titration and Stopped-Flow Apparatus

- Computer controlled titrator.
- Stopped flow package for SLM spectrofluorometer (working with stopped-flow devices by Applied Photophysics, Hi-Tech, Molecular Kinetics and OLIS).

Fiber Optics

- Bifurcated fiber optic bundle, in quartz, 1.5 m long, with adapter for SLM, for in-situ fluorescence measurements.
- Chemically activated fiber tip and fiber optics, complete with XY control and dichroic mirror.

Specifications are subject to change without prior notice. October 2003