C193-E026D

SHIMADZU
Excellence in Science

Fluorescence Detectors for High Performance Liquid Chromatograph

RF-20A
RF-20Axs

Prominent Sensitivity…

The excellent basic performance of the Nexera™/Prominence™ series is further enhanced by the RF-20A/20Axs fluorescence detectors, which offer world-class sensitivity, excellent ease of maintenance, and validation support functions.
They support a wide range of applications from conventional analysis to ultra fast analysis.

RF-20A

Standard Model

The RF-20A offers the highest level of sensitivity in its class, achieving a water Raman S/N ratio of at least 1200.
In addition to excellent performance, it features easy maintenance from the front of the instrument and a long life lamp.

RF-20Axs

Achieves World-Class Sensitivity

The RF-20Axs has the highest level of sensitivity in its class, achieving a water Raman S/N ratio of at least 2000.
It incorporates a temperature-controlled cell with a cooling function to minimize variations in the fluorescence intensity due to fluctuations in room temperature, thereby achieving enhanced reproducibility.
It can also perform an automatic wavelength check using an internal low-pressure mercury lamp. Simply press a button to perform wavelength calibration.

Achieves World-Class Sensitivity

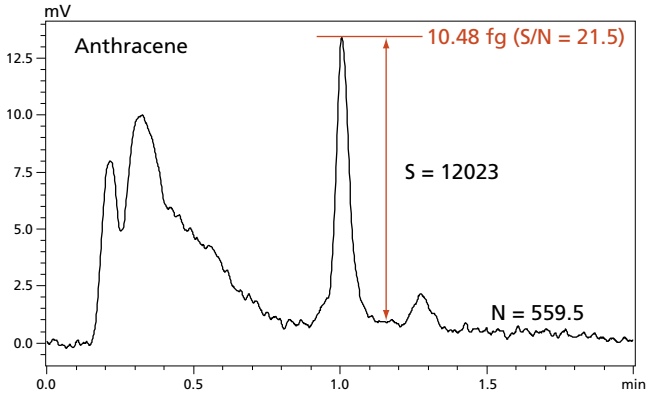
Thanks to a newly designed optical system, the RF-20A/20Axs offer world-leading levels of sensitivity. A water Raman S/N ratio of at least 2000 for the RF-20Axs and 1200 for the RF-20A makes these detectors powerful tools for analysis that demands the detection of trace-level components.

Ultra-High-Sensitivity Analysis of Anthracene (RF-20Axs)

An S/N ratio of 21.5 was achieved for an injection of 10.48 fg anthracene (RF-20Axs).
This is equivalent to approx. 1.5 fg limit of detection (S/N ratio = 3), which is excellent.

Analytical Conditions

Mobile phase	Water / acetonitrile = 30 / 70 (v/v)
Flow rate	0.6 mL/min
Column	Shim-pack™ XR-ODS (50 mmL. × 2.0 mm I.D., 2.2 µm)
Temperature	40 °C
Detection	250 nm excitation wavelength, 400 nm emission wavelength



High-Sensitivity Analysis of Anthracene

Cell Temperature Control Further Enhances Reproducibility (RF-20Axs)

The fluorescence intensity drops as the temperature rises.

A fluctuation of about 1°C near room temperature may result in approximately 5% intensity fluctuations for some compounds.

RF-20Axs features a temperature-controlled cell with a cooling function. It maintains a constant detector cell temperature, even if the room temperature fluctuates significantly, to ensure superb reproducibility with no drop in sensitivity.

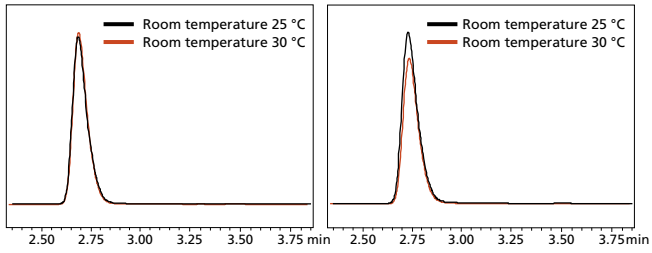
Effect of Temperature-Controlled Cell

Without temperature control, the peak area value dropped approximately 17 % due to the increase in cell temperature when the room temperature changed from 25 °C to 30 °C. Good accuracy could not be obtained, with reproducibility of 6.3 % RSD (n=6).

RF-20Axs incorporates a temperature-controlled cell to ensure excellent reproducibility with respect to such fluctuations in room temperature.

Analytical Conditions

Mobile phase	Water / acetonitrile = 20 / 80 (v/v)
Flow rate	1.0 mL/min
Column	Shim-pack VP-ODS (150 mmL. × 4.6 mmI.D., 5 µm)
Temperature	40°C
Detection	360 nm excitation wavelength, 450 nm emission wavelength
Sample	Acridine



Analysis of Acridine at 25 °C and 30 °C

	Rate of Change (%)	%RSD
RF-20Axs (With cell temperature control)	0.64	0.29
RF-20A (No cell temperature control)	−17.45	6.30

Rate of Change
Consecutive analyses are performed at 25 °C and 30 °C.
The rate of change shows the change in the peak area, taking the average peak area value at 25 °C as 1. It is used to confirm the effect of long-term fluctuations in room temperature due to the passage of the seasons.

%RSD
Consecutive analysis is performed while changing the room temperature from 25 to 30 °C, and the %RSD value is determined from the analysis data (n=6). It is used to confirm the effect of room-temperature fluctuations during the analysis.

Easy Maintenance for Ease of Use

RF-20A/20Axs offer excellent ease-of-use as well as superb performance.

Maintenance from Front Panel

The xenon lamp, dust-proof filter, and flow cell can all be replaced from the front of the instrument. No positional adjustment is required when replacing the Xenon lamp.

No tools are required to replace the flow cell. The standard flow cell or semimicro flow cell can be rapidly switched.

Long-Life Lamp Reduces Running Costs

The Xenon lamp life is extended to 2000 hours, four times longer than previous Shimadzu lamps. This significantly reduces running costs and down-time due to maintenance.

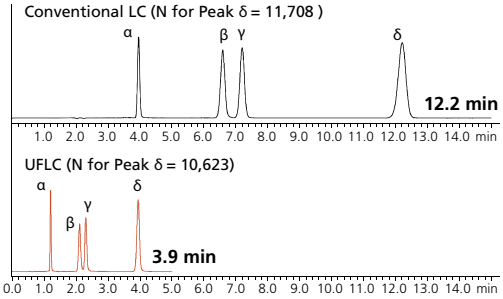
Support for Ultra Fast Analysis

Switch from Conventional LC to Ultra Fast LC

Fast response is required to follow the sharp peaks obtained in ultra fast LC analysis. The 10 ms response of the RF-20A/20Axs permits ultra fast LC analysis with no loss of separation. In this analysis example, the analysis time was reduced by a factor of more than three, while maintaining the separation.

Analytical Conditions

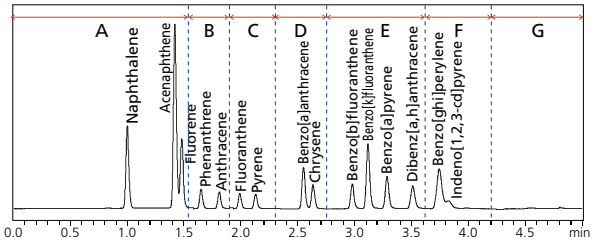
Mobile phase	Hexane / 2-propanol = 100 / 0.5 (v/v)
Flow rate	1.0 mL/min (Conventional), 0.8 mL/min (UFLC)
Column	Shim-pack CLC-SIL(M) (150 mmL. × 4.6 mmI.D., 5 µm: Conventional) Shim-pack XR-SIL (75 mmL. × 3 mmI.D., 2.2 µm: UFLC)
Temperature	30°C
Detection	298 nm excitation wavelength, 325 nm emission wavelength



Switching from Conventional LC to UFLC Analysis of α-, β-, γ-, δ-Tocopherols

Multi-Component, High-Sensitivity UFLC Analysis

The highly sensitive simultaneous analysis of multiple components requires detection at the optimal wavelengths. The RF-20A/20Axs permit ultra fast, high-sensitivity multi-component analysis using wavelength switching by time program.



Ultra Fast Simultaneous Analysis of 15 Polycyclic Aromatics

A	270 nm excitation wavelength, 330 nm emission wavelength
B	250 nm excitation wavelength, 370 nm emission wavelength
C	330 nm excitation wavelength, 430 nm emission wavelength
D	270 nm excitation wavelength, 390 nm emission wavelength
E	290 nm excitation wavelength, 430 nm emission wavelength
F	370 nm excitation wavelength, 460 nm emission wavelength
G	270 nm excitation wavelength, 330 nm emission wavelength

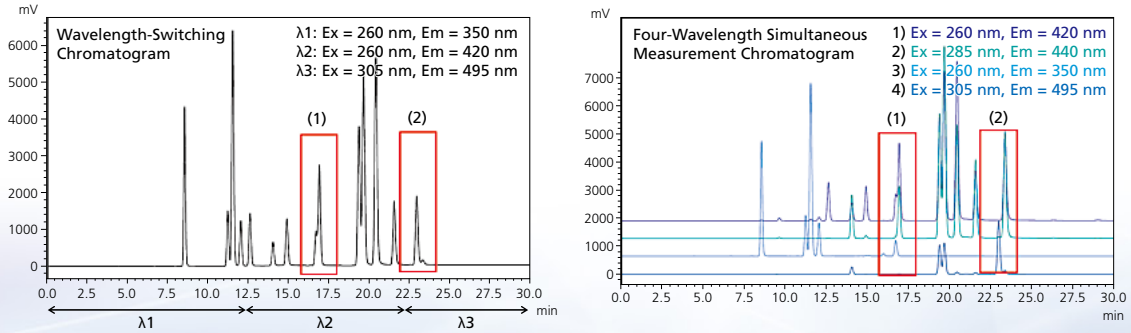
Support for Improved Quantitative Analysis Accuracy

Utility of Four-Wavelength Measurement Function

Using detection at a single wavelength when performing multicomponent simultaneous analysis of components with different optimal detection wavelengths necessitates sacrificing sensitivity for certain components.

The RF-20A/20Axs detectors eliminate this issue by incorporating a four-wavelength measurement function that permits detection of each component at the optimal wavelength.

Detection using wavelength switching in the left-hand diagram exhibits incomplete separation in area (1) and one peak of reduced size in area (2). In such a case, setting up to four optimal wavelengths enhances the quantitative analysis accuracy by reducing the effects of adjacent peaks and improving sensitivity.



Analysis of Polycyclic Aromatics by Four-Wavelength Simultaneous Measurement (Elution sequence shown in previous diagram)

Validation Functions Provide Powerful Support for Daily Analysis Tasks

RF-20A/20Axs offer comprehensive validation functions.
In addition to the VP functions familiar from the Prominence series, RF-20Axs features an automatic wavelength check to enhance the reliability of the analysis data.

Automatic Wavelength Checks Maintain the Optimal Detector Condition (RF-20Axs)

RF-20Axs incorporates an automatic wavelength accuracy check function using an internal low-pressure mercury lamp. It provides simple confirmation of the wavelength accuracy for validation.

Simple Wavelength Calibration (RF-20Axs)

If a wavelength displacement is discovered in the RF-20Axs during the system check, it can be easily corrected using the calibration menu. It is not necessary to provide a separate low-pressure mercury lamp each time the check is conducted.

Simple Output of System Check Reports

Simple operations from the workstation permit all tasks from conducting the system check to printing the report.

The system check automatically checks all items essential for instrument management, such as the lamp lit time and wavelength accuracy (RF-20Axs).

The system check results are automatically saved in the analysis data acquired by the detector to allow confirmation of the instrument status at the time the data was acquired and to further enhance the reliability of the analysis data.

Specifications

		RF-20A (228-45147-XX)	RF-20Axs (228-45148-XX)
Light source		Xenon lamp	Xenon lamp, low-pressure mercury lamp (to check wavelength accuracy)
Wavelength range		0, 200 to 650 nm	0, 200 to 750 nm
Spectral bandwidth		20 nm	
Wavelength accuracy		2 nm	
Wavelength reproducibility		0.2 nm	
S/N		Water Raman peak S/N 1200 min. With low background, S/N 9000 min.	Water Raman peak S/N 2000 min. With low background, S/N 12000 min.
Cell (capacity, pressure resistance, material)		12 µL; 2 MPa (approx. 20 kgf/cm^2); SUS316L, PTFE (fluororesin), quartz	
Cell temperature input range		—	4 to 40 °C, 1 °C step
Cell temperature control range		—	(Room temperature – 10 °C) to 40 °C (2 mL/minute max. flow rate, 85 °C max. oven temperature)
Simultaneous Monitoring of Wavelengths	Measured wavelength	Any two wavelengths between 200 and 650 nm (Four wavelengths can be set from LabSolutions.)	Any two wavelengths between 200 and 750 nm (Four wavelengths can be set from LabSolutions.)
	Sampling period	0.5 s per wavelength	
Operational ambient temperature range		4 to 35 °C	
Dimensions / weight		W260 × D420 × H210 mm, 16 kg	W260 × D420 × H210 mm, 18 kg

Options

Part Name	P/N	Remarks
Temperature-controlled flow cell for semimicro LC	228-51950-91	Cell capacity: 3 µL Supports temperature control (RF-20Axs only) Contact materials: SUS316L, PTFE, quartz
Flow cell for inert LC	228-51951-91	Plastic flow cell with non-metal liquid-contact parts Cell capacity: 12 µL Temperature control: not supported Contact materials: PEEK, PTFE, quartz
Photomultiplier R928-08	200-75021	Replacing the photomultiplier with this option extends the measurement wavelength range to 200 nm to 900 nm
Photomultiplier R3788	200-75031	For RF-20A (supplied as standard with RF-20Axs) Replacing the photomultiplier with this option extends the measurement wavelength range to 200 nm to 750 nm.

Application Systems Support Diverse Analyses

A range of application systems is available that combines the great expandability of the Nexera/Prominence series with the high-sensitivity RF-20A/20Axs. These systems offer high accuracy and reliable data acquisition.

Amino Acid Analysis System

This is an automatic amino acid analysis system that uses the post-column fluorescence derivatization method with *o*-phthalaldehyde (OPA)/*N*-acetylcysteine as reaction reagents. This system adopts Shimadzu's unique method using *N*-acetylcysteine (odorless solid) as a thiol-based reaction promoter. This is easier to handle than the conventional method using mercaptoethanol and enhances the sensitivity for imino acids, such as proline. Mobile phases and reaction reagents are available as kits to eliminate troublesome solution preparation.

Major component units	CBM-20A, LC-20AB, LC-20AD×2, FCV-11ALS, DGU-405, SIL-20AC, CTO-20AC, RF-20A, LabSolutions LC, etc.

Reducing Sugar Analysis System

This is an automatic reducing sugar analysis system that uses Shimadzu's unique post-column fluorescence derivatization method with arginine as the reaction reagent. It is a highly sensitive and selective method for analyzing reducing sugars in samples containing many impurity components.

Major component units	CBM-40, LC-40D×2, DGU-403, SIL-40C, CTO-40C, RF-20Axs, CRB-40, LabSolutions LC, etc.

Carbamate Pesticide Analysis System

This is an automatic *N*-methyl carbamate pesticide analysis system that uses the post-column fluorescence derivatization method with *o*-phthalaldehyde (OPA) as the reaction reagent.
It is an accurate method for analyzing *N*-methyl carbamate pesticides in foods and tap water.

Major component units	CBM-20A, LC-20AB, LC-20AD×2, DGU-405, SIL-20AC, CTO-20AC, CRB-6A, RF-20A, LabSolutions LC, etc.

Synthetic Antibacterial Agent / Mycotoxin Screening System

This system is capable of screening for synthetic antibacterial agents and mycotoxins in food having UV absorption and natural fluorescence. By mounting the RF-20Axs as an extension detector, the system can confirm with good sensitivity even components with severe criteria values. Method files provided with the screening kit simplify and shorten the work of determining the separation conditions and setting the measurement parameters.

Major component units	LC-2050C 3D, RF-20Axs, LabSolutions LC, etc.

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