Photonic Multichannel Spectral Analyzer Model: PMA-11

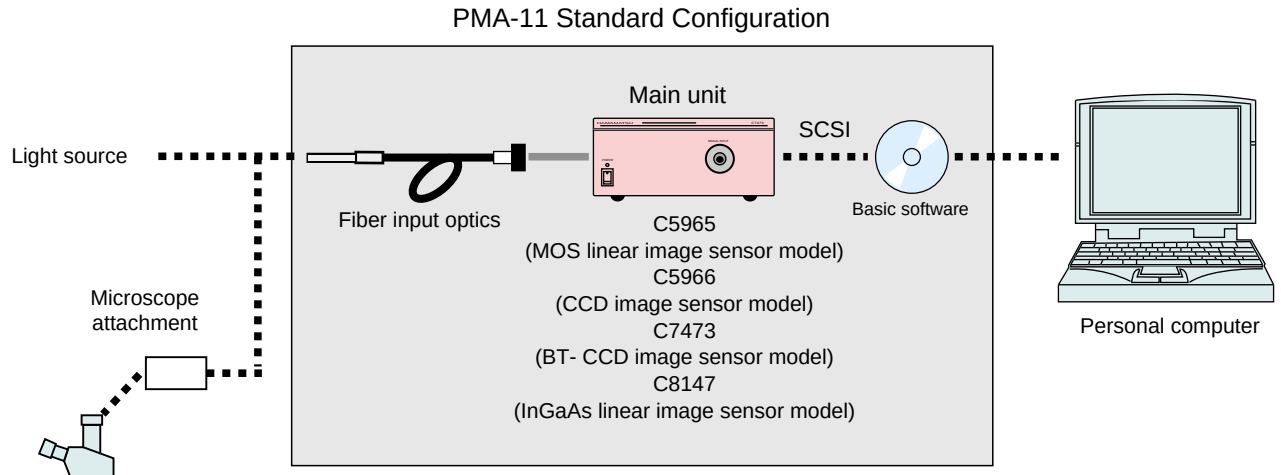
The PMA-11 is a spectral analyzer that integrates a spectrograph and high performance multi-channel photodetector in a single compact chassis. Light collection is simplified through the use of optical fiber. The diffraction grating of the spectrograph and multi-channel photodetector are rigidly fixed, resulting in excellent wavelength reproducibility. The wavelength axis and spectral response characteristics are calibrated at the factory, so that spectral measurements can be carried out easily and accurately.

The PMA-11 series offers four different multi-channel photo-detectors to choose from, for additional flexibility in grating selection, allowing the user to optimize the performance for the application at hand.

Equipped with a standard SCSI interface, the PMA-11 is easily connected to any type of computer for data collection and analysis.

- **Compact Integration of a Spectrograph and Multi-channel Photodetector**
- **High Sensitivity**
- **Easy Measurement Using Optical Fiber Input**

HAMAMATSU



[Standard Configuration]

Main unit	1
Fiber input optics	1
Basic software	1

* SCSI cable not included

A compact unit containing a multi-channel photo-detector,and power supply all in one. Optical fiber input makes spectral measurements easier than ever.

FEATURES

● Measurements of the spectrum are easier and more accurate than ever before

The spectrum can now be easily measured by light collection through an optical fiber. The wavelength axis and spectral response characteristics are calibrated at the factory, so that spectral measurements can be carried out easily and accurately.

● Superb cost perfomance model : C5965

The C5965 uses a MOS linear image sensor realises high performance and low cost.

● High sensitivity model : C5966

The C5699 uses the CCD leaner image sensor has sensitivity a hundred times better than the C5965 model.

● Ultra-high sensitivity model : C7473-36

The C7473-36 consists the thermoelectric-cooling type BT-CCD image sensors, which have a high quantum efficiency and a compact Czerny-Turner type spectrograph. The simultaneous measurement of the wavelength from an ultraviolet to a near-infrared region with high wavelength resolution and high sensitivity is realised.

● Near infrared model : C8147-34, C8147-38

The C8147 realises a simultaneous and high-resolution measurement of absorption or reflection spectra in a near infrared wavelength region with a wide dynamic range and a low noise.

● High efficiency optics

Adoption of a ø1mm bundle fiber and a bright spectrograph detects a measured light efficiently.

● Compact design

High performance is built in a small case. This completely new design ensures that the PMA-11 will fit anywhere.

● External synchronisation can be used

Measurements can now be carried out synchronised to external trigger signals, allowing measurement of pulse phenomena.

● Standard SCSI interface allows connection to computer

APPLICATIONS

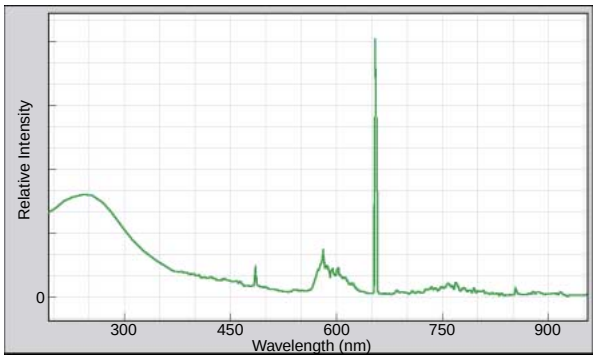
[Scientific applications]

- UV to visible spectroscopy
- Fluorescence spectroscopy
- Raman scattering
- Chemiluminescence analysis
- Liquid chromatography
- Gas chromatography
- ICP emission analysis
- Discharge emission analysis
- Combustion analysis
- Micro spectroscopy

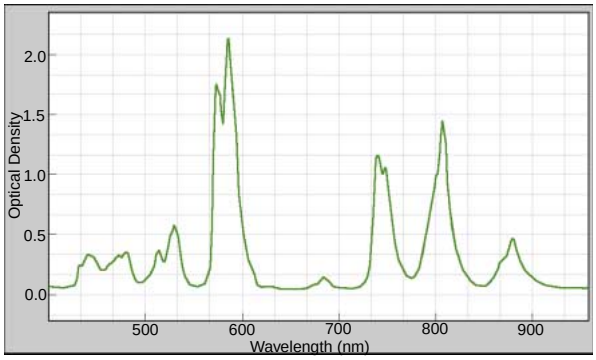
[Industrial applications]

- Water quality testing
- Evaluation of light sources
- Chromaticity measurements
- Impurities testing
- Thin film thickness monitors
- UV-ray monitors
- Plasma monitors
- Fruit tester
- Plastic sorting
- Color filter testing

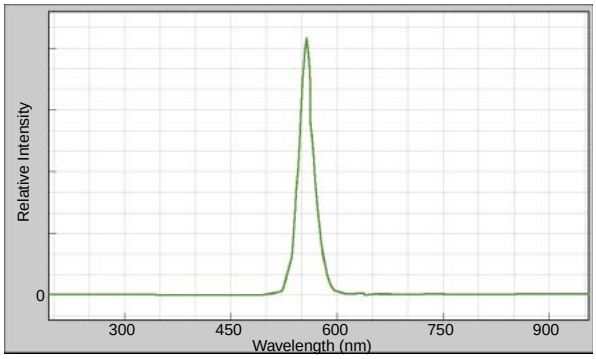
MEASUREMENT EXAMPLES



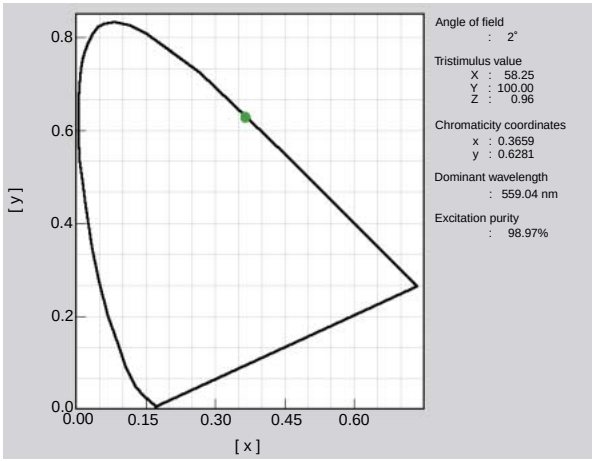
①Luminescence spectrum of a deuterium lamp



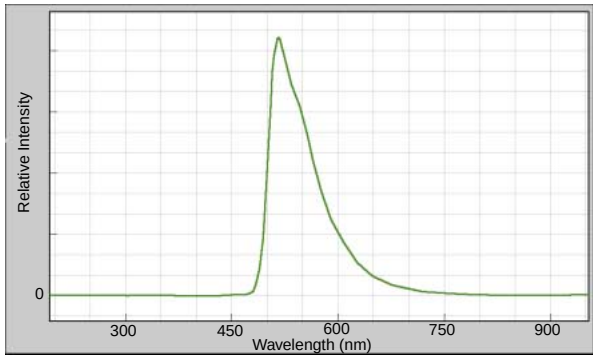
②Absorption spectrum of a didymium filter



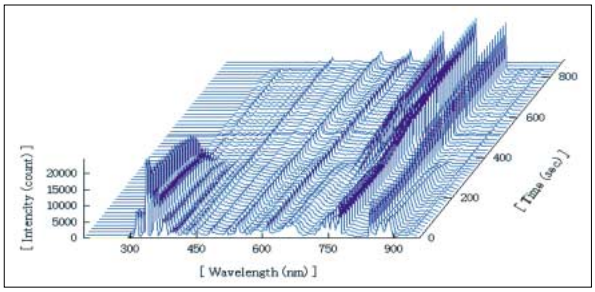
③Luminescence spectrum of an LED



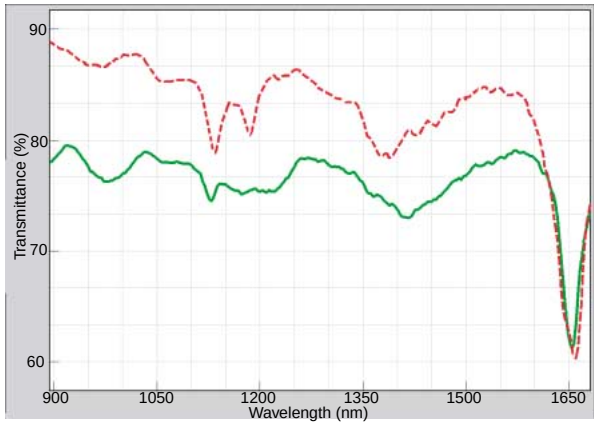
④Chromaticity coordinates of an LED



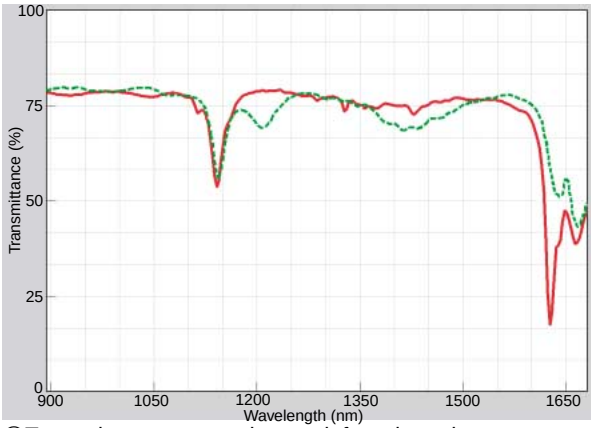
⑤Fluorescence spectrum of fluorosein



⑥3-d display of plasma emission spectra



⑦Transmittance spectra in near infrared reagion
Dotted line: Compact disc
Solid line: PET botle



⑧Transmittance spectra in near infrared reagion
Dotted line : Styren monomer
Solid line : Polystyren

SPECIFICATIONS

Main unit

Type No.	C5965-31	C5966-3x	C7473-36	C8147-34	C8147-38
Photodetector	MOS linear image sensor	CCD linear image sensor	BT- CCD linear image sensor	InGaAs linear image sensor	
No. of photosensitive device channels	1024 ch	1024 ch	1024 ch	256 ch	
Channel size	25 µm(H) × 2.5 mm (V)	24µm (H) × 3.07 mm(V)	24 µm(H) × 2.928 mm(V)	50 µm(H) × 250 µm (V)	
Cooling temepareture	non-cooling	0˚C	-15˚C	0˚C	-10˚C
Read-out noise	10 000 electrons	60 electrons	10 electrons	12,500 electrons	
Dark current	12,500 electrons/scan (at 25˚C; 20ms)	512 electrons/scan(at 0˚C; 20ms)	75 electrons/scan (at -15˚C; 20ms)	20,000 electrons/scan (at 0˚C; 5ms)	2.5×10^7 electrons/scan (at -10˚C; 5ms)
A/D resolution	16bit				
Spectrograph F number	3		4		
Spectrograph type	Concave spherical grating type		Czerny-Turner type		
Simultaneous measurement wavelength range	300 nm to 800nm	x=1 300 nm to 800 nm x=2 200 nm to 400 nm x=3 600 nm to 1000nm	200 nm to 950 nm	900 nm to 1650 nm	1600 nm to 2350 nm
Wavelength resolution *	< 3 nm(FWHM)	x=1 < 3 nm(FWHM) x=2 < 1.5 nm(FWHM) x=3 < 2.5 nm(FWHM)	< 2 nm(FWHM)	< 9 nm(FWHM)	< 9 nm(FWHM)
Effective Light-receiving area of optical fiber	ϕ 1mm				
Optical fiber length	1.5m				
Exposure time	20ms to 32s			5 ms to 32 s	5 ms to 50 ms (typ.)
External trigger input	TTL level / High impedance				
Interface	SCSI				
Line voltage	AC100V to 240V ±10%, 50, 60Hz				

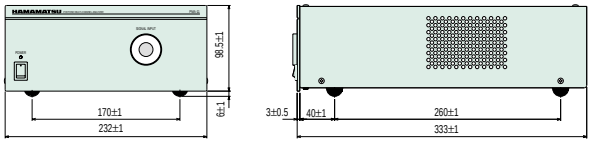
*Tested by the bright-line spectrum of Hg-Ar lamp (at 312.57nm, 435.84nm, 546.07nm, 696.54nm, 1013.98nm)

Basic software

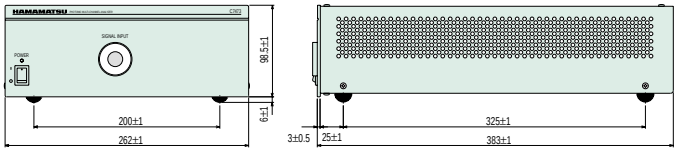
Measurement functions	• Spectral measurement • Reflection spectra measurement • Absorption spectra measurement • Color measurement
Temporal resolution measurement functions	• Temporal fluctuation of spectra over time • Temporal fluctuation of reflection factor and transmittance over time
Data acquisition condition setting	• Exposure time • Memory integration count times • Temporal fluctuation measurement
Calibration and correction	• Wavelength axis • Sensitivity uniformity • Dark current
Display functions	• Spectrum (non-limited accumulation) • Temporal fluctuation of waveform over time (non-limited accumulation) • Chromaticity diagram
Wavelength axis display	• Wavelength (nm) ,Wavenumber (cm^{-1}), Energy (eV)
Brightness axis display	• Linear, logarithm
Cursor analysis functions	• Wavelength (Wavenumber etc.) vs, intensity • Peak detection • FWHM between two cursors • Integrated intensity
Other analytical functions	• Smoothing • Differential waveform • Color measurement

DIMENSIONAL OUTLINES (Unit :mm)

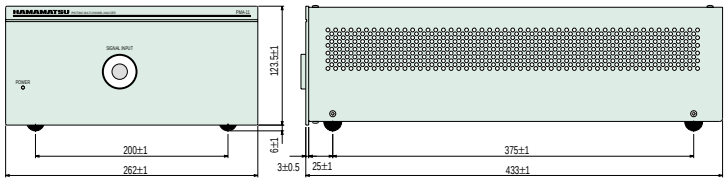
C5965. C5966 (approx. 4.5kg)



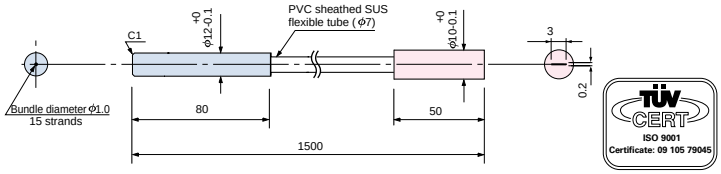
C7473 (approx. 5kg)



C8147 (approx. 7.5kg)



Fiber input optics (approx.100g)



HAMAMATSU

Homepage Address http://www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Systems Division
812 Joko-cho, Hamamatsu City, 431-3196, Japan, Telephone: (81)53-431-0124, Fax: (81)53-435-1574, E-mail:export@sys.hpk.co.jp

U.S.A. and Canada: Hamamatsu Photonic Systems: 360 Foothill Road, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1)908-231-1116, Fax: (1)908-231-0852, E-mail: usa@hamamatsu.com
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658, E-mail: info@hamamatsu.de
France: Hamamatsu Photonics France S.A.R.L.: 8, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10, E-mail: infos@hamamatsu.fr
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, U.K., Telephone: (44) 1707-294888, Fax: (44) 1707-325777, E-mail: info@hamamatsu.co.uk
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171-41 Solna, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01, E-mail: info@hamamatsu.se
Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Mois, 1/E 20020 Arese (Milano), Italy, Telephone: (39)02-935 81 733, Fax: (39)02-935 81 741, E-mail: info@hamamatsu.it

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