

NEWS RELEASE

Hamamatsu Photonics has developed a new spectrometer
with ultra-high dynamic range

January 24, 2023

Hamamatsu Photonics K. K.

Headquarters: 325-6, Sunayama-cho,
Naka-ku, Hamamatsu City, Japan

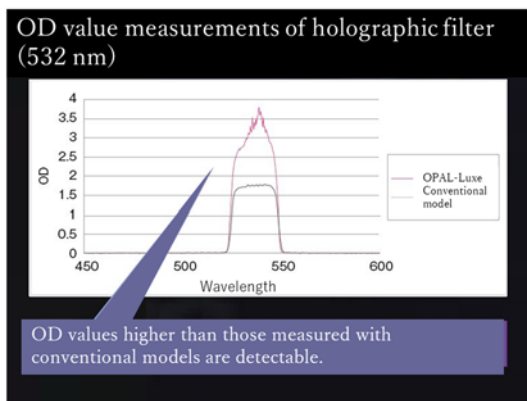
President and CEO: Tadashi Maruno

By leveraging our unique opto-semiconductor design technology and software technology, we have succeeded in developing a new spectrometer having an extremely high dynamic range ^(*1) of 2,500,000 to 1 in the spectral range from 200 nm to 900 nm that allows simultaneous measurement of both strong and weak signals. This high dynamic range spectrometer called “OPAL-Luxe C16736-01” is the top-end model among our spectrometer lineup.

Incorporating the OPAL-Luxe into component analyzers that utilize light absorption properties of substances in the ultraviolet to near-infrared region, it will allow simultaneous analysis of the various components within a sample. This includes components in large quantities absorbing large amounts of light and components in small quantities absorbing small amounts of light. This increases component analysis efficiency in the quality control of chemicals by detecting the trace amounts of impurities in substances without having to repeat measurements. The OPAL-Luxe will also help make further progress in plasma application research since it can analyze plasma emissions with high accuracy.

We will start accepting orders of the OPAL-Luxe from Wednesday, February 1, 2023, for analytical instrument manufacturers, universities, and research institutes. We will also have the OPAL-Luxe on exhibit at the “SPIE Photonics West 2023” which is an international conference on photonics and related technologies held in San Francisco, California, USA from Tuesday, January 31 to Thursday, February 2.

*1: Dynamic range is the range of identifiable light intensity and is expressed as the ratio of the maximum to the minimum intensity. The larger the ratio, the better the accuracy of high-intensity and low-intensity light measurements.



The graph shows the OD (Optical Density) values of a holographic filter, which is an optical component that indicates the degree of light absorption versus wavelength.

Data measured with our conventional model exhibits saturation of strong signals due to the measurement conditions adjusted for weak signals, making it difficult to obtain correct data. In contrast, the data measured with the OPAL-Luxe shows no saturation thanks to its high dynamic range, allowing accurate and simultaneous measurement of weak to strong signals.

Measurement results comparing the OPAL-Luxe with a conventional model

Product overview

The OPAL-Luxe is an ultra-high dynamic range spectrometer that integrates an opto-semiconductor with spectroscopic optics.

By measuring the amount of light absorbed in substances, we can make use of the innate properties of molecules thanks to their unique vibration and light absorption at specific wavelengths. The type and amount of components contained in a sample can therefore be analyzed by irradiating it and measuring the transmitted or reflected light.

Hamamatsu Photonics develops and produces multichannel spectrometers from the ultraviolet to the near-infrared region which are capable of making simultaneous measurements of wavelengths in that spectral range. However, the dynamic range of these multichannel spectrometers is limited, making it necessary to repeat measurements. For example, when analyzing the components of a sample containing components that differ greatly from each other in light absorption, the measurement conditions must be adjusted to perform two or more measurements. Also, in plasma emissions where strong and weak signals are simultaneously present, the strong signal must be cut or blocked with a filter in order to allow analyzing the weak signal with high accuracy. To deal with these challenges, we have been working to develop a higher dynamic range spectrometer to streamline the measurement process.

We have now achieved an extremely high dynamic range by applying our unique design and software technology to re-engineer the structure and operation of the opto-semiconductor. This led to the successful development of the OPAL-Luxe spectrometer. What's more, our unique optical design technology has enabled us to improve the optical system built into the OPAL-Luxe to achieve both high sensitivity and high spectral resolution, which have a mutual trade-off relationship. This improved optical system also suppresses the generation of stray light ^(*2) to give better measurement accuracy.

We will be expanding sales of OPAL-Luxe from here on and exploring new applications.

*2: Stray light is unwanted light other than the signal light used for measurement. Stray light can cause problems including measurement errors.

Main features of OPAL-Luxe

1. Ultra-high dynamic range of 2,500,000 to 1

Improving the opto-semiconductor structure has increased the dynamic range up to 2,500,000 to 1 in the spectral range from 200 nm to 900 nm, which is about 100 times higher than our conventional spectrometers. This makes it possible to measure signals that were impossible to identify up until now.

2. High sensitivity, high spectral resolution and low stray light for improved measurement accuracy

Redesigning the optical system built into the OPAL-Luxe enhances its spectral resolution without compromising sensitivity. At the same time, suppressing the generation of stray light achieves high measurement accuracy.

●Main specifications

Parameter		Unit
Product number	C16736-01	-
Spectral wavelength range	200 to 900	nm
Spectral resolution	0.85	nm
Spectral wavelength accuracy	±0.1	nm
Dynamic range	2,500,000 to 1	-
Repetition frequency	100	Hz



OPAL-Luxe High dynamic range spectrometer C16736-01