NEWS RELEASE

Hamamatsu Photonics now offers a bold new terahertz spectrometer with a separate handheld probe head that can measure even large samples, solids, and living organisms.
Product sales start on October 1, 2021.

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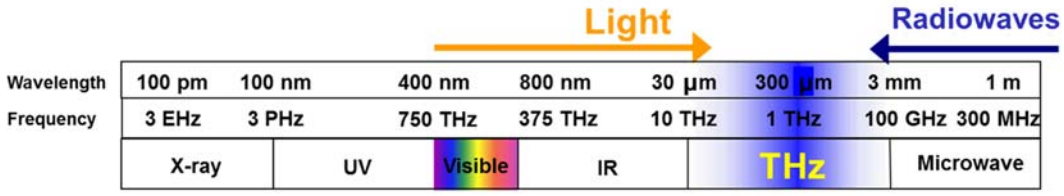
Hamamatsu Photonics has completely reengineered the optical design of prior products to develop the Handy Probe Terahertz Spectrometer C16356 that harnesses terahertz wave spectroscopy*. The C16356 has a separate handheld probe head that connects to the main unit by an optical fiber to allow measurements of large samples, soft solids, living organisms and other items that could not be measured up until now. Compared to conventional benchtop products, the C16356 is more compact, lightweight and highly vibration-resistant so can easily be carried around into production sites for medicines, chemicals and foods, making it a promising and versatile tool for quality control of those products.

Sales of this Handy Probe Terahertz Spectrometer C16356 start on October 1, 2021 for pharmaceutical companies and chemical and food manufacturers both in Japan and overseas.

* Terahertz wave spectroscopy: Terahertz waves are electromagnetic waves around a wavelength of 300 micrometers which corresponds to a frequency of 1 THz. Terahertz waves have intermediate properties between straight-travelling light and radio waves that can pass through and around objects. Terahertz wave spectroscopy can yield information on each wavelength in the terahertz range absorbed by samples, which helps identify their crystallization, moisture content and other features.



THz (terahertz) wave band

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Product overview

The C16356 is an attenuated total reflection (ATR) terahertz spectrometer that allows separation of the probe head from the main unit, which until now has never been possible.

Terahertz wave spectroscopy mostly applies a light transmission method that utilizes terahertz waves transmitting through samples. However, this method has limitations such as difficulty in measuring liquids because terahertz waves are easily absorbed by water. In addition, this method also requires a step to prepare special pellets when measuring powders. To deal with these issues, we succeeded in creating a benchtop terahertz spectrometer using ATR spectroscopy compatible with liquid and powder measurements. These units have mainly been sold to universities and research institutes.

Now based on our unique optical design technology and terahertz wave technology fostered in-house over many years, we reviewed the optical design of our previous products from scratch and shifted terahertz wave measurement from the traditional electrical method to an optical method. We also redesigned the spectrometer's optical system made up of optical fibers and optical communication devices. These efforts made the measurement unit (probe head) much more compact and connectable to the main unit by an optical fiber. In previous products, the samples had to be set within a measurement chamber inside the spectrometer. The C16356, however, has a handheld probe head that can be flexibly moved to match the sample size and position, which drastically improves measurement freedom! By also reducing the number of optical components and electrical wiring and by optimizing the housing design, we downsized the main unit making it around 60% the cubic size and 40% the weight of the previous products. What's more, the C16356 is designed with enhanced ruggedness against vibration that makes it easy and safe to take to various kinds of locations in a carry case.

The Handy Probe Terahertz Spectrometer C16356 can also measure large samples, soft solids and living organisms that traditionally could not be measured.

We will be continuously expanding sales and applications of the C16356 to meet new needs.

(Left) Measurement using previous product (Right) Handy probe head of C16356

Major features

1. World's first ATR terahertz spectrometer with a separate probe head measurement unit!

In previous spectrometer products, the samples had to be set in the measurement chamber inside the spectrometer. The C16356, however, has a separate handheld probe head which connects to the main unit by an optical fiber. This allows flexibly moving the probe head according to the sample, making it possible to measure large samples that cannot fit in the measurement chamber as well as soft solids and living organisms that are difficult to place in tight contact with the measurement surface.

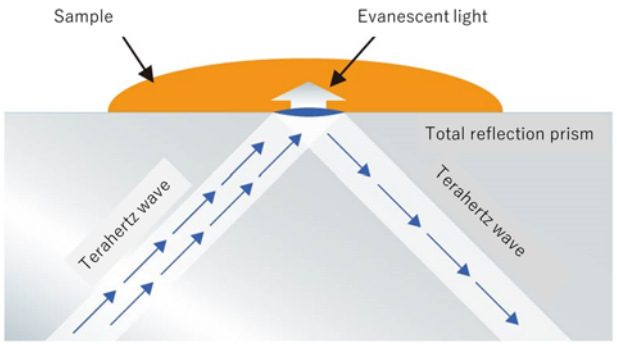
2. Compact, lightweight and highly resistant to vibration

By reducing the number of optical components and electrical wiring and by also optimizing the housing design, the main unit was downsized 0.055 cubic meters in volume and 20 kg in weight making it around 60% the cubic size and 40% the weight of the previous products. What's more, the C16356 comes with a rugged optical system having high vibration resistance, making it easy to carry around production sites for pharmaceutical, chemical, food, etc.

Development background

Intensive R&D into terahertz waves is underway around the world in a widely diverse array of fields such as telecommunications, industry, and academic research. Among these, terahertz waves are drawing special attention in the field of spectroscopy because terahertz wave spectroscopy is capable of obtaining information on the crystallization and moisture content of samples. This is very useful information different from that obtained by widely used UV-visible and infrared spectroscopy. As a result, these features have spurred the rapid development of practical terahertz spectrometers.

We also have been doing both basic and applied research on terahertz waves to develop and manufacture spectrometers and terahertz waveplates. Currently, we manufacture and sell benchtop terahertz spectrometers using ATR spectroscopy. However, there are challenging issues such as limitations on the size and state of the samples and also the need to bring the samples to the lab. To deal with these issues we have been developing more user-friendly terahertz spectrometers.



When terahertz waves are totally reflected inside a prism, the small amount of light exuding from the prism is known as evanescent light. The crystallization and moisture content of a sample placed on the prism surface can be measured by detecting the reflected terahertz waves attenuated by the interaction between the evanescent light and the sample.

Principle of ATR spectroscopy

● Main specifications

Item	C16356	Unit
Bandwidth	1.5 to 4.0	THz
Measurement time (Fastest time)	5	seconds
Measurement objects	Liquids, powders, living organisms, soft solids	-
Control unit (supplied)	PC (Windows 10)	-
Communication method	Ethernet (TCP/IP)	-
Dimensions (W×D×H) (Main unit only)	Approx. 512 × 426 × 250	mm

Handy Probe Terahertz Spectrometer C16356