

# TPS Spectra 3000 Accessories



Terahertz (THz) spectrometer with modular sample compartment for transmission and ATR analysis

## Product Description

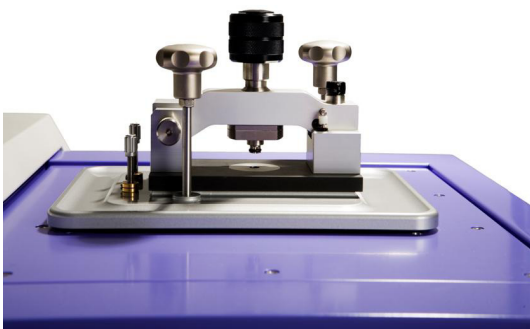
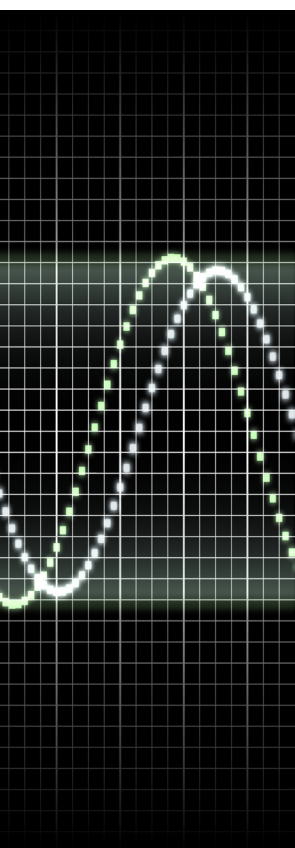
The TPS Spectra 3000 is a natural development of the world's first commercially available terahertz spectrometer capable of performing both transmission and attenuated total reflection (ATR) measurements.

Utilising TeraView's proprietary semiconductor based, terahertz pulsed technology, TPS Spectra 3000 yields superior analytical performance, while operating under ambient conditions.

Modular in design, the TPS Spectra 3000 pulsed terahertz spectrometer is designed to accept a wide range of accessories to suit many different applications. Modules fit inside the purged sample compartment. The TPS Spectra 3000 automatically recognises the module in position and selects the required operating parameters.

TeraView's TPS Spectra 3000 is capable of performing:

- | Transmission spectroscopy
- | Reflectance spectroscopy (ATR and Specular)
- | Transmission mapping
- | Stand-off transmission and reflectance spectroscopy
- | Terahertz reflectance imaging



## Attenuated Total Reflection Accessory

This is the first commercially available ATR optimised for use at terahertz frequencies. The module is available either with a 35° or 45° incidence angle. Small amounts of sample are placed on the ATR crystal and measured directly with no sample preparation. Solids, powders and gels can all be measured in this way.

Liquid samples require a sample cell. The lack of sample preparation means pressure sensitive samples can be measured without risk of pressure induced polymorphic change or other sample damage.

TeraView



### Transmission Sample Holder

The holder accepts a standard FTIR transmission sample cell. Powder samples are mixed with Polyethylene powder and compressed into pellets and mounted in the sample cell for measurement. A Pike Liquid Sample Cell is also available.

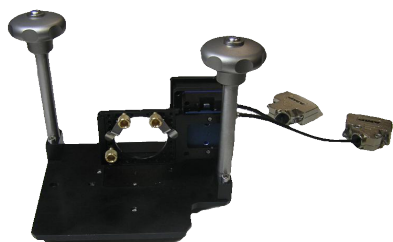
### Specular Reflectance Accessory

Although broadly similar in design to the ATR, this accessory allows reflectance spectra to be collected from the sample surface at specific angles of incidence and reflection (45 degrees). This module operates at room temperature and is ideal for samples such as crystals, semiconductors and polymers.



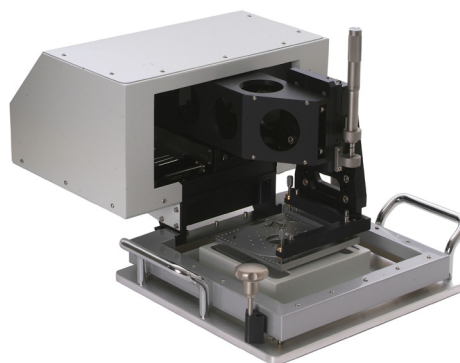
### X-Y Transmission Mapping Stage

With this module, the TPS Spectra 3000 can perform X-Y transmission mapping. The motor driven module allows transmission spectra to be collected at different points on the sample. Spectral variations across the sample can be identified and by using TeraView's TPI imaging software, images of pulse intensity variation or spectral mapping can be preformed. The maximum scan area is 19mm x 19mm with a point spacing of between 50 and 500 microns. Spectral averaging is also possible.



### Reflectance Imaging Module

This accessory converts the TPS Spectra 3000 in to a flat-bed imaging system. Samples as large as 100mm x 100mm can be placed in the unit and raster scanned using a software controlled motorized scanning table. Areas up to 80mm x 80mm can be scanned with a user-selected distance between measurement points and up to 3mm penetration depth. Using the TeraView supplied Image and Data analysis software, thickness maps and cross sectional images can be generated from the data collected and physical features such as buried cracks, defects and air pockets can be non-destructively detected.





### Variable temperature (heated) Sample Holder

The Variable Temperature Cell is suitable for transmission measurements on liquid or solid samples. Temperatures can be set between ambient and 250°C. The accessory comprises of an electrically heated cell jacket, electronic controller, THz transparent cell inserts and a modified sample compartment cover for the TPS Spectra 3000 to maintain sample compartment purge.

### Variable Temperature (cooled) Sample Holder

The cell consists of a vacuum jacket with a refrigerant dewar/cell holder assembly and Z-cut quartz windows. Sample cells are inserted into the heating block part of the dewar/cell holder and the whole system is operated within a vacuum environment maintained by the outer jacket. Using a combination of refrigerant and cell block heaters any temperature from -190°C to 250°C can be achieved. Typically liquid nitrogen is used as the coolant .



### Cryostat Accessory

A Cryostat specifically designed for material physics and condensed matter investigations can be supplied with the TPS Spectra 3000. It enables THz spectroscopy to be performed on super/semi-conducting materials and many other sample types within a range of temperatures from 2.3K to 300K. In addition to the Transmission accessory, a Reflectance option is also available. This module has a height adjustment collar that allows the THz radiation to reflect onto the bottom port of the cryostat. A He re-circulating Cryostat is also available.

### Gantry

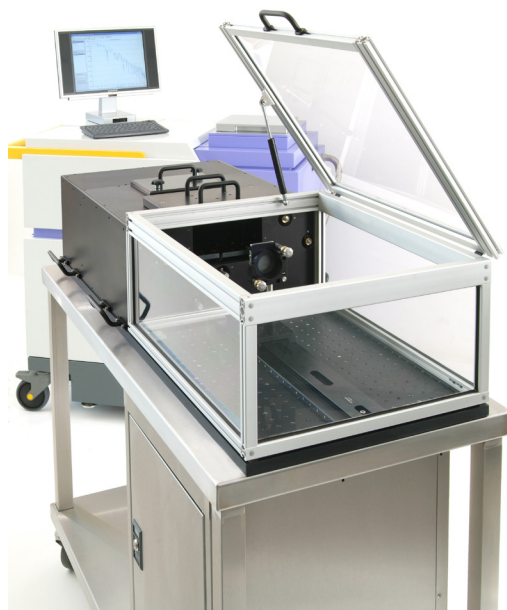
All of our instruments can be sold with the addition of suitable supports, such as a gantry in order to perform spectroscopy and imaging on a range of objects and materials over areas of over 1 metre by 1 metre. Our emitters and detectors are configured onto a suitable controlled gantry which is controlled by the integrated software. The gantry systems are ideally suited for non-destructive inspection and evaluation measurements as they can be used in reflection or transmission modes. They allow material characterisation and precision analysis with thickness and density mapping.



## Stand-Off Reflectance/Transmission Module

This module allows both transmission and reflectance (diffuse, non-specular) spectroscopy measurements to be made on larger samples at stand-off distances. THz spectra can be measured in the range of 0.3 to 3 THz, where the distance between source and sample can be varied between 0.3 and 0.5 meters. Collection angles can also be adjusted with a spectral resolution of  $1\text{ cm}^{-1}$  across the spectral range. The module is also purged (N<sub>2</sub> or Dry Air) to remove water vapour features from the sample spectrum.

A fibre-optic umbilical, feeds laser pulses from the core unit to the devices mounted in the module. The optical configuration can be changed between transmission and non-specular reflectance in just a few minutes. "Plug-in" components are supplied that make the change easy to perform.



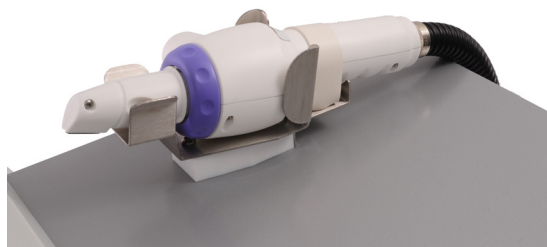
## External Fibre-fed Devices

Similar in principle to the Stand-Off Module, it is possible to provide the capability of fibre launched external THz devices to be used on an optical bench. The TPS Spectra 3000 is modified in certain key areas which allows external devices to be mounted in line for transmission measurements or at user defined angles for reflectance measurements. For normal use, the operator would mount head assemblies as required, replace/fit terahertz lens optics to match device separation, adjust delay line with TPS Spectra 3000 software to peak signal and then measure spectra.



## Medical Imaging Probe

This THz medical probe provides three-dimensional information revealing structures beneath the surface with spatial resolution precision of  $20\text{ }\mu\text{m}$  axial resolution of  $40\text{ }\mu\text{m}$ . Capable of imaging a wide range of tissue, the research unit is designed to allow developments to move seamlessly through in-vitro, *ex vivo* and into *in vivo* studies. It has been used in the detection of cancer, providing contrast between healthy and cancerous areas tissue.



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