ADVANTEST

Terahertz Spectroscopic/ Imaging Analysis Systems

Sales of this product have ended.

TAS7500 Series

Non-Destructive Analysis of Pharmaceuticals, Chemicals, Communication Materials, etc.

ADVANTEST

Compact, High-Speed Terahertz Spectroscopic/ Imaging Analysis Systems

The TAS7500 series of high-speed, multifunctional analysis systems that perform spectroscopy and imaging by utilizing terahertz (THz) waves. Featuring easy operation and high-speed analysis, the systems enable non-destructive analysis of chemical samples, industrial products, materials for advanced communications and other substances, without complicated operation, as required by older terahertz analysis equipment. Utilizing Advantest's high-performance sampling detection technology, the TAS7500 series is ideally suited not only for routine analysis, but also for use in R&D projects thus extending the practical use of terahertz technology.

Key Features

- High-speed measurement functionality
- Compact, desktop form factor
- One-touch terahertz spectroscopic analysis in a range of instruments covering frequencies from 0.03—7 THz
- Multiple spectroscopic analysis modes—transmission, reflectance, ATR (Attenuated Total Reflection), and polarization—enable the analysis of a wide variety of materials
- Imaging and analysis of internal sample structures, thickness, and density
- External dry air purge unit eliminates atmospheric moisture interferences

The systems in the TAS7500 series cover a diverse range of applications.

Wide-Band Coverage Terahertz Spectroscopic System

TAS7500SU

Wide-band spectroscopic analysis functionality covering the widest frequency range in the industry up to 7 THz

Terahertz Spectroscopic System

TAS7500SP

Supports spectroscopic analysis of chemicals, materials, pharmaceuticals, etc.

Low-Frequency Coverage Terahertz Spectroscopic System

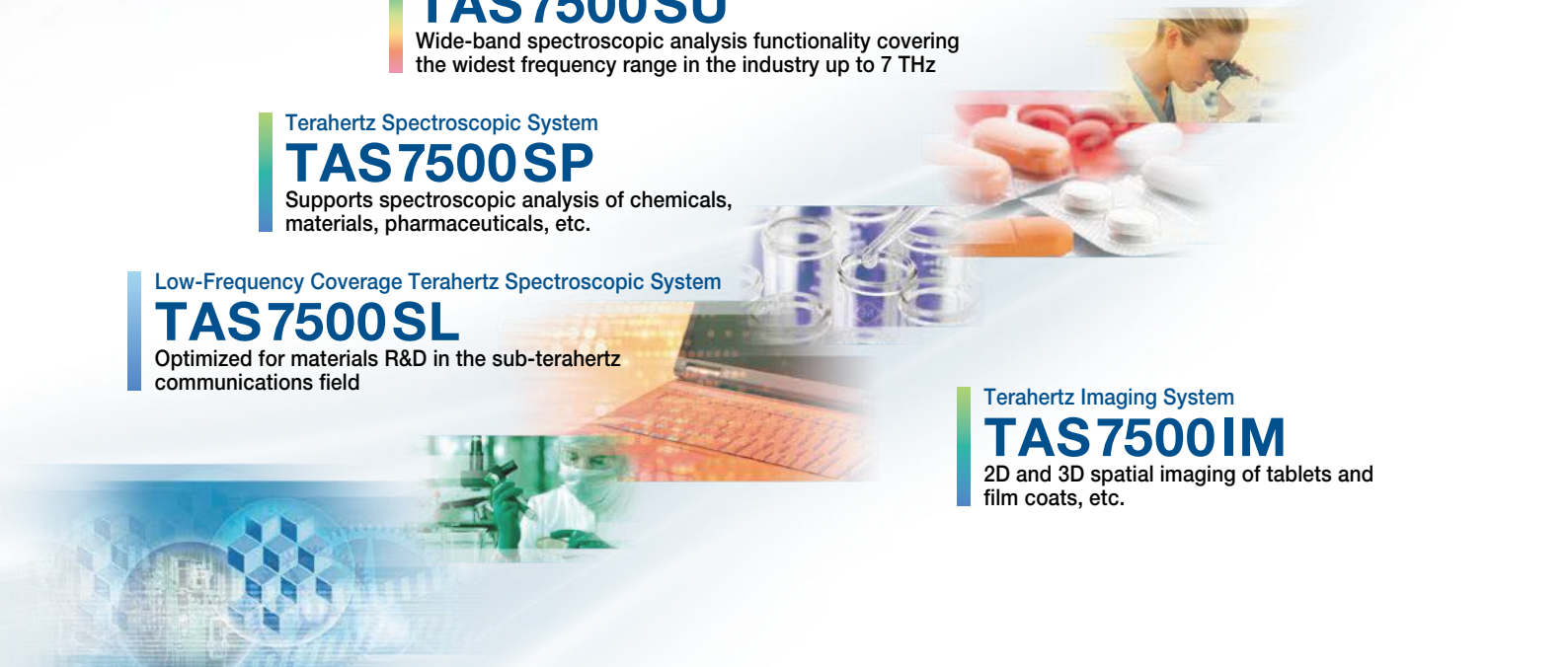
TAS7500SL

Optimized for materials R&D in the sub-terahertz communications field

Terahertz Imaging System

TAS7500IM

2D and 3D spatial imaging of tablets and film coats, etc.



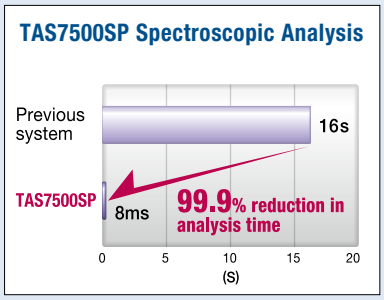
Spectroscopic Analysis

Why the TAS7500 Series Delivers Superior Performance

Best-In-Class Throughput

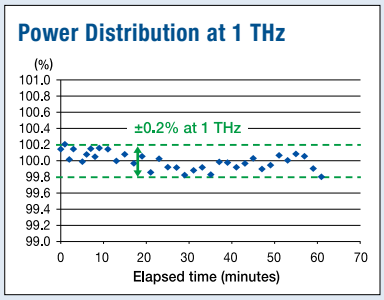
Advantest's proprietary sampling technique—an electronically controlled sweep method—delivers higher throughput than any previous system.

Patent Pending



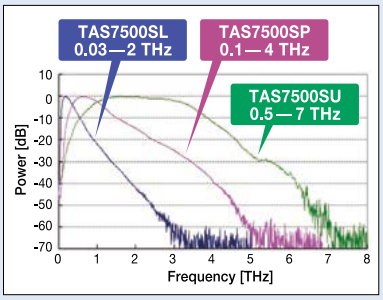
Highly Stable Terahertz Wave Measurement

Advantest's independently developed optical fiber laser technology enables spectral power stability to within ±0.2%.



Specialized Systems for Specific Bandwidth Needs

In addition to the TAS7500SP, two specialized spectroscopic analysis systems—the TAS7500SL and the TAS7500SU—expand the bandwidth coverage of the TAS7500 series to serve a broad array of applications.



Terahertz Spectroscopic System

Target Materials	Dielectric material, reagents and chemical materials	Pharmaceutical tablets, pharmaceutical products (powder, liquid), dielectric material, other reagents and chemical materials	
Frequency range	0.03—2 THz	0.1—4 THz	0.5—7 THz
Accessories	Transmission/reflectance	Transmission/reflectance/ATR/ transmission polarization analysis	Transmission/reflectance/ATR
	TAS7500SL	TAS7500SP	TAS7500SU

TAS7500 Series Accessory Lineup

Transmission Accessory

Measurement of samples for maximum sensitivity

Can be used with: SL SP SU

▲Sample stage for the transmission accessory (dry air unit attached)

Reflectance Accessory

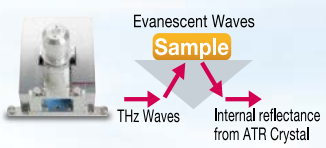
For density measurement and analysis of samples with internal layers

Can be used with: SL SP SU

ATR Accessory

For measurement of samples with high absorbance, powders

Can be used with: SP SU



Transmission Polarization Analysis Accessory

For measurement of polarization characteristics

Can be used with: SP

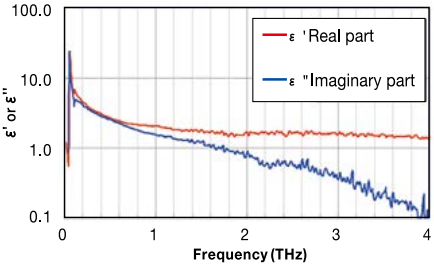
Terahertz Spectroscopic System TAS7500SP

Four easily interchangeable measurement accessories facilitate spectroscopic analysis of a wide range of materials.

TAS7500SP

- Spectroscopic analysis methodology tailored to liquids, powders, and solids
- Industry-best scan time of 8 milliseconds

Measurement of complex dielectric permittivity of a liquid (acetone), using the transmission module



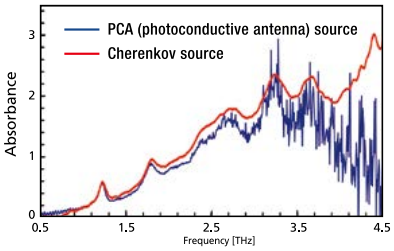
Wide-Band Terahertz Analysis System TAS7500SU

Advantest's newly developed Cherenkov terahertz source enables broad-band terahertz spectroscopy at frequencies up to 7 THz.

TAS7500SU

- Supports spectroscopic analysis at frequencies up to 7 THz, greatly improving high-frequency performance
- Industry-best scan time of 8 milliseconds
- Delivers improved 30 dB SN at 4 THz
- Excellent spectral flatness means highly reliable terahertz spectroscopy

Pharmaceutical analysis (example)



Sample: carbamazepine, crystalline form III

Low-Frequency Terahertz Analysis System TAS7500SL

Specialized for the sub-terahertz band, optimized for R&D in the area of materials for communication components, and for spectroscopic analysis at lower bandwidths.

TAS7500SL

- 0.03 – 2 THz bandwidth coverage is optimal for millimeter/sub-millimeter spectroscopic analysis
- Industry-best scan time of 8 milliseconds
- Two easily interchangeable accessories (transmission and reflectance) enable diverse spectroscopic analysis applications

TAS7500 Series Basic Configuration

Dry air unit | Measurement unit | Analysis unit | PC (Controller + analyze)

Terahertz Imaging System TAS7500IM

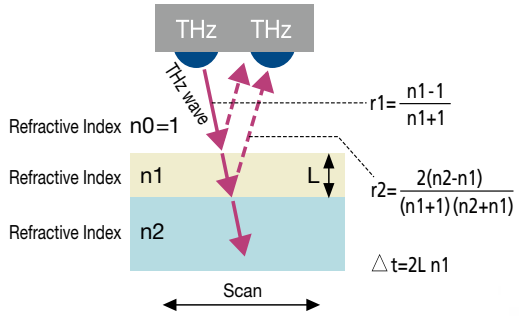
2D/3D imaging of layer thickness distributions and cross-sections, etc.

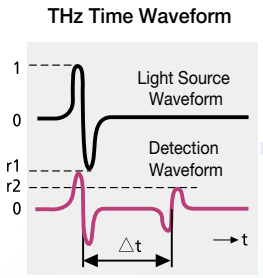
- Analyzes thickness/density of layers
- Non-destructive analysis of sample internal interfaces
- Autosampler enables measurement of up to 10 samples

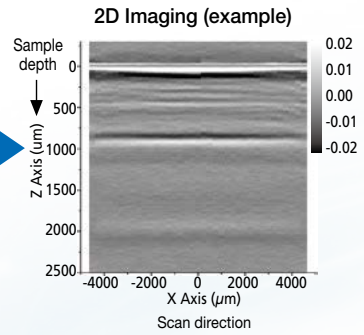
TAS7500IM

Terahertz time-of-flight tomography

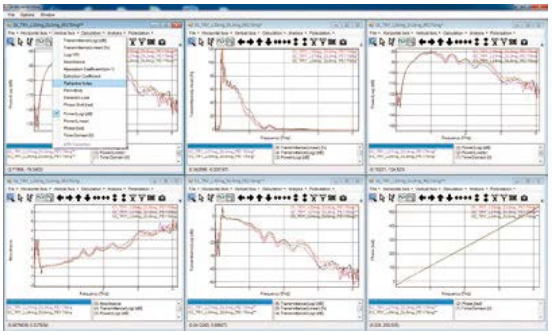
Reflectance of THz pulses from samples allows non-destructive analysis of layer thicknesses and density via detection of delay times and amplitude.







Sample Analysis Results



Spectroscopic analysis

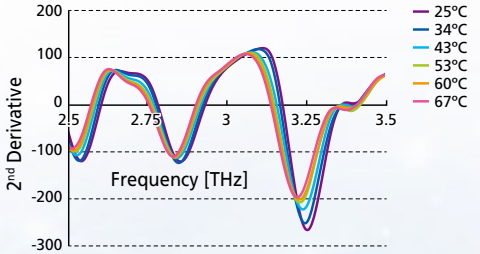
Imaging analysis

Thermal Control Accessory (Option for Transmission Accessory)

- By adding this accessory to the transmission accessory, the thermal dependence of a specimen's absorbance spectra can easily be measured.
- This accessory is available in two temperature-control ranges for differing measurement needs: -10 ～ +80℃ (TAS1020) and room temperature ～ +300℃ (TAS1030)
- Dry air purge function prevents condensation at low temperatures.
- Superior time-response feature enables highly responsive thermal load measurement.

Example of usage

Users can monitor the changes caused by heating in peak frequency and phase changes in crystalline structure. (TAS1020 used in this example)



Thermal dependence of lactose hydrate absorbance spectra (2nd derivative)

Key Specifications

		TAS7500IM Terahertz Imaging System	TAS7500SL Terahertz Spectroscopic System Low-Frequency Coverage	TAS7500SP Terahertz Spectroscopic System	TAS7500SU Terahertz Spectroscopic System Wide-Band Coverage
Primary measurement applications (*1)		Tablet imaging and analysis	Spectroscopy (transmission/reflectance modes)*1	Spectroscopy (transmission/reflectance/ATR/ transmission polarization analysis modes)*1	Spectroscopy (transmission/reflectance/ATR modes)*1
Analytical object		Pharmaceutical tablets	Dielectric material, other reagents and chemical materials	Dielectric material, pharmaceutical tablets, pharmaceutical products (powder, liquid), other reagents and chemical materials	Pharmaceutical tablets, pharmaceutical products (powder, liquid), other reagents and chemical materials
Specimen dimensions		Imaging and analysis mode: Round tablet, Oval tablet, Oblong tablet Diameter: 5 to 20 mm or less, Thickness: 2.5 to 8.5 mm or less, Weight: 2 g or less (only in case of no engraved marks or score lines *2)	Transmission/reflectance mode: Horizontal dimensions: 20 to 30 mm, Vertical dimensions: 10 mm or less	Transmission/reflectance mode, transmission polarization analysis (TAS7500SP only): Horizontal dimensions: 5 to 30 mm, Vertical dimensions: 10 mm or less ATR mode: Powder/Liquid: Sample boat horizontal dimensions: Less than 5 mm Solid: Horizontal dimensions: 5 to 20 mm, Vertical dimensions: less than 10 mm	
Imaging function	Spatial resolution	Less than 0.3 mm (2 THz)	—	—	—
	Min. scanning esolution:	0.05mm	—	—	—
	Coating thickness measurement range:	30 μm and higher	—	—	—
	Automatic measurement:	Max.10 tablets on a dedicated cassette, measures automatically	—	—	—
Analysis/display function		Point display (reflection intensity, reflection spectrum), Tomographic image display, 3D mapping display (thickness, surface reflectance, interface reflectance, FCSI) *FCSI: Film Coating Strength Index	Spectral display (transmittance, reflectance, phase difference, absorbance, absorption coefficient, complex refractive index, complex permittivity), Time response display (electric field strength), Quantitative analysis *3	Spectral display (transmittance, reflectance, ATR, phase difference, absorbance, absorption coefficient, complex refractive index, complex permittivity birefringence phase difference, birefringence, optical retardation, optical rotation, optical ellipticity, optical rotation angle), Time response display (electric field strength), Quantitative analysis *3, Jones Vector representation	Spectral display (transmittance, reflectance, ATR, phase difference, absorbance, absorption coefficient, complex refractive index, complex permittivity), Time response display (electric field strength),Quantitative analysis *3
Measurement performance	Frequency range *4	0.1 to 4 THz	0.03 to 2 THz	0.1 to 4 THz	Transmission/ reflectance mode: 0.5 to 7 THz ATR mode: 0.5 to 6.5 THz
	Frequency accuracy *4	Max. ±10 GHz (1.4 THz)	Max. ±10 GHz (0.56 THz)	Max. ±10 GHz (1.4 THz)	
	Frequency resolution	30.4GHz	7.6GHz		
	Dynamic range *4*5 (under peak frequency)	70 dB or higher	60 dB or higher	70 dB or higher	Transmission/reflectance mode: 70 dB or higher ATR mode: 65 dB or higher
	Polarization extinction ratio	—	—	30 dB or higher (at maximum value)	—
	Throughput	<15 min (32 x 32 points, integrate 32 times)	8ms / scan		
Purge		Dry air unit (external air supply required)			
Controller		Standard (OS: Windows7 Pro. 64 bits)			
Data file format		Binary format, JCAMP-DX, SPC, CSV			
General specifications	Usage environment	Temperature range: +10 to +30 °C, Relative humidity: 80% or less (no condensation)			
	Storage environment	Temperature range: -10 to +50 °C, Relative humidity: 80% or less (no condensation)			
	Power	Analysis unit: AC100V (100-120) / 200V (220-240) ± 10%, 50/60 Hz, 160 VA Measurement unit (TAS7500IM) : AC100V (100-120) / 200V (220-240) ± 10%, 50/60Hz, 180 VA Measurement unit (TAS7500SL/SP/SU) : AC100V (100-120) / 200V (220-240) ± 10%, 50/60Hz, 150 VA (Does not include analysis PC)			
	Size/weight	Analysis unit: Approx. 430 (W) x 540 (D) x 330 (H) mm/28 kg or less Measurement unit: Approx. 500 (W) x 490 (D) x 410 (H) mm/48 kg or less (TAS7500IM), 40 kg or less (TAS7500SL/SP/SU)			

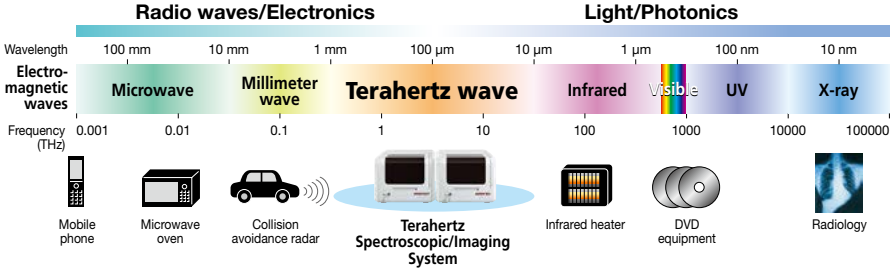
*1: When purchasing a terahertz spectroscopic system, user must select at least one measurement accessory (transmission, reflectance, ATR, transmission polarization analysis) *2: Please contact us for analysis of tablets with engraved marks or score lines *3: Option *4: At temperatures of 23°C ± 5°C *5: The peak level frequency varies in each system, and the dynamic range on each frequency varies in each system. Number of integration:262144

Thermal Control Accessory Specification

	TAS1020	TAS1030	Notes
Temperature range	-10.0～+80.0℃	Room temperature ～ +300℃	—
Resolution	0.1℃	1.0℃	—
Control interface	USB		Can be controlled independently of system
Accessories supported	Transmission accessory		—

Terahertz waves

Terahertz waves, which possess an energy level between that of radio waves and light waves, have both the permeability of radio waves and linearity of light waves, and are capable of acquiring fingerprint spectra from organic compounds like pharmaceuticals based on molecular interactions in the THz frequency range. For the first time, imaging and analysis technology utilizing the unique qualities of terahertz waves to perform non-destructive imaging is possible.



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ADVANTEST CORPORATION

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