

Terahertz Wave Spectroscopy and Analysis Platform

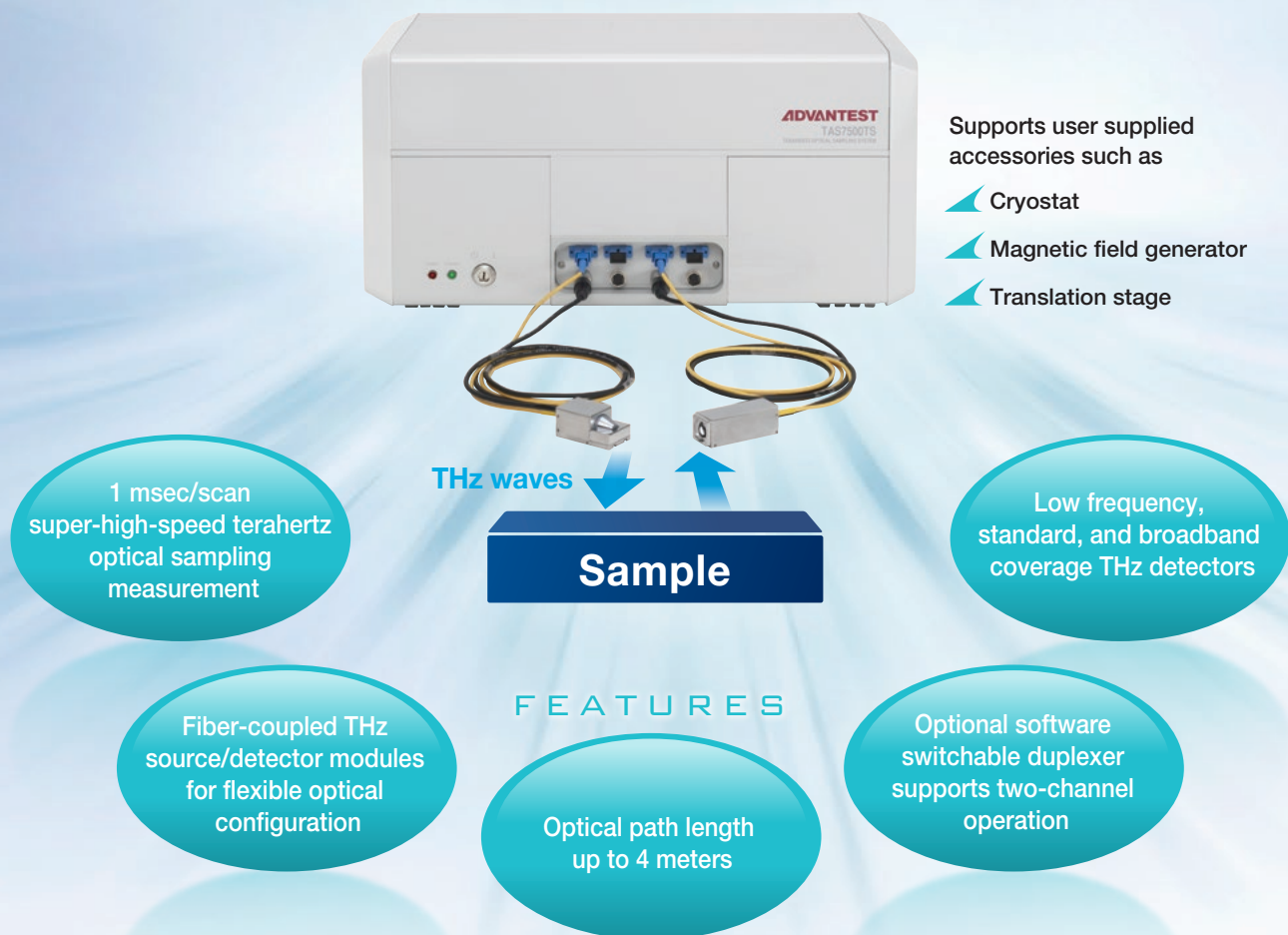
Full Coverage of Applications From R&D to Industrial Testing



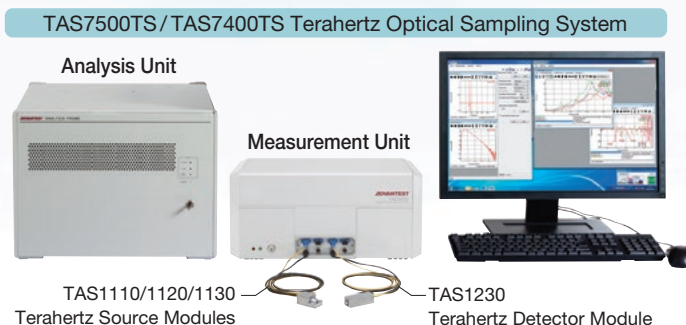
Terahertz Wave Spectroscopy and Analysis Platform

Optimal for a wide range of terahertz research and applications

The TAS7500TS Terahertz Wave Spectroscopy and Analysis Platform consists of an optical fiber laser module and a data acquisition unit. Flexible source selection and source/detector placement allow the user to build customized configurations



Basic Configuration

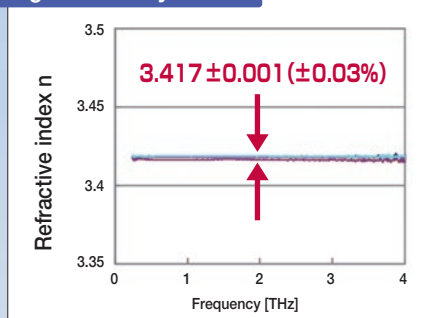


► TAS7500TS/TAS7400TS : Superior Performance

Excellent Reproducibility

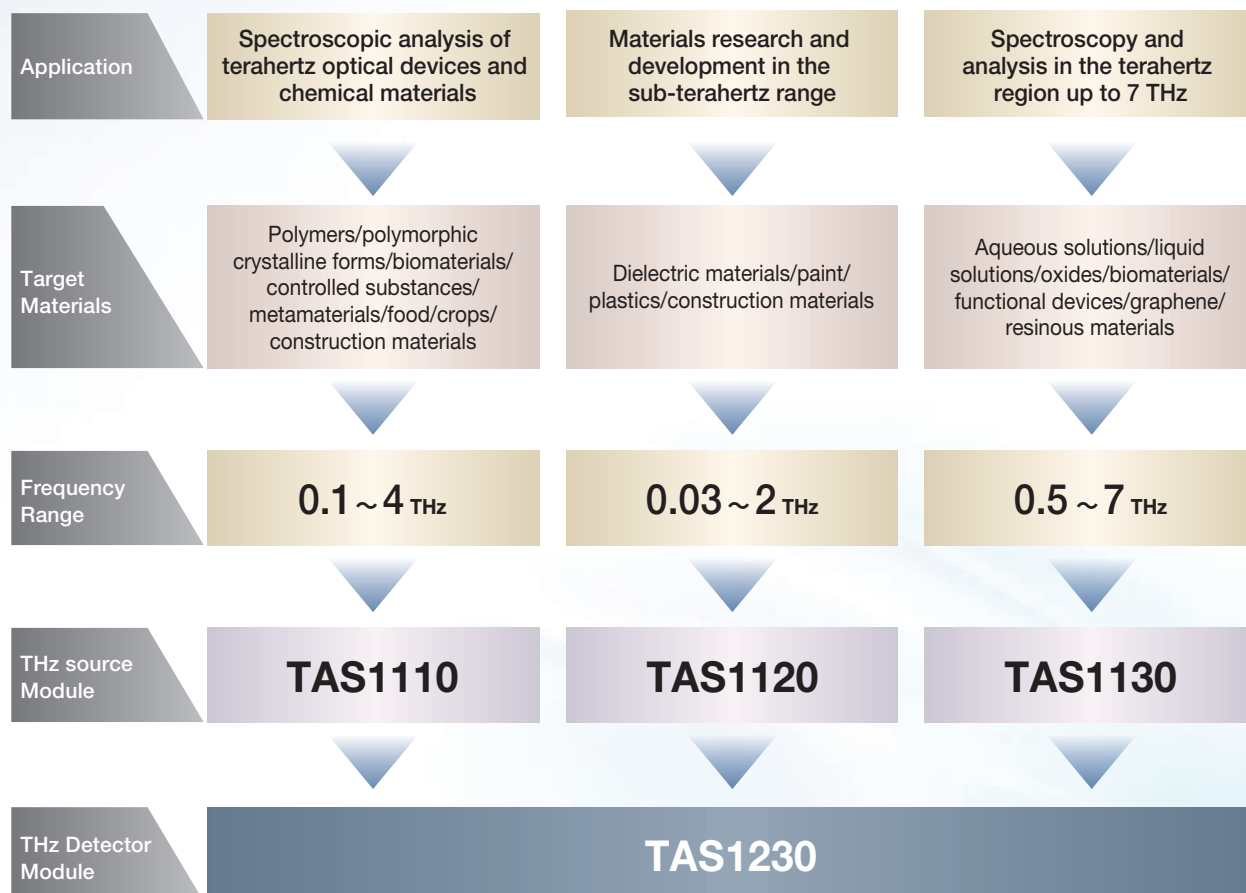
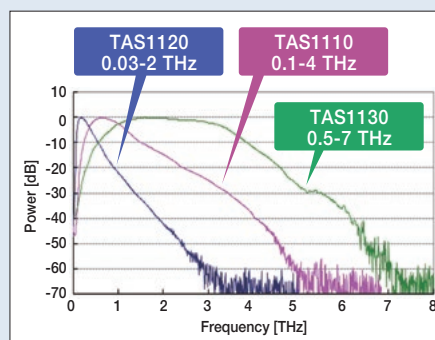
Advantest's proprietary low-jitter fiber laser and analog signal analysis technology enable superior refractive index (phase) measurement repeatability of within $\pm 0.03\%$.

High resistivity Silicon



Broadband Terahertz Spectroscopy

In addition to standard type TAS1110, two specialized source modules - the low frequency type TAS1120 and the broadband type TAS1130 - expand the bandwidth coverage of the platform to serve a broad array of applications.



Terahertz Optical Sampling System

▶ **TAS7500TS** 1 ms/scan

▶ **TAS7400TS** 200 ms/scan

FEATURES

- The system uses two channels of ultra short pulse lasers (1550 nm) with either biased output (for THz generation) or signal input (for THz detection). Advantest's unique optical sampling method, utilizing phase-modulated dual-laser-synchronized control technology without a mechanical optical delay line, enables extremely high speed terahertz spectroscopy.
- The basic configuration has a single channel input and output, and an optional second channel with software controlled duplexer can be added.
- Spectroscopic functionality is implemented by connecting optional fiber-coupled THz source and detector modules.
- Ethernet remote control option enables support for remote programming of THz measurement and analysis functions and peripheral equipment.



TAS7500TS

Terahertz Source Modules

▶ **TAS1110**

Standard: 0.1~4 THz

▶ **TAS1120**

Low frequency type: 0.03~2 THz

▶ **TAS1130**

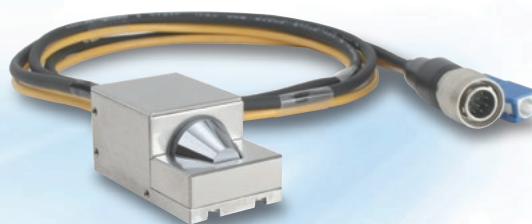
Broadband type: 0.5~7 THz

FEATURES

- Easy to use all-in-one THz source modules complete with a fiber pigtailed compact housing.
- TAS1110 and TAS1120 consist of a photoconductive antenna and a hyper-hemispherical silicon lens. Current monitor and thermistor on the built-in bias circuit deliver stable output intensity regardless of environmental temperature changes.
- TAS1130 is a Cherenkov THz source module that utilizes non-linear optical crystal LiNbO₃ waveguides.

Usage:

- Broadband THz source for THz spectroscopy and spatial mapping
- Difference frequency THz generation
- THz frequency comb generation



TAS1130

Terahertz Detector Module

▶ **TAS1230**

FEATURES

- Easy to use all-in-one photoconductive THz detector complete with hyper-hemispherical silicon lens and fiber pigtailed compact housing.
- THz waves are sampled by introducing 1550 nm ultra short laser pulses.
- Built-in trans-impedance (current-voltage transfer) amplifier with 500 kHz bandwidth simplifies implementation.

Usage:

- THz wave generation for time domain spectroscopy (TDS), etc.

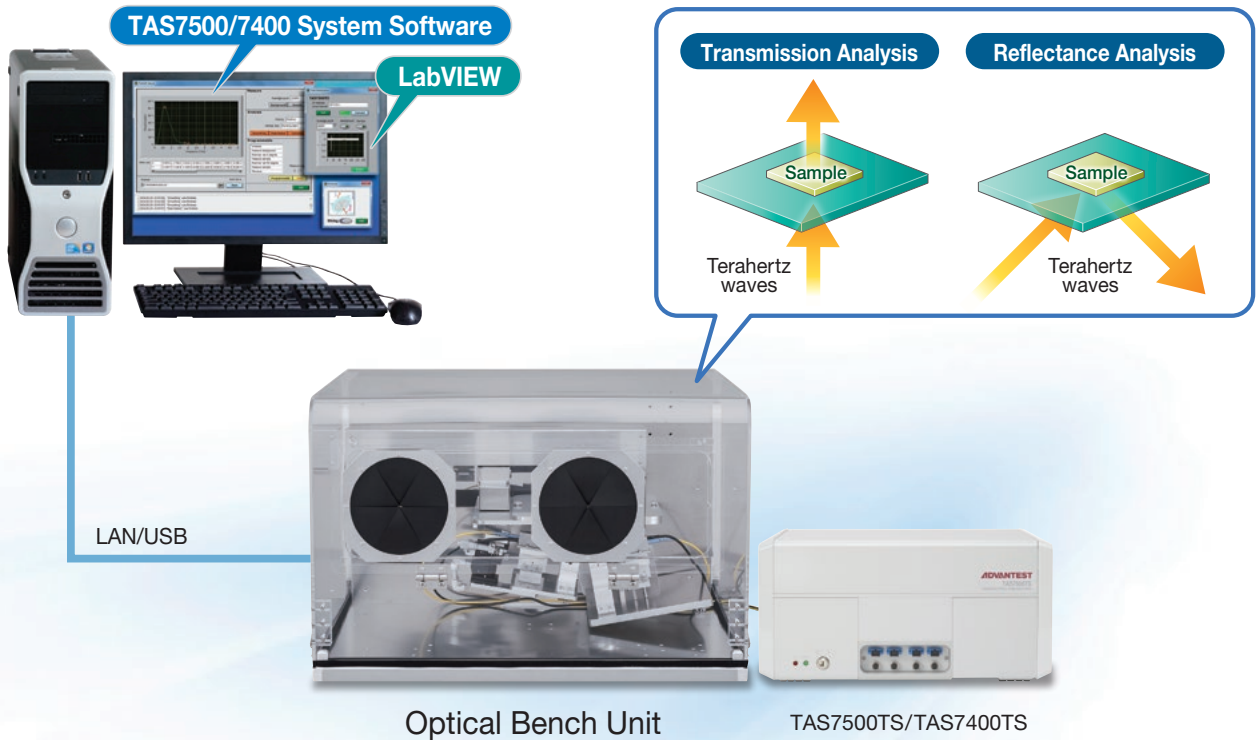


TAS1230

► System Configurations with the Optical Bench Unit Option

Supports Measurement & Imaging via Transmittance and Reflectance Methods

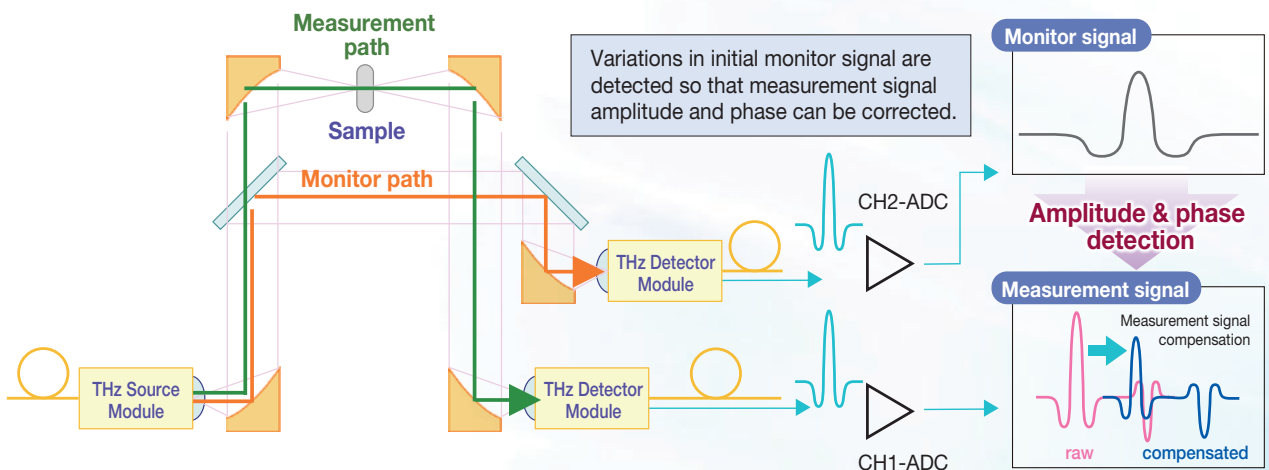
- Can measure and render 2D images of specimens up to a maximum size of 150mm x 150mm
- Remote programming option supports Visual Basic, Excel VBA, C#, and LabVIEW programming languages. Calculation libraries enable users to easily create programs including analysis of acquired data.
- Sample programs are provided for each language, enabling users to build system configurations with linked peripheral equipment.



► Dual Channel Monitoring Option

Supports highly stable measurement for long measurement times.

Dual beam path architecture enables highly stable measurement over long periods. By using this option, the system can monitor the amplitude and phase fluctuation during the measurement using the second detector and compensates automatically.



Specifications

TAS7500TS/TAS7400TS Terahertz Optical Sampling System

| Items | | Specification | | | | |
|----------------------------|----------------------|--|-----------|-----------|-------------|---------|
| | | TAS7500TS | | | TAS7400TS | |
| System configuration | | Dual ultra-short pulsed optical fiber laser (for THz generation and detection) measurement unit, analysis unit, controller & analysis PC | | | | |
| Excitation laser | Center wavelength | 1550 nm | | | | |
| | Output power | ≥ 20 mW (Option: Max. ≥50 mW)* ¹ | | | | |
| | Pulse width | ≤ 50 fs (Using 1.5 m fiber)* ¹ | | | | |
| | Repetition rate | 50 MHz ± 200 Hz | | | | |
| | Optical output port | THz generation: 1 port, THz detection: 1 port (can be optionally increased to 2 of each) | | | | |
| Measurement specifications | Measurement method | Terahertz optical sampling method (phase modulation method) | | | | |
| | Time resolution | 2 fs | | | | |
| | Frequency resolution | 3.8 GHz | 7.6 GHz | 61.0 GHz | 1.9 GHz | 7.6 GHz |
| | Scan range | 262 ps | 131 ps | 16 ps | 524 ps | 131 ps |
| | Throughput | 16 ms/scan | 8 ms/scan | 1 ms/scan | 200 ms/scan | |
| | Frequency accuracy | ±10 GHz* ¹ | | | | |
| General specifications | Usage environment | Temperature range: +10°C to +30°C Relative humidity: 80% or less (no condensation) | | | | |
| | Storage environment | Temperature range: -10°C to +50°C Relative humidity: 80% or less (no condensation) | | | | |
| | Power | AC100V(100-120)/200V(220-240)±10%, 50/60 Hz, 250VA (not including analysis PC) | | | | |
| | Size/Weight | Analysis unit: 430 (W) × 540 (D) × 330 (H) mm / Analysis unit: 30 kg or less Measurement unit: 430 (W) × 240 (D) × 220 (H) mm / Measurement unit: 14 kg or less | | | | |

*1: At temperatures of: 23°C \pm 5°C

TAS1110/1120/1130 Terahertz Source Module

| Items | | Specification | | | Notes |
|--|--------------------|--|------------------------------|-------------------------------------|--|
| | | TAS1110 (Standard) | TAS1120 (Low frequency Type) | TAS1130 (Broadband type) | |
| Generation method | | Photoconductive antenna | | | Input power: 20 mW (TAS1110/ TAS1120) 50 mW (TAS1130) Laser pulse width: 50 fs |
| Bandwidth (SNR=1)* ² * ³ | | 0.1 to 4 THz | 0.03 to 2 THz | 0.5 to 7 THz | |
| Dynamic range* ² (Peak level) | with the TAS7500TS | ≥ 70 dB | ≥ 60 dB | ≥ 70 dB | |
| | with the TAS7400TS | ≥ 60 dB | ≥ 50 dB | ≥ 60 dB | |
| Input optical fiber connector | | ϕ 3 mm 1550 nm Polarization maintaining fiber | | | Length: 1.5 m |
| Size | | 55 mm \times 20 mm \times 20 mm | | 43 mm \times 24 mm \times 21 mm | Without fiber pigtail |

*2: Detector: TAS1230 *3: In case of measuring samples with the TAS7500TS at 7.6 GHz

TAS1230 Terahertz Detector Module

| Items | | Specification | | Notes |
|-------------------------------|--------------------|--|--|---|
| Detection method | | Photoconductive antenna | | |
| Bandwidth (SNR=1) | | 0.1 to 4 THz (Generator: TAS1110) 0.5 to 7 THz (Generator: TAS1130) | | Input power:20 mW Laser pulse width: 50 fs |
| Dynamic range (Peak level) | with the TAS7500TS | ≥ 70 dB (Detector: TAS1110, TAS1130) ≥ 60 dB (Detector: TAS1120) | | |
| | with the TAS7400TS | ≥ 60 dB (Detector: TAS1110, TAS1130) ≥ 50 dB (Detector: TAS1120) | | |
| TIA sensitivity | | 9.7 × 10 ⁶ V/A | | |
| TIA bandwidth | | 500 kHz | | -3 dB bandwidth |
| Input optical fiber connector | | ø 3 mm 1550 nm Polarization maintaining fiber | | Length: 1.5 m |
| Size | | 55 mm × 20 mm × 20 mm | | Without fiber pigtail |

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