

Real-Time Terahertz Spectrometer

T-SPEC series



Real-time Terahertz Spectrometer offered by TERAVID is a powerful tool for investigative applications of pulsed terahertz waves. With simple and robust design, it is easy-to-use and adaptable to individual requirements.

The unique design of microstrip photoconductive antenna fabricated on low-temperature grown GaAs substrate ensures broadband spectral coverage and high dynamic range. The system is designed with two delay lines: fast and slow. Fast scan line allows real time data acquisition with 10 spectra/s speed and 116 ps time window. Average of collected spectra can increase dynamic range up to 90 dB at pulse maximum and extend spectral range up to 5 THz. Additional slow delay line allows combination of multiple time windows;

thus spectrometer obtains excellent spectral resolution up to 1 GHz. The fast scan line is designed without bearings and uses a magnetically coupled drive which makes it extremely reliable and significantly extends the lifetime.

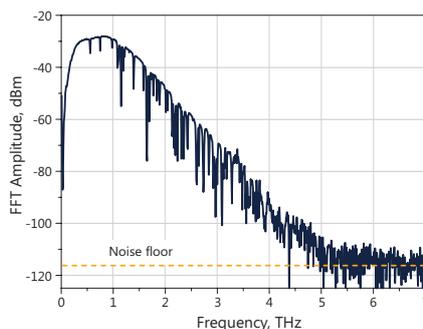
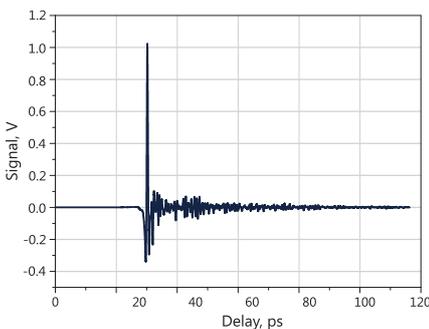
T-SPEC spectrometer has housing with mounted gas inlets. It can be used as purging box, when experiment requires special environmental conditions, like nitrogen or dried air. The spacious sample area allows easy integration of additional equipment, like cryostat or heater. On a special demand we can provide the integration of such equipment, ensuring good fit, spectrometer box sealing, vibration isolation and operation automation.

FEATURES

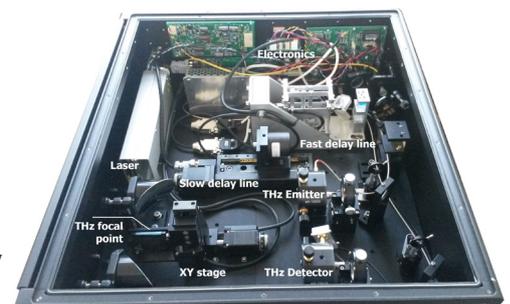
- ▶ Wide spectral range up to 5 THz
- ▶ High dynamic range >90 dB @ 0.4 THz
- ▶ Real-time data acquisition up to 10 spectra/s
- ▶ Excellent spectral resolution up to 1 GHz
- ▶ "No bearing" design of fast delay line – virtually unlimited lifetime
- ▶ Transmission, reflection, optical pump THz probe modes
- ▶ High spatial resolution THz imaging
- ▶ Complete PC control
- ▶ User-friendly software

APPLICATIONS

- ▶ Chemical material characterization
- ▶ Carrier lifetime and mobility in semiconductors
- ▶ Dielectric properties and complex refractive index
- ▶ Metamaterials investigation
- ▶ Medical and biological nondestructive research
- ▶ Thickness measurements



Typical performance of T-SPEC series Real-time THz Spectrometer (measured in ambient atmosphere)



T-SPEC 1000 without top cover

Spectrometer is equipped with two standard spectroscopy modules for transmission and reflection configurations. Each module contains motorized sample manipulator. This allows measurements of multiple samples one by one, without physical access to the spectrometer. Reflection module has convenient vertical architecture, where THz beams reaches the sample from bottom and reflects backwards. The measured samples can be replaced quickly just by laying them down on the sample holder. No adjustment is needed either when changing samples or when changing modules.

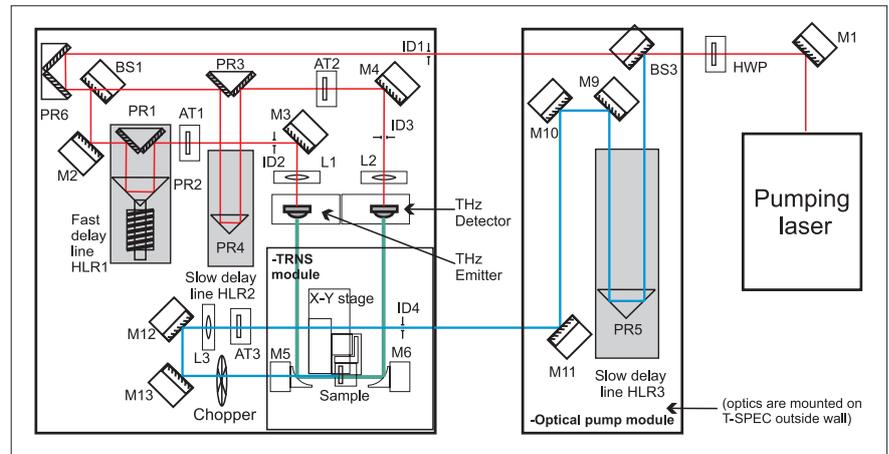
Our T-SPEC series spectrometer is the perfect choice for broadband THz imaging. It allows scan of up to 25×25 mm sample with spatial resolution of approx. 1 mm. Measurements contain information about the target, revealing both structural and spectroscopic information.

T-SPEC spectrometer can be adopted for optical pump THz probe measurements. This allows investigation of carrier dynamics in semiconductors, nanocrystals, and other materials. One part of additional optics is placed inside spectrometer; another part with delay line is mounted on T-SPEC outside wall. Measurement can be done up to 1 ns with temporal resolution of approx. 0.5 ps.

In case when customer has own 780 nm or 1060 nm fs-laser, TERAVIL could provide T-SPEC spectrometer adopted to that laser. The optical and THz beam paths will be pre-aligned. Therefore, it is only required to feed the laser beam into the optical setup of the spectrometer. Laser must satisfy following parameters: pulse duration ~100 fs, repetition rate in range 10-100 MHz.

SPECIFICATIONS

Model	T-SPEC 800	T-SPEC 1000
GENERAL SPECIFICATIONS		
Spectral range	>4.5 THz	>3.5 THz
Dynamic range	>90 dB @ 0.4 THz	>70 dB @ 0.4 THz
Acquisition rate	10 scans/s	
Spectral resolution:		
fast scan	8.6 GHz	
combined mode (fast + slow)	~1 GHz	
Scan range:		
fast scan	116 ps	
combined mode (fast + slow)	928 ps	
Beam diameter on the sample	~ 2 mm @ 0.4 THz	
Configurations	Transmission / normal reflection	
Computer interface	USB 2.0	
Dimensions	560 × 520 × 202 mm	
PUMP LASER		
Pump laser	Integrated ELMO with second harmonic module	Integrated FF50
Laser output type	Free space	
Wavelength	780 nm	1064 nm
Pulse duration	<100 fs	<160 fs
Output power	>80 mW	>60 mW
Pulse repetition rate	100 MHz	30 MHz



Optical layout of THz spectrometer T-SPEC series for optical pump THz probe measurements



T-SPEC spectroscopy modules: reflection geometry (left) and transmission geometry (right)