

Terahertz Time-Domain Spectrometer



Newport's Terahertz Time-Domain Spectrometer (THz-TDS) is the first commercially available turn-key terahertz pump-probe spectrometer designed for amplified laser sources. In an ultrafast experiment using THz-TDS, terahertz radiation is generated using two-color laser induced plasma and detected by balanced detection with a zinc telluride crystal after passing through the sample of interest. When combined with an OPA, the sample of interest can additionally be excited by ultraviolet to mid-infrared radiation. This allows for THz spectroscopy of the excited state of the sample. THz-TDS incorporates Newport's highest quality optics, opto-mechanics, balanced detector, vibration control, delay line stages, and easy-to-use LabVIEW™ based software to deliver high quality results with consistency. THz-TDS is configured for ultrafast amplifiers and OPAs with repetition rates ranging from <1 kHz to 1 MHz. THz-TDS can be upgraded and reconfigured to support other ultrafast spectroscopy techniques as your research needs evolve. THz-TDS includes a computer with pre-installed software, conveniently mounted in a 19" rack which can easily fit under most optical tables.

Many options are available, including extended delay range, automated beam steering, SHG pump, OPA pump, motorized sample holder, optical chopper integration, automated pump power control, pump reference and extended warranty.

Features and benefits

- Flexibly designed terahertz pump-probe spectrometer with many upgrade options
- Supports a variety of ultrafast amplifiers and optical parametric amplifiers (OPA) as input
- Broad pump-probe delay range and high pump-probe delay resolution
- High-speed stage allows rapid acquisition of THz waveforms
- Robust, stable device is factory assembled and aligned for easy integration
- Worldwide installation and support by our global support network

For more information, please see
<https://www.newport.com/f/terahertz-time-domain-spectrometer>

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THz-TDS Specifications	Standard	Maximum Upgrade
Required Input Energy	> 1 mJ @ 1-10 kHz	
THz detection range*	0.25-3 THz (8-117 cm ⁻¹) (1200 - 85 m)	0.25 – 4 THz (8-133 cm ⁻¹) (1200 – 75 m)
Best THz Resolution **	1.25 GHz	0.230 GHz
Maximum Optical Pump-THz Probe Delay Range	4.3 ns	8.6 ns
Minimum Optical Pump-THz Probe Delay Step Size	1 fs	
Maximum THz Gate Delay Range	0.8 ns	2 ns
Minimum THz Gate Step Size	0.25 fs	
Delay Stage Bidirectional Repeatability	<4 fs pump, <2 fs gate	
Delay Stage Maximum Speed***	500 mm/s (6.67 ns/s)	500 mm/s (13.3 ns/s)
Delay Stage Maximum Acceleration***	5 m/s ² (66.7 ns/s ²)	4 m/s ² (106.7 ns/s ²)
Supported Data Acquisition Rate	10 Hz - 2 kHz @ 16-bit	10 Hz – 500 kHz
Supported Laser Rate	0.1 - 2 kHz	0.1 – 1 MHz
Breadboard Dimensions	2' x 3' (600 mm x 900 mm)	
Supports Inert Gas Purging Out of the Box	No	

* The THz detection range is reported for a 50 fs pulse width at 800 nm with 1 mm or 0.2 mm thick ZnTe wafers serving as EO crystal. The range is limited by pulse duration, averaging time, EO crystal material, EO crystal thickness, and laser noise. User can replace EO crystal with different material or thinner crystal to increase bandwidth at the cost of signal intensity.

** The THz resolution is limited by the total time scanned, which is set by the maximum THz gate delay. In reality, detection of the THz waveform after >150 ps is often limited by noise.

*** Derived units are for the pump delay stage. Recommended maximum acceleration is reduced with added mass for 8-pass option.



Software showing acquisition of time resolved THz data for gallium arsenide



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