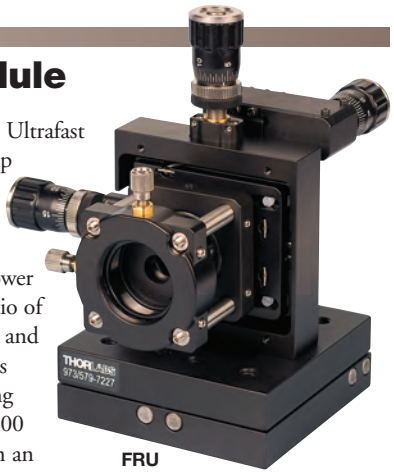
Terahertz Transmitter/Receiver Mounting Module


FRU

Research interest in the terahertz (THz) region of the electromagnetic spectrum has been substantially increasing. This region is defined as the spectral region between the infrared and microwave spectral bands and ranges from 100 µm to 1000 µm (300 GHz to 3 THz). In this region, the photon energies range from 1.2 to 12.4 eV and the equivalent black body temperature ranges from 14 K to 140 K, which is below the earth's ambient background.

The Ultrafast Terahertz Research Group at Oklahoma State University (OSU) in Stillwater has put together a THz Time Domain Spectroscopy (THz-TDS) system based on Thorlabs' optomechanical components, as shown in Figure 1. Their system includes two FRU modules; one houses a transmitter and the other houses a receiver. A femtosecond laser is used to illuminate the THz transmitter, which has biased coplanar transmission lines fabricated on high-resistivity GaAs with a geometry similar to that shown in Figure 3. The laser is focused on the edge of the positively biased line and generates a very large number of photo-induced charge carriers in the high electric field region, creating synchronous bursts of THz radiation. Their receiver FRU includes a receiver chip that has antennae structures fabricated on an ion-implanted silicon-on-sapphire (SOS) wafer. The antennae structures have geometries similar to that shown in Figure 2.

The pulsed THz radiation is focused between the gap of an antenna and induces a transient bias voltage. The portion of the femtosecond laser beam that is directed into the receiver is also focused onto the antenna, inducing a transient photocurrent that synchronously gates the receiver. One can consider this detection process a sub-picosecond boxcar integrator.

With this system, OSU's Ultrafast Terahertz Research Group has scanned out past 5 THz. Their system generates THz radiation with ~10 nW average power with a signal-to-noise ratio of 10,000:1. The generated and detected THz radiation is coherent and the resulting receiver sensitivity is ~1000 times more sensitive than an incoherent liquid helium-cooled bolometer. The receiver module of the THz-TDS system uses the same optomechanical components as the transmitter module. Thorlabs stocks this kit (part number FRU), which includes all the optomechanical parts needed to mount a transmitter or receiver module to a teflon lens. Please see page 1258 for a transmitter and receiver antennae from Menlo Systems.

Terahertz Kit

- THz Transmitter/Receiver Mount Module Using Thorlabs Catalog Components
- Free-Space Coupled
- Fiber Coupling by Request
- Highly Stable

Applications

- THz-TDS: Terahertz Time Domain Spectroscopy
- THz-DTDS: Terahertz Differential Time Domain Spectroscopy
- Interferometry

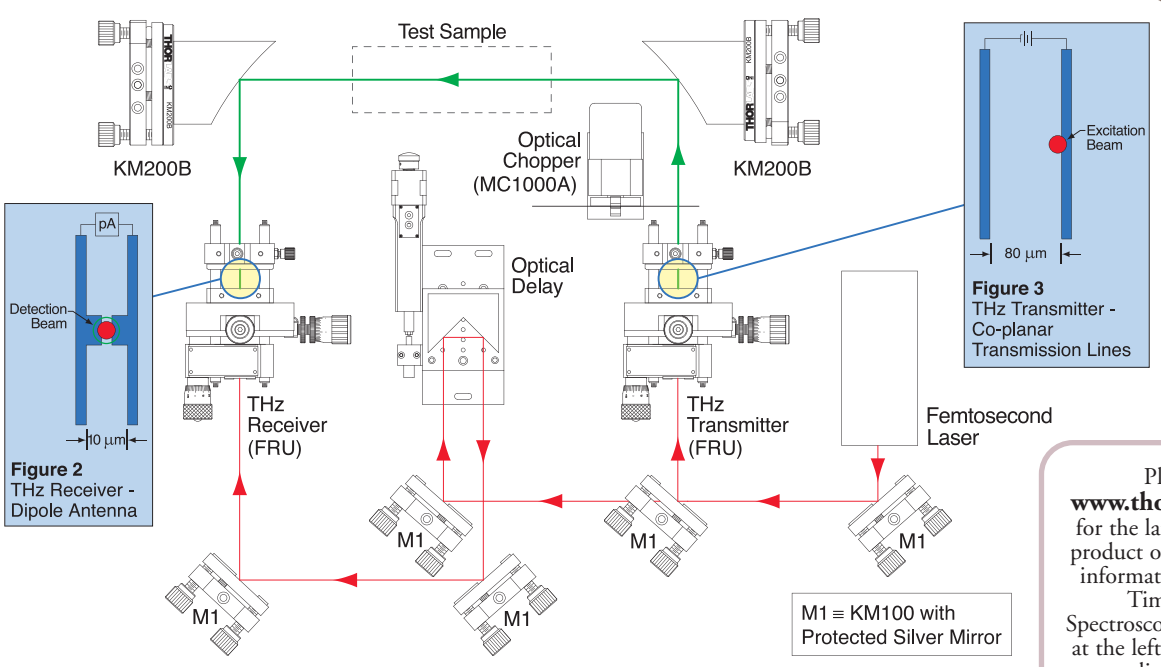


Figure 2
THz Receiver - Dipole Antenna

Figure 3
THz Transmitter - Co-planar Transmission Lines

Figure 1
THz-TDS System Based on Thorlabs' Standard Optomechanical Components

Please visit **www.thorlabs.com/thz** for the latest THz-related product offering and more information on the THz Time Domain Spectroscopy system shown at the left, including a full list of parts.

ITEM#	METRIC ITEM#	$	£	€	RMB	DESCRIPTION
FRU	FRU/M	$ 950.30	£ 658.80	€ 843,70	¥ 8,024.40	THz Transmitter/Receiver Mounting Module