

## THZ SPECTROMETERS

### Product description:

THz Spectrometers offered by Microtech Instruments, Inc. enable high-resolution spectroscopic measurements in the spectral range from 180 GHz to 1.42 THz. These systems employ frequency tunable Backward Wave Oscillators (BWO's) as sources of THz radiation and broadband detectors such as Pyroelectric or Golay Cells.

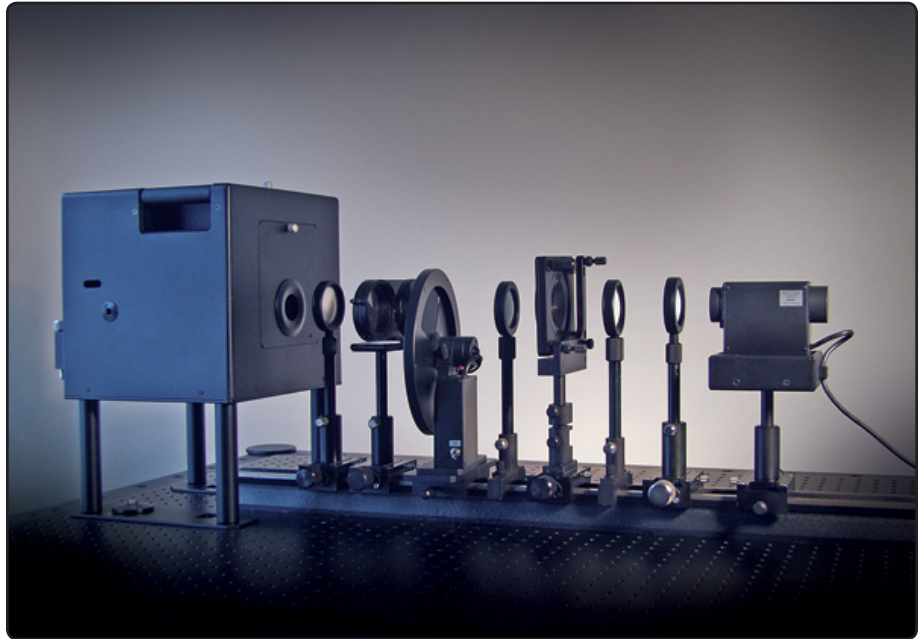
Key features include:

Spectral range: 30 GHz - 1.42 THz

Spectral resolution: 1 - 10 MHz

Dynamic range:  $10^5$

### Transmission Setup



### Product specifications:

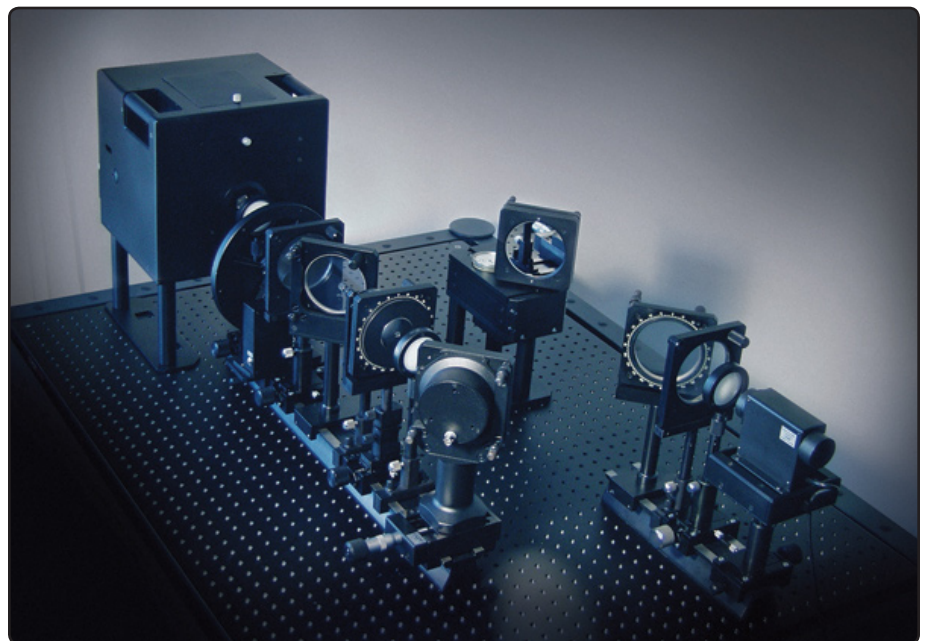
MODEL	OPERATING SPECTRAL RANGE
TScan-260	180 - 260 GHz
TScan-370	180 - 370 GHz
TScan-1100	180 - 1100 GHz
TScan-1250	180 - 1250 GHz
TScan-1420	180 - 1420 GHz
TScan-1420V	30 - 1420 GHz

## **All models can be set up for transmission, reflection and Mach-Zehnder configurations.**

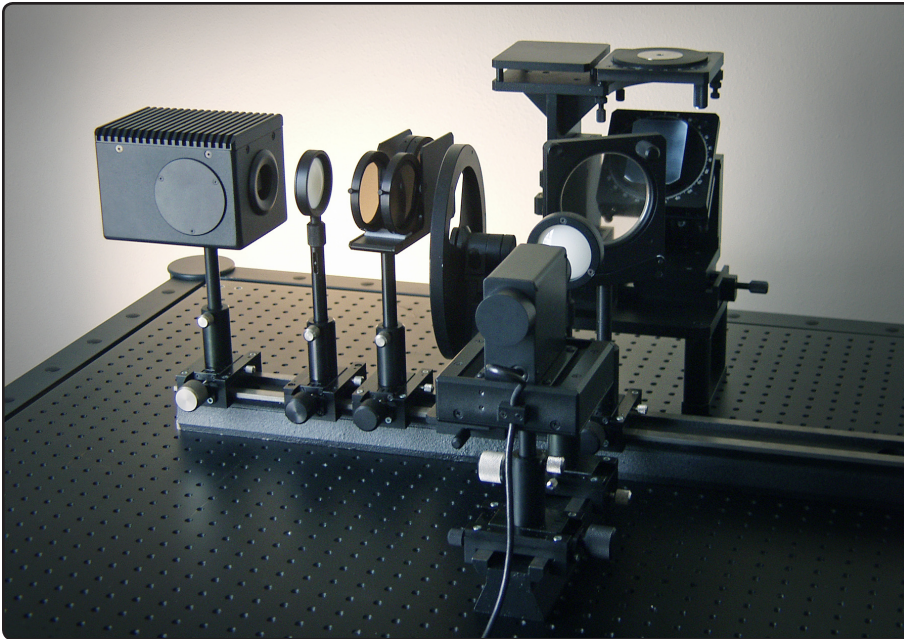
Transmission measurement is the best method for characterization of highly transparent materials. In particular, transmission spectra of plane parallel plates exhibit a periodic transmission pattern caused by interference (Fabry-Perot etalon fringes). Real and imaginary parts of the dielectric constant can be determined from these measurements, as the period and amplitude of the etalon fringes depend on the material refractive index and absorption, respectively.

Characterization of semi-transparent materials requires a THz Mach-Zehnder interferometer (shown below), since no etalon fringes can be observed in the transmission spectra of such materials. The Mach-Zehnder setup enables measurements of a phase shift induced by the sample as a function of frequency. Combining this data with transmission spectrum, real and imaginary parts of the dielectric constant can be calculated.

### **Mach-Zehnder Setup**



## Reflection Setup



Opaque materials characterization requires the reflection spectrometer. Because the transmitted signal is too small for characterization, a system using 6-axis control is employed to measure the reflected signal. As with the transmission and phase spectrometers the index of refraction, extinction, real and imaginary parts of the dielectric function can be quickly calculated from the software theoretical fitting routine.

The transmission, Mach-Zehnder and reflection spectrometers are supported by TScan Software, enabling automated data acquisition and analysis. One spectral scan takes 1 - 5 minutes for each of the BWO's employed in the system. Operating frequency range of the spectrometer varies with selection of BWOs.