

Compact, Portable Terahertz Spectroscopy System

Bakman Technologies' versatile PB7220-2000-T/R Spectroscopy Platform is designed for scanning complex compounds to precise specifications with greater accuracy and control. The PB7220 is ideal for THz researchers and application developers who need to study the properties of materials at THz frequencies with high-resolution, but who don't want to design and build their own high-resolution THz spectroscopy system. The PB7220 can sweep from 100 GHz to over 1.8 THz in a single rapid scan with frequency resolution better than 0.25 GHz. Because it has two channels it can be configured to simultaneously measure both the THz transmission and reflection properties of a sample. The second channel allows a single system to collect sample information at various angles of reflection or scattering from the sample while continuously monitoring the transmission.

The PB7220 employs precisely tuned, fiber coupled, butterfly packaged semiconductor DFB lasers, an advanced photo-mixing source and detector, and sophisticated digital control hardware and software to provide a fully turnkey THz spectrometer. The room temperature solid-state homodyne detection technique eliminates the need for cryogenics. The highly efficient CW nature of the photo-mixing source puts all the THz power at the frequency of interest, yielding excellent signal-to-noise ratios across the scan range of up to 70 dB Hz.

Unlike time-domain systems requiring expensive mode-locked lasers, the tunable semiconductor laser diodes in the PB7220 can support linear scans or can 'frequency hop' between frequencies of interest to scan specific regions of the spectrum with varying degrees of resolution. The fiber-optically-coupled source and detector heads are mounted on an adaptable optical bench and configured for simultaneous reflection and transmission measurements. They may also be detached from the processor unit and used with extended fiber optic cables to provide maximum measurement flexibility in a wide range of applications.

Applications

- Threat Signature Characterization
 - Explosives
 - Biologicals
 - Chemicals
- Microwave and THz Spectroscopy
- Materials Characterization

Features

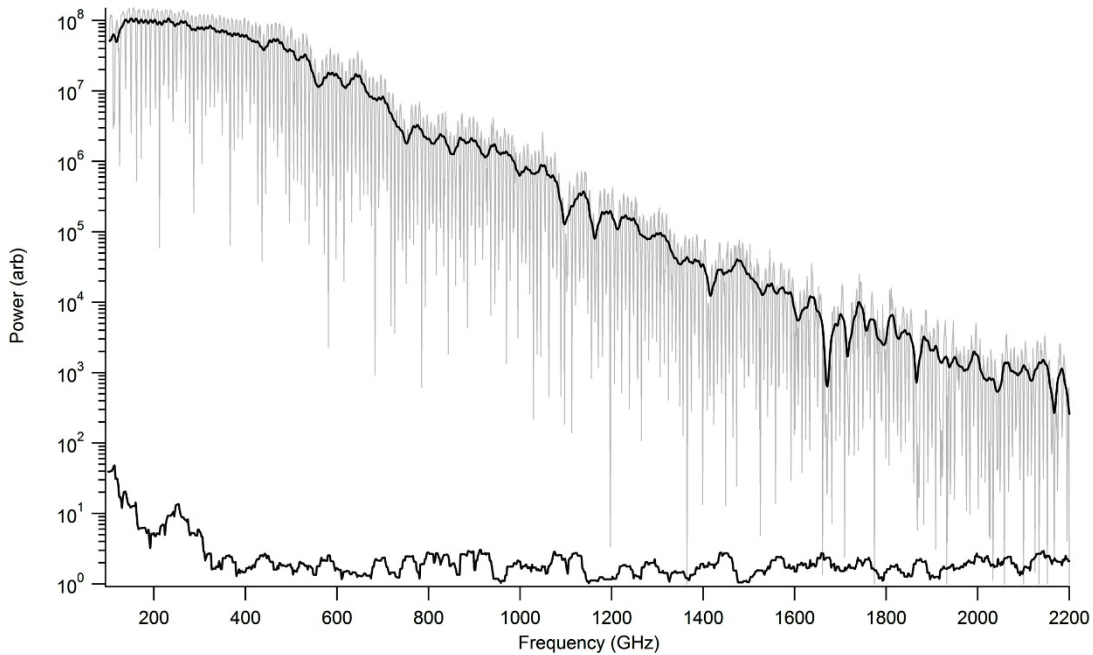
- Full Turnkey System: Arrives Configured and Ready to Start Making Measurements
- Extremely Economical: A Fraction of the Cost of Previous THz Systems
- Portable: Configurable with Built-in Li Ion Battery with up to 12 hours of Continuous Use
- Continuous Rapid Scanning From 100 GHz to over 1.8 THz
- Fiber Optic Coupled THz Source and Detector Heads
- Shipped with a Separate Detection Head for Each Channel
- Configured for Simultaneous THz Reflection and Transmission Measurements
- Room Temperature Solid State Detection: No Cryogenics Required

Performance Highlights

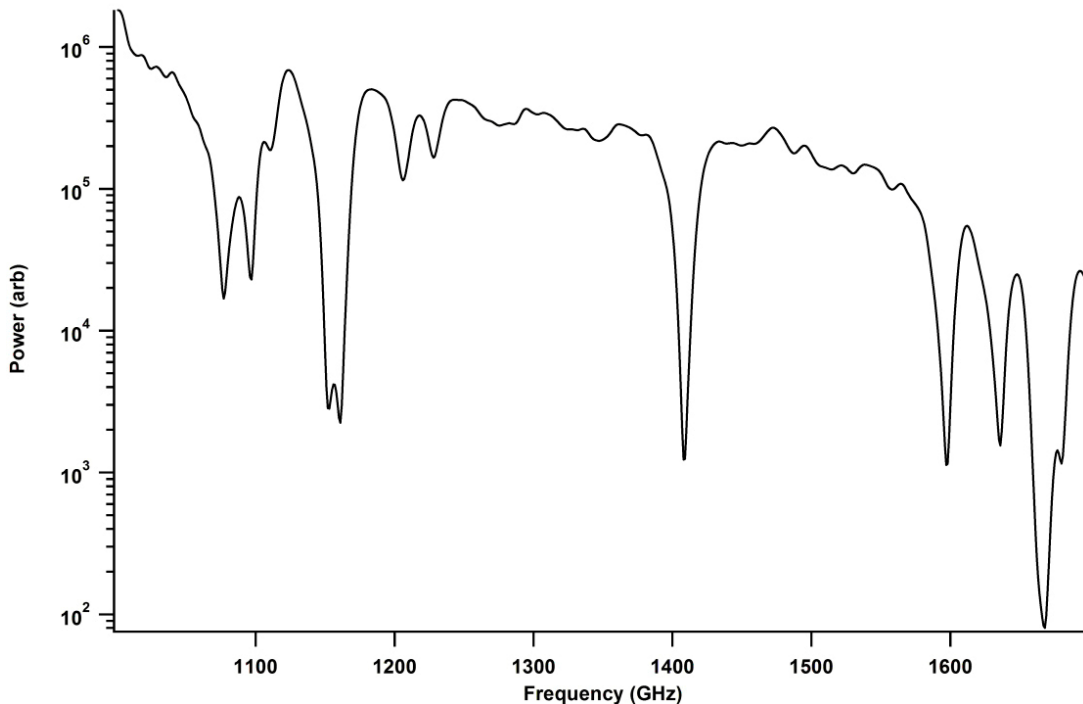
Parameter	Min	Typical	Max	Units
System Bandwidth	1700	1850	2100	GHz
Spectral Purity	0.010	0.015	0.025	GHz
Frequency Resolution	100	1000	5000	MHz
Dynamic Range @ 100 GHz	65	70	75	dB Hz
Dynamic Range @ 1000 GHz	40	55	60	dB Hz
Dynamic Range @ 2000 GHz	30	40	45	dB Hz
THz Beam Diameter @ 500 GHz		6		mm (FWHM)
THz path length	10	25		cm
Tuning speed		10		GHz/sec
Electronic Chopping Frequency		6000		Hz

Terahertz Performance

Typical transmission performance of a PB7220-2000 TR - THz Spectrometer for a scan of laboratory air at 1 ATM, 1 sec time constant.



Air at 1 ATM with water vapor. No processing was performed because head spacing was adjusted to remove interference fringes from the region of interest.



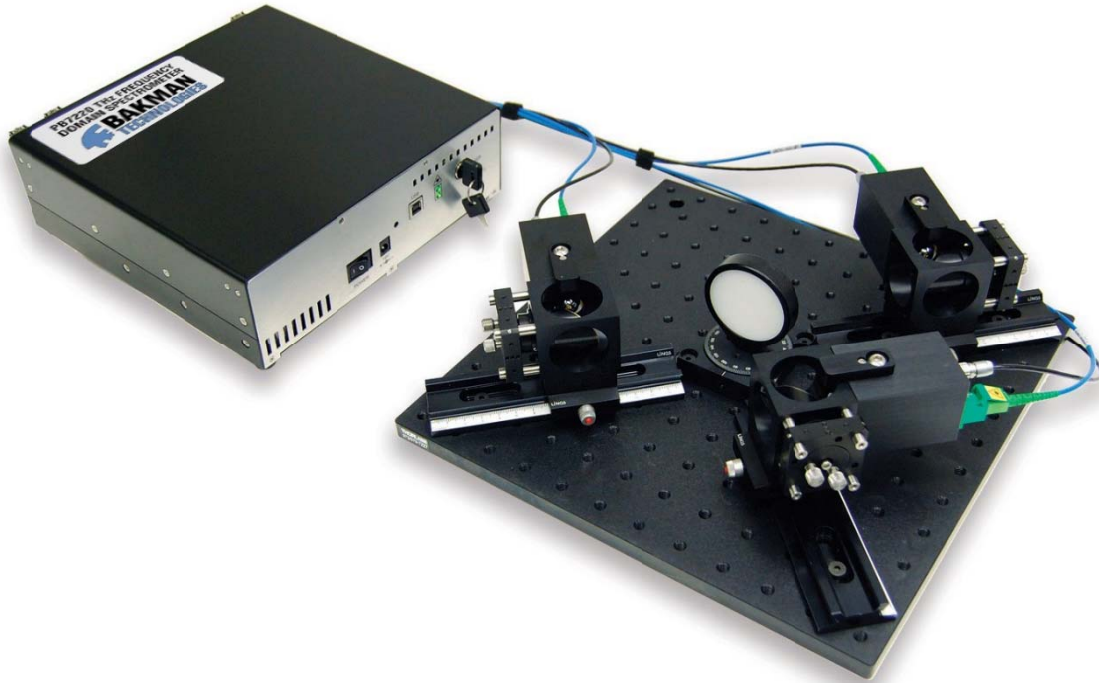
PB7220-2000-T/R Two-Channel Portable Frequency Domain Terahertz Spectrometer



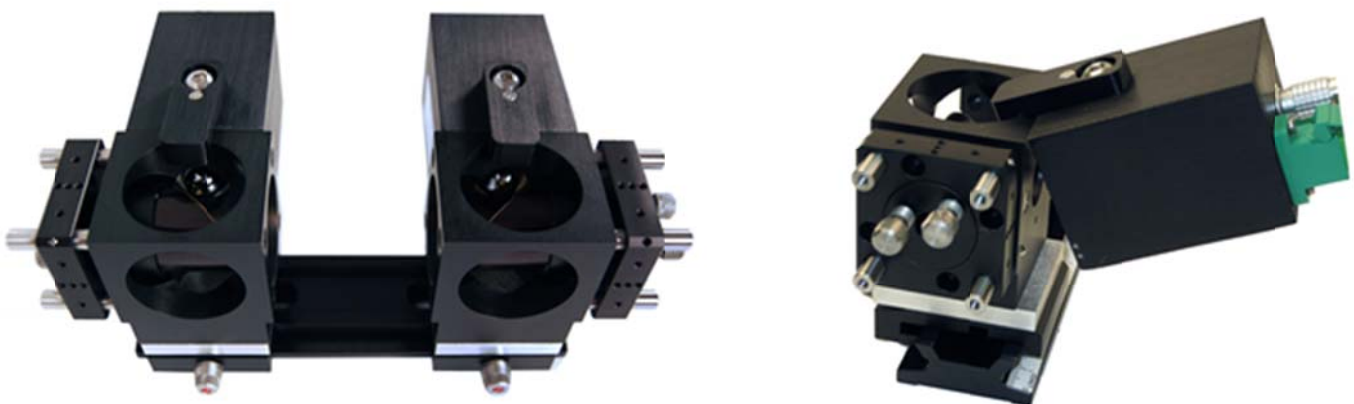
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PB7220-2000-T/R Terahertz System



PB7220 2000-T/R Terahertz Optics



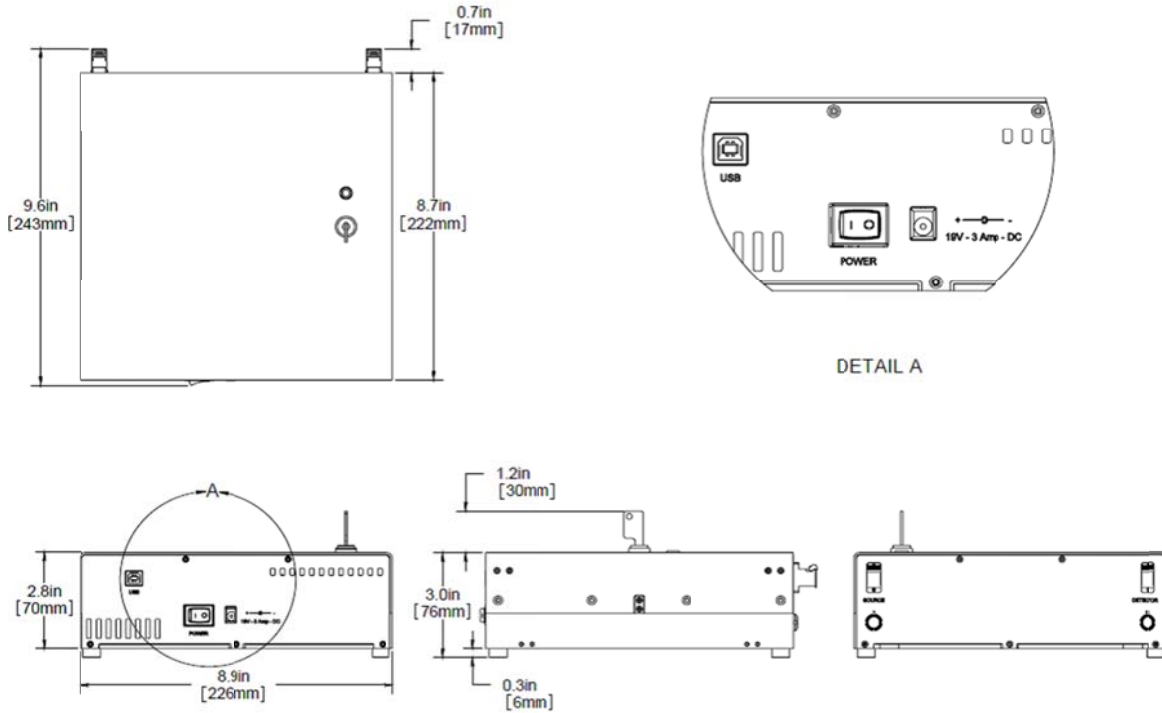
PB7220-2000-T/R Two-Channel Portable Frequency Domain Terahertz Spectrometer



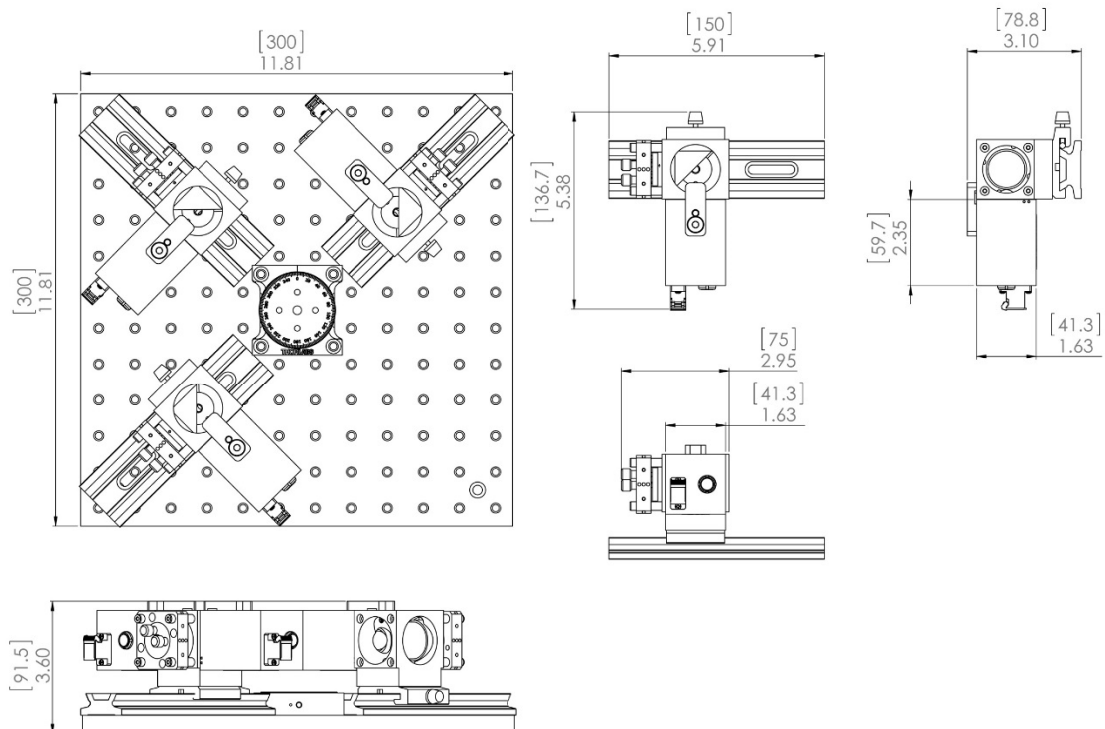
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Terahertz Control Unit Dimensions



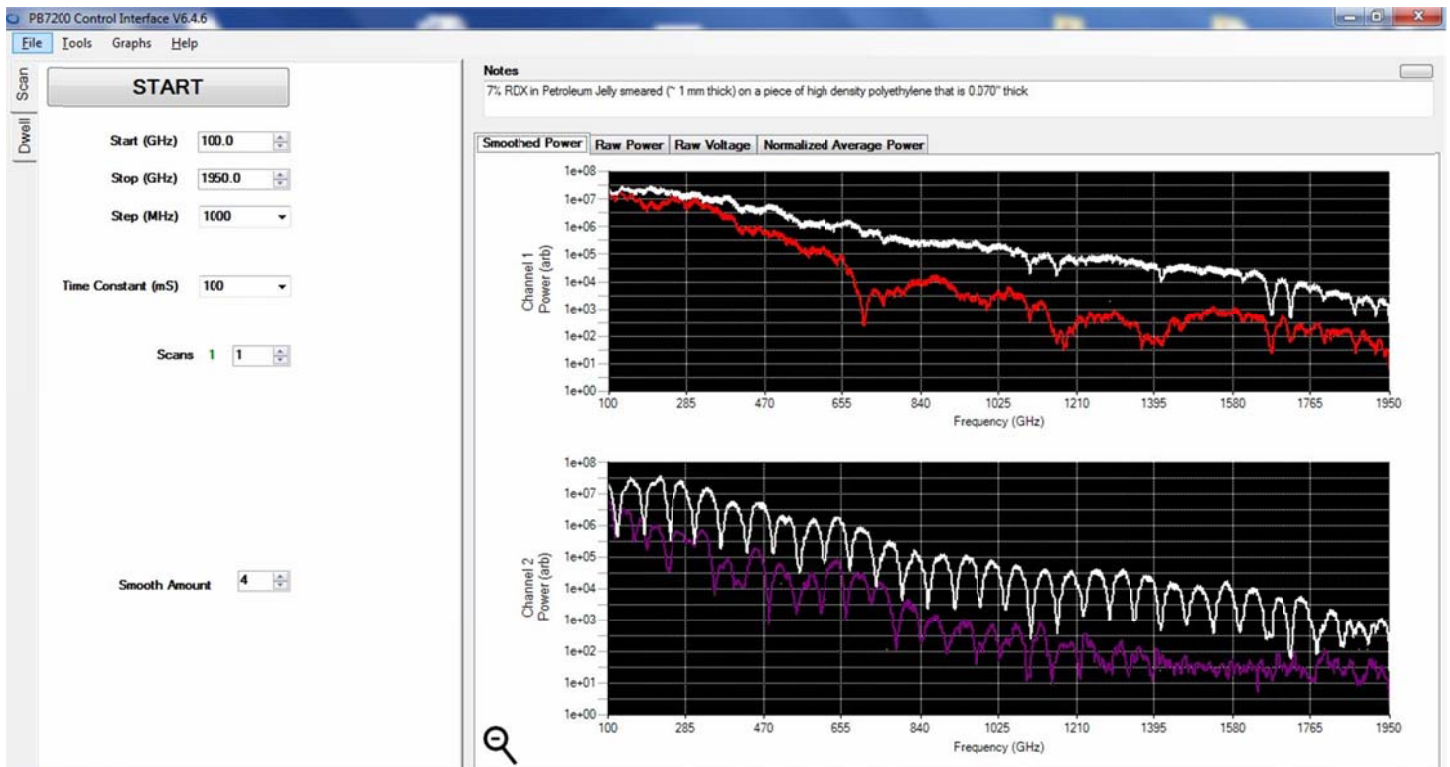
Terahertz Optics Dimensions



Graphical User Interface

The PB7220 includes highly functional software for Windows 7 PCs. Besides being able to control the frequency of the system with the Dwell or Scan, it is now also possible to do averaging, background subtraction, normalization and smoothing all from the same interface. The calibration files are installed into the PB7220, and if a new computer is connected to the PB7220, the calibration files are automatically downloaded to the computer. This makes it easy to move the PB7220 to different computers. With two channels both channels are visible on-screen and can be processed similarly.

Two-Channel System Graphical User Interface



PB7220-2000-T/R Two-Channel Portable Frequency Domain Terahertz Spectrometer



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Specifications

Parameter	Value
Weight – Control Chassis (ea)	2.5 kg
Weight – Adaptable Optical Bench with Heads and Optics	2.5 kg
Operating Temperature	-20°C to +55°C
Storage Temperature	-20°C to +75°C
Humidity	10% to 90% (non-condensing)
Input Voltage	100 – 240 VAC
Input Frequency	50 - 60 Hz
AC Input Load @ 120 vac @ 25°C	1.5 Amps
AC Input Load @ 240 vac @ 25°C	0.75 Amps
DC Output Load @ 19 vdc @ 25°C (average)	250 mA
Runtime on Internal Battery (estimated)	12 hours

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