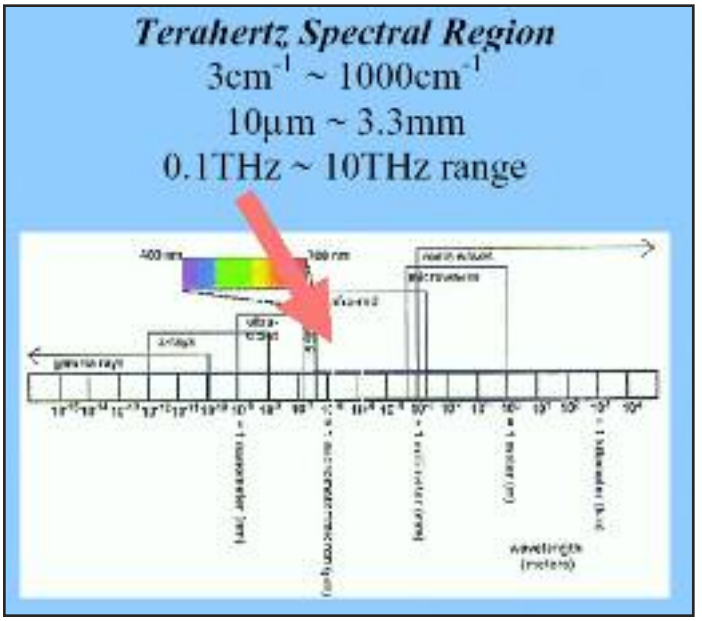
Integrated System and Instruments

Sciencetech Model SPS-300 Modular Terahertz Fourier Transform Spectrometer

The Sciencetech Model SPS-300 is a modular polarizing Fourier Transform Spectrometer (FTS) designed specifically to operate in the terahertz spectral region. Terahertz is the spectral region between infrared light and microwaves (approx. 20µm~3mm) and is also known as the far infrared or sub-millimeter spectral region. The modularity of the Model SPS-300 allows it to be configured into a terahertz light source spectral analyzer or into a terahertz materials transmission and reflectance spectrometer.

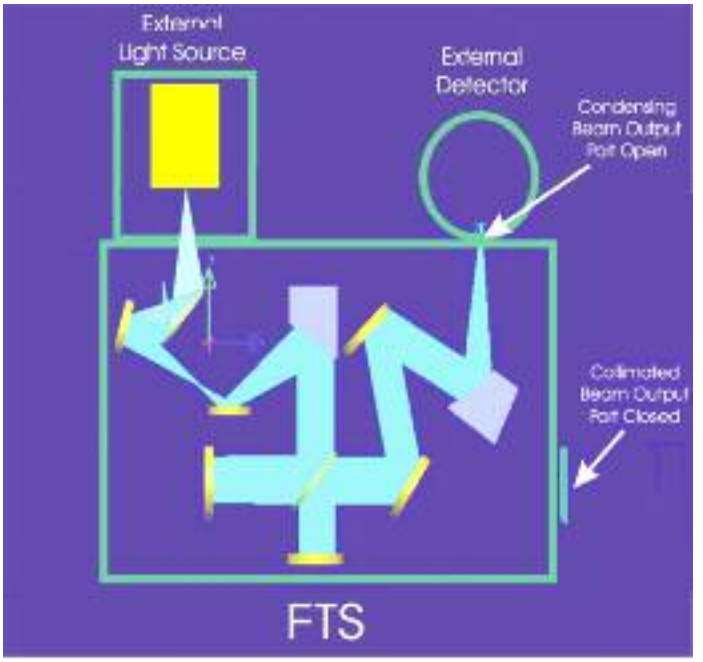


HIGHLIGHTS

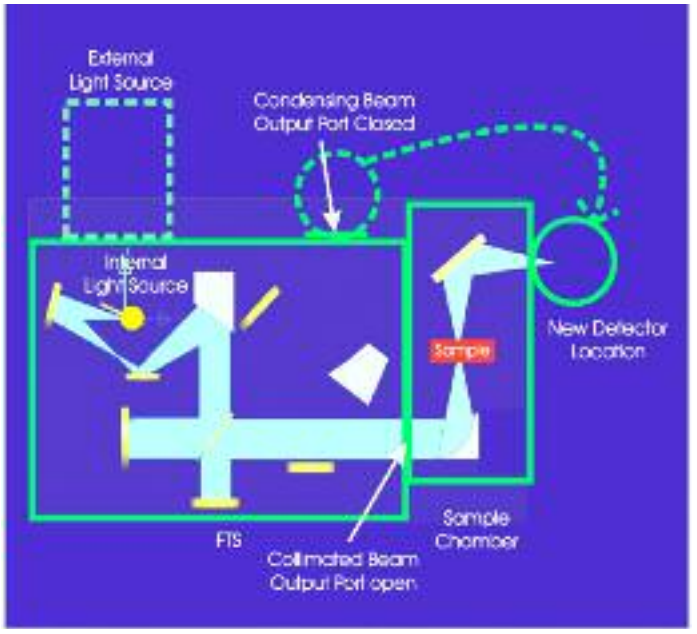
- Modular Design For Use As Terahertz Spectral Analyzer Or Materials Spectrometer
- Martin Puplett Michelson Interferometer Optical Configuration
- Supports External Third Party Light Sources and Detectors
- Supports External Custom Designed Sample Chambers
- Standard and Available Fast Scan Modes
- Michelson and Polarizing Scanning Modes
- Large 90mm Optics with Mylar Grid Polarizer Beam Splitter
- 3~1000cm^{-1} (10µm~3.3mm) Spectral Range
- 0.2cm^{-1} Resolution (0.025cm^{-1} for high resolution model)
- Vacuum Sealed Housing to eliminate spectral effects of atmospheric water vapor.

Terahertz Spectral Analyzer

The Model SPS-300 can be used as a terahertz spectral analyzer by mounting an external terahertz light source to its input light port, and an external terahertz detector to its condensing beam output port.



Terahertz Materials Transmission / Reflectance Spectrometer

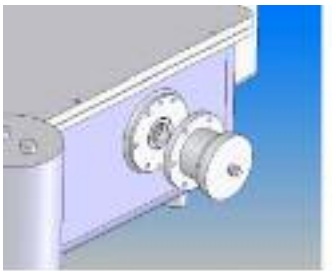


The Model SPS-300 can be used as a terahertz materials transmission and reflectance spectrometer by mounting an external sample chamber to its collimated beam output port. The external terahertz detector would need to be relocated to the detector output port of the sample chamber. In this configuration, either an external terahertz light source or the SPS-300 built-in internal terahertz light source can be used to illuminate the sample.

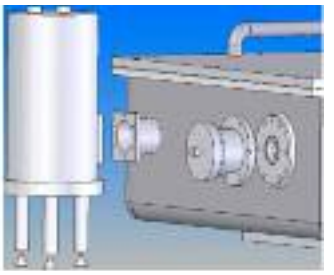
Light Source and Input Light Port

The Model SPS-300 has a built-in 75W mercury arc lamp for use as a terahertz light source. Since this internal light source is not required in the spectral analyzer configuration or the user may want to use his own terahertz light source in the materials transmission and reflectance spectrometer configuration, an internal flipping mirror can be rotated to bypass the internal light source and allow an external terahertz light source to enter through the input light port. This input light port is 1.5” in diameter and can accept a 1” diameter collimated input beam, f/2.5 condensing input beam, and even a diverging input beam such as that of a gun oscillator.

In the spectral analyzer configuration, an external light source must be connected to the input port. The internal light source would only be used as a reference source. In the materials transmission and reflectance spectrometer configuration, either the internal 75W mercury arc lamp or an external light source can be used. If the user prefers an external light source, Sciencetech does manufacture a global light source and a gun oscillator light source that can be mounted to the input light port. The user can choose to use a third party light source.



Input Light Port



Output Detector Port

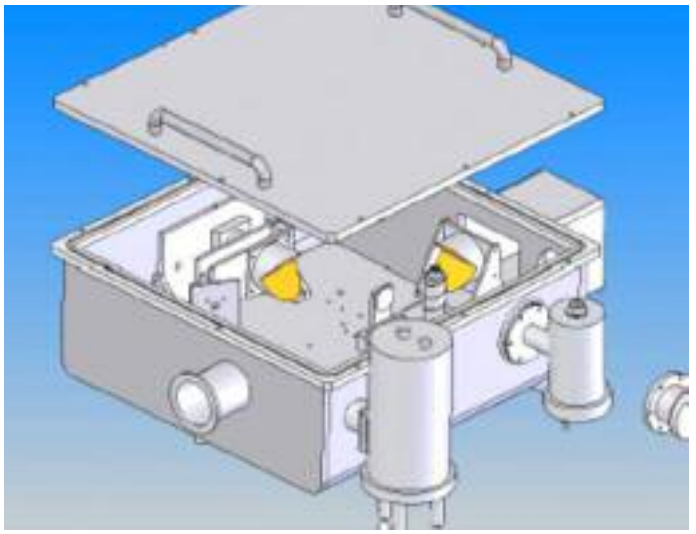
Output Ports

The Model SPS-300 has two output ports with an internal flipping mirror to select between the two. One of the output ports produces a condensing output beam for mating with a detector while the other output port produces a collimating output beam for mating with an external sample chamber.

Only the output detector port is used in the spectral analyzer configuration whereas only the output external sample chamber port is used in the materials transmission and reflectance spectrometer configuration. Please note that the external sample chamber has its own output detector port and therefore a detector is still required. The user can select either configuration by redirecting the internal flipping mirror accordingly.

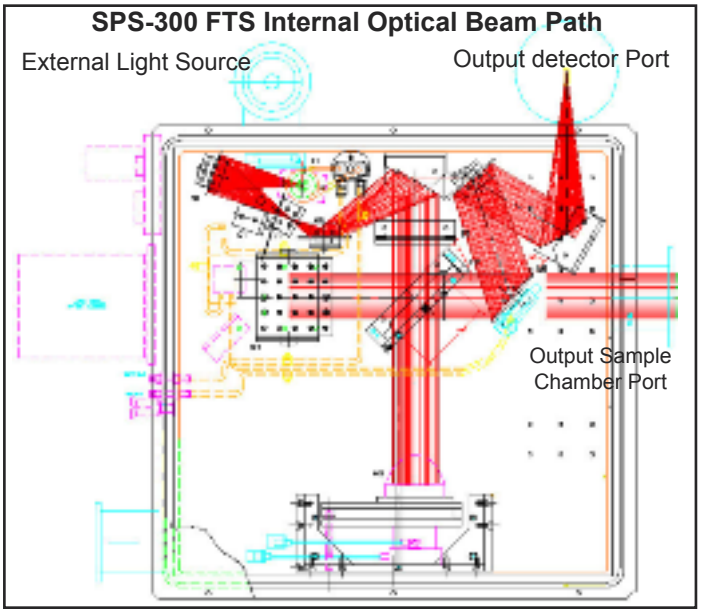
Sciencetech provides two available terahertz detectors. The most common is a pyroelectric detector which operates at room temperature. A more sensitive liquid helium cooled bolometer detector is also available at additional cost. The user can also choose to use a third party terahertz detector.

Vacuum Environment

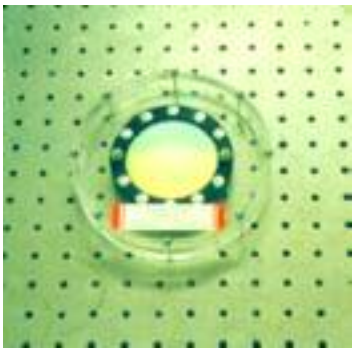


The Model SPS-300 FTS maintain a 10-3 Torr vacuum environment in its optics chamber to minimize the spectral absorption effects of atmospherics water vapor. Due to this internal vacuum environment, its input port and two output ports are sealed with polystyrene windows to prevent leakage. The polystyrene windows allows terahertz light through while maintaining a sealed internal vacuum environment. The polystyrene windows can be removed, as some input light sources, output detectors, and sample chambers need to be inside a vacuum environment. The top lid is removable for maintenance and for changing the beam splitter and choppers between Polarizing and Michelson modes.

SPS-300 FTS Internal Optical Beam Path



Optics



One of the most important optical features of the Model SPS-300 is its exclusive mylar polarizer grid beam splitters,which is nearly 100% efficient for all wavelengths up to the cut-off frequency set by the grid separation of 4µm.The Model SPS-300 also features large 90mm optics for high light throughput, a high precision translating stage, large roof mirrors, and large input/output off axis paraboloids to support a 4” diameter output beam.

The Model SPS-300 also supports both Polarizing or Michelson mode. Each mode has its own computer controlled chopper (input mylar beam splitter chopper for Michelson mode, output grid polarizer chopper for Polarizing mode). Changing modes involves demounting the unused chopper and selecting the correct chopper settings on the external electronics controller.

Optional Fast Scan Mode

In the standard “Step and Scan Mode”, detector data acquisition correlates to the translating roof mirror position. The control software sets the mirror position via RS-232 commands and acquires the corresponding detector data via the GPIB interface of the lock-in amplifier.

Since this standard scan mode can be time consuming, a faster but less accurate fast scan mode is available as an option. In this “Fast Scan Mode”, the roof mirror moves continously and does not stop at each reference position for detector data acquisition. An interferogram is generated immediately after the mirror completes its translation, typically in 15~60 seconds. Due to this high data speed, a 16-bit AD board is required to collect the data from the detector into the computer rather than the much slower GPIB interface of the standard scan mode.

Software

The SPS-300 control software is a LabView based application that operates on a Windows based PC computer. An executable version of the software is supplied so the user do not require LabView to operate it. Although Sciencetech only supports the Windows version of the SPS-300 control software, a Mac-OS version is also available through a third party vendor.

Main Software Features:

"Step and Scan" or "Fast Scan" operation: Fast Scan operation significantly reduces dead time between data acquisition. By performing more scans in the same time measurement interval, better baseline stability and a higher signal-to-noise ratio can be achieved

Multitasking: The software is capable of simultaneously scanning and performing data analysis. The SPS-300 software runs in its own window and is undisturbed by other Windows applications running in the background.

Batch Processing: Automated data acquisition can be achieved with simple command scripts. This is useful in organizing unattended automated measurement series.

Modular LabView VI structure: Users may add application-specific LabVIEW virtual instruments (VI's) without recompiling the SPS-300 software. This is useful for experiment automation where scanning operation needs to be integrated with external features from the sample changer, light source, temperature controller and magnetic field sweeps, etc.

Data acquisition: Data stored in ASCII format text files for easy importing into other data analysis software

Data Processing and Manipulation:

Phase correction: Mertz-Forman method

Apodizations: Boxcar, Triangular, Bessel, Cosine

Digital filtering of the Rapid Scan signal

Data Calculations: Add, subtract, normalize, multiply (interferograms or spectra); Average and standard deviation (interferograms or spectra)

Fitting of data by user-specified functions: Functions are analytically specified and new functions are automatically saved on the hard disk for later retrieval

Display:

Fast Scan Mode: display of interferogram, spectrum and the relative sigma of the spectrum

Step and Scan Mode: display of interferogram and contents of lock-in amplifier buffer

Display of spectra, interferograms, ratios, fit results and other data

Print selected data

Host PC Computer

A mid-range Windows based PC with flat screen monitor is supplied as the host computer. The SPS-300 control software will be fully installed and operational. A copy of the software will also be provided on CD for emergency back-up.

Cooling System

Since heat does not dissipate well inside the vacuum optics chamber, a ¼" diameter water cooling loop with external recirculating is used to cool all heat-generating components such as electric motors and the mercury light source. All heat- dissipating electronics such as motor controllers and light source power supplies are located separately outside for operation in an ambient environment.

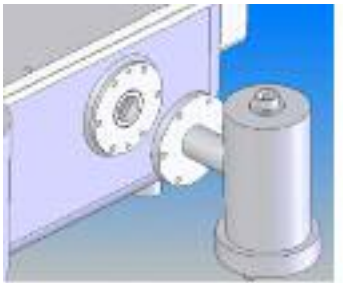
Technical Specifications

Optics:
Martin Puplett optical configuration with large 4" optics with fast f/2.35 condensers for high light throughput grid polarizer beam splitter for polarizing mode operation (2μm lines with 4μm pitch aluminum on Mylar substrate)Roof mirrors with angle within 3 arc-sec. Off-axis paraboloid condensing optics.
Body:
Vacuum tight steel housing
Source:
Internal 75W Hg arc lamp (water cooled) with external DC stabilized power supply and ignitor.
Controls:
Motorized alignment for roof mirror (tilt, rotational shear, lateral shear) to fine tune interference at beam splitter. Such fine adjustments are required to compensate for signal loss resulting from thermal expansion (restores signal at Zero Pass difference position).
Ports:
Vacuum Purge Port, Thermocouple vacuum gauge with analog dial display, Water Cooling Connections (inlet and outlet ports for water cooling of internal light source and stepper motors)
Scan:
Step and Scan Mode: In this standard scan mode, detector data collection correlates to the translating roof mirror position. The SPS-300 control software sets the mirror position via RS-232 interface, and collects the detector data via GPIB interface and lock-in amplifier.
Fast Scan Mode: The roof mirror moves continously and does not stop at each reference position for detector data collection. An interferogram is generated immediately after the mirror completes its translation (typically 15~60sec). Due to the high data speed, a 16-bit AD board is required to collect the data from the detector into the computer rather than the much slower GPIB interface.
Spectral Range:
3~500cm^{-1} (20μm~3.3mm) in Polarizing Mode
3~1000cm^{-1} (10μm~3.3mm) in Michelson
Resolution:
Standard 0.20cm^{-1} with 5cm translation stage
Hi-res 0.025cm^{-1} with 30cm translation stage
Signal/noise ratio:
Michelson mode: 0.4 %
MP mode: 2.2 %
Dimensions:
39"x 25"x15"
Weight:
180kg (steel body), 80kg (aluminum body)

Accessories

Optional External Light Sources

Various third party external light sources can be mounted to the input light port of the FTS. Sciencetech provides full documentation of the mounting bracket and internal optics geometry. Sciencetech also manufactures two demountable external light sources that mates to the input light port. The light sources are fully enclosed structures that form a vacuum seal with the FTS body.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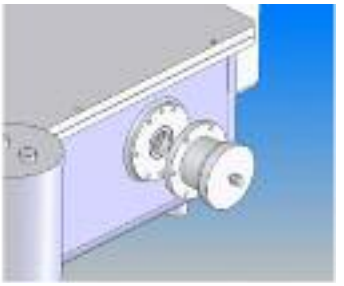

Gun Oscillator

Optional Detectors

Various third party terahertz detector can be mounted to the output detector port of the SPS-300 body. Sciencetech provides full documentation of the output detector port and optics geometry for users to mount their own. The software is also structured such that data acquisition of third party detectors can be captured into the LabView-based control software with little customization.

Sciencetech has two available terahertz detectors. The most common is the pyro-electric detector which operates at room temperature. A more sensitive liquid helium cooled bolometer detector is also available at additional cost.

Pyro-Electric Detector - Sciencetech Model IR-Pyro-5-det room temperature pyro-electric detector system utilizes a lithium tantalite crystal sensitive in the 1μm ~ 2mm spectral region. The system includes a detector head, power supply, lock-in amplifier, and mount for mating to the SPS-300 output detector port or output sample chamber port. A Stanford Instrument single phase lock-in amplifier is included to synchronize the

detector with the internal chopper of the FTS as a reference signal. The detector signal is then digitized into the host PC computer's SPS-300 software via a GPIB National Instrument PCI card and Stanford Instrument's LabView drivers.

Pyro-Electric Detector Specifications

Sensor Material	lithium tantalite
Sensor Size	5mm diameter
Responsivity	2000 V/W
Cutoff frequency	100 Hz
Frequency Range	1μm ~ 2mm
Interface	GPIB PCI interfacecard

Bolometer Detector – Bolometers are more sensitive than Pyro-Electric detectors in the terahertz region, but requires helium cooling which makes them expensive and tedious to operate. Sciencetech supports bolometers manufactured by IR Labs.

Sample Chamber

By having a collimated beam output port, an external sample chamber can be mated to the Model SPS-300 FTS. This configuration provides flexibility to the user who may wish to use a custom designed sample chamber with the instrument. However for most users, Sciencetech standard Model SPS401 transmission and reflectance sample chamber is sufficient.

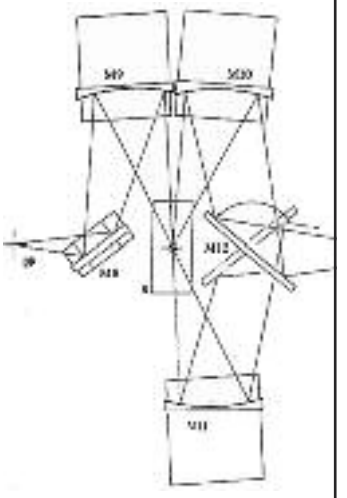
Sciencetech Model SPS401

Sciencetech SPS401 sample chamber can be connected to the output port of the SPS-300 to allow small samples to be studied under both transmission and reflection modes. The sample chamber is totally isolated from the SPS-300 vacuum environment by the sealed polyethylene window, and thereby enabling the user to change samples without up setting SPS-300 vacuum housing. The sample can be operated independently in vacuum or in atmospheric conditions and has cooling pipes for the sample.

The sample chamber utilizes reflective aspheric optics with gold coating for terahertz operation. A manual flipping mirror inside the sample chamber allows the user to select between transmission and reflective modes. In transmission mode, an internal mirror focuses the sample onto the detector, whereas in reflection mode, a secondary internal mirror focuses onto the sample. All optics are pre-aligned and focused for a specific detector positions at the sample chamber output port.

Sample Chamber Optical Layout

Photo (Lid removed)



Schematic

An optional peltier cooler is also available to maintain the temperature of the sample holder. For this option, a water cooling loop inside the sample chamber is required. This water cooling loop can be connected to the same water re-circulating system as the main SPS-300 body.

SPS 300 software package

The SPS 300 software package was developed at the Physics Department of McMaster University, summarizing thirty years of experience in infrared spectroscopy. It has been written with the objective of being well suited for the most demanding research, while at the same time remaining user-friendly and easy to operate.

Sciencetech offers different packages for software support and updates, adaptation to your system requirements and source code for user modification.

Features:

- Lab View based - executable code and Lab View drivers
- Help Instructions
- Multi-user files setup
- Scanning and data analysis and manipulation
- Single or double sided interferogram operation
- Fast Fourier Transform
- Parameter Selection: menu driven selection of display and initial data processing parameters

Graphics:

- Up to four simultaneous displays with expandable windows
- Colour selection
- Display of spectra, interferogram or ratios while scanning
- Display of last data or accumulated average

Data processing:

- User can select preferred method of several available for:
  - Zero path location
  - Base line corrections
  - Phase Correction methods: Mertz, Formam
  - Apodizations: Boxcar, Triangular, Parabolic, Cosine, Gassing
- Selection of apodization levels
- Mathematical Filtering
- Interpolation Routines: Least squares, Lagrangian

Spectral Manipulation:

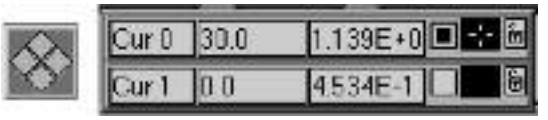
- Add, subtract, normalize (interferograms of spectra)
- Possibility to abort or scrap bad runs
- Error messages

Graphing:

- Graphing palette allows complete control and management of scales and/or ranges. Auto scaling function also available.

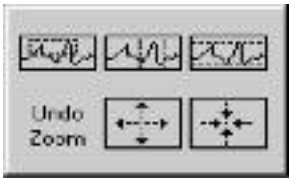
Cursor Pad and Palette:

- Cursor palette and pad allows placement of cursor on graphs for more accurate reading of x and y values.



Zoom Pop-Up Menu:

- Zoom function allows for enlargement of x and/or y axis or any point on graph with cursor.



Hardware Requirements:

- minimum Pentium processor
- Super VGA (resolution 1024 x 768)
- 15” monitor
- 32 MB RAM

SPS 300 software runs under the Windows Operating System. Software is supplied on two 3.5”floppy disks. SPS 300 software is fully supported.

If a computer system is purchased from Sciencetech with the SPS 300 interferometer, the SPS 300 software and GPIB board will be installed at the factory. Otherwise, the software and GPIB board (sold separately from software) must be installed by the user.

Description	Price (USD)
Computer system	——
SPS-300 Software	

Sciencetech Model TEO200 Bentchtop FTIR Spectrometer

The Model TEO200 benchtop FTIR spectrometer is a low cost Fourier transform infrared spectrometer that employs a number of unique features to achieve high performance from such a compact size. At just 59 x 39 x 19 cm, it is one of the most compact FTIR systems on the market today.

The TEO200 is unique in terms of its optical geometry and software/firmware design. The optical geometry is simplified by employing a new and remarkably compact Michelson self compensating optical system that eliminates many of the optical alignment problems found in conventional linear and pendulum type optical interferometers. For example, the TEO200 design avoids the use of conventional corner cube optics and dynamic alignment. In practical terms, the instrument can be used inside a research laboratory, or even as a mobile unit in outside environments. Its software and firmware design is also tightly coordinated which significantly reduces overall data acquisition and computational time.

The sealed, desiccated enclosure of the TEO200 eliminates the need for continuous dry nitrogen purging during operation. Other notable features include an air cooled IR source as opposed toa water cooled one, and the interferometer mechanical bearing does not require gas supply. There are however three dry nitrogen gas inlets on the rear of the spectrometer for the purging of the detector compartment, sample compartment, and interferometer compartment from moisture, carbon dioxide and other gases.

Instrument Performance

The TEO200 FTIR offers high S:N ratios and can provide SNR up to 12000:1. Resolution in the infrared is available 2 cm^{-1} and programmable up to 32 cm^{-1} (option 0.5 and 1 cm^{-1}). The overall wavelength range is 7000 to 400 cm^{-1} { i.e. 1.43 to 25 µm (IR) } or 15000 to 3850 cm^{-1} { i.e. 0.67 to 2.60 µm (NIR)}.

HIGHLIGHTS

- Compact self-aligning Michelson FTIR
- Standard 2cm^{-1} Unapodized Resolution Optional 1 cm^{-1}, 0.5 cm^{-1} Resolution Available
- 7000 ~ 400cm^{-1}(1.43 ~ 25µm) wavelength range
- Multi-layer coated KBr beam splitter
- High emission air cooled IR Source
- DLATGS low noise pyroelectric detector
- HeNe laser interferometer wavelength calibration and control system
- Interferometer Unit Sealed against humidity
- Windows 98/XP spectroscopic and analytical
- 1 Year Warranty supply.

Built-In Sample Compartment

A large transmission sample compartment is built into the instrument to accommodate most typical sample handling requirements relating to FTIR spectroscopy. The sample compartment can be equipped with a sampler holder that accepts slide-mounted samples as well. This unique compartment can also accommodate the wide range of accessories supplied by specialist accessory manufacturers. Overall dimensions of the sample compartment are W20 X D26 X H16 cm. The optical axis is 74.5 mm above the base of the sample compartment and there is 90 mm of free space between the optical axis to the underside of the lid.

IR Source

The radiation source is situated on the back side of the spectrometer. The IR source is a high intensity long life device made from a special alloy wire to achieve excellent instrument sensitivity and stability. Neither cooling water nor purge gases are required for this unique low power infrared source. The source is housed so as to achieve a very high operating temperature with minimum power. The colour temperature of the source is about 1200 °C and the heating power is about 15 W. The applied voltage is stabilized using a feedback loop driving a switched mode power supply.

Description	Version Code	Price (USD)
Standard 2cm^{-1} Version Resolution	-2cm^{-1}	

Extended Wavelength Ranges

In order to facilitate the use of more than one beam splitter or detector, provision has been made to interchange the beam splitter and detector assemblies allowing the Sciencetech TEO200 to be used at any wavelength from 15000 to 400 cm^{-1}.

- KBr 7,000 to 400 cm^{-1} (1.43 to 25 µm)
- ZnSe 5,000 to 500 cm^{-1} (2.0 to 20 µm)
- CaF2 10,000 to 1,000 cm^{-1} (1.0 to 10 µm)
- Quartz 15,000 to 3,000 cm^{-1} (0.67 to 3.33 µm)

* Please note that the beam splitters range is subject to coatings.

Detector Options

The detector compartment can be purged using dry nitrogen by way of a purge connector at the rear of the spectrometer. The standard detector is a selected high sensitivity DLATGS pyroelectric design providing the highest possible signal-to-noise for all but the most demanding applications. However there are many applications in infrared spectroscopy where high resolution analysis is required for materials with high absorption characteristics and for these applications cryogenically cooled MCT detector options are available each with a specific wavelength range. In case of NIR spectral region two types of photodiodes are available: Si and InGaAs.

SOFTWARE

Windows software is supplied on CD and provided with each system shipped. The software includes features for all standard analytical requirements including manipulation of spectral data, instrument control, plotting with preview on screen, plus many others. Also included are several features for analytical modeling of interferograms or spectra, with smoothing, baseline correction, interactive editing, data manipulation, spectral subtraction, mixture subtraction, smoothing derivatives, etc. Data input and output is possible in ASCII or JCAMP. Other commercial programs can be used including. Thermo/Galactic GRAMS for features such as Library Search. The software program is written in 32 bit protected mode. Our unique software has been designed specifically for multi function applications, it is easy to use, and it is provided free of charge. The utility of the software program can be extended by adding other commercial programs such as search, component identification, Kramers Kronig Transform, Chemometrics, etc. to suit individual requirements.

Air Cooled Infrared Source

Our Infrared source has a long lifespan and is a trouble free operation device. Our design achieves excellent wavelength emission characteristics and very high stability. The colour temperature of the source is about 1200°C. A quartz-halogen lamp is used in the NIR region

Desiccated and Sealed Interferometer

The Sciencetech TEO200 series of instruments employ a sealed and desiccated interferometer and detector compartment, ensuring high spectral integrity with low levels of water vapor within the interferometer. We also offer a version (200-XZ) that employs ZnSe moisture-insensitive optics to be impervious to water vapor, which can be used in tropical environments. Provision is made for purging should this be of interest to the user. Near infrared version (200-XN) employs fused silica optics and is insensitive to any influence of water vapor.

ACCESSORIES

Cryogenically Cooled MCT Detector Upgrade

The standard detector is a high sensitivity DTGS (Deuterated triglycine sulphate) pyroelectric design providing the highest possible signal-to-noise for all but the most demanding applications. However there are many applications in infrared spectroscopy where fast, high resolution analysis is required for materials with high absorption characteristics and for these applications a number of cryogenically cooled detector options are available including MCT detectors each with a specific wavelength range. Each detector type is supplied mounted and pre-aligned on simple to use and easily changeable mounts.

Preconfigured Host Computer System

Sciencetech instruments and software are designed to work on MS-Windows based PC computers. Since the installation and software configuration of such a computer system can be tedious and complex, Sciencetech offers a completely configured host PC computer with all software and PCI boards installed and functionally tested with the instrument. This preconfigured host computer will be a Windows XP mid-grade computer with 15" flat panel LCD monitor and network adapter. The cost of the software itself and AD boards are priced separately. Sciencetech strongly recommends the customer purchases this preconfigured computer with their instrument if the system control is complex or if the customer is unable to take advantage of Sciencetech's off-site warranty support, should they be unable to configure the software themselves. Sciencetech is not responsible for the configuration of its software on third party computers as there could be conflicts in setup and configuration with other software or hardware.

Specifications of TEO200 Benchtop FTIR Spectrometer

Spectral range	7000 - 400 cm^{-1} (Optional: 7800 - 400 cm^{-1}) i.e. {1.43 - 25 µm (Optional: 1.28 -25µm)}
Resolution (Unapodized)	2 cm^{-1} (Option: 1.0 and 0.5 cm^{-1})
Wave Number	Precision 0.01 cm^{-1}
Ordinate Precision	0.1 - 0.01 %T
Interferometer	Michelson type, self-compensated for tilt and shear
Beam Diameter	25 mm
Aperture Ratio	f/3.2
Operation Mode	Single Channel
Throughput	0.015 cm^2sr
Beam Splitter	KBr Substrate, multilayer coated (Option: ZnSe Substrate)
Scanner	Pendulous Scan
Scanning Rate	1.6 mm/s
Frequency Reference System	He-Ne Laser, 633 nm
Sampling	Conventional
Sample Compartment	Single beam, 200/260/160 mm
Beam Size	10 mm - centre focus, beam center 74.5 mm above the base plate
Input Port (Option)	Entrance port for radiation from external sources
Source	Coil form, air cooled
Detectors	DLATGS Pyroelectric (Option: LN_2 MCT)
Atmosphere	Sealed, with ports for dry nitrogen or air
A/D converter	16 bit, 100 kHz
Computer	IBM PC Pentium or similar
Operating system	Windows 95/98/XP
Display	SVGA (1024 x 768 pixels recommended)
Dimensions (w/d/h)	590/390/190 mm
Weight	24 kg
Power Consumption	100 - 240 VAC, 40 W, 50/60 Hz 12 VDC
Temperature Environment	18 °C to 28 °C
Humidity Environment	Below 65%, non-condensing

Sciencetech LUMUC Series Benchtop Raman System

Despite their small footprint size, the LUMUC series Raman spectrometers are high-performance instruments. The LUMUC I and LUMUC II are capable of achieving resolutions up to 3cm^{-1} and 4cm^{-1} respectively. The LUMUC series Raman spectrometers come with fully featured software with many built-in analytical features. These spectrometers are equipped with a high throughput proprietary fibre bundle probe and the LUMUC I features a built-in Princeton Instrument CCD that is TE-cooled to <-70°C, yielding excellent light throughput, sensitivity and resolution needed to confidently use Raman to answer critical QA/QC and analytical questions.

There is also an external sampling module which can be connected via the fibre bundle probe. The base laser excitation wavelength is 785nm, though other excitation wavelengths are available. The LUMUC I base version has a standard resolution (SR) of 5cm^{-1} (wavelength coverage: 140 - 3300cm^{-1}). A high resolution (HR) version of 3 cm^{-1} (wavelength coverage 140 - 2000 cm^{-1}) is also available. The LUMUC II base version has a standard resolution (SR) of 6 cm^{-1} (wavelength coverage: 140 - 3300 cm^{-1}). A high resolution (HR) version of 4cm^{-1} (wavelength coverage 140 - 2000 cm^{-1}) is also available.

Base Setup of the LUMUC Series Raman Systems:

- Raman Body
- Vector Raman Probe
- External Sampling Module (optional)
- Laser Fibre (thin black cable)
- Power cord for LUMUC Raman
- Laser Power key
- Sealed cyclohexane standard sample
- USB 2,0 cable
- RamanSoft CD-Rom
- Raman System User manual

HIGHLIGHTS

- Benchtop Unit with External Sample Chamber
- LUMUC I: Resolution of 5 & 3 Wave Number
- LUMUC II: Resolution of 6 & 4 Wave Number
- Single Fibre Optic Probe for illumination and Fibre Optic bundle with specialized fibre coupling to maximize light throughput for collection cable
- LUMUC I: 4-Position Internal Sample Chamber with optional External Sample Chamber
- 785nm Excitation Laser comes standard, other choices are available
- LUMUC I: Princeton Instrument CCD TE-Cooled to <-70°C
- Extraordinary stability and reproducibility
- Exceptional signal throughput, sensitivity, and sampling versatility
- Ideal for the university laboratory, industrial quality control, and reaction monitoring

Description	Code	Price (USD)
LUMUC I		
Base Model, Std Resolution with 785nm diode laser	SR-785	
Base Model, High Resolution with 785nm diode laser	HR-785	
LUMUC II		
Base Model, Std Resolution with 785nm Diode Laser	SR-785	
Base Model, High Resolution with 785 Diode Laser	HR-785	

OPTIONAL COMPONENTS

Microscope Adaptor

- Adapters available for popular microscope models: Nikon L-150, Olympus BX51, Olympus BX51M
- Calibration Kit
- Additional Software - GRAMS/AI 7.0 with PLSplus/IQ add-on (or IQ Predict), Spectral ID, and their corresponding user manuals

Built-In Laser

- 785 nm excitation laser (Choice of Lasers He-Ne are available and must be specified during order)
- Laser Power: Up to 700 mW (0 - 350 mW to the sample) - Stability +/- 1%

SOFTWARE

The LUMUC I Raman System is operated through RamanSoft proprietary software for data acquisition, data processing, and data analysis for its LUMUC I Raman systems. The software functions as an instrument control centre permitting the user to set CCD temperature and integration time, control the laser shutter and laser power. In addition, RamanSoft has user-friendly interfaces which give easy access to advanced features, including automated spectral library searching, qualitative and/or quantitative spectral analysis, and real time process monitoring.

The program provides a comprehensive suite of data handing features designed to expedite data processing and analysis. These include several spectral smoothing algorithms for noise reduction, the ability to normalize spectra to different spectral features and/or to laser power, and LUMUC's proprietary algorithm for background removal to enable the user to obtain consistent spectra across different background conditions. These features, along with quantitative procedures for peak intensity and peak area, provide a full range of processing and analysis features.

Key Features

- Software control of laser power, CCD gain and digitization rate
- Auto system calibration with calibration kit (optional)
- Automatic & manual background removal, signal averaging, normalization, spectrum overlay
- Peak ID, peak area, Spectrum Search, SpectrumPredict, Real Time Monitoring
- User-definable automation sequences for seamless data processing / data analysis

ACCESSORIES

External Sampler (RM-B2ExtSampler)

External Sample chamber for cuvette and for positioning probe over flat surfaces

Microscope Adapter (RM-B2Microscope)

This microscope adapter allows the Raman System to mate to a microscope for Raman microscopy. The adapter fits between the illuminator and ocular. Currently, adapters for the Nikon L-150, the Olympus BX51 and BX51M series microscopes are available. The adapter is an epi-illuminated reflectance microscope with infinity corrected optics, allowing for analysis of surface as well as subsurface regions in translucent material. With a Raman Microscope system, the user can save both microscope images and Raman spectra of discrete sample regions and simultaneously make full use of the functionalities of the LUMUC Raman systems.

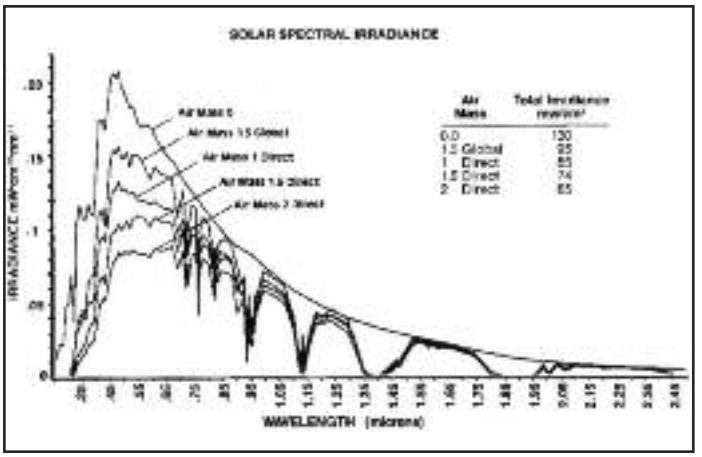
Alternate Excitation Wavelengths(RM-B2Laser)

To provide a different excitation wavelength, the users can select 632.8nm or 830nm at no additional cost, or 532nm at additional cost.

Specifications of LUMUC Series Benchtop Raman System

Raman Systems	LUMUC I		LUMUC II	
	SR Model	HR Model	SR Model	HR Model
Spectrometer				
Optics	85 mm, f/1.8 lens-based, Czerny -Turner spectrograph			
Resolution	5 cm^{-1}	3 cm^{-1}	6 cm^{-1}	4 cm^{-1}
Coverage	140 - 3300 cm^{-1}	140 - 2000 cm^{-1}	140 - 3300 cm^{-1}	140 - 2000 cm^{-1}
Sensitivity (@ 100mW/785nm laser)	>10,000 counts at 992 cm^{-1} of Na_2SO_4 at lowest of 3 available gain settings		>5,000 counts at 992 cm^{-1} of Na_2SO_4	
Detector				
CCD	1340 x 100 pixels, 20µm x 20 um		1024 x 124 pixels, 24um x 24um	
TE Cooling	< -70°C		< -15°C	
Digitization Rate (16 bits)	100 kHz, 2 MHz		100 kHz	
Excitation Lasers				
Laser	Choice of 785 nm, 632.8 nm, and 532 nm			
Laser Power	Up to 700 mW (0 - 350 mW to the sample) - Stability ±1%			
Sampling				
Probe	Sciencetech Vector Raman fibre optic probe, 1m fibre cable standard (other lengths available)			
Sample Cells	4-position internal sample cell and multi-purpose external sampling module			
Software				
RamanSoft control of laser power, CCD settings, data acquisition, processing & analysis including quantification, Real-Time Monitoring, Spectrum Search & SpectrumPredict				
Dimensions				
L x W x H	52 cm x 39 cm x 20 cm		39 cm x 25 cm x 15 cm	
Weight	18.5 kg		10 kg	

Introduction to Sciencetech Solar Simulators



Sciencetech Solar Simulator Systems produce high intensity, very uniform illumination on a target. The spectral distribution can be tailored to customer needs by the use of easily removable transmission and reflection filters in the unit, e.g. to provide solar spectra and/or UV illumination, near infrared energy, etc.

The sun's spectrum, when viewed from outer space without atmospheric absorption, approximates a 6000°K black body with superimposed spectral lines. A high pressure xenon lamp is an excellent artificial source for solar simulation. This source allows the design of an optical system that produces an intense collimated beam, and the spectrum approximates that of a 6000°K black body similar to the sun, but with superimposed xenon lines.

The xenon lamp differs from the solar spectrum in the 800 to 1100 nm region because of the intense line output of the lamp. An AM0 filter may be used to reduce the mismatch, but complete removal of the line structure is impossible with an economical filter, and without severe changes in the remainder of the spectrum. Residual infrared mismatch relevance depends on the application. AM1, AM1.5 and AM2 filters modify the visible and ultraviolet portion of the spectrum for a better match to the standard solar spectra. Information regarding these filters can be found on the following page.

It is important to remember solar simulators cannot replicate the sun's spectrum with extreme precision and the spectrum of the simulator will change with system and lamp age (refer to arc lamp descriptions on pages 3-6 and 3-7 for information regarding the affect of age on arc lamps). This should be kept in mind when designing tests that use solar simulators. Of course, the spectrum of the sun's radiation reaching the earth's surface is subject to the affects of sun altitude, atmospheric components and atmospheric scattering. Measuring the beam power in the primary spectral region of interest with care will reduce the effects of a mismatch caused by the variance in the terrestrial solar spectrum.

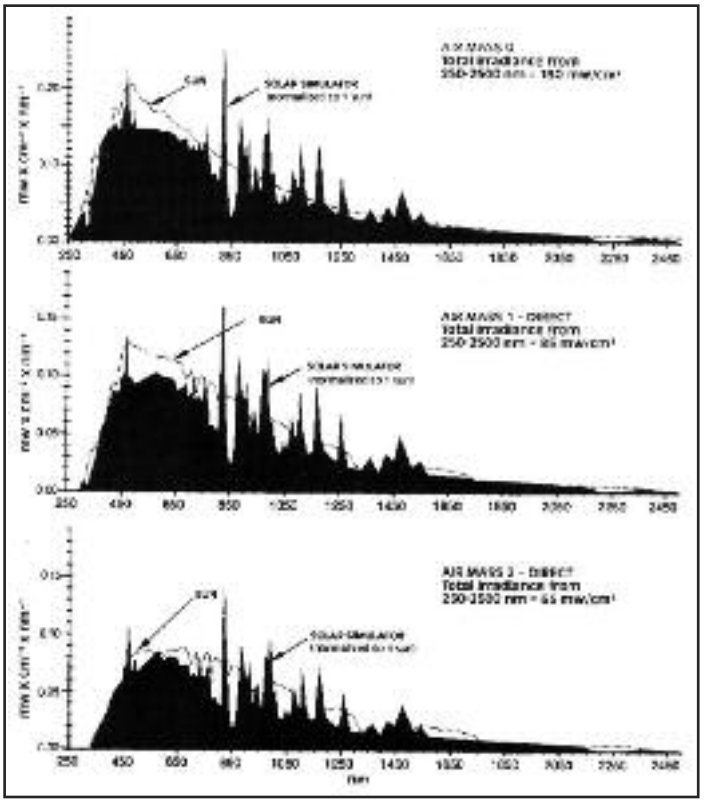
Sciencetech offers three solar simulator systems in differing powers and components. The fiber optic / 1" collimated beam 150 W system (low cost), a 150-300 W high throughput system with a 2" and 3" diameter illumination area respectively and a 1 kW system offering power for an 8" diameter target area. An option on the 1 kW system allows for 1.5 kW system providing a 9" diameter illuminated area.

150 W system *150-300 W system*
1 kW system *1.5 kW system*

Sciencetech solar simulators have class B or better performance under ASTM standard E-927-85.

Filters for Solar Simulation Systems

The spectrum of solar radiation is expressed in different ways, depending on the location of measurement. Total ground radiation is called global radiation. The direction of the target surface must be defined for global irradiance. The target surface faces the incoming beam for direct radiation. The spectrum in outer space is the AM0 spectrum, because the radiation does not pass through the atmosphere or Air Mass. When the sun is directly overhead, the radiation that reaches a sea level reference site is AM1 direct radiation, as it passes through the all the air mass of the atmosphere. The atmospheric path for any zenith angle is described relative to the overhead air mass. This includes AM1.5 (48.2° zenith angle) and AM2.0 (60.1° zenith angle).



Sciencetech 150W Collimated Solar Simulator

Sciencetech is proud to offer a low cost 150 W solar simulator system featuring an arc lamp housing and bulb, power supply and igniter, filter holder, solar filters and UV fused silica collimator.

An option for fibre optic illumination is available. An additional condenser and fibre mount is required with this option. Please contact our sales representatives.

The model SF150 produces a 1" diameter collimated beam. The SF150 uses a 150 W ozone-free Xenon lamp with the Sciencetech 201-100 air-cooled arc lamp housing. The system is powered by the Sciencetech 500-220 power supply and igniter.

A multiple filter holder is installed to hold solar filters so the user can selectively attenuate the Xenon spectrum to the desired AM spectrum. The solar filters available are AM0, AM1, AM1.5 direct and global, and AM2.

Other filters such as dichroic filters and bandpass filters are available for further modification of the spectrum. Please inquire.

Model	Description	Price (USD)
SF150	Low cost 150 W solar simulator system including light source, power supply and igniter, AM0 filter and collimator (1" diameter)	$

Accessories

Solar Simulator and Beam Homogenizer Shutter with Controller (two steel blades, activation < 300ms)
(code: ES-HP/s)

Technical Specifications

Lamp housing
- 201-100 air-cooled research arc lamp housing
- Includes back spherical reflector, alignment adjustments, air-cooled
- One collimating lens 1" diameter (UV Fused Silica) at the exit port of the light source.

Lamp
- 100-150XOF, 150 Watts, Xenon, ozone free
- Sciencetech multiple filter holder for the COL65 /CON65 families of condensers and collimators
- Mounts up to three filters

Adjustable Power Supply
Sciencetech 550-200 highly regulated, linear, adjustable power supply for arc lamps up to 250W.
Input: 110-115v/60Hz or 220-240v/50Hz (selectable)
Power: 0-250W
Operating voltage: 0-30V
Operating Current: 0-10A
Pre-ignition voltage: >80V
Ripple at Maximum Current: < 1mV
Stability after warm-up: 0.05%
Line Voltage Regulation: 0.02% current variation for 5V line change
Display: digital LCD

Igniter
Sciencetech 510-IG igniter for 210 series arc lamp housing. Operates automatically.

Optical Feedback Intensity Stabilizer (code: FS-02)

The Optical Feedback unit is a microprocessor based, stand alone unit. It comes with a light sensor, coupled to the light source with a fibre optic cable for temperature isolation. The unit is easy to install/operate, and it is used to monitor the light intensity of the solar simulator. It corrects intensity fluctuations caused by a change in environmental or power conditions by automatically adjusting the power supply output in real time to maintain the same light intensity level. The optical feedback unit uses relative intensity comparison to maintain light levels, and thus is unable to compensate for gradual aging of the lamp.

- Input power: 115/230 Vac, 60/50 Hz, user selectable
- bit control (256 steps)
- Approx. +/- 25% maximum control range (from set point)
- DC Gain: 40
- Input level dynamic ratio: 15 : 1
- Set point accuracy: 1%

High Efficiency Solar Simulator

Sciencetech manufactures three models of its ultra-high efficiency solar simulators. The smallest model is the 500W model, which approaches the power output of most conventional 1000W solar simulators on the market. Sciencetech also manufactures 1000W and 1600W models which are also noticeably more intense than competing models of the same power rating.

Sciencetech solar simulators are ideal for high intensity applications and where energy conservation is important. Sciencetech Solar Simulators achieve their superb efficiency through their proprietary fully reflective design. Unlike conventional solar simulators that utilize light-losing focusing lenses and diffusers to achieve uniformity, Sciencetech's ultra - high efficiency solar simulators utilize only mirrors to "fold" the light from the arc lamp source to the target. The result is a highly uniform illuminated target without the intensity losses or spectral distortions typically found in conventional designs.

A high pressure xenon arc lamp is used as the light source. The spectral distribution of the xenon light source along with the use of specially calibrated Air Mass filters can simulate the sun's true spectral distribution at various earth conditions (i.e. sun directly overhead or at other zenith angles) or even space conditions (no atmosphere).

Version Description	Version Code	Price (USD)
500W Model with Power Supply	SS0.5KW	
1KW Model with Power Supply	SS1.0KW	
1.6KW Model with Power Supply	SS1.6KW	

Highlights

Standard Features
- Xenon Ozone Free Arc lamp (500W, 1000W, or 1,600W)
- Adjustable digital switching power supply with built-in igniter
- Horizontal operation
- Access Door for Exchanging Filters
- MgF2 coated mirrors for UV, visible and IR operation
- Air-cooled

Optional Features
- Spare Xenon arc lamp
- Floor stand and folding mirror for vertical operation
- Computer controlled electronic shutter
- Computer controlled optical feedback intensity stabilizer

Power Density and Target Spot Size

Please note that a 10cm x 10cm square target fits exactly inside a 5.6" beam diameter. The column highlighted in yellow provides the equivalent power of the sun (1 sun).

Technical Specifications

Uniformity:
Constant within 10% over specified area

Stability of Power on Target (Short Term):
± 1% after 30 minutes

Stability of Power on Target (Long Term):
–20% (due to aging of lamp)

Mounting Options:
Horizontal or Vertical

Wavelength Control:
Solar and Bandpass Filter

Dimensions (without power supply):
53" x 30" x 18" (Vertical); 48" x 30 ' x 14" (Horizontal)

Weight (approximate):
55 kg

Distance to Target (typical range):
36" (from edge of solar simulator)

Specification of Sciencetech 500W Model Solar Simulator

Distance From Exit	10"	18"	20"	21"	30"	36"
Beam Diameter	3.7"	5"	5.3"	5.6"	7"	8"
Power without filters, W/cm^2	0.51	0.226	0.19	0.17	0.11	0.078
Power with AM0 filter, W/cm^2	0.31	0.136	0.11	0.10	0.065	0.047
Power with AM0 filter, solar constants (SUN)	2.3	1	0.8	0.7	0.5	0.3
Power with AM1 direct filter, W/cm^2	0.28	0.12	0.10	0.09	0.059	0.043

Specification of Sciencetech 1000W Model Solar Simulator *

Distance from exit	10"	20"	21"	30"	36"
Beam diameter	3.7"	5.3"	5.6"	7"	8"
Power without filters, W/cm^2	1.083	0.406	0.36	0.228	0.164
Power with AM0 filter, W/cm^2	0.646	0.242	0.216	0.136	0.098
Power with AM0 filter, solar constants (SUN)	4.8	1.8	1.6	1	0.7
Power with AM1 direct filter, W/cm^2	0.58	0.22	0.19	0.12	0.087

**: Total Power Output on Target: 90W with 1kW arc lamp*

Specification of Sciencetech 1600W Model Solar Simulator

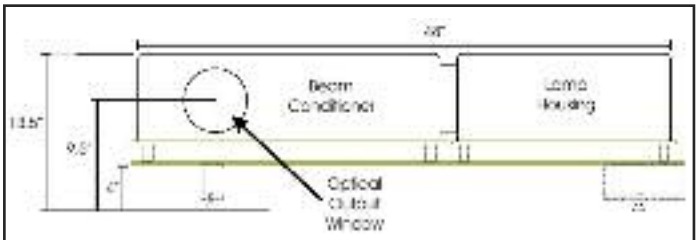
Distance from exit	10"	20"	21"	30"	36"
Beam diameter	3.7"	5.3"	5.6"	7"	8"
Power without filters, W/cm^2	1.46	0.548	0.485	0.308	0.221
Power with AM0 filter, W/cm^2	0.898	0.337	0.29	0.189	0.136
Power with AM0 filter, solar constants (SUN)	6.6	2.5	2.1	1.4	1
Power with AM1 direct filter, W/cm^2	0.81	0.30	0.26	0.17	0.13

Please note that the 1000W and 1500W power supplies can be set to overpower the lamps by at least 20%. Although this would increase the output power density above what is listed in the charts above, overpowering the lamps will also shorten their service life. The above readings are based on maintaining the lamp at its rated power.

Beam Direction

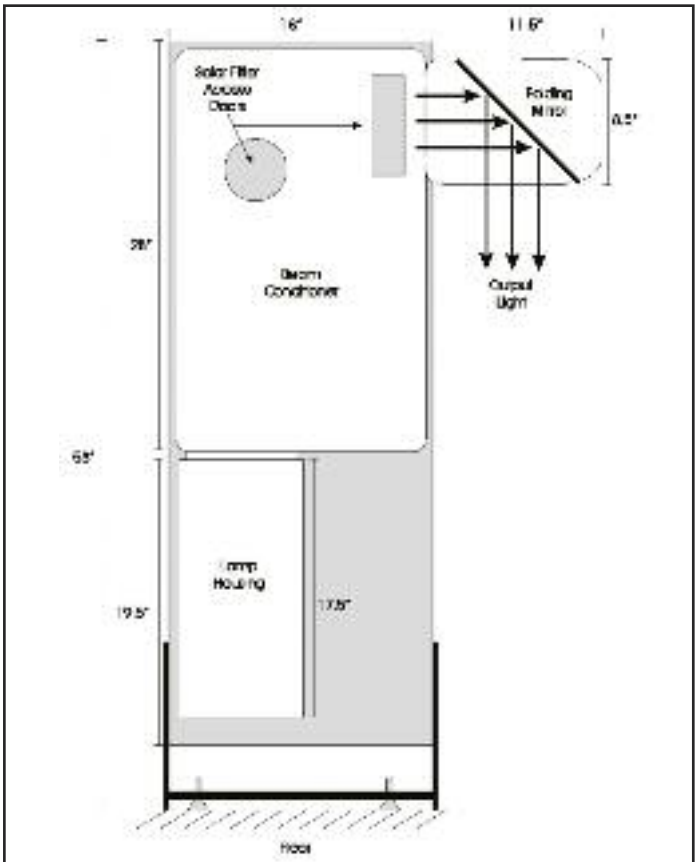
The Solar Simulator can be mounted in a vertical or horizontal position, depending on which direction the user would like to have the output beam.

In a horizontal position, the output beam exits on a side panel and illuminates an area on the wall. An optional 90 degree folding mirror can be mounted at the output window allowing the beam to be redirected upwards towards the ceiling, or downwards towards the floor, or sideways towards the left or right.



Horizontal Mounting Dimensions

For vertical operation, a floor mounted stand is required. The 90 degree folding mirror allows the output beam to be directed downwards towards the floor or horizontally towards the left or right side by rotating the folding mirror.



Vertical Mounting Dimensions

Component Description

Light Source

Sciencetech's Solar Simulator utilizes Sciencetech Model 200-1K arc lamp housing and a xenon ozone free arc lamp as its light source. This particular arc lamp housing has an internal 5.5" diameter diamond turned aluminum f/2.5 ellipsoidal reflector for optimum light collection. All models are air cooled with electric blowers and have adjustment pins to align the focal point of the lamp. The arc lamp is powered through an external adjustable DC power supply. Both the 1000W and 1500W models can be overpowered by 20% while the 500W model can be adjusted between 350W~500W. Although this would result in a higher intensity output, it also shortens the lamp's service life. The power supply has a built - in igniter and a manually operated control panel with LCD display for fine voltage, current, and power adjustments.

Beam Conditioner with Base Plate

Sciencetech's Model 5520BC beam conditioner that forms the rest of the Solar Simulator contains the proprietary fully reflective mirror design that "folds" the light beam from the Sciencetech Model 200-1K arc lamp light source onto a uniformly illuminated output target area. The beam conditioner optics matches that of the Model 200-1K light source housing described above. It also contains the filter holders (with access door) for the air mass (and other) filters, and an optional electronic shutter. The beam conditioner is forced air-cooled. A base plate for mounting the mount beam conditioner and arc lamp source together is also included. Please note that the beam conditioner must be optically calibrated to provide a uniform illumination across a set target distance.

UV Simulator Model

Realizing that some customers may wish to use the Sciencetech ultra-high efficient solar simulator as a high intensity light source with custom spectral distribution, removable transmission and reflection filters including a thermal IR water filter are available as options. Please see Sciencetech's ultra-high efficient UV Simulator for the ultraviolet version of this solar simulator.

Drawbacks

The main drawback to Sciencetech's ultra-high efficiency solar simulators is their large physical size. Unfortunately, using mirrors to "fold" light takes up more optical space than lenses and diffusers. The second drawback is that the mirrors must be aligned according to each target distance. So if the target distance needs to be changed, the mirrors need to be realigned for each setting.

ACCESSORIES

Vertical Operation for Solar Simulators
(VertOp) $

A foot mount vertical stand and beam folding mirror are required for the Solar Simulator to operate in a vertical position. The beam folding mirror, which fits at the output beam port, can rotate the beam upwards or downwards for vertical illumination, or sideways for horizontal illumination.

Electronic Shutter
(SSES) $

An arc lamp is not designed to be frequently turned off and on as that would dramatically lower its service life. In addition, each time it is turned on, it requires the power supply to ignite it with a 20,000V+ spark.

Therefore, an electronic shutter system inside the beam homogenizer is available to control exposure time. Please note that the shutter cannot be closed for long periods of time while the solar simulator is on as the high intensity beam can damage it.

The Electronic Shutter is computer controlled with an activation time of <150 ms.

Optical Feedback Intensity Stabilizer
(FS-02) $

The Optical Feedback unit is a microprocessor based, stand alone unit. It comes with a light sensor, coupled to the light source with a fibre optic cable for temperature isolation. The unit is easy to install/operate, and it is used to monitor the light intensity of the solar simulator. It corrects intensity fluctuations caused by a change in environmental or power conditions by automatically adjusting the power supply output in real time to maintain the same light intensity level. The optical feedback unit uses relative intensity comparison to maintain light levels, and thus is unable to compensate for gradual aging of the lamp.

- Input power: 115/230 Vac, 60/50 Hz, user selectable
- 8 bit control (256 steps)
- approx. +/ - 25% maximum control range (from set point)
- DC Gain: 40
- Input level dynamic ratio: 15: 1
- Set point accuracy: 1%

Group Accessories

Please check the appropriate sections in the catalogue for the following:

Air Mass Solar Filters	(AMFilters)
Spare Xenon Arc Lamps for Solar Simulators	(SpareXeLamps)
Power Supplies for Solar Simulators	(SSPS)

Air Mass Solar Filters

The spectrum of solar radiation is expressed in different ways, depending on the location of measurement. Total ground radiation is called global radiation. The direction of the target surface must be defined for global irradiance. The target surface faces the incoming beam for direct radiation.

Air Mass 0 Filter - 4 inch dia.
(SS 500W, 1kW, 1.5kW Solar Simulators)
(code: AM0 4inch) $

The spectrum in outer space is the AM0 spectrum because the radiation does not pass through the atmosphere or Air Mass.

Specification:

total irradiance from 250-2500nm = 130mW/cm^2

Air Mass 1 Direct Filter - 4 inch dia.
(SS 500W, 1kW, 1.5kW Solar Simulators)
(code: AM1 4inch) $

When the sun is directly overhead, the radiation that reaches a sea level reference site is AM1 direct radiation, as it passes through all the air mass of the atmosphere.

Specification:

total irradiance from 250-2500nm = 85mW/cm^2

Air Mass 1.5 Direct Filter - 4 inch dia.
(SS 500W, 1kW, 1.5kW Solar Simulators)
(code: AM15D 4inch) $

The atmospheric path for any zenith angle is described relative to the overhead air mass. This includes AM1.5 (48.2 degree zenith angle) and AM2.0 (60.1 degree zenith angle).

Air Mass 1.5 Global Filter - 4 inch dia.
(SS 500W, 1kW, 1.5kW Solar Simulators)
(code: AM15G 4inch) $

The atmospheric path for any zenith angle is described relative to the overhead air mass. This includes AM1.5 (48.2 degree zenith angle) and AM2.0 (60.1 degree zenith angle).

Air Mass 2 Direct Filter - 4 inch dia.
(SS 500W, 1kW, 1.5kW Solar Simulators)
(code: AM2 4inch) $

The atmospheric path for any zenith angle is described relative to the overhead air mass. This includes AM1.5 (48.2 degree zenith angle) and AM2.0 (60.1 degree zenith angle).

Spare Xenon Arc Lamps for Solar Simulators

500W Xenon, Ozone-Free
(code: 100500XOF) $ USD

This Xenon Arc lamp has a small arc gap of 0.9mm x 2.5mm, which allows it to achieve 40,000 cd/cm^2. The total lumens is 14,500lm. The service life of this arc lamp is 2000 hrs. and the operating voltage is 17V @ 28A.

1000 W Xenon, Ozone-Free
(code: 1001kXOF) $ USD

The Sciencetech Model 500-1K power supply is designed for this lamp (23VDC, 43.5A, 3000cd, 400cd/mm^2, Avg. life 1000 hours, length 215mm).

1600W Xenon, Ozone-Free
(code: 1001k6XOF) $ USD

The Sciencetech Model 500-1.5K power supply is designed for use with this lamp (24VDC, 65A, 6000cd, 650cd/mm^2, Avg. life 2400 hours, length 370mm). Power Supplies for Solar Simulators

500W Adjustable Power Supply - Xenon
(code: 500-500 -Xe) $ USD

For both Xe and Hg-Xe arc lamps up to 500W. The arc lamp is powered through an external adjustable DC power supply capable of producing 350W~500W. The power supply has a built-in igniter and a manually operated control panel with LCD display for fine voltage, current, and power adjustments. The power supply auto selects the voltage and current between Xenon and HgXe lamps.

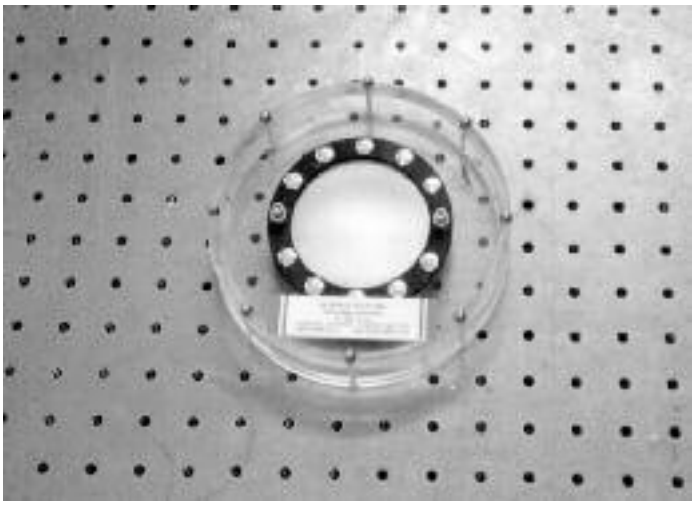
1KW Adjustable Power Supply - Xenon
(code: 500-1K -Xe) $ USD

The Sciencetech 500-1K is a DC power supply for Xenon (Xe) and Mercury Xenon (Hg-Xe) arc lamps from 800 W to 1.2kW. It can drive lamps with a voltage of up to 36 V and currents up to 50 A within a power limitation excluding cable resistance and starter voltage losses. The switch mode design allows for a compact system.

1.5KW Adjustable Power Supply - Xenon
(code: 500- 1.5K -Xe) $ USD

This power supply is used for 800W, 1000W, and 1200W Xenon, Mercury Xenon, and Mercury lamps. DC 1000W~1900W

Infrared Grid Polarizers

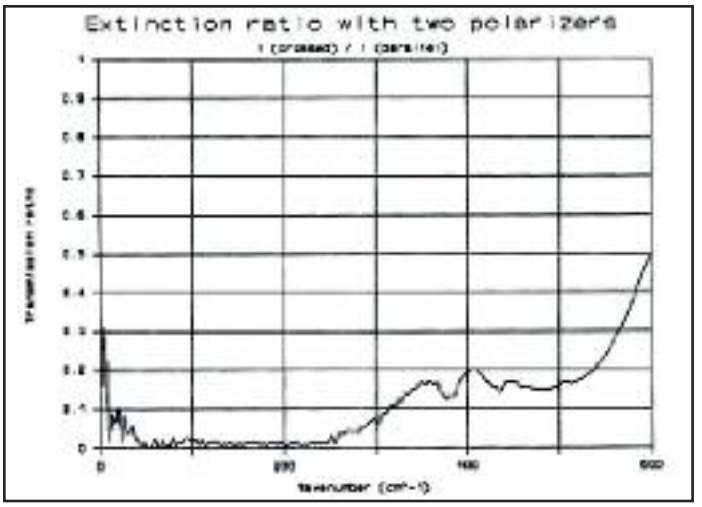


Sciencetech large area far-infrared grid polarizers P280 consist of a conducting grid of parallel wires on a thin substrate. They polarize light for wavelengths longer than the spacing between the wires with a very high degree of polarization.

The masters for the Sciencetech P280 grid polarizers are produced by Sciencetech's special holographic process and reproduced on a film substrate coated with aluminum using photolithographic techniques.

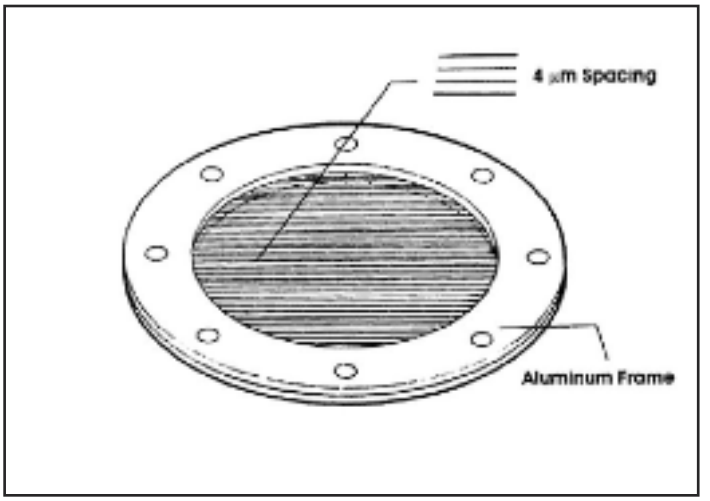
The Sciencetech P280 has the largest clear aperture available on the market for this type of device. This is especially important in the far-infrared, where energy is at a premium. It also has the widest spectral range with a higher frequency cutoff than that of other polarizers that work in the near-millimeter wavelength range.

The Sciencetech P280 is less sensitive to the angle of incidence than regular polarizers. Its line width and pitch are consistent throughout the whole area, making it especially good for interferometric applications. Special stainless steel frames are also available, ground to a flatness of better than 2µm.



Technical Specifications

Frequency Range: 2 - 800 cm^{-1} (0.5 - 5000µm)
Active Aperture: Standard Diameters
GP-1 1" (25.4mm)
GP-2 2" (50.8mm)
GP-3 3" (76.2mm)
GP-4 4" (101.6mm)
GP-5 5" (127mm)
Custom aperture available up to 5" active area
Grid Pitch: 4 µm
Grid Metal: Aluminum
Conductors cross section: 2 µm wide, 0.7 µm thick
Transmitted Intensity: > 85% for wavelengths > 30 µm
> 70% at 16 µm
Degree of Polarization: > 95%
Substrate: Polyethylene Terephthalate, 6 or 12 µm thick
Custom thicknesses from 1.5 to 50 µm available, Other substrates available
Holder: Standard: black anodized aluminum holders outside diameter = active aperture + 1.5"
Custom aluminum or stainless steel (magnetic or non-magnetic) holders can be provided Stainless steel interferometric frames are available (< 2.0 µm thickness)



Model	Description	Price(USD)
GP-1	1" dia. infrared grid polarizer	P.O.R
GP-2	2" dia. infrared grid polarizer	P.O.R
GP-3	3" dia. infrared grid polarizer	P.O.R
GP-4	4" dia. infrared grid polarizer	P.O.R
GP-5	5" dia. infrared grid polarizer	P.O.R

Sciencetech MPT 8000 Microscope Photometer

Dual Output Port Model D Shown

This is a microscope accessory that allows a point on the microscope field of view to be singled out for intensity or spectroscopy measurement while the light from the other areas in the field of view are physically blocked out.

A proprietary 4 curtain mechanism allows the user to crop any rectangular region of any size and any aspect ratio in the field of view to be measured while the remaining regions are blocked out. The cropped field of view can be seen through an observation eye piece. A filter drawer allows the use of colored glass or interferometric filters for the rejection of undesired wavelengths.

Light transmitted through the cropped region is then directed to an output port where its intensity can be measured by an optional detector or further broken down into its constituent wavelengths via an optional monochromator attachment.

The system is light tight and hence even a photon counting detector can be used. A second output port is also available as an option for dual simultaneous measurements with a dichroic mirror or flipping mirror separating the two ports.

Version Description	Version Code	Price (USD)
Single Output Port - with iris	-A	
Single Output Port - with slit area selector	-B	
Dual Output Port - with iris	-C	
Dual Output Port - with slit area selector	-D	

Input Port

The MPT-8000 is designed for interfacing with microscopes. The standard input port has a “C” Mount, but adapters for use with Nikon, Olympus, Leitz and Zeiss microscopes have been made. If your microscope is not a “C” Mount, please indicate which microscope interface mount is required. An additional interface mount cost may be levied if custom development is required.

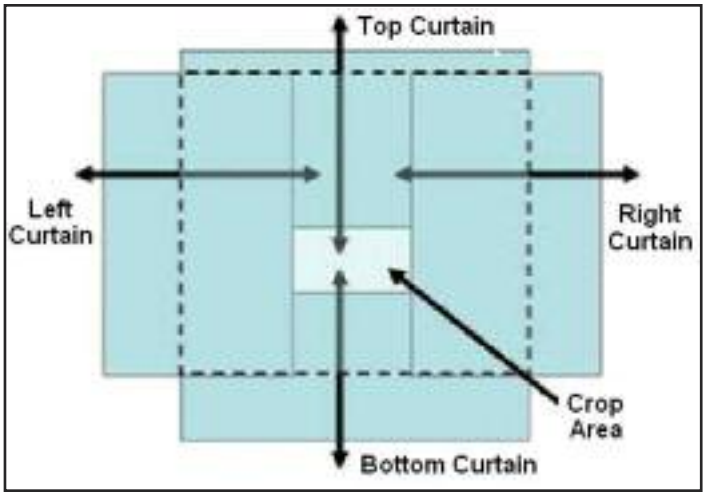
Slit Area Selector

The slit area selector curtain mechanism is immediately behind the microscope mount to crop the field of view region of interest. Referring to the diagram, there are 4 independently translating curtains that allow any region of the field of view to be cropped. The cropped region can also be of any rectangular aspect ratio, not necessarily that of a square.

The 4 independently translating curtains each have their own manual knob adjustment on the outside body. The actual position of each curtain can be viewed through the view finder eye piece.

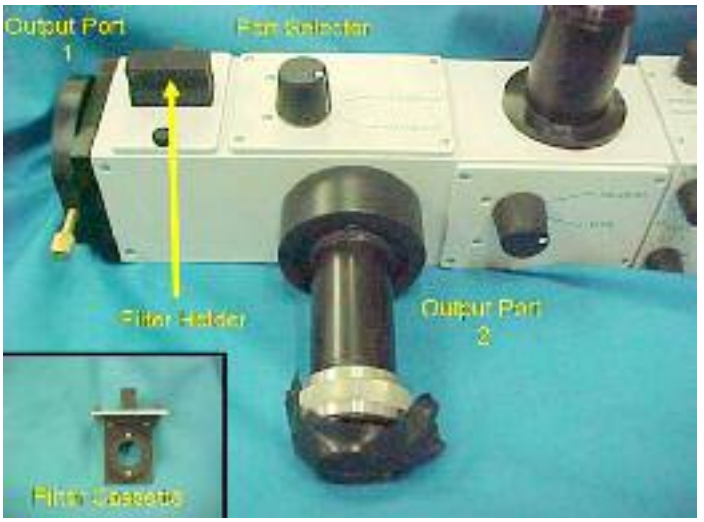
Please note that the precision of the curtain positions are limited to about 1mm, but this is sufficient, considering the entire field of view is over 25mm and the eye piece provides feedback as to the exact position of the curtain.

This slit area selection can be replaced with a circular round iris where only the diameter of the cropped field of view can be adjusted. The centre of this cropped region is always in the middle of the field of view with the iris.



Eye Piece Optical View Finder

The incoming light from the microscope is cropped with the slit area selector. However, to determine exactly which part of the field of view is cropped, an optical eye piece view finder is used as feedback. A flipping mirror allows the user to select between viewing mode and measurement mode.



Output Ports

The MPT 8000 can have up to two output ports. The main output port has a standard quick release mount for mating to a high sensitivity Sciencetech PMT detector for intensity measurements. This quick release mount could be exchanged for another type of single channel detector or even to a Sciencetech scanning monochromator or spectrograph for wavelength spectral analysis. If the main output port is used for intensity measurements, the optional second output port can be mated to a Sciencetech scanning monochromator or spectrograph for wavelength spectral analysis. Instead, the second port can also be mated to an area CCD detector. The output port selector controls an internal flipping mirror to direct the cropped light to the selected output port. The flipping mirror could be upgraded to a dichroic beam splitter so both ports can capture the same output light at once.

Filter Holder

A 1" filter holder is placed between the field of view area selection curtains and main detector port so only the light from the selected area is filtered. If the dual output port model is selected, please note that the filter only applies to the main port. A removable holder cassette allows easy removal and replacement of the filters. The filter holder cassette can support round or squared filters.

Detector

The standard and recommended detector for the MPT-8000 is the Sciencetech PMT detector for its high sensitivity and wide selection of spectral range PMT tubes (sensors) available. If the selected area from the field of view is small, the intensity of light passing through is very low, which only a PMT detector would be able to adequately detect. Please see the selection of Sciencetech PMT detectors for use with the MPT-8000 Microscope Photometer.

MPT-8000 shown with Sciencetech PMH-2 PMT Detector attached