

Designer and Manufacturer of Scientific Instruments since 1985

SCIENCETECH



MODULAR OPTICAL SYSTEMS AND COMPONENTS

SOLAR SIMULATORS
SPECTROSCOPY
PV CHARACTERIZATION &
CUSTOM SOLUTIONS

www.sciencetech-inc.com

Company Profile



- Established in 1985 by three physicists and one engineer.
- Currently 33 employees, about half holding advanced degrees in Physics, Chemistry, Chemical Engineering and Mechanical Engineering.
- Sciencetech is a 930 m² manufacturing facility in London, Ontario Canada which is currently being expanded.



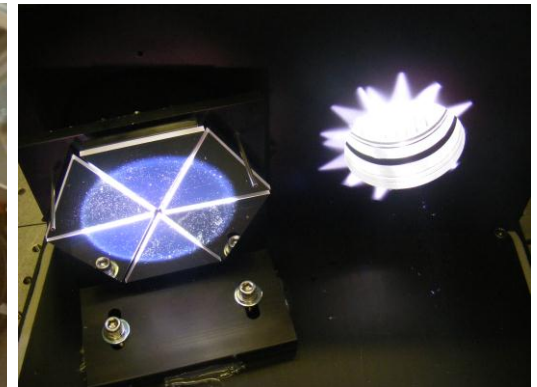
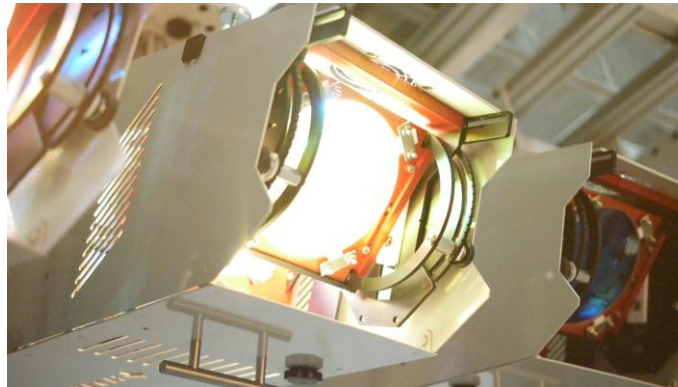
Main Products

- Solar Simulators
- Photovoltaic Testing Solutions
- Modular Spectroscopy
- Electrochemical Work Stations



Main Applications

- Aerospace
- Cosmetic Testing
- Photovoltaics
- Photochemistry
- Materials Science



Solar Simulators



Sciencetech Solar Simulators comply with the following international standards

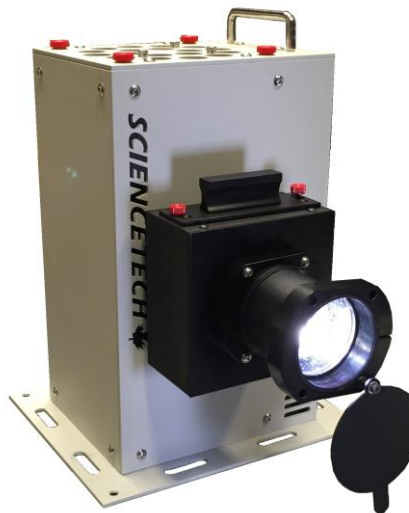
- **ASTM E927** : Specification for Solar Simulation for Photovoltaic Testing,
- **IEC 60904-9** : Solar Simulator performance requirements.
- **JIS C 8912** : Solar simulators for crystalline solar cells and modules.
- **IEC 61215** : Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval.
- **IEC 61646** : Thin-film terrestrial photovoltaic (PV) modules – Design qualification and type approval.



Low Cost, Lens Based Solar Simulators

SF Series

- 300 - 2000 nm
- Xenon arc lamps : 150W, 300W
- Class AAA
- Collimation: 1.0° half angle (highly collimated)
- Target size up to 50 mm diameter
- One sun irradiance



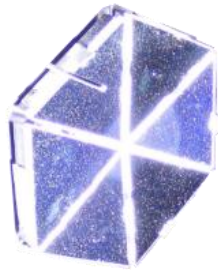
SLB Series

- 350 – 2000 nm
- Xenon arc lamps : 150W, 300W
- Class AAA
- Target size up to 50 x 50 mm squared area
- One sun irradiance

Fully Reflective Solar Simulator

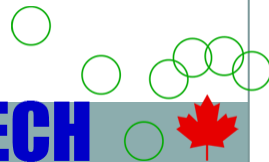


- Metal coated mirrors allow for the whole spectrum to be passed without compromise.
- We have four high powered versions of fully reflective solar simulators using xenon arc lamps of 0.5 kW , 1.0 kW, 1.6 kW and 2.5 kW.
- Sciencetech also manufactures small 150W high efficiency solar simulators.



★ Hexagonal segment mirrors
for exceptional uniformity
and high efficiency

- 300 nm – 2000 nm
- Up to Class AAA
- Up to 2 suns irradiance
- Target size up to 34 cm diameter



Large Area Solar Simulators (LASI)



- 0.5 x 0.5 m – 3 x 3 m target ranges are available.
- Consists of a light source, beam homogenizer, power supply and necessary IR filter to adjust to the solar spectrum.
- Uses a 1600W Xenon Arc Lamp with a spectral range of 350-1800 nm. Lamp power can be customized.
- Sciencetech manufactures custom products to fit your requirements for target area, collimation, power output and spectral ranges.
- Additional accessories : System Enclosures, IV Test Equipment, Custom Filters, Calibrated Reference Cells etc.



Other Solar Simulators for Larger Areas

Flash Solar Simulators



- Class AAA
- Generally uses 1000W Xenon lamp
- Pulse duration: 0.5 – 10 ms
- Target Size: up to 2m × 2m
- One of the largest, most uniform solar simulators currently available on the market.

LED Solar Simulators

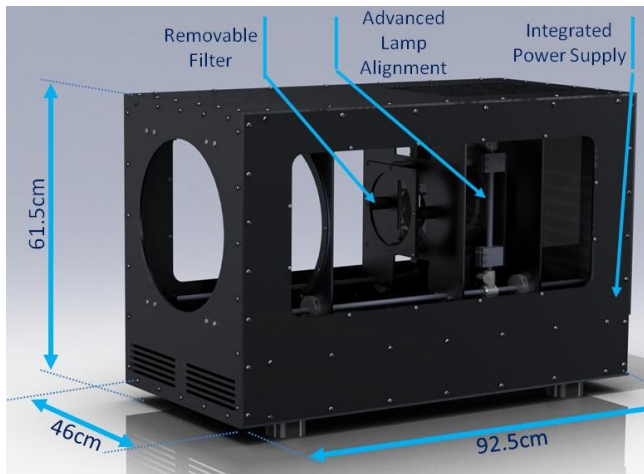


- Target areas from 7 cm x 7 cm up to 2m x 2m
- AAA Standard
- Light Source : 16 LED channels
- Reduced Operating Costs : 30-70% lower power consumption.



Highly Collimated Fresnel Solar Simulator

- Highly collimated with a half angle of 0.5°
- Target area diameters : 22cm – 30 cm.
- One sun (AM1.5D) intensity level.
- Fresnel lenses are used as optics.



Ultra High Efficiency (UHE) Solar Simulators

- Class AAA
- Lamp type : Xenon Arc lamps from 150 - 300 W)
- Target size up to 30 x 30 cm.
- Customization can be done according to your needs!
- Please contact one of our technical representatives for assistance.



UHE-NS/NL Solar Simulator



- The UHE-NS/NL family of solar simulators are ultra high efficiency, convenient, integrated work stations which uses a uniform xenon light source.
- Uses Xenon lamps : 150 – 1600W. Can be customized accordingly.
- Produces 1 Sun (+/-) 10% solar irradiance. Illumination area 50x50 mm² – 300x300 mm²
- Provide Class AAA with downward facing or horizontal beams.
- Spectral range 300-1800 nm
- Maintains Sciencetech's proprietary "Fully Reflective" design maximizing ultraviolet light.



Fiberized Solar Simulators

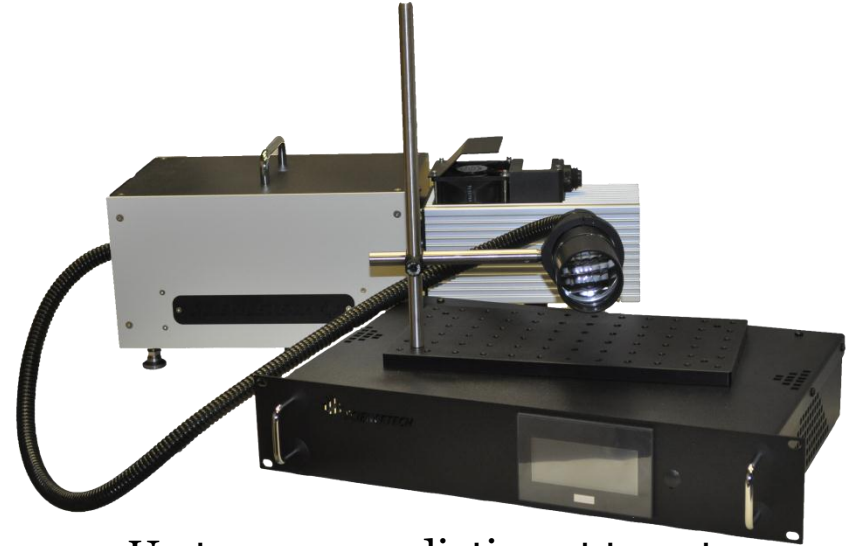
A4 Light line



Up to 12 suns radiation at target plane

- Xenon lamp sources (300-1000 W)
- Class AAA Standard
- Up to 50 x 50 mm target size

A1 Light line



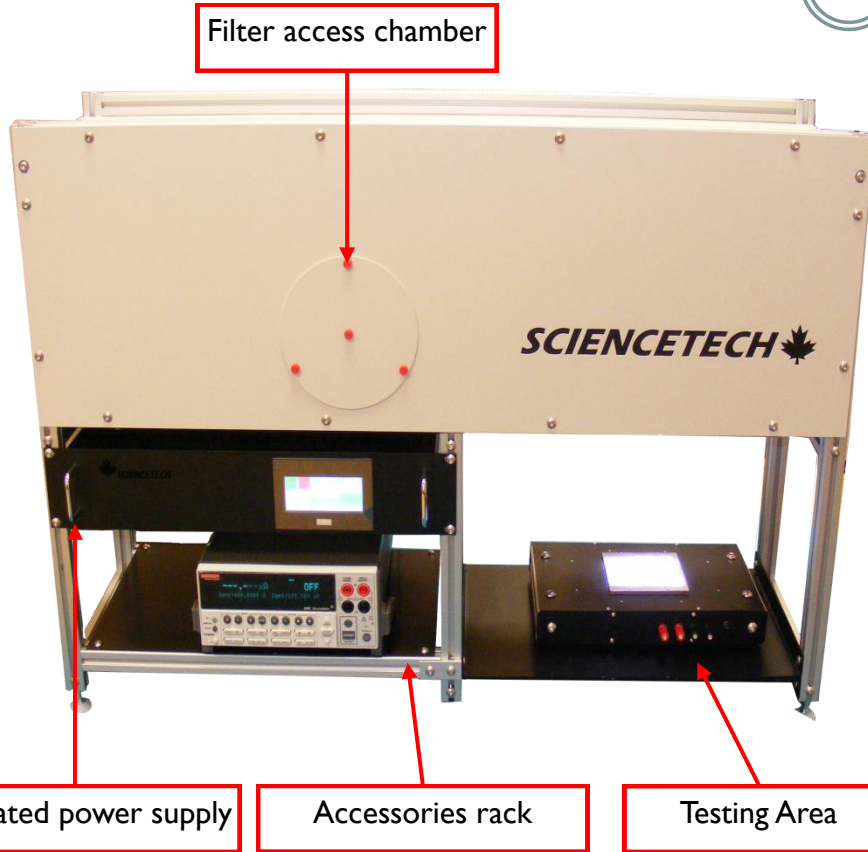
- Up to 4 suns radiation at target plane
- Xenon lamp source: 300 W
- Class AAA Standard
- Up to 25 x 25 mm target size

Brings the light source to your sample!

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Solar Simulator Work Stations



- Features a convenient bench-top configuration with automatic shutter, beam turner for vertical beam orientation, and 2-position filter holder.
- Xenon arc sources : 150 – 300 W
- Spectrum range 350 nm – 2000 nm
- Produces Class AAA standard
- Target size up to 60 mm × 60 mm
- Up to 2 suns irradiance at target plane
- Excellent choice when collimation and significant UV light are not needed.



Photovoltaic Testing solutions



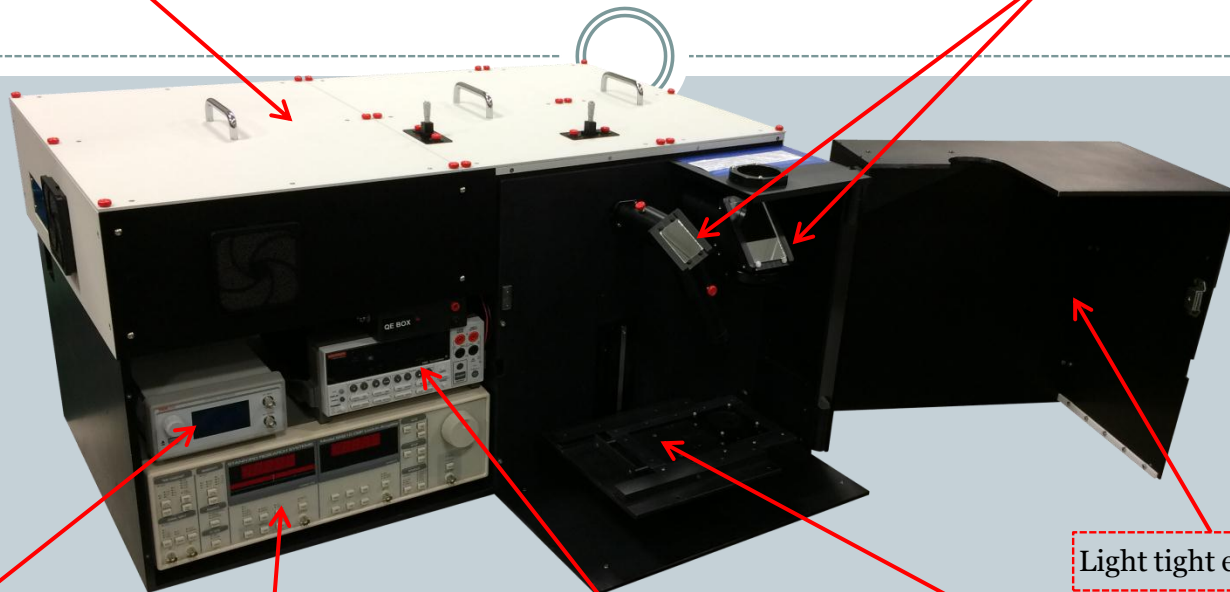
- IV measurements, Spectral Responsivity and External and Internal Quantum Efficiency available with the system.
- Additional methods include:
Constant Photocurrent, Dual Beam Photoconductivity, Photothermal Deflection Spectroscopy, and Steady State Photoconductivity.
- Uses a 150W Xe arc lamp or 250W QTH tunable source for the monochromator with motorized triple grating system.
- 75W Ultra-stable biased light with a calibrated range of 250-2500 nm in the reference detector.
- Stanford Lock-in Amplifier SR800 series for data acquisition, Keithley 2400 sourcemeter, order sorting filters, and IV testers are all included.



Quantum Efficiency and Spectral Responsivity

Light Source, Source Modulator,
Monochromatic Source, Order Sorting Filters,
and Xenon Bias Light integrated into top area

Optical system: beam turners for
monochromatic and white light



Optical chopper controller

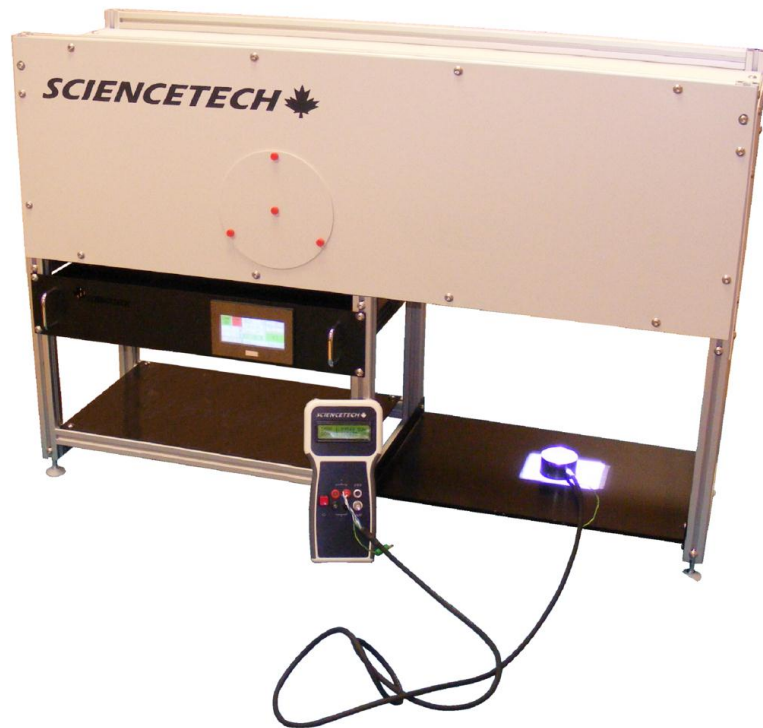
Light tight enclosure

Lock-in amplifier for
synchronous detection:
Stanford 800 series

DUT: cell chuck and detector

Source Meter: Keithley
2400 series (for biasing the
Device Under Test (DUT))

(PTS-LED-QE) Quantum Efficiency System



- Spectral output is controlled by individual LEDs and includes IV measurements, Spectral response and QE system.
- Less expensive and simpler compared to a standard Laboratory EQE measurement system.
- Power and spectral response measurements can be combined in a single tool saving valuable processing time.
- Illuminating cell size 2 x 2 cm with a class AAA solar simulation.





Modular Spectroscopy

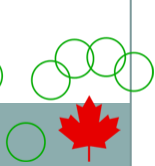
Sciencetech Modular Spectroscopy Systems give you the ultimate flexibility



Modular Spectroscopy



- Tunable Light Sources
- Fluorescence Spectrometers
- Fourier Transform Spectrometers
- Raman Spectrometers
- Spectroradiometers
- Spectrophotometers
- Laser-Induced Breakdown Spectrometers



Research Grade Light Sources



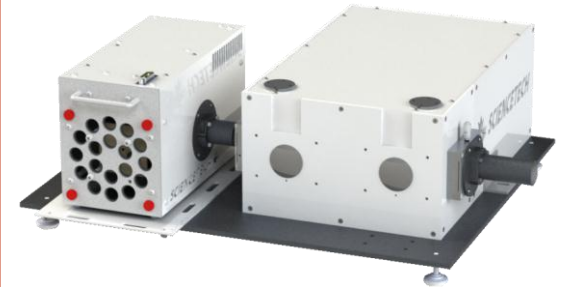
Xenon Lamps/ Housings



Infrared Lamps/ Housings



Tunable Light Sources

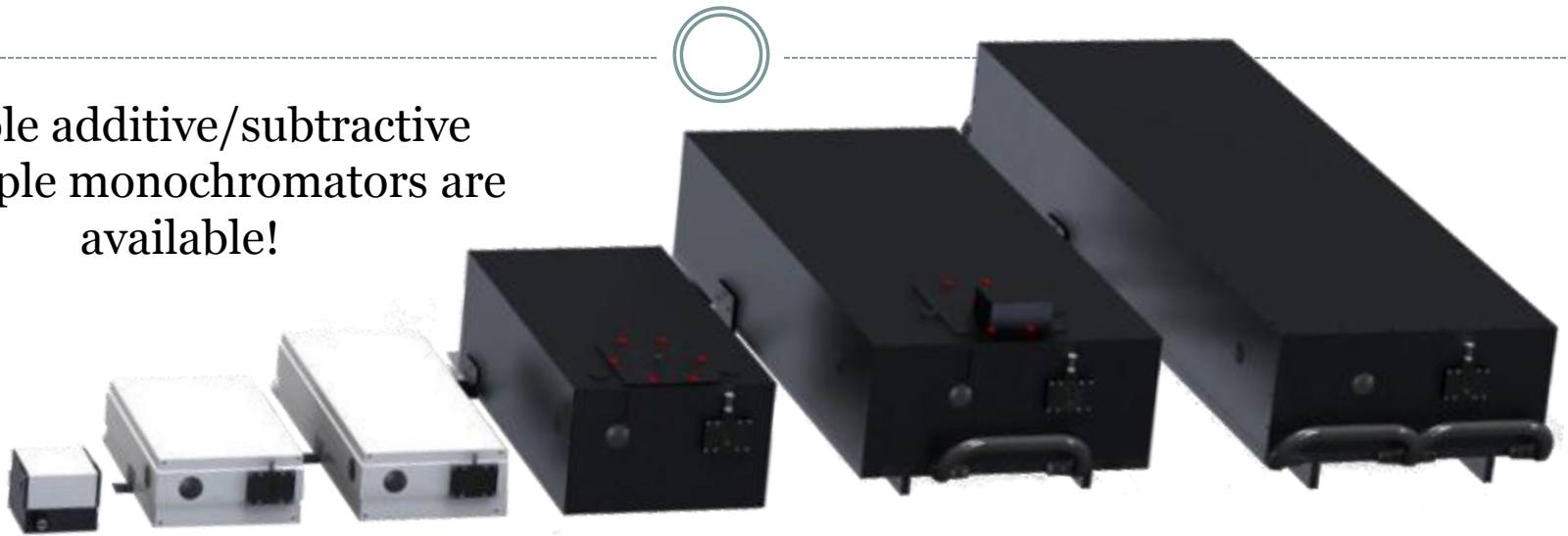


- Light Sources available from the deep UV to the far IR, in Collimated or Focused, Non-Tunable or Tunable variations.
- Power input can be varied from 75W to 6.5kW, operates vertically or horizontally.
- Optics can be inserted as your choice, depending on your research needs



Monochromators

Double additive/subtractive
and triple monochromators are
available!



9030 9072 9010 9055 9057 9040 9490 9150

Focal Length (mm) 100 125 200 250 457 550 1000 1500

F/# 3.2 3.5 3.5 3.5 8 6.9 13 12

Resolution (nm) 1 0.4 0.4 0.2 0.2 0.03 0.017 0.013

Turret Configuration* S
(32 × 32) T
(30 × 30) D
(50 × 50) T
(50 × 50) T
(50 × 50) T
(64 × 64) T
(64 × 64) S
(110 × 110)

*(S for single, D for double, T for triple, grating size mm × mm)





Fourier-Transform Terahertz Spectroscopy

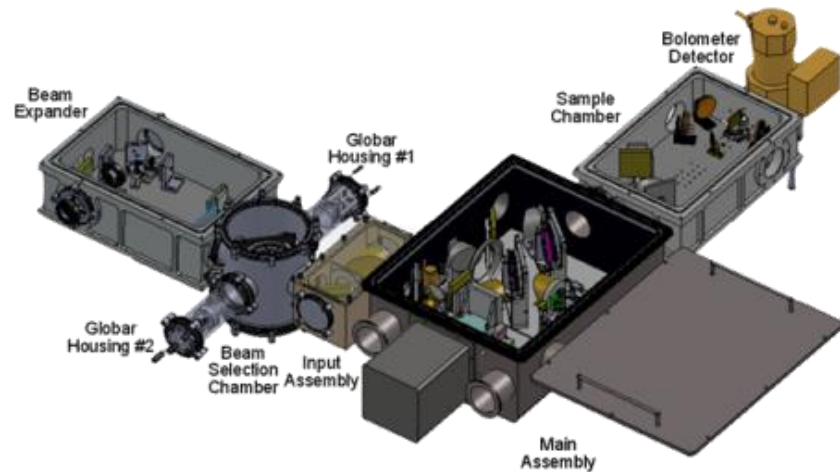


THz FTIR SPS-300



“Every SPS is a work of art.”

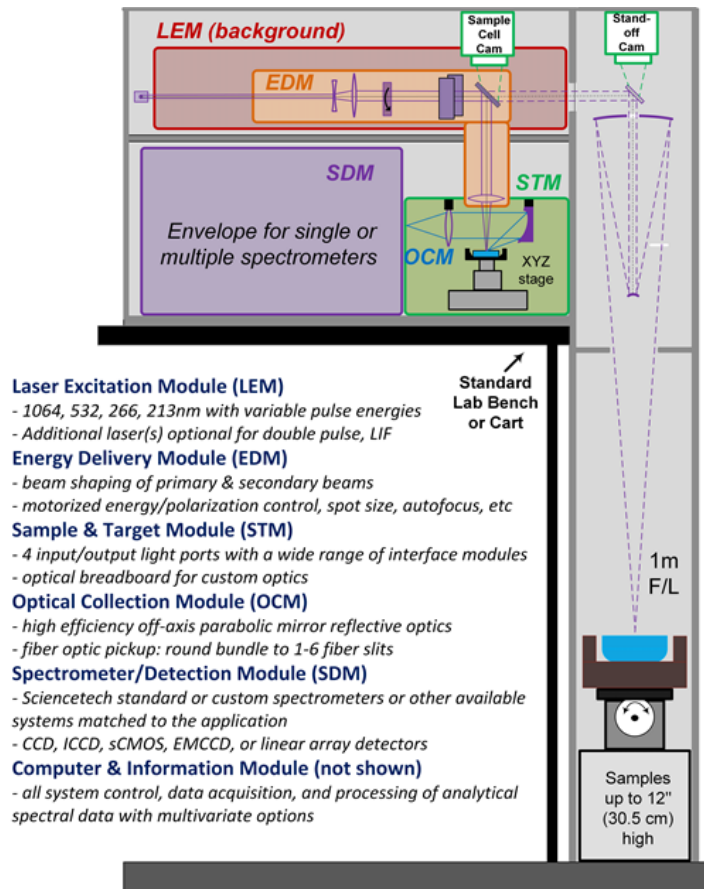
– Terry Barnes, Manufacturing Technologist in Sciencetech



- Modified Michelson (Martin-Puplett) Interferometer, vacuum compatible, helium cooled bolometer
- Designed specifically to operate in the far infrared or THz spectral region (operating at wavelengths from $5 \mu\text{m}$ to $5000 \mu\text{m}$, 0.06 to 60 THz or 2 cm^{-1} to 2000 cm^{-1})



Laser Induced Breakdown Spectroscopy (LIBS)



- At Sciencetech we pride ourselves in providing custom solutions for your atomic emission spectroscopy needs.
- LIBS can analyze any matter regardless of its physical state.
- With our modular instrumentations, we can customize and cater the system to your needs.
- Whether this involves increased resolution requirements, a unique probe design or incorporation into an existing system, we have the capacity to design an ideal solution.

This configuration template is meant as a guide for our LIBS system and does not represent a concrete schematic.





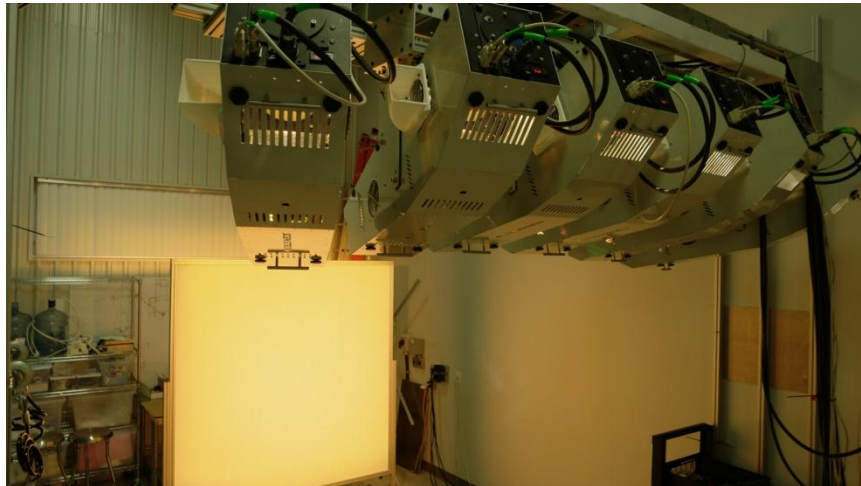
Custom Solutions

Sciencetech offers custom solutions from light sources to spectroscopy systems that specifically fit your research or industrial needs.

A few of our diverse custom projects and large scale manufactured equipment are listed in the following slides.



IR Solar Simulator for 3D Camera Testing



- Target Area 1×1 m meeting $\pm 5\%$ Non-uniformity.
- Target Area 1.5×1.5 m meeting.
- Spectral match better than ASTM Class A for 700 nm – 1000 nm.
- Power and uniformity maintained over 30 cm depth.



UV Solar Simulator for Air-pollution Studies in the Upper Atmosphere



- Solar simulator illuminates a rotating cylindrical drum designed to hold aerosols in suspension.
- 6.5 kW Light Source, 0.5 m² target area with a beam collimation of 1° half angle.
- AMO spectral match with variable intensity from 0.25- 1 sun and ambient room temperature is to be kept below 23° C.
- All equipment in the system were to fit within a room of dimensions ~3m width by ~5m length by 2.5m height.
- The intensity, cross sectional area, room size, and cooling requirements made the system a significant engineering challenge which Sciencetech was able to successfully overcome.



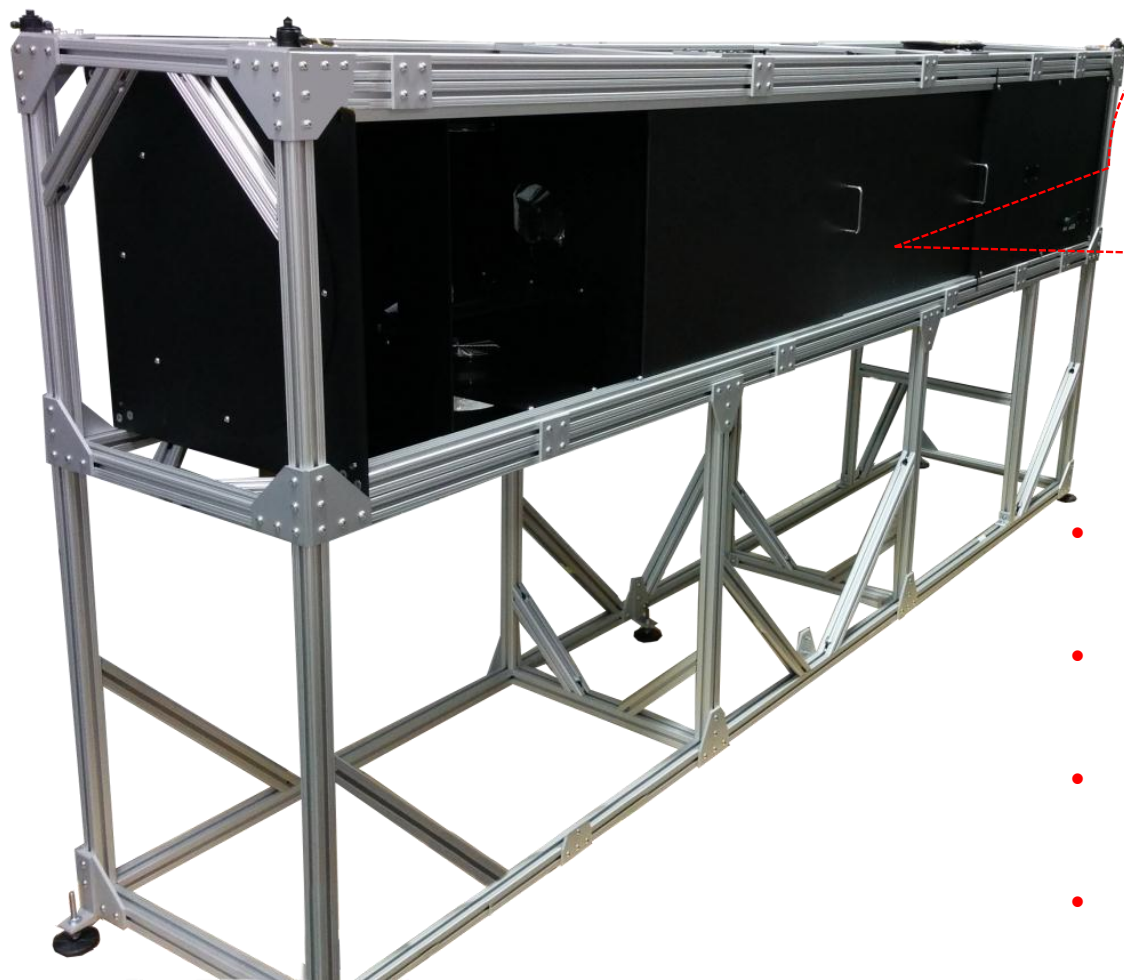
Large Area QTH Solar Simulator



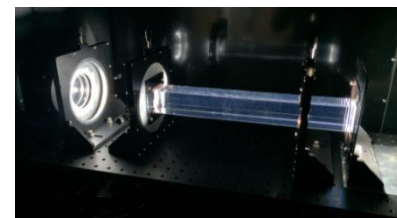
- Consists of multiple QTH sources and illuminates a target area of 1.5 x 1.5 m.
- Wavelength ranges from 700-1100 nm at one sun intensity of AM1.5G Class.
- Temporal Instability of Irradiance +/-5%.
- Attenuation down to 0.1 Sun for the 700-1100 nm wavelength range while maintaining the color temperature to within 10%.



Large-area Solar Illuminator for PV Testing in Extra-terrestrial Planetary Conditions



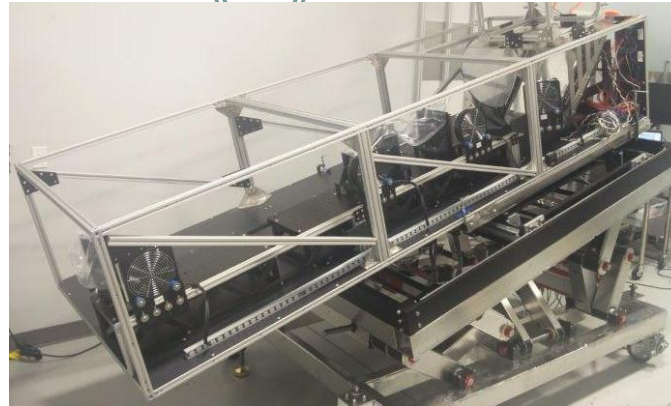
40 cm long quartz
homogenizing rod for non-
uniformity requirement



- 6.5 kW Xenon Arc Lamp
- Target size 1m x 1m
- Uniformity $\pm 25\%$
- Temporal Stability 2%



Standalone Solar Simulator (SS) and Moving System (MS)

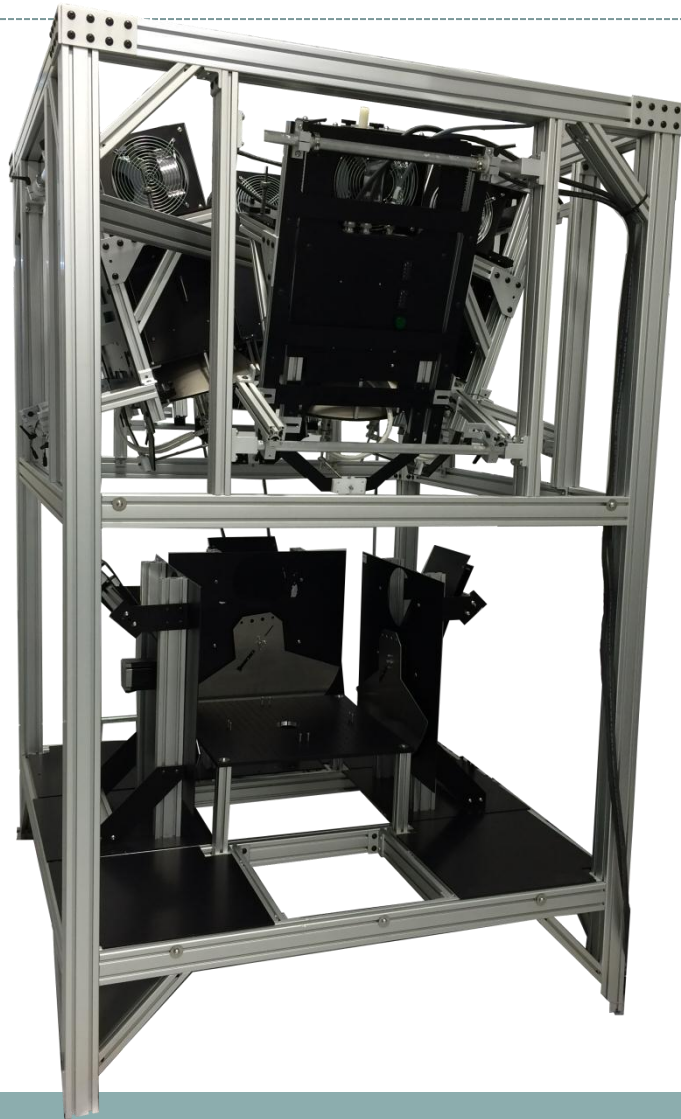


The Moving System controls the position and incident angle of the SS which is mounted on top of the System.



- 0.5° full-angle collimated beam is 400 mm in diameter, 1 sun with AMO spectral match at a 3 m working distance.
- Beam can be translated 60 cm in the X and Y directions, 40 cm in the Z direction and can rotate $\pm 15^\circ$ both about the X-axis and the Z-axis.
- Extraordinary effort was put into providing the highest level of temporal stability (0.2%) and 3% spatial non-uniformity of irradiance in the full range of the incident angles.

10 kW Spot-Focused Image Furnace for Ultra-high Temperature Oxidation Studies



Screw melts in 30 seconds with only 20% power



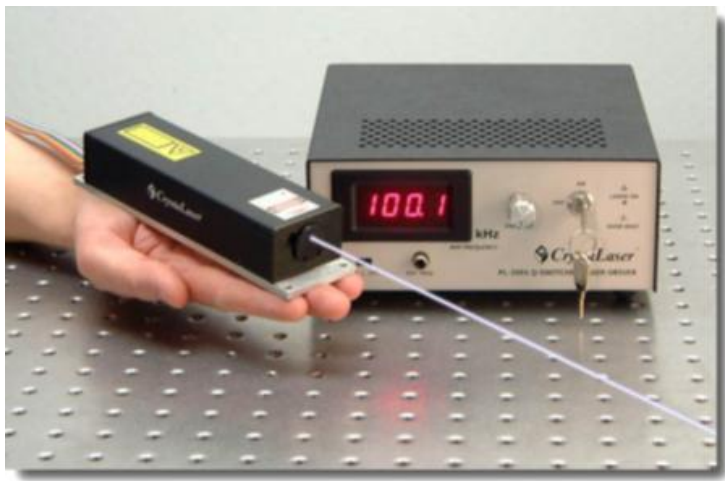
- Four 6.5 kW Xenon Arc Lamps
- Target size 5 cm diameter
- More than 10 kW optical power at target plane



Dual Wavelength Fast Time-Gated Laser Induced Fluorescence System (TGF)



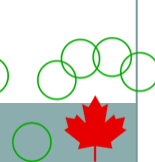
- The TGF measure time gated fluorescence from a sample using laser induced fluorescence (LIF) method.
- TGF allowed for the excitement and spectral measurement of fluorescence of samples at two distinct laser lines (351 nm and 262 nm).
- Sample excitation is based on two newly introduced Neodymium Yttrium-Lithium-Fluoride lasers.
- The induced fluorescence is spectrally dispersed and then measured with a nano-second time gated camera.





Electrochemistry

Zahner electrochemistry (in Canada only)



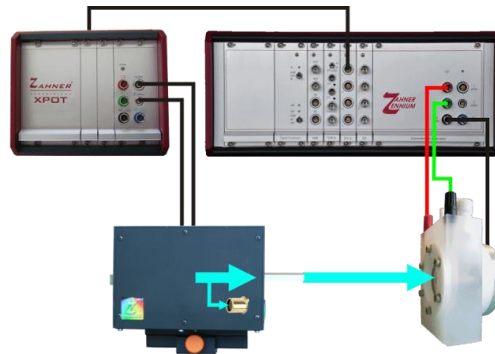
ZAHNER-elektrik's only authorized distributor in Canada



- Applications include corrosion, coating, Li-ion battery, fuel cell, solar cell, etc.



Potentiostat

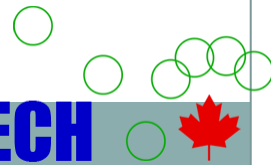


Complete Workstation



Accessories

	Zennium X	Zennium pro	Zennium	Zennium E
Upper frequency limit	12 MHz	8 MHz	4 MHz	2 MHz
Current range	±4.0A	±3.0A	±2.5A	±2.0A
Extension slots	10	5	4	N.A.
Max parallel channels	17	5	5	N.A.





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**THANK YOU VERY MUCH AND DO CONTACT
US FOR YOUR OPTICAL SPECTROSCOPY AND
SOLAR SIMULATOR NEEDS!**

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