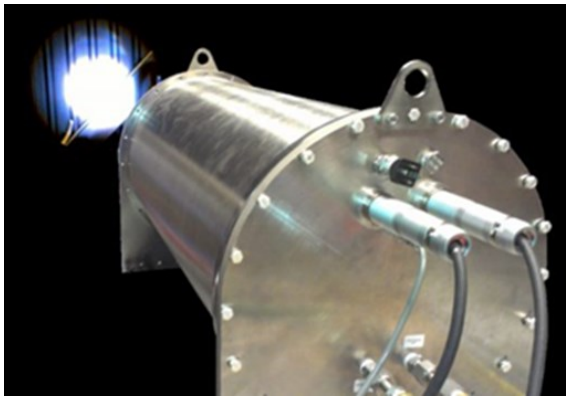
SOLAR SIMULATORS FOR SPACE RELATED RESEARCH

1. Highly collimated Fresnel Solar simulator for space environment simulation

A globally recognized space agency approached SCIENCETECH to custom design a highly collimated solar simulator. It was required to be placed within a vacuum chamber. The solar simulator was part of a larger system to simulate extra-terrestrial environments within a controlled laboratory.



Main Characteristics of the system

The illumination area was defined as a 36 cm diameter target area and the solar spectrum provided AM0 spectral match in order to simulate the solar irradiance in space. An irradiation of 1360 W/m^2 was achieved at the target plane to meet the required levels of optical power on target. This solar simulator was designed to illuminate with high spatial uniformity and temporal stability as defined by ASTM E927-10 standards.

Inside this issue

If you have any questions or would like to discuss with one of our engineers about your special requirements, do email us at :

sales@Sciencetech-Inc.com

SCIENCETECH INC. 1450 Global Drive, London, Ontario Canada, N6N 1R3
Phone: +1 (519) 644-0135 - **Email:** sales@sciencetech-inc.com - www.sciencetech-inc.com

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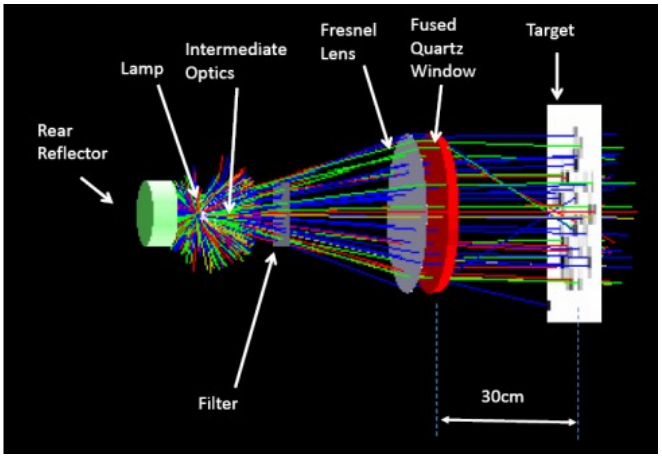
Complex ray tracing models were developed to assess the optical characteristics of the proposed solar simulator system. After the development of the optical design, we were able to obtain more than 85% of the optical power within ±0.7° of the collimation full angle. This was more than enough to provide the required power on target.

The solar simulator was required to be installed within a vacuum chamber. The solar simulator housing was specifically manufactured by a professional vacuum system engineering company and was guaranteed to be leak-tight.

The system went through an on-site acceptance testing at the end user's facilities and was successful installed by Sciencetech's service engineers.



Ray tracing model of the Fresnel Solar Simulator

2. Highly Collimated Solar Simulator with automated beam angle movement

This solar simulator was also developed for a prominent national space agency to test sensors equipped within satellites. Some members of the customer agency had hands-on experience using one of Sciencetech's highly collimated solar simulators several years ago. They reached out to Sciencetech and asked if we could provide a solar simulator with an extraordinarily close match to the Sun.

The customer had precise guidelines for:

- Irradiance : 1 sun (AM0 spectral match)
- Collimation angle : 0.7°
- Spatial non-uniformity : Class A
- Attenuation : down to 10% in increments
- Clean-room compliance : ISO Class 5
- Automated beam angle movement

The system was designed to manipulate the solar simulator in X, Y, Z, and 2 rotation angles so that the incident light angles can be changed. The entire system was sealed for use in a clean room, including an isolated air cooling system preventing contamination of the clean room environment.

Would you like to read more about these projects? Do contact us for more details at :

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

- This Solar simulator illuminates a rotating cylindrical drum designed to test aerosols suspended in the upper atmosphere.

- We used a 6.5 kW Xenon Light Source to illuminate a 0.5 m^2 target area with a beam collimation of 1° half angle.
- AM0 spectral match with variable attenuation from 0.25- 1 sun was provided and ambient room temperature was to be maintained at 23◦ C.

- All equipment in the system were to fit within a room of dimensions 3 m x 5 m x 2.5 m.
- The intensity, cross sectional area, room size, and cooling requirements made the system a significant engineering challenge which Sciencetech was able to successfully overcome.

Ongoing projects : 5m x 5m solar simulator for environmental simulation

Recent developments in SCIENCETECH has resulted in the designing of a large area solar simulator worth 2.3 million dollars. This solar simulator is being built to :

- Illuminate a 5 mx 5 m target area
- Be fitted into multi environment simulation chambers.
- Consists of a modular array of full spectrum metal halide lamps.
- Each lamp can be controlled to turn on or off via control software in order to attenuate the power on target.
- Comply with precise spectral matching requirements.
- Extensive testing is already being conducted to prove conformity of the required specifications.
- High spatial uniformity over the 5m x 5m will be provided
- Air flow within the testing area will be

Do visit us at www.sciencetech-inc.com for more information.

If you have any inquiries about our past projects or if you would like to discuss your special requirements with one of our engineers, please do direct the emails to :

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ABOUT US

SCIENCETECH INC. has been designing and manufacturing optical spectroscopic instruments and solar simulators in Canada since 1985.

During the past 34 years, we have supplied spectroscopic instruments, among them, solar simulators, far infrared Terahertz spectroscopy systems, photovoltaic testing equipment, and custom made instruments to distinguished institutions around the world like:

- The National Aeronautics and Space Administration (NASA),
- The European Space Agency (ESA),
- The Jet Propulsion Laboratory (JPL),
- The Max Planck Institute for Solid State Research,
- The Max Planck Institute for the Structure and Dynamics of Matter,
- The Brookhaven National Laboratory,
- The Herzberg Institute of Astrophysics,
- The Argonne National Lab,
- over 2,000 top universities plus many synchrotron and accelerator facilities, and government institutions.

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