

Ground, Aerial, Vacuum and Space Systems Capabilities



Traceable Testing Solutions
0.3 – 14 μm (UV/VIS/NIR/SWIR/MWIR/LWIR)

Bare Sensor/CCD/CMOS Testing

Imaging Camera/Sensor Testing

Flat Fielding/Non-Uniformity Correction

Linearity and Dynamic Range Testing Solutions

Signal-to-Noise (SNR) Characterization
or Night Vision Levels

Target Illumination
(PSF, MTF, Keystone, Edge-effects, etc.)

Hyper and Multi Spectral Calibration Solutions

Quantum Efficiency Testing Solutions
(Spectral or In-Band)

Spectral "Blending" of Light Sources
(LED, Lasers and Xenon/Tungsten)

In-Vacuum Calibration Solutions



MEASURE
any light source

CREATE
any spectrum

REFLECT
any wavelength

Develop solutions that fit
your chip, module, camera
or telescope needs

Discuss testing procedures
to get best possible uncertainty
and test methods for your
products

Determine a level of optical
performance, automation,
accuracy and speed to meet
today's challenging applications
in remote sensing

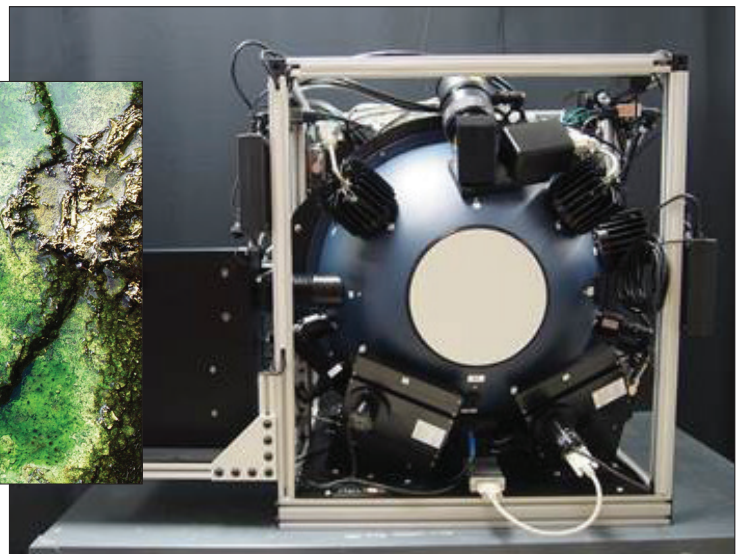
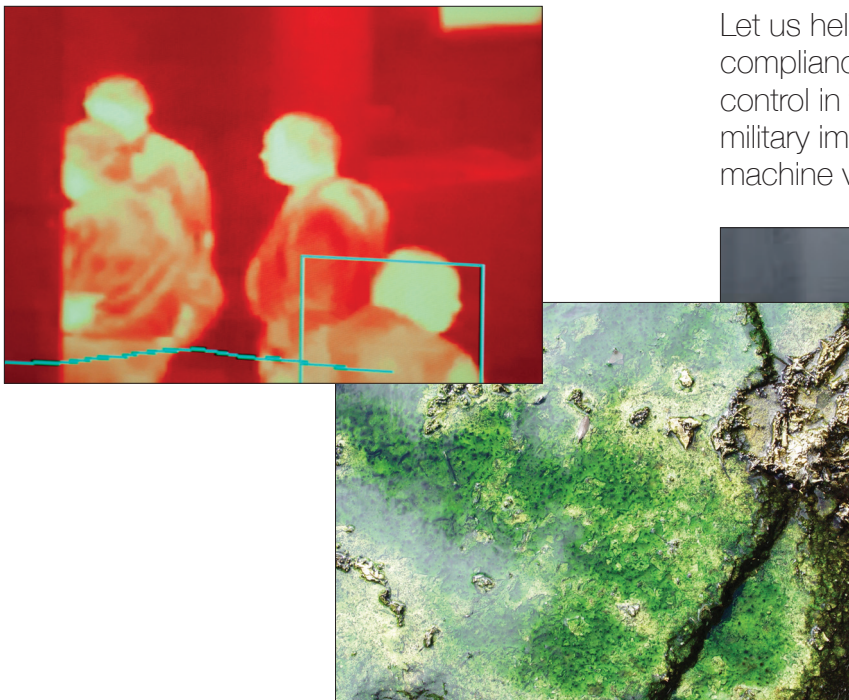
Determine product performance
at a lower level in the value
chain to maximize your yields
and standardize/characterize
product output

Engineer and build a solution
with our experts to meet
your budget

Labsphere is the world's premier source for ground-based calibration systems for large earth observing satellites, imaging systems and remote sensing optical calibration solutions. We are the world leader in sphere-based uniform source system design and implementation. We are committed to always being on the cutting edge in measurement uncertainty and system performance that enables the next generation of remote sensing, climate science, military hardware and tactical calibration. We can operate traceably in any test environment condition from vacuum to ambient and over a wide range of temperatures.

In addition to our highest performing systems, we offer a modular and flexible product line that enables us to engineer product to your specific test problems, uncertainty requirements and budget. We offer broad-band, solar-like, vacuum compatible and spectral source solutions that focus on everything from FPA or chip level testing to finished telescopes and all levels of product in between. Our solutions range from simple manual systems to fully automated/software integrated production test systems that engage with your product at frame-grabber, FPA, camera or prober level. Our staff is current on all testing standards (EMVA-1288, MIL, and others) and we are NIST-traceable for source system calibrations.

Let us help you build your laboratory, obtain compliance and bring your products under your control in the fast moving world of remote sensing, military imaging systems, scientific imaging and machine vision.



HELIOS® Legacy System for NASA PACE Satellite

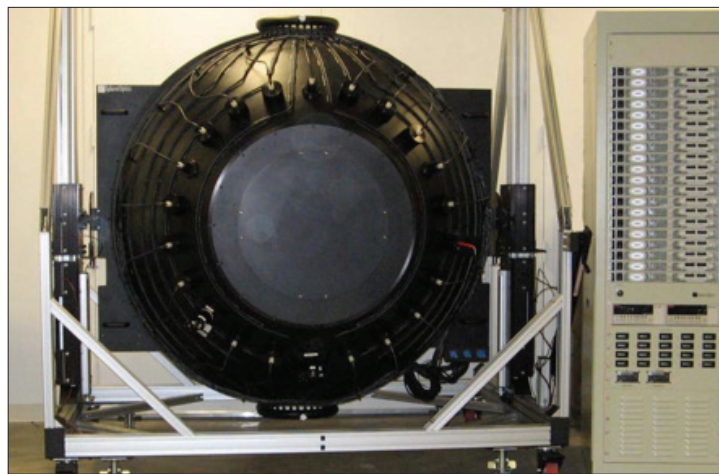
Ground-based Imager or Sensor Testing

Solutions for ground-based testing are driven by the needs and testing of today's cutting edge satellites, small sats, terrestrial and airborne imaging systems.

Incredible dynamic range, solar spectrums, precision multi-band and spectral monitoring and most of all unprecedented levels of low uncertainty are the hallmark of the science and military remote sensing programs today.

Whether you are trying to understand weather and climate changes, investigating hyperspectral applications or have specific tactical requirements, Labsphere can build a test system that will suit your needs.

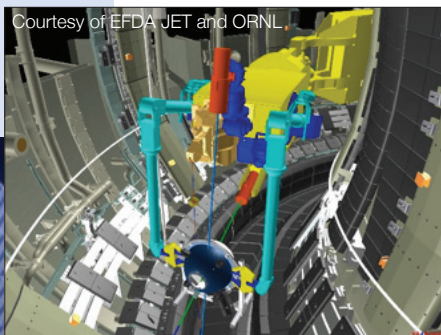
Solutions are available for a huge range of aperture sizes: <25 mm to >2 m.



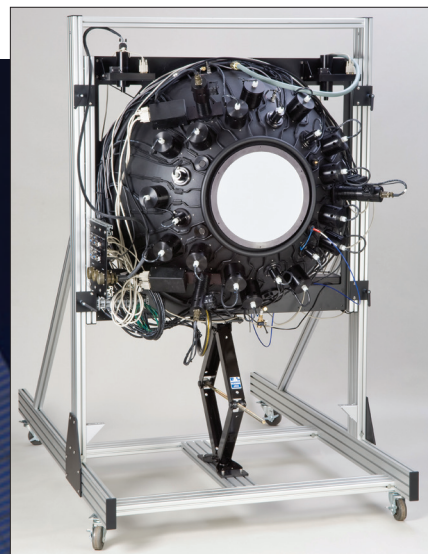
1.5 m, 11 kW Water-Cooled, N2 Purged Calibration System



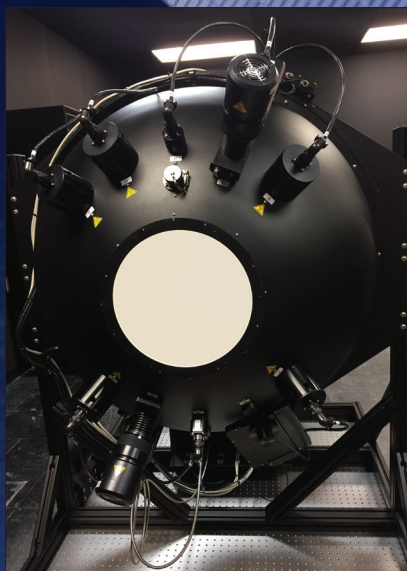
20 kW, 2 m Sphere, 1.5 m Aperture with Plasma and QTH



12 in System for Harsh Environment Tokamak Sensor Calibration



9 kW, 7-Decade Dynamic Range, Water-Cooled Ground-Based Optical Calibration System



40" Spectralon® Calibration Sphere for Sentinel 4

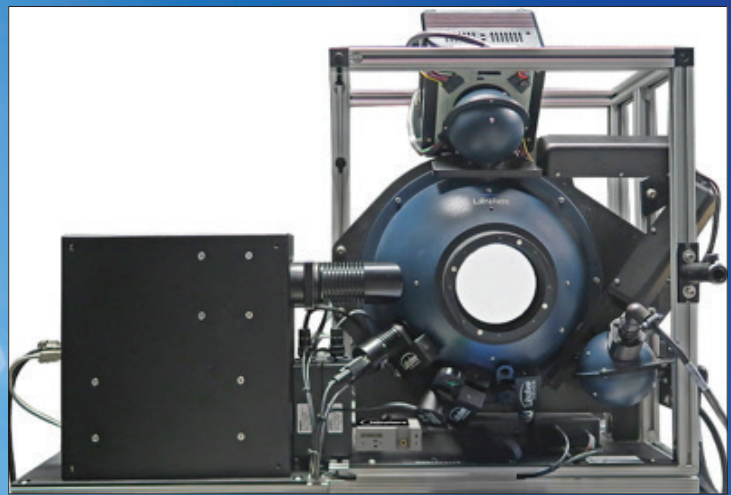
Innovative Spectrums

An ideal calibration source is a uniform, spectral signature identical to the target(s) of interest: top of atmosphere as reflected from clouds, snow, deserts, forests or ocean surfaces. Labsphere furnishes a wide range of sources to meet these spectral requirements including:

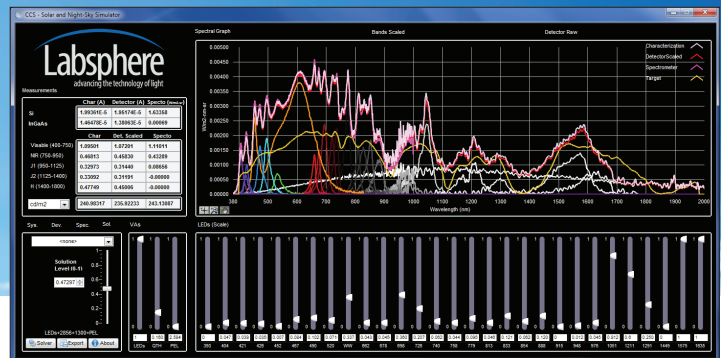
- Tungsten halogen
- Xenon
- Electrodeless plasma sources
- LEDs

Tungsten halogen lamps are still the staple of most optical calibration programs and instruments and spheres are no exception.

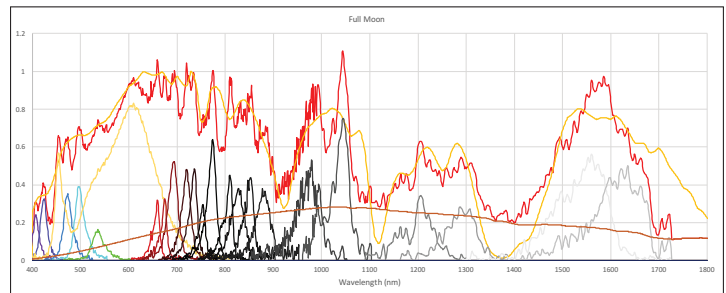
Labsphere regularly seeks solutions with more solar-like spectrums to improve blue and UV band signal ratios to provide spectrums that are almost spectrally identical to terrestrial or even extra-terrestrial solar sources.



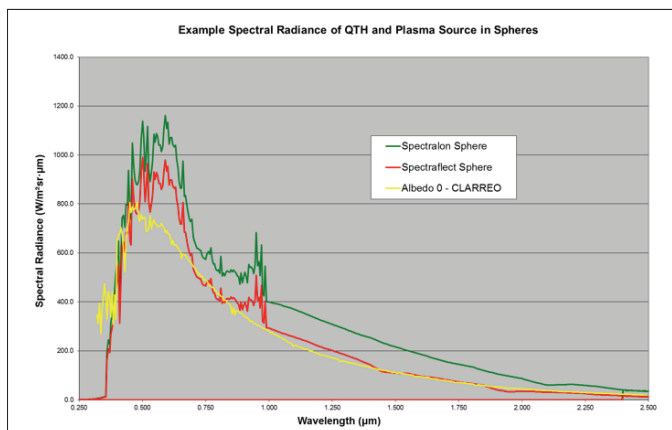
Spectrally Tunable Light Engine for UV-VIS-NIR-SWIR



Expanded CCS Platform for Tunable Light Engine



Tunable Spectral Calibration System Showing Night Sky Spectrum



Example Spectral Radiance of QTH and Plasma Source in Spheres

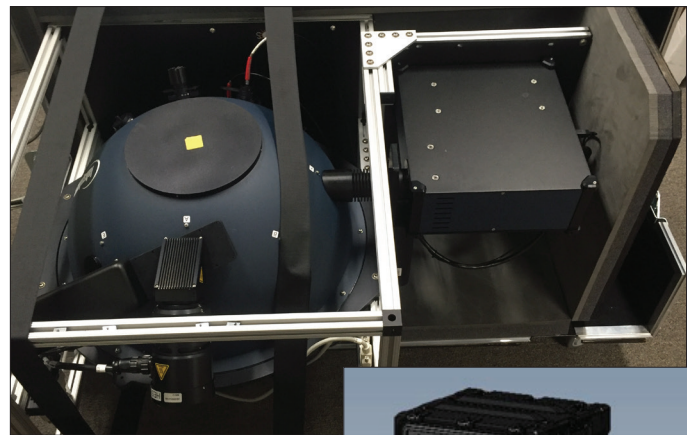
Labsphere has conducted feasibility studies on challenging sources for NASA to find spectrums that can be used to simulate flight conditions. With today's hyperspectral and multi-band system requirements even more band-selectable sources such as lasers and blue or UV LEDs are becoming critical to testing needs. Labsphere has also created spectrally tunable sources using combinations of the above referenced materials. Let us help you with your custom spectral requirement applications.

Airborne Calibration Solutions

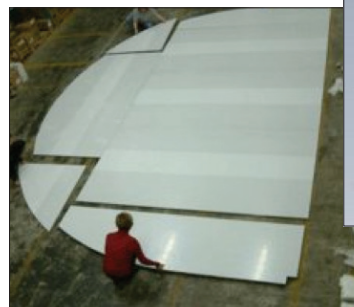
The need for precise radiometric solutions for aerial reconnaissance and imaging is steadily increasing with the advent of Unmanned Aerial Vehicles (UAVs) and more detailed image requirements in a variety of challenging tactical environments. Science has also taken to the air with hyperspectral, LiDAR and spectral sensing applications that require accurate calibration and portability to remote locations.

Labsphere can create a variety of field-based solutions for real-time calibration:

- Custom onboard solutions for real-time radiometric verification in aircraft
- Large, weather resistant targets used at-site for ground truth measurements
- Mobile sphere system solutions that sit in the hangar ready to deploy for fast calibration and certification needs.



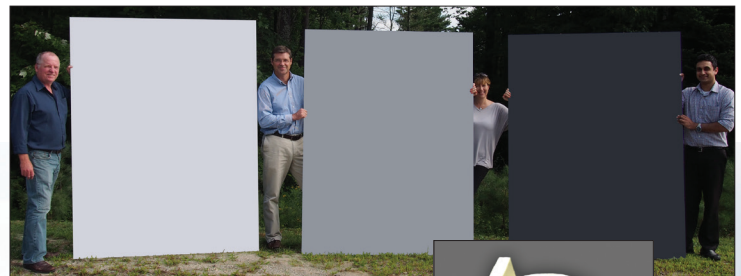
Airplane Fuselage Multi-Band Calibration Source for Reconnaissance Applications



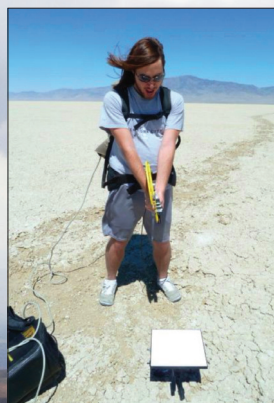
Lightweight, Modular, Large Area Lambertian Calibration Target



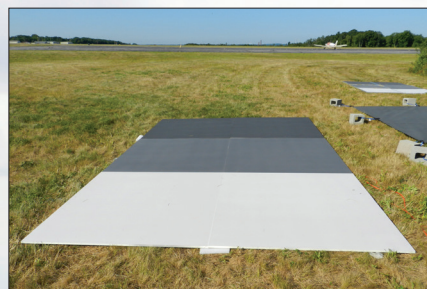
Ruggedized Hyperspectral Calibration Source for Hangar and Runway Deployment



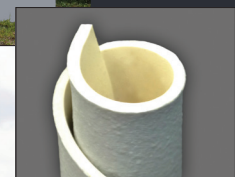
1.2 x 2.4 m LiDAR Targets



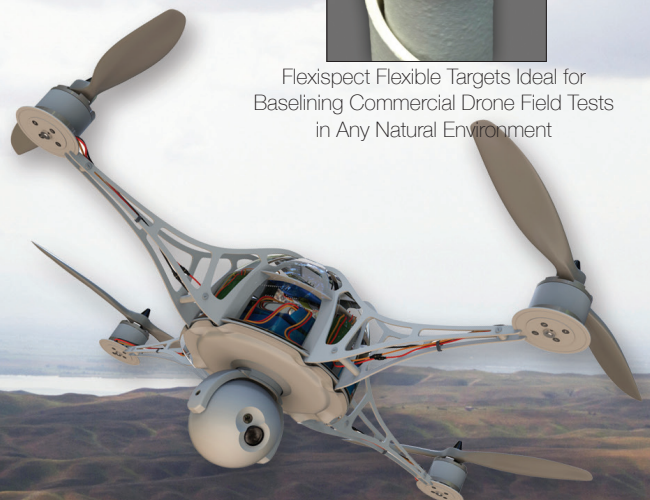
Classic Spectralon Target for Spectral Ground Truth Reflectance

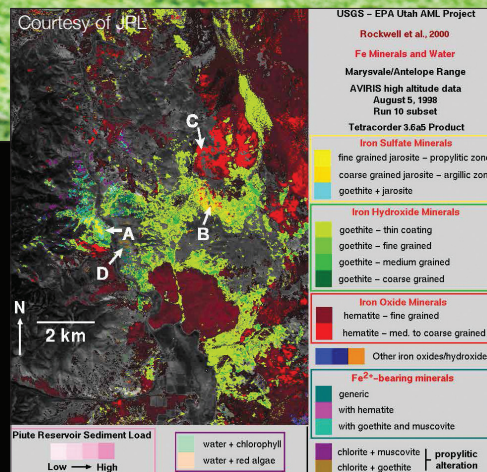
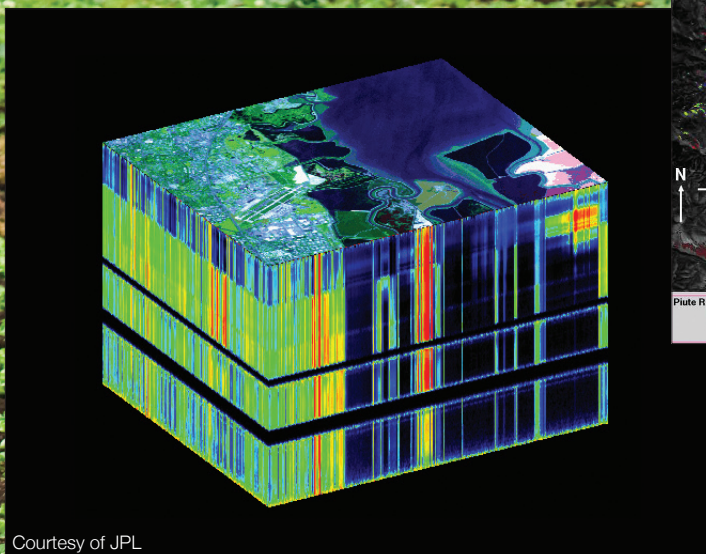


Edgeless Permafect® Targets for Airborne Calibration



Flexispect Flexible Targets Ideal for Baseline Commercial Drone Field Tests in Any Natural Environment





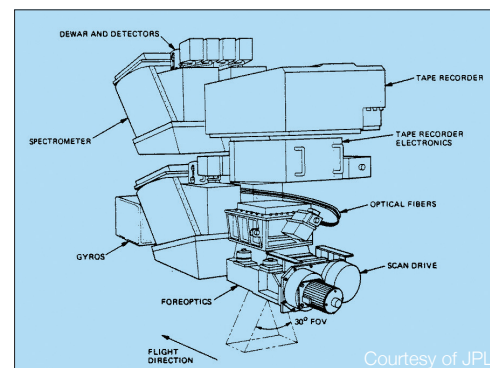
Images and a Hyper-cube
from Systems for Agriculture,
Aerosols from Fires, and
Mining Applications

Courtesy of JPL

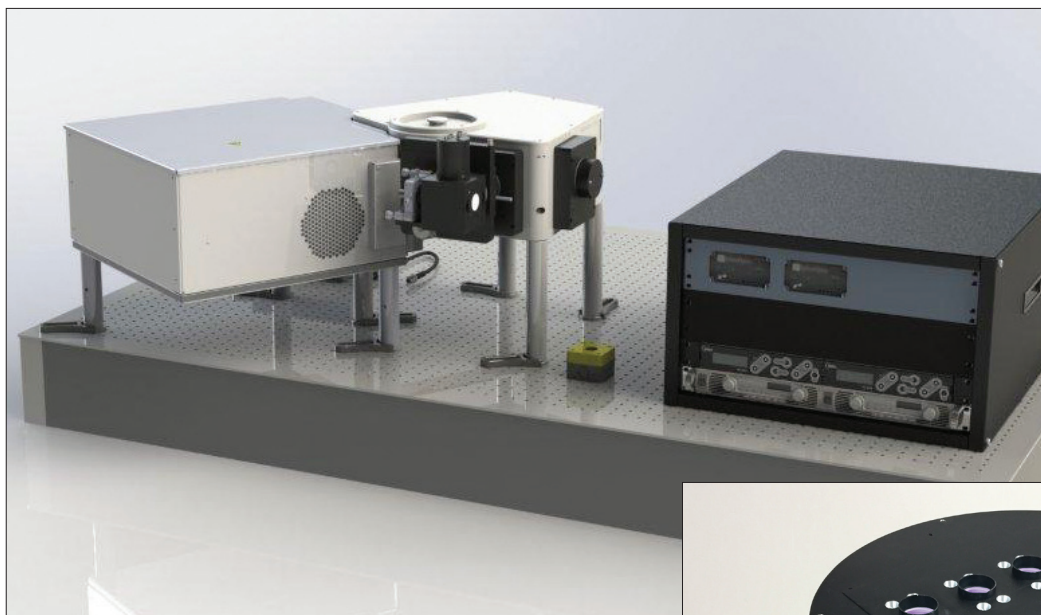
Hyperspectral Calibration Solutions

One of the most dynamic changes to the remote sensing market is the innovation of hyperspectral imagers. These challenging devices combine a conventional 2D image with a third dimension containing spectral or band information to create a "hyper-cube". Calibration also gets a third dimension of complexity in dealing with simultaneous imaging issues, broadband scenes, spectral registration and stray light (in and out of band) considerations.

Labsphere can create complete, absolute calibration systems that combine broad spectrums, monochromatic or line sources, and high dynamic ranges to meet the requirements of this new and rapidly evolving technology.



AVIRIS Hyperspectral Instrument -
One of the Forerunners of Today's Compact,
Commercial and Military Solutions

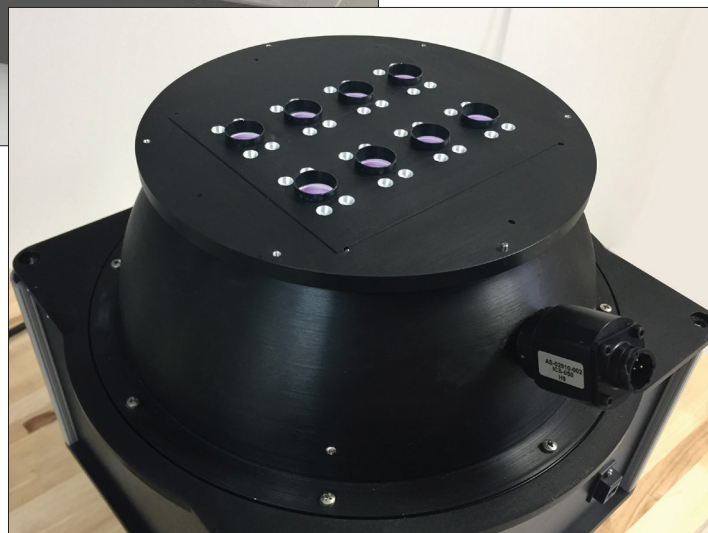


Absolute, Radiance and Irradiance Spectral and Broadband Illuminator for Image FPA Testing

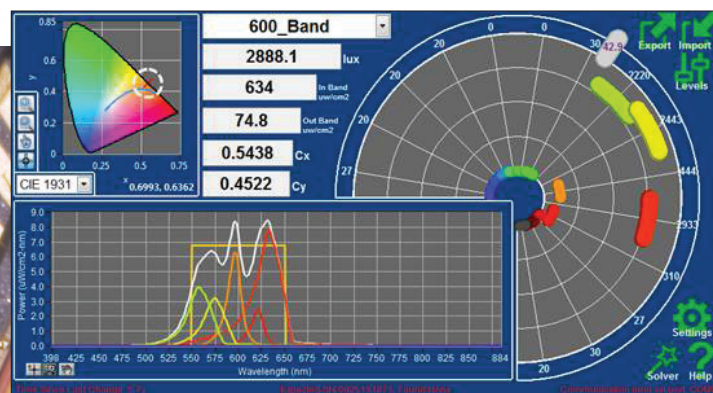
Quantum Efficiency for FPA or Prober Based Solutions

Baseline characterization of FPAs and imaging chips is required at the earliest possible point in production helping to sort out critical performance and yield issues while keeping costs as low as possible.

Labsphere has designed uniform irradiance systems for wafer prober, prepackaged chip and raw-FPA level testing of spectral quantum efficiency (QE), flat fielding, linearity, dynamic range and special controlled angle sets.



Multi-Port Test Unit on Pick and Place Production Line and Spectral Band Radiance

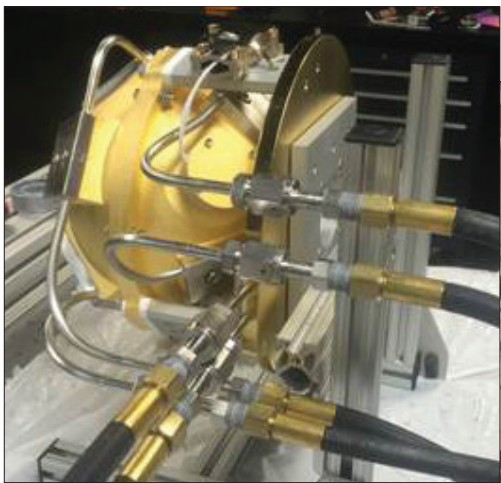


Vacuum and Thermal Vacuum Source Systems

How do you achieve the lowest possible uncertainty?
Test as you Fly and Fly as you Test.
For space systems that means leaving the ambient realm for the most aggressive environment we know: the vacuum and temperature ranges of space. Labsphere specializes in creating optical uniform sources in vacuum environments. Our materials, spheres, light sources and detectors can be designed for vacuum compatibility and stable, traceable radiometric performance.



In-Vacuum Radiant Source



Vacuum Source for Collimator Assembly



Vacuum, 1.5 m LN₂ Cooled 8 kW Absolute Uniform Source
Descending into NASA 3 m TV Chamber



Spectralon® Diffuse Reflectance Materials

Machinable, highly diffuse reflectance materials that are ideal for improving performance, efficiencies and measurement accuracy.

Labsphere offers three options to meet your needs:

- **Optical Grade 2% to 99% Reflectance Materials**

The standard in diffuse reflectance reference materials for spectrophotometry and optical properties of materials analysis

- **EPV 99% Reflectance Material**

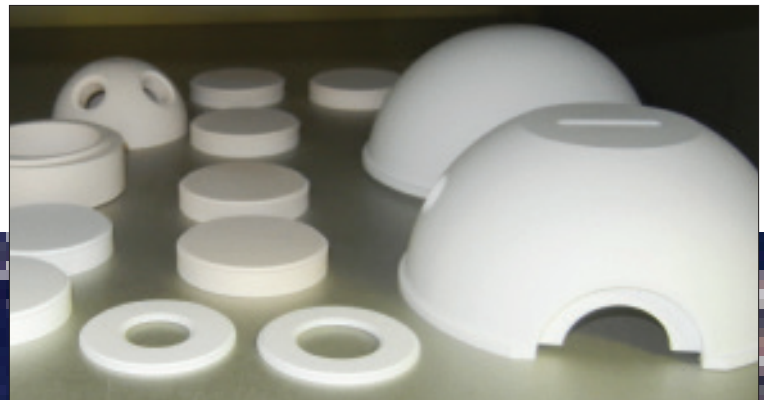
When stable performance is essential in a vacuum or for long term exposure to UV

- **Space Grade 99% Reflectance Material**

Qualified ultra-clean material for space-borne metrology

Space-grade Spectralon is a critical optical reference material for over a dozen platforms and is in operation on the following orbital programs.

Instrument	Platform
MISR	EOS AM-1
MODIS	EOS AM-1, PM-1
MERIS	ENVISAT
LRC	KOMPSAT
GLI	ADEOS II
ALI	NMP/EO-1
GOSAT	GOSAT
ABI	GOES-R
OLI	Landsat 8
VIIRS	NPOESS
ENMAP	ENMAP
UVN	SENTINEL 3
VIIRS II	NPOESS
GOES	GOES-16
RBI	RBI





Collimated Optics, Software and Uniform Source Solutions

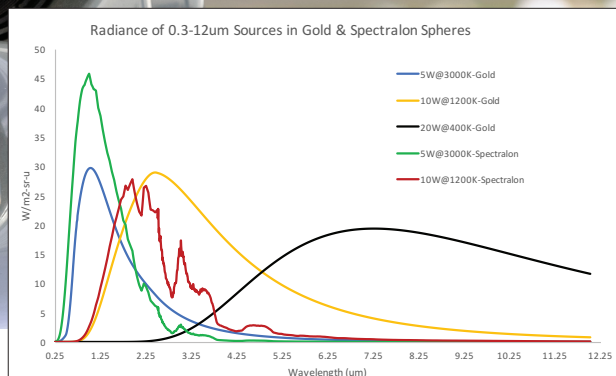
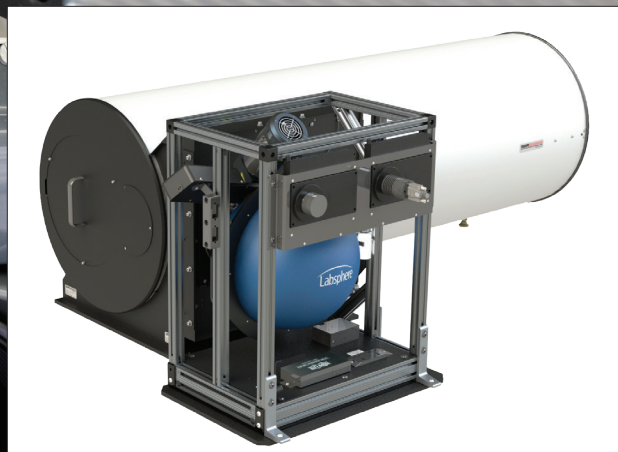
One family of test and calibration solutions spanning the two worlds of VIS to IR

- One software
- One footprint
- One calibration
- One call for support
- The best of two world class companies
- Creating a new standard platform for the evolution of test specifications

Comprehensive 0.3 – 14 μm Solutions

- Traceable radiance/irradiance
- Technician/development/programmers level for test development and execution
- Collimated, spatial and flood characterization
- VIS, NIR, SWIR, MWIR, LWIR

COLOSUS extends the radiance possibilities from the VIS to the LWIR with a variety of sources, spheres and blackbodies for complete calibration of your instruments. Select, combine and tune your calibration sources to match the dynamic range and spectral performance of your instrument.



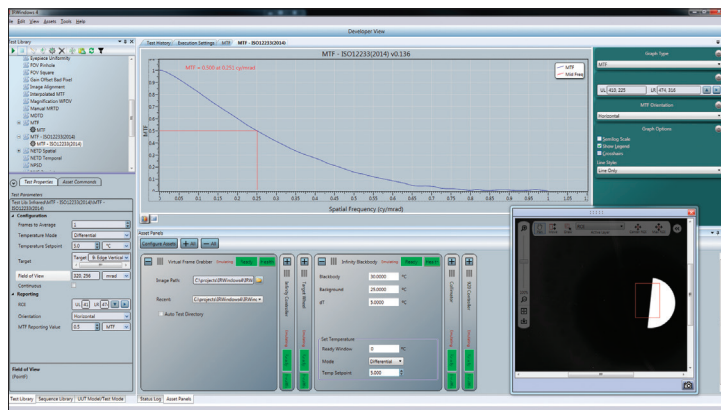
Cover the Entire VIS-LWIR Spectral Range

IRWindows™4 Software

Complete Control, Real Time Image and Standard Testing

- Fully automates the execution, data collection and results analysis for industry standard E-O performance
- VIS, IR, and Laser Tests

SBIR
SANTA BARBARA INFRARED, INC.
a HEICO company



HELIOsPlus

Uniform Sources for Luminance and Radiance

- Modular, design driven systems configured for common testing tasks with flexible options to meet your unique needs and budget
- Scalable, rugged solutions for R&D, production or field applications
- Unparalleled built-in characterization and performance
- A flexible foundation to meet the challenges for rapidly changing remote sensing needs
- LabVIEW® and intelligent components for active system configuration

5 family configurations designed to meet common testing tasks

- D (Dynamic Range)
- A (Air Mass-Albedo-Sunlight)
- L (Low Level)
- V (Variable Modular)
- AS (Application Specific)



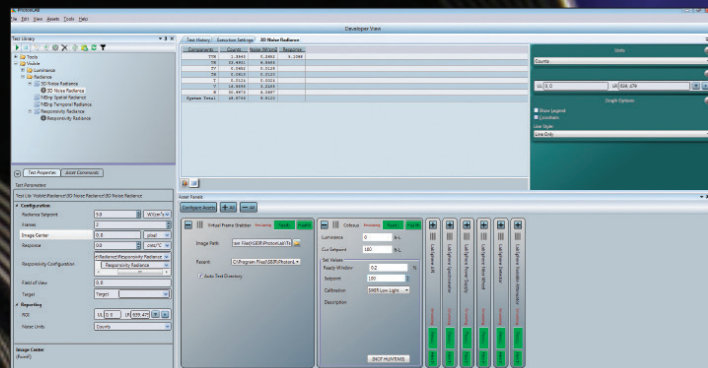
HELIOsense Software

HELIOsense Software is the primary interface for HELIOs®Plus components and systems. It is a flexible architecture where any hardware built into the Labsphere API (LSAPI) can be recognized and used in HELIOsPlus systems.



PhotonLAB Software

PhotonLAB is an advanced software tool that automates the setup, execution, data collection and results analysis for industry standard performance testing of UV, Visible, NIR and SWIR systems.



Calibration and Traceability

Labsphere offers an extensive range of calibration capabilities and expertise to meet your program needs.

Many of our products and services are traceable (highlighted in yellow) or NVLAP* accredited under NVLAP Lab Code 200951-0 (highlighted in green):

TYPES OF UNIFORM SOURCE SYSTEM CHARACTERIZATIONS

	Luminance Meter	Colorimeter	Illuminance Meter	Spectral Radiometer	Double Monochromator	PMT Photometer/Colorimeter	Uniformity Mapping Station	Angular Mapping Station	Filtered Detector	Laser Power Measurement	Electrical Calibration Station	Engineering Services	Portable Calibration Source	Sphere-based Spectral Flux	CMM	d/8 Spectrophotometer	Vacuum Oven	UV Irradiance Station	BRDF Instrument	Custom Solutions
LUMINANCE	X	X		X	X	X	X	X												X
ILLUMINANCE @ DUT PLANE			X				X		X											X
ANGLE LIMITED (F/#) RADIANCE OR IRRADIANCE																				X
COLOR TEMPERATURE		X				X	X	X												X
SPECTRAL RADIANCE				X	X															X
SPECTRAL IRRADIANCE @ DUT PLANE				X	X															X
BAND SELECTED RADIANCE/IRRADIANCE									X											X
SPATIAL UNIFORMITY	X	X	X	X		X	X		X											X
ANGULAR UNIFORMITY	X	X		X		X		X												X
TEMPORAL STABILITY	X	X	X	X	X	X			X		X									X
SPECTRAL STABILITY				X	X															X
SPECTRAL MATCHING OF LAMPS		X		X	X	X														X
LOW LEVEL (NIGHT VISION)					X	X														X
ON-SITE CALIBRATIONS				X			X	X			X		X							X
ELECTRICAL CALIBRATIONS											X		X							X
DYNAMIC RANGE MEASUREMENT	X	X	X	X	X	X			X		X									X
LUMINOUS FLUX														X						X
SPECTRAL FLUX														X						X
SPECTRAL REFLECTANCE																X				X
BRDF																			X	X
VACUUM BAKEOUT																	X			X
UV IRRADIANCE STABILITY																		X		X
FIDUCIAL & DIMENSIONAL MEASUREMENT															X					X
THERMAL MODELING PERFORMANCE (STABILITY)												X								X
MECHANICAL SHOCK/VIBRATION												X								X

* NVLAP Lab Code 200951-0 Accredited Product (ISO/IEC 17025:2005)

