

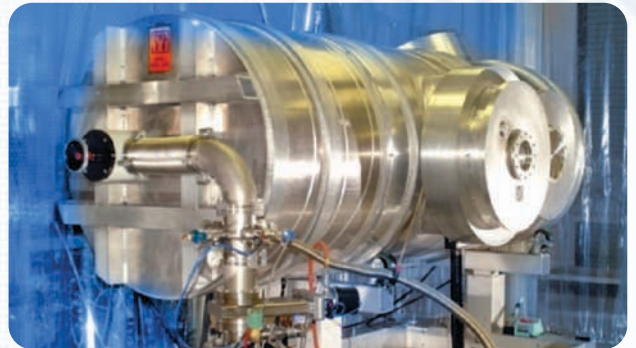
# ELECTRO - OPTICAL CALIBRATION EQUIPMENT

With over thirty years in the electro-optical calibration field, the Space Dynamics Laboratory (SDL) has built a nationally and internationally recognized reputation as a state-of-the-art calibration facility. Among many other payloads, SDL has calibrated instruments for the Wide-field Infrared Survey Explorer (WISE), Spatial Infrared Imaging Telescope (SPIRITIII), Multiple Kill Vehicle (MKV), Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS), Far-Infrared Spectroscopy of the Troposphere (FIRST), and Space-based Infrared System (SBIRS) programs. Most of SDL's specialized calibration hardware is traceable to national standards.

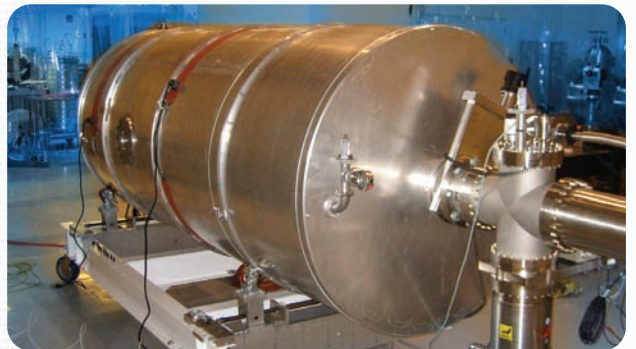
### MULTIFUNCTION CALIBRATION CHAMBERS

SDL's multifunction calibration chambers are used to characterize a variety of optical sensors in the infrared and visible ranges. They can operate in multiple configurations (e.g., collimator, extended source, Jones source), and can interface to a variety of external sources (e.g., spectral, radiance sources).

These chambers can also interface to sensors located in any of SDL's antechambers or directly to standalone sensors. Furthermore, coordinated control and monitoring of these calibration chambers and sensors under test enables automated test sequences. These chambers are based in Logan, Utah, but are transportable to customer locations. SDL owns and operates other specialty test chambers in addition to the chambers highlighted below.



MIC2



MIC3



MIC5

PARAMETER	MIC1	MIC2	MIC3	MIC5
<b>EXTERNAL DIMENSIONS</b> (LENGTH X DIAMETER)		109" x 40"	118" x 53"	144" x 84"
<b>FOCAL LENGTH</b>	~100"	198.5"	279.9"	147"
<b>EXIT BEAM DIAMETER</b>	6"	11" x 21"(ellipse)	19"	15.5"
<b>POINTING MIRROR RANGE</b>	5° x 5°	~5° x 5°	~5° x 5°	20° x 17°
<b>BACKGROUND</b>	10 K, 77 K	10 K, 77 K	Ambient	77 K

*Calibration equipment and facilities not highlighted herein include: various clean rooms, step-scan Fourier transform spectrometers, a vibration table, and contamination measurement equipment.*



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**TVAC CHAMBERS** • SDL maintains a variety of thermal-vacuum (TVAC) chambers for used to test customer equipment. Many of the TVAC chambers can be attached mechanically and optically to SDL’s other calibration chambers and sources for ease of testing. SDL’s largest TVAC chamber, THOR, has a thermally controlled cold bench for mounting sensors and other equipment

under test, as well as a shroud that can be cooled to LN<sub>2</sub> temperatures.

\*THOR is not transportable to customer sites



THOR

PARAMETER	THOR
<b>INTERNAL SHROUD DIMENSION</b> (LENGTH X DIAMETER)	144" x 84"
<b>VACUUM CAPABILITY</b>	10 <sup>-7</sup> Torr
<b>OPERATING TEMPERATURE RANGE</b>	77 K to 373 K
<b>TIME TO PUMP DOWN</b>	~48 hrs
<b>TIME TO COOL &amp; STABILIZE</b>	~24 hrs

**RADIANCE SOURCES** • SDL’s has two large radiance sources, Long-Wave Infrared Calibration Source (LWIRCS) and the High Accuracy Extended area Source (HAES15), that are used to characterize electro-optical sensors. LWIRCS is SDL's secondary radiance transfer standard and has been characterized at the National Institute of Standards and Technology (NIST) facility in Gaithersburg, MD using their low background infrared (LBIR) chamber. HAES15 provides a large aperture source that includes a cold shutter for measuring the background of the sensor being tested.

PARAMETER	LWIRCS	HAES15
<b>EXTERNAL DIMENSIONS</b> (LENGTH X DIAMETER)	40" x 16"	Cold tube: 54" x 25"; BB tube: 67" x 25"
<b>OPERATING TEMPERATURE RANGE</b>	100 K to 350 K	100 K to 350 K
<b>CONTROL STABILIZATION TIME</b>	Near 150 K: ~2 hrs; Near 300 K: ~3 hrs	77 K: 16 hrs; increase by ~20 K: 2 hrs
<b>NORMAL EMISSIVITY</b>	1-15 μm: > 0.9999, 15-35 μm: > 0.9998, 35-100 μm > 0.9980	1-20 μm: >0.996, 20-25 μm: >0.994
<b>RADIOMETRIC APERTURE</b>	6" exit aperture	15" diameter exit aperture
<b>NOTES</b>	Light rays entering at near normal incidence must encounter at least six surfaces before exiting	An LN <sub>2</sub> -cooled shutter sits between the two tubes so the view to the extended source can be closed

**SDL TRANSFER RADIOMETER** • SDL has developed a transfer radiometer similar to NIST’s Missile Defense Agency Transfer Radiometer (MDXR) to assist in transferring calibrations from SDL instruments to customer equipment and to provide a relative measurement during test of undesired buildup on cryogenic optics.

PARAMETER	SDL-XR
<b>ENTRANCE BEAM DIAMETER</b>	65 mm (2.56")
<b>FIELD OF VIEW</b>	1 mrad
<b>OPTICAL BENCH OPERATING TEMP</b>	< 20 K
<b>SPECTRAL RANGE</b>	2 to 30 μm
<b>Si:As BIB DETECTOR OPERATING TEMP</b>	~ 11 K, with 10 K shroud



SDL-XR (Transfer Radiometer)



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