



ELECTRICAL INSTRUMENTATION CALIBRATION REPORT

This document states that the instrument described below meets or exceeds all manufacturer specifications. The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). ILT is Accredited to ISO/IEC 17025:2017. Calibration conforms to ANSI/NCSL Z540.1-1994 and ANSI/NCSL Z540.3-2006, subclause 5.3

Date: 17-Oct-22 Certificate #: 2210171405E SO#: 177778

Temp: 23 Degrees C Humidity: 45 % Procedure: TP-0113:08NOV2011

Rendered To: Quantum Design GmbH

InstrumentModel-S/N: IL1700 #2338

Calibration/Repair Remarks: None

Parts (If Needed): None

As Found Tolerance In Out	As Found Readings	As Found Permissible Error	Applied Current	Adjusted Readings	Permissible Adjustment Error	As Left Tolerance In Out
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.000E-3	+/- 0.5%	1.000E-3	1.000E-3	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.001E-4	+/-0.5%	1.000E-4	1.001E-4	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.000E-5	+/-0.7%	1.000E-5	1.000E-5	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	9.99E-7	+/-1.0%	1.000E-6	9.99E-7	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	9.98E-8	+/-1.0%	1.000E-7	9.98E-8	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.001E-8	+/-1.0%	1.000E-8	1.001E-8	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.002E-9	+/-1.0%	1.000E-9	1.002E-9	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	9.97E-11	+/-1.5%	1.000E-10	9.97E-11	+/- 1.0%	<input checked="" type="checkbox"/> <input type="checkbox"/>

Tolerance after repair and/or calibration: In Out

Measurement Uncertainty: 1mA=±0.065%, 100uA=±0.062% , 10uA=±0.062%, 1uA=±0.065%, 100nA=±0.073%, 10nA=±0.079%, 1nA=±0.084%, 100pA=0.26%. Confidence Level of Uncertainty is 95% (K=2).

ILT's Simple Accept Decision Rule applies, unless stated above.

The above Instrument was compared to the Keithley Current Calibrator/Source Model 263 S/N 0730631 calibrated on 3/23/2022. Calibration Due: 3/23/2023

Calibrated By: Chris Kucy
Electrical Calibration Tech. Chris Kucy

This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval by International Light Technologies, Inc.





OPTICAL CALIBRATION CERTIFICATE

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Rendered-to: QUANTUM DESIGN GMBH

Detector: SED033 #4776 Input Optic: W #5599

Filter: F #16702 Misc.: N/A #

Calibrated With: IL1700 #2338 +5V Bias Off

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 18-Oct-2022

1.246E-2 (A)(cm2)(W-1) assuming monochromatic irradiance at 600nm

1.246E-05 (A)(cm2)(mW-1) assuming monochromatic irradiance at 600nm

1.05% *Change In Sensitivity From Previous Calibration Dated: 29-Oct-2018

Tolerance As Found: In Out Tolerance As Left: In Out

Unit will read directly in watts per square centimeter or milliWatts per square centimeter when used with the sensitivity factor above.

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

* ILT's Simple Accept Decision Rule Applies, Unless Stated Above. Difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response
I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 Calibration Due: December 3, 2025
D204 - December 2, 2015 - NIST Test No. 685/287304-15/1 Calibration Due: December 2, 2025

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

IL #01 IL #02 SED033 #3275

ILT Transfer Uncertainty to Customer = +/- 3% plus NIST Uncertainty of: +/- 0.31% Confidence Level of Uncertainty is 95% (k=2)

LIGHT SOURCE: 1T 1000W QTH LAMP OUTPUT: 3.20E-5 W/cm2

INSTRUMENTATION: SED033 #6400 PROCEDURE: OP-0029

TEMPERATURE: 22.8 degrees C HUMIDITY: 30%

CALIBRATED BY: J. Hoyt

Calibration Technician: Jon Hoyt

THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LIGHT TECHNOLOGIES, INC.

Calibration Date: 10/18/2022 Certificate No: 210183225 Sales Order #: 177778





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Rendered-to: QUANTUM DESIGN GMBH

Detector: SED033 #4776 Input Optic: R #415

Filter: F #16702 Misc.: N/A #

Calibrated With: IL1700 #2338 +5V Bias Off

(PRR) PEAK RADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 18-Oct-2022

9.12E-4 (A)(cm²)(sr)(W-1) assuming monochromatic radiance at 600nm

2.82% *Change In Sensitivity From Previous Calibration Dated: 29-Oct-2018

Tolerance As Found: In Out Tolerance As Left: In Out

Unit will read directly in watts per square centimeter per steradian when used with the sensitivity factor above.

REFERENCE PLANE: Average F.O.V. +/-0.75 Degrees

* ILT's Simple Accept Decision Rule Applies, Unless Stated Above. Difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response
I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 Calibration Due: December 3, 2025
D204 - December 2, 2015 - NIST Test No. 685/287304-15/1 Calibration Due: December 2, 2025

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

IL #01 IL #02 SED033 #3275

ILT Transfer Uncertainty to Customer = +/- 3% plus NIST Uncertainty of: +/- 0.31% Confidence Level of Uncertainty is 95% (k=2)

LIGHT SOURCE: 1T 1000W QTH/Reflectance Tablet LAMP OUTPUT: 9.89E-6 W/cm²/sr

INSTRUMENTATION: SED033 #6400 PROCEDURE: OP-0041

TEMPERATURE: 22.8 degrees C HUMIDITY: 30%

CALIBRATED BY: J. Hoyt

Calibration Technician: Jon Hoyt

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Calibration Date: 10/18/2022 Certificate No: 210183224 Sales Order #: 177778





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Rendered-to: QUANTUM DESIGN GMBH

Detector: SED240 #5676 Input Optic: W #7743

Filter: UVB-1 #23781 Misc.: N/A #

Calibrated With: IL1700 #2338 +5V Bias On

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 18-Oct-2022

1.36E-5 (A)(cm²)(W-1) assuming monochromatic irradiance at 290nm

1.360E-08 (A)(cm²)(mW-1) assuming monochromatic irradiance at 290nm

-4.23% *Change In Sensitivity From Previous Calibration Dated: 29-Oct-2018

Tolerance As Found: In Out Tolerance As Left: In Out

Unit will read directly in watts per square centimeter or milliWatts per square centimeter when used with the sensitivity factor above.

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

* ILT's Simple Accept Decision Rule Applies, Unless Stated Above. Difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response
I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 Calibration Due: December 3, 2025
D204 - December 2, 2015 - NIST Test No. 685/287304-15/1 Calibration Due: December 2, 2025

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

U522 U1023 N/A

ILT Transfer Uncertainty to Customer = +/- 5.5% plus NIST Uncertainty of: +/- 1.25% Confidence Level of Uncertainty is 95% (k=2)

LIGHT SOURCE: 19s Hg-Xe LAMP OUTPUT: 1.250E-3 W/cm2

INSTRUMENTATION: #1029/SCS280/W PROCEDURE: OP-0007

TEMPERATURE: 22.8 degrees C HUMIDITY: 30%

CALIBRATED BY: J. Hoyt
Calibration Technician: Jon Hoyt

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Calibration Date: 10/18/2022 Certificate No: 210183227 Sales Order #: 177778





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Rendered-to: QUANTUM DESIGN GMBH
 Detector: SED240 #5676 Input Optic: W #7743
 Filter: ACT5 #23008 Misc.: N/A #
 Calibrated With: IL1700 #2338 +5V Bias On

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 18-Oct-2022

3.94E-4 (A)(cm²)(eff W⁻¹) assuming monochromatic irradiance at 270nm

-4.14% *Change In Sensitivity From Previous Calibration Dated: 29-Oct-2018
 Tolerance As Found: In Out Tolerance As Left: In Out

Unit will read directly in effective watts per square centimeter when used with the sensitivity factor above.

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.
 * ILT's Simple Accept Decision Rule Applies, Unless Stated Above. Difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response
 I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 Calibration Due: December 3, 2025
 D204 - December 2, 2015 - NIST Test No. 685/287304-15/1 Calibration Due: December 2, 2025

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

U1023 U522 N/A
 ILT Transfer Uncertainty to Customer = +/- 4.5% plus NIST Uncertainty of: +/- 1.77% Confidence Level of Uncertainty is 95% (k=2)

LIGHT SOURCE: SpectroPro1500/1000W Xe LAMP OUTPUT: 1.072E-6 W/cm²
 INSTRUMENTATION: SED240 #3355 PROCEDURE: OP-0018
 TEMPERATURE: 22.8 degrees C HUMIDITY: 30%
 CALIBRATED BY: J. Hoyt
 Calibration Technician: Jon Hoyt

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 Calibration Date: 10/18/2022 Certificate No: 210183228 Sales Order #: 177778





OPTICAL CALIBRATION CERTIFICATE

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Rendered-to: QUANTUM DESIGN GMBH

Detector: SED033 #7059

Input Optic: W7 #00119

Filter: UVA #23821

Misc.: N/A #

Calibrated With: IL1700 #2338

+5V Bias Off

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 18-Oct-2022

6.35E-3 (A)(cm2)(W-1) assuming monochromatic irradiance at 360nm

6.350E-06 (A)(cm2)(mW-1) assuming monochromatic irradiance at 360nm

-1.55% *Change In Sensitivity From Previous Calibration Dated: 29-Oct-2018

Tolerance As Found: In

Out

Tolerance As Left: In

Out

Unit will read directly in watts per square centimeter or milliWatts per square centimeter when used with the sensitivity factor above.

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

* ILT's Simple Accept Decision Rule Applies, Unless Stated Above. Difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response
I219 - December 3, 2015 - NIST Test No. 685/287304-15/2 Calibration Due: December 3, 2025
D204 - December 2, 2015 - NIST Test No. 685/287304-15/1 Calibration Due: December 2, 2025

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

SED400 #139

SED400 #1490

IL #01

ILT Transfer Uncertainty to Customer = +/- 4.5% plus NIST Uncertainty of: +/- 1.16% Confidence Level of Uncertainty is 95% (k=2)

LIGHT SOURCE: 19s Hg-Xe

LAMP OUTPUT: 2.68E-3 W/cm2

INSTRUMENTATION: SED033 #4544/UVA/W

PROCEDURE: OP-0007

TEMPERATURE: 22.8 degrees C

HUMIDITY: 30%

CALIBRATED BY: J. Hoyt

Calibration Technician: Jon Hoyt

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Calibration Date: 10/18/2022

Certificate No: 210183226

Sales Order #: 177778

