SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: September 30, 2022 Certificate Number: 4099.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 4, 6]:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Voltage – Measure	Up to 10 mV (10 to 100) mV 100 mV to 1 V (1 to 10) V	0.07 % 0.06 % 0.06 % 0.01 %	Keithley 2182A Keithley 2002
DC Voltage – Generate	Up to 10 mV (10 to 100) mV 100 mV to 1 V (1 to 10) V	0.09 % 0.06 % 0.06 % 0.01 %	Yokogawa 2553A
DC Current – Measure	Up to 20 mA	0.02 %	Keithley 2002
DC Current – Generate	Up to 20 mA	0.01 %	Yokogawa 2553A

II. Optical Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Direct Solar Irradiance[3]			ASTM E816; ISO 9059
Calibrate Reference Pyrheliometers[3]	(0.29 to 3.0) µm	0.43 %	Eppley AHF cavity pyrheliometer; Basis: 1000 W/m^2 day
Calibration of Field Pyrheliometers[3]	(0.29 to 3.0) µm	0.61 %	Pyrheliometer group; Basis: 1000 W/m^2 day
Global Solar Irradiance			ASTM G167; ISO 9846
Calibration of Reference Pyranometers[3] –			
Normal Incidence	(0.29 to 3.0) µm	0.44 %	Eppley AHF cavity pyrheliometer;
0/45° Tilt[3]	(0.29 to 3.0) µm	0.49 %	Basis: 1000 W/m^2 day
Calibration of Field Pyranometer			
(Outdoor)[3]			
Normal Incidence	(0.29 to 3.0) µm	0.71 %	ASTM E824; ISO 9847
0/45° Tilt	(0.29 to 3.0) µm	0.75 %	Pyranometer group; Basis: 1000 W/m^2 day
(Indoor)			
Normal Incidence	(0.29 to 3.0) µm	0.48 %	ASTM G207 reference pyranometer of same make and model;
Calibration of Field Pyrgeometers[3]–	(4.5 to 50.0) µm	3.5 %	Pyrgeometer group

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Spectral Irradiance –			
Spectroradiometers (Normal Incidence to Source)	(0.250 to 1.100) µm	3.4 %	ASTM G138 using FEL spectral irradiance standard
PAR Sensors	(0.380 to 0.780) µm	2.3 %	ASTM G130; Spectoradiomter OL754
Calibrate Reference Ultra-Violet Radiometers[3]	(0.280 to 0.315) µm (0.280 to 0.400) µm (0.295 to 0.385) µm (0.300 to 0.400) µm (0.315 to 0.400) µm	4.1 % 2.8 % 2.8 % 2.8 % 2.8 %	Basis: 0.2 W/m^2 Basis: 0.2 W/m^2 Basis: 60 W/m^2 Basis: 70 W/m^2 Basis: 70 W/m^2
Calibrate Field Ultra-Violet Radiometers[3]–			ASTM E824; ultraviolet radiometer group
UV-B Ultra-Violet Radiometers	(0.280 to 0.315) µm	5.4 %	Basis: 0.2 W/m^2
Total Ultra-Violet Radiometers	(0.280 to 0.400) µm (0.295 to 0.385) µm	3.7 % 3.7 %	Basis: 70 W/m^2 Basis: 60 W/m^2
UV-A Ultra-Violet Radiometers	(0.300 to 0.400) µm (0.315 to 0.400) µm	3.7 % 3.7 %	Basis: 60 W/m^2 Basis: 60 W/m^2

[1] This laboratory offers commercial calibration service and field calibration services.

[2] Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal Generate. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] Calibrations are performed under reasonably controlled conditions of clear skies to minimize atmospheric effects, high solar radiance approaching 1000 W/m^2 to preclude linearity effects and near-normal incidence for all calibrations unless stated otherwise to preclude cosine effects. It should be recognized that the uncertainties associated with the use of carefully calibrated radiometers under the diverse conditions of field use would be significantly higher.

[5] In the statement of CMC, percentages are percentages of reading, unless otherwise indicated.

[6] This scope meets A2LA's *P112 Flexible Scope Policy*.

[7] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

Accredited Laboratory

A2LA has accredited

ISO-CAL NORTH AMERICA

Phoenix, AZ

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and *R205 – Specific Requirements: Calibration Laboratory Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 25th day of September 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4099.01
Valid to September 30, 2022

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.