



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
&ANSI/NCSL Z540-1-1994

SAPPHIRE TECHNICAL SOLUTIONS, L.L.C.
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Pineville, NC 28134
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CALIBRATION

Valid To: October 31, 2019

Certificate Number: 5273.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,13}:

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Angles – Measure ³	0° to 360°	66 arc sec	Theodolite

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 14} (±)	Comments
DC Voltage – Measure ³	(0.1 to 1000) V	0.005 %	Agilent 34411A
DC Current – Measure ³	2 pA to 2 nA	0.36 % + 0.47 pA	Keithley 6487A
	(2 to 20) nA	0.24 %	
	20 nA to 100 µA	0.19 %	
	100 µA to 3 A	0.047 %	Agilent 34411A
	(3 to 10) A	0.013 %	Agilent 34411A/ Isotek RUG-Z-R100-0.1TK1
	(10 to 30) A	0.26 %	Agilent 34411A/ 34330A
DC Resistance – Measure ³	1 Ω to 50 GΩ	0.16 %	Keithley 6487A

Parameter/Range	Frequency	CMC ^{2,4,14} (±)	Comments
AC Voltage – Measure ³ (0.1 to 750) V	50 Hz to 1.2 kHz	0.18 %	Agilent 34411A
AC Current – Measure 100 µA to 3.0 A (3 to 10) A (10 to 20) A	50 Hz to 1.2 kHz 50 Hz to 1.2 kHz 50 Hz to 1.2 kHz	0.17 % 0.25 % 0.13 %	Agilent 34411A Agilent 34411A/34330A
Power – Measure (1 to 300) W 300 W to 1.5 kW	45 Hz to 1 kHz 45 Hz to 1 kHz	0.37 % 0.64 %	Yokogawa WT210

III. Optical Quantities

Parameter/Equipment	Range	CMC ^{2,4,15} (±)	Comments
Photometric ⁵ – Measure and Generate			
Luminous Intensity Bench Goniometer ^{7,8}	0.5 mcd to 25 000 cd 0.5 mcd to 10 000 000 cd	0.65 % 0.67 %	Luminous intensity reference standard
Illuminance	(0.001 to 10 000) lx	0.76 %	
Illuminance Responsivity for 2856 K Source	1.0 fA to 10.0 A/lx 100 µV to 10.0 V/lx	1.4 % 1.4 %	
Luminance ^{7,9}	2 cd/m ² to 70 000 cd/m ²	0.85 %	Diffuse reflectance source
Luminance Responsivity for 2856 K Source	1.0 fA to 10.0 A/(cd/m ²) 100 µV to 10.0 V/(cd/m ²)	0.84 % 0.84 %	
Total Luminous Flux ^{7,10}	0.001 lm to 100 000 lm	0.65 %	Luminous flux reference standard

Parameter/Equipment	Range	CMC ^{2, 4, 15} (\pm)	Comments
Photometric ⁵ – Measure and Generate (cont)			
Correlated Color Temperature	Incandescent	2300 K 2856 K 3200 K	Irradiance standard, spectroradiometer
	Non-incandescent	~ 6500 K	
Chromaticity Coordinates ^{3, 11}	x	0.0010	Spectroradiometer
	y	0.0010	
	u'	0.0006	
	v'	0.0005	
Photometric Color Correction ^{3, 12}	Amber	0.68 %	Characterized color filters
	Red	1.0 %	
	Deep-red	1.5 %	
	Blue	3.4 %	
	Green	0.53 %	
	Customer supplied source	1.9 %	
Photometric Detector Linearity ^{3, 12}		0.53 %	Neutral density filter set
Radiometric ⁶ – Measure and Generate			
Spectral Irradiance (0 to 3000) W/m ² /nm	(350 to 450) nm	1.3 %	1000 W FEL Lamp
	(450 to 555) nm	1.0 %	
	(555 to 1000) nm	0.88 %	
(0 to 3000) W/m ² /nm	(350 to 450) nm	2.3 %	Customer submitted source
	(450 to 555) nm	2.1 %	
	(555 to 1000) nm	2.0 %	
Spectral Radiance (0 to 3000) W/sr/nm	(350 to 450) nm	1.5 %	Sphere source
	(450 to 555) nm	1.2 %	
	(555 to 1000) nm	1.1 %	
(0 to 3000) W/sr/nm	(350 to 450) nm	2.3 %	Customer submitted source
	(450 to 655) nm	2.2 %	
	(655 to 1000) nm	2.1 %	

Parameter/Range	Range	CMC ^{2, 4, 15} (\pm)	Comments
Radiometric ⁶ – Measure and Generate (cont)			
Total Spectral Radiant Flux (0 to 3000) W/nm	(350 to 450) nm (450 to 555) nm (555 to 1000) nm	2.5 % 1.9 % 2.0 %	Incandescent or halogen source
Radiance Coefficient (0 to 5.0 sr ⁻¹)	(350 to 1000) nm	0.85 %	Diffuse plaque 0°/45° geometry
Wavelength	(350 to 1000) nm	1.0 nm	Hg (Ar) spectral lamp

¹ This laboratory offers commercial calibration service and field calibration service.

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 measuring equipment. CMCs 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 In the statement of CMC, the value and percentages are defined as the percentage of reading, unless otherwise noted.

⁵ For other sources, a photometric color correction is required.

⁶ Signal less than 10 % of the peak will have a larger uncertainty.

⁷ Measured values within the range of this scope of accreditation would be applicable to other standards as well as the ones listed below. These specifications are for reference only and the lab is not accredited to any of the listed items.

⁸ SAE J95, SAE J96, SAE J99, SAE J131, SAE J186, SAE J222, SAE J278, SAE J279, SAE J280, SAE J292, SAE J387, SAE J572, SAE J575, SAE J581, SAE J582, SAE J583, SAE J584, SAE J585, SAE J586, SAE J588, SAE J591, SAE J592, SAE J593, SAE J594, SAE J595, SAE J598, SAE J759, SAE J774, SAE J845, SAE J852, SAE J887, SAE J914, SAE J943, SAE J974, SAE J975, SAE J1029, SAE J1133, SAE J1306, SAE J1318, SAE J1319, SAE J1330, SAE J1373, SAE J1383, SAE J1395, SAE J1398, SAE J1424, SAE J1432, SAE J1577, SAE J1623, SAE J1735, SAE J1889, SAE J1957, SAE J1967, SAE J2009, SAE J2039, SAE J2040, SAE J2041, SAE J2042, SAE J2087, SAE J2139, SAE J2261, SAE J2282, SAE J2320, SAE J2560, SAE J2595, SAE J2560, SAE J2382, SAE J2650; FMVSS 108; CMVSS 108; ECE Reg. 3, ECE Reg 5, ECE Reg 6, ECE Reg 7, ECE Reg 19, ECE Reg 23, ECE Reg 31, ECE Reg 38, ECE Reg 50, ECE Reg 65, ECE Reg 77, ECE Reg 87, ECE Reg 91, ECE Reg 98, ECE Reg 112, ECE Reg 113; FAA AC 150/5345-5, FAA AC 150/5345-10, FAA AC 150/5345-12, FAA AC 150/5345-26, FAA AC 150/5345-27, FAA AC 150/5345-28, FAA AC 150/5345-39, FAA AC 150/5345-42, FAA AC 150/5345-43, FAA AC 150/5345-44, FAA AC 150/5345-46, FAA AC 150/5345-47, FAA AC 150/5345-50, FAA AC 150/5345-51, FAA AC 150/5345-52, FAA AC 150/5345-54; FAA Engineering Brief No. 67; ASTM-E809, E810, D4956, ICAO/CARC AN14-1-APP.2

⁹ SAE J587;ECE Reg 4

¹⁰ SAE J573;ECE Reg 37

¹¹ SAE J578c, J578; FMVSS 108; CMVSS 108; ECE Reg. 3, ECE Reg 4, ECE Reg 5, ECE Reg 6, ECE Reg 7, ECE Reg 19, ECE Reg 23, ECE Reg 31, ECE Reg 38, ECE Reg 50, ECE Reg 65, ECE Reg 77, ECE Reg 87, ECE Reg 91, ECE Reg 98, ECE Reg 112, ECE Reg 113; FAA AC 150/5345-12, FAA AC 150/5345-27, FAA AC 150/5345-28, FAA AC 150/5345-43, FAA AC 150/5345-46, FAA AC 150/5345-50, FAA AC 150/5345-51, FAA AC 150/5345-52

¹² SAE J578, SAE J1330

¹³ This scope meets A2LA's *P112 Flexible Scope Policy*.

¹⁴ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

¹⁵ 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

SAPPHIRE TECHNICAL SOLUTIONS, L.L.C.

Pineville, NC

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI 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 17th day of January 2019.

A handwritten signature in blue ink, positioned above a horizontal line.

Senior Director, Accreditation Services
For the Accreditation Council
Certificate Number 5273.01
Valid to October 31, 2019

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