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

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CALIBRATION

Valid To: June 30, 2025 Certificate Number: 2067.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 10]:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5, 9] (±)	Comments
DC Voltage[3] – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	64 µV/V + 3.5 µV 51 µV/V + 7 µV 46 µV/V + 50 µV 56 µV/V + 0.6 mV 56 µV/V + 10 mV	Agilent 34401A
DC Voltage[3] – Generate	(0 to 320) mV (0.32 to 3.2) V (3.2 to 33) V (33 to 330) V (330 to 1020) V	72 µV/V + 3 µV 61 µV/V + 5 µV 61 µV/V + 50 µV 67 µV/V + 500 µV 67 µV/V + 1.5 mV	Fluke 5500A
DC Current[3] – Measure	(1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 3) A (3 to 10) A	0.06 % + 2 µA 0.06 % + 5 µA 0.12 % + 0.1 mA 0.14 % + 0.6 mA 2 %	Agilent 34401A 0.1 Ω shunt

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Current[3] – Generate	(0 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 2.2) A (2.2 to 11) A	0.06 % + 0.05 µA 0.06 % + 0.25 µA 0.06 % + 3.3 µA 0.07 % + 44 µA 0.09 % + 330 µA	Fluke 5500A

Parameter/Range	Frequency	CMC[2, 5, 9] (±)	Comments
AC Voltage[3] – Measure			
(10 to 100) mV	10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.07 % + 40 µV 0.14 % + 50 µV 0.7 % + 80 µV	Agilent 34401A
100 mV to 1.0 V	10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.07 % + 0.3 mV 0.14 % + 0.5 mV 0.7 % + 0.8 mV	
(1 to 10) V	10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.07 % + 3 mV 0.14 % + 5 mV 0.7 % + 8 mV	
(10 to 100) V	10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.07 % + 30 mV 0.14 % + 50 mV 0.7 % + 80 mV	
(100 to 750) V	10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.07 % + 230 mV 0.14 % + 380 mV 0.7 % + 600 mV	
10 mV to 100 V	DC to 0.5 GHz	1.8 %	Tek TDS 5052B

Parameter/Range	Frequency	CMC[2, 5, 9] (±)	Comments
AC Voltage[3] – Generate			
(1.0 to 33) mV	45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz	0.21 % + 20 µV 0.26 % + 20 µV 0.31 % + 20 µV	Fluke 5500A
(33 to 330) mV	45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz	0.06 % + 20 µV 0.12 % + 20 µV 0.19 % + 40 µV	
(0.33 to 3.3) V	45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz	0.04 % + 60 µV 0.09 % + 60 µV 0.16 % + 0.3 mV	
(3.3 to 33) V	45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz	0.05 % + 0.6 mV 0.09 % + 2.6 mV 0.22 % + 5 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.06 % + 6.6 mV 0.09 % + 15 mV 0.09 % + 33 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.06 % + 80 mV 0.23 % + 100 mV 0.23 % + 500 mV	
AC Current[3] – Measure			
(0 to 1) A	10 Hz to 5 kHz	0.13 % + 0.4 mA	Agilent 34401A
(1 to 3) A	10 Hz to 5 kHz	0.2 % + 1.8 mA	
(3 to 10) A	(10 to 500) Hz	2.0 %	0.1 Ω shunt
(1 to 5000) A_{peak}	1 Hz to 20 MHz	3.2 %	Oscilloscope with Pearson 110 current monitor coil

Parameter/Range	Frequency	CMC[2, 5, 9] (±)	Comments
AC Current[3] – Generate			
(0.03 to 0.33) mA	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.15 % + 0.25 µA 0.46 % + 0.15 µA 1.5 % + 0.15 µA	Fluke 5500A
(0.33 to 3.3) mA	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.12 % + 0.3 µA 0.23 % + 0.3 µA 0.69 % + 0.3 µA	
(3.3 to 33) mA	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.11 % + 3 µA 0.23 % + 3 µA 0.69 % + 3 µA	
(33 to 330) mA	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.11 % + 30 µA 0.23 % + 30 µA 0.69 % + 30 µA	
(0.33 to 2.2) A	45 Hz to 1 kHz (1 to 5) kHz	0.12 % + 0.3 mA 0.87 % + 0.3 mA	
(2.2 to 11) A	45 Hz to 65 Hz (65 to 500) Hz (0.5 to 1) kHz	0.08 % + 2 mA 0.12 % + 2 mA 0.38 % + 2 mA	
Inductance[3] – Measure			
32 µH to 1 H	1 kHz	0.17 %	NF ZM2371 LCR meter

Parameter/Equipment	Range	CMC[2, 5, 9] (±)	Comments
Resistance[3] – Measure	(0 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	0.04 % + 4 mΩ 0.04 % + 10 mΩ 0.04 % + 100 mΩ 0.04 % + 1 Ω 0.04 % + 10 Ω 0.06 % + 100 Ω 0.93 % + 10 kΩ	Agilent 34401A
	(0.1 to 1) Ω	0.2 %	NF ZM2371 LCR meter

Parameter/Equipment	Range	CMC[2, 5, 9] (±)	Comments
Resistance[3] – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (0.33 to 1.1) MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ	0.03 % + 0.008 Ω 0.03 % + 0.01 Ω 0.03 % + 0.01 Ω 0.03 % + 0.01 Ω 0.03 % + 0.06 Ω 0.03 % + 0.06 Ω 0.03 % + 0.6 Ω 0.03 % + 0.6 Ω 0.03 % + 6 Ω 0.03 % + 6 Ω 0.03 % + 55 Ω 0.03 % + 55 Ω 0.07 % + 0.55 kΩ 0.12 % + 0.55 kΩ 0.6 % + 5.5 kΩ 0.6 % + 17 kΩ	Fluke 5500A
AC Stabilization Power Supplies (CVCF)[3] – AC Voltage: (50 to 400) Hz Frequency Phase Angle Distortion: 2nd to 10th Regulation AC Current: (50 to 400) Hz Crest Factor	 (100 to 750) V (50 to 400) Hz (0 to 360)º (0 to 80) % (1 to 50) A (1 to 100) A (100 to 120) V (200 to 240) V	 0.13 % + 230 mV 0.04 % 0.6° 2.7 % 2.7 % 2.2 % 0.013 % 0.009 %	Agilent 34401A, oscilloscope, Pearson current monitor, AC voltage divider, audio analyzer

Parameter/Range	Frequency	CMC[2, 9, 11] (±)	Comments
Capacitance[3] – Measure 1 pF to 10 µF	 1 kHz	 0.44 %	 NF ZM2371 LCR meter

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 4, 6, 7] (±)	Comments
Attenuation/Insertion[3] – Loss			
(0 to 30) dB (30 to 50) dB (50 to 80) dB	5 Hz to 500 MHz 5 Hz to 500 MHz 5 Hz to 300 MHz (300 to 500) MHz	0.3 dB 0.5 dB 0.5 dB 0.9 dB	Network analyzer HP 8751A with calibration kit
(0 to 40) dB	300 kHz to 6 GHz (6 to 20) GHz	0.5 dB 0.5 dB	Network analyzer Advantest R3770 with calibration kit
(40 to 50) dB	300 kHz to 20 GHz (6 to 20) GHz	0.5 dB 0.6 dB	
(50 to 70) dB	300 kHz to 20 GHz (6 to 20) GHz	0.6 dB 0.6 dB	
(0 to 50) dB (50 to 60) dB (60 to 70) dB	45 MHz to 40 GHz 45 MHz to 40 GHz 45 MHz to 40 GHz	0.5 dB 0.7 dB 1.0 dB	Network analyzer Agilent N5230A with calibration kit
VSWR[3] –			
(1 to 60)	5 Hz to 500 MHz	1.7 %	Network analyzer HP 8751A with calibration kit
	500 MHz to 3 GHz (3 to 20) GHz	2.1 % 3.7 %	Network analyzer, Advantest R3770 with calibration kit
	(20 to 40) GHz	5.6 %	Network analyzer Advantest N5230A with calibration kit
RF Power, Absolute[3] – Measure			
(-60 to 20) dBm (-70 to 20) dBm	9 kHz to 6 GHz 50 MHz to 50 GHz	0.26 dB + *M* 0.32 dB + *M*	Power meter and power sensor

Parameter/Range	Frequency	CMC[2, 4, 6, 7, 9] (±)	Comments
RF Power[3]– Generate			
(-37 to 30) dBm (-37 to 10) dBm (-10 to 10) dBm (-27 to -5) dBm	9 Hz to 15 MHz 15 MHz to 1 GHz (1 to 4) GHz (4 to 40) GHz	0.21 dB + *M* 0.55 dB + *M* 0.59 dB + *M* 0.73 dB + *M*	Signal generators, power dividers, and power meter/sensor
Attenuation[3] – Generate			
(0 to 50) dB, 10 dB Steps	DC to 6 GHz (6 to 12.4) GHz (12.4 to 18) GHz (18 to 26.5) GHz (26.5 to 40) GHz	0.4 dB 0.5 dB 0.6 dB 0.6 dB 0.7 dB	Step attenuators
Broadband NSA Measurements[3]	(30 to 300) MHz (200 to 1000) MHz (30 to 300) MHz (300 to 1000) MHz (1 to 40) GHz	1.0 dB 1.0 dB 1.1 dB 1.1 dB 1.4 dB	ANSI C63.4, ANSI C63.4a-2017, CISPR 16-1-4, network analyzer ETSI TS 102 321
SVSWR Validation[3]	(1 to 18) GHz	1.3 dB	ANSI C63.4, CISPR 16-1-4, network analyzer
EM Field Uniformity[3]	(80 to 1000) MHz (1 to 18) GHz	1.2 dB 1.8 dB	IEC 61000-4-3
Electric Field Probes[8]	10 kHz to 1 GHz 100 kHz to 1 GHz (1 to 4) GHz (4 to 18) GHz	1.0 dB 1.0 dB 1.3 dB 1.4 dB	IEEE1309 G-TEM using substitution method with transfer standard Anechoic chamber using substitution method with transfer standard

Parameter/Range	Frequency	CMC[2, 4, 6, 7, 9] (±)	Comments
Antenna Factor[3, 8] –			
Broad Band Antennas, Bi-conical, LPD, Hybrid, Dipole	(25 to 2000) MHz	0.7 dB	SSM per ANSI C63.5 (1988, 1998, 2006, 2017)
	(25 to 2000) MHz	1.2 dB	SAE ARP 958
	(30 to 1000) MHz	0.7 dB	SSM per CISPR16-1-6
Dipole Antennas	(30 to 1000) MHz	1.0 dB	RAM per ANSI C63.5 (1988, 1998, 2006, 2017)
Horn Antennas	800 MHz to 18 GHz (18 to 40) GHz	1.1 dB 1.1 dB	SSM per ANSI C63.5 (1988, 1998, 2006, 2017) TAM per CISPR 16-1-6
	800 MHz to 18 GHz (18 to 40) GHz	1.2 dB 1.4 dB	SAE ARP 958
Antenna Pattern Measurement	800 MHz to 18 GHz (18 to 40) GHz	0.7 dB 1.0 dB	CISPR 16-1-6, CISPR 16-1-4
Loop Antenna/Loop Sensor	10 Hz to 10 MHz (10 to 30) MHz	0.9 dB 1.0 dB	IEEE 291-1991, CISPR 16-1-6
Rod Antenna	10 Hz to 60 MHz	0.7 dB	Equivalent capacitance substitution method (ECSM) per CISPR 16-1-6, ANSI C63.5 (1988, 1998, 2006, 2017)
Antenna Symmetry/ Balance of Antenna/ Cross Polar	30 MHz to 20 GHz	0.4 dB	ANSI C63.5 (1988, 1998, 2006, 2017) CISPR 16-1-6

Parameter/Range	Frequency	CMC[2,, 6, 7, 9] (±)	Comments
LISN[3] –			
Insertion Loss	9 kHz to 100 MHz (100 to 300) MHz	0.6 dB 1.3 dB	CISPR 16-1-2, ANSI C63.4
Isolation	9 kHz to 100 MHz (100 to 300) MHz	0.6 dB 1.4 dB	
Impedance – Magnitude	9 kHz to 100 MHz (100 to 300) MHz	0.6 dB 1.2 dB	
Impedance – Phase (0 to ± 180)°	9 kHz to 100 MHz (100 to 300) MHz	3.5° 6.2°	
CDN's and Adapters[3, 6] –			
(50 to 150) Ω			
Adapter Insertion Loss	10 kHz to 230 MHz	0.5 dB	IEC 61000-4-6 (2008), IEC 61000-4-6
Coupling Factor	10 kHz to 230 MHz	0.7 dB	Network analyzer and calibration kits
Impedance	10 kHz to 230 MHz	4.1 %	
Current Probes and Bulk Current Injection Probes[3, 6] –			CISPR 16-1-2 (2003), CISPR 16-1-2, IEC 61000-4-6
Transfer Impedance	5 Hz to 500 MHz 500 MHz to 1 GHz	0.5 dB 0.6 dB	HP 8751A, Advantest R3770 with BNC load
ESD Simulators[3] –			IEC 61000-4-2, ISO 10605, SAE J 1113-13
Contact Voltage (±) Current Rise/Fall Time	 (0.15 to 74) A (0.6 to 20) ns	 3.0 % 28 ps	 Oscilloscope ESD target and 1.3 m x 1.3 m plate
Air Discharge (±) Rise/Fall Time RC time Constant	 (0.6 to 20) ns (220 to 740) ns	 28 ps 1.6 %	
Generated Voltage	Up to ± 30 kV	2.0 %	Electro-Static volt meter

Parameter/Range	Frequency	CMC[2, 6, 7, 9] (±)	Comments
EFT/Burst Generator[3] –			IEC 61000-4-4 (2004, 2007, 2010, 2012)
(50 and 1000) Ω:			
Voltage (±)	125 V to 6 kV	3.9 %	Oscilloscope
Rise Time / Duration	1 ns to 360 ms	1.6 %	
Repetition Rate	Up to 500 kHz	1.6 %	
Capacitive Clamp:			
Voltage (±)	125 V to 6 kV	3.9 %	IEC 61000-4-4
Rise Time / Duration	1 ns to 360 ms	1.6 %	
Surge Generator[3] –			
Ring Wave Frequency	Up to 100 kHz	1.6 %	IEC 61000-4-5 (2005, 2014) oscilloscope
Front Time/Duration Time (±)	(0.7 to 840) µs	1.6 %	
Voltage (±)	250 V to 6 kV	3.1 %	
Current (±)	(0.125 to 3) kA	3.6 %	
Phase Shift	(0 to 360)°	5.8°	
Voltage Dip/Interruption Generator[3] (PQF) –			
Voltage	Up to 500 V	1.9 %	IEC 61000-4-11 oscilloscope
Current	Up to 1000 A	2.2 %	
Phase	(0 to 360)°	2.7°	
Time	0.5 µs to 100 ms	1.7 %	
In-Rush Current	Up to 1000 A	4.1 %	

Parameter/Equipment	Range	CMC[2, 5, 6, 7, 9] (±)	Comments
Pulse Generator[3] –			
Voltage Without Load With Load	 (1 to 1000) V (1 to 1000) V	 2.0 % 2.1 %	ISO 7637-1, ISO 7637-2 (2004, 2011), ISO 7637-3 and JASO D-001-94
Time	1 ns to 1 s	1.7 %	
Power Energy	Up to 500 joule	3.0 %	
Magnetic Field[3] – Measure			
Current	Up to 100 A	1.9 %	IEC 61000-4-8 IEC 61000-4-9
Magnetic Field	(0.01 to 199.9) µT	1.8 %	
Distortion	45 Hz to 4 kHz	2.7 % of indicated value	
Coil factor	Up to 10 µT	2.6 %	
Large Loop Antenna System[3]	9 kHz to 30 MHz	0.9 dB	CISPR16-1-4
Oscilloscope[3] –			
Voltage Accuracy	2 mV/div to 10 V/div	0.9 %	Function generator
Frequency Bandwidth	9 kHz to 6 GHz	0.65 dB	Signal generator
Rise Time	(0.2 to 10) ns	12 %	Pulse generator
CAL Out, Frequency	1 kHz	1.2 x 10^{-8} Hz/Hz	Function generator and rubidium oscillator
Input Impedance	50 Ω 1 MΩ	0.04 % + 4 mΩ 0.04 % + 10 Ω	Agilent 34401A
Time Accuracy	(0.1 to 10) nsec 10 nsec to 1 sec	0.3 % 0.25 %	Signal generator Pulse generator

Parameter/Range	Frequency	CMC[2, 5, 6, 7, 9] (±)	Comments
Power Analyzer[3] –			
(10 to 1000) V	AC Voltage: (45 to 500) Hz	0.15 %	Fluke 5500A
(0.33 to 2.2) A (2.2 to 11) A	AC Current: (45 to 500) Hz	0.19 % 0.15 %	
0.1 W to 11 kW	AC Power: (45 to 65) Hz at Unity Power Factor	0.2 %	
Power Factor (0 to 1)	Up to 1.0 kW	0.17 %	
Frequency	10 Hz to 2.4 kHz	0.02 Hz	
Harmonics Current	50 Hz to 2.4 kHz	0.3 %	Waveform generator and power supply unit
Harmonics Distortion	50 Hz to 2.4 kHz	0.12 %	
Short-term Flicker Severity (Pst)	(0.4 to 3.0) kHz	0.3 %	
EMI Receiver[3] –			CISPR 16-1-1 (2015), CISPR 16-1-1
Reference Frequency	9 kHz to 20 GHz	1.2 x 10^{-8} Hz/Hz	Frequency counter and rubidium oscillator
Input Impedance, SWR	9 kHz to 500 MHz 500 MHz to 3 GHz (3 to 20) GHz (20 to 40) GHz	0.2 dB 0.2 dB 0.4 dB 0.5 dB	Network analyzer with calibration kit
Sine-Wave Accuracy (110 to 0) dB µV	9 kHz to 1 GHz (1 to 4) GHz (4 to 6) GHz (6 to 10) GHz (10 to 18) GHz	0.42 dB 0.96 dB 1.1 dB 1.1 dB 1.3 dB	Signal generator, power meter/sensor

Parameter/Range	Frequency	CMC[2, 6, 7] (±)	Comments
EMI Receiver[3] – (cont)			CISPR 16-1-1 (2015), CISPR 16-1-1
Pulse Response: Absolute Calibration	Band A and B Band C and D > 1 GHz	0.8 dB 1.3 dB 1.5 dB	Schwarzbeck IGUU 2916
QP Pulse Rate Response: Relative Calibration	Band A and B Band C and D > 1 GHz	1.0 dB 1.4 dB 1.5 dB	Schwarzbeck IGUU 2916
Relative Pulse Response/QP and Peak	Band A and B Band C and D > 1 GHz	1.0 dB 1.4 dB 1.5 dB	Schwarzbeck IGUU 2916
Relative Pulse Response/QP and Average	Band A and B Band C and D > 1 GHz	1.0 dB 1.4 dB 1.5 dB	Schwarzbeck IGUU 2916
Relative Pulse Response/QP and RMS/	Band A and B Band C and D > 1 GHz	1.0 dB 1.4 dB 1.5 dB	Schwarzbeck IGUU 2916
Selectivity, 6 dB Bandwidth	9 kHz to 1 GHz (1 to 4) GHz (4 to 10) GHz (10 to 18) GHz	0.42 dB 0.96 dB 1.1 dB 1.3 dB	Signal generator, power meter/sensor
IF Rejection Ratio Image Rejection Ratio Spurious Responses	9 kHz to 1 GHz (1 to 4) GHz (4 to 10) GHz (10 to 18) GHz	0.6 dB 1.4 dB 1.6 dB 1.8 dB	Signal generator, power meter/sensor

Parameter/Range	Frequency	CMC[2, 6, 9] (±)	Comments
Signal Generator[3] –			
Output:			
Frequency Accuracy	10 Hz to 18 GHz	1.2 x 10^{-8} Hz/Hz	Frequency counter and rubidium oscillator
Level Accuracy			
(20 to -50) dBm	1 kHz to 6 GHz	0.4 dB	Power meter/sensors
(20 to -50) dBm	(6 to 40) GHz	0.5 dB	
(-50 to -120) dBm	9 kHz to 3.1 GHz	1.0 dB	Spectrum analyzer
(-50 to -120) dBm	(3.1 to 8) GHz	1.2 dB	
(-50 to -120) dBm	(8 to 14.5) GHz	3.5 dB	
(-50 to -120) dBm	(14.5 to 28) GHz	4.1 dB	
(-50 to -120) dBm	(28 to 40) GHz	5.2 dB	
Flatness	1 kHz to 40 GHz	0.5 dB	Power meter/sensors
Impedance, SWR	5 Hz to 3 GHz	0.2 dB	Network analyzer with calibration kit
	(3 to 20) GHz	0.4 dB	
	(20 to 40) GHz	0.5 dB	
Harmonics	9 kHz to 10 MHz	4.1 dB	Spectrum analyzer
	10 MHz to 3.1 GHz	2.8 dB	
	(3.1 to 8) GHz	3.0 dB	
	(8 to 14.5) GHz	5.0 dB	
	(14.5 to 28) GHz	5.8 dB	
Amplitude Modulation	500 kHz to 1 GHz Index: (10 to 99) % Modulation Frequency 400 Hz to 10 kHz	1.8 %	Oscilloscope
Frequency Modulation	10 MHz to 2 GHz Modulation Index (1 to 100) kHz Modulation Frequency 400 Hz to 10 kHz	1.2 %	Spectrum analyzer
Pulse Modulation Pulse width, Rise Time and Fall Time	10 MHz to 2 GHz Pulse Repetition: 1 Hz to 1 MHz Pulse width: 1 µsec to 10 msec	1.6 %	Oscilloscope

Parameter/Range	Frequency	CMC[2, 6, 9] (±)	Comments
Spectrum Analyzer[3] –			
Calibration Output: Frequency	10 MHz	1.2 x 10^{-8} Hz/Hz	Frequency counter power meter/sensor and rubidium oscillator
Span Readout Accuracy	10 Hz to 18 GHz	0.9 %	Signal generator, frequency counter and rubidium oscillator
Frequency Readout Accuracy (Including Maker Frequency)	10 Hz to 18 GHz	1.2 x 10^{-8} Hz/Hz	
Level Accuracy	5 Hz to 15 MHz 15 MHz to 1 GHz (1 to 4) GHz (4 to 40) GHz	0.21 dB 0.55 dB 0.59 dB 0.73 dB	Signal generators, power dividers, and power meter/sensor
Input Attenuator	5 Hz to 20 kHz 20 kHz to 1 GHz (1 to 4) GHz (4 to 40) GHz	0.21 dB 0.55 dB 0.59 dB 0.73 dB	
Reference Level (IF Attenuator)	5 Hz to 20 kHz 20 kHz to 1 GHz (1 to 4) GHz (4 to 40) GHz	0.21 dB 0.55 dB 0.59 dB 0.73 dB	
Input Impedance, SWR	5 Hz to 500 MHz 500 MHz to 3 GHz (3 to 20) GHz (20 to 40) GHz	0.2 dB 0.2 dB 0.4 dB 0.5 dB	Network analyzer with calibration kit
Resolution Bandwidth	9 kHz to 1 GHz (1 to 4) GHz (4 to 10) GHz (10 to 18) GHz	0.42 dB 0.96 dB 1.1 dB 1.3 dB	Signal generator, power meter/sensor, frequency counter
Spurious Response	20 kHz to 1 GHz (1 to 4) GHz (4 to 40) GHz	0.77 dB 0.83 dB 1.0 dB	Signal generator, power meter/sensor

Parameter/Range	Frequency	CMC[2, 4, 6, 9] (±)	Comments
Spectrum Analyzer[3] – (cont)			
Tracking Generator[4]:			
Absolute Output	1 kHz to 40 GHz	0.5 dB	Power meter/sensor
Output Level Flatness	1 kHz to 40 GHz	0.5 dB	Power meter/sensor
Network Analyzer[3] –			
Frequency	1 kHz to 40 GHz	1.2 x 10^{-8} Hz/Hz	Frequency counter and rubidium oscillator
VSWR	5 Hz to 500 MHz 500 MHz to 3 GHz (3 to 20) GHz (20 to 40) GHz	0.2 dB 0.2 dB 0.4 dB 0.5 dB	Network analyzer
Output Level Accuracy	9 kHz to 6 GHz (6 to 50) GHz	0.26 dB + *M* 0.32 dB + *M*	Power meter/sensor
Output Level Flatness	9 kHz to 6 GHz (6 to 50) GHz	0.26 dB + *M* 0.32 dB + *M*	Power meter/sensor
Receiver Linearity			
(0 to 50) dB	1 kHz to 18 GHz (18 to 40) GHz	0.5 dB 1.5 dB	Precision attenuators
Network Analyzer with Calibration Kit – Return Loss	1 kHz to 18 GHz (18 to 40) GHz	0.8 dB for 12 dB 2.4 dB for 12 dB	Precision attenuators and calibration kit

III. Time & Frequency

Parameter/Equipment	Frequency	CMC[2, 9, 11, 12] (±)	Comments
Frequency[3] – Generate and Measure	10 Hz to 20 GHz	1.2 x 10^{-8} Hz/Hz	EIP 575 and rubidium oscillator and signal generators

[1] This laboratory offers commercial 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] This laboratory performs field calibration activities for these parameters. 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, *M* is the source of the mismatch uncertainty due to connections of the device to other devices in actual use.

[5] 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.

[6] These calibrations may also, at customer request, be based on conformance to the calibration requirements of various standards such as CISPR 16-1-1, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11, EN 61000-4-5, IEC 61000-4-2, IEC 61000-3-2, IEC 61000-3-3, IEC 61000-4-6, IEC 61000-4-7, IEC 61000-4-8, IEC 61000-4-9, IEC 61000-4-10, IEC 61000-4-11, IEC 61000-4-12, IEC 61000-4-13, IEC 61000-4-14, IEC 61000-4-15, ANSI 62.41:1991, ANSI C63.16, ANSI C62-41, UL 864, UL 1449, ISO 7637-2, ISO 17069, ITU Rec K.17, ITU Rec K.20, ITU Rec K.21, SBC-TP-76200, GR1089CORE and SAE J1113-13. Other standards may apply and the customer should contact the lab for further information.

[7] Some of the types of instruments calibrated under these parameters are: EMI Receivers, EFT/Burst Generators, ESD Guns and Targets, Surge Generators, Generators for Voltage Dips, Short Interrupts and Variations, Ring Wave Generators, Network Analyzers, Click Analyzers, Impulse Generators, Power Meters, Power Sensors, Signal Generators, Spectrum Analyzers, Attenuators, Terminations, Power Analyzers, Reference Impedance Network (RIN) and CVCF power supply.

[8] These calibrations are performed (as applicable to the normative requirements) at *Samoto & Associates, Ltd.,* the *Fujitsu General EMC Laboratory*, located at 3-3-17 Suenaga, Takatsu-ku, Kawasaki, 213-8502, JAPAN; at *UL Japan Kashima EMC*, 1614 Mushihata, Katori-shi, Chiba-ken, 289-0341, JAPAN where Standard Site Methods (SSM) is required; and at customer's location meeting standard antenna calibration site requirements.

[9] In the statement of CMC, percentages are to be read as percent of reading unless otherwise noted.

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

[11] 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.

[12] CMC of Frequency-Rubidium standard is based on manufacturer's one-year specification.

Accredited Laboratory

A2LA has accredited

SAMOTO & ASSOCIATES, LTD.

Yokohama, Kanagawa, JAPAN

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 17th day of July 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2067.01
Valid to June 30, 2025
Revised October 2, 2023

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