



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: January 31, 2025

Certificate Number: 1266.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 8}:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 6, 9} (±)	Comments
DC Voltage – Generate and Measure ³	1 mV to 700 V	0.080 %	Standard equipment: digital multimeter
DC Current – Generate and Measure ³	100 µA to 1 A (1 to 50) A	0.042 % 0.14 %	Standard equipment: digital multimeter, shunt resistor

Parameter/Range	Frequency	CMC ^{2, 6, 9} (±)	Comments
AC Voltage – Generate and Measure ³			
1 mV to 700 V	(1 to 10) Hz	0.80 %	Standard equipment: digital multimeter
1 mV to 700 V	10 Hz to 1 kHz	0.29 %	
1 mV to 500 V	(1 to 10) kHz	0.29 %	

Parameter/Range	Frequency	CMC ^{2, 6, 9} (±)	Comments ⁴
AC Voltage – Generate and Measure ³ (continued)			
1 mV to 300 V	(10 to 20) kHz	0.29 %	Standard equipment: digital multimeter
1 mV to 7 V	(20 to 100) kHz	0.66 %	
1 mV to 7 V	(100 to 300) kHz	2.1 %	
AC Current – Generate and Measure ³			
100 µA to 120 mA	(10 to 45) Hz 45 Hz to 5 kHz	0.65 % 0.26 %	Standard equipment: digital multimeter, shunt resistor
(1 to 120) mA	(5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.26 % 0.85 % 2.1 %	
120 mA to 50 A	5 Hz to 10 kHz	0.14 %	

Parameter/Equipment	Range	CMC ^{2, 6, 9} (±)	Comments ⁴
AC Power – Generate and Measure ³			
5 Hz to 1 kHz; 12 mV to 700 V			Standard equipment: digital multimeter, shunt resistor, frequency counter, function generator
Range: 120 mA to 50 A	1.5 mW to 35 kW	0.32 %	
1 kHz to 10 kHz; 12 mV to 500 V			
Range: 120 mA to 50 A	1.5 mW to 25 kW	0.32 %	

Parameter/Equipment	Range	CMC ^{2, 6, 9} (\pm)	Comments ⁴
DC Power – Generate and Measure ³ 12 mV to 700 V 100 μ A to 50 A	1 mW to 35 kW	0.18 %	Standard equipment: digital multimeter, shunt resistor
Total Power Consumption Electric Energy: DC, AC 5 Hz to 10 kHz Generate ³ Measure ³	1 W to 60 kWh (1 to 10) Wh (10 to 30) Wh 30 W to 60 kWh	0.33 % 5.8 % 0.75 % 0.51 %	Standard equipment: digital multimeter, shunt resistor, frequency counter Power analyzer

Parameter/Range	Frequency	CMC ^{2, 9} (\pm)	Comments ⁴
Power Factor – Generate ³ Up to Power Factor = 1	5 Hz to 1 kHz	0.0013 PF	Standard equipment: digital multimeter, frequency counter, function generator

Parameter/Equipment	Range	CMC ^{2, 6, 9} (\pm)	Comments ⁴
Flicker Meter – Percentile Short Term ³ (50 / 60) Hz	1 PST	0.49 %	Applicable standard: IEC 61000-4-15 Standard equipment: digital multimeter, frequency counter
Capacitance – Measure ³ , Capacitive Reactance 50 Hz to 1 kHz	1 pF to 10 mF	0.53 %	Standard equipment: LCR meter
Inductance – Measure ³ , Inductive Reactance 50 Hz to 1 kHz	1 μ H to 100 mH	0.53 %	Applicable standards: JIS C 61000-3-2, IEC 61000-3-3, IEC 61000-3-11 Standard equipment: LCR meter
Resistance – Measure ³	1 m Ω to 1 Ω 1 Ω to 1 k Ω 1 k Ω to 1 M Ω (1 to 100) M Ω	0.13 % 0.014 % 0.0062 % 0.13 %	Applicable standards: JIS C 61000-3-2, IEC 61000-3-3, IEC 61000-3-11, IEC 61000-4-2 Standard equipment: digital multimeter, ohmmeter

Parameter/Equipment	Range	CMC ^{2, 6, 9} (\pm)	Comments ⁴
Oscilloscope ³ –			
Voltage Accuracy	1 mV/div to 1 kV/div	0.16 %	Standard equipment: digital multimeter, power meter, network analyzer
Frequency Response	9 kHz to 6 GHz	0.20 dB	
	9 kHz to 500 MHz	0.016 dB	
Frequency/Time	0.1 Hz to 1 kHz	0.13 %	Frequency counter
	1 kHz to 100 MHz	0.12 %	
	100 MHz to 6 GHz	0.014 %	
Voltage Probes ³ –			
Voltage Ratio	Up to 3000:1 Ratio	0.11 %	Standard equipment: digital multimeter, network analyzer
Frequency Response	9 kHz to 500 MHz	0.24 dB	
Current Transformer ³ –			
Current/Voltage Ratio	Up to 3000:1 Ratio	0.32 %	Standard equipment: digital multimeter, network analyzer
Frequency Response	9 kHz to 30 MHz (30 to 500) MHz	0.47 dB 1.1 dB	
Transient Generator ³			
Peak Voltage, Measure	(1 to 800) V	2.0 %	Applicable standard: ISO 7637-2, ISO 7637-2:2004, ISO 16750-2, JASO D 001
Peak Voltage, Measure Load at 0.5, 2, 10, and 50 Ω	(1 to 800) V	2.1 %	
Rise and Fall Time	3.5 ns to 55 ms	1.5 %	Standard equipment: oscilloscope
Pulse Width	105 ns to 2.4 s	1.3 %	
Constant Amplitude Continues Time	1 ms to 30 s	1.2 %	

Parameter/Range	Frequency	CMC ^{2, 6, 9} (\pm)	Comments ⁴
Total Harmonic Distortion V-THD – Measure ³ Fundamental Freq. (0.1 to 30) %	(50 to 400) Hz	0.92 %	Standard equipment: Harmonic analyzer
V-THD – Generate ³ Fundamental Freq. (0.1 to 99) %	10 Hz to 10 kHz (10 to 150) kHz	0.41 % 3.0 %	Digital multimeter
I-THD – Measure ³ Fundamental Freq. (0.1 to 30) %	(50 to 400) Hz	0.85 %	Harmonic analyzer
I-THD – Generate ³ Fundamental Freq. (0.1 to 99) %	10 Hz to 10 kHz	0.20 %	Digital multimeter, shunt resistor

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 5, 9} (\pm)	Comments
RF Power – Measure ³			
0 dBm	50 MHz	0.052 dB	Standard equipment: power meter, power sensor, spectrum analyzer
(-80 to -36) dBm	9 kHz to 6 GHz (6 to 18) GHz	1.2 dB 1.3 dB	
(-36 to -17) dBm	9 kHz to 18 GHz (18 to 26.5) GHz	0.21 dB 0.24 dB	
(-17 to 20) dBm	9 kHz to 18 GHz (18 to 26.5) GHz (26.5 to 40) GHz (40 to 43.5) GHz	0.21 dB 0.24 dB 0.27 dB 0.41 dB	
(20 to 30) dBm	9 kHz to 18 GHz (18 to 26.5) GHz (26.5 to 40) GHz	0.31 dB 0.36 dB 0.39 dB	
(30 to 40) dBm	9 kHz to 18 GHz	0.31 dB	
(40 to 50) dBm	9 kHz to 6 GHz	0.31 dB	

Parameter/Range	Frequency	CMC ^{2, 5, 9} (\pm)	Comments ⁴
RF Power – Generate ³			
0 dBm	50 MHz	0.048 dB	Standard equipment: power meter, power sensor
(-70 to -36) dBm	9 kHz to 18 GHz	0.30 dB	
	(18 to 26.5) GHz	0.36 dB	
(-50 to -36) dBm	(26.5 to 40) GHz	0.38 dB	
(-36 to -17) dBm	9 kHz to 18 GHz	0.20 dB	
	(18 to 26.5) GHz	0.24 dB	
	(26.5 to 40) GHz	0.38 dB	
(-17 to 20) dBm	9 kHz to 18 GHz	0.20 dB	
	(18 to 26.5) GHz	0.24 dB	
	(26.5 to 40) GHz	0.27 dB	
	(40 to 43.5) GHz	0.36 dB	
(20 to 30) dBm	9 kHz to 18 GHz	0.30 dB	
	(18 to 26.5) GHz	0.36 dB	
	(26.5 to 40) GHz	0.38 dB	
(30 to 50) dBm	9 kHz to 6 GHz	0.30 dB	
	(6 to 18) GHz	0.30 dB	
RF Voltage – Measure ³			
(20 to 137) dB(μ V)	9 kHz to 6 GHz (6 to 18) GHz	1.2 dB 1.5 dB	Standard equipment: spectrum analyzer

Parameter/Range	Frequency	CMC ^{2, 5, 6} (\pm)	Comments ⁴
Amplifier ³ – Gain: (0 to 80) dB Compression Point: (0 to 5) dB	5 Hz to 9 kHz 9 kHz to 1 GHz (1 to 6) GHz (6 to 18) GHz (18 to 40) GHz (40 to 43.5) GHz 5 Hz to 6 GHz (6 to 43.5) GHz	0.20 dB 0.17 dB 0.30 dB 0.45 dB 0.54 dB 0.74 dB 1.5 dB 1.8 dB	Standard equipment: network analyzer
Attenuation – Measure ³ Insertion Loss (0 to 50) dB (50 to 100) dB	5 Hz to 9 kHz 9 kHz to 1 GHz (1 to 6) GHz (6 to 18) GHz (18 to 40) GHz (40 to 43.5) GHz 5 Hz to 9 kHz 9 kHz to 1 GHz (1 to 6) GHz (6 to 18) GHz (18 to 40) GHz (40 to 43.5) GHz	0.15 dB 0.11 dB 0.15 dB 0.23 dB 0.27 dB 0.31 dB 0.22 dB 0.26 dB 0.59 dB 0.59 dB 0.62 dB 0.70 dB	Standard equipment: network analyzer
Impedence ³ – VSWR	5 Hz to 4 GHz (4 to 20) GHz (20 to 26.5) GHz (26.5 to 43.5) GHz	2.4 % 4.9 % 7.6 % 12 %	Standard equipment: network analyzer

Parameter/Range	Frequency	CMC ^{2, 5, 6} (\pm)	Comments ⁴
Current Probe, CVP ³ –			
Transfer Impedance	5 Hz to 9 kHz 9 kHz to 30 MHz (30 to 800) MHz 800 MHz to 2.1 GHz	1.1 dB 0.47 dB 1.1 dB 1.8 dB	Applicable standards: CISPR 16-1-2, ISO 11452-4 Standard equipment: network analyzer
Voltage Division Factor	150 kHz to 30 MHz	0.37 dB	
Influence of External E-Field	150 kHz to 30 MHz	1.4 dB	
Signal Generator ³ –			
Frequency	0.1 Hz to 1 kHz 1 kHz to 100 MHz 100 MHz to 40 GHz	$2.3 \times 10^{-2} \%$ $3.0 \times 10^{-6} \%$ $2.1 \times 10^{-7} \%$	Standard equipment: frequency counter, power meter, power sensor, spectrum analyzer
Amplitude:			
0 dBm	50 MHz	0.052 dB	
(-80 to -36) dBm	9 kHz to 6 GHz (6 to 18) GHz	1.2 dB 1.3 dB	
(-36 to -17) dBm	9 kHz to 18 GHz (18 to 26.5) GHz	0.21 dB 0.24 dB	
(-17 to 20) dBm	9 kHz to 18 GHz (18 to 26.5) GHz (26.5 to 40) GHz (40 to 43.5) GHz	0.21 dB 0.24 dB 0.27 dB 0.41 dB	
(20 to 30) dBm	9 kHz to 18 GHz (18 to 26.5) GHz (26.5 to 40) GHz	0.31 dB 0.36 dB 0.39 dB	
(30 to 40) dBm	9 kHz to 18 GHz	0.31 dB	
(40 to 50) dBm	9 kHz to 6 GHz	0.31 dB	

Parameter/Range	Frequency	CMC ^{2, 5, 6} (\pm)	Comments
Amplitude Modulation – Measure ³			
Depth –			
(5 to 99) %	Carrier Frequency: 150 kHz to 10 MHz Modulation Frequency: 50 Hz to 10 kHz	3.1 %	Standard equipment: modulation analyzer, frequency counter, oscilloscope
	Carrier Frequency: 10 MHz to 1.3 GHz Modulation Frequency: 50 Hz to 50 kHz	2.4 %	
80 %	Carrier Frequency: 26 MHz to 2.5 GHz Modulation Frequency: 2 Hz	2.0 %	
Modulation Frequency –			
50 Hz to 10 kHz	Carrier Frequency: 150 kHz to 10 MHz Depth: (5 to 99) %	0.038 %	
50 Hz to 50 kHz	Carrier Frequency: 10 MHz to 1.3 GHz Depth: (5 to 99) %	0.038 %	
2 Hz	Carrier Frequency: 26 MHz to 2.5 GHz Depth: 80 %	0.23 %	

Parameter/Range	Frequency	CMC ^{2, 5, 6, 9} (\pm)	Comments
Frequency Modulation – Measure ³			
Deviation –			
(1 to 40) kHz	Carrier Frequency: 250 kHz to 10 MHz Modulation Frequency: 20 Hz to 10 kHz	2.7 %	Standard equipment: modulation analyzer, frequency counter
(1 to 400) kHz	Carrier Frequency: 10 MHz to 1.3 GHz Modulation Frequency: 50 Hz to 100 kHz	1.8 %	
Modulation Frequency –			
50 Hz to 10 kHz	Carrier Frequency: 150 kHz to 10 MHz Deviation: (1 to 40) kHz	0.038 %	
50 Hz to 50 kHz	Carrier Frequency: 10 MHz to 1.3 GHz Deviation: (1 to 400) kHz	0.038 %	
Phase Modulation – Measure ³			
Deviation –			
(1 to 21) Radian	Carrier Frequency: 10 MHz to 1.3 GHz Modulation Frequency: 200 Hz to 20 kHz	4.1 %	Standard equipment: modulation analyzer, frequency counter
Modulation Frequency –			
200 Hz to 20 kHz	Carrier Frequency: 10 MHz to 1.3 GHz Deviation: (1 to 100) Radian	0.038 %	

Parameter/Range	Frequency	CMC ^{2, 5, 9} (±)	Comments
Spurious Responses – Measure ³			
Up to 60 dBc	Fundamental: 9 kHz to 3.6 GHz, Harmonic: Up to 18 GHz	1.6 dB	Standard equipment: spectrum analyzer
	Fundamental 9 kHz to 8 GHz Harmonic Up to 40 GHz	2.4 dB	

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
LISN, AMN, AN, ISN, AAN, T-ISN, CDNE, and High Impedance Probe ³ –			
Voltage Division Factor	9 kHz to 150 MHz (150 to 300) MHz	0.15 dB 0.24 dB	Applicable standards: CISPR 16-1-2, CISPR 16-1-2:2014, CISPR 25, ISO 7637-2, ANSI C63.4, Ministry of Internal Affairs and Communications (Japan) EN 50561-1
Impedance Magnitude	9 kHz to 150 MHz (150 to 300) MHz	2.3 % 2.9 %	
Impedance Phase	9 kHz to 300 MHz	0.84 °	
Isolation, Balance	9 kHz to 300 MHz	1.4 dB	
LCL – Up to 60 dB (60 to 70) dB (70 to 80) dB	9 kHz to 100 MHz	0.45 dB 0.54 dB 1.1 dB	Standard equipment: network analyzer, calibration kit, reference LCL standard
Insertion Loss	9 kHz to 30 MHz	0.084 dB	

Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments
Absorbing Clamp – Clamp Factor (Original Method Only) Decoupling Factor DF^3 Decoupling Ratio DR^3	 (30 to 1000) MHz (30 to 1000) MHz (30 to 1000) MHz	 2.5 dB 0.66 dB 0.77 dB	 Applicable standards: CISPR 16-1, CISPR 16-1-3 Standard equipment: network analyzer
Injection Clamp and Decoupling Clamp ³ – Input Impedance Decoupling Factor Coupling Factor	 9 kHz to 230 MHz 230 MHz to 1 GHz 9 kHz to 230 MHz 230 MHz to 1 GHz 9 kHz to 230 MHz (230 to 800) MHz (800 to 1000) MHz	 7.3 % 8.2 % 0.52 dB 1.6 dB 0.51 dB 2.3 dB 4.0 dB	 Applicable standard: IEC 61000-4-6 Standard equipment: network analyzer, calibration kit
Common Mode Absorption Device (CMAD) ³ – S_{11} S_{21}	 (30 to 200) MHz (30 to 200) MHz	 0.029 lin 0.020 lin	 Applicable standards: CISPR 16-1-4 Standard equipment: network analyzer

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments ⁴
Antennas – (Dipole, Biconical, Log-Periodic, Hybrid and Horn, etc. Antenna Factors Standard Site Method	30 MHz to 1 GHz (1 to 18) GHz (18 to 40) GHz	0.63 dB 0.78 dB 1.2 dB	Applicable standards: ANSI C63.5, ANSI C63.5:1998, ANSI C63.5:2006, CISPR 16-1-6 Standard equipment: network analyzer
Antenna Factor for Antenna Pair	30 MHz to 1 GHz	0.55 dB	Applicable standards: ANSI C63.5, ANSI C63.5:1998, ANSI C63.5:2006 Standard equipment: network analyzer
Geometry – Specific Correction Factors (GSCF)	30 MHz to 1 GHz	0.56 dB	Applicable standards: ANSI C63.5, ANSI C63.5:2006 Standard equipment: network analyzer
Antenna Pair Reference	30 MHz to 1 GHz	0.44 dB	Applicable standards: CISPR 16-1-4 Standard equipment: network analyzer
Antenna Factors – 1m Method –	20 MHz to 1 GHz (1 to 3) GHz (3 to 18) GHz	0.50 dB 0.83 dB 0.96 dB	Applicable standards: SAE ARP958 Rev. D, SAE ARP958 Rev. E Standard equipment: network analyzer

Parameter/Frequency	Range	CMC ^{2, 5, 6} (\pm)	Comments ⁴
Antennas – (Dipole, Biconical, Log-periodic, Hybrid and Horn, etc.)			
Antenna Factor – Reference Antenna Method – Discrete Frequency Points	(30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 125, 140, 150, 160, 175, 180, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000) MHz	1.3 dB	Applicable standards: ANSI C63.5, ANSI C63.5:1998, ANSI C63.5:2006, CISPR 16-1-6, VCCI
Other Frequency Points	30 MHz to 1 GHz	1.7 dB	Standard equipment: reference dipole
Antenna Symmetry, Balance	30 MHz to 1 GHz	0.39 dB	Applicable standards: ANSI C63.5, ANSI C63.5:2006, CISPR 16-1-6
			Standard equipment: network analyzer
VSWR for Antennas	(30 to 300) MHz	2.5 %	Applicable standards: ANSI C63.4, ANSI C63.5, CISPR 16-1-6,
			Standard equipment: network analyzer
Antenna Directional Pattern			
(± 15 dB Down From Reference Response)	(1 to 18) GHz	1.0 dB	Applicable standards: CISPR 16-1-4, CISPR 16-1-6
Antenna Beam Width	(1 to 18) GHz	0.93°	Standard equipment: network analyzer

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments ⁴
Monopole Antenna ³ – Antenna Factor – Equivalent Capacitance Substitution Method	5 Hz to 9 kHz 9 kHz to 30 MHz (30 to 60) MHz	0.70 dB 0.65 dB 1.6 dB	Applicable standards: ANSI C63.5, ANSI C63.5:1998, ANSI C63.5:2006, SAE ARP958 Rev. D, SAE ARP958 Rev. E, CISPR 25:2002, CISPR 16-1-4:2010, CISPR 16-1-4, CISPR 16-1-6 Standard equipment: network analyzer
Loop Antenna – Antenna Factor – Standard Magnetic Field Method Standard Field Method Using TEM Cell	9 kHz to 10 MHz (10 to 30) MHz 1 kHz to 10 MHz (10 to 400) MHz	0.74 dB 1.3 dB 0.54 dB 1.3 dB	Applicable standards: SAE ARP958 Rev. D, SAE ARP958 Rev. E, IEEE Std 291, ANSI C63.5, CISPR 16-1-6 Standard equipment: network analyzer, current transformer, transmit loop, antenna Standard equipment: network analyzer
Loop Coil/Sensor ³ – Antenna Factor Magnetic Flux Density	5 Hz to 500 kHz	0.84 dB	Applicable standards: SAE ARP958 Rev. D, SAE ARP958 Rev. E, MIL-STD-461, MIL-STD-461F Standard equipment: network analyzer, digital multimeter, shunt resistor, spectrum analyzer
Large Loop Antenna ³ – Validation Factor	9 kHz to 30 MHz	0.87 dB	Applicable standard: CISPR 16-1-4 Standard equipment: network analyzer

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments ⁴
Electric Field Probe –			
Correction Factor (Frequency Response)	(1 to 10) kHz 10 kHz to 6 GHz	0.87 dB 1.0 dB	Applicable standard: IEEE Std 1309
Linearity	(1 to 10) kHz 10 kHz to 6 GHz	0.034 dB 0.37 dB	Standard equipment: reference field probe, power meter, power sensor
Rotational Response	10 kHz to 6 GHz	0.17 dB	
EMI Receiver ³ –			
Absolute Pulse Response	(9 to 150) kHz 150 kHz to 30 MHz 30 MHz to 1 GHz	0.54 dB 0.58 dB 0.65 dB	Applicable standards: CISPR 16-1-1, CISPR 16-1-1:2010, CISPR 16-1-1:2015, ANSI C63.2
Relative Pulse Response	(9 to 150) kHz 150 kHz to 30 MHz 30 MHz to 1 GHz	0.47 dB 0.57 dB 0.67 dB	Standard equipment: power meter, power sensor, pulse generator, signal generator, function generator, frequency counter, digital multimeter
Response to Pulses (Above 1 GHz)	(1 to 18) GHz	0.37 dB	
Absolute Amplitude / Sinewave Voltage, Intermediate Frequency Rejection Ratio, Image Frequency Rejection Ratio, Other Spurious Responses, Random Noise	10 Hz to 9 kHz 9 kHz to 6 GHz (6 to 18) GHz (18 to 26.5) GHz (26.5 to 40) GHz (40 to 43.5) GHz	0.025 dB 0.23 dB 0.23 dB 0.33 dB 0.44 dB 0.50 dB	
Selectivity	200 Hz to 1 MHz	4.0 %	
Response to Intermittent, Unsteady and Drifting Narrowband Disturbances	9 kHz to 18 GHz	0.26 dB	
Impulse Bandwidth	1 MHz	2.3 %	
Disturbance Analyzer	150 kHz to 30 MHz	0.64 dB	
Displayed Average Noise	9 kHz to 40 GHz	2.0 dB	

Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments ⁴
Spectrum Analyzer ³ –			
Absolute Amplitude / Frequency Response, Amplitude Accuracy	10 Hz to 9 kHz 9 kHz to 6 GHz (6 to 18) GHz (18 to 26.5) GHz (26.5 to 40) GHz (40 to 43.5) GHz	0.025 dB 0.25 dB 0.31 dB 0.36 dB 0.38 dB 0.48 dB	Standard equipment: power meter, power sensor, frequency counter, digital multimeter
Relative Amplitude / Input Attenuator Switching Accuracy, Scale Fidelity	10 Hz to 9 kHz 9 kHz to 18 GHz (18 to 26.5) GHz (26.5 to 40) GHz (40 to 43.5) GHz	0.023 dB 0.21 dB 0.22 dB 0.22 dB 0.24 dB	
Frequency Readout	0.1 Hz to 1 kHz 1 kHz to 100 MHz 100 MHz to 40 GHz	0.023 % 3.0×10^{-6} % 2.1×10^{-7} %	
Frequency Span	0.1 Hz to 1 kHz 1 kHz to 100 MHz 100 MHz to 40 GHz	1.2 % 1.2 % 1.2 %	
Resolution Bandwidth	10 Hz to 100 MHz	1.2 %	
Displayed Average Noise	9 kHz to 18 GHz (18 to 40) GHz	0.38 dB 2.0 dB	
CDN and (150 to 50) Ω Adapters ³ –			Applicable standard: IEC 61000-4-6
Insertion Loss (Typical 9.5 dB)	150 kHz to 300 MHz	0.13 dB	Standard equipment: network analyzer, calibration kit
Coupling Factor	150 kHz to 300 MHz	0.38 dB	
Impedance	150 kHz to 80 MHz (80 to 230) MHz (230 to 300) MHz	2.4 % 2.9 % 3.7 %	

Parameter/Range	Frequency	CMC ^{2, 5, 6} (\pm)	Comments ⁴
Directional Coupler ³ – Insertion Loss, Coupling Factor, and Isolation – (0 to 50) dB	5 Hz to 9 kHz 9 kHz to 1 GHz (1 to 6) GHz (6 to 18) GHz (18 to 40) GHz (40 to 43.5) GHz	0.15 dB 0.11 dB 0.15 dB 0.23 dB 0.27 dB 0.31 dB	Standard equipment: network analyzer
(50 to 100) dB	5 Hz to 9 kHz 9 kHz to 1 GHz (1 to 6) GHz (6 to 18) GHz (18 to 40) GHz (40 to 43.5) GHz	0.22 dB 0.26 dB 0.59 dB 0.59 dB 0.62 dB 0.70 dB	
BCI Probe and Tubular Wave Coupler ³ – Insertion Loss	9 kHz to 3 GHz	0.54 dB	Applicable standards: ISO 11452-4, MIL-STD-461 Standard equipment: network analyzer

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments ⁴
ESD Simulator –			
Contact Discharge –			
Current (I _p)	(0.25 to 30) kV	3.3 %	Applicable standards: IEC 61000-4-2, ISO 10605, ISO 10605:2001, RTCA/DO-160
Current (I ₁) (I ₂)	(0.25 to 30) kV	5.1 %	
Rise/Fall Time	600 ps to 1 ns	7.7 %	
Air Discharge –			Standard equipment: oscilloscope, voltage meter
Rise/Fall Time	500 ps to 5 ns	13 %	
RC Time Constant	(240 to 730) ns	3.3 %	
Charging Voltage	(2 to 30) kV	1.1 %	
EFT/Burst Generator ³ –			
Peak Voltage (Load at 50 Ω and 1 kΩ)	Pulse Voltage 250 V to 8 kV	2.6 %	Applicable standard: IEC 61000-4-4, IEC 61000-4-4:2004
Rise/Fall Time	(3.5 to 7) ns	1.6 %	
Pulse Width	(35 to 150) ns	0.74 %	Standard equipment: oscilloscope
Burst Duration	750 μs to 15 ms	0.14 %	
Burst Period	300 ms	0.14 %	
Repetition Rate	(2.5 to 100) kHz	0.38 %	
Capacitive Coupling Clamp ³ –			
Peak Voltage	Pulse Voltage 2 kV	3.3 %	Applicable standard: IEC 61000-4-4
Rise Time	(3.5 to 6.5) ns	3.2 %	
Pulse Width	(35 to 65) ns	1.7 %	Standard equipment: oscilloscope

Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments ⁴
Surge Generator ³ –			
Front Time (Rise / Fall Time)	(1 to 10) μ s	10 %	Applicable standard: IEC 61000-4-5, IEC 61000-4-5:2005, IEC 61000-4-9 Standard equipment: oscilloscope, current transformer
Duration Time (Time to Half-value)	(16 to 700) μ s	2.6 %	
Peak Voltage	CW Voltage 500 V to 8 kV	3.5 %	
Peak Current	CW Voltage 500 V to 8 kV	3.1 %	
Over/Under Shoot	(0 to 30) %	3.4 %	
Phase Shift (50 Hz / 60 Hz)	(0 to 360) $^{\circ}$	0.93 $^{\circ}$	

Parameter/Equipment	Range	CMC ^{2, 5, 6, 9} (\pm)	Comments ⁴
Voltage Dip Generator ³ – Voltage Over/Under Shoot Rise/Fall Time Phase Shift (50 Hz / 60 Hz) Duration Time Current (Inrush Current Capability)	(1 to 400) V Up to 20 V (1 to 5) μ s (0 to 360) $^{\circ}$ 8.333 ms to 5 s 50 A to 2 kA	1.2 % 4.1 % 2.9 % 0.93 $^{\circ}$ 0.16 % 3.4 %	Applicable standards: IEC 61000-4-11, IEC 61000-4-29, IEC 61000-4-34, Standard equipment: oscilloscope, current transformer
Site Attenuation ³ – Normalized Site Attenuation (Distance 3 m to 10 m)	30 MHz to 1 GHz	1.0 dB	Applicable standards: CISPR 16-1-4, ANSI 63.4:2014, ANSI C63.4a, VCCI Standard equipment: network analyzer antenna pair
Reference Site Method ³ – (Distance 3 m to 10 m)	30 MHz to 1 GHz	0.55 dB	Applicable standards: CISPR 16-1-4 Standard equipment: network analyzer antenna pair reference
Site VSWR Measurement ³ – SVSWR (Distance 3 m to 10 m)	(1 to 6) GHz (6 to 18) GHz	0.49 dB 0.73 dB	Applicable standards: CISPR 16-1-4, CISPR 16-1-4:2012 Standard equipment: network analyzer

III. Magnetic Quantities

Parameter/Equipment	Range	CMC ^{2, 6, 7} (\pm)	Comments ⁴
Magnetic Field Coils ³ – Coil Factor (50 Hz / 60 Hz)	(0.5 to 50) μ T	1.1 %	Applicable standards: IEC 61000-4-8, IEC 61000-4-9 Standard equipment: digital multimeter, H-Field meter
Magnetic Field – Measuring Equipment			
DC	(0.1 to 1) A/m (1 to 3) A/m (3 to 10) A/m (10 to 30) A/m 30 A/m to 4 kA/m	6.0 % 6.0 % 3.9 % 2.2 % 0.81 %	Applicable standard: IEC 61786 Standard equipment: helmholtz coil, digital multimeter, shunt resistor
AC	(5 to 10) Hz, (0.1 A/m to 1 kA/m)	1.1 %	
	10 Hz to 400 kHz, (0.1 A/m to 1 A/m)	1.1 %	
	(10 to 100) Hz, (1 A/m to 1 kA/m)	1.1 %	
	100 Hz to 1 kHz, (1 A/m to 300 A/m)	1.1 %	
	(1 to 10) kHz, (1 A/m to 50 A/m)	1.1 %	
	(10 to 400) kHz, (1 A/m to 3 A/m)	5.5 %	

IV. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6, 7} (\pm)	Comments ⁴
Frequency ³ – Measure	10 MHz 0.1 Hz to 1 kHz 1 kHz to 100 MHz 100 MHz to 40 GHz	$1.1 \times 10^{-7} \%$ $2.3 \times 10^{-2} \%$ $3.0 \times 10^{-6} \%$ $2.1 \times 10^{-7} \%$	Standard equipment: frequency counter
Frequency ³ – Generate	10 MHz 0.1 Hz to 1 kHz 1 kHz to 100 MHz 100 MHz to 40 GHz	$1.1 \times 10^{-7} \%$ $2.3 \times 10^{-2} \%$ $3.5 \times 10^{-4} \%$ $1.2 \times 10^{-4} \%$	Standard equipment: signal generator
Time Interval – Measure ³			
Pulse Width	10 ns to 1 s	0.55 %	Standard equipment: oscilloscope
Pulse Period	100 ns to 100 s	0.13 %	
Duty Cycle	(1 to 99) %	0.59 %	
Rise/ Fall Time	1 ns to 1 s	1.6 %	

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. CMC's 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. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the Calibration and Measurement Capability Uncertainty (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 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 For standards or methods listed on the scope of accreditation without a revision date, laboratories are expected to be competent in the use of the current version within one year of the date of publication of the standard calibration method contained in referenced standards (e.g. CISPR 25). When a superseded standard or method is required for an accredited test, the scope will include the superseded date/version.

⁵ Mismatch uncertainty is not included.

⁶ In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.

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.

⁸ This scope meets A2LA's *P112 Flexible Scope Policy*.

⁹ 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. CMC's 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.



Accredited Laboratory

A2LA has accredited

UL JAPAN, INC. – KASHIMA EMC LABORATORY

Chiba-ken, 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 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 22nd day of February 2023.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1266.02
Valid to January 31, 2025

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