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

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CALIBRATION

Valid To: December 31, 2024 Certificate Number: 1207.01

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

I. Electrical – RF/Microwave

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Conical Log Spiral Antenna – Antenna Factor	(100 to 300) MHz (300 to 850) MHz 850 MHz to 1 GHz (1 to 10) GHz	1.4 dB 1.1 dB 0.87 dB 1.3 dB	SAE ARP958E (three antenna method)
Biconical Antenna – Antenna Factor	(20 to 30) MHz (30 to 300) MHz 300 MHz to 2.5 GHz (2 to 18) GHz (30 to 300) MHz 300 MHz to 2.5 GHz (2.5 to 3) GHz (30 to 200) MHz	0.69 dB 1.1 dB 1.4 dB 3.1 dB 0.82 dB 1.4 dB 1.6 dB 0.97 dB	SAE ARP958E (three antenna method) ANSI C63.5:1998, ANSI C63.5:2006, ANSI C63.5:2017 (standard site method) ANSI C63.5:2017 (dual antenna factor)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Biconical Antenna – Antenna Factor (cont)			
Antenna Pair Reference	(30 to 200) MHz	1.1 dB	CISPR 16-1-4 2019+AMD1:2020+ AMD2:2023 CISPR 16-1-4 (2010)+A1(2012)+A2 (2017) (Reference Site Method)
	(30 to 300) MHz	0.73 dB	CISPR 16-1-6 (standard site method)
Ridge Guide Horn Antenna – Antenna Factor	(0.2 to 2) GHz (2 to 8) GHz (8 to 18) GHz (18 to 40) GHz	1.7 dB 1.2 dB 1.1 dB 1.1 dB	SAE ARP958E (three antenna method)
	(0.2 to 18) GHz	1.5 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006, ANSI C63.5:2017 (standard site method)
	(1 to 18) GHz	0.67 dB	CISPR 16-1-6 (three antenna method)
Microwave Horn Antenna – Antenna Factor	(0.75 to 2) GHz (2 to 10) GHz (10 to 18) GHz (18 to 40) GHz	0.84 dB 0.69 dB 0.66 dB 1.4 dB	SAE ARP958E (three antenna method)
	(1 to 40) GHz	0.93 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006, ANSI C63.5:2017 (standard site method)
	(1 to 18) GHz	0.68 dB	CISPR 16-1-6 (three antenna method)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Dipole Antennas – Antenna Factor	(30 to 60) MHz (60 to 140) MHz (140 to 400) MHz (400 to 1000) MHz	0.89 dB 0.92 dB 1.0 dB 0.97 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006, ANSI C63.5:2017 (standard site method)
Fixed Length Dipole – Antenna Factor	(420 to 3010) MHz	1.4 dB	1150-3-3012 (three antenna method in fully anechoic chamber)
Sleeve Dipole and Resonant Loop - Gain	400 MHz to 7.5 GHz	0.43 dB	1650-3-0007 (at resonant frequency only)
VSWR	400 MHz to 7.5 GHz	0.22 dB	
Hybrid Antennas – Antenna Factor	(26 to 30) MHz 30 MHz to 1 GHz (1 to 7) GHz	0.92 dB 0.94 dB 2.1 dB	SAE ARP958E (three antenna method)
	(26 to 30) MHz 30 MHz to 1 GHz (1 to 7) GHz	0.83 dB 0.82 dB 1.4 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006, ANSI C63.5:2017 (standard site method)
	30 MHz to 1 GHz	0.77 dB	CISPR 16-1-6 (standard site method)
	(1 to 6) GHz	1.1 dB	CISPR 16-1-6 (three antenna method)
Log-Periodic Antennas – Antenna Factor	200 MHz to 2 GHz	1.1 dB	SAE ARP958E (three antenna method)
	(20 to 200) MHz 200 MHz to 1 GHz (1 to 6) GHz (6 to 18) GHz	1.5 dB 0.71 dB 1.6 dB 1.7 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006, ANSI C63.5:2017 (standard site method)
	200 MHz to 1 GHz	1.6 dB	ANSI C63.5:2017 (GSCF)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Log-Periodic Antennas – Antenna Factor (cont)			
Antenna Pair Reference	200 MHz to 1 GHz	1.0 dB	CISPR 16-1-4 2019+AMD1:2020+ AMD2:2023 CISPR 16-1-4 (2010)+A1(2012)+A2 (2017) (Reference Site Method)
	30 MHz to 1 GHz	0.99 dB	CISPR 16-1-6 (standard site method)
	(1 to 6) GHz (6 to 18) GHz	0.78 dB 1.6 dB	CISPR 16-1-6 (three antenna method)
Antenna VSWR	(10 to 100) MHz 100 MHz to 6 GHz (6 to 20) GHz (20 to 40) GHz (40 to 50) GHz	1.7 dB 0.30 dB 0.23 dB 0.50 dB 0.50 dB	1150-3-3042
Antenna Symmetry, Balance	(30 to 1000) MHz (30 to 300) MHz 20 MHz to 2 GHz (2 to 6) GHz	0.50 dB 0.66 dB 1.2 dB 1.6 dB	CISPR 16-1-4 ANSI C63.4 1150-3-3020
Antenna Pattern	(1 to 18) GHz	0.88 dB	CISPR 16-1-6, annex I
Monopole/Rod Antenna – Antenna Factor	30 Hz to 50 MHz	1.3 dB	IEEE/IEC 291, CISPR 16-1-4 (2010), ANSI C63.5 (ECSM), SAE ARP958D/E, CISPR 16-1-6 (ECSM)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Loop Antenna – Antenna Factor	20 Hz to 30 MHz	0.60 dB	IEEE/IEC 291, ANSI C63.5:2017 (reference field method)
E-Field Probe –			
Frequency Response, Linearity	10 kHz to 1 GHz (7.5cm TEM) 10 kHz to 1 GHz (15cm TEM) (1 to 18) GHz (26.5 to 40) GHz	0.88 dB 0.84 dB 1.1 dB 1.2 dB	IEEE 1309 (TEM cell, GTEM, anechoic test chamber)
Frequency Response, Linearity	80 MHz to 1 GHz (1 to 6) GHz	0.79 dB 1.2 dB	IEC 61000-4-3
Isotropicity	80 MHz to 6 GHz	0.95 dB	IEEE 1309
Magnetic Field Meter –			
Frequency Response, Linearity	300 kHz to 300 MHz	1.3 dB	IEEE 1309 (standard field method)
LISN (Line Impedance Stabilization Network) –			
Insertion Loss	9 kHz to 100 MHz	0.40 dB	ANSI C63.4, CISPR 25, CISPR 16-1-2
Impedance – Magnitude	(9 to 25) kHz (25 to 100) kHz 100 kHz to 1.5 MHz (1.5 to 100) MHz	2.0 % of reading 2.0 % of reading 2.0 % of reading 2.0 % of reading	
Impedance – Phase	9 kHz to 100 MHz	3.0°	
Isolation	9 kHz to 100 MHz	0.30 dB	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
PLISN (Power Line Impedance Stabilization Network) –			
Insertion Loss	9 kHz to 1 GHz	0.84 dB	1150-3-3054
Impedance – Magnitude	(9 to 25) kHz (25 to 100) kHz 100 kHz to 1.5 MHz (1.5 to 100) MHz 100 MHz to 1 GHz	1.8 dB 1.4 dB 1.3 dB 1.4 dB 1.4 dB	
Line Impedance Probe –			
Insertion Loss	9 kHz to 100 MHz	0.99 dB	1150-3-3021
Impedance – Magnitude	(9 to 100) kHz 100 kHz to 10 MHz (10 to 100) MHz	2.8 % (of reading) 2.3 % (of reading) 5.5 % (of reading)	
RF Cable – Insertion Loss	10 Hz to 3 GHz (3 to 50) GHz	0.56 dB 1.2 dB	1150-3-3040
RF Directional Couplers – Insertion Loss, Directivity, Coupling Factor	9 kHz to 3 GHz < 40 dB < 55 dB < 70 dB (3 to 50) GHz < 40 dB < 55 dB < 70 dB	 1.2 dB 1.2 dB 1.4 dB 2.1 dB 2.2 dB 3.6 dB	1150-3-3025
RF Attenuators – Attenuation	10 Hz to 3 GHz < 40 dB < 55 dB < 70 dB (3 to 50) GHz < 40 dB < 55 dB < 70 dB	 0.57 dB 0.59 dB 0.98 dB 1.7 dB 1.7 dB 2.5 dB	1150-3-3041

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Current Probe –			
Transfer Impedance	10 Hz to 3 GHz	1.6 dB	CISPR 16-1-2
RF Power Sensor –			
Frequency Response	9 kHz to 6 GHz (6 to 18) GHz	0.60 dB 0.61 dB	1150-3-3067
VSWR	(10 to 100) MHz 100 MHz to 2 GHz (2 to 6) GHz	0.04 dB 0.03 dB 0.05 dB	
Linearity	(50 and 500) MHz	0.74 dB	
Linearity (-45 dBm)	(50 and 500) MHz	0.58 dB	
RF Signal Generator –			
Frequency Response	9 kHz to 6 GHz	0.63 dB	1150-3-3064
Wireless Test Chamber Calibrations[3] –			
Range Calibration Ripple Test	< 6 GHz < 6 GHz	0.71 dB 0.71 dB	CTIA test plan for wireless device over-the-air performance
Field Uniformity[3]	26 MHz to 6 GHz	1.5 dB 1.4 dB	IEC 61000-4-3 Ed.4.0 IEC 61000-4-3 Ed.3.2 IEC 61000-4-21 (2011), IEC 61000-4-21 (2003-08); RTCA DO-160F/G method 20 (reverberation chamber)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Validation of Radiated Emission Test Sites[3]	(30 to 1000) MHz	1.6 dB	ANSI C63.4a (2017) ANSI C63.4 (2014) ANSI C63.4 (2009) (Normalized Site Attenuation, OATS)
	(30 to 1000) MHz	1.6 dB	ANSI C63.4a (2017) ANSI C63.4 (2014) ANSI C63.4 (2009) (normalized alternative site attenuation)
	(1 to 18) GHz	1.3 dB	CISPR 16-1-4 2019+AMD1:2020+AMD2:2023 CISPR 16-1-4 (2010)+A1(2012)+A2 (2017) ANSI C63.25.1 (SVSWR method)
	(30 to 1000) MHz	1.6 dB	CISPR 16-1-4 2019+AMD1:2020+AMD2:2023 CISPR 16-1-4 (2010)+A1(2012)+A2 (2017) Reference Site Method (normalized alternative site attenuation)

[1] This laboratory offers commercial calibration service and field calibration service, where noted.

[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. 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.

Accredited Laboratory

A2LA has accredited

ETS-LINDGREN INC.

Cedar Park, TX

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 5th day of June 2023.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1207.01
Valid to December 31, 2024

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