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

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CALIBRATION

Valid To: May 31, 2017 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 Factor	(100 to 300) MHz (300 to 850) MHz (850 to 1000) MHz (1 to 10) GHz	2 dB 0.8 dB 1.4 dB 0.8 dB	SAE/ARP 958D
Biconical – Antenna Factor	(20 to 30) MHz	0.9 dB	SAE/ARP 958D
	(30 to 200) MHz	1.2 dB	
	(20 to 300) MHz	0.9 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)
	300 MHz to 18 GHz	2.4 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Ridge Guide Horn Antenna	(0.2 to 40) GHz	0.3 dB 1 dB	SAE/ARP 958D ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)
Microwave Horn Antenna – Antenna Factor	(1 to 40) GHz	0.5 dB 0.5 dB	SAE/ARP 958D ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)
Dipole Antennas – Antenna Factor	(30 to 60) MHz (60 to 140) MHz (140 to 400) MHz (400 to 1000) MHz	0.9 dB 0.7 dB 0.8 dB 1 dB	ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)
Fixed Length – Antenna Factor	(420 to 3010) MHz	0.12 dB	1150-3-3012 (three antenna method in fully anechoic chamber)
Sleeve Dipole and Resonant Loop, Gain Efficiency	400 MHz to 6 GHz	0.19 dB	1650-3-0007 (at resonant frequency only)
Biconilog Antennas – Antenna Factor	(26 to 30) MHz 30 MHz to 1 GHz (1 to 7) GHz (26 to 30) MHz 30 MHz to 1 GHz (1 to 7) GHz	1.4 dB 0.8 dB 1.2 dB 1.5 dB 1 dB 1.4 dB	SAE/ARP 958D ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Log Periodic Antennas	(26 to 30) MHz 30 MHz to 1 GHz (1 to 5) GHz (5 to 18) GHz (26 to 30) MHz 30 MHz to 1 GHz (1 to 5) GHz	1.4 dB 0.8 dB 1.2 dB 2 dB 1.4 dB 0.8 dB 1.2 dB	SAE/ARP 958D ANSI C63.5:1988, ANSI C63.5:1998, ANSI C63.5:2006 (standard site method)
Antenna VSWR	(10 to 100) MHz 100 MHz to 6 GHz	1.4 dB 0.33 dB	1150-3-3020
Antenna Symmetry	(20 to 500) MHz 500 MHz to 2 GHz (2 to 6) GHz	1.6 dB 1.6 dB 1.9 dB	1150-3-3020 CISPR 16-1-4 ANSI C63.5

II. Electrical – RF/EMC Instrument Parameters

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Monopole/Rod Antenna – Antenna Factor	30 Hz to 50 MHz	1.8 dB	IEEE/IEC 291, CISPR 16-1-4, ANSI C63.5 (ECSM) SAE/ARP 958D
Loop Antenna – Antenna Factor	20 Hz to 30 MHz	2 dB	IEEE/IEC 291 (thermocouple)
E-Field Probe – Frequency Response, Linearity Frequency Response, Linearity Isotropicity	 10 kHz to 18 GHz (26.5 to 40) GHz 80 MHz to 6 GHz 80 MHz to 6 GHz	 0.64 dB 0.95 dB 7.7 % rdg 0.86 dB	IEEE 1309 (TEM cell, GTEM, anechoic test chamber) IEC 61000-4-3 IEEE 1309

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
Magnetic Field Meter, Frequency Response, Linearity	50 kHz to 220 MHz	1.3 dB	IEEE 1309 (standard H-field method)
LISN (Line Impedance Stabilization Network) –			
Insertion Loss	9 kHz to 100 MHz	0.44 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% 2.0% 2.0% 2.0%	CISPR 16-1-2
Impedance – Phase	9 kHz to 100 MHz	3.8°	
Isolation	9 kHz to 100 MHz	0.47 dB	CISPR 16-1-2
PLISN (Power Line Impedance Stabilization Network) –			1150-3-3054
Insertion Loss	9 kHz to 1 GHz	0.84 dB	
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	1.9 dB 1.4 dB 1.3 dB 1.4 dB 1.4 dB	
Line Impedance Probe –			1150-3-3021
Insertion Loss	9 kHz to 100 MHz	0.84 dB	
Impedance – Magnitude	(9 to 25) kHz (25 to 100) kHz 100 kHz to 1.5 MHz (1.5 to 100) MHz	1.9 dB 1.4 dB 1.3 dB 1.4 dB	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
RF Cable – Insertion Loss	10 Hz to 3 GHz (3 to 40) GHz	0.61 dB 1.2dB	1150-3-3040
RF Directional Couplers – Insertion Loss	9 kHz to 40 GHz < 40 dB < 55 dB < 70 dB	 2.3 dB 2.1 dB 2.1 dB	1150-3-3025
RF Attenuators – Attenuation	10 Hz to 40 GHz	2.1 dB	1150-3-3041
Current Probe – Transfer Impedance Insertion Loss	 10 Hz to 3 GHz 10 Hz to 3 GHz	 2.3 dB 2.0 dB	CISPR 16-1-2
RF Power Meter – Frequency Response VSWR Linearity Linearity (-45 dBm) -45 dBm Mode	 9 kHz to 6GHz (10 to 100) MHz 100MHz to 2 GHz (2 to 6) GHz 50 and 500 MHz 50 and 500 MHz 50 MHz 500 MHz	 3.0 dB 0.28 dB 0.28 dB 0.28 dB 0.72 dB 0.68 dB 0.04 dB 0.58 dB	1150-3-3067
RF Signal Generator – Frequency Response	 (9 kHz to 6 GHz)	 1.1 dB	 1150-3-3064

III. Electrical – Field Calibrations

Equipment Type	Frequency	CMC[2] (±)	Comments
Wireless Test Chamber Calibrations[3] –			
Range Calibration	< 6 GHz	1.3 dB	CTIA Test Plan for Wireless Device Over-the-Air Performance
Ripple Test	< 6 GHz	1.3 dB	
Normalized Site Attenuation[3] (OATS)	30 MHz to 1 GHz	1.7 dB	ANSI C63.4
Normalized Alternative Site Attenuation[3]	30 MHz to 1 GHz	1.7 dB	ANSI C63.4
Field Uniformity[3]	26 MHz to 6 GHz	1.5 dB 1.4 dB	IEC 61000-4-3 IEC 61000-4-21
SVSWR[3]	(1 to 18) GHz	1.3 dB	CISPR 16-1-4

[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 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.

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 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and any additional program requirements in the field of calibration. 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 8 January 2009*).

Presented this 16th day of June 2015.

President & CEO
For the Accreditation Council
Certificate Number 1207.01
Valid to May 31, 2017
Revised on April 26, 2017

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