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

MVG, INC.
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CALIBRATION

Valid To: May 31, 2015 Certificate Number: 2246.02

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 (RF/EMC Instrument Parameters)

Parameter/Equipment	Range	CMC[2] (±)	Comments
Patch Antenna	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Dipoles & Sleeve Dipoles	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Loop Antennas	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.

Parameter/Equipment	Range	CMC[2] (±)	Comments
Monopole Antennas	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Monocone Antennas	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Discone Antennas	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Biconic Antennas	(400 to 550) MHz (550 to 800) MHz (800 to 1000) MHz (1000 to 2500) MHz (2500 to 4500) MHz (4500 to 6000) MHz	1.2 dB 0.95 dB 0.97 dB 0.63 dB 0.57 dB 0.55 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Dual Ridge Horns	(400 to 800) MHz (800 to 1000) MHz (1000 to 6000) MHz	0.88 dB 0.87 dB 0.43 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Quad Ridge Horns	(400 to 800) MHz (800 to 1000) MHz (1000 to 6000) MHz	0.88 dB 0.87 dB 0.43 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.

Parameter/Equipment	Range	CMC[2] (±)	Comments
Standard Gain Horns	(400 to 800) MHz (800 to 1000) MHz (1000 to 6000) MHz	0.88 dB 0.87 dB 0.43 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Broadband Horns	(400 to 800) MHz (800 to 1000) MHz (1000 to 6000) MHz	0.92 dB 0.92 dB 0.51 dB	ANSI/IEEE 149, clause 12.3 and nearfield-farfield extrapolation. Assumes S_{11}<-10 dB for antenna under test.
Antenna (Directivity of 5 dB or Greater)	(0.4 to 1) GHz (1 to 6) GHz (6 to 18) GHz (18 to 24) GHz	0.98 dB 0.91 dB 0.94 dB 1.2 dB	Gain determined using the Three Antenna Method, ANSI/IEEE 149, with a Directivity of 5 dB or greater.
Probe Calibration – SAR Dosimetric	(400 to 6000) MHz (0.01 to 100) W/kg	12 % SAR	IEC/CEI 62209-01; IEC/CEI 62209-02; IEEE 1528; OET Bulletin 65, Supplement C
Probe Calibration – HAC E Field (V/m)	(800 to 3000) MHz (0.5 to 800) V/m	9.0 % Electric Field (V/m)	ANSI C 63.19; IEEE 1309, Section 5
Probe Calibration – HAC H Field (A/m)	(800 to 3000) MHz (0.01 to 2) A/m	9.0 % Magnetic Field (A/m)	ANSI C 63.19; IEEE 1309, Section 5
Probe Calibration – T-Coil	(200 to 5000) Hz (-60 to 20) dB/A/m	1 dB/A/m Sensitivity	ANSI C 63.19; IEEE 1027

Parameter/Equipment	Range	CMC[2] (±)	Comments
Dielectric Probe for Liquid Permittivity Measurements –	(400 to 6000) MHz		IEC/CEI 62209-01; IEC/CEI 62209-02; IEEE 1528
Permittivity	1 to 90	10 % rdg	
Conductivity	(0 to 8) S/m	8.1 % rdg	
Dielectric Property Measurement of Tissue Equivalent Liquid –	(400 to 6000) MHz		IEC/CEI 62209-01; IEC/CEI 62209-02; IEEE 1528
Permittivity	1 to 90	10 % rdg	
Conductivity	(0 to 8) S/m	8.1 % rdg	
Validation Dipole – SAR	(400 to 5000) MHz		IEC/CEI 62209-01; IEC/CEI 62209-02; IEEE 1528; IEEE 1528a; OET Bulletin 65, Supplement C
Length / Dimensions of Dipole	(0 to 300) mm	0.052 mm	
Return Loss (S_{11})	(0 to 60) dB	0.10 dB	
System Check / SAR Measurement	(0.01 to 100) W/kg	20 % $SAR_{1\,g}$ 20 % $SAR_{10\,g}$	
Validation Waveguide – SAR	(5000 to 6000) MHz		IEC/CEI 62209-01; IEC/CEI 62209-02; IEEE 1528; IEEE 1528a; OET Bulletin 65, Supplement C
Length / Dimensions of Waveguide	(0 to 300) mm	0.052 mm	
Return Loss (S_{11})	(0 to 60) dB	0.10 dB	
System Check / SAR Measurement	(0.01 to 100) W/kg	20 % $SAR_{1\,g}$ 20 % $SAR_{10\,g}$	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Validation Dipole – HAC	(800 to 3000) MHz		ANSI C 63.19
Return Loss (S_{11})	(0 to 60) dB	0.10 dB	
Area Scan	(150 × 20) mm (0.01 to 2) A/m (0.5 to 300) V/m	13 % Magnetic Field 13 % Electric Field	
Telephone Magnetic Field Simulator	(200 to 5000) Hz (-30 to 10) dB/A/m	0.85 dB/A/m Sensitivity	ANSI C 63.19; IEEE 1027
Probe Array Site Calibrations[3, 4]	(0.4 to 6) GHz	0.17 dB	The stated uncertainty assumes a standard 63-element probe array system by Satimo, determined at the MVG, Inc. location in Kennesaw, GA.

[1] This laboratory offers commercial and field calibration service 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] Field calibration service is available for the Probe Array calibration at Customer Site for the Satimo SG Measurement. As the environments and methodologies for calibration meets the same basis for determined expanded measurement uncertainties the determined values are the same at the factory and the customer location.

American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MVG, INC.

Kennesaw, GA

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/NCSL 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 6th day of May 2013.

President & CEO
For the Accreditation Council
Certificate Number 2246.02
Valid to May 31, 2015
Revised on April 28, 2015

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