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

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CALIBRATION

Valid To: May 31, 2020 Certificate Number: 2273.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 5]:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
EFT/Burst Generator[3] –			Verification of generator conformance to the waveform parameters and levels of:
Voltage	20 V to 8 kV	2.3 %	
Rise Time	5 ns ± 20 %	2.9 %	
Pulse Width	(35 to 200) ns	2.4 %	IEC 61000-4-4, EN 61000-4-4, GR 1089 CORE, ANSI C37.90, ISO 7637-2, ISO 7637-3, ISO 16750-2
Burst Duration	(0.5 to 20) ms	0.63 %	
Burst Period	(100 to 300) ms	0.63 %	
Repetition Rate	1 kHz to 1 MHz	0.63 %	Tektronix TDS 5052B, Tektronix TDS 620B, Tektronix DPO4054, Schaffner CAS 3025

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
ESD Simulators –			Verification of generator conformance to the waveform parameters & levels of:
Tip Voltage	200 V to 30 kV ± 5 %	1.0 %	
Rise Time	(0.6 to 1) ns	90 ps	
Peak Current	(7.5 to 112.5) A ± 10 %	7.0 %	IEC 61000-4-2,
30 ns Current	(4 to 60) A ± 30 %	11 %	EN 61000-4-2, IEC 801-2,
60 ns Current	(2 to 30) A	18 %	ISO TR 10605, ISO 10605,
65 ns Current	(2 to 20) A	9.0 %	SAE J1113 -13,
130 ns Current	(2 to 20) A	17 %	ANSI C63.16,
180 ns Current	(2 to 20) A	11 %	FORD ES-XW7T-1A278-
360 ns Current	(2 to 20) A	18 %	AC, FORD EMC CS 2009,
400 ns Current	(2 to 20) A	11 %	GMW 3097, DC-10614,
800 ns Current	(2 to 20) A	19 %	DC-11224
RC Time Constant	600 ns ± 130 ns 300 ns ± 60 ns	35 ns 15 ns	Brandenburg HV meter 139D & 149-03 (up to 40 kV, 30 GΩ input impedance), TEK TDS 7254 with Schaffner MD102 ESD target
Transient Generator[3] (Surge Generator) –			Verification of generator conformance to the waveform parameters and levels of:
Front/Rise Time –			
Open Circuit	1 µs to 10 ms	2.8 %	
Short Circuit	(1 to 100) µs		IEC 61000-4-5,
Time to Half Value/ Duration –			EN 61000-4-5, IEC 61000-4-9, IEC 61000-4-12,
Open Circuit	1 µs to 1000 ms	2.5 %	ANSI C62.41,
Short Circuit	1 µs to 1 ms		UL1449, ISO7637-2,
Open Circuit Voltage	10 V to 8 kV	2.6 %	ITU Rec K.17, K.20, K.21 GR1089CORE
Short Circuit Current	1 A to 4 kA	2.4 %	
Repetition Rate	(0.1 to 100) s	0.64 %	Tektronix TDS 5052B, Tektronix TDS 620B, Pearson model 110
Ring/Oscillatory Wave Rise Time	(0.5 to 1.5) µs	2.1 %	
Ring/Oscillatory Wave Frequency	5 kHz to 1 MHz	0.64 %	
Ring/Oscillatory Wave Current	1 A to 4 kA	2.4 %	

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
PQT[3] –			
Output Voltage	Up to 260 V (AC or DC)	0.33 %	Verification of generator conformance to the waveform parameters & levels of: IEC 61000-4-11, EN 61000-4-11, Tektronix TDS 620B, Tektronix DPO 4054
Phase Angle	(0 to 359)°	1.2 %	
Pulse Rise/Fall Time	(1 to 5) ns	1.2 %	
DC Voltage[3] – Measure	(10 to 100) mV (0.1 to 1.0) V (1 to 10) V (10 to 100) V (100 to 1000) V	0.13 % 0.13 % 0.13 % 0.13 % 0.13 %	HP34401A, Keysight 34460A
DC Current[3] – Measure	(10 to 100) mA (0.1 to 1.0) A (1.0 to 3.0) A	0.20 % 0.20 % 0.20 %	HP34401A, Keysight 34460A
Resistance[3] – Measure	(0.1 to 100) kΩ (0 to 10) Ω (10 to 100) Ω	1.5 % 0.10 Ω 0.10 Ω	HP34401A Keysight 34460A 4-wire measurement
AC Voltage[3] – Measure, 10 Hz to 100 kHz	(10 to 100) mV (0.1 to 1.0) V (1 to 10) V (10 to 100) V (100 to 750) V	1.1 % 1.1 % 1.1 % 1.1 % 1.1 %	HP34401A, Keysight 34460A
AC Current[3] – Measure, 10 Hz to 5 kHz	(10 to 100) mA (0.1 to 1.0) A (1.0 to 3.0) A	0.86 % 0.86 % 0.86 %	HP34401A, Keysight 34460A
AC Voltage[3] – Measure	(1 to 100) V	2.5 %	Tektronix TDS 5052B, Tektronix TDS 620B, Tektronix DPO 4054, Schaffner MD 200

II. Electrical – Microwave/RF

Parameter/Equipment	Frequency	CMC[2, 4] (±)	Comments
Immunity Test Set –			
Amplitude Accuracy – Measure/ Compare			
(>10 to 20) dBm	10 kHz to 6000 MHz	5.2 %	Power meter, IEC 61000-4-6
(>0 to 10) dBm	10 kHz to 6000 MHz	4.0 %	
(-40 to 0) dBm	10 kHz to 6000 MHz	3.9 %	
Frequency Accuracy	100 kHz to 100 MHz (100 to 500) MHz 500 MHz to 1 GHz	0.10 MHz 0.10 MHz 0.10 MHz	R&S FS 3000
Amplitude Modulation – Measure, (5 to 100) % AM	100 MHz	1.2 %	
CDN & CDNE –			
Common Mode Impedance	10 kHz to 300 MHz	2.2 Ω	IEC 61000-4-6, CISPR 22, CISPR 16-1-2, CISPR 15, CISPR 16-2-1, R&S ZVRE w/ TOSM
Voltage Division Factor	10 kHz to 300 MHz	0.80 dB	
Transmission Bandwidth	(1 to 100) MHz	0.60 dB	
Crosstalk	(1 to 100) MHz	1.6 dB	
LISN –			
Common Mode Impedance	9 kHz to 30 MHz	0.60 Ω	CISPR 16-1-2, R&S ZVRE w/ TOSM
Phase Angle	9 kHz to 30 MHz	0.20º	
Voltage Division Factor	9 kHz to 30 MHz	0.10 dB	
Isolation	9 kHz to 30 MHz	6.0 dB	

Parameter/Equipment	Frequency	CMC[2, 6] (±)	Comments
ISN –			
Longitudinal Conversion Loss	150 kHz to 300 MHz	0.60 dB	CISPR 16-1-2, CISPR 22, CISPR 32 R&S ZVRE w/ TOSM
Isolation	150 kHz to 30 MHz	1.0 dB	
Transmission Bandwidth	150 kHz to 250 MHz	0.60 dB	
Crosstalk	(1 to 250) MHz	1.2 dB	
EM Clamp –			
Common Mode Impedance	10 kHz to 100 MHz	5.3 Ω	CISPR 16-1-4, IEC/EN 61000-4-6 R&S ZVRE w/ TOSM
S Parameters –			
S_{11}	9 kHz to 4000 MHz	2.2 dB	R&S ZVRE w/ TOSM one port device
S_{21}	9 kHz to 4000 MHz	1.4 dB	
Phase Angle	9 kHz to 110 MHz	0.2º	R&S ZVRE w/ TOSM
Verification Load Kit –			
S_{21}	100 kHz to 100 MHz	0.30 dB	IEC 61000-4-4, ISO 7637-2, R&S ZVRE w/TOSM
S_{21}	(100 to 400) MHz	0.30 dB	
Resistance – Measure	(0 to 1000) Ω	0.30 Ω	Keysight 34460A 4 wire measurement
Injection Probe –			
S_{21}	10 kHz to 600 MHz	0.60 dB	IEC 61000-4-6, DO 160, CISPR 16-1-2, CISPR 22, CISPR 25, CISPR 32, IEC/EN 61000-4-6, EN 61000-6-1, EN 61000-6-2, R&S ZVRE w/TOSM

Parameter/Equipment	Frequency	CMC[2, 4] (±)	Comments
Calibration Jig –			
S_{11}	10 kHz to 100 MHz	0.045 %	IEC 6100-4-6, R&S ZVRE w TOSM
S_{11}	(100 to 400) MHz	0.40 %	

Parameter/Range	Frequency	CMC[2, 4, 6] (±)	Comments
RF Power – Measure/ Compare			
(>10 to 20) dBm	10 kHz to 6000 MHz	5.2 %	Power meter
(> 0 to 10) dBm	10 kHz to 6000 MHz	4.0 %	
(-40 to 0) dBm	10 kHz to 6000 MHz	3.9 %	
Amplitude Modulation – Measure			
9 kHz to 3 GHz	(1 to 50) kHz rate (5 to 100) % AM	1.2 %	RS FS300

III. Time & Frequency

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Frequency – Measure	100 Hz to 1 MHz	0.7 %	Tektronix TDS 5052B, Pearson model 110

[1] This laboratory offers commercial 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 uncertainty 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, all percentages are stated as percent of reading unless otherwise noted.

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

[6] 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.

Accredited Laboratory

A2LA has accredited

AMETEK CTS US

Edison, NJ

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 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 31st day of October 2018.

President and CEO
For the Accreditation Council
Certificate Number 2273.01
Valid to May 31, 2020

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