The American Association for Laboratory Accreditation

"World Class Accreditation"

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

INSTRUMENT RENTAL LABS
2100 W. 6th Ave.
Broomfield, CO 80020
Everett Hedrick Phone: 303 469 5335

CALIBRATION

Valid until: May 31, 2013 Certificate Number: 3104.01

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 – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
DC Voltage – Generate	Up to 220 mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	11 µV/V 6.1 µV/V 4.2 µV/V 4.2 µV/V 6.7 µV/V 4.6 µV/V	Fluke 5720A-03WB
Generate & Measure	(1.0 to 40) kV	1.4 %	EMC-Partner, model VERI-V voltage divider, Fluke 80K-40 probe
DC Current – Generate	Up to 220 µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	48 µA/A 45 µA/A 45 µA/A 55 µA/A 0.011 %	Fluke 5720A-03WB
	(2.2 to 11.0) A	0.047 %	Fluke 5720A-03WB w/ Fluke 5725A amplifier and Fluke 289 meter

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
Resistance – Generate			
Fixed Points	1 Ω 10 kΩ	0.013 % 0.0011 %	Fluke-742A-1 Fluke-742A-10K standard resistors
Generate	Up to 10 Ω (>10 to 100) Ω (>0.10 to 1.0) kΩ (>1.0 to 10) kΩ (>10 to 100) kΩ (>0.10 to 1.0) MΩ (1 to 100) MΩ	0.039 % 0.0046 % 0.0074 % 0.0016 % 0.0019 % 0.0029 % 0.078 %	Fluke 5720A-03WB
	(100 to 300) MΩ (0.30 to 1.0) GΩ	0.41 % 0.89 %	Fluke 5520A & HP 3458A

Parameter/Range	Frequency	CMC[2, 3] (±)	Comments
AC Volts – Generate			
(22 to 220) mV	1 kHz	0.016 %	Fluke 5720A-03WB,
(0.22 to 2.2) V	20 kHz	0.011 %	
(2.2 to 22) V	20 kHz	0.011 %	
(2.2 to 22) V	100 kHz	0.058 %	
(2.2 to 22) V	500 kHz	0.37 %	
700 V	30 kHz	0.13%	w/ Fluke 5725A amplifier
(1 to 15) kV	60 Hz	4.8 %	Fluke 5720A-03WB, Fluke 5725A amplifier, Fluke 80K-40

Parameter/Range	Frequency	CMC[2, 3] (±)	Comments
AC Current – Generate			
Up to 220 µA	10 Hz to 5 kHz	0.310 %	Fluke 5720A-03WB
(0.22 to 2.2) mA	10 Hz to 5 kHz	0.060 %	
(2.2 to 22) mA	10 Hz to 5 kHz	0.085 %	
(22 to 220) mA	10 Hz to 5 kHz	0.010 %	
(0.22 to 2.2) A	20 Hz to 10 kHz	0.073 %	
(2.2 to 11) A	40 Hz to 10 kHz	0.15 %	Fluke 5720A-03WB w/ Fluke 5725A amplifier & Fluke 289 meter
(11 to 3000) A	60 Hz	0.94 %	Fluke 5520A HP 3458A HTE multi-turn coils Fluke Flexi i3000s amp Rogowski air cored coil
Capacitance – Generate & Measure			
Fixed Points (1.0, 10, 100, 1000) pF	1 kHz	1.1 %	Capacitor Set, HP 16380A with Instek LCR-817
Generate & Measure	At various frequencies ranging anywhere from		Fluke 5520A calibrator with Instek LCR-817 meter
10 nF to 10 000 µF	DC to 1 kHz	0.78 %	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouples – Thermocouple Simulation			
Generate & Measure			
J-Type	(-210 to -100) ºC (-100 to -30) ºC (-30 to 150) ºC (150 to 760) ºC (760 to 1200) ºC	0.27 ºC 0.18 ºC 0.16 ºC 0.19 ºC 0.25 ºC	Fluke 5520 A
K-Type	(-200 to -100) ºC (-100 to -25) ºC (-25to 120) ºC (120 to 1000) ºC (1000 to 1372) ºC	0.35 ºC 0.20 ºC 0.18 ºC 0.28 ºC 0.42 ºC	
T-Type	(-250 to -150) ºC (-150 to 0) ºC (0 to 120) ºC (120 to 400) ºC	0.65 ºC 0.26 ºC 0.18 ºC 0.16 ºC	
ESD Impulse – Measure	Voltage: (1 to 30) kV	3.8 %	Agilent 54845A Oscilloscope Calibrator, EMC Partner ESD Veri-V, Target 2-DN, Agilent 34401A DMM
Oscilloscope – Rise Time	150 ps	39 ps	Fluke 9500B, Active Head 9530 , Tek 694C Oscilloscope

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2] (±)	Comments
RF Power Low Frequency Generate & Measure	0.1 Hz to 100 kHz	0.023 V_{RMS}	Agilent 3325B synthesized signal generator, HP 3458A DMM

Parameter/Range	Frequency	CMC[2] (±)	Comments
RF Power – Low to Medium Frequency Generate & Measure			
(-56 to +24) dBm (1mV to 10 V)	(0.1 to 20) MHz	0.095 V_{RMS}	Agilent 3325B synthesized signal generator, HP8902A-050 measuring receiver, HP 11722A sensor
RF Power – Generate & Measure			HP8902A-050 measuring receiver; 11793A microwave converter; HP 8340B synthesizer-asset HTE0333 only)
(-5 to -85 dBm)	1 GHz	0.69 dBm	w/ 11722A sensor
(-5 to -85 dBm)	7 GHz	1.2 dBm	w/ 11792A sensor
(-5 to -85 dBm)	12.4 GHz	1.4 dBm	w/ 11792A sensor
(-5 to -85 dBm)	20 GHz & 26 GHz	2.1 dBm	w/ 11792A sensor
RF Attenuation Tuned RF level Generate & Measure			Agilent 8902A-050 measuring receiver Agilent 11793A microwave converter, HP 8496B / 8494B step attenuators
(10 to 100 dB)	10 MHz	0.53 dB	w. Agilent 11722A sensor
	50 MHz	0.55 dB	
	1 GHz	0.63 dB	
	4 GHz	0.50 dB	w. 11792A power sensor
	10 GHz	0.94 dB	
	15 GHz	1.4 dB	
	18 GHz	0.51 dB	

III. Time and Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
Frequency – Generate	(1.0 to 26.5) GHz	5.0 parts in 10^{12}	Agilent 5071A (cesium beam), Agilent 8340B synthesized sweeper
Frequency – Measure	10 Hz to 40 GHz	1 Hz	Agilent 5071A (cesium beam), HP 5352B-010

[1] This laboratory offers commercial calibration service.

[2] Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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] Unless listed otherwise stated, all CMCs stated in percent are in percent of reading

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

INSTRUMENT RENTAL LABS

Broomfield, CO

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 the requirements of ANSI/NCSLI Z540.3-2006 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 11th day of April 2011.

President & CEO
For the Accreditation Council
Certificate Number 3104.01
Valid to May 31, 2013

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