



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

SIMCO ELECTRONICS
45472 Holiday Dr.
Suite 1
Sterling, VA 20166
Robb Horn Phone: 703 404 9704

CALIBRATION

Valid To: September 30, 2024

Certificate Number: 1395.08

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,9}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,6} ($\pm$)	Comments
Micrometers ³	Up to 1 in	$(7.5 + 2.0L) \mu\text{in}$	Gage blocks
Height Gages ³	(1 to 20) in	$(200 + 0.25L) \mu\text{in}$	Gage blocks
Depth Gages ³	Up to 6 in	380 μin	Gage blocks
Calipers ³	Up to 6 in	$(290 + 0.8L) \mu\text{in}$	Gage blocks
Indicators ³	Up to 2 in	$(30 + 0.5L) \mu\text{in}$	Gage blocks
	Up to 1 in	$(68 + 2L) \mu\text{in}$	Supermicrometer TM
Cylindrical Plugs and Pins	Up to 1 in	21 μin	Supermicrometer TM
	Up to 1 in	19 μin	Mitutoyo LSM-6200, lasermicrometer

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
DC Voltage – Generate ³	(0 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	7.7 μ V/V + 0.40 μ V 5.3 μ V/V + 0.70 μ V 4.0 μ V/V + 2.5 μ V 4.0 μ V/V + 4.0 μ V 5.3 μ V/V + 40 μ V 6.8 μ V/V + 400 μ V	Fluke 5700A/EP
DC Voltage – Measure ³ Auto, 10 M Ω , 1 M Ω Auto, 10 M Ω , 1 M Ω Auto, 10 M Ω , 1 M Ω Auto, 10 M Ω 1 M Ω Auto, 10 M Ω 1 M Ω	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (20 to 200) V 200 V to 1.0 kV 200 V to 1.0 kV	7.7 μ V/V + 0.40 μ V 3.0 μ V/V + 0.60 μ V 3.0 μ V/V + 0.60 μ V 4.4 μ V/V + 60 μ V 9.7 μ V/V + 1 mV 4.5 μ V/V + 500 μ V 9.8 μ V/V + 25 mV	Fluke 8588A
DC Current – Generate ³	(0 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A (11 to 20.5) A	39 μ A/A + 7.0 nA 32 μ A/A + 7.0 nA 32 μ A/A + 7.0 nA 39 μ A/A + 0.8 μ A 70 μ A/A + 15 μ A 280 μ A/A + 480 μ A 780 μ A/A + 750 μ A	Fluke 5700A/EP w/ 5725A Fluke 5520A
DC Current – Measure ³	Up to 20 μ A (20 to 200) μ A 200 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A (20 to 30) A	28 μ A/A + 7.0 nA 10 μ A/A + 7.0 nA 9 μ A/A + 70 nA 14 μ A/A + 0.7 μ A 58 μ A/A + 7.0 μ A 140 μ A/A + 0.1 mA 240 μ A/A + 1.6 mA 560 μ A/A + 5.4 mA	Fluke 8588A
Resistance – Measure ³	Up to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω (0.2 to 2) G Ω (2 to 20) G Ω	17 $\mu\Omega/\Omega$ + 0.1 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 0.3 $\mu\Omega$ 9.4 $\mu\Omega/\Omega$ + 1 $\mu\Omega$ 9.3 $\mu\Omega/\Omega$ + 10 $\mu\Omega$ 9.4 $\mu\Omega/\Omega$ + 100 $\mu\Omega$ 9.5 $\mu\Omega/\Omega$ + 1.0 m Ω 11 $\mu\Omega/\Omega$ + 20 m Ω 19 $\mu\Omega/\Omega$ + 20 m Ω 69 $\mu\Omega/\Omega$ + 20 m Ω 240 $\mu\Omega/\Omega$ + 200 m Ω 1400 $\mu\Omega/\Omega$ + 20 M Ω	Fluke 8588A

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Resistance – Generate ³	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	46 $\mu\Omega$ 97 $\mu\Omega$ 97 $\mu\Omega$ 24 $\mu\Omega$ 24 $\mu\Omega$ 11 $\mu\Omega$ 11 $\mu\Omega$ 9.7 $\mu\Omega$ 9.7 $\mu\Omega$ 9.7 $\mu\Omega$ 9.7 $\mu\Omega$ 11 $\mu\Omega$ 11 $\mu\Omega$ 20 $\mu\Omega$ 21 $\mu\Omega$ 40 $\mu\Omega$ 47 $\mu\Omega$ 100 $\mu\Omega$	Fluke 5700A/EP
Oscilloscopes ³ – Level Sine Absolute 50 kHz Reference Level Sine Flatness 5 mV to 5.5 V relative to 50 kHz Reference Amplitude Square Wave 1 M Ω , 1 kHz 50 Ω , 1 kHz Square Wave 1 M Ω , 1 kHz 50 Ω , 1 kHz Time Marker Output into 50 Ω Pulse Rise Time 5 mV _{p-p} to 2.5 V _{p-p}	5 mV _{p-p} to 5.5 V _{p-p} 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1000) MHz ± 1 mV ± 130 V _{p-p} ± 1 mV ± 6.6 V _{p-p} 100 mV, 1 V, 10 V 2 ns to 20 ms 50 ms to 5 s (200 to 300) ps 1 kHz to 2 MHz (200 to 350) ps (>2 to 10) MHz	2.0 % + 300 μ V 1.5 % + 100 μ V 2.0 % + 100 μ V 4.0 % + 100 μ V 5.0 % + 100 μ V 0.10 % + 40 μ V 0.25 % + 40 μ V 3.0 % + 100 μ V 3.0 % + 100 μ V 2.5×10^{-6} s (25 + 1000t) μ s/s 300 ps 350 ps	Fluke 5520A/SC1100 9500B – Fluke A2LA t = time in seconds

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouple – Generate and Measure ³ –			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.50 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	Fluke 5520A/SC1100
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.40 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	

Parameter/Range	Frequency	CMC ^{2, 8} (±)	Comments
AC Voltage – Generate ³			
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	230 µV/V + 5 µV 89 µV/V + 5 µV 78 µV/V + 5 µV 190 µV/V + 5 µV 470 µV/V + 6 µV 1000 µV/V + 12 µV 1300 µV/V + 25 µV 2600 µV/V + 25 µV	Fluke 5700A/EP
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	230 µV/V + 15 µV 89 µV/V + 8 µV 78 µV/V + 8 µV 200 µV/V + 8 µV 470 µV/V + 20 µV 1000 µV/V + 25 µV 1300 µV/V + 30 µV 2600 µV/V + 60 µV	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Voltage – Generate ³ (cont)			
(0.22 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	230 μ V/V + 50 μ V 85 μ V/V + 20 μ V 41 μ V/V + 10 μ V 70 μ V/V + 12 μ V 100 μ V/V + 40 μ V 390 μ V/V + 100 μ V 930 μ V/V + 250 μ V 1600 μ V/V + 600 μ V	Fluke 5700A/EP
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	230 μ V/V + 500 μ V 85 μ V/V + 200 μ V 41 μ V/V + 70 μ V 70 μ V/V + 120 μ V 93 μ V/V + 250 μ V 250 μ V/V + 800 μ V 930 μ V/V + 2500 μ V 1400 μ V/V + 4000 μ V	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	230 μ V/V + 5.0 mV 85 μ V/V + 2.0 mV 51 μ V/V + 0.7 mV 78 μ V/V + 1.2 mV 140 μ V/V + 3.0 mV 850 μ V/V + 20 mV 4200 μ V/V + 50 mV 7800 μ V/V + 100 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz (40 to 1) kHz (1 to 20) kHz (20 to 30) kHz (30 to 50) kHz * (50 to 100) kHz *	280 μ V/V + 20 mV 66 μ V/V + 4.0 mV 70 μ V/V + 4.0 mV 130 μ V/V + 6.0 mV 470 μ V/V + 11 mV 470 μ V/V + 11 mV 1800 μ V/V + 45 mV	
			* Max voltage 750 V

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Voltage – Measure ³			
Up to 12.12 mV, Auto, 10 M Ω , 1 M Ω	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	290 μ V/V + 1.7 μ V 370 μ V/V + 1.7 μ V 380 μ V/V + 1.7 μ V 3000 μ V/V + 1.2 μ V 10 000 μ V/V + 6.1 μ V 20 000 μ V/V + 6.1 μ V	Fluke 8588A
(12 to 121.2) mV, Auto, 10 M Ω , 1 M Ω	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	89 μ V/V + 790 nV 130 μ V/V + 790 μ V 230 μ V/V + 1.6 μ V 530 μ V/V + 7.9 μ V 2100 μ V/V + 48 μ V 10 000 μ V/V + 160 μ V 15 000 μ V/V + 790 μ V 41 000 μ V/V + 1.6 mV 78 000 μ V/V + 1.6 mV 160 000 μ V/V + 1.6 mV	
(0.121 to 1.212) V, Auto, 10 M Ω , 1 M Ω	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	76 μ V/V + 7.9 μ V 120 μ V/V + 7.9 μ V 230 μ V/V + 16 μ V 530 μ V/V + 79 μ V 2100 μ V/V + 490 μ V 10 000 μ V/V + 16 mV 15 000 μ V/V + 79 mV 40 000 μ V/V + 160 mV 78 000 μ V/V + 160 mV 150 000 μ V/V + 160 mV	
(1.212 to 12.12) V, Auto, 10 M Ω , 1 M Ω	(1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	76 μ V/V + 79 μ V 120 μ V/V + 79 μ V 230 μ V/V + 160 μ V 530 μ V/V + 790 μ V 2100 μ V/V + 5 mV 10 000 μ V/V + 16 mV 15 000 μ V/V + 79 mV 40 000 μ V/V + 160 mV 78 000 μ V/V + 160 mV 150 000 μ V/V + 160 mV	
(12.12 to 121.2) V, 10 M Ω	1 Hz to 1 kHz (1 to 2) kHz (2 to 10) kHz	250 μ V/V + 0.8 μ V 1000 μ V/V + 0.8 μ V 20 000 μ V/V + 1.6 μ V	
(12.12 to 121.2) V, Auto, 1 M Ω	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	90 μ V/V + 0.8 μ V 110 μ V/V + 0.8 μ V 230 μ V/V + 1.6 μ V 590 μ V/V + 7.9 μ V 3700 μ V/V + 73 μ V 10 000 μ V/V + 790 μ V	
(121.2 to 1050) V, 10 M Ω	1 Hz to 1 kHz (1 to 2) kHz (2 to 10) kHz	250 μ V/V + 13 μ V 3700 μ V/V + 630 μ V 10 000 μ V/V + 7 mV	

Parameter/Range ⁵	Frequency	CMC ^{2, 8} ($\pm$)	Comments
AC Current – Measure ³			
Up to 20.2 μ A	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	2000 μ A/A + 7 nA 2000 μ A/A + 7 nA 2000 μ A/A + 7 nA	Fluke 8588A
(20 to 202) μ A	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	280 μ A/A + 13 nA 530 μ A/A + 13 nA 740 μ A/A + 13 nA 4100 μ A/A + 26 nA	
(0.202 to 2.02) mA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	280 μ A/A + 130 nA 530 μ A/A + 130 nA 740 μ A/A + 130 nA 4100 μ A/A + 260 nA	
(2.02 to 20.20) mA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	280 μ A/A + 1.3 μ A 530 μ A/A + 1.3 μ A 740 μ A/A + 1.3 μ A 4100 μ A/A + 2.6 μ A	
(20.2 to 202) mA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	280 μ A/A + 13 μ A 520 μ A/A + 13 μ A 740 μ A/A + 13 μ A	
(0.202 to 2.02) A	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	300 μ A/A + 260 μ A 550 μ A/A + 260 μ A 790 μ A/A + 260 μ A	
(2.02 to 20.2) A	10 Hz to 2 kHz (2 to 10) kHz	840 μ A/A + 1.3 mA 840 μ A/A + 1.3 mA	
(20.2 to 30.2) A	10 Hz to 2 kHz (2 to 10) kHz	650 μ A/A + 12 mA 960 μ A/A + 12 mA	
Phase Angle – Generate ³			
(0 to 180) $^{\circ}$	(10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.11 $^{\circ}$ 0.28 $^{\circ}$ 0.57 $^{\circ}$ 2.9 $^{\circ}$ 5.7 $^{\circ}$ 11 $^{\circ}$	Fluke 5520A/SC1100

Parameter/Equipment ⁵	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
Capacitance – Generate ³	(0.19 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) μ F (1.1 to 3.2999) μ F (3.3 to 10.999) μ F (11 to 32.999) μ F (33 to 109.99) μ F (110 to 329.99) μ F 330 μ F to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.57 % + 0.01 nF 0.57 % + 0.01 nF 0.57 % + 0.01 nF 0.28 % + 0.01 nF 0.28 % + 0.1 nF 0.28 % + 0.1 nF 0.28 % + 0.3 nF 0.28 % + 1 nF 0.28 % + 3 nF 0.28 % + 10 nF 0.46 % + 30 nF 0.51 % + 100 nF 0.51 % + 300 nF 0.51 % + 1 μ F 0.51 % + 3 μ F 0.51 % + 10 μ F 0.85 % + 30 μ F 1.3 % + 100 μ F	Fluke 55XXA
AC/DC High Voltage – Measure ³			
DC High Voltage	Up to 20 kV (20 to 35) kV (35 to 40) kV	2.0 % 2.0 % 2.0 %	Fluke 80k-40i w/ Fluke 87 Series
AC High Voltage (60 Hz)	Up to 28 kV	5.0 %	

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 4, 8} (±)	Comments
Amplitude Modulation – Measure Rate: 50 Hz to 10 kHz Depth: (5 to 99) % Rate: 50 Hz to 100 kHz Depth: (5 to 20) % (20 to 99) % Rate: 50 Hz to 100 kHz Depth: (5 to 20) % (20 to 99) % Depth: (5 to 20) % (20 to 99) % Depth: (5 to 20) % (20 to 99) %	(0.1 to 10) MHz (0.01 to 3) GHz (3 to 26.5) GHz (26.5 to 31.15) GHz (31.15 to 50) GHz	0.90 % 2.9 % 0.58 % 5.2 % 1.7 % 7.9 % 2.2 % 30 % 7 %	Agilent N5531S
Frequency Modulation – Measure Rate: 20 Hz to 10 kHz Deviation: 200 Hz to 40 kHz Rate: 50 Hz to 200 kHz Deviation: 250 Hz to 400 kHz	(0.25 to 10) MHz > 0.2 β > 1.2 β (0.01 to 6.6) GHz > 0.2 β > 0.45 β (6.6 to 13.2) GHz > 0.2 β > 8 β (13.2 to 31.15) GHz > 0.2 β > 16 β (31.15 to 50) GHz > 0.2 β > 32 β	10 Hz 29 Hz 6.8 Hz 10 Hz 8.9 Hz 15 Hz 32 Hz 13 Hz 56 Hz 70 Hz	Agilent N5531S, β is the ratio of frequency deviation to modulation rate

Parameter/Range	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
Phase Modulation – Measure > 0.7 rad > 0.3 rad > 2 rad > 0.6 rad > 4 rad > 1.2 rad > 4 rad > 1.3 rad > 8 rad > 2.4 rad	100 kHz to 6.6 GHz (6.6 to 13.2) GHz (13.2 to 26.5) GHz (26.5 to 31.5) GHz (31.5 to 50) GHz	1.2 % + 0.0023 rad 3.5 % + 0.0021 rad 1.2 % + 0.048 rad 3.5 % + 0.0025 rad 1.2 % + 0.032 rad 3.5 % + 0.0096 rad 1.2 % + 0.046 rad 3.5 % + 0.003 rad 1.2 % + 0.022 rad 3.5 % + 0.0073 rad	Agilent N5531S
Distortion – Measure (-80 to 0) dB (-65 to 0) dB	20 Hz to 20 kHz (20 to 100) kHz	1.8 dB 4.5 dB	HP 8903B
Digital Modulation – Measure Carrier: 2 MHz to 2.65 GHz Error Vector Magnitude Formats Other Than FSK Error Vector Magnitude For FSK Modulation	Mod Frequency Span: 1 Hz to 100 kHz (0.1 to 1) MHz (1 to 10) MHz Mod Frequency: 3.2 kHz 1.152 kHz	0.46 % rms 0.78 % rms 1.2 % rms 0.52 % rms 1.5 % rms	HP 89441A vector signal analyzer

Parameter/Range	Frequency	CMC ^{2, 4, 8} (±)	Comments
RF Absolute Power – Measure, Standard Coaxial Thermistor Mount with Type IV Meter			
Power Reference ³ 1 mW, Type-N(f), 50 Ω	50 MHz	0.029 dB (0.68 %)	HP 432A power meter w/ 478A-H76 power sensor
Coaxial Power Sensors ³ (+20 to -30) dBm, 50 Ω	100 kHz to 4.2 GHz	0.12 dB (2.8 %)	HP 436A or 438A power meter w/8482A, type- N(m) power sensor
(+20 to -30) dBm, 50 Ω	10 MHz to 18 GHz	0.12 dB (2.8 %)	HP 436A or 438A power meter w/8481A, type- N(m) power sensor
(+20 to -30) dBm, 50 Ω	50 MHz to 26.5 GHz	0.13 dB (3.1 %)	HP 436A or 438A power meters w/ 8485A, 3.5 mm(m) power sensor
(+20 to -30) dBm, 50 Ω	50 MHz to 50 GHz	0.15 dB (3.5 %)	HP 436A or 438A power meter w/ 8487A, 2.4 mm(m) power sensor
(+20 to -70) dBm, 50 Ω	10 MHz to 18 GHz	0.12 dB (2.8 %)	HP E4419A power meter w/ E4412A type-N(m) power sensor
(+20 to -70) dBm, 50 Ω	50 MHz to 26.5GHz	0.13 dB (3.1 %)	HP E4419A power meter w/ E4413A, 3.5 mm(m)
(+20 to -30) dBm, 50 Ω	100 kHz to 2.6 GHz	0.13 dB (2.9 %)	8902A w/ 11722A, type-N (m)
(+20 to -30) dBm, 50 Ω	50 MHz to 26.5 GHz	0.13 dB (2.9 %)	8902A w/ 11792A, type-N (m)
(+20 to -70) dBm, 50 Ω	9 kHz to 18 GHz	0.13 dB (2.9 %)	HP E4419A power meter w/E9304A-H18

Parameter/Range	Frequency	CMC ^{2,8} ($\pm$)	Comments
Attenuation, Relative – Measure ³ 0 dB, Reference (-0.0 to -10) dB (-10 to -20) dB (-20 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB (-70 to -80) dB (-80 to -90) dB (-90 to -100) dB (-100 to -110) dB (-110 to -127) dB	2.5 MHz to 26.5 GHz	0 dB 0.026 dB 0.048 dB 0.07 dB 0.10 dB 0.13 dB 0.15 dB 0.17 dB 0.21 dB 0.23 dB 0.25 dB 0.27 dB 0.29 dB	HP 8902A measuring receiver
RF Absolute Power – Generate ³ Sine Wave into 50 Ω (10 to 3) V _{P-P} 2.99 V _{P-P} to 1 mV _{P-P} (10 to 3) V _{P-P} 2.999 V _{P-P} to 1 mV _{P-P} (2.999 to 0.1) V _{P-P} (99.99 to 1) mV _{P-P} Sine Wave Full Amplitude, 50 Ω 13.01 dBm	0.001 Hz to 100 kHz SWR 1.2:1 0.001 Hz to 100 kHz SWR 1.2:1 100 kHz to 20 MHz SWR 1.2:1 100 kHz to 10 MHz SWR 1.2:1 (10 to 20) MHz SWR 1.2:1 (10 to 20) MHz SWR 1.2:1 1 kHz to 25 MHz 200 kHz to 80 MHz	0.1 dB 0.2 dB 0.3 dB 0.5 dB 0.5 dB 0.8 dB 0.12 dB 0.2 dB	Function generator 3325 A/B with BNC(f), monitored output

Parameter/Range	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
RF Absolute Power – Generate ³ (cont)			
Attenuation, 50 Ω (0 to 18) dB	200 Hz to 80 MHz	0.24 dB	Function generator 3325 A/B with BNC(f), monitored output
(20 to 58) dB	200 Hz to 80 MHz	0.29 dB	
(60 to 98) dB	200 Hz to 80 MHz	0.4 dB	
Sine Wave: Analog Attenuator (0 to 1.99) dB	100 kHz to 1280 MHz SWR 1.5:1	0.020 dB	Level generator 3335A with BNC(f), monitored output
Into 50 Ω (+13 to -119.9) dBm	100 kHz to 1280 MHz SWR 1.5:1	1.0 dB	Synthesized signal generator 8662A w/ type-N(f), monitored output
(-120 to -130) dBm	100 kHz to 1280 MHz SWR 1.5:1	3.0 dB	
Into 50 Ω (Absolute) (> +20 to +24) dBm	10 Hz to 125 MHz	0.050 dB	Fluke 9640A RF reference standard type-N w/9640A-50 leveling head
(> +14 to +20) dBm	10 Hz to 1.4 GHz	0.050 dB	
(-17 to +14) dBm	10 Hz to 4 GHz	0.050 dB	
(-48 to < -17) dBm	10 Hz to 4 GHz	0.050 dB	
(> -74 to < -48) dBm	100 kHz to 4 GHz	0.20 dB	
(> -84 to -74) dBm	100 kHz to 4 GHz	0.50 dB	
(> -94 to -84) dBm	100 kHz to 3 GHz	0.50 dB	
(-130 to -94) dBm	100 kHz to 3 GHz	1.5 dB	
Attenuation 50 Ω (0 to 33) dB	100 kHz to 100 MHz	0.035 dB	Fluke 9640A RF reference standard, type-N w/ 9640A-50 Ω leveling head, relative to +16 dBm
(33 to 64) dB	100 kHz to 100 MHz	0.04 dB	
(64 to 100) dB	100 kHz to 100 MHz	0.10 dB	
(100 to 116) dB	100 kHz to 100 MHz	0.20 dB	
(+13 to -10) dBm	10 MHz to 4.2 GHz	0.16 dB (3.7 %)	HP sweeper 83630A, 3.5mm(m) w/ 8482A power sensor, power splitter 11667A
(+13 to -10) dBm	10 MHz to 18 GHz	0.16 dB (3.6 %)	HP sweeper 83630A, 3.5mm(m) w/ 8481A power sensor, power splitter 11667A
(+13 to -10) dBm	10 MHz to 26.5 GHz	0.16 dB (3.8 %)	HP sweeper 83630A, 3.5mm(m) w/ 8485A power sensor, power splitter 11667B
(+10 to -10) dBm	(26.5 to 50) GHz	2.1 dB	HP sweeper 83650A, 2.4mm(m)

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
Attenuation – Generate ³			
Coaxial, 1 dB Step 0 dB	Reference	Reference	Agilent attenuator 355C w/ BNC(f)
(0 to 12) dB	0.10 MHz 0.30 MHz 50 MHz	0.06 dB	
Coaxial, 10 dB Step 0 dB	Reference	Reference	
10 dB	0.10 MHz 0.30 MHz 50 MHz	0.014 dB	Agilent attenuator 355D w/ BNC(f)
20 dB	0.10 MHz 0.30 MHz 50 MHz	0.014 dB	
30 dB	0.10 MHz 0.30 MHz 50 MHz	0.017 dB	
40 dB	0.10 MHz 0.30 MHz 50 MHz	0.017 dB	
50 dB	0.10 MHz 0.30 MHz 50 MHz	0.017 dB	
60 dB	0.10 MHz 0.30 MHz 50 MHz	0.017 dB	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
Attenuation – Generate ³ (cont)			
Coaxial, 10 dB Step 70 dB	0.10 MHz 0.30 MHz 50 MHz	0.022 dB	Agilent attenuator 355D w/ BNC(f) Keysight ANAB accredited
80 dB	0.10 MHz 0.30 MHz 50 MHz	0.025 dB	
90 dB	0.10 MHz 0.30 MHz 50 MHz	0.030 dB	
100 dB	0.10 MHz 0.30 MHz 50 MHz	0.038 dB	
110 dB	0.10 MHz 0.30 MHz 50 MHz	0.050 dB	
120 dB	0.10 MHz 0.30 MHz 50 MHz	0.052 dB	
Reflection S ₁₁ /S ₂₂ – Measure			
(0.6 to 1) lin	300 kHz to 6 GHz	(0.012 to + 0.024) lin (1.2 to + 1.9) ^o	8753C/D/E 85032B/E type-N cal kit
(0.2 to 0.5) lin		(0.006 to + 0.014) lin (1.3 to + 2.5) ^o	
(0.0 to 0.1) lin		(0.004 to + 0.007) lin (2.9 to + 180) ^o	

Parameter/Range	Frequency	CMC ^{2, 8} ($\pm$)	Comments
Reflection S_{11}/S_{22} – Measure (cont)			
(0.6 to 1) lin	300 kHz to 6 GHz	(0.0070 to + 0.014) lin (0.70 to + 1.0) ^o	8753C/D/E 85031B 7mm cal. kit
(0.2 to 0.5) lin		(0.0040 to + 0.0080) lin (0.90 to + 1.7) ^o	
(0.0 to 0.1) lin		(0.0020 to + 0.0040) lin (1.7 to + 180) ^o	
(0.6 to 1) lin	45 MHz to 18 GHz	(0.012 to + 0.018) lin (0.83 to + 0.94) ^o	8510B/C, 8515A, 85054B type-N (sliding load cal)
(0.2 to 0.5) lin		(0.0064 to + 0.011) lin (1.1 to + 1.8) ^o	
(0.0 to 0.1) lin		(0.0051 to + 0.0056) lin (3.3 to + 180) ^o	
(0.6 to 1) lin	45 MHz to 20 GHz	(0.0093 to + 0.015) lin (0.63 to + 0.72) ^o	8510B/C, 8515A, 85050C 7mm (TRL cal)
(0.2 to 0.5) lin		(0.0048 to + 0.0081) lin (0.77 to + 1.4) ^o	
(0.0 to 0.1) lin		(0.0035 to + 0.004) lin (2.3 to + 180) ^o	
(0.6 to 1) lin	45 MHz to 26.5 GHz	(0.014 to + 0.023) lin (1.2 to + 1.2) ^o	8510B/C, 8515A, 85052B 3.5mm (sliding load cal)
(0.2 to 0.5) lin		(0.0073 to + 0.012) lin (1.3 to + 2.1) ^o	
(0.0 to 0.1) lin		(0.0059 to + 0.0064) lin (3.8 to + 180) ^o	

Parameter/Range ⁵	Frequency	CMC ^{2, 8} ($\pm$)	Comments
Transmission S_{12}/S_{21} – Measure			
10 dB	300 kHz to 6 GHz	(0.24 to + 0.24) dB (3.7 to + 3.7) ^o	8753C/D/E 85032B/E type-N cal. kit
0 dB		(0.070 to + 0.085) dB (0.50 to + 0.59) ^o	
-10 dB		(0.084 to + 0.10) dB (0.75 to + 0.82) ^o	
-20 dB		(0.090 to + 0.10) dB (0.80 to + 0.90) ^o	
-30 dB	300 kHz to 6 GHz	(0.090 to + 0.11) dB (0.8 to + 0.90) ^o	8753C/D/E 85032B/E type-N cal. kit
-40 dB		(0.090 to + 0.12) dB (0.81 to + 0.90) ^o	
-50 dB		(0.098 to + 0.12) dB (0.85 to + 0.93) ^o	
-60 dB		(0.14 to + 0.15) dB (1.2 to + 1.4) ^o	
(-70 to -100) dB		(0.14 to + 10) dB (1.2 to + 180) ^o	
10 dB	300 kHz to 6 GHz	(0.27 to + 0.27) dB (3.5 to + 3.5) ^o	8753C/D/E 85031B 7 mm cal. kit
0 dB		(0.059 to + 0.066) dB (0.40 to + 0.44) ^o	
-10 dB		(0.072 to + 0.077) dB (0.66 to + 0.69) ^o	
-20 dB		(0.078 to + 0.082) dB (0.72 to + 0.77) ^o	

Parameter/Range ⁵	Frequency	CMC ^{2, 8} ($\pm$)	Comments
Transmission S ₁₂ /S ₂₁ – Measure (cont)			
-30 dB	300 kHz to 6 GHz	(0.078 to + 0.082) dB (0.72 to + 0.77) ^o	8753C/D/E 85032B/E type-N cal kit
-40 dB		(0.079 to + 0.083) dB (0.73 to + 0.77) ^o	
-50 dB		(0.083 to + 0.090) dB (0.77 to + 0.81) ^o	
-60 dB		(0.13 to + 0.14) dB (0.11 to + 0.12) ^o	
(-60 to -100) dB		(0.13 to + 10) dB (1.0 to + 180) ^o	
10 dB	45 MHz to 18 GHz	(0.13 to + 0.22) dB (1.3 to + 4.2) ^o	8510B/C, 8515A, 85054B type-N (sliding load cal)
0 dB		(0.051 to + 0.093) dB (0.21 to + 3.9) ^o	
-10 dB		(0.066 to + 0.093) dB (0.33 to + 4.0) ^o	
-20 dB		(0.067 to + 0.094) dB (0.34 to + 4.0) ^o	
-30 dB		(0.07 to + 0.097) dB (0.37 to + 4.0) ^o	
-40 dB		(0.076 to + 0.12) dB (0.45 to + 4.2) ^o	
-50 dB		(0.11 to + 0.20) dB (0.73 to + 4.8) ^o	
-60 dB		(0.24 to + 0.49) dB (1.7 to + 6.7) ^o	

Parameter/Range ⁵	Frequency	CMC ^{2, 8} ($\pm$)	Comments
Transmission S ₁₂ /S ₂₁ – Measure (cont)			
10 dB	45 MHz to 20 GHz	(0.068 to + 0.22) dB (1.3 to + 3.8) ^o	8510B/C, 8515A, 85050C, 7mm (TRL Cal)
0 dB		(0.046 to + 0.049) dB (0.18 to + 3.6) ^o	
-10 dB		(0.050 to + 0.065) dB (0.30 to + 3.7) ^o	
-20 dB		(0.051 to + 0.067) dB (0.31 to + 3.7) ^o	
-30 dB		(0.054 to + 0.068) dB (0.35 to + 3.7) ^o	
-40 dB		(0.064 to + 0.073) dB (0.43 to + 3.9) ^o	
-50 dB		(0.11 to + 0.15) dB (0.72 to + 4.5) ^o	
-60 dB		(0.24 to + 0.45) dB (1.7 to + 6.4) ^o	
10 dB		(0.13 to + 0.22) dB (1.3 to + 5.8) ^o	
0 dB	45 MHz to 26.5 GHz	(0.054 to + 0.11) dB (0.21 to + 5.7) ^o	
-10 dB		(0.069 to + 0.11) dB (0.31 to + 5.7) ^o	
-20 dB		(0.070 to + 0.11) dB (0.34 to + 5.7) ^o	
-30 dB		(0.073 to + 0.13) dB (0.38 to + 5.9) ^o	

Parameter/Range ⁵	Frequency	CMC ^{2, 4, 8} ($\pm$)	Comments
Transmission S ₁₂ /S ₂₁ – Measure (cont)			
-40 dB	45 MHz to 26.5 GHz	(0.078 to + 0.20) dB (0.46 to + 6.4) ^o	8510B/C, 8515A, 85052B 3.5mm (sliding load cal)
-50 dB		(0.11 to + 0.46) dB (0.75 to + 8.1) ^o	
-60 dB		(0.24 to + 1.4) dB (1.7 to + 14) ^o	
RF Power Sensors – Measure			
Coaxial TC / Diode Power Sensors: Reference: 1 mW, 50 MHz	0.1 MHz 0.3 MHz to 2.5 GHz 3.0 GHz 3.5 GHz 4.0 GHz, 4.2 GHz	0.80 %* 0.71 % 0.73 % 0.75 % 0.76 %	HP 438A, 8482A- H84 * % indicates uncertainty of adjusted reference
	10 MHz (0.05 to 6.0) GHz (7.0 to 9.0) GHz (10 to 11) GHz (12 to 12.4) GHz 13 GHz 14 GHz 15 GHz 16 GHz 17 GHz 18 GHz	1.1 % 0.72 % 0.76 % 0.80 % 0.77 % 0.80 % 0.82 % 0.86 % 0.85 % 0.93 % 1.0 %	HP 438A, 8481A- H84

Parameter/Range	Frequency	CMC ^{2, 4, 8} (±)	Comments
RF Power Sensors – Measure Coaxial TC / Diode Power Sensors @ 1 mW; Reference to 50 MHz @1 mW	(0.05 to 2.0) GHz (4.0 to 19) GHz (11 to 13) GHz (14 to 17) GHz 18 GHz 19 GHz 20 GHz 21 GHz 22 GHz 23 GHz 24 GHz 25 GHz 26 GHz 26.5 GHz	1.2 % 2.8 % 1.4 % 2.1 % 2.8 % 2.8 % 2.0 % 2.0 % 2.0 % 2.0 % 2.0 % 2.1 % 2.4 % 2.4 %	HP 432A power meter w/ 8485A-H84
Phase Noise – Measure 250 kHz to 20 GHz	Offset: 1 Hz 10 Hz 100 Hz 1 kHz 10 kHz 100 kHz	2.6 dBc/Hz 2.6 dBc/Hz 2.5 dBc/Hz 2.4 dBc/Hz 2.4 dBc/Hz 2.3 dBc/Hz	E8257D Opt. UNX w/ E5505A system

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 10} (±)	Comments
Pressure ³ – Measuring Equipment Pneumatic – Nitrogen Gas	(0 to 100) psig (0 to 300) psig (0 to 500) psig (0 to 1500) psig (0 to 5000) psig	0.021 psig 0.030 % (of span) 0.030 % (of span) 0.030 % (of span) 0.033 % (of span)	Druck DPI 510 Heise PTE-1/HQS-2

Parameter/Equipment	Range	CMC ^{2, 4, 10} ($\pm$)	Comments
Scales & Balances ³	(1 to 500) mg > 500 mg to 5 g (> 5 to 20) g (> 20 to 453) g > 453 g to 2 kg (> 2 to 9) kg (> 9 to 204) kg	0.003 mg + 0.6R 0.004 mg + 0.6R 0.66 mg + 0.6R 9.9 mg + 0.6R 23 mg + 0.6R 180 mg + 0.6R (350 mg * N) + 0.6R	Class 1 and 2 weights Class 1 and 2 weights Class 6 weights N = # of 50 lb weights R = resolution of DUT
Torque – Measuring Equipment ³	(0.5 to 2.5) ozf•in (2 to 10) ozf•in	0.24 % + 0.29 ozf•in 0.24 % + 0.058 ozf•in	Waters 6500-T3
Dial Wrenches, Click Wrenches, Beam Wrenches, Screwdrivers	(10 to 100) ozf•in (20 to 200) ozf•in (2.5 to 25) lbf•in (10 to 100) lbf•in (25 to 250) lbf•in (100 to 1000) lbf•in (25 to 250) lbf•ft (75 to 750) lbf•ft	0.57 % ozf•in 0.39 % ozf•in 0.50 % lbf•in 0.29 % lbf•in 0.58 % lbf•in 0.38 % lbf•in 0.65 % lbf•ft 0.43 % lbf•ft	Reference torque transducers

V. Thermodynamics

Parameter/Equipment	Range ⁵	CMC ^{2, 10} ($\pm$)	Comments
Temperature – Measure ³	(-196 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 420) °C	0.090 °C 0.030 °C 0.031 °C 0.046 °C	PRT 5614 w. Fluke 1521
Relative Humidity – Measuring Equipment	(5 to 95) % RH	1.4 % RH	RH systems 973

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 10} ($\pm$)	Comments
Frequency – Timebase, Measure	10 MHz	12 pHz/Hz	NIST FMAS system w/ respect to UTC, frequency counter
Frequency – Measure ³	Up to 3 GHz 525 MHz to 26.5 GHz	0.8 nHz/Hz 0.23 μ Hz/Hz	HP 53132A, HP 5351B, NIST FMAS system w/ respect to UTC
Frequency – Measuring Equipment ³	1 Hz to 120 MHz	0.068 μ Hz/Hz	Fluke 96270A, NIST FMAS system w/ respect to UTC
Timers & Stopwatches	Up to 24 hrs	51 ms	Frequency counter /GPS controlled frequency standard

¹ This laboratory offers commercial calibration service and field 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. 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 In the statement of CMC, the value is defined as the percentage of reading unless otherwise noted.

⁵ Where ranges are not specified, the CMC stated is for the cardinal points only.

⁶ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.

⁷ Enrolled in Fluke's DVMP Program for Proficiency Testing as compared to Fluke Primary Standards Laboratory equipment.

⁸ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

⁹ This scope meets A2LA's *P112 Flexible Scope Policy*.

¹⁰ 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

SIMCO ELECTRONICS

Sterling, VA

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 7th day of December 2022.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1395.08
Valid to September 30, 2024
Revised February 10, 2023

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