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

BIRD SERVICE CENTER
30303 Aurora Rd.
Solon, OH 44139
Russell Geisthardt Phone: 440 519-2051

CALIBRATION

Valid To: February 28, 2026 Certificate Number: 2626.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations[1, 7]:

I. Electrical – DC/Low Frequency

Parameter/Range	Range	CMC[2, 3, 4, 5, 6] (±)	Comments
DC Voltage – Generate	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	11 µV/V + 0.40 µV 5.1 µV/V + 0.70 µV 3.7 µV/V + 2.5 µV 4.9 µV/V + 4.0 µV 6.0 µV/V + 40 µV 7.3 µV/V + 0.40 mV	Fluke 5720A
DC Voltage – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	14 µV/V + 0.70 µV 12 µV/V + 0.70 µV 12 µV/V + 0.90 µV 13 µV/V + 70 µV 13 µV/V + 0.14 mV	Agilent 3458A, opt 002 (2-year specifications)
DC Resistance – Generate, Fixed Points	(1, 1.9) Ω (10, 19) Ω (100, 190) Ω (1, 1.9) kΩ (10, 19) kΩ (100, 190) kΩ (1, 1.9) MΩ (10, 19) MΩ 100 MΩ	98 µΩ/Ω 27 µΩ/Ω 12 µΩ/Ω 9.8 µΩ/Ω 9.3 µΩ/Ω 12 µΩ/Ω 31 µΩ/Ω 72 µΩ/Ω 0.16 mΩ/Ω	Fluke 5720A

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8398 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

Parameter/Range	Range	CMC[2, 3, 4, 5, 6] (±)	Comments
DC Resistance – Generate	(1.2 to 12) Ω (12 to 120) Ω 120 Ω to 1.2 kΩ (1.2 to 12) kΩ (12 to 120) kΩ 120 kΩ to 1.2 MΩ (1.2 to 12) MΩ (12 to 120) MΩ 120 MΩ to 1.2 GΩ	23 µΩ/Ω + 1 mΩ 19 µΩ/Ω + 1 mΩ 23 µΩ/Ω + 2 mΩ 45 µΩ/Ω + 20 mΩ 31 µΩ/Ω + 200 mΩ 41 µΩ/Ω + 2 Ω 48 µΩ/Ω + 30 Ω 0.36 mΩ/Ω + 2.5 kΩ 0.95 mΩ/Ω + 100 kΩ	Fluke 5560A
DC Resistance – Measure	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	30 µΩ/Ω + 0.14 mΩ 29 µΩ/Ω + 1.4 mΩ 22 µΩ/Ω + 1.4 mΩ 22 µΩ/Ω + 14 mΩ 22 µΩ/Ω + 0.14 Ω 28 µΩ/Ω + 8.0 Ω 0.012 % + 0.18 kΩ 0.024 % + 1.8 kΩ 1.3 % + 18 kΩ	Agilent 3458A, opt 002 (2-year specifications)
DC Current – Generate	(0 to 220) µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A (1.2 to 3.1) A (3.1 to 12) A (12 to 30.2) A	41 µA/A + 6.0 nA 37 µA/A + 7.0 nA 39 µA/A + 40 nA 49 µA/A + 0.70 µA 86 µA/A + 12 µA 0.37 mA/A + 0.48 mA 0.23 mA/A + 0.15 mA 0.23 mA/A + 0.25 mA 0.8 mA/A + 0.5 mA	Fluke 5720A & Fluke 5725A Fluke 5560A
DC Current – Measure	(1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	39 µA/A + 0.14 nA 38 µA/A + 1.2 nA 38 µA/A + 9.0 nA 42 µA/A + 90 nA 57 µA/A + 0.90 µA 0.14 mA/A + 18 µA	Agilent 3458A, opt 002 (2-year specifications)
DC Power – Generate	(1 to 600) W (>600 to 5000) W	0.013 % 0.027 %	Fluke 5560A

Parameter/Range	Frequency	CMC[2, 3, 4, 5, 6] (±)	Comments
AC Voltage – Generate			
(0 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.072 % + 4.0 µV 0.12 % + 4.0 µV 0.051 % + 4.0 µV 0.12 % + 4.0 µV 0.095 % + 5.0 µV 0.16 % + 10 µV 0.24 % + 20 µV 0.39 % + 20 µV	Fluke 5720A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.029 % + 20 µV 0.019 % + 20 µV 0.011 % + 20 µV 0.031 % + 20 µV 0.079 % + 20 µV 0.11 % + 20 µV 0.14 % + 20 µV 0.31 % + 20 µV	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.024 % + 20 µV 0.0099 % + 20 µV 0.0083 % + 20 µV 0.022 % + 20 µV 0.047 % + 20 µV 0.091 % + 20 µV 0.14 % + 20 µV 0.29 % + 20 µV	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.024 % + 20 µV 0.0092 % + 20 µV 0.0047 % + 20 µV 0.0077 % + 20 µV 0.011 % + 20 µV 0.026 % + 20 µV 0.10 % + 20 µV 0.18 % + 20 µV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.024 % + 20 µV 0.0093 % + 20 µV 0.0048 % + 20 µV 0.0077 % + 20 µV 0.010 % + 20 µV 0.029 % + 20 µV 0.10 % + 20 µV 0.17 % + 20 µV	

Parameter/Range	Frequency	CMC[2, 3, 4, 5, 6] (±)	Comments
AC Voltage – Generate (cont)			
(22 to 220) V	(10 to 20) Hz	0.024 % + 20 µV	Fluke 5720A
	(20 to 40) Hz	0.0096 % + 20 µV	
	40 Hz to 20 kHz	0.0064 % + 20 µV	
	(20 to 50) kHz	0.0092 % + 20 µV	
	(50 to 100) kHz	0.017 % + 20 µV	
	(100 to 300) kHz	0.093 % + 20 µV	Where V*F ≤2.2*10^7 V*Hz
	(300 to 500) kHz	0.44 % + 20 µV	
	500 kHz to 1 MHz	0.83 % + 20 µV	
(220 to 1100) V	(15 to 50) Hz	0.030 % + 20 µV	
	50 Hz to 1 kHz	0.0078 % + 20 µV	
	40 Hz to 1 kHz	0.012 % + 20 µV	
	(1 to 20) kHz	0.018 % + 20 µV	
	(20 to 30) kHz	0.061 % + 20 µV	
(220 to 750) V	(30 to 50) kHz	0.063 % + 20 µV	
	(50 to 100) kHz	0.23 % + 20 µV	
(15 to 17) V	(45 to 65) Hz	0.0051 %	Fluke 6105A
(28 to 32) V	(45 to 65) Hz	0.0052 %	
(56 to 64) V	(45 to 65) Hz	0.0059 %	
(110 to 128) V	(45 to 65) Hz	0.0056 %	
(13 to 180) V	(45 to 65) Hz	0.0053 % + 1.6 mV	
(25 to 360) V	(45 to 65) Hz	0.0067 % + 3.2 mV	
(75 to 1008) V	(45 to 65) Hz	0.007 % + 10 mV	
(1.2 to 12) mV	(3 to 5) Hz	0.2 % + 7 µV	Fluke 5560A
	(5 to 10) Hz	0.071 % + 7 µV	
	10 Hz to 20 kHz	0.027 % + 6 µV	
	(20 to 50) kHz	0.03 % + 6 µV	
	(50 to 100) kHz	0.12 % + 15 µV	
	(100 to 500) kHz	0.62 % + 30 µV	
(12 to 120) mV	(3 to 5) Hz	0.19 % + 7 µV	
	(5 to 10) Hz	0.068 % + 7 µV	
	10 Hz to 20 kHz	0.011 % + 6 µV	
	(20 to 50) kHz	0.027 % + 8 µV	
	(50 to 100) kHz	0.062 % + 20 µV	
	(100 to 500) kHz	0.16 % + 30 µV	

Parameter/Range	Frequency	CMC[2, 3, 4, 5, 6] (±)	Comments
AC Voltage – Generate (cont)			
120 mV to 1.2 V	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.19 % + 75 µV 0.068 % + 70 µV 0.011 % + 60 µV 0.011 % + 8 µV 0.023 % + 14 µV 0.054 % + 40 µV 0.15 % + 80 µV	Fluke 5560A
(1.2 to 12) V	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.19 % + 0.75 mV 0.068 % + 0.75 mV 0.011 % + 0.35 mV 0.011 % + 50 µV 0.023 % + 50 µV 0.055 % + 0.13 mV 0.16 % + 0.6 mV	
(12 to 120) V	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz	0.19 % + 7.5 mV 0.068 % + 7.5 mV 0.012 % + 3.5 mV	
(12 to 120) V	40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.011 % + 0.5 mV 0.023 % + 0.5 mV 0.054 % + 1.3 mV 0.13 % + 20 mV	
(120 to 330) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.19 % + 75 mV 0.069 % + 75 mV 0.018 % + 8 mV 0.048 % + 8 mV 0.17 % + 13 mV	
(330 to 1020) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 10 kHz	0.19 % + 75 mV 0.068 % + 75 mV 0.013 % + 80 mV	
AC Voltage – Measure			
(0 to 10) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.056 % + 13 µV 0.037 % + 11 µV 0.056 % + 11 µV 0.16 % + 11 µV 0.59 % + 11 µV 4.6 % + 12 µV	Agilent 3458A, opt 002 (2-year specifications)

Parameter/Range	Frequency	CMC[2, 3, 4, 5, 6] (±)	Comments
AC Voltage – Measure cont.			
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.013 % + 5.1 µV 0.013 % + 2.8 µV 0.021 % + 2.8 µV 0.040 % + 2.8 µV 0.097 % + 2.8 µV 0.35 % + 12 µV 1.2 % + 12 µV 1.7 % + 12 µV	Agilent 3458A, opt 002 (2-year specifications)
100 mV to 1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.013 % + 51 µV 0.013 % + 28 µV 0.021 % + 28 µV 0.039 % + 28 µV 0.097 % + 28 µV 0.35 % + 0.12 mV 1.2 % + 0.12 mV 1.7 % + 0.12 mV	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.013 % + 0.51 mV 0.013 % + 0.28 mV 0.021 % + 0.28 mV 0.039 % + 0.28 mV 0.097 % + 0.28 mV 0.35 % + 1.2 mV 1.2 % + 1.2 mV 1.7 % + 1.2 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.028 % + 5.1 mV 0.028 % + 2.8 mV 0.028 % + 2.8 mV 0.045 % + 2.8 mV 0.14 % + 2.8 mV 0.47 % + 12 mV 1.7 % + 12 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.051 % + 51 mV 0.051 % + 28 mV 0.074 % + 28 mV 0.14 % + 28 mV 0.35 % + 28 mV	

Parameter/Range	Frequency	CMC[2, 3, 4, 5, 6] (±)	Comments
AC Current – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 16 nA 0.017 % + 10 nA 0.014 % + 8.0 nA 0.033 % + 12 nA 0.11 % + 65 nA	Fluke 5720A & Fluke 5725A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 40 nA 0.017 % + 35 nA 0.013 % + 35 nA 0.022 % + 0.11 µA 0.11 % + 0.65 µA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 0.4 µA 0.017 % + 0.35 µA 0.013 % + 0.35 µA 0.021 % + 0.55 µA 0.11 % + 5.0 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 4.0 µA 0.017 % + 3.5 µA 0.014 % + 2.5 µA 0.022 % + 3.5 µA 0.11 % + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.027 % + 35 µA 0.048 % + 80 µA 0.71 % + 0.16 mA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.049 % + 0.17 mA 0.097 % + 0.38 mA 0.36 % + 0.75 mA	
(0.2 to 0.5) A (0.4 to 1) A (0.8 to 2) A (2 to 5) A (4 to 10) A	(45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz	0.0093 % + 3.0 µA 0.012 % + 6.0 µA 0.015 % + 12 µA 0.018 % + 30 µA 0.022 % + 60 µA	Fluke 6105A
(12 to 120) µA	3 Hz to 5 kHz (5 to 10) kHz (10 to 30) kHz	0.025 % + 10 nA 0.12 % + 40 nA 0.39 % + 1 µA	Fluke 5560A

Parameter/Range	Frequency	CMC[2, 3, 4, 5, 6] (±)	Comments
AC Current – Generate (cont)			
120 µA to 1.2 mA	3 Hz to 5 kHz (5 to 10) kHz (10 to 30) kHz	0.021 % + 0.1 µA 0.12 % + 0.1 µA 0.39 % + 5 µA	Fluke 5560A
(1.2 to 12) mA	3 Hz to 5 kHz (5 to 10) kHz (10 to 30) kHz	0.021 % + 1 µA 0.12 % + 1 µA 0.39 % + 10 µA	
(12 to 120) mA	(3 to 45) Hz 45 Hz to 1 kHz 1 kHz to 5 kHz	0.022 % + 10 µA 0.015 % + 5 µA 0.022 % + 8 µA	
(12 to 120) mA	5 kHz to 10 kHz 10 kHz to 30 kHz	0.12 % + 10 µA 0.39 % + 0.1 mA	
120 mA to 1.2 A	(3 to 45) Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.019 % + 0.1 mA 0.019 % + 50 µA 0.019 % + 80 µA 0.19 % + 0.3 mA 0.39 % + 0.3 mA	
(1.2 to 3.1) A	(3 to 45) Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.029 % + 0.5 mA 0.023 % + 0.3 mA 0.03 % + 0.3 mA 0.2 % + 0.5 mA	
(3.1 to 12) A	(3 to 45) Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.029 % + 1 mA 0.023 % + 0.5 mA 0.03 % + 0.8 mA 0.2 % + 1 mA	
(12 to 30.2) A	(3 to 45) Hz 45 Hz to 1 kHz 1 kHz to 5 kHz	0.078 % + 10 mA 0.054 % + 8 mA 0.39 % + 8 mA	
AC Current – Measure			
(0 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.47 % + 35 nA 0.18 % + 35 nA 0.079 % + 35 nA 0.079 % + 35 nA	Agilent 3458A, opt 002 (2-year specifications)

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC Current – Measure (cont)			
100 µA to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 0.23 µA 0.18 % + 0.23 µA 0.079 % + 0.23 µA 0.044 % + 0.23 µA 0.079 % + 0.23 µA 0.47 % + 0.46 µA 0.64 % + 1.7 µA	Agilent 3458A, opt 002 (2-year specifications)
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 2.3 µA 0.18 % + 2.3 µA 0.079 % + 2.3 µA 0.044 % + 2.3 µA 0.079 % + 2.3 µA 0.47 % + 4.6 µA 0.64 % + 17 µA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.47 % + 23 µA 0.18 % + 23 µA 0.079 % + 23 µA 0.044 % + 23 µA 0.079 % + 23 µA 0.47 % + 46 µA	
100 mA to 1 A	(50 to 100) kHz (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.64 % + 0.17 mA 0.47 % + 0.23 mA 0.19 % + 0.23 mA 0.10 % + 0.23 mA 0.13 % + 0.23 mA 0.36 % + 0.23 mA 1.2 % + 0.46 mA	
AC Power – Generate			Fluke 6105A
PF = 1			
(1 to 300) W	45 to 65 Hz	77 µW/W	
(>300 to 1000) W	45 to 65 Hz	91 µW/W	
(>1000 to 3500) W	45 to 65 Hz	0.10 mW/W	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC Power – Measure PF = 1 (1 to 60) W (60 to 200) W (200 to 750) W (750 to 3500) W	 (45 to 66) Hz (45 to 66) Hz (45 to 66) Hz (45 to 66) Hz	 0.055 % 0.051 % 0.049 % 0.050 %	 Yokogawa WT3000E precision power analyzer
Capacitance – Generate	(0.10 to 1.2) nF (1.2 to 12) nF (12 to 120) nF 120 nF to 1.2 µF (1.2 to 12) µF (12 to 120) µF 120 µF to 1.2 mF (1.2 to 12) mF (12 to 120) mF	0.18 % + 2 pF 0.18 % + 5 pF 0.18 % + 30 pF 0.18 % + 0.3 nF 0.16 % + 3 nF 0.17 % + 23 nF 0.25 % + 0.25 µF 0.25 % + 3 µF 0.42 % + 30 µF	Fluke 5560A
Oscilloscopes – Amplitude Square Wave Leveled Sine Wave Amplitude Time Marker	Into 50 Ω Into 1 MΩ 5 mVp-p to 5.5 Vp-p 50 kHz (reference) 50 kHz to 10 MHz (10 to 600) MHz 5 mVp-p to 3.5 Vp-p, 600 MHz to 1.1 GHz 80 ms	0.26 % + 40 µV 0.47 % + 40 µV 2.9 % + 100 µV 2.7 % + 100 µV 3.4 % + 100 µV 3.9 % + 100 µV 0.23 µs	Fluke 5560A/1G
Electrical Calibration of Thermocouples – Generate & Measure Type J	 (-200 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	 0.42 °C 0.32 °C 0.18 °C 0.17 °C 0.16 °C	 Fluke 5560A

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
Electrical Calibration of Thermocouples – Generate & Measure cont.			
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.69 °C 0.59 °C 0.54 °C 0.88 °C 1.4 °C	Fluke 5560A
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C	0.80 °C 0.60 °C 0.54 °C	
Type U	(120 to 400) °C (-200 to 0) °C (0 to 600) °C	0.87 °C 0.47 °C 0.13 °C	

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
RF Power – 1 mW Calibration Factor	(9 to 100) kHz 100 kHz to 50 MHz 50 MHz to 1 GHz (1 to 2) GHz (2 to 4) GHz (4 to 6) GHz (6 to 12) GHz (12 to 18) GHz	0.48 % 0.60 % 0.59 % 0.60 % 0.62 % 0.63 % 0.81 % 1.7 %	Tegam Feedthrough standard
RF Power – Generate & Measure 1 mW	(9 to 100) kHz 100 kHz to 50 MHz 50 MHz 50 MHz to 1 GHz (1 to 2) GHz (2 to 4) GHz (4 to 6) GHz (6 to 12) GHz (12 to 18) GHz	0.48 % 0.60 % 0.59 % 0.59 % 0.60 % 0.62 % 0.63 % 0.81 % 1.7 %	Tegam Feedthrough standard

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
RF Power – Generate & Measure (cont)			
(0.1 to 10) W	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 6) GHz	1.5 % 1.7 % 1.7 %	Directional coupler & N8482A
(10 to 100) W	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 6) GHz	1.6 % 1.8 % 1.8 %	
(100 to 1000) W	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 6) GHz	1.7 % 1.8 % 1.8 %	Directional Coupler & N8482H
1700 W	250 kHz to 5 MHz (10 to 15) MHz (25 to 30) MHz (35 to 65) MHz (95 to 105) MHz (150 to 170) MHz	0.41 % 0.41 % 0.41 % 0.41 % 0.41 % 0.41 %	Bird 6080 calorimeter, Yokogawa WT3000 power analyzer
700 W	250 kHz to 5 MHz (10 to 15) MHz (25 to 30) MHz (35 to 65) MHz (95 to 105) MHz (150 to 170) MHz	0.42 % 0.42 % 0.42 % 0.42 % 0.42 % 0.42 %	Bird 6080 calorimeter, Yokogawa WT3000 power analyzer
1700 Watts	0.33 to 0.5 MHz 0.82 to 1.3 MHz 1.8 to 2.8 MHz 10 to 15 MHz 23 to 30 MHz 30 to 45 MHz 45 to 72 MHz	0.21 % 0.21 % 0.21 % 0.21 % 0.21 % 0.21 % 0.21 %	Bird 6085b calorimeter, Yokogawa WT3000 power analyzer

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
RF Attenuation – Measure			
Magnitude:			
(0 to 10) dB	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 8.5) GHz	0.023 dB 0.040 dB 0.031 dB	Rohde & Schwarz ZNB8, Keysight 85032F
(11 to 20) dB	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 8.5) GHz	0.026 dB 0.039 dB 0.033 dB	
(21 to 30) dB	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 8.5) GHz	0.029 dB 0.038 dB 0.037 dB	
(31 to 40) dB	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 8.5) GHz	0.034 dB 0.043 dB 0.041 dB	
(41 to 50) dB	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 8.5) GHz	0.040 dB 0.047 dB 0.047 dB	
(51 to 60) dB	100 kHz to 100 MHz 100 MHz to 1 GHz (1 to 8.5) GHz	0.064 dB 0.067 dB 0.064 dB	
Phase:			
0 to 180°	100 kHz to 8.5 GHz	180°	If $U_{Mag} \geq \|\Gamma\|$,
0 to 180°	100 kHz to 8.5 GHz	$U_{Ph} = \arcsin(U_{Mag}/\|\Gamma\|) \times 180°/\pi$	If $U_{Mag} < \|\Gamma\|$, where: Γ: reflection magnitude U_{Mag}: magnitude uncertainty in linear units U_{Ph}: phase uncertainty in degrees

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
RF Reflection Coefficient – Measure			
Magnitude, Linear:			
0.0 to 0.2	100 kHz to 2 GHz (2 to 3) GHz (3 to 6) GHz (6 to 8.5) GHz	0.0042 0.0058 0.010 0.013	Rohde & Schwarz ZNB8, Keysight 85032F
>0.2 to 1	100 kHz to 2 GHz (2 to 3) GHz (3 to 6) GHz (6 to 8.5) GHz	0.0044 0.0062 0.0095 0.012	
Phase:			
0 to 180°	100 kHz to 8.5 GHz	180°	If $U_{Mag} \geq \|\Gamma\|$,
0 to 180°	100 kHz to 8.5 GHz	$U_{Ph} = \arcsin(U_{Mag}/\|\Gamma\|) \times 180°/\pi$	If $U_{Mag} < \|\Gamma\|$, where: Γ: reflection magnitude U_{Mag}: magnitude uncertainty in linear units U_{Ph}: phase uncertainty in degrees
Relative Power – Measure			
100 kHz to 18 GHz	(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 >-120) dB (-120 to -127) dB	0.032 dB 0.034 dB 0.061 dB 0.062 dB 0.046 dB 0.059 dB 0.12 dB 0.11 dB 0.19 dB 0.19 dB 0.2 dB 0.2 dB 0.24 dB	N5531S Measuring Receiver

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Amplitude Modulation– Measure Depth (20 to 99) %	Rate: 50 Hz to 100 kHz 100 kHz to 10 MHz 10 MHz to 3 GHz 3 GHz to 18 GHz	 0.87 % 0.58 % 1.7 %	N5531S Measuring Receiver
Frequency Modulation– Measure Deviation 200 Hz to 400 kHz, 1 kHz Modulation Rate	250 kHz to 10 MHz 10 MHz to 6.6 GHz 6.6 GHz to 18 GHz	1.2 % 1.7 % 2.9 %	N5531S Measuring Receiver
Phase Modulation– Measure 1 kHz Modulation Rate >0.7 radians >2 radians	 100 kHz to 6.6 GHz 6.6 GHz to 18 GHz	 1.2 % 1.2 %	N5531S Measuring Receiver
Harmonics & Subharmonics	3 Hz to 1.5 GHz 1.5 GHz to 3 GHz 3 GHz to 3.3 GHz 3.3 GHz to 6.6 GHz 6.6 GHz to 13.25 GHz	0.63 dB 1.8 dB 2.5 dB 2.9 dB 3.3 dB	E4440A Spectrum Analyzer

III. Mechanical

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Torque wrenches	(0.5 to 1) lbf·in (1 to 5) lbf·in (5 to 10) lbf·in (10 to 50) lbf·in (25 to 50) lbf·in (50 to 250) lbf·in	3.5 % 3.3 % 2.2 % 1.9 % 1.3 % 0.9 %	Torque Mate PTT-2000 & BMX sensors

IV. Thermodynamics

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Temperature – Measure & Measuring Equipment	(18 to 28) °C	0.53 °C	Rotronic HC2-S
Humidity – Measure & Measuring Equipment	33 % RH 75 % RH (10 to 90) % RH	2.7 % RH 2.6 % RH 2.6 % RH	Rotronic HC2-S

V. Time & Frequency

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Frequency – Measure & Measuring Equipment	10 Hz to 15 GHz	80 pHz/Hz + 0.74 µHz	Agilent 53230A counter, 910R GPS receiver, RF / function generator
Frequency – Time Base	10 MHz	3.5×10^{-12} Hz/Hz	Wavetek 910R GPS receiver

[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] The measurands stated are generated with the Fluke 5720A series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMC are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

[4] The measurands stated are measured with the Agilent 3458A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a combination of the fraction of the reading/output plus a range specification.

[5] In the statement of CMC, uncertainties expressed as a percent are to be read as percent of reading unless otherwise indicated.

[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.

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

Accredited Laboratory

A2LA has accredited

BIRD SERVICE CENTER

Solon, OH

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 February 2024.

Mr. Trace McInturff Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2626.01
Valid to February 28, 2026
Revised March 13, 2025

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