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

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CALIBRATION

Valid To: July 31, 2018 Certificate Number: 2166.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location listed above as well as the one satellite laboratory location listed below to perform the following calibrations[1]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
Micrometers	Up to 1 in	(8.0 + 8.0*L*) µin	Gage blocks
Calipers	Up to 6 in	(138 + 1.0*L*) µin	Gage blocks
Dial Indicators	Up to 1 in	(93 + 2.0*L*) µin	Gage blocks
RF Connector Gages	Type N 3.5 & 2.92	0.000 20 in	Super micrometer

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4, 5, 7] (±)	Comments
DC Voltage System – Generate, Fixed Points	± 100 mV ± 1 V ± 5 V ± 10 V ± 15 V	2.8 µV/V 0.70 µV/V 0.80 µV/V 0.50 µV/V 0.60 µV/V	Calibration of reference multimeters w/ Fluke 5720A characterized calibrator

Parameter/Equipment	Range	CMC[2, 4, 5, 6, 7] (±)	Comments
DC Voltage System – Generate, Fixed Points (cont)	± 19 V ± 100 V ± 1 kV	0.60 µV/V 0.60 µV/V 0.80 µV/V	Calibration of reference multimeters w/ Fluke 5720A characterized calibrator
DC Reference Calibration – Measure & Generate, Fixed Points	10 V reference 1.018 V reference 1.00 V reference	0.30 µV/V 0.70 µV/V 0.70 µV/V	Direct transfer techniques performed utilizing Fluke 732A/732B
DC Voltage – Measure & Generate	(0 to 0.02) V (20 to 120) mV 120 mV to 1.2 V (1.2 to 12) V (12 to 120) V 120 V to 1.05 kV (1.0 to 40) kV 0.00 V	4.0 µV/V + 0.21 µV 3.0 µV/V + 0.10 µV 0.70 µV/V + 0.20 µV 0.50 µV/V + 0.50 µV 0.8 µV/V + 20 µV 1.9 µV/V + 0.15 mV 0.10 % 0.15 µV	Direct measurements or transfer techniques using the Fluke 4950 HP 3458A characterized DMM Direct measurements using Ross VD120 voltage divider/Fluke 8846A Copper short
DC Voltage – Generate	(10 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	3.0 µV/V + 0.30 µV 1.0 µV/V + 1.0 µV 0.60 µV/V + 2.5 µV 0.60 µV/V + 5.0 µV 1.0 µV/V + 50 µV 1.2 µV/V + 0.20 mV	Fluke 57X0 series characterized calibrator
Resistance – Generate, Fixed Points[9]	0.00 Ω 0.01 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ 1 TΩ 10 TΩ	2.5 µΩ 33 µΩ/Ω 4.0 µΩ/Ω 0.30 µΩ/Ω 0.40 µΩ/Ω 0.40 µΩ/Ω 0.40 µΩ/Ω 0.50 µΩ/Ω 1.4 µΩ/Ω 2.2 µΩ/Ω 3.2 µΩ/Ω 18 µΩ/Ω 44 µΩ/Ω 0.013 % 0.040 % 0.040 % 0.090 %	Copper short MIL, Guildline, L&N, Tinsley Wilkins, Ohms lab reference resistors

Parameter/Equipment	Range	CMC[2, 4, 5, 6, 7] (±)	Comments
Resistance – Generate & Measure	(0.0001 to 0.01) Ω (0.01 to 0.1) Ω (0.1 to 1) Ω (1 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 1.1 GΩ	6.0 μΩ 5.0 μΩ/Ω 1.0 μΩ/Ω 0.50 μΩ/Ω 0.50 μΩ/Ω 0.50 μΩ/Ω 0.70 μΩ/Ω 0.70 μΩ/Ω 1.6 μΩ/Ω 2.2 μΩ/Ω 5.1 μΩ/Ω 26 μΩ/Ω	Fluke 5450A/8508A MI 6010 bridge, working standard resistors Ratio measurements using MIL bridge or 1:1 measurements w/ Fluke 8508A
Resistance – Generate & Measure, Fixed Points	2 GΩ 4 GΩ 8 GΩ 10 GΩ 100 GΩ 1 TΩ 9 TΩ	0.15 % 0.15 % 0.15 % 0.15 % 0.20 % 0.50 % 0.90 %	Fluke 5320A, QuadTech 1865 megohmmeter
DC Current – Generate & 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 (1 to 10) A (10 to 18) A (18 to 20) A	6.0 μA/A + 10 pA 6.0 μA/A + 60 pA 6.0 μA/A + 1.0 nA 6.0 μA/A + 10 nA 6.0 μA/A + 0.10 μA 6.0 μA/A + 1.8 μA 5.0 μA/A + 5.0 μA 55 μA/A + 20 μA 80 μA/A	Standard resistors, and long scale voltmeter
Generate Only	(20 to 150) A Turns (150 to 1000) A Turns	0.50 % + 0.15 A 0.52 % + 0.55 A	Fluke 5520A w/coil
DC Current – Generate & Measure	(20 to 50) A (50 to 80) A (80 to 120) A 0.00 A	29 μA/A 33 μA/A 28 μA/A 0.000 06 μA	Fluke 61XX system Fluke 52120A transconductance amplifier Open input

Parameter/Equipment	Range	CMC[2, 4, 5, 6, 7] (±)	Comments
DC Current – Fixed Points			
Measure	± 100 µA ± 1 mA ± 10 mA ± 100 mA ± 300 mA ± 1 A ± 10 A	1.3 µA/A 1.8 µA/A 1.9 µA/A 1.1 µA/A 4.4 µA/A 2.4 µA/A 6.2 µA/A	Comparison to DC reference shunts and characterized voltmeter
Generate	± 100 µA ± 1 mA ± 10 mA ± 100 mA ± 300 mA ± 1 A ± 10 A	2.2 µA/A 2.2 µA/A 2.2 µA/A 1.8 µA/A 5.0 µA/A 2.8 µA/A 11 µA/A	Fluke 5720 /5725A characterized calibrator
Electrical Calibration of Thermocouple Reference Junction –			
Type J Type K Type T Type E	(295 to 299) K (295 to 299) K (295 to 299) K (295 to 299) K	0.035 K 0.035 K 0.035 K 0.035 K	1595A Superthermometer/ SPRT
Capacitance Measurement on Fluke 55XX Series Calibrators[9]	0.33 mF 0.8 mF 1.0 mF 1.2 mF 3 mF 3.3 mF 8 mF 10 mF 12 mF 30 mF 33 mF 80 mF 100 mF	0.18 % 0.080 % 0.067 % 0.060 % 0.035 % 0.050 % 0.050 % 0.050 % 0.050 % 0.020 % 0.050 % 0.030 % 0.020 %	Charge technique using a DC current source and a long scale voltmeter

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Generate, Fixed Points			
0.6 mV	1 kHz	0.070 %	Fluke 792 AC/DC transfer sdtandard w/AC divider
1 mV	10 Hz, 20 Hz, 30 Hz, 40 Hz, 55 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 20 kHz, 30 kHz, 50 kHz, 60 kHz, 100 kHz, 200 kHz, 300 kHz, 500 kHz, 800 kHz, 1 MHz	0.37 %	Reference multimeter calibration
2 mV	10 Hz, 20 Hz, 100 Hz, 1 kHz, 10 kHz, 20 kHz, 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	0.020 % 0.022 % 0.030 % 0.036 % 0.13 %	Fluke 792 AC/DC transfer standard w/ AC Divider
6 mV	(10, 20, 100) Hz; (1, 10, 20, 50) kHz 100 kHz 300 kHz 500 kHz 1 MHz	80 µV/V 90 µV/V 0.021 % 0.026 % 0.055 %	Fluke 792A AC/DC transfer standard w/ AC Divider
10 mV	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 10 kHz 20 kHz 30 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	0.012 % 0.023 % 0.016 % 0.010 % 0.011 % 0.019 % 0.024 % 0.017 % 0.017 % 0.018 % 0.021 % 0.034 % 0.028 % 0.066 % 0.062 %	Calibration of reference multimeters
20 mV	10 Hz 20 Hz 100 Hz, 1 kHz, 10 kHz	70 µV/V 60 µV/V 40 µV/V	Fluke 792 AC/DC transfer standard w/ AC divider

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Generate, Fixed Points (cont)			
20 mV	20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	40 µV/V 50 µV/V 85 µV/V 0.020 % 0.025 % 0.04 %	Fluke 792 AC/DC transfer standard w/ AC divider
60 mV	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	0.010 % 67 µV/V 47 µV/V 38 µV/V 48 µV/V 53 µV/V 72 µV/V 0.014 % 0.027 % 0.035 % 0.041 %	
100 mV	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 3 kHz 10 kHz 20 kHz 30 kHz 50 kHz 60 kHz 100 kHz 300 kHz 500 kHz 1 MHz	50 µV/V 72 µV/V 48 µV/V 26 µV/V 30 µV/V 41 µV/V 34 µV/V 39 µV/V 31 µV/V 33 µV/V 47 µV/V 47 µV/V 0.012 % 88 µV/V 0.016 % 0.021 % 0.033 %	Calibration of reference multimeter
200 mV	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	35 µV/V 23 µV/V 18 µV/V 18 µV/V 18 µV/V 17 µV/V 23 µV/V 36 µV/V 80 µV/V 0.011 % 0.018 %	792 AC/DC transfer standard

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Generate, Fixed Points (cont)			
500 mV	40 Hz 1 kHz 20 kHz 100 kHz 300 kHz 1 MHz	18 µV/V 12 µV/V 11 µV/V 23 µV/V 70 µV/V 0.014 %	Calibration of AC measurement standard Fluke 5790A
600 mV	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	26 µV/V 20 µV/V 10 µV/V 12 µV/V 11 µV/V 11 µV/V 10 µV/V 12 µV/V 30 µV/V 32 µV/V 65 µV/V	792A AC/DC transfer standard
1 V	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 100 Hz 300 Hz 1 kHz 3 kHz 10 kHz 20 kHz 30 kHz 50 kHz 60 kHz 100 kHz 300 kHz 500 kHz 1 MHz	26 µV/V 23 µV/V 20 µV/V 17 µV/V 15 µV/V 7 µV/V 7 µV/V 7 µV/V 7 µV/V 7 µV/V 7 µV/V 7 µV/V 8 µV/V 8 µV/V 10 µV/V 25 µV/V 26 µV/V 45 µV/V	
2 V	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	25 µV/V 20 µV/V 7 µV/V 6 µV/V 6 µV/V 6 µV/V 8 µV/V 10 µV/V 25 µV/V 26 µV/V 45 µV/V	
5 V	1 kHz	0.030 %	Calibration of 8508A

Parameter/Range	Frequency	CMC[2, 4, 5, 7] (±)	Comments
AC Voltage – Generate, Fixed Points (cont)			
6 V	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	25 µV/V 20 µV/V 8.0 µV/V 8.0 µV/V 7.0 µV/V 7.0 µV/V 7.0 µV/V 8.0 µV/V 23 µV/V 28 µV/V 45 µV/V	792A AC/DC transfer standard
10 V	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 3 kHz 10 kHz 20 kHz 30 kHz 50 kHz 60 kHz 100 kHz 300 kHz 500 kHz 1 MHz	26 µV/V 22 µV/V 21 µV/V 18 µV/V 17 µV/V 9.0 µV/V 8.0 µV/V 8.0 µV/V 8.0 µV/V 9.0 µV/V 9.0 µV/V 10 µV/V 10 µV/V 11 µV/V 23 µV/V 28 µV/V 45 µV/V	
19 V	1 kHz	8.0 µV/V	
20 V	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz 500 kHz 1 MHz	25 µV/V 20 µV/V 8.0 µV/V 8.0 µV/V 8.0 µV/V 8.0 µV/V 8.0 µV/V 10 µV/V 25 µV/V 30 µV/V 45 µV/V	
50 V	300 kHz	40 µV/V	Calibration of AC measure standard Fluke 5790A

Parameter/Range	Frequency	CMC[2, 4, 5, 7] (±)	Comments
AC Voltage – Generate, Fixed Points (cont)			
60 V	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz 300 kHz	26 µV/V 22 µV/V 10 µV/V 10 µV/V 10 µV/V 10 µV/V 12 µV/V 15 µV/V 30 µV/V	792A AC/DC transfer standard
100 V	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 3 kHz 10 kHz 20 kHz 30 kHz 50 kHz 60 kHz 100 kHz	30 µV/V 30 µV/V 23 µV/V 22 µV/V 30 µV/V 18 µV/V 10 µV/V 10 µV/V 10 µV/V 10 µV/V 10 µV/V 10 µV/V 10 µV/V 15 µV/V	
200 V	10 Hz 20 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz	36 µV/V 23 µV/V 18 µV/V 13 µV/V 13 µV/V 14 µV/V 16 µV/V 21 µV/V	
250 V	15 Hz	40 µV/V	Calibration of Fluke 5790A or reference multimeter
500 V	50 Hz 55 Hz 300 Hz 1 kHz 3 kHz 10 kHz 30 kHz	24 µV/V 24 µV/V 20 µV/V 15 µV/V 15 µV/V 15 µV/V 17 µV/V	792A AC/DC transfer standard

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Generate, Fixed Points (cont)			
600 V	40 Hz 100 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz	23 µV/V 21 µV/V 15 µV/V 15 µV/V 16 µV/V 20 µV/V 40 µV/V	Calibration of reference multimeters or 5790A
700 V	50 kHz 100 kHz	28 µV/V 38 µV/V	
1000 V	10 Hz 20 Hz 40 Hz 55 Hz 100 Hz 300 Hz 1 kHz 3 kHz 10 kHz 20 kHz 30 kHz 50 kHz 100 kHz	50 µV/V 21 µV/V 21 µV/V 21 µV/V 21 µV/V 21 µV/V 18 µV/V 18 µV/V 18 µV/V 19 µV/V 24 µV/V 40 µV/V 50 µV/V	
1V	4 MHz, 8 MHz, 10 MHz	0.60 %	
3 V	2 MHz, 4 MHz, 8 MHz, 10 MHz	0.50 %	
AC Voltage – Generate			
(1 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	0.33 % + 4 µV 0.34 % + 4 µV 0.34 % + 4 µV 0.35 % + 4 µV 0.38 % + 5 µV 0.47 % + 20 µV 0.61 % + 10 µV 0.71 % + 20 µV	Fluke 5720A series II

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Generate (cont)			
(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	0.030 % + 4.0 µV 0.020 % + 4.0 µV 0.020 % + 4.0 µV 0.030 % + 4.0 µV 0.060 % + 5.0 µV 0.11 % + 10 µV 0.15 % + 20 µV 0.28 % + 20 µV	Fluke 5720A series II
(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	0.030 % + 12 µV 97 µV/V + 7.0 µV 82 µV/V + 7.0 µV 0.030 % + 7.0 µV 0.050 % + 17 µV 0.090 % + 20 µV 0.14 % + 25 µV 0.27 % + 45 µV	
(0.22 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	0.030 % + 40 µV 95 µV/V + 7.0 µV 49 µV/V + 8.0 µV 80 µV/V + 10 µV 0.020 % + 30 µV 0.050 % + 80 µV 0.10 % + 0.20 mV 0.18 % + 0.30 mV	
(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	0.030 % + 0.40 mV 95 µV/V + 0.15 mV 49 µV/V + 50 µV 80 µV/V + 0.10 mV 0.020 % + 0.20 mV 0.030 % + 0.60 mV 0.10 % + 2.0 mV 0.16 % + 3.2 mV	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.030 % + 4.0 µV 97 µV/V + 1.5 µV 56 µV/V + 0.60 µV 90 µV/V + 1.0 µV 0.020 % + 2.5 µV	
(220 to 1000) V	(10 to 40) Hz 40 Hz to 50 Hz 50 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.030 % + 16 µV 94 µV/V + 4.0 µV 77 µV/V + 3.5 µV 0.020 % + 6.0 µV 0.060 % + 11 µV 0.060 % + 11 µV 0.23 % + 45 µV	Fluke 5720A series II plus Fluke 5725A

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Measure			
0.6 mV	1 kHz	0.20 %	Fluke 792A or Fluke 5790A transfer standard
(1 to 2.2) mV	(9.5 to 10) Hz	0.10 %	
	(10 to 20) Hz	0.026 % + 1 µV	
	(20 to 40) Hz	0.026 % + 1 µV	
	40 Hz to 20 kHz	0.028 % + 1 µV	
	(20 to 50) kHz	0.029 % + 1.6 µV	
	(50 to 100) kHz	0.032 % + 1.9 µV	
	(100 to 300) kHz	0.053 % + 3.1 µV	
	(300 to 500) kHz	0.073 % + 4.7 µV	
	500 kHz to 1 MHz	0.19 % + 4.7 µV	
(2.2 to 7) mV	(9.5 to 10) Hz	0.10 %	
	(10 to 20) Hz	0.014 % + 1 µV	
	(20 to 40) Hz	0.011 % + 1 µV	
	40 Hz to 20 kHz	0.011 % + 1 µV	
	(20 to 50) kHz	0.011 % + 1.6 µV	
	(50 to 100) kHz	0.018 % + 1.9 µV	
	(100 to 300) kHz	0.048 % + 3.1 µV	
	(300 to 500) kHz	0.059 % + 4.7 µV	
	500 kHz to 1 MHz	0.085 % + 4.7 µV	
(7 to 22) mV	(9.5 to 10) Hz	0.10 %	
	(10 to 20) Hz	70 µV/V + 1 µV	
	(20 to 40) Hz	70 µV/V + 1 µV	
	40 Hz to 20 kHz	50 µV/V + 1 µV	
	(20 to 50) kHz	60 µV/V + 1.6 µV	
	(50 to 100) kHz	0.01 % + 1.9 µV	
	(100 to 300) kHz	0.024 % + 3.1 µV	
	(300 to 500) kHz	0.032 % + 4.7 µV	
	500 kHz to 1 MHz	0.049 % + 4.7 µV	
(22 to 70) mV	(9.5 to 10) Hz	0.10 %	
	(10to 20) Hz	0.012 % + 1.2 µV	
	(20 to 40) Hz	0.011 % + 1.2 µV	
	40 Hz to 20 kHz	60 µV/V + 1.2 µV	
	(20 to 50) kHz	80 µV/V + 1.6 µV	
	(50 to 100) kHz	0.014 % + 1.9 µV	
	(100 to 300) kHz	0.029 % + 3.1 µV	
	(300 to 500) kHz	0.038 % + 4.7 µV	
	500 kHz to 1 MHz	0.051 % + 4.7 µV	
(70 to 220) mV	(9.5 to 10) Hz	0.10 %	
	(10 to 20) Hz	60 µV/V + 1.2 µV	
	(20 to 40) Hz	50 µV/V + 1.2 µV	
	(40 Hz to 20) kHz	30 µV/V + 1.2 µV	
	(20 to 50) kHz	50 µV/V + 1.6 µV	
	(50 to 100) kHz	90 µV/V + 1.9 µV	
	(100 to 300) kHz	0.014 % + 3.1 µV	
	(300 to 500) kHz	0.013 % + 4.7 µV	
	500 kHz to 1 MHz	0.031 % + 4.7 µV	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Measure (cont)			
(220 to 700) mV	(9.5 to 10) Hz (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	0.10 % 50 µV/V 50 µV/V 30 µV/V 50 µV/V 80 µV/V 0.013 % 0.017 % 0.023 %	Fluke 792A or Fluke 5790A transfer standard
700 mV to 2.2 V	(9.5 to 10) Hz (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	0.10 % 40 µV/V 40 µV/V 30 µV/V 30 µV/V 30 µV/V 0.01 % 0.01 % 0.011 %	
(2.2 to 7) V	(9.5 to 10) Hz (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	0.10 % 40 µV/V 40 µV/V 30 µV/V 30 µV/V 30 µV/V 0.01 % 0.01 % 0.011 %	
(7 to 22) V	(9.5 to 10) Hz (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	0.10 % 90 µV/V 40 µV/V 30 µV/V 30 µV/V 30 µV/V 80 µV/V 80 µV/V 0.011 %	
(22 to 70) V	(9.5 to 10) Hz (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	0.10 % 40 µV/V 40 µV/V 30 µV/V 40 µV/V 40 µV/V 0.01 % 0.032 % 0.092 %	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage – Measure (cont)			
(70 to 220) 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	90 µV/V 50 µVV 30 µVV 40 µV/V 50 µV/V 0.011 % 0.053 %	Fluke 792A or Fluke 5790A transfer standard
(220 to 700) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.010 % 60 µV/V 40 µV/V 37 µV/V 60 µV/V	
(700 to 1050) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	90 µV/V 50 µV/V 30 µV/V 40 µV/V 60 µV/V	
AC Current – Generate, Fixed Points			
100 µA	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 5 kHz 10 kHz 20 kHz 30 kHz	52 µA/A 56 µA/A 56 µA/A 51 µA/A 51 µA/A 68 µA/A 57 µA/A 67 µA/A 79 µA/A 0.012 % 0.019 %	Calibration of reference multimeters
1 mA	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 5 kHz	73 µA/A 21 µA/A 21 µA/A 22 µA/A 22 µA/A 24 µA/A 24 µA/A 22 µA/A	

Parameter/Range	Frequency	CMC[2, 4, 6, 7] (±)	Comments
AC Current – Generate, Fixed Points (cont)			
1 mA	10 kHz 20 kHz 30 kHz	23 µA/A 80 µA/A 80 µA/A	Calibration of reference multimeters
10 mA	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 5 kHz 10 kHz 20 kHz 30 kHz	66 µA/A 37 µA/A 44 µA/A 28 µA/A 36 µA/A 36 µA/A 29 µA/A 38 µA/A 55 µA/A 0.010 % 0.010 %	
100 mA	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 5 kHz 10 kHz 20 kHz 30 kHz	44 µA/A 37 µA/A 44 µA/A 27 µA/A 37 µA/A 35 µA/A 27 µA/A 27 µA/A 29 µA/A 0.010 % 0.010 %	
300 mA	10 kHz 20 kHz 30 kHz	84 µA/A 0.010 % 0.015 %	
1 A	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 5 kHz 10 kHz	53 µA/A 41 µA/A 51 µA/A 32 µA/A 43 µA/A 44 µA/A 32 µA/A 37 µA/A 0.010 %	

Parameter/Range	Frequency	CMC[2, 4, 6, 7] (±)	Comments
AC Current – Generate, Fixed Points (cont)			
10 A	10 Hz 20 Hz 30 Hz 40 Hz 55 Hz 300 Hz 1 kHz 5 kHz 10 kHz 20 kHz	0.015 % 0.011 % 0.012 % 65 µA/A 87 µA/A 87 µA/A 66 µA/A 67 µA/A 0.010 % 0.022 %	Calibration of reference multimeters
AC Current – Measure, Fixed Points			
20 µA	1 kHz 10 kHz	0.015 % 0.05 %	MFC calibration
200 µA	10 Hz 20 Hz 40 Hz, 1 kHz 5 kHz 10 kHz	80 µA/A 65 µA/A 55 µA/A 0.016 % 0.027 %	
300 µA	10 Hz, 20 Hz 45 Hz, 1 kHz 5 kHz 10 kHz 30 kHz	0.01 % 75 µA/A 0.02 % 0.025 % 0.05 %	
2 mA	10 Hz 20 Hz 40 Hz, 1 kHz 5 kHz 10 kHz	75 µA/A 55 µA/A 45 µA/A 75 µA/A 0.010 %	
3 mA	(10, 20) Hz 45 Hz, 1 kHz 5 kHz 10 kHz 30 kHz	0.01 % 65 µA/A 85 µA/A 0.01 % 0.015 %	
20 mA	10 Hz 20 Hz 40 Hz, 1 kHz 5 kHz 10 kHz	0.012 % 65 µA/A 45 µA/A 65 µA/A 0.01 %	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Current – Measure, Fixed Points			
200 mA	10 Hz 20 Hz 40 Hz, 1 kHz 5 kHz 10 kHz	0.012 % 65 µA/A 45 µA/A 65 µA/A 0.01 %	MFC calibration
2 A	20 Hz 1 kHz, 5 kHz 10 kHz	70 µA/A 65 µA/A 0.01 %	
AC Current – Generate & Measure			
(1 to 200) µA	10 Hz (10 to 20) Hz (20 to 30) Hz (30 to 40) Hz (40 to 55) Hz (55 to 300) Hz 300 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) kHz (20 to 30) kHz	75 µA/A + 5.4 nA 78 µA/A + 5.4 nA 78 µA/A + 5.4 nA 74 µA/A + 5.4 nA 74 µA/A + 5.4 nA 87 µA/A + 5.4 nA 78 µA/A + 5.4 nA 0.012 % + 5.4 nA 0.031 % + 5.4 nA 0.034 % + 7.1 nA 0.053 % + 12 nA	Direct measurements or transfer techniques using a Fluke 4950
200 µA to 2 mA	10 Hz (10 to 20) Hz (20 to 30) Hz (30 to 40) Hz (40 to 55) Hz (55 to 300) Hz 300 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) kHz (20 to 30) kHz	86 µA/A + 21 nA 50 µA/A + 21 nA 50 µA/A + 21 nA 50 µA/A + 21 nA 50 µA/A + 21 nA 51 µA/A + 21 nA 51 µA/A + 21 nA 76 µA/A + 21 nA 0.020 % + 21 nA 0.031 % + 51 nA 0.051 % + 0.10 µA	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Current – Generate & Measure (cont)			
(2 to 20) mA	10 Hz (10 to 20) Hz (20 to 30) Hz (30 to 40) Hz (40 to 55) Hz (55 to 300) Hz 300 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) kHz (20 to 30) kHz	80 µA/A + 0.21 µA 58 µA/A + 0.21 µA 62 µA/A + 0.21 µA 53 µA/A + 0.21 µA 57 µA/A + 0.21 µA 58 µA/A + 0.21 µA 53 µA/A + 0.21 µA 82 µA/A + 0.21 µA 0.021 % + 0.21 µA 0.032 % + 0.51 µA 0.051 % + 1.1 µA	Direct measurements or transfer techniques using a Fluke 4950
(20 to 200) mA	10 Hz (10 to 20) Hz (20 to 30) Hz (30 to 40) Hz (40 to 55) Hz (55 to 300) Hz 300 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) kHz (20 to 30) kHz	63 µA/A + 2.1 µA 58 µA/A + 2.1 µA 63 µA/A + 2.1 µA 52 µA/A + 2.1 µA 58 µA/A + 2.1 µA 57 µA/A + 2.1 µA 52 µA/A + 2.1 µA 78 µA/A + 2.1 µA 0.020 % + 2.1 µA 0.032 % + 5.0 µA 0.051 % + 10 µA	
200 mA to 2 A	10 Hz (10 to 20) Hz (20 to 30) Hz (30 to 40) Hz (40 to 55) Hz (55 to 300) Hz 300 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) kHz (20 to 30) kHz	70 µA/A + 20.6 µA 61 µA/A + 20.6 µA 68 µA/A + 20.6 µA 55 µA/A + 20.6 µA 62 µA/A + 20.6 µA 63 µA/A + 20.6 µA 55 µA/A + 20.6 µA 82 µA/A + 20.6 µA 0.022 % + 20.6 µA 0.032 % + 50.2 µA 0.052 % + 100 µA	
(2 to 11) A	40 Hz to 1 kHz	0.060 % + 0.17 mA	Fluke 5725A
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz	0.080 % + 5.0 mA 0.11 % + 5.0 mA	Fluke 5520A
(2 to 20) A	(1 to 5) kHz (5 to 10) kHz (10 to 20) kHz	0.031 % + 0.21 mA 0.061 % + 0.21 mA 0.11 % + 0.51 mA	Direct measurements or transfer techniques using a Fluke 4950

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Current – Generate & Measure (cont)			
(20 to 80) A	16 Hz 40 Hz 50 Hz 60 Hz 120 Hz 180 Hz 450 Hz 600 Hz 1.2 kHz (1.8 to 4.8) kHz (4.8 to 6.0) kHz	52 µA/A 37 µA/A 37 µA/A 36 µA/A 49 µA/A 49 µA/A 49 µA/A 50 µA/A 50 µA/A 60 µA/A 60 µA/A	Fluke 61XX calibration system
(80 to 120) A	(16 to 450) Hz 850 Hz 1 kHz (1.2 to 6) kHz	49 µA/A 51 µA/A 0.011 % 0.011 %	Fluke 52120A transconductance amplifier w/ Fluke 61XX calibration system
AC Current – Generate & Measure			
(5 to 10) mA[8]	(10, 20) Hz (40, 400) Hz	0.013 % 75 µA/A	Fluke 792 AC/DC transfer standard, Fluke A40 AC/DC current shunt
(5 to 10) mA[8]	(1, 5, 10, 20) kHz 30 kHz	75 µA/A 90 µA/A	
(10 to 20) mA	10 Hz 20 Hz (0.04, 0.4, 1) kHz (5, 10, 20) kHz 30 kHz	0.013 % 75 µA/A 60 µA/A 75 µA/A 90 µA/A	
(20 to 30) mA	(10, 20) Hz (0.04, 0.4, 1) kHz (5, 10, 20) kHz 30 kHz	0.015 % 95 µA/A 95 µA/A 0.012 %	
(30 to 50) mA	(10, 20) Hz (0.04, 0.4, 1) kHz (5, 10, 20) kHz 30 kHz	0.017 % 0.010 % 0.010 % 0.011 %	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Current – Generate & Measure (cont)			
(50 to 100) mA[8]	(10, 20) Hz (0.04, 0.4, 1) kHz (5, 10, 20) kHz 30 kHz	0.014 % 85 µA/A 85 µA/A 0.01 %	Fluke 792 AC/DC transfer standard, Fluke A40 AC/DC current shunt
(100 to 200) mA[8]	(10, 20) Hz (0.04, 0.4, 1) kHz (5, 10, 20) kHz 30 kHz	0.013 % 80 µA/A 80 µA/A 95 µA/A	
(200 to 300) mA	(10, 20) Hz (0.04, 0.4, 1) kHz (5, 10) kHz (20, 30) kHz	0.015 % 90 µA/A 90 µA/A 0.015 %	
(300 to 500) mA	(10, 20) Hz (0.04, 0.4, 1) kHz (5, 10, 20) kHz 30 kHz	0.016 % 0.010 % 0.010 % 0.012 %	
500 mA to 1 A	(10, 20) Hz (40, 400) Hz (1, 5, 10) kHz	0.015 % 90 µA/A 90 µA/A	
(1 to 2) A	10 Hz (20, 40, 400) Hz (1, 5) kHz 10 kHz	0.012 % 0.011 % 0.011 % 0.012 %	
(2 to 3) A	(10, 20) Hz (40, 400) Hz (1, 5, 10) kHz	0.015 % 0.010 % 0.010 %	
(3 to 5) A	(10, 20) Hz (40, 400) Hz (1, 5, 10) kHz	0.018 % 0.011 % 0.011 %	
(5 to 10) A	(10, 20, 40) Hz (0.4, 1) kHz (5, 10) kHz	0.015 % 0.015 % 0.015 %	
(10 to 20) A	(10, 20, 40) Hz (0.4, 1) kHz (5, 10) kHz	0.017 % 0.013 % 0.016 %	
AC Current – Generate			
(20 to 150) A Turns (150 to 1000) A Turns	(45 to 440) Hz (45 to 440) Hz	0.32 % + 50 mA 0.35 % + 90 mA	Fluke 5520A w/ 5500 coil

Parameter/Range	Frequency	CMC[2, 4, 6, 7] (±)	Comments
Phase – Generate			
(0 to 360)°	1 Hz to 6.25 kHz (6.25 to 200) kHz	10 m° 20 m°	Clarke Hess 5500 phase standard
0°	(201 to 1000) kHz	(f* 2.0 E-08)°	Coupler
Phase – Measure			
(0 to 360)° (-180 to +180)°	(5 to 10) Hz 10 Hz to 50 kHz	0.34° 52 m°	Clarke Hess model 6000 phase meter
	50 Hz 60 Hz 180 Hz 1.8 kHz	2.8 m° 3.3 m° 10 m° 100 m°	61XX system
Inductance – Measuring Equipment, Fixed Points			
1 mH 100 mH 10 H	1 kHz 400 Hz	0.022 % 0.022 % 0.11 %	General Radio 1482
Capacitance – Measure			
(1 to 1000) nF	1 kHz	25 µF/F	Andeen Hagerling 2500A option E
Capacitance – Generate Fixed points			
5 pF 20 pF 29 pF 50 pF	10 MHz	0.18 pF 0.35 pF 0.35 pF 0.70 pF	Standard capacitors
20 pF 70 pF 90 pF	1 MHz	0.160 pF 0.50 pF 0.50 pF	
1.0 pF 10 pF 100 pF 1000 pF	100 Hz to 10 MHz	0.035 % 0.015 % 0.015 % 0.035 %	
(1, 10, 100, 200, 500) nF	1 kHz	50 µF/F	
1µF		50 µF/F	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
Capacitance – Generate Fixed points (cont)			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	0.29 % + 7.8 pF	GR 1409 capacitor
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.29 % + 7.8 pF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.29 % + 7.8 pF	
(3.3 to 10.9999) nF	10 Hz to 1 kHz	0.15 % + 7.8 pF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.15 % + 77.5 pF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.15 % + 77.5 pF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.15 % + 232.6 pF	
330 nF to 1.09 999 µF	(10 to 600) Hz	0.15 % + 775.2 pF	
(1.1 to 3.29 999) µF	(10 to 300) Hz	0.15 % + 775.2 pF	
(3.3 to 10.9999) µF	(10 to 150) Hz	0.15 % + 775.2 pF	
(11 to 32.9999) µF	(10 to 120) Hz	0.23 % + 23 nF	
(33 to 109.999) µF	(10 to 80) Hz	0.26 % + 0.775 µF	Fluke 5520A
(110 to 329.999) µF	(0 to 50) Hz	0.26 % + 0.232 µF	
330 µF to 1.09999) mF	(0 to 20) Hz	0.26 % + 0.7752 µF	
(1.1 to 3.2999) mF	(0 to 6) Hz	0.26 % + 2.3 µF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.26 % + 7.8 µF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.54 % + 23.3 µF	
(33 to 110) mF	(0 to 0.2) Hz	0.78 % + 77.5 µF	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
Capacitance – Measure, Fluke 55XX Series Calibrators			
(100 to 300) pF	1 kHz	0.70 %	Fluke PM 6304 RLC meter
(300 to 600) pF	1 kHz	0.40 %	
(0.6 to 1.0) nF	1 kHz	0.17 %	
(1 to 3.0) nF	1 kHz	0.11 %	
(3 to 10) nF	1 kHz	0.13 %	
(10 to 30) nF	1 kHz	0.060 %	
(30 to 100) nF	1 kHz	0.060 %	
(100 to 300) nF	1 kHz	0.060 %	
(0.3 to 1.0) µF	100 Hz	0.080 %	
(1.0 to 3.0) µF	100 Hz	0.060 %	
(3 to 10) µF	100 Hz	0.060 %	
(10 to 30) µF	100 Hz	0.080 %	
(30 to 100) µF	100 Hz	0.11 %	
(100 to 300) µF	100 Hz	0.11 %	
Fixed Points			
3.3 nF	1 kHz	0.13 %	
7.0 nF	1 kHz	0.13 %	
33 nF	1 kHz	0.080 %	
70 nF	1 kHz	0.080 %	
0.33 µF	100 Hz	0.080 %	
0.70 µF	100 Hz	0.080 %	
3.3 µF	100 Hz	0.080 %	
7.0 µF	100 Hz	0.080 %	
33 µF	100 Hz	0.080 %	
70 µF	50 Hz	0.080 %	
109 µF	50 Hz	0.11 %	
200 µF	50 Hz	0.11 %	
300 µF	50 Hz	0.11 %	
330 µF	50 Hz	0.13 %	
1100 µ	50 Hz	0.29 %	
AC Voltage Flatness – Measure			
(5 to 10) mV	50 kHz to 10 MHz	0.20 %	Fluke 5790 AC standard
10 mV to 5.5 V	50 kHz to 10 MHz	0.10 %	

Parameter/Range	Frequency	CMC[2, 4, 6, 7] (±)	Comments
AC Voltage Flatness – Measure (cont)			
Fixed Points			
5 mV	(50 to 900) MHz 900 MHz to 1.1 GHz (1.1 to 1.5) GHz (1.5 to 2.0) GHz (2.0 to 2.1) GHz	1.0 % 1.1 % 1.2 % 1.3 % 1.4 %	Agilent EPM 441 power meter and power sensors
9.9 mV	(50 to 500) MHz 500 MHz to 1.1 GHz (1.1 to 1.6) GHz (1.6 to 2.1) GHz	0.80 % 0.90 % 1.0 % 1.2 %	
10 mV	(50 to 400) MHz 400 MHz to 1.2 GHz (1.2 to 1.6) GHz (1.6 to 2.0) GHz (2.0 to 2.1) GHz	0.80 % 0.90 % 1.0 % 1.2 % 1.3 %	
(34, 39, 40) mV	(50 to 900) MHz 900 MHz to 1.2 GHz (1.2 to 1.6) GHz (1.6 to 2.0) GHz (2.0 to 2.1) GHz	0.80 % 0.90 % 1.0 % 1.2 % 1.3 %	
(99, 100, 340, 399, 400) mV	50 MHz to 1.0 GHz (1.0 to 1.2) GHz (1.2 to 1.6) GHz (1.6 to 2.1) GHz	0.70 % 0.80 % 0.90 % 1.0 %	
1.2 V	(50 to 200) MHz (200 to 400) MHz 400 MHz to 1.2 GHz (1.2 to 1.6) GHz (1.6 to 2.1) GHz	0.60 % 0.65 % 0.70 % 0.95 % 1.0 %	
1.3 V & 3.4 V	(50 to 100) MHz (100 to 400) MHz 400 MHz to 1.1 GHz (1.1 to 2.1) GHz	0.85 % 0.75 % 0.70 % 1.0 %	
5.5 V	(50 to 100) MHz (100 to 200) MHz (200 to 300) MHz (300 to 400) MHz (400 to 600) MHz	0.85 % 0.75 % 0.70 % 0.75 % 0.70 %	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage Flatness – Generate & Measure			
(1 to 2.2) mV	(10 to 50) Hz 50 Hz to 100 kHz 100 kHz to 2 MHz (2 to 10) MHz (10 to 15) MHz (15 to 20) MHz (20 to 26) MHz (26 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.038 % 0.021 % 0.030 % 0.050 % 0.065 % 0.080 % 0.13 % 0.15 % 0.17 % 0.20 % 0.22 % 0.25 %	Fluke 5720A, relative to a reference frequency
(2.2 to 7) mV	(10 to 50) Hz 50 Hz to 100 kHz (100 to 500) kHz 500 kHz to 2 MHz (2 to 6) MHz (6 to 10) MHz (10 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.026 % 0.012 % 0.016 % 0.020 % 0.033 % 0.040 % 0.055 % 0.062 % 0.070 % 0.10 % 0.11 % 0.13 % 0.14 % 0.16 % 0.19 % 0.21 % 0.23 %	
(7 to 22) mV	(10 to 50) Hz 50 Hz to 100 kHz (100 to 500) kHz 500 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 9) MHz (9 to 10) MHz (10 to 12) MHz (12 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz	0.022 % 0.010 % 0.015 % 0.018 % 0.019 % 0.030 % 0.035 % 0.036 % 0.040 % 0.050 % 0.052 % 0.060 % 0.065 % 0.090 % 0.11 % 0.12 % 0.13 % 0.16 % 0.18 %	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage Flatness – Generate & Measure (cont)			
(7 to 22) mV	(40 to 45) MHz (45 to 50) MHz	0.20 % 0.22 %	Fluke 5720A, relative to a reference frequency
(22 to 70) mV	(10 to 50) Hz 50 Hz to 100 kHz (100 to 700) kHz 700 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 6) MHz (6 to 10) MHz (10 to 12) MHz (12 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.021 % 0.009 % 0.015 % 0.017 % 0.018 % 0.027 % 0.029 % 0.035 % 0.047 % 0.050 % 0.055 % 0.060 % 0.090 % 0.11 % 0.12 % 0.13 % 0.15 % 0.17 % 0.19 % 0.21 %	
(70 to 220) mV	(10 to 50) Hz 50 Hz to 100 kHz (100 to 500) kHz 500 kHz to 2 MHz (2 to 4) MHz (4 to 6) MHz (6 to 8) MHz (8 to 10) MHz (10 to 12) MHz (12 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.020 % 0.009 % 0.014 % 0.017 % 0.025 % 0.027 % 0.031 % 0.032 % 0.045 % 0.046 % 0.055 % 0.060 % 0.090 % 0.10 % 0.11 % 0.12 % 0.15 % 0.16 % 0.18 % 0.20 %	
(220 to 700) mV	(10 to 50) Hz 50 Hz to 100 kHz (100 to 500) kHz	0.016 % 0.0080 % 0.014 %	

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Voltage Flatness – Generate & Measure (cont)			
(220 to 700) mV	500 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 6) MHz (6 to 10) MHz (10 to 12) MHz (12 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.016 % 0.017 % 0.024 % 0.026 % 0.030 % 0.042 % 0.045 % 0.050 % 0.060 % 0.09 % 0.10 % 0.11 % 0.12 % 0.14 % 0.16 % 0.17 % 0.19 %	Fluke 5720A, relative to a reference frequency
700 mV to 2.2 V	(10 to 50) Hz 50 Hz to 100 kHz (100 to 500) kHz 500 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 6) MHz (6 to 9) MHz (9 to 10) MHz (10 to 12) MHz (12 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.016 % 0.0075 % 0.013 % 0.016 % 0.017 % 0.023 % 0.026 % 0.028 % 0.030 % 0.040 % 0.045 % 0.050 % 0.060 % 0.090 % 0.10 % 0.11 % 0.12 % 0.14 % 0.15 % 0.17 % 0.19 %	
(2.2 to 7) V	(10 to 50) Hz 50 Hz to 100 kHz (100 to 500) kHz 500 kHz to 2 MHz (2 to 6) MHz (6 to 9) MHz (9 to 10) MHz (10 to 12) MHz	0.015 % 0.0070 % 0.013 % 0.017 % 0.025 % 0.028 % 0.030 % 0.040 %	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage Flatness – Generate & Measure (cont)			
(2.2 to 7) V	(12 to 15) MHz (15 to 17) MHz (17 to 20) MHz (20 to 23) MHz (23 to 26) MHz (26 to 28) MHz (28 to 30) MHz (30 to 35) MHz (35 to 40) MHz (40 to 45) MHz (45 to 50) MHz	0.045 % 0.050 % 0.060 % 0.090 % 0.10 % 0.11 % 0.13 % 0.13 % 0.15 % 0.16 % 0.18 %	Fluke 5720A, relative to a reference frequency
Electrical Calibration of Thermocouple Indicators – Generate & Measure[9]			
Type B	(600 to 800) °C (800 to 1550) °C (1550 to 1820) °C	0.27 °C 0.21 °C 0.16 °C	Fluke 5520A or Fluke 7526A
Type C	(0 to 1000) °C (1000 to 1800) °C (1800 to 2000) °C (2000 to 2316) °C	0.11 °C 0.17 °C 0.18 °C 0.24 °C	
Type E	(-250 to -200) °C (-200 to -100) °C (-100 to 0) °C (0 to 600) °C (600 to 1000) °C	0.18 °C 0.08 °C 0.05 °C 0.05 °C 0.06 °C	
Type J	(-210 to -100) °C (-100 to 800) °C (800 to 1200) °C	0.10 °C 0.05 °C 0.06 °C	

Parameter/Equipment	Range	CMC[2, 4, 5, 6] (±)	Comments
Electrical Calibration of Thermocouple Indicators – Generate & Measure[9] (cont)			
Type K	(-270 to -200) °C (-200 to -100) °C (-100 to 500) °C (500 to 800) °C (800 to 1372) °C	0.19 °C 0.11 °C 0.06 °C 0.07 °C 0.08 °C	Fluke 5520A or Fluke 7526A
Type N	(-270 to -200) °C (-200 to -100) °C (-100 to 0) °C (0 to 100) °C (100 to 800) °C (800 to 1300) °C	0.25 °C 0.17 °C 0.08 °C 0.07 °C 0.06 °C 0.08 °C	
Type R	(-50 to -25) °C (-25 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 1000) °C (1000 to 1600) °C (1600 to 1767) °C	0.41 °C 0.34 °C 0.29 °C 0.21 °C 0.16 °C 0.15 °C 0.14 °C 0.16 °C	
Type S	(-50 to -25) °C (-25 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 1000) °C (1000 to 1600) °C (1600 to 1767) °C	0.39 °C 0.33 °C 0.28 °C 0.21 °C 0.17 °C 0.16 °C 0.15 °C 0.18 °C	
Type T	(-270 to -250) °C (-250 to -200) °C (-200 to -100) °C (-100 to 0) °C (0 to 200) °C (200 to 400) °C	0.39 °C 0.26 °C 0.11 °C 0.07 °C 0.05 °C 0.05 °C	
Type U	(-200 to 0) °C (0 to 200) °C (200 to 600) °C	0.11 °C 0.06 °C 0.05 °C	

Parameter/Equipment	Range	CMC[2, 4, 5, 6, 7] (±)	Comments
Electrical Calibration of Thermistor & RTD's –			
Pt 385, 100 Ω	(-200 to 800) °C	0.030 °C	Fluke 525B or Fluke 7526A
Pt 3926, 100 Ω	(-200 to 630) °C	0.030 °C	
Pt 3916, 100 Ω	(-200 to 630) °C	0.030 °C	
Pt 385, 200 Ω	(-200 to 400) °C (400 to 630) °C	0.27 °C 0.33 °C	
Pt 385, 500 Ω	(-200 to 630) °C	0.11 °C	
Pt 385, 1000 Ω	(-200 to 600) °C	0.060 °C	
Ni 120, 120 Ω	(-80 to 260) °C	0.010 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.25 °C	
YSI 400	(15 to 50) °C	0.0047 °C	
Oscilloscopes[9] –			
DC:			
50 Ω 1 MΩ	(0 to ± 6.6) V (0 to ± 130) V	0.25 % + 40 µV 0.05 % + 40 µV	Fluke 5520A/SC1100
Square Wave:			
50 Ω	(0 to ± 6.6) V (10 Hz to 10 kHz)	0.25 % + 40 µV	Fluke 5520A/SC1100
1 MΩ	(0 to ± 130) V (10 Hz to 10 kHz)	0.10 % + 40 µV	
Leveled Sine Flatness (Relative to 50 kHz)	5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	 1.5 % + 100 µV 2 % + 100 µV 4 % + 100 µV 5 % + 100 µV	Fluke 5520A/SC1100
Time Mark (50 Ω)	(2 to 5) ns 10 ns (20 to 50) ns 100 ns to 20 ms 50 ms to 5 s	2.5 µs/s 2.5 µs/s 2.5 µs/s 2.5 µs/s (25 + 1000*t*) µs/s	 *t* = time in seconds

Parameter/Range	Frequency	CMC[2, 4, 5, 6, 7] (±)	Comments
AC Resistance – Generate & Measure			
(25 to 500) mΩ	60 Hz	0.31 %	Calibration of Fluke 5320A (ground bond resistance decade f=60Hz)
(1 to 180) Ω	60 Hz	0.12 %	
500 Ω 1.8 kΩ	60 Hz	0.08 %	
10 kΩ to 5 MΩ	60 Hz	0.20 %	Calibration of Fluke 5320A load
1 Ω	1 kHz	0.085 %	General Radio 1689M
5 Ω	1 kHz	0.027 %	
10 Ω to 1 kΩ	1 kHz	0.025 %	
10 kΩ	1 kHz	0.027 %	
100 kΩ	1 kHz	0.025 %	
2 MΩ	1 kHz	0.070 %	
100 MΩ	1 kHz	3.0 %	
1 Ω	100 Hz	0.25 %	
5 Ω	100 Hz	0.055 %	
10 Ω to 100 kΩ	100 Hz	0.050 %	
2 MΩ	100 Hz	0.20 %	
100 MΩ	100 Hz	8.5 %	

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 4, 6, 7, 11] (±)	Comments
RF Power –			
1 mW	50 MHz	0.15 %	Tegam 1830 power meter w/ HP 478H76 power sensor

Parameter/Range	Frequency	CMC[2, 4, 6, 7, 11] (±)	Comments
RF Flatness – Measure (cont)			
50 Ω:			
+24 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.017 dBm 0.017 dBm 0.018 dBm 0.018 dBm 0.018 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm	Measurement of 96x0 series RF generators
+16 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.00 GHz 1.25 GHz 1.3 GHz 1.40 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.011 dBm 0.011 dBm 0.012 dBm 0.012 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm	

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
+13 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHZ 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.3 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.011 dBm 0.011 dBm 0.012 dBm 0.012 dBm 0.012 dBm 0.019 dBm 0.019 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.066 dBm 0.066 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
+3 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.011 dBm 0.011 dBm 0.012 dBm 0.012 dBm 0.012 dBm 0.019 dBm 0.019 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.040 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.058 dBm 0.066 dBm 0.066 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω: -7 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.024 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.030 dBm 0.030 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.087 dBm 0.087 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-17 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0030 dBm 0.0030 dBm 0.0030 dBm 0.0003 dBm 0.024 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.030 dBm 0.030 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.087 dBm 0.087 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-27 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0030 dBm 0.0030 dBm 0.0030 dBm 0.0040 dBm 0.022 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.028 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.032 dBm 0.033 dBm 0.033 dBm 0.033 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.062 dBm 0.062 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.062 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.085 dBm 0.085 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω: -37 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0040 dBm 0.0040 dBm 0.0040 dBm 0.0050 dBm 0.022 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.028 dBm 0.028 dBm 0.028 dBm 0.028 dBm 0.033 dBm 0.033 dBm 0.033 dBm 0.033 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.085 dBm 0.085 dBm 0.11 dBm 0.11 dBm	

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω: -47 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.0040 dBm 0.0040 dBm 0.0040 dBm 0.0060 dBm 0.024 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.046 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.070 dBm 0.086 dBm 0.086 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-57 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.030 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.034 dBm 0.038 dBm 0.038 dBm 0.038 dBm 0.038 dBm 0.049 dBm 0.049 dBm 0.049 dBm 0.049 dBm 0.050 dBm 0.066 dBm 0.066 dBm 0.066 dBm 0.066 dBm 0.066 dBm 0.066 dBm 0.078 dBm 0.078 dBm 0.078 dBm 0.078 dBm 0.078 dBm 0.078 dBm 0.092 dBm 0.092 dBm 0.12 dBm 0.12 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-66 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.042 dBm 0.042 dBm 0.042 dBm 0.035 dBm 0.035 dBm 0.035 dBm 0.040 dBm 0.040 dBm 0.039 dBm 0.039 dBm 0.039 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.078 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.14 dBm 0.14 dBm 0.17 dBm 0.17 dBm 0.17 dBm 0.17 dBm 0.18 dBm 0.18 dBm 0.19 dBm 0.19 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-75 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz 3.8 GHz 4.0 GHz	0.045 dBm 0.038 dBm 0.038 dBm 0.038 dBm 0.038 dBm 0.038 dBm 0.042 dBm 0.042 dBm 0.041 dBm 0.041 dBm 0.041 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.045 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.080 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.14 dBm 0.14 dBm 0.17 dBm 0.17 dBm 0.17 dBm 0.17 dBm 0.18 dBm 0.18 dBm 0.20 dBm 0.20 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-85 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz 3.0 GHz 3.2 GHz 3.5 GHz	0.10 dBm 0.10 dBm 0.10 dBm 0.092 dBm 0.092 dBm 0.092 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.077 dBm 0.077 dBm 0.077 dBm 0.10 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.15 dBm 0.15 dBm 0.15 dBm 0.18 dBm 0.18 dBm 0.18 dBm 0.18 dBm 0.18 dBm 0.18 dBm 0.18 dBm 0.18 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω:			
-95 dBm	10 MHz 13MHz 20 MHz 30MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.39 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.061 dBm 0.061 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.086 dBm 0.086 dBm 0.086 dBm 0.086 dBm 0.10 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.14 dBm 0.14 dBm 0.14 dBm 0.17 dBm 0.17 dBm 0.19 dBm 0.19 dBm 0.19 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω: -105 dBm	10 MHz 13MHz 20 MHz 30MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.39 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.11 dBm 0.10 dBm 0.10 dBm 0.10 dBm 0.099 dBm 0.099 dBm 0.099 dBm 0.10 dBm 0.20 dBm 0.20 dBm 0.20 dBm 0.20 dBm 0.20 dBm 0.20 dBm 0.20 dBm 0.21 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.24 dBm 0.24 dBm 0.24 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω: -115 dBm	10 MHz 13MHz 20 MHz 30MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.39 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.17 dBm 0.16 dBm 0.16 dBm 0.16 dBm 0.16 dBm 0.16 dBm 0.16 dBm 0.16 dBm 0.39 dBm 0.39 dBm 0.39 dBm 0.39 dBm 0.39 dBm 0.39 dBm 0.41 dBm 0.41 dBm 0.42 dBm 0.42 dBm 0.43 dBm 0.43 dBm 0.43 dBm 0.43 dBm 0.43 dBm 0.43 dBm 0.45 dBm 0.45 dBm 0.45 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7, 11] (±)	Comments
RF Flatness – Measure (cont) 50 Ω: -124 dBm	10 MHz 13MHz 20 MHz 30MHz 50 MHz 75 MHz 100 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1.0 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.39 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.21 dBm 0.21 dBm 0.21 dBm 0.21 dBm 0.21 dBm 0.21 dBm 0.21 dBm 0.40 dBm 0.47 dBm 0.47 dBm 0.47 dBm 0.47 dBm 0.47 dBm 0.47 dBm 0.47 dBm 0.47 dBm 0.48 dBm 0.48 dBm 0.48 dBm 0.43 dBm 0.48 dBm 0.48 dBm 0.49 dBm 0.49 dBm 0.49 dBm 0.49 dBm 0.49 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont)			
75 Ω:			
+18 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz	0.0020 dBm 0.002 dBm 0.002 dBm 0.002 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm	Measurement of 96x0 series RF generators
+16 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.023 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.029 dBm	

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure, (cont) 75 Ω: +10 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.10 GHz 1.25 GHz 1.30 GHz 1.40 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.020 dBm 0.020 dBm 0.020 dBm 0.020 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.064 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure, (cont) 75 Ω:			
+7 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.1 GHz 1.2 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0020 dBm 0.020 dBm 0.020 dBm 0.020 dBm 0.020 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.068 dBm 0.068 dBm 0.068 dBm 0.068 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω:			
-3 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.0020 dBm 0.0020 dBm 0.0020 dBm 0.0030 dBm 0.020 dBm 0.020 dBm 0.020 dBm 0.020 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.064 dBm 0.068 dBm 0.068 dBm 0.068 dBm 0.068 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω:			
-13 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz	0.0030 dBm 0.0030 dBm 0.0030 dBm 0.0030 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.021 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.027 dBm 0.029 dBm 0.029 dBm 0.029 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.044 dBm 0.065 dBm 0.065 dBm 0.065 dBm 0.068 dBm 0.068 dBm 0.068 dBm 0.068 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω:			
-23 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.0030 dBm 0.0030 dBm 0.0030 dBm 0.0040 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.028 dBm 0.028 dBm 0.028 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω:			
-33 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.10 GHz 1.25 GHz 1.30 GHz 1.40 GHz 1.50 GHz 1.70 GHz 1.90 GHz 2.00 GHz 2.20 GHz 2.40 GHz 2.60 GHz 2.70 GHz 2.80 GHz	0.0040 dBm 0.0040 dBm 0.0040 dBm 0.0050 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.028 dBm 0.028 dBm 0.028 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω:			
-43 dBm	0.0002 MHz 0.001 MHz 0.020 MHz 0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.0040 dBm 0.0040 dBm 0.0040 dBm 0.0050 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.019 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.026 dBm 0.028 dBm 0.028 dBm 0.028 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.043 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.062 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.067 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm 0.11 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -53 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.0050 dBm 0.047 dBm 0.047 dBm 0.047 dBm 0.047 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.089 dBm 0.089 dBm 0.089 dBm 0.089 dBm 0.090 dBm 0.090 dBm 0.090 dBm 0.090 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -63 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.045 dBm 0.047 dBm 0.047 dBm 0.047 dBm 0.047 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.050 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.061 dBm 0.089 dBm 0.089 dBm 0.089 dBm 0.090 dBm 0.090 dBm 0.090 dBm 0.090 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω:			
-72 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.046 dBm 0.049 dBm 0.049 dBm 0.049 dBm 0.049 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.052 dBm 0.053 dBm 0.053 dBm 0.053 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.063 dBm 0.090 dBm 0.090 dBm 0.090 dBm 0.091 dBm 0.091 dBm 0.091 dBm 0.091 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -81 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.067 dBm 0.069 dBm 0.069 dBm 0.069 dBm 0.069 dBm 0.071 dBm 0.071 dBm 0.071 dBm 0.071 dBm 0.071 dBm 0.071 dBm 0.071 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.079 dBm 0.079 dBm 0.079 dBm 0.079 dBm 0.079 dBm 0.079 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.12 dBm 0.15 dBm 0.15 dBm 0.15 dBm 0.15 dBm 0.15 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -91 dBm	0.1 MHz 0.3 MHz 1 MHz 3 MHz 10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.070 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.072 dBm 0.074 dBm 0.074 dBm 0.074 dBm 0.074 dBm 0.074 dBm 0.074 dBm 0.074 dBm 0.075 dBm 0.075 dBm 0.075 dBm 0.082 dBm 0.082 dBm 0.082 dBm 0.082 dBm 0.082 dBm 0.082 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.15 dBm 0.15 dBm 0.15 dBm 0.15 dBm 0.15 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -101 dBm	10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.13 dBm 0.21 dBm 0.21 dBm 0.21 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.22 dBm 0.24 dBm 0.24 dBm 0.24 dBm 0.24 dBm 0.24 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -111 dBm	10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.46 dBm 0.46 dBm 0.46 dBm 0.46 dBm 0.46 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
RF Flatness – Measure (cont) 75 Ω: -121 dBm	10 MHz 13 MHz 20 MHz 30 MHz 50 MHz 75 MHz 100 MHz 125 MHz 150 MHz 250 MHz 300 MHz 354 MHz 454 MHz 500 MHz 625 MHz 847 MHz 1 GHz 1.25 GHz 1.3 GHz 1.4 GHz 1.5 GHz 1.7 GHz 1.9 GHz 2.0 GHz 2.2 GHz 2.4 GHz 2.6 GHz 2.7 GHz 2.8 GHz	0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.25 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.44 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.45 dBm 0.46 dBm 0.46 dBm 0.46 dBm 0.46 dBm 0.46 dBm	Measurement of 96x0 series RF generators

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
VSWR –			
50 Ω	(1 to 10) MHz 10 MHz to 1 GHz (1 to 1.7) GHz (1.7 to 2) GHz (2 to 2.5) GHz (2.5 to 3) GHz (3 to 3.6) GHz (3.6 to 4) GHz	0.037 dB 0.028 dB 0.037 dB 0.047 dB 0.064 dB 0.10 dB 0.18 dB 0.21 dB	VSWR of 1 to 1.4 and source outputs up to +13 dBm
75 Ω	(1 to 50) MHz 50 MHz to 1 GHz (1 to 1.3) GHz (1.3 to 2) GHz	0.043 dB 0.036 dB 0.041 dB 0.067 dB	VSWR of 1 to 1.4 and source outputs up to +7 dBm
2.92 mm	(2.5 to 5) GHz (5 to 11) GHz (11 to 20) GHz (20 to 27) GHz	0.26 dB 0.42 dB 0.42 dB 0.65 dB	VSWR of 1 to 1.4 and source outputs up to +13 dBm
	(2.5 to 5) GHz (5 to 11) GHz (11 to 20) GHz (20 to 26.5) GHz	0.28 dB 0.45 dB 0.52 dB 0.76 dB	VSWR of 1.4 to 2.4 and source outputs up to +13 dBm

50 Ω Level Sine Measurement – 2.92 mm Microwave Output – Fluke 96270A RF Reference Source[2,4,7, 11]

Frequency	(24 to 18) dBm	(18 to 0) dBm	(0 to -10) dBm	(-10 to -20) dBm	(-20 to -30) dBm
0.001 MHz	0.005 dB	0.005 dB	0.005 dB	0.023 dB	0.023 dB
0.020 MHz	0.005 dB	0.005 dB	0.005 dB	0.023 dB	0.023 dB
0.1 MHz	0.005 dB	0.005 dB	0.005 dB	0.024 dB	0.024 dB
0.3 MHz	0.094 dB	0.087 dB	0.094 dB	0.095 dB	0.096 dB
1 MHz	0.094 dB	0.087 dB	0.094 dB	0.095 dB	0.096 dB
10 MHz	0.094 dB	0.087 dB	0.094 dB	0.095 dB	0.096 dB
20 MHz	0.094 dB	0.087 dB	0.094 dB	0.095 dB	0.097 dB
100 MHz	0.094 dB	0.087 dB	0.094 dB	0.095 dB	0.096 dB
125 MHz	0.099 dB	0.092 dB	0.098 dB	0.099 dB	0.10 dB
300 MHz	0.099 dB	0.092 dB	0.098 dB	0.099 dB	0.10 dB
750 MHz	0.11 dB	0.095 dB	0.11 dB	0.11 dB	0.11 dB
1000 MHz	0.11 dB	0.095 dB	0.11 dB	0.11 dB	0.11 dB
1400 MHz	0.11 dB	0.096 dB	0.11 dB	0.11 dB	0.11 dB
2000 MHz	0.12 dB	0.11 dB	0.12 dB	0.12 dB	0.12 dB
2500 MHz	0.12 dB	0.11 dB	0.12 dB	0.12 dB	0.12 dB
3000 MHz	0.12 dB	0.11 dB	0.12 dB	0.11 dB	0.11 dB
3500 MHz	0.12 dB	0.11 dB	0.12 dB	0.12 dB	0.12 dB
4000 MHz	0.12 dB	0.11 dB	0.12 dB	0.12 dB	0.12 dB
5000 MHz	0.12 dB	0.11 dB	0.12 dB	0.12 dB	0.12 dB
6000 MHz	0.12 dB	0.11 dB	0.12 dB	0.12 dB	0.12 dB
7000 MHz	0.14 dB	0.12 dB	0.14 dB	0.14 dB	0.14 dB
8000 MHz	0.14 dB	0.12 dB	0.14 dB	0.14 dB	0.14 dB
9000 MHz	0.14 dB	0.12 dB	0.14 dB	0.14 dB	0.14 dB
10 000 MHz	0.14 dB	0.12 dB	0.14 dB	0.15 dB	0.15 dB
11 000 MHz	0.14 dB	0.12 dB	0.14 dB	0.15 dB	0.15 dB
12 000 MHz	0.14 dB	0.12 dB	0.14 dB	0.16 dB	0.16 dB
13 000 MHz	0.19 dB	0.18 dB	0.2 dB	0.21 dB	0.21 dB
14 000 MHz	0.19 dB	0.18 dB	0.2 dB	0.21 dB	0.21 dB
15 000 MHz	0.19 dB	0.18 dB	0.2 dB	0.21 dB	0.21 dB
16 000 MHz	0.2 dB	0.18 dB	0.2 dB	0.22 dB	0.22 dB
17 000 MHz	0.2 dB	0.18 dB	0.2 dB	0.22 dB	0.22 dB
18 000 MHz	0.2 dB	0.18 dB	0.21 dB	0.22 dB	0.22 dB
19 000 MHz	0.2 dB	0.18 dB	0.21 dB	0.22 dB	0.23 dB
20 000 MHz	0.2 dB	0.18 dB	0.21 dB	0.23 dB	0.23 dB
21 000 MHz	0.2 dB	0.18 dB	0.21 dB	0.25 dB	0.25 dB
22 000 MHz	0.2 dB	0.18 dB	0.21 dB	0.25 dB	0.25 dB
23 000 MHz	0.21 dB	0.19 dB	0.22 dB	0.26 dB	0.26 dB
24 000 MHz	0.21 dB	0.19 dB	0.22 dB	0.27 dB	0.27 dB
25 000 MHz	0.21 dB	0.19 dB	0.23 dB	0.28 dB	0.28 dB
26 000 MHz	0.22 dB	0.2 dB	0.24 dB	0.28 dB	0.28 dB
26 500 MHz	0.22 dB	0.2 dB	0.24 dB	0.28 dB	0.28 dB

50 Ω Level Sine Measurement – 2.92 mm Microwave Output – Fluke 96270A RF Reference Source (cont)[2, 4, 7, 11]

Frequency	(-30 to -40) dBm	(-40 to -50) dBm	(-50 to -60) dBm	(-60 to -70) dBm	(-70 to -80) dBm	(-80 to -90) dBm
0.001 MHz	0.024 dB	0.047 dB				
0.020 MHz	0.024 dB	0.047 dB	0.11 dB	0.13 dB	0.16 dB	0.16 dB
0.1 MHz	0.024 dB	0.047 dB	0.080 dB	0.082 dB	0.16 dB	0.16 dB
0.3 MHz	0.097 dB	0.11 dB	0.11 dB	0.12 dB	0.13 dB	0.13 dB
1 MHz	0.097 dB	0.11 dB	0.11 dB	0.12 dB	0.13 dB	0.13 dB
10 MHz	0.097 dB	0.11 dB	0.11 dB	0.12 dB	0.13 dB	0.13 dB
20 MHz	0.097 dB	0.11 dB	0.11 dB	0.12 dB	0.13 dB	0.13 dB
100 MHz	0.097 dB	0.11 dB	0.11 dB	0.12 dB	0.13 dB	0.13 dB
125 MHz	0.10 dB	0.12 dB	0.12 dB	0.12 dB	0.13 dB	0.13 dB
300 MHz	0.1 dB	0.12 dB	0.12 dB	0.12 dB	0.13 dB	0.13 dB
750 MHz	0.11 dB	0.12 dB	0.12 dB	0.12 dB	0.13 dB	0.13 dB
1000 MHz	0.11 dB	0.12 dB	0.12 dB	0.12 dB	0.13 dB	0.14 dB
1400 MHz	0.11 dB	0.12 dB	0.12 dB	0.12 dB	0.13 dB	0.14 dB
2000 MHz	0.12 dB	0.13 dB	0.13 dB	0.13 dB	0.14 dB	0.14 dB
2500 MHz	0.12 dB	0.13 dB	0.13 dB	0.13 dB	0.14 dB	0.15 dB
3000 MHz	0.12 dB	0.13 dB	0.13 dB	0.13 dB	0.14 dB	0.15 dB
3500 MHz	0.12 dB	0.13 dB	0.13 dB	0.13 dB	0.14 dB	0.15 dB
4000 MHz	0.12 dB	0.13 dB	0.13 dB	0.13 dB	0.14 dB	0.15 dB
5000 MHz	0.12 dB	0.13 dB	0.13 dB	0.13 dB	0.14 dB	0.15 dB
6000 MHz	0.13 dB	0.15 dB	0.15 dB	0.14 dB	0.15 dB	0.15 dB
7000 MHz	0.14 dB	0.16 dB	0.16 dB	0.16 dB	0.20 dB	0.19 dB
8000 MHz	0.14 dB	0.16 dB	0.16 dB	0.16 dB	0.20 dB	0.20 dB
9000 MHz	0.14 dB	0.16 dB	0.17 dB	0.17 dB	0.20 dB	0.20 dB
10 000 MHz	0.15 dB	0.17 dB	0.17 dB	0.17 dB	0.20 dB	0.20 dB
11 000 MHz	0.15 dB	0.21 dB	0.21 dB	0.17 dB	0.20 dB	0.20 dB
12 000 MHz	0.16 dB	0.21 dB	0.21 dB	0.18 dB	0.20 dB	0.20 dB
13 000 MHz	0.21 dB	0.25 dB	0.25 dB	0.22 dB	0.24 dB	0.20 dB
14 000 MHz	0.21 dB	0.25 dB	0.25 dB	0.28 dB	0.24 dB	0.24 dB
15 000 MHz	0.21 dB	0.25 dB	0.28 dB	0.28 dB	0.24 dB	0.24 dB
16 000 MHz	0.22 dB	0.28 dB	0.28 dB	0.30 dB	0.27 dB	0.27 dB
17 000 MHz	0.22 dB	0.28 dB	0.28 dB	0.30 dB	0.27 dB	0.27 dB
18 000 MHz	0.22 dB	0.46 dB	0.32 dB	0.30 dB	0.30 dB	0.30 dB
19 000 MHz	0.23 dB	0.46 dB	0.32 dB	0.31 dB	0.31 dB	0.30 dB
20 000 MHz	0.23 dB	0.46 dB	0.33 dB	0.54 dB	0.37 dB	0.37 dB
21 000 MHz	0.25 dB	0.46 dB	0.33 dB	0.54 dB	0.37 dB	0.37 dB
22 000 MHz	0.25 dB	0.46 dB	0.33 dB	0.54 dB	0.37 dB	0.37 dB
23 000 MHz	0.26 dB	0.46 dB	0.33 dB	0.54 dB	0.37 dB	0.37 dB
24 000 MHz	0.27 dB	0.46 dB	0.44 dB	0.62 dB	0.54 dB	0.54 dB
25 000 MHz	0.28 dB	0.73 dB	0.49 dB	0.62 dB	0.54 dB	0.54 dB
26 000 MHz	0.28 dB	0.73 dB	0.49 dB	0.7 dB	0.91 dB	0.91 dB
26 500 MHz	0.28 dB	0.73 dB	0.62 dB	0.70 dB	0.91 dB	0.91 dB

IV. Mechanical

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Gauge Pressure (Pneumatic) – Nitrogen	(-100 to 280) kPa	0.0016 % + 0.31 Pa	Fluke PG7601 differential mode
	(0 to <7) kPa (7 to 9) kPa	0.0077 % + 0.55 Pa 0.0090 % + 0.4 Pa	Ruska 7250xi
	(9 to 380) kPa (380 to 720) kPa (720 to 7000) kPa	0.0016 % + 0.06 Pa 0.0017 % + 0.13 Pa 0.0017 % + 1.2 Pa	Fluke PG7601
	(7 to 13.8) MPa	0.0090 % + 0.13 kPa	Ruska 7250xi
Gauge Pressure[10] (Pneumatic) – Air	(0 to 750) Pa (750 to 2833) Pa (2833 to 7500) Pa	0.0075 % + 53 mPa 0.0090 % + 37 mPa 0.0091 % + 14 mPa	Fluke 7250LP differential
Absolute Pressure (Pneumatic) – Nitrogen	(0.7 to 9) kPa	0.0077 % + 15 Pa	Ruska 7250xi
	(9 to 380) kPa (380 to 720) kPa (720 to 7000) kPa (7000 to 7100) kPa	0.0016 % + 0.21 Pa 0.0017 % + 0.24 Pa 0.0017 % + 1.2 Pa 0.0017 % + 10 Pa	Fluke PG7601
	(7.1 to 10) MPa	0.010 % but not less than 0.30 kPa	Fluke RPM4
Gauge Pressure (Hydraulic) –	(0 to 70) MPa	0.013 % but not less than 2.7 kPa	Fluke RPM4

V. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Temperature – Measure			
PRT	223 K, 303 K 373 K, 430 K (373 to 773) K	10 mK 12 mK 50 mK	Super-thermometer (1595A) /PRT reference thermometer, TPW cell, Ga cell, In cell
Thermistor	(273 to 373) K	8.0 mK	
Temperature – Measuring Equipment	223 K, 233 K 213 K 273 K 303 K 323 K 373 K 430 K 473K, 573 K, 673 K 673 K	10 mK 16 mK 4.0 mK 5.0 mK 11 mK 11 mK 6.0 mK 38 mK 40 mK	Super-thermometer (1595A) /PRT reference thermometer, TPW cell, Ga cell, In cell
Humidity – Measuring Equipment	(15 to 90) % RH	1 % RH	Thunder Scientific 2500
Infrared Radiation Measure [λ]			
(8 to 14) µm	(253 to 573) K (573 to 1233) K	$0.40 \times 10^{-3}\ T_m + 0.10$ K $2.1 \times 10^{-3}\ T_m - 0.65$ K	Raytek Trirat LT Heitronics TRT II
3.9 µm 1.6 µm 1.0 µm	(428 to 1233) K (573 to 1073) K (1033 to 2973) K	$0.20 \times 10^{-3}\ T_m + 0.65$ K $2.9 \times 10^{-3}\ T_m + 0.19$ K $1.9 \times 10^{-3}\ T_m + 0.90$ K	Heitronics TRT II Raytek MA1 Rayrek MA2 T_m represents the measurement temperature [K]

Parameter/Equipment	Range	CMC[2] (±)	Comments
Infrared Radiation Calibration of IRT [λ]			
(8 to 14) µm	(253 to 573) K	0.40 x 10^{-3} T_m + 0.12 K	IR Cavity, Raytek Trirat LT
	(573 to 1233) K	1.9 x 10^{-3} T_m – 0.35 K	IR Cavity, Heitronics TRT II
3.9 µm	(428 to 1233) K	0.80 x 10^{-3} T_m + 0.19 K	IR Cavity, KT19.41
1.6 µm	(573 to 1073) K	2.9 x 10^{-3} T_m – 0.19 K	T-Gauge, Raytek MA2
1.0 µm	(1033 to 2973) K	1.9 x 10^{-3} T_m – 0.90 K	T-Gauge, Raytek MA1

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
Rise Time – Measure & Measuring Equipment Measure >24 ps	4 mV to 4 V	7.3 ps	Fast ftep generator w/ Tektronix 11801 digital sampling oscilloscope
Frequency & Period – Measure & Measuring Equipment	(1, 5, 10) MHz	2.5 parts in 10^{12} Hz/Hz	GPS through FMAS dystem from NIST and Fluke 910R
	1 mHz to 1.3 GHz	7.0 parts in 10^{12} + 6 µHz	GPS based 10 MHz distributed signal and Fluke 6680B counter
	(1.3 to 2.7) GHz	14 µHz	
Stroboscope	(300 000 to 153 600) FPM	4.0 FPM	Photodiode and counter
	(153 600 to 76 800) FPM	3.3 FPM	FPM=flashes per minute
	(76 800 to 38 400) FPM	3.1 FPM	
	(38 400 to 1000) FPM	3.0 FPM	
	(1000) to 600 FPM	0.30 FPM	

VII. Calibration of Current Coils

Parameter/Equipment	Range	CMC[2] (±)	Comments
Effective Current Transfer Ratio	(50 to 400) Hz:		
	25 Turn Coils	0.085 % of ratio	1000 A max simulated current
	50 Turn Coils	0.28 % of ratio	6000 A max simulated current
	DC	0.25 % of ratio	Calibration of 5500 coils @ DC

VIII. Laser Power

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Fiber Optic Laser Power –			
(635 to 650) nm	Absolute Pwr 700 µW to 1 mW	6.8 %	EXFO FPM-820 with FHM-8705 special
850 nm	Absolute Pwr 100 µW Linearty (0 to -58) dBm	1.8 % 2.4 %	
1310 nm	Absolute Pwr 100 µW Linearty (0 to -58) dBm	2.0 % 2.3 %	

[1] This laboratory offers commercial calibration service at the main laboratory listed above, and the following satellite laboratory listed below.

[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. CMC's 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] In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.

[4] The uncertainties shown relate to voltages and frequencies that lie within ± 10 % of the specified values. For intermediate points between the discrete current/voltage/frequency pairs, the uncertainty will be the greatest of the 4 adjacent voltage frequency/current frequency pairs, plus 10 %.

[5] The measurands stated are generated with the Fluke 4900, 5500, 5700 and 700 series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

[6] In the statement of CMC, percentages are percent of reading, unless otherwise indicated.

[7] The uncertainty quoted on an A2LA certificate will include that of the reference standard plus any uncertainties attributable to the device under test during calibration.

[8] CMC values shown are for direct characterization and calibration of reference standard contributors traceable to NIST calibrated AC/DC difference (current) standards and shunts (ref. BIPM KCDB. Pages 23 and 67).

[9] The contributions from the "best existing device" are not included in the CMC claim for this parameter.

[10] CMCs apply to negative equivalent pressure.

[11] For Intermediate Frequency points the amplitude uncertainty will report the larger amplitude uncertainty from the adjacent Frequency points.

Satellite Location
FLUKE CORPORATION
BEAVERTON SERVICE CENTER
13725 Karl Braun Center
Beaverton, OR 97077

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
DC Voltage – Generate	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V 100 V to 1.02 kV	16 µV/V + 780 nV 8.5 µV/V + 1.6 µV 9.3 µV/V + 16 µV 14 µV/V + 120 µV 14 µV/V + 1.2 mV	Fluke 5522A
DC Current – Generate	Up to 320 µA 320 µA to 3.2 mA (3.2 to 32) mA (32 to 320) mA 320 mA to 1.1 A (1.1 to 2.9) A (2.9 to 11) A (11 to 20.5) A	0.012 % + 16 nA 78 µA/A + 39 nA 78 µA/A + 190 nA 78 µA/A + 1.9 µA 0.015 % + 31 µA 0.029 % + 31 µA 0.039 % + 390 µA 0.078 % + 580 µA	Fluke 5522A
Resistance – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ	31 µΩ/Ω + 78 µΩ 23 µΩ/Ω + 1.2 mΩ 22 µΩ/Ω + 1.1 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 160 mΩ 22 µΩ/Ω + 160 mΩ 25 µΩ/Ω + 1.6 Ω 25 µΩ/Ω + 1.6 Ω 47 µΩ/Ω + 23 Ω 0.010 % + 39 Ω	Fluke 5522A

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
Resistance – Generate (cont)	(11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	0.019 % + 1.9 kΩ 0.039 % + 2.3 kΩ 0.23 % + 78 kΩ 1.2 % + 390 kΩ	Fluke 5522A

Parameter/Range	Frequency	CMC[2, 3] (±)	Comments
AC Voltage – Generate			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.062 % + 4.7 µV 0.012 % + 4.7 µV 0.016 %+ 4.7 µV 0.078 % + 4.7 µV 2.7 mV/V + 9.3 µV 6.2 mV/V + 39 µV	Fluke 5522A
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 6.2 µV 0.011 % + 6.2 µV 0.012 % + 6.2 µV 0.027 % + 6.2 µV 0.062 % + 25 µV 1.5 mV/V + 54 µV	
(0.33 to 3.3) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 39 µV 0.011 % + 47 µV 0.015 % + 47 µV 0.023 % + 39 µV 0.054 % + 97 µV 1.8 mV/V + 470 µV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.023 % + 500 µV 0.012 % + 470 µV 0.019 % + 470 µV 0.027 % + 470 µV 0.070 % + 1.2 mV	
(33 to 330) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.015 % + 1.6 mV 0.016 % + 4.7 mV 0.019 % + 4.7 mV 0.023 % + 4.7 mV 1.6 mV/V + 39 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 7.8 mV 0.019 % + 7.8 mV 0.023 % + 7.8 mV	

Parameter/Range	Frequency	CMC[2, 3] (±)	Comments
AC Current – Generate			
(29 to 330) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 78 nA 0.12 % + 78 nA 0.10 % + 78 nA 0.23 % + 0.12 µA 0.62 % + 0.16 µA 1.3 % + 0.31 µA	Fluke 5522A
(0.33 to 3.3) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 0.12 µA 0.10 % + 0.12 µA 0.075 % + 0.12 µA 0.16 % + 0.16 µA 0.39 % + 0.23 µA 0.77 % + 0.47 µA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 1.6 µA 0.07 % + 1.6 µA 0.03 % + 1.6 µA 0.06 % + 1.6 µA 0.16 % + 2.3 µA 0.31 % + 3.1 µA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 16 µA 0.07 % + 16 µA 0.03 % + 16 µA 0.08 % + 39 µA 0.16 % + 78 µA 0.31 % + 160 µA	
(0.33 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 78 µA 0.039 % + 78 µA 0.47 % + 780 µA 1.9 % + 3.9 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 78 µA 0.05 % + 78 µA 0.47 % + 780 µA 1.9 % + 3.9 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.047 % + 1.5 mA 0.078 % + 1.5 mA 2.3 % + 1.5 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.09 % + 3.9 mA 0.12 % + 3.9 mA 2.3 % + 3.9 mA	

Parameter/Equipment	Range	CMC[2, 3] (±)	Comments
Capacitance – Generate	(220 to 399.9) pF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF (0.33 to 1.1) µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.39 % + 7.8 pF 0.39 % + 7.8 pF 0.39 % + 7.8 pF 0.19 % + 7.8 pF 0.19 % + 78 pF 0.19 % + 78 pF 0.19 % + 0.23 nF 0.19 % + 0.78 nF 0.19 % + 2.3 nF 0.19 % + 7.8 nF 0.31 % + 23 nF 0.35 % + 78 nF 0.35 % + 230 nF 0.35 % + 0.78 µF 0.35 % + 2.3 µF 0.35 % + 7.8 µF 0.35 % + 23 µF 0.85 % + 78 µF	Fluke 5522A
Electrical Simulation of Thermocouples –			
Type J	(-210 to -100) ºC (-100 to -30) ºC (-30 to 150) ºC (150 to 760) ºC	0.15 ºC 0.09 ºC 0.08 ºC 0.10 ºC	Fluke 5522A
Type K	(-200 to -100) ºC (-100 to -25) ºC (-25 to 120) ºC (120 to 1000) ºC (1000 to 1372) ºC	0.19 ºC 0.11 ºC 0.09 ºC 0.14 ºC 0.23 ºC	
Type T	(-250 to -150) ºC (-150 to 0) ºC (0 to 120) ºC (120 to 400) ºC	0.37 ºC 0.14 ºC 0.09 ºC 0.08 ºC	

II. Time & Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
Frequency	0.01 Hz to 2 MHz	1.9 µHz/Hz + 3.9 µHz	Fluke 5522A

[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 measured and generated with the Fluke 5522A instrument. This capability is suitable for the calibration of the devices intended to measure the measurand in the ranges indicated. CMC are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.

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for technical competence in the field of

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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 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 April 2017*).

Presented this 6th day of June 2016.

President and CEO
For the Accreditation Council
Certificate Number 2166.01
Valid to July 31, 2018
Revised on April 25, 2018

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