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

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CALIBRATION

Valid To: September 30, 2023 Certificate Number: 2018.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 6]:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
DC Resistance –			
Measure (For Calibration of TEGAM RF Power Meters Only)	(100, 1000) Ω	0.0040 % + 0.000 14 % rng	Keysight 34420A DMM
DC Resistance, TEGAM 1830A Calibration Factors	5 CalcResistance (200 Ω)	0.032 Ω	Using TEGAM calibration tool, tracing through Keysight 34420A
	6 CalcResistance (100 Ω)	0.056 Ω	Measurands are calibration coefficients for TEGAM 1830A power meter
Measure	(0 to 120) Ω	0.0065 % + 0.0009 Ω	Keithley 3706A

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Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Voltage – Generate (For Calibration of TEGAM RF Power Meters Only)	10 V	0.0020 % + 28 µV	Using TEGAM calibration tool, tracing through Keysight 34420A
DC A/D Calibration Factors for TEGAM 1830A Power Meter	CS2RvSlope (Voltmeter Slope Adjust, 1.0 Nominal)	0.000 28 V/V	Measurands are calibration coefficients for TEGAM 1830A power meter
	CS2RvOffset (Voltmeter Offset)	0.000 24 V	
	DacSlope (Reference Source Slope Adjust 1.0 Nominal)	0.000 26 V/V	PGA: "programmable gain amplifier"
	DacOffset (Reference Source Offset)	0.0004 V	
	DACRVSlope (PGA Slope Adjust, Gain of 8, 1.0 Nominal)	0.000 28 V/V	
	1 DacRvSlope (PGA Slope Adjust, Gain of 1, 1.0 Nominal)	0.000 28 V/V	
Thermocouples Simulation Source & Measure T/C Alloy Types –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.40 °C 0.31 °C 0.31 °C 0.24 °C	Fluke 7526A
Type E	(-250 to -200) °C (-200 to -100) °C (-100 to -25) °C (-25 to 0) °C (0 to 350) °C (350 to 600) °C (600 to 650) °C (650 to 1000) °C	0.30 °C 0.13 °C 0.10 °C 0.10 °C 0.09 °C 0.09 °C 0.11 °C 0.11 °C	

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Thermocouples Simulation Source & Measure T/C Alloy Types – (cont)			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 800) °C (800 to 1200) °C	0.16 °C 0.10 °C 0.10 °C 0.10 °C 0.10 °C 0.11 °C	Fluke 7526A
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 800) °C (800 to 1000) °C (1000 to 1372) °C	0.18 °C 0.11 °C 0.11 °C 0.11 °C 0.14 °C 0.14 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 0) °C (0 to 100) °C (100 to 120) °C (120 to 410) °C (410 to 800) °C (800 to 1300) °C	0.26 °C 0.14 °C 0.13 °C 0.12 °C 0.11 °C 0.11 °C 0.11 °C 0.13 °C	
Type R	(0 to 100) °C (100 to 250) °C (250 to 400) °C (400 to 600) °C (600 to 1000) °C (1000 to 1600) °C (1600 to 1767) °C	0.44 °C 0.32 °C 0.31 °C 0.25 °C 0.23 °C 0.21 °C 0.25 °C	
Type S	(0 to 100) °C (100 to 250) °C (250 to 400) °C (400 to 600) °C (600 to 1000) °C (1000 to 1400) °C (1400 to 1600) °C (1600 to 1767) °C	0.43 °C 0.33 °C 0.32 °C 0.26 °C 0.25 °C 0.24 °C 0.24 °C 0.28 °C	

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Thermocouples Simulation Source & Measure T/C Alloy Types – (cont)			
Type T	(-250 to -200) °C (-200 to -150) °C (-150 to -100) °C (-100 to 0) °C (0 to 120) °C (120 to 200) °C (200 to 400) °C	0.44 °C 0.26 °C 0.17 °C 0.12 °C 0.10 °C 0.10 °C 0.10 °C	Fluke 7526A
DC Voltage – Measure	(0 to 120) mV	0.0034 % rdg + 2µV	Keithley 3706A DMM
PRT/RTD Resistance – Measuring Equipment & Measure	(0 to 400) Ω	0.002 % rdg + 0.002 Ω	Fluke 1586A
DC Resistance – Generate			
Fixed Points	20 MΩ 10 MΩ 2 MΩ 1 MΩ 200 kΩ 180 kΩ 100 kΩ 20 kΩ 18 kΩ 10 kΩ 2 kΩ 1.8 kΩ 1 kΩ 200 Ω 180 Ω 100 Ω 20 Ω 18 Ω 10 Ω 2 Ω 1.8 Ω	34 µΩ/Ω 32 µΩ/Ω 25 µΩ/Ω 23 µΩ/Ω 11 µΩ/Ω 18 µΩ/Ω 8 µΩ/Ω 10 µΩ/Ω 26 µΩ/Ω 10 µΩ/Ω 12 µΩ/Ω 14 µΩ/Ω 9 µΩ/Ω 13 µΩ/Ω 11 µΩ/Ω 5 µΩ/Ω 18 µΩ/Ω 20 µΩ/Ω 5 µΩ/Ω 24 µΩ/Ω 38 µΩ/Ω	Precision resistance standards

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
DC Resistance – Generate (cont) Fixed Points	1 Ω 200 mΩ 180 mΩ 100 mΩ 20 mΩ 18 mΩ 10 mΩ 2 mΩ 1.8 mΩ 1 mΩ 180 µΩ 0 Ω	8 µΩ/Ω 39 µΩ/Ω 200 µΩ/Ω 13 µΩ/Ω 39 µΩ/Ω 200 µΩ/Ω 13 µΩ/Ω 55 µΩ/Ω 130 µΩ/Ω 13 µΩ/Ω 310 µΩ/Ω 5 nΩ	Precision resistance standards

II. Electrical – RF/Microwave

Parameter/Equipment	Frequency	CMC[2, 3, 4] (±)	Comments
RF Power – 1 mW Calibration Factor N Connector Terminating Mount with $\|S_{11}\|$ <0.01	6 kHz ≤ f < 20 kHz 20 kHz ≤ f < 50 kHz 50 kHz ≤ f < 100 kHz	0.0020 mW/mW 0.0021 mW/mW 0.0024 mW/mW	Impedance method, 4284A LCZ meter, 3458 AC RMS, voltmeter, 3458 or 34420A DC voltmeter

Parameter/Equipment	Frequency	CMC[2, 3, 5] (±)	Comments
RF Power – 1 mW Calibration Factor			
N Connector	100 kHz 200 kHz 300 kHz to 2.0 GHz (2.1 to 3.6) GHz (3.7 to 4.6) GHz (4.8 to 10.0) GHz (10.2 to 11.8) GHz (12.0 to 18.0) GHz	0.62 % 0.57 % 0.54 % 0.56 % 0.58 % 0.63 % 0.68 % 0.76 %	TEGAM 1505, M1130 power standards with 1806 power meter & Keysight 34420A or 3458A DMMs
3.5 mm Connector	10 MHz 20 MHz (30 to 90) MHz (100 to 700) MHz (0.75 to 3.0) GHz (3.1 to 5.4) GHz (5.6 to 6.4) GHz (6.6 to 9.2) GHz (9.4 to 13.5) GHz (13.75 to 22.00) GHz (23.00 to 26.50) GHz	1.5 % 1.3 % 1.2 % 1.1 % 1.2 % 1.3 % 1.4 % 1.5 % 1.8 % 2.3 % 2.9 %	TEGAM 1135 power standards with 1806 power meter & Keysight 34420A or 3458A DMMs
2.4 mm Connector	(10 to 40) MHz 50 MHz (100 to 2000) MHz (2.2 to 4.6) GHz (4.8 to 10.8) GHz (11 to 12) GHz (12.2 to 13) GHz 14 GHz 15 GHz 16 GHz 17 GHz 18 GHz	0.81 % 0.80 % 0.87 % 1.0 % 1.2 % 1.2 % 1.3 % 1.4 % 1.4 % 1.3 % 1.4 % 1.4 %	TEGAM M1130. 1510 power standard with 1806 power meter & Keysight 34420A or 3458A DMMs
	(19 to 21) GHz (22 to 26) GHz (27 to 29) GHz (30 to 32) GHz (33 to 39) GHz 40 GHz 41 GHz 42 GHz 43 GHz 44 GHz 45 GHz	1.4 % 1.6 % 1.6 % 1.6 % 1.9 % 2.1 % 2.1 % 1.6 % 1.7 % 2.1 % 2.5 %	TEGAM 1510, Keysight 8487A power standard with 1806 power meter & Keysight 34420A or 3458A DMMs

Parameter/Equipment	Frequency	CMC[2, 3, 5] (±)	Comments
RF Power – 1 mW Calibration Factor (cont)			
2.4 mm Connector	46 GHz 47 GHz 48 GHz 49 GHz 50 GHz	2.3 % 2.2 % 2.3 % 2.7 % 2.8 %	TEGAM 1510 with 1806 power meter & Keysight 34420A or 3458A DMMs
RF Reflection S_{11}/S_{22} –			
Linear Magnitude:			
Low Frequency, All Types	(6 to 100) kHz	0.01 lin. mag.	Keysight 4284
	100 kHz to 50 MHz	0.01 lin. mag.	Agilent 4395A impedance analyzer with 87511A & 87512A test set, 85054A, 85052B, or 85056A cal kits
N Connector	45 MHz to 2 GHz		
	$\rho < 0.024$ $0.024 < \rho < 0.047$ $0.047 < \rho < 0.07$ $0.07 < \rho < 0.09$ $0.09 < \rho < 0.13$ $0.13 < \rho < 0.17$ $0.17 < \rho < 0.25$ $0.25 < \rho < 0.5$	0.0050 lin. mag. 0.0050 lin. mag. 0.0050 lin. mag. 0.0050 lin. mag. 0.0050 lin. mag. 0.0050 lin. mag. 0.0050 lin. mag. 0.0060 lin. mag.	Keysight 8510C VNA with 8515A test set & 85054A calibration kit ρ = voltage reflection coefficient
	(2 to 8) GHz		
	$\rho < 0.024$ $0.024 < \rho < 0.047$ $0.047 < \rho < 0.07$ $0.07 < \rho < 0.09$ $0.09 < \rho < 0.13$ $0.13 < \rho < 0.17$ $0.17 < \rho < 0.25$ $0.25 < \rho < 0.5$	0.0075 lin. mag. 0.0075 lin. mag. 0.0075 lin. mag. 0.0075 lin. mag. 0.0075 lin. mag. 0.0080 lin. mag. 0.0090 lin. mag. 0.011 lin. mag.	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
RF Reflection S_{11}/S_{22} – (cont)			
Linear Magnitude:			
N Connector	(8 to 20) GHz		
	$\rho < 0.024$	0.0075 lin. mag.	Keysight 8510C VNA with 8515A test set & 85052B calibration kit
	$0.024 < \rho < 0.047$	0.0075 lin. mag.	
	$0.047 < \rho < 0.07$	0.0075 lin. mag.	
	$0.07 < \rho < 0.09$	0.0075 lin. mag.	
	$0.09 < \rho < 0.13$	0.0076 lin. mag.	ρ = voltage reflection coefficient
	$0.13 < \rho < 0.17$	0.0080 lin. mag.	
	$0.17 < \rho < 0.25$	0.010 lin. mag.	
	$0.25 < \rho < 0.5$	0.013 lin. mag.	
3.5 mm Connector	45 MHz to 2 GHz		
	$\rho < 0.024$	0.0050 lin. mag.	
	$0.024 < \rho < 0.047$	0.0050 lin. mag.	
	$0.047 < \rho < 0.07$	0.0050 lin. mag.	
	$0.07 < \rho < 0.09$	0.0050 lin. mag.	
	$0.09 < \rho < 0.13$	0.0050 lin. mag.	
	$0.13 < \rho < 0.17$	0.0050 lin. mag.	
	$0.17 < \rho < 0.25$	0.0050 lin. mag.	
	$0.25 < \rho < 0.5$	0.0050 lin. mag.	
	(2 to 8) GHz		
	$\rho < 0.024$	0.0050 lin. mag.	
	$0.024 < \rho < 0.047$	0.0050 lin. mag.	
	$0.047 < \rho < 0.07$	0.0050 lin. mag.	
	$0.07 < \rho < 0.09$	0.0050 lin. mag.	
	$0.09 < \rho < 0.13$	0.0050 lin. mag.	
	$0.13 < \rho < 0.17$	0.0060 lin. mag.	
	$0.17 < \rho < 0.25$	0.0060 lin. mag.	
	$0.25 < \rho < 0.5$	0.0060 lin. mag.	
	(8 to 20) GHz		
	$\rho < 0.024$	0.0050 lin. mag.	
	$0.024 < \rho < 0.047$	0.0050 lin. mag.	
	$0.047 < \rho < 0.07$	0.0050 lin. mag.	
	$0.07 < \rho < 0.09$	0.0050 lin. mag.	
	$0.09 < \rho < 0.13$	0.0060 lin. mag.	
	$0.13 < \rho < 0.17$	0.0060 lin. mag.	
	$0.17 < \rho < 0.25$	0.0060 lin. mag.	
	$0.25 < \rho < 0.5$	0.0070 lin. mag.	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
RF Reflection S_{11}/S_{22} – (cont)			
Linear Magnitude:			
3.5 mm Connector	(20 to 26.5) GHz		
	$\rho < 0.024$	0.0050 lin. mag.	Keysight 8510C VNA with 8515A test set & 85052B calibration kit ρ = voltage reflection coefficient
	$0.024 < \rho < 0.047$	0.0050 lin. mag.	
	$0.047 < \rho < 0.07$	0.0050 lin. mag.	
	$0.07 < \rho < 0.09$	0.0050 lin. mag.	
	$0.09 < \rho < 0.13$	0.0060 lin. mag.	
	$0.13 < \rho < 0.17$	0.0070 lin. mag.	
	$0.17 < \rho < 0.25$	0.0070 lin. mag.	
	$0.25 < \rho < 0.5$	0.0080 lin. mag.	
2.4 mm Connectors	45 MHz to 2 GHz		
	$\rho < 0.024$	0.010 lin. mag.	Keysight 8510A VNA with 8517A test set & 85056A SOLT
	$0.024 < \rho < 0.047$	0.010 lin. mag.	
	$0.047 < \rho < 0.07$	0.010 lin. mag.	
	$0.07 < \rho < 0.09$	0.010 lin. mag.	
	$0.09 < \rho < 0.13$	0.010 lin. mag.	
	$0.13 < \rho < 0.17$	0.010 lin. mag.	
	$0.17 < \rho < 0.25$	0.010 lin. mag.	
	$0.25 < \rho < 0.5$	0.012 lin. mag.	
	(2 to 20) GHz		
	$\rho < 0.024$	0.010 lin. mag.	
	$0.024 < \rho < 0.047$	0.010 lin. mag.	
	$0.047 < \rho < 0.07$	0.010 lin. mag.	
	$0.07 < \rho < 0.09$	0.010 lin. mag.	
	$0.09 < \rho < 0.13$	0.010 lin. mag.	
	$0.13 < \rho < 0.17$	0.010 lin. mag.	
	$0.17 < \rho < 0.25$	0.010 lin. mag.	
	$0.25 < \rho < 0.5$	0.013 lin. mag.	
	(20 to 40) GHz		
	$\rho < 0.024$	0.015 lin. mag.	
	$0.024 < \rho < 0.047$	0.015 lin. mag.	
	$0.047 < \rho < 0.07$	0.015 lin. mag.	
	$0.07 < \rho < 0.09$	0.015 lin. mag.	
	$0.09 < \rho < 0.13$	0.015 lin. mag.	
	$0.13 < \rho < 0.17$	0.016 lin. mag.	
	$0.17 < \rho < 0.25$	0.017 lin. mag.	
	$0.25 < \rho < 0.5$	0.022 lin. mag.	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
RF Reflection S_{11}/S_{22} – (cont)			
Linear Magnitude:			
2.4 mm Connectors	(40 to 50) GHz		
	$\rho < 0.024$	0.019 lin. mag.	Keysight 8510A VNA with 8517A test set & 85056A SOLT
	$0.024 < \rho < 0.047$	0.019 lin. mag.	
	$0.047 < \rho < 0.07$	0.019 lin. mag.	
	$0.07 < \rho < 0.09$	0.019 lin. mag.	
	$0.09 < \rho < 0.13$	0.019 lin. mag.	
	$0.13 < \rho < 0.17$	0.020 lin. mag.	
	$0.17 < \rho < 0.25$	0.021 lin. mag.	
	$0.25 < \rho < 0.5$	0.028 lin. mag.	
Phase Angle:			
Low Frequency, All Types	(6 to 100) kHz		
	$\rho < 0.01$	180º	Keysight 4284
	100 kHz to 50 MHz		
	$\rho < 0.024$	180º	Keysight 4395A impedance analyzer with 87511A & 87512A Test Set, 85054A, 85052B, or 85056A cal kits
	$0.024 < \rho < 0.047$	17º	
	$0.047 < \rho < 0.07$	10º	
	$0.07 < \rho < 0.09$	7º	
	$0.09 < \rho < 0.13$	5º	
	$0.13 < \rho < 0.17$	4º	
	$0.17 < \rho < 0.25$	3º	
	$0.25 < \rho < 0.5$	2º	
N Connector	45 MHz to 2 GHz		
	$\rho < 0.024$	180º	Keysight 8510C VNA with 8515A test set & 85054A calibration kit ρ = voltage reflection coefficient
	$0.024 < \rho < 0.047$	10º	
	$0.047 < \rho < 0.07$	6º	
	$0.07 < \rho < 0.09$	4º	
	$0.09 < \rho < 0.13$	3º	
	$0.13 < \rho < 0.17$	2º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	1º	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
RF Reflection S_{11}/S_{22} – (cont)			
Phase Angle:			
N Connector	(2 to 8) GHz		
	$\rho < 0.024$	180º	Keysight 8510C VNA with 8515A test set & 85052B calibration kit
	$0.024 < \rho < 0.047$	24º	
	$0.047 < \rho < 0.07$	9º	
	$0.07 < \rho < 0.09$	6º	
	$0.09 < \rho < 0.13$	5º	ρ = voltage reflection coefficient
	$0.13 < \rho < 0.17$	4º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	2º	
	(8 to 20) GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	24º	
	$0.047 < \rho < 0.07$	9º	
	$0.07 < \rho < 0.09$	6º	
	$0.09 < \rho < 0.13$	5º	
	$0.13 < \rho < 0.17$	4º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	2º	
3.5 mm Connector	45 MHz to 2 GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	10º	
	$0.047 < \rho < 0.07$	5º	
	$0.07 < \rho < 0.09$	4º	
	$0.09 < \rho < 0.13$	3º	
	$0.13 < \rho < 0.17$	2º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	2º	
	(2 to 8) GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	10º	
	$0.047 < \rho < 0.07$	5º	
	$0.07 < \rho < 0.09$	4º	
	$0.09 < \rho < 0.13$	3º	
	$0.13 < \rho < 0.17$	2º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	2º	

Parameter/Equipment	Frequency	CMC[2] (±)	Comments
RF Reflection S_{11}/S_{22} – (cont)			
Phase Angle:			
3.5 mm Connector	(8 to 20) GHz		
	$\rho < 0.024$	180º	Keysight 8510A VNA with 8517A test set & 85056A SOLT
	$0.024 < \rho < 0.047$	10º	
	$0.047 < \rho < 0.07$	5º	
	$0.07 < \rho < 0.09$	4º	
	$0.09 < \rho < 0.13$	3º	ρ = voltage reflection coefficient
	$0.13 < \rho < 0.17$	3º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	2º	
	(20 to 26.5) GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	10º	
	$0.047 < \rho < 0.07$	5º	
	$0.07 < \rho < 0.09$	4º	
	$0.09 < \rho < 0.13$	3º	
	$0.13 < \rho < 0.17$	3º	
	$0.17 < \rho < 0.25$	2º	
	$0.25 < \rho < 0.5$	2º	
2.4 mm Connectors	45 MHz to 2 GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	31º	
	$0.047 < \rho < 0.07$	11º	
	$0.07 < \rho < 0.09$	8º	
	$0.09 < \rho < 0.13$	5º	
	$0.13 < \rho < 0.17$	4º	
	$0.17 < \rho < 0.25$	3º	
	$0.25 < \rho < 0.5$	2º	
	(2 to 20) GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	31º	
	$0.047 < \rho < 0.07$	11º	
	$0.07 < \rho < 0.09$	8º	
	$0.09 < \rho < 0.13$	5º	
	$0.13 < \rho < 0.17$	4º	
	$0.17 < \rho < 0.25$	3º	
	$0.25 < \rho < 0.5$	2º	

Parameter/Equipment	Frequency	CMC[2, 7] (±)	Comments
RF Reflection S_{11}/S_{22} – (cont)			
Phase Angle:			
2.4 mm Connectors	(20 to 40) GHz		
	$\rho < 0.024$	180º	Keysight 8510A VNA with 8517A test set & 85056A SOLT ρ = voltage reflection coefficient
	$0.024 < \rho < 0.047$	41º	
	$0.047 < \rho < 0.07$	18º	
	$0.07 < \rho < 0.09$	12º	
	$0.09 < \rho < 0.13$	8º	
	$0.13 < \rho < 0.17$	7º	
	$0.17 < \rho < 0.25$	5º	
	$0.25 < \rho < 0.5$	4º	
	(40 to 50) GHz		
	$\rho < 0.024$	180º	
	$0.024 < \rho < 0.047$	47º	
	$0.047 < \rho < 0.07$	29º	
	$0.07 < \rho < 0.09$	16º	
	$0.09 < \rho < 0.13$	11º	
	$0.13 < \rho < 0.17$	9º	
	$0.17 < \rho < 0.25$	7º	
	$0.25 < \rho < 0.5$	5º	
Transmission – Measure S_{12}/S_{21}			
Low Frequency, Any Port	100 kHz to 50 MHz	0.12 dB	Keysight 4395A impedance analyzer with 87511A test set, 85054A, 85052B, or 85056A cal kits
N Connection:			
(0, -3, -6, -10) dB	50 MHz to 2 GHz	0.033 dB	Keysight 8510C VNA with 85054A calibration kit
	(2 to 8) GHz	0.060 dB	
	(8 to 20) GHz	0.10 dB	
(-12, -20) dB	50 MHz to 2 GHz	0.055 dB	
	(2 to 8) GHz	0.060 dB	
	(8 to 20) GHz	0.10 dB	
-30 dB	50 MHz to 2 GHz	0.15 dB	
	(2 to 8) GHz	0.060 dB	
	(8 to 20) GHz	0.11 dB	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
Transmission – Measure S_{12}/S_{21} (cont)			
3.5 mm Connection:			
(0, -3, - 6, -10) dB	50 MHz to 2 GHz (2 to 8) GHz (8 to 20) GHz (20 to 26.5) GHz	0.030 dB 0.020 dB 0.020 dB 0.030 dB	Keysight 8510C VNA with 85052B calibration kit
(-12, -20) dB	50 MHz to 2 GHz (2 to 8) GHz (8 to 20) GHz (20 to 26.5) GHz	0.035 dB 0.020 dB 0.025 dB 0.040 dB	
-30 dB	50 MHz to 2 GHz (2 to 8) GHz (8 to 20) GHz (20 to 26.5) GHz	0.040 dB 0.025 dB 0.033 dB 0.080 dB	
2.4 mm Connection:			
(0, -3, -6, -10) dB	50 MHz to 2 GHz (2 to 20) GHz (20 to 40) GHz (40 to 50) GHz	0.025 dB 0.055 dB 0.15 dB 0.20 dB	Keysight 8510C VNA with 85056A calibration kit
(-12, -20) dB	50 MHz to 2 GHz (2 to 20) GHz (20 to 40) GHz (40 to 50) GHz	0.032 dB 0.060 dB 0.15 dB 0.25 dB	
-30 dB	50 MHz to 2 GHz (2 to 20) GHz (20 to 40) GHz (40 to 50) GHz	0.060 dB 0.060 dB 0.20 dB 0.45 dB	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
Attenuation (For Calibrating VM-7 Attenuator & Signal Calibrator)			
N Connection:			
10 dB	30 MHz	0.015 dB	Weinschel PA-2
20 dB	30 MHz	0.017 dB	
30 dB	30 MHz	0.020 dB	
40 dB	30 MHz	0.021 dB	
50 dB	30 MHz	0.027 dB	
60 dB	30 MHz	0.030 dB	
70 dB	30 MHz	0.033 dB	
80 dB	30 MHz	0.036 dB	
90 dB	30 MHz	0.041 dB	
100 dB	30 MHz	0.059 dB	
110 dB	30 MHz	0.17 dB	
120 dB	30 MHz	0.17 dB	
RF Power – Measure[4]			
(10 to 250) W	50 Hz to 3.5 GHz	0.15 W + 0.14 % of rdg + 0.2 % of rdg · f(GHz)	TEGAM Model 1314 calorimeter transferring from radian RD-23 wattmeter
(10 to 5000) W	50 Hz to 500 MHz	1.2 W + 0.10 % of rdg	TEGAM Model 1315 calorimeter transferring from radian RD-23 wattmeter
(10 to 10 000) W	50 Hz to 500 MHz	1 W + 0.11 % of rdg	TEGAM Model 1316 calorimeter transferring from Zimmer LMG600 power analyzer

III. Thermodynamics

Parameter/Equipment	Range	CMC[2, 3, 8] (±)	Comments
Temperature – Measure & Measuring Equipment	(-200 to 670) °C	0.0074 °C	AM1760 secondary SPRT
	(21 to 25) °C	0.01 °C	RTD-002

[1] This laboratory offers commercial calibration service.

[2] Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Expressed as linear error of reported Cal Factor, reported in percentage, where the ideal Cal Factor is 100%. Number given is the CMC of the highest uncertainty test in the frequency range.

[4] The CMC claim is smaller than that of the expanded uncertainty claim for NIST as listed in the BIPM Key Comparison Database. A2LA has evaluated the laboratory's CMC claim and has verified this information to be correct and appropriate.

[5] In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.

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

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

[8] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

Accredited Laboratory

A2LA has accredited

TEGAM, INC.

Geneva, 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 18th day of August 2021.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2018.01
Valid to September 30, 2023

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