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

AGILENT TECHNOLOGIES SANTA ROSA METROLOGY SERVICES
1400 Fountain Grove Parkway
Santa Rosa, CA 95403
Bob Ramirez Phone: 707 577 5020

CALIBRATION

Valid To: March 31, 2012 Certificate Number: 2079.01

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

I. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Plain Ring Gages	(1 to 25) mm	0.21 µm	OD/ID comparator
Plain Plug Gages	(0.5 to 75) mm	0.8 µm	Supermicrometer w/ laser interferometer
Length – Coaxial Lines	(0.10 to 300) mm	(0.9 + *L*/400) µm	Zeiss UPMC550 CMM (*L* is the numerical value of the nominal length in mm)
	(0.1 to 25.4) mm	0.61 µm	HeidenHain Certo drop indicator
Pin Depth	(-50 to 50) µm	0.95 µm	Zeiss UPMC550 CMM
	(-10 to 10) µm	0.27 µm	Zygo white light interferometer microscope

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Parameter/Equipment	Range	CMC[2] (±)	Comments
Diameter	(1 to 16) mm	(0.9 + D/400) μm	Zeiss UPMC550 CMM D=Diameter (mm)
Diameter – Outer	(0.4 to 16) mm	0.3 μm	Z-Mike 1210 gold laser micrometer
Diameter – Inner	(1.845 to 1.855) mm (2.395 to 2.405) mm (2.912 to 2.928) mm (3.495 to 3.505) mm (6.492 to 6.058) mm (6.995 to 7.005) mm	0.6 μm 0.6 μm 0.6 μm 0.6 μm 0.6 μm 0.6 μm	Ring gages w/ 1.85 mm air probe 2.4 mm air probe 2.92 mm air probe 3.5 mm air probe 6.5 mm air probe 7 mm air probe

II. Electrical – DC/Low Frequency

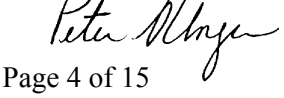
Parameter/Equipment	Range	CMC[2] (±)	Comments
Resistance – Measure	(10 to 100) Ω	13 μΩ/ Ω + 740 μΩ	HP 3458A

III. Electrical – RF/Microwave

Parameter/Range	CMC[2] (±)	Comments
Reflection S_{11}/S_{22} – Measure[3] 10 MHz to 18 GHz (0.0001 to 1.0) lin (0 to 0.01) lin (0.01 to 0.1) lin (0.1 to 0.5) lin (0.5 to 1.0) lin	 (± 0.00043 to ± 0.0018) lin (± 2.56 to ± 180) deg (± 0.38 to ± 10.65) deg (± 0.18 to ± 1.14) deg (± 0.17 to ± 0.36) deg	 Network analyzer, ET33733 APC 7 mm, characterized device cal kit

Parameter/Range	CMC[2] (±)	Comments
Reflection S_{11}/S_{22} – Measure[3] (cont.)		
10 MHz to 18 GHz		
(0.0001 to 1.0) lin	(± 0.00045 to ± 0.0028) lin	Network analyzer, ET33717 type N, characterized device cal kit
(0 to 0.01) lin	(± 2.65 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.42 to ± 16.49) deg	
(0.1 to 0.5) lin	(± 0.24 to ± 1.91) deg	
(0.5 to 1.0) lin	(± 0.24 to ± 0.84) deg	
10 MHz to 33.5 GHz		
(0.0001 to 1.0) lin	(± 0.00043 to ± 0.0022) lin	Network analyzer, ET33700 3.5 mm, characterized device cal kit
(0 to 0.01) lin	(± 2.56 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.38 to ± 13) deg	
(0.1 to 0.5) lin	(± 0.18 to ± 1.4) deg	
(0.5 to 1.0) lin	(± 0.17 to ± 0.43) deg	
10 MHz to 50 GHz		
(0.0001 to 1.0) lin	(0.00085 to ± 0.0047) lin	Network analyzer, ET33702 2.4 mm, characterized device cal kit
(0 to 0.01) lin	(± 5.02 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.71 to ± 29) deg	
(0.1 to 0.5) lin	(± 0.37 to ± 3.6) deg	
(0.5 to 1.0) lin	(± 0.37 to ± 2.1) deg	
10 MHz to 70 GHz		
(0.0001 to 1.0) lin	(0.00042 to ± 0.010) lin	Network analyzer, ET36411 1.85 mm, multi-offset short mode, characterized device cal kit
(0 to 0.01) lin	(± 2.55 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.52 to ± 180) deg	
(0.1 to 0.5) lin	(± 0.52 to ± 7.0) deg	
(0.5 to 1.0) lin	(± 0.53 to ± 3.3) deg	
10 MHz to 8.2 GHz		
(0.0001 to 1.0) lin	(± 0.00048 to ± 0.0019) lin	Network analyzer, ET51600 7-16 connector, characterized device cal kit
(0 to 0.01) lin	(± 2.82 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.42 to ± 11.3) deg	
(0.1 to 0.5) lin	(± 0.20 to ± 1.2) deg	
(0.5 to 1.0) lin	(± 0.20 to ± 0.36) deg	

Parameter/Range	CMC[2] (±)	Comments
Reflection S_{11}/S_{22} – Measure[3] (cont.)		
10 MHz to 12 GHz		
(0.0001 to 1.0) lin	(± 0.00055 to ± 0.0010) lin	Network analyzer, ET36409 type N 75 ohm, characterized device cal kit
(0 to 0.01) lin	(± 3.24 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.47 to ± 180) deg	
(0.1 to 0.5) lin	(± 0.23 to ± 9.2) deg	
(0.5 to 1.0) lin	(± 0.22 to ± 7.1) deg	
10 MHz to 6.2 GHz		
(0.0001 to 1.0) lin	(± 0.00051 to ± 0.002) lin	Network analyzer, ET36442 type F 75 ohm, characterized device cal kit
(0 to 0.01) lin	(± 3.06 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.46 to ± 12) deg	
(0.1 to 0.5) lin	(± 0.21 to ± 1.3) deg	
(0.5 to 1.0) lin	(± 0.20 to ± 0.37) deg	
(8.2 to 12.4) GHz		
(0.0001 to 1.0) lin	(± 0.0012 to ± 0.0075) lin	Network analyzer, ET36405 X band, TRL cal kit
(0 to 0.01) lin	(± 8.9 to ± 180) deg	
(0.01 to 0.1) lin	(± 2.5 to ± 8.9) deg	
(0.1 to 0.5) lin	(± 1.9 to ± 2.5) deg	
(0.5 to 1.0) lin	(± 1.9 to ± 1.9) deg	
(12.4 to 18.0) GHz		
(0.0001 to 1.0) lin	(± 0.00073 to ± 0.0023) lin	Network analyzer, ET36406 P band, TRL cal kit
(0 to 0.01) lin	(± 4.5 to ± 180) deg	
(0.01 to 0.1) lin	(± 0.72 to ± 4.5) deg	
(0.1 to 0.5) lin	(± 0.41 to ± 0.72) deg	
(0.5 to 1.0) lin	(± 0.73 to ± 0.41) deg	
(18.0 to 26.5) GHz		
(0.0001 to 1.0) lin	(± 0.0013 to ± 0.0028) lin	Network analyzer, ET36407 K band, TRL cal kit
(0 to 0.01) lin	(± 7.7 to ± 180) deg	
(0.01 to 0.1) lin	(± 1.1 to ± 7.8) deg	
(0.1 to 0.5) lin	(± 0.53 to ± 1.2) deg	
(0.5 to 1.0) lin	(± 0.48 to ± 0.65) deg	



Parameter/Range	CMC[2] (±)	Comments
Reflection S_{11}/S_{22} – Measure[3] (cont.)		
(26.5 to 40) GHz		
(0.0001 to 1.0) lin	(± 0.0022 to ± 0.0077) lin	Network analyzer, ET36320 R-band, TRL cal kit
(0 to 0.01) lin	(± 13 to ± 180) deg	
(0.01 to 0.1) lin	(± 1.7 to ± 13) deg	
(0.1 to 0.5) lin	(± 0.67 to ± 1.7) deg	
(0.5 to 1.0) lin	(± 0.64 to ± 0.67) deg	
(33 to 50) GHz		
(0.0001 to 1.0) lin	(± 0.0022 to ± 0.0077) lin	Network analyzer. ET36321 Q-band, TRL cal kit
(0 to 0.01) lin	(± 13 to ± 180) deg	
(0.01 to 0.1) lin	(± 1.7 to ± 13) deg	
(0.1 to 0.5) lin	(± 0.74 to ± 1.7) deg	
(0.5 to 1.0) lin	(± 0.70 to ± 0.74) deg	
(40 to 60) GHz		
(0.0001 to 1.0) lin	(± 0.0012 to ± 0.011) lin	Network analyzer HP8510C, multiplier test set HP U85104A,
(0 to 0.01) lin	(± 17 to ± 180) deg	HP 85105A mm
(0.01 to 0.1) lin	(± 5.0 to ± 17) deg	wave controller
(0.1 to 0.5) lin	(± 4.1 to ± 5.0) deg	RF source HP83623B Lo
(0.5 to 1.0) lin	(± 4.1 to ± 4.2) deg	source HP 83651 A/B, ET36322 U-band, TRL cal kit
(50 to 75) GHz		
(0.0001 to 1.0) lin	(± 0.0022 to ± 0.013) lin	Network analyzer HP8510C, multiplier test set HP V85104A,
(0 to 0.01) lin	(± 18 to ± 180) deg	HP 85105A mm wave controller,
(0.01 to 0.1) lin	(± 6.0 to ± 18) deg	source HP 83623B,
(0.1 to 0.5) lin	(± 5.1 to + 6.0) deg	source HP 83651 A/B,
(0.5 to 1.0) lin	(± 5.1 to ± 5.3) deg	ET36323 V-band, TRL cal kit
(75 to 110) GHz		
(0.0001 to 1.0) lin	(± 0.0022 to ± 0.015) lin	Network analyzer HP8510C, multiplier test set HP W85104A,
(0 to 0.01) lin	(± 30 to ± 180) deg	HP 85105A mm wave controller,
(0.01 to 0.1) lin	(± 9.1 to ± 30) deg	source HP 83623B,
(0.1 to 0.5) lin	(± 7.5 to ± 9.1) deg	source HP 83651 A/B,
(0.5 to 1.0) lin	(± 7.5 to ± 7.6) deg	ET36324 W-band, TRL cal kit

Parameter/Range	CMC[2] (±)	Comments
Reflection S_{11}/S_{22} – Measure[3] (cont.)		
(9 kHz to 8.5) GHz		
(0.0001 to 1.0) lin	(± 0.004 to ± 0.014) lin (± 1.1 to ± 180) deg	Network analyzer, E5071C, cal kit 85032F
(9 kHz to 8.5) GHz		
(0.0001 to 1.0) lin	(± 0.0051 to ± 0.013) lin (± 0.91 to ± 180) deg	Network analyzer, E5071C, cal kit 85033E
Transmission S_{12}/S_{21} – Measure[4]		
(9 kHz to 8.5) GHz		
(0 to 20) dB	(± 0.046 to ±0. 15) dB (± 0.48 to ±1 .0) deg	Network analyzer, E5071C, cal kit 85032F
(20 to 40) dB	(± 0.072 to ± 0.18) dB (± 0.48 to ±1.3) deg	
(40 to 60) dB	(± 0.10 to ± 0.24) dB (± 0.69 to ± 17) deg	
(9 kHz to 8.5) GHz		
(0 to 20) dB	(± 0.04 to ±0.14) dB (± 0.27 to ±0.90) deg	Network analyzer, E5071C, cal kit 85033E
(20 to 40) dB	(± 0.067 to ±0.17) dB (± 0.44 to ±1.12) deg	
(40 to 60) dB	(± 0.098 to ±0.23) dB (± 0.65 to ±1.52) deg	
10 MHz to 18 GHz		
(0 to 20) dB	(± 0.012 to ±0.042) dB (± 0.12 to ±0.34) deg	Network analyzer, ET33733 APC 7 mm, characterized device cal kit
(20 to 40) dB	(± 0.024 to ±0.25) dB (± 0.22 to ±1.75) deg	
(40 to 60) dB	(± 0.036 to ±2.2) dB (±0.36 to ±16.83.) deg	

Parameter/Range	CMC[2] (±)	Comments
Transmission S_{12}/S_{21} – Measure[4] (cont).		
10 MHz to 18 GHz		
(0 to 20) dB	(± 0.012 to ± 0.042) dB (± 0.12 to ± 0.34) deg	Network analyzer, ET33717 type N, characterized device cal kit
(20 to 40) dB	(± 0.024 to ± 0.25) dB (± 0.22 to ± 1.8) deg	
(40 to 60) dB	(± 0.037 to ± 2.2) dB (± 0.36 to ± 17) deg	
10 MHz to 33.5 GHz		
(0 to 20) dB	(± 0.012 to ± 0.042) dB (± 0.12 to ± 0.34) deg	Network analyzer, ET33700 3.5 mm, characterized device cal kit
(20 to 40) dB	(± 0.024 to ± 0.25) dB (± 0.22 to ± 1.75) deg	
(40 to 60) dB	(± 0.036 to ± 2.2) dB (± 0.36 to ± 17 deg	
10 MHz to 50 GHz		
(0 to 20) dB	(± 0.012 to ± 0.051) dB (± 0.12 to ± 0.43) deg	Network analyzer, ET33702 2.4 mm, characterized device cal kit
(20 to 40) dB	(± 0.023 to ± 0.27) dB (± 0.23 to ± 2.0) deg	
(40 to 60) dB	(± 0.034 to ± 2.3) dB (± 0.36 to ± 18) deg	
10 MHz to 70 GHz		
(0 to 20) dB	(± 0.012 to ± 0.088) dB (± 0.12 to ± 0.65) deg	Network analyzer, ET36411 1.85 mm, multi offset short mode characterized device cal kit
(20 to 40) dB	(± 0.024 to ± 0.56) dB (± 0.22 to ± 3.9) deg	
(40 to 60) dB	(± 0.036 to ± 4.4) dB (± 0.40 to ± 42) deg	

Parameter/Range	CMC[2] (±)	Comments
Transmission S_{12}/S_{21} – Measure[4] (cont.)		
10 MHz to 8.2 GHz		
(0 to 20) dB	(± 0.012 to ± 0.042) dB (± 0.12 to ± 0.34) deg	Network analyzer, ET51600 7-16 connector, Characterized device cal kit
(20 to 40) dB	(± 0.024 to ± 0.25) dB (± 0.22 to ± 1.75) deg	
(40 to 60) dB	(± 0.038 to ± 2.20) dB (± 0.37 to ± 16.83) deg	
10 MHz to 12 GHz		
(0 to 20) dB	(± 0.012 to ± 0.053) dB (± 0.12 to ± 0.39) deg	Network analyzer, ET36409 type N 75 ohm, Characterized device cal kit
(20 to 40) dB	(± 0.024 to ± 0.25) dB (± 0.22 to ± 1.8) deg	
(40 to 60) dB	(± 0.038 to ± 2.2) dB (± 0.37 to ± 17) deg	
10 MHz to 6.2 GHz		
(0 to 20) dB	(± 0.013 to ± 0.048) dB (± 0.12 to ± 0.43) deg	Network analyzer, ET36442 type F 75 ohm, Characterized device cal kit
(20 to 40) dB	(± 0.024 to ± 0.27) dB (± 0.22 to ± 2.0) deg	
(40 to 60) dB	(± 0.039 to ± 2.3) dB (± 0.37 to ± 18) deg	
(8.2 to 12.4) GHz		
(0 to 20) dB	(± 0.0046 to ± 0.0047) dB (± 1.7 to ± 1.8) deg	Network analyzer, ET36405 X-band, TRL cal kit
(20 to 40) dB	(± 0.047 to ± 0.051) dB (± 1.8 to ± 1.9) deg	
(40 to 60) dB	(± 0.051 to ± 0.13) dB (± 1.9 to ± 2.5) deg	

Parameter/Range	CMC[2] (±)	Comments
Transmission S_{12}/S_{21} – Measure[4] (cont.)		
(12.4 to 18.0) GHz		
(0 to 20) dB	(± 0.046 to ± 0.046) dB (± 2.57 to ± 2.60) deg	Network analyzer, ET36406 P-band, TRL cal kit
(20 to 40) dB	(± 0.046 to ± 0.051) dB (± 2.6 to ± 2.7) deg	
(40 to 60) dB	(± 0.051 to ± 0.17) dB (± 2.6 to ± 3.7) deg	
(18.0 to 26.5) GHz		
(0 to 20) dB	(± 0.046 to ± 0.047) dB (± 4.0 to ± 5.9) deg	Network analyzer, ET36408 K-band, TRL cal kit
(20 to 40) dB	(± 0.047 to ± 0.078) dB (± 4.1 to ± 6.2) deg	
(40 to 60) dB	(± 0.053 to ± 0.57) dB (± 4.2 to ± 9.7) deg	
(26.5 to 40) GHz		
(0 to 20) dB	(± 0.051 to ± 0.052) dB (± 2.5 to ± 2.6) deg	Network analyzer, ET36320 R-band, TRL cal kit
(20 to 40) dB	(± 0.052 to ± 0.073) dB (± 2.6 to ± 2.8) deg	
(40 to 60) dB	(± 0.073 to ± 0.45) dB (± 2.8 to ± 5.5) deg	
(33 to 50) GHz		
(0 to 20) dB	(± 0.051 to ± 0.053) dB (± 3.1 to ± 3.2) deg	Network analyzer HP8510C, ET36321 Q-band, TRL cal kit
(20 to 40) dB	(± 0.052 to ± 0.081) dB (± 3.2 to ± 3.5) deg	
(40 to 60) dB	(± 0.081 to ± 0.56) dB (± 3.5 to ± 6.9) deg	

Parameter/Range	CMC[2] (±)	Comments
Transmission S_{12}/S_{21} – Measure[4] (cont.)		
(40 to 60) GHz		Network analyzer HP8510C, multiplier test set HP U85104A, HP 85105A mm wave controller RF source HP83623B, Lo source HP 83651 A/B, ET36322 U-band, TRL cal kit
(0 to 20) dB	(± 0.051 to ± 0.053) dB (± 3.75 to ± 3.8) deg	
(20 to 40) dB	(± 0.053 to ± 0.082) dB (± 3.8 to ± 4.1) deg	
(40 to 60) dB	(± 0.082 to ± 0.60) dB (± 4.1 to ± 7.5) deg	
(50 to 75) GHz		Network analyzer HP8510C, multiplier test set HP V85104A, HP 85105A mm wave controller, source HP 83623B, source HP 83651 A/B ET36323 V-band, TRL cal kit
(0 to 20) dB	(± 0.034 to ± 0.040) dB (± 4.7 to ± 5.1) deg	
(20 to 40) dB	(± 0.040 to ± 0.34) dB (± 5.1 to ± 9.4) deg	
(40 to 60) dB	(± 0.34 to ± 16) dB (± 9.4 to ± 62) deg	
(75 to 110) GHz		Network analyzer HP8510C, multiplier test set HP W85104A, HP 85105A mm wave controller, source HP 83623B, source HP 83651 A/B, ET36324 W-band, TRL cal kit
(0 to 20) dB	(± 0.038 to ± 0.065) dB (± 6.9 to ± 7.2) deg	
(20 to 40) dB	(± 0.065 to ± 0.33) dB (± 7.1 to ± 9.9) deg	
(40 to 60) dB	(± 0.33 to ± 6.5) dB (± 9.9 to ± 39) deg	

Parameter/Range	CMC[2] (±)	Comments
RF / μ-Wave power Power Sensor Calibration Factor – Measure		
9 kHz to 18.0 GHz		
(0.009 to 10) MHz	0.0040	83650A/B signal generator,
(0.01 to 0.03) GHz	0.0050	8648C/D signal generator,
0.050 GHz	0.0035	11667A power splitter,
(0.050 to 1.0) GHz	0.0035	11051A thermal converter,
(1.0 to 1.6) GHz	0.0035	478A-H75 thermistor mount,
(1.8 to 2.0) GHz	0.0033	8478B thermistor mount,
2.2 GHz	0.0033	3458A DVM,
(2.4 to 3.6) GHz	0.0033	34970 + 34901A data acquisition
(3.8 to 4.6) GHz	0.0033	switch w/ DMM,
(4.8 to 5.2) GHz	0.0036	50 MHz 1mW ref oscillator
(5.4 to 5.6) GHz	0.0037	
(5.8 to 6.4) GHz	0.0039	uncertainty based on 8481 or
6.6 GHz	0.0041	E9304A power sensor
7.6 GHz	0.0043	
9 kHz to 18.0 GHz		
7.8 GHz	0.0043	
8.0 GHz	0.0043	
(8.2 to 9.6) GHz	0.0048	
(9.8 to 10.8) GHz	0.0052	
(11.0 to 11.4) GHz	0.0053	
(11.6 to 11.8.0) GHz	0.0053	
(12.00 to 12.5) GHz	0.0059	
(12.75 to 13.00) GHz	0.0057	
(13.25 to 13.75) GHz	0.0059	
(14.00 to 14.25) GHz	0.0059	
(14.50 to 14.75) GHz	0.0057	
(15.00 to 15.50) GHz	0.0066	
(15.75 to 16.00) GHz	0.0066	
16.25 GHz	0.0067	
(16.50 to 17.00) GHz	0.0077	
17.25 GHz	0.0083	
17.50 GHz	0.0081	
17.75 GHz	0.0089	
18.00 GHz	0.0094	

Parameter/Range	CMC[2] (±)	Comments
RF / μ-Wave power Power Sensor Calibration Factor – Measure (cont.)		
10 MHz to 50 GHz		
(0.01 to 9.0) GHz	0.015	83650A/B source,
(10.0 to 17.0) GHz	0.016	11667C power splitter,
(18.0 to 20.0) GHz	0.017	8487A power sensor
(21.0 to 31.0) GHz	0.017	
(31.5 to 33.0) GHz	0.020	uncertainty based on 8487A
(33.5 to 38.0) GHz	0.019	power sensor
(38.5 to 42.0) GHz	0.022	
43.0 GHz	0.023	
44.0 GHz	0.026	
(45.0, 49.0) GHz	0.027	
50.0 GHz	0.034	
(33 to 50) GHz		
(33.0 to 34.1) GHz	0.024	Q8486A power sensor,
(34.2 to 36.2) GHz	0.026	83650A/B signal generator,
(36.3 to 37.8) GHz	0.024	83555A multiplier head,
(37.9 to 48.0) GHz	0.023	
(48.1 to 48,8) GHz	0.024	uncertainty based on Q8486A
(48.9 to 50.0) GHz	0.027	power sensor
(50 to 75) GHz		
(50.0 to 54.0) GHz	0.050	45774H power sensor,
(55.0) GHz	0.041	83650A/B source,
(56.00 to 67.0) GHz	0.055	83557A multiplier head,
(67.5 to 75.0) GHz	0.054	uncertainty based on V8486A power sensor

Parameter/Range	CMC[2] (±)	Comments
RF / μ-Wave power Power Sensor Calibration Factor – Measure (cont.) (75 to 110) GHz 75 GHz 76 GHz 78 GHz 80 GHz 82 GHz 84 GHz 86 GHz 88 GHz 90 GHz 92 GHz 94 GHz 95 GHz 96 GHz 98 GHz 100 GHz 102 GHz 104 GHz 108 GHz 110 GHz	 0.055 0.055 0.053 0.054 0.050 0.052 0.048 0.047 0.045 0.045 0.044 0.044 0.043 0.044 0.046 0.047 0.048 0.050 0.053	 Hughes 45786H -1000 calorimeter 45776H power sensor, 83650A/B source, 83558A multiplier head
RF / μ-Wave Power Absolute Power – Measure 50 MHz 1000 μW (0 dBm) 3.2 μW (-25 dBm) 1.0 μW (-30 dBm)	 4.0 μW 15 nW 20 nW	 478A-H75 thermistor mount, 34970 + 34901A data acquisition switch w/DMM, E9304A power sensor, 50 MHz 1-mW ref oscillator, E4419B Power Meter

Parameter/Range	CMC[2] (±)	Comments
RF / μ-Wave Thermal Noise ENR – Measure		
10 MHz to 18.0 GHz		
(4.5 to 6.5) dB		
10 MHz to 1 GHz 2 GHz to 17 GHz 18 GHz	0.10 dB 0.12 dB 0.16 dB	83631 A/B source, N4000A noise source standard, N8973A noise figure analyzer (NFA)
(14 to 16) dB		
10 MHz to 11 GHz 12 GHz to 17 GHz 18 GHz	0.10 dB 0.12 dB 0.15 dB	83631 A/B source, N4001A noise source standard, N8973A noise figure analyzer (NFA)
10 MHz to 26.5 GHz		
(12 to 17) dB		
10 MHz to 13 GHz 14 GHz to 17 GHz 18 GHz to 23 GHz 24 GHz to 26 GHz 26.5 GHz	0.10 dB 0.12 dB 0.15 dB 0.23 dB 0.27 dB	83631 A/B source, N4002A noise source standard, N8973A noise figure analyzer (NFA)

IV. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Torque	(1 to 50) in·ozf (2.5 to 250) in·lbf	0.6 % of reading 0.3 % of reading	Torque Transducers

[1] These laboratories offer 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] S_{11}/S_{22} reflection CMCs are a function of actual measured reflection and transmission magnitude. The CMC statements assume $S_{21}=S_{12}=0$.

[4] S_{21}/S_{12} transmission CMCs are a function of actual measured transmission and reflection magnitudes. These CMC statements assume $S_{11}=S_{22}=0$.