SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
ANSI/NCSL Z540-1-1994 & ANSI/NCSLI Z540.3-2006

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CALIBRATION

Valid To: April 30, 2026 Certificate Number: 2160.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 7]:

I. Dimensional

Parameter/Equipment	Range	CMC[2]	Comments
Outside Diameter	(0 to 3) mm	0.56 µm	Optical micrometer & cylindrical plugs
Inside Diameter	(0.8 to 1) mm (1 to 7) mm	0.5 µm 0.7 µm	Air comparator & cylindrical rings
Indicator & Pin Depth	Up to 0.1 in	60 µin	Indicator & gage blocks
Airline Mechanical Impedance	(49 to 51) Ω Type W Type V Type K Type N	 0.09 Ω 0.04 Ω 0.03 Ω 0.015 Ω	Optical mic & air comparator

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
S Parameters[3] – Measure Transmission & Phase for S12, S21			
(-80 to 10) dB, (0 to 180) °	9 kHz to 4 GHz (4 to 10) GHz (10 to 18) GHz	0.015 dB / 0.15° 0.020 dB / 0.25° 0.027 dB / 0.35°	VNA with N cal kits
	70 kHz to 20 GHz (20 to 30) GHz	0.01 dB / 1.0° 0.02 dB / 2.0°	VNA & 3.5mm cal kit
	(0.04 to 1000) MHz (1 to 20) GHz (20 to 40) GHz (40 to 45) GHz	0.037 dB / 0.4° 0.022 dB / 0.5° 0.032 dB / 0.8° 0.046 dB / 1.1°	VNA with K cal kit
	70 kHz to 20 GHz (20 to 40) GHz (40 to 67) GHz (67 to 70) GHz	0.035 dB / 0.3° 0.035 dB / 0.6° 0.045 dB / 0.9° 0.05 dB / 2.4°	VNA with V cal kit
	70 kHz to 20 GHz (20 to 40) GHz (40 to 50) GHz (50 to 60) GHz (60 to 70) GHz (70 to 80) GHz (80 to 90) GHz (90 to 100) GHz (100 to 110) GHz (110 to 116.5) GHz	0.02 dB / 0.5° 0.04 dB / 2.5° 0.05 dB / 2.8° 0.07dB / 3.2° 0.08 dB / 3.9° 0.1 dB / 4.2° 0.12 dB / 4.6° 0.13 dB / 5.4° 0.14 dB / 6.6° 0.16 dB / 6.6°	VNA with 1 mm cal kit
	(40 to 170) GHz	0.14 dB / 15°	VNA with Waveguide cal kit

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Reflection[3] S_{11}, S_{22} – Measure			
Coaxial Components (0.000 01 to 1.0) lin, (0 to 180) °	9 kHz to 300 MHz (0.3 to 2) GHz (2 to 6) GHz (6 to 14) GHz (14 to 18) GHz	0.002 lin, 0.2° 0.003 lin, 0.3° 0.004 lin, 0.4° 0.006 lin, 0.6° 0.007 lin, 0.8°	VNA with N cal kit
	70 kHz to 8 GHz (8 to 20) GHz (20 to 26) GHz (26 to 30) GHz	0.005 lin, 0.5° 0.008 lin, 1.0° 0.012 lin, 1.5° 0.020 lin, 2.0°	VNA with SMA cal kit
	(0.04 to 1000) MHz (1 to 20) GHz (20 to 40) GHz (40 to 45) GHz	0.003 lin, 0.4° 0.0025 lin, 0.6° 0.0035 lin, 1.0° 0.0055 lin, 1.1°	VNA with K cal kit
	100 kHz to 10 GHz (10 to 20) GHz (20 to 40) GHz (40 to 67) GHz (67 to 69.5) GHz	0.005 lin, 1.5° 0.005 lin, 1.5° 0.007 lin, 3° 0.008 lin, 3.5° 0.008 lin, 4°	VNA with V cal kit
	70 kHz to 20 GHz (20 to 40) GHz (40 to 50) GHz (50 to 60) GHz (60 to 70) GHz (70 to 80) GHz (80 to 90) GHz (90 to 100) GHz (100 to 110) GHz (110 to 116.5) GHz	0.005 lin / 0.5° 0.009 lin / 0.7° 0.012 lin / 1.0° 0.016 lin / 1.1° 0.019 lin / 1.2° 0.023 lin / 1.2° 0.027 lin / 1.3° 0.030 lin 1.6° 0.033 lin 1.7° 0.037 lin 1.8°	VNA with 1 mm cal kit
	70 kHz to 145 GHz	0.006 lin / 0.6°	VNA with 0.8 mm cal kit
	(40 to 170) GHz	0.032 lin / 15°	VNA with Waveguide cal kit

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Reflection[3] S_{11}, S_{22} – Measure, Directivity & Test Port Match	9 kHz to 18 GHz 70 kHz to 45 GHz 70 kHz to 70 GHz 125 kHz to 116.5 GHz	0.32 dB 0.1 dB 0.2 dB 0.4 dB	VNA, Airline, Autocal
Power Level – Absolute[6] Measure			
0 dBm	(0.01 to 5) GHz (7 to 15) GHz (15 to 18) GHz	0.025 dB 0.030 dB 0.034 dB	Type N power sensor
(-20 to 20) dBm	(0.01 to 2) GHz (2 to 8) GHz (8 to 12) GHz (12 to 18) GHz	0.035 dB 0.042 dB 0.048 dB 0.065 dB	
(-40 to -20) dBm	(0.01 to 2) GHz (2 to 8) GHz (8 to 12) GHz (12 to 18) GHz	0.062 dB 0.074 dB 0.083 dB 0.1 dB	
(-60 to -40) dBm	(0.01 to 18) GHz	0.12 dB	
(-90 to -60) dBm	(0.01 to 18) GHz	0.17 dB	Spectrum analyzer power sensor with attenuator
0 dBm	(10 to 100) MHz (0.1 to 2) GHz (2 to 8) GHZ (8 to 12) GHz (12 to 43.5) GHz	0.027 dB 0.037 dB 0.044 dB 0.056 dB 0.062 dB	Type K power sensor
(-20 to 20) dBm	(0.05 to 2) GHz (2 to 8) GHz (8 to 12) GHz (12 to 43.5) GHz	0.052 dB 0.061 dB 0.07 dB 0.11 dB	
(-60 to -20) dBm	(0.05 to 2) GHz (2 to 12) GHz (12 to 33) GHz (33 to 43.5) GHz	0.094 dB 0.11 dB 0.12 dB 0.15 dB	
(-90 to -60) dBm	(0.05 to 18) GHz	0.18 dB	Spectrum analyzer, power sensor with attenuator

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Power Level – Absolute [6] Measure: Type N, Type K, Type V, & W Connector			
0 dBm	(0 to 100) MHz (0.1 to 2) GHz (2 to 8) GHz (8 to 12) GHz (12 to 18) GHz (18 to 40) GHz (40 to 49) GHz (49 to 67) GHz (67 to 70) GHz	0.024 dB 0.036 dB 0.042 dB 0.054 dB 0.07 dB 0.06 dB 0.10 dB 0.15 dB 0.18 dB	Type V power sensor
(-20 to 20) dBm	(0.05 to 2) GHz (2 to 8) GHz (8 to 12) GHz (12 to 40) GHz (40 to 50) GHz (50 to 70) GHz	0.044 dB 0.051 dB 0.059 dB 0.09 dB 0.13 dB 0.21 dB	
(-40 to -20) dBm	(0.05 to 8) GHz (8 to 12) GHz (12 to 40) GHz (40 to 50) GHz	0.08 dB 0.09 dB 0.13 dB 0.17 dB	
(-60 to -40) dBm	(0.05 to 8) GHz (8 to 12) GHz (12 to 26) GHz (26 to 33) GHz (33 to 40) GHz (40 to 50) GHz	0.09 dB 0.10 dB 0.12 dB 0.13 dB 0.14 dB 0.17 dB	
(-90 to -60) dBm	(0.05 to 8) GHz (8 to 12) GHz (12 to 26) GHz (26 to 33) GHz (33 to 40) GHz (40 to 50) GHz	0.18 dB 0.2 dB 0.25 dB 0.26 dB 0.28 dB 0.35 dB	Spectrum analyzer, power sensor, attenuator

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Power Level – Absolute[6] Measure: Type N, Type K, Type V, W & Waveguide Connector			
0 dBm	(10 to 50) MHz (0.05 to 2) GHz (2 to 8) GHz (8 to 12) GHz (12 to 40) GHz (40 to 50) GHz (50 to 75) GHz (75 to 92) GHz (92 to 110) GHz	0.03 dB 0.04 dB 0.05 dB 0.07 dB 0.09 dB 0.13 dB 0.18 dB 0.20 dB 0.21 dB	Type W power sensor
(-35 to 20) dBm	(0.01 to 2) GHz (2 to 12) GHz (12 to 26) GHz (26 to 40) GHz (40 to 50) GHz (50 to 67) GHz (67 to 95) GHz (95 to 110) GHz	0.06 dB 0.08 dB 0.10 dB 0.12 dB 0.17 dB 0.24 dB 0.27 dB 0.30 dB	
(0 to -60) dBm	(0.01 to 20 GHz (20 to 50) GHz (50 to 67) GHz (67 to 70) GHz	0.1 dB 0.15 dB 0.18 dB 0.21 dB	Spectrum analyzer
(-80 to -60) dBm	(0.01 to 50) GHz	0.25 dB	
(-100 to -80) dBm	(0.01 to 50) GHz	1.3 dB	
(-20 to 0) dBm (-60 to -20) dBm (-90 to -60) dBm	(40 to 170) GHz	0.35 dB 0.66 dB 1.5 dB	Spectrum analyzer with waveguide connector
(-125 to 0) dBm	(0 to 3) GHz	0.25dB	Measuring receiver
	(3 to 40) GHz	1.4 dB	Receiver with mixer

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Frequency Modulation – Measure Carrier 1 GHz 5 GHz 10 GHz 20 GHz 30 GHz 40 GHz	Modulation 10%	0.02 % 0.08 % 0.15 % 0.30 % 0.45 % 0.60 %	Function generator, measuring receiver LO synthesizer
Amplitude Modulation – Measure (1 to 20) GHz (20 to 40) GHz	(10 to 100) %	2.6 % 3.9 %	Function generator & measuring receiver
Pulse Modulation – Measure Power Rise, Fall & Compression High Level Noise Magnitude High Level Noise Phase	(0.01 to 40) GHz (0.5 to 40) GHz < 500 KHz (0.005 to 2.5) GHz (2.5 to 5) GHz (5 to 20) GHz (20 to 40) GHz (40 to 67) GHz (67 to 70) GHz < 500KHz (0.005 to 2.5) GHz (2.5 to 5) GHz (5 to 20) GHz (20 to 40) GHz (40 to 67) GHz (67 to 70) GHz	0.09 dB 0.011 ns 0.000 59 dB-rms 0.000 33 dB-rms 0.000 25 dB-rms 0.000 28 dB-rms 0.000 32 dB-rms 0.000 23 dB-rms 0.000 22 dB-rms 0.0055 deg-rms 0.0025 deg-rms 0.0029 deg-rms 0.0018 deg-rms 0.0028 deg-rms 0.0024 deg-rms 0.0019 deg-rms	Wide band oscilloscope & function generator VNA

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
Noise, Spurs & Distortion – Measure			
Phase Noise (0.01 to 16) GHz Carrier	Offset (0.01 to 10) MHz	3.5 dB	Spectrum analyzer
Spurious Signals	(0.01 to 45) GHz	3 dB	Spectrum analyzer
Dynamic Noise Level >-156 dBm	(0.01 to 70) GHz	0.74 dB	VNA or SPA
Harmonic Distortion 2nd Harmonic	(0.01 to 1) GHz (1 to 43.5) GHz	0.56 dB 0.15 dB	Spectrum analyzer

III. Mechanical

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Torque Devices	(0.25 to 250) lbf.in	2.5 %	Torque analyzer

IV. Optical Quantities

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Optical Wavelength & Power – Measure			
Optical – Electrical Responsivity			
Transmission & Reflection (850 to 1550) nm (-80 to 0) dBm, (0 to 180) °	70 kHz to 80 GHz (80 to 90) GHz (90 to 100) GHz (100 to 110) GHz	1 dB 1.5 dB 3 dB 4.5 dB	VNA & photodiode

V. Time & Frequency

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Time & Frequency – Measure & Measuring Equipment	10 MHz	4×10^{-13} Hz/Hz	GPS receiver
	70 kHz to 170 GHz[4]	2×10^{-9} Hz/Hz	VNA
	9 kHz to 170 GHz[4]	2×10^{-7} Hz/Hz	Spectrum analyzer
UTC Time	24 Hours	45 ns	NIST TMAS

[1] This laboratory offers commercial calibration services.

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

[3] Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] The measurands stated are generated using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure the 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.

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

[6] Enlisted values represent absolute power level uncertainty, including test port match.

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

[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

ANRITSU AUS, CALIFORNIA

Morgan Hill, CA

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 the requirements of ANSI/NCSL Z540.3-2006 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 8th day of March 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2160.01
Valid to April 30, 2026

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