



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Cal-Asia Pte. Ltd.
690 West Camp Road, JTC Aviation 2, #09-04
Singapore 797523
(and satellite locations as shown on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

and national standards

ANSI/NCSL Z540-1-1994 (R2002) and
ANSI/NCSL Z540.3-2006 (R2013)

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

Jason Stine, Vice President

Expiry Date: 08 July 2028

Certificate Number: AC-2886



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
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).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AND

ANSI/NCSL Z540-1-1994 (R2002)

ANSI/NCSL Z540.3-2006 (R2013)

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CALIBRATION

ISO/IEC 17025 Accreditation Granted: **07 July 2026**

Certificate Number: **AC-2886** Certificate Expiry Date: **08 July 2028**

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters ^{1,3}	5 µS/cm 10 µS/cm 100 µS/cm 300 µS/cm 500 µS/cm 1 000 µS/cm 1 413 µS/cm	0.8 % of reading 0.7 % of reading 0.8 % of reading 0.7 % of reading 0.7 % of reading 0.7 % of reading 0.38 % of reading	Comparison to Conductivity Standard Solutions

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Conductivity Meters ^{1,3}	5 mS/cm 10 mS/cm 20 mS/cm 50 mS/cm 100 mS/cm 200 mS/cm	0.7 % of reading 0.47 % of reading 0.7 % of reading 0.7 % of reading 0.4 % of reading 0.3 % of reading	Comparison to Conductivity Standard Solutions
pH Meters ^{1,3}	2 pH 4 pH 7 pH 10 pH 12 pH	0.03 pH 0.01 pH 0.01 pH 0.01 pH 0.07 pH	Comparison to pH Buffer Solutions
Particle Counters – Counting Efficiency ¹	50 ± 20 % 100 ± 10 % (0.1 to 5.0) µm	3.56 % Efficiency	Comparison against a standard particle counter in accordance with ISO 21501-4:2018
Particle Counters Size Resolution ¹	(1 to 15) % (0.1 to 1.0) µm	2.3 % Size Resolution	Comparison against a standard particle counter in accordance with ISO 21501-4:2018
Particle Counters – Size verification ¹	0.1 µm 0.15 µm 0.2 µm 0.25 µm 0.3 µm 0.4 µm 0.5 µm 0.6 µm 0.7 µm 1.0 µm 2.0 µm 2.5 µm 3.0 µm 5.0 µm 10 µm 15 µm 25 µm 50 µm	0.002 µm 0.006 µm 0.004 µm 0.006 µm 0.006 µm 0.007 µm 0.007 µm 0.007 µm 0.006 µm 0.012 µm 0.015 µm 0.027 µm 0.032 µm 0.038 µm 0.06 µm 0.12 µm 0.22 µm 0.8 µm	Measurement using Pulse Height Analyzer, Standard PSL Nano spheres & Particle Distributing System as per ISO 21501-4:2018

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Particle Counters – Zero Count Test ¹	2.83 L/min 14.15 L/min 28.3 L/min 100 L/min	18 particles/ m ³ 4 particles/ m ³ 2 particles/ m ³ 1 particles/ m ³	As Per ISO 21501-4:2018 Annex C
Particle Counters – Flow Rate ¹	(1 to 100) L/min	1 % of reading	Comparison to Standard Mass flow meter System as per ISO 21501-4:2018
Aerosol Photometer / Aerosol oil Particle Concentration Counting Efficiency ¹	100 ±15 % (0.1 to 10) µm	7 % Efficiency	Comparison against a standard Aerosol Photometer in accordance with CAL063-0323-R01
ORP Instruments ^{1,3}	220 mV 470 mV	6.2 mV 6.2 mV	Comparison to ORP Buffer Solutions
CO ₂ Gas Instruments ^{1,3}	0.02 % CO ₂ Concentration 0.2 % CO ₂ Concentration 0.5 % CO ₂ Concentration	0.000 24 % of Concentration 0.004 6 % of Concentration 0.012 % of Concentration	By Direct comparison to Reference Gas.

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ¹	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V 330 V to 1 kV	0.018 mV 0.000 14 V 0.001 4 V 0.015 V 0.044 V	Comparison to Multifunction Calibrator
DC Voltage – Measure ¹	(0 to 100) mV 100 mV to 1V (1 to 10) V (10 to 100) V (100 to 1 000) V	0.001 5 mV 0.000 015 V 0.000 096 V 0.001 3 V 0.012 V	Comparison to Agilent 3458A Multimeter
DC Current – Source ¹	Up to 330 µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A 2.2 A to 11 A	0.06 µA 0.38 µA 2.8 µA 28 µA 0.27 mA 5.4 mA	Comparison to Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measure ¹	(1 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 2) A (2 to 5) A (5 to 10) A (10 to 100) A	0.003 3 μ A 0.03 μ A 0.3 μ A 4.7 μ A 0.14 mA 10mA 0.02 A 0.04 A 0.58 A	Comparison to Agilent 3458A Multimeter, Keysight 34461A/34401A Multimeter and Current Shunt
AC Voltage – Source ¹	10 Hz to 450 kHz Up to 33 mV (33 to 330) mV 330 mV to 3.3 V 10 Hz to 100 kHz (3.3 to 33) V 10 Hz to 20 kHz (33 to 330) V 45 Hz to 10 kHz (330 to 1000) V	0.28 mV 2.1 mV 0.016 V 0.075 V 0.26 V 2 V	Comparison to Multifunction Calibrator
AC Voltage – Measure ¹	1 kHz to 100 kHz Up to 10 mV (10 to 100) mV 40 Hz to 300 kHz 100 mV to 10 V 40 Hz to 100 kHz (10 to 100) V 40 Hz to 1 kHz (100 to 700) V	0.06 mV 0.6 mV 0.035 V 0.16 V 0.35 V	Comparison to Agilent 3458A Multimeter
AC Current – Source ¹	10 Hz to 10 kHz 30 to 330 μ A 330 μ A 3.3 (3.3 to 33) mA (33 to 330) mA 10 Hz to 5 kHz 330 mA to 2.2 A 45 Hz to 1 kHz 2.2 A to 11 A	3.4 μ A 16 μ A 0.16 mA 1.6 mA 13 mA 0.03 A	Comparison to Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	45 Hz to 5 kHz (10 to 100) μ A (1 to 100) mA 100 mA to 1 A (1 to 2) A (2 to 5) A (5 to 10) A	0.11 μ A 0.058 mA 1.4 mA 2.5 mA 21 mA 37 mA	Comparison to Agilent 3458A Multimeter Comparison to Keysight 34461A
Resistance – Source ¹ 2- Wire	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (330 to 1.1) M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω	7.3 m Ω 15 m Ω 19 m Ω 35 m Ω 0.13 Ω 0.28 Ω 1.3 Ω 2.8 Ω 14.1 Ω 35 Ω 0.17 K Ω 0.43 k Ω 5.6 k Ω 26 k Ω 0.44 M Ω 1.3 M Ω	Comparison to Multifunction Calibrator
Resistance – Measure ¹ 2- Wire	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω	0.00039 Ω 0.0039 Ω 0.023 Ω 0.22 Ω 0.0022 k Ω 0.033 k Ω 1.1 K Ω 0.12 M Ω	Comparison to Agilent 3458A Multimeter
Electrical Calibration of RTD Instruments ¹ (Source)	PT100, (385) (-200 to 100) $^{\circ}$ C (100 to 850) $^{\circ}$ C	0.01 $^{\circ}$ C 0.04 $^{\circ}$ C	Comparison to Agilent 3458A Multimeter (measure)
Electrical Calibration of RTD Indicating Instruments ¹ (Measure)	PT100, (385) (-200 to 100) $^{\circ}$ C (100 to 400) $^{\circ}$ C (400 to 850) $^{\circ}$ C	0.04 $^{\circ}$ C 0.11 $^{\circ}$ C 0.25 $^{\circ}$ C	Comparison to Temperature Calibrator Direct method (source)

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Temperature Measuring Instruments/Controllers / Transmitters ¹	(-200 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 850) °C	0.02 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.1 °C 0.12 °C	Comparison to Precision Decade Resistance Box by Simulation method
Capacitance – Source ¹	(0.33 to 0.5) nF (0.5 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	9.8 pF 12 pF 21 pF 0.06 nF 0.15 nF 0.31 nF 0.88 nF 3 nF 11 nF 0.04 µF 0.13 µF 0.51 µF 2.1 µF 0.02 mF	Comparison to Multifunction Calibrator
Oscilloscope Functions ¹ DC Voltage 50 Ω Load 1 MΩ Load Input Impedance Bandwidth and AC Voltage Flatness 50 kHz to 10 MHz (wrt reference frequency)	(1 to 100) mV 100 mV to 1 V (1 to 5) V (1 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 150) V (40 to 90) Ω 800 kΩ to 1.2 MΩ 9 kHz to 500 MHz 500 MHz to 1.2 GHz (1.2 to 6) GHz	0.024 % of output + 49 nV 0.027 % of output + 19 µV 0.026 % of output + 0.19 mV 0.024 % of output + 4.9 µV 0.027 % of output + 19 µV 0.026 % of output + 0.19 mV 0.026 % of output + 2.4 mV 0.017 % of output + 43 mV 10 mΩ 600 Ω 0.28 % of reading + 0.47 dBm 0.28 % of reading + 0.46 dBm 0.36 % of reading + 0.41 dBm	Comparisons to Multimeter Multimeter Power Sensor

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscope Functions ¹ DC Balance	1 mV/Div to 1 V/Div 1 mV/Div to 10 V/Div	0.029 % of range 0.029 % of range	Comparison to 50 Ω Termination

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power Measure ¹ (50 Ω)	10 MHz to 6 GHz (0 to 16) dBm (-10 to 0) dBm (-40 to -10) dBm	0.44 dB 0.43 dB 0.39 dB	Comparison to Power Meter, Power Sensor
RF Power Measure ¹ (50 Ω)	(-120 to 30) dBm 20 Hz to 3.6 GHz (3.6 to 6.6) GHz (6.6 to 20) GHz	0.43 dB 0.67 dB 1.1 dB	Comparison to Spectrum Analyzer
CW Power Measurement ¹	(20 to 50) dBm 10 MHz (10 to 500) MHz	0.54 dB 0.48 dB	Comparison to Power Meter, Power Sensor
Pulse Power Measurement ¹	(980 to 1 150) MHz (-30 to 56) dBm (56 to 64) dBm	0.43 dB 0.74 dB	Comparison to Power Meter, Power sensor
Amplitude Modulation Measure ¹	(1.50 to 10) MHz Rate :50 Hz to 10 kHz (5 to 99) % Depth 10 MHz to 1.3 GHz Rate :50 Hz to 50kHz (5 to 99) % Depth Rate: 20 Hz to 100 kHz (5 to 99) % Depth	2.5 % Depth 1.2 % Depth 2.5 % Depth	Comparison to Measuring Receiver
Frequency Modulation Measure ¹ 10 MHz to 1 GHz	Deviation: 10 kHz to 40 kHz Rate: 1kHz Deviation: 40 kHz to 200 kHz Rate: 1kHz	0.59 kHz 2.5 kHz	Comparison to Measuring Receiver

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DDM – Measure ^{1,2} Fmod 90/150 Hz Localizer Mode Glideslope Mode	(0 to 0.1) DDM (0.1 to 0.4) DDM (0 to 0.2) DDM (0.2 to 0.8) DDM	0.000 003 DDM 0.000 061 DDM 0.000 76 DDM 0.001 1 DDM	Comparison to Spectrum Analyzer
VOR Signal – Measure AM Modulation ¹ Depth (RF Signal)	30 % Depth (30, 9 960) Hz 300 Hz to 4 kHz	0.16 % Depth 0.31 % Depth	Comparison to Spectrum Analyzer
VOR Signal – Measure FM Modulation Deviation ¹	Fmod :9 960 Hz ± 1 % (0 to 700) Hz	2.3 Hz	Comparison to Spectrum Analyzer
VOR Signal – Measure Phase Modulation ¹	(0 to 360)° 30 Hz, 9 960 Hz	0.04°	Comparison to Spectrum Analyzer
VOR Signal – Measure Distortion ¹	(0.001 to 100) % Distortion (30, 1 020) Hz	0.31 % Distortion	Comparison to Spectrum Analyzer
VSWR Measurement ¹ VSWR (RF I/O and SWR Connectors)	VSWR < 1.5 (5 to 2 000) MHz	14 % of reading	Comparison to Spectrum Analyzer

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Differential Pressure Gages/ Transmitters/pressure – Instruments ¹	(-1 000 Pa to 1 000) Pa (1 000 Pa to 2 500) Pa (2 500 Pa to 10 000) Pa (0.1 bar to 1) bar (1 bar to 2) bar (2 bar to 10) bar (10 bar to 15) bar (15 bar to 20) bar	0.24 Pa 0.47 Pa 1.2 Pa 0.000 13 bar 0.000 29 bar 0.001 2 bar 0.001 8 bar 0.004 8 bar	Using Differential Pressure Calibrator by comparison method

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
(Pressure & Vacuum Instruments Pressure / Vacuum/Level) ¹	(-0.99 to 0) bar 0 mbar to 10 mbar 10 mbar to 25 mbar 25 mbar to 100 mbar 100 mbar to 1 bar (1 to 2) bar (2 to 10) bar (10 to 15) bar (15 to 20) bar (20 to 70) bar (70 to 200) bar (200 to 700) bar (700 to 1 400) bar	0.13 mbar 0.002 4 mbar 0.004 7 mbar 0.012 mbar 0.13 mbar 0.000 29 bar 0.001 2 bar 0.001 8 bar 0.004 8 bar 0.043 bar 0.13 bar 0.42 bar 0.6 bar	Using Pressure Calibrator by comparison method
Vacuum Instruments ¹	(-0.99 to 0) bar	0.13 mbar	Using Vacuum Calibrator by comparison method
Pressure Instruments ¹ Absolute	(0 to 2) bar (a) (2 to 20) bar (a)	0.16 mbar 7.5 mbar	Using Pressure Calibrator by comparison method
Gage Pressure/ Transmitters/Pressure Instruments ¹	(> 7 to 35) bar (> 35 to 70) (> 70 to 700) bar	0.01 bar 0.02 bar 0.03 % of reading	Dead Weight Tester By Direct method
Pressure Valve/ Damper ¹	(-0.9 to 0) bar (0 to 20) bar (20 to 200) bar (200 to 700) bar (700 to 1 000) bar	0.003 bar 0.03 bar 0.059 bar 0.2 bar 0.89 bar	Comparison to Pressure Calibrator

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature / Humidity Measuring Devices ¹	(0 to 50) °C (10 to 95) % RH (10 to 80) %RH (0 to 50) °C (80 to 90) %RH (0 to 50) °C	0.1 °C 0.95 %RH 0.98 %RH	Comparison to Temperature / Humidity Probe
Dew point temperature Measuring Devices ¹	(-20 to 20) °C	0.19 °C	Comparison to Dew point Probe

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity Measuring Devices ¹	10 %RH @ 23 °C 11.3 %RH @ 23 °C 35 %RH @ 23 °C 50 %RH @ 23 °C 75.3 %RH @ 23 °C 80 %RH @ 23 °C	0.4 %RH 0.4 %RH 0.5 %RH 0.7 %RH 0.8 %RH 0.8 %RH	Comparison to Humidity Standard
RTD Thermometer ¹	(-90 to 250) °C (250 to 650) °C	0.04 °C 0.05 °C	Direct comparison to SPRT using Thermal baths and wells
Temperature Sensors incorporated in Humidity instruments ¹	(0 to 50) °C	0.04 °C	Comparison to Reference Temperature Probe
(Temperature Bath / Calibrator /Chamber) ¹	(-90 to 250) °C (250 to 650) °C	0.05 °C 0.06 °C	Comparison to Platinum Resistance Thermometer
(RTD/Digital and Mechanical Thermometers /Thermocouple with or without indicator/Controller/Capillary thermometer/Data logger with sensor/Temperature Gauge/temperature switch/Temperature transmitter) ¹	(-90 to 250) °C (250 to 650) °C	0.04 °C 0.05 °C	Platinum Resistance Thermometer by comparison method.

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source ¹	10 Hz to 10 kHz (10 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 100) MHz 100 MHz to 1GHz (1 to 3) GHz (3 to 6) GHz (6 to 20) GHz	0.2 Hz 0.000 3 Hz 0.000 4 Hz 0.002 Hz 0.19 Hz 1.9 Hz 5.5 Hz 11 Hz 5 Hz	Comparison to Signal Generator

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	10 Hz to 10 kHz (10 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 100) MHz 100 MHz to 1 GHz (1 to 3) GHz (3 to 6) GHz (6 to 20) GHz	0.000 7 Hz 0.000 03 Hz 0.000 07 Hz 0.000 2 Hz 0.025 Hz 0.25 Hz 0.73 Hz 1.5 Hz 5 Hz	Comparison to Frequency Counter
Time Base Measurement Horizontal Deflection ¹	(20 to 40) ns (40 to 200) ns (200 to 400) ns (1.00 to 4) μ s (4 to 20) μ s (20 to 100) μ s (100 to 400) μ s 400 μ s to 4 ms (4 to 20) ms (20 to 100) ms (100 to 400) ms 400 ms to 2 s (2 to 10) s	0.024 ns 0.12 ns 0.24 ns 0.002 4 μ s 0.012 μ s 0.061 μ s 0.244 μ s 0.002 6 ms 0.012 ms 0.061 ms 0.24 ms 0.001 2 s 0.006 1 s	Comparison to Oscilloscope

Services performed at satellite laboratory

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscope Functions ¹			
DC Voltage			Comparisons to Multimeter
50 Ω Load	(1 to 100) mV 100 mV to 1 V (1 to 5) V	0.024 % of output + 49 nV 0.027 % of output + 19 μ V 0.026 % of output + 0.19 mV	
1 M Ω Load	(1 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 150) V	0.024 % of output + 4.9 μ V 0.027 % of output + 19 μ V 0.026 % of output + 0.19 mV 0.026 % of output + 2.4 mV 0.017 % of output + 43 mV	
Input Impedance	(40 to 90) Ω 800 k Ω to 1.2 M Ω	10 m Ω 600 Ω	Multimeter
Bandwidth and AC Voltage Flatness			Power Sensor
50 kHz to 10 MHz (wrt reference frequency)	9 kHz to 500 MHz 500 MHz to 1.2 GHz (1.2 to 6) GHz	0.28 % of reading + 0.47 dBm 0.28 % of reading + 0.46 dBm 0.36 % of reading + 0.41 dBm	
DC Balance	1 mV/Div to 1 V/Div 1 mV/Div to 10 V/Div	0.029 % of range 0.029 % of range	50 Ω Termination

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power – Measure ¹ (50 Ω)	10 MHz to 6 GHz (10 to 16) dBm (-40 to -10) dBm	0.35 dB 0.42 dB	Comparison to Power Meter, Power sensor

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power – Measure ¹ (50 Ω)	(-120 to 30) dBm 20 Hz to 3.6 GHz (3.6 to 6.6) GHz (6.6 to 20) GHz	0.43 dB 0.67 dB 1.1 dB	Comparison to Spectrum Analyzer
RF Power – Source	(-30 to 10) dBm 10 MHz to 2 GHz (2 to 3) GHz (3 to 6) GHz (-110 to 10) dBm 10 MHz to 2 GHz (2 to 3) GHz (3 to 6) GHz	0.51 dB 0.76 dB 1.1 dB 0.51 dB 0.76 dB 1.2 dB	Comparison to Signal Analyzer
CW Power Measurement ¹	(20 to 50) dBm 10 MHz (10 to 500) MHz	0.54 dB 0.48 dB	Comparison to Power Meter, Power Sensor
Pulse Power Measurement ¹	(980 to 1 150) MHz (-30 to 55) dBm (55 to 64) dBm	0.4 dB 0.5 dB	Comparison to Power Meter, Peak and Average Power Sensor
Amplitude Modulation Depth – Measure ¹ Carrier: (1.50 to 10) MHz Carrier: 10 MHz to 1.3 GHz	Mod. Rate: 50 Hz to 10 kHz Depth: 5% Mod. Rate: 50 Hz to 50 kHz Depth: 5%	2.6 % of reading + 0.16 % Depth 1.6 % of reading + 0.18 % Depth	Comparison to Modulation Analyzer
Frequency Modulation Deviation – Measure ¹ Carrier: 250 kHz to 10 MHz Carrier: 10 MHz to 1.3 GHz	Mod. Rate: 50 Hz to 10 kHz Freq. Deviation: 4 kHz to 40 kHz Mod. Rate: 50 Hz to 100 kHz Freq. Deviation: 4 kHz to 100 kHz	2.9 % of reading + 0.01 kHz 1.7 % of reading + 0.06 kHz	Comparison to Modulation Analyzer

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DDM – Measure ^{1,2} Fmod: 90/150 Hz Localizer Mode Glideslope Mode	(0 to 0.1) DDM (0.1 to 0.4) DDM (0 to 0.2) DDM (0.2 to 0.8) DDM	0.000 003 DDM 0.000 061 DDM 0.000 76 DDM 0.001 1 DDM	Comparison to Spectrum Analyzer
VOR Signal – AM Modulation Depth ¹ (RF Signal)	Depth: 30 % (30, 9 960) Hz 300 Hz to 4 kHz	0.16 % Depth 0.31 % Depth	Comparison to Spectrum Analyzer
VOR Signal – FM Modulation Deviation ¹	Fmod: 9 960 Hz $\pm$ 1 % (0 to 700) Hz	2.3 Hz	Comparison to Spectrum Analyzer
VOR Signal – Phase Modulation ¹	Fmod: 30 Hz, 9 960 Hz (30° to 330°)	0.04°	Comparison to Spectrum Analyzer
VOR Signal – Distortion ¹	Fmod: (30, 1 020) Hz (0.001 to 100) %	0.18 % Distortion	Comparison to Spectrum Analyzer
VSWR Measurement ¹ VSWR (RF I/O and SWR Connectors)	VSWR: (1 to <1.5) (5 to 2 000) MHz	13 % of reading	Comparison to Network Analyzer

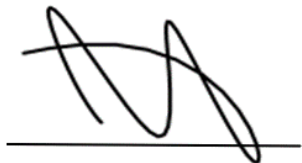
Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	10 Hz to 100 kHz 100 kHz to 3 GHz (3 to 6) GHz (6 to 20) GHz	0.02 Hz 1×10^{-8} Hz/Hz 5×10^{-9} Hz/Hz 7×10^{-9} Hz/Hz	Comparison to Frequency Counters with Rubidium Frequency Standard
Frequency – Source ¹	10 Hz 10 Hz to 6 GHz	0.000 001 Hz 6×10^{-9} Hz/Hz	Comparison to Signal/Function Generator with Rubidium Frequency Standard
Time Base Measurement Horizontal Deflection ¹	20 ns to 10 s	0.063 % of reading	Comparison to Oscilloscope

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. Lab and On-site calibration services are available for this parameter.
2. DDM = Difference in Depth of Modulation. Fmod = Modulation Frequency.
3. The nominal values listed are approximate.



Jason Stine, Vice President

