



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid To: August 31, 2017

Certificate Number: 0952.04

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Electrical – RF/Microwave

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Antenna Factor – Biconical Antennas			ANSI C63.5:2006, 1998
3 Meters, 10 Meters	(30 to 300) MHz (300 to 1000) MHz	1.2 dB 2.5 dB	Using 3-antenna method with HP 4396A and Agilent 87512A
	(30 to 300) MHz (300 to 1000) MHz	1.2 dB 2.5 dB	using identical antenna method with HP 4396A and Agilent 87512A
10 Meters	(30 to 300) MHz	1.2 dB	using reference antenna method with R&S SMY02

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Antenna Factor (cont) – Log.Per. Antennas			ANSI C63.5:2006, 1998
3 Meters, 10 Meters	(300 to 1800) MHz	3.2 dB	Using 3-antenna method w/ HP 4396A & Agilent 87512A
	(300 to 1800) MHz	3.2. dB	Using identical antenna method w/ HP 4396A & Agilent 87512A
10 Meters	(300 to 1000) MHz	1.0 dB	Using reference antenna method with R&S SMY02
Dipole Antenna 10 Meters	(30 to 300) MHz (300 to 1000) MHz	1.3 dB 1.4 dB	Using reference antenna method with R&S SMY02
Horn Antennas	(1 to 18) GHz	2.1 dB 2.3 dB	Agilent E4446A Agilent E8257D identical and 3-antenna method
Monopole Antenna	100 kHz to 50 MHz	2.5 dB	CISPR 25:2008, CISPR 16-1-4:2010+A1:2012, ECSM w/ R&S, ESHS10 & ESVS10 & SMY02
Antenna Balance – Biconical Antennas	(30 to 300) MHz	0.50 dB	CISPR 16-1-4:2010 +A1:2012, ANSI C63.5:2006, IEEE291:1991 w/ Agilent 4396A & 87512A
Antenna Cross-Polarization – Log.Per. Antennas	(300 to 1800) MHz 200 MHz to 18 GHz	0.60 dB 0.70 dB	CISPR 16-1-4:2010+A1:2012, ANSI C63.5:2006, IEEE291:1991 w/ Agilent E8257D & Agilent E4446A
Horn Antennas	(1 to 18) GHz	0.80 dB	CISPR 16-1-4 2007,A1 2007 ANSI C63.5:2006 IEEE291:1991

Parameter/Equipment	Frequency	CMC ^{2,5} (±)	Comments
LISN –			
Impedance	9 kHz to 30 MHz 30 kHz to 1 GHz	3.0 % 0.98 %	CISPR 16-1-2:2014, CISPR 16-4-1:2009, CISPR 16-4-2:2011, CISPR 16-4-3:2004+A1:2006, CISPR 16-4-4:2007, ANSI C63.4:2014
Phase	9 kHz to 30 MHz	0.51 deg	
Decoupling Factor	9 kHz to 1 GHz	1.7 dB	
Voltage Division Factor	9 kHz to 30 MHz	0.12 dB	
	30 kHz to 1 GHz	0.34 dB	
ISN (Impedance Stabilization Network) –			
Termination Impedance	(0.1 to 80) MHz	0.35 Ω	CISPR 22:2008, EN 55022:2010, HP 4396A with Agilent 85046B, 4395A with 87512A, 85032B Type N calibration kit
Phase of Basic Network for Asymmetric Disturbance	(0.1 to 80) MHz	0.74 deg	
Voltage Division Factor	(0.1 to 80) MHz	0.76 dB	
Insertion Loss	(0.1 to 80) MHz	0.76 dB	CISPR 22:2008, EN 55022:2010 with HP 8753D
Decoupling Attenuation	(0.1 to 80) MHz	0.70 dB	
Longitudinal Conversion Loss (LCL)	(0.1 to 80) MHz	0.73 dB	
Asymmetric Attenuation	(0.1 to 80) MHz	1.4 dB	

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Amplifier –			
Gain	30 kHz to 3 GHz	0.60 dB	HP 8753D
	(2 to 18) GHz	1.1 dB	Agilent E8257D & Agilent E4418A w/ Agilent E4412A
Linearity	30 kHz to 3 GHz	2.0 dB	HP 8753D &
	(2 to 18) GHz	1.4 dB	Agilent E8257D & Agilent E4418A w/ Agilent E4412A
Harmonic Distortion	100 kHz to 1.8 GHz	1.8 dB	Agilent E4446A
Absorbing Clamp –			
Clamp Factor	(30 to 300) MHz	2.9 dB	Ordinal Method CISPR 16-1-3:2004, CISPR 16-1-3, Corrigendum 1:2006
	(300 to 1000) MHz	3.0 dB	
Clamp Factor	(30 to 300) MHz	1.8 dB	Reference Device Method CISPR 16-1-3:2004, CISPR 16-1-3, Corrigendum 1:2006
	(300 to 1000) MHz	2.1 dB	
Decoupling Factor DF	(30 to 300) MHz	0.57 dB	
Decoupling Factor DR	(30 to 300) MHz	0.58 dB	
Capacitive Voltage Probe –			
Pulse Response	100 kHz to 30 MHz	0.83 dB	CISPR 16-1-2:2014, ANSI C63.4:2014, CISPR 16-1-1:2010 w/ IGUU2916
Relative Pulse Response	100 kHz to 30 MHz	1.1 dB	

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Capacitive Voltage Probe – (cont)			
CW Response (Voltage Division Factor)	100 kHz to 30 MHz	1.3 dB	Network analyzer 4396A + 85046A
	100 kHz to 30 MHz	0.44 dB	Generator & receiver SMY02 + FCKL1528
Decoupling	100 kHz to 30 MHz	1.9 dB	Network analyzer 8753D
	100 kHz to 30 MHz	1.9 dB	Generator & receiver SMY02 + FCKL1528
CDN –			
Insertion Loss	100 kHz to 230 MHz	0.87 dB	IEC 61000-4-6: 2013, EN 61000-4-6:2014, HP 4396A & Agilent 85046A & Agilent 85032B Type N calibration kit
Impedance	100 kHz to 230 MHz	1.1 %	
EFT/Burst Generator –			
Peak Voltage	250 V to 5 kV	2.8 %	IEC 61000-4-4:2012 with DSO80204B oscilloscope
Rise Time	5 ns	5.7 %	
Pulse Duration	50 ns	1.2 %	
Pulse Repetition Frequency	(5 to 100) kHz	0.50 %	
Burst Period	300 ms	0.20 %	
Burst Duration	15 ms & 0.75 ms	0.80 %	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Surge Generator – Open Circuit: Peak Voltage Front Time Duration Time to Half Value Short Circuit: Peak Current Front Time Duration Time to Half Value CDN Section Phase Shifting	(0.5, 1, 2, 4) kV (0.5, 1, 2, 4) kV (0.5, 1, 2, 4) kV (0.5, 1, 2, 4) kV 10 A to 2 kA 10 A to 2 kA 10 A to 2 kA 10 A to 2 kA 10 µs	2.4 % 2.3 % 2.3 % 2.3 % 2.5 % 2.3 % 2.3 % 2.3 % 10 µs	EN 61000-4-5:2014, IEC 61000-4-5:2014 with DSO6102A oscilloscope
EM Clamp or Current Probe – Insertion Loss	100 kHz to 230 MHz	1.4 dB	IEC 61000-4-6:2013, EN 61000-4-6:2014 HP 4396A with 85046A, 4395A with 87512A
50 Ω Termination – Impedance	9 kHz to 1.8 GHz	0.75 %	HP 4396A & Agilent 85046A & Agilent 85032B Type N calibration kit
Magnetic Field Strength Meter – Magnetic Field Strength	50 Hz, 60 Hz	0.28 %	IEC 61000-4-8:2009, EN 61000-4-8:2010, IEC 61786:1998 5.2.1.a (JIS C 1910:2004), Yokogawa 2558 and standard coil
Reflection Coefficient ³	30 kHz to 3 GHz (3 to 18) GHz	1.6 % 1.3 %	HP 8753D & Agilent 85032B Type N calibration kit Agilent 11692D & Agilent 773D

Parameter/Equipment	Range	CMC ² (±)	Comments
CISPR Pulse Generator ⁶ –			
Impulse Area	Band A Band B Band C and D	47 nVsec 1.1 nVsec 0.18 nVsec	HP 54750A with HP 54753A (uncertainty based on Schwarzbeck IGUU 2916)
Impulse Bandwidth	Band A Band B Band C and D	3.7 ns 0.015 ns 0.020 ns	Agilent E4446A (uncertainty based on Schwarzbeck IGUU 2916)
Null Point Frequency	Band A Band B Band C and D	0.046 MHz 3.5 MHz 41 MHz	Agilent E4446A (uncertainty based on Schwarzbeck IGUU 2916)
Flatness of Spectrum Amplitude	Band A Band B Band C and D	0.45 dB 0.45 dB 0.57 dB	Agilent E4446A (uncertainty based on Schwarzbeck IGUU 2916)
Pulse Repetition Frequency	Band A Band B Band C and D	0.00050 Hz 0.00090 Hz 0.00075 Hz	Agilent 53132A + Symmetricom 8040 (uncertainty based on Schwarzbeck IGUU 2916)
Source Errors for Sinewave Output for CISPR Checks (@ 60 dB μ V)	(1, 10, and 100) MHz	0.11 dB	Agilent E4418A w/ Agilent E4412A (uncertainty based on Schwarzbeck IGUU 2916)

Parameter/Equipment	Range	CMC ² (±)	Comments
EMI Receiver ⁴ –			
Input Impedance	Band A Band B Band C Band D Band E	0.75 dB 0.75 dB 1.2 dB 1.2 dB 1.3 dB	CISPR16-1-1:2010, CISPR16-1-1 +A1:2010, CISPR16-4-2:2011, ANSI C63.2:1996, HP 4396A & Agilent 85032B Type N calibration kit, Agilent 11692D & Agilent 773D
Pulse Response	Band A Band B Band C Band D	1.4 dB 1.4 dB 1.4 dB 1.4 dB	Schwarzbeck IGUU2916
Relative Pulse Response	Band A Band B Band C Band D	0.95 dB 0.95 dB 0.97 dB 0.97 dB	
Sine-Wave Accuracy	Band A Band B Band C Band D Band E	0.67 dB 0.67 dB 0.67 dB 0.67 dB 0.72 dB	R&S SMY02 w/ HP 437B & HP 8482A E8257D (option 540.1E1)
Selectivity, 6 dB Bandwidth	Band A Band B Band C Band D Band E	2.0 Hz 0.11 kHz 0.22 kHz 0.22 kHz 2.9 kHz	R&S SMY02 E8257D option 540.1E1
Intermediate Frequency Rejection Ratio	Band A Band B Band C Band D Band E	0.96 dB 0.96 dB 1.2 dB 1.2 dB 1.9 dB	R&S SMY02 & Wiltron 68037B E8257D option 540.1E1
Image Frequency Rejection Ratio	Band A Band B Band C Band D Band E	0.87 dB 0.87 dB 0.87 dB 0.87 dB 1.9 dB	R&S SMY02 E8257D option 540.1E1

Parameter/Equipment	Range	CMC ^{2,3} (±)	Comments
EMI Receiver ⁴ – (cont)			
Spurious Frequency Rejection Ratio	Band A	1.8 dB	R&S SMY02 E8257D option 540.1E1
	Band B	1.8 dB	
	Band C	1.3 dB	
	Band D	1.3 dB	
	Band E	1.9 dB	
Peak Detector Verification	Band A	1.2 dB	Schwarzbeck IGUU2916
	Band B	1.2 dB	
	Band C	1.2 dB	
	Band D	1.2 dB	
Average Detector Verification	Band A	1.2 dB	
	Band B	1.2 dB	
	Band C	1.2 dB	
	Band D	1.2 dB	
RMS Detector Verification	Band A	1.2 dB	
	Band B	1.2 dB	
	Band C	1.2 dB	
	Band D	1.2 dB	
Response to Intermittent, Unsteady & Drifting Narrowband Disturbances	Band A	0.64 dB	R&S SMY02
	Band B	0.64 dB	
	Band C	0.72 dB	
	Band D	0.72 dB	
Impulse Bandwidth Measurement (EMI Receiver & Spectrum Analyzer)	1 MHz < 1 MHz resolution bandwidth	3.1 kHz	Agilent 81101A
Input Impedance on CISPR Band E	(1to 18) GHz	2.1 dB	Network analyzer N5230A CISPR 16-1-1:2006

Parameter/ Range	Frequency	CMC ^{2,4,5} (±)	Comments
Signal Generator –			
Frequency Accuracy	9 kHz to 1 GHz	0.59 x10 ⁻⁷ %	Agilent 53132A + Symmetricom 8040
	(1 to 18) GHz	1.0 x10 ⁻⁸ %	Agilent 53152A + Symmetricom 8040
	(18 to 40) GHz	7.8 x10 ⁻⁹ %	Agilent 53152A + Symmetricom 8040
Reference Frequency Accuracy	10 MHz	7.9 x10 ⁻⁹ %	Agilent 53132A + Symmetricom 8040
Level Accuracy	9 kHz to 1 GHz	0.84 dB	Agilent E4417A w/ E9304A
	(1 to 18) GHz	0.50 dB	HP 437B w/ HP 8481A
(≥-30 dBm)	(18 to 40) GHz	1.1 dB	Agilent E4417A w/ 8487A
(<-30 dBm)	(18 to 40) GHz	1.4 dB	Agilent E4446A
AM Depth	(1 to 100) %	1.9 %	Agilent E4446A
Attenuator Setting Accuracy	9 kHz to 1 GHz	1.9 dB	Agilent E4446A
	(1 to 18) GHz	1.6 dB	
	(18 to 40) GHz	1.9 dB	
Harmonic Distortion	9 kHz to 1 GHz	1.7 dB	Agilent E4446A
	(1 to 18) GHz	1.9 dB	
	(18 to 40) GHz	3.0 dB	
Insertion Loss			
(0 to 80) dB	9kHz to 500 MHz	0.48 dB	HP 4395A, 87512A
(0 to 130) dB	30 kHz to 3 GHz	0.67 dB	HP 8753D, Agilent 4396A 85032B (assuming no mismatch at input & output of EUT)
	(3 to 18) GHz	0.060 dB	Power sensor E4412A + power meter E4418A
	(18 to 40) GHz	2.3 dB	Power sensor 8487A + power meter E4417A

Parameter/Equipment	Frequency	CMC ^{2,3,5} (±)	Comments
Spectrum Analyzer –			
10 MHz Output Frequency Accuracy	10 MHz	0.10 Hz 0.10 Hz	Agilent E7405A Agilent E4446A
10 MHz Reference Frequency Accuracy	10 MHz	0.10 Hz	Agilent E7405A
Marker Readout Accuracy	DC to 26.5 GHz DC to 40 GHz	0.20 % 0.50 %	Agilent E7405A Agilent E4446A
Frequency Span Accuracy	DC to 26.5 GHz DC to 40 GHz	0.47 % 0.70 %	Agilent E7405A Agilent E4446A
Frequency Readout Accuracy	DC to 40 GHz	1.2 %	Agilent E4446A
Noise Sidebands	DC to 26.5 GHz DC to 40 GHz	0.20 dB/Hz 1.0 dB/Hz	Agilent E7405A Agilent E4446A
Spurious Responses	DC to 40 GHz	2.3 dB	Agilent E4446A
Residual FM	DC to 26.5 GHz DC to 40 GHz	0.70 dB 0.80 dB	Agilent E7405A Agilent E4446A
Display Scale Fidelity	DC to 26.5 GHz DC to 40 GHz	0.57 dB 0.12 dB	Agilent E7405A Agilent E4446A
Input Attenuation Switching Uncertainty	DC to 26.5 GHz DC to 40 GHz	0.61 dB 0.41 dB	Agilent E7405A Agilent E4446A
Reference Level Accuracy	DC to 26.5 GHz DC to 40 GHz	0.92 dB 0.10 dB	Agilent E7405A Agilent E4446A
Resolution Bandwidth Switching Uncertainty	DC to 26.5 GHz	0.14 dB	Agilent E7405A
Absolute Amplitude Accuracy	DC to 26.5 GHz DC to 40 GHz	1.0 dB 0.31 dB	Agilent E7405A Agilent E4446A
Resolution Bandwidth Accuracy	DC to 26.5 GHz DC to 40 GHz	0.40 dB 1.0 dB	Agilent E7405A Agilent E4446A

Parameter/Equipment	Frequency	CMC ^{2,5} (±)	Comments
Spectrum Analyzer – (cont)			
Residual Response	DC to 26.5 GHz	0.40 dB	Agilent E7405A
	DC to 40 GHz	0.26 dB	Agilent E4446A
Displayed Average Noise Level	DC to 26.5 GHz	0.26 dB	Agilent E7405A
	DC to 40 GHz	4.4 dB	Agilent E4446A
Frequency Response/Flatness	DC to 26.5 GHz	0.52 dB	Agilent E7405A
	DC to 40 GHz	1.1 dB	Agilent E4446A
Tracking Generator Level Flatness	DC to 26.5 GHz	0.50 dB	Agilent E7405A
	DC to 40 GHz	0.10 dB	Agilent E4446A
Overall Absolute Amplitude Accuracy	DC to 26.5 GHz	1.1 dB	Agilent E7405A
	DC to 40 GHz	0.31 dB	Agilent E4446A
Digital Multimeter –			
AC Voltage	1 mV to 1200 V	0.27 %	Yokogawa 255800-1/B
DC Voltage	12 mV to 1200 V	0.084 %	Yokogawa 256042-1/B
AC Current	1 mA to 60 A	0.22 %	Yokogawa 255800-1/B
DC Current	DC 12 µA to 36 A	0.27 %	Yokogawa 256042-1/B
Resistance	(0.1 to 1111.21) Ω	0.52 %	Yokogawa 279301
	0 Ω	1.0 %	Yokogawa 279301
	(1 kΩ to 111.11 M Ω)	0.23 %	Yokogawa 279303
Frequency	0.1 Hz to 2 MHz	0.023 %	NF 1915

Parameter/Equipment	Frequency	CMC ^{2,5} (±)	Comments
Oscilloscope –			
DC Output	DC	0.020 %	Agilent 34401A
AC Output	DC to 2 GHz	0.028 %	Agilent 34401A
Time Interval Accuracy	DC to 2 GHz	0.23 %	Rohde & Schwarz SMY02
Input Impedance	DC to 2 GHz	0.45 %	Agilent 34401A
DC Voltage Measurement Accuracy	DC	1.3 %	Agilent 34401A Yokogawa 256042-1/B
Bandwidth	DC to 2 GHz	0.31 dB	Rohde & Schwarz SMY02, Power sensor E9304A + power meter E4417A
Trigger Sensitivity	DC to 2 GHz	1.6 %	Rohde & Schwarz SMY02
Zero Error	DC to 2 GHz	7.0 %	
Offset Gain	DC to 2 GHz	0.12 %	Agilent 34401A
DC Gain	DC	0.12 %	
Click Generator –			
QP Amplitude	150 kHz to 30 MHz	2.1 dB	Agilent DSO80204B
Click Duration	150 kHz to 30 MHz	1.1 %	
Click Analyzer –			
QP Amplitude	150 kHz to 30 MHz	4.5 dB	MEB TSG-1
Click Duration	150 kHz to 30 MHz	2.5 %	

Parameter/Equipment	Frequency	CMC ^{2,5} (±)	Comments
S-Parameter Test Set – Directivity Switch Repeatability	9 kHz to 6 GHz	0.58 dB 1.2 dB	
GTEM-Cell – V.S.W.R Frequency Response in GTEM-Cell Frequency Response of Field Probe Amplitude Linearity of Field Probe	9 kHz to 6 GHz 9 kHz to 6 GHz 9 kHz to 3 GHz 9 kHz to 3 GHz	1.6 dB 3.1 dB 0.85 dB 1.2 dB	IEC 61000-4-3 IEC 61000-4-3 IEEE 1309 IEEE 1309
Pre Amplifier – Gain Linearity	10 MHz to 18 GHz (18 to 40) GHz 10 MHz to 18 GHz (18 to 40) GHz	1.7 dB 2.9 dB 2.5 dB 2.9 dB	Network analyzer N5230A Network analyzer N5230A

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Power Amplifier –			
Gain	10 MHz to 18 GHz	2.3 dB	With N5230A
Linearity	10 MHz to 18 GHz	2.3 dB	
Network Analyzer –			
Frequency Accuracy	9 kHz to 6 GHz	0.013 x 10 ⁻⁶	
Level Accuracy	9 kHz to 6 GHz	0.25 dB	
Level Flatness	9 kHz to 6 GHz	0.25 dB	
Power Linearity	9 kHz to 6 GHz	0.56 dB	
Harmonics	9 kHz to 6 GHz	0.43 dB	
Noise Level / Input Cross Talk	9 kHz to 6 GHz	2.0 dB	
Input Impedance	9 kHz to 6 GHz	1.2 dB	
Absolute Amplitude Accuracy	9 kHz to 6 GHz	0.46 dB	
Dynamic Accuracy –			
Magnitude Ratio	9 kHz to 6 GHz	0.50 dB	
Phase	9 kHz to 6 GHz	3.9 deg	
Coaxial Cable –			
Cable Loss	9 kHz to 10 MHz	0.48 dB	4395A, 87512A
	10 MHz to 18 GHz	1.7 dB	Network analyzer N5230A
	(18 to 40) GHz	2.9 dB	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Attenuator – Attenuation V.S.W.R	9 kHz to 10 MHz 10 MHz to 18 GHz (18 to 40) GHz (10 to 18) GHz	0.48 dB 1.7 dB 2.9 dB 1.8 dB	4395A, 87512A Network analyzer N5230A
ESD Simulator – Rise Time / Fall Time Peak Current, Current at 30/60 ns	(0.5 to 1.2) ns ±(1 to 15) kV	0.031 ns 2.4 %	IEC 61000-4-2:2008 ISO 10605
DIP/Interruption Simulator – Output Voltage – (0 to 500) V _(rms) Repetition Time – 10 s Event Time – (0 to 500) ms Phase Shifting – (0 to 360)° Rising Time/Falling Time – (1 to 5) μs Overshoot and Under Shoot Voltage – Less than 5 % of Rated Voltage (Ut)	DC to 400 Hz DC to 400 Hz DC to 400 Hz DC to 400 Hz DC to 400 Hz	0.61 % 0.39 % 0.91 % 0.29 deg 2.9 % 3.0 %	IEC 61000-4-11:2004
Capacitive Clamp – Peak Voltage Rise time Pulse Duration	2 kV(set voltage) 5 ns 50ns	3.9 % 5.8 % 1.2 %	IEC 61000-4-4:2012

Parameter/Equipment	Frequency	CMC ^{2,5} (±)	Comments
Anechoic Chamber – Field Uniformity	(26 to 80) MHz (80 to 200) MHz 200 MHz to 1 GHz (1 to 2.7) GHz	1.2 dB 1.4 dB 1.5 dB 2.2 dB	IEC 61000-4-3:2010
AC Power Source – Frequency Accuracy Voltage Accuracy Distortion In-Rush Current Supplying Capacity	DC to 800 Hz (1 to 700) V 20 Hz to 20 kHz 10 kVA (par Phase) 10 kVA	0.26 % 0.47 % 3.6 % 0.83 % 2.1 %	HP 34401A
DC Power Source – Output Voltage Accuracy Voltage Drop Noise Level Output Current Accuracy	1 mV to 1000 V DC DC 100 µA to 3A	0.26 % 0.70 % 6.4 % 0.23 %	HP 34401A HP 3458A
Audio Generator / Function Generator– Frequency Accuracy Sine Wave Amplitude Accuracy Sine Wave Distortion Sine Wave Rise/Fall Time Square and Triangle Form Wave Voltage Accuracy Duty Cycle	1 Hz to 2 MHz 3 Hz to 300 kHz 20 Hz to 20 kHz DC to 2 MHz DC to 2 MHz DC to 2 MHz	0.023 % 0.50 % 3.5 % 0.91 ns 3.0 % 0.30 %	53152A, 53132A HP 3458A, E9304A,+E4417A Panasonic VP-7727D DSO6102A HP 3458A DSO6102A

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Open Area Test Site – Site Attenuation	(30 to 300) MHz 300 MHz to 1 GHz	1.6 dB 1.5 dB	ANSI C63.5:2006
Site V.S.W.R.	(1 to 18) GHz	2.5 dB	CISPR 16-1-4
Current Probe – Transfer Impedance	100 kHz to 230 MHz 0.1 MHz to 1 GHz (1.0 to 2.1) GHz	0.40 dB 1.2 dB 1.9 dB	CISPR 16-1-2:2014 CISPR 16-1-2:2014 CISPR 16-1-2:2014
Television Analyzer – Field Strength	300 MHz to 1 GHz	1.4 dB	
ESD Target – Flatness of Measurement Chain, 30 kHz to 4GHz Input Resistance	30 kHz to 3 GHz 10 MHz to 4 GHz DC	1.2 dB 1.7 dB 1.9 %	IEC 61000-4-2:2008, ISO 10605:2008, 8753D N5230A
Directional Couplers – Coupling Factor Insertion loss V.S.W.R. Directivity	9 kHz to 1 GHz (1 to 18) GHz (18 to 40) GHz 9 kHz to 1 GHz (1 to 18) GHz (18 to 40) GHz 9 kHz to 1 GHz (1 to 18) GHz 9 kHz to 1 GHz (1 to 18) GHz (18 to 40) GHz	1.4 dB 1.8 dB 3.0 dB 1.3 dB 1.7 dB 2.9 dB 0.55 dB 1.8 dB 1.3 dB 1.9 dB 3.2 dB	4395A, 8753D, N5230A

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Coil – Magnetic Field Level	(40 to 800) Hz	0.41 %	Yokogawa 2558 EMCO HI-3624A
Power Sensor – V.S.W.R.	DC to 3 GHz (3 to 18) GHz	0.85 % 1.3 %	HP 8753D, Agilent E8257D, Agilent E4418A + Agilent E4412A, Agilent 11692D
Insertion Loss on Passage Typed Power Sensor	9 kHz to 1 GHz	0.47 dB	
	(1 to 18) GHz	1.7 dB	
Level Accuracy			
-60 dBm to 0 dBm	9 kHz to 10 MHz	4.7 %	
-70 dBm to 0 dBm	10 MHz to 4 GHz	5.1 %	
	(4 to 6) GHz (6 to 18) GHz	5.7 % 6.8 %	
-30 dBm to 0 dBm	(18 to 26.5) GHz	6.3 %	
	(26.5 to 40) GHz	12 %	
-70 dBm to -30 dBm	(18 to 26.5) GHz	6.6 %	
	(26.5 to 40) GHz	18 %	
Calibration Factor	9 kHz to 4 GHz	3.7 %	
	(4 to 6) GHz	5.0 %	
	(6 to 18) GHz	5.8 %	
	(18 to 26.5) GHz	8.9 %	
	(26.5 to 40) GHz	11 %	
Power Meter –			
Zero Carryover	50 MHz	0.34 %	
Instrument Accuracy	50 MHz	0.34 %	
Reference Power	50 MHz	0.59 %	

¹ This laboratory offers commercial calibration service and field 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 For Reflection Coefficient calibrations, CMCs are based on a 1 port device measurement.

⁴ For the calibrations noted, CMCs are based on R&S ESHS10 and R&S ESVS10.

⁵ In the statement of CMC, the value is defined as the percentage of reading unless otherwise noted.

⁶ For CISPR Pulse Generator calibrations, CMCs are based on Schwarzbeck IGUU 2916.



Accredited Laboratory

A2LA has accredited

JEL LIMITED

Abiko-City, Chiba-Prefecture, Japan

for technical competence in the field of

Calibration

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 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 8 January 2009).



Presented this 2nd day of March 2016.

A handwritten signature in blue ink, appearing to read "J. C. Burt".

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 0952.04
Valid to August 31, 2017

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