



CALIBRATION LABORATORIES

NVLAP LAB CODE 600125-0

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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When international, national, or commercial / engineering – society methods or standards are cited, such references apply only to the specific equipment, parameters and conditions listed in this scope of accreditation, and do not imply compliance to other requirements that may appear within the cited documents.

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY			
AC RESISTORS and CURRENT (20/E02)			
AC Current – Measure 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz	50 µA to 50 A	0.70 % 0.70 % 0.70 %	
Harmonics, Inter-Harmonics 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz	50 µA to 50 A	0.70 % 0.70 % 0.70 %	IEC 61000-4-7
Reference Impedance Network AC (50 Hz)	0.01 Ω to 1 Ω	0.69 %	IEC 61000-3-3
In-Rush Current	1A to 1000 A	3.3 %	IEC 61000-4-11
DC RESISTANCE and CURRENT (20/E05)			
DC Current - Measure	50 µA to 50 A	0.70 %	

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DC Resistance - Measure	1 Ω to 100 MΩ	0.059 %	IEC 61000-3-3 JIS C 61000-3-2 IEC 61000-4-5 IEC 61000-4-4	
Reference Impedance Network DC Resistance	0.03 Ω to 3 Ω	0.78 %		
Surge Generator Field calibrations available ^{Note 4} Impedance	1 Ω to 50 Ω	6.4 %		
Short Circuit Output Undershoot	0 % to 100 %	4.3 %		
Peak Current	1 A to 6 kA	4.2 %		
Short Circuit CDN Current Undershoot	0 % to 100 %	4.5 %		
Peak Current	1 A to 6 kA	4.2 %		
Test Load (50 Ω and 1 kΩ) Resistance	50 Ω and 1 kΩ	0.0014 %		
DC VOLTAGE (20/E06)				
DC Voltage Measure	1 mV to 1000 V 1 kV to 30 kV	0.0099 % 0.76 %		IEC 61000-4-5
Surge Generator Field calibrations available ^{Note 4} Open Circuit Output Undershoot	0 % to 100 %	3.5 %		
Peak Voltage	100 V to 7 kV	4.1 %		
Open Circuit Voltage of CDN Undershoot	0 % to 100 %	3.6 %		
Peak Voltage	100 V to 7 kV	4.0 %		
Residual Surge Voltage	1 V to 7 kV	5.0 %		
Oscilloscopes – DC Measure	10 mV to 650 V	0.0099 %		

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Electrical Fast Transient Burst Generator Field calibrations available ^{Note 4} Waveform Characteristics Output Voltage Peak Value	100 V to 5 kV	3.8 %	IEC 61000-4-4 50 Ω or 1000 Ω Load
Coupling/decoupling network for AC/DC mains supply port Peak Voltage Residual Test Voltage	100 V to 5 kV 1 V to 5 kV	3.8 % 4.3 %	
Capacitive Coupling Clamp Peak Voltage	100 V to 5 kV	3.5 %	
Voltage Dip Generator Field calibrations available ^{Note 4} Voltage at No Load Voltage at 100 Ω Load	0.1 V to 400 V	6.8 % 4.5 %	IEC 61000-4-11
LF AC VOLTAGE (20/E09)			
LF AC Voltage – Measure 3 Hz to 10 Hz 10 Hz to 20 kHz 20 kHz to 300 kHz 50 Hz to 60 Hz	1 mV to 750 V 700 V to 10 kV	1.9 % 0.10 % 1.9 % 3.5 %	
Function Generator 1 Hz to 20 MHz	10 mV to 1 V	3.5 %	
Flicker Analyzer Δ V at P _{st} = 1	0.9 to 1.1	0.14 %	IEC 61000-4-15
Oscilloscope – AC Measure 10 Hz to 1 kHz 1 kHz to 1 GHz 1 GHz to 3 GHz	10 mV to 650 V 10 mV to 1 V	0.11 % 3.1 % 6.9 %	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
LF CAPACITANCE (20/E10)			
Capacitive Coupling Clamp Field calibrations available ^{Note 4}			IEC 61000-4-4
Coupling Capacitance	100 pF to 1000 pF	0.12 %	
1000 Ω Test Load Capacitance	≤ 6 pF	0.12 %	IEC 61000-4-4
LF INDUCTANCE (20/E11)			
Reference Impedance Network Field calibrations available ^{Note 4}			
50 Hz to 60 Hz	0.32 mH to 3.2 mH	0.69 %	JIS C 61000-3-2
LF POWER/ENERGY (20/E12)			
Power, Harmonic Analyzer			IEC 61000-4-7
DC	1 mW to 50 kW	0.70 %	Maximum 1000 V x 50 A
AC			
3 Hz to 40 Hz	1 mW to 38 kW	2.0 %	Maximum 750 V x 50 A
40 Hz to 1 kHz		0.71 %	
1 kHz to 10 kHz		2.0 %	
Electric Energy			
50 Hz to 60 Hz	1 Wh to 38 kWh	0.71 %	
PHASE METERS (20/E15)			
Voltage Dip Generator Field calibrations available ^{Note 4}			IEC 61000-4-11
Phase Angle Accuracy	0° to 360°	2.5 % + 1°	
Power, Harmonic Analyzer			IEC 61000-4-7
Power Factor (PF)	0.5 PF to 1.0 PF	0.0075 PF	50 Hz or 60 Hz Only
TIME and FREQUENCY			
FREQUENCY DISSEMINATION (20/F01)			
Frequency Measure	10 Hz to 300 kHz	1.3 x 10 ⁻⁷ + 0.01 Hz	Using digital multimeter
	0.1 Hz to 18 GHz	5.2 x 10 ⁻⁸ % + 0.1 Hz	Using frequency counter
	18 GHz to 40 GHz	1.2 x 10 ⁻⁸ % + 0.1 Hz	Using frequency counter

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
Impulse Bandwidth Method 1 Method 2 Method 3	BW _{imp} = 1 MHz	4.1 % 4.3 % 4.0 %	CISPR 16-1-1
Spectrum Analyzer, RF Voltmeter Field calibrations available ^{Note 4} Frequency Frequency Span Resolution Bandwidth	10 Hz to 40 GHz 10 kHz to 100 MHz 200 Hz to 5 MHz	1.0 x 10 ⁻⁵ % 1.0 x 10 ⁻⁵ % 2.7 %	
Function Generator Field calibrations available ^{Note 4} Time (Sine Wave) Time (Square Wave)	1 Hz to 20 MHz	0.75 % 0.51 %	
Electrical Fast Transient Burst Generator Field calibrations available ^{Note 4} Repetition Frequency	1 kHz to 1 MHz	1.9 %	IEC 61000-4-4
Surge Generator Field calibrations available ^{Note 4} Phase Shifting	0° to 360°	3.6 % + 1°	IEC 61000-4-5 Measured by Differential Time
Horizontal Axis (Time)	0.1 Hz to 1 GHz 1 GHz to 3 GHz	1.9 % 5.3 %	
OSCILLATOR CHARACTERIZATION (20/F03)			
Signal Generators, RF Generator Field calibrations available ^{Note 4} AM Frequency AM Depth FM Modulation FM Deviation	20 Hz to 100 kHz 1 % to 99 % 20 Hz to 200 kHz 20 Hz to 400 kHz	0.05 % 0.25 % 0.29 % 0.57 %	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
Spurious Responses	10 MHz to 4 GHz	1.6 dB	
PULSE WAVEFORM (20/F04)			
Surge Generator Field calibrations available ^{Note 4}			IEC 61000-4-5
Open Circuit Voltage of Generator			
Front Time	0.1 μ s to 20 μ s	2.9 %	
Time to Half Value	1 μ s to 1 ms	3.7 %	
Short Circuit Output of Generator			
Front Time	0.1 μ s to 20 μ s	4.9 %	
Time to Half Value	1 μ s to 1 ms	2.2 %	
Open Circuit Voltage of CDN			
Front Time	0.1 μ s to 20 μ s	5.3 %	
Time to Half Value	1 μ s to 1 ms	3.3 %	
Short Circuit Current of CDN			
Front Time	0.1 μ s to 20 μ s	4.0 %	
Time to Half Value	1 μ s to 1 ms	3.5 %	
Fast Transient Burst Generator Field calibrations available ^{Note 4}			IEC 61000-4-4
Rise Time	3.0 ns to 10 ns	3.8 %	
Impulse Duration 50 %	6.5 ns to 200 ns	3.6 %	
Burst Duration	0.5 ms to 20 ms	1.9 %	
Burst Period	200 ms to 400 ms	1.9 %	
Coupling/decoupling network			AC/DC mains supply port
Rise Time	3.0 ns to 10 ns	3.9 %	
Impulse Duration 50 %	6.5 ns to 200 ns	2.4 %	
Capacitive Coupling Clamp			
Rise Time	3.0 ns to 10 ns	4.1 %	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
Pulse Width	6.5 ns to 200 ns	4.0 %	IEC 61000-4-11
Voltage Dip Generator Field calibrations available ^{Note 4}			
Rise/Fall Time	0.5 µs to 100 µs	8.2 %	
Overshoot, Undershoot	< 300 V	4.8 %	
Duration Voltage Dips	5 ms to 1000 ms	2.0 %	
Monopole Antenna Field calibrations available ^{Note 4}	20 Hz to 50 MHz	0.72 dB	Capacitance Substitution Method CISPR 16-1-4, ANSI C63.5 SAE ARP958 Revision D
Current Probe, Injection Probe, Transfer Impedance Field calibrations available ^{Note 4}	10 Hz to 20 Hz 20 Hz to 500 MHz 500 MHz to 2.1 GHz	0.89 dB 0.86 dB 2.3 dB	CISPR 16-1-2, ANSI C63.4
RF/MICROWAVE POWER (20/R17)			
CISPR Receiver (50 Ω Nominal) Field calibrations available ^{Note 4}			CISPR 16-1-1
Input Impedance	9 kHz to 6 GHz 6 GHz to 26.5 GHz	1.3 % 1.2 %	
Sine Wave Voltage Accuracy	9 kHz to 4 GHz 4 GHz to 18 GHz 18 GHz to 40 GHz	0.39 dB 1.3 dB 2.3 dB	
Overall Selectivity	9 kHz to 4GHz	1.3 dB	
Amplitude (absolute)	9 kHz to 1 GHz	0.4 dB	
Amplitude (relative)	9 kHz to 1 GHz	0.35 dB	
Spectrum Analyzer, RF Voltmeter Field calibrations available ^{Note 4}			
Frequency Response	10 Hz to 1 GHz 1 GHz to 18 GHz	0.40 dB 0.56 dB	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
Reference Level	18 GHz to 40 GHz	1.0 dB	
Input Attenuator	40 dB μ V to 100 dB μ V	0.23 dB	
Signal Generators, RF Generator			
Field calibrations available ^{Note 4}			
Frequency Response	0 dB to 60 dB	0.33 dB	
	9 kHz to 1 GHz	0.07 dB	
	1 GHz to 18 GHz	0.27 dB	
	18 GHz to 40 GHz	0.78 dB	
Spurious Harmonics	9 kHz to 1 GHz	0.69 dB	
	1 GHz to 6 GHz	0.97 dB	
Power Meter			
Termination Type	9 kHz to 1 GHz	1.5 %	
	1 GHz to 18 GHz	1.8 %	
	18 GHz to 40 GHz	6.9 %	
Through Line Type	9 kHz to 6 GHz	3.3 %	
Reference & Other Signal Sources	10 MHz to 18 GHz	0.08 dB	
Disturbance / Click Analyzer Amplitude	60 dB μ V to 120 dB μ V	0.56 dB	
Oscilloscope - Frequency Response	10 Hz to 1 GHz	0.28 dB	
	1 GHz to 3 GHz	0.62 dB	
SCATTERING PARAMETERS (20/R18)			
VSWR (1 to 2)	10 Hz to 1 GHz	0.41 %	Gamma, Impedance, and Return Loss measurements also available
	1 GHz to 6 GHz	1.3 %	
	6 GHz to 26.5 GHz	1.2 %	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
CDNs, CDNE Field calibrations available ^{Note 4}			CISPR 16-1-2, IEC 61000-4-6, CISPR 20
Insertion Loss (0 dB to 50 dB)	9 kHz to 80 MHz	0.50 dB	
	80 MHz to 300 MHz	0.48 dB	
Voltage Division Factor	9 kHz to 30 MHz	0.50 dB	
	30 MHz to 300 MHz	0.48 dB	
Isolation	9 kHz to 30 MHz	0.52 dB	
	30 MHz to 300 MHz	1.1 dB	
Phase	9 kHz to 80 MHz	1.4 %	
	80 MHz to 300 MHz	1.4 %	
Impedance (Nominal 150 Ω)	9 kHz to 80 MHz	1.9 %	
	80 MHz to 300 MHz	1.8 %	
150 Ω Adapter Field calibrations available ^{Note 4}			CISPR 16-1-2, IEC 61000-4-6
Insertion Loss	9 kHz to 80 MHz	0.54 dB	
	80 MHz to 300 MHz	0.48 dB	
Impedance	9 kHz to 80 MHz	0.66 %	
	80 MHz to 300 MHz	6.0 %	
Voltage Probe Field calibrations available ^{Note 4}			CISPR 16-1-2
Insertion Loss, VDF	9 kHz to 30 MHz	0.49 dB	
Impedance	9 kHz to 30 MHz	3.4 %	
Current Probe, Injection Probe Field calibrations available ^{Note 4}			CISPR 16-1-2
Insertion Impedance	10 Hz to 500 MHz	1.7 %	
Capacitive Voltage Probe Field calibrations available ^{Note 4}			CISPR 16-1-2
Insertion Loss, VDF	9 kHz to 30 MHz	0.56 dB	

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Measured Parameter or Device Calibrated	Range	Expanded Uncertainty ^{Note 3,5}	Remarks
Insertion Loss with Influence of External Electric Field	9 kHz to 30 MHz	1.9 dB	CISPR 16-1-2
ISNs Field calibrations available ^{Note 4}			
Asymmetric Impedance	9 kHz to 80 MHz	2.2 %	
Asymmetric Impedance Phase		0.44 %	
LCL ≤ 55 dB		0.43 dB	
LCL ≤ 65 dB		0.63 dB	
LCL ≤ 75 dB		2.3 dB	
Decoupling Attenuation		1.2 dB	
Symmetric Insertion Loss		0.07 dB	
Voltage Division Factor		0.12 dB	
Symmetric Impedance		2.2 %	IEC 61000-4-6
EM, Injection Clamp Field calibrations available ^{Note 4}			
Coupling Factor	9 kHz to 100 kHz	0.56 dB	
	100 kHz to 230 MHz	0.53 dB	
	230 MHz to 1 GHz	1.3 dB	
Decoupling Factor	9 kHz to 100 kHz	0.50 dB	
	100 kHz to 230 MHz	0.52 dB	
	230 MHz to 1 GHz	1.3 dB	
Impedance	9 kHz to 100 kHz	2.8 %	
	100 kHz to 230 MHz	13.6 %	
	230 MHz to 1 GHz	16.9 %	

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Directional Coupler Field calibrations available ^{Note 4} Insertion Loss, Coupling Factor, Directivity, Isolation (0 dB to 100 dB)	10 kHz to 1 GHz	0.12 dB	
	1 GHz to 40 GHz	0.20 dB	
CISPR Receiver 50 Ω Input Field calibrations available ^{Note 4} Random Noise	9 kHz to 4 GHz	0.31 dB	CISPR 16-1-1
Response to Intermittent, unsteady and Drifting narrowband disturbances	9 kHz to 1 GHz	0.84 dB	
LISNs Field calibrations available ^{Note 4} Insertion Loss (0 dB to 50 dB)	9 kHz to 30 MHz 30 MHz to 200 MHz	0.20 dB 0.44 dB	CISPR 16-1-2, ANSI C63.4, CISPR 25, ISO 7637-2, IEC 61000-4-6 and RTCA/DO-160F
Isolation (0 dB to 100 dB) (Balance of Delta Network)	9 kHz to 30 MHz 30 MHz to 200 MHz	0.50 dB 1.4 dB	
Impedance	9 kHz to 30 MHz 30 MHz to 200 MHz	1.4 % 6.6 %	
Phase	9 kHz to 30 MHz 30 MHz to 200 MHz	0.94° 5.6°	
Voltage Drop Ratio	50 Hz, 60 Hz	0.30 %	
Frequency Response Gain Field calibrations available ^{Note 4}	10 Hz to 10 kHz 10 kHz to 1 GHz 1 GHz to 40 GHz	0.48 dB 0.33 dB 0.42 dB	
Frequency Response Insertion Loss	10 Hz to 10 kHz	0.27 dB	

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Field calibrations available ^{Note 4}	10 kHz to 1 GHz 1 GHz to 40 GHz 40 GHz to 67 GHz	0.12 dB 0.20 dB 0.24 dB	IEC 61000-4-4
Test Load (50 Ω and 1000 Ω) Insertion Loss (0 dB to 70 dB)	10 kHz to 500 MHz	0.12 dB	
END			

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Notes

Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable.

Note 2: Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

Note 3: The uncertainty associated with a measurement in a CMC is an expanded uncertainty with a level of confidence of approximately 95 %, typically using a coverage factor of $k = 2$. However, laboratories may report a coverage factor different than $k = 2$ to achieve the 95 % level of confidence. Units for the measurand and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg).

Note 3a: The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use.

Note 3b: As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC.

Note 3c: As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions*. However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.1.h. of NIST Handbook 150, Procedures and General Requirements.

Note 4: Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

Note 5: Values listed with percent (%) are percent of reading or generated value unless otherwise noted.

Note 6: NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.

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