CALIBRATION LABORATORIES **NVLAP LAB CODE 200625-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Scantek, Inc. Calibration Laboratory	**Fields of Calibration**
6430 Dobbin Road, Suite C Columbia, MD 21045 Lydon Dawkins Phone: 410-384-4257 E-mail: l.dawkins@scantekinc.com URL: http://www.scantekinc.com	Electromagnetics – DC/Low Frequency Time and Frequency Mechanical This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (20/A01)

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	**Range**	**Expanded Uncertainty** Note 3,5,8	**Remarks**
ELECTROMAGNETICS – DC/LOW FREQUENCY			
DC VOLTAGE (20/E06)			
DC Voltage	1 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.0055 % + 0.0036 mV 0.0055 % + 0.007 mV 0.0055 % + 0.05 mV 0.0055 % + 0.6 mV 0.0055 % + 0.01 V	Agilent 34401A

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Frequency Range	Expanded Uncertainty [Note 3,5,8]	Remarks
LF AC VOLTAGE (20/E09)				
AC Voltage – Generate				Stanford Research
Sine, Square, two-tone	10 μV_{pp} to 40 V_{pp}	0.001 Hz to 200 kHz	1.1 %	(SR) DS360
Sine or square bursts	10 μV_{pp} to 40 V_{pp}	0.001 Hz to 200 kHz	1.1 %	SR DS360
AC Voltage Transfer – Measuring equipment:				
Measure	1 mV to 100 mV	10 Hz to 50 kHz 50 kHz to 200 kHz	0.001 % + 2 µV 0.001 % + 5 µV	Agilent 34401A
	100 mV to 1 V	10 Hz to 50 kHz 50 kHz to 200 kHz	0.001 % + 20 µV 0.001 % + 50 µV	
	1V to 10 V	10 Hz to 50 kHz 50 kHz to 200 kHz	0.001 % + 0.2 mV 0.001 % + 0.5 mV	
	10 V to 100 V	10 Hz to 50 kHz 50 kHz to 200 kHz	0.001 % + 2 mV 0.001 % + 5 mV	
	100 V to 750 V	10 Hz to 50 kHz 50 kHz to 200 kHz	0.001 % + 15 mV 0.001 % + 38 mV	
AC Voltage: True RMS	50 µV to 1 mV	20 Hz to 20 kHz 3 Hz to 100 kHz	2.8 % 4.7 %	N-1504A System
	1 mV to 100 mV	3 Hz to 5 Hz 5 Hz to 10 Hz	1.0 % + 0.04 mV 0.36 % + 0.04 mV	Agilent 34401A

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Measured Parameter or Device Calibrated	Range	Frequency Range	Expanded Uncertainty Note 3,5,8	Remarks
		10 Hz to 20 kHz	0.12 % + 0.04 mV	
		20 kHz to 50 kHz	0.16 % + 0.05 mV	
		50 kHz to 100 kHz	0.62 % + 0.08 mV	
		100 kHz to 300 kHz	4.0 % + 0.50 mV	
	100 mV to 1 V	3 Hz to 5 Hz	1.0 % + 30 mV	
		5 Hz to 10 Hz	0.36 % + 30 mV	
		10 Hz to 20 kHz	0.12 % + 30 mV	
		20 kHz to 50 kHz	0.16 % + 50 mV	
		50 kHz to 100 kHz	0.62 % + 80 mV	
		100 kHz to 300 kHz	4.0 % + 0.5 V	
	1 V to 10 V	3 Hz to 5 Hz	1.0 % + 30 mV	
		5 Hz to 10 Hz	0.36 % + 30 mV	
		10 Hz to 20 kHz	0.12 % + 30 mV	
		20 kHz to 50 kHz	0.16 % + 50 mV	
		50 kHz to 100 kHz	0.62 % + 80 mV	
		100 kHz to 300 kHz	4.0 % + 0.5 V	
	10 V to 100 V	3 Hz to 5 Hz	1.0 % + 30 mV	
		5 Hz to 10 Hz	0.36 % + 30 mV	
		10 Hz to 20 kHz	0.12 % + 30 mV	
		20 kHz to 50 kHz	0.16 % + 50 mV	
		50 kHz to 100 kHz	0.62 % + 80 mV	
		100 kHz to 300 kHz	4.0 % + 0.5 V	
	100 V to 750 V	3 Hz to 5 Hz	1.0 % + 30 mV	
		5 Hz to 10 Hz	0.36 % + 30 mV	
		10 Hz to 20 kHz	0.12 % + 30 mV	
		20 kHz to 50 kHz	0.16 % + 50 mV	
		50 kHz to 100 kHz	0.62 % + 80 mV	
		100 kHz to 300 kHz	4.0 % + 0.5 V	
Self-Generated Noise	1 µV to 10 V	0.1 Hz to 20 kHz	10 %	840 RTA

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Measured Parameter or Device Calibrated	Range	Frequency Range	Expanded Uncertainty Note 3,5,8	Remarks
TIME AND FREQUENCY				
FREQUENCY DISSEMINATION (20/F01)				
Frequency Measure	100 mV to 750 V	3 Hz to 5 Hz 5 Hz to 10 Hz 10 Hz to 40 Hz 40 Hz to 300 kHz	0.1 % 0.06 % 0.04 % 0.01 %	Agilent 34401A
Frequency Generate	10 μV_{pp} to 40 V_{pp}	0.001 Hz to 200 kHz	61 µHz/Hz + 4 mHz	SR DS360
Time intervals	(8 to 30) s		1 s	Chronometer
MECHANICAL				
ACOUSTIC (20/M01)				
Sensitivity or Open Circuit Sensitivity:				
Direct and Comparison Methods	-50 dB to 0 dB -50 dB to 0 dB	250 Hz 1 kHz	0.092 dB 0.094 dB	dB range values
Frequency Response:			Actuator / Free-field and Diffuse Field Response	dB range values relative to 1 V/Pa
Electrostatic Excitation Note 7 (for condenser microphones with removable grid)	-70 dB to 0 dB	31.5 Hz to 100 Hz > 100 Hz to 1.25 kHz > 1.25 kHz to 4 kHz > 4 kHz to 8 kHz > 8 kHz to 10 kHz > 10 kHz to 16 kHz > 16 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	0.20 dB / 0.20 dB 0.14 dB / 0.18 dB 0.14 dB / 0.23 dB 0.17 dB / 0.45 dB 0.38 dB / 0.57 dB 0.38 dB / 0.77 dB 0.59 dB / 0.89 dB 0.8 dB / 2.1 dB 1.1 dB / 4.2 dB	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Expanded Uncertainty Note 3,5,8	Remarks
Acoustical Method Note 7 Microphone Sensitivity			Pressure / Free-field and Diffuse Field Response	dB range values relative to 1 V/Pa
	-70 dB to 0 dB	31.5 Hz	0.13 dB / 0.18 dB	4226 Calibrator
		63 Hz	0.12 dB / 0.18 dB	
		125 Hz	0.12 dB / 0.17 dB	
		250 Hz	0.10 dB / 0.16 dB	1253 Calibrator
		500 Hz	0.12 dB / 0.17 dB	4226 Calibrator
		1 kHz	0.12 dB / 0.17 dB	1253 Calibrator
		2 kHz	0.12 dB / 0.23 dB	4226 Calibrator
		4 kHz	0.12 dB / 0.44 dB	
		8 kHz	0.14 dB / 0.45 dB	
		12.5 kHz	0.14 dB / 0.70 dB	
		16 kHz	0.14 dB / 0.70 dB	
Acoustical Calibrators and Pistonphones				dB range values relative to 20 µPa
Sound Pressure Level	90 dB to 140 dB	250 Hz (± 10 Hz)	ref. conditions	ref. conditions
		1 kHz (± 40 Hz)	ref. conditions	ref. conditions
Sound Level Stability	90 dB to 140 dB	20 Hz to 20 kHz	0.03 dB	1504A

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Measured Parameter or Device Calibrated	Range	Frequency Range	Expanded Uncertainty Note 3,5,8	Remarks
Sound Level Meters, Dosimeters, Real-time and FFT analyzers, Filter Sets Note 7			Pressure / Free-field and Diffuse Field Response	dB range values relative to 20 µPa
Sound Pressure Level: Fixed points, Tones	94 dB, 104 dB, 114 dB	31.5 Hz 63 Hz 125 Hz 250 Hz	0.15 dB / 0.20 dB 0.14 dB / 0.20 dB 0.14 dB / 0.20 dB 0.14 dB / 0.15 dB	4226 Calibrator
	124 dB	250 Hz	0.09 dB / 0.11 dB	1253 Calibrator
	94 dB, 104 dB, 114 dB	500 Hz 1 kHz	0.14 dB / 0.15 dB 0.13 dB / 0.13 dB	4226 Calibrator
	124 dB	1 kHz	0.12 dB / 0.13 dB	1253 Calibrator
	94 dB, 104 dB, 114 dB	2 kHz 4 kHz 8 kHz 12.5 kHz 16 kHz	0.14 dB / 0.20 dB 0.14 dB / 0.25 dB 0.14 dB / 0.45 dB 0.15 dB / 0.70 dB 0.25 dB / 0.75 dB	4226 Calibrator
Sensitivity / Calibration Check	(94 and 114) dB	250 Hz and 1 kHz	0.16 dB	Acoustic Calibrator
Acoustical Signal Tests of Frequency Weighting				
Sound Level – Free Field Response. Excitation: Multi-frequency Calibrator.	(94 to 124) dB	31.5 Hz ≤ f ≤ 4 kHz 4 kHz < f ≤ 8 kHz 8 kHz < f ≤ 12.5 kHz 12.5 kHz < f ≤ 16 kHz 16 kHz < f ≤ 20 kHz	0.3 dB 0.4 dB 0.5 dB 0.8 dB 1.0 dB	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Expanded Uncertainty Note 3,5,8	Remarks
Electrical Test of Frequency Weighting	75 B	A. C. and Z 31.5 Hz to 16 kHz	0.1 dB	
Electrical test of Frequency and Time Weightings	(94 to 104) dB	A. C. Z. F. S. and L. SEL. 1 kHz	0.1 dB	
Long Term Stability	94 dB	A weighted at 1 kHz	0.15 dB	
Level Linearity on Reference Level Range	(75 to 125) dB	A-weighted at 31.5 Hz 1 kHz and 8 kHz	0.15 dB	
Level Linearity with Range Selection	(39 to 130) dB	A-weighted at 31.5 Hz 1 kHz and 8 kHz	0.2 dB	
Toneburst Response	(80 to 120) dB	A-weighted (0.2 to 200) ms	0.2 dB	
C-weighted Peak Response	124 dB	C-weighted 500 Hz to 8 kHz	0.3 dB	
Overload Indication	(0 to 140) dB	A-weighted 4 kHz	0.2 dB	
High Level Stability	(120 to 140) dB	A-weighted 1 kHz	0.1 dB	
Tone Burst Sounds	80 dB to 100 dB	2 kHz	0.15 dB	dB range values relative to 20 µPa 4226 Calibrator
Time Sounds Measuring Equipment – Generate	94 dB 104 dB 114 dB 124 dB	1 kHz 1 kHz 1 kHz 1 kHz	0.01 % dose 0.03 % dose 0.12 % dose 0.26 % dose	

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VIBRATION (20/M11)				
Exciters and Vibration Calibrators				
Acceleration – Measure	0.1 m/s^2 to 110 m/s^2	10 Hz to 100 Hz	1.1 %	
		> 100 Hz to 160 Hz	1.0 %	
		> 160 Hz to 1 kHz	1.1 %	
		> 1 kHz to 5 kHz	1.4 %	
		> 5 kHz to 10 kHz	1.8 %	
Accelerometers				
Sensitivity (Volts)	0.03 $mV/(m/s^2)$ to 5 $V/(m/s^2)$	10 Hz to 20 Hz	1.4 %	Comparison Method
		21 Hz to 99 Hz	1.3 %	
		100 Hz to 160 Hz	1.0 %	
		161 Hz to 1 kHz	1.2 %	
		> 1 kHz to < 5 kHz	1.9 %	
		5 kHz to < 8 kHz	2.7 %	
		8 kHz to 10 kHz	3.1 %	
Sensitivity (Coulombs)	0.03 $pC/(m/s^2)$ to 1 $nC/(m/s^2)$	10 Hz to 20 Hz	1.4 %	Comparison Method
		21 Hz to 99 Hz	1.3 %	
		100 Hz to 160 Hz	1.0 %	
		161 Hz to 1 kHz	1.2 %	
		> 1 kHz to < 5 kHz	1.9 %	
		5 kHz to < 8 kHz	2.7 %	
		8 kHz to 10 kHz	3.1 %	
Velocity Sensors	0.03 $mV/(m/s^2)$ to 5 $V/(m/s^2)$	10 Hz to 20 Hz	1.4 %	Comparison Method
		21 Hz to 99 Hz	1.3 %	
		100 Hz to 160 Hz	1.0 %	
		161 Hz to 1 kHz	1.2 %	
		> 1 kHz to < 5 kHz	1.9 %	
		5 kHz to < 8 kHz	2.7 %	
		8 kHz to 10 kHz	3.1 %	
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.5 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.

Note 7: The Free-field and Diffuse Field Responses characteristics are calculated using the measured actuator/pressure response and the correction coefficients provided by the manufacturer of the tested device.

Note 8: Unless otherwise specified, uncertainties are given at actual conditions.

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