



**CALIBRATION LABORATORIES**

**NVLAP LAB CODE 200566-0**

Scope Revised: 2011-10-05

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005**

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>**

Note: The parameters listed in this scope of accreditation are for the calibration of electrical analyzers used in the biomedical field and do not apply to other devices, with the exception of NVLAP Code 20/I01 Ionizing Radiation Dosimetry.

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) <sup>Note 3</sup>	Remarks
<b>ELECTROMAGNETICS – DC/LOW FREQUENCY</b>				
<b>NVLAP Code: 20/E02</b> <b>AC RESISTORS</b> AC Current Source      AC Current Measure	5 mA to 27.5 mA	60 Hz	0.24 mA	6221 & 8846A
	1 µA to 760 µA	60 Hz or 120 Hz	0.5 % + 0.02 µA	6221
	1 mA to 16 mA	60 Hz or 120 Hz	0.1 % + 0.018 µA	
	1 mA	1 kHz	0.0014 mA	5520A
	1 mA	10 kHz	0.0045 mA	
	0.1 mA to 3.0 mA	60 Hz	0.0015 mA	8846A
	0.1 A to 10 A	60 Hz	0.04 A	8846A & 34330A
	14 A to 15 A	60 Hz	0.002 A	8846A & Calibrated Shunt
	3.5 mA	50Hz or 60 Hz	0.011 mA	8846A
	7.5 mA	50Hz or 60 Hz	0.017 mA	
1 mA	1 kHz	0.0016 mA		
1 mA	10 kHz	0.0016 mA		

2011-10-01 through 2012-09-30

Effective dates

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** <sup>Notes 1,2</sup>

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Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Note 3</sup>	Remarks
<b>NVLAP Code: 20/E05 DC RESISTANCE</b> Fixed Point Resistance Source	0.000 $\Omega$	0.0006 $\Omega$	Calibrated Resistor
	0.050 $\Omega$	0.0020 $\Omega$	
	0.150 $\Omega$	0.0006 $\Omega$	
	1.0 $\Omega$	0.002 $\Omega$	
	0.5 $\Omega$	0.0024 $\Omega$	
	1.800 $\Omega$	0.0024 $\Omega$	
	5.0 $\Omega$	0.0024 $\Omega$	
	10.0 $\Omega$	0.0024 $\Omega$	
	15.0 $\Omega$	0.0024 $\Omega$	
	0.7 M $\Omega$	0.0006 M $\Omega$	
	1.0 M $\Omega$	0.0009 M $\Omega$	
	2.0 M $\Omega$	0.0015 M $\Omega$	
	3.1 M $\Omega$	0.0024 M $\Omega$	
	6.5 M $\Omega$	0.0044 M $\Omega$	
	10.0 M $\Omega$	0.007 M $\Omega$	
	18 M $\Omega$	0.012 M $\Omega$	
	22 M $\Omega$	0.015 M $\Omega$	
	60 M $\Omega$	0.042 M $\Omega$	
	100 M $\Omega$	0.07 M $\Omega$	
	Resistance Measure	25 $\Omega$	0.013 $\Omega$
50 $\Omega$		0.018 $\Omega$	
75 $\Omega$		0.023 $\Omega$	
100 $\Omega$		0.028 $\Omega$	
125 $\Omega$		0.045 $\Omega$	
150 $\Omega$		0.05 $\Omega$	
175 $\Omega$		0.055 $\Omega$	
200 $\Omega$		0.06 $\Omega$	
250 $\Omega$		0.07 $\Omega$	
450 $\Omega$		0.11 $\Omega$	
850 $\Omega$		0.19 $\Omega$	
1 k $\Omega$	0.0001 k $\Omega$		

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Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Note 3</sup>	Remarks
DC Current Source	1.5 k $\Omega$	0.0005 k $\Omega$	5520A
	2 k $\Omega$	0.0003 k $\Omega$	
DC Current Measure	10 $\mu$ A to 500 $\mu$ A	150 $\mu$ A/A + 0.02 $\mu$ A	8846A
	1.0 mA to 7.0 mA	0.0006 mA	
DC Current Measure	0.1 mA to 2.0 mA	0.005 mA	8846A
<b>NVLAP Code: 20/E06</b> <b>DC VOLTAGE</b> DC Voltage Measure	0.07 mV to 5.0 mV	0.002 mV	5520A & 8846A
	> 5 mV to 10.0 mV	0.003 mV	
	0.2 V to 0.7 V	0.05 mV	8846A
	4.0 V to 8.0 V	0.41 mV	
	200 V to 500 V	40 $\mu$ V/V	

**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** <sup>Notes 1,2</sup>

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ( $k=2$ ) <sup>Note 3</sup>	Remarks
<b>NVLAP Code: 20/E09</b> <b>LF AC VOLTAGE</b> AC Voltage Source	0.01 V to 240 V	45 Hz to 65 Hz	75 $\mu$ V/V + 5 $\mu$ V	5520A
	1.0 V	60 Hz, 1 kHz, or 10 kHz	0.65 mV	
	1.0 V	50 kHz	0.72 mV	
AC Voltage Measure	0.1 V to 275 V	50 Hz or 60 Hz	0.06 % + 5 mV	8846A
	0.8839 V	200 Hz	1.7 mV	

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Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Note 3</sup>	Remarks
<b>NVLAP Code: 20/E12 LF POWER/ENERGY</b> LF Power	0.1 J to 360 J	0.16 %	Monophasic Power
<b>TIME &amp; FREQUENCY</b>			
<b>NVLAP Code: 20/F01 FREQUENCY DISSEMINATION</b> Frequency	0.1 Hz to 3.0 Hz 200 Hz	0.001 Hz 0.045 Hz	TDS 2002B
<b>MECHANICAL</b>			
<b>NVLAP Code: 20/M06 FORCE</b> Force	0.1 ozf to 24.0 ozf	0.12 ozf	475040

**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** <sup>Notes 1,2</sup>

Measured Parameter or Device Calibrated	Radiation Type or Beam Code	Range	Uncertainty ( $k=2$ ) <sup>Note 3</sup>	Remarks
<b>IONIZING RADIATION</b>				
<b>NVLAP Code: 20/I01 DOSIMETRY OF X-RAYS, GAMMA RAYS, and ELECTRONS</b> Reference Class Instruments	Gamma			
		Co-60	2.4E-05 Gy/s to 6.1E-03 Gy/s	2.0 %
		Cs-137	9.8E-11 Gy/s to 7.1E-04 Gy/s	2.0 %
	X-Ray			
		L100	1.2E-06 Gy/s to 1.2E-04 Gy/s	1.9 %
		M30	6.1E-07 Gy/s to 3.6E-04 Gy/s	1.9 %
		M50	7.3E-07 Gy/s to 3.4E-04 Gy/s	1.9 %
		M60	7.3E-07 Gy/s to 2.8E-04 Gy/s	1.9 %
		M80	7.3E-07 Gy/s to 5.5E-04 Gy/s	1.9 %
		M100	7.3E-07 Gy/s to 2.7E-04 Gy/s	1.9 %
	M150	9.7E-07 Gy/s to 3.9E-04 Gy/s	1.9 %	

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Measured Parameter or Device Calibrated	Radiation Type or Beam Code	Range	Uncertainty (k=2) <small>Note 3</small>	Remarks
	M200	9.7E-07 Gy/s to 3.9E-04 Gy/s	1.9 %	
	M250	4.9E-07 Gy/s to 3.7E-04 Gy/s	1.9 %	
	H50	9.7E-07 Gy/s to 4.9E-06 Gy/s	1.9 %	
	H60	9.7E-07 Gy/s to 7.3E-06 Gy/s	1.9 %	
	H100	7.3E-07 Gy/s to 9.7E-06 Gy/s	1.9 %	
	H150	4.9E-07 Gy/s to 4.9E-06 Gy/s	1.9 %	
	H200	7.3E-07 Gy/s to 7.3E-06 Gy/s	1.9 %	
	H250	1.2E-06 Gy/s to 7.3E-06 Gy/s	1.9 %	
	Mo/Mo 28	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Mo/Mo 35	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Mo/Mo 28X	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Mo/Rh 28	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Mo/Rh 35	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Rh/Rh 25	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Rh/Rh 35	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Rh/Rh 40	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	Rh/Rh 30X	4.9E-07 Gy/s to 7.3E-04 Gy/s	1.9 %	
	W/Ag 24, 28, 30	3.5E-07 Gy/s to 6.1E-04 Gy/s	2.4 %	
	W/Rh 24, 28, 30	3.5E-07 Gy/s to 6.1E-04 Gy/s	2.4 %	
Survey Instruments				
Gamma	Co-60	2.4E-05 Gy/s to 6.1E-03 Gy/s	2.4 %	
	Cs-137	9.8E-11 Gy/s to 7.1E-04 Gy/s	2.4 %	
X-Ray	L100	1.2E-06 Gy/s to 1.2E-04 Gy/s	2.4 %	
	M30	6.1E-07 Gy/s to 3.6E-04 Gy/s	2.4 %	
	M50	7.3E-07 Gy/s to 3.4E-04 Gy/s	2.4 %	
	M60	7.3E-07 Gy/s to 2.8E-04 Gy/s	2.4 %	
	M80	7.3E-07 Gy/s to 5.5E-04 Gy/s	2.4 %	
	M100	7.3E-07 Gy/s to 2.7E-04 Gy/s	2.4 %	
	M150	9.7E-07 Gy/s to 3.9E-04 Gy/s	2.4 %	
	M200	9.7E-07 Gy/s to 3.9E-04 Gy/s	2.4 %	
	M250	4.9E-07 Gy/s to 3.7E-04 Gy/s	2.4 %	
	H50	9.7E-07 Gy/s to 4.9E-06 Gy/s	2.4 %	
	H60	9.7E-07 Gy/s to 7.3E-06 Gy/s	2.4 %	
	H100	7.3E-07 Gy/s to 9.7E-06 Gy/s	2.4 %	

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Measured Parameter or Device Calibrated	Radiation Type or Beam Code	Range	Uncertainty ( $k=2$ ) <small>Note 3</small>	Remarks
	H150	4.9E-07 Gy/s to 4.9E-06 Gy/s	2.4 %	
	H200	7.3E-07 Gy/s to 7.3E-06 Gy/s	2.4 %	
	H250	1.2E-06 Gy/s to 7.3E-06 Gy/s	2.4 %	
	Mo/Mo 28	4.9E-07 Gy/s to 7.3E-04 Gy/s	2.4 %	
<b>END</b>				

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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 using a coverage factor,  $k = 2$ , with a level of confidence of approximately 95 %. 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.

**Note 7:** See [NIST Handbook 150](#) for further explanation of these notes.

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