



**CALIBRATION LABORATORIES**

**NVLAP LAB CODE 200823-0**

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

<p><b>Gamma Scientific, Inc.</b> 9925 Carroll Canyon Road San Diego, CA 92131 Mr. Christopher Flores Phone: 858-279-8034 Fax 858-576-9286 E-mail: cflores@gamma-sci.com URL: www.gamma-sci.com</p>	<p><b>Fields of Calibration</b> Electromagnetics – DC/Low Frequency Optical Radiation</p> <p>This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)</p>
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>**

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty <sup>Note 3,5</sup>	Remarks
<b>ELECTROMAGNETICS – DC/LOW FREQUENCY</b>			
<b>DC RESISTANCE and CURRENT (20/E05)</b>			
Current	100 nA to 1 $\mu$ A	0.087 %	
	1 $\mu$ A to 10 $\mu$ A	0.014 %	
	10 $\mu$ A to 100 $\mu$ A	0.0074 %	
	100 $\mu$ A to 10 mA	0.0068 %	
	10 mA to 100 mA	0.0092 %	
	100 mA to 1 A	0.025 %	
<b>DC VOLTAGE (20/E06)</b>			
Voltage	100 mV to 1 V	0.0034 %	
	1 V to 10 V	0.0029 %	
	10 V to 900 V	0.0030 %	
<b>OPTICAL RADIATION</b>			
<b>PHOTOMETRIC (20/O02)</b>			
Illuminance	0.001 lux to 0.1 lux	1.2 %	See note 7
	0.1 lux < to 10 000 lux	0.74 %	
Illuminance Responsivity	0.001 mV/lux to 1 mV/lux	1.2 %	
	0.001 V/lux to 10 V/lux	0.74 %	
Luminance	0.001 cd/m <sup>2</sup> to 1 cd/m <sup>2</sup>	1.2 %	
	1 cd/m <sup>2</sup> to 10 000 cd/m <sup>2</sup>	0.88 %	

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Luminance Responsivity	1 $\mu\text{v}/\text{cd}/\text{m}^2$ to 1 $\text{mV}/\text{cd}/\text{m}^2$ 1 $\text{mv}/\text{cd}/\text{m}^2$ to 10 $\text{V}/\text{cd}/\text{m}^2$	1.2 % 0.74 %	
Luminous Intensity	0.001 cd to 0.1 cd 0.1 cd to 10 000 cd	1.2 % 0.68 %	
Total Luminous Flux	0.01 lm to 10 lm 10 lm to 10 000 lm 10 000 lm to 100 000 lm	1.5 % 1.1 % 1.6 %	
Chromaticity x y u' v'	Nominal for lamp type	0.0008 0.0004 0.0004 0.0002	Dimensionless quantity
Correlated Color Temperature	2600 K to 3150 K	7 K	Based on 1000W FEL Irradiance Standard Uncertainty of Spectral Profile in Photometric Region
Color Rendering Index (CRI)	Nominal for lamp type	1.2 %	Dimensionless quantity
<b>RADIOMETRIC (20/O03)</b>			
Total Spectral Radiant Flux	220 nm 250 nm 350 nm 450 nm 555 nm 654.6 nm 900 nm 1100 nm	3.9 % 3.7 % 2.5 % 2.0 % 1.7 % 1.6 % 1.3 % 1.2 %	Reported in $\mu\text{W}/\text{nm}$ for wavelength shown in range
Spectral Irradiance 1000 W FEL Lamp	220 nm	3.7 %	Reported in $\mu\text{W}/\text{cm}^2 \cdot \text{nm}$ for wavelength shown in range

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Spectral Radiance	250 nm	3.4 %	Reported in $\mu\text{W}/\text{cm}^2 \cdot \text{nm}$ for wavelengths shown in range
	350 nm	2.5 %	
	450 nm	1.9 %	
	555 nm	1.6 %	
	654.6 nm	1.4 %	
	900 nm	1.1 %	
	1100 nm	1.0 %	
	2000 nm	1.2 %	
	2300 nm	1.7 %	
	2400 nm	2.1 %	
Spectral Radiance	300 nm to 400 nm	2.7 %	Reported in $\mu\text{W}/\text{cm}^2 \cdot \text{nm} \cdot \text{sr}$ for wavelengths shown in range
	400 nm to 930 nm	1.8 %	
	930 nm to 1200 nm	1.4 %	
Radiometric Detectors	300 nm to 400 nm	3.0 %	Reported in volts or amps per watt format for wavelength shown in range
	400 nm to 930 nm	2.1 %	
	930 nm to 1200 nm	1.9 %	
Radiometric Detectors	200 nm	6.2 %	Reported in volts or amps per watt format for wavelength shown in range
	205 nm	6.2 %	
	210 nm	6.2 %	
	215 nm	6.2 %	
	220 nm	2.1 %	
	225 nm	2.1 %	
	230 nm	2.1 %	
	235 nm	2.1 %	
	240 nm	1.9 %	
	245 nm	1.9 %	
	250 nm	1.9 %	
	255 nm	1.9 %	
	260 nm	1.6 %	

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<b>Measured Parameter or Device Calibrated</b>	<b>Range</b>	<b>Expanded Uncertainty <sup>Note 3,5</sup></b>	<b>Remarks</b>
	265 nm	1.6 %	
	270 nm	1.6 %	
	275 nm	1.6 %	
	280 nm	0.98 %	
	285 nm	0.98 %	
	290 nm	0.98 %	
	295 nm	0.98 %	
	300 nm	0.83 %	
	305 nm	0.83 %	
	310 nm	0.83 %	
	315 nm	0.83 %	
	320 nm	0.81 %	
	325 nm	0.81 %	
	330 nm	0.81 %	
	335 nm	0.81 %	
	340 nm	0.92 %	
	345 nm	0.92 %	
	350 nm	1.1 %	
	355 nm	1.1 %	
	360 nm	1.1 %	
	365 nm	1.1 %	
	370 nm	1.1 %	
	375 nm	0.70 %	
	380 nm	0.70 %	
	385 nm	0.70 %	
	390 nm	0.70 %	
	395 nm	0.70 %	
	400 nm	0.45 %	
	405 nm	0.45 %	
	410 nm	0.45 %	
	415 nm	0.45 %	
	420 nm	0.45 %	
	425 nm	0.40 %	
	430 nm	0.40 %	
	435 nm	0.40 %	
	440 nm	0.40 %	

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	445 nm	0.40 %	
	450 nm	0.39 %	
	455 nm	0.35 %	
	460 nm	0.35 %	
	465 nm	0.35 %	
	470 nm	0.35 %	
	475 nm	0.35 %	
	480 nm	0.35 %	
	485 nm	0.35 %	
	490 nm	0.35 %	
	495 nm	0.35 %	
	500 nm	0.35 %	
	505 nm	0.35 %	
	510 nm	0.35 %	
	515 nm	0.35 %	
	520 nm	0.35 %	
	525 nm	0.33 %	
	530 nm	0.33 %	
	535 nm	0.33 %	
	540 nm	0.33 %	
	545 nm	0.33 %	
	550 nm	0.33 %	
	555 nm	0.33 %	
	560 nm	0.33 %	
	565 nm	0.33 %	
	570 nm	0.33 %	
	575 nm	0.33 %	
	580 nm	0.33 %	
	585 nm	0.33 %	
	590 nm	0.33 %	
	595 nm	0.33 %	
	600 nm	0.33 %	
	605 nm	0.33 %	
	610 nm	0.33 %	
	615 nm	0.33 %	
	620 nm	0.33 %	

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	625 nm	0.33 %	
	630 nm	0.33 %	
	635 nm	0.33 %	
	640 nm	0.33 %	
	645 nm	0.33 %	
	650 nm	0.33 %	
	655 nm	0.33 %	
	660 nm	0.33 %	
	665 nm	0.33 %	
	670 nm	0.33 %	
	675 nm	0.32 %	
	680 nm	0.32 %	
	685 nm	0.32 %	
	690 nm	0.32 %	
	695 nm	0.32 %	
	700 nm	0.32 %	
	705 nm	0.32 %	
	715 nm	0.32 %	
	720 nm	0.32 %	
	725 nm	0.30 %	
	730 nm	0.30 %	
	735 nm	0.30 %	
	740 nm	0.30 %	
	745 nm	0.30 %	
	750 nm	0.30 %	
	755 nm	0.30 %	
	760 nm	0.30 %	
	765 nm	0.30 %	
	770 nm	0.30 %	
	775 nm	0.30 %	
	780 nm	0.30 %	
	785 nm	0.30 %	
	790 nm	0.30 %	
	795 nm	0.30 %	
	800 nm	0.30 %	
	805 nm	0.30 %	

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	815 nm	0.30 %	
	820 nm	0.30 %	
	825 nm	0.30 %	
	830 nm	0.30 %	
	835 nm	0.30 %	
	840 nm	0.30 %	
	845 nm	0.30 %	
	850 nm	0.30 %	
	855 nm	0.30 %	
	860 nm	0.30 %	
	865 nm	0.30 %	
	870 nm	0.30 %	
	875 nm	0.30 %	
	880 nm	0.30 %	
	885 nm	0.30 %	
	890 nm	0.30 %	
	895 nm	0.30 %	
	900 nm	0.32 %	
	905 nm	0.32 %	
	910 nm	0.32 %	
	915 nm	0.32 %	
	920 nm	0.32 %	
	925 nm	0.33 %	
	930 nm	0.33 %	
	935 nm	0.33 %	
	940 nm	0.33 %	
	945 nm	0.33 %	
	950 nm	0.33 %	
	955 nm	0.33 %	
	960 nm	0.33 %	
	965 nm	0.33 %	
	970 nm	0.33 %	
	975 nm	0.42 %	
	980 nm	0.42 %	
	985 nm	0.42 %	
	990 nm	0.42 %	

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	995 nm	0.42 %	
	1000 nm	0.41 %	
	1005 nm	0.41 %	
	1010 nm	0.41 %	
	1015 nm	0.41 %	
	1020 nm	0.41 %	
	1025 nm	0.39 %	
	1030 nm	0.39 %	
	1035 nm	0.39 %	
	1040 nm	0.39 %	
	1045 nm	0.39 %	
	1050 nm	0.38 %	
	1055 nm	0.38 %	
	1060 nm	0.38 %	
	1065 nm	0.38 %	
	1070 nm	0.38 %	
	1075 nm	0.38 %	
	1080 nm	0.38 %	
	1085 nm	0.38 %	
	1090 nm	0.38 %	
	1095 nm	0.38 %	
	1100 nm	0.38 %	
	1105 nm	0.38 %	
	1110 nm	0.38 %	
	1115 nm	0.38 %	
	1120 nm	0.38 %	
	1125 nm	0.38 %	
	1130 nm	0.38 %	
	1135 nm	0.38 %	
	1140 nm	0.38 %	
	1145 nm	0.38 %	
	1150 nm	0.38 %	
	1155 nm	0.38 %	
	1160 nm	0.38 %	
	1165 nm	0.38 %	
	1170 nm	0.38 %	

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	1175 nm	0.38 %	
	1180 nm	0.38 %	
	1185 nm	0.38 %	
	1190 nm	0.38 %	
	1195 nm	0.38 %	
	1200 nm	0.39 %	
	1205 nm	0.39 %	
	1210 nm	0.39 %	
	1215 nm	0.39 %	
	1220 nm	0.39 %	
	1225 nm	0.40 %	
	1230 nm	0.40 %	
	1235 nm	0.40 %	
	1240 nm	0.40 %	
	1245 nm	0.40 %	
	1250 nm	0.40 %	
	1255 nm	0.40 %	
	1260 nm	0.40 %	
	1265 nm	0.40 %	
	1270 nm	0.40 %	
	1275 nm	0.40 %	
	1280 nm	0.40 %	
	1285 nm	0.40 %	
	1290 nm	0.40 %	
	1295 nm	0.40 %	
	1300 nm	0.40 %	
	1305 nm	0.40 %	
	1310 nm	0.40 %	
	1315 nm	0.40 %	
	1320 nm	0.40 %	
	1325 nm	0.40 %	
	1330 nm	0.40 %	
	1335 nm	0.40 %	
	1340 nm	0.40 %	
	1345 nm	0.40 %	
	1350 nm	0.40 %	

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<b>Measured Parameter or Device Calibrated</b>	<b>Range</b>	<b>Expanded Uncertainty <sup>Note 3,5</sup></b>	<b>Remarks</b>
	1355 nm	0.40 %	
	1360 nm	0.40 %	
	1365 nm	0.40 %	
	1370 nm	0.40 %	
	1375 nm	0.40 %	
	1380 nm	0.40 %	
	1385 nm	0.40 %	
	1390 nm	0.40 %	
	1395 nm	0.40 %	
	1400 nm	0.39 %	
	1405 nm	0.39 %	
	1410 nm	0.39 %	
	1415 nm	0.39 %	
	1420 nm	0.39 %	
	1425 nm	0.39 %	
	1430 nm	0.39 %	
	1435 nm	0.39 %	
	1440 nm	0.39 %	
	1445 nm	0.39 %	
	1450 nm	0.38 %	
	1455 nm	0.38 %	
	1460 nm	0.38 %	
	1465 nm	0.38 %	
	1470 nm	0.38 %	
	1475 nm	0.38 %	
	1480 nm	0.38 %	
	1485 nm	0.38 %	
	1490 nm	0.38 %	
	1495 nm	0.38 %	
	1500 nm	0.39 %	
	1505 nm	0.39 %	
	1510 nm	0.39 %	
	1515 nm	0.39 %	
	1520 nm	0.39 %	
	1525 nm	0.41 %	
	1530 nm	0.41 %	

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<b>Measured Parameter or Device Calibrated</b>	<b>Range</b>	<b>Expanded Uncertainty <sup>Note 3,5</sup></b>	<b>Remarks</b>
	1535 nm	0.41 %	
	1540 nm	0.41 %	
	1545 nm	0.41 %	
	1550 nm	0.42 %	
	1555 nm	0.42 %	
	1560 nm	0.42 %	
	1565 nm	0.42 %	
	1570 nm	0.42 %	
	1575 nm	0.46 %	
	1580 nm	0.46 %	
	1585 nm	0.46 %	
	1590 nm	0.46 %	
	1595 nm	0.46 %	
	1600 nm	0.47 %	
	1605 nm	0.47 %	
	1610 nm	0.47 %	
	1615 nm	0.47 %	
	1620 nm	0.47 %	
	1625 nm	0.67 %	
	1630 nm	0.67 %	
	1635 nm	0.67 %	
	1640 nm	0.67 %	
	1645 nm	0.67 %	
	1650 nm	1.3 %	
	1655 nm	1.3 %	
	1660 nm	1.3 %	
	1665 nm	1.3 %	
	1670 nm	1.3 %	
	1675 nm	1.6 %	
	1680 nm	1.6 %	
	1685 nm	1.6 %	
	1690 nm	1.6 %	
	1695 nm	1.6 %	
	1700 nm	2.0 %	
	1705 nm	2.0 %	
	1710 nm	2.0 %	

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	1715 nm	2.0 %	
	1720 nm	2.0 %	
	1725 nm	2.4 %	
	1730 nm	2.4 %	
	1735 nm	2.4 %	
	1740 nm	2.4 %	
	1745 nm	2.4 %	
	1750 nm	2.9 %	
	1755 nm	2.9 %	
	1760 nm	2.9 %	
	1765 nm	2.9 %	
	1770 nm	2.9 %	
	1775 nm	3.6 %	
	1780 nm	3.6 %	
	1785 nm	3.6 %	
	1790 nm	3.6 %	
	1795 nm	3.6 %	
	1800 nm	4.3 %	
<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 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: All photometric parameters are for halogen or incandescent sources operating at a nominal color temperature of 2856 K.

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