



Les Industries Spectralux Inc. Spectralux Industries Inc.

2750 Sabourin, Saint-Laurent (Quebec) H4S 1M2 Canada
Tel.: (514) 332-0082 Fax: (514) 332-3590 www.spectralux.ca

ISO/IEC 17025
NVLAP
NVLAP LAB CODE: 200899-0

Moving Mirror Goniophotometer Test Report

Standard(s): , IESNA LM-35-02, IES LM-79-08, ANSI C82.77-2002

Customer Lumenpulse, 1751 Richardson, suite 1505, Montréal, Québec, Canada, H3K 1G6

| General Information | | SSL Details | Driver Details | |
|---------------------|-------------|---------------------------|--------------------------------|---------------------------------|
| Test Report | S1607011-R1 | Description | 72W White 4000K SSL | Type Commercial |
| Test Date | 1 July 2016 | Serial Number | SRIS 2433 | Description 71SSL-CY1101 |
| Report Date | 8 July 2016 | Photometric Method | Absolute | Manufacturer Mean Well |
| Ambient | 24.7 °C | Lamp Lumens | -1 | Catalog No. LPF-60-24 |
| Humidity | 44.9 % | Test Position | Axial | Voltage Tap 120.00 V |
| Lamp Type | SSL | Comments | Clusters of CREE XPE2 LED's | Power Factor 0.9900 |

Floodlight Data

| General Information | | Optics | Aperture (feet) | |
|---------------------|---------------------------------|------------------|------------------------|-----------------|
| Manufacturer | Lumenpulse | Reflector | 48 Collimators Acrylic | X 4.0000 |
| Name | LUMENFACADE | Housing | Extruded Aluminum | Y 0.1667 |
| Catalog No. | LOG-HO-120-48-40K-8x8 -SI-NO | Lens | Glass/Polycarbonate | Z 0.0000 |

Lamp Stabilization Time: 55 minutes

Tested By: George Hedrei

Approved Signatory: Chrisnel Blot

Signature:



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Luminaire Test Method

Precise installation and alignment of the luminaire to the rotation axis of the photometer is governed by a servomotor controlled via a microcontroller. A laser is used to validate the luminaire positioning. Before photometric measurements are taken, luminaire is operated long enough to reach stabilization and temperature equilibrium.

All movement commands issued to the photometer axes are mediated by the software to ensure the motion is within the limits of operation. The photometric detector used is a silicon detector corrected to closely match the spectral luminous efficiency photopic curve with a quality index less than 1.5%. Proper shielding is incorporated to the photometric test bench such that only the light from the unit under test is measured.

Luminous intensity measurements are performed at a distance great enough so that the inverse-square law applies. During each measurement the computer records the luminous intensity associated to the corresponding angles of radiation, as well as input electrical operational parameters and temperature measurements. Candela values are reported in IES format as per LM-63.

Equipment, reference standards are traceable to National Institute of Standards and Technology (NIST) and National Research Council of Canada (NRC).





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Electrical Equipment

| Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due Date |
|--------------------|--------------|-----------|---------------|------------------|----------------------|
| Power Supply | iRDC | CIF-3000A | 974998 | N.P.C.R. | N.P.C.R. |
| Input Power Meter | Yokogawa | WT210 | 91L236539 | 2016/05/05 | 2017/05/05 |
| Output Power Meter | N/A | N/A | N/A | N.P.C.R. | N.P.C.R. |

Photometric Equipment

| Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due Date |
|---------------|--------------|-------------|---------------|------------------|----------------------|
| Photometer | N/A | N/A | N/A | N.P.C.R. | N.P.C.R. |
| Photodetector | INPHORA | IPR-PDET 19 | 110802 | 2015/10/05 | 2016/10/05 |

Environment Equipment

| Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------------------|--------------|-------|---------------|------------------|----------------------|
| Temperature Humidity Sensor | Omega | HH311 | 051202970 | 2014/10/24 | 2016/10/24 |



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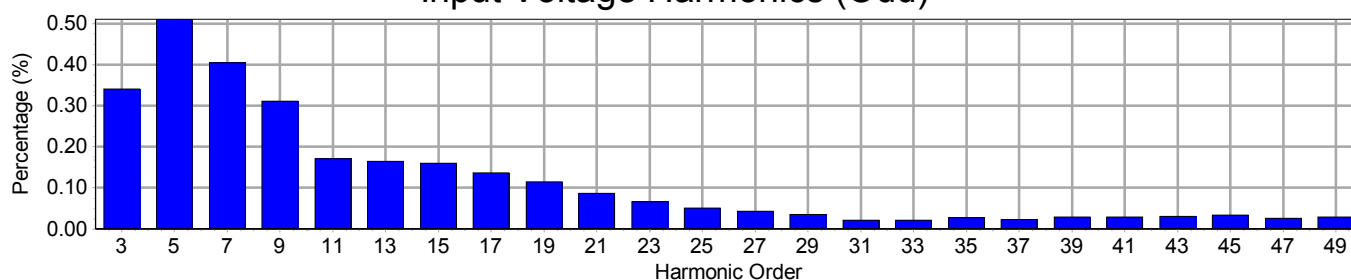
NVLAP LAB CODE: 200899-0

Electrical Measurements

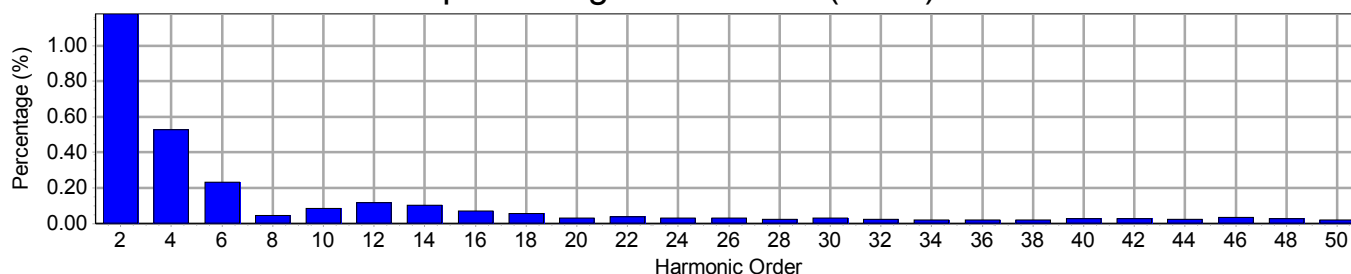
Input

| | | | | | |
|-----------|---------------|----------------|----------|------------------|-----------|
| Frequency | 60 Hz | Active Power | 62.58 W | THDV [ANSI] | 1.60 % |
| Voltage | 120.1 V(rms) | Apparent Power | 63.14 VA | THDA [ANSI] | 4.20 % |
| Current | 0.5257 A(rms) | Power Factor | 0.991 | Max. Harmonic At | 5th order |

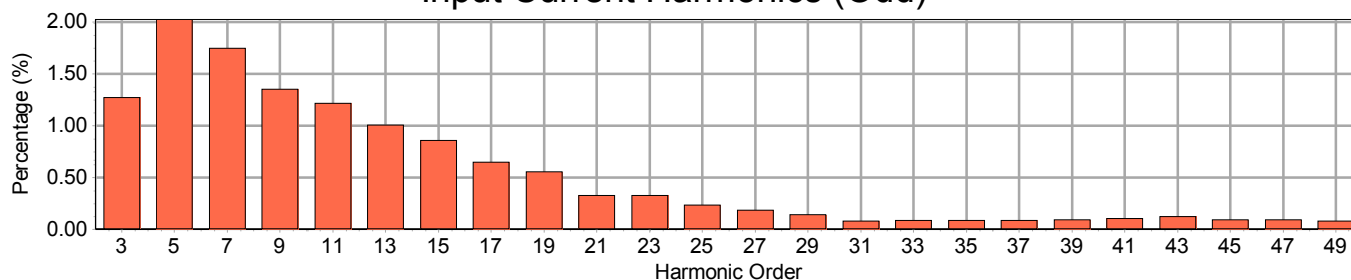
Input Voltage Harmonics (Odd)



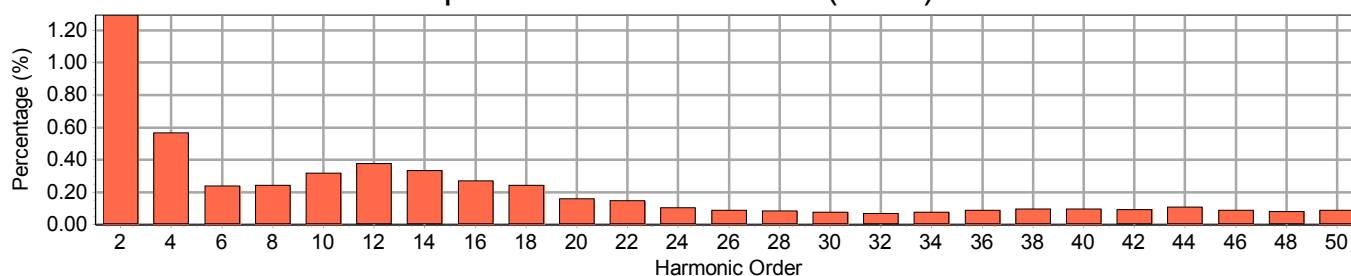
Input Voltage Harmonics (Even)



Input Current Harmonics (Odd)



Input Current Harmonics (Even)





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Harmonic Measurements

| Odd Harmonics | | | | Even Harmonics | | | |
|----------------|----------------|-----------------------|-----------------------|----------------|----------------|-----------------------|-----------------------|
| Harmonic Order | Frequency (HZ) | Voltage Harmonics (%) | Current Harmonics (%) | Harmonic Order | Frequency (HZ) | Voltage Harmonics (%) | Current Harmonics (%) |
| 1 | 60 | 100.000 | 100.000 | 2 | 120 | 1.180 | 1.295 |
| 3 | 180 | 0.341 | 1.273 | 4 | 240 | 0.527 | 0.566 |
| 5 | 300 | 0.512 | 2.029 | 6 | 360 | 0.232 | 0.239 |
| 7 | 420 | 0.405 | 1.748 | 8 | 480 | 0.045 | 0.244 |
| 9 | 540 | 0.312 | 1.351 | 10 | 600 | 0.083 | 0.317 |
| 11 | 660 | 0.171 | 1.218 | 12 | 720 | 0.117 | 0.377 |
| 13 | 780 | 0.165 | 1.005 | 14 | 840 | 0.102 | 0.334 |
| 15 | 900 | 0.160 | 0.860 | 16 | 960 | 0.071 | 0.269 |
| 17 | 1020 | 0.136 | 0.645 | 18 | 1080 | 0.057 | 0.243 |
| 19 | 1140 | 0.114 | 0.554 | 20 | 1200 | 0.030 | 0.159 |
| 21 | 1260 | 0.087 | 0.323 | 22 | 1320 | 0.037 | 0.149 |
| 23 | 1380 | 0.066 | 0.325 | 24 | 1440 | 0.030 | 0.103 |
| 25 | 1500 | 0.051 | 0.232 | 26 | 1560 | 0.032 | 0.091 |
| 27 | 1620 | 0.043 | 0.183 | 28 | 1680 | 0.025 | 0.087 |
| 29 | 1740 | 0.035 | 0.141 | 30 | 1800 | 0.029 | 0.076 |
| 31 | 1860 | 0.021 | 0.079 | 32 | 1920 | 0.022 | 0.067 |
| 33 | 1980 | 0.021 | 0.084 | 34 | 2040 | 0.020 | 0.077 |
| 35 | 2100 | 0.027 | 0.086 | 36 | 2160 | 0.021 | 0.091 |
| 37 | 2220 | 0.022 | 0.081 | 38 | 2280 | 0.021 | 0.098 |
| 39 | 2340 | 0.028 | 0.089 | 40 | 2400 | 0.027 | 0.096 |
| 41 | 2460 | 0.029 | 0.103 | 42 | 2520 | 0.027 | 0.095 |
| 43 | 2580 | 0.031 | 0.123 | 44 | 2640 | 0.022 | 0.110 |
| 45 | 2700 | 0.034 | 0.087 | 46 | 2760 | 0.034 | 0.089 |
| 47 | 2820 | 0.025 | 0.092 | 48 | 2880 | 0.027 | 0.080 |
| 49 | 2940 | 0.029 | 0.077 | 50 | 3000 | 0.018 | 0.090 |



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Photometric Report: S1607011-R1

Prepared for: Lumenpulse · Test Date: 01 July 2016

Floodlight: LUMENFACADE · Lumcat: LOG-HO-120-48-40K-8x8-SI-NO

Photometric Floodlight Characteristics

| | | |
|------------------------------|--------------|--|
| Nominal SSL Power | 72.00 W | |
| Measured Input Voltage | 120.11 V | Notes |
| Test SSL Current | 0.300 A | 1) Floodlight tested in accordance to IES LM-35-1989 at a distance great enough so that the inverse-square law applies. |
| Floodlight Luminous Flux | 4045 | |
| Measured Input Power | 62.58 W | |
| Floodlight Luminous Efficacy | 64.6 lm/W | 2) Field performance may differ from laboratory measurements. |
| Maximum Candela Value | 77896 | |
| Maximum Candela Location | 0.0 H, 0.0 V | 3) Results are valid for the tested material only. |
| Horizontal Beam Angle (50%) | 12.0 ° | |
| Vertical Beam Angle (50%) | 10.0 ° | 4) All data published in this report are based on absolute photometry. |
| Horizontal Field Angle (10%) | 23.0 ° | |
| Vertical Field Angle (10%) | 20.0 ° | 5) The original electronic file or paper report cannot be edited in whole or in part without written consent of Spectralux Industries Inc. |
| IES/NEMA Type Classification | 2Hx2V | |
| Beam Lumens (50%) | 1540 | |
| Beam Efficiency (50%) | N/A | |
| Field Lumens (10%) | 3030 | |
| Field Efficiency (10%) | N/A | |
| Spill Lumens | 1015 | |
| Total Floodlight Lumens | 4045 | |
| Total Floodlight Efficiency | N/A | |



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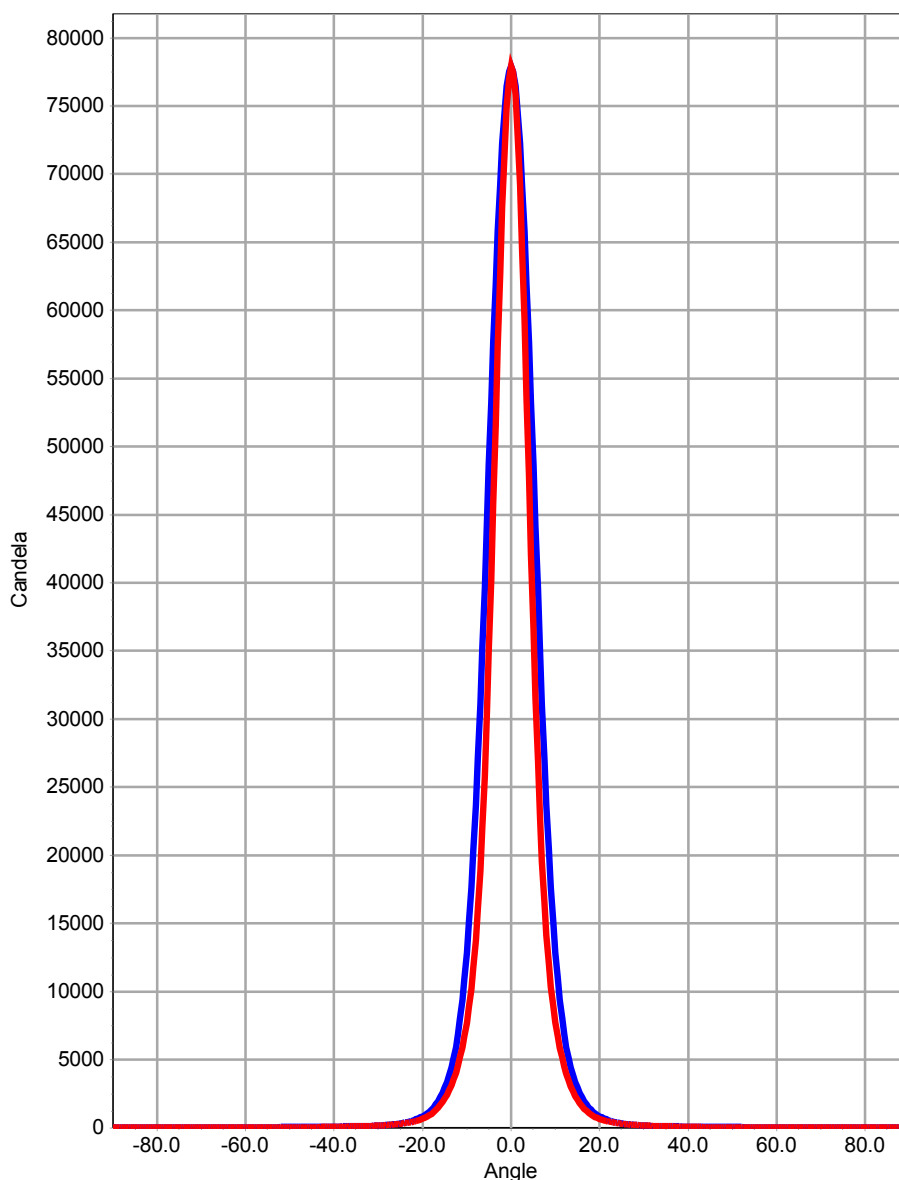
Photometric Report: S1607011-R1

Prepared for: Lumenpulse · Test Date: 01 July 2016

Floodlight: LUMENFACADE · Lumcat: LOG-HO-120-48-40K-8x8-SI-NO

Maximum Candela Trace (Max. Location: 0.0 H, 0.0 V)

| Horizontal Angles | Candela |
|-------------------|---------|
| -90.0 | 9 |
| -85.0 | 9 |
| -80.0 | 10 |
| -75.0 | 14 |
| -70.0 | 21 |
| -65.0 | 30 |
| -60.0 | 37 |
| -55.0 | 43 |
| -50.0 | 51 |
| -45.0 | 64 |
| -40.0 | 86 |
| -35.0 | 113 |
| -30.0 | 162 |
| -25.0 | 329 |
| -20.0 | 841 |
| -15.0 | 2921 |
| -10.0 | 12862 |
| -5.0 | 48696 |
| 0.0 | 77896 |
| 5.0 | 48696 |
| 10.0 | 12862 |
| 15.0 | 2921 |
| 20.0 | 841 |
| 25.0 | 329 |
| 30.0 | 162 |
| 35.0 | 113 |
| 40.0 | 86 |
| 45.0 | 64 |
| 50.0 | 51 |
| 55.0 | 43 |
| 60.0 | 37 |
| 65.0 | 30 |
| 70.0 | 21 |
| 75.0 | 14 |
| 80.0 | 10 |
| 85.0 | 9 |
| 90.0 | 9 |



| Vertical Angles | Candela |
|-----------------|---------|
| -90.0 | 2 |
| -85.0 | 2 |
| -80.0 | 4 |
| -75.0 | 6 |
| -70.0 | 6 |
| -65.0 | 7 |
| -60.0 | 10 |
| -55.0 | 15 |
| -50.0 | 22 |
| -45.0 | 38 |
| -40.0 | 68 |
| -35.0 | 106 |
| -30.0 | 159 |
| -25.0 | 289 |
| -20.0 | 665 |
| -15.0 | 2143 |
| -10.0 | 7704 |
| -5.0 | 34974 |
| 0.0 | 77896 |
| 5.0 | 36596 |
| 10.0 | 7716 |
| 15.0 | 2053 |
| 20.0 | 657 |
| 25.0 | 301 |
| 30.0 | 166 |
| 35.0 | 111 |
| 40.0 | 70 |
| 45.0 | 38 |
| 50.0 | 22 |
| 55.0 | 15 |
| 60.0 | 9 |
| 65.0 | 5 |
| 70.0 | 4 |
| 75.0 | 5 |
| 80.0 | 3 |
| 85.0 | 1 |
| 90.0 | 2 |

— Horizontal — Vertical



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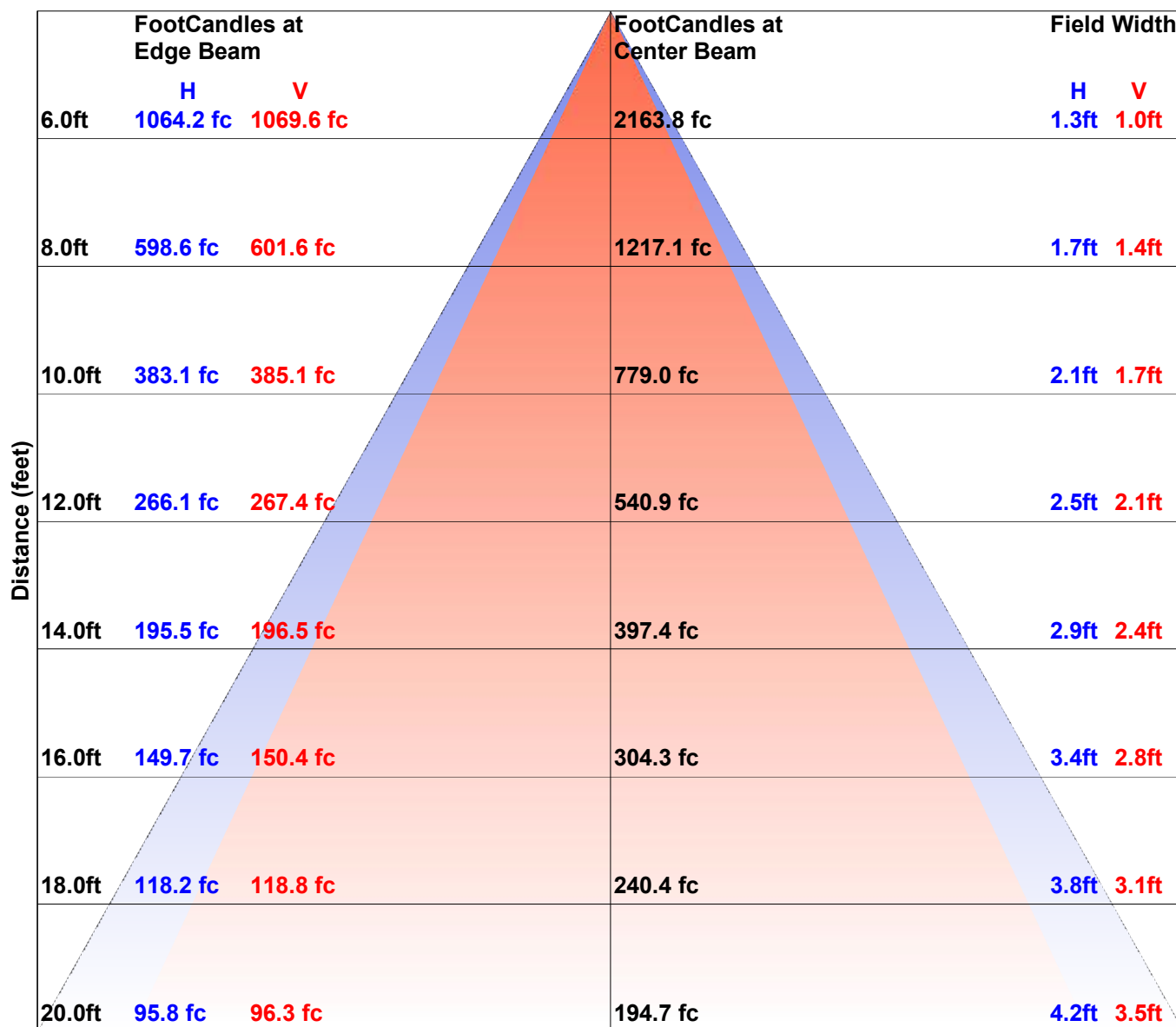
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Prepared for: Lumenpulse · Test Date: 01 July 2016

Floodlight: LUMENFACADE · Lumcat: LOG-HO-120-48-40K-8x8-SI-NO

Downlight Beam



— Horizontal (12.0 °) — Vertical (10.0 °)



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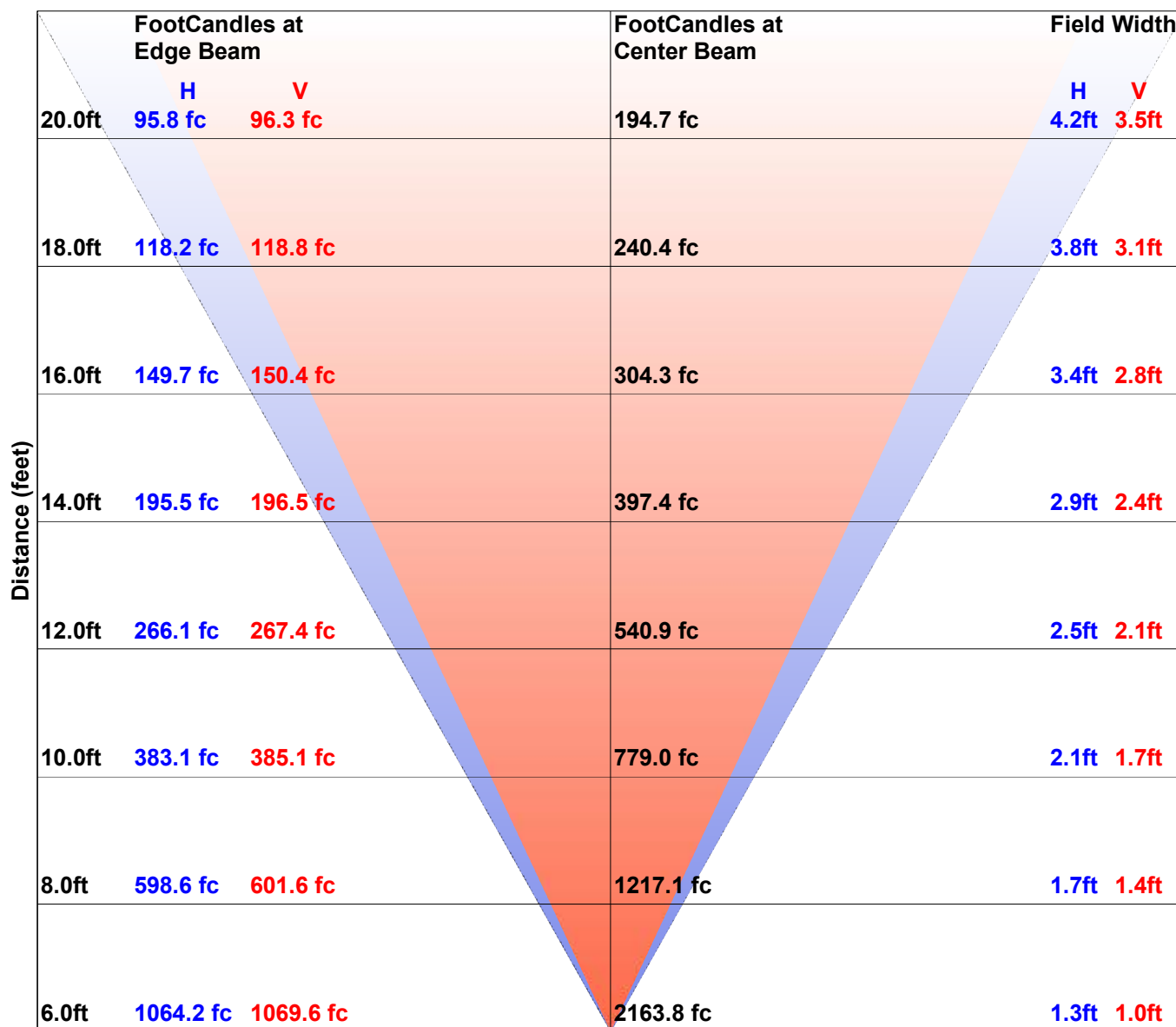
NVLAP LAB CODE: 200899-0

Photometric Report: S1607011-R1

Prepared for: Lumenpulse · Test Date: 01 July 2016

Floodlight: LUMENFACADE · Lumcat: LOG-HO-120-48-40K-8x8-SI-NO

Uplight Beam



— Horizontal (12.0 °) — Vertical (10.0 °)



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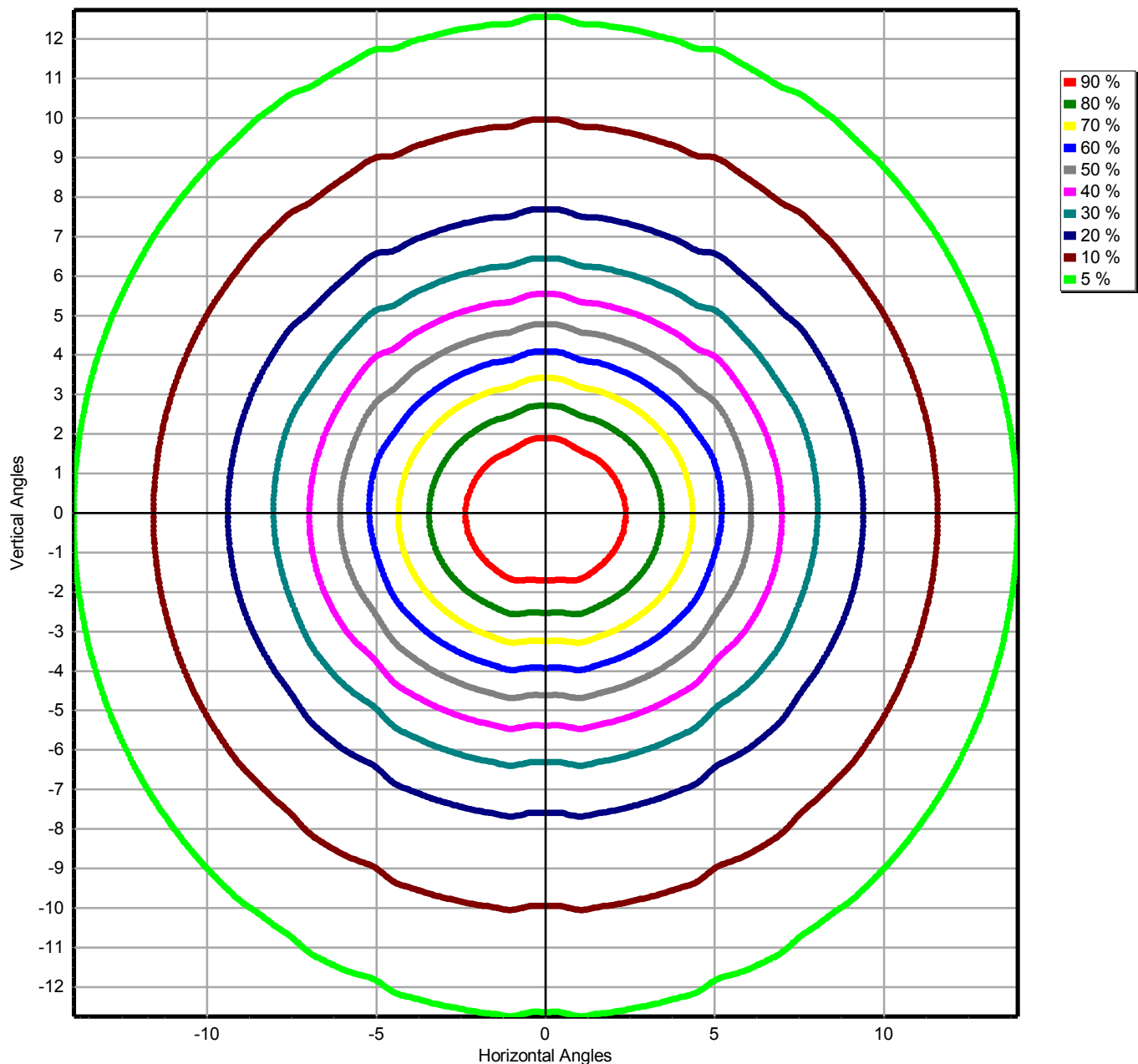
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Floodlight: LUMENFACADE · Lumcat: LOG-HO-120-48-40K-8x8-SI-NO

ISO Candela Diagram





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IES File Headers

IESNA:LM-63-2002
[ISSUEDATE] 01 July 2016
[TESTLAB] Spectra Lux Industries Inc.
[TEST] S1607011-R1
[MANUFAC] Lumenpulse
[LUMCAT] LOG-HO-120-48-40K-8x8-SI-NO
[LUMINAIRE] LUMENFACADE
[LAMP] Clusters of CREE XPE2 LED's - 72W SSL c/w Mean Well Driver LPF-60-24 @ 120.00V
[_BURNING] Axial (4,045 Luminaire Lumens)
[_REFLECTOR] 48 Collimators Acrylic
[_LENS] Glass/Polycarbonate
[_HOUSING] Extruded Aluminum
[DISTRIBUTION] NEMA 2Hx2V (Max. CP at 0.0H,0.0V)
[MORE] (Based on IES LM-35-1989)

Candela Table

Horizontal Angles

| | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| V e r t i c a l | -90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | -85.0 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 1 |
| | -75.0 | 6 | 4 | 5 | 4 | 4 | 4 | 4 | 4 |
| | -65.0 | 7 | 6 | 8 | 7 | 8 | 8 | 9 | 6 |
| | -55.0 | 15 | 16 | 15 | 16 | 15 | 16 | 15 | 14 |
| | -45.0 | 38 | 38 | 38 | 37 | 38 | 38 | 36 | 39 |
| | -35.0 | 106 | 106 | 107 | 107 | 108 | 106 | 106 | 103 |
| | -25.0 | 289 | 290 | 293 | 293 | 290 | 289 | 287 | 284 |
| | -20.0 | 665 | 666 | 681 | 675 | 664 | 657 | 650 | 639 |
| | -15.0 | 2143 | 2142 | 2200 | 2171 | 2153 | 2076 | 2036 | 1990 |
| | -12.5 | 4040 | 4043 | 4140 | 4082 | 4034 | 3870 | 3782 | 3677 |
| | -12.0 | 4582 | 4586 | 4695 | 4626 | 4569 | 4378 | 4273 | 4150 |
| | -11.5 | 5205 | 5207 | 5329 | 5250 | 5181 | 4959 | 4835 | 4690 |
| | -11.0 | 5914 | 5919 | 6060 | 5965 | 5882 | 5752 | 5618 | 5300 |
| | -10.5 | 6741 | 6746 | 6909 | 6797 | 6694 | 6542 | 6385 | 6004 |
| | -10.0 | 7704 | 7709 | 7897 | 7763 | 7638 | 7458 | 7270 | 6814 |
| | -9.5 | 8841 | 8849 | 9072 | 8911 | 8757 | 8540 | 8309 | 7762 |
| A n g l e s | -9.0 | 10190 | 10202 | 10461 | 10263 | 10078 | 9810 | 9532 | 8866 |
| | -8.5 | 11818 | 11824 | 12136 | 11894 | 11662 | 11339 | 10993 | 10178 |
| | -8.0 | 13749 | 13760 | 14123 | 13828 | 13537 | 13141 | 12715 | 11715 |
| | -7.5 | 16065 | 16079 | 16509 | 16145 | 15781 | 15297 | 14774 | 13537 |
| | -7.0 | 18812 | 18826 | 19313 | 18874 | 18417 | 17821 | 17178 | 15656 |
| | -6.5 | 22044 | 22059 | 22625 | 22086 | 21533 | 20800 | 20003 | 18136 |
| | -6.0 | 25822 | 25826 | 26450 | 25799 | 25123 | 24235 | 23257 | 20978 |
| | -5.5 | 30125 | 30122 | 30818 | 30039 | 29217 | 28147 | 26962 | 24200 |
| | -5.0 | 34974 | 34965 | 35676 | 34768 | 33779 | 32507 | 31083 | 27778 |
| | -4.5 | 40222 | 40200 | 40917 | 39860 | 38690 | 37195 | 35523 | 31621 |
| | -4.0 | 45834 | 45788 | 46478 | 45274 | 43900 | 42179 | 40236 | 35687 |
| | -3.5 | 51562 | 51491 | 52094 | 50743 | 49190 | 47215 | 44990 | 39796 |
| | -3.0 | 57295 | 57194 | 57673 | 56192 | 54440 | 52229 | 49726 | 43868 |
| | -2.5 | 62713 | 62574 | 62858 | 61256 | 59319 | 56894 | 54131 | 47661 |
| | -2.0 | 67622 | 67449 | 67514 | 65819 | 63717 | 61091 | 58094 | 51067 |
| | -1.5 | 71761 | 71544 | 71335 | 69573 | 67340 | 64553 | 61365 | 53864 |
| | -1.0 | 74949 | 74690 | 74190 | 72405 | 70068 | 67165 | 63825 | 55973 |
| | -0.5 | 77027 | 76720 | 75916 | 74124 | 71738 | 68760 | 65326 | 57248 |



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Horizontal Angles

| | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | |
|--------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| V e r t i c a l | 0.0 | 77896 | 77539 | 76437 | 74679 | 72278 | 69280 | 65812 | 61901 | 57646 |
| | 0.5 | 77494 | 77100 | 75719 | 74032 | 71647 | 68684 | 65245 | 61356 | 57131 |
| | 1.0 | 75856 | 75435 | 73813 | 72213 | 69898 | 67017 | 63665 | 59861 | 55749 |
| | 1.5 | 73037 | 72608 | 70783 | 69288 | 67091 | 64337 | 61124 | 57482 | 53546 |
| | 2.0 | 69222 | 68777 | 66821 | 65459 | 63397 | 60812 | 57793 | 54358 | 50653 |
| | 2.5 | 64553 | 64115 | 62071 | 60851 | 58961 | 56579 | 53779 | 50602 | 47183 |
| | 3.0 | 59277 | 58849 | 56769 | 55707 | 53991 | 51833 | 49308 | 46406 | 43305 |
| | 3.5 | 53567 | 53164 | 51125 | 50208 | 48701 | 46776 | 44523 | 41941 | 39174 |
| | 4.0 | 47773 | 47398 | 45456 | 44680 | 43353 | 41677 | 39704 | 37438 | 35009 |
| | 4.5 | 42025 | 41688 | 39885 | 39233 | 38112 | 36666 | 34956 | 33005 | 30913 |
| | 5.0 | 36596 | 36288 | 34650 | 34118 | 33166 | 31937 | 30480 | 28826 | 27044 |
| | 5.5 | 31544 | 31276 | 29814 | 29382 | 28585 | 27564 | 26341 | 24951 | 23463 |
| | 6.0 | 27000 | 26772 | 25498 | 25148 | 24496 | 23645 | 22633 | 21480 | 20244 |
| | 6.5 | 22986 | 22786 | 21696 | 21420 | 20881 | 20190 | 19355 | 18412 | 17396 |
| | 7.0 | 19533 | 19363 | 18448 | 18227 | 17794 | 17229 | 16542 | 15776 | 14947 |
| | 7.5 | 16589 | 16450 | 15679 | 15501 | 15151 | 14697 | 14136 | 13515 | 12840 |
| | 8.0 | 14122 | 14003 | 13371 | 13227 | 12947 | 12575 | 12120 | 11617 | 11068 |
| | 8.5 | 12056 | 11963 | 11432 | 11319 | 11090 | 10789 | 10420 | 10012 | 9566 |
| | 9.0 | 10334 | 10258 | 9823 | 9731 | 9547 | 9304 | 9002 | 8671 | 8306 |
| A n g l e s | 9.5 | 8910 | 8847 | 8481 | 8410 | 8255 | 8058 | 7813 | 7541 | 7241 |
| | 10.0 | 7716 | 7663 | 7361 | 7302 | 7176 | 7016 | 6810 | 6589 | 6340 |
| | 10.5 | 6714 | 6673 | 6415 | 6366 | 6263 | 6132 | 5960 | 5775 | 5570 |
| | 11.0 | 5863 | 5827 | 5610 | 5571 | 5481 | 5374 | 5232 | 5079 | 4905 |
| | 11.5 | 5138 | 5107 | 4920 | 4889 | 4812 | 4723 | 4604 | 4474 | 4329 |
| | 12.0 | 4502 | 4479 | 4316 | 4288 | 4224 | 4152 | 4051 | 3940 | 3818 |
| | 12.5 | 3955 | 3933 | 3793 | 3771 | 3716 | 3655 | 3571 | 3478 | 3372 |
| | 15.0 | 2053 | 2046 | 1972 | 1964 | 1939 | 1916 | 1879 | 1838 | 1792 |
| | 20.0 | 657 | 653 | 638 | 638 | 635 | 629 | 625 | 617 | 608 |
| | 25.0 | 301 | 300 | 295 | 295 | 294 | 291 | 291 | 288 | 285 |
| | 35.0 | 111 | 111 | 110 | 109 | 108 | 108 | 108 | 107 | 107 |
| | 45.0 | 38 | 39 | 39 | 36 | 37 | 37 | 36 | 37 | 37 |
| | 55.0 | 15 | 14 | 15 | 14 | 14 | 14 | 15 | 13 | 13 |
| | 65.0 | 5 | 7 | 7 | 8 | 7 | 6 | 7 | 6 | 7 |
| | 75.0 | 5 | 4 | 5 | 3 | 4 | 4 | 4 | 4 | 4 |
| | 85.0 | 1 | 1 | 3 | 2 | 3 | 2 | 2 | 1 | 0 |
| | 90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |



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Horizontal Angles

| | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| V e r t i c a l | -90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | -85.0 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 |
| | -75.0 | 4 | 4 | 4 | 5 | 4 | 3 | 5 | 3 |
| | -65.0 | 7 | 7 | 8 | 8 | 7 | 7 | 8 | 8 |
| | -55.0 | 16 | 16 | 15 | 16 | 15 | 15 | 16 | 15 |
| | -45.0 | 36 | 36 | 39 | 37 | 38 | 37 | 37 | 35 |
| | -35.0 | 104 | 104 | 102 | 102 | 101 | 102 | 99 | 96 |
| | -25.0 | 282 | 275 | 274 | 272 | 270 | 267 | 260 | 253 |
| | -20.0 | 631 | 607 | 598 | 591 | 578 | 565 | 541 | 509 |
| | -15.0 | 1939 | 1821 | 1778 | 1735 | 1677 | 1609 | 1504 | 1366 |
| | -12.5 | 3565 | 3330 | 3224 | 3130 | 2999 | 2857 | 2649 | 2362 |
| | -12.0 | 4021 | 3750 | 3627 | 3514 | 3363 | 3199 | 2957 | 2628 |
| | -11.5 | 4538 | 4225 | 4079 | 3945 | 3770 | 3579 | 3302 | 2922 |
| | -11.0 | 5122 | 4758 | 4585 | 4431 | 4224 | 4001 | 3685 | 3246 |
| | -10.5 | 5792 | 5368 | 5164 | 4979 | 4738 | 4477 | 4110 | 3605 |
| | -10.0 | 6559 | 6064 | 5817 | 5597 | 5314 | 5009 | 4585 | 3999 |
| | -9.5 | 7454 | 6862 | 6570 | 6309 | 5973 | 5612 | 5120 | 4440 |
| | -9.0 | 8495 | 7791 | 7439 | 7124 | 6721 | 6296 | 5719 | 4927 |
| | -8.5 | 9727 | 8880 | 8451 | 8068 | 7591 | 7083 | 6403 | 5473 |
| | -8.0 | 11162 | 10145 | 9624 | 9158 | 8578 | 7970 | 7174 | 6620 |
| A n g l e s | -7.5 | 12858 | 11632 | 10995 | 10424 | 9723 | 8996 | 8049 | 7395 |
| | -7.0 | 14824 | 13356 | 12576 | 11871 | 11025 | 10155 | 9039 | 8261 |
| | -6.5 | 17115 | 15353 | 14402 | 13543 | 12521 | 11476 | 10156 | 9232 |
| | -6.0 | 19741 | 17652 | 16496 | 15437 | 14207 | 12957 | 11406 | 10317 |
| | -5.5 | 22708 | 20246 | 18848 | 17563 | 16092 | 14605 | 12795 | 11506 |
| | -5.0 | 25993 | 23143 | 21460 | 19910 | 18158 | 16404 | 14312 | 12801 |
| | -4.5 | 29514 | 26265 | 24268 | 22422 | 20363 | 18311 | 15921 | 14171 |
| | -4.0 | 33232 | 29586 | 27248 | 25071 | 22683 | 20318 | 17620 | 15611 |
| | -3.5 | 36996 | 32973 | 30273 | 27752 | 25018 | 22334 | 19340 | 17060 |
| | -3.0 | 40723 | 36370 | 33304 | 30419 | 27338 | 24328 | 21049 | 18502 |
| | -2.5 | 44184 | 39581 | 36153 | 32906 | 29496 | 26185 | 22660 | 19856 |
| | -2.0 | 47289 | 42499 | 38742 | 35157 | 31441 | 27844 | 24127 | 21084 |
| | -1.5 | 49841 | 44973 | 40916 | 37025 | 33050 | 29214 | 25359 | 22120 |
| | -1.0 | 51755 | 46890 | 42599 | 38443 | 34263 | 30243 | 26317 | 22922 |
| | -0.5 | 52903 | 48150 | 43682 | 39327 | 35007 | 30866 | 26941 | 23439 |
| | 0.0 | 53238 | 48696 | 44122 | 39638 | 35249 | 31056 | 27197 | 23653 |
| | 0.5 | 52740 | 48487 | 43889 | 39352 | 34972 | 30799 | 27077 | 23542 |
| | 1.0 | 51441 | 47548 | 43001 | 38491 | 34190 | 30107 | 26579 | 23119 |
| | 1.5 | 49387 | 45908 | 41495 | 37088 | 32938 | 29014 | 25727 | 22399 |
| | 2.0 | 46710 | 43666 | 39457 | 35227 | 31289 | 27581 | 24575 | 21421 |
| | 2.5 | 43501 | 40913 | 36968 | 32980 | 29310 | 25861 | 23166 | 20227 |
| | 3.0 | 39929 | 37786 | 34152 | 30457 | 27095 | 23941 | 21564 | 18877 |
| | 3.5 | 36138 | 34404 | 31118 | 27753 | 24727 | 21901 | 19834 | 17413 |
| | 4.0 | 32323 | 30950 | 28023 | 25019 | 22338 | 19835 | 18070 | 15919 |
| | 4.5 | 28574 | 27514 | 24956 | 22309 | 19970 | 17794 | 16306 | 14424 |
| | 5.0 | 25033 | 24237 | 22030 | 19738 | 17726 | 15854 | 14616 | 12990 |
| | 5.5 | 21759 | 21170 | 19293 | 17337 | 15630 | 14041 | 13020 | 11628 |
| | 6.0 | 18819 | 18388 | 16817 | 15164 | 13726 | 12394 | 11556 | 10376 |
| | 6.5 | 16222 | 15907 | 14599 | 13216 | 12023 | 10912 | 10231 | 9237 |
| | 7.0 | 13981 | 13748 | 12667 | 11525 | 10533 | 9612 | 9055 | 8220 |
| | 7.5 | 12052 | 11883 | 10996 | 10050 | 9230 | 8467 | 8014 | 7317 |
| | 8.0 | 10423 | 10295 | 9567 | 8788 | 8114 | 7481 | 7107 | 6521 |
| | 8.5 | 9040 | 8946 | 8347 | 7705 | 7144 | 6617 | 6313 | 5821 |
| | 9.0 | 7875 | 7799 | 7307 | 6776 | 6310 | 5871 | 5617 | 5201 |



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ISO/IEC 17025



NVLAP LAB CODE: 200899-0

Horizontal Angles

| | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 |
|------|------|------|------|------|------|------|------|------|------|
| 9.5 | 6886 | 6829 | 6419 | 5976 | 5586 | 5219 | 5009 | 4655 | 4328 |
| 10.0 | 6046 | 5999 | 5658 | 5289 | 4960 | 4649 | 4473 | 4171 | 3890 |
| 10.5 | 5324 | 5289 | 5002 | 4689 | 4410 | 4145 | 3998 | 3741 | 3500 |
| 11.0 | 4698 | 4671 | 4428 | 4161 | 3925 | 3700 | 3576 | 3354 | 3147 |
| 11.5 | 4153 | 4135 | 3926 | 3701 | 3496 | 3303 | 3200 | 3007 | 2829 |
| 12.0 | 3670 | 3657 | 3482 | 3286 | 3111 | 2946 | 2857 | 2693 | 2539 |
| 12.5 | 3248 | 3239 | 3087 | 2918 | 2769 | 2627 | 2554 | 2411 | 2279 |
| 15.0 | 1738 | 1744 | 1676 | 1597 | 1528 | 1464 | 1436 | 1371 | 1310 |
| 20.0 | 597 | 600 | 586 | 570 | 557 | 544 | 538 | 523 | 511 |
| 25.0 | 282 | 285 | 280 | 277 | 273 | 269 | 268 | 265 | 260 |
| 35.0 | 107 | 107 | 105 | 104 | 103 | 102 | 103 | 101 | 101 |
| 45.0 | 37 | 36 | 36 | 38 | 38 | 36 | 36 | 38 | 37 |
| 55.0 | 13 | 13 | 14 | 14 | 13 | 15 | 13 | 14 | 14 |
| 65.0 | 8 | 7 | 8 | 6 | 7 | 6 | 8 | 7 | 7 |
| 75.0 | 4 | 4 | 5 | 4 | 4 | 4 | 3 | 5 | 3 |
| 85.0 | 0 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | 2 |
| 90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

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Horizontal Angles

| | 9.0 | 9.5 | 10.0 | 10.5 | 11.0 | 11.5 | 12.0 | 12.5 | 15.0 |
|--|-------|-------|-------|-------|-------|------|------|------|------|
| V e r t i c a l A n g l e s | -90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | -85.0 | 2 | 1 | 2 | 3 | 1 | 3 | 1 | 1 |
| | -75.0 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 5 |
| | -65.0 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 6 |
| | -55.0 | 15 | 15 | 16 | 15 | 14 | 15 | 15 | 14 |
| | -45.0 | 37 | 38 | 36 | 36 | 35 | 36 | 35 | 36 |
| | -35.0 | 97 | 97 | 93 | 93 | 93 | 91 | 90 | 83 |
| | -25.0 | 253 | 248 | 243 | 240 | 235 | 230 | 227 | 222 |
| | -20.0 | 499 | 483 | 467 | 451 | 435 | 419 | 403 | 388 |
| | -15.0 | 1319 | 1252 | 1185 | 1120 | 1053 | 995 | 936 | 880 |
| | -12.5 | 2253 | 2117 | 1980 | 1849 | 1720 | 1603 | 1492 | 1384 |
| | -12.0 | 2502 | 2345 | 2190 | 2041 | 1893 | 1761 | 1633 | 1512 |
| | -11.5 | 2778 | 2595 | 2418 | 2247 | 2080 | 1930 | 1787 | 1648 |
| | -11.0 | 3076 | 2869 | 2664 | 2472 | 2285 | 2114 | 1950 | 1795 |
| | -10.5 | 3408 | 3169 | 2937 | 2717 | 2502 | 2310 | 2126 | 1953 |
| | -10.0 | 3771 | 3495 | 3229 | 2979 | 2738 | 2517 | 2313 | 2117 |
| | -9.5 | 4168 | 3854 | 3550 | 3264 | 2993 | 2745 | 2513 | 2295 |
| | -9.0 | 4610 | 4246 | 3900 | 3573 | 3266 | 2985 | 2724 | 2480 |
| | -8.5 | 5103 | 4680 | 4281 | 3910 | 3561 | 3242 | 2951 | 2678 |
| | -8.0 | 5641 | 5152 | 4695 | 4271 | 3877 | 3517 | 3189 | 2885 |
| | -7.5 | 6245 | 5675 | 5149 | 4663 | 4214 | 3808 | 3440 | 3103 |
| | -7.0 | 6907 | 6244 | 5637 | 5083 | 4575 | 4114 | 3703 | 3327 |
| | -6.5 | 7635 | 6868 | 6167 | 5532 | 4961 | 4440 | 3978 | 3562 |
| | -6.0 | 8436 | 7545 | 6739 | 6014 | 5362 | 4778 | 4263 | 3804 |
| | -5.5 | 9304 | 8271 | 7346 | 6523 | 5787 | 5132 | 4559 | 4050 |
| | -5.0 | 10233 | 9045 | 7991 | 7054 | 6229 | 5496 | 4858 | 4299 |
| | -4.5 | 11203 | 9848 | 8655 | 7601 | 6674 | 5859 | 5157 | 4546 |
| | -4.0 | 12214 | 10676 | 9332 | 8154 | 7124 | 6222 | 5454 | 4786 |
| | -3.5 | 13215 | 11498 | 10001 | 8695 | 7562 | 6577 | 5736 | 5017 |
| | -3.0 | 14207 | 12305 | 10654 | 9223 | 7984 | 6915 | 6007 | 5234 |
| | -2.5 | 15127 | 13051 | 11256 | 9705 | 8369 | 7221 | 6252 | 5427 |
| | -2.0 | 15957 | 13721 | 11797 | 10136 | 8712 | 7493 | 6463 | 5598 |
| | -1.5 | 16648 | 14278 | 12245 | 10491 | 8991 | 7712 | 6636 | 5733 |
| | -1.0 | 17174 | 14702 | 12581 | 10759 | 9200 | 7878 | 6766 | 5834 |
| | -0.5 | 17504 | 14962 | 12789 | 10921 | 9331 | 7978 | 6839 | 5892 |
| | 0.0 | 17623 | 15058 | 12862 | 10979 | 9370 | 8006 | 6861 | 5909 |
| | 0.5 | 17523 | 14970 | 12786 | 10918 | 9320 | 7967 | 6826 | 5879 |
| | 1.0 | 17206 | 14709 | 12574 | 10743 | 9182 | 7857 | 6735 | 5808 |
| | 1.5 | 16688 | 14286 | 12231 | 10468 | 8957 | 7678 | 6593 | 5694 |
| | 2.0 | 15997 | 13722 | 11772 | 10098 | 8664 | 7443 | 6406 | 5544 |
| | 2.5 | 15157 | 13038 | 11218 | 9651 | 8306 | 7160 | 6178 | 5362 |
| | 3.0 | 14213 | 12266 | 10592 | 9149 | 7900 | 6836 | 5920 | 5154 |
| | 3.5 | 13193 | 11432 | 9914 | 8600 | 7459 | 6481 | 5635 | 4925 |
| | 4.0 | 12149 | 10576 | 9215 | 8031 | 7003 | 6113 | 5337 | 4685 |
| | 4.5 | 11105 | 9717 | 8512 | 7458 | 6534 | 5733 | 5031 | 4433 |
| | 5.0 | 10099 | 8883 | 7826 | 6895 | 6075 | 5360 | 4723 | 4181 |
| | 5.5 | 9138 | 8086 | 7166 | 6350 | 5627 | 4989 | 4419 | 3928 |
| | 6.0 | 8245 | 7342 | 6545 | 5833 | 5197 | 4633 | 4122 | 3681 |
| | 6.5 | 7425 | 6650 | 5963 | 5345 | 4788 | 4291 | 3834 | 3438 |
| | 7.0 | 6685 | 6021 | 5430 | 4893 | 4407 | 3967 | 3559 | 3204 |
| | 7.5 | 6014 | 5448 | 4941 | 4474 | 4047 | 3659 | 3297 | 2980 |
| | 8.0 | 5417 | 4931 | 4494 | 4089 | 3715 | 3373 | 3050 | 2768 |
| | 8.5 | 4879 | 4462 | 4085 | 3732 | 3405 | 3103 | 2816 | 2562 |
| | 9.0 | 4398 | 4040 | 3712 | 3405 | 3117 | 2851 | 2597 | 2369 |



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NVLAP LAB CODE: 200899-0

Horizontal Angles

| | 9.0 | 9.5 | 10.0 | 10.5 | 11.0 | 11.5 | 12.0 | 12.5 | 15.0 |
|------|------|------|------|------|------|------|------|------|------|
| 9.5 | 3967 | 3655 | 3372 | 3103 | 2852 | 2616 | 2389 | 2186 | 1376 |
| 10.0 | 3578 | 3307 | 3061 | 2826 | 2604 | 2397 | 2194 | 2014 | 1282 |
| 10.5 | 3225 | 2993 | 2776 | 2571 | 2374 | 2191 | 2013 | 1852 | 1197 |
| 11.0 | 2908 | 2706 | 2517 | 2336 | 2164 | 2003 | 1843 | 1701 | 1115 |
| 11.5 | 2619 | 2442 | 2278 | 2120 | 1969 | 1826 | 1686 | 1560 | 1036 |
| 12.0 | 2354 | 2201 | 2059 | 1921 | 1788 | 1663 | 1540 | 1428 | 963 |
| 12.5 | 2118 | 1983 | 1860 | 1739 | 1623 | 1515 | 1406 | 1308 | 895 |
| 15.0 | 1232 | 1169 | 1109 | 1052 | 995 | 942 | 887 | 837 | 618 |
| 20.0 | 491 | 475 | 462 | 446 | 432 | 417 | 402 | 388 | 320 |
| 25.0 | 255 | 251 | 247 | 244 | 239 | 237 | 232 | 226 | 205 |
| 35.0 | 99 | 99 | 98 | 95 | 93 | 94 | 92 | 93 | 85 |
| 45.0 | 37 | 34 | 36 | 35 | 35 | 34 | 34 | 33 | 34 |
| 55.0 | 12 | 13 | 13 | 13 | 14 | 13 | 13 | 13 | 12 |
| 65.0 | 6 | 6 | 7 | 7 | 6 | 7 | 7 | 6 | 6 |
| 75.0 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 3 |
| 85.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| 90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

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Horizontal Angles

| | 20.0 | 25.0 | 35.0 | 45.0 | 55.0 | 65.0 | 75.0 | 85.0 | 90.0 |
|--|-------|------|------|------|------|------|------|------|------|
| V e r t i c a l A n g l e s | -90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | -85.0 | 2 | 2 | 5 | 8 | 9 | 3 | 7 | 9 |
| | -75.0 | 4 | 2 | 7 | 9 | 9 | 3 | 8 | 9 |
| | -65.0 | 8 | 7 | 8 | 10 | 11 | 4 | 7 | 9 |
| | -55.0 | 13 | 13 | 13 | 13 | 11 | 7 | 4 | 8 |
| | -45.0 | 30 | 26 | 21 | 18 | 15 | 7 | 3 | 8 |
| | -35.0 | 71 | 59 | 43 | 33 | 21 | 11 | 6 | 9 |
| | -25.0 | 158 | 119 | 68 | 47 | 33 | 20 | 7 | 7 |
| | -20.0 | 219 | 154 | 78 | 53 | 39 | 25 | 9 | 8 |
| | -15.0 | 337 | 203 | 93 | 57 | 42 | 27 | 12 | 9 |
| | -12.5 | 432 | 234 | 100 | 59 | 43 | 29 | 14 | 9 |
| | -12.0 | 453 | 240 | 101 | 59 | 42 | 28 | 13 | 9 |
| | -11.5 | 474 | 246 | 102 | 58 | 42 | 28 | 15 | 8 |
| | -11.0 | 496 | 253 | 102 | 60 | 43 | 29 | 13 | 9 |
| | -10.5 | 519 | 257 | 104 | 60 | 43 | 29 | 14 | 9 |
| | -10.0 | 541 | 264 | 105 | 59 | 42 | 28 | 13 | 8 |
| | -9.5 | 565 | 270 | 105 | 60 | 44 | 29 | 14 | 10 |
| | -9.0 | 587 | 274 | 106 | 61 | 42 | 29 | 13 | 11 |
| | -8.5 | 610 | 279 | 107 | 60 | 42 | 29 | 14 | 7 |
| | -8.0 | 633 | 285 | 108 | 61 | 44 | 30 | 14 | 9 |
| | -7.5 | 655 | 289 | 107 | 62 | 43 | 28 | 14 | 9 |
| | -7.0 | 675 | 294 | 108 | 61 | 43 | 30 | 14 | 8 |
| | -6.5 | 698 | 299 | 109 | 61 | 43 | 30 | 14 | 9 |
| | -6.0 | 718 | 302 | 110 | 63 | 43 | 29 | 14 | 9 |
| | -5.5 | 736 | 307 | 109 | 62 | 43 | 30 | 14 | 9 |
| | -5.0 | 754 | 312 | 111 | 62 | 44 | 29 | 15 | 9 |
| | -4.5 | 771 | 313 | 110 | 63 | 43 | 29 | 14 | 9 |
| | -4.0 | 786 | 316 | 110 | 62 | 43 | 29 | 14 | 7 |
| | -3.5 | 800 | 320 | 111 | 64 | 44 | 30 | 14 | 10 |
| | -3.0 | 812 | 321 | 112 | 64 | 43 | 29 | 14 | 8 |
| | -2.5 | 821 | 325 | 111 | 63 | 43 | 30 | 13 | 8 |
| | -2.0 | 830 | 327 | 111 | 65 | 43 | 30 | 14 | 9 |
| | -1.5 | 836 | 327 | 112 | 64 | 43 | 30 | 13 | 10 |
| | -1.0 | 840 | 329 | 112 | 64 | 43 | 30 | 14 | 7 |
| | -0.5 | 843 | 330 | 112 | 64 | 44 | 30 | 14 | 10 |
| | 0.0 | 841 | 329 | 113 | 64 | 43 | 30 | 14 | 9 |
| | 0.5 | 844 | 351 | 112 | 63 | 42 | 29 | 14 | 8 |
| | 1.0 | 852 | 499 | 112 | 63 | 44 | 30 | 14 | 10 |
| | 1.5 | 828 | 326 | 113 | 63 | 43 | 30 | 14 | 8 |
| | 2.0 | 820 | 325 | 112 | 61 | 42 | 29 | 14 | 8 |
| | 2.5 | 809 | 323 | 111 | 62 | 44 | 29 | 14 | 9 |
| | 3.0 | 798 | 319 | 111 | 62 | 43 | 29 | 15 | 9 |
| | 3.5 | 784 | 316 | 111 | 61 | 42 | 29 | 13 | 8 |
| | 4.0 | 769 | 314 | 110 | 61 | 43 | 29 | 13 | 9 |
| | 4.5 | 753 | 310 | 111 | 62 | 42 | 29 | 14 | 9 |
| | 5.0 | 735 | 306 | 110 | 60 | 42 | 30 | 14 | 8 |
| | 5.5 | 718 | 304 | 109 | 60 | 44 | 28 | 14 | 9 |
| | 6.0 | 698 | 298 | 110 | 61 | 44 | 29 | 14 | 8 |
| | 6.5 | 678 | 295 | 110 | 60 | 42 | 29 | 13 | 8 |
| | 7.0 | 657 | 291 | 109 | 60 | 43 | 29 | 14 | 9 |
| | 7.5 | 635 | 286 | 110 | 59 | 43 | 29 | 14 | 8 |
| | 8.0 | 615 | 280 | 108 | 58 | 42 | 29 | 14 | 9 |
| | 8.5 | 593 | 278 | 107 | 59 | 43 | 30 | 14 | 9 |
| | 9.0 | 571 | 270 | 107 | 60 | 43 | 29 | 14 | 8 |



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NVLAP LAB CODE: 200899-0

Horizontal Angles

| | | 20.0 | 25.0 | 35.0 | 45.0 | 55.0 | 65.0 | 75.0 | 85.0 | 90.0 |
|--------------------------------------|------|------|------|------|------|------|------|------|------|------|
| V e r t i c a l | 9.5 | 549 | 266 | 106 | 58 | 41 | 29 | 14 | 7 | 8 |
| | 10.0 | 528 | 261 | 106 | 58 | 43 | 29 | 13 | 7 | 10 |
| | 10.5 | 505 | 255 | 105 | 59 | 43 | 28 | 14 | 8 | 9 |
| | 11.0 | 485 | 249 | 104 | 57 | 41 | 28 | 13 | 7 | 9 |
| | 11.5 | 464 | 245 | 102 | 58 | 43 | 29 | 14 | 7 | 9 |
| | 12.0 | 443 | 237 | 102 | 57 | 43 | 28 | 15 | 8 | 10 |
| | 12.5 | 423 | 231 | 100 | 56 | 41 | 27 | 14 | 7 | 9 |
| | 15.0 | 335 | 202 | 94 | 56 | 41 | 27 | 14 | 8 | 8 |
| | 20.0 | 218 | 155 | 78 | 51 | 39 | 25 | 10 | 7 | 8 |
| | 25.0 | 162 | 122 | 68 | 47 | 35 | 20 | 7 | 8 | 9 |
| | 35.0 | 71 | 62 | 45 | 33 | 22 | 11 | 5 | 8 | 8 |
| | 45.0 | 30 | 26 | 22 | 18 | 14 | 9 | 5 | 7 | 10 |
| | 55.0 | 13 | 10 | 12 | 13 | 11 | 8 | 5 | 7 | 9 |
| | 65.0 | 5 | 7 | 7 | 11 | 11 | 7 | 4 | 8 | 9 |
| | 75.0 | 4 | 2 | 6 | 8 | 8 | 6 | 4 | 6 | 9 |
| 85.0 | 3 | 0 | 4 | 7 | 7 | 4 | 2 | 7 | 8 | |
| 90.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |