

Report of Test LLI-15261-2-R03

This test report supersedes test report number LLI-15261-2-R02

Greenstar Products - Pole arm mounted roadway luminaire. Product ID: XAVH20434SNXXI

Grey painted cast aluminum housing with fins. Fixture extents ~ 37" x 12.75" x 5".

20 LEDs mounted on four white PCBs with clear plastic sheets of individual lenses.

One Inventronics driver. Model: EUC-085S175DT and two Moon' drivers. Model MU060H175AQ.

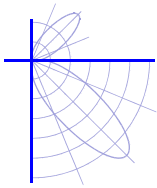
Operating at 277 Vac and 60 Hz with step down transformer and dimming disconnected.



Performance Summary

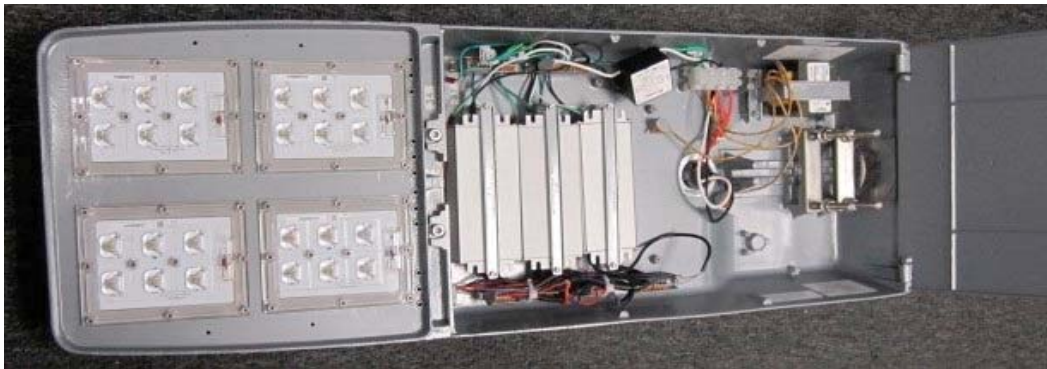
| | | | |
|--------------------|----------------|------------------------|-----------------|
| Total Light Output | 22808 lm | Power Factor | 0.99 |
| Luminaire Power | 233.0 W | THD(i)* | 7.5 % |
| Luminous Efficacy | 97.9 lm/W | 0-90° Zonal Flux % | 100.0 % |
| CCT | 4040 K | 80-90° Zonal Flux % | 1.5 % |
| CIE(x,y) 1931 | (0.378, 0.372) | BUG Rating* | B3-U0-G3 |
| CRI | 73 | Street Classification* | Type III Medium |

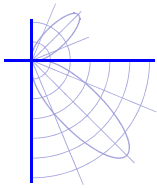
PREPARED FOR : Greenstar Products, Inc., 6900 Alamo Downs Pkwy, San Antonio, TX 78238



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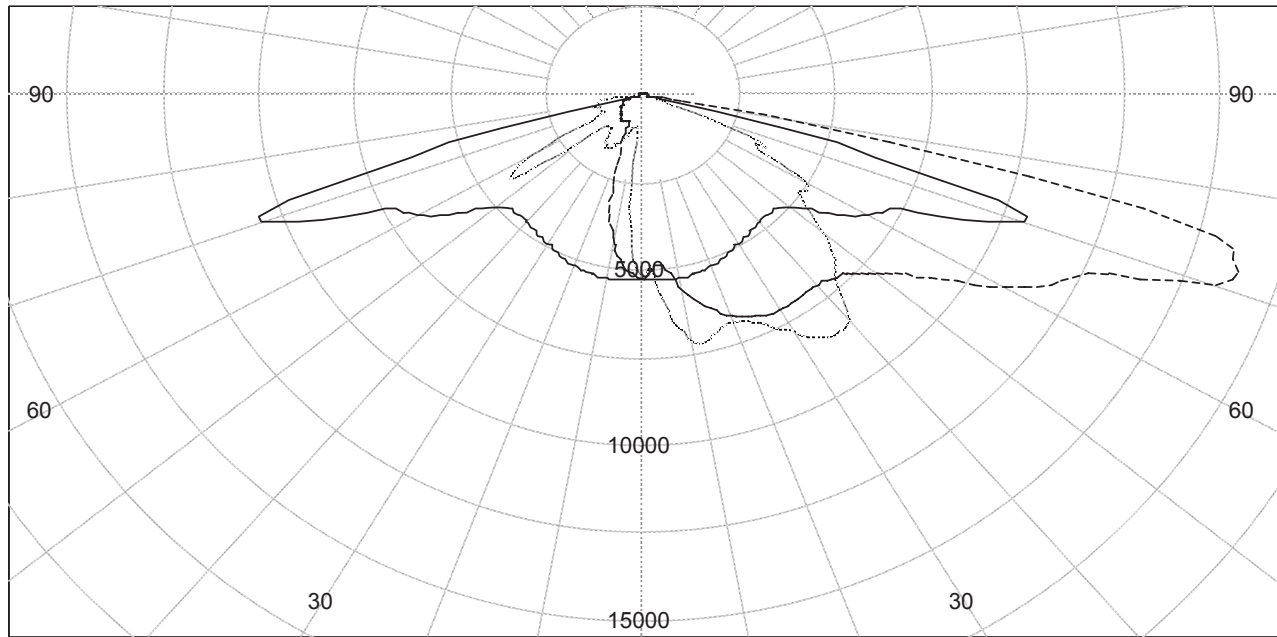




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Polar Light Distribution Curves



House side / L270

L90 / 270 - Solid, Plane of maximum - Dashed, L0 / 180 - Grey (cd)

Street side / L90

Percentage Outputs

| | Upward | Downward | Total |
|-------------|--------|----------|---------|
| Street Side | 0.0 % | 79.6 % | 79.6 % |
| House Side | 0.0 % | 20.4 % | 20.4 % |
| | 0.0 % | 100.0 % | 100.0 % |

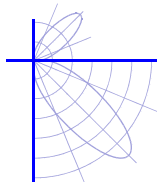
Report data based on absolute values as measured.

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test
Date of report

2-Nov-2015
25-Jan-2016



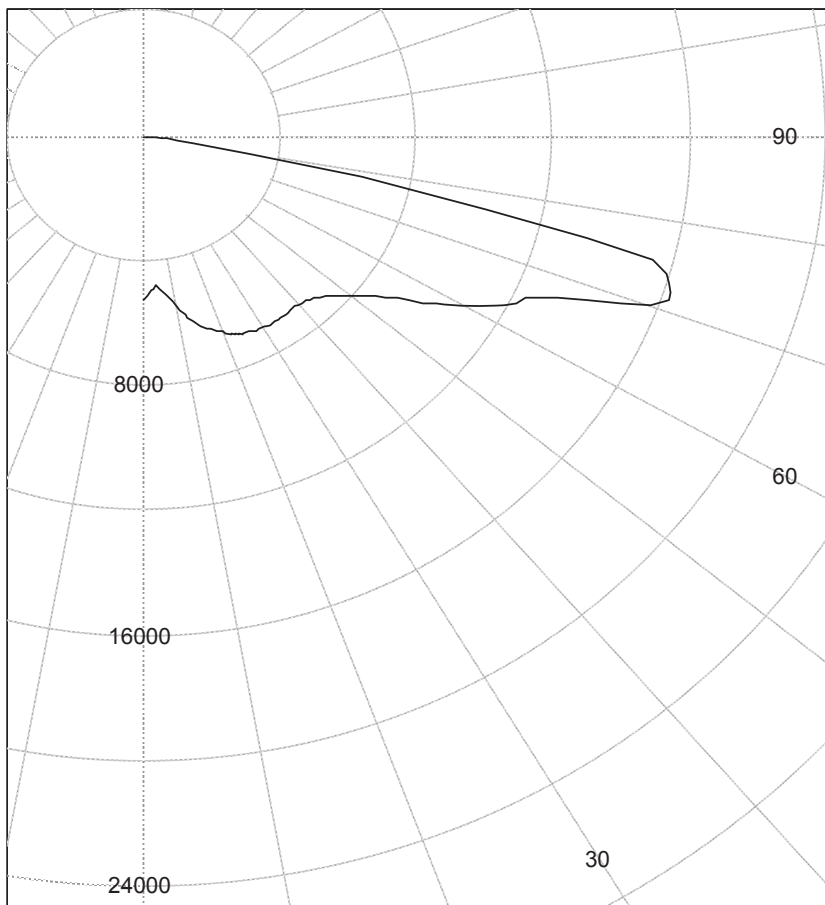
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Intensity
in principal plane

| Vertical Angle (°) | Intensity (cd) |
|--------------------|----------------|
| 0.0 | 5271.0 |
| 10.0 | 5532.1 |
| 20.0 | 6709.1 |
| 30.0 | 7087.4 |
| 35.0 | 7056.9 |
| 40.0 | 7072.6 |
| 45.0 | 7293.9 |
| 47.5 | 7560.4 |
| 50.0 | 7949.0 |
| 52.5 | 8432.1 |
| 55.0 | 9082.9 |
| 57.5 | 9960.5 |
| 60.0 | 10934.8 |
| 62.5 | 11797.2 |
| 65.0 | 12347.3 |
| 67.5 | 13549.8 |
| 70.0 | 15809.7 |
| 72.5 | 16173.2 |
| 75.0 | 15424.8 |
| 77.5 | 8484.9 |
| 80.0 | 1543.6 |
| 82.5 | 636.2 |
| 85.0 | 269.9 |
| 87.5 | 69.5 |
| 90.0 | 0.0 |
| 92.5 | 0.0 |
| 95.0 | 0.0 |
| 97.5 | 0.0 |
| 100.0 | 0.0 |
| 102.5 | 0.0 |
| 105.0 | 0.0 |
| 120.0 | 0.0 |
| 135.0 | 0.0 |
| 150.0 | 0.0 |
| 165.0 | 0.0 |
| 180.0 | 0.0 |

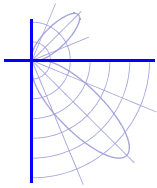
Principal Vertical Plane



Plane of maximum intensity (cd)

| | Maximum Intensity |
|-------------|----------------------------|
| House Side | 10652 cd @ (270.0°, 70.5°) |
| Street Side | 16296 cd @ (295.0°, 71.5°) |

Coordinates expressed in the C Type coordinate system
Data for the two symmetric halves of the luminaire has been averaged.



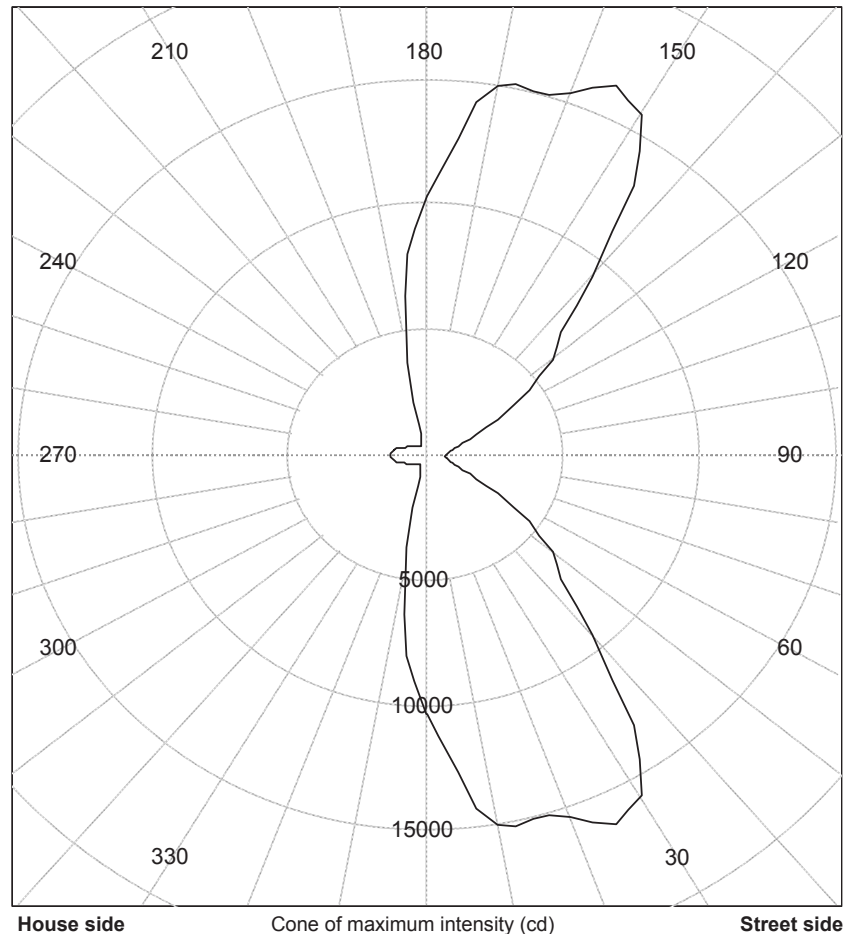
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Intensity
in principal cone

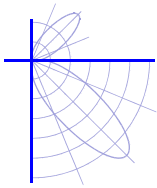
| Lateral Plane (°) | Intensity (cd) |
|-------------------|----------------|
| 0 | 676.7 |
| 15 | 1046.9 |
| 30 | 2951.5 |
| 40 | 6003.6 |
| 45 | 6936.5 |
| 50 | 9349.3 |
| 55 | 13191.1 |
| 60 | 15717.3 |
| 65 | 16296.5 |
| 70 | 15440.0 |
| 75 | 15040.1 |
| 80 | 15012.7 |
| 85 | 12729.3 |
| 90 | 10287.3 |
| 95 | 8002.6 |
| 100 | 3758.1 |
| 105 | 1317.1 |
| 110 | 725.8 |
| 115 | 522.4 |
| 120 | 441.8 |
| 125 | 461.0 |
| 130 | 478.4 |
| 135 | 524.6 |
| 140 | 591.3 |
| 150 | 742.6 |
| 165 | 1096.4 |
| 180 | 1274.2 |

Principal Conical Surface



| | <u>Maximum Intensity</u> |
|-------------|----------------------------|
| House Side | 10652 cd @ (270.0°, 70.5°) |
| Street Side | 16296 cd @ (295.0°, 71.5°) |

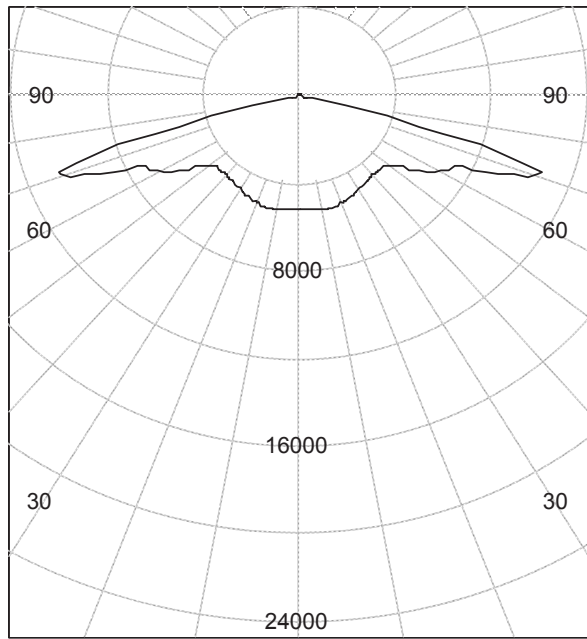
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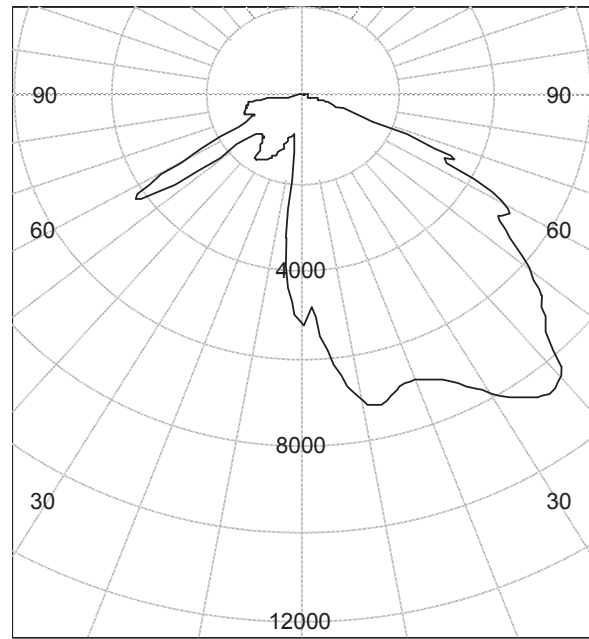
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Polar curve through L90 / L270

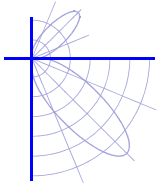


(L90) (cd) (L270)

Polar curve through L0 / L180



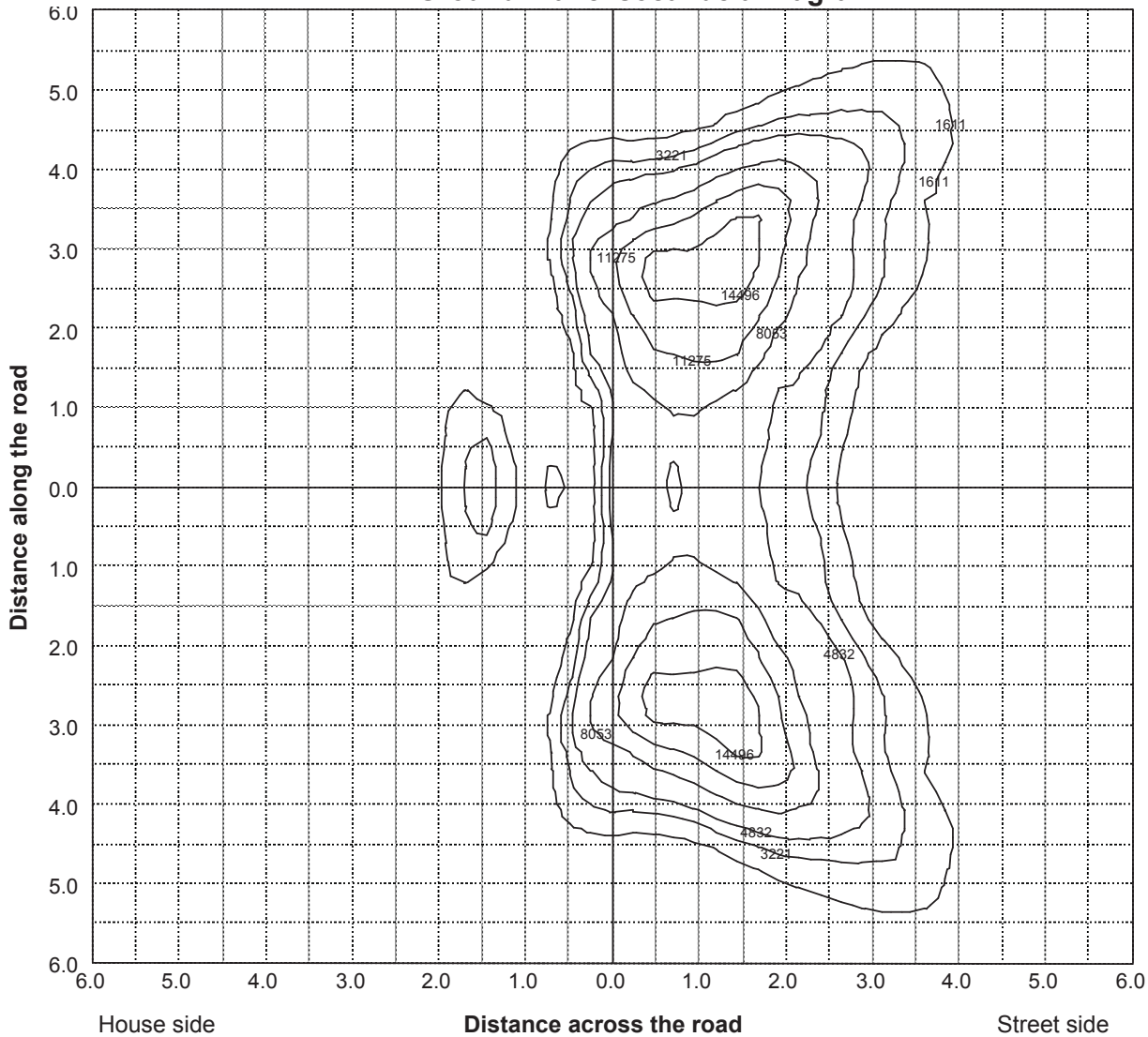
House side (L180) (cd) Street side (L0)



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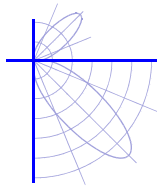
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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House side intensity data (cd)

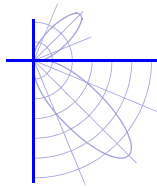
| Vertical | L-Plane | | | | | | | | |
|----------|---------|------|------|------|------|------|------|------|------|
| | L180 | L195 | L210 | L220 | L225 | L230 | L235 | L240 | L245 |
| 0.0 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 |
| 10.0 | 955 | 1041 | 1520 | 2240 | 2652 | 3089 | 3541 | 3969 | 4333 |
| 20.0 | 1281 | 1233 | 1089 | 980 | 936 | 904 | 888 | 1027 | 1795 |
| 30.0 | 1707 | 1681 | 1560 | 1399 | 1298 | 1186 | 1051 | 924 | 850 |
| 35.0 | 1743 | 1727 | 1567 | 1438 | 1334 | 1232 | 1152 | 1018 | 885 |
| 40.0 | 1292 | 1335 | 1411 | 1336 | 1208 | 1103 | 1028 | 978 | 882 |
| 45.0 | 1231 | 1226 | 1084 | 993 | 938 | 912 | 886 | 852 | 860 |
| 47.5 | 1251 | 1206 | 1027 | 900 | 826 | 780 | 795 | 807 | 830 |
| 50.0 | 1802 | 1517 | 987 | 831 | 756 | 713 | 718 | 758 | 796 |
| 52.5 | 3068 | 2341 | 1133 | 781 | 707 | 663 | 664 | 712 | 761 |
| 55.0 | 4100 | 3579 | 1561 | 784 | 671 | 636 | 627 | 666 | 729 |
| 57.5 | 3975 | 3862 | 2074 | 930 | 671 | 609 | 604 | 634 | 704 |
| 60.0 | 2979 | 3146 | 2585 | 1036 | 731 | 607 | 594 | 609 | 670 |
| 62.5 | 1714 | 1956 | 2304 | 1095 | 753 | 599 | 574 | 579 | 631 |
| 65.0 | 1173 | 1202 | 1620 | 1108 | 733 | 585 | 546 | 554 | 598 |
| 67.5 | 1122 | 1006 | 1066 | 914 | 692 | 556 | 521 | 519 | 584 |
| 70.0 | 1215 | 1034 | 800 | 662 | 593 | 516 | 490 | 476 | 553 |
| 72.5 | 1288 | 1139 | 728 | 558 | 493 | 450 | 433 | 419 | 498 |
| 75.0 | 1251 | 1200 | 732 | 592 | 433 | 394 | 370 | 363 | 414 |
| 77.5 | 1206 | 1164 | 800 | 714 | 410 | 336 | 312 | 297 | 312 |
| 80.0 | 1178 | 1125 | 856 | 625 | 350 | 274 | 254 | 224 | 217 |
| 82.5 | 1099 | 1081 | 823 | 566 | 275 | 197 | 180 | 159 | 145 |
| 85.0 | 892 | 971 | 658 | 371 | 146 | 118 | 117 | 105 | 81 |
| 87.5 | 455 | 572 | 285 | 123 | 45 | 43 | 46 | 41 | 33 |
| 90.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 92.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 95.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 135.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 165.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



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| Vertical | House side | | Intensity data (cd) | | | | | | Street side | |
|----------|------------|------|---------------------|---------|-------|-------|-------|-------|-------------|--|
| | L250 | L255 | L260 | L-Plane | | | L280 | L285 | L290 | |
| 0.0 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | |
| 10.0 | 4642 | 4889 | 5100 | 5262 | 5306 | 5127 | 4900 | 4947 | 5210 | |
| 20.0 | 2897 | 3899 | 4592 | 5036 | 5187 | 4890 | 5178 | 5802 | 6309 | |
| 30.0 | 1080 | 2428 | 3900 | 4718 | 4929 | 4889 | 5626 | 6347 | 6842 | |
| 35.0 | 852 | 1808 | 3535 | 4581 | 4800 | 4957 | 5818 | 6565 | 6998 | |
| 40.0 | 792 | 1373 | 3179 | 4473 | 4712 | 5072 | 6031 | 6781 | 7114 | |
| 45.0 | 800 | 1118 | 2912 | 4426 | 4708 | 5270 | 6351 | 7104 | 7355 | |
| 47.5 | 807 | 1047 | 2831 | 4473 | 4804 | 5490 | 6630 | 7379 | 7605 | |
| 50.0 | 800 | 1008 | 2833 | 4612 | 5004 | 5846 | 7082 | 7836 | 8020 | |
| 52.5 | 787 | 1028 | 2956 | 4875 | 5353 | 6399 | 7747 | 8472 | 8580 | |
| 55.0 | 766 | 1099 | 3231 | 5258 | 5847 | 7144 | 8596 | 9280 | 9274 | |
| 57.5 | 752 | 1200 | 3618 | 5686 | 6404 | 7983 | 9564 | 10225 | 10115 | |
| 60.0 | 749 | 1313 | 3935 | 5958 | 6785 | 8627 | 10349 | 11061 | 10966 | |
| 62.5 | 754 | 1361 | 3969 | 6069 | 7131 | 9285 | 11141 | 11732 | 11599 | |
| 65.0 | 749 | 1196 | 3751 | 6464 | 7886 | 10450 | 12413 | 12655 | 12195 | |
| 67.5 | 748 | 1144 | 4031 | 7532 | 9348 | 12345 | 14629 | 14552 | 13714 | |
| 70.0 | 743 | 1275 | 4032 | 8197 | 10570 | 13432 | 15767 | 15640 | 15434 | |
| 72.5 | 690 | 1160 | 3231 | 7092 | 8840 | 10957 | 13440 | 14077 | 15091 | |
| 75.0 | 520 | 558 | 1673 | 4139 | 5233 | 6198 | 7619 | 9490 | 12704 | |
| 77.5 | 351 | 370 | 432 | 994 | 1036 | 945 | 1369 | 2981 | 5598 | |
| 80.0 | 218 | 199 | 205 | 223 | 250 | 276 | 323 | 485 | 884 | |
| 82.5 | 127 | 111 | 116 | 140 | 145 | 164 | 192 | 242 | 398 | |
| 85.0 | 71 | 61 | 65 | 70 | 74 | 79 | 101 | 120 | 178 | |
| 87.5 | 28 | 22 | 18 | 22 | 23 | 21 | 27 | 30 | 37 | |
| 90.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 92.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 95.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 97.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 100.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 102.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 105.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 120.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 135.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 150.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 165.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 180.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

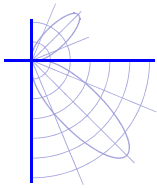


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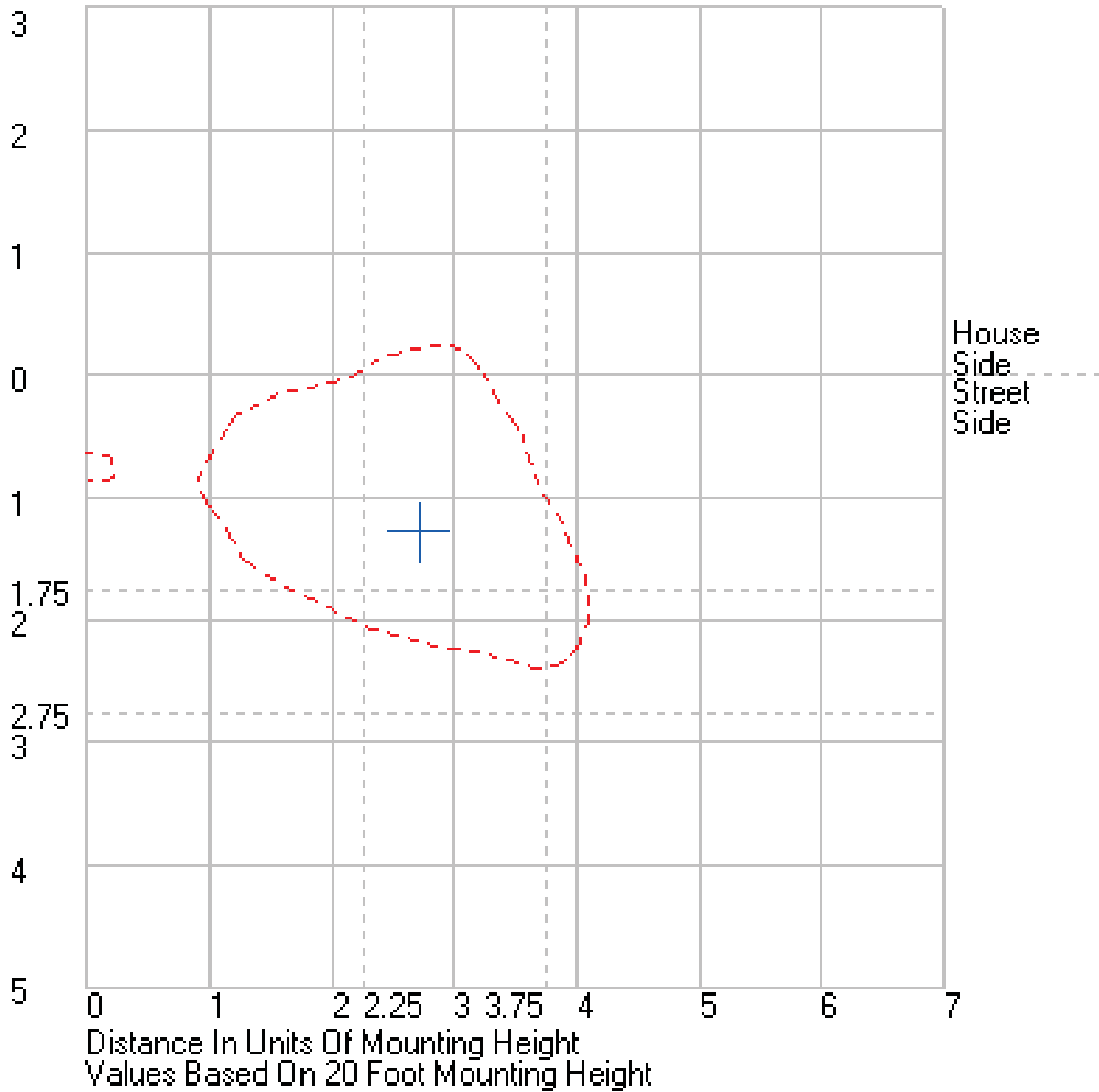
Street side intensity data (cd)

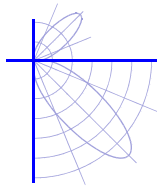
| Vertical | L-Plane | | | | | | | | |
|----------|---------|-------|-------|-------|------|------|------|------|------|
| | L295 | L300 | L305 | L310 | L315 | L320 | L330 | L345 | L0 |
| 0.0 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 | 5271 |
| 10.0 | 5532 | 5822 | 6078 | 6277 | 6461 | 6605 | 6822 | 6992 | 7061 |
| 20.0 | 6709 | 7015 | 7212 | 7245 | 7174 | 7073 | 6927 | 6864 | 6880 |
| 30.0 | 7087 | 7076 | 6961 | 6884 | 6913 | 6992 | 7293 | 7674 | 7833 |
| 35.0 | 7057 | 6961 | 6922 | 6974 | 7112 | 7266 | 7683 | 8237 | 8445 |
| 40.0 | 7073 | 7010 | 7078 | 7217 | 7385 | 7502 | 7748 | 8287 | 8371 |
| 45.0 | 7294 | 7332 | 7477 | 7603 | 7662 | 7655 | 7573 | 7255 | 7079 |
| 47.5 | 7560 | 7633 | 7791 | 7845 | 7824 | 7713 | 7401 | 6928 | 6688 |
| 50.0 | 7949 | 8040 | 8165 | 8119 | 7993 | 7759 | 7207 | 6562 | 6157 |
| 52.5 | 8432 | 8522 | 8556 | 8407 | 8177 | 7773 | 6958 | 6089 | 5532 |
| 55.0 | 9083 | 9138 | 9011 | 8746 | 8373 | 7757 | 6595 | 5572 | 4973 |
| 57.5 | 9960 | 9947 | 9646 | 9188 | 8544 | 7661 | 6216 | 5493 | 5043 |
| 60.0 | 10935 | 10850 | 10459 | 9761 | 8791 | 7710 | 6356 | 5448 | 4779 |
| 62.5 | 11797 | 11791 | 11407 | 10606 | 9410 | 8035 | 5974 | 4571 | 3707 |
| 65.0 | 12347 | 12540 | 12408 | 11544 | 9725 | 7478 | 4760 | 3788 | 3489 |
| 67.5 | 13550 | 13389 | 12961 | 11574 | 8693 | 6395 | 4524 | 3536 | 2697 |
| 70.0 | 15810 | 15117 | 13314 | 10317 | 7524 | 5964 | 3980 | 1832 | 891 |
| 72.5 | 16173 | 15455 | 12534 | 8549 | 6680 | 5770 | 2275 | 900 | 611 |
| 75.0 | 15425 | 13716 | 9186 | 6400 | 5615 | 4365 | 1114 | 694 | 435 |
| 77.5 | 8485 | 8819 | 6573 | 4404 | 3021 | 2011 | 836 | 495 | 306 |
| 80.0 | 1544 | 2642 | 3394 | 2332 | 1134 | 1019 | 788 | 344 | 214 |
| 82.5 | 636 | 802 | 570 | 554 | 760 | 787 | 612 | 221 | 132 |
| 85.0 | 270 | 335 | 219 | 223 | 283 | 365 | 267 | 110 | 63 |
| 87.5 | 69 | 94 | 48 | 45 | 55 | 70 | 49 | 24 | 15 |
| 90.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 92.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 95.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 97.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 135.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 165.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



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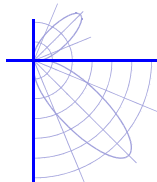
LM-79 Performance Data

| | | |
|-----------------|--|----------------|
| Spectral | CIE 1931 (x, y) ⁽¹⁾ | (0.378, 0.372) |
| | CIE 1976 (u', v') ⁽¹⁾ | (0.225, 0.499) |
| | Correlated Color Temperature (CCT) ⁽¹⁾ | 4040 K |
| | Color Spatial Uniformity ⁽²⁾ | 0.0184 |
| | Color Rendering Index (Ra) ⁽¹⁾ | 73 |
| | Special CRI 9 (R _g) ^{(1),(3)} | -19 |
| | Distance from Planckian Locus (Duv) ^{(1),(3)} | -0.0014 |
| | Scotopic/Photopic Ratio ^{(1),(3)} | 1.53 |

| | | |
|-------------------|--------------|---------|
| Electrical | Voltage | 480 V |
| | Frequency | 60 Hz |
| | Current | 0.488 A |
| | Power | 233 W |
| | Power Factor | 0.994 |
| | Current THD | 7.53 % |

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer

- (1) Value is computed from the weighted average of the spatial measurements
- (2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average
- (3) Quantity is in addition to the scope of IESNA LM-79-08



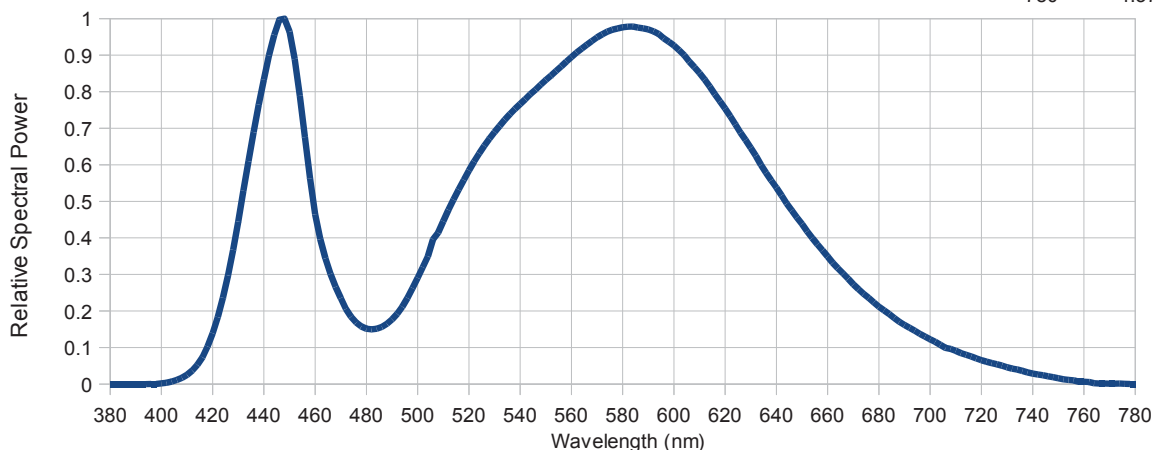
Test Report No. LLI-15261-2-R03

Greenstar Products - Pole arm mounted roadway luminaire. Product ID: XAVH20434SNXXI
Grey painted cast aluminum housing with fins. Fixture extends ~ 37" x 12.75" x 5".
20 LEDs mounted on four white PCBs with clear plastic sheets of individual lenses.
One Inventronics driver. Model: EUC-085S175DT and two Moon' drivers. Model MU060H175AQ.
Operating at 277 Vac and 60 Hz with step down transformer and dimming disconnected.

LM-79 Performance Data

Summary Relative Spectral Irradiance Distribution (wavelength – nm, irradiance – relative to peak = 1)

| | | | | | | | |
|-----|----------|-----|----------|-----|----------|-----|----------|
| 380 | 0.00E+00 | 480 | 1.51E-01 | 580 | 9.77E-01 | 680 | 2.12E-01 |
| 385 | 0.00E+00 | 485 | 1.54E-01 | 585 | 9.77E-01 | 685 | 1.86E-01 |
| 390 | 0.00E+00 | 490 | 1.77E-01 | 590 | 9.71E-01 | 690 | 1.62E-01 |
| 395 | 2.18E-05 | 495 | 2.23E-01 | 595 | 9.52E-01 | 695 | 1.42E-01 |
| 400 | 1.64E-03 | 500 | 2.91E-01 | 600 | 9.27E-01 | 700 | 1.23E-01 |
| 405 | 9.01E-03 | 505 | 3.73E-01 | 605 | 8.91E-01 | 705 | 1.03E-01 |
| 410 | 2.54E-02 | 510 | 4.46E-01 | 610 | 8.51E-01 | 710 | 9.08E-02 |
| 415 | 6.27E-02 | 515 | 5.18E-01 | 615 | 8.03E-01 | 715 | 7.77E-02 |
| 420 | 1.39E-01 | 520 | 5.85E-01 | 620 | 7.54E-01 | 720 | 6.51E-02 |
| 425 | 2.67E-01 | 525 | 6.42E-01 | 625 | 7.00E-01 | 725 | 5.58E-02 |
| 430 | 4.45E-01 | 530 | 6.90E-01 | 630 | 6.47E-01 | 730 | 4.58E-02 |
| 435 | 6.50E-01 | 535 | 7.31E-01 | 635 | 5.89E-01 | 735 | 3.80E-02 |
| 440 | 8.33E-01 | 540 | 7.66E-01 | 640 | 5.37E-01 | 740 | 2.87E-02 |
| 445 | 9.76E-01 | 545 | 8.00E-01 | 645 | 4.85E-01 | 745 | 2.27E-02 |
| 450 | 9.64E-01 | 550 | 8.32E-01 | 650 | 4.38E-01 | 750 | 1.58E-02 |
| 455 | 7.32E-01 | 555 | 8.63E-01 | 655 | 3.91E-01 | 755 | 1.07E-02 |
| 460 | 4.64E-01 | 560 | 8.95E-01 | 660 | 3.49E-01 | 760 | 6.28E-03 |
| 465 | 3.23E-01 | 565 | 9.23E-01 | 665 | 3.10E-01 | 765 | 1.75E-03 |
| 470 | 2.35E-01 | 570 | 9.49E-01 | 670 | 2.73E-01 | 770 | 1.08E-03 |
| 475 | 1.76E-01 | 575 | 9.67E-01 | 675 | 2.41E-01 | 775 | 9.24E-04 |
| | | | | | | 780 | 4.37E-05 |



* The spectral power distribution combines the weighted spectral power distributions of all spatial measurements.



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 Operating at 277 Vac and 60 Hz with step down transformer and dimming disconnected.

LM-79 Performance Data

Spatial measurements

| Vertical angle (deg) | CIE 1976 (u',v') coordinates | |
|----------------------|------------------------------|---------------------|
| | Horizontal 0 plane | Horizontal 90 plane |
| 0 | (0.224, 0.482) | (0.224, 0.482) |
| 10 | (0.224, 0.484) | (0.224, 0.481) |
| 20 | (0.224, 0.485) | (0.224, 0.482) |
| 30 | (0.224, 0.487) | (0.224, 0.487) |
| 40 | (0.224, 0.490) | (0.225, 0.494) |
| 50 | (0.225, 0.494) | (0.225, 0.501) |
| 60 | (0.226, 0.502) | (0.226, 0.512) |
| 70 | (0.227, 0.513) | I <= 10 % |
| 80 | I <= 10 % | I <= 10 % |
| - | - | - |

Spatial measurements

| Vertical angle (deg) | CIE 1976 (u',v') coordinates | |
|----------------------|------------------------------|---------------------|
| | Horizontal 0 plane | Horizontal 90 plane |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimize stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilized supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer, spectral irradiance. The distribution locus comprises points in two or more planes (as indicated in the table above) at no more than 10° vertical intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

| | | | |
|--------------------|------------|----------------------|----------|
| Sample Orientation | Horizontal | Stabilization Time | 3.0 hour |
| | | Total Operation Time | 6.0 hour |

Equipment and uncertainties

LightLab International R80A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

| | | | |
|-----------------------------|---------|-------------------|---------|
| Luminous Intensity | ± 4 % | Temperature | ± 1 °C |
| Luminous Flux | ± 4 % | Luminous Efficacy | ± 4.5 % |
| Horizontal, Vertical Angles | ± 0.25° | | |

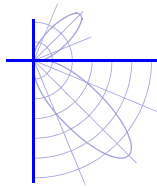
PhotoResearch PR-670 spectroradiometer (380 - 780 nm., 2 nm. per pixel) measuring at a distance from the sample deemed greater than five times the maximum observed luminous opening dimension.

| | | | |
|--------------------------------|---------|-----------------------------|---------|
| CIE (x, y) coordinates | ± 0.003 | CCT | ± 100 K |
| CIE (u', v') coordinates | ± 0.002 | CRI (Ra) | ± 2 |
| Δ (u', v') Color difference | ± 0.001 | Scotopic / Photopic Ratio * | ± 0.02 |
| Relative Spectral Irradiance * | ± 2 % | R9 * | ± 2 |

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

| | | | |
|---------------|---------|--------------|----------|
| Voltage | ± 0.5 % | Frequency * | ± 0.1 Hz |
| Current | ± 0.5 % | Power | ± 0.5 % |
| Current THD * | ± 3 % | Power Factor | ± 0.02 |

This report contains data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.
 IESNA LM-79-08 Calculator v5 (17th Apr 2015)



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Operating at 277 Vac and 60 Hz with step down transformer and dimming disconnected.

Test Distance 8.0 m
Test Temperature 24.7 °C

Notes The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of publications: IES LM-79-08 (Sec. 12), IES LM-16-93, IES LM-58-13, CIE 13.3:1995, CIE 15:2004, ANSI C78.377:2011, ANSI C82.77:2002.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the IESNA Type C coordinate system (L, V) as defined in IESNA publication LM-75.

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This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the Federal Government.