

Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions

Brand: STREETWORKS

Report Number: P363301

Luminaire Tested: NVN-SA3B-727-U-T4W-HSS

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P363301  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-19)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA3B-727-U-T4W-HSS  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(3) 70 CRI, 2700K, 800mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV WIDE OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 10490 lumens  
Efficiency: N/A  
Efficacy: 84.6 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1.5' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

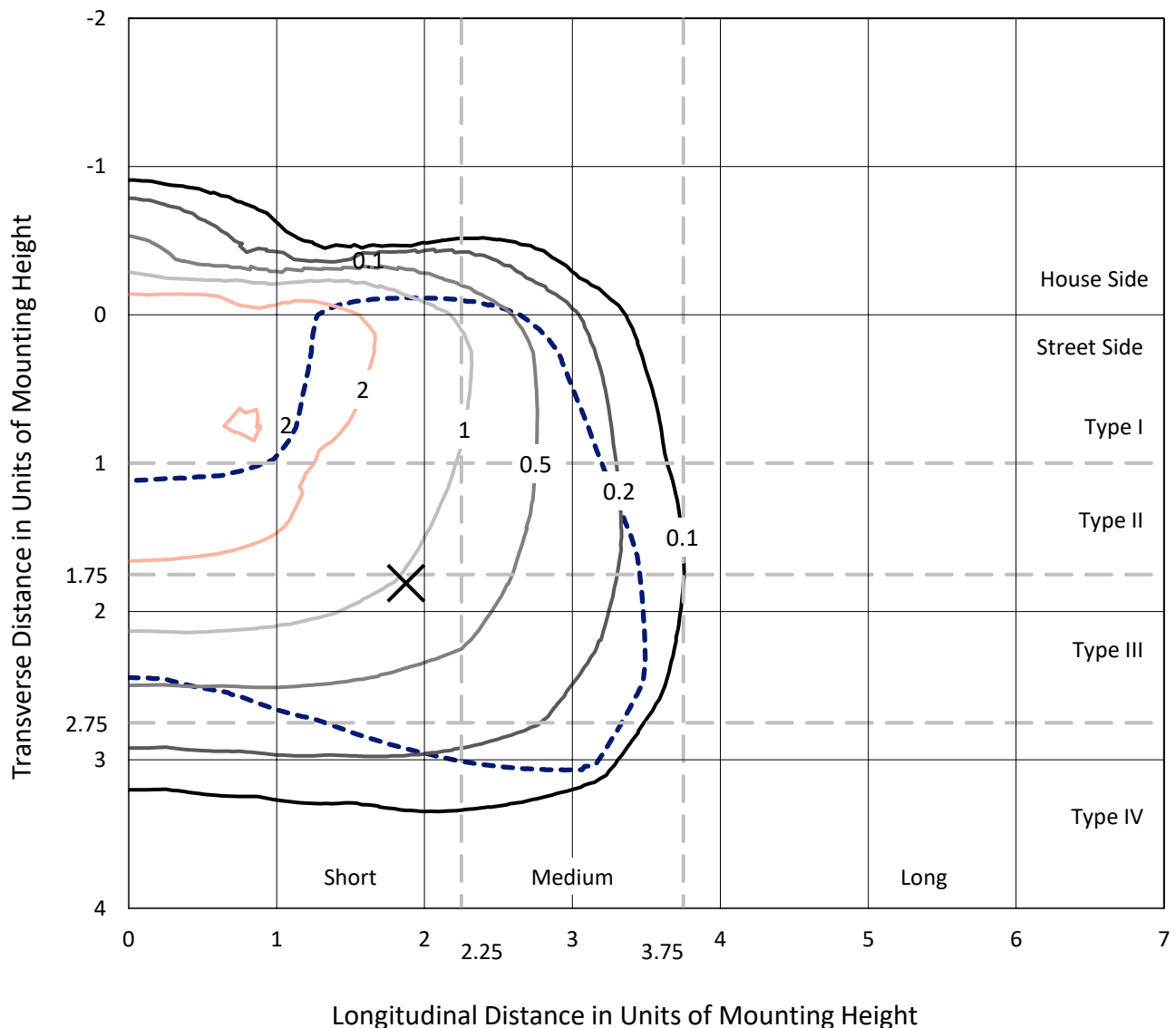
Input Watts (W): 124  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



REPORT NUMBER: P363301  
 CATALOG NUMBER: NVN-SA3B-727-U-T4W-HSS

## Iso-Footcandle Lines of Horizontal Illumination

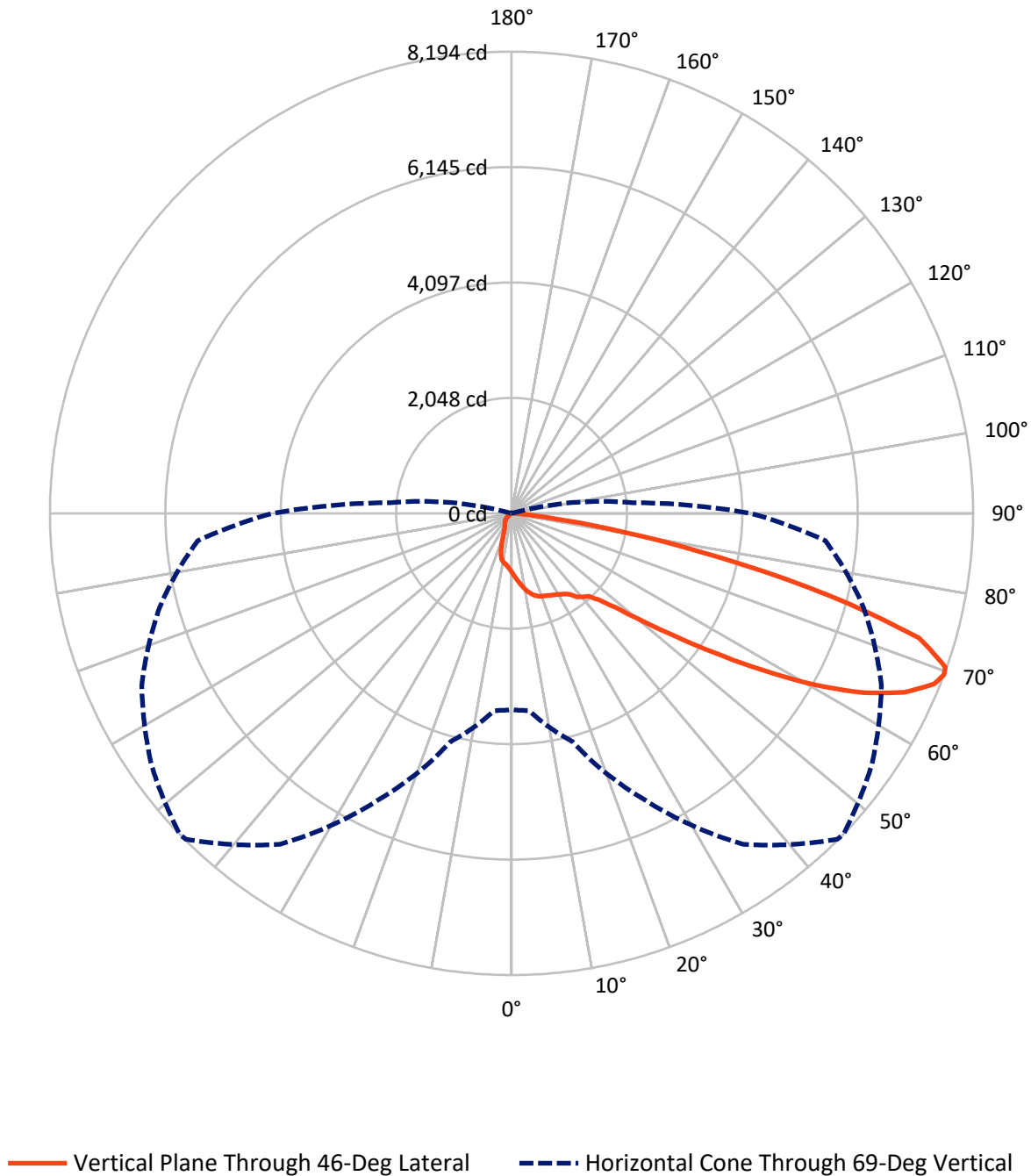
✕ Max cd  
 - - - 1/2 Max cd



Based on 20 foot mounting height. Maximum calculated value = 3.8 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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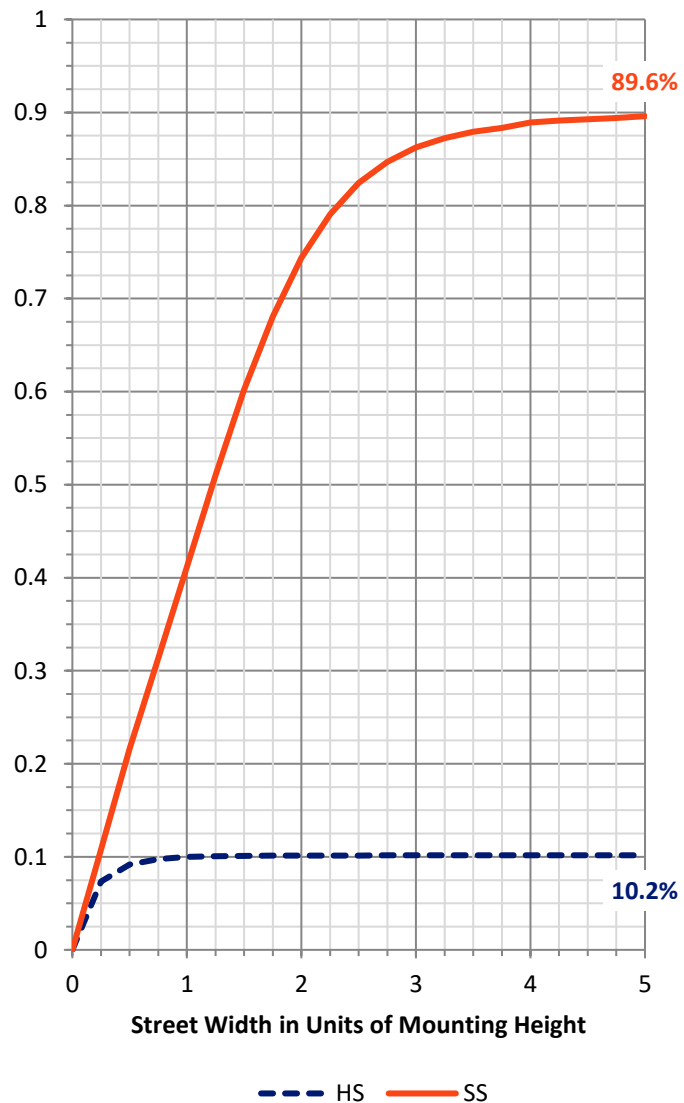
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 1076.6   | 0.0    | 1076.6  |
|                    | % Fixture | 10.3     | 0.0    | 10.3    |
| <b>Street Side</b> | Lumens    | 9413.4   | 0.0    | 9413.4  |
|                    | % Fixture | 89.7     | 0.0    | 89.7    |
| <b>Total</b>       | Lumens    | 10490.0  | 0.0    | 10490.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 104.6   | 1.0       |
| 10°-20°   | 317.4   | 3.0       |
| 20°-30°   | 499.1   | 4.8       |
| 30°-40°   | 715.8   | 6.8       |
| 40°-50°   | 1237.1  | 11.8      |
| 50°-60°   | 2444.0  | 23.3      |
| 60°-70°   | 3415.7  | 32.6      |
| 70°-80°   | 1650.2  | 15.7      |
| 80°-90°   | 106.1   | 1.0       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 10490.0 | 100.0     |
| 0°-180°   | 10490.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P363301

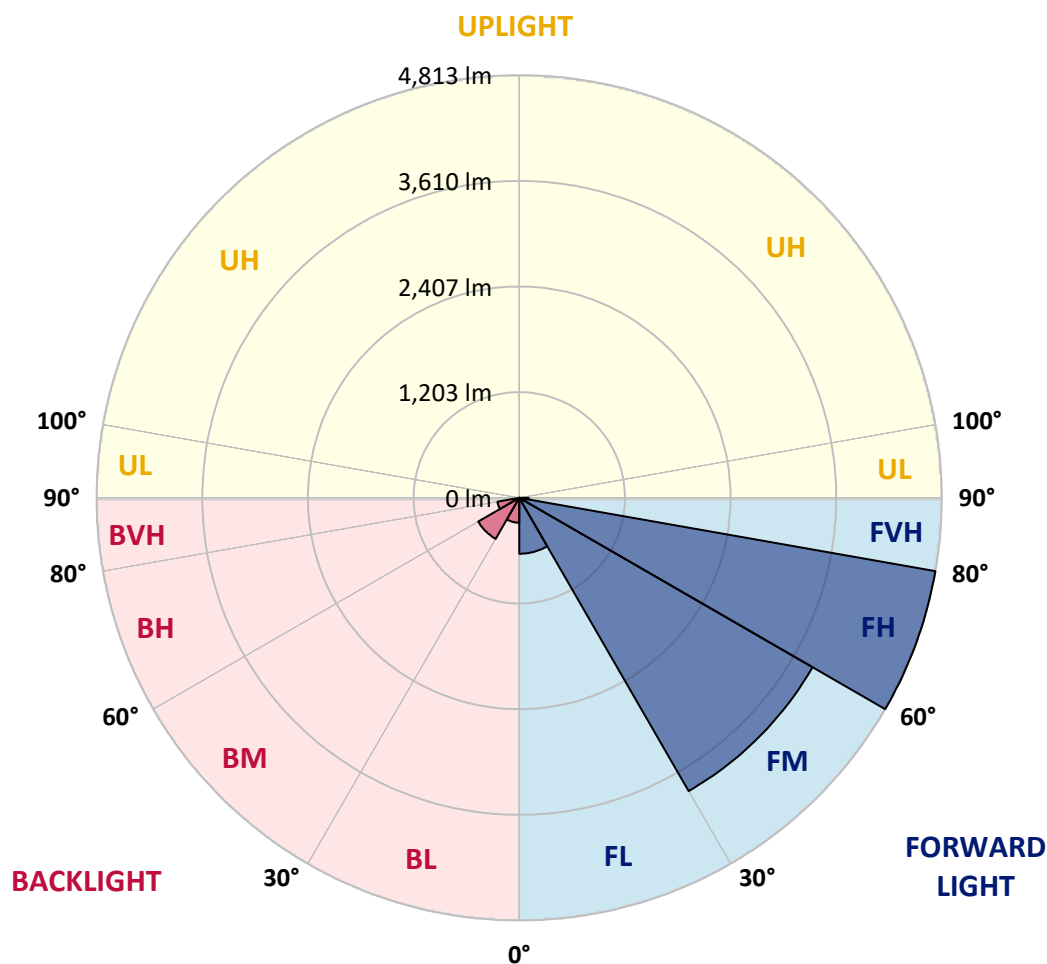
CATALOG NUMBER: NVN-SA3B-727-U-T4W-HSS

**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 637.4  | 6.1       |                         |      |         |
| FM   | (30°-60°)   | 3857.4 | 36.8      |                         |      |         |
| FH   | (60°-80°)   | 4813.5 | 45.9      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 105.2  | 1.0       |                         |      | G2/225  |
| BL   | (0°-30°)    | 283.7  | 2.7       | B1/500                  |      |         |
| BM   | (30°-60°)   | 539.5  | 5.1       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 252.4  | 2.4       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 0.9    | 0.0       |                         |      | G0/10   |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G2**

Type IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 46°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 |
| 2.5°  | 1167.6 | 1166.1 | 1159.3 | 1156.3 | 1139.6 | 1129.8 | 1125.8 | 1113.5 | 1095.8 | 1078.1 | 1058.4 |
| 5°    | 1300.4 | 1299.9 | 1287.1 | 1274.8 | 1243.4 | 1213.9 | 1208.4 | 1179.9 | 1140.1 | 1102.7 | 1065.3 |
| 7.5°  | 1436.2 | 1429.8 | 1417.0 | 1393.4 | 1347.6 | 1300.4 | 1296.0 | 1255.7 | 1199.1 | 1145.0 | 1091.4 |
| 10°   | 1551.3 | 1547.3 | 1530.6 | 1494.7 | 1441.1 | 1387.5 | 1382.1 | 1332.4 | 1268.5 | 1202.1 | 1133.7 |
| 12.5° | 1640.8 | 1637.8 | 1615.7 | 1570.9 | 1513.9 | 1458.3 | 1450.9 | 1406.7 | 1338.3 | 1264.0 | 1183.4 |
| 15°   | 1695.4 | 1693.9 | 1666.8 | 1619.1 | 1563.1 | 1514.9 | 1508.5 | 1469.6 | 1406.2 | 1328.5 | 1237.5 |
| 17.5° | 1708.2 | 1708.6 | 1680.6 | 1632.4 | 1586.2 | 1551.8 | 1546.8 | 1517.3 | 1464.2 | 1387.0 | 1291.6 |
| 20°   | 1679.6 | 1685.5 | 1660.4 | 1618.6 | 1590.1 | 1571.9 | 1568.0 | 1550.3 | 1505.5 | 1432.7 | 1334.8 |
| 22.5° | 1639.3 | 1642.2 | 1625.0 | 1597.0 | 1585.2 | 1588.6 | 1586.7 | 1576.8 | 1539.0 | 1472.1 | 1377.6 |
| 25°   | 1614.7 | 1614.7 | 1604.4 | 1580.8 | 1588.6 | 1609.8 | 1610.3 | 1608.3 | 1578.3 | 1520.3 | 1429.8 |
| 27.5° | 1613.7 | 1610.8 | 1599.0 | 1581.3 | 1602.9 | 1635.4 | 1637.3 | 1650.6 | 1631.9 | 1578.8 | 1494.7 |
| 30°   | 1653.1 | 1649.6 | 1624.5 | 1601.4 | 1629.0 | 1663.9 | 1668.8 | 1697.8 | 1688.5 | 1642.2 | 1567.0 |
| 32.5° | 1745.0 | 1732.7 | 1677.2 | 1639.3 | 1660.0 | 1701.8 | 1708.2 | 1754.4 | 1769.1 | 1720.5 | 1636.8 |
| 35°   | 1871.0 | 1832.1 | 1751.9 | 1711.1 | 1713.1 | 1756.8 | 1762.7 | 1830.6 | 1874.4 | 1792.3 | 1690.9 |
| 37.5° | 2044.6 | 2025.4 | 1895.1 | 1785.9 | 1794.7 | 1861.1 | 1878.3 | 1952.1 | 1939.8 | 1831.6 | 1752.4 |
| 40°   | 2425.3 | 2395.3 | 2256.6 | 1995.4 | 1872.9 | 1945.7 | 1951.1 | 1990.5 | 1991.5 | 1920.6 | 1880.3 |
| 42.5° | 2943.7 | 2931.4 | 2785.3 | 2375.6 | 2026.9 | 2002.3 | 2012.1 | 2078.5 | 2152.8 | 2108.5 | 2106.5 |
| 45°   | 3517.6 | 3511.2 | 3356.3 | 2880.2 | 2338.2 | 2187.7 | 2200.0 | 2289.0 | 2431.2 | 2441.0 | 2503.5 |
| 47.5° | 3979.5 | 3976.5 | 3887.5 | 3443.4 | 2814.8 | 2502.0 | 2505.9 | 2600.3 | 2850.2 | 2973.7 | 3073.5 |
| 50°   | 4400.5 | 4414.7 | 4344.4 | 4052.7 | 3464.0 | 2994.3 | 2985.0 | 3047.9 | 3449.3 | 3651.4 | 3775.4 |
| 52.5° | 4985.8 | 5005.9 | 4808.7 | 4621.3 | 4145.2 | 3605.2 | 3597.8 | 3663.7 | 4169.3 | 4320.8 | 4342.9 |
| 55°   | 5502.7 | 5468.3 | 5312.3 | 5258.2 | 4975.9 | 4359.7 | 4357.7 | 4415.7 | 4865.8 | 4930.2 | 4971.0 |
| 57.5° | 5730.9 | 5717.6 | 5792.9 | 5916.8 | 5846.0 | 5251.4 | 5246.9 | 5202.7 | 5488.9 | 5495.8 | 5621.2 |
| 60°   | 5875.0 | 5891.2 | 6121.9 | 6504.1 | 6680.6 | 6210.9 | 6182.4 | 5912.4 | 6084.0 | 6068.8 | 6203.1 |
| 62.5° | 5766.8 | 5798.8 | 6213.9 | 6850.8 | 7305.3 | 7048.5 | 7008.2 | 6562.6 | 6592.6 | 6540.0 | 6664.9 |
| 65°   | 5192.3 | 5242.0 | 5922.2 | 6785.4 | 7615.1 | 7703.2 | 7662.4 | 7136.6 | 6996.4 | 6909.8 | 6840.5 |
| 67.5° | 4216.0 | 4245.5 | 4955.8 | 6216.3 | 7475.5 | 8093.7 | 8085.3 | 7639.7 | 7301.3 | 6847.4 | 6309.3 |
| 69°   | 3484.2 | 3513.2 | 4196.9 | 5617.3 | 7168.1 | 8177.3 | 8193.5 | 7801.0 | 7243.3 | 6467.7 | 5590.2 |
| 70°   | 2951.0 | 2982.0 | 3618.9 | 5103.8 | 6811.5 | 8138.5 | 8167.5 | 7785.8 | 7077.1 | 6028.0 | 4959.2 |
| 72.5° | 1547.8 | 1574.4 | 2228.0 | 3516.2 | 5552.9 | 7473.0 | 7561.0 | 7127.7 | 5999.0 | 4377.9 | 2932.3 |
| 75°   | 486.4  | 501.7  | 870.1  | 1838.0 | 3801.9 | 5810.6 | 5830.7 | 5591.2 | 4259.8 | 2408.0 | 1221.2 |
| 77.5° | 185.4  | 181.0  | 289.7  | 677.3  | 1922.1 | 3658.8 | 3782.2 | 3494.0 | 2235.4 | 851.4  | 281.8  |
| 80°   | 99.8   | 100.3  | 150.5  | 280.3  | 822.4  | 1880.3 | 1984.6 | 1693.4 | 794.3  | 265.6  | 64.9   |
| 82.5° | 43.3   | 45.2   | 84.6   | 148.5  | 377.7  | 693.5  | 745.6  | 620.7  | 303.5  | 178.5  | 24.1   |
| 85°   | 9.3    | 10.3   | 40.8   | 80.7   | 153.9  | 194.8  | 204.1  | 201.2  | 193.3  | 138.7  | 9.3    |
| 87.5° | 0.0    | 0.0    | 18.2   | 29.0   | 38.9   | 44.3   | 38.9   | 50.7   | 106.7  | 93.4   | 4.9    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



REPORT NUMBER: P363301

CATALOG NUMBER: NVN-SA3B-727-U-T4W-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 | 1051.1 |
| 2.5°  | 1052.0 | 1043.2 | 1027.9 | 1011.2 | 999.4  | 987.1  | 977.3  | 972.9  | 967.9  | 964.5  | 968.9  |
| 5°    | 1050.1 | 1032.9 | 1003.4 | 974.8  | 954.2  | 937.4  | 923.7  | 918.3  | 912.9  | 908.9  | 908.4  |
| 7.5°  | 1067.3 | 1043.2 | 997.9  | 956.1  | 924.2  | 901.5  | 882.9  | 875.0  | 868.6  | 865.6  | 863.2  |
| 10°   | 1100.2 | 1069.3 | 1008.8 | 954.2  | 912.9  | 874.5  | 834.2  | 803.2  | 783.0  | 773.7  | 770.2  |
| 12.5° | 1143.0 | 1104.2 | 1029.4 | 964.5  | 904.5  | 830.7  | 745.1  | 671.4  | 623.7  | 607.9  | 598.6  |
| 15°   | 1193.2 | 1145.0 | 1056.5 | 977.8  | 874.0  | 739.2  | 594.1  | 497.7  | 453.5  | 444.6  | 434.8  |
| 17.5° | 1241.4 | 1188.3 | 1088.9 | 980.2  | 807.1  | 590.7  | 435.3  | 369.9  | 352.6  | 358.6  | 360.0  |
| 20°   | 1283.7 | 1231.1 | 1120.9 | 958.6  | 685.6  | 443.1  | 336.9  | 320.7  | 327.1  | 338.4  | 340.4  |
| 22.5° | 1326.5 | 1272.4 | 1150.4 | 901.5  | 530.2  | 336.4  | 303.5  | 307.4  | 313.8  | 325.1  | 327.1  |
| 25°   | 1378.6 | 1322.6 | 1178.0 | 796.8  | 397.9  | 286.2  | 288.2  | 294.1  | 300.5  | 310.8  | 311.8  |
| 27.5° | 1438.6 | 1386.0 | 1196.2 | 660.5  | 295.1  | 263.1  | 269.5  | 278.4  | 284.8  | 294.6  | 296.6  |
| 30°   | 1518.3 | 1469.6 | 1202.1 | 519.4  | 247.4  | 242.5  | 245.4  | 256.2  | 265.6  | 274.4  | 275.9  |
| 32.5° | 1593.1 | 1552.2 | 1182.4 | 392.0  | 229.2  | 223.3  | 223.3  | 229.7  | 240.5  | 248.9  | 250.8  |
| 35°   | 1661.9 | 1635.4 | 1119.4 | 286.7  | 215.4  | 205.6  | 200.7  | 200.7  | 207.6  | 214.4  | 216.4  |
| 37.5° | 1752.9 | 1751.9 | 1017.6 | 228.7  | 202.1  | 190.8  | 180.5  | 172.6  | 170.2  | 171.7  | 172.6  |
| 40°   | 1908.8 | 1910.3 | 884.8  | 205.1  | 190.8  | 175.6  | 159.8  | 145.6  | 132.3  | 127.9  | 127.4  |
| 42.5° | 2152.3 | 2130.2 | 745.6  | 193.8  | 181.0  | 159.8  | 136.2  | 117.1  | 96.4   | 90.0   | 89.5   |
| 45°   | 2538.9 | 2407.5 | 598.1  | 183.5  | 170.7  | 142.1  | 112.6  | 86.6   | 69.8   | 64.9   | 64.9   |
| 47.5° | 3102.0 | 2772.0 | 463.3  | 172.1  | 156.9  | 122.0  | 85.1   | 62.5   | 51.2   | 48.7   | 49.2   |
| 50°   | 3684.4 | 3129.1 | 355.1  | 157.9  | 140.2  | 100.8  | 63.0   | 45.2   | 38.9   | 38.9   | 39.3   |
| 52.5° | 4200.8 | 3390.7 | 276.9  | 142.6  | 119.5  | 79.2   | 47.7   | 35.4   | 32.5   | 32.0   | 32.5   |
| 55°   | 4684.3 | 3559.4 | 212.0  | 124.9  | 94.9   | 59.0   | 36.4   | 29.0   | 27.1   | 26.1   | 25.6   |
| 57.5° | 5150.5 | 3643.0 | 158.9  | 100.8  | 68.9   | 42.8   | 29.0   | 24.6   | 22.6   | 21.1   | 20.7   |
| 60°   | 5460.9 | 3575.2 | 109.2  | 74.3   | 47.7   | 31.0   | 24.1   | 21.1   | 18.7   | 17.2   | 16.7   |
| 62.5° | 5636.0 | 3389.8 | 70.3   | 53.6   | 33.9   | 23.1   | 19.2   | 17.7   | 14.3   | 12.8   | 12.8   |
| 65°   | 5565.2 | 3083.8 | 49.2   | 38.4   | 24.6   | 17.2   | 14.3   | 14.3   | 10.3   | 8.4    | 7.9    |
| 67.5° | 4931.7 | 2605.3 | 37.4   | 28.5   | 17.7   | 12.8   | 10.8   | 12.3   | 6.4    | 3.9    | 3.9    |
| 69°   | 4243.1 | 2159.2 | 32.0   | 23.6   | 14.8   | 10.3   | 9.3    | 11.3   | 4.4    | 3.0    | 2.5    |
| 70°   | 3687.8 | 1862.6 | 29.0   | 20.7   | 12.3   | 8.9    | 8.4    | 10.8   | 4.4    | 2.5    | 2.0    |
| 72.5° | 2206.4 | 1038.8 | 22.1   | 14.8   | 7.9    | 6.9    | 6.9    | 12.3   | 4.4    | 2.5    | 2.0    |
| 75°   | 891.7  | 365.9  | 16.2   | 10.3   | 5.9    | 5.9    | 8.4    | 15.7   | 3.9    | 2.0    | 1.5    |
| 77.5° | 202.1  | 80.2   | 9.3    | 6.4    | 3.9    | 5.9    | 9.8    | 12.3   | 2.5    | 1.0    | 0.0    |
| 80°   | 49.2   | 19.7   | 5.9    | 3.9    | 2.5    | 4.4    | 7.4    | 6.9    | 0.5    | 0.0    | 0.0    |
| 82.5° | 16.2   | 6.9    | 2.5    | 2.0    | 0.5    | 1.5    | 3.4    | 2.0    | 0.0    | 0.0    | 0.0    |
| 85°   | 6.9    | 3.9    | 1.0    | 0.5    | 0.0    | 0.0    | 0.5    | 0.0    | 0.0    | 0.0    | 0.0    |
| 87.5° | 4.4    | 1.5    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



LM-79-2008: Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-1908-441-1-R4

Test Date: 08/20/2019

Luminaire Tested: SA1C-727-U-5WQ

### Test Information

Test Method: LM-79-2008  
 Report Number: SP1-1908-441-1-R4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/28/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **SA1C-727-U-5WQ**  
 Description: MCGRAW EDISON ROADWAY AND AREA LUMINAIRE

\*\*\*THIS IS A REVISION OF SP1-1908-441-1-R3. TO UPDATE THE CATALOG NUMBER.\*\*\*TESTED IN SITU. (1) 70 CRI, 2700K, 1050MA LIGHTSQUARE WITH 16 LEDS AND TYPE V WIDE OPTICS.

### Spectral Parameters

|                           |        |           |      |      |       |
|---------------------------|--------|-----------|------|------|-------|
| CCT (K):                  | 2741   | CRI (Ra): | 71.5 |      |       |
| CIE u':                   | 0.2605 | R1:       | 69.2 | R9:  | -16.1 |
| CIE v':                   | 0.5272 | R2:       | 79.4 | R10: | 51.4  |
| Duv:                      | 0.0005 | R3:       | 87.8 | R11: | 63.1  |
| CIE x:                    | 0.4573 | R4:       | 69.4 | R12: | 42.0  |
| CIE y:                    | 0.4113 | R5:       | 66.4 | R13: | 70.2  |
| CIE z:                    | 0.1313 | R6:       | 69.8 | R14: | 92.4  |
| Peak Wavelength (nm):     | 602    | R7:       | 79.8 |      |       |
| Dominant Wavelength (nm): | 583    | R8:       | 50.1 |      |       |
| Purity:                   | 61.2   |           |      |      |       |
| Rf:                       | 69.9   |           |      |      |       |
| Rg:                       | 98.3   |           |      |      |       |



### Test Conditions

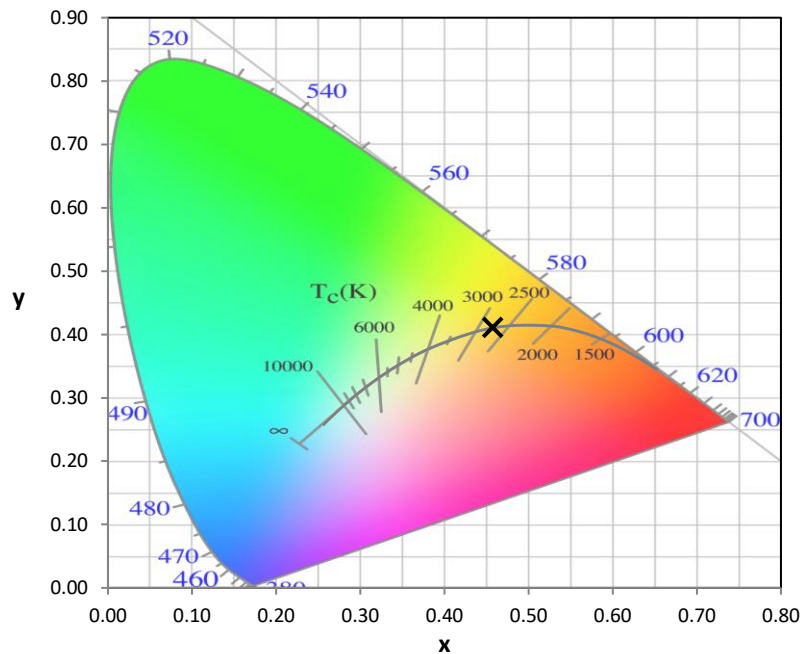
Stabilization Time: 56M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.3./42%  
 Sphere Temperature (°C): 25.7

REPORT NUMBER: SP1-1908-441-1-R4

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/28/2019        | 12/28/2019           |
| Power Meter                    | IN0071                | 12/5/2018        | 12/5/2019            |
| AC Power Source                | IN0063                | 12/5/2018        | 12/5/2019            |
| DC Power Source                | IN0208                | 12/5/2018        | 12/5/2019            |
| Sphere Thermometer             | IN0085                | 12/5/2018        | 12/5/2019            |
| Room Thermometer               | IN0046                | 12/5/2018        | 12/5/2019            |

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CIE 1931 Chromaticity Diagram



CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 2700K 4-step quadrangle

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**Photopic Flux vs. Wavelength**



**Photopic Lumens: 6211.7**

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 2044             | 0.0              | 490       | 7179             | 1.0              | 620       | 118034           | 30.7             | 750       | 8362             | 0.0              | 880       | 3128             | 0.0              |
| 365       | 2016             | 0.0              | 495       | 10476            | 1.9              | 625       | 111884           | 24.7             | 755       | 7635             | 0.0              | 885       | 3110             | 0.0              |
| 370       | 2020             | 0.0              | 500       | 15549            | 3.4              | 630       | 106119           | 19.2             | 760       | 6582             | 0.0              | 890       | 2632             | 0.0              |
| 375       | 2137             | 0.0              | 505       | 22477            | 6.3              | 635       | 99706            | 15.0             | 765       | 5777             | 0.0              | 895       | 2709             | 0.0              |
| 380       | 2046             | 0.0              | 510       | 30417            | 10.4             | 640       | 92142            | 11.0             | 770       | 5474             | 0.0              | 900       | 2016             | 0.0              |
| 385       | 1925             | 0.0              | 515       | 39274            | 16.3             | 645       | 84987            | 8.2              | 775       | 4977             | 0.0              | 905       | 1748             | 0.0              |
| 390       | 1893             | 0.0              | 520       | 47282            | 22.9             | 650       | 78016            | 5.7              | 780       | 4723             | 0.0              | 910       | 2046             | 0.0              |
| 395       | 1695             | 0.0              | 525       | 55413            | 29.7             | 655       | 71541            | 4.1              | 785       | 4219             | 0.0              | 915       | 1844             | 0.0              |
| 400       | 1633             | 0.0              | 530       | 62377            | 36.7             | 660       | 64863            | 2.7              | 790       | 3969             | 0.0              | 920       | 2734             | 0.0              |
| 405       | 2065             | 0.0              | 535       | 68520            | 42.5             | 665       | 58485            | 1.9              | 795       | 4122             | 0.0              | 925       | 2307             | 0.0              |
| 410       | 3449             | 0.0              | 540       | 73435            | 47.8             | 670       | 51641            | 1.1              | 800       | 2864             | 0.0              | 930       | 2039             | 0.0              |
| 415       | 7117             | 0.0              | 545       | 78677            | 52.4             | 675       | 46030            | 0.8              | 805       | 3151             | 0.0              | 935       | 1784             | 0.0              |
| 420       | 13992            | 0.0              | 550       | 83331            | 56.6             | 680       | 40590            | 0.5              | 810       | 3022             | 0.0              | 940       | 2464             | 0.0              |
| 425       | 25176            | 0.1              | 555       | 89120            | 60.9             | 685       | 35691            | 0.3              | 815       | 3471             | 0.0              | 945       | 2794             | 0.0              |
| 430       | 38151            | 0.3              | 560       | 94613            | 64.3             | 690       | 31631            | 0.2              | 820       | 2749             | 0.0              | 950       | 3090             | 0.0              |
| 435       | 49673            | 0.6              | 565       | 99818            | 66.4             | 695       | 27437            | 0.1              | 825       | 2729             | 0.0              | 955       | 1866             | 0.0              |
| 440       | 57273            | 0.9              | 570       | 106526           | 69.3             | 700       | 24589            | 0.1              | 830       | 2282             | 0.0              | 960       | 3110             | 0.0              |
| 445       | 54802            | 1.1              | 575       | 111610           | 69.4             | 705       | 21832            | 0.0              | 835       | 3140             | 0.0              | 965       | 3880             | 0.0              |
| 450       | 39184            | 1.0              | 580       | 117163           | 69.6             | 710       | 19500            | 0.0              | 840       | 2365             | 0.0              | 970       | 3243             | 0.0              |
| 455       | 22506            | 0.8              | 585       | 122201           | 67.9             | 715       | 17870            | 0.0              | 845       | 3024             | 0.0              | 975       | 2014             | 0.0              |
| 460       | 13692            | 0.6              | 590       | 125662           | 65.0             | 720       | 15924            | 0.0              | 850       | 2510             | 0.0              | 980       | 1688             | 0.0              |
| 465       | 9446             | 0.5              | 595       | 127415           | 60.4             | 725       | 14268            | 0.0              | 855       | 2739             | 0.0              | 985       | 2827             | 0.0              |
| 470       | 6698             | 0.4              | 600       | 129155           | 55.7             | 730       | 12438            | 0.0              | 860       | 3515             | 0.0              | 990       | 4172             | 0.0              |
| 475       | 5328             | 0.4              | 605       | 128057           | 49.6             | 735       | 11255            | 0.0              | 865       | 3600             | 0.0              | 995       | 3177             | 0.0              |
| 480       | 5081             | 0.5              | 610       | 126031           | 43.3             | 740       | 9951             | 0.0              | 870       | 3609             | 0.0              | 1000      | 3241             | 0.0              |
| 485       | 5579             | 0.7              | 615       | 123059           | 37.1             | 745       | 8870             | 0.0              | 875       | 3208             | 0.0              |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 6474.3

S/P: 1.04

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 2044             | 0.0              | 490       | 7179             | 6.0              | 620       | 118034           | 0.1              | 750       | 8362             | 0.0              | 880       | 3128             | 0.0              |
| 365       | 2016             | 0.0              | 495       | 10476            | 8.6              | 625       | 111884           | 0.1              | 755       | 7635             | 0.0              | 885       | 3110             | 0.0              |
| 370       | 2020             | 0.0              | 500       | 15549            | 12.5             | 630       | 106119           | 0.0              | 760       | 6582             | 0.0              | 890       | 2632             | 0.0              |
| 375       | 2137             | 0.0              | 505       | 22477            | 17.3             | 635       | 99706            | 0.0              | 765       | 5777             | 0.0              | 895       | 2709             | 0.0              |
| 380       | 2046             | 0.0              | 510       | 30417            | 21.8             | 640       | 92142            | 0.0              | 770       | 5474             | 0.0              | 900       | 2016             | 0.0              |
| 385       | 1925             | 0.0              | 515       | 39274            | 25.7             | 645       | 84987            | 0.0              | 775       | 4977             | 0.0              | 905       | 1748             | 0.0              |
| 390       | 1893             | 0.0              | 520       | 47282            | 27.5             | 650       | 78016            | 0.0              | 780       | 4723             | 0.0              | 910       | 2046             | 0.0              |
| 395       | 1695             | 0.0              | 525       | 55413            | 28.1             | 655       | 71541            | 0.0              | 785       | 4219             | 0.0              | 915       | 1844             | 0.0              |
| 400       | 1633             | 0.0              | 530       | 62377            | 27.0             | 660       | 64863            | 0.0              | 790       | 3969             | 0.0              | 920       | 2734             | 0.0              |
| 405       | 2065             | 0.0              | 535       | 68520            | 24.7             | 665       | 58485            | 0.0              | 795       | 4122             | 0.0              | 925       | 2307             | 0.0              |
| 410       | 3449             | 0.1              | 540       | 73435            | 21.5             | 670       | 51641            | 0.0              | 800       | 2864             | 0.0              | 930       | 2039             | 0.0              |
| 415       | 7117             | 0.5              | 545       | 78677            | 18.3             | 675       | 46030            | 0.0              | 805       | 3151             | 0.0              | 935       | 1784             | 0.0              |
| 420       | 13992            | 1.6              | 550       | 83331            | 15.0             | 680       | 40590            | 0.0              | 810       | 3022             | 0.0              | 940       | 2464             | 0.0              |
| 425       | 25176            | 3.9              | 555       | 89120            | 12.0             | 685       | 35691            | 0.0              | 815       | 3471             | 0.0              | 945       | 2794             | 0.0              |
| 430       | 38151            | 8.1              | 560       | 94613            | 9.3              | 690       | 31631            | 0.0              | 820       | 2749             | 0.0              | 950       | 3090             | 0.0              |
| 435       | 49673            | 13.3             | 565       | 99818            | 7.0              | 695       | 27437            | 0.0              | 825       | 2729             | 0.0              | 955       | 1866             | 0.0              |
| 440       | 57273            | 19.1             | 570       | 106526           | 5.2              | 700       | 24589            | 0.0              | 830       | 2282             | 0.0              | 960       | 3110             | 0.0              |
| 445       | 54802            | 21.6             | 575       | 111610           | 3.7              | 705       | 21832            | 0.0              | 835       | 3140             | 0.0              | 965       | 3880             | 0.0              |
| 450       | 39184            | 18.1             | 580       | 117163           | 2.6              | 710       | 19500            | 0.0              | 840       | 2365             | 0.0              | 970       | 3243             | 0.0              |
| 455       | 22506            | 11.8             | 585       | 122201           | 1.8              | 715       | 17870            | 0.0              | 845       | 3024             | 0.0              | 975       | 2014             | 0.0              |
| 460       | 13692            | 8.1              | 590       | 125662           | 1.2              | 720       | 15924            | 0.0              | 850       | 2510             | 0.0              | 980       | 1688             | 0.0              |
| 465       | 9446             | 6.2              | 595       | 127415           | 0.8              | 725       | 14268            | 0.0              | 855       | 2739             | 0.0              | 985       | 2827             | 0.0              |
| 470       | 6698             | 4.8              | 600       | 129155           | 0.5              | 730       | 12438            | 0.0              | 860       | 3515             | 0.0              | 990       | 4172             | 0.0              |
| 475       | 5328             | 4.1              | 605       | 128057           | 0.4              | 735       | 11255            | 0.0              | 865       | 3600             | 0.0              | 995       | 3177             | 0.0              |
| 480       | 5081             | 4.1              | 610       | 126031           | 0.2              | 740       | 9951             | 0.0              | 870       | 3609             | 0.0              | 1000      | 3241             | 0.0              |
| 485       | 5579             | 4.6              | 615       | 123059           | 0.1              | 745       | 8870             | 0.0              | 875       | 3208             | 0.0              |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 2145.7 M/P: 0.35**

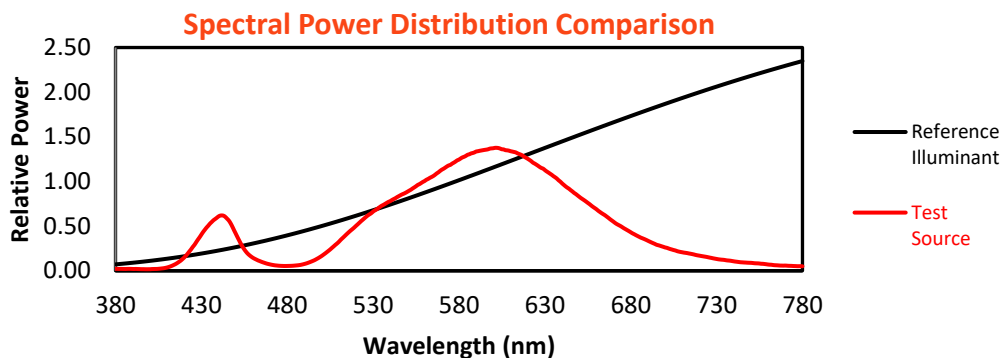
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 2044             | 0.0              | 490       | 7179             | 11.1             | 620       | 118034           | 1.5              | 750       | 8362             | 0.0              | 880       | 3128             | 0.0              |
| 365       | 2016             | 0.0              | 495       | 10476            | 16.9             | 625       | 111884           | 0.9              | 755       | 7635             | 0.0              | 885       | 3110             | 0.0              |
| 370       | 2020             | 0.0              | 500       | 15549            | 26.0             | 630       | 106119           | 0.6              | 760       | 6582             | 0.0              | 890       | 2632             | 0.0              |
| 375       | 2137             | 0.0              | 505       | 22477            | 38.2             | 635       | 99706            | 0.4              | 765       | 5777             | 0.0              | 895       | 2709             | 0.0              |
| 380       | 2046             | 0.0              | 510       | 30417            | 51.6             | 640       | 92142            | 0.2              | 770       | 5474             | 0.0              | 900       | 2016             | 0.0              |
| 385       | 1925             | 0.0              | 515       | 39274            | 65.1             | 645       | 84987            | 0.1              | 775       | 4977             | 0.0              | 905       | 1748             | 0.0              |
| 390       | 1893             | 0.0              | 520       | 47282            | 75.2             | 650       | 78016            | 0.1              | 780       | 4723             | 0.0              | 910       | 2046             | 0.0              |
| 395       | 1695             | 0.0              | 525       | 55413            | 82.9             | 655       | 71541            | 0.1              | 785       | 4219             | 0.0              | 915       | 1844             | 0.0              |
| 400       | 1633             | 0.0              | 530       | 62377            | 86.0             | 660       | 64863            | 0.0              | 790       | 3969             | 0.0              | 920       | 2734             | 0.0              |
| 405       | 2065             | 0.1              | 535       | 68520            | 85.4             | 665       | 58485            | 0.0              | 795       | 4122             | 0.0              | 925       | 2307             | 0.0              |
| 410       | 3449             | 0.2              | 540       | 73435            | 81.1             | 670       | 51641            | 0.0              | 800       | 2864             | 0.0              | 930       | 2039             | 0.0              |
| 415       | 7117             | 0.7              | 545       | 78677            | 75.4             | 675       | 46030            | 0.0              | 805       | 3151             | 0.0              | 935       | 1784             | 0.0              |
| 420       | 13992            | 2.3              | 550       | 83331            | 68.1             | 680       | 40590            | 0.0              | 810       | 3022             | 0.0              | 940       | 2464             | 0.0              |
| 425       | 25176            | 6.2              | 555       | 89120            | 60.9             | 685       | 35691            | 0.0              | 815       | 3471             | 0.0              | 945       | 2794             | 0.0              |
| 430       | 38151            | 13.0             | 560       | 94613            | 52.9             | 690       | 31631            | 0.0              | 820       | 2749             | 0.0              | 950       | 3090             | 0.0              |
| 435       | 49673            | 22.2             | 565       | 99818            | 44.8             | 695       | 27437            | 0.0              | 825       | 2729             | 0.0              | 955       | 1866             | 0.0              |
| 440       | 57273            | 32.0             | 570       | 106526           | 37.6             | 700       | 24589            | 0.0              | 830       | 2282             | 0.0              | 960       | 3110             | 0.0              |
| 445       | 54802            | 36.7             | 575       | 111610           | 30.4             | 705       | 21832            | 0.0              | 835       | 3140             | 0.0              | 965       | 3880             | 0.0              |
| 450       | 39184            | 30.4             | 580       | 117163           | 24.1             | 710       | 19500            | 0.0              | 840       | 2365             | 0.0              | 970       | 3243             | 0.0              |
| 455       | 22506            | 19.7             | 585       | 122201           | 18.7             | 715       | 17870            | 0.0              | 845       | 3024             | 0.0              | 975       | 2014             | 0.0              |
| 460       | 13692            | 13.2             | 590       | 125662           | 14.0             | 720       | 15924            | 0.0              | 850       | 2510             | 0.0              | 980       | 1688             | 0.0              |
| 465       | 9446             | 10.0             | 595       | 127415           | 10.2             | 725       | 14268            | 0.0              | 855       | 2739             | 0.0              | 985       | 2827             | 0.0              |
| 470       | 6698             | 7.7              | 600       | 129155           | 7.3              | 730       | 12438            | 0.0              | 860       | 3515             | 0.0              | 990       | 4172             | 0.0              |
| 475       | 5328             | 6.7              | 605       | 128057           | 5.0              | 735       | 11255            | 0.0              | 865       | 3600             | 0.0              | 995       | 3177             | 0.0              |
| 480       | 5081             | 6.9              | 610       | 126031           | 3.4              | 740       | 9951             | 0.0              | 870       | 3609             | 0.0              | 1000      | 3241             | 0.0              |
| 485       | 5579             | 8.1              | 615       | 123059           | 2.3              | 745       | 8870             | 0.0              | 875       | 3208             | 0.0              |           |                  |                  |

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**TM-30-18**

### Summary

$R_f = 69.9$   
 $R_g = 98.3$   
 $CIE R_a = 71.5$   
 $R_g = -16.1$



### Color Vector Graphics



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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 54 | CES51 = 77 | CES76 = 48 |
| CES02 = 63 | CES27 = 74 | CES52 = 80 | CES77 = 75 |
| CES03 = 31 | CES28 = 80 | CES53 = 66 | CES78 = 56 |
| CES04 = 71 | CES29 = 44 | CES54 = 77 | CES79 = 81 |
| CES05 = 50 | CES30 = 46 | CES55 = 74 | CES80 = 80 |
| CES06 = 52 | CES31 = 50 | CES56 = 63 | CES81 = 73 |
| CES07 = 42 | CES32 = 49 | CES57 = 60 | CES82 = 91 |
| CES08 = 41 | CES33 = 53 | CES58 = 63 | CES83 = 84 |
| CES09 = 29 | CES34 = 66 | CES59 = 85 | CES84 = 90 |
| CES10 = 77 | CES35 = 82 | CES60 = 89 | CES85 = 87 |
| CES11 = 60 | CES36 = 78 | CES61 = 85 | CES86 = 65 |
| CES12 = 66 | CES37 = 75 | CES62 = 69 | CES87 = 78 |
| CES13 = 43 | CES38 = 53 | CES63 = 68 | CES88 = 73 |
| CES14 = 74 | CES39 = 91 | CES64 = 68 | CES89 = 68 |
| CES15 = 71 | CES40 = 85 | CES65 = 65 | CES90 = 68 |
| CES16 = 48 | CES41 = 76 | CES66 = 62 | CES91 = 91 |
| CES17 = 50 | CES42 = 76 | CES67 = 60 | CES92 = 71 |
| CES18 = 57 | CES43 = 65 | CES68 = 68 | CES93 = 82 |
| CES19 = 73 | CES44 = 98 | CES69 = 77 | CES94 = 57 |
| CES20 = 67 | CES45 = 75 | CES70 = 60 | CES95 = 78 |
| CES21 = 88 | CES46 = 70 | CES71 = 57 | CES96 = 80 |
| CES22 = 80 | CES47 = 63 | CES72 = 86 | CES97 = 79 |
| CES23 = 92 | CES48 = 51 | CES73 = 52 | CES98 = 71 |
| CES24 = 91 | CES49 = 68 | CES74 = 90 | CES99 = 64 |
| CES25 = 73 | CES50 = 77 | CES75 = 58 |            |



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**TM-30-18**

Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)