

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: P361142

Luminaire Tested: NVN-SA4B-727-U-T2

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P361142  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-12)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA4B-727-U-T2  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(4) 70 CRI, 2700K, 800mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 19172 lumens  
Efficiency: N/A  
Efficacy: 112.1 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1.5' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B3 - U0 - G3

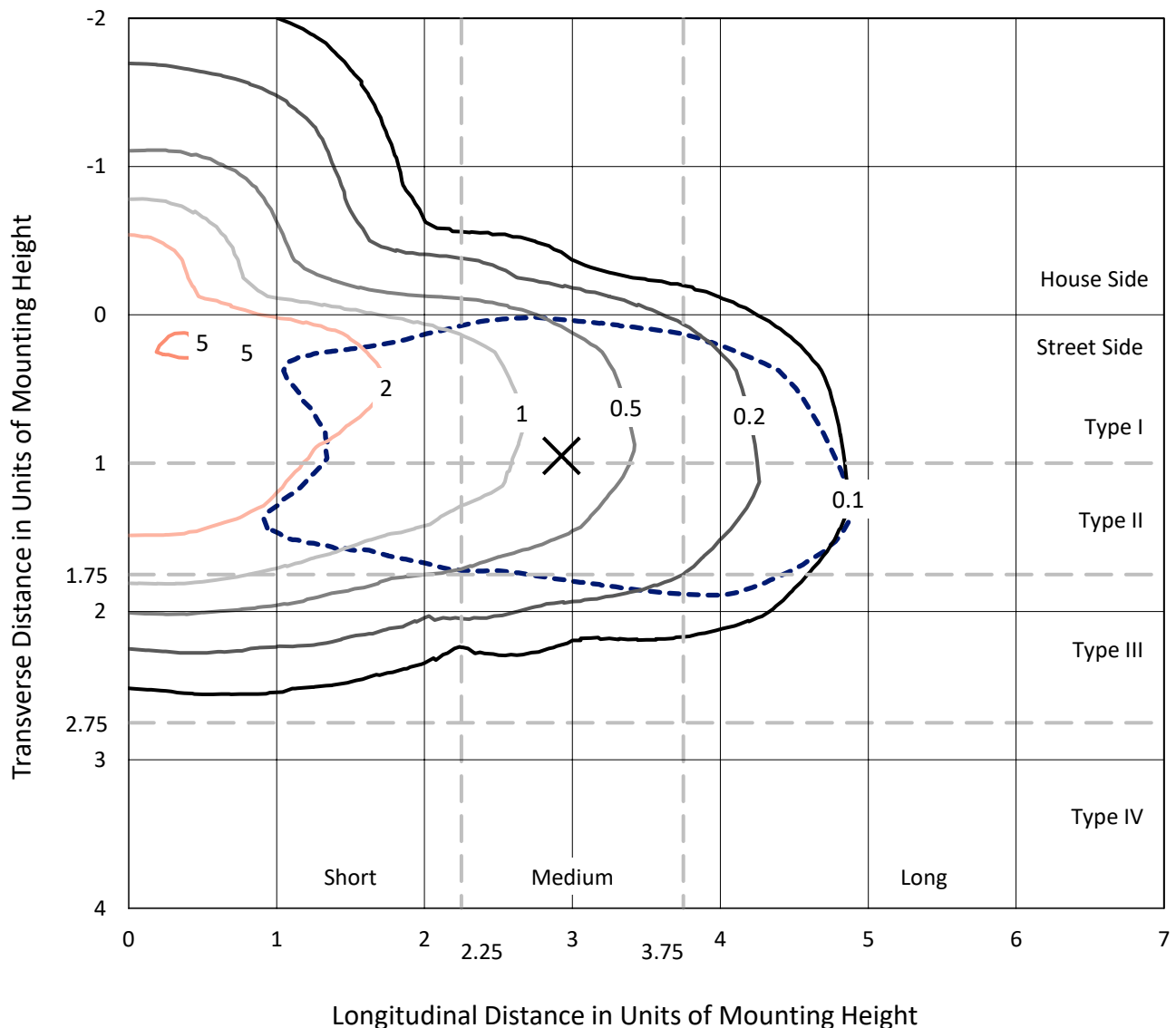
Input Watts (W): 171  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

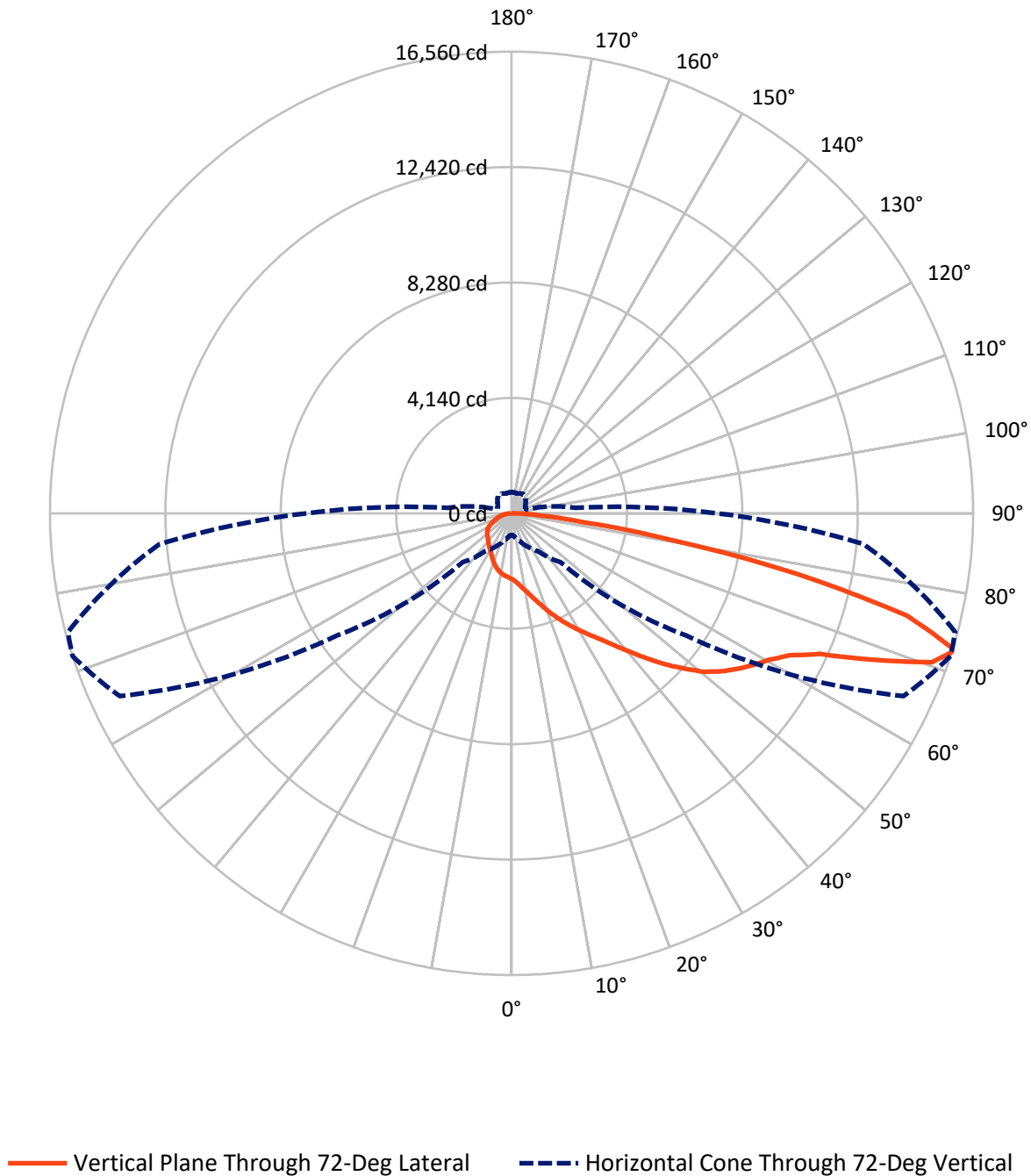
× Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 5.2 fc  
 Type III - Medium - N/A

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## Luminous Intensity Polar Plot



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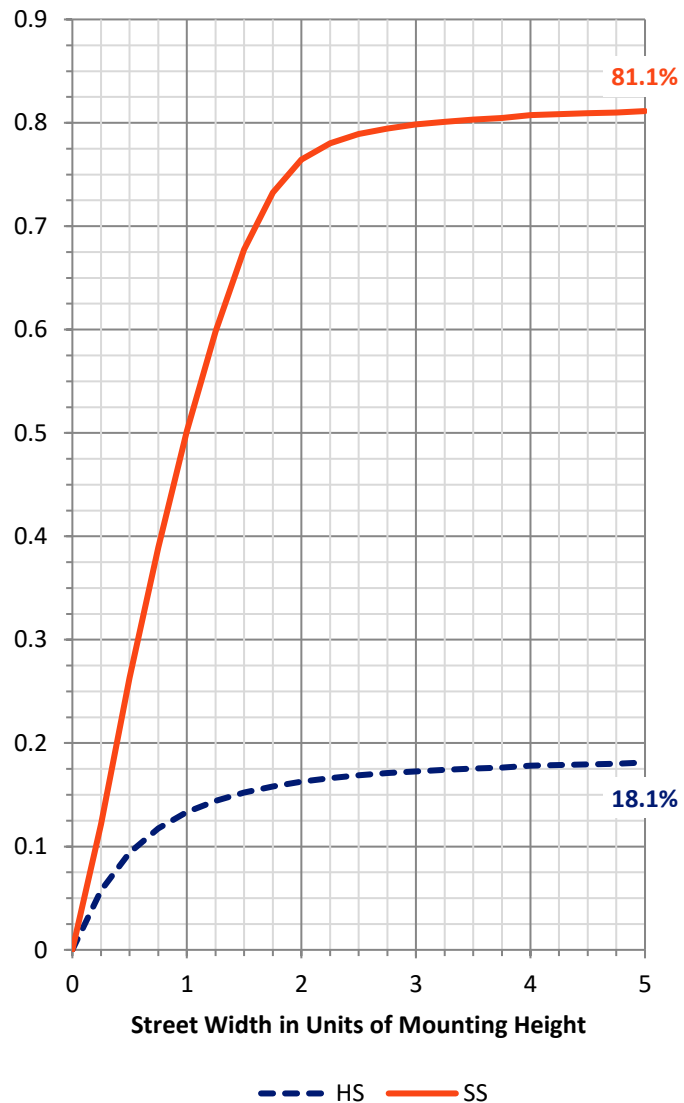
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 3556.5   | 0.0    | 3556.5  |
|                    | % Fixture | 18.6     | 0.0    | 18.6    |
| <b>Street Side</b> | Lumens    | 15615.5  | 0.0    | 15615.5 |
|                    | % Fixture | 81.4     | 0.0    | 81.4    |
| <b>Total</b>       | Lumens    | 19172.0  | 0.0    | 19172.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 236.3   | 1.2       |
| 10°-20°   | 763.7   | 4.0       |
| 20°-30°   | 1338.3  | 7.0       |
| 30°-40°   | 1984.3  | 10.4      |
| 40°-50°   | 2902.2  | 15.1      |
| 50°-60°   | 3993.4  | 20.8      |
| 60°-70°   | 4445.9  | 23.2      |
| 70°-80°   | 3012.5  | 15.7      |
| 80°-90°   | 495.1   | 2.6       |
| 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°    | 19172.0 | 100.0     |
| 0°-180°   | 19172.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P361142

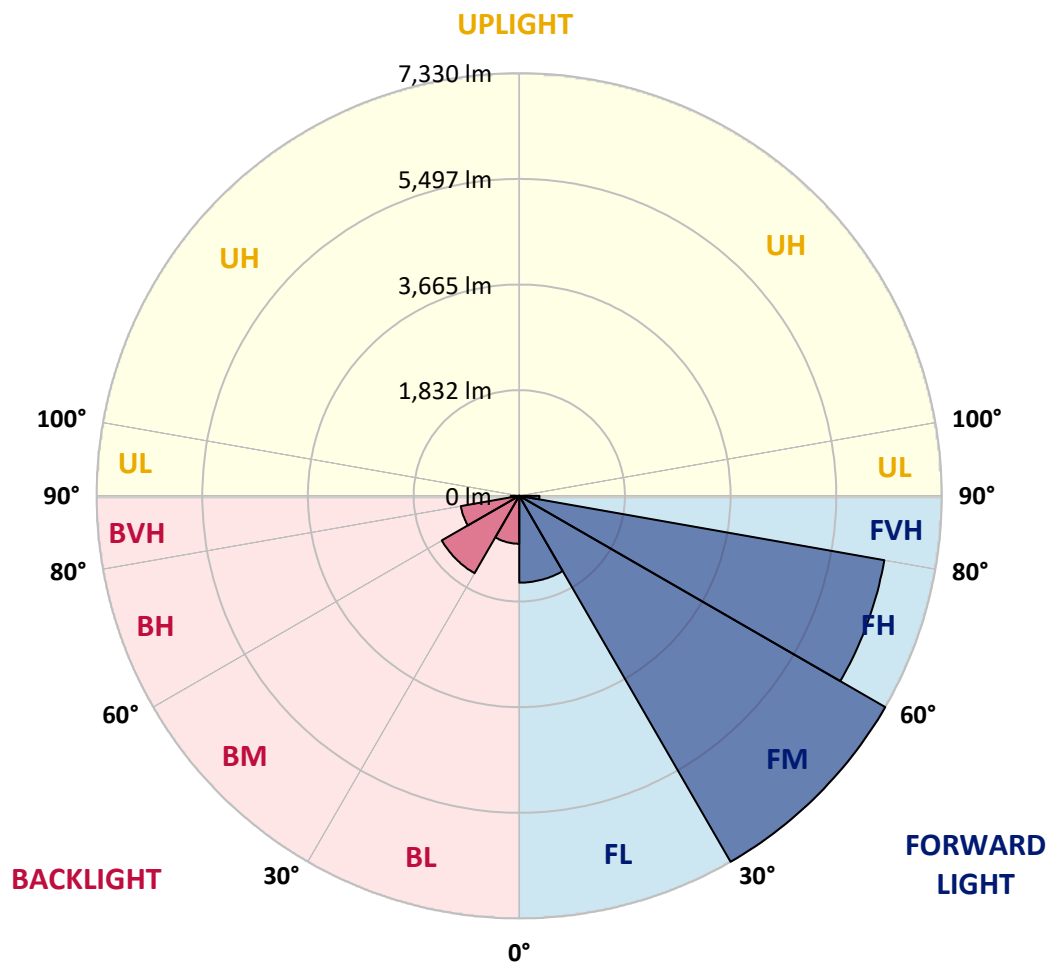
CATALOG NUMBER: NVN-SA4B-727-U-T2

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 1507.0 | 7.9       |                         |      |         |
| FM   | (30°-60°)   | 7329.7 | 38.2      |                         |      |         |
| FH   | (60°-80°)   | 6429.5 | 33.5      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 349.3  | 1.8       |                         |      | G3/500  |
| BL   | (0°-30°)    | 831.4  | 4.3       | B2/1000                 |      |         |
| BM   | (30°-60°)   | 1550.3 | 8.1       | B2/2500                 |      |         |
| BH   | (60°-80°)   | 1029.0 | 5.4       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 145.9  | 0.8       |                         |      | G2/225  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B3-U0-G3**

Type III Medium





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°     | 65°     | 72°     | 75°     | 85°     |
|-------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|
| 0°    | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7  | 2358.7  | 2358.7  | 2358.7  | 2358.7  |
| 2.5°  | 2605.5 | 2601.6 | 2587.7 | 2587.7 | 2561.3 | 2538.9 | 2496.6  | 2468.2  | 2434.6  | 2422.7  | 2383.1  |
| 5°    | 2857.7 | 2859.0 | 2841.9 | 2830.0 | 2791.0 | 2743.5 | 2671.6  | 2606.2  | 2540.9  | 2514.4  | 2433.3  |
| 7.5°  | 3069.6 | 3067.0 | 3062.4 | 3052.5 | 3016.1 | 2967.3 | 2870.3  | 2773.2  | 2676.8  | 2637.2  | 2497.3  |
| 10°   | 3205.6 | 3211.5 | 3215.5 | 3220.1 | 3204.9 | 3170.0 | 3078.2  | 2960.0  | 2834.0  | 2779.8  | 2573.9  |
| 12.5° | 3274.3 | 3284.8 | 3303.3 | 3335.0 | 3360.1 | 3356.1 | 3289.4  | 3164.0  | 3014.2  | 2946.2  | 2669.6  |
| 15°   | 3314.5 | 3328.4 | 3357.4 | 3414.2 | 3484.8 | 3525.1 | 3507.3  | 3393.7  | 3226.7  | 3142.9  | 2786.4  |
| 17.5° | 3339.6 | 3350.8 | 3395.7 | 3471.6 | 3576.6 | 3683.5 | 3730.4  | 3635.4  | 3467.0  | 3371.3  | 2920.4  |
| 20°   | 3356.8 | 3365.4 | 3421.5 | 3510.6 | 3646.6 | 3816.9 | 3947.6  | 3923.8  | 3731.7  | 3607.6  | 3060.4  |
| 22.5° | 3395.1 | 3402.3 | 3455.8 | 3545.6 | 3696.1 | 3915.9 | 4156.9  | 4192.5  | 4011.0  | 3870.4  | 3210.2  |
| 25°   | 3502.0 | 3502.0 | 3546.9 | 3609.6 | 3750.9 | 4001.7 | 4333.8  | 4491.5  | 4296.1  | 4132.4  | 3348.9  |
| 27.5° | 3706.0 | 3704.0 | 3720.5 | 3742.3 | 3849.2 | 4088.9 | 4491.5  | 4755.6  | 4591.9  | 4413.0  | 3483.5  |
| 30°   | 3947.6 | 3960.8 | 3962.8 | 3952.2 | 4002.4 | 4197.8 | 4637.4  | 5034.2  | 4889.6  | 4696.8  | 3621.5  |
| 32.5° | 4258.5 | 4267.1 | 4257.2 | 4222.2 | 4215.0 | 4352.3 | 4780.7  | 5326.0  | 5211.8  | 4993.2  | 3747.6  |
| 35°   | 4653.3 | 4636.8 | 4605.7 | 4534.5 | 4466.5 | 4558.9 | 4944.4  | 5617.7  | 5573.5  | 5351.7  | 3921.2  |
| 37.5° | 5076.4 | 5077.1 | 5038.8 | 4877.1 | 4783.3 | 4822.9 | 5170.2  | 5948.5  | 6011.2  | 5778.1  | 4143.7  |
| 40°   | 5415.7 | 5433.6 | 5457.3 | 5244.8 | 5123.3 | 5178.1 | 5457.3  | 6332.0  | 6528.7  | 6283.8  | 4433.5  |
| 42.5° | 5652.7 | 5673.2 | 5740.5 | 5607.2 | 5481.1 | 5582.7 | 5795.3  | 6741.3  | 7109.6  | 6867.4  | 4772.8  |
| 45°   | 5903.6 | 5914.8 | 5962.3 | 5904.9 | 5824.4 | 6053.4 | 6176.2  | 7165.1  | 7724.2  | 7489.2  | 5152.3  |
| 47.5° | 6167.6 | 6179.5 | 6228.4 | 6190.1 | 6147.8 | 6493.1 | 6573.6  | 7564.5  | 8313.1  | 8172.4  | 5557.7  |
| 50°   | 6493.7 | 6501.7 | 6547.9 | 6478.5 | 6491.8 | 6824.5 | 6928.8  | 7930.8  | 8930.3  | 8786.4  | 5964.3  |
| 52.5° | 6938.7 | 6940.6 | 7004.7 | 6942.0 | 6879.9 | 7067.4 | 7234.4  | 8276.1  | 9414.2  | 9346.2  | 6370.9  |
| 55°   | 7287.2 | 7308.3 | 7518.3 | 7505.1 | 7469.4 | 7287.9 | 7489.9  | 8604.8  | 9845.9  | 9878.2  | 6802.7  |
| 57.5° | 7064.7 | 7147.3 | 7572.4 | 7872.1 | 8163.9 | 7836.4 | 7835.1  | 8975.2  | 10247.2 | 10400.4 | 7277.3  |
| 60°   | 6187.4 | 6299.7 | 6926.1 | 7590.9 | 8503.8 | 8791.0 | 8552.0  | 9427.4  | 10652.6 | 10917.9 | 7872.1  |
| 62.5° | 4418.9 | 4603.8 | 5452.7 | 6514.2 | 8037.8 | 9423.4 | 10010.9 | 10144.9 | 11203.8 | 11517.3 | 8645.1  |
| 65°   | 2233.9 | 2373.8 | 3085.5 | 4364.1 | 6421.8 | 9010.2 | 11596.6 | 11716.0 | 12161.6 | 12440.2 | 9835.3  |
| 67.5° | 1357.2 | 1410.0 | 1757.3 | 2427.3 | 3937.0 | 7018.5 | 12114.1 | 14334.8 | 14015.3 | 14163.2 | 11532.5 |
| 70°   | 1000.1 | 1039.0 | 1255.6 | 1612.0 | 2264.3 | 4118.6 | 10525.8 | 16203.6 | 15993.7 | 15977.2 | 12786.8 |
| 72°   | 779.0  | 807.3  | 998.8  | 1302.4 | 1655.6 | 2470.9 | 7629.2  | 15513.8 | 16560.1 | 16476.9 | 12671.9 |
| 72.5° | 738.7  | 763.8  | 938.0  | 1225.9 | 1564.5 | 2239.8 | 6859.4  | 15048.4 | 16519.2 | 16481.5 | 12523.4 |
| 75°   | 581.6  | 599.4  | 694.5  | 948.0  | 1224.5 | 1270.8 | 3758.8  | 11661.9 | 14654.3 | 15263.6 | 11263.9 |
| 77.5° | 481.2  | 483.9  | 534.0  | 689.8  | 954.6  | 898.4  | 1846.4  | 8091.3  | 10493.5 | 11163.5 | 7979.0  |
| 80°   | 392.1  | 395.4  | 419.2  | 483.9  | 722.2  | 664.8  | 876.7   | 4652.6  | 5875.2  | 5882.4  | 3794.4  |
| 82.5° | 312.2  | 312.9  | 339.3  | 353.8  | 518.9  | 475.3  | 502.4   | 2184.4  | 2567.3  | 2469.6  | 1363.8  |
| 85°   | 219.8  | 215.2  | 331.4  | 290.5  | 339.3  | 305.0  | 277.3   | 864.8   | 1061.5  | 1015.3  | 427.1   |
| 87.5° | 73.3   | 75.9   | 147.2  | 188.1  | 198.0  | 173.0  | 123.4   | 331.4   | 400.7   | 397.4   | 135.3   |
| 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: P361142

CATALOG NUMBER: NVN-SA4B-727-U-T2

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 | 2358.7 |
| 2.5°  | 2370.5 | 2349.4 | 2318.4 | 2284.1 | 2257.0 | 2229.3 | 2208.8 | 2198.2 | 2186.4 | 2176.5 | 2188.3 |
| 5°    | 2395.6 | 2356.0 | 2290.0 | 2225.3 | 2177.8 | 2135.5 | 2105.2 | 2089.3 | 2074.8 | 2064.9 | 2066.2 |
| 7.5°  | 2436.6 | 2372.5 | 2261.6 | 2167.2 | 2101.2 | 2055.7 | 2024.6 | 2014.1 | 2004.8 | 2002.2 | 2005.5 |
| 10°   | 2480.1 | 2385.7 | 2224.0 | 2098.6 | 2023.3 | 1985.7 | 1971.8 | 1979.1 | 1985.7 | 1991.6 | 1998.2 |
| 12.5° | 2529.6 | 2397.6 | 2169.2 | 2018.0 | 1954.0 | 1939.5 | 1953.3 | 1985.0 | 2008.1 | 2022.0 | 2030.6 |
| 15°   | 2594.3 | 2408.2 | 2105.8 | 1937.5 | 1894.6 | 1911.1 | 1958.0 | 2012.7 | 2053.0 | 2078.8 | 2082.7 |
| 17.5° | 2653.7 | 2407.5 | 2024.6 | 1856.3 | 1846.4 | 1894.6 | 1965.2 | 2042.5 | 2096.6 | 2132.9 | 2140.2 |
| 20°   | 2715.1 | 2389.7 | 1930.2 | 1777.1 | 1797.5 | 1876.8 | 1968.5 | 2061.6 | 2126.9 | 2169.2 | 2179.1 |
| 22.5° | 2772.6 | 2358.7 | 1826.6 | 1705.1 | 1756.6 | 1853.0 | 1956.0 | 2050.4 | 2115.7 | 2150.1 | 2160.6 |
| 25°   | 2811.5 | 2304.5 | 1721.6 | 1644.4 | 1720.3 | 1823.9 | 1915.0 | 1991.0 | 2039.8 | 2057.0 | 2059.6 |
| 27.5° | 2831.3 | 2233.9 | 1622.6 | 1591.6 | 1682.7 | 1776.4 | 1839.1 | 1876.8 | 1890.6 | 1889.3 | 1886.7 |
| 30°   | 2834.0 | 2140.8 | 1537.5 | 1548.7 | 1639.1 | 1706.4 | 1736.2 | 1728.9 | 1711.1 | 1680.7 | 1683.3 |
| 32.5° | 2825.4 | 2035.9 | 1466.2 | 1507.7 | 1583.7 | 1621.3 | 1622.6 | 1587.6 | 1540.1 | 1491.9 | 1478.7 |
| 35°   | 2828.0 | 1932.9 | 1403.4 | 1461.5 | 1516.3 | 1532.8 | 1517.6 | 1466.2 | 1401.5 | 1339.4 | 1326.2 |
| 37.5° | 2857.1 | 1843.1 | 1349.3 | 1408.1 | 1441.7 | 1445.7 | 1423.9 | 1369.8 | 1322.2 | 1261.5 | 1256.2 |
| 40°   | 2926.4 | 1779.1 | 1297.8 | 1348.0 | 1367.1 | 1369.1 | 1338.1 | 1299.8 | 1303.8 | 1271.4 | 1270.8 |
| 42.5° | 3051.1 | 1751.3 | 1252.3 | 1285.3 | 1297.2 | 1301.1 | 1277.4 | 1252.9 | 1287.3 | 1266.1 | 1258.9 |
| 45°   | 3212.2 | 1757.9 | 1214.0 | 1223.9 | 1245.7 | 1264.2 | 1249.6 | 1219.9 | 1233.1 | 1141.4 | 1111.0 |
| 47.5° | 3398.4 | 1800.2 | 1183.6 | 1171.1 | 1208.7 | 1243.7 | 1221.2 | 1176.4 | 1129.5 | 1038.4 | 1021.2 |
| 50°   | 3616.2 | 1865.5 | 1155.9 | 1118.9 | 1168.4 | 1216.0 | 1193.5 | 1129.5 | 1058.9 | 1014.6 | 1008.7 |
| 52.5° | 3843.3 | 1945.4 | 1128.2 | 1061.5 | 1117.6 | 1194.8 | 1183.6 | 1118.9 | 1031.8 | 988.2  | 980.3  |
| 55°   | 4100.7 | 2025.9 | 1093.2 | 994.8  | 1062.8 | 1184.9 | 1179.0 | 1080.6 | 1011.3 | 986.9  | 981.0  |
| 57.5° | 4420.9 | 2117.7 | 1047.0 | 925.5  | 1011.3 | 1149.3 | 1130.8 | 1057.5 | 990.2  | 971.7  | 969.7  |
| 60°   | 4838.1 | 2253.0 | 980.3  | 851.6  | 948.6  | 1094.5 | 1090.5 | 1023.9 | 956.5  | 943.3  | 940.7  |
| 62.5° | 5463.9 | 2476.8 | 888.5  | 777.6  | 878.6  | 1001.4 | 1037.7 | 978.3  | 920.9  | 920.2  | 921.5  |
| 65°   | 6434.3 | 2813.5 | 788.9  | 712.9  | 808.0  | 922.9  | 976.3  | 931.4  | 884.6  | 897.8  | 899.8  |
| 67.5° | 7559.2 | 3092.7 | 691.2  | 649.6  | 736.0  | 848.3  | 920.9  | 884.6  | 836.4  | 870.7  | 871.4  |
| 70°   | 7933.5 | 2843.2 | 605.3  | 586.9  | 661.5  | 776.3  | 860.8  | 833.1  | 784.2  | 818.6  | 815.3  |
| 72°   | 7382.9 | 2295.3 | 549.9  | 539.3  | 605.3  | 716.9  | 807.3  | 784.9  | 736.7  | 759.8  | 751.2  |
| 72.5° | 7209.3 | 2188.3 | 536.0  | 527.4  | 590.2  | 701.7  | 793.5  | 773.0  | 724.8  | 744.6  | 736.7  |
| 75°   | 6431.0 | 1900.5 | 460.8  | 462.8  | 514.9  | 627.8  | 715.6  | 709.0  | 659.5  | 661.5  | 658.8  |
| 77.5° | 4664.5 | 1393.5 | 388.2  | 401.4  | 438.3  | 551.9  | 637.0  | 633.1  | 578.9  | 569.0  | 567.1  |
| 80°   | 2164.6 | 711.0  | 316.2  | 322.1  | 360.4  | 461.4  | 543.3  | 538.0  | 494.4  | 481.9  | 474.6  |
| 82.5° | 741.3  | 338.0  | 237.6  | 241.6  | 279.2  | 371.7  | 471.3  | 468.0  | 431.7  | 407.3  | 392.1  |
| 85°   | 264.7  | 168.3  | 166.4  | 162.4  | 199.4  | 292.4  | 410.6  | 392.8  | 339.3  | 289.1  | 287.8  |
| 87.5° | 85.8   | 72.0   | 85.8   | 85.2   | 116.2  | 198.0  | 298.4  | 254.2  | 246.2  | 204.6  | 200.7  |
| 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

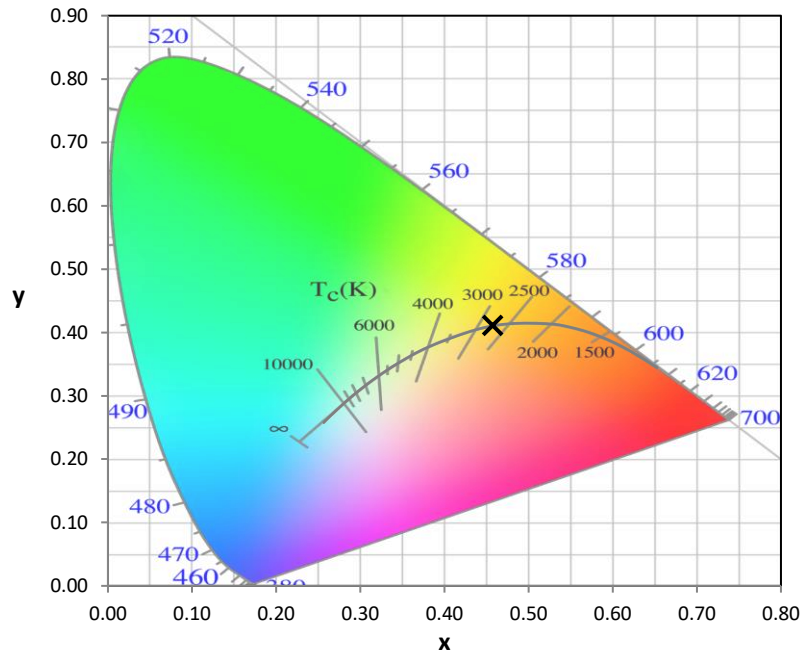
Stabilization Time: 56M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.3./42%  
 Sphere Temperature (°C): 25.7

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| 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



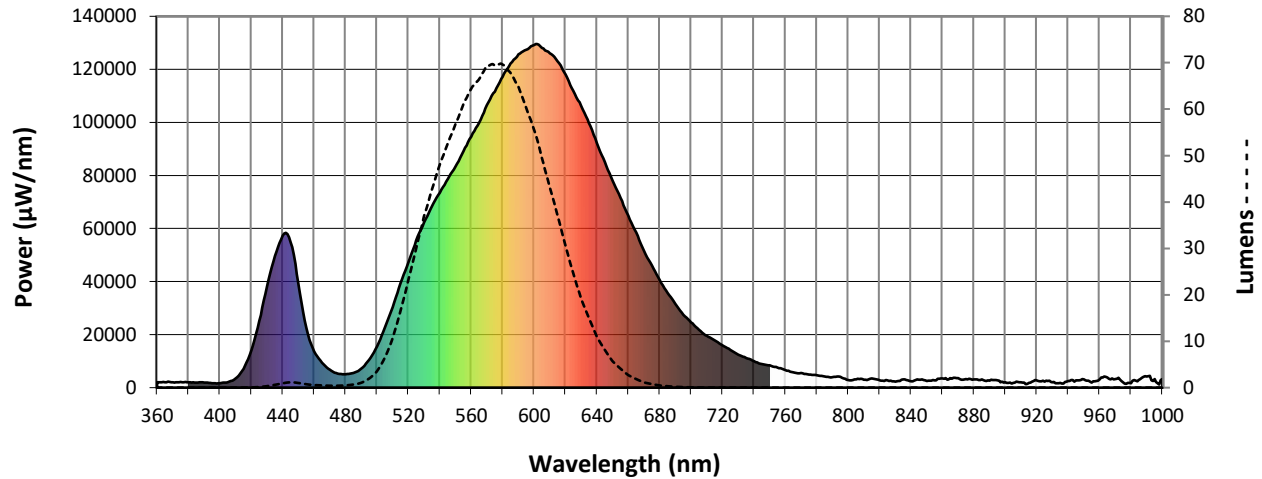
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



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



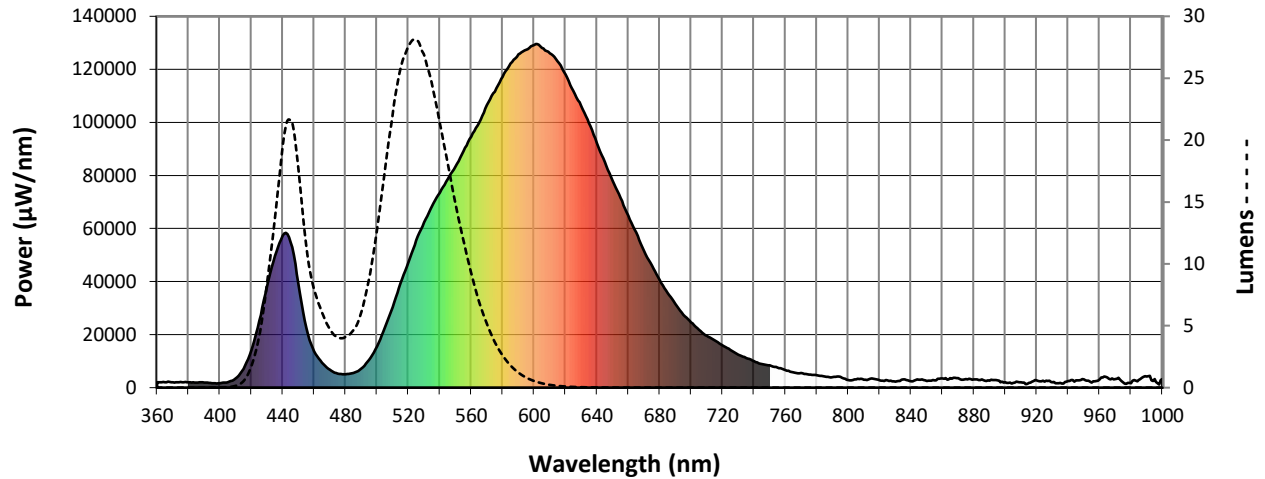
Scotopic Lumens: 6474.3

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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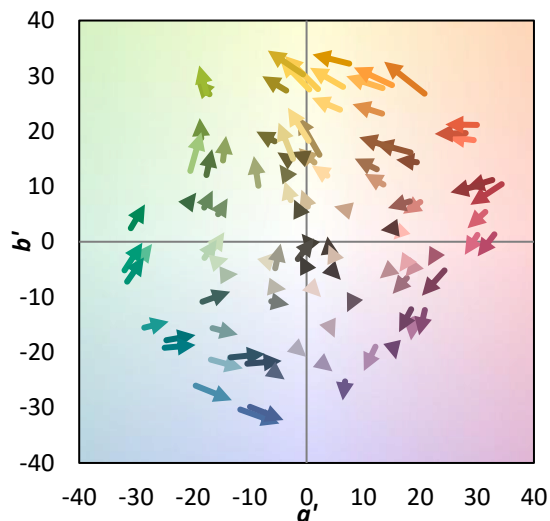
**TM-30-18**

### Summary

$R_f = 69.9$   
 $R_g = 98.3$   
 $CIE R_a = 71.5$   
 $R_9 = -16.1$



### Color Vector Graphics



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**TM-30-18**

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

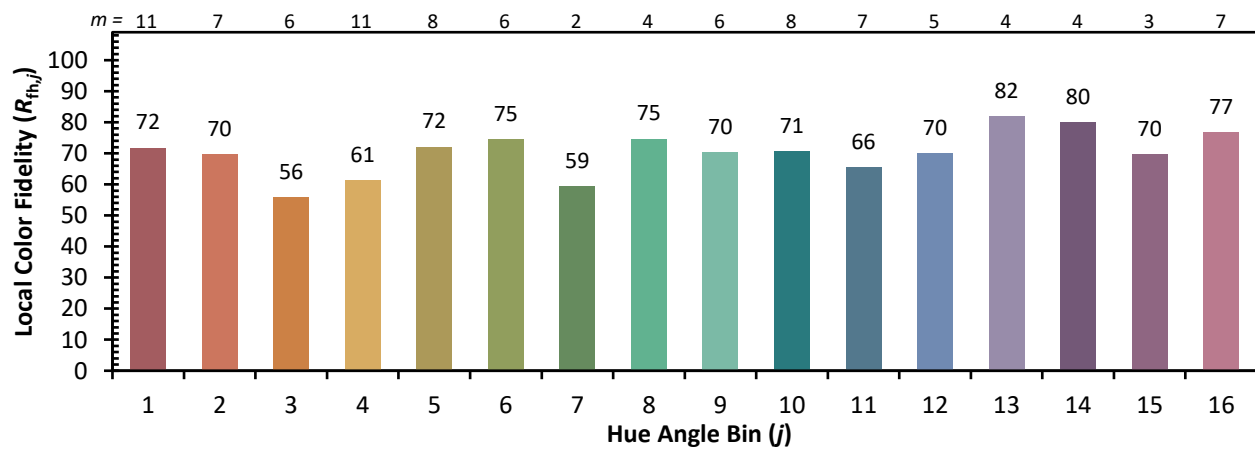
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 54 | CES51 = 77 | CES76 = 48 |
| CES02 = 63 | CES27 = 74 | CES52 = 80 | CES77 = 75 |
| CES03 = 31 | CES28 = 80 | CES53 = 66 | CES78 = 56 |
| CES04 = 71 | CES29 = 44 | CES54 = 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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**TM-30-18**

**Measure Comparisons**



(END OF REPORT)