

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: McGRAW-EDISON

Report Number: P631492

Luminaire Tested: GWS-SA1F-827-U-SL4-W-HSS

Issue Date: 1/10/2023

**Test Information**

Test Method: LM-79-2019  
Report Number: P631492  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2209-782-36)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 1/10/2023  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: McGRAW-EDISON  
Catalog Number: GWS-SA1F-827-U-SL4-W-HSS  
Description: GALLEON WALL SLIM LUMINAIRE. (1) LIGHTSQUARES WITH 16 LEDS EACH AND  
TYPE IV SPILL LIGHT ELIMINATOR OPTICS WITH HOUSE SIDE SHIELD  
Light Source: (16) 2700K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 4879.8 lumens  
Efficiency: N/A  
Efficacy: 72.6 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 0.5' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

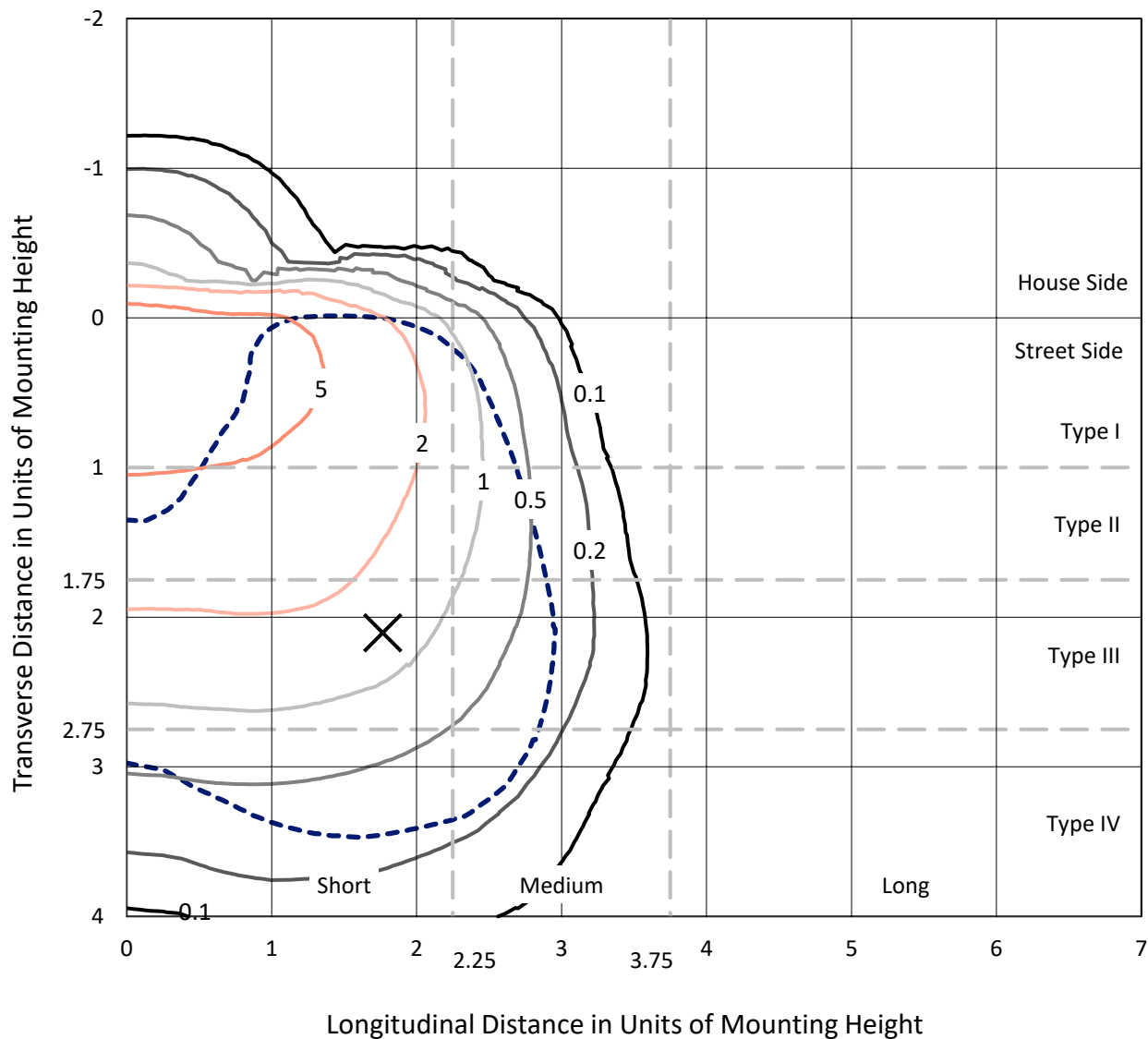
Input Watts (W): 67.2  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 0  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



REPORT NUMBER: P631492  
 CATALOG NUMBER: GWS-SA1F-827-U-SL4-W-HSS

## Iso-Footcandle Lines of Horizontal Illumination

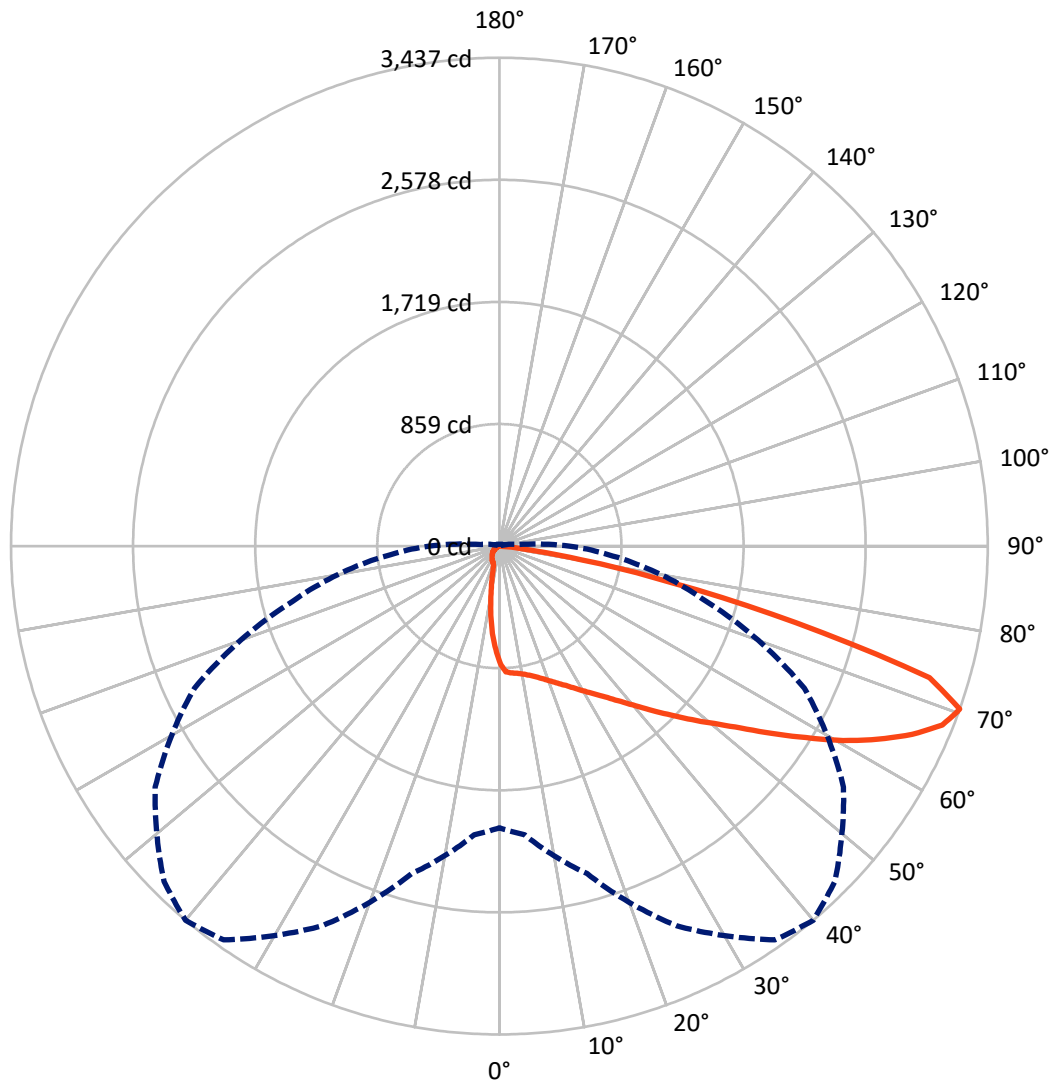
✕ Max cd  
 --- 1/2 Max cd



Based on 10 foot mounting height. Maximum calculated value = 9 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



— Vertical Plane Through 40-Deg Lateral    - - - Horizontal Cone Through 70-Deg Vertical

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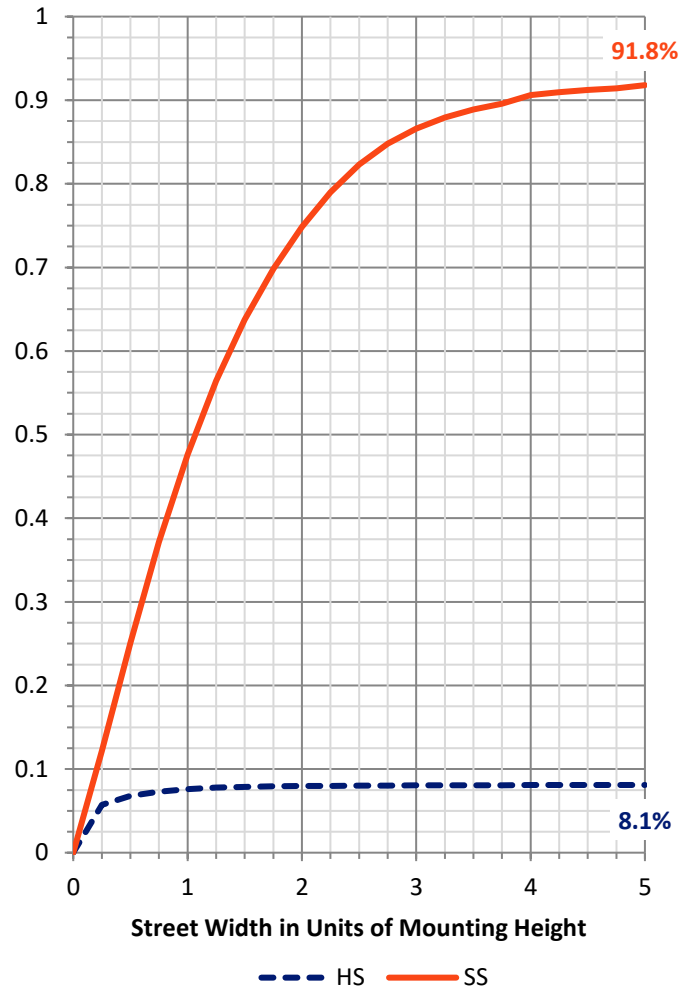
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 399.0    | 0.0    | 399.0  |
|                    | % Fixture | 8.2      | 0.0    | 8.2    |
| <b>Street Side</b> | Lumens    | 4480.7   | 0.0    | 4480.7 |
|                    | % Fixture | 91.8     | 0.0    | 91.8   |
| <b>Total</b>       | Lumens    | 4879.8   | 0.0    | 4879.8 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 70.0   | 1.4       |
| 10°-20°   | 177.5  | 3.6       |
| 20°-30°   | 297.1  | 6.1       |
| 30°-40°   | 466.6  | 9.6       |
| 40°-50°   | 738.0  | 15.1      |
| 50°-60°   | 1076.6 | 22.1      |
| 60°-70°   | 1334.6 | 27.4      |
| 70°-80°   | 675.2  | 13.8      |
| 80°-90°   | 44.1   | 0.9       |
| 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°    | 4879.8 | 100.0     |
| 0°-180°   | 4879.8 | 100.0     |

**Coefficient of Utilization**



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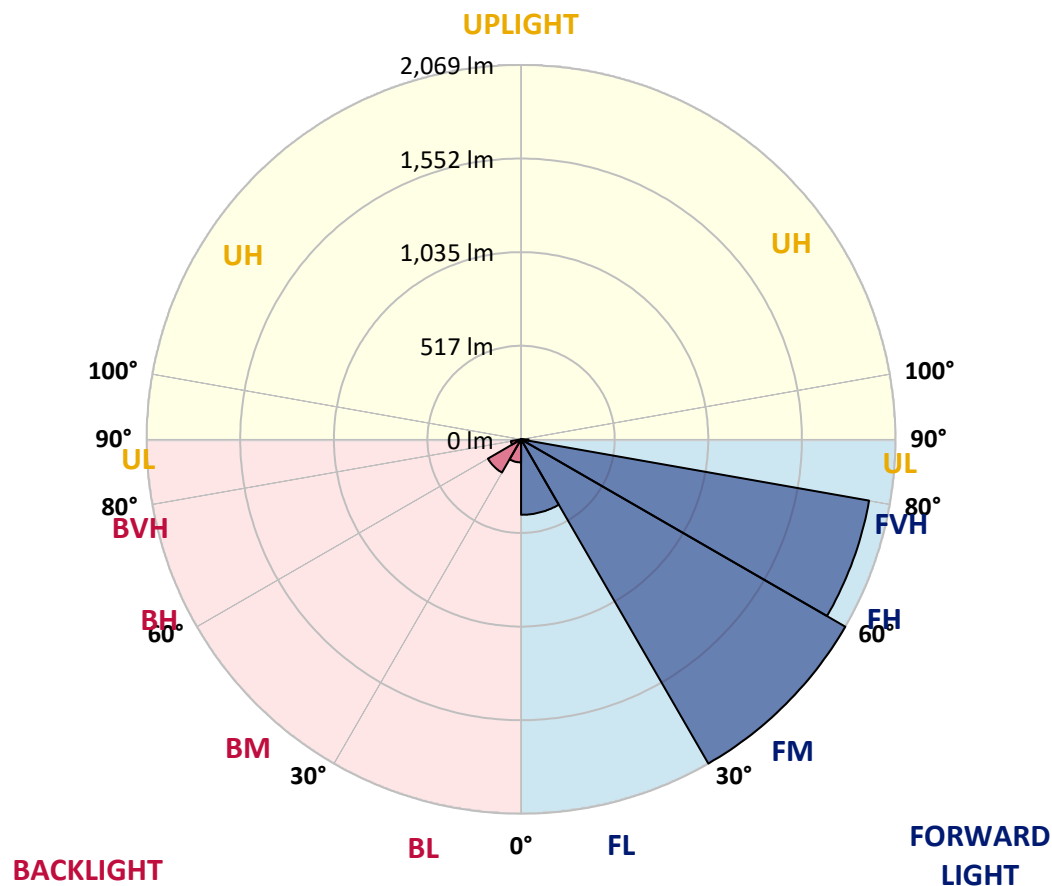
CATALOG NUMBER: GWS-SA1F-827-U-SL4-W-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 417.1  | 8.5       |                         |      |         |
| FM   | (30°-60°)   | 2069.5 | 42.4      |                         |      |         |
| FH   | (60°-80°)   | 1953.0 | 40.0      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 41.2   | 0.8       |                         |      | G1/100  |
| BL   | (0°-30°)    | 127.4  | 2.6       | B1/500                  |      |         |
| BM   | (30°-60°)   | 211.8  | 4.3       | B0/220                  |      |         |
| BH   | (60°-80°)   | 56.9   | 1.2       | B0/110                  |      | G0/110  |
| BVH  | (80°-90°)   | 2.9    | 0.1       |                         |      | 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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CATALOG NUMBER: GWS-SA1F-827-U-SL4-W-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 40°    | 45°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  | 828.0  |
| 2.5°  | 890.2  | 893.3  | 892.9  | 894.2  | 891.1  | 886.2  | 885.3  | 878.7  | 866.7  | 851.6  | 834.7  |
| 5°    | 908.4  | 912.0  | 909.3  | 908.0  | 902.2  | 896.9  | 895.5  | 888.4  | 874.7  | 854.2  | 824.9  |
| 7.5°  | 923.9  | 924.8  | 923.1  | 919.9  | 911.5  | 904.4  | 899.5  | 889.8  | 873.3  | 852.9  | 819.2  |
| 10°   | 926.6  | 926.2  | 927.1  | 927.5  | 922.2  | 916.0  | 912.0  | 898.6  | 877.8  | 856.0  | 819.6  |
| 12.5° | 923.5  | 923.5  | 929.3  | 935.9  | 935.9  | 932.8  | 928.8  | 916.8  | 892.4  | 866.7  | 828.5  |
| 15°   | 927.5  | 928.8  | 939.9  | 952.4  | 956.4  | 953.2  | 951.5  | 939.0  | 913.7  | 885.3  | 844.5  |
| 17.5° | 941.7  | 943.0  | 960.8  | 979.4  | 984.3  | 980.8  | 977.2  | 964.8  | 937.7  | 906.6  | 862.7  |
| 20°   | 962.6  | 966.1  | 988.8  | 1012.7 | 1017.2 | 1012.7 | 1005.6 | 988.3  | 961.2  | 929.7  | 880.0  |
| 22.5° | 1000.8 | 1003.0 | 1027.4 | 1052.7 | 1054.9 | 1047.8 | 1037.2 | 1013.2 | 984.8  | 954.1  | 899.5  |
| 25°   | 1051.4 | 1054.5 | 1078.9 | 1103.3 | 1097.5 | 1086.9 | 1072.2 | 1045.2 | 1012.7 | 983.0  | 924.4  |
| 27.5° | 1111.8 | 1115.3 | 1139.3 | 1160.6 | 1145.5 | 1133.1 | 1116.6 | 1082.9 | 1050.0 | 1023.0 | 956.4  |
| 30°   | 1177.0 | 1180.1 | 1201.4 | 1220.5 | 1200.6 | 1185.9 | 1166.4 | 1131.7 | 1098.4 | 1078.0 | 1001.6 |
| 32.5° | 1240.1 | 1239.6 | 1260.0 | 1275.6 | 1255.2 | 1243.6 | 1225.9 | 1190.8 | 1164.1 | 1155.3 | 1069.1 |
| 35°   | 1298.7 | 1298.7 | 1315.5 | 1331.1 | 1316.4 | 1310.2 | 1293.8 | 1265.8 | 1250.7 | 1261.4 | 1159.3 |
| 37.5° | 1357.7 | 1354.6 | 1370.6 | 1387.9 | 1386.6 | 1387.0 | 1377.7 | 1364.4 | 1365.3 | 1403.0 | 1283.1 |
| 40°   | 1406.6 | 1405.2 | 1423.9 | 1446.5 | 1464.3 | 1478.5 | 1472.7 | 1477.6 | 1505.6 | 1576.2 | 1441.6 |
| 42.5° | 1445.6 | 1448.7 | 1472.7 | 1508.7 | 1553.5 | 1582.4 | 1586.4 | 1606.4 | 1678.3 | 1787.5 | 1620.6 |
| 45°   | 1490.5 | 1490.9 | 1524.2 | 1579.3 | 1650.8 | 1696.5 | 1712.5 | 1764.0 | 1866.1 | 2006.8 | 1816.8 |
| 47.5° | 1545.5 | 1540.2 | 1577.5 | 1654.8 | 1758.2 | 1825.7 | 1854.1 | 1918.5 | 2076.5 | 2220.8 | 1976.6 |
| 50°   | 1606.4 | 1596.6 | 1638.8 | 1744.0 | 1878.5 | 1962.9 | 2020.6 | 2114.7 | 2285.2 | 2396.7 | 2095.6 |
| 52.5° | 1677.0 | 1667.6 | 1715.6 | 1846.6 | 2022.8 | 2125.4 | 2199.5 | 2294.5 | 2464.2 | 2530.7 | 2166.7 |
| 55°   | 1766.6 | 1757.3 | 1807.9 | 1969.5 | 2193.3 | 2326.5 | 2404.2 | 2484.1 | 2630.6 | 2629.8 | 2218.2 |
| 57.5° | 1866.1 | 1853.2 | 1923.4 | 2124.9 | 2406.0 | 2544.5 | 2623.5 | 2662.6 | 2757.2 | 2706.6 | 2252.8 |
| 60°   | 1980.2 | 1968.7 | 2065.9 | 2310.1 | 2651.5 | 2779.8 | 2829.6 | 2813.6 | 2861.1 | 2751.9 | 2240.8 |
| 62.5° | 2083.2 | 2077.9 | 2198.6 | 2506.3 | 2885.5 | 2993.8 | 3007.6 | 2937.9 | 2937.4 | 2752.7 | 2160.0 |
| 65°   | 2190.2 | 2200.4 | 2379.8 | 2732.3 | 3120.8 | 3193.6 | 3170.1 | 3061.3 | 2968.1 | 2644.0 | 1921.1 |
| 67.5° | 2230.2 | 2259.9 | 2499.2 | 2936.6 | 3306.4 | 3363.2 | 3321.9 | 3123.0 | 2840.7 | 2278.1 | 1463.0 |
| 70°   | 1983.3 | 2039.3 | 2386.5 | 2948.1 | 3383.2 | 3437.4 | 3338.4 | 2957.0 | 2368.2 | 1509.1 | 801.4  |
| 72.5° | 1508.2 | 1573.5 | 1988.6 | 2414.0 | 3042.7 | 3166.1 | 2996.9 | 2409.1 | 1526.4 | 661.1  | 269.1  |
| 75°   | 844.0  | 914.6  | 1481.2 | 1817.7 | 2042.8 | 2155.6 | 2093.4 | 1545.5 | 676.2  | 172.7  | 80.4   |
| 77.5° | 285.5  | 309.0  | 689.1  | 1124.6 | 1348.4 | 1247.2 | 1055.8 | 767.7  | 248.6  | 65.7   | 42.6   |
| 80°   | 169.2  | 178.0  | 256.6  | 559.9  | 709.5  | 588.3  | 464.4  | 283.7  | 126.5  | 35.1   | 29.7   |
| 82.5° | 50.6   | 59.9   | 141.6  | 207.8  | 277.9  | 173.2  | 146.5  | 162.1  | 65.7   | 19.1   | 24.9   |
| 85°   | 0.0    | 0.0    | 30.2   | 64.4   | 72.8   | 28.4   | 28.4   | 91.9   | 12.0   | 8.0    | 18.2   |
| 87.5° | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.4    | 2.2    | 1.3    | 1.8    | 4.0    |
| 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: P631492

CATALOG NUMBER: GWS-SA1F-827-U-SL4-W-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 828.0  | 828.0  | 828.0 | 828.0 | 828.0 | 828.0 | 828.0 | 828.0 | 828.0 | 828.0 | 828.0 |
| 2.5°  | 822.7  | 807.2  | 789.0 | 771.7 | 755.2 | 733.9 | 723.7 | 711.3 | 700.6 | 694.8 | 698.0 |
| 5°    | 806.3  | 781.9  | 744.6 | 706.8 | 668.7 | 632.7 | 600.3 | 578.5 | 559.0 | 548.8 | 551.0 |
| 7.5°  | 792.1  | 759.2  | 701.1 | 639.3 | 578.1 | 516.4 | 466.2 | 427.1 | 396.9 | 384.5 | 382.3 |
| 10°   | 785.9  | 744.6  | 662.4 | 573.6 | 479.5 | 396.5 | 325.4 | 282.4 | 251.7 | 236.6 | 239.3 |
| 12.5° | 789.0  | 737.0  | 629.6 | 509.3 | 387.2 | 290.4 | 222.4 | 182.0 | 160.3 | 151.4 | 149.2 |
| 15°   | 797.9  | 735.2  | 600.3 | 443.5 | 298.8 | 202.9 | 153.6 | 137.2 | 132.8 | 131.9 | 131.9 |
| 17.5° | 808.1  | 735.7  | 570.1 | 376.9 | 226.9 | 150.5 | 131.4 | 128.3 | 127.0 | 126.1 | 126.5 |
| 20°   | 818.3  | 735.7  | 535.5 | 309.5 | 170.5 | 130.1 | 125.2 | 123.0 | 121.7 | 121.2 | 121.2 |
| 22.5° | 830.7  | 735.7  | 496.8 | 246.9 | 136.7 | 123.4 | 119.4 | 118.1 | 116.8 | 116.3 | 115.9 |
| 25°   | 845.8  | 736.1  | 454.2 | 193.1 | 124.3 | 117.7 | 114.5 | 113.2 | 111.9 | 111.0 | 111.0 |
| 27.5° | 867.6  | 739.7  | 407.1 | 150.5 | 117.2 | 112.3 | 109.7 | 108.3 | 107.0 | 105.7 | 105.7 |
| 30°   | 899.1  | 748.6  | 354.3 | 124.3 | 110.6 | 106.6 | 103.9 | 103.0 | 101.7 | 100.3 | 99.9  |
| 32.5° | 946.1  | 764.1  | 299.7 | 111.4 | 104.3 | 100.3 | 97.2  | 96.3  | 95.0  | 93.7  | 93.2  |
| 35°   | 1011.9 | 792.5  | 246.4 | 103.4 | 96.3  | 92.4  | 90.6  | 90.1  | 88.4  | 87.0  | 87.0  |
| 37.5° | 1108.2 | 838.7  | 195.4 | 95.5  | 89.7  | 86.6  | 84.4  | 83.5  | 81.7  | 80.4  | 79.9  |
| 40°   | 1225.9 | 898.6  | 151.8 | 89.2  | 83.5  | 80.4  | 78.1  | 76.8  | 74.6  | 72.8  | 71.9  |
| 42.5° | 1375.9 | 971.9  | 119.9 | 82.6  | 77.7  | 74.6  | 72.8  | 70.2  | 67.0  | 64.4  | 63.9  |
| 45°   | 1532.2 | 1047.4 | 99.0  | 76.4  | 72.4  | 69.7  | 67.5  | 63.9  | 59.5  | 56.4  | 55.5  |
| 47.5° | 1652.1 | 1094.4 | 86.6  | 69.7  | 66.6  | 64.4  | 61.7  | 57.3  | 51.9  | 48.4  | 47.5  |
| 50°   | 1737.8 | 1101.5 | 77.3  | 63.5  | 61.7  | 59.5  | 55.5  | 50.2  | 44.4  | 40.8  | 40.0  |
| 52.5° | 1780.0 | 1069.6 | 69.7  | 57.7  | 56.4  | 54.2  | 49.3  | 43.5  | 37.3  | 33.7  | 32.9  |
| 55°   | 1799.1 | 1009.2 | 62.6  | 52.8  | 51.1  | 48.4  | 43.1  | 36.9  | 30.6  | 27.5  | 26.6  |
| 57.5° | 1791.5 | 919.9  | 56.4  | 48.0  | 45.7  | 42.6  | 36.9  | 30.2  | 25.3  | 22.2  | 21.8  |
| 60°   | 1735.6 | 794.7  | 50.2  | 43.1  | 40.4  | 36.9  | 31.1  | 24.9  | 20.4  | 18.2  | 17.8  |
| 62.5° | 1614.8 | 639.3  | 44.0  | 37.3  | 35.5  | 32.0  | 26.6  | 20.4  | 16.9  | 15.5  | 15.1  |
| 65°   | 1367.5 | 452.0  | 37.7  | 31.5  | 30.6  | 27.1  | 22.2  | 16.9  | 14.7  | 13.8  | 13.3  |
| 67.5° | 983.0  | 274.8  | 32.0  | 27.1  | 26.2  | 23.1  | 18.6  | 14.7  | 13.3  | 12.9  | 12.9  |
| 70°   | 494.2  | 130.1  | 25.3  | 22.2  | 22.2  | 19.1  | 16.0  | 13.3  | 12.9  | 12.4  | 12.4  |
| 72.5° | 167.8  | 55.5   | 19.1  | 17.3  | 18.2  | 16.4  | 13.8  | 12.4  | 12.4  | 12.4  | 12.4  |
| 75°   | 57.3   | 29.3   | 13.3  | 12.4  | 13.3  | 13.3  | 12.0  | 12.0  | 12.4  | 12.4  | 12.4  |
| 77.5° | 37.3   | 19.5   | 9.3   | 8.4   | 10.2  | 10.2  | 10.2  | 11.1  | 12.0  | 12.0  | 12.0  |
| 80°   | 30.6   | 10.7   | 6.2   | 5.8   | 7.5   | 7.5   | 8.4   | 10.2  | 11.1  | 11.1  | 11.1  |
| 82.5° | 26.2   | 6.7    | 3.6   | 4.0   | 5.3   | 5.8   | 7.1   | 8.4   | 9.8   | 10.2  | 10.2  |
| 85°   | 17.8   | 3.6    | 2.7   | 3.1   | 3.6   | 4.4   | 5.8   | 7.1   | 8.0   | 8.9   | 8.9   |
| 87.5° | 4.9    | 1.3    | 1.8   | 2.2   | 2.2   | 3.1   | 4.4   | 5.3   | 6.2   | 6.7   | 6.7   |
| 90°   | 0.0    | 0.0    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

Invue

Report Number: SP1-2407-157-9

Test Date: 10/03/2024

Luminaire Tested: EMM2-HTN-SA1A-827-U-5WQ

Data applicable to all product families utilizing light square engine

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2407-157-9  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/03/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Invue  
 Catalog Number: **EMM2-HTN-SA1A-827-U-5WQ**  
 Description: Epic Modern Light Square 40W 5WQ Optic

### Spectral Parameters

CCT (K): 2764  
 CIE  $u'$ : 0.2591  
 CIE  $v'$ : 0.5290  
 Duv: 0.0020  
 CIE x: 0.4581  
 CIE y: 0.4156  
 CIE z: 0.1263  
 Peak Wavelength (nm): 603  
 Dominant Wavelength (nm): 583  
 Purity: 62.2537  
 R<sub>f</sub>: 84.7  
 R<sub>g</sub>: 94.6

CRI (Ra): 80.9  
 R1: 78.8  
 R2: 89.9  
 R3: 96.2  
 R4: 79.1  
 R5: 79.1  
 R6: 88.8  
 R7: 81.3  
 R8: 54.3  
 R9: -1.5  
 R10: 77.9  
 R11: 78.9  
 R12: 71.6  
 R13: 81.2  
 R14: 98.5  
 R15: 69.9



### Test Conditions

Stabilization Time: 81M  
 Operation Time: 2H 21M  
 Sphere Temperature (°C): 25.2

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| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/18/2024        | 12/18/2024           |
| Power Meter                    | INXT2011004           | 2/8/2024         | 2/8/2025             |
| AC Power Source                | IN0063                | 10/24/2023       | 10/24/2024           |
| DC Power Source                | IN0208                | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | IN0085                | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | IN0046                | 10/24/2023       | 10/24/2024           |

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**CIE 1931 Chromaticity Diagram**

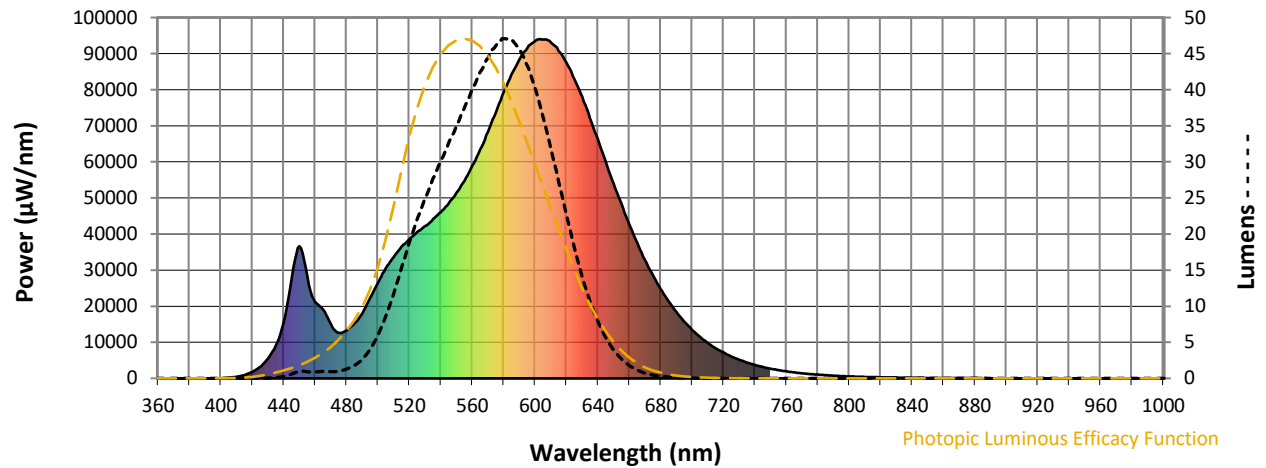


**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



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### Photopic Flux vs. Wavelength


**Photopic Lumens: 4337.9**

| 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       | 0                | 0.0              | 490       | 18018            | 2.6              | 620       | 87426            | 22.8             | 750       | 2680             | 0.0              | 880       | 58               | 0.0              |
| 365       | 0                | 0.0              | 495       | 22295            | 3.9              | 625       | 83013            | 18.2             | 755       | 2287             | 0.0              | 885       | 46               | 0.0              |
| 370       | 0                | 0.0              | 500       | 26478            | 5.8              | 630       | 78077            | 14.1             | 760       | 1944             | 0.0              | 890       | 45               | 0.0              |
| 375       | 0                | 0.0              | 505       | 30524            | 8.5              | 635       | 72080            | 10.7             | 765       | 1653             | 0.0              | 895       | 41               | 0.0              |
| 380       | 0                | 0.0              | 510       | 33611            | 11.5             | 640       | 66249            | 7.9              | 770       | 1413             | 0.0              | 900       | 38               | 0.0              |
| 385       | 0                | 0.0              | 515       | 36490            | 15.2             | 645       | 59973            | 5.7              | 775       | 1198             | 0.0              | 905       | 33               | 0.0              |
| 390       | 0                | 0.0              | 520       | 38610            | 18.7             | 650       | 53972            | 3.9              | 780       | 1025             | 0.0              | 910       | 30               | 0.0              |
| 395       | 0                | 0.0              | 525       | 40511            | 21.9             | 655       | 48369            | 2.7              | 785       | 874              | 0.0              | 915       | 23               | 0.0              |
| 400       | 48               | 0.0              | 530       | 42223            | 24.9             | 660       | 42641            | 1.8              | 790       | 747              | 0.0              | 920       | 24               | 0.0              |
| 405       | 201              | 0.0              | 535       | 44137            | 27.6             | 665       | 37602            | 1.1              | 795       | 639              | 0.0              | 925       | 22               | 0.0              |
| 410       | 457              | 0.0              | 540       | 46032            | 30.0             | 670       | 32798            | 0.7              | 800       | 547              | 0.0              | 930       | 22               | 0.0              |
| 415       | 925              | 0.0              | 545       | 48553            | 32.5             | 675       | 28558            | 0.5              | 805       | 473              | 0.0              | 935       | 17               | 0.0              |
| 420       | 1816             | 0.0              | 550       | 51408            | 34.9             | 680       | 24782            | 0.3              | 810       | 401              | 0.0              | 940       | 13               | 0.0              |
| 425       | 3217             | 0.0              | 555       | 54711            | 37.4             | 685       | 21386            | 0.2              | 815       | 351              | 0.0              | 945       | 6                | 0.0              |
| 430       | 5520             | 0.0              | 560       | 58847            | 40.0             | 690       | 18413            | 0.1              | 820       | 307              | 0.0              | 950       | 10               | 0.0              |
| 435       | 9225             | 0.1              | 565       | 63386            | 42.4             | 695       | 15721            | 0.1              | 825       | 261              | 0.0              | 955       | 11               | 0.0              |
| 440       | 15522            | 0.2              | 570       | 68196            | 44.3             | 700       | 13432            | 0.0              | 830       | 228              | 0.0              | 960       | 8                | 0.0              |
| 445       | 27642            | 0.6              | 575       | 73613            | 46.0             | 705       | 11513            | 0.0              | 835       | 193              | 0.0              | 965       | 12               | 0.0              |
| 450       | 36602            | 0.9              | 580       | 79207            | 47.1             | 710       | 9780             | 0.0              | 840       | 174              | 0.0              | 970       | 3                | 0.0              |
| 455       | 28292            | 0.9              | 585       | 84248            | 47.0             | 715       | 8356             | 0.0              | 845       | 151              | 0.0              | 975       | 8                | 0.0              |
| 460       | 21166            | 0.9              | 590       | 88397            | 45.7             | 720       | 7161             | 0.0              | 850       | 123              | 0.0              | 980       | 2                | 0.0              |
| 465       | 19092            | 1.0              | 595       | 91428            | 43.4             | 725       | 6067             | 0.0              | 855       | 106              | 0.0              | 985       | 13               | 0.0              |
| 470       | 14951            | 0.9              | 600       | 93452            | 40.3             | 730       | 5164             | 0.0              | 860       | 95               | 0.0              | 990       | 16               | 0.0              |
| 475       | 12606            | 1.0              | 605       | 93959            | 36.4             | 735       | 4393             | 0.0              | 865       | 82               | 0.0              | 995       | 20               | 0.0              |
| 480       | 13323            | 1.3              | 610       | 93079            | 32.0             | 740       | 3694             | 0.0              | 870       | 77               | 0.0              | 1000      | 0                | 0.0              |
| 485       | 15164            | 1.8              | 615       | 90707            | 27.3             | 745       | 3157             | 0.0              | 875       | 65               | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: 5286.7

S/P: 1.22

| 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       | 0                | 0.0              | 490       | 18018            | 75.9             | 620       | 87426            | 0.4              | 750       | 2680             | 0.0              | 880       | 58               | 0.0              |
| 365       | 0                | 0.0              | 495       | 22295            | 93.2             | 625       | 83013            | 0.2              | 755       | 2287             | 0.0              | 885       | 46               | 0.0              |
| 370       | 0                | 0.0              | 500       | 26478            | 107.8            | 630       | 78077            | 0.1              | 760       | 1944             | 0.0              | 890       | 45               | 0.0              |
| 375       | 0                | 0.0              | 505       | 30524            | 118.7            | 635       | 72080            | 0.1              | 765       | 1653             | 0.0              | 895       | 41               | 0.0              |
| 380       | 0                | 0.0              | 510       | 33611            | 122.2            | 640       | 66249            | 0.1              | 770       | 1413             | 0.0              | 900       | 38               | 0.0              |
| 385       | 0                | 0.0              | 515       | 36490            | 120.8            | 645       | 59973            | 0.0              | 775       | 1198             | 0.0              | 905       | 33               | 0.0              |
| 390       | 0                | 0.0              | 520       | 38610            | 113.9            | 650       | 53972            | 0.0              | 780       | 1025             | 0.0              | 910       | 30               | 0.0              |
| 395       | 0                | 0.0              | 525       | 40511            | 104.1            | 655       | 48369            | 0.0              | 785       | 874              | 0.0              | 915       | 23               | 0.0              |
| 400       | 48               | 0.0              | 530       | 42223            | 92.4             | 660       | 42641            | 0.0              | 790       | 747              | 0.0              | 920       | 24               | 0.0              |
| 405       | 201              | 0.0              | 535       | 44137            | 80.5             | 665       | 37602            | 0.0              | 795       | 639              | 0.0              | 925       | 22               | 0.0              |
| 410       | 457              | 0.1              | 540       | 46032            | 68.2             | 670       | 32798            | 0.0              | 800       | 547              | 0.0              | 930       | 22               | 0.0              |
| 415       | 925              | 0.3              | 545       | 48553            | 57.1             | 675       | 28558            | 0.0              | 805       | 473              | 0.0              | 935       | 17               | 0.0              |
| 420       | 1816             | 1.1              | 550       | 51408            | 46.7             | 680       | 24782            | 0.0              | 810       | 401              | 0.0              | 940       | 13               | 0.0              |
| 425       | 3217             | 2.5              | 555       | 54711            | 37.4             | 685       | 21386            | 0.0              | 815       | 351              | 0.0              | 945       | 6                | 0.0              |
| 430       | 5520             | 5.9              | 560       | 58847            | 29.4             | 690       | 18413            | 0.0              | 820       | 307              | 0.0              | 950       | 10               | 0.0              |
| 435       | 9225             | 12.5             | 565       | 63386            | 22.5             | 695       | 15721            | 0.0              | 825       | 261              | 0.0              | 955       | 11               | 0.0              |
| 440       | 15522            | 26.3             | 570       | 68196            | 16.9             | 700       | 13432            | 0.0              | 830       | 228              | 0.0              | 960       | 8                | 0.0              |
| 445       | 27642            | 55.2             | 575       | 73613            | 12.4             | 705       | 11513            | 0.0              | 835       | 193              | 0.0              | 965       | 12               | 0.0              |
| 450       | 36602            | 85.4             | 580       | 79207            | 9.0              | 710       | 9780             | 0.0              | 840       | 174              | 0.0              | 970       | 3                | 0.0              |
| 455       | 28292            | 75.1             | 585       | 84248            | 6.3              | 715       | 8356             | 0.0              | 845       | 151              | 0.0              | 975       | 8                | 0.0              |
| 460       | 21166            | 63.2             | 590       | 88397            | 4.4              | 720       | 7161             | 0.0              | 850       | 123              | 0.0              | 980       | 2                | 0.0              |
| 465       | 19092            | 63.2             | 595       | 91428            | 3.0              | 725       | 6067             | 0.0              | 855       | 106              | 0.0              | 985       | 13               | 0.0              |
| 470       | 14951            | 54.2             | 600       | 93452            | 2.0              | 730       | 5164             | 0.0              | 860       | 95               | 0.0              | 990       | 16               | 0.0              |
| 475       | 12606            | 48.8             | 605       | 93959            | 1.3              | 735       | 4393             | 0.0              | 865       | 82               | 0.0              | 995       | 20               | 0.0              |
| 480       | 13323            | 54.2             | 610       | 93079            | 0.9              | 740       | 3694             | 0.0              | 870       | 77               | 0.0              | 1000      | 0                | 0.0              |
| 485       | 15164            | 63.3             | 615       | 90707            | 0.5              | 745       | 3157             | 0.0              | 875       | 65               | 0.0              |           |                  |                  |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 9797**

**M/P: 2.26**

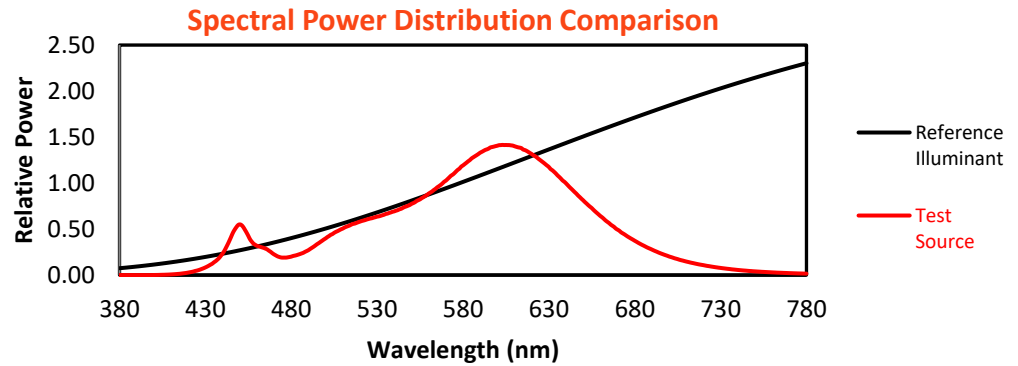
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 0                | 0.0              | 490       | 18018            | 27.7             | 620       | 87426            | 1.1              | 750       | 2680             | 0.0              | 880       | 58               | 0.0              |
| 365       | 0                | 0.0              | 495       | 22295            | 36.0             | 625       | 83013            | 0.7              | 755       | 2287             | 0.0              | 885       | 46               | 0.0              |
| 370       | 0                | 0.0              | 500       | 26478            | 44.2             | 630       | 78077            | 0.4              | 760       | 1944             | 0.0              | 890       | 45               | 0.0              |
| 375       | 0                | 0.0              | 505       | 30524            | 51.8             | 635       | 72080            | 0.3              | 765       | 1653             | 0.0              | 895       | 41               | 0.0              |
| 380       | 0                | 0.0              | 510       | 33611            | 57.0             | 640       | 66249            | 0.2              | 770       | 1413             | 0.0              | 900       | 38               | 0.0              |
| 385       | 0                | 0.0              | 515       | 36490            | 60.5             | 645       | 59973            | 0.1              | 775       | 1198             | 0.0              | 905       | 33               | 0.0              |
| 390       | 0                | 0.0              | 520       | 38610            | 61.4             | 650       | 53972            | 0.1              | 780       | 1025             | 0.0              | 910       | 30               | 0.0              |
| 395       | 0                | 0.0              | 525       | 40511            | 60.6             | 655       | 48369            | 0.0              | 785       | 874              | 0.0              | 915       | 23               | 0.0              |
| 400       | 48               | 0.0              | 530       | 42223            | 58.2             | 660       | 42641            | 0.0              | 790       | 747              | 0.0              | 920       | 24               | 0.0              |
| 405       | 201              | 0.0              | 535       | 44137            | 55.0             | 665       | 37602            | 0.0              | 795       | 639              | 0.0              | 925       | 22               | 0.0              |
| 410       | 457              | 0.0              | 540       | 46032            | 50.9             | 670       | 32798            | 0.0              | 800       | 547              | 0.0              | 930       | 22               | 0.0              |
| 415       | 925              | 0.1              | 545       | 48553            | 46.6             | 675       | 28558            | 0.0              | 805       | 473              | 0.0              | 935       | 17               | 0.0              |
| 420       | 1816             | 0.3              | 550       | 51408            | 42.0             | 680       | 24782            | 0.0              | 810       | 401              | 0.0              | 940       | 13               | 0.0              |
| 425       | 3217             | 0.8              | 555       | 54711            | 37.4             | 685       | 21386            | 0.0              | 815       | 351              | 0.0              | 945       | 6                | 0.0              |
| 430       | 5520             | 1.9              | 560       | 58847            | 32.9             | 690       | 18413            | 0.0              | 820       | 307              | 0.0              | 950       | 10               | 0.0              |
| 435       | 9225             | 4.1              | 565       | 63386            | 28.4             | 695       | 15721            | 0.0              | 825       | 261              | 0.0              | 955       | 11               | 0.0              |
| 440       | 15522            | 8.7              | 570       | 68196            | 24.1             | 700       | 13432            | 0.0              | 830       | 228              | 0.0              | 960       | 8                | 0.0              |
| 445       | 27642            | 18.5             | 575       | 73613            | 20.0             | 705       | 11513            | 0.0              | 835       | 193              | 0.0              | 965       | 12               | 0.0              |
| 450       | 36602            | 28.3             | 580       | 79207            | 16.3             | 710       | 9780             | 0.0              | 840       | 174              | 0.0              | 970       | 3                | 0.0              |
| 455       | 28292            | 24.7             | 585       | 84248            | 12.9             | 715       | 8356             | 0.0              | 845       | 151              | 0.0              | 975       | 8                | 0.0              |
| 460       | 21166            | 20.4             | 590       | 88397            | 9.8              | 720       | 7161             | 0.0              | 850       | 123              | 0.0              | 980       | 2                | 0.0              |
| 465       | 19092            | 20.1             | 595       | 91428            | 7.3              | 725       | 6067             | 0.0              | 855       | 106              | 0.0              | 985       | 13               | 0.0              |
| 470       | 14951            | 17.2             | 600       | 93452            | 5.3              | 730       | 5164             | 0.0              | 860       | 95               | 0.0              | 990       | 16               | 0.0              |
| 475       | 12606            | 15.7             | 605       | 93959            | 3.7              | 735       | 4393             | 0.0              | 865       | 82               | 0.0              | 995       | 20               | 0.0              |
| 480       | 13323            | 18.0             | 610       | 93079            | 2.5              | 740       | 3694             | 0.0              | 870       | 77               | 0.0              | 1000      | 0                | 0.0              |
| 485       | 15164            | 21.9             | 615       | 90707            | 1.7              | 745       | 3157             | 0.0              | 875       | 65               | 0.0              |           |                  |                  |

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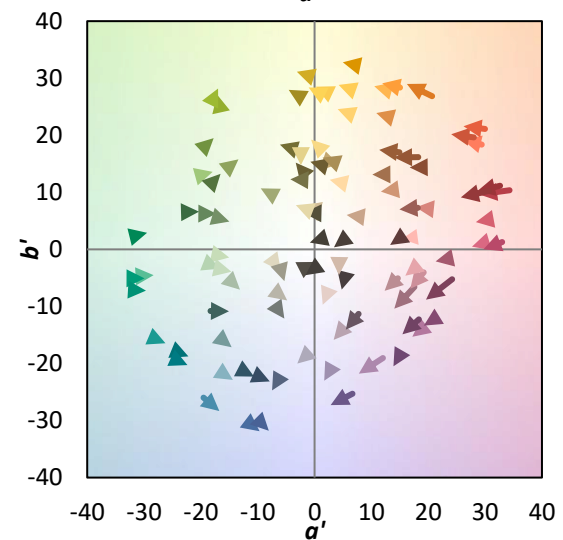
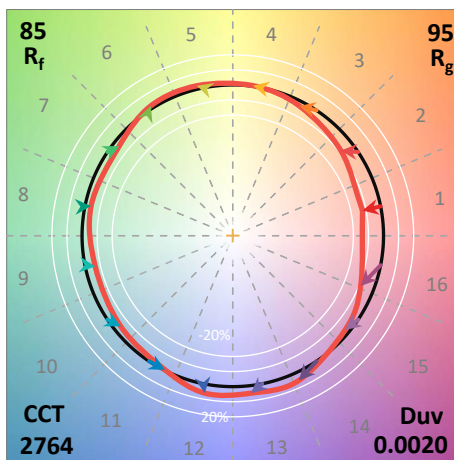
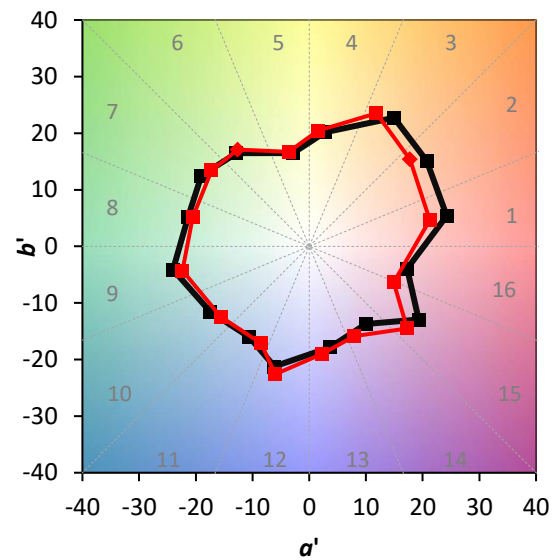
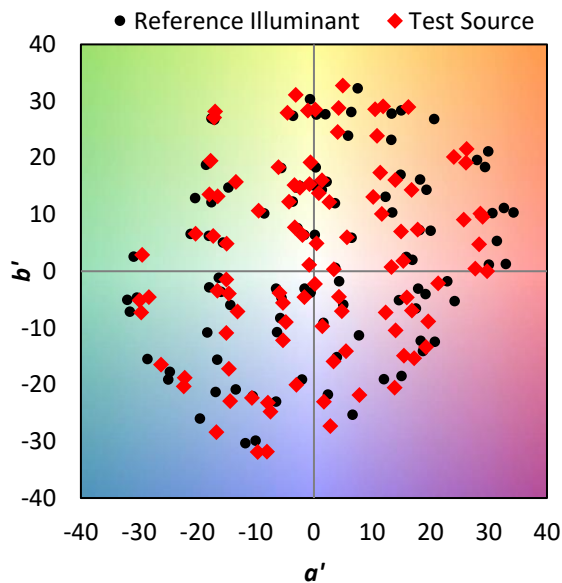
TM-30-18

### Summary

$R_f = 84.7$   
 $R_g = 94.6$   
 $CIE R_a = 80.9$   
 $R_g = -1.5$



### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 84 | CES51 = 95 | CES76 = 81 |
| CES02 = 63 | CES27 = 95 | CES52 = 94 | CES77 = 84 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 81 |
| CES04 = 71 | CES29 = 87 | CES54 = 91 | CES79 = 89 |
| CES05 = 50 | CES30 = 94 | CES55 = 90 | CES80 = 89 |
| CES06 = 52 | CES31 = 89 | CES56 = 86 | CES81 = 69 |
| CES07 = 43 | CES32 = 82 | CES57 = 85 | CES82 = 96 |
| CES08 = 41 | CES33 = 91 | CES58 = 86 | CES83 = 93 |
| CES09 = 29 | CES34 = 92 | CES59 = 91 | CES84 = 92 |
| CES10 = 77 | CES35 = 96 | CES60 = 94 | CES85 = 76 |
| CES11 = 60 | CES36 = 90 | CES61 = 89 | CES86 = 65 |
| CES12 = 66 | CES37 = 96 | CES62 = 94 | CES87 = 84 |
| CES13 = 44 | CES38 = 98 | CES63 = 87 | CES88 = 86 |
| CES14 = 74 | CES39 = 98 | CES64 = 82 | CES89 = 73 |
| CES15 = 72 | CES40 = 95 | CES65 = 78 | CES90 = 88 |
| CES16 = 48 | CES41 = 96 | CES66 = 81 | CES91 = 82 |
| CES17 = 50 | CES42 = 97 | CES67 = 80 | CES92 = 64 |
| CES18 = 57 | CES43 = 91 | CES68 = 83 | CES93 = 78 |
| CES19 = 73 | CES44 = 99 | CES69 = 88 | CES94 = 59 |
| CES20 = 67 | CES45 = 93 | CES70 = 80 | CES95 = 74 |
| CES21 = 87 | CES46 = 89 | CES71 = 79 | CES96 = 83 |
| CES22 = 79 | CES47 = 92 | CES72 = 92 | CES97 = 88 |
| CES23 = 92 | CES48 = 83 | CES73 = 75 | CES98 = 83 |
| CES24 = 91 | CES49 = 90 | CES74 = 91 | CES99 = 74 |
| CES25 = 72 | CES50 = 94 | CES75 = 81 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)