

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: P360932

Luminaire Tested: NVN-SA4C-827-U-T2R

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P360932  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-8)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA4C-827-U-T2R  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(4) 80 CRI, 2700K, 1050mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II  
ROADWAY OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 22333 lumens  
Efficiency: N/A  
Efficacy: 99.3 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1.5' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B3 - U0 - G3

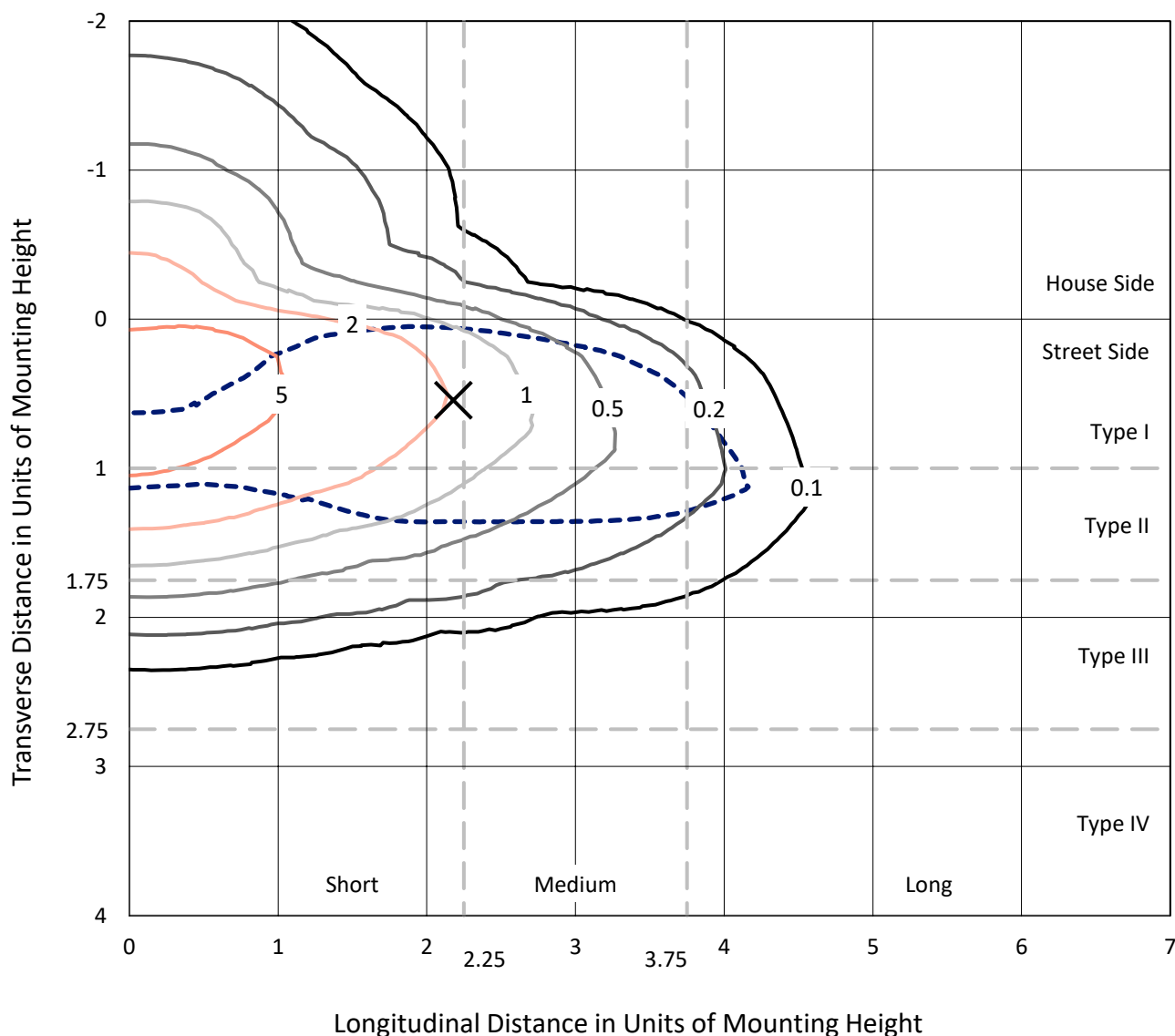
Input Watts (W): 225  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

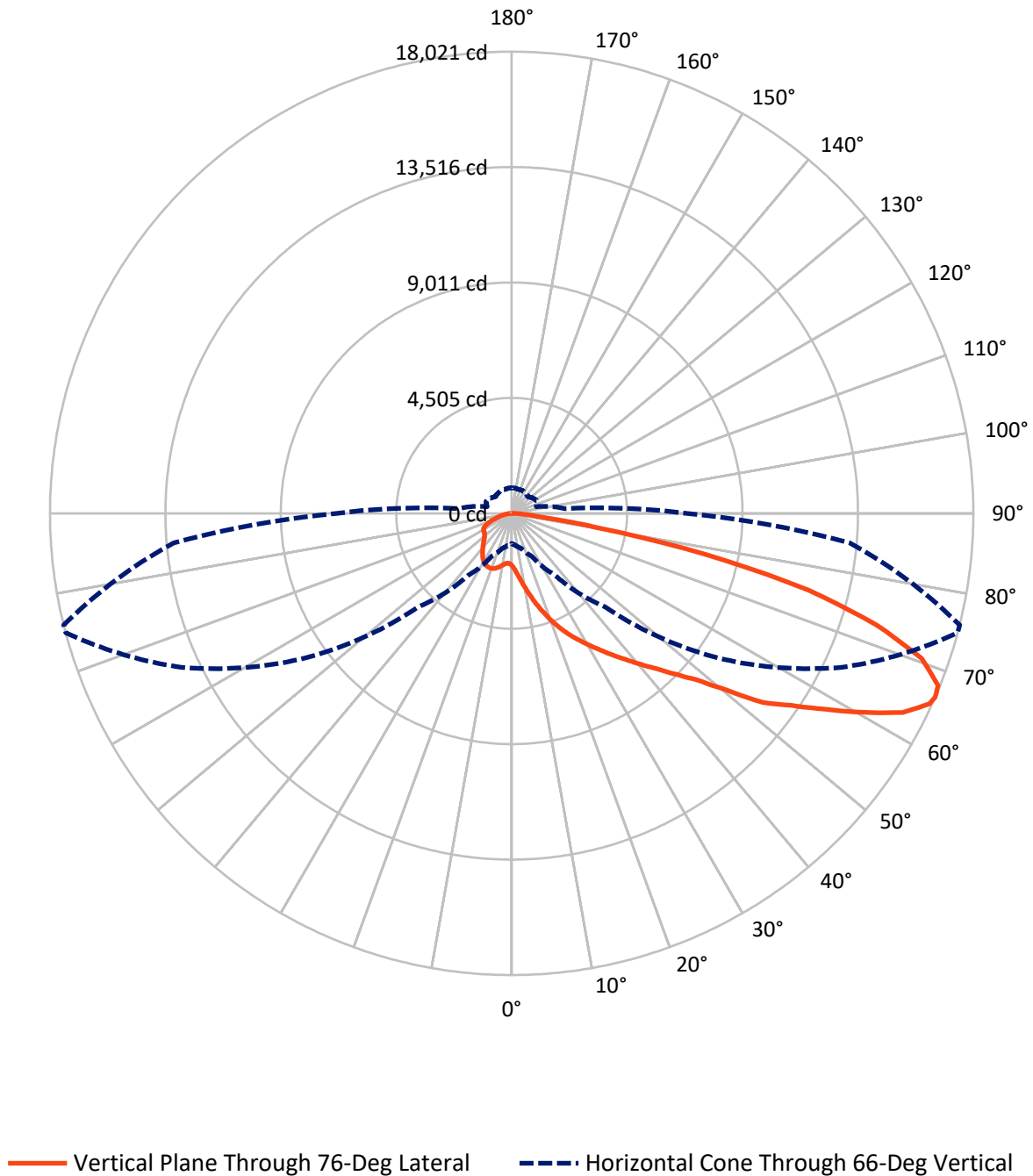
× Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 8.7 fc  
 Type II - Short - N/A

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## Luminous Intensity Polar Plot



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CATALOG NUMBER: NVN-SA4C-827-U-T2R

**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 3757.9   | 0.0    | 3757.9  |
|                    | % Fixture | 16.8     | 0.0    | 16.8    |
| <b>Street Side</b> | Lumens    | 18575.1  | 0.0    | 18575.1 |
|                    | % Fixture | 83.2     | 0.0    | 83.2    |
| <b>Total</b>       | Lumens    | 22333.0  | 0.0    | 22333.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 246.6   | 1.1       |
| 10°-20°   | 973.9   | 4.4       |
| 20°-30°   | 1892.6  | 8.5       |
| 30°-40°   | 3089.1  | 13.8      |
| 40°-50°   | 4220.5  | 18.9      |
| 50°-60°   | 4916.0  | 22.0      |
| 60°-70°   | 4407.3  | 19.7      |
| 70°-80°   | 2227.3  | 10.0      |
| 80°-90°   | 359.7   | 1.6       |
| 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°    | 22333.0 | 100.0     |
| 0°-180°   | 22333.0 | 100.0     |

**Coefficient of Utilization**



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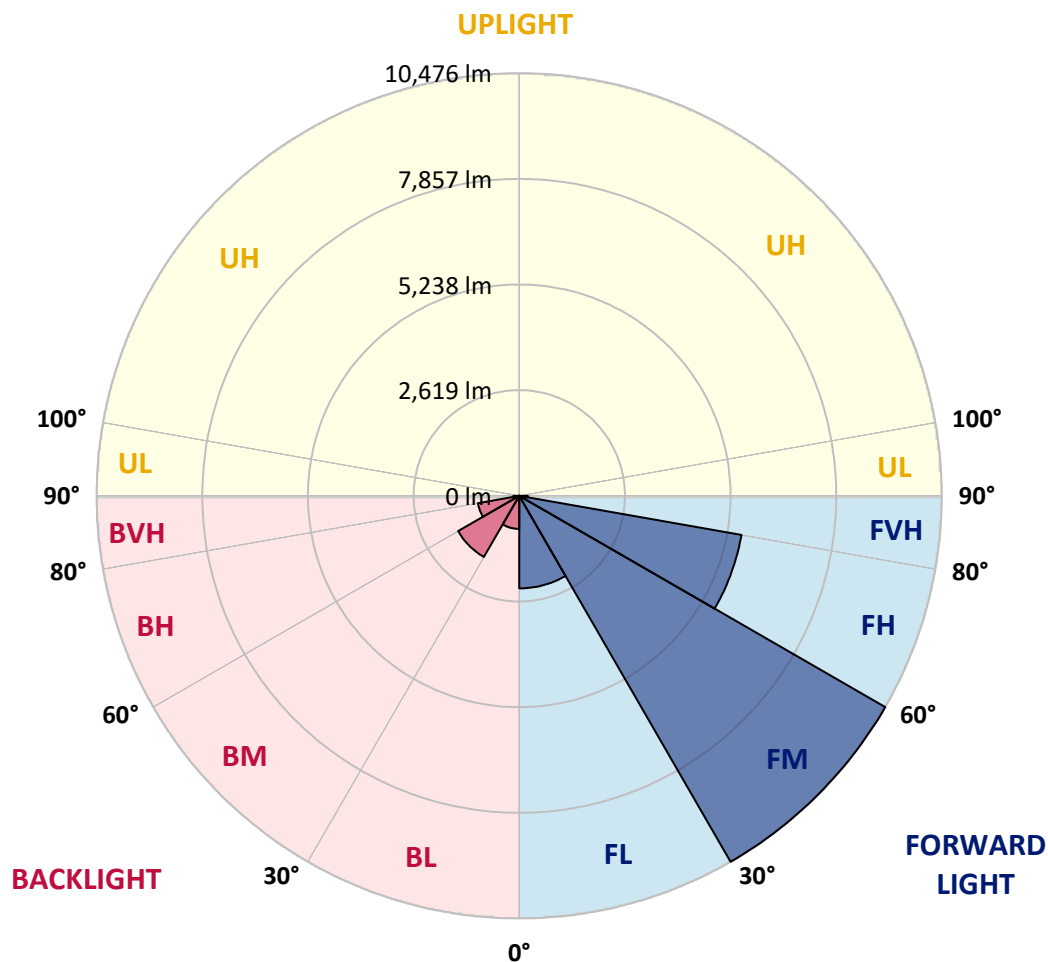
CATALOG NUMBER: NVN-SA4C-827-U-T2R

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 2293.5  | 10.3      |                         |      |         |
| FM   | (30°-60°)   | 10475.7 | 46.9      |                         |      |         |
| FH   | (60°-80°)   | 5593.4  | 25.0      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 212.4   | 1.0       |                         |      | G2/225  |
| BL   | (0°-30°)    | 819.6   | 3.7       | B2/1000                 |      |         |
| BM   | (30°-60°)   | 1749.9  | 7.8       | B2/2500                 |      |         |
| BH   | (60°-80°)   | 1041.1  | 4.7       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 147.3   | 0.7       |                         |      | 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 II Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°    | 25°    | 35°    | 45°     | 55°     | 65°     | 75°     | 76°     | 85°     |
|-------|---------|---------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| 0°    | 2039.5  | 2039.5  | 2039.5 | 2039.5 | 2039.5 | 2039.5  | 2039.5  | 2039.5  | 2039.5  | 2039.5  | 2039.5  |
| 2.5°  | 2707.5  | 2666.5  | 2662.7 | 2602.8 | 2589.2 | 2474.7  | 2390.5  | 2302.6  | 2202.5  | 2182.8  | 2104.0  |
| 5°    | 3477.8  | 3474.0  | 3421.7 | 3323.9 | 3247.3 | 3051.7  | 2858.3  | 2653.6  | 2429.2  | 2392.8  | 2215.4  |
| 7.5°  | 4170.8  | 4164.7  | 4124.5 | 4019.1 | 3908.4 | 3668.1  | 3392.1  | 3078.2  | 2714.3  | 2660.5  | 2366.3  |
| 10°   | 4696.9  | 4694.7  | 4681.0 | 4603.7 | 4509.7 | 4279.2  | 3974.4  | 3546.0  | 3045.6  | 2972.1  | 2555.1  |
| 12.5° | 5103.3  | 5107.9  | 5117.0 | 5089.7 | 5044.9 | 4848.6  | 4536.2  | 4041.9  | 3398.9  | 3326.1  | 2765.1  |
| 15°   | 5378.5  | 5392.2  | 5439.2 | 5477.9 | 5501.4 | 5380.8  | 5078.3  | 4549.1  | 3794.7  | 3707.5  | 2997.8  |
| 17.5° | 5517.3  | 5532.4  | 5613.6 | 5730.3 | 5838.0 | 5825.9  | 5585.5  | 5032.8  | 4174.5  | 4090.4  | 3248.0  |
| 20°   | 5637.1  | 5648.4  | 5739.4 | 5879.7 | 6070.0 | 6154.2  | 6019.2  | 5498.3  | 4590.8  | 4490.7  | 3513.4  |
| 22.5° | 5984.3  | 5998.7  | 6026.0 | 6105.6 | 6273.9 | 6428.6  | 6363.4  | 5938.8  | 4972.2  | 4878.9  | 3765.1  |
| 25°   | 6654.6  | 6672.0  | 6612.9 | 6545.4 | 6577.2 | 6684.9  | 6697.0  | 6340.7  | 5358.8  | 5253.4  | 4035.8  |
| 27.5° | 7462.0  | 7487.0  | 7386.2 | 7212.6 | 7060.9 | 7019.2  | 7004.8  | 6669.7  | 5728.1  | 5606.0  | 4303.4  |
| 30°   | 8252.8  | 8296.0  | 8164.9 | 7939.7 | 7661.4 | 7465.8  | 7321.0  | 6991.9  | 6092.0  | 5975.2  | 4555.9  |
| 32.5° | 9025.4  | 9007.9  | 8817.6 | 8597.8 | 8271.8 | 8026.9  | 7676.6  | 7337.7  | 6501.4  | 6367.2  | 4806.9  |
| 35°   | 9554.6  | 9560.7  | 9384.0 | 9123.2 | 8812.3 | 8624.3  | 8152.7  | 7710.7  | 6919.2  | 6795.6  | 5091.9  |
| 37.5° | 10005.0 | 9976.9  | 9776.7 | 9533.4 | 9265.7 | 9185.4  | 8710.0  | 8121.6  | 7371.8  | 7236.8  | 5395.2  |
| 40°   | 10155.1 | 10122.5 | 9991.3 | 9816.2 | 9601.6 | 9594.8  | 9324.9  | 8587.2  | 7883.6  | 7750.1  | 5737.2  |
| 42.5° | 10064.1 | 10022.4 | 9968.6 | 9920.8 | 9854.8 | 9885.2  | 9902.6  | 9133.0  | 8446.1  | 8296.8  | 6132.9  |
| 45°   | 9728.2  | 9665.3  | 9703.2 | 9807.1 | 9950.4 | 10121.7 | 10424.2 | 9737.3  | 9076.2  | 8951.1  | 6597.7  |
| 47.5° | 9211.9  | 9155.0  | 9273.3 | 9495.5 | 9885.2 | 10318.8 | 10917.8 | 10404.5 | 9828.3  | 9704.0  | 7259.6  |
| 50°   | 8485.6  | 8502.2  | 8671.3 | 9075.4 | 9664.5 | 10409.8 | 11525.9 | 11287.8 | 10921.6 | 10805.6 | 8162.6  |
| 52.5° | 7293.7  | 7296.7  | 7772.9 | 8436.3 | 9273.3 | 10362.8 | 11863.3 | 12416.7 | 12414.5 | 12274.2 | 9022.4  |
| 55°   | 6186.8  | 6254.2  | 6631.1 | 7512.8 | 8639.5 | 10174.8 | 12099.1 | 12965.7 | 13394.8 | 13230.3 | 9823.7  |
| 57.5° | 5105.6  | 5145.0  | 5502.1 | 6387.7 | 7735.0 | 9673.6  | 12340.9 | 13624.5 | 14524.5 | 14420.6 | 10820.0 |
| 60°   | 3875.8  | 3936.5  | 4305.7 | 5123.8 | 6578.0 | 8784.3  | 12363.7 | 14312.2 | 15874.8 | 15770.2 | 11932.3 |
| 62.5° | 2515.6  | 2620.3  | 2966.0 | 3732.5 | 5178.4 | 7505.2  | 11836.0 | 14761.8 | 17154.6 | 17117.5 | 12919.4 |
| 65°   | 1445.9  | 1524.7  | 1765.0 | 2356.4 | 3572.5 | 5899.4  | 10581.2 | 14588.9 | 17942.4 | 17921.1 | 13288.6 |
| 66°   | 1181.2  | 1230.5  | 1414.8 | 1841.6 | 2947.8 | 5180.7  | 9851.8  | 14224.2 | 18020.4 | 18021.2 | 13246.2 |
| 67.5° | 944.7   | 966.7   | 1049.3 | 1318.5 | 2175.2 | 4106.3  | 8548.5  | 13419.8 | 17923.4 | 17949.9 | 12972.5 |
| 70°   | 781.7   | 793.1   | 818.8  | 884.0  | 1187.3 | 2476.2  | 6067.7  | 11329.5 | 16949.1 | 16969.6 | 11904.2 |
| 72.5° | 701.3   | 708.1   | 718.0  | 727.1  | 837.8  | 1383.7  | 3706.0  | 9063.3  | 14860.3 | 14886.9 | 10276.4 |
| 75°   | 635.4   | 639.1   | 637.6  | 638.4  | 702.8  | 881.8   | 1915.2  | 6766.8  | 12015.7 | 11962.6 | 7872.2  |
| 77.5° | 558.0   | 561.8   | 554.2  | 555.7  | 621.7  | 677.8   | 953.0   | 4737.1  | 8108.7  | 7734.2  | 4435.4  |
| 80°   | 471.6   | 474.6   | 471.6  | 476.9  | 541.3  | 511.8   | 554.2   | 2665.0  | 3585.4  | 3391.3  | 1577.0  |
| 82.5° | 356.3   | 369.2   | 378.3  | 399.6  | 445.8  | 363.9   | 370.8   | 1037.9  | 1091.8  | 1039.5  | 483.7   |
| 85°   | 156.2   | 190.3   | 285.1  | 305.5  | 335.1  | 218.4   | 243.4   | 423.1   | 444.3   | 430.6   | 175.9   |
| 87.5° | 40.9    | 44.7    | 141.0  | 177.4  | 185.8  | 98.6    | 126.6   | 192.6   | 203.2   | 192.6   | 58.4    |
| 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: P360932

CATALOG NUMBER: NVN-SA4C-827-U-T2R

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 | 2039.5 |
| 2.5°  | 2062.3 | 2025.1 | 1958.4 | 1899.2 | 1854.5 | 1824.2 | 1793.9 | 1778.7 | 1769.6 | 1760.5 | 1762.0 |
| 5°    | 2128.2 | 2053.2 | 1938.7 | 1857.5 | 1812.1 | 1783.2 | 1768.1 | 1762.0 | 1758.2 | 1749.1 | 1749.1 |
| 7.5°  | 2227.5 | 2121.4 | 1963.7 | 1880.3 | 1844.7 | 1822.7 | 1813.6 | 1810.5 | 1806.0 | 1795.4 | 1796.9 |
| 10°   | 2352.6 | 2204.0 | 2016.0 | 1934.9 | 1902.3 | 1878.0 | 1865.1 | 1860.6 | 1852.2 | 1840.1 | 1841.6 |
| 12.5° | 2499.7 | 2306.4 | 2085.0 | 2000.1 | 1960.7 | 1928.1 | 1906.8 | 1893.9 | 1879.5 | 1863.6 | 1864.4 |
| 15°   | 2660.5 | 2417.8 | 2159.3 | 2058.5 | 2004.6 | 1959.1 | 1925.0 | 1903.0 | 1880.3 | 1860.6 | 1859.8 |
| 17.5° | 2823.5 | 2525.5 | 2216.2 | 2090.3 | 2017.5 | 1957.6 | 1911.4 | 1877.3 | 1849.2 | 1824.9 | 1822.7 |
| 20°   | 2999.4 | 2622.5 | 2248.0 | 2087.3 | 1993.3 | 1922.0 | 1860.6 | 1818.1 | 1787.0 | 1762.8 | 1759.0 |
| 22.5° | 3178.3 | 2713.5 | 2253.3 | 2056.2 | 1939.4 | 1852.2 | 1787.8 | 1740.8 | 1708.9 | 1683.9 | 1674.8 |
| 25°   | 3342.1 | 2784.0 | 2231.3 | 1996.3 | 1864.4 | 1770.4 | 1707.4 | 1659.7 | 1633.9 | 1604.3 | 1595.2 |
| 27.5° | 3491.4 | 2833.3 | 2187.4 | 1919.7 | 1780.2 | 1687.7 | 1628.6 | 1587.6 | 1559.6 | 1536.8 | 1529.3 |
| 30°   | 3625.6 | 2859.9 | 2115.3 | 1828.7 | 1693.8 | 1609.6 | 1559.6 | 1531.5 | 1507.3 | 1478.5 | 1473.1 |
| 32.5° | 3753.0 | 2859.9 | 2022.8 | 1729.4 | 1608.1 | 1540.6 | 1511.1 | 1493.6 | 1466.3 | 1438.3 | 1430.7 |
| 35°   | 3880.4 | 2842.4 | 1913.6 | 1625.5 | 1529.3 | 1491.3 | 1489.8 | 1469.4 | 1427.7 | 1389.7 | 1379.9 |
| 37.5° | 4014.6 | 2806.8 | 1790.8 | 1528.5 | 1464.8 | 1469.4 | 1482.2 | 1436.8 | 1377.6 | 1323.8 | 1309.4 |
| 40°   | 4166.2 | 2757.5 | 1663.4 | 1444.3 | 1411.0 | 1459.5 | 1461.8 | 1389.7 | 1274.5 | 1225.2 | 1212.3 |
| 42.5° | 4344.4 | 2708.2 | 1545.2 | 1370.0 | 1368.5 | 1429.9 | 1423.1 | 1288.1 | 1219.2 | 1194.1 | 1187.3 |
| 45°   | 4578.7 | 2680.2 | 1433.0 | 1299.5 | 1335.2 | 1382.2 | 1357.1 | 1232.0 | 1203.2 | 1188.8 | 1182.8 |
| 47.5° | 4947.9 | 2694.6 | 1329.8 | 1243.4 | 1301.8 | 1334.4 | 1234.3 | 1209.3 | 1188.8 | 1171.4 | 1165.3 |
| 50°   | 5410.4 | 2686.2 | 1246.4 | 1204.7 | 1263.9 | 1284.4 | 1179.0 | 1179.7 | 1169.1 | 1149.4 | 1140.3 |
| 52.5° | 5758.4 | 2621.0 | 1192.6 | 1182.8 | 1230.5 | 1195.7 | 1144.1 | 1150.9 | 1145.6 | 1116.8 | 1106.9 |
| 55°   | 6094.3 | 2564.9 | 1165.3 | 1174.4 | 1206.3 | 1085.0 | 1103.2 | 1119.8 | 1114.5 | 1086.5 | 1081.9 |
| 57.5° | 6512.0 | 2554.3 | 1148.6 | 1176.7 | 1185.8 | 1029.6 | 1063.7 | 1085.7 | 1081.9 | 1069.8 | 1067.5 |
| 60°   | 7023.8 | 2557.3 | 1133.5 | 1180.5 | 1163.0 | 988.7  | 1026.6 | 1054.6 | 1056.9 | 1054.6 | 1053.1 |
| 62.5° | 7305.1 | 2474.7 | 1095.6 | 1169.9 | 1122.9 | 953.0  | 987.9  | 1028.9 | 1029.6 | 1034.2 | 1033.4 |
| 65°   | 7066.2 | 2227.5 | 1025.1 | 1132.7 | 1055.4 | 923.5  | 954.5  | 999.3  | 987.9  | 1008.4 | 1008.4 |
| 66°   | 6834.2 | 2085.0 | 990.2  | 1108.5 | 1026.6 | 912.1  | 943.9  | 984.1  | 969.7  | 997.8  | 997.8  |
| 67.5° | 6360.4 | 1844.7 | 927.3  | 1056.9 | 985.6  | 896.2  | 931.8  | 959.1  | 939.4  | 981.1  | 978.1  |
| 70°   | 5494.5 | 1426.9 | 800.6  | 940.1  | 918.2  | 872.7  | 915.1  | 909.1  | 880.2  | 943.9  | 931.8  |
| 72.5° | 4632.5 | 1084.2 | 642.9  | 787.0  | 815.8  | 843.1  | 891.6  | 845.4  | 809.0  | 853.7  | 827.2  |
| 75°   | 3594.5 | 815.0  | 508.0  | 611.9  | 689.2  | 796.8  | 863.6  | 771.8  | 719.5  | 715.0  | 700.6  |
| 77.5° | 1943.2 | 559.5  | 402.6  | 467.0  | 547.4  | 739.2  | 844.6  | 693.0  | 614.1  | 595.9  | 584.6  |
| 80°   | 769.6  | 363.9  | 292.7  | 354.1  | 382.9  | 655.8  | 799.1  | 601.2  | 506.5  | 488.3  | 470.8  |
| 82.5° | 317.7  | 215.3  | 188.8  | 237.3  | 249.4  | 561.1  | 717.2  | 492.8  | 391.2  | 541.3  | 574.7  |
| 85°   | 136.5  | 118.3  | 112.2  | 122.8  | 141.0  | 393.5  | 570.9  | 376.1  | 422.3  | 376.8  | 299.5  |
| 87.5° | 40.9   | 50.0   | 47.8   | 47.0   | 51.6   | 94.0   | 304.0  | 209.3  | 310.1  | 117.5  | 87.9   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

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

REPORT NUMBER: SP1-2407-157-9

| 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           |

REPORT NUMBER: SP1-2407-157-9

**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

REPORT NUMBER: SP1-2407-157-9

### Photopic Flux vs. Wavelength



**Photopic Lumens: 4337.9**

| λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (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



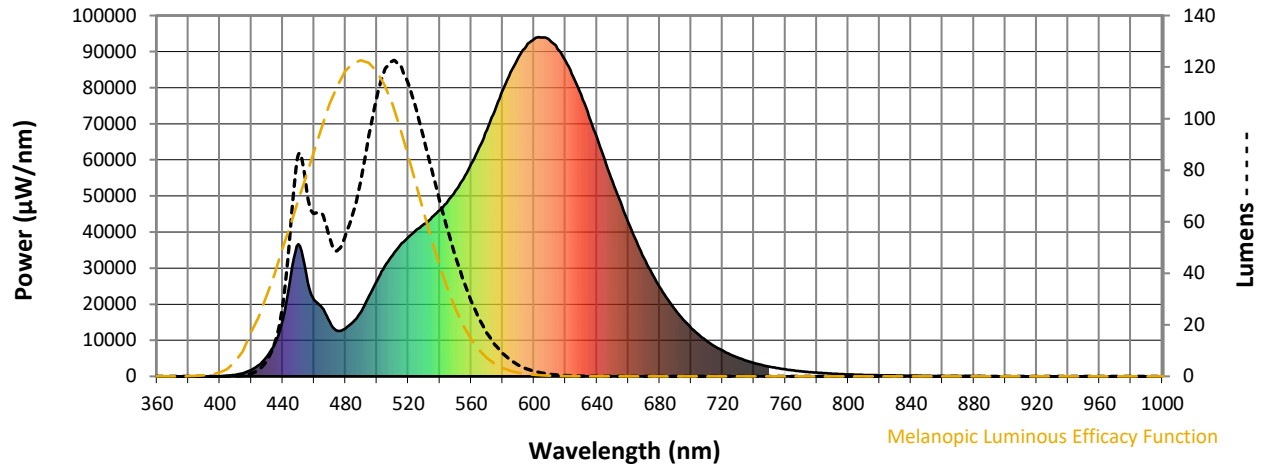
Scotopic Lumens: 5286.7

S/P: 1.22

| λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (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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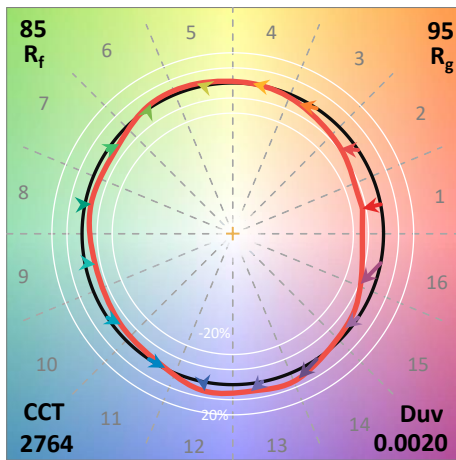
TM-30-18

### 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 ( $R_{f,i}$ )**

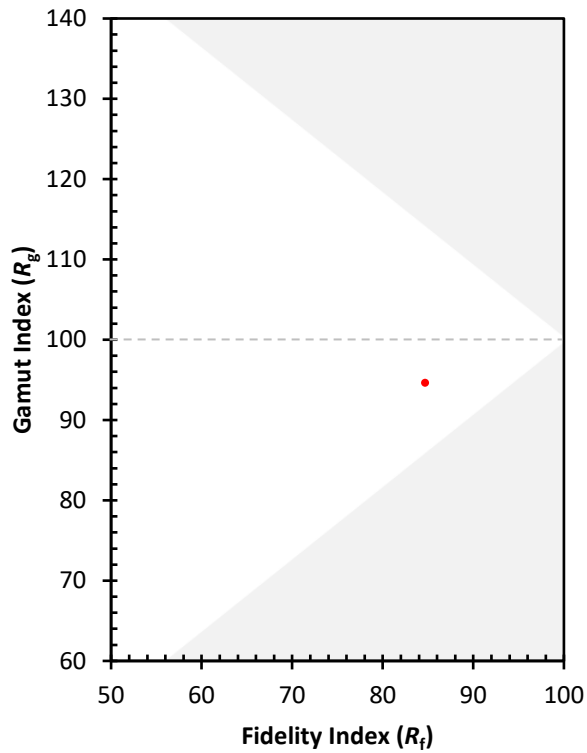
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 84 | CES51 = 95 | CES76 = 81 |
| CES02 = 63 | CES27 = 95 | CES52 = 94 | CES77 = 84 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 81 |
| CES04 = 71 | CES29 = 87 | CES54 = 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)