

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: P361788

Luminaire Tested: NVN-SA2B-827-U-SL2

Issue Date: 3/3/2020

### Test Information

Test Method: LM-79-2019  
Report Number: P361788  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-20)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA2B-827-U-SL2  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(2) 80 CRI, 2700K, 800mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II SPILL  
LIGHT ELIMINATOR OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

### Summary

Lumens per Lamp: N/A  
Luminaire Lumens: 8427 lumens  
Efficiency: N/A  
Efficacy: 99.1 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B2 - U0 - G3

Input Watts (W): 85  
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

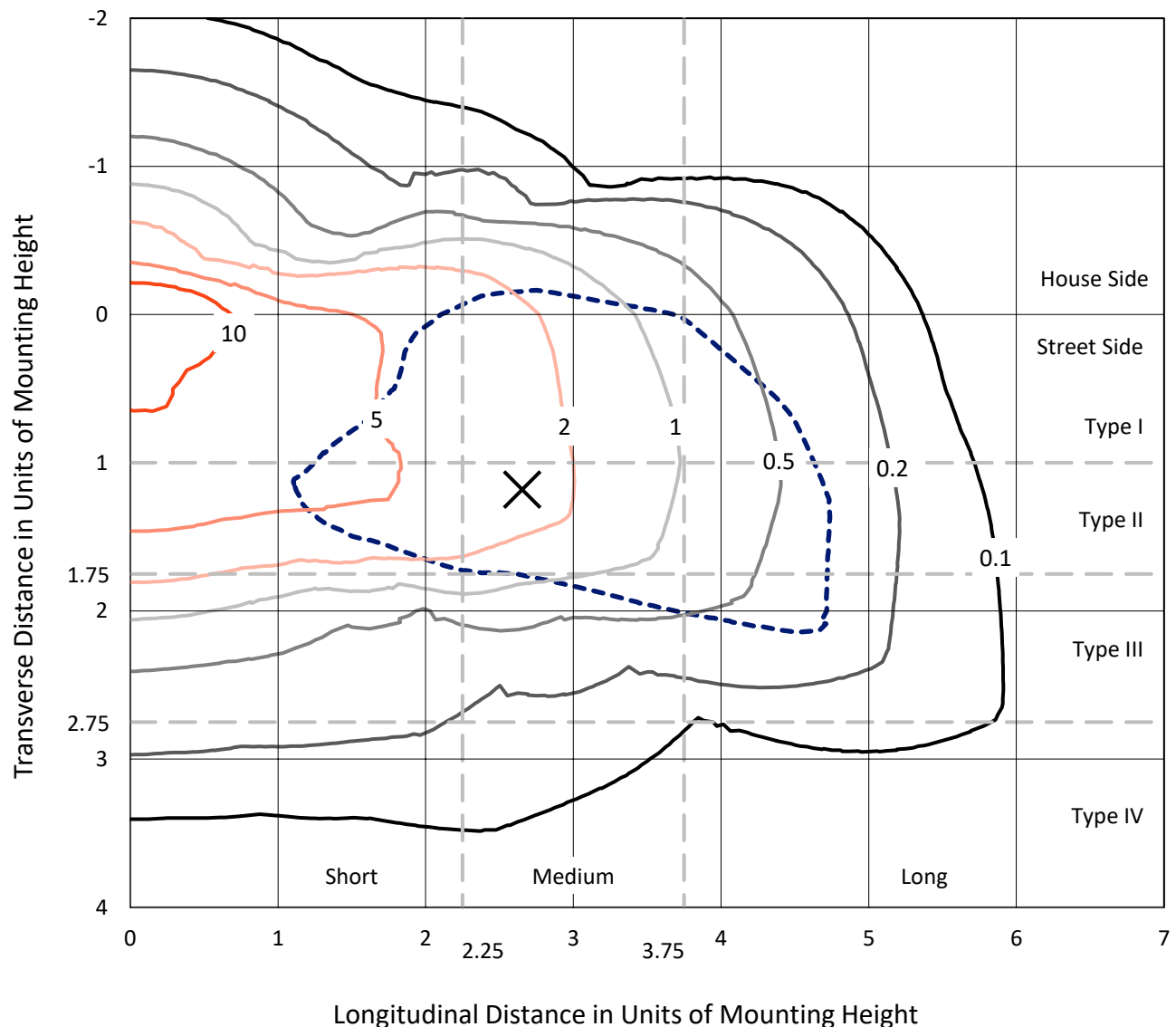


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## Iso-Footcandle Lines of Horizontal Illumination

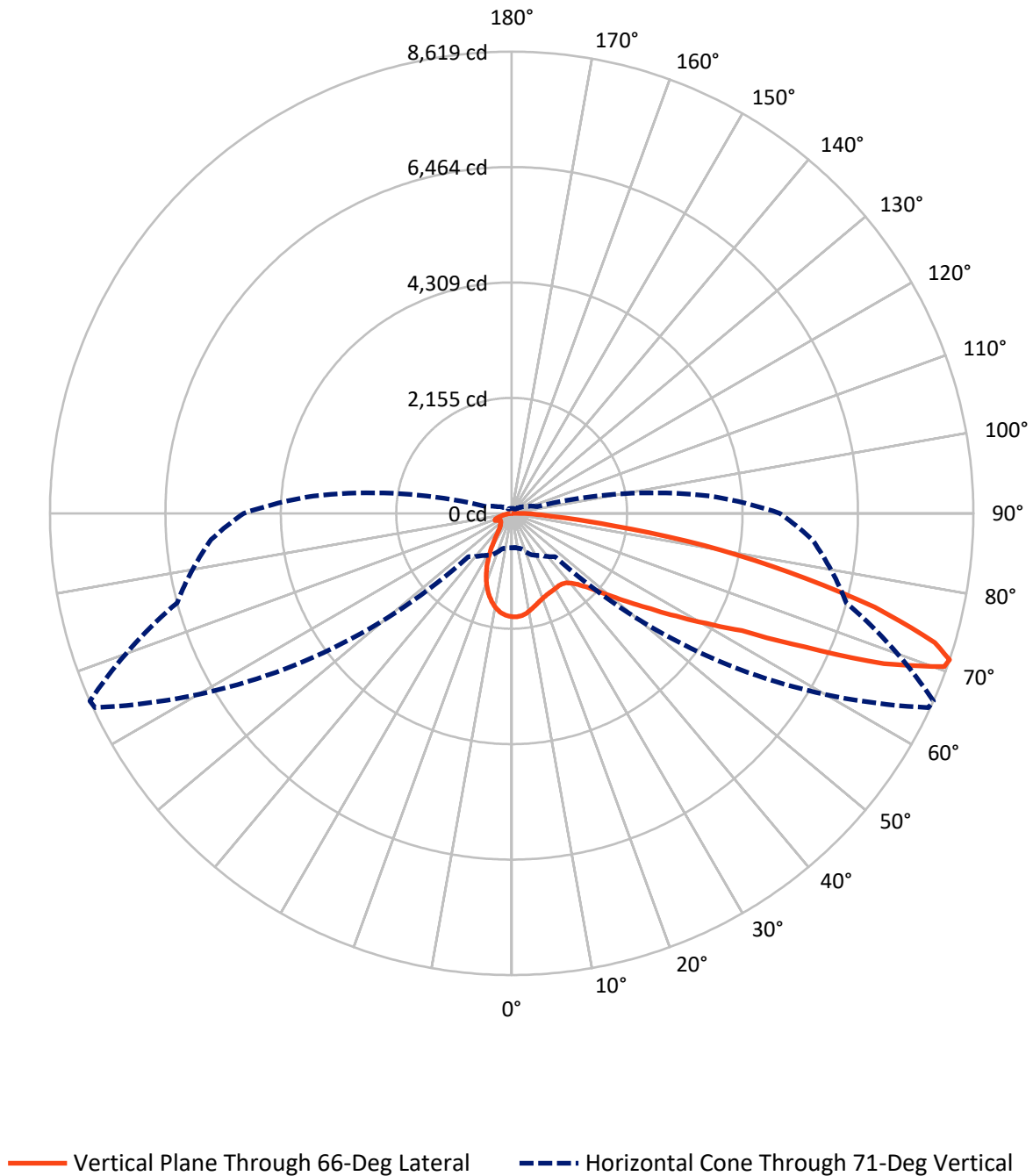
× Max cd  
 - - - 1/2 Max cd



Based on 10 foot mounting height. Maximum calculated value = 19.3 fc  
 Type III - Medium - N/A

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## Luminous Intensity Polar Plot



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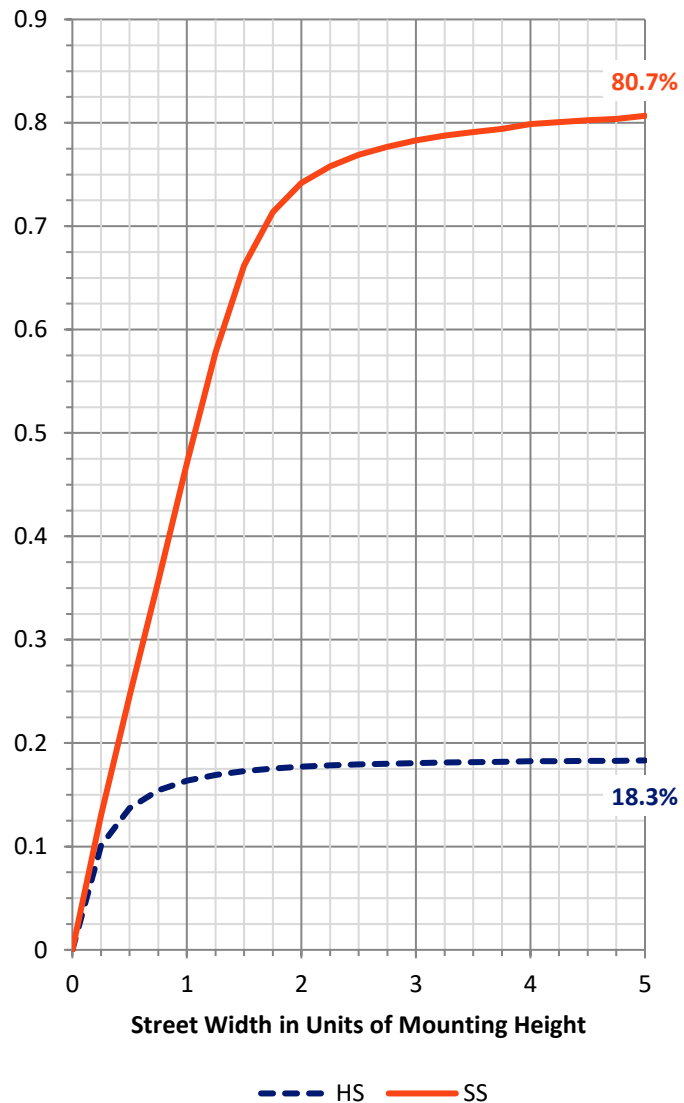
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 1561.7   | 0.0    | 1561.7 |
|                    | % Fixture | 18.5     | 0.0    | 18.5   |
| <b>Street Side</b> | Lumens    | 6865.2   | 0.0    | 6865.2 |
|                    | % Fixture | 81.5     | 0.0    | 81.5   |
| <b>Total</b>       | Lumens    | 8427.0   | 0.0    | 8427.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 169.9  | 2.0       |
| 10°-20°   | 407.6  | 4.8       |
| 20°-30°   | 547.5  | 6.5       |
| 30°-40°   | 720.2  | 8.5       |
| 40°-50°   | 1047.6 | 12.4      |
| 50°-60°   | 1636.5 | 19.4      |
| 60°-70°   | 2050.0 | 24.3      |
| 70°-80°   | 1563.7 | 18.6      |
| 80°-90°   | 284.0  | 3.4       |
| 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°    | 8427.0 | 100.0     |
| 0°-180°   | 8427.0 | 100.0     |

**Coefficient of Utilization**



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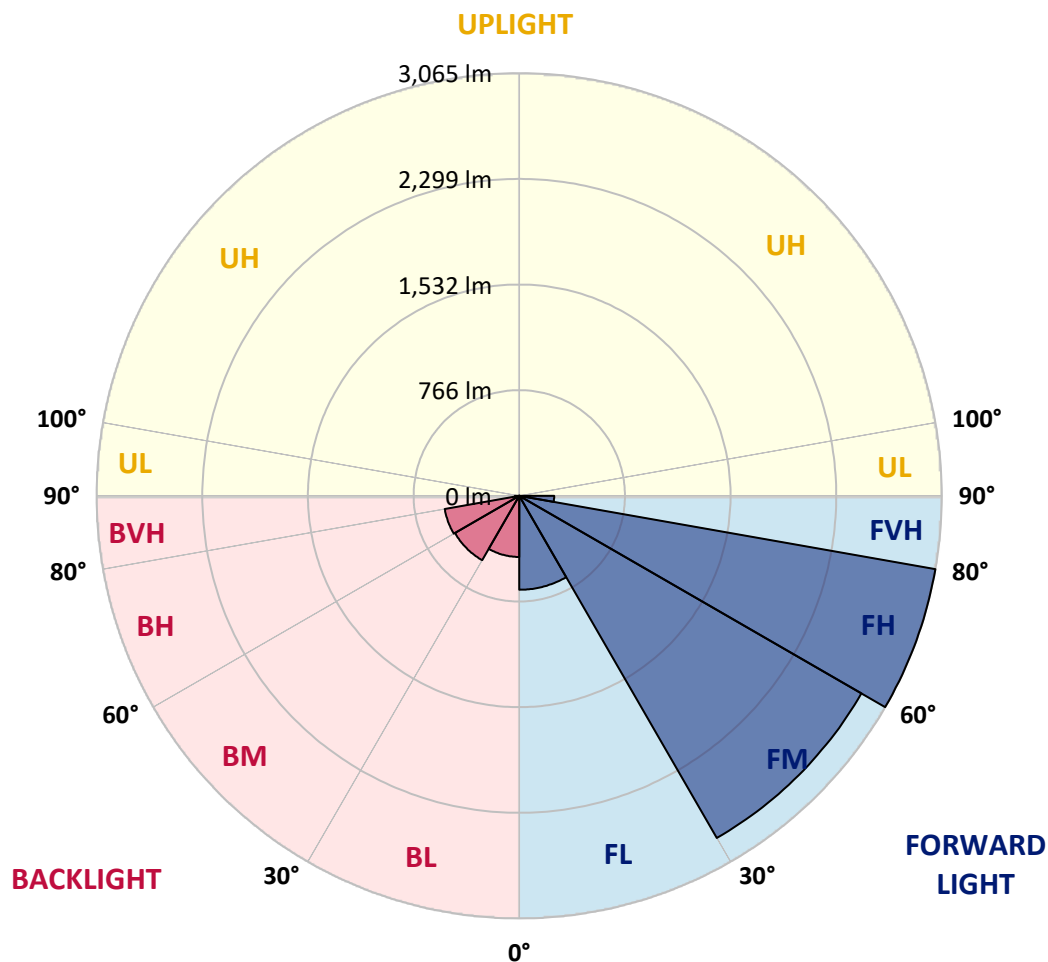
CATALOG NUMBER: NVN-SA2B-827-U-SL2

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 681.4  | 8.1       |                         |      |         |
| FM   | (30°-60°)   | 2865.6 | 34.0      |                         |      |         |
| FH   | (60°-80°)   | 3065.0 | 36.4      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 253.2  | 3.0       |                         |      | G3/500  |
| BL   | (0°-30°)    | 443.5  | 5.3       | B1/500                  |      |         |
| BM   | (30°-60°)   | 538.8  | 6.4       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 548.8  | 6.5       | B2/1000                 |      | G2/1000 |
| BVH  | (80°-90°)   | 30.7   | 0.4       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B2-U0-G3**

Type III Medium



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 66°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 |
| 2.5°  | 1894.7 | 1891.8 | 1900.5 | 1909.5 | 1913.0 | 1918.8 | 1927.6 | 1932.5 | 1932.2 | 1933.1 | 1930.2 |
| 5°    | 1769.0 | 1765.2 | 1782.7 | 1796.9 | 1824.3 | 1855.1 | 1892.6 | 1919.4 | 1920.0 | 1935.1 | 1939.2 |
| 7.5°  | 1650.0 | 1647.4 | 1667.4 | 1690.4 | 1722.1 | 1769.3 | 1830.1 | 1887.7 | 1891.2 | 1932.2 | 1946.5 |
| 10°   | 1554.6 | 1554.0 | 1573.5 | 1598.5 | 1635.4 | 1688.1 | 1757.9 | 1842.3 | 1847.5 | 1918.2 | 1947.6 |
| 12.5° | 1480.1 | 1481.2 | 1498.1 | 1526.6 | 1565.6 | 1620.6 | 1696.2 | 1791.4 | 1799.8 | 1896.1 | 1940.9 |
| 15°   | 1425.1 | 1429.7 | 1443.4 | 1472.2 | 1510.6 | 1566.5 | 1644.2 | 1744.3 | 1757.1 | 1871.4 | 1937.2 |
| 17.5° | 1393.7 | 1398.9 | 1408.5 | 1432.4 | 1468.4 | 1522.3 | 1595.9 | 1705.6 | 1717.2 | 1852.5 | 1937.4 |
| 20°   | 1384.3 | 1388.7 | 1394.2 | 1408.8 | 1439.3 | 1488.2 | 1557.8 | 1670.6 | 1683.2 | 1837.4 | 1940.4 |
| 22.5° | 1402.7 | 1405.9 | 1406.5 | 1405.3 | 1423.9 | 1463.8 | 1530.1 | 1645.0 | 1658.4 | 1827.5 | 1942.4 |
| 25°   | 1442.0 | 1446.3 | 1443.1 | 1432.4 | 1426.2 | 1450.7 | 1515.9 | 1628.2 | 1641.5 | 1820.2 | 1938.3 |
| 27.5° | 1501.0 | 1501.6 | 1499.0 | 1485.0 | 1456.2 | 1452.1 | 1511.5 | 1618.3 | 1631.1 | 1811.8 | 1929.9 |
| 30°   | 1581.3 | 1585.1 | 1580.4 | 1561.5 | 1514.4 | 1475.4 | 1516.7 | 1608.7 | 1620.3 | 1801.0 | 1916.2 |
| 32.5° | 1675.3 | 1684.6 | 1684.3 | 1664.5 | 1597.0 | 1527.5 | 1538.3 | 1602.9 | 1611.9 | 1789.6 | 1899.6 |
| 35°   | 1772.8 | 1785.6 | 1809.4 | 1801.0 | 1717.5 | 1609.8 | 1579.6 | 1612.2 | 1618.3 | 1788.2 | 1888.0 |
| 37.5° | 1874.0 | 1886.8 | 1936.0 | 1958.7 | 1860.9 | 1727.7 | 1644.7 | 1645.0 | 1647.9 | 1805.9 | 1887.1 |
| 40°   | 1979.9 | 1993.6 | 2067.5 | 2126.6 | 2046.8 | 1876.9 | 1749.8 | 1713.7 | 1710.5 | 1849.6 | 1904.3 |
| 42.5° | 2128.3 | 2140.5 | 2229.3 | 2304.6 | 2253.1 | 2068.1 | 1895.0 | 1819.6 | 1812.9 | 1935.1 | 1959.3 |
| 45°   | 2316.0 | 2326.4 | 2420.7 | 2501.3 | 2474.8 | 2286.3 | 2077.4 | 1965.4 | 1964.2 | 2077.7 | 2070.7 |
| 47.5° | 2539.1 | 2547.3 | 2631.9 | 2709.9 | 2719.5 | 2537.4 | 2306.7 | 2190.3 | 2171.4 | 2273.2 | 2243.2 |
| 50°   | 2771.6 | 2780.6 | 2838.2 | 2922.0 | 2993.3 | 2873.4 | 2601.7 | 2465.8 | 2440.5 | 2531.3 | 2487.6 |
| 52.5° | 2925.5 | 2937.4 | 2987.5 | 3093.7 | 3301.1 | 3241.8 | 2950.5 | 2799.8 | 2761.4 | 2844.0 | 2810.6 |
| 55°   | 2856.9 | 2883.6 | 2960.1 | 3130.3 | 3547.3 | 3804.5 | 3380.9 | 3189.4 | 3146.1 | 3214.7 | 3194.9 |
| 57.5° | 2544.7 | 2581.3 | 2685.8 | 2948.5 | 3581.9 | 4300.3 | 4031.4 | 3648.2 | 3617.7 | 3597.9 | 3606.9 |
| 60°   | 1974.1 | 2009.3 | 2138.8 | 2481.2 | 3340.7 | 4662.2 | 5010.5 | 4213.8 | 4169.6 | 3982.5 | 3990.7 |
| 62.5° | 1397.1 | 1379.4 | 1468.1 | 1718.6 | 2714.6 | 4704.7 | 6124.5 | 4970.3 | 4824.8 | 4388.7 | 4352.9 |
| 65°   | 1065.5 | 1061.4 | 1101.3 | 1181.0 | 1644.2 | 4196.4 | 6788.2 | 6241.8 | 6014.5 | 4866.5 | 4782.1 |
| 67.5° | 875.5  | 868.2  | 907.5  | 1023.6 | 1058.8 | 2707.3 | 6802.7 | 7716.9 | 7493.7 | 5461.2 | 5278.4 |
| 70°   | 719.8  | 711.7  | 748.3  | 898.2  | 978.5  | 1373.0 | 5725.3 | 8580.7 | 8568.8 | 6214.1 | 5653.2 |
| 71°   | 645.3  | 639.5  | 683.4  | 849.9  | 961.3  | 1144.3 | 4943.3 | 8583.1 | 8618.9 | 6469.0 | 5631.1 |
| 72.5° | 525.5  | 527.5  | 574.0  | 756.5  | 948.5  | 1010.5 | 3633.1 | 8183.0 | 8258.7 | 6712.0 | 5430.0 |
| 75°   | 349.1  | 350.9  | 412.0  | 581.9  | 919.7  | 988.7  | 1996.8 | 6866.5 | 7005.5 | 6566.5 | 4954.9 |
| 77.5° | 234.5  | 233.9  | 275.5  | 399.2  | 801.3  | 988.7  | 1170.8 | 5135.6 | 5288.3 | 5224.9 | 3819.9 |
| 80°   | 161.5  | 160.3  | 189.7  | 275.5  | 606.6  | 1000.6 | 905.1  | 3599.1 | 3645.3 | 2821.6 | 1552.5 |
| 82.5° | 98.9   | 99.8   | 123.9  | 194.6  | 412.9  | 900.5  | 854.5  | 1962.5 | 1912.1 | 791.4  | 387.8  |
| 85°   | 56.7   | 56.4   | 79.1   | 131.8  | 265.1  | 760.0  | 833.3  | 844.6  | 774.8  | 238.3  | 140.2  |
| 87.5° | 20.4   | 21.8   | 42.5   | 73.0   | 151.9  | 529.2  | 707.0  | 439.3  | 396.0  | 107.7  | 63.4   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 | 1930.5 |
| 2.5°  | 1928.1 | 1929.9 | 1927.8 | 1916.2 | 1906.3 | 1890.3 | 1881.3 | 1868.8 | 1865.0 | 1863.3 | 1867.9 |
| 5°    | 1935.4 | 1936.0 | 1918.8 | 1888.3 | 1853.9 | 1813.5 | 1784.4 | 1748.6 | 1731.7 | 1724.5 | 1729.1 |
| 7.5°  | 1942.1 | 1939.5 | 1901.9 | 1843.5 | 1780.0 | 1709.6 | 1647.1 | 1589.8 | 1556.3 | 1542.6 | 1543.8 |
| 10°   | 1943.0 | 1931.9 | 1871.7 | 1781.2 | 1682.9 | 1579.6 | 1483.6 | 1395.1 | 1339.2 | 1302.9 | 1313.9 |
| 12.5° | 1934.0 | 1915.3 | 1827.2 | 1700.6 | 1564.2 | 1423.3 | 1293.6 | 1160.9 | 1081.2 | 1044.2 | 1045.4 |
| 15°   | 1927.0 | 1893.2 | 1772.5 | 1605.8 | 1422.5 | 1236.0 | 1058.8 | 902.8  | 817.9  | 780.0  | 762.3  |
| 17.5° | 1921.2 | 1869.4 | 1709.0 | 1499.0 | 1255.2 | 1018.6 | 805.6  | 666.6  | 620.0  | 609.0  | 604.3  |
| 20°   | 1913.0 | 1844.0 | 1638.3 | 1375.3 | 1064.6 | 775.4  | 588.3  | 519.6  | 519.9  | 532.7  | 534.5  |
| 22.5° | 1901.7 | 1815.2 | 1563.0 | 1236.5 | 860.1  | 564.7  | 461.2  | 441.4  | 461.4  | 485.9  | 490.3  |
| 25°   | 1884.8 | 1781.2 | 1479.2 | 1083.2 | 655.8  | 434.1  | 393.9  | 393.1  | 417.5  | 443.1  | 446.9  |
| 27.5° | 1860.9 | 1736.7 | 1386.1 | 918.5  | 483.3  | 368.9  | 352.9  | 359.0  | 377.1  | 395.7  | 397.1  |
| 30°   | 1828.9 | 1684.9 | 1283.4 | 744.8  | 378.8  | 328.5  | 326.7  | 332.3  | 343.3  | 356.4  | 357.6  |
| 32.5° | 1793.7 | 1632.2 | 1173.7 | 576.7  | 324.4  | 306.7  | 308.4  | 311.0  | 316.3  | 321.5  | 322.7  |
| 35°   | 1761.7 | 1578.4 | 1061.4 | 438.2  | 298.5  | 292.4  | 291.2  | 290.7  | 291.2  | 289.5  | 289.8  |
| 37.5° | 1741.1 | 1533.9 | 944.4  | 348.9  | 283.7  | 279.9  | 276.4  | 272.0  | 267.1  | 264.2  | 264.8  |
| 40°   | 1733.5 | 1500.7 | 826.0  | 301.4  | 271.5  | 268.8  | 262.1  | 252.8  | 247.0  | 245.3  | 245.3  |
| 42.5° | 1753.9 | 1483.6 | 711.7  | 277.6  | 261.3  | 256.9  | 245.9  | 235.1  | 230.7  | 230.4  | 230.1  |
| 45°   | 1816.1 | 1490.5 | 602.9  | 264.5  | 252.0  | 243.5  | 229.0  | 220.0  | 217.0  | 217.6  | 217.3  |
| 47.5° | 1927.8 | 1534.5 | 509.7  | 255.7  | 242.7  | 231.6  | 215.3  | 208.0  | 204.5  | 204.5  | 204.8  |
| 50°   | 2117.8 | 1637.2 | 435.6  | 248.5  | 234.8  | 220.5  | 205.4  | 196.4  | 191.7  | 191.4  | 191.4  |
| 52.5° | 2394.5 | 1821.1 | 389.3  | 242.4  | 226.1  | 210.6  | 195.5  | 184.2  | 178.6  | 177.5  | 176.9  |
| 55°   | 2741.3 | 2084.7 | 376.5  | 238.3  | 214.4  | 199.9  | 183.6  | 172.2  | 166.1  | 163.5  | 163.2  |
| 57.5° | 3129.2 | 2405.3 | 401.8  | 233.3  | 202.5  | 187.1  | 170.5  | 159.7  | 153.3  | 150.1  | 149.8  |
| 60°   | 3521.7 | 2755.3 | 505.1  | 226.4  | 192.6  | 173.1  | 157.1  | 147.2  | 140.8  | 137.3  | 136.7  |
| 62.5° | 3914.8 | 3124.2 | 716.0  | 225.8  | 185.6  | 159.7  | 143.4  | 135.0  | 128.9  | 125.1  | 124.2  |
| 65°   | 4358.2 | 3528.1 | 955.8  | 241.2  | 183.3  | 147.5  | 129.5  | 122.8  | 117.5  | 114.1  | 113.8  |
| 67.5° | 4867.3 | 3984.0 | 932.8  | 272.9  | 191.2  | 136.5  | 116.4  | 111.1  | 107.4  | 104.5  | 104.2  |
| 70°   | 5106.2 | 3912.7 | 579.9  | 295.3  | 202.2  | 125.7  | 103.9  | 100.1  | 97.2   | 95.1   | 94.3   |
| 71°   | 5006.1 | 3715.2 | 486.2  | 292.7  | 201.0  | 121.0  | 98.9   | 96.0   | 93.1   | 91.4   | 90.5   |
| 72.5° | 4733.2 | 3388.1 | 405.6  | 272.3  | 188.0  | 112.6  | 92.5   | 89.6   | 87.0   | 85.0   | 84.4   |
| 75°   | 4247.3 | 3025.9 | 324.7  | 217.6  | 149.8  | 95.1   | 81.2   | 78.0   | 75.9   | 74.8   | 73.6   |
| 77.5° | 3122.2 | 2159.4 | 251.1  | 172.0  | 110.3  | 77.7   | 69.2   | 66.9   | 64.9   | 63.1   | 62.3   |
| 80°   | 1196.1 | 836.5  | 169.0  | 128.3  | 80.9   | 61.4   | 55.9   | 54.7   | 52.7   | 51.5   | 51.5   |
| 82.5° | 322.1  | 249.9  | 90.2   | 77.7   | 54.1   | 44.8   | 42.8   | 42.2   | 40.4   | 38.1   | 38.4   |
| 85°   | 130.3  | 110.3  | 50.6   | 42.8   | 33.2   | 26.5   | 28.8   | 29.1   | 27.1   | 24.1   | 24.4   |
| 87.5° | 57.3   | 46.8   | 28.2   | 18.9   | 14.5   | 10.2   | 13.1   | 13.1   | 11.9   | 9.9    | 9.0    |
| 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**



Point lies inside the ANSI 2700K 4-step quadrangle

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### Photopic Flux vs. Wavelength

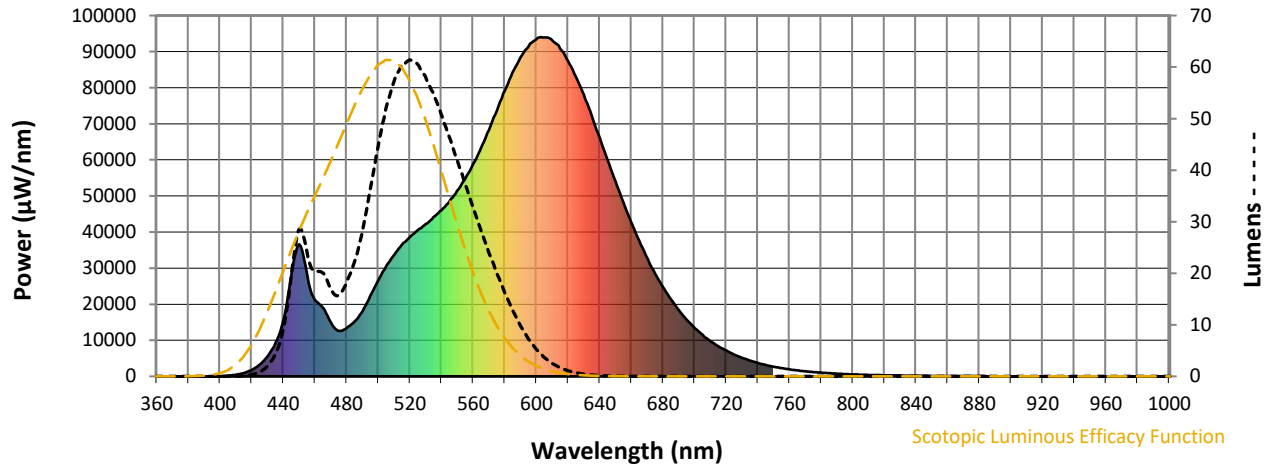


**Photopic Lumens: 4337.9**

| 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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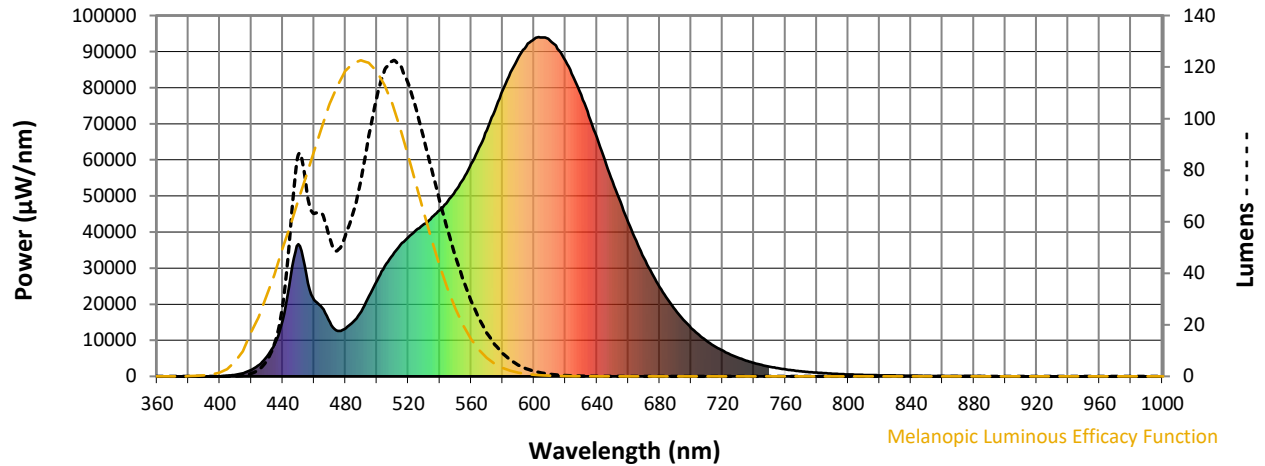
### Scotopic Flux vs. Wavelength


**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**

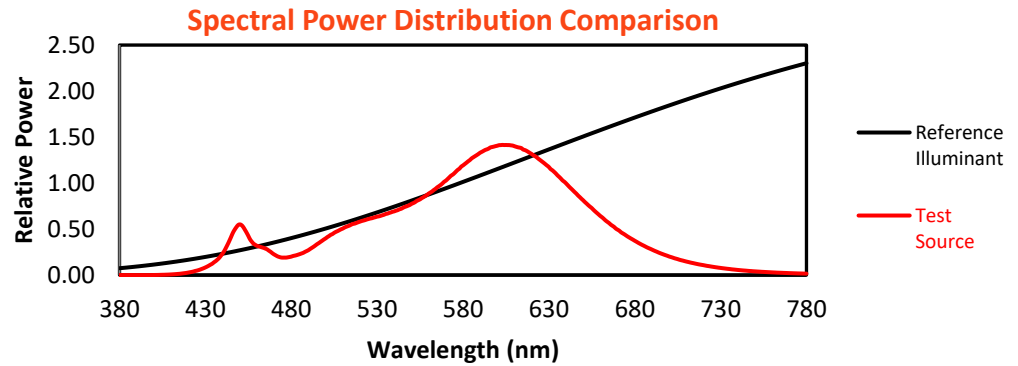
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 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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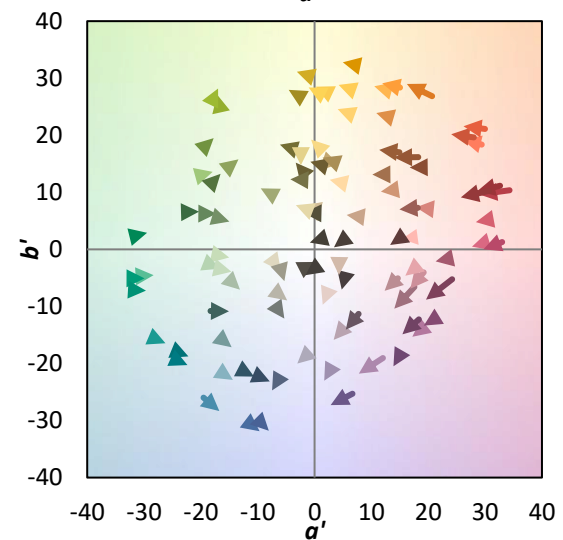
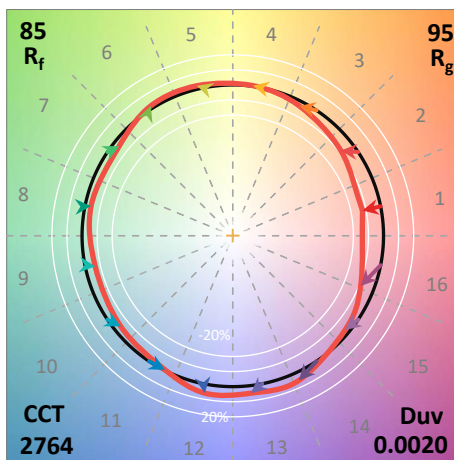
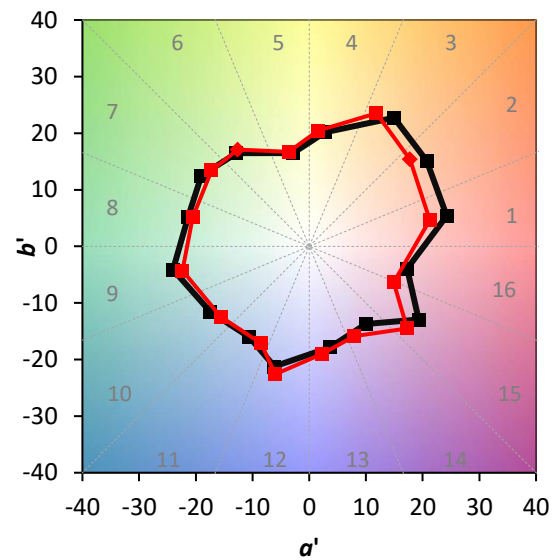
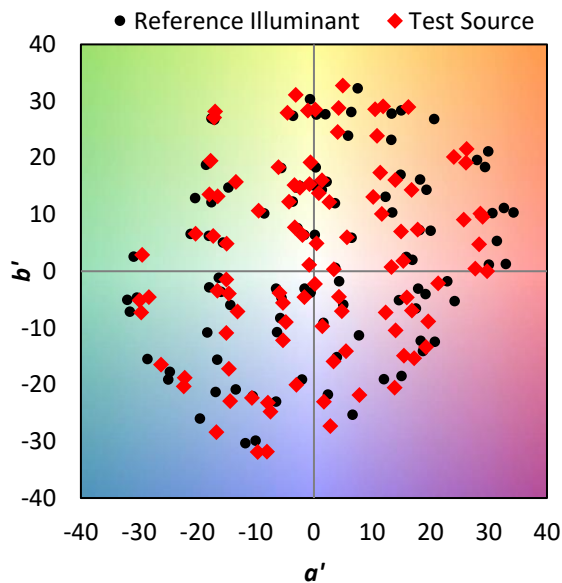
TM-30-18

### 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)