

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



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

Test Report Prepared for

Cooper Lighting Solutions

Brand: STREETWORKS

Report Number: P361368

Luminaire Tested: NVN-SA2D-827-U-T3

Issue Date: 3/3/2020

### Test Information

Test Method: LM-79-2019  
Report Number: P361368  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-14)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA2D-827-U-T3  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(2) 80 CRI, 2700K, 1200mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE III OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

### Summary

Lumens per Lamp: N/A  
Luminaire Lumens: 11676 lumens  
Efficiency: N/A  
Efficacy: 90.5 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type III - Short  
BUG Rating: B2 - U0 - G2

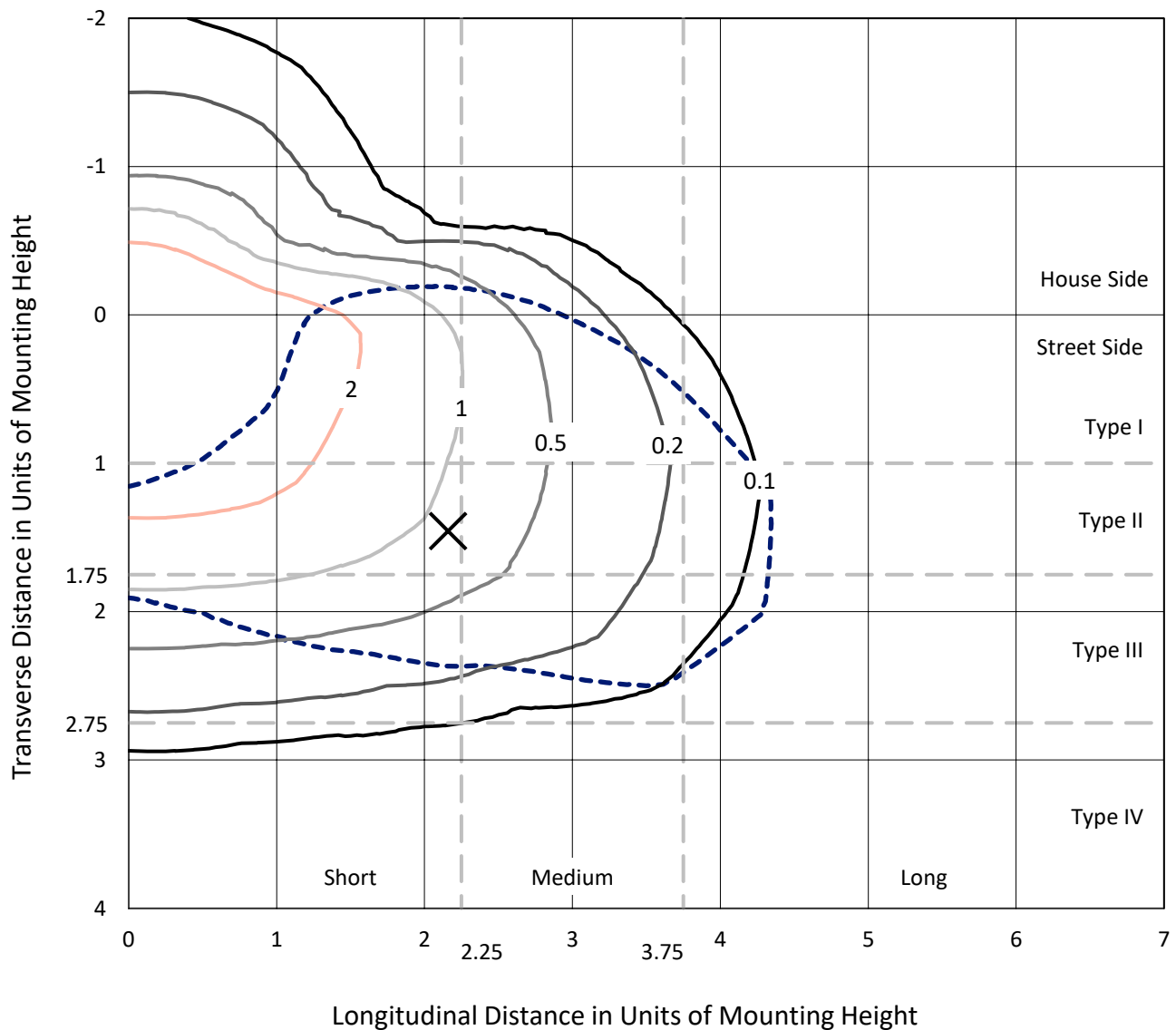
Input Watts (W): 129  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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CATALOG NUMBER: NVN-SA2D-827-U-T3

## Iso-Footcandle Lines of Horizontal Illumination

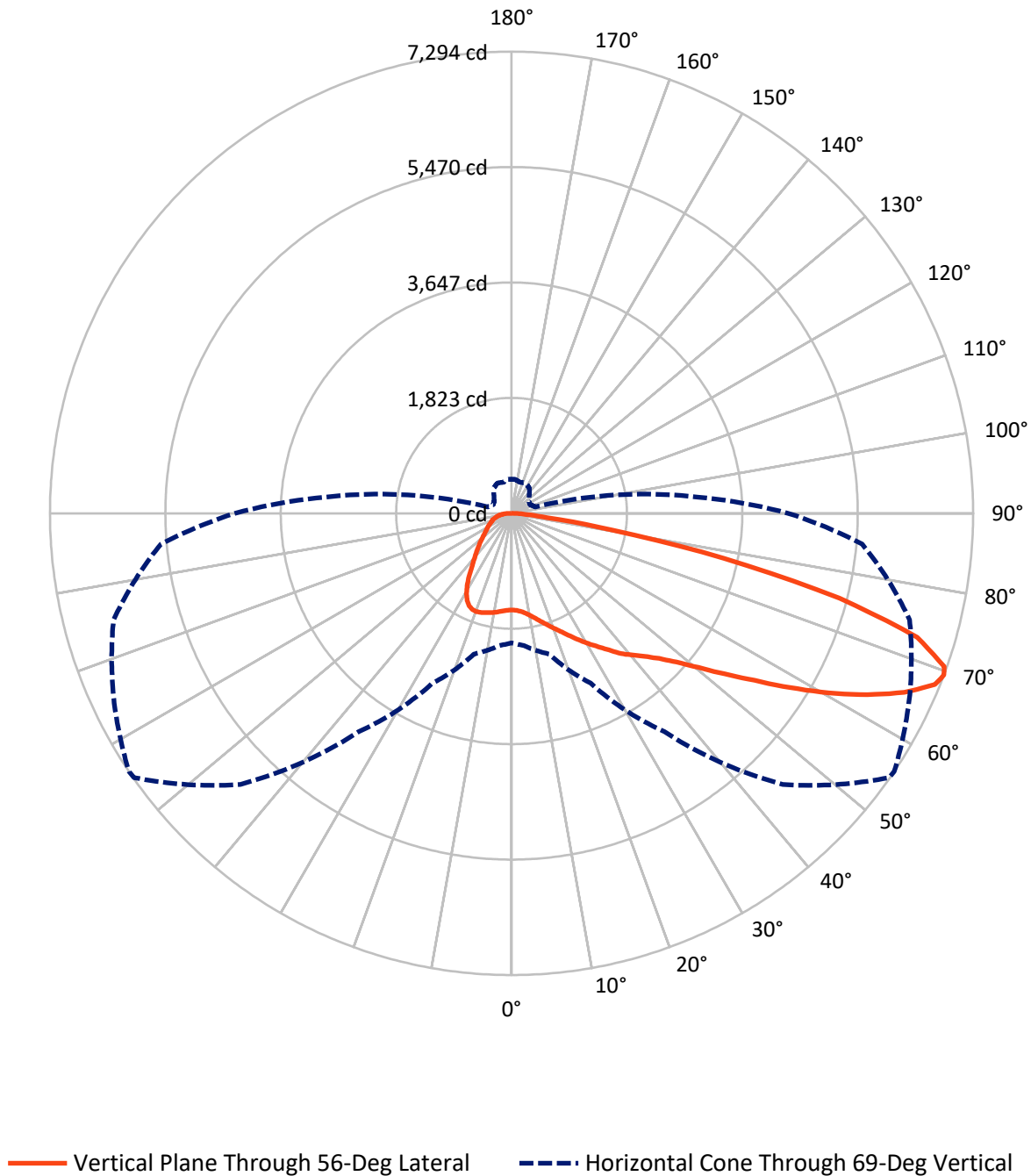
× Max cd  
- - - 1/2 Max cd



Based on 20 foot mounting height. Maximum calculated value = 4.2 fc  
Type III - Short - N/A

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## Luminous Intensity Polar Plot



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**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 2600.2   | 0.0    | 2600.2  |
|                    | % Fixture | 22.3     | 0.0    | 22.3    |
| <b>Street Side</b> | Lumens    | 9075.8   | 0.0    | 9075.8  |
|                    | % Fixture | 77.7     | 0.0    | 77.7    |
| <b>Total</b>       | Lumens    | 11676.0  | 0.0    | 11676.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 149.9   | 1.3       |
| 10°-20°   | 482.1   | 4.1       |
| 20°-30°   | 841.5   | 7.2       |
| 30°-40°   | 1208.9  | 10.4      |
| 40°-50°   | 1673.0  | 14.3      |
| 50°-60°   | 2451.2  | 21.0      |
| 60°-70°   | 2988.4  | 25.6      |
| 70°-80°   | 1652.2  | 14.2      |
| 80°-90°   | 228.8   | 2.0       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 11676.0 | 100.0     |
| 0°-180°   | 11676.0 | 100.0     |

**Coefficient of Utilization**



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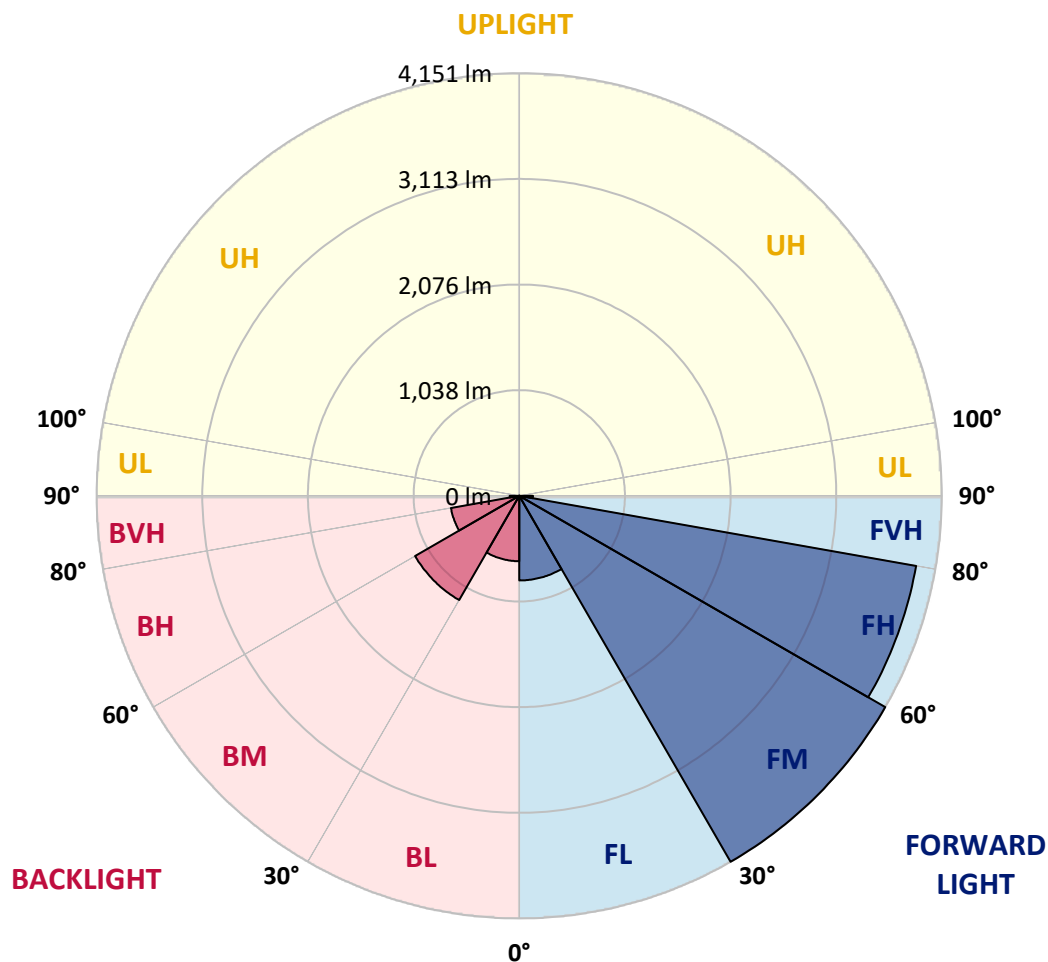
CATALOG NUMBER: NVN-SA2D-827-U-T3

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 831.0  | 7.1       |                         |      |         |
| FM   | (30°-60°)   | 4151.3 | 35.6      |                         |      |         |
| FH   | (60°-80°)   | 3958.8 | 33.9      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 134.8  | 1.2       |                         |      | G2/225  |
| BL   | (0°-30°)    | 642.6  | 5.5       | B2/1000                 |      |         |
| BM   | (30°-60°)   | 1181.7 | 10.1      | B2/2500                 |      |         |
| BH   | (60°-80°)   | 681.9  | 5.8       | B2/1000                 |      | G2/1000 |
| BVH  | (80°-90°)   | 94.0   | 0.8       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B2-U0-G2**

Type III Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 56°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 |
| 2.5°  | 1536.1 | 1537.7 | 1536.5 | 1539.7 | 1536.1 | 1538.5 | 1536.5 | 1536.5 | 1535.3 | 1531.7 | 1527.7 |
| 5°    | 1560.2 | 1563.5 | 1561.5 | 1564.7 | 1560.2 | 1561.1 | 1557.4 | 1557.4 | 1553.8 | 1546.2 | 1538.1 |
| 7.5°  | 1598.1 | 1601.7 | 1600.1 | 1603.3 | 1597.3 | 1597.3 | 1592.4 | 1592.0 | 1584.8 | 1572.3 | 1563.1 |
| 10°   | 1643.1 | 1647.9 | 1646.3 | 1651.2 | 1646.3 | 1647.9 | 1643.1 | 1643.1 | 1633.5 | 1615.8 | 1604.1 |
| 12.5° | 1708.7 | 1714.7 | 1710.3 | 1709.9 | 1707.9 | 1711.1 | 1707.1 | 1706.3 | 1697.4 | 1673.3 | 1657.2 |
| 15°   | 1796.4 | 1802.8 | 1793.5 | 1792.7 | 1781.5 | 1780.3 | 1780.3 | 1779.1 | 1773.4 | 1744.5 | 1717.9 |
| 17.5° | 1897.3 | 1899.3 | 1891.3 | 1878.4 | 1863.9 | 1854.7 | 1853.5 | 1856.7 | 1856.7 | 1822.9 | 1780.7 |
| 20°   | 1996.3 | 1999.9 | 1993.4 | 1979.0 | 1960.5 | 1946.8 | 1937.1 | 1943.6 | 1943.2 | 1902.9 | 1843.0 |
| 22.5° | 2104.1 | 2112.5 | 2102.9 | 2084.4 | 2062.6 | 2047.3 | 2030.5 | 2036.1 | 2036.5 | 1987.0 | 1904.2 |
| 25°   | 2243.6 | 2236.0 | 2230.0 | 2203.8 | 2172.8 | 2157.2 | 2141.5 | 2147.1 | 2145.5 | 2077.5 | 1967.3 |
| 27.5° | 2367.1 | 2368.7 | 2360.7 | 2332.9 | 2297.1 | 2262.5 | 2261.7 | 2265.4 | 2259.3 | 2171.6 | 2026.8 |
| 30°   | 2510.7 | 2511.5 | 2500.3 | 2475.3 | 2436.3 | 2391.7 | 2381.2 | 2387.2 | 2374.4 | 2260.9 | 2089.6 |
| 32.5° | 2653.5 | 2657.5 | 2645.1 | 2614.9 | 2583.5 | 2529.2 | 2508.3 | 2512.3 | 2480.1 | 2352.2 | 2154.3 |
| 35°   | 2778.6 | 2784.2 | 2780.2 | 2760.1 | 2725.9 | 2679.3 | 2654.3 | 2651.9 | 2612.1 | 2464.1 | 2240.0 |
| 37.5° | 2906.1 | 2911.3 | 2906.9 | 2890.0 | 2876.3 | 2826.9 | 2813.6 | 2813.6 | 2744.4 | 2578.3 | 2349.0 |
| 40°   | 3037.2 | 3045.3 | 3040.1 | 3016.7 | 3005.1 | 2982.5 | 2950.8 | 2943.1 | 2868.3 | 2715.5 | 2526.8 |
| 42.5° | 3159.1 | 3169.6 | 3190.5 | 3176.8 | 3153.1 | 3156.3 | 3092.3 | 3088.3 | 3033.6 | 2918.2 | 2750.0 |
| 45°   | 3332.1 | 3347.4 | 3382.8 | 3372.3 | 3367.5 | 3349.8 | 3273.7 | 3270.1 | 3249.2 | 3190.9 | 3027.2 |
| 47.5° | 3520.7 | 3541.6 | 3605.6 | 3607.6 | 3659.5 | 3626.1 | 3522.7 | 3510.3 | 3515.1 | 3517.5 | 3365.5 |
| 50°   | 3694.5 | 3717.4 | 3822.4 | 3871.9 | 3994.1 | 4001.4 | 3836.1 | 3824.8 | 3843.7 | 3899.2 | 3759.6 |
| 52.5° | 3833.2 | 3862.2 | 3993.3 | 4146.2 | 4355.7 | 4415.3 | 4221.8 | 4213.4 | 4227.4 | 4323.2 | 4205.3 |
| 55°   | 3935.0 | 3966.4 | 4109.2 | 4387.5 | 4722.2 | 4827.2 | 4665.9 | 4657.8 | 4666.7 | 4788.5 | 4690.0 |
| 57.5° | 3958.7 | 3966.4 | 4173.5 | 4550.0 | 5031.5 | 5283.7 | 5209.3 | 5193.2 | 5149.7 | 5255.9 | 5225.0 |
| 60°   | 3847.3 | 3877.9 | 4120.4 | 4607.1 | 5270.8 | 5733.8 | 5777.2 | 5757.1 | 5635.2 | 5722.1 | 5697.2 |
| 62.5° | 3621.3 | 3676.0 | 3922.1 | 4520.3 | 5364.5 | 6101.4 | 6334.3 | 6310.2 | 6100.2 | 6156.5 | 6036.7 |
| 65°   | 3252.0 | 3275.4 | 3534.0 | 4220.6 | 5245.5 | 6336.7 | 6831.1 | 6819.0 | 6554.7 | 6466.6 | 6099.4 |
| 67.5° | 2591.6 | 2635.4 | 2855.0 | 3594.3 | 4758.4 | 6309.0 | 7215.2 | 7214.0 | 6851.6 | 6581.7 | 5877.0 |
| 69°   | 2047.3 | 2092.8 | 2302.0 | 2960.8 | 4210.5 | 6055.2 | 7279.6 | 7293.6 | 6935.2 | 6511.7 | 5559.2 |
| 70°   | 1632.2 | 1684.9 | 1828.5 | 2493.8 | 3724.2 | 5720.5 | 7226.1 | 7251.4 | 6919.2 | 6396.3 | 5266.0 |
| 72.5° | 694.7  | 737.3  | 839.5  | 1285.5 | 2269.8 | 4271.7 | 6607.0 | 6702.8 | 6546.3 | 5854.0 | 4352.1 |
| 75°   | 303.3  | 316.6  | 362.8  | 524.1  | 1007.6 | 2324.9 | 5175.9 | 5352.9 | 5597.4 | 4948.2 | 3242.0 |
| 77.5° | 222.0  | 227.7  | 253.0  | 307.7  | 452.1  | 878.1  | 3328.4 | 3431.4 | 4036.8 | 3600.8 | 1988.6 |
| 80°   | 171.8  | 175.8  | 195.5  | 226.1  | 295.2  | 355.2  | 1518.0 | 1606.5 | 2269.8 | 1849.5 | 828.2  |
| 82.5° | 136.8  | 139.6  | 153.2  | 166.5  | 203.9  | 215.2  | 504.0  | 559.1  | 837.8  | 510.8  | 219.2  |
| 85°   | 127.1  | 130.3  | 135.1  | 121.5  | 130.7  | 126.3  | 218.0  | 228.1  | 253.0  | 200.7  | 91.7   |
| 87.5° | 57.5   | 68.0   | 133.9  | 94.5   | 69.6   | 55.5   | 89.3   | 93.3   | 105.0  | 105.4  | 40.6   |
| 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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CATALOG NUMBER: NVN-SA2D-827-U-T3

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 | 1526.5 |
| 2.5°  | 1530.1 | 1528.9 | 1530.9 | 1526.1 | 1532.1 | 1531.7 | 1529.7 | 1530.5 | 1534.5 | 1534.1 | 1534.5 |
| 5°    | 1539.3 | 1538.5 | 1540.9 | 1537.3 | 1544.6 | 1547.0 | 1547.4 | 1551.0 | 1555.4 | 1556.6 | 1556.6 |
| 7.5°  | 1562.7 | 1562.7 | 1563.9 | 1559.0 | 1563.9 | 1563.5 | 1561.5 | 1565.1 | 1569.5 | 1569.9 | 1569.5 |
| 10°   | 1602.9 | 1603.3 | 1601.3 | 1588.8 | 1584.8 | 1573.9 | 1563.9 | 1564.3 | 1569.9 | 1574.3 | 1575.5 |
| 12.5° | 1653.6 | 1652.0 | 1643.1 | 1620.2 | 1603.3 | 1581.2 | 1570.7 | 1570.3 | 1575.9 | 1579.6 | 1580.8 |
| 15°   | 1711.5 | 1707.1 | 1684.1 | 1646.7 | 1617.0 | 1595.2 | 1578.3 | 1574.3 | 1571.1 | 1567.1 | 1567.5 |
| 17.5° | 1766.2 | 1756.1 | 1717.9 | 1666.0 | 1634.7 | 1605.7 | 1573.1 | 1547.0 | 1528.9 | 1518.4 | 1515.2 |
| 20°   | 1821.7 | 1802.0 | 1746.9 | 1684.1 | 1644.3 | 1591.6 | 1528.9 | 1475.8 | 1442.8 | 1427.5 | 1424.7 |
| 22.5° | 1872.4 | 1840.6 | 1773.8 | 1703.0 | 1636.7 | 1544.2 | 1445.6 | 1368.4 | 1322.5 | 1302.0 | 1303.6 |
| 25°   | 1921.9 | 1877.6 | 1802.0 | 1716.3 | 1598.1 | 1460.5 | 1329.8 | 1234.8 | 1181.8 | 1158.8 | 1158.0 |
| 27.5° | 1965.3 | 1915.0 | 1832.6 | 1705.5 | 1526.1 | 1341.4 | 1192.6 | 1100.1 | 1055.9 | 1036.1 | 1032.9 |
| 30°   | 2015.2 | 1962.1 | 1873.2 | 1664.0 | 1420.7 | 1203.9 | 1058.7 | 993.5  | 962.1  | 942.4  | 938.8  |
| 32.5° | 2075.9 | 2026.0 | 1906.6 | 1588.8 | 1285.9 | 1060.3 | 954.1  | 908.6  | 880.1  | 858.0  | 853.9  |
| 35°   | 2164.4 | 2110.5 | 1915.0 | 1481.0 | 1137.9 | 946.8  | 877.3  | 830.6  | 792.0  | 763.4  | 760.6  |
| 37.5° | 2275.4 | 2216.3 | 1895.7 | 1341.4 | 994.3  | 873.2  | 813.3  | 755.8  | 705.5  | 665.3  | 658.9  |
| 40°   | 2435.5 | 2346.2 | 1842.2 | 1180.5 | 888.5  | 816.5  | 751.0  | 685.4  | 623.1  | 576.0  | 566.7  |
| 42.5° | 2627.8 | 2498.7 | 1760.2 | 1020.5 | 810.9  | 759.0  | 689.0  | 607.8  | 548.2  | 514.9  | 510.0  |
| 45°   | 2872.3 | 2657.1 | 1646.3 | 880.5  | 734.5  | 701.5  | 622.2  | 547.4  | 510.4  | 485.9  | 481.9  |
| 47.5° | 3151.5 | 2834.9 | 1526.9 | 766.6  | 669.7  | 647.6  | 568.8  | 520.5  | 491.1  | 471.8  | 468.2  |
| 50°   | 3494.6 | 3035.6 | 1400.2 | 673.3  | 604.6  | 582.8  | 543.4  | 505.6  | 482.3  | 467.4  | 463.8  |
| 52.5° | 3881.5 | 3262.1 | 1308.9 | 599.7  | 550.7  | 535.0  | 530.1  | 497.6  | 478.7  | 467.4  | 463.8  |
| 55°   | 4298.2 | 3492.6 | 1210.3 | 537.8  | 504.0  | 508.4  | 521.3  | 498.4  | 485.5  | 471.8  | 466.6  |
| 57.5° | 4715.3 | 3730.7 | 1100.5 | 485.5  | 467.0  | 488.7  | 515.3  | 500.0  | 489.1  | 475.8  | 471.0  |
| 60°   | 5045.2 | 3881.5 | 930.4  | 441.6  | 437.6  | 467.0  | 500.8  | 487.9  | 473.8  | 474.2  | 473.4  |
| 62.5° | 5199.2 | 3873.5 | 742.5  | 402.6  | 408.3  | 437.6  | 477.4  | 469.0  | 457.3  | 473.0  | 474.2  |
| 65°   | 5112.7 | 3680.4 | 578.0  | 367.2  | 376.9  | 407.1  | 453.3  | 459.7  | 463.8  | 493.9  | 498.0  |
| 67.5° | 4749.9 | 3304.7 | 447.7  | 336.3  | 348.3  | 386.1  | 455.7  | 500.8  | 506.0  | 537.8  | 537.4  |
| 69°   | 4374.6 | 2952.4 | 389.0  | 320.2  | 334.3  | 391.4  | 487.1  | 526.9  | 507.2  | 541.0  | 536.2  |
| 70°   | 4060.1 | 2673.6 | 357.6  | 309.3  | 327.8  | 400.6  | 508.0  | 526.5  | 501.2  | 530.1  | 522.1  |
| 72.5° | 3126.9 | 1923.5 | 303.3  | 289.2  | 306.1  | 383.3  | 514.0  | 514.9  | 487.1  | 492.7  | 479.1  |
| 75°   | 2144.7 | 1215.5 | 264.7  | 261.9  | 273.1  | 345.5  | 494.7  | 491.9  | 450.5  | 442.5  | 431.2  |
| 77.5° | 1182.6 | 617.4  | 224.8  | 235.7  | 243.3  | 306.1  | 449.7  | 445.7  | 411.5  | 394.6  | 390.6  |
| 80°   | 456.1  | 270.3  | 189.9  | 209.6  | 214.4  | 265.1  | 394.2  | 390.6  | 362.0  | 340.3  | 334.3  |
| 82.5° | 172.2  | 141.6  | 156.9  | 181.4  | 179.8  | 218.8  | 333.9  | 331.8  | 304.1  | 272.3  | 262.7  |
| 85°   | 79.6   | 84.9   | 124.3  | 149.6  | 138.0  | 162.1  | 267.1  | 270.7  | 236.9  | 199.1  | 199.1  |
| 87.5° | 33.8   | 47.5   | 88.1   | 113.0  | 92.9   | 109.4  | 195.9  | 187.0  | 171.8  | 119.1  | 111.8  |
| 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  
 Rf: 84.7  
 Rg: 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           |

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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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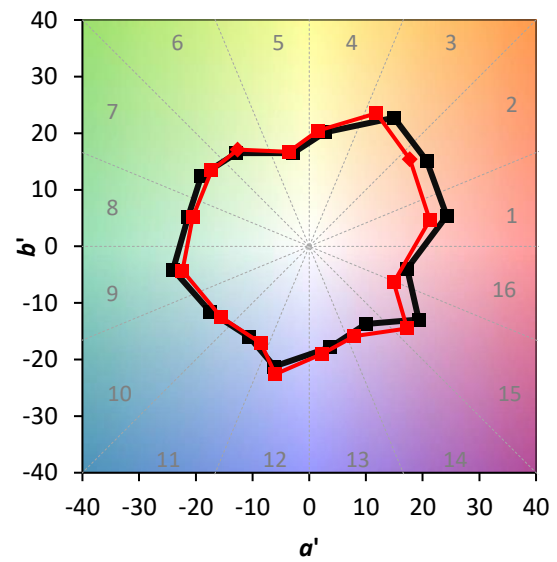
TM-30-18

### 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)