

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: P362565

Luminaire Tested: NVN-SA5C-722-U-AFL

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P362565  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-29)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA5C-722-U-AFL  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(5) 70 CRI, 2200K, 1050mA LIGHTSQUARES WITH 16 LEDS EACH AND AUTOMOTIVE  
FRONTLINE OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 26913 lumens  
Efficiency: N/A  
Efficacy: 96.5 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): 279  
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

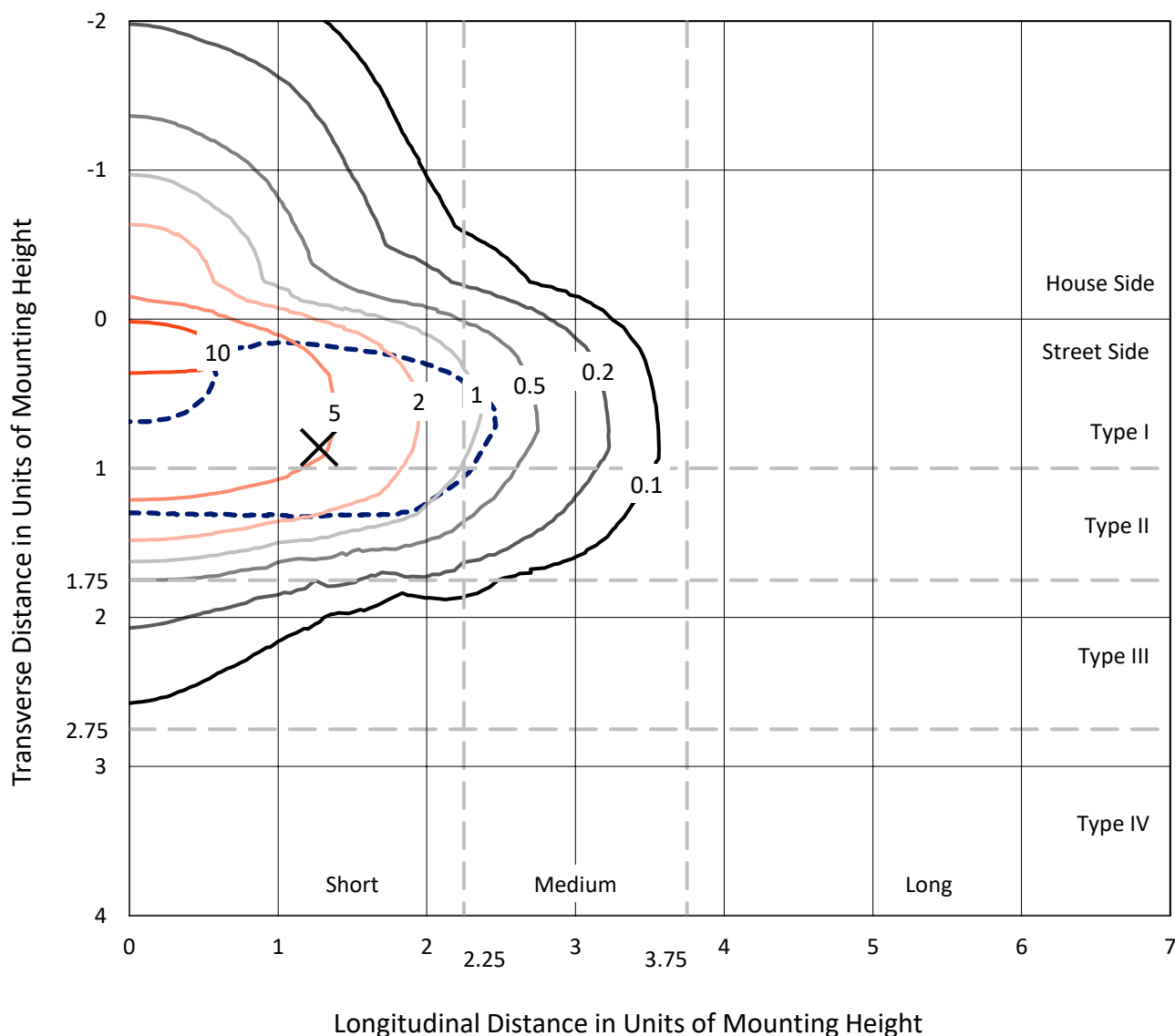


REPORT NUMBER: P362565  
 CATALOG NUMBER: NVN-SA5C-722-U-AFL

## Iso-Footcandle Lines of Horizontal Illumination

✕ Max cd

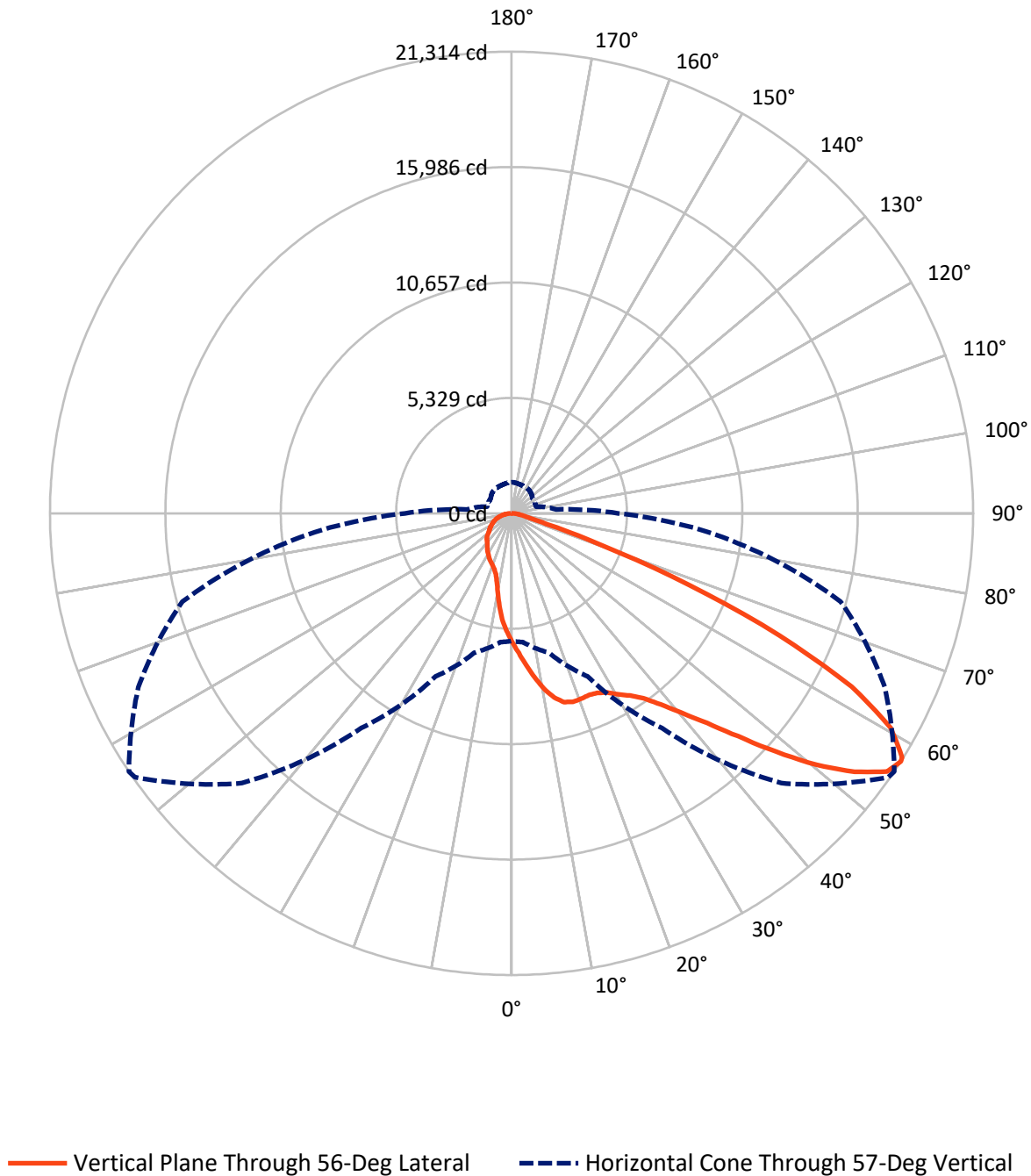
--- 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 13.2 fc  
 Type II - Short - N/A

REPORT NUMBER: P362565  
CATALOG NUMBER: NVN-SA5C-722-U-AFL

## Luminous Intensity Polar Plot



REPORT NUMBER: P362565

CATALOG NUMBER: NVN-SA5C-722-U-AFL

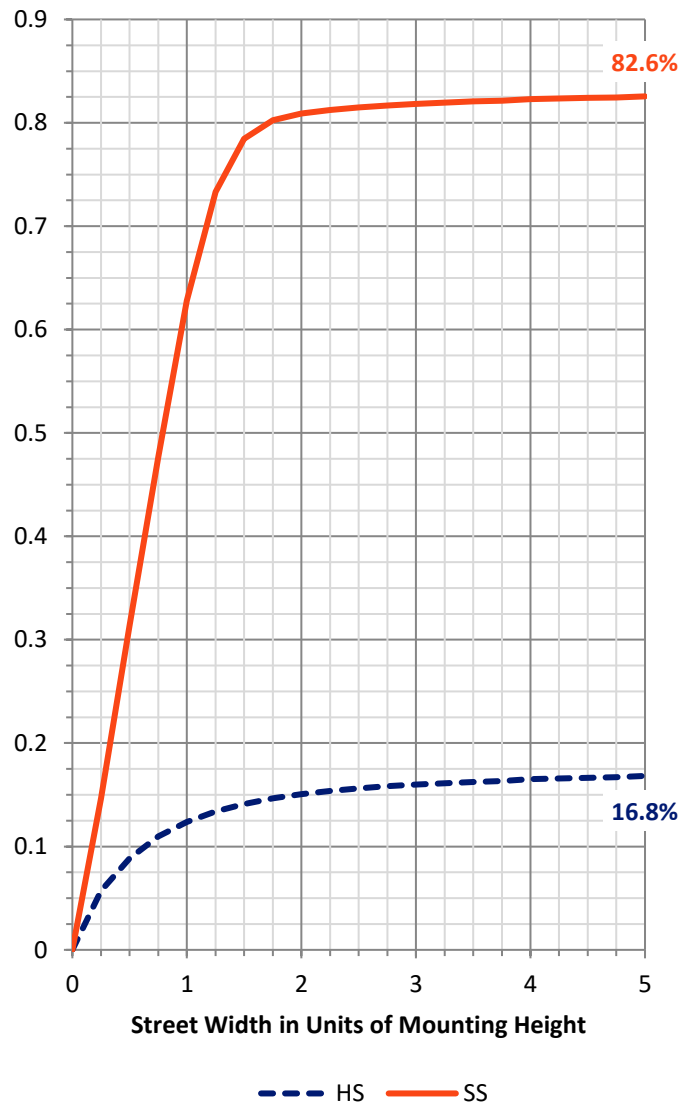
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 4639.2   | 0.0    | 4639.2  |
|                    | % Fixture | 17.2     | 0.0    | 17.2    |
| <b>Street Side</b> | Lumens    | 22273.8  | 0.0    | 22273.8 |
|                    | % Fixture | 82.8     | 0.0    | 82.8    |
| <b>Total</b>       | Lumens    | 26913.0  | 0.0    | 26913.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 570.2   | 2.1       |
| 10°-20°   | 1612.1  | 6.0       |
| 20°-30°   | 2625.9  | 9.8       |
| 30°-40°   | 3925.4  | 14.6      |
| 40°-50°   | 5954.0  | 22.1      |
| 50°-60°   | 6673.4  | 24.8      |
| 60°-70°   | 3941.5  | 14.6      |
| 70°-80°   | 1291.4  | 4.8       |
| 80°-90°   | 319.1   | 1.2       |
| 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°    | 26913.0 | 100.0     |
| 0°-180°   | 26913.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P362565

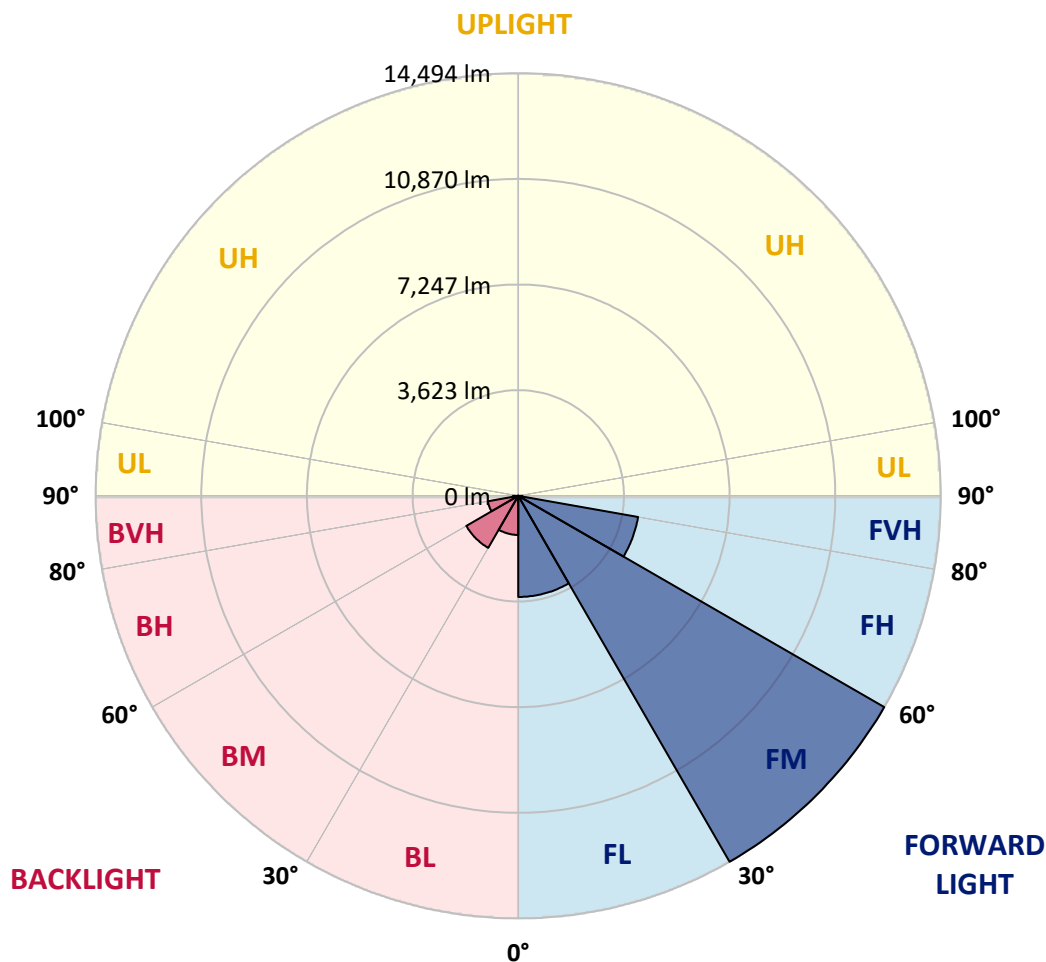
CATALOG NUMBER: NVN-SA5C-722-U-AFL

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 3466.8  | 12.9      |                         |      |         |
| FM   | (30°-60°)   | 14493.5 | 53.9      |                         |      |         |
| FH   | (60°-80°)   | 4172.9  | 15.5      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 140.5   | 0.5       |                         |      | G2/225  |
| BL   | (0°-30°)    | 1341.4  | 5.0       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 2059.2  | 7.7       | B2/2500                 |      |         |
| BH   | (60°-80°)   | 1060.0  | 3.9       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 178.6   | 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





REPORT NUMBER: P362565

CATALOG NUMBER: NVN-SA5C-722-U-AFL

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 56°     | 65°     | 75°     | 85°    |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| 0°    | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3  | 5969.3 |
| 2.5°  | 6854.5  | 6917.4  | 6889.6  | 6793.4  | 6719.4  | 6614.9  | 6498.4  | 6463.2  | 6340.2  | 6202.4  | 6036.8 |
| 5°    | 7939.4  | 7907.9  | 7862.6  | 7712.8  | 7554.6  | 7370.6  | 7078.3  | 7032.0  | 6758.3  | 6446.6  | 6117.3 |
| 7.5°  | 8557.2  | 8554.4  | 8527.6  | 8439.7  | 8295.5  | 8055.0  | 7702.6  | 7648.0  | 7234.6  | 6733.3  | 6222.8 |
| 10°   | 8467.5  | 8461.0  | 8505.4  | 8597.0  | 8640.4  | 8590.5  | 8293.6  | 8239.0  | 7731.3  | 7050.5  | 6344.8 |
| 12.5° | 7957.9  | 7961.6  | 8032.8  | 8225.2  | 8486.9  | 8801.4  | 8753.3  | 8726.5  | 8246.4  | 7409.4  | 6492.8 |
| 15°   | 7561.1  | 7569.4  | 7625.8  | 7793.2  | 8102.2  | 8672.8  | 9032.6  | 9041.9  | 8745.0  | 7805.3  | 6665.8 |
| 17.5° | 7387.2  | 7404.8  | 7430.7  | 7548.1  | 7831.2  | 8416.6  | 9099.2  | 9149.1  | 9181.5  | 8215.9  | 6832.3 |
| 20°   | 7442.7  | 7459.3  | 7466.7  | 7541.7  | 7773.8  | 8261.2  | 9053.0  | 9142.7  | 9516.3  | 8602.5  | 6998.7 |
| 22.5° | 7691.5  | 7701.7  | 7706.3  | 7725.7  | 7906.1  | 8305.6  | 9022.4  | 9116.8  | 9758.7  | 8949.4  | 7124.5 |
| 25°   | 8104.0  | 8096.6  | 8067.0  | 8042.0  | 8163.2  | 8481.4  | 9092.7  | 9182.4  | 9955.7  | 9263.8  | 7206.8 |
| 27.5° | 8597.9  | 8588.7  | 8531.3  | 8462.9  | 8532.2  | 8755.1  | 9295.3  | 9366.5  | 10132.3 | 9558.0  | 7248.5 |
| 30°   | 9190.8  | 9166.7  | 9058.5  | 8977.1  | 9003.9  | 9165.8  | 9629.2  | 9693.9  | 10405.2 | 9891.8  | 7289.2 |
| 32.5° | 9876.1  | 9850.2  | 9693.9  | 9558.9  | 9558.9  | 9693.9  | 9973.2  | 10026.9 | 10636.4 | 10269.2 | 7354.8 |
| 35°   | 10734.4 | 10702.1 | 10498.6 | 10272.0 | 10208.2 | 10276.6 | 10442.2 | 10480.1 | 11052.6 | 10744.6 | 7474.1 |
| 37.5° | 11746.3 | 11702.8 | 11439.2 | 11135.8 | 10996.2 | 10992.5 | 11111.8 | 11189.5 | 11717.6 | 11368.9 | 7676.7 |
| 40°   | 12760.9 | 12730.4 | 12500.1 | 12261.4 | 11987.7 | 11899.8 | 12083.9 | 12107.9 | 12587.0 | 12144.0 | 7935.7 |
| 42.5° | 13545.2 | 13539.7 | 13497.1 | 13528.6 | 13248.3 | 13070.7 | 13215.0 | 13234.4 | 13648.8 | 12982.9 | 8211.3 |
| 45°   | 13959.6 | 13968.8 | 14175.1 | 14632.0 | 14735.6 | 14606.1 | 14677.3 | 14682.8 | 14862.3 | 13829.2 | 8463.8 |
| 47.5° | 13627.5 | 13675.6 | 14197.3 | 15219.3 | 16067.4 | 16497.5 | 16379.1 | 16447.6 | 16038.8 | 14556.1 | 8661.7 |
| 50°   | 12333.6 | 12392.8 | 13280.7 | 14957.5 | 16689.0 | 18327.9 | 18265.9 | 18250.2 | 16987.7 | 15088.9 | 8769.0 |
| 52.5° | 10730.7 | 10777.0 | 11509.5 | 13597.0 | 16233.0 | 19339.7 | 19908.6 | 19827.2 | 17831.2 | 15487.5 | 8789.4 |
| 55°   | 8289.9  | 8362.1  | 9064.1  | 10881.5 | 14388.7 | 18953.1 | 21116.5 | 21043.4 | 18599.8 | 15696.5 | 8765.3 |
| 57°   | 5893.5  | 5969.3  | 6666.7  | 8304.7  | 12104.2 | 17614.8 | 21236.7 | 21314.4 | 19015.1 | 15731.7 | 8792.1 |
| 57.5° | 5259.0  | 5336.7  | 6027.6  | 7618.4  | 11392.0 | 17131.1 | 21133.1 | 21262.6 | 19090.0 | 15726.1 | 8806.9 |
| 60°   | 2648.0  | 2677.6  | 3117.9  | 4252.7  | 7201.3  | 13849.5 | 19781.8 | 20115.7 | 19157.5 | 15454.2 | 8870.8 |
| 62.5° | 1646.3  | 1625.1  | 1611.2  | 1958.9  | 3503.5  | 9184.3  | 16993.3 | 17636.1 | 17865.4 | 14795.7 | 8716.3 |
| 65°   | 1447.5  | 1407.7  | 1255.1  | 1227.3  | 1547.4  | 4460.8  | 12797.0 | 13597.0 | 15104.6 | 13757.9 | 8348.2 |
| 67.5° | 1359.6  | 1320.8  | 1148.7  | 1045.1  | 1046.1  | 1768.4  | 7944.9  | 8845.8  | 11766.6 | 12003.4 | 7479.7 |
| 70°   | 1269.0  | 1233.8  | 1072.9  | 950.8   | 890.7   | 979.5   | 3655.2  | 4338.7  | 7670.2  | 9434.9  | 6251.4 |
| 72.5° | 1152.4  | 1128.4  | 975.8   | 850.0   | 786.2   | 733.4   | 1399.4  | 1652.8  | 4440.5  | 6336.5  | 4341.5 |
| 75°   | 1030.3  | 1008.1  | 877.7   | 757.5   | 679.8   | 577.1   | 788.0   | 849.1   | 2255.8  | 3241.8  | 2137.5 |
| 77.5° | 896.2   | 883.3   | 780.6   | 669.6   | 607.7   | 478.2   | 557.7   | 587.3   | 967.4   | 1390.1  | 1072.0 |
| 80°   | 713.1   | 738.1   | 682.6   | 596.6   | 539.2   | 382.9   | 394.9   | 414.4   | 563.3   | 678.9   | 608.6  |
| 82.5° | 464.3   | 507.8   | 534.6   | 484.6   | 444.0   | 301.5   | 283.9   | 292.3   | 367.2   | 414.4   | 264.5  |
| 85°   | 193.3   | 217.4   | 351.5   | 317.2   | 295.0   | 220.1   | 190.5   | 194.2   | 227.5   | 235.9   | 108.2  |
| 87.5° | 86.0    | 91.6    | 154.5   | 145.2   | 124.9   | 75.8    | 81.4    | 88.8    | 121.2   | 114.7   | 41.6   |
| 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: P362565

CATALOG NUMBER: NVN-SA5C-722-U-AFL

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 | 5969.3 |
| 2.5°  | 5974.9 | 5897.2 | 5764.0 | 5616.9 | 5496.7 | 5400.5 | 5303.4 | 5236.8 | 5159.1 | 5117.5 | 5096.2 |
| 5°    | 5979.5 | 5826.9 | 5546.6 | 5259.0 | 5001.9 | 4767.0 | 4543.1 | 4371.1 | 4210.2 | 4123.2 | 4099.2 |
| 7.5°  | 5998.9 | 5769.5 | 5316.3 | 4842.8 | 4385.9 | 3968.8 | 3646.9 | 3445.3 | 3300.1 | 3235.3 | 3216.8 |
| 10°   | 6014.6 | 5702.0 | 5031.5 | 4330.4 | 3708.9 | 3286.2 | 3036.5 | 2923.6 | 2873.7 | 2865.4 | 2857.0 |
| 12.5° | 6051.6 | 5632.7 | 4731.8 | 3795.8 | 3182.6 | 2890.3 | 2803.4 | 2796.0 | 2809.9 | 2830.2 | 2830.2 |
| 15°   | 6109.9 | 5564.2 | 4389.6 | 3337.1 | 2847.8 | 2745.1 | 2762.7 | 2803.4 | 2841.3 | 2872.8 | 2877.4 |
| 17.5° | 6152.5 | 5480.1 | 4021.5 | 2969.9 | 2669.3 | 2697.0 | 2759.9 | 2817.3 | 2856.1 | 2886.6 | 2889.4 |
| 20°   | 6183.0 | 5349.6 | 3628.4 | 2689.6 | 2566.6 | 2652.6 | 2731.2 | 2782.1 | 2808.9 | 2839.5 | 2844.1 |
| 22.5° | 6167.3 | 5174.8 | 3279.7 | 2488.9 | 2483.4 | 2587.9 | 2662.8 | 2723.8 | 2703.5 | 2673.9 | 2693.3 |
| 25°   | 6091.4 | 4934.4 | 2920.8 | 2339.1 | 2395.5 | 2500.9 | 2593.4 | 2552.7 | 2484.3 | 2471.3 | 2478.7 |
| 27.5° | 5956.4 | 4627.3 | 2588.8 | 2200.3 | 2293.8 | 2420.5 | 2414.9 | 2374.2 | 2350.2 | 2333.5 | 2343.7 |
| 30°   | 5811.2 | 4294.3 | 2298.4 | 2079.2 | 2180.9 | 2285.4 | 2264.2 | 2263.2 | 2239.2 | 2212.4 | 2225.3 |
| 32.5° | 5667.8 | 3959.5 | 2068.1 | 1979.3 | 2095.8 | 2109.7 | 2156.0 | 2169.8 | 2122.7 | 2066.2 | 2062.5 |
| 35°   | 5542.9 | 3643.2 | 1893.3 | 1888.7 | 1993.2 | 1995.0 | 2062.5 | 2043.1 | 1925.6 | 1867.4 | 1867.4 |
| 37.5° | 5449.5 | 3327.8 | 1760.1 | 1807.3 | 1858.1 | 1906.2 | 1940.4 | 1860.0 | 1840.6 | 1808.2 | 1807.3 |
| 40°   | 5408.8 | 3050.3 | 1676.9 | 1745.3 | 1762.9 | 1823.9 | 1736.0 | 1767.5 | 1776.7 | 1760.1 | 1760.1 |
| 42.5° | 5366.3 | 2808.9 | 1604.7 | 1698.1 | 1695.3 | 1687.0 | 1642.6 | 1683.3 | 1720.3 | 1721.2 | 1718.5 |
| 45°   | 5323.7 | 2600.8 | 1540.9 | 1597.3 | 1636.2 | 1546.4 | 1554.8 | 1598.2 | 1650.0 | 1668.5 | 1668.5 |
| 47.5° | 5276.6 | 2436.2 | 1482.6 | 1490.9 | 1551.1 | 1490.9 | 1484.5 | 1517.8 | 1578.8 | 1608.4 | 1614.9 |
| 50°   | 5173.0 | 2288.2 | 1416.0 | 1397.5 | 1414.2 | 1434.5 | 1440.1 | 1455.8 | 1523.3 | 1570.5 | 1581.6 |
| 52.5° | 5029.6 | 2156.0 | 1330.9 | 1311.5 | 1311.5 | 1388.3 | 1414.2 | 1418.8 | 1476.1 | 1532.6 | 1543.7 |
| 55°   | 4910.3 | 2071.8 | 1243.1 | 1239.4 | 1235.7 | 1339.3 | 1383.7 | 1391.1 | 1430.8 | 1475.2 | 1480.8 |
| 57°   | 4918.6 | 2065.3 | 1175.6 | 1179.3 | 1178.3 | 1289.3 | 1355.0 | 1370.7 | 1391.1 | 1429.0 | 1435.5 |
| 57.5° | 4923.3 | 2069.9 | 1160.8 | 1162.6 | 1161.7 | 1275.4 | 1346.7 | 1364.2 | 1380.0 | 1419.7 | 1426.2 |
| 60°   | 4992.6 | 2082.0 | 1100.6 | 1080.3 | 1084.9 | 1201.4 | 1299.5 | 1321.7 | 1331.9 | 1384.6 | 1392.9 |
| 62.5° | 4890.0 | 2028.3 | 1052.5 | 1003.5 | 1003.5 | 1123.8 | 1233.8 | 1269.0 | 1284.7 | 1355.9 | 1369.8 |
| 65°   | 4592.1 | 1877.6 | 996.1  | 916.6  | 925.8  | 1046.1 | 1155.2 | 1212.5 | 1236.6 | 1325.4 | 1340.2 |
| 67.5° | 4132.5 | 1702.7 | 936.0  | 838.9  | 848.1  | 964.7  | 1073.8 | 1135.8 | 1173.7 | 1292.1 | 1304.1 |
| 70°   | 3534.1 | 1489.1 | 854.6  | 756.6  | 767.7  | 875.9  | 977.6  | 1047.9 | 1104.3 | 1260.6 | 1264.3 |
| 72.5° | 2605.5 | 1220.9 | 740.8  | 665.9  | 678.0  | 772.3  | 880.5  | 961.9  | 1037.7 | 1182.0 | 1180.2 |
| 75°   | 1549.2 | 954.5  | 615.1  | 574.4  | 582.7  | 670.6  | 792.6  | 891.6  | 1005.4 | 1151.5 | 1169.1 |
| 77.5° | 939.7  | 718.7  | 501.3  | 480.9  | 491.1  | 580.8  | 729.7  | 835.2  | 991.5  | 1085.8 | 1080.3 |
| 80°   | 567.9  | 513.3  | 400.5  | 387.5  | 397.7  | 496.7  | 675.2  | 792.6  | 866.6  | 927.7  | 927.7  |
| 82.5° | 296.9  | 313.5  | 294.1  | 283.9  | 297.8  | 403.3  | 614.1  | 691.8  | 765.8  | 657.6  | 614.1  |
| 85°   | 121.2  | 163.7  | 178.5  | 177.6  | 185.9  | 279.3  | 530.0  | 591.9  | 493.9  | 468.9  | 480.0  |
| 87.5° | 40.7   | 69.4   | 86.9   | 74.9   | 78.6   | 175.7  | 367.2  | 285.8  | 339.4  | 236.8  | 224.8  |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



LM-79-2008: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-1908-441-10-R4

Test Date: 10/25/2019

Luminaire Tested: SA1C-722-U-5WQ

Data in this report applies to families of products SA1C-722-U-5WQ.

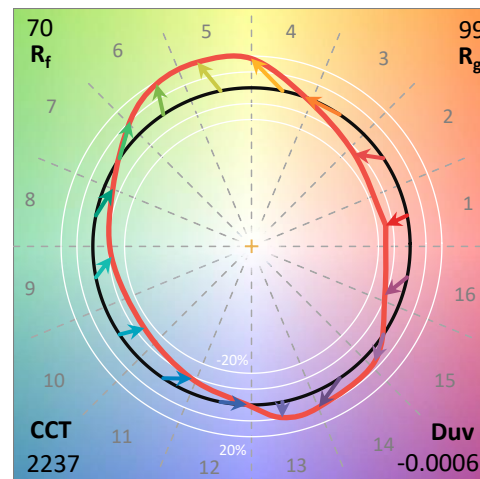
### Test Information

Test Method: LM-79-2008 Report  
 Number: SP1-1908-441-10-R4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/28/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **SA1C-722-U-5WQ**  
 Description: MCGRAW EDISON ROADWAY AND AREA LUMINAIRE

\*\*\*THIS IS A REVISION OF SP1-1908-441-4-R3. TO UPDATE THE CATALOG INFORMATION.\*\*\*TESTED IN SITU. ROADWAY AND AREA LUMINAIRE. (1) 70 CRI, 5000K, 1050MA LIGHTSQUARE WITH 16 LEDS AND TYPE V WIDE OPTICS.

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 2237    | CRI (Ra): | 72.0 |      |       |
| CIE u':                   | 0.2876  | R1:       | 68.9 | R9:  | -17.4 |
| CIE v':                   | 0.5346  | R2:       | 83.0 | R10: | 61.3  |
| Duv:                      | -0.0006 | R3:       | 95.2 | R11: | 59.8  |
| CIE x:                    | 0.5005  | R4:       | 66.2 | R12: | 50.5  |
| CIE y:                    | 0.4134  | R5:       | 65.9 | R13: | 71.1  |
| CIE z:                    | 0.0860  | R6:       | 76.3 | R14: | 96.9  |
| Peak Wavelength (nm):     | 603     | R7:       | 76.7 |      |       |
| Dominant Wavelength (nm): | 587     | R8:       | 43.8 |      |       |
| Purity:                   | 74.5    |           |      |      |       |
| Rf:                       | 69.8    |           |      |      |       |
| Rg:                       | 99.2    |           |      |      |       |



### Test Conditions

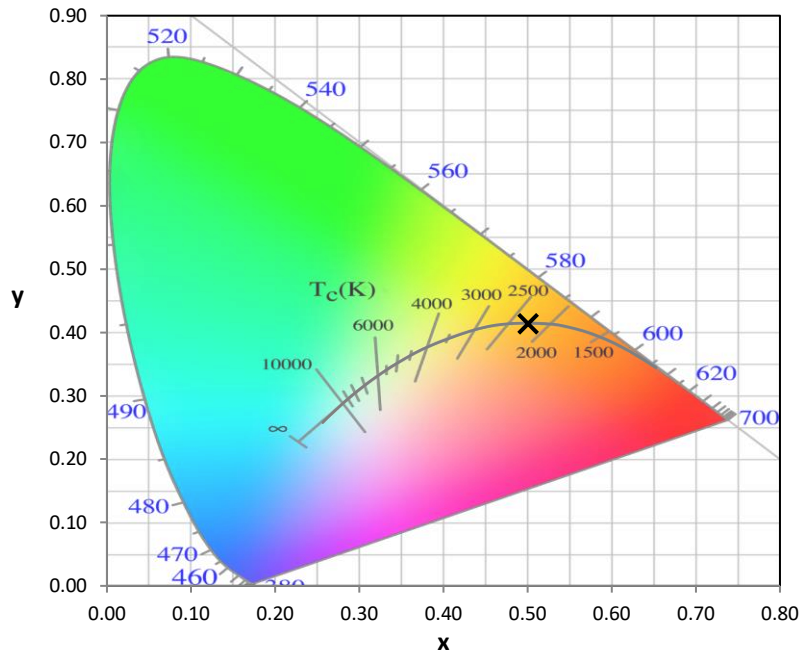
Stabilization Time: 71M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.7/41%  
 Sphere Temperature (°C): 25.6

REPORT NUMBER: SP1-1908-441-10-R4

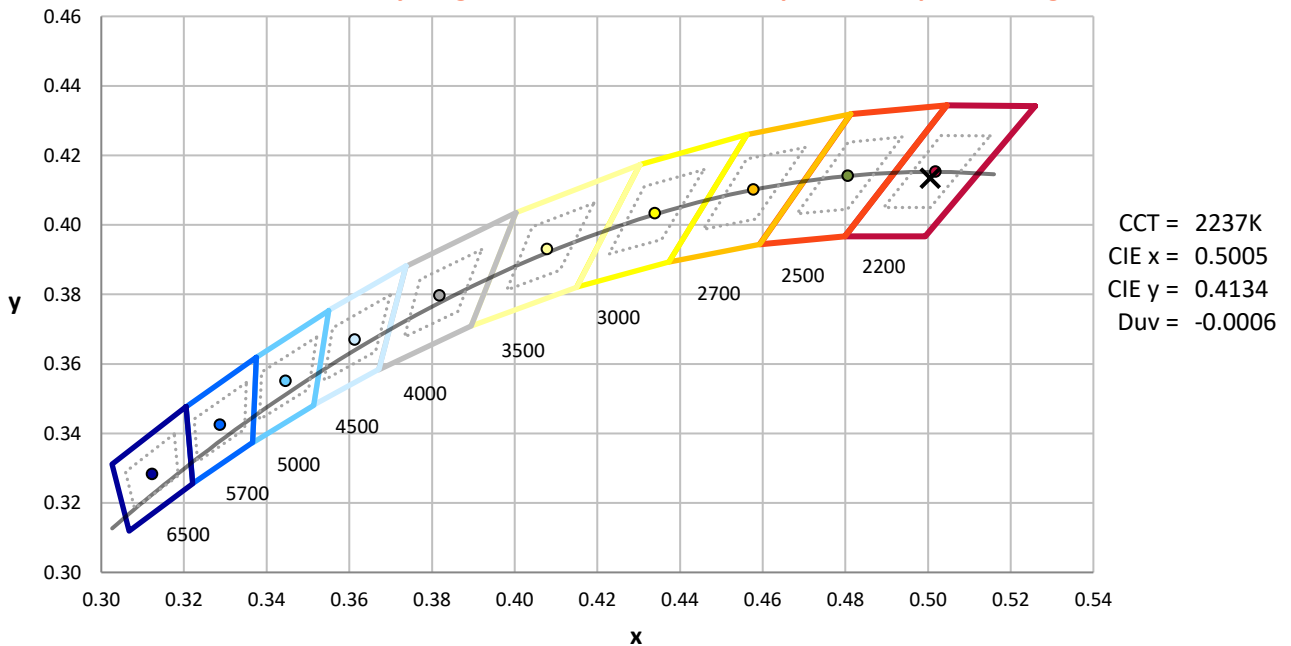
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/28/2019        | 12/28/2019           |
| Power Meter                    | IN0071                | 12/5/2018        | 12/5/2019            |
| AC Power Source                | IN0063                | 12/5/2018        | 12/5/2019            |
| DC Power Source                | IN0208                | 12/5/2018        | 12/5/2019            |
| Sphere Thermometer             | IN0085                | 12/5/2018        | 12/5/2019            |
| Room Thermometer               | IN0046                | 12/5/2018        | 12/5/2019            |

REPORT NUMBER: SP1-1908-441-10-R4

CIE 1931 Chromaticity Diagram



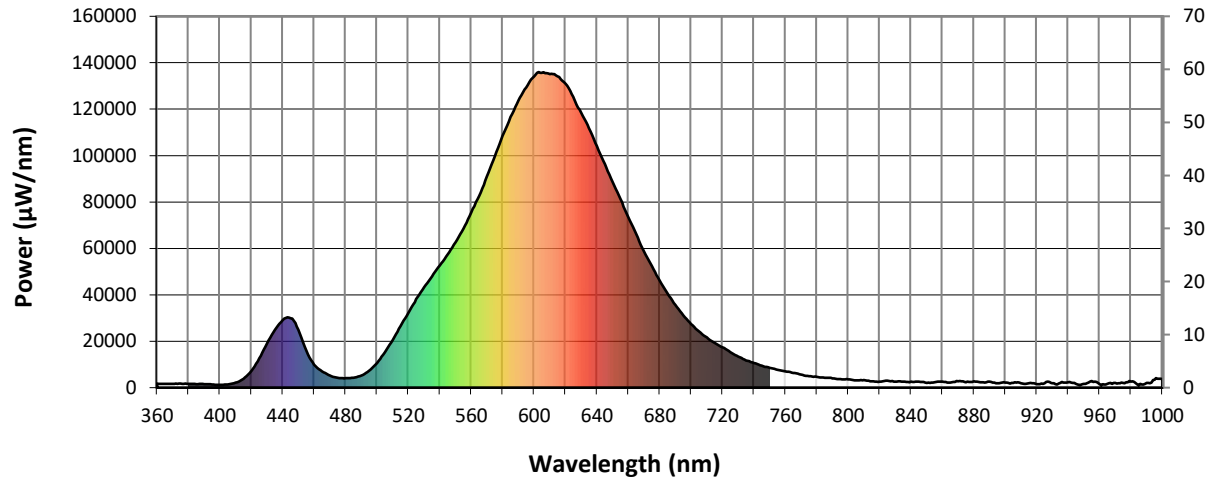
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 2200K 4-step quadrangle

REPORT NUMBER: SP1-1908-441-10-R4

**Photopic Flux vs. Wavelength**

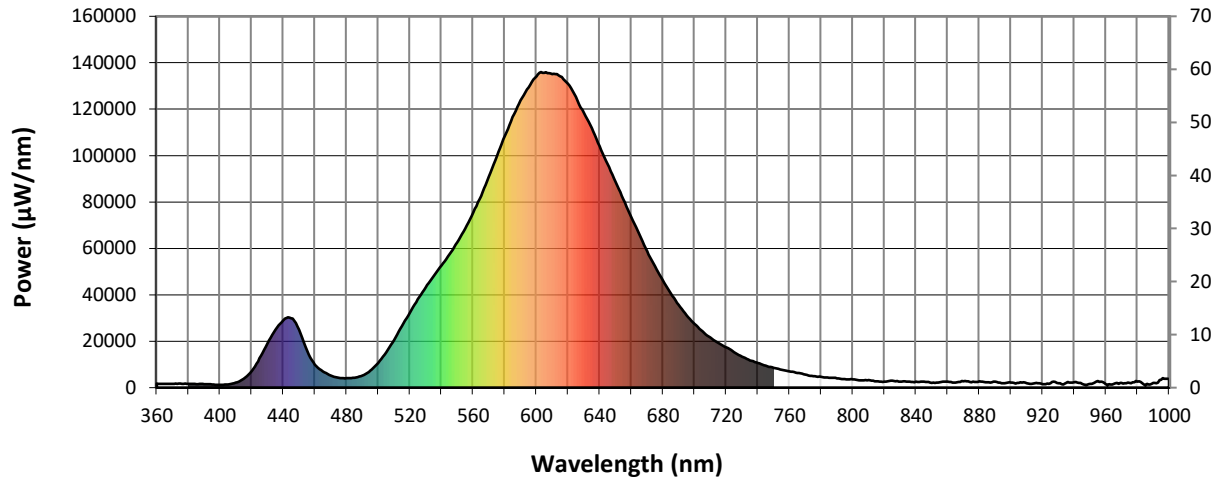


#####

| 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       | 1768             | NR               | 490       | 5206             | NR               | 620       | 130919           | NR               | 750       | 8553             | NR               | 880       | 2713             | NR               |
| 365       | 1569             | NR               | 495       | 7286             | NR               | 625       | 125335           | NR               | 755       | 7696             | NR               | 885       | 2316             | NR               |
| 370       | 1594             | NR               | 500       | 10654            | NR               | 630       | 118388           | NR               | 760       | 6978             | NR               | 890       | 2539             | NR               |
| 375       | 1744             | NR               | 505       | 15189            | NR               | 635       | 111855           | NR               | 765       | 6377             | NR               | 895       | 1933             | NR               |
| 380       | 1659             | NR               | 510       | 20541            | NR               | 640       | 104062           | NR               | 770       | 5600             | NR               | 900       | 2216             | NR               |
| 385       | 1504             | NR               | 515       | 26492            | NR               | 645       | 96365            | NR               | 775       | 5000             | NR               | 905       | 2067             | NR               |
| 390       | 1541             | NR               | 520       | 32294            | NR               | 650       | 88651            | NR               | 780       | 4709             | NR               | 910       | 1959             | NR               |
| 395       | 1355             | NR               | 525       | 38123            | NR               | 655       | 81152            | NR               | 785       | 4305             | NR               | 915       | 1874             | NR               |
| 400       | 1243             | NR               | 530       | 43232            | NR               | 660       | 73523            | NR               | 790       | 4040             | NR               | 920       | 1484             | NR               |
| 405       | 1417             | NR               | 535       | 48012            | NR               | 665       | 66123            | NR               | 795       | 3642             | NR               | 925       | 1914             | NR               |
| 410       | 2147             | NR               | 540       | 52623            | NR               | 670       | 58677            | NR               | 800       | 3594             | NR               | 930       | 1948             | NR               |
| 415       | 3837             | NR               | 545       | 57516            | NR               | 675       | 52349            | NR               | 805       | 3190             | NR               | 935       | 2079             | NR               |
| 420       | 7159             | NR               | 550       | 62613            | NR               | 680       | 46159            | NR               | 810       | 3241             | NR               | 940       | 2263             | NR               |
| 425       | 12599            | NR               | 555       | 68554            | NR               | 685       | 40525            | NR               | 815       | 2732             | NR               | 945       | 1688             | NR               |
| 430       | 19019            | NR               | 560       | 75325            | NR               | 690       | 35615            | NR               | 820       | 2612             | NR               | 950       | 1560             | NR               |
| 435       | 24875            | NR               | 565       | 82533            | NR               | 695       | 31158            | NR               | 825       | 2966             | NR               | 955       | 2826             | NR               |
| 440       | 29103            | NR               | 570       | 90909            | NR               | 700       | 27409            | NR               | 830       | 2574             | NR               | 960       | 1477             | NR               |
| 445       | 29901            | NR               | 575       | 99621            | NR               | 705       | 24204            | NR               | 835       | 2633             | NR               | 965       | 1568             | NR               |
| 450       | 24862            | NR               | 580       | 108484           | NR               | 710       | 21558            | NR               | 840       | 2526             | NR               | 970       | 2030             | NR               |
| 455       | 15942            | NR               | 585       | 116679           | NR               | 715       | 19222            | NR               | 845       | 2631             | NR               | 975       | 1986             | NR               |
| 460       | 9916             | NR               | 590       | 123752           | NR               | 720       | 17310            | NR               | 850       | 2079             | NR               | 980       | 2540             | NR               |
| 465       | 7051             | NR               | 595       | 129324           | NR               | 725       | 15280            | NR               | 855       | 2309             | NR               | 985       | 1139             | NR               |
| 470       | 5227             | NR               | 600       | 134082           | NR               | 730       | 13282            | NR               | 860       | 2528             | NR               | 990       | 2018             | NR               |
| 475       | 4257             | NR               | 605       | 135698           | NR               | 735       | 11753            | NR               | 865       | 2121             | NR               | 995       | 3445             | NR               |
| 480       | 4052             | NR               | 610       | 135144           | NR               | 740       | 10654            | NR               | 870       | 2751             | NR               | 1000      | 3704             | NR               |
| 485       | 4298             | NR               | 615       | 134180           | NR               | 745       | 9451             | NR               | 875       | 2317             | NR               |           |                  |                  |

REPORT NUMBER: SP1-1908-441-10-R4

**Scotopic Flux vs. Wavelength**



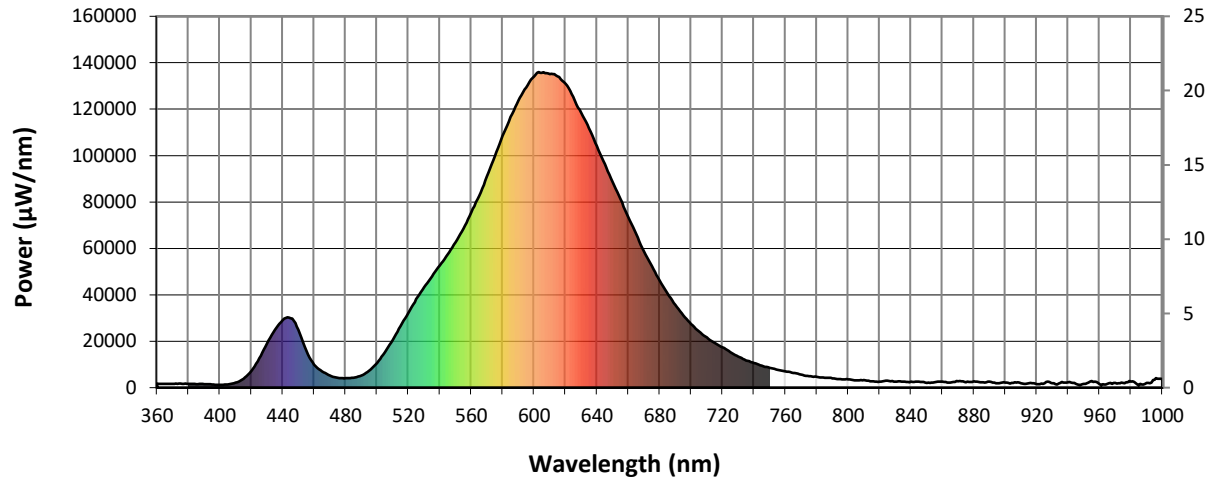
**Scotopic Lumens: 4696.9**

**S/P: 0.85**

| 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       | 1768             | NR               | 490       | 5206             | NR               | 620       | 130919           | NR               | 750       | 8553             | NR               | 880       | 2713             | NR               |
| 365       | 1569             | NR               | 495       | 7286             | NR               | 625       | 125335           | NR               | 755       | 7696             | NR               | 885       | 2316             | NR               |
| 370       | 1594             | NR               | 500       | 10654            | NR               | 630       | 118388           | NR               | 760       | 6978             | NR               | 890       | 2539             | NR               |
| 375       | 1744             | NR               | 505       | 15189            | NR               | 635       | 111855           | NR               | 765       | 6377             | NR               | 895       | 1933             | NR               |
| 380       | 1659             | NR               | 510       | 20541            | NR               | 640       | 104062           | NR               | 770       | 5600             | NR               | 900       | 2216             | NR               |
| 385       | 1504             | NR               | 515       | 26492            | NR               | 645       | 96365            | NR               | 775       | 5000             | NR               | 905       | 2067             | NR               |
| 390       | 1541             | NR               | 520       | 32294            | NR               | 650       | 88651            | NR               | 780       | 4709             | NR               | 910       | 1959             | NR               |
| 395       | 1355             | NR               | 525       | 38123            | NR               | 655       | 81152            | NR               | 785       | 4305             | NR               | 915       | 1874             | NR               |
| 400       | 1243             | NR               | 530       | 43232            | NR               | 660       | 73523            | NR               | 790       | 4040             | NR               | 920       | 1484             | NR               |
| 405       | 1417             | NR               | 535       | 48012            | NR               | 665       | 66123            | NR               | 795       | 3642             | NR               | 925       | 1914             | NR               |
| 410       | 2147             | NR               | 540       | 52623            | NR               | 670       | 58677            | NR               | 800       | 3594             | NR               | 930       | 1948             | NR               |
| 415       | 3837             | NR               | 545       | 57516            | NR               | 675       | 52349            | NR               | 805       | 3190             | NR               | 935       | 2079             | NR               |
| 420       | 7159             | NR               | 550       | 62613            | NR               | 680       | 46159            | NR               | 810       | 3241             | NR               | 940       | 2263             | NR               |
| 425       | 12599            | NR               | 555       | 68554            | NR               | 685       | 40525            | NR               | 815       | 2732             | NR               | 945       | 1688             | NR               |
| 430       | 19019            | NR               | 560       | 75325            | NR               | 690       | 35615            | NR               | 820       | 2612             | NR               | 950       | 1560             | NR               |
| 435       | 24875            | NR               | 565       | 82533            | NR               | 695       | 31158            | NR               | 825       | 2966             | NR               | 955       | 2826             | NR               |
| 440       | 29103            | NR               | 570       | 90909            | NR               | 700       | 27409            | NR               | 830       | 2574             | NR               | 960       | 1477             | NR               |
| 445       | 29901            | NR               | 575       | 99621            | NR               | 705       | 24204            | NR               | 835       | 2633             | NR               | 965       | 1568             | NR               |
| 450       | 24862            | NR               | 580       | 108484           | NR               | 710       | 21558            | NR               | 840       | 2526             | NR               | 970       | 2030             | NR               |
| 455       | 15942            | NR               | 585       | 116679           | NR               | 715       | 19222            | NR               | 845       | 2631             | NR               | 975       | 1986             | NR               |
| 460       | 9916             | NR               | 590       | 123752           | NR               | 720       | 17310            | NR               | 850       | 2079             | NR               | 980       | 2540             | NR               |
| 465       | 7051             | NR               | 595       | 129324           | NR               | 725       | 15280            | NR               | 855       | 2309             | NR               | 985       | 1139             | NR               |
| 470       | 5227             | NR               | 600       | 134082           | NR               | 730       | 13282            | NR               | 860       | 2528             | NR               | 990       | 2018             | NR               |
| 475       | 4257             | NR               | 605       | 135698           | NR               | 735       | 11753            | NR               | 865       | 2121             | NR               | 995       | 3445             | NR               |
| 480       | 4052             | NR               | 610       | 135144           | NR               | 740       | 10654            | NR               | 870       | 2751             | NR               | 1000      | 3704             | NR               |
| 485       | 4298             | NR               | 615       | 134180           | NR               | 745       | 9451             | NR               | 875       | 2317             | NR               |           |                  |                  |

REPORT NUMBER: SP1-1908-441-10-R4

**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 1470.8**

**M/P: 0.27**

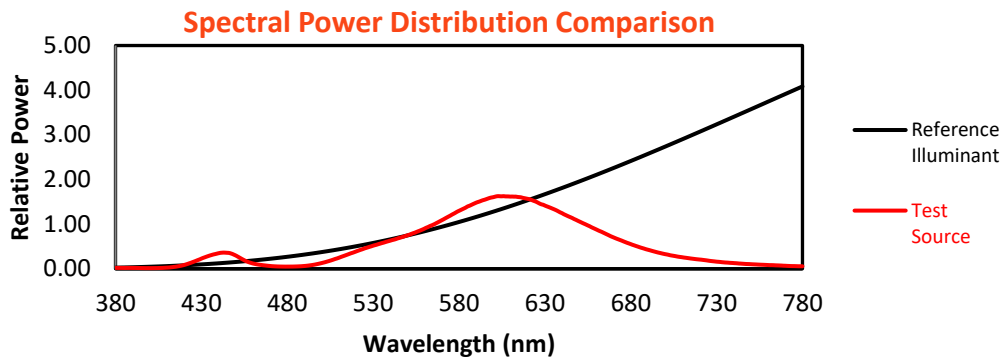
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1768             | NR               | 490       | 5206             | NR               | 620       | 130919           | NR               | 750       | 8553             | NR               | 880       | 2713             | NR               |
| 365       | 1569             | NR               | 495       | 7286             | NR               | 625       | 125335           | NR               | 755       | 7696             | NR               | 885       | 2316             | NR               |
| 370       | 1594             | NR               | 500       | 10654            | NR               | 630       | 118388           | NR               | 760       | 6978             | NR               | 890       | 2539             | NR               |
| 375       | 1744             | NR               | 505       | 15189            | NR               | 635       | 111855           | NR               | 765       | 6377             | NR               | 895       | 1933             | NR               |
| 380       | 1659             | NR               | 510       | 20541            | NR               | 640       | 104062           | NR               | 770       | 5600             | NR               | 900       | 2216             | NR               |
| 385       | 1504             | NR               | 515       | 26492            | NR               | 645       | 96365            | NR               | 775       | 5000             | NR               | 905       | 2067             | NR               |
| 390       | 1541             | NR               | 520       | 32294            | NR               | 650       | 88651            | NR               | 780       | 4709             | NR               | 910       | 1959             | NR               |
| 395       | 1355             | NR               | 525       | 38123            | NR               | 655       | 81152            | NR               | 785       | 4305             | NR               | 915       | 1874             | NR               |
| 400       | 1243             | NR               | 530       | 43232            | NR               | 660       | 73523            | NR               | 790       | 4040             | NR               | 920       | 1484             | NR               |
| 405       | 1417             | NR               | 535       | 48012            | NR               | 665       | 66123            | NR               | 795       | 3642             | NR               | 925       | 1914             | NR               |
| 410       | 2147             | NR               | 540       | 52623            | NR               | 670       | 58677            | NR               | 800       | 3594             | NR               | 930       | 1948             | NR               |
| 415       | 3837             | NR               | 545       | 57516            | NR               | 675       | 52349            | NR               | 805       | 3190             | NR               | 935       | 2079             | NR               |
| 420       | 7159             | NR               | 550       | 62613            | NR               | 680       | 46159            | NR               | 810       | 3241             | NR               | 940       | 2263             | NR               |
| 425       | 12599            | NR               | 555       | 68554            | NR               | 685       | 40525            | NR               | 815       | 2732             | NR               | 945       | 1688             | NR               |
| 430       | 19019            | NR               | 560       | 75325            | NR               | 690       | 35615            | NR               | 820       | 2612             | NR               | 950       | 1560             | NR               |
| 435       | 24875            | NR               | 565       | 82533            | NR               | 695       | 31158            | NR               | 825       | 2966             | NR               | 955       | 2826             | NR               |
| 440       | 29103            | NR               | 570       | 90909            | NR               | 700       | 27409            | NR               | 830       | 2574             | NR               | 960       | 1477             | NR               |
| 445       | 29901            | NR               | 575       | 99621            | NR               | 705       | 24204            | NR               | 835       | 2633             | NR               | 965       | 1568             | NR               |
| 450       | 24862            | NR               | 580       | 108484           | NR               | 710       | 21558            | NR               | 840       | 2526             | NR               | 970       | 2030             | NR               |
| 455       | 15942            | NR               | 585       | 116679           | NR               | 715       | 19222            | NR               | 845       | 2631             | NR               | 975       | 1986             | NR               |
| 460       | 9916             | NR               | 590       | 123752           | NR               | 720       | 17310            | NR               | 850       | 2079             | NR               | 980       | 2540             | NR               |
| 465       | 7051             | NR               | 595       | 129324           | NR               | 725       | 15280            | NR               | 855       | 2309             | NR               | 985       | 1139             | NR               |
| 470       | 5227             | NR               | 600       | 134082           | NR               | 730       | 13282            | NR               | 860       | 2528             | NR               | 990       | 2018             | NR               |
| 475       | 4257             | NR               | 605       | 135698           | NR               | 735       | 11753            | NR               | 865       | 2121             | NR               | 995       | 3445             | NR               |
| 480       | 4052             | NR               | 610       | 135144           | NR               | 740       | 10654            | NR               | 870       | 2751             | NR               | 1000      | 3704             | NR               |
| 485       | 4298             | NR               | 615       | 134180           | NR               | 745       | 9451             | NR               | 875       | 2317             | NR               |           |                  |                  |

REPORT NUMBER: SP1-1908-441-10-R4

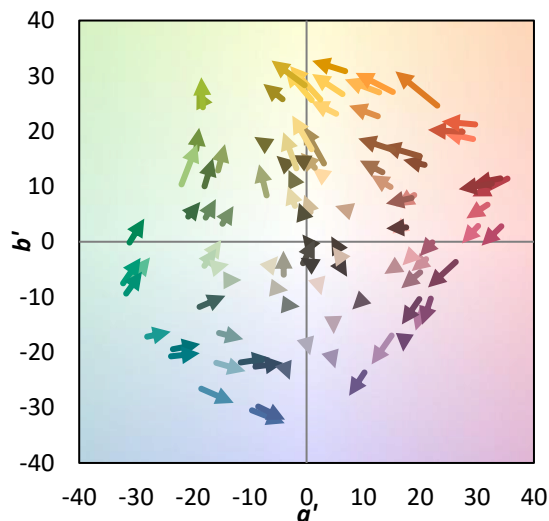
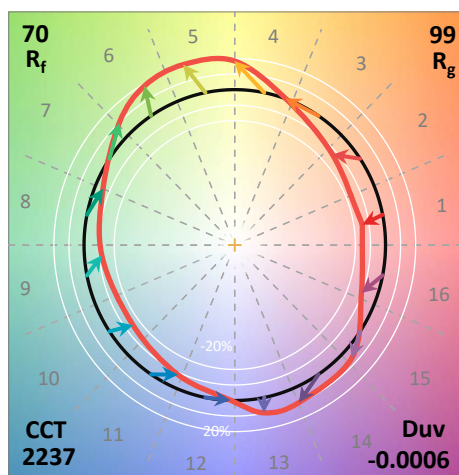
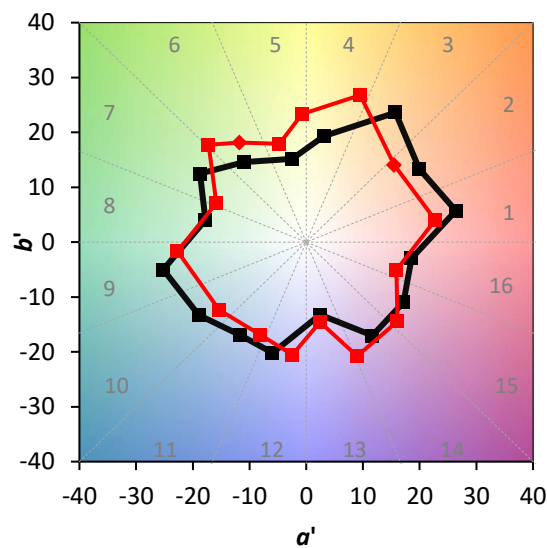
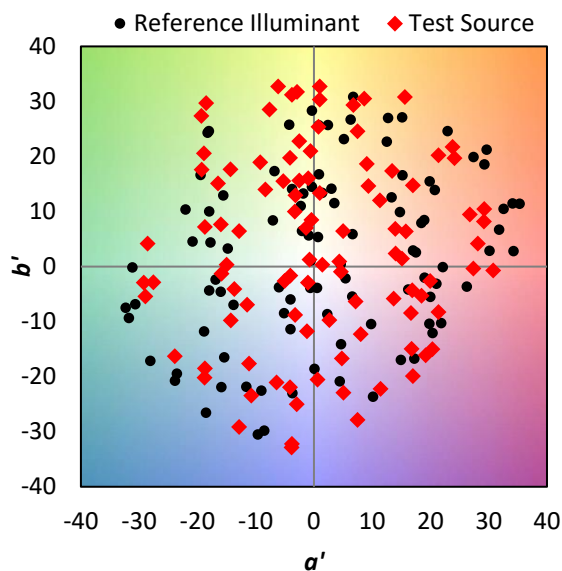
**TM-30-18**

**Summary**

$R_f = 69.8$   
 $R_g = 99.2$   
 CIE  $R_a = 72.0$   
 $R_g = -17.4$



**Color Vector Graphics**



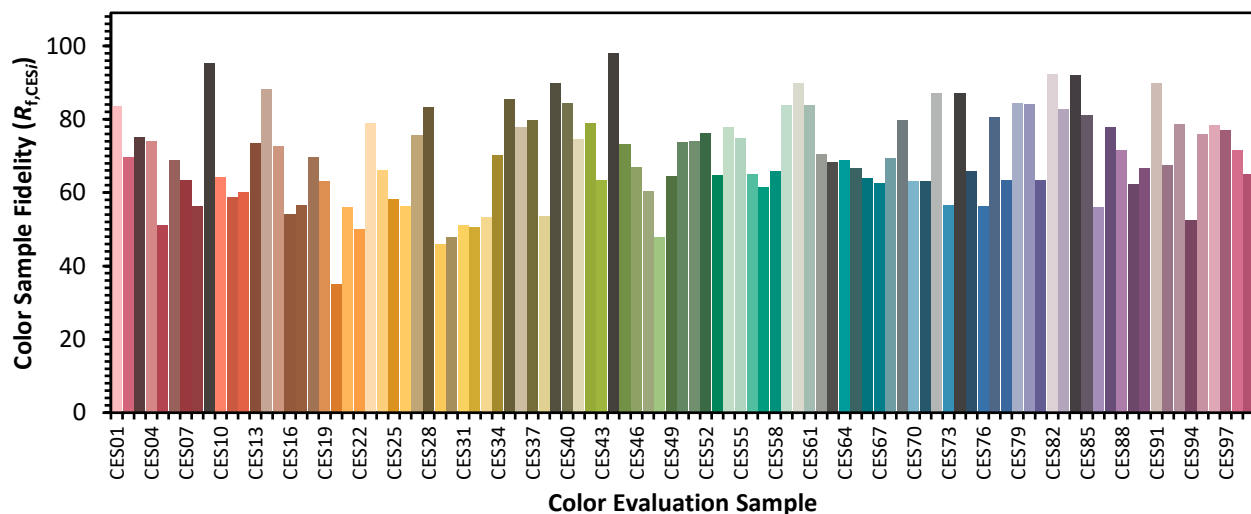


REPORT NUMBER: SP1-1908-441-10-R4

**TM-30-18**

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

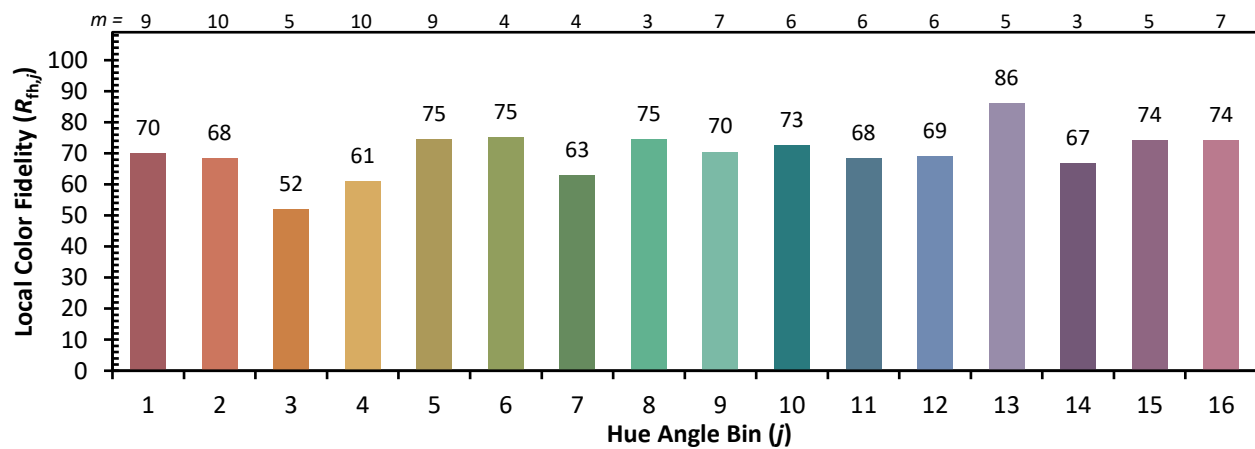
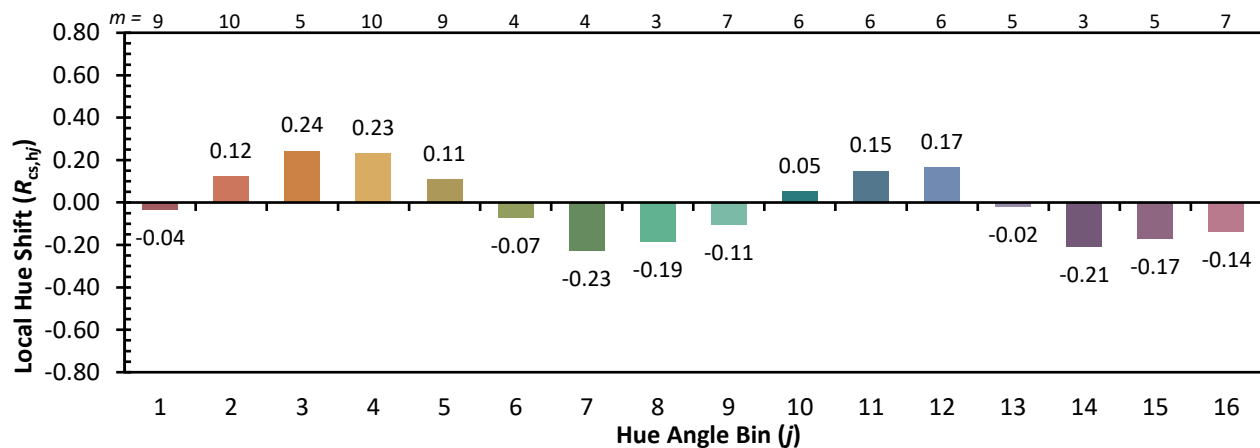
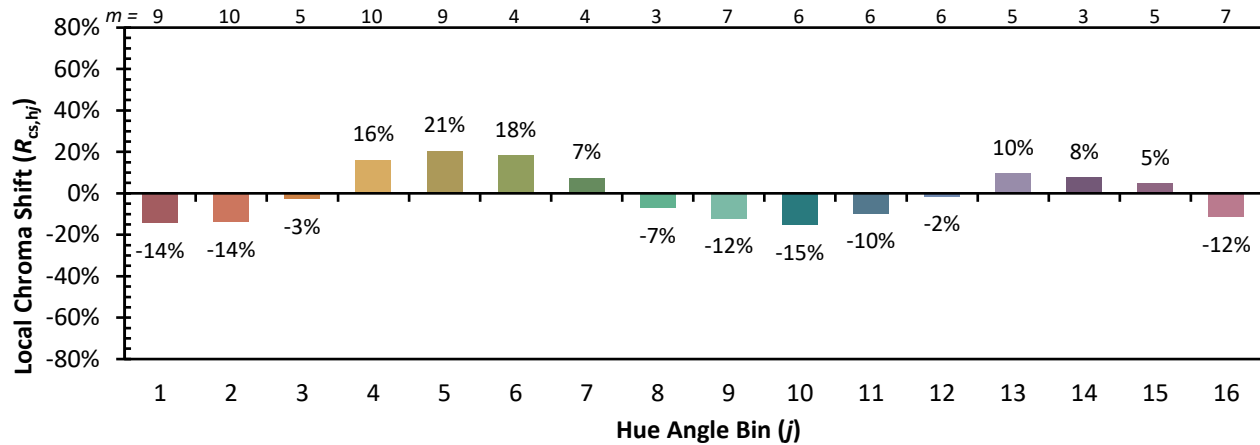
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 56 | CES51 = 74 | CES76 = 56 |
| CES02 = 65 | CES27 = 76 | CES52 = 76 | CES77 = 81 |
| CES03 = 32 | CES28 = 83 | CES53 = 65 | CES78 = 63 |
| CES04 = 72 | CES29 = 46 | CES54 = 78 | CES79 = 84 |
| CES05 = 52 | CES30 = 48 | CES55 = 75 | CES80 = 84 |
| CES06 = 52 | CES31 = 51 | CES56 = 65 | CES81 = 63 |
| CES07 = 44 | CES32 = 51 | CES57 = 62 | CES82 = 92 |
| CES08 = 42 | CES33 = 53 | CES58 = 66 | CES83 = 83 |
| CES09 = 29 | CES34 = 70 | CES59 = 84 | CES84 = 92 |
| CES10 = 78 | CES35 = 85 | CES60 = 90 | CES85 = 81 |
| CES11 = 61 | CES36 = 78 | CES61 = 84 | CES86 = 56 |
| CES12 = 68 | CES37 = 80 | CES62 = 70 | CES87 = 78 |
| CES13 = 45 | CES38 = 53 | CES63 = 68 | CES88 = 72 |
| CES14 = 75 | CES39 = 90 | CES64 = 69 | CES89 = 62 |
| CES15 = 72 | CES40 = 84 | CES65 = 67 | CES90 = 67 |
| CES16 = 49 | CES41 = 75 | CES66 = 64 | CES91 = 90 |
| CES17 = 51 | CES42 = 79 | CES67 = 63 | CES92 = 67 |
| CES18 = 57 | CES43 = 64 | CES68 = 69 | CES93 = 79 |
| CES19 = 74 | CES44 = 98 | CES69 = 80 | CES94 = 52 |
| CES20 = 68 | CES45 = 73 | CES70 = 63 | CES95 = 76 |
| CES21 = 89 | CES46 = 67 | CES71 = 63 | CES96 = 78 |
| CES22 = 81 | CES47 = 60 | CES72 = 87 | CES97 = 77 |
| CES23 = 92 | CES48 = 48 | CES73 = 56 | CES98 = 71 |
| CES24 = 92 | CES49 = 64 | CES74 = 87 | CES99 = 65 |
| CES25 = 74 | CES50 = 74 | CES75 = 66 |            |



REPORT NUMBER: SP1-1908-441-10-R4

**TM-30-18**

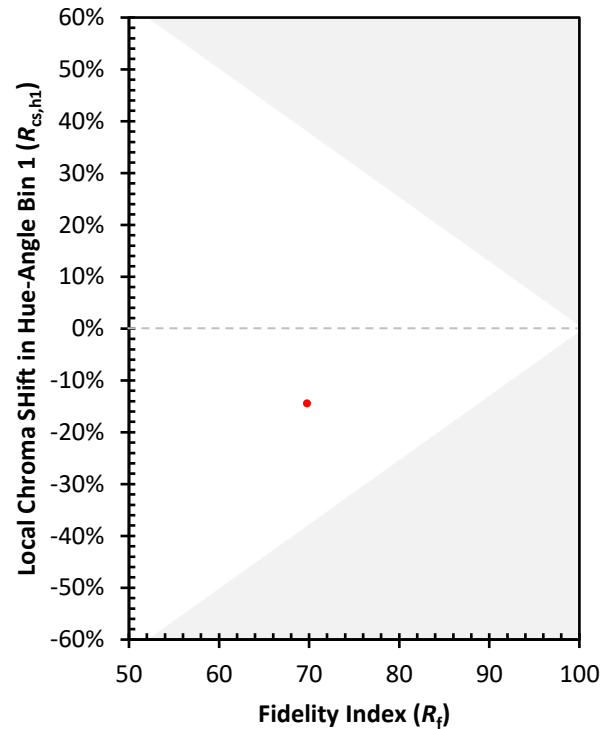
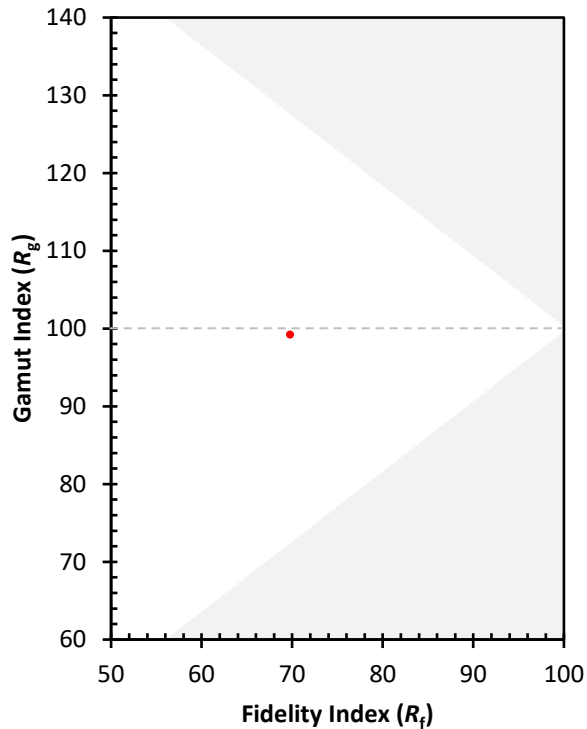
Color Rendition by Hue-Angle Bin



REPORT NUMBER: SP1-1908-441-10-R4

**TM-30-18**

**Measure Comparisons**



(END OF REPORT)