

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



Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: McGRAW-EDISON

Report Number: P386329

Luminaire Tested: **GWC-SA2A-727-U-SL2**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P386329  
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 (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: GWC-SA2A-727-U-SL2  
Description: GALLEON WALL LUMINAIRE  
(2) 70 CRI, 2700K, 615mA 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: 7968 lumens  
Efficiency: N/A  
Efficacy: 120.7 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 0.5' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B2 - U0 - G3

Input Watts (W): 66  
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

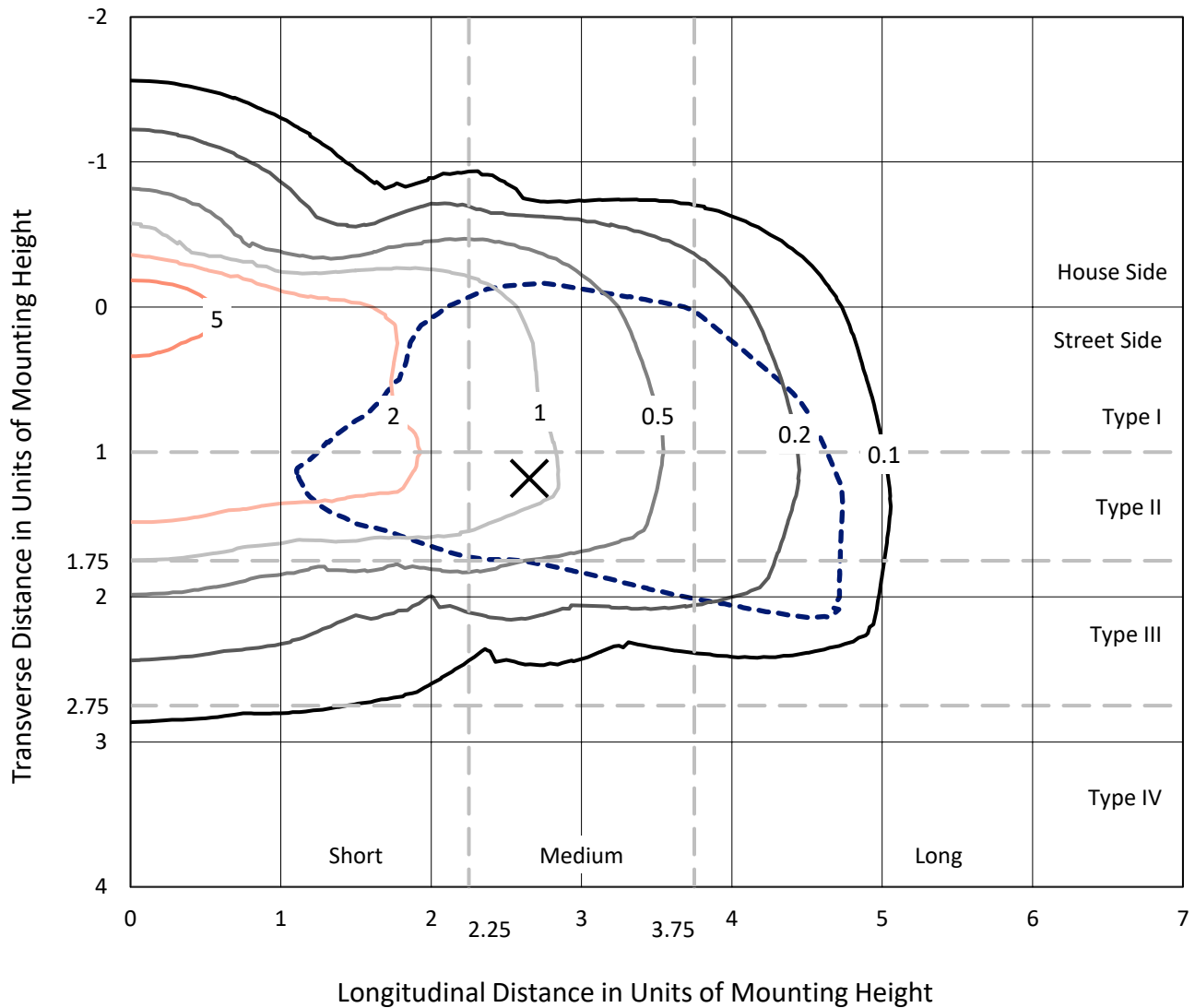


REPORT NUMBER: P386329

CATALOG NUMBER: GWC-SA2A-727-U-SL2

## Iso-Footcandle Lines of Horizontal Illumination

✕ Max cd  
 - - - 1/2 Max cd

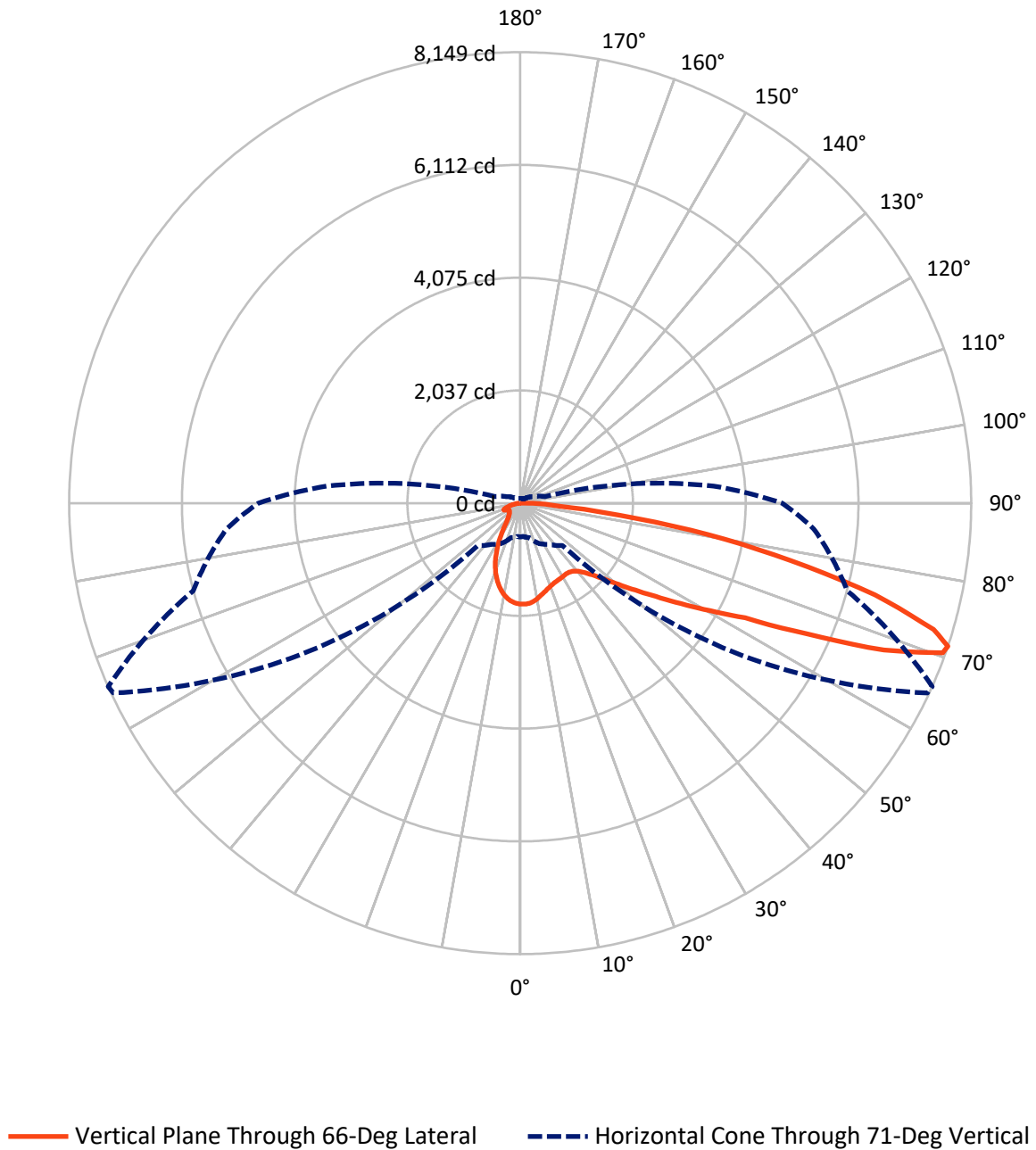


Based on 15 foot mounting height. Maximum calculated value = 8.1 fc  
 Type III - Medium - N/A

REPORT NUMBER: P386329

CATALOG NUMBER: GWC-SA2A-727-U-SL2

## Luminous Intensity Polar Plot



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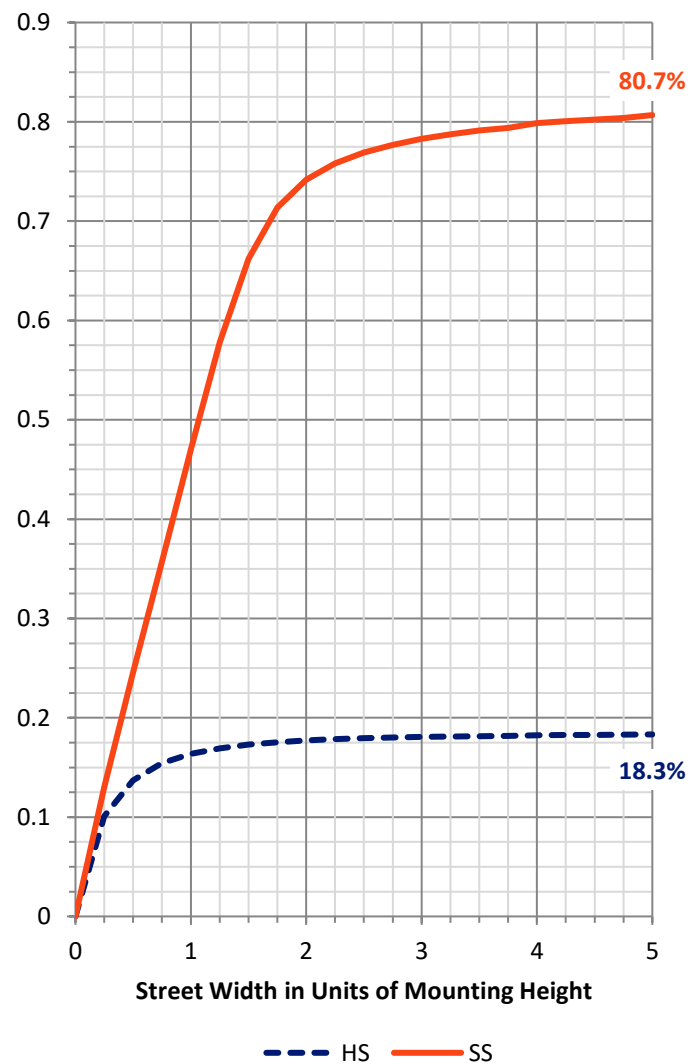
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 1476.7   | 0.0    | 1476.7 |
|                    | % Fixture | 18.5     | 0.0    | 18.5   |
| <b>Street Side</b> | Lumens    | 6491.3   | 0.0    | 6491.3 |
|                    | % Fixture | 81.5     | 0.0    | 81.5   |
| <b>Total</b>       | Lumens    | 7968.0   | 0.0    | 7968.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 160.7  | 2.0       |
| 10°-20°   | 385.4  | 4.8       |
| 20°-30°   | 517.6  | 6.5       |
| 30°-40°   | 680.9  | 8.5       |
| 40°-50°   | 990.6  | 12.4      |
| 50°-60°   | 1547.4 | 19.4      |
| 60°-70°   | 1938.4 | 24.3      |
| 70°-80°   | 1478.5 | 18.6      |
| 80°-90°   | 268.5  | 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°    | 7968.0 | 100.0     |
| 0°-180°   | 7968.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P386329

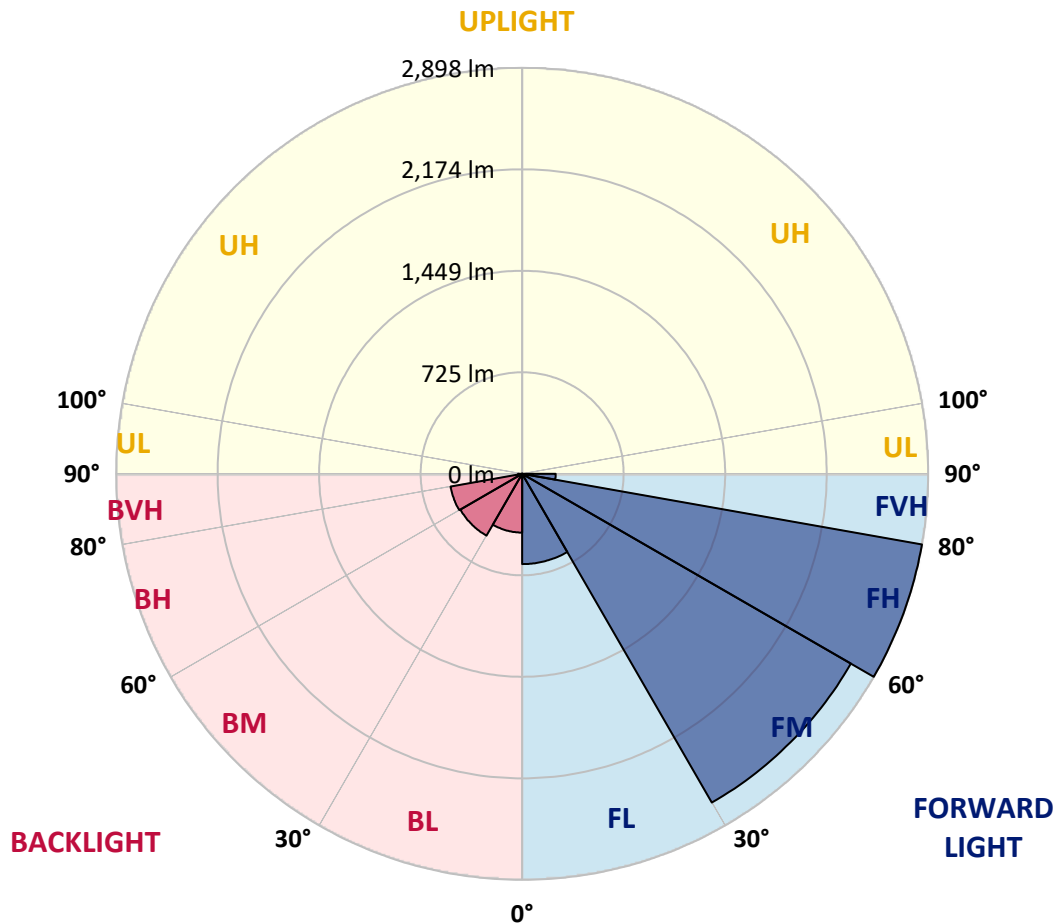
CATALOG NUMBER: GWC-SA2A-727-U-SL2

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 644.3  | 8.1       |                         |      |         |
| FM   | (30°-60°)   | 2709.5 | 34.0      |                         |      |         |
| FH   | (60°-80°)   | 2898.0 | 36.4      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 239.4  | 3.0       |                         |      | G3/500  |
| BL   | (0°-30°)    | 419.3  | 5.3       | B1/500                  |      |         |
| BM   | (30°-60°)   | 509.4  | 6.4       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 518.9  | 6.5       | B2/1000                 |      | G2/1000 |
| BVH  | (80°-90°)   | 29.1   | 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



REPORT NUMBER: P386329

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 66°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 |
| 2.5°  | 1791.5 | 1788.7 | 1797.0 | 1805.5 | 1808.8 | 1814.3 | 1822.6 | 1827.2 | 1827.0 | 1827.8 | 1825.0 |
| 5°    | 1672.6 | 1669.1 | 1685.6 | 1699.0 | 1724.9 | 1754.1 | 1789.6 | 1814.9 | 1815.4 | 1829.7 | 1833.6 |
| 7.5°  | 1560.1 | 1557.6 | 1576.6 | 1598.4 | 1628.3 | 1672.9 | 1730.4 | 1784.9 | 1788.2 | 1827.0 | 1840.4 |
| 10°   | 1469.9 | 1469.3 | 1487.8 | 1511.4 | 1546.4 | 1596.2 | 1662.2 | 1742.0 | 1746.9 | 1813.8 | 1841.5 |
| 12.5° | 1399.5 | 1400.6 | 1416.5 | 1443.5 | 1480.3 | 1532.3 | 1603.9 | 1693.8 | 1701.8 | 1792.9 | 1835.2 |
| 15°   | 1347.5 | 1351.9 | 1364.8 | 1392.0 | 1428.3 | 1481.2 | 1554.6 | 1649.2 | 1661.4 | 1769.5 | 1831.6 |
| 17.5° | 1317.7 | 1322.7 | 1331.8 | 1354.3 | 1388.4 | 1439.3 | 1508.9 | 1612.7 | 1623.7 | 1751.6 | 1831.9 |
| 20°   | 1308.9 | 1313.1 | 1318.3 | 1332.1 | 1360.9 | 1407.2 | 1472.9 | 1579.6 | 1591.5 | 1737.3 | 1834.7 |
| 22.5° | 1326.3 | 1329.3 | 1329.9 | 1328.8 | 1346.4 | 1384.0 | 1446.8 | 1555.4 | 1568.1 | 1727.9 | 1836.6 |
| 25°   | 1363.4 | 1367.5 | 1364.5 | 1354.3 | 1348.6 | 1371.7 | 1433.3 | 1539.5 | 1552.1 | 1721.1 | 1832.7 |
| 27.5° | 1419.3 | 1419.8 | 1417.3 | 1404.1 | 1376.9 | 1373.0 | 1429.2 | 1530.1 | 1542.2 | 1713.1 | 1824.8 |
| 30°   | 1495.2 | 1498.8 | 1494.4 | 1476.5 | 1431.9 | 1395.1 | 1434.1 | 1521.0 | 1532.1 | 1702.9 | 1811.8 |
| 32.5° | 1584.0 | 1592.9 | 1592.6 | 1573.9 | 1510.0 | 1444.3 | 1454.5 | 1515.5 | 1524.1 | 1692.2 | 1796.2 |
| 35°   | 1676.2 | 1688.3 | 1710.9 | 1702.9 | 1623.9 | 1522.2 | 1493.5 | 1524.4 | 1530.1 | 1690.8 | 1785.1 |
| 37.5° | 1771.9 | 1784.0 | 1830.5 | 1852.0 | 1759.6 | 1633.6 | 1555.2 | 1555.4 | 1558.2 | 1707.6 | 1784.3 |
| 40°   | 1872.1 | 1885.0 | 1954.9 | 2010.7 | 1935.4 | 1774.7 | 1654.5 | 1620.4 | 1617.3 | 1748.8 | 1800.6 |
| 42.5° | 2012.4 | 2023.9 | 2107.8 | 2179.1 | 2130.4 | 1955.4 | 1791.8 | 1720.5 | 1714.2 | 1829.7 | 1852.5 |
| 45°   | 2189.8 | 2199.7 | 2288.9 | 2365.1 | 2340.0 | 2161.8 | 1964.2 | 1858.3 | 1857.2 | 1964.5 | 1957.9 |
| 47.5° | 2400.8 | 2408.5 | 2488.6 | 2562.3 | 2571.4 | 2399.2 | 2181.0 | 2071.0 | 2053.1 | 2149.4 | 2121.1 |
| 50°   | 2620.6 | 2629.2 | 2683.6 | 2762.9 | 2830.3 | 2716.9 | 2460.0 | 2331.5 | 2307.6 | 2393.4 | 2352.1 |
| 52.5° | 2766.2 | 2777.4 | 2824.8 | 2925.2 | 3121.3 | 3065.2 | 2789.8 | 2647.3 | 2611.0 | 2689.1 | 2657.5 |
| 55°   | 2701.2 | 2726.6 | 2798.9 | 2959.8 | 3354.1 | 3597.3 | 3196.7 | 3015.7 | 2974.7 | 3039.6 | 3020.9 |
| 57.5° | 2406.1 | 2440.7 | 2539.5 | 2787.9 | 3386.8 | 4066.0 | 3811.8 | 3449.5 | 3420.6 | 3401.9 | 3410.5 |
| 60°   | 1866.6 | 1899.9 | 2022.3 | 2346.1 | 3158.7 | 4408.3 | 4737.6 | 3984.3 | 3942.5 | 3765.6 | 3773.3 |
| 62.5° | 1321.0 | 1304.3 | 1388.2 | 1625.0 | 2566.7 | 4448.4 | 5790.9 | 4699.6 | 4562.0 | 4149.7 | 4115.8 |
| 65°   | 1007.4 | 1003.6 | 1041.3 | 1116.6 | 1554.6 | 3967.8 | 6418.4 | 5901.8 | 5686.9 | 4601.4 | 4521.6 |
| 67.5° | 827.8  | 820.9  | 858.0  | 967.8  | 1001.1 | 2559.8 | 6432.2 | 7296.6 | 7085.6 | 5163.7 | 4990.9 |
| 70°   | 680.6  | 672.9  | 707.6  | 849.2  | 925.2  | 1298.2 | 5413.5 | 8113.4 | 8102.1 | 5875.7 | 5345.3 |
| 71°   | 610.2  | 604.7  | 646.2  | 803.6  | 908.9  | 1082.0 | 4674.0 | 8115.6 | 8149.4 | 6116.7 | 5324.4 |
| 72.5° | 496.8  | 498.8  | 542.8  | 715.3  | 896.8  | 955.4  | 3435.2 | 7737.3 | 7808.8 | 6346.4 | 5134.3 |
| 75°   | 330.1  | 331.8  | 389.5  | 550.2  | 869.6  | 934.8  | 1888.0 | 6492.5 | 6624.0 | 6208.8 | 4685.0 |
| 77.5° | 221.7  | 221.2  | 260.5  | 377.4  | 757.6  | 934.8  | 1107.0 | 4855.9 | 5000.3 | 4940.3 | 3611.8 |
| 80°   | 152.7  | 151.6  | 179.4  | 260.5  | 573.6  | 946.1  | 855.8  | 3403.0 | 3446.8 | 2668.0 | 1468.0 |
| 82.5° | 93.5   | 94.4   | 117.2  | 184.0  | 390.4  | 851.4  | 808.0  | 1855.6 | 1808.0 | 748.3  | 366.7  |
| 85°   | 53.6   | 53.4   | 74.8   | 124.6  | 250.6  | 718.6  | 787.9  | 798.6  | 732.6  | 225.3  | 132.6  |
| 87.5° | 19.3   | 20.6   | 40.2   | 69.1   | 143.6  | 500.4  | 668.5  | 415.4  | 374.4  | 101.8  | 60.0   |
| 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: GWC-SA2A-727-U-SL2

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 | 1825.3 |
| 2.5°  | 1823.1 | 1824.8 | 1822.8 | 1811.8 | 1802.5 | 1787.4 | 1778.8 | 1767.0 | 1763.4 | 1761.8 | 1766.2 |
| 5°    | 1830.0 | 1830.5 | 1814.3 | 1785.4 | 1753.0 | 1714.7 | 1687.2 | 1653.4 | 1637.4 | 1630.5 | 1634.9 |
| 7.5°  | 1836.3 | 1833.8 | 1798.4 | 1743.1 | 1683.1 | 1616.5 | 1557.4 | 1503.2 | 1471.5 | 1458.6 | 1459.7 |
| 10°   | 1837.1 | 1826.7 | 1769.7 | 1684.2 | 1591.2 | 1493.5 | 1402.8 | 1319.1 | 1266.3 | 1231.9 | 1242.4 |
| 12.5° | 1828.6 | 1811.0 | 1727.7 | 1608.0 | 1479.0 | 1345.8 | 1223.1 | 1097.7 | 1022.3 | 987.3  | 988.4  |
| 15°   | 1822.0 | 1790.1 | 1675.9 | 1518.3 | 1345.0 | 1168.6 | 1001.1 | 853.6  | 773.3  | 737.6  | 720.8  |
| 17.5° | 1816.5 | 1767.5 | 1616.0 | 1417.3 | 1186.8 | 963.1  | 761.8  | 630.3  | 586.2  | 575.8  | 571.4  |
| 20°   | 1808.8 | 1743.6 | 1549.1 | 1300.4 | 1006.6 | 733.2  | 556.3  | 491.3  | 491.6  | 503.7  | 505.4  |
| 22.5° | 1798.1 | 1716.4 | 1477.9 | 1169.2 | 813.2  | 534.0  | 436.0  | 417.3  | 436.3  | 459.4  | 463.6  |
| 25°   | 1782.1 | 1684.2 | 1398.6 | 1024.2 | 620.1  | 410.5  | 372.5  | 371.7  | 394.8  | 419.0  | 422.6  |
| 27.5° | 1759.6 | 1642.1 | 1310.6 | 868.5  | 456.9  | 348.8  | 333.7  | 339.5  | 356.5  | 374.1  | 375.5  |
| 30°   | 1729.3 | 1593.1 | 1213.5 | 704.3  | 358.2  | 310.6  | 308.9  | 314.2  | 324.6  | 337.0  | 338.1  |
| 32.5° | 1696.0 | 1543.3 | 1109.8 | 545.3  | 306.7  | 290.0  | 291.6  | 294.1  | 299.0  | 304.0  | 305.1  |
| 35°   | 1665.8 | 1492.4 | 1003.6 | 414.3  | 282.3  | 276.5  | 275.4  | 274.8  | 275.4  | 273.7  | 274.0  |
| 37.5° | 1646.2 | 1450.3 | 893.0  | 329.8  | 268.2  | 264.6  | 261.3  | 257.2  | 252.5  | 249.8  | 250.3  |
| 40°   | 1639.1 | 1419.0 | 781.0  | 285.0  | 256.7  | 254.2  | 247.9  | 239.1  | 233.6  | 231.9  | 231.9  |
| 42.5° | 1658.3 | 1402.8 | 672.9  | 262.4  | 247.0  | 242.9  | 232.5  | 222.3  | 218.2  | 217.9  | 217.6  |
| 45°   | 1717.2 | 1409.4 | 570.0  | 250.1  | 238.2  | 230.3  | 216.5  | 208.0  | 205.2  | 205.8  | 205.5  |
| 47.5° | 1822.8 | 1450.9 | 482.0  | 241.8  | 229.4  | 219.0  | 203.6  | 196.7  | 193.4  | 193.4  | 193.7  |
| 50°   | 2002.5 | 1548.0 | 411.8  | 234.9  | 222.0  | 208.5  | 194.2  | 185.7  | 181.3  | 181.0  | 181.0  |
| 52.5° | 2264.1 | 1721.9 | 368.1  | 229.2  | 213.8  | 199.2  | 184.9  | 174.1  | 168.9  | 167.8  | 167.3  |
| 55°   | 2592.0 | 1971.1 | 356.0  | 225.3  | 202.8  | 189.0  | 173.6  | 162.9  | 157.1  | 154.6  | 154.3  |
| 57.5° | 2958.7 | 2274.3 | 379.9  | 220.6  | 191.5  | 176.9  | 161.2  | 151.0  | 145.0  | 142.0  | 141.7  |
| 60°   | 3329.9 | 2605.2 | 477.6  | 214.0  | 182.1  | 163.7  | 148.6  | 139.2  | 133.2  | 129.8  | 129.3  |
| 62.5° | 3701.5 | 2954.1 | 677.0  | 213.5  | 175.5  | 151.0  | 135.6  | 127.6  | 121.9  | 118.3  | 117.5  |
| 65°   | 4120.8 | 3335.9 | 903.7  | 228.1  | 173.3  | 139.5  | 122.4  | 116.1  | 111.1  | 107.8  | 107.6  |
| 67.5° | 4602.2 | 3767.0 | 882.0  | 258.0  | 180.7  | 129.0  | 110.0  | 105.1  | 101.5  | 98.8   | 98.5   |
| 70°   | 4828.1 | 3699.6 | 548.3  | 279.2  | 191.2  | 118.8  | 98.2   | 94.6   | 91.9   | 90.0   | 89.1   |
| 71°   | 4733.4 | 3512.8 | 459.7  | 276.8  | 190.1  | 114.4  | 93.5   | 90.8   | 88.0   | 86.4   | 85.6   |
| 72.5° | 4475.4 | 3203.6 | 383.5  | 257.5  | 177.7  | 106.5  | 87.5   | 84.7   | 82.3   | 80.3   | 79.8   |
| 75°   | 4016.0 | 2861.1 | 307.0  | 205.8  | 141.7  | 90.0   | 76.8   | 73.7   | 71.8   | 70.7   | 69.6   |
| 77.5° | 2952.1 | 2041.8 | 237.4  | 162.6  | 104.3  | 73.5   | 65.5   | 63.3   | 61.3   | 59.7   | 58.9   |
| 80°   | 1131.0 | 790.9  | 159.8  | 121.3  | 76.5   | 58.0   | 52.8   | 51.7   | 49.8   | 48.7   | 48.7   |
| 82.5° | 304.5  | 236.3  | 85.3   | 73.5   | 51.2   | 42.4   | 40.4   | 39.9   | 38.2   | 36.0   | 36.3   |
| 85°   | 123.2  | 104.3  | 47.9   | 40.4   | 31.4   | 25.0   | 27.2   | 27.5   | 25.6   | 22.8   | 23.1   |
| 87.5° | 54.2   | 44.3   | 26.7   | 17.9   | 13.8   | 9.6    | 12.4   | 12.4   | 11.3   | 9.4    | 8.5    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



LM-79-08: Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

INVUE

Report Number: SP1-2012-088-8-R2

Luminaire Tested: CCW-SA1B-727-U-SL4

Test Date: 01/20/2021

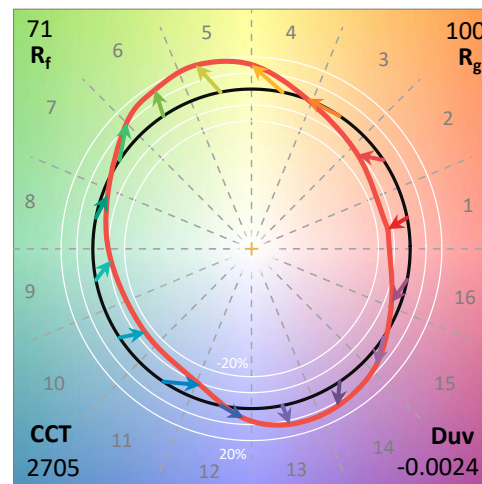
### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2012-088-8-R2  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 01/20/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: INVUE  
 Catalog Number: **CCW-SA1B-727-U-SL4**  
 Description: INVUE WALL PACK

\*\*\*THIS IS A REVISION OF SP1-2012-088-8. TO UPDATE THE CATALOG INFORMATION.\*\*\*TESTED IN SITU. INVUE WALL PACK LIGHT SQUARE SL4 OPTICS 1-SQUARE

### Spectral Parameters

|                           |         |           |      |      |      |
|---------------------------|---------|-----------|------|------|------|
| CCT (K):                  | 2705    | CRI (Ra): | 73.8 |      |      |
| CIE u':                   | 0.2629  | R1:       | 72.2 | R9:  | -7.6 |
| CIE v':                   | 0.5237  | R2:       | 81.9 | R10: | 56.9 |
| Duv:                      | -0.0024 | R3:       | 89.3 | R11: | 66.0 |
| CIE x:                    | 0.4552  | R4:       | 71.3 | R12: | 47.9 |
| CIE y:                    | 0.4030  | R5:       | 69.5 | R13: | 73.4 |
| CIE z:                    | 0.1418  | R6:       | 73.6 | R14: | 93.2 |
| Peak Wavelength (nm):     | 603     | R7:       | 80.1 |      |      |
| Dominant Wavelength (nm): | 585     | R8:       | 52.8 |      |      |
| Purity:                   | 57.7    |           |      |      |      |
| Rf:                       | 71.2    |           |      |      |      |
| Rg:                       | 100.1   |           |      |      |      |



### Test Conditions

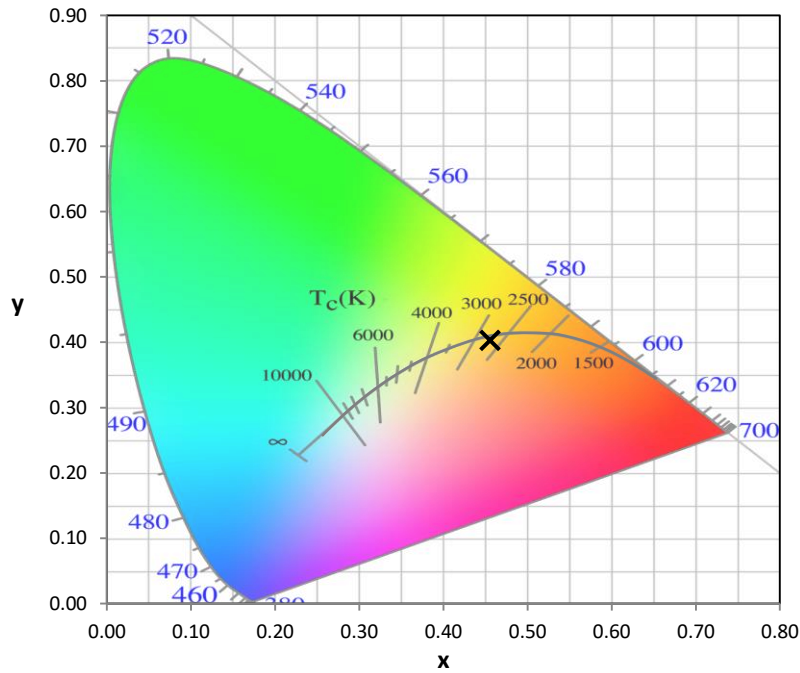
Stabilization Time: 177M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.8/34%  
 Sphere Temperature (°C): 24.7

REPORT NUMBER: SP1-2012-088-8-R2

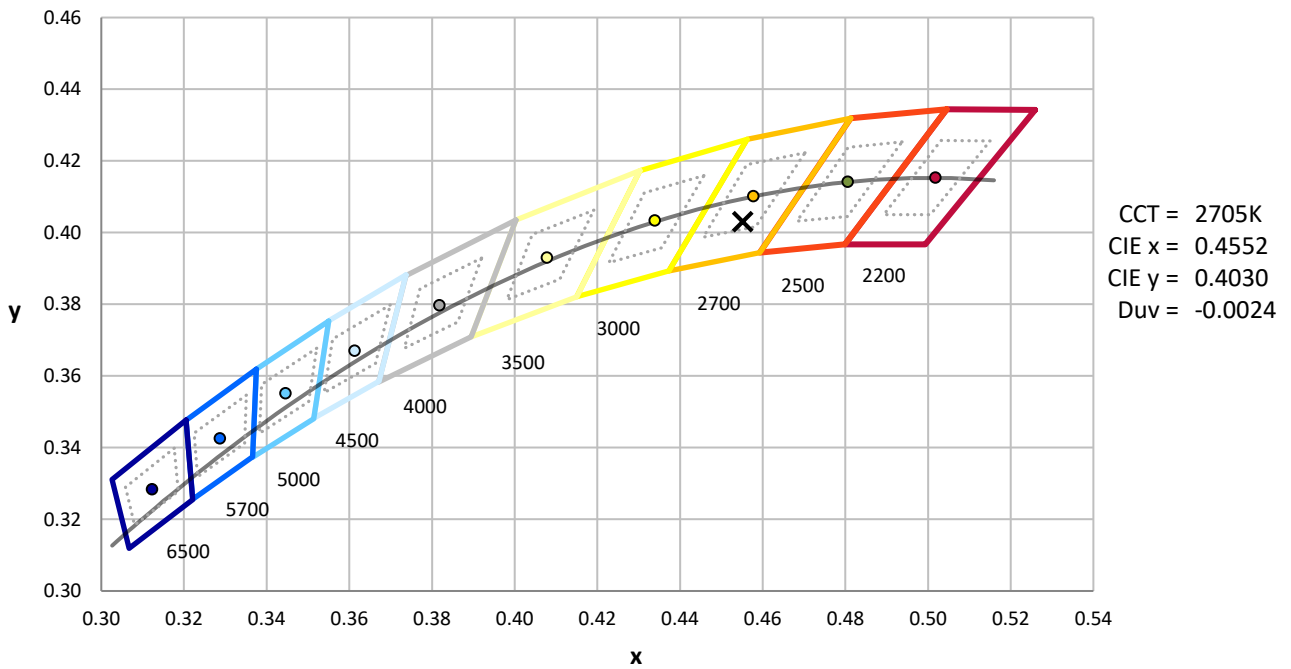
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 7/29/2020        | 1/29/2021            |
| Power Meter                    | IN0071                | 12/1/2020        | 12/1/2021            |
| AC Power Source                | IN0063                | 12/1/2020        | 12/1/2021            |
| DC Power Source                | IN0208                | 12/1/2020        | 12/1/2021            |
| Sphere Thermometer             | IN0085                | 12/1/2020        | 12/1/2021            |
| Room Thermometer               | IN0046                | 12/1/2020        | 12/1/2021            |

REPORT NUMBER: SP1-2012-088-8-R2

**CIE 1931 Chromaticity Diagram**



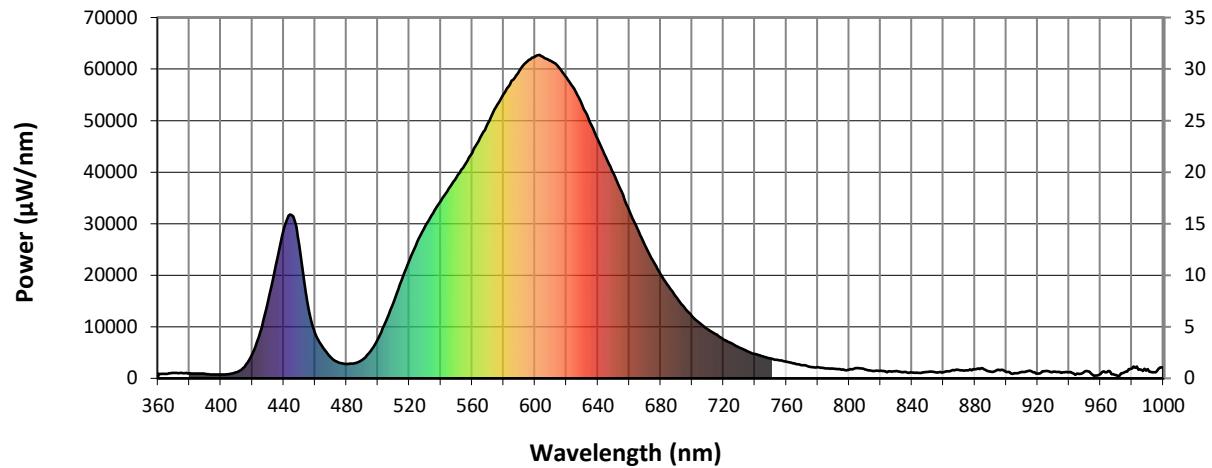
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 2700K 4-step quadrangle

REPORT NUMBER: SP1-2012-088-8-R2

### Photopic Flux vs. Wavelength

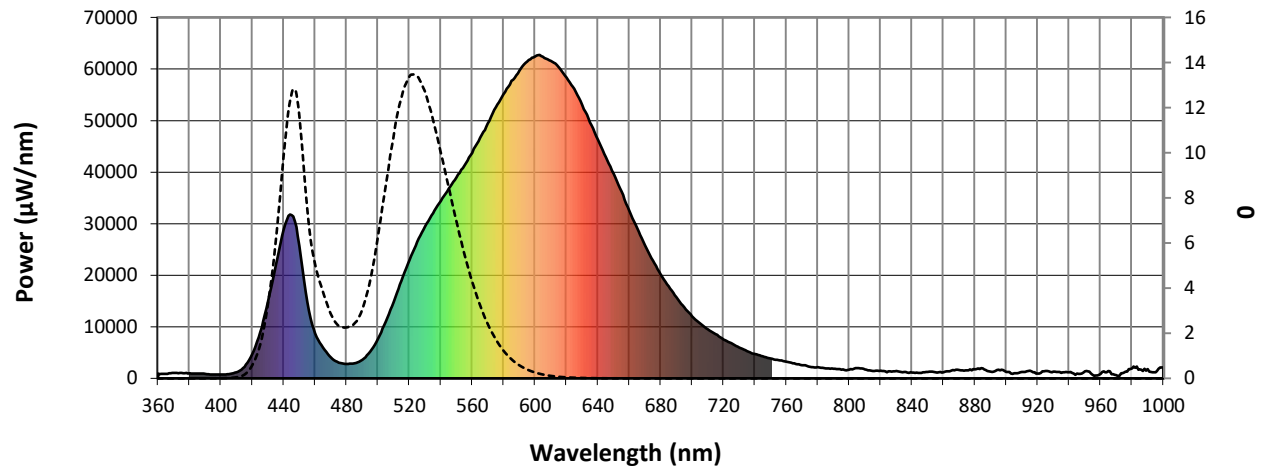


#####

| 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       | 926              | 0.0              | 490       | 3601             | 0.5              | 620       | 58340            | 15.2             | 750       | 3861             | 0.0              | 880       | 1742             | 0.0              |
| 365       | 867              | 0.0              | 495       | 5135             | 0.9              | 625       | 56180            | 12.4             | 755       | 3520             | 0.0              | 885       | 1920             | 0.0              |
| 370       | 1032             | 0.0              | 500       | 7689             | 1.7              | 630       | 53018            | 9.6              | 760       | 3223             | 0.0              | 890       | 1286             | 0.0              |
| 375       | 1034             | 0.0              | 505       | 11015            | 3.1              | 635       | 49683            | 7.5              | 765       | 2910             | 0.0              | 895       | 1660             | 0.0              |
| 380       | 979              | 0.0              | 510       | 14817            | 5.1              | 640       | 46308            | 5.5              | 770       | 2560             | 0.0              | 900       | 1274             | 0.0              |
| 385       | 938              | 0.0              | 515       | 18962            | 7.9              | 645       | 42927            | 4.1              | 775       | 2242             | 0.0              | 905       | 1020             | 0.0              |
| 390       | 893              | 0.0              | 520       | 22933            | 11.1             | 650       | 39728            | 2.9              | 780       | 2156             | 0.0              | 910       | 1258             | 0.0              |
| 395       | 757              | 0.0              | 525       | 26438            | 14.2             | 655       | 36260            | 2.1              | 785       | 1926             | 0.0              | 915       | 1481             | 0.0              |
| 400       | 728              | 0.0              | 530       | 29492            | 17.4             | 660       | 32543            | 1.4              | 790       | 1871             | 0.0              | 920       | 923              | 0.0              |
| 405       | 812              | 0.0              | 535       | 32054            | 19.9             | 665       | 29105            | 0.9              | 795       | 1697             | 0.0              | 925       | 1444             | 0.0              |
| 410       | 1197             | 0.0              | 540       | 34386            | 22.4             | 670       | 25817            | 0.6              | 800       | 1691             | 0.0              | 930       | 1315             | 0.0              |
| 415       | 2254             | 0.0              | 545       | 36784            | 24.5             | 675       | 22832            | 0.4              | 805       | 1967             | 0.0              | 935       | 1037             | 0.0              |
| 420       | 4742             | 0.0              | 550       | 39017            | 26.5             | 680       | 20201            | 0.2              | 810       | 1719             | 0.0              | 940       | 1195             | 0.0              |
| 425       | 8975             | 0.0              | 555       | 41253            | 28.2             | 685       | 17863            | 0.2              | 815       | 1436             | 0.0              | 945       | 914              | 0.0              |
| 430       | 14905            | 0.1              | 560       | 43733            | 29.7             | 690       | 15761            | 0.1              | 820       | 1465             | 0.0              | 950       | 1373             | 0.0              |
| 435       | 22096            | 0.3              | 565       | 46694            | 31.0             | 695       | 13762            | 0.1              | 825       | 1365             | 0.0              | 955       | 692              | 0.0              |
| 440       | 28868            | 0.5              | 570       | 49493            | 32.2             | 700       | 12064            | 0.0              | 830       | 1404             | 0.0              | 960       | 844              | 0.0              |
| 445       | 31683            | 0.7              | 575       | 52587            | 32.7             | 705       | 10683            | 0.0              | 835       | 1222             | 0.0              | 965       | 1427             | 0.0              |
| 450       | 25690            | 0.7              | 580       | 55129            | 32.8             | 710       | 9480             | 0.0              | 840       | 1144             | 0.0              | 970       | 654              | 0.0              |
| 455       | 14802            | 0.5              | 585       | 57737            | 32.1             | 715       | 8582             | 0.0              | 845       | 1078             | 0.0              | 975       | 1127             | 0.0              |
| 460       | 8755             | 0.4              | 590       | 59688            | 30.9             | 720       | 7530             | 0.0              | 850       | 1254             | 0.0              | 980       | 1935             | 0.0              |
| 465       | 5978             | 0.3              | 595       | 61458            | 29.1             | 725       | 6824             | 0.0              | 855       | 1203             | 0.0              | 985       | 1754             | 0.0              |
| 470       | 4047             | 0.3              | 600       | 62443            | 26.9             | 730       | 5968             | 0.0              | 860       | 1183             | 0.0              | 990       | 1822             | 0.0              |
| 475       | 3070             | 0.2              | 605       | 62403            | 24.2             | 735       | 5266             | 0.0              | 865       | 1505             | 0.0              | 995       | 1176             | 0.0              |
| 480       | 2814             | 0.3              | 610       | 61581            | 21.2             | 740       | 4712             | 0.0              | 870       | 1624             | 0.0              | 1000      | 2143             | 0.0              |
| 485       | 2926             | 0.3              | 615       | 60386            | 18.2             | 745       | 4264             | 0.0              | 875       | 1559             | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2012-088-8-R2

### Scotopic Flux vs. Wavelength



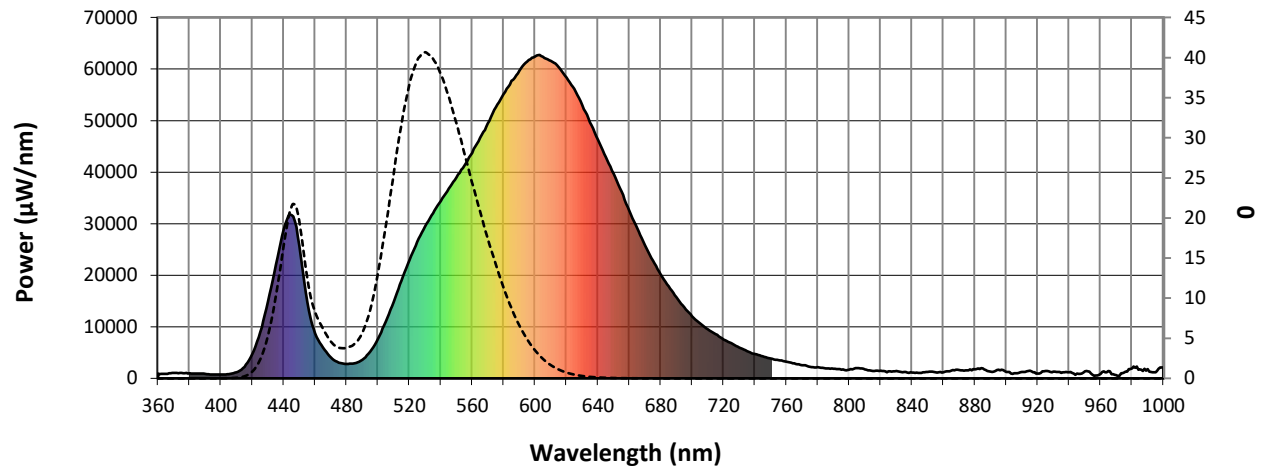
Scotopic Lumens: 1073.3

S/P: 0.36

| 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       | 926              | 0.0              | 490       | 3601             | 5.5              | 620       | 58340            | 0.7              | 750       | 3861             | 0.0              | 880       | 1742             | 0.0              |
| 365       | 867              | 0.0              | 495       | 5135             | 8.3              | 625       | 56180            | 0.5              | 755       | 3520             | 0.0              | 885       | 1920             | 0.0              |
| 370       | 1032             | 0.0              | 500       | 7689             | 12.9             | 630       | 53018            | 0.3              | 760       | 3223             | 0.0              | 890       | 1286             | 0.0              |
| 375       | 1034             | 0.0              | 505       | 11015            | 18.7             | 635       | 49683            | 0.2              | 765       | 2910             | 0.0              | 895       | 1660             | 0.0              |
| 380       | 979              | 0.0              | 510       | 14817            | 25.1             | 640       | 46308            | 0.1              | 770       | 2560             | 0.0              | 900       | 1274             | 0.0              |
| 385       | 938              | 0.0              | 515       | 18962            | 31.4             | 645       | 42927            | 0.1              | 775       | 2242             | 0.0              | 905       | 1020             | 0.0              |
| 390       | 893              | 0.0              | 520       | 22933            | 36.5             | 650       | 39728            | 0.0              | 780       | 2156             | 0.0              | 910       | 1258             | 0.0              |
| 395       | 757              | 0.0              | 525       | 26438            | 39.6             | 655       | 36260            | 0.0              | 785       | 1926             | 0.0              | 915       | 1481             | 0.0              |
| 400       | 728              | 0.0              | 530       | 29492            | 40.7             | 660       | 32543            | 0.0              | 790       | 1871             | 0.0              | 920       | 923              | 0.0              |
| 405       | 812              | 0.0              | 535       | 32054            | 39.9             | 665       | 29105            | 0.0              | 795       | 1697             | 0.0              | 925       | 1444             | 0.0              |
| 410       | 1197             | 0.1              | 540       | 34386            | 38.0             | 670       | 25817            | 0.0              | 800       | 1691             | 0.0              | 930       | 1315             | 0.0              |
| 415       | 2254             | 0.2              | 545       | 36784            | 35.3             | 675       | 22832            | 0.0              | 805       | 1967             | 0.0              | 935       | 1037             | 0.0              |
| 420       | 4742             | 0.8              | 550       | 39017            | 31.9             | 680       | 20201            | 0.0              | 810       | 1719             | 0.0              | 940       | 1195             | 0.0              |
| 425       | 8975             | 2.2              | 555       | 41253            | 28.2             | 685       | 17863            | 0.0              | 815       | 1436             | 0.0              | 945       | 914              | 0.0              |
| 430       | 14905            | 5.1              | 560       | 43733            | 24.4             | 690       | 15761            | 0.0              | 820       | 1465             | 0.0              | 950       | 1373             | 0.0              |
| 435       | 22096            | 9.9              | 565       | 46694            | 20.9             | 695       | 13762            | 0.0              | 825       | 1365             | 0.0              | 955       | 692              | 0.0              |
| 440       | 28868            | 16.1             | 570       | 49493            | 17.5             | 700       | 12064            | 0.0              | 830       | 1404             | 0.0              | 960       | 844              | 0.0              |
| 445       | 31683            | 21.2             | 575       | 52587            | 14.3             | 705       | 10683            | 0.0              | 835       | 1222             | 0.0              | 965       | 1427             | 0.0              |
| 450       | 25690            | 19.9             | 580       | 55129            | 11.4             | 710       | 9480             | 0.0              | 840       | 1144             | 0.0              | 970       | 654              | 0.0              |
| 455       | 14802            | 12.9             | 585       | 57737            | 8.8              | 715       | 8582             | 0.0              | 845       | 1078             | 0.0              | 975       | 1127             | 0.0              |
| 460       | 8755             | 8.5              | 590       | 59688            | 6.6              | 720       | 7530             | 0.0              | 850       | 1254             | 0.0              | 980       | 1935             | 0.0              |
| 465       | 5978             | 6.3              | 595       | 61458            | 4.9              | 725       | 6824             | 0.0              | 855       | 1203             | 0.0              | 985       | 1754             | 0.0              |
| 470       | 4047             | 4.7              | 600       | 62443            | 3.5              | 730       | 5968             | 0.0              | 860       | 1183             | 0.0              | 990       | 1822             | 0.0              |
| 475       | 3070             | 3.8              | 605       | 62403            | 2.5              | 735       | 5266             | 0.0              | 865       | 1505             | 0.0              | 995       | 1176             | 0.0              |
| 480       | 2814             | 3.8              | 610       | 61581            | 1.7              | 740       | 4712             | 0.0              | 870       | 1624             | 0.0              | 1000      | 2143             | 0.0              |
| 485       | 2926             | 4.2              | 615       | 60386            | 1.1              | 745       | 4264             | 0.0              | 875       | 1559             | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2012-088-8-R2

### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 3157.6**      **S/P: 1.07**

| 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       | 926              | 0.0              | 490       | 3601             | 3.0              | 620       | 58340            | 0.0              | 750       | 3861             | 0.0              | 880       | 1742             | 0.0              |
| 365       | 867              | 0.0              | 495       | 5135             | 4.2              | 625       | 56180            | 0.0              | 755       | 3520             | 0.0              | 885       | 1920             | 0.0              |
| 370       | 1032             | 0.0              | 500       | 7689             | 6.2              | 630       | 53018            | 0.0              | 760       | 3223             | 0.0              | 890       | 1286             | 0.0              |
| 375       | 1034             | 0.0              | 505       | 11015            | 8.5              | 635       | 49683            | 0.0              | 765       | 2910             | 0.0              | 895       | 1660             | 0.0              |
| 380       | 979              | 0.0              | 510       | 14817            | 10.6             | 640       | 46308            | 0.0              | 770       | 2560             | 0.0              | 900       | 1274             | 0.0              |
| 385       | 938              | 0.0              | 515       | 18962            | 12.4             | 645       | 42927            | 0.0              | 775       | 2242             | 0.0              | 905       | 1020             | 0.0              |
| 390       | 893              | 0.0              | 520       | 22933            | 13.4             | 650       | 39728            | 0.0              | 780       | 2156             | 0.0              | 910       | 1258             | 0.0              |
| 395       | 757              | 0.0              | 525       | 26438            | 13.4             | 655       | 36260            | 0.0              | 785       | 1926             | 0.0              | 915       | 1481             | 0.0              |
| 400       | 728              | 0.0              | 530       | 29492            | 12.7             | 660       | 32543            | 0.0              | 790       | 1871             | 0.0              | 920       | 923              | 0.0              |
| 405       | 812              | 0.0              | 535       | 32054            | 11.5             | 665       | 29105            | 0.0              | 795       | 1697             | 0.0              | 925       | 1444             | 0.0              |
| 410       | 1197             | 0.0              | 540       | 34386            | 10.1             | 670       | 25817            | 0.0              | 800       | 1691             | 0.0              | 930       | 1315             | 0.0              |
| 415       | 2254             | 0.1              | 545       | 36784            | 8.5              | 675       | 22832            | 0.0              | 805       | 1967             | 0.0              | 935       | 1037             | 0.0              |
| 420       | 4742             | 0.5              | 550       | 39017            | 7.0              | 680       | 20201            | 0.0              | 810       | 1719             | 0.0              | 940       | 1195             | 0.0              |
| 425       | 8975             | 1.4              | 555       | 41253            | 5.6              | 685       | 17863            | 0.0              | 815       | 1436             | 0.0              | 945       | 914              | 0.0              |
| 430       | 14905            | 3.1              | 560       | 43733            | 4.3              | 690       | 15761            | 0.0              | 820       | 1465             | 0.0              | 950       | 1373             | 0.0              |
| 435       | 22096            | 5.9              | 565       | 46694            | 3.3              | 695       | 13762            | 0.0              | 825       | 1365             | 0.0              | 955       | 692              | 0.0              |
| 440       | 28868            | 9.6              | 570       | 49493            | 2.4              | 700       | 12064            | 0.0              | 830       | 1404             | 0.0              | 960       | 844              | 0.0              |
| 445       | 31683            | 12.5             | 575       | 52587            | 1.8              | 705       | 10683            | 0.0              | 835       | 1222             | 0.0              | 965       | 1427             | 0.0              |
| 450       | 25690            | 11.8             | 580       | 55129            | 1.2              | 710       | 9480             | 0.0              | 840       | 1144             | 0.0              | 970       | 654              | 0.0              |
| 455       | 14802            | 7.8              | 585       | 57737            | 0.9              | 715       | 8582             | 0.0              | 845       | 1078             | 0.0              | 975       | 1127             | 0.0              |
| 460       | 8755             | 5.2              | 590       | 59688            | 0.6              | 720       | 7530             | 0.0              | 850       | 1254             | 0.0              | 980       | 1935             | 0.0              |
| 465       | 5978             | 3.9              | 595       | 61458            | 0.4              | 725       | 6824             | 0.0              | 855       | 1203             | 0.0              | 985       | 1754             | 0.0              |
| 470       | 4047             | 2.9              | 600       | 62443            | 0.3              | 730       | 5968             | 0.0              | 860       | 1183             | 0.0              | 990       | 1822             | 0.0              |
| 475       | 3070             | 2.3              | 605       | 62403            | 0.2              | 735       | 5266             | 0.0              | 865       | 1505             | 0.0              | 995       | 1176             | 0.0              |
| 480       | 2814             | 2.3              | 610       | 61581            | 0.1              | 740       | 4712             | 0.0              | 870       | 1624             | 0.0              | 1000      | 2143             | 0.0              |
| 485       | 2926             | 2.4              | 615       | 60386            | 0.1              | 745       | 4264             | 0.0              | 875       | 1559             | 0.0              |           |                  |                  |

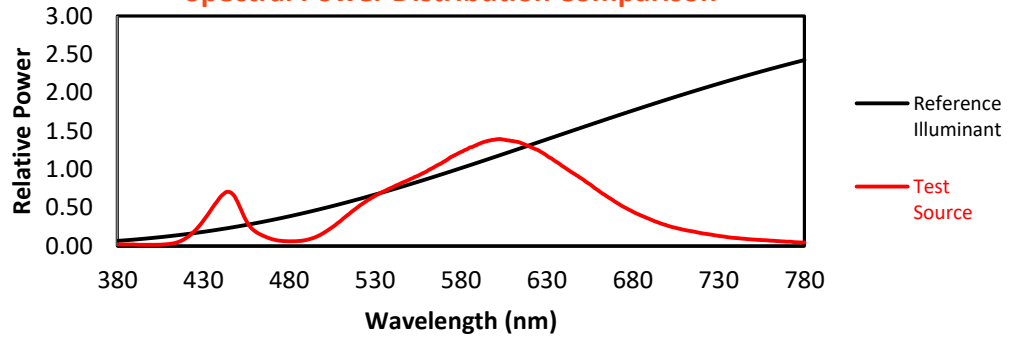
REPORT NUMBER: SP1-2012-088-8-R2

TM-30-18

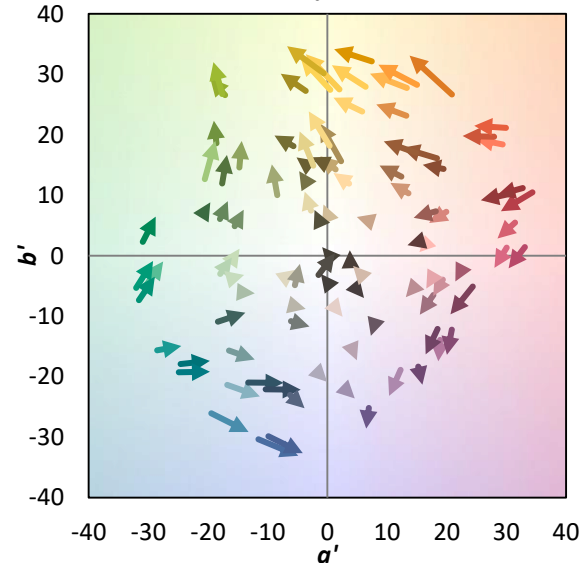
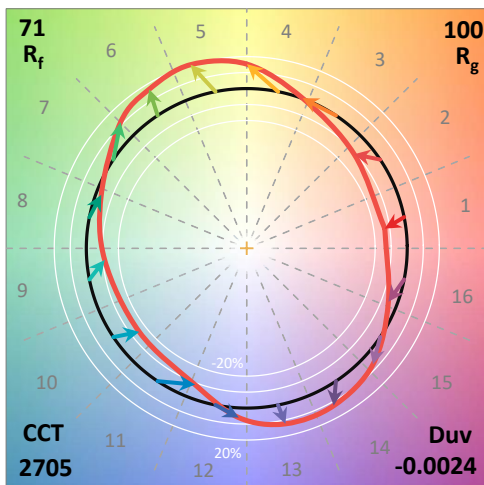
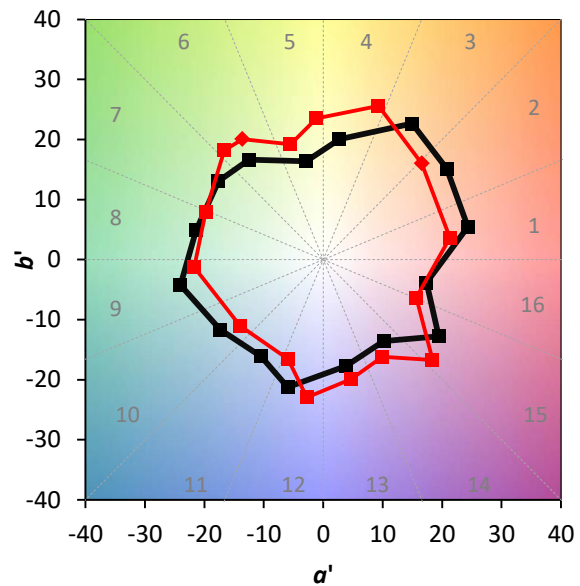
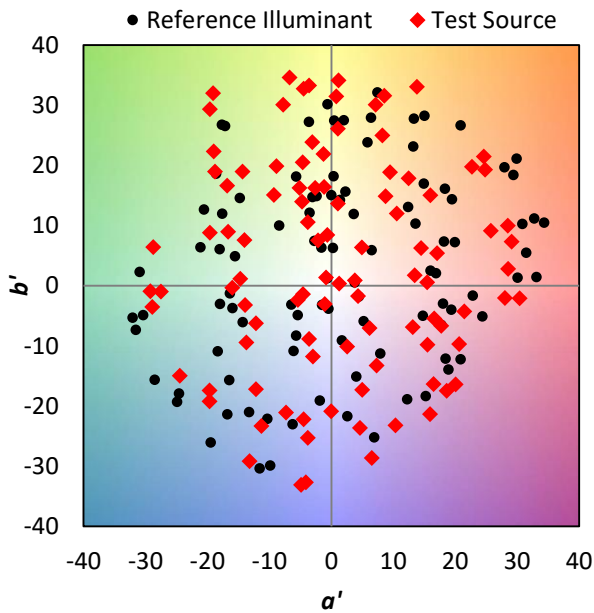
### Summary

$R_f = 71.2$   
 $R_g = 100.1$   
 CIE  $R_a = 73.8$   
 $R_g = -7.6$

### Spectral Power Distribution Comparison



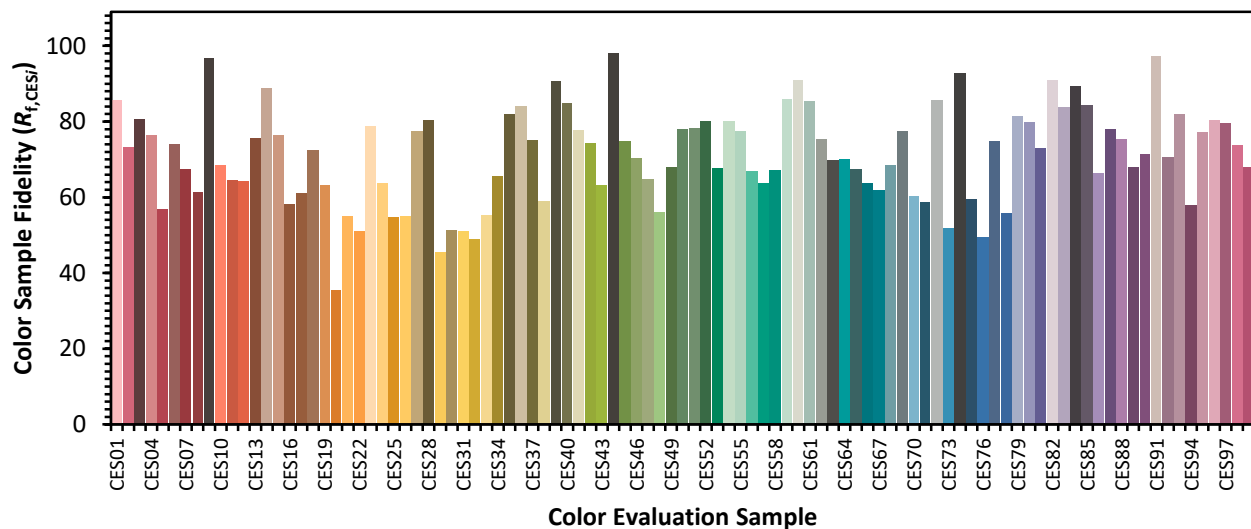
### Color Vector Graphics

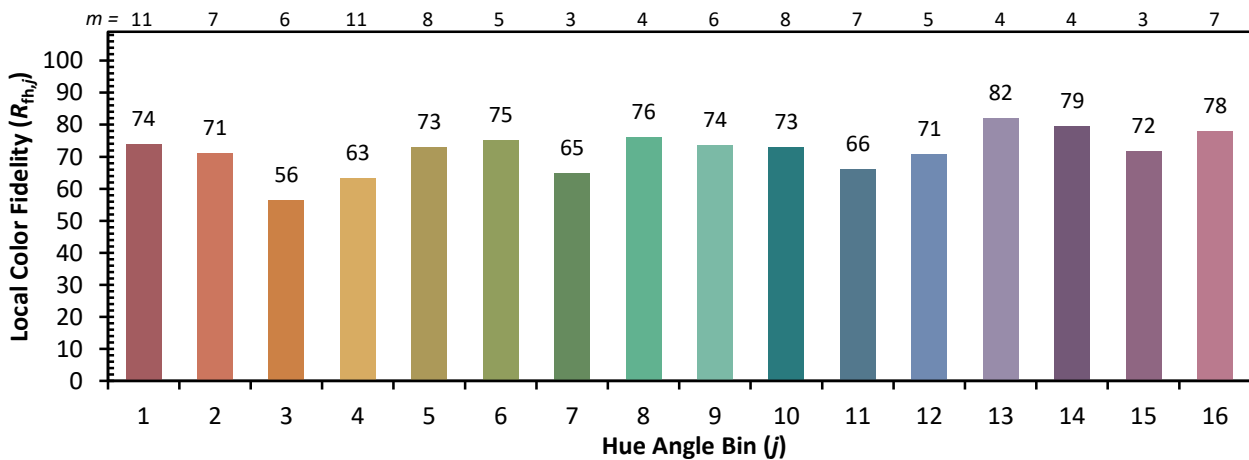
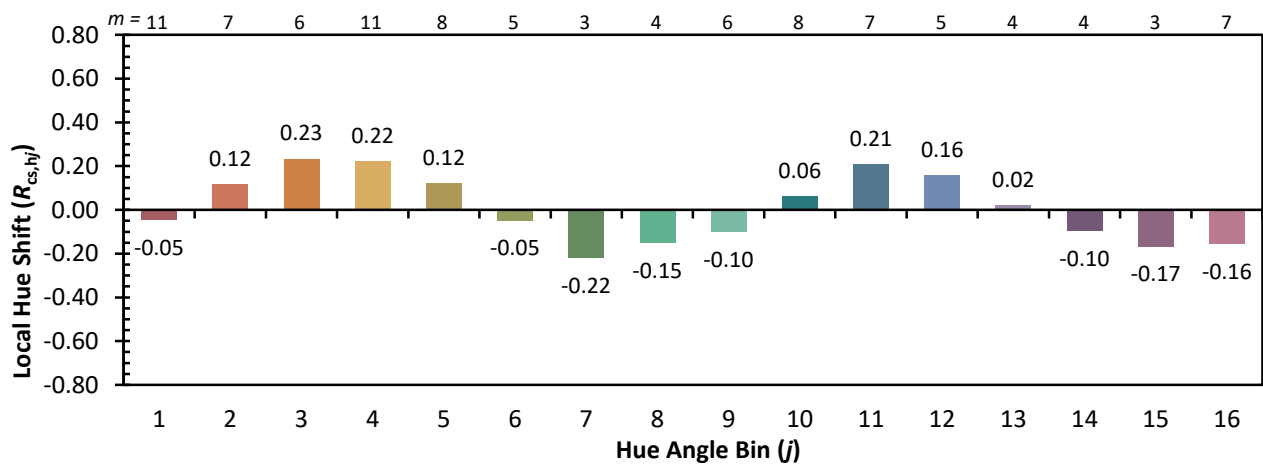
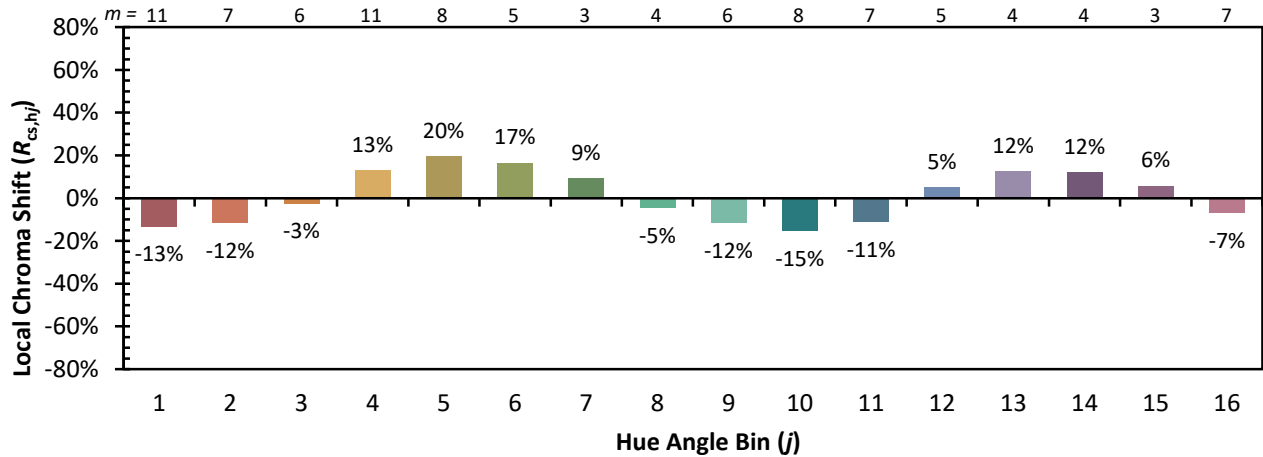


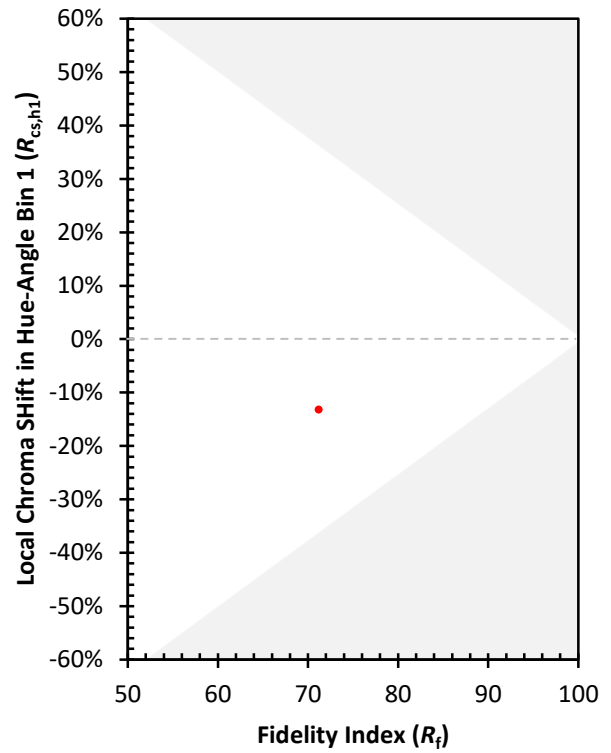
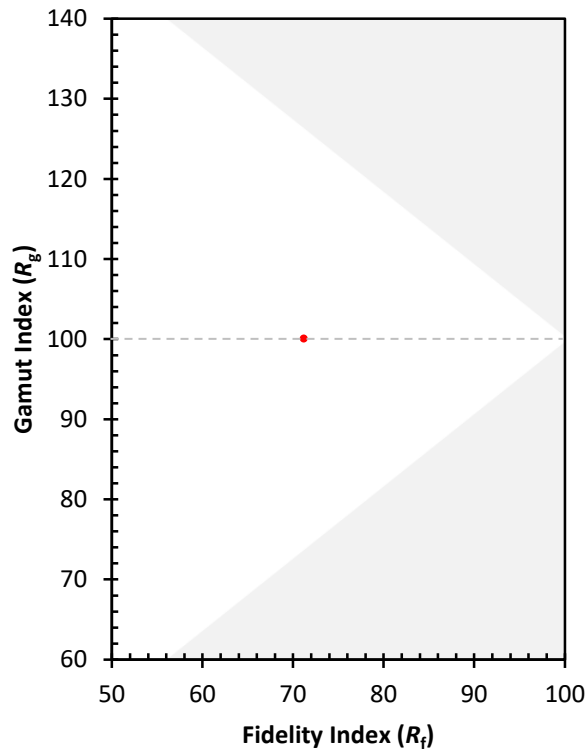


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 55 | CES51 = 78 | CES76 = 50 |
| CES02 = 63 | CES27 = 77 | CES52 = 80 | CES77 = 75 |
| CES03 = 31 | CES28 = 80 | CES53 = 68 | CES78 = 56 |
| CES04 = 71 | CES29 = 46 | CES54 = 80 | CES79 = 81 |
| CES05 = 50 | CES30 = 51 | CES55 = 78 | CES80 = 80 |
| CES06 = 52 | CES31 = 51 | CES56 = 67 | CES81 = 73 |
| CES07 = 43 | CES32 = 49 | CES57 = 64 | CES82 = 91 |
| CES08 = 41 | CES33 = 55 | CES58 = 67 | CES83 = 84 |
| CES09 = 29 | CES34 = 65 | CES59 = 86 | CES84 = 89 |
| CES10 = 77 | CES35 = 82 | CES60 = 91 | CES85 = 84 |
| CES11 = 60 | CES36 = 84 | CES61 = 85 | CES86 = 66 |
| CES12 = 66 | CES37 = 75 | CES62 = 75 | CES87 = 78 |
| CES13 = 44 | CES38 = 59 | CES63 = 70 | CES88 = 75 |
| CES14 = 74 | CES39 = 91 | CES64 = 70 | CES89 = 68 |
| CES15 = 72 | CES40 = 85 | CES65 = 67 | CES90 = 71 |
| CES16 = 48 | CES41 = 78 | CES66 = 64 | CES91 = 97 |
| CES17 = 51 | CES42 = 74 | CES67 = 62 | CES92 = 71 |
| CES18 = 57 | CES43 = 63 | CES68 = 68 | CES93 = 82 |
| CES19 = 73 | CES44 = 98 | CES69 = 77 | CES94 = 58 |
| CES20 = 67 | CES45 = 75 | CES70 = 60 | CES95 = 77 |
| CES21 = 88 | CES46 = 70 | CES71 = 59 | CES96 = 80 |
| CES22 = 80 | CES47 = 65 | CES72 = 86 | CES97 = 80 |
| CES23 = 92 | CES48 = 56 | CES73 = 52 | CES98 = 74 |
| CES24 = 91 | CES49 = 68 | CES74 = 93 | CES99 = 68 |
| CES25 = 73 | CES50 = 78 | CES75 = 59 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**


(END OF REPORT)