

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: INVUE

Report Number: P672038

Luminaire Tested: **CCP-SA-2A-840-U-AFL**

Issue Date: 04/16/2023

**Test Information**

Test Method: LM-79-08  
Report Number: P672038  
Test Lab: INNOVATION CENTER(G2)  
Issue Date: 04/16/2023  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: CCP-SA-2A-840-U-AFL  
Description: INVUE CLEAR CURVE POLE MOUNT LIGHT SQUARE LUMINAIRE @350mA w/ AFL  
distribution lens  
Light Source: (32) 4000K CCT, 80 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 4707.8 lumens  
Efficiency: N/A  
Efficacy: 130.0 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B1 - U0 - G1

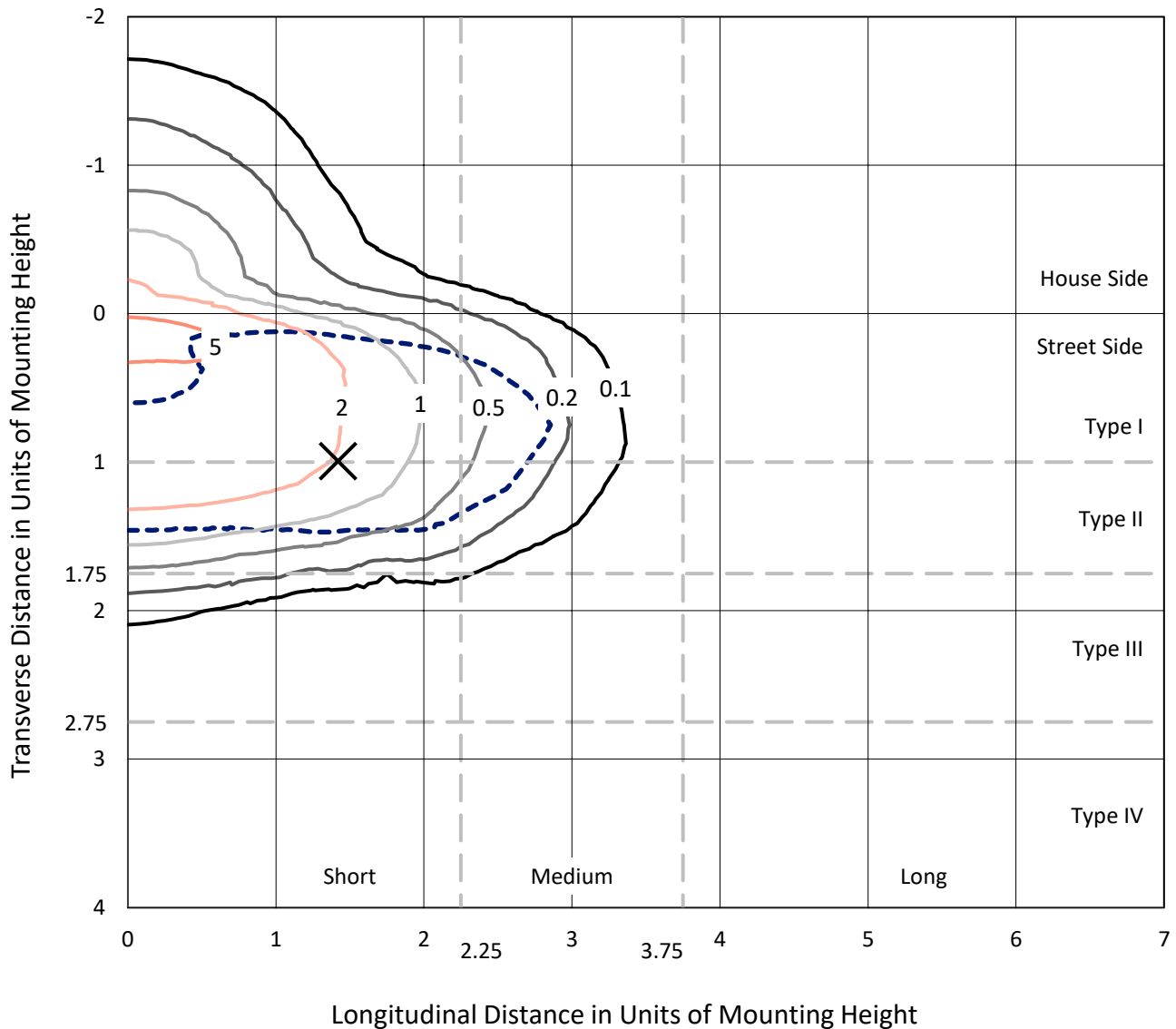
Input Watts (W): 36.2  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 25 FT

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## Iso-Footcandle Lines of Horizontal Illumination

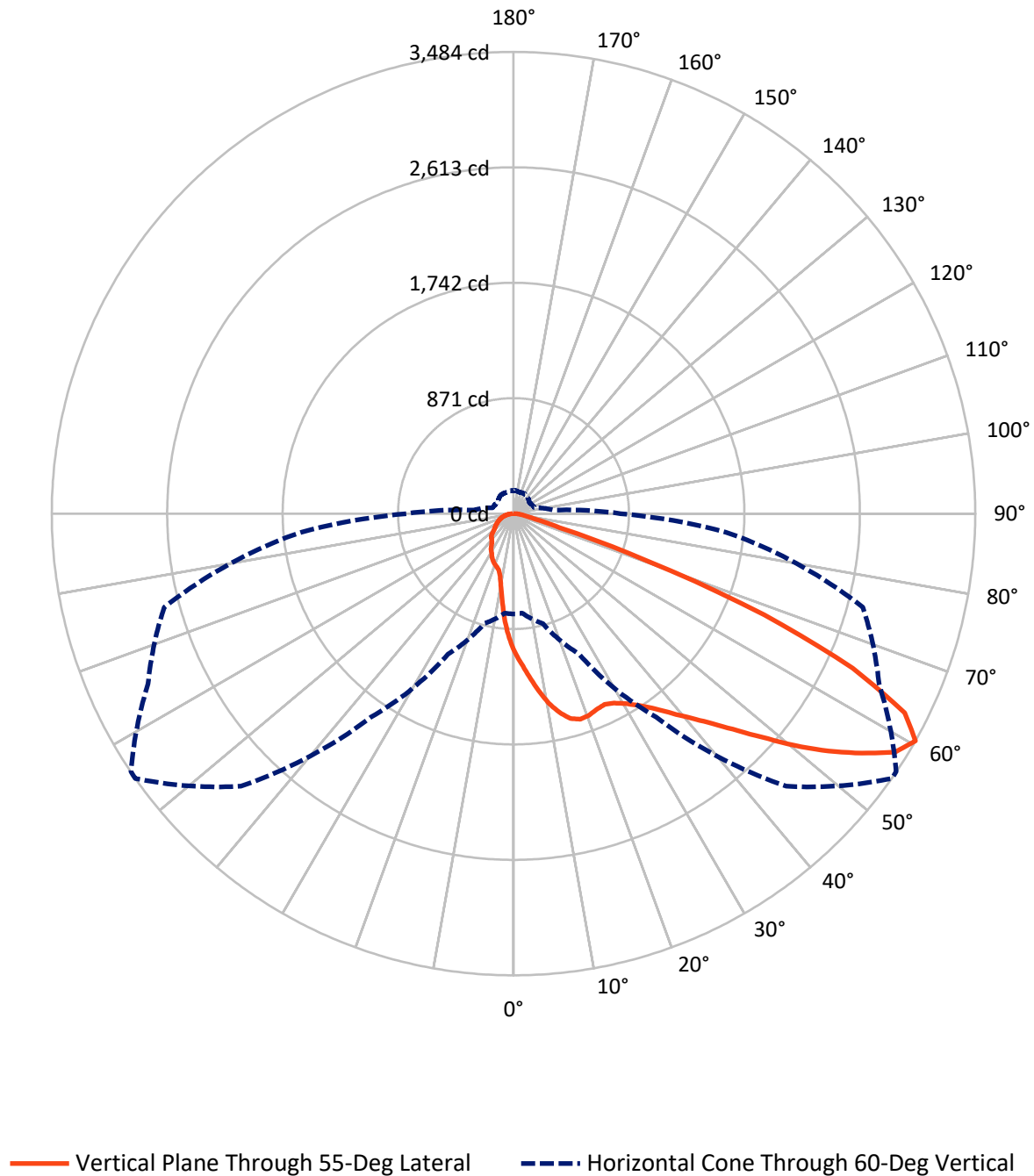
× Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 6.5 fc  
 Type II - Short - N/A

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## Luminous Intensity Polar Plot



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CATALOG NUMBER: CCP-SA-2A-840-U-AFL

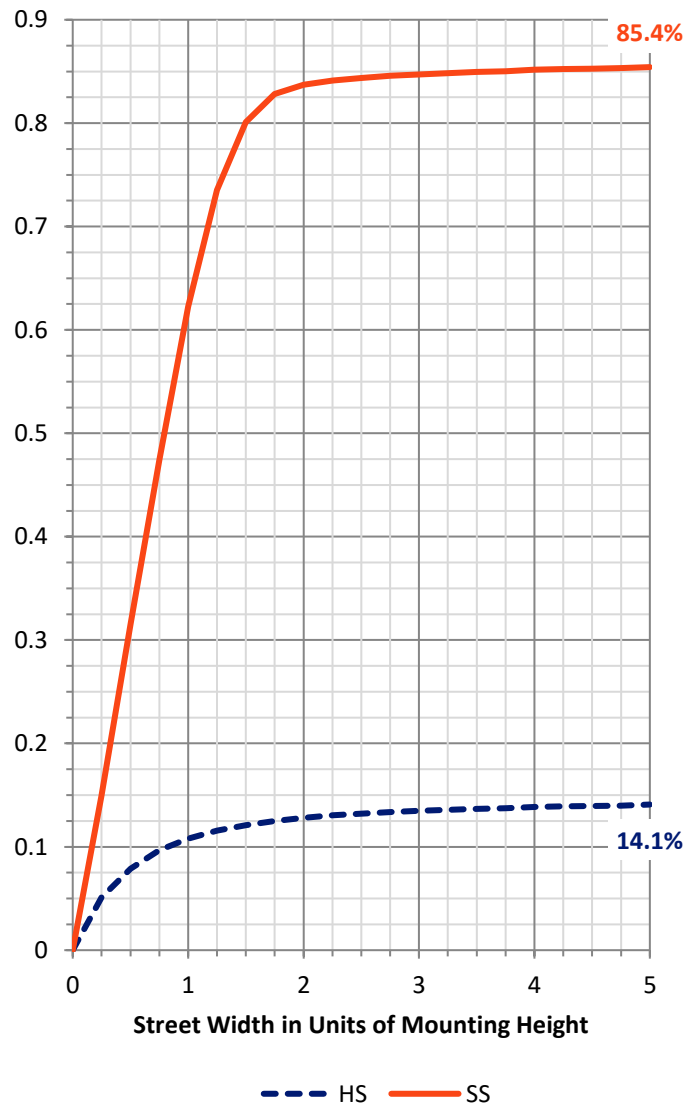
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 676.8    | 0.0    | 676.8  |
|                    | % Fixture | 14.4     | 0.0    | 14.4   |
| <b>Street Side</b> | Lumens    | 4031.0   | 0.0    | 4031.0 |
|                    | % Fixture | 85.6     | 0.0    | 85.6   |
| <b>Total</b>       | Lumens    | 4707.8   | 0.0    | 4707.8 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**Coefficient of Utilization**

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 97.7   | 2.1       |
| 10°-20°   | 276.8  | 5.9       |
| 20°-30°   | 450.7  | 9.6       |
| 30°-40°   | 673.7  | 14.3      |
| 40°-50°   | 990.1  | 21.0      |
| 50°-60°   | 1160.5 | 24.6      |
| 60°-70°   | 765.1  | 16.3      |
| 70°-80°   | 243.6  | 5.2       |
| 80°-90°   | 49.5   | 1.1       |
| 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°    | 4707.8 | 100.0     |
| 0°-180°   | 4707.8 | 100.0     |



REPORT NUMBER: P672038

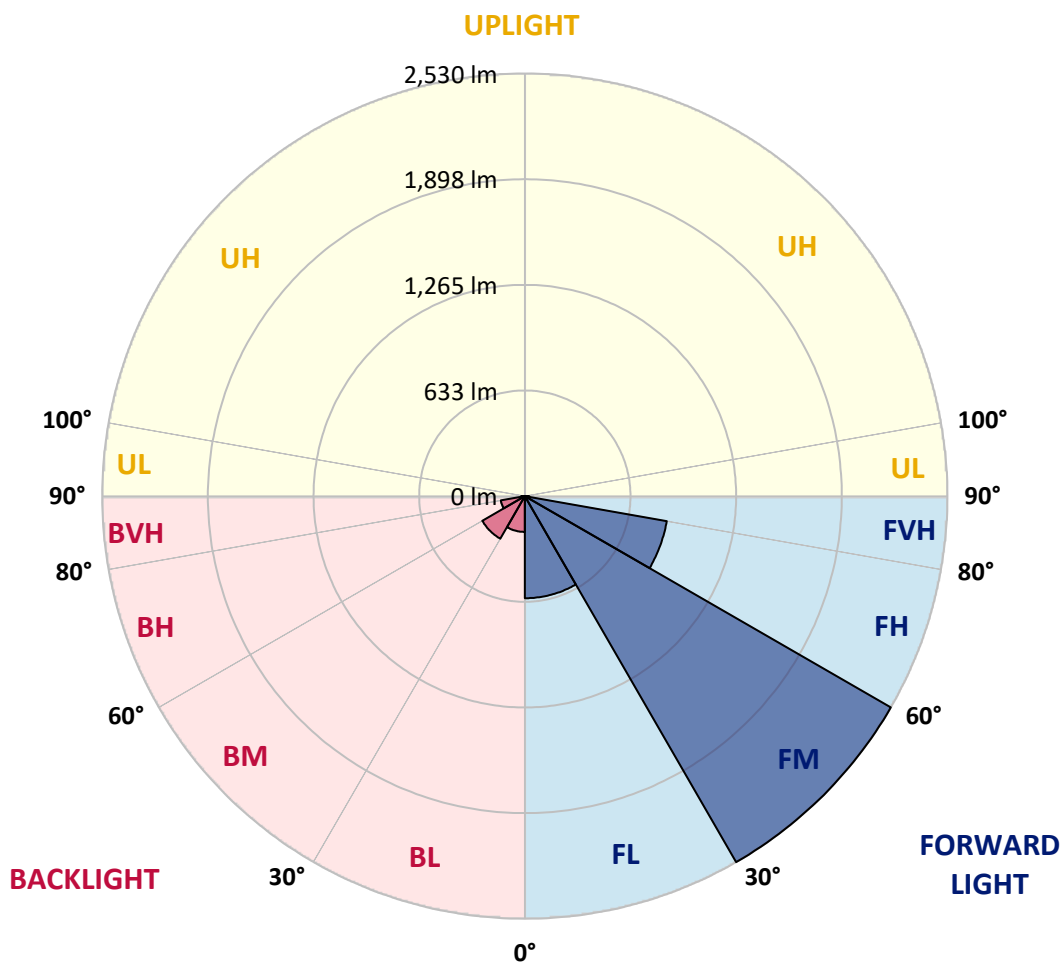
CATALOG NUMBER: CCP-SA-2A-840-U-AFL

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 611.0  | 13.0      |                         |      |         |
| FM   | (30°-60°)   | 2530.1 | 53.7      |                         |      |         |
| FH   | (60°-80°)   | 862.7  | 18.3      |                         |      | G1/1800 |
| FVH  | (80°-90°)   | 27.2   | 0.6       |                         |      | G1/100  |
| BL   | (0°-30°)    | 214.2  | 4.6       | B1/500                  |      |         |
| BM   | (30°-60°)   | 294.1  | 6.2       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 146.0  | 3.1       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 22.4   | 0.5       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G1**

Type II Short





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CATALOG NUMBER: CCP-SA-2A-840-U-AFL

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 56°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 |
| 2.5°  | 1215.0 | 1210.6 | 1210.6 | 1199.3 | 1182.6 | 1159.4 | 1131.8 | 1125.0 | 1114.4 | 1087.4 | 1052.6 |
| 5°    | 1400.3 | 1395.5 | 1389.0 | 1369.3 | 1338.2 | 1291.8 | 1233.5 | 1222.9 | 1185.0 | 1129.4 | 1066.6 |
| 7.5°  | 1522.8 | 1520.1 | 1518.0 | 1501.0 | 1470.2 | 1424.5 | 1346.4 | 1334.4 | 1270.3 | 1178.2 | 1079.9 |
| 10°   | 1510.2 | 1518.4 | 1532.7 | 1544.6 | 1550.8 | 1527.2 | 1453.9 | 1439.9 | 1360.4 | 1234.8 | 1099.7 |
| 12.5° | 1391.8 | 1403.4 | 1430.0 | 1478.8 | 1535.1 | 1580.5 | 1538.8 | 1531.0 | 1456.6 | 1294.9 | 1124.6 |
| 15°   | 1303.7 | 1308.5 | 1321.5 | 1357.7 | 1441.6 | 1562.7 | 1604.7 | 1597.5 | 1546.3 | 1372.0 | 1153.3 |
| 17.5° | 1276.4 | 1278.5 | 1281.6 | 1293.5 | 1350.8 | 1493.5 | 1631.6 | 1638.5 | 1633.3 | 1452.2 | 1185.7 |
| 20°   | 1290.1 | 1291.5 | 1291.8 | 1293.8 | 1321.1 | 1435.4 | 1624.5 | 1636.1 | 1709.8 | 1532.3 | 1217.8 |
| 22.5° | 1342.6 | 1340.9 | 1338.5 | 1330.7 | 1346.1 | 1425.2 | 1605.4 | 1623.8 | 1768.8 | 1605.4 | 1247.4 |
| 25°   | 1434.4 | 1432.0 | 1415.3 | 1398.9 | 1405.4 | 1462.1 | 1595.1 | 1614.9 | 1814.9 | 1674.3 | 1269.3 |
| 27.5° | 1543.6 | 1541.2 | 1524.2 | 1493.1 | 1486.3 | 1523.5 | 1619.0 | 1631.3 | 1848.6 | 1735.4 | 1278.8 |
| 30°   | 1656.9 | 1656.9 | 1635.7 | 1599.9 | 1578.1 | 1593.8 | 1663.0 | 1672.9 | 1874.2 | 1794.4 | 1285.0 |
| 32.5° | 1780.4 | 1783.8 | 1751.1 | 1710.1 | 1685.9 | 1676.7 | 1724.8 | 1733.3 | 1911.4 | 1864.0 | 1297.9 |
| 35°   | 1939.1 | 1931.6 | 1891.6 | 1837.7 | 1798.8 | 1778.0 | 1801.2 | 1811.1 | 1966.0 | 1950.7 | 1318.8 |
| 37.5° | 2117.5 | 2104.2 | 2055.1 | 1990.6 | 1922.7 | 1887.9 | 1903.2 | 1905.6 | 2046.9 | 2063.6 | 1356.6 |
| 40°   | 2264.9 | 2262.5 | 2220.9 | 2159.8 | 2074.2 | 2027.4 | 2019.9 | 2021.3 | 2159.1 | 2197.4 | 1414.0 |
| 42.5° | 2389.1 | 2380.2 | 2372.7 | 2351.2 | 2260.5 | 2183.7 | 2153.0 | 2153.3 | 2281.0 | 2335.5 | 1471.6 |
| 45°   | 2444.0 | 2442.3 | 2464.5 | 2519.8 | 2454.6 | 2364.2 | 2320.5 | 2326.7 | 2420.5 | 2477.5 | 1527.2 |
| 47.5° | 2420.5 | 2421.9 | 2481.2 | 2626.2 | 2664.8 | 2595.5 | 2518.1 | 2514.3 | 2555.6 | 2586.3 | 1576.4 |
| 50°   | 2210.3 | 2232.5 | 2393.2 | 2636.1 | 2802.7 | 2837.1 | 2749.8 | 2735.8 | 2674.0 | 2673.0 | 1606.4 |
| 52.5° | 2051.7 | 2050.6 | 2149.2 | 2535.5 | 2851.4 | 3055.1 | 2976.7 | 2945.3 | 2771.9 | 2721.8 | 1608.8 |
| 55°   | 1837.4 | 1836.0 | 1909.4 | 2241.0 | 2754.5 | 3207.3 | 3190.6 | 3151.4 | 2861.7 | 2737.8 | 1592.4 |
| 57.5° | 1391.4 | 1417.4 | 1490.4 | 1794.1 | 2447.5 | 3183.1 | 3395.0 | 3362.2 | 2949.4 | 2730.7 | 1589.3 |
| 60°   | 757.1  | 754.1  | 859.8  | 1169.3 | 1873.9 | 2908.1 | 3484.0 | 3482.3 | 3042.5 | 2727.9 | 1608.1 |
| 62.5° | 349.1  | 345.6  | 366.8  | 520.7  | 1074.5 | 2329.7 | 3312.1 | 3336.6 | 3128.8 | 2703.0 | 1606.4 |
| 65°   | 261.0  | 252.1  | 223.5  | 242.3  | 411.2  | 1390.7 | 2813.2 | 2878.7 | 2995.8 | 2600.7 | 1532.0 |
| 67.5° | 232.7  | 224.2  | 190.7  | 178.8  | 206.4  | 490.7  | 2040.7 | 2101.1 | 2505.1 | 2408.9 | 1411.6 |
| 70°   | 213.3  | 205.7  | 172.3  | 153.5  | 154.9  | 217.3  | 1068.3 | 1187.0 | 1836.0 | 2010.4 | 1203.1 |
| 72.5° | 194.5  | 188.0  | 157.6  | 135.1  | 130.3  | 143.6  | 364.1  | 439.1  | 1142.0 | 1465.1 | 897.0  |
| 75°   | 174.7  | 168.6  | 141.9  | 121.1  | 111.9  | 106.5  | 173.3  | 186.6  | 603.9  | 809.0  | 481.4  |
| 77.5° | 151.8  | 148.4  | 126.6  | 106.8  | 98.9   | 80.5   | 115.3  | 121.1  | 258.6  | 317.7  | 229.3  |
| 80°   | 132.0  | 129.3  | 112.9  | 96.9   | 88.7   | 62.1   | 79.5   | 83.6   | 127.6  | 158.7  | 128.3  |
| 82.5° | 86.0   | 92.8   | 93.5   | 83.3   | 78.1   | 49.8   | 52.5   | 55.6   | 84.6   | 93.5   | 56.0   |
| 85°   | 35.5   | 43.0   | 64.5   | 57.3   | 54.3   | 42.3   | 34.8   | 35.5   | 51.9   | 54.6   | 20.1   |
| 87.5° | 16.0   | 17.7   | 31.7   | 32.1   | 28.0   | 16.0   | 17.4   | 19.1   | 26.6   | 26.3   | 8.9    |
| 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: CCP-SA-2A-840-U-AFL

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 | 1044.1 |
| 2.5°  | 1043.1 | 1027.4 | 999.4  | 963.6  | 938.0  | 919.2  | 898.7  | 883.7  | 867.0  | 852.3  | 854.7  |
| 5°    | 1040.7 | 1010.3 | 947.5  | 881.0  | 816.2  | 762.9  | 718.6  | 685.8  | 652.0  | 638.7  | 637.0  |
| 7.5°  | 1042.7 | 991.2  | 888.2  | 779.3  | 680.7  | 612.8  | 561.3  | 530.2  | 510.8  | 499.5  | 500.2  |
| 10°   | 1042.0 | 973.1  | 824.0  | 673.9  | 566.1  | 504.0  | 472.6  | 462.3  | 460.6  | 462.0  | 464.0  |
| 12.5° | 1043.1 | 948.5  | 752.0  | 579.0  | 483.8  | 452.1  | 453.5  | 462.7  | 468.5  | 472.2  | 474.6  |
| 15°   | 1047.5 | 928.4  | 678.3  | 504.3  | 440.8  | 441.9  | 456.5  | 470.9  | 479.4  | 483.5  | 485.5  |
| 17.5° | 1054.0 | 903.2  | 612.8  | 447.7  | 422.8  | 438.4  | 457.6  | 472.9  | 479.4  | 481.8  | 483.5  |
| 20°   | 1054.7 | 874.2  | 546.6  | 408.8  | 410.8  | 431.3  | 448.0  | 460.3  | 468.5  | 471.2  | 472.6  |
| 22.5° | 1051.6 | 834.9  | 478.7  | 380.4  | 397.2  | 417.6  | 432.0  | 446.0  | 435.0  | 426.2  | 423.8  |
| 25°   | 1038.6 | 785.5  | 420.7  | 357.2  | 380.1  | 399.2  | 415.6  | 400.2  | 395.1  | 388.3  | 389.0  |
| 27.5° | 1010.6 | 723.7  | 366.1  | 335.4  | 360.0  | 387.3  | 375.3  | 373.3  | 366.8  | 360.0  | 360.0  |
| 30°   | 973.8  | 658.5  | 320.4  | 312.5  | 335.7  | 349.4  | 352.1  | 349.1  | 345.3  | 336.4  | 337.1  |
| 32.5° | 940.7  | 589.6  | 288.0  | 293.4  | 320.4  | 320.4  | 332.3  | 332.3  | 318.7  | 293.8  | 293.8  |
| 35°   | 907.9  | 524.8  | 264.1  | 277.4  | 295.1  | 300.9  | 317.3  | 295.8  | 276.4  | 265.1  | 264.4  |
| 37.5° | 882.4  | 469.5  | 248.4  | 263.8  | 270.6  | 285.2  | 285.6  | 269.9  | 263.4  | 253.2  | 252.1  |
| 40°   | 867.3  | 423.1  | 238.8  | 256.9  | 257.6  | 271.3  | 248.7  | 253.2  | 251.8  | 244.0  | 242.9  |
| 42.5° | 859.2  | 387.3  | 231.7  | 251.1  | 247.7  | 234.4  | 230.3  | 237.8  | 240.2  | 236.1  | 234.4  |
| 45°   | 852.7  | 359.3  | 225.9  | 231.0  | 239.9  | 215.6  | 213.9  | 219.7  | 224.9  | 224.5  | 223.1  |
| 47.5° | 849.3  | 339.8  | 220.8  | 218.4  | 220.1  | 204.4  | 201.0  | 203.7  | 210.2  | 214.3  | 213.9  |
| 50°   | 836.0  | 324.8  | 213.3  | 205.4  | 194.5  | 194.5  | 192.8  | 192.8  | 200.6  | 208.8  | 209.5  |
| 52.5° | 812.4  | 307.1  | 202.3  | 193.1  | 180.5  | 186.0  | 186.6  | 185.3  | 193.5  | 202.3  | 203.0  |
| 55°   | 786.5  | 293.8  | 187.7  | 181.9  | 168.9  | 178.1  | 181.2  | 179.8  | 185.3  | 191.4  | 191.1  |
| 57.5° | 786.8  | 293.4  | 175.0  | 170.6  | 158.0  | 168.2  | 175.7  | 176.1  | 175.7  | 180.2  | 180.2  |
| 60°   | 806.6  | 300.3  | 165.1  | 155.6  | 145.4  | 157.6  | 169.9  | 169.9  | 167.5  | 174.0  | 174.7  |
| 62.5° | 812.4  | 299.6  | 159.0  | 141.3  | 134.1  | 148.1  | 161.4  | 163.4  | 161.7  | 170.9  | 172.0  |
| 65°   | 761.2  | 283.5  | 152.9  | 128.3  | 123.9  | 137.5  | 150.8  | 156.6  | 154.9  | 166.8  | 168.2  |
| 67.5° | 690.3  | 262.7  | 143.3  | 116.7  | 113.3  | 127.3  | 139.9  | 146.0  | 145.7  | 161.4  | 162.1  |
| 70°   | 595.1  | 237.1  | 131.4  | 104.7  | 103.0  | 115.3  | 126.6  | 133.1  | 136.1  | 154.2  | 153.9  |
| 72.5° | 461.0  | 203.4  | 113.3  | 92.1   | 91.8   | 103.0  | 112.9  | 120.1  | 125.9  | 143.3  | 143.3  |
| 75°   | 297.2  | 160.0  | 92.5   | 79.8   | 78.5   | 89.1   | 99.3   | 107.5  | 125.2  | 152.9  | 152.5  |
| 77.5° | 181.5  | 122.2  | 74.4   | 66.5   | 66.2   | 75.7   | 86.0   | 100.0  | 136.8  | 136.1  | 132.4  |
| 80°   | 108.8  | 87.7   | 59.4   | 53.2   | 53.2   | 62.1   | 73.4   | 107.1  | 113.6  | 129.7  | 122.5  |
| 82.5° | 56.6   | 53.9   | 44.4   | 39.2   | 40.9   | 48.8   | 66.9   | 85.6   | 92.8   | 78.8   | 72.3   |
| 85°   | 23.2   | 28.7   | 27.3   | 24.9   | 25.9   | 33.8   | 64.5   | 68.6   | 54.9   | 57.7   | 58.0   |
| 87.5° | 7.8    | 12.6   | 12.6   | 9.9    | 10.9   | 23.9   | 38.2   | 22.9   | 27.6   | 16.4   | 12.3   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

INVUE

Report Number: SP1-2104-224-8

Luminaire Tested: CCW-SA-2A-840-U-SL4

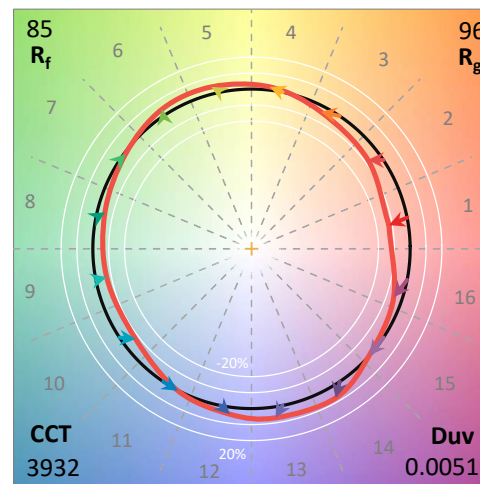
Test Date: 04/27/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-224-8  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 04/27/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: INVUE  
 Catalog Number: **CCW-SA-2A-840-U-SL4**  
 Description: INVUE WALL PACK ClearCurve Light Square

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 3932   | CRI (Ra): | 81.8 |      |      |
| CIE u':                   | 0.2235 | R1:       | 78.9 | R9:  | 0.1  |
| CIE v':                   | 0.5092 | R2:       | 86.4 | R10: | 69.8 |
| Duv:                      | 0.0051 | R3:       | 94.7 | R11: | 82.4 |
| CIE x:                    | 0.3873 | R4:       | 82.5 | R12: | 67.7 |
| CIE y:                    | 0.3923 | R5:       | 79.9 | R13: | 80.2 |
| CIE z:                    | 0.2205 | R6:       | 83.2 | R14: | 97.1 |
| Peak Wavelength (nm):     | 590    | R7:       | 86.3 |      |      |
| Dominant Wavelength (nm): | 576    | R8:       | 62.5 |      |      |
| Purity:                   | 34     |           |      |      |      |
|                           |        |           |      |      |      |
| Rf:                       | 85.2   |           |      |      |      |
| Rg:                       | 96.1   |           |      |      |      |



### Test Conditions

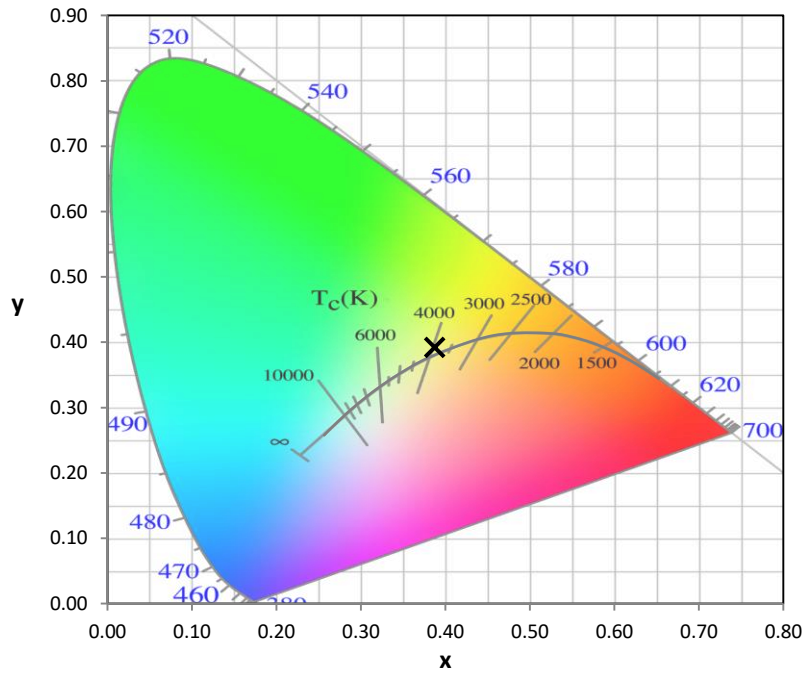
Stabilization Time: 123M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.9/41%  
 Sphere Temperature (°C): 24.2

REPORT NUMBER: SP1-2104-224-8

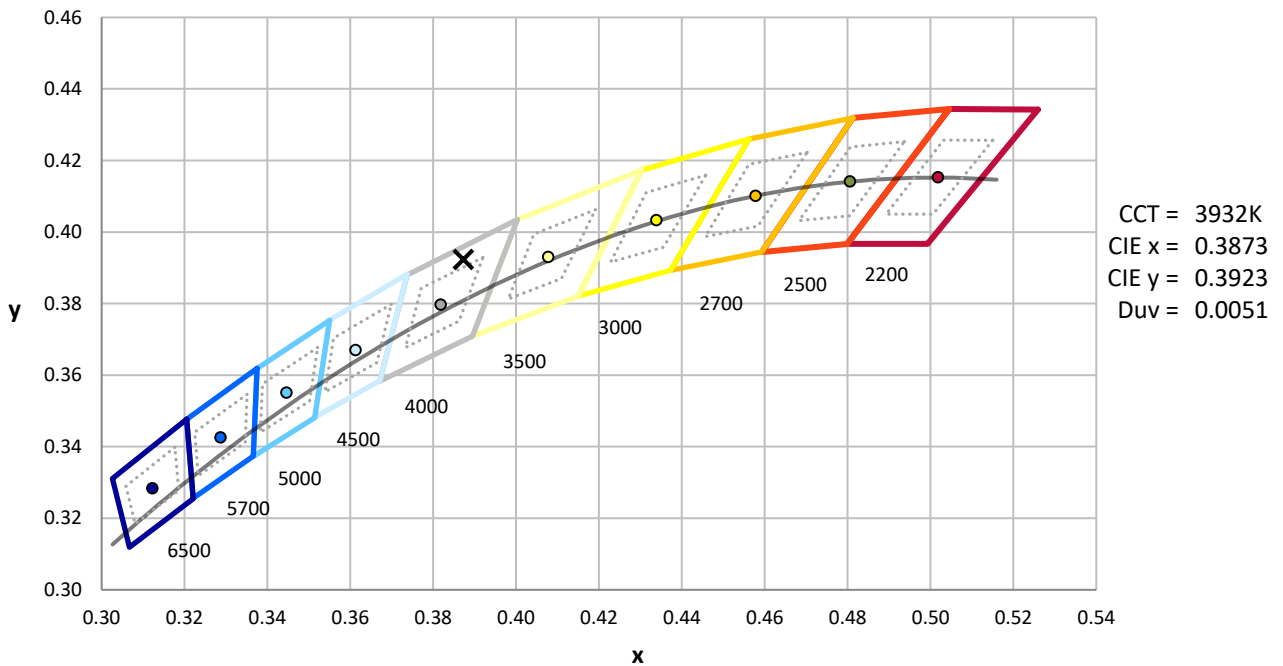
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 1/31/2021        | 7/31/2021            |
| 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            |

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**CIE 1931 Chromaticity Diagram**



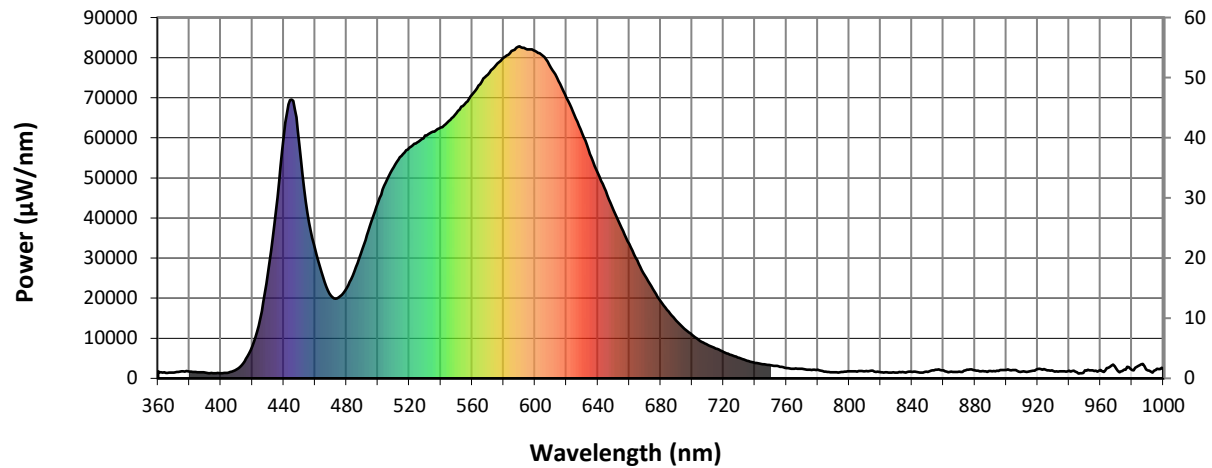
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 4000K 7-step quadrangle

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### Photopic Flux vs. Wavelength

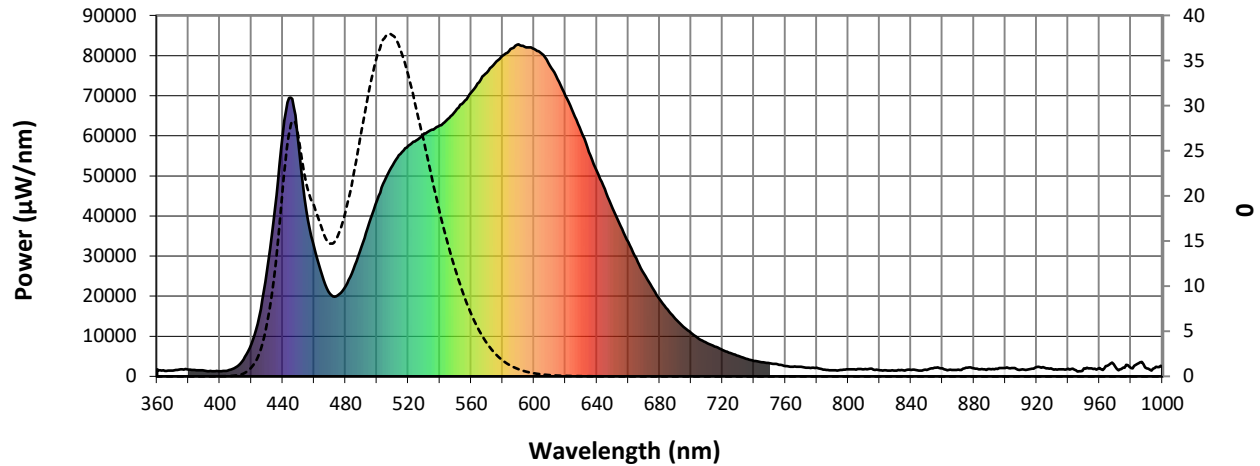


#####

| 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       | 1725             | 0.0              | 490       | 32247            | 4.6              | 620       | 69956            | 18.2             | 750       | 3261             | 0.0              | 880       | 1960             | 0.0              |
| 365       | 1400             | 0.0              | 495       | 38143            | 6.9              | 625       | 65781            | 14.5             | 755       | 3018             | 0.0              | 885       | 1828             | 0.0              |
| 370       | 1447             | 0.0              | 500       | 43918            | 9.7              | 630       | 61092            | 11.1             | 760       | 2521             | 0.0              | 890       | 1806             | 0.0              |
| 375       | 1728             | 0.0              | 505       | 48833            | 13.7             | 635       | 55954            | 8.4              | 765       | 2437             | 0.0              | 895       | 1814             | 0.0              |
| 380       | 1669             | 0.0              | 510       | 52659            | 18.1             | 640       | 51151            | 6.1              | 770       | 2407             | 0.0              | 900       | 2078             | 0.0              |
| 385       | 1495             | 0.0              | 515       | 55510            | 23.0             | 645       | 46656            | 4.5              | 775       | 2143             | 0.0              | 905       | 2072             | 0.0              |
| 390       | 1437             | 0.0              | 520       | 57534            | 27.9             | 650       | 41933            | 3.1              | 780       | 2156             | 0.0              | 910       | 1650             | 0.0              |
| 395       | 1307             | 0.0              | 525       | 58806            | 31.6             | 655       | 37478            | 2.2              | 785       | 1708             | 0.0              | 915       | 1725             | 0.0              |
| 400       | 1277             | 0.0              | 530       | 60565            | 35.7             | 660       | 33501            | 1.4              | 790       | 1555             | 0.0              | 920       | 2324             | 0.0              |
| 405       | 1471             | 0.0              | 535       | 61554            | 38.2             | 665       | 29439            | 0.9              | 795       | 1560             | 0.0              | 925       | 2173             | 0.0              |
| 410       | 2252             | 0.0              | 540       | 62542            | 40.8             | 670       | 25594            | 0.6              | 800       | 1752             | 0.0              | 930       | 1833             | 0.0              |
| 415       | 4196             | 0.0              | 545       | 64150            | 42.7             | 675       | 22306            | 0.4              | 805       | 1696             | 0.0              | 935       | 1740             | 0.0              |
| 420       | 7969             | 0.0              | 550       | 66171            | 45.0             | 680       | 19204            | 0.2              | 810       | 1762             | 0.0              | 940       | 1956             | 0.0              |
| 425       | 14965            | 0.1              | 555       | 68352            | 46.7             | 685       | 16645            | 0.1              | 815       | 1884             | 0.0              | 945       | 1549             | 0.0              |
| 430       | 26348            | 0.2              | 560       | 70775            | 48.1             | 690       | 14365            | 0.1              | 820       | 1502             | 0.0              | 950       | 2026             | 0.0              |
| 435       | 41840            | 0.5              | 565       | 73374            | 48.8             | 695       | 12367            | 0.1              | 825       | 1454             | 0.0              | 955       | 1971             | 0.0              |
| 440       | 60229            | 0.9              | 570       | 75776            | 49.3             | 700       | 10847            | 0.0              | 830       | 1466             | 0.0              | 960       | 2048             | 0.0              |
| 445       | 69537            | 1.4              | 575       | 78035            | 48.6             | 705       | 9369             | 0.0              | 835       | 1541             | 0.0              | 965       | 2608             | 0.0              |
| 450       | 58253            | 1.5              | 580       | 79996            | 47.5             | 710       | 8303             | 0.0              | 840       | 1616             | 0.0              | 970       | 2403             | 0.0              |
| 455       | 41363            | 1.4              | 585       | 81672            | 45.4             | 715       | 7458             | 0.0              | 845       | 1445             | 0.0              | 975       | 2154             | 0.0              |
| 460       | 32336            | 1.3              | 590       | 82819            | 42.8             | 720       | 6565             | 0.0              | 850       | 1636             | 0.0              | 980       | 2109             | 0.0              |
| 465       | 25279            | 1.3              | 595       | 82030            | 38.9             | 725       | 5799             | 0.0              | 855       | 2149             | 0.0              | 985       | 3271             | 0.0              |
| 470       | 20560            | 1.3              | 600       | 81639            | 35.2             | 730       | 5071             | 0.0              | 860       | 2002             | 0.0              | 990       | 1987             | 0.0              |
| 475       | 20192            | 1.6              | 605       | 80430            | 31.1             | 735       | 4394             | 0.0              | 865       | 1653             | 0.0              | 995       | 2115             | 0.0              |
| 480       | 22473            | 2.1              | 610       | 77509            | 26.6             | 740       | 3856             | 0.0              | 870       | 1669             | 0.0              | 1000      | 2424             | 0.0              |
| 485       | 26686            | 3.2              | 615       | 74116            | 22.4             | 745       | 3544             | 0.0              | 875       | 2164             | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



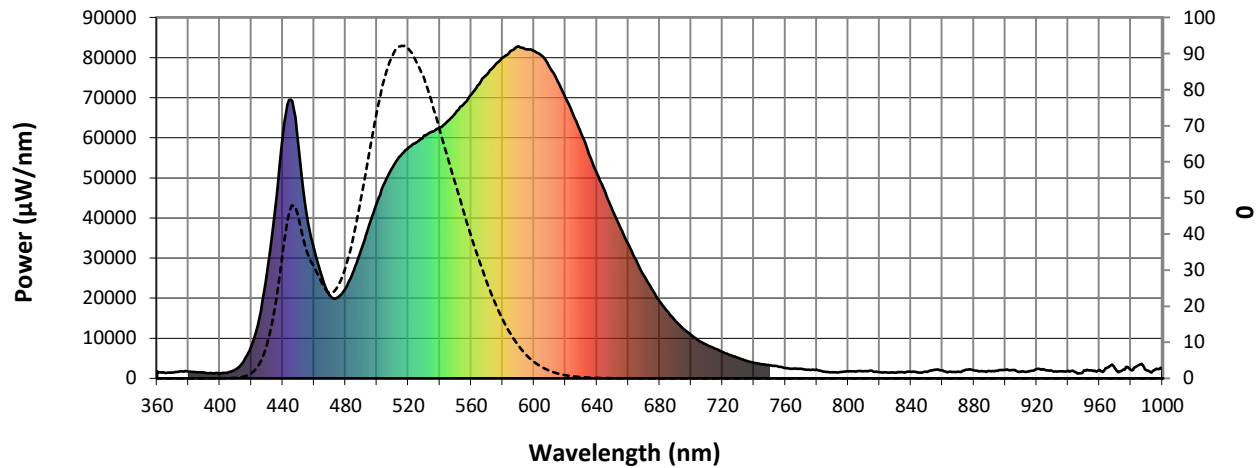
Scotopic Lumens: 7846

S/P: 1.64

| 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       | 1725             | 0.0              | 490       | 32247            | 49.7             | 620       | 69956            | 0.9              | 750       | 3261             | 0.0              | 880       | 1960             | 0.0              |
| 365       | 1400             | 0.0              | 495       | 38143            | 61.7             | 625       | 65781            | 0.6              | 755       | 3018             | 0.0              | 885       | 1828             | 0.0              |
| 370       | 1447             | 0.0              | 500       | 43918            | 73.5             | 630       | 61092            | 0.3              | 760       | 2521             | 0.0              | 890       | 1806             | 0.0              |
| 375       | 1728             | 0.0              | 505       | 48833            | 83.0             | 635       | 55954            | 0.2              | 765       | 2437             | 0.0              | 895       | 1814             | 0.0              |
| 380       | 1669             | 0.0              | 510       | 52659            | 89.3             | 640       | 51151            | 0.1              | 770       | 2407             | 0.0              | 900       | 2078             | 0.0              |
| 385       | 1495             | 0.0              | 515       | 55510            | 92.0             | 645       | 46656            | 0.1              | 775       | 2143             | 0.0              | 905       | 2072             | 0.0              |
| 390       | 1437             | 0.0              | 520       | 57534            | 91.5             | 650       | 41933            | 0.0              | 780       | 2156             | 0.0              | 910       | 1650             | 0.0              |
| 395       | 1307             | 0.0              | 525       | 58806            | 88.0             | 655       | 37478            | 0.0              | 785       | 1708             | 0.0              | 915       | 1725             | 0.0              |
| 400       | 1277             | 0.0              | 530       | 60565            | 83.5             | 660       | 33501            | 0.0              | 790       | 1555             | 0.0              | 920       | 2324             | 0.0              |
| 405       | 1471             | 0.0              | 535       | 61554            | 76.7             | 665       | 29439            | 0.0              | 795       | 1560             | 0.0              | 925       | 2173             | 0.0              |
| 410       | 2252             | 0.1              | 540       | 62542            | 69.1             | 670       | 25594            | 0.0              | 800       | 1752             | 0.0              | 930       | 1833             | 0.0              |
| 415       | 4196             | 0.4              | 545       | 64150            | 61.5             | 675       | 22306            | 0.0              | 805       | 1696             | 0.0              | 935       | 1740             | 0.0              |
| 420       | 7969             | 1.3              | 550       | 66171            | 54.1             | 680       | 19204            | 0.0              | 810       | 1762             | 0.0              | 940       | 1956             | 0.0              |
| 425       | 14965            | 3.7              | 555       | 68352            | 46.7             | 685       | 16645            | 0.0              | 815       | 1884             | 0.0              | 945       | 1549             | 0.0              |
| 430       | 26348            | 9.0              | 560       | 70775            | 39.6             | 690       | 14365            | 0.0              | 820       | 1502             | 0.0              | 950       | 2026             | 0.0              |
| 435       | 41840            | 18.7             | 565       | 73374            | 32.9             | 695       | 12367            | 0.0              | 825       | 1454             | 0.0              | 955       | 1971             | 0.0              |
| 440       | 60229            | 33.7             | 570       | 75776            | 26.7             | 700       | 10847            | 0.0              | 830       | 1466             | 0.0              | 960       | 2048             | 0.0              |
| 445       | 69537            | 46.6             | 575       | 78035            | 21.3             | 705       | 9369             | 0.0              | 835       | 1541             | 0.0              | 965       | 2608             | 0.0              |
| 450       | 58253            | 45.1             | 580       | 79996            | 16.5             | 710       | 8303             | 0.0              | 840       | 1616             | 0.0              | 970       | 2403             | 0.0              |
| 455       | 41363            | 36.1             | 585       | 81672            | 12.5             | 715       | 7458             | 0.0              | 845       | 1445             | 0.0              | 975       | 2154             | 0.0              |
| 460       | 32336            | 31.2             | 590       | 82819            | 9.2              | 720       | 6565             | 0.0              | 850       | 1636             | 0.0              | 980       | 2109             | 0.0              |
| 465       | 25279            | 26.7             | 595       | 82030            | 6.5              | 725       | 5799             | 0.0              | 855       | 2149             | 0.0              | 985       | 3271             | 0.0              |
| 470       | 20560            | 23.7             | 600       | 81639            | 4.6              | 730       | 5071             | 0.0              | 860       | 2002             | 0.0              | 990       | 1987             | 0.0              |
| 475       | 20192            | 25.2             | 605       | 80430            | 3.2              | 735       | 4394             | 0.0              | 865       | 1653             | 0.0              | 995       | 2115             | 0.0              |
| 480       | 22473            | 30.4             | 610       | 77509            | 2.1              | 740       | 3856             | 0.0              | 870       | 1669             | 0.0              | 1000      | 2424             | 0.0              |
| 485       | 26686            | 38.7             | 615       | 74116            | 1.4              | 745       | 3544             | 0.0              | 875       | 2164             | 0.0              |           |                  |                  |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 3084.4**

**M/P: 0.64**

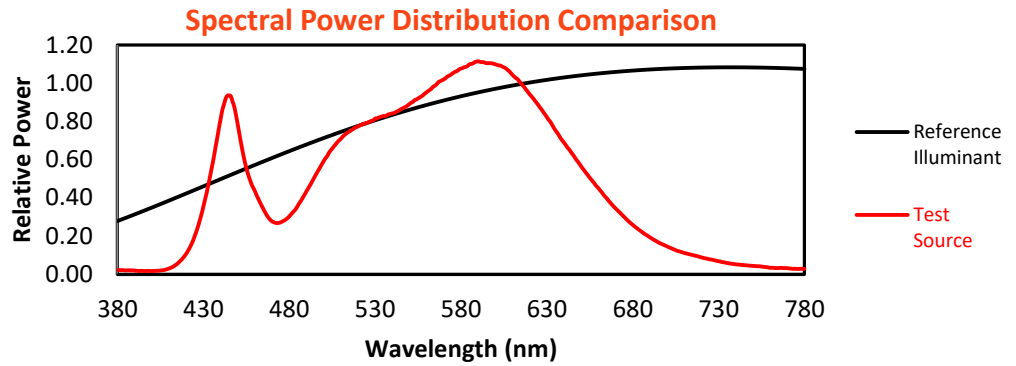
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1725             | 0.0              | 490       | 32247            | 26.8             | 620       | 69956            | 0.1              | 750       | 3261             | 0.0              | 880       | 1960             | 0.0              |
| 365       | 1400             | 0.0              | 495       | 38143            | 31.5             | 625       | 65781            | 0.0              | 755       | 3018             | 0.0              | 885       | 1828             | 0.0              |
| 370       | 1447             | 0.0              | 500       | 43918            | 35.3             | 630       | 61092            | 0.0              | 760       | 2521             | 0.0              | 890       | 1806             | 0.0              |
| 375       | 1728             | 0.0              | 505       | 48833            | 37.5             | 635       | 55954            | 0.0              | 765       | 2437             | 0.0              | 895       | 1814             | 0.0              |
| 380       | 1669             | 0.0              | 510       | 52659            | 37.8             | 640       | 51151            | 0.0              | 770       | 2407             | 0.0              | 900       | 2078             | 0.0              |
| 385       | 1495             | 0.0              | 515       | 55510            | 36.3             | 645       | 46656            | 0.0              | 775       | 2143             | 0.0              | 905       | 2072             | 0.0              |
| 390       | 1437             | 0.0              | 520       | 57534            | 33.5             | 650       | 41933            | 0.0              | 780       | 2156             | 0.0              | 910       | 1650             | 0.0              |
| 395       | 1307             | 0.0              | 525       | 58806            | 29.8             | 655       | 37478            | 0.0              | 785       | 1708             | 0.0              | 915       | 1725             | 0.0              |
| 400       | 1277             | 0.0              | 530       | 60565            | 26.2             | 660       | 33501            | 0.0              | 790       | 1555             | 0.0              | 920       | 2324             | 0.0              |
| 405       | 1471             | 0.0              | 535       | 61554            | 22.2             | 665       | 29439            | 0.0              | 795       | 1560             | 0.0              | 925       | 2173             | 0.0              |
| 410       | 2252             | 0.1              | 540       | 62542            | 18.3             | 670       | 25594            | 0.0              | 800       | 1752             | 0.0              | 930       | 1833             | 0.0              |
| 415       | 4196             | 0.3              | 545       | 64150            | 14.9             | 675       | 22306            | 0.0              | 805       | 1696             | 0.0              | 935       | 1740             | 0.0              |
| 420       | 7969             | 0.9              | 550       | 66171            | 11.9             | 680       | 19204            | 0.0              | 810       | 1762             | 0.0              | 940       | 1956             | 0.0              |
| 425       | 14965            | 2.3              | 555       | 68352            | 9.2              | 685       | 16645            | 0.0              | 815       | 1884             | 0.0              | 945       | 1549             | 0.0              |
| 430       | 26348            | 5.6              | 560       | 70775            | 7.0              | 690       | 14365            | 0.0              | 820       | 1502             | 0.0              | 950       | 2026             | 0.0              |
| 435       | 41840            | 11.2             | 565       | 73374            | 5.1              | 695       | 12367            | 0.0              | 825       | 1454             | 0.0              | 955       | 1971             | 0.0              |
| 440       | 60229            | 20.1             | 570       | 75776            | 3.7              | 700       | 10847            | 0.0              | 830       | 1466             | 0.0              | 960       | 2048             | 0.0              |
| 445       | 69537            | 27.4             | 575       | 78035            | 2.6              | 705       | 9369             | 0.0              | 835       | 1541             | 0.0              | 965       | 2608             | 0.0              |
| 450       | 58253            | 26.8             | 580       | 79996            | 1.8              | 710       | 8303             | 0.0              | 840       | 1616             | 0.0              | 970       | 2403             | 0.0              |
| 455       | 41363            | 21.7             | 585       | 81672            | 1.2              | 715       | 7458             | 0.0              | 845       | 1445             | 0.0              | 975       | 2154             | 0.0              |
| 460       | 32336            | 19.1             | 590       | 82819            | 0.8              | 720       | 6565             | 0.0              | 850       | 1636             | 0.0              | 980       | 2109             | 0.0              |
| 465       | 25279            | 16.5             | 595       | 82030            | 0.5              | 725       | 5799             | 0.0              | 855       | 2149             | 0.0              | 985       | 3271             | 0.0              |
| 470       | 20560            | 14.7             | 600       | 81639            | 0.3              | 730       | 5071             | 0.0              | 860       | 2002             | 0.0              | 990       | 1987             | 0.0              |
| 475       | 20192            | 15.4             | 605       | 80430            | 0.2              | 735       | 4394             | 0.0              | 865       | 1653             | 0.0              | 995       | 2115             | 0.0              |
| 480       | 22473            | 18.1             | 610       | 77509            | 0.1              | 740       | 3856             | 0.0              | 870       | 1669             | 0.0              | 1000      | 2424             | 0.0              |
| 485       | 26686            | 22.0             | 615       | 74116            | 0.1              | 745       | 3544             | 0.0              | 875       | 2164             | 0.0              |           |                  |                  |

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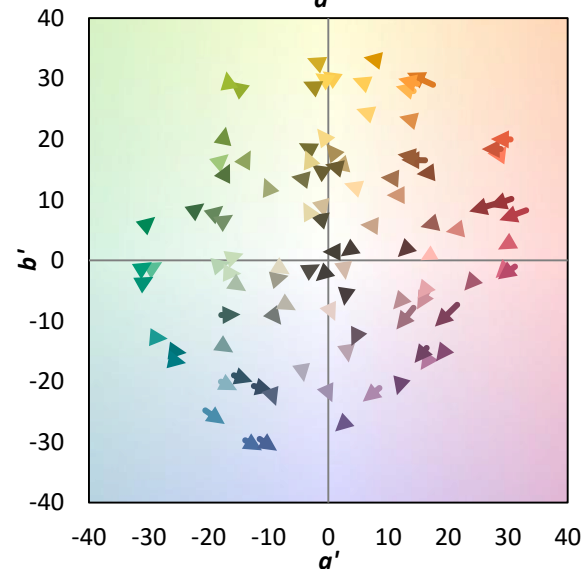
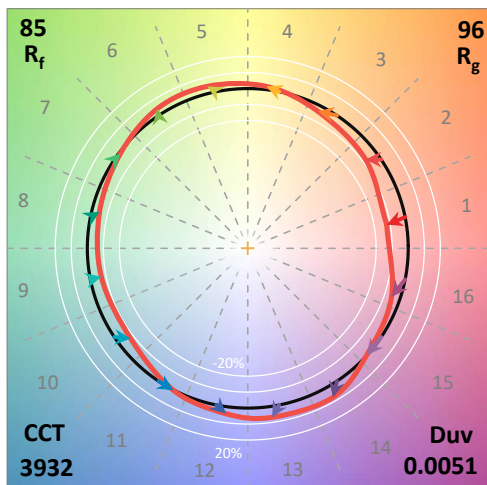
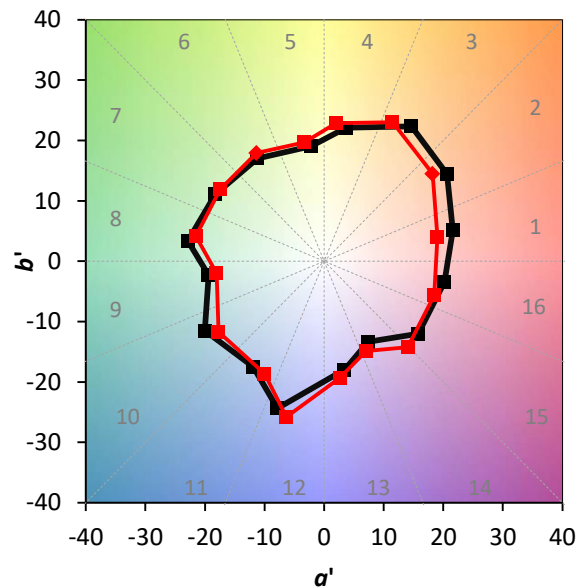
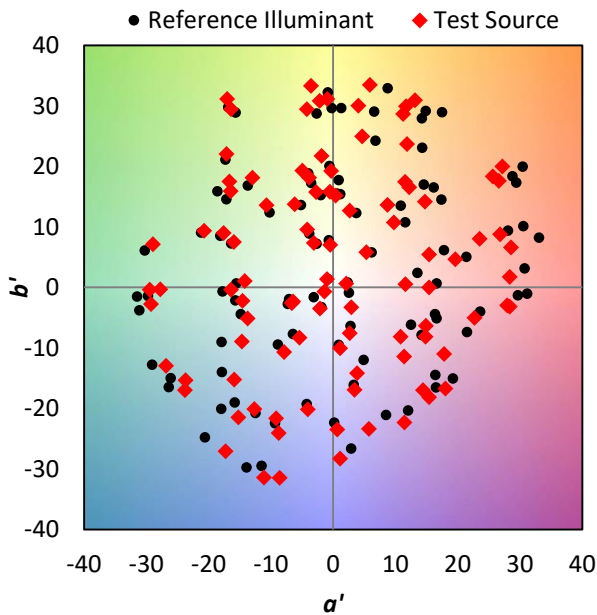
TM-30-18

### Summary

$R_f = 85.2$   
 $R_g = 96.1$   
 CIE  $R_a = 81.8$   
 $R_9 = 0.1$

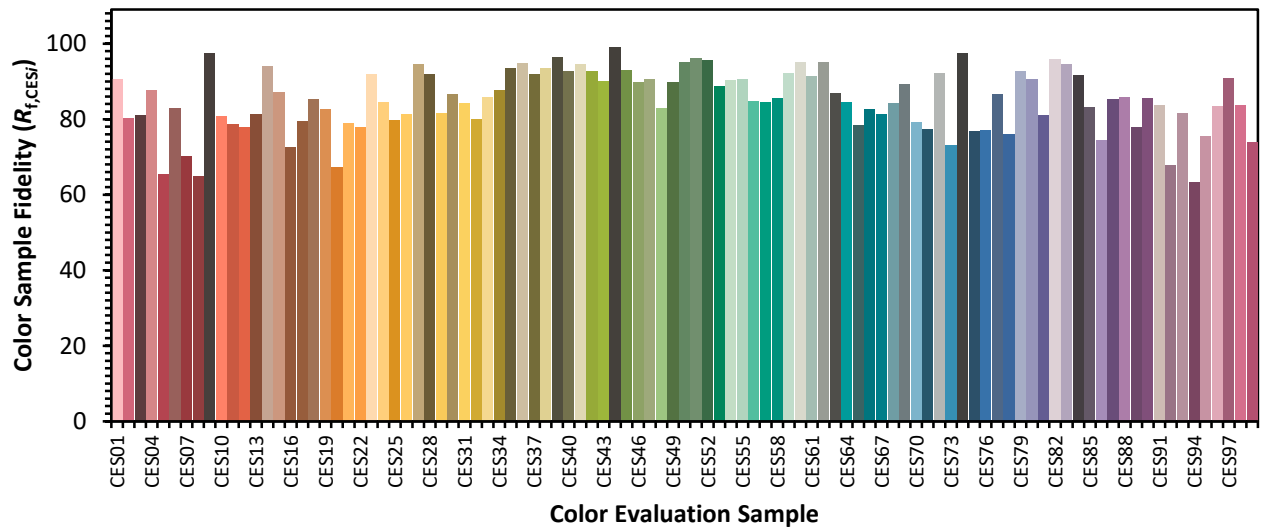


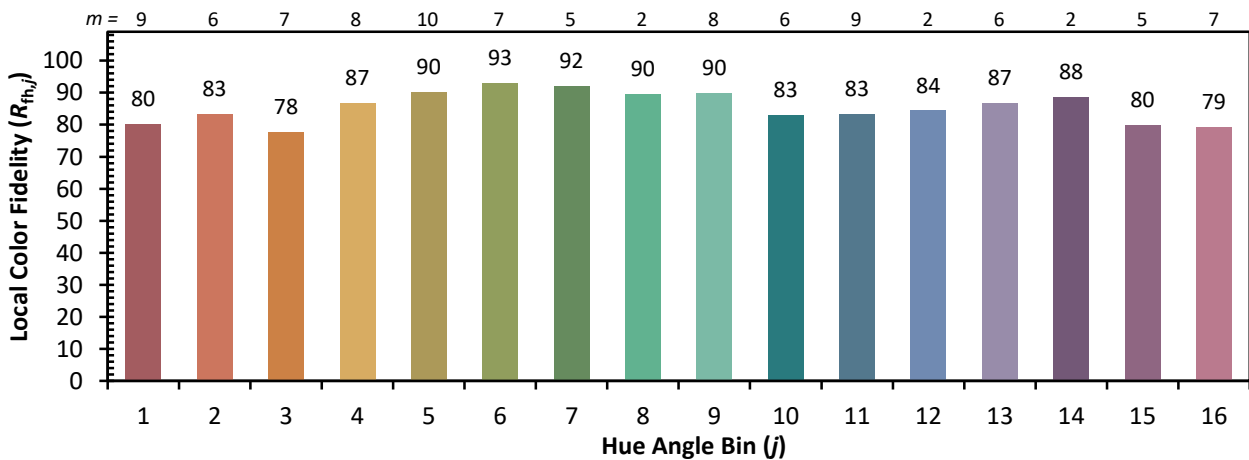
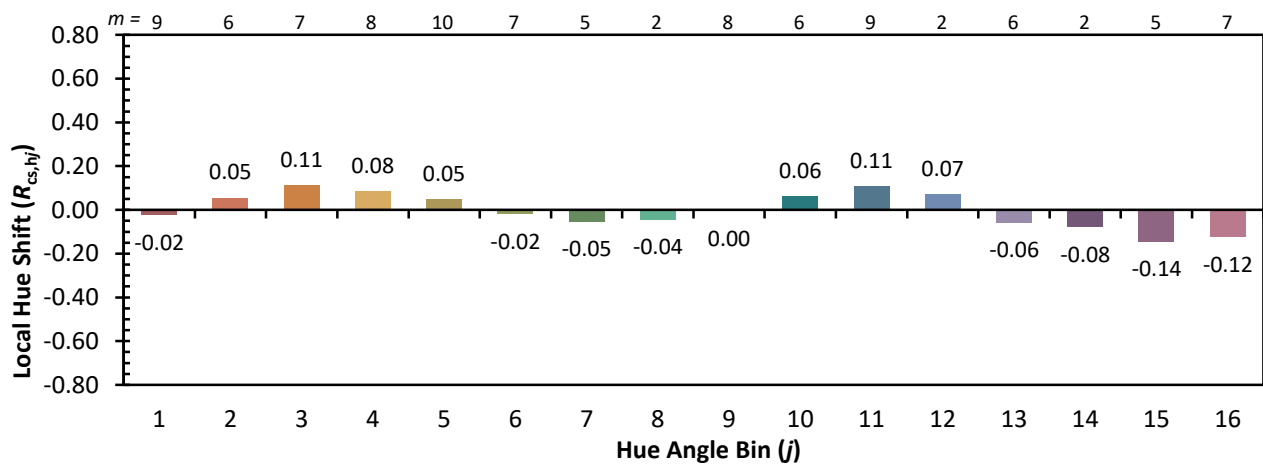
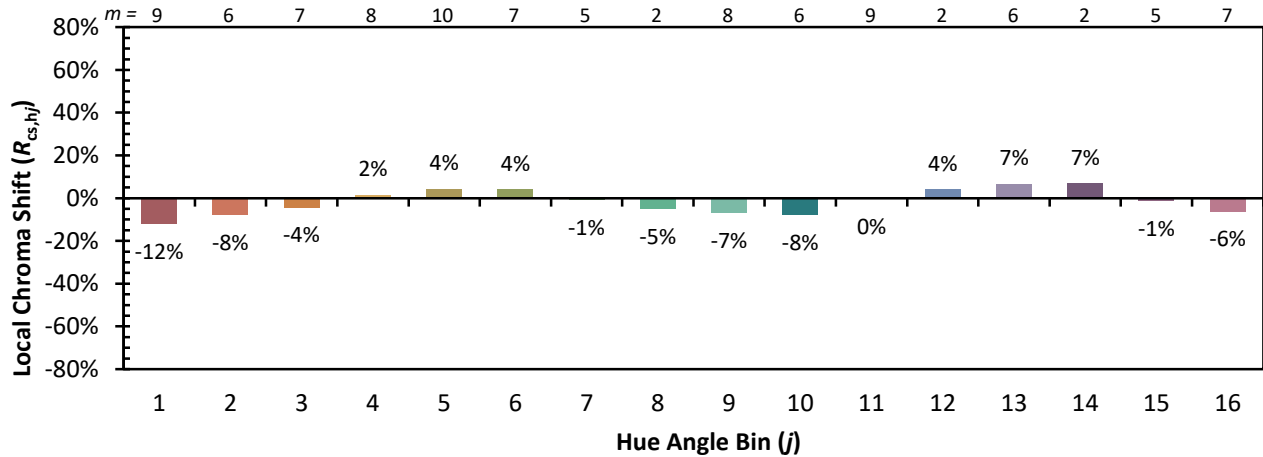
### Color Vector Graphics



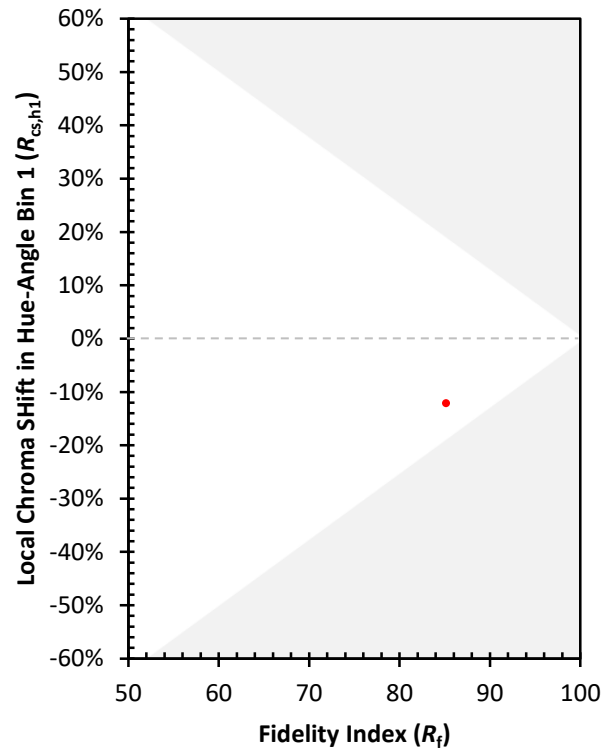
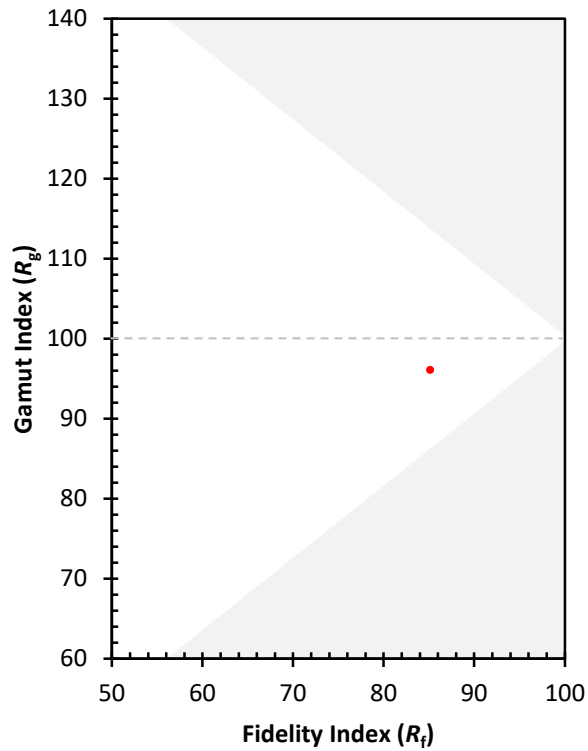
**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 81 | CES51 = 96 | CES76 = 77 |
| CES02 = 61 | CES27 = 95 | CES52 = 96 | CES77 = 87 |
| CES03 = 31 | CES28 = 92 | CES53 = 89 | CES78 = 76 |
| CES04 = 69 | CES29 = 82 | CES54 = 90 | CES79 = 93 |
| CES05 = 48 | CES30 = 87 | CES55 = 91 | CES80 = 91 |
| CES06 = 50 | CES31 = 84 | CES56 = 85 | CES81 = 81 |
| CES07 = 40 | CES32 = 80 | CES57 = 84 | CES82 = 96 |
| CES08 = 39 | CES33 = 86 | CES58 = 85 | CES83 = 95 |
| CES09 = 29 | CES34 = 88 | CES59 = 92 | CES84 = 92 |
| CES10 = 74 | CES35 = 93 | CES60 = 95 | CES85 = 83 |
| CES11 = 57 | CES36 = 95 | CES61 = 91 | CES86 = 74 |
| CES12 = 63 | CES37 = 92 | CES62 = 95 | CES87 = 85 |
| CES13 = 42 | CES38 = 93 | CES63 = 87 | CES88 = 86 |
| CES14 = 74 | CES39 = 96 | CES64 = 84 | CES89 = 78 |
| CES15 = 71 | CES40 = 93 | CES65 = 78 | CES90 = 85 |
| CES16 = 47 | CES41 = 95 | CES66 = 83 | CES91 = 84 |
| CES17 = 49 | CES42 = 93 | CES67 = 81 | CES92 = 68 |
| CES18 = 56 | CES43 = 90 | CES68 = 84 | CES93 = 82 |
| CES19 = 71 | CES44 = 99 | CES69 = 89 | CES94 = 63 |
| CES20 = 65 | CES45 = 93 | CES70 = 79 | CES95 = 75 |
| CES21 = 86 | CES46 = 90 | CES71 = 77 | CES96 = 83 |
| CES22 = 78 | CES47 = 91 | CES72 = 92 | CES97 = 91 |
| CES23 = 91 | CES48 = 83 | CES73 = 73 | CES98 = 84 |
| CES24 = 90 | CES49 = 90 | CES74 = 98 | CES99 = 74 |
| CES25 = 71 | CES50 = 95 | CES75 = 77 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**



(END OF REPORT)