

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: P822852

Luminaire Tested: **MSA-SA2C-840-U-SL4-HSS**

Issue Date: 04/10/2024

**Test Information**

Test Method: LM-79-08  
Report Number: P822852  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1910-543-21)  
Test Lab: INNOVATION CENTER  
Issue Date: 04/10/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: MSA-SA2C-840-U-SL4-HSS  
Description: MESA POST TOP DECORATIVE LUMINAIRE. (2) LIGHTSQUARES WITH 16 LEDS  
EACH AND TYPE IV SPILL LIGHT ELIMINATOR OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

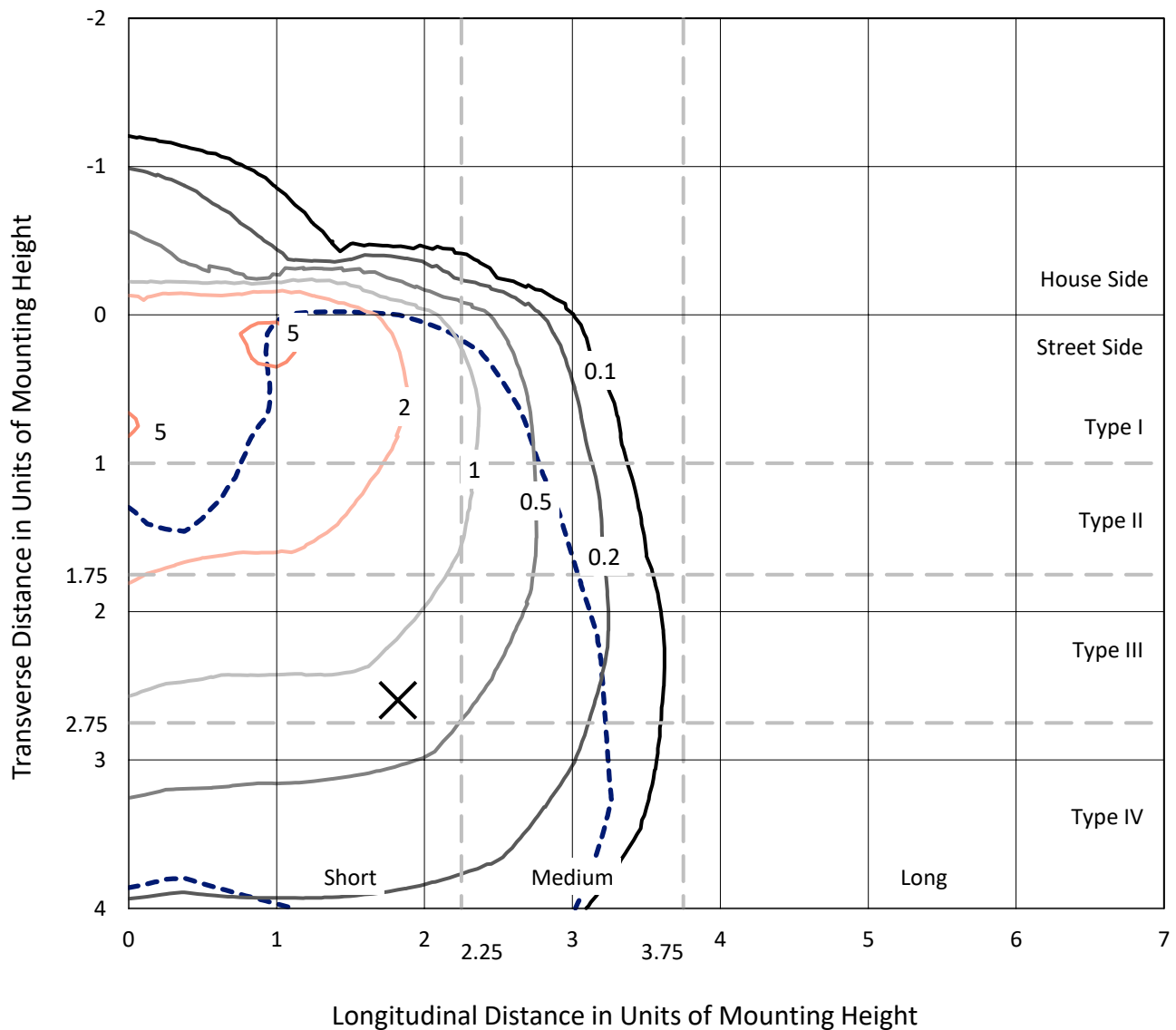
Lumens per Lamp: N/A  
Luminaire Lumens: 8578.9 lumens  
Efficiency: N/A  
Efficacy: 75.9 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

Input Watts (W): 113  
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: 25 FT

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## Iso-Footcandle Lines of Horizontal Illumination

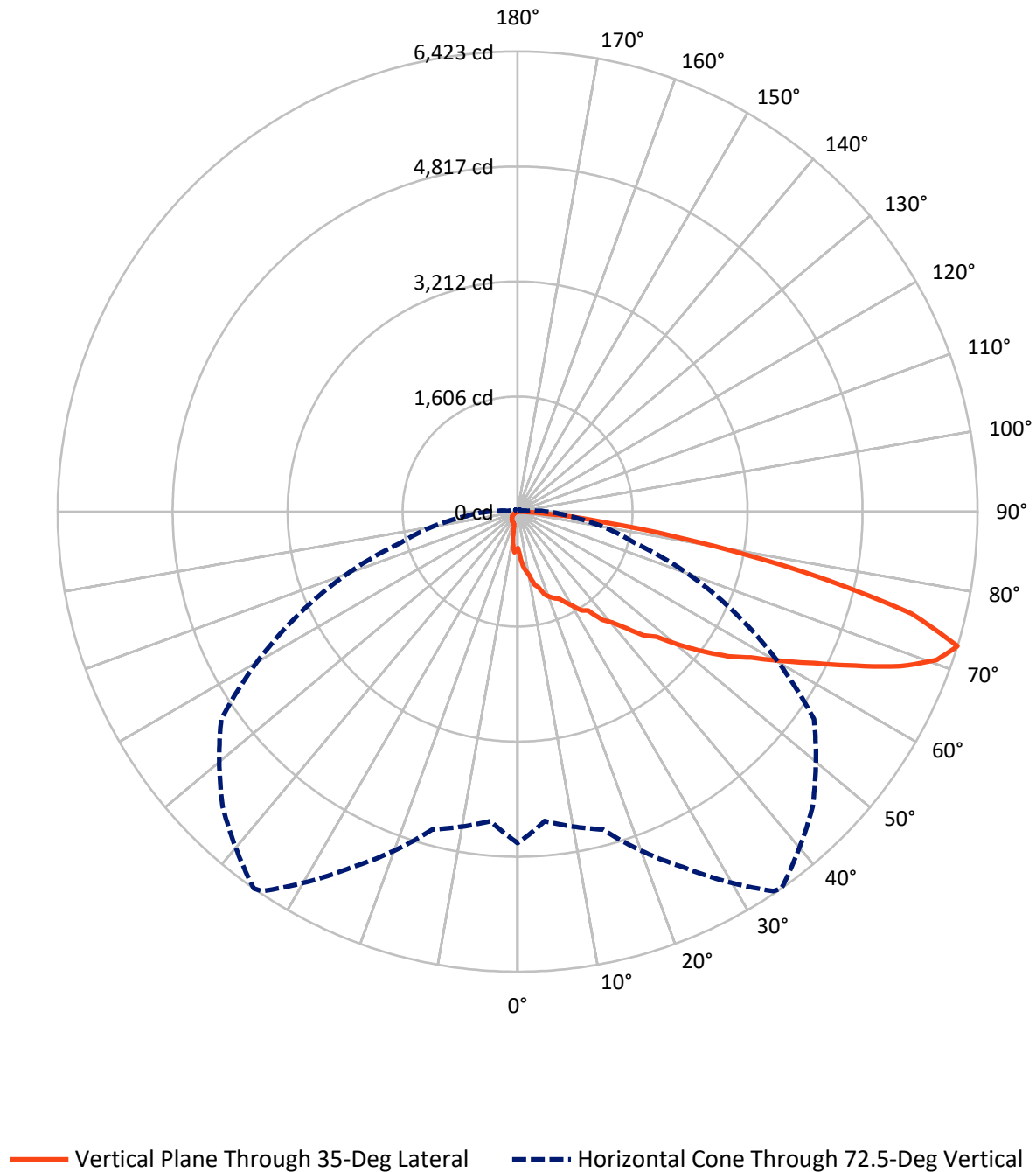
× Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 5.4 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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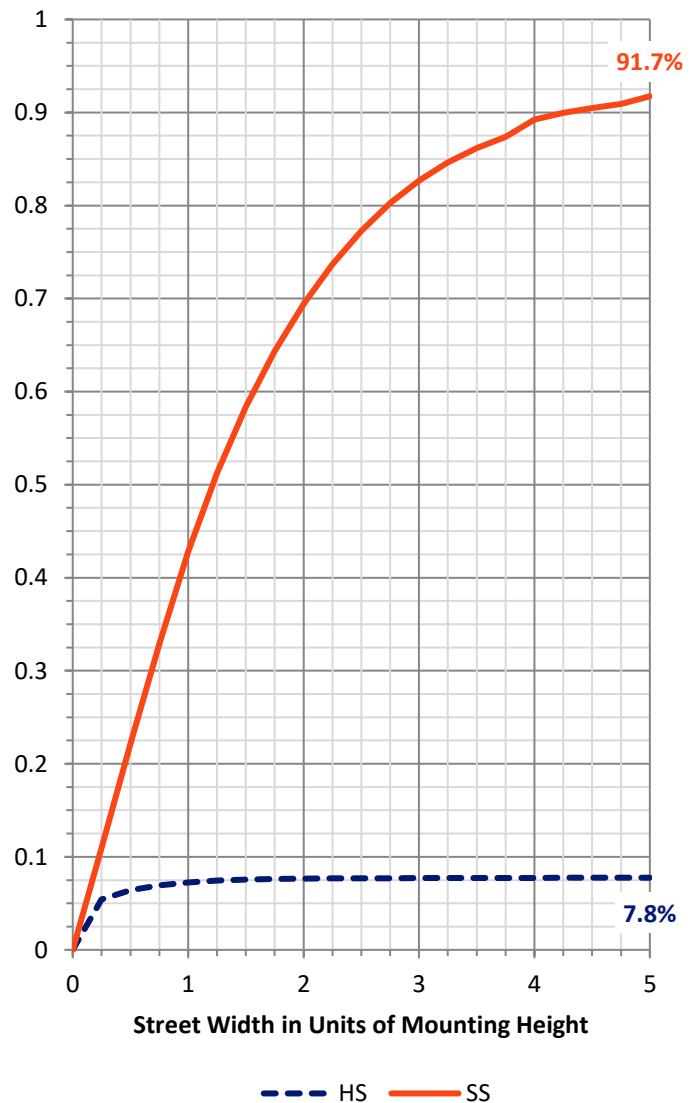
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 669.1    | 0.0    | 669.1  |
|                    | % Fixture | 7.8      | 0.0    | 7.8    |
| <b>Street Side</b> | Lumens    | 7909.7   | 0.0    | 7909.7 |
|                    | % Fixture | 92.2     | 0.0    | 92.2   |
| <b>Total</b>       | Lumens    | 8578.9   | 0.0    | 8578.9 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 65.2   | 0.8       |
| 10°-20°   | 219.5  | 2.6       |
| 20°-30°   | 399.8  | 4.7       |
| 30°-40°   | 689.6  | 8.0       |
| 40°-50°   | 1225.9 | 14.3      |
| 50°-60°   | 1829.4 | 21.3      |
| 60°-70°   | 2337.2 | 27.2      |
| 70°-80°   | 1626.1 | 19.0      |
| 80°-90°   | 186.0  | 2.2       |
| 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°    | 8578.9 | 100.0     |
| 0°-180°   | 8578.9 | 100.0     |

**Coefficient of Utilization**



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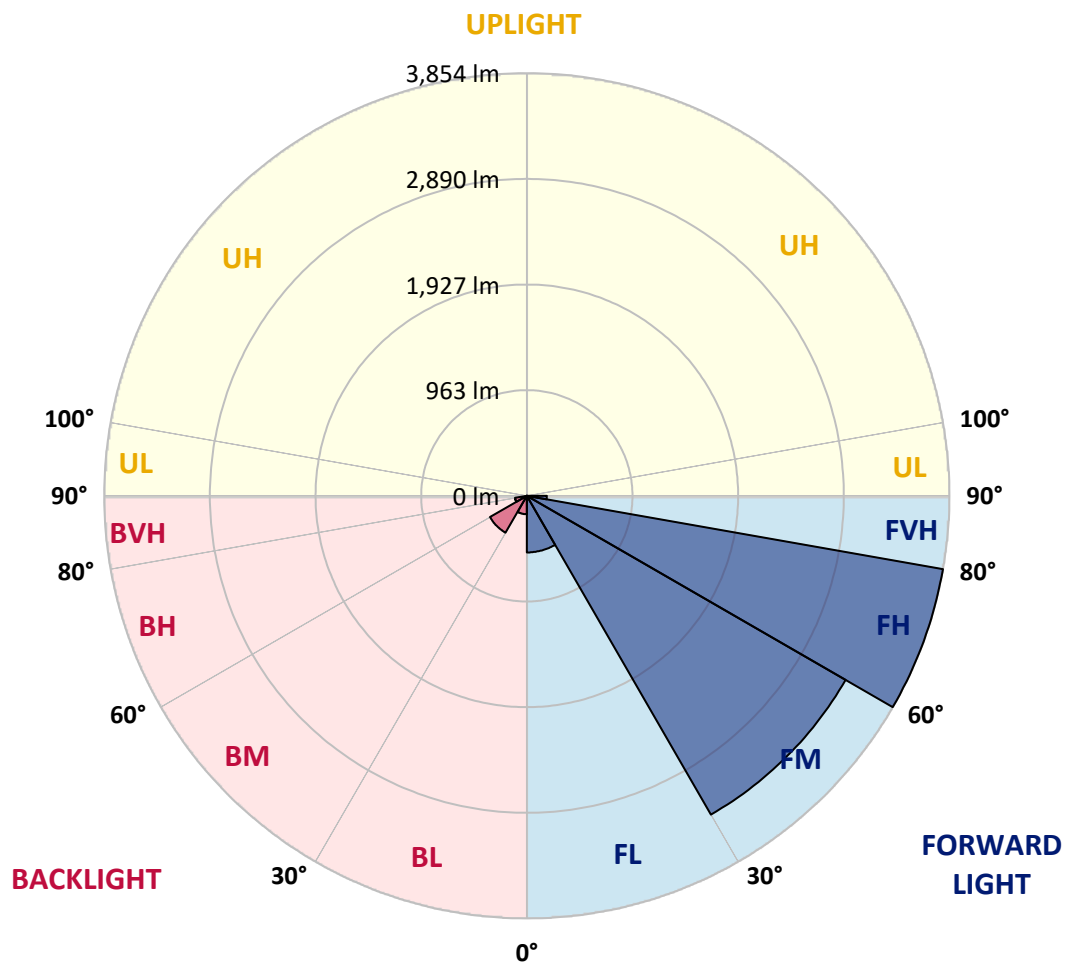
CATALOG NUMBER: MSA-SA2C-840-U-SL4-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 516.2  | 6.0       |                         |      |         |
| FM   | (30°-60°)   | 3356.9 | 39.1      |                         |      |         |
| FH   | (60°-80°)   | 3853.6 | 44.9      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 182.9  | 2.1       |                         |      | G2/225  |
| BL   | (0°-30°)    | 168.3  | 2.0       | B1/500                  |      |         |
| BM   | (30°-60°)   | 388.0  | 4.5       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 109.7  | 1.3       | B0/110                  |      | G0/110  |
| BVH  | (80°-90°)   | 3.1    | 0.0       |                         |      | G0/10   |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G2**

Type IV Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 34°    | 35°    | 45°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  | 511.0  |
| 2.5°  | 650.4  | 624.9  | 583.5  | 586.5  | 605.0  | 608.9  | 614.5  | 599.9  | 586.9  | 564.1  | 608.5  |
| 5°    | 833.2  | 796.5  | 773.2  | 765.9  | 755.1  | 756.0  | 729.6  | 739.2  | 736.6  | 753.4  | 773.7  |
| 7.5°  | 936.3  | 916.0  | 886.6  | 878.5  | 838.8  | 834.5  | 802.1  | 845.7  | 850.0  | 844.0  | 877.1  |
| 10°   | 977.2  | 950.5  | 953.9  | 923.3  | 903.5  | 908.7  | 913.8  | 917.3  | 922.9  | 928.5  | 888.0  |
| 12.5° | 1001.3 | 1006.1 | 1053.1 | 1021.2 | 1041.0 | 1041.0 | 1076.0 | 1038.9 | 1040.2 | 999.7  | 1006.6 |
| 15°   | 1110.1 | 1136.4 | 1115.2 | 1114.8 | 1093.3 | 1098.9 | 1139.4 | 1110.1 | 1125.1 | 1113.1 | 1066.5 |
| 17.5° | 1246.3 | 1251.5 | 1211.4 | 1193.7 | 1213.2 | 1213.6 | 1196.3 | 1195.0 | 1142.4 | 1231.2 | 1174.7 |
| 20°   | 1289.9 | 1319.2 | 1262.3 | 1193.3 | 1274.0 | 1270.1 | 1268.7 | 1248.5 | 1160.9 | 1284.3 | 1237.7 |
| 22.5° | 1408.5 | 1366.6 | 1327.9 | 1282.5 | 1314.1 | 1314.1 | 1309.3 | 1264.9 | 1230.8 | 1279.5 | 1299.4 |
| 25°   | 1445.6 | 1450.7 | 1400.3 | 1385.6 | 1386.5 | 1347.7 | 1344.3 | 1325.3 | 1292.5 | 1375.7 | 1336.0 |
| 27.5° | 1573.2 | 1571.1 | 1449.9 | 1490.8 | 1438.7 | 1439.1 | 1343.8 | 1386.5 | 1392.1 | 1380.4 | 1424.9 |
| 30°   | 1698.7 | 1733.7 | 1550.8 | 1602.6 | 1547.8 | 1531.4 | 1438.3 | 1476.2 | 1486.1 | 1472.8 | 1528.8 |
| 32.5° | 1858.7 | 1910.0 | 1732.3 | 1681.5 | 1597.8 | 1644.4 | 1580.1 | 1490.4 | 1539.6 | 1659.0 | 1690.5 |
| 35°   | 2028.3 | 2053.2 | 1863.9 | 1792.7 | 1698.3 | 1697.9 | 1695.7 | 1703.1 | 1757.4 | 1891.9 | 1918.7 |
| 37.5° | 2332.7 | 2273.6 | 2102.4 | 1939.4 | 1960.5 | 1913.5 | 1880.8 | 1915.2 | 1971.7 | 2193.4 | 2307.7 |
| 40°   | 2502.6 | 2459.9 | 2218.8 | 2122.3 | 2017.4 | 2034.6 | 2123.5 | 2119.7 | 2270.2 | 2502.2 | 2673.4 |
| 42.5° | 2667.8 | 2627.2 | 2390.0 | 2312.0 | 2177.4 | 2224.4 | 2263.3 | 2312.4 | 2620.7 | 2995.1 | 3089.1 |
| 45°   | 2814.8 | 2695.8 | 2528.5 | 2531.5 | 2461.7 | 2467.2 | 2535.8 | 2581.1 | 3027.0 | 3410.9 | 3476.8 |
| 47.5° | 2903.6 | 2805.7 | 2645.3 | 2642.4 | 2638.0 | 2611.7 | 2934.7 | 2976.1 | 3350.9 | 3806.8 | 3812.7 |
| 50°   | 3028.8 | 2906.2 | 2765.6 | 2768.2 | 2867.9 | 2923.5 | 3309.0 | 3304.7 | 3663.5 | 4137.1 | 3997.8 |
| 52.5° | 3184.4 | 3034.8 | 2879.9 | 2995.1 | 3149.1 | 3239.7 | 3552.7 | 3680.4 | 3999.5 | 4344.5 | 4070.2 |
| 55°   | 3383.7 | 3196.5 | 3047.3 | 3194.7 | 3530.7 | 3565.7 | 3791.2 | 4060.7 | 4365.6 | 4556.2 | 4093.5 |
| 57.5° | 3617.4 | 3394.0 | 3273.3 | 3510.8 | 3845.9 | 3846.9 | 4138.3 | 4466.1 | 4590.3 | 4642.5 | 4067.2 |
| 60°   | 3869.2 | 3608.8 | 3487.1 | 3701.1 | 4193.6 | 4228.9 | 4524.3 | 4690.0 | 4818.4 | 4686.1 | 4020.2 |
| 62.5° | 4090.9 | 3803.3 | 3708.8 | 3960.2 | 4574.8 | 4658.4 | 4860.7 | 4837.0 | 4983.2 | 4740.8 | 3900.8 |
| 65°   | 4354.9 | 4055.2 | 3993.0 | 4364.4 | 5072.5 | 5187.6 | 5238.5 | 5097.9 | 5038.4 | 4698.5 | 3589.8 |
| 67.5° | 4616.2 | 4335.8 | 4334.2 | 4812.4 | 5724.9 | 5764.6 | 5711.1 | 5465.8 | 4974.2 | 4325.9 | 3020.1 |
| 70°   | 4800.4 | 4499.3 | 4612.8 | 5303.2 | 6317.9 | 6206.7 | 5981.6 | 5639.6 | 4510.1 | 3315.5 | 1973.0 |
| 72.5° | 4627.4 | 4337.2 | 4592.9 | 5477.9 | 6391.3 | 6423.1 | 5825.0 | 5051.8 | 3350.9 | 1695.7 | 714.2  |
| 75°   | 3516.5 | 3338.8 | 3987.9 | 4859.8 | 5674.5 | 5681.8 | 4862.0 | 3563.1 | 1650.0 | 460.6  | 197.5  |
| 77.5° | 1771.2 | 1714.7 | 2524.1 | 3450.0 | 4140.1 | 4128.0 | 3340.6 | 1908.8 | 530.9  | 153.1  | 99.6   |
| 80°   | 896.6  | 851.3  | 1074.2 | 1861.3 | 2458.6 | 2476.7 | 1907.5 | 854.8  | 267.8  | 83.2   | 69.0   |
| 82.5° | 550.7  | 522.7  | 587.8  | 842.2  | 1193.3 | 1222.2 | 723.7  | 541.2  | 166.0  | 49.2   | 63.0   |
| 85°   | 106.5  | 112.1  | 337.7  | 421.8  | 476.5  | 465.4  | 214.3  | 445.5  | 50.0   | 29.3   | 45.7   |
| 87.5° | 0.0    | 1.8    | 78.0   | 137.6  | 138.0  | 122.5  | 48.8   | 98.7   | 6.9    | 8.2    | 5.6    |
| 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: P822852

CATALOG NUMBER: MSA-SA2C-840-U-SL4-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 511.0  | 511.0  | 511.0 | 511.0 | 511.0 | 511.0 | 511.0 | 511.0 | 511.0 | 511.0 | 511.0 |
| 2.5°  | 615.9  | 609.4  | 555.5 | 549.4 | 550.7 | 541.6 | 538.7 | 519.7 | 514.9 | 544.2 | 549.4 |
| 5°    | 765.1  | 721.9  | 671.9 | 653.8 | 625.8 | 578.3 | 571.4 | 559.4 | 546.0 | 551.1 | 547.3 |
| 7.5°  | 856.5  | 799.1  | 745.6 | 650.4 | 571.4 | 502.4 | 491.2 | 470.5 | 449.8 | 450.2 | 463.6 |
| 10°   | 871.2  | 822.8  | 749.1 | 633.1 | 543.0 | 456.7 | 381.7 | 327.4 | 302.7 | 280.8 | 287.3 |
| 12.5° | 956.1  | 911.3  | 775.4 | 627.9 | 501.5 | 367.0 | 268.7 | 215.6 | 192.3 | 184.6 | 183.7 |
| 15°   | 1024.2 | 988.9  | 820.2 | 611.9 | 409.7 | 258.3 | 192.3 | 176.8 | 172.5 | 179.9 | 177.7 |
| 17.5° | 1125.5 | 1061.7 | 815.5 | 546.0 | 312.2 | 196.2 | 177.3 | 175.1 | 180.3 | 184.6 | 185.8 |
| 20°   | 1170.0 | 1078.1 | 783.1 | 442.5 | 233.8 | 179.9 | 173.0 | 168.6 | 178.1 | 191.1 | 188.4 |
| 22.5° | 1214.8 | 1106.2 | 745.2 | 362.3 | 188.0 | 172.0 | 168.2 | 164.7 | 172.0 | 184.6 | 187.6 |
| 25°   | 1235.1 | 1151.0 | 703.0 | 282.9 | 174.7 | 163.1 | 160.4 | 161.7 | 167.8 | 178.9 | 177.7 |
| 27.5° | 1337.4 | 1156.2 | 622.3 | 223.4 | 169.0 | 156.6 | 156.6 | 159.6 | 159.6 | 174.7 | 173.4 |
| 30°   | 1401.2 | 1243.8 | 556.8 | 188.0 | 162.5 | 147.5 | 152.7 | 154.0 | 151.8 | 168.2 | 169.5 |
| 32.5° | 1513.3 | 1267.9 | 492.9 | 172.5 | 152.2 | 146.2 | 145.3 | 146.2 | 147.9 | 163.9 | 164.3 |
| 35°   | 1685.8 | 1386.9 | 405.8 | 166.5 | 147.1 | 139.8 | 133.7 | 138.4 | 142.8 | 154.4 | 156.6 |
| 37.5° | 2023.0 | 1509.0 | 330.8 | 161.7 | 144.5 | 133.7 | 131.5 | 130.7 | 138.4 | 151.8 | 156.2 |
| 40°   | 2296.0 | 1725.0 | 269.1 | 157.8 | 139.3 | 130.3 | 124.6 | 125.0 | 131.9 | 141.9 | 148.3 |
| 42.5° | 2682.5 | 1881.2 | 228.1 | 151.8 | 131.9 | 122.9 | 116.5 | 120.3 | 123.4 | 133.7 | 138.0 |
| 45°   | 3005.0 | 2002.4 | 201.0 | 147.9 | 124.6 | 116.0 | 110.8 | 115.1 | 112.1 | 117.3 | 123.4 |
| 47.5° | 3261.6 | 2108.0 | 180.7 | 138.4 | 119.9 | 112.1 | 105.6 | 104.4 | 99.2  | 100.5 | 106.1 |
| 50°   | 3402.6 | 2090.3 | 163.9 | 128.9 | 113.9 | 108.2 | 99.2  | 90.1  | 83.2  | 82.8  | 86.3  |
| 52.5° | 3452.7 | 1995.9 | 150.1 | 120.8 | 106.5 | 99.6  | 89.3  | 76.8  | 69.9  | 67.7  | 70.7  |
| 55°   | 3466.4 | 1860.0 | 137.6 | 111.7 | 99.6  | 88.8  | 78.0  | 64.7  | 57.3  | 53.9  | 56.9  |
| 57.5° | 3421.6 | 1650.9 | 125.5 | 103.1 | 91.4  | 78.5  | 66.9  | 53.1  | 46.2  | 41.8  | 44.4  |
| 60°   | 3310.8 | 1385.2 | 114.7 | 92.3  | 82.8  | 69.5  | 56.5  | 42.7  | 35.4  | 31.4  | 32.8  |
| 62.5° | 3065.4 | 1085.9 | 103.1 | 82.4  | 73.7  | 60.8  | 47.4  | 33.6  | 26.7  | 23.3  | 23.7  |
| 65°   | 2691.9 | 809.5  | 89.7  | 72.9  | 65.6  | 52.6  | 37.9  | 25.9  | 20.3  | 17.2  | 16.8  |
| 67.5° | 2144.6 | 548.6  | 76.4  | 63.0  | 58.2  | 44.4  | 30.2  | 20.3  | 16.0  | 13.8  | 12.9  |
| 70°   | 1260.6 | 276.4  | 63.4  | 54.3  | 50.0  | 37.1  | 23.7  | 16.4  | 14.6  | 12.9  | 12.1  |
| 72.5° | 415.7  | 119.5  | 49.6  | 44.8  | 41.4  | 29.8  | 18.6  | 15.1  | 14.2  | 12.5  | 11.6  |
| 75°   | 144.9  | 69.0   | 36.7  | 34.5  | 32.8  | 22.5  | 15.6  | 13.8  | 13.8  | 12.1  | 10.8  |
| 77.5° | 94.9   | 53.5   | 27.2  | 25.0  | 24.6  | 16.4  | 13.4  | 12.9  | 12.1  | 9.9   | 8.2   |
| 80°   | 79.0   | 30.2   | 19.0  | 17.7  | 17.2  | 10.3  | 10.8  | 9.5   | 7.3   | 4.3   | 1.8   |
| 82.5° | 72.9   | 18.1   | 9.9   | 10.8  | 9.9   | 3.9   | 6.1   | 5.2   | 3.9   | 1.8   | 0.0   |
| 85°   | 42.7   | 8.2    | 5.6   | 5.6   | 4.3   | 0.8   | 3.0   | 3.0   | 1.8   | 0.4   | 0.0   |
| 87.5° | 4.7    | 3.9    | 3.0   | 3.0   | 2.2   | 0.0   | 1.3   | 0.8   | 0.0   | 0.0   | 0.0   |
| 90°   | 0.0    | 0.0    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-2309-178-2

Test Date: 09/22/2023

Luminaire Tested: GALN-SA2A-840-U-T4W

Data in this report applies to families of products including GALN-SA2A-840-U-T4W.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2309-178-2  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 09/22/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **GALN-SA2A-840-U-T4W**  
 Description: GALLEON 2 AREA AND ROADWAY LUMINAIRE. (2) 80 CRI, 4000K, 615MA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV WIDE OPTICS

LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV WIDE OPTICS

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 3867   | CRI (Ra): | 79.8 |      |      |
| CIE u':                   | 0.2254 | R1:       | 76.6 | R9:  | -8.6 |
| CIE v':                   | 0.5090 | R2:       | 84.7 | R10: | 66.3 |
| Duv:                      | 0.0039 | R3:       | 93.7 | R11: | 80.5 |
| CIE x:                    | 0.3895 | R4:       | 80.6 | R12: | 67.3 |
| CIE y:                    | 0.3908 | R5:       | 77.9 | R13: | 77.9 |
| CIE z:                    | 0.2197 | R6:       | 81.2 | R14: | 96.6 |
| Peak Wavelength (nm):     | 593    | R7:       | 84.2 |      |      |
| Dominant Wavelength (nm): | 577    | R8:       | 59.0 |      |      |
| Purity:                   | 34.3   |           |      |      |      |
| Rf:                       | 82.7   |           |      |      |      |
| Rg:                       | 96.5   |           |      |      |      |



### Test Conditions

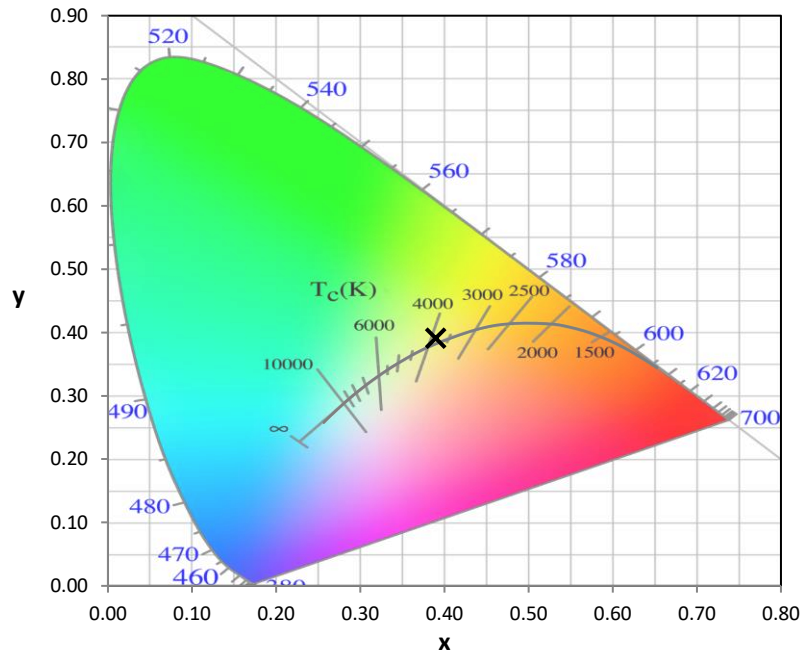
Stabilization Time: 25M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.8/46%  
 Sphere Temperature (°C): 24.7

REPORT NUMBER: SP1-2309-178-2

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 8/9/2023         | 2/9/2024             |
| Power Meter                    | XITRON 2801 IN0071    | 11/29/2022       | 11/29/2023           |
| AC Power Source                | CHROMA 61603 IN0063   | 11/28/2022       | 11/28/2023           |
| DC Power Source                | AGILENT E3634A IN0208 | 11/28/2022       | 11/28/2023           |
| Sphere Thermometer             | ONSET IN0085          | 11/28/2022       | 11/28/2023           |
| Room Thermometer               | ONSET IN0046          | 11/28/2022       | 11/28/2023           |

REPORT NUMBER: SP1-2309-178-2

CIE 1931 Chromaticity Diagram



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



Point lies inside the ANSI 4000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**



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| 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       | 3123             | NR               | 490       | 57459            | NR               | 620       | 129941           | NR               | 750       | 5858             | NR               | 880       | 4622             | NR               |
| 365       | 3041             | NR               | 495       | 69038            | NR               | 625       | 121678           | NR               | 755       | 5395             | NR               | 885       | 3949             | NR               |
| 370       | 2965             | NR               | 500       | 79493            | NR               | 630       | 112252           | NR               | 760       | 5011             | NR               | 890       | 4035             | NR               |
| 375       | 3195             | NR               | 505       | 87950            | NR               | 635       | 102369           | NR               | 765       | 4514             | NR               | 895       | 3391             | NR               |
| 380       | 3028             | NR               | 510       | 94704            | NR               | 640       | 93616            | NR               | 770       | 4375             | NR               | 900       | 3268             | NR               |
| 385       | 2738             | NR               | 515       | 100214           | NR               | 645       | 84211            | NR               | 775       | 3450             | NR               | 905       | 2767             | NR               |
| 390       | 2690             | NR               | 520       | 103961           | NR               | 650       | 75380            | NR               | 780       | 3547             | NR               | 910       | 3391             | NR               |
| 395       | 2604             | NR               | 525       | 106854           | NR               | 655       | 66946            | NR               | 785       | 3648             | NR               | 915       | 3784             | NR               |
| 400       | 2384             | NR               | 530       | 109533           | NR               | 660       | 59483            | NR               | 790       | 3081             | NR               | 920       | 3790             | NR               |
| 405       | 3031             | NR               | 535       | 112417           | NR               | 665       | 51858            | NR               | 795       | 3104             | NR               | 925       | 3175             | NR               |
| 410       | 5239             | NR               | 540       | 115725           | NR               | 670       | 44882            | NR               | 800       | 3444             | NR               | 930       | 3642             | NR               |
| 415       | 10499            | NR               | 545       | 119091           | NR               | 675       | 38742            | NR               | 805       | 3315             | NR               | 935       | 3040             | NR               |
| 420       | 20790            | NR               | 550       | 122884           | NR               | 680       | 33597            | NR               | 810       | 3022             | NR               | 940       | 4039             | NR               |
| 425       | 39276            | NR               | 555       | 128300           | NR               | 685       | 29101            | NR               | 815       | 2832             | NR               | 945       | 4797             | NR               |
| 430       | 66418            | NR               | 560       | 133274           | NR               | 690       | 24855            | NR               | 820       | 3142             | NR               | 950       | 4945             | NR               |
| 435       | 101961           | NR               | 565       | 139112           | NR               | 695       | 21367            | NR               | 825       | 3115             | NR               | 955       | 3757             | NR               |
| 440       | 134023           | NR               | 570       | 144467           | NR               | 700       | 18479            | NR               | 830       | 2520             | NR               | 960       | 4539             | NR               |
| 445       | 129385           | NR               | 575       | 149331           | NR               | 705       | 16131            | NR               | 835       | 2783             | NR               | 965       | 4857             | NR               |
| 450       | 90434            | NR               | 580       | 154784           | NR               | 710       | 14388            | NR               | 840       | 3364             | NR               | 970       | 4463             | NR               |
| 455       | 63521            | NR               | 585       | 156899           | NR               | 715       | 12865            | NR               | 845       | 3807             | NR               | 975       | 3718             | NR               |
| 460       | 48429            | NR               | 590       | 157796           | NR               | 720       | 11277            | NR               | 850       | 2907             | NR               | 980       | 3955             | NR               |
| 465       | 36445            | NR               | 595       | 157849           | NR               | 725       | 10063            | NR               | 855       | 3470             | NR               | 985       | 4314             | NR               |
| 470       | 31953            | NR               | 600       | 155418           | NR               | 730       | 8942             | NR               | 860       | 3820             | NR               | 990       | 4478             | NR               |
| 475       | 32768            | NR               | 605       | 151601           | NR               | 735       | 7722             | NR               | 865       | 3922             | NR               | 995       | 2959             | NR               |
| 480       | 37631            | NR               | 610       | 146416           | NR               | 740       | 6964             | NR               | 870       | 4061             | NR               | 1000      | 4570             | NR               |
| 485       | 46354            | NR               | 615       | 139241           | NR               | 745       | 6117             | NR               | 875       | 3975             | NR               |           |                  |                  |

REPORT NUMBER: SP1-2309-178-2

**Scotopic Flux vs. Wavelength**



**Scotopic Lumens: 14236**

**S/P: 1.59**

| 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       | 3123             | NR               | 490       | 57459            | NR               | 620       | 129941           | NR               | 750       | 5858             | NR               | 880       | 4622             | NR               |
| 365       | 3041             | NR               | 495       | 69038            | NR               | 625       | 121678           | NR               | 755       | 5395             | NR               | 885       | 3949             | NR               |
| 370       | 2965             | NR               | 500       | 79493            | NR               | 630       | 112252           | NR               | 760       | 5011             | NR               | 890       | 4035             | NR               |
| 375       | 3195             | NR               | 505       | 87950            | NR               | 635       | 102369           | NR               | 765       | 4514             | NR               | 895       | 3391             | NR               |
| 380       | 3028             | NR               | 510       | 94704            | NR               | 640       | 93616            | NR               | 770       | 4375             | NR               | 900       | 3268             | NR               |
| 385       | 2738             | NR               | 515       | 100214           | NR               | 645       | 84211            | NR               | 775       | 3450             | NR               | 905       | 2767             | NR               |
| 390       | 2690             | NR               | 520       | 103961           | NR               | 650       | 75380            | NR               | 780       | 3547             | NR               | 910       | 3391             | NR               |
| 395       | 2604             | NR               | 525       | 106854           | NR               | 655       | 66946            | NR               | 785       | 3648             | NR               | 915       | 3784             | NR               |
| 400       | 2384             | NR               | 530       | 109533           | NR               | 660       | 59483            | NR               | 790       | 3081             | NR               | 920       | 3790             | NR               |
| 405       | 3031             | NR               | 535       | 112417           | NR               | 665       | 51858            | NR               | 795       | 3104             | NR               | 925       | 3175             | NR               |
| 410       | 5239             | NR               | 540       | 115725           | NR               | 670       | 44882            | NR               | 800       | 3444             | NR               | 930       | 3642             | NR               |
| 415       | 10499            | NR               | 545       | 119091           | NR               | 675       | 38742            | NR               | 805       | 3315             | NR               | 935       | 3040             | NR               |
| 420       | 20790            | NR               | 550       | 122884           | NR               | 680       | 33597            | NR               | 810       | 3022             | NR               | 940       | 4039             | NR               |
| 425       | 39276            | NR               | 555       | 128300           | NR               | 685       | 29101            | NR               | 815       | 2832             | NR               | 945       | 4797             | NR               |
| 430       | 66418            | NR               | 560       | 133274           | NR               | 690       | 24855            | NR               | 820       | 3142             | NR               | 950       | 4945             | NR               |
| 435       | 101961           | NR               | 565       | 139112           | NR               | 695       | 21367            | NR               | 825       | 3115             | NR               | 955       | 3757             | NR               |
| 440       | 134023           | NR               | 570       | 144467           | NR               | 700       | 18479            | NR               | 830       | 2520             | NR               | 960       | 4539             | NR               |
| 445       | 129385           | NR               | 575       | 149331           | NR               | 705       | 16131            | NR               | 835       | 2783             | NR               | 965       | 4857             | NR               |
| 450       | 90434            | NR               | 580       | 154784           | NR               | 710       | 14388            | NR               | 840       | 3364             | NR               | 970       | 4463             | NR               |
| 455       | 63521            | NR               | 585       | 156899           | NR               | 715       | 12865            | NR               | 845       | 3807             | NR               | 975       | 3718             | NR               |
| 460       | 48429            | NR               | 590       | 157796           | NR               | 720       | 11277            | NR               | 850       | 2907             | NR               | 980       | 3955             | NR               |
| 465       | 36445            | NR               | 595       | 157849           | NR               | 725       | 10063            | NR               | 855       | 3470             | NR               | 985       | 4314             | NR               |
| 470       | 31953            | NR               | 600       | 155418           | NR               | 730       | 8942             | NR               | 860       | 3820             | NR               | 990       | 4478             | NR               |
| 475       | 32768            | NR               | 605       | 151601           | NR               | 735       | 7722             | NR               | 865       | 3922             | NR               | 995       | 2959             | NR               |
| 480       | 37631            | NR               | 610       | 146416           | NR               | 740       | 6964             | NR               | 870       | 4061             | NR               | 1000      | 4570             | NR               |
| 485       | 46354            | NR               | 615       | 139241           | NR               | 745       | 6117             | NR               | 875       | 3975             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 5542.6**

**M/P: 0.62**

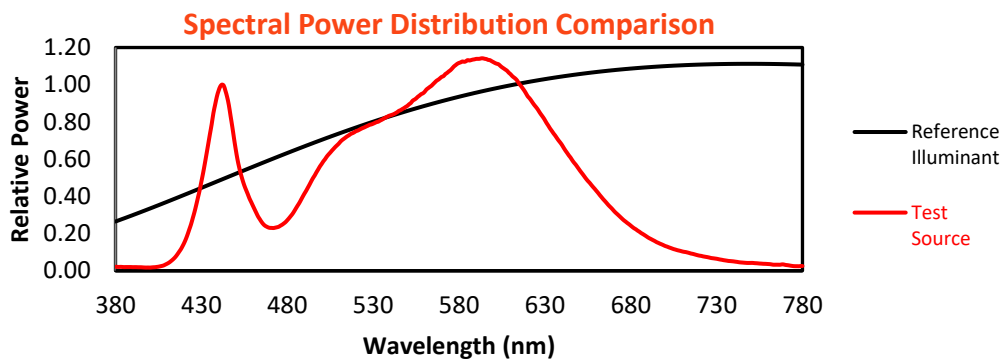
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 3123             | NR               | 490       | 57459            | NR               | 620       | 129941           | NR               | 750       | 5858             | NR               | 880       | 4622             | NR               |
| 365       | 3041             | NR               | 495       | 69038            | NR               | 625       | 121678           | NR               | 755       | 5395             | NR               | 885       | 3949             | NR               |
| 370       | 2965             | NR               | 500       | 79493            | NR               | 630       | 112252           | NR               | 760       | 5011             | NR               | 890       | 4035             | NR               |
| 375       | 3195             | NR               | 505       | 87950            | NR               | 635       | 102369           | NR               | 765       | 4514             | NR               | 895       | 3391             | NR               |
| 380       | 3028             | NR               | 510       | 94704            | NR               | 640       | 93616            | NR               | 770       | 4375             | NR               | 900       | 3268             | NR               |
| 385       | 2738             | NR               | 515       | 100214           | NR               | 645       | 84211            | NR               | 775       | 3450             | NR               | 905       | 2767             | NR               |
| 390       | 2690             | NR               | 520       | 103961           | NR               | 650       | 75380            | NR               | 780       | 3547             | NR               | 910       | 3391             | NR               |
| 395       | 2604             | NR               | 525       | 106854           | NR               | 655       | 66946            | NR               | 785       | 3648             | NR               | 915       | 3784             | NR               |
| 400       | 2384             | NR               | 530       | 109533           | NR               | 660       | 59483            | NR               | 790       | 3081             | NR               | 920       | 3790             | NR               |
| 405       | 3031             | NR               | 535       | 112417           | NR               | 665       | 51858            | NR               | 795       | 3104             | NR               | 925       | 3175             | NR               |
| 410       | 5239             | NR               | 540       | 115725           | NR               | 670       | 44882            | NR               | 800       | 3444             | NR               | 930       | 3642             | NR               |
| 415       | 10499            | NR               | 545       | 119091           | NR               | 675       | 38742            | NR               | 805       | 3315             | NR               | 935       | 3040             | NR               |
| 420       | 20790            | NR               | 550       | 122884           | NR               | 680       | 33597            | NR               | 810       | 3022             | NR               | 940       | 4039             | NR               |
| 425       | 39276            | NR               | 555       | 128300           | NR               | 685       | 29101            | NR               | 815       | 2832             | NR               | 945       | 4797             | NR               |
| 430       | 66418            | NR               | 560       | 133274           | NR               | 690       | 24855            | NR               | 820       | 3142             | NR               | 950       | 4945             | NR               |
| 435       | 101961           | NR               | 565       | 139112           | NR               | 695       | 21367            | NR               | 825       | 3115             | NR               | 955       | 3757             | NR               |
| 440       | 134023           | NR               | 570       | 144467           | NR               | 700       | 18479            | NR               | 830       | 2520             | NR               | 960       | 4539             | NR               |
| 445       | 129385           | NR               | 575       | 149331           | NR               | 705       | 16131            | NR               | 835       | 2783             | NR               | 965       | 4857             | NR               |
| 450       | 90434            | NR               | 580       | 154784           | NR               | 710       | 14388            | NR               | 840       | 3364             | NR               | 970       | 4463             | NR               |
| 455       | 63521            | NR               | 585       | 156899           | NR               | 715       | 12865            | NR               | 845       | 3807             | NR               | 975       | 3718             | NR               |
| 460       | 48429            | NR               | 590       | 157796           | NR               | 720       | 11277            | NR               | 850       | 2907             | NR               | 980       | 3955             | NR               |
| 465       | 36445            | NR               | 595       | 157849           | NR               | 725       | 10063            | NR               | 855       | 3470             | NR               | 985       | 4314             | NR               |
| 470       | 31953            | NR               | 600       | 155418           | NR               | 730       | 8942             | NR               | 860       | 3820             | NR               | 990       | 4478             | NR               |
| 475       | 32768            | NR               | 605       | 151601           | NR               | 735       | 7722             | NR               | 865       | 3922             | NR               | 995       | 2959             | NR               |
| 480       | 37631            | NR               | 610       | 146416           | NR               | 740       | 6964             | NR               | 870       | 4061             | NR               | 1000      | 4570             | NR               |
| 485       | 46354            | NR               | 615       | 139241           | NR               | 745       | 6117             | NR               | 875       | 3975             | NR               |           |                  |                  |

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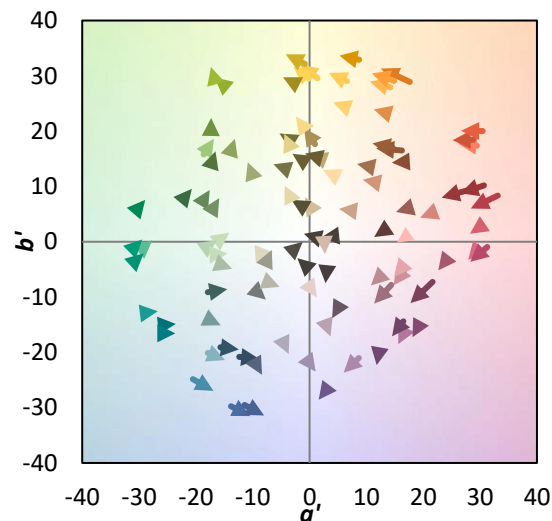
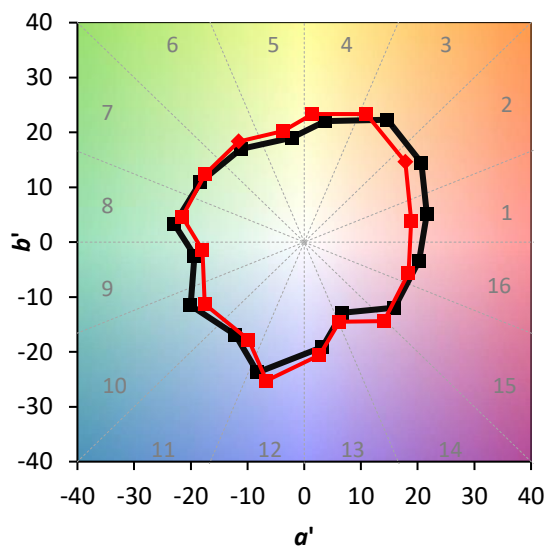
**TM-30-18**

**Summary**

$R_f = 82.7$   
 $R_g = 96.5$   
 $CIE R_a = 79.8$   
 $R_g = -8.6$



**Color Vector Graphics**

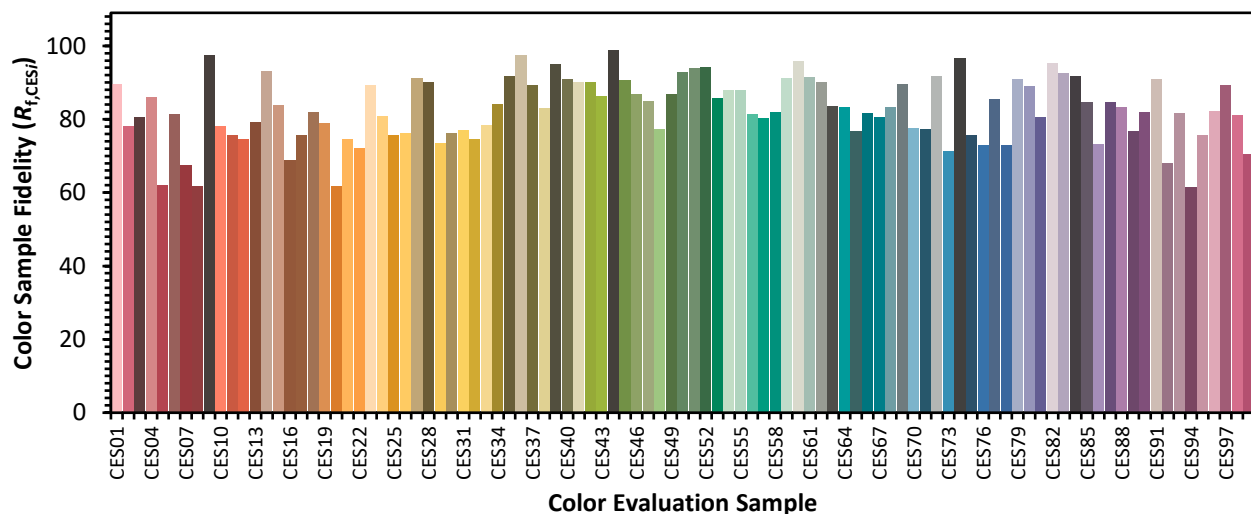


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**TM-30-18**

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

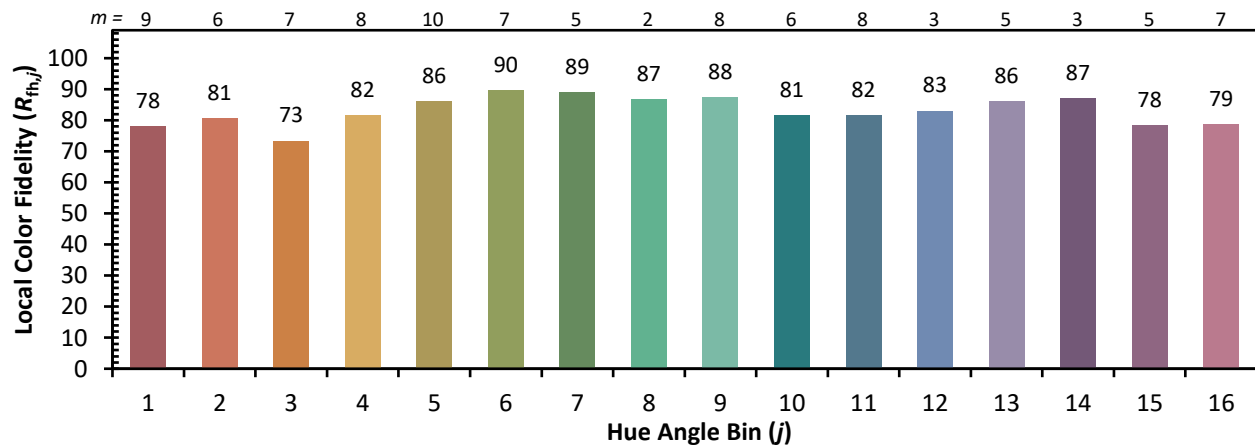
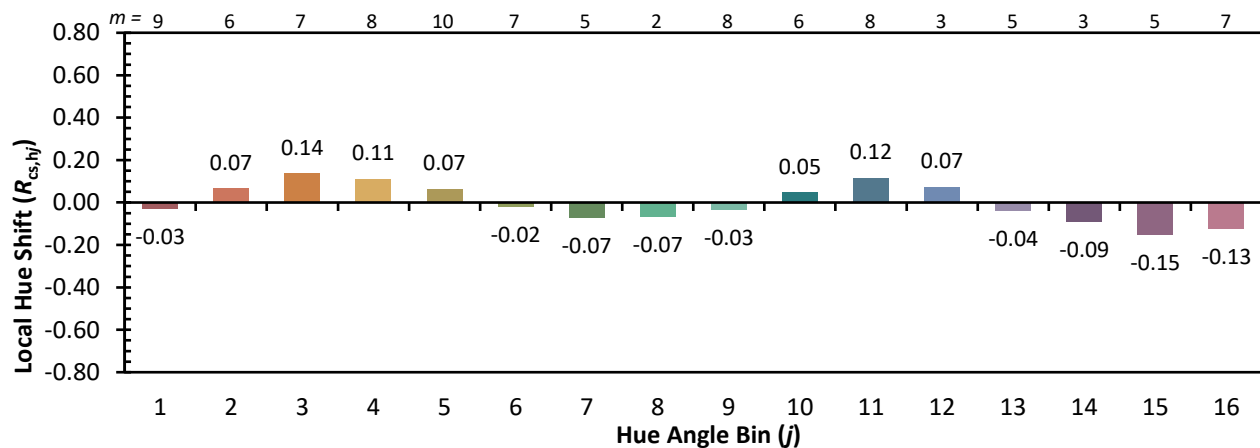
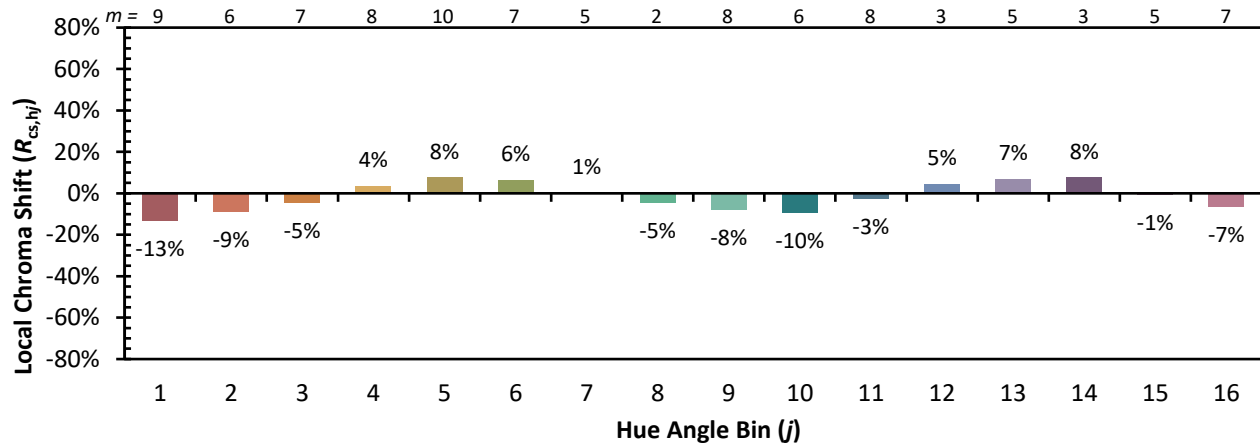
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 76 | CES51 = 94 | CES76 = 73 |
| CES02 = 61 | CES27 = 91 | CES52 = 94 | CES77 = 85 |
| CES03 = 31 | CES28 = 90 | CES53 = 86 | CES78 = 73 |
| CES04 = 69 | CES29 = 73 | CES54 = 88 | CES79 = 91 |
| CES05 = 48 | CES30 = 76 | CES55 = 88 | CES80 = 89 |
| CES06 = 50 | CES31 = 77 | CES56 = 81 | CES81 = 80 |
| CES07 = 40 | CES32 = 74 | CES57 = 80 | CES82 = 95 |
| CES08 = 39 | CES33 = 78 | CES58 = 82 | CES83 = 92 |
| CES09 = 29 | CES34 = 84 | CES59 = 91 | CES84 = 92 |
| CES10 = 74 | CES35 = 92 | CES60 = 96 | CES85 = 85 |
| CES11 = 57 | CES36 = 97 | CES61 = 92 | CES86 = 73 |
| CES12 = 63 | CES37 = 89 | CES62 = 90 | CES87 = 85 |
| CES13 = 42 | CES38 = 83 | CES63 = 83 | CES88 = 83 |
| CES14 = 74 | CES39 = 95 | CES64 = 83 | CES89 = 77 |
| CES15 = 71 | CES40 = 91 | CES65 = 77 | CES90 = 82 |
| CES16 = 47 | CES41 = 90 | CES66 = 82 | CES91 = 91 |
| CES17 = 49 | CES42 = 90 | CES67 = 80 | CES92 = 68 |
| CES18 = 56 | CES43 = 86 | CES68 = 83 | CES93 = 82 |
| CES19 = 71 | CES44 = 99 | CES69 = 90 | CES94 = 61 |
| CES20 = 65 | CES45 = 91 | CES70 = 77 | CES95 = 76 |
| CES21 = 86 | CES46 = 87 | CES71 = 77 | CES96 = 82 |
| CES22 = 78 | CES47 = 85 | CES72 = 92 | CES97 = 89 |
| CES23 = 91 | CES48 = 77 | CES73 = 71 | CES98 = 81 |
| CES24 = 90 | CES49 = 87 | CES74 = 97 | CES99 = 70 |
| CES25 = 71 | CES50 = 93 | CES75 = 76 |            |



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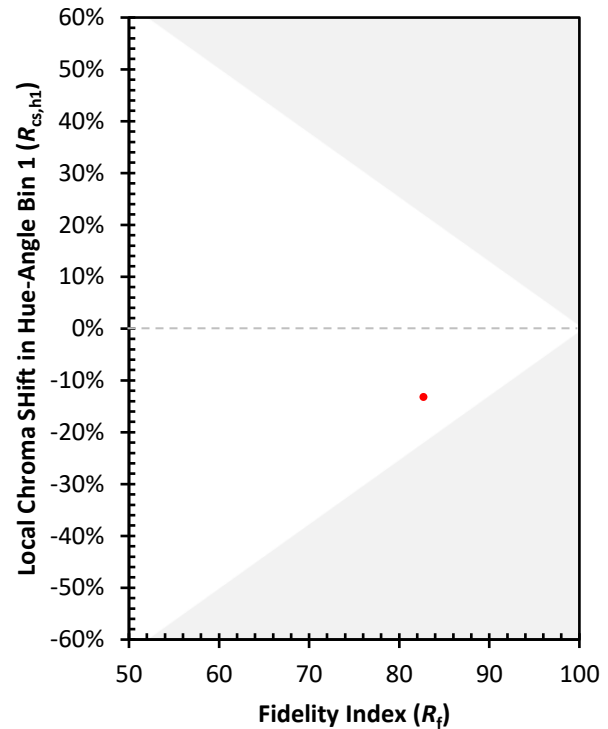
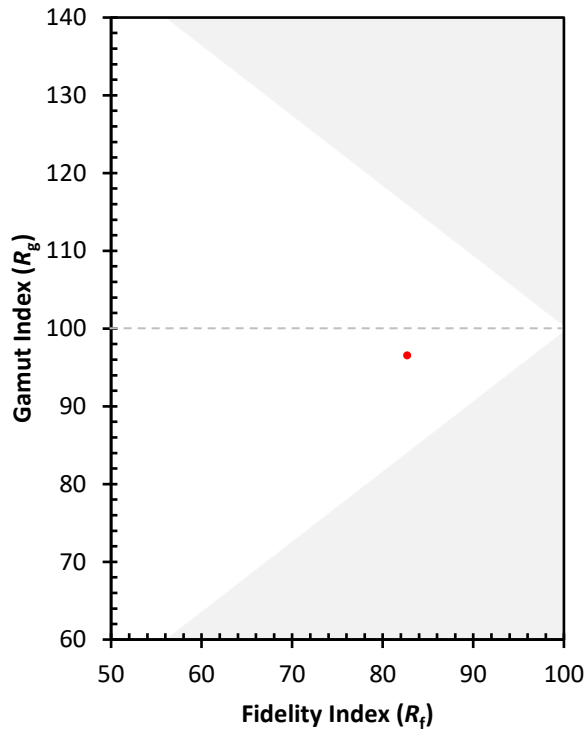
Color Rendition by Hue-Angle Bin



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**TM-30-18**

**Measure Comparisons**



(END OF REPORT)