

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: P822803

Luminaire Tested: **MSA-SA2A-840-U-SL2**

Issue Date: 04/10/2024

**Test Information**

Test Method: LM-79-08  
Report Number: P822803  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1910-543-16)  
Test Lab: INNOVATION CENTER  
Issue Date: 04/10/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: MSA-SA2A-840-U-SL2  
Description: MESA POST TOP DECORATIVE LUMINAIRE. (2) LIGHTSQUARES WITH 16 LEDS  
EACH AND TYPE II SPILL LIGHT ELIMINATOR OPTICS.  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

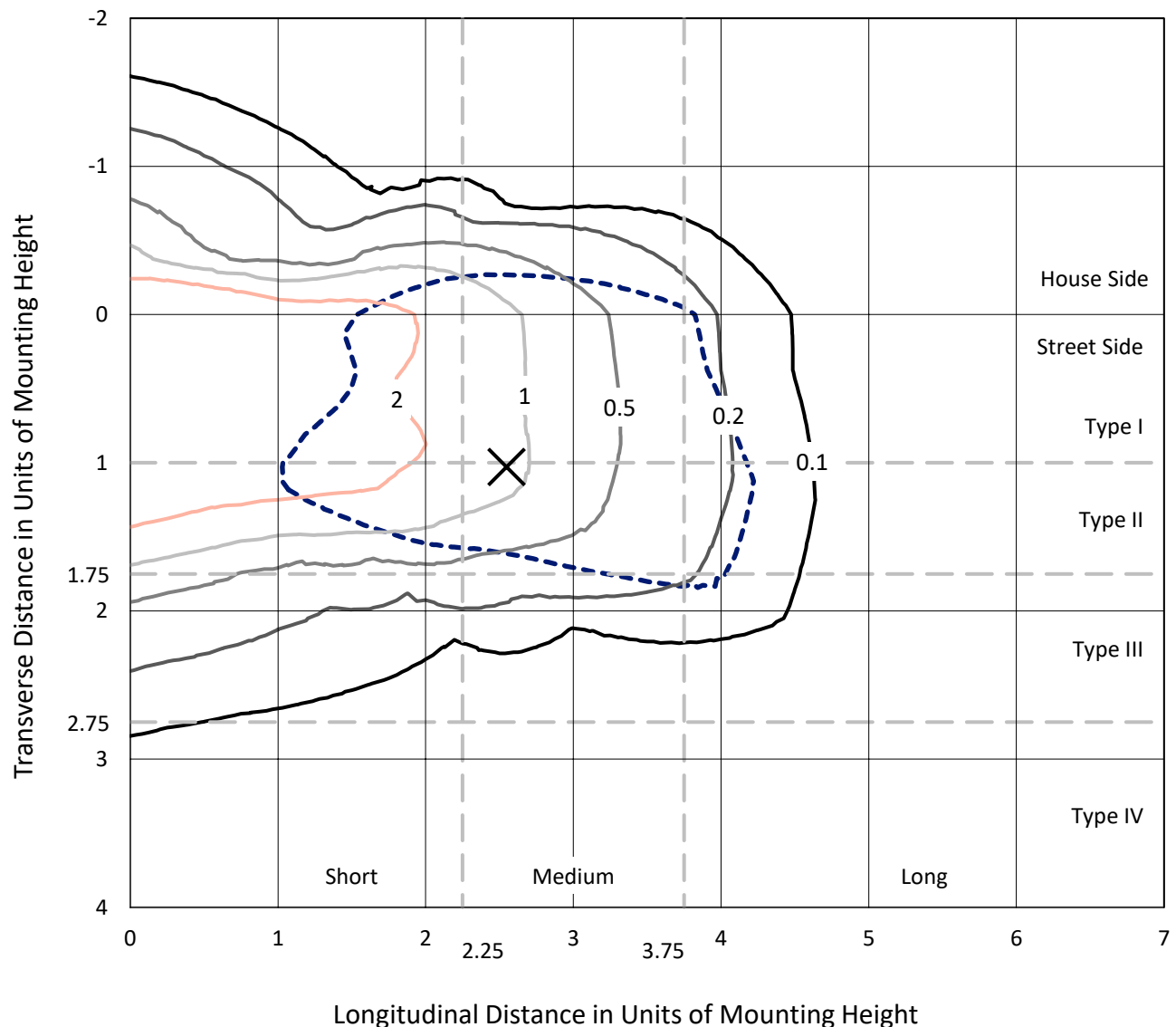
Lumens per Lamp: N/A  
Luminaire Lumens: 6639.8 lumens  
Efficiency: N/A  
Efficacy: 100.6 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B2 - U0 - G2

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: 25 FT

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## Iso-Footcandle Lines of Horizontal Illumination

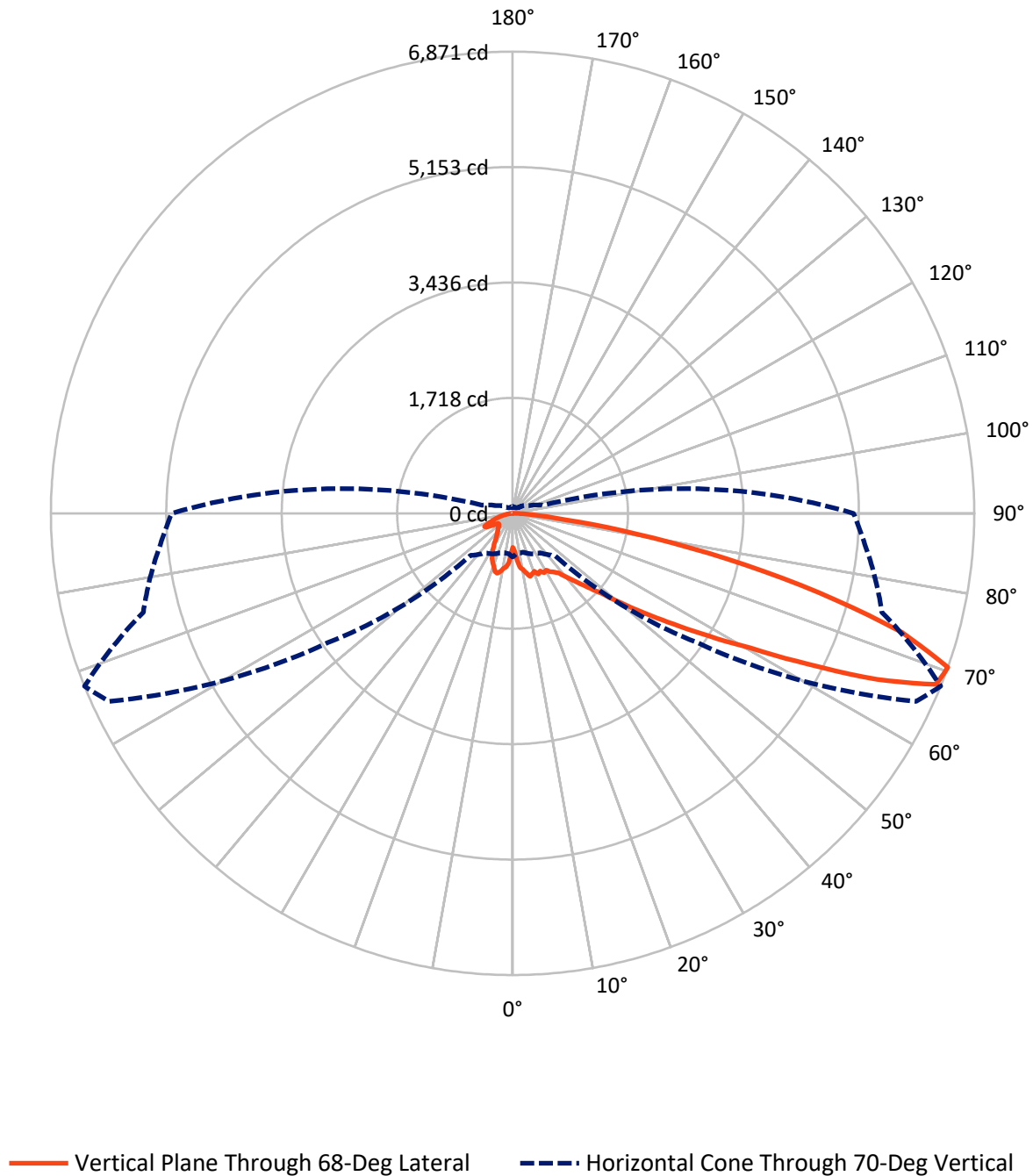
× Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 4.5 fc  
 Type III - Medium - N/A

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## Luminous Intensity Polar Plot



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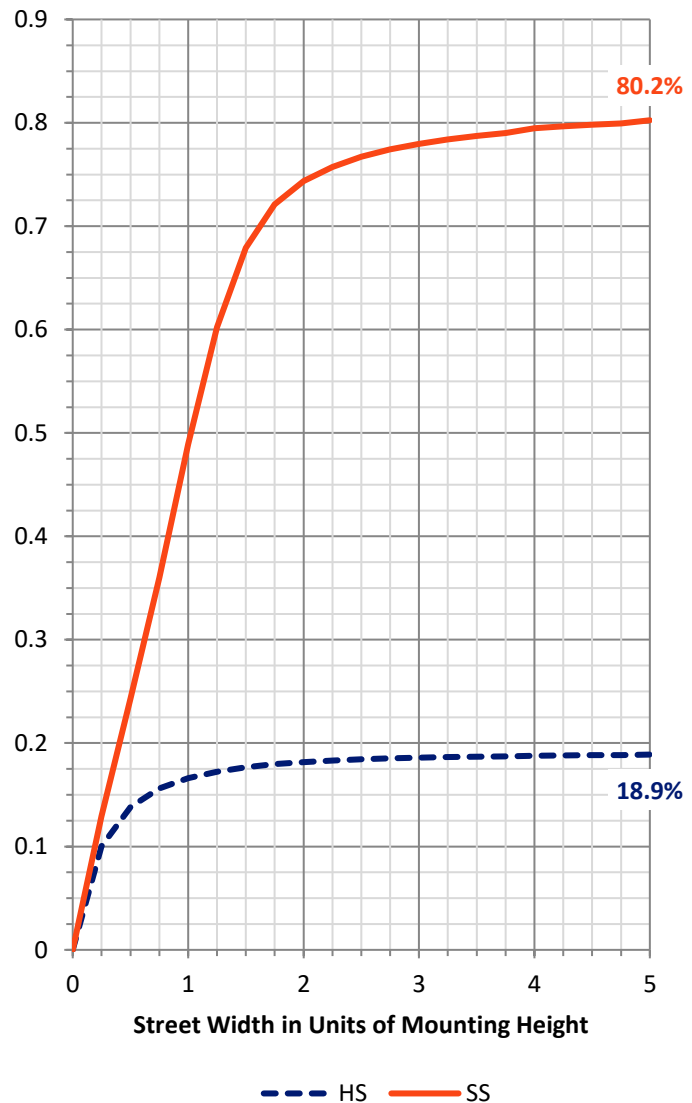
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 1267.7   | 0.0    | 1267.7 |
|                    | % Fixture | 19.1     | 0.0    | 19.1   |
| <b>Street Side</b> | Lumens    | 5372.1   | 0.0    | 5372.1 |
|                    | % Fixture | 80.9     | 0.0    | 80.9   |
| <b>Total</b>       | Lumens    | 6639.8   | 0.0    | 6639.8 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 68.0   | 1.0       |
| 10°-20°   | 221.6  | 3.3       |
| 20°-30°   | 337.1  | 5.1       |
| 30°-40°   | 514.9  | 7.8       |
| 40°-50°   | 885.4  | 13.3      |
| 50°-60°   | 1465.5 | 22.1      |
| 60°-70°   | 1806.7 | 27.2      |
| 70°-80°   | 1160.6 | 17.5      |
| 80°-90°   | 180.0  | 2.7       |
| 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°    | 6639.8 | 100.0     |
| 0°-180°   | 6639.8 | 100.0     |

**Coefficient of Utilization**



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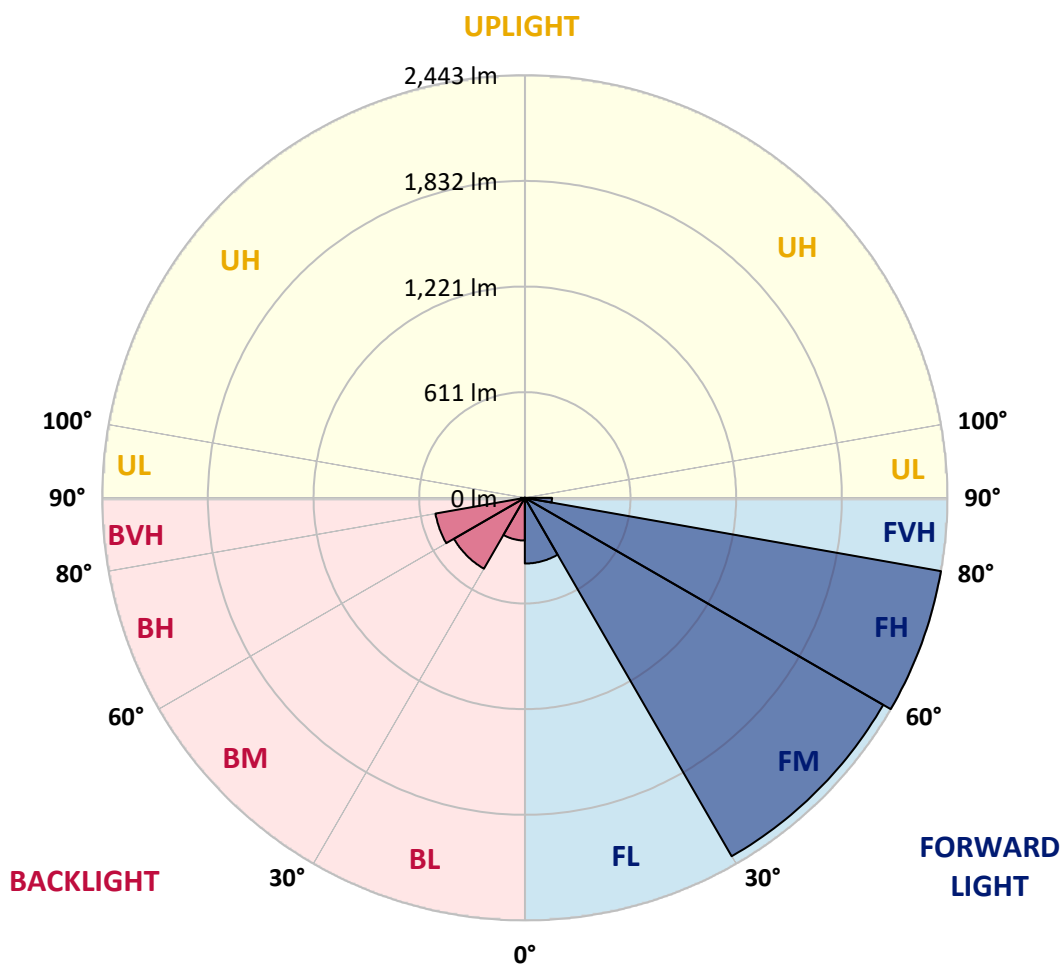
CATALOG NUMBER: MSA-SA2A-840-U-SL2

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 379.7  | 5.7       |                         |      |         |
| FM   | (30°-60°)   | 2392.6 | 36.0      |                         |      |         |
| FH   | (60°-80°)   | 2442.9 | 36.8      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 156.9  | 2.4       |                         |      | G2/225  |
| BL   | (0°-30°)    | 247.0  | 3.7       | B1/500                  |      |         |
| BM   | (30°-60°)   | 473.2  | 7.1       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 524.4  | 7.9       | B2/1000                 |      | G2/1000 |
| BVH  | (80°-90°)   | 23.1   | 0.3       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

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

Type III Medium





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CATALOG NUMBER: MSA-SA2A-840-U-SL2

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 68°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  | 509.1  |
| 2.5°  | 584.9  | 561.3  | 537.4  | 549.1  | 567.7  | 584.1  | 580.8  | 582.7  | 560.2  | 557.2  | 616.4  |
| 5°    | 689.2  | 648.6  | 647.7  | 648.3  | 650.0  | 631.1  | 677.2  | 701.1  | 706.4  | 730.8  | 788.9  |
| 7.5°  | 725.3  | 708.9  | 692.2  | 700.6  | 679.4  | 681.4  | 738.1  | 800.3  | 815.1  | 832.8  | 912.3  |
| 10°   | 717.8  | 702.2  | 707.2  | 708.6  | 712.5  | 743.9  | 780.3  | 840.1  | 852.6  | 909.3  | 929.8  |
| 12.5° | 718.9  | 716.1  | 739.5  | 740.3  | 782.0  | 838.4  | 852.8  | 907.8  | 912.9  | 954.6  | 1040.4 |
| 15°   | 757.0  | 776.2  | 763.1  | 770.0  | 778.1  | 845.6  | 866.5  | 945.3  | 975.4  | 1029.0 | 1093.5 |
| 17.5° | 831.1  | 836.7  | 797.5  | 787.3  | 813.7  | 834.3  | 881.8  | 915.9  | 947.4  | 1097.1 | 1186.0 |
| 20°   | 848.4  | 863.4  | 816.7  | 763.6  | 819.5  | 848.1  | 881.2  | 896.7  | 921.2  | 1107.1 | 1233.3 |
| 22.5° | 922.3  | 891.2  | 834.8  | 788.7  | 807.0  | 834.8  | 858.6  | 917.3  | 981.5  | 1078.5 | 1280.5 |
| 25°   | 964.3  | 946.2  | 895.9  | 846.4  | 830.9  | 831.7  | 877.8  | 930.4  | 952.6  | 1120.4 | 1289.9 |
| 27.5° | 1065.7 | 1036.8 | 923.7  | 914.2  | 855.6  | 810.0  | 880.9  | 962.6  | 1001.5 | 1087.6 | 1336.1 |
| 30°   | 1192.7 | 1170.8 | 1022.4 | 1009.8 | 920.4  | 840.9  | 919.8  | 986.5  | 980.9  | 1109.1 | 1368.1 |
| 32.5° | 1295.5 | 1332.2 | 1182.4 | 1083.8 | 1020.1 | 944.0  | 907.6  | 982.3  | 1037.7 | 1158.8 | 1422.2 |
| 35°   | 1442.2 | 1476.7 | 1307.2 | 1240.5 | 1102.4 | 991.8  | 992.9  | 1039.6 | 1073.7 | 1216.9 | 1482.8 |
| 37.5° | 1696.3 | 1665.9 | 1529.5 | 1424.1 | 1335.9 | 1170.8 | 1121.3 | 1104.9 | 1132.4 | 1288.0 | 1601.5 |
| 40°   | 1879.3 | 1853.8 | 1693.2 | 1633.2 | 1461.1 | 1365.3 | 1229.6 | 1214.1 | 1262.7 | 1361.4 | 1698.4 |
| 42.5° | 2096.4 | 2050.8 | 1901.4 | 1851.8 | 1672.0 | 1499.2 | 1362.5 | 1371.4 | 1395.0 | 1499.7 | 1829.6 |
| 45°   | 2317.4 | 2206.7 | 2121.9 | 2118.1 | 1998.1 | 1759.3 | 1575.6 | 1568.4 | 1569.2 | 1703.5 | 1976.9 |
| 47.5° | 2492.7 | 2393.2 | 2296.2 | 2250.1 | 2189.5 | 2209.2 | 1885.2 | 1800.5 | 1774.9 | 1908.5 | 2197.9 |
| 50°   | 2611.3 | 2496.8 | 2387.1 | 2376.2 | 2537.9 | 2644.4 | 2175.9 | 2085.3 | 2101.2 | 2202.0 | 2492.4 |
| 52.5° | 2613.9 | 2478.0 | 2363.4 | 2439.3 | 2820.3 | 2972.6 | 2676.7 | 2423.5 | 2474.0 | 2542.7 | 2876.7 |
| 55°   | 2432.1 | 2291.2 | 2216.7 | 2389.6 | 2930.6 | 3361.9 | 3380.2 | 2965.3 | 2907.0 | 2932.3 | 3336.0 |
| 57.5° | 2048.9 | 1906.6 | 1863.3 | 2070.3 | 2721.4 | 3737.3 | 4230.1 | 3612.8 | 3441.6 | 3336.0 | 3806.8 |
| 60°   | 1542.3 | 1419.2 | 1392.2 | 1524.2 | 2256.2 | 3627.0 | 4918.1 | 4418.7 | 4070.0 | 3787.1 | 4278.9 |
| 62.5° | 1156.6 | 1068.2 | 1027.7 | 1046.5 | 1561.2 | 3268.2 | 5369.9 | 5436.9 | 4943.1 | 4279.5 | 4740.2 |
| 65°   | 939.8  | 868.4  | 832.2  | 807.9  | 970.9  | 2527.2 | 5288.3 | 6293.9 | 5962.9 | 4796.7 | 5099.3 |
| 67.5° | 785.1  | 721.7  | 705.0  | 728.9  | 767.5  | 1466.1 | 4649.1 | 6773.3 | 6795.8 | 5306.8 | 5309.1 |
| 70°   | 651.6  | 604.7  | 598.6  | 666.4  | 717.2  | 884.8  | 3358.1 | 6622.7 | 6871.1 | 5689.5 | 5259.9 |
| 72.5° | 503.5  | 478.2  | 477.4  | 583.8  | 712.5  | 754.2  | 1999.7 | 5721.1 | 6054.9 | 5567.3 | 4778.6 |
| 75°   | 349.3  | 331.8  | 345.1  | 479.9  | 696.1  | 765.1  | 1141.3 | 4456.3 | 4706.0 | 4737.5 | 3827.9 |
| 77.5° | 240.4  | 225.6  | 240.1  | 347.1  | 621.7  | 783.4  | 798.4  | 3222.2 | 3249.9 | 3176.8 | 2192.6 |
| 80°   | 167.3  | 157.0  | 168.1  | 245.6  | 483.8  | 775.3  | 679.7  | 2028.6 | 1861.3 | 1417.8 | 702.0  |
| 82.5° | 103.7  | 100.6  | 112.8  | 175.1  | 340.7  | 705.3  | 644.1  | 1046.8 | 799.2  | 391.3  | 250.7  |
| 85°   | 54.5   | 50.0   | 65.6   | 114.2  | 213.2  | 553.6  | 603.6  | 477.7  | 308.4  | 138.9  | 100.6  |
| 87.5° | 16.1   | 14.5   | 25.3   | 46.2   | 90.3   | 248.1  | 345.4  | 202.6  | 115.0  | 40.9   | 31.4   |
| 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: MSA-SA2A-840-U-SL2

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 509.1  | 509.1  | 509.1 | 509.1 | 509.1 | 509.1 | 509.1 | 509.1 | 509.1 | 509.1 | 509.1 |
| 2.5°  | 620.5  | 617.5  | 576.4 | 581.7 | 590.5 | 592.8 | 592.5 | 577.4 | 561.6 | 605.8 | 604.4 |
| 5°    | 790.3  | 762.8  | 742.3 | 737.8 | 712.5 | 687.2 | 696.1 | 693.1 | 689.2 | 709.2 | 711.7 |
| 7.5°  | 912.6  | 874.5  | 850.7 | 789.2 | 730.8 | 680.3 | 696.3 | 701.4 | 691.4 | 727.5 | 738.3 |
| 10°   | 944.8  | 914.8  | 889.0 | 810.0 | 777.8 | 748.3 | 704.8 | 655.0 | 648.3 | 627.5 | 630.0 |
| 12.5° | 1027.9 | 1023.7 | 935.7 | 866.2 | 824.3 | 765.6 | 671.4 | 611.1 | 559.4 | 561.9 | 546.9 |
| 15°   | 1093.5 | 1095.7 | 989.8 | 892.6 | 780.0 | 690.5 | 579.7 | 504.6 | 451.6 | 441.1 | 430.2 |
| 17.5° | 1181.5 | 1177.2 | 994.3 | 860.9 | 718.4 | 587.2 | 451.3 | 376.8 | 367.9 | 374.0 | 364.6 |
| 20°   | 1219.9 | 1180.8 | 965.9 | 782.3 | 621.9 | 446.0 | 341.0 | 301.5 | 318.7 | 343.2 | 343.8 |
| 22.5° | 1254.4 | 1187.4 | 951.2 | 718.9 | 493.5 | 324.3 | 273.7 | 266.5 | 286.7 | 319.9 | 322.7 |
| 25°   | 1253.0 | 1218.3 | 924.8 | 655.0 | 382.7 | 253.2 | 237.9 | 243.2 | 267.3 | 301.8 | 303.7 |
| 27.5° | 1316.1 | 1194.7 | 856.2 | 571.1 | 288.2 | 216.8 | 220.7 | 230.4 | 241.8 | 274.6 | 280.9 |
| 30°   | 1315.5 | 1238.6 | 821.7 | 469.1 | 231.5 | 198.7 | 208.7 | 217.0 | 226.5 | 256.5 | 260.1 |
| 32.5° | 1346.6 | 1210.0 | 800.9 | 364.9 | 207.6 | 194.2 | 196.8 | 205.1 | 218.7 | 239.0 | 241.5 |
| 35°   | 1384.2 | 1242.4 | 734.2 | 289.9 | 198.7 | 190.4 | 192.3 | 197.0 | 209.6 | 228.1 | 230.7 |
| 37.5° | 1504.5 | 1248.6 | 707.8 | 244.3 | 198.1 | 188.7 | 188.4 | 190.9 | 205.1 | 222.0 | 229.6 |
| 40°   | 1551.5 | 1304.4 | 630.8 | 228.1 | 196.2 | 188.7 | 184.8 | 186.2 | 197.9 | 219.6 | 225.4 |
| 42.5° | 1664.0 | 1323.1 | 573.8 | 222.6 | 196.2 | 185.3 | 179.3 | 181.5 | 195.1 | 214.3 | 223.4 |
| 45°   | 1779.8 | 1349.4 | 506.1 | 221.5 | 195.9 | 185.1 | 173.4 | 178.4 | 189.5 | 205.6 | 215.6 |
| 47.5° | 1944.9 | 1444.5 | 438.2 | 218.1 | 193.7 | 186.4 | 172.0 | 171.7 | 181.5 | 195.3 | 204.8 |
| 50°   | 2214.3 | 1592.8 | 385.7 | 214.0 | 194.0 | 185.3 | 169.3 | 165.3 | 171.7 | 184.0 | 193.2 |
| 52.5° | 2589.1 | 1845.8 | 365.1 | 211.7 | 191.7 | 180.9 | 164.5 | 158.4 | 162.0 | 171.7 | 180.6 |
| 55°   | 3024.3 | 2187.3 | 385.5 | 211.7 | 187.3 | 174.0 | 157.8 | 150.6 | 152.5 | 159.3 | 167.8 |
| 57.5° | 3532.8 | 2611.6 | 483.5 | 208.7 | 181.7 | 165.7 | 149.8 | 141.4 | 142.0 | 147.8 | 155.7 |
| 60°   | 4063.8 | 3085.7 | 703.3 | 206.2 | 177.9 | 156.5 | 140.3 | 131.7 | 130.8 | 136.5 | 143.4 |
| 62.5° | 4595.8 | 3523.1 | 934.6 | 212.0 | 176.8 | 148.7 | 130.3 | 121.7 | 121.4 | 126.5 | 132.3 |
| 65°   | 5018.7 | 3822.1 | 992.1 | 235.6 | 184.0 | 139.8 | 120.1 | 112.0 | 111.4 | 115.6 | 122.0 |
| 67.5° | 5226.3 | 3865.4 | 753.6 | 265.1 | 199.2 | 131.4 | 110.1 | 102.5 | 102.0 | 106.5 | 112.0 |
| 70°   | 5072.6 | 3569.2 | 465.2 | 268.2 | 198.5 | 121.7 | 99.7  | 93.3  | 92.2  | 97.0  | 101.2 |
| 72.5° | 4504.0 | 3122.1 | 353.5 | 237.3 | 171.7 | 107.8 | 89.5  | 83.9  | 82.2  | 86.4  | 90.3  |
| 75°   | 3615.0 | 2478.8 | 283.1 | 191.5 | 135.3 | 90.9  | 79.2  | 73.9  | 72.0  | 75.8  | 79.2  |
| 77.5° | 2105.9 | 1394.5 | 207.0 | 149.5 | 102.3 | 74.2  | 67.5  | 62.8  | 60.5  | 64.7  | 67.3  |
| 80°   | 684.7  | 464.6  | 130.1 | 107.3 | 74.8  | 58.1  | 54.7  | 51.4  | 49.2  | 52.0  | 52.8  |
| 82.5° | 246.0  | 172.9  | 72.0  | 65.8  | 49.8  | 41.7  | 41.4  | 39.4  | 36.7  | 37.8  | 37.8  |
| 85°   | 108.9  | 79.0   | 42.8  | 35.3  | 29.8  | 22.2  | 26.2  | 24.7  | 21.9  | 21.4  | 20.6  |
| 87.5° | 30.6   | 26.2   | 15.6  | 11.9  | 9.8   | 3.6   | 8.3   | 7.5   | 6.1   | 5.5   | 3.9   |
| 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: 4π  
 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

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| 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           |

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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 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               |           |                  |                  |

REPORT NUMBER: SP1-2309-178-2

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

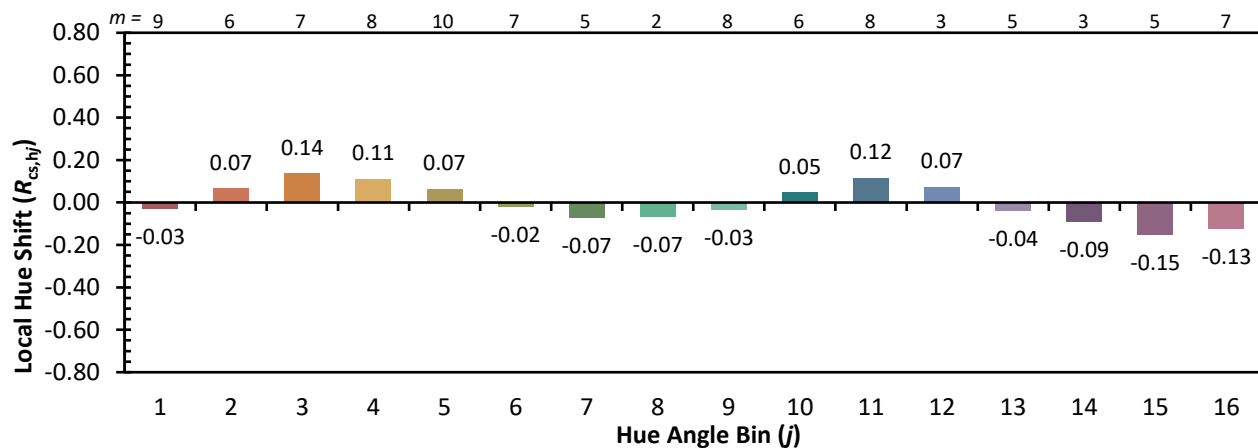
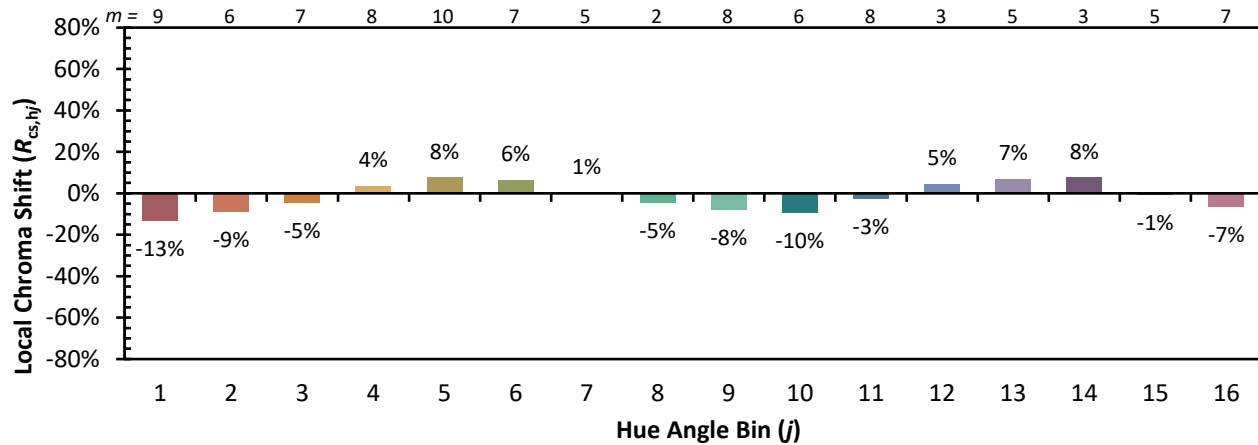
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|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 76 | CES51 = 94 | CES76 = 73 |
| CES02 = 61 | CES27 = 91 | CES52 = 94 | CES77 = 85 |
| CES03 = 31 | CES28 = 90 | CES53 = 86 | CES78 = 73 |
| CES04 = 69 | CES29 = 73 | CES54 = 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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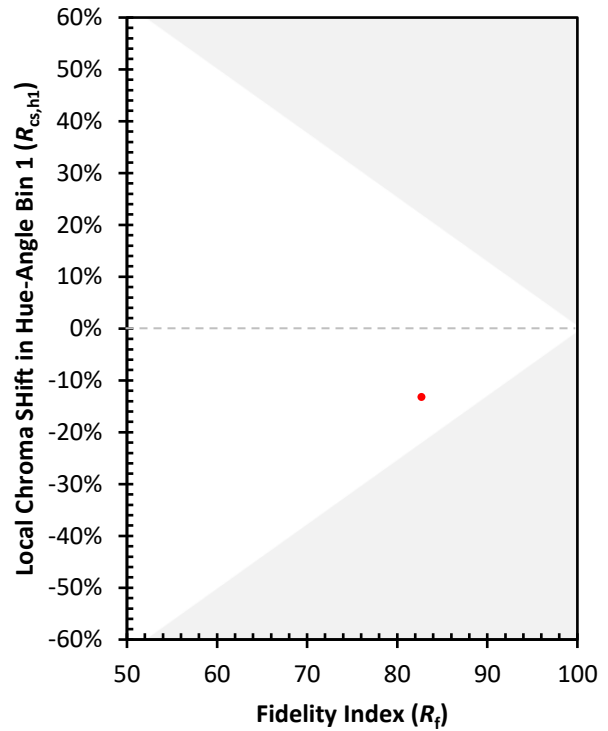
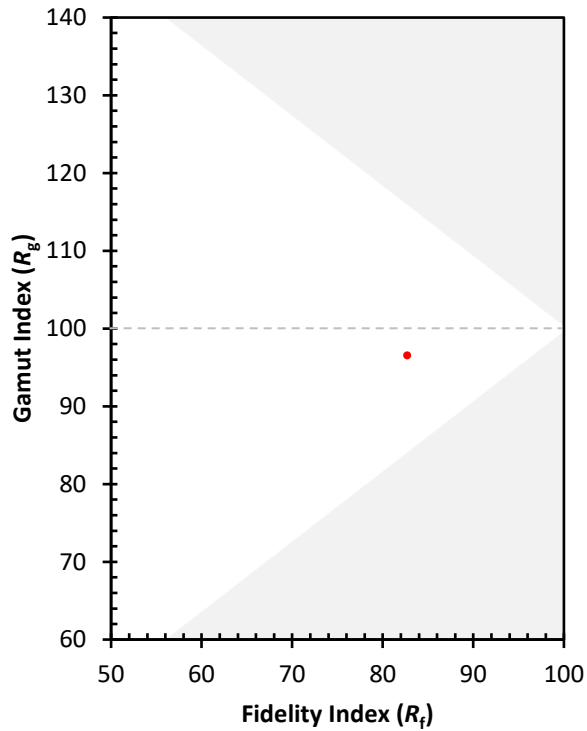
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)