

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: P822817

Luminaire Tested: **MSA-SA2A-840-U-T4FT-HSS**

Issue Date: 04/10/2024

**Test Information**

Test Method: LM-79-08  
Report Number: P822817  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1910-543-13)  
Test Lab: INNOVATION CENTER  
Issue Date: 04/10/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: MSA-SA2A-840-U-T4FT-HSS  
Description: MESA POST TOP DECORATIVE LUMINAIRE. (2) LIGHTSQUARES WITH 16 LEDS  
EACH AND TYPE IV FORWARD THROW OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

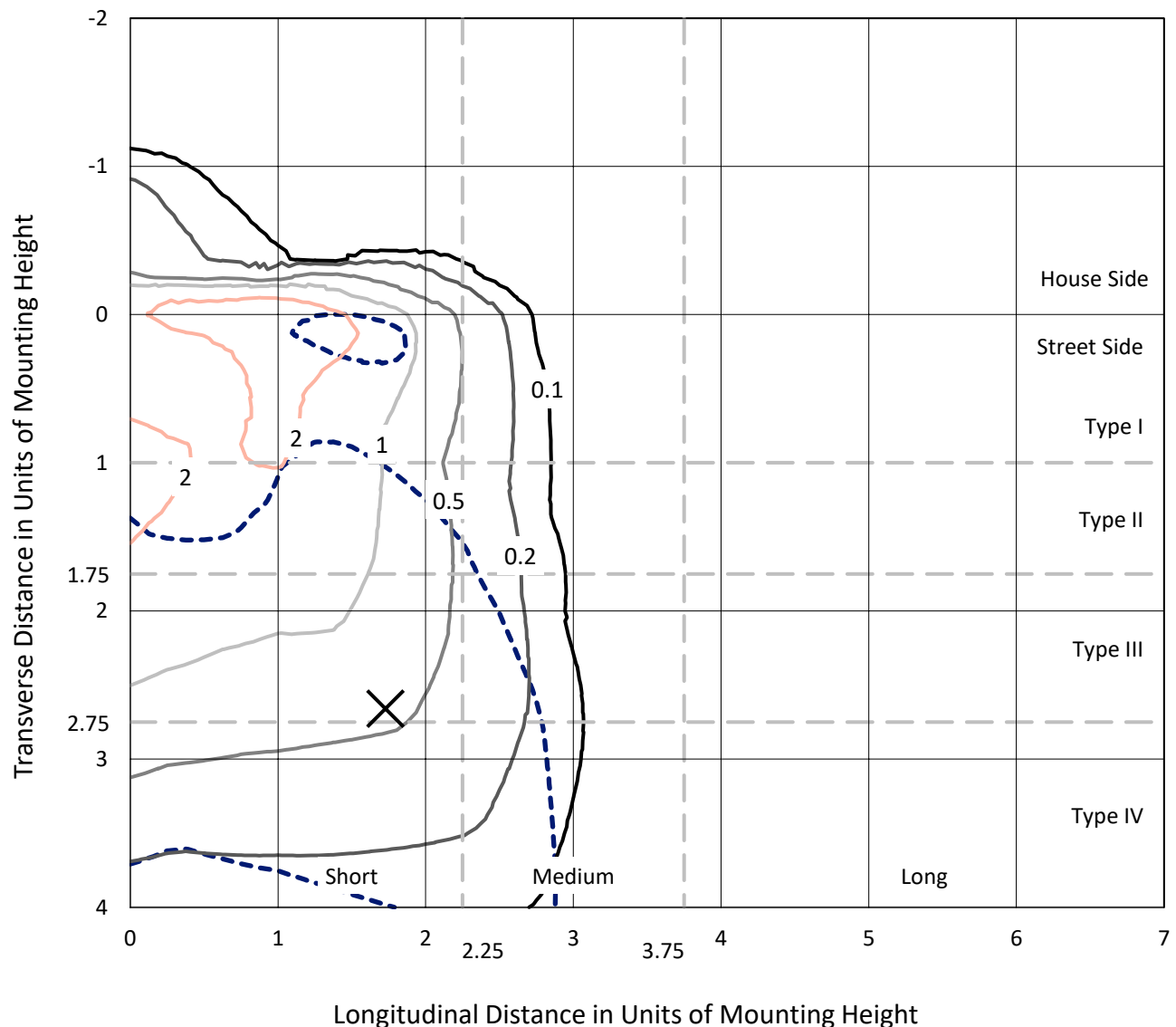
Lumens per Lamp: N/A  
Luminaire Lumens: 5005 lumens  
Efficiency: N/A  
Efficacy: 75.8 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

Input Watts (W): 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

REPORT NUMBER: P822817  
 CATALOG NUMBER: MSA-SA2A-840-U-T4FT-HSS

## Iso-Footcandle Lines of Horizontal Illumination

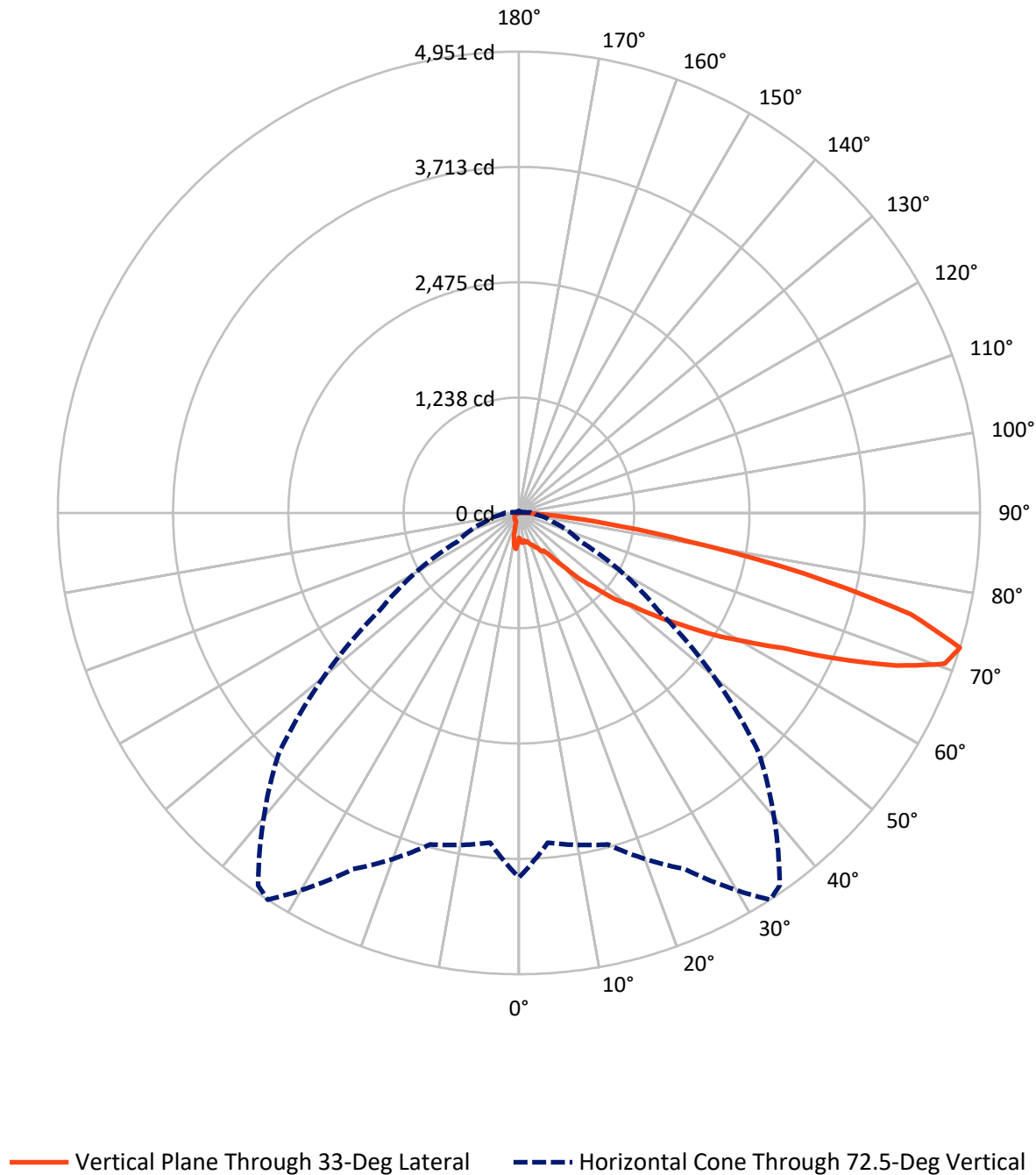
× Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 3.5 fc  
 Type IV - Short - N/A

REPORT NUMBER: P822817  
CATALOG NUMBER: MSA-SA2A-840-U-T4FT-HSS

## Luminous Intensity Polar Plot



REPORT NUMBER: P822817

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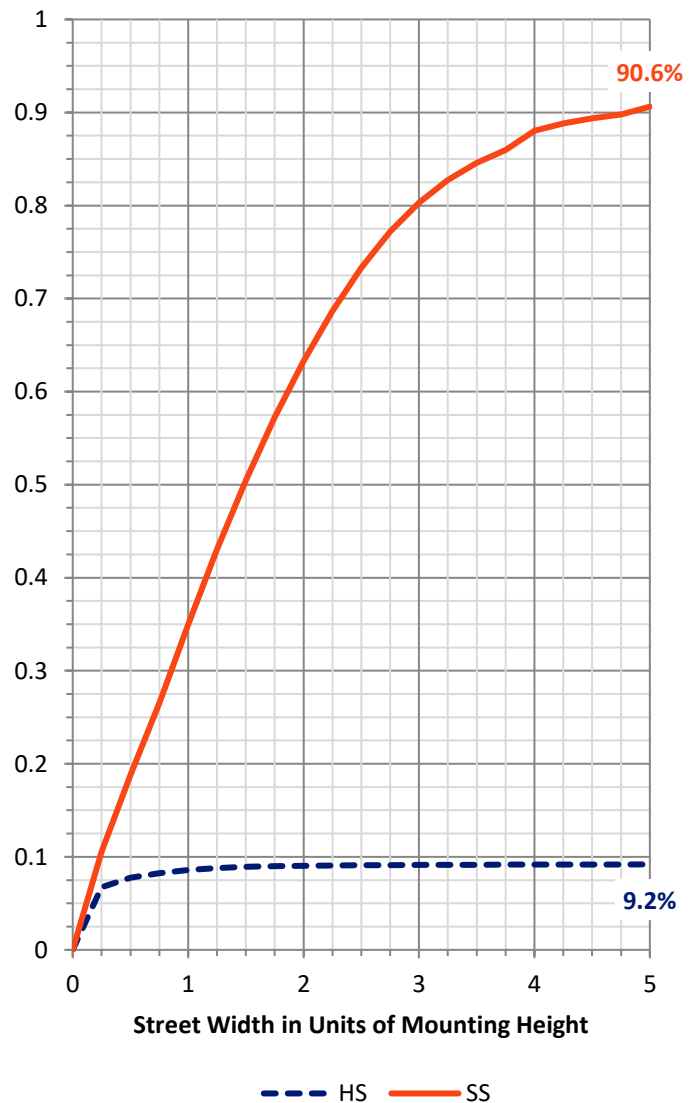
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 462.8    | 0.0    | 462.8  |
|                    | % Fixture | 9.2      | 0.0    | 9.2    |
| <b>Street Side</b> | Lumens    | 4542.3   | 0.0    | 4542.3 |
|                    | % Fixture | 90.8     | 0.0    | 90.8   |
| <b>Total</b>       | Lumens    | 5005.0   | 0.0    | 5005.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 34.5   | 0.7       |
| 10°-20°   | 102.7  | 2.1       |
| 20°-30°   | 174.1  | 3.5       |
| 30°-40°   | 318.7  | 6.4       |
| 40°-50°   | 672.6  | 13.4      |
| 50°-60°   | 1125.2 | 22.5      |
| 60°-70°   | 1506.2 | 30.1      |
| 70°-80°   | 983.9  | 19.7      |
| 80°-90°   | 87.2   | 1.7       |
| 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°    | 5005.0 | 100.0     |
| 0°-180°   | 5005.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P822817

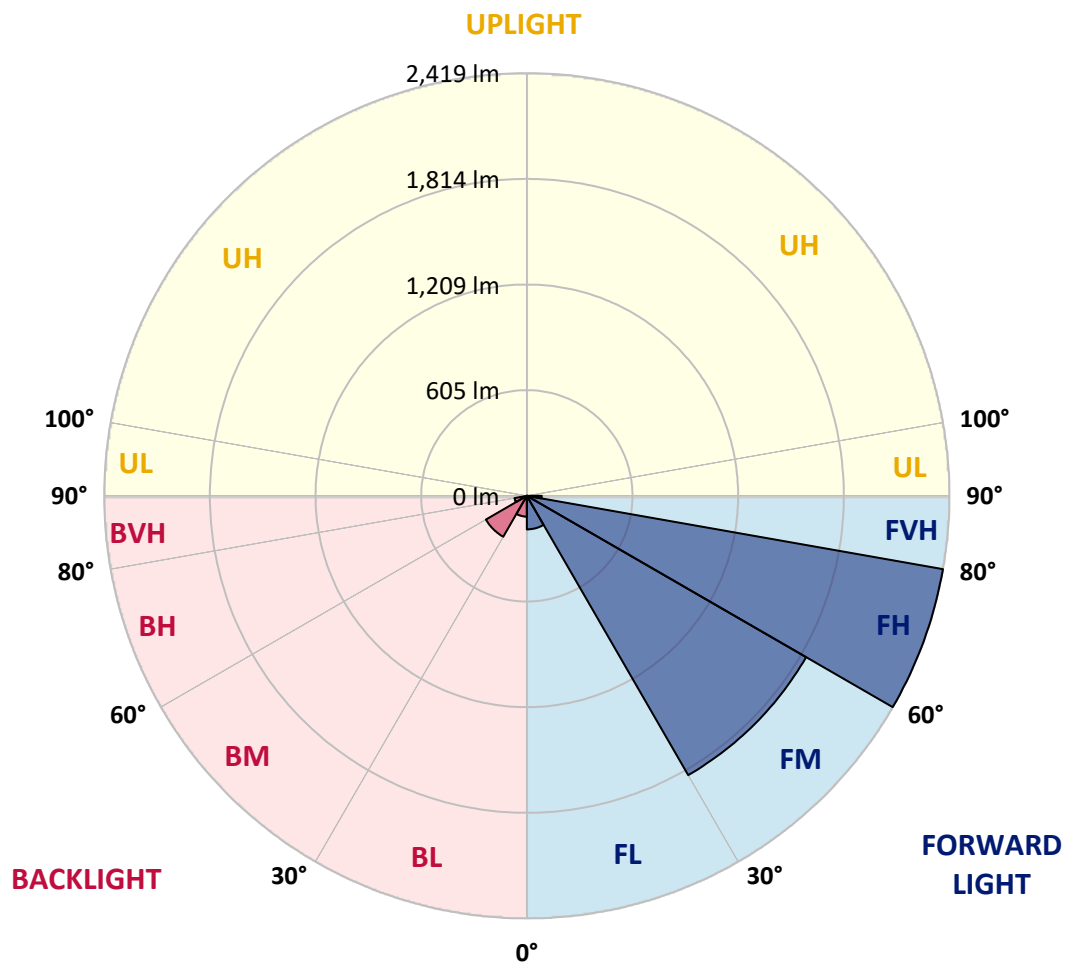
CATALOG NUMBER: MSA-SA2A-840-U-T4FT-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 192.1  | 3.8       |                         |      |         |
| FM   | (30°-60°)   | 1845.9 | 36.9      |                         |      |         |
| FH   | (60°-80°)   | 2418.7 | 48.3      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 85.5   | 1.7       |                         |      | G1/100  |
| BL   | (0°-30°)    | 119.1  | 2.4       | B1/500                  |      |         |
| BM   | (30°-60°)   | 270.5  | 5.4       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 71.4   | 1.4       | B0/110                  |      | G0/110  |
| BVH  | (80°-90°)   | 1.7    | 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



REPORT NUMBER: P822817

CATALOG NUMBER: MSA-SA2A-840-U-T4FT-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 33°    | 35°    | 45°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  | 266.2  |
| 2.5°  | 317.4  | 305.1  | 287.3  | 288.4  | 291.5  | 294.0  | 300.7  | 297.8  | 292.6  | 292.3  | 317.4  |
| 5°    | 336.3  | 322.7  | 321.5  | 323.2  | 322.3  | 326.8  | 321.2  | 339.3  | 354.6  | 372.9  | 402.4  |
| 7.5°  | 327.0  | 320.6  | 312.6  | 321.0  | 320.6  | 318.4  | 322.1  | 358.7  | 395.7  | 419.0  | 467.7  |
| 10°   | 300.7  | 293.5  | 299.5  | 302.3  | 300.4  | 310.1  | 334.3  | 364.3  | 408.5  | 457.4  | 481.0  |
| 12.5° | 293.1  | 297.6  | 299.9  | 299.9  | 318.4  | 323.5  | 360.4  | 388.7  | 441.3  | 479.9  | 548.5  |
| 15°   | 322.3  | 331.0  | 315.7  | 312.3  | 318.2  | 321.0  | 362.1  | 396.2  | 463.5  | 534.1  | 591.6  |
| 17.5° | 368.7  | 368.2  | 344.6  | 331.5  | 340.6  | 347.4  | 370.2  | 410.2  | 449.6  | 576.6  | 659.9  |
| 20°   | 400.7  | 401.3  | 358.7  | 331.5  | 361.8  | 365.7  | 391.0  | 423.0  | 454.1  | 598.0  | 704.7  |
| 22.5° | 441.8  | 427.1  | 380.2  | 353.8  | 374.3  | 377.9  | 405.7  | 431.0  | 476.9  | 595.5  | 761.9  |
| 25°   | 475.4  | 466.0  | 406.8  | 388.5  | 406.8  | 401.8  | 427.1  | 465.2  | 501.3  | 635.2  | 795.6  |
| 27.5° | 527.7  | 511.6  | 425.7  | 429.0  | 427.9  | 431.5  | 437.4  | 495.7  | 544.4  | 637.1  | 873.4  |
| 30°   | 576.4  | 566.9  | 468.0  | 468.0  | 478.8  | 471.8  | 476.0  | 546.6  | 586.0  | 682.2  | 960.9  |
| 32.5° | 626.6  | 627.1  | 517.7  | 491.3  | 482.7  | 511.3  | 539.4  | 571.3  | 636.3  | 759.4  | 1094.9 |
| 35°   | 759.8  | 748.6  | 613.0  | 547.2  | 540.2  | 538.5  | 583.6  | 669.9  | 725.5  | 860.1  | 1275.2 |
| 37.5° | 1027.9 | 989.2  | 818.1  | 673.9  | 647.7  | 638.8  | 690.0  | 778.6  | 833.9  | 1007.9 | 1573.3 |
| 40°   | 1303.0 | 1232.1 | 1042.0 | 879.5  | 794.7  | 756.4  | 815.8  | 891.2  | 989.6  | 1171.3 | 1849.3 |
| 42.5° | 1544.5 | 1456.9 | 1210.7 | 1101.2 | 990.9  | 974.3  | 918.4  | 1041.0 | 1211.8 | 1409.1 | 2119.7 |
| 45°   | 1779.8 | 1607.5 | 1360.7 | 1274.0 | 1140.2 | 1149.6 | 1130.7 | 1236.9 | 1442.7 | 1669.8 | 2359.5 |
| 47.5° | 1941.8 | 1787.1 | 1544.7 | 1432.2 | 1378.6 | 1323.2 | 1473.3 | 1583.7 | 1648.4 | 1835.4 | 2566.8 |
| 50°   | 2116.4 | 1959.6 | 1702.8 | 1624.2 | 1553.6 | 1609.5 | 1804.3 | 1819.0 | 1813.7 | 1989.9 | 2708.0 |
| 52.5° | 2341.7 | 2156.9 | 1884.3 | 1795.4 | 1835.4 | 1891.0 | 2115.8 | 2118.6 | 1960.7 | 2120.0 | 2809.6 |
| 55°   | 2550.1 | 2345.4 | 2126.0 | 2042.1 | 2125.8 | 2172.7 | 2422.0 | 2330.6 | 2046.3 | 2208.3 | 2859.6 |
| 57.5° | 2843.8 | 2606.8 | 2447.6 | 2299.8 | 2469.2 | 2424.2 | 2691.3 | 2555.4 | 2142.4 | 2267.0 | 2841.3 |
| 60°   | 3215.1 | 2936.1 | 2776.6 | 2620.2 | 2801.9 | 2832.4 | 2954.2 | 2667.7 | 2179.7 | 2286.2 | 2731.0 |
| 62.5° | 3592.7 | 3312.1 | 3102.2 | 2996.1 | 3202.3 | 3302.9 | 3197.6 | 2723.5 | 2135.0 | 2248.7 | 2481.2 |
| 65°   | 4061.2 | 3701.9 | 3456.9 | 3394.6 | 3776.7 | 3924.5 | 3485.4 | 2737.1 | 2048.5 | 2042.1 | 1994.9 |
| 67.5° | 4382.2 | 4032.4 | 3807.5 | 3911.7 | 4373.3 | 4385.2 | 3743.9 | 2741.3 | 1757.6 | 1598.9 | 1309.4 |
| 70°   | 4458.3 | 4083.7 | 3983.2 | 4289.9 | 4849.3 | 4698.9 | 3827.3 | 2530.1 | 1303.6 | 949.0  | 598.6  |
| 72.5° | 3913.6 | 3553.0 | 3683.9 | 4218.5 | 4950.5 | 4881.5 | 3643.0 | 1825.4 | 733.9  | 379.6  | 183.7  |
| 75°   | 2400.6 | 2182.5 | 2763.5 | 3576.6 | 4345.5 | 4301.0 | 2842.2 | 943.2  | 295.7  | 151.7  | 68.6   |
| 77.5° | 1044.0 | 969.6  | 1442.2 | 2373.1 | 3122.5 | 3082.8 | 1665.3 | 347.4  | 152.9  | 106.7  | 34.7   |
| 80°   | 345.4  | 335.1  | 546.3  | 1123.8 | 1829.0 | 1794.0 | 701.6  | 144.5  | 108.9  | 85.6   | 19.4   |
| 82.5° | 82.0   | 81.4   | 190.6  | 517.2  | 931.7  | 902.5  | 215.4  | 79.7   | 78.9   | 67.5   | 10.3   |
| 85°   | 20.6   | 21.1   | 52.8   | 211.5  | 378.5  | 333.8  | 56.2   | 39.8   | 55.6   | 45.8   | 5.3    |
| 87.5° | 0.0    | 0.0    | 13.6   | 30.3   | 57.3   | 35.8   | 6.1    | 10.6   | 15.6   | 16.4   | 2.8    |
| 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: P822817

CATALOG NUMBER: MSA-SA2A-840-U-T4FT-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 266.2  | 266.2  | 266.2 | 266.2 | 266.2 | 266.2 | 266.2 | 266.2 | 266.2 | 266.2 | 266.2 |
| 2.5°  | 322.9  | 319.9  | 294.8 | 301.0 | 310.4 | 309.5 | 315.7 | 311.0 | 306.8 | 327.4 | 325.4 |
| 5°    | 410.7  | 394.0  | 386.2 | 397.1 | 391.3 | 377.6 | 389.0 | 387.1 | 383.8 | 390.7 | 396.0 |
| 7.5°  | 476.5  | 461.3  | 454.3 | 431.5 | 398.5 | 372.4 | 376.6 | 366.8 | 357.6 | 368.5 | 379.6 |
| 10°   | 498.2  | 489.9  | 489.1 | 444.6 | 413.5 | 375.7 | 331.0 | 292.3 | 282.0 | 268.4 | 274.6 |
| 12.5° | 557.2  | 562.1  | 530.8 | 478.8 | 418.8 | 346.2 | 266.7 | 212.0 | 189.8 | 175.3 | 176.2 |
| 15°   | 605.5  | 623.0  | 577.4 | 484.1 | 368.5 | 264.0 | 177.6 | 128.4 | 114.4 | 110.9 | 109.7 |
| 17.5° | 677.5  | 694.4  | 591.9 | 446.5 | 297.1 | 178.9 | 114.2 | 100.1 | 100.9 | 103.3 | 102.8 |
| 20°   | 730.8  | 728.3  | 579.4 | 380.2 | 219.0 | 117.3 | 95.6  | 93.7  | 98.1  | 105.3 | 103.7 |
| 22.5° | 782.2  | 765.0  | 571.6 | 318.7 | 141.7 | 94.2  | 92.2  | 92.0  | 96.1  | 103.1 | 105.0 |
| 25°   | 819.0  | 821.7  | 558.5 | 249.5 | 103.1 | 87.5  | 89.2  | 91.7  | 95.9  | 103.3 | 102.3 |
| 27.5° | 924.0  | 846.1  | 504.0 | 181.2 | 86.9  | 83.9  | 88.1  | 93.1  | 94.5  | 103.9 | 104.2 |
| 30°   | 992.0  | 938.4  | 468.5 | 122.0 | 80.3  | 77.5  | 85.9  | 92.5  | 94.2  | 106.5 | 107.3 |
| 32.5° | 1110.7 | 978.1  | 427.3 | 90.6  | 74.8  | 75.6  | 80.9  | 89.7  | 97.5  | 110.6 | 111.2 |
| 35°   | 1258.2 | 1105.7 | 352.9 | 81.4  | 72.8  | 71.4  | 73.9  | 84.2  | 97.0  | 111.2 | 113.9 |
| 37.5° | 1539.2 | 1182.1 | 279.9 | 78.9  | 72.8  | 70.3  | 72.8  | 78.9  | 95.3  | 116.7 | 122.5 |
| 40°   | 1727.3 | 1337.7 | 201.7 | 78.4  | 71.4  | 69.2  | 70.0  | 76.1  | 90.6  | 113.4 | 122.0 |
| 42.5° | 1959.0 | 1403.3 | 148.7 | 76.9  | 70.0  | 66.7  | 67.3  | 75.0  | 85.9  | 106.5 | 112.8 |
| 45°   | 2148.8 | 1451.1 | 117.0 | 76.4  | 66.7  | 65.6  | 66.7  | 74.2  | 81.4  | 91.4  | 97.3  |
| 47.5° | 2293.1 | 1506.6 | 93.9  | 72.8  | 65.8  | 65.6  | 64.2  | 69.5  | 73.9  | 76.4  | 80.3  |
| 50°   | 2398.7 | 1494.2 | 77.8  | 67.3  | 63.1  | 64.7  | 62.2  | 63.1  | 64.2  | 62.8  | 67.3  |
| 52.5° | 2463.4 | 1449.1 | 64.7  | 60.5  | 59.7  | 61.1  | 58.1  | 55.6  | 53.6  | 52.6  | 55.3  |
| 55°   | 2487.0 | 1358.8 | 55.0  | 52.0  | 53.9  | 54.5  | 52.0  | 47.5  | 44.1  | 42.5  | 44.7  |
| 57.5° | 2442.3 | 1221.3 | 47.8  | 43.1  | 47.5  | 47.5  | 44.1  | 39.4  | 35.6  | 32.8  | 35.0  |
| 60°   | 2329.0 | 1069.3 | 42.5  | 35.8  | 40.5  | 40.9  | 37.0  | 32.0  | 28.9  | 26.2  | 27.5  |
| 62.5° | 2117.7 | 903.6  | 37.3  | 31.1  | 35.0  | 35.3  | 30.6  | 25.8  | 23.6  | 20.6  | 21.7  |
| 65°   | 1695.3 | 691.1  | 31.7  | 27.5  | 30.3  | 29.4  | 25.3  | 21.9  | 19.2  | 16.4  | 17.0  |
| 67.5° | 1100.4 | 426.6  | 27.5  | 25.0  | 25.6  | 24.7  | 21.4  | 19.2  | 16.1  | 13.9  | 14.2  |
| 70°   | 492.7  | 183.7  | 24.1  | 22.5  | 22.2  | 20.9  | 18.1  | 17.7  | 15.8  | 13.9  | 13.9  |
| 72.5° | 152.0  | 69.2   | 20.9  | 20.3  | 19.2  | 17.5  | 15.8  | 17.0  | 15.6  | 13.4  | 13.0  |
| 75°   | 60.0   | 31.7   | 17.2  | 17.2  | 16.6  | 14.5  | 14.2  | 15.3  | 14.5  | 12.2  | 11.7  |
| 77.5° | 31.4   | 20.0   | 14.2  | 14.7  | 14.5  | 11.1  | 12.8  | 13.9  | 13.4  | 10.3  | 8.6   |
| 80°   | 18.6   | 12.2   | 10.6  | 11.9  | 11.7  | 7.8   | 9.8   | 8.9   | 6.4   | 3.0   | 0.8   |
| 82.5° | 10.3   | 5.5    | 4.7   | 7.0   | 7.0   | 2.8   | 5.0   | 4.5   | 2.5   | 0.0   | 0.0   |
| 85°   | 5.0    | 3.9    | 3.6   | 3.9   | 2.8   | 0.8   | 2.5   | 2.5   | 1.4   | 0.0   | 0.0   |
| 87.5° | 2.5    | 2.2    | 1.7   | 1.4   | 1.1   | 0.0   | 0.8   | 1.1   | 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   |           |      |      |      |



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

REPORT NUMBER: SP1-2309-178-2

**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               |           |                  |                  |

REPORT NUMBER: SP1-2309-178-2

**TM-30-18**

**Summary**

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



**Color Vector Graphics**



REPORT NUMBER: SP1-2309-178-2

**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 |            |



REPORT NUMBER: SP1-2309-178-2

**TM-30-18**

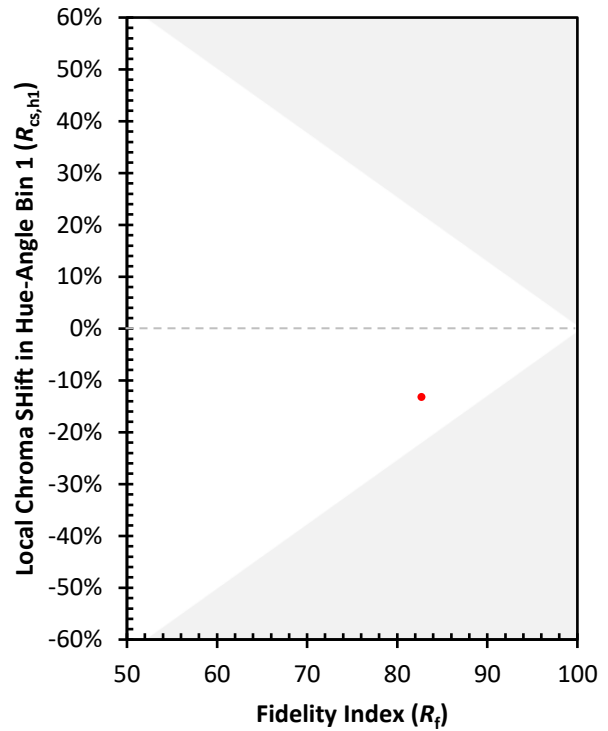
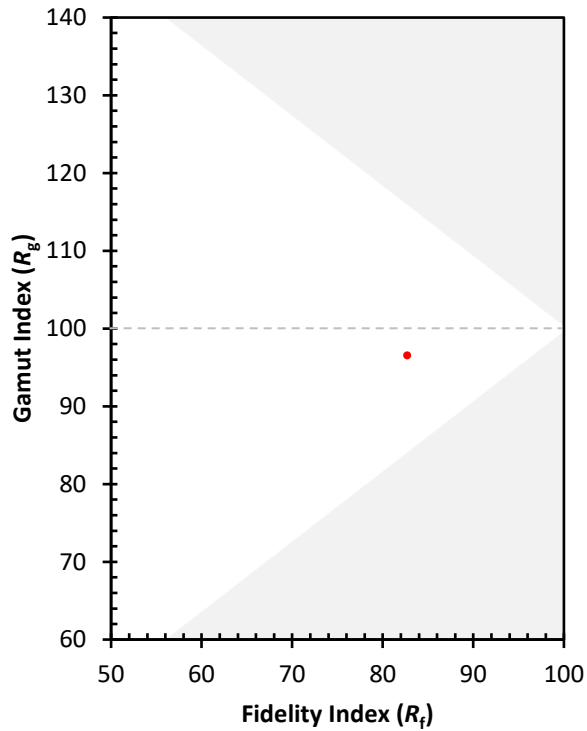
Color Rendition by Hue-Angle Bin



REPORT NUMBER: SP1-2309-178-2

**TM-30-18**

**Measure Comparisons**



(END OF REPORT)