

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



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

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: McGRAW-EDISON

Report Number: P437607

Luminaire Tested: **ISS-SA1D-830-U-T4W**

Issue Date: 12/9/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P437607  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2011-074-12)  
Test Lab: INNOVATION CENTER  
Issue Date: 12/9/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: ISS-SA1D-830-U-T4W  
Description: IMPACT ELITE LED QUARTER SPHERE LUMINAIRE  
(1) 80 CRI, 3000K, 800mA LIGHTSQUARE WITH 16 LEDS AND TYPE IV WIDE OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

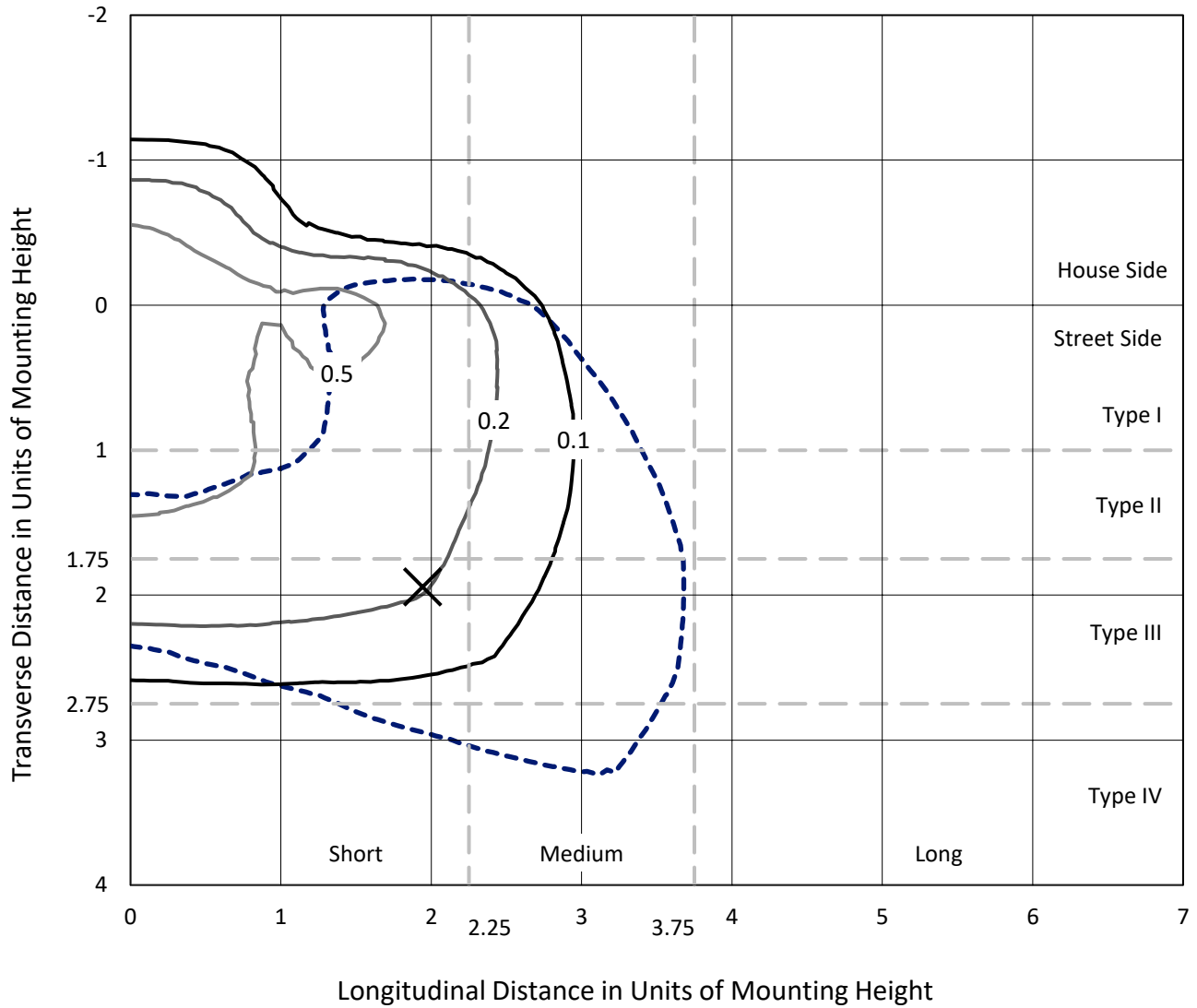
Lumens per Lamp: N/A  
Luminaire Lumens: 4555 lumens  
Efficiency: N/A  
Efficacy: 100.8 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 0.5' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2  
  
Input Watts (W): 45.2  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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 CATALOG NUMBER: ISS-SA1D-830-U-T4W

### Iso-Footcandle Lines of Horizontal Illumination

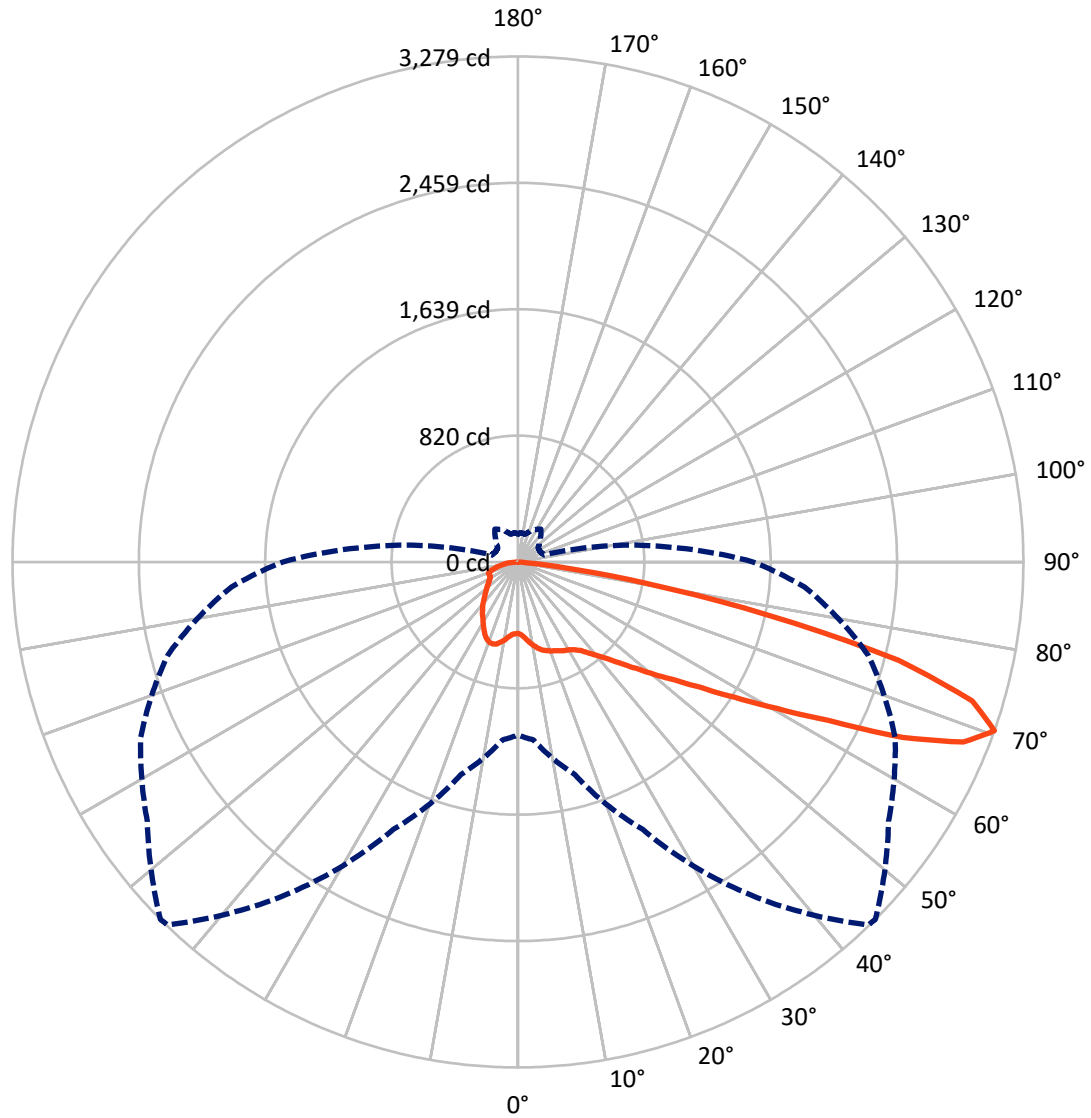
× Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 0.9 fc  
 Type IV - Short - N/A

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### Luminous Intensity Polar Plot



— Vertical Plane Through 45-Deg Lateral      - - - Horizontal Cone Through 70-Deg Vertical

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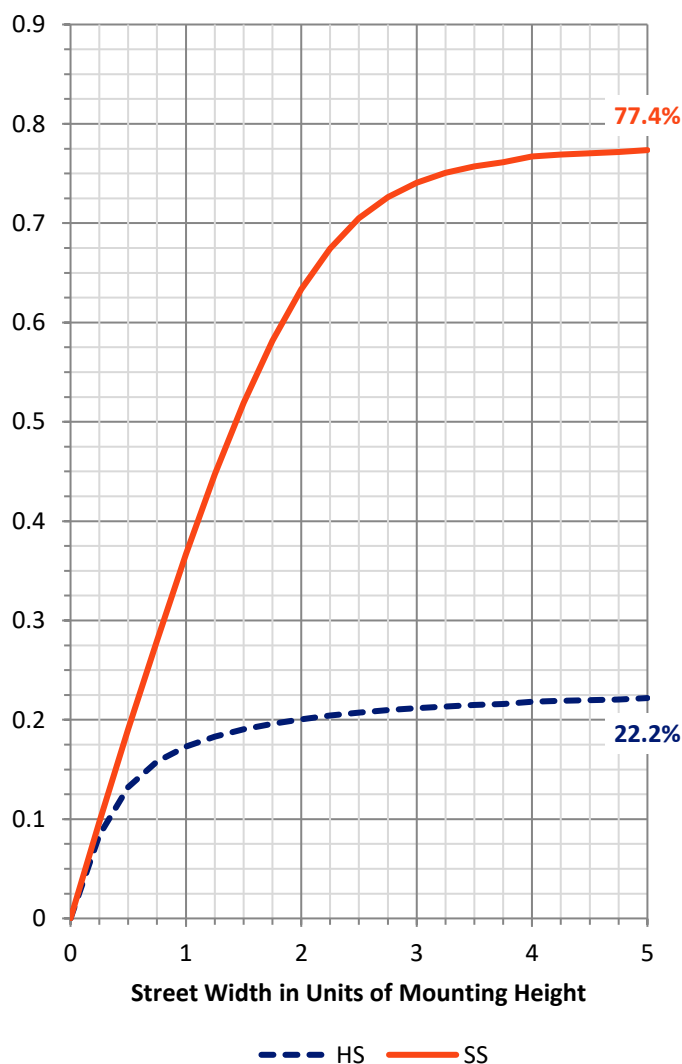
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 1028.4   | 0.0    | 1028.4 |
|                    | % Fixture | 22.6     | 0.0    | 22.6   |
| <b>Street Side</b> | Lumens    | 3526.6   | 0.0    | 3526.6 |
|                    | % Fixture | 77.4     | 0.0    | 77.4   |
| <b>Total</b>       | Lumens    | 4555.0   | 0.0    | 4555.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 47.8   | 1.0       |
| 10°-20°   | 160.0  | 3.5       |
| 20°-30°   | 270.9  | 5.9       |
| 30°-40°   | 391.7  | 8.6       |
| 40°-50°   | 564.8  | 12.4      |
| 50°-60°   | 926.4  | 20.3      |
| 60°-70°   | 1327.2 | 29.1      |
| 70°-80°   | 788.9  | 17.3      |
| 80°-90°   | 77.2   | 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°    | 4555.0 | 100.0     |
| 0°-180°   | 4555.0 | 100.0     |

**Coefficient of Utilization**



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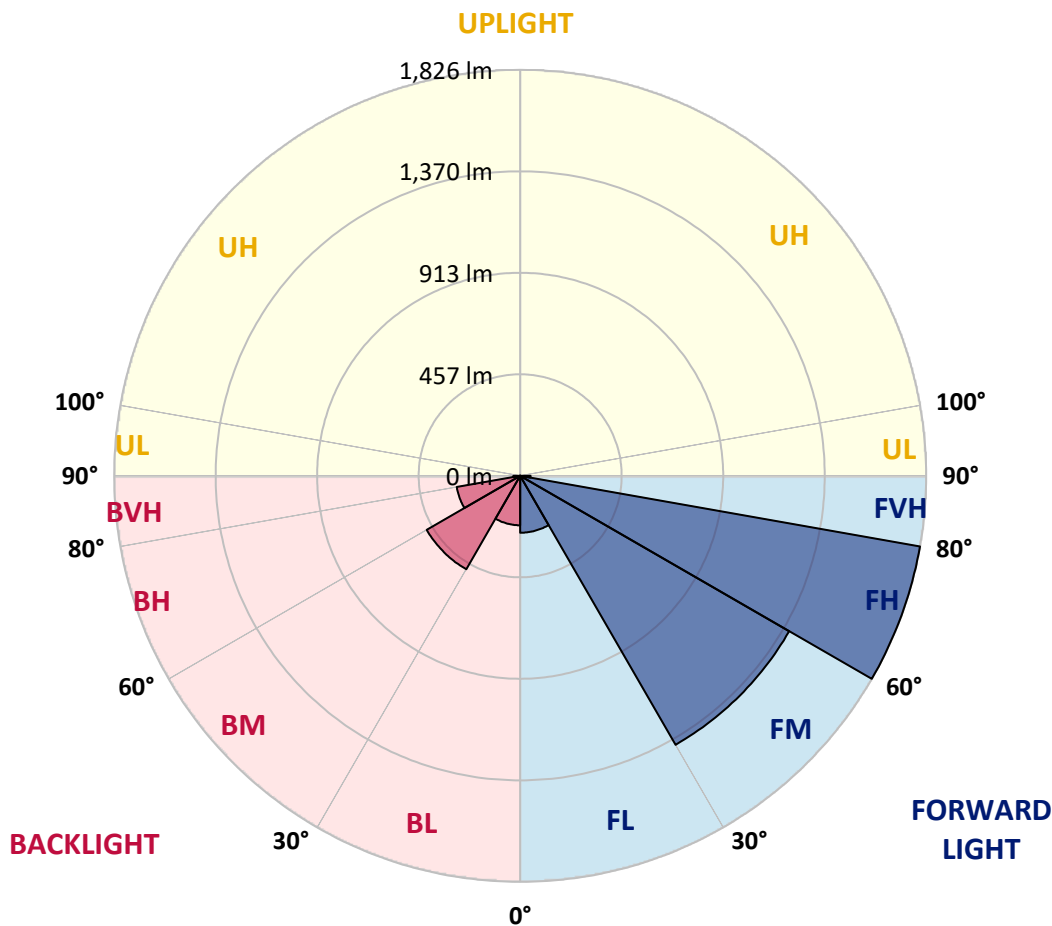
CATALOG NUMBER: ISS-SA1D-830-U-T4W

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

| Zone           | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|----------------|--------|-----------|-------------------------|------|---------|
|                |        |           | B                       | U    | G       |
| FL (0°-30°)    | 256.1  | 5.6       |                         |      |         |
| FM (30°-60°)   | 1397.5 | 30.7      |                         |      |         |
| FH (60°-80°)   | 1826.4 | 40.1      |                         |      | G2/5000 |
| FVH (80°-90°)  | 46.5   | 1.0       |                         |      | G1/100  |
| BL (0°-30°)    | 222.6  | 4.9       | B1/500                  |      |         |
| BM (30°-60°)   | 485.5  | 10.7      | B1/1000                 |      |         |
| BH (60°-80°)   | 289.7  | 6.4       | B1/500                  |      | G1/500  |
| BVH (80°-90°)  | 30.7   | 0.7       |                         |      | G1/100  |
| 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°    | 35°    | 44°    | 45°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  | 463.7  |
| 2.5°  | 486.6  | 486.6  | 485.0  | 483.3  | 480.1  | 476.8  | 475.2  | 470.2  | 470.2  | 468.6  | 465.3  |
| 5°    | 522.7  | 519.4  | 517.8  | 511.2  | 506.3  | 498.1  | 496.5  | 485.0  | 478.4  | 473.5  | 470.2  |
| 7.5°  | 560.4  | 562.0  | 555.4  | 547.2  | 535.8  | 524.3  | 524.3  | 511.2  | 499.7  | 488.3  | 478.4  |
| 10°   | 596.4  | 596.4  | 588.2  | 578.4  | 566.9  | 552.2  | 548.9  | 534.1  | 521.0  | 506.3  | 494.8  |
| 12.5° | 624.3  | 622.6  | 612.8  | 603.0  | 588.2  | 576.7  | 573.5  | 555.4  | 544.0  | 525.9  | 509.6  |
| 15°   | 643.9  | 643.9  | 634.1  | 619.3  | 604.6  | 593.1  | 593.1  | 580.0  | 563.6  | 545.6  | 525.9  |
| 17.5° | 655.4  | 653.8  | 645.6  | 629.2  | 616.1  | 606.2  | 604.6  | 594.8  | 584.9  | 566.9  | 542.3  |
| 20°   | 655.4  | 652.1  | 645.6  | 632.5  | 621.0  | 614.4  | 616.1  | 607.9  | 601.3  | 580.0  | 560.4  |
| 22.5° | 653.8  | 652.1  | 640.6  | 630.8  | 627.5  | 625.9  | 624.3  | 621.0  | 609.5  | 593.1  | 576.7  |
| 25°   | 668.5  | 666.9  | 653.8  | 640.6  | 634.1  | 634.1  | 637.4  | 630.8  | 624.3  | 607.9  | 593.1  |
| 27.5° | 709.5  | 702.9  | 684.9  | 660.3  | 650.5  | 648.8  | 650.5  | 642.3  | 637.4  | 625.9  | 612.8  |
| 30°   | 778.3  | 775.0  | 747.1  | 701.3  | 675.1  | 661.9  | 660.3  | 658.7  | 652.1  | 643.9  | 632.5  |
| 32.5° | 868.4  | 865.1  | 822.5  | 763.5  | 707.8  | 678.3  | 680.0  | 671.8  | 671.8  | 660.3  | 650.5  |
| 35°   | 979.8  | 973.3  | 930.7  | 847.1  | 757.0  | 707.8  | 704.5  | 693.1  | 694.7  | 675.1  | 665.2  |
| 37.5° | 1078.1 | 1071.6 | 1030.6 | 932.3  | 819.2  | 755.3  | 750.4  | 722.6  | 704.5  | 680.0  | 681.6  |
| 40°   | 1161.7 | 1163.3 | 1133.8 | 1035.5 | 899.5  | 807.8  | 799.6  | 745.5  | 724.2  | 702.9  | 712.7  |
| 42.5° | 1246.9 | 1251.8 | 1232.1 | 1127.3 | 981.4  | 865.1  | 861.8  | 784.8  | 766.8  | 750.4  | 773.4  |
| 45°   | 1330.4 | 1340.3 | 1323.9 | 1225.6 | 1073.2 | 952.0  | 938.8  | 848.7  | 837.3  | 827.4  | 896.2  |
| 47.5° | 1404.2 | 1407.4 | 1405.8 | 1328.8 | 1174.8 | 1050.3 | 1032.2 | 932.3  | 947.0  | 973.3  | 1087.9 |
| 50°   | 1495.9 | 1500.8 | 1474.6 | 1432.0 | 1312.4 | 1161.7 | 1145.3 | 1037.2 | 1097.8 | 1183.0 | 1356.7 |
| 52.5° | 1631.9 | 1638.5 | 1564.7 | 1538.5 | 1482.8 | 1296.0 | 1271.5 | 1191.2 | 1322.2 | 1450.0 | 1656.5 |
| 55°   | 1710.6 | 1700.7 | 1668.0 | 1671.2 | 1640.1 | 1456.6 | 1435.3 | 1379.6 | 1566.4 | 1718.8 | 1995.7 |
| 57.5° | 1761.4 | 1756.4 | 1776.1 | 1820.3 | 1820.3 | 1663.0 | 1654.9 | 1630.3 | 1828.5 | 2012.0 | 2264.4 |
| 60°   | 1843.3 | 1853.1 | 1899.0 | 1987.5 | 2035.0 | 1933.4 | 1928.5 | 1933.4 | 2123.5 | 2216.9 | 2456.1 |
| 62.5° | 1894.1 | 1915.4 | 2031.7 | 2184.1 | 2284.0 | 2295.5 | 2264.4 | 2261.1 | 2352.8 | 2387.3 | 2582.2 |
| 65°   | 1804.0 | 1838.4 | 2028.4 | 2275.8 | 2582.2 | 2767.4 | 2744.4 | 2546.2 | 2542.9 | 2541.3 | 2557.7 |
| 67.5° | 1566.4 | 1592.6 | 1867.9 | 2234.9 | 2742.8 | 3129.5 | 3116.4 | 2800.1 | 2723.1 | 2554.4 | 2328.3 |
| 70°   | 1122.4 | 1158.4 | 1427.1 | 1913.7 | 2639.6 | 3273.7 | 3278.6 | 2934.5 | 2700.2 | 2354.5 | 1866.2 |
| 72.5° | 694.7  | 696.4  | 870.0  | 1363.2 | 2234.9 | 3062.3 | 3082.0 | 2801.8 | 2429.9 | 1961.3 | 1319.0 |
| 75°   | 214.6  | 232.7  | 368.7  | 714.4  | 1512.3 | 2490.5 | 2551.1 | 2328.3 | 1944.9 | 1356.7 | 722.6  |
| 77.5° | 106.5  | 109.8  | 132.7  | 262.2  | 727.5  | 1612.3 | 1658.1 | 1554.9 | 1228.9 | 657.0  | 303.1  |
| 80°   | 60.6   | 63.9   | 81.9   | 116.3  | 278.5  | 801.2  | 838.9  | 819.2  | 498.1  | 237.6  | 129.4  |
| 82.5° | 29.5   | 31.1   | 41.0   | 59.0   | 118.0  | 239.2  | 268.7  | 294.9  | 190.1  | 126.2  | 70.5   |
| 85°   | 8.2    | 8.2    | 11.5   | 19.7   | 31.1   | 49.2   | 49.2   | 54.1   | 67.2   | 63.9   | 34.4   |
| 87.5° | 0.0    | 0.0    | 0.0    | 1.6    | 1.6    | 1.6    | 3.3    | 1.6    | 3.3    | 4.9    | 4.9    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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 CATALOG NUMBER: ISS-SA1D-830-U-T4W

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 463.7  | 463.7  | 463.7 | 463.7 | 463.7 | 463.7 | 463.7 | 463.7 | 463.7 | 463.7 | 463.7 |
| 2.5°  | 465.3  | 465.3  | 462.0 | 463.7 | 463.7 | 465.3 | 465.3 | 467.0 | 468.6 | 470.2 | 470.2 |
| 5°    | 468.6  | 467.0  | 465.3 | 467.0 | 468.6 | 471.9 | 476.8 | 481.7 | 485.0 | 489.9 | 488.3 |
| 7.5°  | 478.4  | 473.5  | 475.2 | 475.2 | 481.7 | 488.3 | 498.1 | 504.6 | 511.2 | 514.5 | 514.5 |
| 10°   | 489.9  | 486.6  | 485.0 | 491.5 | 498.1 | 511.2 | 519.4 | 529.2 | 534.1 | 542.3 | 539.1 |
| 12.5° | 506.3  | 498.1  | 499.7 | 507.9 | 521.0 | 530.9 | 537.4 | 545.6 | 550.5 | 557.1 | 555.4 |
| 15°   | 519.4  | 514.5  | 516.1 | 529.2 | 542.3 | 548.9 | 552.2 | 555.4 | 557.1 | 562.0 | 563.6 |
| 17.5° | 535.8  | 534.1  | 535.8 | 547.2 | 555.4 | 557.1 | 555.4 | 552.2 | 550.5 | 555.4 | 553.8 |
| 20°   | 553.8  | 552.2  | 553.8 | 562.0 | 558.7 | 552.2 | 545.6 | 540.7 | 535.8 | 539.1 | 540.7 |
| 22.5° | 568.5  | 570.2  | 571.8 | 568.5 | 555.4 | 539.1 | 527.6 | 519.4 | 516.1 | 519.4 | 522.7 |
| 25°   | 586.6  | 588.2  | 589.8 | 573.5 | 542.3 | 516.1 | 499.7 | 494.8 | 496.5 | 501.4 | 503.0 |
| 27.5° | 609.5  | 614.4  | 609.5 | 571.8 | 524.3 | 486.6 | 473.5 | 471.9 | 473.5 | 478.4 | 483.3 |
| 30°   | 634.1  | 640.6  | 624.3 | 563.6 | 499.7 | 457.1 | 445.7 | 445.7 | 450.6 | 453.9 | 458.8 |
| 32.5° | 655.4  | 668.5  | 637.4 | 548.9 | 465.3 | 429.3 | 421.1 | 417.8 | 417.8 | 421.1 | 422.7 |
| 35°   | 681.6  | 698.0  | 645.6 | 522.7 | 432.6 | 406.3 | 399.8 | 390.0 | 381.8 | 383.4 | 381.8 |
| 37.5° | 707.8  | 732.4  | 642.3 | 481.7 | 396.5 | 380.1 | 373.6 | 358.8 | 345.7 | 337.5 | 340.8 |
| 40°   | 757.0  | 786.5  | 635.7 | 429.3 | 363.7 | 357.2 | 345.7 | 329.3 | 312.9 | 298.2 | 296.6 |
| 42.5° | 843.8  | 845.5  | 621.0 | 381.8 | 332.6 | 329.3 | 319.5 | 304.8 | 285.1 | 265.4 | 265.4 |
| 45°   | 960.1  | 930.7  | 601.3 | 337.5 | 303.1 | 306.4 | 298.2 | 283.5 | 260.5 | 242.5 | 242.5 |
| 47.5° | 1135.5 | 1032.2 | 563.6 | 298.2 | 278.5 | 285.1 | 280.2 | 265.4 | 240.9 | 224.5 | 224.5 |
| 50°   | 1381.2 | 1197.7 | 525.9 | 270.3 | 260.5 | 267.1 | 265.4 | 247.4 | 224.5 | 211.4 | 211.4 |
| 52.5° | 1666.3 | 1414.0 | 499.7 | 249.0 | 239.2 | 250.7 | 250.7 | 234.3 | 213.0 | 203.2 | 201.5 |
| 55°   | 1959.6 | 1617.2 | 473.5 | 231.0 | 224.5 | 234.3 | 239.2 | 224.5 | 204.8 | 196.6 | 195.0 |
| 57.5° | 2167.7 | 1718.8 | 437.5 | 216.3 | 208.1 | 221.2 | 227.7 | 217.9 | 199.9 | 191.7 | 190.1 |
| 60°   | 2272.6 | 1728.6 | 367.0 | 201.5 | 193.3 | 209.7 | 221.2 | 213.0 | 199.9 | 196.6 | 196.6 |
| 62.5° | 2297.1 | 1687.6 | 293.3 | 188.4 | 183.5 | 203.2 | 222.8 | 219.6 | 209.7 | 213.0 | 214.6 |
| 65°   | 2192.3 | 1551.6 | 239.2 | 178.6 | 177.0 | 201.5 | 232.7 | 231.0 | 211.4 | 219.6 | 221.2 |
| 67.5° | 1941.6 | 1315.7 | 203.2 | 168.8 | 167.1 | 204.8 | 250.7 | 231.0 | 199.9 | 208.1 | 204.8 |
| 70°   | 1525.4 | 1042.1 | 175.3 | 158.9 | 158.9 | 203.2 | 260.5 | 227.7 | 186.8 | 190.1 | 180.2 |
| 72.5° | 1002.7 | 683.2  | 155.7 | 149.1 | 144.2 | 185.1 | 254.0 | 221.2 | 180.2 | 170.4 | 158.9 |
| 75°   | 507.9  | 339.2  | 139.3 | 140.9 | 126.2 | 157.3 | 245.8 | 219.6 | 178.6 | 162.2 | 157.3 |
| 77.5° | 209.7  | 158.9  | 124.5 | 127.8 | 106.5 | 134.4 | 231.0 | 203.2 | 160.6 | 144.2 | 139.3 |
| 80°   | 109.8  | 98.3   | 104.9 | 106.5 | 86.8  | 106.5 | 183.5 | 175.3 | 144.2 | 132.7 | 126.2 |
| 82.5° | 63.9   | 62.3   | 80.3  | 81.9  | 60.6  | 86.8  | 162.2 | 152.4 | 121.2 | 108.1 | 104.9 |
| 85°   | 29.5   | 34.4   | 54.1  | 49.2  | 37.7  | 57.3  | 98.3  | 75.4  | 54.1  | 47.5  | 45.9  |
| 87.5° | 3.3    | 4.9    | 11.5  | 11.5  | 8.2   | 4.9   | 1.6   | 0.0   | 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   |



Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



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

Report Prepared for

Cooper Lighting Solutions

MCGRAW EDISON

Report Number: SP1-2408-195-9

Test Date: 08/07/2024

Luminaire Tested: GALN-SB1A-830-U-5WQ

Data in this report applies to families of products including GALN-SB1A-830-U-5WQ.

**Test Information**

Test Method: LM-79-2019  
 Report Number: SP1-2408-195-9  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry: 4π  
 Issue Date: 08/07/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW EDISON  
 Catalog Number: **GALN-SB1A-830-U-5WQ**  
 Description: GALLEON AREA AND ROADWAY LUMINAIRE. (1) 80 CRI, 3000K, 350MA HIGH DENSITY LIGHTSQUARE WITH 26 LEDS AND TYPE V WIDE OPTICS

**Spectral Parameters**

CCT (K): 3050  
 CIE u': 0.2476  
 CIE v': 0.5251  
 Duv: 0.0034  
 CIE x: 0.4383  
 CIE y: 0.4131  
 CIE z: 0.1487  
 Peak Wavelength (nm): 603  
 Dominant Wavelength (nm): 581  
 Purity: 55.55201  
 Rf: 81.5  
 Rg: 99.2

|           |      |      |      |
|-----------|------|------|------|
| CRI (Ra): | 81.0 |      |      |
| R1:       | 79.6 | R9:  | 7.1  |
| R2:       | 85.6 | R10: | 67.0 |
| R3:       | 92.0 | R11: | 82.7 |
| R4:       | 82.6 | R12: | 63.2 |
| R5:       | 78.9 | R13: | 80.3 |
| R6:       | 81.7 | R14: | 95.0 |
| R7:       | 85.2 | R15: | 71.7 |
| R8:       | 62.0 |      |      |



**Test Conditions**

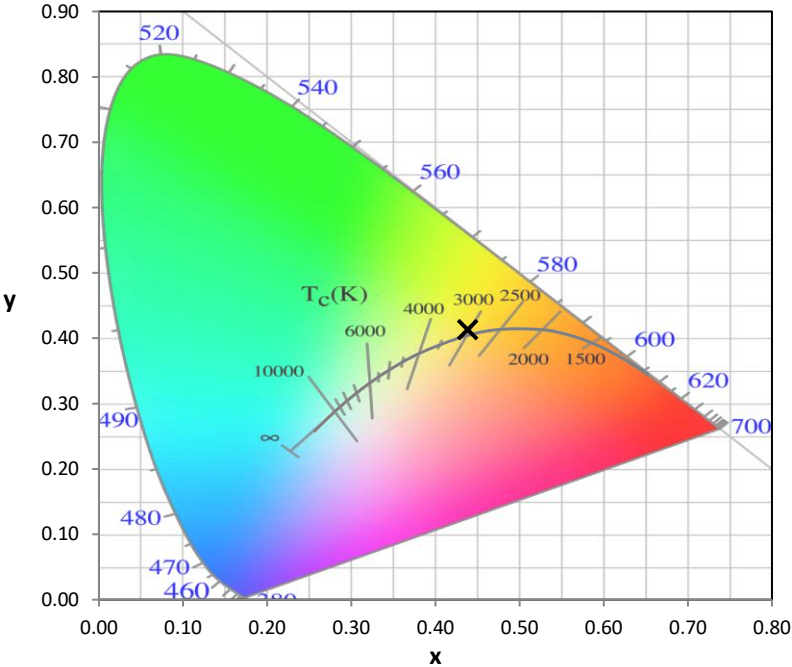
Stabilization Time: 20M  
 Operation Time: 1H 20M  
 Sphere Temperature (°C): 24.2

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| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/18/2024        | 12/18/2024           |
| Power Meter                    | INXT2011004           | 2/8/2024         | 2/8/2025             |
| AC Power Source                | IN0063                | 10/24/2023       | 10/24/2024           |
| DC Power Source                | IN0208                | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | IN0085                | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | IN0046                | 10/24/2023       | 10/24/2024           |

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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 3000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**



**Photopic Lumens: NR**

| $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) |
|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|
| 360               | 0                           | NR                      | 490               | 168                         | NR                      | 620               | 940                         | NR                      | 750               | 35                          | NR                      | 880               | 1                           | NR                      |
| 365               | 0                           | NR                      | 495               | 233                         | NR                      | 625               | 897                         | NR                      | 755               | 30                          | NR                      | 885               | 1                           | NR                      |
| 370               | 0                           | NR                      | 500               | 300                         | NR                      | 630               | 847                         | NR                      | 760               | 26                          | NR                      | 890               | 1                           | NR                      |
| 375               | 0                           | NR                      | 505               | 372                         | NR                      | 635               | 790                         | NR                      | 765               | 22                          | NR                      | 895               | 1                           | NR                      |
| 380               | 0                           | NR                      | 510               | 430                         | NR                      | 640               | 730                         | NR                      | 770               | 19                          | NR                      | 900               | 1                           | NR                      |
| 385               | 0                           | NR                      | 515               | 483                         | NR                      | 645               | 668                         | NR                      | 775               | 16                          | NR                      | 905               | 1                           | NR                      |
| 390               | 0                           | NR                      | 520               | 524                         | NR                      | 650               | 605                         | NR                      | 780               | 14                          | NR                      | 910               | 0                           | NR                      |
| 395               | 2                           | NR                      | 525               | 555                         | NR                      | 655               | 545                         | NR                      | 785               | 12                          | NR                      | 915               | 0                           | NR                      |
| 400               | 4                           | NR                      | 530               | 581                         | NR                      | 660               | 485                         | NR                      | 790               | 10                          | NR                      | 920               | 0                           | NR                      |
| 405               | 7                           | NR                      | 535               | 604                         | NR                      | 665               | 430                         | NR                      | 795               | 9                           | NR                      | 925               | 0                           | NR                      |
| 410               | 17                          | NR                      | 540               | 623                         | NR                      | 670               | 378                         | NR                      | 800               | 8                           | NR                      | 930               | 0                           | NR                      |
| 415               | 34                          | NR                      | 545               | 645                         | NR                      | 675               | 331                         | NR                      | 805               | 7                           | NR                      | 935               | 0                           | NR                      |
| 420               | 68                          | NR                      | 550               | 667                         | NR                      | 680               | 290                         | NR                      | 810               | 6                           | NR                      | 940               | 0                           | NR                      |
| 425               | 128                         | NR                      | 555               | 693                         | NR                      | 685               | 251                         | NR                      | 815               | 5                           | NR                      | 945               | 0                           | NR                      |
| 430               | 214                         | NR                      | 560               | 719                         | NR                      | 690               | 218                         | NR                      | 820               | 4                           | NR                      | 950               | 0                           | NR                      |
| 435               | 339                         | NR                      | 565               | 754                         | NR                      | 695               | 188                         | NR                      | 825               | 4                           | NR                      | 955               | 0                           | NR                      |
| 440               | 507                         | NR                      | 570               | 791                         | NR                      | 700               | 162                         | NR                      | 830               | 3                           | NR                      | 960               | 0                           | NR                      |
| 445               | 573                         | NR                      | 575               | 830                         | NR                      | 705               | 139                         | NR                      | 835               | 3                           | NR                      | 965               | 0                           | NR                      |
| 450               | 356                         | NR                      | 580               | 873                         | NR                      | 710               | 119                         | NR                      | 840               | 3                           | NR                      | 970               | 0                           | NR                      |
| 455               | 217                         | NR                      | 585               | 913                         | NR                      | 715               | 102                         | NR                      | 845               | 2                           | NR                      | 975               | 0                           | NR                      |
| 460               | 168                         | NR                      | 590               | 948                         | NR                      | 720               | 88                          | NR                      | 850               | 2                           | NR                      | 980               | 0                           | NR                      |
| 465               | 113                         | NR                      | 595               | 974                         | NR                      | 725               | 76                          | NR                      | 855               | 2                           | NR                      | 985               | 0                           | NR                      |
| 470               | 85                          | NR                      | 600               | 994                         | NR                      | 730               | 65                          | NR                      | 860               | 1                           | NR                      | 990               | 0                           | NR                      |
| 475               | 85                          | NR                      | 605               | 998                         | NR                      | 735               | 55                          | NR                      | 865               | 1                           | NR                      | 995               | 0                           | NR                      |
| 480               | 94                          | NR                      | 610               | 994                         | NR                      | 740               | 47                          | NR                      | 870               | 1                           | NR                      | 1000              | 0                           | NR                      |
| 485               | 120                         | NR                      | 615               | 973                         | NR                      | 745               | 41                          | NR                      | 875               | 1                           | NR                      |                   |                             |                         |

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**Scotopic Flux vs. Wavelength**



**Scotopic Lumens: NR**

**S/P: 1.27**

| $\lambda$ (nm) | Power W <sup>^</sup> /nm | Lumens ( $\phi$ /nm) | $\lambda$ (nm) | Power W <sup>^</sup> /nm | Lumens ( $\phi$ /nm) | $\lambda$ (nm) | Power W <sup>^</sup> /nm | Lumens ( $\phi$ /nm) | $\lambda$ (nm) | Power W <sup>^</sup> /nm | Lumens ( $\phi$ /nm) | $\lambda$ (nm) | Power W <sup>^</sup> /nm | Lumens ( $\phi$ /nm) |
|----------------|--------------------------|----------------------|----------------|--------------------------|----------------------|----------------|--------------------------|----------------------|----------------|--------------------------|----------------------|----------------|--------------------------|----------------------|
| 360            | 0                        | NR                   | 490            | 168                      | NR                   | 620            | 940                      | NR                   | 750            | 35                       | NR                   | 880            | 1                        | NR                   |
| 365            | 0                        | NR                   | 495            | 233                      | NR                   | 625            | 897                      | NR                   | 755            | 30                       | NR                   | 885            | 1                        | NR                   |
| 370            | 0                        | NR                   | 500            | 300                      | NR                   | 630            | 847                      | NR                   | 760            | 26                       | NR                   | 890            | 1                        | NR                   |
| 375            | 0                        | NR                   | 505            | 372                      | NR                   | 635            | 790                      | NR                   | 765            | 22                       | NR                   | 895            | 1                        | NR                   |
| 380            | 0                        | NR                   | 510            | 430                      | NR                   | 640            | 730                      | NR                   | 770            | 19                       | NR                   | 900            | 1                        | NR                   |
| 385            | 0                        | NR                   | 515            | 483                      | NR                   | 645            | 668                      | NR                   | 775            | 16                       | NR                   | 905            | 1                        | NR                   |
| 390            | 0                        | NR                   | 520            | 524                      | NR                   | 650            | 605                      | NR                   | 780            | 14                       | NR                   | 910            | 0                        | NR                   |
| 395            | 2                        | NR                   | 525            | 555                      | NR                   | 655            | 545                      | NR                   | 785            | 12                       | NR                   | 915            | 0                        | NR                   |
| 400            | 4                        | NR                   | 530            | 581                      | NR                   | 660            | 485                      | NR                   | 790            | 10                       | NR                   | 920            | 0                        | NR                   |
| 405            | 7                        | NR                   | 535            | 604                      | NR                   | 665            | 430                      | NR                   | 795            | 9                        | NR                   | 925            | 0                        | NR                   |
| 410            | 17                       | NR                   | 540            | 623                      | NR                   | 670            | 378                      | NR                   | 800            | 8                        | NR                   | 930            | 0                        | NR                   |
| 415            | 34                       | NR                   | 545            | 645                      | NR                   | 675            | 331                      | NR                   | 805            | 7                        | NR                   | 935            | 0                        | NR                   |
| 420            | 68                       | NR                   | 550            | 667                      | NR                   | 680            | 290                      | NR                   | 810            | 6                        | NR                   | 940            | 0                        | NR                   |
| 425            | 128                      | NR                   | 555            | 693                      | NR                   | 685            | 251                      | NR                   | 815            | 5                        | NR                   | 945            | 0                        | NR                   |
| 430            | 214                      | NR                   | 560            | 719                      | NR                   | 690            | 218                      | NR                   | 820            | 4                        | NR                   | 950            | 0                        | NR                   |
| 435            | 339                      | NR                   | 565            | 754                      | NR                   | 695            | 188                      | NR                   | 825            | 4                        | NR                   | 955            | 0                        | NR                   |
| 440            | 507                      | NR                   | 570            | 791                      | NR                   | 700            | 162                      | NR                   | 830            | 3                        | NR                   | 960            | 0                        | NR                   |
| 445            | 573                      | NR                   | 575            | 830                      | NR                   | 705            | 139                      | NR                   | 835            | 3                        | NR                   | 965            | 0                        | NR                   |
| 450            | 356                      | NR                   | 580            | 873                      | NR                   | 710            | 119                      | NR                   | 840            | 3                        | NR                   | 970            | 0                        | NR                   |
| 455            | 217                      | NR                   | 585            | 913                      | NR                   | 715            | 102                      | NR                   | 845            | 2                        | NR                   | 975            | 0                        | NR                   |
| 460            | 168                      | NR                   | 590            | 948                      | NR                   | 720            | 88                       | NR                   | 850            | 2                        | NR                   | 980            | 0                        | NR                   |
| 465            | 113                      | NR                   | 595            | 974                      | NR                   | 725            | 76                       | NR                   | 855            | 2                        | NR                   | 985            | 0                        | NR                   |
| 470            | 85                       | NR                   | 600            | 994                      | NR                   | 730            | 65                       | NR                   | 860            | 1                        | NR                   | 990            | 0                        | NR                   |
| 475            | 85                       | NR                   | 605            | 998                      | NR                   | 735            | 55                       | NR                   | 865            | 1                        | NR                   | 995            | 0                        | NR                   |
| 480            | 94                       | NR                   | 610            | 994                      | NR                   | 740            | 47                       | NR                   | 870            | 1                        | NR                   | 1000           | 0                        | NR                   |
| 485            | 120                      | NR                   | 615            | 973                      | NR                   | 745            | 41                       | NR                   | 875            | 1                        | NR                   |                |                          |                      |

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**Melanopic Flux vs. Wavelength**



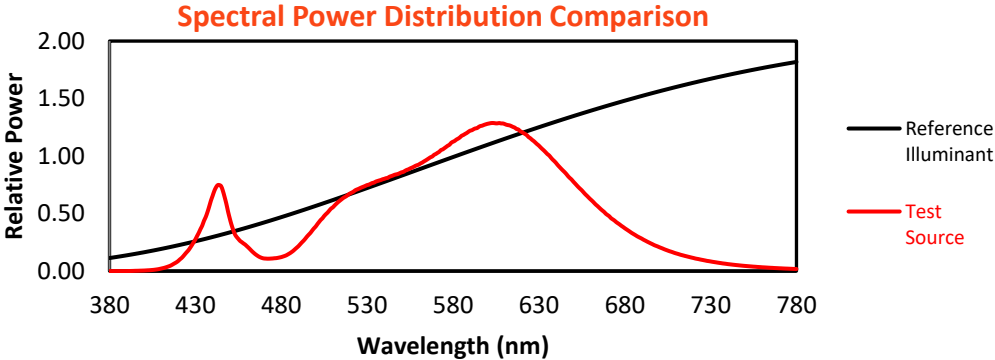
**Melanopic Lumens: NR**

**M/P: 2.32**

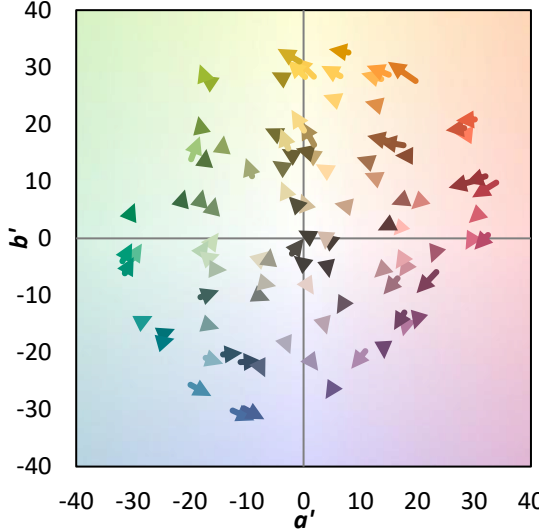
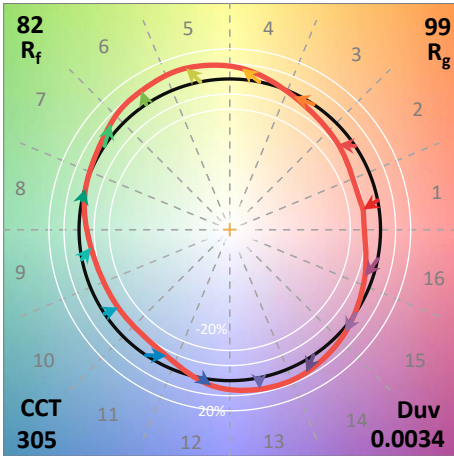
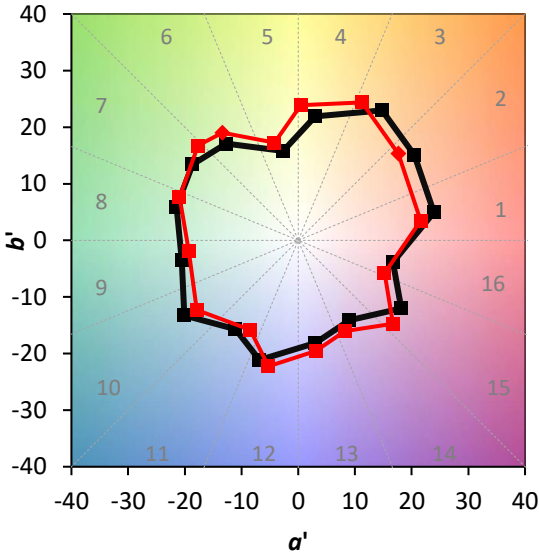
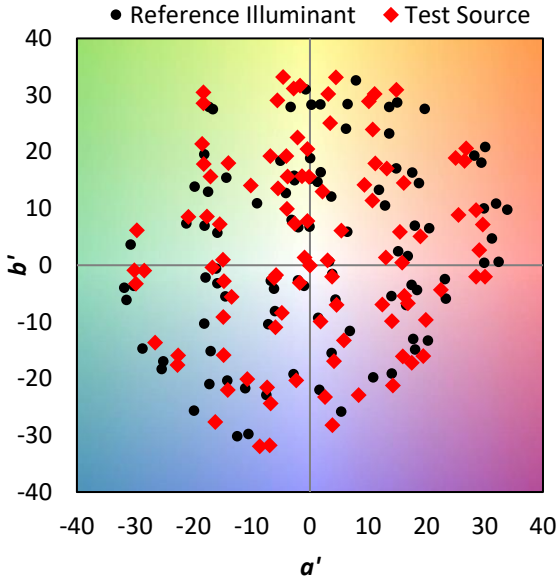
| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 168                      | NR            | 620    | 940                      | NR            | 750    | 35                       | NR            | 880    | 1                        | NR            |
| 365    | 0                        | NR            | 495    | 233                      | NR            | 625    | 897                      | NR            | 755    | 30                       | NR            | 885    | 1                        | NR            |
| 370    | 0                        | NR            | 500    | 300                      | NR            | 630    | 847                      | NR            | 760    | 26                       | NR            | 890    | 1                        | NR            |
| 375    | 0                        | NR            | 505    | 372                      | NR            | 635    | 790                      | NR            | 765    | 22                       | NR            | 895    | 1                        | NR            |
| 380    | 0                        | NR            | 510    | 430                      | NR            | 640    | 730                      | NR            | 770    | 19                       | NR            | 900    | 1                        | NR            |
| 385    | 0                        | NR            | 515    | 483                      | NR            | 645    | 668                      | NR            | 775    | 16                       | NR            | 905    | 1                        | NR            |
| 390    | 0                        | NR            | 520    | 524                      | NR            | 650    | 605                      | NR            | 780    | 14                       | NR            | 910    | 0                        | NR            |
| 395    | 2                        | NR            | 525    | 555                      | NR            | 655    | 545                      | NR            | 785    | 12                       | NR            | 915    | 0                        | NR            |
| 400    | 4                        | NR            | 530    | 581                      | NR            | 660    | 485                      | NR            | 790    | 10                       | NR            | 920    | 0                        | NR            |
| 405    | 7                        | NR            | 535    | 604                      | NR            | 665    | 430                      | NR            | 795    | 9                        | NR            | 925    | 0                        | NR            |
| 410    | 17                       | NR            | 540    | 623                      | NR            | 670    | 378                      | NR            | 800    | 8                        | NR            | 930    | 0                        | NR            |
| 415    | 34                       | NR            | 545    | 645                      | NR            | 675    | 331                      | NR            | 805    | 7                        | NR            | 935    | 0                        | NR            |
| 420    | 68                       | NR            | 550    | 667                      | NR            | 680    | 290                      | NR            | 810    | 6                        | NR            | 940    | 0                        | NR            |
| 425    | 128                      | NR            | 555    | 693                      | NR            | 685    | 251                      | NR            | 815    | 5                        | NR            | 945    | 0                        | NR            |
| 430    | 214                      | NR            | 560    | 719                      | NR            | 690    | 218                      | NR            | 820    | 4                        | NR            | 950    | 0                        | NR            |
| 435    | 339                      | NR            | 565    | 754                      | NR            | 695    | 188                      | NR            | 825    | 4                        | NR            | 955    | 0                        | NR            |
| 440    | 507                      | NR            | 570    | 791                      | NR            | 700    | 162                      | NR            | 830    | 3                        | NR            | 960    | 0                        | NR            |
| 445    | 573                      | NR            | 575    | 830                      | NR            | 705    | 139                      | NR            | 835    | 3                        | NR            | 965    | 0                        | NR            |
| 450    | 356                      | NR            | 580    | 873                      | NR            | 710    | 119                      | NR            | 840    | 3                        | NR            | 970    | 0                        | NR            |
| 455    | 217                      | NR            | 585    | 913                      | NR            | 715    | 102                      | NR            | 845    | 2                        | NR            | 975    | 0                        | NR            |
| 460    | 168                      | NR            | 590    | 948                      | NR            | 720    | 88                       | NR            | 850    | 2                        | NR            | 980    | 0                        | NR            |
| 465    | 113                      | NR            | 595    | 974                      | NR            | 725    | 76                       | NR            | 855    | 2                        | NR            | 985    | 0                        | NR            |
| 470    | 85                       | NR            | 600    | 994                      | NR            | 730    | 65                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 85                       | NR            | 605    | 998                      | NR            | 735    | 55                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 94                       | NR            | 610    | 994                      | NR            | 740    | 47                       | NR            | 870    | 1                        | NR            | 1000   | 0                        | NR            |
| 485    | 120                      | NR            | 615    | 973                      | NR            | 745    | 41                       | NR            | 875    | 1                        | NR            |        |                          |               |

**Summary**

$R_f = 81.5$   
 $R_g = 99.2$   
 $CIE R_a = 81.0$   
 $R_9 = 7.1$



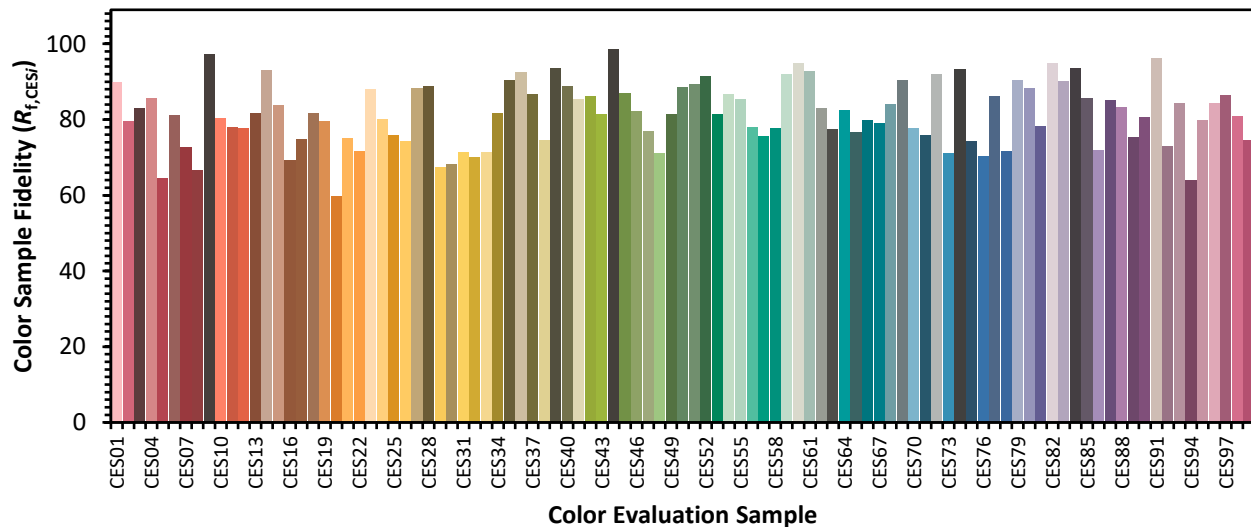
**Color Vector Graphics**



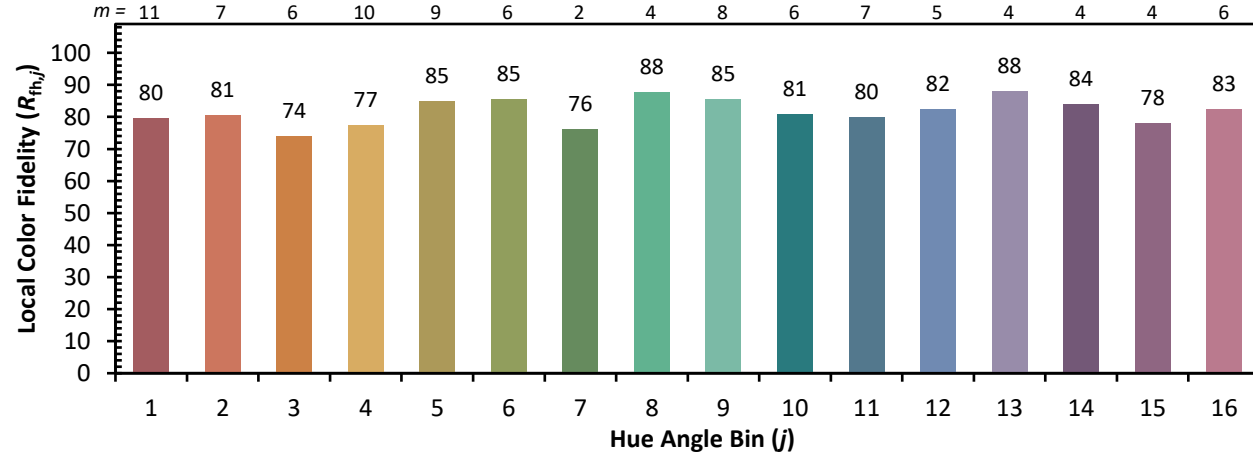


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

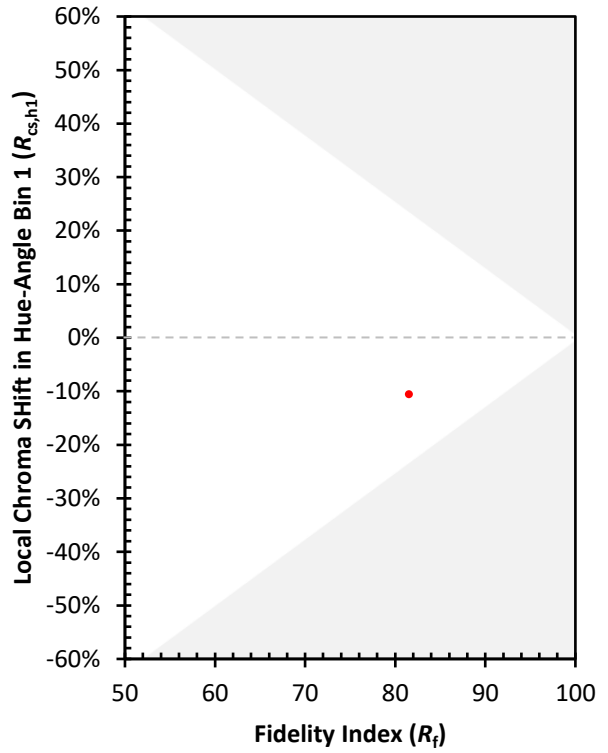
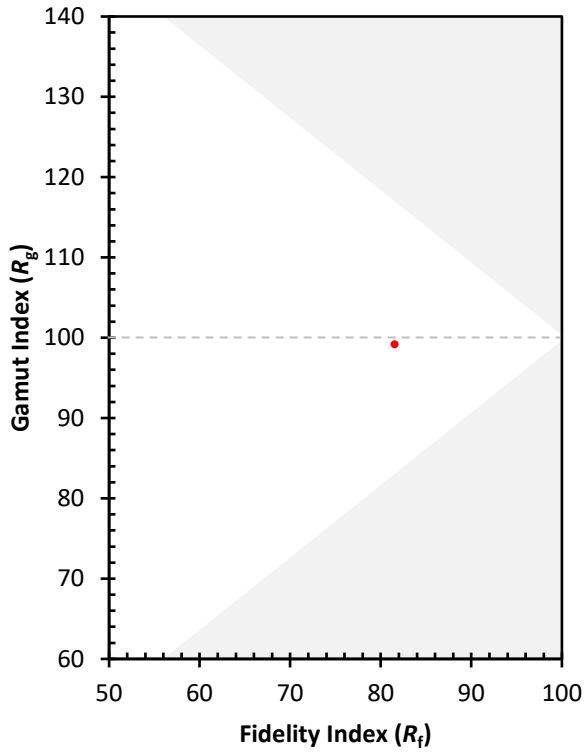
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 74 | CES51 = 89 | CES76 = 70 |
| CES02 = 63 | CES27 = 88 | CES52 = 92 | CES77 = 86 |
| CES03 = 31 | CES28 = 89 | CES53 = 81 | CES78 = 72 |
| CES04 = 70 | CES29 = 67 | CES54 = 87 | CES79 = 90 |
| CES05 = 50 | CES30 = 68 | CES55 = 85 | CES80 = 88 |
| CES06 = 51 | CES31 = 71 | CES56 = 78 | CES81 = 78 |
| CES07 = 42 | CES32 = 70 | CES57 = 76 | CES82 = 95 |
| CES08 = 41 | CES33 = 71 | CES58 = 78 | CES83 = 90 |
| CES09 = 29 | CES34 = 82 | CES59 = 92 | CES84 = 94 |
| CES10 = 76 | CES35 = 90 | CES60 = 95 | CES85 = 86 |
| CES11 = 59 | CES36 = 93 | CES61 = 93 | CES86 = 72 |
| CES12 = 65 | CES37 = 87 | CES62 = 83 | CES87 = 85 |
| CES13 = 43 | CES38 = 75 | CES63 = 77 | CES88 = 83 |
| CES14 = 74 | CES39 = 94 | CES64 = 83 | CES89 = 75 |
| CES15 = 71 | CES40 = 89 | CES65 = 77 | CES90 = 81 |
| CES16 = 47 | CES41 = 85 | CES66 = 80 | CES91 = 96 |
| CES17 = 50 | CES42 = 86 | CES67 = 79 | CES92 = 73 |
| CES18 = 56 | CES43 = 81 | CES68 = 84 | CES93 = 84 |
| CES19 = 72 | CES44 = 99 | CES69 = 91 | CES94 = 64 |
| CES20 = 66 | CES45 = 87 | CES70 = 78 | CES95 = 80 |
| CES21 = 87 | CES46 = 82 | CES71 = 76 | CES96 = 84 |
| CES22 = 79 | CES47 = 77 | CES72 = 92 | CES97 = 87 |
| CES23 = 92 | CES48 = 71 | CES73 = 71 | CES98 = 81 |
| CES24 = 91 | CES49 = 81 | CES74 = 93 | CES99 = 74 |
| CES25 = 72 | CES50 = 89 | CES75 = 74 |            |



Color Rendition by Hue-Angle Bin



Measure Comparisons



(END OF REPORT)