

Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for

Cooper Lighting Solutions

Brand: McGRAW-EDISON

Report Number: P636992

Luminaire Tested: GWS-SA4B-830-U-SL4-W-HSS

Issue Date: 1/10/2023

**Test Information**

Test Method: LM-79-2019  
Report Number: P636992  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2209-782-36)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 1/10/2023  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: McGRAW-EDISON  
Catalog Number: GWS-SA4B-830-U-SL4-W-HSS  
Description: GALLEON WALL SLIM LUMINAIRE. (4) LIGHTSQUARES WITH 16 LEDS EACH AND  
TYPE IV SPILL LIGHT ELIMINATOR OPTICS WITH HOUSE SIDE SHIELD  
Light Source: (64) 3000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 9059.6 lumens  
Efficiency: N/A  
Efficacy: 96.0 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

Input Watts (W): 94.4  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 0  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



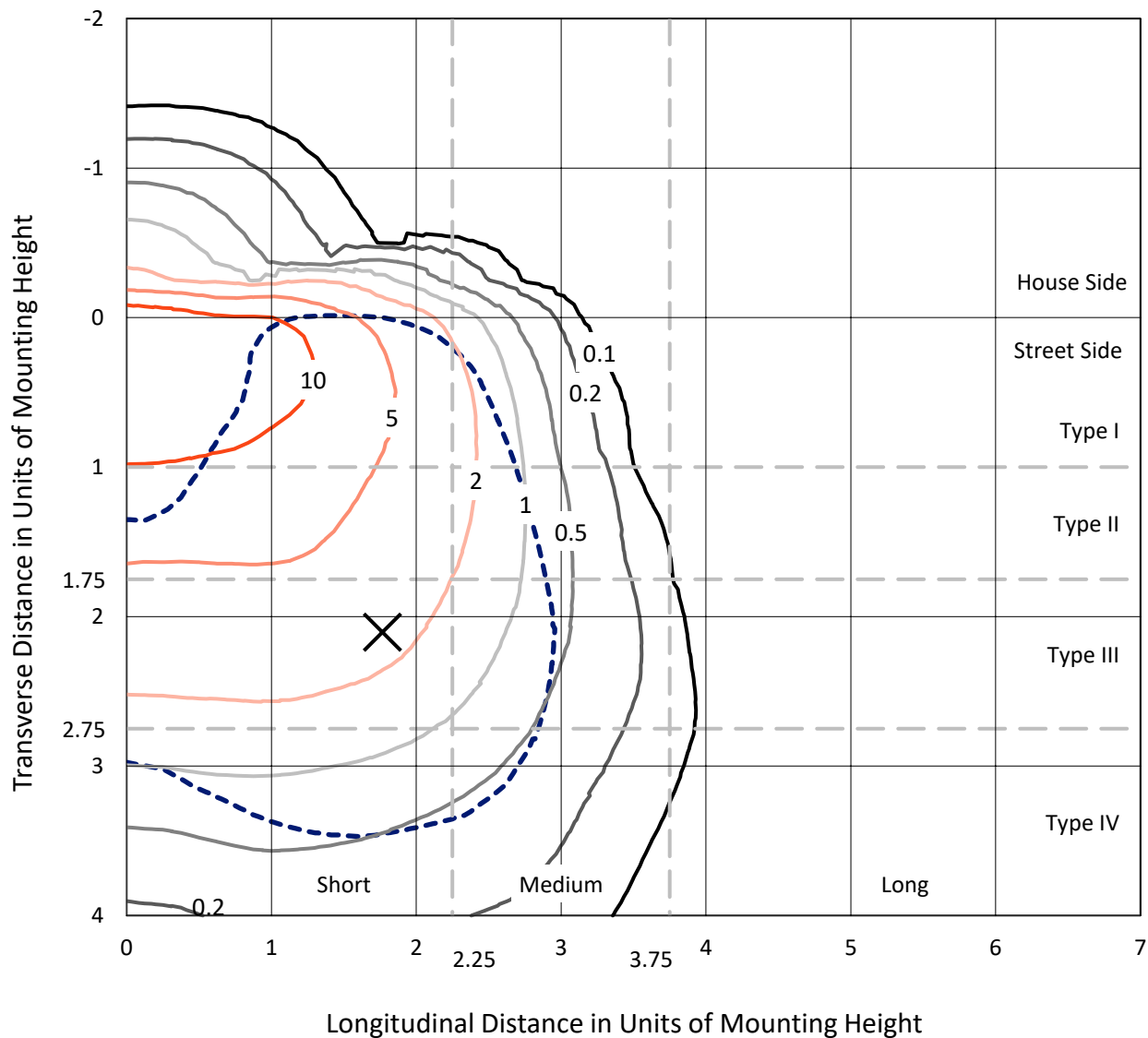
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## Iso-Footcandle Lines of Horizontal Illumination

✕ Max cd

--- 1/2 Max cd

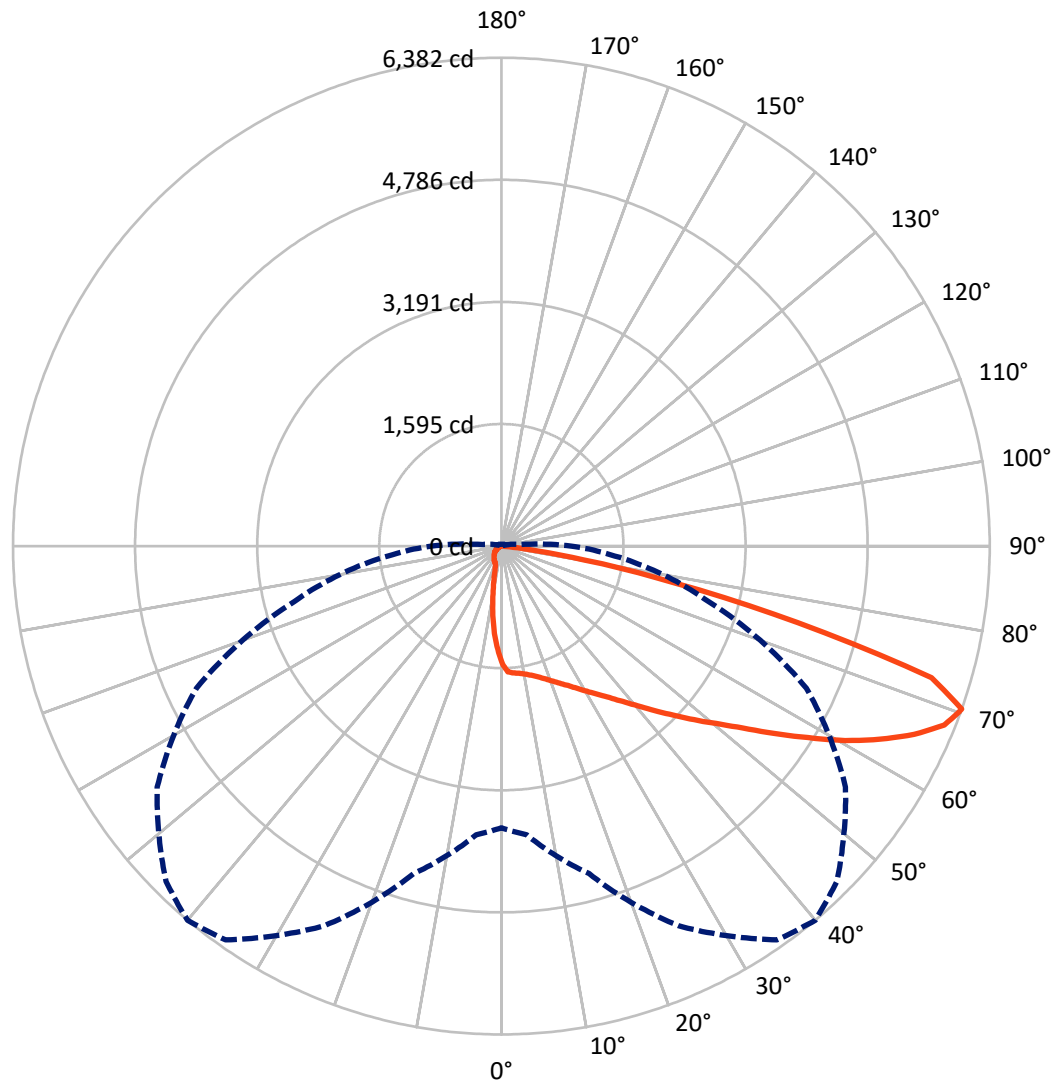


Based on 10 foot mounting height. Maximum calculated value = 16.7 fc  
 Type IV - Short - N/A

REPORT NUMBER: P636992

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## Luminous Intensity Polar Plot



— Vertical Plane Through 40-Deg Lateral    - - - Horizontal Cone Through 70-Deg Vertical

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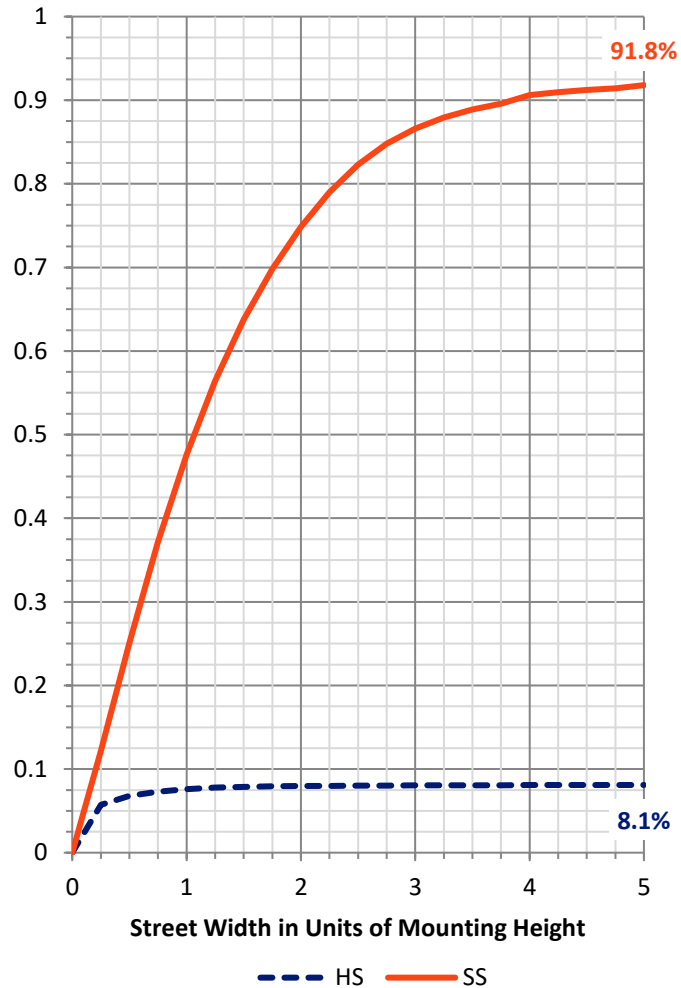
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 740.8    | 0.0    | 740.8  |
|                    | % Fixture | 8.2      | 0.0    | 8.2    |
| <b>Street Side</b> | Lumens    | 8318.8   | 0.0    | 8318.8 |
|                    | % Fixture | 91.8     | 0.0    | 91.8   |
| <b>Total</b>       | Lumens    | 9059.6   | 0.0    | 9059.6 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 129.9  | 1.4       |
| 10°-20°   | 329.5  | 3.6       |
| 20°-30°   | 551.5  | 6.1       |
| 30°-40°   | 866.3  | 9.6       |
| 40°-50°   | 1370.2 | 15.1      |
| 50°-60°   | 1998.8 | 22.1      |
| 60°-70°   | 2477.8 | 27.4      |
| 70°-80°   | 1253.6 | 13.8      |
| 80°-90°   | 81.8   | 0.9       |
| 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°    | 9059.6 | 100.0     |
| 0°-180°   | 9059.6 | 100.0     |

**Coefficient of Utilization**



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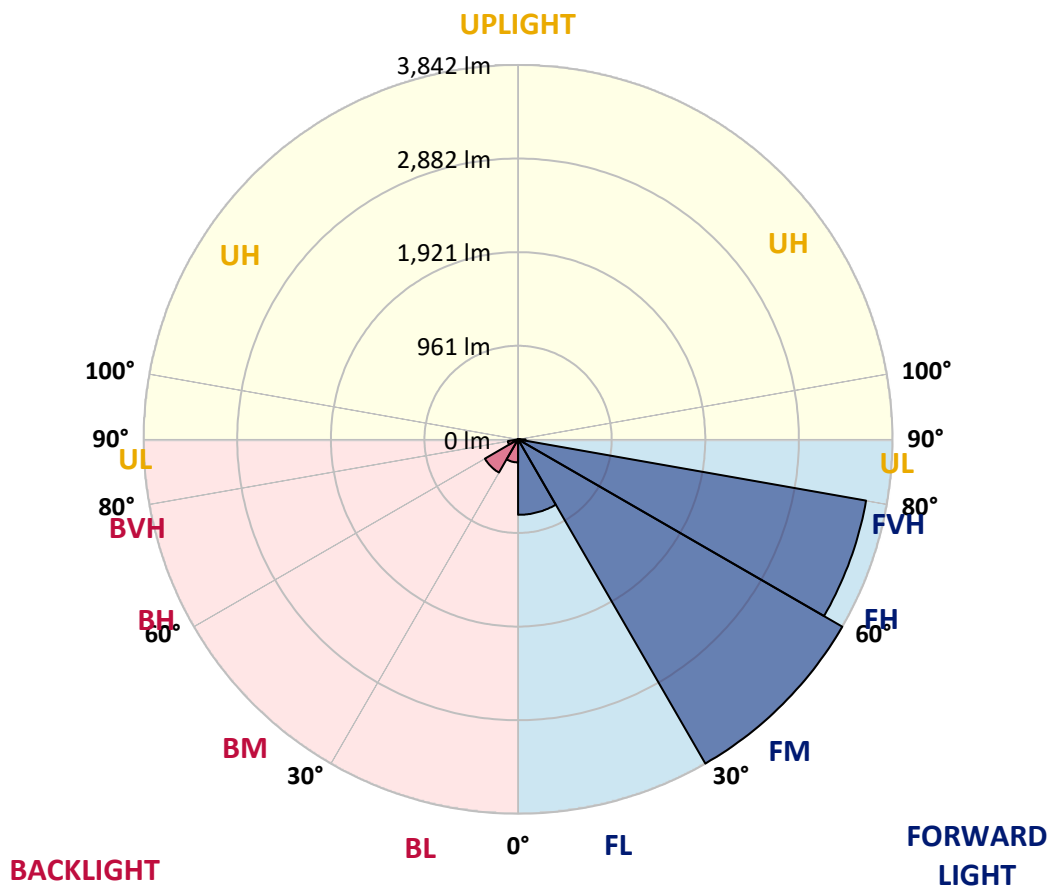
CATALOG NUMBER: GWS-SA4B-830-U-SL4-W-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 774.4  | 8.5       |                         |      |         |
| FM   | (30°-60°)   | 3842.1 | 42.4      |                         |      |         |
| FH   | (60°-80°)   | 3625.8 | 40.0      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 76.4   | 0.8       |                         |      | G1/100  |
| BL   | (0°-30°)    | 236.6  | 2.6       | B1/500                  |      |         |
| BM   | (30°-60°)   | 393.2  | 4.3       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 105.6  | 1.2       | B0/110                  |      | G0/110  |
| BVH  | (80°-90°)   | 5.4    | 0.1       |                         |      | G0/10   |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

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

Type IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 40°    | 45°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 |
| 2.5°  | 1652.7 | 1658.5 | 1657.7 | 1660.1 | 1654.4 | 1645.3 | 1643.6 | 1631.3 | 1609.0 | 1581.0 | 1549.7 |
| 5°    | 1686.5 | 1693.1 | 1688.2 | 1685.7 | 1675.0 | 1665.1 | 1662.6 | 1649.4 | 1623.9 | 1585.9 | 1531.5 |
| 7.5°  | 1715.4 | 1717.0 | 1713.7 | 1707.9 | 1692.3 | 1679.1 | 1670.0 | 1651.9 | 1621.4 | 1583.5 | 1520.8 |
| 10°   | 1720.3 | 1719.5 | 1721.1 | 1721.9 | 1712.1 | 1700.5 | 1693.1 | 1668.4 | 1629.6 | 1589.2 | 1521.6 |
| 12.5° | 1714.5 | 1714.5 | 1725.2 | 1737.6 | 1737.6 | 1731.8 | 1724.4 | 1702.2 | 1656.8 | 1609.0 | 1538.1 |
| 15°   | 1721.9 | 1724.4 | 1745.0 | 1768.1 | 1775.5 | 1769.8 | 1766.5 | 1743.4 | 1696.4 | 1643.6 | 1567.8 |
| 17.5° | 1748.3 | 1750.8 | 1783.8 | 1818.4 | 1827.5 | 1820.9 | 1814.3 | 1791.2 | 1740.9 | 1683.2 | 1601.6 |
| 20°   | 1787.1 | 1793.7 | 1835.7 | 1880.2 | 1888.5 | 1880.2 | 1867.0 | 1834.9 | 1784.6 | 1726.1 | 1633.7 |
| 22.5° | 1858.0 | 1862.1 | 1907.4 | 1954.4 | 1958.5 | 1945.3 | 1925.5 | 1881.0 | 1828.3 | 1771.4 | 1670.0 |
| 25°   | 1951.9 | 1957.7 | 2003.0 | 2048.4 | 2037.7 | 2017.9 | 1990.7 | 1940.4 | 1880.2 | 1825.0 | 1716.2 |
| 27.5° | 2064.0 | 2070.6 | 2115.1 | 2154.7 | 2126.7 | 2103.6 | 2073.1 | 2010.4 | 1949.5 | 1899.2 | 1775.5 |
| 30°   | 2185.2 | 2191.0 | 2230.5 | 2266.0 | 2228.9 | 2201.7 | 2165.4 | 2101.1 | 2039.3 | 2001.4 | 1859.6 |
| 32.5° | 2302.2 | 2301.4 | 2339.3 | 2368.2 | 2330.3 | 2308.8 | 2275.9 | 2210.8 | 2161.3 | 2144.8 | 1984.9 |
| 35°   | 2411.1 | 2411.1 | 2442.4 | 2471.2 | 2444.0 | 2432.5 | 2402.0 | 2350.1 | 2322.0 | 2341.8 | 2152.2 |
| 37.5° | 2520.7 | 2514.9 | 2544.6 | 2576.7 | 2574.3 | 2575.1 | 2557.8 | 2533.1 | 2534.7 | 2604.8 | 2382.2 |
| 40°   | 2611.4 | 2608.9 | 2643.5 | 2685.5 | 2718.5 | 2744.9 | 2734.2 | 2743.2 | 2795.2 | 2926.2 | 2676.5 |
| 42.5° | 2683.9 | 2689.7 | 2734.2 | 2800.9 | 2884.2 | 2937.8 | 2945.2 | 2982.3 | 3115.8 | 3318.6 | 3008.7 |
| 45°   | 2767.1 | 2768.0 | 2829.8 | 2932.0 | 3064.7 | 3149.6 | 3179.3 | 3274.9 | 3464.5 | 3725.8 | 3373.0 |
| 47.5° | 2869.4 | 2859.5 | 2928.7 | 3072.1 | 3264.2 | 3389.5 | 3442.2 | 3561.8 | 3855.2 | 4123.1 | 3669.8 |
| 50°   | 2982.3 | 2964.2 | 3042.5 | 3237.8 | 3487.6 | 3644.2 | 3751.4 | 3926.1 | 4242.6 | 4449.5 | 3890.7 |
| 52.5° | 3113.4 | 3096.0 | 3185.1 | 3428.2 | 3755.5 | 3945.9 | 4083.5 | 4259.9 | 4574.8 | 4698.5 | 4022.5 |
| 55°   | 3279.9 | 3262.5 | 3356.5 | 3656.6 | 4072.0 | 4319.3 | 4463.5 | 4611.9 | 4883.9 | 4882.3 | 4118.2 |
| 57.5° | 3464.5 | 3440.6 | 3570.8 | 3945.1 | 4466.8 | 4724.0 | 4870.7 | 4943.3 | 5118.9 | 5024.9 | 4182.5 |
| 60°   | 3676.3 | 3654.9 | 3835.4 | 4288.8 | 4922.7 | 5160.9 | 5253.2 | 5223.5 | 5311.7 | 5109.0 | 4160.2 |
| 62.5° | 3867.6 | 3857.7 | 4081.9 | 4653.1 | 5357.1 | 5558.2 | 5583.8 | 5454.3 | 5453.5 | 5110.6 | 4010.2 |
| 65°   | 4066.2 | 4085.2 | 4418.2 | 5072.7 | 5794.0 | 5929.1 | 5885.4 | 5683.5 | 5510.4 | 4908.7 | 3566.7 |
| 67.5° | 4140.4 | 4195.6 | 4639.9 | 5451.9 | 6138.5 | 6244.0 | 6167.4 | 5798.1 | 5273.8 | 4229.4 | 2716.0 |
| 70°   | 3682.1 | 3786.0 | 4430.6 | 5473.3 | 6281.1 | 6381.7 | 6197.9 | 5489.8 | 4396.8 | 2801.8 | 1487.8 |
| 72.5° | 2800.1 | 2921.3 | 3692.0 | 4481.7 | 5648.9 | 5878.0 | 5564.0 | 4472.6 | 2833.9 | 1227.4 | 499.5  |
| 75°   | 1567.0 | 1698.0 | 2749.8 | 3374.7 | 3792.6 | 4001.9 | 3886.5 | 2869.4 | 1255.4 | 320.6  | 149.2  |
| 77.5° | 530.0  | 573.7  | 1279.3 | 2087.9 | 2503.4 | 2315.4 | 1960.2 | 1425.2 | 461.6  | 122.0  | 79.1   |
| 80°   | 314.1  | 330.5  | 476.4  | 1039.4 | 1317.2 | 1092.2 | 862.2  | 526.7  | 234.9  | 65.1   | 55.2   |
| 82.5° | 94.0   | 111.3  | 262.9  | 385.8  | 516.0  | 321.5  | 272.0  | 300.9  | 122.0  | 35.4   | 46.2   |
| 85°   | 0.0    | 0.0    | 56.1   | 119.5  | 135.2  | 52.8   | 52.8   | 170.6  | 22.3   | 14.8   | 33.8   |
| 87.5° | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.8    | 4.1    | 2.5    | 3.3    | 7.4    |
| 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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**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 | 1537.3 |
| 2.5°  | 1527.4 | 1498.6 | 1464.8 | 1432.6 | 1402.1 | 1362.6 | 1343.6 | 1320.5 | 1300.7 | 1290.0 | 1295.8 |
| 5°    | 1496.9 | 1451.6 | 1382.3 | 1312.3 | 1241.4 | 1174.6 | 1114.4 | 1074.1 | 1037.8 | 1018.8 | 1022.9 |
| 7.5°  | 1470.5 | 1409.5 | 1301.6 | 1187.0 | 1073.2 | 958.7  | 865.5  | 793.0  | 736.9  | 713.8  | 709.7  |
| 10°   | 1459.0 | 1382.3 | 1229.8 | 1065.0 | 890.2  | 736.1  | 604.2  | 524.3  | 467.4  | 439.3  | 444.3  |
| 12.5° | 1464.8 | 1368.3 | 1168.8 | 945.5  | 718.8  | 539.1  | 413.0  | 338.0  | 297.6  | 281.1  | 277.0  |
| 15°   | 1481.3 | 1365.0 | 1114.4 | 823.5  | 554.7  | 376.7  | 285.2  | 254.7  | 246.5  | 244.8  | 244.8  |
| 17.5° | 1500.2 | 1365.9 | 1058.4 | 699.8  | 421.2  | 279.4  | 244.0  | 238.2  | 235.7  | 234.1  | 234.9  |
| 20°   | 1519.2 | 1365.9 | 994.1  | 574.5  | 316.5  | 241.5  | 232.5  | 228.3  | 225.9  | 225.0  | 225.0  |
| 22.5° | 1542.3 | 1365.9 | 922.4  | 458.3  | 253.9  | 229.2  | 221.7  | 219.3  | 216.8  | 216.0  | 215.1  |
| 25°   | 1570.3 | 1366.7 | 843.3  | 358.6  | 230.8  | 218.4  | 212.7  | 210.2  | 207.7  | 206.1  | 206.1  |
| 27.5° | 1610.7 | 1373.3 | 755.9  | 279.4  | 217.6  | 208.5  | 203.6  | 201.1  | 198.7  | 196.2  | 196.2  |
| 30°   | 1669.2 | 1389.8 | 657.8  | 230.8  | 205.2  | 197.8  | 192.9  | 191.2  | 188.8  | 186.3  | 185.5  |
| 32.5° | 1756.6 | 1418.6 | 556.4  | 206.9  | 193.7  | 186.3  | 180.5  | 178.9  | 176.4  | 173.9  | 173.1  |
| 35°   | 1878.6 | 1471.4 | 457.5  | 192.1  | 178.9  | 171.5  | 168.2  | 167.3  | 164.0  | 161.6  | 161.6  |
| 37.5° | 2057.4 | 1557.1 | 362.7  | 177.2  | 166.5  | 160.7  | 156.6  | 155.0  | 151.7  | 149.2  | 148.4  |
| 40°   | 2275.9 | 1668.4 | 281.9  | 165.7  | 155.0  | 149.2  | 145.1  | 142.6  | 138.5  | 135.2  | 133.5  |
| 42.5° | 2554.5 | 1804.4 | 222.6  | 153.3  | 144.3  | 138.5  | 135.2  | 130.2  | 124.5  | 119.5  | 118.7  |
| 45°   | 2844.6 | 1944.5 | 183.8  | 141.8  | 134.4  | 129.4  | 125.3  | 118.7  | 110.5  | 104.7  | 103.0  |
| 47.5° | 3067.2 | 2031.9 | 160.7  | 129.4  | 123.6  | 119.5  | 114.6  | 106.3  | 96.4   | 89.8   | 88.2   |
| 50°   | 3226.3 | 2045.1 | 143.4  | 117.9  | 114.6  | 110.5  | 103.0  | 93.1   | 82.4   | 75.8   | 74.2   |
| 52.5° | 3304.6 | 1985.7 | 129.4  | 107.2  | 104.7  | 100.6  | 91.5   | 80.8   | 69.2   | 62.6   | 61.0   |
| 55°   | 3340.0 | 1873.6 | 116.2  | 98.1   | 94.8   | 89.8   | 80.0   | 68.4   | 56.9   | 51.1   | 49.5   |
| 57.5° | 3326.0 | 1707.9 | 104.7  | 89.0   | 84.9   | 79.1   | 68.4   | 56.1   | 47.0   | 41.2   | 40.4   |
| 60°   | 3222.2 | 1475.5 | 93.1   | 80.0   | 75.0   | 68.4   | 57.7   | 46.2   | 37.9   | 33.8   | 33.0   |
| 62.5° | 2998.0 | 1187.0 | 81.6   | 69.2   | 65.9   | 59.3   | 49.5   | 37.9   | 31.3   | 28.9   | 28.0   |
| 65°   | 2538.8 | 839.1  | 70.1   | 58.5   | 56.9   | 50.3   | 41.2   | 31.3   | 27.2   | 25.6   | 24.7   |
| 67.5° | 1825.0 | 510.2  | 59.3   | 50.3   | 48.6   | 42.9   | 34.6   | 27.2   | 24.7   | 23.9   | 23.9   |
| 70°   | 917.4  | 241.5  | 47.0   | 41.2   | 41.2   | 35.4   | 29.7   | 24.7   | 23.9   | 23.1   | 23.1   |
| 72.5° | 311.6  | 103.0  | 35.4   | 32.1   | 33.8   | 30.5   | 25.6   | 23.1   | 23.1   | 23.1   | 23.1   |
| 75°   | 106.3  | 54.4   | 24.7   | 23.1   | 24.7   | 24.7   | 22.3   | 22.3   | 23.1   | 23.1   | 23.1   |
| 77.5° | 69.2   | 36.3   | 17.3   | 15.7   | 19.0   | 19.0   | 19.0   | 20.6   | 22.3   | 22.3   | 22.3   |
| 80°   | 56.9   | 19.8   | 11.5   | 10.7   | 14.0   | 14.0   | 15.7   | 19.0   | 20.6   | 20.6   | 20.6   |
| 82.5° | 48.6   | 12.4   | 6.6    | 7.4    | 9.9    | 10.7   | 13.2   | 15.7   | 18.1   | 19.0   | 19.0   |
| 85°   | 33.0   | 6.6    | 4.9    | 5.8    | 6.6    | 8.2    | 10.7   | 13.2   | 14.8   | 16.5   | 16.5   |
| 87.5° | 9.1    | 2.5    | 3.3    | 4.1    | 4.1    | 5.8    | 8.2    | 9.9    | 11.5   | 12.4   | 12.4   |
| 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: SP1-2408-195-9

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:  $4\pi$   
 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  
 R<sub>f</sub>: 81.5  
 R<sub>g</sub>: 99.2

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



### 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>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|
| 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

| $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|
| 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**

| $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|
| 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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TM-30-18

### Summary

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



### 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)