

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



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

Test Report Prepared for

Cooper Lighting Solutions

Brand: McGRAW-EDISON

Report Number: P635999

Luminaire Tested: GWS-SA3E-830-U-SL3-W-GRSWH

Issue Date: 1/10/2023

**Test Information**

Test Method: LM-79-2019  
Report Number: P635999  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2209-782-33)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 1/10/2023  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: McGRAW-EDISON  
Catalog Number: GWS-SA3E-830-U-SL3-W-GRSWH  
Description: GALLEON WALL SLIM LUMINAIRE. (3) LIGHTSQUARES WITH 16 LEDS EACH AND TYPE III SPILL LIGHT ELIMINATOR OPTICS W/ FACTORY INSTALLED GLARE SHIELD, WH  
Light Source: (48) 3000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

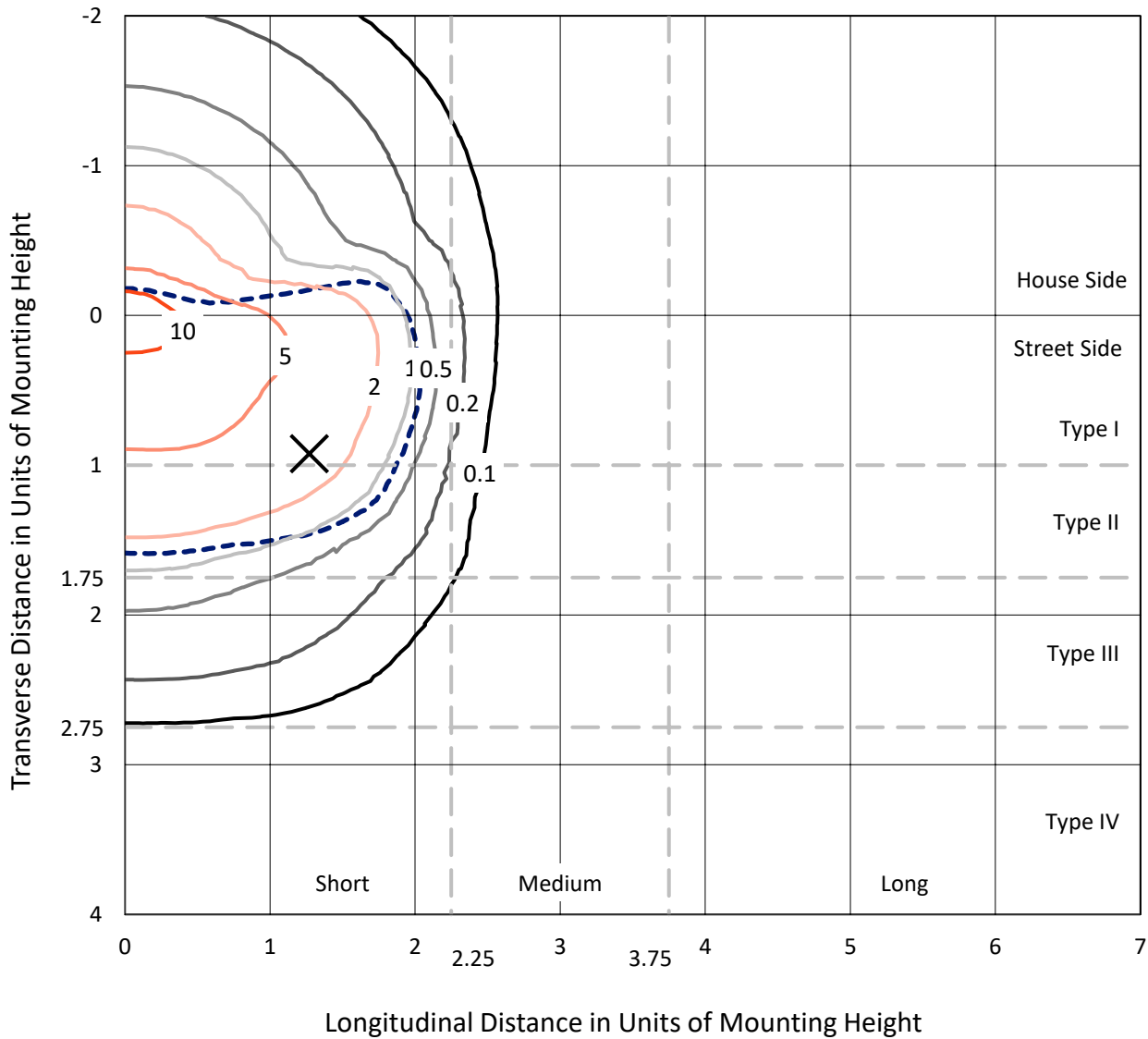
Lumens per Lamp: N/A  
Luminaire Lumens: 14630.1 lumens  
Efficiency: N/A  
Efficacy: 91.9 lumens/watt  
Luminous Opening: Rectangular (W 1.5' x L: 0.5' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B3 - U0 - G2  
  
Input Watts (W): 159.2  
Input Voltage (V): 120  
Input Current (Ain): 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



REPORT NUMBER: P635999  
 CATALOG NUMBER: GWS-SA3E-830-U-SL3-W-GRSWH

### Iso-Footcandle Lines of Horizontal Illumination

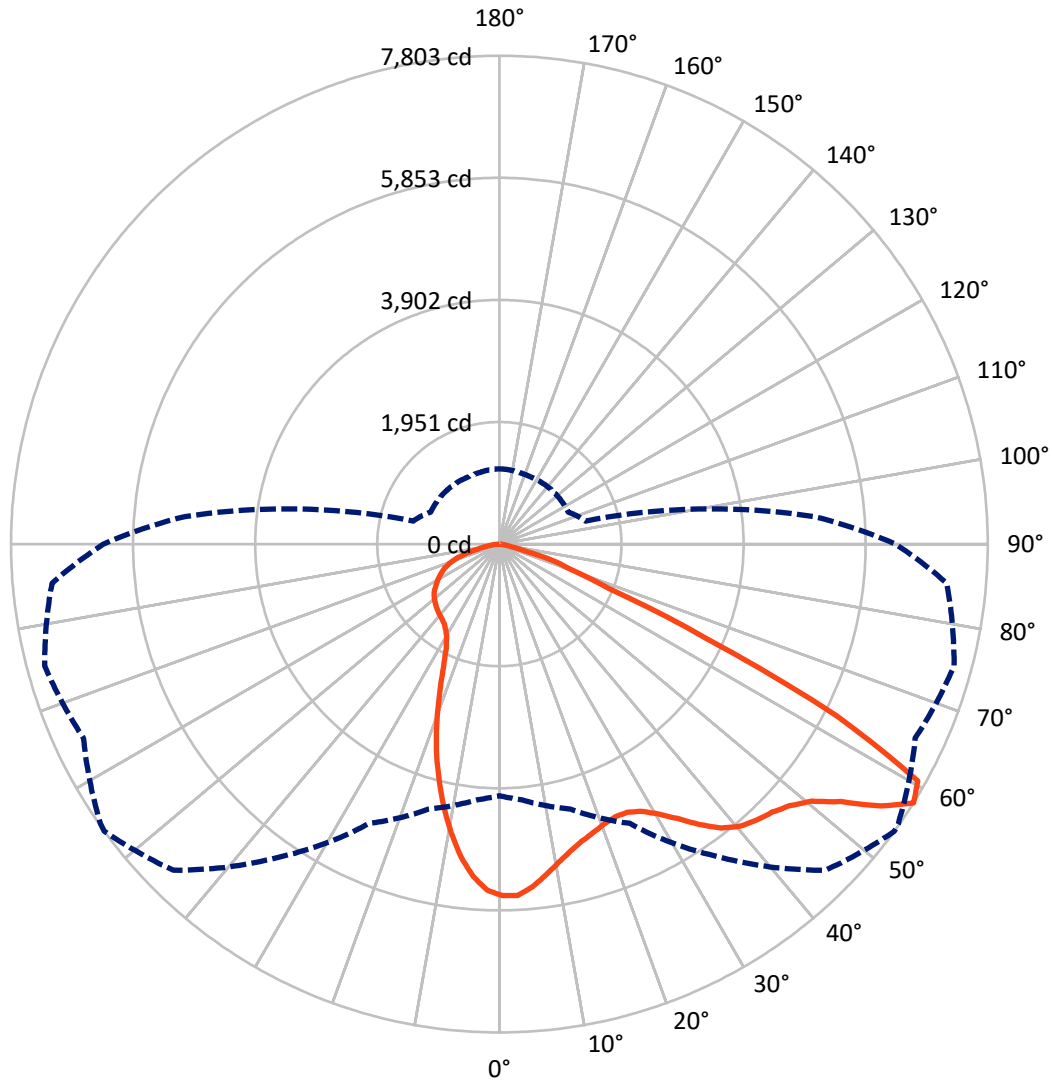
✕ Max cd  
 - - - 1/2 Max cd



Based on 20 foot mounting height. Maximum calculated value = 14 fc  
 Type II - Short - N/A

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### Luminous Intensity Polar Plot



— Vertical Plane Through 54-Deg Lateral    - - - Horizontal Cone Through 57.5-Deg Vertical

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**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 4253.1   | 0.0    | 4253.1  |
|                    | % Fixture | 29.1     | 0.0    | 29.1    |
| <b>Street Side</b> | Lumens    | 10377.0  | 0.0    | 10377.0 |
|                    | % Fixture | 70.9     | 0.0    | 70.9    |
| <b>Total</b>       | Lumens    | 14630.1  | 0.0    | 14630.1 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 493.7   | 3.4       |
| 10°-20°   | 1178.1  | 8.1       |
| 20°-30°   | 1630.3  | 11.1      |
| 30°-40°   | 2265.3  | 15.5      |
| 40°-50°   | 2991.7  | 20.4      |
| 50°-60°   | 3555.2  | 24.3      |
| 60°-70°   | 1969.6  | 13.5      |
| 70°-80°   | 490.5   | 3.4       |
| 80°-90°   | 55.8    | 0.4       |
| 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°    | 14630.1 | 100.0     |
| 0°-180°   | 14630.1 | 100.0     |

**Coefficient of Utilization**



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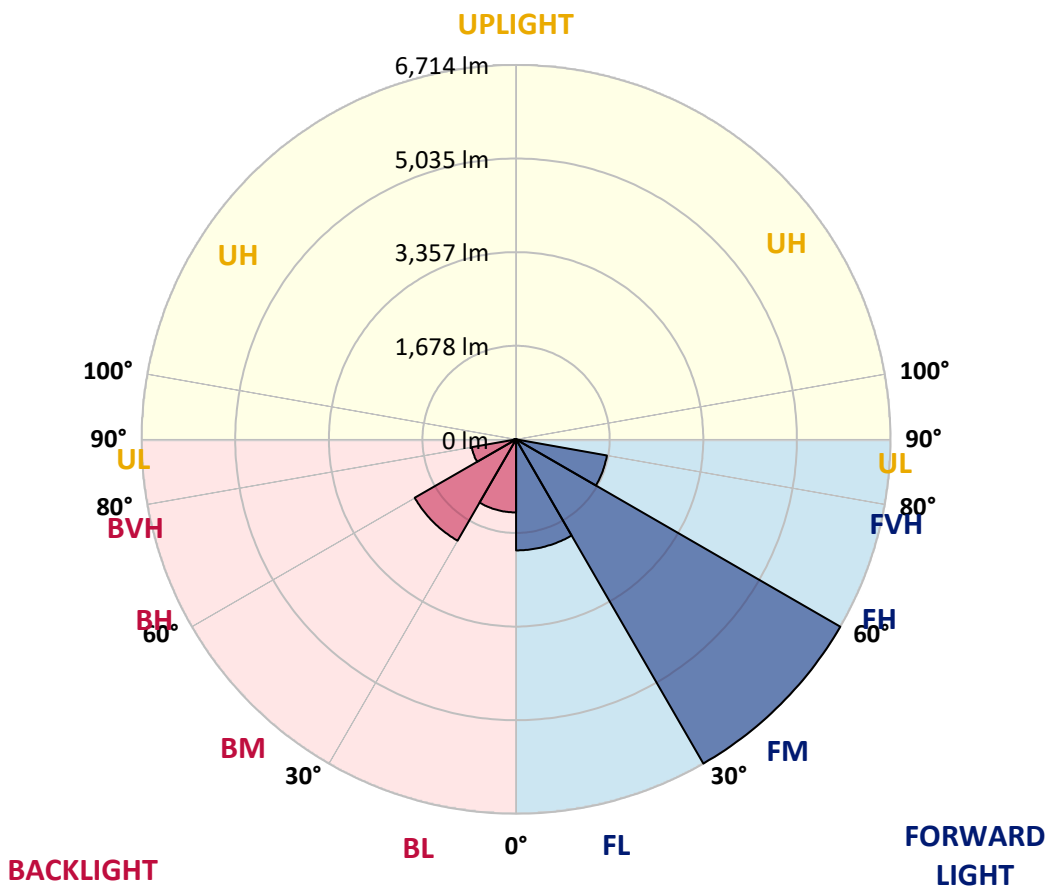
CATALOG NUMBER: GWS-SA3E-830-U-SL3-W-GRSWH

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

| Zone           | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|----------------|--------|-----------|-------------------------|------|---------|
|                |        |           | B                       | U    | G       |
| FL (0°-30°)    | 1991.4 | 13.6      |                         |      |         |
| FM (30°-60°)   | 6714.0 | 45.9      |                         |      |         |
| FH (60°-80°)   | 1654.1 | 11.3      |                         |      | G1/1800 |
| FVH (80°-90°)  | 17.5   | 0.1       |                         |      | G1/100  |
| BL (0°-30°)    | 1310.6 | 9.0       | B3/2500                 |      |         |
| BM (30°-60°)   | 2098.2 | 14.3      | B2/2500                 |      |         |
| BH (60°-80°)   | 806.0  | 5.5       | B2/1000                 |      | G2/1000 |
| BVH (80°-90°)  | 38.3   | 0.3       |                         |      | G1/100  |
| UL (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B3-U0-G2**

Type II Short





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CATALOG NUMBER: GWS-SA3E-830-U-SL3-W-GRSWH

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 54°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 |
| 2.5°  | 5511.6 | 5522.9 | 5530.4 | 5556.7 | 5579.3 | 5599.3 | 5620.6 | 5620.6 | 5619.3 | 5615.6 | 5608.1 |
| 5°    | 5293.7 | 5306.2 | 5323.8 | 5360.1 | 5408.9 | 5444.0 | 5501.6 | 5506.6 | 5531.7 | 5541.7 | 5536.7 |
| 7.5°  | 5040.7 | 5044.5 | 5067.0 | 5114.6 | 5192.3 | 5254.9 | 5337.6 | 5347.6 | 5407.7 | 5442.7 | 5436.5 |
| 10°   | 4764.0 | 4751.4 | 4791.5 | 4861.7 | 4963.1 | 5068.3 | 5174.7 | 5183.5 | 5279.9 | 5346.3 | 5341.3 |
| 12.5° | 4511.0 | 4512.2 | 4552.3 | 4637.5 | 4764.0 | 4894.2 | 5037.0 | 5057.0 | 5176.0 | 5261.2 | 5252.4 |
| 15°   | 4299.3 | 4304.4 | 4353.2 | 4449.6 | 4593.7 | 4748.9 | 4926.8 | 4945.6 | 5095.8 | 5208.6 | 5183.5 |
| 17.5° | 4130.3 | 4135.3 | 4177.9 | 4288.1 | 4442.1 | 4630.0 | 4846.6 | 4865.4 | 5052.0 | 5186.0 | 5134.7 |
| 20°   | 4013.8 | 4011.3 | 4052.6 | 4157.8 | 4316.9 | 4521.0 | 4776.5 | 4804.0 | 5038.2 | 5194.8 | 5102.1 |
| 22.5° | 3966.2 | 3965.0 | 3995.0 | 4081.4 | 4230.5 | 4437.1 | 4733.9 | 4771.5 | 5053.3 | 5233.6 | 5082.1 |
| 25°   | 3990.0 | 3985.0 | 4011.3 | 4075.2 | 4194.1 | 4404.5 | 4746.4 | 4786.5 | 5117.1 | 5313.8 | 5085.8 |
| 27.5° | 4063.9 | 4057.6 | 4080.2 | 4137.8 | 4228.0 | 4438.4 | 4834.1 | 4880.4 | 5252.4 | 5460.3 | 5135.9 |
| 30°   | 4176.6 | 4172.9 | 4195.4 | 4250.5 | 4329.4 | 4551.1 | 5001.9 | 5054.5 | 5461.5 | 5688.2 | 5244.9 |
| 32.5° | 4308.1 | 4301.9 | 4341.9 | 4405.8 | 4497.2 | 4756.5 | 5227.3 | 5296.2 | 5709.5 | 5981.3 | 5427.7 |
| 35°   | 4455.9 | 4450.9 | 4506.0 | 4598.7 | 4730.2 | 5042.0 | 5500.4 | 5575.5 | 5962.5 | 6313.1 | 5670.7 |
| 37.5° | 4599.9 | 4599.9 | 4706.4 | 4844.1 | 5009.4 | 5352.6 | 5757.1 | 5804.7 | 6137.8 | 6607.4 | 5931.2 |
| 40°   | 4727.7 | 4735.2 | 4895.5 | 5102.1 | 5312.5 | 5633.1 | 5926.2 | 5966.2 | 6215.5 | 6810.3 | 6157.8 |
| 42.5° | 4869.2 | 4875.4 | 5062.0 | 5332.5 | 5583.0 | 5859.8 | 6028.9 | 6048.9 | 6230.5 | 6911.8 | 6318.1 |
| 45°   | 4981.9 | 4990.6 | 5222.3 | 5511.6 | 5818.5 | 6030.1 | 6110.3 | 6127.8 | 6251.8 | 6966.9 | 6434.6 |
| 47.5° | 5040.7 | 5053.3 | 5318.8 | 5655.7 | 5977.5 | 6182.9 | 6244.3 | 6251.8 | 6339.4 | 7063.3 | 6574.9 |
| 50°   | 5030.7 | 5055.8 | 5355.1 | 5727.0 | 6095.2 | 6336.9 | 6459.7 | 6472.2 | 6518.5 | 7204.8 | 6738.9 |
| 52.5° | 5119.6 | 5130.9 | 5432.7 | 5812.2 | 6263.0 | 6621.2 | 6834.1 | 6851.7 | 6830.4 | 7311.3 | 6836.6 |
| 55°   | 4971.9 | 5025.7 | 5336.3 | 5799.7 | 6518.5 | 7060.8 | 7388.9 | 7380.1 | 7113.4 | 7430.2 | 6999.4 |
| 57.5° | 4021.3 | 4100.2 | 4384.5 | 4923.0 | 6097.7 | 7368.9 | 7803.4 | 7782.2 | 7332.6 | 7521.7 | 7176.0 |
| 60°   | 2784.0 | 2796.5 | 3053.2 | 3435.2 | 4706.4 | 6509.8 | 7682.0 | 7728.3 | 7372.6 | 7406.4 | 6849.1 |
| 62.5° | 2226.7 | 2222.9 | 2246.7 | 2256.7 | 2993.1 | 4576.1 | 6063.9 | 6233.0 | 6125.3 | 5770.9 | 4854.1 |
| 65°   | 1901.1 | 1914.9 | 1985.0 | 1948.7 | 1953.7 | 2577.4 | 3623.1 | 3646.9 | 3571.7 | 3444.0 | 2567.3 |
| 67.5° | 1487.8 | 1511.6 | 1635.6 | 1777.1 | 1732.0 | 1659.4 | 1879.8 | 1868.5 | 1472.8 | 1139.6 | 941.8  |
| 70°   | 931.8  | 946.8  | 1079.5 | 1395.1 | 1507.8 | 1362.6 | 1208.5 | 1203.5 | 789.0  | 648.7  | 711.3  |
| 72.5° | 543.5  | 546.0  | 583.6  | 777.7  | 1000.6 | 931.8  | 889.2  | 856.6  | 507.2  | 517.2  | 567.3  |
| 75°   | 299.3  | 299.3  | 298.1  | 335.6  | 394.5  | 349.4  | 338.1  | 329.4  | 339.4  | 384.5  | 422.0  |
| 77.5° | 62.6   | 63.9   | 67.6   | 88.9   | 115.2  | 140.3  | 176.6  | 177.8  | 221.7  | 256.7  | 286.8  |
| 80°   | 28.8   | 30.1   | 37.6   | 47.6   | 61.4   | 81.4   | 107.7  | 109.0  | 134.0  | 161.6  | 181.6  |
| 82.5° | 15.0   | 16.3   | 20.0   | 25.0   | 32.6   | 42.6   | 60.1   | 60.1   | 80.2   | 95.2   | 107.7  |
| 85°   | 5.0    | 5.0    | 7.5    | 10.0   | 13.8   | 17.5   | 23.8   | 23.8   | 35.1   | 46.3   | 53.9   |
| 87.5° | 0.0    | 0.0    | 0.0    | 0.0    | 1.3    | 2.5    | 5.0    | 5.0    | 6.3    | 7.5    | 12.5   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



REPORT NUMBER: P635999

CATALOG NUMBER: GWS-SA3E-830-U-SL3-W-GRSWH

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 | 5616.8 |
| 2.5°  | 5591.8 | 5553.0 | 5554.2 | 5561.7 | 5537.9 | 5501.6 | 5477.8 | 5447.8 | 5429.0 | 5425.2 | 5439.0 |
| 5°    | 5511.6 | 5466.5 | 5435.2 | 5402.7 | 5335.0 | 5254.9 | 5192.3 | 5140.9 | 5107.1 | 5094.6 | 5079.6 |
| 7.5°  | 5401.4 | 5342.6 | 5263.7 | 5172.2 | 5049.5 | 4906.7 | 4806.6 | 4712.6 | 4647.5 | 4628.7 | 4620.0 |
| 10°   | 5291.2 | 5206.1 | 5065.8 | 4895.5 | 4691.3 | 4498.5 | 4316.9 | 4177.9 | 4067.7 | 4005.0 | 4025.1 |
| 12.5° | 5177.2 | 5072.1 | 4852.9 | 4591.1 | 4306.9 | 4016.3 | 3778.4 | 3547.9 | 3370.1 | 3281.2 | 3254.9 |
| 15°   | 5077.1 | 4934.3 | 4628.7 | 4274.3 | 3896.1 | 3530.4 | 3186.0 | 2840.3 | 2614.9 | 2492.2 | 2458.4 |
| 17.5° | 4991.9 | 4806.6 | 4392.0 | 3951.2 | 3499.1 | 2978.1 | 2554.8 | 2234.2 | 2080.2 | 2012.5 | 2007.5 |
| 20°   | 4908.0 | 4681.3 | 4157.8 | 3603.0 | 3040.7 | 2457.1 | 2078.9 | 1928.6 | 1873.5 | 1849.7 | 1848.5 |
| 22.5° | 4832.9 | 4549.8 | 3911.1 | 3254.9 | 2584.9 | 2065.1 | 1857.2 | 1792.1 | 1777.1 | 1777.1 | 1774.6 |
| 25°   | 4769.0 | 4418.3 | 3658.1 | 2885.4 | 2172.8 | 1838.5 | 1742.0 | 1714.5 | 1720.7 | 1732.0 | 1733.3 |
| 27.5° | 4742.7 | 4315.6 | 3413.9 | 2506.0 | 1888.6 | 1707.0 | 1663.1 | 1659.4 | 1676.9 | 1694.4 | 1696.9 |
| 30°   | 4770.2 | 4245.5 | 3163.5 | 2142.8 | 1718.2 | 1626.8 | 1606.8 | 1614.3 | 1635.6 | 1653.1 | 1653.1 |
| 32.5° | 4855.4 | 4210.4 | 2908.0 | 1877.3 | 1619.3 | 1570.5 | 1564.2 | 1571.7 | 1588.0 | 1598.0 | 1599.3 |
| 35°   | 4999.4 | 4224.2 | 2643.7 | 1698.2 | 1555.4 | 1529.1 | 1527.9 | 1532.9 | 1539.1 | 1545.4 | 1546.7 |
| 37.5° | 5181.0 | 4285.6 | 2360.7 | 1594.3 | 1514.1 | 1499.1 | 1496.6 | 1495.3 | 1496.6 | 1496.6 | 1497.8 |
| 40°   | 5358.8 | 4378.2 | 2107.7 | 1532.9 | 1485.3 | 1472.8 | 1466.5 | 1457.7 | 1456.5 | 1454.0 | 1452.7 |
| 42.5° | 5490.3 | 4449.6 | 1906.1 | 1489.1 | 1459.0 | 1444.0 | 1436.5 | 1422.7 | 1421.4 | 1420.2 | 1418.9 |
| 45°   | 5589.3 | 4509.7 | 1738.3 | 1446.5 | 1431.4 | 1417.7 | 1401.4 | 1388.9 | 1391.4 | 1393.9 | 1393.9 |
| 47.5° | 5700.7 | 4562.3 | 1615.5 | 1406.4 | 1397.6 | 1383.9 | 1363.8 | 1355.1 | 1363.8 | 1372.6 | 1372.6 |
| 50°   | 5836.0 | 4636.2 | 1515.4 | 1366.3 | 1362.6 | 1346.3 | 1328.8 | 1325.0 | 1335.0 | 1347.5 | 1347.5 |
| 52.5° | 5934.9 | 4700.1 | 1444.0 | 1326.2 | 1326.2 | 1305.0 | 1289.9 | 1288.7 | 1299.9 | 1312.5 | 1313.7 |
| 55°   | 6120.3 | 4849.1 | 1418.9 | 1279.9 | 1274.9 | 1258.6 | 1247.3 | 1238.6 | 1252.4 | 1263.6 | 1263.6 |
| 57.5° | 6329.4 | 5047.0 | 1425.2 | 1213.5 | 1207.3 | 1202.3 | 1193.5 | 1183.5 | 1187.2 | 1199.8 | 1201.0 |
| 60°   | 5886.1 | 4663.8 | 1356.3 | 1147.2 | 1143.4 | 1140.9 | 1129.6 | 1112.1 | 1117.1 | 1127.1 | 1128.4 |
| 62.5° | 4111.5 | 3099.6 | 1097.1 | 1064.5 | 1077.0 | 1075.8 | 1060.7 | 1040.7 | 1042.0 | 1055.7 | 1055.7 |
| 65°   | 2134.0 | 1676.9 | 963.1  | 989.4  | 1008.1 | 1000.6 | 975.6  | 958.1  | 955.5  | 973.1  | 969.3  |
| 67.5° | 920.5  | 915.5  | 876.7  | 910.5  | 930.5  | 914.2  | 887.9  | 859.1  | 861.6  | 867.9  | 862.9  |
| 70°   | 741.4  | 763.9  | 780.2  | 816.5  | 832.8  | 802.8  | 774.0  | 757.7  | 743.9  | 742.6  | 733.9  |
| 72.5° | 592.4  | 623.7  | 660.0  | 697.6  | 702.6  | 672.5  | 636.2  | 621.2  | 599.9  | 598.6  | 589.9  |
| 75°   | 445.8  | 472.1  | 500.9  | 531.0  | 531.0  | 502.2  | 478.4  | 470.9  | 445.8  | 438.3  | 430.8  |
| 77.5° | 304.3  | 320.6  | 343.1  | 350.7  | 358.2  | 346.9  | 323.1  | 310.6  | 281.8  | 274.3  | 264.2  |
| 80°   | 191.6  | 202.9  | 216.7  | 221.7  | 229.2  | 215.4  | 196.6  | 182.8  | 162.8  | 156.5  | 151.5  |
| 82.5° | 115.2  | 122.7  | 131.5  | 134.0  | 140.3  | 130.2  | 112.7  | 102.7  | 91.4   | 86.4   | 82.7   |
| 85°   | 58.9   | 62.6   | 67.6   | 68.9   | 67.6   | 57.6   | 51.3   | 46.3   | 38.8   | 37.6   | 35.1   |
| 87.5° | 15.0   | 17.5   | 18.8   | 17.5   | 16.3   | 12.5   | 8.8    | 6.3    | 2.5    | 2.5    | 1.3    |
| 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 $W^{\wedge}/nm$ | Lumens ( $\phi/nm$ ) | $\lambda$ (nm) | Power $W^{\wedge}/nm$ | Lumens ( $\phi/nm$ ) | $\lambda$ (nm) | Power $W^{\wedge}/nm$ | Lumens ( $\phi/nm$ ) | $\lambda$ (nm) | Power $W^{\wedge}/nm$ | Lumens ( $\phi/nm$ ) | $\lambda$ (nm) | Power $W^{\wedge}/nm$ | 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)