

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: P640969

Luminaire Tested: GWS-SA5E-830-U-T2R-W-HSS

Issue Date: 1/10/2023

**Test Information**

Test Method: LM-79-2019  
Report Number: P640969  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2209-782-14)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 1/10/2023  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: McGRAW-EDISON  
Catalog Number: GWS-SA5E-830-U-T2R-W-HSS  
Description: GALLEON WALL SLIM LUMINAIRE. (5) LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II ROADWAY OPTICS WITH HOUSE SIDE SHIELD  
Light Source: (80) 3000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

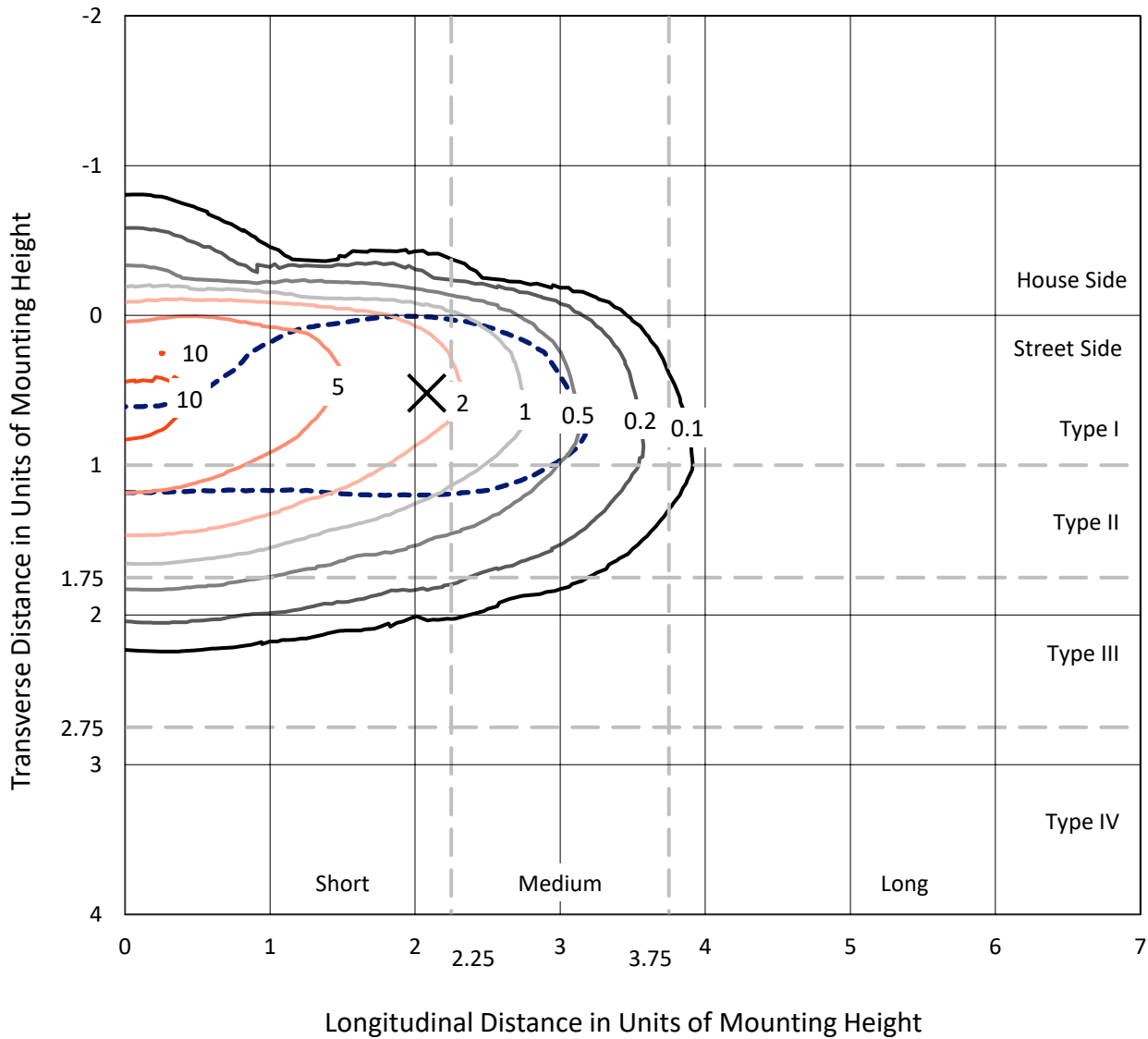
Lumens per Lamp: N/A  
Luminaire Lumens: 24050.7 lumens  
Efficiency: N/A  
Efficacy: 89.2 lumens/watt  
Luminous Opening: Rectangular (W 1.5' x L: 1' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B1 - U0 - G3  
  
Input Watts (W): 269.6  
Input Voltage (V): 120  
Input Current (Ain): 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: P640969  
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### Iso-Footcandle Lines of Horizontal Illumination

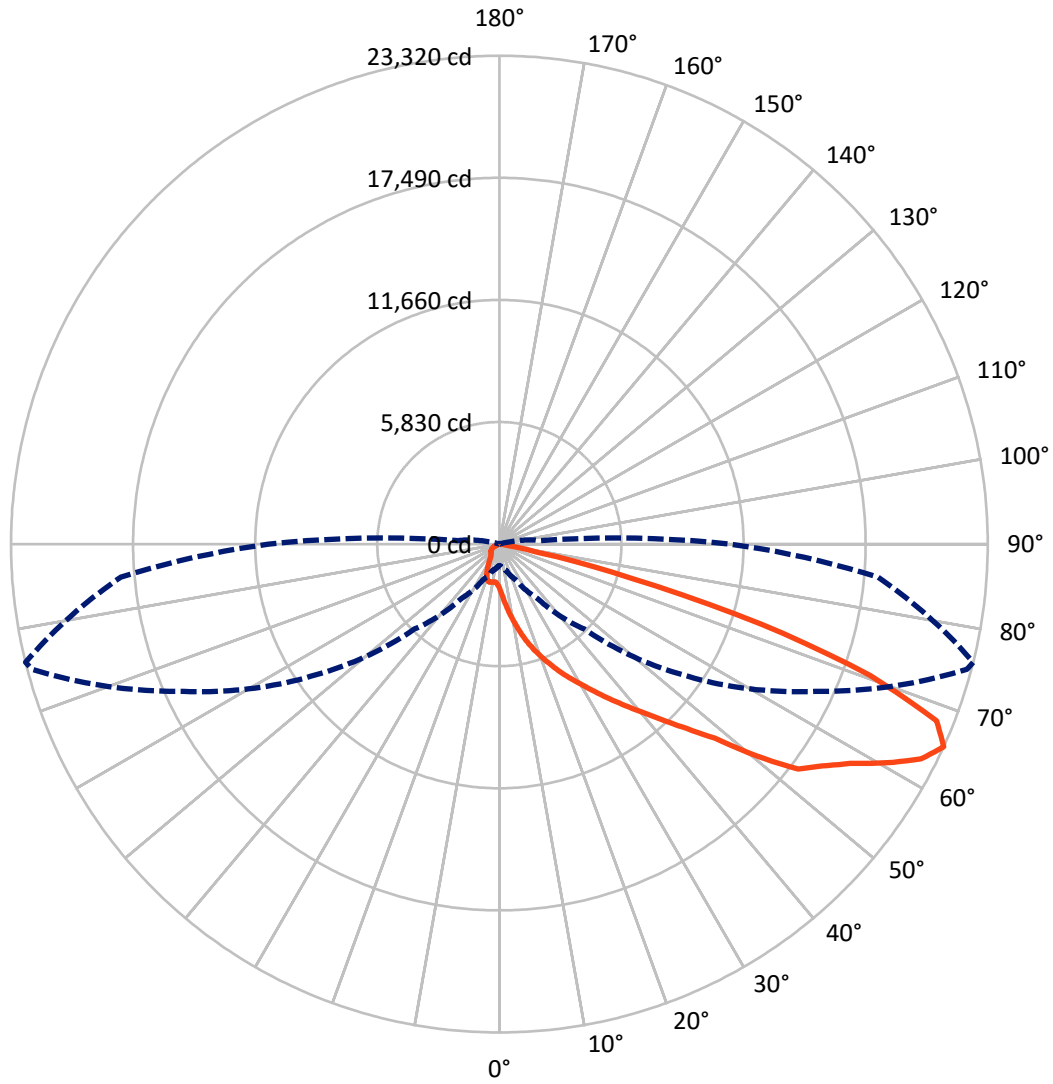
✕ Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 11.5 fc  
 Type II - Short - N/A

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### Luminous Intensity Polar Plot



— Vertical Plane Through 76-Deg Lateral    - - - Horizontal Cone Through 65-Deg Vertical

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**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 1329.9   | 0.0    | 1329.9  |
|                    | % Fixture | 5.5      | 0.0    | 5.5     |
| <b>Street Side</b> | Lumens    | 22720.8  | 0.0    | 22720.8 |
|                    | % Fixture | 94.5     | 0.0    | 94.5    |
| <b>Total</b>       | Lumens    | 24050.7  | 0.0    | 24050.7 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 259.0   | 1.1       |
| 10°-20°   | 983.0   | 4.1       |
| 20°-30°   | 2005.4  | 8.3       |
| 30°-40°   | 3566.6  | 14.8      |
| 40°-50°   | 5272.3  | 21.9      |
| 50°-60°   | 6036.4  | 25.1      |
| 60°-70°   | 4605.5  | 19.1      |
| 70°-80°   | 1290.1  | 5.4       |
| 80°-90°   | 32.5    | 0.1       |
| 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°    | 24050.7 | 100.0     |
| 0°-180°   | 24050.7 | 100.0     |

**Coefficient of Utilization**



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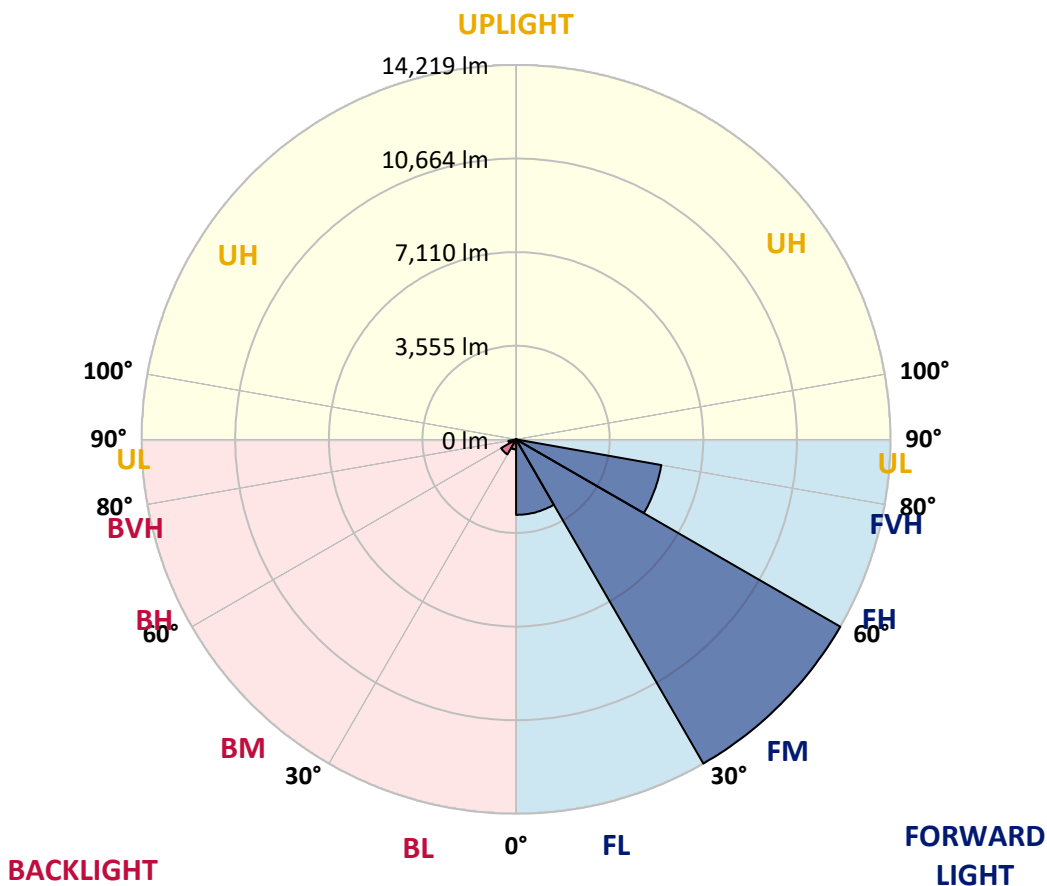
CATALOG NUMBER: GWS-SA5E-830-U-T2R-W-HSS

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

| Zone           | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|----------------|---------|-----------|-------------------------|------|---------|
|                |         |           | B                       | U    | G       |
| FL (0°-30°)    | 2867.9  | 11.9      |                         |      |         |
| FM (30°-60°)   | 14219.2 | 59.1      |                         |      |         |
| FH (60°-80°)   | 5603.2  | 23.3      |                         |      | G3/7500 |
| FVH (80°-90°)  | 30.6    | 0.1       |                         |      | G1/100  |
| BL (0°-30°)    | 379.5   | 1.6       | B1/500                  |      |         |
| BM (30°-60°)   | 656.1   | 2.7       | B1/1000                 |      |         |
| BH (60°-80°)   | 292.3   | 1.2       | B1/500                  |      | G1/500  |
| BVH (80°-90°)  | 1.9     | 0.0       |                         |      | G0/10   |
| UL (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G3**

Type II Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 65°     | 75°     | 76°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  | 2129.4  |
| 2.5°  | 3281.7  | 3330.9  | 3292.4  | 3228.3  | 3104.3  | 2984.5  | 2830.6  | 2618.9  | 2450.1  | 2428.7  | 2270.5  |
| 5°    | 4431.9  | 4427.6  | 4344.2  | 4260.9  | 4130.5  | 3925.2  | 3615.2  | 3221.8  | 2843.4  | 2811.4  | 2456.5  |
| 7.5°  | 5116.0  | 5122.4  | 5075.4  | 5011.3  | 4883.0  | 4671.3  | 4348.5  | 3873.9  | 3320.2  | 3256.0  | 2710.9  |
| 10°   | 5691.1  | 5689.0  | 5654.8  | 5624.9  | 5509.4  | 5368.3  | 5022.0  | 4500.3  | 3833.3  | 3732.8  | 2995.2  |
| 12.5° | 6123.0  | 6138.0  | 6155.1  | 6185.0  | 6135.8  | 5996.9  | 5669.8  | 5101.1  | 4352.8  | 4241.6  | 3320.2  |
| 15°   | 6465.1  | 6469.3  | 6533.5  | 6648.9  | 6689.5  | 6616.8  | 6319.7  | 5682.6  | 4865.9  | 4769.7  | 3694.3  |
| 17.5° | 6567.7  | 6576.2  | 6685.3  | 6896.9  | 7110.7  | 7151.3  | 6926.8  | 6268.4  | 5370.4  | 5267.8  | 4057.8  |
| 20°   | 6783.6  | 6802.8  | 6884.1  | 7070.1  | 7339.5  | 7557.5  | 7469.9  | 6860.6  | 5875.0  | 5740.3  | 4429.8  |
| 22.5° | 7463.5  | 7474.2  | 7446.4  | 7469.9  | 7608.8  | 7861.1  | 7914.6  | 7433.5  | 6392.4  | 6249.1  | 4831.7  |
| 25°   | 8632.9  | 8637.2  | 8442.6  | 8258.8  | 8154.0  | 8201.0  | 8318.6  | 7961.6  | 6905.5  | 6764.4  | 5205.8  |
| 27.5° | 9847.2  | 9862.2  | 9629.2  | 9317.0  | 8942.9  | 8729.1  | 8694.9  | 8444.8  | 7422.8  | 7266.8  | 5575.7  |
| 30°   | 10991.0 | 10991.0 | 10745.2 | 10364.6 | 9864.3  | 9447.5  | 9201.6  | 8932.2  | 7976.6  | 7805.5  | 5954.1  |
| 32.5° | 12019.4 | 12010.8 | 11696.5 | 11283.9 | 10790.1 | 10332.5 | 9815.2  | 9441.0  | 8592.3  | 8402.0  | 6390.2  |
| 35°   | 12868.1 | 12846.7 | 12489.7 | 12094.2 | 11566.1 | 11226.2 | 10649.0 | 9988.3  | 9259.3  | 9069.0  | 6839.2  |
| 37.5° | 13509.5 | 13486.0 | 13158.9 | 12739.8 | 12250.3 | 12030.1 | 11546.9 | 10644.7 | 9962.7  | 9789.5  | 7337.3  |
| 40°   | 13858.0 | 13810.9 | 13584.3 | 13272.2 | 12861.7 | 12669.3 | 12468.3 | 11459.2 | 10790.1 | 10574.1 | 7925.3  |
| 42.5° | 13960.6 | 13905.0 | 13755.4 | 13610.0 | 13362.0 | 13210.2 | 13426.1 | 12378.5 | 11698.7 | 11512.7 | 8596.6  |
| 45°   | 13657.0 | 13624.9 | 13612.1 | 13716.9 | 13761.8 | 13804.5 | 14336.9 | 13396.2 | 12701.4 | 12560.3 | 9441.0  |
| 47.5° | 12925.8 | 12917.3 | 13030.6 | 13466.7 | 13941.3 | 14392.4 | 15326.7 | 14651.1 | 14001.2 | 13849.4 | 10621.2 |
| 50°   | 11574.7 | 11662.3 | 11978.7 | 12744.1 | 13693.4 | 14726.0 | 16252.4 | 16391.4 | 16104.9 | 15882.6 | 12160.5 |
| 52.5° | 9462.4  | 9631.3  | 10341.1 | 11504.1 | 12868.1 | 14631.9 | 16680.0 | 17785.3 | 18078.2 | 17847.3 | 13263.6 |
| 55°   | 7425.0  | 7583.2  | 8216.0  | 9691.2  | 11510.5 | 13915.7 | 16699.3 | 18266.4 | 18905.6 | 18691.8 | 14009.8 |
| 57.5° | 5530.8  | 5676.2  | 6251.3  | 7662.3  | 9663.4  | 12506.8 | 16241.7 | 18533.6 | 19886.9 | 19750.1 | 15187.8 |
| 60°   | 3615.2  | 3758.5  | 4278.0  | 5511.5  | 7495.5  | 10454.4 | 15115.1 | 18478.0 | 21223.1 | 21210.3 | 16635.1 |
| 62.5° | 2005.4  | 2118.7  | 2494.9  | 3457.0  | 5231.5  | 8096.3  | 13344.9 | 17920.0 | 22516.5 | 22597.8 | 17828.1 |
| 65°   | 1026.2  | 1098.9  | 1327.6  | 1900.6  | 3166.3  | 5740.3  | 11016.7 | 16641.5 | 23115.1 | 23320.4 | 18142.4 |
| 67.5° | 671.3   | 694.8   | 750.4   | 987.7   | 1695.4  | 3610.9  | 8290.8  | 14591.3 | 22272.8 | 22512.3 | 17088.4 |
| 70°   | 545.2   | 564.4   | 596.5   | 658.5   | 874.4   | 1917.7  | 5445.3  | 11653.8 | 18610.6 | 18773.0 | 13607.8 |
| 72.5° | 399.8   | 425.4   | 487.4   | 528.1   | 630.7   | 1051.9  | 2832.7  | 7649.5  | 12780.5 | 13066.9 | 8551.7  |
| 75°   | 295.0   | 310.0   | 361.3   | 416.9   | 515.2   | 664.9   | 1083.9  | 4021.4  | 6599.7  | 6433.0  | 3591.7  |
| 77.5° | 177.4   | 188.1   | 230.9   | 267.2   | 367.7   | 414.8   | 378.4   | 1485.9  | 2007.5  | 1887.8  | 868.0   |
| 80°   | 87.7    | 98.3    | 151.8   | 201.0   | 235.2   | 166.8   | 158.2   | 414.8   | 446.8   | 446.8   | 218.1   |
| 82.5° | 29.9    | 38.5    | 81.2    | 132.6   | 115.4   | 64.1    | 74.8    | 106.9   | 119.7   | 126.1   | 64.1    |
| 85°   | 0.0     | 0.0     | 19.2    | 38.5    | 17.1    | 8.6     | 19.2    | 23.5    | 29.9    | 32.1    | 21.4    |
| 87.5° | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 2.1     | 6.4     | 8.6     | 8.6     |
| 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: P640969

CATALOG NUMBER: GWS-SA5E-830-U-T2R-W-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2129.4  | 2129.4 | 2129.4 | 2129.4 | 2129.4 | 2129.4 | 2129.4 | 2129.4 | 2129.4 | 2129.4 | 2129.4 |
| 2.5°  | 2184.9  | 2084.5 | 1932.7 | 1795.8 | 1691.1 | 1592.7 | 1517.9 | 1458.1 | 1447.4 | 1413.2 | 1417.4 |
| 5°    | 2283.3  | 2101.6 | 1821.5 | 1605.6 | 1453.8 | 1351.2 | 1265.6 | 1201.5 | 1173.7 | 1145.9 | 1124.5 |
| 7.5°  | 2435.1  | 2172.1 | 1778.7 | 1515.8 | 1338.3 | 1180.1 | 1047.6 | 940.7  | 889.4  | 857.3  | 835.9  |
| 10°   | 2621.1  | 2270.5 | 1780.9 | 1462.3 | 1199.4 | 957.8  | 776.1  | 658.5  | 602.9  | 585.8  | 583.7  |
| 12.5° | 2843.4  | 2394.5 | 1798.0 | 1374.7 | 998.4  | 711.9  | 575.1  | 521.7  | 504.5  | 489.6  | 489.6  |
| 15°   | 3078.6  | 2533.4 | 1798.0 | 1214.3 | 761.1  | 555.9  | 498.1  | 463.9  | 442.5  | 434.0  | 429.7  |
| 17.5° | 3326.6  | 2663.8 | 1755.2 | 994.1  | 583.7  | 489.6  | 442.5  | 410.5  | 393.4  | 380.5  | 376.3  |
| 20°   | 3591.7  | 2787.8 | 1648.3 | 761.1  | 500.3  | 438.3  | 393.4  | 361.3  | 344.2  | 331.4  | 331.4  |
| 22.5° | 3861.1  | 2903.3 | 1475.2 | 585.8  | 442.5  | 389.1  | 346.3  | 316.4  | 299.3  | 286.5  | 286.5  |
| 25°   | 4111.2  | 2980.3 | 1252.8 | 483.2  | 399.8  | 346.3  | 307.9  | 277.9  | 258.7  | 250.1  | 245.9  |
| 27.5° | 4344.2  | 3029.4 | 1007.0 | 425.4  | 359.2  | 310.0  | 269.4  | 241.6  | 226.6  | 220.2  | 215.9  |
| 30°   | 4585.8  | 3042.3 | 769.6  | 387.0  | 325.0  | 273.7  | 235.2  | 213.8  | 201.0  | 192.4  | 192.4  |
| 32.5° | 4821.0  | 3027.3 | 587.9  | 354.9  | 295.0  | 241.6  | 209.5  | 190.3  | 179.6  | 173.2  | 171.0  |
| 35°   | 5060.4  | 2958.9 | 476.8  | 327.1  | 265.1  | 211.7  | 186.0  | 171.0  | 164.6  | 156.1  | 156.1  |
| 37.5° | 5321.3  | 2866.9 | 414.8  | 299.3  | 235.2  | 190.3  | 166.8  | 156.1  | 147.5  | 141.1  | 139.0  |
| 40°   | 5646.2  | 2760.0 | 380.5  | 275.8  | 207.4  | 171.0  | 149.7  | 139.0  | 132.6  | 126.1  | 124.0  |
| 42.5° | 6031.1  | 2655.3 | 363.4  | 250.1  | 186.0  | 151.8  | 134.7  | 121.9  | 115.4  | 106.9  | 104.8  |
| 45°   | 6576.2  | 2631.8 | 344.2  | 222.3  | 166.8  | 136.8  | 117.6  | 104.8  | 96.2   | 89.8   | 87.7   |
| 47.5° | 7452.8  | 2698.0 | 312.1  | 192.4  | 147.5  | 119.7  | 100.5  | 89.8   | 79.1   | 72.7   | 68.4   |
| 50°   | 8322.9  | 2680.9 | 280.1  | 166.8  | 130.4  | 102.6  | 85.5   | 74.8   | 64.1   | 57.7   | 55.6   |
| 52.5° | 8797.5  | 2599.7 | 250.1  | 147.5  | 113.3  | 87.7   | 72.7   | 59.9   | 53.4   | 47.0   | 44.9   |
| 55°   | 9227.2  | 2567.6 | 220.2  | 128.3  | 96.2   | 77.0   | 59.9   | 49.2   | 44.9   | 38.5   | 36.3   |
| 57.5° | 10069.6 | 2642.5 | 194.6  | 111.2  | 83.4   | 66.3   | 51.3   | 40.6   | 36.3   | 29.9   | 27.8   |
| 60°   | 10950.4 | 2651.0 | 166.8  | 96.2   | 72.7   | 55.6   | 40.6   | 32.1   | 27.8   | 21.4   | 19.2   |
| 62.5° | 11410.1 | 2435.1 | 136.8  | 81.2   | 59.9   | 47.0   | 34.2   | 25.7   | 21.4   | 12.8   | 12.8   |
| 65°   | 11025.2 | 1969.0 | 115.4  | 66.3   | 47.0   | 36.3   | 25.7   | 19.2   | 12.8   | 6.4    | 2.1    |
| 67.5° | 9757.4  | 1400.3 | 96.2   | 53.4   | 34.2   | 25.7   | 19.2   | 12.8   | 2.1    | 0.0    | 0.0    |
| 70°   | 7144.9  | 799.6  | 74.8   | 38.5   | 25.7   | 17.1   | 12.8   | 6.4    | 0.0    | 0.0    | 0.0    |
| 72.5° | 4391.3  | 427.6  | 55.6   | 25.7   | 19.2   | 12.8   | 10.7   | 4.3    | 0.0    | 0.0    | 0.0    |
| 75°   | 1665.4  | 205.2  | 34.2   | 17.1   | 15.0   | 10.7   | 6.4    | 2.1    | 0.0    | 0.0    | 0.0    |
| 77.5° | 451.1   | 100.5  | 19.2   | 12.8   | 10.7   | 6.4    | 4.3    | 0.0    | 0.0    | 0.0    | 0.0    |
| 80°   | 117.6   | 47.0   | 12.8   | 8.6    | 6.4    | 4.3    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 82.5° | 40.6    | 21.4   | 6.4    | 6.4    | 4.3    | 2.1    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 85°   | 17.1    | 8.6    | 4.3    | 4.3    | 2.1    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 87.5° | 6.4     | 2.1    | 2.1    | 2.1    | 2.1    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 90°   | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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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

REPORT NUMBER: SP1-2408-195-9

| 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           |

REPORT NUMBER: SP1-2408-195-9

CIE 1931 Chromaticity Diagram



CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



CCT = 3050K  
 CIE x = 0.4383  
 CIE y = 0.4131  
 Duv = 0.0034

Point lies inside the ANSI 3000K 4-step quadrangle

REPORT NUMBER: SP1-2408-195-9

**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                      |                   |                             |                         |

REPORT NUMBER: SP1-2408-195-9

**Scotopic Flux vs. Wavelength**



**Scotopic Lumens: NR**

**S/P: 1.27**

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

REPORT NUMBER: SP1-2408-195-9

**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)