

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

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: McGRAW-EDISON

Report Number: P320224

Luminaire Tested: **GLEON-SA0D-722-U-SL4**

Issue Date: 3/3/2020

### Test Information

Test Method: LM-79-08  
Report Number: P320224  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-24)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: GLEON-SA0D-722-U-SL4  
Description: GALLEON AREA AND ROADWAY LUMINAIRE  
(10) 70 CRI, 2200K, 1200mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV  
SPILL LIGHT ELIMINATOR OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

### Summary

Lumens per Lamp: N/A  
Luminaire Lumens: 53647 lumens  
Efficiency: N/A  
Efficacy: 83.8 lumens/watt  
Luminous Opening: Rectangular (W 2.5' x L: 1' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B3 - U0 - G5

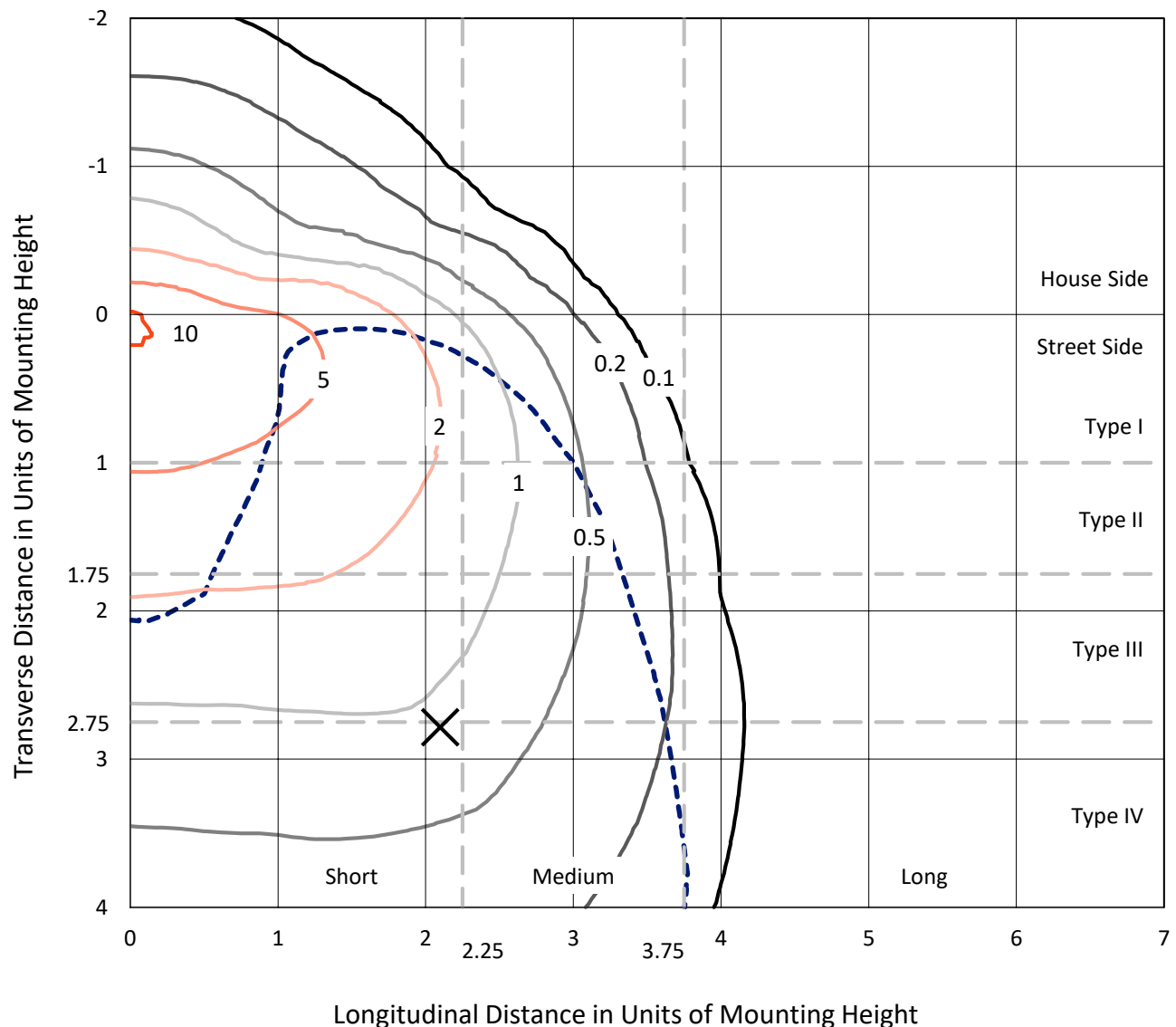
Input Watts (W): 640  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



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## Iso-Footcandle Lines of Horizontal Illumination

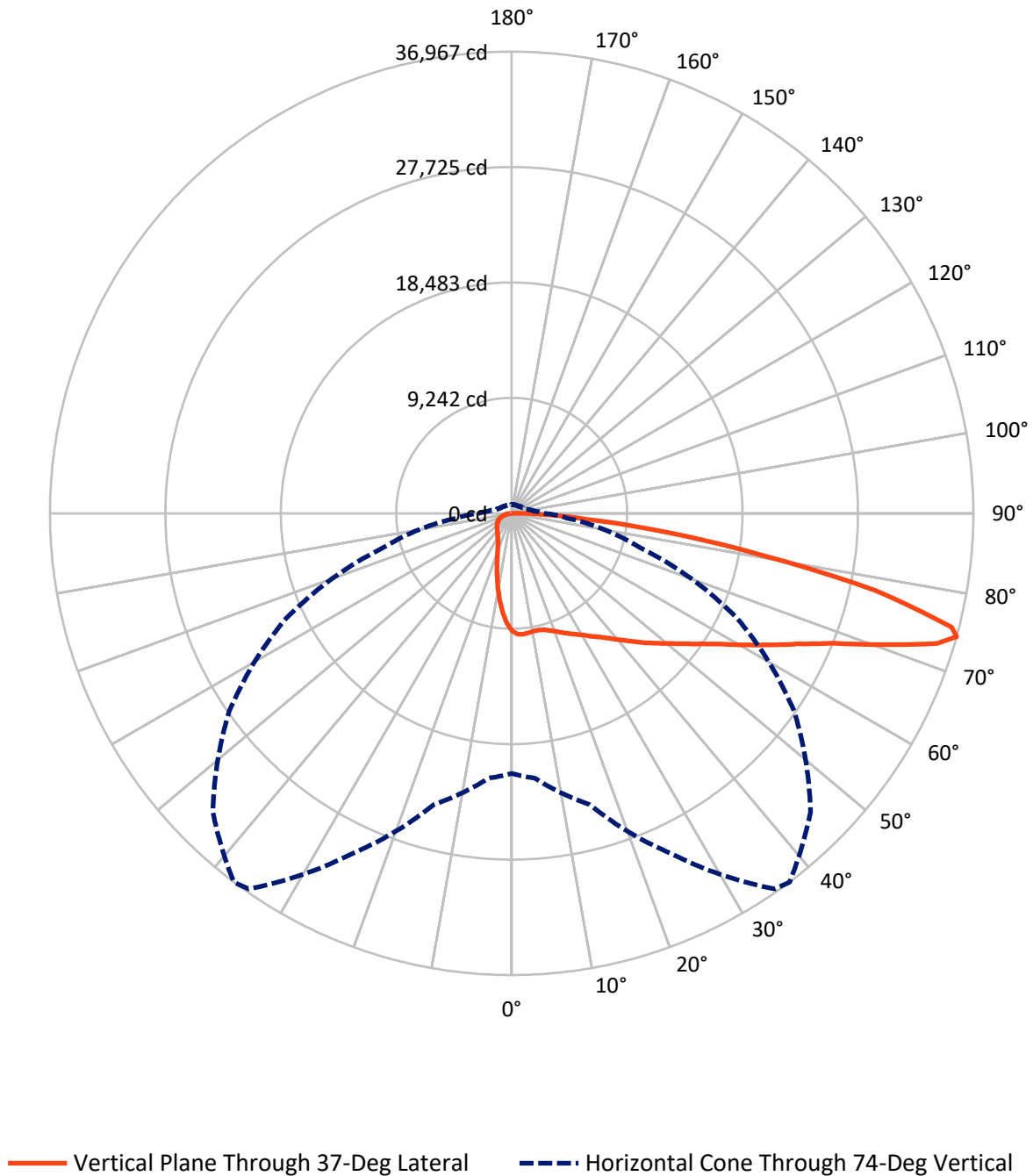
✕ Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 10.7 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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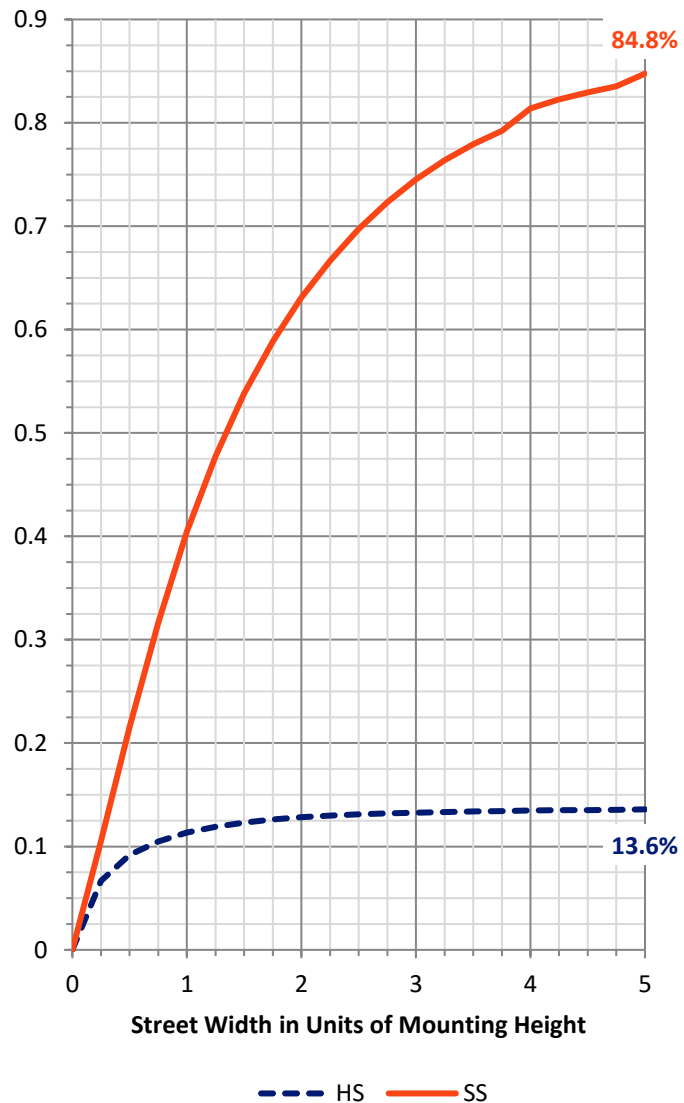
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 7381.4   | 0.0    | 7381.4  |
|                    | % Fixture | 13.8     | 0.0    | 13.8    |
| <b>Street Side</b> | Lumens    | 46265.6  | 0.0    | 46265.6 |
|                    | % Fixture | 86.2     | 0.0    | 86.2    |
| <b>Total</b>       | Lumens    | 53647.0  | 0.0    | 53647.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 832.4   | 1.6       |
| 10°-20°   | 2133.6  | 4.0       |
| 20°-30°   | 3287.5  | 6.1       |
| 30°-40°   | 4780.5  | 8.9       |
| 40°-50°   | 7036.1  | 13.1      |
| 50°-60°   | 9881.0  | 18.4      |
| 60°-70°   | 12506.3 | 23.3      |
| 70°-80°   | 11012.2 | 20.5      |
| 80°-90°   | 2177.4  | 4.1       |
| 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°    | 53647.0 | 100.0     |
| 0°-180°   | 53647.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P320224

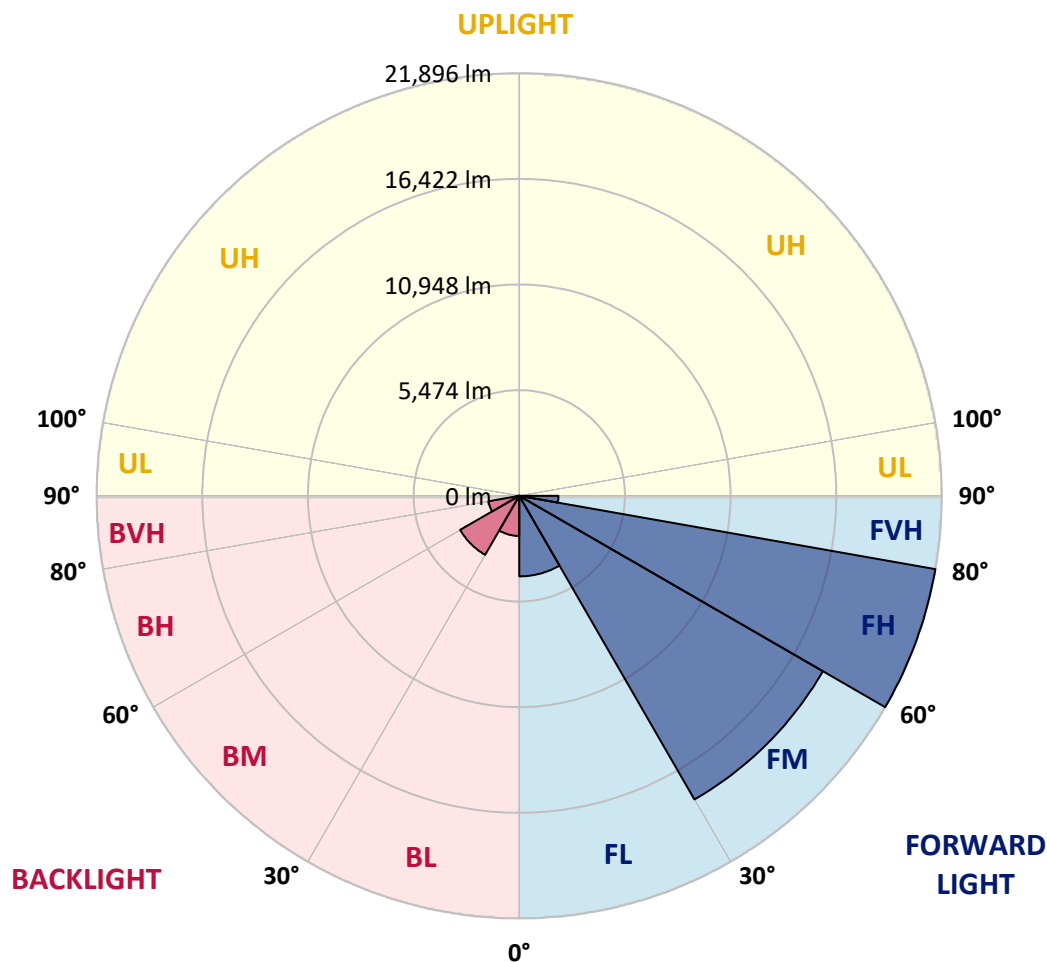
CATALOG NUMBER: GLEON-SA0D-722-U-SL4

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 4174.4  | 7.8       |                         |      |         |
| FM   | (30°-60°)   | 18165.3 | 33.9      |                         |      |         |
| FH   | (60°-80°)   | 21896.0 | 40.8      |                         |      | G5      |
| FVH  | (80°-90°)   | 2029.9  | 3.8       |                         |      | G5      |
| BL   | (0°-30°)    | 2079.2  | 3.9       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 3532.3  | 6.6       | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1622.5  | 3.0       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 147.4   | 0.3       |                         |      | G2/225  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B3-U0-G5**

Type IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 37°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  | 9452.4  |
| 2.5°  | 9775.5  | 9777.4  | 9775.5  | 9760.4  | 9724.5  | 9694.3  | 9669.7  | 9633.8  | 9554.4  | 9494.0  | 9403.3  |
| 5°    | 9868.1  | 9856.8  | 9849.2  | 9820.9  | 9764.2  | 9730.2  | 9682.9  | 9614.9  | 9484.5  | 9363.6  | 9216.2  |
| 7.5°  | 9824.7  | 9811.4  | 9794.4  | 9760.4  | 9696.2  | 9667.8  | 9601.7  | 9512.9  | 9356.0  | 9197.3  | 8985.6  |
| 10°   | 9690.5  | 9686.7  | 9679.2  | 9671.6  | 9616.8  | 9594.1  | 9533.7  | 9439.2  | 9284.2  | 9091.5  | 8843.9  |
| 12.5° | 9541.2  | 9550.7  | 9580.9  | 9620.6  | 9596.0  | 9584.7  | 9546.9  | 9482.6  | 9323.9  | 9116.0  | 8817.4  |
| 15°   | 9446.7  | 9473.2  | 9554.4  | 9658.4  | 9679.2  | 9675.4  | 9665.9  | 9624.4  | 9456.2  | 9225.6  | 8877.9  |
| 17.5° | 9414.6  | 9458.1  | 9613.0  | 9785.0  | 9845.5  | 9858.7  | 9862.5  | 9790.7  | 9603.6  | 9359.8  | 8940.3  |
| 20°   | 9473.2  | 9528.0  | 9754.7  | 9991.0  | 10087.3 | 10094.9 | 10077.9 | 9953.2  | 9743.4  | 9475.1  | 8974.3  |
| 22.5° | 9650.8  | 9699.9  | 9983.4  | 10249.9 | 10359.5 | 10370.8 | 10319.8 | 10130.8 | 9890.8  | 9611.1  | 9021.5  |
| 25°   | 9992.9  | 10053.3 | 10336.8 | 10603.2 | 10659.9 | 10661.8 | 10588.1 | 10353.8 | 10083.6 | 9802.0  | 9123.6  |
| 27.5° | 10438.8 | 10499.3 | 10754.4 | 11015.2 | 10985.0 | 10968.0 | 10867.8 | 10633.5 | 10334.9 | 10064.7 | 9305.0  |
| 30°   | 10935.8 | 11002.0 | 11243.9 | 11429.0 | 11357.2 | 11323.2 | 11242.0 | 10939.6 | 10684.5 | 10423.7 | 9582.8  |
| 32.5° | 11449.8 | 11510.3 | 11722.0 | 11848.6 | 11757.9 | 11742.7 | 11619.9 | 11344.0 | 11139.9 | 10971.7 | 10032.5 |
| 35°   | 11977.1 | 12020.5 | 12228.4 | 12300.2 | 12179.3 | 12175.5 | 12141.5 | 11888.2 | 11759.7 | 11839.1 | 10686.4 |
| 37.5° | 12515.6 | 12527.0 | 12704.6 | 12708.4 | 12672.5 | 12687.6 | 12723.5 | 12564.8 | 12600.7 | 12848.2 | 11536.8 |
| 40°   | 12995.6 | 13025.9 | 13154.4 | 13194.0 | 13256.4 | 13309.3 | 13488.8 | 13384.9 | 13662.7 | 14101.1 | 12595.0 |
| 42.5° | 13350.9 | 13409.5 | 13615.5 | 13717.5 | 13919.7 | 14002.8 | 14256.1 | 14352.4 | 14911.8 | 15569.4 | 13853.6 |
| 45°   | 13651.4 | 13742.1 | 14072.8 | 14282.5 | 14624.6 | 14770.1 | 15132.9 | 15456.0 | 16323.4 | 17162.5 | 15178.3 |
| 47.5° | 13976.4 | 14091.7 | 14505.5 | 14906.1 | 15371.0 | 15535.4 | 16194.9 | 16678.7 | 17829.5 | 18764.9 | 16427.4 |
| 50°   | 14454.5 | 14543.3 | 14947.7 | 15577.0 | 16157.1 | 16368.8 | 17281.5 | 17975.0 | 19360.2 | 20291.8 | 17510.2 |
| 52.5° | 15121.6 | 15087.5 | 15429.6 | 16312.1 | 17090.7 | 17351.4 | 18441.8 | 19354.5 | 20911.7 | 21673.2 | 18424.8 |
| 55°   | 15792.4 | 15735.7 | 15975.7 | 17081.2 | 18179.1 | 18453.1 | 19719.3 | 20739.7 | 22387.5 | 22916.7 | 19125.9 |
| 57.5° | 16538.9 | 16431.1 | 16633.3 | 17948.6 | 19418.8 | 19745.7 | 21149.8 | 22211.8 | 23838.9 | 23922.0 | 19571.9 |
| 60°   | 17308.0 | 17162.5 | 17389.2 | 19023.8 | 20992.9 | 21378.4 | 22824.1 | 23648.0 | 25207.0 | 24727.0 | 19715.5 |
| 62.5° | 17980.7 | 17878.7 | 18228.3 | 20223.8 | 22767.4 | 23190.7 | 24468.1 | 25174.9 | 26556.3 | 25061.5 | 19197.7 |
| 65°   | 18568.4 | 18585.4 | 19190.1 | 21573.1 | 24745.9 | 25197.6 | 26354.1 | 27057.1 | 27618.3 | 24863.1 | 17986.4 |
| 67.5° | 19269.5 | 19365.9 | 20397.7 | 23349.4 | 27236.6 | 27731.7 | 29098.0 | 29109.3 | 28211.7 | 23699.0 | 15601.6 |
| 70°   | 20291.8 | 20490.3 | 22058.7 | 25813.6 | 30777.9 | 31458.2 | 32512.7 | 30314.9 | 27378.3 | 20543.2 | 12275.6 |
| 72.5° | 21198.9 | 21569.3 | 23825.6 | 28633.1 | 35094.0 | 35609.9 | 34510.1 | 29619.5 | 23895.5 | 15395.6 | 7647.7  |
| 74°   | 20830.4 | 21289.6 | 24146.9 | 30022.0 | 36719.2 | 36966.8 | 33835.5 | 27590.0 | 19923.3 | 10661.8 | 4444.6  |
| 75°   | 20036.7 | 20535.6 | 23678.2 | 30008.8 | 36513.2 | 36375.3 | 32206.5 | 25271.3 | 16408.5 | 7271.7  | 2957.4  |
| 77.5° | 16170.4 | 16697.6 | 19951.7 | 25719.1 | 29938.9 | 29808.5 | 24740.3 | 16952.7 | 7186.6  | 2384.8  | 1502.3  |
| 80°   | 9401.4  | 9803.9  | 12385.2 | 16332.9 | 20187.9 | 20424.1 | 16270.5 | 8388.5  | 2827.0  | 1339.8  | 1018.6  |
| 82.5° | 4176.3  | 4454.1  | 5982.9  | 8337.5  | 12183.0 | 12487.3 | 8520.8  | 4395.5  | 1746.1  | 814.5   | 612.3   |
| 85°   | 2740.1  | 2946.1  | 3632.0  | 3970.3  | 5801.4  | 6009.3  | 4170.6  | 3422.3  | 1152.7  | 447.9   | 449.8   |
| 87.5° | 1971.0  | 2169.4  | 2698.5  | 2356.5  | 2662.6  | 2520.9  | 2269.6  | 3167.2  | 463.0   | 255.1   | 151.2   |
| 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: P320224

CATALOG NUMBER: GLEON-SA0D-722-U-SL4

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 9452.4  | 9452.4  | 9452.4 | 9452.4 | 9452.4 | 9452.4 | 9452.4 | 9452.4 | 9452.4 | 9452.4 | 9452.4 |
| 2.5°  | 9363.6  | 9333.3  | 9265.3 | 9136.8 | 9065.0 | 9004.5 | 8904.4 | 8845.8 | 8819.3 | 8817.4 | 8828.8 |
| 5°    | 9131.1  | 9061.2  | 8885.5 | 8670.0 | 8498.1 | 8341.2 | 8146.6 | 8029.4 | 7946.3 | 7897.2 | 7910.4 |
| 7.5°  | 8860.9  | 8751.3  | 8475.4 | 8131.5 | 7855.6 | 7551.3 | 7250.9 | 7071.3 | 6931.5 | 6827.6 | 6846.5 |
| 10°   | 8675.7  | 8524.5  | 8122.0 | 7626.9 | 7167.7 | 6725.5 | 6311.7 | 6064.1 | 5867.6 | 5716.4 | 5727.7 |
| 12.5° | 8613.4  | 8409.3  | 7851.8 | 7190.4 | 6546.0 | 5941.3 | 5400.8 | 5021.0 | 4818.8 | 4646.8 | 4660.1 |
| 15°   | 8622.8  | 8348.8  | 7625.0 | 6797.3 | 5986.6 | 5225.1 | 4569.3 | 4125.3 | 3851.3 | 3732.2 | 3734.1 |
| 17.5° | 8630.4  | 8278.9  | 7386.9 | 6375.9 | 5433.0 | 4556.1 | 3843.7 | 3393.9 | 3135.1 | 3025.4 | 3027.3 |
| 20°   | 8605.8  | 8165.5  | 7092.1 | 5892.2 | 4854.7 | 3942.0 | 3252.2 | 2870.5 | 2674.0 | 2588.9 | 2588.9 |
| 22.5° | 8573.7  | 8031.3  | 6759.5 | 5406.5 | 4284.0 | 3409.1 | 2828.9 | 2537.9 | 2424.5 | 2367.8 | 2365.9 |
| 25°   | 8588.8  | 7931.2  | 6419.4 | 4907.6 | 3758.7 | 2983.9 | 2547.3 | 2354.6 | 2279.0 | 2243.1 | 2241.2 |
| 27.5° | 8670.0  | 7883.9  | 6105.7 | 4410.6 | 3299.5 | 2664.5 | 2358.4 | 2222.3 | 2173.2 | 2150.5 | 2150.5 |
| 30°   | 8817.4  | 7883.9  | 5778.8 | 3987.3 | 2917.7 | 2428.3 | 2212.9 | 2120.3 | 2086.3 | 2071.1 | 2071.1 |
| 32.5° | 9074.4  | 7927.4  | 5463.2 | 3567.8 | 2613.5 | 2243.1 | 2091.9 | 2029.6 | 2003.1 | 1995.5 | 1995.5 |
| 35°   | 9516.6  | 8074.8  | 5155.2 | 3171.0 | 2367.8 | 2091.9 | 1976.7 | 1940.7 | 1921.8 | 1920.0 | 1925.6 |
| 37.5° | 10138.4 | 8375.3  | 4866.0 | 2878.0 | 2194.0 | 1969.1 | 1880.3 | 1851.9 | 1840.6 | 1850.0 | 1857.6 |
| 40°   | 10920.7 | 8783.4  | 4603.4 | 2613.5 | 2061.7 | 1870.8 | 1791.5 | 1772.6 | 1766.9 | 1780.1 | 1791.5 |
| 42.5° | 11865.6 | 9335.2  | 4387.9 | 2422.6 | 1959.6 | 1787.7 | 1715.9 | 1693.2 | 1687.5 | 1702.6 | 1717.8 |
| 45°   | 12887.9 | 9928.6  | 4236.8 | 2280.9 | 1880.3 | 1725.3 | 1649.7 | 1625.2 | 1613.8 | 1621.4 | 1638.4 |
| 47.5° | 13817.7 | 10489.9 | 4176.3 | 2180.7 | 1804.7 | 1672.4 | 1591.1 | 1560.9 | 1542.0 | 1538.2 | 1551.5 |
| 50°   | 14601.9 | 10907.5 | 4204.6 | 2120.3 | 1744.2 | 1613.8 | 1534.5 | 1500.4 | 1472.1 | 1455.1 | 1464.5 |
| 52.5° | 15172.6 | 11170.2 | 4231.1 | 2093.8 | 1697.0 | 1549.6 | 1472.1 | 1440.0 | 1402.2 | 1373.8 | 1373.8 |
| 55°   | 15586.4 | 11230.6 | 4172.5 | 2073.0 | 1661.1 | 1479.7 | 1402.2 | 1371.9 | 1334.1 | 1302.0 | 1298.2 |
| 57.5° | 15748.9 | 11060.5 | 3955.2 | 2042.8 | 1636.5 | 1413.5 | 1328.5 | 1305.8 | 1273.7 | 1235.9 | 1234.0 |
| 60°   | 15529.7 | 10535.2 | 3535.7 | 1978.5 | 1604.4 | 1358.7 | 1254.8 | 1239.7 | 1224.5 | 1188.6 | 1186.7 |
| 62.5° | 14649.1 | 9382.5  | 2993.3 | 1848.1 | 1540.1 | 1300.1 | 1186.7 | 1194.3 | 1196.2 | 1171.6 | 1167.8 |
| 65°   | 13052.3 | 7798.9  | 2464.2 | 1678.1 | 1443.7 | 1230.2 | 1116.8 | 1152.7 | 1173.5 | 1169.7 | 1164.1 |
| 67.5° | 10731.7 | 6069.8  | 2088.1 | 1498.6 | 1317.1 | 1133.8 | 1041.2 | 1082.8 | 1099.8 | 1113.0 | 1109.3 |
| 70°   | 7965.2  | 4280.2  | 1727.2 | 1309.6 | 1164.1 | 1020.5 | 943.0  | 963.8  | 952.4  | 967.5  | 973.2  |
| 72.5° | 4440.8  | 2568.1  | 1407.8 | 1120.6 | 1005.3 | 888.2  | 833.4  | 829.6  | 805.0  | 805.0  | 805.0  |
| 74°   | 2664.5  | 1884.1  | 1237.8 | 1003.4 | 909.0  | 801.2  | 754.0  | 737.0  | 714.3  | 716.2  | 714.3  |
| 75°   | 2142.9  | 1619.5  | 1135.7 | 926.0  | 840.9  | 750.2  | 703.0  | 680.3  | 663.3  | 663.3  | 661.4  |
| 77.5° | 1353.0  | 1230.2  | 914.6  | 737.0  | 672.7  | 617.9  | 585.8  | 555.6  | 555.6  | 553.7  | 551.8  |
| 80°   | 1022.3  | 978.9   | 712.4  | 557.5  | 515.9  | 474.3  | 453.5  | 440.3  | 440.3  | 446.0  | 444.1  |
| 82.5° | 701.1   | 737.0   | 500.8  | 389.3  | 368.5  | 338.3  | 334.5  | 336.4  | 330.7  | 323.1  | 321.3  |
| 85°   | 512.1   | 553.7   | 338.3  | 245.7  | 224.9  | 206.0  | 221.1  | 228.7  | 219.2  | 202.2  | 194.6  |
| 87.5° | 196.5   | 362.8   | 181.4  | 102.0  | 94.5   | 81.3   | 94.5   | 98.3   | 105.8  | 83.1   | 85.0   |
| 90°   | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



LM-79-2008: Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-1908-441-10-R4

Test Date: 10/25/2019

Luminaire Tested: SA1C-722-U-5WQ

Data in this report applies to families of products SA1C-722-U-5WQ.

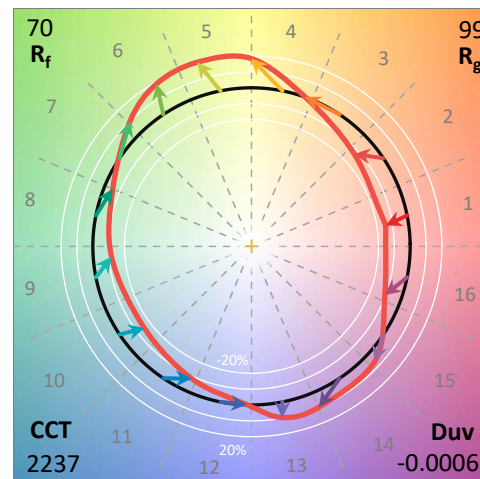
### Test Information

Test Method: LM-79-2008 Report  
 Number: SP1-1908-441-10-R4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/28/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **SA1C-722-U-5WQ**  
 Description: MCGRAW EDISON ROADWAY AND AREA LUMINAIRE

\*\*\*THIS IS A REVISION OF SP1-1908-441-4-R3. TO UPDATE THE CATALOG INFORMATION.\*\*\*TESTED IN SITU. ROADWAY AND AREA LUMINAIRE. (1) 70 CRI, 5000K, 1050MA LIGHTSQUARE WITH 16 LEDS AND TYPE V WIDE OPTICS.

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 2237    | CRI (Ra): | 72.0 |      |       |
| CIE u':                   | 0.2876  | R1:       | 68.9 | R9:  | -17.4 |
| CIE v':                   | 0.5346  | R2:       | 83.0 | R10: | 61.3  |
| Duv:                      | -0.0006 | R3:       | 95.2 | R11: | 59.8  |
| CIE x:                    | 0.5005  | R4:       | 66.2 | R12: | 50.5  |
| CIE y:                    | 0.4134  | R5:       | 65.9 | R13: | 71.1  |
| CIE z:                    | 0.0860  | R6:       | 76.3 | R14: | 96.9  |
| Peak Wavelength (nm):     | 603     | R7:       | 76.7 |      |       |
| Dominant Wavelength (nm): | 587     | R8:       | 43.8 |      |       |
| Purity:                   | 74.5    |           |      |      |       |
| Rf:                       | 69.8    |           |      |      |       |
| Rg:                       | 99.2    |           |      |      |       |



### Test Conditions

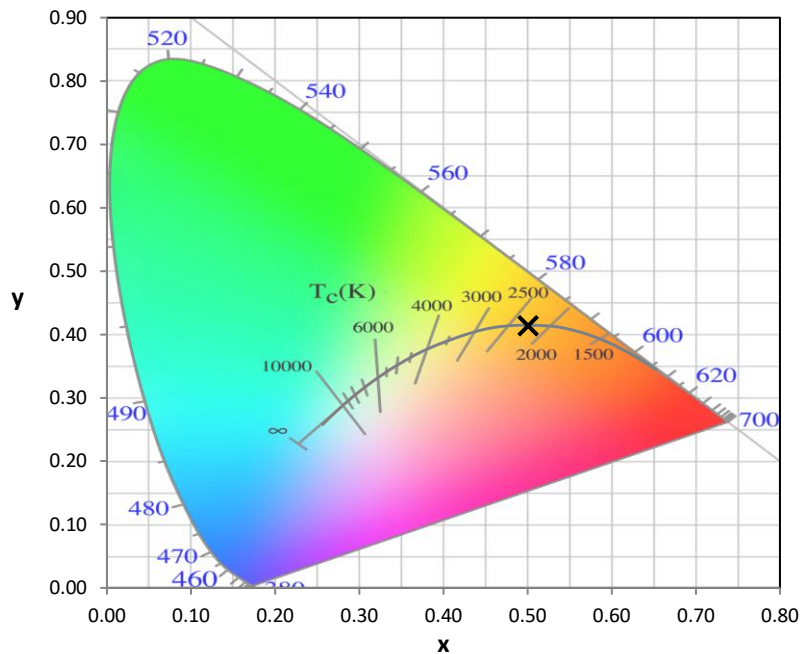
Stabilization Time: 71M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.7/41%  
 Sphere Temperature (°C): 25.6

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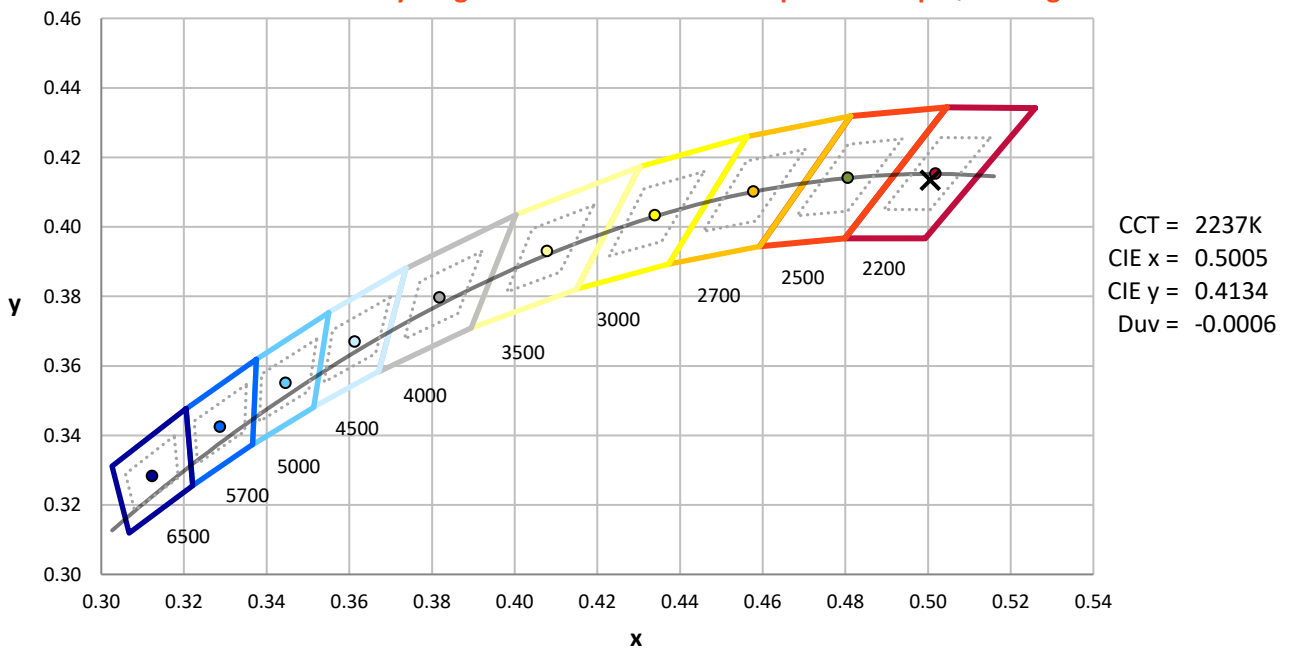
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/28/2019        | 12/28/2019           |
| Power Meter                    | IN0071                | 12/5/2018        | 12/5/2019            |
| AC Power Source                | IN0063                | 12/5/2018        | 12/5/2019            |
| DC Power Source                | IN0208                | 12/5/2018        | 12/5/2019            |
| Sphere Thermometer             | IN0085                | 12/5/2018        | 12/5/2019            |
| Room Thermometer               | IN0046                | 12/5/2018        | 12/5/2019            |

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CIE 1931 Chromaticity Diagram



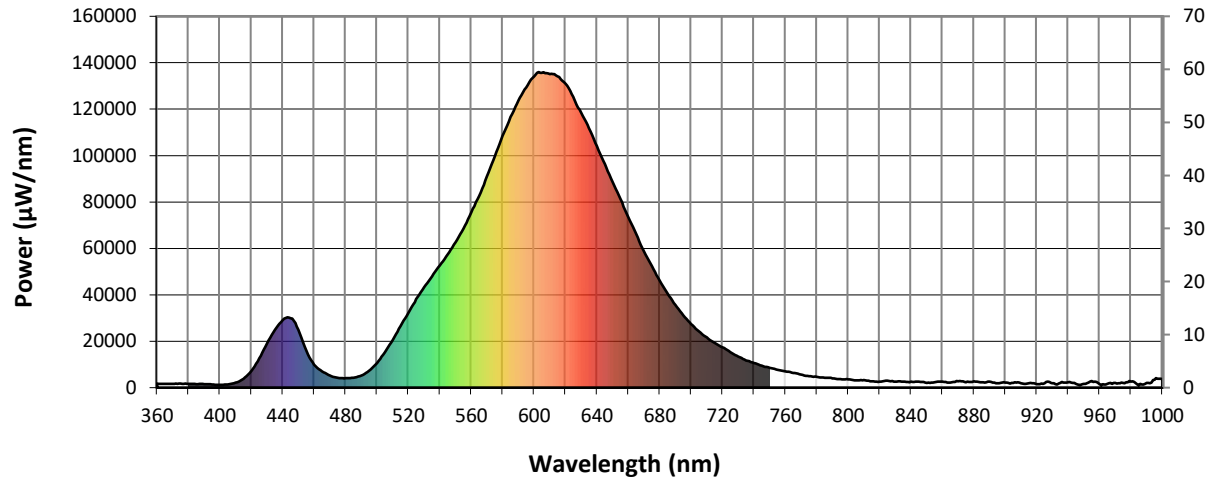
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 2200K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

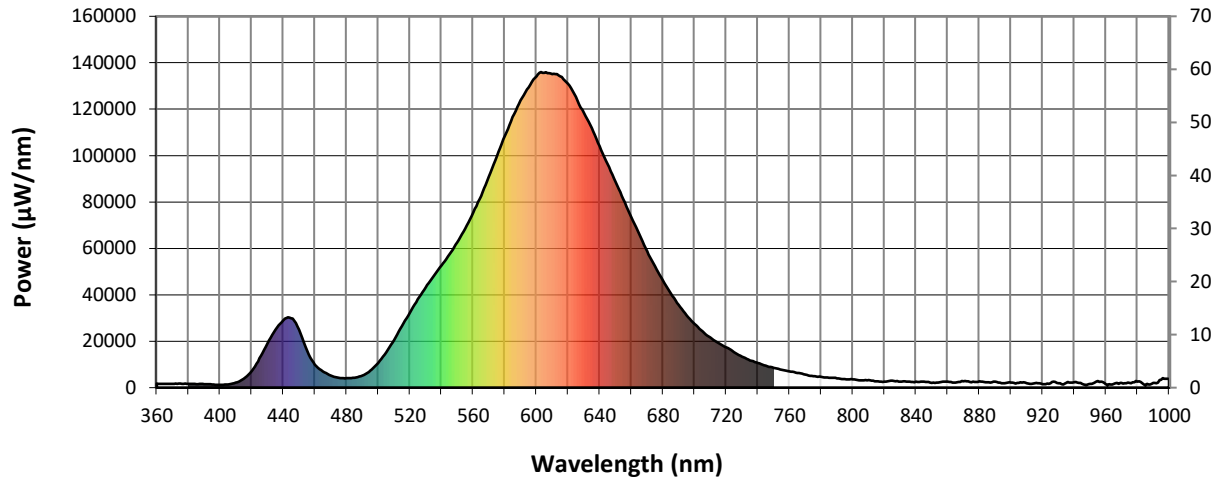


#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1768             | NR               | 490       | 5206             | NR               | 620       | 130919           | NR               | 750       | 8553             | NR               | 880       | 2713             | NR               |
| 365       | 1569             | NR               | 495       | 7286             | NR               | 625       | 125335           | NR               | 755       | 7696             | NR               | 885       | 2316             | NR               |
| 370       | 1594             | NR               | 500       | 10654            | NR               | 630       | 118388           | NR               | 760       | 6978             | NR               | 890       | 2539             | NR               |
| 375       | 1744             | NR               | 505       | 15189            | NR               | 635       | 111855           | NR               | 765       | 6377             | NR               | 895       | 1933             | NR               |
| 380       | 1659             | NR               | 510       | 20541            | NR               | 640       | 104062           | NR               | 770       | 5600             | NR               | 900       | 2216             | NR               |
| 385       | 1504             | NR               | 515       | 26492            | NR               | 645       | 96365            | NR               | 775       | 5000             | NR               | 905       | 2067             | NR               |
| 390       | 1541             | NR               | 520       | 32294            | NR               | 650       | 88651            | NR               | 780       | 4709             | NR               | 910       | 1959             | NR               |
| 395       | 1355             | NR               | 525       | 38123            | NR               | 655       | 81152            | NR               | 785       | 4305             | NR               | 915       | 1874             | NR               |
| 400       | 1243             | NR               | 530       | 43232            | NR               | 660       | 73523            | NR               | 790       | 4040             | NR               | 920       | 1484             | NR               |
| 405       | 1417             | NR               | 535       | 48012            | NR               | 665       | 66123            | NR               | 795       | 3642             | NR               | 925       | 1914             | NR               |
| 410       | 2147             | NR               | 540       | 52623            | NR               | 670       | 58677            | NR               | 800       | 3594             | NR               | 930       | 1948             | NR               |
| 415       | 3837             | NR               | 545       | 57516            | NR               | 675       | 52349            | NR               | 805       | 3190             | NR               | 935       | 2079             | NR               |
| 420       | 7159             | NR               | 550       | 62613            | NR               | 680       | 46159            | NR               | 810       | 3241             | NR               | 940       | 2263             | NR               |
| 425       | 12599            | NR               | 555       | 68554            | NR               | 685       | 40525            | NR               | 815       | 2732             | NR               | 945       | 1688             | NR               |
| 430       | 19019            | NR               | 560       | 75325            | NR               | 690       | 35615            | NR               | 820       | 2612             | NR               | 950       | 1560             | NR               |
| 435       | 24875            | NR               | 565       | 82533            | NR               | 695       | 31158            | NR               | 825       | 2966             | NR               | 955       | 2826             | NR               |
| 440       | 29103            | NR               | 570       | 90909            | NR               | 700       | 27409            | NR               | 830       | 2574             | NR               | 960       | 1477             | NR               |
| 445       | 29901            | NR               | 575       | 99621            | NR               | 705       | 24204            | NR               | 835       | 2633             | NR               | 965       | 1568             | NR               |
| 450       | 24862            | NR               | 580       | 108484           | NR               | 710       | 21558            | NR               | 840       | 2526             | NR               | 970       | 2030             | NR               |
| 455       | 15942            | NR               | 585       | 116679           | NR               | 715       | 19222            | NR               | 845       | 2631             | NR               | 975       | 1986             | NR               |
| 460       | 9916             | NR               | 590       | 123752           | NR               | 720       | 17310            | NR               | 850       | 2079             | NR               | 980       | 2540             | NR               |
| 465       | 7051             | NR               | 595       | 129324           | NR               | 725       | 15280            | NR               | 855       | 2309             | NR               | 985       | 1139             | NR               |
| 470       | 5227             | NR               | 600       | 134082           | NR               | 730       | 13282            | NR               | 860       | 2528             | NR               | 990       | 2018             | NR               |
| 475       | 4257             | NR               | 605       | 135698           | NR               | 735       | 11753            | NR               | 865       | 2121             | NR               | 995       | 3445             | NR               |
| 480       | 4052             | NR               | 610       | 135144           | NR               | 740       | 10654            | NR               | 870       | 2751             | NR               | 1000      | 3704             | NR               |
| 485       | 4298             | NR               | 615       | 134180           | NR               | 745       | 9451             | NR               | 875       | 2317             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



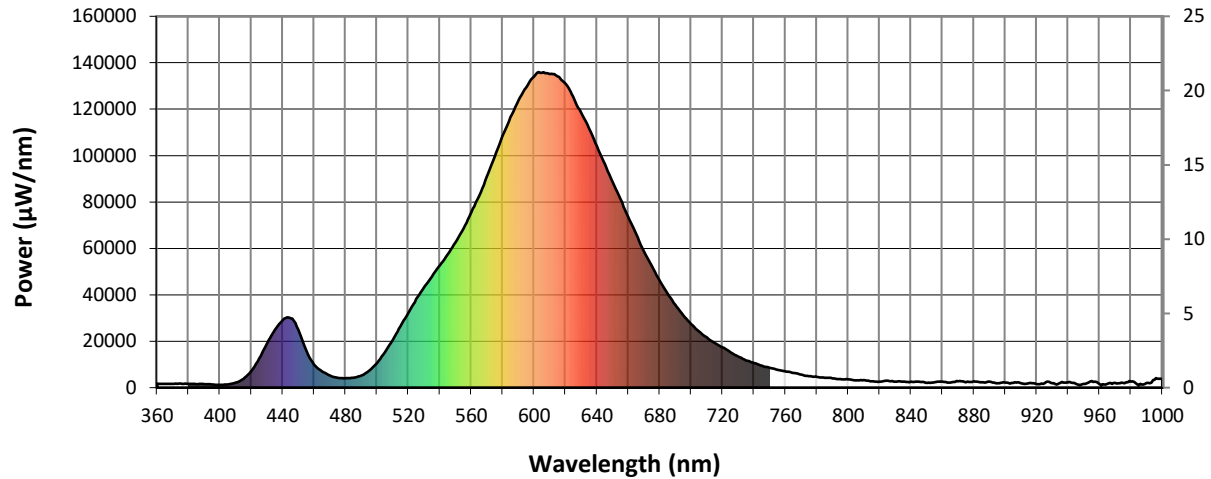
Scotopic Lumens: 4696.9

S/P: 0.85

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1768             | NR               | 490       | 5206             | NR               | 620       | 130919           | NR               | 750       | 8553             | NR               | 880       | 2713             | NR               |
| 365       | 1569             | NR               | 495       | 7286             | NR               | 625       | 125335           | NR               | 755       | 7696             | NR               | 885       | 2316             | NR               |
| 370       | 1594             | NR               | 500       | 10654            | NR               | 630       | 118388           | NR               | 760       | 6978             | NR               | 890       | 2539             | NR               |
| 375       | 1744             | NR               | 505       | 15189            | NR               | 635       | 111855           | NR               | 765       | 6377             | NR               | 895       | 1933             | NR               |
| 380       | 1659             | NR               | 510       | 20541            | NR               | 640       | 104062           | NR               | 770       | 5600             | NR               | 900       | 2216             | NR               |
| 385       | 1504             | NR               | 515       | 26492            | NR               | 645       | 96365            | NR               | 775       | 5000             | NR               | 905       | 2067             | NR               |
| 390       | 1541             | NR               | 520       | 32294            | NR               | 650       | 88651            | NR               | 780       | 4709             | NR               | 910       | 1959             | NR               |
| 395       | 1355             | NR               | 525       | 38123            | NR               | 655       | 81152            | NR               | 785       | 4305             | NR               | 915       | 1874             | NR               |
| 400       | 1243             | NR               | 530       | 43232            | NR               | 660       | 73523            | NR               | 790       | 4040             | NR               | 920       | 1484             | NR               |
| 405       | 1417             | NR               | 535       | 48012            | NR               | 665       | 66123            | NR               | 795       | 3642             | NR               | 925       | 1914             | NR               |
| 410       | 2147             | NR               | 540       | 52623            | NR               | 670       | 58677            | NR               | 800       | 3594             | NR               | 930       | 1948             | NR               |
| 415       | 3837             | NR               | 545       | 57516            | NR               | 675       | 52349            | NR               | 805       | 3190             | NR               | 935       | 2079             | NR               |
| 420       | 7159             | NR               | 550       | 62613            | NR               | 680       | 46159            | NR               | 810       | 3241             | NR               | 940       | 2263             | NR               |
| 425       | 12599            | NR               | 555       | 68554            | NR               | 685       | 40525            | NR               | 815       | 2732             | NR               | 945       | 1688             | NR               |
| 430       | 19019            | NR               | 560       | 75325            | NR               | 690       | 35615            | NR               | 820       | 2612             | NR               | 950       | 1560             | NR               |
| 435       | 24875            | NR               | 565       | 82533            | NR               | 695       | 31158            | NR               | 825       | 2966             | NR               | 955       | 2826             | NR               |
| 440       | 29103            | NR               | 570       | 90909            | NR               | 700       | 27409            | NR               | 830       | 2574             | NR               | 960       | 1477             | NR               |
| 445       | 29901            | NR               | 575       | 99621            | NR               | 705       | 24204            | NR               | 835       | 2633             | NR               | 965       | 1568             | NR               |
| 450       | 24862            | NR               | 580       | 108484           | NR               | 710       | 21558            | NR               | 840       | 2526             | NR               | 970       | 2030             | NR               |
| 455       | 15942            | NR               | 585       | 116679           | NR               | 715       | 19222            | NR               | 845       | 2631             | NR               | 975       | 1986             | NR               |
| 460       | 9916             | NR               | 590       | 123752           | NR               | 720       | 17310            | NR               | 850       | 2079             | NR               | 980       | 2540             | NR               |
| 465       | 7051             | NR               | 595       | 129324           | NR               | 725       | 15280            | NR               | 855       | 2309             | NR               | 985       | 1139             | NR               |
| 470       | 5227             | NR               | 600       | 134082           | NR               | 730       | 13282            | NR               | 860       | 2528             | NR               | 990       | 2018             | NR               |
| 475       | 4257             | NR               | 605       | 135698           | NR               | 735       | 11753            | NR               | 865       | 2121             | NR               | 995       | 3445             | NR               |
| 480       | 4052             | NR               | 610       | 135144           | NR               | 740       | 10654            | NR               | 870       | 2751             | NR               | 1000      | 3704             | NR               |
| 485       | 4298             | NR               | 615       | 134180           | NR               | 745       | 9451             | NR               | 875       | 2317             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 1470.8 M/P: 0.27**

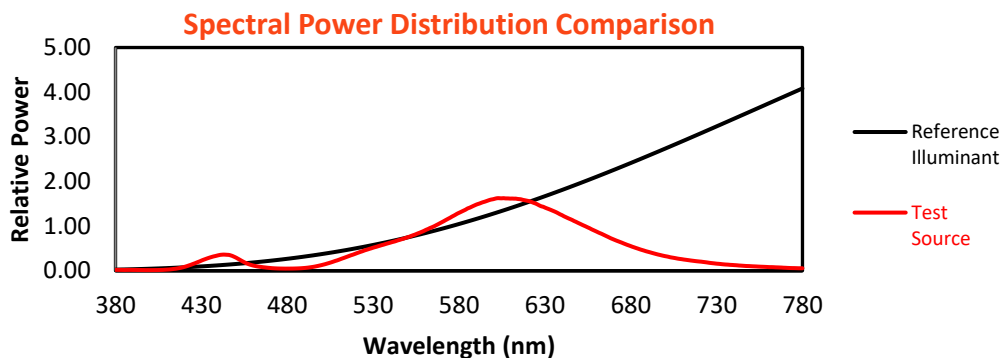
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1768             | NR               | 490       | 5206             | NR               | 620       | 130919           | NR               | 750       | 8553             | NR               | 880       | 2713             | NR               |
| 365       | 1569             | NR               | 495       | 7286             | NR               | 625       | 125335           | NR               | 755       | 7696             | NR               | 885       | 2316             | NR               |
| 370       | 1594             | NR               | 500       | 10654            | NR               | 630       | 118388           | NR               | 760       | 6978             | NR               | 890       | 2539             | NR               |
| 375       | 1744             | NR               | 505       | 15189            | NR               | 635       | 111855           | NR               | 765       | 6377             | NR               | 895       | 1933             | NR               |
| 380       | 1659             | NR               | 510       | 20541            | NR               | 640       | 104062           | NR               | 770       | 5600             | NR               | 900       | 2216             | NR               |
| 385       | 1504             | NR               | 515       | 26492            | NR               | 645       | 96365            | NR               | 775       | 5000             | NR               | 905       | 2067             | NR               |
| 390       | 1541             | NR               | 520       | 32294            | NR               | 650       | 88651            | NR               | 780       | 4709             | NR               | 910       | 1959             | NR               |
| 395       | 1355             | NR               | 525       | 38123            | NR               | 655       | 81152            | NR               | 785       | 4305             | NR               | 915       | 1874             | NR               |
| 400       | 1243             | NR               | 530       | 43232            | NR               | 660       | 73523            | NR               | 790       | 4040             | NR               | 920       | 1484             | NR               |
| 405       | 1417             | NR               | 535       | 48012            | NR               | 665       | 66123            | NR               | 795       | 3642             | NR               | 925       | 1914             | NR               |
| 410       | 2147             | NR               | 540       | 52623            | NR               | 670       | 58677            | NR               | 800       | 3594             | NR               | 930       | 1948             | NR               |
| 415       | 3837             | NR               | 545       | 57516            | NR               | 675       | 52349            | NR               | 805       | 3190             | NR               | 935       | 2079             | NR               |
| 420       | 7159             | NR               | 550       | 62613            | NR               | 680       | 46159            | NR               | 810       | 3241             | NR               | 940       | 2263             | NR               |
| 425       | 12599            | NR               | 555       | 68554            | NR               | 685       | 40525            | NR               | 815       | 2732             | NR               | 945       | 1688             | NR               |
| 430       | 19019            | NR               | 560       | 75325            | NR               | 690       | 35615            | NR               | 820       | 2612             | NR               | 950       | 1560             | NR               |
| 435       | 24875            | NR               | 565       | 82533            | NR               | 695       | 31158            | NR               | 825       | 2966             | NR               | 955       | 2826             | NR               |
| 440       | 29103            | NR               | 570       | 90909            | NR               | 700       | 27409            | NR               | 830       | 2574             | NR               | 960       | 1477             | NR               |
| 445       | 29901            | NR               | 575       | 99621            | NR               | 705       | 24204            | NR               | 835       | 2633             | NR               | 965       | 1568             | NR               |
| 450       | 24862            | NR               | 580       | 108484           | NR               | 710       | 21558            | NR               | 840       | 2526             | NR               | 970       | 2030             | NR               |
| 455       | 15942            | NR               | 585       | 116679           | NR               | 715       | 19222            | NR               | 845       | 2631             | NR               | 975       | 1986             | NR               |
| 460       | 9916             | NR               | 590       | 123752           | NR               | 720       | 17310            | NR               | 850       | 2079             | NR               | 980       | 2540             | NR               |
| 465       | 7051             | NR               | 595       | 129324           | NR               | 725       | 15280            | NR               | 855       | 2309             | NR               | 985       | 1139             | NR               |
| 470       | 5227             | NR               | 600       | 134082           | NR               | 730       | 13282            | NR               | 860       | 2528             | NR               | 990       | 2018             | NR               |
| 475       | 4257             | NR               | 605       | 135698           | NR               | 735       | 11753            | NR               | 865       | 2121             | NR               | 995       | 3445             | NR               |
| 480       | 4052             | NR               | 610       | 135144           | NR               | 740       | 10654            | NR               | 870       | 2751             | NR               | 1000      | 3704             | NR               |
| 485       | 4298             | NR               | 615       | 134180           | NR               | 745       | 9451             | NR               | 875       | 2317             | NR               |           |                  |                  |

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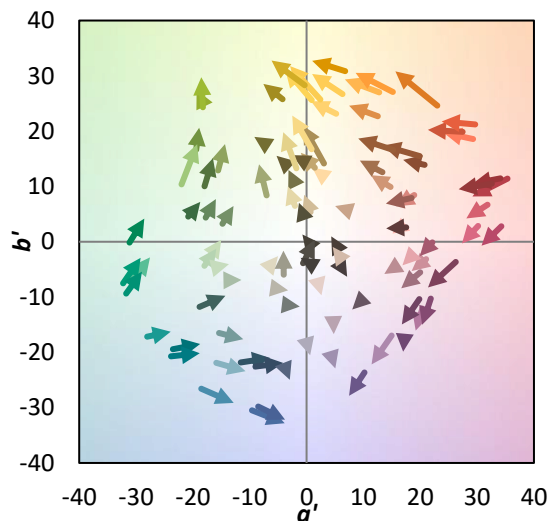
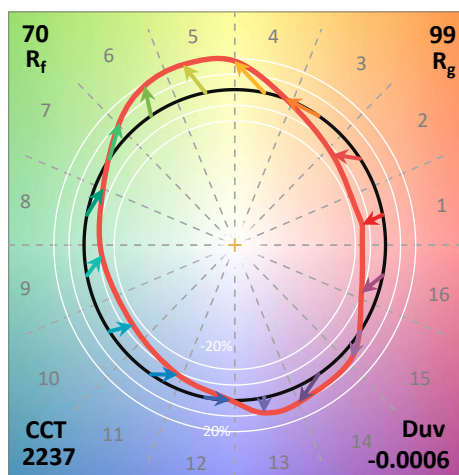
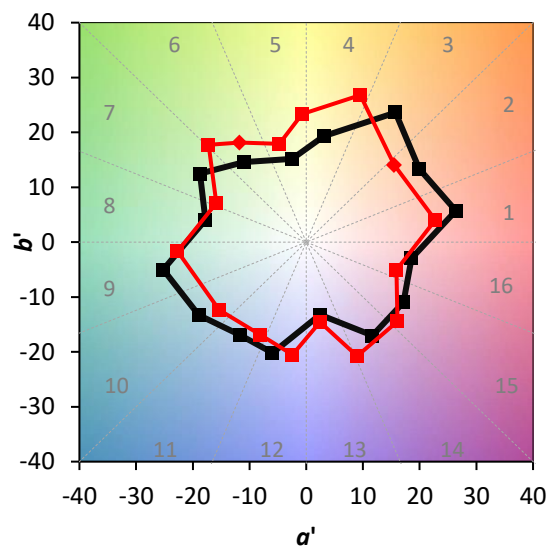
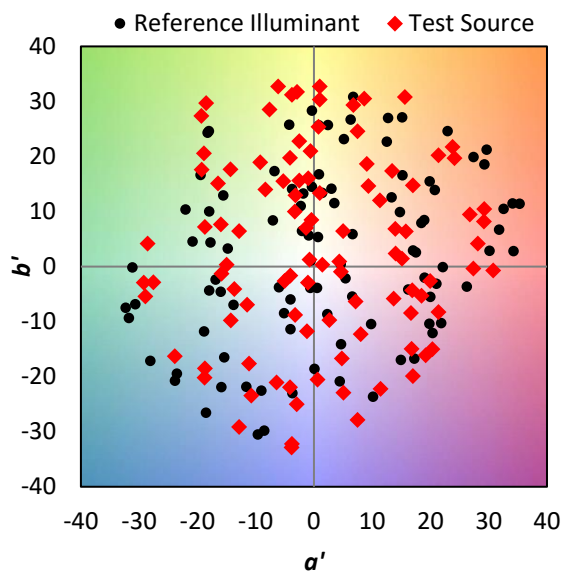
**TM-30-18**

### Summary

$R_f = 69.8$   
 $R_g = 99.2$   
 CIE  $R_a = 72.0$   
 $R_g = -17.4$



### Color Vector Graphics



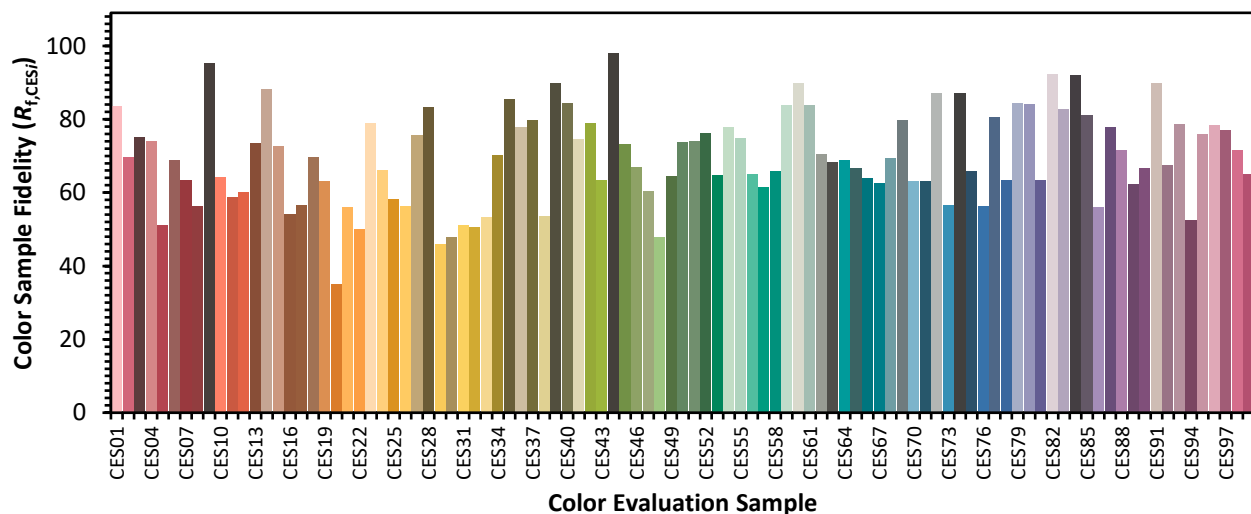


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

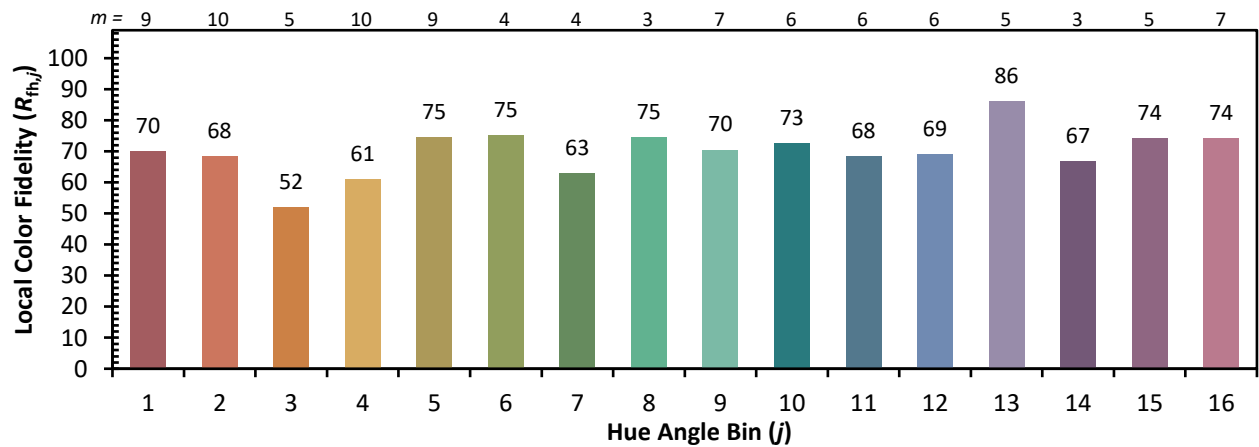
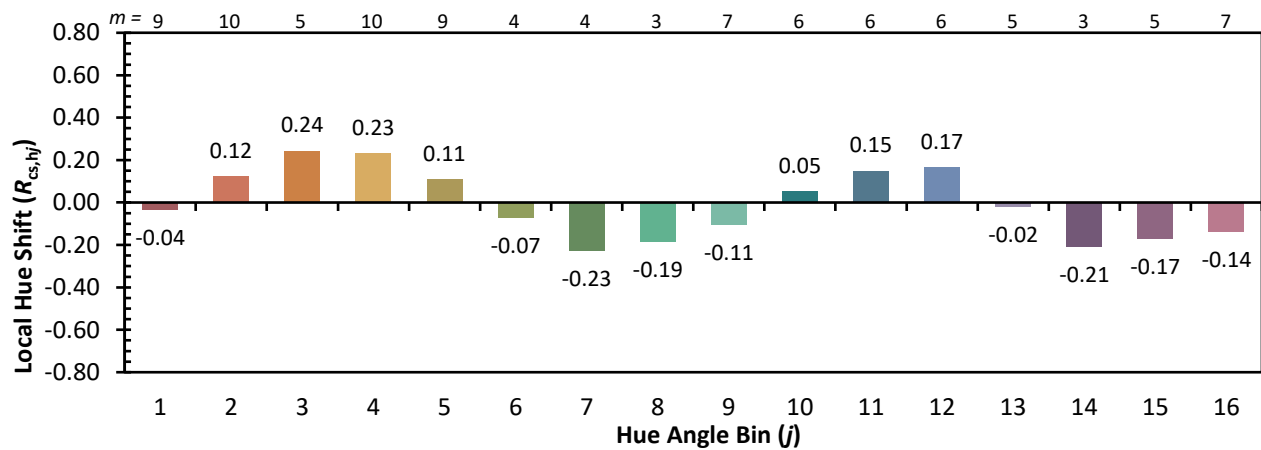
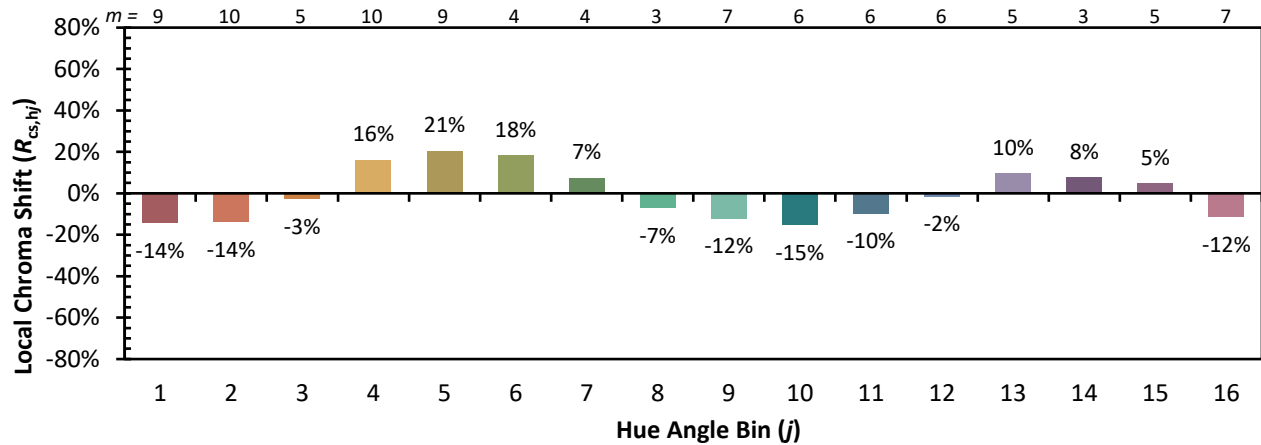
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 56 | CES51 = 74 | CES76 = 56 |
| CES02 = 65 | CES27 = 76 | CES52 = 76 | CES77 = 81 |
| CES03 = 32 | CES28 = 83 | CES53 = 65 | CES78 = 63 |
| CES04 = 72 | CES29 = 46 | CES54 = 78 | CES79 = 84 |
| CES05 = 52 | CES30 = 48 | CES55 = 75 | CES80 = 84 |
| CES06 = 52 | CES31 = 51 | CES56 = 65 | CES81 = 63 |
| CES07 = 44 | CES32 = 51 | CES57 = 62 | CES82 = 92 |
| CES08 = 42 | CES33 = 53 | CES58 = 66 | CES83 = 83 |
| CES09 = 29 | CES34 = 70 | CES59 = 84 | CES84 = 92 |
| CES10 = 78 | CES35 = 85 | CES60 = 90 | CES85 = 81 |
| CES11 = 61 | CES36 = 78 | CES61 = 84 | CES86 = 56 |
| CES12 = 68 | CES37 = 80 | CES62 = 70 | CES87 = 78 |
| CES13 = 45 | CES38 = 53 | CES63 = 68 | CES88 = 72 |
| CES14 = 75 | CES39 = 90 | CES64 = 69 | CES89 = 62 |
| CES15 = 72 | CES40 = 84 | CES65 = 67 | CES90 = 67 |
| CES16 = 49 | CES41 = 75 | CES66 = 64 | CES91 = 90 |
| CES17 = 51 | CES42 = 79 | CES67 = 63 | CES92 = 67 |
| CES18 = 57 | CES43 = 64 | CES68 = 69 | CES93 = 79 |
| CES19 = 74 | CES44 = 98 | CES69 = 80 | CES94 = 52 |
| CES20 = 68 | CES45 = 73 | CES70 = 63 | CES95 = 76 |
| CES21 = 89 | CES46 = 67 | CES71 = 63 | CES96 = 78 |
| CES22 = 81 | CES47 = 60 | CES72 = 87 | CES97 = 77 |
| CES23 = 92 | CES48 = 48 | CES73 = 56 | CES98 = 71 |
| CES24 = 92 | CES49 = 64 | CES74 = 87 | CES99 = 65 |
| CES25 = 74 | CES50 = 74 | CES75 = 66 |            |



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**TM-30-18**

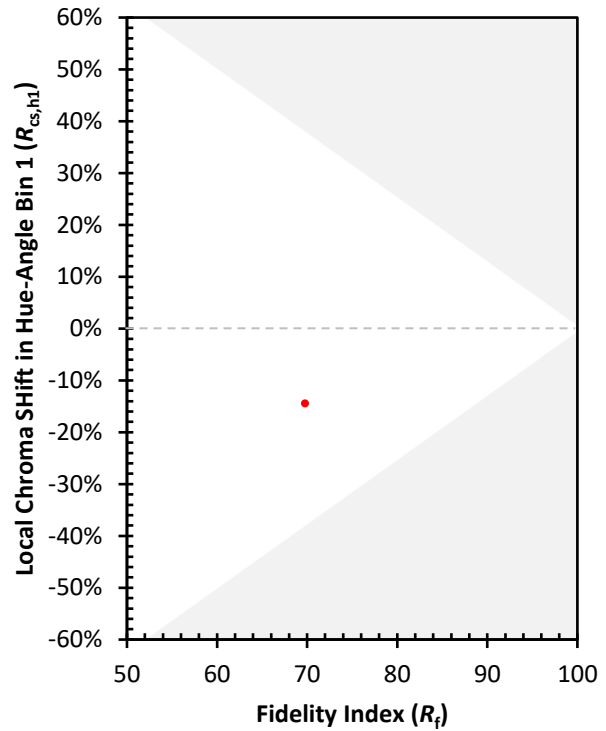
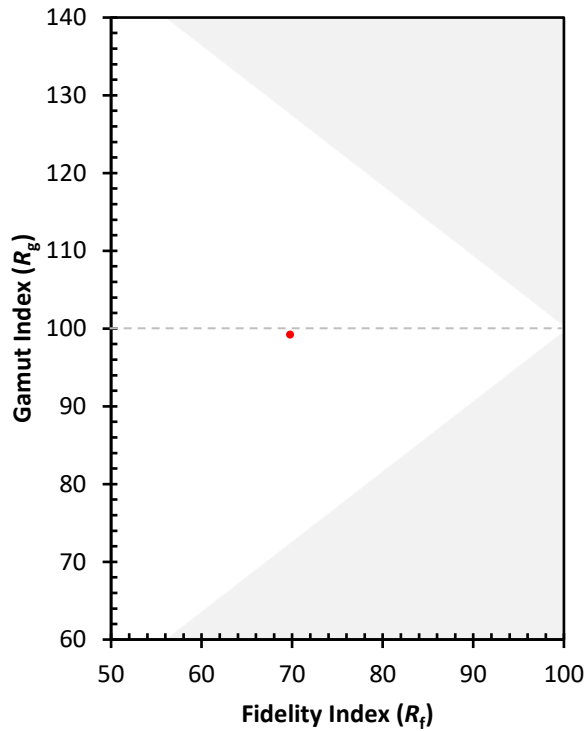
Color Rendition by Hue-Angle Bin



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**TM-30-18**

**Measure Comparisons**



(END OF REPORT)