

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: P321163

Luminaire Tested: **GLEON-SA9B-722-U-AFL**

Issue Date: 3/3/2020

### Test Information

Test Method: LM-79-08  
Report Number: P321163  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-29)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: GLEON-SA9B-722-U-AFL  
Description: GALLEON AREA AND ROADWAY LUMINAIRE  
(9) 70 CRI, 2200K, 800mA LIGHTSQUARES WITH 16 LEDS EACH AND AUTOMOTIVE  
FRONTLINE OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

### Summary

Lumens per Lamp: N/A  
Luminaire Lumens: 38529 lumens  
Efficiency: N/A  
Efficacy: 103.0 lumens/watt  
Luminous Opening: Rectangular (W 2.5' x L: 1' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B3 - U0 - G3

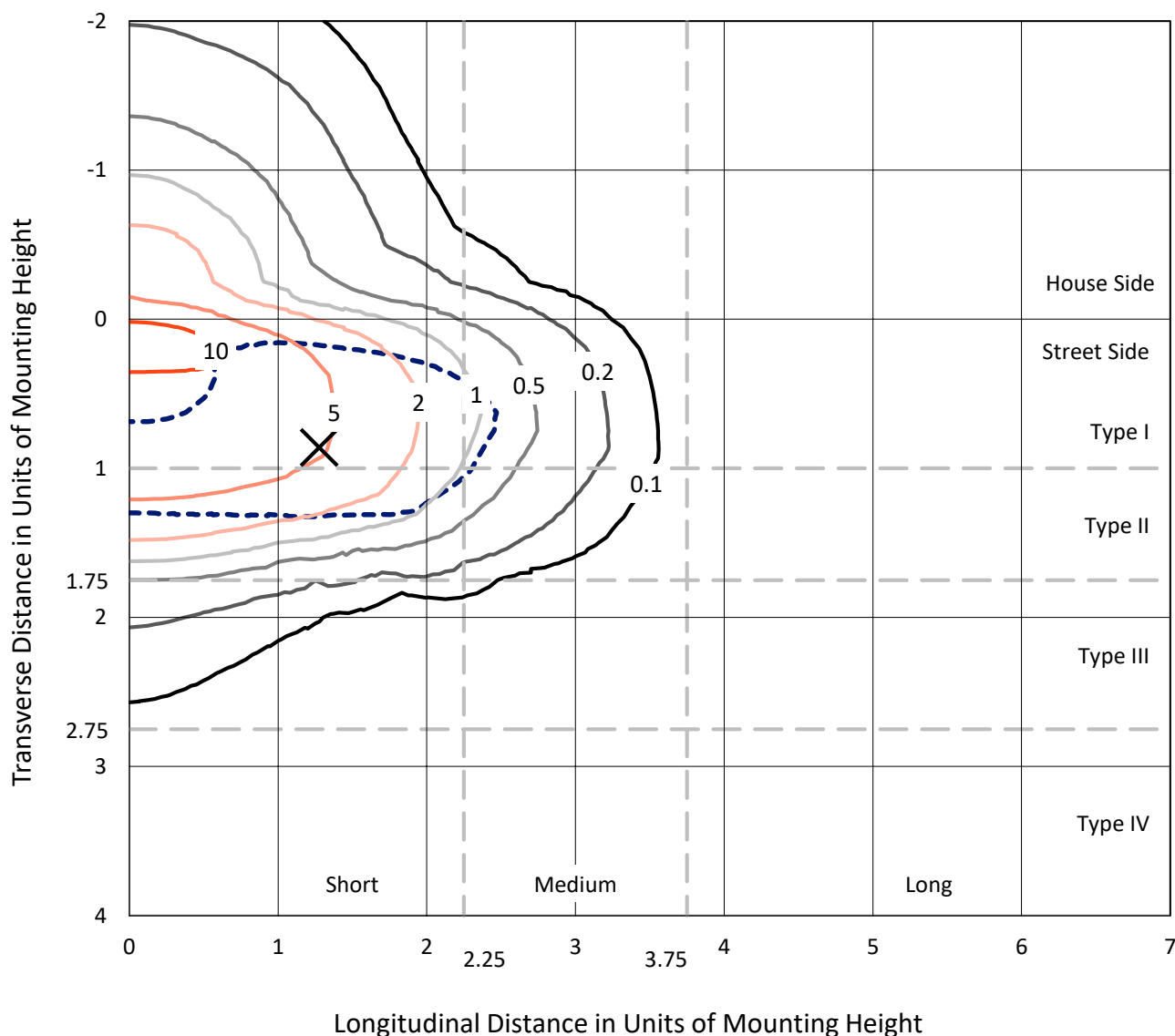
Input Watts (W): 374  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



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 CATALOG NUMBER: GLEON-SA9B-722-U-AFL

## Iso-Footcandle Lines of Horizontal Illumination

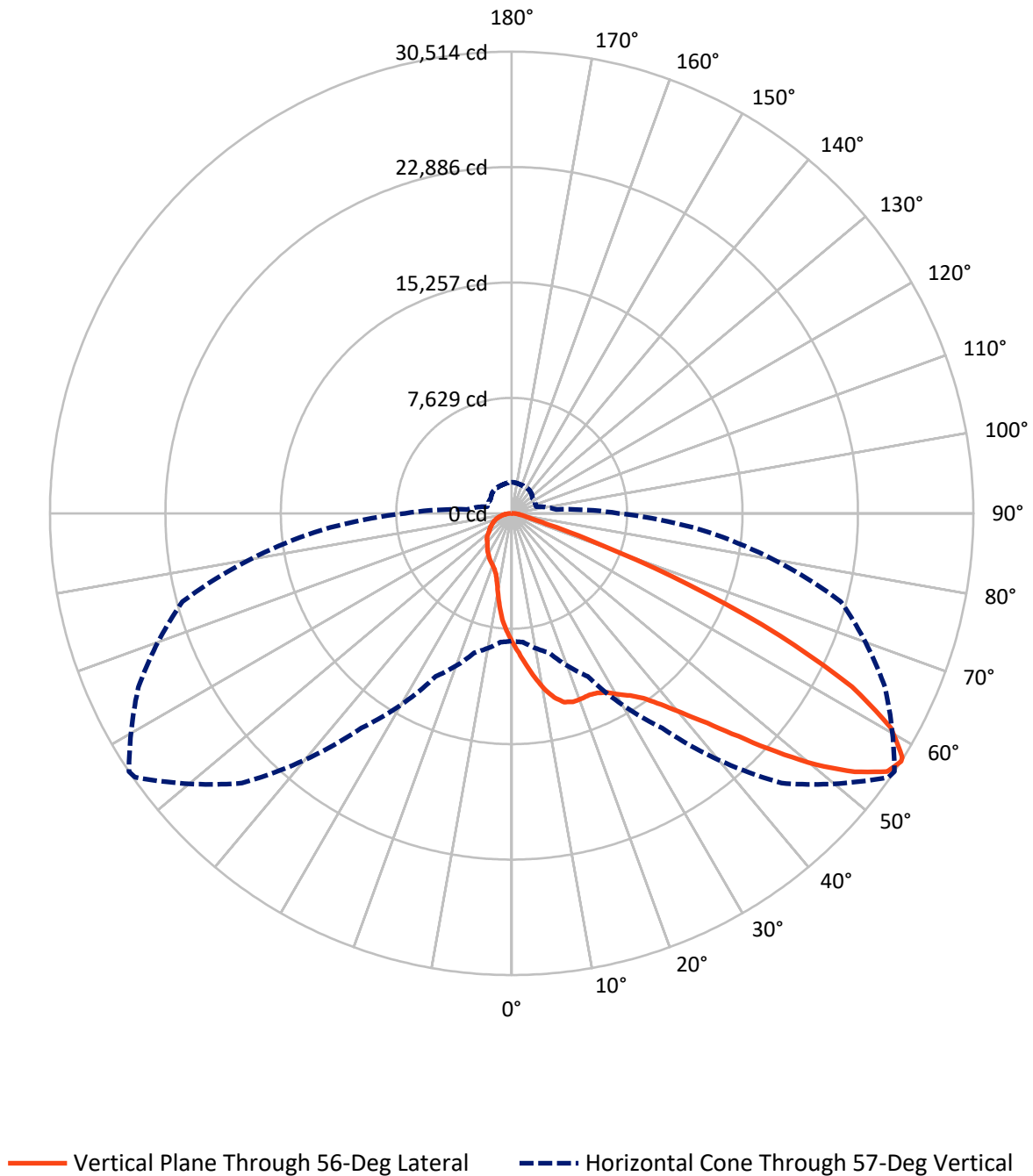
✕ Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 13.2 fc  
 Type II - Short - N/A

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## Luminous Intensity Polar Plot



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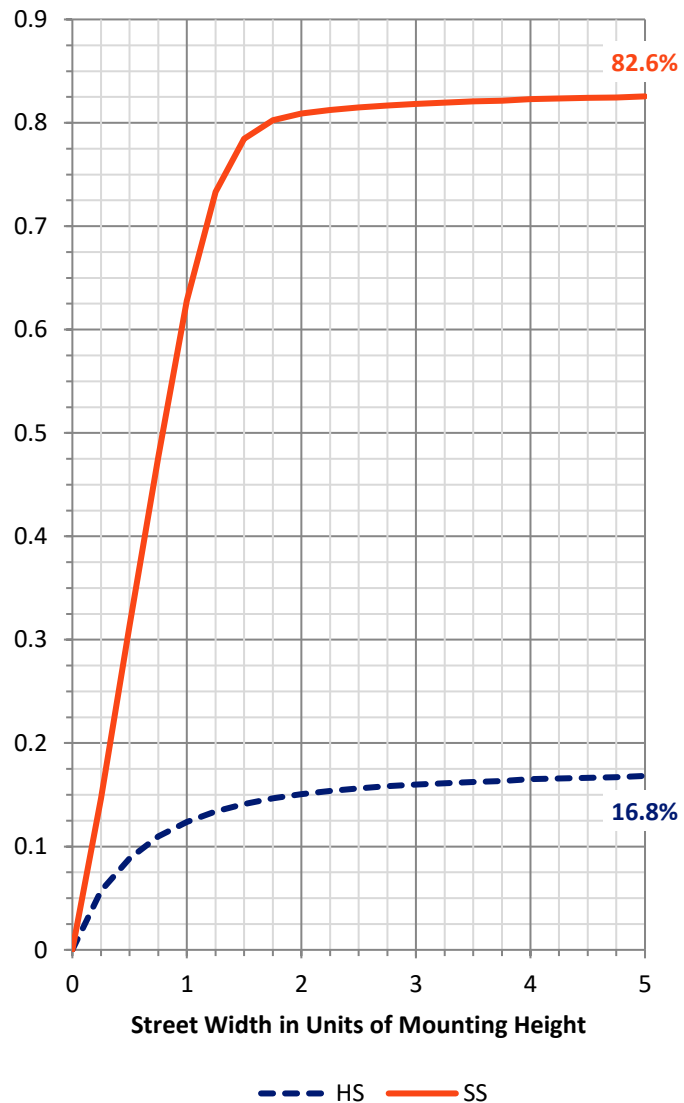
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 6641.6   | 0.0    | 6641.6  |
|                    | % Fixture | 17.2     | 0.0    | 17.2    |
| <b>Street Side</b> | Lumens    | 31887.4  | 0.0    | 31887.4 |
|                    | % Fixture | 82.8     | 0.0    | 82.8    |
| <b>Total</b>       | Lumens    | 38529.0  | 0.0    | 38529.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 816.3   | 2.1       |
| 10°-20°   | 2308.0  | 6.0       |
| 20°-30°   | 3759.2  | 9.8       |
| 30°-40°   | 5619.6  | 14.6      |
| 40°-50°   | 8523.8  | 22.1      |
| 50°-60°   | 9553.7  | 24.8      |
| 60°-70°   | 5642.8  | 14.6      |
| 70°-80°   | 1848.8  | 4.8       |
| 80°-90°   | 456.8   | 1.2       |
| 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°    | 38529.0 | 100.0     |
| 0°-180°   | 38529.0 | 100.0     |

**Coefficient of Utilization**



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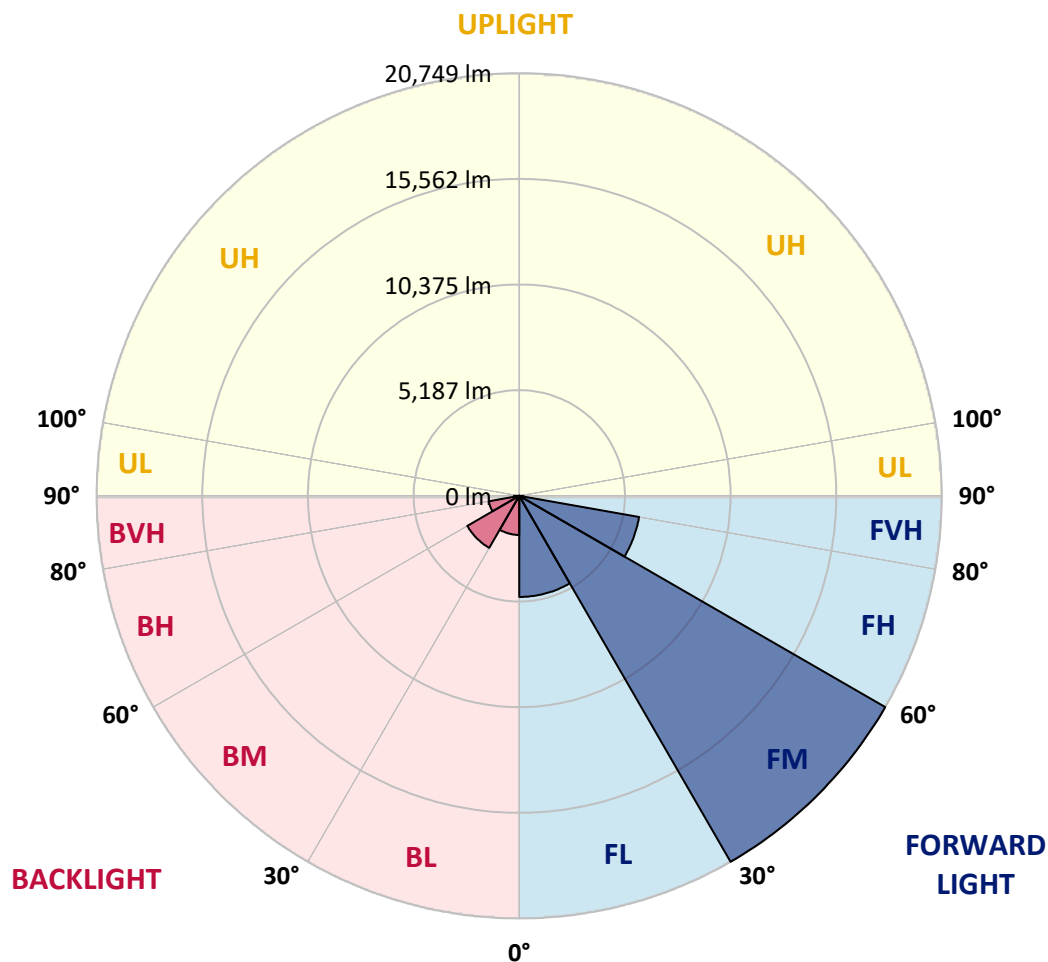
CATALOG NUMBER: GLEON-SA9B-722-U-AFL

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 4963.1  | 12.9      |                         |      |         |
| FM   | (30°-60°)   | 20749.1 | 53.9      |                         |      |         |
| FH   | (60°-80°)   | 5974.0  | 15.5      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 201.1   | 0.5       |                         |      | G2/225  |
| BL   | (0°-30°)    | 1920.4  | 5.0       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 2948.0  | 7.7       | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1517.5  | 3.9       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 255.6   | 0.7       |                         |      | G3/500  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B3-U0-G3**

Type II Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 56°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  | 8545.8  |
| 2.5°  | 9812.9  | 9903.0  | 9863.3  | 9725.5  | 9619.6  | 9470.0  | 9303.2  | 9252.8  | 9076.7  | 8879.4  | 8642.4  |
| 5°    | 11366.1 | 11321.1 | 11256.2 | 11041.7 | 10815.3 | 10551.8 | 10133.4 | 10067.2 | 9675.2  | 9229.0  | 8757.6  |
| 7.5°  | 12250.6 | 12246.6 | 12208.2 | 12082.4 | 11875.9 | 11531.6 | 11027.1 | 10949.0 | 10357.1 | 9639.5  | 8908.6  |
| 10°   | 12122.2 | 12112.9 | 12176.5 | 12307.5 | 12369.8 | 12298.3 | 11873.2 | 11795.1 | 11068.2 | 10093.6 | 9083.4  |
| 12.5° | 11392.6 | 11397.9 | 11499.8 | 11775.3 | 12150.0 | 12600.2 | 12531.3 | 12492.9 | 11805.7 | 10607.4 | 9295.2  |
| 15°   | 10824.6 | 10836.5 | 10917.2 | 11156.9 | 11599.2 | 12416.1 | 12931.2 | 12944.4 | 12519.4 | 11174.1 | 9542.8  |
| 17.5° | 10575.6 | 10600.8 | 10637.9 | 10806.0 | 11211.2 | 12049.3 | 13026.5 | 13098.0 | 13144.4 | 11762.0 | 9781.2  |
| 20°   | 10655.1 | 10678.9 | 10689.5 | 10796.7 | 11129.1 | 11826.9 | 12960.3 | 13088.8 | 13623.7 | 12315.5 | 10019.5 |
| 22.5° | 11011.2 | 11025.8 | 11032.4 | 11060.2 | 11318.4 | 11890.5 | 12916.6 | 13051.7 | 13970.6 | 12812.0 | 10199.6 |
| 25°   | 11601.8 | 11591.2 | 11548.8 | 11513.1 | 11686.5 | 12142.0 | 13017.3 | 13145.7 | 14252.7 | 13262.2 | 10317.4 |
| 27.5° | 12308.9 | 12295.6 | 12213.5 | 12115.6 | 12214.9 | 12534.0 | 13307.2 | 13409.2 | 14505.6 | 13683.3 | 10377.0 |
| 30°   | 13157.6 | 13123.2 | 12968.3 | 12851.8 | 12890.2 | 13121.9 | 13785.2 | 13877.9 | 14896.2 | 14161.3 | 10435.3 |
| 32.5° | 14138.8 | 14101.7 | 13877.9 | 13684.6 | 13684.6 | 13877.9 | 14277.8 | 14354.6 | 15227.2 | 14701.5 | 10529.3 |
| 35°   | 15367.6 | 15321.2 | 15029.9 | 14705.5 | 14614.1 | 14712.1 | 14949.1 | 15003.4 | 15823.0 | 15382.1 | 10700.1 |
| 37.5° | 16816.1 | 16753.9 | 16376.5 | 15942.2 | 15742.3 | 15737.0 | 15907.8 | 16019.0 | 16775.1 | 16275.9 | 10990.1 |
| 40°   | 18268.7 | 18225.0 | 17895.3 | 17553.6 | 17161.7 | 17035.9 | 17299.4 | 17333.8 | 18019.7 | 17385.5 | 11360.8 |
| 42.5° | 19391.5 | 19383.6 | 19322.6 | 19367.7 | 18966.5 | 18712.2 | 18918.8 | 18946.6 | 19539.8 | 18586.4 | 11755.4 |
| 45°   | 19984.7 | 19997.9 | 20293.2 | 20947.3 | 21095.6 | 20910.3 | 21012.2 | 21020.2 | 21277.0 | 19798.0 | 12116.9 |
| 47.5° | 19509.3 | 19578.2 | 20325.0 | 21788.1 | 23002.3 | 23618.0 | 23448.6 | 23546.5 | 22961.3 | 20838.7 | 12400.2 |
| 50°   | 17656.9 | 17741.7 | 19012.8 | 21413.4 | 23892.1 | 26238.4 | 26149.7 | 26127.2 | 24319.8 | 21601.4 | 12553.8 |
| 52.5° | 15362.3 | 15428.5 | 16477.2 | 19465.7 | 23239.3 | 27687.0 | 28501.3 | 28384.8 | 25527.4 | 22172.1 | 12583.0 |
| 55°   | 11867.9 | 11971.2 | 12976.2 | 15578.1 | 20599.1 | 27133.5 | 30230.6 | 30126.0 | 26627.7 | 22471.4 | 12548.5 |
| 57°   | 8437.2  | 8545.8  | 9544.1  | 11889.1 | 17328.5 | 25217.6 | 30402.8 | 30514.0 | 27222.3 | 22521.7 | 12586.9 |
| 57.5° | 7528.9  | 7640.1  | 8629.2  | 10906.6 | 16309.0 | 24525.1 | 30254.5 | 30439.8 | 27329.5 | 22513.7 | 12608.1 |
| 60°   | 3790.9  | 3833.3  | 4463.6  | 6088.2  | 10309.5 | 19827.1 | 28319.9 | 28797.9 | 27426.2 | 22124.5 | 12699.5 |
| 62.5° | 2356.9  | 2326.5  | 2306.6  | 2804.5  | 5015.7  | 13148.4 | 24327.8 | 25248.0 | 25576.4 | 21181.7 | 12478.4 |
| 65°   | 2072.2  | 2015.3  | 1796.8  | 1757.1  | 2215.2  | 6386.2  | 18320.3 | 19465.7 | 21623.9 | 19696.0 | 11951.4 |
| 67.5° | 1946.4  | 1890.8  | 1644.5  | 1496.2  | 1497.6  | 2531.7  | 11374.1 | 12663.7 | 16845.3 | 17184.2 | 10708.0 |
| 70°   | 1816.7  | 1766.4  | 1536.0  | 1361.2  | 1275.1  | 1402.2  | 5232.9  | 6211.4  | 10980.8 | 13507.2 | 8949.6  |
| 72.5° | 1649.8  | 1615.4  | 1396.9  | 1216.9  | 1125.5  | 1050.0  | 2003.4  | 2366.2  | 6357.0  | 9071.4  | 6215.3  |
| 75°   | 1475.1  | 1443.3  | 1256.6  | 1084.4  | 973.2   | 826.2   | 1128.1  | 1215.5  | 3229.5  | 4641.0  | 3060.0  |
| 77.5° | 1283.1  | 1264.5  | 1117.5  | 958.7   | 869.9   | 684.6   | 798.4   | 840.8   | 1385.0  | 1990.1  | 1534.6  |
| 80°   | 1020.9  | 1056.6  | 977.2   | 854.0   | 772.0   | 548.2   | 565.4   | 593.2   | 806.4   | 971.9   | 871.3   |
| 82.5° | 664.7   | 726.9   | 765.3   | 693.8   | 635.6   | 431.7   | 406.5   | 418.4   | 525.7   | 593.2   | 378.7   |
| 85°   | 276.7   | 311.2   | 503.2   | 454.2   | 422.4   | 315.1   | 272.8   | 278.1   | 325.7   | 337.6   | 154.9   |
| 87.5° | 123.1   | 131.1   | 221.1   | 207.9   | 178.8   | 108.6   | 116.5   | 127.1   | 173.5   | 164.2   | 59.6    |
| 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: P321163

CATALOG NUMBER: GLEON-SA9B-722-U-AFL

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 | 8545.8 |
| 2.5°  | 8553.7 | 8442.5 | 8251.8 | 8041.3 | 7869.2 | 7731.4 | 7592.4 | 7497.1 | 7385.9 | 7326.3 | 7295.8 |
| 5°    | 8560.3 | 8341.9 | 7940.7 | 7528.9 | 7160.8 | 6824.4 | 6504.0 | 6257.7 | 6027.3 | 5902.9 | 5868.4 |
| 7.5°  | 8588.1 | 8259.8 | 7610.9 | 6933.0 | 6278.9 | 5681.7 | 5220.9 | 4932.3 | 4724.4 | 4631.7 | 4605.2 |
| 10°   | 8610.6 | 8163.1 | 7203.1 | 6199.5 | 5309.7 | 4704.5 | 4347.0 | 4185.5 | 4114.0 | 4102.1 | 4090.2 |
| 12.5° | 8663.6 | 8063.8 | 6774.1 | 5434.1 | 4556.2 | 4137.8 | 4013.4 | 4002.8 | 4022.6 | 4051.8 | 4051.8 |
| 15°   | 8747.0 | 7965.8 | 6284.2 | 4777.4 | 4076.9 | 3929.9 | 3955.1 | 4013.4 | 4067.6 | 4112.7 | 4119.3 |
| 17.5° | 8807.9 | 7845.3 | 5757.2 | 4251.7 | 3821.4 | 3861.1 | 3951.1 | 4033.2 | 4088.8 | 4132.5 | 4136.5 |
| 20°   | 8851.6 | 7658.6 | 5194.5 | 3850.5 | 3674.4 | 3797.5 | 3910.1 | 3982.9 | 4021.3 | 4065.0 | 4071.6 |
| 22.5° | 8829.1 | 7408.4 | 4695.3 | 3563.2 | 3555.2 | 3704.8 | 3812.1 | 3899.5 | 3870.4 | 3828.0 | 3855.8 |
| 25°   | 8720.5 | 7064.1 | 4181.5 | 3348.7 | 3429.4 | 3580.4 | 3712.8 | 3654.5 | 3556.5 | 3538.0 | 3548.6 |
| 27.5° | 8527.2 | 6624.5 | 3706.2 | 3150.0 | 3283.8 | 3465.2 | 3457.2 | 3399.0 | 3364.5 | 3340.7 | 3355.3 |
| 30°   | 8319.3 | 6147.8 | 3290.4 | 2976.6 | 3122.2 | 3271.9 | 3241.4 | 3240.1 | 3205.7 | 3167.3 | 3185.8 |
| 32.5° | 8114.1 | 5668.5 | 2960.7 | 2833.6 | 3000.4 | 3020.3 | 3086.5 | 3106.3 | 3038.8 | 2958.0 | 2952.8 |
| 35°   | 7935.4 | 5215.6 | 2710.4 | 2703.8 | 2853.4 | 2856.1 | 2952.8 | 2924.9 | 2756.8 | 2673.4 | 2673.4 |
| 37.5° | 7801.6 | 4764.1 | 2519.8 | 2587.3 | 2660.1 | 2729.0 | 2778.0 | 2662.8 | 2635.0 | 2588.6 | 2587.3 |
| 40°   | 7743.4 | 4366.9 | 2400.6 | 2498.6 | 2523.7 | 2611.1 | 2485.3 | 2530.4 | 2543.6 | 2519.8 | 2519.8 |
| 42.5° | 7682.5 | 4021.3 | 2297.3 | 2431.1 | 2427.1 | 2415.2 | 2351.6 | 2409.9 | 2462.8 | 2464.2 | 2460.2 |
| 45°   | 7621.5 | 3723.4 | 2206.0 | 2286.7 | 2342.3 | 2213.9 | 2225.8 | 2288.1 | 2362.2 | 2388.7 | 2388.7 |
| 47.5° | 7554.0 | 3487.7 | 2122.5 | 2134.5 | 2220.5 | 2134.5 | 2125.2 | 2172.9 | 2260.2 | 2302.6 | 2311.9 |
| 50°   | 7405.7 | 3275.8 | 2027.2 | 2000.7 | 2024.6 | 2053.7 | 2061.6 | 2084.1 | 2180.8 | 2248.3 | 2264.2 |
| 52.5° | 7200.5 | 3086.5 | 1905.4 | 1877.6 | 1877.6 | 1987.5 | 2024.6 | 2031.2 | 2113.3 | 2194.0 | 2209.9 |
| 55°   | 7029.7 | 2966.0 | 1779.6 | 1774.3 | 1769.0 | 1917.3 | 1980.9 | 1991.5 | 2048.4 | 2111.9 | 2119.9 |
| 57°   | 7041.6 | 2956.7 | 1682.9 | 1688.2 | 1686.9 | 1845.8 | 1939.8 | 1962.3 | 1991.5 | 2045.7 | 2055.0 |
| 57.5° | 7048.2 | 2963.3 | 1661.8 | 1664.4 | 1663.1 | 1825.9 | 1927.9 | 1953.1 | 1975.6 | 2032.5 | 2041.8 |
| 60°   | 7147.5 | 2980.6 | 1575.7 | 1546.6 | 1553.2 | 1720.0 | 1860.4 | 1892.1 | 1906.7 | 1982.2 | 1994.1 |
| 62.5° | 7000.5 | 2903.8 | 1506.8 | 1436.7 | 1436.7 | 1608.8 | 1766.4 | 1816.7 | 1839.2 | 1941.1 | 1961.0 |
| 65°   | 6574.2 | 2687.9 | 1426.1 | 1312.2 | 1325.4 | 1497.6 | 1653.8 | 1735.9 | 1770.3 | 1897.4 | 1918.6 |
| 67.5° | 5916.1 | 2437.7 | 1340.0 | 1201.0 | 1214.2 | 1381.0 | 1537.3 | 1626.0 | 1680.3 | 1849.8 | 1867.0 |
| 70°   | 5059.4 | 2131.8 | 1223.5 | 1083.1 | 1099.0 | 1253.9 | 1399.6 | 1500.2 | 1581.0 | 1804.8 | 1810.1 |
| 72.5° | 3730.0 | 1747.8 | 1060.6 | 953.4  | 970.6  | 1105.6 | 1260.5 | 1377.1 | 1485.6 | 1692.2 | 1689.6 |
| 75°   | 2217.9 | 1366.5 | 880.5  | 822.3  | 834.2  | 960.0  | 1134.8 | 1276.4 | 1439.3 | 1648.5 | 1673.7 |
| 77.5° | 1345.3 | 1028.8 | 717.7  | 688.5  | 703.1  | 831.5  | 1044.7 | 1195.7 | 1419.4 | 1554.5 | 1546.6 |
| 80°   | 813.0  | 734.9  | 573.3  | 554.8  | 569.4  | 711.0  | 966.6  | 1134.8 | 1240.7 | 1328.1 | 1328.1 |
| 82.5° | 425.0  | 448.9  | 421.1  | 406.5  | 426.4  | 577.3  | 879.2  | 990.4  | 1096.4 | 941.4  | 879.2  |
| 85°   | 173.5  | 234.4  | 255.6  | 254.2  | 266.1  | 399.9  | 758.7  | 847.4  | 707.1  | 671.3  | 687.2  |
| 87.5° | 58.3   | 99.3   | 124.5  | 107.3  | 112.5  | 251.6  | 525.7  | 409.1  | 485.9  | 339.0  | 321.8  |
| 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.

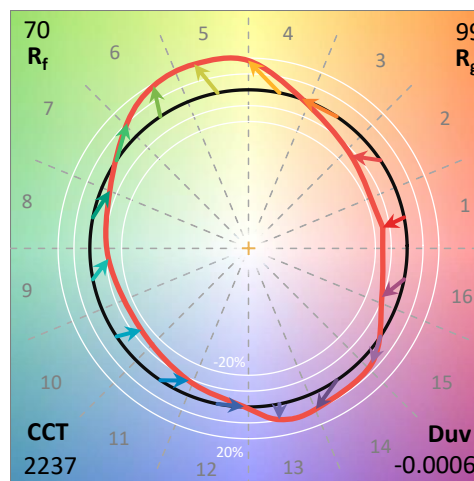
### Test Information

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

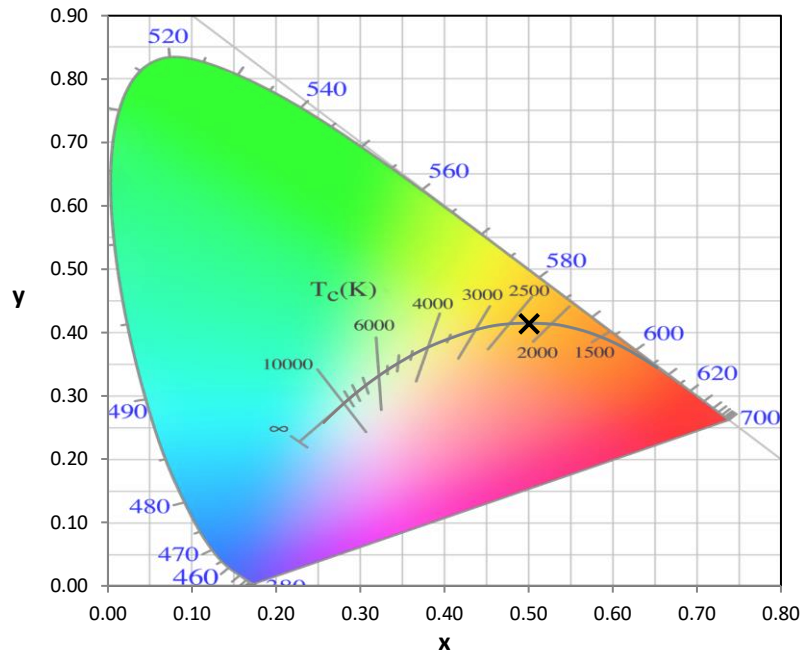
Stabilization Time: 71M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.7/41%  
 Sphere Temperature (°C): 25.6

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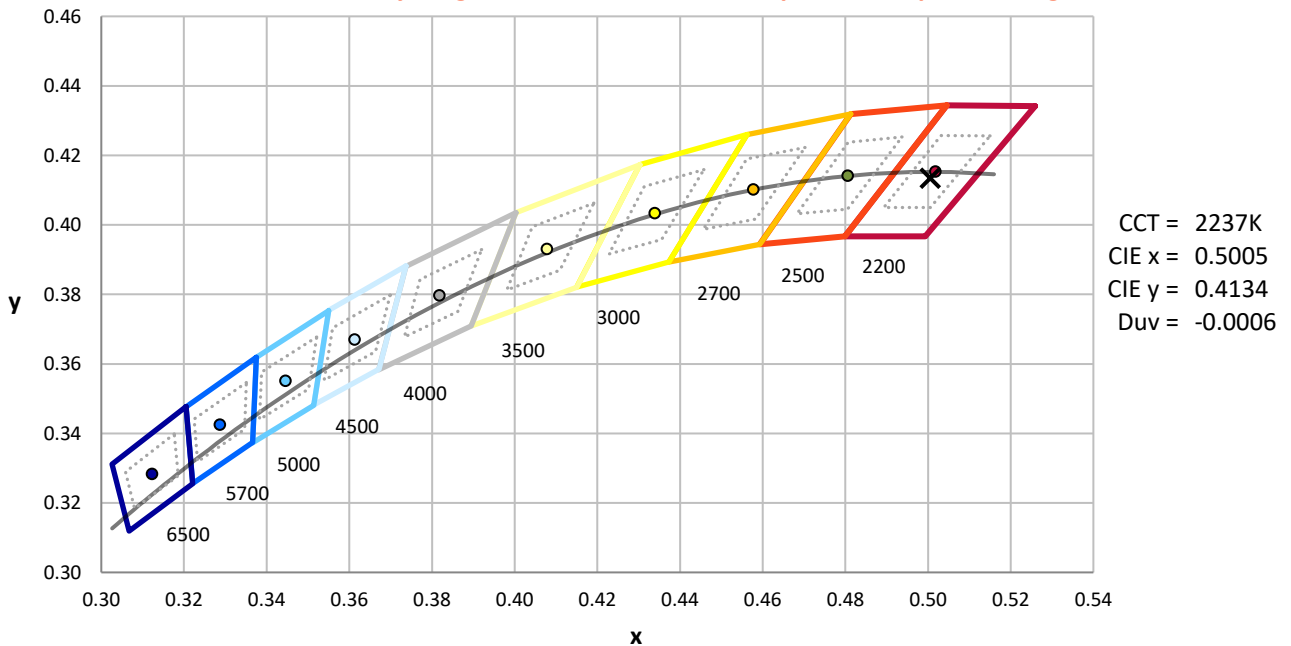
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| 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**



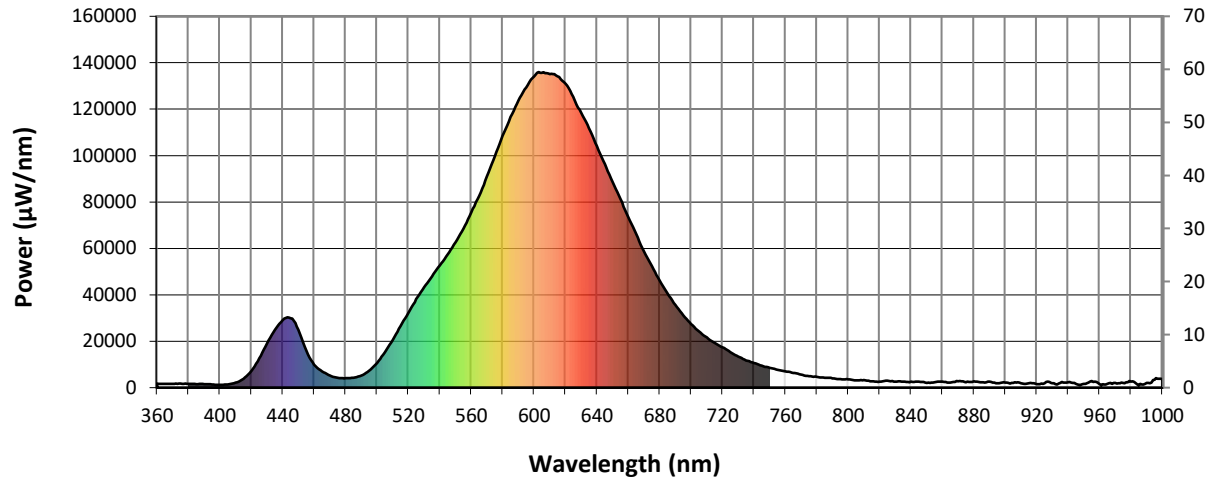
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 2200K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

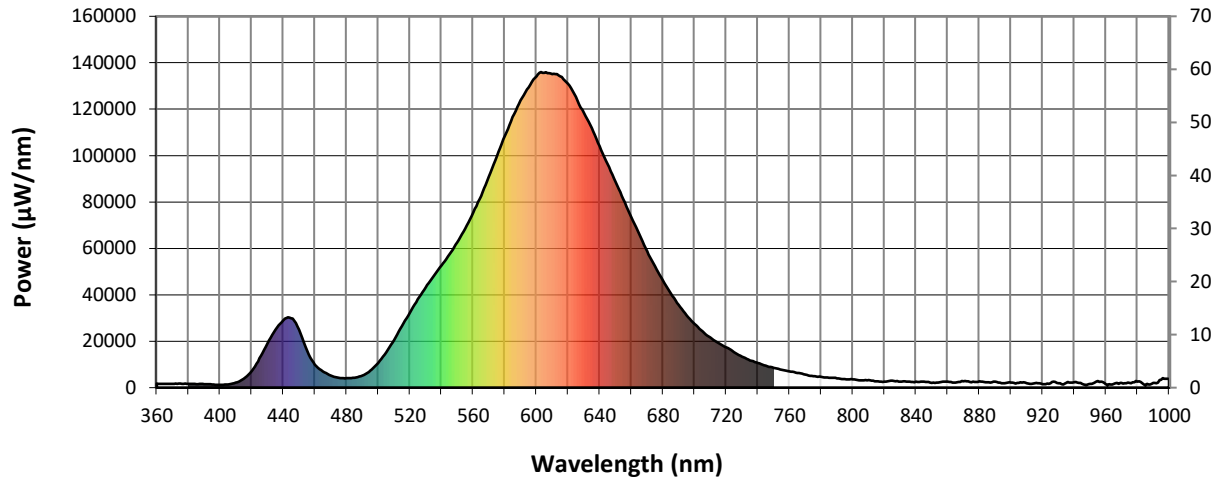


#####

| 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**



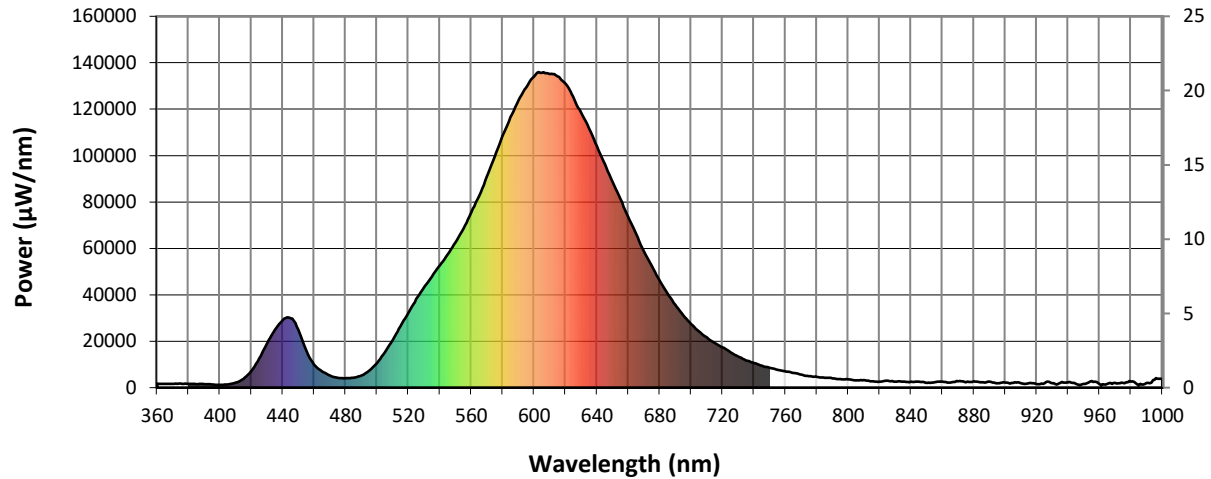
**Scotopic Lumens: 4696.9**

**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**

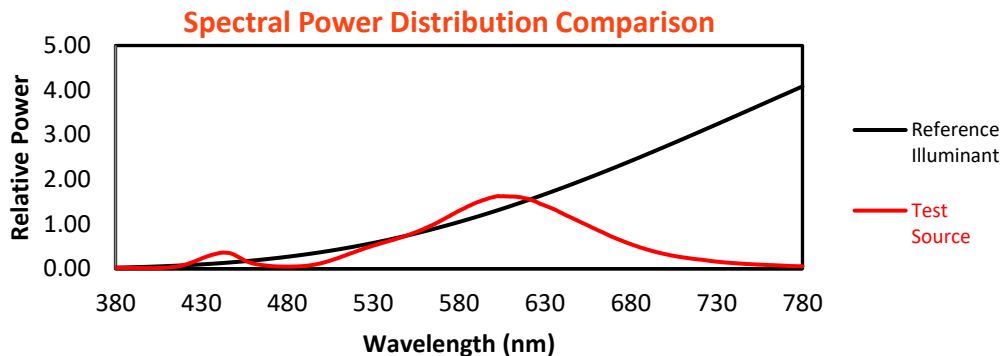
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 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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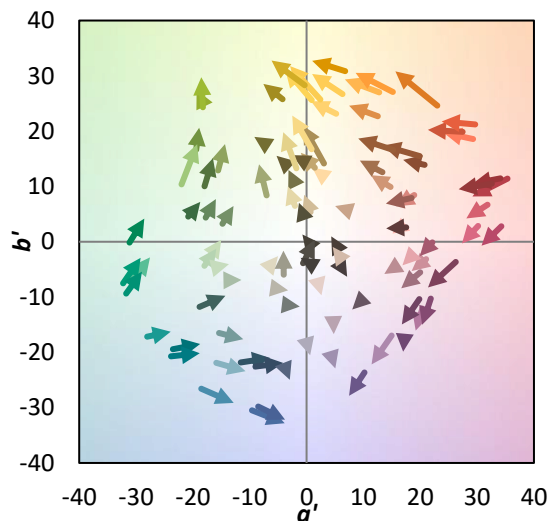
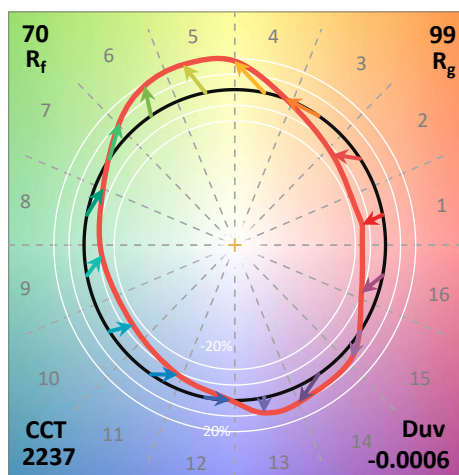
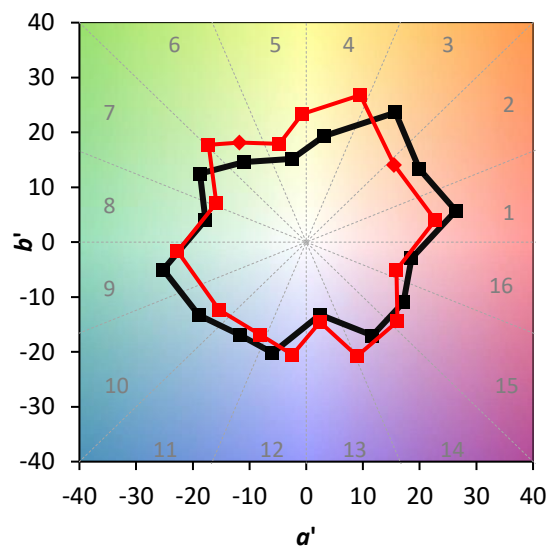
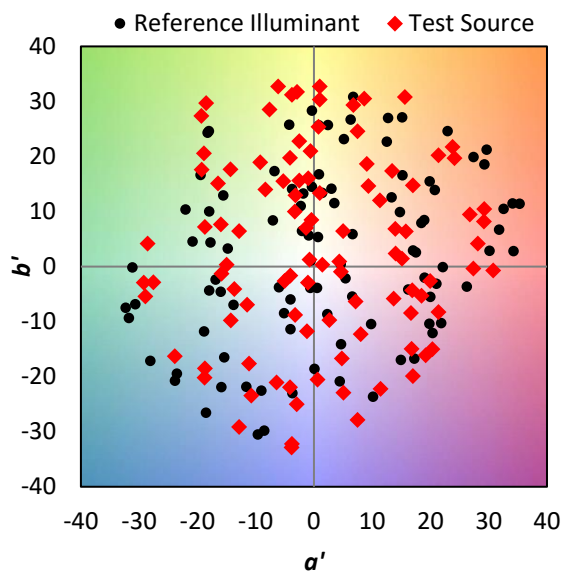
**TM-30-18**

### Summary

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



### Color Vector Graphics



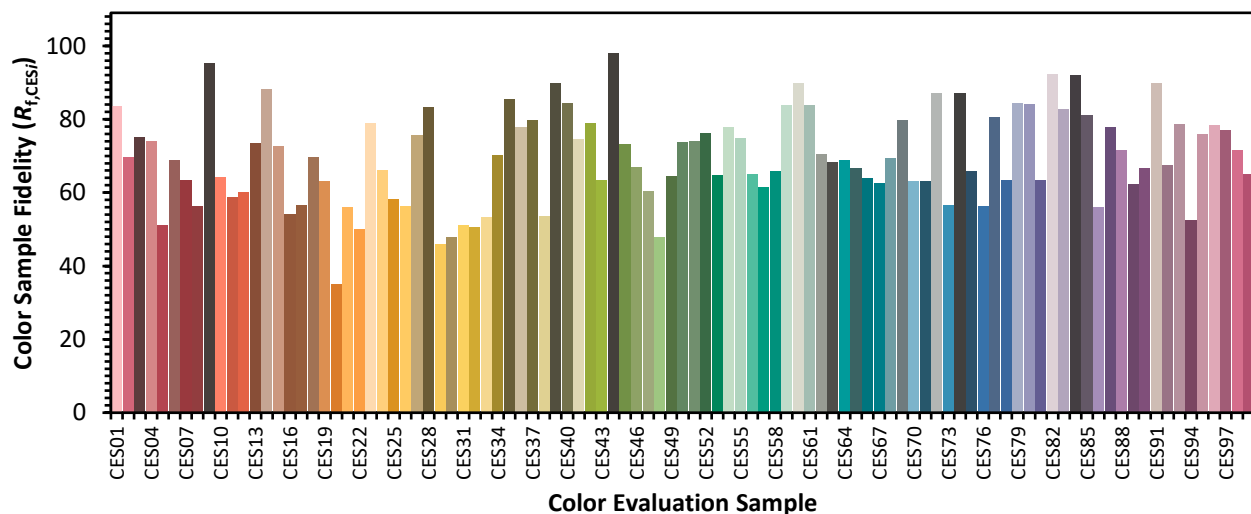


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

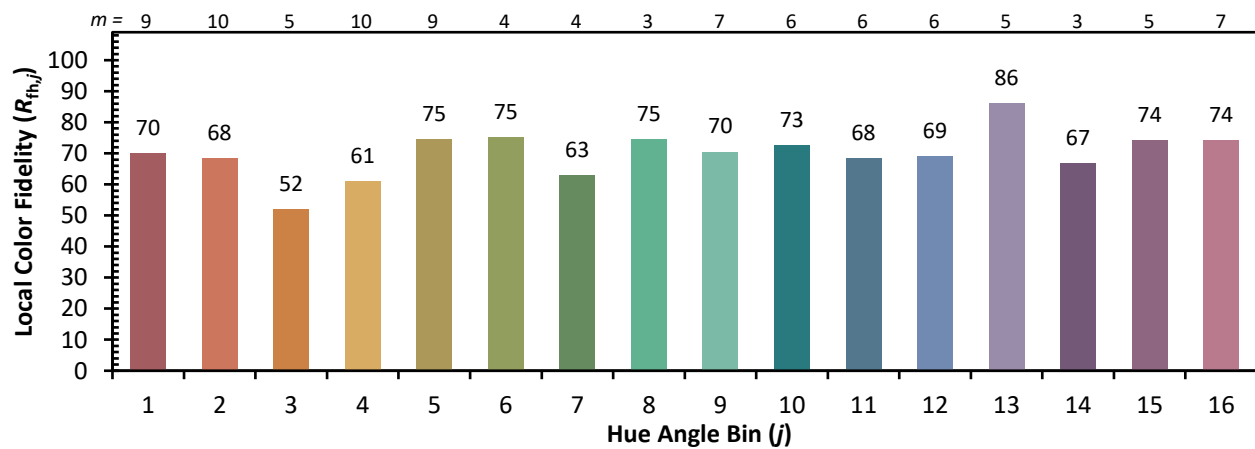
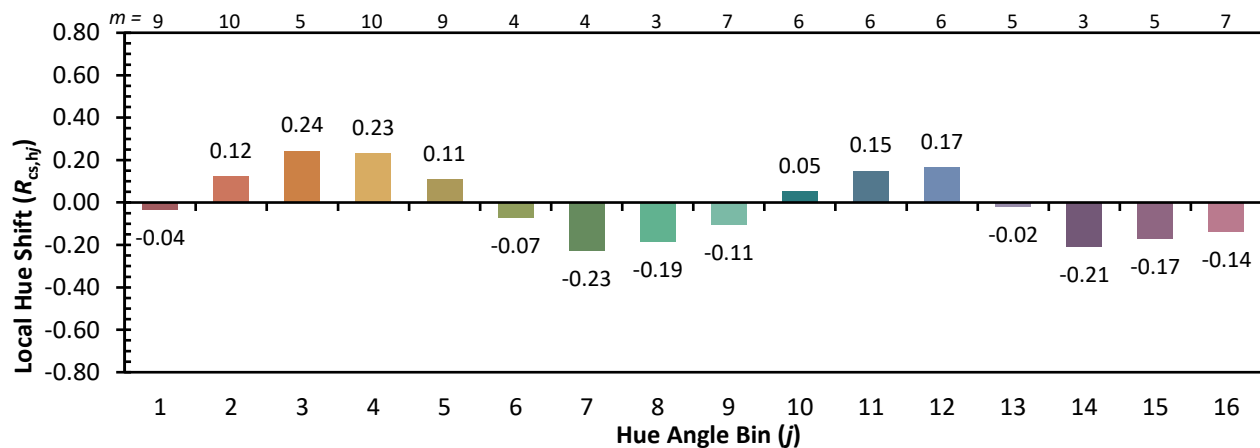
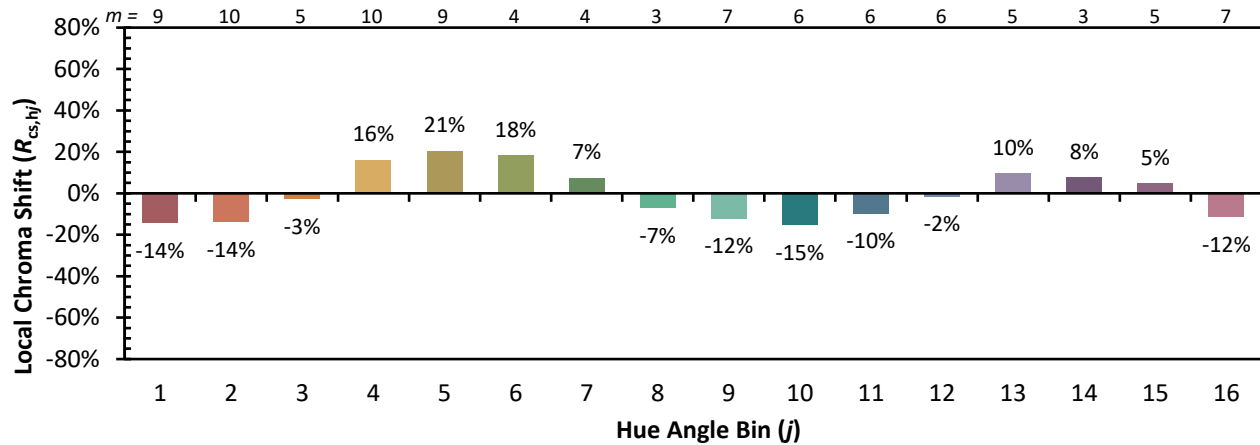
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 56 | CES51 = 74 | CES76 = 56 |
| CES02 = 65 | CES27 = 76 | CES52 = 76 | CES77 = 81 |
| CES03 = 32 | CES28 = 83 | CES53 = 65 | CES78 = 63 |
| CES04 = 72 | CES29 = 46 | CES54 = 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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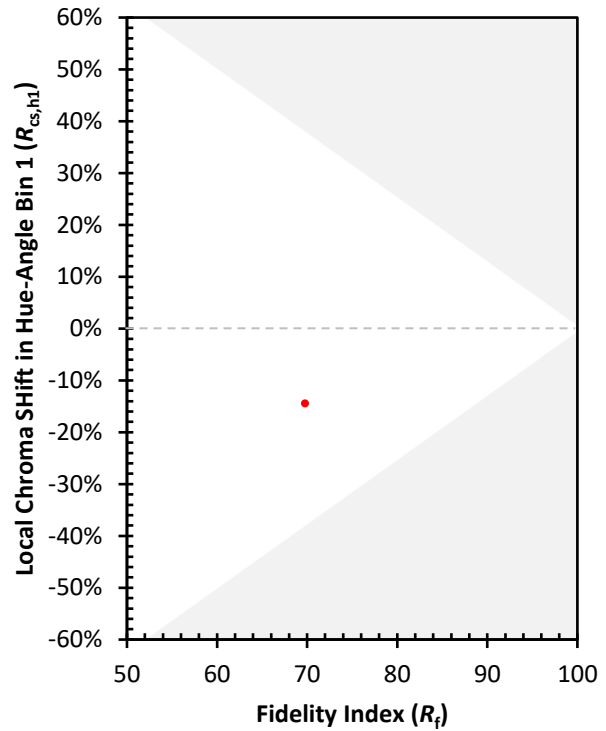
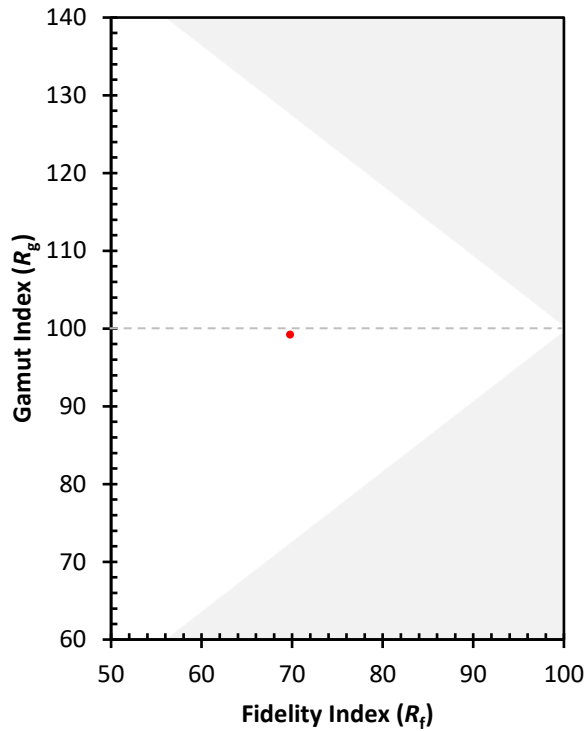
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)