

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: P232716

Luminaire Tested: **CTN-8-6-D-E1-T4-7030**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P232716  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1707-171-20)  
Test Lab: INNOVATION CENTER(G2)  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: MCGRAW-EDISON  
Catalog Number: CTN-8-6-D-E1-T4-7030  
Description: CELESTEON HIGH MAST LUMINAIRE  
(8) 70 CRI, 3000K LEDS AND TYPE IV OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 60199 lumens  
Efficiency: N/A  
Efficacy: 126.2 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short - Non-Cutoff  
BUG Rating: B4 - U0 - G5

Input Watts (W): 477  
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: 25 FT



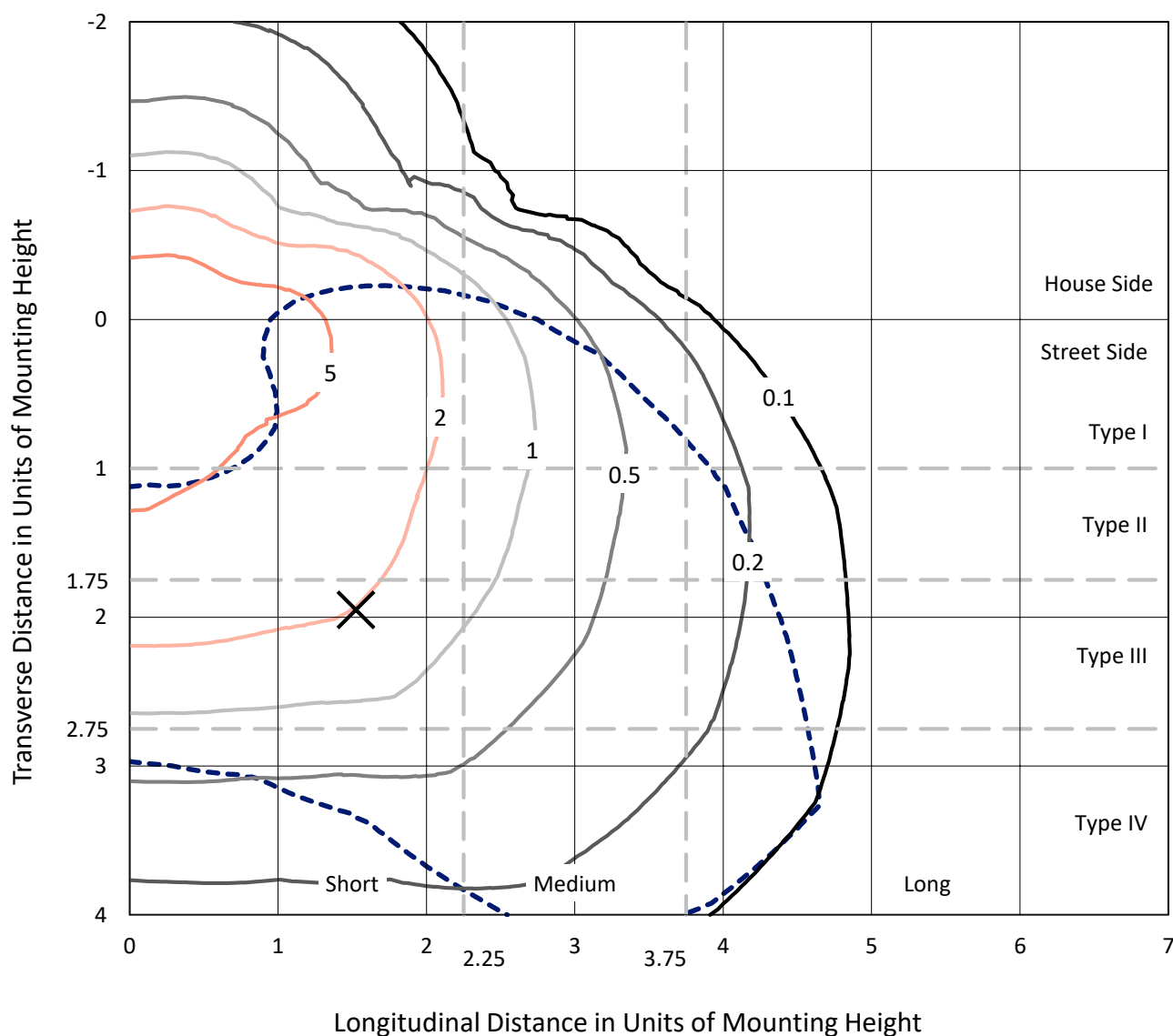
REPORT NUMBER: P232716

CATALOG NUMBER: CTN-8-6-D-E1-T4-7030

## Iso-Footcandle Lines of Horizontal Illumination

× Max cd

--- 1/2 Max cd

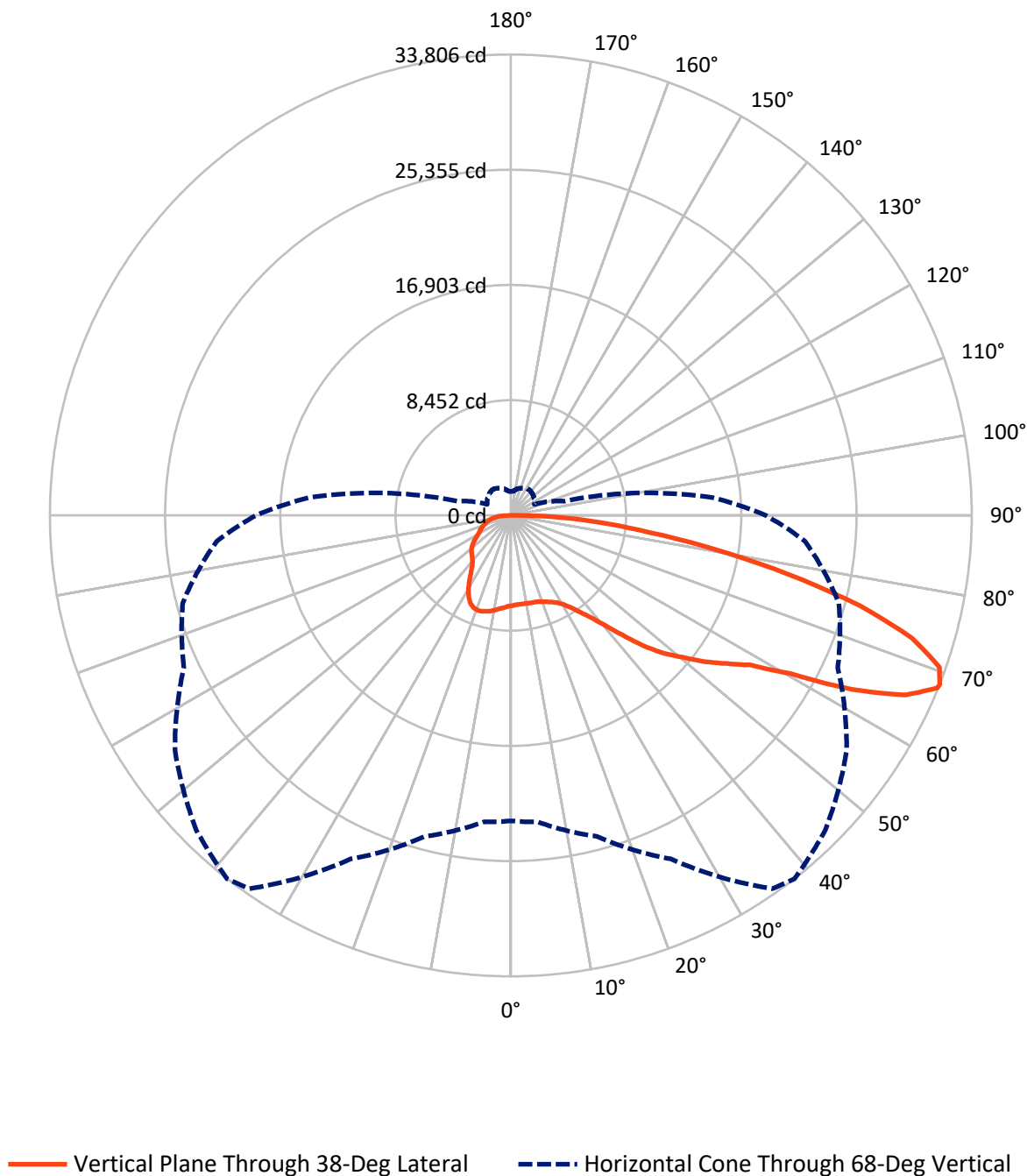


Based on 30 foot mounting height. Maximum calculated value = 7.6 fc  
 Type IV - Short - Non-Cutoff

REPORT NUMBER: P232716

CATALOG NUMBER: CTN-8-6-D-E1-T4-7030

## Luminous Intensity Polar Plot



REPORT NUMBER: P232716

CATALOG NUMBER: CTN-8-6-D-E1-T4-7030

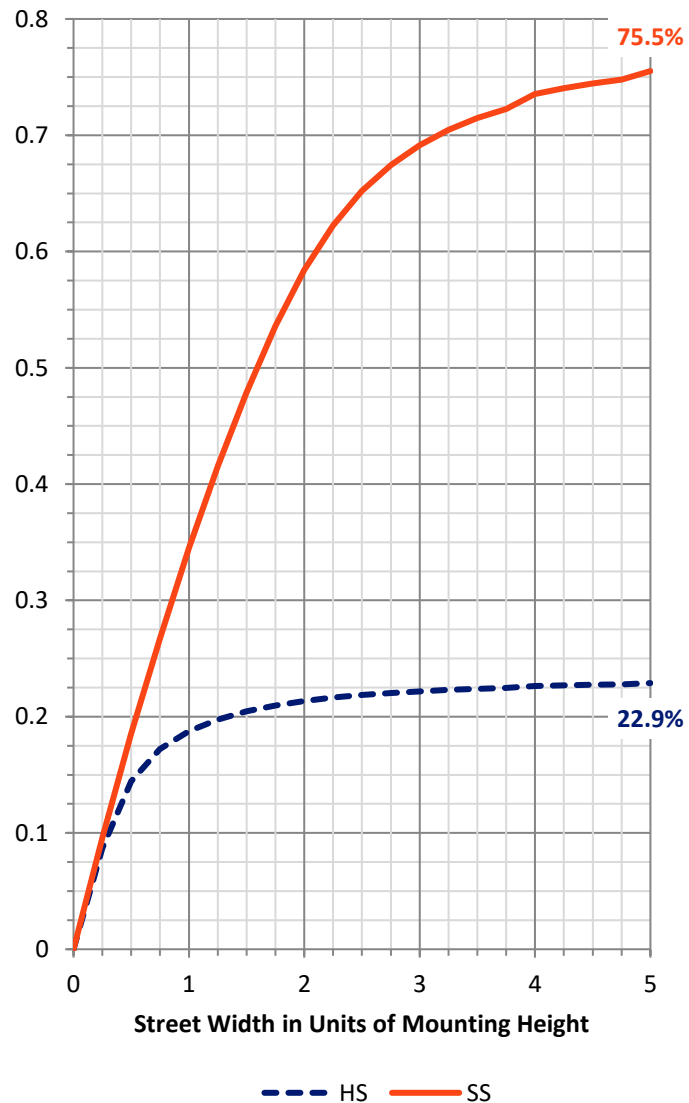
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 14049.1  | 0.0    | 14049.1 |
|                    | % Fixture | 23.3     | 0.0    | 23.3    |
| <b>Street Side</b> | Lumens    | 46149.9  | 0.0    | 46149.9 |
|                    | % Fixture | 76.7     | 0.0    | 76.7    |
| <b>Total</b>       | Lumens    | 60199.0  | 0.0    | 60199.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 641.4   | 1.1       |
| 10°-20°   | 1979.8  | 3.3       |
| 20°-30°   | 3363.5  | 5.6       |
| 30°-40°   | 5093.5  | 8.5       |
| 40°-50°   | 8424.6  | 14.0      |
| 50°-60°   | 12135.3 | 20.2      |
| 60°-70°   | 15304.3 | 25.4      |
| 70°-80°   | 10892.3 | 18.1      |
| 80°-90°   | 2364.2  | 3.9       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 60199.0 | 100.0     |
| 0°-180°   | 60199.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P232716

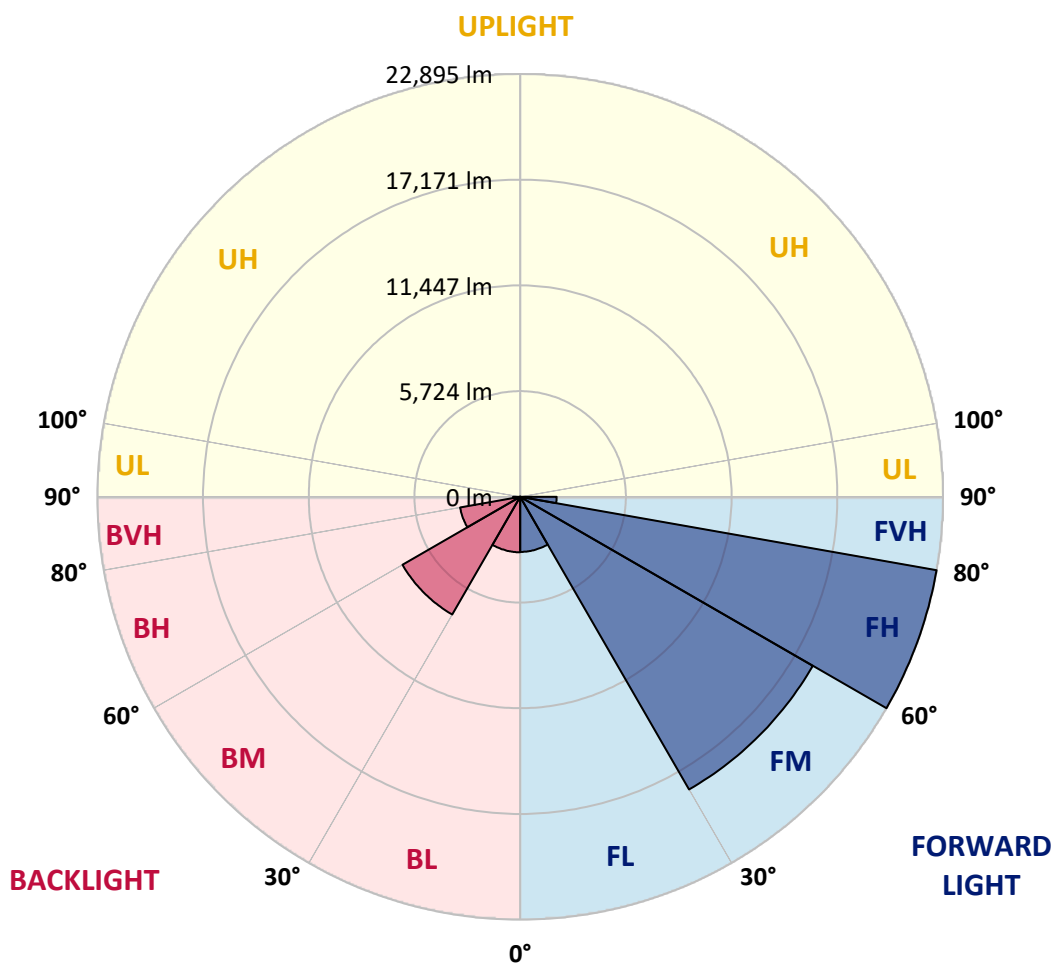
CATALOG NUMBER: CTN-8-6-D-E1-T4-7030

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 2982.6  | 5.0       |                         |      |         |
| FM   | (30°-60°)   | 18296.4 | 30.4      |                         |      |         |
| FH   | (60°-80°)   | 22894.7 | 38.0      |                         |      | G5      |
| FVH  | (80°-90°)   | 1976.3  | 3.3       |                         |      | G5      |
| BL   | (0°-30°)    | 3002.1  | 5.0       | B4/5000                 |      |         |
| BM   | (30°-60°)   | 7357.1  | 12.2      | B4/8500                 |      |         |
| BH   | (60°-80°)   | 3302.0  | 5.5       | B4/5000                 |      | G4/5000 |
| BVH  | (80°-90°)   | 388.0   | 0.6       |                         |      | G3/500  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B4-U0-G5**

Type IV Short



REPORT NUMBER: P232716

CATALOG NUMBER: CTN-8-6-D-E1-T4-7030

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 38°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  | 6631.8  |
| 2.5°  | 6608.3  | 6620.1  | 6612.3  | 6608.3  | 6557.5  | 6569.2  | 6588.8  | 6561.4  | 6627.9  | 6624.0  | 6663.1  |
| 5°    | 6545.8  | 6551.6  | 6553.6  | 6571.2  | 6522.3  | 6547.7  | 6571.2  | 6553.6  | 6624.0  | 6604.4  | 6659.2  |
| 7.5°  | 6528.2  | 6526.2  | 6528.2  | 6561.4  | 6508.6  | 6547.7  | 6575.1  | 6569.2  | 6645.5  | 6629.9  | 6696.4  |
| 10°   | 6483.2  | 6485.1  | 6491.0  | 6528.2  | 6500.8  | 6553.6  | 6602.5  | 6627.9  | 6729.6  | 6715.9  | 6792.2  |
| 12.5° | 6405.0  | 6420.6  | 6442.1  | 6504.7  | 6510.6  | 6581.0  | 6653.3  | 6704.2  | 6837.2  | 6848.9  | 6944.7  |
| 15°   | 6336.5  | 6363.9  | 6401.0  | 6485.1  | 6520.3  | 6600.5  | 6692.4  | 6786.3  | 6960.4  | 7013.2  | 7134.4  |
| 17.5° | 6358.0  | 6399.1  | 6448.0  | 6534.0  | 6559.5  | 6643.5  | 6747.2  | 6872.4  | 7087.5  | 7200.9  | 7357.4  |
| 20°   | 6491.0  | 6518.4  | 6559.5  | 6639.6  | 6672.9  | 6757.0  | 6841.1  | 6964.3  | 7244.0  | 7427.8  | 7621.4  |
| 22.5° | 6657.2  | 6696.4  | 6723.7  | 6772.6  | 6811.7  | 6886.1  | 6974.1  | 7095.3  | 7425.8  | 7656.6  | 7922.6  |
| 25°   | 6835.2  | 6854.8  | 6893.9  | 6927.1  | 6976.0  | 7034.7  | 7134.4  | 7283.1  | 7633.1  | 7916.7  | 8288.3  |
| 27.5° | 6999.5  | 7009.3  | 7083.6  | 7111.0  | 7206.8  | 7249.8  | 7328.0  | 7525.6  | 7903.0  | 8253.1  | 8710.7  |
| 30°   | 7240.0  | 7259.6  | 7316.3  | 7380.9  | 7521.7  | 7564.7  | 7644.9  | 7852.2  | 8262.9  | 8710.7  | 9260.3  |
| 32.5° | 7695.7  | 7746.6  | 7738.7  | 7807.2  | 7973.4  | 8030.1  | 8139.7  | 8409.6  | 8857.4  | 9371.8  | 10025.0 |
| 35°   | 8618.8  | 8691.2  | 8601.2  | 8509.3  | 8597.3  | 8673.6  | 8841.8  | 9236.8  | 9790.3  | 10639.1 | 11284.5 |
| 37.5° | 10130.6 | 10202.9 | 9882.2  | 9588.8  | 9397.2  | 9457.8  | 9686.6  | 10246.0 | 11092.8 | 12567.4 | 13287.1 |
| 40°   | 11896.6 | 11974.8 | 11528.9 | 11000.9 | 10568.7 | 10545.2 | 10615.6 | 11327.5 | 12549.8 | 14712.8 | 15274.1 |
| 42.5° | 13435.7 | 13641.1 | 13058.3 | 12602.6 | 12043.3 | 11949.4 | 11779.2 | 12498.9 | 14090.9 | 16699.8 | 17016.6 |
| 45°   | 14931.9 | 15131.3 | 14671.7 | 14356.9 | 13785.8 | 13633.3 | 13310.6 | 13746.7 | 15602.7 | 18438.4 | 18452.1 |
| 47.5° | 16304.8 | 16465.1 | 15931.2 | 15729.8 | 15166.5 | 15100.0 | 14769.5 | 15074.6 | 17002.9 | 19911.1 | 19633.4 |
| 50°   | 17840.0 | 18008.2 | 17157.4 | 16909.1 | 16455.3 | 16365.4 | 16257.8 | 16476.9 | 18608.6 | 21180.3 | 20636.7 |
| 52.5° | 19717.5 | 19654.9 | 18604.7 | 18035.6 | 17795.0 | 17816.5 | 17695.3 | 17937.8 | 20312.0 | 22256.0 | 21426.8 |
| 55°   | 21964.6 | 21643.8 | 20490.0 | 19627.5 | 19074.0 | 19179.7 | 19021.2 | 19377.2 | 21995.9 | 23163.4 | 21997.8 |
| 57.5° | 23241.7 | 23329.7 | 23220.2 | 22111.3 | 20703.2 | 20687.5 | 20437.2 | 20779.4 | 23466.6 | 23904.7 | 22346.0 |
| 60°   | 25103.5 | 25467.3 | 25606.1 | 25306.9 | 24043.5 | 23544.8 | 22291.2 | 22213.0 | 24708.4 | 24544.2 | 22523.9 |
| 62.5° | 26280.8 | 26451.0 | 27286.1 | 27647.9 | 28054.7 | 28140.7 | 26149.8 | 23939.9 | 25625.7 | 24870.8 | 22598.2 |
| 65°   | 25717.6 | 25889.7 | 27450.4 | 28868.2 | 31281.6 | 31766.6 | 31133.0 | 26675.9 | 26245.6 | 24943.1 | 22349.9 |
| 67.5° | 22831.0 | 23042.2 | 25136.7 | 28042.9 | 33233.4 | 33755.6 | 32732.7 | 29830.5 | 26449.0 | 24900.1 | 21810.1 |
| 68°   | 22408.5 | 22565.0 | 24372.1 | 27802.4 | 33429.0 | 33806.4 | 32627.1 | 30069.1 | 26460.8 | 24913.8 | 21643.8 |
| 70°   | 19162.1 | 19437.8 | 21340.7 | 25613.9 | 33114.1 | 33354.6 | 31968.0 | 29936.1 | 26194.8 | 24690.8 | 20427.4 |
| 72.5° | 14935.8 | 15317.1 | 16764.4 | 21274.2 | 30585.4 | 30780.9 | 29619.2 | 28469.3 | 25391.0 | 23143.9 | 17509.5 |
| 75°   | 10820.9 | 11147.6 | 12540.0 | 16418.2 | 25748.9 | 26443.2 | 26247.6 | 26454.9 | 22760.6 | 19609.9 | 12680.8 |
| 77.5° | 7472.8  | 7752.4  | 9051.0  | 12250.6 | 19965.9 | 20844.0 | 21859.0 | 22396.8 | 18702.5 | 14548.5 | 6027.5  |
| 80°   | 4787.6  | 5002.7  | 6107.7  | 8626.6  | 14397.9 | 15223.3 | 16316.5 | 16873.9 | 13302.7 | 7318.3  | 1069.8  |
| 82.5° | 2814.3  | 2960.9  | 3715.9  | 5566.0  | 9704.2  | 10206.9 | 10734.9 | 9800.1  | 5339.1  | 1400.3  | 674.7   |
| 85°   | 1398.3  | 1496.1  | 1959.6  | 3148.7  | 6033.4  | 6494.9  | 6670.9  | 4181.3  | 1128.4  | 512.4   | 459.6   |
| 87.5° | 625.8   | 653.2   | 841.0   | 1417.9  | 2867.1  | 3021.6  | 2947.3  | 1300.5  | 226.9   | 191.7   | 164.3   |
| 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: P232716

CATALOG NUMBER: CTN-8-6-D-E1-T4-7030

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°    | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 6631.8  | 6631.8  | 6631.8  | 6631.8 | 6631.8 | 6631.8 | 6631.8 | 6631.8 | 6631.8 | 6631.8 | 6631.8 |
| 2.5°  | 6667.0  | 6651.4  | 6647.5  | 6672.9 | 6645.5 | 6678.8 | 6669.0 | 6743.3 | 6753.1 | 6725.7 | 6770.7 |
| 5°    | 6676.8  | 6669.0  | 6674.8  | 6721.8 | 6712.0 | 6780.4 | 6798.1 | 6872.4 | 6872.4 | 6850.9 | 6897.8 |
| 7.5°  | 6721.8  | 6721.8  | 6739.4  | 6825.4 | 6825.4 | 6884.1 | 6903.7 | 6985.8 | 6983.8 | 6983.8 | 7026.9 |
| 10°   | 6835.2  | 6835.2  | 6872.4  | 6981.9 | 6954.5 | 7030.8 | 7040.6 | 7083.6 | 7073.8 | 7075.8 | 7120.7 |
| 12.5° | 7003.4  | 7013.2  | 7077.7  | 7173.5 | 7155.9 | 7183.3 | 7163.8 | 7155.9 | 7085.5 | 7085.5 | 7114.9 |
| 15°   | 7197.0  | 7238.1  | 7326.1  | 7414.1 | 7355.4 | 7345.6 | 7234.2 | 7136.4 | 6985.8 | 6921.3 | 6954.5 |
| 17.5° | 7449.3  | 7519.7  | 7621.4  | 7684.0 | 7572.5 | 7492.3 | 7290.9 | 7036.6 | 6792.2 | 6649.4 | 6653.3 |
| 20°   | 7729.0  | 7822.8  | 7948.0  | 7969.5 | 7805.2 | 7605.8 | 7269.4 | 6870.4 | 6449.9 | 6223.1 | 6207.4 |
| 22.5° | 8039.9  | 8157.3  | 8302.0  | 8217.9 | 7950.0 | 7625.3 | 7144.2 | 6614.2 | 6049.0 | 5667.6 | 5661.8 |
| 25°   | 8419.3  | 8546.5  | 8638.4  | 8403.7 | 7983.2 | 7525.6 | 6927.1 | 6215.2 | 5517.1 | 5106.4 | 5079.0 |
| 27.5° | 8902.4  | 8986.5  | 8918.0  | 8499.5 | 7883.5 | 7287.0 | 6559.5 | 5702.9 | 4963.6 | 4592.0 | 4550.9 |
| 30°   | 9475.4  | 9465.6  | 9094.1  | 8472.1 | 7682.0 | 6909.5 | 6058.8 | 5147.4 | 4509.9 | 4191.1 | 4153.9 |
| 32.5° | 10171.7 | 10030.8 | 9264.2  | 8341.1 | 7357.4 | 6414.7 | 5464.3 | 4685.9 | 4181.3 | 3858.6 | 3819.5 |
| 35°   | 11282.5 | 10885.5 | 9485.2  | 8143.6 | 6905.6 | 5818.2 | 4903.0 | 4329.9 | 3927.1 | 3557.4 | 3481.2 |
| 37.5° | 13005.5 | 12168.4 | 9852.9  | 7936.3 | 6387.4 | 5233.5 | 4484.4 | 4071.8 | 3727.6 | 3309.1 | 3219.1 |
| 40°   | 14777.3 | 13658.7 | 10412.2 | 7713.3 | 5902.3 | 4791.5 | 4247.8 | 3950.5 | 3606.3 | 3203.5 | 3113.5 |
| 42.5° | 16316.5 | 15049.2 | 11083.0 | 7433.7 | 5405.6 | 4443.4 | 4126.5 | 3911.4 | 3567.2 | 3183.9 | 3097.8 |
| 45°   | 17675.7 | 16298.9 | 11783.2 | 7109.0 | 4885.4 | 4161.8 | 4022.9 | 3856.7 | 3508.5 | 3138.9 | 3060.7 |
| 47.5° | 18808.1 | 17294.3 | 12399.2 | 6749.2 | 4374.9 | 3954.4 | 3921.2 | 3727.6 | 3397.1 | 3041.1 | 2974.6 |
| 50°   | 19684.2 | 18002.3 | 12811.9 | 6348.2 | 3938.8 | 3792.1 | 3774.5 | 3530.1 | 3209.3 | 2869.0 | 2802.5 |
| 52.5° | 20306.1 | 18477.6 | 13052.4 | 6197.6 | 3596.6 | 3604.4 | 3575.0 | 3314.9 | 3004.0 | 2665.6 | 2612.8 |
| 55°   | 20701.2 | 18804.2 | 12993.7 | 6004.0 | 3250.4 | 3340.4 | 3344.3 | 3156.5 | 2882.7 | 2554.2 | 2511.1 |
| 57.5° | 20851.8 | 18790.5 | 12647.6 | 5034.0 | 2914.0 | 3023.5 | 3076.3 | 3047.0 | 2804.5 | 2483.8 | 2448.5 |
| 60°   | 20769.6 | 18569.5 | 11910.3 | 3688.5 | 2565.9 | 2714.5 | 2843.6 | 2837.7 | 2632.4 | 2329.3 | 2292.1 |
| 62.5° | 20632.7 | 18057.1 | 10465.0 | 2640.2 | 2303.8 | 2495.5 | 2651.9 | 2599.1 | 2403.6 | 2137.6 | 2112.2 |
| 65°   | 20141.9 | 17153.5 | 8090.8  | 2112.2 | 2194.3 | 2372.3 | 2501.4 | 2411.4 | 2219.7 | 1942.0 | 1928.3 |
| 67.5° | 19056.4 | 15346.5 | 4723.0  | 1926.4 | 2114.1 | 2268.6 | 2360.5 | 2249.1 | 2071.1 | 1801.2 | 1777.7 |
| 68°   | 18688.8 | 14883.0 | 4017.0  | 1908.8 | 2098.5 | 2243.2 | 2327.3 | 2210.0 | 2035.9 | 1773.8 | 1750.4 |
| 70°   | 16832.8 | 12062.8 | 1916.6  | 1836.4 | 2030.0 | 2125.9 | 2174.8 | 2067.2 | 1897.0 | 1664.3 | 1648.7 |
| 72.5° | 13101.3 | 7277.2  | 1281.0  | 1726.9 | 1897.0 | 1989.0 | 2000.7 | 1832.5 | 1672.1 | 1500.0 | 1490.3 |
| 75°   | 7740.7  | 2415.3  | 1191.0  | 1564.6 | 1713.2 | 1840.3 | 1873.6 | 1705.4 | 1527.4 | 1327.9 | 1324.0 |
| 77.5° | 1885.3  | 936.8   | 1124.5  | 1396.4 | 1552.8 | 1676.0 | 1701.5 | 1578.3 | 1421.8 | 1196.9 | 1189.1 |
| 80°   | 776.4   | 778.4   | 1048.3  | 1157.8 | 1331.8 | 1451.1 | 1488.3 | 1378.8 | 1238.0 | 1093.2 | 1077.6 |
| 82.5° | 645.4   | 657.1   | 889.8   | 854.6  | 1065.9 | 1204.7 | 1241.9 | 1165.6 | 1116.7 | 960.3  | 944.6  |
| 85°   | 459.6   | 582.8   | 590.6   | 575.0  | 747.1  | 858.6  | 1046.3 | 1009.1 | 956.3  | 823.4  | 745.1  |
| 87.5° | 215.1   | 340.3   | 256.2   | 246.4  | 379.4  | 508.5  | 598.4  | 627.8  | 543.7  | 422.4  | 391.1  |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

STREETWORKS

Report Number: SP1-2104-215-6

Luminaire Tested: CST-CA6-230-730-U-T4

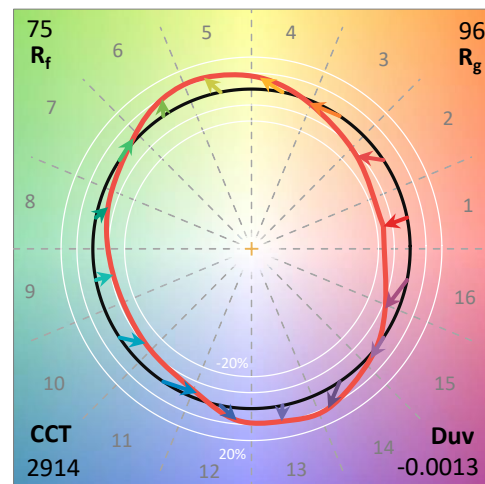
Test Date: 04/22/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-6  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 04/22/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: STREETWORKS  
 Catalog Number: **CST-CA6-230-730-U-T4**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 2914    | CRI (Ra): | 73.2 |      |       |
| CIE u':                   | 0.2541  | R1:       | 70.1 | R9:  | -27.2 |
| CIE v':                   | 0.5212  | R2:       | 83.3 | R10: | 61.9  |
| Duv:                      | -0.0013 | R3:       | 94.2 | R11: | 65.4  |
| CIE x:                    | 0.4410  | R4:       | 69.4 | R12: | 53.3  |
| CIE y:                    | 0.4020  | R5:       | 69.3 | R13: | 72.6  |
| CIE z:                    | 0.1571  | R6:       | 77.3 | R14: | 96.9  |
| Peak Wavelength (nm):     | 599     | R7:       | 77.5 |      |       |
| Dominant Wavelength (nm): | 583     | R8:       | 44.9 |      |       |
| Purity:                   | 53.4    |           |      |      |       |
| Rf:                       | 75.3    |           |      |      |       |
| Rg:                       | 95.7    |           |      |      |       |



### Test Conditions

Stabilization Time: 72M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.6/15%  
 Sphere Temperature (°C): 24.0

REPORT NUMBER: SP1-2104-215-6

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 1/31/2021        | 7/31/2021            |
| Power Meter                    | IN0071                | 12/1/2020        | 12/1/2021            |
| AC Power Source                | IN0063                | 12/1/2020        | 12/1/2021            |
| DC Power Source                | IN0208                | 12/1/2020        | 12/1/2021            |
| Sphere Thermometer             | IN0085                | 12/1/2020        | 12/1/2021            |
| Room Thermometer               | IN0046                | 12/1/2020        | 12/1/2021            |



REPORT NUMBER: SP1-2104-215-6

**CIE 1931 Chromaticity Diagram**



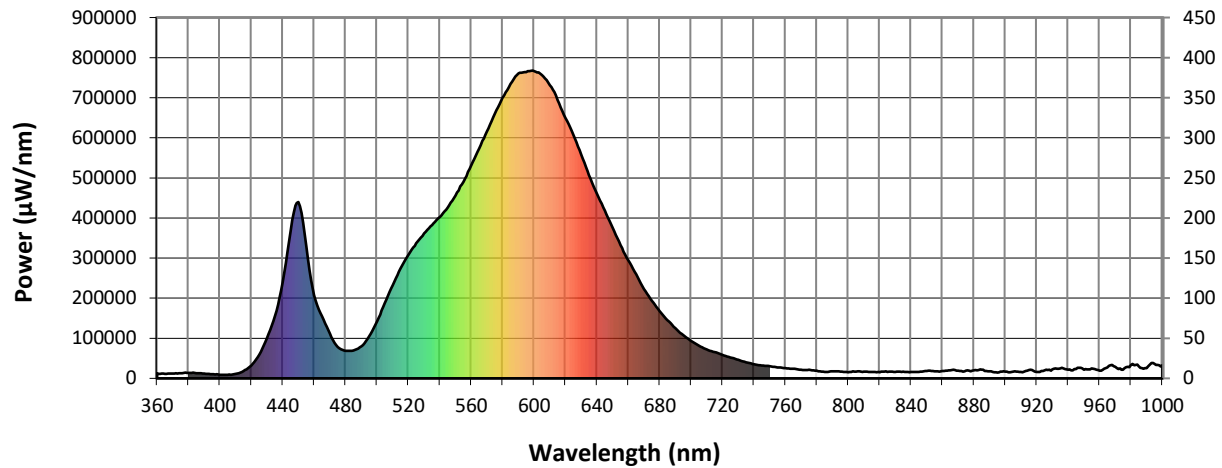
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 3000K 7-step quadrangle

REPORT NUMBER: SP1-2104-215-6

### 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       | 12827            | 0.0              | 490       | 80096            | 11.4             | 620       | 649050           | 168.9            | 750       | 30187            | 0.0              | 880       | 19756            | 0.0              |
| 365       | 11336            | 0.0              | 495       | 104447           | 18.9             | 625       | 608162           | 134.2            | 755       | 27442            | 0.0              | 885       | 21245            | 0.0              |
| 370       | 11776            | 0.0              | 500       | 142477           | 31.4             | 630       | 557990           | 101.0            | 760       | 25382            | 0.0              | 890       | 17771            | 0.0              |
| 375       | 13009            | 0.0              | 505       | 187724           | 52.5             | 635       | 506861           | 76.2             | 765       | 23778            | 0.0              | 895       | 14356            | 0.0              |
| 380       | 13906            | 0.0              | 510       | 232209           | 79.8             | 640       | 460827           | 55.1             | 770       | 21474            | 0.0              | 900       | 16683            | 0.0              |
| 385       | 12960            | 0.0              | 515       | 273388           | 113.2            | 645       | 418064           | 40.3             | 775       | 21394            | 0.0              | 905       | 16548            | 0.0              |
| 390       | 11750            | 0.0              | 520       | 308378           | 149.5            | 650       | 376246           | 27.5             | 780       | 18945            | 0.0              | 910       | 15630            | 0.0              |
| 395       | 10399            | 0.0              | 525       | 336804           | 180.8            | 655       | 332016           | 19.0             | 785       | 16318            | 0.0              | 915       | 20907            | 0.0              |
| 400       | 9192             | 0.0              | 530       | 361609           | 212.9            | 660       | 294638           | 12.3             | 790       | 17841            | 0.0              | 920       | 16083            | 0.0              |
| 405       | 8943             | 0.0              | 535       | 382440           | 237.2            | 665       | 259105           | 8.2              | 795       | 16506            | 0.0              | 925       | 20203            | 0.0              |
| 410       | 11120            | 0.0              | 540       | 401976           | 261.9            | 670       | 223041           | 4.9              | 800       | 15058            | 0.0              | 930       | 22625            | 0.0              |
| 415       | 18193            | 0.0              | 545       | 426232           | 283.7            | 675       | 193569           | 3.2              | 805       | 16851            | 0.0              | 935       | 24828            | 0.0              |
| 420       | 32317            | 0.1              | 550       | 455969           | 309.9            | 680       | 167520           | 1.9              | 810       | 16679            | 0.0              | 940       | 21275            | 0.0              |
| 425       | 59220            | 0.3              | 555       | 490448           | 335.0            | 685       | 144697           | 1.2              | 815       | 15851            | 0.0              | 945       | 23270            | 0.0              |
| 430       | 100522           | 0.8              | 560       | 530799           | 360.7            | 690       | 125032           | 0.7              | 820       | 15536            | 0.0              | 950       | 21756            | 0.0              |
| 435       | 155311           | 1.8              | 565       | 572799           | 380.9            | 695       | 107458           | 0.5              | 825       | 16381            | 0.0              | 955       | 24823            | 0.0              |
| 440       | 239817           | 3.8              | 570       | 615361           | 400.1            | 700       | 93549            | 0.3              | 830       | 16149            | 0.0              | 960       | 19499            | 0.0              |
| 445       | 368265           | 7.7              | 575       | 659689           | 410.5            | 705       | 81608            | 0.2              | 835       | 16687            | 0.0              | 965       | 27077            | 0.0              |
| 450       | 439895           | 11.4             | 580       | 700037           | 416.0            | 710       | 71559            | 0.1              | 840       | 16206            | 0.0              | 970       | 28727            | 0.0              |
| 455       | 329010           | 11.0             | 585       | 734518           | 408.1            | 715       | 65193            | 0.1              | 845       | 16062            | 0.0              | 975       | 21725            | 0.0              |
| 460       | 207545           | 8.5              | 590       | 760906           | 393.4            | 720       | 58466            | 0.0              | 850       | 18530            | 0.0              | 980       | 33536            | 0.0              |
| 465       | 154577           | 8.0              | 595       | 763605           | 362.0            | 725       | 52265            | 0.0              | 855       | 17709            | 0.0              | 985       | 30537            | 0.0              |
| 470       | 110708           | 6.9              | 600       | 766048           | 330.1            | 730       | 46287            | 0.0              | 860       | 18086            | 0.0              | 990       | 25187            | 0.0              |
| 475       | 78445            | 6.2              | 605       | 756483           | 293.0            | 735       | 40164            | 0.0              | 865       | 19763            | 0.0              | 995       | 35676            | 0.0              |
| 480       | 68887            | 6.5              | 610       | 730981           | 251.1            | 740       | 35097            | 0.0              | 870       | 19416            | 0.0              | 1000      | 32909            | 0.0              |
| 485       | 69832            | 8.3              | 615       | 694682           | 209.7            | 745       | 32334            | 0.0              | 875       | 19352            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-6

### Scotopic Flux vs. Wavelength



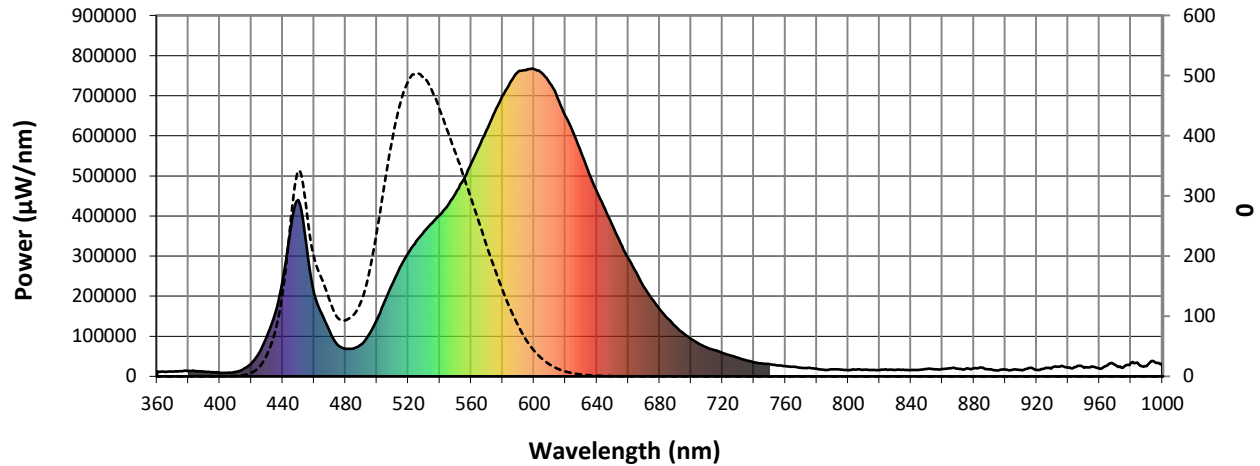
Scotopic Lumens: 43125.2

S/P: 1.19

| 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       | 12827            | 0.0              | 490       | 80096            | 123.3            | 620       | 649050           | 8.1              | 750       | 30187            | 0.0              | 880       | 19756            | 0.0              |
| 365       | 11336            | 0.0              | 495       | 104447           | 168.8            | 625       | 608162           | 5.1              | 755       | 27442            | 0.0              | 885       | 21245            | 0.0              |
| 370       | 11776            | 0.0              | 500       | 142477           | 238.3            | 630       | 557990           | 3.2              | 760       | 25382            | 0.0              | 890       | 17771            | 0.0              |
| 375       | 13009            | 0.0              | 505       | 187724           | 319.1            | 635       | 506861           | 1.9              | 765       | 23778            | 0.0              | 895       | 14356            | 0.0              |
| 380       | 13906            | 0.0              | 510       | 232209           | 393.6            | 640       | 460827           | 1.2              | 770       | 21474            | 0.0              | 900       | 16683            | 0.0              |
| 385       | 12960            | 0.0              | 515       | 273388           | 453.1            | 645       | 418064           | 0.7              | 775       | 21394            | 0.0              | 905       | 16548            | 0.0              |
| 390       | 11750            | 0.0              | 520       | 308378           | 490.2            | 650       | 376246           | 0.4              | 780       | 18945            | 0.0              | 910       | 15630            | 0.0              |
| 395       | 10399            | 0.1              | 525       | 336804           | 503.9            | 655       | 332016           | 0.3              | 785       | 16318            | 0.0              | 915       | 20907            | 0.0              |
| 400       | 9192             | 0.1              | 530       | 361609           | 498.6            | 660       | 294638           | 0.2              | 790       | 17841            | 0.0              | 920       | 16083            | 0.0              |
| 405       | 8943             | 0.3              | 535       | 382440           | 476.6            | 665       | 259105           | 0.1              | 795       | 16506            | 0.0              | 925       | 20203            | 0.0              |
| 410       | 11120            | 0.7              | 540       | 401976           | 444.2            | 670       | 223041           | 0.1              | 800       | 15058            | 0.0              | 930       | 22625            | 0.0              |
| 415       | 18193            | 1.9              | 545       | 426232           | 408.7            | 675       | 193569           | 0.0              | 805       | 16851            | 0.0              | 935       | 24828            | 0.0              |
| 420       | 32317            | 5.3              | 550       | 455969           | 372.8            | 680       | 167520           | 0.0              | 810       | 16679            | 0.0              | 940       | 21275            | 0.0              |
| 425       | 59220            | 14.5             | 555       | 490448           | 335.2            | 685       | 144697           | 0.0              | 815       | 15851            | 0.0              | 945       | 23270            | 0.0              |
| 430       | 100522           | 34.2             | 560       | 530799           | 296.7            | 690       | 125032           | 0.0              | 820       | 15536            | 0.0              | 950       | 21756            | 0.0              |
| 435       | 155311           | 69.4             | 565       | 572799           | 257.0            | 695       | 107458           | 0.0              | 825       | 16381            | 0.0              | 955       | 24823            | 0.0              |
| 440       | 239817           | 134.0            | 570       | 615361           | 217.2            | 700       | 93549            | 0.0              | 830       | 16149            | 0.0              | 960       | 19499            | 0.0              |
| 445       | 368265           | 246.6            | 575       | 659689           | 179.7            | 705       | 81608            | 0.0              | 835       | 16687            | 0.0              | 965       | 27077            | 0.0              |
| 450       | 439895           | 340.9            | 580       | 700037           | 144.2            | 710       | 71559            | 0.0              | 840       | 16206            | 0.0              | 970       | 28727            | 0.0              |
| 455       | 329010           | 287.5            | 585       | 734518           | 112.3            | 715       | 65193            | 0.0              | 845       | 16062            | 0.0              | 975       | 21725            | 0.0              |
| 460       | 207545           | 200.5            | 590       | 760906           | 84.7             | 720       | 58466            | 0.0              | 850       | 18530            | 0.0              | 980       | 33536            | 0.0              |
| 465       | 154577           | 163.3            | 595       | 763605           | 60.9             | 725       | 52265            | 0.0              | 855       | 17709            | 0.0              | 985       | 30537            | 0.0              |
| 470       | 110708           | 127.5            | 600       | 766048           | 43.2             | 730       | 46287            | 0.0              | 860       | 18086            | 0.0              | 990       | 25187            | 0.0              |
| 475       | 78445            | 98.1             | 605       | 756483           | 29.7             | 735       | 40164            | 0.0              | 865       | 19763            | 0.0              | 995       | 35676            | 0.0              |
| 480       | 68887            | 93.1             | 610       | 730981           | 19.8             | 740       | 35097            | 0.0              | 870       | 19416            | 0.0              | 1000      | 32909            | 0.0              |
| 485       | 69832            | 101.2            | 615       | 694682           | 12.8             | 745       | 32334            | 0.0              | 875       | 19352            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-6

### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 15555.2**      **M/P: 0.43**

| 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       | 12827            | 0.0              | 490       | 80096            | 66.7             | 620       | 649050           | 0.5              | 750       | 30187            | 0.0              | 880       | 19756            | 0.0              |
| 365       | 11336            | 0.0              | 495       | 104447           | 86.2             | 625       | 608162           | 0.3              | 755       | 27442            | 0.0              | 885       | 21245            | 0.0              |
| 370       | 11776            | 0.0              | 500       | 142477           | 114.5            | 630       | 557990           | 0.2              | 760       | 25382            | 0.0              | 890       | 17771            | 0.0              |
| 375       | 13009            | 0.0              | 505       | 187724           | 144.1            | 635       | 506861           | 0.1              | 765       | 23778            | 0.0              | 895       | 14356            | 0.0              |
| 380       | 13906            | 0.0              | 510       | 232209           | 166.7            | 640       | 460827           | 0.1              | 770       | 21474            | 0.0              | 900       | 16683            | 0.0              |
| 385       | 12960            | 0.0              | 515       | 273388           | 178.6            | 645       | 418064           | 0.0              | 775       | 21394            | 0.0              | 905       | 16548            | 0.0              |
| 390       | 11750            | 0.0              | 520       | 308378           | 179.5            | 650       | 376246           | 0.0              | 780       | 18945            | 0.0              | 910       | 15630            | 0.0              |
| 395       | 10399            | 0.1              | 525       | 336804           | 170.8            | 655       | 332016           | 0.0              | 785       | 16318            | 0.0              | 915       | 20907            | 0.0              |
| 400       | 9192             | 0.1              | 530       | 361609           | 156.3            | 660       | 294638           | 0.0              | 790       | 17841            | 0.0              | 920       | 16083            | 0.0              |
| 405       | 8943             | 0.2              | 535       | 382440           | 137.6            | 665       | 259105           | 0.0              | 795       | 16506            | 0.0              | 925       | 20203            | 0.0              |
| 410       | 11120            | 0.4              | 540       | 401976           | 117.6            | 670       | 223041           | 0.0              | 800       | 15058            | 0.0              | 930       | 22625            | 0.0              |
| 415       | 18193            | 1.2              | 545       | 426232           | 99.0             | 675       | 193569           | 0.0              | 805       | 16851            | 0.0              | 935       | 24828            | 0.0              |
| 420       | 32317            | 3.7              | 550       | 455969           | 81.9             | 680       | 167520           | 0.0              | 810       | 16679            | 0.0              | 940       | 21275            | 0.0              |
| 425       | 59220            | 9.2              | 555       | 490448           | 66.1             | 685       | 144697           | 0.0              | 815       | 15851            | 0.0              | 945       | 23270            | 0.0              |
| 430       | 100522           | 21.2             | 560       | 530799           | 52.4             | 690       | 125032           | 0.0              | 820       | 15536            | 0.0              | 950       | 21756            | 0.0              |
| 435       | 155311           | 41.4             | 565       | 572799           | 40.2             | 695       | 107458           | 0.0              | 825       | 16381            | 0.0              | 955       | 24823            | 0.0              |
| 440       | 239817           | 80.1             | 570       | 615361           | 30.1             | 700       | 93549            | 0.0              | 830       | 16149            | 0.0              | 960       | 19499            | 0.0              |
| 445       | 368265           | 145.3            | 575       | 659689           | 22.0             | 705       | 81608            | 0.0              | 835       | 16687            | 0.0              | 965       | 27077            | 0.0              |
| 450       | 439895           | 202.7            | 580       | 700037           | 15.7             | 710       | 71559            | 0.0              | 840       | 16206            | 0.0              | 970       | 28727            | 0.0              |
| 455       | 329010           | 172.4            | 585       | 734518           | 10.9             | 715       | 65193            | 0.0              | 845       | 16062            | 0.0              | 975       | 21725            | 0.0              |
| 460       | 207545           | 122.3            | 590       | 760906           | 7.5              | 720       | 58466            | 0.0              | 850       | 18530            | 0.0              | 980       | 33536            | 0.0              |
| 465       | 154577           | 101.0            | 595       | 763605           | 4.9              | 725       | 52265            | 0.0              | 855       | 17709            | 0.0              | 985       | 30537            | 0.0              |
| 470       | 110708           | 79.3             | 600       | 766048           | 3.2              | 730       | 46287            | 0.0              | 860       | 18086            | 0.0              | 990       | 25187            | 0.0              |
| 475       | 78445            | 59.9             | 605       | 756483           | 2.1              | 735       | 40164            | 0.0              | 865       | 19763            | 0.0              | 995       | 35676            | 0.0              |
| 480       | 68887            | 55.4             | 610       | 730981           | 1.3              | 740       | 35097            | 0.0              | 870       | 19416            | 0.0              | 1000      | 32909            | 0.0              |
| 485       | 69832            | 57.6             | 615       | 694682           | 0.8              | 745       | 32334            | 0.0              | 875       | 19352            | 0.0              |           |                  |                  |

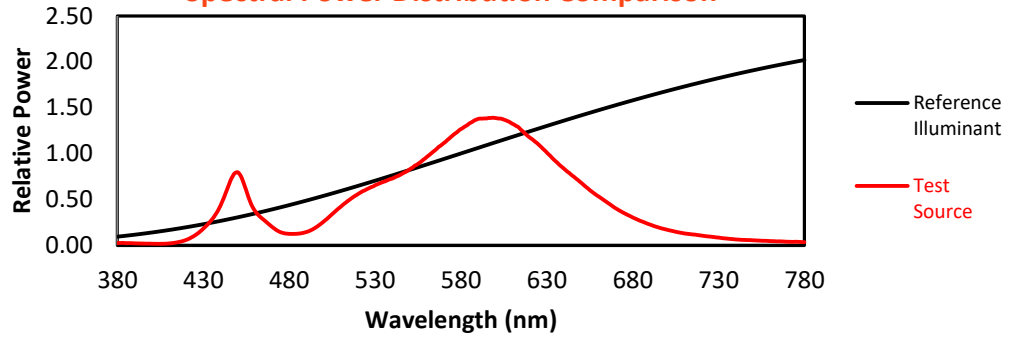
REPORT NUMBER: SP1-2104-215-6

TM-30-18

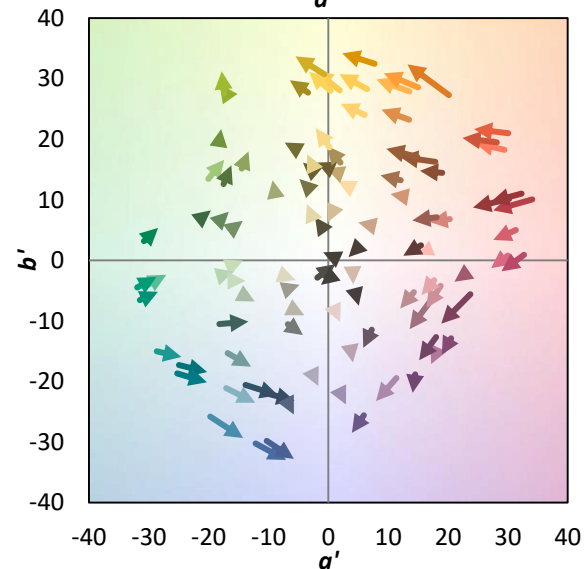
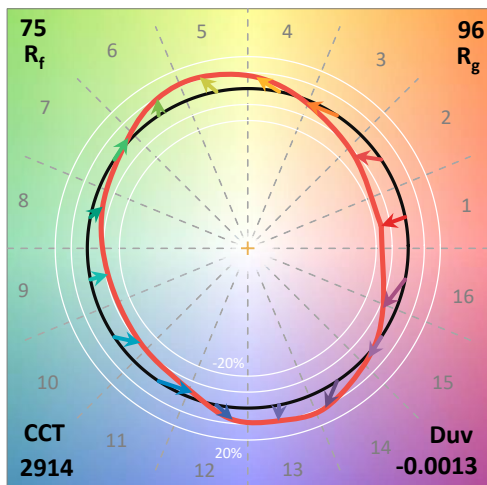
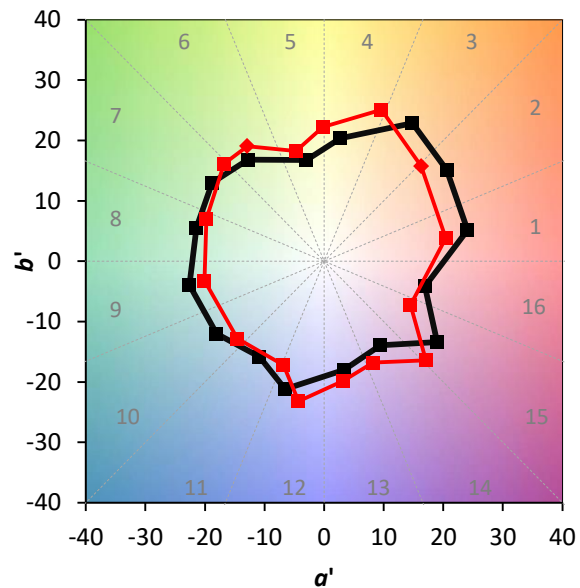
### Summary

$R_f = 75.3$   
 $R_g = 95.7$   
 CIE  $R_a = 73.2$   
 $R_g = -27.2$

### Spectral Power Distribution Comparison



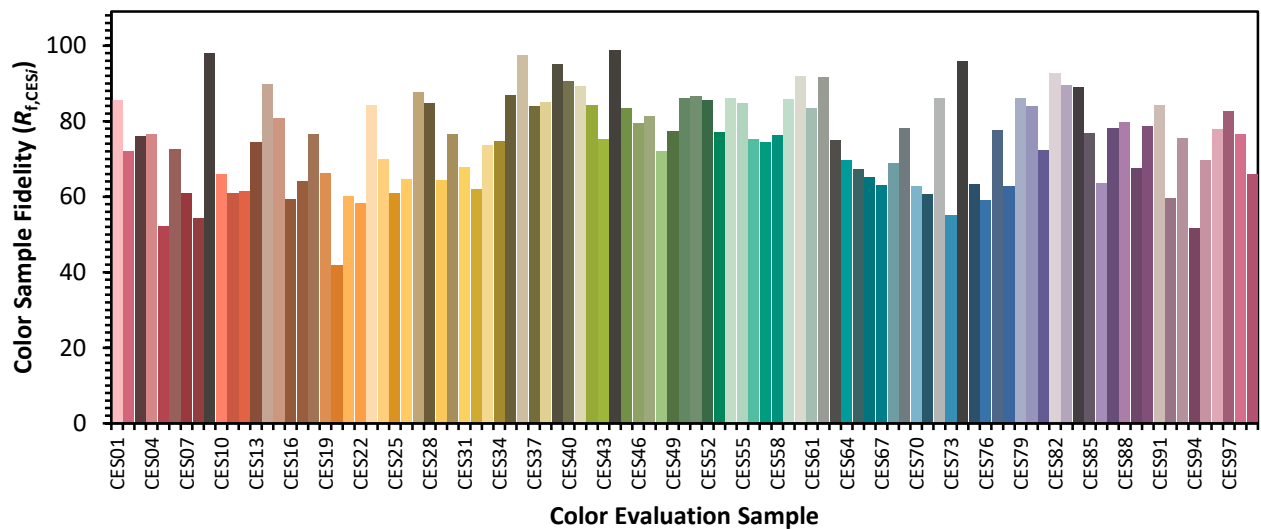
### Color Vector Graphics



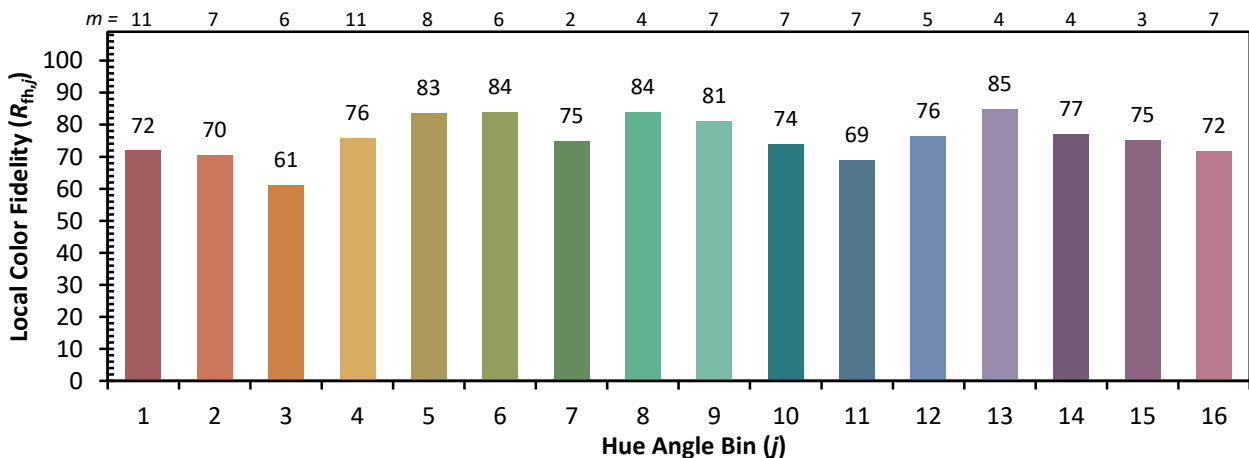
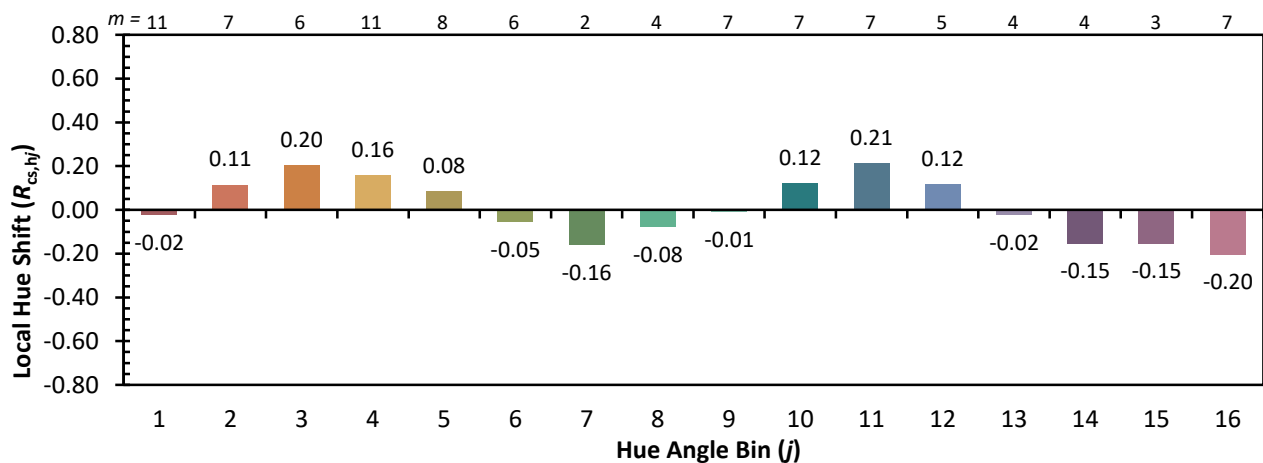
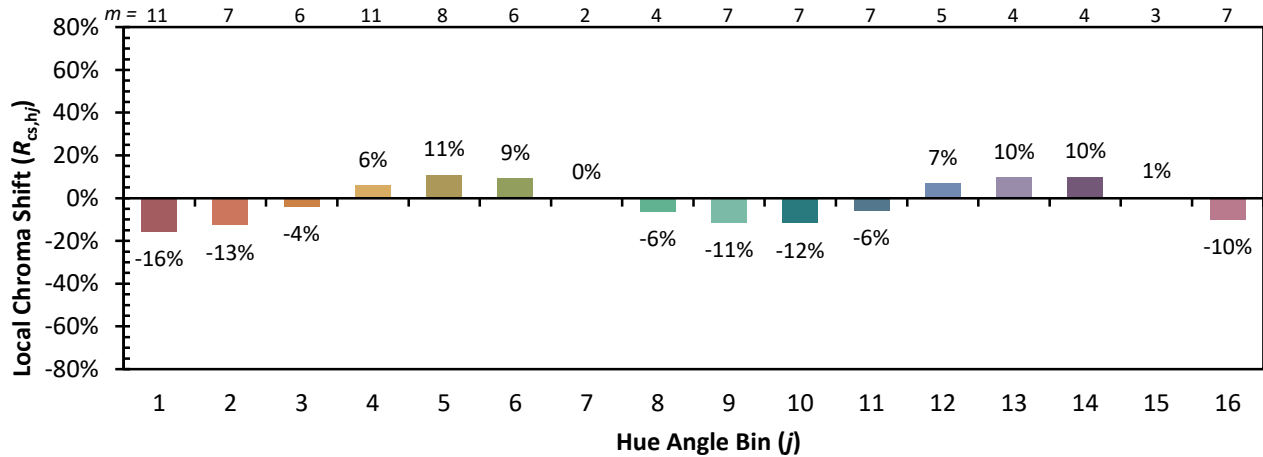


Individual Sample Fidelity Index ( $R_{f,i}$ )

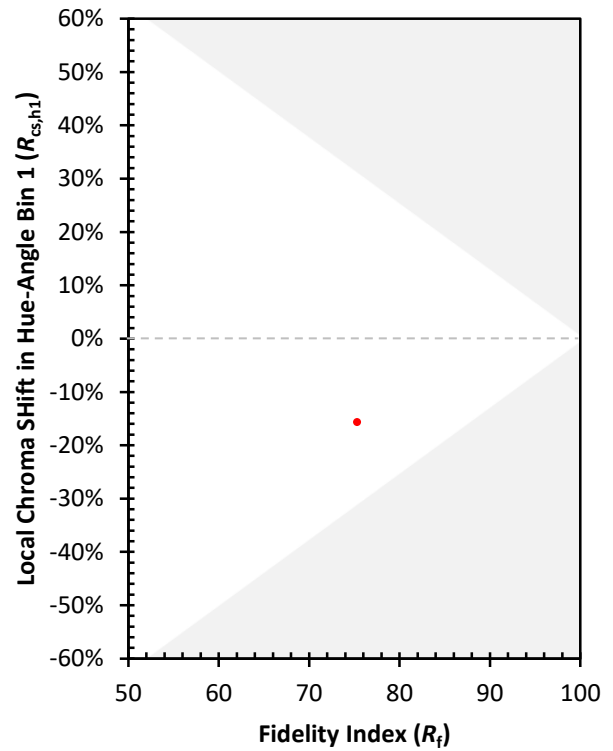
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 65 | CES51 = 87 | CES76 = 59 |
| CES02 = 63 | CES27 = 88 | CES52 = 86 | CES77 = 78 |
| CES03 = 31 | CES28 = 85 | CES53 = 77 | CES78 = 63 |
| CES04 = 71 | CES29 = 64 | CES54 = 86 | CES79 = 86 |
| CES05 = 49 | CES30 = 77 | CES55 = 85 | CES80 = 84 |
| CES06 = 51 | CES31 = 68 | CES56 = 75 | CES81 = 72 |
| CES07 = 42 | CES32 = 62 | CES57 = 75 | CES82 = 93 |
| CES08 = 40 | CES33 = 74 | CES58 = 76 | CES83 = 89 |
| CES09 = 29 | CES34 = 75 | CES59 = 86 | CES84 = 89 |
| CES10 = 76 | CES35 = 87 | CES60 = 92 | CES85 = 77 |
| CES11 = 59 | CES36 = 98 | CES61 = 84 | CES86 = 64 |
| CES12 = 65 | CES37 = 84 | CES62 = 92 | CES87 = 78 |
| CES13 = 43 | CES38 = 85 | CES63 = 75 | CES88 = 80 |
| CES14 = 74 | CES39 = 95 | CES64 = 70 | CES89 = 67 |
| CES15 = 71 | CES40 = 90 | CES65 = 67 | CES90 = 79 |
| CES16 = 47 | CES41 = 89 | CES66 = 65 | CES91 = 84 |
| CES17 = 50 | CES42 = 84 | CES67 = 63 | CES92 = 60 |
| CES18 = 56 | CES43 = 75 | CES68 = 69 | CES93 = 75 |
| CES19 = 73 | CES44 = 99 | CES69 = 78 | CES94 = 52 |
| CES20 = 66 | CES45 = 83 | CES70 = 63 | CES95 = 70 |
| CES21 = 87 | CES46 = 80 | CES71 = 61 | CES96 = 78 |
| CES22 = 79 | CES47 = 81 | CES72 = 86 | CES97 = 83 |
| CES23 = 92 | CES48 = 72 | CES73 = 55 | CES98 = 77 |
| CES24 = 91 | CES49 = 77 | CES74 = 96 | CES99 = 66 |
| CES25 = 73 | CES50 = 86 | CES75 = 63 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)