

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: STREETWORKS

Report Number: P510640

Luminaire Tested: **CST-CA6-230-722-U-T4-HSS**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510640  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-17)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: STREETWORKS  
Catalog Number: CST-CA6-230-722-U-T4-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (6) 2200K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 24849 lumens  
Efficiency: N/A  
Efficacy: 109.1 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B2 - U0 - G5

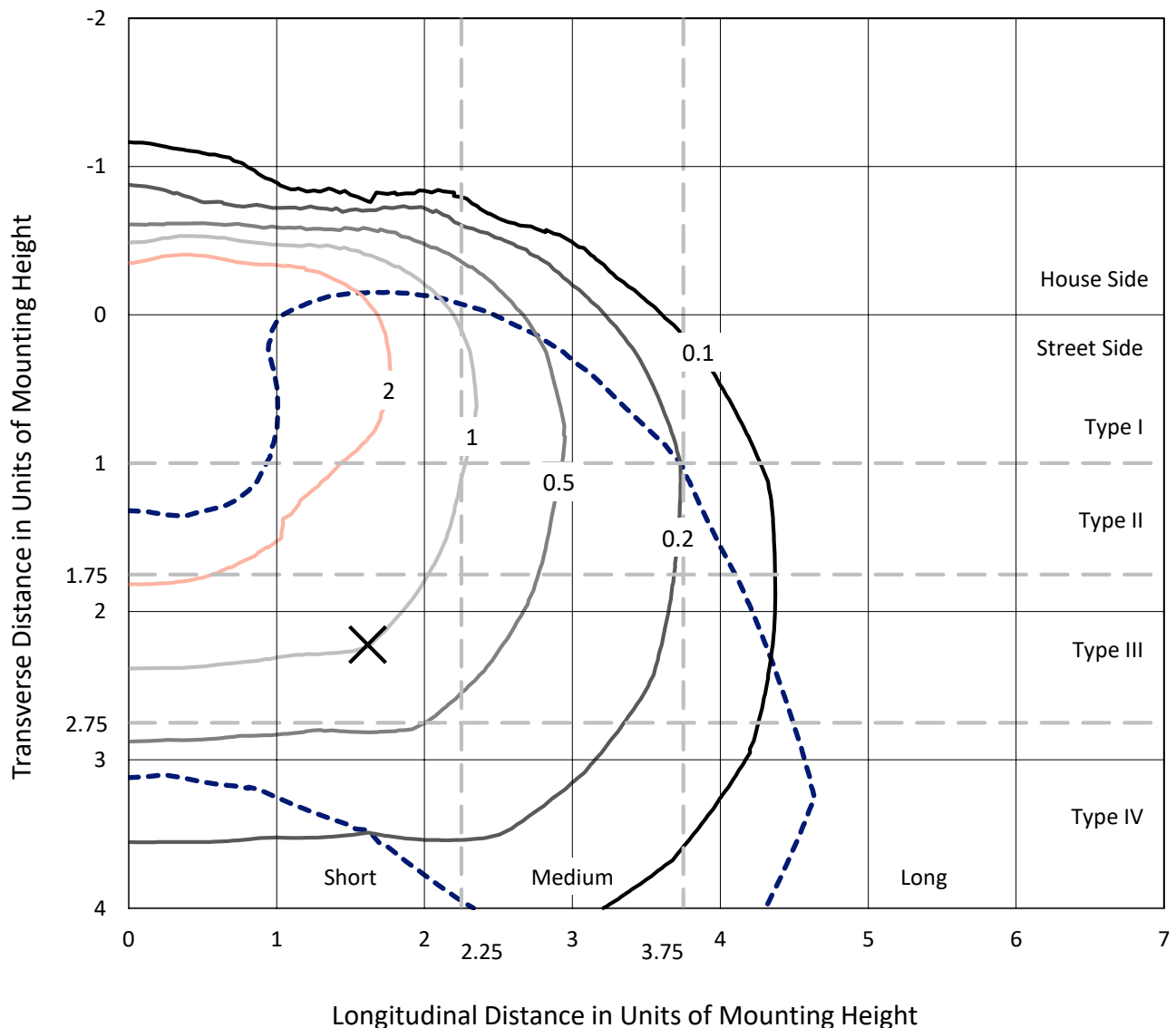
Input Watts (W): 227.8  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



REPORT NUMBER: P510640  
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## Iso-Footcandle Lines of Horizontal Illumination

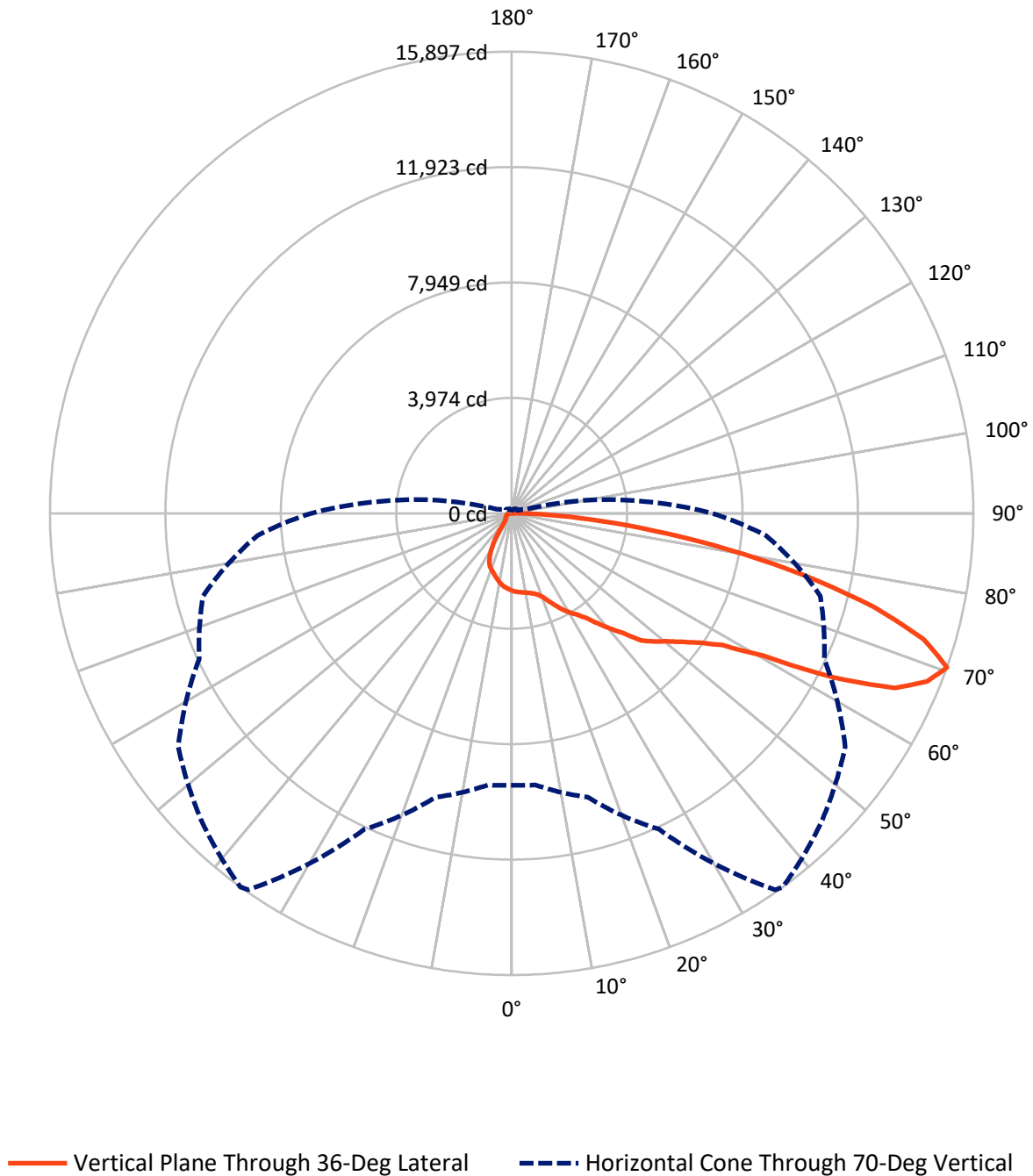
✕ Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 4.9 fc  
 Type IV - Short - N/A

REPORT NUMBER: P510640  
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## Luminous Intensity Polar Plot



FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE

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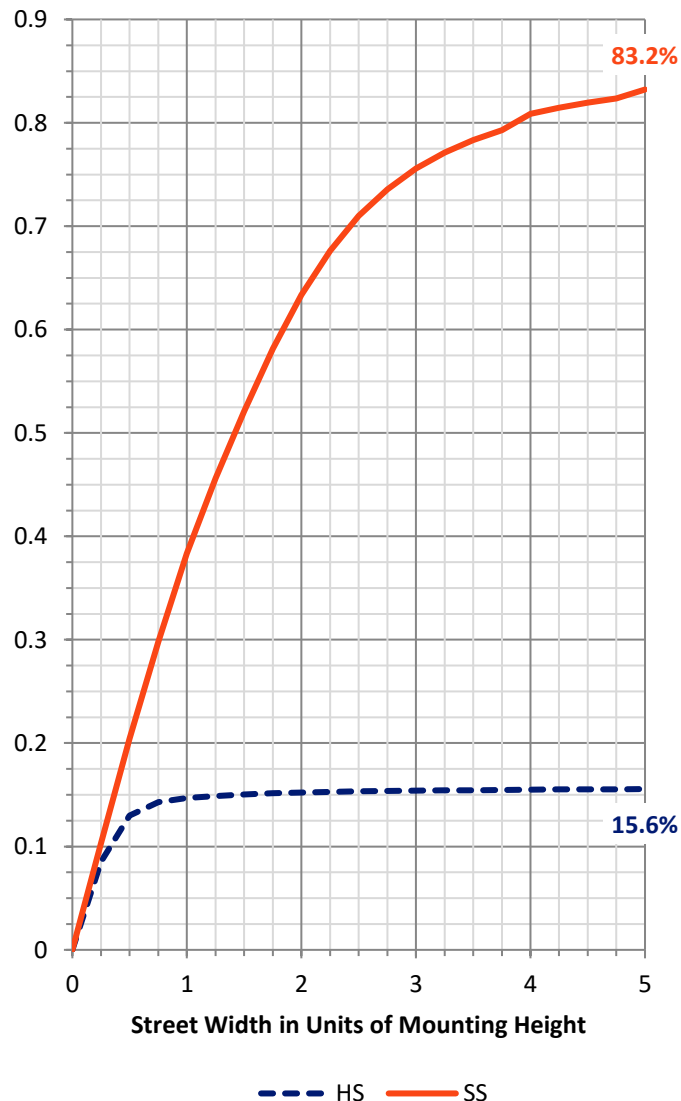
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 3921.4   | 0.0    | 3921.4  |
|                    | % Fixture | 15.8     | 0.0    | 15.8    |
| <b>Street Side</b> | Lumens    | 20927.6  | 0.0    | 20927.6 |
|                    | % Fixture | 84.2     | 0.0    | 84.2    |
| <b>Total</b>       | Lumens    | 24849.0  | 0.0    | 24849.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 252.5   | 1.0       |
| 10°-20°   | 750.9   | 3.0       |
| 20°-30°   | 1350.4  | 5.4       |
| 30°-40°   | 2136.9  | 8.6       |
| 40°-50°   | 3339.6  | 13.4      |
| 50°-60°   | 4795.6  | 19.3      |
| 60°-70°   | 6504.8  | 26.2      |
| 70°-80°   | 4814.3  | 19.4      |
| 80°-90°   | 904.0   | 3.6       |
| 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°    | 24849.0 | 100.0     |
| 0°-180°   | 24849.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P510640

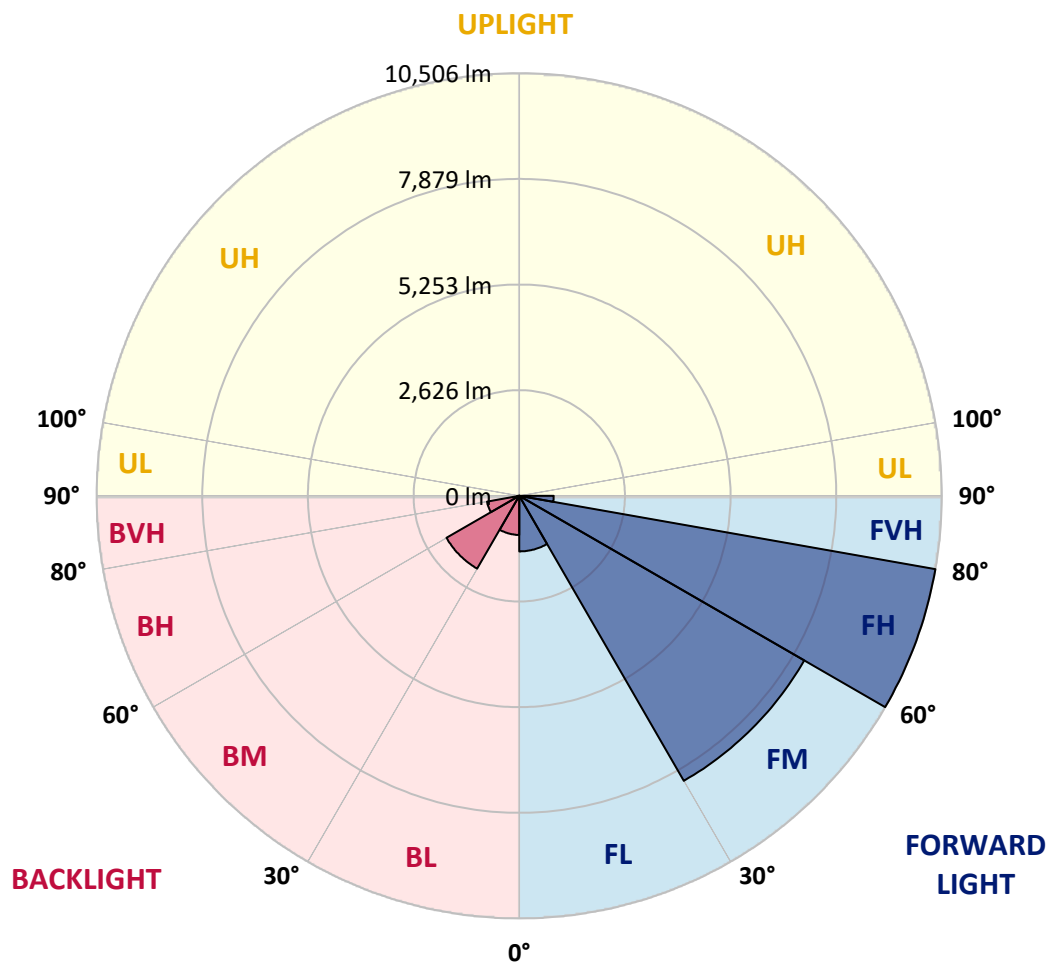
CATALOG NUMBER: CST-CA6-230-722-U-T4-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|---------|-----------|-------------------------|------|----------|
|      |             |         |           | B                       | U    | G        |
| FL   | (0°-30°)    | 1382.1  | 5.6       |                         |      |          |
| FM   | (30°-60°)   | 8182.6  | 32.9      |                         |      |          |
| FH   | (60°-80°)   | 10505.9 | 42.3      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 857.1   | 3.4       |                         |      | G5       |
| BL   | (0°-30°)    | 971.7   | 3.9       | B2/1000                 |      |          |
| BM   | (30°-60°)   | 2089.6  | 8.4       | B2/2500                 |      |          |
| BH   | (60°-80°)   | 813.2   | 3.3       | B2/1000                 |      | G2/1000  |
| BVH  | (80°-90°)   | 46.9    | 0.2       |                         |      | G1/100   |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |          |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |          |

**BUG Rating: B2-U0-G5**

Type IV Short



FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 36°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  | 2662.4  |
| 2.5°  | 2716.4  | 2710.6  | 2706.0  | 2707.8  | 2704.3  | 2706.6  | 2701.5  | 2695.1  | 2680.2  | 2673.9  | 2671.1  |
| 5°    | 2740.5  | 2738.7  | 2734.2  | 2730.7  | 2724.4  | 2722.1  | 2716.4  | 2721.5  | 2713.5  | 2692.9  | 2680.8  |
| 7.5°  | 2754.8  | 2754.2  | 2749.1  | 2741.6  | 2745.1  | 2747.9  | 2753.7  | 2745.6  | 2735.3  | 2725.6  | 2700.9  |
| 10°   | 2761.1  | 2761.1  | 2754.8  | 2758.8  | 2776.6  | 2778.3  | 2781.2  | 2786.4  | 2776.6  | 2762.3  | 2737.6  |
| 12.5° | 2777.2  | 2776.0  | 2778.3  | 2791.5  | 2809.9  | 2813.9  | 2828.2  | 2828.2  | 2829.4  | 2820.8  | 2792.1  |
| 15°   | 2817.3  | 2817.3  | 2822.5  | 2834.6  | 2866.1  | 2868.4  | 2889.6  | 2908.6  | 2910.8  | 2898.2  | 2876.4  |
| 17.5° | 2910.3  | 2908.0  | 2905.1  | 2912.6  | 2946.4  | 2947.6  | 2984.3  | 3008.4  | 3014.7  | 3028.5  | 3025.0  |
| 20°   | 3087.0  | 3084.7  | 3084.1  | 3084.7  | 3082.4  | 3078.9  | 3115.1  | 3140.9  | 3173.0  | 3197.1  | 3209.2  |
| 22.5° | 3340.0  | 3334.8  | 3334.8  | 3306.7  | 3284.9  | 3288.3  | 3294.1  | 3308.4  | 3350.9  | 3393.3  | 3438.6  |
| 25°   | 3612.5  | 3609.0  | 3611.9  | 3540.2  | 3510.9  | 3522.4  | 3514.9  | 3537.3  | 3593.0  | 3629.7  | 3677.9  |
| 27.5° | 3835.0  | 3840.2  | 3824.1  | 3768.5  | 3749.6  | 3758.2  | 3741.0  | 3805.2  | 3866.6  | 3930.9  | 4003.7  |
| 30°   | 4112.1  | 4084.6  | 4045.0  | 3977.3  | 3970.4  | 3971.6  | 3970.4  | 4073.7  | 4201.1  | 4292.8  | 4393.8  |
| 32.5° | 4474.1  | 4478.7  | 4389.8  | 4230.3  | 4171.8  | 4163.8  | 4186.7  | 4338.2  | 4510.3  | 4713.9  | 4847.0  |
| 35°   | 4840.1  | 4847.6  | 4782.8  | 4616.4  | 4449.5  | 4424.2  | 4390.4  | 4587.1  | 4835.5  | 5244.0  | 5444.8  |
| 37.5° | 5228.5  | 5254.9  | 5178.0  | 5029.4  | 4831.5  | 4808.0  | 4648.0  | 4841.3  | 5208.4  | 5871.6  | 6134.9  |
| 40°   | 5748.3  | 5720.2  | 5627.2  | 5438.5  | 5254.3  | 5216.5  | 5030.6  | 5132.1  | 5688.0  | 6657.6  | 6848.6  |
| 42.5° | 6131.5  | 6123.5  | 6044.9  | 5858.4  | 5673.1  | 5642.7  | 5493.0  | 5603.1  | 6292.1  | 7454.4  | 7539.9  |
| 45°   | 6435.5  | 6484.9  | 6483.2  | 6366.1  | 6261.7  | 6244.5  | 6156.2  | 6318.5  | 7022.4  | 8206.5  | 8164.6  |
| 47.5° | 6705.7  | 6736.1  | 6687.4  | 6636.3  | 6587.6  | 6593.3  | 6658.7  | 6992.6  | 7768.8  | 8863.3  | 8678.0  |
| 50°   | 7148.0  | 7109.0  | 6890.5  | 6851.5  | 6920.3  | 6923.2  | 7122.2  | 7636.2  | 8590.9  | 9431.3  | 9112.9  |
| 52.5° | 7737.8  | 7695.3  | 7246.1  | 7179.6  | 7342.5  | 7354.6  | 7685.6  | 8277.6  | 9438.7  | 9974.0  | 9545.5  |
| 55°   | 8615.5  | 8516.8  | 8035.5  | 7737.2  | 7811.8  | 7860.6  | 8261.6  | 8894.3  | 10102.5 | 10452.4 | 9873.0  |
| 57.5° | 9693.5  | 9765.2  | 9518.5  | 8844.4  | 8534.1  | 8552.4  | 8920.7  | 9484.6  | 10688.2 | 10871.2 | 10064.6 |
| 60°   | 10832.8 | 10815.6 | 10918.8 | 10634.9 | 10040.5 | 9941.9  | 9754.3  | 10087.0 | 11142.0 | 11224.0 | 10262.0 |
| 62.5° | 11457.0 | 11557.3 | 11901.6 | 11958.3 | 12494.7 | 12442.5 | 11163.8 | 10833.9 | 11666.3 | 11445.5 | 10315.9 |
| 65°   | 11453.5 | 11497.1 | 12137.9 | 12842.4 | 14518.1 | 14503.2 | 13908.9 | 11914.2 | 12057.0 | 11563.7 | 10208.1 |
| 67.5° | 10713.5 | 10781.2 | 11530.4 | 12906.6 | 15453.2 | 15435.4 | 15024.7 | 13432.7 | 12179.8 | 11421.4 | 9704.9  |
| 70°   | 9364.2  | 9387.1  | 10118.0 | 12001.9 | 15829.0 | 15897.2 | 15063.1 | 14015.6 | 11874.6 | 10998.6 | 8787.6  |
| 72.5° | 7725.2  | 7677.6  | 8392.4  | 10249.4 | 14872.1 | 14831.3 | 14426.3 | 13319.7 | 11360.6 | 10177.6 | 7167.0  |
| 75°   | 5688.0  | 5820.6  | 6461.9  | 8229.4  | 12733.4 | 12882.5 | 13062.1 | 12254.9 | 10089.9 | 8387.8  | 4956.0  |
| 77.5° | 3755.9  | 3924.5  | 4572.8  | 6170.5  | 10080.7 | 10312.5 | 10777.7 | 10423.2 | 8208.2  | 6016.8  | 2360.1  |
| 80°   | 1940.8  | 2068.1  | 2651.5  | 4094.4  | 7226.6  | 7561.1  | 8414.2  | 7894.4  | 5819.4  | 2720.4  | 528.4   |
| 82.5° | 734.3   | 717.7   | 1188.1  | 2343.5  | 4633.6  | 4937.7  | 5557.8  | 4734.0  | 2071.0  | 477.9   | 245.5   |
| 85°   | 322.4   | 341.3   | 492.2   | 1068.8  | 2649.3  | 2688.8  | 3148.4  | 1845.5  | 303.5   | 228.3   | 166.9   |
| 87.5° | 139.4   | 160.1   | 206.5   | 307.5   | 893.8   | 1032.0  | 1277.0  | 586.3   | 91.8    | 79.2    | 83.8    |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |

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CATALOG NUMBER: CST-CA6-230-722-U-T4-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 | 2662.4 |
| 2.5°  | 2665.9 | 2662.4 | 2656.7 | 2642.4 | 2618.8 | 2616.0 | 2613.7 | 2611.4 | 2606.8 | 2609.1 | 2622.3 |
| 5°    | 2671.6 | 2665.3 | 2644.7 | 2624.0 | 2603.4 | 2585.0 | 2562.6 | 2554.0 | 2542.5 | 2535.1 | 2548.9 |
| 7.5°  | 2691.1 | 2677.9 | 2647.5 | 2619.4 | 2563.2 | 2536.2 | 2507.6 | 2473.7 | 2449.6 | 2434.1 | 2447.9 |
| 10°   | 2723.8 | 2707.2 | 2669.3 | 2611.4 | 2545.4 | 2471.4 | 2420.9 | 2364.7 | 2318.8 | 2306.2 | 2318.8 |
| 12.5° | 2777.2 | 2752.5 | 2708.3 | 2629.7 | 2512.7 | 2415.8 | 2320.0 | 2246.0 | 2172.0 | 2150.7 | 2157.0 |
| 15°   | 2863.8 | 2844.3 | 2776.6 | 2668.2 | 2513.3 | 2365.3 | 2223.0 | 2103.7 | 2006.7 | 1972.9 | 1970.6 |
| 17.5° | 3002.6 | 2982.0 | 2904.0 | 2744.5 | 2533.9 | 2325.7 | 2127.8 | 1945.9 | 1799.1 | 1724.5 | 1712.4 |
| 20°   | 3201.7 | 3173.0 | 3054.8 | 2856.9 | 2578.7 | 2308.5 | 2039.4 | 1795.0 | 1566.7 | 1426.7 | 1405.5 |
| 22.5° | 3423.1 | 3392.7 | 3218.3 | 2943.5 | 2610.8 | 2274.6 | 1955.1 | 1628.1 | 1327.5 | 1156.5 | 1132.4 |
| 25°   | 3698.5 | 3632.0 | 3375.0 | 3025.6 | 2603.4 | 2203.5 | 1818.0 | 1401.5 | 1075.6 | 927.6  | 911.6  |
| 27.5° | 3970.4 | 3886.1 | 3534.4 | 3068.6 | 2570.7 | 2090.5 | 1617.2 | 1136.5 | 842.2  | 737.2  | 724.0  |
| 30°   | 4307.8 | 4144.8 | 3676.1 | 3088.7 | 2488.0 | 1921.3 | 1348.1 | 864.0  | 630.5  | 558.2  | 545.6  |
| 32.5° | 4708.8 | 4462.1 | 3809.2 | 3066.3 | 2350.4 | 1663.1 | 1048.1 | 632.8  | 468.7  | 423.4  | 422.8  |
| 35°   | 5237.7 | 4851.0 | 3955.5 | 2992.9 | 2139.3 | 1384.9 | 734.9  | 432.6  | 365.4  | 349.9  | 352.8  |
| 37.5° | 5856.1 | 5377.7 | 4104.1 | 2872.4 | 1900.6 | 1059.6 | 489.9  | 333.3  | 321.3  | 321.8  | 322.4  |
| 40°   | 6508.4 | 5959.4 | 4304.3 | 2703.2 | 1610.9 | 767.0  | 352.8  | 299.5  | 298.9  | 304.6  | 306.3  |
| 42.5° | 7131.4 | 6524.5 | 4551.0 | 2477.7 | 1307.4 | 507.1  | 305.8  | 285.7  | 278.2  | 280.5  | 282.3  |
| 45°   | 7710.3 | 7009.2 | 4761.0 | 2258.0 | 982.1  | 362.0  | 300.0  | 269.6  | 258.2  | 257.0  | 258.2  |
| 47.5° | 8176.7 | 7397.6 | 4888.9 | 1999.8 | 699.9  | 300.6  | 288.0  | 254.7  | 238.7  | 235.2  | 233.5  |
| 50°   | 8531.8 | 7686.2 | 4935.4 | 1707.3 | 473.3  | 286.8  | 271.9  | 237.5  | 218.0  | 218.6  | 218.6  |
| 52.5° | 8878.3 | 7948.3 | 4881.4 | 1412.4 | 348.2  | 274.8  | 261.0  | 223.7  | 203.1  | 214.0  | 216.9  |
| 55°   | 9127.8 | 8058.5 | 4724.3 | 1093.4 | 290.3  | 259.9  | 249.0  | 207.7  | 193.3  | 211.1  | 216.9  |
| 57.5° | 9273.5 | 8145.1 | 4435.7 | 789.4  | 266.2  | 245.5  | 233.5  | 192.8  | 179.6  | 184.2  | 187.0  |
| 60°   | 9364.2 | 8024.1 | 4054.2 | 539.8  | 253.6  | 234.1  | 218.0  | 183.0  | 165.2  | 154.3  | 152.6  |
| 62.5° | 9314.3 | 7721.2 | 3551.6 | 371.2  | 240.4  | 221.4  | 204.8  | 173.8  | 150.3  | 136.0  | 134.8  |
| 65°   | 8907.5 | 7160.7 | 2726.7 | 300.6  | 232.3  | 215.7  | 196.8  | 165.2  | 140.0  | 126.2  | 124.5  |
| 67.5° | 8153.1 | 6153.3 | 1592.5 | 267.3  | 228.9  | 210.0  | 190.5  | 157.2  | 134.2  | 119.3  | 117.0  |
| 70°   | 6913.4 | 4628.4 | 533.5  | 238.7  | 228.3  | 209.4  | 185.3  | 151.5  | 127.9  | 112.4  | 110.1  |
| 72.5° | 4987.6 | 2792.7 | 259.9  | 210.0  | 213.4  | 200.8  | 181.3  | 146.9  | 123.9  | 104.4  | 100.4  |
| 75°   | 2834.6 | 909.3  | 234.6  | 181.3  | 198.5  | 191.6  | 179.0  | 147.4  | 125.6  | 94.7   | 90.1   |
| 77.5° | 806.6  | 265.6  | 226.6  | 154.3  | 187.6  | 197.9  | 167.5  | 133.1  | 128.5  | 87.8   | 82.0   |
| 80°   | 272.5  | 236.4  | 218.6  | 119.9  | 151.5  | 163.5  | 145.1  | 117.0  | 129.7  | 79.7   | 74.0   |
| 82.5° | 218.6  | 237.5  | 183.6  | 95.8   | 115.3  | 123.9  | 115.3  | 105.0  | 105.0  | 71.1   | 66.5   |
| 85°   | 175.0  | 220.3  | 116.5  | 76.3   | 86.1   | 95.2   | 81.5   | 78.6   | 73.4   | 59.7   | 57.9   |
| 87.5° | 101.5  | 68.8   | 48.2   | 39.0   | 36.1   | 36.7   | 31.6   | 37.9   | 46.5   | 40.7   | 40.2   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

STREETWORKS

Report Number: SP1-2104-215-4

Luminaire Tested: CST-CA10-630-722-U-T3

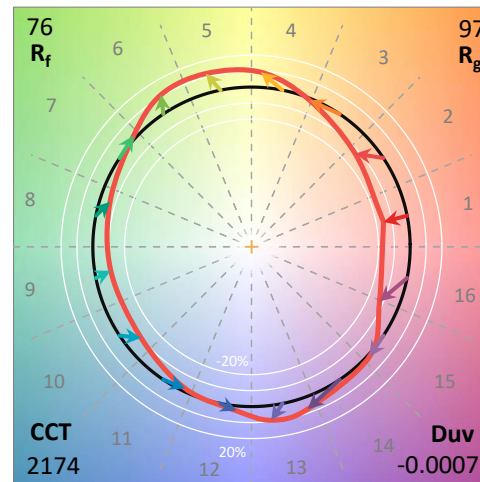
Test Date: 04/20/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 04/20/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: STREETWORKS  
 Catalog Number: **CST-CA10-630-722-U-T3**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 2174    | CRI (Ra): | 72.8 |      |       |
| CIE u':                   | 0.2919  | R1:       | 70.2 | R9:  | -23.3 |
| CIE v':                   | 0.5354  | R2:       | 86.8 | R10: | 71.8  |
| Duv:                      | -0.0007 | R3:       | 92.8 | R11: | 63.6  |
| CIE x:                    | 0.5067  | R4:       | 66.8 | R12: | 66.0  |
| CIE y:                    | 0.4131  | R5:       | 69.1 | R13: | 73.5  |
| CIE z:                    | 0.0802  | R6:       | 84.7 | R14: | 96.9  |
| Peak Wavelength (nm):     | 608     | R7:       | 73.2 |      |       |
| Dominant Wavelength (nm): | 587     | R8:       | 39.0 |      |       |
| Purity:                   | 76.7    |           |      |      |       |
| Rf:                       | 75.7    |           |      |      |       |
| Rg:                       | 96.7    |           |      |      |       |



### Test Conditions

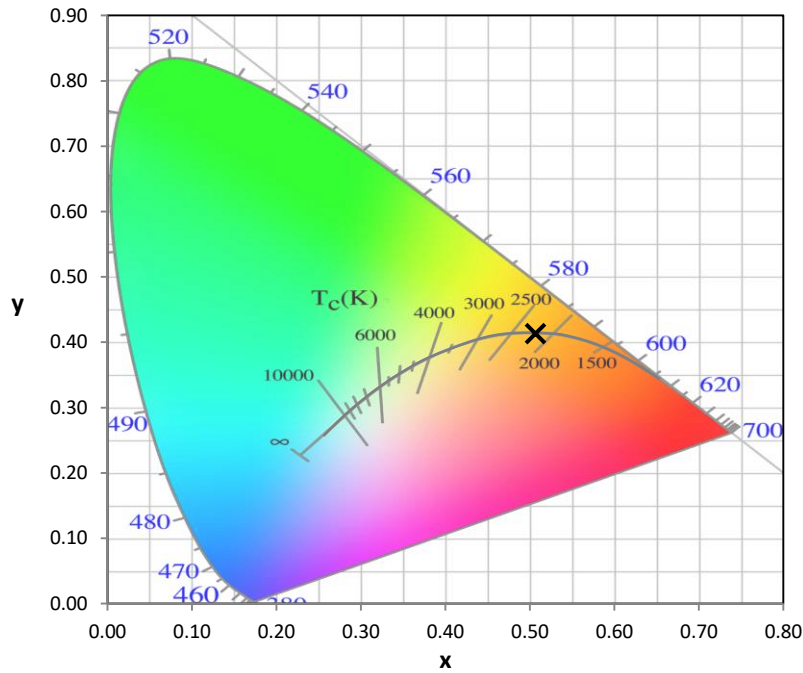
Stabilization Time: 79M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.7/32%  
 Sphere Temperature (°C): 24.8

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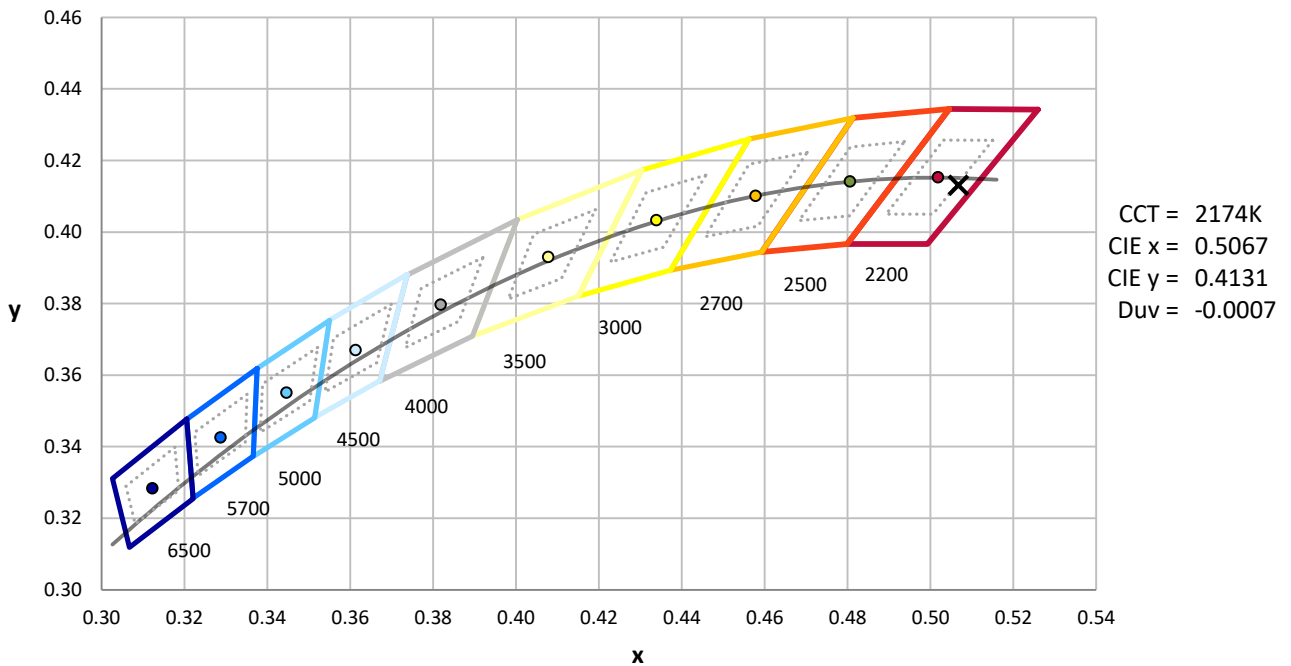
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date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

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**CIE 1931 Chromaticity Diagram**



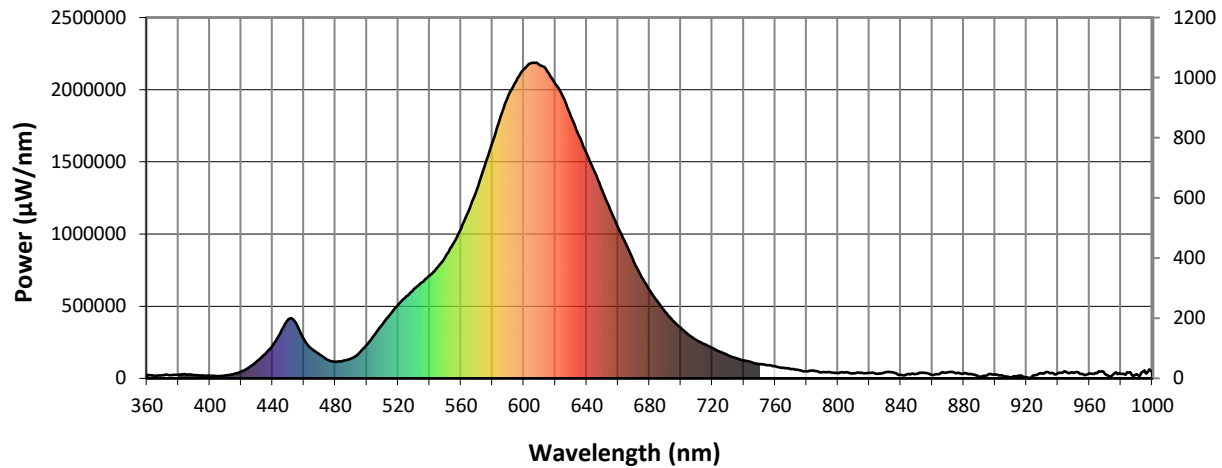
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 2200K 7-step quadrangle

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### Photopic Flux vs. Wavelength

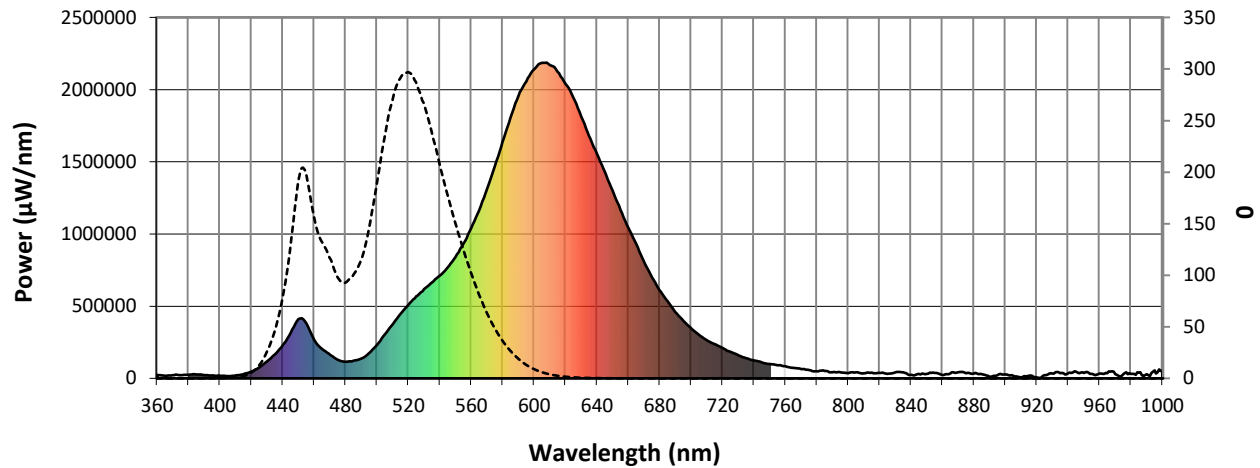


#####

| 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       | 23398            | 0.0              | 490       | 137099           | 19.5             | 620       | 2038916          | 530.6            | 750       | 99721            | 0.0              | 880       | 32326            | 0.0              |
| 365       | 18626            | 0.0              | 495       | 174286           | 31.6             | 625       | 1946743          | 429.5            | 755       | 91432            | 0.0              | 885       | 29783            | 0.0              |
| 370       | 21702            | 0.0              | 500       | 232711           | 51.3             | 630       | 1814508          | 328.4            | 760       | 83300            | 0.0              | 890       | 12135            | 0.0              |
| 375       | 22606            | 0.0              | 505       | 303528           | 84.9             | 635       | 1681061          | 252.6            | 765       | 72172            | 0.0              | 895       | 22953            | 0.0              |
| 380       | 25296            | 0.0              | 510       | 374456           | 128.6            | 640       | 1557170          | 186.1            | 770       | 65008            | 0.0              | 900       | 27214            | 0.0              |
| 385       | 27032            | 0.0              | 515       | 445274           | 184.5            | 645       | 1430182          | 137.7            | 775       | 56809            | 0.0              | 905       | 17038            | 0.0              |
| 390       | 22156            | 0.0              | 520       | 510296           | 247.5            | 650       | 1300435          | 95.0             | 780       | 49368            | 0.0              | 910       | 6896             | 0.0              |
| 395       | 20190            | 0.0              | 525       | 566771           | 304.3            | 655       | 1165554          | 66.9             | 785       | 51733            | 0.0              | 915       | 17142            | 0.0              |
| 400       | 18423            | 0.0              | 530       | 617892           | 363.8            | 660       | 1044122          | 43.5             | 790       | 41796            | 0.0              | 920       | 7675             | 0.0              |
| 405       | 16139            | 0.0              | 535       | 664903           | 412.3            | 665       | 932131           | 29.6             | 795       | 42601            | 0.0              | 925       | 21587            | 0.0              |
| 410       | 19812            | 0.0              | 540       | 711603           | 463.7            | 670       | 808971           | 17.7             | 800       | 36382            | 0.0              | 930       | 32992            | 0.0              |
| 415       | 29121            | 0.1              | 545       | 768835           | 511.7            | 675       | 701208           | 11.7             | 805       | 41419            | 0.0              | 935       | 35464            | 0.0              |
| 420       | 46007            | 0.1              | 550       | 841179           | 571.6            | 680       | 610741           | 7.1              | 810       | 35865            | 0.0              | 940       | 34460            | 0.0              |
| 425       | 76329            | 0.4              | 555       | 932641           | 637.0            | 685       | 533825           | 4.6              | 815       | 39722            | 0.0              | 945       | 46305            | 0.0              |
| 430       | 117696           | 0.9              | 560       | 1040487          | 707.1            | 690       | 459427           | 2.6              | 820       | 37236            | 0.0              | 950       | 38353            | 0.0              |
| 435       | 166890           | 2.0              | 565       | 1164360          | 774.2            | 695       | 399973           | 1.7              | 825       | 31566            | 0.0              | 955       | 30772            | 0.0              |
| 440       | 227762           | 3.6              | 570       | 1307677          | 850.3            | 700       | 347460           | 1.0              | 830       | 42647            | 0.0              | 960       | 32413            | 0.0              |
| 445       | 315427           | 6.6              | 575       | 1470810          | 915.2            | 705       | 302187           | 0.6              | 835       | 41433            | 0.0              | 965       | 35310            | 0.0              |
| 450       | 409560           | 10.6             | 580       | 1637734          | 973.2            | 710       | 262909           | 0.4              | 840       | 24213            | 0.0              | 970       | 28048            | 0.0              |
| 455       | 381103           | 12.8             | 585       | 1807622          | 1004.4           | 715       | 236689           | 0.3              | 845       | 31358            | 0.0              | 975       | 26258            | 0.0              |
| 460       | 269221           | 11.0             | 590       | 1958195          | 1012.4           | 720       | 209675           | 0.1              | 850       | 30957            | 0.0              | 980       | 31067            | 0.0              |
| 465       | 203513           | 10.5             | 595       | 2055425          | 974.3            | 725       | 184999           | 0.1              | 855       | 38865            | 0.0              | 985       | 40288            | 0.0              |
| 470       | 163989           | 10.2             | 600       | 2141598          | 923.0            | 730       | 160261           | 0.1              | 860       | 23238            | 0.0              | 990       | 29366            | 0.0              |
| 475       | 129159           | 10.1             | 605       | 2185430          | 846.3            | 735       | 140736           | 0.0              | 865       | 32686            | 0.0              | 995       | 54854            | 0.0              |
| 480       | 115440           | 11.0             | 610       | 2170089          | 745.5            | 740       | 125207           | 0.0              | 870       | 41855            | 0.0              | 1000      | 50994            | 0.0              |
| 485       | 120959           | 14.3             | 615       | 2123505          | 641.1            | 745       | 110736           | 0.0              | 875       | 35838            | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



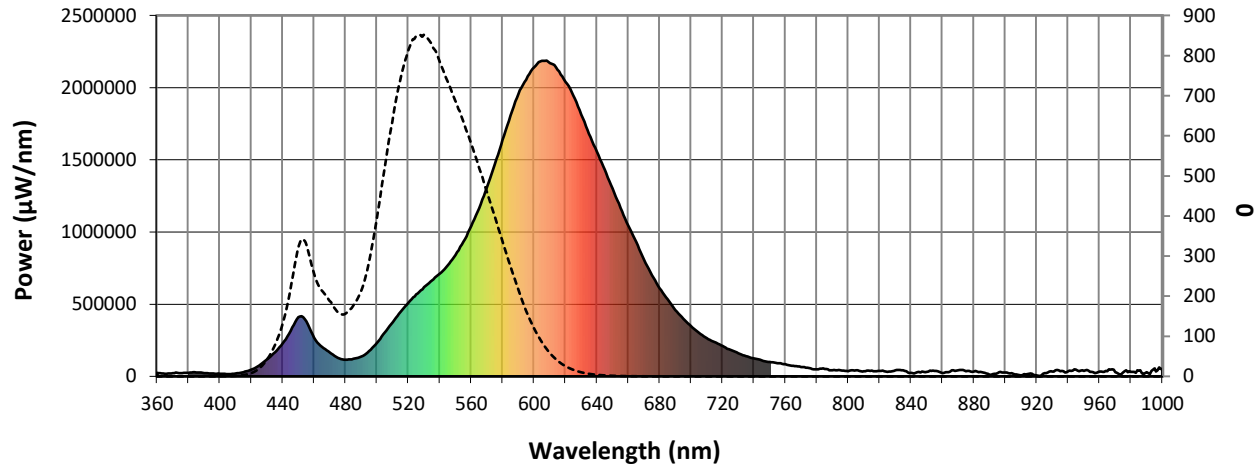
Scotopic Lumens: 72942.9

S/P: 0.88

| 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       | 23398            | 0.0              | 490       | 137099           | 211.1            | 620       | 2038916          | 25.5             | 750       | 99721            | 0.0              | 880       | 32326            | 0.0              |
| 365       | 18626            | 0.0              | 495       | 174286           | 281.7            | 625       | 1946743          | 16.4             | 755       | 91432            | 0.0              | 885       | 29783            | 0.0              |
| 370       | 21702            | 0.0              | 500       | 232711           | 389.3            | 630       | 1814508          | 10.3             | 760       | 83300            | 0.0              | 890       | 12135            | 0.0              |
| 375       | 22606            | 0.0              | 505       | 303528           | 516.0            | 635       | 1681061          | 6.4              | 765       | 72172            | 0.0              | 895       | 22953            | 0.0              |
| 380       | 25296            | 0.0              | 510       | 374456           | 634.7            | 640       | 1557170          | 4.0              | 770       | 65008            | 0.0              | 900       | 27214            | 0.0              |
| 385       | 27032            | 0.1              | 515       | 445274           | 738.0            | 645       | 1430182          | 2.4              | 775       | 56809            | 0.0              | 905       | 17038            | 0.0              |
| 390       | 22156            | 0.1              | 520       | 510296           | 811.1            | 650       | 1300435          | 1.5              | 780       | 49368            | 0.0              | 910       | 6896             | 0.0              |
| 395       | 20190            | 0.2              | 525       | 566771           | 847.9            | 655       | 1165554          | 0.9              | 785       | 51733            | 0.0              | 915       | 17142            | 0.0              |
| 400       | 18423            | 0.3              | 530       | 617892           | 851.9            | 660       | 1044122          | 0.6              | 790       | 41796            | 0.0              | 920       | 7675             | 0.0              |
| 405       | 16139            | 0.5              | 535       | 664903           | 828.5            | 665       | 932131           | 0.3              | 795       | 42601            | 0.0              | 925       | 21587            | 0.0              |
| 410       | 19812            | 1.2              | 540       | 711603           | 786.3            | 670       | 808971           | 0.2              | 800       | 36382            | 0.0              | 930       | 32992            | 0.0              |
| 415       | 29121            | 3.0              | 545       | 768835           | 737.2            | 675       | 701208           | 0.1              | 805       | 41419            | 0.0              | 935       | 35464            | 0.0              |
| 420       | 46007            | 7.6              | 550       | 841179           | 687.8            | 680       | 610741           | 0.1              | 810       | 35865            | 0.0              | 940       | 34460            | 0.0              |
| 425       | 76329            | 18.7             | 555       | 932641           | 637.4            | 685       | 533825           | 0.0              | 815       | 39722            | 0.0              | 945       | 46305            | 0.0              |
| 430       | 117696           | 40.1             | 560       | 1040487          | 581.6            | 690       | 459427           | 0.0              | 820       | 37236            | 0.0              | 950       | 38353            | 0.0              |
| 435       | 166890           | 74.6             | 565       | 1164360          | 522.4            | 695       | 399973           | 0.0              | 825       | 31566            | 0.0              | 955       | 30772            | 0.0              |
| 440       | 227762           | 127.3            | 570       | 1307677          | 461.5            | 700       | 347460           | 0.0              | 830       | 42647            | 0.0              | 960       | 32413            | 0.0              |
| 445       | 315427           | 211.2            | 575       | 1470810          | 400.6            | 705       | 302187           | 0.0              | 835       | 41433            | 0.0              | 965       | 35310            | 0.0              |
| 450       | 409560           | 317.4            | 580       | 1637734          | 337.4            | 710       | 262909           | 0.0              | 840       | 24213            | 0.0              | 970       | 28048            | 0.0              |
| 455       | 381103           | 333.0            | 585       | 1807622          | 276.3            | 715       | 236689           | 0.0              | 845       | 31358            | 0.0              | 975       | 26258            | 0.0              |
| 460       | 269221           | 260.0            | 590       | 1958195          | 218.0            | 720       | 209675           | 0.0              | 850       | 30957            | 0.0              | 980       | 31067            | 0.0              |
| 465       | 203513           | 214.9            | 595       | 2055425          | 163.9            | 725       | 184999           | 0.0              | 855       | 38865            | 0.0              | 985       | 40288            | 0.0              |
| 470       | 163989           | 188.8            | 600       | 2141598          | 120.7            | 730       | 160261           | 0.0              | 860       | 23238            | 0.0              | 990       | 29366            | 0.0              |
| 475       | 129159           | 161.5            | 605       | 2185430          | 85.9             | 735       | 140736           | 0.0              | 865       | 32686            | 0.0              | 995       | 54854            | 0.0              |
| 480       | 115440           | 155.9            | 610       | 2170089          | 58.8             | 740       | 125207           | 0.0              | 870       | 41855            | 0.0              | 1000      | 50994            | 0.0              |
| 485       | 120959           | 175.3            | 615       | 2123505          | 39.3             | 745       | 110736           | 0.0              | 875       | 35838            | 0.0              |           |                  |                  |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 23955.7**      **M/P: 0.29**

| 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       | 23398            | 0.0              | 490       | 137099           | 114.1            | 620       | 2038916          | 1.6              | 750       | 99721            | 0.0              | 880       | 32326            | 0.0              |
| 365       | 18626            | 0.0              | 495       | 174286           | 143.9            | 625       | 1946743          | 1.0              | 755       | 91432            | 0.0              | 885       | 29783            | 0.0              |
| 370       | 21702            | 0.0              | 500       | 232711           | 187.1            | 630       | 1814508          | 0.6              | 760       | 83300            | 0.0              | 890       | 12135            | 0.0              |
| 375       | 22606            | 0.0              | 505       | 303528           | 232.9            | 635       | 1681061          | 0.4              | 765       | 72172            | 0.0              | 895       | 22953            | 0.0              |
| 380       | 25296            | 0.0              | 510       | 374456           | 268.9            | 640       | 1557170          | 0.2              | 770       | 65008            | 0.0              | 900       | 27214            | 0.0              |
| 385       | 27032            | 0.0              | 515       | 445274           | 290.9            | 645       | 1430182          | 0.2              | 775       | 56809            | 0.0              | 905       | 17038            | 0.0              |
| 390       | 22156            | 0.1              | 520       | 510296           | 297.1            | 650       | 1300435          | 0.1              | 780       | 49368            | 0.0              | 910       | 6896             | 0.0              |
| 395       | 20190            | 0.1              | 525       | 566771           | 287.4            | 655       | 1165554          | 0.1              | 785       | 51733            | 0.0              | 915       | 17142            | 0.0              |
| 400       | 18423            | 0.2              | 530       | 617892           | 267.0            | 660       | 1044122          | 0.0              | 790       | 41796            | 0.0              | 920       | 7675             | 0.0              |
| 405       | 16139            | 0.3              | 535       | 664903           | 239.3            | 665       | 932131           | 0.0              | 795       | 42601            | 0.0              | 925       | 21587            | 0.0              |
| 410       | 19812            | 0.8              | 540       | 711603           | 208.3            | 670       | 808971           | 0.0              | 800       | 36382            | 0.0              | 930       | 32992            | 0.0              |
| 415       | 29121            | 1.9              | 545       | 768835           | 178.6            | 675       | 701208           | 0.0              | 805       | 41419            | 0.0              | 935       | 35464            | 0.0              |
| 420       | 46007            | 5.3              | 550       | 841179           | 151.0            | 680       | 610741           | 0.0              | 810       | 35865            | 0.0              | 940       | 34460            | 0.0              |
| 425       | 76329            | 11.9             | 555       | 932641           | 125.8            | 685       | 533825           | 0.0              | 815       | 39722            | 0.0              | 945       | 46305            | 0.0              |
| 430       | 117696           | 24.9             | 560       | 1040487          | 102.6            | 690       | 459427           | 0.0              | 820       | 37236            | 0.0              | 950       | 38353            | 0.0              |
| 435       | 166890           | 44.5             | 565       | 1164360          | 81.7             | 695       | 399973           | 0.0              | 825       | 31566            | 0.0              | 955       | 30772            | 0.0              |
| 440       | 227762           | 76.1             | 570       | 1307677          | 63.9             | 700       | 347460           | 0.0              | 830       | 42647            | 0.0              | 960       | 32413            | 0.0              |
| 445       | 315427           | 124.4            | 575       | 1470810          | 49.0             | 705       | 302187           | 0.0              | 835       | 41433            | 0.0              | 965       | 35310            | 0.0              |
| 450       | 409560           | 188.7            | 580       | 1637734          | 36.6             | 710       | 262909           | 0.0              | 840       | 24213            | 0.0              | 970       | 28048            | 0.0              |
| 455       | 381103           | 199.7            | 585       | 1807622          | 26.9             | 715       | 236689           | 0.0              | 845       | 31358            | 0.0              | 975       | 26258            | 0.0              |
| 460       | 269221           | 158.6            | 590       | 1958195          | 19.2             | 720       | 209675           | 0.0              | 850       | 30957            | 0.0              | 980       | 31067            | 0.0              |
| 465       | 203513           | 133.0            | 595       | 2055425          | 13.2             | 725       | 184999           | 0.0              | 855       | 38865            | 0.0              | 985       | 40288            | 0.0              |
| 470       | 163989           | 117.4            | 600       | 2141598          | 9.0              | 730       | 160261           | 0.0              | 860       | 23238            | 0.0              | 990       | 29366            | 0.0              |
| 475       | 129159           | 98.6             | 605       | 2185430          | 6.0              | 735       | 140736           | 0.0              | 865       | 32686            | 0.0              | 995       | 54854            | 0.0              |
| 480       | 115440           | 92.8             | 610       | 2170089          | 3.9              | 740       | 125207           | 0.0              | 870       | 41855            | 0.0              | 1000      | 50994            | 0.0              |
| 485       | 120959           | 99.7             | 615       | 2123505          | 2.5              | 745       | 110736           | 0.0              | 875       | 35838            | 0.0              |           |                  |                  |

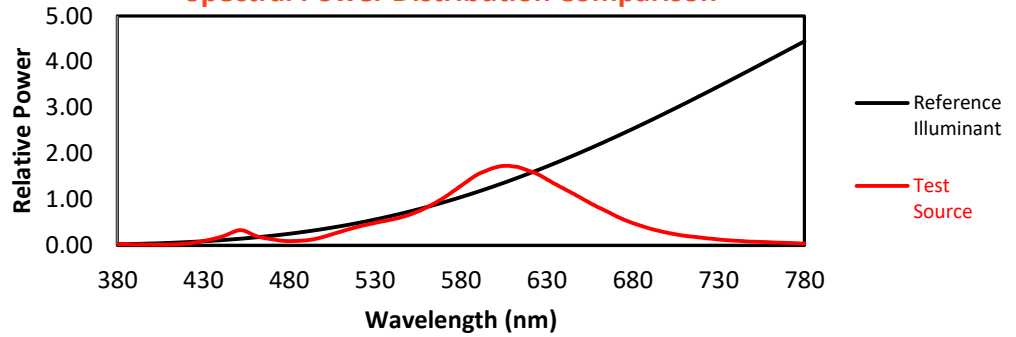
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TM-30-18

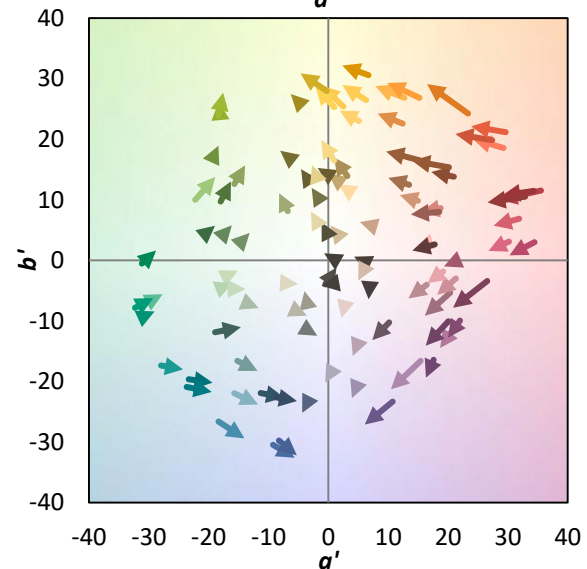
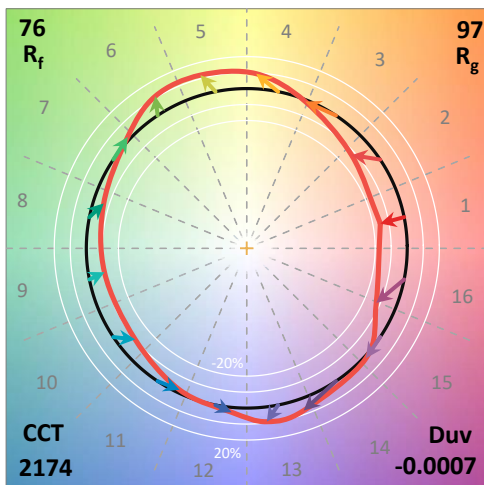
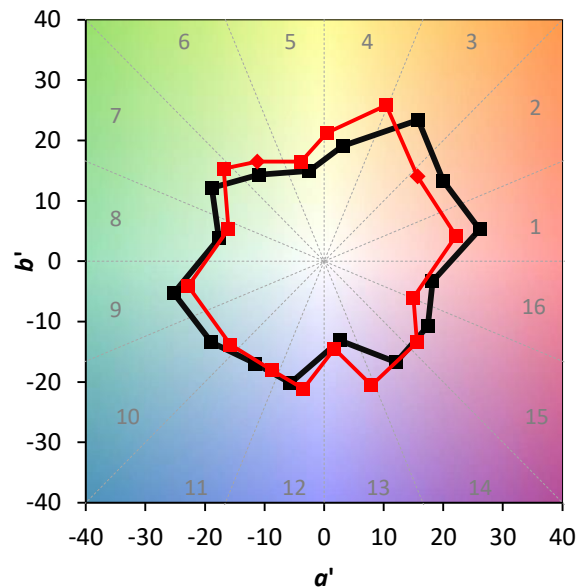
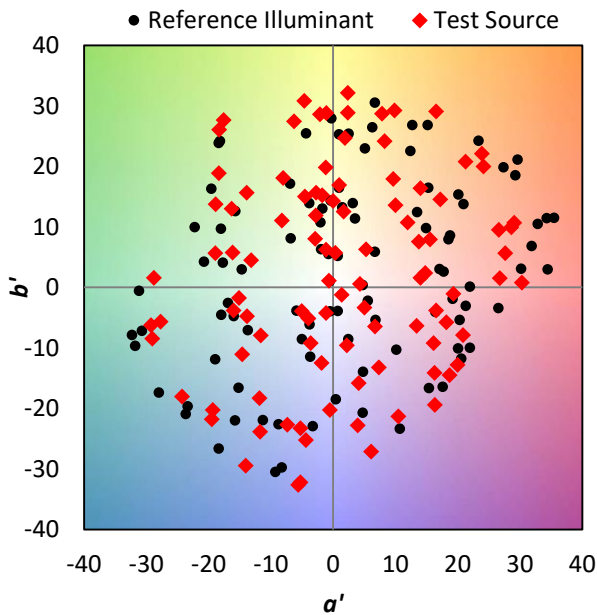
### Summary

$R_f = 75.7$   
 $R_g = 96.7$   
 CIE  $R_a = 72.8$   
 $R_g = -23.3$

### Spectral Power Distribution Comparison



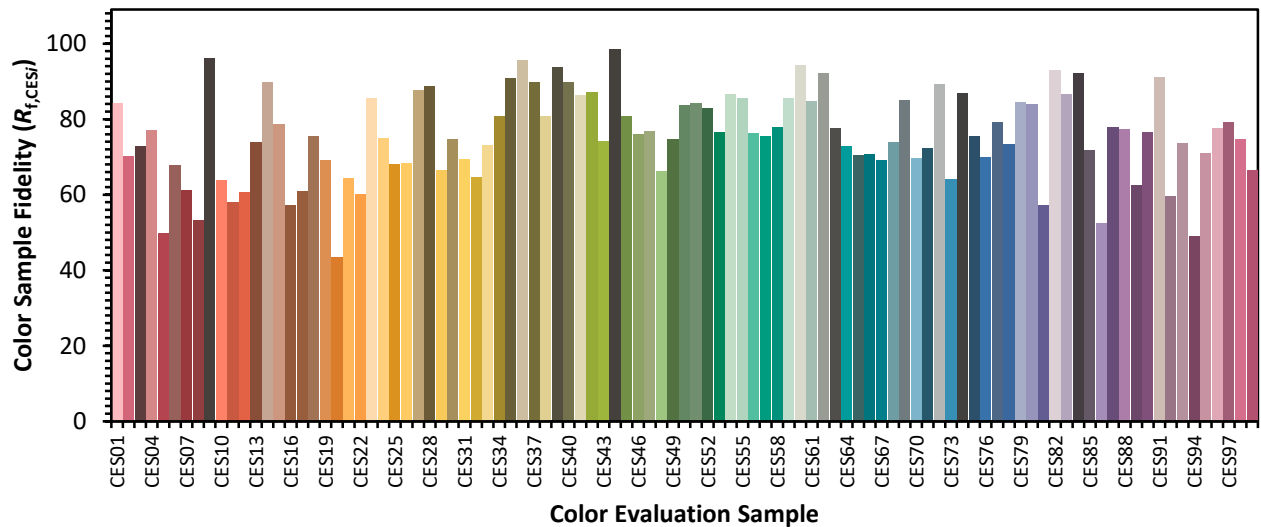
### Color Vector Graphics

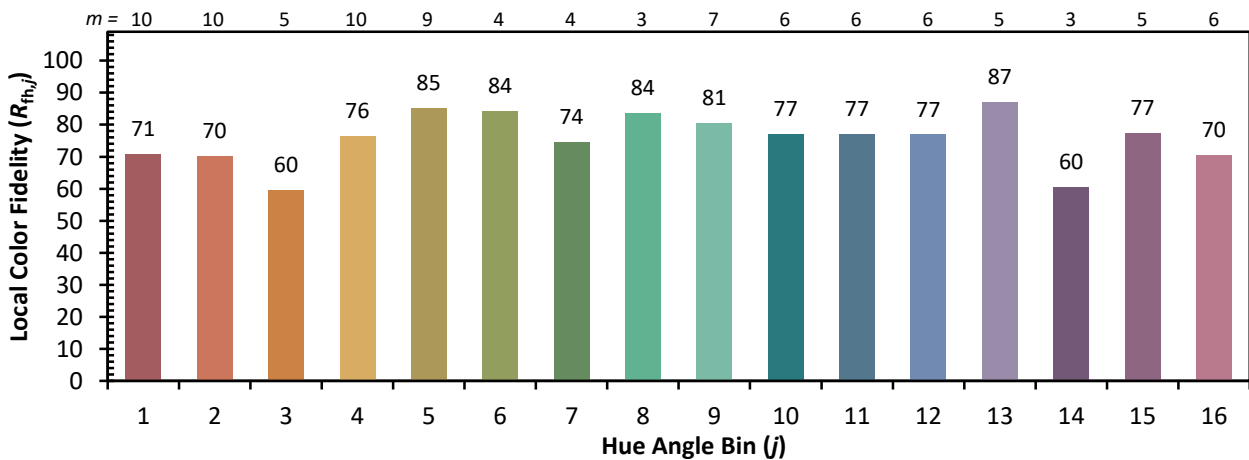
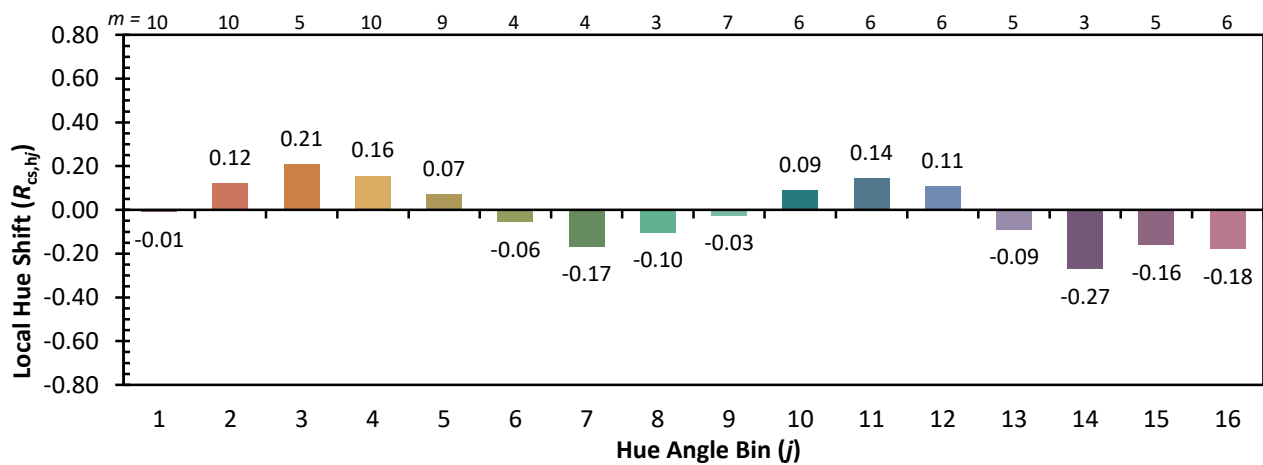
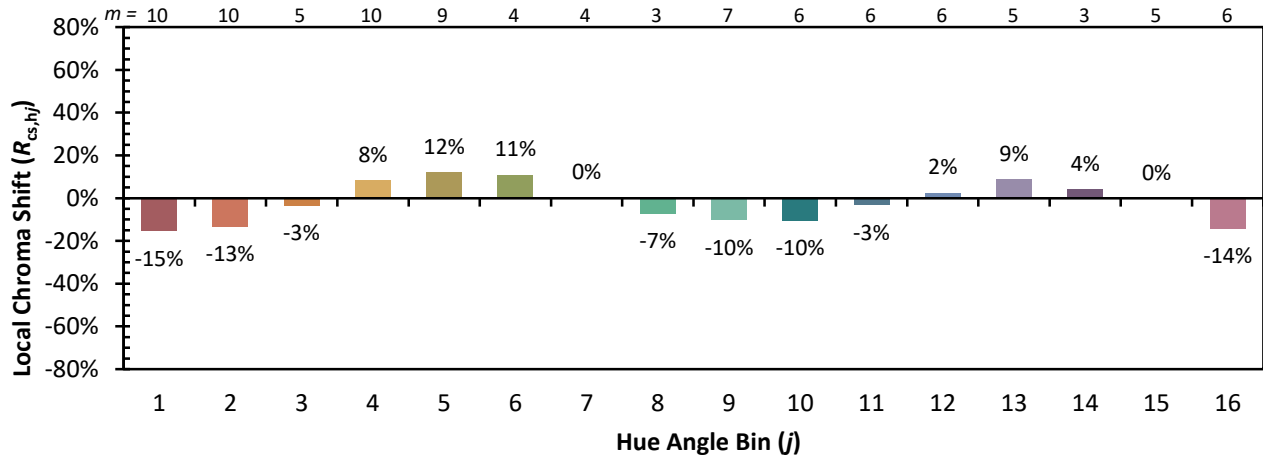




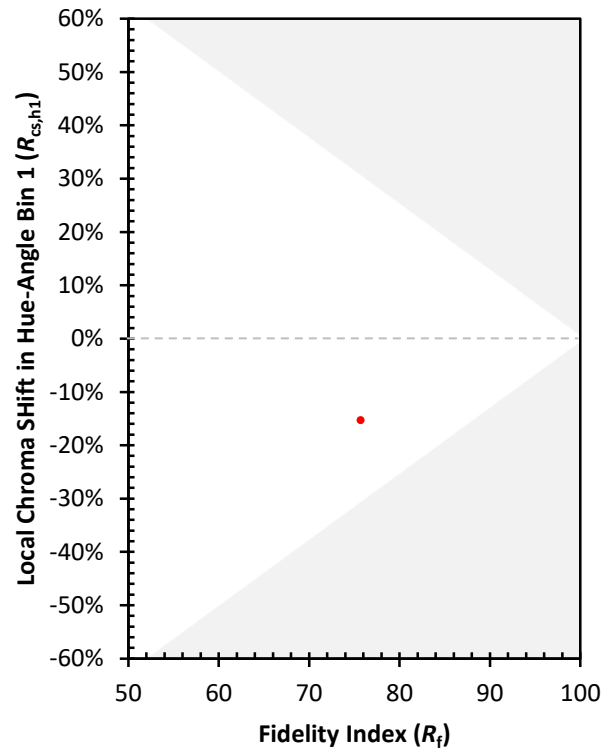
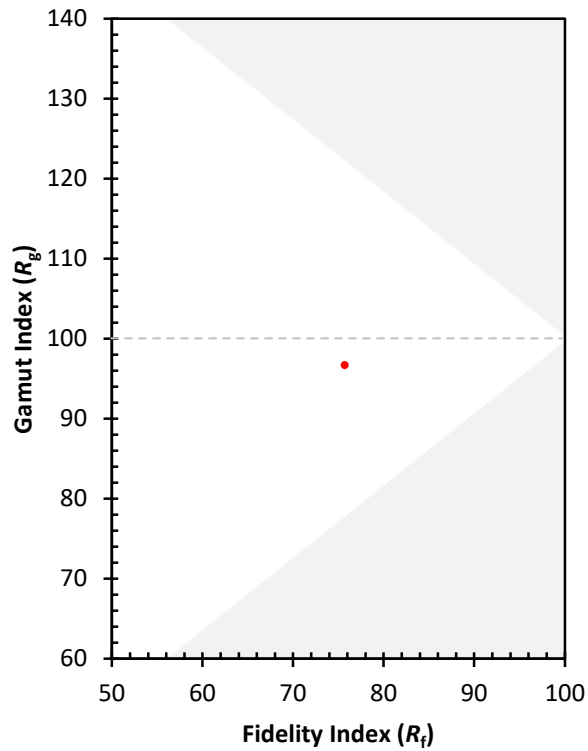
**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 68 | CES51 = 84 | CES76 = 70 |
| CES02 = 65 | CES27 = 88 | CES52 = 83 | CES77 = 79 |
| CES03 = 32 | CES28 = 89 | CES53 = 77 | CES78 = 73 |
| CES04 = 72 | CES29 = 66 | CES54 = 87 | CES79 = 85 |
| CES05 = 52 | CES30 = 75 | CES55 = 85 | CES80 = 84 |
| CES06 = 53 | CES31 = 69 | CES56 = 76 | CES81 = 57 |
| CES07 = 44 | CES32 = 65 | CES57 = 75 | CES82 = 93 |
| CES08 = 43 | CES33 = 73 | CES58 = 78 | CES83 = 87 |
| CES09 = 29 | CES34 = 81 | CES59 = 86 | CES84 = 92 |
| CES10 = 79 | CES35 = 91 | CES60 = 94 | CES85 = 72 |
| CES11 = 62 | CES36 = 96 | CES61 = 85 | CES86 = 52 |
| CES12 = 68 | CES37 = 90 | CES62 = 92 | CES87 = 78 |
| CES13 = 45 | CES38 = 81 | CES63 = 78 | CES88 = 77 |
| CES14 = 75 | CES39 = 94 | CES64 = 73 | CES89 = 62 |
| CES15 = 72 | CES40 = 90 | CES65 = 71 | CES90 = 77 |
| CES16 = 49 | CES41 = 86 | CES66 = 71 | CES91 = 91 |
| CES17 = 51 | CES42 = 87 | CES67 = 69 | CES92 = 60 |
| CES18 = 57 | CES43 = 74 | CES68 = 74 | CES93 = 74 |
| CES19 = 74 | CES44 = 99 | CES69 = 85 | CES94 = 49 |
| CES20 = 69 | CES45 = 81 | CES70 = 70 | CES95 = 71 |
| CES21 = 89 | CES46 = 76 | CES71 = 72 | CES96 = 77 |
| CES22 = 81 | CES47 = 77 | CES72 = 89 | CES97 = 79 |
| CES23 = 92 | CES48 = 66 | CES73 = 64 | CES98 = 75 |
| CES24 = 92 | CES49 = 75 | CES74 = 87 | CES99 = 67 |
| CES25 = 74 | CES50 = 84 | CES75 = 75 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**



(END OF REPORT)