

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: P237551

Luminaire Tested: **CTN-8-3-D-E1-T2-7030-HSS**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P237551  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1707-171-25)  
Test Lab: INNOVATION CENTER(G2)  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: MCGRAW-EDISON  
Catalog Number: CTN-8-3-D-E1-T2-7030-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
(8) 70 CRI, 3000K LEDS AND TYPE II OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 27635 lumens  
Efficiency: N/A  
Efficacy: 122.3 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type II - Short - Non-Cutoff  
BUG Rating: B3 - U0 - G3

Input Watts (W): 226  
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



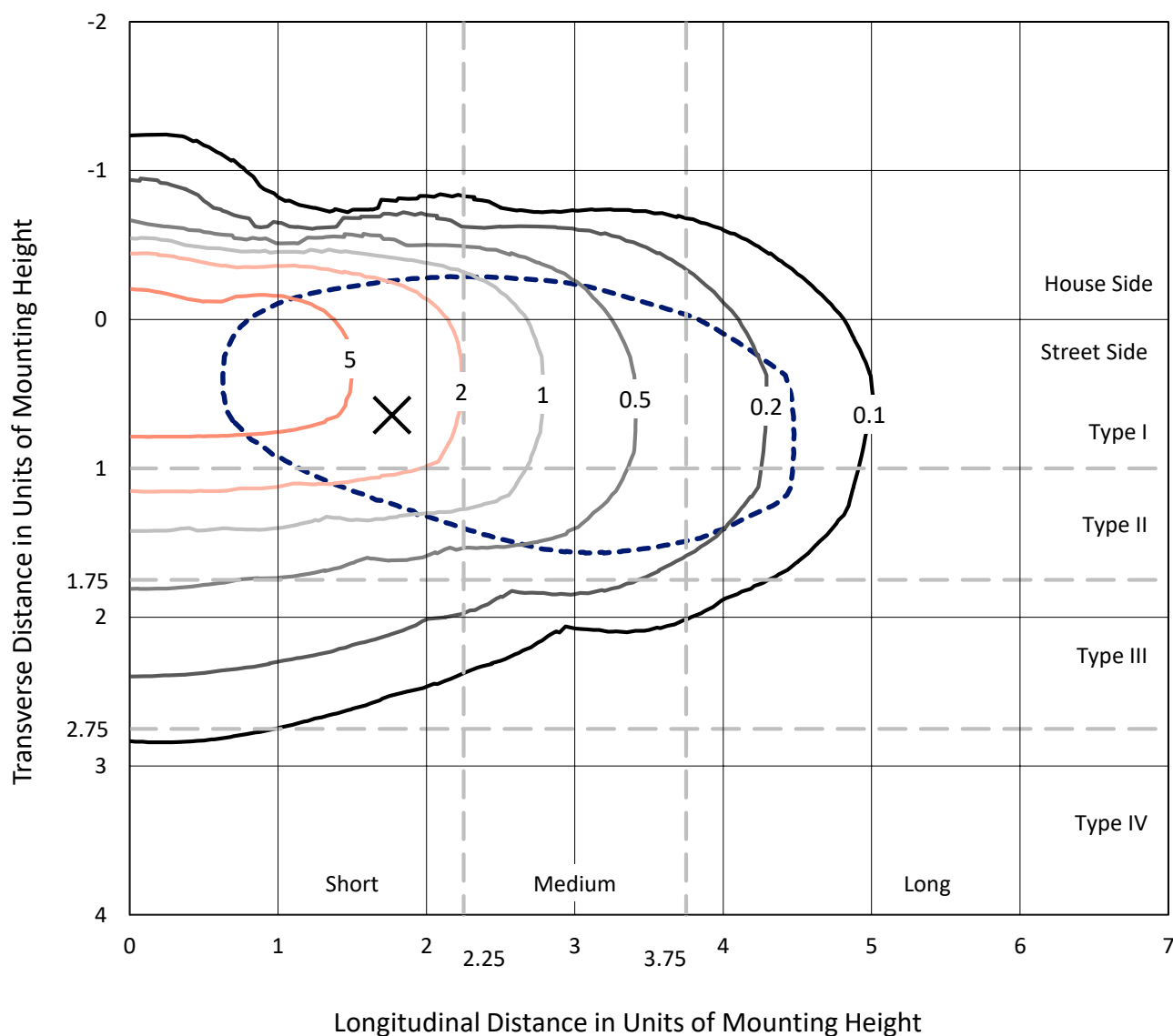
REPORT NUMBER: P237551

CATALOG NUMBER: CTN-8-3-D-E1-T2-7030-HSS

## Iso-Footcandle Lines of Horizontal Illumination

× Max cd

--- 1/2 Max cd

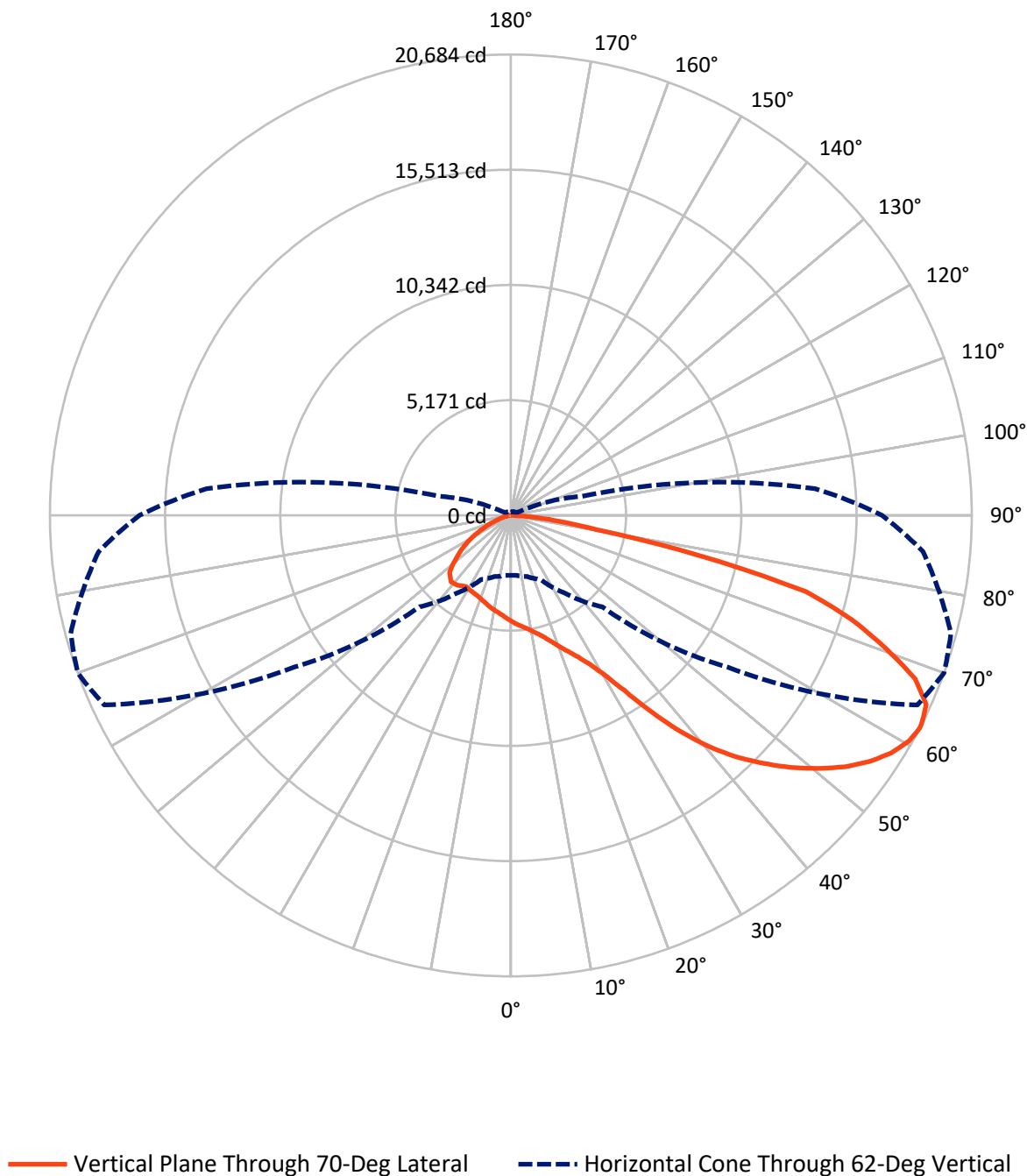


Based on 25 foot mounting height. Maximum calculated value = 9.8 fc  
 Type II - Short - Non-Cutoff

REPORT NUMBER: P237551

CATALOG NUMBER: CTN-8-3-D-E1-T2-7030-HSS

## Luminous Intensity Polar Plot



REPORT NUMBER: P237551

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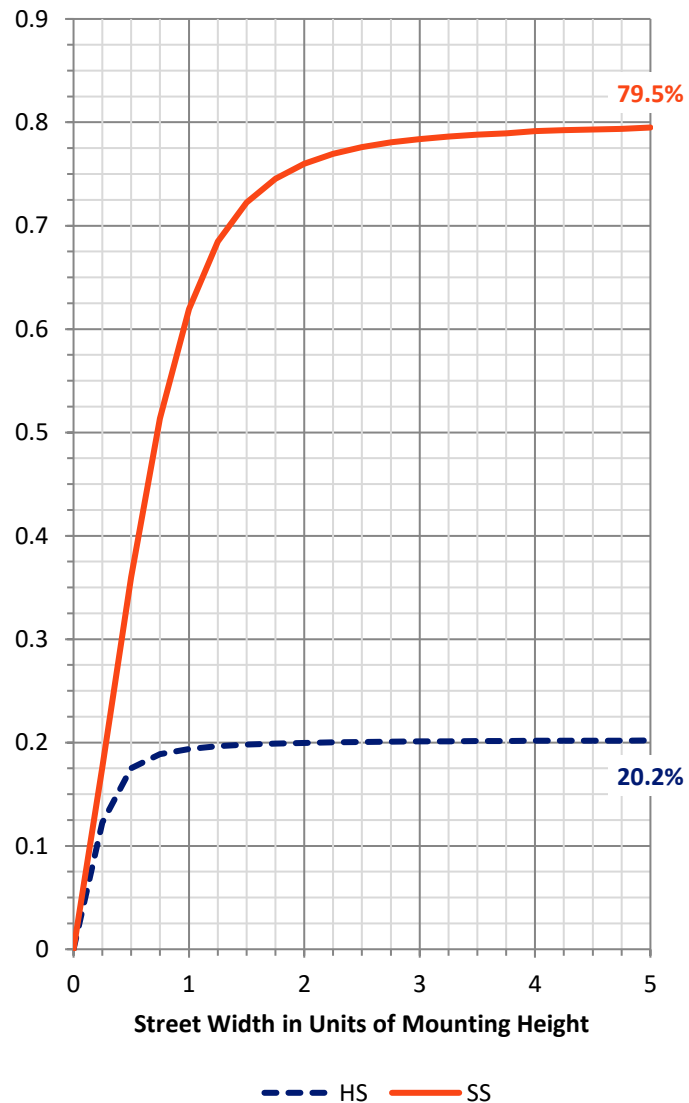
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 5653.0   | 0.0    | 5653.0  |
|                    | % Fixture | 20.5     | 0.0    | 20.5    |
| <b>Street Side</b> | Lumens    | 21982.0  | 0.0    | 21982.0 |
|                    | % Fixture | 79.5     | 0.0    | 79.5    |
| <b>Total</b>       | Lumens    | 27635.0  | 0.0    | 27635.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 452.9   | 1.6       |
| 10°-20°   | 1377.8  | 5.0       |
| 20°-30°   | 2319.7  | 8.4       |
| 30°-40°   | 3502.7  | 12.7      |
| 40°-50°   | 4911.9  | 17.8      |
| 50°-60°   | 5740.8  | 20.8      |
| 60°-70°   | 5569.6  | 20.2      |
| 70°-80°   | 3256.0  | 11.8      |
| 80°-90°   | 503.6   | 1.8       |
| 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°    | 27635.0 | 100.0     |
| 0°-180°   | 27635.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P237551

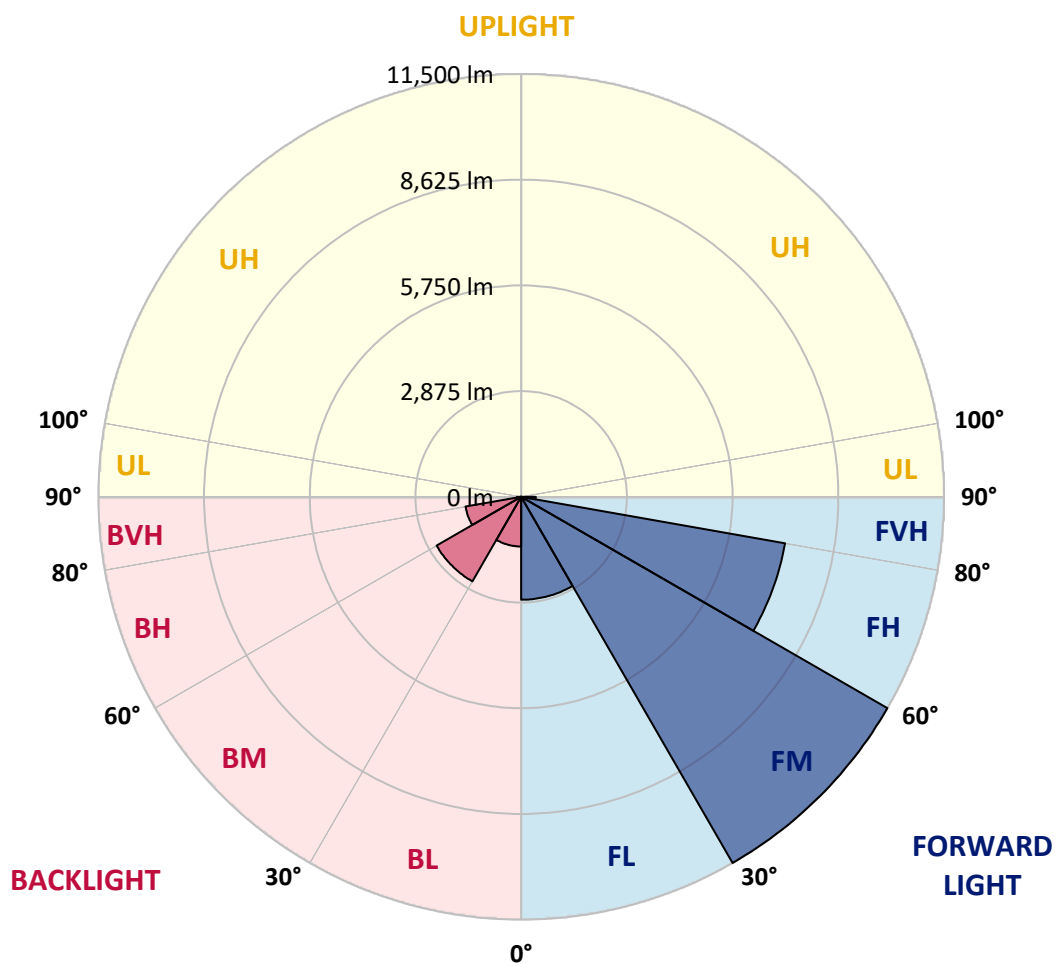
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**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 2798.8  | 10.1      |                         |      |         |
| FM   | (30°-60°)   | 11500.0 | 41.6      |                         |      |         |
| FH   | (60°-80°)   | 7288.6  | 26.4      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 394.7   | 1.4       |                         |      | G3/500  |
| BL   | (0°-30°)    | 1351.6  | 4.9       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 2655.4  | 9.6       | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1537.1  | 5.6       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 109.0   | 0.4       |                         |      | G2/225  |
| 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



REPORT NUMBER: P237551

CATALOG NUMBER: CTN-8-3-D-E1-T2-7030-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°     | 55°     | 65°     | 70°     | 75°     | 85°     |
|-------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| 0°    | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3  | 4754.3  | 4754.3  | 4754.3  | 4754.3  | 4754.3  |
| 2.5°  | 5159.4 | 5125.2 | 5110.6 | 5132.1 | 4988.6 | 4991.5  | 4922.2  | 4911.5  | 4878.3  | 4831.4  | 4779.7  |
| 5°    | 5454.2 | 5414.2 | 5393.7 | 5406.4 | 5255.1 | 5228.7  | 5115.5  | 5059.8  | 4994.4  | 4935.9  | 4823.6  |
| 7.5°  | 5737.4 | 5696.3 | 5680.7 | 5673.9 | 5491.3 | 5451.3  | 5306.8  | 5208.2  | 5119.4  | 5044.2  | 4891.9  |
| 10°   | 6022.4 | 5980.4 | 5948.2 | 5957.0 | 5765.7 | 5694.4  | 5527.5  | 5391.8  | 5277.5  | 5179.9  | 4970.0  |
| 12.5° | 6305.5 | 6254.8 | 6219.6 | 6219.6 | 6031.2 | 5961.9  | 5774.4  | 5600.7  | 5455.2  | 5332.2  | 5068.6  |
| 15°   | 6595.5 | 6529.1 | 6521.3 | 6521.3 | 6321.1 | 6237.2  | 6052.7  | 5860.4  | 5681.7  | 5523.6  | 5187.7  |
| 17.5° | 6895.2 | 6811.2 | 6809.3 | 6822.0 | 6638.4 | 6543.7  | 6370.0  | 6190.3  | 5962.9  | 5762.7  | 5333.2  |
| 20°   | 7092.4 | 7017.2 | 6999.6 | 7037.7 | 6893.2 | 6831.7  | 6645.3  | 6519.3  | 6300.6  | 6062.4  | 5520.6  |
| 22.5° | 7242.7 | 7196.8 | 7213.4 | 7275.9 | 7205.6 | 7152.9  | 6956.7  | 6843.4  | 6646.2  | 6402.2  | 5773.5  |
| 25°   | 7394.0 | 7363.8 | 7401.8 | 7512.2 | 7518.0 | 7532.7  | 7368.6  | 7224.2  | 7040.6  | 6822.9  | 6102.5  |
| 27.5° | 7347.2 | 7338.4 | 7453.6 | 7681.0 | 7806.0 | 7872.4  | 7780.6  | 7729.9  | 7561.9  | 7332.5  | 6516.4  |
| 30°   | 7381.3 | 7359.9 | 7498.5 | 7786.5 | 8064.7 | 8257.0  | 8257.0  | 8372.2  | 8299.0  | 8068.6  | 7148.0  |
| 32.5° | 7279.8 | 7239.8 | 7398.9 | 7811.9 | 8290.2 | 8664.1  | 8830.1  | 9238.1  | 9366.0  | 9283.0  | 8400.5  |
| 35°   | 6812.2 | 6842.5 | 7153.9 | 7710.3 | 8445.4 | 9062.4  | 9501.7  | 10376.4 | 10769.9 | 10863.6 | 9842.4  |
| 37.5° | 6520.3 | 6533.0 | 6850.3 | 7544.4 | 8500.1 | 9453.9  | 10236.8 | 11690.5 | 12247.9 | 12305.5 | 11107.6 |
| 40°   | 6118.1 | 6165.9 | 6521.3 | 7321.8 | 8468.9 | 9784.8  | 11028.6 | 12985.9 | 13605.8 | 13558.0 | 12214.7 |
| 42.5° | 5800.8 | 5814.5 | 6124.9 | 6968.4 | 8332.2 | 10048.4 | 11827.1 | 14162.3 | 14811.5 | 14677.7 | 13309.1 |
| 45°   | 5405.4 | 5430.8 | 5724.7 | 6529.1 | 8089.1 | 10182.2 | 12516.3 | 15265.4 | 15860.0 | 15693.0 | 14257.0 |
| 47.5° | 4927.1 | 5038.4 | 5345.9 | 6055.6 | 7677.1 | 10168.5 | 13100.1 | 16220.2 | 16898.7 | 16641.9 | 15143.4 |
| 50°   | 3968.4 | 4104.1 | 4719.1 | 5629.0 | 7137.3 | 9977.2  | 13564.8 | 17271.6 | 17852.5 | 17593.8 | 15952.7 |
| 52.5° | 3466.6 | 3493.0 | 3806.4 | 5149.7 | 6504.7 | 9549.6  | 13881.1 | 18140.5 | 18745.7 | 18473.4 | 16730.8 |
| 55°   | 3240.1 | 3267.5 | 3425.6 | 4373.5 | 5923.8 | 8792.0  | 13997.3 | 18969.3 | 19506.2 | 19193.8 | 17372.2 |
| 57.5° | 3042.0 | 3050.7 | 3237.2 | 3699.0 | 5370.3 | 7794.3  | 13752.3 | 19660.5 | 20120.3 | 19695.6 | 17817.3 |
| 60°   | 2815.5 | 2850.6 | 3034.1 | 3376.8 | 4746.5 | 6635.5  | 12912.7 | 20102.7 | 20537.1 | 20159.3 | 18279.1 |
| 62°   | 2688.6 | 2697.3 | 2840.9 | 3176.7 | 4263.2 | 5797.9  | 11867.1 | 20128.1 | 20683.6 | 20444.4 | 18563.2 |
| 62.5° | 2651.5 | 2657.3 | 2793.0 | 3125.9 | 4163.7 | 5631.9  | 11582.1 | 20107.6 | 20674.8 | 20494.2 | 18625.6 |
| 65°   | 2438.6 | 2452.3 | 2574.3 | 2885.8 | 3727.3 | 4984.7  | 10246.6 | 19772.7 | 20486.4 | 20410.2 | 18619.8 |
| 67.5° | 2179.9 | 2183.8 | 2313.7 | 2593.9 | 3277.2 | 4376.5  | 8606.5  | 19132.3 | 19563.8 | 19465.2 | 17804.6 |
| 70°   | 1782.6 | 1853.9 | 1995.4 | 2242.4 | 2711.0 | 3630.6  | 6546.7  | 17137.9 | 17845.6 | 17943.3 | 16344.2 |
| 72.5° | 1355.0 | 1350.1 | 1399.9 | 1571.7 | 1974.9 | 2789.1  | 4419.4  | 14359.5 | 15999.6 | 16527.7 | 14732.4 |
| 75°   | 836.6  | 868.9  | 1077.8 | 1215.4 | 1415.5 | 1967.1  | 2770.6  | 9995.7  | 13681.0 | 14593.8 | 13022.0 |
| 77.5° | 650.2  | 656.0  | 764.4  | 1002.6 | 1159.8 | 1394.1  | 1727.9  | 5446.4  | 8576.3  | 10846.0 | 10142.1 |
| 80°   | 495.0  | 505.7  | 577.0  | 628.7  | 816.1  | 849.3   | 1152.9  | 2817.4  | 3905.9  | 5470.8  | 6813.2  |
| 82.5° | 298.7  | 315.3  | 381.7  | 412.0  | 450.0  | 425.6   | 619.9   | 1520.0  | 2165.3  | 2799.9  | 3469.5  |
| 85°   | 150.3  | 180.6  | 253.8  | 240.2  | 204.0  | 188.4   | 265.5   | 735.1   | 1034.8  | 1369.7  | 1592.2  |
| 87.5° | 38.1   | 45.9   | 59.6   | 71.3   | 60.5   | 49.8    | 72.2    | 199.2   | 205.0   | 196.2   | 549.6   |
| 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: P237551

CATALOG NUMBER: CTN-8-3-D-E1-T2-7030-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4754.3  | 4754.3  | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3 | 4754.3 |
| 2.5°  | 4762.1  | 4722.1  | 4648.8 | 4606.9 | 4502.4 | 4462.4 | 4387.2 | 4414.5 | 4398.0 | 4381.4 | 4382.3 |
| 5°    | 4769.9  | 4697.7  | 4558.1 | 4457.5 | 4306.2 | 4229.1 | 4130.5 | 4114.8 | 4071.9 | 4045.5 | 4048.5 |
| 7.5°  | 4786.5  | 4683.0  | 4485.8 | 4325.7 | 4112.9 | 3991.8 | 3860.0 | 3837.6 | 3773.2 | 3743.9 | 3747.8 |
| 10°   | 4828.5  | 4706.4  | 4439.0 | 4203.7 | 3963.5 | 3795.6 | 3641.4 | 3591.6 | 3530.1 | 3496.9 | 3494.9 |
| 12.5° | 4892.9  | 4741.6  | 4372.6 | 4110.9 | 3819.0 | 3601.3 | 3423.7 | 3343.6 | 3255.8 | 3226.5 | 3229.4 |
| 15°   | 4995.4  | 4786.5  | 4316.9 | 3983.1 | 3644.3 | 3417.8 | 3198.2 | 3101.5 | 3008.8 | 2974.6 | 2971.7 |
| 17.5° | 5120.4  | 4827.5  | 4277.9 | 3832.7 | 3493.0 | 3221.6 | 3028.3 | 2896.5 | 2740.3 | 2717.8 | 2693.4 |
| 20°   | 5244.4  | 4909.5  | 4242.7 | 3723.4 | 3313.4 | 3024.4 | 2771.5 | 2636.8 | 2413.3 | 2329.3 | 2299.0 |
| 22.5° | 5425.0  | 5039.3  | 4237.8 | 3593.5 | 3132.7 | 2808.6 | 2467.9 | 2250.2 | 2004.2 | 1861.7 | 1830.4 |
| 25°   | 5666.1  | 5181.9  | 4250.5 | 3494.9 | 2930.7 | 2534.3 | 2074.5 | 1760.2 | 1525.9 | 1364.8 | 1331.6 |
| 27.5° | 5979.5  | 5376.1  | 4288.6 | 3386.6 | 2747.1 | 2205.3 | 1633.2 | 1310.1 | 1111.9 | 977.2  | 946.0  |
| 30°   | 6441.2  | 5702.2  | 4348.2 | 3286.0 | 2479.6 | 1776.8 | 1200.8 | 944.0  | 789.8  | 706.8  | 705.8  |
| 32.5° | 7519.0  | 6430.5  | 4382.3 | 3161.1 | 2230.7 | 1343.3 | 864.0  | 683.4  | 560.4  | 529.1  | 555.5  |
| 35°   | 8754.9  | 7462.4  | 4645.9 | 3026.3 | 1841.2 | 988.0  | 617.0  | 486.2  | 435.4  | 443.2  | 457.9  |
| 37.5° | 9895.1  | 8454.2  | 5048.1 | 2807.7 | 1474.1 | 696.1  | 443.2  | 386.6  | 375.9  | 404.2  | 430.5  |
| 40°   | 10904.6 | 9311.4  | 5392.7 | 2567.5 | 1042.6 | 486.2  | 355.4  | 357.3  | 346.6  | 359.3  | 368.0  |
| 42.5° | 11894.5 | 10106.0 | 5756.9 | 2244.4 | 695.1  | 359.3  | 321.2  | 338.8  | 326.1  | 328.0  | 315.3  |
| 45°   | 12878.5 | 10944.6 | 5914.0 | 1845.1 | 465.7  | 311.4  | 300.7  | 321.2  | 320.2  | 312.4  | 293.8  |
| 47.5° | 13727.9 | 11522.5 | 6113.2 | 1392.1 | 346.6  | 283.1  | 286.0  | 300.7  | 310.4  | 296.8  | 288.0  |
| 50°   | 14458.1 | 12135.6 | 5959.9 | 921.6  | 309.5  | 264.6  | 275.3  | 275.3  | 290.9  | 267.5  | 256.8  |
| 52.5° | 15156.1 | 12745.8 | 5566.5 | 607.2  | 284.1  | 251.9  | 262.6  | 255.8  | 262.6  | 239.2  | 236.2  |
| 55°   | 15574.9 | 13061.1 | 5091.1 | 473.5  | 268.5  | 241.1  | 246.0  | 244.1  | 238.2  | 213.8  | 218.7  |
| 57.5° | 16035.7 | 13424.2 | 4499.5 | 397.3  | 261.6  | 228.4  | 229.4  | 226.5  | 208.9  | 192.3  | 193.3  |
| 60°   | 16403.7 | 13695.6 | 3866.9 | 350.5  | 253.8  | 221.6  | 207.9  | 203.1  | 178.7  | 168.9  | 169.9  |
| 62°   | 16661.5 | 13708.3 | 3315.3 | 326.1  | 244.1  | 216.7  | 195.2  | 184.5  | 157.2  | 149.4  | 148.4  |
| 62.5° | 16689.8 | 13660.5 | 3180.6 | 320.2  | 240.2  | 214.8  | 194.3  | 178.7  | 151.3  | 145.5  | 143.5  |
| 65°   | 16584.3 | 13128.4 | 2537.2 | 288.0  | 223.6  | 203.1  | 180.6  | 155.2  | 129.8  | 122.0  | 119.1  |
| 67.5° | 15799.4 | 12175.6 | 1937.8 | 261.6  | 203.1  | 195.2  | 166.9  | 136.7  | 115.2  | 105.4  | 103.5  |
| 70°   | 14268.7 | 10886.0 | 1383.3 | 228.4  | 182.6  | 177.7  | 167.9  | 125.0  | 106.4  | 92.7   | 90.8   |
| 72.5° | 12568.1 | 9513.4  | 941.1  | 203.1  | 162.1  | 146.4  | 124.0  | 118.1  | 99.6   | 82.0   | 80.1   |
| 75°   | 10695.7 | 7576.6  | 669.7  | 174.7  | 139.6  | 124.0  | 104.5  | 109.3  | 93.7   | 73.2   | 71.3   |
| 77.5° | 8206.3  | 5572.4  | 496.9  | 143.5  | 108.4  | 100.6  | 87.9   | 96.6   | 84.9   | 66.4   | 65.4   |
| 80°   | 5603.6  | 3848.3  | 353.4  | 108.4  | 71.3   | 71.3   | 74.2   | 83.0   | 75.2   | 59.6   | 58.6   |
| 82.5° | 3150.3  | 2025.7  | 208.9  | 78.1   | 48.8   | 48.8   | 57.6   | 67.4   | 62.5   | 51.7   | 50.8   |
| 85°   | 1305.2  | 733.2   | 110.3  | 48.8   | 32.2   | 33.2   | 41.0   | 49.8   | 48.8   | 41.0   | 40.0   |
| 87.5° | 454.0   | 184.5   | 32.2   | 16.6   | 13.7   | 14.6   | 16.6   | 23.4   | 23.4   | 20.5   | 21.5   |
| 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**



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**

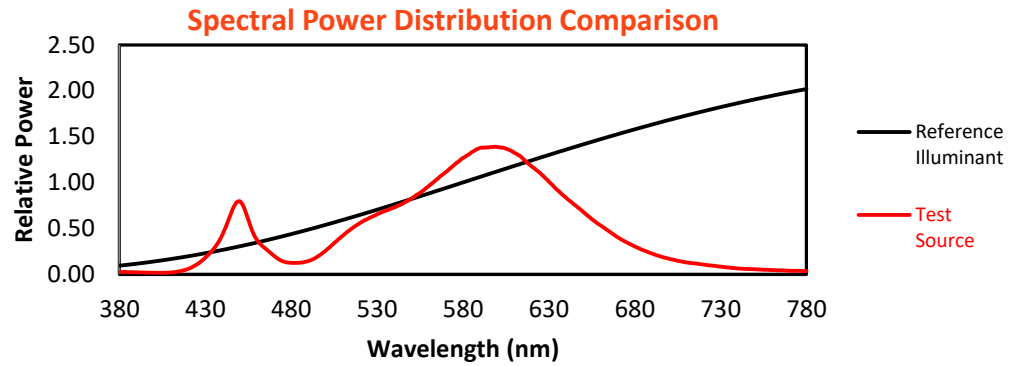
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 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

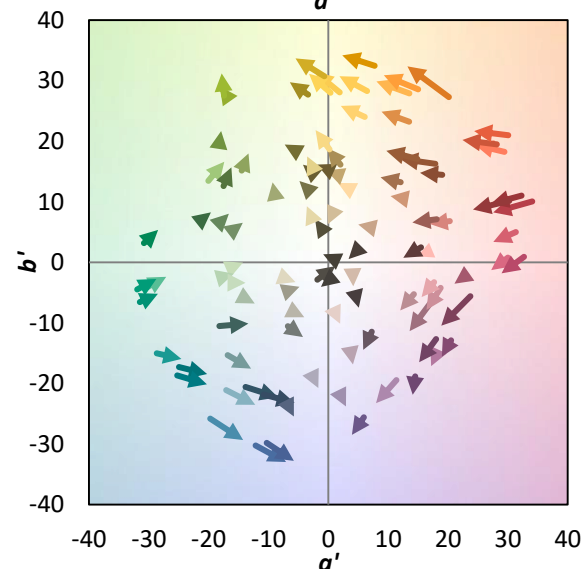
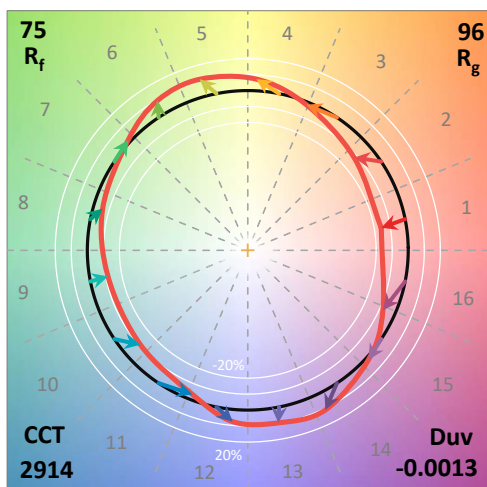
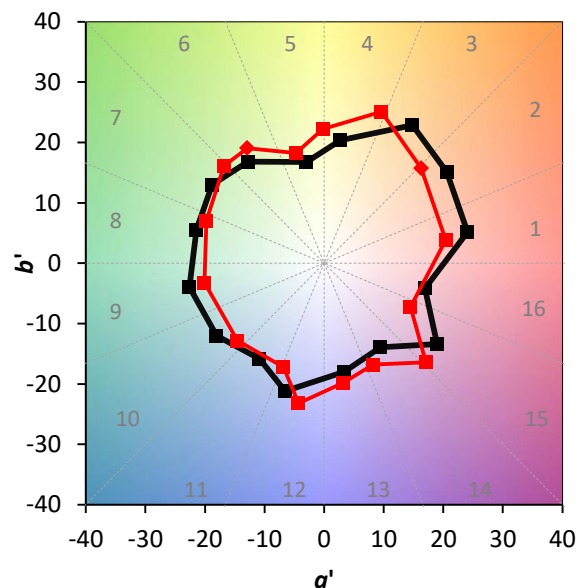
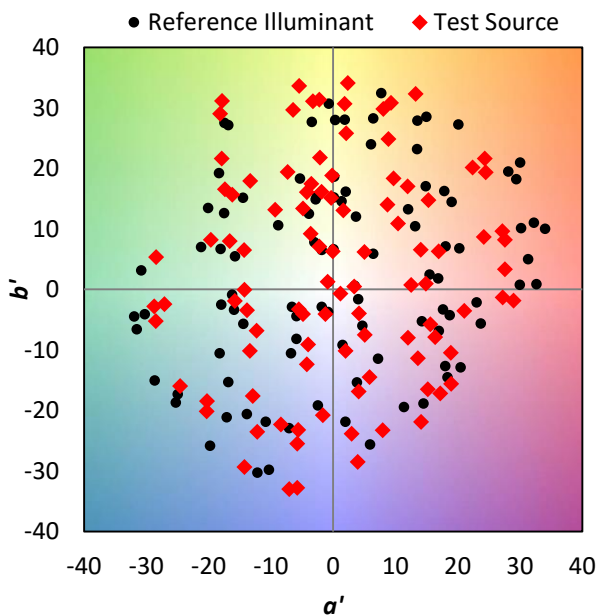
TM-30-18

### Summary

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

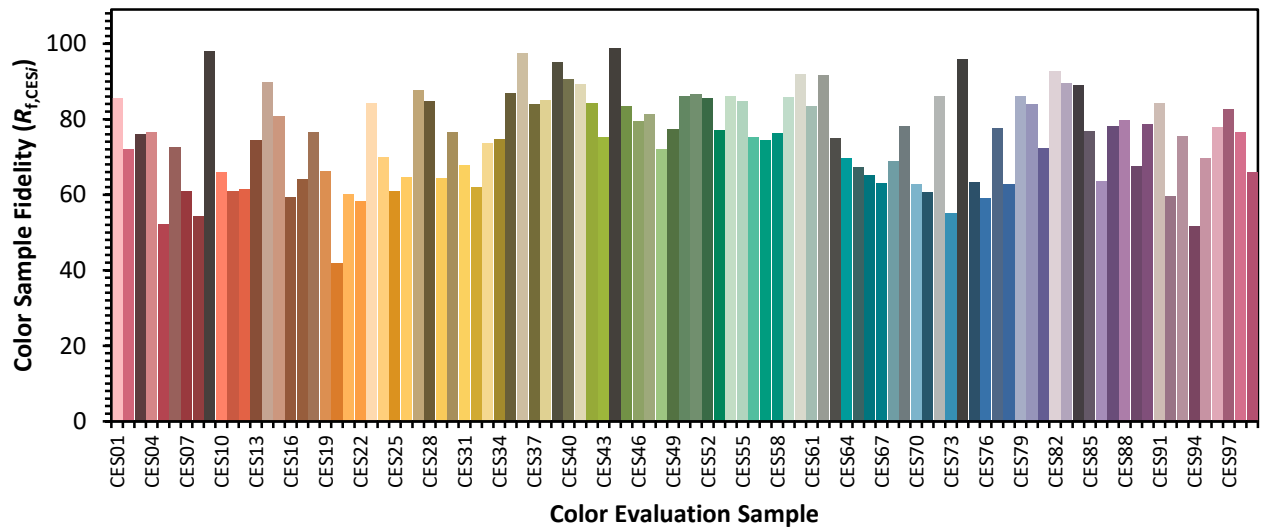


### Color Vector Graphics

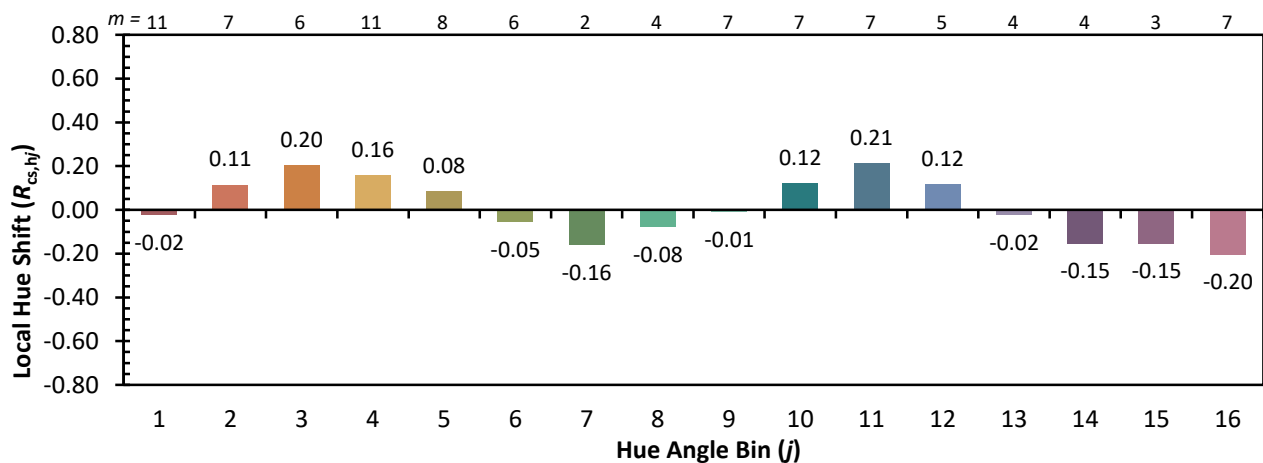


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| 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)