

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: P237553

Luminaire Tested: **CTN-8-4-D-E1-T2-7030-HSS**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P237553  
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-8-4-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: 38148 lumens  
Efficiency: N/A  
Efficacy: 117.4 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type II - Short - Non-Cutoff  
BUG Rating: B3 - U0 - G4

Input Watts (W): 325  
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



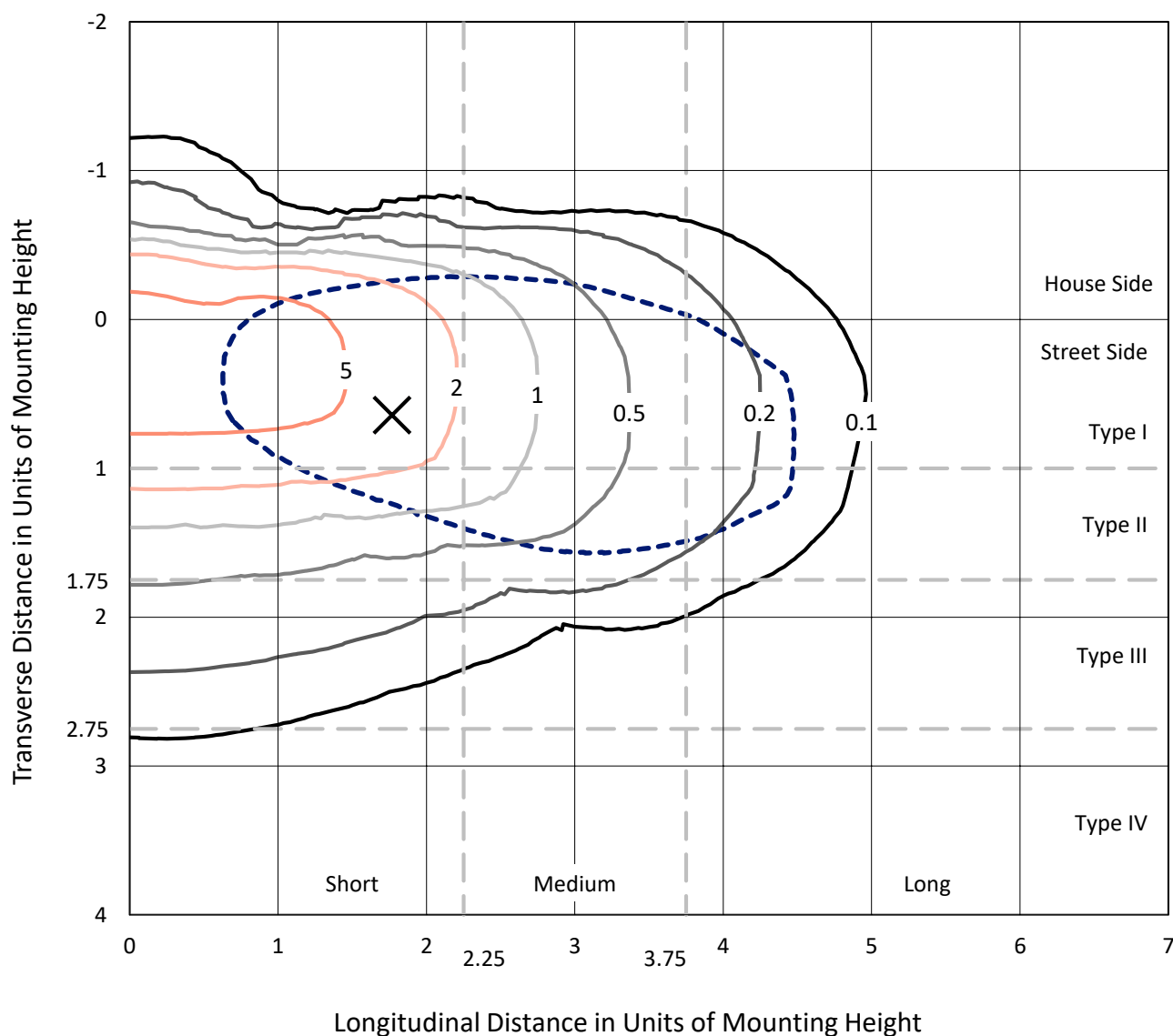
REPORT NUMBER: P237553

CATALOG NUMBER: CTN-8-4-D-E1-T2-7030-HSS

## Iso-Footcandle Lines of Horizontal Illumination

× Max cd

--- 1/2 Max cd

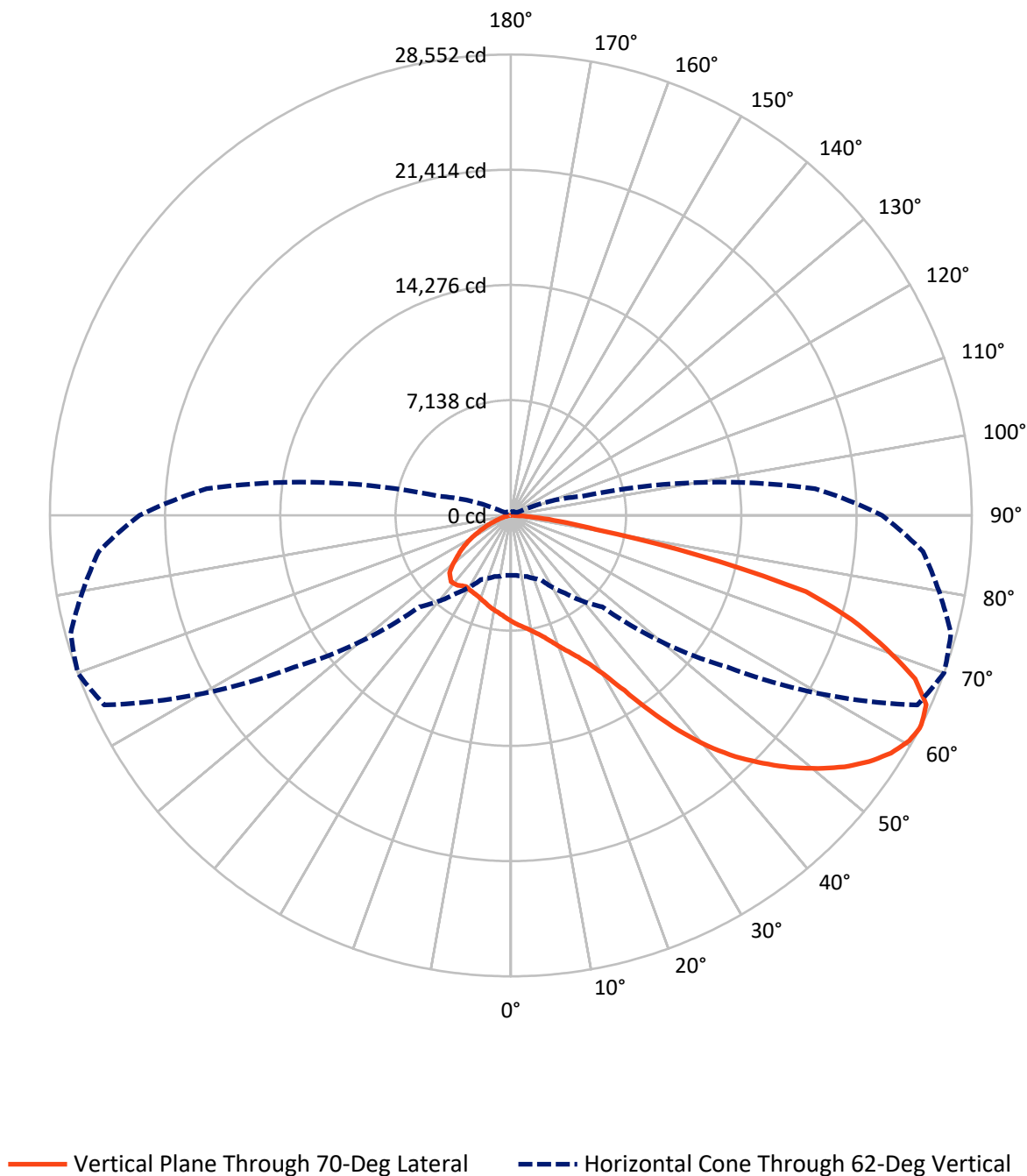


Based on 30 foot mounting height. Maximum calculated value = 9.4 fc  
 Type II - Short - Non-Cutoff

REPORT NUMBER: P237553

CATALOG NUMBER: CTN-8-4-D-E1-T2-7030-HSS

## Luminous Intensity Polar Plot



REPORT NUMBER: P237553

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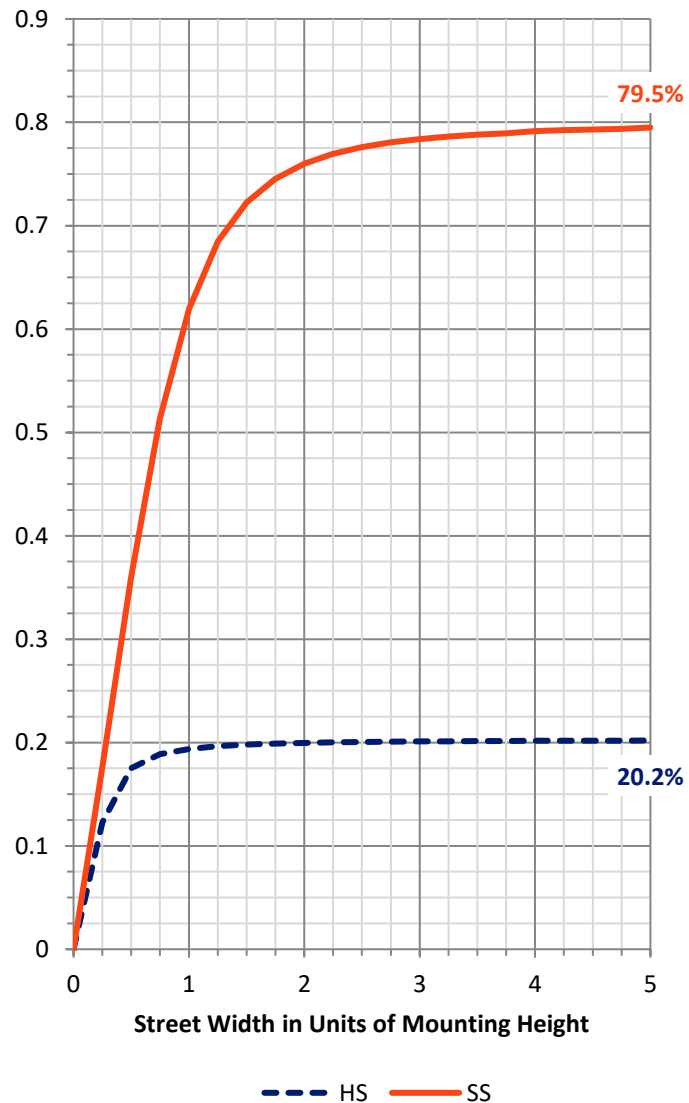
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 7803.5   | 0.0    | 7803.5  |
|                    | % Fixture | 20.5     | 0.0    | 20.5    |
| <b>Street Side</b> | Lumens    | 30344.5  | 0.0    | 30344.5 |
|                    | % Fixture | 79.5     | 0.0    | 79.5    |
| <b>Total</b>       | Lumens    | 38148.0  | 0.0    | 38148.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 625.1   | 1.6       |
| 10°-20°   | 1902.0  | 5.0       |
| 20°-30°   | 3202.2  | 8.4       |
| 30°-40°   | 4835.2  | 12.7      |
| 40°-50°   | 6780.4  | 17.8      |
| 50°-60°   | 7924.7  | 20.8      |
| 60°-70°   | 7688.5  | 20.2      |
| 70°-80°   | 4494.6  | 11.8      |
| 80°-90°   | 695.3   | 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°    | 38148.0 | 100.0     |
| 0°-180°   | 38148.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P237553

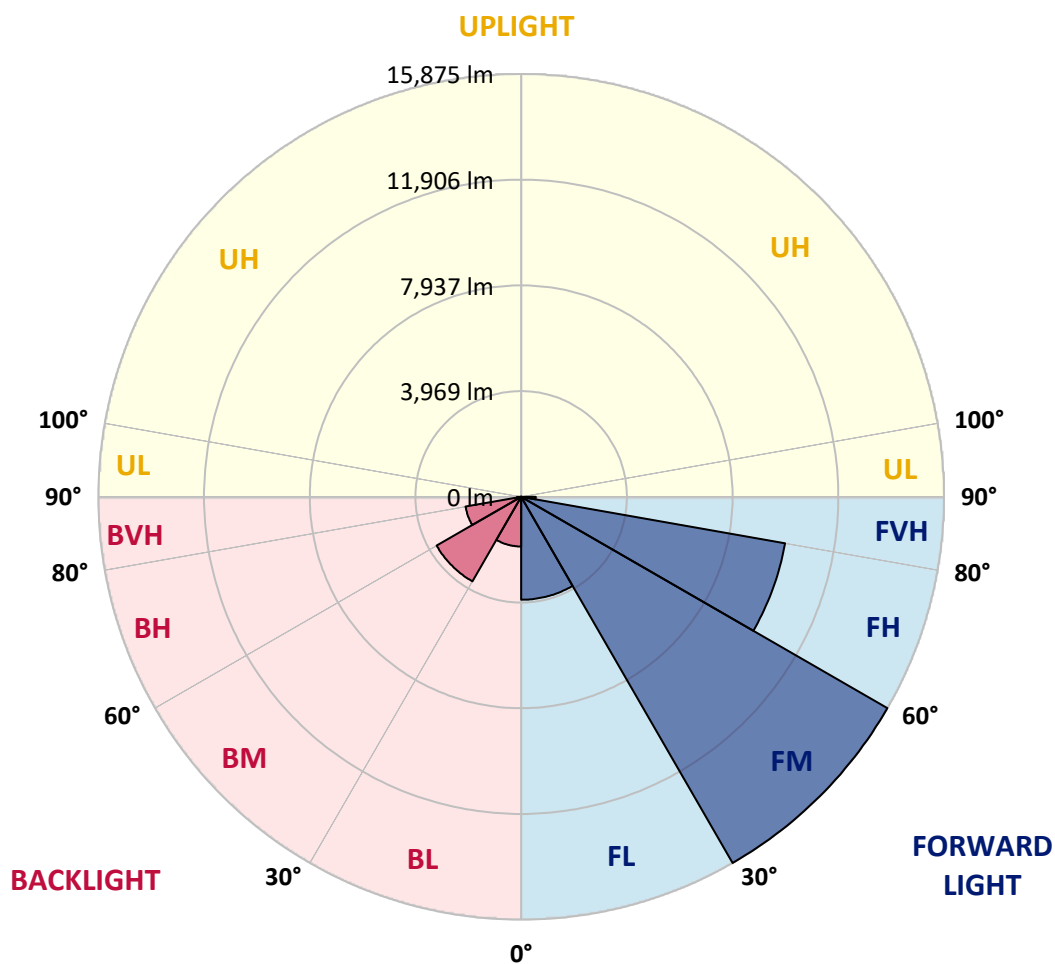
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**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|---------|-----------|-------------------------|------|----------|
|      |             |         |           | B                       | U    | G        |
| FL   | (0°-30°)    | 3863.6  | 10.1      |                         |      |          |
| FM   | (30°-60°)   | 15874.8 | 41.6      |                         |      |          |
| FH   | (60°-80°)   | 10061.3 | 26.4      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 544.8   | 1.4       |                         |      | G4/750   |
| BL   | (0°-30°)    | 1865.7  | 4.9       | B3/2500                 |      |          |
| BM   | (30°-60°)   | 3665.6  | 9.6       | B3/5000                 |      |          |
| BH   | (60°-80°)   | 2121.8  | 5.6       | B3/2500                 |      | G3/2500  |
| BVH  | (80°-90°)   | 150.4   | 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-G4**

Type II Short



REPORT NUMBER: P237553

CATALOG NUMBER: CTN-8-4-D-E1-T2-7030-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 65°     | 70°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  | 6562.9  |
| 2.5°  | 7122.2  | 7075.0  | 7054.8  | 7084.4  | 6886.3  | 6890.4  | 6794.7  | 6779.9  | 6734.1  | 6669.4  | 6598.0  |
| 5°    | 7529.2  | 7473.9  | 7445.6  | 7463.1  | 7254.2  | 7217.9  | 7061.5  | 6984.7  | 6894.4  | 6813.6  | 6658.6  |
| 7.5°  | 7920.0  | 7863.4  | 7841.8  | 7832.4  | 7580.4  | 7525.1  | 7325.7  | 7189.6  | 7066.9  | 6963.2  | 6752.9  |
| 10°   | 8313.5  | 8255.5  | 8211.1  | 8223.2  | 7959.1  | 7860.7  | 7630.2  | 7442.9  | 7285.2  | 7150.5  | 6860.7  |
| 12.5° | 8704.3  | 8634.2  | 8585.7  | 8585.7  | 8325.6  | 8229.9  | 7971.2  | 7731.3  | 7530.5  | 7360.7  | 6996.9  |
| 15°   | 9104.5  | 9012.9  | 9002.1  | 9002.1  | 8725.9  | 8610.0  | 8355.3  | 8089.8  | 7843.2  | 7624.8  | 7161.3  |
| 17.5° | 9518.3  | 9402.4  | 9399.7  | 9417.2  | 9163.8  | 9033.1  | 8793.2  | 8545.3  | 8231.3  | 7955.0  | 7362.1  |
| 20°   | 9790.5  | 9686.7  | 9662.4  | 9715.0  | 9515.6  | 9430.7  | 9173.3  | 8999.4  | 8697.6  | 8368.7  | 7620.8  |
| 22.5° | 9998.0  | 9934.7  | 9957.6  | 10043.8 | 9946.8  | 9874.0  | 9603.2  | 9446.8  | 9174.6  | 8837.7  | 7969.8  |
| 25°   | 10206.9 | 10165.1 | 10217.7 | 10369.9 | 10378.0 | 10398.2 | 10171.8 | 9972.4  | 9719.0  | 9418.5  | 8424.0  |
| 27.5° | 10142.2 | 10130.1 | 10289.1 | 10603.1 | 10775.6 | 10867.2 | 10740.5 | 10670.5 | 10438.7 | 10122.0 | 8995.4  |
| 30°   | 10189.4 | 10159.7 | 10351.1 | 10748.6 | 11132.7 | 11398.2 | 11398.2 | 11557.2 | 11456.1 | 11138.1 | 9867.3  |
| 32.5° | 10049.2 | 9994.0  | 10213.6 | 10783.7 | 11444.0 | 11960.1 | 12189.2 | 12752.5 | 12929.1 | 12814.5 | 11596.3 |
| 35°   | 9403.7  | 9445.5  | 9875.4  | 10643.5 | 11658.3 | 12510.0 | 13116.4 | 14323.9 | 14867.0 | 14996.3 | 13586.7 |
| 37.5° | 9000.8  | 9018.3  | 9456.3  | 10414.4 | 11733.7 | 13050.4 | 14131.2 | 16137.8 | 16907.3 | 16986.8 | 15333.2 |
| 40°   | 8445.5  | 8511.6  | 9002.1  | 10107.2 | 11690.6 | 13507.2 | 15224.1 | 17926.1 | 18781.8 | 18715.8 | 16861.4 |
| 42.5° | 8007.6  | 8026.4  | 8455.0  | 9619.3  | 11502.0 | 13871.1 | 16326.4 | 19549.9 | 20446.1 | 20261.5 | 18372.1 |
| 45°   | 7461.8  | 7496.8  | 7902.5  | 9012.9  | 11166.4 | 14055.7 | 17277.9 | 21072.8 | 21893.5 | 21663.0 | 19680.7 |
| 47.5° | 6801.4  | 6955.1  | 7379.6  | 8359.3  | 10597.7 | 14036.8 | 18083.7 | 22390.7 | 23327.3 | 22972.9 | 20904.3 |
| 50°   | 5478.1  | 5665.4  | 6514.4  | 7770.4  | 9852.5  | 13772.7 | 18725.2 | 23842.1 | 24644.0 | 24286.8 | 22021.5 |
| 52.5° | 4785.4  | 4821.8  | 5254.4  | 7108.7  | 8979.2  | 13182.4 | 19161.8 | 25041.5 | 25877.0 | 25501.0 | 23095.5 |
| 55°   | 4472.8  | 4510.5  | 4728.8  | 6037.3  | 8177.4  | 12136.7 | 19322.2 | 26185.6 | 26926.8 | 26495.6 | 23980.9 |
| 57.5° | 4199.2  | 4211.3  | 4468.7  | 5106.1  | 7413.3  | 10759.4 | 18983.9 | 27139.8 | 27774.5 | 27188.3 | 24595.4 |
| 60°   | 3886.5  | 3935.1  | 4188.4  | 4661.4  | 6552.1  | 9159.8  | 17825.0 | 27750.2 | 28349.9 | 27828.4 | 25232.9 |
| 62°   | 3711.4  | 3723.5  | 3921.6  | 4385.2  | 5885.1  | 8003.5  | 16381.7 | 27785.3 | 28552.1 | 28221.9 | 25625.0 |
| 62.5° | 3660.1  | 3668.2  | 3855.5  | 4315.1  | 5747.6  | 7774.4  | 15988.2 | 27757.0 | 28539.9 | 28290.6 | 25711.3 |
| 65°   | 3366.4  | 3385.2  | 3553.7  | 3983.6  | 5145.2  | 6881.0  | 14144.6 | 27294.7 | 28279.8 | 28174.7 | 25703.2 |
| 67.5° | 3009.2  | 3014.6  | 3193.9  | 3580.6  | 4524.0  | 6041.4  | 11880.6 | 26410.7 | 27006.3 | 26870.2 | 24577.9 |
| 70°   | 2460.8  | 2559.1  | 2754.5  | 3095.5  | 3742.3  | 5011.8  | 9037.2  | 23657.5 | 24634.5 | 24769.3 | 22561.9 |
| 72.5° | 1870.5  | 1863.8  | 1932.5  | 2169.7  | 2726.2  | 3850.2  | 6100.7  | 19822.2 | 22086.2 | 22815.2 | 20337.0 |
| 75°   | 1154.9  | 1199.4  | 1487.8  | 1677.8  | 1954.1  | 2715.5  | 3824.6  | 13798.3 | 18885.6 | 20145.6 | 17975.9 |
| 77.5° | 897.5   | 905.6   | 1055.2  | 1384.0  | 1601.0  | 1924.4  | 2385.3  | 7518.4  | 11838.9 | 14972.1 | 14000.4 |
| 80°   | 683.2   | 698.1   | 796.4   | 867.9   | 1126.6  | 1172.4  | 1591.5  | 3889.2  | 5391.8  | 7552.1  | 9405.1  |
| 82.5° | 412.4   | 435.3   | 526.9   | 568.7   | 621.3   | 587.6   | 855.7   | 2098.2  | 2989.0  | 3865.0  | 4789.4  |
| 85°   | 207.5   | 249.3   | 350.4   | 331.5   | 281.7   | 260.1   | 366.6   | 1014.8  | 1428.5  | 1890.7  | 2198.0  |
| 87.5° | 52.6    | 63.3    | 82.2    | 98.4    | 83.6    | 68.7    | 99.7    | 274.9   | 283.0   | 270.9   | 758.7   |
| 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: P237553

CATALOG NUMBER: CTN-8-4-D-E1-T2-7030-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 6562.9  | 6562.9  | 6562.9 | 6562.9 | 6562.9 | 6562.9 | 6562.9 | 6562.9 | 6562.9 | 6562.9 | 6562.9 |
| 2.5°  | 6573.7  | 6518.4  | 6417.4 | 6359.4 | 6215.2 | 6160.0 | 6056.2 | 6093.9 | 6071.0 | 6048.1 | 6049.5 |
| 5°    | 6584.5  | 6484.8  | 6292.0 | 6153.2 | 5944.4 | 5837.9 | 5701.8 | 5680.2 | 5620.9 | 5584.5 | 5588.6 |
| 7.5°  | 6607.4  | 6464.5  | 6192.3 | 5971.3 | 5677.5 | 5510.4 | 5328.5 | 5297.5 | 5208.6 | 5168.1 | 5173.5 |
| 10°   | 6665.3  | 6496.9  | 6127.6 | 5802.9 | 5471.3 | 5239.6 | 5026.6 | 4957.9 | 4873.0 | 4827.2 | 4824.5 |
| 12.5° | 6754.3  | 6545.4  | 6036.0 | 5674.8 | 5271.9 | 4971.4 | 4726.1 | 4615.6 | 4494.3 | 4453.9 | 4457.9 |
| 15°   | 6895.8  | 6607.4  | 5959.2 | 5498.3 | 5030.7 | 4718.0 | 4414.8 | 4281.4 | 4153.4 | 4106.2 | 4102.2 |
| 17.5° | 7068.3  | 6664.0  | 5905.3 | 5290.8 | 4821.8 | 4447.2 | 4180.3 | 3998.4 | 3782.8 | 3751.8 | 3718.1 |
| 20°   | 7239.4  | 6777.2  | 5856.8 | 5139.8 | 4573.8 | 4174.9 | 3825.9 | 3639.9 | 3331.3 | 3215.4 | 3173.6 |
| 22.5° | 7488.7  | 6956.4  | 5850.0 | 4960.6 | 4324.5 | 3877.1 | 3406.8 | 3106.3 | 2766.7 | 2569.9 | 2526.8 |
| 25°   | 7821.6  | 7153.2  | 5867.5 | 4824.5 | 4045.6 | 3498.4 | 2863.7 | 2429.8 | 2106.3 | 1884.0 | 1838.2 |
| 27.5° | 8254.2  | 7421.4  | 5920.1 | 4674.9 | 3792.2 | 3044.3 | 2254.6 | 1808.5 | 1534.9 | 1349.0 | 1305.8 |
| 30°   | 8891.6  | 7871.5  | 6002.3 | 4536.1 | 3423.0 | 2452.7 | 1657.6 | 1303.2 | 1090.2 | 975.7  | 974.3  |
| 32.5° | 10379.4 | 8876.8  | 6049.5 | 4363.6 | 3079.3 | 1854.3 | 1192.6 | 943.3  | 773.5  | 730.4  | 766.8  |
| 35°   | 12085.5 | 10301.2 | 6413.3 | 4177.6 | 2541.6 | 1363.8 | 851.7  | 671.1  | 601.0  | 611.8  | 632.0  |
| 37.5° | 13659.5 | 11670.4 | 6968.6 | 3875.8 | 2034.9 | 960.9  | 611.8  | 533.7  | 518.8  | 557.9  | 594.3  |
| 40°   | 15052.9 | 12853.6 | 7444.3 | 3544.2 | 1439.3 | 671.1  | 490.5  | 493.2  | 478.4  | 495.9  | 508.1  |
| 42.5° | 16419.4 | 13950.6 | 7946.9 | 3098.2 | 959.5  | 495.9  | 443.4  | 467.6  | 450.1  | 452.8  | 435.3  |
| 45°   | 17777.8 | 15108.2 | 8163.9 | 2547.0 | 642.8  | 429.9  | 415.1  | 443.4  | 442.0  | 431.2  | 405.6  |
| 47.5° | 18950.3 | 15906.0 | 8438.8 | 1921.7 | 478.4  | 390.8  | 394.9  | 415.1  | 428.5  | 409.7  | 397.5  |
| 50°   | 19958.3 | 16752.3 | 8227.2 | 1272.2 | 427.2  | 365.2  | 380.0  | 380.0  | 401.6  | 369.2  | 354.4  |
| 52.5° | 20921.8 | 17594.5 | 7684.1 | 838.2  | 392.2  | 347.7  | 362.5  | 353.1  | 362.5  | 330.2  | 326.1  |
| 55°   | 21500.0 | 18029.8 | 7027.8 | 653.6  | 370.6  | 332.9  | 339.6  | 336.9  | 328.8  | 295.1  | 301.9  |
| 57.5° | 22136.0 | 18531.1 | 6211.2 | 548.5  | 361.2  | 315.3  | 316.7  | 312.6  | 288.4  | 265.5  | 266.8  |
| 60°   | 22644.1 | 18905.8 | 5337.9 | 483.8  | 350.4  | 305.9  | 287.0  | 280.3  | 246.6  | 233.1  | 234.5  |
| 62°   | 22999.9 | 18923.3 | 4576.5 | 450.1  | 336.9  | 299.2  | 269.5  | 254.7  | 217.0  | 206.2  | 204.8  |
| 62.5° | 23038.9 | 18857.3 | 4390.6 | 442.0  | 331.5  | 296.5  | 268.2  | 246.6  | 208.9  | 200.8  | 198.1  |
| 65°   | 22893.4 | 18122.8 | 3502.5 | 397.5  | 308.6  | 280.3  | 249.3  | 214.3  | 179.2  | 168.5  | 164.4  |
| 67.5° | 21809.9 | 16807.5 | 2675.0 | 361.2  | 280.3  | 269.5  | 230.4  | 188.7  | 159.0  | 145.5  | 142.8  |
| 70°   | 19696.8 | 15027.3 | 1909.6 | 315.3  | 252.0  | 245.3  | 231.8  | 172.5  | 146.9  | 128.0  | 125.3  |
| 72.5° | 17349.3 | 13132.6 | 1299.1 | 280.3  | 223.7  | 202.1  | 171.1  | 163.1  | 137.5  | 113.2  | 110.5  |
| 75°   | 14764.5 | 10458.9 | 924.5  | 241.2  | 192.7  | 171.1  | 144.2  | 150.9  | 129.4  | 101.1  | 98.4   |
| 77.5° | 11328.1 | 7692.2  | 685.9  | 198.1  | 149.6  | 138.8  | 121.3  | 133.4  | 117.2  | 91.6   | 90.3   |
| 80°   | 7735.3  | 5312.3  | 487.8  | 149.6  | 98.4   | 98.4   | 102.4  | 114.5  | 103.8  | 82.2   | 80.9   |
| 82.5° | 4348.8  | 2796.3  | 288.4  | 107.8  | 67.4   | 67.4   | 79.5   | 93.0   | 86.2   | 71.4   | 70.1   |
| 85°   | 1801.8  | 1012.1  | 152.3  | 67.4   | 44.5   | 45.8   | 56.6   | 68.7   | 67.4   | 56.6   | 55.3   |
| 87.5° | 626.6   | 254.7   | 44.5   | 22.9   | 18.9   | 20.2   | 22.9   | 32.3   | 32.3   | 28.3   | 29.6   |
| 90°   | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

Report 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

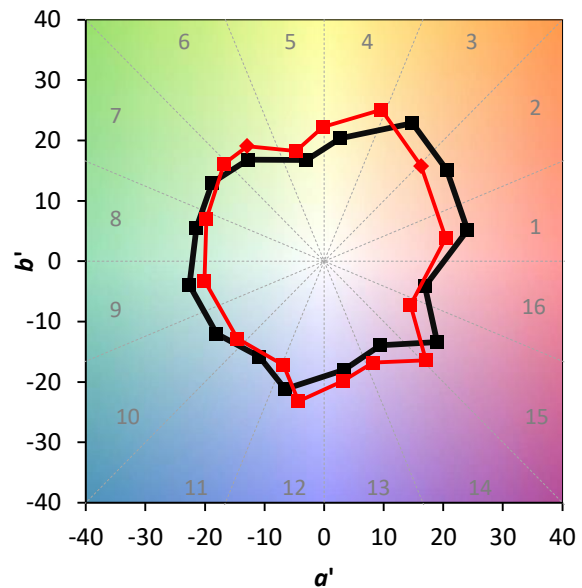
### Summary

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

### Spectral Power Distribution Comparison



### Color Vector Graphics

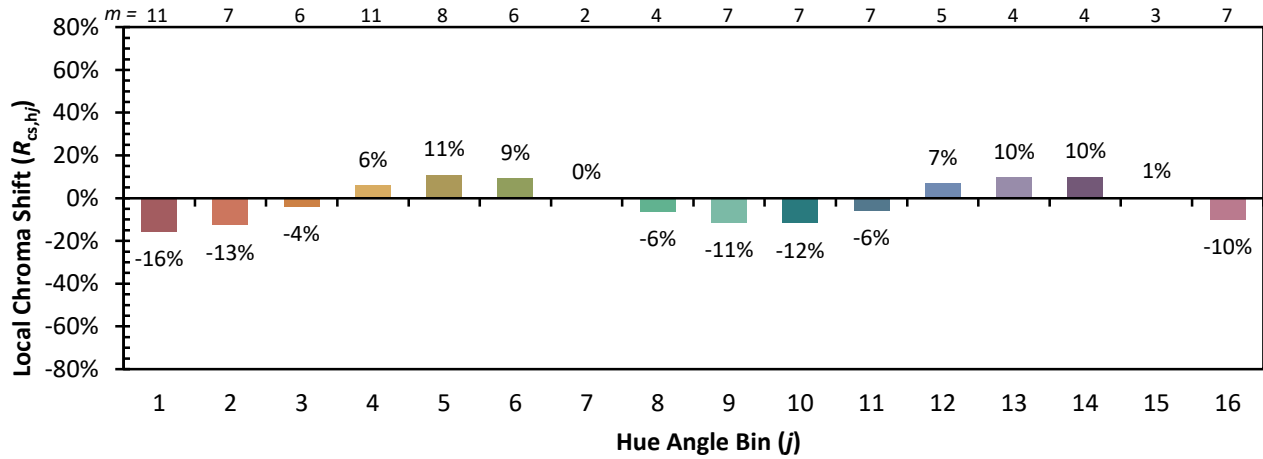


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

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