

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: P510531

Luminaire Tested: **CST-CA10-630-727-U-T4**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510531  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-12)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: STREETWORKS  
Catalog Number: CST-CA10-630-727-U-T4  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (10) 2700K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 77094 lumens  
Efficiency: N/A  
Efficacy: 122.1 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B5 - U0 - G5

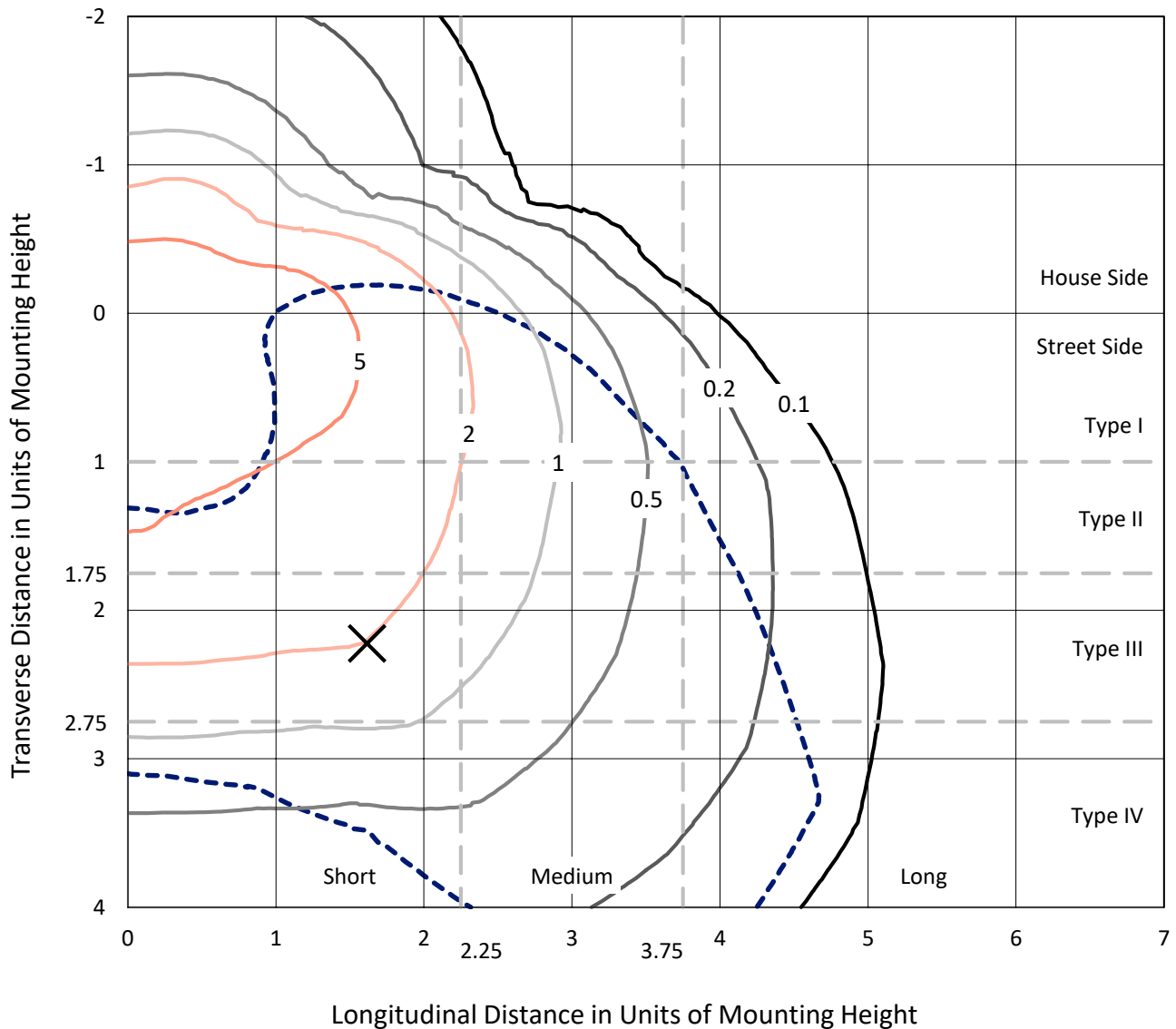
Input Watts (W): 631.4  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



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 CATALOG NUMBER: CST-CA10-630-727-U-T4

## Iso-Footcandle Lines of Horizontal Illumination

✕ Max cd  
 - - - 1/2 Max cd

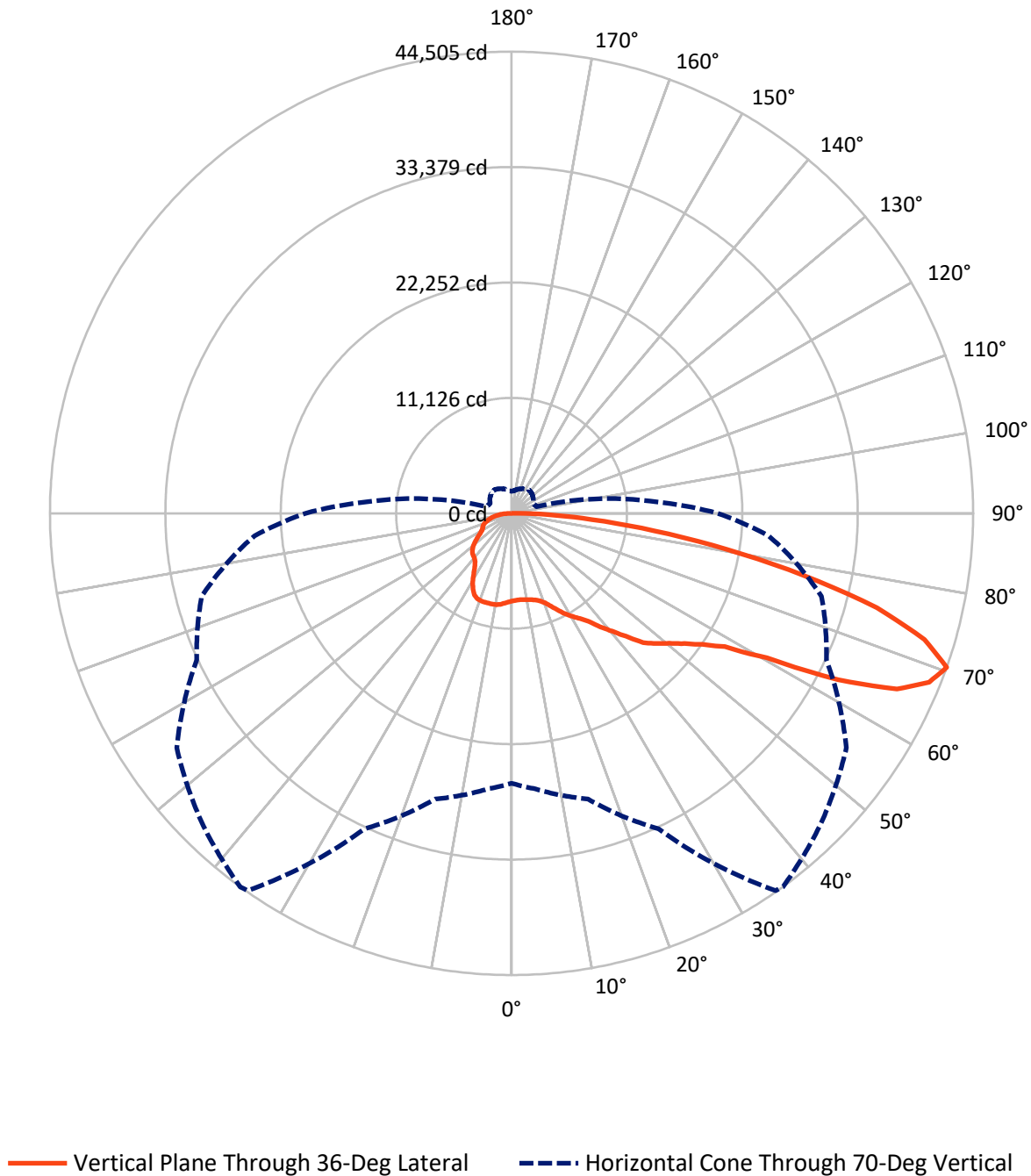


Based on 30 foot mounting height. Maximum calculated value = 9.8 fc  
 Type IV - Short - N/A

FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE

REPORT NUMBER: P510531  
CATALOG NUMBER: CST-CA10-630-727-U-T4

## Luminous Intensity Polar Plot



FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE

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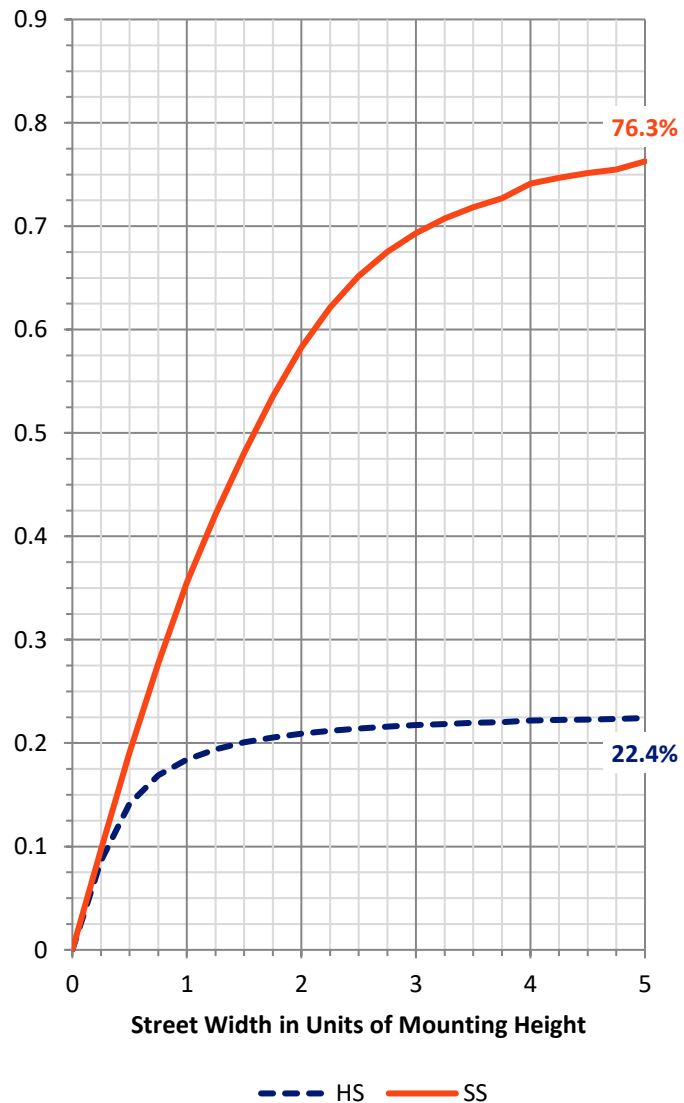
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 17565.4  | 0.0    | 17565.4 |
|                    | % Fixture | 22.8     | 0.0    | 22.8    |
| <b>Street Side</b> | Lumens    | 59528.6  | 0.0    | 59528.6 |
|                    | % Fixture | 77.2     | 0.0    | 77.2    |
| <b>Total</b>       | Lumens    | 77094.0  | 0.0    | 77094.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 818.1   | 1.1       |
| 10°-20°   | 2529.1  | 3.3       |
| 20°-30°   | 4562.0  | 5.9       |
| 30°-40°   | 7065.6  | 9.2       |
| 40°-50°   | 10732.6 | 13.9      |
| 50°-60°   | 14876.1 | 19.3      |
| 60°-70°   | 19344.1 | 25.1      |
| 70°-80°   | 14285.4 | 18.5      |
| 80°-90°   | 2881.0  | 3.7       |
| 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°    | 77094.0 | 100.0     |
| 0°-180°   | 77094.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P510531

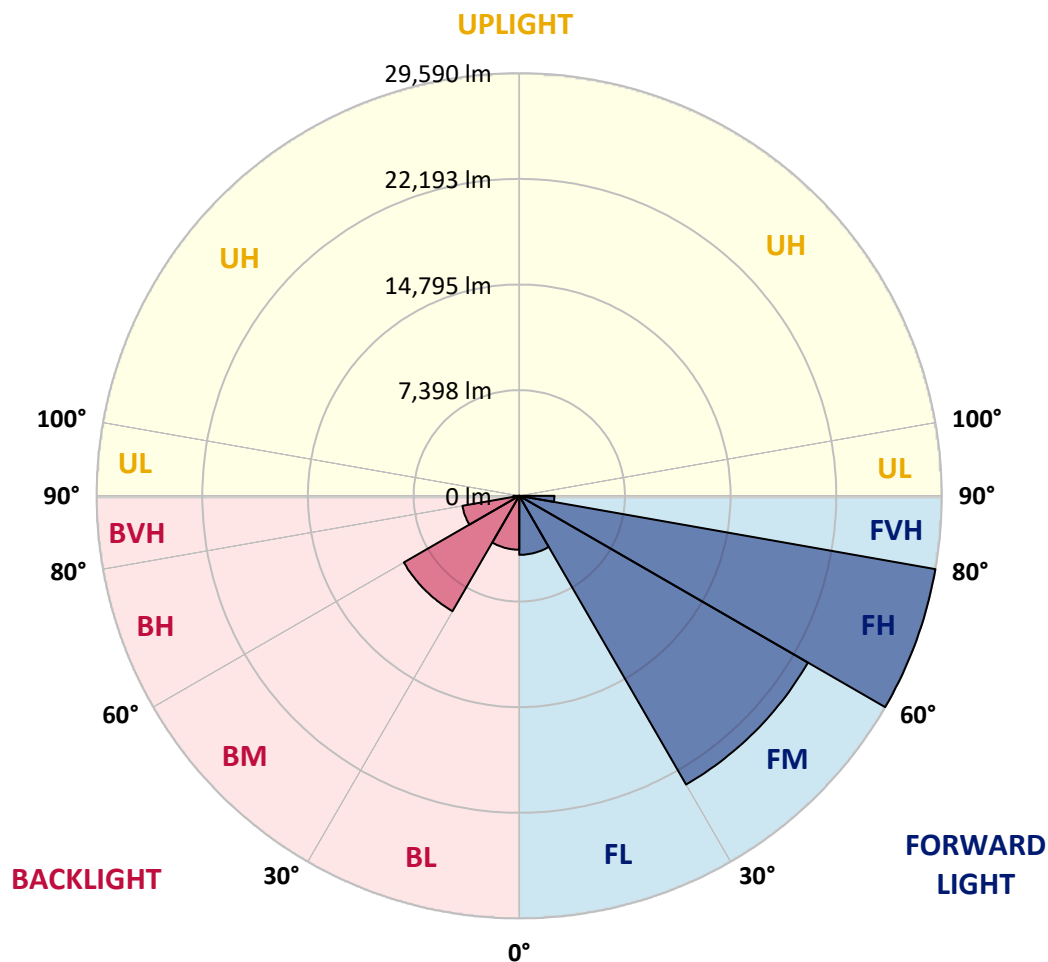
CATALOG NUMBER: CST-CA10-630-727-U-T4

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 4133.0  | 5.4       |                         |      |         |
| FM   | (30°-60°)   | 23343.9 | 30.3      |                         |      |         |
| FH   | (60°-80°)   | 29590.4 | 38.4      |                         |      | G5      |
| FVH  | (80°-90°)   | 2461.3  | 3.2       |                         |      | G5      |
| BL   | (0°-30°)    | 3776.1  | 4.9       | B4/5000                 |      |         |
| BM   | (30°-60°)   | 9330.5  | 12.1      | B5                      |      |         |
| BH   | (60°-80°)   | 4039.1  | 5.2       | B4/5000                 |      | G4/5000 |
| BVH  | (80°-90°)   | 419.7   | 0.5       |                         |      | G3/500  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B5-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°    | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1  |
| 2.5°  | 8393.0  | 8381.8  | 8375.5  | 8388.2  | 8393.0  | 8394.6  | 8397.8  | 8394.6  | 8386.6  | 8415.4  | 8450.5  |
| 5°    | 8394.6  | 8388.2  | 8375.5  | 8364.3  | 8364.3  | 8364.3  | 8365.9  | 8402.6  | 8418.6  | 8415.4  | 8458.5  |
| 7.5°  | 8407.4  | 8402.6  | 8378.6  | 8370.7  | 8389.8  | 8396.2  | 8428.1  | 8417.0  | 8434.5  | 8463.2  | 8500.0  |
| 10°   | 8409.0  | 8402.6  | 8381.8  | 8399.4  | 8453.7  | 8463.2  | 8477.6  | 8509.5  | 8515.9  | 8551.0  | 8587.8  |
| 12.5° | 8424.9  | 8424.9  | 8432.9  | 8471.2  | 8528.7  | 8539.9  | 8594.1  | 8619.7  | 8658.0  | 8675.5  | 8720.2  |
| 15°   | 8509.5  | 8507.9  | 8527.1  | 8570.2  | 8662.8  | 8669.2  | 8736.2  | 8812.8  | 8841.6  | 8884.7  | 8956.5  |
| 17.5° | 8710.7  | 8720.2  | 8721.8  | 8753.8  | 8863.9  | 8867.1  | 8977.2  | 9049.1  | 9114.5  | 9191.1  | 9355.5  |
| 20°   | 9187.9  | 9170.4  | 9151.2  | 9151.2  | 9194.3  | 9216.7  | 9301.3  | 9416.2  | 9550.3  | 9686.0  | 9879.1  |
| 22.5° | 9788.1  | 9823.2  | 9753.0  | 9716.3  | 9737.0  | 9711.5  | 9775.4  | 9867.9  | 10024.4 | 10227.1 | 10471.3 |
| 25°   | 10504.8 | 10508.0 | 10503.2 | 10354.8 | 10308.5 | 10324.5 | 10377.1 | 10463.3 | 10670.8 | 10832.1 | 11186.4 |
| 27.5° | 11204.0 | 11189.6 | 11138.5 | 10982.1 | 10937.4 | 10959.8 | 10958.2 | 11196.0 | 11408.3 | 11614.2 | 12030.8 |
| 30°   | 11839.3 | 11877.6 | 11786.6 | 11523.2 | 11528.0 | 11524.8 | 11598.3 | 11904.7 | 12292.6 | 12675.7 | 13103.5 |
| 32.5° | 12959.8 | 12843.3 | 12720.4 | 12200.0 | 12104.3 | 12093.1 | 12136.2 | 12592.7 | 13167.4 | 13813.8 | 14327.8 |
| 35°   | 14015.0 | 13986.2 | 13864.9 | 13336.6 | 12782.7 | 12773.1 | 12714.0 | 13269.5 | 14077.2 | 15274.4 | 15916.1 |
| 37.5° | 15094.0 | 15052.5 | 14932.8 | 14482.7 | 13932.0 | 13879.3 | 13382.8 | 13991.0 | 15082.8 | 16982.4 | 17897.0 |
| 40°   | 16380.6 | 16355.0 | 16169.9 | 15593.6 | 15028.6 | 14948.8 | 14433.2 | 14749.2 | 16351.8 | 19257.0 | 19901.9 |
| 42.5° | 17509.1 | 17504.3 | 17292.0 | 16757.3 | 16276.8 | 16197.0 | 15758.0 | 16086.9 | 18115.7 | 21485.3 | 21865.2 |
| 45°   | 18337.6 | 18463.7 | 18473.2 | 18168.4 | 17836.3 | 17766.1 | 17649.6 | 18102.9 | 20155.7 | 23507.8 | 23451.9 |
| 47.5° | 19036.7 | 19145.3 | 19031.9 | 18875.5 | 18762.2 | 18767.0 | 18947.3 | 19847.6 | 22170.1 | 25270.0 | 24835.8 |
| 50°   | 20205.2 | 20138.1 | 19549.1 | 19456.5 | 19600.2 | 19684.8 | 20208.4 | 21731.2 | 24476.7 | 26923.7 | 26077.7 |
| 52.5° | 21890.8 | 21633.8 | 20478.1 | 20289.8 | 20834.1 | 20866.0 | 21699.2 | 23415.2 | 26781.7 | 28342.8 | 27214.2 |
| 55°   | 24197.4 | 23985.1 | 22679.3 | 21809.4 | 22083.9 | 22299.4 | 23472.7 | 25140.7 | 28663.6 | 29677.2 | 28089.0 |
| 57.5° | 27606.9 | 27622.9 | 26558.2 | 24936.4 | 24002.6 | 24232.5 | 25148.7 | 26818.4 | 30218.4 | 30794.6 | 28634.9 |
| 60°   | 30339.7 | 30845.7 | 30528.0 | 29787.4 | 28446.5 | 28290.1 | 27592.5 | 28566.2 | 31546.4 | 31744.4 | 29156.9 |
| 62.5° | 32234.4 | 32464.3 | 33556.1 | 33712.5 | 35244.9 | 35310.3 | 31969.4 | 30614.2 | 33005.4 | 32366.9 | 29267.0 |
| 65°   | 32138.6 | 32280.7 | 34006.2 | 36106.9 | 40633.8 | 40836.5 | 38881.1 | 33712.5 | 34004.6 | 32644.6 | 28946.2 |
| 67.5° | 29900.7 | 30114.6 | 32307.8 | 36234.6 | 43505.4 | 43428.8 | 42188.5 | 38025.5 | 34333.5 | 32199.3 | 27417.0 |
| 70°   | 26013.9 | 26673.1 | 28515.2 | 33541.7 | 44402.5 | 44504.7 | 42218.9 | 39403.1 | 33485.9 | 30939.9 | 24867.8 |
| 72.5° | 21440.6 | 21648.2 | 23388.1 | 29013.2 | 41779.9 | 41629.8 | 40488.5 | 37585.0 | 31953.5 | 28662.0 | 20406.3 |
| 75°   | 16305.6 | 16305.6 | 18412.6 | 23121.5 | 35878.6 | 36405.4 | 36849.1 | 34041.3 | 28307.7 | 23360.9 | 13895.2 |
| 77.5° | 10824.1 | 11212.0 | 12908.8 | 17375.0 | 28400.2 | 28789.7 | 30322.1 | 29016.4 | 23177.4 | 17130.8 | 6346.6  |
| 80°   | 5741.7  | 5789.6  | 7609.3  | 11545.6 | 20313.7 | 21048.0 | 23155.0 | 22379.2 | 16671.1 | 8025.9  | 1604.2  |
| 82.5° | 2008.1  | 2191.6  | 3345.7  | 6691.4  | 13384.4 | 13842.6 | 15360.6 | 13298.2 | 5888.5  | 1776.6  | 887.5   |
| 85°   | 997.6   | 1032.8  | 1473.3  | 3186.1  | 7535.8  | 7757.7  | 8974.0  | 5179.8  | 948.2   | 775.8   | 603.4   |
| 87.5° | 480.5   | 491.6   | 565.1   | 1139.7  | 3275.5  | 3427.1  | 3628.2  | 1685.6  | 351.2   | 295.3   | 261.8   |
| 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: P510531

CATALOG NUMBER: CST-CA10-630-727-U-T4

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°    | 115°    | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 8444.1  | 8444.1  | 8444.1  | 8444.1  | 8444.1 | 8444.1 | 8444.1 | 8444.1 | 8444.1 | 8444.1 | 8444.1 |
| 2.5°  | 8458.5  | 8472.8  | 8500.0  | 8507.9  | 8488.8 | 8523.9 | 8557.4 | 8587.8 | 8586.2 | 8597.3 | 8637.2 |
| 5°    | 8477.6  | 8507.9  | 8536.7  | 8587.8  | 8637.2 | 8666.0 | 8693.1 | 8718.6 | 8726.6 | 8750.6 | 8774.5 |
| 7.5°  | 8536.7  | 8567.0  | 8632.4  | 8721.8  | 8725.0 | 8796.9 | 8843.2 | 8851.1 | 8857.5 | 8857.5 | 8913.4 |
| 10°   | 8627.7  | 8683.5  | 8788.9  | 8851.1  | 8907.0 | 8883.1 | 8930.9 | 8900.6 | 8878.3 | 8887.8 | 8926.2 |
| 12.5° | 8784.1  | 8833.6  | 8985.2  | 9053.9  | 9002.8 | 8993.2 | 8945.3 | 8876.7 | 8798.5 | 8790.5 | 8825.6 |
| 15°   | 9029.9  | 9122.5  | 9258.2  | 9323.6  | 9195.9 | 9082.6 | 8921.4 | 8780.9 | 8629.3 | 8573.4 | 8595.7 |
| 17.5° | 9425.8  | 9537.5  | 9686.0  | 9641.3  | 9408.2 | 9184.7 | 8918.2 | 8621.3 | 8327.6 | 8123.2 | 8175.9 |
| 20°   | 10005.2 | 10088.2 | 10209.5 | 10029.2 | 9689.2 | 9320.4 | 8883.1 | 8413.8 | 7917.3 | 7545.4 | 7502.3 |
| 22.5° | 10613.4 | 10739.5 | 10666.1 | 10332.4 | 9887.1 | 9373.1 | 8809.6 | 8112.1 | 7344.3 | 6878.2 | 6807.9 |
| 25°   | 11346.0 | 11387.6 | 11133.8 | 10630.9 | 9943.0 | 9290.1 | 8571.8 | 7671.5 | 6758.5 | 6319.5 | 6298.7 |
| 27.5° | 12123.4 | 12029.2 | 11556.8 | 10768.2 | 9880.7 | 9044.3 | 8094.5 | 6975.6 | 6228.5 | 5840.6 | 5780.0 |
| 30°   | 13001.3 | 12782.7 | 11906.3 | 10782.6 | 9646.1 | 8565.4 | 7491.1 | 6431.2 | 5797.5 | 5408.0 | 5345.8 |
| 32.5° | 14131.5 | 13615.9 | 12230.4 | 10634.1 | 9151.2 | 7863.1 | 6766.4 | 5966.7 | 5409.6 | 5018.6 | 4962.7 |
| 35°   | 15576.1 | 14706.1 | 12573.6 | 10366.0 | 8541.5 | 7160.7 | 6166.3 | 5572.5 | 5095.2 | 4624.3 | 4549.3 |
| 37.5° | 17241.0 | 16227.3 | 12983.8 | 10027.6 | 7872.6 | 6543.0 | 5760.8 | 5321.9 | 4862.1 | 4329.0 | 4239.6 |
| 40°   | 19175.6 | 17750.2 | 13615.9 | 9623.7  | 7272.5 | 6097.6 | 5564.5 | 5235.7 | 4732.8 | 4177.4 | 4075.2 |
| 42.5° | 20851.6 | 19360.8 | 14367.7 | 9189.5  | 6705.8 | 5727.3 | 5476.7 | 5178.2 | 4651.4 | 4064.0 | 3947.5 |
| 45°   | 22401.6 | 20690.4 | 15102.0 | 8662.8  | 6108.8 | 5473.5 | 5371.3 | 5034.5 | 4507.8 | 3923.5 | 3802.2 |
| 47.5° | 23661.0 | 21764.7 | 15740.5 | 8179.1  | 5631.5 | 5240.4 | 5141.5 | 4761.6 | 4266.7 | 3754.3 | 3665.0 |
| 50°   | 24628.3 | 22572.4 | 16090.1 | 7794.4  | 5127.1 | 4975.5 | 4844.6 | 4453.5 | 3977.8 | 3535.7 | 3459.0 |
| 52.5° | 25618.0 | 23381.7 | 16262.5 | 7813.6  | 4657.8 | 4581.2 | 4447.1 | 4111.9 | 3748.0 | 3408.0 | 3325.0 |
| 55°   | 26194.2 | 23713.7 | 16080.5 | 7349.1  | 4226.8 | 4137.4 | 4020.9 | 3846.9 | 3629.8 | 3328.2 | 3249.9 |
| 57.5° | 26531.0 | 23919.6 | 15526.6 | 5993.9  | 3708.1 | 3623.5 | 3642.6 | 3628.2 | 3449.5 | 3131.8 | 3060.0 |
| 60°   | 26773.7 | 23472.7 | 14391.7 | 4405.6  | 3265.9 | 3202.1 | 3360.1 | 3309.0 | 3154.2 | 2906.7 | 2846.1 |
| 62.5° | 26577.3 | 22621.9 | 12348.5 | 3312.2  | 2905.2 | 3040.8 | 3179.7 | 3085.5 | 2874.8 | 2649.8 | 2579.5 |
| 65°   | 25380.2 | 20952.2 | 9385.9  | 2660.9  | 2788.6 | 2975.4 | 3087.1 | 2935.5 | 2721.6 | 2455.0 | 2423.1 |
| 67.5° | 23201.3 | 17925.7 | 5535.7  | 2439.0  | 2700.8 | 2898.8 | 2991.3 | 2790.2 | 2601.9 | 2346.5 | 2308.2 |
| 70°   | 19876.3 | 13419.6 | 2472.6  | 2271.4  | 2547.6 | 2743.9 | 2804.6 | 2614.6 | 2410.3 | 2170.9 | 2132.6 |
| 72.5° | 14793.9 | 8091.3  | 1666.5  | 2097.5  | 2320.9 | 2494.9 | 2562.0 | 2360.8 | 2215.6 | 2107.0 | 2095.9 |
| 75°   | 8215.8  | 2809.4  | 1537.2  | 1899.5  | 2073.5 | 2229.9 | 2312.9 | 2170.9 | 2056.0 | 1907.5 | 1846.8 |
| 77.5° | 2616.2  | 1194.0  | 1460.6  | 1698.4  | 1918.7 | 2048.0 | 2035.2 | 1821.3 | 1784.6 | 1604.2 | 1588.3 |
| 80°   | 1043.9  | 1040.7  | 1350.4  | 1390.3  | 1637.7 | 1746.3 | 1717.6 | 1447.8 | 1495.7 | 1390.3 | 1348.8 |
| 82.5° | 818.9   | 953.0   | 1082.2  | 1061.5  | 1273.8 | 1401.5 | 1361.6 | 1063.1 | 1202.0 | 1104.6 | 1010.4 |
| 85°   | 622.5   | 834.8   | 694.4   | 691.2   | 889.1  | 1040.7 | 1066.3 | 817.3  | 818.9  | 745.4  | 664.0  |
| 87.5° | 320.8   | 308.1   | 266.6   | 265.0   | 296.9  | 423.0  | 518.8  | 464.5  | 367.1  | 276.1  | 265.0  |
| 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: SP1-2104-215-5

Luminaire Tested: CST-CA6-230-727-U-T4

Test Date: 04/22/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-5  
 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-CA6-230-727-U-T4**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 2613    | CRI (Ra): | 72.6 |      |       |
| CIE u':                   | 0.2668  | R1:       | 69.4 | R9:  | -28.6 |
| CIE v':                   | 0.5272  | R2:       | 84.5 | R10: | 65.5  |
| Duv:                      | -0.0012 | R3:       | 95.0 | R11: | 63.4  |
| CIE x:                    | 0.4648  | R4:       | 67.5 | R12: | 56.9  |
| CIE y:                    | 0.4082  | R5:       | 68.5 | R13: | 72.3  |
| CIE z:                    | 0.1270  | R6:       | 79.7 | R14: | 97.8  |
| Peak Wavelength (nm):     | 603     | R7:       | 75.4 |      |       |
| Dominant Wavelength (nm): | 585     | R8:       | 41.2 |      |       |
| Purity:                   | 62.2    |           |      |      |       |
|                           |         |           |      |      |       |
| Rf:                       | 75.3    |           |      |      |       |
| Rg:                       | 95.8    |           |      |      |       |



### Test Conditions

Stabilization Time: 121M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.5/25%  
 Sphere Temperature (°C): 24.8

REPORT NUMBER: SP1-2104-215-5

| 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: SP1-2104-215-5

**CIE 1931 Chromaticity Diagram**



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



Point lies inside the ANSI 2700K 7-step quadrangle

REPORT NUMBER: SP1-2104-215-5

### 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       | 11220            | 0.0              | 490       | 69401            | 9.9              | 620       | 692536           | 180.2            | 750       | 31541            | 0.0              | 880       | 18253            | 0.0              |
| 365       | 10182            | 0.0              | 495       | 90053            | 16.3             | 625       | 651217           | 143.7            | 755       | 28760            | 0.0              | 885       | 21369            | 0.0              |
| 370       | 10420            | 0.0              | 500       | 121940           | 26.9             | 630       | 598624           | 108.3            | 760       | 26534            | 0.0              | 890       | 16745            | 0.0              |
| 375       | 12164            | 0.0              | 505       | 159641           | 44.7             | 635       | 546251           | 82.1             | 765       | 24261            | 0.0              | 895       | 14205            | 0.0              |
| 380       | 12715            | 0.0              | 510       | 197034           | 67.7             | 640       | 499000           | 59.6             | 770       | 21584            | 0.0              | 900       | 14113            | 0.0              |
| 385       | 11387            | 0.0              | 515       | 232805           | 96.4             | 645       | 451749           | 43.5             | 775       | 20805            | 0.0              | 905       | 13457            | 0.0              |
| 390       | 10503            | 0.0              | 520       | 263165           | 127.6            | 650       | 406338           | 29.7             | 780       | 17853            | 0.0              | 910       | 12811            | 0.0              |
| 395       | 8950             | 0.0              | 525       | 288012           | 154.6            | 655       | 360522           | 20.7             | 785       | 17033            | 0.0              | 915       | 17471            | 0.0              |
| 400       | 8271             | 0.0              | 530       | 310825           | 183.0            | 660       | 321663           | 13.4             | 790       | 16986            | 0.0              | 920       | 15483            | 0.0              |
| 405       | 7777             | 0.0              | 535       | 330894           | 205.2            | 665       | 283133           | 9.0              | 795       | 16655            | 0.0              | 925       | 19757            | 0.0              |
| 410       | 9299             | 0.0              | 540       | 349086           | 227.5            | 670       | 244093           | 5.3              | 800       | 15070            | 0.0              | 930       | 16307            | 0.0              |
| 415       | 13971            | 0.0              | 545       | 372506           | 247.9            | 675       | 210996           | 3.5              | 805       | 15366            | 0.0              | 935       | 18687            | 0.0              |
| 420       | 23461            | 0.1              | 550       | 403721           | 274.3            | 680       | 183942           | 2.1              | 810       | 15472            | 0.0              | 940       | 17986            | 0.0              |
| 425       | 41887            | 0.2              | 555       | 442032           | 301.9            | 685       | 158373           | 1.4              | 815       | 17184            | 0.0              | 945       | 15266            | 0.0              |
| 430       | 69840            | 0.6              | 560       | 485515           | 329.9            | 690       | 137120           | 0.8              | 820       | 14166            | 0.0              | 950       | 21027            | 0.0              |
| 435       | 106868           | 1.3              | 565       | 532962           | 354.4            | 695       | 116757           | 0.5              | 825       | 13854            | 0.0              | 955       | 19232            | 0.0              |
| 440       | 164642           | 2.6              | 570       | 582457           | 378.7            | 700       | 102093           | 0.3              | 830       | 14283            | 0.0              | 960       | 11261            | 0.0              |
| 445       | 256049           | 5.3              | 575       | 634550           | 394.8            | 705       | 87819            | 0.2              | 835       | 14112            | 0.0              | 965       | 20156            | 0.0              |
| 450       | 327314           | 8.5              | 580       | 686476           | 407.9            | 710       | 78011            | 0.1              | 840       | 13092            | 0.0              | 970       | 22393            | 0.0              |
| 455       | 265614           | 8.9              | 585       | 730571           | 405.9            | 715       | 70264            | 0.1              | 845       | 12158            | 0.0              | 975       | 20121            | 0.0              |
| 460       | 168394           | 6.9              | 590       | 768228           | 397.2            | 720       | 63584            | 0.0              | 850       | 14790            | 0.0              | 980       | 28091            | 0.0              |
| 465       | 127370           | 6.6              | 595       | 780593           | 370.0            | 725       | 55749            | 0.0              | 855       | 15683            | 0.0              | 985       | 27040            | 0.0              |
| 470       | 94724            | 5.9              | 600       | 791888           | 341.3            | 730       | 48683            | 0.0              | 860       | 19011            | 0.0              | 990       | 20772            | 0.0              |
| 475       | 67810            | 5.3              | 605       | 789088           | 305.6            | 735       | 42520            | 0.0              | 865       | 18194            | 0.0              | 995       | 26800            | 0.0              |
| 480       | 59825            | 5.7              | 610       | 765121           | 262.9            | 740       | 37531            | 0.0              | 870       | 15713            | 0.0              | 1000      | 28539            | 0.0              |
| 485       | 61079            | 7.2              | 615       | 735839           | 222.1            | 745       | 34522            | 0.0              | 875       | 19703            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-5

### Scotopic Flux vs. Wavelength



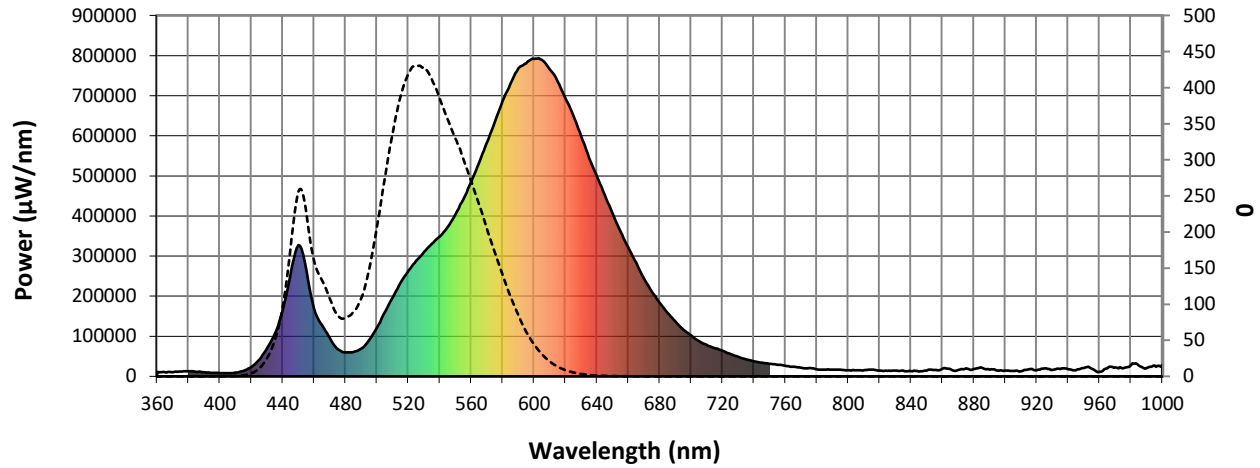
Scotopic Lumens: 37163.1

S/P: 1.07

| 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       | 11220            | 0.0              | 490       | 69401            | 106.9            | 620       | 692536           | 8.7              | 750       | 31541            | 0.0              | 880       | 18253            | 0.0              |
| 365       | 10182            | 0.0              | 495       | 90053            | 145.6            | 625       | 651217           | 5.5              | 755       | 28760            | 0.0              | 885       | 21369            | 0.0              |
| 370       | 10420            | 0.0              | 500       | 121940           | 204.0            | 630       | 598624           | 3.4              | 760       | 26534            | 0.0              | 890       | 16745            | 0.0              |
| 375       | 12164            | 0.0              | 505       | 159641           | 271.4            | 635       | 546251           | 2.1              | 765       | 24261            | 0.0              | 895       | 14205            | 0.0              |
| 380       | 12715            | 0.0              | 510       | 197034           | 334.0            | 640       | 499000           | 1.3              | 770       | 21584            | 0.0              | 900       | 14113            | 0.0              |
| 385       | 11387            | 0.0              | 515       | 232805           | 385.9            | 645       | 451749           | 0.8              | 775       | 20805            | 0.0              | 905       | 13457            | 0.0              |
| 390       | 10503            | 0.0              | 520       | 263165           | 418.3            | 650       | 406338           | 0.5              | 780       | 17853            | 0.0              | 910       | 12811            | 0.0              |
| 395       | 8950             | 0.1              | 525       | 288012           | 430.9            | 655       | 360522           | 0.3              | 785       | 17033            | 0.0              | 915       | 17471            | 0.0              |
| 400       | 8271             | 0.1              | 530       | 310825           | 428.5            | 660       | 321663           | 0.2              | 790       | 16986            | 0.0              | 920       | 15483            | 0.0              |
| 405       | 7777             | 0.2              | 535       | 330894           | 412.3            | 665       | 283133           | 0.1              | 795       | 16655            | 0.0              | 925       | 19757            | 0.0              |
| 410       | 9299             | 0.6              | 540       | 349086           | 385.7            | 670       | 244093           | 0.1              | 800       | 15070            | 0.0              | 930       | 16307            | 0.0              |
| 415       | 13971            | 1.4              | 545       | 372506           | 357.2            | 675       | 210996           | 0.0              | 805       | 15366            | 0.0              | 935       | 18687            | 0.0              |
| 420       | 23461            | 3.9              | 550       | 403721           | 330.1            | 680       | 183942           | 0.0              | 810       | 15472            | 0.0              | 940       | 17986            | 0.0              |
| 425       | 41887            | 10.2             | 555       | 442032           | 302.1            | 685       | 158373           | 0.0              | 815       | 17184            | 0.0              | 945       | 15266            | 0.0              |
| 430       | 69840            | 23.8             | 560       | 485515           | 271.4            | 690       | 137120           | 0.0              | 820       | 14166            | 0.0              | 950       | 21027            | 0.0              |
| 435       | 106868           | 47.8             | 565       | 532962           | 239.1            | 695       | 116757           | 0.0              | 825       | 13854            | 0.0              | 955       | 19232            | 0.0              |
| 440       | 164642           | 92.0             | 570       | 582457           | 205.6            | 700       | 102093           | 0.0              | 830       | 14283            | 0.0              | 960       | 11261            | 0.0              |
| 445       | 256049           | 171.5            | 575       | 634550           | 172.8            | 705       | 87819            | 0.0              | 835       | 14112            | 0.0              | 965       | 20156            | 0.0              |
| 450       | 327314           | 253.7            | 580       | 686476           | 141.4            | 710       | 78011            | 0.0              | 840       | 13092            | 0.0              | 970       | 22393            | 0.0              |
| 455       | 265614           | 232.1            | 585       | 730571           | 111.7            | 715       | 70264            | 0.0              | 845       | 12158            | 0.0              | 975       | 20121            | 0.0              |
| 460       | 168394           | 162.6            | 590       | 768228           | 85.5             | 720       | 63584            | 0.0              | 850       | 14790            | 0.0              | 980       | 28091            | 0.0              |
| 465       | 127370           | 134.5            | 595       | 780593           | 62.2             | 725       | 55749            | 0.0              | 855       | 15683            | 0.0              | 985       | 27040            | 0.0              |
| 470       | 94724            | 109.1            | 600       | 791888           | 44.6             | 730       | 48683            | 0.0              | 860       | 19011            | 0.0              | 990       | 20772            | 0.0              |
| 475       | 67810            | 84.8             | 605       | 789088           | 31.0             | 735       | 42520            | 0.0              | 865       | 18194            | 0.0              | 995       | 26800            | 0.0              |
| 480       | 59825            | 80.8             | 610       | 765121           | 20.7             | 740       | 37531            | 0.0              | 870       | 15713            | 0.0              | 1000      | 28539            | 0.0              |
| 485       | 61079            | 88.5             | 615       | 735839           | 13.6             | 745       | 34522            | 0.0              | 875       | 19703            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-5

### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 13012.4**      **M/P: 0.38**

| 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       | 11220            | 0.0              | 490       | 69401            | 57.8             | 620       | 692536           | 0.5              | 750       | 31541            | 0.0              | 880       | 18253            | 0.0              |
| 365       | 10182            | 0.0              | 495       | 90053            | 74.3             | 625       | 651217           | 0.3              | 755       | 28760            | 0.0              | 885       | 21369            | 0.0              |
| 370       | 10420            | 0.0              | 500       | 121940           | 98.0             | 630       | 598624           | 0.2              | 760       | 26534            | 0.0              | 890       | 16745            | 0.0              |
| 375       | 12164            | 0.0              | 505       | 159641           | 122.5            | 635       | 546251           | 0.1              | 765       | 24261            | 0.0              | 895       | 14205            | 0.0              |
| 380       | 12715            | 0.0              | 510       | 197034           | 141.5            | 640       | 499000           | 0.1              | 770       | 21584            | 0.0              | 900       | 14113            | 0.0              |
| 385       | 11387            | 0.0              | 515       | 232805           | 152.1            | 645       | 451749           | 0.0              | 775       | 20805            | 0.0              | 905       | 13457            | 0.0              |
| 390       | 10503            | 0.0              | 520       | 263165           | 153.2            | 650       | 406338           | 0.0              | 780       | 17853            | 0.0              | 910       | 12811            | 0.0              |
| 395       | 8950             | 0.0              | 525       | 288012           | 146.1            | 655       | 360522           | 0.0              | 785       | 17033            | 0.0              | 915       | 17471            | 0.0              |
| 400       | 8271             | 0.1              | 530       | 310825           | 134.3            | 660       | 321663           | 0.0              | 790       | 16986            | 0.0              | 920       | 15483            | 0.0              |
| 405       | 7777             | 0.1              | 535       | 330894           | 119.1            | 665       | 283133           | 0.0              | 795       | 16655            | 0.0              | 925       | 19757            | 0.0              |
| 410       | 9299             | 0.4              | 540       | 349086           | 102.2            | 670       | 244093           | 0.0              | 800       | 15070            | 0.0              | 930       | 16307            | 0.0              |
| 415       | 13971            | 0.9              | 545       | 372506           | 86.5             | 675       | 210996           | 0.0              | 805       | 15366            | 0.0              | 935       | 18687            | 0.0              |
| 420       | 23461            | 2.7              | 550       | 403721           | 72.5             | 680       | 183942           | 0.0              | 810       | 15472            | 0.0              | 940       | 17986            | 0.0              |
| 425       | 41887            | 6.5              | 555       | 442032           | 59.6             | 685       | 158373           | 0.0              | 815       | 17184            | 0.0              | 945       | 15266            | 0.0              |
| 430       | 69840            | 14.8             | 560       | 485515           | 47.9             | 690       | 137120           | 0.0              | 820       | 14166            | 0.0              | 950       | 21027            | 0.0              |
| 435       | 106868           | 28.5             | 565       | 532962           | 37.4             | 695       | 116757           | 0.0              | 825       | 13854            | 0.0              | 955       | 19232            | 0.0              |
| 440       | 164642           | 55.0             | 570       | 582457           | 28.5             | 700       | 102093           | 0.0              | 830       | 14283            | 0.0              | 960       | 11261            | 0.0              |
| 445       | 256049           | 101.0            | 575       | 634550           | 21.1             | 705       | 87819            | 0.0              | 835       | 14112            | 0.0              | 965       | 20156            | 0.0              |
| 450       | 327314           | 150.8            | 580       | 686476           | 15.4             | 710       | 78011            | 0.0              | 840       | 13092            | 0.0              | 970       | 22393            | 0.0              |
| 455       | 265614           | 139.2            | 585       | 730571           | 10.9             | 715       | 70264            | 0.0              | 845       | 12158            | 0.0              | 975       | 20121            | 0.0              |
| 460       | 168394           | 99.2             | 590       | 768228           | 7.5              | 720       | 63584            | 0.0              | 850       | 14790            | 0.0              | 980       | 28091            | 0.0              |
| 465       | 127370           | 83.2             | 595       | 780593           | 5.0              | 725       | 55749            | 0.0              | 855       | 15683            | 0.0              | 985       | 27040            | 0.0              |
| 470       | 94724            | 67.8             | 600       | 791888           | 3.3              | 730       | 48683            | 0.0              | 860       | 19011            | 0.0              | 990       | 20772            | 0.0              |
| 475       | 67810            | 51.8             | 605       | 789088           | 2.2              | 735       | 42520            | 0.0              | 865       | 18194            | 0.0              | 995       | 26800            | 0.0              |
| 480       | 59825            | 48.1             | 610       | 765121           | 1.4              | 740       | 37531            | 0.0              | 870       | 15713            | 0.0              | 1000      | 28539            | 0.0              |
| 485       | 61079            | 50.3             | 615       | 735839           | 0.9              | 745       | 34522            | 0.0              | 875       | 19703            | 0.0              |           |                  |                  |

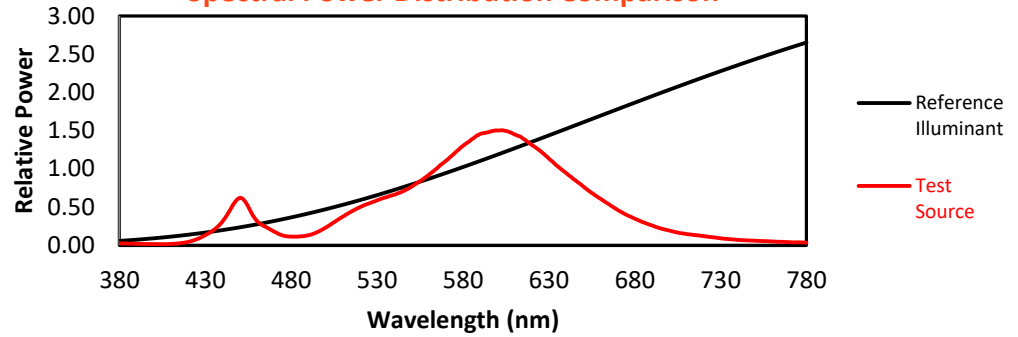
REPORT NUMBER: SP1-2104-215-5

TM-30-18

### Summary

$R_f = 75.3$   
 $R_g = 95.8$   
 CIE  $R_a = 72.6$   
 $R_g = -28.6$

### Spectral Power Distribution Comparison

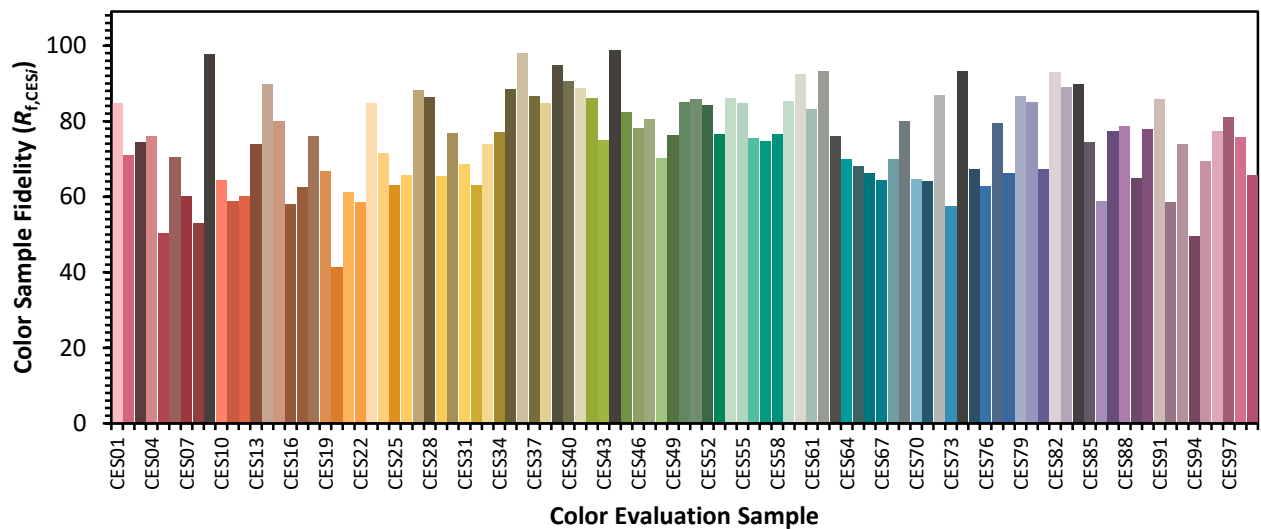


### Color Vector Graphics

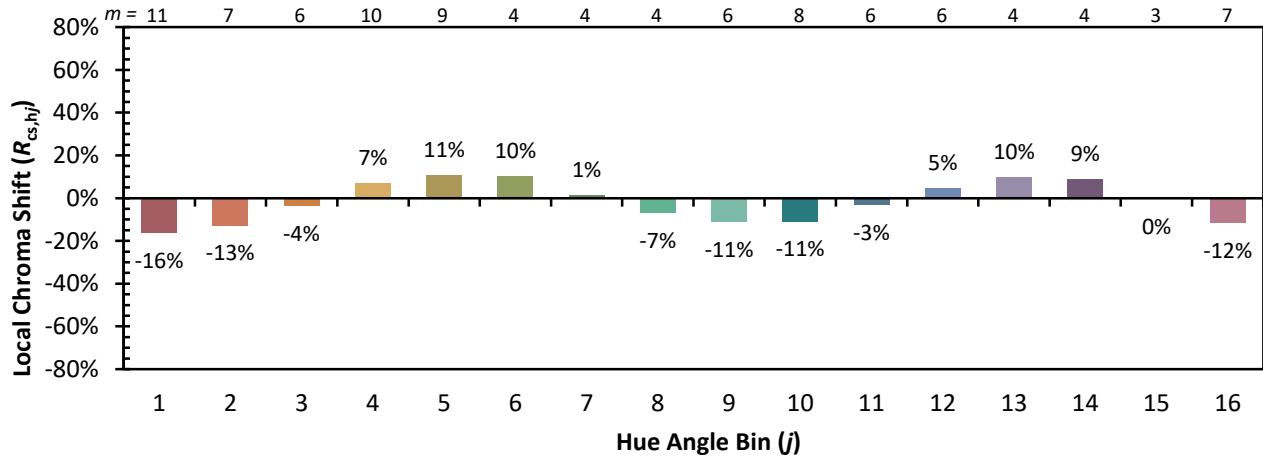


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 66 | CES51 = 86 | CES76 = 63 |
| CES02 = 64 | CES27 = 88 | CES52 = 84 | CES77 = 79 |
| CES03 = 31 | CES28 = 86 | CES53 = 77 | CES78 = 66 |
| CES04 = 71 | CES29 = 65 | CES54 = 86 | CES79 = 87 |
| CES05 = 50 | CES30 = 77 | CES55 = 85 | CES80 = 85 |
| CES06 = 52 | CES31 = 69 | CES56 = 75 | CES81 = 67 |
| CES07 = 42 | CES32 = 63 | CES57 = 75 | CES82 = 93 |
| CES08 = 41 | CES33 = 74 | CES58 = 77 | CES83 = 89 |
| CES09 = 29 | CES34 = 77 | CES59 = 85 | CES84 = 90 |
| CES10 = 77 | CES35 = 88 | CES60 = 92 | CES85 = 74 |
| CES11 = 60 | CES36 = 98 | CES61 = 83 | CES86 = 59 |
| CES12 = 66 | CES37 = 86 | CES62 = 93 | CES87 = 77 |
| CES13 = 44 | CES38 = 85 | CES63 = 76 | CES88 = 79 |
| CES14 = 74 | CES39 = 95 | CES64 = 70 | CES89 = 65 |
| CES15 = 72 | CES40 = 91 | CES65 = 68 | CES90 = 78 |
| CES16 = 48 | CES41 = 89 | CES66 = 66 | CES91 = 86 |
| CES17 = 51 | CES42 = 86 | CES67 = 64 | CES92 = 59 |
| CES18 = 57 | CES43 = 75 | CES68 = 70 | CES93 = 74 |
| CES19 = 73 | CES44 = 99 | CES69 = 80 | CES94 = 50 |
| CES20 = 67 | CES45 = 83 | CES70 = 65 | CES95 = 69 |
| CES21 = 88 | CES46 = 78 | CES71 = 64 | CES96 = 77 |
| CES22 = 80 | CES47 = 80 | CES72 = 87 | CES97 = 81 |
| CES23 = 92 | CES48 = 70 | CES73 = 58 | CES98 = 76 |
| CES24 = 91 | CES49 = 76 | CES74 = 93 | CES99 = 66 |
| CES25 = 73 | CES50 = 85 | CES75 = 67 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)