

Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



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: P510460

Luminaire Tested: **CTN-CA10-310-722-U-T4-HSS**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510460  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-17)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: CTN-CA10-310-722-U-T4-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (10) 2200K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 34944 lumens  
Efficiency: N/A  
Efficacy: 111.9 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B3 - U0 - G5

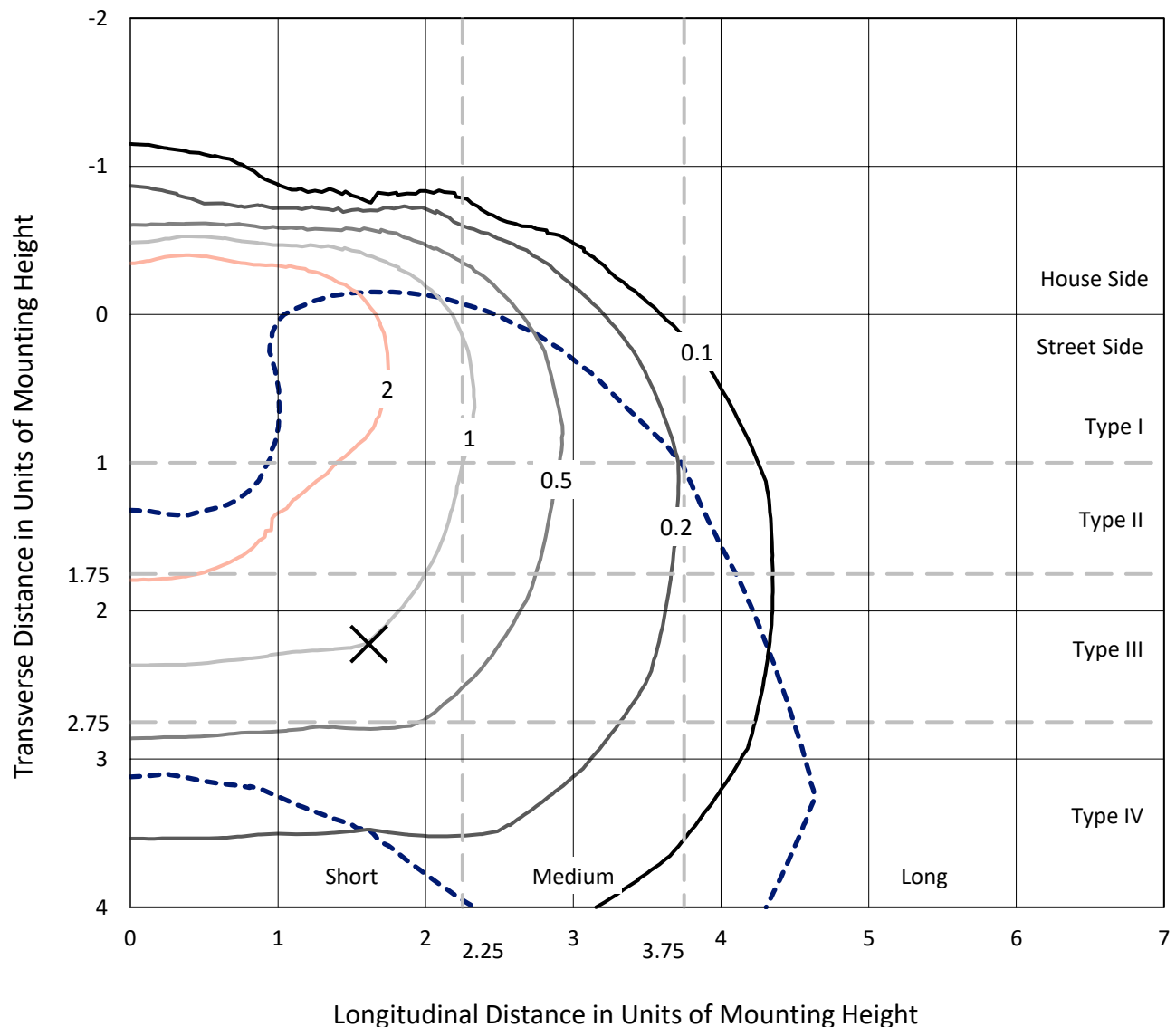
Input Watts (W): 312.4  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



REPORT NUMBER: P510460  
 CATALOG NUMBER: CTN-CA10-310-722-U-T4-HSS

## Iso-Footcandle Lines of Horizontal Illumination

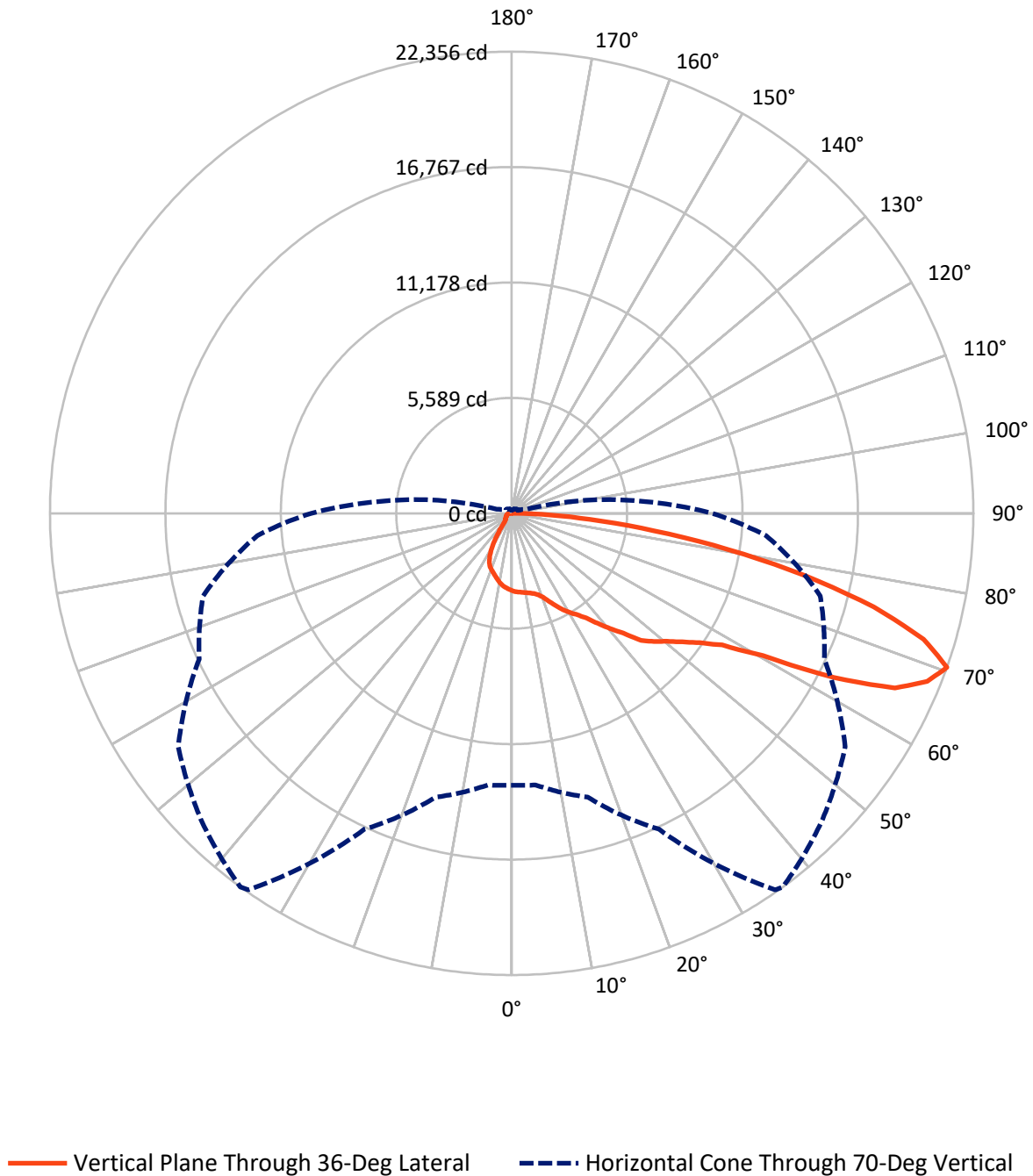
✕ Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 4.7 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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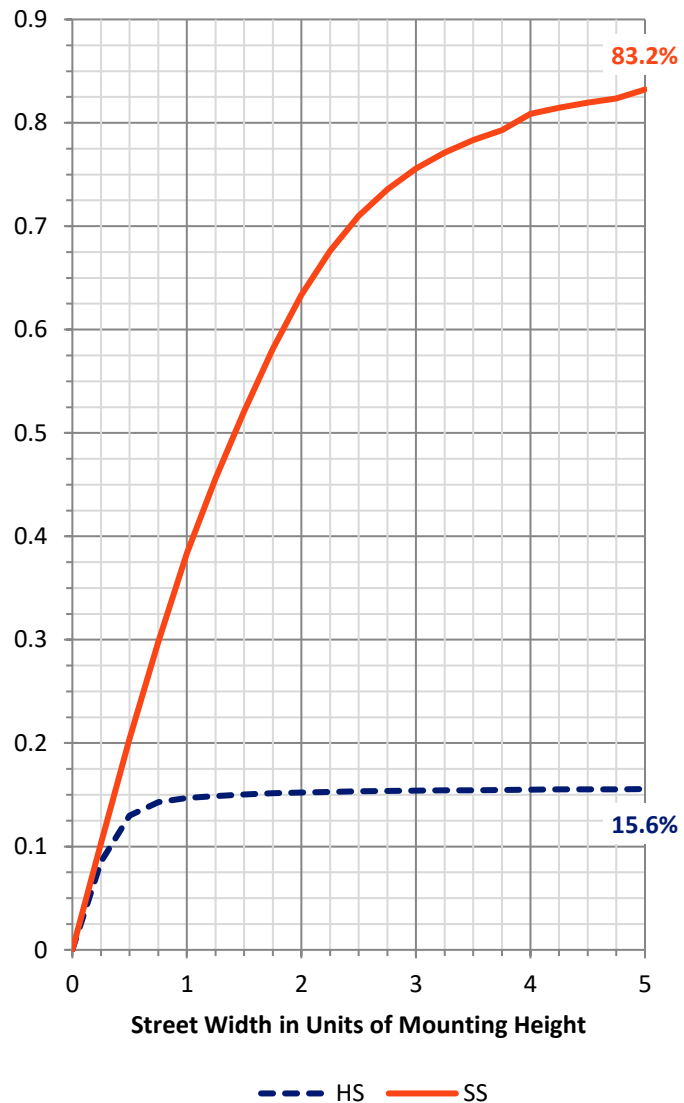
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 5514.4   | 0.0    | 5514.4  |
|                    | % Fixture | 15.8     | 0.0    | 15.8    |
| <b>Street Side</b> | Lumens    | 29429.6  | 0.0    | 29429.6 |
|                    | % Fixture | 84.2     | 0.0    | 84.2    |
| <b>Total</b>       | Lumens    | 34944.0  | 0.0    | 34944.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 355.1   | 1.0       |
| 10°-20°   | 1056.0  | 3.0       |
| 20°-30°   | 1899.0  | 5.4       |
| 30°-40°   | 3005.0  | 8.6       |
| 40°-50°   | 4696.3  | 13.4      |
| 50°-60°   | 6743.9  | 19.3      |
| 60°-70°   | 9147.4  | 26.2      |
| 70°-80°   | 6770.1  | 19.4      |
| 80°-90°   | 1271.2  | 3.6       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 34944.0 | 100.0     |
| 0°-180°   | 34944.0 | 100.0     |

**Coefficient of Utilization**



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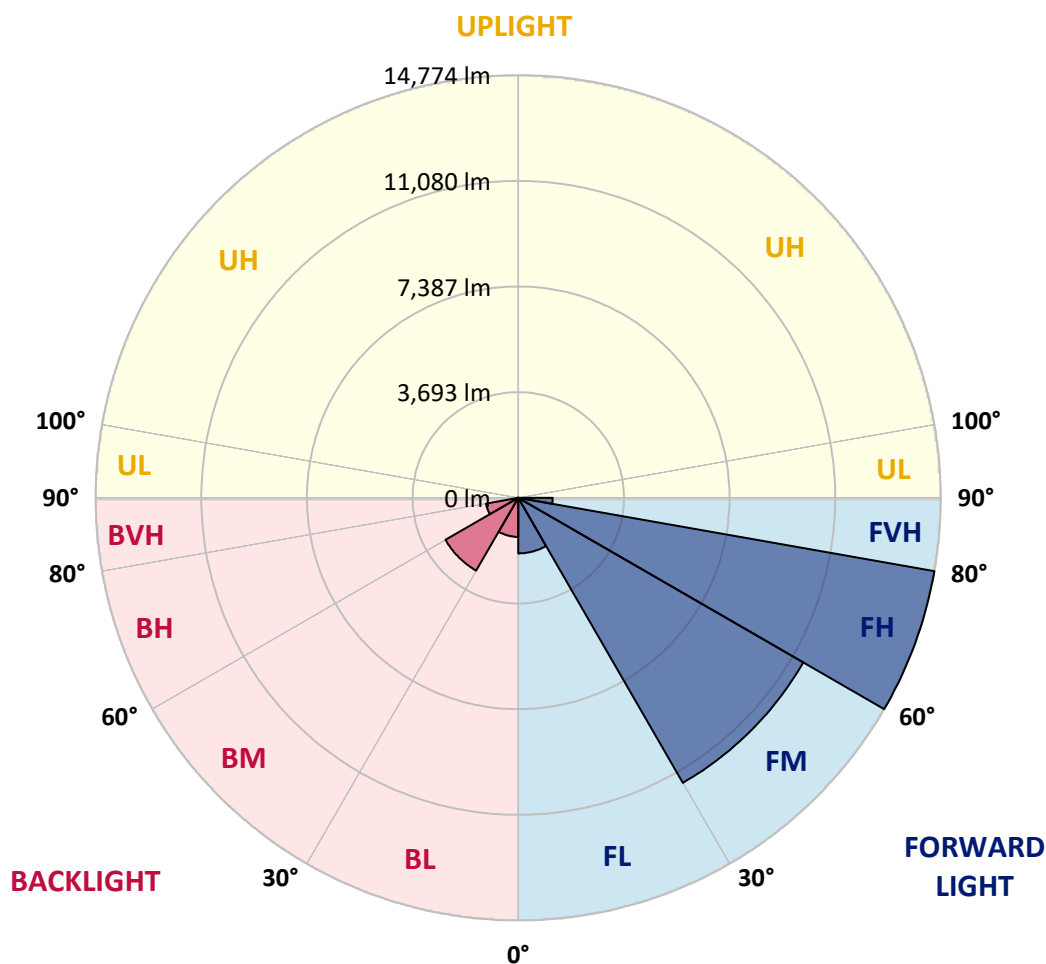
CATALOG NUMBER: CTN-CA10-310-722-U-T4-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 1943.6  | 5.6       |                         |      |         |
| FM   | (30°-60°)   | 11506.7 | 32.9      |                         |      |         |
| FH   | (60°-80°)   | 14774.0 | 42.3      |                         |      | G5      |
| FVH  | (80°-90°)   | 1205.3  | 3.4       |                         |      | G5      |
| BL   | (0°-30°)    | 1366.4  | 3.9       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 2938.5  | 8.4       | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1143.5  | 3.3       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 65.9    | 0.2       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B3-U0-G5**

Type IV Short





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CATALOG NUMBER: CTN-CA10-310-722-U-T4-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 36°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  | 3744.1  |
| 2.5°  | 3819.9  | 3811.8  | 3805.4  | 3807.8  | 3803.0  | 3806.2  | 3798.9  | 3790.1  | 3769.1  | 3760.2  | 3756.2  |
| 5°    | 3853.8  | 3851.4  | 3844.9  | 3840.1  | 3831.2  | 3828.0  | 3819.9  | 3827.2  | 3815.9  | 3786.8  | 3769.9  |
| 7.5°  | 3874.0  | 3873.2  | 3865.9  | 3855.4  | 3860.2  | 3864.3  | 3872.3  | 3861.1  | 3846.5  | 3832.8  | 3798.1  |
| 10°   | 3882.8  | 3882.8  | 3874.0  | 3879.6  | 3904.6  | 3907.0  | 3911.1  | 3918.3  | 3904.6  | 3884.4  | 3849.8  |
| 12.5° | 3905.4  | 3903.8  | 3907.0  | 3925.6  | 3951.4  | 3957.1  | 3977.2  | 3977.2  | 3978.8  | 3966.7  | 3926.4  |
| 15°   | 3961.9  | 3961.9  | 3969.2  | 3986.1  | 4030.5  | 4033.7  | 4063.5  | 4090.2  | 4093.4  | 4075.6  | 4045.0  |
| 17.5° | 4092.6  | 4089.4  | 4085.3  | 4095.8  | 4143.4  | 4145.0  | 4196.7  | 4230.5  | 4239.4  | 4258.8  | 4253.9  |
| 20°   | 4341.1  | 4337.8  | 4337.0  | 4337.8  | 4334.6  | 4329.8  | 4380.6  | 4416.9  | 4462.1  | 4496.0  | 4512.9  |
| 22.5° | 4696.8  | 4689.6  | 4689.6  | 4650.0  | 4619.4  | 4624.2  | 4632.3  | 4652.5  | 4712.2  | 4771.9  | 4835.6  |
| 25°   | 5080.0  | 5075.2  | 5079.2  | 4978.4  | 4937.2  | 4953.4  | 4942.9  | 4974.4  | 5052.6  | 5104.2  | 5172.0  |
| 27.5° | 5393.0  | 5400.3  | 5377.7  | 5299.5  | 5272.8  | 5284.9  | 5260.7  | 5351.1  | 5437.4  | 5527.8  | 5630.2  |
| 30°   | 5782.7  | 5744.0  | 5688.3  | 5593.1  | 5583.4  | 5585.1  | 5583.4  | 5728.7  | 5907.7  | 6036.8  | 6178.8  |
| 32.5° | 6291.8  | 6298.2  | 6173.2  | 5948.9  | 5866.6  | 5855.3  | 5887.6  | 6100.6  | 6342.6  | 6629.0  | 6816.1  |
| 35°   | 6806.5  | 6816.9  | 6725.8  | 6491.8  | 6257.1  | 6221.6  | 6174.0  | 6450.7  | 6800.0  | 7374.4  | 7656.8  |
| 37.5° | 7352.6  | 7389.7  | 7281.6  | 7072.7  | 6794.4  | 6761.3  | 6536.2  | 6808.1  | 7324.4  | 8257.0  | 8627.3  |
| 40°   | 8083.5  | 8044.0  | 7913.3  | 7647.9  | 7388.9  | 7335.7  | 7074.3  | 7217.1  | 7998.8  | 9362.2  | 9630.8  |
| 42.5° | 8622.4  | 8611.1  | 8500.6  | 8238.4  | 7977.8  | 7935.1  | 7724.5  | 7879.4  | 8848.3  | 10482.8 | 10603.0 |
| 45°   | 9050.0  | 9119.4  | 9117.0  | 8952.4  | 8805.6  | 8781.4  | 8657.1  | 8885.4  | 9875.3  | 11540.4 | 11481.5 |
| 47.5° | 9430.0  | 9472.7  | 9404.2  | 9332.4  | 9263.8  | 9271.9  | 9363.8  | 9833.3  | 10924.9 | 12464.1 | 12203.5 |
| 50°   | 10052.0 | 9997.1  | 9689.7  | 9634.9  | 9731.7  | 9735.7  | 10015.7 | 10738.5 | 12080.9 | 13262.8 | 12815.0 |
| 52.5° | 10881.3 | 10821.6 | 10189.9 | 10096.3 | 10325.5 | 10342.4 | 10807.9 | 11640.4 | 13273.3 | 14026.0 | 13423.3 |
| 55°   | 12115.6 | 11976.8 | 11300.0 | 10880.5 | 10985.4 | 11053.9 | 11617.8 | 12507.7 | 14206.7 | 14698.8 | 13884.0 |
| 57.5° | 13631.5 | 13732.3 | 13385.4 | 12437.5 | 12001.0 | 12026.9 | 12544.8 | 13337.8 | 15030.4 | 15287.7 | 14153.4 |
| 60°   | 15233.7 | 15209.4 | 15354.7 | 14955.3 | 14119.5 | 13980.8 | 13717.0 | 14184.9 | 15668.5 | 15783.8 | 14430.9 |
| 62.5° | 16111.4 | 16252.6 | 16736.6 | 16816.5 | 17570.8 | 17497.4 | 15699.1 | 15235.3 | 16405.8 | 16095.2 | 14506.8 |
| 65°   | 16106.5 | 16167.9 | 17069.0 | 18059.7 | 20416.1 | 20395.2 | 19559.4 | 16754.4 | 16955.2 | 16261.4 | 14355.1 |
| 67.5° | 15065.8 | 15161.0 | 16214.6 | 18150.0 | 21731.1 | 21706.1 | 21128.5 | 18889.8 | 17127.9 | 16061.4 | 13647.6 |
| 70°   | 13168.4 | 13200.7 | 14228.5 | 16877.8 | 22259.5 | 22355.5 | 21182.5 | 19709.4 | 16698.7 | 15466.8 | 12357.6 |
| 72.5° | 10863.5 | 10796.6 | 11801.8 | 14413.2 | 20913.9 | 20856.6 | 20287.1 | 18730.9 | 15975.9 | 14312.4 | 10078.6 |
| 75°   | 7998.8  | 8185.2  | 9087.1  | 11572.7 | 17906.4 | 18116.1 | 18368.6 | 17233.6 | 14188.9 | 11795.3 | 6969.4  |
| 77.5° | 5281.7  | 5518.9  | 6430.5  | 8677.3  | 14176.0 | 14501.9 | 15156.2 | 14657.6 | 11542.8 | 8461.1  | 3318.9  |
| 80°   | 2729.2  | 2908.3  | 3728.7  | 5757.7  | 10162.5 | 10632.8 | 11832.4 | 11101.5 | 8183.6  | 3825.6  | 743.0   |
| 82.5° | 1032.6  | 1009.2  | 1670.8  | 3295.5  | 6516.0  | 6943.6  | 7815.7  | 6657.2  | 2912.3  | 672.0   | 345.3   |
| 85°   | 453.4   | 480.0   | 692.2   | 1503.0  | 3725.5  | 3781.2  | 4427.4  | 2595.3  | 426.8   | 321.1   | 234.8   |
| 87.5° | 196.0   | 225.1   | 290.4   | 432.4   | 1256.9  | 1451.3  | 1795.8  | 824.5   | 129.1   | 111.3   | 117.8   |
| 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: P510460

CATALOG NUMBER: CTN-CA10-310-722-U-T4-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 3744.1  | 3744.1  | 3744.1 | 3744.1 | 3744.1 | 3744.1 | 3744.1 | 3744.1 | 3744.1 | 3744.1 | 3744.1 |
| 2.5°  | 3748.9  | 3744.1  | 3736.0 | 3715.8 | 3682.8 | 3678.7 | 3675.5 | 3672.3 | 3665.8 | 3669.0 | 3687.6 |
| 5°    | 3757.0  | 3748.1  | 3719.1 | 3690.0 | 3661.0 | 3635.2 | 3603.7 | 3591.6 | 3575.5 | 3565.0 | 3584.3 |
| 7.5°  | 3784.4  | 3765.9  | 3723.1 | 3683.6 | 3604.5 | 3566.6 | 3526.3 | 3478.7 | 3444.8 | 3423.0 | 3442.4 |
| 10°   | 3830.4  | 3807.0  | 3753.8 | 3672.3 | 3579.5 | 3475.4 | 3404.4 | 3325.4 | 3260.8 | 3243.1 | 3260.8 |
| 12.5° | 3905.4  | 3870.7  | 3808.6 | 3698.1 | 3533.5 | 3397.2 | 3262.5 | 3158.4 | 3054.3 | 3024.5 | 3033.3 |
| 15°   | 4027.2  | 3999.8  | 3904.6 | 3752.1 | 3534.3 | 3326.2 | 3126.1 | 2958.3 | 2822.0 | 2774.4 | 2771.1 |
| 17.5° | 4222.5  | 4193.4  | 4083.7 | 3859.4 | 3563.4 | 3270.5 | 2992.2 | 2736.5 | 2529.9 | 2425.1 | 2408.1 |
| 20°   | 4502.4  | 4462.1  | 4295.9 | 4017.6 | 3626.3 | 3246.3 | 2868.0 | 2524.3 | 2203.2 | 2006.4 | 1976.5 |
| 22.5° | 4813.8  | 4771.1  | 4525.8 | 4139.4 | 3671.5 | 3198.7 | 2749.4 | 2289.5 | 1866.8 | 1626.4 | 1592.5 |
| 25°   | 5201.0  | 5107.5  | 4746.0 | 4254.7 | 3661.0 | 3098.7 | 2556.6 | 1970.9 | 1512.6 | 1304.5 | 1281.9 |
| 27.5° | 5583.4  | 5464.8  | 4970.3 | 4315.2 | 3615.0 | 2939.8 | 2274.2 | 1598.1 | 1184.3 | 1036.7 | 1018.1 |
| 30°   | 6057.8  | 5828.7  | 5169.6 | 4343.5 | 3498.8 | 2701.8 | 1895.8 | 1214.9 | 886.6  | 785.0  | 767.2  |
| 32.5° | 6621.7  | 6274.8  | 5356.7 | 4312.0 | 3305.2 | 2338.7 | 1473.9 | 889.8  | 659.1  | 595.4  | 594.6  |
| 35°   | 7365.5  | 6821.8  | 5562.5 | 4208.8 | 3008.3 | 1947.5 | 1033.4 | 608.3  | 513.9  | 492.1  | 496.1  |
| 37.5° | 8235.2  | 7562.4  | 5771.4 | 4039.3 | 2672.7 | 1490.0 | 689.0  | 468.7  | 451.8  | 452.6  | 453.4  |
| 40°   | 9152.5  | 8380.4  | 6053.0 | 3801.4 | 2265.3 | 1078.6 | 496.1  | 421.1  | 420.3  | 428.4  | 430.8  |
| 42.5° | 10028.6 | 9175.0  | 6399.9 | 3484.3 | 1838.6 | 713.2  | 430.0  | 401.8  | 391.3  | 394.5  | 396.9  |
| 45°   | 10842.6 | 9856.7  | 6695.1 | 3175.3 | 1381.1 | 509.1  | 421.9  | 379.2  | 363.0  | 361.4  | 363.0  |
| 47.5° | 11498.5 | 10402.9 | 6875.0 | 2812.3 | 984.2  | 422.7  | 405.0  | 358.2  | 335.6  | 330.8  | 328.3  |
| 50°   | 11997.8 | 10808.7 | 6940.4 | 2400.9 | 665.6  | 403.4  | 382.4  | 334.0  | 306.6  | 307.4  | 307.4  |
| 52.5° | 12485.1 | 11177.4 | 6864.5 | 1986.2 | 489.7  | 386.4  | 367.1  | 314.6  | 285.6  | 300.9  | 304.9  |
| 55°   | 12836.0 | 11332.3 | 6643.5 | 1537.6 | 408.2  | 365.5  | 350.1  | 292.0  | 271.9  | 296.9  | 304.9  |
| 57.5° | 13040.9 | 11454.1 | 6237.7 | 1110.1 | 374.3  | 345.3  | 328.3  | 271.1  | 252.5  | 259.0  | 263.0  |
| 60°   | 13168.4 | 11283.9 | 5701.2 | 759.1  | 356.6  | 329.1  | 306.6  | 257.3  | 232.3  | 217.0  | 214.6  |
| 62.5° | 13098.2 | 10857.9 | 4994.5 | 522.0  | 338.0  | 311.4  | 288.0  | 244.4  | 211.4  | 191.2  | 189.6  |
| 65°   | 12526.2 | 10069.7 | 3834.4 | 422.7  | 326.7  | 303.3  | 276.7  | 232.3  | 196.8  | 177.5  | 175.1  |
| 67.5° | 11465.4 | 8653.1  | 2239.5 | 375.9  | 321.9  | 295.3  | 267.8  | 221.0  | 188.8  | 167.8  | 164.6  |
| 70°   | 9722.0  | 6508.8  | 750.3  | 335.6  | 321.1  | 294.5  | 260.6  | 213.0  | 179.9  | 158.1  | 154.9  |
| 72.5° | 7013.8  | 3927.2  | 365.5  | 295.3  | 300.1  | 282.4  | 254.9  | 206.5  | 174.3  | 146.8  | 141.2  |
| 75°   | 3986.1  | 1278.7  | 330.0  | 254.9  | 279.1  | 269.5  | 251.7  | 207.3  | 176.7  | 133.1  | 126.7  |
| 77.5° | 1134.3  | 373.5   | 318.7  | 217.0  | 263.8  | 278.3  | 235.6  | 187.2  | 180.7  | 123.4  | 115.4  |
| 80°   | 383.2   | 332.4   | 307.4  | 168.6  | 213.0  | 229.9  | 204.1  | 164.6  | 182.3  | 112.1  | 104.1  |
| 82.5° | 307.4   | 334.0   | 258.2  | 134.7  | 162.2  | 174.3  | 162.2  | 147.6  | 147.6  | 100.0  | 93.6   |
| 85°   | 246.1   | 309.8   | 163.8  | 107.3  | 121.0  | 133.9  | 114.6  | 110.5  | 103.3  | 83.9   | 81.5   |
| 87.5° | 142.8   | 96.8    | 67.8   | 54.9   | 50.8   | 51.6   | 44.4   | 53.2   | 65.3   | 57.3   | 56.5   |
| 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: SP1-2104-215-4

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

Test Date: 04/20/2021

### Test Information

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

### Spectral Parameters

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



### Test Conditions

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

REPORT NUMBER: SP1-2104-215-4

| 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: SP1-2104-215-4

**CIE 1931 Chromaticity Diagram**



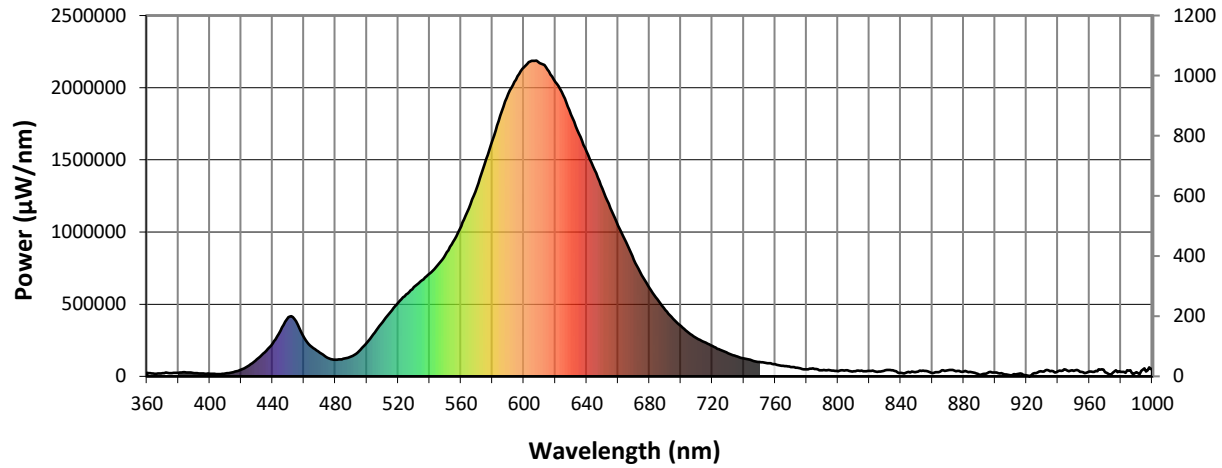
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 2200K 7-step quadrangle

REPORT NUMBER: SP1-2104-215-4

### Photopic Flux vs. Wavelength



#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 23398            | 0.0              | 490       | 137099           | 19.5             | 620       | 2038916          | 530.6            | 750       | 99721            | 0.0              | 880       | 32326            | 0.0              |
| 365       | 18626            | 0.0              | 495       | 174286           | 31.6             | 625       | 1946743          | 429.5            | 755       | 91432            | 0.0              | 885       | 29783            | 0.0              |
| 370       | 21702            | 0.0              | 500       | 232711           | 51.3             | 630       | 1814508          | 328.4            | 760       | 83300            | 0.0              | 890       | 12135            | 0.0              |
| 375       | 22606            | 0.0              | 505       | 303528           | 84.9             | 635       | 1681061          | 252.6            | 765       | 72172            | 0.0              | 895       | 22953            | 0.0              |
| 380       | 25296            | 0.0              | 510       | 374456           | 128.6            | 640       | 1557170          | 186.1            | 770       | 65008            | 0.0              | 900       | 27214            | 0.0              |
| 385       | 27032            | 0.0              | 515       | 445274           | 184.5            | 645       | 1430182          | 137.7            | 775       | 56809            | 0.0              | 905       | 17038            | 0.0              |
| 390       | 22156            | 0.0              | 520       | 510296           | 247.5            | 650       | 1300435          | 95.0             | 780       | 49368            | 0.0              | 910       | 6896             | 0.0              |
| 395       | 20190            | 0.0              | 525       | 566771           | 304.3            | 655       | 1165554          | 66.9             | 785       | 51733            | 0.0              | 915       | 17142            | 0.0              |
| 400       | 18423            | 0.0              | 530       | 617892           | 363.8            | 660       | 1044122          | 43.5             | 790       | 41796            | 0.0              | 920       | 7675             | 0.0              |
| 405       | 16139            | 0.0              | 535       | 664903           | 412.3            | 665       | 932131           | 29.6             | 795       | 42601            | 0.0              | 925       | 21587            | 0.0              |
| 410       | 19812            | 0.0              | 540       | 711603           | 463.7            | 670       | 808971           | 17.7             | 800       | 36382            | 0.0              | 930       | 32992            | 0.0              |
| 415       | 29121            | 0.1              | 545       | 768835           | 511.7            | 675       | 701208           | 11.7             | 805       | 41419            | 0.0              | 935       | 35464            | 0.0              |
| 420       | 46007            | 0.1              | 550       | 841179           | 571.6            | 680       | 610741           | 7.1              | 810       | 35865            | 0.0              | 940       | 34460            | 0.0              |
| 425       | 76329            | 0.4              | 555       | 932641           | 637.0            | 685       | 533825           | 4.6              | 815       | 39722            | 0.0              | 945       | 46305            | 0.0              |
| 430       | 117696           | 0.9              | 560       | 1040487          | 707.1            | 690       | 459427           | 2.6              | 820       | 37236            | 0.0              | 950       | 38353            | 0.0              |
| 435       | 166890           | 2.0              | 565       | 1164360          | 774.2            | 695       | 399973           | 1.7              | 825       | 31566            | 0.0              | 955       | 30772            | 0.0              |
| 440       | 227762           | 3.6              | 570       | 1307677          | 850.3            | 700       | 347460           | 1.0              | 830       | 42647            | 0.0              | 960       | 32413            | 0.0              |
| 445       | 315427           | 6.6              | 575       | 1470810          | 915.2            | 705       | 302187           | 0.6              | 835       | 41433            | 0.0              | 965       | 35310            | 0.0              |
| 450       | 409560           | 10.6             | 580       | 1637734          | 973.2            | 710       | 262909           | 0.4              | 840       | 24213            | 0.0              | 970       | 28048            | 0.0              |
| 455       | 381103           | 12.8             | 585       | 1807622          | 1004.4           | 715       | 236689           | 0.3              | 845       | 31358            | 0.0              | 975       | 26258            | 0.0              |
| 460       | 269221           | 11.0             | 590       | 1958195          | 1012.4           | 720       | 209675           | 0.1              | 850       | 30957            | 0.0              | 980       | 31067            | 0.0              |
| 465       | 203513           | 10.5             | 595       | 2055425          | 974.3            | 725       | 184999           | 0.1              | 855       | 38865            | 0.0              | 985       | 40288            | 0.0              |
| 470       | 163989           | 10.2             | 600       | 2141598          | 923.0            | 730       | 160261           | 0.1              | 860       | 23238            | 0.0              | 990       | 29366            | 0.0              |
| 475       | 129159           | 10.1             | 605       | 2185430          | 846.3            | 735       | 140736           | 0.0              | 865       | 32686            | 0.0              | 995       | 54854            | 0.0              |
| 480       | 115440           | 11.0             | 610       | 2170089          | 745.5            | 740       | 125207           | 0.0              | 870       | 41855            | 0.0              | 1000      | 50994            | 0.0              |
| 485       | 120959           | 14.3             | 615       | 2123505          | 641.1            | 745       | 110736           | 0.0              | 875       | 35838            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-4

### Scotopic Flux vs. Wavelength



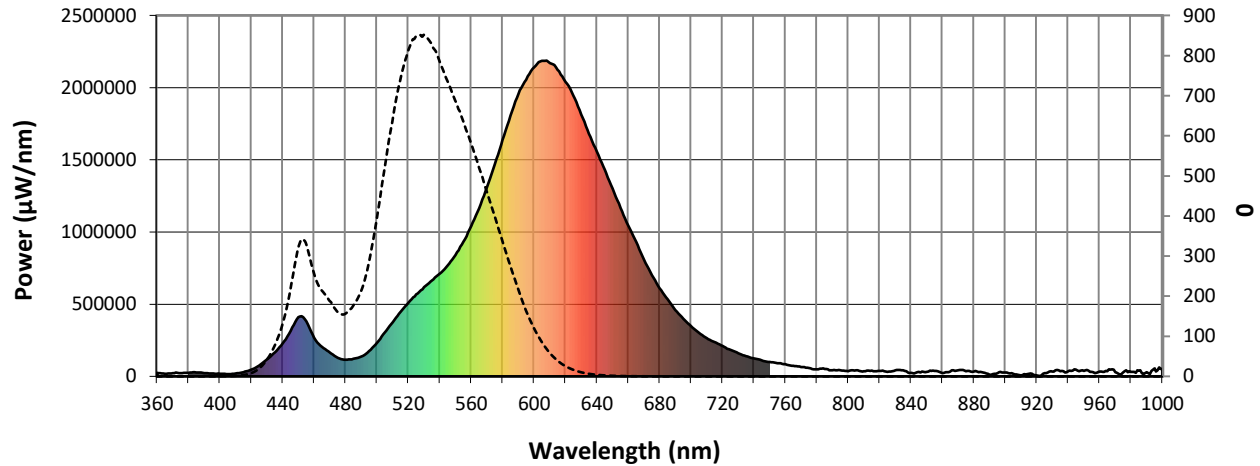
Scotopic Lumens: 72942.9

S/P: 0.88

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 23398            | 0.0              | 490       | 137099           | 211.1            | 620       | 2038916          | 25.5             | 750       | 99721            | 0.0              | 880       | 32326            | 0.0              |
| 365       | 18626            | 0.0              | 495       | 174286           | 281.7            | 625       | 1946743          | 16.4             | 755       | 91432            | 0.0              | 885       | 29783            | 0.0              |
| 370       | 21702            | 0.0              | 500       | 232711           | 389.3            | 630       | 1814508          | 10.3             | 760       | 83300            | 0.0              | 890       | 12135            | 0.0              |
| 375       | 22606            | 0.0              | 505       | 303528           | 516.0            | 635       | 1681061          | 6.4              | 765       | 72172            | 0.0              | 895       | 22953            | 0.0              |
| 380       | 25296            | 0.0              | 510       | 374456           | 634.7            | 640       | 1557170          | 4.0              | 770       | 65008            | 0.0              | 900       | 27214            | 0.0              |
| 385       | 27032            | 0.1              | 515       | 445274           | 738.0            | 645       | 1430182          | 2.4              | 775       | 56809            | 0.0              | 905       | 17038            | 0.0              |
| 390       | 22156            | 0.1              | 520       | 510296           | 811.1            | 650       | 1300435          | 1.5              | 780       | 49368            | 0.0              | 910       | 6896             | 0.0              |
| 395       | 20190            | 0.2              | 525       | 566771           | 847.9            | 655       | 1165554          | 0.9              | 785       | 51733            | 0.0              | 915       | 17142            | 0.0              |
| 400       | 18423            | 0.3              | 530       | 617892           | 851.9            | 660       | 1044122          | 0.6              | 790       | 41796            | 0.0              | 920       | 7675             | 0.0              |
| 405       | 16139            | 0.5              | 535       | 664903           | 828.5            | 665       | 932131           | 0.3              | 795       | 42601            | 0.0              | 925       | 21587            | 0.0              |
| 410       | 19812            | 1.2              | 540       | 711603           | 786.3            | 670       | 808971           | 0.2              | 800       | 36382            | 0.0              | 930       | 32992            | 0.0              |
| 415       | 29121            | 3.0              | 545       | 768835           | 737.2            | 675       | 701208           | 0.1              | 805       | 41419            | 0.0              | 935       | 35464            | 0.0              |
| 420       | 46007            | 7.6              | 550       | 841179           | 687.8            | 680       | 610741           | 0.1              | 810       | 35865            | 0.0              | 940       | 34460            | 0.0              |
| 425       | 76329            | 18.7             | 555       | 932641           | 637.4            | 685       | 533825           | 0.0              | 815       | 39722            | 0.0              | 945       | 46305            | 0.0              |
| 430       | 117696           | 40.1             | 560       | 1040487          | 581.6            | 690       | 459427           | 0.0              | 820       | 37236            | 0.0              | 950       | 38353            | 0.0              |
| 435       | 166890           | 74.6             | 565       | 1164360          | 522.4            | 695       | 399973           | 0.0              | 825       | 31566            | 0.0              | 955       | 30772            | 0.0              |
| 440       | 227762           | 127.3            | 570       | 1307677          | 461.5            | 700       | 347460           | 0.0              | 830       | 42647            | 0.0              | 960       | 32413            | 0.0              |
| 445       | 315427           | 211.2            | 575       | 1470810          | 400.6            | 705       | 302187           | 0.0              | 835       | 41433            | 0.0              | 965       | 35310            | 0.0              |
| 450       | 409560           | 317.4            | 580       | 1637734          | 337.4            | 710       | 262909           | 0.0              | 840       | 24213            | 0.0              | 970       | 28048            | 0.0              |
| 455       | 381103           | 333.0            | 585       | 1807622          | 276.3            | 715       | 236689           | 0.0              | 845       | 31358            | 0.0              | 975       | 26258            | 0.0              |
| 460       | 269221           | 260.0            | 590       | 1958195          | 218.0            | 720       | 209675           | 0.0              | 850       | 30957            | 0.0              | 980       | 31067            | 0.0              |
| 465       | 203513           | 214.9            | 595       | 2055425          | 163.9            | 725       | 184999           | 0.0              | 855       | 38865            | 0.0              | 985       | 40288            | 0.0              |
| 470       | 163989           | 188.8            | 600       | 2141598          | 120.7            | 730       | 160261           | 0.0              | 860       | 23238            | 0.0              | 990       | 29366            | 0.0              |
| 475       | 129159           | 161.5            | 605       | 2185430          | 85.9             | 735       | 140736           | 0.0              | 865       | 32686            | 0.0              | 995       | 54854            | 0.0              |
| 480       | 115440           | 155.9            | 610       | 2170089          | 58.8             | 740       | 125207           | 0.0              | 870       | 41855            | 0.0              | 1000      | 50994            | 0.0              |
| 485       | 120959           | 175.3            | 615       | 2123505          | 39.3             | 745       | 110736           | 0.0              | 875       | 35838            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-4

### Melanopic Flux vs. Wavelength



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

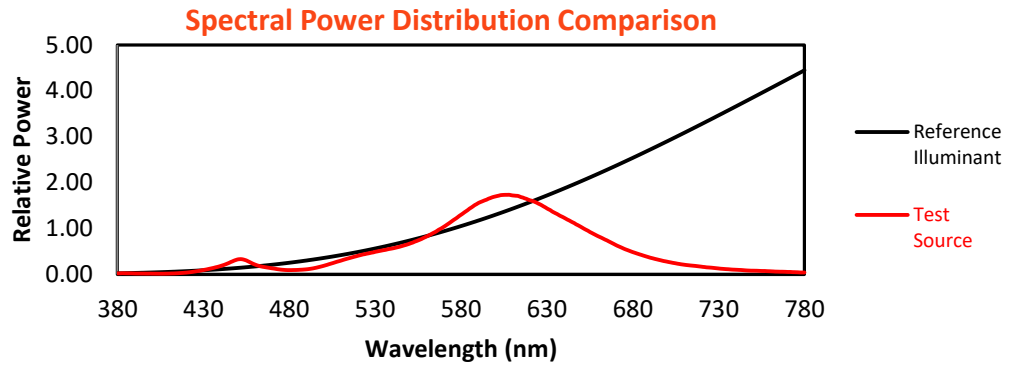
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 23398            | 0.0              | 490       | 137099           | 114.1            | 620       | 2038916          | 1.6              | 750       | 99721            | 0.0              | 880       | 32326            | 0.0              |
| 365       | 18626            | 0.0              | 495       | 174286           | 143.9            | 625       | 1946743          | 1.0              | 755       | 91432            | 0.0              | 885       | 29783            | 0.0              |
| 370       | 21702            | 0.0              | 500       | 232711           | 187.1            | 630       | 1814508          | 0.6              | 760       | 83300            | 0.0              | 890       | 12135            | 0.0              |
| 375       | 22606            | 0.0              | 505       | 303528           | 232.9            | 635       | 1681061          | 0.4              | 765       | 72172            | 0.0              | 895       | 22953            | 0.0              |
| 380       | 25296            | 0.0              | 510       | 374456           | 268.9            | 640       | 1557170          | 0.2              | 770       | 65008            | 0.0              | 900       | 27214            | 0.0              |
| 385       | 27032            | 0.0              | 515       | 445274           | 290.9            | 645       | 1430182          | 0.2              | 775       | 56809            | 0.0              | 905       | 17038            | 0.0              |
| 390       | 22156            | 0.1              | 520       | 510296           | 297.1            | 650       | 1300435          | 0.1              | 780       | 49368            | 0.0              | 910       | 6896             | 0.0              |
| 395       | 20190            | 0.1              | 525       | 566771           | 287.4            | 655       | 1165554          | 0.1              | 785       | 51733            | 0.0              | 915       | 17142            | 0.0              |
| 400       | 18423            | 0.2              | 530       | 617892           | 267.0            | 660       | 1044122          | 0.0              | 790       | 41796            | 0.0              | 920       | 7675             | 0.0              |
| 405       | 16139            | 0.3              | 535       | 664903           | 239.3            | 665       | 932131           | 0.0              | 795       | 42601            | 0.0              | 925       | 21587            | 0.0              |
| 410       | 19812            | 0.8              | 540       | 711603           | 208.3            | 670       | 808971           | 0.0              | 800       | 36382            | 0.0              | 930       | 32992            | 0.0              |
| 415       | 29121            | 1.9              | 545       | 768835           | 178.6            | 675       | 701208           | 0.0              | 805       | 41419            | 0.0              | 935       | 35464            | 0.0              |
| 420       | 46007            | 5.3              | 550       | 841179           | 151.0            | 680       | 610741           | 0.0              | 810       | 35865            | 0.0              | 940       | 34460            | 0.0              |
| 425       | 76329            | 11.9             | 555       | 932641           | 125.8            | 685       | 533825           | 0.0              | 815       | 39722            | 0.0              | 945       | 46305            | 0.0              |
| 430       | 117696           | 24.9             | 560       | 1040487          | 102.6            | 690       | 459427           | 0.0              | 820       | 37236            | 0.0              | 950       | 38353            | 0.0              |
| 435       | 166890           | 44.5             | 565       | 1164360          | 81.7             | 695       | 399973           | 0.0              | 825       | 31566            | 0.0              | 955       | 30772            | 0.0              |
| 440       | 227762           | 76.1             | 570       | 1307677          | 63.9             | 700       | 347460           | 0.0              | 830       | 42647            | 0.0              | 960       | 32413            | 0.0              |
| 445       | 315427           | 124.4            | 575       | 1470810          | 49.0             | 705       | 302187           | 0.0              | 835       | 41433            | 0.0              | 965       | 35310            | 0.0              |
| 450       | 409560           | 188.7            | 580       | 1637734          | 36.6             | 710       | 262909           | 0.0              | 840       | 24213            | 0.0              | 970       | 28048            | 0.0              |
| 455       | 381103           | 199.7            | 585       | 1807622          | 26.9             | 715       | 236689           | 0.0              | 845       | 31358            | 0.0              | 975       | 26258            | 0.0              |
| 460       | 269221           | 158.6            | 590       | 1958195          | 19.2             | 720       | 209675           | 0.0              | 850       | 30957            | 0.0              | 980       | 31067            | 0.0              |
| 465       | 203513           | 133.0            | 595       | 2055425          | 13.2             | 725       | 184999           | 0.0              | 855       | 38865            | 0.0              | 985       | 40288            | 0.0              |
| 470       | 163989           | 117.4            | 600       | 2141598          | 9.0              | 730       | 160261           | 0.0              | 860       | 23238            | 0.0              | 990       | 29366            | 0.0              |
| 475       | 129159           | 98.6             | 605       | 2185430          | 6.0              | 735       | 140736           | 0.0              | 865       | 32686            | 0.0              | 995       | 54854            | 0.0              |
| 480       | 115440           | 92.8             | 610       | 2170089          | 3.9              | 740       | 125207           | 0.0              | 870       | 41855            | 0.0              | 1000      | 50994            | 0.0              |
| 485       | 120959           | 99.7             | 615       | 2123505          | 2.5              | 745       | 110736           | 0.0              | 875       | 35838            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-4

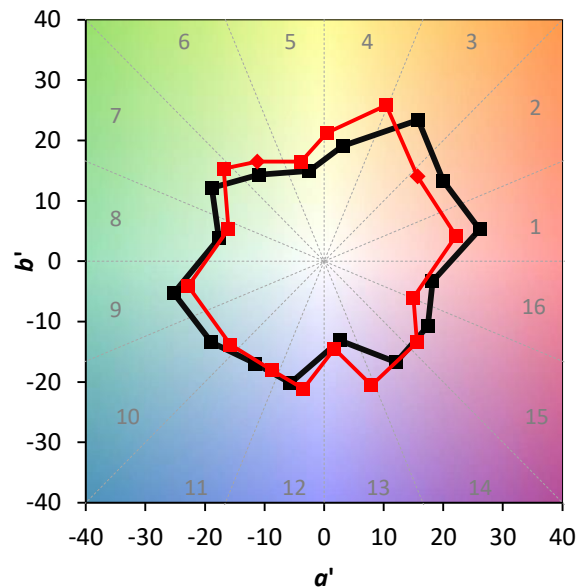
TM-30-18

### Summary

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



### Color Vector Graphics



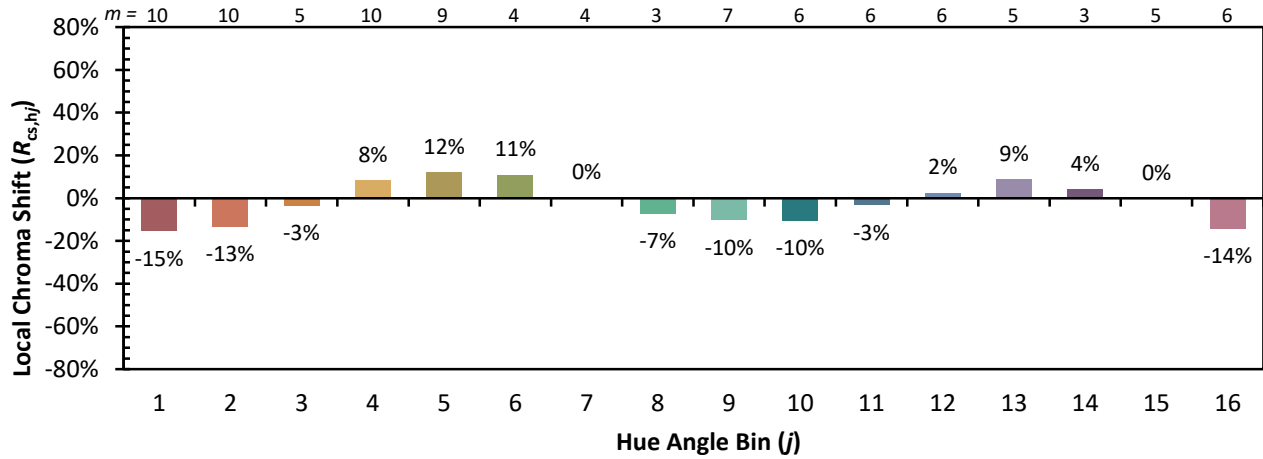


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

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



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)