

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: P237559

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

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P237559  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1707-171-25)  
Test Lab: INNOVATION CENTER(G2)  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: MCGRAW-EDISON  
Catalog Number: CTN-8-3-D-E1-T2-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
(8) 70 CRI, 4000K LEDS AND TYPE II OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 28399 lumens  
Efficiency: N/A  
Efficacy: 125.7 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type II - Short - Non-Cutoff  
BUG Rating: B3 - U0 - G3

Input Watts (W): 226  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 25 FT



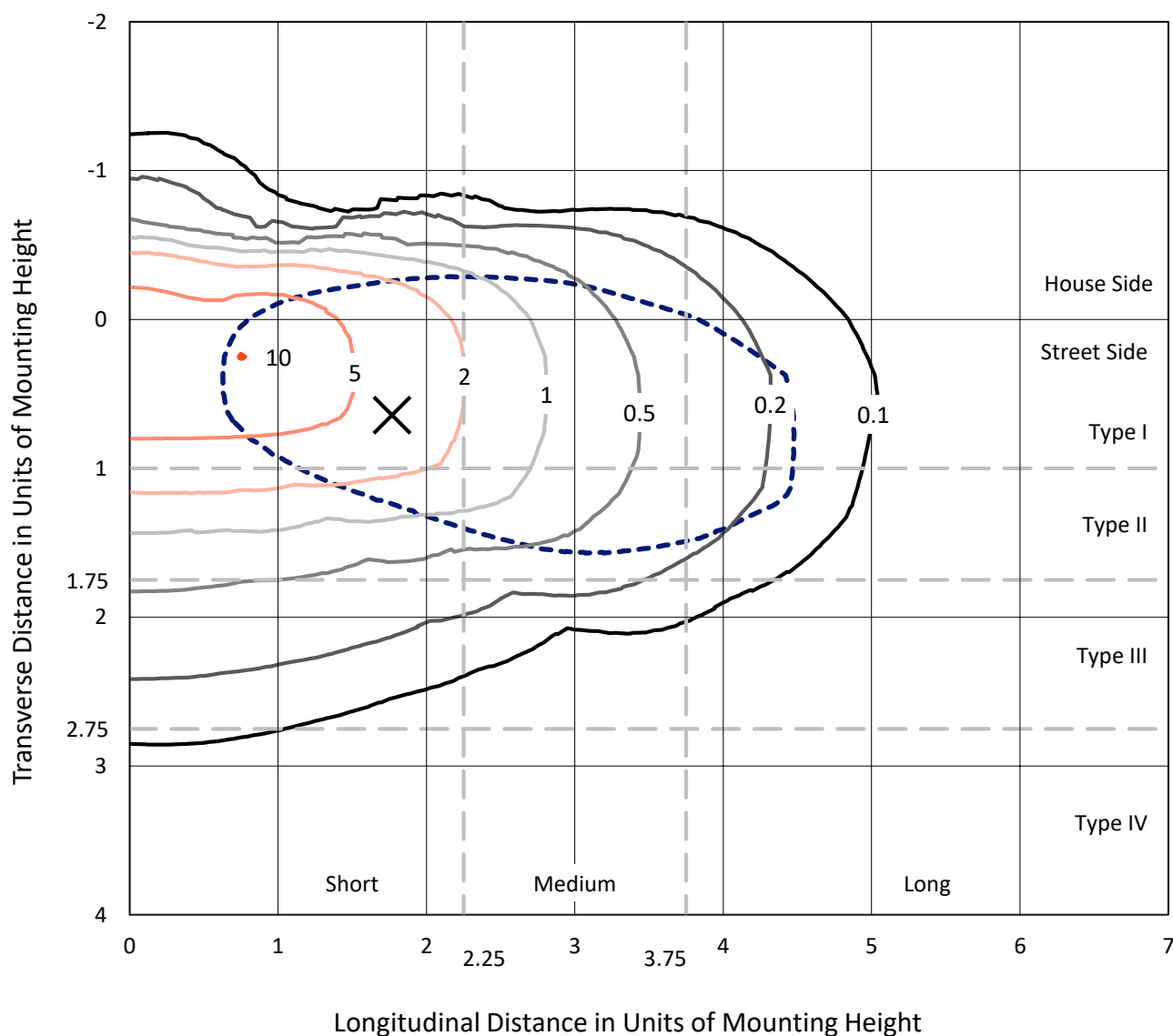
REPORT NUMBER: P237559

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## Iso-Footcandle Lines of Horizontal Illumination

× Max cd

--- 1/2 Max cd

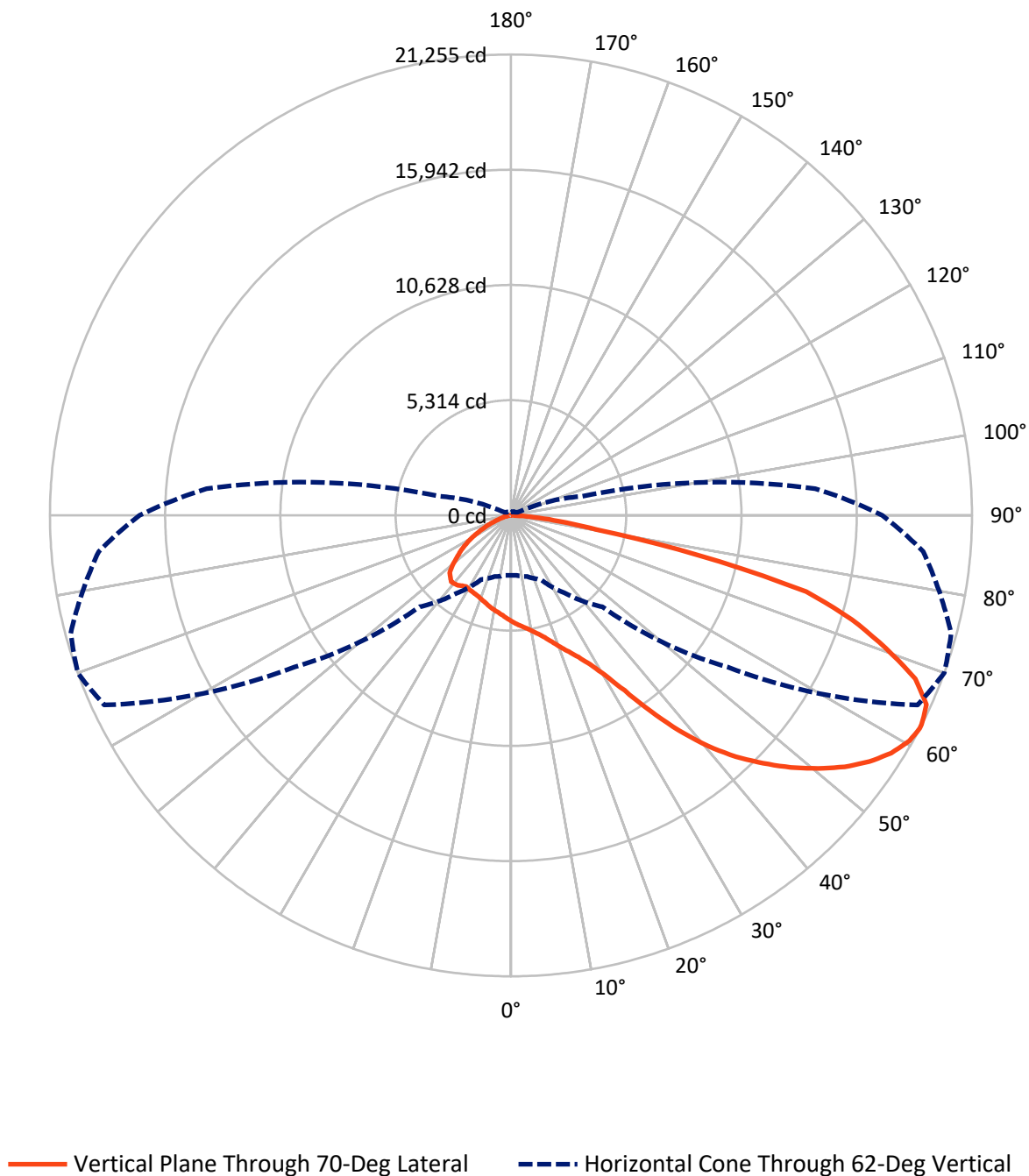


Based on 25 foot mounting height. Maximum calculated value = 10.1 fc  
 Type II - Short - Non-Cutoff

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## Luminous Intensity Polar Plot



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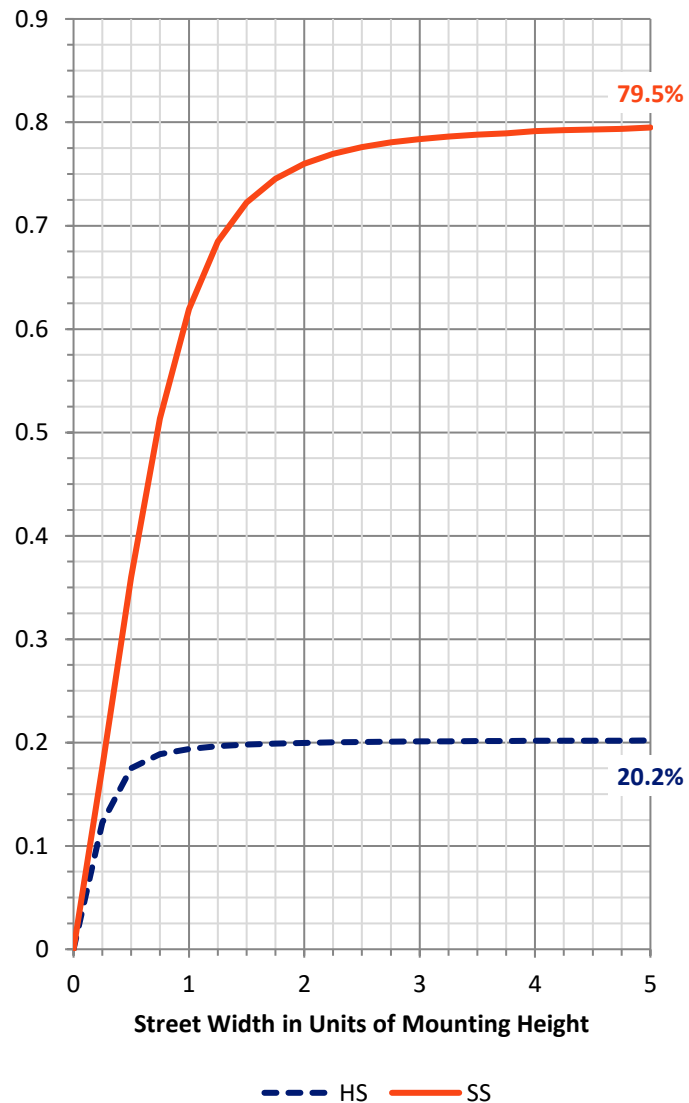
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 5809.3   | 0.0    | 5809.3  |
|                    | % Fixture | 20.5     | 0.0    | 20.5    |
| <b>Street Side</b> | Lumens    | 22589.7  | 0.0    | 22589.7 |
|                    | % Fixture | 79.5     | 0.0    | 79.5    |
| <b>Total</b>       | Lumens    | 28399.0  | 0.0    | 28399.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 465.4   | 1.6       |
| 10°-20°   | 1415.9  | 5.0       |
| 20°-30°   | 2383.8  | 8.4       |
| 30°-40°   | 3599.5  | 12.7      |
| 40°-50°   | 5047.7  | 17.8      |
| 50°-60°   | 5899.5  | 20.8      |
| 60°-70°   | 5723.6  | 20.2      |
| 70°-80°   | 3346.0  | 11.8      |
| 80°-90°   | 517.6   | 1.8       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 28399.0 | 100.0     |
| 0°-180°   | 28399.0 | 100.0     |

**Coefficient of Utilization**



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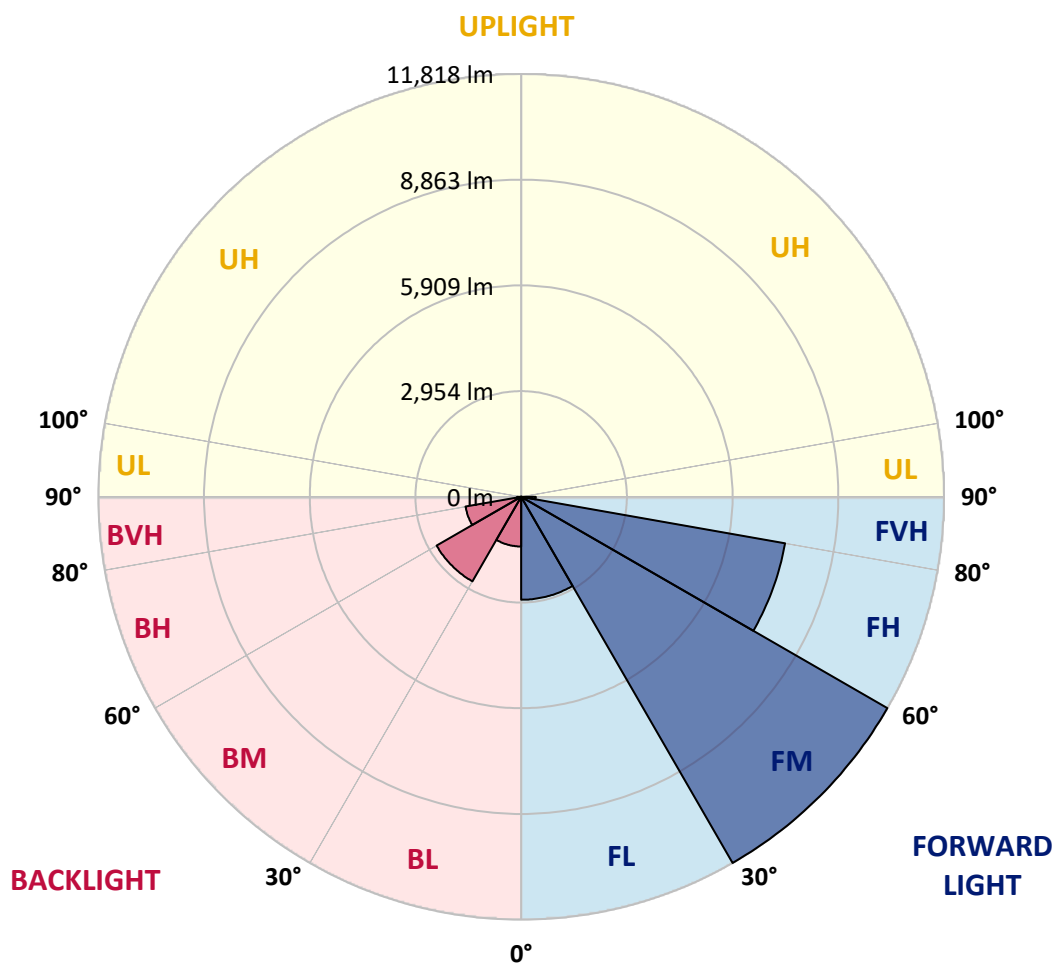
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**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 2876.2  | 10.1      |                         |      |         |
| FM   | (30°-60°)   | 11817.9 | 41.6      |                         |      |         |
| FH   | (60°-80°)   | 7490.1  | 26.4      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 405.6   | 1.4       |                         |      | G3/500  |
| BL   | (0°-30°)    | 1388.9  | 4.9       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 2728.8  | 9.6       | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1579.6  | 5.6       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 112.0   | 0.4       |                         |      | G2/225  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B3-U0-G3**

Type II Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°     | 55°     | 65°     | 70°     | 75°     | 85°     |
|-------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| 0°    | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7  | 4885.7  | 4885.7  | 4885.7  | 4885.7  | 4885.7  |
| 2.5°  | 5302.1 | 5266.9 | 5251.9 | 5274.0 | 5126.5 | 5129.5  | 5058.3  | 5047.2  | 5013.1  | 4965.0  | 4911.8  |
| 5°    | 5605.0 | 5563.9 | 5542.8 | 5555.9 | 5400.4 | 5373.3  | 5256.9  | 5199.7  | 5132.5  | 5072.3  | 4956.9  |
| 7.5°  | 5896.0 | 5853.8 | 5837.8 | 5830.8 | 5643.2 | 5602.0  | 5453.5  | 5352.2  | 5260.9  | 5183.7  | 5027.2  |
| 10°   | 6188.9 | 6145.8 | 6112.7 | 6121.7 | 5925.1 | 5851.8  | 5680.3  | 5540.8  | 5423.4  | 5323.1  | 5107.4  |
| 12.5° | 6479.8 | 6427.7 | 6391.6 | 6391.6 | 6197.9 | 6126.7  | 5934.1  | 5755.5  | 5606.0  | 5479.6  | 5208.8  |
| 15°   | 6777.8 | 6709.6 | 6701.6 | 6701.6 | 6495.9 | 6409.6  | 6220.0  | 6022.4  | 5838.8  | 5676.3  | 5331.1  |
| 17.5° | 7085.8 | 6999.5 | 6997.5 | 7010.6 | 6821.9 | 6724.6  | 6546.1  | 6361.5  | 6127.7  | 5922.1  | 5480.6  |
| 20°   | 7288.4 | 7211.2 | 7193.1 | 7232.3 | 7083.8 | 7020.6  | 6829.0  | 6699.6  | 6474.8  | 6230.0  | 5673.2  |
| 22.5° | 7442.9 | 7395.8 | 7412.8 | 7477.1 | 7404.8 | 7350.6  | 7149.0  | 7032.6  | 6830.0  | 6579.2  | 5933.1  |
| 25°   | 7598.4 | 7567.3 | 7606.5 | 7719.8 | 7725.9 | 7740.9  | 7572.4  | 7423.9  | 7235.3  | 7011.6  | 6271.2  |
| 27.5° | 7550.3 | 7541.3 | 7659.6 | 7893.4 | 8021.8 | 8090.0  | 7995.7  | 7943.6  | 7771.0  | 7535.2  | 6696.5  |
| 30°   | 7585.4 | 7563.3 | 7705.8 | 8001.7 | 8287.7 | 8485.3  | 8485.3  | 8603.7  | 8528.4  | 8291.7  | 7345.6  |
| 32.5° | 7481.1 | 7439.9 | 7603.5 | 8027.8 | 8519.4 | 8903.6  | 9074.2  | 9493.5  | 9625.0  | 9539.7  | 8632.8  |
| 35°   | 7000.5 | 7031.6 | 7351.6 | 7923.5 | 8678.9 | 9313.0  | 9764.4  | 10663.3 | 11067.6 | 11163.9 | 10114.5 |
| 37.5° | 6700.6 | 6713.6 | 7039.6 | 7752.9 | 8735.1 | 9715.3  | 10519.8 | 12013.6 | 12586.5 | 12645.7 | 11414.7 |
| 40°   | 6287.2 | 6336.4 | 6701.6 | 7524.2 | 8703.0 | 10055.3 | 11333.5 | 13344.9 | 13982.0 | 13932.8 | 12552.4 |
| 42.5° | 5961.2 | 5975.2 | 6294.2 | 7161.0 | 8562.5 | 10326.2 | 12154.1 | 14553.8 | 15221.0 | 15083.5 | 13677.0 |
| 45°   | 5554.9 | 5581.0 | 5882.9 | 6709.6 | 8312.7 | 10463.7 | 12862.4 | 15687.5 | 16298.4 | 16126.9 | 14651.1 |
| 47.5° | 5063.3 | 5177.7 | 5493.7 | 6223.0 | 7889.4 | 10449.6 | 13462.3 | 16668.6 | 17365.9 | 17102.0 | 15562.1 |
| 50°   | 4078.1 | 4217.6 | 4849.6 | 5784.6 | 7334.6 | 10253.0 | 13939.8 | 17749.1 | 18346.0 | 18080.2 | 16393.7 |
| 52.5° | 3562.5 | 3589.5 | 3911.6 | 5292.0 | 6684.5 | 9813.6  | 14264.9 | 18642.0 | 19264.0 | 18984.1 | 17193.3 |
| 55°   | 3329.7 | 3357.8 | 3520.3 | 4494.5 | 6087.6 | 9035.1  | 14384.3 | 19493.7 | 20045.5 | 19724.4 | 17852.4 |
| 57.5° | 3126.1 | 3135.1 | 3326.7 | 3801.2 | 5518.8 | 8009.8  | 14132.5 | 20204.0 | 20676.5 | 20240.1 | 18309.9 |
| 60°   | 2893.3 | 2929.4 | 3118.0 | 3470.2 | 4877.7 | 6818.9  | 13269.7 | 20658.5 | 21104.9 | 20716.6 | 18784.4 |
| 62°   | 2762.9 | 2771.9 | 2919.4 | 3264.5 | 4381.1 | 5958.2  | 12195.2 | 20684.5 | 21255.4 | 21009.6 | 19076.4 |
| 62.5° | 2724.8 | 2730.8 | 2870.2 | 3212.3 | 4278.8 | 5787.6  | 11902.3 | 20663.5 | 21246.3 | 21060.7 | 19140.6 |
| 65°   | 2506.1 | 2520.1 | 2645.5 | 2965.5 | 3830.3 | 5122.5  | 10529.9 | 20319.4 | 21052.7 | 20974.5 | 19134.6 |
| 67.5° | 2240.2 | 2244.2 | 2377.6 | 2665.6 | 3367.8 | 4497.5  | 8844.5  | 19661.2 | 20104.7 | 20003.3 | 18296.9 |
| 70°   | 1831.9 | 1905.1 | 2050.6 | 2304.4 | 2786.0 | 3731.0  | 6727.6  | 17611.7 | 18339.0 | 18439.3 | 16796.0 |
| 72.5° | 1392.5 | 1387.5 | 1438.6 | 1615.2 | 2029.5 | 2866.2  | 4541.6  | 14756.5 | 16441.9 | 16984.6 | 15139.7 |
| 75°   | 859.8  | 892.9  | 1107.6 | 1249.0 | 1454.7 | 2021.5  | 2847.2  | 10272.0 | 14059.2 | 14997.2 | 13382.0 |
| 77.5° | 668.1  | 674.2  | 785.5  | 1030.3 | 1191.8 | 1432.6  | 1775.7  | 5597.0  | 8813.4  | 11145.9 | 10422.5 |
| 80°   | 508.6  | 519.7  | 592.9  | 646.1  | 838.7  | 872.8   | 1184.8  | 2895.3  | 4013.9  | 5622.1  | 7001.5  |
| 82.5° | 307.0  | 324.0  | 392.3  | 423.4  | 462.5  | 437.4   | 637.0   | 1562.0  | 2225.2  | 2877.3  | 3565.5  |
| 85°   | 154.5  | 185.6  | 260.8  | 246.8  | 209.7  | 193.6   | 272.9   | 755.4   | 1063.4  | 1407.5  | 1636.3  |
| 87.5° | 39.1   | 47.2   | 61.2   | 73.2   | 62.2   | 51.2    | 74.2    | 204.7   | 210.7   | 201.6   | 564.8   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |

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**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4885.7  | 4885.7  | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7 | 4885.7 |
| 2.5°  | 4893.7  | 4852.6  | 4777.4 | 4734.2 | 4626.9 | 4585.8 | 4508.5 | 4536.6 | 4519.5 | 4502.5 | 4503.5 |
| 5°    | 4901.8  | 4827.5  | 4684.1 | 4580.7 | 4425.2 | 4346.0 | 4244.7 | 4228.6 | 4184.5 | 4157.4 | 4160.4 |
| 7.5°  | 4918.8  | 4812.5  | 4609.8 | 4445.3 | 4226.6 | 4102.2 | 3966.8 | 3943.7 | 3877.5 | 3847.4 | 3851.4 |
| 10°   | 4962.0  | 4836.6  | 4561.7 | 4319.9 | 4073.1 | 3900.5 | 3742.0 | 3690.9 | 3627.7 | 3593.6 | 3591.6 |
| 12.5° | 5028.2  | 4872.7  | 4493.5 | 4224.6 | 3924.6 | 3700.9 | 3518.3 | 3436.1 | 3345.8 | 3315.7 | 3318.7 |
| 15°   | 5133.5  | 4918.8  | 4436.3 | 4093.2 | 3745.0 | 3512.3 | 3286.6 | 3187.3 | 3091.9 | 3056.8 | 3053.8 |
| 17.5° | 5261.9  | 4961.0  | 4396.1 | 3938.7 | 3589.5 | 3310.6 | 3112.0 | 2976.6 | 2816.1 | 2793.0 | 2767.9 |
| 20°   | 5389.3  | 5045.2  | 4360.0 | 3826.3 | 3405.0 | 3108.0 | 2848.2 | 2709.7 | 2480.0 | 2393.7 | 2362.6 |
| 22.5° | 5574.9  | 5178.7  | 4355.0 | 3692.9 | 3219.4 | 2886.3 | 2536.2 | 2312.4 | 2059.6 | 1913.2 | 1881.1 |
| 25°   | 5822.7  | 5325.1  | 4368.1 | 3591.6 | 3011.7 | 2604.4 | 2131.9 | 1808.8 | 1568.0 | 1402.5 | 1368.4 |
| 27.5° | 6144.8  | 5524.8  | 4407.2 | 3480.2 | 2823.1 | 2266.3 | 1678.4 | 1346.3 | 1142.7 | 1004.2 | 972.1  |
| 30°   | 6619.3  | 5859.9  | 4468.4 | 3376.9 | 2548.2 | 1825.9 | 1234.0 | 970.1  | 811.6  | 726.3  | 725.3  |
| 32.5° | 7726.9  | 6608.3  | 4503.5 | 3248.4 | 2292.4 | 1380.4 | 887.9  | 702.3  | 575.9  | 543.7  | 570.8  |
| 35°   | 8996.9  | 7668.7  | 4774.4 | 3110.0 | 1892.1 | 1015.3 | 634.0  | 499.6  | 447.4  | 455.5  | 470.5  |
| 37.5° | 10168.7 | 8687.9  | 5187.7 | 2885.3 | 1514.9 | 715.3  | 455.5  | 397.3  | 386.2  | 415.3  | 442.4  |
| 40°   | 11206.0 | 9568.8  | 5541.8 | 2638.5 | 1071.4 | 499.6  | 365.2  | 367.2  | 356.1  | 369.2  | 378.2  |
| 42.5° | 12223.3 | 10385.4 | 5916.0 | 2306.4 | 714.3  | 369.2  | 330.1  | 348.1  | 335.1  | 337.1  | 324.0  |
| 45°   | 13234.6 | 11247.2 | 6077.6 | 1896.1 | 478.5  | 320.0  | 309.0  | 330.1  | 329.1  | 321.0  | 302.0  |
| 47.5° | 14107.4 | 11841.1 | 6282.2 | 1430.6 | 356.1  | 290.9  | 293.9  | 309.0  | 319.0  | 305.0  | 296.0  |
| 50°   | 14857.8 | 12471.1 | 6124.7 | 947.0  | 318.0  | 271.9  | 282.9  | 282.9  | 299.0  | 274.9  | 263.8  |
| 52.5° | 15575.1 | 13098.1 | 5720.4 | 624.0  | 291.9  | 258.8  | 269.9  | 262.8  | 269.9  | 245.8  | 242.8  |
| 55°   | 16005.5 | 13422.2 | 5231.8 | 486.6  | 275.9  | 247.8  | 252.8  | 250.8  | 244.8  | 219.7  | 224.7  |
| 57.5° | 16479.0 | 13795.4 | 4623.9 | 408.3  | 268.9  | 234.8  | 235.8  | 232.7  | 214.7  | 197.6  | 198.6  |
| 60°   | 16857.2 | 14074.3 | 3973.8 | 360.2  | 260.8  | 227.7  | 213.7  | 208.7  | 183.6  | 173.6  | 174.6  |
| 62°   | 17122.1 | 14087.3 | 3407.0 | 335.1  | 250.8  | 222.7  | 200.6  | 189.6  | 161.5  | 153.5  | 152.5  |
| 62.5° | 17151.2 | 14038.2 | 3268.5 | 329.1  | 246.8  | 220.7  | 199.6  | 183.6  | 155.5  | 149.5  | 147.5  |
| 65°   | 17042.8 | 13491.4 | 2607.4 | 296.0  | 229.7  | 208.7  | 185.6  | 159.5  | 133.4  | 125.4  | 122.4  |
| 67.5° | 16236.2 | 12512.2 | 1991.4 | 268.9  | 208.7  | 200.6  | 171.6  | 140.5  | 118.4  | 108.3  | 106.3  |
| 70°   | 14663.2 | 11187.0 | 1421.6 | 234.8  | 187.6  | 182.6  | 172.6  | 128.4  | 109.4  | 95.3   | 93.3   |
| 72.5° | 12915.5 | 9776.4  | 967.1  | 208.7  | 166.5  | 150.5  | 127.4  | 121.4  | 102.3  | 84.3   | 82.3   |
| 75°   | 10991.4 | 7786.0  | 688.2  | 179.6  | 143.5  | 127.4  | 107.3  | 112.4  | 96.3   | 75.2   | 73.2   |
| 77.5° | 8433.1  | 5726.4  | 510.6  | 147.5  | 111.4  | 103.3  | 90.3   | 99.3   | 87.3   | 68.2   | 67.2   |
| 80°   | 5758.5  | 3954.7  | 363.2  | 111.4  | 73.2   | 73.2   | 76.2   | 85.3   | 77.2   | 61.2   | 60.2   |
| 82.5° | 3237.4  | 2081.7  | 214.7  | 80.3   | 50.2   | 50.2   | 59.2   | 69.2   | 64.2   | 53.2   | 52.2   |
| 85°   | 1341.3  | 753.4   | 113.4  | 50.2   | 33.1   | 34.1   | 42.1   | 51.2   | 50.2   | 42.1   | 41.1   |
| 87.5° | 466.5   | 189.6   | 33.1   | 17.1   | 14.0   | 15.0   | 17.1   | 24.1   | 24.1   | 21.1   | 22.1   |
| 90°   | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

LM-79-08: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

STREETWORKS

Report Number: SP1-2104-215-1

Luminaire Tested: CST-CA6-230-740-U-T4

Test Date: 04/20/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-1  
 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-CA6-230-740-U-T4**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

230W

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 3783    | CRI (Ra): | 75.1 |      |       |
| CIE u':                   | 0.2297  | R1:       | 72.8 | R9:  | -19.0 |
| CIE v':                   | 0.5046  | R2:       | 81.9 | R10: | 57.0  |
| Duv:                      | -0.0008 | R3:       | 89.0 | R11: | 70.7  |
| CIE x:                    | 0.3897  | R4:       | 74.1 | R12: | 48.2  |
| CIE y:                    | 0.3804  | R5:       | 72.3 | R13: | 74.4  |
| CIE z:                    | 0.2299  | R6:       | 74.5 | R14: | 93.7  |
| Peak Wavelength (nm):     | 450     | R7:       | 81.7 |      |       |
| Dominant Wavelength (nm): | 580     | R8:       | 54.6 |      |       |
| Purity:                   | 31.3    |           |      |      |       |
| Rf:                       | 76.5    |           |      |      |       |
| Rg:                       | 95.6    |           |      |      |       |



### Test Conditions

Stabilization Time: 47M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.5/39%  
 Sphere Temperature (°C): 24.0

REPORT NUMBER: SP1-2104-215-1

| 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: SP1-2104-215-1

**CIE 1931 Chromaticity Diagram**



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



REPORT NUMBER: SP1-2104-215-1

### Photopic Flux vs. Wavelength



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| 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       | 13329            | 0.0              | 490       | 105235           | 15.0             | 620       | 524343           | 136.4            | 750       | 24224            | 0.0              | 880       | 16135            | 0.0              |
| 365       | 11697            | 0.0              | 495       | 137678           | 25.0             | 625       | 488932           | 107.9            | 755       | 22376            | 0.0              | 885       | 16876            | 0.0              |
| 370       | 10917            | 0.0              | 500       | 186689           | 41.2             | 630       | 445400           | 80.6             | 760       | 20109            | 0.0              | 890       | 13554            | 0.0              |
| 375       | 12548            | 0.0              | 505       | 244611           | 68.4             | 635       | 403534           | 60.6             | 765       | 18097            | 0.0              | 895       | 11525            | 0.0              |
| 380       | 13932            | 0.0              | 510       | 298987           | 102.7            | 640       | 366414           | 43.8             | 770       | 17366            | 0.0              | 900       | 14656            | 0.0              |
| 385       | 13265            | 0.0              | 515       | 348170           | 144.2            | 645       | 331272           | 31.9             | 775       | 16226            | 0.0              | 905       | 11999            | 0.0              |
| 390       | 11808            | 0.0              | 520       | 390427           | 189.3            | 650       | 297360           | 21.7             | 780       | 14803            | 0.0              | 910       | 12965            | 0.0              |
| 395       | 10395            | 0.0              | 525       | 421211           | 226.1            | 655       | 263291           | 15.1             | 785       | 15199            | 0.0              | 915       | 15939            | 0.0              |
| 400       | 9348             | 0.0              | 530       | 446063           | 262.6            | 660       | 232931           | 9.7              | 790       | 12989            | 0.0              | 920       | 16238            | 0.0              |
| 405       | 9479             | 0.0              | 535       | 465110           | 288.4            | 665       | 204719           | 6.5              | 795       | 12106            | 0.0              | 925       | 14419            | 0.0              |
| 410       | 12414            | 0.0              | 540       | 479189           | 312.2            | 670       | 177096           | 3.9              | 800       | 12942            | 0.0              | 930       | 14788            | 0.0              |
| 415       | 21574            | 0.0              | 545       | 495864           | 330.0            | 675       | 153254           | 2.6              | 805       | 13253            | 0.0              | 935       | 18619            | 0.0              |
| 420       | 41448            | 0.1              | 550       | 516625           | 351.1            | 680       | 132874           | 1.5              | 810       | 12808            | 0.0              | 940       | 13995            | 0.0              |
| 425       | 79385            | 0.4              | 555       | 538555           | 367.8            | 685       | 115378           | 1.0              | 815       | 12903            | 0.0              | 945       | 18047            | 0.0              |
| 430       | 141845           | 1.1              | 560       | 562412           | 382.2            | 690       | 100157           | 0.6              | 820       | 12621            | 0.0              | 950       | 21418            | 0.0              |
| 435       | 231290           | 2.7              | 565       | 585835           | 389.5            | 695       | 85561            | 0.4              | 825       | 13903            | 0.0              | 955       | 23138            | 0.0              |
| 440       | 374482           | 5.9              | 570       | 608681           | 395.8            | 700       | 75396            | 0.2              | 830       | 11870            | 0.0              | 960       | 13665            | 0.0              |
| 445       | 596715           | 12.4             | 575       | 629563           | 391.7            | 705       | 65658            | 0.1              | 835       | 11069            | 0.0              | 965       | 14793            | 0.0              |
| 450       | 719656           | 18.7             | 580       | 646820           | 384.3            | 710       | 58172            | 0.1              | 840       | 15291            | 0.0              | 970       | 14396            | 0.0              |
| 455       | 530438           | 17.8             | 585       | 659231           | 366.3            | 715       | 52563            | 0.1              | 845       | 15125            | 0.0              | 975       | 11155            | 0.0              |
| 460       | 330446           | 13.5             | 590       | 665630           | 344.2            | 720       | 47085            | 0.0              | 850       | 15336            | 0.0              | 980       | 17987            | 0.0              |
| 465       | 241999           | 12.5             | 595       | 656228           | 311.1            | 725       | 41741            | 0.0              | 855       | 15791            | 0.0              | 985       | 16185            | 0.0              |
| 470       | 167096           | 10.4             | 600       | 646946           | 278.8            | 730       | 37415            | 0.0              | 860       | 14660            | 0.0              | 990       | 22120            | 0.0              |
| 475       | 113791           | 8.9              | 605       | 628643           | 243.4            | 735       | 32125            | 0.0              | 865       | 12528            | 0.0              | 995       | 11943            | 0.0              |
| 480       | 96126            | 9.1              | 610       | 599057           | 205.8            | 740       | 29322            | 0.0              | 870       | 14089            | 0.0              | 1000      | 16020            | 0.0              |
| 485       | 94467            | 11.2             | 615       | 565669           | 170.8            | 745       | 26862            | 0.0              | 875       | 11732            | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2104-215-1

### Scotopic Flux vs. Wavelength



Scotopic Lumens: 54268.8

S/P: 1.5

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 13329                         | 0.0                            | 490               | 105235                        | 162.0                          | 620               | 524343                        | 6.6                            | 750               | 24224                         | 0.0                            | 880               | 16135                         | 0.0                            |
| 365               | 11697                         | 0.0                            | 495               | 137678                        | 222.6                          | 625               | 488932                        | 4.1                            | 755               | 22376                         | 0.0                            | 885               | 16876                         | 0.0                            |
| 370               | 10917                         | 0.0                            | 500               | 186689                        | 312.3                          | 630               | 445400                        | 2.5                            | 760               | 20109                         | 0.0                            | 890               | 13554                         | 0.0                            |
| 375               | 12548                         | 0.0                            | 505               | 244611                        | 415.8                          | 635               | 403534                        | 1.5                            | 765               | 18097                         | 0.0                            | 895               | 11525                         | 0.0                            |
| 380               | 13932                         | 0.0                            | 510               | 298987                        | 506.8                          | 640               | 366414                        | 0.9                            | 770               | 17366                         | 0.0                            | 900               | 14656                         | 0.0                            |
| 385               | 13265                         | 0.0                            | 515               | 348170                        | 577.1                          | 645               | 331272                        | 0.6                            | 775               | 16226                         | 0.0                            | 905               | 11999                         | 0.0                            |
| 390               | 11808                         | 0.0                            | 520               | 390427                        | 620.6                          | 650               | 297360                        | 0.3                            | 780               | 14803                         | 0.0                            | 910               | 12965                         | 0.0                            |
| 395               | 10395                         | 0.1                            | 525               | 421211                        | 630.1                          | 655               | 263291                        | 0.2                            | 785               | 15199                         | 0.0                            | 915               | 15939                         | 0.0                            |
| 400               | 9348                          | 0.1                            | 530               | 446063                        | 615.0                          | 660               | 232931                        | 0.1                            | 790               | 12989                         | 0.0                            | 920               | 16238                         | 0.0                            |
| 405               | 9479                          | 0.3                            | 535               | 465110                        | 579.6                          | 665               | 204719                        | 0.1                            | 795               | 12106                         | 0.0                            | 925               | 14419                         | 0.0                            |
| 410               | 12414                         | 0.7                            | 540               | 479189                        | 529.5                          | 670               | 177096                        | 0.0                            | 800               | 12942                         | 0.0                            | 930               | 14788                         | 0.0                            |
| 415               | 21574                         | 2.2                            | 545               | 495864                        | 475.4                          | 675               | 153254                        | 0.0                            | 805               | 13253                         | 0.0                            | 935               | 18619                         | 0.0                            |
| 420               | 41448                         | 6.8                            | 550               | 516625                        | 422.4                          | 680               | 132874                        | 0.0                            | 810               | 12808                         | 0.0                            | 940               | 13995                         | 0.0                            |
| 425               | 79385                         | 19.4                           | 555               | 538555                        | 368.0                          | 685               | 115378                        | 0.0                            | 815               | 12903                         | 0.0                            | 945               | 18047                         | 0.0                            |
| 430               | 141845                        | 48.3                           | 560               | 562412                        | 314.4                          | 690               | 100157                        | 0.0                            | 820               | 12621                         | 0.0                            | 950               | 21418                         | 0.0                            |
| 435               | 231290                        | 103.4                          | 565               | 585835                        | 262.8                          | 695               | 85561                         | 0.0                            | 825               | 13903                         | 0.0                            | 955               | 23138                         | 0.0                            |
| 440               | 374482                        | 209.3                          | 570               | 608681                        | 214.8                          | 700               | 75396                         | 0.0                            | 830               | 11870                         | 0.0                            | 960               | 13665                         | 0.0                            |
| 445               | 596715                        | 399.6                          | 575               | 629563                        | 171.5                          | 705               | 65658                         | 0.0                            | 835               | 11069                         | 0.0                            | 965               | 14793                         | 0.0                            |
| 450               | 719656                        | 557.8                          | 580               | 646820                        | 133.3                          | 710               | 58172                         | 0.0                            | 840               | 15291                         | 0.0                            | 970               | 14396                         | 0.0                            |
| 455               | 530438                        | 463.5                          | 585               | 659231                        | 100.8                          | 715               | 52563                         | 0.0                            | 845               | 15125                         | 0.0                            | 975               | 11155                         | 0.0                            |
| 460               | 330446                        | 319.2                          | 590               | 665630                        | 74.1                           | 720               | 47085                         | 0.0                            | 850               | 15336                         | 0.0                            | 980               | 17987                         | 0.0                            |
| 465               | 241999                        | 255.6                          | 595               | 656228                        | 52.3                           | 725               | 41741                         | 0.0                            | 855               | 15791                         | 0.0                            | 985               | 16185                         | 0.0                            |
| 470               | 167096                        | 192.4                          | 600               | 646946                        | 36.5                           | 730               | 37415                         | 0.0                            | 860               | 14660                         | 0.0                            | 990               | 22120                         | 0.0                            |
| 475               | 113791                        | 142.3                          | 605               | 628643                        | 24.7                           | 735               | 32125                         | 0.0                            | 865               | 12528                         | 0.0                            | 995               | 11943                         | 0.0                            |
| 480               | 96126                         | 129.8                          | 610               | 599057                        | 16.2                           | 740               | 29322                         | 0.0                            | 870               | 14089                         | 0.0                            | 1000              | 16020                         | 0.0                            |
| 485               | 94467                         | 136.9                          | 615               | 565669                        | 10.5                           | 745               | 26862                         | 0.0                            | 875               | 11732                         | 0.0                            |                   |                               |                                |

REPORT NUMBER: SP1-2104-215-1

### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 20938.3**      **M/P: 0.58**

| 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       | 13329            | 0.0              | 490       | 105235           | 87.6             | 620       | 524343           | 0.4              | 750       | 24224            | 0.0              | 880       | 16135            | 0.0              |
| 365       | 11697            | 0.0              | 495       | 137678           | 113.7            | 625       | 488932           | 0.3              | 755       | 22376            | 0.0              | 885       | 16876            | 0.0              |
| 370       | 10917            | 0.0              | 500       | 186689           | 150.1            | 630       | 445400           | 0.2              | 760       | 20109            | 0.0              | 890       | 13554            | 0.0              |
| 375       | 12548            | 0.0              | 505       | 244611           | 187.7            | 635       | 403534           | 0.1              | 765       | 18097            | 0.0              | 895       | 11525            | 0.0              |
| 380       | 13932            | 0.0              | 510       | 298987           | 214.7            | 640       | 366414           | 0.1              | 770       | 17366            | 0.0              | 900       | 14656            | 0.0              |
| 385       | 13265            | 0.0              | 515       | 348170           | 227.5            | 645       | 331272           | 0.0              | 775       | 16226            | 0.0              | 905       | 11999            | 0.0              |
| 390       | 11808            | 0.0              | 520       | 390427           | 227.3            | 650       | 297360           | 0.0              | 780       | 14803            | 0.0              | 910       | 12965            | 0.0              |
| 395       | 10395            | 0.1              | 525       | 421211           | 213.6            | 655       | 263291           | 0.0              | 785       | 15199            | 0.0              | 915       | 15939            | 0.0              |
| 400       | 9348             | 0.1              | 530       | 446063           | 192.8            | 660       | 232931           | 0.0              | 790       | 12989            | 0.0              | 920       | 16238            | 0.0              |
| 405       | 9479             | 0.2              | 535       | 465110           | 167.4            | 665       | 204719           | 0.0              | 795       | 12106            | 0.0              | 925       | 14419            | 0.0              |
| 410       | 12414            | 0.5              | 540       | 479189           | 140.2            | 670       | 177096           | 0.0              | 800       | 12942            | 0.0              | 930       | 14788            | 0.0              |
| 415       | 21574            | 1.4              | 545       | 495864           | 115.2            | 675       | 153254           | 0.0              | 805       | 13253            | 0.0              | 935       | 18619            | 0.0              |
| 420       | 41448            | 4.7              | 550       | 516625           | 92.7             | 680       | 132874           | 0.0              | 810       | 12808            | 0.0              | 940       | 13995            | 0.0              |
| 425       | 79385            | 12.4             | 555       | 538555           | 72.6             | 685       | 115378           | 0.0              | 815       | 12903            | 0.0              | 945       | 18047            | 0.0              |
| 430       | 141845           | 30.0             | 560       | 562412           | 55.5             | 690       | 100157           | 0.0              | 820       | 12621            | 0.0              | 950       | 21418            | 0.0              |
| 435       | 231290           | 61.7             | 565       | 585835           | 41.1             | 695       | 85561            | 0.0              | 825       | 13903            | 0.0              | 955       | 23138            | 0.0              |
| 440       | 374482           | 125.1            | 570       | 608681           | 29.7             | 700       | 75396            | 0.0              | 830       | 11870            | 0.0              | 960       | 13665            | 0.0              |
| 445       | 596715           | 235.4            | 575       | 629563           | 21.0             | 705       | 65658            | 0.0              | 835       | 11069            | 0.0              | 965       | 14793            | 0.0              |
| 450       | 719656           | 331.6            | 580       | 646820           | 14.5             | 710       | 58172            | 0.0              | 840       | 15291            | 0.0              | 970       | 14396            | 0.0              |
| 455       | 530438           | 277.9            | 585       | 659231           | 9.8              | 715       | 52563            | 0.0              | 845       | 15125            | 0.0              | 975       | 11155            | 0.0              |
| 460       | 330446           | 194.7            | 590       | 665630           | 6.5              | 720       | 47085            | 0.0              | 850       | 15336            | 0.0              | 980       | 17987            | 0.0              |
| 465       | 241999           | 158.1            | 595       | 656228           | 4.2              | 725       | 41741            | 0.0              | 855       | 15791            | 0.0              | 985       | 16185            | 0.0              |
| 470       | 167096           | 119.6            | 600       | 646946           | 2.7              | 730       | 37415            | 0.0              | 860       | 14660            | 0.0              | 990       | 22120            | 0.0              |
| 475       | 113791           | 86.9             | 605       | 628643           | 1.7              | 735       | 32125            | 0.0              | 865       | 12528            | 0.0              | 995       | 11943            | 0.0              |
| 480       | 96126            | 77.2             | 610       | 599057           | 1.1              | 740       | 29322            | 0.0              | 870       | 14089            | 0.0              | 1000      | 16020            | 0.0              |
| 485       | 94467            | 77.9             | 615       | 565669           | 0.7              | 745       | 26862            | 0.0              | 875       | 11732            | 0.0              |           |                  |                  |

### Summary

$R_f = 76.5$   
 $R_g = 95.6$   
 CIE  $R_a = 75.1$   
 $R_g = -19.0$



### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 66 | CES51 = 90 | CES76 = 56 |
| CES02 = 61 | CES27 = 89 | CES52 = 89 | CES77 = 73 |
| CES03 = 31 | CES28 = 83 | CES53 = 81 | CES78 = 58 |
| CES04 = 70 | CES29 = 69 | CES54 = 87 | CES79 = 84 |
| CES05 = 48 | CES30 = 84 | CES55 = 86 | CES80 = 81 |
| CES06 = 51 | CES31 = 72 | CES56 = 77 | CES81 = 79 |
| CES07 = 40 | CES32 = 64 | CES57 = 77 | CES82 = 92 |
| CES08 = 39 | CES33 = 79 | CES58 = 77 | CES83 = 90 |
| CES09 = 29 | CES34 = 73 | CES59 = 87 | CES84 = 87 |
| CES10 = 74 | CES35 = 85 | CES60 = 90 | CES85 = 78 |
| CES11 = 57 | CES36 = 91 | CES61 = 84 | CES86 = 73 |
| CES12 = 63 | CES37 = 81 | CES62 = 87 | CES87 = 79 |
| CES13 = 42 | CES38 = 94 | CES63 = 75 | CES88 = 83 |
| CES14 = 74 | CES39 = 96 | CES64 = 69 | CES89 = 73 |
| CES15 = 71 | CES40 = 91 | CES65 = 66 | CES90 = 83 |
| CES16 = 47 | CES41 = 94 | CES66 = 63 | CES91 = 76 |
| CES17 = 49 | CES42 = 82 | CES67 = 60 | CES92 = 62 |
| CES18 = 56 | CES43 = 78 | CES68 = 68 | CES93 = 77 |
| CES19 = 72 | CES44 = 99 | CES69 = 76 | CES94 = 57 |
| CES20 = 65 | CES45 = 86 | CES70 = 60 | CES95 = 69 |
| CES21 = 86 | CES46 = 84 | CES71 = 54 | CES96 = 79 |
| CES22 = 78 | CES47 = 87 | CES72 = 85 | CES97 = 86 |
| CES23 = 92 | CES48 = 80 | CES73 = 52 | CES98 = 79 |
| CES24 = 91 | CES49 = 82 | CES74 = 94 | CES99 = 69 |
| CES25 = 72 | CES50 = 90 | CES75 = 56 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)