

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: P510548

Luminaire Tested: **CTN-CA10-630-740-U-T3-HSS**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510548  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-16)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: CTN-CA10-630-740-U-T3-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (10) 4000K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 86054 lumens  
Efficiency: N/A  
Efficacy: 136.3 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type III - Short  
BUG Rating: B4 - U0 - G5

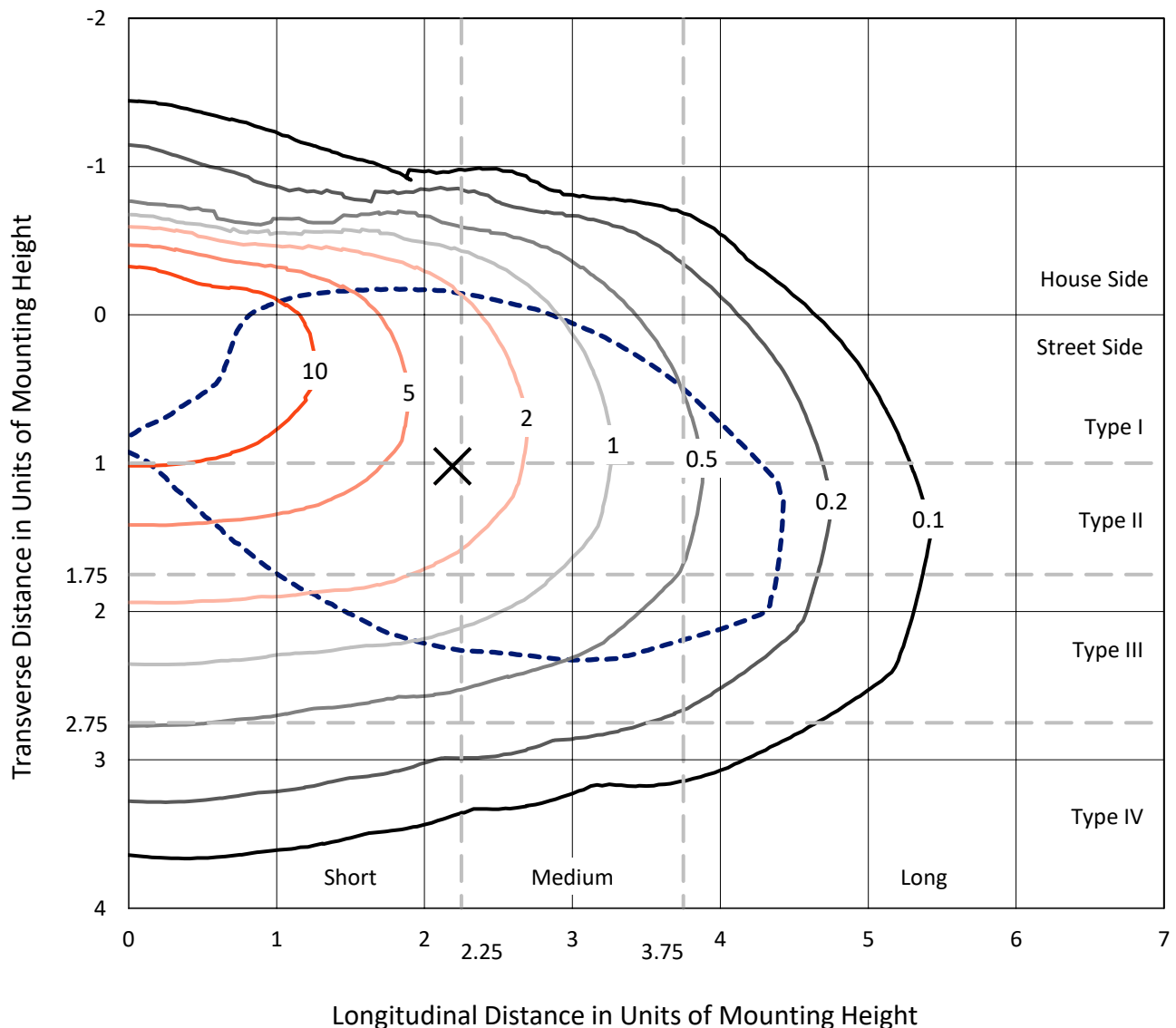
Input Watts (W): 631.4  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



REPORT NUMBER: P510548  
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## Iso-Footcandle Lines of Horizontal Illumination

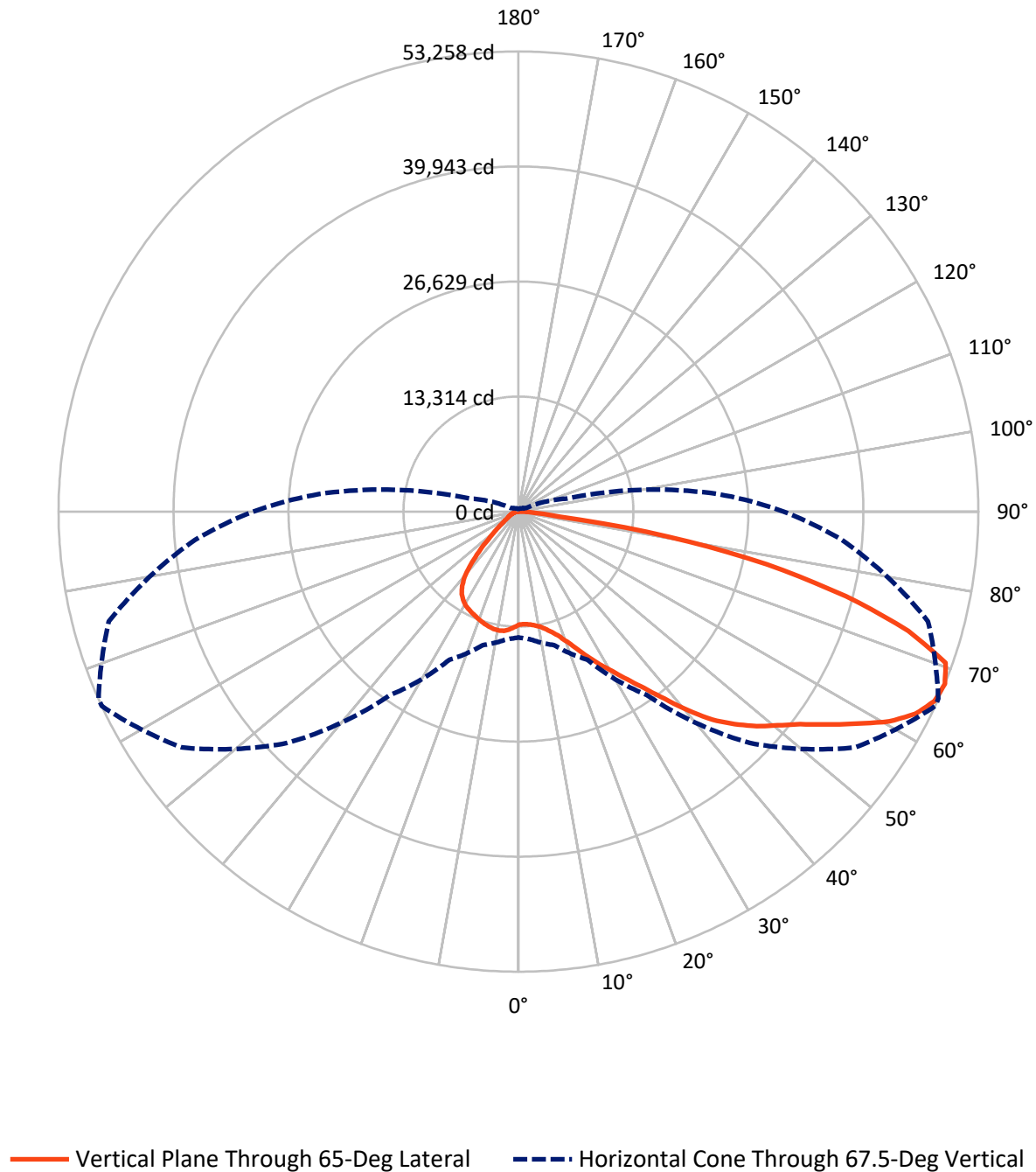
✕ Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 17.1 fc  
 Type III - Short - N/A

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## Luminous Intensity Polar Plot



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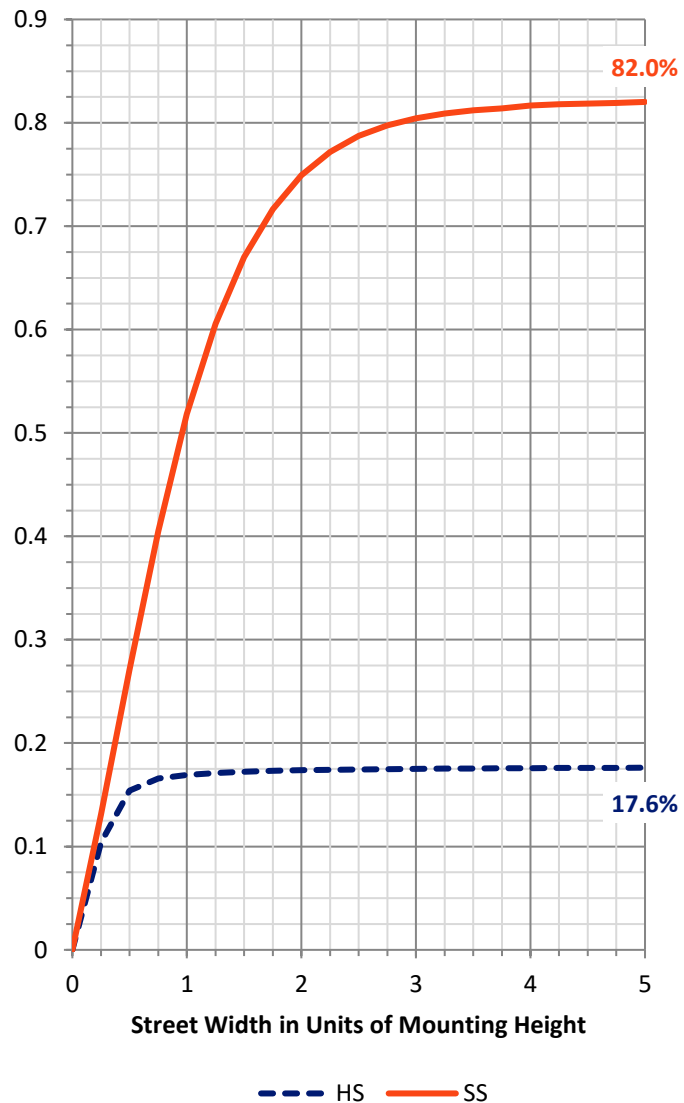
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 15380.0  | 0.0    | 15380.0 |
|                    | % Fixture | 17.9     | 0.0    | 17.9    |
| <b>Street Side</b> | Lumens    | 70674.0  | 0.0    | 70674.0 |
|                    | % Fixture | 82.1     | 0.0    | 82.1    |
| <b>Total</b>       | Lumens    | 86054.0  | 0.0    | 86054.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 1293.7  | 1.5       |
| 10°-20°   | 3994.1  | 4.6       |
| 20°-30°   | 6929.0  | 8.1       |
| 30°-40°   | 10452.3 | 12.1      |
| 40°-50°   | 14492.8 | 16.8      |
| 50°-60°   | 17889.4 | 20.8      |
| 60°-70°   | 19060.9 | 22.1      |
| 70°-80°   | 10907.0 | 12.7      |
| 80°-90°   | 1034.9  | 1.2       |
| 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°    | 86054.0 | 100.0     |
| 0°-180°   | 86054.0 | 100.0     |

**Coefficient of Utilization**



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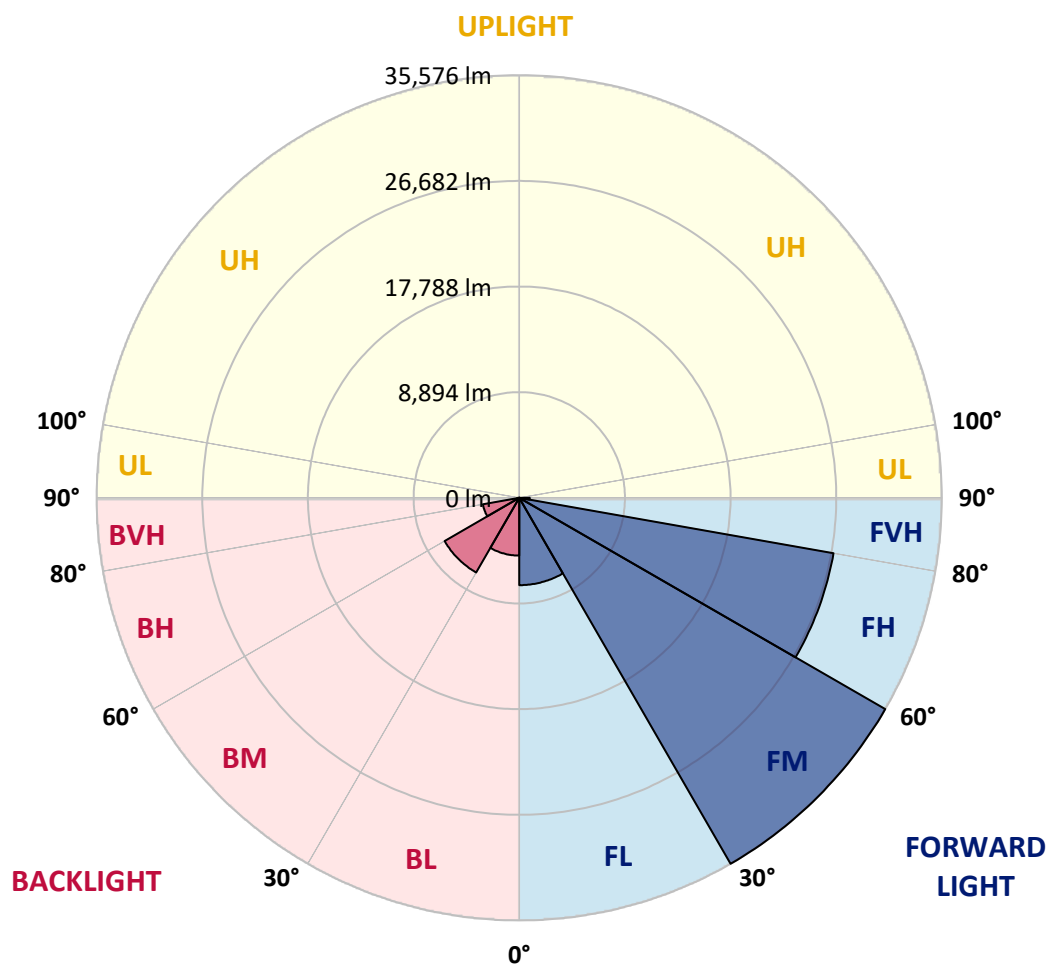
CATALOG NUMBER: CTN-CA10-630-740-U-T3-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 7350.2  | 8.5       |                         |      |         |
| FM   | (30°-60°)   | 35576.0 | 41.3      |                         |      |         |
| FH   | (60°-80°)   | 26863.7 | 31.2      |                         |      | G5      |
| FVH  | (80°-90°)   | 884.2   | 1.0       |                         |      | G5      |
| BL   | (0°-30°)    | 4866.6  | 5.7       | B4/5000                 |      |         |
| BM   | (30°-60°)   | 7258.5  | 8.4       | B4/8500                 |      |         |
| BH   | (60°-80°)   | 3104.2  | 3.6       | B4/5000                 |      | G4/5000 |
| BVH  | (80°-90°)   | 150.6   | 0.2       |                         |      | G2/225  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

**BUG Rating: B4-U0-G5**

Type III Short





REPORT NUMBER: P510548

CATALOG NUMBER: CTN-CA10-630-740-U-T3-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 65°     | 66°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 |
| 2.5°  | 12950.2 | 12933.2 | 12918.1 | 12944.5 | 12959.6 | 12984.1 | 13019.9 | 13044.4 | 13052.0 | 13074.6 | 13102.9 |
| 5°    | 13157.5 | 13155.6 | 13134.9 | 13123.6 | 13091.5 | 13080.2 | 13087.8 | 13117.9 | 13119.8 | 13148.1 | 13236.7 |
| 7.5°  | 13564.7 | 13560.9 | 13510.0 | 13487.4 | 13419.5 | 13344.1 | 13287.6 | 13293.2 | 13291.4 | 13319.6 | 13438.4 |
| 10°   | 14179.2 | 14149.1 | 14077.4 | 14007.7 | 13875.7 | 13734.3 | 13630.7 | 13536.4 | 13536.4 | 13577.9 | 13709.8 |
| 12.5° | 14872.9 | 14914.4 | 14816.4 | 14710.8 | 14490.2 | 14235.8 | 14054.8 | 13949.2 | 13937.9 | 13958.7 | 14052.9 |
| 15°   | 15734.4 | 15734.4 | 15668.4 | 15517.6 | 15323.4 | 14969.0 | 14595.8 | 14462.0 | 14443.1 | 14486.5 | 14480.8 |
| 17.5° | 16705.2 | 16733.4 | 16609.0 | 16533.6 | 16235.8 | 15843.7 | 15376.2 | 15144.3 | 15144.3 | 15116.1 | 14986.0 |
| 20°   | 17943.6 | 17789.0 | 17802.2 | 17677.8 | 17459.2 | 16889.9 | 16414.9 | 16077.4 | 16073.7 | 16017.1 | 15651.4 |
| 22.5° | 19289.5 | 19204.7 | 19131.2 | 19021.9 | 18720.3 | 18211.3 | 17551.5 | 17217.9 | 17210.3 | 17070.8 | 16528.0 |
| 25°   | 20616.6 | 20680.7 | 20599.6 | 20399.8 | 20179.3 | 19625.1 | 18897.4 | 18569.5 | 18567.6 | 18335.7 | 17566.6 |
| 27.5° | 21981.4 | 22051.1 | 22024.7 | 21843.8 | 21549.7 | 21116.1 | 20428.1 | 20000.2 | 19973.8 | 19823.0 | 18856.0 |
| 30°   | 23489.4 | 23427.2 | 23508.2 | 23430.9 | 23283.9 | 22577.0 | 21955.0 | 21457.3 | 21521.4 | 21476.2 | 20320.6 |
| 32.5° | 24586.5 | 24626.1 | 24891.8 | 24899.4 | 24744.8 | 24220.8 | 23461.1 | 23155.7 | 23257.5 | 23197.2 | 22120.9 |
| 35°   | 25578.0 | 25642.1 | 25985.2 | 26322.6 | 26435.7 | 25862.6 | 25089.8 | 25070.9 | 25202.9 | 25570.5 | 24601.6 |
| 37.5° | 26430.0 | 26475.3 | 26956.0 | 27395.2 | 27760.9 | 27368.8 | 26807.0 | 27476.2 | 27670.4 | 28422.5 | 27161.4 |
| 40°   | 26940.9 | 26999.3 | 27621.4 | 28239.7 | 28891.9 | 28752.4 | 28699.6 | 30283.0 | 30465.9 | 31127.5 | 29029.5 |
| 42.5° | 26652.5 | 26767.5 | 27804.2 | 28935.2 | 29894.7 | 30173.7 | 30895.7 | 32931.5 | 33140.7 | 33197.3 | 30865.5 |
| 45°   | 26137.9 | 26281.1 | 27440.4 | 29270.8 | 30835.4 | 31730.7 | 33104.9 | 35089.9 | 35204.9 | 35044.6 | 32386.7 |
| 47.5° | 25583.7 | 25736.3 | 27031.4 | 29170.9 | 31591.3 | 33542.3 | 35078.6 | 37121.9 | 37203.0 | 36711.0 | 33919.3 |
| 50°   | 24954.1 | 25095.4 | 26488.5 | 28937.1 | 32160.5 | 35252.0 | 37106.9 | 38878.8 | 39182.3 | 38209.6 | 35110.6 |
| 52.5° | 24188.7 | 24339.5 | 25817.4 | 28571.4 | 32660.1 | 36520.6 | 38895.7 | 40863.7 | 40884.5 | 40083.3 | 36452.7 |
| 55°   | 23197.2 | 23459.2 | 24974.8 | 27938.1 | 32922.1 | 37610.2 | 40454.7 | 43489.6 | 43623.4 | 42848.7 | 37576.2 |
| 57.5° | 22094.5 | 22322.5 | 23960.6 | 27093.6 | 32686.5 | 38437.7 | 42961.8 | 46305.8 | 46288.8 | 44733.7 | 38558.3 |
| 60°   | 20637.3 | 20799.4 | 22639.2 | 25988.9 | 31926.8 | 39438.6 | 45572.5 | 49323.7 | 49293.6 | 46581.0 | 39189.8 |
| 62.5° | 18767.4 | 18929.5 | 20660.0 | 24256.6 | 30810.8 | 40109.7 | 47344.5 | 51583.9 | 51497.2 | 47925.1 | 39384.0 |
| 65°   | 16599.6 | 16889.9 | 18392.3 | 22007.7 | 28837.2 | 39668.6 | 48200.3 | 52914.7 | 52775.2 | 48950.5 | 38920.3 |
| 67.5° | 14567.5 | 14814.5 | 16003.9 | 18912.5 | 25924.8 | 37879.7 | 47597.1 | 53257.8 | 53216.3 | 49099.4 | 37610.2 |
| 70°   | 11691.0 | 11781.4 | 12871.0 | 15361.1 | 21570.4 | 34049.3 | 45512.2 | 52466.1 | 52484.9 | 47727.1 | 34978.7 |
| 72.5° | 8002.0  | 8222.5  | 8707.0  | 10673.1 | 15696.7 | 27078.5 | 39227.5 | 47218.2 | 47221.9 | 42795.9 | 30475.3 |
| 75°   | 4303.5  | 4644.7  | 5210.2  | 6184.8  | 8774.8  | 17376.2 | 31502.7 | 39180.4 | 39253.9 | 35681.8 | 24222.7 |
| 77.5° | 2133.9  | 2256.4  | 2584.4  | 3308.2  | 4022.7  | 8198.0  | 20260.3 | 29410.3 | 29585.6 | 27389.5 | 16520.4 |
| 80°   | 976.4   | 997.2   | 1021.7  | 1016.0  | 1540.1  | 3596.6  | 8697.5  | 17662.7 | 17715.5 | 16290.4 | 7542.0  |
| 82.5° | 763.4   | 759.7   | 771.0   | 701.2   | 705.0   | 1387.4  | 3010.4  | 4625.9  | 4933.1  | 3883.2  | 2392.1  |
| 85°   | 461.8   | 459.9   | 495.8   | 384.5   | 473.1   | 750.2   | 1519.3  | 1845.4  | 1868.1  | 1519.3  | 1238.5  |
| 87.5° | 175.3   | 169.7   | 156.5   | 137.6   | 158.3   | 211.1   | 525.9   | 678.6   | 663.5   | 471.3   | 427.9   |
| 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: P510548

CATALOG NUMBER: CTN-CA10-630-740-U-T3-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°    | 115°    | 125°    | 135°    | 145°    | 155°    | 165°    | 175°    | 180°    |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 | 13076.5 |
| 2.5°  | 13127.4 | 13187.7 | 13298.9 | 13383.7 | 13412.0 | 13502.5 | 13589.2 | 13604.3 | 13666.5 | 13691.0 | 13772.0 |
| 5°    | 13291.4 | 13393.2 | 13566.6 | 13681.6 | 13732.5 | 13883.3 | 13981.3 | 14030.3 | 14013.3 | 14022.8 | 14113.2 |
| 7.5°  | 13530.8 | 13626.9 | 13766.4 | 13905.9 | 13930.4 | 13956.8 | 13947.4 | 13939.8 | 13873.8 | 13817.3 | 13902.1 |
| 10°   | 13749.4 | 13839.9 | 13926.6 | 13947.4 | 13822.9 | 13753.2 | 13628.8 | 13532.6 | 13404.5 | 13346.0 | 13413.9 |
| 12.5° | 14056.7 | 14075.5 | 13990.7 | 13877.6 | 13609.9 | 13361.1 | 13159.4 | 12984.1 | 12825.8 | 12716.4 | 12806.9 |
| 15°   | 14380.9 | 14307.4 | 14060.5 | 13730.6 | 13315.9 | 12959.6 | 12629.7 | 12337.5 | 12075.5 | 12011.4 | 12035.9 |
| 17.5° | 14810.7 | 14610.9 | 14113.2 | 13559.0 | 12914.4 | 12360.2 | 11936.0 | 11566.6 | 11223.5 | 11080.2 | 11067.0 |
| 20°   | 15334.7 | 15012.4 | 14220.7 | 13342.3 | 12439.3 | 11702.3 | 11046.3 | 10494.0 | 10020.8 | 9632.5  | 9641.9  |
| 22.5° | 16017.1 | 15549.6 | 14382.8 | 13116.1 | 11913.4 | 10931.3 | 9977.5  | 9038.7  | 8260.2  | 7924.7  | 7841.7  |
| 25°   | 16918.2 | 16220.7 | 14612.8 | 12910.6 | 11325.3 | 9951.1  | 8603.3  | 7278.1  | 6454.3  | 6128.2  | 6092.4  |
| 27.5° | 18039.8 | 17121.7 | 14963.4 | 12682.5 | 10695.7 | 8788.0  | 6850.2  | 5551.4  | 4795.5  | 4452.4  | 4337.5  |
| 30°   | 19314.0 | 18232.0 | 15323.4 | 12445.0 | 9934.1  | 7293.2  | 5223.4  | 3951.0  | 3176.3  | 2869.0  | 2829.4  |
| 32.5° | 20963.4 | 19638.3 | 15858.8 | 12071.7 | 8821.9  | 5732.4  | 3643.8  | 2465.6  | 1939.7  | 1807.7  | 1770.0  |
| 35°   | 23306.5 | 21540.3 | 16520.4 | 11600.5 | 7393.1  | 4003.8  | 2258.3  | 1443.9  | 1163.1  | 1097.1  | 1083.9  |
| 37.5° | 25491.3 | 23406.4 | 17187.7 | 10818.2 | 5613.6  | 2499.6  | 1291.2  | 925.6   | 863.3   | 865.2   | 869.0   |
| 40°   | 27223.6 | 24682.6 | 17726.8 | 9789.0  | 3692.8  | 1419.4  | 897.3   | 769.1   | 771.0   | 765.3   | 761.6   |
| 42.5° | 28765.6 | 25700.5 | 17970.0 | 8267.8  | 2139.5  | 950.1   | 778.5   | 708.8   | 691.8   | 697.5   | 693.7   |
| 45°   | 30041.8 | 26739.2 | 17498.8 | 6558.0  | 1261.1  | 852.0   | 735.2   | 657.9   | 639.0   | 669.2   | 673.0   |
| 47.5° | 31383.9 | 27725.1 | 16776.8 | 4940.7  | 1023.6  | 810.6   | 695.6   | 620.2   | 610.8   | 648.5   | 652.2   |
| 50°   | 32513.0 | 28439.5 | 15545.9 | 3722.9  | 976.4   | 765.3   | 659.8   | 582.5   | 580.6   | 614.5   | 614.5   |
| 52.5° | 33457.4 | 28871.1 | 14085.0 | 2874.7  | 944.4   | 725.7   | 623.9   | 546.7   | 546.7   | 558.0   | 559.9   |
| 55°   | 34122.8 | 28784.4 | 13214.1 | 2262.0  | 910.5   | 688.0   | 586.2   | 512.7   | 490.1   | 482.6   | 486.3   |
| 57.5° | 34243.5 | 28554.5 | 12203.7 | 1764.4  | 870.9   | 652.2   | 552.3   | 473.1   | 431.7   | 426.0   | 424.1   |
| 60°   | 34166.2 | 28049.3 | 11050.1 | 1474.1  | 825.6   | 618.3   | 518.4   | 431.7   | 390.2   | 377.0   | 380.8   |
| 62.5° | 33843.9 | 27153.9 | 9717.3  | 1293.1  | 780.4   | 591.9   | 480.7   | 403.4   | 365.7   | 348.7   | 348.7   |
| 65°   | 32871.2 | 25872.1 | 7738.1  | 1132.9  | 723.9   | 563.6   | 450.5   | 392.1   | 350.6   | 331.8   | 328.0   |
| 67.5° | 30733.6 | 23212.3 | 5815.3  | 993.4   | 669.2   | 533.5   | 446.8   | 390.2   | 343.1   | 316.7   | 312.9   |
| 70°   | 27866.4 | 19939.9 | 3969.9  | 872.8   | 608.9   | 505.2   | 444.9   | 392.1   | 335.5   | 301.6   | 297.8   |
| 72.5° | 23263.2 | 15719.3 | 2286.5  | 759.7   | 548.5   | 478.8   | 437.3   | 394.0   | 322.3   | 280.9   | 275.2   |
| 75°   | 17479.9 | 11025.6 | 1342.1  | 652.2   | 490.1   | 439.2   | 416.6   | 382.7   | 301.6   | 256.4   | 250.7   |
| 77.5° | 10512.8 | 5148.0  | 1010.4  | 541.0   | 420.4   | 386.4   | 371.4   | 350.6   | 275.2   | 237.5   | 231.9   |
| 80°   | 3856.8  | 1954.8  | 793.6   | 433.6   | 333.7   | 335.5   | 320.5   | 307.3   | 250.7   | 218.7   | 214.9   |
| 82.5° | 1681.4  | 1195.1  | 586.2   | 329.9   | 262.0   | 299.7   | 263.9   | 252.6   | 214.9   | 196.0   | 188.5   |
| 85°   | 1019.8  | 712.5   | 377.0   | 224.3   | 181.0   | 203.6   | 184.7   | 194.2   | 165.9   | 154.6   | 148.9   |
| 87.5° | 337.4   | 213.0   | 167.8   | 109.3   | 90.5    | 84.8    | 82.9    | 99.9    | 94.3    | 86.7    | 86.7    |
| 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**



Point lies inside the ANSI 4000K 7-step quadrangle

REPORT NUMBER: SP1-2104-215-1

### Photopic Flux vs. Wavelength

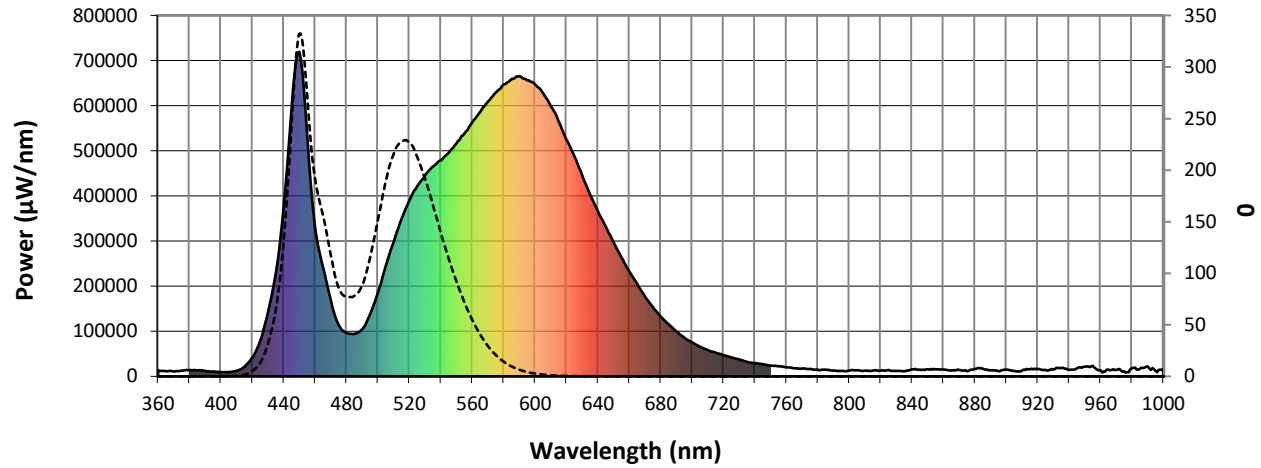


#####

| 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       | 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              |           |                  |                  |

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### 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                            |                   |                               |                                |

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### 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              |           |                  |                  |

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TM-30-18

### 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)