

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: STREETWORKS

Report Number: P510397

Luminaire Tested: **CST-CA10-210-722-U-T2**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510397  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-10)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: STREETWORKS  
Catalog Number: CST-CA10-210-722-U-T2  
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: 28235 lumens  
Efficiency: N/A  
Efficacy: 132.6 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B3 - U0 - G3

Input Watts (W): 212.9  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT

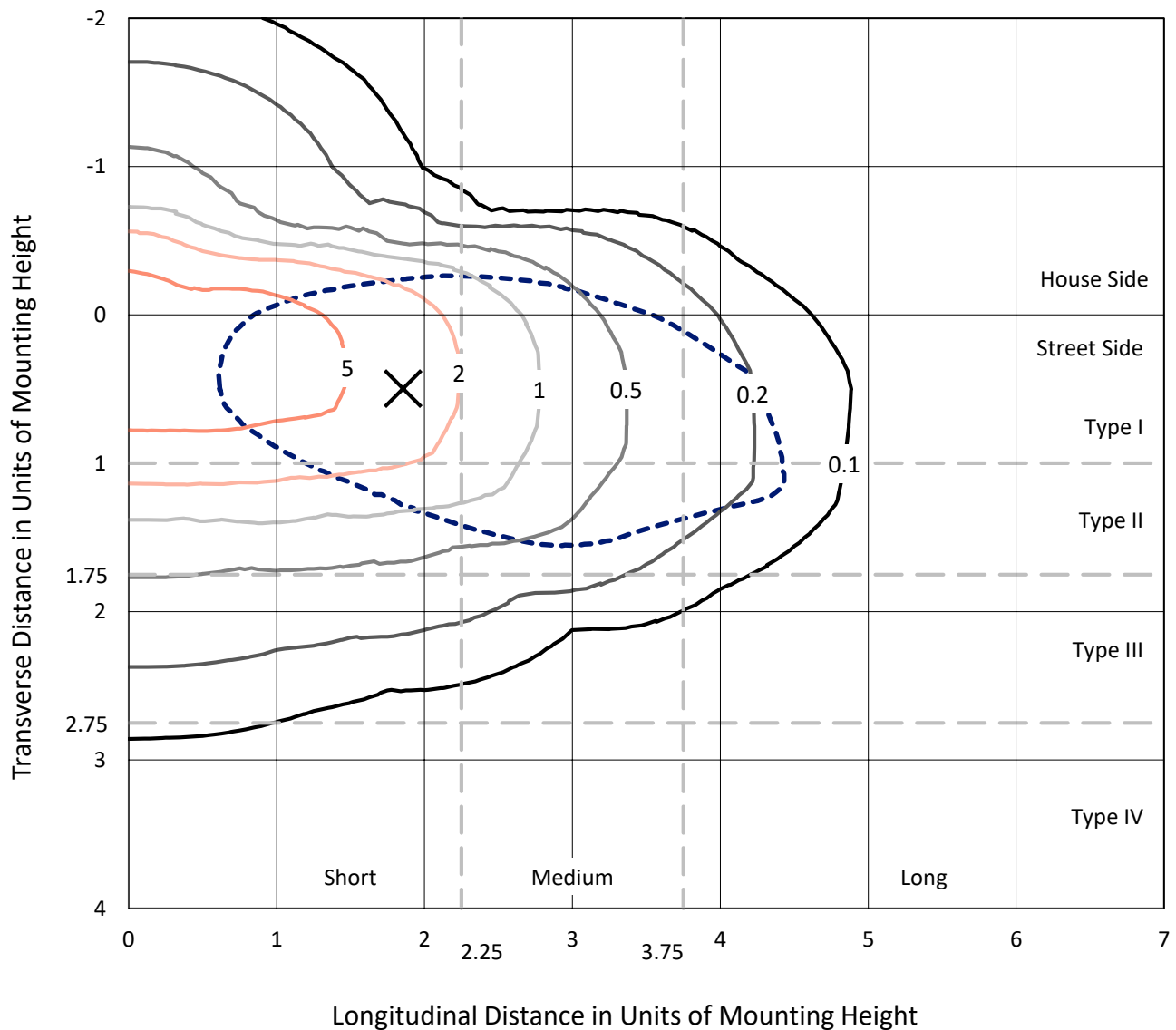


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## Iso-Footcandle Lines of Horizontal Illumination

× Max cd  
 - - - 1/2 Max cd

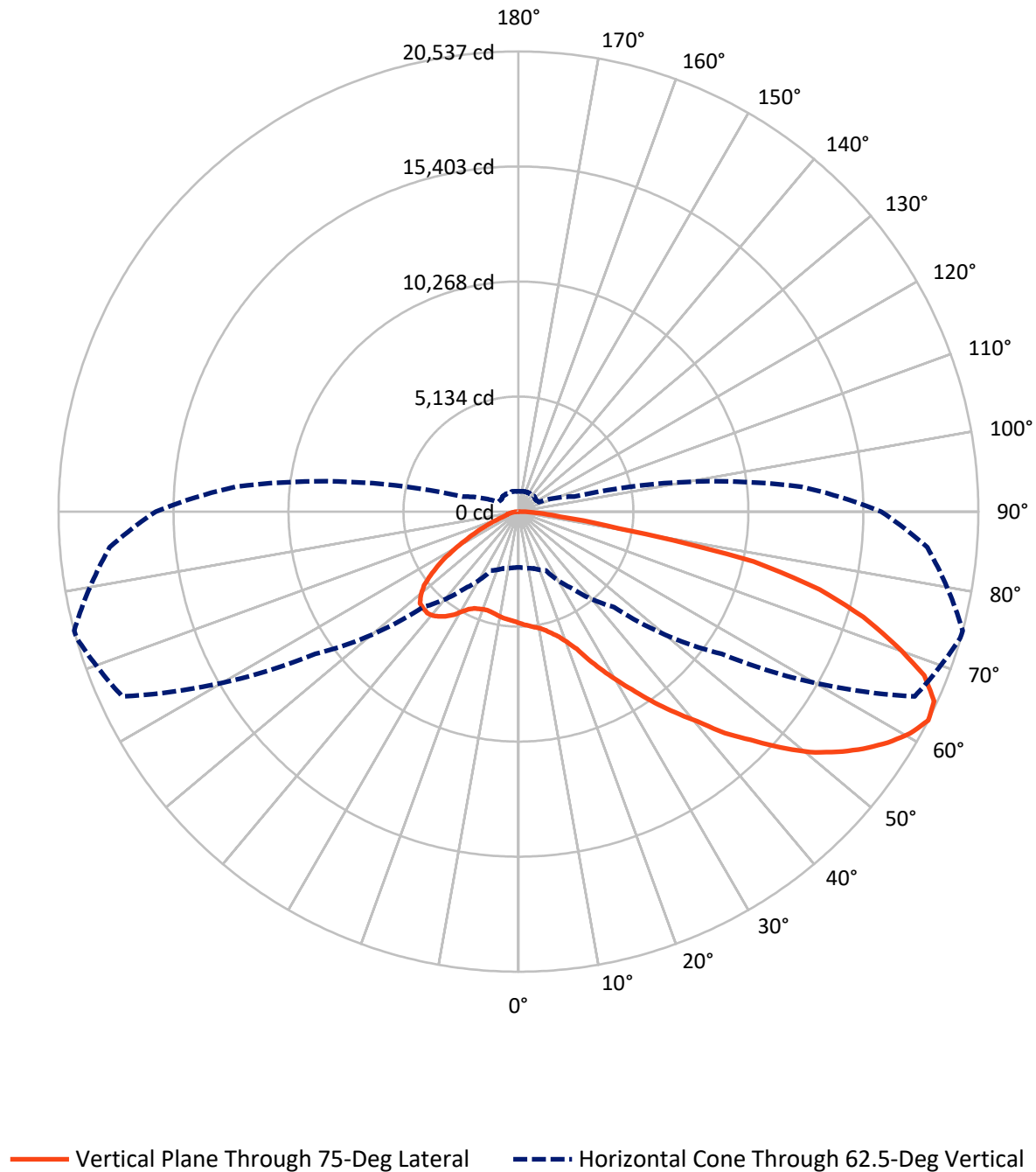


Based on 25 foot mounting height. Maximum calculated value = 9.4 fc  
 Type II - Short - N/A

FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE

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## Luminous Intensity Polar Plot



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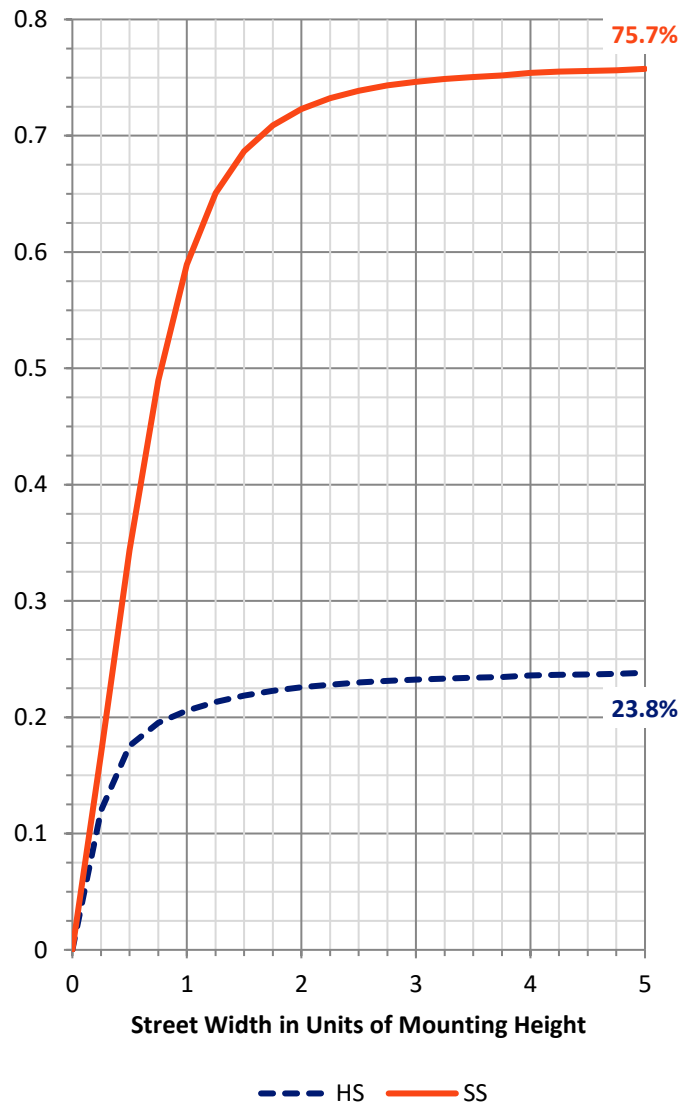
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 6840.8   | 0.0    | 6840.8  |
|                    | % Fixture | 24.2     | 0.0    | 24.2    |
| <b>Street Side</b> | Lumens    | 21394.2  | 0.0    | 21394.2 |
|                    | % Fixture | 75.8     | 0.0    | 75.8    |
| <b>Total</b>       | Lumens    | 28235.0  | 0.0    | 28235.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 478.8   | 1.7       |
| 10°-20°   | 1453.2  | 5.1       |
| 20°-30°   | 2506.4  | 8.9       |
| 30°-40°   | 3695.7  | 13.1      |
| 40°-50°   | 4871.8  | 17.3      |
| 50°-60°   | 5733.6  | 20.3      |
| 60°-70°   | 5704.4  | 20.2      |
| 70°-80°   | 3326.6  | 11.8      |
| 80°-90°   | 464.5   | 1.6       |
| 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°    | 28235.0 | 100.0     |
| 0°-180°   | 28235.0 | 100.0     |

**Coefficient of Utilization**



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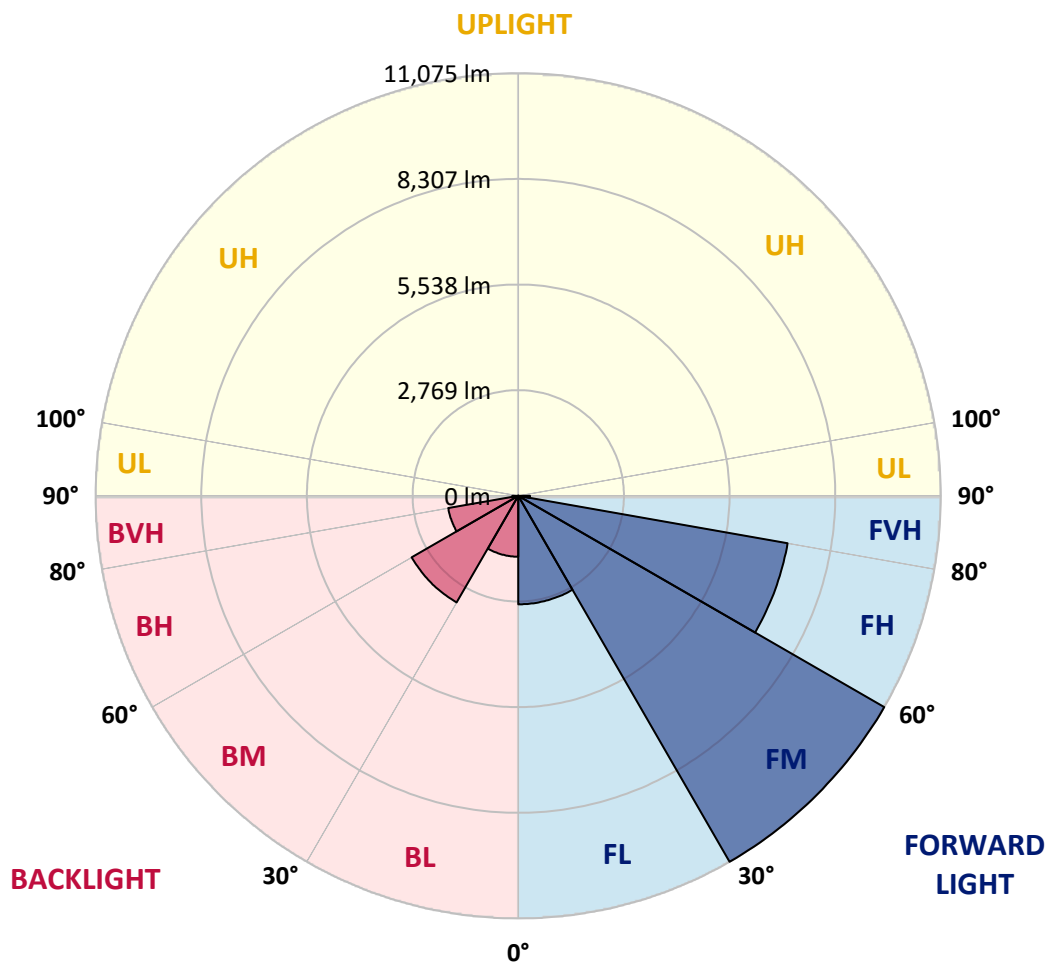
CATALOG NUMBER: CST-CA10-210-722-U-T2

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 2843.1  | 10.1      |                         |      |         |
| FM   | (30°-60°)   | 11075.4 | 39.2      |                         |      |         |
| FH   | (60°-80°)   | 7167.3  | 25.4      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 308.2   | 1.1       |                         |      | G3/500  |
| BL   | (0°-30°)    | 1595.3  | 5.6       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 3225.7  | 11.4      | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1863.7  | 6.6       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 156.3   | 0.6       |                         |      | 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



FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°     | 55°     | 65°     | 74°     | 75°     | 85°     |
|-------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| 0°    | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2  | 4977.2  | 4977.2  | 4977.2  | 4977.2  | 4977.2  |
| 2.5°  | 5249.7 | 5228.2 | 5231.1 | 5216.0 | 5193.4 | 5176.5  | 5132.3  | 5084.7  | 5056.2  | 5053.9  | 5013.2  |
| 5°    | 5513.5 | 5520.5 | 5522.3 | 5474.0 | 5426.4 | 5372.3  | 5304.9  | 5213.1  | 5138.2  | 5126.5  | 5047.5  |
| 7.5°  | 5754.1 | 5753.5 | 5750.1 | 5723.3 | 5701.2 | 5621.1  | 5486.2  | 5342.1  | 5220.1  | 5209.0  | 5080.6  |
| 10°   | 6000.5 | 5998.8 | 5963.9 | 5919.2 | 5869.2 | 5795.4  | 5679.7  | 5507.2  | 5309.6  | 5295.1  | 5111.4  |
| 12.5° | 6269.0 | 6249.8 | 6227.7 | 6173.7 | 6114.4 | 5986.6  | 5865.1  | 5677.4  | 5471.1  | 5445.0  | 5166.0  |
| 15°   | 6490.4 | 6470.6 | 6439.8 | 6403.2 | 6341.0 | 6243.4  | 6114.4  | 5891.8  | 5670.4  | 5644.9  | 5288.7  |
| 17.5° | 6709.5 | 6700.2 | 6678.1 | 6639.2 | 6591.5 | 6507.2  | 6388.7  | 6199.8  | 5909.9  | 5878.5  | 5492.6  |
| 20°   | 6889.0 | 6866.9 | 6850.7 | 6868.7 | 6872.8 | 6810.6  | 6745.5  | 6586.9  | 6267.2  | 6219.0  | 5743.1  |
| 22.5° | 6991.3 | 6986.7 | 7075.6 | 7141.8 | 7168.5 | 7182.5  | 7162.1  | 7034.3  | 6744.9  | 6660.7  | 6091.7  |
| 25°   | 7088.3 | 7080.8 | 7201.7 | 7367.3 | 7524.8 | 7605.0  | 7659.0  | 7675.8  | 7410.3  | 7334.2  | 6652.5  |
| 27.5° | 7091.3 | 7112.2 | 7287.7 | 7565.4 | 7805.4 | 8050.1  | 8309.3  | 8338.9  | 8105.9  | 8045.4  | 7290.6  |
| 30°   | 7106.9 | 7116.2 | 7290.0 | 7609.0 | 8108.8 | 8501.0  | 8838.6  | 9005.4  | 8804.4  | 8776.5  | 7993.1  |
| 32.5° | 6907.6 | 6919.8 | 7190.0 | 7685.1 | 8337.7 | 8967.7  | 9415.7  | 9663.2  | 9613.3  | 9577.8  | 8742.8  |
| 35°   | 6700.2 | 6710.6 | 7024.4 | 7577.1 | 8508.0 | 9391.3  | 9936.9  | 10423.3 | 10514.6 | 10487.8 | 9579.0  |
| 37.5° | 6374.7 | 6409.6 | 6738.5 | 7448.1 | 8537.6 | 9702.8  | 10434.4 | 11180.5 | 11456.0 | 11375.8 | 10463.4 |
| 40°   | 6021.4 | 6047.0 | 6430.0 | 7177.8 | 8504.5 | 9907.3  | 10923.1 | 12018.5 | 12352.0 | 12309.0 | 11341.5 |
| 42.5° | 5575.1 | 5643.7 | 6027.2 | 6832.7 | 8334.2 | 10034.6 | 11375.2 | 12968.6 | 13453.2 | 13510.7 | 12148.1 |
| 45°   | 5199.2 | 5197.4 | 5553.6 | 6332.9 | 8025.7 | 10064.8 | 11791.3 | 13929.1 | 14638.1 | 14530.0 | 13214.4 |
| 47.5° | 4756.9 | 4775.0 | 5146.9 | 5835.5 | 7570.7 | 9968.9  | 12115.5 | 15064.6 | 15782.3 | 15723.6 | 14089.0 |
| 50°   | 3733.6 | 3863.2 | 4567.5 | 5407.8 | 6955.3 | 9701.6  | 12385.7 | 16170.5 | 16855.6 | 16882.3 | 14883.9 |
| 52.5° | 3218.8 | 3268.7 | 3657.5 | 4977.2 | 6409.0 | 9253.0  | 12682.1 | 17414.6 | 17892.9 | 17824.9 | 15786.4 |
| 55°   | 3012.5 | 3039.2 | 3225.7 | 4203.7 | 5880.8 | 8558.6  | 12824.5 | 18550.7 | 18701.8 | 18690.7 | 16529.0 |
| 57.5° | 2863.1 | 2883.5 | 3015.9 | 3508.1 | 5300.9 | 7667.1  | 12704.2 | 19289.9 | 19524.6 | 19452.6 | 17229.8 |
| 60°   | 2647.5 | 2663.8 | 2861.4 | 3161.2 | 4704.1 | 6767.0  | 11964.4 | 19625.2 | 20121.4 | 20094.7 | 17849.3 |
| 62.5° | 2485.4 | 2513.3 | 2623.7 | 2905.0 | 4194.4 | 6025.5  | 11082.9 | 19520.6 | 20513.1 | 20536.9 | 18322.3 |
| 65°   | 2314.0 | 2339.0 | 2432.5 | 2678.3 | 3732.5 | 5538.0  | 10132.2 | 18996.4 | 20333.0 | 20396.3 | 18399.0 |
| 67.5° | 2102.4 | 2121.6 | 2232.6 | 2445.3 | 3192.6 | 5050.4  | 9060.0  | 18069.5 | 19333.4 | 19537.4 | 17635.5 |
| 70°   | 1836.3 | 1843.3 | 1979.3 | 2123.9 | 2651.0 | 4315.3  | 7204.0  | 16552.3 | 17887.1 | 17891.1 | 16193.7 |
| 72.5° | 1461.5 | 1467.3 | 1503.3 | 1613.2 | 1991.5 | 3415.2  | 5295.1  | 13830.4 | 16128.6 | 16099.0 | 14392.3 |
| 75°   | 993.7  | 1044.8 | 1169.8 | 1274.4 | 1436.5 | 2398.2  | 3293.1  | 9318.1  | 13664.7 | 13897.2 | 11822.1 |
| 77.5° | 785.1  | 789.7  | 841.4  | 937.3  | 1077.4 | 1791.6  | 1845.6  | 5155.6  | 10187.4 | 10740.0 | 9292.5  |
| 80°   | 547.4  | 555.5  | 527.6  | 550.9  | 751.4  | 1226.1  | 1078.5  | 2243.7  | 4248.5  | 4536.1  | 5579.2  |
| 82.5° | 260.9  | 270.2  | 310.3  | 288.2  | 373.7  | 521.3   | 569.5   | 1159.3  | 1835.1  | 1883.4  | 2172.2  |
| 85°   | 172.0  | 172.0  | 172.6  | 163.3  | 217.9  | 227.2   | 258.6   | 494.5   | 896.1   | 926.3   | 921.1   |
| 87.5° | 55.2   | 61.0   | 59.3   | 69.2   | 83.7   | 75.5    | 79.0    | 155.2   | 307.4   | 304.5   | 254.5   |
| 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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CATALOG NUMBER: CST-CA10-210-722-U-T2

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4977.2  | 4977.2  | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2 | 4977.2 |
| 2.5°  | 4984.2  | 4960.3  | 4904.5 | 4855.7 | 4807.5 | 4770.9 | 4739.5 | 4697.7 | 4677.9 | 4659.9 | 4697.7 |
| 5°    | 4998.7  | 4956.3  | 4856.3 | 4756.4 | 4664.5 | 4597.1 | 4555.9 | 4525.7 | 4498.4 | 4498.4 | 4511.1 |
| 7.5°  | 5015.5  | 4958.0  | 4815.1 | 4673.3 | 4535.5 | 4458.8 | 4400.1 | 4361.8 | 4339.7 | 4340.9 | 4368.2 |
| 10°   | 5026.6  | 4938.3  | 4768.0 | 4576.8 | 4426.9 | 4303.7 | 4246.2 | 4190.9 | 4149.1 | 4124.1 | 4152.0 |
| 12.5° | 5039.4  | 4931.9  | 4704.6 | 4489.1 | 4306.6 | 4167.1 | 4047.4 | 4006.2 | 3965.5 | 3934.1 | 3949.2 |
| 15°   | 5118.4  | 4956.3  | 4651.8 | 4377.5 | 4166.0 | 3992.2 | 3835.3 | 3759.8 | 3748.1 | 3726.6 | 3731.9 |
| 17.5° | 5247.4  | 5021.9  | 4617.5 | 4240.9 | 3996.9 | 3791.7 | 3593.0 | 3495.4 | 3472.1 | 3461.1 | 3466.9 |
| 20°   | 5439.7  | 5146.9  | 4627.9 | 4145.0 | 3806.3 | 3576.7 | 3319.9 | 3205.4 | 3128.1 | 3132.8 | 3155.4 |
| 22.5° | 5733.8  | 5348.5  | 4684.9 | 4039.9 | 3600.0 | 3298.9 | 3039.8 | 2884.0 | 2806.2 | 2789.3 | 2814.9 |
| 25°   | 6202.2  | 5673.4  | 4747.6 | 3939.3 | 3400.6 | 2999.1 | 2712.0 | 2543.5 | 2443.6 | 2437.2 | 2465.6 |
| 27.5° | 6802.4  | 6171.4  | 4884.2 | 3852.2 | 3153.1 | 2638.8 | 2353.5 | 2209.4 | 2103.0 | 2090.2 | 2080.9 |
| 30°   | 7416.7  | 6724.6  | 5131.2 | 3719.7 | 2864.3 | 2266.9 | 2018.8 | 1906.0 | 1786.9 | 1738.7 | 1749.1 |
| 32.5° | 8067.5  | 7240.0  | 5420.6 | 3626.7 | 2541.2 | 1939.7 | 1724.1 | 1616.6 | 1507.4 | 1437.7 | 1421.4 |
| 35°   | 8723.0  | 7752.6  | 5664.1 | 3487.8 | 2234.9 | 1680.0 | 1473.7 | 1362.7 | 1267.4 | 1210.4 | 1206.4 |
| 37.5° | 9490.1  | 8286.0  | 5859.3 | 3340.2 | 1917.1 | 1476.6 | 1228.5 | 1164.5 | 1118.6 | 1068.7 | 1073.9 |
| 40°   | 10258.3 | 8907.8  | 6015.6 | 3096.1 | 1653.3 | 1258.1 | 1045.4 | 1058.2 | 1068.1 | 1026.2 | 1022.7 |
| 42.5° | 10896.3 | 9430.2  | 6087.1 | 2780.0 | 1419.6 | 1068.1 | 964.6  | 1022.7 | 1065.8 | 1038.4 | 1035.0 |
| 45°   | 11544.3 | 9870.1  | 6059.2 | 2387.8 | 1225.6 | 977.4  | 958.2  | 1017.5 | 1072.7 | 1066.3 | 1063.4 |
| 47.5° | 12248.6 | 10446.6 | 6011.0 | 1940.9 | 1086.7 | 968.7  | 972.2  | 1000.1 | 1069.8 | 1081.4 | 1076.8 |
| 50°   | 13109.8 | 10977.1 | 5725.7 | 1511.5 | 1019.3 | 982.7  | 1003.6 | 989.0  | 1048.3 | 1072.1 | 1076.2 |
| 52.5° | 13966.9 | 11385.6 | 5343.9 | 1309.8 | 992.5  | 996.0  | 1047.2 | 997.8  | 1023.9 | 1044.8 | 1064.0 |
| 55°   | 14628.2 | 11801.7 | 4726.1 | 1188.4 | 983.8  | 1002.4 | 1059.4 | 1016.4 | 1015.8 | 1015.8 | 1022.2 |
| 57.5° | 15305.2 | 12359.0 | 4108.4 | 1109.9 | 968.7  | 1009.4 | 1044.8 | 1019.8 | 1011.7 | 1000.1 | 992.5  |
| 60°   | 15776.5 | 12565.3 | 3314.6 | 1058.2 | 953.0  | 999.5  | 1004.2 | 1000.7 | 975.7  | 964.6  | 955.9  |
| 62.5° | 16194.9 | 12677.4 | 2580.7 | 998.9  | 931.5  | 976.3  | 951.9  | 944.3  | 929.8  | 903.0  | 907.7  |
| 65°   | 16082.7 | 12436.9 | 1966.5 | 932.1  | 916.4  | 948.4  | 905.9  | 887.9  | 889.1  | 861.2  | 870.5  |
| 67.5° | 15361.0 | 11357.7 | 1412.1 | 829.8  | 875.1  | 893.2  | 853.6  | 840.3  | 820.5  | 806.6  | 819.4  |
| 70°   | 13903.0 | 10068.3 | 952.4  | 688.6  | 781.0  | 819.9  | 793.8  | 770.5  | 739.7  | 730.5  | 744.4  |
| 72.5° | 11701.8 | 8404.6  | 657.2  | 553.8  | 674.1  | 724.6  | 714.8  | 690.9  | 668.9  | 691.5  | 718.8  |
| 75°   | 9613.3  | 6217.9  | 536.4  | 453.8  | 518.3  | 603.8  | 632.8  | 639.8  | 706.0  | 926.9  | 949.5  |
| 77.5° | 6919.8  | 3854.5  | 482.3  | 369.0  | 413.7  | 482.9  | 541.0  | 564.8  | 862.4  | 825.8  | 824.0  |
| 80°   | 4034.6  | 2246.6  | 367.8  | 291.1  | 334.7  | 353.9  | 423.0  | 663.0  | 743.8  | 638.1  | 622.4  |
| 82.5° | 1840.9  | 991.4   | 256.3  | 233.0  | 232.4  | 234.2  | 288.2  | 638.1  | 570.6  | 502.7  | 484.1  |
| 85°   | 677.0   | 348.7   | 155.7  | 134.8  | 154.6  | 134.2  | 188.9  | 467.8  | 330.7  | 325.4  | 271.4  |
| 87.5° | 166.8   | 71.5    | 52.9   | 44.2   | 36.0   | 34.3   | 57.5   | 154.0  | 80.8   | 73.8   | 70.9   |
| 90°   | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

Report 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            |

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**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

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### Photopic Flux vs. Wavelength

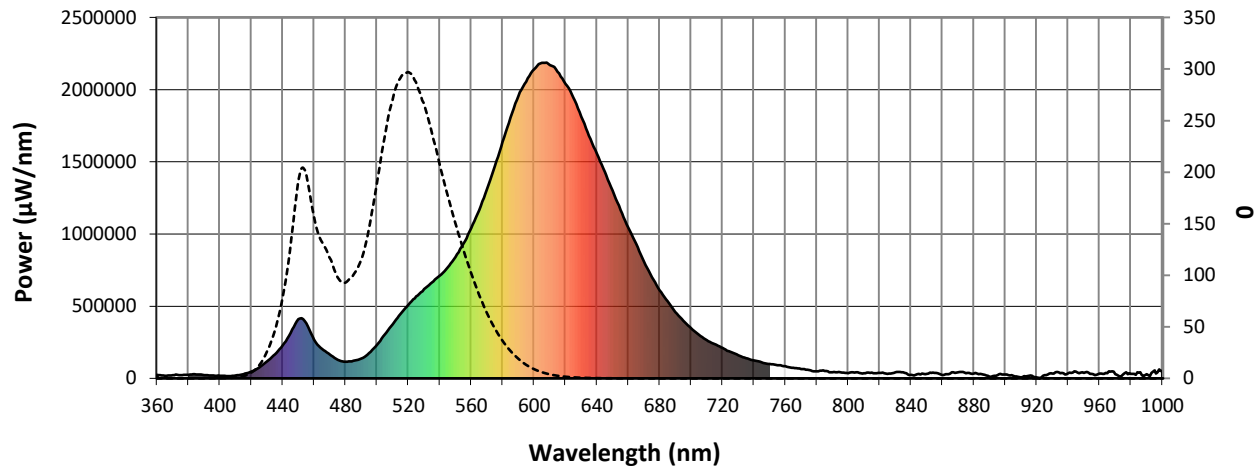


#####

| 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              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



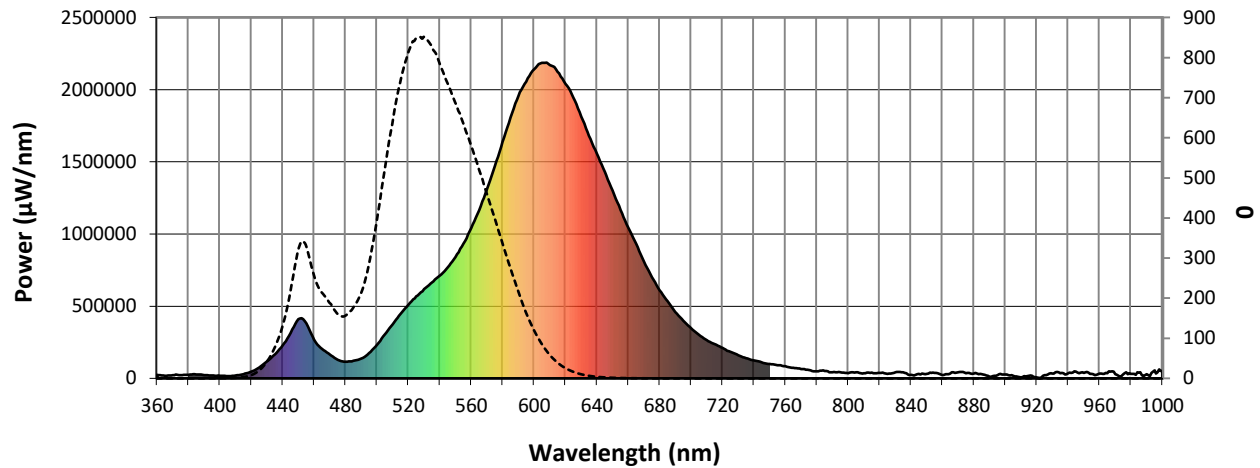
Scotopic Lumens: 72942.9

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              |           |                  |                  |

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### Melanopic Flux vs. Wavelength



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

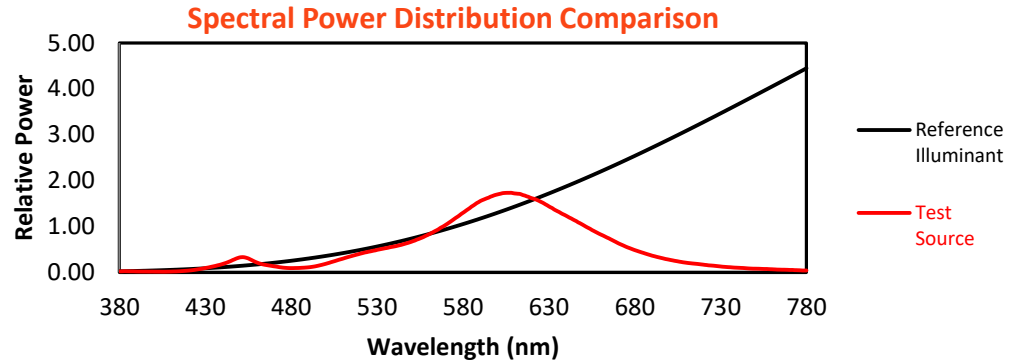
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 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              |           |                  |                  |

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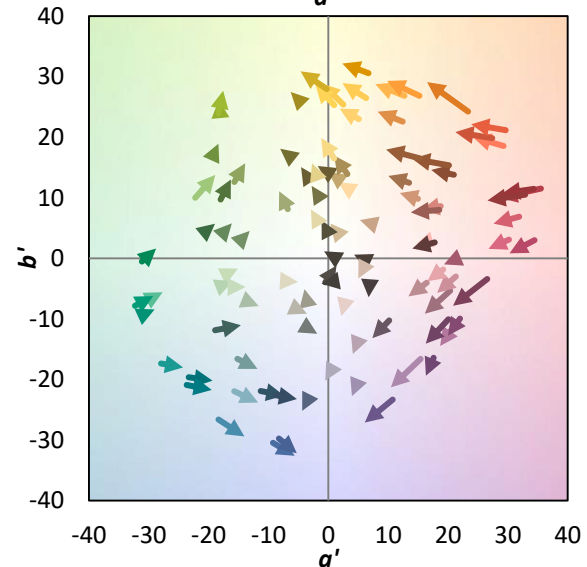
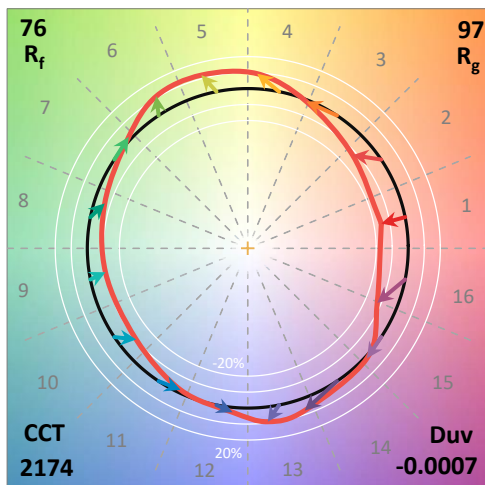
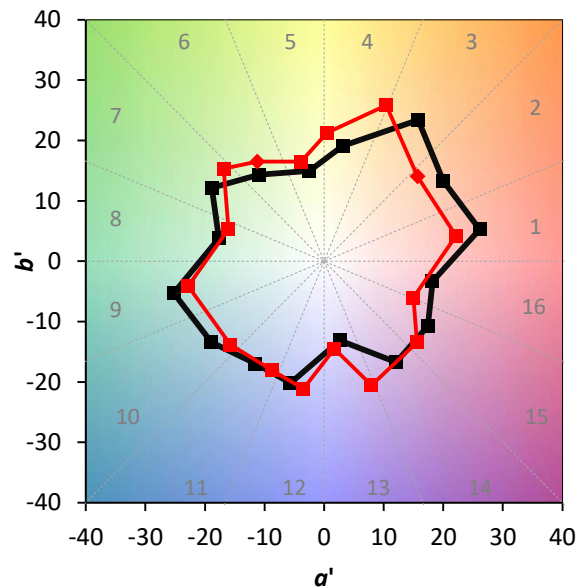
TM-30-18

### Summary

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



### Color Vector Graphics

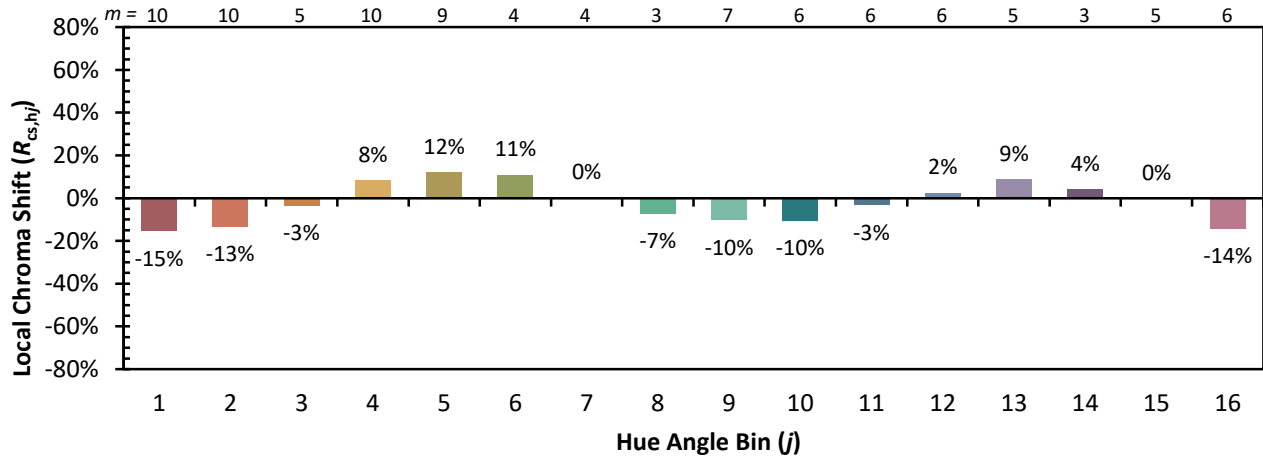


Individual Sample Fidelity Index ( $R_{f,i}$ )

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