

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: P510761

Luminaire Tested: **CTN-CA8-330-722-U-T4**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510761  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-12)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: CTN-CA8-330-722-U-T4  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (8) 2200K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 39362 lumens  
Efficiency: N/A  
Efficacy: 118.7 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B3 - U0 - G5

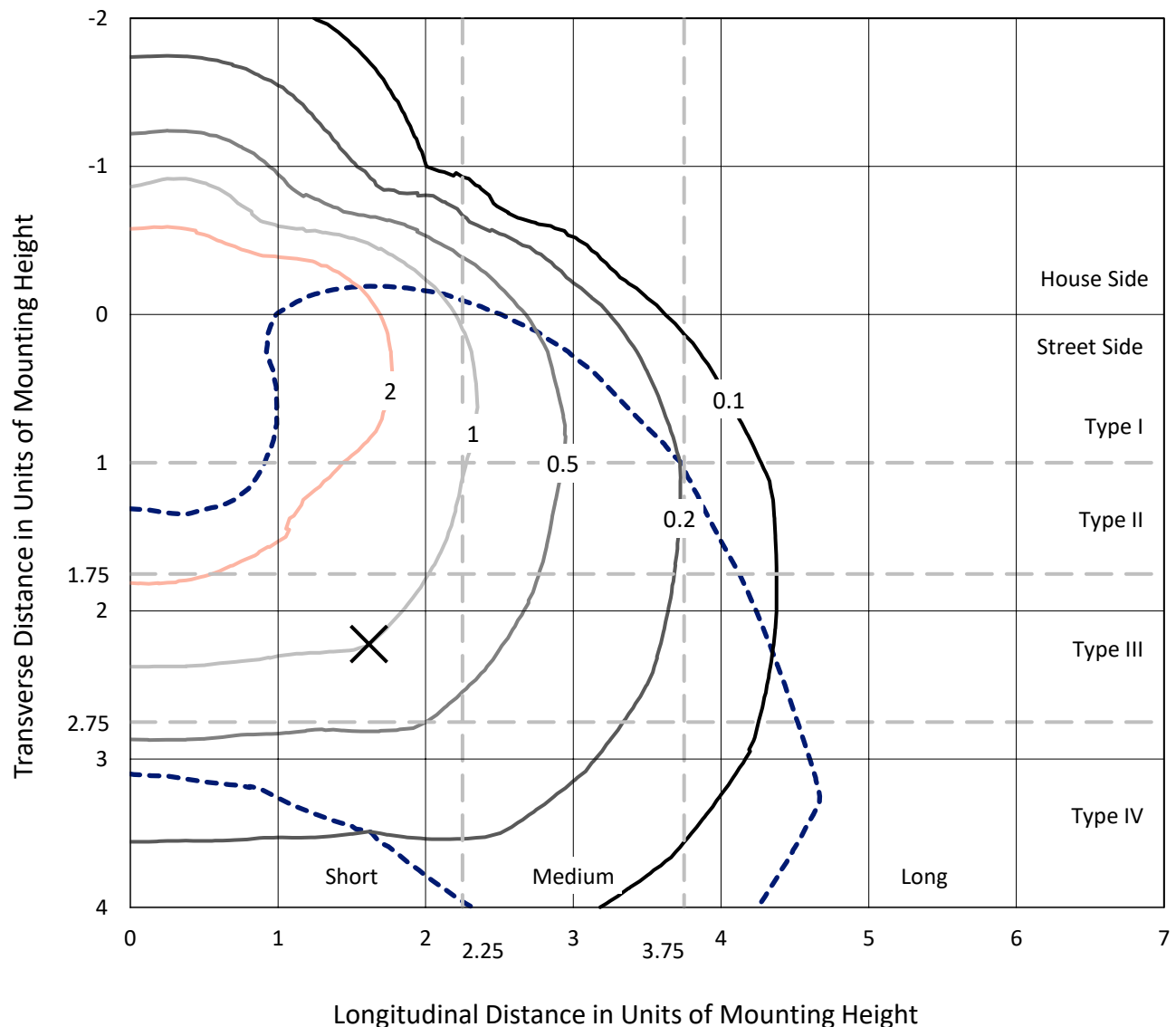
Input Watts (W): 331.5  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

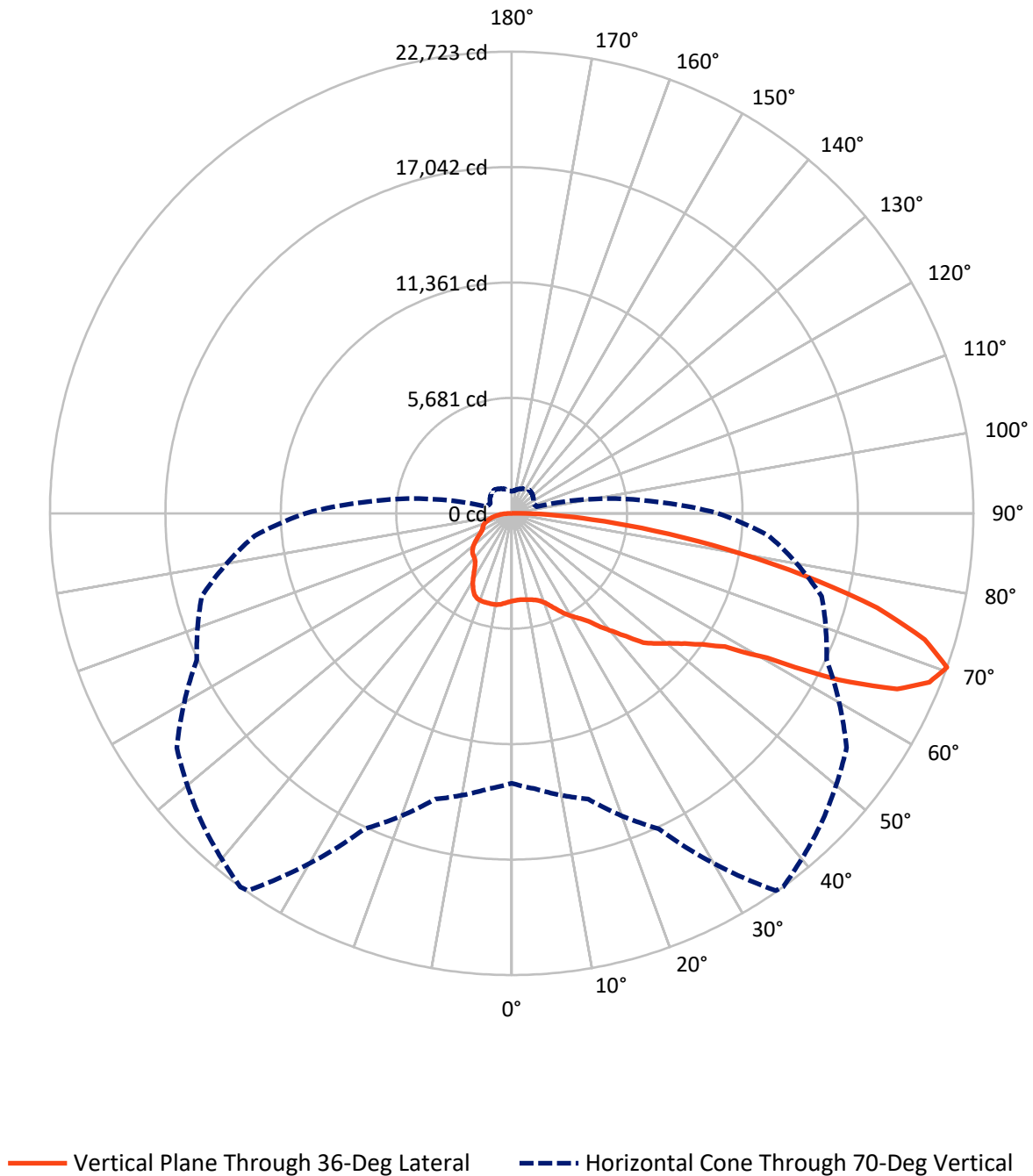
✕ Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 5 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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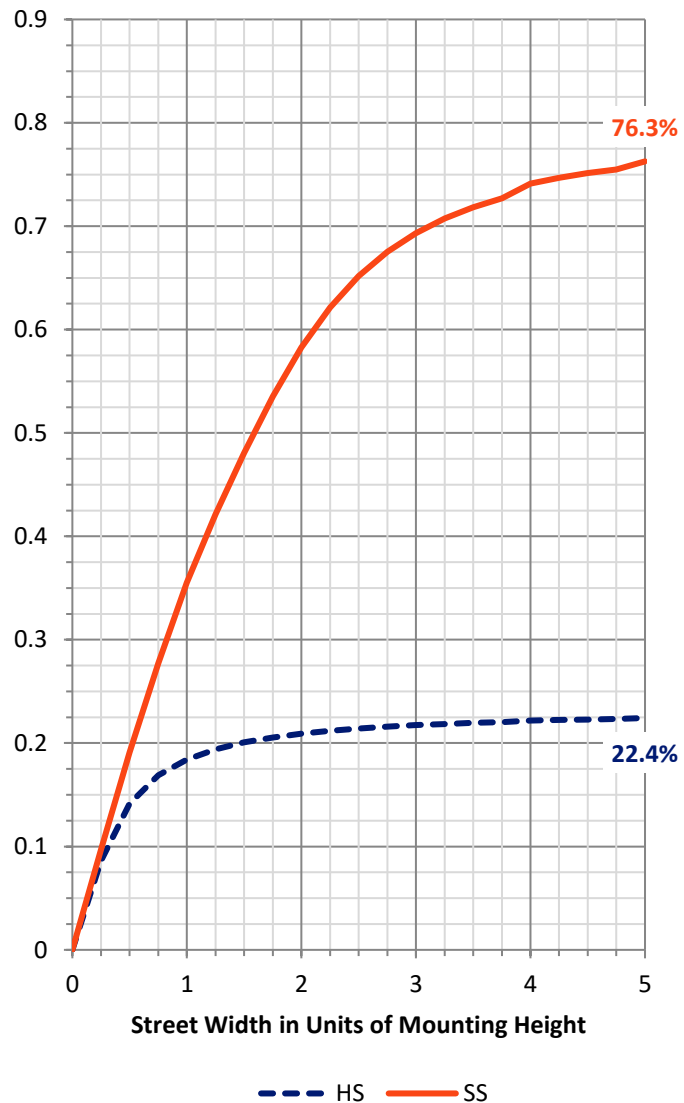
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 8968.4   | 0.0    | 8968.4  |
|                    | % Fixture | 22.8     | 0.0    | 22.8    |
| <b>Street Side</b> | Lumens    | 30393.6  | 0.0    | 30393.6 |
|                    | % Fixture | 77.2     | 0.0    | 77.2    |
| <b>Total</b>       | Lumens    | 39362.0  | 0.0    | 39362.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 417.7   | 1.1       |
| 10°-20°   | 1291.3  | 3.3       |
| 20°-30°   | 2329.2  | 5.9       |
| 30°-40°   | 3607.5  | 9.2       |
| 40°-50°   | 5479.8  | 13.9      |
| 50°-60°   | 7595.3  | 19.3      |
| 60°-70°   | 9876.5  | 25.1      |
| 70°-80°   | 7293.7  | 18.5      |
| 80°-90°   | 1471.0  | 3.7       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 39362.0 | 100.0     |
| 0°-180°   | 39362.0 | 100.0     |

**Coefficient of Utilization**



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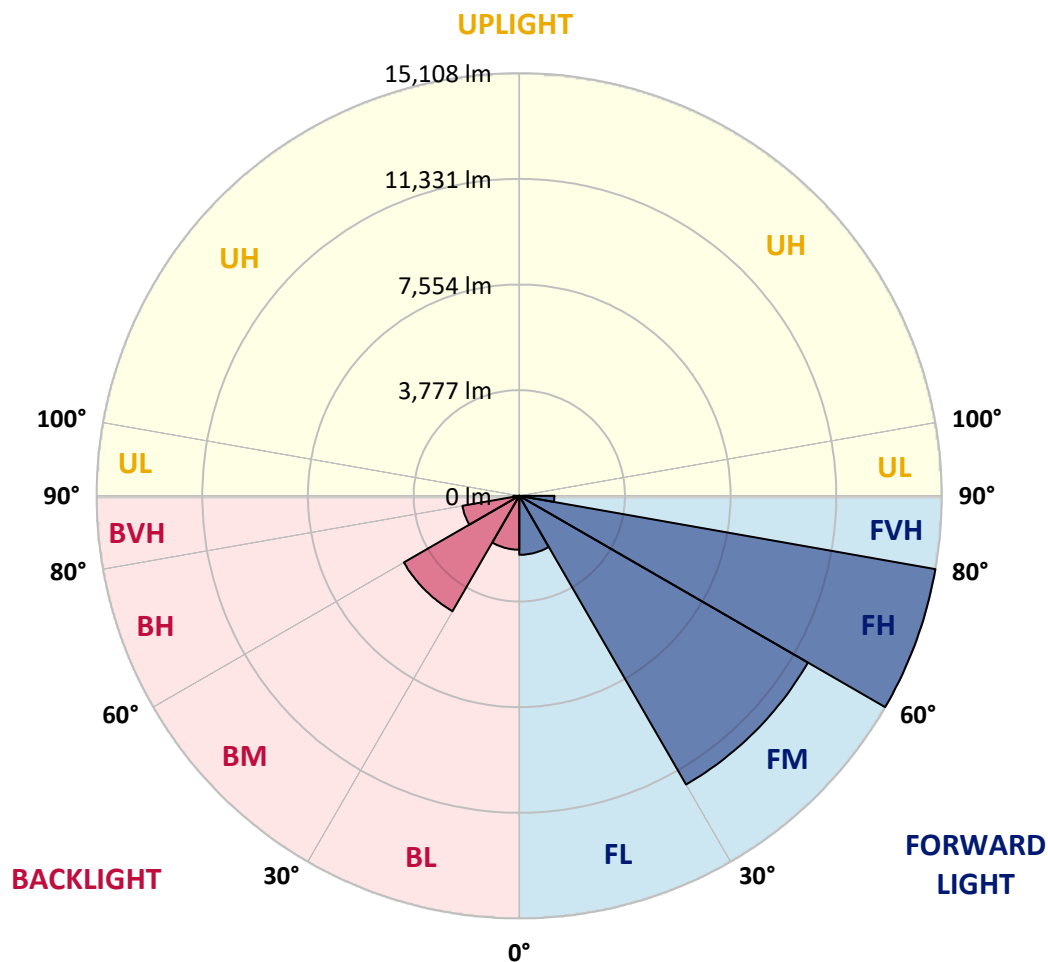
CATALOG NUMBER: CTN-CA8-330-722-U-T4

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 2110.2  | 5.4       |                         |      |         |
| FM   | (30°-60°)   | 11918.7 | 30.3      |                         |      |         |
| FH   | (60°-80°)   | 15108.0 | 38.4      |                         |      | G5      |
| FVH  | (80°-90°)   | 1256.7  | 3.2       |                         |      | G5      |
| BL   | (0°-30°)    | 1928.0  | 4.9       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 4763.9  | 12.1      | B3/5000                 |      |         |
| BH   | (60°-80°)   | 2062.2  | 5.2       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 214.3   | 0.5       |                         |      | G2/225  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

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

Type IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 36°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  | 4311.3  |
| 2.5°  | 4285.2  | 4279.5  | 4276.3  | 4282.8  | 4285.2  | 4286.0  | 4287.7  | 4286.0  | 4282.0  | 4296.6  | 4314.6  |
| 5°    | 4286.0  | 4282.8  | 4276.3  | 4270.6  | 4270.6  | 4270.6  | 4271.4  | 4290.1  | 4298.3  | 4296.6  | 4318.6  |
| 7.5°  | 4292.6  | 4290.1  | 4277.9  | 4273.8  | 4283.6  | 4286.9  | 4303.2  | 4297.5  | 4306.4  | 4321.1  | 4339.8  |
| 10°   | 4293.4  | 4290.1  | 4279.5  | 4288.5  | 4316.2  | 4321.1  | 4328.4  | 4344.7  | 4348.0  | 4365.9  | 4384.7  |
| 12.5° | 4301.5  | 4301.5  | 4305.6  | 4325.2  | 4354.5  | 4360.2  | 4387.9  | 4401.0  | 4420.5  | 4429.5  | 4452.3  |
| 15°   | 4344.7  | 4343.9  | 4353.7  | 4375.7  | 4423.0  | 4426.2  | 4460.5  | 4499.6  | 4514.2  | 4536.3  | 4572.9  |
| 17.5° | 4447.4  | 4452.3  | 4453.1  | 4469.4  | 4525.7  | 4527.3  | 4583.5  | 4620.2  | 4653.6  | 4692.7  | 4776.7  |
| 20°   | 4691.1  | 4682.1  | 4672.4  | 4672.4  | 4694.4  | 4705.8  | 4749.0  | 4807.6  | 4876.1  | 4945.4  | 5044.0  |
| 22.5° | 4997.5  | 5015.5  | 4979.6  | 4960.9  | 4971.5  | 4958.4  | 4991.0  | 5038.3  | 5118.2  | 5221.7  | 5346.4  |
| 25°   | 5363.5  | 5365.1  | 5362.7  | 5286.9  | 5263.2  | 5271.4  | 5298.3  | 5342.3  | 5448.2  | 5530.5  | 5711.5  |
| 27.5° | 5720.4  | 5713.1  | 5687.0  | 5607.2  | 5584.3  | 5595.7  | 5594.9  | 5716.4  | 5824.8  | 5929.9  | 6142.6  |
| 30°   | 6044.8  | 6064.4  | 6017.9  | 5883.4  | 5885.9  | 5884.2  | 5921.7  | 6078.2  | 6276.3  | 6471.9  | 6690.3  |
| 32.5° | 6616.9  | 6557.4  | 6494.7  | 6229.0  | 6180.1  | 6174.4  | 6196.4  | 6429.5  | 6722.9  | 7052.9  | 7315.4  |
| 35°   | 7155.6  | 7141.0  | 7079.0  | 6809.3  | 6526.5  | 6521.6  | 6491.4  | 6775.0  | 7187.4  | 7798.7  | 8126.3  |
| 37.5° | 7706.6  | 7685.4  | 7624.3  | 7394.4  | 7113.3  | 7086.4  | 6832.9  | 7143.4  | 7700.9  | 8670.7  | 9137.7  |
| 40°   | 8363.5  | 8350.4  | 8255.9  | 7961.7  | 7673.2  | 7632.4  | 7369.2  | 7530.5  | 8348.8  | 9832.1  | 10161.3 |
| 42.5° | 8939.7  | 8937.2  | 8828.8  | 8555.8  | 8310.5  | 8269.7  | 8045.6  | 8213.5  | 9249.4  | 10969.8 | 11163.8 |
| 45°   | 9362.6  | 9427.0  | 9431.9  | 9276.2  | 9106.7  | 9070.9  | 9011.4  | 9242.8  | 10290.9 | 12002.4 | 11973.9 |
| 47.5° | 9719.6  | 9775.0  | 9717.2  | 9637.3  | 9579.4  | 9581.9  | 9674.0  | 10133.6 | 11319.4 | 12902.2 | 12680.5 |
| 50°   | 10316.2 | 10282.0 | 9981.2  | 9933.9  | 10007.3 | 10050.5 | 10317.8 | 11095.3 | 12497.1 | 13746.5 | 13314.5 |
| 52.5° | 11176.8 | 11045.6 | 10455.5 | 10359.4 | 10637.3 | 10653.6 | 11079.0 | 11955.1 | 13674.0 | 14471.0 | 13894.8 |
| 55°   | 12354.5 | 12246.1 | 11579.4 | 11135.2 | 11275.4 | 11385.5 | 11984.5 | 12836.1 | 14634.8 | 15152.3 | 14341.4 |
| 57.5° | 14095.3 | 14103.5 | 13559.9 | 12731.8 | 12255.0 | 12372.4 | 12840.2 | 13692.7 | 15428.6 | 15722.8 | 14620.2 |
| 60°   | 15490.6 | 15748.9 | 15586.7 | 15208.6 | 14524.0 | 14444.1 | 14088.0 | 14585.1 | 16106.7 | 16207.8 | 14886.7 |
| 62.5° | 16458.0 | 16575.3 | 17132.8 | 17212.7 | 17995.0 | 18028.5 | 16322.7 | 15630.7 | 16851.6 | 16525.6 | 14942.9 |
| 65°   | 16409.1 | 16481.6 | 17362.6 | 18435.1 | 20746.5 | 20850.0 | 19851.6 | 17212.7 | 17361.8 | 16667.4 | 14779.1 |
| 67.5° | 15266.4 | 15375.7 | 16495.5 | 18500.3 | 22212.6 | 22173.5 | 21540.3 | 19414.8 | 17529.7 | 16440.0 | 13998.3 |
| 70°   | 13281.9 | 13618.5 | 14559.0 | 17125.4 | 22670.7 | 22722.8 | 21555.7 | 20118.1 | 17096.9 | 15797.0 | 12696.8 |
| 72.5° | 10947.0 | 11052.9 | 11941.3 | 14813.3 | 21331.6 | 21255.0 | 20672.3 | 19189.8 | 16314.5 | 14634.0 | 10418.9 |
| 75°   | 8325.2  | 8325.2  | 9400.9  | 11805.2 | 18318.6 | 18587.5 | 18814.1 | 17380.5 | 14453.1 | 11927.4 | 7094.5  |
| 77.5° | 5526.5  | 5724.5  | 6590.8  | 8871.2  | 14500.4 | 14699.2 | 15481.6 | 14814.9 | 11833.7 | 8746.5  | 3240.4  |
| 80°   | 2931.5  | 2956.0  | 3885.1  | 5894.8  | 10371.6 | 10746.5 | 11822.3 | 11426.2 | 8511.8  | 4097.8  | 819.1   |
| 82.5° | 1025.3  | 1119.0  | 1708.2  | 3416.5  | 6833.7  | 7067.6  | 7842.7  | 6789.7  | 3006.5  | 907.1   | 453.1   |
| 85°   | 509.4   | 527.3   | 752.2   | 1626.7  | 3847.6  | 3960.9  | 4581.9  | 2644.7  | 484.1   | 396.1   | 308.1   |
| 87.5° | 245.3   | 251.0   | 288.5   | 581.9   | 1672.4  | 1749.8  | 1852.5  | 860.6   | 179.3   | 150.8   | 133.7   |
| 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: CTN-CA8-330-722-U-T4

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4311.3  | 4311.3  | 4311.3 | 4311.3 | 4311.3 | 4311.3 | 4311.3 | 4311.3 | 4311.3 | 4311.3 | 4311.3 |
| 2.5°  | 4318.6  | 4326.0  | 4339.8 | 4343.9 | 4334.1 | 4352.1 | 4369.2 | 4384.7 | 4383.8 | 4389.6 | 4409.9 |
| 5°    | 4328.4  | 4343.9  | 4358.6 | 4384.7 | 4409.9 | 4424.6 | 4438.5 | 4451.5 | 4455.6 | 4467.8 | 4480.0 |
| 7.5°  | 4358.6  | 4374.1  | 4407.5 | 4453.1 | 4454.8 | 4491.4 | 4515.1 | 4519.1 | 4522.4 | 4522.4 | 4550.9 |
| 10°   | 4405.0  | 4433.6  | 4487.4 | 4519.1 | 4547.7 | 4535.4 | 4559.9 | 4544.4 | 4533.0 | 4537.9 | 4557.4 |
| 12.5° | 4484.9  | 4510.2  | 4587.6 | 4622.6 | 4596.6 | 4591.7 | 4567.2 | 4532.2 | 4492.2 | 4488.2 | 4506.1 |
| 15°   | 4610.4  | 4657.7  | 4727.0 | 4760.4 | 4695.2 | 4637.3 | 4555.0 | 4483.3 | 4405.9 | 4377.3 | 4388.7 |
| 17.5° | 4812.5  | 4869.6  | 4945.4 | 4922.6 | 4803.6 | 4689.5 | 4553.4 | 4401.8 | 4251.8 | 4147.5 | 4174.4 |
| 20°   | 5108.4  | 5150.8  | 5212.7 | 5120.6 | 4947.0 | 4758.7 | 4535.4 | 4295.8 | 4042.4 | 3852.5 | 3830.5 |
| 22.5° | 5418.9  | 5483.3  | 5445.8 | 5275.4 | 5048.1 | 4785.6 | 4497.9 | 4141.8 | 3749.8 | 3511.8 | 3475.9 |
| 25°   | 5793.0  | 5814.2  | 5684.6 | 5427.9 | 5076.6 | 4743.3 | 4376.5 | 3916.9 | 3450.7 | 3226.6 | 3216.0 |
| 27.5° | 6189.9  | 6141.8  | 5900.5 | 5497.9 | 5044.8 | 4617.7 | 4132.8 | 3561.5 | 3180.1 | 2982.1 | 2951.1 |
| 30°   | 6638.1  | 6526.5  | 6079.0 | 5505.3 | 4925.0 | 4373.3 | 3824.8 | 3283.6 | 2960.1 | 2761.2 | 2729.4 |
| 32.5° | 7215.1  | 6951.9  | 6244.5 | 5429.5 | 4672.4 | 4014.7 | 3454.8 | 3046.4 | 2762.0 | 2562.3 | 2533.8 |
| 35°   | 7952.7  | 7508.5  | 6419.7 | 5292.6 | 4361.0 | 3656.1 | 3148.3 | 2845.1 | 2601.5 | 2361.0 | 2322.7 |
| 37.5° | 8802.7  | 8285.2  | 6629.2 | 5119.8 | 4019.5 | 3340.7 | 2941.3 | 2717.2 | 2482.5 | 2210.3 | 2164.6 |
| 40°   | 9790.5  | 9062.7  | 6951.9 | 4913.6 | 3713.1 | 3113.3 | 2841.1 | 2673.2 | 2416.5 | 2132.8 | 2080.7 |
| 42.5° | 10646.3 | 9885.0  | 7335.8 | 4691.9 | 3423.8 | 2924.2 | 2796.2 | 2643.8 | 2374.9 | 2075.0 | 2015.5 |
| 45°   | 11437.6 | 10563.9 | 7710.6 | 4423.0 | 3119.0 | 2794.6 | 2742.5 | 2570.5 | 2301.5 | 2003.3 | 1941.3 |
| 47.5° | 12080.6 | 11112.4 | 8036.6 | 4176.0 | 2875.3 | 2675.6 | 2625.1 | 2431.1 | 2178.5 | 1916.9 | 1871.2 |
| 50°   | 12574.5 | 11524.8 | 8215.1 | 3979.6 | 2617.8 | 2540.3 | 2473.5 | 2273.8 | 2031.0 | 1805.2 | 1766.1 |
| 52.5° | 13079.8 | 11938.0 | 8303.1 | 3989.4 | 2378.1 | 2339.0 | 2270.6 | 2099.4 | 1913.6 | 1740.0 | 1697.6 |
| 55°   | 13374.0 | 12107.5 | 8210.2 | 3752.2 | 2158.1 | 2112.5 | 2053.0 | 1964.1 | 1853.3 | 1699.3 | 1659.3 |
| 57.5° | 13546.0 | 12212.7 | 7927.4 | 3060.3 | 1893.2 | 1850.0 | 1859.8 | 1852.5 | 1761.2 | 1599.0 | 1562.3 |
| 60°   | 13669.9 | 11984.5 | 7348.0 | 2249.4 | 1667.5 | 1634.9 | 1715.6 | 1689.5 | 1610.4 | 1484.1 | 1453.1 |
| 62.5° | 13569.6 | 11550.1 | 6304.8 | 1691.1 | 1483.3 | 1552.6 | 1623.5 | 1575.4 | 1467.8 | 1352.9 | 1317.0 |
| 65°   | 12958.4 | 10697.6 | 4792.2 | 1358.6 | 1423.8 | 1519.1 | 1576.2 | 1498.8 | 1389.6 | 1253.5 | 1237.2 |
| 67.5° | 11845.9 | 9152.4  | 2826.4 | 1245.3 | 1379.0 | 1480.0 | 1527.3 | 1424.6 | 1328.4 | 1198.0 | 1178.5 |
| 70°   | 10148.3 | 6851.6  | 1262.4 | 1159.7 | 1300.7 | 1401.0 | 1431.9 | 1335.0 | 1230.6 | 1108.4 | 1088.8 |
| 72.5° | 7553.4  | 4131.2  | 850.9  | 1070.9 | 1185.0 | 1273.8 | 1308.1 | 1205.4 | 1131.2 | 1075.8 | 1070.1 |
| 75°   | 4194.8  | 1434.4  | 784.8  | 969.8  | 1058.7 | 1138.5 | 1180.9 | 1108.4 | 1049.7 | 973.9  | 942.9  |
| 77.5° | 1335.8  | 609.6   | 745.7  | 867.2  | 979.6  | 1045.6 | 1039.1 | 929.9  | 911.2  | 819.1  | 810.9  |
| 80°   | 533.0   | 531.4   | 689.5  | 709.9  | 836.2  | 891.6  | 876.9  | 739.2  | 763.6  | 709.9  | 688.7  |
| 82.5° | 418.1   | 486.6   | 552.6  | 542.0  | 650.4  | 715.6  | 695.2  | 542.8  | 613.7  | 564.0  | 515.9  |
| 85°   | 317.8   | 426.2   | 354.5  | 352.9  | 454.0  | 531.4  | 544.4  | 417.3  | 418.1  | 380.6  | 339.0  |
| 87.5° | 163.8   | 157.3   | 136.1  | 135.3  | 151.6  | 216.0  | 264.9  | 237.2  | 187.4  | 141.0  | 135.3  |
| 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



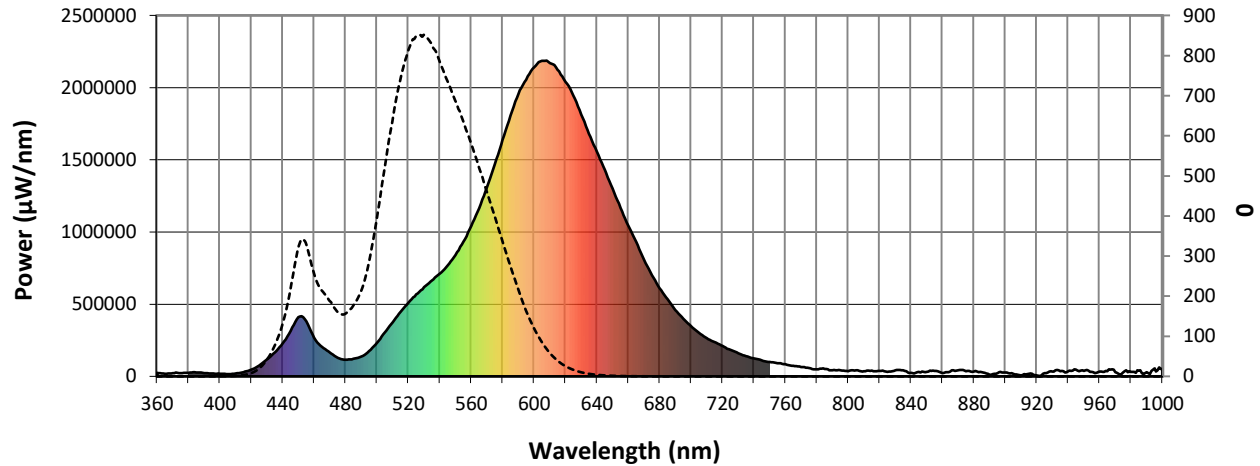
Scotopic Lumens: 72942.9

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              |           |                  |                  |

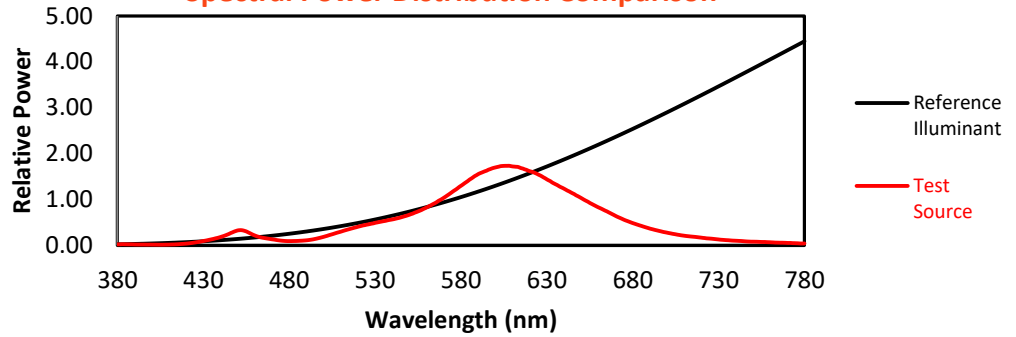
REPORT NUMBER: SP1-2104-215-4

TM-30-18

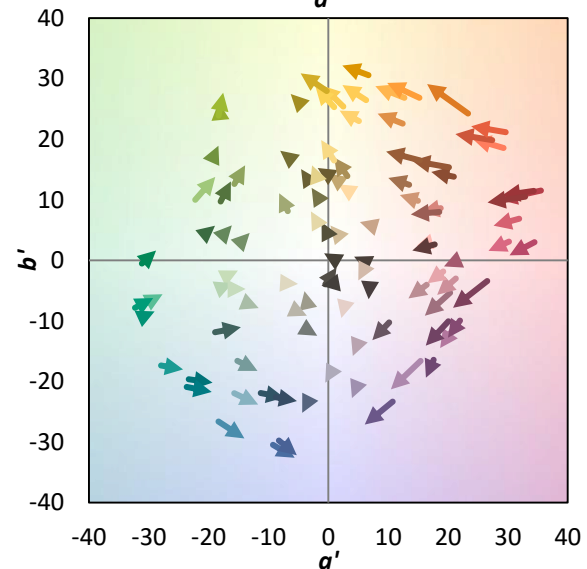
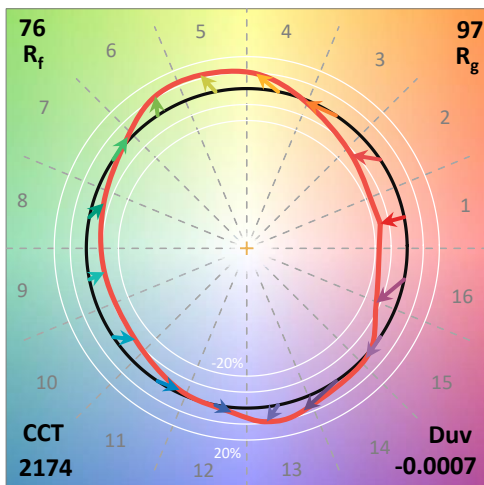
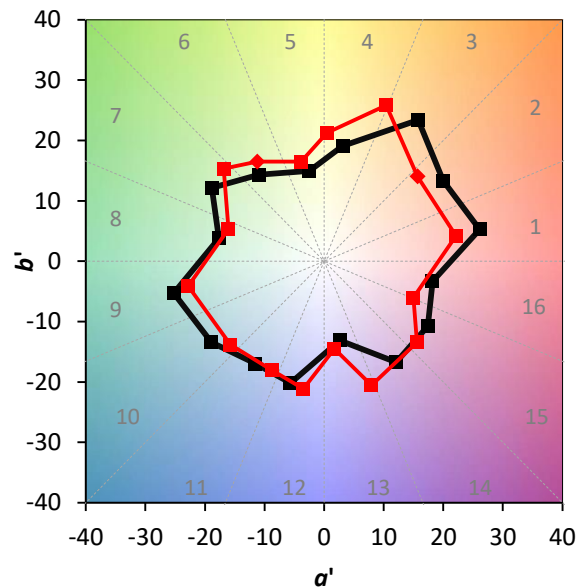
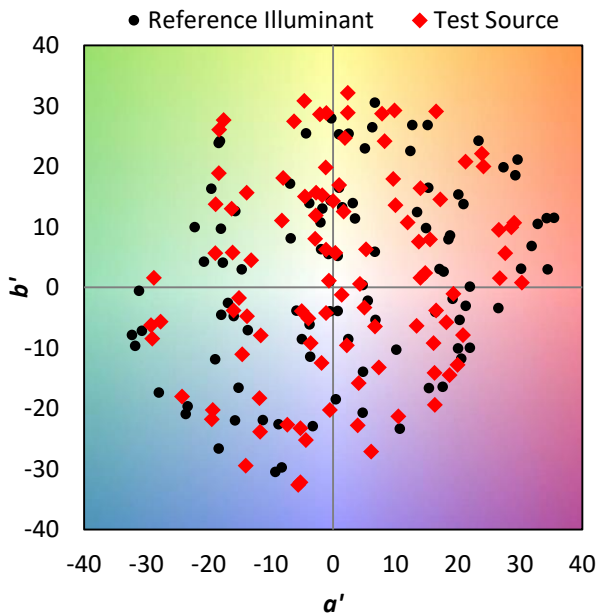
### Summary

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

### Spectral Power Distribution Comparison



### 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)