

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: P237522

Luminaire Tested: **CTN-10-4-D-E1-T4-7050-HSS**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P237522  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1707-171-27)  
Test Lab: INNOVATION CENTER(G2)  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: MCGRAW-EDISON  
Catalog Number: CTN-10-4-D-E1-T4-7050-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
(10) 70 CRI, 5000K LEDS AND TYPE IV OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 38118 lumens  
Efficiency: N/A  
Efficacy: 123.8 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type IV - Short - Non-Cutoff  
BUG Rating: B3 - U0 - G5

Input Watts (W): 308  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 25 FT



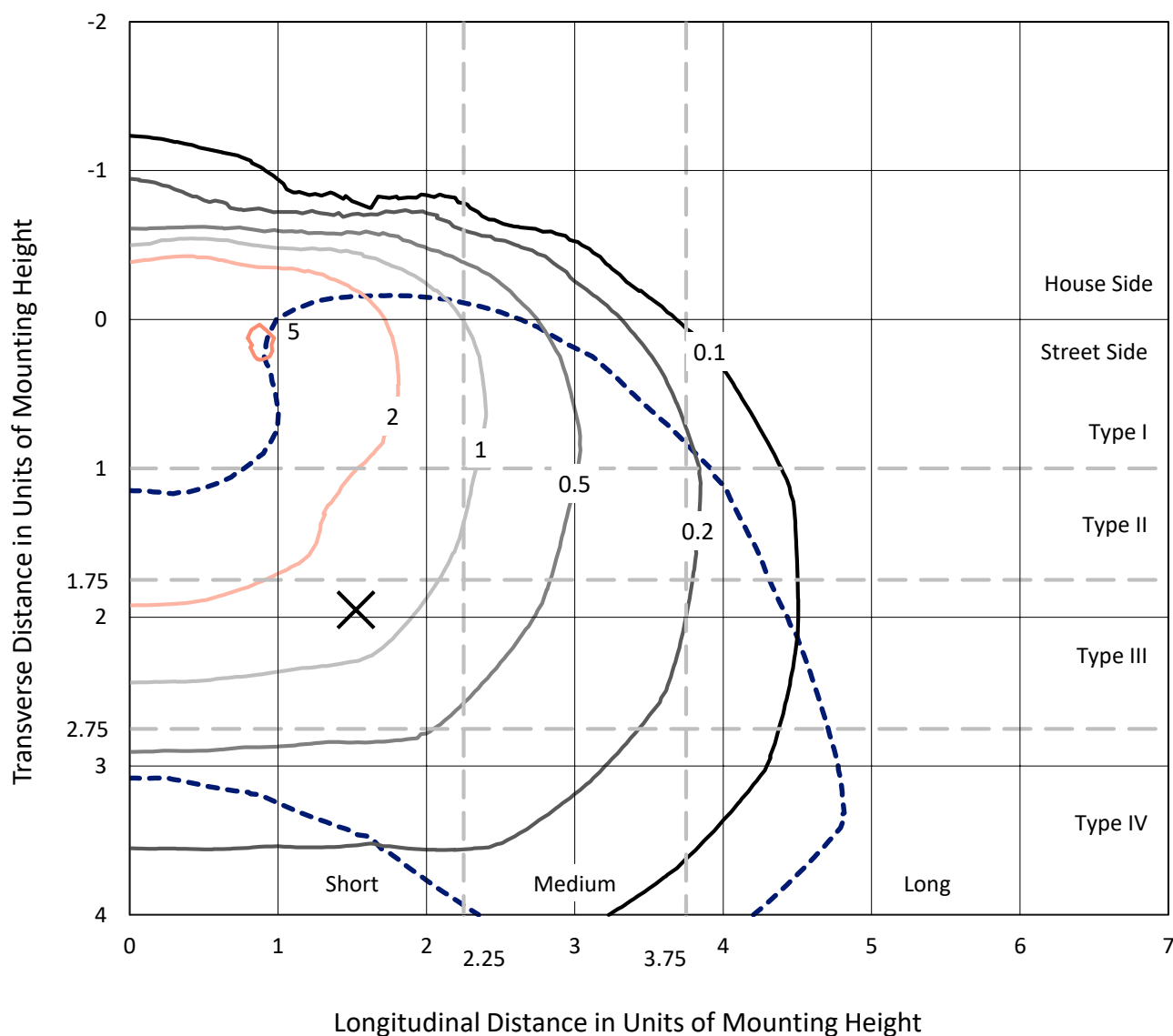
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## Iso-Footcandle Lines of Horizontal Illumination

× Max cd

--- 1/2 Max cd

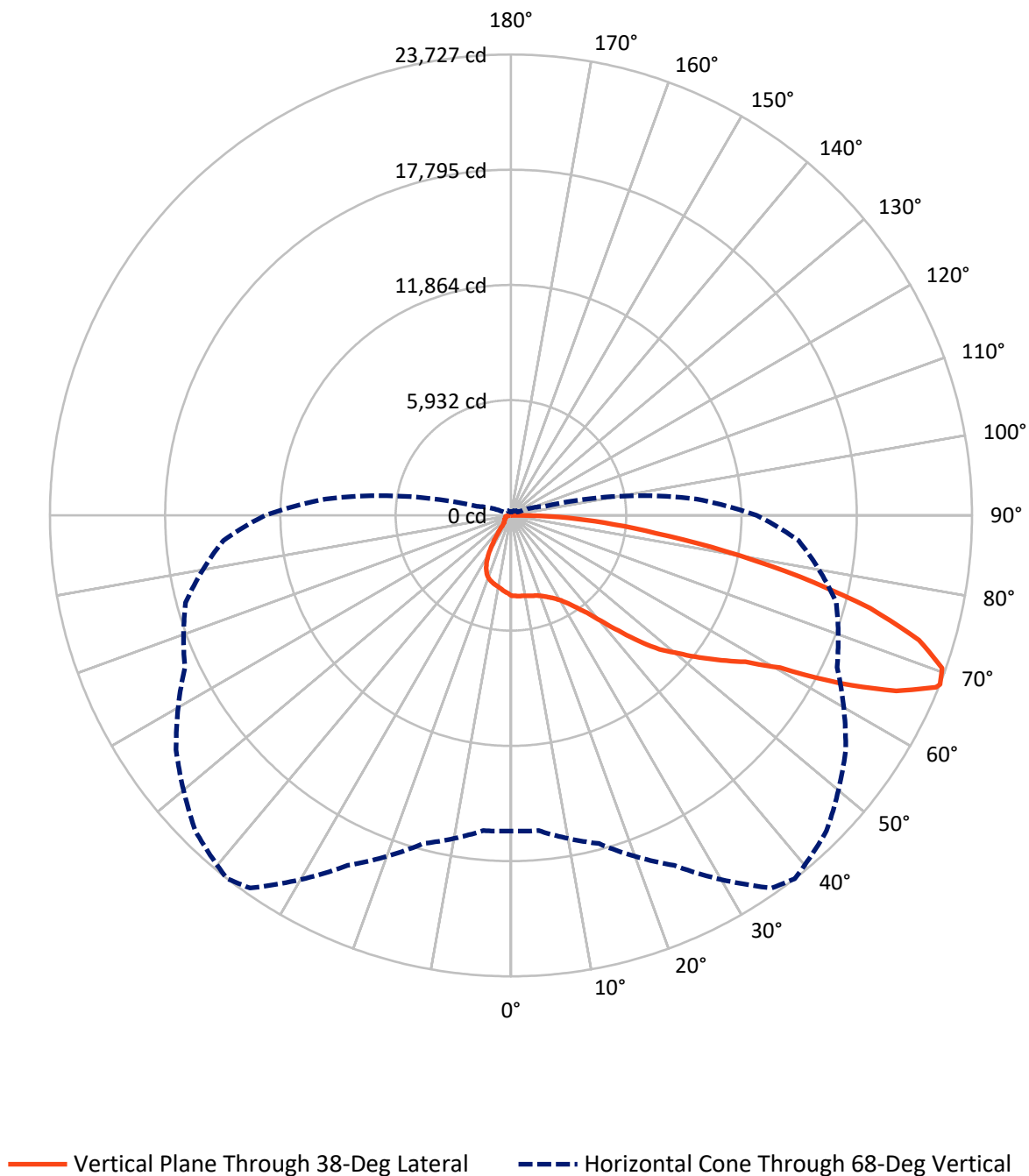


Based on 30 foot mounting height. Maximum calculated value = 5.2 fc  
 Type IV - Short - Non-Cutoff

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## Luminous Intensity Polar Plot



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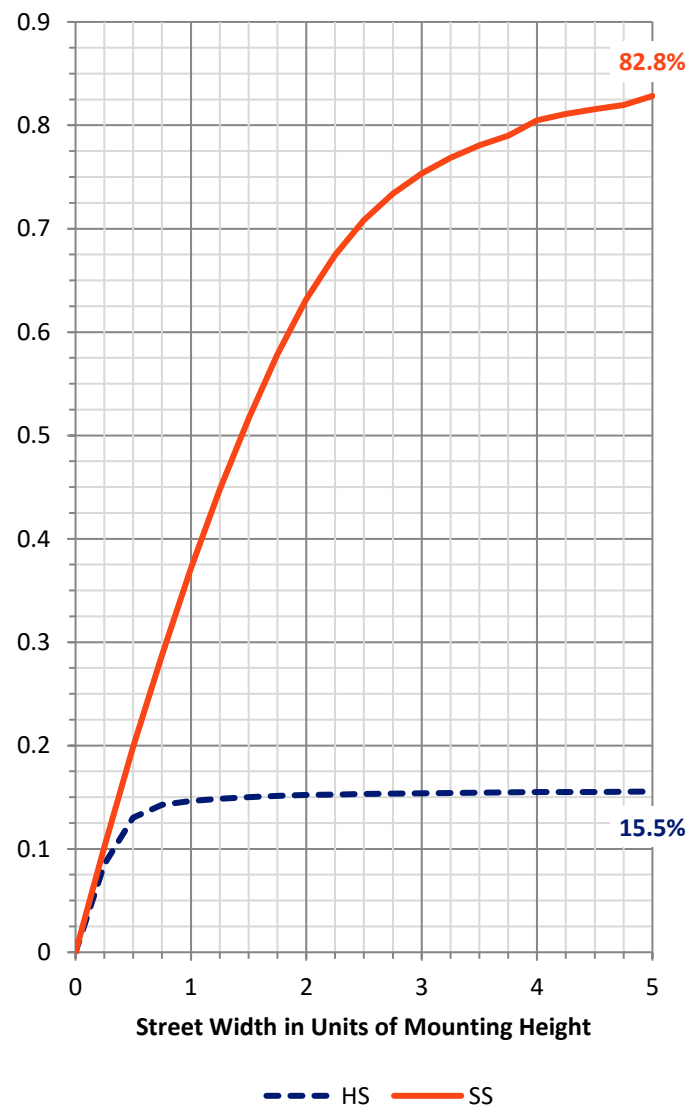
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 6012.3   | 0.0    | 6012.3  |
|                    | % Fixture | 15.8     | 0.0    | 15.8    |
| <b>Street Side</b> | Lumens    | 32105.7  | 0.0    | 32105.7 |
|                    | % Fixture | 84.2     | 0.0    | 84.2    |
| <b>Total</b>       | Lumens    | 38118.0  | 0.0    | 38118.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 390.3   | 1.0       |
| 10°-20°   | 1159.1  | 3.0       |
| 20°-30°   | 1934.4  | 5.1       |
| 30°-40°   | 2967.1  | 7.8       |
| 40°-50°   | 5108.3  | 13.4      |
| 50°-60°   | 7591.6  | 19.9      |
| 60°-70°   | 10043.1 | 26.3      |
| 70°-80°   | 7375.8  | 19.3      |
| 80°-90°   | 1548.2  | 4.1       |
| 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°    | 38118.0 | 100.0     |
| 0°-180°   | 38118.0 | 100.0     |

**Coefficient of Utilization**



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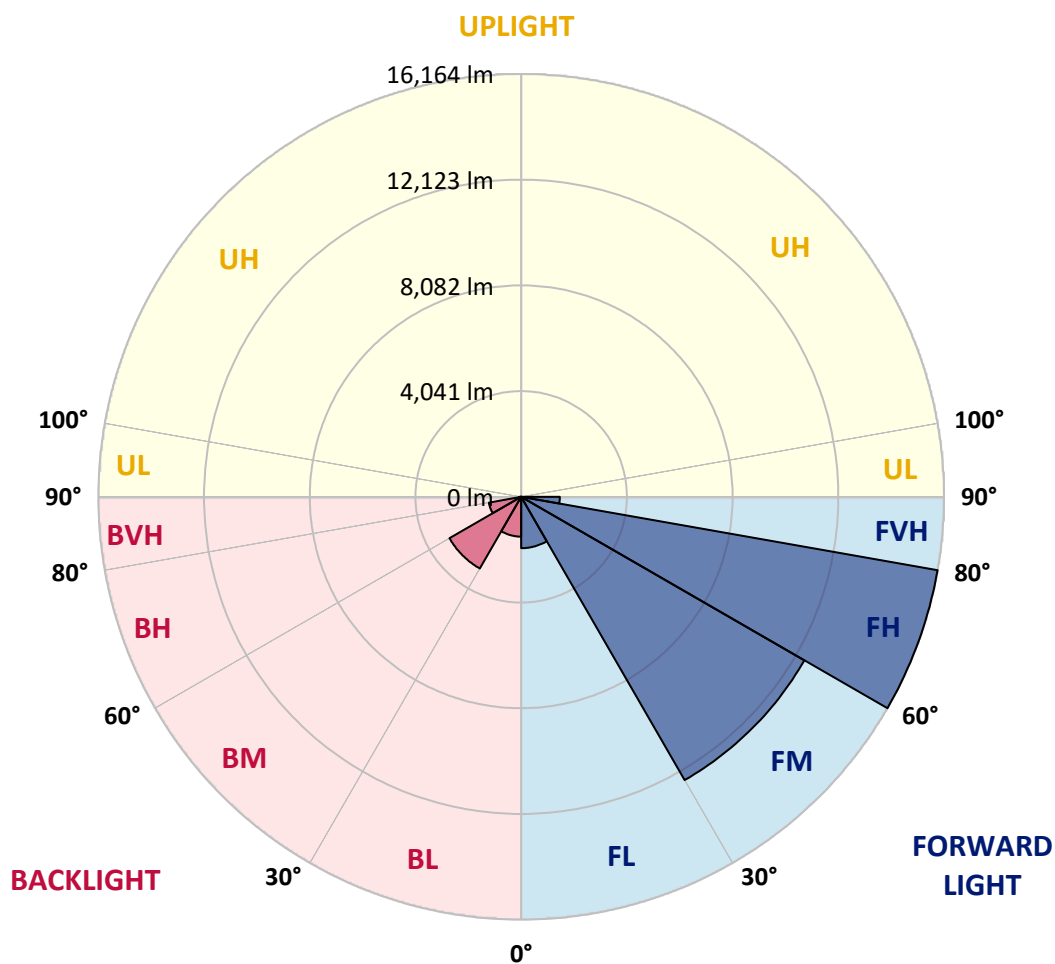
CATALOG NUMBER: CTN-10-4-D-E1-T4-7050-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|---------|-----------|-------------------------|------|---------|
|      |             |         |           | B                       | U    | G       |
| FL   | (0°-30°)    | 1962.6  | 5.1       |                         |      |         |
| FM   | (30°-60°)   | 12502.1 | 32.8      |                         |      |         |
| FH   | (60°-80°)   | 16163.9 | 42.4      |                         |      | G5      |
| FVH  | (80°-90°)   | 1477.0  | 3.9       |                         |      | G5      |
| BL   | (0°-30°)    | 1521.2  | 4.0       | B3/2500                 |      |         |
| BM   | (30°-60°)   | 3165.0  | 8.3       | B3/5000                 |      |         |
| BH   | (60°-80°)   | 1254.9  | 3.3       | B3/2500                 |      | G3/2500 |
| BVH  | (80°-90°)   | 71.2    | 0.2       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |         |

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

Type IV Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 38°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  | 4139.6  |
| 2.5°  | 4227.4  | 4198.1  | 4203.7  | 4221.8  | 4148.0  | 4142.4  | 4166.1  | 4139.6  | 4174.5  | 4157.7  | 4159.1  |
| 5°    | 4238.6  | 4210.7  | 4221.8  | 4249.7  | 4180.0  | 4178.6  | 4205.1  | 4171.7  | 4198.1  | 4177.2  | 4171.7  |
| 7.5°  | 4228.8  | 4203.7  | 4212.1  | 4238.6  | 4178.6  | 4182.8  | 4217.7  | 4206.5  | 4245.5  | 4224.6  | 4209.3  |
| 10°   | 4224.6  | 4207.9  | 4209.3  | 4245.5  | 4198.1  | 4209.3  | 4253.9  | 4260.8  | 4323.5  | 4305.4  | 4298.5  |
| 12.5° | 4187.0  | 4174.5  | 4187.0  | 4244.1  | 4228.8  | 4251.1  | 4311.0  | 4347.2  | 4421.1  | 4414.1  | 4428.1  |
| 15°   | 4164.7  | 4159.1  | 4168.9  | 4235.8  | 4253.9  | 4290.1  | 4369.5  | 4440.6  | 4529.8  | 4542.3  | 4574.4  |
| 17.5° | 4191.2  | 4199.5  | 4217.7  | 4272.0  | 4297.1  | 4334.7  | 4423.9  | 4521.4  | 4648.2  | 4702.5  | 4740.2  |
| 20°   | 4302.6  | 4312.4  | 4329.1  | 4364.0  | 4391.8  | 4423.9  | 4503.3  | 4614.8  | 4783.4  | 4868.3  | 4928.3  |
| 22.5° | 4464.3  | 4447.6  | 4471.2  | 4500.5  | 4508.9  | 4536.7  | 4617.5  | 4729.0  | 4919.9  | 5048.1  | 5131.7  |
| 25°   | 4589.7  | 4578.5  | 4602.2  | 4652.4  | 4651.0  | 4676.1  | 4755.5  | 4869.7  | 5076.0  | 5259.9  | 5407.6  |
| 27.5° | 4720.7  | 4713.7  | 4723.4  | 4790.3  | 4816.8  | 4847.4  | 4917.1  | 5045.3  | 5278.0  | 5509.3  | 5742.0  |
| 30°   | 4910.1  | 4925.5  | 4908.8  | 4985.4  | 5042.5  | 5077.3  | 5148.4  | 5305.9  | 5555.3  | 5871.6  | 6165.6  |
| 32.5° | 5204.1  | 5211.1  | 5183.2  | 5268.2  | 5350.4  | 5403.4  | 5471.7  | 5677.9  | 5951.0  | 6336.9  | 6715.9  |
| 35°   | 5831.1  | 5832.5  | 5718.3  | 5705.7  | 5751.7  | 5828.4  | 5928.7  | 6235.2  | 6642.1  | 7237.0  | 7666.2  |
| 37.5° | 6781.4  | 6735.4  | 6626.7  | 6415.0  | 6346.7  | 6360.6  | 6504.1  | 6930.5  | 7547.7  | 8645.7  | 9056.7  |
| 40°   | 7871.0  | 7818.1  | 7627.2  | 7347.1  | 7146.5  | 7133.9  | 7182.7  | 7694.1  | 8596.9  | 10229.9 | 10437.5 |
| 42.5° | 9047.0  | 9010.8  | 8701.4  | 8411.6  | 8155.2  | 8114.8  | 8004.8  | 8517.5  | 9753.4  | 11644.2 | 11642.8 |
| 45°   | 10132.4 | 10125.4 | 9747.8  | 9604.3  | 9332.6  | 9226.7  | 9095.8  | 9494.3  | 10941.9 | 12758.9 | 12625.1 |
| 47.5° | 11150.9 | 11130.0 | 10728.8 | 10564.3 | 10356.7 | 10299.6 | 10144.9 | 10423.6 | 11957.7 | 13799.7 | 13466.7 |
| 50°   | 12232.2 | 12168.1 | 11571.7 | 11405.9 | 11201.1 | 11156.5 | 11075.7 | 11396.2 | 13064.0 | 14709.5 | 14157.8 |
| 52.5° | 13489.0 | 13391.4 | 12577.7 | 12269.8 | 12123.5 | 12152.8 | 12101.2 | 12388.2 | 14301.3 | 15470.3 | 14723.5 |
| 55°   | 14975.7 | 14683.1 | 13905.6 | 13346.9 | 13022.2 | 13157.4 | 13057.0 | 13415.1 | 15488.4 | 16062.5 | 15135.9 |
| 57.5° | 16066.7 | 16065.3 | 15749.0 | 14954.8 | 14219.1 | 14226.1 | 14024.0 | 14432.3 | 16448.4 | 16651.9 | 15377.0 |
| 60°   | 17315.1 | 17388.9 | 17497.6 | 17145.1 | 16277.1 | 15913.4 | 15202.8 | 15439.7 | 17220.4 | 17079.6 | 15484.2 |
| 62.5° | 18400.5 | 18443.7 | 18924.4 | 19059.6 | 19126.4 | 19037.3 | 17457.2 | 16600.3 | 17851.5 | 17317.9 | 15514.9 |
| 65°   | 18361.5 | 18357.3 | 19396.8 | 20302.4 | 21709.7 | 21789.1 | 21333.5 | 18323.9 | 18340.6 | 17348.5 | 15356.1 |
| 67.5° | 16569.7 | 16654.7 | 18045.2 | 19986.1 | 23342.7 | 23593.5 | 22965.1 | 20826.3 | 18521.7 | 17334.6 | 14977.1 |
| 68°   | 16249.2 | 16285.4 | 17487.9 | 19874.7 | 23412.4 | 23727.3 | 22967.9 | 21035.3 | 18516.2 | 17336.0 | 14860.0 |
| 70°   | 14207.9 | 14262.3 | 15664.0 | 18524.5 | 23431.9 | 23540.6 | 22623.7 | 21149.6 | 18332.2 | 17206.4 | 14015.7 |
| 72.5° | 11216.4 | 11279.1 | 12556.8 | 15630.5 | 21971.7 | 21967.5 | 21081.3 | 20192.4 | 17709.4 | 16258.9 | 11889.4 |
| 75°   | 8126.0  | 8330.8  | 9448.3  | 12276.8 | 18808.8 | 19095.8 | 18981.5 | 18804.6 | 15937.1 | 13739.8 | 8390.7  |
| 77.5° | 5697.4  | 5801.9  | 6853.9  | 9233.7  | 14780.6 | 15219.5 | 15990.0 | 16218.5 | 13285.5 | 10203.5 | 3778.8  |
| 80°   | 3593.4  | 3789.9  | 4660.7  | 6557.1  | 10767.8 | 11173.2 | 12106.8 | 12491.3 | 9806.4  | 5004.9  | 661.8   |
| 82.5° | 2094.2  | 2211.2  | 2852.2  | 4246.9  | 7239.8  | 7522.7  | 8134.3  | 7662.0  | 3975.2  | 666.0   | 367.8   |
| 85°   | 1014.4  | 1121.6  | 1531.3  | 2416.1  | 4520.0  | 4805.6  | 5135.9  | 3341.2  | 657.7   | 261.9   | 248.0   |
| 87.5° | 411.0   | 422.2   | 627.0   | 1072.9  | 2253.0  | 2498.3  | 2417.5  | 1096.6  | 171.4   | 94.7    | 78.0    |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |

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**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4139.6  | 4139.6  | 4139.6 | 4139.6 | 4139.6 | 4139.6 | 4139.6 | 4139.6 | 4139.6 | 4139.6 | 4139.6 |
| 2.5°  | 4166.1  | 4145.2  | 4120.1 | 4111.8 | 4053.2 | 4050.5 | 4001.7 | 4072.7 | 4051.8 | 4053.2 | 4070.0 |
| 5°    | 4168.9  | 4145.2  | 4096.4 | 4074.1 | 4011.4 | 3994.7 | 3913.9 | 3958.5 | 3911.1 | 3906.9 | 3934.8 |
| 7.5°  | 4198.1  | 4171.7  | 4102.0 | 4067.2 | 3950.1 | 3894.4 | 3817.8 | 3856.8 | 3784.3 | 3769.0 | 3774.6 |
| 10°   | 4276.2  | 4242.7  | 4157.7 | 4075.5 | 3930.6 | 3849.8 | 3699.3 | 3711.9 | 3647.8 | 3626.9 | 3645.0 |
| 12.5° | 4394.6  | 4354.2  | 4252.5 | 4131.3 | 3947.3 | 3805.2 | 3621.3 | 3547.5 | 3449.9 | 3417.9 | 3427.6 |
| 15°   | 4556.2  | 4508.9  | 4375.1 | 4234.4 | 3983.6 | 3784.3 | 3533.5 | 3380.3 | 3190.8 | 3137.8 | 3118.3 |
| 17.5° | 4733.2  | 4683.0  | 4528.4 | 4351.4 | 4047.7 | 3760.6 | 3433.2 | 3189.4 | 2916.3 | 2796.4 | 2789.5 |
| 20°   | 4940.8  | 4886.5  | 4724.8 | 4488.0 | 4099.2 | 3731.4 | 3307.8 | 2958.1 | 2602.8 | 2402.1 | 2388.2 |
| 22.5° | 5179.1  | 5131.7  | 4949.2 | 4609.2 | 4125.7 | 3654.7 | 3118.3 | 2662.7 | 2218.2 | 1967.4 | 1954.9 |
| 25°   | 5459.1  | 5414.5  | 5158.2 | 4694.2 | 4096.4 | 3519.6 | 2859.1 | 2300.4 | 1765.4 | 1514.6 | 1503.4 |
| 27.5° | 5793.5  | 5723.9  | 5322.6 | 4719.3 | 4010.0 | 3298.0 | 2534.5 | 1835.0 | 1304.2 | 1113.3 | 1103.5 |
| 30°   | 6173.9  | 6049.9  | 5477.2 | 4712.3 | 3856.8 | 3015.2 | 2087.2 | 1352.9 | 926.6  | 798.4  | 794.2  |
| 32.5° | 6653.2  | 6435.9  | 5624.9 | 4656.6 | 3638.0 | 2644.6 | 1588.4 | 939.1  | 666.0  | 603.3  | 601.9  |
| 35°   | 7453.0  | 6987.6  | 5786.6 | 4556.2 | 3341.2 | 2158.3 | 1100.7 | 639.5  | 542.0  | 529.5  | 529.5  |
| 37.5° | 8645.7  | 7897.5  | 6016.5 | 4396.0 | 2956.7 | 1645.5 | 724.5  | 508.6  | 510.0  | 516.9  | 518.3  |
| 40°   | 9870.5  | 8943.9  | 6349.5 | 4157.7 | 2508.0 | 1156.5 | 526.7  | 472.3  | 489.1  | 500.2  | 508.6  |
| 42.5° | 10994.9 | 9891.4  | 6720.1 | 3831.7 | 2000.8 | 763.6  | 471.0  | 454.2  | 462.6  | 471.0  | 479.3  |
| 45°   | 11938.2 | 10721.8 | 7069.8 | 3459.7 | 1482.5 | 543.4  | 466.8  | 433.3  | 429.2  | 434.7  | 440.3  |
| 47.5° | 12733.8 | 11397.6 | 7315.1 | 3040.3 | 1008.8 | 465.4  | 455.6  | 411.0  | 397.1  | 398.5  | 401.3  |
| 50°   | 13341.3 | 11875.5 | 7423.7 | 2579.1 | 668.8  | 452.8  | 434.7  | 387.3  | 365.1  | 365.1  | 367.8  |
| 52.5° | 13750.9 | 12175.0 | 7359.6 | 2059.4 | 480.7  | 445.9  | 418.0  | 362.3  | 335.8  | 340.0  | 342.8  |
| 55°   | 14054.7 | 12335.3 | 7107.5 | 1513.2 | 423.6  | 425.0  | 398.5  | 333.0  | 310.7  | 321.9  | 326.0  |
| 57.5° | 14173.1 | 12331.1 | 6683.9 | 1045.0 | 420.8  | 392.9  | 370.6  | 307.9  | 289.8  | 305.1  | 312.1  |
| 60°   | 14129.9 | 12127.7 | 6068.0 | 712.0  | 412.4  | 367.8  | 341.4  | 284.2  | 270.3  | 270.3  | 271.7  |
| 62.5° | 14043.5 | 11842.0 | 5174.9 | 528.1  | 392.9  | 349.7  | 319.1  | 264.7  | 248.0  | 239.7  | 236.9  |
| 65°   | 13653.4 | 11149.5 | 3799.7 | 455.6  | 373.4  | 340.0  | 298.2  | 246.6  | 224.3  | 210.4  | 207.6  |
| 67.5° | 12881.5 | 9958.2  | 2123.5 | 420.8  | 359.5  | 334.4  | 284.2  | 229.9  | 204.8  | 188.1  | 186.7  |
| 68°   | 12644.6 | 9586.2  | 1800.2 | 418.0  | 362.3  | 334.4  | 282.8  | 225.7  | 202.0  | 183.9  | 182.5  |
| 70°   | 11242.9 | 7733.1  | 744.0  | 392.9  | 381.8  | 335.8  | 275.9  | 213.2  | 190.9  | 172.8  | 171.4  |
| 72.5° | 8503.6  | 4479.6  | 392.9  | 341.4  | 372.0  | 330.2  | 278.7  | 203.4  | 181.1  | 160.2  | 157.4  |
| 75°   | 4685.8  | 1283.3  | 349.7  | 277.3  | 344.2  | 348.3  | 284.2  | 202.0  | 175.6  | 149.1  | 143.5  |
| 77.5° | 1040.8  | 418.0   | 326.0  | 242.4  | 296.8  | 320.5  | 263.3  | 192.3  | 178.3  | 136.5  | 131.0  |
| 80°   | 398.5   | 340.0   | 309.3  | 186.7  | 235.5  | 271.7  | 218.8  | 171.4  | 182.5  | 128.2  | 121.2  |
| 82.5° | 333.0   | 298.2   | 284.2  | 144.9  | 163.0  | 199.2  | 175.6  | 146.3  | 168.6  | 118.4  | 112.9  |
| 85°   | 245.2   | 288.4   | 200.6  | 114.3  | 119.8  | 122.6  | 122.6  | 114.3  | 144.9  | 104.5  | 98.9   |
| 87.5° | 98.9    | 139.3   | 85.0   | 52.9   | 61.3   | 57.1   | 50.2   | 61.3   | 83.6   | 73.8   | 73.8   |
| 90°   | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

STREETWORKS

Report Number: SP1-2104-215-7

Luminaire Tested: CST-CA6-230-750-U-T4

Test Date: 04/22/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-7  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 04/22/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: STREETWORKS  
 Catalog Number: **CST-CA6-230-750-U-T4**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

### Spectral Parameters

|                           |        |           |      |      |       |
|---------------------------|--------|-----------|------|------|-------|
| CCT (K):                  | 4852   | CRI (Ra): | 74.1 |      |       |
| CIE u':                   | 0.2118 | R1:       | 71.0 | R9:  | -25.4 |
| CIE v':                   | 0.4888 | R2:       | 79.6 | R10: | 51.4  |
| Duv:                      | 0.0017 | R3:       | 85.8 | R11: | 70.1  |
| CIE x:                    | 0.3498 | R4:       | 73.5 | R12: | 42.9  |
| CIE y:                    | 0.3588 | R5:       | 71.4 | R13: | 72.5  |
| CIE z:                    | 0.2914 | R6:       | 71.2 | R14: | 92.1  |
| Peak Wavelength (nm):     | 449    | R7:       | 82.9 |      |       |
| Dominant Wavelength (nm): | 572    | R8:       | 57.2 |      |       |
| Purity:                   | 12.7   |           |      |      |       |
| Rf:                       | 75.2   |           |      |      |       |
| Rg:                       | 94.7   |           |      |      |       |



### Test Conditions

Stabilization Time: 72M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.4/13%  
 Sphere Temperature (°C): 24.0

REPORT NUMBER: SP1-2104-215-7

| 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 5000K 4-step quadrangle

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### Photopic Flux vs. Wavelength

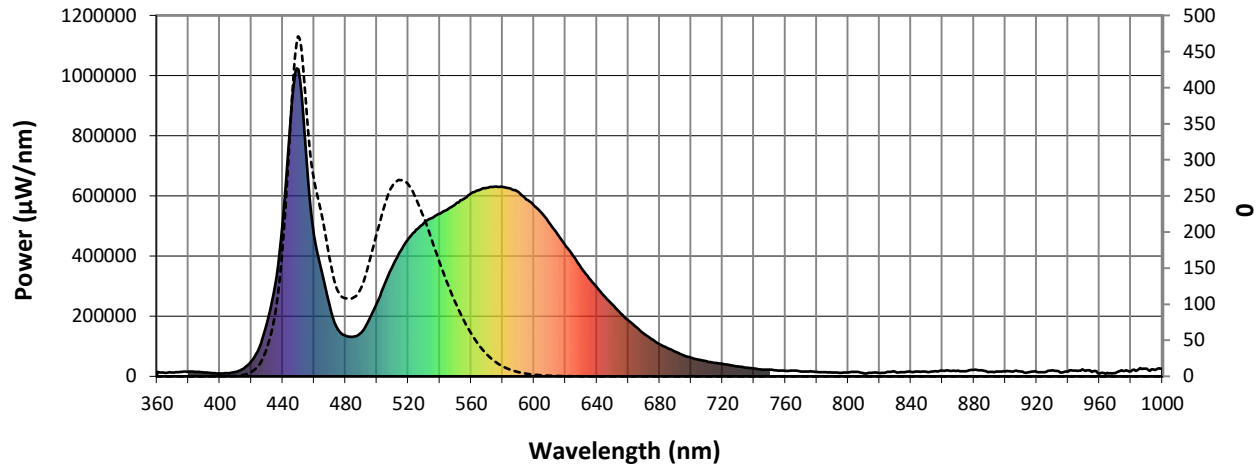


#####

| 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       | 15077            | 0.0              | 490       | 146327           | 20.8             | 620       | 434415           | 113.0            | 750       | 22886            | 0.0              | 880       | 20960            | 0.0              |
| 365       | 12138            | 0.0              | 495       | 188585           | 34.2             | 625       | 400670           | 88.4             | 755       | 19692            | 0.0              | 885       | 20315            | 0.0              |
| 370       | 12993            | 0.0              | 500       | 245069           | 54.1             | 630       | 360611           | 65.3             | 760       | 18199            | 0.0              | 890       | 15211            | 0.0              |
| 375       | 14513            | 0.0              | 505       | 307682           | 86.1             | 635       | 326986           | 49.1             | 765       | 19191            | 0.0              | 895       | 15502            | 0.0              |
| 380       | 15679            | 0.0              | 510       | 367102           | 126.1            | 640       | 295583           | 35.3             | 770       | 16229            | 0.0              | 900       | 15935            | 0.0              |
| 385       | 14569            | 0.0              | 515       | 416068           | 172.4            | 645       | 264664           | 25.5             | 775       | 16351            | 0.0              | 905       | 15965            | 0.0              |
| 390       | 13091            | 0.0              | 520       | 457470           | 221.8            | 650       | 238441           | 17.4             | 780       | 14567            | 0.0              | 910       | 16119            | 0.0              |
| 395       | 10927            | 0.0              | 525       | 486980           | 261.4            | 655       | 210047           | 12.1             | 785       | 13349            | 0.0              | 915       | 13972            | 0.0              |
| 400       | 9655             | 0.0              | 530       | 511184           | 301.0            | 660       | 186019           | 7.8              | 790       | 12552            | 0.0              | 920       | 14830            | 0.0              |
| 405       | 10895            | 0.0              | 535       | 527191           | 326.9            | 665       | 164001           | 5.2              | 795       | 11517            | 0.0              | 925       | 13744            | 0.0              |
| 410       | 14929            | 0.0              | 540       | 540658           | 352.3            | 670       | 142007           | 3.1              | 800       | 13250            | 0.0              | 930       | 20340            | 0.0              |
| 415       | 25993            | 0.0              | 545       | 555639           | 369.8            | 675       | 123441           | 2.1              | 805       | 15135            | 0.0              | 935       | 13272            | 0.0              |
| 420       | 49620            | 0.1              | 550       | 572229           | 388.9            | 680       | 106894           | 1.2              | 810       | 9873             | 0.0              | 940       | 16357            | 0.0              |
| 425       | 95836            | 0.5              | 555       | 589788           | 402.8            | 685       | 94026            | 0.8              | 815       | 11566            | 0.0              | 945       | 19257            | 0.0              |
| 430       | 178101           | 1.4              | 560       | 608278           | 413.4            | 690       | 82099            | 0.5              | 820       | 11216            | 0.0              | 950       | 19804            | 0.0              |
| 435       | 300144           | 3.5              | 565       | 619317           | 411.8            | 695       | 70275            | 0.3              | 825       | 15165            | 0.0              | 955       | 14877            | 0.0              |
| 440       | 512674           | 8.1              | 570       | 627176           | 407.8            | 700       | 61784            | 0.2              | 830       | 14983            | 0.0              | 960       | 9882             | 0.0              |
| 445       | 857336           | 17.9             | 575       | 631114           | 392.7            | 705       | 55550            | 0.1              | 835       | 13993            | 0.0              | 965       | 11741            | 0.0              |
| 450       | 1021494          | 26.5             | 580       | 630436           | 374.6            | 710       | 50234            | 0.1              | 840       | 15281            | 0.0              | 970       | 11068            | 0.0              |
| 455       | 730207           | 24.4             | 585       | 625204           | 347.4            | 715       | 44909            | 0.0              | 845       | 15737            | 0.0              | 975       | 18108            | 0.0              |
| 460       | 467897           | 19.2             | 590       | 612752           | 316.8            | 720       | 41441            | 0.0              | 850       | 15148            | 0.0              | 980       | 17506            | 0.0              |
| 465       | 344659           | 17.8             | 595       | 589048           | 279.2            | 725       | 36834            | 0.0              | 855       | 17198            | 0.0              | 985       | 23821            | 0.0              |
| 470       | 230541           | 14.3             | 600       | 567479           | 244.6            | 730       | 32988            | 0.0              | 860       | 19169            | 0.0              | 990       | 25862            | 0.0              |
| 475       | 157156           | 12.3             | 605       | 542722           | 210.2            | 735       | 28984            | 0.0              | 865       | 18632            | 0.0              | 995       | 21133            | 0.0              |
| 480       | 134805           | 12.8             | 610       | 507118           | 174.2            | 740       | 26177            | 0.0              | 870       | 18831            | 0.0              | 1000      | 25640            | 0.0              |
| 485       | 132031           | 15.6             | 615       | 472188           | 142.5            | 745       | 22680            | 0.0              | 875       | 16978            | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: 66024.8

S/P: 1.78

| 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       | 15077            | 0.0              | 490       | 146327           | 225.3            | 620       | 434415           | 5.4              | 750       | 22886            | 0.0              | 880       | 20960            | 0.0              |
| 365       | 12138            | 0.0              | 495       | 188585           | 304.9            | 625       | 400670           | 3.4              | 755       | 19692            | 0.0              | 885       | 20315            | 0.0              |
| 370       | 12993            | 0.0              | 500       | 245069           | 409.9            | 630       | 360611           | 2.0              | 760       | 18199            | 0.0              | 890       | 15211            | 0.0              |
| 375       | 14513            | 0.0              | 505       | 307682           | 523.1            | 635       | 326986           | 1.2              | 765       | 19191            | 0.0              | 895       | 15502            | 0.0              |
| 380       | 15679            | 0.0              | 510       | 367102           | 622.2            | 640       | 295583           | 0.8              | 770       | 16229            | 0.0              | 900       | 15935            | 0.0              |
| 385       | 14569            | 0.0              | 515       | 416068           | 689.6            | 645       | 264664           | 0.5              | 775       | 16351            | 0.0              | 905       | 15965            | 0.0              |
| 390       | 13091            | 0.0              | 520       | 457470           | 727.1            | 650       | 238441           | 0.3              | 780       | 14567            | 0.0              | 910       | 16119            | 0.0              |
| 395       | 10927            | 0.1              | 525       | 486980           | 728.5            | 655       | 210047           | 0.2              | 785       | 13349            | 0.0              | 915       | 13972            | 0.0              |
| 400       | 9655             | 0.2              | 530       | 511184           | 704.8            | 660       | 186019           | 0.1              | 790       | 12552            | 0.0              | 920       | 14830            | 0.0              |
| 405       | 10895            | 0.3              | 535       | 527191           | 656.9            | 665       | 164001           | 0.1              | 795       | 11517            | 0.0              | 925       | 13744            | 0.0              |
| 410       | 14929            | 0.9              | 540       | 540658           | 597.4            | 670       | 142007           | 0.0              | 800       | 13250            | 0.0              | 930       | 20340            | 0.0              |
| 415       | 25993            | 2.7              | 545       | 555639           | 532.7            | 675       | 123441           | 0.0              | 805       | 15135            | 0.0              | 935       | 13272            | 0.0              |
| 420       | 49620            | 8.2              | 550       | 572229           | 467.9            | 680       | 106894           | 0.0              | 810       | 9873             | 0.0              | 940       | 16357            | 0.0              |
| 425       | 95836            | 23.4             | 555       | 589788           | 403.1            | 685       | 94026            | 0.0              | 815       | 11566            | 0.0              | 945       | 19257            | 0.0              |
| 430       | 178101           | 60.6             | 560       | 608278           | 340.0            | 690       | 82099            | 0.0              | 820       | 11216            | 0.0              | 950       | 19804            | 0.0              |
| 435       | 300144           | 134.2            | 565       | 619317           | 277.8            | 695       | 70275            | 0.0              | 825       | 15165            | 0.0              | 955       | 14877            | 0.0              |
| 440       | 512674           | 286.5            | 570       | 627176           | 221.3            | 700       | 61784            | 0.0              | 830       | 14983            | 0.0              | 960       | 9882             | 0.0              |
| 445       | 857336           | 574.1            | 575       | 631114           | 171.9            | 705       | 55550            | 0.0              | 835       | 13993            | 0.0              | 965       | 11741            | 0.0              |
| 450       | 1021494          | 791.7            | 580       | 630436           | 129.9            | 710       | 50234            | 0.0              | 840       | 15281            | 0.0              | 970       | 11068            | 0.0              |
| 455       | 730207           | 638.1            | 585       | 625204           | 95.5             | 715       | 44909            | 0.0              | 845       | 15737            | 0.0              | 975       | 18108            | 0.0              |
| 460       | 467897           | 451.9            | 590       | 612752           | 68.2             | 720       | 41441            | 0.0              | 850       | 15148            | 0.0              | 980       | 17506            | 0.0              |
| 465       | 344659           | 364.0            | 595       | 589048           | 47.0             | 725       | 36834            | 0.0              | 855       | 17198            | 0.0              | 985       | 23821            | 0.0              |
| 470       | 230541           | 265.5            | 600       | 567479           | 32.0             | 730       | 32988            | 0.0              | 860       | 19169            | 0.0              | 990       | 25862            | 0.0              |
| 475       | 157156           | 196.5            | 605       | 542722           | 21.3             | 735       | 28984            | 0.0              | 865       | 18632            | 0.0              | 995       | 21133            | 0.0              |
| 480       | 134805           | 182.1            | 610       | 507118           | 13.7             | 740       | 26177            | 0.0              | 870       | 18831            | 0.0              | 1000      | 25640            | 0.0              |
| 485       | 132031           | 191.4            | 615       | 472188           | 8.7              | 745       | 22680            | 0.0              | 875       | 16978            | 0.0              |           |                  |                  |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 26696.3**      **M/P: 0.72**

| 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       | 15077            | 0.0              | 490       | 146327           | 121.8            | 620       | 434415           | 0.3              | 750       | 22886            | 0.0              | 880       | 20960            | 0.0              |
| 365       | 12138            | 0.0              | 495       | 188585           | 155.7            | 625       | 400670           | 0.2              | 755       | 19692            | 0.0              | 885       | 20315            | 0.0              |
| 370       | 12993            | 0.0              | 500       | 245069           | 197.0            | 630       | 360611           | 0.1              | 760       | 18199            | 0.0              | 890       | 15211            | 0.0              |
| 375       | 14513            | 0.0              | 505       | 307682           | 236.1            | 635       | 326986           | 0.1              | 765       | 19191            | 0.0              | 895       | 15502            | 0.0              |
| 380       | 15679            | 0.0              | 510       | 367102           | 263.6            | 640       | 295583           | 0.0              | 770       | 16229            | 0.0              | 900       | 15935            | 0.0              |
| 385       | 14569            | 0.0              | 515       | 416068           | 271.9            | 645       | 264664           | 0.0              | 775       | 16351            | 0.0              | 905       | 15965            | 0.0              |
| 390       | 13091            | 0.0              | 520       | 457470           | 266.3            | 650       | 238441           | 0.0              | 780       | 14567            | 0.0              | 910       | 16119            | 0.0              |
| 395       | 10927            | 0.1              | 525       | 486980           | 247.0            | 655       | 210047           | 0.0              | 785       | 13349            | 0.0              | 915       | 13972            | 0.0              |
| 400       | 9655             | 0.1              | 530       | 511184           | 220.9            | 660       | 186019           | 0.0              | 790       | 12552            | 0.0              | 920       | 14830            | 0.0              |
| 405       | 10895            | 0.2              | 535       | 527191           | 189.7            | 665       | 164001           | 0.0              | 795       | 11517            | 0.0              | 925       | 13744            | 0.0              |
| 410       | 14929            | 0.6              | 540       | 540658           | 158.2            | 670       | 142007           | 0.0              | 800       | 13250            | 0.0              | 930       | 20340            | 0.0              |
| 415       | 25993            | 1.7              | 545       | 555639           | 129.1            | 675       | 123441           | 0.0              | 805       | 15135            | 0.0              | 935       | 13272            | 0.0              |
| 420       | 49620            | 5.7              | 550       | 572229           | 102.7            | 680       | 106894           | 0.0              | 810       | 9873             | 0.0              | 940       | 16357            | 0.0              |
| 425       | 95836            | 14.9             | 555       | 589788           | 79.5             | 685       | 94026            | 0.0              | 815       | 11566            | 0.0              | 945       | 19257            | 0.0              |
| 430       | 178101           | 37.6             | 560       | 608278           | 60.0             | 690       | 82099            | 0.0              | 820       | 11216            | 0.0              | 950       | 19804            | 0.0              |
| 435       | 300144           | 80.1             | 565       | 619317           | 43.5             | 695       | 70275            | 0.0              | 825       | 15165            | 0.0              | 955       | 14877            | 0.0              |
| 440       | 512674           | 171.3            | 570       | 627176           | 30.6             | 700       | 61784            | 0.0              | 830       | 14983            | 0.0              | 960       | 9882             | 0.0              |
| 445       | 857336           | 338.2            | 575       | 631114           | 21.0             | 705       | 55550            | 0.0              | 835       | 13993            | 0.0              | 965       | 11741            | 0.0              |
| 450       | 1021494          | 470.7            | 580       | 630436           | 14.1             | 710       | 50234            | 0.0              | 840       | 15281            | 0.0              | 970       | 11068            | 0.0              |
| 455       | 730207           | 382.6            | 585       | 625204           | 9.3              | 715       | 44909            | 0.0              | 845       | 15737            | 0.0              | 975       | 18108            | 0.0              |
| 460       | 467897           | 275.7            | 590       | 612752           | 6.0              | 720       | 41441            | 0.0              | 850       | 15148            | 0.0              | 980       | 17506            | 0.0              |
| 465       | 344659           | 225.2            | 595       | 589048           | 3.8              | 725       | 36834            | 0.0              | 855       | 17198            | 0.0              | 985       | 23821            | 0.0              |
| 470       | 230541           | 165.0            | 600       | 567479           | 2.4              | 730       | 32988            | 0.0              | 860       | 19169            | 0.0              | 990       | 25862            | 0.0              |
| 475       | 157156           | 120.0            | 605       | 542722           | 1.5              | 735       | 28984            | 0.0              | 865       | 18632            | 0.0              | 995       | 21133            | 0.0              |
| 480       | 134805           | 108.3            | 610       | 507118           | 0.9              | 740       | 26177            | 0.0              | 870       | 18831            | 0.0              | 1000      | 25640            | 0.0              |
| 485       | 132031           | 108.8            | 615       | 472188           | 0.6              | 745       | 22680            | 0.0              | 875       | 16978            | 0.0              |           |                  |                  |

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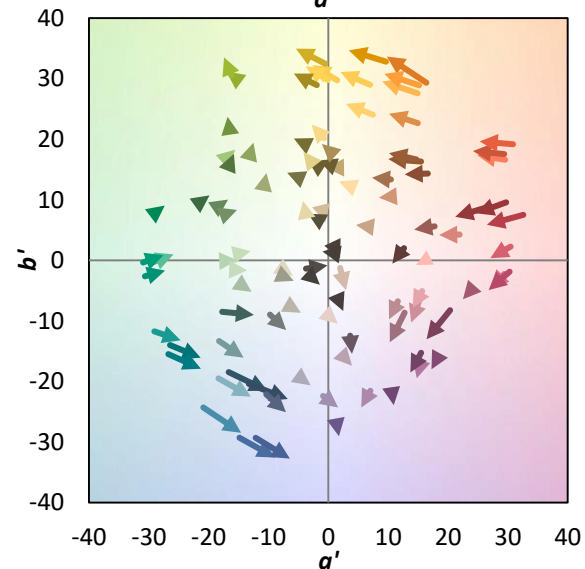
TM-30-18

### Summary

$R_f = 75.2$   
 $R_g = 94.7$   
 CIE  $R_a = 74.1$   
 $R_g = -25.4$



### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 63 | CES51 = 90 | CES76 = 52 |
| CES02 = 60 | CES27 = 88 | CES52 = 90 | CES77 = 68 |
| CES03 = 30 | CES28 = 81 | CES53 = 81 | CES78 = 54 |
| CES04 = 69 | CES29 = 67 | CES54 = 86 | CES79 = 81 |
| CES05 = 46 | CES30 = 85 | CES55 = 84 | CES80 = 77 |
| CES06 = 50 | CES31 = 71 | CES56 = 76 | CES81 = 79 |
| CES07 = 39 | CES32 = 63 | CES57 = 75 | CES82 = 91 |
| CES08 = 38 | CES33 = 79 | CES58 = 76 | CES83 = 89 |
| CES09 = 29 | CES34 = 70 | CES59 = 87 | CES84 = 86 |
| CES10 = 73 | CES35 = 83 | CES60 = 89 | CES85 = 79 |
| CES11 = 56 | CES36 = 90 | CES61 = 83 | CES86 = 76 |
| CES12 = 62 | CES37 = 79 | CES62 = 85 | CES87 = 78 |
| CES13 = 42 | CES38 = 94 | CES63 = 76 | CES88 = 82 |
| CES14 = 74 | CES39 = 96 | CES64 = 67 | CES89 = 74 |
| CES15 = 70 | CES40 = 91 | CES65 = 64 | CES90 = 81 |
| CES16 = 46 | CES41 = 95 | CES66 = 61 | CES91 = 74 |
| CES17 = 49 | CES42 = 80 | CES67 = 58 | CES92 = 61 |
| CES18 = 55 | CES43 = 78 | CES68 = 66 | CES93 = 77 |
| CES19 = 71 | CES44 = 99 | CES69 = 74 | CES94 = 56 |
| CES20 = 64 | CES45 = 86 | CES70 = 58 | CES95 = 67 |
| CES21 = 85 | CES46 = 85 | CES71 = 51 | CES96 = 78 |
| CES22 = 77 | CES47 = 88 | CES72 = 83 | CES97 = 86 |
| CES23 = 91 | CES48 = 80 | CES73 = 48 | CES98 = 77 |
| CES24 = 90 | CES49 = 83 | CES74 = 92 | CES99 = 65 |
| CES25 = 71 | CES50 = 90 | CES75 = 52 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)