

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: P510648

Luminaire Tested: **CTN-CA6-230-727-U-T3-HSS**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510648  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-16)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: CTN-CA6-230-727-U-T3-HSS  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (6) 2700K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 27211 lumens  
Efficiency: N/A  
Efficacy: 119.5 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type III - Short  
BUG Rating: B3 - U0 - G4

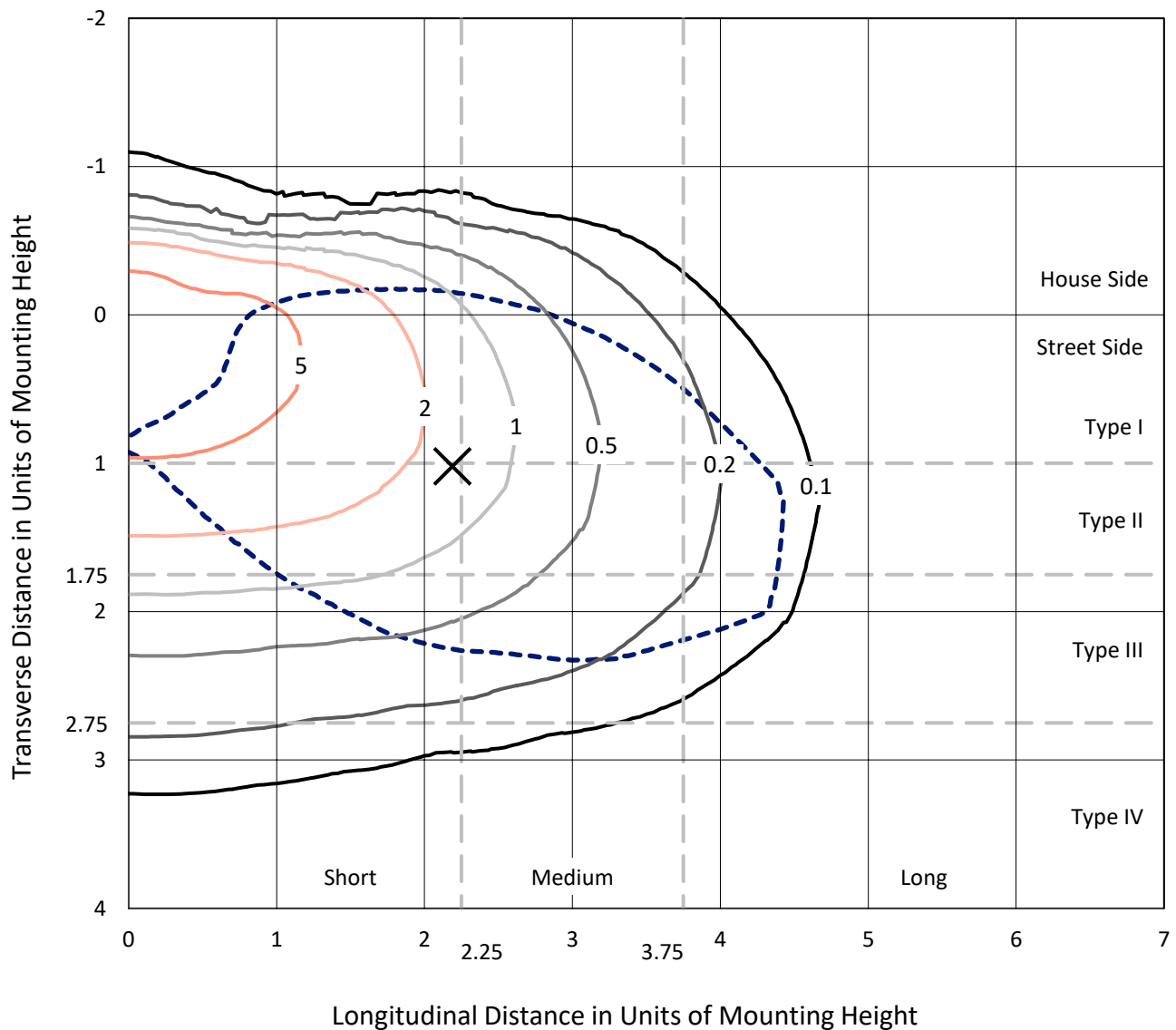
Input Watts (W): 227.8  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

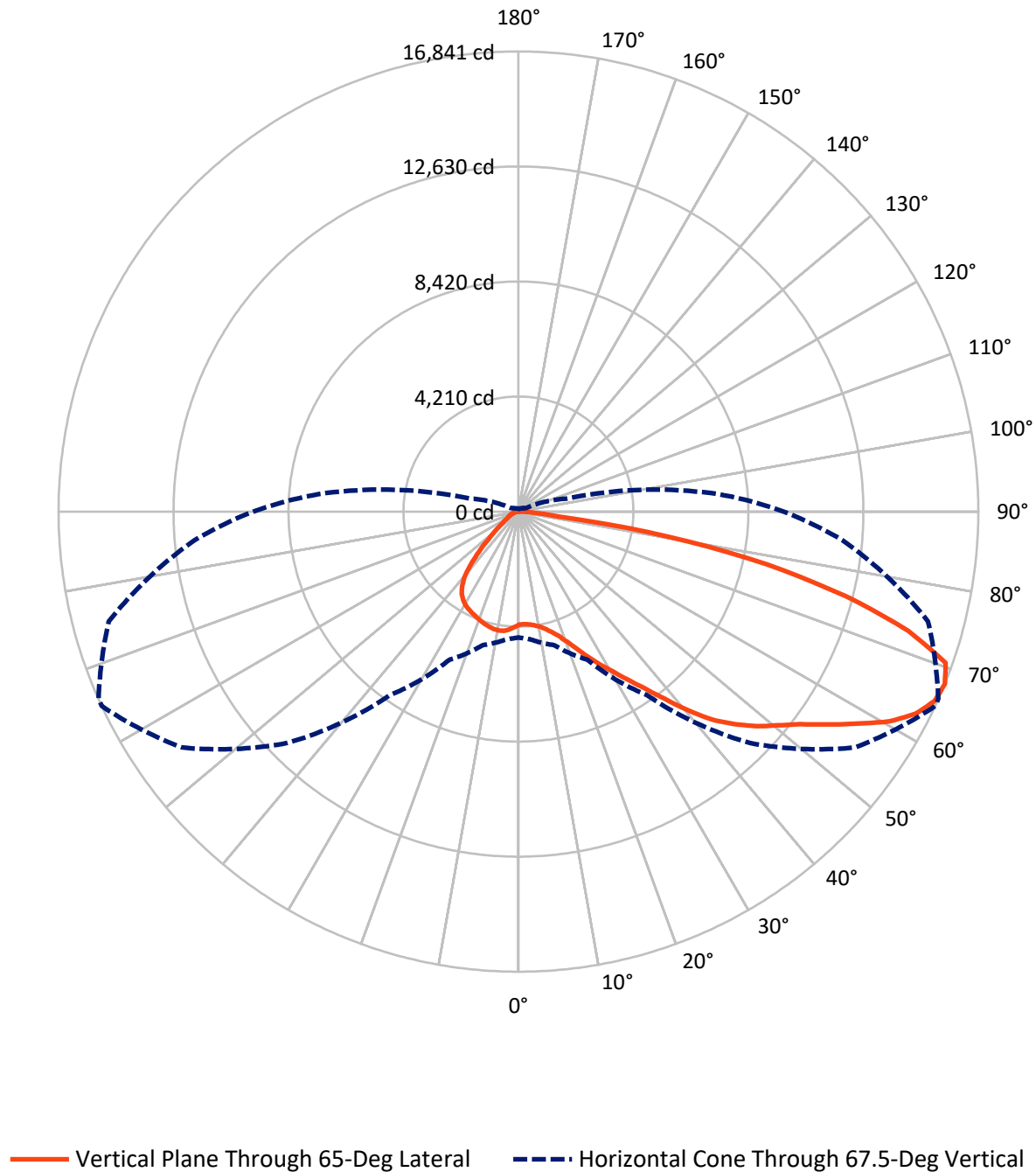
✕ Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 7.8 fc  
 Type III - Short - N/A

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## Luminous Intensity Polar Plot



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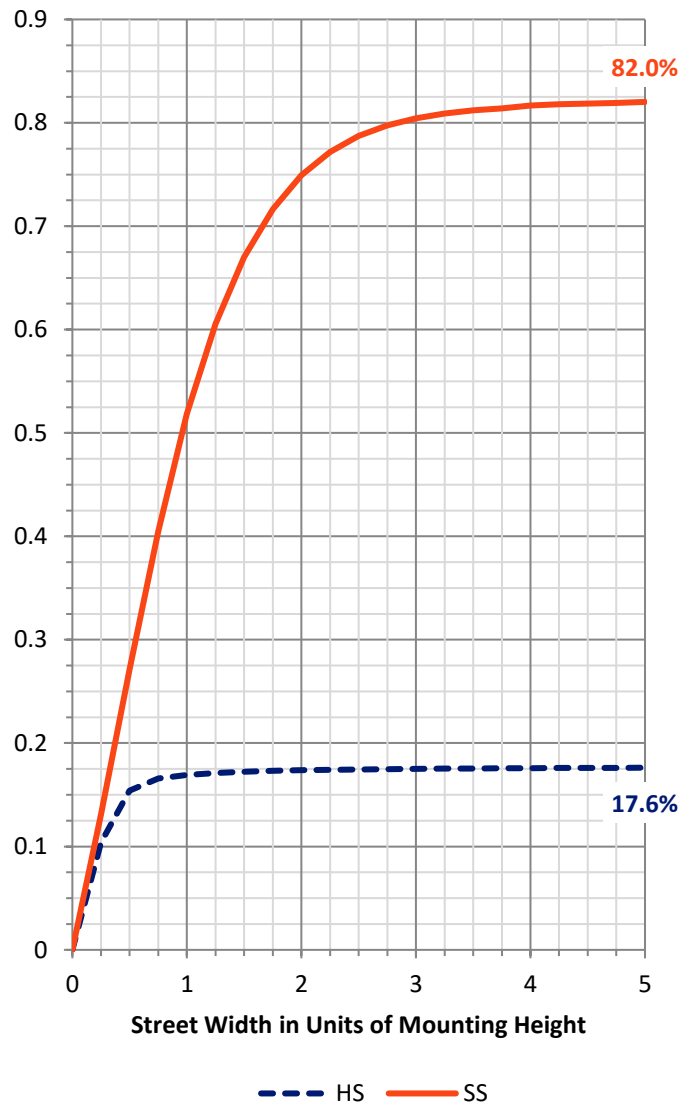
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 4863.3   | 0.0    | 4863.3  |
|                    | % Fixture | 17.9     | 0.0    | 17.9    |
| <b>Street Side</b> | Lumens    | 22347.7  | 0.0    | 22347.7 |
|                    | % Fixture | 82.1     | 0.0    | 82.1    |
| <b>Total</b>       | Lumens    | 27211.0  | 0.0    | 27211.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 409.1   | 1.5       |
| 10°-20°   | 1263.0  | 4.6       |
| 20°-30°   | 2191.0  | 8.1       |
| 30°-40°   | 3305.1  | 12.1      |
| 40°-50°   | 4582.7  | 16.8      |
| 50°-60°   | 5656.8  | 20.8      |
| 60°-70°   | 6027.2  | 22.1      |
| 70°-80°   | 3448.9  | 12.7      |
| 80°-90°   | 327.2   | 1.2       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 27211.0 | 100.0     |
| 0°-180°   | 27211.0 | 100.0     |

**Coefficient of Utilization**



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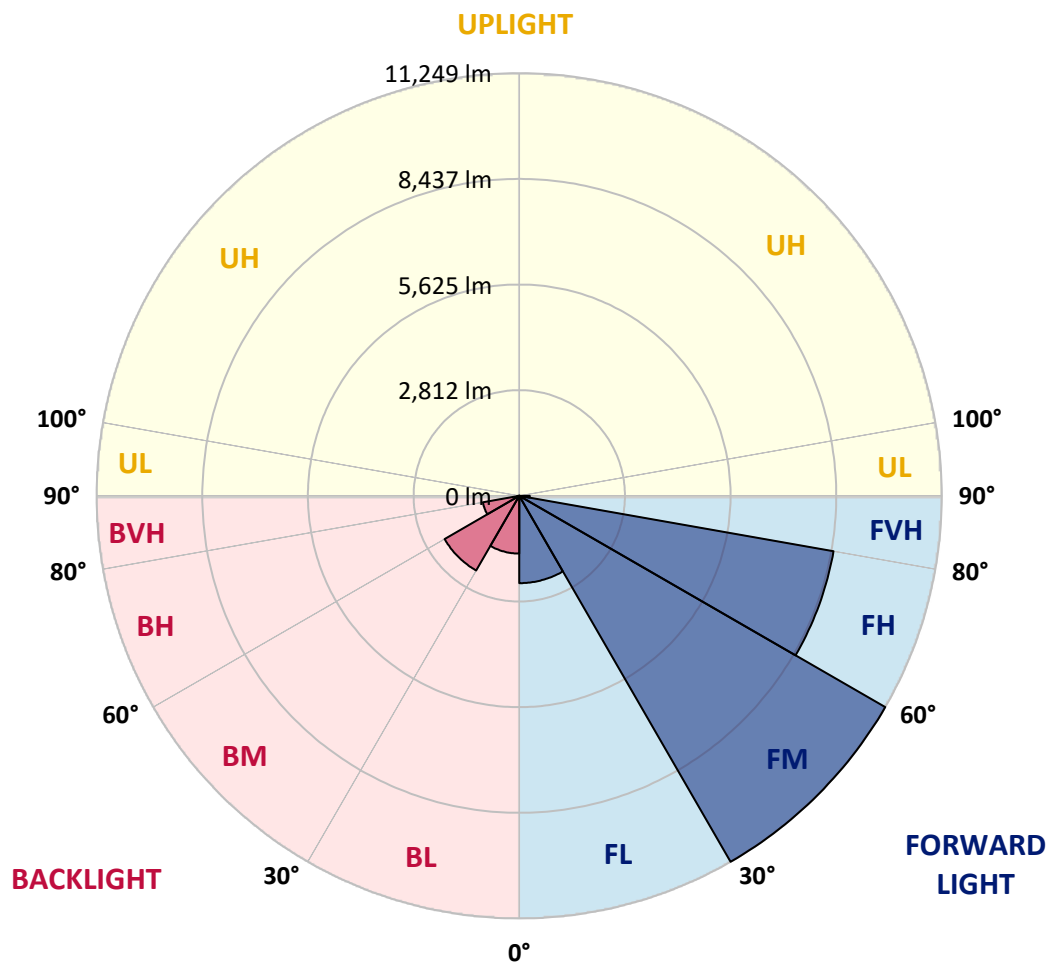
CATALOG NUMBER: CTN-CA6-230-727-U-T3-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|---------|-----------|-------------------------|------|----------|
|      |             |         |           | B                       | U    | G        |
| FL   | (0°-30°)    | 2324.2  | 8.5       |                         |      |          |
| FM   | (30°-60°)   | 11249.4 | 41.3      |                         |      |          |
| FH   | (60°-80°)   | 8494.5  | 31.2      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 279.6   | 1.0       |                         |      | G3/500   |
| BL   | (0°-30°)    | 1538.9  | 5.7       | B3/2500                 |      |          |
| BM   | (30°-60°)   | 2295.2  | 8.4       | B2/2500                 |      |          |
| BH   | (60°-80°)   | 981.6   | 3.6       | B2/1000                 |      | G2/1000  |
| BVH  | (80°-90°)   | 47.6    | 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-G4**

Type III Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°     | 45°     | 55°     | 65°     | 66°     | 75°     | 85°     |
|-------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9  | 4134.9  | 4134.9  | 4134.9  | 4134.9  | 4134.9  | 4134.9  |
| 2.5°  | 4095.0 | 4089.6 | 4084.8 | 4093.2 | 4097.9  | 4105.7  | 4117.0  | 4124.8  | 4127.1  | 4134.3  | 4143.2  |
| 5°    | 4160.5 | 4159.9 | 4153.4 | 4149.8 | 4139.7  | 4136.1  | 4138.5  | 4148.0  | 4148.6  | 4157.5  | 4185.6  |
| 7.5°  | 4289.3 | 4288.1 | 4272.0 | 4264.8 | 4243.4  | 4219.5  | 4201.6  | 4203.4  | 4202.8  | 4211.8  | 4249.3  |
| 10°   | 4483.6 | 4474.0 | 4451.4 | 4429.3 | 4387.6  | 4342.9  | 4310.1  | 4280.3  | 4280.3  | 4293.4  | 4335.2  |
| 12.5° | 4702.9 | 4716.1 | 4685.1 | 4651.7 | 4581.9  | 4501.5  | 4444.2  | 4410.9  | 4407.3  | 4413.8  | 4443.6  |
| 15°   | 4975.3 | 4975.3 | 4954.5 | 4906.8 | 4845.4  | 4733.3  | 4615.3  | 4573.0  | 4567.0  | 4580.7  | 4579.0  |
| 17.5° | 5282.3 | 5291.3 | 5251.9 | 5228.1 | 5133.9  | 5009.9  | 4862.1  | 4788.8  | 4788.8  | 4779.8  | 4738.7  |
| 20°   | 5673.9 | 5625.0 | 5629.2 | 5589.9 | 5520.7  | 5340.7  | 5190.5  | 5083.8  | 5082.6  | 5064.7  | 4949.1  |
| 22.5° | 6099.5 | 6072.7 | 6049.4 | 6014.9 | 5919.5  | 5758.6  | 5549.9  | 5444.4  | 5442.1  | 5397.9  | 5226.3  |
| 25°   | 6519.1 | 6539.4 | 6513.8 | 6450.6 | 6380.9  | 6205.6  | 5975.5  | 5871.8  | 5871.2  | 5797.9  | 5554.7  |
| 27.5° | 6950.7 | 6972.7 | 6964.4 | 6907.2 | 6814.2  | 6677.1  | 6459.5  | 6324.2  | 6315.9  | 6268.2  | 5962.4  |
| 30°   | 7427.5 | 7407.9 | 7433.5 | 7409.1 | 7362.6  | 7139.0  | 6942.3  | 6785.0  | 6805.3  | 6790.9  | 6425.6  |
| 32.5° | 7774.4 | 7787.0 | 7871.0 | 7873.4 | 7824.5  | 7658.8  | 7418.6  | 7322.0  | 7354.2  | 7335.2  | 6994.8  |
| 35°   | 8088.0 | 8108.2 | 8216.7 | 8323.4 | 8359.2  | 8178.0  | 7933.6  | 7927.6  | 7969.4  | 8085.6  | 7779.2  |
| 37.5° | 8357.4 | 8371.7 | 8523.7 | 8662.6 | 8778.2  | 8654.2  | 8476.6  | 8688.2  | 8749.6  | 8987.4  | 8588.7  |
| 40°   | 8518.9 | 8537.4 | 8734.1 | 8929.6 | 9135.9  | 9091.7  | 9075.1  | 9575.8  | 9633.6  | 9842.8  | 9179.4  |
| 42.5° | 8427.7 | 8464.1 | 8791.9 | 9149.6 | 9453.0  | 9541.2  | 9769.5  | 10413.2 | 10479.4 | 10497.3 | 9759.9  |
| 45°   | 8265.0 | 8310.3 | 8676.9 | 9255.7 | 9750.4  | 10033.5 | 10468.1 | 11095.7 | 11132.1 | 11081.4 | 10241.0 |
| 47.5° | 8089.8 | 8138.0 | 8547.5 | 9224.1 | 9989.4  | 10606.3 | 11092.1 | 11738.3 | 11763.9 | 11608.3 | 10725.6 |
| 50°   | 7890.7 | 7935.4 | 8375.9 | 9150.2 | 10169.4 | 11147.0 | 11733.5 | 12293.8 | 12389.8 | 12082.2 | 11102.3 |
| 52.5° | 7648.7 | 7696.4 | 8163.7 | 9034.5 | 10327.4 | 11548.1 | 12299.2 | 12921.5 | 12928.0 | 12674.7 | 11526.7 |
| 55°   | 7335.2 | 7418.0 | 7897.2 | 8834.2 | 10410.2 | 11892.6 | 12792.1 | 13751.8 | 13794.1 | 13549.1 | 11881.9 |
| 57.5° | 6986.5 | 7058.6 | 7576.6 | 8567.2 | 10335.7 | 12154.3 | 13584.9 | 14642.3 | 14636.9 | 14145.2 | 12192.5 |
| 60°   | 6525.7 | 6577.0 | 7158.7 | 8217.9 | 10095.5 | 12470.8 | 14410.4 | 15596.6 | 15587.0 | 14729.3 | 12392.1 |
| 62.5° | 5934.4 | 5985.7 | 6532.9 | 7670.1 | 9742.6  | 12683.0 | 14970.7 | 16311.3 | 16283.8 | 15154.3 | 12453.5 |
| 65°   | 5248.9 | 5340.7 | 5815.8 | 6959.0 | 9118.6  | 12543.5 | 15241.3 | 16732.1 | 16688.0 | 15478.6 | 12306.9 |
| 67.5° | 4606.4 | 4684.5 | 5060.6 | 5980.3 | 8197.7  | 11977.9 | 15050.6 | 16840.6 | 16827.5 | 15525.7 | 11892.6 |
| 70°   | 3696.8 | 3725.4 | 4069.9 | 4857.3 | 6820.7  | 10766.7 | 14391.3 | 16590.2 | 16596.2 | 15091.7 | 11060.5 |
| 72.5° | 2530.3 | 2600.0 | 2753.2 | 3374.9 | 4963.4  | 8562.4  | 12404.1 | 14930.8 | 14932.0 | 13532.4 | 9636.6  |
| 75°   | 1360.8 | 1468.7 | 1647.5 | 1955.7 | 2774.7  | 5494.5  | 9961.4  | 12389.2 | 12412.4 | 11282.9 | 7659.4  |
| 77.5° | 674.7  | 713.5  | 817.2  | 1046.1 | 1272.0  | 2592.3  | 6406.5  | 9299.8  | 9355.2  | 8660.8  | 5223.9  |
| 80°   | 308.8  | 315.3  | 323.1  | 321.3  | 487.0   | 1137.3  | 2750.2  | 5585.1  | 5601.8  | 5151.2  | 2384.8  |
| 82.5° | 241.4  | 240.2  | 243.8  | 221.7  | 222.9   | 438.7   | 951.9   | 1462.7  | 1559.9  | 1227.9  | 756.4   |
| 85°   | 146.0  | 145.4  | 156.8  | 121.6  | 149.6   | 237.2   | 480.4   | 583.5   | 590.7   | 480.4   | 391.6   |
| 87.5° | 55.4   | 53.6   | 49.5   | 43.5   | 50.1    | 66.8    | 166.3   | 214.6   | 209.8   | 149.0   | 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 NUMBER: P510648

CATALOG NUMBER: CTN-CA6-230-727-U-T3-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4134.9  | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9 | 4134.9 |
| 2.5°  | 4151.0  | 4170.1 | 4205.2 | 4232.0 | 4241.0 | 4269.6 | 4297.0 | 4301.8 | 4321.5 | 4329.2 | 4354.8 |
| 5°    | 4202.8  | 4235.0 | 4289.9 | 4326.2 | 4342.3 | 4390.0 | 4421.0 | 4436.5 | 4431.1 | 4434.1 | 4462.7 |
| 7.5°  | 4278.5  | 4308.9 | 4353.0 | 4397.2 | 4404.9 | 4413.3 | 4410.3 | 4407.9 | 4387.0 | 4369.1 | 4396.0 |
| 10°   | 4347.7  | 4376.3 | 4403.7 | 4410.3 | 4370.9 | 4348.9 | 4309.5 | 4279.1 | 4238.6 | 4220.1 | 4241.6 |
| 12.5° | 4444.8  | 4450.8 | 4424.0 | 4388.2 | 4303.6 | 4224.9 | 4161.1 | 4105.7 | 4055.6 | 4021.0 | 4049.7 |
| 15°   | 4547.4  | 4524.1 | 4446.0 | 4341.7 | 4210.6 | 4097.9 | 3993.6 | 3901.2 | 3818.4 | 3798.1 | 3805.9 |
| 17.5° | 4683.3  | 4620.1 | 4462.7 | 4287.5 | 4083.6 | 3908.4 | 3774.3 | 3657.4 | 3549.0 | 3503.7 | 3499.5 |
| 20°   | 4849.0  | 4747.0 | 4496.7 | 4218.9 | 3933.4 | 3700.4 | 3492.9 | 3318.3 | 3168.7 | 3045.9 | 3048.9 |
| 22.5° | 5064.7  | 4916.9 | 4548.0 | 4147.4 | 3767.1 | 3456.6 | 3155.0 | 2858.1 | 2611.9 | 2505.8 | 2479.6 |
| 25°   | 5349.7  | 5129.1 | 4620.7 | 4082.4 | 3581.1 | 3146.6 | 2720.4 | 2301.4 | 2040.9 | 1937.8 | 1926.5 |
| 27.5° | 5704.3  | 5414.0 | 4731.5 | 4010.3 | 3382.1 | 2778.8 | 2166.1 | 1755.4 | 1516.4 | 1407.9 | 1371.5 |
| 30°   | 6107.3  | 5765.1 | 4845.4 | 3935.2 | 3141.3 | 2306.2 | 1651.7 | 1249.3 | 1004.4 | 907.2  | 894.7  |
| 32.5° | 6628.8  | 6209.8 | 5014.7 | 3817.2 | 2789.6 | 1812.6 | 1152.2 | 779.7  | 613.3  | 571.6  | 559.7  |
| 35°   | 7369.7  | 6811.2 | 5223.9 | 3668.2 | 2337.8 | 1266.0 | 714.1  | 456.6  | 367.8  | 346.9  | 342.7  |
| 37.5° | 8060.6  | 7401.3 | 5434.9 | 3420.8 | 1775.1 | 790.4  | 408.3  | 292.7  | 273.0  | 273.6  | 274.8  |
| 40°   | 8608.3  | 7804.8 | 5605.4 | 3095.4 | 1167.7 | 448.8  | 283.7  | 243.2  | 243.8  | 242.0  | 240.8  |
| 42.5° | 9095.9  | 8126.7 | 5682.3 | 2614.3 | 676.5  | 300.4  | 246.2  | 224.1  | 218.8  | 220.5  | 219.4  |
| 45°   | 9499.5  | 8455.2 | 5533.3 | 2073.7 | 398.8  | 269.4  | 232.5  | 208.0  | 202.1  | 211.6  | 212.8  |
| 47.5° | 9923.9  | 8766.9 | 5305.0 | 1562.3 | 323.7  | 256.3  | 219.9  | 196.1  | 193.1  | 205.0  | 206.2  |
| 50°   | 10280.9 | 8992.8 | 4915.7 | 1177.2 | 308.8  | 242.0  | 208.6  | 184.2  | 183.6  | 194.3  | 194.3  |
| 52.5° | 10579.5 | 9129.3 | 4453.8 | 909.0  | 298.6  | 229.5  | 197.3  | 172.9  | 172.9  | 176.4  | 177.0  |
| 55°   | 10789.9 | 9101.9 | 4178.4 | 715.3  | 287.9  | 217.6  | 185.4  | 162.1  | 155.0  | 152.6  | 153.8  |
| 57.5° | 10828.1 | 9029.2 | 3858.9 | 557.9  | 275.4  | 206.2  | 174.6  | 149.6  | 136.5  | 134.7  | 134.1  |
| 60°   | 10803.6 | 8869.4 | 3494.1 | 466.1  | 261.1  | 195.5  | 163.9  | 136.5  | 123.4  | 119.2  | 120.4  |
| 62.5° | 10701.7 | 8586.3 | 3072.7 | 408.9  | 246.8  | 187.2  | 152.0  | 127.6  | 115.6  | 110.3  | 110.3  |
| 65°   | 10394.1 | 8181.0 | 2446.8 | 358.2  | 228.9  | 178.2  | 142.5  | 124.0  | 110.9  | 104.9  | 103.7  |
| 67.5° | 9718.2  | 7339.9 | 1838.9 | 314.1  | 211.6  | 168.7  | 141.3  | 123.4  | 108.5  | 100.1  | 98.9   |
| 70°   | 8811.6  | 6305.2 | 1255.3 | 276.0  | 192.5  | 159.7  | 140.7  | 124.0  | 106.1  | 95.4   | 94.2   |
| 72.5° | 7356.0  | 4970.6 | 723.0  | 240.2  | 173.5  | 151.4  | 138.3  | 124.6  | 101.9  | 88.8   | 87.0   |
| 75°   | 5527.3  | 3486.4 | 424.4  | 206.2  | 155.0  | 138.9  | 131.7  | 121.0  | 95.4   | 81.1   | 79.3   |
| 77.5° | 3324.2  | 1627.8 | 319.5  | 171.1  | 132.9  | 122.2  | 117.4  | 110.9  | 87.0   | 75.1   | 73.3   |
| 80°   | 1219.5  | 618.1  | 250.9  | 137.1  | 105.5  | 106.1  | 101.3  | 97.2   | 79.3   | 69.1   | 68.0   |
| 82.5° | 531.7   | 377.9  | 185.4  | 104.3  | 82.9   | 94.8   | 83.4   | 79.9   | 68.0   | 62.0   | 59.6   |
| 85°   | 322.5   | 225.3  | 119.2  | 70.9   | 57.2   | 64.4   | 58.4   | 61.4   | 52.5   | 48.9   | 47.1   |
| 87.5° | 106.7   | 67.4   | 53.0   | 34.6   | 28.6   | 26.8   | 26.2   | 31.6   | 29.8   | 27.4   | 27.4   |
| 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: SP1-2104-215-5

Luminaire Tested: CST-CA6-230-727-U-T4

Test Date: 04/22/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2104-215-5  
 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-CA6-230-727-U-T4**  
 Description: STREETWORKS HIGH MAST LUMINAIRE

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 2613    | CRI (Ra): | 72.6 |      |       |
| CIE u':                   | 0.2668  | R1:       | 69.4 | R9:  | -28.6 |
| CIE v':                   | 0.5272  | R2:       | 84.5 | R10: | 65.5  |
| Duv:                      | -0.0012 | R3:       | 95.0 | R11: | 63.4  |
| CIE x:                    | 0.4648  | R4:       | 67.5 | R12: | 56.9  |
| CIE y:                    | 0.4082  | R5:       | 68.5 | R13: | 72.3  |
| CIE z:                    | 0.1270  | R6:       | 79.7 | R14: | 97.8  |
| Peak Wavelength (nm):     | 603     | R7:       | 75.4 |      |       |
| Dominant Wavelength (nm): | 585     | R8:       | 41.2 |      |       |
| Purity:                   | 62.2    |           |      |      |       |
| Rf:                       | 75.3    |           |      |      |       |
| Rg:                       | 95.8    |           |      |      |       |



### Test Conditions

Stabilization Time: 121M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.5/25%  
 Sphere Temperature (°C): 24.8

REPORT NUMBER: SP1-2104-215-5

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 1/31/2021        | 7/31/2021            |
| Power Meter                    | IN0071                | 12/1/2020        | 12/1/2021            |
| AC Power Source                | IN0063                | 12/1/2020        | 12/1/2021            |
| DC Power Source                | IN0208                | 12/1/2020        | 12/1/2021            |
| Sphere Thermometer             | IN0085                | 12/1/2020        | 12/1/2021            |
| Room Thermometer               | IN0046                | 12/1/2020        | 12/1/2021            |

REPORT NUMBER: SP1-2104-215-5

**CIE 1931 Chromaticity Diagram**



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



Point lies inside the ANSI 2700K 7-step quadrangle

REPORT NUMBER: SP1-2104-215-5

### Photopic Flux vs. Wavelength



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| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 11220            | 0.0              | 490       | 69401            | 9.9              | 620       | 692536           | 180.2            | 750       | 31541            | 0.0              | 880       | 18253            | 0.0              |
| 365       | 10182            | 0.0              | 495       | 90053            | 16.3             | 625       | 651217           | 143.7            | 755       | 28760            | 0.0              | 885       | 21369            | 0.0              |
| 370       | 10420            | 0.0              | 500       | 121940           | 26.9             | 630       | 598624           | 108.3            | 760       | 26534            | 0.0              | 890       | 16745            | 0.0              |
| 375       | 12164            | 0.0              | 505       | 159641           | 44.7             | 635       | 546251           | 82.1             | 765       | 24261            | 0.0              | 895       | 14205            | 0.0              |
| 380       | 12715            | 0.0              | 510       | 197034           | 67.7             | 640       | 499000           | 59.6             | 770       | 21584            | 0.0              | 900       | 14113            | 0.0              |
| 385       | 11387            | 0.0              | 515       | 232805           | 96.4             | 645       | 451749           | 43.5             | 775       | 20805            | 0.0              | 905       | 13457            | 0.0              |
| 390       | 10503            | 0.0              | 520       | 263165           | 127.6            | 650       | 406338           | 29.7             | 780       | 17853            | 0.0              | 910       | 12811            | 0.0              |
| 395       | 8950             | 0.0              | 525       | 288012           | 154.6            | 655       | 360522           | 20.7             | 785       | 17033            | 0.0              | 915       | 17471            | 0.0              |
| 400       | 8271             | 0.0              | 530       | 310825           | 183.0            | 660       | 321663           | 13.4             | 790       | 16986            | 0.0              | 920       | 15483            | 0.0              |
| 405       | 7777             | 0.0              | 535       | 330894           | 205.2            | 665       | 283133           | 9.0              | 795       | 16655            | 0.0              | 925       | 19757            | 0.0              |
| 410       | 9299             | 0.0              | 540       | 349086           | 227.5            | 670       | 244093           | 5.3              | 800       | 15070            | 0.0              | 930       | 16307            | 0.0              |
| 415       | 13971            | 0.0              | 545       | 372506           | 247.9            | 675       | 210996           | 3.5              | 805       | 15366            | 0.0              | 935       | 18687            | 0.0              |
| 420       | 23461            | 0.1              | 550       | 403721           | 274.3            | 680       | 183942           | 2.1              | 810       | 15472            | 0.0              | 940       | 17986            | 0.0              |
| 425       | 41887            | 0.2              | 555       | 442032           | 301.9            | 685       | 158373           | 1.4              | 815       | 17184            | 0.0              | 945       | 15266            | 0.0              |
| 430       | 69840            | 0.6              | 560       | 485515           | 329.9            | 690       | 137120           | 0.8              | 820       | 14166            | 0.0              | 950       | 21027            | 0.0              |
| 435       | 106868           | 1.3              | 565       | 532962           | 354.4            | 695       | 116757           | 0.5              | 825       | 13854            | 0.0              | 955       | 19232            | 0.0              |
| 440       | 164642           | 2.6              | 570       | 582457           | 378.7            | 700       | 102093           | 0.3              | 830       | 14283            | 0.0              | 960       | 11261            | 0.0              |
| 445       | 256049           | 5.3              | 575       | 634550           | 394.8            | 705       | 87819            | 0.2              | 835       | 14112            | 0.0              | 965       | 20156            | 0.0              |
| 450       | 327314           | 8.5              | 580       | 686476           | 407.9            | 710       | 78011            | 0.1              | 840       | 13092            | 0.0              | 970       | 22393            | 0.0              |
| 455       | 265614           | 8.9              | 585       | 730571           | 405.9            | 715       | 70264            | 0.1              | 845       | 12158            | 0.0              | 975       | 20121            | 0.0              |
| 460       | 168394           | 6.9              | 590       | 768228           | 397.2            | 720       | 63584            | 0.0              | 850       | 14790            | 0.0              | 980       | 28091            | 0.0              |
| 465       | 127370           | 6.6              | 595       | 780593           | 370.0            | 725       | 55749            | 0.0              | 855       | 15683            | 0.0              | 985       | 27040            | 0.0              |
| 470       | 94724            | 5.9              | 600       | 791888           | 341.3            | 730       | 48683            | 0.0              | 860       | 19011            | 0.0              | 990       | 20772            | 0.0              |
| 475       | 67810            | 5.3              | 605       | 789088           | 305.6            | 735       | 42520            | 0.0              | 865       | 18194            | 0.0              | 995       | 26800            | 0.0              |
| 480       | 59825            | 5.7              | 610       | 765121           | 262.9            | 740       | 37531            | 0.0              | 870       | 15713            | 0.0              | 1000      | 28539            | 0.0              |
| 485       | 61079            | 7.2              | 615       | 735839           | 222.1            | 745       | 34522            | 0.0              | 875       | 19703            | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



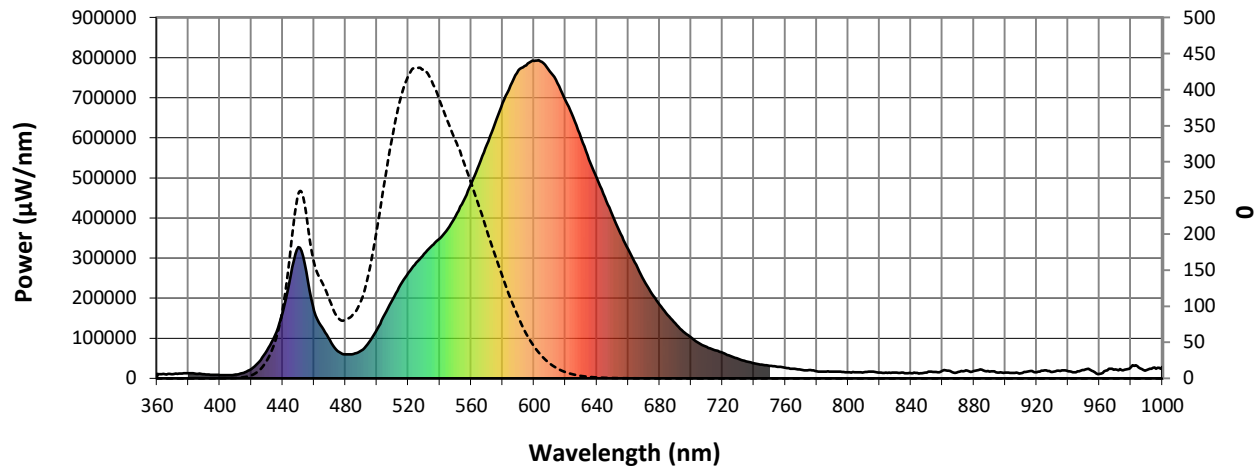
Scotopic Lumens: 37163.1

S/P: 1.07

| 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       | 11220            | 0.0              | 490       | 69401            | 106.9            | 620       | 692536           | 8.7              | 750       | 31541            | 0.0              | 880       | 18253            | 0.0              |
| 365       | 10182            | 0.0              | 495       | 90053            | 145.6            | 625       | 651217           | 5.5              | 755       | 28760            | 0.0              | 885       | 21369            | 0.0              |
| 370       | 10420            | 0.0              | 500       | 121940           | 204.0            | 630       | 598624           | 3.4              | 760       | 26534            | 0.0              | 890       | 16745            | 0.0              |
| 375       | 12164            | 0.0              | 505       | 159641           | 271.4            | 635       | 546251           | 2.1              | 765       | 24261            | 0.0              | 895       | 14205            | 0.0              |
| 380       | 12715            | 0.0              | 510       | 197034           | 334.0            | 640       | 499000           | 1.3              | 770       | 21584            | 0.0              | 900       | 14113            | 0.0              |
| 385       | 11387            | 0.0              | 515       | 232805           | 385.9            | 645       | 451749           | 0.8              | 775       | 20805            | 0.0              | 905       | 13457            | 0.0              |
| 390       | 10503            | 0.0              | 520       | 263165           | 418.3            | 650       | 406338           | 0.5              | 780       | 17853            | 0.0              | 910       | 12811            | 0.0              |
| 395       | 8950             | 0.1              | 525       | 288012           | 430.9            | 655       | 360522           | 0.3              | 785       | 17033            | 0.0              | 915       | 17471            | 0.0              |
| 400       | 8271             | 0.1              | 530       | 310825           | 428.5            | 660       | 321663           | 0.2              | 790       | 16986            | 0.0              | 920       | 15483            | 0.0              |
| 405       | 7777             | 0.2              | 535       | 330894           | 412.3            | 665       | 283133           | 0.1              | 795       | 16655            | 0.0              | 925       | 19757            | 0.0              |
| 410       | 9299             | 0.6              | 540       | 349086           | 385.7            | 670       | 244093           | 0.1              | 800       | 15070            | 0.0              | 930       | 16307            | 0.0              |
| 415       | 13971            | 1.4              | 545       | 372506           | 357.2            | 675       | 210996           | 0.0              | 805       | 15366            | 0.0              | 935       | 18687            | 0.0              |
| 420       | 23461            | 3.9              | 550       | 403721           | 330.1            | 680       | 183942           | 0.0              | 810       | 15472            | 0.0              | 940       | 17986            | 0.0              |
| 425       | 41887            | 10.2             | 555       | 442032           | 302.1            | 685       | 158373           | 0.0              | 815       | 17184            | 0.0              | 945       | 15266            | 0.0              |
| 430       | 69840            | 23.8             | 560       | 485515           | 271.4            | 690       | 137120           | 0.0              | 820       | 14166            | 0.0              | 950       | 21027            | 0.0              |
| 435       | 106868           | 47.8             | 565       | 532962           | 239.1            | 695       | 116757           | 0.0              | 825       | 13854            | 0.0              | 955       | 19232            | 0.0              |
| 440       | 164642           | 92.0             | 570       | 582457           | 205.6            | 700       | 102093           | 0.0              | 830       | 14283            | 0.0              | 960       | 11261            | 0.0              |
| 445       | 256049           | 171.5            | 575       | 634550           | 172.8            | 705       | 87819            | 0.0              | 835       | 14112            | 0.0              | 965       | 20156            | 0.0              |
| 450       | 327314           | 253.7            | 580       | 686476           | 141.4            | 710       | 78011            | 0.0              | 840       | 13092            | 0.0              | 970       | 22393            | 0.0              |
| 455       | 265614           | 232.1            | 585       | 730571           | 111.7            | 715       | 70264            | 0.0              | 845       | 12158            | 0.0              | 975       | 20121            | 0.0              |
| 460       | 168394           | 162.6            | 590       | 768228           | 85.5             | 720       | 63584            | 0.0              | 850       | 14790            | 0.0              | 980       | 28091            | 0.0              |
| 465       | 127370           | 134.5            | 595       | 780593           | 62.2             | 725       | 55749            | 0.0              | 855       | 15683            | 0.0              | 985       | 27040            | 0.0              |
| 470       | 94724            | 109.1            | 600       | 791888           | 44.6             | 730       | 48683            | 0.0              | 860       | 19011            | 0.0              | 990       | 20772            | 0.0              |
| 475       | 67810            | 84.8             | 605       | 789088           | 31.0             | 735       | 42520            | 0.0              | 865       | 18194            | 0.0              | 995       | 26800            | 0.0              |
| 480       | 59825            | 80.8             | 610       | 765121           | 20.7             | 740       | 37531            | 0.0              | 870       | 15713            | 0.0              | 1000      | 28539            | 0.0              |
| 485       | 61079            | 88.5             | 615       | 735839           | 13.6             | 745       | 34522            | 0.0              | 875       | 19703            | 0.0              |           |                  |                  |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 13012.4**      **M/P: 0.38**

| 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       | 11220            | 0.0              | 490       | 69401            | 57.8             | 620       | 692536           | 0.5              | 750       | 31541            | 0.0              | 880       | 18253            | 0.0              |
| 365       | 10182            | 0.0              | 495       | 90053            | 74.3             | 625       | 651217           | 0.3              | 755       | 28760            | 0.0              | 885       | 21369            | 0.0              |
| 370       | 10420            | 0.0              | 500       | 121940           | 98.0             | 630       | 598624           | 0.2              | 760       | 26534            | 0.0              | 890       | 16745            | 0.0              |
| 375       | 12164            | 0.0              | 505       | 159641           | 122.5            | 635       | 546251           | 0.1              | 765       | 24261            | 0.0              | 895       | 14205            | 0.0              |
| 380       | 12715            | 0.0              | 510       | 197034           | 141.5            | 640       | 499000           | 0.1              | 770       | 21584            | 0.0              | 900       | 14113            | 0.0              |
| 385       | 11387            | 0.0              | 515       | 232805           | 152.1            | 645       | 451749           | 0.0              | 775       | 20805            | 0.0              | 905       | 13457            | 0.0              |
| 390       | 10503            | 0.0              | 520       | 263165           | 153.2            | 650       | 406338           | 0.0              | 780       | 17853            | 0.0              | 910       | 12811            | 0.0              |
| 395       | 8950             | 0.0              | 525       | 288012           | 146.1            | 655       | 360522           | 0.0              | 785       | 17033            | 0.0              | 915       | 17471            | 0.0              |
| 400       | 8271             | 0.1              | 530       | 310825           | 134.3            | 660       | 321663           | 0.0              | 790       | 16986            | 0.0              | 920       | 15483            | 0.0              |
| 405       | 7777             | 0.1              | 535       | 330894           | 119.1            | 665       | 283133           | 0.0              | 795       | 16655            | 0.0              | 925       | 19757            | 0.0              |
| 410       | 9299             | 0.4              | 540       | 349086           | 102.2            | 670       | 244093           | 0.0              | 800       | 15070            | 0.0              | 930       | 16307            | 0.0              |
| 415       | 13971            | 0.9              | 545       | 372506           | 86.5             | 675       | 210996           | 0.0              | 805       | 15366            | 0.0              | 935       | 18687            | 0.0              |
| 420       | 23461            | 2.7              | 550       | 403721           | 72.5             | 680       | 183942           | 0.0              | 810       | 15472            | 0.0              | 940       | 17986            | 0.0              |
| 425       | 41887            | 6.5              | 555       | 442032           | 59.6             | 685       | 158373           | 0.0              | 815       | 17184            | 0.0              | 945       | 15266            | 0.0              |
| 430       | 69840            | 14.8             | 560       | 485515           | 47.9             | 690       | 137120           | 0.0              | 820       | 14166            | 0.0              | 950       | 21027            | 0.0              |
| 435       | 106868           | 28.5             | 565       | 532962           | 37.4             | 695       | 116757           | 0.0              | 825       | 13854            | 0.0              | 955       | 19232            | 0.0              |
| 440       | 164642           | 55.0             | 570       | 582457           | 28.5             | 700       | 102093           | 0.0              | 830       | 14283            | 0.0              | 960       | 11261            | 0.0              |
| 445       | 256049           | 101.0            | 575       | 634550           | 21.1             | 705       | 87819            | 0.0              | 835       | 14112            | 0.0              | 965       | 20156            | 0.0              |
| 450       | 327314           | 150.8            | 580       | 686476           | 15.4             | 710       | 78011            | 0.0              | 840       | 13092            | 0.0              | 970       | 22393            | 0.0              |
| 455       | 265614           | 139.2            | 585       | 730571           | 10.9             | 715       | 70264            | 0.0              | 845       | 12158            | 0.0              | 975       | 20121            | 0.0              |
| 460       | 168394           | 99.2             | 590       | 768228           | 7.5              | 720       | 63584            | 0.0              | 850       | 14790            | 0.0              | 980       | 28091            | 0.0              |
| 465       | 127370           | 83.2             | 595       | 780593           | 5.0              | 725       | 55749            | 0.0              | 855       | 15683            | 0.0              | 985       | 27040            | 0.0              |
| 470       | 94724            | 67.8             | 600       | 791888           | 3.3              | 730       | 48683            | 0.0              | 860       | 19011            | 0.0              | 990       | 20772            | 0.0              |
| 475       | 67810            | 51.8             | 605       | 789088           | 2.2              | 735       | 42520            | 0.0              | 865       | 18194            | 0.0              | 995       | 26800            | 0.0              |
| 480       | 59825            | 48.1             | 610       | 765121           | 1.4              | 740       | 37531            | 0.0              | 870       | 15713            | 0.0              | 1000      | 28539            | 0.0              |
| 485       | 61079            | 50.3             | 615       | 735839           | 0.9              | 745       | 34522            | 0.0              | 875       | 19703            | 0.0              |           |                  |                  |

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TM-30-18

### Summary

$R_f = 75.3$   
 $R_g = 95.8$   
 CIE  $R_a = 72.6$   
 $R_g = -28.6$

### Spectral Power Distribution Comparison



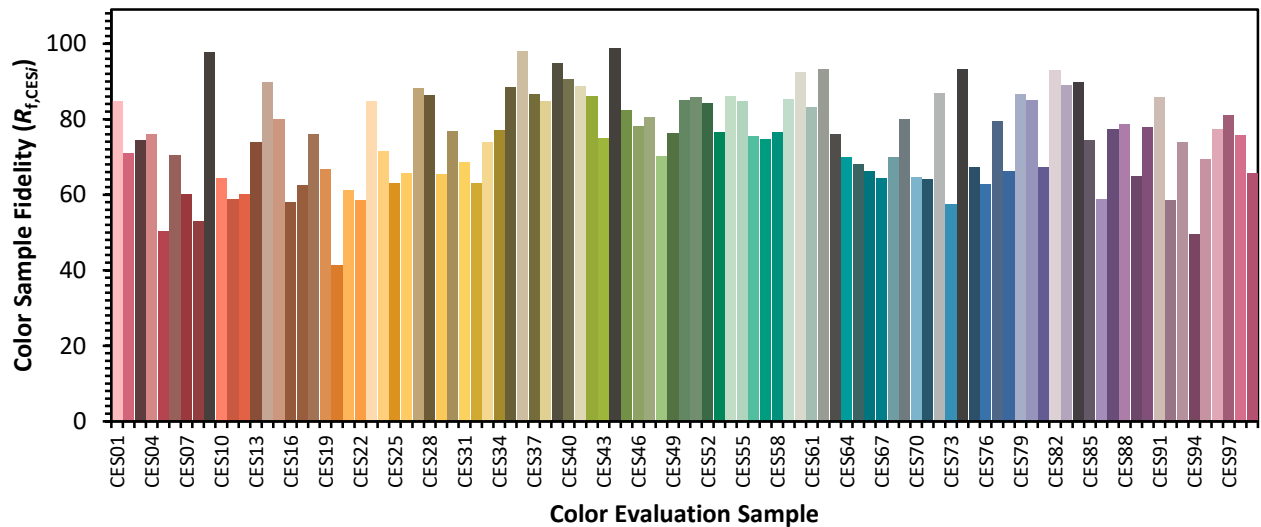
### Color Vector Graphics





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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 66 | CES51 = 86 | CES76 = 63 |
| CES02 = 64 | CES27 = 88 | CES52 = 84 | CES77 = 79 |
| CES03 = 31 | CES28 = 86 | CES53 = 77 | CES78 = 66 |
| CES04 = 71 | CES29 = 65 | CES54 = 86 | CES79 = 87 |
| CES05 = 50 | CES30 = 77 | CES55 = 85 | CES80 = 85 |
| CES06 = 52 | CES31 = 69 | CES56 = 75 | CES81 = 67 |
| CES07 = 42 | CES32 = 63 | CES57 = 75 | CES82 = 93 |
| CES08 = 41 | CES33 = 74 | CES58 = 77 | CES83 = 89 |
| CES09 = 29 | CES34 = 77 | CES59 = 85 | CES84 = 90 |
| CES10 = 77 | CES35 = 88 | CES60 = 92 | CES85 = 74 |
| CES11 = 60 | CES36 = 98 | CES61 = 83 | CES86 = 59 |
| CES12 = 66 | CES37 = 86 | CES62 = 93 | CES87 = 77 |
| CES13 = 44 | CES38 = 85 | CES63 = 76 | CES88 = 79 |
| CES14 = 74 | CES39 = 95 | CES64 = 70 | CES89 = 65 |
| CES15 = 72 | CES40 = 91 | CES65 = 68 | CES90 = 78 |
| CES16 = 48 | CES41 = 89 | CES66 = 66 | CES91 = 86 |
| CES17 = 51 | CES42 = 86 | CES67 = 64 | CES92 = 59 |
| CES18 = 57 | CES43 = 75 | CES68 = 70 | CES93 = 74 |
| CES19 = 73 | CES44 = 99 | CES69 = 80 | CES94 = 50 |
| CES20 = 67 | CES45 = 83 | CES70 = 65 | CES95 = 69 |
| CES21 = 88 | CES46 = 78 | CES71 = 64 | CES96 = 77 |
| CES22 = 80 | CES47 = 80 | CES72 = 87 | CES97 = 81 |
| CES23 = 92 | CES48 = 70 | CES73 = 58 | CES98 = 76 |
| CES24 = 91 | CES49 = 76 | CES74 = 93 | CES99 = 66 |
| CES25 = 73 | CES50 = 85 | CES75 = 67 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)