

Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: STREETWORKS

Report Number: P510739

Luminaire Tested: **CST-CA8-230-750-U-T3**

Issue Date: 4/6/2021

**Test Information**

Test Method: LM-79-08  
Report Number: P510739  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2102-151-11)  
Test Lab: COOPER LIGHTING SOLUTIONS  
Issue Date: 4/6/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: STREETWORKS  
Catalog Number: CST-CA8-230-750-U-T3  
Description: CELESTEON HIGH MAST LUMINAIRE  
Light Source: (8) 5000K CCT, 70 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 36577 lumens  
Efficiency: N/A  
Efficacy: 160.1 lumens/watt  
Luminous Opening: Circular (Dia: 2.08' x H: 0')  
IES Classification: Type III - Short  
BUG Rating: B3 - U0 - G4

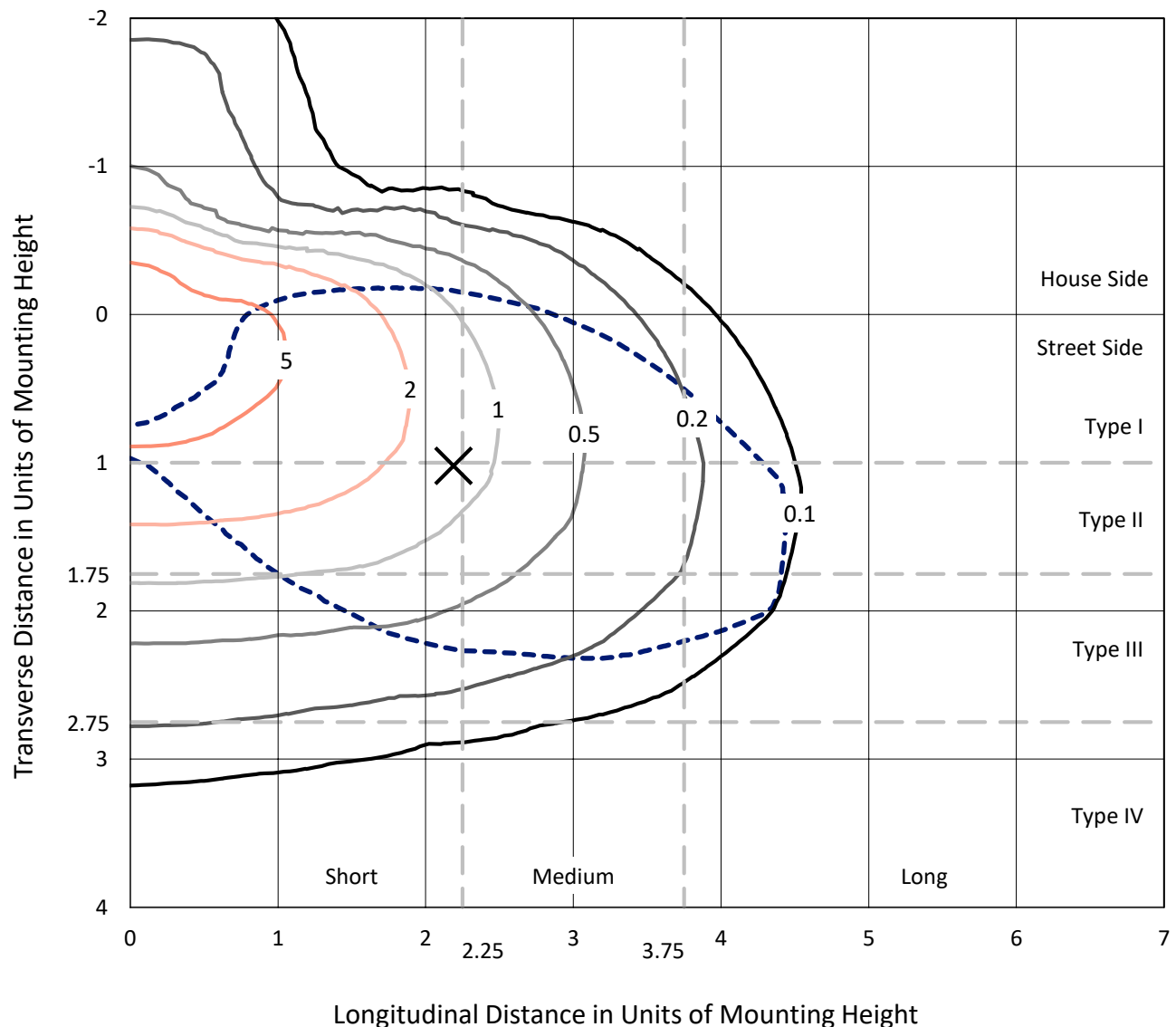
Input Watts (W): 228.4  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



REPORT NUMBER: P510739  
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## Iso-Footcandle Lines of Horizontal Illumination

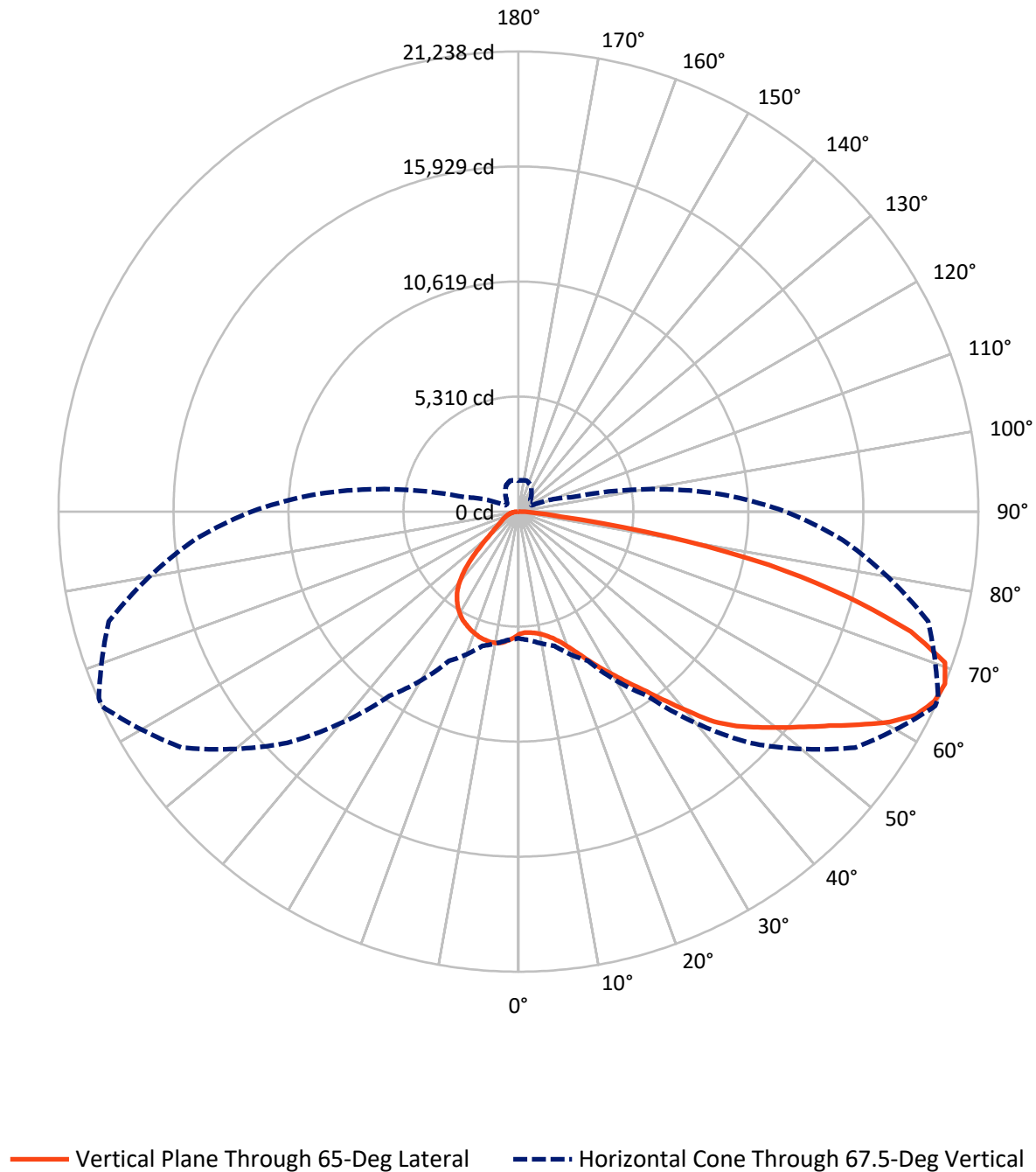
✕ Max cd  
 - - - 1/2 Max cd



Based on 30 foot mounting height. Maximum calculated value = 7 fc  
 Type III - Short - N/A

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## Luminous Intensity Polar Plot



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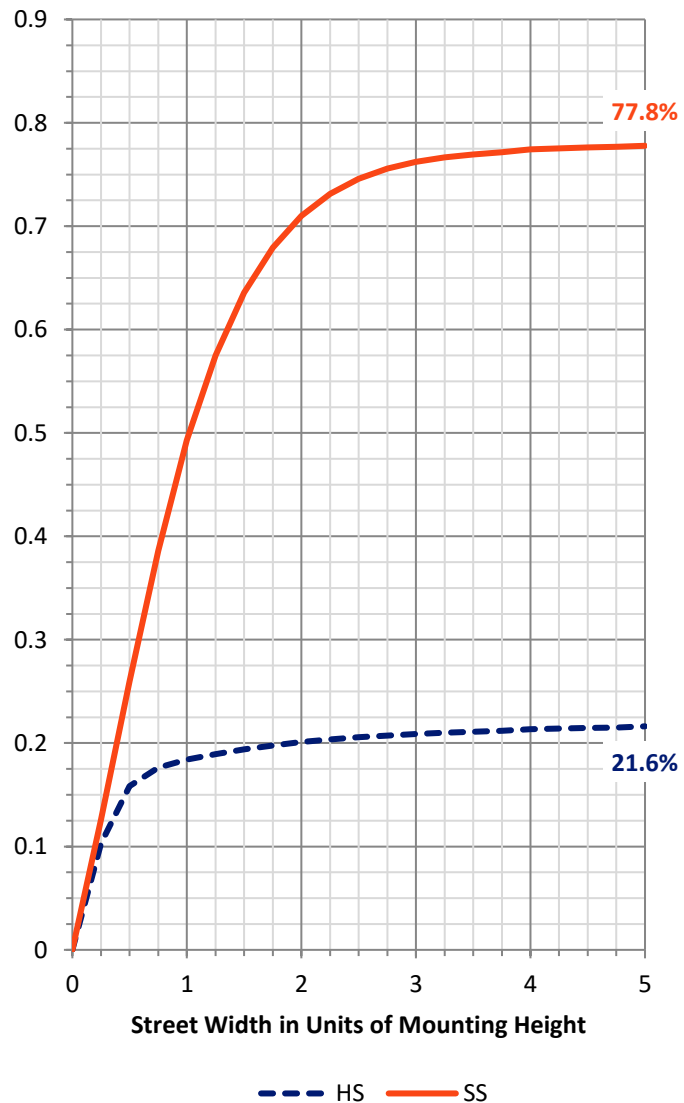
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 8079.4   | 0.0    | 8079.4  |
|                    | % Fixture | 22.1     | 0.0    | 22.1    |
| <b>Street Side</b> | Lumens    | 28497.6  | 0.0    | 28497.6 |
|                    | % Fixture | 77.9     | 0.0    | 77.9    |
| <b>Total</b>       | Lumens    | 36577.0  | 0.0    | 36577.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 562.9   | 1.5       |
| 10°-20°   | 1758.7  | 4.8       |
| 20°-30°   | 3044.6  | 8.3       |
| 30°-40°   | 4473.7  | 12.2      |
| 40°-50°   | 6046.8  | 16.5      |
| 50°-60°   | 7435.7  | 20.3      |
| 60°-70°   | 7967.8  | 21.8      |
| 70°-80°   | 4699.3  | 12.8      |
| 80°-90°   | 587.4   | 1.6       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 36577.0 | 100.0     |
| 0°-180°   | 36577.0 | 100.0     |

**Coefficient of Utilization**



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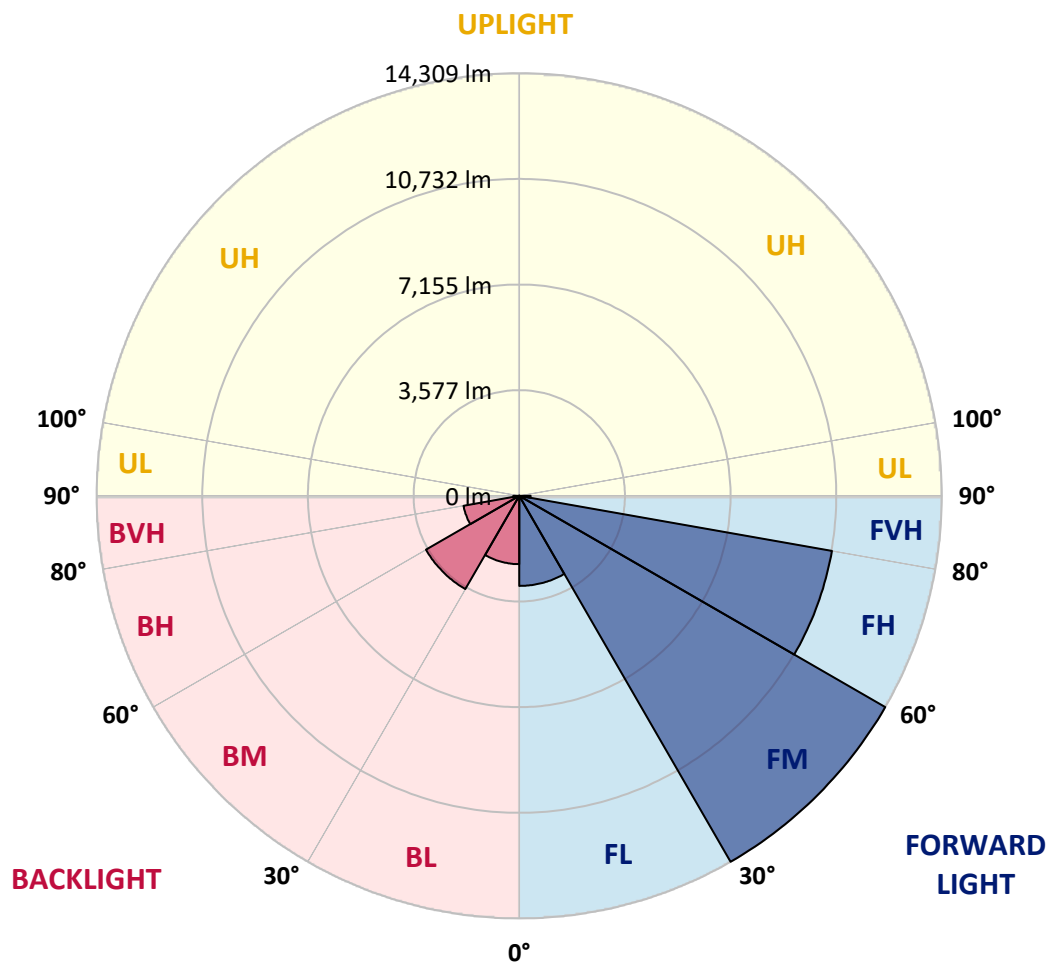
CATALOG NUMBER: CST-CA8-230-750-U-T3

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|---------|-----------|-------------------------|------|----------|
|      |             |         |           | B                       | U    | G        |
| FL   | (0°-30°)    | 3052.1  | 8.3       |                         |      |          |
| FM   | (30°-60°)   | 14309.2 | 39.1      |                         |      |          |
| FH   | (60°-80°)   | 10751.2 | 29.4      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 385.2   | 1.1       |                         |      | G3/500   |
| BL   | (0°-30°)    | 2314.2  | 6.3       | B3/2500                 |      |          |
| BM   | (30°-60°)   | 3647.0  | 10.0      | B3/5000                 |      |          |
| BH   | (60°-80°)   | 1916.0  | 5.2       | B3/2500                 |      | G3/2500  |
| BVH  | (80°-90°)   | 202.2   | 0.6       |                         |      | G2/225   |
| UL   | (90°-100°)  | 0.0     | 0.0       |                         | U0/0 |          |
| UH   | (100°-180°) | 0.0     | 0.0       |                         | U0/0 |          |

**BUG Rating: B3-U0-G4**

Type III Short



FIELD PERFORMANCE MAY DIFFER FROM LABORATORY PERFORMANCE

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 65°     | 66°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  | 5649.8  |
| 2.5°  | 5543.1  | 5532.7  | 5528.2  | 5542.4  | 5552.8  | 5564.7  | 5581.9  | 5598.3  | 5600.5  | 5622.2  | 5650.5  |
| 5°    | 5610.2  | 5601.3  | 5591.6  | 5589.4  | 5585.6  | 5584.9  | 5589.4  | 5608.0  | 5612.5  | 5633.4  | 5694.5  |
| 7.5°  | 5759.4  | 5750.4  | 5732.5  | 5725.8  | 5705.7  | 5669.9  | 5652.7  | 5662.4  | 5664.7  | 5690.0  | 5766.1  |
| 10°   | 6002.5  | 5974.9  | 5953.3  | 5930.9  | 5867.5  | 5810.8  | 5769.1  | 5751.2  | 5747.5  | 5772.1  | 5860.1  |
| 12.5° | 6292.6  | 6269.5  | 6245.6  | 6186.7  | 6106.2  | 6004.0  | 5930.2  | 5889.1  | 5886.2  | 5907.0  | 5973.4  |
| 15°   | 6599.1  | 6599.1  | 6582.7  | 6512.6  | 6433.5  | 6264.3  | 6150.2  | 6081.5  | 6086.0  | 6102.4  | 6133.0  |
| 17.5° | 6995.1  | 6962.3  | 6954.8  | 6875.0  | 6787.0  | 6632.7  | 6451.4  | 6341.8  | 6347.0  | 6354.5  | 6331.4  |
| 20°   | 7397.8  | 7388.1  | 7376.9  | 7324.0  | 7244.2  | 7045.8  | 6842.2  | 6698.3  | 6699.0  | 6672.2  | 6569.3  |
| 22.5° | 7930.2  | 7898.2  | 7906.4  | 7846.7  | 7738.6  | 7535.0  | 7300.8  | 7130.1  | 7141.2  | 7102.5  | 6916.0  |
| 25°   | 8459.0  | 8426.9  | 8409.8  | 8369.5  | 8276.3  | 8083.1  | 7805.0  | 7648.4  | 7634.9  | 7564.8  | 7294.1  |
| 27.5° | 8987.0  | 8968.3  | 8982.5  | 8934.0  | 8858.0  | 8642.4  | 8387.4  | 8213.6  | 8222.6  | 8174.1  | 7770.7  |
| 30°   | 9533.6  | 9512.7  | 9574.6  | 9496.3  | 9449.3  | 9239.8  | 8995.2  | 8790.8  | 8798.3  | 8816.2  | 8363.5  |
| 32.5° | 9946.0  | 9970.6  | 10078.7 | 10069.8 | 10060.8 | 9827.4  | 9570.1  | 9456.8  | 9468.0  | 9530.6  | 9067.5  |
| 35°   | 10344.2 | 10346.5 | 10498.6 | 10613.4 | 10661.9 | 10466.5 | 10199.5 | 10195.8 | 10268.9 | 10459.8 | 10048.9 |
| 37.5° | 10674.6 | 10667.1 | 10870.0 | 11048.2 | 11180.9 | 11029.6 | 10882.6 | 11111.6 | 11178.0 | 11574.0 | 11037.0 |
| 40°   | 10855.1 | 10870.7 | 11131.7 | 11354.0 | 11615.0 | 11543.4 | 11559.0 | 12144.4 | 12307.8 | 12654.5 | 11776.1 |
| 42.5° | 10728.3 | 10776.0 | 11182.4 | 11635.9 | 12029.6 | 12125.1 | 12439.8 | 13260.1 | 13329.4 | 13392.1 | 12503.2 |
| 45°   | 10515.7 | 10565.7 | 11016.1 | 11748.5 | 12371.9 | 12775.3 | 13316.0 | 14118.4 | 14194.5 | 14124.4 | 13108.0 |
| 47.5° | 10294.3 | 10345.7 | 10847.6 | 11703.0 | 12655.3 | 13428.6 | 14095.3 | 14877.6 | 14974.5 | 14757.5 | 13689.6 |
| 50°   | 10013.1 | 10092.9 | 10641.8 | 11606.8 | 12885.0 | 14133.3 | 14832.9 | 15659.1 | 15703.9 | 15390.7 | 14130.4 |
| 52.5° | 9667.1  | 9755.1  | 10348.7 | 11442.0 | 13064.7 | 14625.5 | 15579.3 | 16507.1 | 16502.6 | 16130.5 | 14634.5 |
| 55°   | 9303.2  | 9383.0  | 9994.5  | 11182.4 | 13165.4 | 15004.4 | 16175.9 | 17441.5 | 17495.2 | 17183.4 | 15090.9 |
| 57.5° | 8837.1  | 8909.4  | 9576.1  | 10833.4 | 13061.0 | 15325.8 | 17142.4 | 18551.9 | 18578.7 | 17916.5 | 15454.1 |
| 60°   | 8219.6  | 8326.2  | 8995.9  | 10389.7 | 12761.2 | 15697.9 | 18207.4 | 19719.7 | 19752.5 | 18637.6 | 15687.5 |
| 62.5° | 7541.7  | 7584.2  | 8266.6  | 9706.6  | 12324.9 | 15985.0 | 18945.6 | 20633.3 | 20585.5 | 19201.4 | 15757.6 |
| 65°   | 6715.4  | 6749.0  | 7339.6  | 8828.1  | 11514.3 | 15827.7 | 19210.4 | 21103.1 | 21044.2 | 19555.7 | 15542.1 |
| 67.5° | 5850.4  | 5954.0  | 6417.9  | 7609.6  | 10383.0 | 15101.3 | 18986.7 | 21238.1 | 21208.2 | 19582.5 | 15027.5 |
| 70°   | 4727.3  | 4763.8  | 5182.9  | 6199.4  | 8663.3  | 13647.1 | 18240.9 | 20892.0 | 20868.9 | 18982.9 | 13976.7 |
| 72.5° | 3333.5  | 3297.7  | 3501.3  | 4298.5  | 6257.5  | 10855.8 | 15574.1 | 18947.9 | 18986.7 | 16981.3 | 12171.3 |
| 75°   | 1769.7  | 1838.3  | 2155.2  | 2631.7  | 3547.5  | 6978.7  | 12416.6 | 15681.5 | 15668.1 | 14199.7 | 9620.8  |
| 77.5° | 942.6   | 941.1   | 1158.9  | 1362.5  | 1736.8  | 3206.7  | 8189.8  | 11826.0 | 11891.6 | 11002.0 | 6605.8  |
| 80°   | 452.7   | 469.8   | 483.2   | 554.1   | 865.8   | 1481.8  | 3425.9  | 6857.9  | 7305.3  | 6561.8  | 3138.1  |
| 82.5° | 362.4   | 363.9   | 365.4   | 349.8   | 358.0   | 603.3   | 1320.0  | 1984.4  | 2056.0  | 1652.6  | 1012.0  |
| 85°   | 268.5   | 252.1   | 249.8   | 211.8   | 239.4   | 362.4   | 665.9   | 847.2   | 805.4   | 783.8   | 571.2   |
| 87.5° | 108.1   | 101.4   | 98.4    | 92.5    | 92.5    | 136.5   | 234.9   | 306.5   | 305.8   | 278.9   | 191.7   |
| 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: CST-CA8-230-750-U-T3

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°     | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 5649.8  | 5649.8  | 5649.8 | 5649.8 | 5649.8 | 5649.8 | 5649.8 | 5649.8 | 5649.8 | 5649.8 | 5649.8 |
| 2.5°  | 5672.9  | 5699.7  | 5762.4 | 5816.1 | 5836.2 | 5885.4 | 5931.7 | 5958.5 | 5977.1 | 5988.3 | 6039.0 |
| 5°    | 5731.8  | 5785.5  | 5885.4 | 5960.7 | 6033.8 | 6124.8 | 6183.7 | 6221.0 | 6241.9 | 6253.8 | 6290.4 |
| 7.5°  | 5822.0  | 5876.5  | 5982.4 | 6098.0 | 6165.1 | 6239.6 | 6277.7 | 6304.5 | 6317.9 | 6314.2 | 6343.3 |
| 10°   | 5902.6  | 5956.3  | 6062.2 | 6150.9 | 6188.9 | 6231.4 | 6251.6 | 6257.5 | 6258.3 | 6261.3 | 6290.4 |
| 12.5° | 6012.2  | 6045.0  | 6101.7 | 6159.8 | 6151.6 | 6153.1 | 6170.3 | 6162.8 | 6145.7 | 6142.7 | 6162.1 |
| 15°   | 6130.0  | 6130.8  | 6135.2 | 6122.6 | 6071.1 | 6048.7 | 6024.9 | 6004.7 | 5957.8 | 5954.8 | 5985.3 |
| 17.5° | 6277.7  | 6242.6  | 6161.3 | 6074.8 | 5952.5 | 5868.3 | 5783.2 | 5748.2 | 5690.8 | 5679.6 | 5694.5 |
| 20°   | 6467.8  | 6394.8  | 6197.1 | 5982.4 | 5753.4 | 5602.8 | 5499.9 | 5396.2 | 5316.4 | 5297.0 | 5311.2 |
| 22.5° | 6740.8  | 6596.9  | 6242.6 | 5883.9 | 5529.7 | 5272.4 | 5072.6 | 4948.0 | 4813.8 | 4745.2 | 4751.9 |
| 25°   | 7070.4  | 6845.2  | 6321.7 | 5759.4 | 5266.4 | 4895.1 | 4570.7 | 4320.8 | 4169.5 | 4068.8 | 4095.6 |
| 27.5° | 7502.2  | 7192.7  | 6416.4 | 5636.3 | 4939.1 | 4412.6 | 3942.0 | 3603.4 | 3449.1 | 3401.3 | 3370.0 |
| 30°   | 8002.6  | 7612.6  | 6516.3 | 5454.4 | 4585.6 | 3815.2 | 3212.7 | 2930.8 | 2754.0 | 2725.7 | 2701.8 |
| 32.5° | 8672.3  | 8141.3  | 6703.5 | 5256.8 | 4163.5 | 3217.9 | 2563.9 | 2239.5 | 2199.2 | 2176.1 | 2170.9 |
| 35°   | 9535.8  | 8834.1  | 6899.6 | 5000.2 | 3613.1 | 2517.6 | 1939.7 | 1764.4 | 1745.0 | 1770.4 | 1772.6 |
| 37.5° | 10452.4 | 9585.8  | 7134.5 | 4710.9 | 2980.0 | 1878.5 | 1484.0 | 1362.5 | 1384.1 | 1463.2 | 1481.0 |
| 40°   | 11072.8 | 10081.0 | 7347.8 | 4317.9 | 2197.7 | 1364.7 | 1079.8 | 1053.7 | 1173.1 | 1274.5 | 1295.4 |
| 42.5° | 11667.9 | 10456.1 | 7434.3 | 3798.1 | 1567.6 | 971.7  | 871.8  | 961.3  | 1128.3 | 1239.4 | 1254.3 |
| 45°   | 12175.8 | 10892.3 | 7216.6 | 3174.6 | 1062.7 | 812.1  | 835.2  | 959.0  | 1144.7 | 1267.8 | 1279.0 |
| 47.5° | 12659.0 | 11248.8 | 6919.0 | 2501.2 | 838.2  | 781.5  | 834.5  | 979.2  | 1181.3 | 1297.6 | 1304.3 |
| 50°   | 13120.6 | 11520.3 | 6411.2 | 1903.1 | 785.3  | 767.4  | 841.2  | 1010.5 | 1201.4 | 1274.5 | 1271.5 |
| 52.5° | 13462.9 | 11660.5 | 5870.5 | 1536.2 | 764.4  | 756.2  | 859.1  | 1050.0 | 1205.1 | 1249.1 | 1246.1 |
| 55°   | 13714.2 | 11633.6 | 5515.5 | 1258.1 | 747.2  | 751.7  | 888.2  | 1079.8 | 1240.9 | 1307.3 | 1305.1 |
| 57.5° | 13737.4 | 11512.1 | 5112.1 | 1062.7 | 726.4  | 751.0  | 919.5  | 1121.6 | 1419.9 | 1542.2 | 1504.9 |
| 60°   | 13709.8 | 11310.7 | 4709.4 | 932.9  | 703.2  | 755.4  | 952.3  | 1246.9 | 1677.9 | 1774.1 | 1748.0 |
| 62.5° | 13574.0 | 10935.6 | 4106.1 | 847.2  | 683.1  | 771.8  | 976.9  | 1346.1 | 1665.2 | 1676.4 | 1639.1 |
| 65°   | 13154.9 | 10433.7 | 3314.1 | 760.7  | 663.0  | 783.0  | 997.1  | 1372.2 | 1529.5 | 1493.7 | 1475.1 |
| 67.5° | 12325.7 | 9312.9  | 2556.4 | 681.6  | 636.9  | 780.8  | 1056.7 | 1334.9 | 1478.1 | 1452.0 | 1428.1 |
| 70°   | 11147.4 | 8039.1  | 1774.9 | 600.3  | 592.9  | 766.6  | 1041.8 | 1347.6 | 1453.5 | 1413.2 | 1381.1 |
| 72.5° | 9312.9  | 6306.8  | 1129.1 | 534.0  | 527.2  | 733.1  | 1004.5 | 1339.4 | 1437.0 | 1419.2 | 1375.2 |
| 75°   | 7012.2  | 4402.1  | 717.4  | 461.6  | 469.1  | 671.9  | 944.9  | 1295.4 | 1428.8 | 1372.9 | 1288.6 |
| 77.5° | 4414.8  | 2173.1  | 557.8  | 392.3  | 403.4  | 579.4  | 816.6  | 1131.3 | 1371.4 | 1337.9 | 1229.7 |
| 80°   | 1669.7  | 882.2   | 436.3  | 318.4  | 328.1  | 450.4  | 669.7  | 930.7  | 1262.5 | 1317.7 | 1271.5 |
| 82.5° | 768.9   | 551.9   | 327.4  | 255.8  | 259.5  | 328.1  | 499.6  | 689.1  | 1068.7 | 1209.6 | 1325.2 |
| 85°   | 448.9   | 361.7   | 218.5  | 170.8  | 177.5  | 193.9  | 281.1  | 420.6  | 692.8  | 922.5  | 1032.1 |
| 87.5° | 152.9   | 126.0   | 85.0   | 72.3   | 70.1   | 79.8   | 67.9   | 138.0  | 205.8  | 362.4  | 413.9  |
| 90°   | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

STREETWORKS

Report Number: SP1-2104-215-7

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

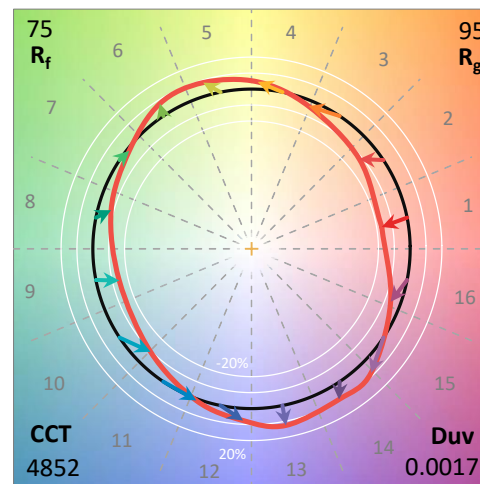
Test Date: 04/22/2021

### 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

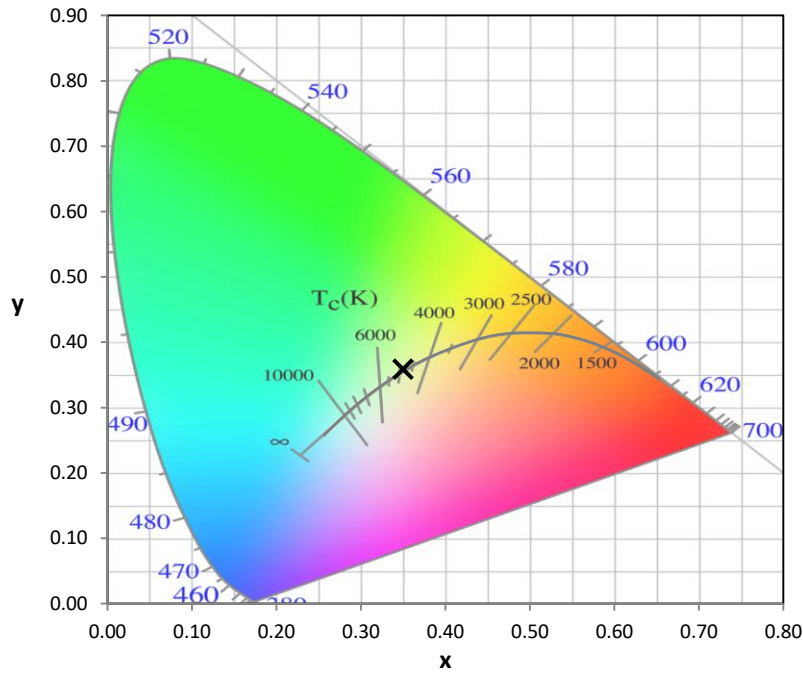
Stabilization Time: 72M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.4/13%  
 Sphere Temperature (°C): 24.0

REPORT NUMBER: SP1-2104-215-7

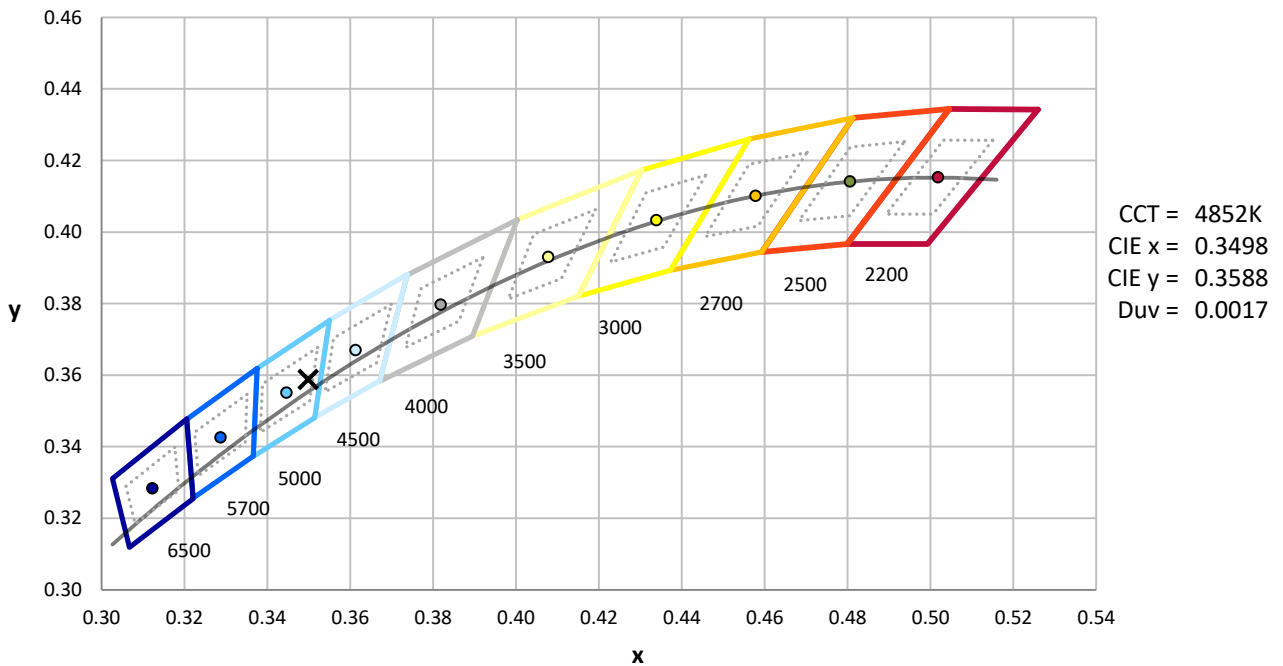
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| 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**



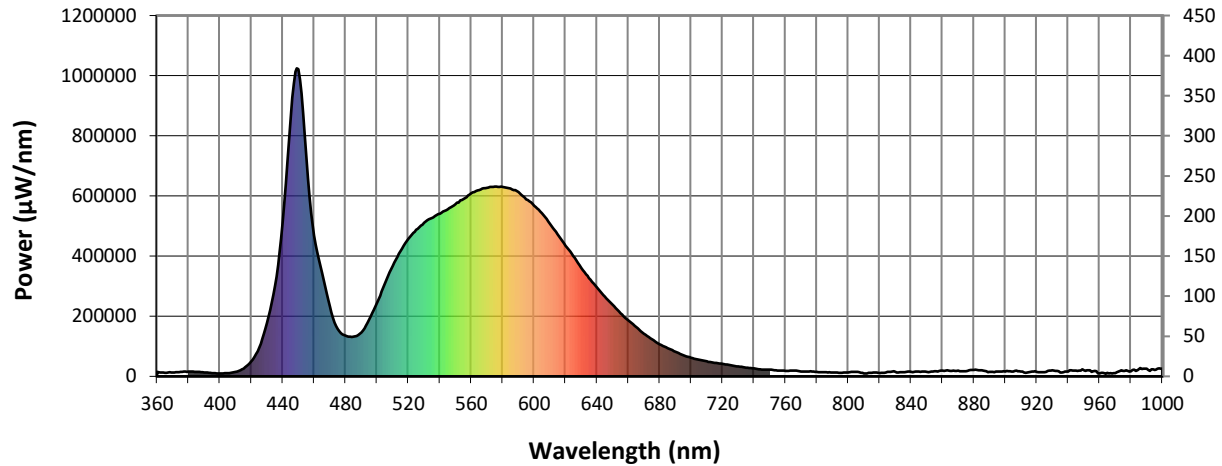
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 5000K 4-step quadrangle

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### Photopic Flux vs. Wavelength

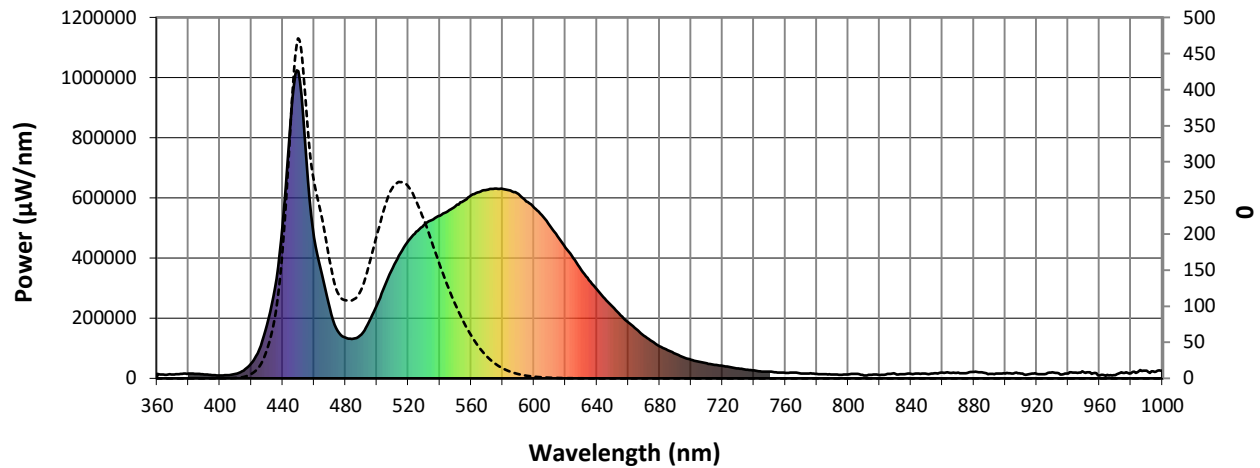


#####

| 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



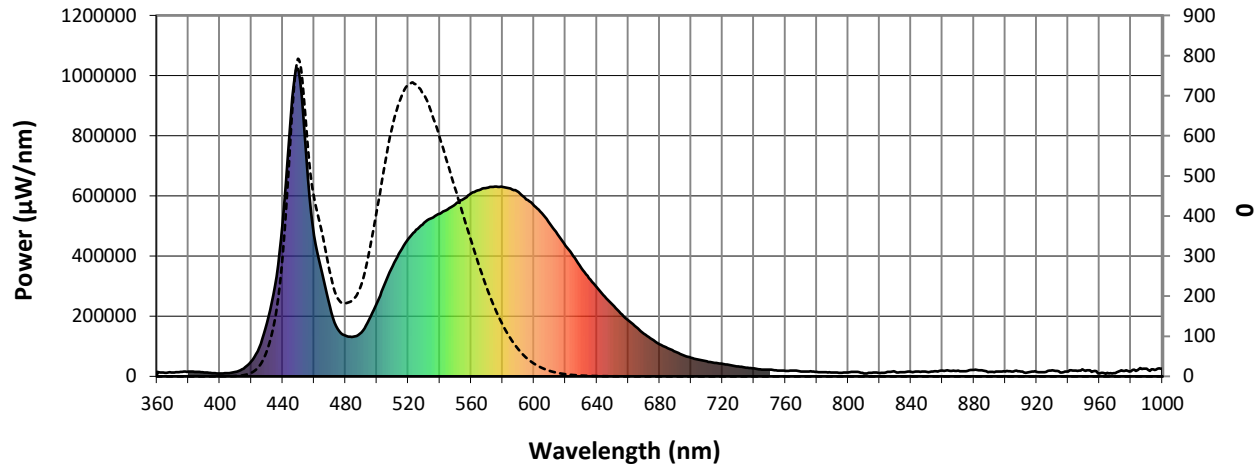
Scotopic Lumens: 66024.8

S/P: 1.78

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 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**

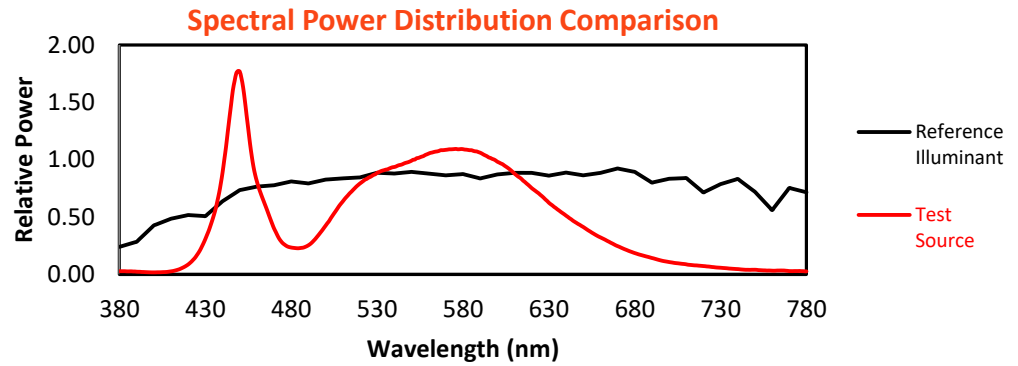
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 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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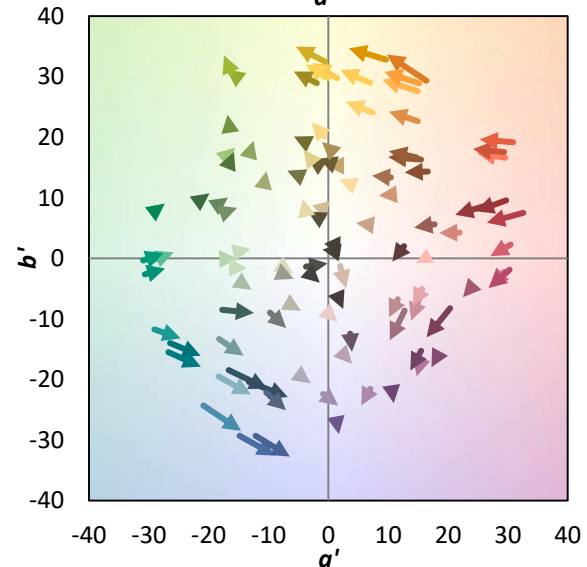
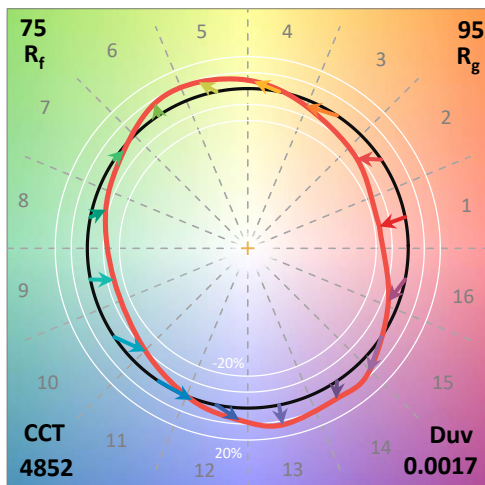
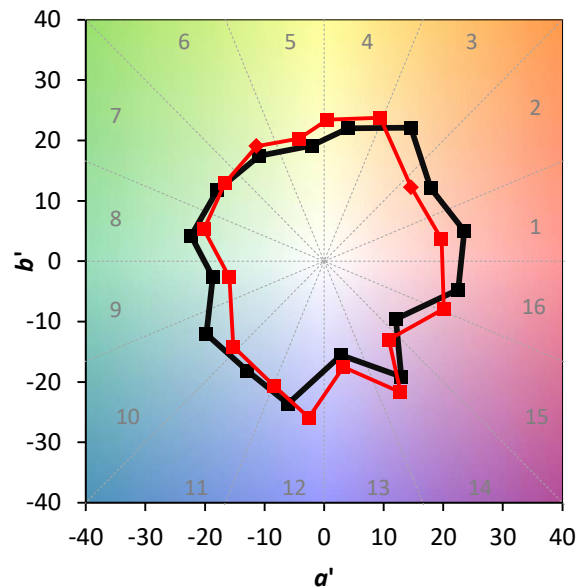
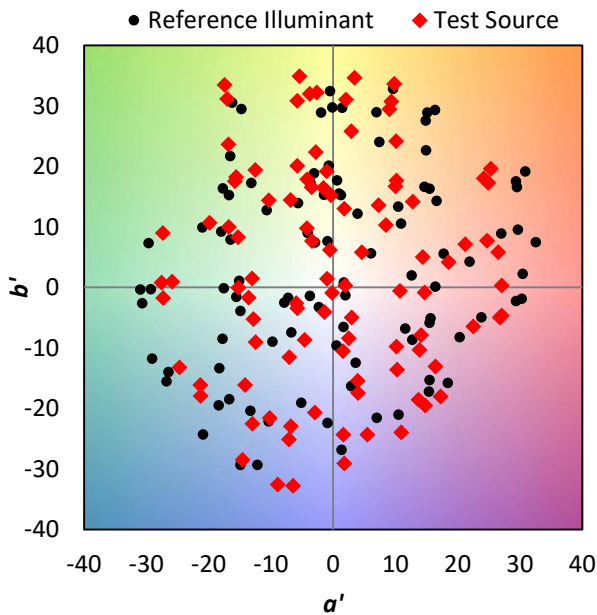
TM-30-18

### Summary

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



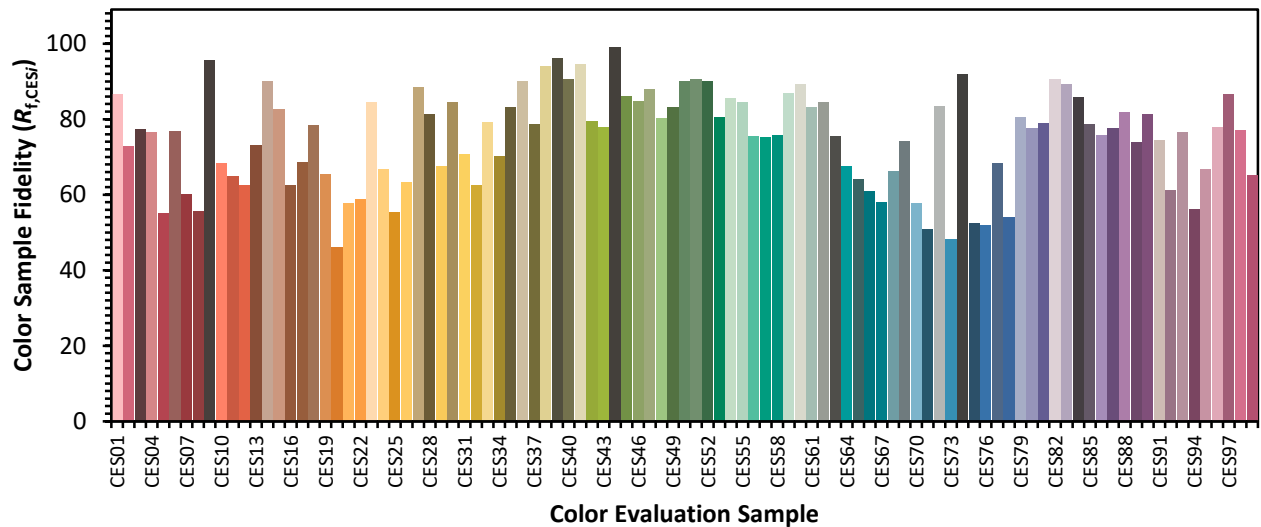
### Color Vector Graphics



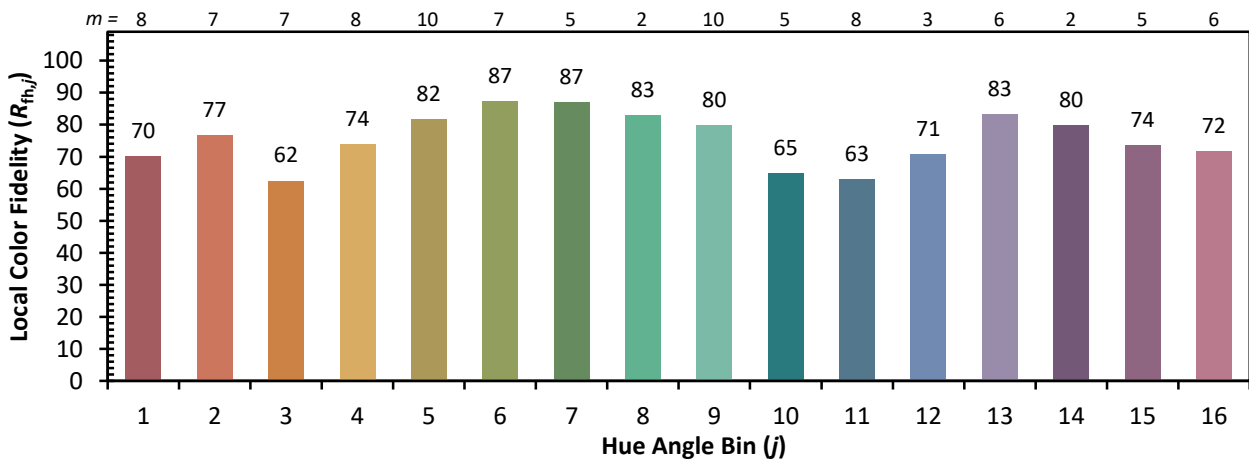
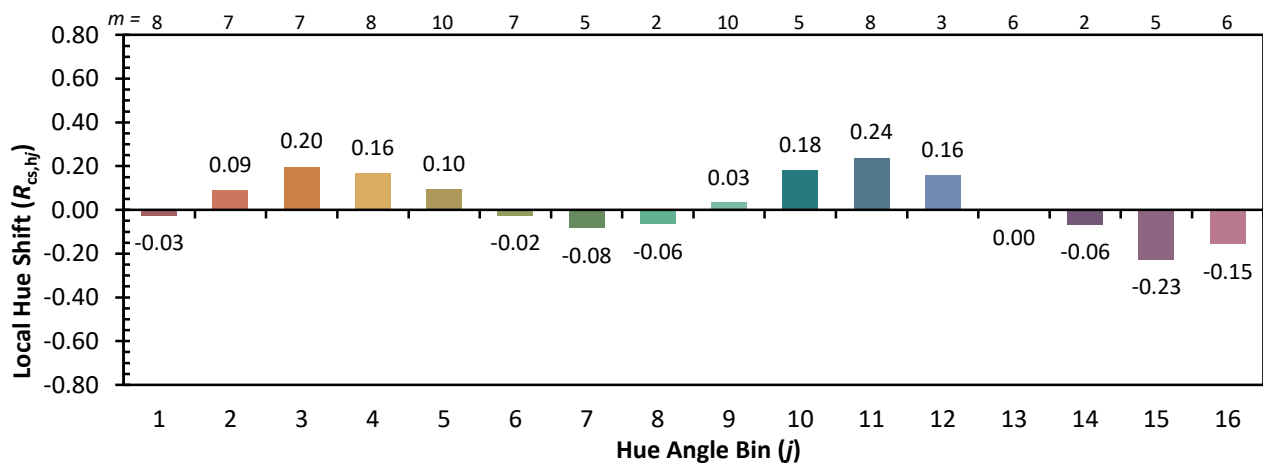
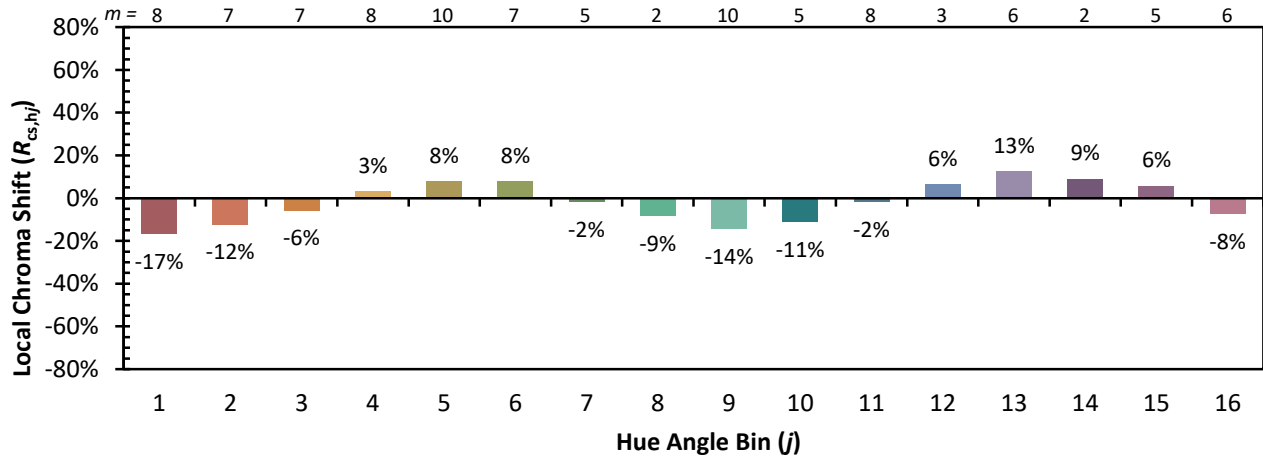


Individual Sample Fidelity Index ( $R_{f,i}$ )

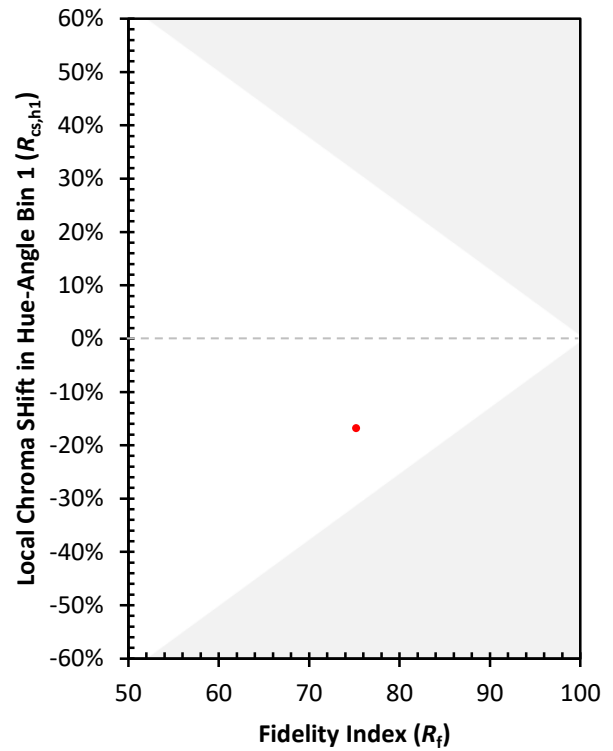
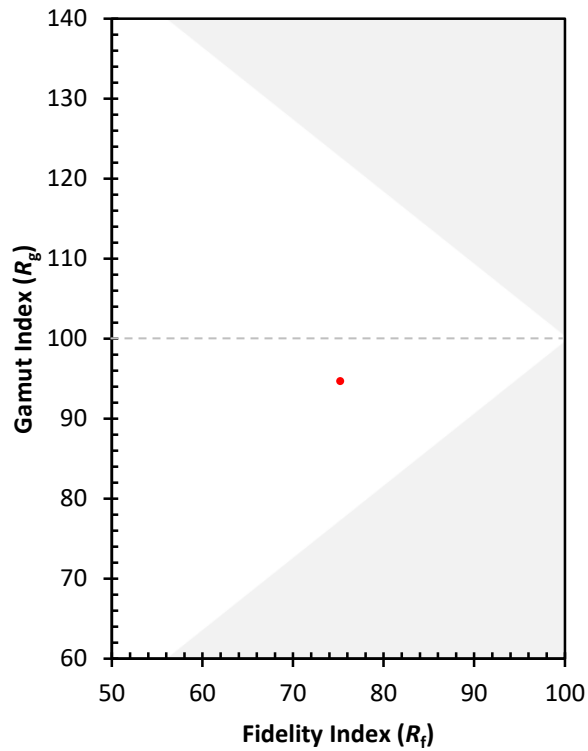
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 63 | CES51 = 90 | CES76 = 52 |
| CES02 = 60 | CES27 = 88 | CES52 = 90 | CES77 = 68 |
| CES03 = 30 | CES28 = 81 | CES53 = 81 | CES78 = 54 |
| CES04 = 69 | CES29 = 67 | CES54 = 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)