

Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions

Brand: STREETWORKS

Report Number: P360864

Luminaire Tested: NVN-SA2D-727-U-T2R

Issue Date: 3/3/2020

### Test Information

Test Method: LM-79-2019  
Report Number: P360864  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-8)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA2D-727-U-T2R  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(2) 70 CRI, 2700K, 1200mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II  
ROADWAY OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

### Summary

Lumens per Lamp: N/A  
Luminaire Lumens: 13915 lumens  
Efficiency: N/A  
Efficacy: 107.9 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type II - Short  
BUG Rating: B2 - U0 - G2

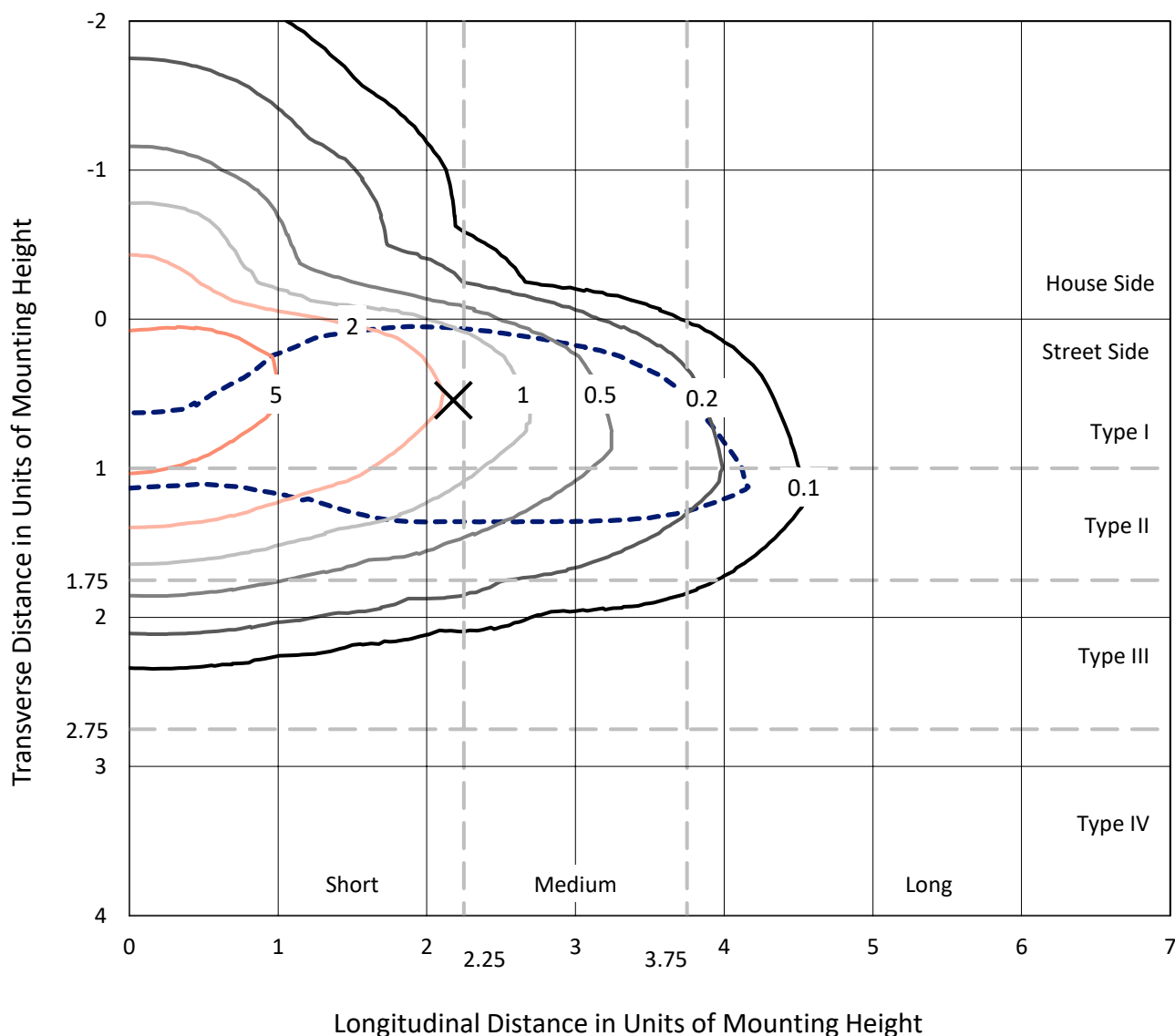
Input Watts (W): 129  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

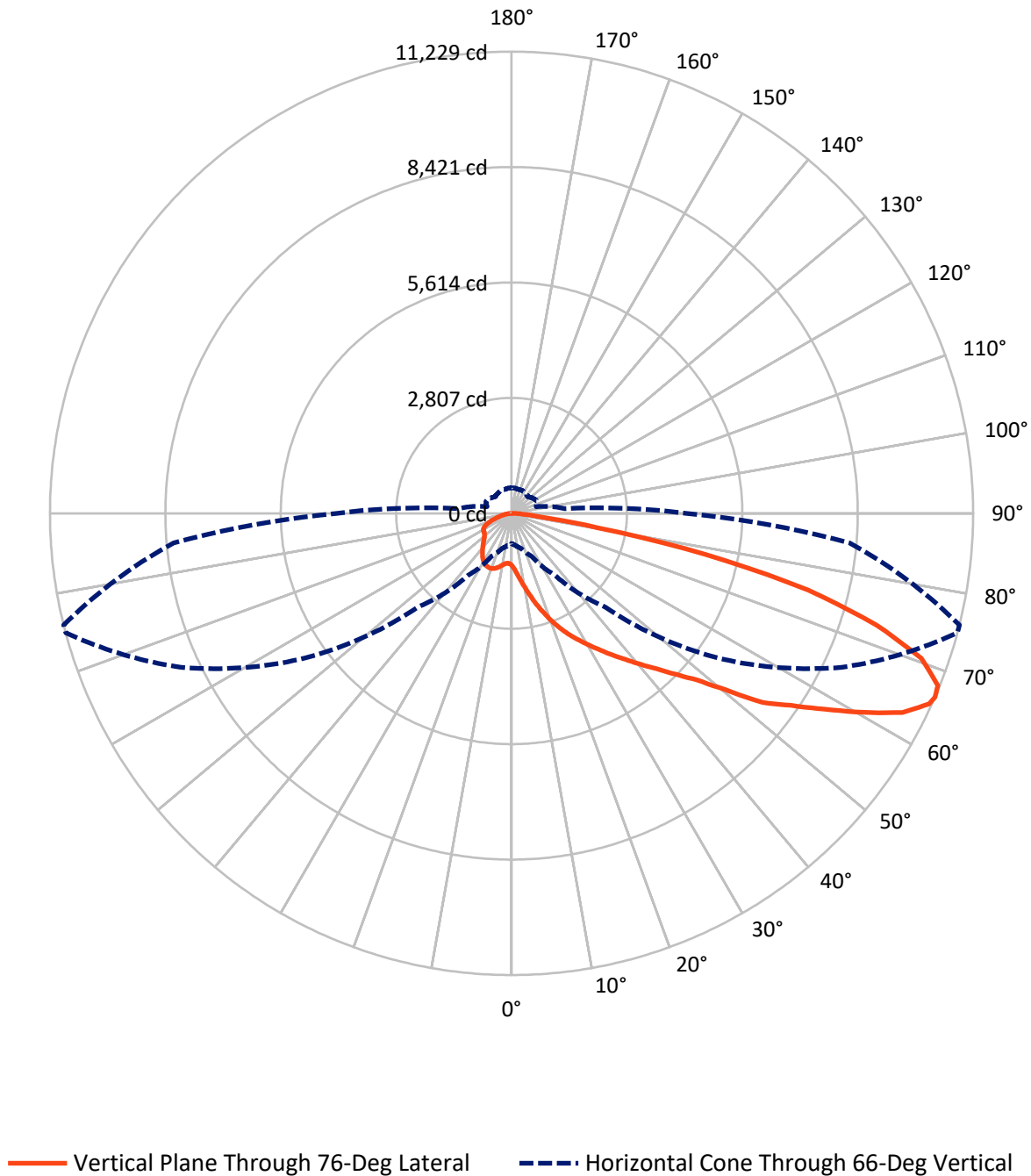
✕ Max cd  
 - - - 1/2 Max cd



Based on 20 foot mounting height. Maximum calculated value = 8.4 fc  
 Type II - Short - N/A

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## Luminous Intensity Polar Plot



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CATALOG NUMBER: NVN-SA2D-727-U-T2R

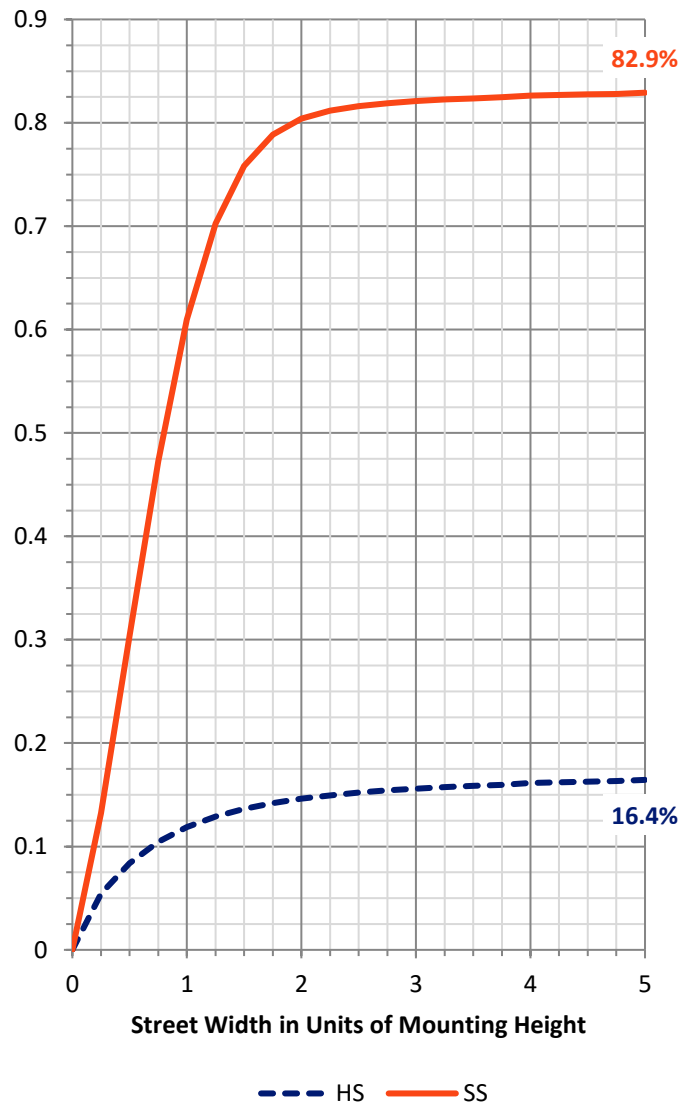
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 2341.4   | 0.0    | 2341.4  |
|                    | % Fixture | 16.8     | 0.0    | 16.8    |
| <b>Street Side</b> | Lumens    | 11573.6  | 0.0    | 11573.6 |
|                    | % Fixture | 83.2     | 0.0    | 83.2    |
| <b>Total</b>       | Lumens    | 13915.0  | 0.0    | 13915.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 153.7   | 1.1       |
| 10°-20°   | 606.8   | 4.4       |
| 20°-30°   | 1179.2  | 8.5       |
| 30°-40°   | 1924.7  | 13.8      |
| 40°-50°   | 2629.6  | 18.9      |
| 50°-60°   | 3063.0  | 22.0      |
| 60°-70°   | 2746.0  | 19.7      |
| 70°-80°   | 1387.7  | 10.0      |
| 80°-90°   | 224.1   | 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°    | 13915.0 | 100.0     |
| 0°-180°   | 13915.0 | 100.0     |

**Coefficient of Utilization**



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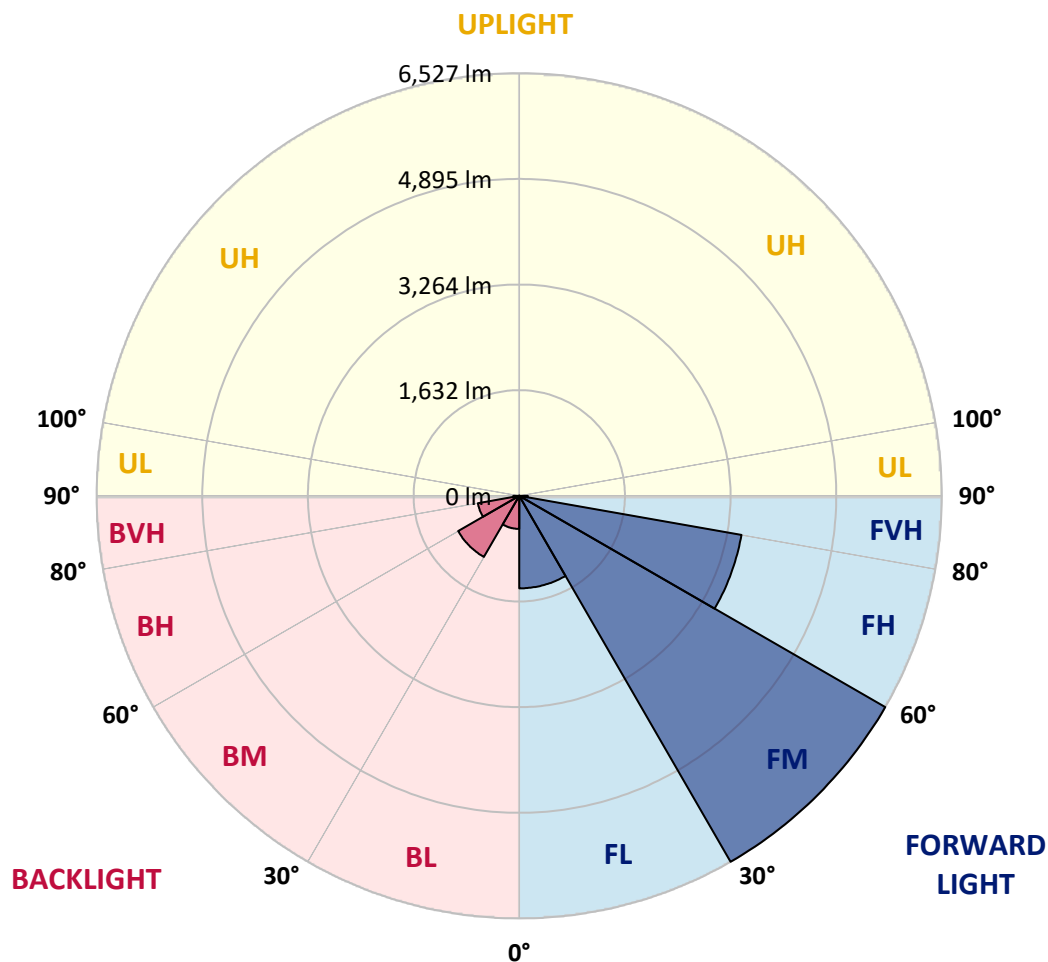
CATALOG NUMBER: NVN-SA2D-727-U-T2R

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 1429.0 | 10.3      |                         |      |         |
| FM   | (30°-60°)   | 6527.1 | 46.9      |                         |      |         |
| FH   | (60°-80°)   | 3485.1 | 25.0      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 132.3  | 1.0       |                         |      | G2/225  |
| BL   | (0°-30°)    | 510.7  | 3.7       | B2/1000                 |      |         |
| BM   | (30°-60°)   | 1090.3 | 7.8       | B2/2500                 |      |         |
| BH   | (60°-80°)   | 648.7  | 4.7       | B2/1000                 |      | G2/1000 |
| BVH  | (80°-90°)   | 91.8   | 0.7       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B2-U0-G2**

Type II Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 75°     | 76°     | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|--------|
| 0°    | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8  | 1270.8  | 1270.8 |
| 2.5°  | 1686.9 | 1661.4 | 1659.1 | 1621.7 | 1613.2 | 1541.9 | 1489.5 | 1434.7 | 1372.3  | 1360.0  | 1310.9 |
| 5°    | 2166.9 | 2164.5 | 2131.9 | 2071.0 | 2023.3 | 1901.4 | 1780.9 | 1653.4 | 1513.6  | 1490.9  | 1380.3 |
| 7.5°  | 2598.7 | 2594.9 | 2569.9 | 2504.2 | 2435.2 | 2285.5 | 2113.5 | 1917.9 | 1691.2  | 1657.6  | 1474.4 |
| 10°   | 2926.5 | 2925.1 | 2916.6 | 2868.4 | 2809.8 | 2666.2 | 2476.3 | 2209.4 | 1897.6  | 1851.8  | 1592.0 |
| 12.5° | 3179.7 | 3182.6 | 3188.2 | 3171.2 | 3143.3 | 3021.0 | 2826.4 | 2518.4 | 2117.8  | 2072.4  | 1722.8 |
| 15°   | 3351.2 | 3359.7 | 3389.0 | 3413.1 | 3427.7 | 3352.6 | 3164.1 | 2834.4 | 2364.4  | 2310.0  | 1867.9 |
| 17.5° | 3437.6 | 3447.1 | 3497.6 | 3570.4 | 3637.5 | 3629.9 | 3480.2 | 3135.8 | 2601.0  | 2548.6  | 2023.8 |
| 20°   | 3512.3 | 3519.4 | 3576.1 | 3663.5 | 3782.0 | 3834.5 | 3750.4 | 3425.8 | 2860.4  | 2798.0  | 2189.1 |
| 22.5° | 3728.6 | 3737.6 | 3754.6 | 3804.2 | 3909.1 | 4005.5 | 3964.8 | 3700.3 | 3098.0  | 3039.9  | 2345.9 |
| 25°   | 4146.2 | 4157.1 | 4120.3 | 4078.2 | 4098.1 | 4165.1 | 4172.7 | 3950.7 | 3338.9  | 3273.3  | 2514.6 |
| 27.5° | 4649.4 | 4664.9 | 4602.1 | 4493.9 | 4399.5 | 4373.5 | 4364.5 | 4155.7 | 3569.0  | 3492.9  | 2681.3 |
| 30°   | 5142.1 | 5169.0 | 5087.3 | 4947.0 | 4773.6 | 4651.7 | 4561.5 | 4356.5 | 3795.7  | 3723.0  | 2838.6 |
| 32.5° | 5623.4 | 5612.6 | 5494.0 | 5357.0 | 5153.9 | 5001.3 | 4783.0 | 4571.9 | 4050.8  | 3967.2  | 2995.0 |
| 35°   | 5953.2 | 5957.0 | 5846.9 | 5684.4 | 5490.7 | 5373.5 | 5079.7 | 4804.3 | 4311.1  | 4234.1  | 3172.6 |
| 37.5° | 6233.8 | 6216.3 | 6091.6 | 5939.9 | 5773.2 | 5723.1 | 5426.9 | 5060.3 | 4593.1  | 4509.0  | 3361.6 |
| 40°   | 6327.3 | 6307.0 | 6225.3 | 6116.1 | 5982.5 | 5978.2 | 5810.0 | 5350.4 | 4912.0  | 4828.9  | 3574.6 |
| 42.5° | 6270.6 | 6244.6 | 6211.1 | 6181.3 | 6140.2 | 6159.1 | 6170.0 | 5690.5 | 5262.5  | 5169.5  | 3821.2 |
| 45°   | 6061.4 | 6022.1 | 6045.8 | 6110.5 | 6199.8 | 6306.5 | 6495.0 | 6067.0 | 5655.1  | 5577.1  | 4110.8 |
| 47.5° | 5739.6 | 5704.2 | 5777.9 | 5916.3 | 6159.1 | 6429.4 | 6802.5 | 6482.7 | 6123.7  | 6046.2  | 4523.2 |
| 50°   | 5287.1 | 5297.5 | 5402.8 | 5654.6 | 6021.7 | 6486.0 | 7181.4 | 7033.1 | 6804.9  | 6732.6  | 5085.8 |
| 52.5° | 4544.5 | 4546.4 | 4843.0 | 5256.4 | 5777.9 | 6456.7 | 7391.6 | 7736.5 | 7735.1  | 7647.7  | 5621.5 |
| 55°   | 3854.8 | 3896.8 | 4131.6 | 4681.0 | 5383.0 | 6339.6 | 7538.5 | 8078.5 | 8345.9  | 8243.4  | 6120.9 |
| 57.5° | 3181.1 | 3205.7 | 3428.2 | 3980.0 | 4819.4 | 6027.3 | 7689.2 | 8489.0 | 9049.7  | 8985.0  | 6741.6 |
| 60°   | 2414.9 | 2452.7 | 2682.8 | 3192.5 | 4098.5 | 5473.2 | 7703.4 | 8917.5 | 9891.1  | 9825.9  | 7434.6 |
| 62.5° | 1567.4 | 1632.6 | 1848.0 | 2325.6 | 3226.5 | 4676.3 | 7374.6 | 9197.6 | 10688.5 | 10665.4 | 8049.7 |
| 65°   | 900.9  | 950.0  | 1099.7 | 1468.2 | 2225.9 | 3675.7 | 6592.8 | 9089.9 | 11179.3 | 11166.1 | 8279.7 |
| 66°   | 736.0  | 766.7  | 881.5  | 1147.5 | 1836.7 | 3227.9 | 6138.4 | 8862.7 | 11228.0 | 11228.5 | 8253.3 |
| 67.5° | 588.6  | 602.3  | 653.8  | 821.5  | 1355.3 | 2558.5 | 5326.3 | 8361.5 | 11167.5 | 11184.0 | 8082.7 |
| 70°   | 487.0  | 494.1  | 510.2  | 550.8  | 739.8  | 1542.9 | 3780.6 | 7059.1 | 10560.5 | 10573.2 | 7417.1 |
| 72.5° | 437.0  | 441.2  | 447.4  | 453.0  | 522.0  | 862.1  | 2309.1 | 5647.1 | 9259.0  | 9275.6  | 6402.9 |
| 75°   | 395.9  | 398.2  | 397.3  | 397.8  | 437.9  | 549.4  | 1193.3 | 4216.2 | 7486.6  | 7453.5  | 4904.9 |
| 77.5° | 347.7  | 350.0  | 345.3  | 346.3  | 387.4  | 422.3  | 593.8  | 2951.5 | 5052.3  | 4818.9  | 2763.5 |
| 80°   | 293.8  | 295.7  | 293.8  | 297.1  | 337.3  | 318.9  | 345.3  | 1660.5 | 2234.0  | 2113.0  | 982.6  |
| 82.5° | 222.0  | 230.1  | 235.7  | 249.0  | 277.8  | 226.8  | 231.0  | 646.7  | 680.3   | 647.7   | 301.4  |
| 85°   | 97.3   | 118.6  | 177.6  | 190.4  | 208.8  | 136.1  | 151.6  | 263.6  | 276.8   | 268.3   | 109.6  |
| 87.5° | 25.5   | 27.9   | 87.9   | 110.5  | 115.7  | 61.4   | 78.9   | 120.0  | 126.6   | 120.0   | 36.4   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0     | 0.0     | 0.0    |



REPORT NUMBER: P360864

CATALOG NUMBER: NVN-SA2D-727-U-T2R

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 | 1270.8 |
| 2.5°  | 1284.9 | 1261.8 | 1220.2 | 1183.4 | 1155.5 | 1136.6 | 1117.7 | 1108.2 | 1102.6 | 1096.9 | 1097.9 |
| 5°    | 1326.0 | 1279.3 | 1207.9 | 1157.4 | 1129.0 | 1111.1 | 1101.6 | 1097.9 | 1095.5 | 1089.8 | 1089.8 |
| 7.5°  | 1387.9 | 1321.8 | 1223.5 | 1171.5 | 1149.3 | 1135.6 | 1130.0 | 1128.1 | 1125.3 | 1118.6 | 1119.6 |
| 10°   | 1465.9 | 1373.3 | 1256.1 | 1205.6 | 1185.2 | 1170.1 | 1162.1 | 1159.3 | 1154.1 | 1146.5 | 1147.5 |
| 12.5° | 1557.5 | 1437.0 | 1299.1 | 1246.2 | 1221.6 | 1201.3 | 1188.1 | 1180.1 | 1171.1 | 1161.2 | 1161.6 |
| 15°   | 1657.6 | 1506.5 | 1345.4 | 1282.6 | 1249.0 | 1220.7 | 1199.4 | 1185.7 | 1171.5 | 1159.3 | 1158.8 |
| 17.5° | 1759.2 | 1573.6 | 1380.8 | 1302.4 | 1257.1 | 1219.7 | 1190.9 | 1169.7 | 1152.2 | 1137.1 | 1135.6 |
| 20°   | 1868.8 | 1634.0 | 1400.7 | 1300.5 | 1241.9 | 1197.5 | 1159.3 | 1132.8 | 1113.4 | 1098.3 | 1096.0 |
| 22.5° | 1980.3 | 1690.7 | 1404.0 | 1281.1 | 1208.4 | 1154.1 | 1113.9 | 1084.6 | 1064.8 | 1049.2 | 1043.5 |
| 25°   | 2082.3 | 1734.6 | 1390.3 | 1243.8 | 1161.6 | 1103.1 | 1063.8 | 1034.1 | 1018.0 | 999.6  | 993.9  |
| 27.5° | 2175.4 | 1765.4 | 1362.9 | 1196.1 | 1109.2 | 1051.6 | 1014.7 | 989.2  | 971.7  | 957.6  | 952.8  |
| 30°   | 2259.0 | 1781.9 | 1318.0 | 1139.4 | 1055.3 | 1002.9 | 971.7  | 954.2  | 939.1  | 921.2  | 917.9  |
| 32.5° | 2338.4 | 1781.9 | 1260.4 | 1077.5 | 1002.0 | 959.9  | 941.5  | 930.6  | 913.6  | 896.1  | 891.4  |
| 35°   | 2417.7 | 1771.0 | 1192.3 | 1012.8 | 952.8  | 929.2  | 928.3  | 915.5  | 889.5  | 865.9  | 859.8  |
| 37.5° | 2501.4 | 1748.8 | 1115.8 | 952.4  | 912.7  | 915.5  | 923.5  | 895.2  | 858.3  | 824.8  | 815.8  |
| 40°   | 2595.8 | 1718.1 | 1036.4 | 899.9  | 879.1  | 909.4  | 910.8  | 865.9  | 794.1  | 763.4  | 755.4  |
| 42.5° | 2706.8 | 1687.4 | 962.7  | 853.6  | 852.7  | 890.9  | 886.7  | 802.6  | 759.6  | 744.0  | 739.8  |
| 45°   | 2852.8 | 1669.9 | 892.8  | 809.7  | 831.9  | 861.2  | 845.6  | 767.6  | 749.7  | 740.7  | 736.9  |
| 47.5° | 3082.9 | 1678.9 | 828.6  | 774.7  | 811.1  | 831.4  | 769.1  | 753.5  | 740.7  | 729.9  | 726.1  |
| 50°   | 3371.0 | 1673.7 | 776.6  | 750.6  | 787.5  | 800.2  | 734.6  | 735.1  | 728.4  | 716.2  | 710.5  |
| 52.5° | 3587.9 | 1633.1 | 743.1  | 736.9  | 766.7  | 745.0  | 712.9  | 717.1  | 713.8  | 695.8  | 689.7  |
| 55°   | 3797.1 | 1598.1 | 726.1  | 731.7  | 751.6  | 676.0  | 687.3  | 697.7  | 694.4  | 676.9  | 674.1  |
| 57.5° | 4057.4 | 1591.5 | 715.7  | 733.2  | 738.8  | 641.5  | 662.8  | 676.5  | 674.1  | 666.6  | 665.1  |
| 60°   | 4376.3 | 1593.4 | 706.2  | 735.5  | 724.7  | 616.0  | 639.6  | 657.1  | 658.5  | 657.1  | 656.2  |
| 62.5° | 4551.6 | 1541.9 | 682.6  | 728.9  | 699.6  | 593.8  | 615.5  | 641.0  | 641.5  | 644.4  | 643.9  |
| 65°   | 4402.8 | 1387.9 | 638.7  | 705.8  | 657.6  | 575.4  | 594.8  | 622.6  | 615.5  | 628.3  | 628.3  |
| 66°   | 4258.2 | 1299.1 | 617.0  | 690.6  | 639.6  | 568.3  | 588.1  | 613.2  | 604.2  | 621.7  | 621.7  |
| 67.5° | 3963.0 | 1149.3 | 577.7  | 658.5  | 614.1  | 558.4  | 580.6  | 597.6  | 585.3  | 611.3  | 609.4  |
| 70°   | 3423.5 | 889.1  | 498.9  | 585.8  | 572.1  | 543.7  | 570.2  | 566.4  | 548.5  | 588.1  | 580.6  |
| 72.5° | 2886.4 | 675.5  | 400.6  | 490.4  | 508.3  | 525.3  | 555.5  | 526.7  | 504.0  | 531.9  | 515.4  |
| 75°   | 2239.6 | 507.8  | 316.5  | 381.2  | 429.4  | 496.5  | 538.1  | 480.9  | 448.3  | 445.5  | 436.5  |
| 77.5° | 1210.8 | 348.6  | 250.8  | 291.0  | 341.1  | 460.6  | 526.3  | 431.8  | 382.6  | 371.3  | 364.2  |
| 80°   | 479.5  | 226.8  | 182.3  | 220.6  | 238.6  | 408.6  | 497.9  | 374.6  | 315.6  | 304.2  | 293.4  |
| 82.5° | 197.9  | 134.2  | 117.6  | 147.9  | 155.4  | 349.6  | 446.9  | 307.1  | 243.8  | 337.3  | 358.1  |
| 85°   | 85.0   | 73.7   | 69.9   | 76.5   | 87.9   | 245.2  | 355.7  | 234.3  | 263.1  | 234.8  | 186.6  |
| 87.5° | 25.5   | 31.2   | 29.8   | 29.3   | 32.1   | 58.6   | 189.4  | 130.4  | 193.2  | 73.2   | 54.8   |
| 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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Peachtree City, GA 30269



LM-79-2008: Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-1908-441-1-R4

Test Date: 08/20/2019

Luminaire Tested: SA1C-727-U-5WQ

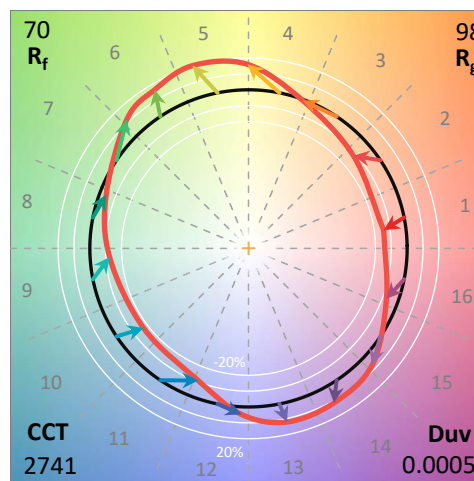
### Test Information

Test Method: LM-79-2008  
 Report Number: SP1-1908-441-1-R4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/28/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **SA1C-727-U-5WQ**  
 Description: MCGRAW EDISON ROADWAY AND AREA LUMINAIRE

\*\*\*THIS IS A REVISION OF SP1-1908-441-1-R3. TO UPDATE THE CATALOG NUMBER.\*\*\*TESTED IN SITU. (1) 70 CRI, 2700K, 1050MA LIGHTSQUARE WITH 16 LEDS AND TYPE V WIDE OPTICS.

### Spectral Parameters

|                           |        |           |      |      |       |
|---------------------------|--------|-----------|------|------|-------|
| CCT (K):                  | 2741   | CRI (Ra): | 71.5 |      |       |
| CIE u':                   | 0.2605 | R1:       | 69.2 | R9:  | -16.1 |
| CIE v':                   | 0.5272 | R2:       | 79.4 | R10: | 51.4  |
| Duv:                      | 0.0005 | R3:       | 87.8 | R11: | 63.1  |
| CIE x:                    | 0.4573 | R4:       | 69.4 | R12: | 42.0  |
| CIE y:                    | 0.4113 | R5:       | 66.4 | R13: | 70.2  |
| CIE z:                    | 0.1313 | R6:       | 69.8 | R14: | 92.4  |
| Peak Wavelength (nm):     | 602    | R7:       | 79.8 |      |       |
| Dominant Wavelength (nm): | 583    | R8:       | 50.1 |      |       |
| Purity:                   | 61.2   |           |      |      |       |
| Rf:                       | 69.9   |           |      |      |       |
| Rg:                       | 98.3   |           |      |      |       |



### Test Conditions

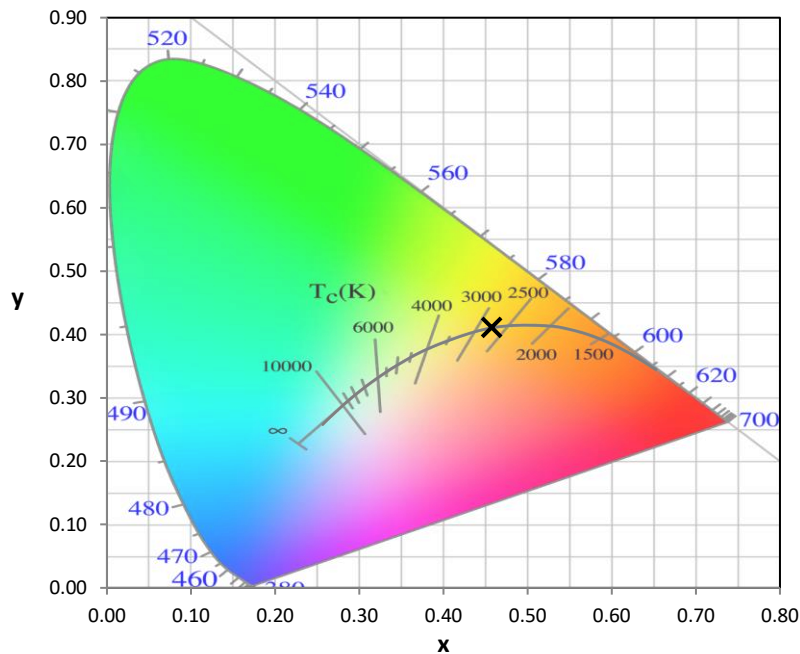
Stabilization Time: 56M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.3./42%  
 Sphere Temperature (°C): 25.7

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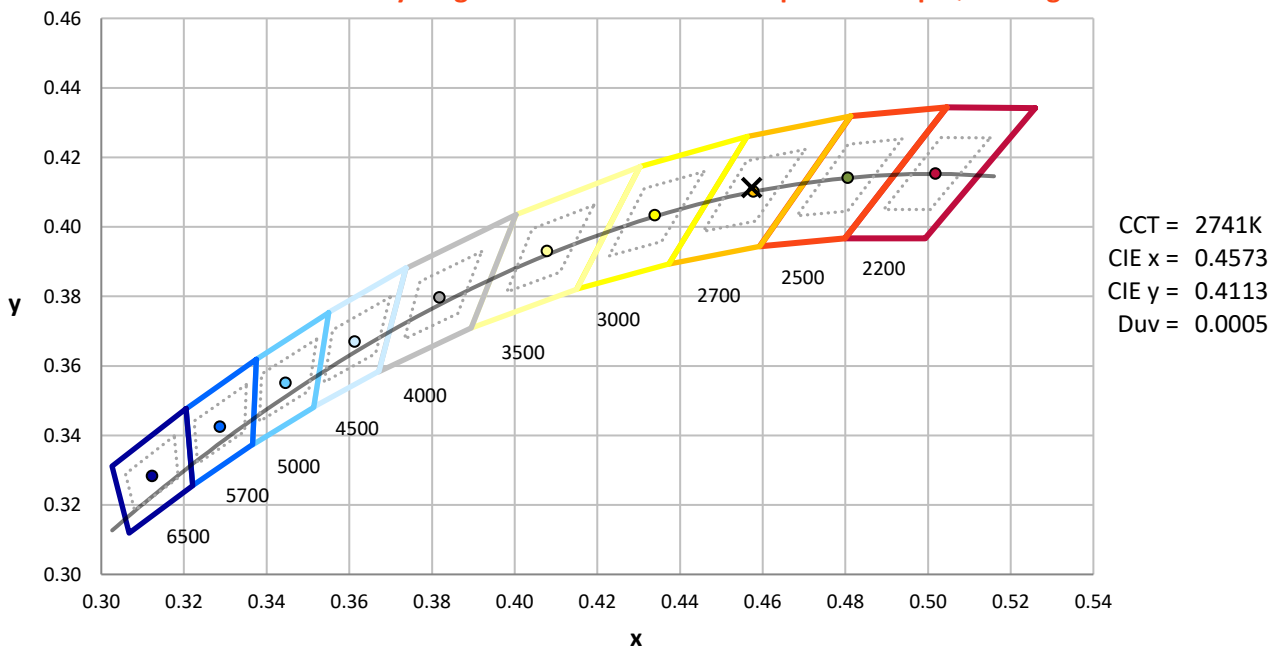
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/28/2019        | 12/28/2019           |
| Power Meter                    | IN0071                | 12/5/2018        | 12/5/2019            |
| AC Power Source                | IN0063                | 12/5/2018        | 12/5/2019            |
| DC Power Source                | IN0208                | 12/5/2018        | 12/5/2019            |
| Sphere Thermometer             | IN0085                | 12/5/2018        | 12/5/2019            |
| Room Thermometer               | IN0046                | 12/5/2018        | 12/5/2019            |

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CIE 1931 Chromaticity Diagram



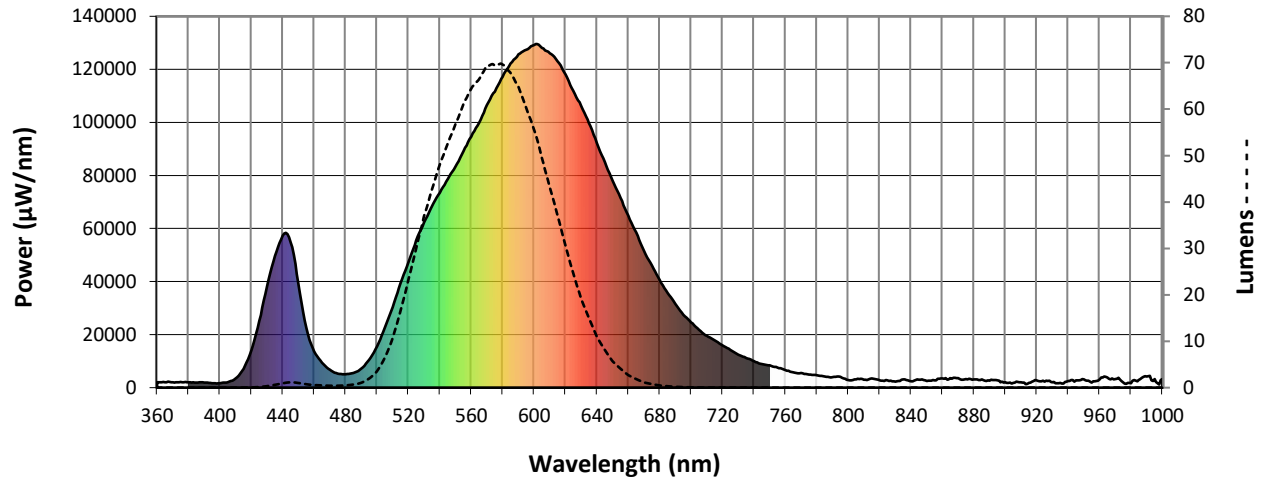
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 2700K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

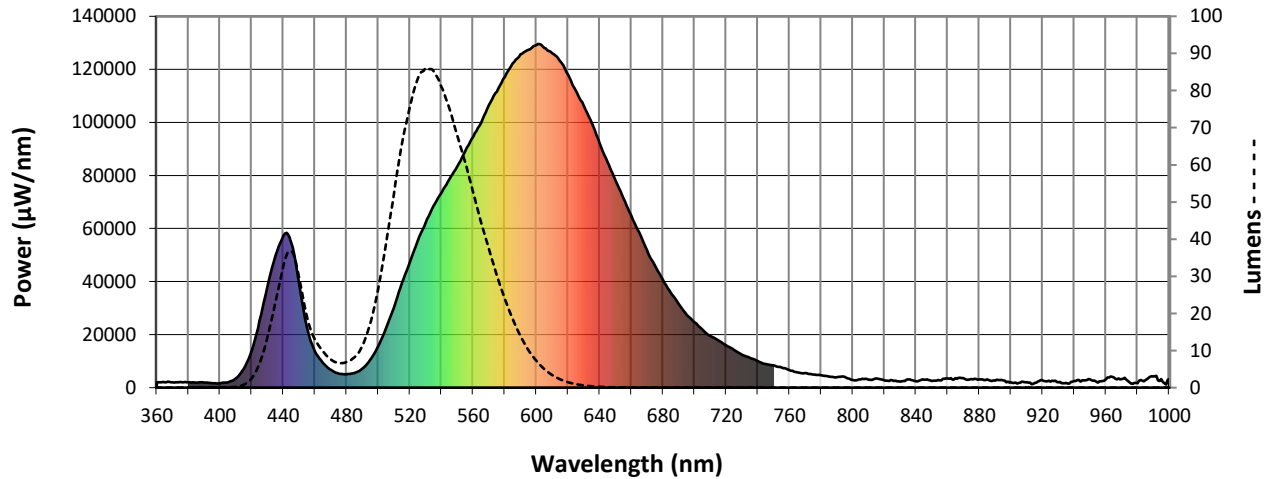


**Photopic Lumens: 6211.7**

| 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       | 2044             | 0.0              | 490       | 7179             | 1.0              | 620       | 118034           | 30.7             | 750       | 8362             | 0.0              | 880       | 3128             | 0.0              |
| 365       | 2016             | 0.0              | 495       | 10476            | 1.9              | 625       | 111884           | 24.7             | 755       | 7635             | 0.0              | 885       | 3110             | 0.0              |
| 370       | 2020             | 0.0              | 500       | 15549            | 3.4              | 630       | 106119           | 19.2             | 760       | 6582             | 0.0              | 890       | 2632             | 0.0              |
| 375       | 2137             | 0.0              | 505       | 22477            | 6.3              | 635       | 99706            | 15.0             | 765       | 5777             | 0.0              | 895       | 2709             | 0.0              |
| 380       | 2046             | 0.0              | 510       | 30417            | 10.4             | 640       | 92142            | 11.0             | 770       | 5474             | 0.0              | 900       | 2016             | 0.0              |
| 385       | 1925             | 0.0              | 515       | 39274            | 16.3             | 645       | 84987            | 8.2              | 775       | 4977             | 0.0              | 905       | 1748             | 0.0              |
| 390       | 1893             | 0.0              | 520       | 47282            | 22.9             | 650       | 78016            | 5.7              | 780       | 4723             | 0.0              | 910       | 2046             | 0.0              |
| 395       | 1695             | 0.0              | 525       | 55413            | 29.7             | 655       | 71541            | 4.1              | 785       | 4219             | 0.0              | 915       | 1844             | 0.0              |
| 400       | 1633             | 0.0              | 530       | 62377            | 36.7             | 660       | 64863            | 2.7              | 790       | 3969             | 0.0              | 920       | 2734             | 0.0              |
| 405       | 2065             | 0.0              | 535       | 68520            | 42.5             | 665       | 58485            | 1.9              | 795       | 4122             | 0.0              | 925       | 2307             | 0.0              |
| 410       | 3449             | 0.0              | 540       | 73435            | 47.8             | 670       | 51641            | 1.1              | 800       | 2864             | 0.0              | 930       | 2039             | 0.0              |
| 415       | 7117             | 0.0              | 545       | 78677            | 52.4             | 675       | 46030            | 0.8              | 805       | 3151             | 0.0              | 935       | 1784             | 0.0              |
| 420       | 13992            | 0.0              | 550       | 83331            | 56.6             | 680       | 40590            | 0.5              | 810       | 3022             | 0.0              | 940       | 2464             | 0.0              |
| 425       | 25176            | 0.1              | 555       | 89120            | 60.9             | 685       | 35691            | 0.3              | 815       | 3471             | 0.0              | 945       | 2794             | 0.0              |
| 430       | 38151            | 0.3              | 560       | 94613            | 64.3             | 690       | 31631            | 0.2              | 820       | 2749             | 0.0              | 950       | 3090             | 0.0              |
| 435       | 49673            | 0.6              | 565       | 99818            | 66.4             | 695       | 27437            | 0.1              | 825       | 2729             | 0.0              | 955       | 1866             | 0.0              |
| 440       | 57273            | 0.9              | 570       | 106526           | 69.3             | 700       | 24589            | 0.1              | 830       | 2282             | 0.0              | 960       | 3110             | 0.0              |
| 445       | 54802            | 1.1              | 575       | 111610           | 69.4             | 705       | 21832            | 0.0              | 835       | 3140             | 0.0              | 965       | 3880             | 0.0              |
| 450       | 39184            | 1.0              | 580       | 117163           | 69.6             | 710       | 19500            | 0.0              | 840       | 2365             | 0.0              | 970       | 3243             | 0.0              |
| 455       | 22506            | 0.8              | 585       | 122201           | 67.9             | 715       | 17870            | 0.0              | 845       | 3024             | 0.0              | 975       | 2014             | 0.0              |
| 460       | 13692            | 0.6              | 590       | 125662           | 65.0             | 720       | 15924            | 0.0              | 850       | 2510             | 0.0              | 980       | 1688             | 0.0              |
| 465       | 9446             | 0.5              | 595       | 127415           | 60.4             | 725       | 14268            | 0.0              | 855       | 2739             | 0.0              | 985       | 2827             | 0.0              |
| 470       | 6698             | 0.4              | 600       | 129155           | 55.7             | 730       | 12438            | 0.0              | 860       | 3515             | 0.0              | 990       | 4172             | 0.0              |
| 475       | 5328             | 0.4              | 605       | 128057           | 49.6             | 735       | 11255            | 0.0              | 865       | 3600             | 0.0              | 995       | 3177             | 0.0              |
| 480       | 5081             | 0.5              | 610       | 126031           | 43.3             | 740       | 9951             | 0.0              | 870       | 3609             | 0.0              | 1000      | 3241             | 0.0              |
| 485       | 5579             | 0.7              | 615       | 123059           | 37.1             | 745       | 8870             | 0.0              | 875       | 3208             | 0.0              |           |                  |                  |

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Scotopic Flux vs. Wavelength



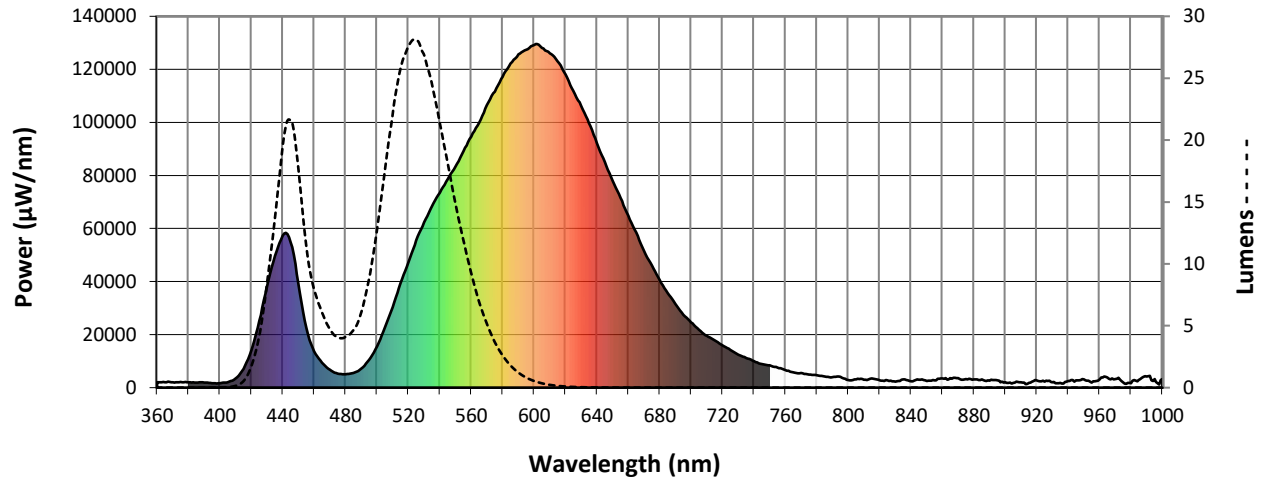
Scotopic Lumens: 6474.3

S/P: 1.04

| 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       | 2044             | 0.0              | 490       | 7179             | 6.0              | 620       | 118034           | 0.1              | 750       | 8362             | 0.0              | 880       | 3128             | 0.0              |
| 365       | 2016             | 0.0              | 495       | 10476            | 8.6              | 625       | 111884           | 0.1              | 755       | 7635             | 0.0              | 885       | 3110             | 0.0              |
| 370       | 2020             | 0.0              | 500       | 15549            | 12.5             | 630       | 106119           | 0.0              | 760       | 6582             | 0.0              | 890       | 2632             | 0.0              |
| 375       | 2137             | 0.0              | 505       | 22477            | 17.3             | 635       | 99706            | 0.0              | 765       | 5777             | 0.0              | 895       | 2709             | 0.0              |
| 380       | 2046             | 0.0              | 510       | 30417            | 21.8             | 640       | 92142            | 0.0              | 770       | 5474             | 0.0              | 900       | 2016             | 0.0              |
| 385       | 1925             | 0.0              | 515       | 39274            | 25.7             | 645       | 84987            | 0.0              | 775       | 4977             | 0.0              | 905       | 1748             | 0.0              |
| 390       | 1893             | 0.0              | 520       | 47282            | 27.5             | 650       | 78016            | 0.0              | 780       | 4723             | 0.0              | 910       | 2046             | 0.0              |
| 395       | 1695             | 0.0              | 525       | 55413            | 28.1             | 655       | 71541            | 0.0              | 785       | 4219             | 0.0              | 915       | 1844             | 0.0              |
| 400       | 1633             | 0.0              | 530       | 62377            | 27.0             | 660       | 64863            | 0.0              | 790       | 3969             | 0.0              | 920       | 2734             | 0.0              |
| 405       | 2065             | 0.0              | 535       | 68520            | 24.7             | 665       | 58485            | 0.0              | 795       | 4122             | 0.0              | 925       | 2307             | 0.0              |
| 410       | 3449             | 0.1              | 540       | 73435            | 21.5             | 670       | 51641            | 0.0              | 800       | 2864             | 0.0              | 930       | 2039             | 0.0              |
| 415       | 7117             | 0.5              | 545       | 78677            | 18.3             | 675       | 46030            | 0.0              | 805       | 3151             | 0.0              | 935       | 1784             | 0.0              |
| 420       | 13992            | 1.6              | 550       | 83331            | 15.0             | 680       | 40590            | 0.0              | 810       | 3022             | 0.0              | 940       | 2464             | 0.0              |
| 425       | 25176            | 3.9              | 555       | 89120            | 12.0             | 685       | 35691            | 0.0              | 815       | 3471             | 0.0              | 945       | 2794             | 0.0              |
| 430       | 38151            | 8.1              | 560       | 94613            | 9.3              | 690       | 31631            | 0.0              | 820       | 2749             | 0.0              | 950       | 3090             | 0.0              |
| 435       | 49673            | 13.3             | 565       | 99818            | 7.0              | 695       | 27437            | 0.0              | 825       | 2729             | 0.0              | 955       | 1866             | 0.0              |
| 440       | 57273            | 19.1             | 570       | 106526           | 5.2              | 700       | 24589            | 0.0              | 830       | 2282             | 0.0              | 960       | 3110             | 0.0              |
| 445       | 54802            | 21.6             | 575       | 111610           | 3.7              | 705       | 21832            | 0.0              | 835       | 3140             | 0.0              | 965       | 3880             | 0.0              |
| 450       | 39184            | 18.1             | 580       | 117163           | 2.6              | 710       | 19500            | 0.0              | 840       | 2365             | 0.0              | 970       | 3243             | 0.0              |
| 455       | 22506            | 11.8             | 585       | 122201           | 1.8              | 715       | 17870            | 0.0              | 845       | 3024             | 0.0              | 975       | 2014             | 0.0              |
| 460       | 13692            | 8.1              | 590       | 125662           | 1.2              | 720       | 15924            | 0.0              | 850       | 2510             | 0.0              | 980       | 1688             | 0.0              |
| 465       | 9446             | 6.2              | 595       | 127415           | 0.8              | 725       | 14268            | 0.0              | 855       | 2739             | 0.0              | 985       | 2827             | 0.0              |
| 470       | 6698             | 4.8              | 600       | 129155           | 0.5              | 730       | 12438            | 0.0              | 860       | 3515             | 0.0              | 990       | 4172             | 0.0              |
| 475       | 5328             | 4.1              | 605       | 128057           | 0.4              | 735       | 11255            | 0.0              | 865       | 3600             | 0.0              | 995       | 3177             | 0.0              |
| 480       | 5081             | 4.1              | 610       | 126031           | 0.2              | 740       | 9951             | 0.0              | 870       | 3609             | 0.0              | 1000      | 3241             | 0.0              |
| 485       | 5579             | 4.6              | 615       | 123059           | 0.1              | 745       | 8870             | 0.0              | 875       | 3208             | 0.0              |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 2145.7**

**M/P: 0.35**

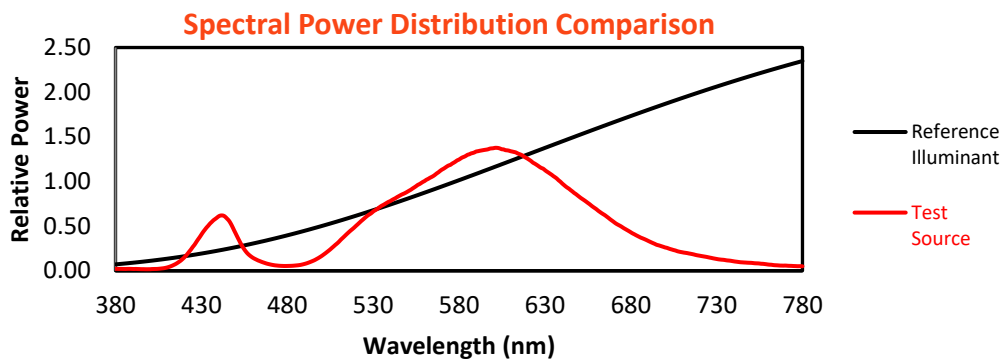
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 2044             | 0.0              | 490       | 7179             | 11.1             | 620       | 118034           | 1.5              | 750       | 8362             | 0.0              | 880       | 3128             | 0.0              |
| 365       | 2016             | 0.0              | 495       | 10476            | 16.9             | 625       | 111884           | 0.9              | 755       | 7635             | 0.0              | 885       | 3110             | 0.0              |
| 370       | 2020             | 0.0              | 500       | 15549            | 26.0             | 630       | 106119           | 0.6              | 760       | 6582             | 0.0              | 890       | 2632             | 0.0              |
| 375       | 2137             | 0.0              | 505       | 22477            | 38.2             | 635       | 99706            | 0.4              | 765       | 5777             | 0.0              | 895       | 2709             | 0.0              |
| 380       | 2046             | 0.0              | 510       | 30417            | 51.6             | 640       | 92142            | 0.2              | 770       | 5474             | 0.0              | 900       | 2016             | 0.0              |
| 385       | 1925             | 0.0              | 515       | 39274            | 65.1             | 645       | 84987            | 0.1              | 775       | 4977             | 0.0              | 905       | 1748             | 0.0              |
| 390       | 1893             | 0.0              | 520       | 47282            | 75.2             | 650       | 78016            | 0.1              | 780       | 4723             | 0.0              | 910       | 2046             | 0.0              |
| 395       | 1695             | 0.0              | 525       | 55413            | 82.9             | 655       | 71541            | 0.1              | 785       | 4219             | 0.0              | 915       | 1844             | 0.0              |
| 400       | 1633             | 0.0              | 530       | 62377            | 86.0             | 660       | 64863            | 0.0              | 790       | 3969             | 0.0              | 920       | 2734             | 0.0              |
| 405       | 2065             | 0.1              | 535       | 68520            | 85.4             | 665       | 58485            | 0.0              | 795       | 4122             | 0.0              | 925       | 2307             | 0.0              |
| 410       | 3449             | 0.2              | 540       | 73435            | 81.1             | 670       | 51641            | 0.0              | 800       | 2864             | 0.0              | 930       | 2039             | 0.0              |
| 415       | 7117             | 0.7              | 545       | 78677            | 75.4             | 675       | 46030            | 0.0              | 805       | 3151             | 0.0              | 935       | 1784             | 0.0              |
| 420       | 13992            | 2.3              | 550       | 83331            | 68.1             | 680       | 40590            | 0.0              | 810       | 3022             | 0.0              | 940       | 2464             | 0.0              |
| 425       | 25176            | 6.2              | 555       | 89120            | 60.9             | 685       | 35691            | 0.0              | 815       | 3471             | 0.0              | 945       | 2794             | 0.0              |
| 430       | 38151            | 13.0             | 560       | 94613            | 52.9             | 690       | 31631            | 0.0              | 820       | 2749             | 0.0              | 950       | 3090             | 0.0              |
| 435       | 49673            | 22.2             | 565       | 99818            | 44.8             | 695       | 27437            | 0.0              | 825       | 2729             | 0.0              | 955       | 1866             | 0.0              |
| 440       | 57273            | 32.0             | 570       | 106526           | 37.6             | 700       | 24589            | 0.0              | 830       | 2282             | 0.0              | 960       | 3110             | 0.0              |
| 445       | 54802            | 36.7             | 575       | 111610           | 30.4             | 705       | 21832            | 0.0              | 835       | 3140             | 0.0              | 965       | 3880             | 0.0              |
| 450       | 39184            | 30.4             | 580       | 117163           | 24.1             | 710       | 19500            | 0.0              | 840       | 2365             | 0.0              | 970       | 3243             | 0.0              |
| 455       | 22506            | 19.7             | 585       | 122201           | 18.7             | 715       | 17870            | 0.0              | 845       | 3024             | 0.0              | 975       | 2014             | 0.0              |
| 460       | 13692            | 13.2             | 590       | 125662           | 14.0             | 720       | 15924            | 0.0              | 850       | 2510             | 0.0              | 980       | 1688             | 0.0              |
| 465       | 9446             | 10.0             | 595       | 127415           | 10.2             | 725       | 14268            | 0.0              | 855       | 2739             | 0.0              | 985       | 2827             | 0.0              |
| 470       | 6698             | 7.7              | 600       | 129155           | 7.3              | 730       | 12438            | 0.0              | 860       | 3515             | 0.0              | 990       | 4172             | 0.0              |
| 475       | 5328             | 6.7              | 605       | 128057           | 5.0              | 735       | 11255            | 0.0              | 865       | 3600             | 0.0              | 995       | 3177             | 0.0              |
| 480       | 5081             | 6.9              | 610       | 126031           | 3.4              | 740       | 9951             | 0.0              | 870       | 3609             | 0.0              | 1000      | 3241             | 0.0              |
| 485       | 5579             | 8.1              | 615       | 123059           | 2.3              | 745       | 8870             | 0.0              | 875       | 3208             | 0.0              |           |                  |                  |

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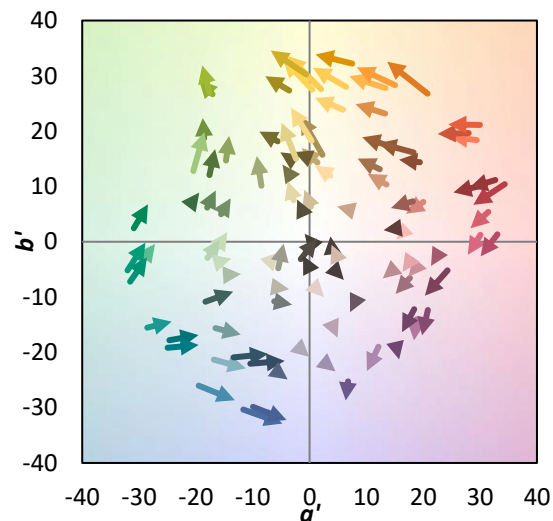
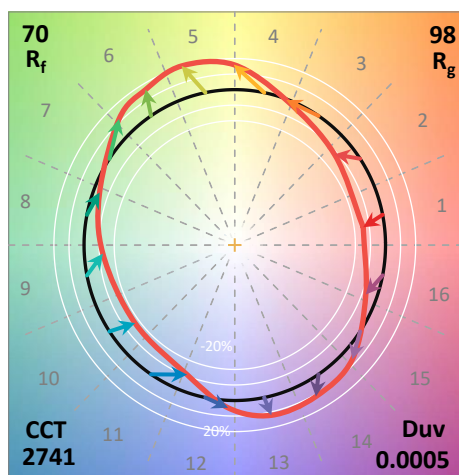
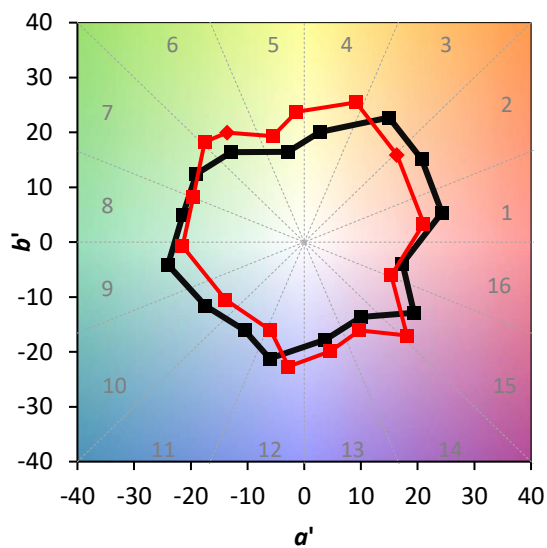
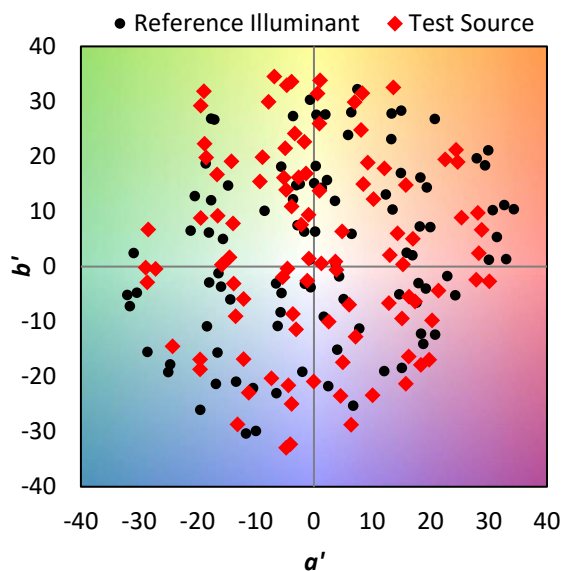
**TM-30-18**

### Summary

$R_f = 69.9$   
 $R_g = 98.3$   
 $CIE R_a = 71.5$   
 $R_g = -16.1$



### Color Vector Graphics



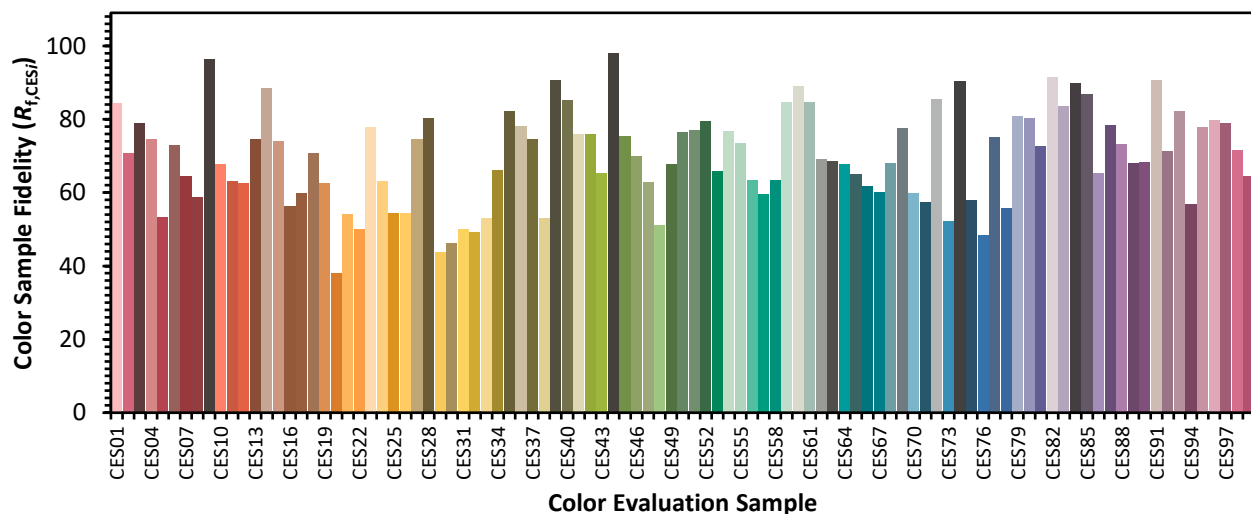


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**TM-30-18**

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

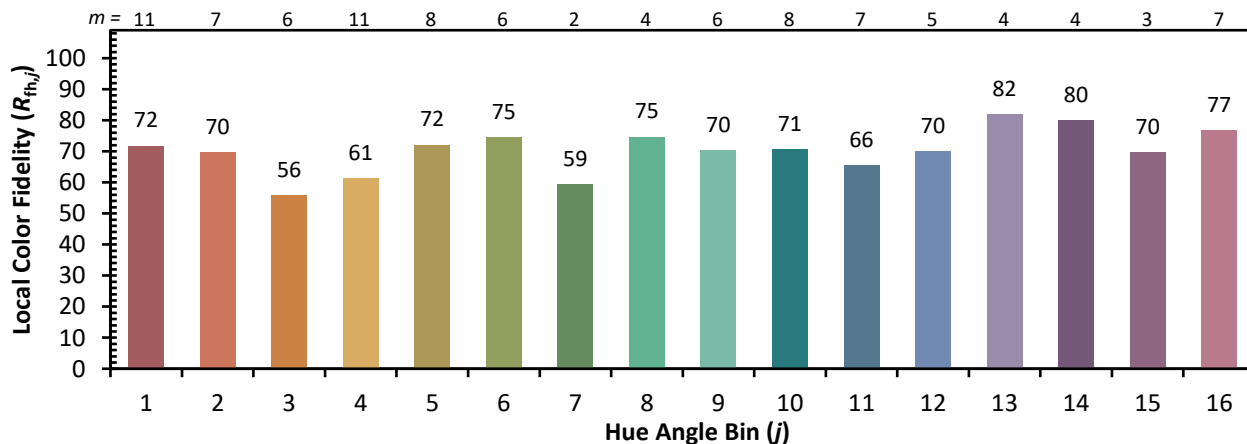
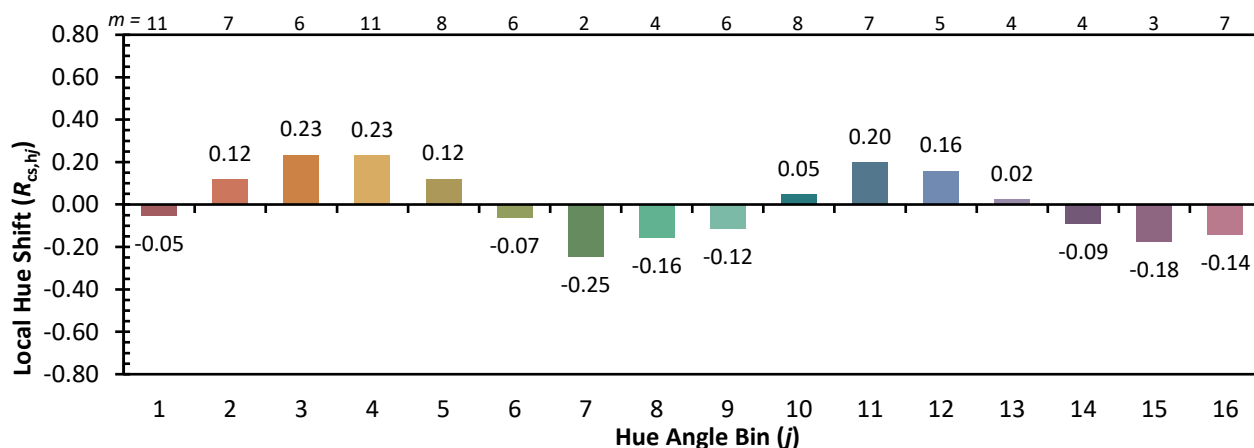
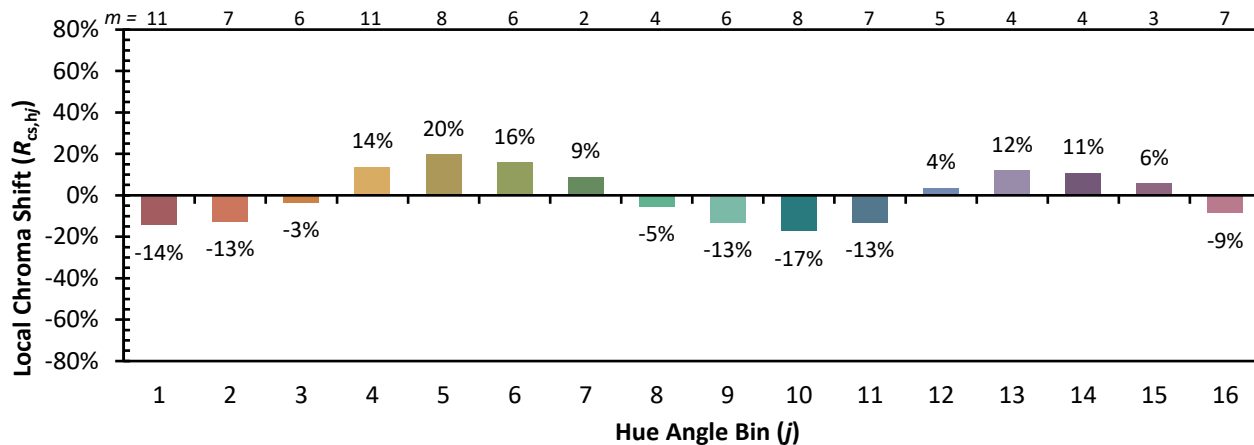
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 54 | CES51 = 77 | CES76 = 48 |
| CES02 = 63 | CES27 = 74 | CES52 = 80 | CES77 = 75 |
| CES03 = 31 | CES28 = 80 | CES53 = 66 | CES78 = 56 |
| CES04 = 71 | CES29 = 44 | CES54 = 77 | CES79 = 81 |
| CES05 = 50 | CES30 = 46 | CES55 = 74 | CES80 = 80 |
| CES06 = 52 | CES31 = 50 | CES56 = 63 | CES81 = 73 |
| CES07 = 42 | CES32 = 49 | CES57 = 60 | CES82 = 91 |
| CES08 = 41 | CES33 = 53 | CES58 = 63 | CES83 = 84 |
| CES09 = 29 | CES34 = 66 | CES59 = 85 | CES84 = 90 |
| CES10 = 77 | CES35 = 82 | CES60 = 89 | CES85 = 87 |
| CES11 = 60 | CES36 = 78 | CES61 = 85 | CES86 = 65 |
| CES12 = 66 | CES37 = 75 | CES62 = 69 | CES87 = 78 |
| CES13 = 43 | CES38 = 53 | CES63 = 68 | CES88 = 73 |
| CES14 = 74 | CES39 = 91 | CES64 = 68 | CES89 = 68 |
| CES15 = 71 | CES40 = 85 | CES65 = 65 | CES90 = 68 |
| CES16 = 48 | CES41 = 76 | CES66 = 62 | CES91 = 91 |
| CES17 = 50 | CES42 = 76 | CES67 = 60 | CES92 = 71 |
| CES18 = 57 | CES43 = 65 | CES68 = 68 | CES93 = 82 |
| CES19 = 73 | CES44 = 98 | CES69 = 77 | CES94 = 57 |
| CES20 = 67 | CES45 = 75 | CES70 = 60 | CES95 = 78 |
| CES21 = 88 | CES46 = 70 | CES71 = 57 | CES96 = 80 |
| CES22 = 80 | CES47 = 63 | CES72 = 86 | CES97 = 79 |
| CES23 = 92 | CES48 = 51 | CES73 = 52 | CES98 = 71 |
| CES24 = 91 | CES49 = 68 | CES74 = 90 | CES99 = 64 |
| CES25 = 73 | CES50 = 77 | CES75 = 58 |            |



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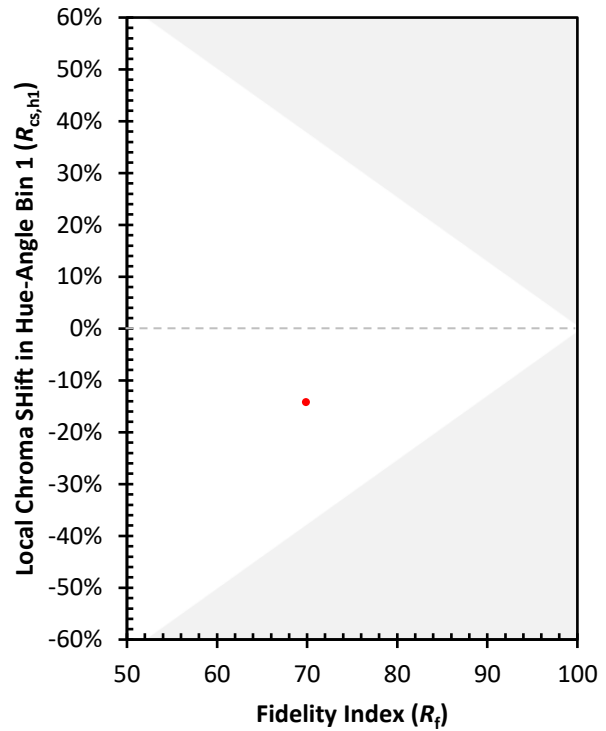
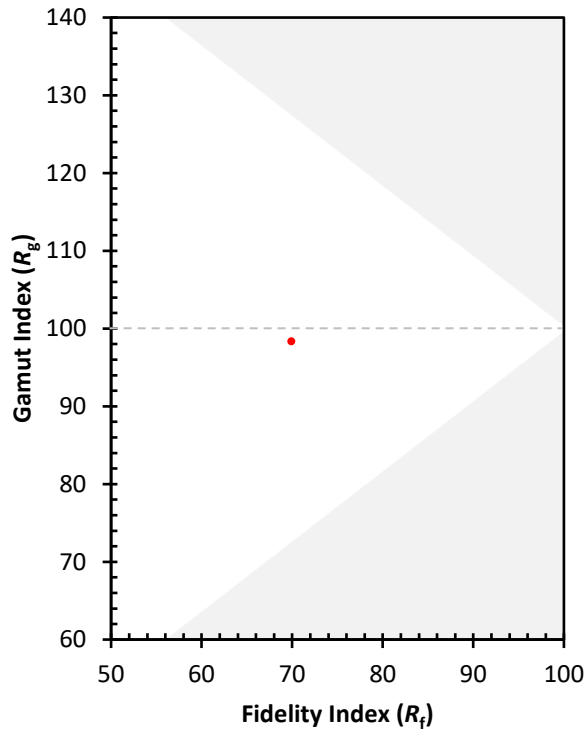
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)