

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: P361715

Luminaire Tested: NVN-SA1B-727-U-SL2

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P361715  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-20)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA1B-727-U-SL2  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(1) 70 CRI, 2700K, 800mA LIGHTSQUARE WITH 16 LEDS AND TYPE II SPILL LIGHT  
ELIMINATOR OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 4808 lumens  
Efficiency: N/A  
Efficacy: 109.3 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 0.5' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B1 - U0 - G2

Input Watts (W): 44  
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

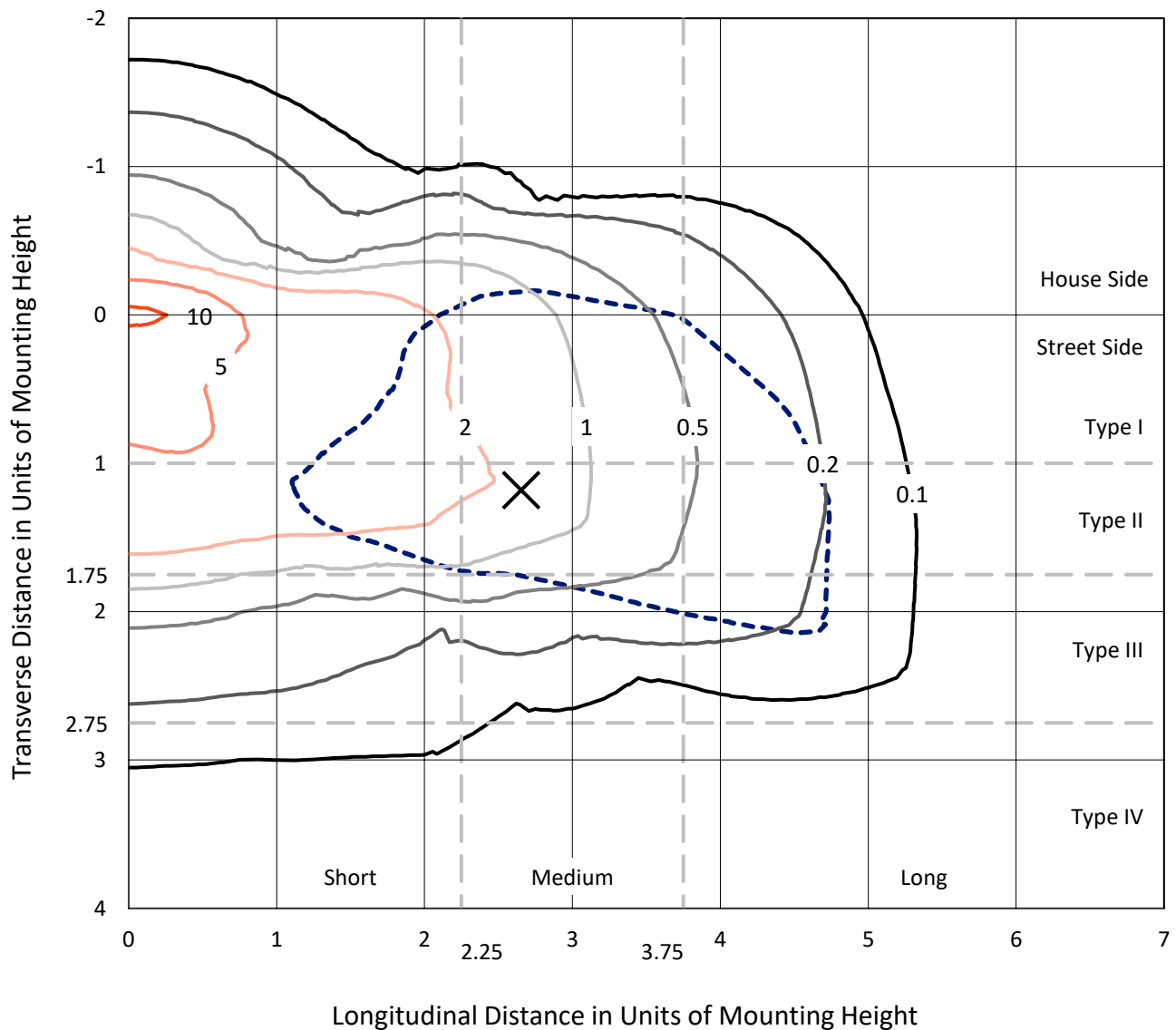


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## Iso-Footcandle Lines of Horizontal Illumination

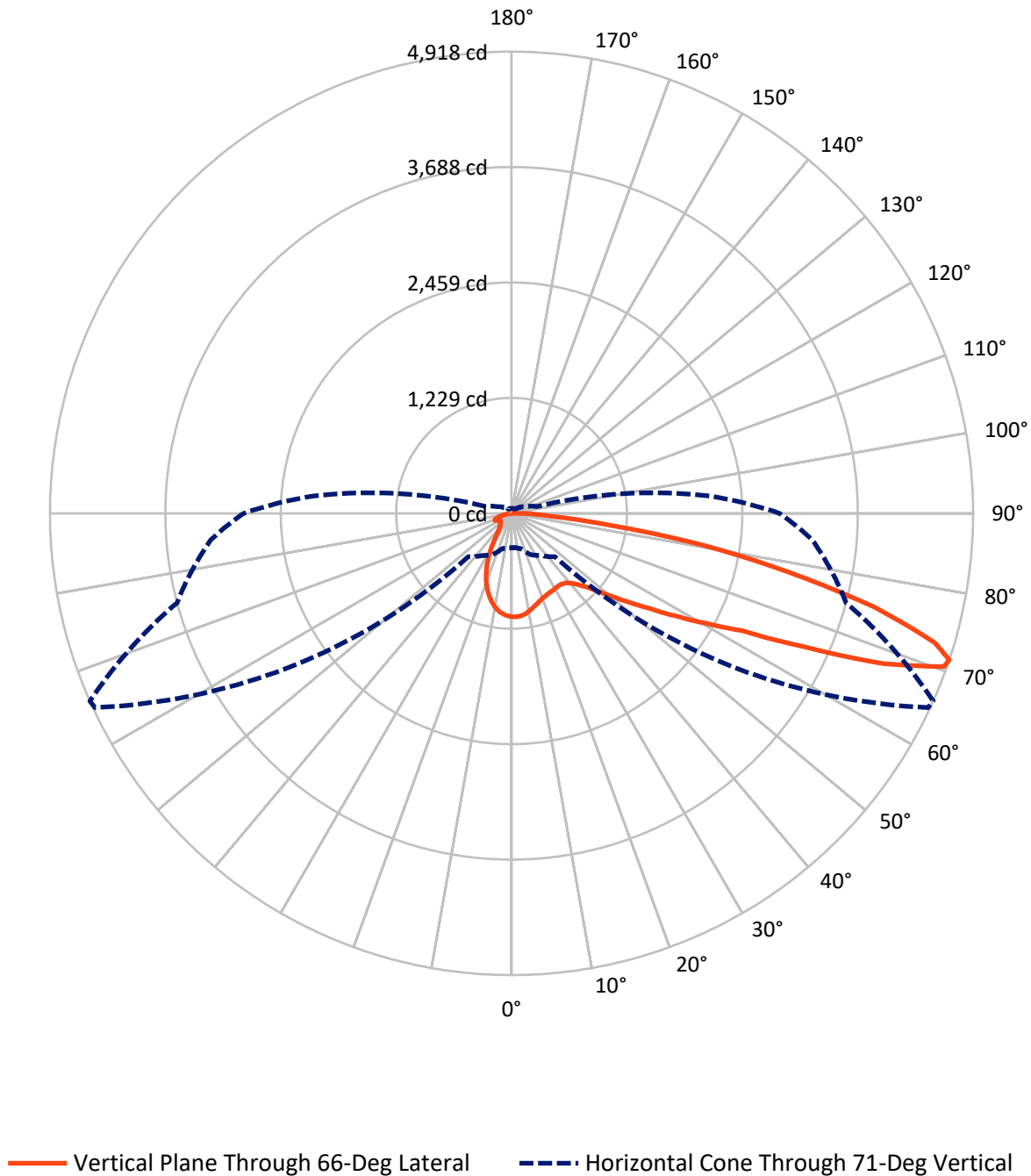
× Max cd  
 - - - 1/2 Max cd



Based on 10 foot mounting height. Maximum calculated value = 11 fc  
 Type III - Medium - N/A

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## Luminous Intensity Polar Plot



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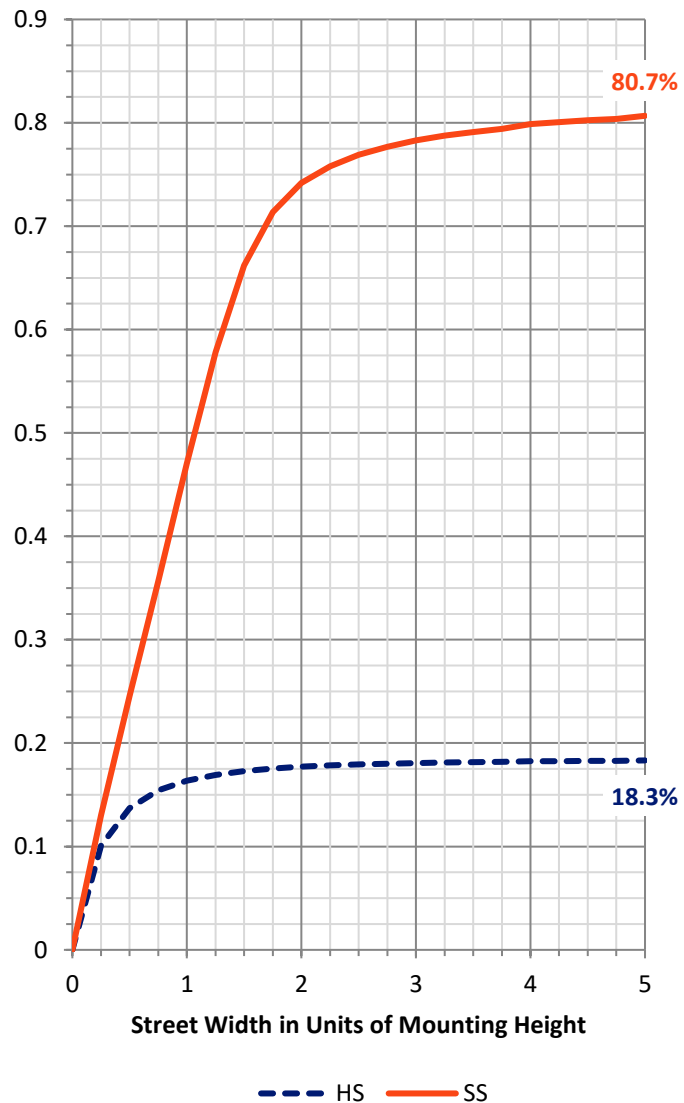
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 891.1    | 0.0    | 891.1  |
|                    | % Fixture | 18.5     | 0.0    | 18.5   |
| <b>Street Side</b> | Lumens    | 3917.0   | 0.0    | 3917.0 |
|                    | % Fixture | 81.5     | 0.0    | 81.5   |
| <b>Total</b>       | Lumens    | 4808.0   | 0.0    | 4808.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 97.0   | 2.0       |
| 10°-20°   | 232.5  | 4.8       |
| 20°-30°   | 312.3  | 6.5       |
| 30°-40°   | 410.9  | 8.5       |
| 40°-50°   | 597.7  | 12.4      |
| 50°-60°   | 933.7  | 19.4      |
| 60°-70°   | 1169.6 | 24.3      |
| 70°-80°   | 892.2  | 18.6      |
| 80°-90°   | 162.0  | 3.4       |
| 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°    | 4808.0 | 100.0     |
| 0°-180°   | 4808.0 | 100.0     |

**Coefficient of Utilization**



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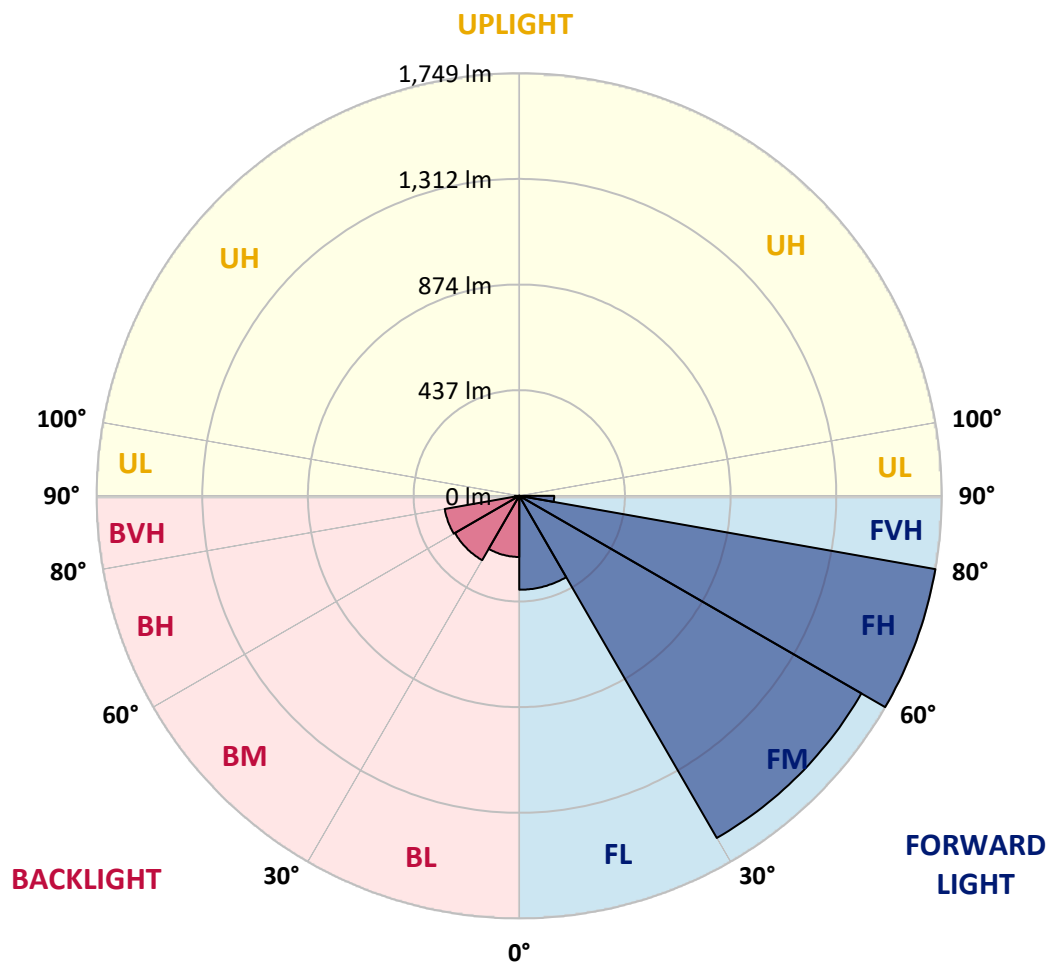
CATALOG NUMBER: NVN-SA1B-727-U-SL2

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 388.8  | 8.1       |                         |      |         |
| FM   | (30°-60°)   | 1635.0 | 34.0      |                         |      |         |
| FH   | (60°-80°)   | 1748.7 | 36.4      |                         |      | G1/1800 |
| FVH  | (80°-90°)   | 144.5  | 3.0       |                         |      | G2/225  |
| BL   | (0°-30°)    | 253.0  | 5.3       | B1/500                  |      |         |
| BM   | (30°-60°)   | 307.4  | 6.4       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 313.1  | 6.5       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 17.5   | 0.4       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G2**

Type III Medium





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 66°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 |
| 2.5°  | 1081.0 | 1079.3 | 1084.3 | 1089.5 | 1091.5 | 1094.8 | 1099.8 | 1102.6 | 1102.4 | 1102.9 | 1101.3 |
| 5°    | 1009.3 | 1007.1 | 1017.1 | 1025.2 | 1040.8 | 1058.4 | 1079.8 | 1095.1 | 1095.4 | 1104.1 | 1106.4 |
| 7.5°  | 941.4  | 939.9  | 951.4  | 964.5  | 982.6  | 1009.5 | 1044.1 | 1077.0 | 1079.0 | 1102.4 | 1110.5 |
| 10°   | 886.9  | 886.6  | 897.7  | 912.0  | 933.1  | 963.1  | 1003.0 | 1051.1 | 1054.1 | 1094.4 | 1111.2 |
| 12.5° | 844.4  | 845.1  | 854.7  | 871.0  | 893.3  | 924.6  | 967.8  | 1022.1 | 1026.9 | 1081.8 | 1107.4 |
| 15°   | 813.1  | 815.7  | 823.5  | 840.0  | 861.9  | 893.8  | 938.1  | 995.2  | 1002.5 | 1067.7 | 1105.2 |
| 17.5° | 795.1  | 798.1  | 803.6  | 817.2  | 837.8  | 868.5  | 910.5  | 973.1  | 979.7  | 1056.9 | 1105.4 |
| 20°   | 789.8  | 792.3  | 795.5  | 803.8  | 821.2  | 849.1  | 888.8  | 953.2  | 960.3  | 1048.3 | 1107.1 |
| 22.5° | 800.3  | 802.1  | 802.5  | 801.8  | 812.4  | 835.2  | 873.0  | 938.6  | 946.2  | 1042.7 | 1108.2 |
| 25°   | 822.7  | 825.2  | 823.4  | 817.2  | 813.7  | 827.7  | 864.9  | 928.9  | 936.6  | 1038.5 | 1105.9 |
| 27.5° | 856.4  | 856.7  | 855.2  | 847.3  | 830.8  | 828.5  | 862.4  | 923.3  | 930.6  | 1033.7 | 1101.1 |
| 30°   | 902.2  | 904.4  | 901.7  | 890.9  | 864.0  | 841.8  | 865.4  | 917.8  | 924.5  | 1027.5 | 1093.3 |
| 32.5° | 955.8  | 961.1  | 961.0  | 949.7  | 911.2  | 871.5  | 877.6  | 914.5  | 919.6  | 1021.1 | 1083.8 |
| 35°   | 1011.4 | 1018.8 | 1032.4 | 1027.5 | 979.9  | 918.5  | 901.2  | 919.8  | 923.3  | 1020.2 | 1077.2 |
| 37.5° | 1069.2 | 1076.5 | 1104.6 | 1117.5 | 1061.7 | 985.7  | 938.4  | 938.6  | 940.2  | 1030.4 | 1076.7 |
| 40°   | 1129.6 | 1137.4 | 1179.6 | 1213.3 | 1167.8 | 1070.9 | 998.3  | 977.7  | 975.9  | 1055.3 | 1086.5 |
| 42.5° | 1214.3 | 1221.3 | 1271.9 | 1314.9 | 1285.5 | 1179.9 | 1081.2 | 1038.2 | 1034.4 | 1104.1 | 1117.9 |
| 45°   | 1321.4 | 1327.3 | 1381.1 | 1427.1 | 1412.0 | 1304.4 | 1185.3 | 1121.3 | 1120.7 | 1185.4 | 1181.4 |
| 47.5° | 1448.7 | 1453.3 | 1501.6 | 1546.1 | 1551.6 | 1447.7 | 1316.1 | 1249.7 | 1238.9 | 1297.0 | 1279.9 |
| 50°   | 1581.3 | 1586.5 | 1619.3 | 1667.2 | 1707.8 | 1639.4 | 1484.4 | 1406.9 | 1392.4 | 1444.2 | 1419.3 |
| 52.5° | 1669.1 | 1676.0 | 1704.5 | 1765.1 | 1883.5 | 1849.6 | 1683.4 | 1597.4 | 1575.5 | 1622.7 | 1603.6 |
| 55°   | 1630.0 | 1645.2 | 1688.9 | 1786.0 | 2023.9 | 2170.6 | 1928.9 | 1819.7 | 1795.0 | 1834.2 | 1822.9 |
| 57.5° | 1451.8 | 1472.8 | 1532.4 | 1682.3 | 2043.6 | 2453.5 | 2300.1 | 2081.5 | 2064.1 | 2052.8 | 2057.9 |
| 60°   | 1126.3 | 1146.4 | 1220.3 | 1415.7 | 1906.0 | 2660.0 | 2858.7 | 2404.2 | 2379.0 | 2272.2 | 2276.9 |
| 62.5° | 797.1  | 787.0  | 837.6  | 980.6  | 1548.8 | 2684.2 | 3494.3 | 2835.8 | 2752.8 | 2504.0 | 2483.5 |
| 65°   | 607.9  | 605.6  | 628.3  | 673.8  | 938.1  | 2394.2 | 3873.0 | 3561.2 | 3431.6 | 2776.5 | 2728.4 |
| 67.5° | 499.5  | 495.3  | 517.8  | 584.0  | 604.1  | 1544.6 | 3881.3 | 4402.9 | 4275.5 | 3115.8 | 3011.6 |
| 70°   | 410.7  | 406.0  | 427.0  | 512.4  | 558.3  | 783.4  | 3266.6 | 4895.7 | 4888.9 | 3545.5 | 3225.4 |
| 71°   | 368.2  | 364.9  | 389.9  | 484.9  | 548.5  | 652.9  | 2820.4 | 4897.0 | 4917.5 | 3690.9 | 3212.8 |
| 72.5° | 299.8  | 301.0  | 327.5  | 431.6  | 541.2  | 576.5  | 2072.9 | 4668.8 | 4712.0 | 3829.5 | 3098.1 |
| 75°   | 199.2  | 200.2  | 235.1  | 332.0  | 524.7  | 564.1  | 1139.3 | 3917.6 | 3997.0 | 3746.5 | 2827.0 |
| 77.5° | 133.8  | 133.5  | 157.2  | 227.8  | 457.2  | 564.1  | 668.0  | 2930.1 | 3017.2 | 2981.1 | 2179.4 |
| 80°   | 92.1   | 91.5   | 108.2  | 157.2  | 346.1  | 570.9  | 516.4  | 2053.4 | 2079.8 | 1609.9 | 885.8  |
| 82.5° | 56.4   | 56.9   | 70.7   | 111.1  | 235.6  | 513.8  | 487.5  | 1119.7 | 1091.0 | 451.5  | 221.3  |
| 85°   | 32.4   | 32.2   | 45.2   | 75.2   | 151.2  | 433.6  | 475.4  | 481.9  | 442.1  | 136.0  | 80.0   |
| 87.5° | 11.6   | 12.5   | 24.2   | 41.7   | 86.7   | 302.0  | 403.4  | 250.7  | 225.9  | 61.4   | 36.2   |
| 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: NVN-SA1B-727-U-SL2

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 | 1101.4 |
| 2.5°  | 1100.1 | 1101.1 | 1099.9 | 1093.3 | 1087.6 | 1078.5 | 1073.4 | 1066.2 | 1064.1 | 1063.1 | 1065.7 |
| 5°    | 1104.2 | 1104.6 | 1094.8 | 1077.3 | 1057.8 | 1034.7 | 1018.1 | 997.7  | 988.0  | 983.9  | 986.5  |
| 7.5°  | 1108.1 | 1106.6 | 1085.2 | 1051.8 | 1015.6 | 975.4  | 939.7  | 907.0  | 887.9  | 880.1  | 880.8  |
| 10°   | 1108.6 | 1102.2 | 1067.9 | 1016.3 | 960.2  | 901.2  | 846.4  | 796.0  | 764.1  | 743.4  | 749.7  |
| 12.5° | 1103.4 | 1092.8 | 1042.5 | 970.3  | 892.4  | 812.1  | 738.0  | 662.3  | 616.9  | 595.8  | 596.4  |
| 15°   | 1099.4 | 1080.2 | 1011.3 | 916.2  | 811.6  | 705.2  | 604.1  | 515.1  | 466.6  | 445.0  | 434.9  |
| 17.5° | 1096.1 | 1066.6 | 975.1  | 855.2  | 716.1  | 581.2  | 459.7  | 380.3  | 353.7  | 347.4  | 344.8  |
| 20°   | 1091.5 | 1052.1 | 934.8  | 784.7  | 607.4  | 442.4  | 335.7  | 296.5  | 296.6  | 303.9  | 304.9  |
| 22.5° | 1085.0 | 1035.7 | 891.8  | 705.5  | 490.7  | 322.2  | 263.1  | 251.8  | 263.3  | 277.2  | 279.7  |
| 25°   | 1075.4 | 1016.3 | 844.0  | 618.0  | 374.2  | 247.7  | 224.8  | 224.3  | 238.2  | 252.8  | 255.0  |
| 27.5° | 1061.7 | 990.9  | 790.8  | 524.1  | 275.7  | 210.5  | 201.4  | 204.8  | 215.1  | 225.8  | 226.6  |
| 30°   | 1043.5 | 961.3  | 732.2  | 425.0  | 216.1  | 187.4  | 186.4  | 189.6  | 195.9  | 203.4  | 204.0  |
| 32.5° | 1023.4 | 931.3  | 669.6  | 329.0  | 185.1  | 175.0  | 176.0  | 177.5  | 180.4  | 183.4  | 184.1  |
| 35°   | 1005.1 | 900.6  | 605.6  | 250.0  | 170.3  | 166.8  | 166.2  | 165.8  | 166.2  | 165.2  | 165.3  |
| 37.5° | 993.4  | 875.2  | 538.8  | 199.0  | 161.9  | 159.7  | 157.7  | 155.2  | 152.4  | 150.7  | 151.1  |
| 40°   | 989.0  | 856.2  | 471.3  | 172.0  | 154.9  | 153.4  | 149.6  | 144.3  | 140.9  | 139.9  | 139.9  |
| 42.5° | 1000.7 | 846.4  | 406.0  | 158.4  | 149.1  | 146.6  | 140.3  | 134.1  | 131.6  | 131.5  | 131.3  |
| 45°   | 1036.2 | 850.4  | 344.0  | 150.9  | 143.8  | 138.9  | 130.6  | 125.5  | 123.8  | 124.2  | 124.0  |
| 47.5° | 1099.9 | 875.5  | 290.8  | 145.9  | 138.4  | 132.1  | 122.8  | 118.7  | 116.7  | 116.7  | 116.9  |
| 50°   | 1208.3 | 934.1  | 248.5  | 141.8  | 134.0  | 125.8  | 117.2  | 112.1  | 109.4  | 109.2  | 109.2  |
| 52.5° | 1366.2 | 1039.0 | 222.1  | 138.3  | 129.0  | 120.2  | 111.6  | 105.1  | 101.9  | 101.3  | 100.9  |
| 55°   | 1564.1 | 1189.4 | 214.8  | 136.0  | 122.3  | 114.0  | 104.7  | 98.3   | 94.8   | 93.3   | 93.1   |
| 57.5° | 1785.3 | 1372.3 | 229.2  | 133.1  | 115.5  | 106.7  | 97.3   | 91.1   | 87.5   | 85.7   | 85.5   |
| 60°   | 2009.3 | 1572.0 | 288.2  | 129.1  | 109.9  | 98.8   | 89.6   | 84.0   | 80.3   | 78.4   | 78.0   |
| 62.5° | 2233.5 | 1782.5 | 408.5  | 128.8  | 105.9  | 91.1   | 81.8   | 77.0   | 73.5   | 71.4   | 70.9   |
| 65°   | 2486.5 | 2012.9 | 545.3  | 137.6  | 104.6  | 84.2   | 73.9   | 70.1   | 67.1   | 65.1   | 64.9   |
| 67.5° | 2777.0 | 2273.1 | 532.2  | 155.7  | 109.1  | 77.9   | 66.4   | 63.4   | 61.3   | 59.6   | 59.4   |
| 70°   | 2913.3 | 2232.4 | 330.8  | 168.5  | 115.4  | 71.7   | 59.3   | 57.1   | 55.4   | 54.3   | 53.8   |
| 71°   | 2856.2 | 2119.7 | 277.4  | 167.0  | 114.7  | 69.1   | 56.4   | 54.8   | 53.1   | 52.1   | 51.6   |
| 72.5° | 2700.5 | 1933.1 | 231.4  | 155.4  | 107.2  | 64.2   | 52.8   | 51.1   | 49.6   | 48.5   | 48.1   |
| 75°   | 2423.3 | 1726.4 | 185.3  | 124.2  | 85.5   | 54.3   | 46.3   | 44.5   | 43.3   | 42.7   | 42.0   |
| 77.5° | 1781.4 | 1232.1 | 143.3  | 98.1   | 62.9   | 44.3   | 39.5   | 38.2   | 37.0   | 36.0   | 35.5   |
| 80°   | 682.4  | 477.3  | 96.4   | 73.2   | 46.1   | 35.0   | 31.9   | 31.2   | 30.0   | 29.4   | 29.4   |
| 82.5° | 183.8  | 142.6  | 51.5   | 44.3   | 30.9   | 25.6   | 24.4   | 24.1   | 23.1   | 21.7   | 21.9   |
| 85°   | 74.4   | 62.9   | 28.9   | 24.4   | 18.9   | 15.1   | 16.4   | 16.6   | 15.4   | 13.8   | 13.9   |
| 87.5° | 32.7   | 26.7   | 16.1   | 10.8   | 8.3    | 5.8    | 7.5    | 7.5    | 6.8    | 5.6    | 5.1    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
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

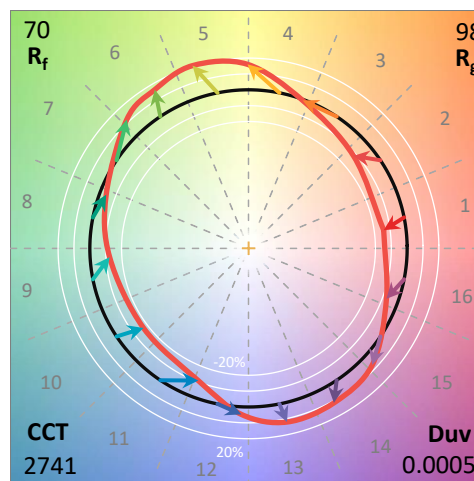
### Test Information

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

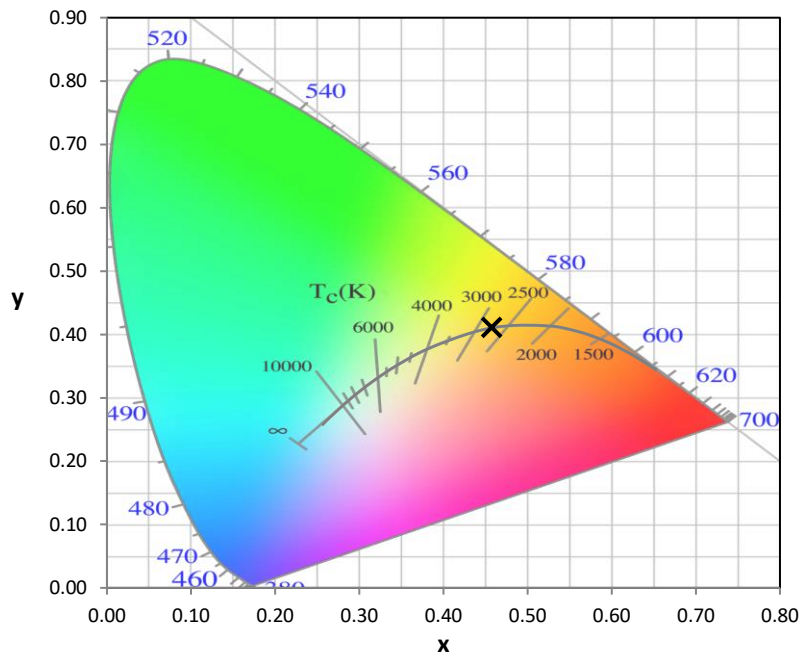
Stabilization Time: 56M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.3./42%  
 Sphere Temperature (°C): 25.7

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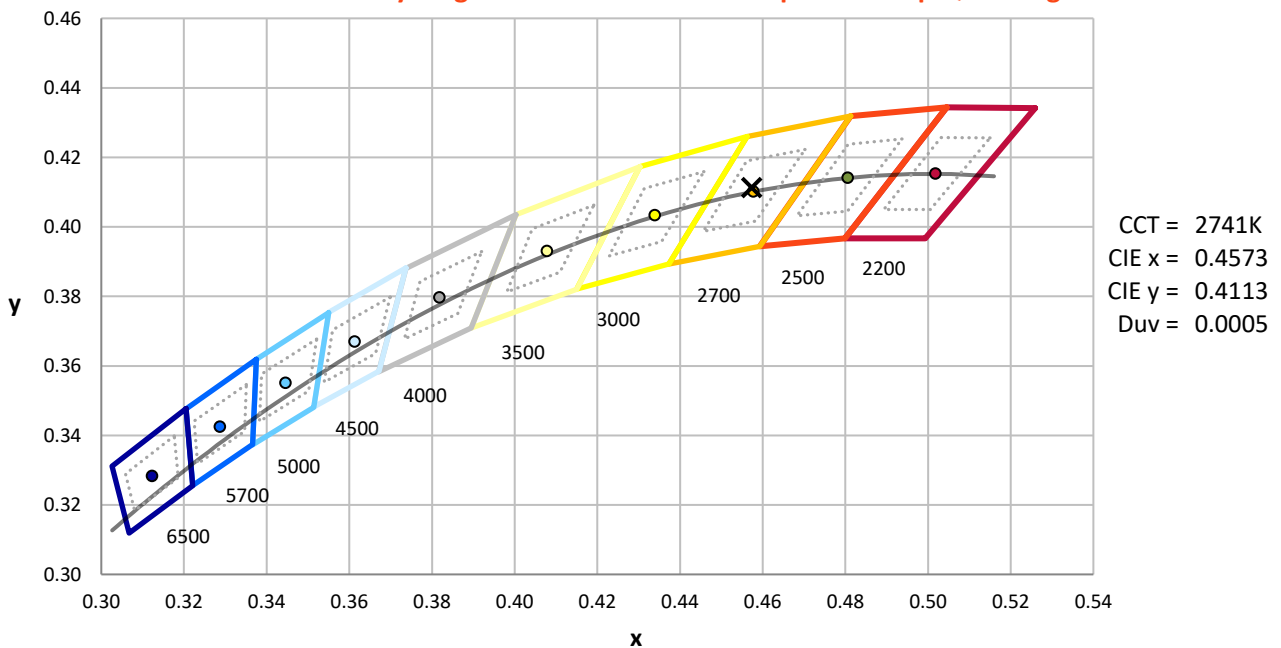
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date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



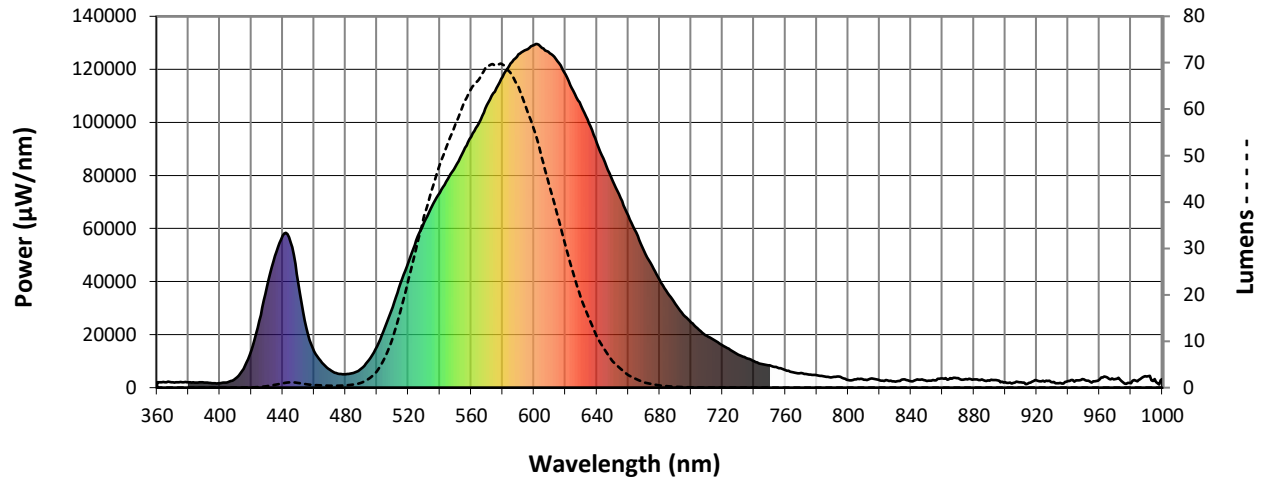
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 2700K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

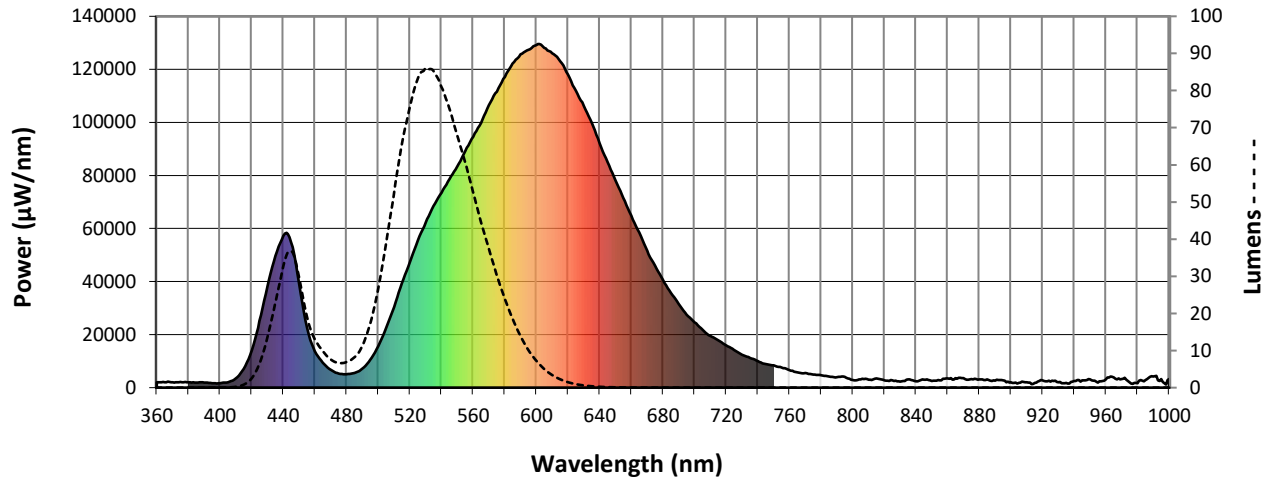


**Photopic Lumens: 6211.7**

| 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



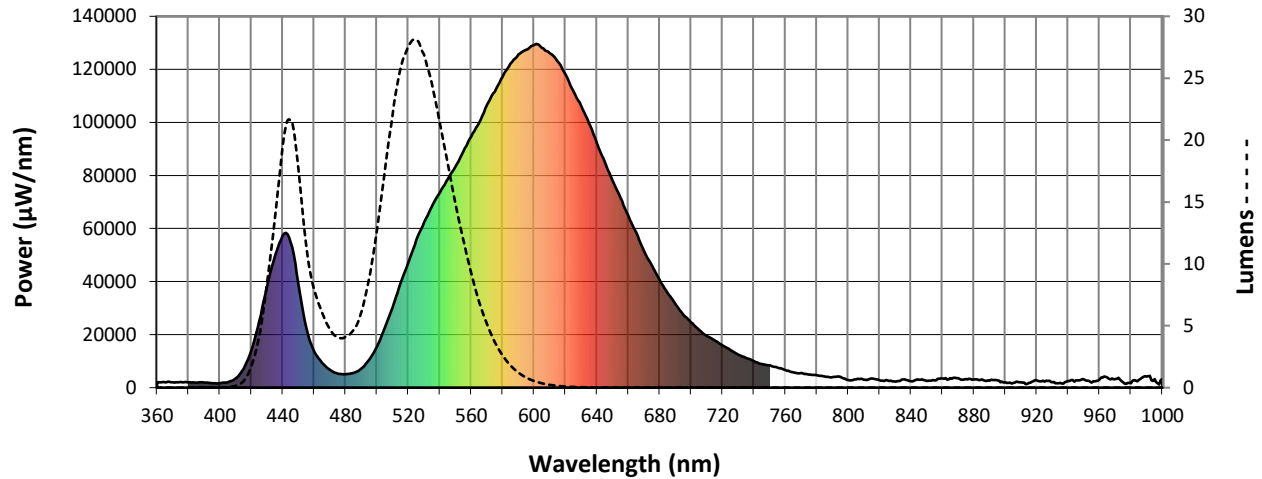
Scotopic Lumens: 6474.3

S/P: 1.04

| $\lambda$<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               | 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**

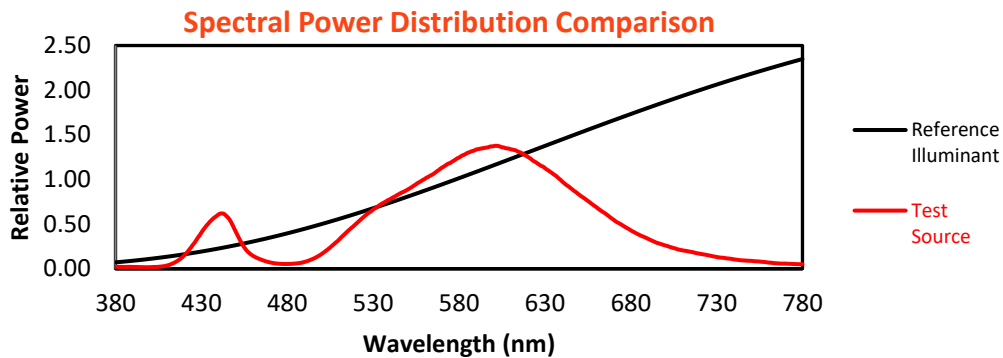
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------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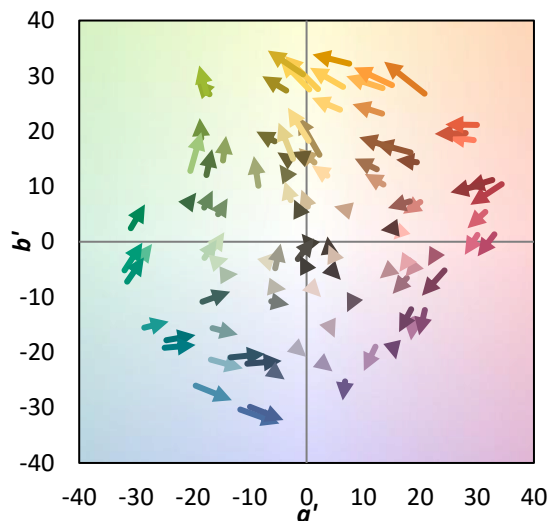
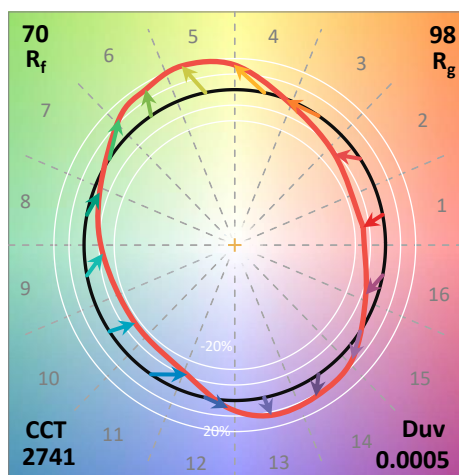
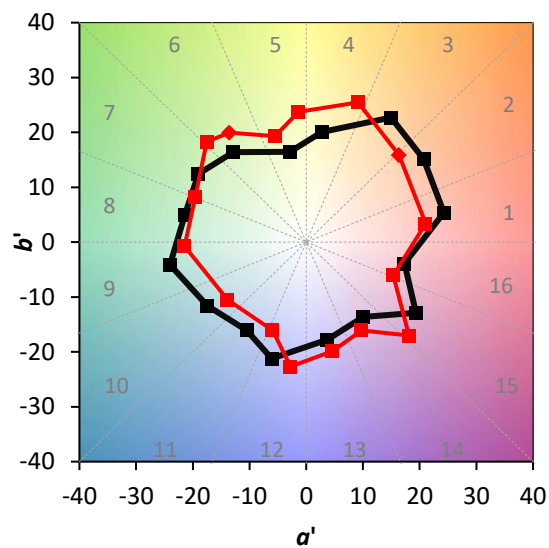
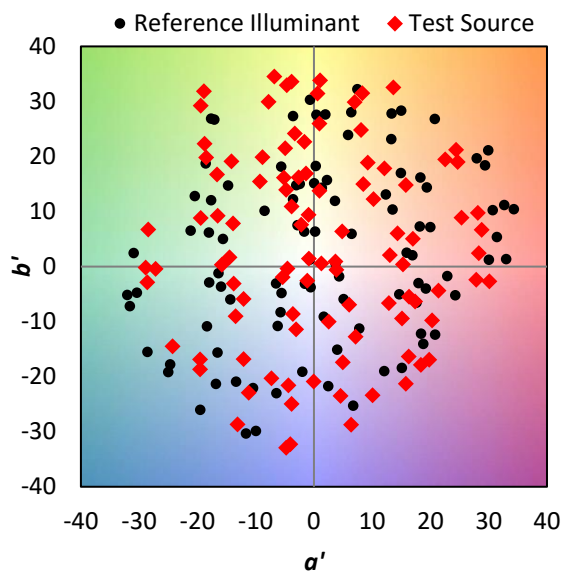
**TM-30-18**

**Summary**

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



**Color Vector Graphics**



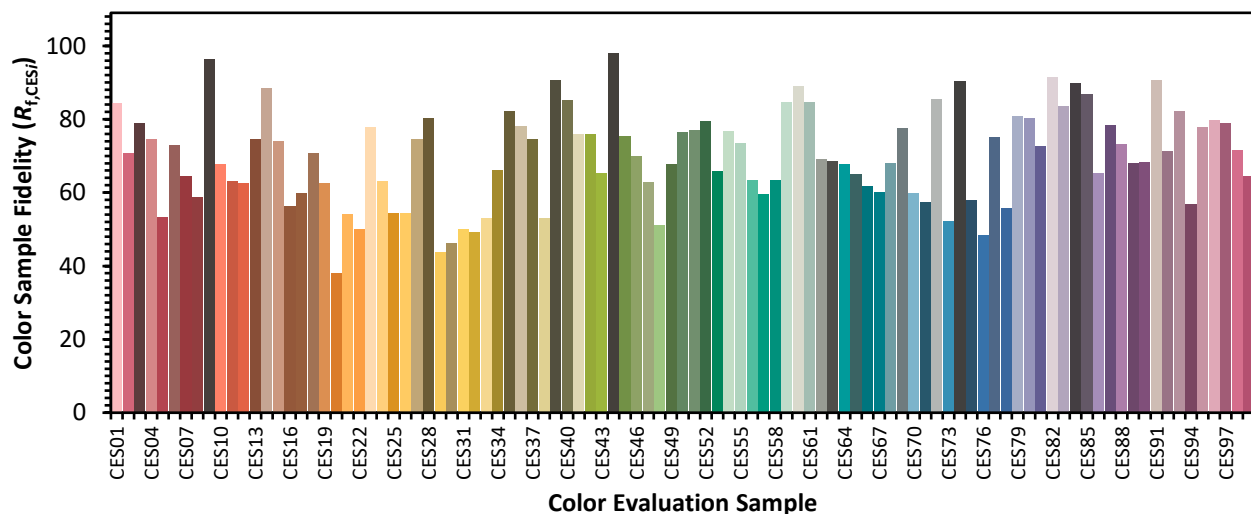


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**TM-30-18**

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

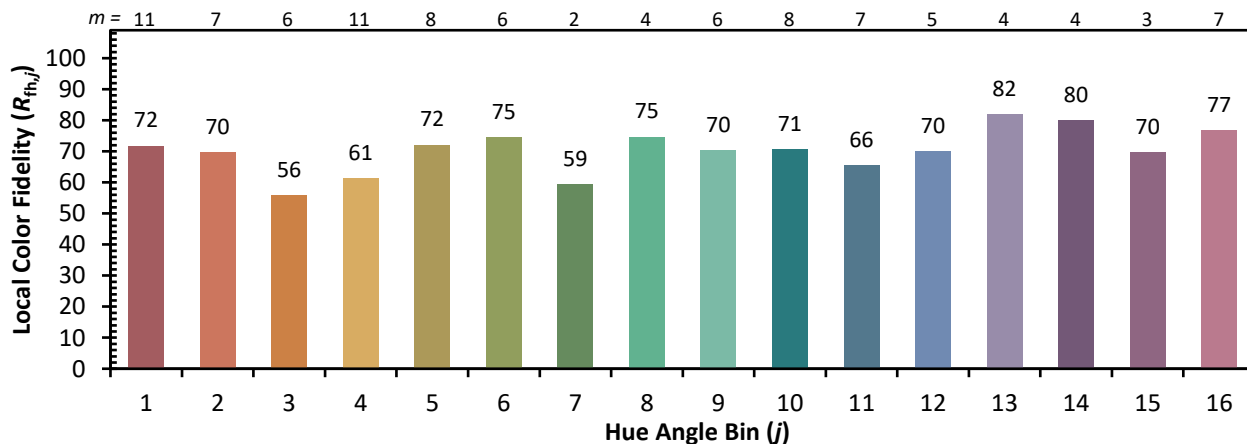
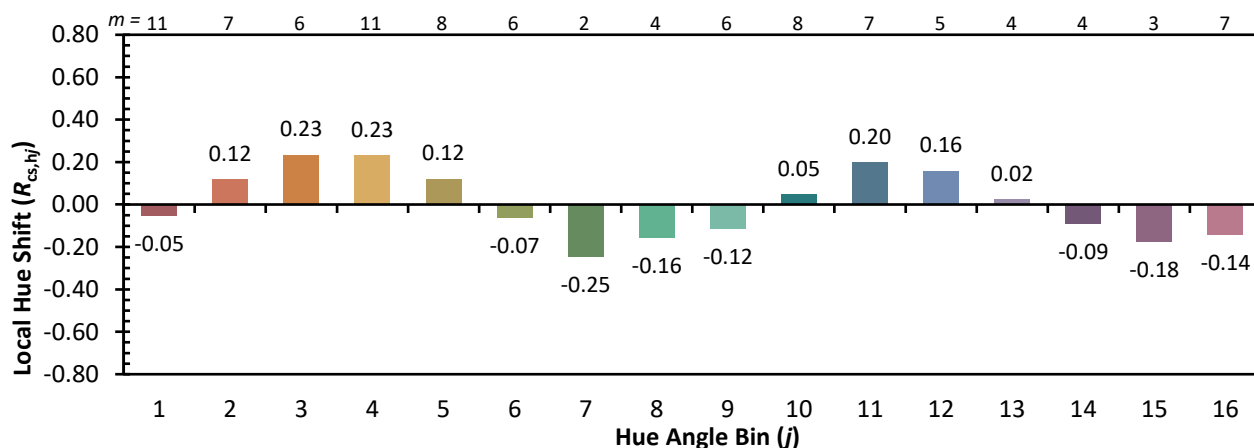
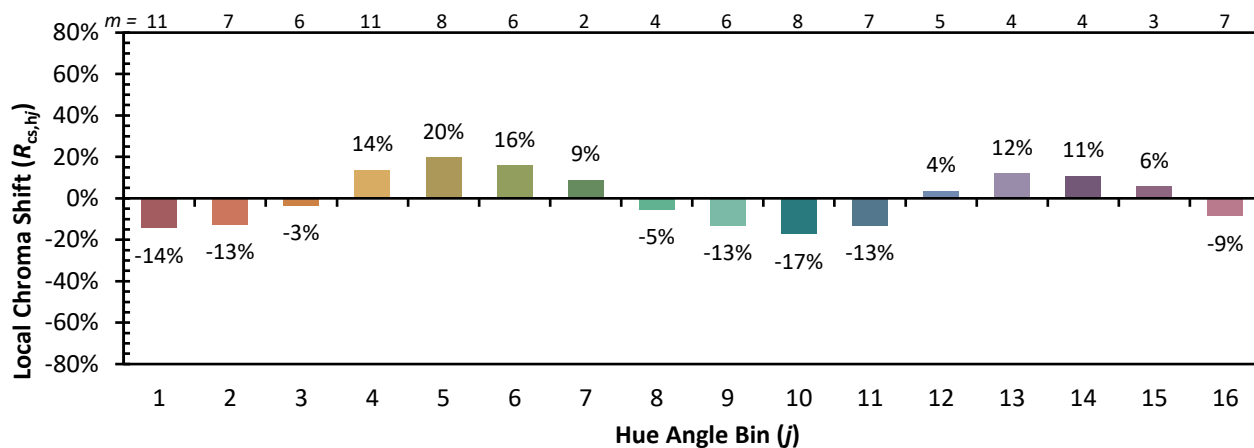
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 54 | CES51 = 77 | CES76 = 48 |
| CES02 = 63 | CES27 = 74 | CES52 = 80 | CES77 = 75 |
| CES03 = 31 | CES28 = 80 | CES53 = 66 | CES78 = 56 |
| CES04 = 71 | CES29 = 44 | CES54 = 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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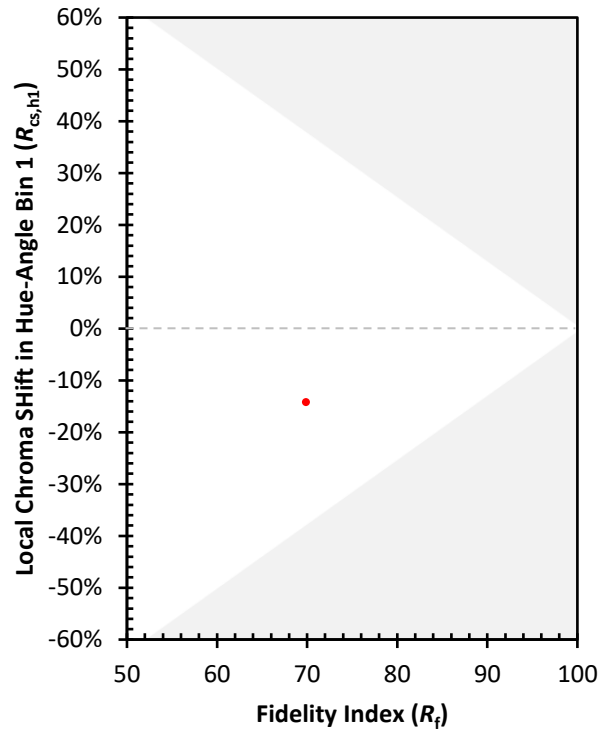
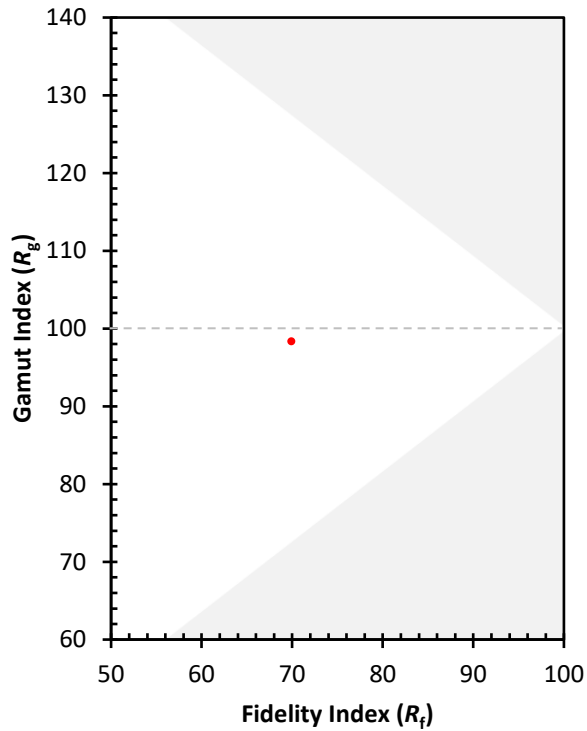
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)