

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



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

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: McGRAW-EDISON

Report Number: P821172

Luminaire Tested: **TT-D1-735-24VDC-T4-PM**

Issue Date: 5/19/2020



**Test Information**

Test Method: LM-79-08  
Report Number: P821172  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-1908-473-26)  
Test Lab: INNOVATION CENTER  
Issue Date: 5/19/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: MCGRAW-EDISON  
Catalog Number: TT-D1-735-24VDC-T4-PM  
Description: TOPTIER LED SITE LUMINAIRE  
3500K, 70 CRI LEDS AND DRIVE LANE DISTRIBUTION  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 3141 lumens  
Efficiency: N/A  
Efficacy: 112.2 lumens/watt  
Luminous Opening: Circular (Dia: 1.12' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

Input Watts (W): 28  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 25 FT

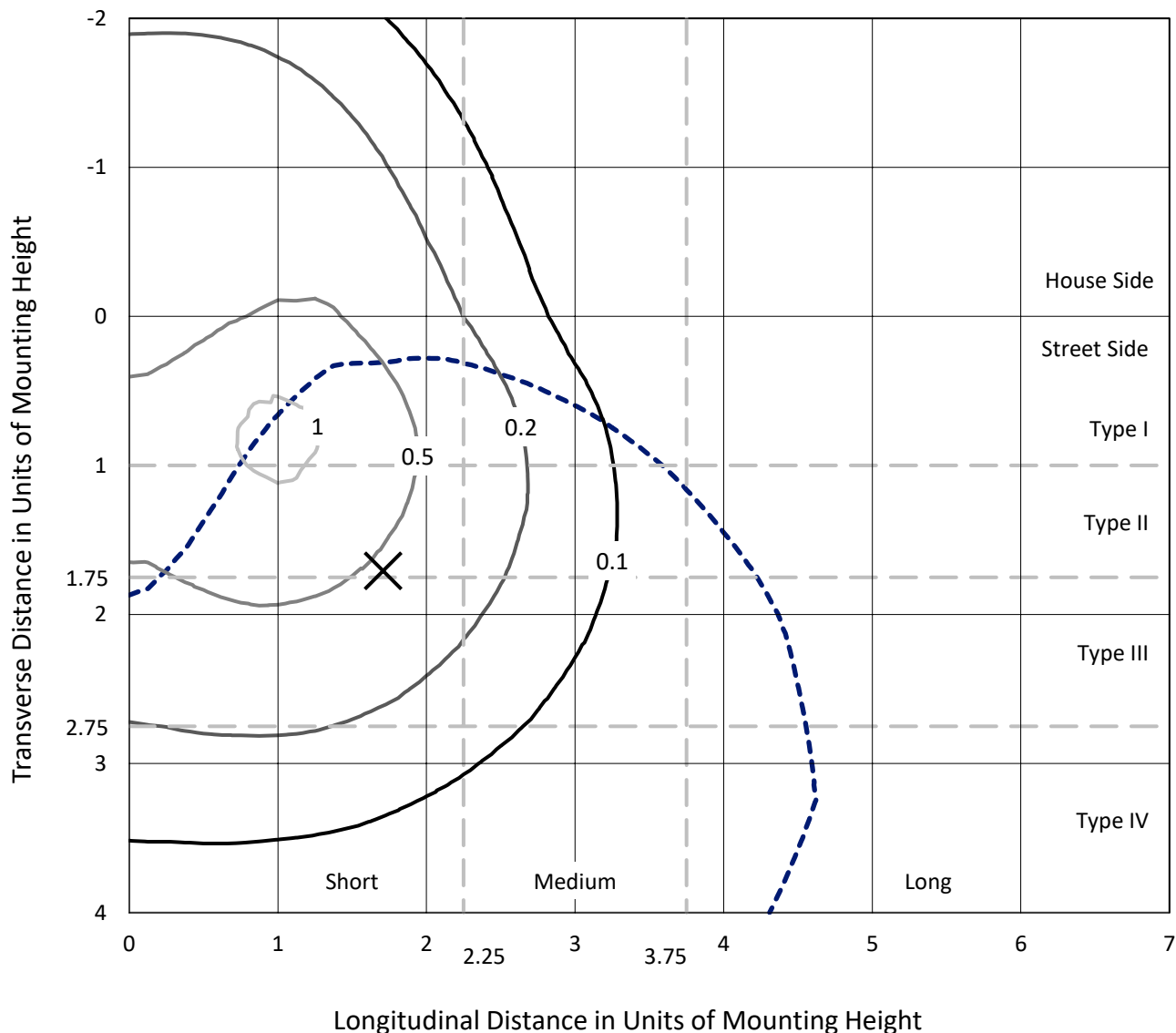
REPORT NUMBER: P821172

CATALOG NUMBER: TT-D1-735-24VDC-T4-PM

## Iso-Footcandle Lines of Horizontal Illumination

✕ Max cd

--- 1/2 Max cd

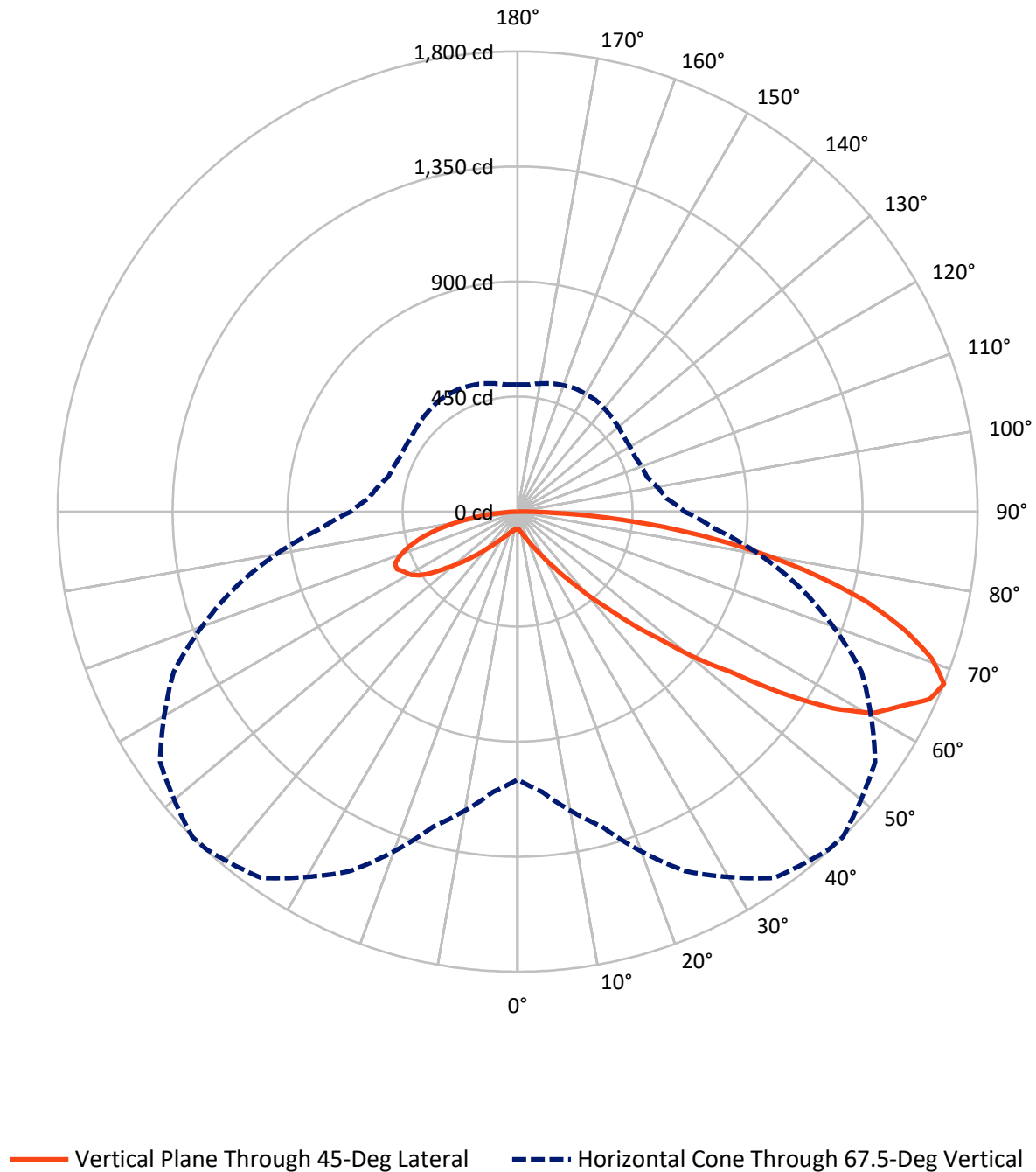


Based on 15 foot mounting height. Maximum calculated value = 1.1 fc

Type IV - Short - N/A

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CATALOG NUMBER: TT-D1-735-24VDC-T4-PM

## Luminous Intensity Polar Plot



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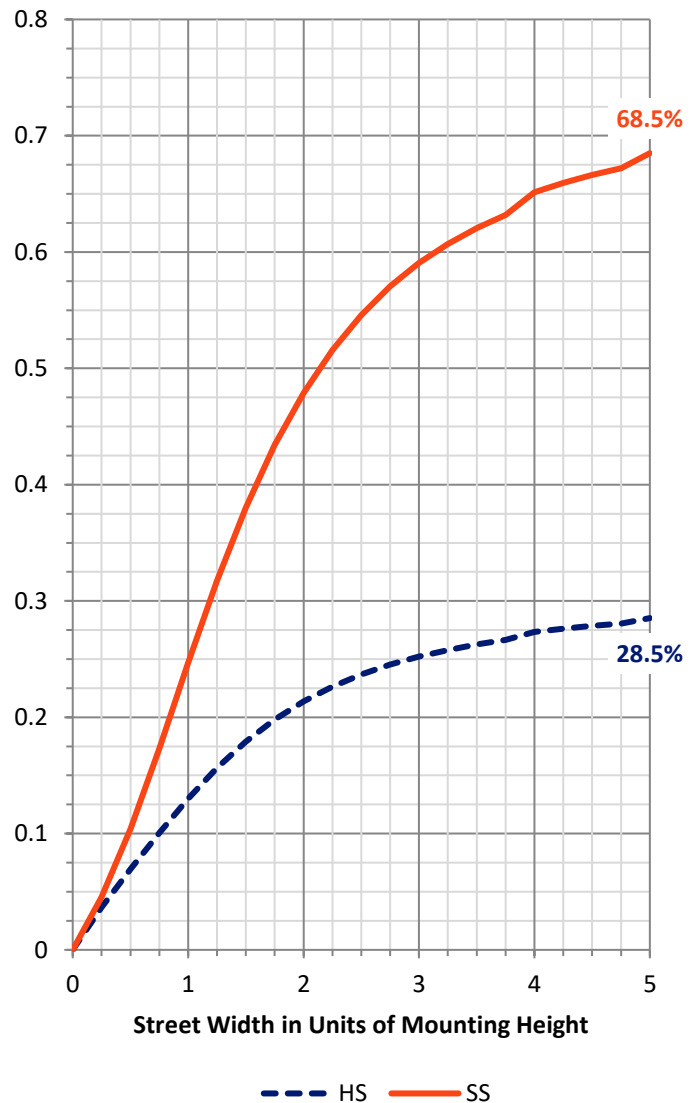
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 915.3    | 0.0    | 915.3  |
|                    | % Fixture | 29.1     | 0.0    | 29.1   |
| <b>Street Side</b> | Lumens    | 2225.7   | 0.0    | 2225.7 |
|                    | % Fixture | 70.9     | 0.0    | 70.9   |
| <b>Total</b>       | Lumens    | 3141.0   | 0.0    | 3141.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**Coefficient of Utilization**

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 7.0    | 0.2       |
| 10°-20°   | 26.0   | 0.8       |
| 20°-30°   | 61.6   | 2.0       |
| 30°-40°   | 139.5  | 4.4       |
| 40°-50°   | 310.9  | 9.9       |
| 50°-60°   | 625.0  | 19.9      |
| 60°-70°   | 918.0  | 29.2      |
| 70°-80°   | 807.2  | 25.7      |
| 80°-90°   | 245.7  | 7.8       |
| 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°    | 3141.0 | 100.0     |
| 0°-180°   | 3141.0 | 100.0     |



REPORT NUMBER: P821172

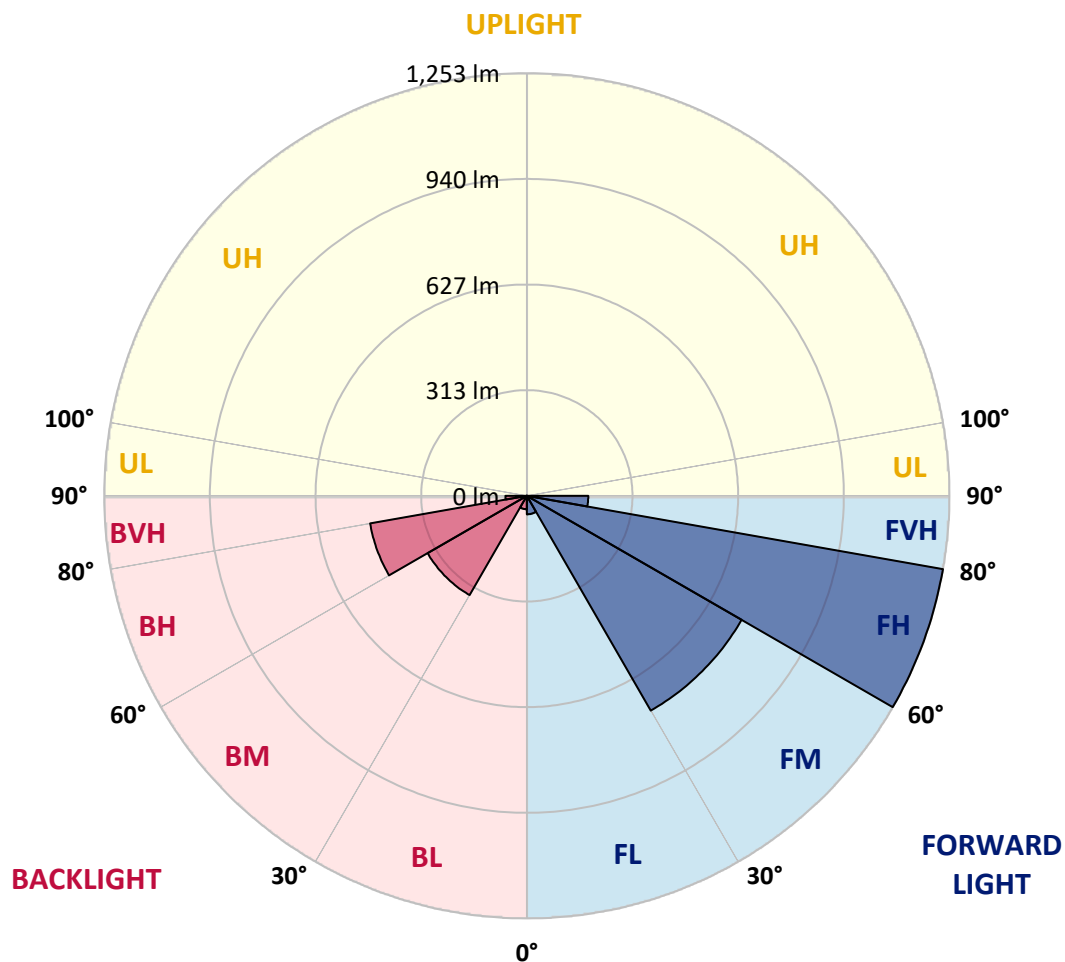
CATALOG NUMBER: TT-D1-735-24VDC-T4-PM

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 54.9   | 1.7       |                         |      |         |
| FM   | (30°-60°)   | 735.6  | 23.4      |                         |      |         |
| FH   | (60°-80°)   | 1253.2 | 39.9      |                         |      | G1/1800 |
| FVH  | (80°-90°)   | 182.1  | 5.8       |                         |      | G2/225  |
| BL   | (0°-30°)    | 39.8   | 1.3       | B0/110                  |      |         |
| BM   | (30°-60°)   | 339.8  | 10.8      | B1/1000                 |      |         |
| BH   | (60°-80°)   | 472.0  | 15.0      | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 63.7   | 2.0       |                         |      | 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 IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 42.5°  | 45°    | 55°    | 65°    | 75°    | 85°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 0°    | 68.1   | 68.1   | 68.1   | 68.1   | 68.1   | 68.1   | 68.1   | 68.1   | 68.1   | 68.1   | 68.1  |
| 2.5°  | 71.1   | 70.5   | 70.5   | 70.5   | 69.9   | 69.9   | 69.9   | 69.9   | 69.3   | 69.3   | 69.3  |
| 5°    | 75.2   | 74.6   | 75.2   | 74.0   | 73.4   | 73.4   | 72.8   | 72.8   | 72.2   | 71.7   | 71.1  |
| 7.5°  | 81.1   | 80.5   | 80.5   | 79.3   | 78.7   | 78.1   | 78.1   | 76.9   | 76.4   | 75.2   | 74.0  |
| 10°   | 87.5   | 87.5   | 86.9   | 86.3   | 85.2   | 84.0   | 84.0   | 82.2   | 81.6   | 79.9   | 78.1  |
| 12.5° | 95.1   | 95.1   | 95.1   | 94.0   | 92.8   | 92.2   | 91.0   | 89.9   | 88.1   | 85.2   | 83.4  |
| 15°   | 104.5  | 104.5  | 104.5  | 103.4  | 102.2  | 101.0  | 100.4  | 98.1   | 95.1   | 92.2   | 88.7  |
| 17.5° | 116.3  | 115.1  | 115.1  | 113.9  | 112.8  | 112.2  | 111.0  | 108.7  | 104.5  | 101.0  | 96.3  |
| 20°   | 129.2  | 128.6  | 128.0  | 128.0  | 126.9  | 125.7  | 125.1  | 121.6  | 116.9  | 110.4  | 104.5 |
| 22.5° | 143.9  | 143.3  | 143.3  | 144.5  | 143.9  | 142.1  | 142.1  | 136.8  | 130.4  | 122.8  | 113.9 |
| 25°   | 162.1  | 161.5  | 162.7  | 165.0  | 165.0  | 163.9  | 162.1  | 156.8  | 147.4  | 136.8  | 126.3 |
| 27.5° | 182.1  | 181.5  | 183.8  | 187.9  | 189.1  | 187.4  | 186.2  | 180.3  | 169.7  | 155.6  | 140.4 |
| 30°   | 206.2  | 206.7  | 213.2  | 217.9  | 220.8  | 219.7  | 219.1  | 212.6  | 195.6  | 179.1  | 159.2 |
| 32.5° | 235.5  | 233.8  | 242.0  | 249.6  | 254.9  | 257.8  | 256.1  | 248.4  | 233.8  | 207.9  | 182.7 |
| 35°   | 266.7  | 267.2  | 277.2  | 288.4  | 300.7  | 301.9  | 305.4  | 297.8  | 277.8  | 247.3  | 212.0 |
| 37.5° | 307.2  | 302.5  | 315.4  | 336.5  | 351.2  | 364.1  | 361.8  | 357.1  | 333.6  | 293.1  | 244.9 |
| 40°   | 343.6  | 342.4  | 360.6  | 390.0  | 417.0  | 435.8  | 438.2  | 432.3  | 401.2  | 343.6  | 280.2 |
| 42.5° | 385.3  | 388.8  | 414.1  | 454.6  | 495.7  | 522.7  | 516.3  | 513.3  | 476.9  | 403.5  | 328.3 |
| 45°   | 427.6  | 439.3  | 471.6  | 530.4  | 578.5  | 617.3  | 628.5  | 618.5  | 573.8  | 498.1  | 389.4 |
| 47.5° | 478.7  | 494.5  | 534.5  | 613.8  | 692.5  | 737.7  | 740.0  | 770.0  | 702.5  | 589.1  | 452.8 |
| 50°   | 546.2  | 553.3  | 609.1  | 706.0  | 814.1  | 877.5  | 895.7  | 896.3  | 828.7  | 680.7  | 524.5 |
| 52.5° | 612.6  | 617.9  | 691.3  | 816.4  | 963.2  | 1035.5 | 1039.6 | 1062.5 | 970.3  | 828.7  | 627.3 |
| 55°   | 692.5  | 690.1  | 791.1  | 941.5  | 1114.8 | 1219.9 | 1250.4 | 1281.6 | 1164.1 | 945.6  | 686.0 |
| 57.5° | 770.0  | 766.5  | 888.1  | 1085.4 | 1322.1 | 1426.6 | 1451.9 | 1429.6 | 1255.1 | 994.4  | 714.8 |
| 60°   | 841.7  | 854.0  | 1002.0 | 1244.6 | 1482.4 | 1582.3 | 1599.3 | 1538.8 | 1313.9 | 1032.0 | 733.0 |
| 62.5° | 916.2  | 940.9  | 1120.1 | 1377.3 | 1605.2 | 1676.8 | 1678.0 | 1607.0 | 1412.0 | 1104.8 | 792.3 |
| 65°   | 986.1  | 1025.5 | 1211.7 | 1490.7 | 1690.9 | 1762.6 | 1770.8 | 1706.8 | 1508.3 | 1168.2 | 802.3 |
| 67.5° | 1047.8 | 1100.1 | 1275.1 | 1551.7 | 1749.1 | 1795.5 | 1799.6 | 1707.4 | 1485.4 | 1142.4 | 774.7 |
| 70°   | 1097.7 | 1140.0 | 1314.5 | 1552.9 | 1708.6 | 1721.5 | 1718.6 | 1620.5 | 1421.9 | 1091.3 | 728.3 |
| 72.5° | 1117.1 | 1151.8 | 1295.7 | 1480.1 | 1589.3 | 1586.4 | 1584.1 | 1493.6 | 1317.4 | 1006.1 | 661.3 |
| 75°   | 1089.5 | 1099.5 | 1192.9 | 1324.4 | 1393.8 | 1410.2 | 1412.5 | 1330.9 | 1155.9 | 879.8  | 567.4 |
| 77.5° | 975.6  | 970.3  | 1041.9 | 1128.9 | 1181.1 | 1192.9 | 1190.5 | 1122.4 | 969.1  | 731.2  | 475.7 |
| 80°   | 773.5  | 784.7  | 829.3  | 886.9  | 939.2  | 952.1  | 943.9  | 892.2  | 754.1  | 570.3  | 365.3 |
| 82.5° | 540.9  | 554.4  | 592.0  | 635.5  | 674.9  | 674.9  | 682.5  | 632.6  | 534.5  | 409.4  | 255.5 |
| 85°   | 291.9  | 284.3  | 325.4  | 374.7  | 402.9  | 408.2  | 411.1  | 394.7  | 330.7  | 247.3  | 151.5 |
| 87.5° | 48.2   | 51.7   | 64.0   | 98.1   | 111.6  | 129.2  | 137.4  | 107.5  | 65.2   | 41.7   | 30.5  |
| 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: TT-D1-735-24VDC-T4-PM

**CANDELA DISTRIBUTION (continued):**

|       | 90°   | 95°   | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  |
| 2.5°  | 69.3  | 68.7  | 68.1  | 67.5  | 67.5  | 67.0  | 67.0  | 67.0  | 67.5  | 67.5  | 67.5  |
| 5°    | 71.1  | 70.5  | 69.9  | 69.3  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  | 68.1  |
| 7.5°  | 74.0  | 72.8  | 72.2  | 71.1  | 69.9  | 69.9  | 69.3  | 69.3  | 69.3  | 69.9  | 69.3  |
| 10°   | 77.5  | 76.4  | 75.2  | 73.4  | 72.8  | 72.2  | 71.7  | 71.7  | 72.2  | 72.2  | 71.7  |
| 12.5° | 81.6  | 81.1  | 78.7  | 76.9  | 75.8  | 75.2  | 74.6  | 75.2  | 74.6  | 75.2  | 75.2  |
| 15°   | 87.5  | 85.8  | 82.8  | 81.1  | 79.3  | 78.7  | 78.1  | 78.7  | 78.7  | 79.3  | 78.7  |
| 17.5° | 94.0  | 91.6  | 88.7  | 85.8  | 83.4  | 82.8  | 82.8  | 82.8  | 83.4  | 84.0  | 83.4  |
| 20°   | 101.6 | 98.7  | 94.6  | 91.0  | 88.7  | 88.1  | 88.1  | 88.7  | 89.3  | 89.9  | 89.9  |
| 22.5° | 109.2 | 106.9 | 101.0 | 96.3  | 95.1  | 94.6  | 94.0  | 95.1  | 96.3  | 96.9  | 97.5  |
| 25°   | 121.0 | 116.3 | 109.2 | 104.0 | 101.6 | 101.6 | 102.2 | 103.4 | 104.0 | 105.1 | 104.5 |
| 27.5° | 133.3 | 128.0 | 119.2 | 112.2 | 110.4 | 109.8 | 111.0 | 112.2 | 114.5 | 114.5 | 113.9 |
| 30°   | 150.4 | 141.5 | 130.4 | 123.9 | 119.2 | 119.8 | 121.6 | 123.3 | 125.7 | 126.9 | 126.9 |
| 32.5° | 169.7 | 160.3 | 145.1 | 135.1 | 132.7 | 133.3 | 133.9 | 136.8 | 139.2 | 141.5 | 139.8 |
| 35°   | 195.0 | 183.2 | 164.5 | 153.3 | 147.4 | 146.8 | 149.2 | 152.7 | 155.1 | 156.2 | 156.2 |
| 37.5° | 222.6 | 207.3 | 183.8 | 174.4 | 167.4 | 166.8 | 167.4 | 170.3 | 173.3 | 174.4 | 176.8 |
| 40°   | 256.1 | 237.3 | 209.7 | 194.4 | 189.1 | 187.9 | 190.3 | 194.4 | 194.4 | 196.2 | 196.8 |
| 42.5° | 297.2 | 273.1 | 242.6 | 222.6 | 216.1 | 216.1 | 215.6 | 219.1 | 219.1 | 219.1 | 217.9 |
| 45°   | 349.5 | 322.4 | 282.5 | 262.0 | 250.8 | 244.9 | 246.7 | 244.3 | 243.7 | 245.5 | 240.2 |
| 47.5° | 400.0 | 365.9 | 318.9 | 296.6 | 285.4 | 281.9 | 275.5 | 273.7 | 270.8 | 270.8 | 263.1 |
| 50°   | 458.7 | 416.4 | 371.2 | 339.5 | 328.9 | 318.9 | 313.6 | 305.4 | 296.6 | 294.8 | 291.9 |
| 52.5° | 556.8 | 503.9 | 432.9 | 398.8 | 371.8 | 361.8 | 349.5 | 338.9 | 328.3 | 320.1 | 324.8 |
| 55°   | 596.7 | 542.7 | 475.2 | 442.3 | 423.5 | 414.1 | 391.2 | 377.1 | 361.2 | 349.5 | 355.9 |
| 57.5° | 616.7 | 558.0 | 495.1 | 470.5 | 465.2 | 456.4 | 439.3 | 415.2 | 397.0 | 382.4 | 383.5 |
| 60°   | 627.9 | 566.2 | 505.7 | 483.4 | 480.4 | 486.3 | 477.5 | 461.1 | 432.9 | 418.2 | 416.4 |
| 62.5° | 670.7 | 606.1 | 535.7 | 503.9 | 497.5 | 501.6 | 503.9 | 494.0 | 470.5 | 451.1 | 445.8 |
| 65°   | 679.5 | 610.8 | 541.5 | 521.0 | 521.6 | 522.7 | 524.5 | 513.9 | 502.2 | 478.1 | 473.4 |
| 67.5° | 653.1 | 585.6 | 523.9 | 506.9 | 508.0 | 521.6 | 532.1 | 531.5 | 518.6 | 498.1 | 496.3 |
| 70°   | 613.2 | 547.4 | 490.4 | 475.2 | 478.1 | 490.4 | 513.3 | 525.1 | 522.7 | 509.2 | 512.2 |
| 72.5° | 550.9 | 492.2 | 442.3 | 430.5 | 437.6 | 449.3 | 471.0 | 492.2 | 504.5 | 507.5 | 513.9 |
| 75°   | 478.1 | 431.1 | 384.1 | 377.1 | 382.4 | 395.9 | 415.8 | 440.5 | 467.5 | 482.2 | 486.3 |
| 77.5° | 394.7 | 351.8 | 317.2 | 312.5 | 320.1 | 332.4 | 352.4 | 371.8 | 402.3 | 428.2 | 434.0 |
| 80°   | 308.9 | 271.9 | 247.3 | 243.2 | 247.9 | 258.4 | 273.7 | 289.6 | 318.9 | 338.9 | 341.8 |
| 82.5° | 214.4 | 192.1 | 176.2 | 173.9 | 176.8 | 180.9 | 193.2 | 207.9 | 224.4 | 240.2 | 242.0 |
| 85°   | 124.5 | 110.4 | 106.3 | 102.8 | 109.2 | 109.2 | 112.2 | 120.4 | 128.6 | 129.8 | 133.3 |
| 87.5° | 22.9  | 21.7  | 22.3  | 16.4  | 20.6  | 14.7  | 14.7  | 18.8  | 14.1  | 16.4  | 13.5  |
| 90°   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |



LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

Streetworks

Report Number: SP1-2407-176-4

Test Date: 09/24/2024

Luminaire Tested: MEM2-HTN-VA-30-735-U-WQ

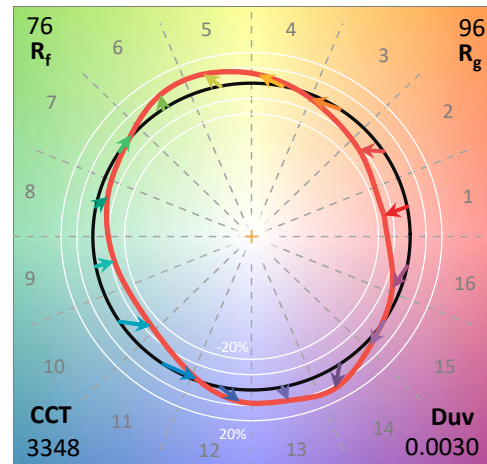
Data in this report applies to families of products including MEM2-HTN-VA-30-735-U-WQ

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2407-176-4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 09/27/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Streetworks  
 Catalog Number: **MEM2-HTN-VA-30-735-U-WQ**  
 Description: EPIC MODERN VISUAL COMFORT 30W WAVESTREAM WIDE

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 3348    | CRI (Ra): | 73.4 |      |       |
| CIE u':                   | 0.2384  | R1:       | 70.8 | R9:  | -19.2 |
| CIE v':                   | 0.5184  | R2:       | 79.9 | R10: | 52.5  |
| Duv:                      | 0.0030  | R3:       | 87.6 | R11: | 68.0  |
| CIE x:                    | 0.4177  | R4:       | 72.6 | R12: | 42.6  |
| CIE y:                    | 0.4036  | R5:       | 69.3 | R13: | 72.0  |
| CIE z:                    | 0.1787  | R6:       | 71.3 | R14: | 92.6  |
| Peak Wavelength (nm):     | 593     | R7:       | 82.1 | R15: | 63.8  |
| Dominant Wavelength (nm): | 580     | R8:       | 53.3 |      |       |
| Purity:                   | 46.5223 |           |      |      |       |
| Rf:                       | 75.8    |           |      |      |       |
| Rg:                       | 95.8    |           |      |      |       |



### Test Conditions

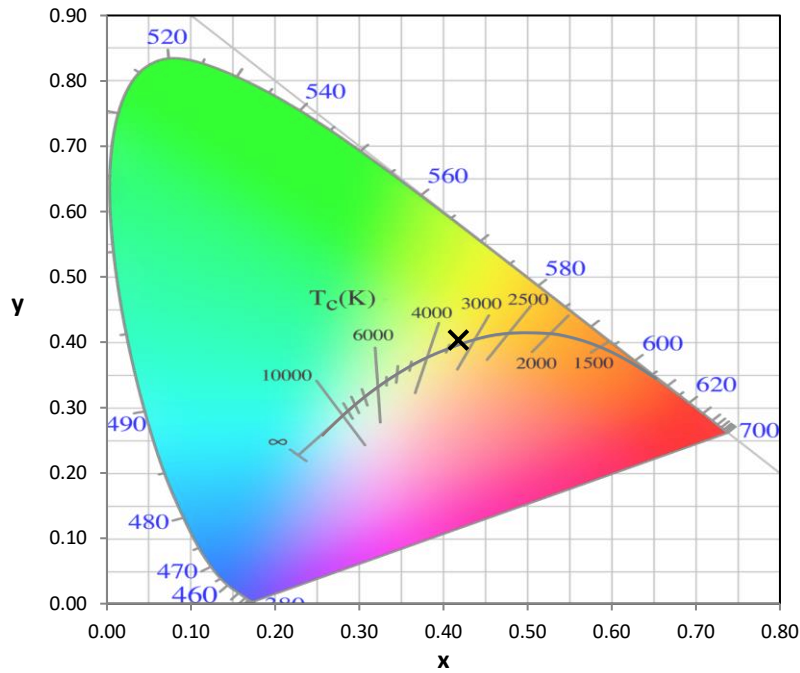
Stabilization Time: 30M  
 Operation Time: 1H 30M  
 Sphere Temperature (°C): 25.2

REPORT NUMBER: SP1-2407-176-4

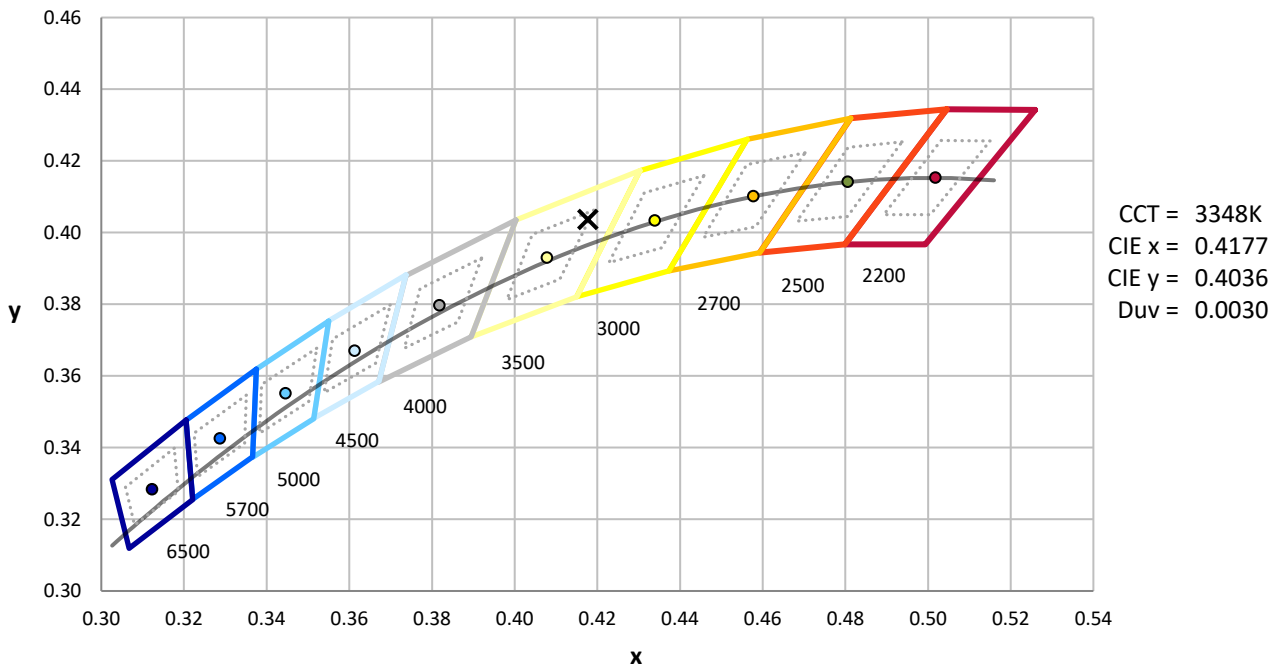
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/18/2024        | 12/18/2024           |
| Power Meter                    | INXT2011004           | 2/8/2024         | 2/8/2025             |
| AC Power Source                | IN0063                | 10/24/2023       | 10/24/2024           |
| DC Power Source                | IN0208                | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | IN0085                | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | IN0046                | 10/24/2023       | 10/24/2024           |

REPORT NUMBER: SP1-2407-176-4

**CIE 1931 Chromaticity Diagram**



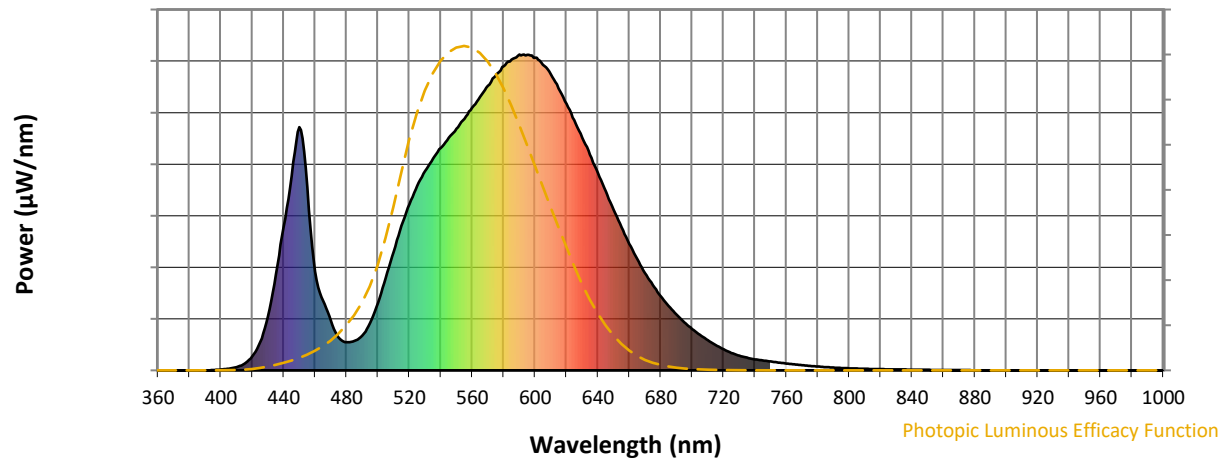
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 3500K 4-step quadrangle

REPORT NUMBER: SP1-2407-176-4

### Photopic Flux vs. Wavelength

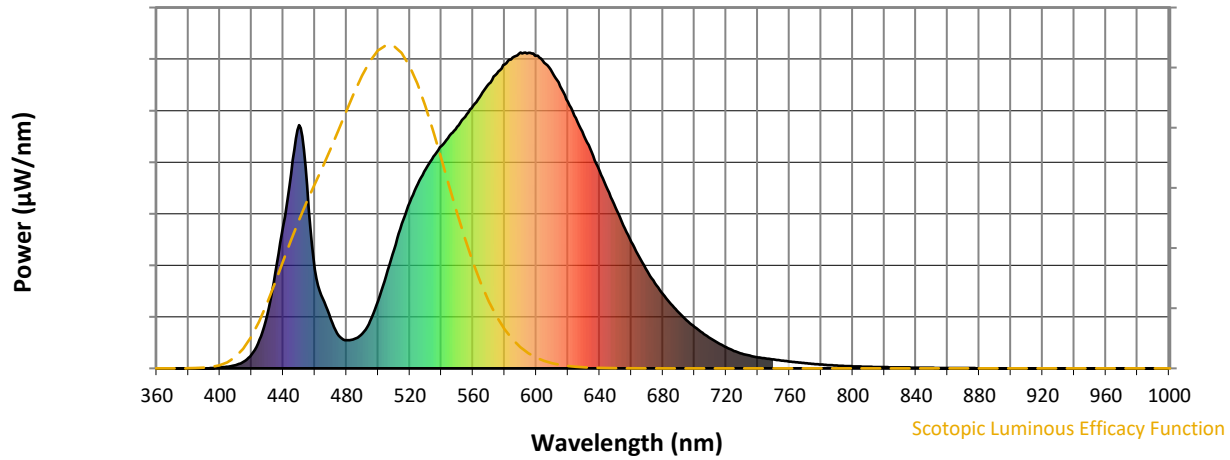


### Photopic Lumens: NR

| λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 110                      | NR            | 620    | 844                      | NR            | 750    | 28                       | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 150                      | NR            | 625    | 792                      | NR            | 755    | 25                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 214                      | NR            | 630    | 737                      | NR            | 760    | 22                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 293                      | NR            | 635    | 683                      | NR            | 765    | 19                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 376                      | NR            | 640    | 625                      | NR            | 770    | 16                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 458                      | NR            | 645    | 566                      | NR            | 775    | 14                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 526                      | NR            | 650    | 509                      | NR            | 780    | 12                       | NR            | 910    | 0                        | NR            |
| 395    | 1                        | NR            | 525    | 584                      | NR            | 655    | 453                      | NR            | 785    | 10                       | NR            | 915    | 0                        | NR            |
| 400    | 3                        | NR            | 530    | 631                      | NR            | 660    | 401                      | NR            | 790    | 9                        | NR            | 920    | 0                        | NR            |
| 405    | 5                        | NR            | 535    | 671                      | NR            | 665    | 353                      | NR            | 795    | 8                        | NR            | 925    | 0                        | NR            |
| 410    | 10                       | NR            | 540    | 704                      | NR            | 670    | 308                      | NR            | 800    | 7                        | NR            | 930    | 0                        | NR            |
| 415    | 21                       | NR            | 545    | 737                      | NR            | 675    | 269                      | NR            | 805    | 6                        | NR            | 935    | 0                        | NR            |
| 420    | 44                       | NR            | 550    | 766                      | NR            | 680    | 235                      | NR            | 810    | 5                        | NR            | 940    | 0                        | NR            |
| 425    | 90                       | NR            | 555    | 797                      | NR            | 685    | 204                      | NR            | 815    | 4                        | NR            | 945    | 0                        | NR            |
| 430    | 171                      | NR            | 560    | 832                      | NR            | 690    | 177                      | NR            | 820    | 4                        | NR            | 950    | 0                        | NR            |
| 435    | 305                      | NR            | 565    | 866                      | NR            | 695    | 152                      | NR            | 825    | 3                        | NR            | 955    | 0                        | NR            |
| 440    | 455                      | NR            | 570    | 901                      | NR            | 700    | 131                      | NR            | 830    | 3                        | NR            | 960    | 0                        | NR            |
| 445    | 615                      | NR            | 575    | 933                      | NR            | 705    | 112                      | NR            | 835    | 3                        | NR            | 965    | 0                        | NR            |
| 450    | 771                      | NR            | 580    | 963                      | NR            | 710    | 96                       | NR            | 840    | 2                        | NR            | 970    | 0                        | NR            |
| 455    | 579                      | NR            | 585    | 984                      | NR            | 715    | 80                       | NR            | 845    | 2                        | NR            | 975    | 0                        | NR            |
| 460    | 313                      | NR            | 590    | 1000                     | NR            | 720    | 67                       | NR            | 850    | 2                        | NR            | 980    | 0                        | NR            |
| 465    | 221                      | NR            | 595    | 999                      | NR            | 725    | 55                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 156                      | NR            | 600    | 990                      | NR            | 730    | 46                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 103                      | NR            | 605    | 968                      | NR            | 735    | 40                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 89                       | NR            | 610    | 937                      | NR            | 740    | 35                       | NR            | 870    | 1                        | NR            | 1000   | 0                        | NR            |
| 485    | 93                       | NR            | 615    | 893                      | NR            | 745    | 31                       | NR            | 875    | 1                        | NR            |        |                          |               |

REPORT NUMBER: SP1-2407-176-4

### Scotopic Flux vs. Wavelength



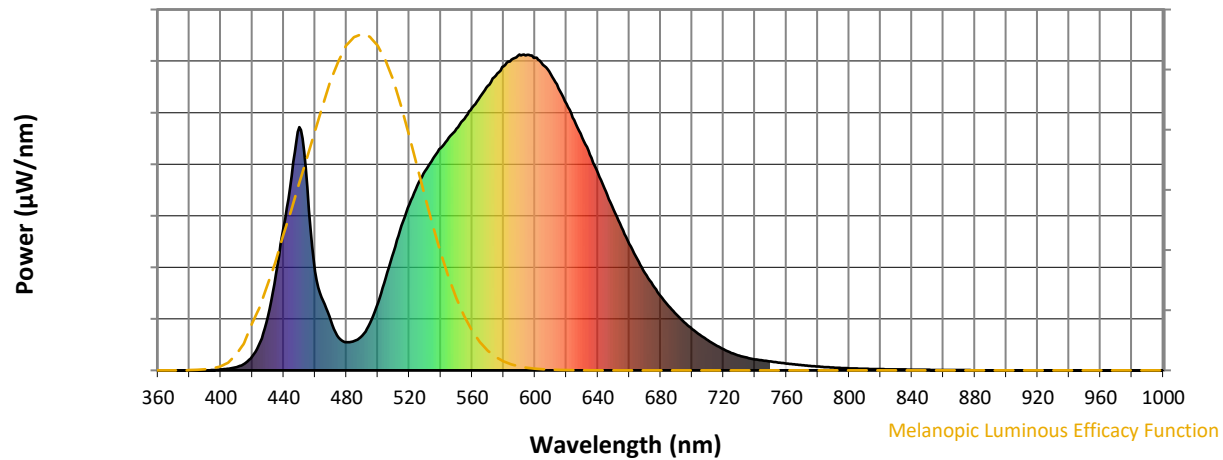
Scotopic Lumens: NR

S/P: 1.31

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 110                      | NR            | 620    | 844                      | NR            | 750    | 28                       | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 150                      | NR            | 625    | 792                      | NR            | 755    | 25                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 214                      | NR            | 630    | 737                      | NR            | 760    | 22                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 293                      | NR            | 635    | 683                      | NR            | 765    | 19                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 376                      | NR            | 640    | 625                      | NR            | 770    | 16                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 458                      | NR            | 645    | 566                      | NR            | 775    | 14                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 526                      | NR            | 650    | 509                      | NR            | 780    | 12                       | NR            | 910    | 0                        | NR            |
| 395    | 1                        | NR            | 525    | 584                      | NR            | 655    | 453                      | NR            | 785    | 10                       | NR            | 915    | 0                        | NR            |
| 400    | 3                        | NR            | 530    | 631                      | NR            | 660    | 401                      | NR            | 790    | 9                        | NR            | 920    | 0                        | NR            |
| 405    | 5                        | NR            | 535    | 671                      | NR            | 665    | 353                      | NR            | 795    | 8                        | NR            | 925    | 0                        | NR            |
| 410    | 10                       | NR            | 540    | 704                      | NR            | 670    | 308                      | NR            | 800    | 7                        | NR            | 930    | 0                        | NR            |
| 415    | 21                       | NR            | 545    | 737                      | NR            | 675    | 269                      | NR            | 805    | 6                        | NR            | 935    | 0                        | NR            |
| 420    | 44                       | NR            | 550    | 766                      | NR            | 680    | 235                      | NR            | 810    | 5                        | NR            | 940    | 0                        | NR            |
| 425    | 90                       | NR            | 555    | 797                      | NR            | 685    | 204                      | NR            | 815    | 4                        | NR            | 945    | 0                        | NR            |
| 430    | 171                      | NR            | 560    | 832                      | NR            | 690    | 177                      | NR            | 820    | 4                        | NR            | 950    | 0                        | NR            |
| 435    | 305                      | NR            | 565    | 866                      | NR            | 695    | 152                      | NR            | 825    | 3                        | NR            | 955    | 0                        | NR            |
| 440    | 455                      | NR            | 570    | 901                      | NR            | 700    | 131                      | NR            | 830    | 3                        | NR            | 960    | 0                        | NR            |
| 445    | 615                      | NR            | 575    | 933                      | NR            | 705    | 112                      | NR            | 835    | 3                        | NR            | 965    | 0                        | NR            |
| 450    | 771                      | NR            | 580    | 963                      | NR            | 710    | 96                       | NR            | 840    | 2                        | NR            | 970    | 0                        | NR            |
| 455    | 579                      | NR            | 585    | 984                      | NR            | 715    | 80                       | NR            | 845    | 2                        | NR            | 975    | 0                        | NR            |
| 460    | 313                      | NR            | 590    | 1000                     | NR            | 720    | 67                       | NR            | 850    | 2                        | NR            | 980    | 0                        | NR            |
| 465    | 221                      | NR            | 595    | 999                      | NR            | 725    | 55                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 156                      | NR            | 600    | 990                      | NR            | 730    | 46                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 103                      | NR            | 605    | 968                      | NR            | 735    | 40                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 89                       | NR            | 610    | 937                      | NR            | 740    | 35                       | NR            | 870    | 1                        | NR            | 1000   | 0                        | NR            |
| 485    | 93                       | NR            | 615    | 893                      | NR            | 745    | 31                       | NR            | 875    | 1                        | NR            |        |                          |               |

REPORT NUMBER: SP1-2407-176-4

### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 2.4

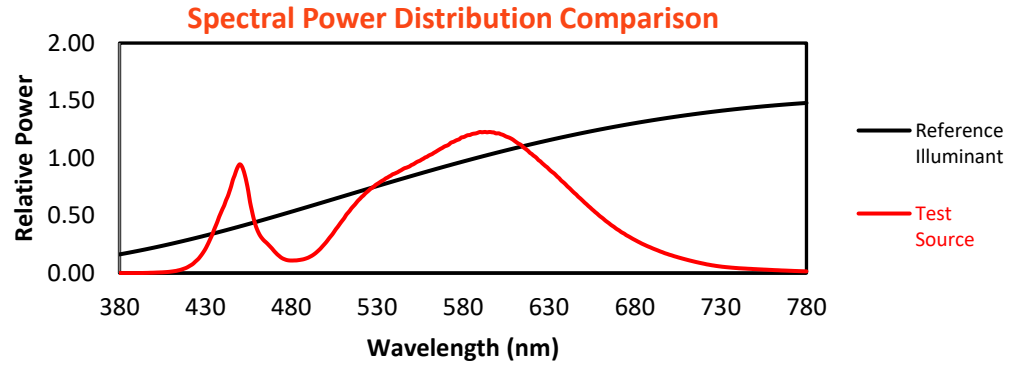
| $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|
| 360               | 0                                      | NR                             | 490               | 110                                    | NR                             | 620               | 844                                    | NR                             | 750               | 28                                     | NR                             | 880               | 0                                      | NR                             |
| 365               | 0                                      | NR                             | 495               | 150                                    | NR                             | 625               | 792                                    | NR                             | 755               | 25                                     | NR                             | 885               | 0                                      | NR                             |
| 370               | 0                                      | NR                             | 500               | 214                                    | NR                             | 630               | 737                                    | NR                             | 760               | 22                                     | NR                             | 890               | 0                                      | NR                             |
| 375               | 0                                      | NR                             | 505               | 293                                    | NR                             | 635               | 683                                    | NR                             | 765               | 19                                     | NR                             | 895               | 0                                      | NR                             |
| 380               | 0                                      | NR                             | 510               | 376                                    | NR                             | 640               | 625                                    | NR                             | 770               | 16                                     | NR                             | 900               | 0                                      | NR                             |
| 385               | 0                                      | NR                             | 515               | 458                                    | NR                             | 645               | 566                                    | NR                             | 775               | 14                                     | NR                             | 905               | 0                                      | NR                             |
| 390               | 0                                      | NR                             | 520               | 526                                    | NR                             | 650               | 509                                    | NR                             | 780               | 12                                     | NR                             | 910               | 0                                      | NR                             |
| 395               | 1                                      | NR                             | 525               | 584                                    | NR                             | 655               | 453                                    | NR                             | 785               | 10                                     | NR                             | 915               | 0                                      | NR                             |
| 400               | 3                                      | NR                             | 530               | 631                                    | NR                             | 660               | 401                                    | NR                             | 790               | 9                                      | NR                             | 920               | 0                                      | NR                             |
| 405               | 5                                      | NR                             | 535               | 671                                    | NR                             | 665               | 353                                    | NR                             | 795               | 8                                      | NR                             | 925               | 0                                      | NR                             |
| 410               | 10                                     | NR                             | 540               | 704                                    | NR                             | 670               | 308                                    | NR                             | 800               | 7                                      | NR                             | 930               | 0                                      | NR                             |
| 415               | 21                                     | NR                             | 545               | 737                                    | NR                             | 675               | 269                                    | NR                             | 805               | 6                                      | NR                             | 935               | 0                                      | NR                             |
| 420               | 44                                     | NR                             | 550               | 766                                    | NR                             | 680               | 235                                    | NR                             | 810               | 5                                      | NR                             | 940               | 0                                      | NR                             |
| 425               | 90                                     | NR                             | 555               | 797                                    | NR                             | 685               | 204                                    | NR                             | 815               | 4                                      | NR                             | 945               | 0                                      | NR                             |
| 430               | 171                                    | NR                             | 560               | 832                                    | NR                             | 690               | 177                                    | NR                             | 820               | 4                                      | NR                             | 950               | 0                                      | NR                             |
| 435               | 305                                    | NR                             | 565               | 866                                    | NR                             | 695               | 152                                    | NR                             | 825               | 3                                      | NR                             | 955               | 0                                      | NR                             |
| 440               | 455                                    | NR                             | 570               | 901                                    | NR                             | 700               | 131                                    | NR                             | 830               | 3                                      | NR                             | 960               | 0                                      | NR                             |
| 445               | 615                                    | NR                             | 575               | 933                                    | NR                             | 705               | 112                                    | NR                             | 835               | 3                                      | NR                             | 965               | 0                                      | NR                             |
| 450               | 771                                    | NR                             | 580               | 963                                    | NR                             | 710               | 96                                     | NR                             | 840               | 2                                      | NR                             | 970               | 0                                      | NR                             |
| 455               | 579                                    | NR                             | 585               | 984                                    | NR                             | 715               | 80                                     | NR                             | 845               | 2                                      | NR                             | 975               | 0                                      | NR                             |
| 460               | 313                                    | NR                             | 590               | 1000                                   | NR                             | 720               | 67                                     | NR                             | 850               | 2                                      | NR                             | 980               | 0                                      | NR                             |
| 465               | 221                                    | NR                             | 595               | 999                                    | NR                             | 725               | 55                                     | NR                             | 855               | 1                                      | NR                             | 985               | 0                                      | NR                             |
| 470               | 156                                    | NR                             | 600               | 990                                    | NR                             | 730               | 46                                     | NR                             | 860               | 1                                      | NR                             | 990               | 0                                      | NR                             |
| 475               | 103                                    | NR                             | 605               | 968                                    | NR                             | 735               | 40                                     | NR                             | 865               | 1                                      | NR                             | 995               | 0                                      | NR                             |
| 480               | 89                                     | NR                             | 610               | 937                                    | NR                             | 740               | 35                                     | NR                             | 870               | 1                                      | NR                             | 1000              | 0                                      | NR                             |
| 485               | 93                                     | NR                             | 615               | 893                                    | NR                             | 745               | 31                                     | NR                             | 875               | 1                                      | NR                             |                   |                                        |                                |

REPORT NUMBER: SP1-2407-176-4

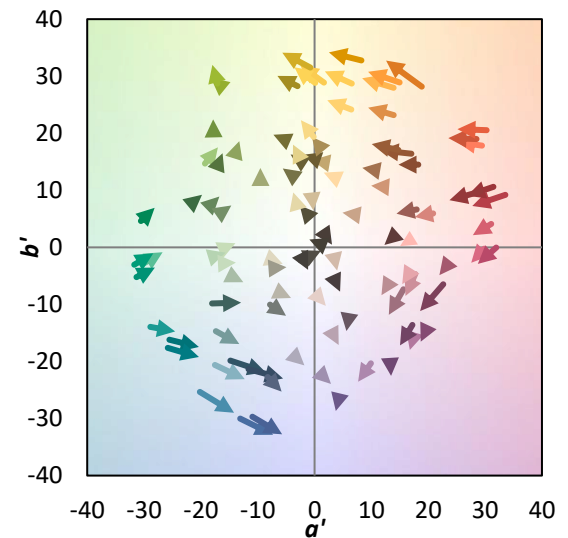
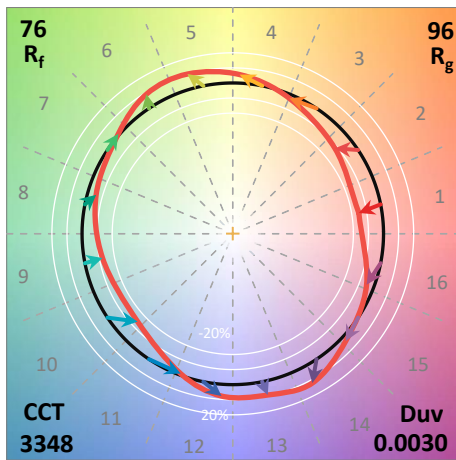
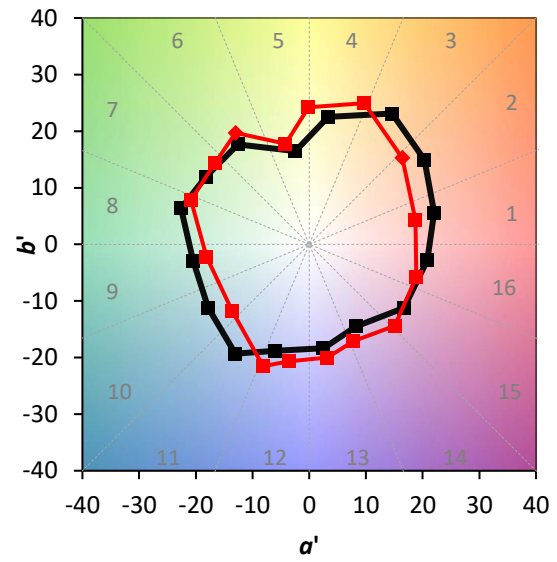
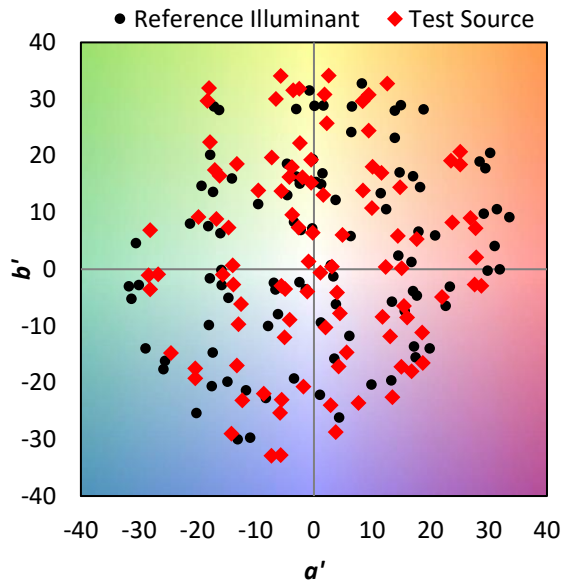
TM-30-18

### Summary

$R_f = 75.8$   
 $R_g = 95.8$   
 $CIE R_a = 73.4$   
 $R_g = -19.2$



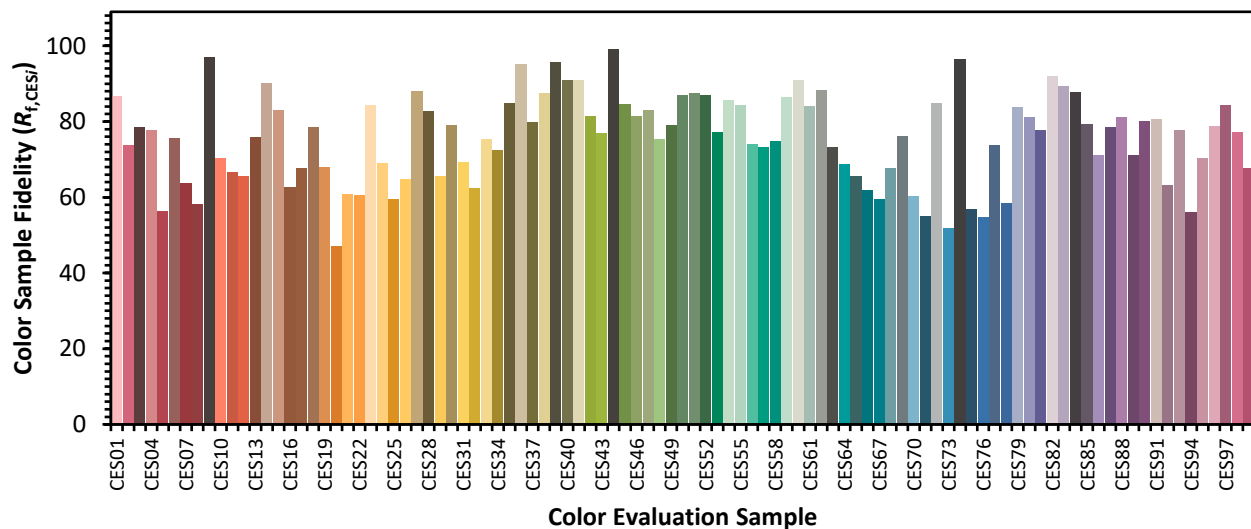
### Color Vector Graphics



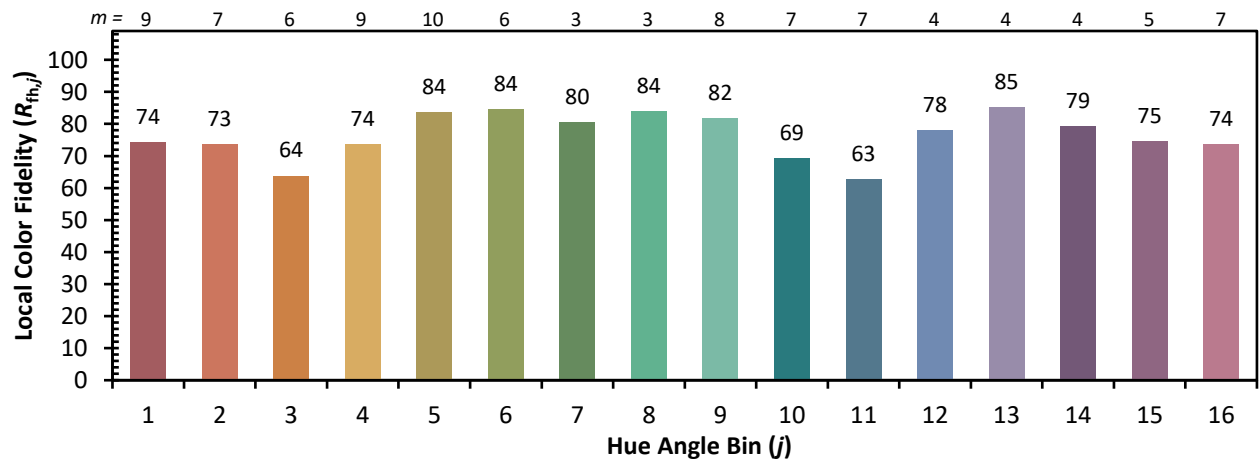
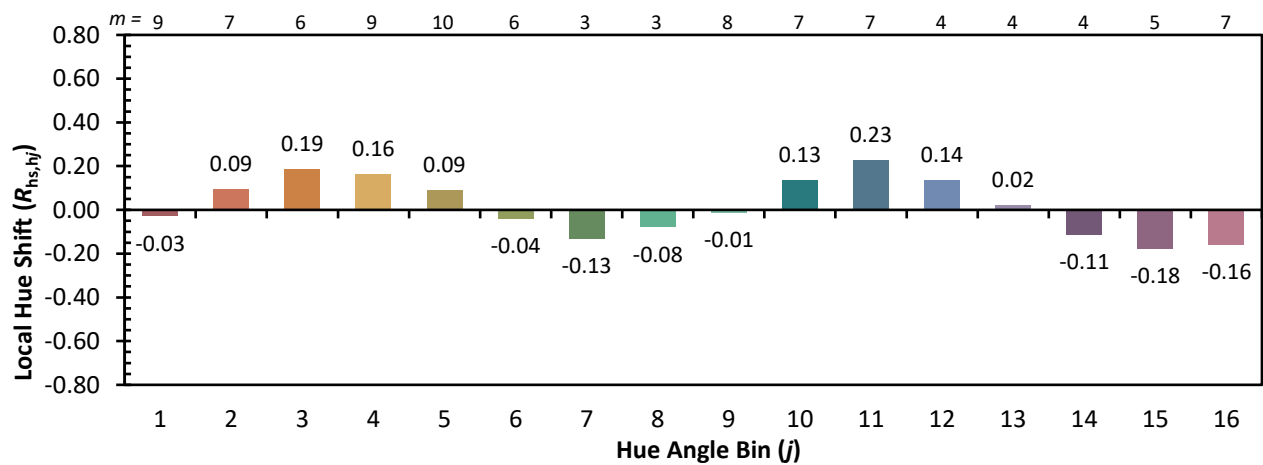
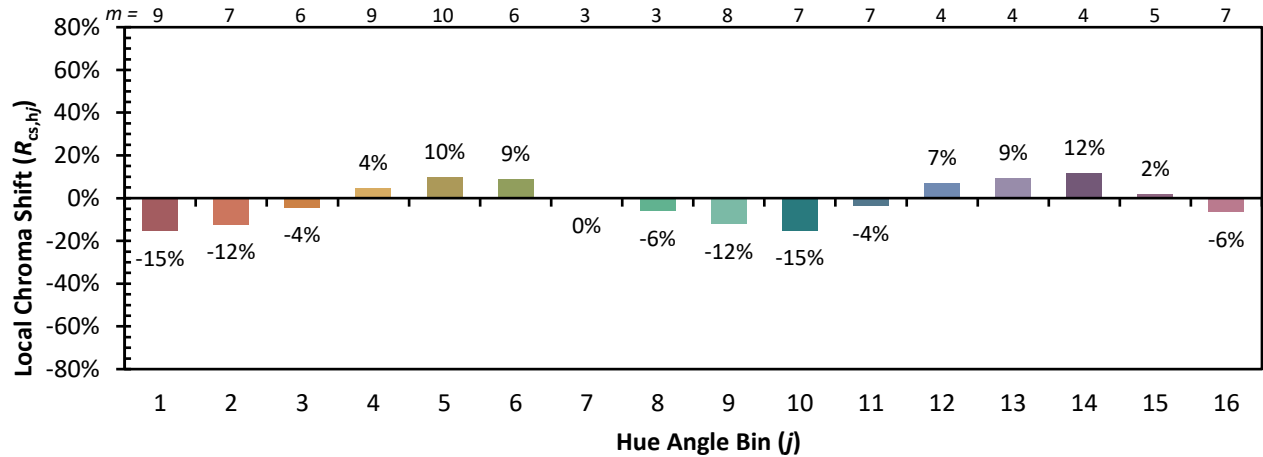


**Individual Sample Fidelity Index ( $R_{f,i}$ )**

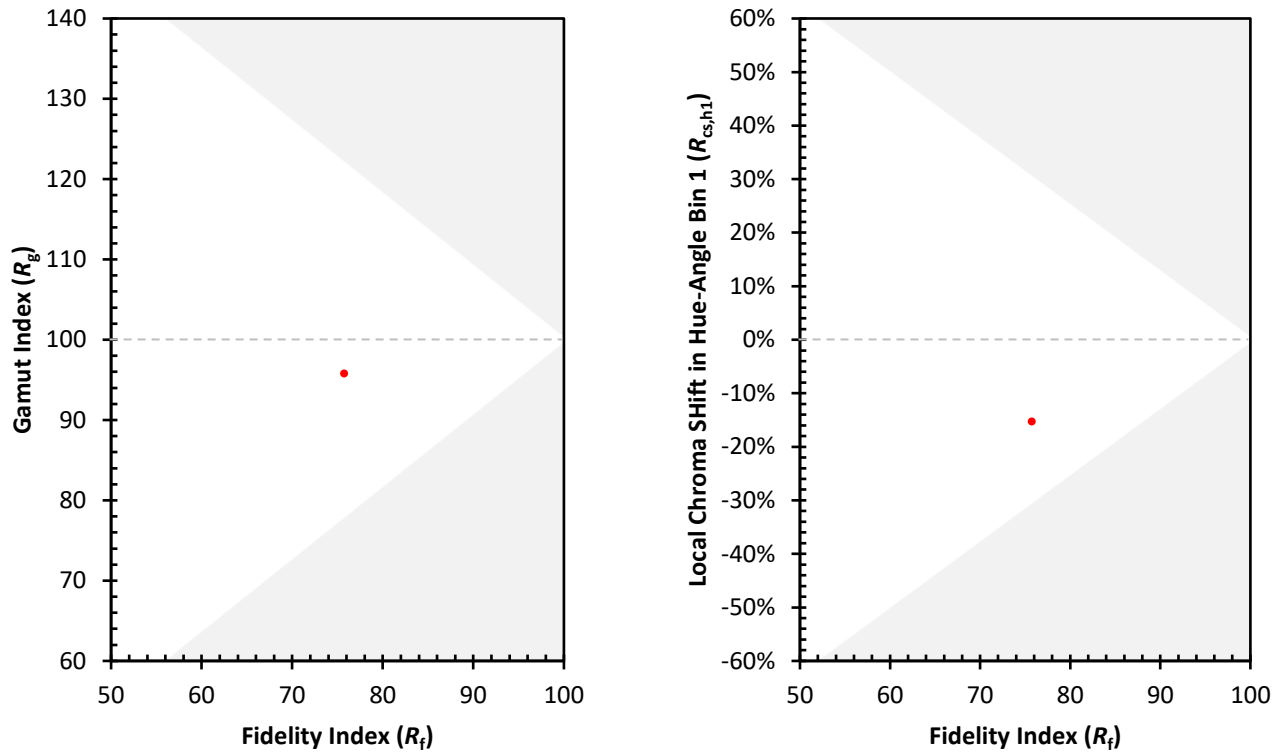
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 65 | CES51 = 88 | CES76 = 55 |
| CES02 = 62 | CES27 = 88 | CES52 = 87 | CES77 = 74 |
| CES03 = 31 | CES28 = 83 | CES53 = 77 | CES78 = 58 |
| CES04 = 70 | CES29 = 66 | CES54 = 86 | CES79 = 84 |
| CES05 = 48 | CES30 = 79 | CES55 = 84 | CES80 = 81 |
| CES06 = 51 | CES31 = 69 | CES56 = 74 | CES81 = 78 |
| CES07 = 41 | CES32 = 62 | CES57 = 73 | CES82 = 92 |
| CES08 = 40 | CES33 = 75 | CES58 = 75 | CES83 = 89 |
| CES09 = 29 | CES34 = 73 | CES59 = 87 | CES84 = 88 |
| CES10 = 75 | CES35 = 85 | CES60 = 91 | CES85 = 79 |
| CES11 = 58 | CES36 = 95 | CES61 = 84 | CES86 = 71 |
| CES12 = 64 | CES37 = 80 | CES62 = 88 | CES87 = 79 |
| CES13 = 43 | CES38 = 88 | CES63 = 73 | CES88 = 81 |
| CES14 = 74 | CES39 = 96 | CES64 = 69 | CES89 = 71 |
| CES15 = 71 | CES40 = 91 | CES65 = 66 | CES90 = 80 |
| CES16 = 47 | CES41 = 91 | CES66 = 62 | CES91 = 81 |
| CES17 = 50 | CES42 = 81 | CES67 = 60 | CES92 = 63 |
| CES18 = 56 | CES43 = 77 | CES68 = 68 | CES93 = 78 |
| CES19 = 72 | CES44 = 99 | CES69 = 76 | CES94 = 56 |
| CES20 = 65 | CES45 = 85 | CES70 = 60 | CES95 = 70 |
| CES21 = 87 | CES46 = 82 | CES71 = 55 | CES96 = 79 |
| CES22 = 79 | CES47 = 83 | CES72 = 85 | CES97 = 84 |
| CES23 = 92 | CES48 = 75 | CES73 = 52 | CES98 = 77 |
| CES24 = 91 | CES49 = 79 | CES74 = 96 | CES99 = 68 |
| CES25 = 72 | CES50 = 87 | CES75 = 57 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)