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: INVUE

Report Number: P868923

Luminaire Tested: **EMM2-HSN-SA2A-740-U-T2U-HSS**

Issue Date: 08/22/2024

Report Generated By 670245763

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
Peachtree City, GA 30269

Scaled Data Report

**Test Information**

| | |
|---|---|
| Test Method: | LM-79-08 |
| Report Number: | P868923 |
| Test Lab: | INNOVATION CENTER(G3) |
| Issue Date: | 08/22/2024 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS (FORMERLY EATON) |
| Product Line: | INVUE |
| Catalog Number: | EMM2-HSN-SA2A-740-U-T2U-HSS |
| Description: | EPIC MODERN SHORT HOUSING DISCRETE LED ARRAYS 70W 70CRI 4000K FIXTURE w/ TYPE II URBAN DISTRIBUTION OPTIC AND HOUSE SIDE SHIELD |
| Light Source: | (20) 4000K CCT, 70 CRI LEDS |
| Ballast/Driver: | ELECTRONIC DRIVER |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 6330.8 lumens |
| Efficiency: | N/A |
| Efficacy: | 103.8 lumens/watt |
| Luminous Opening: | Rectangular (W 0.67' x L: 0.33' x H: 0') |
| IES Classification: | Type II - Short |
| BUG Rating: | B1 - U0 - G1 |

| | |
|---|---|
| Input Watts (W): | 61 |
| Input Voltage (V): | 120 |
| Input Current (Ain): | NR |
| Voltage Rise (V): | NR |
| Power Factor: | 0.99 |
| Total Harmonic Distortion (THDi): | 9.89% |
| Frequency (hertz): | 60 |
| Stabilization Time: | NR |
| Operation Time: | NR |
| Ambient Temperature (°C): | NR |
| Test Distance: | 24 FT |

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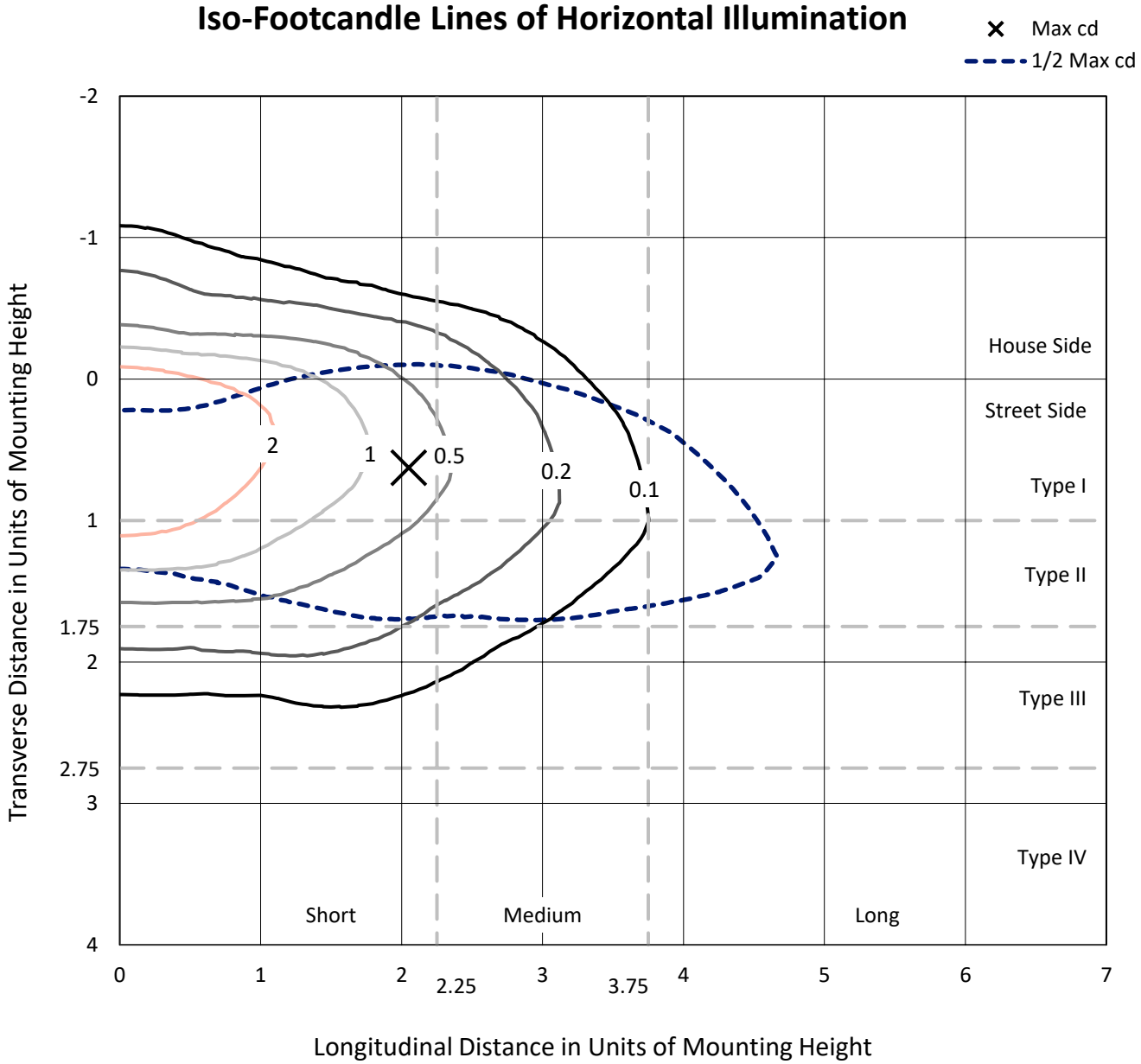
Scaled Data Report

REPORT NUMBER: P868923
CATALOG NUMBER: EMM2-HSN-SA2A-740-U-T2U-HSS

## Iso-Footcandle Lines of Horizontal Illumination




Based on 20 foot mounting height. Maximum calculated value = 4.5 fc
Type II - Short - N/A

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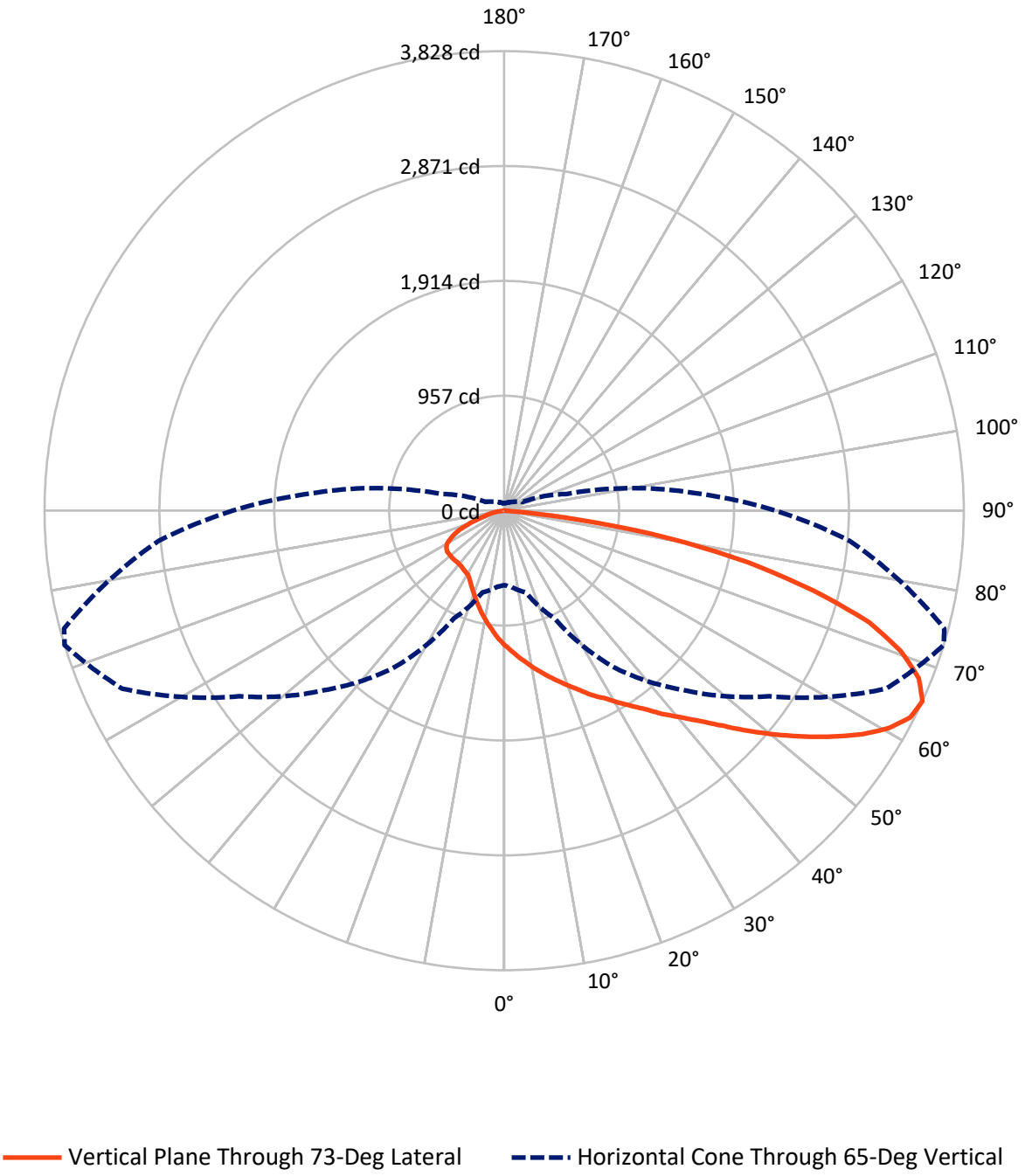
## Luminous Intensity Polar Plot



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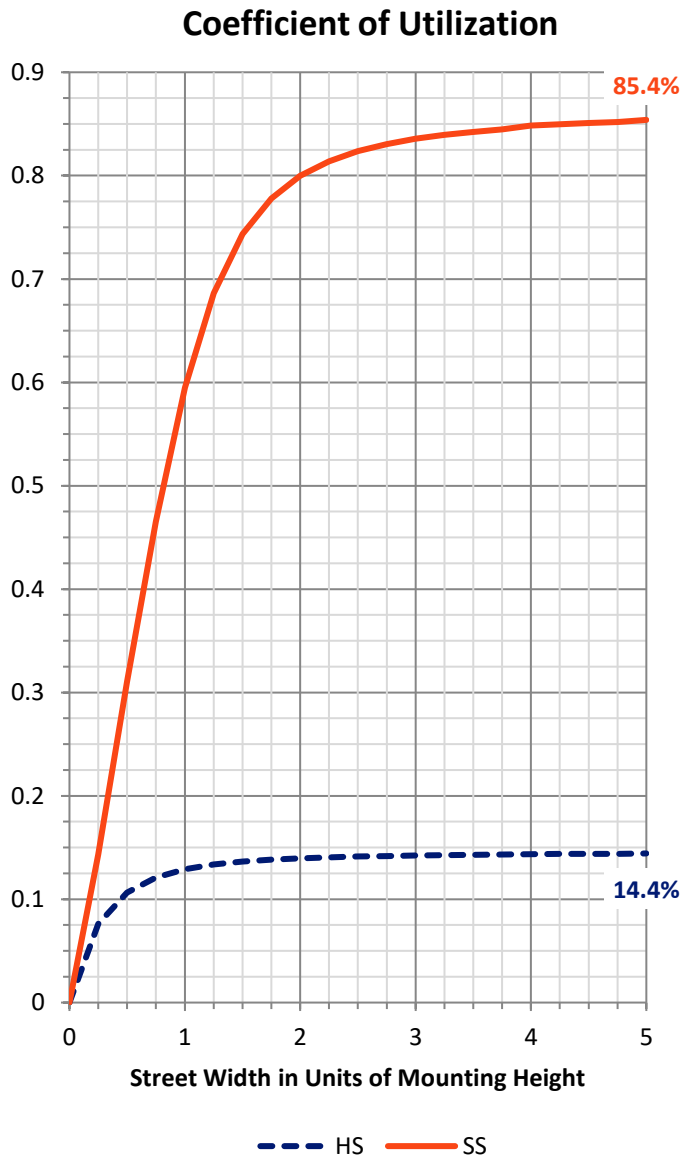
**FLUX DISTRIBUTION:**

| | | Downward | Upward | Total |
|---|---|---|---|---|
| **House Side** | Lumens | 920.6 | 0.0 | 920.6 |
| | % Fixture | 14.5 | 0.0 | 14.5 |
| **Street Side** | Lumens | 5410.2 | 0.0 | 5410.2 |
| | % Fixture | 85.5 | 0.0 | 85.5 |
| **Total** | Lumens | 6330.8 | 0.0 | 6330.8 |
| | % Fixture | 100.0 | 0.0 | 100.0 |

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 108.4 | 1.7 |
| 10°-20° | 329.5 | 5.2 |
| 20°-30° | 551.8 | 8.7 |
| 30°-40° | 832.3 | 13.1 |
| 40°-50° | 1176.1 | 18.6 |
| 50°-60° | 1323.3 | 20.9 |
| 60°-70° | 1186.7 | 18.7 |
| 70°-80° | 721.7 | 11.4 |
| 80°-90° | 101.0 | 1.6 |
| 90°-100° | 0.0 | 0.0 |
| 100°-110° | 0.0 | 0.0 |
| 110°-120° | 0.0 | 0.0 |
| 120°-130° | 0.0 | 0.0 |
| 130°-140° | 0.0 | 0.0 |
| 140°-150° | 0.0 | 0.0 |
| 150°-160° | 0.0 | 0.0 |
| 160°-170° | 0.0 | 0.0 |
| 170°-180° | 0.0 | 0.0 |
| 0°-90° | 6330.8 | 100.0 |
| 0°-180° | 6330.8 | 100.0 |



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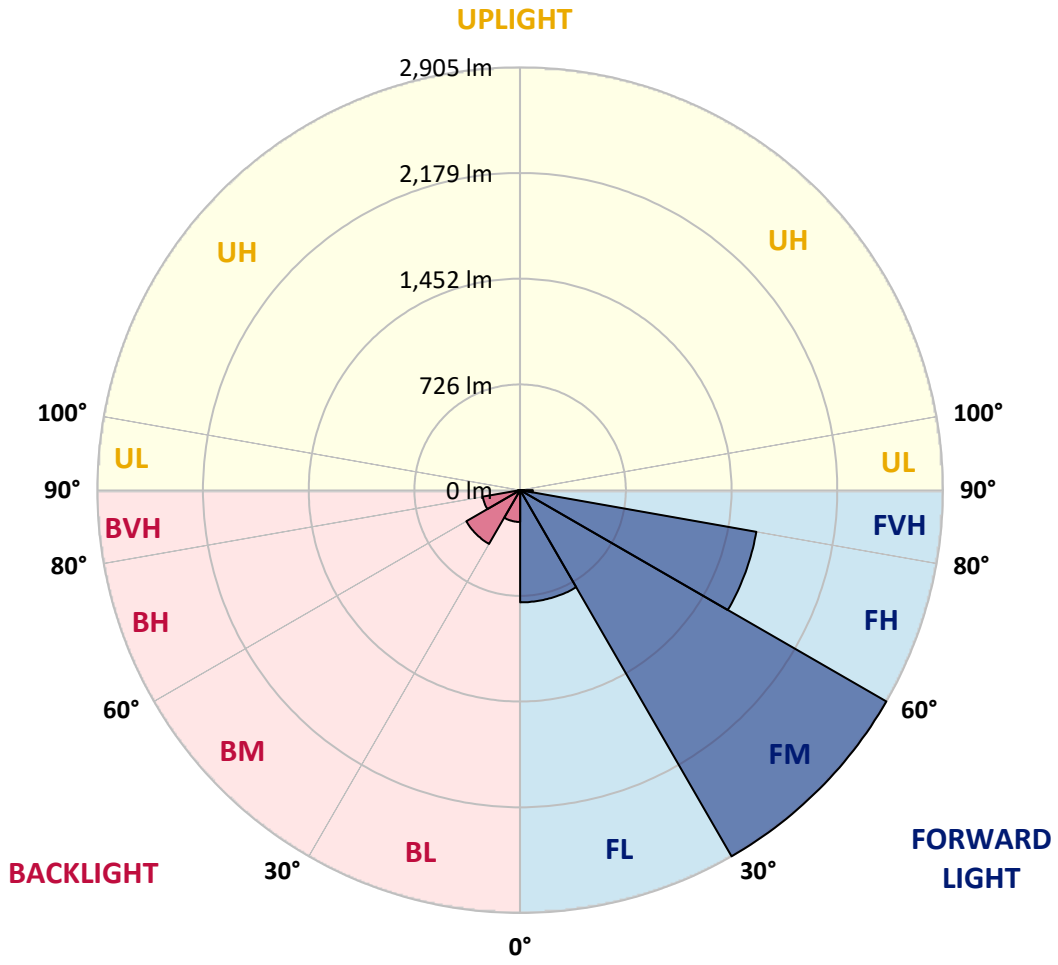
## LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:

| Zone | | Lumens | % Fixture | Zone Rating/Lumen Limit B | U | G |
|---|---|---|---|---|---|---|
| FL | (0°-30°) | 771.0 | 12.2 | | | |
| FM | (30°-60°) | 2904.9 | 45.9 | | | |
| FH | (60°-80°) | 1647.7 | 26.0 | | | G1/1800 |
| FVH | (80°-90°) | 86.8 | 1.4 | | | G1/100 |
| BL | (0°-30°) | 218.7 | 3.5 | B1/500 | | |
| BM | (30°-60°) | 426.9 | 6.7 | B1/1000 | | |
| BH | (60°-80°) | 260.8 | 4.1 | B1/500 | | G1/500 |
| BVH | (80°-90°) | 14.2 | 0.2 | | | G1/100 |
| UL | (90°-100°) | 0.0 | 0.0 | | U0/0 | |
| UH | (100°-180°) | 0.0 | 0.0 | | U0/0 | |

**BUG Rating: B1-U0-G1**
Type II Short



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**CANDELA DISTRIBUTION (FULL):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 73° | 75° | 85° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | *1123.1* | 1123.1 | 1123.1 |
| 2.5° | 1296.3 | 1288.9 | 1277.7 | 1268.4 | 1251.6 | 1229.3 | 1210.6 | 1186.4 | *1169.7* | 1164.1 | 1139.9 |
| 5° | 1484.4 | 1475.1 | 1462.1 | 1439.7 | 1395.0 | 1369.0 | 1320.5 | 1264.7 | *1220.0* | 1210.6 | 1154.8 |
| 7.5° | 1678.1 | 1674.4 | 1644.6 | 1611.1 | 1557.1 | 1499.3 | 1424.8 | 1337.3 | *1272.1* | 1257.2 | 1171.5 |
| 10° | 1842.0 | 1825.3 | 1808.5 | 1776.8 | 1719.1 | 1637.2 | 1540.3 | 1419.2 | *1328.0* | 1303.8 | 1188.3 |
| 12.5° | 1940.7 | 1935.2 | 1920.3 | 1883.0 | 1827.1 | 1756.4 | 1640.9 | 1499.3 | *1382.0* | 1348.5 | 1205.1 |
| 15° | 2013.4 | 2019.0 | 2004.1 | 1979.9 | 1922.1 | 1855.1 | 1743.3 | 1583.1 | *1439.7* | 1400.6 | 1223.7 |
| 17.5° | 2082.3 | 2078.6 | 2076.7 | 2048.8 | 1996.6 | 1929.6 | 1816.0 | 1652.1 | *1497.5* | 1454.6 | 1242.3 |
| 20° | 2121.4 | 2123.3 | 2119.5 | 2108.4 | 2058.1 | 1992.9 | 1886.7 | 1734.0 | *1560.8* | 1512.4 | 1266.5 |
| 22.5° | 2141.9 | 2149.3 | 2156.8 | 2154.9 | 2114.0 | 2063.7 | 1953.8 | 1799.2 | *1626.0* | 1575.7 | 1296.3 |
| 25° | 2154.9 | 2160.5 | 2177.3 | 2199.6 | 2162.4 | 2121.4 | 2028.3 | 1877.4 | *1702.3* | 1644.6 | 1331.7 |
| 27.5° | 2166.1 | 2173.6 | 2194.0 | 2227.6 | 2197.8 | 2173.6 | 2093.5 | 1944.5 | *1767.5* | 1715.4 | 1372.7 |
| 30° | 2238.8 | 2248.1 | 2248.1 | 2264.8 | 2231.3 | 2225.7 | 2166.1 | 2024.6 | *1849.5* | 1793.6 | 1424.8 |
| 32.5° | 2430.6 | 2412.0 | 2378.4 | 2361.7 | 2281.6 | 2283.5 | 2236.9 | 2104.6 | *1937.0* | 1881.1 | 1490.0 |
| 35° | 2596.4 | 2596.4 | 2555.4 | 2501.4 | 2372.9 | 2346.8 | 2318.8 | 2210.8 | *2032.0* | 1978.0 | 1575.7 |
| 37.5° | 2756.5 | 2758.4 | 2715.6 | 2669.0 | 2521.9 | 2428.7 | 2413.8 | 2313.3 | *2149.3* | 2086.0 | 1665.1 |
| 40° | 2857.1 | 2868.3 | 2857.1 | 2821.7 | 2680.2 | 2572.1 | 2507.0 | 2428.7 | *2261.1* | 2212.7 | 1767.5 |
| 42.5° | 2873.9 | 2896.2 | 2937.2 | 2948.4 | 2795.6 | 2700.7 | 2626.2 | 2547.9 | *2395.2* | 2341.2 | 1884.9 |
| 45° | 2831.0 | 2838.5 | 2929.7 | 2942.8 | 2881.3 | 2803.1 | 2752.8 | 2687.6 | *2555.4* | 2508.8 | 2015.2 |
| 47.5° | 2713.7 | 2698.8 | 2730.5 | 2844.1 | 2868.3 | 2864.6 | 2877.6 | 2845.9 | *2741.6* | 2682.0 | 2158.7 |
| 50° | 2462.3 | 2467.8 | 2570.3 | 2708.1 | 2791.9 | 2886.9 | 2970.7 | 3006.1 | *2929.7* | 2870.1 | 2313.3 |
| 52.5° | 2004.1 | 2030.1 | 2225.7 | 2551.7 | 2696.9 | 2872.0 | 3037.8 | 3157.0 | *3125.3* | 3067.6 | 2466.0 |
| 55° | 1646.5 | 1685.6 | 1881.1 | 2300.2 | 2566.6 | 2799.4 | 3076.9 | 3315.3 | *3320.9* | 3276.2 | 2605.7 |
| 57.5° | 1288.9 | 1320.5 | 1527.3 | 1910.9 | 2380.3 | 2685.8 | 3082.5 | 3451.3 | *3514.6* | 3462.4 | 2728.6 |
| 60° | 1009.5 | 1031.8 | 1152.9 | 1592.5 | 2151.2 | 2523.7 | 3041.5 | 3559.3 | *3678.5* | 3639.4 | 2834.8 |
| 62.5° | 765.5 | 782.3 | 890.3 | 1259.1 | 1870.0 | 2333.7 | 2903.7 | 3598.4 | *3794.0* | 3756.7 | 2894.4 |
| 65° | *620.2* | *635.1* | *705.9* | *989.0* | *1592.5* | *2114.0* | *2695.1* | *3509.0* | *3827.5* | *3794.0* | *2886.9* |
| 67.5° | 506.6 | 512.2 | 569.9 | 771.1 | 1346.6 | 1866.2 | 2389.6 | 3276.2 | *3725.0* | 3723.2 | 2801.2 |
| 70° | 409.8 | 424.7 | 473.1 | 614.6 | 1119.4 | 1581.3 | 2033.9 | 2911.1 | *3503.4* | 3522.0 | 2629.9 |
| 72.5° | 348.3 | 352.0 | 394.9 | 508.5 | 912.6 | 1283.3 | 1683.7 | 2490.2 | *3177.5* | 3192.4 | 2361.7 |
| 75° | 294.3 | 299.9 | 331.5 | 411.6 | 741.3 | 1018.8 | 1354.1 | 2011.5 | *2659.7* | 2723.0 | 1989.2 |
| 77.5° | 253.3 | 255.2 | 277.5 | 339.0 | 527.1 | 765.5 | 992.7 | 1508.6 | *2082.3* | 2127.0 | 1562.7 |
| 80° | 199.3 | 203.0 | 227.2 | 268.2 | 366.9 | 497.3 | 685.4 | 1031.8 | *1391.3* | 1441.6 | 1082.1 |
| 82.5° | 93.1 | 104.3 | 109.9 | 147.1 | 191.8 | 245.9 | 324.1 | 430.2 | *629.5* | 627.7 | 504.7 |
| 85° | 9.3 | 7.5 | 7.5 | 11.2 | 16.8 | 16.8 | 20.5 | 24.2 | *48.4* | 57.7 | 44.7 |
| 87.5° | 0.0 | 0.0 | 0.0 | 1.9 | 3.7 | 3.7 | 3.7 | 5.6 | *5.6* | 5.6 | 5.6 |
| 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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Scaled Data Report

REPORT NUMBER: P868923
CATALOG NUMBER: EMM2-HSN-SA2A-740-U-T2U-HSS

**CANDELA DISTRIBUTION (continued):**

| | 90° | 95° | 105° | 115° | 125° | 135° | 145° | 155° | 165° | 175° | 180° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 | 1123.1 |
| 2.5° | 1128.7 | 1111.9 | 1082.1 | 1054.2 | 1035.6 | 1020.7 | 996.4 | 981.5 | 970.4 | 955.5 | 953.6 |
| 5° | 1125.0 | 1095.2 | 1035.6 | 985.3 | 936.8 | 895.9 | 853.0 | 827.0 | 799.0 | 786.0 | 797.2 |
| 7.5° | 1128.7 | 1080.3 | 987.1 | 910.8 | 838.1 | 772.9 | 717.1 | 681.7 | 655.6 | 642.6 | 644.4 |
| 10° | 1130.6 | 1067.2 | 946.2 | 840.0 | 746.9 | 670.5 | 607.2 | 558.8 | 527.1 | 519.6 | 510.3 |
| 12.5° | 1126.8 | 1050.5 | 905.2 | 771.1 | 659.3 | 575.5 | 501.0 | 463.8 | 432.1 | 417.2 | 417.2 |
| 15° | 1130.6 | 1037.4 | 862.3 | 707.8 | 581.1 | 484.3 | 420.9 | 380.0 | 361.3 | 348.3 | 350.2 |
| 17.5° | 1130.6 | 1026.2 | 821.4 | 646.3 | 504.7 | 415.3 | 357.6 | 324.1 | 305.5 | 298.0 | 296.1 |
| 20° | 1143.6 | 1016.9 | 782.3 | 588.6 | 437.7 | 353.9 | 307.3 | 281.2 | 266.3 | 258.9 | 255.2 |
| 22.5° | 1152.9 | 1009.5 | 746.9 | 532.7 | 381.8 | 309.2 | 270.1 | 245.9 | 234.7 | 231.0 | 231.0 |
| 25° | 1169.7 | 1007.6 | 715.2 | 478.7 | 337.1 | 275.7 | 240.3 | 221.6 | 212.3 | 208.6 | 208.6 |
| 27.5° | 1193.9 | 1011.3 | 685.4 | 432.1 | 303.6 | 242.1 | 216.1 | 201.2 | 195.6 | 193.7 | 191.8 |
| 30° | 1229.3 | 1028.1 | 666.8 | 396.7 | 271.9 | 221.6 | 197.4 | 188.1 | 184.4 | 182.5 | 182.5 |
| 32.5° | 1275.8 | 1057.9 | 659.3 | 378.1 | 253.3 | 204.9 | 184.4 | 176.9 | 173.2 | 173.2 | 171.4 |
| 35° | 1333.6 | 1091.4 | 653.7 | 361.3 | 240.3 | 193.7 | 175.1 | 167.6 | 165.8 | 165.8 | 165.8 |
| 37.5° | 1402.5 | 1126.8 | 644.4 | 350.2 | 232.8 | 184.4 | 167.6 | 160.2 | 160.2 | 160.2 | 160.2 |
| 40° | 1478.8 | 1179.0 | 642.6 | 342.7 | 227.2 | 178.8 | 160.2 | 152.7 | 152.7 | 152.7 | 152.7 |
| 42.5° | 1564.5 | 1234.9 | 640.7 | 337.1 | 223.5 | 175.1 | 152.7 | 145.3 | 145.3 | 145.3 | 145.3 |
| 45° | 1668.8 | 1305.6 | 644.4 | 333.4 | 223.5 | 171.4 | 147.1 | 137.8 | 136.0 | 136.0 | 136.0 |
| 47.5° | 1771.3 | 1372.7 | 648.2 | 329.7 | 219.8 | 165.8 | 139.7 | 130.4 | 128.5 | 126.7 | 126.7 |
| 50° | 1881.1 | 1441.6 | 648.2 | 325.9 | 216.1 | 160.2 | 134.1 | 121.1 | 119.2 | 117.3 | 117.3 |
| 52.5° | 1989.2 | 1499.3 | 650.0 | 320.4 | 206.7 | 150.9 | 124.8 | 113.6 | 109.9 | 108.0 | 106.2 |
| 55° | 2093.5 | 1560.8 | 651.9 | 311.0 | 195.6 | 141.6 | 119.2 | 106.2 | 100.6 | 96.9 | 96.9 |
| 57.5° | 2171.7 | 1611.1 | 642.6 | 292.4 | 180.7 | 132.2 | 109.9 | 96.9 | 89.4 | 85.7 | 85.7 |
| 60° | 2246.2 | 1642.7 | 625.8 | 264.5 | 165.8 | 122.9 | 102.4 | 87.5 | 80.1 | 76.4 | 76.4 |
| 62.5° | 2276.0 | 1648.3 | 586.7 | 216.1 | 147.1 | 113.6 | 93.1 | 80.1 | 74.5 | 72.6 | 72.6 |
| 65° | *2259.2* | *1624.1* | *534.5* | *171.4* | *130.4* | *102.4* | *85.7* | *74.5* | *67.1* | *61.5* | *61.5* |
| 67.5° | 2168.0 | 1540.3 | 463.8 | 136.0 | 113.6 | 93.1 | 78.2 | 67.1 | 59.6 | 54.0 | 54.0 |
| 70° | 1994.8 | 1406.2 | 361.3 | 108.0 | 98.7 | 82.0 | 70.8 | 61.5 | 54.0 | 48.4 | 48.4 |
| 72.5° | 1739.6 | 1220.0 | 262.6 | 91.3 | 85.7 | 72.6 | 63.3 | 55.9 | 48.4 | 44.7 | 44.7 |
| 75° | 1434.1 | 940.6 | 186.3 | 78.2 | 76.4 | 65.2 | 57.7 | 50.3 | 44.7 | 41.0 | 41.0 |
| 77.5° | 1076.5 | 655.6 | 145.3 | 68.9 | 67.1 | 59.6 | 52.2 | 46.6 | 41.0 | 39.1 | 37.3 |
| 80° | 717.1 | 406.0 | 109.9 | 52.2 | 50.3 | 46.6 | 42.8 | 39.1 | 33.5 | 29.8 | 29.8 |
| 82.5° | 320.4 | 171.4 | 55.9 | 29.8 | 26.1 | 22.4 | 18.6 | 13.0 | 13.0 | 11.2 | 11.2 |
| 85° | 33.5 | 22.4 | 11.2 | 7.5 | 7.5 | 5.6 | 5.6 | 5.6 | 3.7 | 3.7 | 3.7 |
| 87.5° | 5.6 | 5.6 | 3.7 | 3.7 | 3.7 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 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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# LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

Streetworks

Report Number: SP1-2407-157-5

Test Date: 08/07/2024

Luminaire Tested: MEM2-HTN-SA-40-740-U-5WQ-2

Data in this report applies to families of products including MEM2-HTN-SA-40-740-U-5WQ-2

Report Generated By FNC07603 / LDUCLS01DT446
Version: v7.04

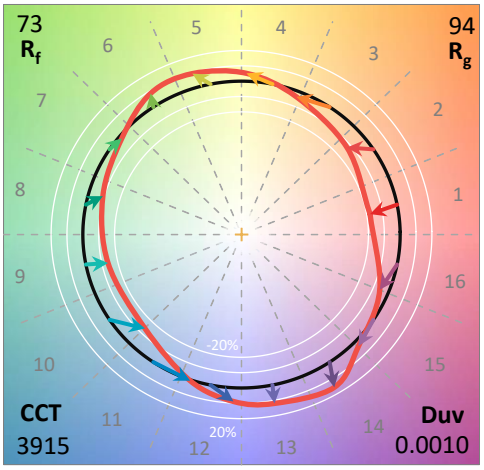
## Test Information

| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | SP1-2407-157-5 |
| Test Lab: | COOPER LIGHTING SOLUTIONS |
| Photometer: | SP1 - 76IN SPHERE |
| Measurement Geometry: | 4π |
| Issue Date: | 08/20/2024 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS |
| Product Line: | Streetworks |
| Catalog Number: | **MEM2-HTN-SA-40-740-U-5WQ-2** |
| Description: | Epic Modern Light Square 40W 5WQ Optic and Flare Trim |

## Spectral Parameters

| | |
|---|---|
| CCT (K): | 3915 |
| CIE u': | 0.2262 |
| CIE v': | 0.5044 |
| Duv: | 0.0010 |
| CIE x: | 0.3850 |
| CIE y: | 0.3816 |
| CIE z: | 0.2334 |
| Peak Wavelength (nm): | 449 |
| Dominant Wavelength (nm): | 578 |
| Purity: | 30.05482 |
| Rf: | 73.2 |
| Rg: | 93.9 |

| | |
|---|---|
| CRI (Ra): | 71.0 |
| R1: | 67.6 |
| R2: | 78.3 |
| R3: | 87.1 |
| R4: | 69.7 |
| R5: | 67.4 |
| R6: | 69.3 |
| R7: | 79.7 |
| R8: | 48.7 |
| R9: | -38.4 |
| R10: | 48.9 |
| R11: | 65.3 |
| R12: | 40.4 |
| R13: | 69.3 |
| R14: | 92.6 |
| R15: | 59.9 |




## Test Conditions

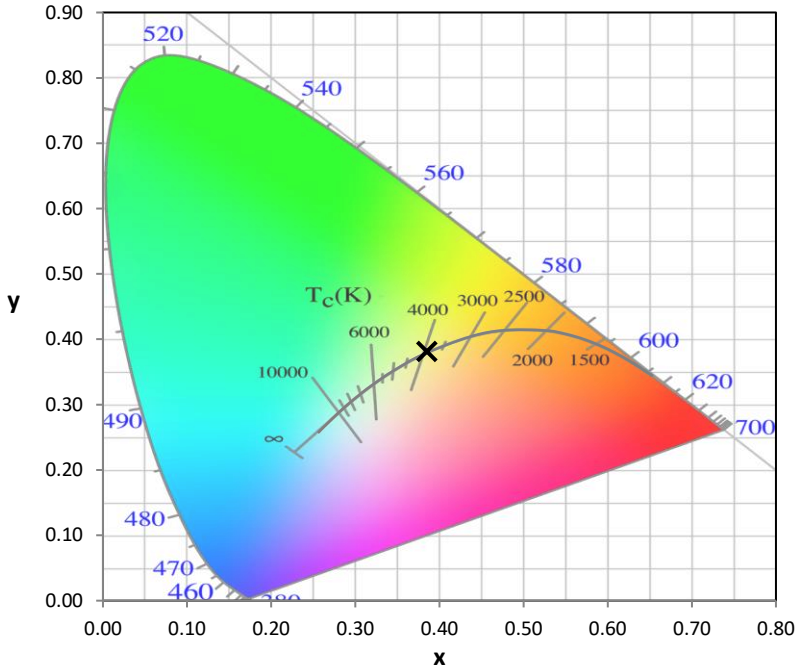
| | |
|---|---|
| Stabilization Time: | 21M |
| Operation Time: | 1H 21M |
| Sphere Temperature (°C): | 24.2 |

REPORT NUMBER: SP1-2407-157-5

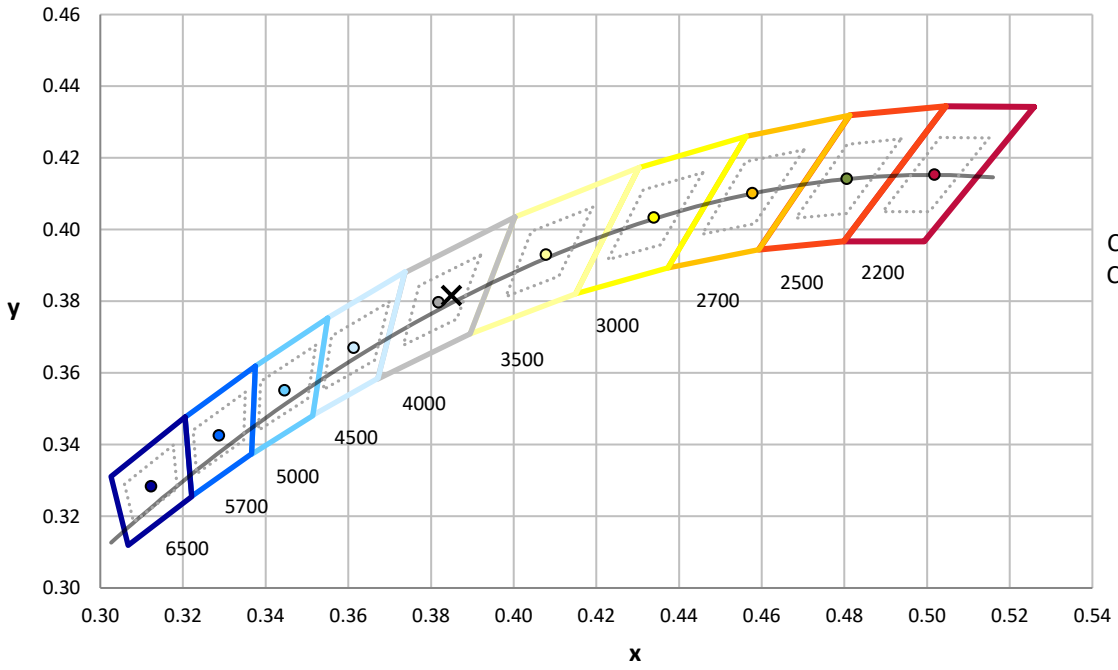
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | IN0058 | 6/18/2024 | 12/18/2024 |
| Power Meter | INXT2011004 | 2/8/2024 | 2/8/2025 |
| AC Power Source | IN0063 | 10/24/2023 | 10/24/2024 |
| DC 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: SP1-2407-157-5

## CIE 1931 Chromaticity Diagram




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

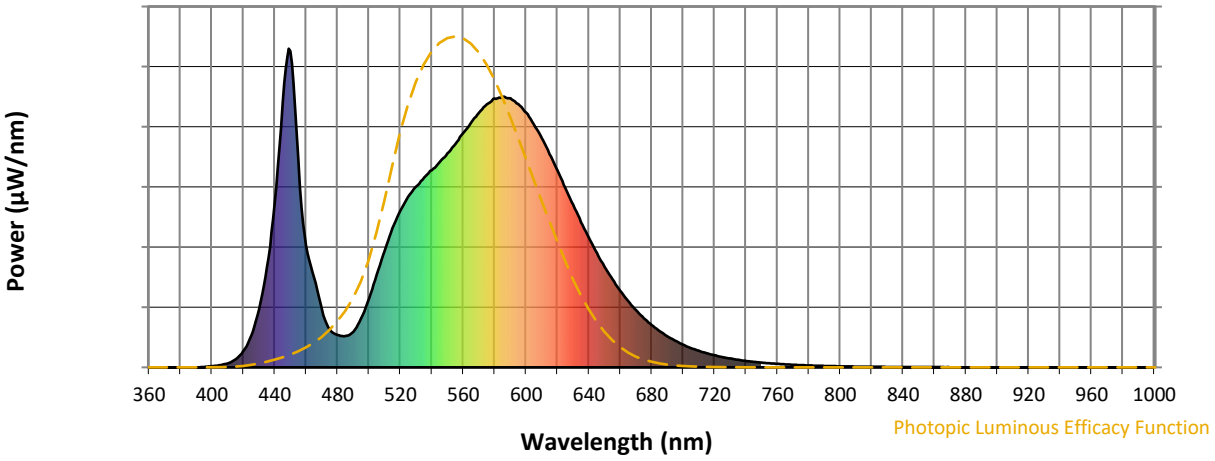



CCT = 3915K
CIE x = 0.3850
CIE y = 0.3816
Duv = 0.0010

Point lies inside the ANSI 4000K 4-step quadrangle

REPORT NUMBER: SP1-2407-157-5

## Photopic Flux vs. Wavelength

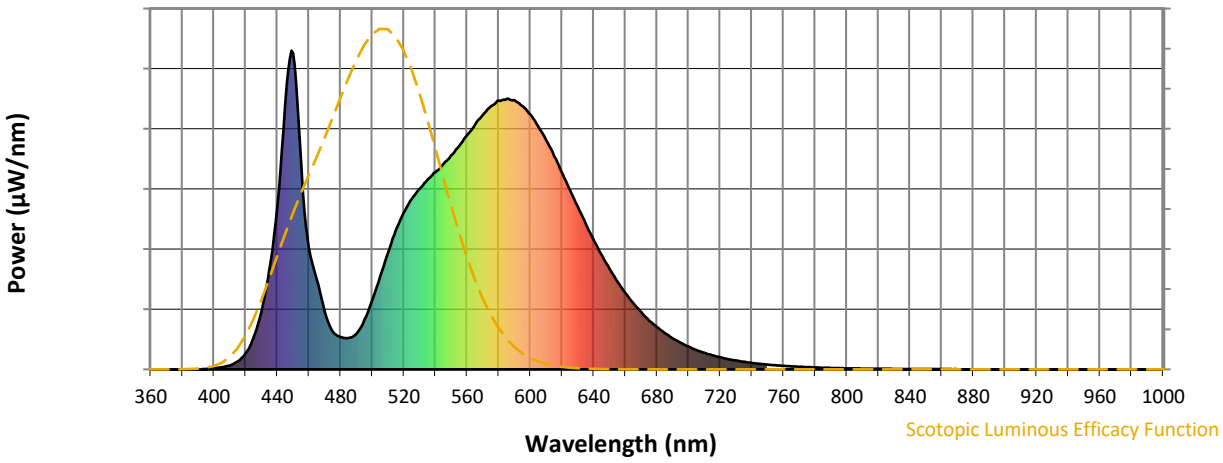



## Photopic Lumens: NR

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 112 | NR | 620 | 618 | NR | 750 | 15 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 153 | NR | 625 | 563 | NR | 755 | 13 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 216 | NR | 630 | 510 | NR | 760 | 11 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 291 | NR | 635 | 456 | NR | 765 | 9 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 366 | NR | 640 | 407 | NR | 770 | 8 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 436 | NR | 645 | 359 | NR | 775 | 7 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 492 | NR | 650 | 316 | NR | 780 | 6 | NR | 910 | 0 | NR |
| 395 | 2 | NR | 525 | 536 | NR | 655 | 277 | NR | 785 | 5 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 567 | NR | 660 | 240 | NR | 790 | 4 | NR | 920 | 0 | NR |
| 405 | 7 | NR | 535 | 596 | NR | 665 | 208 | NR | 795 | 4 | NR | 925 | 0 | NR |
| 410 | 12 | NR | 540 | 619 | NR | 670 | 179 | NR | 800 | 3 | NR | 930 | 0 | NR |
| 415 | 25 | NR | 545 | 644 | NR | 675 | 154 | NR | 805 | 3 | NR | 935 | 0 | NR |
| 420 | 51 | NR | 550 | 671 | NR | 680 | 133 | NR | 810 | 3 | NR | 940 | 0 | NR |
| 425 | 100 | NR | 555 | 701 | NR | 685 | 114 | NR | 815 | 2 | NR | 945 | 0 | NR |
| 430 | 180 | NR | 560 | 735 | NR | 690 | 98 | NR | 820 | 2 | NR | 950 | 0 | NR |
| 435 | 315 | NR | 565 | 768 | NR | 695 | 83 | NR | 825 | 2 | NR | 955 | 0 | NR |
| 440 | 514 | NR | 570 | 798 | NR | 700 | 71 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 828 | NR | 575 | 825 | NR | 705 | 61 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 992 | NR | 580 | 843 | NR | 710 | 52 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 652 | NR | 585 | 848 | NR | 715 | 44 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 382 | NR | 590 | 844 | NR | 720 | 38 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 282 | NR | 595 | 826 | NR | 725 | 32 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 180 | NR | 600 | 800 | NR | 730 | 28 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 119 | NR | 605 | 762 | NR | 735 | 24 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 101 | NR | 610 | 719 | NR | 740 | 20 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 98 | NR | 615 | 669 | NR | 745 | 17 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2407-157-5

## Scotopic Flux vs. Wavelength

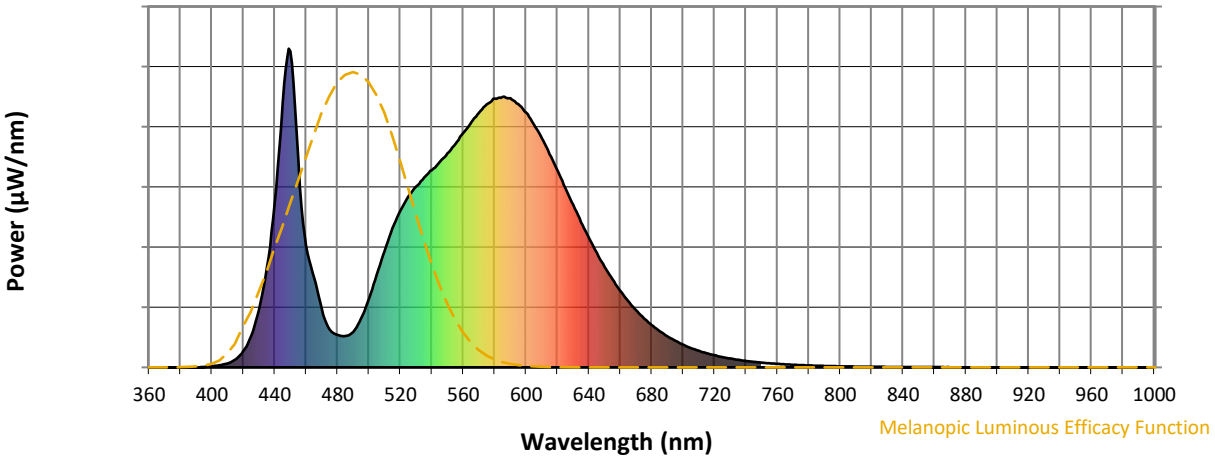



**Scotopic Lumens: NR** **S/P: 1.49**

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 112 | NR | 620 | 618 | NR | 750 | 15 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 153 | NR | 625 | 563 | NR | 755 | 13 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 216 | NR | 630 | 510 | NR | 760 | 11 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 291 | NR | 635 | 456 | NR | 765 | 9 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 366 | NR | 640 | 407 | NR | 770 | 8 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 436 | NR | 645 | 359 | NR | 775 | 7 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 492 | NR | 650 | 316 | NR | 780 | 6 | NR | 910 | 0 | NR |
| 395 | 2 | NR | 525 | 536 | NR | 655 | 277 | NR | 785 | 5 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 567 | NR | 660 | 240 | NR | 790 | 4 | NR | 920 | 0 | NR |
| 405 | 7 | NR | 535 | 596 | NR | 665 | 208 | NR | 795 | 4 | NR | 925 | 0 | NR |
| 410 | 12 | NR | 540 | 619 | NR | 670 | 179 | NR | 800 | 3 | NR | 930 | 0 | NR |
| 415 | 25 | NR | 545 | 644 | NR | 675 | 154 | NR | 805 | 3 | NR | 935 | 0 | NR |
| 420 | 51 | NR | 550 | 671 | NR | 680 | 133 | NR | 810 | 3 | NR | 940 | 0 | NR |
| 425 | 100 | NR | 555 | 701 | NR | 685 | 114 | NR | 815 | 2 | NR | 945 | 0 | NR |
| 430 | 180 | NR | 560 | 735 | NR | 690 | 98 | NR | 820 | 2 | NR | 950 | 0 | NR |
| 435 | 315 | NR | 565 | 768 | NR | 695 | 83 | NR | 825 | 2 | NR | 955 | 0 | NR |
| 440 | 514 | NR | 570 | 798 | NR | 700 | 71 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 828 | NR | 575 | 825 | NR | 705 | 61 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 992 | NR | 580 | 843 | NR | 710 | 52 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 652 | NR | 585 | 848 | NR | 715 | 44 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 382 | NR | 590 | 844 | NR | 720 | 38 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 282 | NR | 595 | 826 | NR | 725 | 32 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 180 | NR | 600 | 800 | NR | 730 | 28 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 119 | NR | 605 | 762 | NR | 735 | 24 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 101 | NR | 610 | 719 | NR | 740 | 20 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 98 | NR | 615 | 669 | NR | 745 | 17 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2407-157-5

## Melanopic Flux vs. Wavelength




**Melanopic Lumens: NR** **M/P: 2.88**

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 112 | NR | 620 | 618 | NR | 750 | 15 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 153 | NR | 625 | 563 | NR | 755 | 13 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 216 | NR | 630 | 510 | NR | 760 | 11 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 291 | NR | 635 | 456 | NR | 765 | 9 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 366 | NR | 640 | 407 | NR | 770 | 8 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 436 | NR | 645 | 359 | NR | 775 | 7 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 492 | NR | 650 | 316 | NR | 780 | 6 | NR | 910 | 0 | NR |
| 395 | 2 | NR | 525 | 536 | NR | 655 | 277 | NR | 785 | 5 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 567 | NR | 660 | 240 | NR | 790 | 4 | NR | 920 | 0 | NR |
| 405 | 7 | NR | 535 | 596 | NR | 665 | 208 | NR | 795 | 4 | NR | 925 | 0 | NR |
| 410 | 12 | NR | 540 | 619 | NR | 670 | 179 | NR | 800 | 3 | NR | 930 | 0 | NR |
| 415 | 25 | NR | 545 | 644 | NR | 675 | 154 | NR | 805 | 3 | NR | 935 | 0 | NR |
| 420 | 51 | NR | 550 | 671 | NR | 680 | 133 | NR | 810 | 3 | NR | 940 | 0 | NR |
| 425 | 100 | NR | 555 | 701 | NR | 685 | 114 | NR | 815 | 2 | NR | 945 | 0 | NR |
| 430 | 180 | NR | 560 | 735 | NR | 690 | 98 | NR | 820 | 2 | NR | 950 | 0 | NR |
| 435 | 315 | NR | 565 | 768 | NR | 695 | 83 | NR | 825 | 2 | NR | 955 | 0 | NR |
| 440 | 514 | NR | 570 | 798 | NR | 700 | 71 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 828 | NR | 575 | 825 | NR | 705 | 61 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 992 | NR | 580 | 843 | NR | 710 | 52 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 652 | NR | 585 | 848 | NR | 715 | 44 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 382 | NR | 590 | 844 | NR | 720 | 38 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 282 | NR | 595 | 826 | NR | 725 | 32 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 180 | NR | 600 | 800 | NR | 730 | 28 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 119 | NR | 605 | 762 | NR | 735 | 24 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 101 | NR | 610 | 719 | NR | 740 | 20 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 98 | NR | 615 | 669 | NR | 745 | 17 | NR | 875 | 0 | NR | | | |

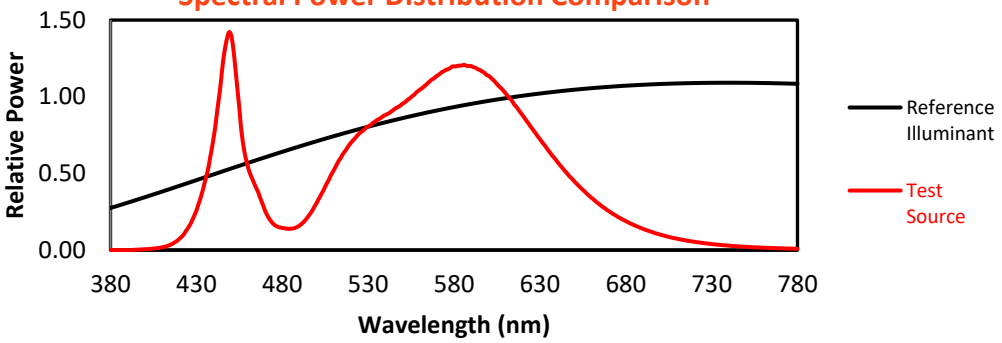
REPORT NUMBER: SP1-2407-157-5

# TM-30-18

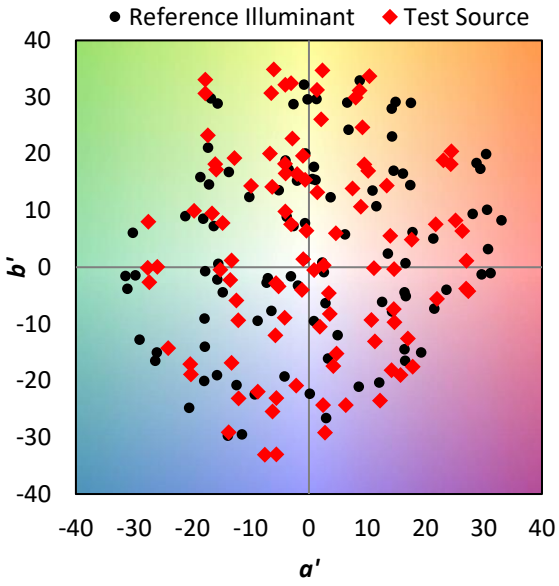
## Summary

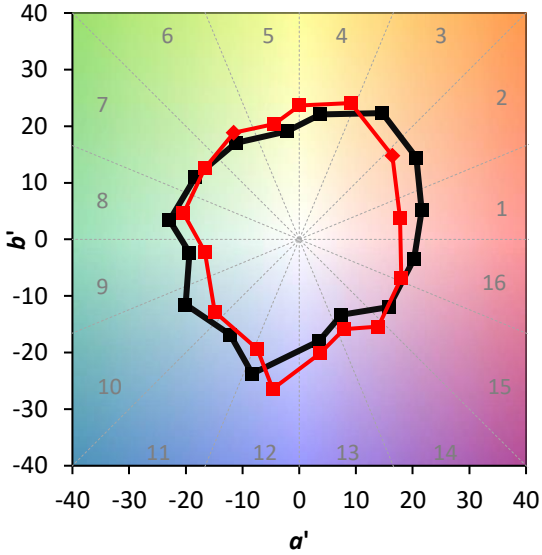
$R_f$ = 73.2
$R_g$ = 93.9
CIE $R_a$ = 71.0
$R_9$ = -38.4

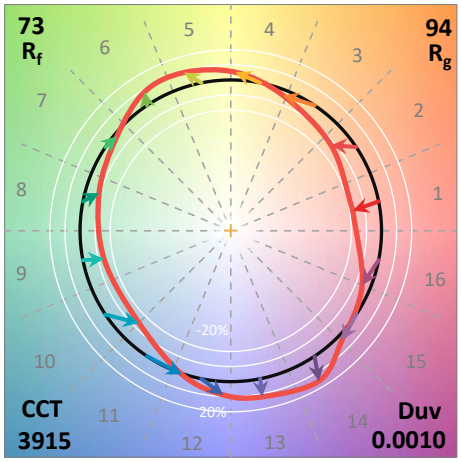
## Spectral Power Distribution Comparison

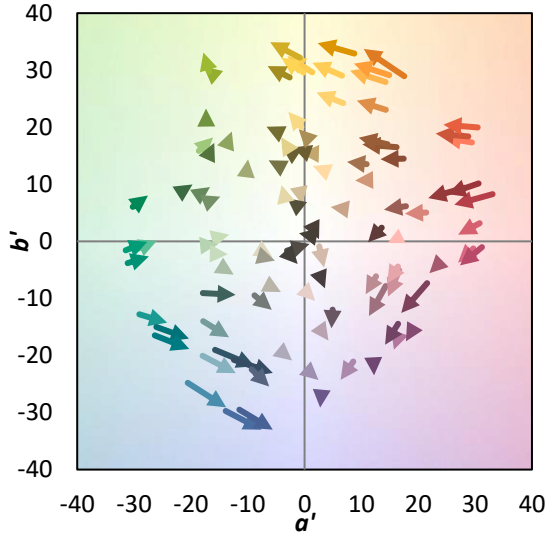



## Color Vector Graphics



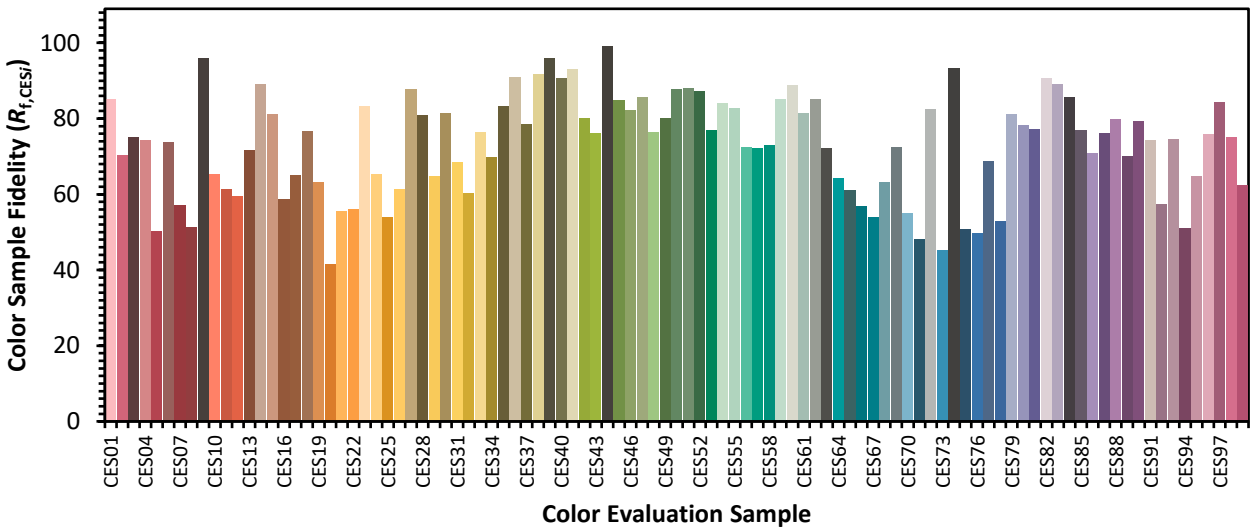



REPORT NUMBER: SP1-2407-157-5

# TM-30-18

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

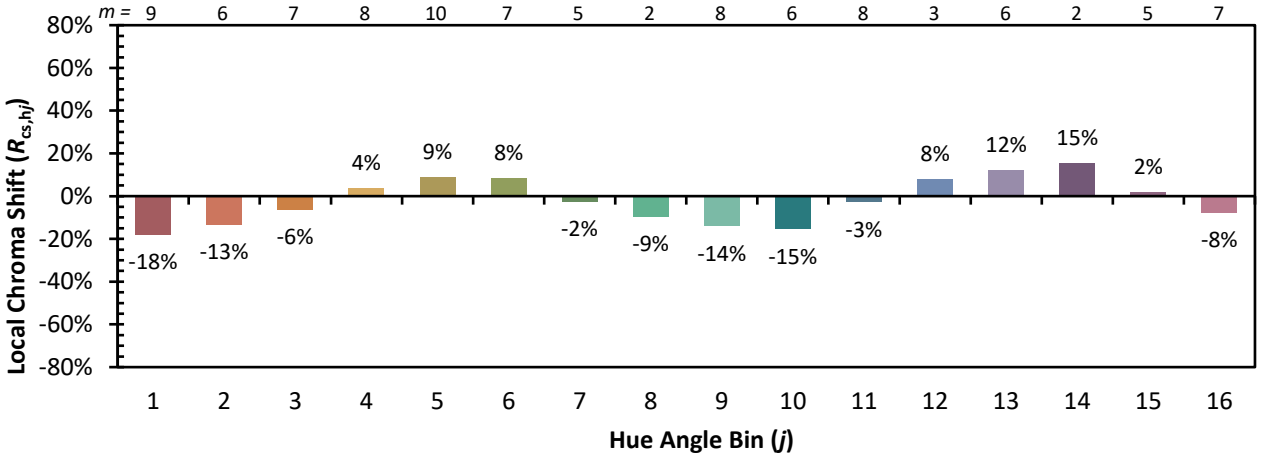
| | | | |
|---|---|---|---|
| CES01 = 85 | CES26 = 61 | CES51 = 88 | CES76 = 50 |
| CES02 = 61 | CES27 = 88 | CES52 = 87 | CES77 = 69 |
| CES03 = 30 | CES28 = 81 | CES53 = 77 | CES78 = 53 |
| CES04 = 70 | CES29 = 65 | CES54 = 84 | CES79 = 81 |
| CES05 = 47 | CES30 = 81 | CES55 = 83 | CES80 = 78 |
| CES06 = 50 | CES31 = 69 | CES56 = 73 | CES81 = 77 |
| CES07 = 40 | CES32 = 60 | CES57 = 72 | CES82 = 91 |
| CES08 = 39 | CES33 = 76 | CES58 = 73 | CES83 = 89 |
| CES09 = 29 | CES34 = 70 | CES59 = 85 | CES84 = 86 |
| CES10 = 74 | CES35 = 83 | CES60 = 89 | CES85 = 77 |
| CES11 = 57 | CES36 = 91 | CES61 = 81 | CES86 = 71 |
| CES12 = 63 | CES37 = 79 | CES62 = 85 | CES87 = 76 |
| CES13 = 42 | CES38 = 92 | CES63 = 72 | CES88 = 80 |
| CES14 = 74 | CES39 = 96 | CES64 = 64 | CES89 = 70 |
| CES15 = 71 | CES40 = 91 | CES65 = 61 | CES90 = 79 |
| CES16 = 46 | CES41 = 93 | CES66 = 57 | CES91 = 74 |
| CES17 = 49 | CES42 = 80 | CES67 = 54 | CES92 = 57 |
| CES18 = 56 | CES43 = 76 | CES68 = 63 | CES93 = 74 |
| CES19 = 72 | CES44 = 99 | CES69 = 73 | CES94 = 51 |
| CES20 = 65 | CES45 = 85 | CES70 = 55 | CES95 = 65 |
| CES21 = 86 | CES46 = 82 | CES71 = 48 | CES96 = 76 |
| CES22 = 78 | CES47 = 86 | CES72 = 83 | CES97 = 84 |
| CES23 = 92 | CES48 = 77 | CES73 = 45 | CES98 = 75 |
| CES24 = 91 | CES49 = 80 | CES74 = 93 | CES99 = 62 |
| CES25 = 72 | CES50 = 88 | CES75 = 51 | |

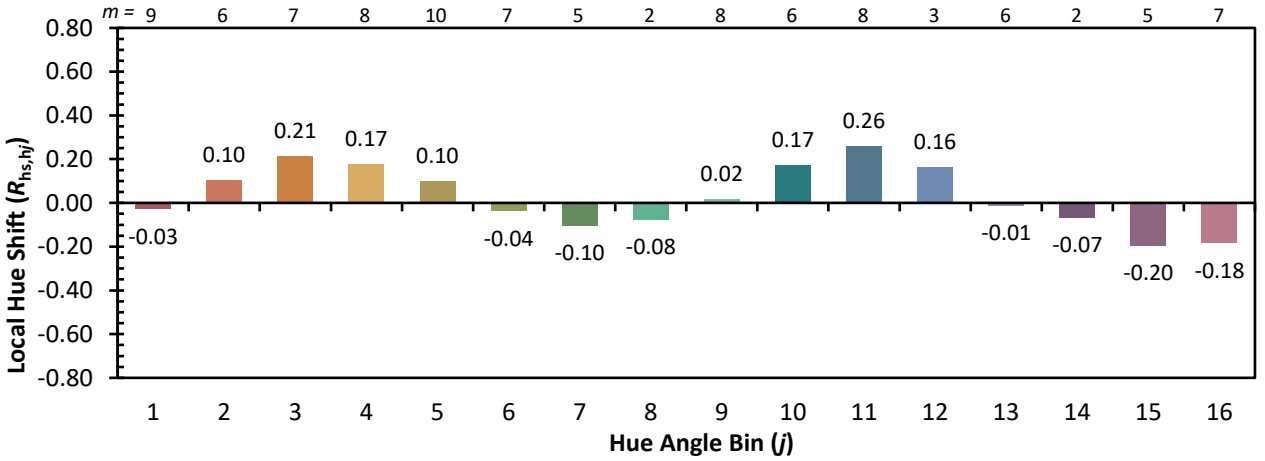


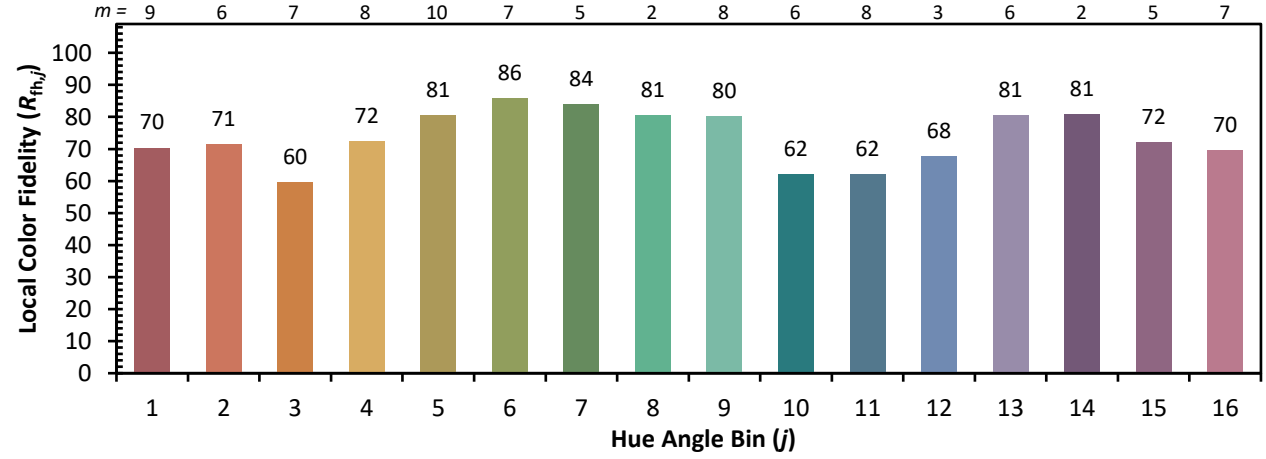
REPORT NUMBER: SP1-2407-157-5

**TM-30-18**

## Color Rendition by Hue-Angle Bin



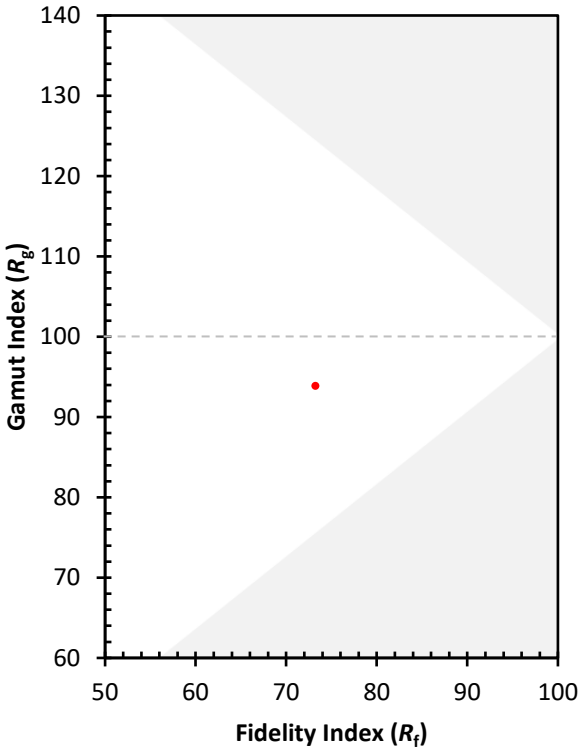



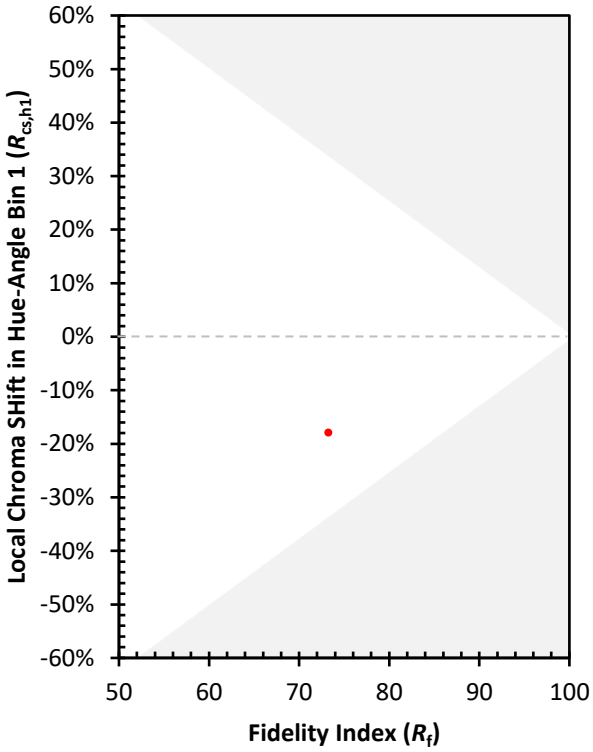



REPORT NUMBER: SP1-2407-157-5

# TM-30-18

## Measure Comparisons




(END OF REPORT)