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

Scaled data based on original data using

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

Test Report Prepared for

Cooper Lighting Solutions

Brand: McGRAW-EDISON

Report Number: P639404

Luminaire Tested: GWS-SA5B-827-U-SL2-W-GRSBK

Issue Date: 1/10/2023

Report Generated By 670246102 / DESKTOP-G35701P

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

Scaled Data Report

**Test Information**

| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | P639404 |
| | TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2209-782-28) |
| Test Lab: | COOPER LIGHTING SOLUTIONS |
| Issue Date: | 1/10/2023 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS |
| Product Line: | McGRAW-EDISON |
| Catalog Number: | GWS-SA5B-827-U-SL2-W-GRSBK |
| Description: | GALLEON WALL SLIM LUMINAIRE. (5) LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II SPILL LIGHT ELIMINATOR OPTICS W/ FACTORY INSTALLED GLARE SHIELD, BK |
| Light Source: | (80) 2700K CCT, 80 CRI LEDS |
| Ballast/Driver: | - |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 7664.3 lumens |
| Efficiency: | N/A |
| Efficacy: | 66.2 lumens/watt |
| Luminous Opening: | Rectangular (W 1.5' x L: 1' x H: 0') |
| IES Classification: | Type II - Short |
| BUG Rating: | B2 - U0 - G1 |

| | |
|---|---|
| Input Watts (W): | 115.7 |
| Input Voltage (V): | 120 |
| Input Current (Ain): | NR |
| Voltage Rise (V): | NR |
| Power Factor: | NR |
| Total Harmonic Distortion (THDi): | NR |
| Frequency (hertz): | 0 |
| Stabilization Time: | NR |
| Operation Time: | NR |
| Ambient Temperature (°C): | NR |
| Test Distance: | 28.75 FT |

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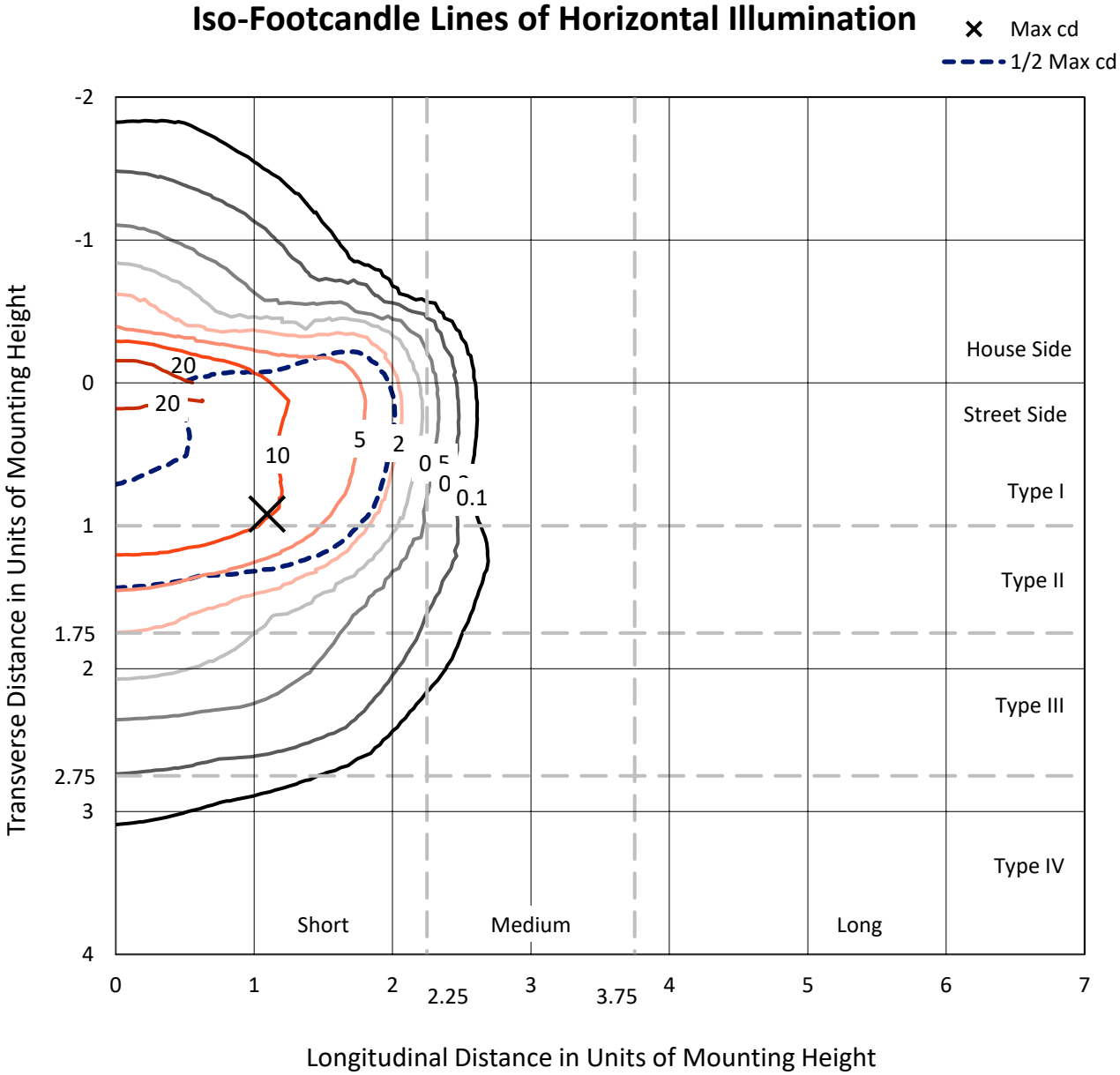
Scaled Data Report

REPORT NUMBER: P639404
CATALOG NUMBER: GWS-SA5B-827-U-SL2-W-GRSBK

## Iso-Footcandle Lines of Horizontal Illumination




Based on 10 foot mounting height. Maximum calculated value = 26.9 fc
Type II - Short - N/A

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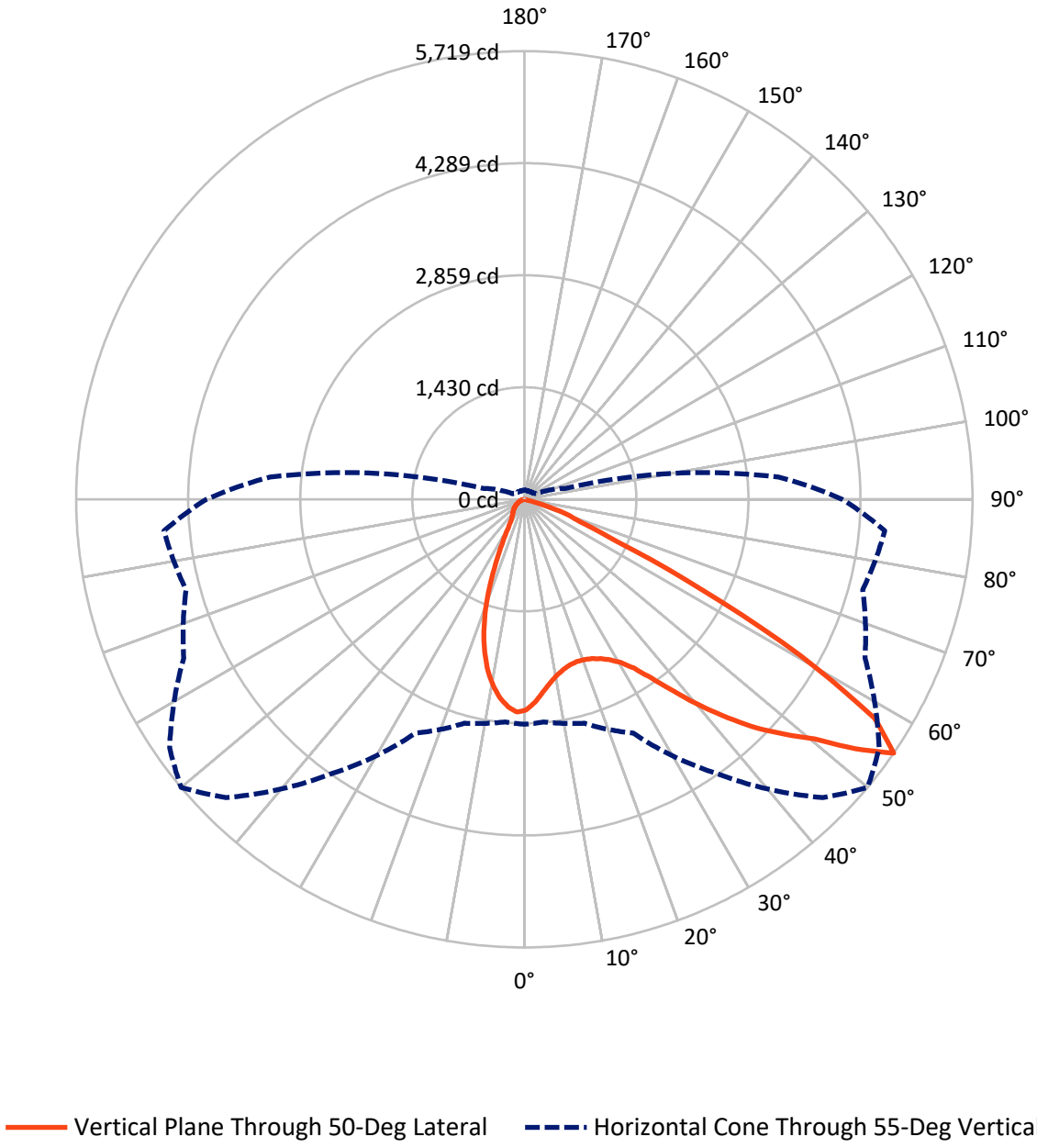
## Luminous Intensity Polar Plot



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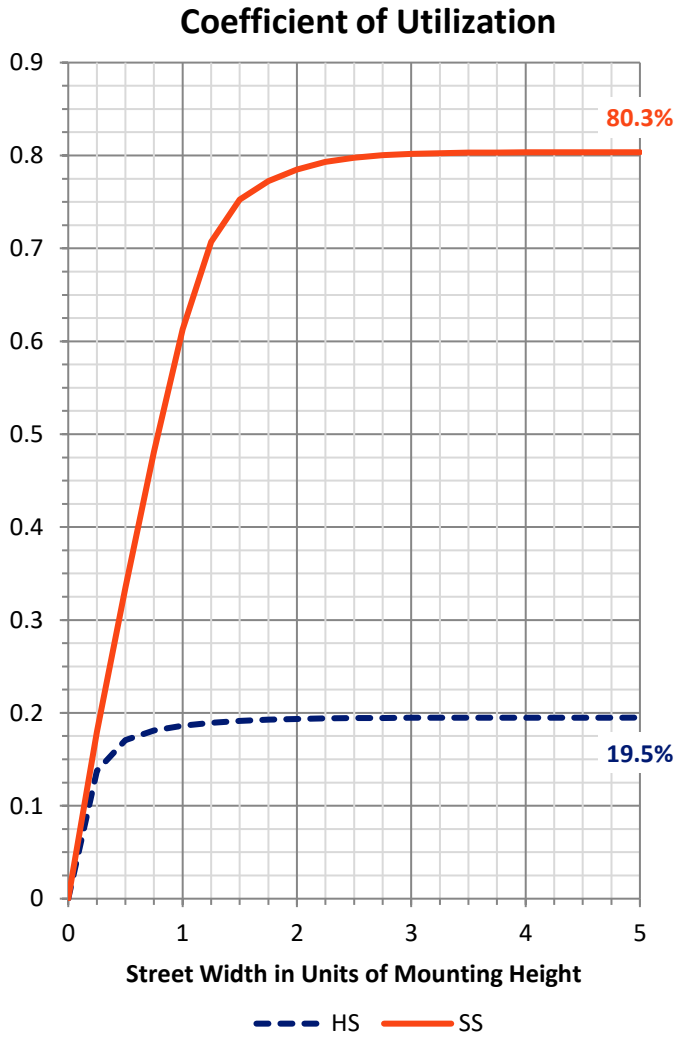
**FLUX DISTRIBUTION:**

| | | Downward | Upward | Total |
|---|---|---|---|---|
| **House Side** | Lumens | 1510.2 | 0.0 | 1510.2 |
| | % Fixture | 19.7 | 0.0 | 19.7 |
| **Street Side** | Lumens | 6154.1 | 0.0 | 6154.1 |
| | % Fixture | 80.3 | 0.0 | 80.3 |
| **Total** | Lumens | 7664.3 | 0.0 | 7664.3 |
| | % Fixture | 100.0 | 0.0 | 100.0 |

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 236.2 | 3.1 |
| 10°-20° | 581.1 | 7.6 |
| 20°-30° | 819.7 | 10.7 |
| 30°-40° | 1213.0 | 15.8 |
| 40°-50° | 1750.0 | 22.8 |
| 50°-60° | 2064.2 | 26.9 |
| 60°-70° | 920.8 | 12.0 |
| 70°-80° | 79.2 | 1.0 |
| 80°-90° | 0.0 | 0.0 |
| 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° | 7664.3 | 100.0 |
| 0°-180° | 7664.3 | 100.0 |



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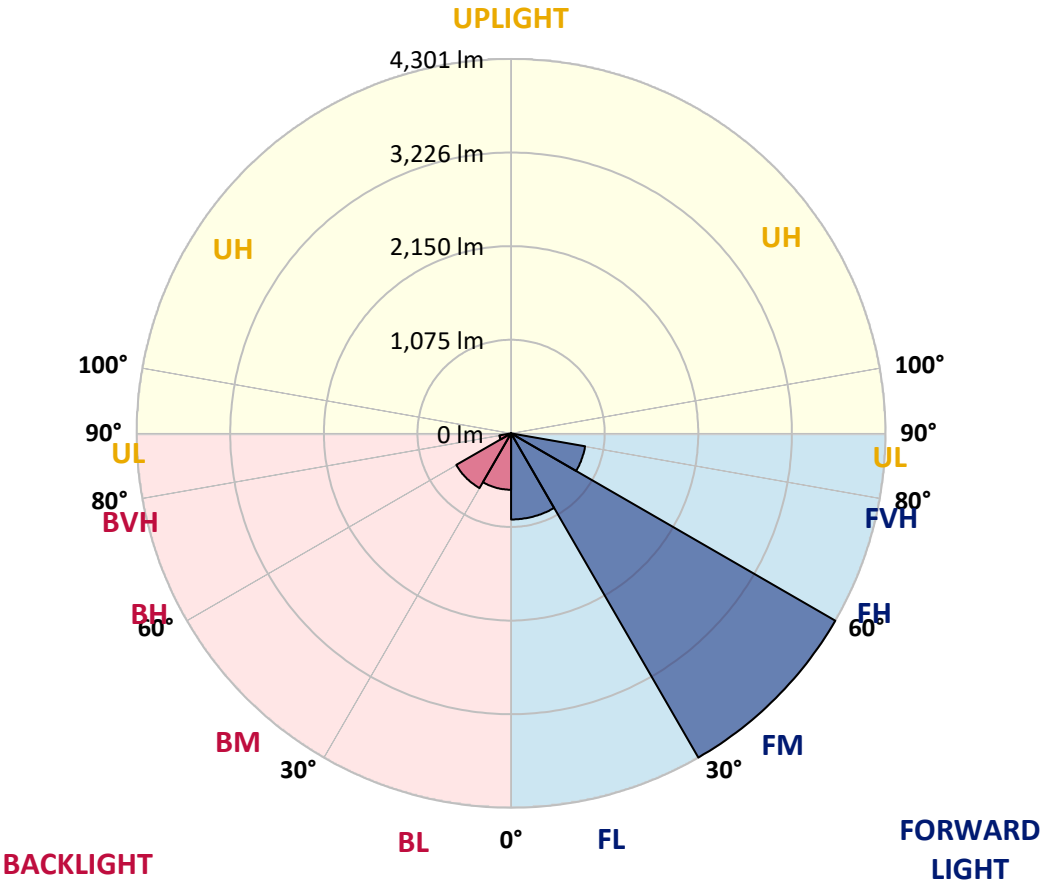
CATALOG NUMBER: GWS-SA5B-827-U-SL2-W-GRSBK

## LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:

| Zone | | Lumens | % Fixture | Zone Rating/Lumen Limit B | U | G |
|---|---|---|---|---|---|---|
| FL | (0°-30°) | 989.5 | 12.9 | | | |
| FM | (30°-60°) | 4301.0 | 56.1 | | | |
| FH | (60°-80°) | 863.6 | 11.3 | | | G1/1800 |
| FVH | (80°-90°) | 0.0 | 0.0 | | | G0/10 |
| BL | (0°-30°) | 647.5 | 8.4 | B2/1000 | | |
| BM | (30°-60°) | 726.3 | 9.5 | B1/1000 | | |
| BH | (60°-80°) | 136.4 | 1.8 | B1/500 | | G1/500 |
| BVH | (80°-90°) | 0.0 | 0.0 | | | G0/10 |
| UL | (90°-100°) | 0.0 | 0.0 | | U0/0 | |
| UH | (100°-180°) | 0.0 | 0.0 | | U0/0 | |

**BUG Rating: B2-U0-G1**
Type II Short



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REPORT NUMBER: P639404
CATALOG NUMBER: GWS-SA5B-827-U-SL2-W-GRSBK

**CANDELA DISTRIBUTION (FULL):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 50° | 55° | 65° | 75° | 85° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | *2689.1* | 2689.1 | 2689.1 | 2689.1 | 2689.1 |
| 2.5° | 2498.2 | 2500.1 | 2501.0 | 2526.3 | 2535.6 | 2573.0 | *2592.7* | 2603.0 | 2630.1 | 2661.9 | 2688.1 |
| 5° | 2330.7 | 2327.9 | 2332.6 | 2364.4 | 2385.0 | 2440.2 | *2470.1* | 2490.7 | 2550.6 | 2625.4 | 2688.1 |
| 7.5° | 2184.7 | 2190.4 | 2196.0 | 2230.6 | 2261.5 | 2321.4 | *2364.4* | 2395.3 | 2478.5 | 2589.9 | 2695.6 |
| 10° | 2081.8 | 2081.8 | 2090.2 | 2129.5 | 2166.0 | 2239.9 | *2283.0* | 2322.3 | 2421.5 | 2558.1 | 2704.0 |
| 12.5° | 2006.0 | 2007.0 | 2017.3 | 2062.2 | 2104.3 | 2181.0 | *2225.9* | 2264.3 | 2373.7 | 2526.3 | 2705.9 |
| 15° | 1970.5 | 1967.7 | 1976.1 | 2023.8 | 2070.6 | 2142.6 | *2189.4* | 2226.9 | 2340.1 | 2508.5 | 2715.3 |
| 17.5° | 1961.1 | 1959.3 | 1965.8 | 2012.6 | 2060.3 | 2130.5 | *2176.3* | 2213.8 | 2335.4 | 2514.1 | 2743.3 |
| 20° | 1988.3 | 1984.5 | 1981.7 | 2021.9 | 2066.9 | 2136.1 | *2183.8* | 2225.9 | 2357.8 | 2545.0 | 2786.4 |
| 22.5° | 2052.8 | 2052.8 | 2046.3 | 2065.9 | 2095.9 | 2158.5 | *2208.1* | 2263.3 | 2416.8 | 2606.7 | 2850.0 |
| 25° | 2171.6 | 2162.3 | 2150.1 | 2158.5 | 2154.8 | 2194.1 | *2253.0* | 2329.8 | 2528.1 | 2708.7 | 2927.7 |
| 27.5° | 2307.3 | 2315.7 | 2295.2 | 2296.1 | 2263.3 | 2249.3 | *2317.6* | 2433.6 | 2693.7 | 2852.8 | 3042.7 |
| 30° | 2491.6 | 2485.1 | 2486.0 | 2483.2 | 2407.4 | 2341.0 | *2414.9* | 2569.3 | 2902.4 | 3072.7 | 3192.4 |
| 32.5° | 2635.7 | 2645.1 | 2676.0 | 2693.7 | 2594.6 | 2487.9 | *2566.5* | 2753.6 | 3140.0 | 3323.4 | 3375.8 |
| 35° | 2788.2 | 2805.1 | 2867.8 | 2925.8 | 2842.5 | 2719.9 | *2804.1* | 2997.8 | 3363.7 | 3571.4 | 3586.4 |
| 37.5° | 2949.2 | 2982.9 | 3057.7 | 3159.7 | 3146.6 | 3038.1 | *3114.8* | 3285.1 | 3539.6 | 3721.1 | 3760.4 |
| 40° | 3133.5 | 3166.2 | 3288.8 | 3435.7 | 3466.6 | 3442.3 | *3467.5* | 3566.7 | 3655.6 | 3727.6 | 3835.2 |
| 42.5° | 3335.6 | 3380.5 | 3535.8 | 3732.3 | 3848.3 | 3869.9 | *3810.9* | 3800.6 | 3706.1 | 3652.8 | 3819.3 |
| 45° | 3574.2 | 3626.6 | 3802.5 | 4057.0 | 4241.3 | 4270.3 | *4168.3* | 4036.4 | 3737.9 | 3597.6 | 3771.6 |
| 47.5° | 3841.8 | 3891.4 | 4066.3 | 4372.3 | 4646.4 | 4657.7 | *4479.9* | 4267.5 | 3832.4 | 3661.2 | 3808.1 |
| 50° | 3931.6 | 3962.5 | 4114.1 | 4473.4 | 4978.6 | 5064.7 | *4807.4* | 4527.6 | 4022.4 | 3848.3 | 3985.9 |
| 52.5° | 3622.8 | 3635.0 | 3766.9 | 4130.0 | 4911.2 | 5464.2 | *5285.5* | 4915.9 | 4360.1 | 4133.7 | 4260.0 |
| 55° | *2870.6* | *2850.9* | *2957.6* | *3290.7* | *4268.4* | *5382.8* | *5718.7* | *5526.0* | *4795.2* | *4468.7* | *4616.5* |
| 57.5° | 2007.9 | 1984.5 | 1960.2 | 2185.7 | 3185.0 | 4563.2 | *5269.6* | 5611.1 | 5209.7 | 4800.8 | 5001.1 |
| 60° | 1650.5 | 1628.0 | 1510.1 | 1406.3 | 1925.6 | 3276.7 | *4047.6* | 4690.4 | 5176.0 | 4784.0 | 4988.9 |
| 62.5° | 1425.9 | 1412.8 | 1365.1 | 1223.8 | 1133.1 | 1870.4 | *2534.7* | 3150.3 | 3971.8 | 3756.6 | 3767.9 |
| 65° | 1120.0 | 1116.2 | 1149.0 | 1164.0 | 1002.1 | 1034.8 | *1293.1* | 1637.4 | 2147.3 | 2024.7 | 1920.0 |
| 67.5° | 765.4 | 756.9 | 818.7 | 1006.8 | 963.7 | 816.8 | *756.9* | 763.5 | 929.1 | 567.9 | 451.0 |
| 70° | 486.5 | 466.9 | 467.8 | 624.1 | 784.1 | 644.7 | *583.8* | 513.7 | 462.2 | 84.2 | 95.4 |
| 72.5° | 311.6 | 299.4 | 257.3 | 281.6 | 363.0 | 314.4 | *317.2* | 273.2 | 182.5 | 44.9 | 52.4 |
| 75° | 131.0 | 120.7 | 92.6 | 73.9 | 73.0 | 45.8 | *40.2* | 37.4 | 25.3 | 25.3 | 27.1 |
| 77.5° | 0.9 | 0.0 | 0.0 | 0.9 | 1.9 | 0.9 | *0.9* | 1.9 | 3.7 | 5.6 | 6.5 |
| 80° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | *0.0* | 0.0 | 0.0 | 0.0 | 0.9 |
| 82.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | *0.0* | 0.0 | 0.0 | 0.0 | 0.0 |
| 85° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | *0.0* | 0.0 | 0.0 | 0.0 | 0.0 |
| 87.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | *0.0* | 0.0 | 0.0 | 0.0 | 0.0 |
| 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: P639404
CATALOG NUMBER: GWS-SA5B-827-U-SL2-W-GRSBK

**CANDELA DISTRIBUTION (continued):**

| | 90° | 95° | 105° | 115° | 125° | 135° | 145° | 155° | 165° | 175° | 180° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 | 2689.1 |
| 2.5° | 2704.0 | 2681.6 | 2706.8 | 2716.2 | 2715.3 | 2716.2 | 2689.1 | 2670.3 | 2669.4 | 2646.0 | 2634.8 |
| 5° | 2714.3 | 2696.5 | 2715.3 | 2703.1 | 2674.1 | 2637.6 | 2588.9 | 2546.8 | 2528.1 | 2501.0 | 2487.9 |
| 7.5° | 2734.0 | 2715.3 | 2712.5 | 2663.8 | 2591.8 | 2515.0 | 2429.0 | 2352.2 | 2311.1 | 2261.5 | 2264.3 |
| 10° | 2748.0 | 2726.5 | 2690.0 | 2590.8 | 2471.1 | 2348.5 | 2220.3 | 2106.2 | 2034.1 | 1967.7 | 1956.4 |
| 12.5° | 2753.6 | 2721.8 | 2636.7 | 2487.0 | 2318.5 | 2158.5 | 1970.5 | 1807.7 | 1695.4 | 1608.4 | 1596.2 |
| 15° | 2763.9 | 2712.5 | 2568.4 | 2361.6 | 2130.5 | 1904.1 | 1664.5 | 1441.8 | 1293.1 | 1193.0 | 1201.4 |
| 17.5° | 2779.8 | 2702.2 | 2491.6 | 2221.2 | 1928.4 | 1608.4 | 1284.6 | 1029.2 | 892.6 | 834.6 | 835.5 |
| 20° | 2802.3 | 2690.0 | 2407.4 | 2066.9 | 1686.0 | 1274.4 | 898.2 | 705.5 | 667.1 | 665.2 | 662.4 |
| 22.5° | 2832.2 | 2677.8 | 2317.6 | 1897.5 | 1398.8 | 892.6 | 597.9 | 538.0 | 553.9 | 584.8 | 590.4 |
| 25° | 2867.8 | 2662.9 | 2217.5 | 1706.6 | 1085.4 | 585.7 | 448.2 | 438.8 | 477.2 | 518.4 | 527.7 |
| 27.5° | 2923.0 | 2655.4 | 2103.3 | 1489.6 | 761.6 | 420.1 | 366.8 | 372.4 | 407.0 | 441.6 | 450.0 |
| 30° | 3016.5 | 2669.4 | 1978.9 | 1246.3 | 489.3 | 335.0 | 318.1 | 326.5 | 345.3 | 363.0 | 370.5 |
| 32.5° | 3143.8 | 2710.6 | 1858.2 | 980.6 | 349.0 | 291.0 | 287.2 | 291.9 | 299.4 | 309.7 | 312.5 |
| 35° | 3292.6 | 2781.7 | 1733.8 | 701.7 | 288.2 | 265.7 | 262.0 | 262.0 | 265.7 | 267.6 | 268.5 |
| 37.5° | 3415.1 | 2856.5 | 1616.8 | 466.9 | 258.2 | 246.1 | 240.5 | 237.7 | 236.7 | 238.6 | 239.5 |
| 40° | 3468.5 | 2887.4 | 1489.6 | 339.6 | 236.7 | 228.3 | 219.9 | 211.5 | 211.5 | 218.0 | 218.9 |
| 42.5° | 3431.0 | 2852.8 | 1342.7 | 280.7 | 221.7 | 209.6 | 196.5 | 189.0 | 192.7 | 199.3 | 201.2 |
| 45° | 3351.5 | 2767.7 | 1180.8 | 247.9 | 206.8 | 190.9 | 175.9 | 171.2 | 175.0 | 183.4 | 185.3 |
| 47.5° | 3338.4 | 2711.5 | 987.1 | 226.4 | 190.9 | 175.0 | 159.1 | 154.4 | 159.1 | 165.6 | 167.5 |
| 50° | 3468.5 | 2760.2 | 771.9 | 207.7 | 175.9 | 158.1 | 145.0 | 140.3 | 143.2 | 146.9 | 148.8 |
| 52.5° | 3706.1 | 2940.8 | 623.1 | 189.9 | 158.1 | 141.3 | 132.9 | 127.2 | 127.2 | 131.0 | 131.9 |
| 55° | *4057.0* | *3256.1* | *538.0* | *169.4* | *137.5* | *128.2* | *120.7* | *115.1* | *115.1* | *117.0* | *117.9* |
| 57.5° | 4461.2 | 3637.8 | 557.6 | 142.2 | 120.7 | 116.0 | 109.5 | 104.8 | 106.7 | 106.7 | 106.7 |
| 60° | 4405.0 | 3609.7 | 596.9 | 119.8 | 106.7 | 104.8 | 99.2 | 97.3 | 102.0 | 98.2 | 96.4 |
| 62.5° | 3244.8 | 2493.5 | 312.5 | 98.2 | 91.7 | 89.8 | 86.1 | 89.8 | 96.4 | 86.1 | 82.3 |
| 65° | 1575.6 | 1207.0 | 125.4 | 80.5 | 77.7 | 75.8 | 73.9 | 79.5 | 83.3 | 67.4 | 63.6 |
| 67.5° | 370.5 | 301.3 | 81.4 | 68.3 | 64.6 | 60.8 | 62.7 | 63.6 | 60.8 | 45.8 | 44.0 |
| 70° | 96.4 | 94.5 | 63.6 | 57.1 | 51.5 | 47.7 | 47.7 | 46.8 | 40.2 | 29.0 | 27.1 |
| 72.5° | 52.4 | 51.5 | 45.8 | 43.0 | 35.6 | 31.8 | 32.7 | 29.0 | 22.5 | 16.8 | 15.9 |
| 75° | 26.2 | 28.1 | 26.2 | 24.3 | 19.6 | 17.8 | 17.8 | 15.9 | 11.2 | 6.5 | 6.5 |
| 77.5° | 5.6 | 6.5 | 6.5 | 5.6 | 4.7 | 3.7 | 3.7 | 4.7 | 1.9 | 0.0 | 0.0 |
| 80° | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 82.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 85° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 87.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 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

Invue

Report Number: SP1-2407-157-9

Test Date: 10/03/2024

Luminaire Tested: EMM2-HTN-SA1A-827-U-5WQ

Data applicable to all product families utilizing light square engine

Report Generated By FNC07603 / LDUCLS01DT446
Version: v7.04

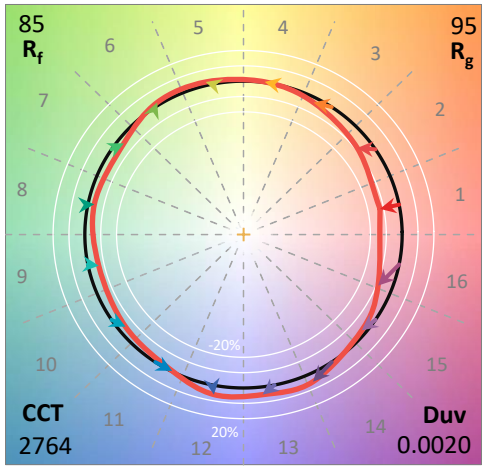
## Test Information

| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | SP1-2407-157-9 |
| Test Lab: | COOPER LIGHTING SOLUTIONS |
| Photometer: | SP1 - 76IN SPHERE |
| Measurement Geometry: | 4π |
| Issue Date: | 10/03/2024 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS |
| Product Line: | Invue |
| Catalog Number: | **EMM2-HTN-SA1A-827-U-5WQ** |
| Description: | Epic Modern Light Square 40W 5WQ Optic |

## Spectral Parameters

| | |
|---|---|
| CCT (K): | 2764 |
| CIE u': | 0.2591 |
| CIE v': | 0.5290 |
| Duv: | 0.0020 |
| CIE x: | 0.4581 |
| CIE y: | 0.4156 |
| CIE z: | 0.1263 |
| Peak Wavelength (nm): | 603 |
| Dominant Wavelength (nm): | 583 |
| Purity: | 62.2537 |
| Rf: | 84.7 |
| Rg: | 94.6 |

| | |
|---|---|
| CRI (Ra): | 80.9 |
| R1: | 78.8 |
| R2: | 89.9 |
| R3: | 96.2 |
| R4: | 79.1 |
| R5: | 79.1 |
| R6: | 88.8 |
| R7: | 81.3 |
| R8: | 54.3 |
| R9: | -1.5 |
| R10: | 77.9 |
| R11: | 78.9 |
| R12: | 71.6 |
| R13: | 81.2 |
| R14: | 98.5 |
| R15: | 69.9 |




## Test Conditions

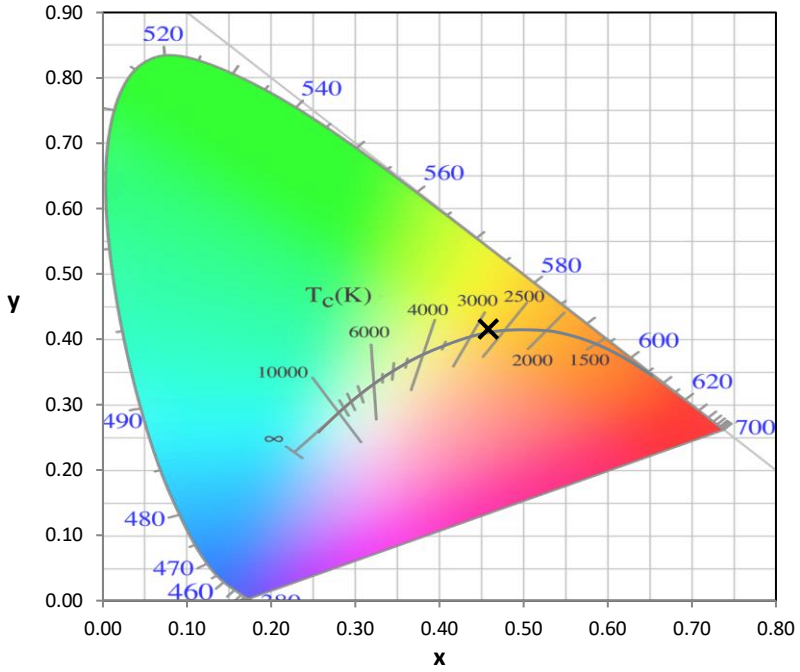
| | |
|---|---|
| Stabilization Time: | 81M |
| Operation Time: | 2H 21M |
| Sphere Temperature (°C): | 25.2 |

REPORT NUMBER: SP1-2407-157-9

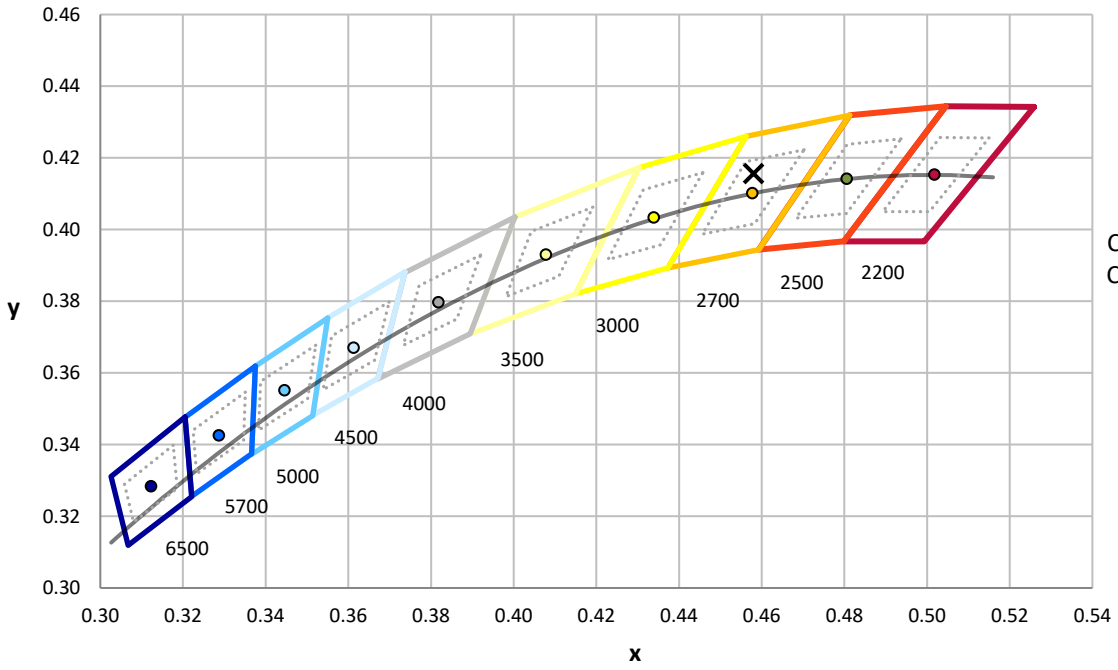
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | IN0058 | 6/18/2024 | 12/18/2024 |
| Power Meter | INXT2011004 | 2/8/2024 | 2/8/2025 |
| AC Power Source | IN0063 | 10/24/2023 | 10/24/2024 |
| DC 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: SP1-2407-157-9

## CIE 1931 Chromaticity Diagram




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




CCT = 2764K
CIE x = 0.4581
CIE y = 0.4156
Duv = 0.0020

Point lies inside the ANSI 2700K 4-step quadrangle

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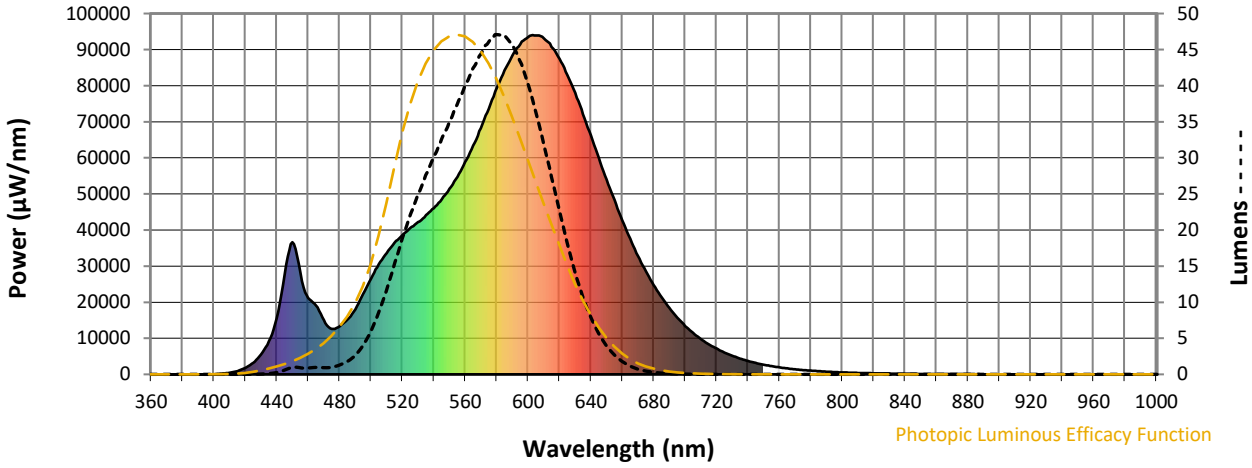
## Photopic Flux vs. Wavelength




**Photopic Lumens: 4337.9**

| λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | 0.0 | 490 | 18018 | 2.6 | 620 | 87426 | 22.8 | 750 | 2680 | 0.0 | 880 | 58 | 0.0 |
| 365 | 0 | 0.0 | 495 | 22295 | 3.9 | 625 | 83013 | 18.2 | 755 | 2287 | 0.0 | 885 | 46 | 0.0 |
| 370 | 0 | 0.0 | 500 | 26478 | 5.8 | 630 | 78077 | 14.1 | 760 | 1944 | 0.0 | 890 | 45 | 0.0 |
| 375 | 0 | 0.0 | 505 | 30524 | 8.5 | 635 | 72080 | 10.7 | 765 | 1653 | 0.0 | 895 | 41 | 0.0 |
| 380 | 0 | 0.0 | 510 | 33611 | 11.5 | 640 | 66249 | 7.9 | 770 | 1413 | 0.0 | 900 | 38 | 0.0 |
| 385 | 0 | 0.0 | 515 | 36490 | 15.2 | 645 | 59973 | 5.7 | 775 | 1198 | 0.0 | 905 | 33 | 0.0 |
| 390 | 0 | 0.0 | 520 | 38610 | 18.7 | 650 | 53972 | 3.9 | 780 | 1025 | 0.0 | 910 | 30 | 0.0 |
| 395 | 0 | 0.0 | 525 | 40511 | 21.9 | 655 | 48369 | 2.7 | 785 | 874 | 0.0 | 915 | 23 | 0.0 |
| 400 | 48 | 0.0 | 530 | 42223 | 24.9 | 660 | 42641 | 1.8 | 790 | 747 | 0.0 | 920 | 24 | 0.0 |
| 405 | 201 | 0.0 | 535 | 44137 | 27.6 | 665 | 37602 | 1.1 | 795 | 639 | 0.0 | 925 | 22 | 0.0 |
| 410 | 457 | 0.0 | 540 | 46032 | 30.0 | 670 | 32798 | 0.7 | 800 | 547 | 0.0 | 930 | 22 | 0.0 |
| 415 | 925 | 0.0 | 545 | 48553 | 32.5 | 675 | 28558 | 0.5 | 805 | 473 | 0.0 | 935 | 17 | 0.0 |
| 420 | 1816 | 0.0 | 550 | 51408 | 34.9 | 680 | 24782 | 0.3 | 810 | 401 | 0.0 | 940 | 13 | 0.0 |
| 425 | 3217 | 0.0 | 555 | 54711 | 37.4 | 685 | 21386 | 0.2 | 815 | 351 | 0.0 | 945 | 6 | 0.0 |
| 430 | 5520 | 0.0 | 560 | 58847 | 40.0 | 690 | 18413 | 0.1 | 820 | 307 | 0.0 | 950 | 10 | 0.0 |
| 435 | 9225 | 0.1 | 565 | 63386 | 42.4 | 695 | 15721 | 0.1 | 825 | 261 | 0.0 | 955 | 11 | 0.0 |
| 440 | 15522 | 0.2 | 570 | 68196 | 44.3 | 700 | 13432 | 0.0 | 830 | 228 | 0.0 | 960 | 8 | 0.0 |
| 445 | 27642 | 0.6 | 575 | 73613 | 46.0 | 705 | 11513 | 0.0 | 835 | 193 | 0.0 | 965 | 12 | 0.0 |
| 450 | 36602 | 0.9 | 580 | 79207 | 47.1 | 710 | 9780 | 0.0 | 840 | 174 | 0.0 | 970 | 3 | 0.0 |
| 455 | 28292 | 0.9 | 585 | 84248 | 47.0 | 715 | 8356 | 0.0 | 845 | 151 | 0.0 | 975 | 8 | 0.0 |
| 460 | 21166 | 0.9 | 590 | 88397 | 45.7 | 720 | 7161 | 0.0 | 850 | 123 | 0.0 | 980 | 2 | 0.0 |
| 465 | 19092 | 1.0 | 595 | 91428 | 43.4 | 725 | 6067 | 0.0 | 855 | 106 | 0.0 | 985 | 13 | 0.0 |
| 470 | 14951 | 0.9 | 600 | 93452 | 40.3 | 730 | 5164 | 0.0 | 860 | 95 | 0.0 | 990 | 16 | 0.0 |
| 475 | 12606 | 1.0 | 605 | 93959 | 36.4 | 735 | 4393 | 0.0 | 865 | 82 | 0.0 | 995 | 20 | 0.0 |
| 480 | 13323 | 1.3 | 610 | 93079 | 32.0 | 740 | 3694 | 0.0 | 870 | 77 | 0.0 | 1000 | 0 | 0.0 |
| 485 | 15164 | 1.8 | 615 | 90707 | 27.3 | 745 | 3157 | 0.0 | 875 | 65 | 0.0 | | | |

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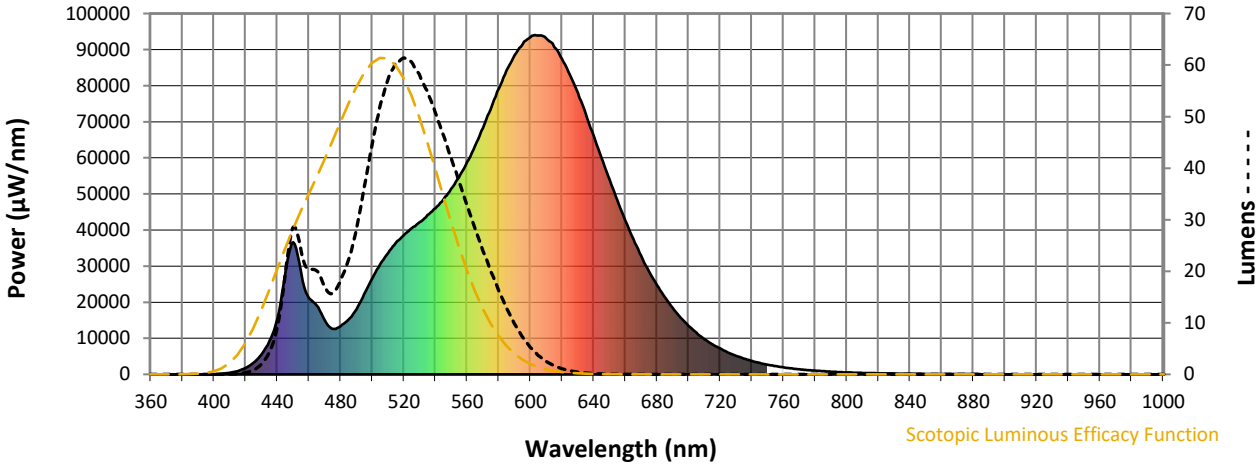
## Scotopic Flux vs. Wavelength




**Scotopic Lumens: 5286.7** **S/P: 1.22**

| λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | 0.0 | 490 | 18018 | 75.9 | 620 | 87426 | 0.4 | 750 | 2680 | 0.0 | 880 | 58 | 0.0 |
| 365 | 0 | 0.0 | 495 | 22295 | 93.2 | 625 | 83013 | 0.2 | 755 | 2287 | 0.0 | 885 | 46 | 0.0 |
| 370 | 0 | 0.0 | 500 | 26478 | 107.8 | 630 | 78077 | 0.1 | 760 | 1944 | 0.0 | 890 | 45 | 0.0 |
| 375 | 0 | 0.0 | 505 | 30524 | 118.7 | 635 | 72080 | 0.1 | 765 | 1653 | 0.0 | 895 | 41 | 0.0 |
| 380 | 0 | 0.0 | 510 | 33611 | 122.2 | 640 | 66249 | 0.1 | 770 | 1413 | 0.0 | 900 | 38 | 0.0 |
| 385 | 0 | 0.0 | 515 | 36490 | 120.8 | 645 | 59973 | 0.0 | 775 | 1198 | 0.0 | 905 | 33 | 0.0 |
| 390 | 0 | 0.0 | 520 | 38610 | 113.9 | 650 | 53972 | 0.0 | 780 | 1025 | 0.0 | 910 | 30 | 0.0 |
| 395 | 0 | 0.0 | 525 | 40511 | 104.1 | 655 | 48369 | 0.0 | 785 | 874 | 0.0 | 915 | 23 | 0.0 |
| 400 | 48 | 0.0 | 530 | 42223 | 92.4 | 660 | 42641 | 0.0 | 790 | 747 | 0.0 | 920 | 24 | 0.0 |
| 405 | 201 | 0.0 | 535 | 44137 | 80.5 | 665 | 37602 | 0.0 | 795 | 639 | 0.0 | 925 | 22 | 0.0 |
| 410 | 457 | 0.1 | 540 | 46032 | 68.2 | 670 | 32798 | 0.0 | 800 | 547 | 0.0 | 930 | 22 | 0.0 |
| 415 | 925 | 0.3 | 545 | 48553 | 57.1 | 675 | 28558 | 0.0 | 805 | 473 | 0.0 | 935 | 17 | 0.0 |
| 420 | 1816 | 1.1 | 550 | 51408 | 46.7 | 680 | 24782 | 0.0 | 810 | 401 | 0.0 | 940 | 13 | 0.0 |
| 425 | 3217 | 2.5 | 555 | 54711 | 37.4 | 685 | 21386 | 0.0 | 815 | 351 | 0.0 | 945 | 6 | 0.0 |
| 430 | 5520 | 5.9 | 560 | 58847 | 29.4 | 690 | 18413 | 0.0 | 820 | 307 | 0.0 | 950 | 10 | 0.0 |
| 435 | 9225 | 12.5 | 565 | 63386 | 22.5 | 695 | 15721 | 0.0 | 825 | 261 | 0.0 | 955 | 11 | 0.0 |
| 440 | 15522 | 26.3 | 570 | 68196 | 16.9 | 700 | 13432 | 0.0 | 830 | 228 | 0.0 | 960 | 8 | 0.0 |
| 445 | 27642 | 55.2 | 575 | 73613 | 12.4 | 705 | 11513 | 0.0 | 835 | 193 | 0.0 | 965 | 12 | 0.0 |
| 450 | 36602 | 85.4 | 580 | 79207 | 9.0 | 710 | 9780 | 0.0 | 840 | 174 | 0.0 | 970 | 3 | 0.0 |
| 455 | 28292 | 75.1 | 585 | 84248 | 6.3 | 715 | 8356 | 0.0 | 845 | 151 | 0.0 | 975 | 8 | 0.0 |
| 460 | 21166 | 63.2 | 590 | 88397 | 4.4 | 720 | 7161 | 0.0 | 850 | 123 | 0.0 | 980 | 2 | 0.0 |
| 465 | 19092 | 63.2 | 595 | 91428 | 3.0 | 725 | 6067 | 0.0 | 855 | 106 | 0.0 | 985 | 13 | 0.0 |
| 470 | 14951 | 54.2 | 600 | 93452 | 2.0 | 730 | 5164 | 0.0 | 860 | 95 | 0.0 | 990 | 16 | 0.0 |
| 475 | 12606 | 48.8 | 605 | 93959 | 1.3 | 735 | 4393 | 0.0 | 865 | 82 | 0.0 | 995 | 20 | 0.0 |
| 480 | 13323 | 54.2 | 610 | 93079 | 0.9 | 740 | 3694 | 0.0 | 870 | 77 | 0.0 | 1000 | 0 | 0.0 |
| 485 | 15164 | 63.3 | 615 | 90707 | 0.5 | 745 | 3157 | 0.0 | 875 | 65 | 0.0 | | | |

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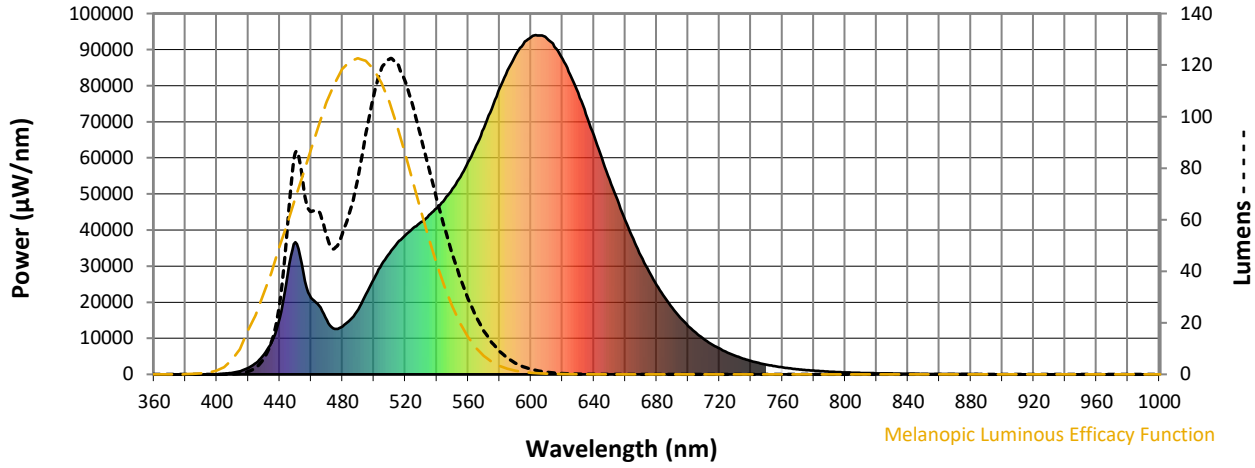
## Melanopic Flux vs. Wavelength




**Melanopic Lumens: 9797** **M/P: 2.26**

| λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | 0.0 | 490 | 18018 | 27.7 | 620 | 87426 | 1.1 | 750 | 2680 | 0.0 | 880 | 58 | 0.0 |
| 365 | 0 | 0.0 | 495 | 22295 | 36.0 | 625 | 83013 | 0.7 | 755 | 2287 | 0.0 | 885 | 46 | 0.0 |
| 370 | 0 | 0.0 | 500 | 26478 | 44.2 | 630 | 78077 | 0.4 | 760 | 1944 | 0.0 | 890 | 45 | 0.0 |
| 375 | 0 | 0.0 | 505 | 30524 | 51.8 | 635 | 72080 | 0.3 | 765 | 1653 | 0.0 | 895 | 41 | 0.0 |
| 380 | 0 | 0.0 | 510 | 33611 | 57.0 | 640 | 66249 | 0.2 | 770 | 1413 | 0.0 | 900 | 38 | 0.0 |
| 385 | 0 | 0.0 | 515 | 36490 | 60.5 | 645 | 59973 | 0.1 | 775 | 1198 | 0.0 | 905 | 33 | 0.0 |
| 390 | 0 | 0.0 | 520 | 38610 | 61.4 | 650 | 53972 | 0.1 | 780 | 1025 | 0.0 | 910 | 30 | 0.0 |
| 395 | 0 | 0.0 | 525 | 40511 | 60.6 | 655 | 48369 | 0.0 | 785 | 874 | 0.0 | 915 | 23 | 0.0 |
| 400 | 48 | 0.0 | 530 | 42223 | 58.2 | 660 | 42641 | 0.0 | 790 | 747 | 0.0 | 920 | 24 | 0.0 |
| 405 | 201 | 0.0 | 535 | 44137 | 55.0 | 665 | 37602 | 0.0 | 795 | 639 | 0.0 | 925 | 22 | 0.0 |
| 410 | 457 | 0.0 | 540 | 46032 | 50.9 | 670 | 32798 | 0.0 | 800 | 547 | 0.0 | 930 | 22 | 0.0 |
| 415 | 925 | 0.1 | 545 | 48553 | 46.6 | 675 | 28558 | 0.0 | 805 | 473 | 0.0 | 935 | 17 | 0.0 |
| 420 | 1816 | 0.3 | 550 | 51408 | 42.0 | 680 | 24782 | 0.0 | 810 | 401 | 0.0 | 940 | 13 | 0.0 |
| 425 | 3217 | 0.8 | 555 | 54711 | 37.4 | 685 | 21386 | 0.0 | 815 | 351 | 0.0 | 945 | 6 | 0.0 |
| 430 | 5520 | 1.9 | 560 | 58847 | 32.9 | 690 | 18413 | 0.0 | 820 | 307 | 0.0 | 950 | 10 | 0.0 |
| 435 | 9225 | 4.1 | 565 | 63386 | 28.4 | 695 | 15721 | 0.0 | 825 | 261 | 0.0 | 955 | 11 | 0.0 |
| 440 | 15522 | 8.7 | 570 | 68196 | 24.1 | 700 | 13432 | 0.0 | 830 | 228 | 0.0 | 960 | 8 | 0.0 |
| 445 | 27642 | 18.5 | 575 | 73613 | 20.0 | 705 | 11513 | 0.0 | 835 | 193 | 0.0 | 965 | 12 | 0.0 |
| 450 | 36602 | 28.3 | 580 | 79207 | 16.3 | 710 | 9780 | 0.0 | 840 | 174 | 0.0 | 970 | 3 | 0.0 |
| 455 | 28292 | 24.7 | 585 | 84248 | 12.9 | 715 | 8356 | 0.0 | 845 | 151 | 0.0 | 975 | 8 | 0.0 |
| 460 | 21166 | 20.4 | 590 | 88397 | 9.8 | 720 | 7161 | 0.0 | 850 | 123 | 0.0 | 980 | 2 | 0.0 |
| 465 | 19092 | 20.1 | 595 | 91428 | 7.3 | 725 | 6067 | 0.0 | 855 | 106 | 0.0 | 985 | 13 | 0.0 |
| 470 | 14951 | 17.2 | 600 | 93452 | 5.3 | 730 | 5164 | 0.0 | 860 | 95 | 0.0 | 990 | 16 | 0.0 |
| 475 | 12606 | 15.7 | 605 | 93959 | 3.7 | 735 | 4393 | 0.0 | 865 | 82 | 0.0 | 995 | 20 | 0.0 |
| 480 | 13323 | 18.0 | 610 | 93079 | 2.5 | 740 | 3694 | 0.0 | 870 | 77 | 0.0 | 1000 | 0 | 0.0 |
| 485 | 15164 | 21.9 | 615 | 90707 | 1.7 | 745 | 3157 | 0.0 | 875 | 65 | 0.0 | | | |

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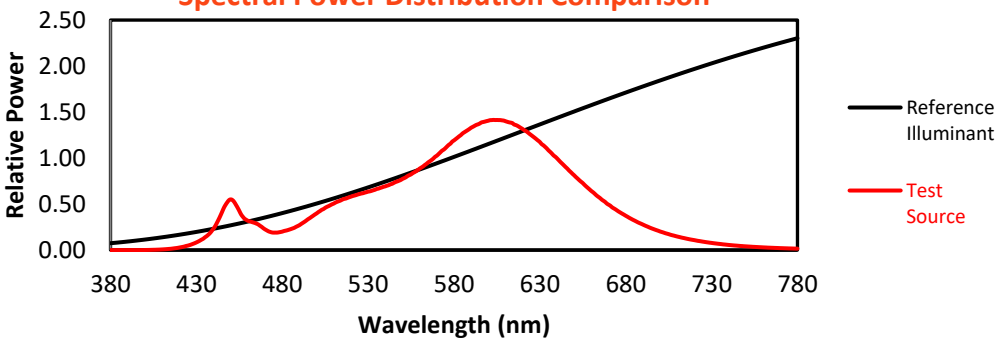
# TM-30-18

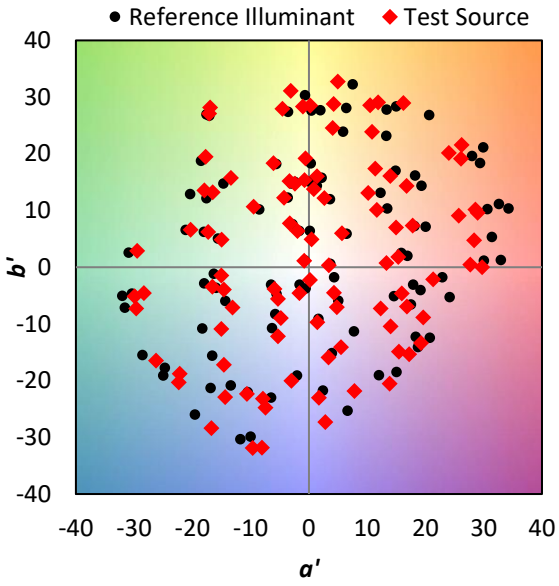
## Summary

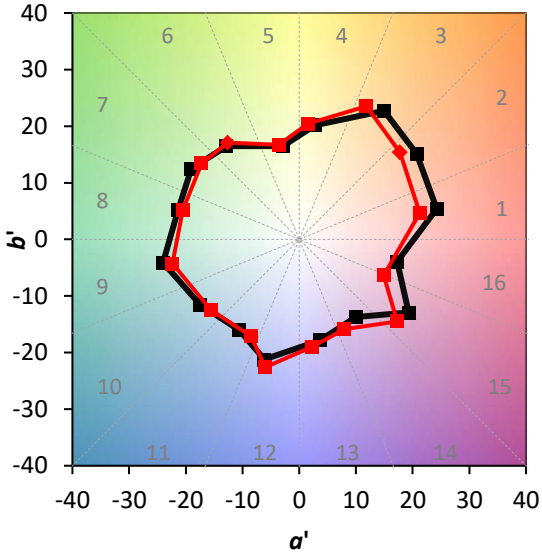
$R_f$ = 84.7
$R_g$ = 94.6
CIE $R_a$ = 80.9
$R_9$ = -1.5

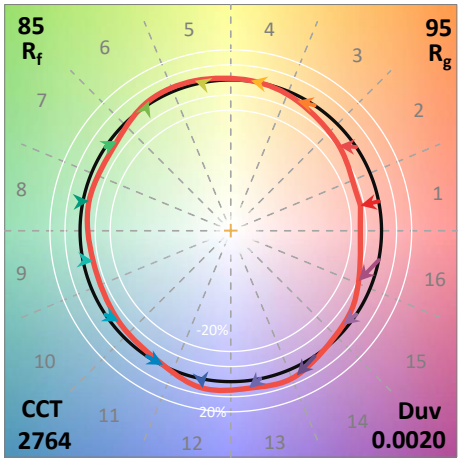
## Spectral Power Distribution Comparison

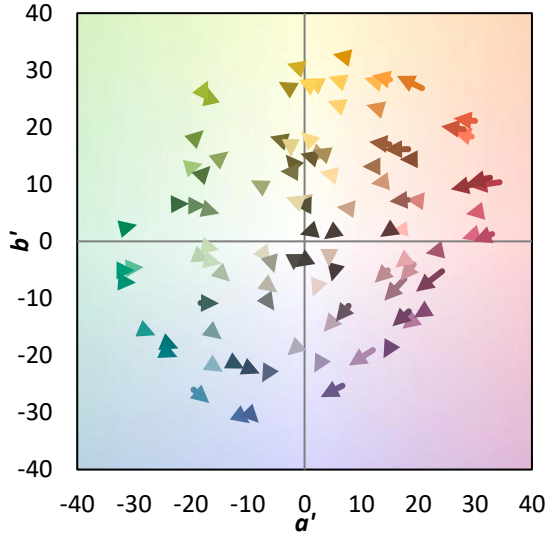



## Color Vector Graphics



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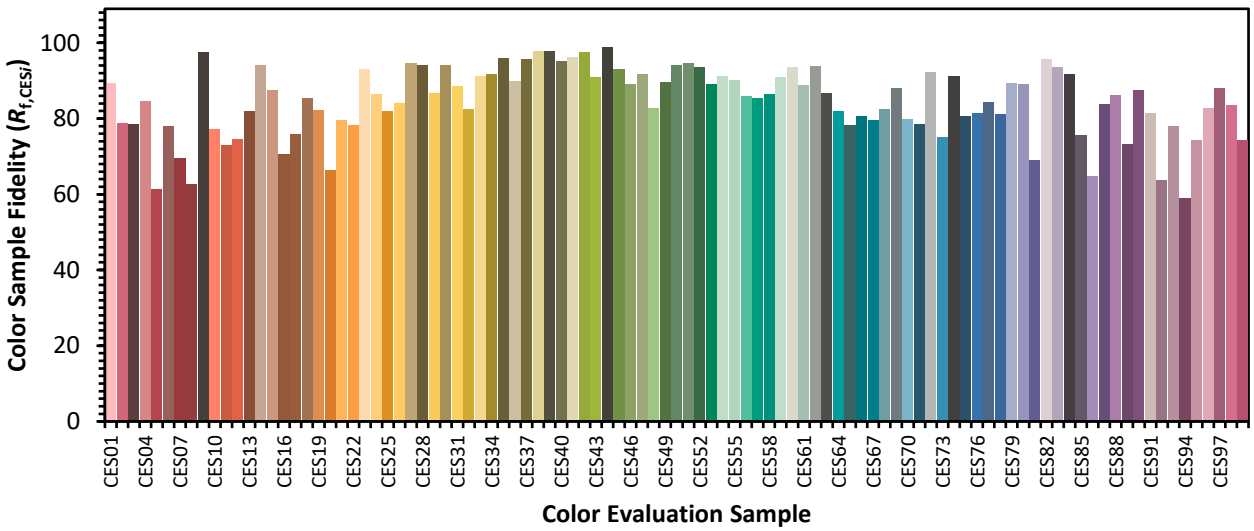
## TM-30-18

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

| | | | |
|---|---|---|---|
| CES01 = 86 | CES26 = 84 | CES51 = 95 | CES76 = 81 |
| CES02 = 63 | CES27 = 95 | CES52 = 94 | CES77 = 84 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 81 |
| CES04 = 71 | CES29 = 87 | CES54 = 91 | CES79 = 89 |
| CES05 = 50 | CES30 = 94 | CES55 = 90 | CES80 = 89 |
| CES06 = 52 | CES31 = 89 | CES56 = 86 | CES81 = 69 |
| CES07 = 43 | CES32 = 82 | CES57 = 85 | CES82 = 96 |
| CES08 = 41 | CES33 = 91 | CES58 = 86 | CES83 = 93 |
| CES09 = 29 | CES34 = 92 | CES59 = 91 | CES84 = 92 |
| CES10 = 77 | CES35 = 96 | CES60 = 94 | CES85 = 76 |
| CES11 = 60 | CES36 = 90 | CES61 = 89 | CES86 = 65 |
| CES12 = 66 | CES37 = 96 | CES62 = 94 | CES87 = 84 |
| CES13 = 44 | CES38 = 98 | CES63 = 87 | CES88 = 86 |
| CES14 = 74 | CES39 = 98 | CES64 = 82 | CES89 = 73 |
| CES15 = 72 | CES40 = 95 | CES65 = 78 | CES90 = 88 |
| CES16 = 48 | CES41 = 96 | CES66 = 81 | CES91 = 82 |
| CES17 = 50 | CES42 = 97 | CES67 = 80 | CES92 = 64 |
| CES18 = 57 | CES43 = 91 | CES68 = 83 | CES93 = 78 |
| CES19 = 73 | CES44 = 99 | CES69 = 88 | CES94 = 59 |
| CES20 = 67 | CES45 = 93 | CES70 = 80 | CES95 = 74 |
| CES21 = 87 | CES46 = 89 | CES71 = 79 | CES96 = 83 |
| CES22 = 79 | CES47 = 92 | CES72 = 92 | CES97 = 88 |
| CES23 = 92 | CES48 = 83 | CES73 = 75 | CES98 = 83 |
| CES24 = 91 | CES49 = 90 | CES74 = 91 | CES99 = 74 |
| CES25 = 72 | CES50 = 94 | CES75 = 81 | |



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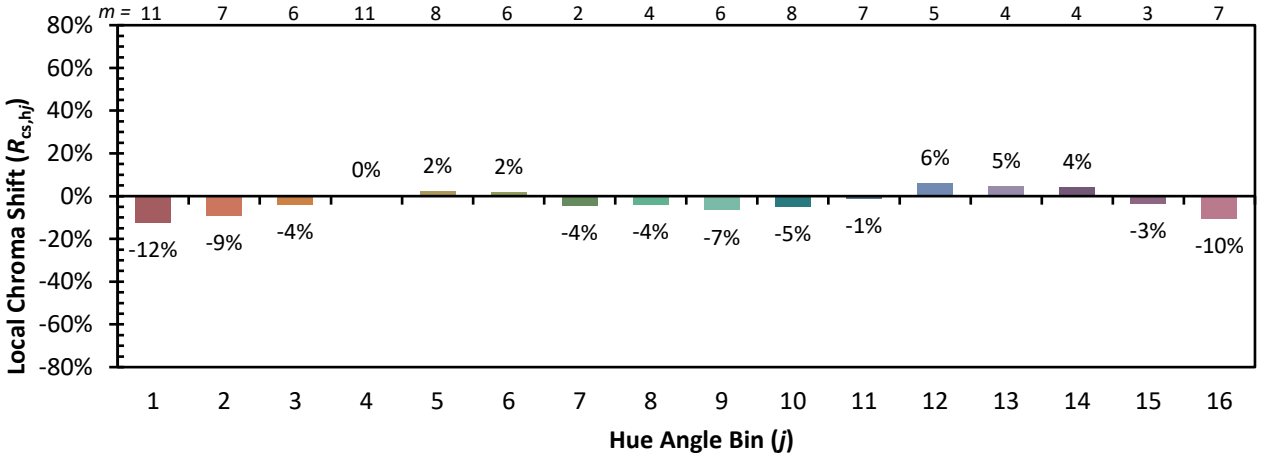
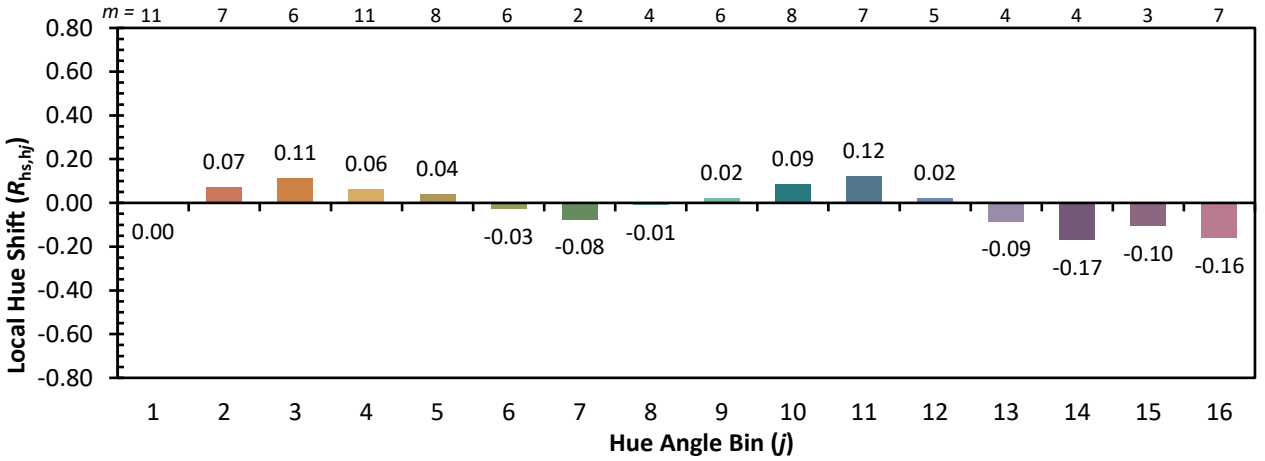
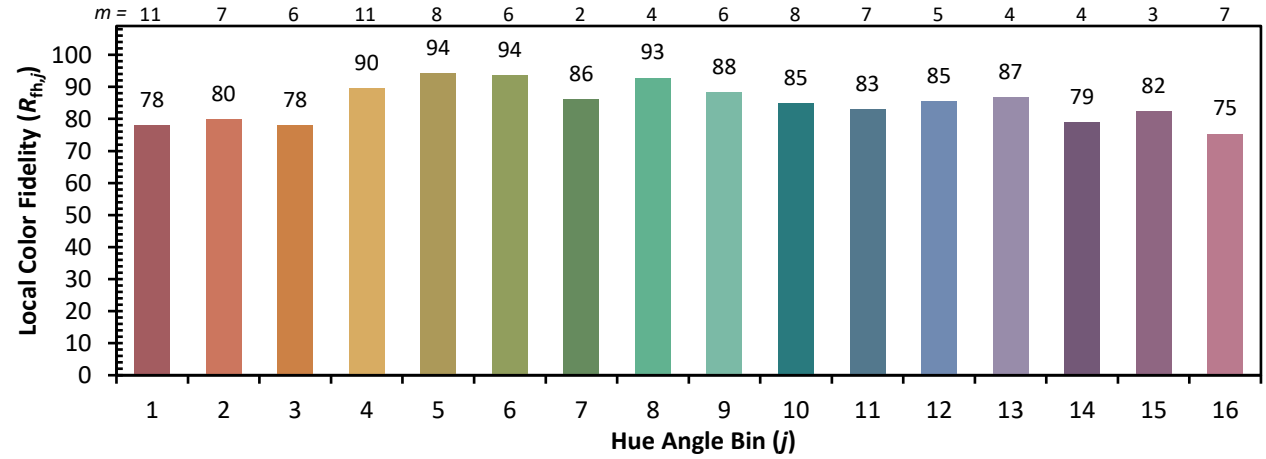
**TM-30-18**

## Color Rendition by Hue-Angle Bin



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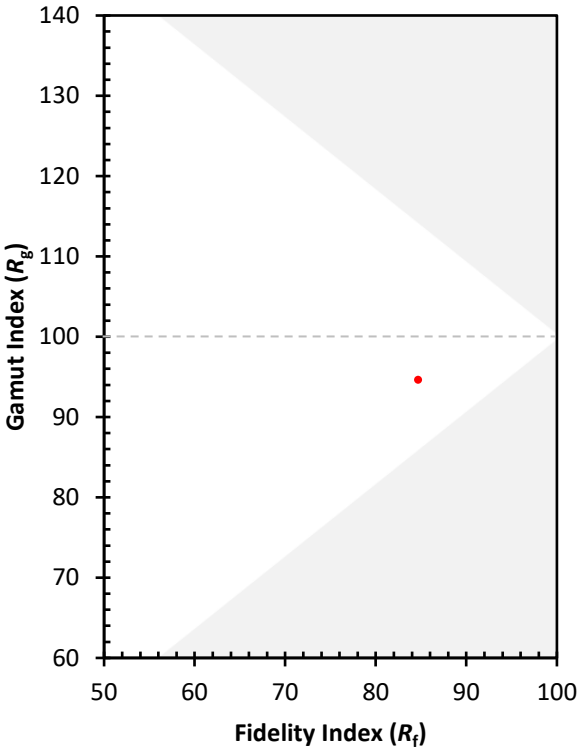
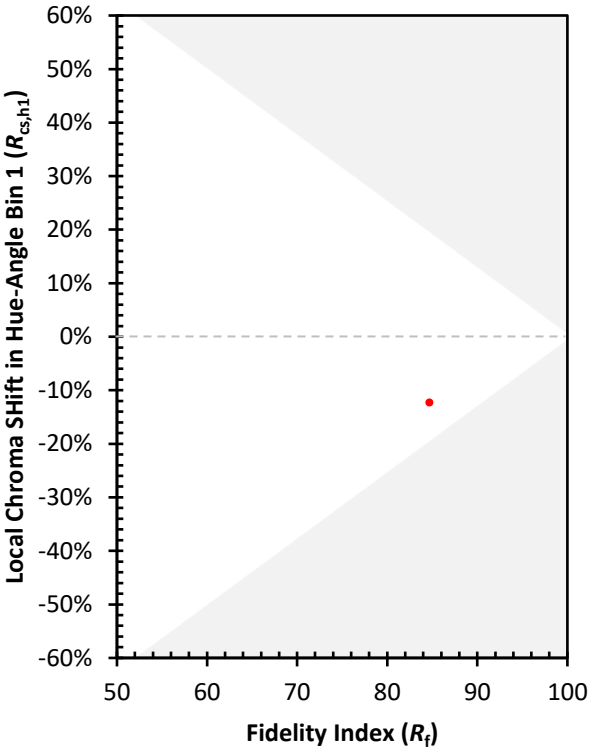
# TM-30-18

## Measure Comparisons




(END OF REPORT)