

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

Scaled data based on original data using  
LM-79-2024 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions

Brand: INVUE

Report Number: P869115

Luminaire Tested: EMM2-HSN-SA3A-722-U-5MQ

Issue Date: 08/22/2024

**Test Information**

Test Method: LM-79-2024  
Report Number: P869115  
Test Lab: INNOVATION CENTER(G3)  
Issue Date: 5/19/2026  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: INVUE  
Catalog Number: EMM2-HSN-SA3A-722-U-5MQ  
Description: EPIC MODERN SHORT HOUSING DISCRETE LED ARRAYS 130W 70CRI 2200K FIXTURE w/  
TYPE V SQUARE MEDIUM DISTRIBUTION OPTIC  
Light Source: (30) 2200K CCT, 70 CRI LEDS  
Ballast/Driver: -

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 15074.4 lumens  
Efficiency: N/A  
Efficacy: 133.4 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 0.33' x H: 0')  
IES Classification: Type V - Short  
BUG Rating: B4 - U0 - G2

Input Watts (W): 113  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: 0.99  
Total Harmonic Distortion (THDi): 7.77%  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT

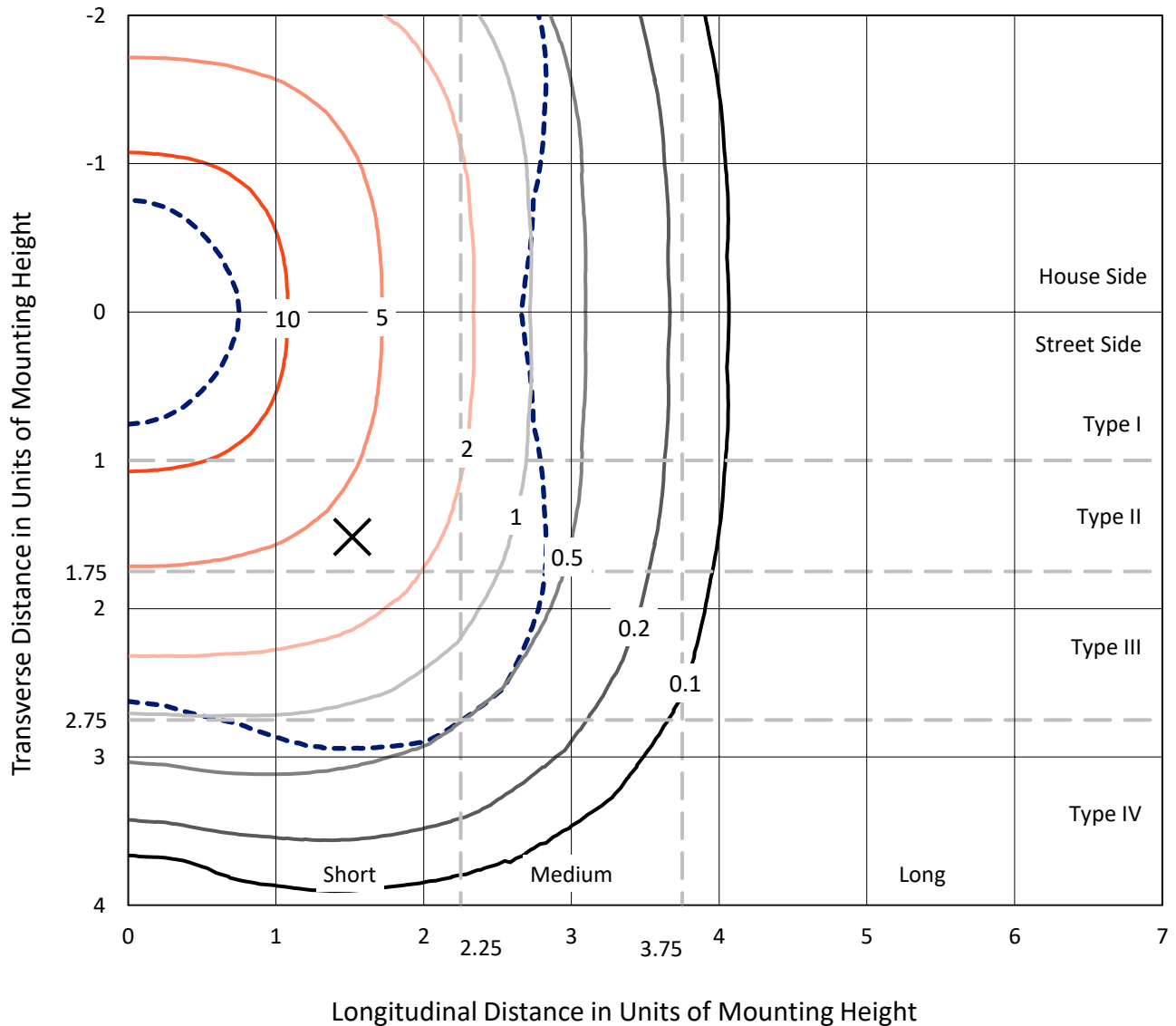


REPORT NUMBER: P869115

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### Iso-Footcandle Lines of Horizontal Illumination

× Max cd  
 - - - 1/2 Max cd

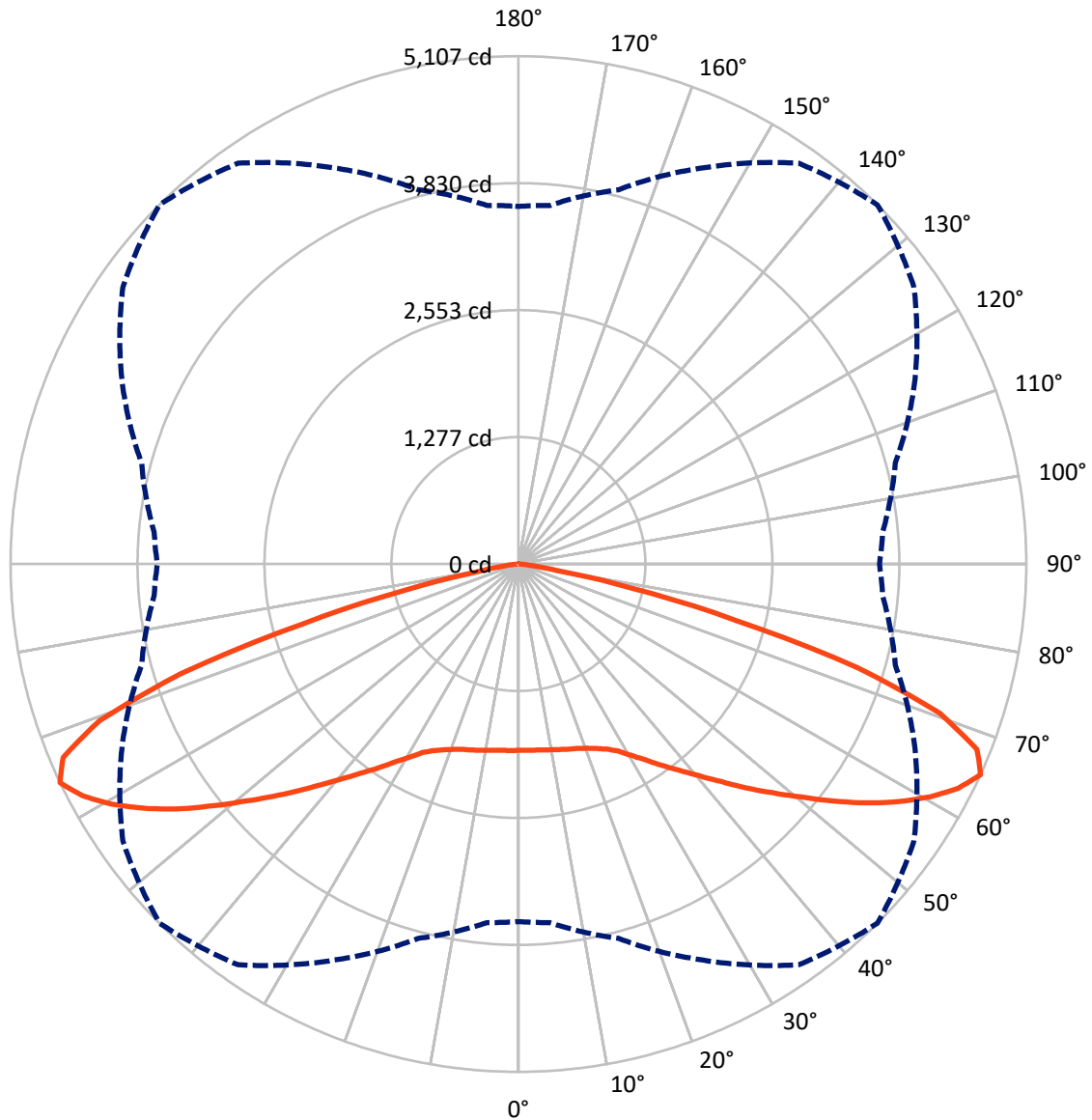


Based on 10 foot mounting height. Maximum calculated value = 18.7 fc  
 Type V - Short - N/A

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### Luminous Intensity Polar Plot



— Vertical Plane Through 45-Deg Lateral      - - - Horizontal Cone Through 65-Deg Vertical

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**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 7537.2   | 0.0    | 7537.2  |
|                    | % Fixture | 50.0     | 0.0    | 50.0    |
| <b>Street Side</b> | Lumens    | 7537.2   | 0.0    | 7537.2  |
|                    | % Fixture | 50.0     | 0.0    | 50.0    |
| <b>Total</b>       | Lumens    | 15074.4  | 0.0    | 15074.4 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**Coefficient of Utilization**

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 180.1   | 1.2       |
| 10°-20°   | 548.2   | 3.6       |
| 20°-30°   | 964.3   | 6.4       |
| 30°-40°   | 1559.5  | 10.3      |
| 40°-50°   | 2429.2  | 16.1      |
| 50°-60°   | 3552.1  | 23.6      |
| 60°-70°   | 4090.4  | 27.1      |
| 70°-80°   | 1670.6  | 11.1      |
| 80°-90°   | 79.9    | 0.5       |
| 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°    | 15074.4 | 100.0     |
| 0°-180°   | 15074.4 | 100.0     |



REPORT NUMBER: P869115

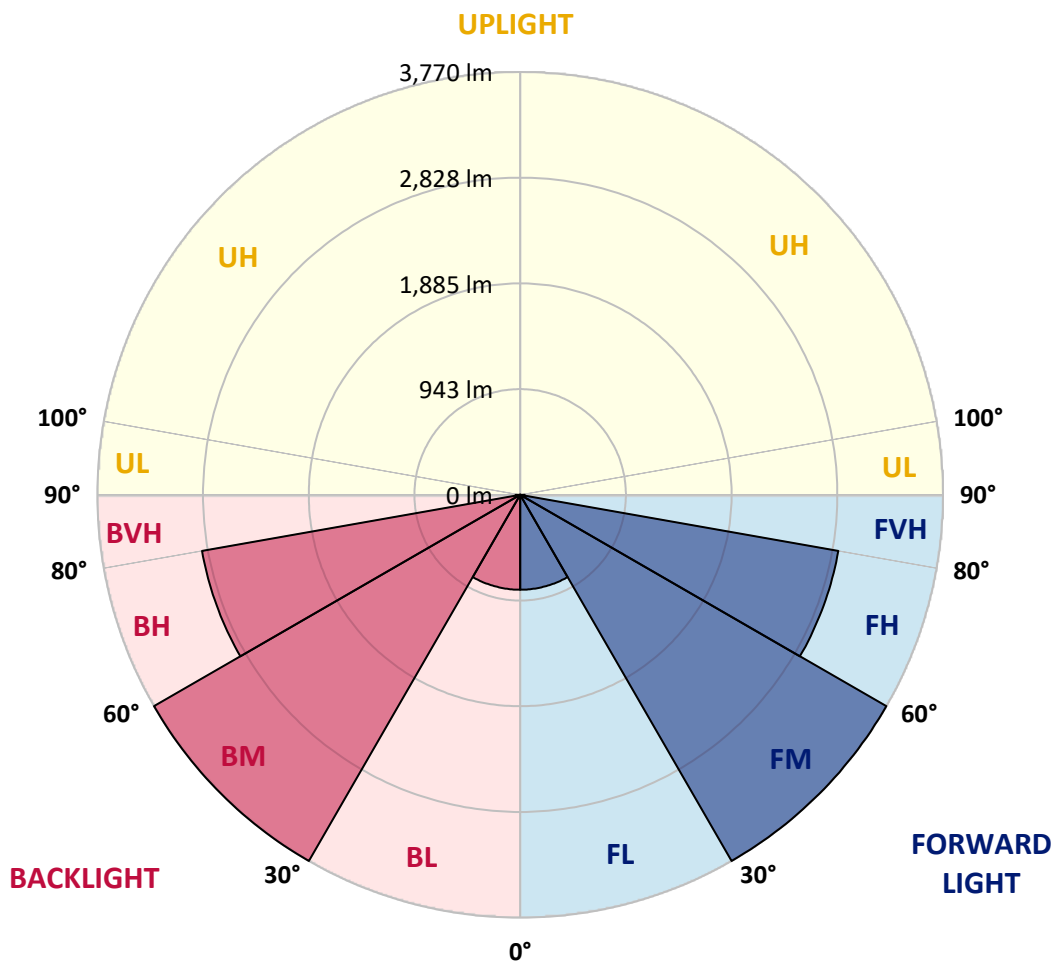
CATALOG NUMBER: EMM2-HSN-SA3A-722-U-5MQ

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

| Zone           | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|----------------|--------|-----------|-------------------------|------|---------|
|                |        |           | B                       | U    | G       |
| FL (0°-30°)    | 846.3  | 5.6       |                         |      |         |
| FM (30°-60°)   | 3770.4 | 25.0      |                         |      |         |
| FH (60°-80°)   | 2880.5 | 19.1      |                         |      | G2/5000 |
| FVH (80°-90°)  | 40.0   | 0.3       |                         |      | G1/100  |
| BL (0°-30°)    | 846.3  | 5.6       | B2/1000                 |      |         |
| BM (30°-60°)   | 3770.4 | 25.0      | B3/5000                 |      |         |
| BH (60°-80°)   | 2880.5 | 19.1      | B4/5000                 |      | G2/5000 |
| BVH (80°-90°)  | 40.0   | 0.3       |                         |      | G1/100  |
| UL (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B4-U0-G2**

Type V Short





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CATALOG NUMBER: EMM2-HSN-SA3A-722-U-5MQ

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 75°    | 85°    | 90°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 | 1873.1 |
| 2.5°  | 1878.9 | 1878.9 | 1876.0 | 1876.0 | 1870.2 | 1876.0 | 1873.1 | 1876.0 | 1873.1 | 1873.1 | 1876.0 |
| 5°    | 1884.7 | 1884.7 | 1878.9 | 1881.8 | 1876.0 | 1878.9 | 1876.0 | 1881.8 | 1878.9 | 1876.0 | 1881.8 |
| 7.5°  | 1893.3 | 1893.3 | 1887.5 | 1890.4 | 1884.7 | 1887.5 | 1884.7 | 1890.4 | 1887.5 | 1887.5 | 1890.4 |
| 10°   | 1902.0 | 1904.9 | 1899.1 | 1896.2 | 1896.2 | 1899.1 | 1902.0 | 1904.9 | 1902.0 | 1902.0 | 1907.8 |
| 12.5° | 1916.5 | 1919.4 | 1913.6 | 1910.7 | 1910.7 | 1913.6 | 1916.5 | 1922.3 | 1913.6 | 1913.6 | 1913.6 |
| 15°   | 1931.0 | 1931.0 | 1928.1 | 1925.2 | 1928.1 | 1931.0 | 1931.0 | 1936.8 | 1931.0 | 1925.2 | 1925.2 |
| 17.5° | 1936.8 | 1939.7 | 1936.8 | 1942.6 | 1945.4 | 1948.3 | 1951.2 | 1951.2 | 1942.6 | 1939.7 | 1939.7 |
| 20°   | 1957.0 | 1959.9 | 1954.1 | 1957.0 | 1965.7 | 1977.3 | 1977.3 | 1977.3 | 1977.3 | 1968.6 | 1968.6 |
| 22.5° | 1991.8 | 1994.7 | 1991.8 | 1991.8 | 2003.3 | 2014.9 | 2014.9 | 2023.6 | 2012.0 | 2006.2 | 2006.2 |
| 25°   | 2049.7 | 2049.7 | 2046.8 | 2049.7 | 2055.5 | 2061.2 | 2072.8 | 2078.6 | 2078.6 | 2075.7 | 2078.6 |
| 27.5° | 2119.1 | 2122.0 | 2119.1 | 2119.1 | 2116.3 | 2127.8 | 2145.2 | 2153.9 | 2156.8 | 2159.7 | 2159.7 |
| 30°   | 2211.8 | 2217.6 | 2214.7 | 2217.6 | 2223.4 | 2232.1 | 2237.8 | 2240.7 | 2240.7 | 2234.9 | 2234.9 |
| 32.5° | 2313.1 | 2318.9 | 2313.1 | 2327.6 | 2347.9 | 2347.9 | 2342.1 | 2353.6 | 2345.0 | 2339.2 | 2333.4 |
| 35°   | 2431.8 | 2431.8 | 2437.6 | 2443.4 | 2472.3 | 2486.8 | 2486.8 | 2481.0 | 2463.7 | 2455.0 | 2460.8 |
| 37.5° | 2567.9 | 2570.8 | 2576.6 | 2579.5 | 2605.5 | 2631.6 | 2628.7 | 2614.2 | 2593.9 | 2570.8 | 2570.8 |
| 40°   | 2730.0 | 2724.2 | 2727.1 | 2747.4 | 2767.6 | 2799.5 | 2802.4 | 2782.1 | 2747.4 | 2724.2 | 2724.2 |
| 42.5° | 2877.6 | 2880.5 | 2892.1 | 2918.2 | 2964.5 | 2990.5 | 2976.1 | 2941.3 | 2903.7 | 2874.7 | 2871.9 |
| 45°   | 3034.0 | 3031.1 | 3062.9 | 3117.9 | 3178.7 | 3210.6 | 3187.4 | 3138.2 | 3080.3 | 3042.7 | 3042.7 |
| 47.5° | 3193.2 | 3190.3 | 3242.4 | 3332.2 | 3410.3 | 3436.4 | 3413.2 | 3349.5 | 3271.4 | 3216.4 | 3207.7 |
| 50°   | 3358.2 | 3369.8 | 3424.8 | 3552.2 | 3653.5 | 3682.5 | 3653.5 | 3569.5 | 3465.3 | 3393.0 | 3381.4 |
| 52.5° | 3546.4 | 3555.1 | 3627.4 | 3766.4 | 3890.9 | 3957.5 | 3914.1 | 3789.6 | 3656.4 | 3569.5 | 3558.0 |
| 55°   | 3720.1 | 3725.9 | 3830.1 | 3998.0 | 4151.4 | 4241.2 | 4171.7 | 4012.5 | 3844.6 | 3734.6 | 3723.0 |
| 57.5° | 3841.7 | 3856.2 | 3989.3 | 4206.5 | 4403.3 | 4507.5 | 4403.3 | 4232.5 | 4009.6 | 3873.5 | 3864.8 |
| 60°   | 3919.8 | 3943.0 | 4096.4 | 4368.6 | 4640.7 | 4753.6 | 4646.5 | 4409.1 | 4134.1 | 3957.5 | 3948.8 |
| 62.5° | 3879.3 | 3911.2 | 4108.0 | 4464.1 | 4843.4 | 4964.9 | 4826.0 | 4493.1 | 4119.6 | 3896.7 | 3873.5 |
| 65°   | 3595.6 | 3618.8 | 3896.7 | 4394.6 | 4918.6 | 5106.8 | 4854.9 | 4400.4 | 3922.7 | 3676.7 | 3630.3 |
| 67.5° | 3007.9 | 3048.4 | 3416.1 | 4058.8 | 4756.5 | 4973.6 | 4655.2 | 4067.5 | 3491.4 | 3190.3 | 3138.2 |
| 70°   | 2310.2 | 2382.6 | 2785.0 | 3482.7 | 4249.9 | 4496.0 | 4145.7 | 3433.5 | 2756.1 | 2449.2 | 2353.6 |
| 72.5° | 1334.6 | 1447.5 | 2038.1 | 2718.4 | 3381.4 | 3566.7 | 3074.5 | 2400.0 | 1829.6 | 1612.5 | 1586.5 |
| 75°   | 442.9  | 483.5  | 969.8  | 1566.2 | 2156.8 | 2249.4 | 1922.3 | 1514.1 | 1204.3 | 1030.6 | 1039.3 |
| 77.5° | 217.1  | 217.1  | 292.4  | 573.2  | 981.4  | 1158.0 | 1050.9 | 732.4  | 526.9  | 399.5  | 387.9  |
| 80°   | 173.7  | 173.7  | 202.7  | 280.8  | 330.0  | 387.9  | 330.0  | 240.3  | 196.9  | 179.5  | 188.2  |
| 82.5° | 84.0   | 81.1   | 95.5   | 136.1  | 139.0  | 133.2  | 124.5  | 124.5  | 118.7  | 110.0  | 107.1  |
| 85°   | 5.8    | 5.8    | 11.6   | 26.1   | 43.4   | 57.9   | 66.6   | 63.7   | 60.8   | 52.1   | 57.9   |
| 87.5° | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 5.8    | 5.8    | 5.8    | 5.8    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

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



**Test Information**

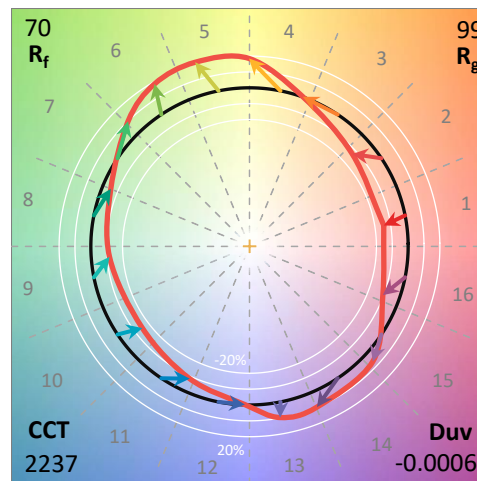
Test Method: LM-79-2008 Report  
 Number: SP1-1908-441-10-R4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry: 4π  
 Issue Date: 10/28/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: McGRAW-EDISON  
 Catalog Number: **SA1C-722-U-5WQ**  
 Description: McGRAW EDISON ROADWAY AND AREA LUMINAIRE

\*\*\*THIS IS A REVISION OF SP1-1908-441-4-R3. TO UPDATE THE CATALOG INFORMATION.\*\*\*TESTED IN SITU. ROADWAY AND AREA LUMINAIRE. (1) 70 CRI, 5000K, 1050MA LIGHTSQUARE WITH 16 LEDS AND TYPE V WIDE OPTICS.

**Spectral Parameters**

CCT (K): 2237  
 CIE u': 0.2876  
 CIE v': 0.5346  
 Duv: -0.0006  
 CIE x: 0.5005  
 CIE y: 0.4134  
 CIE z: 0.0860  
 Peak Wavelength (nm): 603  
 Dominant Wavelength (nm): 587  
 Purity: 74.5  
 Rf: 69.8  
 Rg: 99.2

|           |      |      |       |
|-----------|------|------|-------|
| CRI (Ra): | 72.0 |      |       |
| R1:       | 68.9 | R9:  | -17.4 |
| R2:       | 83.0 | R10: | 61.3  |
| R3:       | 95.2 | R11: | 59.8  |
| R4:       | 66.2 | R12: | 50.5  |
| R5:       | 65.9 | R13: | 71.1  |
| R6:       | 76.3 | R14: | 96.9  |
| R7:       | 76.7 |      |       |
| R8:       | 43.8 |      |       |



**Test Conditions**

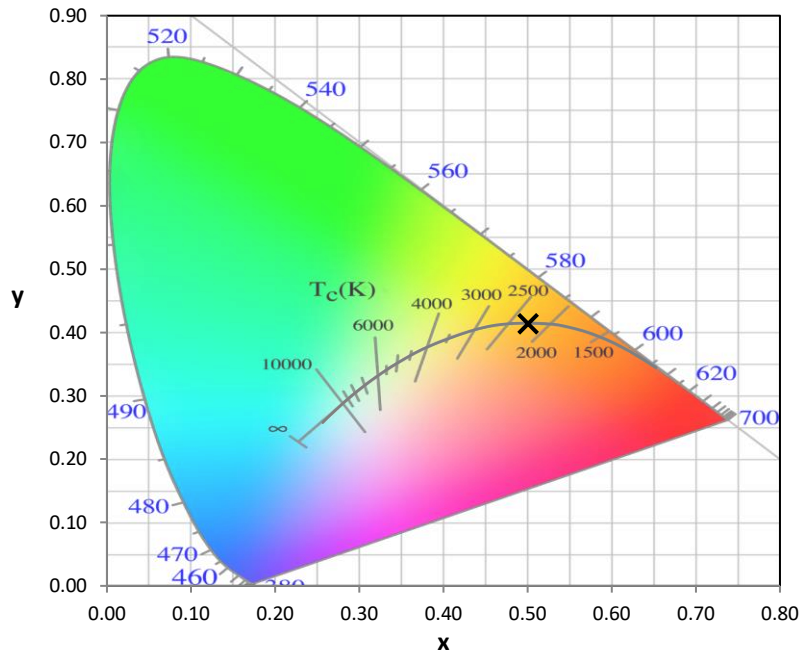
Stabilization Time: 71M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.7/41%  
 Sphere Temperature (°C): 25.6

REPORT NUMBER: SP1-1908-441-10-R4

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

REPORT NUMBER: SP1-1908-441-10-R4

CIE 1931 Chromaticity Diagram



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



Point lies inside the ANSI 2200K 4-step quadrangle

REPORT NUMBER: SP1-1908-441-10-R4

**Photopic Flux vs. Wavelength**



**Photopic Lumens: 5530.5**

| 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    | 1768          | 0.0           | 490    | 5206          | 0.7           | 620    | 130919        | 34.1          | 750    | 8553          | 0.0           | 880    | 2713          | 0.0           |
| 365    | 1569          | 0.0           | 495    | 7286          | 1.3           | 625    | 125335        | 27.7          | 755    | 7696          | 0.0           | 885    | 2316          | 0.0           |
| 370    | 1594          | 0.0           | 500    | 10654         | 2.4           | 630    | 118388        | 21.4          | 760    | 6978          | 0.0           | 890    | 2539          | 0.0           |
| 375    | 1744          | 0.0           | 505    | 15189         | 4.2           | 635    | 111855        | 16.8          | 765    | 6377          | 0.0           | 895    | 1933          | 0.0           |
| 380    | 1659          | 0.0           | 510    | 20541         | 7.1           | 640    | 104062        | 12.4          | 770    | 5600          | 0.0           | 900    | 2216          | 0.0           |
| 385    | 1504          | 0.0           | 515    | 26492         | 11.0          | 645    | 96365         | 9.3           | 775    | 5000          | 0.0           | 905    | 2067          | 0.0           |
| 390    | 1541          | 0.0           | 520    | 32294         | 15.7          | 650    | 88651         | 6.5           | 780    | 4709          | 0.0           | 910    | 1959          | 0.0           |
| 395    | 1355          | 0.0           | 525    | 38123         | 20.5          | 655    | 81152         | 4.7           | 785    | 4305          | 0.0           | 915    | 1874          | 0.0           |
| 400    | 1243          | 0.0           | 530    | 43232         | 25.5          | 660    | 73523         | 3.1           | 790    | 4040          | 0.0           | 920    | 1484          | 0.0           |
| 405    | 1417          | 0.0           | 535    | 48012         | 29.8          | 665    | 66123         | 2.1           | 795    | 3642          | 0.0           | 925    | 1914          | 0.0           |
| 410    | 2147          | 0.0           | 540    | 52623         | 34.3          | 670    | 58677         | 1.3           | 800    | 3594          | 0.0           | 930    | 1948          | 0.0           |
| 415    | 3837          | 0.0           | 545    | 57516         | 38.3          | 675    | 52349         | 0.9           | 805    | 3190          | 0.0           | 935    | 2079          | 0.0           |
| 420    | 7159          | 0.0           | 550    | 62613         | 42.5          | 680    | 46159         | 0.5           | 810    | 3241          | 0.0           | 940    | 2263          | 0.0           |
| 425    | 12599         | 0.1           | 555    | 68554         | 46.8          | 685    | 40525         | 0.3           | 815    | 2732          | 0.0           | 945    | 1688          | 0.0           |
| 430    | 19019         | 0.2           | 560    | 75325         | 51.2          | 690    | 35615         | 0.2           | 820    | 2612          | 0.0           | 950    | 1560          | 0.0           |
| 435    | 24875         | 0.3           | 565    | 82533         | 54.9          | 695    | 31158         | 0.1           | 825    | 2966          | 0.0           | 955    | 2826          | 0.0           |
| 440    | 29103         | 0.5           | 570    | 90909         | 59.1          | 700    | 27409         | 0.1           | 830    | 2574          | 0.0           | 960    | 1477          | 0.0           |
| 445    | 29901         | 0.6           | 575    | 99621         | 62.0          | 705    | 24204         | 0.1           | 835    | 2633          | 0.0           | 965    | 1568          | 0.0           |
| 450    | 24862         | 0.6           | 580    | 108484        | 64.5          | 710    | 21558         | 0.0           | 840    | 2526          | 0.0           | 970    | 2030          | 0.0           |
| 455    | 15942         | 0.5           | 585    | 116679        | 64.8          | 715    | 19222         | 0.0           | 845    | 2631          | 0.0           | 975    | 1986          | 0.0           |
| 460    | 9916          | 0.4           | 590    | 123752        | 64.0          | 720    | 17310         | 0.0           | 850    | 2079          | 0.0           | 980    | 2540          | 0.0           |
| 465    | 7051          | 0.4           | 595    | 129324        | 61.3          | 725    | 15280         | 0.0           | 855    | 2309          | 0.0           | 985    | 1139          | 0.0           |
| 470    | 5227          | 0.3           | 600    | 134082        | 57.8          | 730    | 13282         | 0.0           | 860    | 2528          | 0.0           | 990    | 2018          | 0.0           |
| 475    | 4257          | 0.3           | 605    | 135698        | 52.6          | 735    | 11753         | 0.0           | 865    | 2121          | 0.0           | 995    | 3445          | 0.0           |
| 480    | 4052          | 0.4           | 610    | 135144        | 46.4          | 740    | 10654         | 0.0           | 870    | 2751          | 0.0           | 1000   | 3704          | 0.0           |
| 485    | 4298          | 0.5           | 615    | 134180        | 40.5          | 745    | 9451          | 0.0           | 875    | 2317          | 0.0           |        |               |               |

REPORT NUMBER: SP1-1908-441-10-R4

**Scotopic Flux vs. Wavelength**



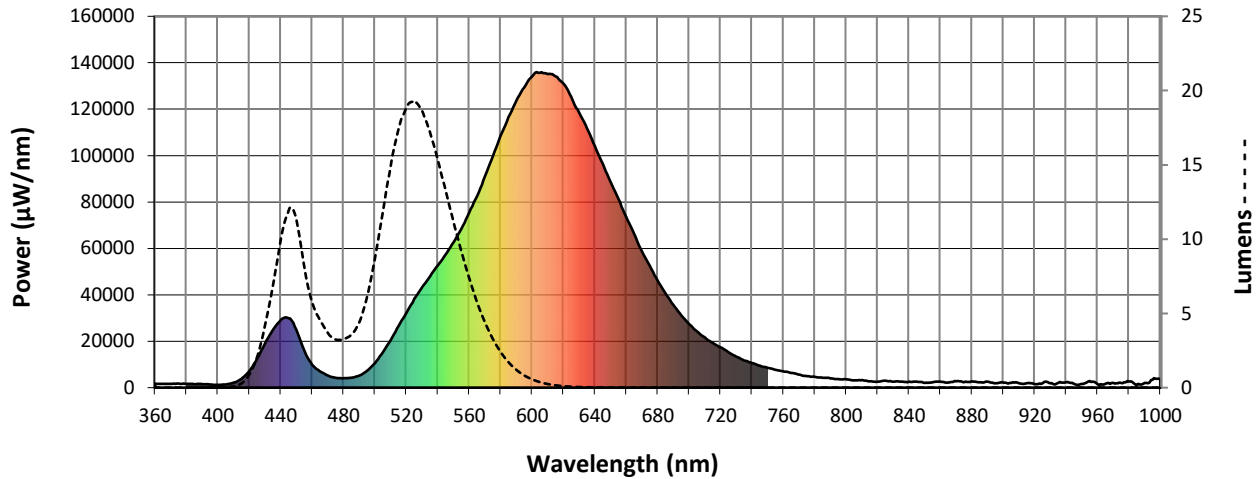
**Scotopic Lumens: 4696.9**

**S/P: 0.85**

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W}/\text{nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W}/\text{nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W}/\text{nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W}/\text{nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W}/\text{nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|
| 360               | 1768                                 | 0.0                            | 490               | 5206                                 | 4.3                            | 620               | 130919                               | 0.1                            | 750               | 8553                                 | 0.0                            | 880               | 2713                                 | 0.0                            |
| 365               | 1569                                 | 0.0                            | 495               | 7286                                 | 6.0                            | 625               | 125335                               | 0.1                            | 755               | 7696                                 | 0.0                            | 885               | 2316                                 | 0.0                            |
| 370               | 1594                                 | 0.0                            | 500               | 10654                                | 8.6                            | 630               | 118388                               | 0.0                            | 760               | 6978                                 | 0.0                            | 890               | 2539                                 | 0.0                            |
| 375               | 1744                                 | 0.0                            | 505               | 15189                                | 11.7                           | 635               | 111855                               | 0.0                            | 765               | 6377                                 | 0.0                            | 895               | 1933                                 | 0.0                            |
| 380               | 1659                                 | 0.0                            | 510               | 20541                                | 14.7                           | 640               | 104062                               | 0.0                            | 770               | 5600                                 | 0.0                            | 900               | 2216                                 | 0.0                            |
| 385               | 1504                                 | 0.0                            | 515               | 26492                                | 17.3                           | 645               | 96365                                | 0.0                            | 775               | 5000                                 | 0.0                            | 905               | 2067                                 | 0.0                            |
| 390               | 1541                                 | 0.0                            | 520               | 32294                                | 18.8                           | 650               | 88651                                | 0.0                            | 780               | 4709                                 | 0.0                            | 910               | 1959                                 | 0.0                            |
| 395               | 1355                                 | 0.0                            | 525               | 38123                                | 19.3                           | 655               | 81152                                | 0.0                            | 785               | 4305                                 | 0.0                            | 915               | 1874                                 | 0.0                            |
| 400               | 1243                                 | 0.0                            | 530               | 43232                                | 18.7                           | 660               | 73523                                | 0.0                            | 790               | 4040                                 | 0.0                            | 920               | 1484                                 | 0.0                            |
| 405               | 1417                                 | 0.0                            | 535               | 48012                                | 17.3                           | 665               | 66123                                | 0.0                            | 795               | 3642                                 | 0.0                            | 925               | 1914                                 | 0.0                            |
| 410               | 2147                                 | 0.1                            | 540               | 52623                                | 15.4                           | 670               | 58677                                | 0.0                            | 800               | 3594                                 | 0.0                            | 930               | 1948                                 | 0.0                            |
| 415               | 3837                                 | 0.3                            | 545               | 57516                                | 13.4                           | 675               | 52349                                | 0.0                            | 805               | 3190                                 | 0.0                            | 935               | 2079                                 | 0.0                            |
| 420               | 7159                                 | 0.8                            | 550               | 62613                                | 11.2                           | 680               | 46159                                | 0.0                            | 810               | 3241                                 | 0.0                            | 940               | 2263                                 | 0.0                            |
| 425               | 12599                                | 2.0                            | 555               | 68554                                | 9.2                            | 685               | 40525                                | 0.0                            | 815               | 2732                                 | 0.0                            | 945               | 1688                                 | 0.0                            |
| 430               | 19019                                | 4.0                            | 560               | 75325                                | 7.4                            | 690               | 35615                                | 0.0                            | 820               | 2612                                 | 0.0                            | 950               | 1560                                 | 0.0                            |
| 435               | 24875                                | 6.6                            | 565               | 82533                                | 5.8                            | 695               | 31158                                | 0.0                            | 825               | 2966                                 | 0.0                            | 955               | 2826                                 | 0.0                            |
| 440               | 29103                                | 9.7                            | 570               | 90909                                | 4.4                            | 700               | 27409                                | 0.0                            | 830               | 2574                                 | 0.0                            | 960               | 1477                                 | 0.0                            |
| 445               | 29901                                | 11.8                           | 575               | 99621                                | 3.3                            | 705               | 24204                                | 0.0                            | 835               | 2633                                 | 0.0                            | 965               | 1568                                 | 0.0                            |
| 450               | 24862                                | 11.5                           | 580               | 108484                               | 2.4                            | 710               | 21558                                | 0.0                            | 840               | 2526                                 | 0.0                            | 970               | 2030                                 | 0.0                            |
| 455               | 15942                                | 8.4                            | 585               | 116679                               | 1.7                            | 715               | 19222                                | 0.0                            | 845               | 2631                                 | 0.0                            | 975               | 1986                                 | 0.0                            |
| 460               | 9916                                 | 5.8                            | 590               | 123752                               | 1.2                            | 720               | 17310                                | 0.0                            | 850               | 2079                                 | 0.0                            | 980               | 2540                                 | 0.0                            |
| 465               | 7051                                 | 4.6                            | 595               | 129324                               | 0.8                            | 725               | 15280                                | 0.0                            | 855               | 2309                                 | 0.0                            | 985               | 1139                                 | 0.0                            |
| 470               | 5227                                 | 3.7                            | 600               | 134082                               | 0.6                            | 730               | 13282                                | 0.0                            | 860               | 2528                                 | 0.0                            | 990               | 2018                                 | 0.0                            |
| 475               | 4257                                 | 3.3                            | 605               | 135698                               | 0.4                            | 735               | 11753                                | 0.0                            | 865               | 2121                                 | 0.0                            | 995               | 3445                                 | 0.0                            |
| 480               | 4052                                 | 3.3                            | 610               | 135144                               | 0.2                            | 740               | 10654                                | 0.0                            | 870               | 2751                                 | 0.0                            | 1000              | 3704                                 | 0.0                            |
| 485               | 4298                                 | 3.5                            | 615               | 134180                               | 0.2                            | 745               | 9451                                 | 0.0                            | 875               | 2317                                 | 0.0                            |                   |                                      |                                |

REPORT NUMBER: SP1-1908-441-10-R4

Melanopic Flux vs. Wavelength



Melanopic Lumens: 1470.8 M/P: 0.27

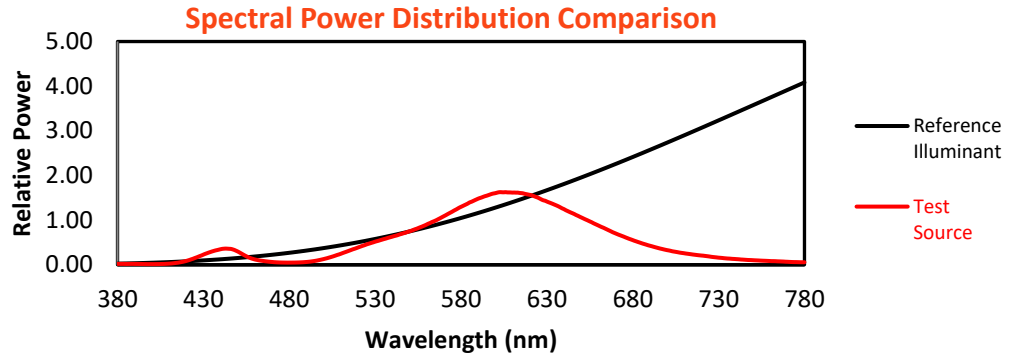
| λ (nm) | Power (µW/nm) | Lumens (φ/nm) | λ (nm) | Power (µW/nm) | Lumens (φ/nm) | λ (nm) | Power (µW/nm) | Lumens (φ/nm) | λ (nm) | Power (µW/nm) | Lumens (φ/nm) | λ (nm) | Power (µW/nm) | Lumens (φ/nm) |
|--------|---------------|---------------|--------|---------------|---------------|--------|---------------|---------------|--------|---------------|---------------|--------|---------------|---------------|
| 360    | 1768          | 0.0           | 490    | 5206          | 8.0           | 620    | 130919        | 1.6           | 750    | 8553          | 0.0           | 880    | 2713          | 0.0           |
| 365    | 1569          | 0.0           | 495    | 7286          | 11.8          | 625    | 125335        | 1.1           | 755    | 7696          | 0.0           | 885    | 2316          | 0.0           |
| 370    | 1594          | 0.0           | 500    | 10654         | 17.8          | 630    | 118388        | 0.7           | 760    | 6978          | 0.0           | 890    | 2539          | 0.0           |
| 375    | 1744          | 0.0           | 505    | 15189         | 25.8          | 635    | 111855        | 0.4           | 765    | 6377          | 0.0           | 895    | 1933          | 0.0           |
| 380    | 1659          | 0.0           | 510    | 20541         | 34.8          | 640    | 104062        | 0.3           | 770    | 5600          | 0.0           | 900    | 2216          | 0.0           |
| 385    | 1504          | 0.0           | 515    | 26492         | 43.9          | 645    | 96365         | 0.2           | 775    | 5000          | 0.0           | 905    | 2067          | 0.0           |
| 390    | 1541          | 0.0           | 520    | 32294         | 51.3          | 650    | 88651         | 0.1           | 780    | 4709          | 0.0           | 910    | 1959          | 0.0           |
| 395    | 1355          | 0.0           | 525    | 38123         | 57.0          | 655    | 81152         | 0.1           | 785    | 4305          | 0.0           | 915    | 1874          | 0.0           |
| 400    | 1243          | 0.0           | 530    | 43232         | 59.6          | 660    | 73523         | 0.0           | 790    | 4040          | 0.0           | 920    | 1484          | 0.0           |
| 405    | 1417          | 0.0           | 535    | 48012         | 59.8          | 665    | 66123         | 0.0           | 795    | 3642          | 0.0           | 925    | 1914          | 0.0           |
| 410    | 2147          | 0.1           | 540    | 52623         | 58.1          | 670    | 58677         | 0.0           | 800    | 3594          | 0.0           | 930    | 1948          | 0.0           |
| 415    | 3837          | 0.4           | 545    | 57516         | 55.1          | 675    | 52349         | 0.0           | 805    | 3190          | 0.0           | 935    | 2079          | 0.0           |
| 420    | 7159          | 1.2           | 550    | 62613         | 51.2          | 680    | 46159         | 0.0           | 810    | 3241          | 0.0           | 940    | 2263          | 0.0           |
| 425    | 12599         | 3.1           | 555    | 68554         | 46.9          | 685    | 40525         | 0.0           | 815    | 2732          | 0.0           | 945    | 1688          | 0.0           |
| 430    | 19019         | 6.5           | 560    | 75325         | 42.1          | 690    | 35615         | 0.0           | 820    | 2612          | 0.0           | 950    | 1560          | 0.0           |
| 435    | 24875         | 11.1          | 565    | 82533         | 37.0          | 695    | 31158         | 0.0           | 825    | 2966          | 0.0           | 955    | 2826          | 0.0           |
| 440    | 29103         | 16.3          | 570    | 90909         | 32.1          | 700    | 27409         | 0.0           | 830    | 2574          | 0.0           | 960    | 1477          | 0.0           |
| 445    | 29901         | 20.0          | 575    | 99621         | 27.1          | 705    | 24204         | 0.0           | 835    | 2633          | 0.0           | 965    | 1568          | 0.0           |
| 450    | 24862         | 19.3          | 580    | 108484        | 22.4          | 710    | 21558         | 0.0           | 840    | 2526          | 0.0           | 970    | 2030          | 0.0           |
| 455    | 15942         | 13.9          | 585    | 116679        | 17.8          | 715    | 19222         | 0.0           | 845    | 2631          | 0.0           | 975    | 1986          | 0.0           |
| 460    | 9916          | 9.6           | 590    | 123752        | 13.8          | 720    | 17310         | 0.0           | 850    | 2079          | 0.0           | 980    | 2540          | 0.0           |
| 465    | 7051          | 7.4           | 595    | 129324        | 10.3          | 725    | 15280         | 0.0           | 855    | 2309          | 0.0           | 985    | 1139          | 0.0           |
| 470    | 5227          | 6.0           | 600    | 134082        | 7.6           | 730    | 13282         | 0.0           | 860    | 2528          | 0.0           | 990    | 2018          | 0.0           |
| 475    | 4257          | 5.3           | 605    | 135698        | 5.3           | 735    | 11753         | 0.0           | 865    | 2121          | 0.0           | 995    | 3445          | 0.0           |
| 480    | 4052          | 5.5           | 610    | 135144        | 3.7           | 740    | 10654         | 0.0           | 870    | 2751          | 0.0           | 1000   | 3704          | 0.0           |
| 485    | 4298          | 6.2           | 615    | 134180        | 2.5           | 745    | 9451          | 0.0           | 875    | 2317          | 0.0           |        |               |               |

REPORT NUMBER: SP1-1908-441-10-R4

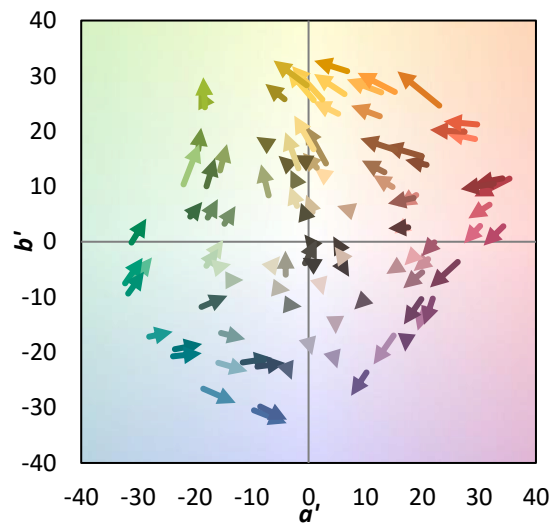
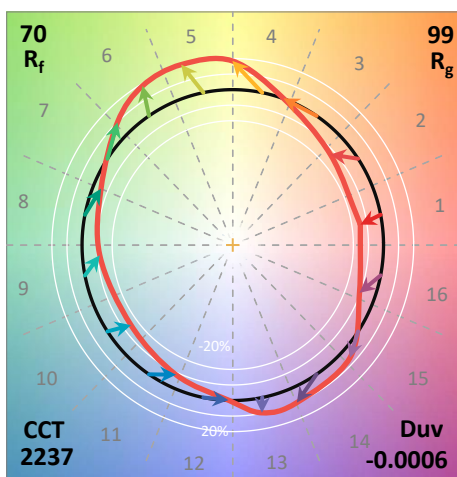
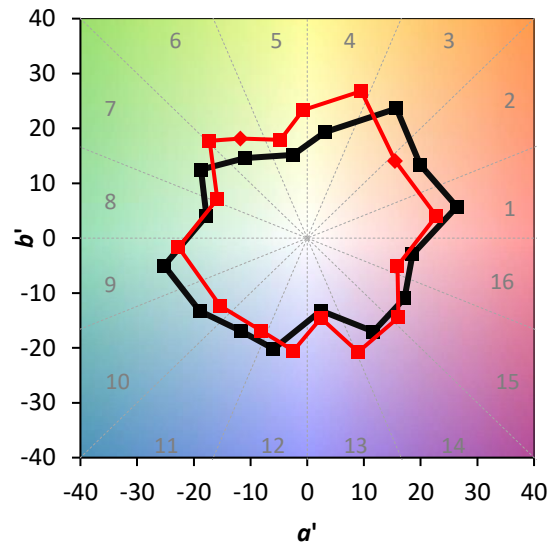
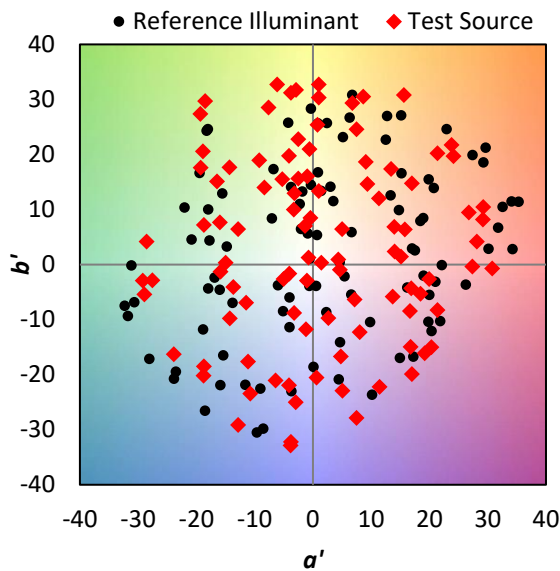
TM-30-18

**Summary**

$R_f = 69.8$   
 $R_g = 99.2$   
 CIE  $R_a = 72.0$   
 $R_9 = -17.4$



**Color Vector Graphics**

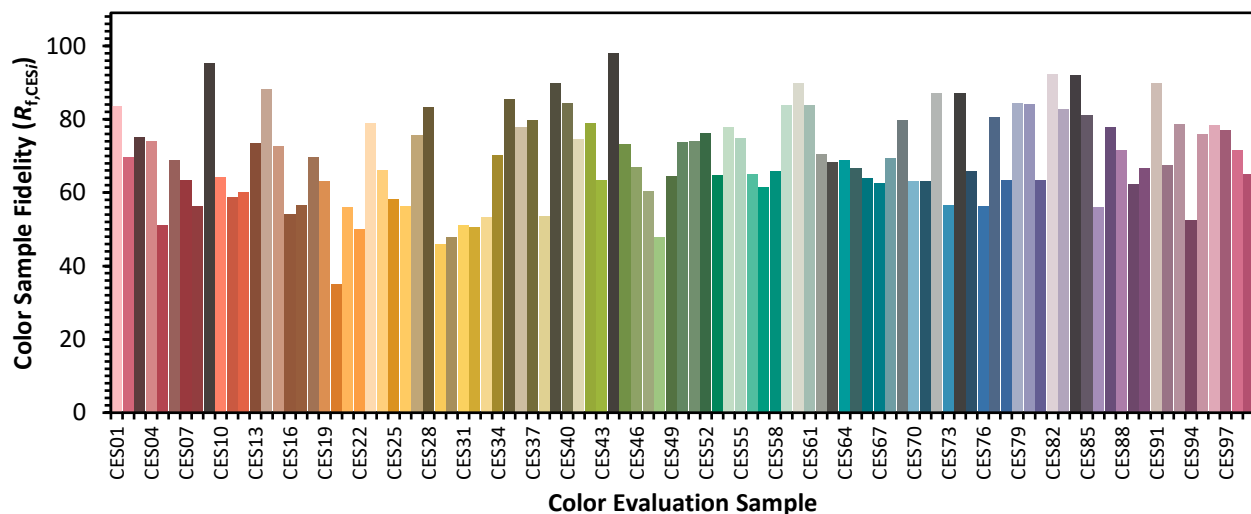


REPORT NUMBER: SP1-1908-441-10-R4

TM-30-18

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

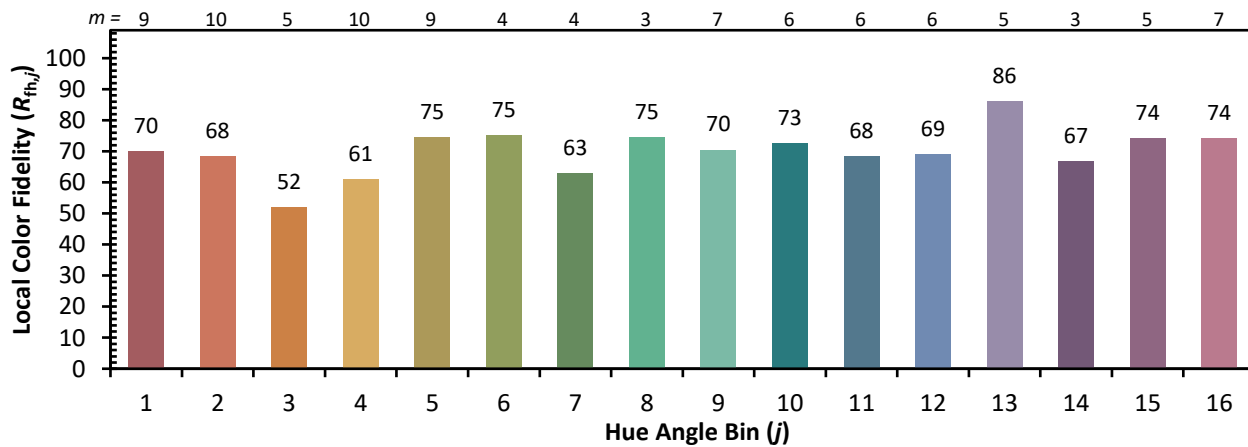
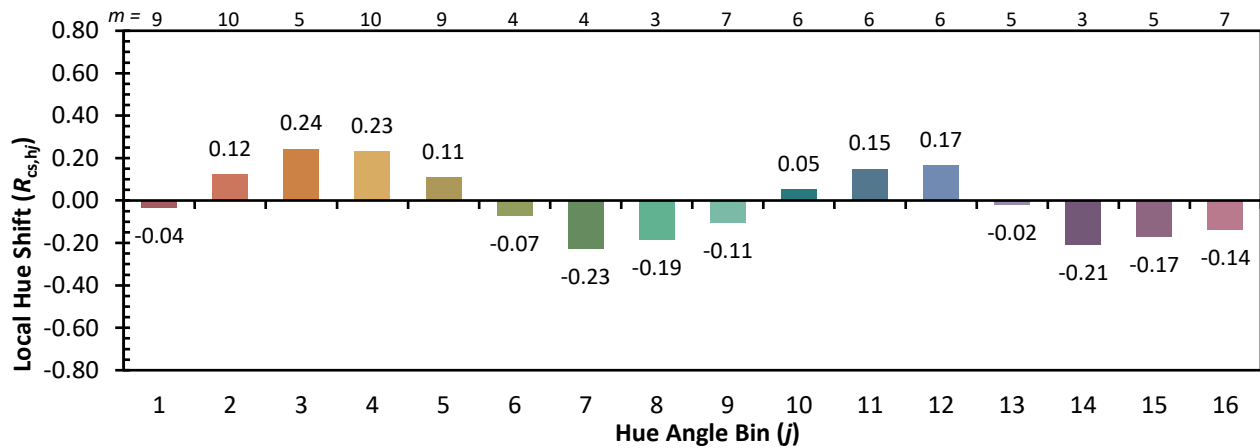
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 87 | CES26 = 56 | CES51 = 74 | CES76 = 56 |
| CES02 = 65 | CES27 = 76 | CES52 = 76 | CES77 = 81 |
| CES03 = 32 | CES28 = 83 | CES53 = 65 | CES78 = 63 |
| CES04 = 72 | CES29 = 46 | CES54 = 78 | CES79 = 84 |
| CES05 = 52 | CES30 = 48 | CES55 = 75 | CES80 = 84 |
| CES06 = 52 | CES31 = 51 | CES56 = 65 | CES81 = 63 |
| CES07 = 44 | CES32 = 51 | CES57 = 62 | CES82 = 92 |
| CES08 = 42 | CES33 = 53 | CES58 = 66 | CES83 = 83 |
| CES09 = 29 | CES34 = 70 | CES59 = 84 | CES84 = 92 |
| CES10 = 78 | CES35 = 85 | CES60 = 90 | CES85 = 81 |
| CES11 = 61 | CES36 = 78 | CES61 = 84 | CES86 = 56 |
| CES12 = 68 | CES37 = 80 | CES62 = 70 | CES87 = 78 |
| CES13 = 45 | CES38 = 53 | CES63 = 68 | CES88 = 72 |
| CES14 = 75 | CES39 = 90 | CES64 = 69 | CES89 = 62 |
| CES15 = 72 | CES40 = 84 | CES65 = 67 | CES90 = 67 |
| CES16 = 49 | CES41 = 75 | CES66 = 64 | CES91 = 90 |
| CES17 = 51 | CES42 = 79 | CES67 = 63 | CES92 = 67 |
| CES18 = 57 | CES43 = 64 | CES68 = 69 | CES93 = 79 |
| CES19 = 74 | CES44 = 98 | CES69 = 80 | CES94 = 52 |
| CES20 = 68 | CES45 = 73 | CES70 = 63 | CES95 = 76 |
| CES21 = 89 | CES46 = 67 | CES71 = 63 | CES96 = 78 |
| CES22 = 81 | CES47 = 60 | CES72 = 87 | CES97 = 77 |
| CES23 = 92 | CES48 = 48 | CES73 = 56 | CES98 = 71 |
| CES24 = 92 | CES49 = 64 | CES74 = 87 | CES99 = 65 |
| CES25 = 74 | CES50 = 74 | CES75 = 66 |            |



REPORT NUMBER: SP1-1908-441-10-R4

TM-30-18

Color Rendition by Hue-Angle Bin



REPORT NUMBER: SP1-1908-441-10-R4

TM-30-18

Measure Comparisons



(END OF REPORT)