

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



Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions

Brand: STREETWORKS

Report Number: P359931

Luminaire Tested: NVN-SA5D-740-U-T4FT-HSS

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P359931  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-17)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA5D-740-U-T4FT-HSS  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(5) 70 CRI, 4000K, 1200mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV  
FORWARD THROW OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 27888 lumens  
Efficiency: N/A  
Efficacy: 87.1 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1.5' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B2 - U0 - G5

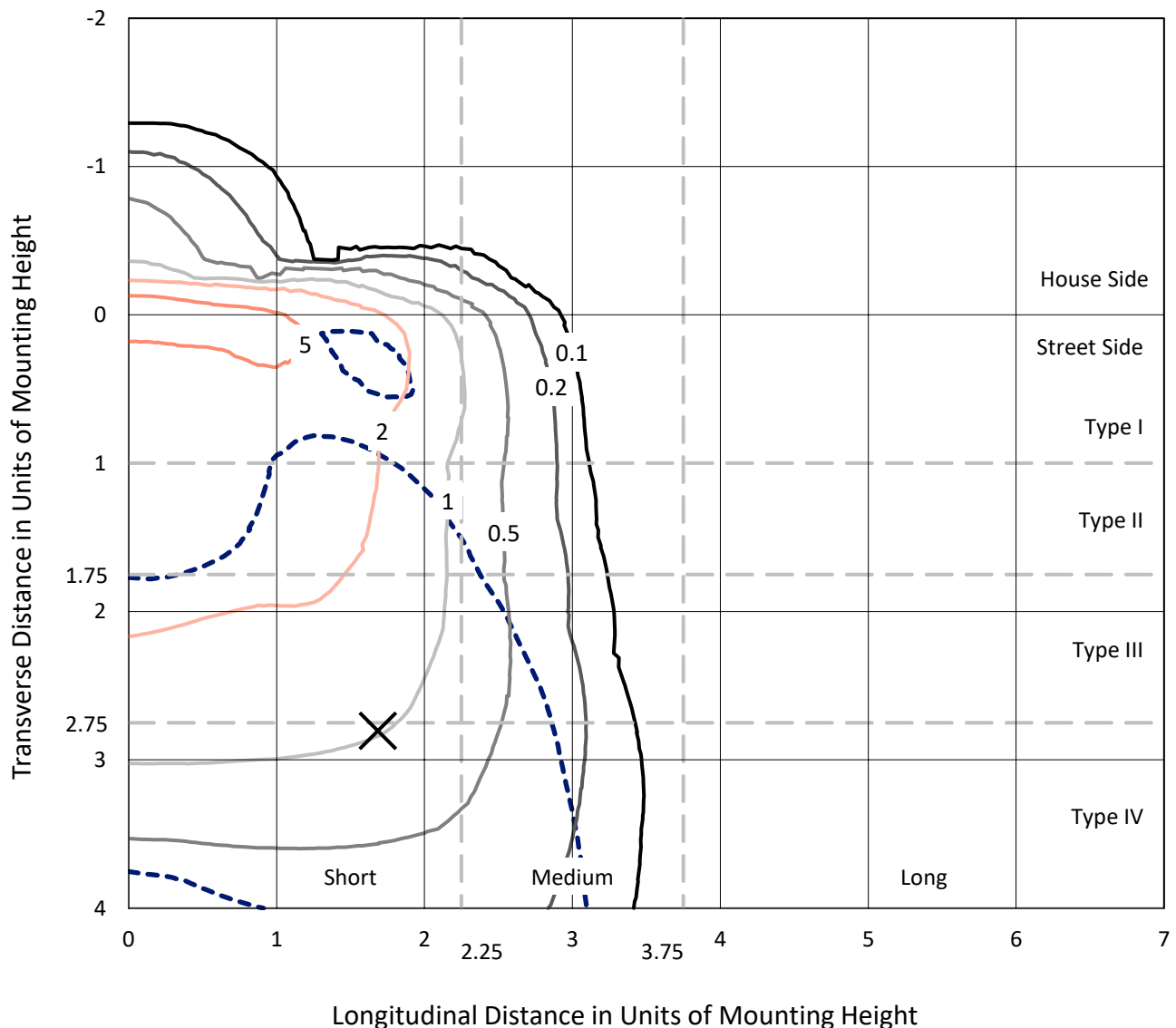
Input Watts (W): 320  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



REPORT NUMBER: P359931  
 CATALOG NUMBER: NVN-SA5D-740-U-T4FT-HSS

## Iso-Footcandle Lines of Horizontal Illumination

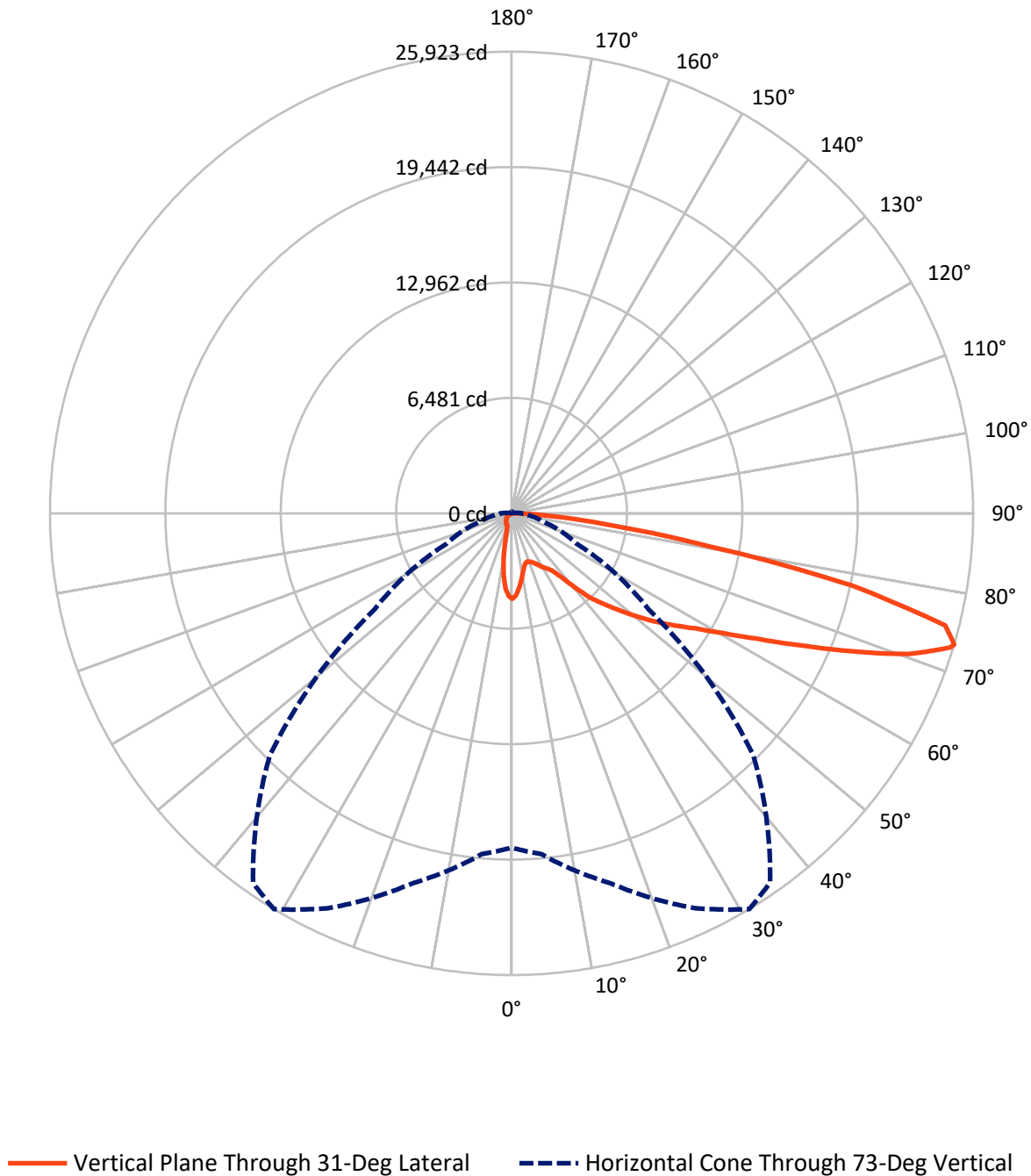
× Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 7.7 fc  
 Type IV - Short - N/A

REPORT NUMBER: P359931  
CATALOG NUMBER: NVN-SA5D-740-U-T4FT-HSS

## Luminous Intensity Polar Plot



REPORT NUMBER: P359931

CATALOG NUMBER: NVN-SA5D-740-U-T4FT-HSS

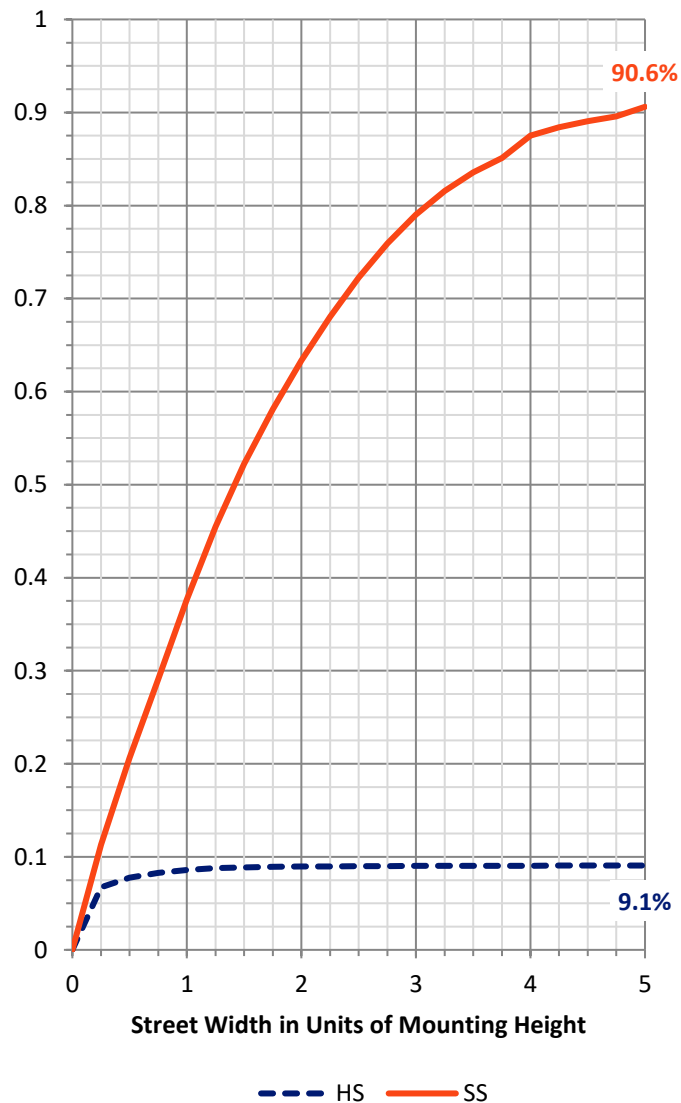
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 2542.1   | 0.0    | 2542.1  |
|                    | % Fixture | 9.1      | 0.0    | 9.1     |
| <b>Street Side</b> | Lumens    | 25345.9  | 0.0    | 25345.9 |
|                    | % Fixture | 90.9     | 0.0    | 90.9    |
| <b>Total</b>       | Lumens    | 27888.0  | 0.0    | 27888.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 397.8   | 1.4       |
| 10°-20°   | 863.8   | 3.1       |
| 20°-30°   | 1294.3  | 4.6       |
| 30°-40°   | 2059.2  | 7.4       |
| 40°-50°   | 3677.1  | 13.2      |
| 50°-60°   | 5705.8  | 20.5      |
| 60°-70°   | 7585.1  | 27.2      |
| 70°-80°   | 5705.5  | 20.5      |
| 80°-90°   | 599.5   | 2.1       |
| 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°    | 27888.0 | 100.0     |
| 0°-180°   | 27888.0 | 100.0     |

**Coefficient of Utilization**



REPORT NUMBER: P359931

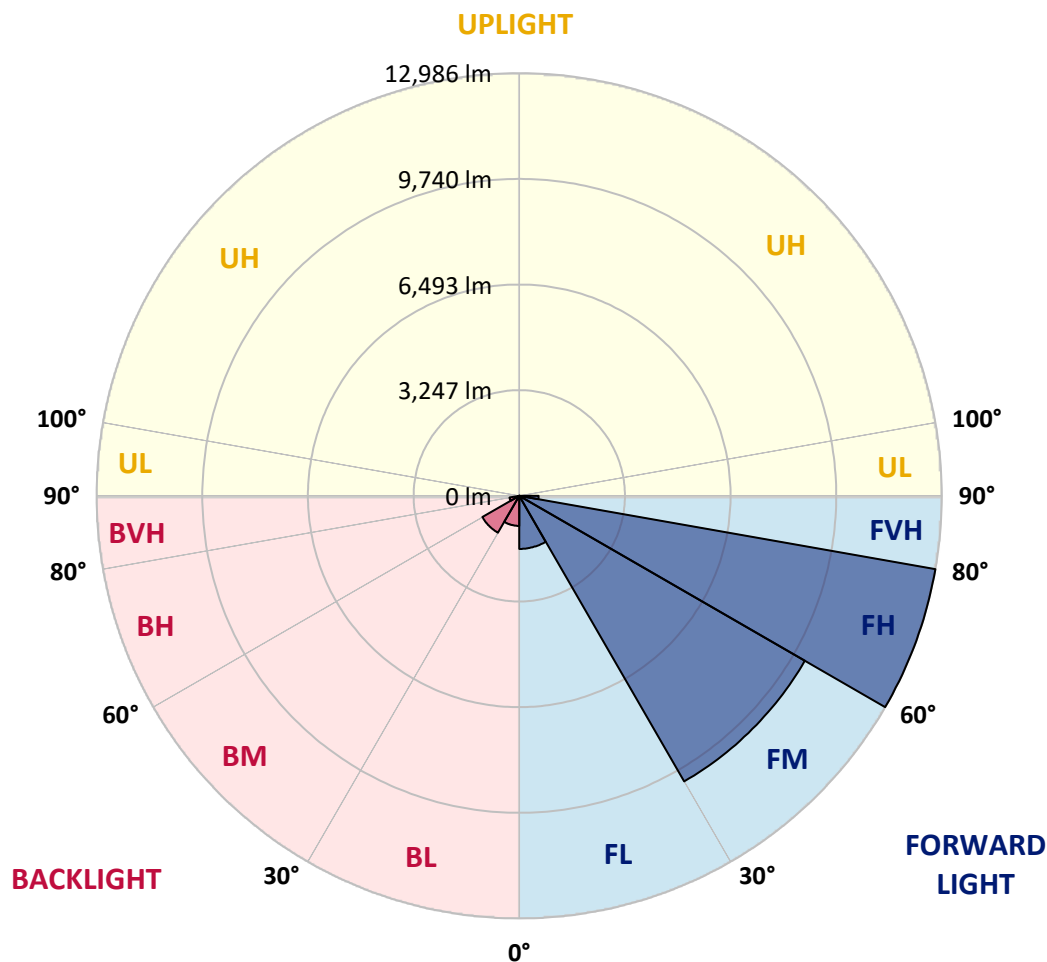
CATALOG NUMBER: NVN-SA5D-740-U-T4FT-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |        |
|------|-------------|---------|-----------|-------------------------|------|--------|
|      |             |         |           | B                       | U    | G      |
| FL   | (0°-30°)    | 1631.5  | 5.9       |                         |      |        |
| FM   | (30°-60°)   | 10133.5 | 36.3      |                         |      |        |
| FH   | (60°-80°)   | 12986.4 | 46.6      |                         |      | G5     |
| FVH  | (80°-90°)   | 594.5   | 2.1       |                         |      | G4/750 |
| BL   | (0°-30°)    | 924.4   | 3.3       | B2/1000                 |      |        |
| BM   | (30°-60°)   | 1308.5  | 4.7       | B2/2500                 |      |        |
| BH   | (60°-80°)   | 304.1   | 1.1       | B1/500                  |      | G1/500 |
| BVH  | (80°-90°)   | 5.0     | 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-G5**

Type IV Short





REPORT NUMBER: P359931

CATALOG NUMBER: NVN-SA5D-740-U-T4FT-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 31°     | 35°     | 45°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  | 4798.2  |
| 2.5°  | 4547.1  | 4566.2  | 4586.7  | 4590.8  | 4624.9  | 4626.2  | 4675.4  | 4712.2  | 4749.1  | 4784.5  | 4796.8  |
| 5°    | 4080.4  | 4111.8  | 4148.6  | 4185.4  | 4257.8  | 4286.4  | 4406.5  | 4529.3  | 4646.7  | 4758.6  | 4813.2  |
| 7.5°  | 3582.3  | 3617.7  | 3669.6  | 3761.0  | 3841.6  | 3897.5  | 4087.2  | 4305.5  | 4523.9  | 4730.0  | 4848.7  |
| 10°   | 3127.8  | 3160.6  | 3215.2  | 3312.1  | 3436.2  | 3512.7  | 3767.9  | 4070.8  | 4391.5  | 4704.0  | 4901.9  |
| 12.5° | 2838.5  | 2856.3  | 2886.3  | 2990.0  | 3101.9  | 3187.9  | 3488.1  | 3863.4  | 4282.3  | 4702.7  | 4987.9  |
| 15°   | 2785.3  | 2790.8  | 2766.2  | 2812.6  | 2899.9  | 2983.2  | 3287.5  | 3695.5  | 4199.1  | 4724.5  | 5099.8  |
| 17.5° | 2869.9  | 2867.2  | 2785.3  | 2779.8  | 2849.4  | 2917.7  | 3189.2  | 3579.5  | 4140.4  | 4775.0  | 5244.4  |
| 20°   | 2998.2  | 2988.6  | 2846.7  | 2820.8  | 2894.5  | 2958.6  | 3182.4  | 3535.9  | 4118.6  | 4859.6  | 5420.5  |
| 22.5° | 3168.8  | 3152.4  | 2930.0  | 2902.7  | 2981.8  | 3048.7  | 3267.0  | 3578.2  | 4137.7  | 4972.9  | 5625.2  |
| 25°   | 3380.3  | 3355.7  | 3073.2  | 3043.2  | 3123.7  | 3190.6  | 3418.5  | 3699.6  | 4195.0  | 5110.7  | 5884.5  |
| 27.5° | 3619.1  | 3583.6  | 3302.5  | 3224.7  | 3316.2  | 3385.8  | 3620.5  | 3885.2  | 4285.1  | 5256.7  | 6202.4  |
| 30°   | 3844.3  | 3797.9  | 3544.1  | 3415.8  | 3527.7  | 3605.5  | 3838.8  | 4106.3  | 4429.7  | 5481.9  | 6637.8  |
| 32.5° | 4070.8  | 4019.0  | 3759.7  | 3606.8  | 3707.8  | 3792.4  | 4064.0  | 4410.6  | 4701.3  | 5825.8  | 7216.4  |
| 35°   | 4592.1  | 4537.5  | 4219.6  | 3967.1  | 3965.7  | 4013.5  | 4379.2  | 4826.8  | 5060.2  | 6304.8  | 7906.9  |
| 37.5° | 5469.6  | 5438.2  | 5135.3  | 4656.3  | 4528.0  | 4474.8  | 4809.1  | 5323.6  | 5576.1  | 6963.9  | 8686.1  |
| 40°   | 6430.3  | 6403.0  | 6063.2  | 5629.3  | 5434.1  | 5303.1  | 5425.9  | 6015.5  | 6304.8  | 7769.1  | 9481.7  |
| 42.5° | 7515.2  | 7385.6  | 6779.7  | 6650.0  | 6475.4  | 6375.7  | 6265.2  | 6868.4  | 7200.0  | 8645.2  | 10270.5 |
| 45°   | 8500.5  | 8282.2  | 7496.1  | 7299.6  | 7260.1  | 7284.6  | 7346.0  | 8014.7  | 8207.1  | 9686.4  | 11056.6 |
| 47.5° | 9087.4  | 8915.4  | 8312.2  | 8123.9  | 8113.0  | 8275.4  | 8739.4  | 9309.8  | 9210.2  | 10594.0 | 11748.5 |
| 50°   | 9645.5  | 9489.9  | 8989.1  | 9035.5  | 9086.0  | 9307.1  | 10321.0 | 10641.7 | 10125.9 | 11416.8 | 12383.0 |
| 52.5° | 10097.2 | 9859.8  | 9597.7  | 9858.4  | 10106.8 | 10462.9 | 11953.2 | 11837.2 | 10775.5 | 12071.9 | 12926.2 |
| 55°   | 10357.9 | 10250.1 | 10377.0 | 10639.0 | 11105.7 | 11684.3 | 13493.9 | 12832.0 | 11250.4 | 12669.6 | 13287.8 |
| 57.5° | 11313.1 | 11101.6 | 11354.1 | 11580.6 | 12189.3 | 12998.5 | 14813.5 | 13573.0 | 11592.9 | 13039.4 | 13371.1 |
| 60°   | 12469.0 | 12298.4 | 12447.2 | 12823.8 | 13645.4 | 14596.5 | 16047.2 | 14177.6 | 11771.7 | 13276.9 | 13155.4 |
| 62.5° | 14308.6 | 14083.4 | 13990.6 | 14412.3 | 15501.3 | 16539.8 | 16983.3 | 14596.5 | 11732.1 | 13171.8 | 12415.8 |
| 65°   | 16773.2 | 16539.8 | 16125.0 | 16507.1 | 17892.2 | 18625.0 | 18030.0 | 14685.2 | 11459.2 | 12321.6 | 10546.2 |
| 67.5° | 19297.8 | 19128.6 | 18773.8 | 19417.9 | 20668.0 | 20904.0 | 19136.8 | 14469.6 | 10580.3 | 9990.8  | 7451.1  |
| 70°   | 20965.5 | 20893.1 | 21123.8 | 22548.5 | 23663.4 | 23595.2 | 20152.1 | 13311.0 | 8246.7  | 6143.8  | 3686.0  |
| 72.5° | 19763.2 | 20109.8 | 21812.9 | 24396.2 | 25758.2 | 25201.4 | 19630.8 | 10221.4 | 4713.6  | 2363.6  | 1065.8  |
| 73°   | 18767.0 | 19210.5 | 21503.1 | 24465.8 | 25923.3 | 25313.3 | 19192.8 | 9382.1  | 4017.6  | 1865.5  | 807.9   |
| 75°   | 13055.8 | 13600.3 | 17802.1 | 22785.9 | 25150.9 | 24117.9 | 15998.1 | 5742.5  | 1861.4  | 827.0   | 326.2   |
| 77.5° | 6338.9  | 6741.5  | 9802.4  | 16463.4 | 19559.8 | 18843.4 | 9959.4  | 2139.8  | 840.6   | 517.2   | 150.1   |
| 80°   | 2366.3  | 2631.1  | 4255.0  | 8379.1  | 11303.6 | 11599.7 | 4380.6  | 809.3   | 559.5   | 416.2   | 76.4    |
| 82.5° | 619.6   | 690.5   | 1569.4  | 3736.5  | 5793.0  | 6063.2  | 1381.0  | 408.0   | 409.4   | 342.5   | 46.4    |
| 85°   | 197.9   | 226.5   | 489.9   | 1677.2  | 2729.3  | 2396.4  | 360.3   | 197.9   | 297.5   | 255.2   | 25.9    |
| 87.5° | 24.6    | 31.4    | 155.6   | 394.4   | 601.8   | 334.3   | 56.0    | 58.7    | 126.9   | 141.9   | 15.0    |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |

REPORT NUMBER: P359931

CATALOG NUMBER: NVN-SA5D-740-U-T4FT-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 4798.2  | 4798.2 | 4798.2 | 4798.2 | 4798.2 | 4798.2 | 4798.2 | 4798.2 | 4798.2 | 4798.2 | 4798.2 |
| 2.5°  | 4809.1  | 4802.3 | 4803.6 | 4768.2 | 4745.0 | 4698.6 | 4650.8 | 4629.0 | 4605.8 | 4596.2 | 4605.8 |
| 5°    | 4833.7  | 4821.4 | 4785.9 | 4676.7 | 4560.7 | 4410.6 | 4270.1 | 4163.6 | 4029.9 | 3993.0 | 4031.2 |
| 7.5°  | 4871.9  | 4847.3 | 4743.6 | 4521.2 | 4263.2 | 3976.7 | 3654.6 | 3419.9 | 3227.4 | 3103.3 | 3148.3 |
| 10°   | 4927.8  | 4881.4 | 4672.6 | 4294.6 | 3833.4 | 3325.7 | 2868.5 | 2512.4 | 2259.9 | 2156.2 | 2152.1 |
| 12.5° | 5022.0  | 4934.7 | 4585.3 | 3999.9 | 3308.0 | 2631.1 | 2032.0 | 1645.8 | 1441.1 | 1308.7 | 1306.0 |
| 15°   | 5125.7  | 4997.4 | 4474.8 | 3646.4 | 2696.6 | 1884.6 | 1308.7 | 1015.3 | 882.9  | 840.6  | 835.2  |
| 17.5° | 5252.6  | 5069.8 | 4331.5 | 3211.1 | 2056.6 | 1248.7 | 854.3  | 769.7  | 764.2  | 760.1  | 760.1  |
| 20°   | 5412.3  | 5155.7 | 4147.2 | 2713.0 | 1458.8 | 833.8  | 726.0  | 731.5  | 734.2  | 728.7  | 730.1  |
| 22.5° | 5597.9  | 5243.1 | 3927.5 | 2178.0 | 986.7  | 697.3  | 694.6  | 701.4  | 704.2  | 701.4  | 702.8  |
| 25°   | 5813.5  | 5344.1 | 3660.1 | 1617.1 | 712.4  | 661.9  | 668.7  | 678.2  | 685.1  | 685.1  | 685.1  |
| 27.5° | 6081.0  | 5466.9 | 3338.0 | 1128.6 | 615.5  | 625.0  | 644.1  | 661.9  | 671.4  | 674.1  | 674.1  |
| 30°   | 6429.0  | 5619.7 | 2951.8 | 773.8  | 559.5  | 575.9  | 611.4  | 645.5  | 663.2  | 666.0  | 667.3  |
| 32.5° | 6868.4  | 5791.7 | 2504.2 | 571.8  | 511.8  | 524.0  | 562.2  | 619.6  | 653.7  | 659.1  | 659.1  |
| 35°   | 7372.0  | 5990.9 | 2022.4 | 498.1  | 477.6  | 481.7  | 511.8  | 577.3  | 637.3  | 652.3  | 653.7  |
| 37.5° | 7923.3  | 6187.4 | 1538.0 | 465.4  | 449.0  | 449.0  | 470.8  | 526.8  | 597.7  | 644.1  | 649.6  |
| 40°   | 8437.8  | 6306.2 | 1078.1 | 439.4  | 423.0  | 423.0  | 442.2  | 483.1  | 550.0  | 619.6  | 634.6  |
| 42.5° | 8912.7  | 6347.1 | 750.6  | 414.9  | 398.5  | 402.6  | 419.0  | 451.7  | 502.2  | 571.8  | 585.4  |
| 45°   | 9401.2  | 6340.3 | 547.2  | 386.2  | 373.9  | 386.2  | 398.5  | 423.0  | 459.9  | 499.5  | 502.2  |
| 47.5° | 9769.7  | 6283.0 | 434.0  | 358.9  | 350.7  | 367.1  | 378.0  | 394.4  | 414.9  | 412.1  | 412.1  |
| 50°   | 10115.0 | 6143.8 | 349.4  | 322.1  | 327.5  | 346.6  | 352.1  | 357.5  | 358.9  | 333.0  | 330.3  |
| 52.5° | 10377.0 | 5926.8 | 279.8  | 282.5  | 304.3  | 323.4  | 318.0  | 309.8  | 296.1  | 264.7  | 259.3  |
| 55°   | 10464.3 | 5509.2 | 219.7  | 233.4  | 270.2  | 294.8  | 274.3  | 256.6  | 230.6  | 204.7  | 199.2  |
| 57.5° | 10306.0 | 4970.1 | 178.8  | 181.5  | 227.9  | 248.4  | 225.2  | 204.7  | 176.0  | 154.2  | 150.1  |
| 60°   | 9970.3  | 4371.0 | 147.4  | 136.5  | 176.0  | 193.8  | 178.8  | 158.3  | 132.4  | 116.0  | 114.6  |
| 62.5° | 9304.3  | 3732.4 | 121.5  | 106.4  | 133.7  | 148.7  | 139.2  | 124.2  | 102.4  | 91.4   | 90.1   |
| 65°   | 7904.2  | 2985.9 | 98.3   | 86.0   | 103.7  | 116.0  | 107.8  | 96.9   | 80.5   | 72.3   | 71.0   |
| 67.5° | 5517.4  | 2018.4 | 80.5   | 71.0   | 81.9   | 91.4   | 84.6   | 79.2   | 64.1   | 62.8   | 64.1   |
| 70°   | 2661.1  | 973.0  | 66.9   | 57.3   | 64.1   | 71.0   | 68.2   | 64.1   | 61.4   | 71.0   | 81.9   |
| 72.5° | 762.9   | 326.2  | 53.2   | 47.8   | 51.9   | 56.0   | 58.7   | 57.3   | 66.9   | 86.0   | 99.6   |
| 73°   | 586.8   | 263.4  | 50.5   | 45.0   | 49.1   | 54.6   | 57.3   | 56.0   | 68.2   | 87.3   | 99.6   |
| 75°   | 251.1   | 126.9  | 38.2   | 36.8   | 40.9   | 47.8   | 50.5   | 50.5   | 68.2   | 88.7   | 95.5   |
| 77.5° | 113.3   | 68.2   | 24.6   | 28.7   | 35.5   | 38.2   | 42.3   | 42.3   | 54.6   | 68.2   | 68.2   |
| 80°   | 64.1    | 36.8   | 19.1   | 21.8   | 25.9   | 25.9   | 25.9   | 23.2   | 24.6   | 27.3   | 30.0   |
| 82.5° | 40.9    | 24.6   | 15.0   | 17.7   | 16.4   | 13.6   | 10.9   | 10.9   | 9.6    | 10.9   | 13.6   |
| 85°   | 23.2    | 13.6   | 13.6   | 10.9   | 6.8    | 5.5    | 6.8    | 5.5    | 1.4    | 0.0    | 1.4    |
| 87.5° | 13.6    | 8.2    | 4.1    | 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    |



LM-79-08: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

MCGRAW, INVUE, LUMARK AND STREETWORKS

DATA VALID FOR LUMINAIRES UTILIZING SA LIGHT ENGINES

Report Number: SP1-2101-121-2

Luminaire Tested: IFLD-S-SA2A-740-U-T3R-HSS

Test Date: 03/05/2021

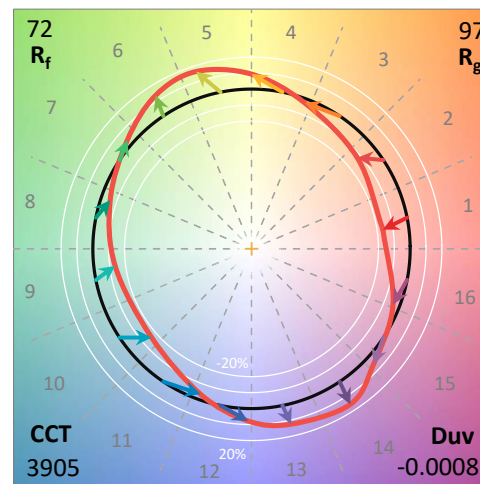
### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2101-121-2  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 03/05/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: STREETWORKS  
 Catalog Number: **IFLD-S-SA2A-740-U-T3R-HSS**  
 Description: STREETWORKS INF FLOOD

SHIELD, DRIVER PROGRAMMED @ 615mA.

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 3905    | CRI (Ra): | 71.2 |      |       |
| CIE u':                   | 0.2273  | R1:       | 68.9 | R9:  | -29.7 |
| CIE v':                   | 0.5024  | R2:       | 77.0 | R10: | 46.2  |
| Duv:                      | -0.0008 | R3:       | 84.0 | R11: | 68.8  |
| CIE x:                    | 0.3841  | R4:       | 71.6 | R12: | 45.6  |
| CIE y:                    | 0.3774  | R5:       | 68.9 | R13: | 69.5  |
| CIE z:                    | 0.2385  | R6:       | 68.3 | R14: | 90.7  |
| Peak Wavelength (nm):     | 443     | R7:       | 78.7 |      |       |
| Dominant Wavelength (nm): | 579     | R8:       | 52.2 |      |       |
| Purity:                   | 28.7    |           |      |      |       |
| Rf:                       | 71.7    |           |      |      |       |
| Rg:                       | 96.9    |           |      |      |       |



### Test Conditions

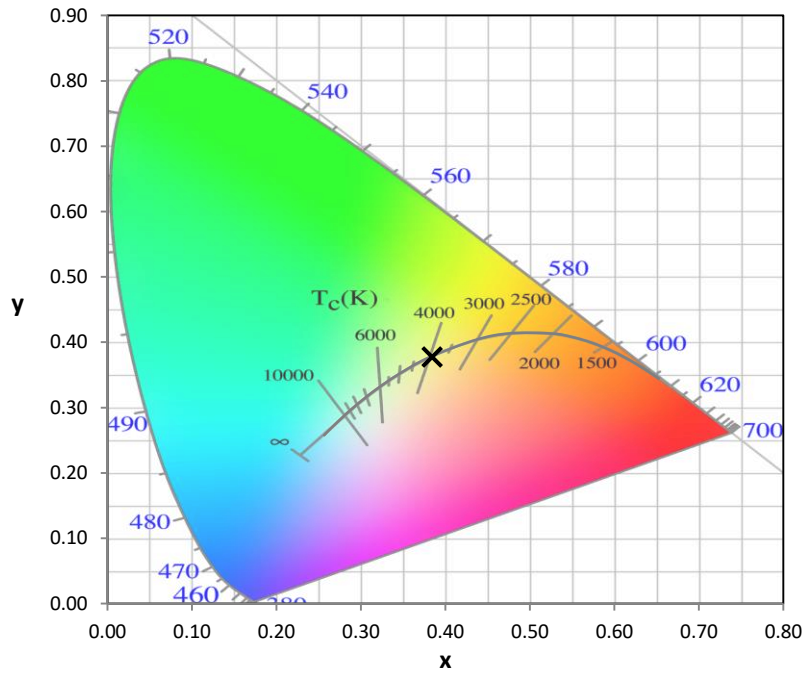
Stabilization Time: 211M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.8/312%  
 Sphere Temperature (°C): 24.1

REPORT NUMBER: SP1-2101-121-2

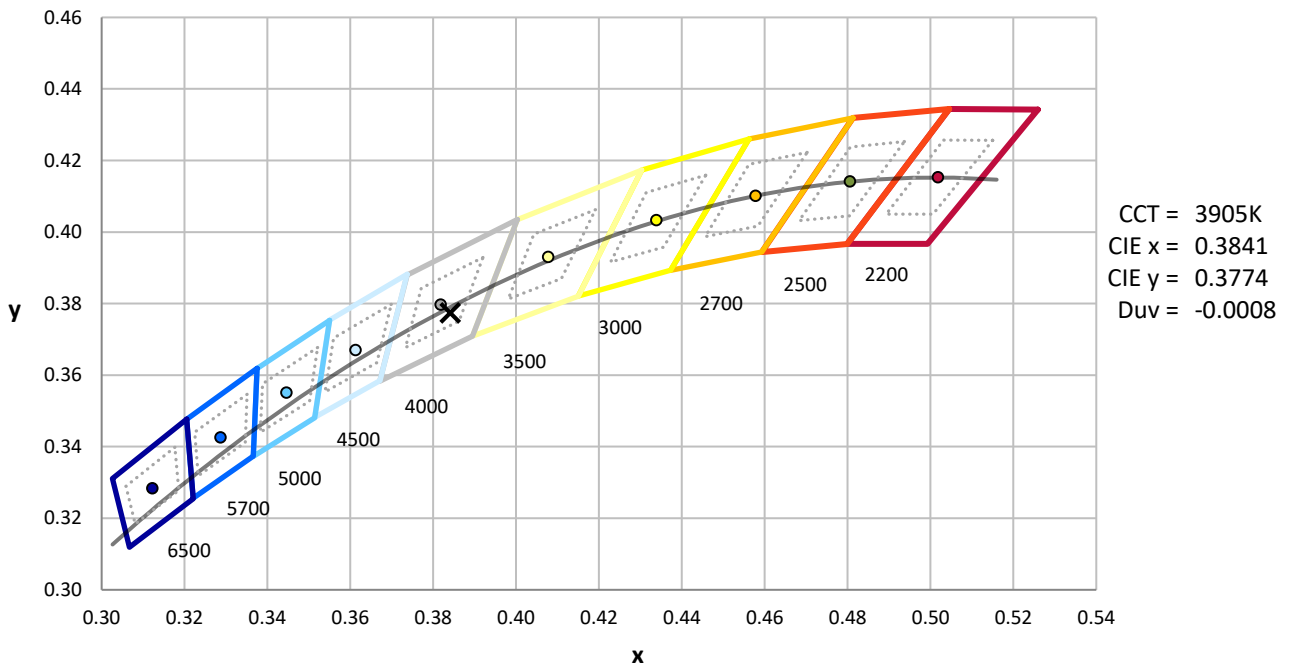
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 1/31/2021        | 7/31/2021            |
| Power Meter                    | IN0071                | 12/1/2020        | 12/1/2021            |
| AC Power Source                | IN0063                | 12/1/2020        | 12/1/2021            |
| DC Power Source                | IN0208                | 12/1/2020        | 12/1/2021            |
| Sphere Thermometer             | IN0085                | 12/1/2020        | 12/1/2021            |
| Room Thermometer               | IN0046                | 12/1/2020        | 12/1/2021            |

REPORT NUMBER: SP1-2101-121-2

**CIE 1931 Chromaticity Diagram**



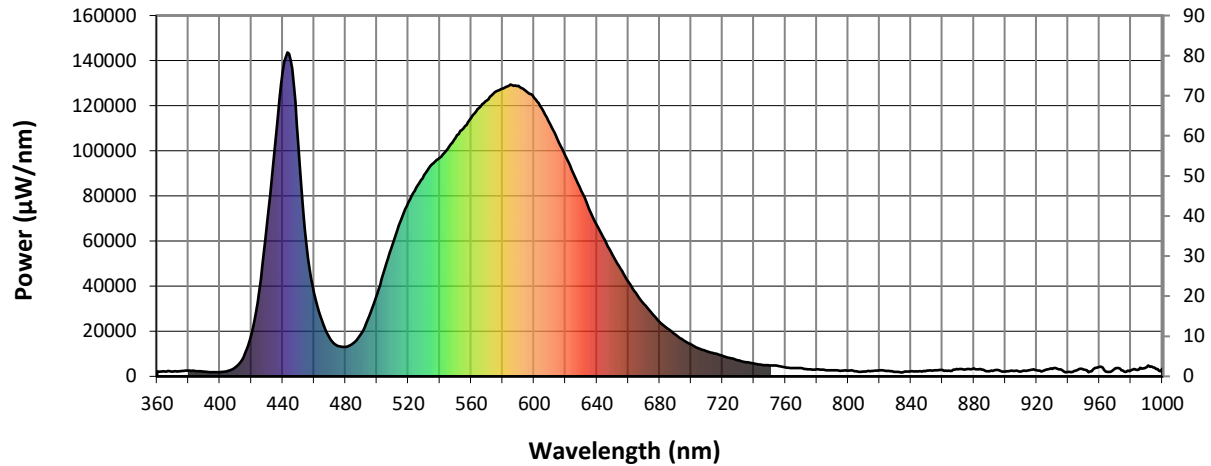
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 4000K 4-step quadrangle

REPORT NUMBER: SP1-2101-121-2

### Photopic Flux vs. Wavelength

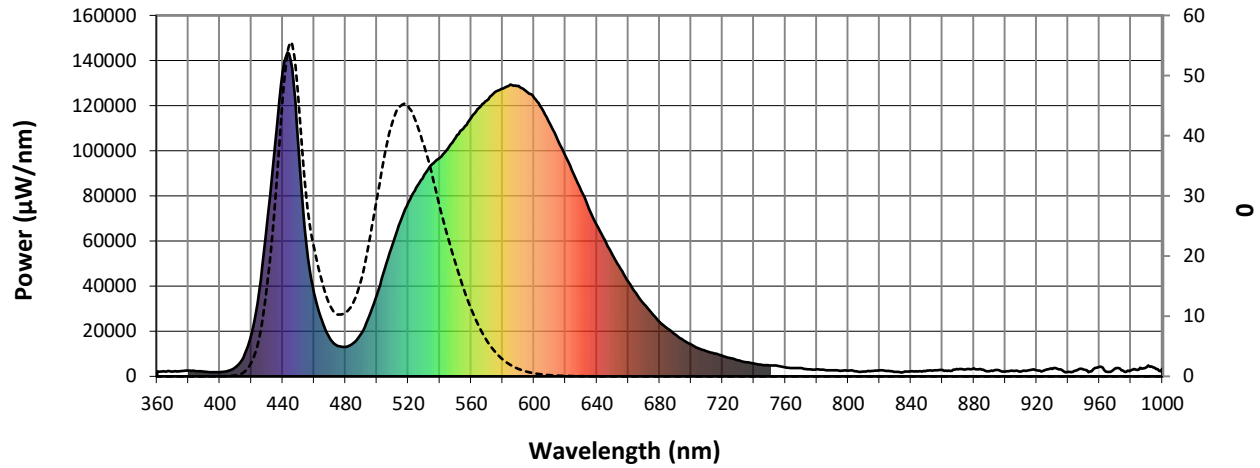


#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 2304             | 0.0              | 490       | 19043            | 2.7              | 620       | 97577            | 25.4             | 750       | 4830             | 0.0              | 880       | 3505             | 0.0              |
| 365       | 2150             | 0.0              | 495       | 26606            | 4.8              | 625       | 90158            | 19.9             | 755       | 4664             | 0.0              | 885       | 2991             | 0.0              |
| 370       | 2146             | 0.0              | 500       | 36376            | 8.0              | 630       | 82240            | 14.9             | 760       | 4006             | 0.0              | 890       | 2327             | 0.0              |
| 375       | 2332             | 0.0              | 505       | 47714            | 13.3             | 635       | 74361            | 11.2             | 765       | 3715             | 0.0              | 895       | 2775             | 0.0              |
| 380       | 2527             | 0.0              | 510       | 58741            | 20.2             | 640       | 66994            | 8.0              | 770       | 3696             | 0.0              | 900       | 2141             | 0.0              |
| 385       | 2304             | 0.0              | 515       | 68716            | 28.5             | 645       | 60405            | 5.8              | 775       | 3117             | 0.0              | 905       | 2421             | 0.0              |
| 390       | 2064             | 0.0              | 520       | 77136            | 37.4             | 650       | 53806            | 3.9              | 780       | 3062             | 0.0              | 910       | 2200             | 0.0              |
| 395       | 1856             | 0.0              | 525       | 83567            | 44.9             | 655       | 47610            | 2.7              | 785       | 2907             | 0.0              | 915       | 2716             | 0.0              |
| 400       | 1856             | 0.0              | 530       | 89283            | 52.6             | 660       | 42018            | 1.8              | 790       | 2655             | 0.0              | 920       | 2656             | 0.0              |
| 405       | 2374             | 0.0              | 535       | 94097            | 58.4             | 665       | 36742            | 1.2              | 795       | 2467             | 0.0              | 925       | 2671             | 0.0              |
| 410       | 4084             | 0.0              | 540       | 96845            | 63.1             | 670       | 32105            | 0.7              | 800       | 2609             | 0.0              | 930       | 3292             | 0.0              |
| 415       | 8543             | 0.0              | 545       | 100829           | 67.1             | 675       | 27946            | 0.5              | 805       | 2293             | 0.0              | 935       | 3188             | 0.0              |
| 420       | 18394            | 0.1              | 550       | 105648           | 71.8             | 680       | 24146            | 0.3              | 810       | 2188             | 0.0              | 940       | 1997             | 0.0              |
| 425       | 37987            | 0.2              | 555       | 110017           | 75.1             | 685       | 21191            | 0.2              | 815       | 2386             | 0.0              | 945       | 2623             | 0.0              |
| 430       | 67605            | 0.5              | 560       | 114586           | 77.9             | 690       | 18544            | 0.1              | 820       | 2712             | 0.0              | 950       | 2969             | 0.0              |
| 435       | 102160           | 1.2              | 565       | 118987           | 79.1             | 695       | 16058            | 0.1              | 825       | 2473             | 0.0              | 955       | 2277             | 0.0              |
| 440       | 135103           | 2.1              | 570       | 122326           | 79.5             | 700       | 14133            | 0.0              | 830       | 1969             | 0.0              | 960       | 4267             | 0.0              |
| 445       | 140126           | 2.9              | 575       | 125968           | 78.4             | 705       | 12309            | 0.0              | 835       | 1917             | 0.0              | 965       | 2034             | 0.0              |
| 450       | 102339           | 2.7              | 580       | 127613           | 75.8             | 710       | 11142            | 0.0              | 840       | 2248             | 0.0              | 970       | 3586             | 0.0              |
| 455       | 58751            | 2.0              | 585       | 129466           | 71.9             | 715       | 10143            | 0.0              | 845       | 2266             | 0.0              | 975       | 2505             | 0.0              |
| 460       | 36892            | 1.5              | 590       | 128813           | 66.6             | 720       | 9072             | 0.0              | 850       | 2558             | 0.0              | 980       | 2666             | 0.0              |
| 465       | 24637            | 1.3              | 595       | 126387           | 59.9             | 725       | 8130             | 0.0              | 855       | 2767             | 0.0              | 985       | 2934             | 0.0              |
| 470       | 16738            | 1.0              | 600       | 123477           | 53.2             | 730       | 7149             | 0.0              | 860       | 2826             | 0.0              | 990       | 4120             | 0.0              |
| 475       | 13456            | 1.1              | 605       | 118718           | 46.0             | 735       | 6311             | 0.0              | 865       | 2385             | 0.0              | 995       | 3858             | 0.0              |
| 480       | 13081            | 1.2              | 610       | 112091           | 38.5             | 740       | 5711             | 0.0              | 870       | 3194             | 0.0              | 1000      | 3405             | 0.0              |
| 485       | 14734            | 1.7              | 615       | 105039           | 31.7             | 745       | 5111             | 0.0              | 875       | 3189             | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2101-121-2

### Scotopic Flux vs. Wavelength



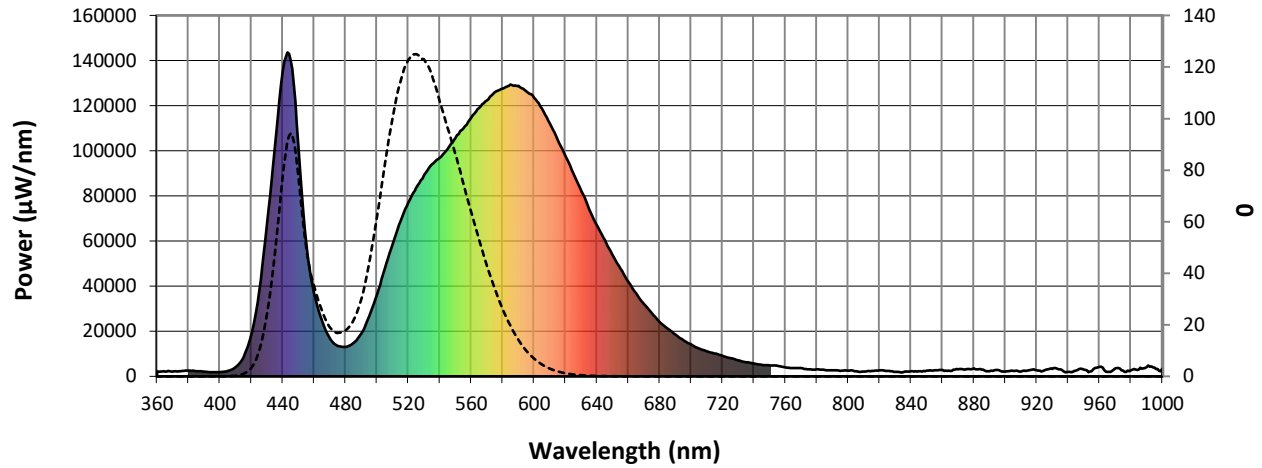
Scotopic Lumens: 10425.8

S/P: 1.47

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 2304                          | 0.0                            | 490               | 19043                         | 29.3                           | 620               | 97577                         | 1.2                            | 750               | 4830                          | 0.0                            | 880               | 3505                          | 0.0                            |
| 365               | 2150                          | 0.0                            | 495               | 26606                         | 43.0                           | 625               | 90158                         | 0.8                            | 755               | 4664                          | 0.0                            | 885               | 2991                          | 0.0                            |
| 370               | 2146                          | 0.0                            | 500               | 36376                         | 60.8                           | 630               | 82240                         | 0.5                            | 760               | 4006                          | 0.0                            | 890               | 2327                          | 0.0                            |
| 375               | 2332                          | 0.0                            | 505               | 47714                         | 81.1                           | 635               | 74361                         | 0.3                            | 765               | 3715                          | 0.0                            | 895               | 2775                          | 0.0                            |
| 380               | 2527                          | 0.0                            | 510               | 58741                         | 99.6                           | 640               | 66994                         | 0.2                            | 770               | 3696                          | 0.0                            | 900               | 2141                          | 0.0                            |
| 385               | 2304                          | 0.0                            | 515               | 68716                         | 113.9                          | 645               | 60405                         | 0.1                            | 775               | 3117                          | 0.0                            | 905               | 2421                          | 0.0                            |
| 390               | 2064                          | 0.0                            | 520               | 77136                         | 122.6                          | 650               | 53806                         | 0.1                            | 780               | 3062                          | 0.0                            | 910               | 2200                          | 0.0                            |
| 395               | 1856                          | 0.0                            | 525               | 83567                         | 125.0                          | 655               | 47610                         | 0.0                            | 785               | 2907                          | 0.0                            | 915               | 2716                          | 0.0                            |
| 400               | 1856                          | 0.0                            | 530               | 89283                         | 123.1                          | 660               | 42018                         | 0.0                            | 790               | 2655                          | 0.0                            | 920               | 2656                          | 0.0                            |
| 405               | 2374                          | 0.1                            | 535               | 94097                         | 117.3                          | 665               | 36742                         | 0.0                            | 795               | 2467                          | 0.0                            | 925               | 2671                          | 0.0                            |
| 410               | 4084                          | 0.2                            | 540               | 96845                         | 107.0                          | 670               | 32105                         | 0.0                            | 800               | 2609                          | 0.0                            | 930               | 3292                          | 0.0                            |
| 415               | 8543                          | 0.9                            | 545               | 100829                        | 96.7                           | 675               | 27946                         | 0.0                            | 805               | 2293                          | 0.0                            | 935               | 3188                          | 0.0                            |
| 420               | 18394                         | 3.0                            | 550               | 105648                        | 86.4                           | 680               | 24146                         | 0.0                            | 810               | 2188                          | 0.0                            | 940               | 1997                          | 0.0                            |
| 425               | 37987                         | 9.3                            | 555               | 110017                        | 75.2                           | 685               | 21191                         | 0.0                            | 815               | 2386                          | 0.0                            | 945               | 2623                          | 0.0                            |
| 430               | 67605                         | 23.0                           | 560               | 114586                        | 64.0                           | 690               | 18544                         | 0.0                            | 820               | 2712                          | 0.0                            | 950               | 2969                          | 0.0                            |
| 435               | 102160                        | 45.7                           | 565               | 118987                        | 53.4                           | 695               | 16058                         | 0.0                            | 825               | 2473                          | 0.0                            | 955               | 2277                          | 0.0                            |
| 440               | 135103                        | 75.5                           | 570               | 122326                        | 43.2                           | 700               | 14133                         | 0.0                            | 830               | 1969                          | 0.0                            | 960               | 4267                          | 0.0                            |
| 445               | 140126                        | 93.8                           | 575               | 125968                        | 34.3                           | 705               | 12309                         | 0.0                            | 835               | 1917                          | 0.0                            | 965               | 2034                          | 0.0                            |
| 450               | 102339                        | 79.3                           | 580               | 127613                        | 26.3                           | 710               | 11142                         | 0.0                            | 840               | 2248                          | 0.0                            | 970               | 3586                          | 0.0                            |
| 455               | 58751                         | 51.3                           | 585               | 129466                        | 19.8                           | 715               | 10143                         | 0.0                            | 845               | 2266                          | 0.0                            | 975               | 2505                          | 0.0                            |
| 460               | 36892                         | 35.6                           | 590               | 128813                        | 14.3                           | 720               | 9072                          | 0.0                            | 850               | 2558                          | 0.0                            | 980               | 2666                          | 0.0                            |
| 465               | 24637                         | 26.0                           | 595               | 126387                        | 10.1                           | 725               | 8130                          | 0.0                            | 855               | 2767                          | 0.0                            | 985               | 2934                          | 0.0                            |
| 470               | 16738                         | 19.3                           | 600               | 123477                        | 7.0                            | 730               | 7149                          | 0.0                            | 860               | 2826                          | 0.0                            | 990               | 4120                          | 0.0                            |
| 475               | 13456                         | 16.8                           | 605               | 118718                        | 4.7                            | 735               | 6311                          | 0.0                            | 865               | 2385                          | 0.0                            | 995               | 3858                          | 0.0                            |
| 480               | 13081                         | 17.7                           | 610               | 112091                        | 3.0                            | 740               | 5711                          | 0.0                            | 870               | 3194                          | 0.0                            | 1000              | 3405                          | 0.0                            |
| 485               | 14734                         | 21.4                           | 615               | 105039                        | 1.9                            | 745               | 5111                          | 0.0                            | 875               | 3189                          | 0.0                            |                   |                               |                                |

REPORT NUMBER: SP1-2101-121-2

### Melanopic Flux vs. Wavelength


**Melanopic Lumens: 3927.2      M/P: 0.55**

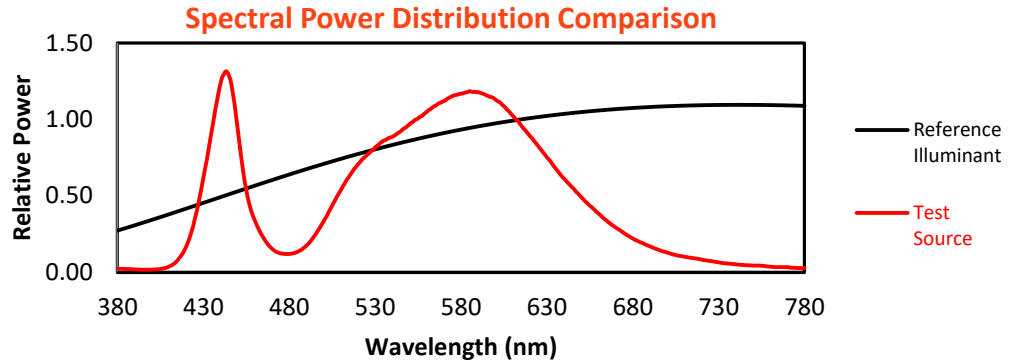
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 2304             | 0.0              | 490       | 19043            | 15.8             | 620       | 97577            | 0.1              | 750       | 4830             | 0.0              | 880       | 3505             | 0.0              |
| 365       | 2150             | 0.0              | 495       | 26606            | 22.0             | 625       | 90158            | 0.0              | 755       | 4664             | 0.0              | 885       | 2991             | 0.0              |
| 370       | 2146             | 0.0              | 500       | 36376            | 29.2             | 630       | 82240            | 0.0              | 760       | 4006             | 0.0              | 890       | 2327             | 0.0              |
| 375       | 2332             | 0.0              | 505       | 47714            | 36.6             | 635       | 74361            | 0.0              | 765       | 3715             | 0.0              | 895       | 2775             | 0.0              |
| 380       | 2527             | 0.0              | 510       | 58741            | 42.2             | 640       | 66994            | 0.0              | 770       | 3696             | 0.0              | 900       | 2141             | 0.0              |
| 385       | 2304             | 0.0              | 515       | 68716            | 44.9             | 645       | 60405            | 0.0              | 775       | 3117             | 0.0              | 905       | 2421             | 0.0              |
| 390       | 2064             | 0.0              | 520       | 77136            | 44.9             | 650       | 53806            | 0.0              | 780       | 3062             | 0.0              | 910       | 2200             | 0.0              |
| 395       | 1856             | 0.0              | 525       | 83567            | 42.4             | 655       | 47610            | 0.0              | 785       | 2907             | 0.0              | 915       | 2716             | 0.0              |
| 400       | 1856             | 0.0              | 530       | 89283            | 38.6             | 660       | 42018            | 0.0              | 790       | 2655             | 0.0              | 920       | 2656             | 0.0              |
| 405       | 2374             | 0.0              | 535       | 94097            | 33.9             | 665       | 36742            | 0.0              | 795       | 2467             | 0.0              | 925       | 2671             | 0.0              |
| 410       | 4084             | 0.2              | 540       | 96845            | 28.3             | 670       | 32105            | 0.0              | 800       | 2609             | 0.0              | 930       | 3292             | 0.0              |
| 415       | 8543             | 0.6              | 545       | 100829           | 23.4             | 675       | 27946            | 0.0              | 805       | 2293             | 0.0              | 935       | 3188             | 0.0              |
| 420       | 18394            | 2.1              | 550       | 105648           | 19.0             | 680       | 24146            | 0.0              | 810       | 2188             | 0.0              | 940       | 1997             | 0.0              |
| 425       | 37987            | 5.9              | 555       | 110017           | 14.8             | 685       | 21191            | 0.0              | 815       | 2386             | 0.0              | 945       | 2623             | 0.0              |
| 430       | 67605            | 14.3             | 560       | 114586           | 11.3             | 690       | 18544            | 0.0              | 820       | 2712             | 0.0              | 950       | 2969             | 0.0              |
| 435       | 102160           | 27.3             | 565       | 118987           | 8.4              | 695       | 16058            | 0.0              | 825       | 2473             | 0.0              | 955       | 2277             | 0.0              |
| 440       | 135103           | 45.1             | 570       | 122326           | 6.0              | 700       | 14133            | 0.0              | 830       | 1969             | 0.0              | 960       | 4267             | 0.0              |
| 445       | 140126           | 55.3             | 575       | 125968           | 4.2              | 705       | 12309            | 0.0              | 835       | 1917             | 0.0              | 965       | 2034             | 0.0              |
| 450       | 102339           | 47.2             | 580       | 127613           | 2.9              | 710       | 11142            | 0.0              | 840       | 2248             | 0.0              | 970       | 3586             | 0.0              |
| 455       | 58751            | 30.8             | 585       | 129466           | 1.9              | 715       | 10143            | 0.0              | 845       | 2266             | 0.0              | 975       | 2505             | 0.0              |
| 460       | 36892            | 21.7             | 590       | 128813           | 1.3              | 720       | 9072             | 0.0              | 850       | 2558             | 0.0              | 980       | 2666             | 0.0              |
| 465       | 24637            | 16.1             | 595       | 126387           | 0.8              | 725       | 8130             | 0.0              | 855       | 2767             | 0.0              | 985       | 2934             | 0.0              |
| 470       | 16738            | 12.0             | 600       | 123477           | 0.5              | 730       | 7149             | 0.0              | 860       | 2826             | 0.0              | 990       | 4120             | 0.0              |
| 475       | 13456            | 10.3             | 605       | 118718           | 0.3              | 735       | 6311             | 0.0              | 865       | 2385             | 0.0              | 995       | 3858             | 0.0              |
| 480       | 13081            | 10.5             | 610       | 112091           | 0.2              | 740       | 5711             | 0.0              | 870       | 3194             | 0.0              | 1000      | 3405             | 0.0              |
| 485       | 14734            | 12.1             | 615       | 105039           | 0.1              | 745       | 5111             | 0.0              | 875       | 3189             | 0.0              |           |                  |                  |

REPORT NUMBER: SP1-2101-121-2

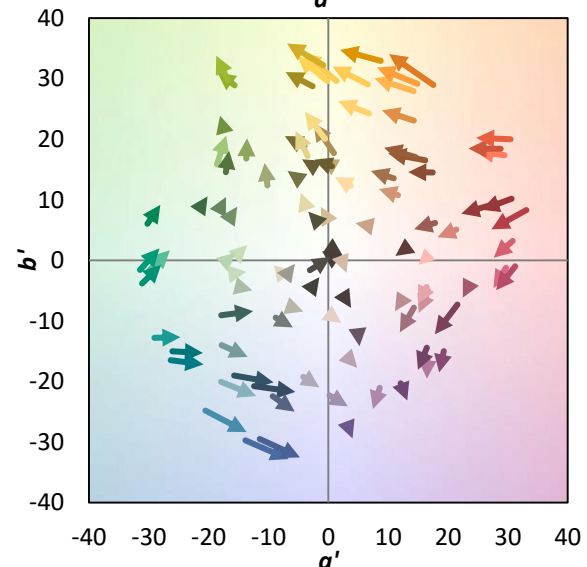
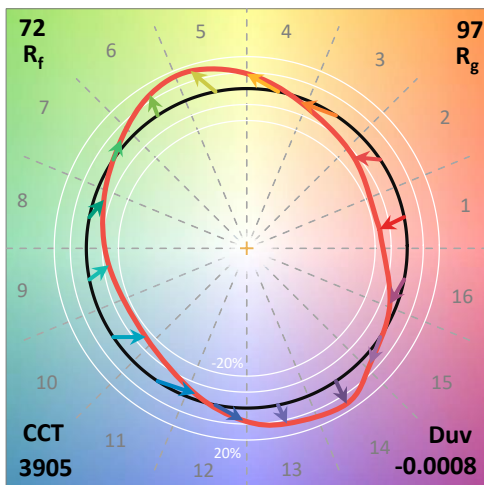
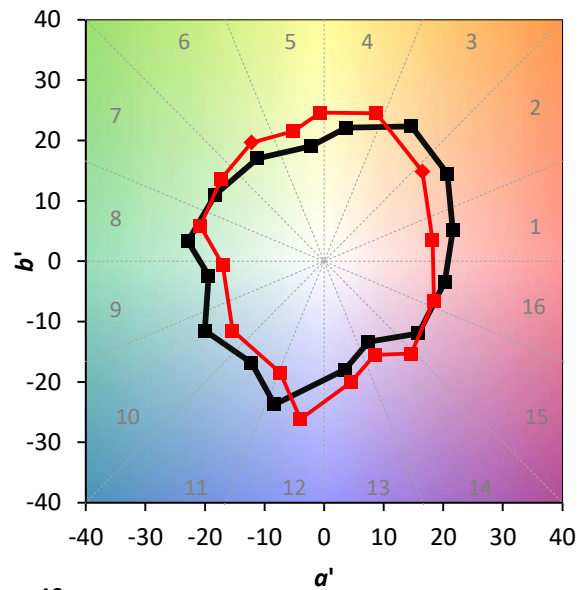
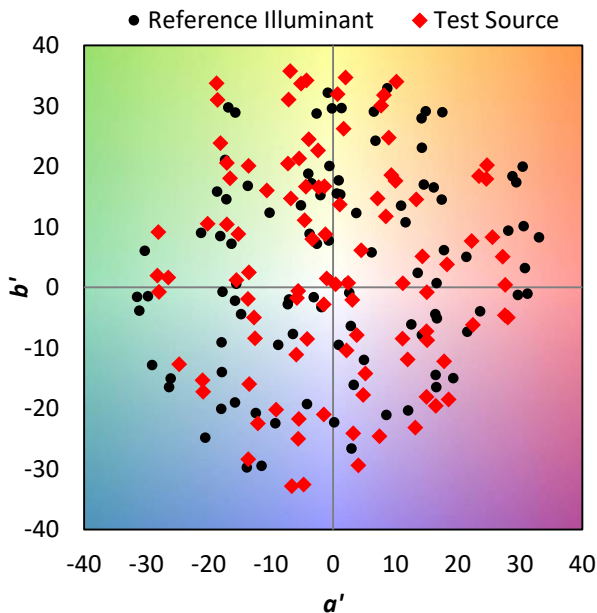
TM-30-18

### Summary

$R_f = 71.7$   
 $R_g = 96.9$   
 CIE  $R_a = 71.2$   
 $R_g = -29.7$



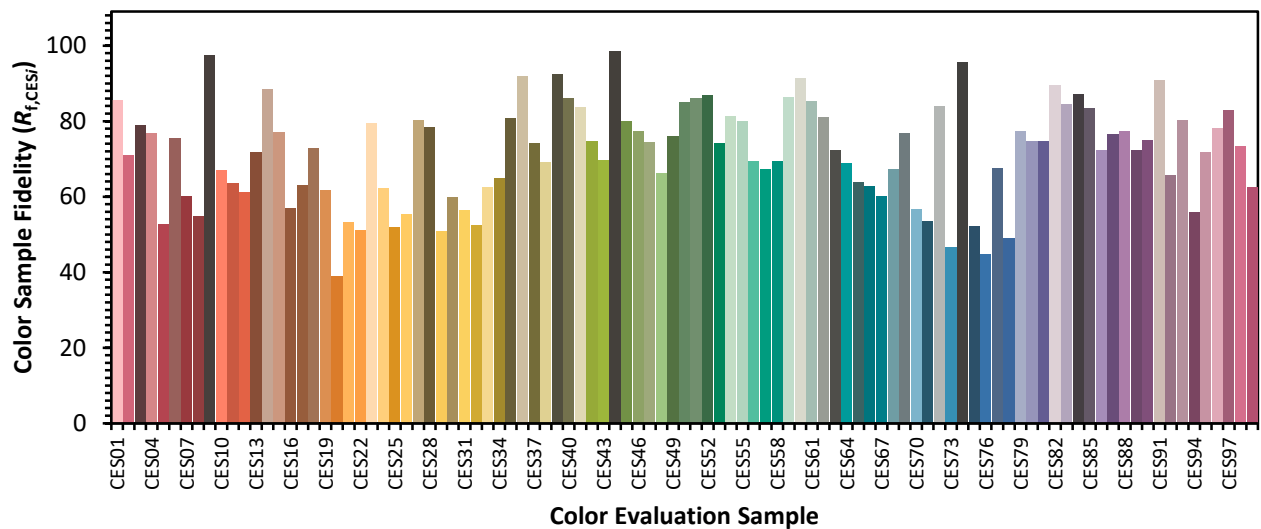
### Color Vector Graphics



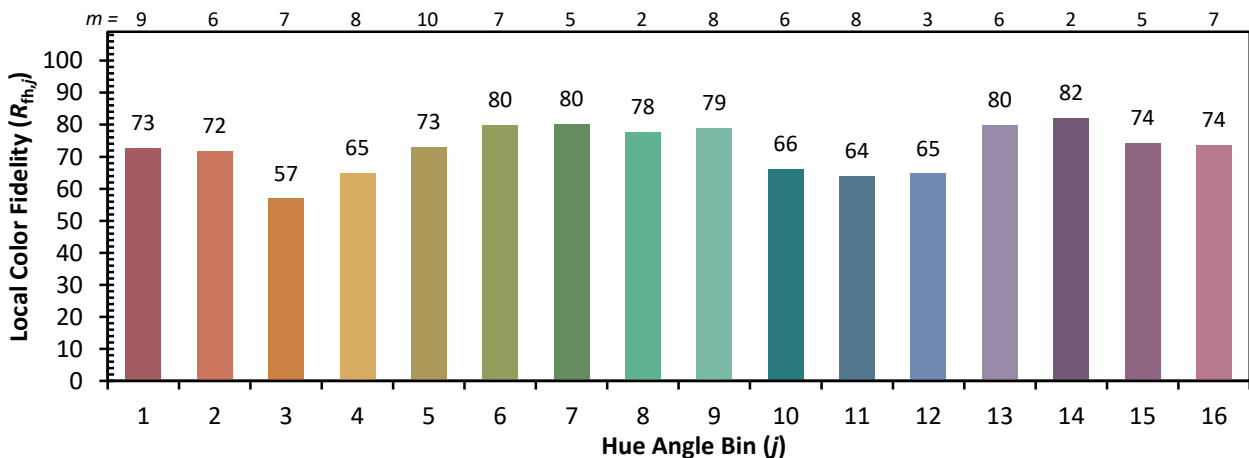
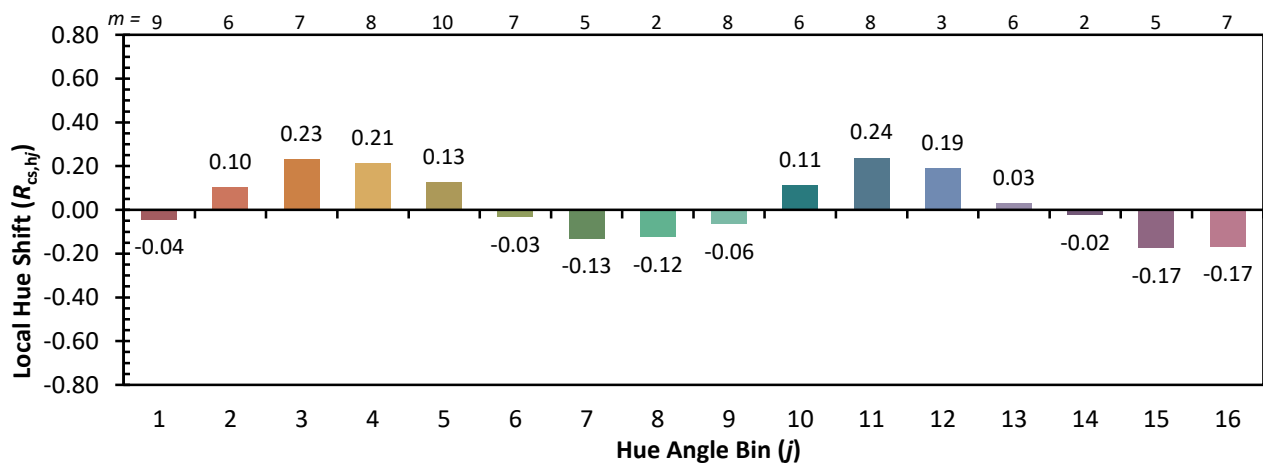
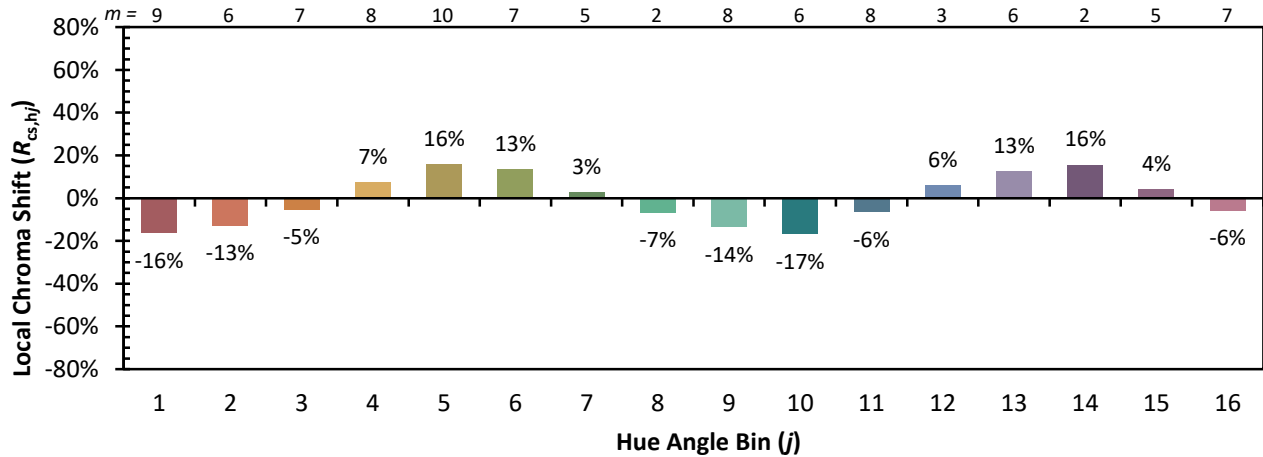


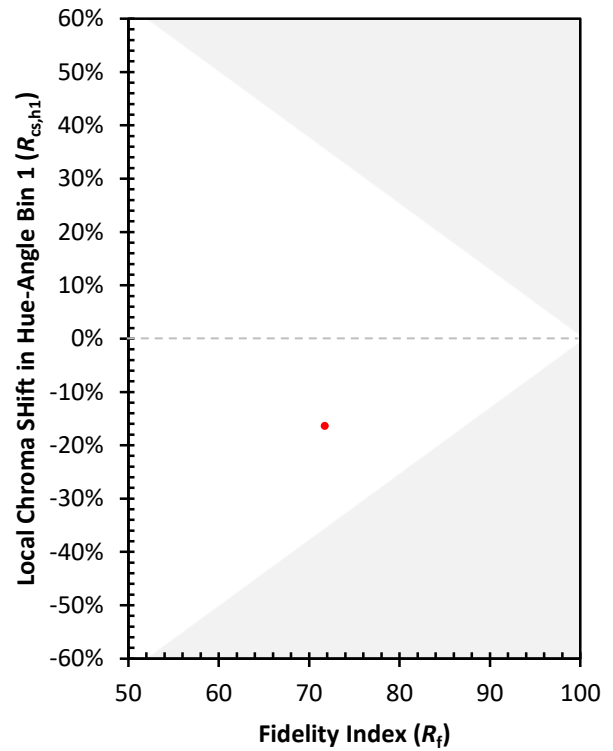
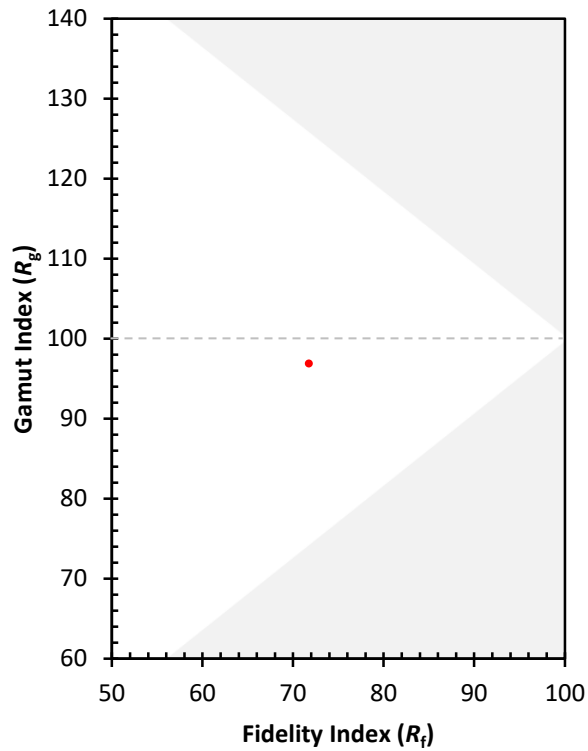
**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 55 | CES51 = 86 | CES76 = 45 |
| CES02 = 61 | CES27 = 80 | CES52 = 87 | CES77 = 68 |
| CES03 = 30 | CES28 = 79 | CES53 = 74 | CES78 = 49 |
| CES04 = 70 | CES29 = 51 | CES54 = 81 | CES79 = 77 |
| CES05 = 47 | CES30 = 60 | CES55 = 80 | CES80 = 75 |
| CES06 = 50 | CES31 = 56 | CES56 = 69 | CES81 = 75 |
| CES07 = 40 | CES32 = 52 | CES57 = 67 | CES82 = 90 |
| CES08 = 39 | CES33 = 62 | CES58 = 69 | CES83 = 85 |
| CES09 = 29 | CES34 = 65 | CES59 = 86 | CES84 = 87 |
| CES10 = 74 | CES35 = 81 | CES60 = 91 | CES85 = 83 |
| CES11 = 57 | CES36 = 92 | CES61 = 85 | CES86 = 72 |
| CES12 = 63 | CES37 = 74 | CES62 = 81 | CES87 = 77 |
| CES13 = 42 | CES38 = 69 | CES63 = 72 | CES88 = 77 |
| CES14 = 74 | CES39 = 92 | CES64 = 69 | CES89 = 72 |
| CES15 = 71 | CES40 = 86 | CES65 = 64 | CES90 = 75 |
| CES16 = 46 | CES41 = 84 | CES66 = 63 | CES91 = 91 |
| CES17 = 49 | CES42 = 75 | CES67 = 60 | CES92 = 66 |
| CES18 = 56 | CES43 = 70 | CES68 = 67 | CES93 = 80 |
| CES19 = 72 | CES44 = 98 | CES69 = 77 | CES94 = 56 |
| CES20 = 65 | CES45 = 80 | CES70 = 57 | CES95 = 72 |
| CES21 = 86 | CES46 = 77 | CES71 = 53 | CES96 = 78 |
| CES22 = 78 | CES47 = 74 | CES72 = 84 | CES97 = 83 |
| CES23 = 92 | CES48 = 66 | CES73 = 47 | CES98 = 73 |
| CES24 = 91 | CES49 = 76 | CES74 = 96 | CES99 = 63 |
| CES25 = 72 | CES50 = 85 | CES75 = 52 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**


(END OF REPORT)