

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: P359811

Luminaire Tested: NVN-SA5D-730-U-T2-HSS

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P359811  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-13)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA5D-730-U-T2-HSS  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(5) 70 CRI, 3000K, 1200mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II  
OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 25327 lumens  
Efficiency: N/A  
Efficacy: 79.1 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1.5' x H: 0')  
IES Classification: Type II - Medium  
BUG Rating: B2 - U0 - G4

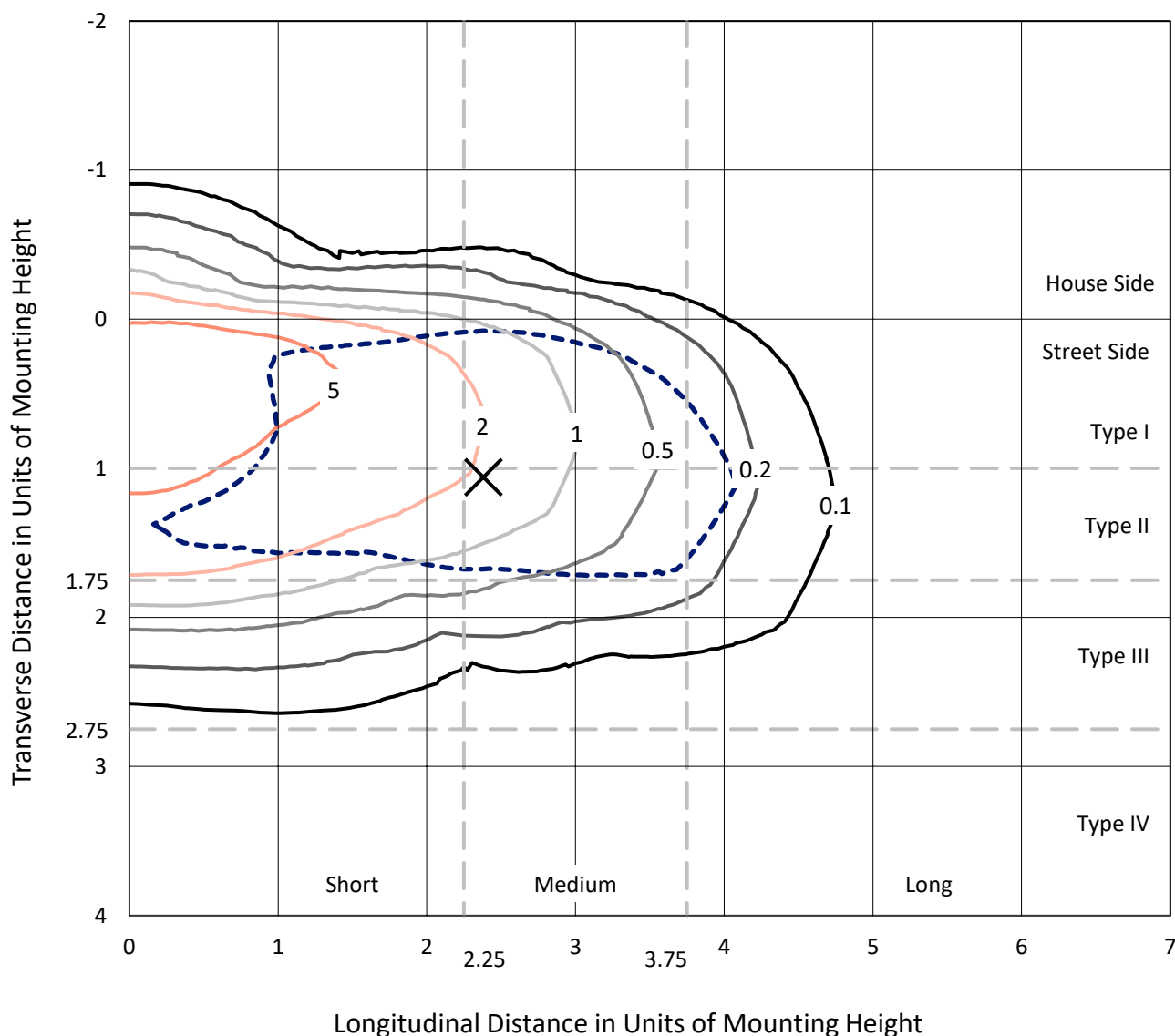
Input Watts (W): 320  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

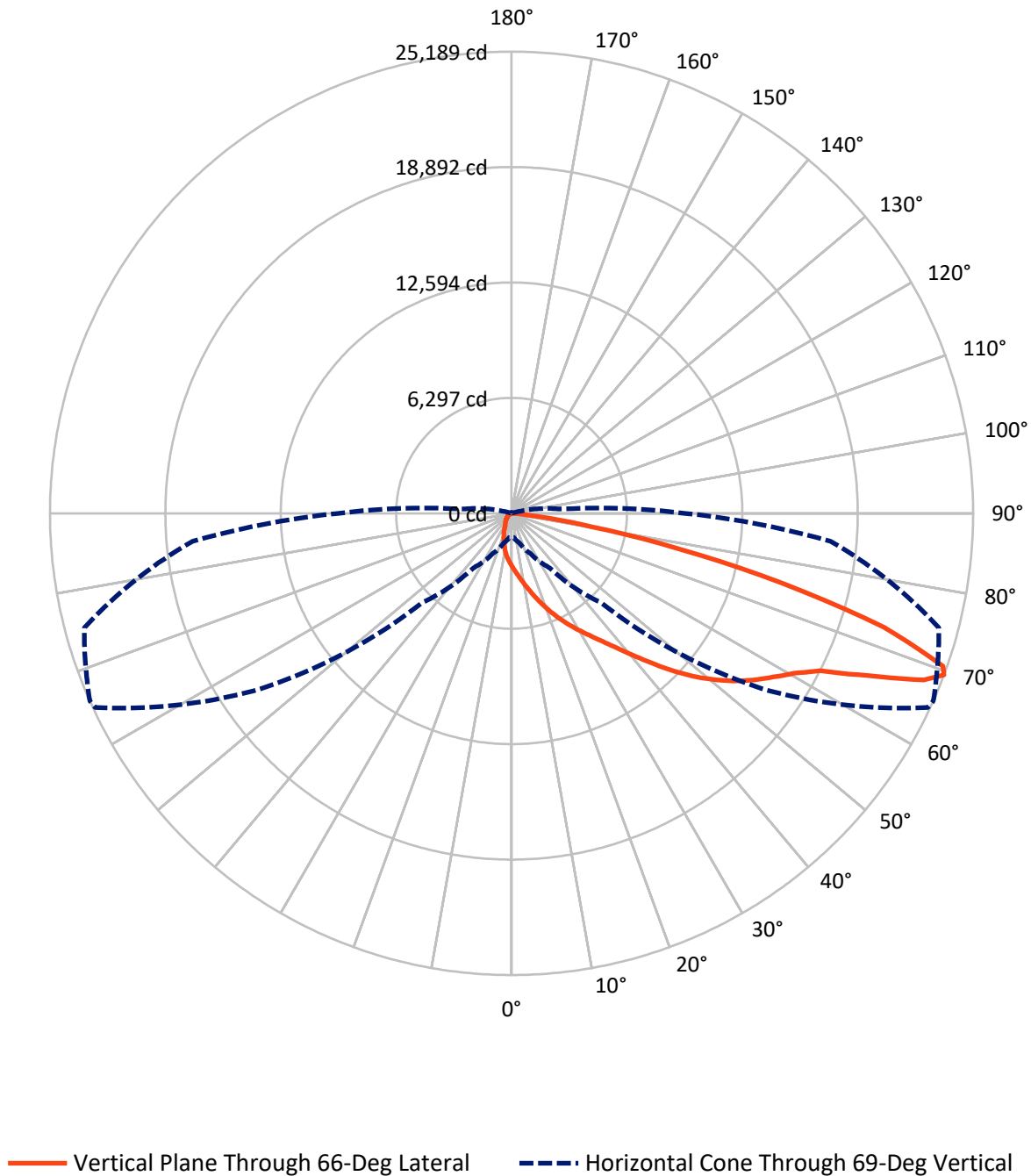
× Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 7.6 fc  
 Type II - Medium - N/A

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## Luminous Intensity Polar Plot



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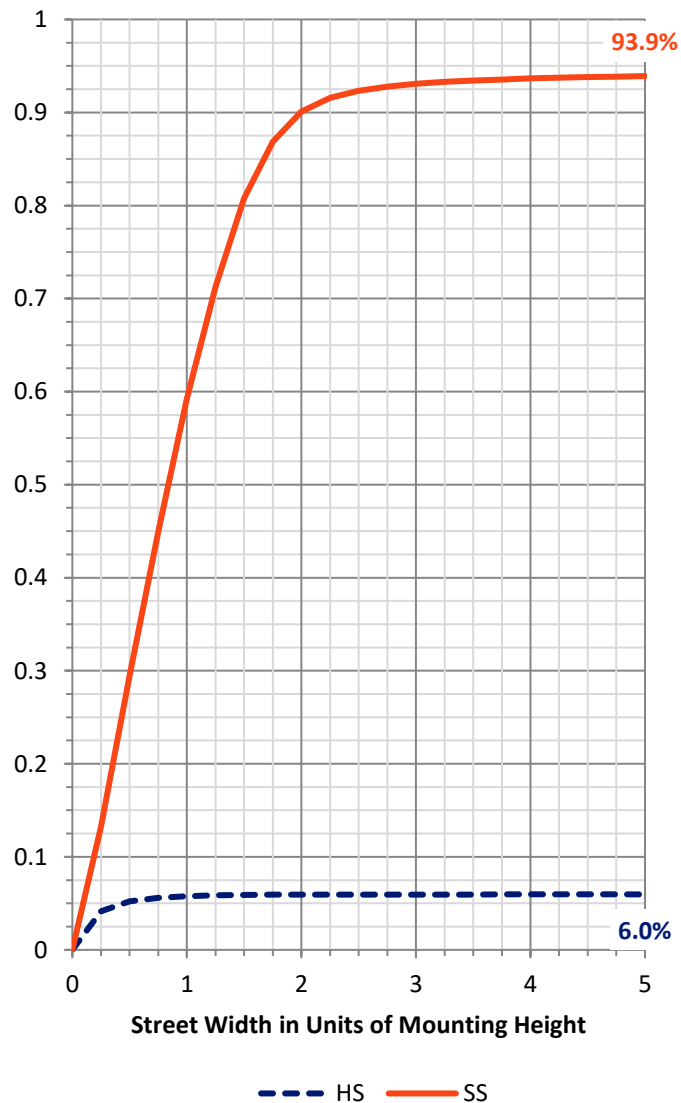
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 1519.3   | 0.0    | 1519.3  |
|                    | % Fixture | 6.0      | 0.0    | 6.0     |
| <b>Street Side</b> | Lumens    | 23807.7  | 0.0    | 23807.7 |
|                    | % Fixture | 94.0     | 0.0    | 94.0    |
| <b>Total</b>       | Lumens    | 25327.0  | 0.0    | 25327.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 278.6   | 1.1       |
| 10°-20°   | 829.2   | 3.3       |
| 20°-30°   | 1443.9  | 5.7       |
| 30°-40°   | 2533.4  | 10.0      |
| 40°-50°   | 4240.5  | 16.7      |
| 50°-60°   | 6233.1  | 24.6      |
| 60°-70°   | 6399.9  | 25.3      |
| 70°-80°   | 3159.4  | 12.5      |
| 80°-90°   | 208.9   | 0.8       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 25327.0 | 100.0     |
| 0°-180°   | 25327.0 | 100.0     |

**Coefficient of Utilization**



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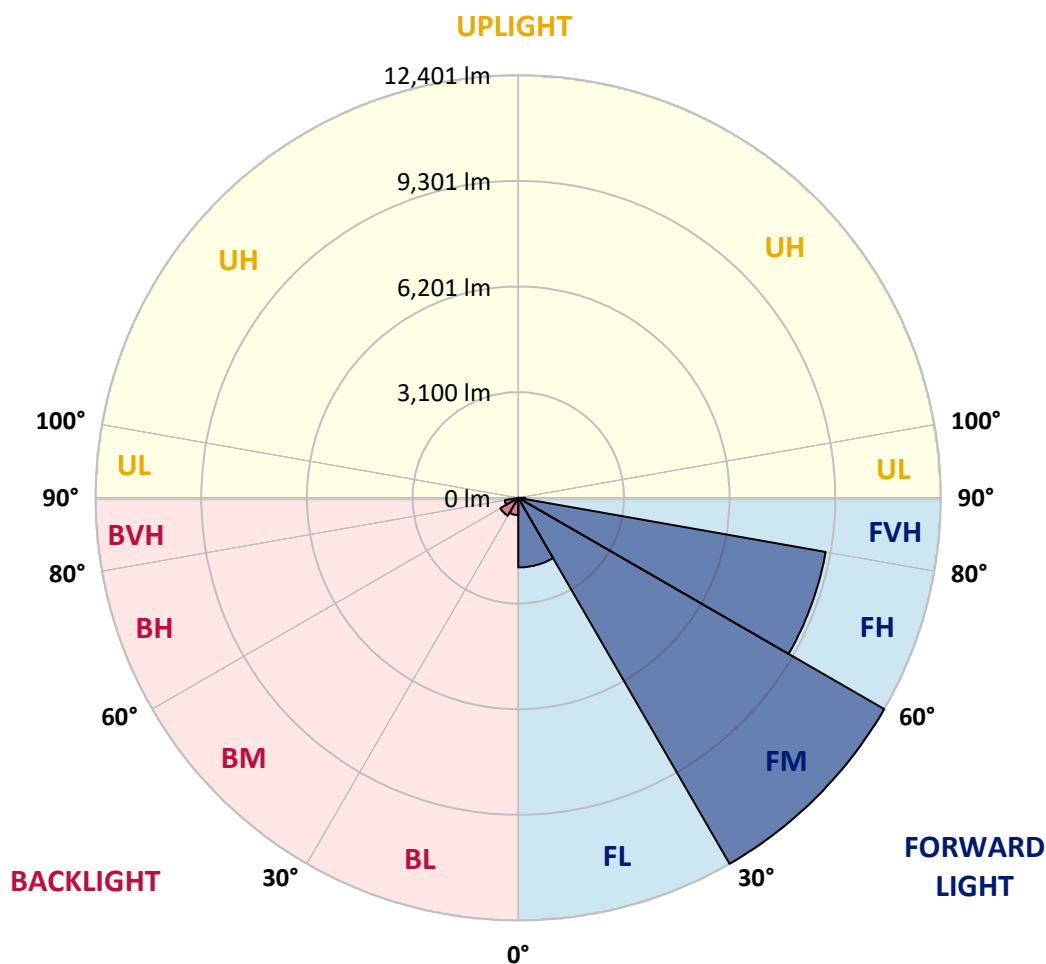
CATALOG NUMBER: NVN-SA5D-730-U-T2-HSS

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

| Zone |             | Lumens  | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|---------|-----------|-------------------------|------|----------|
|      |             |         |           | B                       | U    | G        |
| FL   | (0°-30°)    | 2043.6  | 8.1       |                         |      |          |
| FM   | (30°-60°)   | 12401.3 | 49.0      |                         |      |          |
| FH   | (60°-80°)   | 9158.9  | 36.2      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 203.9   | 0.8       |                         |      | G2/225   |
| BL   | (0°-30°)    | 508.1   | 2.0       | B2/1000                 |      |          |
| BM   | (30°-60°)   | 605.7   | 2.4       | B1/1000                 |      |          |
| BH   | (60°-80°)   | 400.4   | 1.6       | 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-G4**

Type II Medium





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 55°     | 65°     | 66°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  | 2882.3  |
| 2.5°  | 3392.3  | 3377.9  | 3371.9  | 3345.4  | 3299.7  | 3264.8  | 3197.5  | 3119.3  | 3104.8  | 3029.1  | 2936.4  |
| 5°    | 3832.6  | 3820.6  | 3812.2  | 3774.9  | 3728.0  | 3640.2  | 3517.5  | 3371.9  | 3344.2  | 3199.9  | 3014.6  |
| 7.5°  | 4139.4  | 4161.0  | 4161.0  | 4137.0  | 4078.0  | 4011.9  | 3861.5  | 3663.0  | 3628.1  | 3406.8  | 3119.3  |
| 10°   | 4318.6  | 4345.1  | 4365.5  | 4386.0  | 4377.6  | 4351.1  | 4209.2  | 3985.4  | 3943.3  | 3649.8  | 3240.8  |
| 12.5° | 4335.5  | 4361.9  | 4419.7  | 4505.1  | 4588.1  | 4648.2  | 4559.2  | 4342.7  | 4294.6  | 3931.3  | 3385.1  |
| 15°   | 4241.6  | 4269.3  | 4358.3  | 4524.3  | 4725.2  | 4900.9  | 4929.7  | 4738.5  | 4689.1  | 4266.9  | 3565.6  |
| 17.5° | 4078.0  | 4096.1  | 4223.6  | 4453.4  | 4768.5  | 5090.9  | 5265.4  | 5163.1  | 5117.4  | 4650.6  | 3766.5  |
| 20°   | 3956.5  | 3969.8  | 4081.6  | 4328.3  | 4742.1  | 5210.0  | 5582.9  | 5614.2  | 5566.1  | 5062.1  | 3984.2  |
| 22.5° | 4164.7  | 4188.7  | 4192.3  | 4309.0  | 4669.9  | 5269.0  | 5862.0  | 6058.1  | 6022.0  | 5498.7  | 4198.3  |
| 25°   | 4733.7  | 4761.3  | 4669.9  | 4597.7  | 4731.2  | 5295.4  | 6101.4  | 6512.8  | 6484.0  | 5969.1  | 4413.7  |
| 27.5° | 5485.5  | 5514.4  | 5396.5  | 5181.2  | 5052.4  | 5395.3  | 6314.3  | 6974.8  | 6973.6  | 6467.1  | 4645.8  |
| 30°   | 6224.1  | 6253.0  | 6132.7  | 5917.4  | 5621.4  | 5678.0  | 6498.4  | 7458.4  | 7465.6  | 6980.8  | 4892.4  |
| 32.5° | 6998.8  | 7034.9  | 6911.0  | 6634.3  | 6325.2  | 6166.4  | 6757.0  | 7944.4  | 7985.3  | 7576.2  | 5170.3  |
| 35°   | 7879.4  | 7884.2  | 7709.8  | 7419.9  | 7063.8  | 6819.6  | 7172.1  | 8489.3  | 8586.7  | 8313.7  | 5522.8  |
| 37.5° | 8743.1  | 8778.0  | 8634.9  | 8177.7  | 7850.5  | 7573.8  | 7789.2  | 9170.2  | 9308.5  | 9214.7  | 5983.5  |
| 40°   | 9383.1  | 9456.5  | 9436.0  | 8942.8  | 8632.4  | 8435.2  | 8555.5  | 9979.8  | 10155.4 | 10263.7 | 6564.6  |
| 42.5° | 9784.9  | 9840.2  | 9934.0  | 9636.9  | 9355.4  | 9387.9  | 9460.1  | 10922.9 | 11139.4 | 11459.4 | 7232.2  |
| 45°   | 10245.6 | 10272.1 | 10350.3 | 10219.2 | 10029.1 | 10356.3 | 10420.0 | 11985.1 | 12212.5 | 12745.4 | 7973.2  |
| 47.5° | 10808.6 | 10871.2 | 10892.8 | 10772.5 | 10685.9 | 11212.8 | 11345.1 | 12951.1 | 13269.9 | 14122.8 | 8757.6  |
| 50°   | 11525.6 | 11542.4 | 11579.7 | 11501.5 | 11414.9 | 11949.0 | 12175.2 | 13965.2 | 14255.1 | 15505.0 | 9531.1  |
| 52.5° | 12226.9 | 12287.0 | 12417.0 | 12367.6 | 12332.8 | 12575.8 | 12915.0 | 14879.4 | 15203.0 | 16657.4 | 10303.4 |
| 55°   | 12429.0 | 12480.7 | 12929.4 | 13236.2 | 13520.1 | 13348.1 | 13622.3 | 15698.6 | 16048.7 | 17687.1 | 11046.8 |
| 57.5° | 11621.8 | 11726.5 | 12503.6 | 13302.3 | 14480.0 | 14548.6 | 14594.3 | 16539.5 | 16853.5 | 18476.3 | 11820.3 |
| 60°   | 9581.6  | 9602.0  | 10877.2 | 12247.3 | 14321.2 | 15596.4 | 16013.8 | 17442.9 | 17706.4 | 19211.3 | 12746.6 |
| 62.5° | 6094.2  | 6302.3  | 7701.4  | 9635.7  | 12641.9 | 15444.8 | 17730.4 | 18809.5 | 18905.7 | 20093.1 | 14074.6 |
| 65°   | 2902.7  | 3037.5  | 4045.6  | 5953.5  | 9156.9  | 13504.4 | 18915.4 | 21281.6 | 21324.9 | 21841.0 | 15849.0 |
| 67.5° | 1607.2  | 1672.1  | 2152.1  | 3204.7  | 5353.2  | 9550.3  | 18436.6 | 24209.6 | 24250.5 | 23626.1 | 17405.6 |
| 69°   | 1257.1  | 1312.4  | 1690.2  | 2415.5  | 3629.3  | 6864.1  | 16683.9 | 25067.3 | 25188.8 | 24137.4 | 17461.0 |
| 70°   | 1067.0  | 1121.2  | 1455.6  | 2040.2  | 2918.4  | 5303.9  | 14850.6 | 24854.4 | 24983.1 | 24089.3 | 17048.4 |
| 72.5° | 653.2   | 684.5   | 969.6   | 1436.3  | 1956.0  | 2668.2  | 9158.1  | 21019.3 | 21237.1 | 22097.2 | 14652.1 |
| 75°   | 440.3   | 457.1   | 606.3   | 991.2   | 1399.0  | 1373.8  | 4757.7  | 14815.7 | 15287.2 | 17189.1 | 10821.8 |
| 77.5° | 315.2   | 330.8   | 406.6   | 641.2   | 980.4   | 907.0   | 2154.5  | 9207.5  | 9308.5  | 10309.4 | 5901.7  |
| 80°   | 179.2   | 193.7   | 287.5   | 381.3   | 665.2   | 605.1   | 856.5   | 4398.0  | 4448.5  | 4420.9  | 1970.4  |
| 82.5° | 93.8    | 105.9   | 157.6   | 251.4   | 427.1   | 395.8   | 356.1   | 1472.4  | 1479.6  | 1230.6  | 431.9   |
| 85°   | 18.0    | 21.7    | 78.2    | 172.0   | 220.1   | 172.0   | 145.6   | 345.2   | 352.5   | 311.6   | 107.1   |
| 87.5° | 0.0     | 1.2     | 31.3    | 38.5    | 43.3    | 44.5    | 46.9    | 67.4    | 72.2    | 97.4    | 28.9    |
| 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: P359811

CATALOG NUMBER: NVN-SA5D-730-U-T2-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 | 2882.3 |
| 2.5°  | 2895.5 | 2852.2 | 2769.2 | 2673.0 | 2598.4 | 2525.0 | 2467.3 | 2407.1 | 2385.5 | 2374.6 | 2373.4 |
| 5°    | 2924.4 | 2833.0 | 2657.3 | 2476.9 | 2328.9 | 2189.4 | 2089.5 | 1994.5 | 1950.0 | 1929.5 | 1921.1 |
| 7.5°  | 2972.5 | 2825.8 | 2543.1 | 2267.6 | 2054.7 | 1880.2 | 1741.9 | 1638.4 | 1586.7 | 1565.1 | 1556.6 |
| 10°   | 3029.1 | 2816.1 | 2409.5 | 2046.2 | 1774.4 | 1593.9 | 1456.8 | 1354.5 | 1298.0 | 1273.9 | 1261.9 |
| 12.5° | 3095.2 | 2799.3 | 2255.6 | 1822.5 | 1535.0 | 1354.5 | 1188.5 | 1062.2 | 997.3  | 969.6  | 956.4  |
| 15°   | 3177.0 | 2782.4 | 2094.4 | 1612.0 | 1324.5 | 1104.3 | 922.7  | 837.3  | 824.0  | 819.2  | 820.4  |
| 17.5° | 3257.6 | 2756.0 | 1918.7 | 1403.9 | 1103.1 | 862.5  | 769.9  | 765.1  | 767.5  | 767.5  | 767.5  |
| 20°   | 3329.8 | 2695.8 | 1727.5 | 1225.8 | 892.6  | 727.8  | 708.5  | 700.1  | 694.1  | 689.3  | 683.3  |
| 22.5° | 3386.3 | 2615.2 | 1543.4 | 1049.0 | 729.0  | 666.4  | 636.4  | 609.9  | 588.2  | 573.8  | 566.6  |
| 25°   | 3424.8 | 2508.2 | 1375.0 | 879.4  | 655.6  | 606.3  | 552.2  | 507.6  | 474.0  | 453.5  | 445.1  |
| 27.5° | 3453.7 | 2392.7 | 1224.6 | 736.2  | 605.1  | 536.5  | 465.5  | 412.6  | 377.7  | 359.7  | 352.5  |
| 30°   | 3474.2 | 2261.6 | 1092.3 | 647.2  | 548.6  | 463.1  | 387.4  | 335.6  | 310.4  | 300.7  | 295.9  |
| 32.5° | 3493.4 | 2116.0 | 967.2  | 605.1  | 495.6  | 395.8  | 324.8  | 285.1  | 269.5  | 257.4  | 253.8  |
| 35°   | 3541.5 | 1981.3 | 848.1  | 560.6  | 441.5  | 338.0  | 279.1  | 250.2  | 234.6  | 227.4  | 225.0  |
| 37.5° | 3655.8 | 1881.4 | 733.8  | 514.9  | 387.4  | 292.3  | 244.2  | 223.8  | 209.3  | 202.1  | 199.7  |
| 40°   | 3839.9 | 1830.9 | 637.6  | 465.5  | 334.4  | 257.4  | 221.3  | 202.1  | 186.5  | 175.6  | 173.2  |
| 42.5° | 4110.5 | 1838.1 | 570.2  | 416.2  | 292.3  | 229.8  | 199.7  | 176.8  | 160.0  | 150.4  | 148.0  |
| 45°   | 4438.9 | 1891.1 | 523.3  | 368.1  | 257.4  | 208.1  | 175.6  | 151.6  | 135.9  | 127.5  | 125.1  |
| 47.5° | 4795.0 | 1976.5 | 484.8  | 324.8  | 229.8  | 187.7  | 151.6  | 126.3  | 113.1  | 105.9  | 104.7  |
| 50°   | 5170.3 | 2059.5 | 445.1  | 282.7  | 205.7  | 167.2  | 127.5  | 104.7  | 93.8   | 87.8   | 85.4   |
| 52.5° | 5550.5 | 2155.7 | 409.0  | 244.2  | 185.3  | 143.2  | 105.9  | 85.4   | 77.0   | 72.2   | 69.8   |
| 55°   | 5959.5 | 2227.9 | 374.1  | 214.1  | 164.8  | 121.5  | 87.8   | 71.0   | 63.8   | 57.7   | 56.5   |
| 57.5° | 6440.7 | 2339.8 | 338.0  | 185.3  | 140.7  | 101.0  | 72.2   | 56.5   | 50.5   | 44.5   | 43.3   |
| 60°   | 7090.3 | 2470.9 | 299.5  | 163.6  | 115.5  | 83.0   | 58.9   | 45.7   | 38.5   | 33.7   | 32.5   |
| 62.5° | 7946.8 | 2616.4 | 251.4  | 143.2  | 93.8   | 67.4   | 46.9   | 36.1   | 27.7   | 21.7   | 21.7   |
| 65°   | 9033.0 | 2853.4 | 205.7  | 120.3  | 77.0   | 55.3   | 36.1   | 26.5   | 15.6   | 9.6    | 9.6    |
| 67.5° | 9667.0 | 2894.3 | 166.0  | 98.6   | 62.6   | 46.9   | 30.1   | 18.0   | 4.8    | 1.2    | 0.0    |
| 69°   | 9463.7 | 2657.3 | 140.7  | 84.2   | 54.1   | 44.5   | 27.7   | 13.2   | 2.4    | 0.0    | 0.0    |
| 70°   | 9081.2 | 2430.0 | 123.9  | 74.6   | 49.3   | 42.1   | 26.5   | 9.6    | 2.4    | 0.0    | 0.0    |
| 72.5° | 7504.1 | 1729.9 | 93.8   | 55.3   | 36.1   | 37.3   | 24.1   | 6.0    | 2.4    | 0.0    | 0.0    |
| 75°   | 5466.3 | 1051.4 | 67.4   | 38.5   | 22.9   | 27.7   | 16.8   | 2.4    | 1.2    | 0.0    | 0.0    |
| 77.5° | 3041.1 | 495.6  | 42.1   | 21.7   | 14.4   | 16.8   | 8.4    | 0.0    | 0.0    | 0.0    | 0.0    |
| 80°   | 987.6  | 134.7  | 19.2   | 12.0   | 8.4    | 9.6    | 3.6    | 0.0    | 0.0    | 0.0    | 0.0    |
| 82.5° | 182.9  | 38.5   | 10.8   | 6.0    | 2.4    | 2.4    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 85°   | 39.7   | 15.6   | 6.0    | 2.4    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 87.5° | 13.2   | 4.8    | 1.2    | 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-79-2008: Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-1908-441-2-R4

Test Date: 10/03/2019

Luminaire Tested: SA1C-730-U-5WQ

Data in this report applies to families of products SA1C-730-U-5WQ .

### Test Information

Test Method: LM-79-2008  
 Report Number: SP1-1908-441-2-R4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/28/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **SA1C-730-U-5WQ**  
 Description: MCGRAW EDISON ROADWAY AND AREA LUMINAIRE

\*\*\*THIS IS A REVISION OF SP1-1908-441-2-R3. TO UPDATE THE CATALOG INFORMATION.\*\*\*TESTED IN SITU. (1) 70 CRI, 3000K, 1050MA LIGHTSQUARE WITH 16 LEDS AND TYPE V WIDE OPTICS.

### Spectral Parameters

|                           |        |           |      |      |       |
|---------------------------|--------|-----------|------|------|-------|
| CCT (K):                  | 2993   | CRI (Ra): | 71.8 |      |       |
| CIE u':                   | 0.2508 | R1:       | 67.5 | R9:  | -38.3 |
| CIE v':                   | 0.5215 | R2:       | 82.9 | R10: | 62.5  |
| Duv:                      | 0.0000 | R3:       | 94.7 | R11: | 63.7  |
| CIE x:                    | 0.4374 | R4:       | 67.7 | R12: | 57.8  |
| CIE y:                    | 0.4043 | R5:       | 67.9 | R13: | 70.4  |
| CIE z:                    | 0.1583 | R6:       | 77.6 | R14: | 97.3  |
| Peak Wavelength (nm):     | 593    | R7:       | 76.0 |      |       |
| Dominant Wavelength (nm): | 582    | R8:       | 40.5 |      |       |
| Purity:                   | 53     |           |      |      |       |
| Rf:                       | 75.7   |           |      |      |       |
| Rg:                       | 93.9   |           |      |      |       |



### Test Conditions

Stabilization Time: 53M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.0./44%  
 Sphere Temperature (°C): 25.7

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| 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            |

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**CIE 1931 Chromaticity Diagram**



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



Point lies inside the ANSI 3000K 4-step quadrangle

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**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       | 2397             | NR               | 490       | 24908            | NR               | 620       | 118784           | NR               | 750       | 5037             | NR               | 880       | 2677             | NR               |
| 365       | 2084             | NR               | 495       | 30998            | NR               | 625       | 108951           | NR               | 755       | 4413             | NR               | 885       | 2940             | NR               |
| 370       | 2143             | NR               | 500       | 37103            | NR               | 630       | 99573            | NR               | 760       | 4189             | NR               | 890       | 3116             | NR               |
| 375       | 2413             | NR               | 505       | 42987            | NR               | 635       | 90444            | NR               | 765       | 3677             | NR               | 895       | 3345             | NR               |
| 380       | 2172             | NR               | 510       | 48702            | NR               | 640       | 80749            | NR               | 770       | 3366             | NR               | 900       | 2312             | NR               |
| 385       | 1997             | NR               | 515       | 53741            | NR               | 645       | 71664            | NR               | 775       | 3211             | NR               | 905       | 2829             | NR               |
| 390       | 1830             | NR               | 520       | 57283            | NR               | 650       | 63936            | NR               | 780       | 2682             | NR               | 910       | 2783             | NR               |
| 395       | 1861             | NR               | 525       | 61876            | NR               | 655       | 56611            | NR               | 785       | 2804             | NR               | 915       | 2662             | NR               |
| 400       | 1717             | NR               | 530       | 65398            | NR               | 660       | 49763            | NR               | 790       | 2581             | NR               | 920       | 3047             | NR               |
| 405       | 1761             | NR               | 535       | 69597            | NR               | 665       | 42891            | NR               | 795       | 2711             | NR               | 925       | 2256             | NR               |
| 410       | 2680             | NR               | 540       | 74214            | NR               | 670       | 36939            | NR               | 800       | 2609             | NR               | 930       | 2976             | NR               |
| 415       | 4374             | NR               | 545       | 79911            | NR               | 675       | 31946            | NR               | 805       | 2581             | NR               | 935       | 3503             | NR               |
| 420       | 8071             | NR               | 550       | 86153            | NR               | 680       | 27385            | NR               | 810       | 2404             | NR               | 940       | 4226             | NR               |
| 425       | 15169            | NR               | 555       | 93952            | NR               | 685       | 23504            | NR               | 815       | 2556             | NR               | 945       | 2930             | NR               |
| 430       | 26038            | NR               | 560       | 102904           | NR               | 690       | 20210            | NR               | 820       | 2742             | NR               | 950       | 2115             | NR               |
| 435       | 41316            | NR               | 565       | 112009           | NR               | 695       | 17459            | NR               | 825       | 2014             | NR               | 955       | 2634             | NR               |
| 440       | 59674            | NR               | 570       | 121662           | NR               | 700       | 15207            | NR               | 830       | 2488             | NR               | 960       | 4200             | NR               |
| 445       | 72751            | NR               | 575       | 130476           | NR               | 705       | 13322            | NR               | 835       | 2625             | NR               | 965       | 1982             | NR               |
| 450       | 65091            | NR               | 580       | 137926           | NR               | 710       | 11676            | NR               | 840       | 2754             | NR               | 970       | 3613             | NR               |
| 455       | 44894            | NR               | 585       | 143406           | NR               | 715       | 10626            | NR               | 845       | 2708             | NR               | 975       | 4034             | NR               |
| 460       | 32712            | NR               | 590       | 147039           | NR               | 720       | 9416             | NR               | 850       | 2608             | NR               | 980       | 3922             | NR               |
| 465       | 25296            | NR               | 595       | 147365           | NR               | 725       | 8333             | NR               | 855       | 2605             | NR               | 985       | 1909             | NR               |
| 470       | 19318            | NR               | 600       | 145800           | NR               | 730       | 7134             | NR               | 860       | 1765             | NR               | 990       | 3617             | NR               |
| 475       | 17265            | NR               | 605       | 141363           | NR               | 735       | 6437             | NR               | 865       | 2581             | NR               | 995       | 4767             | NR               |
| 480       | 18260            | NR               | 610       | 134199           | NR               | 740       | 5834             | NR               | 870       | 3016             | NR               | 1000      | 2528             | NR               |
| 485       | 20845            | NR               | 615       | 127683           | NR               | 745       | 5500             | NR               | 875       | 3952             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 8494.8

S/P: 1.23

| 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       | 2397             | NR               | 490       | 24908            | NR               | 620       | 118784           | NR               | 750       | 5037             | NR               | 880       | 2677             | NR               |
| 365       | 2084             | NR               | 495       | 30998            | NR               | 625       | 108951           | NR               | 755       | 4413             | NR               | 885       | 2940             | NR               |
| 370       | 2143             | NR               | 500       | 37103            | NR               | 630       | 99573            | NR               | 760       | 4189             | NR               | 890       | 3116             | NR               |
| 375       | 2413             | NR               | 505       | 42987            | NR               | 635       | 90444            | NR               | 765       | 3677             | NR               | 895       | 3345             | NR               |
| 380       | 2172             | NR               | 510       | 48702            | NR               | 640       | 80749            | NR               | 770       | 3366             | NR               | 900       | 2312             | NR               |
| 385       | 1997             | NR               | 515       | 53741            | NR               | 645       | 71664            | NR               | 775       | 3211             | NR               | 905       | 2829             | NR               |
| 390       | 1830             | NR               | 520       | 57283            | NR               | 650       | 63936            | NR               | 780       | 2682             | NR               | 910       | 2783             | NR               |
| 395       | 1861             | NR               | 525       | 61876            | NR               | 655       | 56611            | NR               | 785       | 2804             | NR               | 915       | 2662             | NR               |
| 400       | 1717             | NR               | 530       | 65398            | NR               | 660       | 49763            | NR               | 790       | 2581             | NR               | 920       | 3047             | NR               |
| 405       | 1761             | NR               | 535       | 69597            | NR               | 665       | 42891            | NR               | 795       | 2711             | NR               | 925       | 2256             | NR               |
| 410       | 2680             | NR               | 540       | 74214            | NR               | 670       | 36939            | NR               | 800       | 2609             | NR               | 930       | 2976             | NR               |
| 415       | 4374             | NR               | 545       | 79911            | NR               | 675       | 31946            | NR               | 805       | 2581             | NR               | 935       | 3503             | NR               |
| 420       | 8071             | NR               | 550       | 86153            | NR               | 680       | 27385            | NR               | 810       | 2404             | NR               | 940       | 4226             | NR               |
| 425       | 15169            | NR               | 555       | 93952            | NR               | 685       | 23504            | NR               | 815       | 2556             | NR               | 945       | 2930             | NR               |
| 430       | 26038            | NR               | 560       | 102904           | NR               | 690       | 20210            | NR               | 820       | 2742             | NR               | 950       | 2115             | NR               |
| 435       | 41316            | NR               | 565       | 112009           | NR               | 695       | 17459            | NR               | 825       | 2014             | NR               | 955       | 2634             | NR               |
| 440       | 59674            | NR               | 570       | 121662           | NR               | 700       | 15207            | NR               | 830       | 2488             | NR               | 960       | 4200             | NR               |
| 445       | 72751            | NR               | 575       | 130476           | NR               | 705       | 13322            | NR               | 835       | 2625             | NR               | 965       | 1982             | NR               |
| 450       | 65091            | NR               | 580       | 137926           | NR               | 710       | 11676            | NR               | 840       | 2754             | NR               | 970       | 3613             | NR               |
| 455       | 44894            | NR               | 585       | 143406           | NR               | 715       | 10626            | NR               | 845       | 2708             | NR               | 975       | 4034             | NR               |
| 460       | 32712            | NR               | 590       | 147039           | NR               | 720       | 9416             | NR               | 850       | 2608             | NR               | 980       | 3922             | NR               |
| 465       | 25296            | NR               | 595       | 147365           | NR               | 725       | 8333             | NR               | 855       | 2605             | NR               | 985       | 1909             | NR               |
| 470       | 19318            | NR               | 600       | 145800           | NR               | 730       | 7134             | NR               | 860       | 1765             | NR               | 990       | 3617             | NR               |
| 475       | 17265            | NR               | 605       | 141363           | NR               | 735       | 6437             | NR               | 865       | 2581             | NR               | 995       | 4767             | NR               |
| 480       | 18260            | NR               | 610       | 134199           | NR               | 740       | 5834             | NR               | 870       | 3016             | NR               | 1000      | 2528             | NR               |
| 485       | 20845            | NR               | 615       | 127683           | NR               | 745       | 5500             | NR               | 875       | 3952             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 3101.5 M/P: 0.45**

| 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       | 2397             | NR               | 490       | 24908            | NR               | 620       | 118784           | NR               | 750       | 5037             | NR               | 880       | 2677             | NR               |
| 365       | 2084             | NR               | 495       | 30998            | NR               | 625       | 108951           | NR               | 755       | 4413             | NR               | 885       | 2940             | NR               |
| 370       | 2143             | NR               | 500       | 37103            | NR               | 630       | 99573            | NR               | 760       | 4189             | NR               | 890       | 3116             | NR               |
| 375       | 2413             | NR               | 505       | 42987            | NR               | 635       | 90444            | NR               | 765       | 3677             | NR               | 895       | 3345             | NR               |
| 380       | 2172             | NR               | 510       | 48702            | NR               | 640       | 80749            | NR               | 770       | 3366             | NR               | 900       | 2312             | NR               |
| 385       | 1997             | NR               | 515       | 53741            | NR               | 645       | 71664            | NR               | 775       | 3211             | NR               | 905       | 2829             | NR               |
| 390       | 1830             | NR               | 520       | 57283            | NR               | 650       | 63936            | NR               | 780       | 2682             | NR               | 910       | 2783             | NR               |
| 395       | 1861             | NR               | 525       | 61876            | NR               | 655       | 56611            | NR               | 785       | 2804             | NR               | 915       | 2662             | NR               |
| 400       | 1717             | NR               | 530       | 65398            | NR               | 660       | 49763            | NR               | 790       | 2581             | NR               | 920       | 3047             | NR               |
| 405       | 1761             | NR               | 535       | 69597            | NR               | 665       | 42891            | NR               | 795       | 2711             | NR               | 925       | 2256             | NR               |
| 410       | 2680             | NR               | 540       | 74214            | NR               | 670       | 36939            | NR               | 800       | 2609             | NR               | 930       | 2976             | NR               |
| 415       | 4374             | NR               | 545       | 79911            | NR               | 675       | 31946            | NR               | 805       | 2581             | NR               | 935       | 3503             | NR               |
| 420       | 8071             | NR               | 550       | 86153            | NR               | 680       | 27385            | NR               | 810       | 2404             | NR               | 940       | 4226             | NR               |
| 425       | 15169            | NR               | 555       | 93952            | NR               | 685       | 23504            | NR               | 815       | 2556             | NR               | 945       | 2930             | NR               |
| 430       | 26038            | NR               | 560       | 102904           | NR               | 690       | 20210            | NR               | 820       | 2742             | NR               | 950       | 2115             | NR               |
| 435       | 41316            | NR               | 565       | 112009           | NR               | 695       | 17459            | NR               | 825       | 2014             | NR               | 955       | 2634             | NR               |
| 440       | 59674            | NR               | 570       | 121662           | NR               | 700       | 15207            | NR               | 830       | 2488             | NR               | 960       | 4200             | NR               |
| 445       | 72751            | NR               | 575       | 130476           | NR               | 705       | 13322            | NR               | 835       | 2625             | NR               | 965       | 1982             | NR               |
| 450       | 65091            | NR               | 580       | 137926           | NR               | 710       | 11676            | NR               | 840       | 2754             | NR               | 970       | 3613             | NR               |
| 455       | 44894            | NR               | 585       | 143406           | NR               | 715       | 10626            | NR               | 845       | 2708             | NR               | 975       | 4034             | NR               |
| 460       | 32712            | NR               | 590       | 147039           | NR               | 720       | 9416             | NR               | 850       | 2608             | NR               | 980       | 3922             | NR               |
| 465       | 25296            | NR               | 595       | 147365           | NR               | 725       | 8333             | NR               | 855       | 2605             | NR               | 985       | 1909             | NR               |
| 470       | 19318            | NR               | 600       | 145800           | NR               | 730       | 7134             | NR               | 860       | 1765             | NR               | 990       | 3617             | NR               |
| 475       | 17265            | NR               | 605       | 141363           | NR               | 735       | 6437             | NR               | 865       | 2581             | NR               | 995       | 4767             | NR               |
| 480       | 18260            | NR               | 610       | 134199           | NR               | 740       | 5834             | NR               | 870       | 3016             | NR               | 1000      | 2528             | NR               |
| 485       | 20845            | NR               | 615       | 127683           | NR               | 745       | 5500             | NR               | 875       | 3952             | NR               |           |                  |                  |

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**Summary**

$R_f = 75.7$   
 $R_g = 93.9$   
 CIE  $R_a = 71.8$   
 $R_g = -38.3$



**Color Vector Graphics**



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 67 | CES51 = 87 | CES76 = 63 |
| CES02 = 63 | CES27 = 88 | CES52 = 86 | CES77 = 80 |
| CES03 = 31 | CES28 = 87 | CES53 = 78 | CES78 = 67 |
| CES04 = 71 | CES29 = 66 | CES54 = 84 | CES79 = 87 |
| CES05 = 49 | CES30 = 73 | CES55 = 84 | CES80 = 86 |
| CES06 = 51 | CES31 = 70 | CES56 = 75 | CES81 = 71 |
| CES07 = 41 | CES32 = 65 | CES57 = 74 | CES82 = 94 |
| CES08 = 40 | CES33 = 73 | CES58 = 76 | CES83 = 90 |
| CES09 = 29 | CES34 = 79 | CES59 = 85 | CES84 = 89 |
| CES10 = 76 | CES35 = 89 | CES60 = 93 | CES85 = 77 |
| CES11 = 59 | CES36 = 97 | CES61 = 84 | CES86 = 61 |
| CES12 = 65 | CES37 = 87 | CES62 = 91 | CES87 = 78 |
| CES13 = 43 | CES38 = 81 | CES63 = 77 | CES88 = 77 |
| CES14 = 74 | CES39 = 95 | CES64 = 72 | CES89 = 67 |
| CES15 = 71 | CES40 = 92 | CES65 = 68 | CES90 = 76 |
| CES16 = 47 | CES41 = 88 | CES66 = 69 | CES91 = 89 |
| CES17 = 50 | CES42 = 89 | CES67 = 67 | CES92 = 58 |
| CES18 = 56 | CES43 = 79 | CES68 = 72 | CES93 = 74 |
| CES19 = 73 | CES44 = 99 | CES69 = 81 | CES94 = 49 |
| CES20 = 66 | CES45 = 85 | CES70 = 66 | CES95 = 68 |
| CES21 = 87 | CES46 = 80 | CES71 = 67 | CES96 = 76 |
| CES22 = 79 | CES47 = 82 | CES72 = 88 | CES97 = 82 |
| CES23 = 92 | CES48 = 69 | CES73 = 59 | CES98 = 75 |
| CES24 = 91 | CES49 = 80 | CES74 = 95 | CES99 = 62 |
| CES25 = 73 | CES50 = 87 | CES75 = 69 |            |



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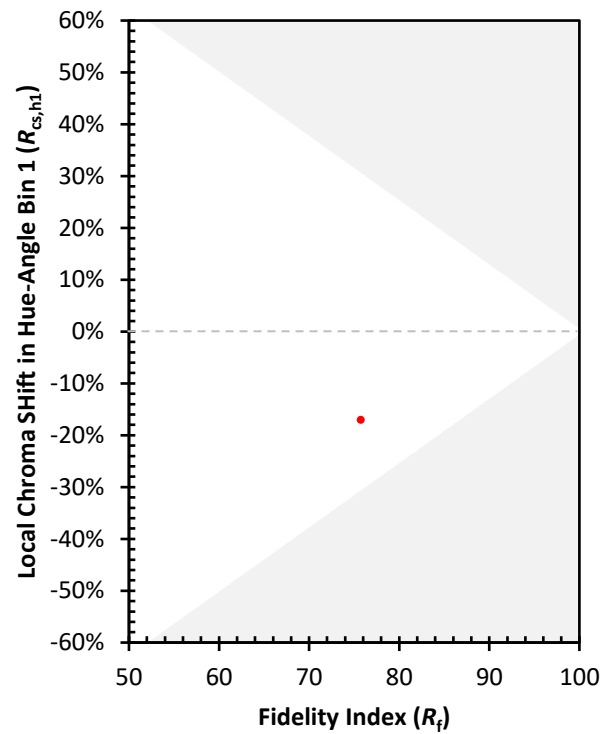
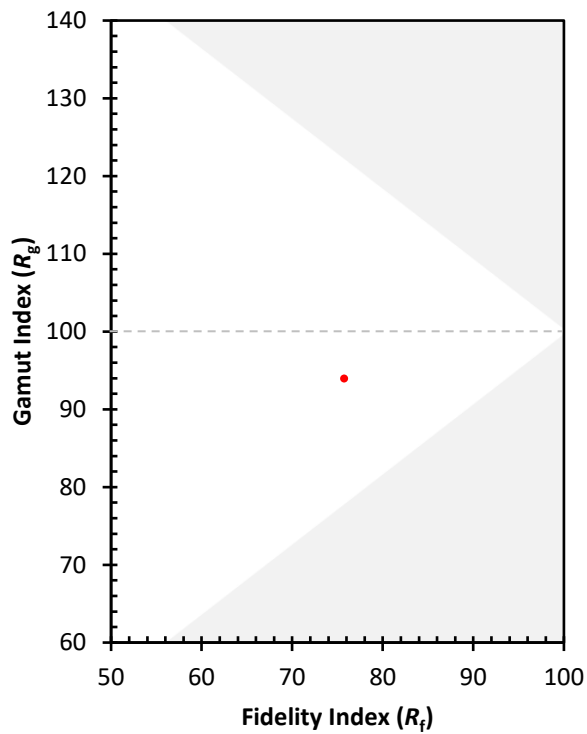
**Color Rendition by Hue-Angle Bin**



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**Measure Comparisons**



(END OF REPORT)