

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: P359984

Luminaire Tested: NVN-SA4A-730-U-SL2-HSS

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P359984  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-21)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA4A-730-U-SL2-HSS  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(4) 70 CRI, 3000K, 615mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE II SPILL  
LIGHT ELIMINATOR OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 14190 lumens  
Efficiency: N/A  
Efficacy: 110.0 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 1.5' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B2 - U0 - G3

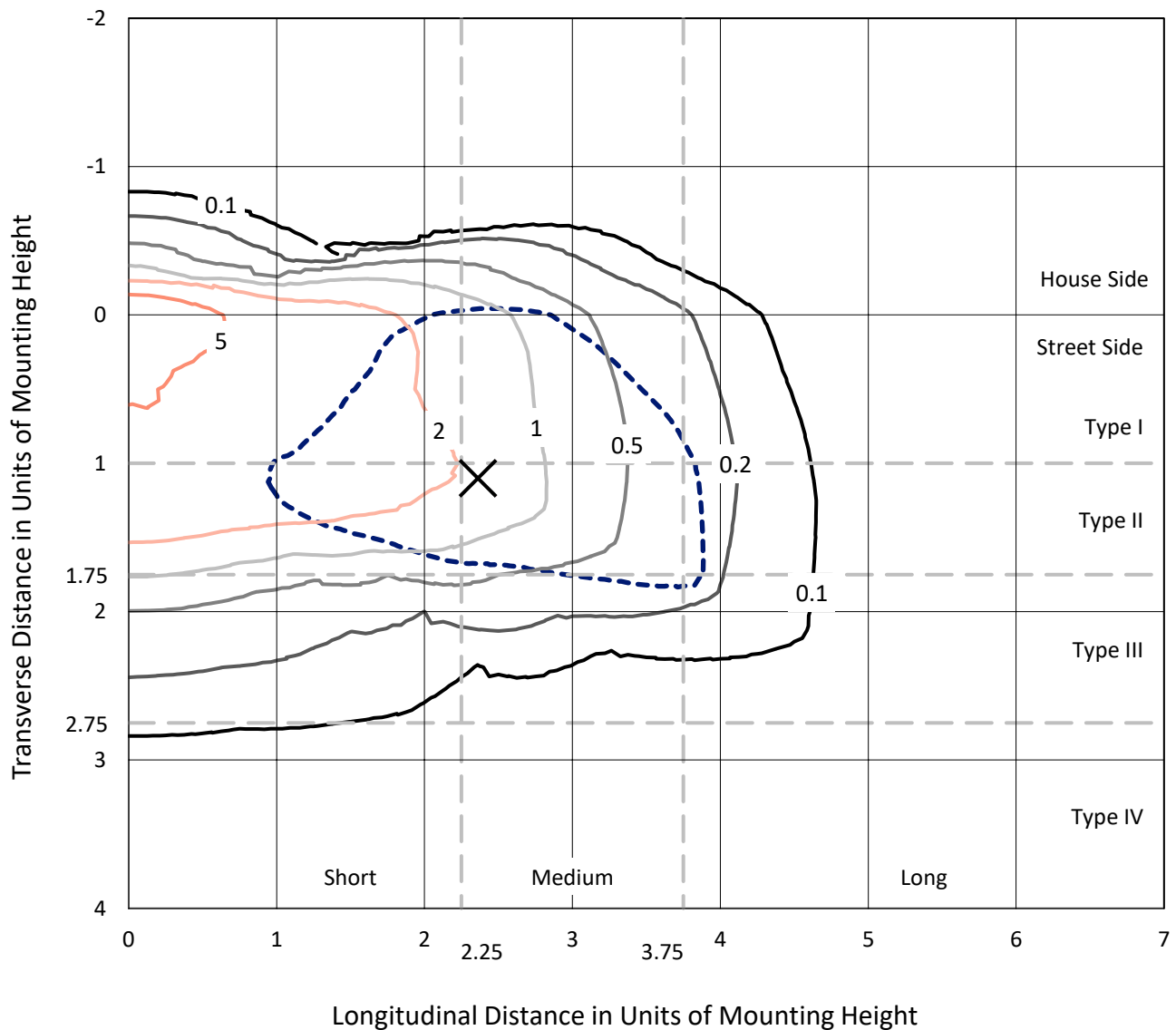
Input Watts (W): 129  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

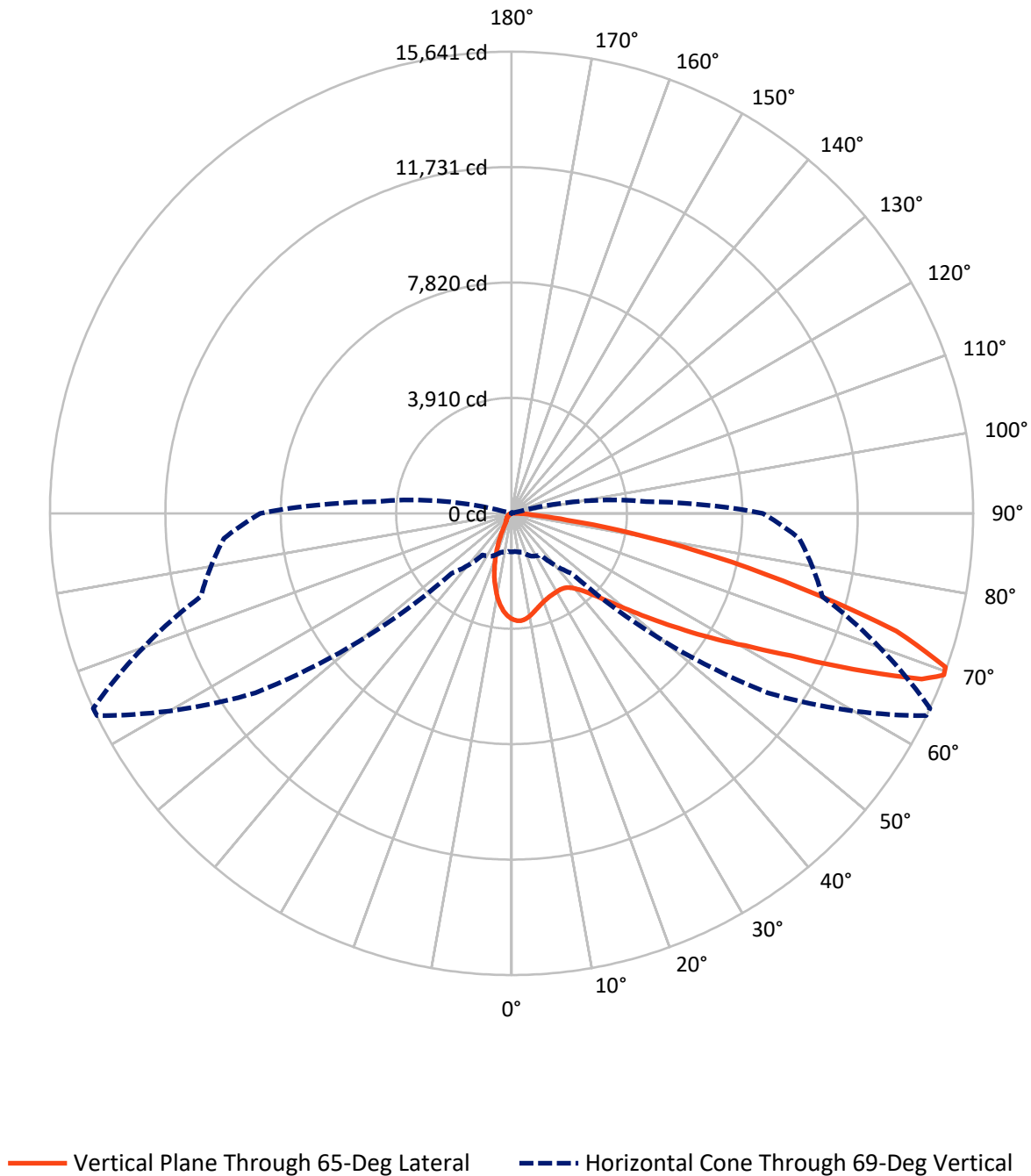
✕ Max cd  
 - - - 1/2 Max cd



Based on 20 foot mounting height. Maximum calculated value = 9 fc  
 Type III - Medium - N/A

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## Luminous Intensity Polar Plot



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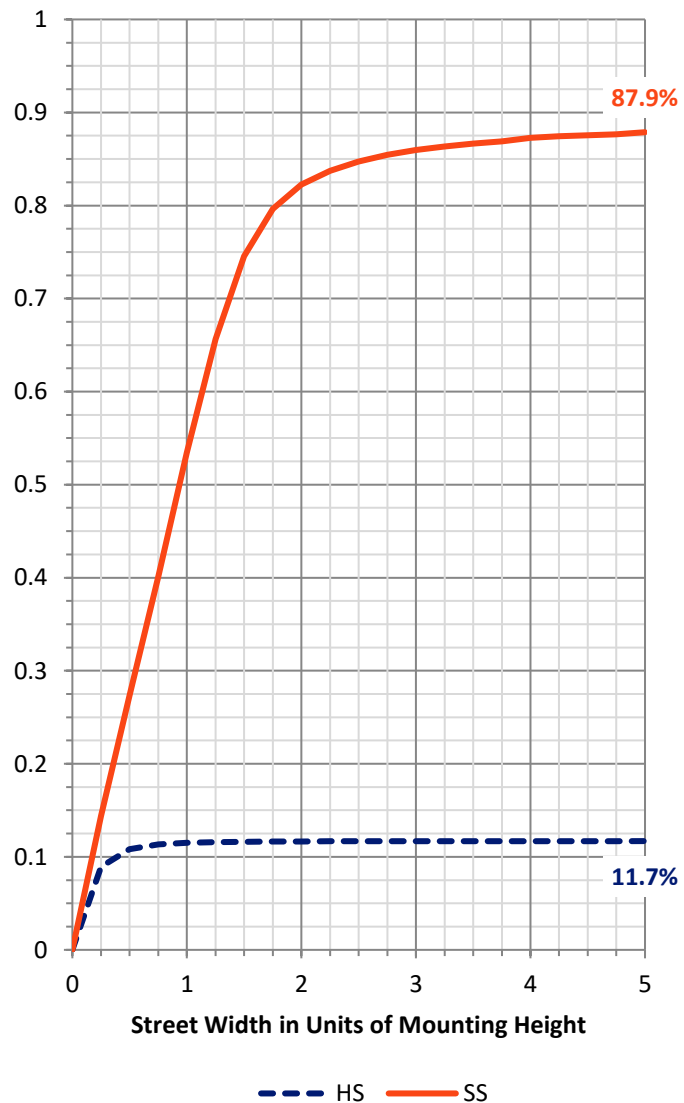
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 1672.6   | 0.0    | 1672.6  |
|                    | % Fixture | 11.8     | 0.0    | 11.8    |
| <b>Street Side</b> | Lumens    | 12517.3  | 0.0    | 12517.3 |
|                    | % Fixture | 88.2     | 0.0    | 88.2    |
| <b>Total</b>       | Lumens    | 14190.0  | 0.0    | 14190.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 299.8   | 2.1       |
| 10°-20°   | 656.4   | 4.6       |
| 20°-30°   | 909.1   | 6.4       |
| 30°-40°   | 1267.6  | 8.9       |
| 40°-50°   | 1970.3  | 13.9      |
| 50°-60°   | 3163.0  | 22.3      |
| 60°-70°   | 3577.9  | 25.2      |
| 70°-80°   | 2101.3  | 14.8      |
| 80°-90°   | 244.4   | 1.7       |
| 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°    | 14190.0 | 100.0     |
| 0°-180°   | 14190.0 | 100.0     |

**Coefficient of Utilization**



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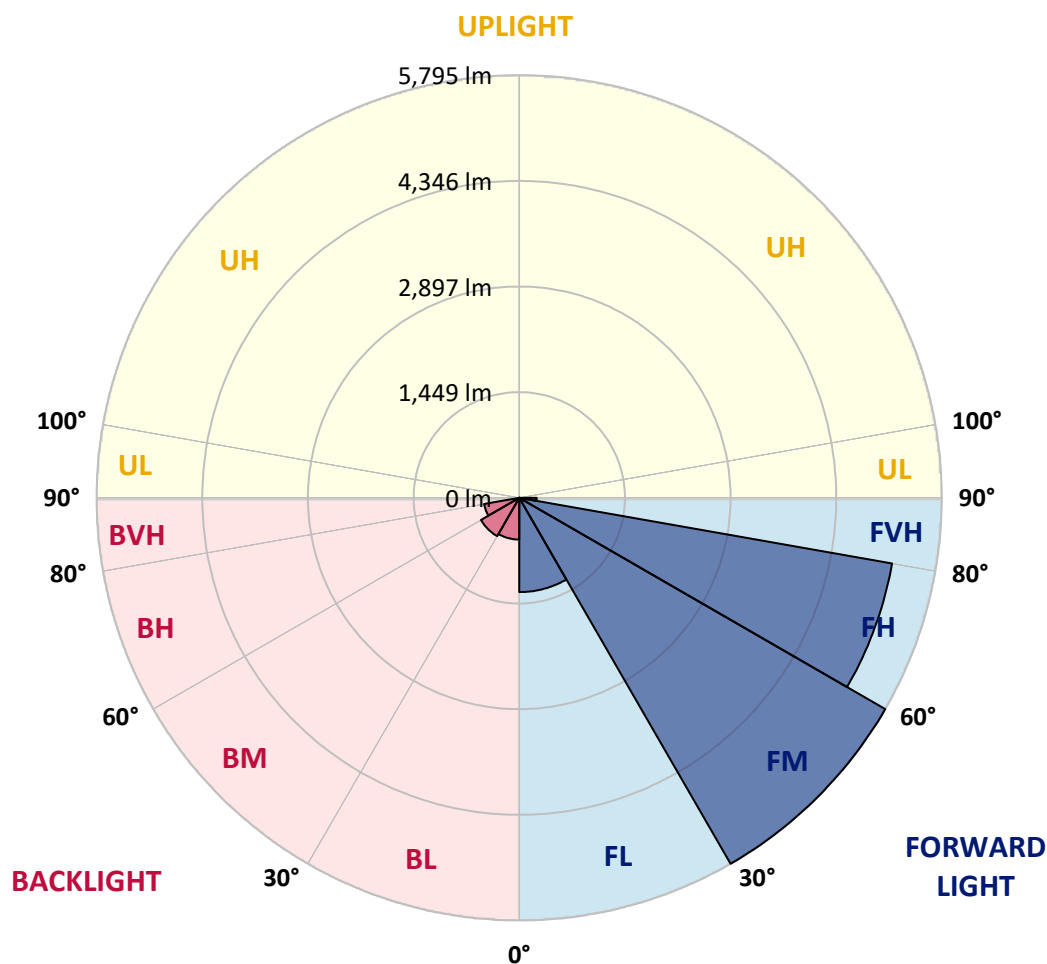
CATALOG NUMBER: NVN-SA4A-730-U-SL2-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 1293.0 | 9.1       |                         |      |         |
| FM   | (30°-60°)   | 5794.8 | 40.8      |                         |      |         |
| FH   | (60°-80°)   | 5190.6 | 36.6      |                         |      | G3/7500 |
| FVH  | (80°-90°)   | 238.9  | 1.7       |                         |      | G3/500  |
| BL   | (0°-30°)    | 572.3  | 4.0       | B2/1000                 |      |         |
| BM   | (30°-60°)   | 606.1  | 4.3       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 488.7  | 3.4       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 5.5    | 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-G3**

Type III Medium





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°     | 64°     | 65°     | 75°     | 85°    |
|-------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|--------|
| 0°    | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8  | 3585.8  | 3585.8  | 3585.8  | 3585.8 |
| 2.5°  | 3617.7 | 3608.7 | 3615.9 | 3631.5 | 3639.3 | 3639.3 | 3645.3  | 3638.1  | 3640.5  | 3623.1  | 3597.8 |
| 5°    | 3391.3 | 3377.5 | 3397.3 | 3441.1 | 3495.2 | 3541.4 | 3609.9  | 3645.9  | 3649.5  | 3650.1  | 3620.7 |
| 7.5°  | 3147.5 | 3134.9 | 3164.3 | 3216.0 | 3285.6 | 3371.5 | 3491.0  | 3595.4  | 3601.4  | 3657.9  | 3636.3 |
| 10°   | 2949.4 | 2940.4 | 2974.6 | 3029.8 | 3111.5 | 3207.6 | 3354.1  | 3499.4  | 3516.8  | 3641.7  | 3633.9 |
| 12.5° | 2792.1 | 2784.8 | 2817.3 | 2880.9 | 2964.4 | 3070.7 | 3223.8  | 3392.5  | 3415.9  | 3605.1  | 3621.9 |
| 15°   | 2677.4 | 2676.2 | 2703.2 | 2764.4 | 2856.9 | 2956.0 | 3112.7  | 3293.4  | 3320.4  | 3565.4  | 3620.1 |
| 17.5° | 2617.3 | 2619.1 | 2638.9 | 2691.2 | 2770.4 | 2868.9 | 3019.0  | 3210.0  | 3239.4  | 3530.0  | 3629.1 |
| 20°   | 2611.3 | 2613.1 | 2623.9 | 2653.4 | 2717.6 | 2804.7 | 2942.8  | 3139.7  | 3170.3  | 3503.6  | 3643.5 |
| 22.5° | 2664.2 | 2663.0 | 2666.0 | 2663.0 | 2699.0 | 2765.0 | 2892.3  | 3085.7  | 3121.1  | 3486.2  | 3654.9 |
| 25°   | 2765.6 | 2763.8 | 2762.6 | 2740.4 | 2716.4 | 2751.8 | 2871.3  | 3055.0  | 3088.7  | 3473.6  | 3661.5 |
| 27.5° | 2906.7 | 2905.5 | 2903.7 | 2867.1 | 2795.1 | 2772.8 | 2873.7  | 3043.6  | 3071.9  | 3463.3  | 3660.3 |
| 30°   | 3092.3 | 3100.7 | 3098.3 | 3047.2 | 2935.0 | 2837.1 | 2898.9  | 3037.6  | 3062.3  | 3443.5  | 3647.7 |
| 32.5° | 3310.2 | 3327.0 | 3340.3 | 3285.6 | 3145.1 | 2964.4 | 2957.2  | 3044.2  | 3062.3  | 3428.5  | 3624.9 |
| 35°   | 3536.6 | 3558.2 | 3606.9 | 3587.6 | 3402.7 | 3155.9 | 3057.4  | 3083.9  | 3098.9  | 3436.9  | 3614.1 |
| 37.5° | 3759.4 | 3785.2 | 3890.9 | 3946.7 | 3740.2 | 3409.3 | 3213.6  | 3181.7  | 3189.5  | 3488.0  | 3626.1 |
| 40°   | 4018.2 | 4057.2 | 4217.5 | 4307.6 | 4143.0 | 3748.6 | 3447.1  | 3349.9  | 3352.9  | 3600.2  | 3681.9 |
| 42.5° | 4358.0 | 4398.2 | 4571.8 | 4712.9 | 4597.0 | 4177.3 | 3764.2  | 3606.9  | 3603.9  | 3810.4  | 3813.4 |
| 45°   | 4772.3 | 4814.3 | 4993.9 | 5150.6 | 5098.4 | 4685.2 | 4170.1  | 3982.1  | 3978.5  | 4141.8  | 4062.6 |
| 47.5° | 5241.9 | 5283.3 | 5443.6 | 5605.1 | 5661.6 | 5278.5 | 4687.0  | 4494.3  | 4485.9  | 4602.4  | 4447.5 |
| 50°   | 5644.8 | 5671.8 | 5819.5 | 6036.8 | 6291.4 | 6007.4 | 5330.1  | 5144.6  | 5135.6  | 5214.2  | 5012.5 |
| 52.5° | 5791.3 | 5806.9 | 5957.0 | 6261.4 | 6896.7 | 6994.5 | 6174.9  | 5936.0  | 5929.4  | 5963.6  | 5764.8 |
| 55°   | 5494.6 | 5522.9 | 5707.2 | 6158.7 | 7224.5 | 8110.2 | 7241.3  | 6915.9  | 6866.1  | 6792.2  | 6551.4 |
| 57.5° | 4686.4 | 4731.5 | 4929.6 | 5530.1 | 7071.4 | 8995.2 | 8808.5  | 8024.3  | 7951.0  | 7499.5  | 7190.9 |
| 60°   | 3511.4 | 3566.6 | 3731.1 | 4379.0 | 6254.2 | 9310.4 | 10520.9 | 9259.4  | 9094.3  | 8062.7  | 7778.7 |
| 62.5° | 2409.6 | 2437.2 | 2548.9 | 2971.0 | 4606.0 | 8794.1 | 11953.6 | 10913.6 | 10612.2 | 8675.2  | 8414.6 |
| 65°   | 1840.4 | 1850.0 | 1895.6 | 2040.9 | 2742.8 | 7143.5 | 12523.4 | 13096.2 | 12731.8 | 9407.7  | 9074.5 |
| 67.5° | 1483.1 | 1475.3 | 1538.3 | 1746.1 | 1836.8 | 4358.0 | 11858.7 | 15161.2 | 14990.6 | 10387.0 | 9738.6 |
| 69°   | 1307.8 | 1297.0 | 1361.2 | 1602.6 | 1725.1 | 2880.9 | 10601.4 | 15630.1 | 15640.9 | 10904.0 | 9784.2 |
| 70°   | 1176.9 | 1184.1 | 1247.7 | 1517.3 | 1687.2 | 2261.3 | 9400.5  | 15510.6 | 15595.9 | 11097.4 | 9510.4 |
| 72.5° | 786.0  | 805.2  | 933.1  | 1259.7 | 1622.4 | 1711.3 | 5676.0  | 13310.0 | 13637.8 | 10662.0 | 8159.4 |
| 75°   | 443.1  | 457.5  | 609.4  | 949.9  | 1528.7 | 1629.6 | 2998.0  | 9805.8  | 10122.8 | 8916.0  | 6292.0 |
| 77.5° | 217.4  | 225.2  | 344.7  | 613.1  | 1278.3 | 1552.7 | 1700.5  | 6660.7  | 7022.8  | 5819.5  | 3558.8 |
| 80°   | 91.9   | 96.1   | 172.3  | 378.3  | 913.9  | 1481.9 | 1262.7  | 4099.2  | 4144.2  | 2279.9  | 948.1  |
| 82.5° | 35.4   | 36.6   | 72.7   | 236.0  | 580.6  | 1155.2 | 1056.2  | 1943.6  | 1896.8  | 429.3   | 216.2  |
| 85°   | 4.2    | 4.8    | 26.4   | 141.7  | 323.0  | 594.4  | 858.0   | 837.6   | 775.2   | 85.3    | 111.1  |
| 87.5° | 0.0    | 0.0    | 1.8    | 43.2   | 96.1   | 278.6  | 446.1   | 347.7   | 313.4   | 27.6    | 57.6   |
| 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: P359984

CATALOG NUMBER: NVN-SA4A-730-U-SL2-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 | 3585.8 |
| 2.5°  | 3576.8 | 3570.8 | 3538.4 | 3491.6 | 3447.1 | 3391.9 | 3339.1 | 3307.2 | 3282.0 | 3265.2 | 3285.0 |
| 5°    | 3586.4 | 3560.0 | 3461.5 | 3335.5 | 3211.8 | 3072.5 | 2942.8 | 2832.9 | 2789.7 | 2741.6 | 2763.2 |
| 7.5°  | 3583.4 | 3533.6 | 3356.5 | 3131.9 | 2904.9 | 2670.2 | 2448.0 | 2276.9 | 2188.0 | 2100.9 | 2123.2 |
| 10°   | 3568.4 | 3484.4 | 3216.0 | 2883.3 | 2543.5 | 2206.0 | 1890.8 | 1651.2 | 1517.3 | 1396.0 | 1413.4 |
| 12.5° | 3535.4 | 3418.3 | 3050.2 | 2598.7 | 2144.2 | 1699.3 | 1330.0 | 1023.2 | 858.6  | 786.0  | 795.0  |
| 15°   | 3515.6 | 3354.1 | 2874.9 | 2310.5 | 1717.9 | 1183.5 | 813.0  | 604.6  | 529.6  | 505.6  | 508.6  |
| 17.5° | 3506.0 | 3292.2 | 2693.6 | 1980.9 | 1281.9 | 753.6  | 525.4  | 463.5  | 447.3  | 443.1  | 444.3  |
| 20°   | 3496.4 | 3229.8 | 2506.8 | 1654.8 | 883.2  | 506.8  | 431.7  | 413.7  | 407.7  | 402.3  | 403.5  |
| 22.5° | 3480.2 | 3169.7 | 2306.3 | 1324.6 | 595.6  | 411.3  | 389.1  | 371.7  | 359.1  | 352.5  | 353.7  |
| 25°   | 3460.3 | 3106.7 | 2101.5 | 986.5  | 434.7  | 366.9  | 345.9  | 321.2  | 306.2  | 294.2  | 294.8  |
| 27.5° | 3428.5 | 3029.2 | 1890.2 | 718.1  | 365.1  | 328.4  | 300.2  | 273.2  | 248.0  | 234.2  | 234.2  |
| 30°   | 3384.1 | 2941.6 | 1655.4 | 514.0  | 327.2  | 290.6  | 256.4  | 222.8  | 195.7  | 183.1  | 181.9  |
| 32.5° | 3334.9 | 2850.3 | 1418.2 | 389.7  | 297.2  | 255.2  | 216.2  | 180.7  | 156.7  | 146.5  | 145.9  |
| 35°   | 3292.8 | 2751.8 | 1181.7 | 326.6  | 267.2  | 221.0  | 178.3  | 148.3  | 129.1  | 120.7  | 120.1  |
| 37.5° | 3265.8 | 2653.4 | 951.1  | 291.8  | 240.2  | 189.1  | 149.5  | 122.5  | 108.7  | 102.1  | 101.5  |
| 40°   | 3261.6 | 2580.1 | 740.3  | 265.4  | 215.0  | 160.9  | 124.9  | 103.9  | 91.3   | 84.1   | 83.5   |
| 42.5° | 3316.2 | 2538.1 | 568.0  | 243.2  | 189.1  | 136.3  | 106.3  | 88.9   | 75.7   | 68.5   | 67.8   |
| 45°   | 3459.7 | 2551.3 | 437.1  | 223.4  | 163.3  | 115.3  | 90.1   | 73.9   | 61.8   | 56.4   | 55.2   |
| 47.5° | 3721.5 | 2642.5 | 347.7  | 203.5  | 138.7  | 97.9   | 76.9   | 61.2   | 51.0   | 45.6   | 45.0   |
| 50°   | 4187.5 | 2856.9 | 290.6  | 181.9  | 115.9  | 83.5   | 63.6   | 49.8   | 41.4   | 36.6   | 36.0   |
| 52.5° | 4805.9 | 3238.8 | 259.4  | 160.9  | 96.1   | 70.9   | 52.2   | 39.6   | 32.4   | 28.8   | 28.2   |
| 55°   | 5488.0 | 3701.1 | 239.0  | 138.1  | 78.7   | 58.8   | 41.4   | 31.2   | 25.2   | 22.2   | 21.0   |
| 57.5° | 6153.9 | 4101.6 | 219.8  | 115.9  | 65.4   | 48.0   | 33.0   | 24.6   | 19.8   | 16.8   | 16.2   |
| 60°   | 6765.8 | 4469.7 | 197.5  | 93.1   | 53.4   | 37.8   | 25.8   | 19.2   | 15.6   | 12.6   | 12.6   |
| 62.5° | 7420.9 | 4754.3 | 166.9  | 72.7   | 43.8   | 28.8   | 21.0   | 17.4   | 12.6   | 10.8   | 10.2   |
| 65°   | 8115.0 | 4965.7 | 130.9  | 56.4   | 34.2   | 21.6   | 17.4   | 18.0   | 10.2   | 7.8    | 7.2    |
| 67.5° | 8627.7 | 4923.6 | 96.7   | 44.4   | 26.4   | 16.8   | 16.8   | 19.2   | 9.0    | 6.0    | 5.4    |
| 69°   | 8514.9 | 4582.0 | 81.1   | 38.4   | 22.8   | 14.4   | 15.6   | 19.2   | 8.4    | 5.4    | 4.8    |
| 70°   | 8187.6 | 4203.7 | 71.5   | 34.2   | 20.4   | 13.2   | 15.0   | 18.6   | 7.8    | 5.4    | 4.8    |
| 72.5° | 6818.6 | 3166.1 | 55.8   | 25.8   | 16.2   | 10.8   | 12.6   | 16.2   | 7.8    | 5.4    | 4.2    |
| 75°   | 5129.0 | 2026.5 | 42.6   | 18.6   | 12.0   | 8.4    | 9.6    | 12.0   | 7.8    | 4.8    | 4.2    |
| 77.5° | 2790.9 | 730.7  | 30.6   | 12.6   | 8.4    | 6.6    | 6.6    | 9.0    | 7.2    | 3.6    | 2.4    |
| 80°   | 717.5  | 183.7  | 19.2   | 8.4    | 6.6    | 4.8    | 4.2    | 6.0    | 4.2    | 0.6    | 0.0    |
| 82.5° | 177.1  | 41.4   | 10.2   | 6.0    | 4.8    | 1.8    | 1.8    | 3.0    | 1.8    | 0.0    | 0.0    |
| 85°   | 97.3   | 20.4   | 6.6    | 4.2    | 2.4    | 0.0    | 0.0    | 0.6    | 0.0    | 0.0    | 0.0    |
| 87.5° | 49.8   | 6.0    | 1.8    | 1.2    | 0.6    | 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

REPORT NUMBER: SP1-1908-441-2-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            |

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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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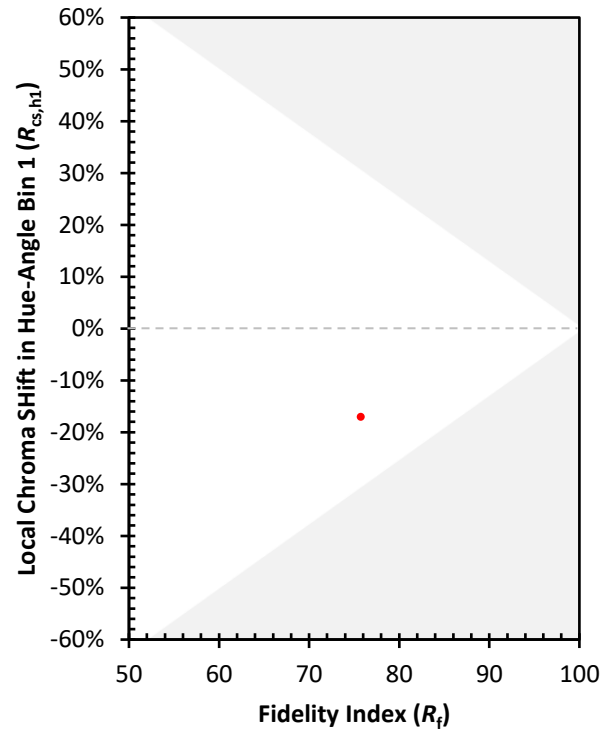
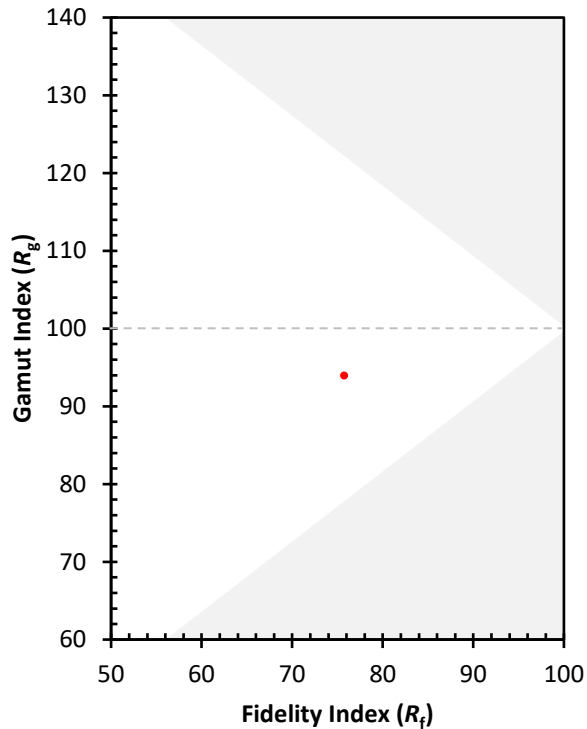
**Color Rendition by Hue-Angle Bin**



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**Measure Comparisons**



(END OF REPORT)