

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



Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: INVUE

Report Number: P822804

Luminaire Tested: **MSA-SA2A-840-U-SL3-HSS**

Issue Date: 04/10/2024

**Test Information**

Test Method: LM-79-08  
Report Number: P822804  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1910-543-19)  
Test Lab: INNOVATION CENTER  
Issue Date: 04/10/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: MSA-SA2A-840-U-SL3-HSS  
Description: MESA POST TOP DECORATIVE LUMINAIRE. (2) LIGHTSQUARES WITH 16 LEDS  
EACH AND TYPE III SPILL LIGHT ELIMINATOR OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

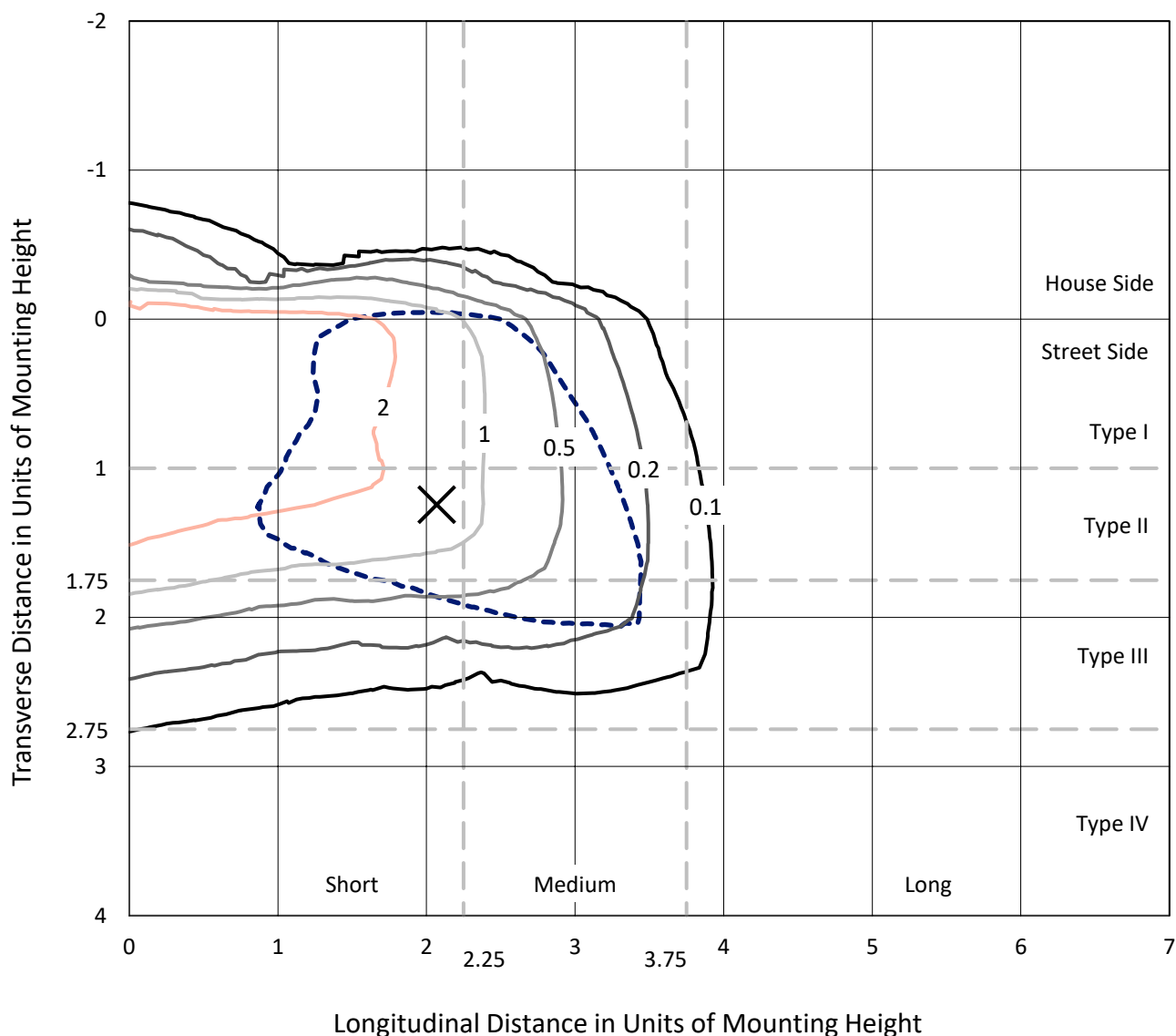
Lumens per Lamp: N/A  
Luminaire Lumens: 5488.6 lumens  
Efficiency: N/A  
Efficacy: 83.2 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 1' x H: 0')  
IES Classification: Type III - Short  
BUG Rating: B1 - U0 - G2

Input Watts (W): 66  
Input Voltage (V): NR  
Input Current (A<sub>in</sub>): 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: 25 FT

REPORT NUMBER: P822804  
 CATALOG NUMBER: MSA-SA2A-840-U-SL3-HSS

## Iso-Footcandle Lines of Horizontal Illumination

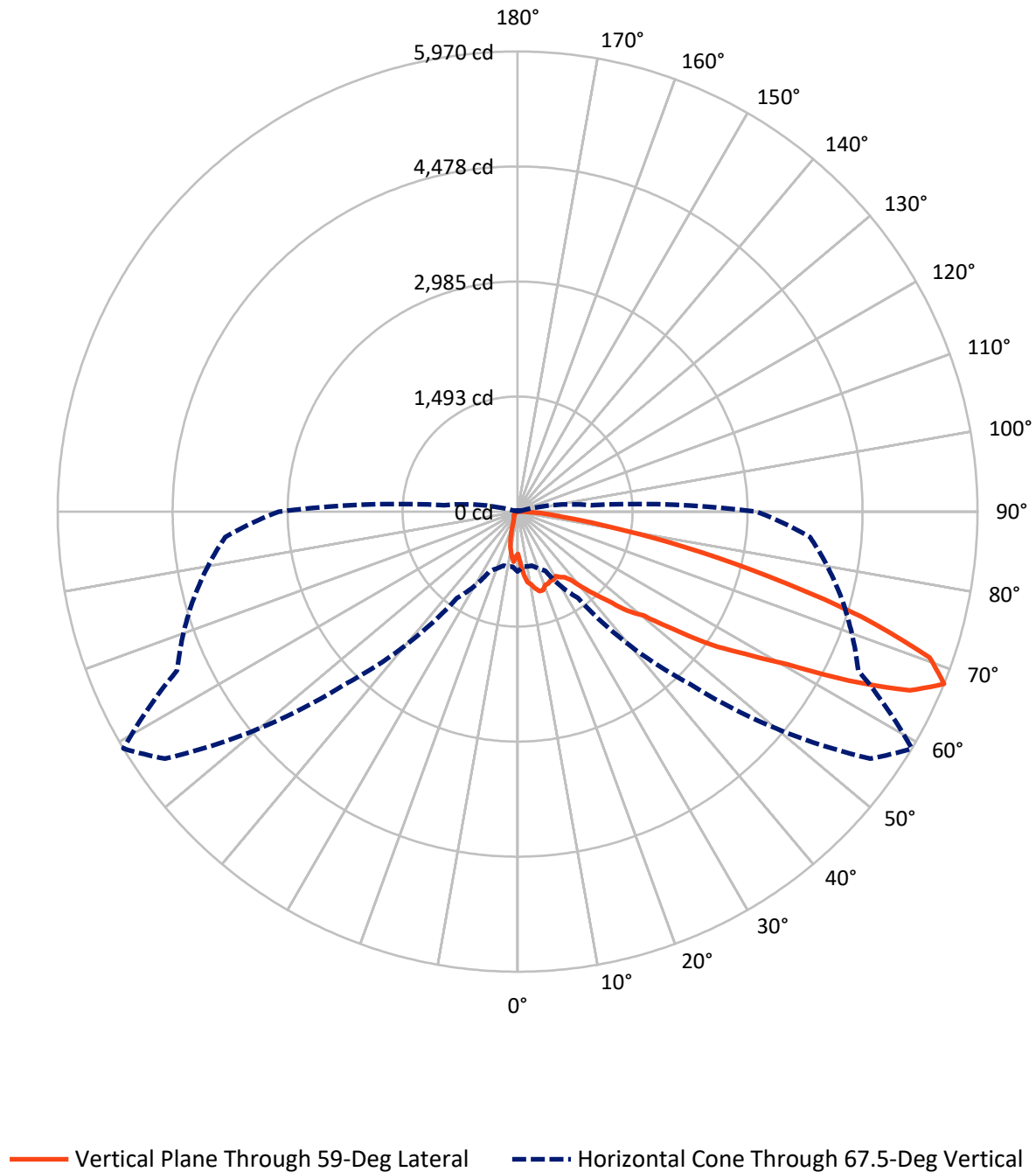
× Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 4.4 fc  
 Type III - Short - N/A

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## Luminous Intensity Polar Plot



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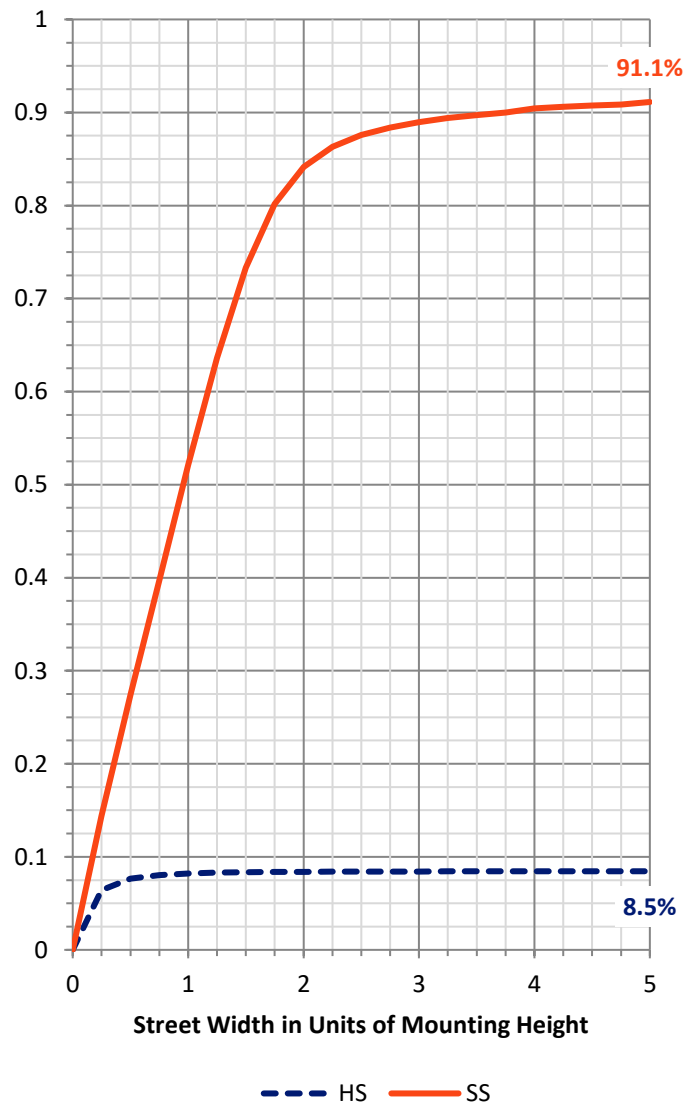
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 466.8    | 0.0    | 466.8  |
|                    | % Fixture | 8.5      | 0.0    | 8.5    |
| <b>Street Side</b> | Lumens    | 5021.8   | 0.0    | 5021.8 |
|                    | % Fixture | 91.5     | 0.0    | 91.5   |
| <b>Total</b>       | Lumens    | 5488.6   | 0.0    | 5488.6 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 66.8   | 1.2       |
| 10°-20°   | 188.0  | 3.4       |
| 20°-30°   | 279.6  | 5.1       |
| 30°-40°   | 431.4  | 7.9       |
| 40°-50°   | 770.0  | 14.0      |
| 50°-60°   | 1370.2 | 25.0      |
| 60°-70°   | 1595.8 | 29.1      |
| 70°-80°   | 709.7  | 12.9      |
| 80°-90°   | 77.1   | 1.4       |
| 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°    | 5488.6 | 100.0     |
| 0°-180°   | 5488.6 | 100.0     |

**Coefficient of Utilization**



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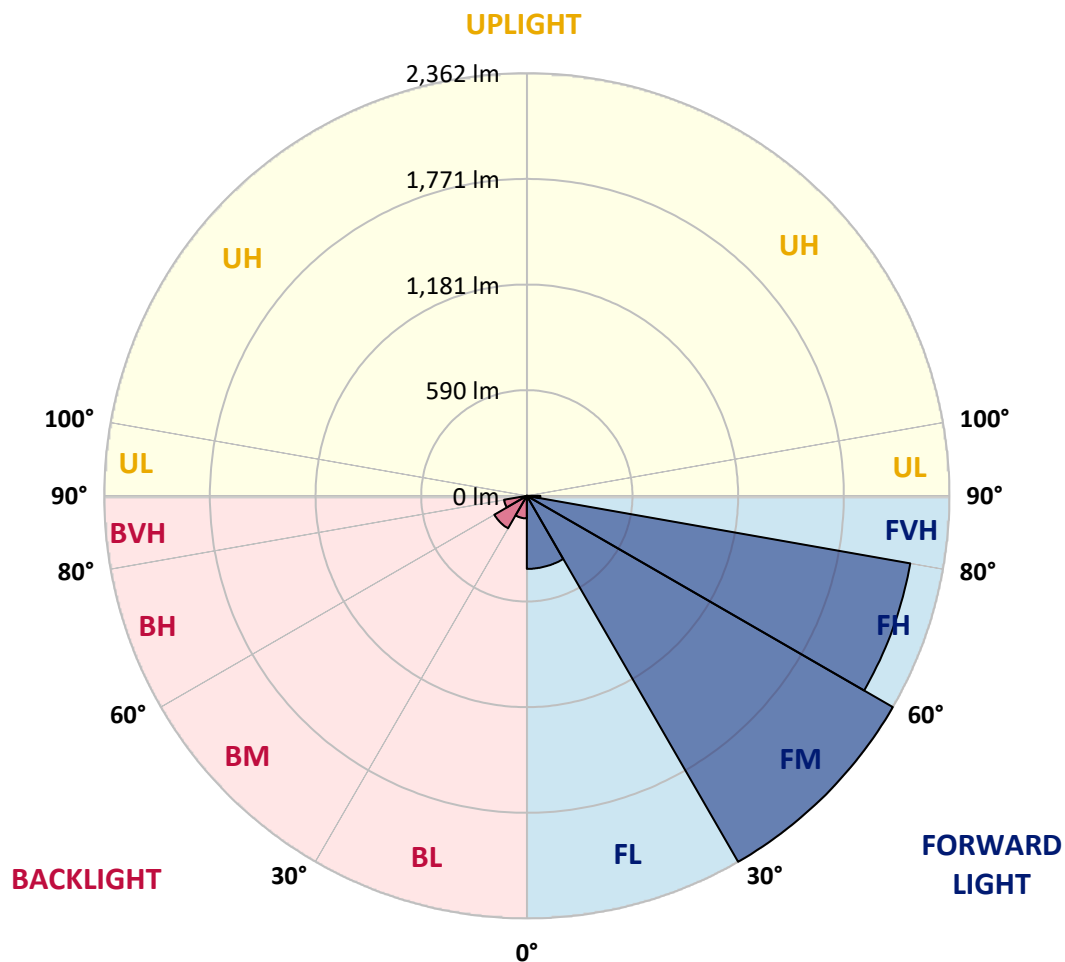
CATALOG NUMBER: MSA-SA2A-840-U-SL3-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 408.2  | 7.4       |                         |      |         |
| FM   | (30°-60°)   | 2361.7 | 43.0      |                         |      |         |
| FH   | (60°-80°)   | 2176.2 | 39.6      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 75.7   | 1.4       |                         |      | G1/100  |
| BL   | (0°-30°)    | 126.2  | 2.3       | B1/500                  |      |         |
| BM   | (30°-60°)   | 209.9  | 3.8       | B0/220                  |      |         |
| BH   | (60°-80°)   | 129.3  | 2.4       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 1.4    | 0.0       |                         |      | G0/10   |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G2**

Type III Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 59°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  | 549.1  |
| 2.5°  | 715.9  | 688.9  | 650.6  | 662.0  | 672.3  | 682.0  | 665.9  | 656.7  | 652.3  | 612.8  | 662.3  |
| 5°    | 879.0  | 845.4  | 827.9  | 823.4  | 812.3  | 787.6  | 828.7  | 810.4  | 816.5  | 824.3  | 840.4  |
| 7.5°  | 928.8  | 913.5  | 888.2  | 897.7  | 855.4  | 851.8  | 908.8  | 924.6  | 945.4  | 931.3  | 950.7  |
| 10°   | 903.2  | 876.8  | 888.7  | 885.4  | 883.8  | 921.0  | 961.0  | 961.8  | 992.9  | 1008.0 | 942.1  |
| 12.5° | 852.6  | 855.7  | 898.5  | 895.1  | 950.7  | 1025.2 | 1034.4 | 1024.6 | 1075.5 | 1049.4 | 1039.4 |
| 15°   | 886.2  | 911.3  | 887.7  | 895.7  | 915.4  | 1008.5 | 1041.0 | 1071.1 | 1119.2 | 1134.7 | 1067.2 |
| 17.5° | 926.8  | 929.4  | 886.2  | 876.2  | 926.0  | 969.3  | 1046.1 | 1070.8 | 1075.5 | 1212.0 | 1129.7 |
| 20°   | 904.9  | 926.3  | 874.9  | 811.8  | 889.0  | 947.9  | 1025.7 | 1018.0 | 1049.7 | 1234.8 | 1143.9 |
| 22.5° | 963.3  | 932.6  | 866.8  | 819.3  | 845.4  | 899.0  | 964.9  | 1015.7 | 1063.3 | 1180.3 | 1162.2 |
| 25°   | 968.8  | 957.7  | 899.0  | 856.8  | 852.3  | 866.0  | 957.7  | 990.5  | 1064.9 | 1229.2 | 1146.7 |
| 27.5° | 1031.3 | 1018.5 | 898.5  | 902.6  | 861.0  | 819.0  | 922.6  | 999.7  | 1095.3 | 1199.5 | 1179.7 |
| 30°   | 1111.9 | 1113.0 | 958.2  | 971.3  | 911.8  | 844.3  | 951.3  | 972.4  | 1115.8 | 1247.0 | 1204.2 |
| 32.5° | 1193.7 | 1227.2 | 1076.4 | 1007.1 | 988.6  | 940.1  | 915.7  | 1013.3 | 1093.3 | 1328.1 | 1265.3 |
| 35°   | 1317.9 | 1340.6 | 1173.6 | 1111.7 | 1038.5 | 983.5  | 1012.4 | 1047.4 | 1174.1 | 1435.7 | 1345.6 |
| 37.5° | 1528.3 | 1487.0 | 1348.1 | 1240.3 | 1222.8 | 1141.7 | 1156.1 | 1124.7 | 1256.7 | 1562.4 | 1504.6 |
| 40°   | 1646.7 | 1609.4 | 1464.8 | 1412.3 | 1300.6 | 1313.1 | 1267.6 | 1285.9 | 1376.5 | 1694.4 | 1649.4 |
| 42.5° | 1770.0 | 1734.4 | 1607.7 | 1570.5 | 1464.0 | 1412.3 | 1391.8 | 1457.6 | 1560.2 | 1914.2 | 1857.0 |
| 45°   | 1894.0 | 1803.6 | 1750.0 | 1768.6 | 1720.8 | 1618.6 | 1594.6 | 1653.3 | 1760.8 | 2184.3 | 2076.0 |
| 47.5° | 1998.5 | 1922.3 | 1882.0 | 1873.4 | 1854.8 | 1996.8 | 1899.5 | 1925.3 | 1972.8 | 2423.4 | 2348.9 |
| 50°   | 2186.8 | 2111.8 | 2048.8 | 2031.2 | 2121.8 | 2323.3 | 2173.2 | 2123.2 | 2218.3 | 2712.1 | 2665.1 |
| 52.5° | 2459.0 | 2363.3 | 2263.0 | 2263.3 | 2434.2 | 2544.8 | 2616.0 | 2528.2 | 2545.9 | 3029.8 | 3008.9 |
| 55°   | 2677.7 | 2556.2 | 2473.1 | 2538.7 | 2793.6 | 2855.5 | 3127.1 | 3050.0 | 3027.0 | 3324.3 | 3298.8 |
| 57.5° | 2707.7 | 2562.1 | 2522.6 | 2637.7 | 2986.4 | 3382.2 | 3674.2 | 3481.9 | 3446.6 | 3570.9 | 3621.7 |
| 60°   | 2427.5 | 2273.0 | 2302.7 | 2487.8 | 3049.2 | 3703.2 | 4176.7 | 4019.7 | 3795.4 | 3859.6 | 3894.6 |
| 62.5° | 1810.5 | 1687.2 | 1770.5 | 2015.6 | 2807.2 | 3918.3 | 4758.3 | 4831.1 | 4200.0 | 4076.3 | 4068.9 |
| 65°   | 1174.7 | 1097.5 | 1152.2 | 1353.2 | 2124.4 | 3893.8 | 5278.1 | 5593.8 | 4518.8 | 4253.1 | 4123.6 |
| 67.5° | 777.0  | 718.4  | 726.2  | 845.1  | 1373.7 | 3166.7 | 5588.7 | 5970.3 | 4877.3 | 4353.4 | 3809.9 |
| 70°   | 579.1  | 533.0  | 535.8  | 600.3  | 815.4  | 2088.5 | 5155.5 | 5673.2 | 5008.2 | 4005.8 | 3075.1 |
| 72.5° | 417.7  | 386.8  | 412.7  | 484.4  | 649.8  | 1104.4 | 3842.7 | 4672.2 | 4367.0 | 3159.5 | 2071.8 |
| 75°   | 289.3  | 269.0  | 311.2  | 405.2  | 593.1  | 685.6  | 2539.3 | 3363.3 | 3060.9 | 1982.3 | 936.5  |
| 77.5° | 160.4  | 154.2  | 215.1  | 330.1  | 538.3  | 561.9  | 1555.4 | 2210.0 | 1697.8 | 710.6  | 222.9  |
| 80°   | 70.0   | 67.8   | 104.2  | 247.9  | 452.4  | 507.7  | 875.7  | 1225.3 | 667.8  | 126.7  | 72.0   |
| 82.5° | 30.0   | 28.9   | 44.5   | 149.3  | 328.8  | 424.7  | 539.9  | 589.7  | 229.8  | 39.2   | 40.9   |
| 85°   | 5.3    | 5.8    | 17.8   | 78.6   | 200.1  | 215.7  | 391.0  | 349.1  | 115.6  | 18.6   | 29.2   |
| 87.5° | 0.0    | 0.0    | 2.8    | 15.3   | 37.5   | 61.7   | 169.5  | 122.3  | 21.9   | 6.1    | 5.0    |
| 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: P822804

CATALOG NUMBER: MSA-SA2A-840-U-SL3-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 549.1  | 549.1  | 549.1 | 549.1 | 549.1 | 549.1 | 549.1 | 549.1 | 549.1 | 549.1 | 549.1 |
| 2.5°  | 669.2  | 653.6  | 594.4 | 586.9 | 578.9 | 566.9 | 562.5 | 536.9 | 533.6 | 566.3 | 566.3 |
| 5°    | 832.9  | 777.3  | 720.9 | 676.4 | 636.7 | 581.7 | 566.1 | 549.9 | 536.9 | 533.6 | 543.9 |
| 7.5°  | 919.4  | 851.5  | 762.9 | 649.8 | 558.0 | 478.3 | 444.9 | 421.6 | 395.5 | 403.2 | 407.4 |
| 10°   | 914.6  | 842.6  | 729.5 | 584.2 | 482.4 | 394.4 | 309.6 | 260.1 | 232.6 | 219.0 | 217.3 |
| 12.5° | 961.0  | 893.2  | 707.0 | 532.0 | 402.1 | 280.4 | 194.8 | 159.5 | 139.3 | 139.5 | 137.8 |
| 15°   | 988.0  | 914.1  | 680.9 | 465.8 | 283.2 | 180.4 | 135.0 | 127.3 | 124.5 | 127.6 | 125.9 |
| 17.5° | 1035.5 | 936.0  | 621.7 | 367.1 | 194.8 | 136.1 | 124.2 | 121.2 | 124.8 | 131.2 | 129.5 |
| 20°   | 1031.9 | 897.9  | 537.5 | 258.7 | 144.0 | 122.5 | 117.6 | 112.8 | 120.3 | 127.0 | 125.9 |
| 22.5° | 1028.5 | 860.7  | 458.3 | 190.9 | 120.3 | 111.8 | 107.6 | 105.6 | 109.5 | 117.3 | 118.9 |
| 25°   | 999.1  | 842.3  | 378.0 | 143.4 | 109.0 | 101.4 | 99.5  | 97.8  | 99.2  | 105.6 | 105.4 |
| 27.5° | 1035.2 | 795.9  | 291.8 | 120.3 | 100.9 | 92.0  | 90.3  | 87.5  | 84.8  | 90.3  | 91.2  |
| 30°   | 1027.7 | 802.3  | 228.7 | 105.9 | 92.8  | 80.9  | 81.4  | 75.6  | 70.6  | 75.6  | 75.6  |
| 32.5° | 1054.9 | 755.6  | 183.1 | 96.1  | 84.8  | 76.2  | 69.2  | 63.1  | 59.5  | 62.6  | 63.1  |
| 35°   | 1094.7 | 757.6  | 143.4 | 90.1  | 77.8  | 67.8  | 59.5  | 53.4  | 50.0  | 51.4  | 52.2  |
| 37.5° | 1227.8 | 744.3  | 119.7 | 85.4  | 75.3  | 62.8  | 54.2  | 46.2  | 43.9  | 45.6  | 46.4  |
| 40°   | 1314.5 | 779.9  | 105.6 | 82.8  | 69.0  | 57.8  | 46.4  | 40.6  | 38.6  | 39.4  | 40.9  |
| 42.5° | 1477.9 | 799.5  | 98.6  | 80.1  | 63.1  | 49.4  | 39.8  | 36.4  | 33.6  | 34.7  | 35.8  |
| 45°   | 1652.7 | 833.2  | 93.3  | 76.9  | 58.6  | 43.4  | 35.0  | 32.2  | 28.6  | 28.9  | 30.0  |
| 47.5° | 1867.6 | 913.2  | 87.3  | 71.7  | 52.6  | 39.4  | 31.1  | 27.0  | 23.6  | 23.4  | 24.7  |
| 50°   | 2156.0 | 1020.2 | 81.7  | 65.0  | 48.6  | 36.2  | 27.2  | 21.9  | 19.2  | 18.3  | 19.4  |
| 52.5° | 2463.9 | 1158.6 | 75.8  | 60.3  | 43.9  | 31.7  | 23.4  | 17.8  | 15.3  | 14.7  | 15.6  |
| 55°   | 2769.1 | 1291.5 | 70.3  | 57.3  | 38.9  | 27.2  | 19.8  | 14.7  | 12.5  | 11.9  | 12.5  |
| 57.5° | 3116.7 | 1435.1 | 63.1  | 51.1  | 34.2  | 23.6  | 16.4  | 12.2  | 10.3  | 9.8   | 10.0  |
| 60°   | 3378.6 | 1485.7 | 57.0  | 44.5  | 29.8  | 20.9  | 13.9  | 9.8   | 8.3   | 7.8   | 8.1   |
| 62.5° | 3502.8 | 1403.1 | 51.1  | 38.6  | 26.2  | 18.1  | 11.7  | 8.1   | 7.0   | 6.4   | 6.4   |
| 65°   | 3470.6 | 1220.3 | 45.3  | 33.0  | 22.5  | 15.0  | 9.2   | 7.0   | 6.1   | 5.3   | 5.0   |
| 67.5° | 3098.1 | 954.9  | 38.6  | 27.7  | 18.9  | 12.2  | 7.8   | 6.6   | 5.5   | 5.0   | 4.2   |
| 70°   | 2457.0 | 691.5  | 31.4  | 23.0  | 15.8  | 10.0  | 6.1   | 6.1   | 5.3   | 5.0   | 3.9   |
| 72.5° | 1610.5 | 435.2  | 25.6  | 18.6  | 13.0  | 7.8   | 4.7   | 5.5   | 5.0   | 5.0   | 3.6   |
| 75°   | 697.9  | 155.7  | 20.6  | 15.0  | 10.8  | 5.3   | 4.2   | 5.0   | 5.3   | 5.0   | 4.2   |
| 77.5° | 163.4  | 48.4   | 16.1  | 11.9  | 8.9   | 3.6   | 4.2   | 5.0   | 5.3   | 4.7   | 3.6   |
| 80°   | 61.4   | 20.6   | 10.6  | 7.8   | 7.0   | 2.2   | 3.6   | 3.0   | 2.8   | 1.9   | 0.6   |
| 82.5° | 37.3   | 8.6    | 5.5   | 3.9   | 3.4   | 0.6   | 1.7   | 1.1   | 0.6   | 0.6   | 0.0   |
| 85°   | 26.4   | 4.2    | 3.0   | 2.8   | 1.7   | 0.0   | 0.3   | 0.0   | 0.0   | 0.3   | 0.0   |
| 87.5° | 3.6    | 1.1    | 1.4   | 1.4   | 1.1   | 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-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

McGRAW-EDISON

Report Number: SP1-2309-178-2

Test Date: 09/22/2023

Luminaire Tested: GALN-SA2A-840-U-T4W

Data in this report applies to families of products including GALN-SA2A-840-U-T4W.

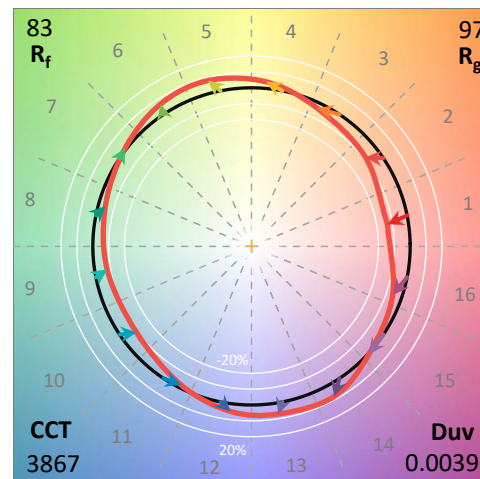
### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2309-178-2  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 09/22/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: MCGRAW-EDISON  
 Catalog Number: **GALN-SA2A-840-U-T4W**  
 Description: GALLEON 2 AREA AND ROADWAY LUMINAIRE. (2) 80 CRI, 4000K, 615MA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV WIDE OPTICS

LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV WIDE OPTICS

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 3867   | CRI (Ra): | 79.8 |      |      |
| CIE u':                   | 0.2254 | R1:       | 76.6 | R9:  | -8.6 |
| CIE v':                   | 0.5090 | R2:       | 84.7 | R10: | 66.3 |
| Duv:                      | 0.0039 | R3:       | 93.7 | R11: | 80.5 |
| CIE x:                    | 0.3895 | R4:       | 80.6 | R12: | 67.3 |
| CIE y:                    | 0.3908 | R5:       | 77.9 | R13: | 77.9 |
| CIE z:                    | 0.2197 | R6:       | 81.2 | R14: | 96.6 |
| Peak Wavelength (nm):     | 593    | R7:       | 84.2 |      |      |
| Dominant Wavelength (nm): | 577    | R8:       | 59.0 |      |      |
| Purity:                   | 34.3   |           |      |      |      |
| Rf:                       | 82.7   |           |      |      |      |
| Rg:                       | 96.5   |           |      |      |      |



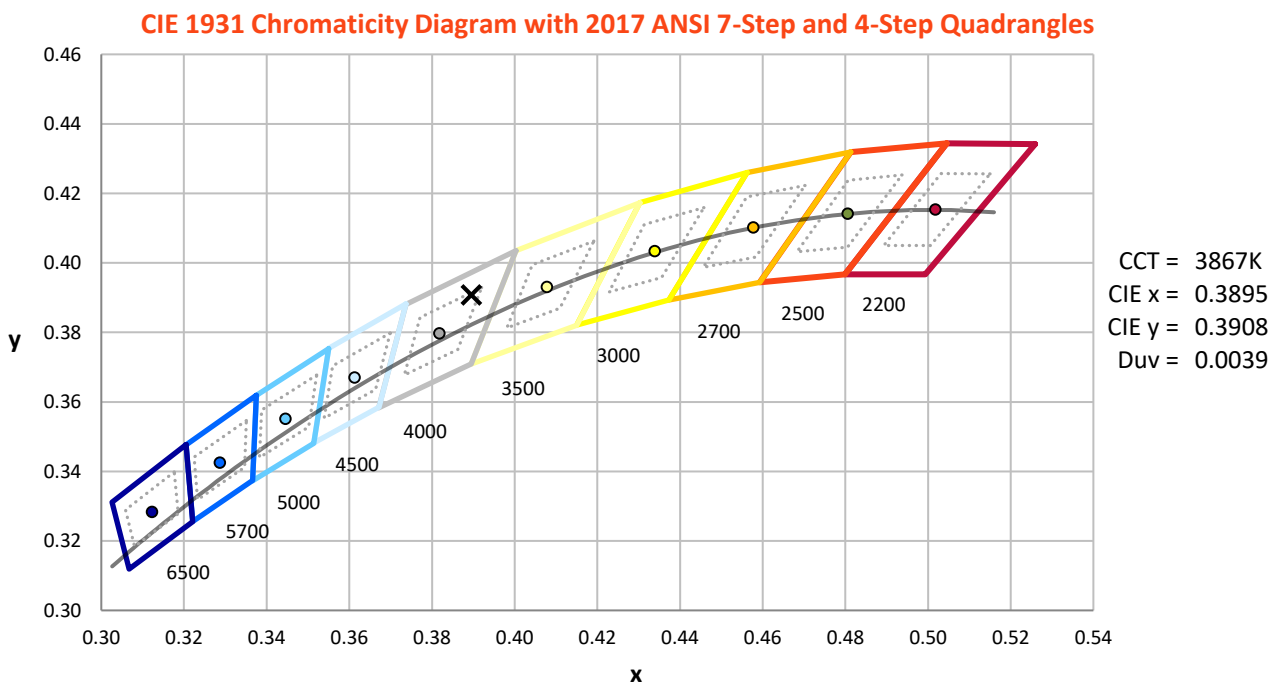
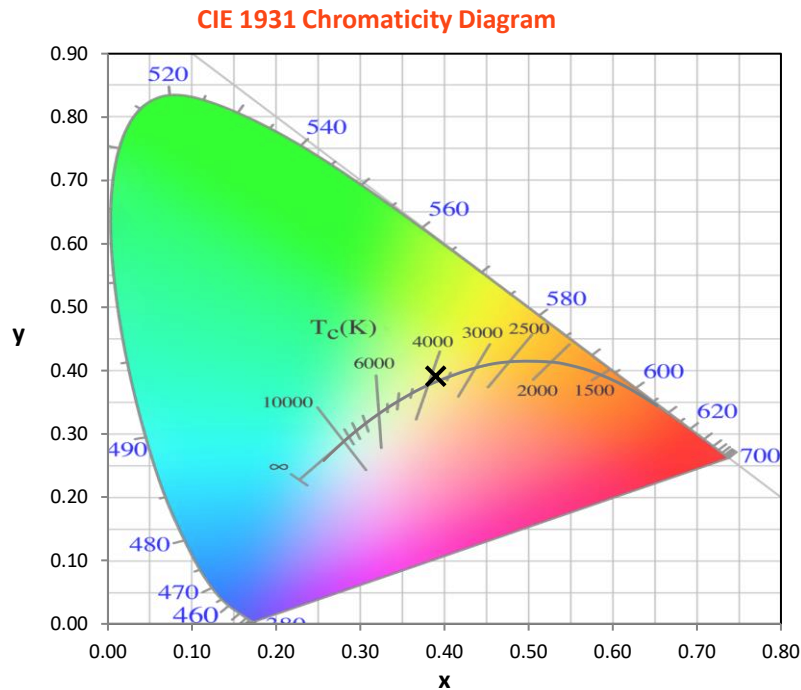
### Test Conditions

Stabilization Time: 25M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.8/46%  
 Sphere Temperature (°C): 24.7

REPORT NUMBER: SP1-2309-178-2

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 8/9/2023         | 2/9/2024             |
| Power Meter                    | XITRON 2801 IN0071    | 11/29/2022       | 11/29/2023           |
| AC Power Source                | CHROMA 61603 IN0063   | 11/28/2022       | 11/28/2023           |
| DC Power Source                | AGILENT E3634A IN0208 | 11/28/2022       | 11/28/2023           |
| Sphere Thermometer             | ONSET IN0085          | 11/28/2022       | 11/28/2023           |
| Room Thermometer               | ONSET IN0046          | 11/28/2022       | 11/28/2023           |

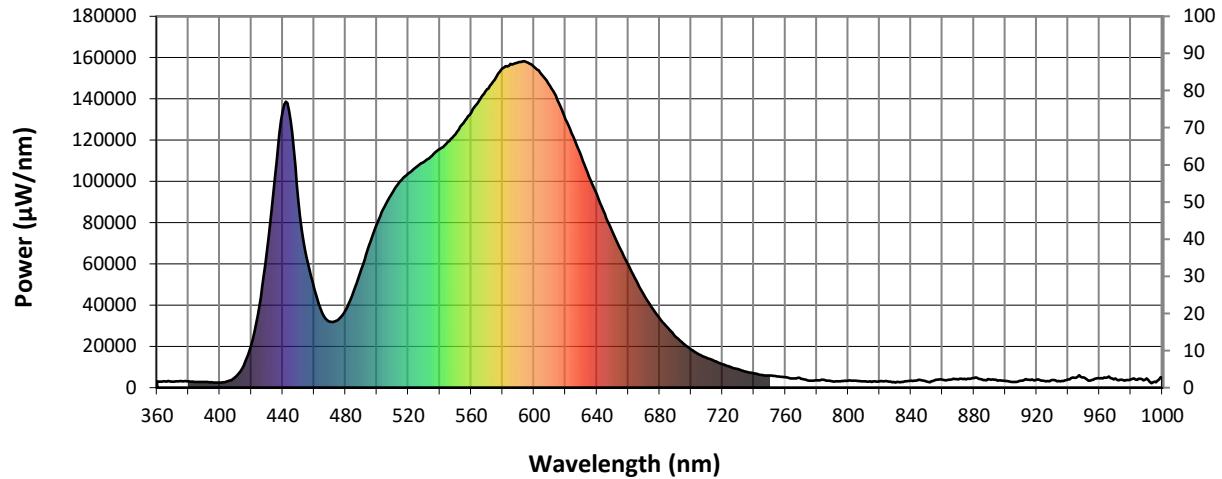
REPORT NUMBER: SP1-2309-178-2



Point lies inside the ANSI 4000K 4-step quadrangle

REPORT NUMBER: SP1-2309-178-2

**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       | 3123             | NR               | 490       | 57459            | NR               | 620       | 129941           | NR               | 750       | 5858             | NR               | 880       | 4622             | NR               |
| 365       | 3041             | NR               | 495       | 69038            | NR               | 625       | 121678           | NR               | 755       | 5395             | NR               | 885       | 3949             | NR               |
| 370       | 2965             | NR               | 500       | 79493            | NR               | 630       | 112252           | NR               | 760       | 5011             | NR               | 890       | 4035             | NR               |
| 375       | 3195             | NR               | 505       | 87950            | NR               | 635       | 102369           | NR               | 765       | 4514             | NR               | 895       | 3391             | NR               |
| 380       | 3028             | NR               | 510       | 94704            | NR               | 640       | 93616            | NR               | 770       | 4375             | NR               | 900       | 3268             | NR               |
| 385       | 2738             | NR               | 515       | 100214           | NR               | 645       | 84211            | NR               | 775       | 3450             | NR               | 905       | 2767             | NR               |
| 390       | 2690             | NR               | 520       | 103961           | NR               | 650       | 75380            | NR               | 780       | 3547             | NR               | 910       | 3391             | NR               |
| 395       | 2604             | NR               | 525       | 106854           | NR               | 655       | 66946            | NR               | 785       | 3648             | NR               | 915       | 3784             | NR               |
| 400       | 2384             | NR               | 530       | 109533           | NR               | 660       | 59483            | NR               | 790       | 3081             | NR               | 920       | 3790             | NR               |
| 405       | 3031             | NR               | 535       | 112417           | NR               | 665       | 51858            | NR               | 795       | 3104             | NR               | 925       | 3175             | NR               |
| 410       | 5239             | NR               | 540       | 115725           | NR               | 670       | 44882            | NR               | 800       | 3444             | NR               | 930       | 3642             | NR               |
| 415       | 10499            | NR               | 545       | 119091           | NR               | 675       | 38742            | NR               | 805       | 3315             | NR               | 935       | 3040             | NR               |
| 420       | 20790            | NR               | 550       | 122884           | NR               | 680       | 33597            | NR               | 810       | 3022             | NR               | 940       | 4039             | NR               |
| 425       | 39276            | NR               | 555       | 128300           | NR               | 685       | 29101            | NR               | 815       | 2832             | NR               | 945       | 4797             | NR               |
| 430       | 66418            | NR               | 560       | 133274           | NR               | 690       | 24855            | NR               | 820       | 3142             | NR               | 950       | 4945             | NR               |
| 435       | 101961           | NR               | 565       | 139112           | NR               | 695       | 21367            | NR               | 825       | 3115             | NR               | 955       | 3757             | NR               |
| 440       | 134023           | NR               | 570       | 144467           | NR               | 700       | 18479            | NR               | 830       | 2520             | NR               | 960       | 4539             | NR               |
| 445       | 129385           | NR               | 575       | 149331           | NR               | 705       | 16131            | NR               | 835       | 2783             | NR               | 965       | 4857             | NR               |
| 450       | 90434            | NR               | 580       | 154784           | NR               | 710       | 14388            | NR               | 840       | 3364             | NR               | 970       | 4463             | NR               |
| 455       | 63521            | NR               | 585       | 156899           | NR               | 715       | 12865            | NR               | 845       | 3807             | NR               | 975       | 3718             | NR               |
| 460       | 48429            | NR               | 590       | 157796           | NR               | 720       | 11277            | NR               | 850       | 2907             | NR               | 980       | 3955             | NR               |
| 465       | 36445            | NR               | 595       | 157849           | NR               | 725       | 10063            | NR               | 855       | 3470             | NR               | 985       | 4314             | NR               |
| 470       | 31953            | NR               | 600       | 155418           | NR               | 730       | 8942             | NR               | 860       | 3820             | NR               | 990       | 4478             | NR               |
| 475       | 32768            | NR               | 605       | 151601           | NR               | 735       | 7722             | NR               | 865       | 3922             | NR               | 995       | 2959             | NR               |
| 480       | 37631            | NR               | 610       | 146416           | NR               | 740       | 6964             | NR               | 870       | 4061             | NR               | 1000      | 4570             | NR               |
| 485       | 46354            | NR               | 615       | 139241           | NR               | 745       | 6117             | NR               | 875       | 3975             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 14236

S/P: 1.59

| 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       | 3123             | NR               | 490       | 57459            | NR               | 620       | 129941           | NR               | 750       | 5858             | NR               | 880       | 4622             | NR               |
| 365       | 3041             | NR               | 495       | 69038            | NR               | 625       | 121678           | NR               | 755       | 5395             | NR               | 885       | 3949             | NR               |
| 370       | 2965             | NR               | 500       | 79493            | NR               | 630       | 112252           | NR               | 760       | 5011             | NR               | 890       | 4035             | NR               |
| 375       | 3195             | NR               | 505       | 87950            | NR               | 635       | 102369           | NR               | 765       | 4514             | NR               | 895       | 3391             | NR               |
| 380       | 3028             | NR               | 510       | 94704            | NR               | 640       | 93616            | NR               | 770       | 4375             | NR               | 900       | 3268             | NR               |
| 385       | 2738             | NR               | 515       | 100214           | NR               | 645       | 84211            | NR               | 775       | 3450             | NR               | 905       | 2767             | NR               |
| 390       | 2690             | NR               | 520       | 103961           | NR               | 650       | 75380            | NR               | 780       | 3547             | NR               | 910       | 3391             | NR               |
| 395       | 2604             | NR               | 525       | 106854           | NR               | 655       | 66946            | NR               | 785       | 3648             | NR               | 915       | 3784             | NR               |
| 400       | 2384             | NR               | 530       | 109533           | NR               | 660       | 59483            | NR               | 790       | 3081             | NR               | 920       | 3790             | NR               |
| 405       | 3031             | NR               | 535       | 112417           | NR               | 665       | 51858            | NR               | 795       | 3104             | NR               | 925       | 3175             | NR               |
| 410       | 5239             | NR               | 540       | 115725           | NR               | 670       | 44882            | NR               | 800       | 3444             | NR               | 930       | 3642             | NR               |
| 415       | 10499            | NR               | 545       | 119091           | NR               | 675       | 38742            | NR               | 805       | 3315             | NR               | 935       | 3040             | NR               |
| 420       | 20790            | NR               | 550       | 122884           | NR               | 680       | 33597            | NR               | 810       | 3022             | NR               | 940       | 4039             | NR               |
| 425       | 39276            | NR               | 555       | 128300           | NR               | 685       | 29101            | NR               | 815       | 2832             | NR               | 945       | 4797             | NR               |
| 430       | 66418            | NR               | 560       | 133274           | NR               | 690       | 24855            | NR               | 820       | 3142             | NR               | 950       | 4945             | NR               |
| 435       | 101961           | NR               | 565       | 139112           | NR               | 695       | 21367            | NR               | 825       | 3115             | NR               | 955       | 3757             | NR               |
| 440       | 134023           | NR               | 570       | 144467           | NR               | 700       | 18479            | NR               | 830       | 2520             | NR               | 960       | 4539             | NR               |
| 445       | 129385           | NR               | 575       | 149331           | NR               | 705       | 16131            | NR               | 835       | 2783             | NR               | 965       | 4857             | NR               |
| 450       | 90434            | NR               | 580       | 154784           | NR               | 710       | 14388            | NR               | 840       | 3364             | NR               | 970       | 4463             | NR               |
| 455       | 63521            | NR               | 585       | 156899           | NR               | 715       | 12865            | NR               | 845       | 3807             | NR               | 975       | 3718             | NR               |
| 460       | 48429            | NR               | 590       | 157796           | NR               | 720       | 11277            | NR               | 850       | 2907             | NR               | 980       | 3955             | NR               |
| 465       | 36445            | NR               | 595       | 157849           | NR               | 725       | 10063            | NR               | 855       | 3470             | NR               | 985       | 4314             | NR               |
| 470       | 31953            | NR               | 600       | 155418           | NR               | 730       | 8942             | NR               | 860       | 3820             | NR               | 990       | 4478             | NR               |
| 475       | 32768            | NR               | 605       | 151601           | NR               | 735       | 7722             | NR               | 865       | 3922             | NR               | 995       | 2959             | NR               |
| 480       | 37631            | NR               | 610       | 146416           | NR               | 740       | 6964             | NR               | 870       | 4061             | NR               | 1000      | 4570             | NR               |
| 485       | 46354            | NR               | 615       | 139241           | NR               | 745       | 6117             | NR               | 875       | 3975             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 5542.6**

**M/P: 0.62**

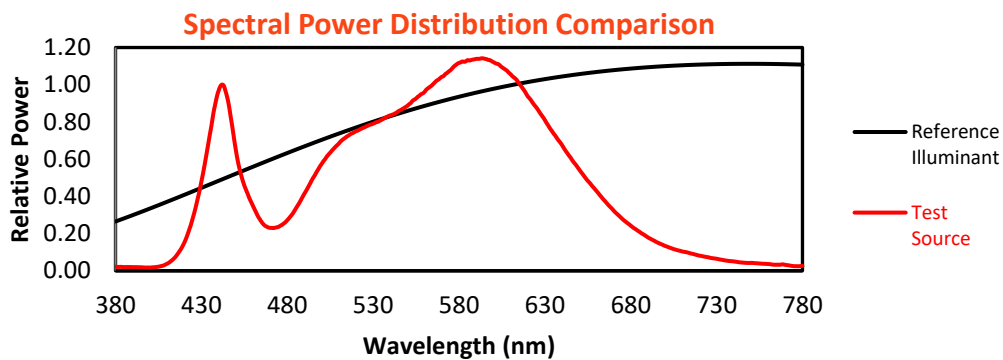
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 3123             | NR               | 490       | 57459            | NR               | 620       | 129941           | NR               | 750       | 5858             | NR               | 880       | 4622             | NR               |
| 365       | 3041             | NR               | 495       | 69038            | NR               | 625       | 121678           | NR               | 755       | 5395             | NR               | 885       | 3949             | NR               |
| 370       | 2965             | NR               | 500       | 79493            | NR               | 630       | 112252           | NR               | 760       | 5011             | NR               | 890       | 4035             | NR               |
| 375       | 3195             | NR               | 505       | 87950            | NR               | 635       | 102369           | NR               | 765       | 4514             | NR               | 895       | 3391             | NR               |
| 380       | 3028             | NR               | 510       | 94704            | NR               | 640       | 93616            | NR               | 770       | 4375             | NR               | 900       | 3268             | NR               |
| 385       | 2738             | NR               | 515       | 100214           | NR               | 645       | 84211            | NR               | 775       | 3450             | NR               | 905       | 2767             | NR               |
| 390       | 2690             | NR               | 520       | 103961           | NR               | 650       | 75380            | NR               | 780       | 3547             | NR               | 910       | 3391             | NR               |
| 395       | 2604             | NR               | 525       | 106854           | NR               | 655       | 66946            | NR               | 785       | 3648             | NR               | 915       | 3784             | NR               |
| 400       | 2384             | NR               | 530       | 109533           | NR               | 660       | 59483            | NR               | 790       | 3081             | NR               | 920       | 3790             | NR               |
| 405       | 3031             | NR               | 535       | 112417           | NR               | 665       | 51858            | NR               | 795       | 3104             | NR               | 925       | 3175             | NR               |
| 410       | 5239             | NR               | 540       | 115725           | NR               | 670       | 44882            | NR               | 800       | 3444             | NR               | 930       | 3642             | NR               |
| 415       | 10499            | NR               | 545       | 119091           | NR               | 675       | 38742            | NR               | 805       | 3315             | NR               | 935       | 3040             | NR               |
| 420       | 20790            | NR               | 550       | 122884           | NR               | 680       | 33597            | NR               | 810       | 3022             | NR               | 940       | 4039             | NR               |
| 425       | 39276            | NR               | 555       | 128300           | NR               | 685       | 29101            | NR               | 815       | 2832             | NR               | 945       | 4797             | NR               |
| 430       | 66418            | NR               | 560       | 133274           | NR               | 690       | 24855            | NR               | 820       | 3142             | NR               | 950       | 4945             | NR               |
| 435       | 101961           | NR               | 565       | 139112           | NR               | 695       | 21367            | NR               | 825       | 3115             | NR               | 955       | 3757             | NR               |
| 440       | 134023           | NR               | 570       | 144467           | NR               | 700       | 18479            | NR               | 830       | 2520             | NR               | 960       | 4539             | NR               |
| 445       | 129385           | NR               | 575       | 149331           | NR               | 705       | 16131            | NR               | 835       | 2783             | NR               | 965       | 4857             | NR               |
| 450       | 90434            | NR               | 580       | 154784           | NR               | 710       | 14388            | NR               | 840       | 3364             | NR               | 970       | 4463             | NR               |
| 455       | 63521            | NR               | 585       | 156899           | NR               | 715       | 12865            | NR               | 845       | 3807             | NR               | 975       | 3718             | NR               |
| 460       | 48429            | NR               | 590       | 157796           | NR               | 720       | 11277            | NR               | 850       | 2907             | NR               | 980       | 3955             | NR               |
| 465       | 36445            | NR               | 595       | 157849           | NR               | 725       | 10063            | NR               | 855       | 3470             | NR               | 985       | 4314             | NR               |
| 470       | 31953            | NR               | 600       | 155418           | NR               | 730       | 8942             | NR               | 860       | 3820             | NR               | 990       | 4478             | NR               |
| 475       | 32768            | NR               | 605       | 151601           | NR               | 735       | 7722             | NR               | 865       | 3922             | NR               | 995       | 2959             | NR               |
| 480       | 37631            | NR               | 610       | 146416           | NR               | 740       | 6964             | NR               | 870       | 4061             | NR               | 1000      | 4570             | NR               |
| 485       | 46354            | NR               | 615       | 139241           | NR               | 745       | 6117             | NR               | 875       | 3975             | NR               |           |                  |                  |

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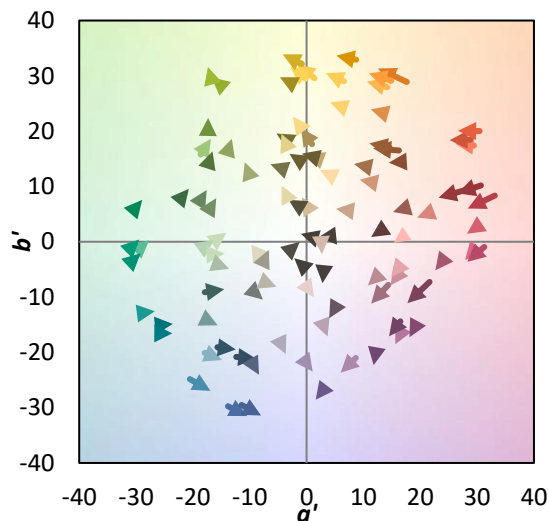
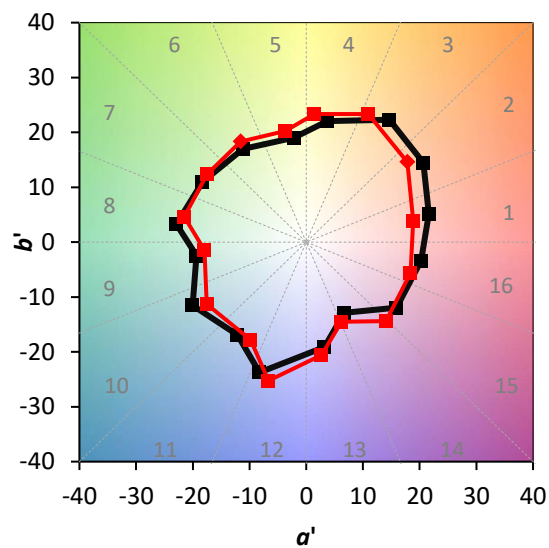
**TM-30-18**

**Summary**

$R_f = 82.7$   
 $R_g = 96.5$   
 $CIE R_a = 79.8$   
 $R_g = -8.6$



**Color Vector Graphics**





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

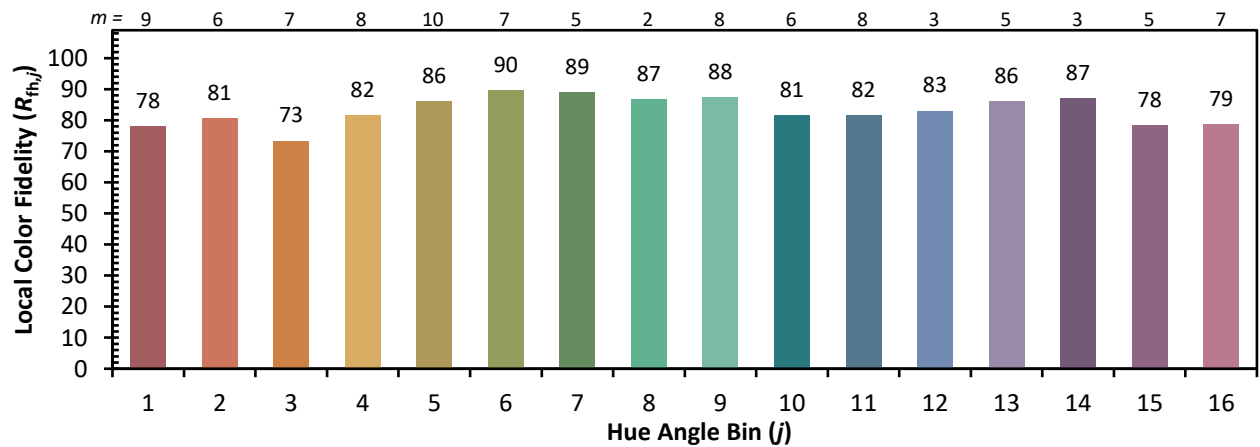
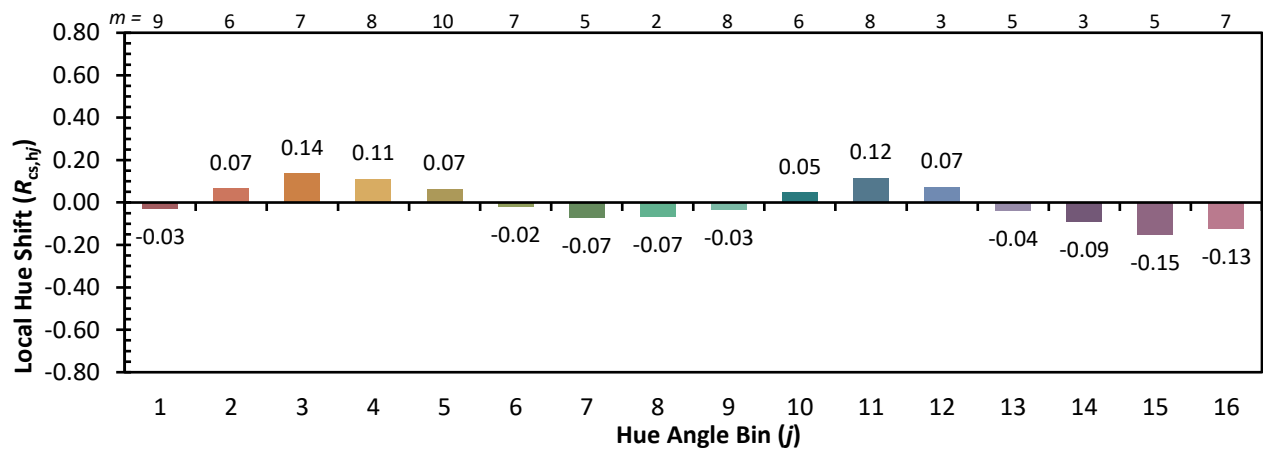
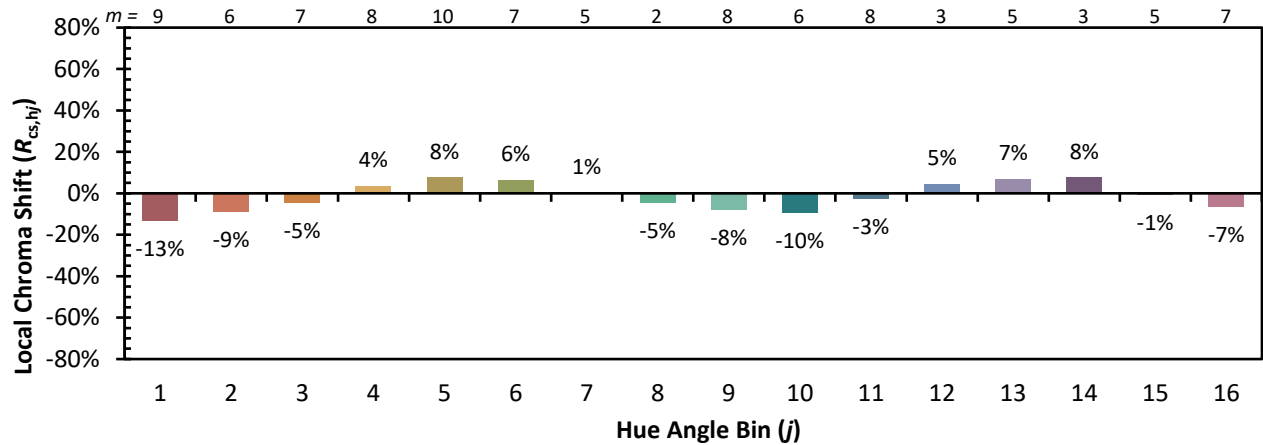
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| CES01 = 85 | CES26 = 76 | CES51 = 94 | CES76 = 73 |
| CES02 = 61 | CES27 = 91 | CES52 = 94 | CES77 = 85 |
| CES03 = 31 | CES28 = 90 | CES53 = 86 | CES78 = 73 |
| CES04 = 69 | CES29 = 73 | CES54 = 88 | CES79 = 91 |
| CES05 = 48 | CES30 = 76 | CES55 = 88 | CES80 = 89 |
| CES06 = 50 | CES31 = 77 | CES56 = 81 | CES81 = 80 |
| CES07 = 40 | CES32 = 74 | CES57 = 80 | CES82 = 95 |
| CES08 = 39 | CES33 = 78 | CES58 = 82 | CES83 = 92 |
| CES09 = 29 | CES34 = 84 | CES59 = 91 | CES84 = 92 |
| CES10 = 74 | CES35 = 92 | CES60 = 96 | CES85 = 85 |
| CES11 = 57 | CES36 = 97 | CES61 = 92 | CES86 = 73 |
| CES12 = 63 | CES37 = 89 | CES62 = 90 | CES87 = 85 |
| CES13 = 42 | CES38 = 83 | CES63 = 83 | CES88 = 83 |
| CES14 = 74 | CES39 = 95 | CES64 = 83 | CES89 = 77 |
| CES15 = 71 | CES40 = 91 | CES65 = 77 | CES90 = 82 |
| CES16 = 47 | CES41 = 90 | CES66 = 82 | CES91 = 91 |
| CES17 = 49 | CES42 = 90 | CES67 = 80 | CES92 = 68 |
| CES18 = 56 | CES43 = 86 | CES68 = 83 | CES93 = 82 |
| CES19 = 71 | CES44 = 99 | CES69 = 90 | CES94 = 61 |
| CES20 = 65 | CES45 = 91 | CES70 = 77 | CES95 = 76 |
| CES21 = 86 | CES46 = 87 | CES71 = 77 | CES96 = 82 |
| CES22 = 78 | CES47 = 85 | CES72 = 92 | CES97 = 89 |
| CES23 = 91 | CES48 = 77 | CES73 = 71 | CES98 = 81 |
| CES24 = 90 | CES49 = 87 | CES74 = 97 | CES99 = 70 |
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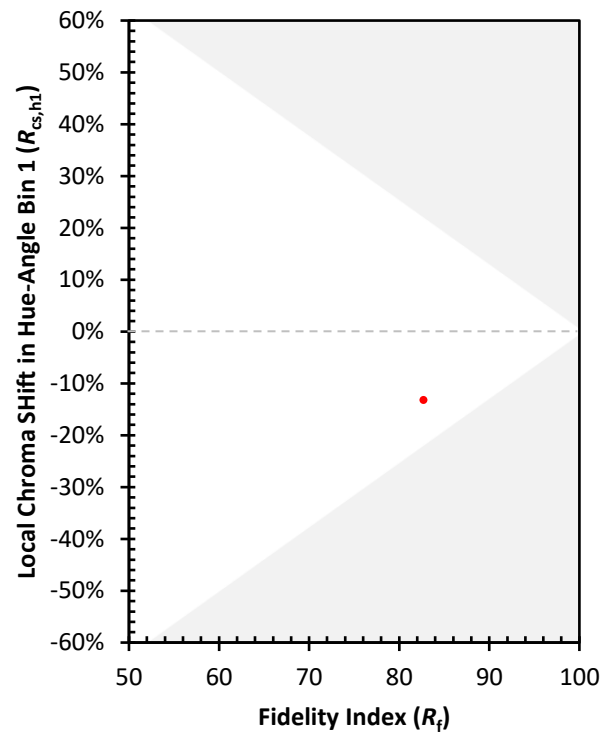
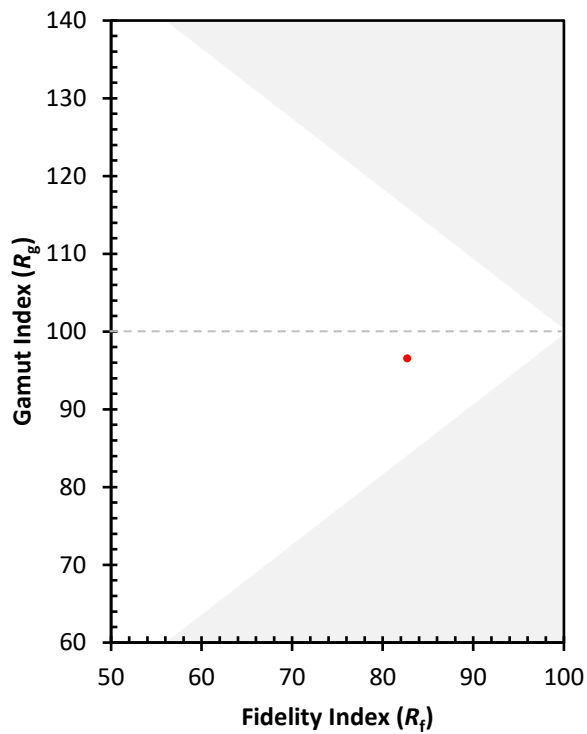
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)