

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: METALUX

Report Number: P860281

Luminaire Tested: **SPHB-9HE-W-L840-CD**

Issue Date: 7/11/2024

This test was performed under the Supervised Manufacturer's Testing Program. The results of this test have not been influenced by sources from within Cooper Lighting Solutions or from external interests.



**Test Information**

Test Method: LM-79-08  
Report Number: P860281  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2404-343-6)  
Test Lab: INNOVATION CENTER  
Issue Date: 7/11/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: SPHB-9HE-W-L840-CD  
Description: 9000 Lumen High Efficacy Select Pro High Bay with Wide Lens and,  
4000K 80CRI LEDs  
Light Source: -  
Ballast/Driver: -

Luminaire Equipment: Sample No.   Condition   Description

**Summary**

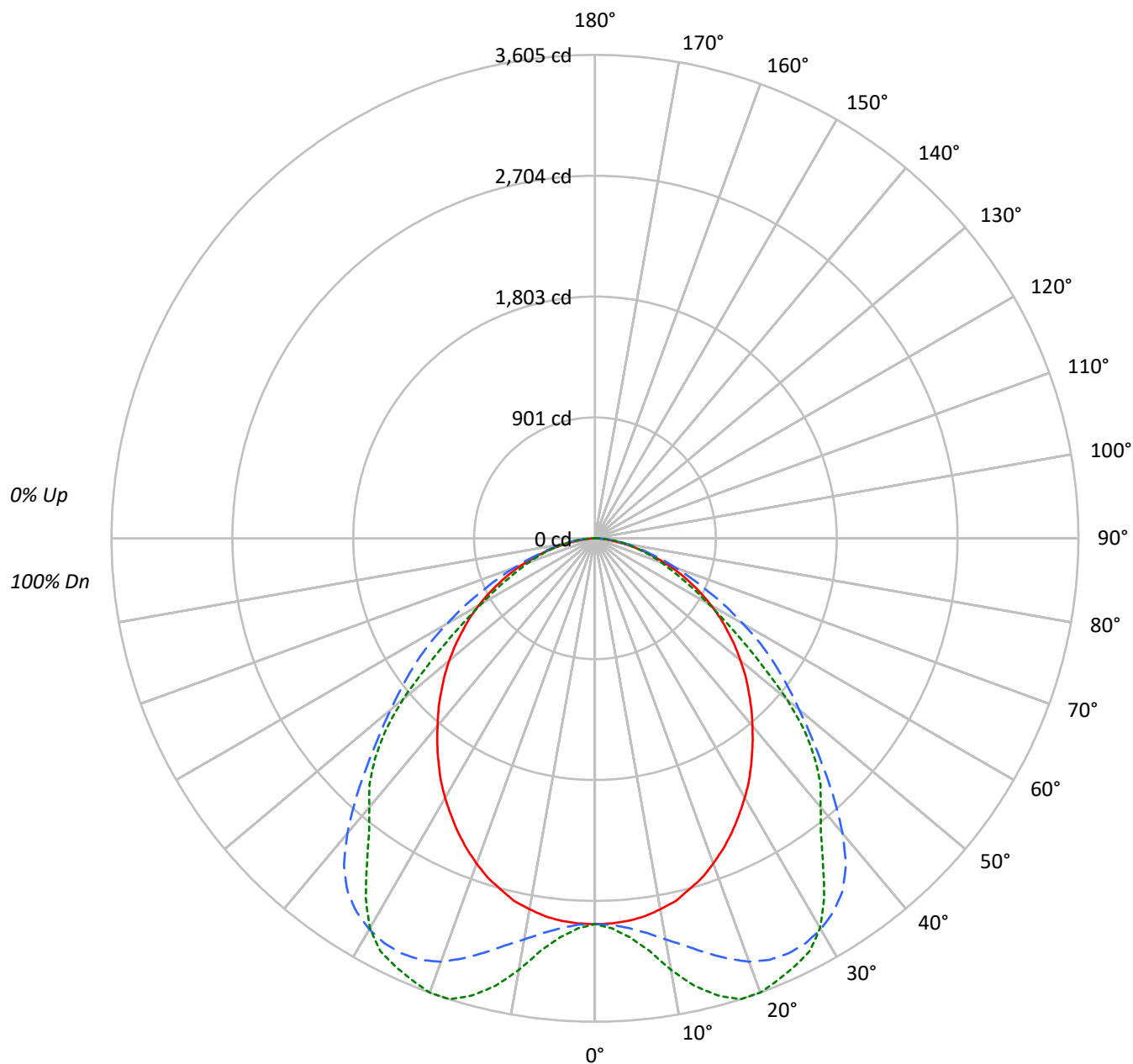
Lumens per Lamp: N/A  
Luminaire Lumens: 9054.0 lumens  
Efficiency: N/A  
Efficacy: 169.9 lumens/watt  
Spacing Criteria (0/90/45): 1.16 / 1.5 / 1.51  
Luminous Opening: Rectangular (W 1' x L: 1.38' x H: 0')  
CIE Type: Direct

Input Watts (W): 53.3  
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: 25 FT

TEST NUMBER: P860281

CATALOG NUMBER: SPHB-9HE-W-L840-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P860281

CATALOG NUMBER: SPHB-9HE-W-L840-CD

**COEFFICIENT OF UTILIZATION - ZONAL CAVITY METHOD:**

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20  |     |     |     |    | 20 |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30  |     |     |     |    | 10 |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |    |    |
| 1   | 110 | 105 | 101 | 98  | 107 | 103 | 99  | 96  | 99  | 96  | 93  | 95  | 92  | 90  | 91  | 89  | 87  | 85  |    |    |
| 2   | 100 | 92  | 86  | 81  | 98  | 91  | 85  | 80  | 87  | 82  | 78  | 84  | 80  | 76  | 81  | 77  | 74  | 72  |    |    |
| 3   | 92  | 82  | 74  | 68  | 89  | 80  | 73  | 67  | 77  | 71  | 66  | 74  | 69  | 65  | 72  | 67  | 64  | 62  |    |    |
| 4   | 84  | 73  | 64  | 58  | 82  | 71  | 63  | 57  | 69  | 62  | 57  | 66  | 61  | 56  | 64  | 59  | 55  | 53  |    |    |
| 5   | 77  | 65  | 56  | 50  | 75  | 64  | 56  | 50  | 62  | 55  | 49  | 60  | 54  | 49  | 58  | 52  | 48  | 46  |    |    |
| 6   | 72  | 59  | 50  | 44  | 70  | 58  | 49  | 43  | 56  | 49  | 43  | 54  | 48  | 43  | 53  | 47  | 42  | 40  |    |    |
| 7   | 66  | 53  | 45  | 39  | 65  | 52  | 44  | 38  | 51  | 43  | 38  | 49  | 43  | 38  | 48  | 42  | 38  | 36  |    |    |
| 8   | 62  | 48  | 40  | 34  | 60  | 48  | 40  | 34  | 46  | 39  | 34  | 45  | 39  | 34  | 44  | 38  | 34  | 32  |    |    |
| 9   | 58  | 44  | 36  | 31  | 56  | 44  | 36  | 31  | 43  | 36  | 31  | 42  | 35  | 30  | 41  | 35  | 30  | 29  |    |    |
| 10  | 54  | 41  | 33  | 28  | 53  | 40  | 33  | 28  | 39  | 33  | 28  | 39  | 32  | 28  | 38  | 32  | 28  | 26  |    |    |

**AVERAGE LUMINANCE (cd/sqm):**

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 22444 | 22444 | 22444 |
| 5°  | 22420 | 22843 | 23384 |
| 10° | 22242 | 24048 | 25872 |
| 15° | 21896 | 25839 | 28498 |
| 20° | 21421 | 27894 | 29921 |
| 25° | 20803 | 29399 | 30313 |
| 30° | 20126 | 30319 | 30231 |
| 35° | 19371 | 30624 | 28209 |
| 40° | 18590 | 29240 | 26643 |
| 45° | 17886 | 26505 | 25563 |
| 50° | 17190 | 24099 | 22661 |
| 55° | 16404 | 22267 | 18441 |
| 60° | 15592 | 19851 | 15188 |
| 65° | 14518 | 17057 | 13169 |
| 70° | 13209 | 14564 | 11911 |
| 75° | 11343 | 12223 | 10919 |
| 80° | 8867  | 10484 | 10129 |
| 85° | 5996  | 8896  | 8350  |



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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 282.5  | 3.1       |
| 10°-20°   | 895.8  | 9.9       |
| 20°-30°   | 1466.1 | 16.2      |
| 30°-40°   | 1788.5 | 19.8      |
| 40°-50°   | 1771.3 | 19.6      |
| 50°-60°   | 1416.5 | 15.6      |
| 60°-70°   | 883.7  | 9.8       |
| 70°-80°   | 433.0  | 4.8       |
| 80°-90°   | 113.5  | 1.3       |
| 90°-100°  | 3.0    | 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°-30°    | 2644.5 | 29.2      |
| 0°-40°    | 4433.0 | 49.0      |
| 0°-60°    | 7620.8 | 84.2      |
| 0°-90°    | 9051.0 | 100.0     |
| 90°-120°  | 3.0    | 0.0       |
| 90°-150°  | 3.0    | 0.0       |
| 90°-180°  | 3.0    | 0.0       |
| 0°-180°   | 9054.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 2878 | 2878  | 2878 | 2878  | 2878 |      |
| 5°   | 2863 | 2876  | 2918 | 2968  | 2987 | 272  |
| 15°  | 2712 | 2869  | 3200 | 3454  | 3529 | 764  |
| 25°  | 2417 | 2826  | 3416 | 3515  | 3522 | 1112 |
| 35°  | 2034 | 2718  | 3216 | 3044  | 2962 | 1272 |
| 45°  | 1622 | 2519  | 2403 | 2322  | 2317 | 1252 |
| 55°  | 1206 | 1934  | 1637 | 1479  | 1356 | 1081 |
| 65°  | 787  | 1085  | 924  | 766   | 714  | 780  |
| 75°  | 376  | 461   | 406  | 371   | 362  | 400  |
| 85°  | 67   | 95    | 99   | 94    | 93   | 83   |
| 90°  | 0    | 10    | 18   | 22    | 23   | 4    |
| 95°  | 0    | 1     | 1    | 1     | 1    | 0    |
| 105° | 0    | 0     | 0    | 0     | 0    | 0    |
| 115° | 0    | 0     | 0    | 0     | 0    | 0    |
| 125° | 0    | 0     | 0    | 0     | 0    | 0    |
| 135° | 0    | 0     | 0    | 0     | 0    | 0    |
| 145° | 0    | 0     | 0    | 0     | 0    | 0    |
| 155° | 0    | 0     | 0    | 0     | 0    | 0    |
| 165° | 0    | 0     | 0    | 0     | 0    | 0    |
| 175° | 0    | 0     | 0    | 0     | 0    | 0    |
| 180° | 0    | 0     | 0    | 0     | 0    |      |



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CATALOG NUMBER: SPHB-9HE-W-L840-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|--------|--------|--------|--------|--------|--------|
| 0°     | 2877.5 | 2877.5 | 2877.5 | 2877.5 | 2877.5 |
| 2.5°   | 2874.6 | 2873.5 | 2884.0 | 2903.1 | 2911.7 |
| 5°     | 2863.4 | 2876.1 | 2917.5 | 2968.3 | 2986.6 |
| 7.5°   | 2843.3 | 2877.1 | 2968.6 | 3061.9 | 3101.5 |
| 10°    | 2808.3 | 2877.9 | 3036.3 | 3200.9 | 3266.5 |
| 12.5°  | 2772.3 | 2875.3 | 3111.6 | 3344.7 | 3416.3 |
| 15°    | 2711.5 | 2869.2 | 3199.9 | 3454.5 | 3529.1 |
| 17.5°  | 2654.9 | 2862.0 | 3284.9 | 3547.8 | 3604.3 |
| 20°    | 2580.7 | 2851.6 | 3360.5 | 3576.2 | 3604.7 |
| 22.5°  | 2502.9 | 2843.3 | 3402.3 | 3557.2 | 3565.8 |
| 25°    | 2417.2 | 2826.4 | 3416.0 | 3515.0 | 3522.2 |
| 27.5°  | 2325.7 | 2811.2 | 3403.0 | 3462.8 | 3468.9 |
| 30°    | 2234.6 | 2783.8 | 3366.3 | 3381.4 | 3356.5 |
| 32.5°  | 2139.1 | 2756.5 | 3306.8 | 3238.8 | 3180.8 |
| 35°    | 2034.3 | 2718.3 | 3216.1 | 3044.3 | 2962.5 |
| 37.5°  | 1930.9 | 2681.6 | 3074.5 | 2826.7 | 2765.1 |
| 40°    | 1825.8 | 2636.2 | 2871.7 | 2623.6 | 2616.7 |
| 42.5°  | 1726.4 | 2587.2 | 2642.3 | 2465.4 | 2488.5 |
| 45°    | 1621.5 | 2519.1 | 2402.8 | 2322.1 | 2317.4 |
| 47.5°  | 1522.1 | 2425.1 | 2184.9 | 2163.6 | 2115.7 |
| 50°    | 1416.6 | 2295.4 | 1986.0 | 1965.9 | 1867.5 |
| 52.5°  | 1313.2 | 2130.1 | 1808.5 | 1732.8 | 1589.5 |
| 55°    | 1206.3 | 1934.2 | 1637.4 | 1479.3 | 1356.1 |
| 57.5°  | 1106.8 | 1718.8 | 1463.4 | 1258.5 | 1147.9 |
| 60°    | 999.5  | 1500.5 | 1272.5 | 1064.7 | 973.6  |
| 62.5°  | 894.3  | 1285.5 | 1099.6 | 899.7  | 839.2  |
| 65°    | 786.6  | 1085.2 | 924.2  | 766.5  | 713.5  |
| 67.5°  | 683.6  | 912.0  | 772.6  | 646.2  | 610.9  |
| 70°    | 579.2  | 739.8  | 638.6  | 542.8  | 522.3  |
| 72.5°  | 471.5  | 591.1  | 516.5  | 458.2  | 442.7  |
| 75°    | 376.4  | 461.0  | 405.6  | 371.3  | 362.3  |
| 77.5°  | 280.2  | 342.9  | 317.0  | 296.8  | 294.3  |
| 80°    | 197.4  | 247.4  | 233.4  | 229.4  | 225.5  |
| 82.5°  | 126.1  | 161.7  | 166.0  | 163.5  | 160.6  |
| 85°    | 67.0   | 95.1   | 99.4   | 94.4   | 93.3   |
| 87.5°  | 27.0   | 41.4   | 44.7   | 49.3   | 50.8   |
| 90°    | 0.4    | 9.7    | 17.6   | 22.3   | 23.1   |
| 92.5°  | 0.4    | 2.2    | 2.5    | 2.5    | 2.2    |
| 95°    | 0.4    | 1.4    | 1.4    | 1.1    | 0.7    |
| 97.5°  | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 100°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 102.5° | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 105°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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**CANDELA DISTRIBUTION (continued):**

|        | 0°  | 22.5° | 45° | 67.5° | 90° |
|--------|-----|-------|-----|-------|-----|
| 112.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 115°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 117.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 120°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 122.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 125°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 127.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 130°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 132.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 135°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 137.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 140°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 142.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 145°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 147.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 150°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 152.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 155°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 157.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 160°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 162.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 165°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 167.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 170°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 172.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 175°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 177.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 180°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |



Report Generated By 670246072 / DESKTOP-50001EG





— 0°-180°    - - 45°-225°    - - - 90°-270°







|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| 107.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 110°   | 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

METALUX

Report Number: SP1-2309-187-7

Test Date: 10/09/2023

Luminaire Tested: SPHB-1224SE-M-UNV-L84050-CD-U (24K LUMEN 4000K)

Data in this report applies to families of products including SPHB-1224SE-M-UNV-L84050-CD-U (24K LUMEN 4000K).

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2309-187-7  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/09/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **SPHB-1224SE-M-UNV-L84050-CD-U (24K LUMEN 4000K)**  
 Description: SPHB SELECT, MEDIUM LENS, 24K LUMENS, 4000K

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 3926   | CRI (Ra): | 82.0 |      |      |
| CIE u':                   | 0.2261 | R1:       | 80.3 | R9:  | 8.2  |
| CIE v':                   | 0.5037 | R2:       | 88.4 | R10: | 71.6 |
| Duv:                      | 0.0006 | R3:       | 93.9 | R11: | 78.1 |
| CIE x:                    | 0.3841 | R4:       | 80.2 | R12: | 57.5 |
| CIE y:                    | 0.3802 | R5:       | 79.7 | R13: | 82.3 |
| CIE z:                    | 0.2357 | R6:       | 83.3 | R14: | 96.6 |
| Peak Wavelength (nm):     | 454    | R7:       | 86.1 |      |      |
| Dominant Wavelength (nm): | 579    | R8:       | 64.3 |      |      |
| Purity:                   | 29.5   |           |      |      |      |
| Rf:                       | 82.9   |           |      |      |      |
| Rg:                       | 95     |           |      |      |      |



### Test Conditions

Stabilization Time: 23M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.5/33%  
 Sphere Temperature (°C): 24.2

REPORT NUMBER: SP1-2309-187-7

| 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           |

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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 4000K 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       | 10992            | NR               | 490       | 118921           | NR               | 620       | 356922           | NR               | 750       | 19019            | NR               | 880       | 13091            | NR               |
| 365       | 9593             | NR               | 495       | 138088           | NR               | 625       | 337439           | NR               | 755       | 17413            | NR               | 885       | 13768            | NR               |
| 370       | 10476            | NR               | 500       | 166483           | NR               | 630       | 313667           | NR               | 760       | 16262            | NR               | 890       | 11509            | NR               |
| 375       | 11916            | NR               | 505       | 198126           | NR               | 635       | 289634           | NR               | 765       | 14555            | NR               | 895       | 10746            | NR               |
| 380       | 10857            | NR               | 510       | 225943           | NR               | 640       | 267120           | NR               | 770       | 13516            | NR               | 900       | 11526            | NR               |
| 385       | 9836             | NR               | 515       | 249652           | NR               | 645       | 244025           | NR               | 775       | 12156            | NR               | 905       | 11085            | NR               |
| 390       | 9329             | NR               | 520       | 270963           | NR               | 650       | 221090           | NR               | 780       | 11138            | NR               | 910       | 12484            | NR               |
| 395       | 8104             | NR               | 525       | 285863           | NR               | 655       | 198958           | NR               | 785       | 10805            | NR               | 915       | 12235            | NR               |
| 400       | 6858             | NR               | 530       | 297396           | NR               | 660       | 178676           | NR               | 790       | 10121            | NR               | 920       | 9666             | NR               |
| 405       | 6914             | NR               | 535       | 307535           | NR               | 665       | 155862           | NR               | 795       | 10392            | NR               | 925       | 11659            | NR               |
| 410       | 8077             | NR               | 540       | 315948           | NR               | 670       | 138150           | NR               | 800       | 9549             | NR               | 930       | 12967            | NR               |
| 415       | 11717            | NR               | 545       | 324499           | NR               | 675       | 120142           | NR               | 805       | 10057            | NR               | 935       | 13555            | NR               |
| 420       | 19513            | NR               | 550       | 333620           | NR               | 680       | 105107           | NR               | 810       | 9285             | NR               | 940       | 12553            | NR               |
| 425       | 34423            | NR               | 555       | 345725           | NR               | 685       | 91191            | NR               | 815       | 9751             | NR               | 945       | 9165             | NR               |
| 430       | 59393            | NR               | 560       | 355808           | NR               | 690       | 79275            | NR               | 820       | 10216            | NR               | 950       | 7624             | NR               |
| 435       | 101278           | NR               | 565       | 369262           | NR               | 695       | 68358            | NR               | 825       | 10410            | NR               | 955       | 11686            | NR               |
| 440       | 162827           | NR               | 570       | 381413           | NR               | 700       | 60050            | NR               | 830       | 10058            | NR               | 960       | 9106             | NR               |
| 445       | 260438           | NR               | 575       | 393089           | NR               | 705       | 51990            | NR               | 835       | 9982             | NR               | 965       | 11345            | NR               |
| 450       | 399252           | NR               | 580       | 402225           | NR               | 710       | 46653            | NR               | 840       | 9215             | NR               | 970       | 10672            | NR               |
| 455       | 445742           | NR               | 585       | 409494           | NR               | 715       | 42391            | NR               | 845       | 11311            | NR               | 975       | 11689            | NR               |
| 460       | 330661           | NR               | 590       | 413322           | NR               | 720       | 37628            | NR               | 850       | 10813            | NR               | 980       | 14054            | NR               |
| 465       | 233593           | NR               | 595       | 413160           | NR               | 725       | 33220            | NR               | 855       | 11652            | NR               | 985       | 17684            | NR               |
| 470       | 187643           | NR               | 600       | 408148           | NR               | 730       | 29243            | NR               | 860       | 11468            | NR               | 990       | 17244            | NR               |
| 475       | 140648           | NR               | 605       | 401766           | NR               | 735       | 25806            | NR               | 865       | 12591            | NR               | 995       | 11439            | NR               |
| 480       | 111871           | NR               | 610       | 390821           | NR               | 740       | 23374            | NR               | 870       | 9925             | NR               | 1000      | 19016            | NR               |
| 485       | 108472           | NR               | 615       | 377363           | NR               | 745       | 21294            | NR               | 875       | 11284            | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 39237.7

S/P: 1.65

| 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       | 10992            | NR               | 490       | 118921           | NR               | 620       | 356922           | NR               | 750       | 19019            | NR               | 880       | 13091            | NR               |
| 365       | 9593             | NR               | 495       | 138088           | NR               | 625       | 337439           | NR               | 755       | 17413            | NR               | 885       | 13768            | NR               |
| 370       | 10476            | NR               | 500       | 166483           | NR               | 630       | 313667           | NR               | 760       | 16262            | NR               | 890       | 11509            | NR               |
| 375       | 11916            | NR               | 505       | 198126           | NR               | 635       | 289634           | NR               | 765       | 14555            | NR               | 895       | 10746            | NR               |
| 380       | 10857            | NR               | 510       | 225943           | NR               | 640       | 267120           | NR               | 770       | 13516            | NR               | 900       | 11526            | NR               |
| 385       | 9836             | NR               | 515       | 249652           | NR               | 645       | 244025           | NR               | 775       | 12156            | NR               | 905       | 11085            | NR               |
| 390       | 9329             | NR               | 520       | 270963           | NR               | 650       | 221090           | NR               | 780       | 11138            | NR               | 910       | 12484            | NR               |
| 395       | 8104             | NR               | 525       | 285863           | NR               | 655       | 198958           | NR               | 785       | 10805            | NR               | 915       | 12235            | NR               |
| 400       | 6858             | NR               | 530       | 297396           | NR               | 660       | 178676           | NR               | 790       | 10121            | NR               | 920       | 9666             | NR               |
| 405       | 6914             | NR               | 535       | 307535           | NR               | 665       | 155862           | NR               | 795       | 10392            | NR               | 925       | 11659            | NR               |
| 410       | 8077             | NR               | 540       | 315948           | NR               | 670       | 138150           | NR               | 800       | 9549             | NR               | 930       | 12967            | NR               |
| 415       | 11717            | NR               | 545       | 324499           | NR               | 675       | 120142           | NR               | 805       | 10057            | NR               | 935       | 13555            | NR               |
| 420       | 19513            | NR               | 550       | 333620           | NR               | 680       | 105107           | NR               | 810       | 9285             | NR               | 940       | 12553            | NR               |
| 425       | 34423            | NR               | 555       | 345725           | NR               | 685       | 91191            | NR               | 815       | 9751             | NR               | 945       | 9165             | NR               |
| 430       | 59393            | NR               | 560       | 355808           | NR               | 690       | 79275            | NR               | 820       | 10216            | NR               | 950       | 7624             | NR               |
| 435       | 101278           | NR               | 565       | 369262           | NR               | 695       | 68358            | NR               | 825       | 10410            | NR               | 955       | 11686            | NR               |
| 440       | 162827           | NR               | 570       | 381413           | NR               | 700       | 60050            | NR               | 830       | 10058            | NR               | 960       | 9106             | NR               |
| 445       | 260438           | NR               | 575       | 393089           | NR               | 705       | 51990            | NR               | 835       | 9982             | NR               | 965       | 11345            | NR               |
| 450       | 399252           | NR               | 580       | 402225           | NR               | 710       | 46653            | NR               | 840       | 9215             | NR               | 970       | 10672            | NR               |
| 455       | 445742           | NR               | 585       | 409494           | NR               | 715       | 42391            | NR               | 845       | 11311            | NR               | 975       | 11689            | NR               |
| 460       | 330661           | NR               | 590       | 413322           | NR               | 720       | 37628            | NR               | 850       | 10813            | NR               | 980       | 14054            | NR               |
| 465       | 233593           | NR               | 595       | 413160           | NR               | 725       | 33220            | NR               | 855       | 11652            | NR               | 985       | 17684            | NR               |
| 470       | 187643           | NR               | 600       | 408148           | NR               | 730       | 29243            | NR               | 860       | 11468            | NR               | 990       | 17244            | NR               |
| 475       | 140648           | NR               | 605       | 401766           | NR               | 735       | 25806            | NR               | 865       | 12591            | NR               | 995       | 11439            | NR               |
| 480       | 111871           | NR               | 610       | 390821           | NR               | 740       | 23374            | NR               | 870       | 9925             | NR               | 1000      | 19016            | NR               |
| 485       | 108472           | NR               | 615       | 377363           | NR               | 745       | 21294            | NR               | 875       | 11284            | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 15753**

**M/P: 0.66**

| 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       | 10992            | NR               | 490       | 118921           | NR               | 620       | 356922           | NR               | 750       | 19019            | NR               | 880       | 13091            | NR               |
| 365       | 9593             | NR               | 495       | 138088           | NR               | 625       | 337439           | NR               | 755       | 17413            | NR               | 885       | 13768            | NR               |
| 370       | 10476            | NR               | 500       | 166483           | NR               | 630       | 313667           | NR               | 760       | 16262            | NR               | 890       | 11509            | NR               |
| 375       | 11916            | NR               | 505       | 198126           | NR               | 635       | 289634           | NR               | 765       | 14555            | NR               | 895       | 10746            | NR               |
| 380       | 10857            | NR               | 510       | 225943           | NR               | 640       | 267120           | NR               | 770       | 13516            | NR               | 900       | 11526            | NR               |
| 385       | 9836             | NR               | 515       | 249652           | NR               | 645       | 244025           | NR               | 775       | 12156            | NR               | 905       | 11085            | NR               |
| 390       | 9329             | NR               | 520       | 270963           | NR               | 650       | 221090           | NR               | 780       | 11138            | NR               | 910       | 12484            | NR               |
| 395       | 8104             | NR               | 525       | 285863           | NR               | 655       | 198958           | NR               | 785       | 10805            | NR               | 915       | 12235            | NR               |
| 400       | 6858             | NR               | 530       | 297396           | NR               | 660       | 178676           | NR               | 790       | 10121            | NR               | 920       | 9666             | NR               |
| 405       | 6914             | NR               | 535       | 307535           | NR               | 665       | 155862           | NR               | 795       | 10392            | NR               | 925       | 11659            | NR               |
| 410       | 8077             | NR               | 540       | 315948           | NR               | 670       | 138150           | NR               | 800       | 9549             | NR               | 930       | 12967            | NR               |
| 415       | 11717            | NR               | 545       | 324499           | NR               | 675       | 120142           | NR               | 805       | 10057            | NR               | 935       | 13555            | NR               |
| 420       | 19513            | NR               | 550       | 333620           | NR               | 680       | 105107           | NR               | 810       | 9285             | NR               | 940       | 12553            | NR               |
| 425       | 34423            | NR               | 555       | 345725           | NR               | 685       | 91191            | NR               | 815       | 9751             | NR               | 945       | 9165             | NR               |
| 430       | 59393            | NR               | 560       | 355808           | NR               | 690       | 79275            | NR               | 820       | 10216            | NR               | 950       | 7624             | NR               |
| 435       | 101278           | NR               | 565       | 369262           | NR               | 695       | 68358            | NR               | 825       | 10410            | NR               | 955       | 11686            | NR               |
| 440       | 162827           | NR               | 570       | 381413           | NR               | 700       | 60050            | NR               | 830       | 10058            | NR               | 960       | 9106             | NR               |
| 445       | 260438           | NR               | 575       | 393089           | NR               | 705       | 51990            | NR               | 835       | 9982             | NR               | 965       | 11345            | NR               |
| 450       | 399252           | NR               | 580       | 402225           | NR               | 710       | 46653            | NR               | 840       | 9215             | NR               | 970       | 10672            | NR               |
| 455       | 445742           | NR               | 585       | 409494           | NR               | 715       | 42391            | NR               | 845       | 11311            | NR               | 975       | 11689            | NR               |
| 460       | 330661           | NR               | 590       | 413322           | NR               | 720       | 37628            | NR               | 850       | 10813            | NR               | 980       | 14054            | NR               |
| 465       | 233593           | NR               | 595       | 413160           | NR               | 725       | 33220            | NR               | 855       | 11652            | NR               | 985       | 17684            | NR               |
| 470       | 187643           | NR               | 600       | 408148           | NR               | 730       | 29243            | NR               | 860       | 11468            | NR               | 990       | 17244            | NR               |
| 475       | 140648           | NR               | 605       | 401766           | NR               | 735       | 25806            | NR               | 865       | 12591            | NR               | 995       | 11439            | NR               |
| 480       | 111871           | NR               | 610       | 390821           | NR               | 740       | 23374            | NR               | 870       | 9925             | NR               | 1000      | 19016            | NR               |
| 485       | 108472           | NR               | 615       | 377363           | NR               | 745       | 21294            | NR               | 875       | 11284            | NR               |           |                  |                  |

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**Summary**

$R_f = 82.9$   
 $R_g = 95$   
 $CIE R_a = 82.0$   
 $R_9 = 8.2$



**Color Vector Graphics**



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

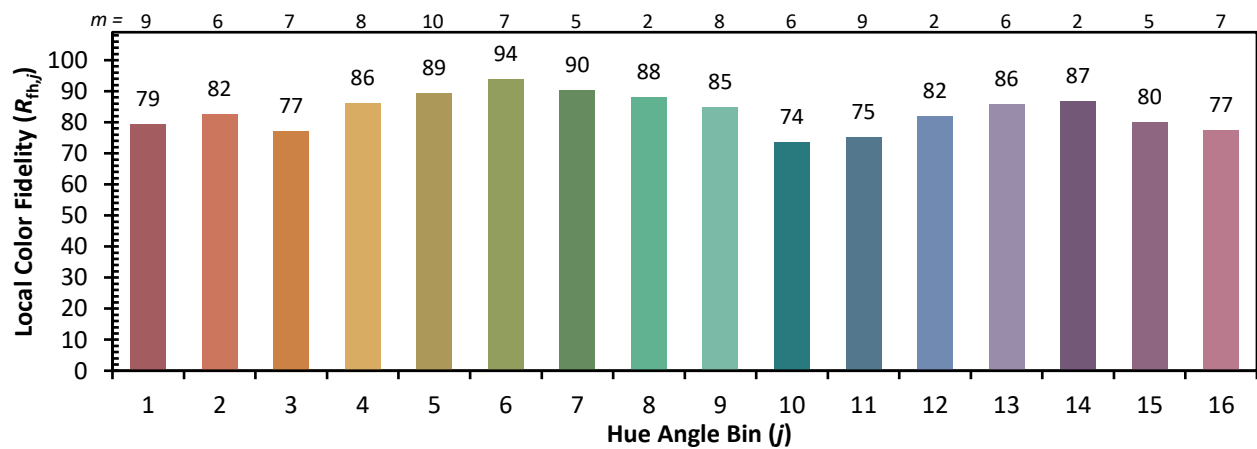
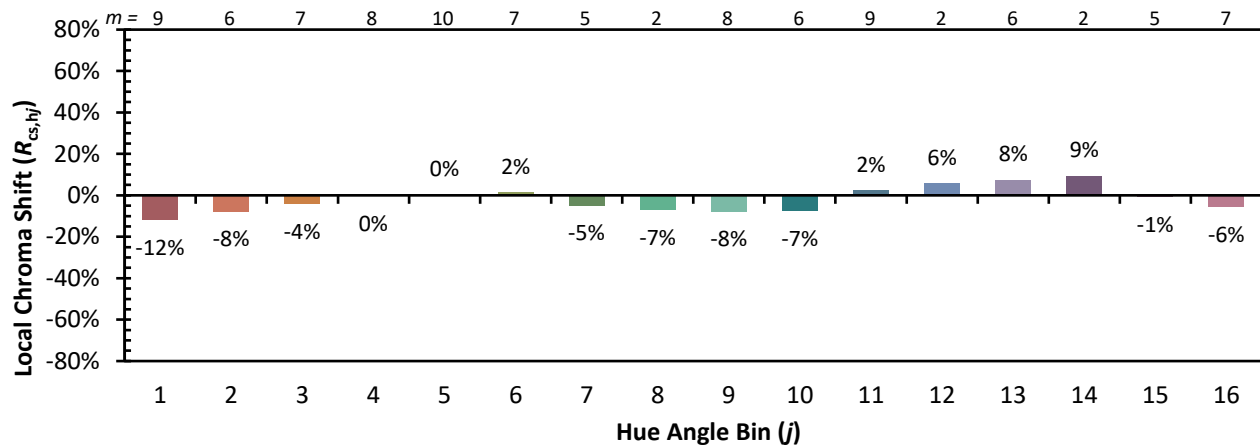
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|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 81 | CES51 = 92 | CES76 = 73 |
| CES02 = 61 | CES27 = 92 | CES52 = 92 | CES77 = 81 |
| CES03 = 31 | CES28 = 90 | CES53 = 88 | CES78 = 72 |
| CES04 = 70 | CES29 = 88 | CES54 = 89 | CES79 = 91 |
| CES05 = 48 | CES30 = 92 | CES55 = 86 | CES80 = 88 |
| CES06 = 50 | CES31 = 89 | CES56 = 83 | CES81 = 82 |
| CES07 = 41 | CES32 = 80 | CES57 = 82 | CES82 = 95 |
| CES08 = 40 | CES33 = 96 | CES58 = 82 | CES83 = 96 |
| CES09 = 29 | CES34 = 85 | CES59 = 90 | CES84 = 90 |
| CES10 = 74 | CES35 = 91 | CES60 = 89 | CES85 = 78 |
| CES11 = 57 | CES36 = 80 | CES61 = 85 | CES86 = 76 |
| CES12 = 63 | CES37 = 90 | CES62 = 80 | CES87 = 84 |
| CES13 = 42 | CES38 = 87 | CES63 = 81 | CES88 = 89 |
| CES14 = 74 | CES39 = 98 | CES64 = 74 | CES89 = 78 |
| CES15 = 71 | CES40 = 96 | CES65 = 74 | CES90 = 90 |
| CES16 = 47 | CES41 = 97 | CES66 = 69 | CES91 = 69 |
| CES17 = 49 | CES42 = 91 | CES67 = 68 | CES92 = 65 |
| CES18 = 56 | CES43 = 89 | CES68 = 75 | CES93 = 79 |
| CES19 = 71 | CES44 = 99 | CES69 = 80 | CES94 = 64 |
| CES20 = 65 | CES45 = 93 | CES70 = 71 | CES95 = 72 |
| CES21 = 86 | CES46 = 91 | CES71 = 63 | CES96 = 84 |
| CES22 = 78 | CES47 = 96 | CES72 = 88 | CES97 = 90 |
| CES23 = 91 | CES48 = 85 | CES73 = 65 | CES98 = 85 |
| CES24 = 90 | CES49 = 90 | CES74 = 90 | CES99 = 77 |
| CES25 = 71 | CES50 = 93 | CES75 = 67 |            |



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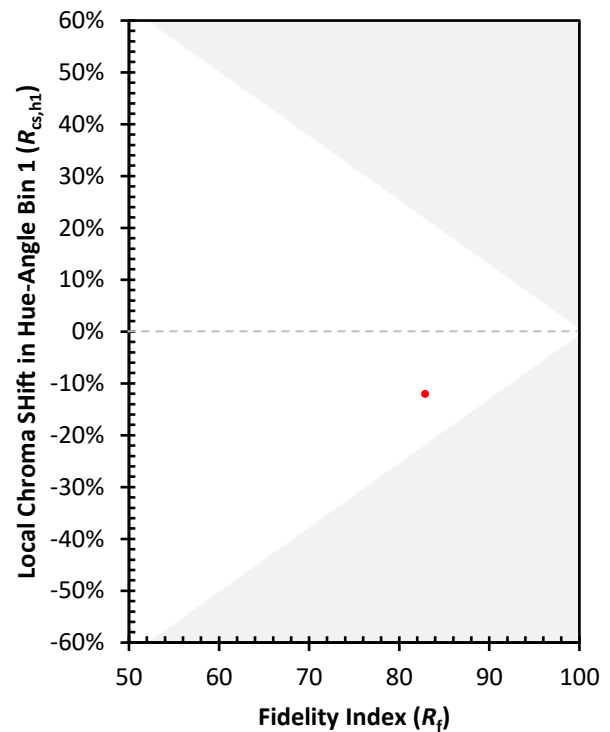
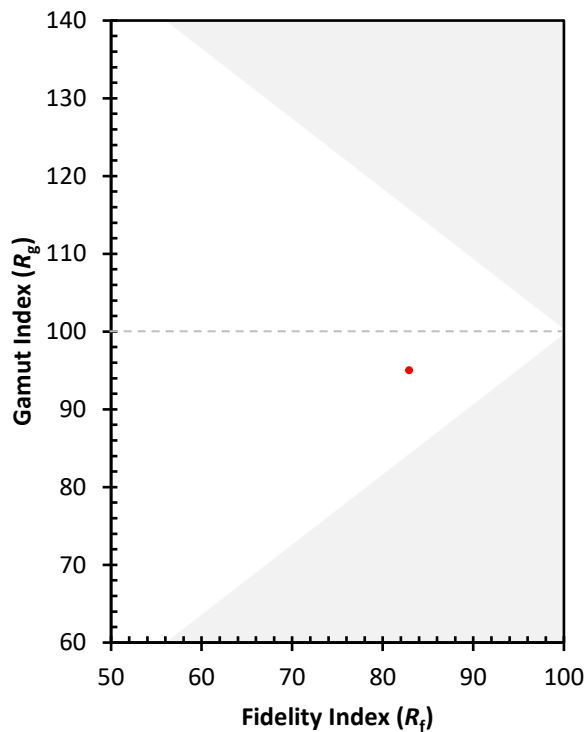
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)