

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: P859940

Luminaire Tested: **SPHB-18HE-M-L850-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: P859940  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2404-343-1)  
Test Lab: INNOVATION CENTER  
Issue Date: 7/11/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: SPHB-18HE-M-L850-CD  
Description: 18000 Lumen High Efficacy Select Pro High Bay with Medium Lens and, 5000K 80CRI LEDs  
Light Source: -  
Ballast/Driver: -

Luminaire Equipment: Sample No.   Condition   Description

**Summary**

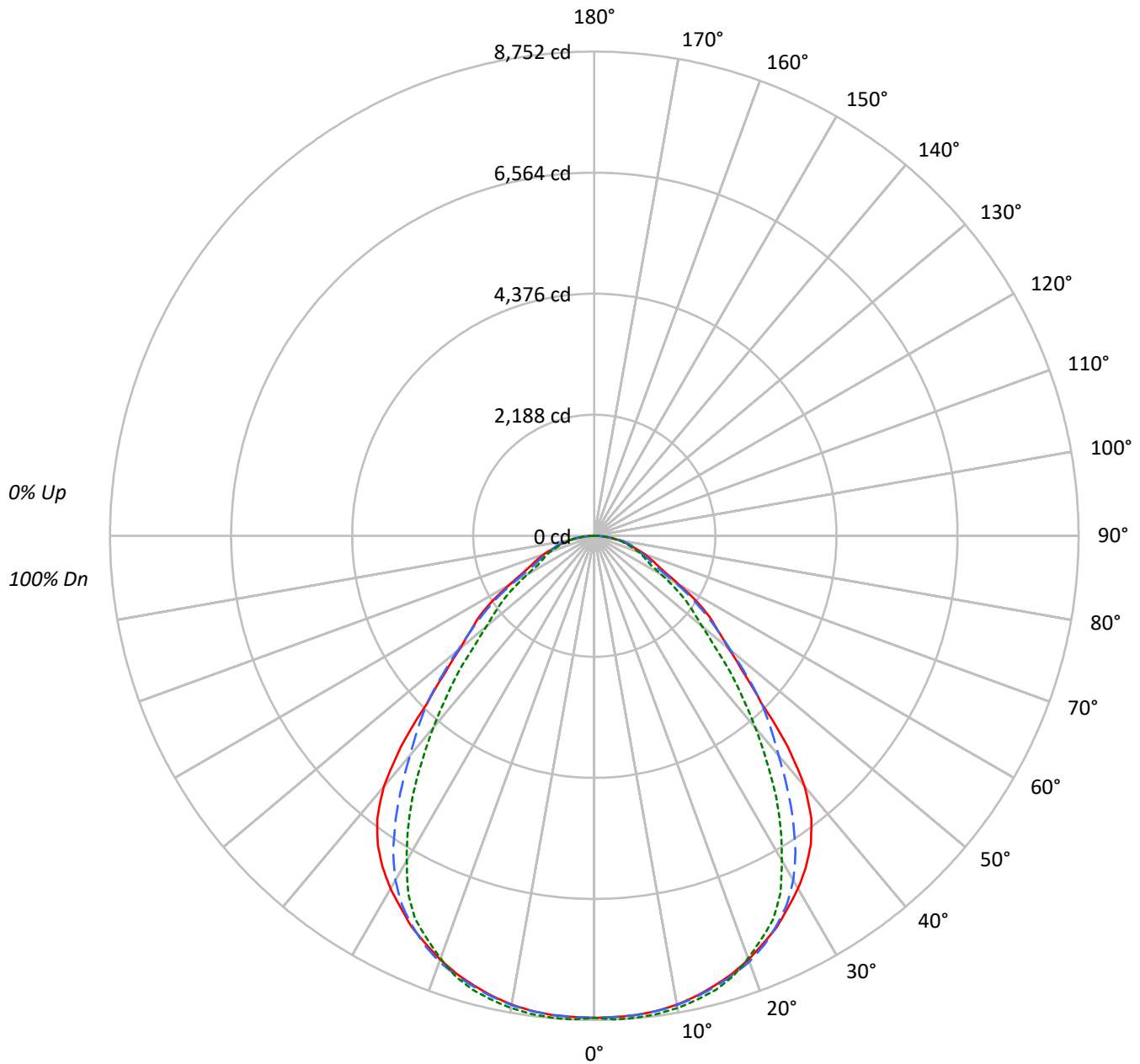
Lumens per Lamp: N/A  
Luminaire Lumens: 18085.0 lumens  
Efficiency: N/A  
Efficacy: 167.3 lumens/watt  
Spacing Criteria (0/90/45): 1.25 / 1.16 / 1.22  
Luminous Opening: Rectangular (W 1' x L: 1.38' x H: 0')  
CIE Type: Direct

Input Watts (W): 108.1  
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: P859940

CATALOG NUMBER: SPHB-18HE-M-L850-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P859940

CATALOG NUMBER: SPHB-18HE-M-L850-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 | 106 | 103 | 99  | 108 | 104 | 101 | 98  | 100 | 97  | 95  | 96  | 94  | 92  | 92  | 91  | 89  | 87  |    |    |
| 2   | 102 | 95  | 89  | 84  | 99  | 93  | 87  | 83  | 89  | 85  | 81  | 86  | 82  | 79  | 83  | 80  | 77  | 75  |    |    |
| 3   | 94  | 85  | 78  | 72  | 92  | 83  | 77  | 71  | 80  | 75  | 70  | 78  | 73  | 69  | 75  | 71  | 68  | 66  |    |    |
| 4   | 87  | 76  | 69  | 63  | 85  | 75  | 68  | 62  | 73  | 66  | 61  | 70  | 65  | 61  | 68  | 64  | 60  | 58  |    |    |
| 5   | 81  | 69  | 61  | 55  | 79  | 68  | 61  | 55  | 66  | 59  | 54  | 64  | 58  | 54  | 62  | 57  | 53  | 51  |    |    |
| 6   | 75  | 63  | 55  | 49  | 73  | 62  | 54  | 49  | 60  | 54  | 48  | 59  | 53  | 48  | 57  | 52  | 48  | 46  |    |    |
| 7   | 70  | 58  | 50  | 44  | 68  | 57  | 49  | 44  | 55  | 49  | 44  | 54  | 48  | 43  | 53  | 47  | 43  | 41  |    |    |
| 8   | 66  | 53  | 45  | 40  | 64  | 52  | 45  | 40  | 51  | 44  | 39  | 50  | 44  | 39  | 49  | 43  | 39  | 37  |    |    |
| 9   | 61  | 49  | 41  | 36  | 60  | 48  | 41  | 36  | 47  | 41  | 36  | 46  | 40  | 36  | 45  | 40  | 36  | 34  |    |    |
| 10  | 58  | 45  | 38  | 33  | 57  | 45  | 38  | 33  | 44  | 37  | 33  | 43  | 37  | 33  | 42  | 37  | 33  | 31  |    |    |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 67961 | 67961 | 67961 |
| 5°  | 68094 | 68076 | 68463 |
| 10° | 68154 | 68227 | 68645 |
| 15° | 67955 | 68131 | 68604 |
| 20° | 67658 | 68001 | 67458 |
| 25° | 67163 | 66976 | 65838 |
| 30° | 66313 | 64750 | 61056 |
| 35° | 64921 | 59570 | 54416 |
| 40° | 60248 | 52725 | 46090 |
| 45° | 47003 | 47130 | 38143 |
| 50° | 38390 | 38934 | 30804 |
| 55° | 34395 | 33098 | 27067 |
| 60° | 27535 | 26066 | 21656 |
| 65° | 23076 | 21125 | 19152 |
| 70° | 21909 | 20128 | 19499 |
| 75° | 19878 | 21367 | 18805 |
| 80° | 19975 | 21835 | 19822 |
| 85° | 17380 | 20360 | 16556 |



TEST NUMBER: P859940

CATALOG NUMBER: SPHB-18HE-M-L850-CD

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 828.5   | 4.6       |
| 10°-20°   | 2382.6  | 13.2      |
| 20°-30°   | 3556.9  | 19.7      |
| 30°-40°   | 3881.1  | 21.5      |
| 40°-50°   | 3174.9  | 17.6      |
| 50°-60°   | 2087.5  | 11.5      |
| 60°-70°   | 1197.7  | 6.6       |
| 70°-80°   | 725.8   | 4.0       |
| 80°-90°   | 243.7   | 1.3       |
| 90°-100°  | 6.3     | 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°    | 6767.9  | 37.4      |
| 0°-40°    | 10649.1 | 58.9      |
| 0°-60°    | 15911.6 | 88.0      |
| 0°-90°    | 18078.7 | 100.0     |
| 90°-120°  | 6.3     | 0.0       |
| 90°-150°  | 6.3     | 0.0       |
| 90°-180°  | 6.0     | 0.0       |
| 0°-180°   | 18085.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 8713 | 8713  | 8713 | 8713  | 8713 |      |
| 5°   | 8697 | 8683  | 8695 | 8730  | 8744 | 827  |
| 15°  | 8415 | 8414  | 8437 | 8491  | 8496 | 2375 |
| 25°  | 7804 | 7822  | 7782 | 7688  | 7650 | 3590 |
| 35°  | 6818 | 6664  | 6256 | 5830  | 5715 | 4226 |
| 45°  | 4261 | 4579  | 4273 | 3772  | 3458 | 3382 |
| 55°  | 2529 | 2460  | 2434 | 2092  | 1990 | 2228 |
| 65°  | 1250 | 1232  | 1145 | 1114  | 1038 | 1278 |
| 75°  | 660  | 714   | 709  | 680   | 624  | 714  |
| 85°  | 194  | 221   | 228  | 199   | 185  | 211  |
| 90°  | 1    | 16    | 32   | 38    | 40   | 9    |
| 95°  | 1    | 2     | 3    | 3     | 2    | 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    |      |



TEST NUMBER: P859940

CATALOG NUMBER: SPHB-18HE-M-L850-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|--------|--------|--------|--------|--------|--------|
| 0°     | 8713.0 | 8713.0 | 8713.0 | 8713.0 | 8713.0 |
| 2.5°   | 8707.3 | 8694.6 | 8706.1 | 8741.7 | 8752.1 |
| 5°     | 8696.9 | 8683.1 | 8694.6 | 8730.2 | 8744.0 |
| 7.5°   | 8661.3 | 8653.3 | 8664.7 | 8700.4 | 8717.6 |
| 10°    | 8605.0 | 8595.8 | 8614.2 | 8645.2 | 8667.0 |
| 12.5°  | 8521.1 | 8517.7 | 8534.9 | 8579.7 | 8588.9 |
| 15°    | 8415.4 | 8414.2 | 8437.2 | 8491.2 | 8495.8 |
| 17.5°  | 8295.9 | 8294.7 | 8323.4 | 8359.1 | 8346.4 |
| 20°    | 8151.1 | 8159.1 | 8192.4 | 8159.1 | 8126.9 |
| 22.5°  | 7977.5 | 8002.8 | 8010.9 | 7906.3 | 7890.2 |
| 25°    | 7804.0 | 7822.4 | 7782.2 | 7688.0 | 7650.0 |
| 27.5°  | 7579.9 | 7601.8 | 7527.1 | 7392.6 | 7284.6 |
| 30°    | 7362.7 | 7342.1 | 7189.2 | 6929.5 | 6779.0 |
| 32.5°  | 7113.4 | 7039.8 | 6765.2 | 6406.6 | 6269.9 |
| 35°    | 6818.0 | 6664.0 | 6256.1 | 5829.7 | 5714.8 |
| 37.5°  | 6444.5 | 6163.0 | 5717.1 | 5272.4 | 5098.9 |
| 40°    | 5917.1 | 5591.9 | 5178.2 | 4718.5 | 4526.6 |
| 42.5°  | 5178.2 | 5057.5 | 4715.0 | 4197.9 | 3969.2 |
| 45°    | 4261.1 | 4579.4 | 4272.6 | 3771.6 | 3457.9 |
| 47.5°  | 3647.5 | 4089.9 | 3721.0 | 3359.0 | 2926.9 |
| 50°    | 3163.7 | 3468.2 | 3208.5 | 2882.1 | 2538.5 |
| 52.5°  | 2814.3 | 2906.3 | 2801.7 | 2443.1 | 2247.8 |
| 55°    | 2529.3 | 2460.4 | 2433.9 | 2091.5 | 1990.4 |
| 57.5°  | 2175.4 | 2137.5 | 2069.7 | 1823.7 | 1690.4 |
| 60°    | 1765.1 | 1845.6 | 1670.9 | 1600.8 | 1388.2 |
| 62.5°  | 1450.3 | 1529.5 | 1342.2 | 1337.6 | 1160.7 |
| 65°    | 1250.3 | 1231.9 | 1144.6 | 1113.5 | 1037.7 |
| 67.5°  | 1106.7 | 1049.2 | 1019.3 | 979.1  | 952.7  |
| 70°    | 960.7  | 936.6  | 882.6  | 890.6  | 855.0  |
| 72.5°  | 801.0  | 832.0  | 778.0  | 792.9  | 728.6  |
| 75°    | 659.6  | 713.6  | 709.0  | 680.3  | 624.0  |
| 77.5°  | 543.6  | 601.0  | 611.4  | 584.9  | 539.0  |
| 80°    | 444.7  | 483.8  | 486.1  | 470.0  | 441.3  |
| 82.5°  | 326.4  | 349.3  | 366.6  | 339.0  | 320.6  |
| 85°    | 194.2  | 220.6  | 227.5  | 198.8  | 185.0  |
| 87.5°  | 63.2   | 88.5   | 98.8   | 102.3  | 103.4  |
| 90°    | 1.1    | 16.1   | 32.2   | 37.9   | 40.2   |
| 92.5°  | 1.1    | 4.6    | 6.9    | 10.3   | 11.5   |
| 95°    | 1.1    | 2.3    | 3.4    | 3.4    | 2.3    |
| 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    |



TEST NUMBER: P859940

CATALOG NUMBER: SPHB-18HE-M-L850-CD

**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: SP1-2309-187-6

Test Date: 10/10/2023

Luminaire Tested: SPHB-2436SE-M-UNV-L84050-CD-U (36K LUMEN 5000K)

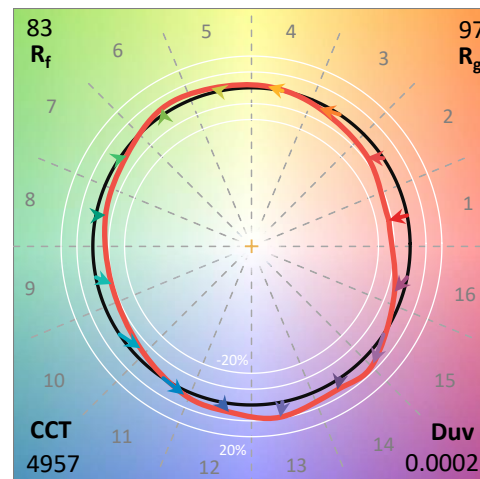
Data in this report applies to families of products including SPHB-2436SE-M-UNV-L84050-CD-U (36K LUMEN 5000K).

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2309-187-6  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/10/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **SPHB-2436SE-M-UNV-L84050-CD-U (36K LUMEN 5000K)**  
 Description: SPHB SELECT, MEDIUM LENS, 36K LUMENS, 5000K

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 4957   | CRI (Ra): | 83.0 |      |      |
| CIE u':                   | 0.2117 | R1:       | 81.6 | R9:  | 13.4 |
| CIE v':                   | 0.4855 | R2:       | 88.2 | R10: | 70.8 |
| Duv:                      | 0.0002 | R3:       | 91.8 | R11: | 80.4 |
| CIE x:                    | 0.3463 | R4:       | 82.0 | R12: | 55.2 |
| CIE y:                    | 0.3530 | R5:       | 81.2 | R13: | 83.4 |
| CIE z:                    | 0.3007 | R6:       | 82.2 | R14: | 95.6 |
| Peak Wavelength (nm):     | 452    | R7:       | 88.1 |      |      |
| Dominant Wavelength (nm): | 573    | R8:       | 69.2 |      |      |
| Purity:                   | 10     |           |      |      |      |
| Rf:                       | 83     |           |      |      |      |
| Rg:                       | 96.6   |           |      |      |      |



### Test Conditions

Stabilization Time: 10M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.8/38%  
 Sphere Temperature (°C): 24.2

REPORT NUMBER: SP1-2309-187-6

| 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 5000K 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       | 16466            | NR               | 490       | 226060           | NR               | 620       | 461721           | NR               | 750       | 25725            | NR               | 880       | 22907            | NR               |
| 365       | 15834            | NR               | 495       | 262555           | NR               | 625       | 431803           | NR               | 755       | 23611            | NR               | 885       | 20279            | NR               |
| 370       | 15705            | NR               | 500       | 311885           | NR               | 630       | 403609           | NR               | 760       | 23080            | NR               | 890       | 16993            | NR               |
| 375       | 16161            | NR               | 505       | 357744           | NR               | 635       | 372123           | NR               | 765       | 19807            | NR               | 895       | 19274            | NR               |
| 380       | 17604            | NR               | 510       | 398986           | NR               | 640       | 341468           | NR               | 770       | 19668            | NR               | 900       | 19961            | NR               |
| 385       | 15901            | NR               | 515       | 433700           | NR               | 645       | 309940           | NR               | 775       | 19158            | NR               | 905       | 18541            | NR               |
| 390       | 15561            | NR               | 520       | 460798           | NR               | 650       | 281489           | NR               | 780       | 15443            | NR               | 910       | 17677            | NR               |
| 395       | 13649            | NR               | 525       | 477719           | NR               | 655       | 251312           | NR               | 785       | 15332            | NR               | 915       | 22715            | NR               |
| 400       | 12726            | NR               | 530       | 489588           | NR               | 660       | 226441           | NR               | 790       | 15443            | NR               | 920       | 20431            | NR               |
| 405       | 12867            | NR               | 535       | 500614           | NR               | 665       | 197313           | NR               | 795       | 12716            | NR               | 925       | 18281            | NR               |
| 410       | 14858            | NR               | 540       | 509478           | NR               | 670       | 174037           | NR               | 800       | 14486            | NR               | 930       | 24254            | NR               |
| 415       | 22758            | NR               | 545       | 518634           | NR               | 675       | 150402           | NR               | 805       | 13381            | NR               | 935       | 22361            | NR               |
| 420       | 40173            | NR               | 550       | 526082           | NR               | 680       | 133071           | NR               | 810       | 13493            | NR               | 940       | 21374            | NR               |
| 425       | 73606            | NR               | 555       | 535227           | NR               | 685       | 115398           | NR               | 815       | 13669            | NR               | 945       | 28437            | NR               |
| 430       | 132581           | NR               | 560       | 544645           | NR               | 690       | 99841            | NR               | 820       | 13949            | NR               | 950       | 12992            | NR               |
| 435       | 230438           | NR               | 565       | 553668           | NR               | 695       | 87508            | NR               | 825       | 15609            | NR               | 955       | 16488            | NR               |
| 440       | 382216           | NR               | 570       | 563202           | NR               | 700       | 76178            | NR               | 830       | 16481            | NR               | 960       | 22861            | NR               |
| 445       | 630161           | NR               | 575       | 570117           | NR               | 705       | 66441            | NR               | 835       | 17363            | NR               | 965       | 29851            | NR               |
| 450       | 918124           | NR               | 580       | 573472           | NR               | 710       | 60098            | NR               | 840       | 16960            | NR               | 970       | 10276            | NR               |
| 455       | 893762           | NR               | 585       | 571600           | NR               | 715       | 54539            | NR               | 845       | 20190            | NR               | 975       | 29525            | NR               |
| 460       | 612059           | NR               | 590       | 567612           | NR               | 720       | 48071            | NR               | 850       | 20506            | NR               | 980       | 26199            | NR               |
| 465       | 443338           | NR               | 595       | 561157           | NR               | 725       | 42545            | NR               | 855       | 18525            | NR               | 985       | 27187            | NR               |
| 470       | 344255           | NR               | 600       | 547832           | NR               | 730       | 38502            | NR               | 860       | 19090            | NR               | 990       | 30712            | NR               |
| 475       | 249784           | NR               | 605       | 530525           | NR               | 735       | 33410            | NR               | 865       | 17185            | NR               | 995       | 15047            | NR               |
| 480       | 207499           | NR               | 610       | 513131           | NR               | 740       | 29667            | NR               | 870       | 18599            | NR               | 1000      | 14588            | NR               |
| 485       | 208029           | NR               | 615       | 491003           | NR               | 745       | 27521            | NR               | 875       | 20800            | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 69332.4

S/P: 1.93

| 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       | 16466            | NR               | 490       | 226060           | NR               | 620       | 461721           | NR               | 750       | 25725            | NR               | 880       | 22907            | NR               |
| 365       | 15834            | NR               | 495       | 262555           | NR               | 625       | 431803           | NR               | 755       | 23611            | NR               | 885       | 20279            | NR               |
| 370       | 15705            | NR               | 500       | 311885           | NR               | 630       | 403609           | NR               | 760       | 23080            | NR               | 890       | 16993            | NR               |
| 375       | 16161            | NR               | 505       | 357744           | NR               | 635       | 372123           | NR               | 765       | 19807            | NR               | 895       | 19274            | NR               |
| 380       | 17604            | NR               | 510       | 398986           | NR               | 640       | 341468           | NR               | 770       | 19668            | NR               | 900       | 19961            | NR               |
| 385       | 15901            | NR               | 515       | 433700           | NR               | 645       | 309940           | NR               | 775       | 19158            | NR               | 905       | 18541            | NR               |
| 390       | 15561            | NR               | 520       | 460798           | NR               | 650       | 281489           | NR               | 780       | 15443            | NR               | 910       | 17677            | NR               |
| 395       | 13649            | NR               | 525       | 477719           | NR               | 655       | 251312           | NR               | 785       | 15332            | NR               | 915       | 22715            | NR               |
| 400       | 12726            | NR               | 530       | 489588           | NR               | 660       | 226441           | NR               | 790       | 15443            | NR               | 920       | 20431            | NR               |
| 405       | 12867            | NR               | 535       | 500614           | NR               | 665       | 197313           | NR               | 795       | 12716            | NR               | 925       | 18281            | NR               |
| 410       | 14858            | NR               | 540       | 509478           | NR               | 670       | 174037           | NR               | 800       | 14486            | NR               | 930       | 24254            | NR               |
| 415       | 22758            | NR               | 545       | 518634           | NR               | 675       | 150402           | NR               | 805       | 13381            | NR               | 935       | 22361            | NR               |
| 420       | 40173            | NR               | 550       | 526082           | NR               | 680       | 133071           | NR               | 810       | 13493            | NR               | 940       | 21374            | NR               |
| 425       | 73606            | NR               | 555       | 535227           | NR               | 685       | 115398           | NR               | 815       | 13669            | NR               | 945       | 28437            | NR               |
| 430       | 132581           | NR               | 560       | 544645           | NR               | 690       | 99841            | NR               | 820       | 13949            | NR               | 950       | 12992            | NR               |
| 435       | 230438           | NR               | 565       | 553668           | NR               | 695       | 87508            | NR               | 825       | 15609            | NR               | 955       | 16488            | NR               |
| 440       | 382216           | NR               | 570       | 563202           | NR               | 700       | 76178            | NR               | 830       | 16481            | NR               | 960       | 22861            | NR               |
| 445       | 630161           | NR               | 575       | 570117           | NR               | 705       | 66441            | NR               | 835       | 17363            | NR               | 965       | 29851            | NR               |
| 450       | 918124           | NR               | 580       | 573472           | NR               | 710       | 60098            | NR               | 840       | 16960            | NR               | 970       | 10276            | NR               |
| 455       | 893762           | NR               | 585       | 571600           | NR               | 715       | 54539            | NR               | 845       | 20190            | NR               | 975       | 29525            | NR               |
| 460       | 612059           | NR               | 590       | 567612           | NR               | 720       | 48071            | NR               | 850       | 20506            | NR               | 980       | 26199            | NR               |
| 465       | 443338           | NR               | 595       | 561157           | NR               | 725       | 42545            | NR               | 855       | 18525            | NR               | 985       | 27187            | NR               |
| 470       | 344255           | NR               | 600       | 547832           | NR               | 730       | 38502            | NR               | 860       | 19090            | NR               | 990       | 30712            | NR               |
| 475       | 249784           | NR               | 605       | 530525           | NR               | 735       | 33410            | NR               | 865       | 17185            | NR               | 995       | 15047            | NR               |
| 480       | 207499           | NR               | 610       | 513131           | NR               | 740       | 29667            | NR               | 870       | 18599            | NR               | 1000      | 14588            | NR               |
| 485       | 208029           | NR               | 615       | 491003           | NR               | 745       | 27521            | NR               | 875       | 20800            | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 29078.2 M/P: 0.81**

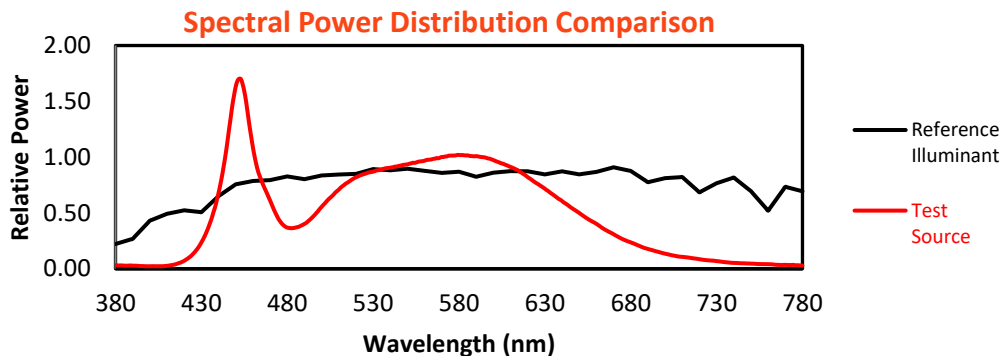
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 16466            | NR               | 490       | 226060           | NR               | 620       | 461721           | NR               | 750       | 25725            | NR               | 880       | 22907            | NR               |
| 365       | 15834            | NR               | 495       | 262555           | NR               | 625       | 431803           | NR               | 755       | 23611            | NR               | 885       | 20279            | NR               |
| 370       | 15705            | NR               | 500       | 311885           | NR               | 630       | 403609           | NR               | 760       | 23080            | NR               | 890       | 16993            | NR               |
| 375       | 16161            | NR               | 505       | 357744           | NR               | 635       | 372123           | NR               | 765       | 19807            | NR               | 895       | 19274            | NR               |
| 380       | 17604            | NR               | 510       | 398986           | NR               | 640       | 341468           | NR               | 770       | 19668            | NR               | 900       | 19961            | NR               |
| 385       | 15901            | NR               | 515       | 433700           | NR               | 645       | 309940           | NR               | 775       | 19158            | NR               | 905       | 18541            | NR               |
| 390       | 15561            | NR               | 520       | 460798           | NR               | 650       | 281489           | NR               | 780       | 15443            | NR               | 910       | 17677            | NR               |
| 395       | 13649            | NR               | 525       | 477719           | NR               | 655       | 251312           | NR               | 785       | 15332            | NR               | 915       | 22715            | NR               |
| 400       | 12726            | NR               | 530       | 489588           | NR               | 660       | 226441           | NR               | 790       | 15443            | NR               | 920       | 20431            | NR               |
| 405       | 12867            | NR               | 535       | 500614           | NR               | 665       | 197313           | NR               | 795       | 12716            | NR               | 925       | 18281            | NR               |
| 410       | 14858            | NR               | 540       | 509478           | NR               | 670       | 174037           | NR               | 800       | 14486            | NR               | 930       | 24254            | NR               |
| 415       | 22758            | NR               | 545       | 518634           | NR               | 675       | 150402           | NR               | 805       | 13381            | NR               | 935       | 22361            | NR               |
| 420       | 40173            | NR               | 550       | 526082           | NR               | 680       | 133071           | NR               | 810       | 13493            | NR               | 940       | 21374            | NR               |
| 425       | 73606            | NR               | 555       | 535227           | NR               | 685       | 115398           | NR               | 815       | 13669            | NR               | 945       | 28437            | NR               |
| 430       | 132581           | NR               | 560       | 544645           | NR               | 690       | 99841            | NR               | 820       | 13949            | NR               | 950       | 12992            | NR               |
| 435       | 230438           | NR               | 565       | 553668           | NR               | 695       | 87508            | NR               | 825       | 15609            | NR               | 955       | 16488            | NR               |
| 440       | 382216           | NR               | 570       | 563202           | NR               | 700       | 76178            | NR               | 830       | 16481            | NR               | 960       | 22861            | NR               |
| 445       | 630161           | NR               | 575       | 570117           | NR               | 705       | 66441            | NR               | 835       | 17363            | NR               | 965       | 29851            | NR               |
| 450       | 918124           | NR               | 580       | 573472           | NR               | 710       | 60098            | NR               | 840       | 16960            | NR               | 970       | 10276            | NR               |
| 455       | 893762           | NR               | 585       | 571600           | NR               | 715       | 54539            | NR               | 845       | 20190            | NR               | 975       | 29525            | NR               |
| 460       | 612059           | NR               | 590       | 567612           | NR               | 720       | 48071            | NR               | 850       | 20506            | NR               | 980       | 26199            | NR               |
| 465       | 443338           | NR               | 595       | 561157           | NR               | 725       | 42545            | NR               | 855       | 18525            | NR               | 985       | 27187            | NR               |
| 470       | 344255           | NR               | 600       | 547832           | NR               | 730       | 38502            | NR               | 860       | 19090            | NR               | 990       | 30712            | NR               |
| 475       | 249784           | NR               | 605       | 530525           | NR               | 735       | 33410            | NR               | 865       | 17185            | NR               | 995       | 15047            | NR               |
| 480       | 207499           | NR               | 610       | 513131           | NR               | 740       | 29667            | NR               | 870       | 18599            | NR               | 1000      | 14588            | NR               |
| 485       | 208029           | NR               | 615       | 491003           | NR               | 745       | 27521            | NR               | 875       | 20800            | NR               |           |                  |                  |

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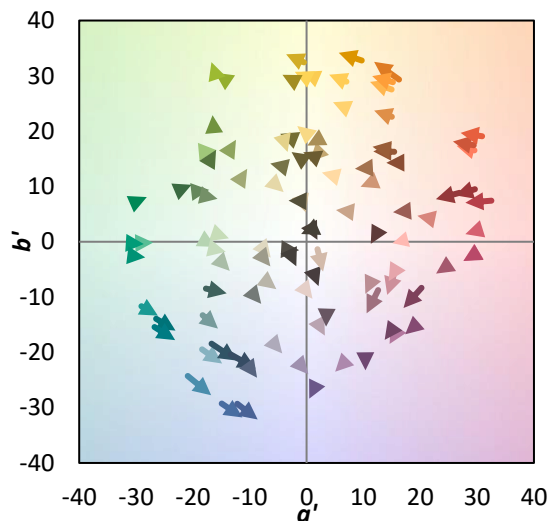
**TM-30-18**

**Summary**

$R_f = 83$   
 $R_g = 96.6$   
 CIE  $R_a = 83.0$   
 $R_9 = 13.4$



**Color Vector Graphics**



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

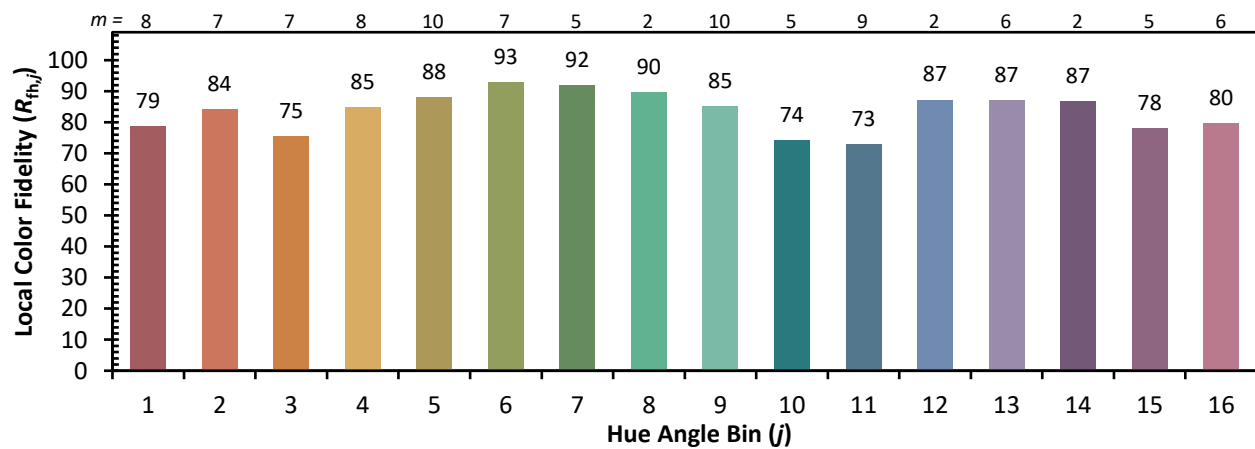
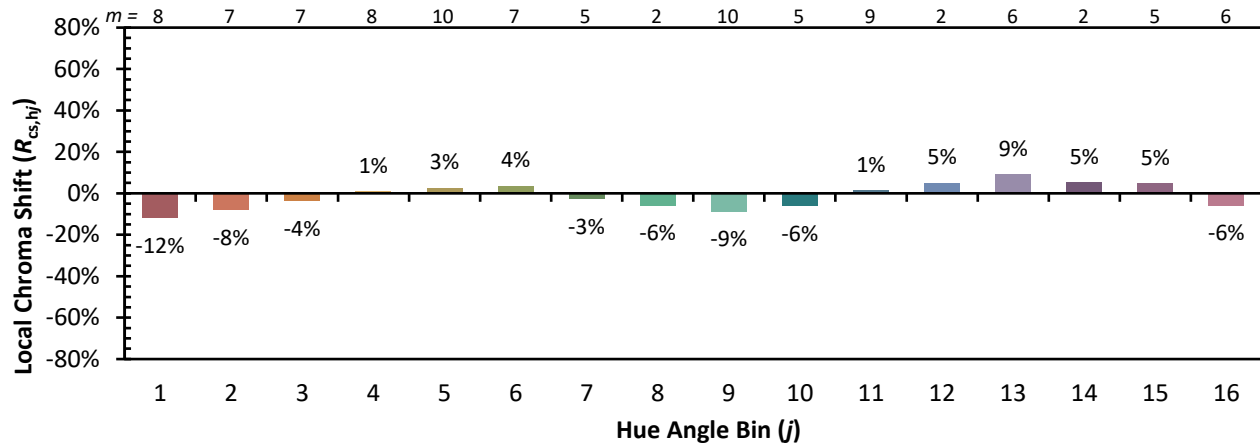
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 78 | CES51 = 94 | CES76 = 69 |
| CES02 = 60 | CES27 = 93 | CES52 = 94 | CES77 = 78 |
| CES03 = 30 | CES28 = 88 | CES53 = 89 | CES78 = 69 |
| CES04 = 69 | CES29 = 83 | CES54 = 90 | CES79 = 89 |
| CES05 = 47 | CES30 = 96 | CES55 = 88 | CES80 = 86 |
| CES06 = 50 | CES31 = 85 | CES56 = 85 | CES81 = 85 |
| CES07 = 40 | CES32 = 77 | CES57 = 84 | CES82 = 94 |
| CES08 = 39 | CES33 = 92 | CES58 = 84 | CES83 = 95 |
| CES09 = 29 | CES34 = 81 | CES59 = 91 | CES84 = 89 |
| CES10 = 73 | CES35 = 89 | CES60 = 90 | CES85 = 80 |
| CES11 = 56 | CES36 = 84 | CES61 = 87 | CES86 = 80 |
| CES12 = 62 | CES37 = 87 | CES62 = 83 | CES87 = 84 |
| CES13 = 42 | CES38 = 93 | CES63 = 83 | CES88 = 89 |
| CES14 = 74 | CES39 = 98 | CES64 = 76 | CES89 = 80 |
| CES15 = 71 | CES40 = 95 | CES65 = 75 | CES90 = 90 |
| CES16 = 46 | CES41 = 99 | CES66 = 72 | CES91 = 72 |
| CES17 = 49 | CES42 = 87 | CES67 = 70 | CES92 = 68 |
| CES18 = 56 | CES43 = 86 | CES68 = 75 | CES93 = 80 |
| CES19 = 71 | CES44 = 99 | CES69 = 80 | CES94 = 66 |
| CES20 = 64 | CES45 = 92 | CES70 = 70 | CES95 = 73 |
| CES21 = 85 | CES46 = 91 | CES71 = 63 | CES96 = 84 |
| CES22 = 77 | CES47 = 95 | CES72 = 88 | CES97 = 91 |
| CES23 = 91 | CES48 = 88 | CES73 = 63 | CES98 = 86 |
| CES24 = 90 | CES49 = 90 | CES74 = 91 | CES99 = 77 |
| CES25 = 71 | CES50 = 94 | CES75 = 65 |            |



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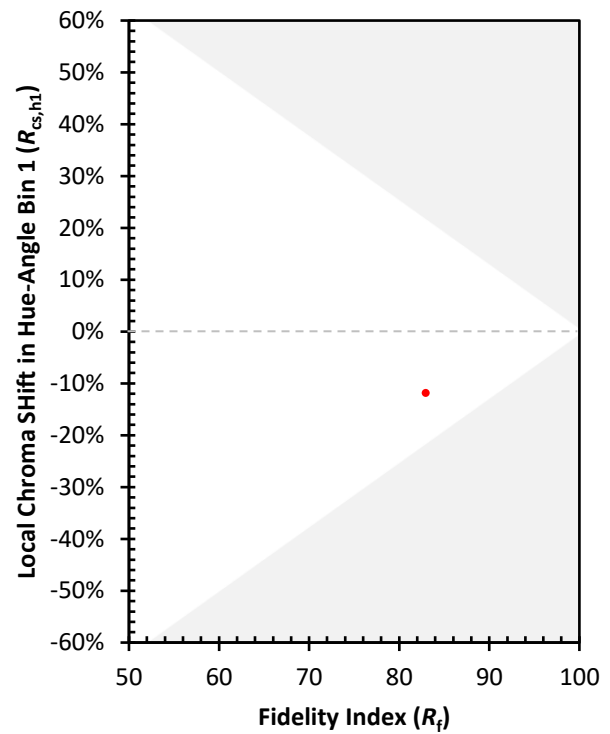
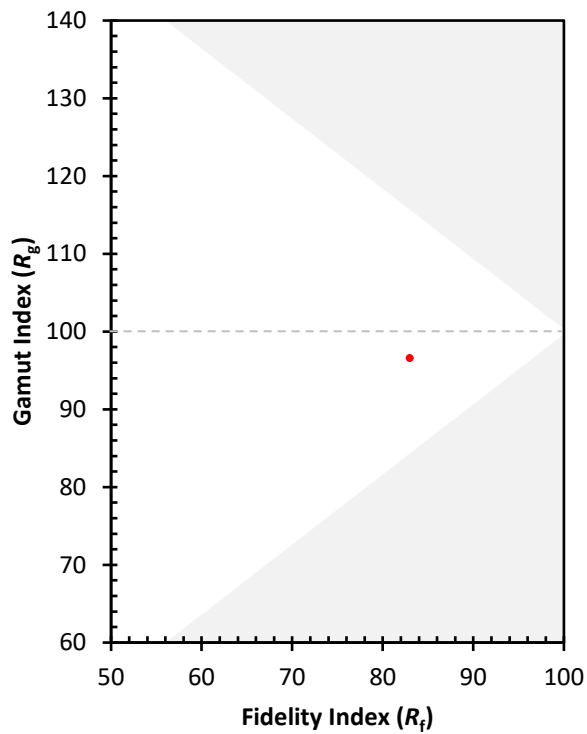
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)