

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: P860047

Luminaire Tested: **SPHB-30HE-M-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: P860047  
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-30HE-M-L840-CD  
Description: 30000 Lumen High Efficacy Select Pro High Bay with Medium Lens and,  
4000K 80CRI LEDs  
Light Source: -  
Ballast/Driver: -

Luminaire Equipment: Sample No.   Condition   Description

**Summary**

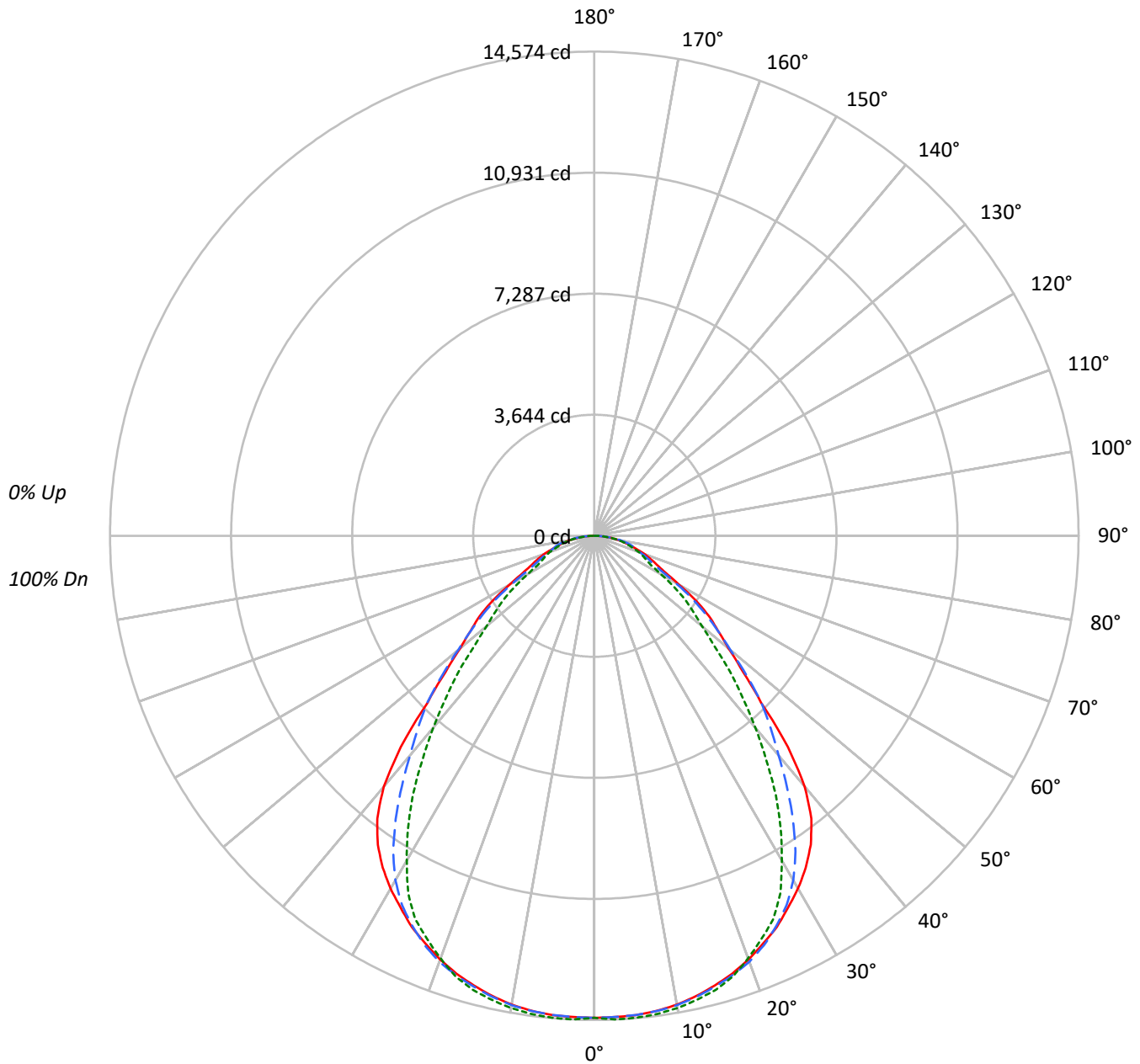
Lumens per Lamp: N/A  
Luminaire Lumens: 30116.0 lumens  
Efficiency: N/A  
Efficacy: 169.6 lumens/watt  
Spacing Criteria (0/90/45): 1.25 / 1.16 / 1.22  
Luminous Opening: Rectangular (W 1' x L: 2.04' x H: 0')  
CIE Type: Direct

Input Watts (W): 177.6  
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: P860047

CATALOG NUMBER: SPHB-30HE-M-L840-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P860047

CATALOG NUMBER: SPHB-30HE-M-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 | 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°  | 76557 | 76557 | 76557 |
| 5°  | 76708 | 76688 | 77124 |
| 10° | 76774 | 76856 | 77328 |
| 15° | 76551 | 76749 | 77282 |
| 20° | 76216 | 76603 | 75991 |
| 25° | 75659 | 75448 | 74166 |
| 30° | 74701 | 72941 | 68778 |
| 35° | 73133 | 67105 | 61300 |
| 40° | 67869 | 59394 | 51920 |
| 45° | 52949 | 53092 | 42968 |
| 50° | 43246 | 43858 | 34700 |
| 55° | 38747 | 37285 | 30490 |
| 60° | 31019 | 29363 | 24395 |
| 65° | 25995 | 23797 | 21574 |
| 70° | 24681 | 22673 | 21965 |
| 75° | 22393 | 24070 | 21184 |
| 80° | 22504 | 24597 | 22327 |
| 85° | 19579 | 22939 | 18652 |



TEST NUMBER: P860047

CATALOG NUMBER: SPHB-30HE-M-L840-CD

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 1379.6  | 4.6       |
| 10°-20°   | 3967.6  | 13.2      |
| 20°-30°   | 5923.0  | 19.7      |
| 30°-40°   | 6463.1  | 21.5      |
| 40°-50°   | 5287.1  | 17.6      |
| 50°-60°   | 3476.2  | 11.5      |
| 60°-70°   | 1994.4  | 6.6       |
| 70°-80°   | 1208.6  | 4.0       |
| 80°-90°   | 405.8   | 1.3       |
| 90°-100°  | 10.5    | 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°    | 11270.3 | 37.4      |
| 0°-40°    | 17733.3 | 58.9      |
| 0°-60°    | 26496.6 | 88.0      |
| 0°-90°    | 30105.4 | 100.0     |
| 90°-120°  | 10.5    | 0.0       |
| 90°-150°  | 10.5    | 0.0       |
| 90°-180°  | 11.0    | 0.0       |
| 0°-180°   | 30116.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°    | 22.5° | 45°   | 67.5° | 90°   | Flux |
|------|-------|-------|-------|-------|-------|------|
| 0°   | 14509 | 14509 | 14509 | 14509 | 14509 |      |
| 5°   | 14482 | 14460 | 14479 | 14538 | 14561 | ###  |
| 15°  | 14014 | 14012 | 14050 | 14140 | 14148 | 3956 |
| 25°  | 12996 | 13026 | 12959 | 12802 | 12739 | 5979 |
| 35°  | 11354 | 11097 | 10418 | 9708  | 9517  | 7037 |
| 45°  | 7096  | 7626  | 7115  | 6281  | 5758  | 5632 |
| 55°  | 4212  | 4097  | 4053  | 3483  | 3314  | 3710 |
| 65°  | 2082  | 2051  | 1906  | 1854  | 1728  | 2128 |
| 75°  | 1098  | 1188  | 1181  | 1133  | 1039  | 1189 |
| 85°  | 323   | 367   | 379   | 331   | 308   | 351  |
| 90°  | 2     | 27    | 54    | 63    | 67    | 15   |
| 95°  | 2     | 4     | 6     | 6     | 4     | 1    |
| 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: P860047

CATALOG NUMBER: SPHB-30HE-M-L840-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°      | 22.5°   | 45°     | 67.5°   | 90°     |
|--------|---------|---------|---------|---------|---------|
| 0°     | 14509.3 | 14509.3 | 14509.3 | 14509.3 | 14509.3 |
| 2.5°   | 14499.7 | 14478.7 | 14497.8 | 14557.2 | 14574.4 |
| 5°     | 14482.5 | 14459.6 | 14478.7 | 14538.0 | 14561.0 |
| 7.5°   | 14423.2 | 14409.8 | 14428.9 | 14488.3 | 14517.0 |
| 10°    | 14329.4 | 14314.1 | 14344.7 | 14396.4 | 14432.8 |
| 12.5°  | 14189.7 | 14184.0 | 14212.7 | 14287.3 | 14302.6 |
| 15°    | 14013.7 | 14011.8 | 14050.0 | 14140.0 | 14147.6 |
| 17.5°  | 13814.7 | 13812.7 | 13860.6 | 13919.9 | 13898.9 |
| 20°    | 13573.5 | 13586.9 | 13642.4 | 13586.9 | 13533.4 |
| 22.5°  | 13284.6 | 13326.7 | 13340.1 | 13165.9 | 13139.1 |
| 25°    | 12995.6 | 13026.2 | 12959.3 | 12802.3 | 12739.2 |
| 27.5°  | 12622.5 | 12658.8 | 12534.4 | 12310.5 | 12130.6 |
| 30°    | 12260.8 | 12226.3 | 11971.8 | 11539.3 | 11288.6 |
| 32.5°  | 11845.5 | 11723.0 | 11265.7 | 10668.6 | 10440.9 |
| 35°    | 11353.7 | 11097.3 | 10417.9 | 9708.0  | 9516.6  |
| 37.5°  | 10731.8 | 10262.9 | 9520.4  | 8779.8  | 8490.9  |
| 40°    | 9853.4  | 9311.8  | 8622.9  | 7857.5  | 7537.9  |
| 42.5°  | 8622.9  | 8422.0  | 7851.7  | 6990.6  | 6609.8  |
| 45°    | 7095.8  | 7625.9  | 7115.0  | 6280.6  | 5758.2  |
| 47.5°  | 6073.9  | 6810.7  | 6196.4  | 5593.6  | 4874.1  |
| 50°    | 5268.3  | 5775.4  | 5342.9  | 4799.4  | 4227.3  |
| 52.5°  | 4686.5  | 4839.6  | 4665.5  | 4068.4  | 3743.1  |
| 55°    | 4212.0  | 4097.1  | 4053.1  | 3482.8  | 3314.4  |
| 57.5°  | 3622.5  | 3559.4  | 3446.5  | 3037.0  | 2815.0  |
| 60°    | 2939.4  | 3073.3  | 2782.5  | 2665.7  | 2311.7  |
| 62.5°  | 2415.0  | 2547.1  | 2235.1  | 2227.5  | 1932.8  |
| 65°    | 2082.1  | 2051.4  | 1906.0  | 1854.3  | 1728.0  |
| 67.5°  | 1842.8  | 1747.2  | 1697.4  | 1630.4  | 1586.4  |
| 70°    | 1599.8  | 1559.6  | 1469.7  | 1483.1  | 1423.8  |
| 72.5°  | 1333.8  | 1385.5  | 1295.5  | 1320.4  | 1213.3  |
| 75°    | 1098.4  | 1188.4  | 1180.7  | 1132.9  | 1039.1  |
| 77.5°  | 905.2   | 1000.8  | 1018.1  | 974.0   | 897.5   |
| 80°    | 740.6   | 805.6   | 809.5   | 782.7   | 734.8   |
| 82.5°  | 543.5   | 581.8   | 610.5   | 564.5   | 533.9   |
| 85°    | 323.4   | 367.4   | 378.9   | 331.1   | 308.1   |
| 87.5°  | 105.3   | 147.4   | 164.6   | 170.3   | 172.2   |
| 90°    | 1.9     | 26.8    | 53.6    | 63.2    | 67.0    |
| 92.5°  | 1.9     | 7.7     | 11.5    | 17.2    | 19.1    |
| 95°    | 1.9     | 3.8     | 5.7     | 5.7     | 3.8     |
| 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

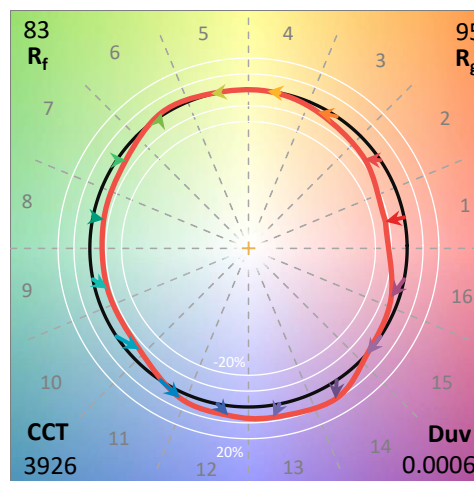
Test Method: LM-79-2019  
 Report Number: SP1-2309-187-7  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/09/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **SPHB-1224SE-M-UNV-L84050-CD-U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

### Spectral Parameters

CCT (K): 3926  
 CIE u': 0.2261  
 CIE v': 0.5037  
 Duv: 0.0006  
 CIE x: 0.3841  
 CIE y: 0.3802  
 CIE z: 0.2357  
 Peak Wavelength (nm): 454  
 Dominant Wavelength (nm): 579  
 Purity: 29.5  
 Rf: 82.9  
 Rg: 95

CRI (Ra): 82.0  
 R1: 80.3  
 R2: 88.4  
 R3: 93.9  
 R4: 80.2  
 R5: 79.7  
 R6: 83.3  
 R7: 86.1  
 R8: 64.3

R9: 8.2  
 R10: 71.6  
 R11: 78.1  
 R12: 57.5  
 R13: 82.3  
 R14: 96.6



### Test Conditions

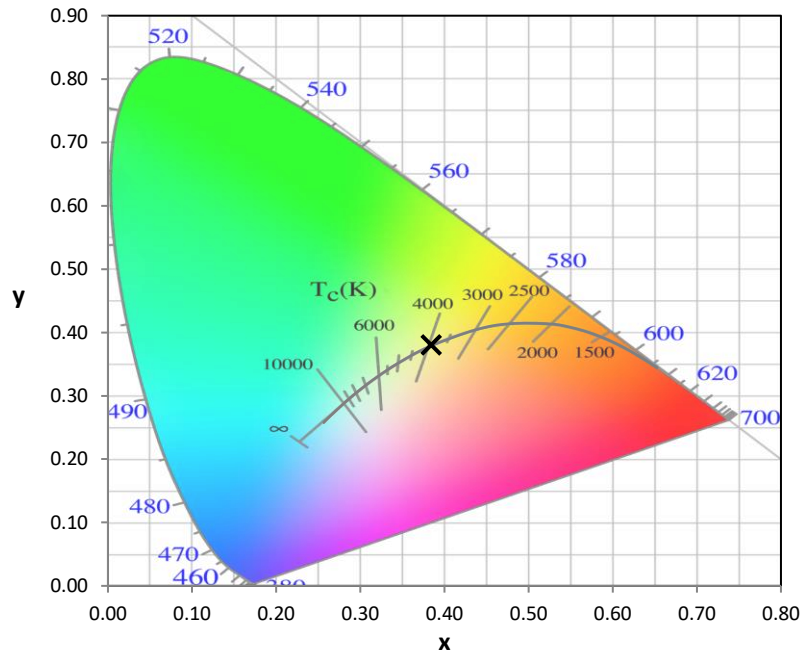
Stabilization Time: 23M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.5/33%  
 Sphere Temperature (°C): 24.2

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**



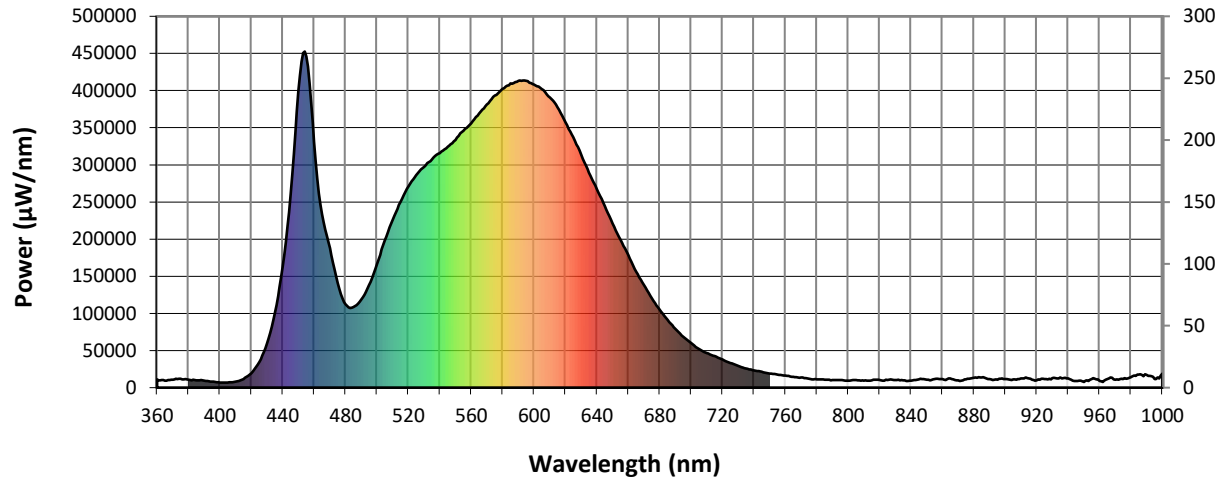
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



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**



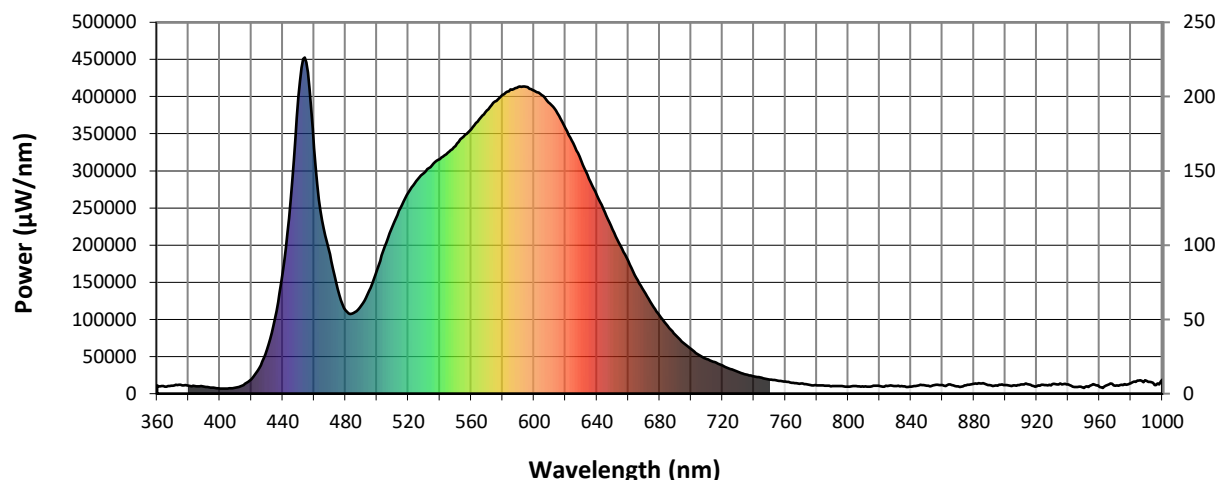
**Scotopic Lumens: 39237.7**

**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 ( $R_{f,i}$ )**

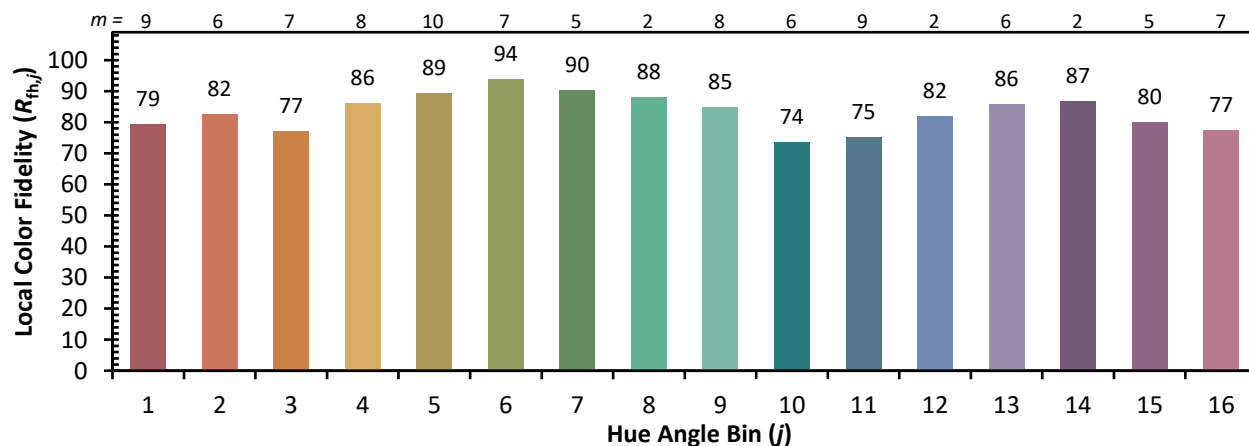
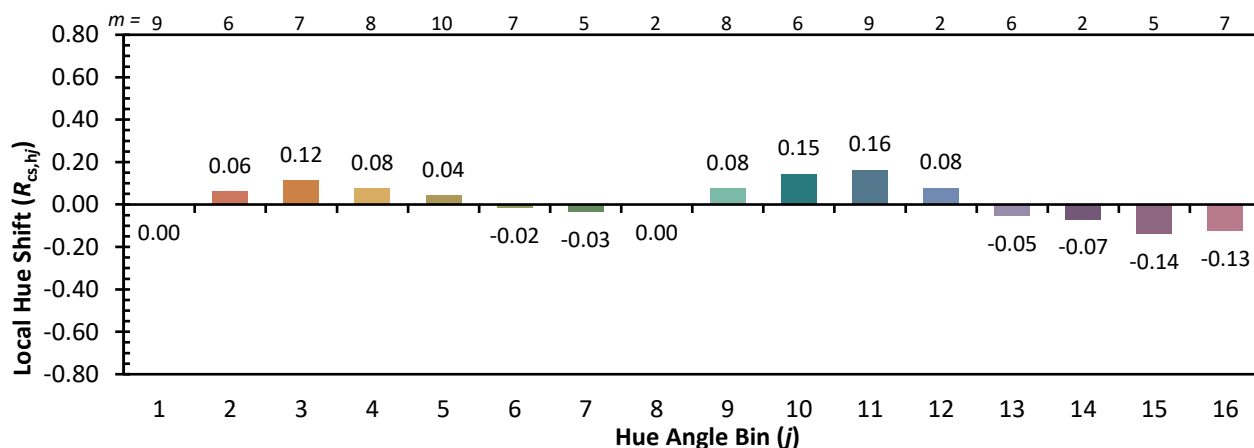
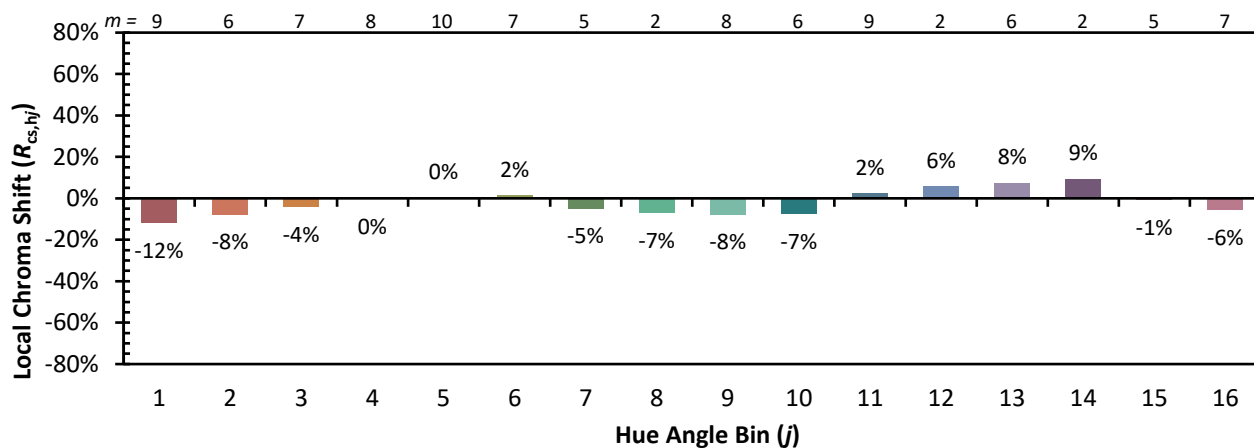
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| CES03 = 31 | CES28 = 90 | CES53 = 88 | CES78 = 72 |
| CES04 = 70 | CES29 = 88 | CES54 = 89 | CES79 = 91 |
| CES05 = 48 | CES30 = 92 | CES55 = 86 | CES80 = 88 |
| CES06 = 50 | CES31 = 89 | CES56 = 83 | CES81 = 82 |
| CES07 = 41 | CES32 = 80 | CES57 = 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 |
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| 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 |
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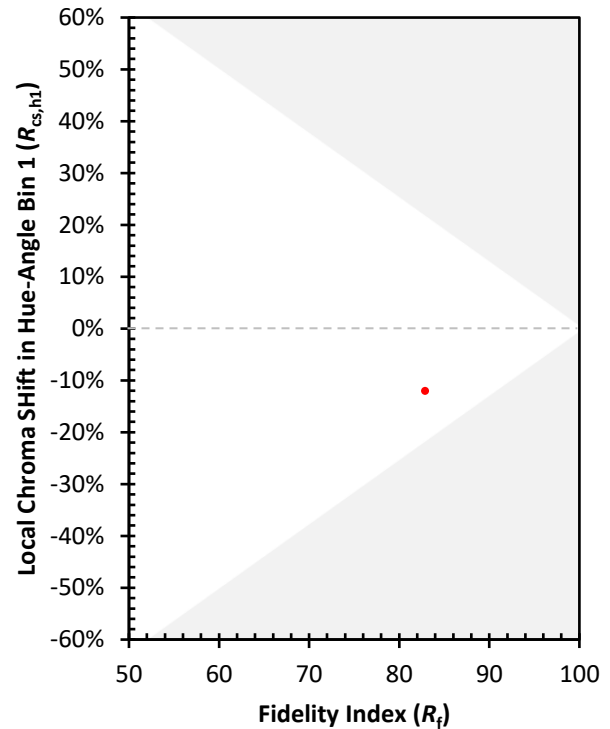
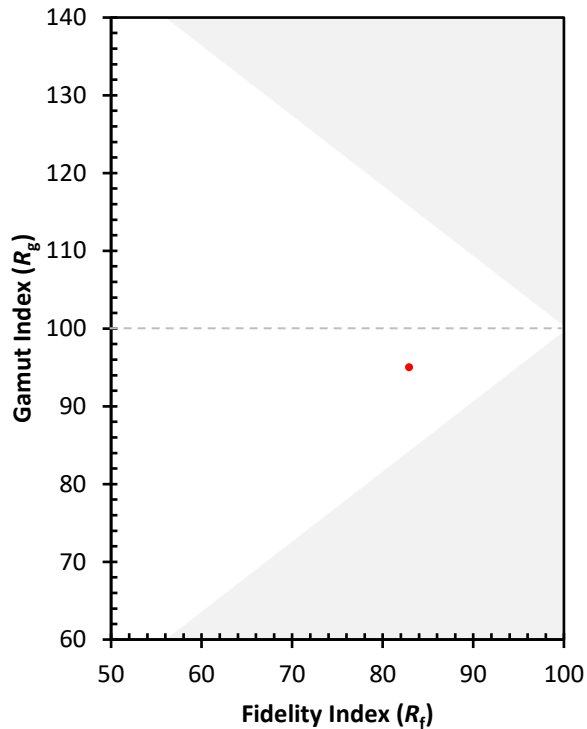
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)