

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: P859983

Luminaire Tested: **SPHB-18SE-W-L835-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: P859983  
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-18SE-W-L835-CD  
Description: 18000 Lumen Standard Efficacy Select Pro High Bay with Wide Lens  
and, 3500K 80CRI LEDs  
Light Source: -  
Ballast/Driver: -

Luminaire Equipment: Sample No.   Condition   Description

**Summary**

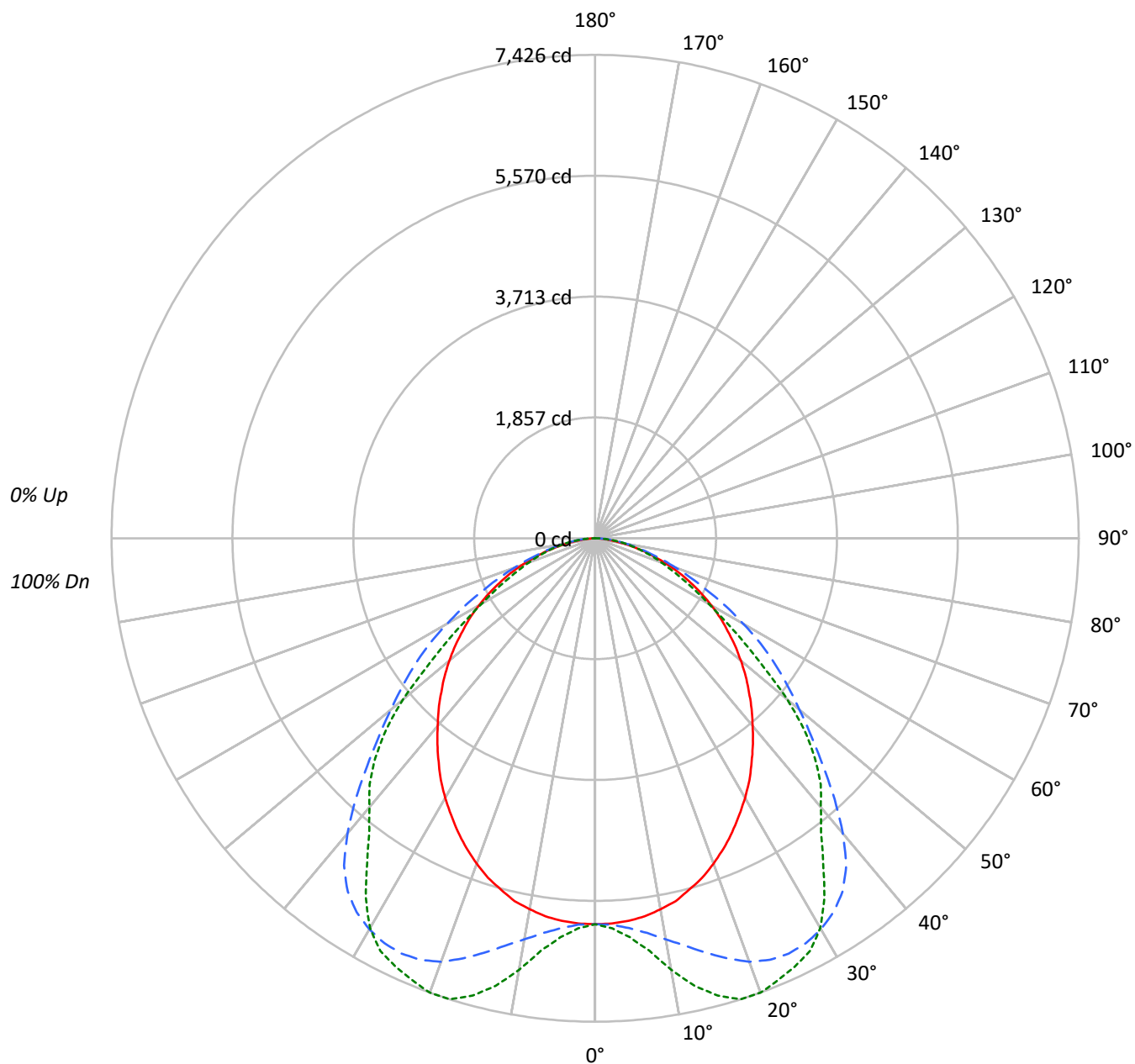
Lumens per Lamp: N/A  
Luminaire Lumens: 18653.0 lumens  
Efficiency: N/A  
Efficacy: 158.9 lumens/watt  
Spacing Criteria (0/90/45): 1.16 / 1.5 / 1.51  
Luminous Opening: Rectangular (W 1' x L: 1.38' x H: 0')  
CIE Type: Direct

Input Watts (W): 117.4  
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: P859983

CATALOG NUMBER: SPHB-18SE-W-L835-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P859983

CATALOG NUMBER: SPHB-18SE-W-L835-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°  | 46240 | 46240 | 46240 |
| 5°  | 46190 | 47061 | 48176 |
| 10° | 45824 | 49544 | 53300 |
| 15° | 45108 | 53233 | 58711 |
| 20° | 44132 | 57467 | 61643 |
| 25° | 42858 | 60568 | 62451 |
| 30° | 41464 | 62463 | 62281 |
| 35° | 39908 | 63090 | 58115 |
| 40° | 38299 | 60240 | 54892 |
| 45° | 36851 | 54605 | 52664 |
| 50° | 35415 | 49650 | 46688 |
| 55° | 33794 | 45873 | 37992 |
| 60° | 32123 | 40897 | 31289 |
| 65° | 29910 | 35143 | 27131 |
| 70° | 27212 | 30003 | 24539 |
| 75° | 23368 | 25179 | 22497 |
| 80° | 18264 | 21597 | 20864 |
| 85° | 12350 | 18328 | 17201 |



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**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 582.0   | 3.1       |
| 10°-20°   | 1845.6  | 9.9       |
| 20°-30°   | 3020.4  | 16.2      |
| 30°-40°   | 3684.7  | 19.8      |
| 40°-50°   | 3649.3  | 19.6      |
| 50°-60°   | 2918.3  | 15.6      |
| 60°-70°   | 1820.5  | 9.8       |
| 70°-80°   | 892.0   | 4.8       |
| 80°-90°   | 233.9   | 1.3       |
| 90°-100°  | 6.2     | 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°    | 5448.1  | 29.2      |
| 0°-40°    | 9132.8  | 49.0      |
| 0°-60°    | 15700.4 | 84.2      |
| 0°-90°    | 18646.8 | 100.0     |
| 90°-120°  | 6.2     | 0.0       |
| 90°-150°  | 6.2     | 0.0       |
| 90°-180°  | 6.0     | 0.0       |
| 0°-180°   | 18653.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 5928 | 5928  | 5928 | 5928  | 5928 |      |
| 5°   | 5899 | 5925  | 6011 | 6115  | 6153 | 560  |
| 15°  | 5586 | 5911  | 6592 | 7117  | 7271 | 1575 |
| 25°  | 4980 | 5823  | 7038 | 7242  | 7256 | 2292 |
| 35°  | 4191 | 5600  | 6626 | 6272  | 6103 | 2622 |
| 45°  | 3341 | 5190  | 4950 | 4784  | 4774 | 2580 |
| 55°  | 2485 | 3985  | 3373 | 3048  | 2794 | 2227 |
| 65°  | 1621 | 2236  | 1904 | 1579  | 1470 | 1607 |
| 75°  | 775  | 950   | 836  | 765   | 746  | 823  |
| 85°  | 138  | 196   | 205  | 194   | 192  | 171  |
| 90°  | 1    | 20    | 36   | 46    | 48   | 8    |
| 95°  | 1    | 3     | 3    | 2     | 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    |      |



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CATALOG NUMBER: SPHB-18SE-W-L835-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|--------|--------|--------|--------|--------|--------|
| 0°     | 5928.2 | 5928.2 | 5928.2 | 5928.2 | 5928.2 |
| 2.5°   | 5922.3 | 5920.0 | 5941.6 | 5980.9 | 5998.7 |
| 5°     | 5899.3 | 5925.2 | 6010.6 | 6115.2 | 6153.0 |
| 7.5°   | 5857.7 | 5927.5 | 6115.9 | 6308.1 | 6389.8 |
| 10°    | 5785.7 | 5928.9 | 6255.4 | 6594.6 | 6729.6 |
| 12.5°  | 5711.5 | 5923.7 | 6410.5 | 6890.6 | 7038.3 |
| 15°    | 5586.1 | 5911.1 | 6592.3 | 7117.0 | 7270.6 |
| 17.5°  | 5469.6 | 5896.3 | 6767.5 | 7309.1 | 7425.6 |
| 20°    | 5316.8 | 5874.8 | 6923.3 | 7367.8 | 7426.4 |
| 22.5°  | 5156.5 | 5857.7 | 7009.4 | 7328.4 | 7346.3 |
| 25°    | 4979.9 | 5822.8 | 7037.6 | 7241.6 | 7256.5 |
| 27.5°  | 4791.4 | 5791.7 | 7010.8 | 7134.0 | 7146.6 |
| 30°    | 4603.7 | 5735.3 | 6935.2 | 6966.3 | 6915.1 |
| 32.5°  | 4407.0 | 5678.9 | 6812.7 | 6672.5 | 6553.0 |
| 35°    | 4191.1 | 5600.2 | 6625.7 | 6271.8 | 6103.3 |
| 37.5°  | 3978.1 | 5524.5 | 6334.1 | 5823.6 | 5696.7 |
| 40°    | 3761.4 | 5431.0 | 5916.3 | 5405.1 | 5391.0 |
| 42.5°  | 3556.6 | 5330.1 | 5443.6 | 5079.3 | 5126.8 |
| 45°    | 3340.7 | 5189.9 | 4950.2 | 4784.0 | 4774.3 |
| 47.5°  | 3135.9 | 4996.2 | 4501.2 | 4457.5 | 4358.8 |
| 50°    | 2918.5 | 4729.1 | 4091.6 | 4050.1 | 3847.5 |
| 52.5°  | 2705.5 | 4388.5 | 3725.8 | 3570.0 | 3274.6 |
| 55°    | 2485.1 | 3984.8 | 3373.3 | 3047.6 | 2793.8 |
| 57.5°  | 2280.3 | 3541.0 | 3014.9 | 2592.7 | 2364.9 |
| 60°    | 2059.2 | 3091.4 | 2621.6 | 2193.5 | 2005.7 |
| 62.5°  | 1842.5 | 2648.4 | 2265.5 | 1853.6 | 1729.0 |
| 65°    | 1620.6 | 2235.8 | 1904.1 | 1579.1 | 1470.0 |
| 67.5°  | 1408.4 | 1878.9 | 1591.7 | 1331.2 | 1258.5 |
| 70°    | 1193.2 | 1524.2 | 1315.6 | 1118.3 | 1076.0 |
| 72.5°  | 971.3  | 1217.7 | 1064.1 | 943.9  | 912.0  |
| 75°    | 775.4  | 949.8  | 835.5  | 765.0  | 746.5  |
| 77.5°  | 577.3  | 706.4  | 653.0  | 611.4  | 606.3  |
| 80°    | 406.6  | 509.8  | 480.8  | 472.7  | 464.5  |
| 82.5°  | 259.7  | 333.2  | 342.1  | 336.9  | 331.0  |
| 85°    | 138.0  | 195.9  | 204.8  | 194.4  | 192.2  |
| 87.5°  | 55.7   | 85.3   | 92.0   | 101.7  | 104.6  |
| 90°    | 0.7    | 20.0   | 36.4   | 46.0   | 47.5   |
| 92.5°  | 0.7    | 4.5    | 5.2    | 5.2    | 4.5    |
| 95°    | 0.7    | 3.0    | 3.0    | 2.2    | 1.5    |
| 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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CATALOG NUMBER: SPHB-18SE-W-L835-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: SP1-2404-343-4

Test Date: 05/20/2024

Luminaire Tested: SPHB-24SE-M-UNV-L835-CD

Data in this report applies to families of products SPHB-24SE-M-UNV-L835-CD.

### Test Information

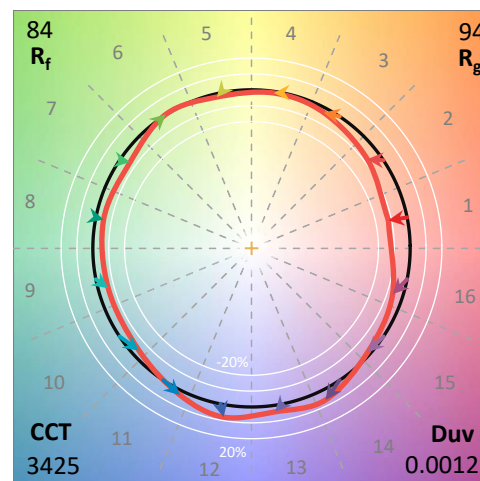
Test Method: LM-79-2019  
 Report Number: SP1-2404-343-4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 05/21/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **SPHB-24SE-M-UNV-L835-CD**  
 Description: 18IN SPHB WITH MEDIUM LENS, 3500K/80CRI, 24K LUMENS, SE

### Spectral Parameters

CCT (K): 3425  
 CIE u': 0.2370  
 CIE v': 0.5143  
 Duv: 0.0012  
 CIE x: 0.4108  
 CIE y: 0.3961  
 CIE z: 0.1931  
 Peak Wavelength (nm): 598  
 Dominant Wavelength (nm): 580  
 Purity: 42.4  
 Rf: 84.3  
 Rg: 94.4

CRI (Ra): 82.9  
 R1: 81.2  
 R2: 90.5  
 R3: 96.5  
 R4: 80.4  
 R5: 80.9  
 R6: 87.3  
 R7: 84.6  
 R8: 61.9

R9: 8.8  
 R10: 77.5  
 R11: 79.1  
 R12: 64.2  
 R13: 83.5  
 R14: 98.5



### Test Conditions

Stabilization Time: 27M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.0/41%  
 Sphere Temperature (°C): 25.2

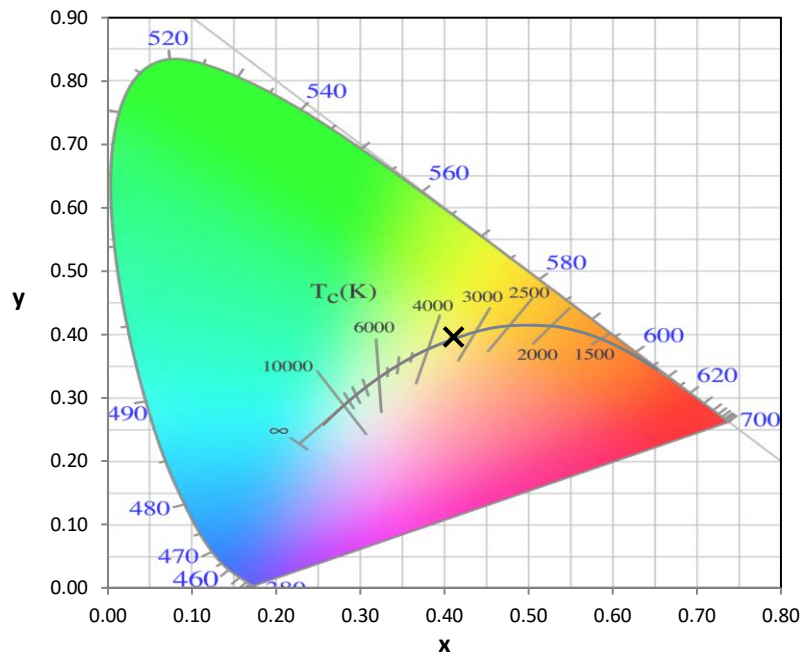


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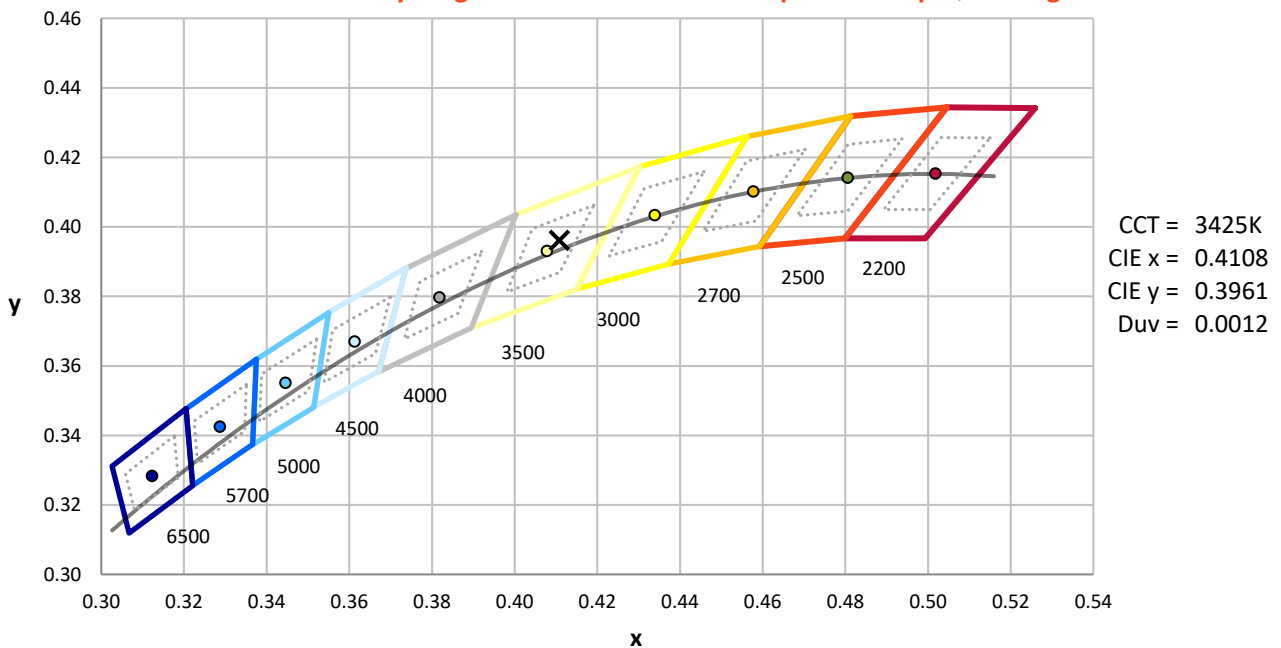
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 2/12/2024        | 8/12/2024            |
| Power Meter                    | XITRON 2801 IN0071    | 10/23/2023       | 10/23/2024           |
| AC Power Source                | CHROMA 61603 IN0063   | 10/24/2023       | 10/24/2024           |
| DC Power Source                | AGILENT E3634A IN0208 | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | ONSET IN0085          | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | ONSET IN0046          | 10/24/2023       | 10/24/2024           |

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CIE 1931 Chromaticity Diagram



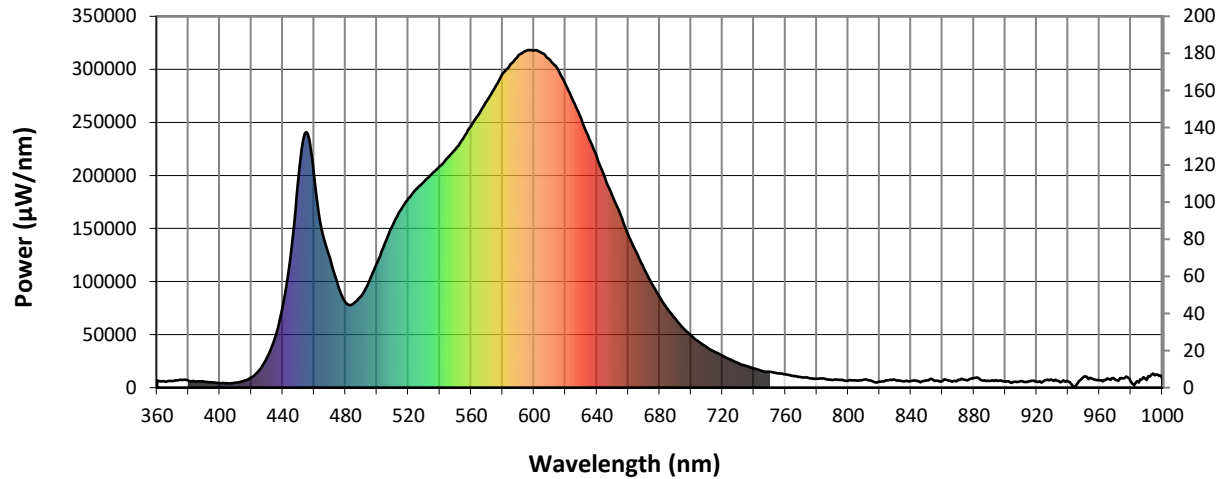
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 3500K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

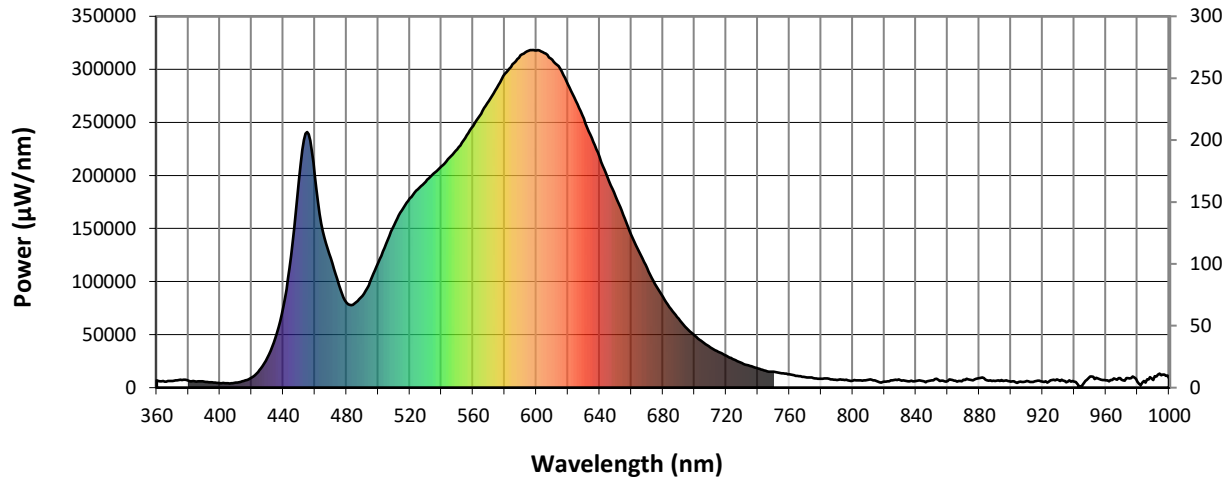


#####

| 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       | 6937             | NR               | 490       | 86536            | NR               | 620       | 285855           | NR               | 750       | 14885            | NR               | 880       | 8993             | NR               |
| 365       | 5820             | NR               | 495       | 100007           | NR               | 625       | 270301           | NR               | 755       | 13434            | NR               | 885       | 6908             | NR               |
| 370       | 6342             | NR               | 500       | 117528           | NR               | 630       | 253548           | NR               | 760       | 12497            | NR               | 890       | 6405             | NR               |
| 375       | 7421             | NR               | 505       | 135586           | NR               | 635       | 235289           | NR               | 765       | 11021            | NR               | 895       | 6392             | NR               |
| 380       | 6619             | NR               | 510       | 153068           | NR               | 640       | 217346           | NR               | 770       | 9938             | NR               | 900       | 5762             | NR               |
| 385       | 5813             | NR               | 515       | 167170           | NR               | 645       | 198000           | NR               | 775       | 9105             | NR               | 905       | 5445             | NR               |
| 390       | 5630             | NR               | 520       | 178364           | NR               | 650       | 180267           | NR               | 780       | 8315             | NR               | 910       | 6424             | NR               |
| 395       | 4917             | NR               | 525       | 186887           | NR               | 655       | 162796           | NR               | 785       | 8364             | NR               | 915       | 5977             | NR               |
| 400       | 4279             | NR               | 530       | 194310           | NR               | 660       | 143827           | NR               | 790       | 7202             | NR               | 920       | 5589             | NR               |
| 405       | 4043             | NR               | 535       | 201832           | NR               | 665       | 127951           | NR               | 795       | 7271             | NR               | 925       | 6728             | NR               |
| 410       | 4666             | NR               | 540       | 208553           | NR               | 670       | 112526           | NR               | 800       | 6583             | NR               | 930       | 7328             | NR               |
| 415       | 6309             | NR               | 545       | 216697           | NR               | 675       | 97790            | NR               | 805       | 6730             | NR               | 935       | 5077             | NR               |
| 420       | 9564             | NR               | 550       | 224567           | NR               | 680       | 85489            | NR               | 810       | 7628             | NR               | 940       | 5558             | NR               |
| 425       | 16500            | NR               | 555       | 235296           | NR               | 685       | 74086            | NR               | 815       | 6335             | NR               | 945       | 2171             | NR               |
| 430       | 28210            | NR               | 560       | 246750           | NR               | 690       | 65039            | NR               | 820       | 5679             | NR               | 950       | 10555            | NR               |
| 435       | 47088            | NR               | 565       | 258189           | NR               | 695       | 56035            | NR               | 825       | 6974             | NR               | 955       | 8787             | NR               |
| 440       | 76402            | NR               | 570       | 270186           | NR               | 700       | 49223            | NR               | 830       | 7136             | NR               | 960       | 6936             | NR               |
| 445       | 124288           | NR               | 575       | 282577           | NR               | 705       | 43027            | NR               | 835       | 5971             | NR               | 965       | 8547             | NR               |
| 450       | 197266           | NR               | 580       | 295795           | NR               | 710       | 38080            | NR               | 840       | 6371             | NR               | 970       | 7502             | NR               |
| 455       | 240978           | NR               | 585       | 304888           | NR               | 715       | 33706            | NR               | 845       | 6027             | NR               | 975       | 8793             | NR               |
| 460       | 199802           | NR               | 590       | 313177           | NR               | 720       | 29961            | NR               | 850       | 6816             | NR               | 980       | 5517             | NR               |
| 465       | 147559           | NR               | 595       | 317388           | NR               | 725       | 26440            | NR               | 855       | 6168             | NR               | 985       | 4652             | NR               |
| 470       | 121976           | NR               | 600       | 317783           | NR               | 730       | 23027            | NR               | 860       | 6333             | NR               | 990       | 7259             | NR               |
| 475       | 97268            | NR               | 605       | 315536           | NR               | 735       | 20496            | NR               | 865       | 6493             | NR               | 995       | 11735            | NR               |
| 480       | 80092            | NR               | 610       | 309123           | NR               | 740       | 18168            | NR               | 870       | 7357             | NR               | 1000      | 8351             | NR               |
| 485       | 79203            | NR               | 615       | 300672           | NR               | 745       | 15812            | NR               | 875       | 7188             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



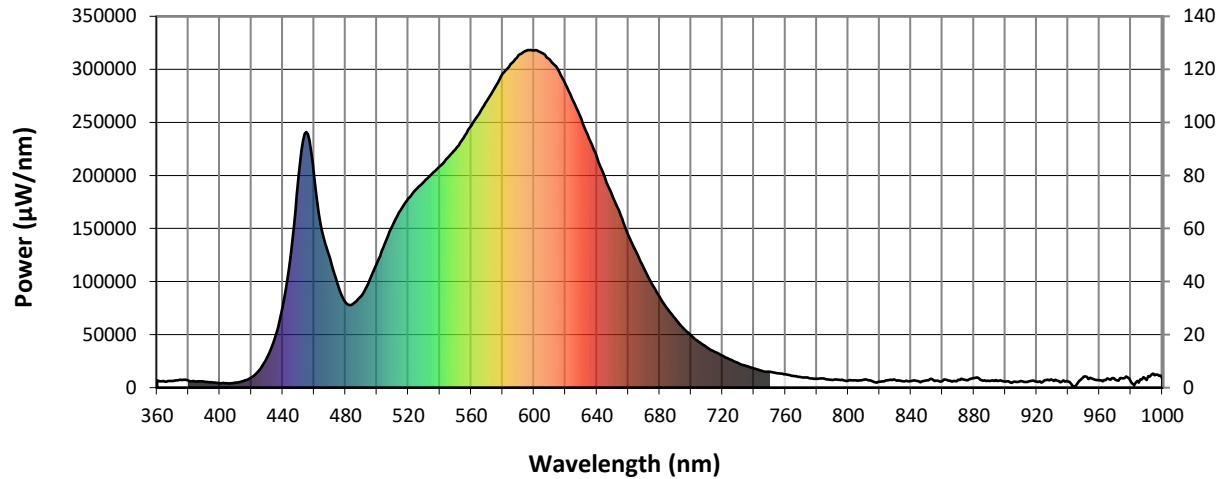
Scotopic Lumens: 25661.8

S/P: 1.51

| 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       | 6937             | NR               | 490       | 86536            | NR               | 620       | 285855           | NR               | 750       | 14885            | NR               | 880       | 8993             | NR               |
| 365       | 5820             | NR               | 495       | 100007           | NR               | 625       | 270301           | NR               | 755       | 13434            | NR               | 885       | 6908             | NR               |
| 370       | 6342             | NR               | 500       | 117528           | NR               | 630       | 253548           | NR               | 760       | 12497            | NR               | 890       | 6405             | NR               |
| 375       | 7421             | NR               | 505       | 135586           | NR               | 635       | 235289           | NR               | 765       | 11021            | NR               | 895       | 6392             | NR               |
| 380       | 6619             | NR               | 510       | 153068           | NR               | 640       | 217346           | NR               | 770       | 9938             | NR               | 900       | 5762             | NR               |
| 385       | 5813             | NR               | 515       | 167170           | NR               | 645       | 198000           | NR               | 775       | 9105             | NR               | 905       | 5445             | NR               |
| 390       | 5630             | NR               | 520       | 178364           | NR               | 650       | 180267           | NR               | 780       | 8315             | NR               | 910       | 6424             | NR               |
| 395       | 4917             | NR               | 525       | 186887           | NR               | 655       | 162796           | NR               | 785       | 8364             | NR               | 915       | 5977             | NR               |
| 400       | 4279             | NR               | 530       | 194310           | NR               | 660       | 143827           | NR               | 790       | 7202             | NR               | 920       | 5589             | NR               |
| 405       | 4043             | NR               | 535       | 201832           | NR               | 665       | 127951           | NR               | 795       | 7271             | NR               | 925       | 6728             | NR               |
| 410       | 4666             | NR               | 540       | 208553           | NR               | 670       | 112526           | NR               | 800       | 6583             | NR               | 930       | 7328             | NR               |
| 415       | 6309             | NR               | 545       | 216697           | NR               | 675       | 97790            | NR               | 805       | 6730             | NR               | 935       | 5077             | NR               |
| 420       | 9564             | NR               | 550       | 224567           | NR               | 680       | 85489            | NR               | 810       | 7628             | NR               | 940       | 5558             | NR               |
| 425       | 16500            | NR               | 555       | 235296           | NR               | 685       | 74086            | NR               | 815       | 6335             | NR               | 945       | 2171             | NR               |
| 430       | 28210            | NR               | 560       | 246750           | NR               | 690       | 65039            | NR               | 820       | 5679             | NR               | 950       | 10555            | NR               |
| 435       | 47088            | NR               | 565       | 258189           | NR               | 695       | 56035            | NR               | 825       | 6974             | NR               | 955       | 8787             | NR               |
| 440       | 76402            | NR               | 570       | 270186           | NR               | 700       | 49223            | NR               | 830       | 7136             | NR               | 960       | 6936             | NR               |
| 445       | 124288           | NR               | 575       | 282577           | NR               | 705       | 43027            | NR               | 835       | 5971             | NR               | 965       | 8547             | NR               |
| 450       | 197266           | NR               | 580       | 295795           | NR               | 710       | 38080            | NR               | 840       | 6371             | NR               | 970       | 7502             | NR               |
| 455       | 240978           | NR               | 585       | 304888           | NR               | 715       | 33706            | NR               | 845       | 6027             | NR               | 975       | 8793             | NR               |
| 460       | 199802           | NR               | 590       | 313177           | NR               | 720       | 29961            | NR               | 850       | 6816             | NR               | 980       | 5517             | NR               |
| 465       | 147559           | NR               | 595       | 317388           | NR               | 725       | 26440            | NR               | 855       | 6168             | NR               | 985       | 4652             | NR               |
| 470       | 121976           | NR               | 600       | 317783           | NR               | 730       | 23027            | NR               | 860       | 6333             | NR               | 990       | 7259             | NR               |
| 475       | 97268            | NR               | 605       | 315536           | NR               | 735       | 20496            | NR               | 865       | 6493             | NR               | 995       | 11735            | NR               |
| 480       | 80092            | NR               | 610       | 309123           | NR               | 740       | 18168            | NR               | 870       | 7357             | NR               | 1000      | 8351             | NR               |
| 485       | 79203            | NR               | 615       | 300672           | NR               | 745       | 15812            | NR               | 875       | 7188             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 10080.3 M/P: 0.59**

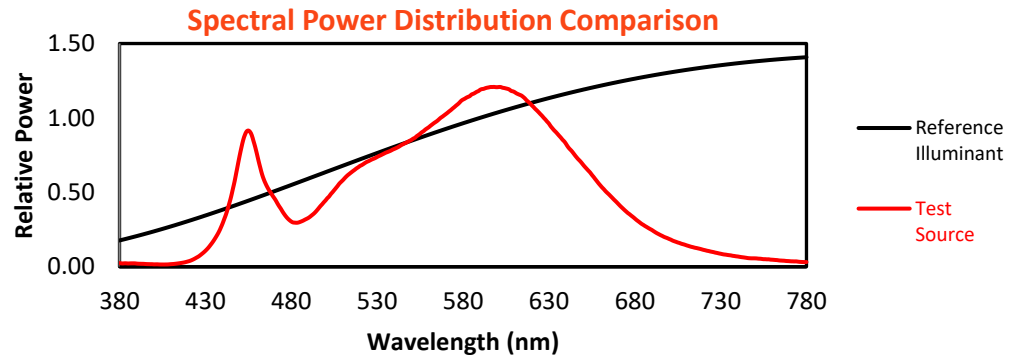
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6937             | NR               | 490       | 86536            | NR               | 620       | 285855           | NR               | 750       | 14885            | NR               | 880       | 8993             | NR               |
| 365       | 5820             | NR               | 495       | 100007           | NR               | 625       | 270301           | NR               | 755       | 13434            | NR               | 885       | 6908             | NR               |
| 370       | 6342             | NR               | 500       | 117528           | NR               | 630       | 253548           | NR               | 760       | 12497            | NR               | 890       | 6405             | NR               |
| 375       | 7421             | NR               | 505       | 135586           | NR               | 635       | 235289           | NR               | 765       | 11021            | NR               | 895       | 6392             | NR               |
| 380       | 6619             | NR               | 510       | 153068           | NR               | 640       | 217346           | NR               | 770       | 9938             | NR               | 900       | 5762             | NR               |
| 385       | 5813             | NR               | 515       | 167170           | NR               | 645       | 198000           | NR               | 775       | 9105             | NR               | 905       | 5445             | NR               |
| 390       | 5630             | NR               | 520       | 178364           | NR               | 650       | 180267           | NR               | 780       | 8315             | NR               | 910       | 6424             | NR               |
| 395       | 4917             | NR               | 525       | 186887           | NR               | 655       | 162796           | NR               | 785       | 8364             | NR               | 915       | 5977             | NR               |
| 400       | 4279             | NR               | 530       | 194310           | NR               | 660       | 143827           | NR               | 790       | 7202             | NR               | 920       | 5589             | NR               |
| 405       | 4043             | NR               | 535       | 201832           | NR               | 665       | 127951           | NR               | 795       | 7271             | NR               | 925       | 6728             | NR               |
| 410       | 4666             | NR               | 540       | 208553           | NR               | 670       | 112526           | NR               | 800       | 6583             | NR               | 930       | 7328             | NR               |
| 415       | 6309             | NR               | 545       | 216697           | NR               | 675       | 97790            | NR               | 805       | 6730             | NR               | 935       | 5077             | NR               |
| 420       | 9564             | NR               | 550       | 224567           | NR               | 680       | 85489            | NR               | 810       | 7628             | NR               | 940       | 5558             | NR               |
| 425       | 16500            | NR               | 555       | 235296           | NR               | 685       | 74086            | NR               | 815       | 6335             | NR               | 945       | 2171             | NR               |
| 430       | 28210            | NR               | 560       | 246750           | NR               | 690       | 65039            | NR               | 820       | 5679             | NR               | 950       | 10555            | NR               |
| 435       | 47088            | NR               | 565       | 258189           | NR               | 695       | 56035            | NR               | 825       | 6974             | NR               | 955       | 8787             | NR               |
| 440       | 76402            | NR               | 570       | 270186           | NR               | 700       | 49223            | NR               | 830       | 7136             | NR               | 960       | 6936             | NR               |
| 445       | 124288           | NR               | 575       | 282577           | NR               | 705       | 43027            | NR               | 835       | 5971             | NR               | 965       | 8547             | NR               |
| 450       | 197266           | NR               | 580       | 295795           | NR               | 710       | 38080            | NR               | 840       | 6371             | NR               | 970       | 7502             | NR               |
| 455       | 240978           | NR               | 585       | 304888           | NR               | 715       | 33706            | NR               | 845       | 6027             | NR               | 975       | 8793             | NR               |
| 460       | 199802           | NR               | 590       | 313177           | NR               | 720       | 29961            | NR               | 850       | 6816             | NR               | 980       | 5517             | NR               |
| 465       | 147559           | NR               | 595       | 317388           | NR               | 725       | 26440            | NR               | 855       | 6168             | NR               | 985       | 4652             | NR               |
| 470       | 121976           | NR               | 600       | 317783           | NR               | 730       | 23027            | NR               | 860       | 6333             | NR               | 990       | 7259             | NR               |
| 475       | 97268            | NR               | 605       | 315536           | NR               | 735       | 20496            | NR               | 865       | 6493             | NR               | 995       | 11735            | NR               |
| 480       | 80092            | NR               | 610       | 309123           | NR               | 740       | 18168            | NR               | 870       | 7357             | NR               | 1000      | 8351             | NR               |
| 485       | 79203            | NR               | 615       | 300672           | NR               | 745       | 15812            | NR               | 875       | 7188             | NR               |           |                  |                  |

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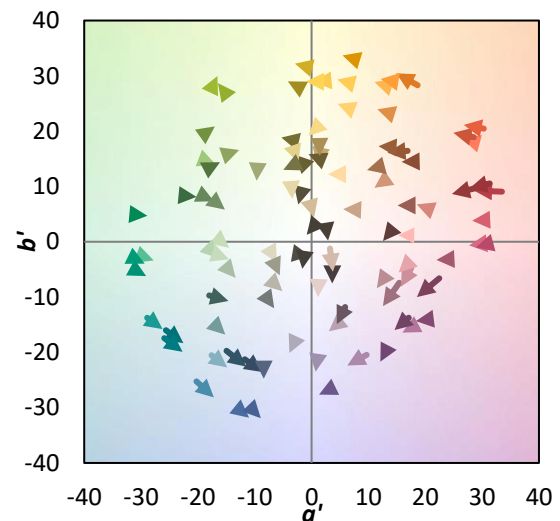
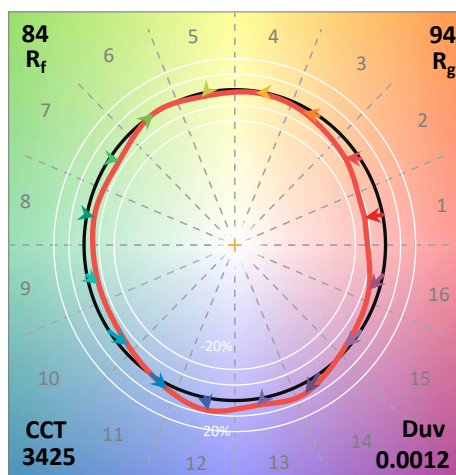
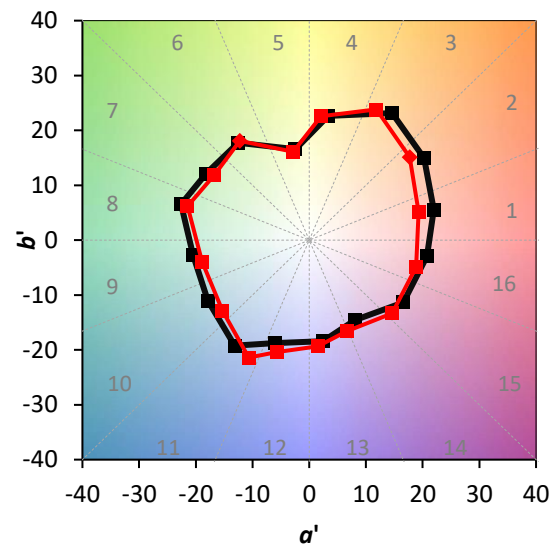
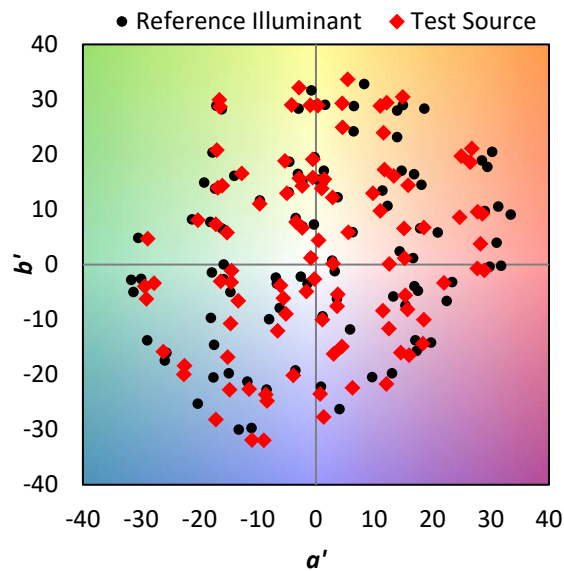
**TM-30-18**

**Summary**

$R_f = 84.3$   
 $R_g = 94.4$   
 CIE  $R_a = 82.9$   
 $R_9 = 8.8$



**Color Vector Graphics**

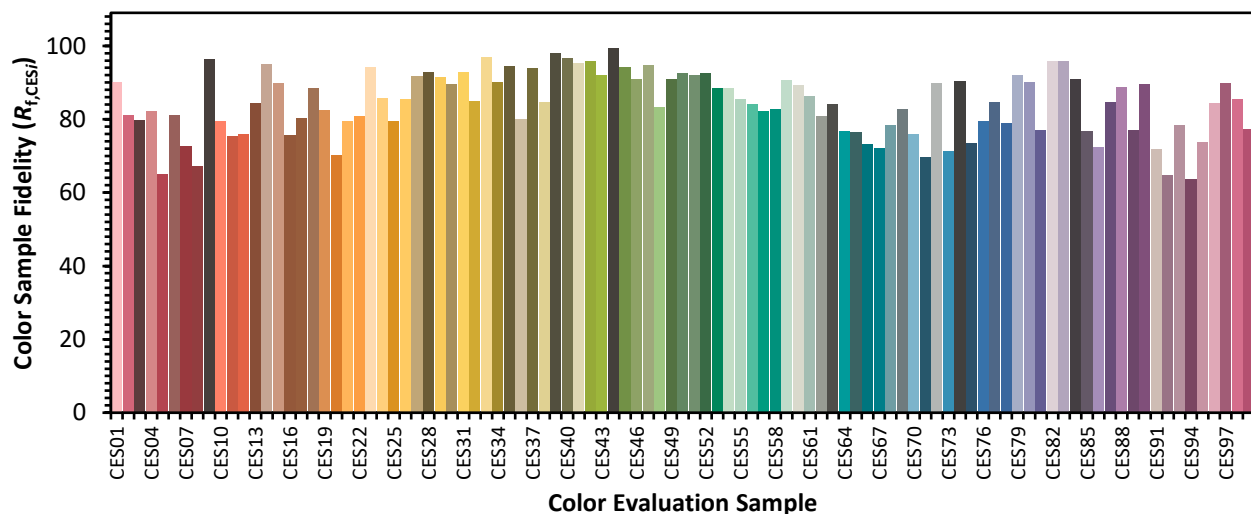


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

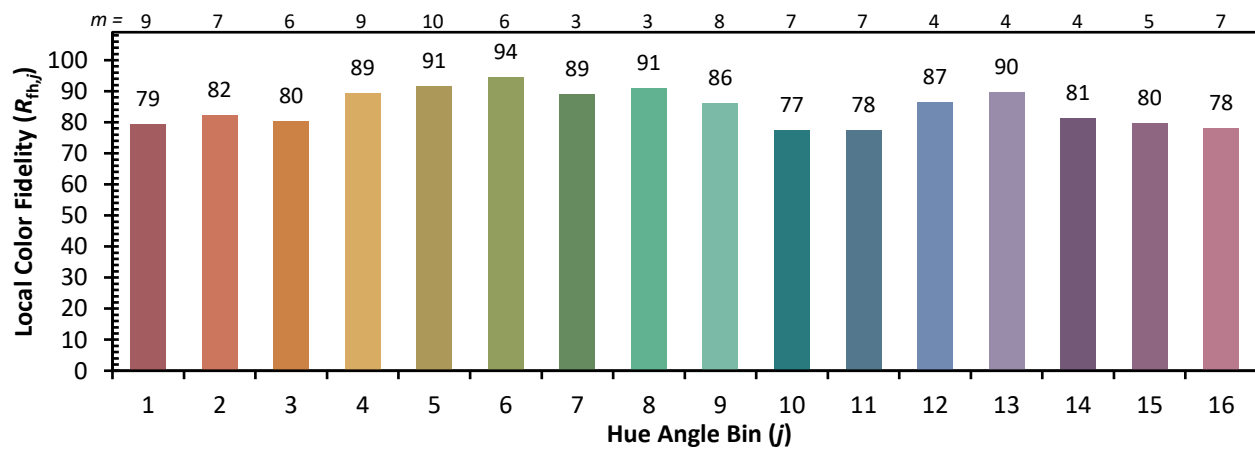
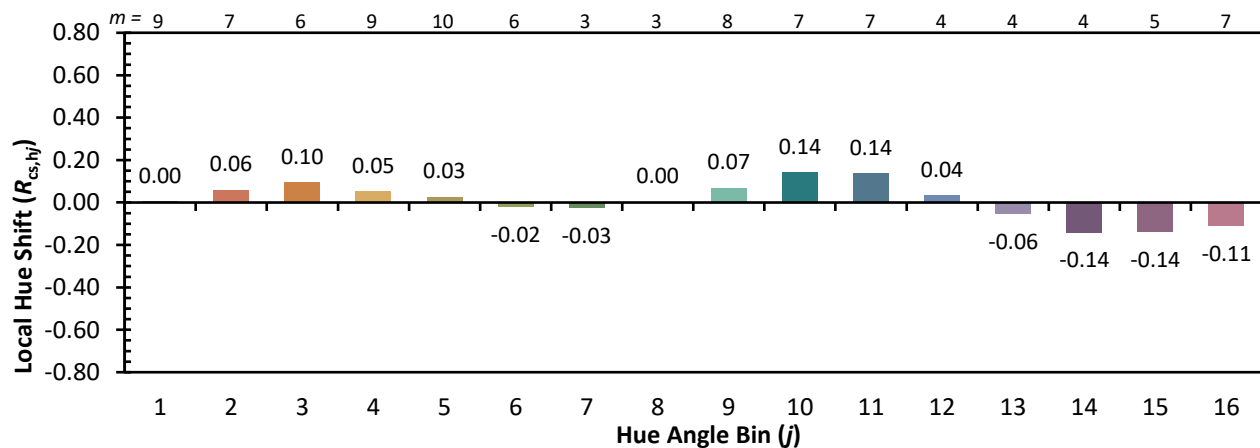
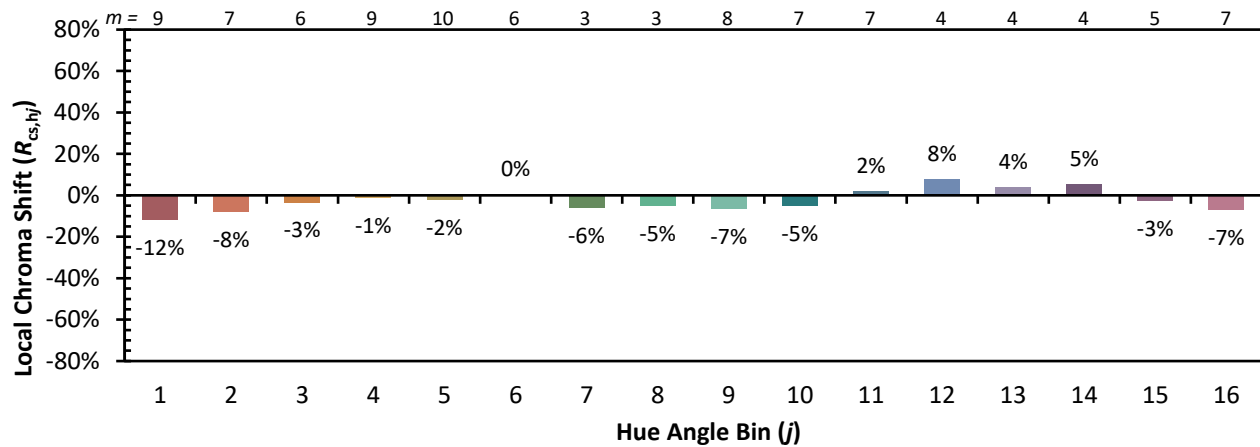
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|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 86 | CES51 = 92 | CES76 = 79 |
| CES02 = 62 | CES27 = 92 | CES52 = 93 | CES77 = 85 |
| CES03 = 31 | CES28 = 93 | CES53 = 88 | CES78 = 79 |
| CES04 = 70 | CES29 = 91 | CES54 = 88 | CES79 = 92 |
| CES05 = 49 | CES30 = 90 | CES55 = 86 | CES80 = 90 |
| CES06 = 51 | CES31 = 93 | CES56 = 84 | CES81 = 77 |
| CES07 = 41 | CES32 = 85 | CES57 = 82 | CES82 = 96 |
| CES08 = 40 | CES33 = 97 | CES58 = 83 | CES83 = 96 |
| CES09 = 29 | CES34 = 90 | CES59 = 91 | CES84 = 91 |
| CES10 = 75 | CES35 = 94 | CES60 = 89 | CES85 = 77 |
| CES11 = 58 | CES36 = 80 | CES61 = 86 | CES86 = 72 |
| CES12 = 64 | CES37 = 94 | CES62 = 81 | CES87 = 85 |
| CES13 = 43 | CES38 = 85 | CES63 = 84 | CES88 = 89 |
| CES14 = 74 | CES39 = 98 | CES64 = 77 | CES89 = 77 |
| CES15 = 71 | CES40 = 97 | CES65 = 76 | CES90 = 90 |
| CES16 = 47 | CES41 = 95 | CES66 = 73 | CES91 = 72 |
| CES17 = 50 | CES42 = 96 | CES67 = 72 | CES92 = 65 |
| CES18 = 56 | CES43 = 92 | CES68 = 78 | CES93 = 78 |
| CES19 = 72 | CES44 = 99 | CES69 = 83 | CES94 = 64 |
| CES20 = 66 | CES45 = 94 | CES70 = 76 | CES95 = 74 |
| CES21 = 86 | CES46 = 91 | CES71 = 70 | CES96 = 84 |
| CES22 = 78 | CES47 = 95 | CES72 = 90 | CES97 = 90 |
| CES23 = 92 | CES48 = 83 | CES73 = 71 | CES98 = 86 |
| CES24 = 91 | CES49 = 91 | CES74 = 90 | CES99 = 77 |
| CES25 = 72 | CES50 = 93 | CES75 = 74 |            |



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Color Rendition by Hue-Angle Bin

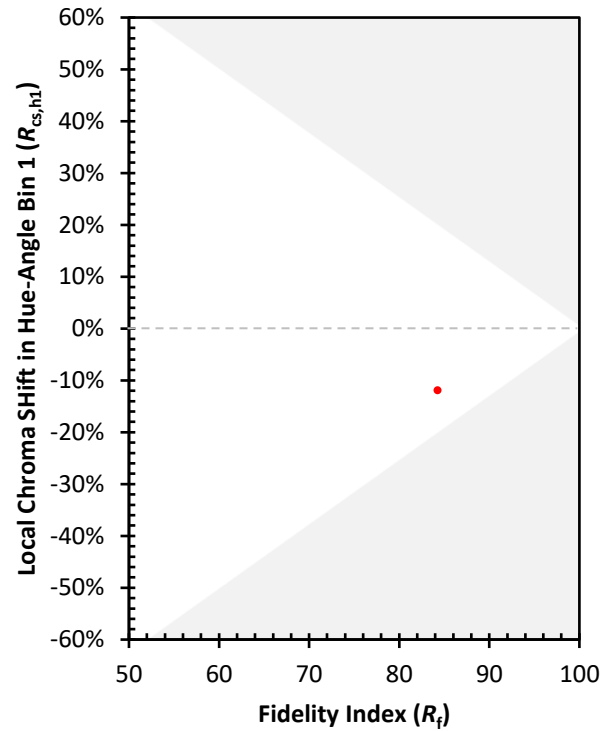
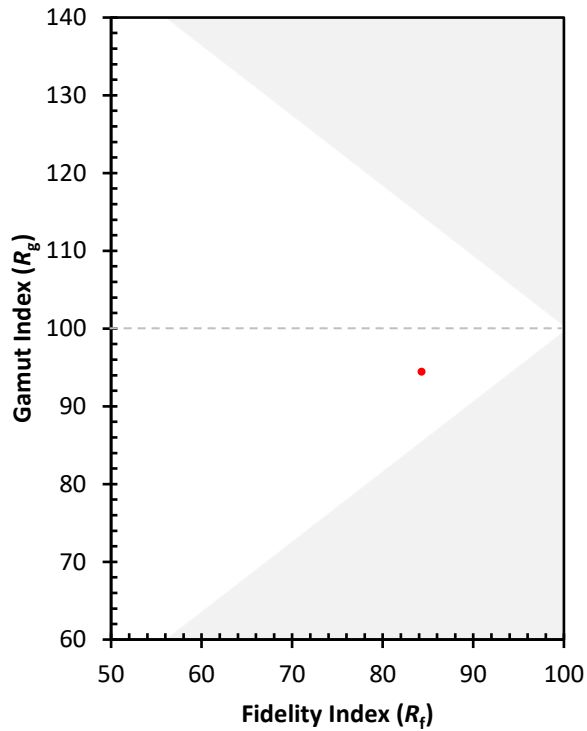




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**Measure Comparisons**



(END OF REPORT)