

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: P830037

Luminaire Tested: **OHBL-24HE-MCL-UNV-L840-CD**

Issue Date: 5/3/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P830037  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2103-200-1)  
Test Lab: INNOVATION CENTER  
Issue Date: 5/3/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: OHBL-24HE-MCL-UNV-L840-CD  
Description: 24000 LUMEN OHBL HE LED LUMINAIRE WITH 80CRI, 4000K LEDS AND MEDIUM CLEAR LENS  
Light Source: -  
Ballast/Driver: -

**Summary**

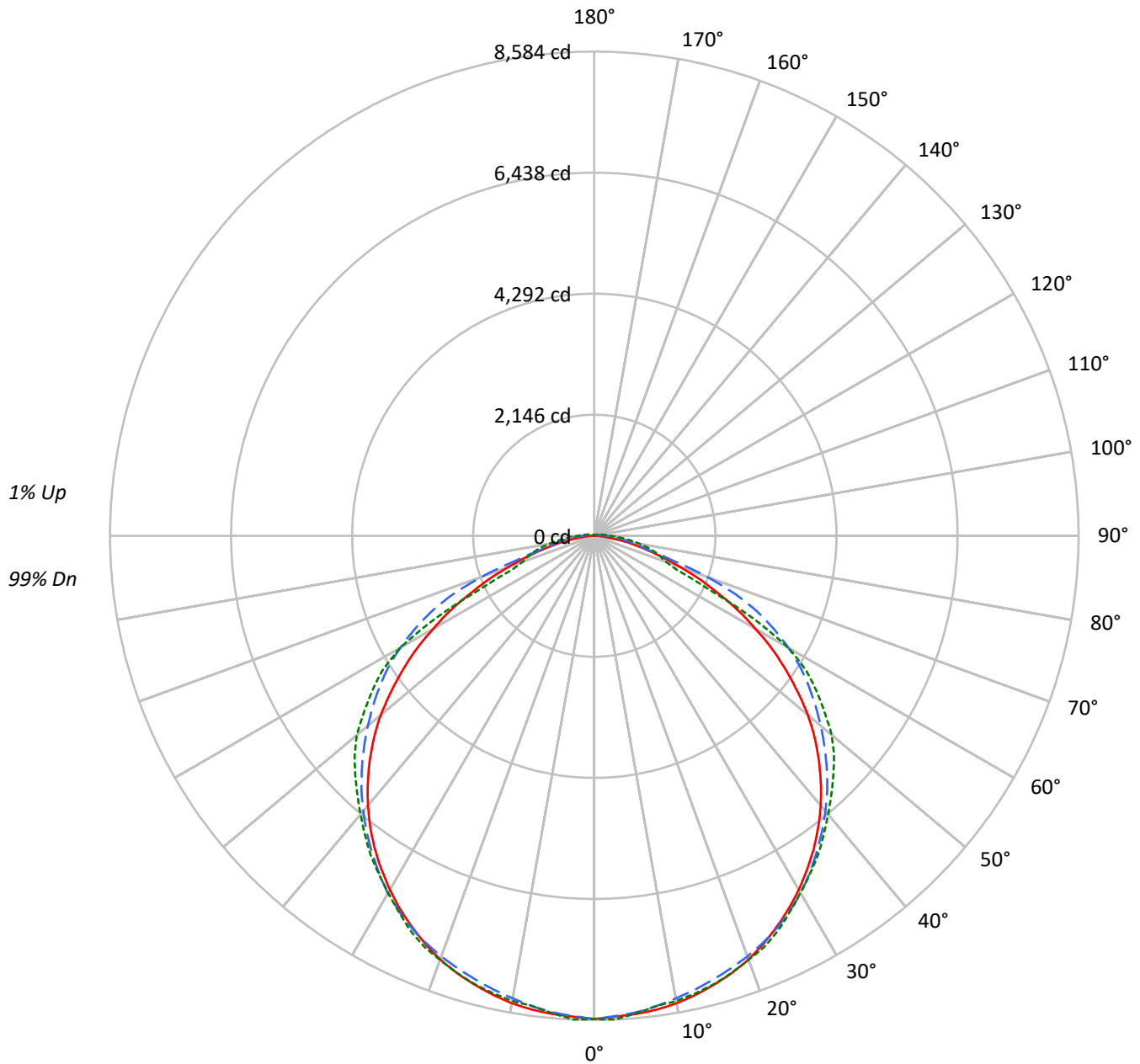
Lumens per Lamp: N/A  
Luminaire Lumens: 24213.0 lumens  
Efficiency: N/A  
Efficacy: 182.1 lumens/watt  
Spacing Criteria (0/90/45): 1.26 / 1.27 / 1.39  
Luminous Opening: Rectangular w/ Sides (W: 1.8' x L: 3.78' x H: 0.17')  
CIE Type: Direct

Input Watts (W): 133  
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

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CATALOG NUMBER: OHBL-24HE-MCL-UNV-L840-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P830037

CATALOG NUMBER: OHBL-24HE-MCL-UNV-L840-CD

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

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20  |     |     |    |    | 20 |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30  |     |     |    |    | 0  |
| 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 | 110 | 110 | 110 | 106 | 106 | 106 | 101 | 101 | 101 |    |    | 99 |
| 1   | 109 | 104 | 100 | 96  | 106 | 102 | 98  | 95  | 97  | 94  | 91  | 93  | 91  | 88  | 90  | 87  | 86  |    |    | 83 |
| 2   | 99  | 91  | 84  | 79  | 96  | 89  | 83  | 78  | 85  | 80  | 76  | 82  | 78  | 74  | 79  | 75  | 72  |    |    | 70 |
| 3   | 91  | 80  | 72  | 66  | 88  | 79  | 71  | 65  | 75  | 69  | 64  | 72  | 67  | 63  | 70  | 65  | 61  |    |    | 59 |
| 4   | 83  | 71  | 62  | 56  | 81  | 70  | 62  | 55  | 67  | 60  | 54  | 65  | 59  | 54  | 62  | 57  | 53  |    |    | 51 |
| 5   | 76  | 64  | 55  | 48  | 74  | 62  | 54  | 48  | 60  | 53  | 47  | 58  | 52  | 46  | 56  | 50  | 46  |    |    | 44 |
| 6   | 70  | 57  | 48  | 42  | 68  | 56  | 48  | 42  | 54  | 47  | 41  | 52  | 46  | 41  | 51  | 45  | 40  |    |    | 38 |
| 7   | 65  | 52  | 43  | 37  | 63  | 51  | 43  | 37  | 49  | 42  | 36  | 48  | 41  | 36  | 46  | 40  | 36  |    |    | 34 |
| 8   | 61  | 47  | 39  | 33  | 59  | 46  | 38  | 33  | 45  | 38  | 33  | 44  | 37  | 32  | 42  | 36  | 32  |    |    | 30 |
| 9   | 57  | 43  | 35  | 30  | 55  | 43  | 35  | 29  | 41  | 34  | 29  | 40  | 34  | 29  | 39  | 33  | 29  |    |    | 27 |
| 10  | 53  | 40  | 32  | 27  | 52  | 39  | 32  | 27  | 38  | 31  | 27  | 37  | 31  | 26  | 36  | 30  | 26  |    |    | 24 |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 13548 | 13548 | 13548 |
| 5°  | 13459 | 13351 | 13379 |
| 10° | 13410 | 13149 | 13230 |
| 15° | 13325 | 12998 | 13142 |
| 20° | 13240 | 12902 | 13026 |
| 25° | 13080 | 12806 | 12910 |
| 30° | 12906 | 12655 | 12666 |
| 35° | 12698 | 12415 | 12531 |
| 40° | 12429 | 12167 | 12348 |
| 45° | 12054 | 11880 | 12267 |
| 50° | 11547 | 11554 | 12170 |
| 55° | 10741 | 11233 | 11715 |
| 60° | 9686  | 10763 | 10831 |
| 65° | 8309  | 9890  | 6864  |
| 70° | 6692  | 7721  | 4977  |
| 75° | 5017  | 4583  | 5051  |
| 80° | 3493  | 3811  | 4822  |
| 85° | 1987  | 3491  | 4520  |



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CATALOG NUMBER: OHBL-24HE-MCL-UNV-L840-CD

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 807.7   | 3.3       |
| 10°-20°   | 2316.2  | 9.6       |
| 20°-30°   | 3537.6  | 14.6      |
| 30°-40°   | 4292.4  | 17.7      |
| 40°-50°   | 4498.8  | 18.6      |
| 50°-60°   | 4076.6  | 16.8      |
| 60°-70°   | 2733.2  | 11.3      |
| 70°-80°   | 1227.3  | 5.1       |
| 80°-90°   | 445.4   | 1.8       |
| 90°-100°  | 134.1   | 0.6       |
| 100°-110° | 63.3    | 0.3       |
| 110°-120° | 31.7    | 0.1       |
| 120°-130° | 17.5    | 0.1       |
| 130°-140° | 12.0    | 0.0       |
| 140°-150° | 8.1     | 0.0       |
| 150°-160° | 6.0     | 0.0       |
| 160°-170° | 3.9     | 0.0       |
| 170°-180° | 1.2     | 0.0       |
| <hr/>     |         |           |
| 0°-30°    | 6661.6  | 27.5      |
| 0°-40°    | 10954.0 | 45.2      |
| 0°-60°    | 19529.4 | 80.7      |
| 0°-90°    | 23935.3 | 98.9      |
| 90°-120°  | 229.0   | 0.9       |
| 90°-150°  | 266.6   | 1.1       |
| 90°-180°  | 278.0   | 1.1       |
| 0°-180°   | 24213.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 8567 | 8567  | 8567 | 8567  | 8567 |      |
| 5°   | 8511 | 8541  | 8481 | 8507  | 8496 | 809  |
| 15°  | 8235 | 8202  | 8144 | 8216  | 8226 | 2325 |
| 25°  | 7650 | 7616  | 7670 | 7740  | 7718 | 3526 |
| 35°  | 6780 | 6796  | 6866 | 6939  | 6912 | 4238 |
| 45°  | 5627 | 5719  | 5825 | 5974  | 5993 | 4335 |
| 55°  | 4141 | 4340  | 4636 | 4822  | 4811 | 3696 |
| 65°  | 2430 | 2810  | 3191 | 2693  | 2199 | 2421 |
| 75°  | 956  | 1387  | 1021 | 1044  | 1112 | 1045 |
| 85°  | 165  | 316   | 405  | 489   | 513  | 201  |
| 90°  | 1    | 105   | 209  | 263   | 275  | 10   |
| 95°  | 1    | 66    | 144  | 175   | 180  | 2    |
| 105° | 5    | 28    | 71   | 86    | 89   | 6    |
| 115° | 10   | 15    | 36   | 46    | 48   | 9    |
| 125° | 9    | 10    | 22   | 26    | 27   | 9    |
| 135° | 11   | 12    | 14   | 20    | 21   | 9    |
| 145° | 11   | 12    | 12   | 14    | 15   | 7    |
| 155° | 12   | 14    | 14   | 14    | 12   | 6    |
| 165° | 14   | 14    | 14   | 14    | 14   | 4    |
| 175° | 14   | 14    | 12   | 11    | 11   | 1    |
| 180° | 12   | 12    | 12   | 12    | 12   |      |



TEST NUMBER: P830037

CATALOG NUMBER: OHBL-24HE-MCL-UNV-L840-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|--------|--------|--------|--------|--------|--------|
| 0°     | 8566.6 | 8566.6 | 8566.6 | 8566.6 | 8566.6 |
| 2.5°   | 8531.9 | 8567.8 | 8523.2 | 8571.5 | 8583.9 |
| 5°     | 8510.8 | 8540.6 | 8481.1 | 8507.1 | 8496.0 |
| 7.5°   | 8472.4 | 8482.4 | 8411.7 | 8432.8 | 8410.5 |
| 10°    | 8415.5 | 8410.5 | 8327.5 | 8368.4 | 8373.3 |
| 12.5°  | 8331.2 | 8316.4 | 8242.1 | 8304.0 | 8305.2 |
| 15°    | 8234.6 | 8202.4 | 8144.2 | 8216.0 | 8225.9 |
| 17.5°  | 8123.1 | 8081.0 | 8042.6 | 8135.5 | 8120.7 |
| 20°    | 7993.1 | 7943.5 | 7936.1 | 8037.7 | 8000.5 |
| 22.5°  | 7832.1 | 7793.7 | 7811.0 | 7907.6 | 7884.1 |
| 25°    | 7650.0 | 7616.5 | 7669.8 | 7740.4 | 7718.1 |
| 27.5°  | 7458.0 | 7438.2 | 7498.9 | 7553.4 | 7510.0 |
| 30°    | 7247.4 | 7236.3 | 7316.8 | 7361.4 | 7306.9 |
| 32.5°  | 7018.3 | 7022.0 | 7098.8 | 7159.5 | 7108.7 |
| 35°    | 6780.4 | 6796.5 | 6865.9 | 6939.0 | 6911.7 |
| 37.5°  | 6519.1 | 6555.0 | 6624.4 | 6707.3 | 6678.9 |
| 40°    | 6242.9 | 6294.9 | 6371.7 | 6472.0 | 6446.0 |
| 42.5°  | 5944.3 | 6010.0 | 6109.1 | 6220.6 | 6218.1 |
| 45°    | 5627.2 | 5718.9 | 5825.4 | 5974.1 | 5992.6 |
| 47.5°  | 5297.8 | 5400.6 | 5535.6 | 5733.8 | 5762.3 |
| 50°    | 4939.8 | 5068.6 | 5237.1 | 5474.9 | 5492.2 |
| 52.5°  | 4540.9 | 4716.8 | 4939.8 | 5167.7 | 5146.6 |
| 55°    | 4140.8 | 4340.3 | 4636.3 | 4822.1 | 4811.0 |
| 57.5°  | 3742.0 | 3966.2 | 4325.4 | 4457.9 | 4456.7 |
| 60°    | 3296.1 | 3579.7 | 3972.4 | 4072.7 | 3973.6 |
| 62.5°  | 2883.6 | 3188.3 | 3595.8 | 3522.8 | 3183.4 |
| 65°    | 2430.3 | 2810.5 | 3190.8 | 2692.8 | 2198.6 |
| 67.5°  | 2027.7 | 2424.1 | 2710.2 | 1844.4 | 1579.3 |
| 70°    | 1622.6 | 2059.9 | 2113.2 | 1368.7 | 1350.1 |
| 72.5°  | 1263.4 | 1729.2 | 1457.9 | 1171.8 | 1231.2 |
| 75°    | 956.2  | 1387.3 | 1020.7 | 1044.2 | 1112.3 |
| 77.5°  | 697.4  | 1065.2 | 794.0  | 915.4  | 971.1  |
| 80°    | 479.4  | 754.3  | 647.8  | 769.2  | 807.6  |
| 82.5°  | 301.0  | 497.9  | 519.0  | 619.3  | 659.0  |
| 85°    | 164.7  | 315.9  | 405.0  | 489.3  | 512.8  |
| 87.5°  | 68.1   | 190.8  | 309.7  | 377.8  | 397.6  |
| 90°    | 1.2    | 105.3  | 209.3  | 262.6  | 275.0  |
| 92.5°  | 1.2    | 80.5   | 170.9  | 211.8  | 220.5  |
| 95°    | 1.2    | 65.6   | 143.7  | 174.7  | 179.6  |
| 97.5°  | 2.5    | 52.0   | 120.2  | 144.9  | 149.9  |
| 100°   | 3.7    | 43.4   | 100.3  | 121.4  | 125.1  |
| 102.5° | 5.0    | 34.7   | 84.2   | 101.6  | 105.3  |
| 105°   | 5.0    | 28.5   | 70.6   | 85.5   | 89.2   |



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**CANDELA DISTRIBUTION (continued):**

|        | 0°   | 22.5° | 45°  | 67.5° | 90°  |
|--------|------|-------|------|-------|------|
| 112.5° | 8.7  | 17.3  | 42.1 | 53.3  | 55.7 |
| 115°   | 9.9  | 14.9  | 35.9 | 45.8  | 48.3 |
| 117.5° | 9.9  | 12.4  | 31.0 | 38.4  | 40.9 |
| 120°   | 9.9  | 11.1  | 27.3 | 33.4  | 34.7 |
| 122.5° | 9.9  | 9.9   | 23.5 | 29.7  | 31.0 |
| 125°   | 8.7  | 9.9   | 22.3 | 26.0  | 27.3 |
| 127.5° | 9.9  | 9.9   | 19.8 | 23.5  | 24.8 |
| 130°   | 9.9  | 11.1  | 17.3 | 22.3  | 22.3 |
| 132.5° | 11.1 | 12.4  | 16.1 | 21.1  | 21.1 |
| 135°   | 11.1 | 12.4  | 13.6 | 19.8  | 21.1 |
| 137.5° | 12.4 | 12.4  | 12.4 | 18.6  | 19.8 |
| 140°   | 12.4 | 12.4  | 11.1 | 16.1  | 17.3 |
| 142.5° | 11.1 | 12.4  | 11.1 | 14.9  | 16.1 |
| 145°   | 11.1 | 12.4  | 12.4 | 13.6  | 14.9 |
| 147.5° | 12.4 | 12.4  | 12.4 | 12.4  | 13.6 |
| 150°   | 12.4 | 12.4  | 12.4 | 12.4  | 12.4 |
| 152.5° | 12.4 | 12.4  | 12.4 | 12.4  | 12.4 |
| 155°   | 12.4 | 13.6  | 13.6 | 13.6  | 12.4 |
| 157.5° | 12.4 | 13.6  | 13.6 | 13.6  | 13.6 |
| 160°   | 12.4 | 13.6  | 13.6 | 13.6  | 13.6 |
| 162.5° | 13.6 | 13.6  | 13.6 | 13.6  | 13.6 |
| 165°   | 13.6 | 13.6  | 13.6 | 13.6  | 13.6 |
| 167.5° | 13.6 | 14.9  | 13.6 | 13.6  | 13.6 |
| 170°   | 13.6 | 13.6  | 13.6 | 12.4  | 12.4 |
| 172.5° | 13.6 | 13.6  | 13.6 | 12.4  | 12.4 |
| 175°   | 13.6 | 13.6  | 12.4 | 11.1  | 11.1 |
| 177.5° | 14.9 | 13.6  | 12.4 | 11.1  | 9.9  |
| 180°   | 12.4 | 12.4  | 12.4 | 12.4  | 12.4 |



Report Generated By 670246072 / DESKTOP-50001EG







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







|        |     |      |      |      |      |
|--------|-----|------|------|------|------|
| 107.5° | 6.2 | 23.5 | 60.7 | 73.1 | 75.6 |
| 110°   | 7.4 | 19.8 | 50.8 | 61.9 | 64.4 |



LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

METALUX

Report Number: SP1-2304-001-1

Test Date: 05/31/2023

Luminaire Tested: OHB-15SE-N-UNV-L840

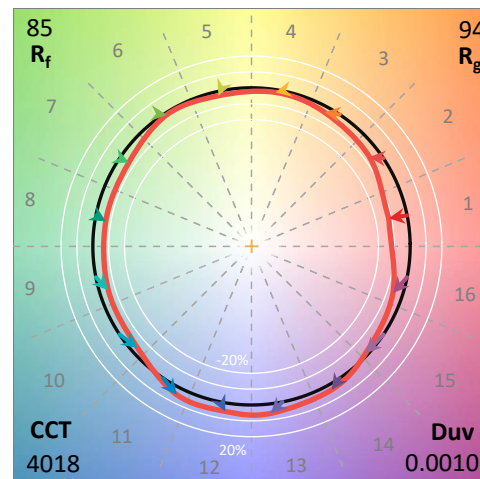
Data in this report applies to families of products including OHB-15SE-N-UNV-L840.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2304-001-1  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 05/31/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **OHB-15SE-N-UNV-L840**  
 Description: 15SE OHB WITH APT LEDS, NARROW LENS, 80CRI 4000K

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 4018   | CRI (Ra): | 84.0 |      |      |
| CIE u':                   | 0.2242 | R1:       | 82.5 | R9:  | 11.5 |
| CIE v':                   | 0.5025 | R2:       | 91.6 | R10: | 79.8 |
| Duv:                      | 0.0010 | R3:       | 96.1 | R11: | 80.5 |
| CIE x:                    | 0.3803 | R4:       | 81.4 | R12: | 64.0 |
| CIE y:                    | 0.3788 | R5:       | 82.4 | R13: | 85.1 |
| CIE z:                    | 0.2410 | R6:       | 88.0 | R14: | 98.4 |
| Peak Wavelength (nm):     | 454    | R7:       | 85.5 |      |      |
| Dominant Wavelength (nm): | 578    | R8:       | 64.7 |      |      |
| Purity:                   | 27.9   |           |      |      |      |
| Rf:                       | 84.5   |           |      |      |      |
| Rg:                       | 93.7   |           |      |      |      |



### Test Conditions

Stabilization Time: 23M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.7/44%  
 Sphere Temperature (°C): 25.3

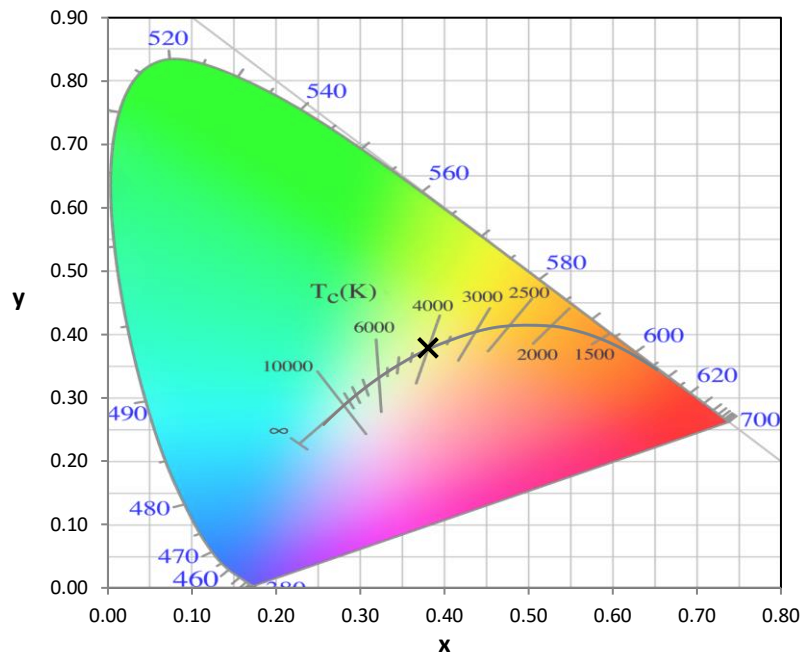


REPORT NUMBER: SP1-2304-001-1

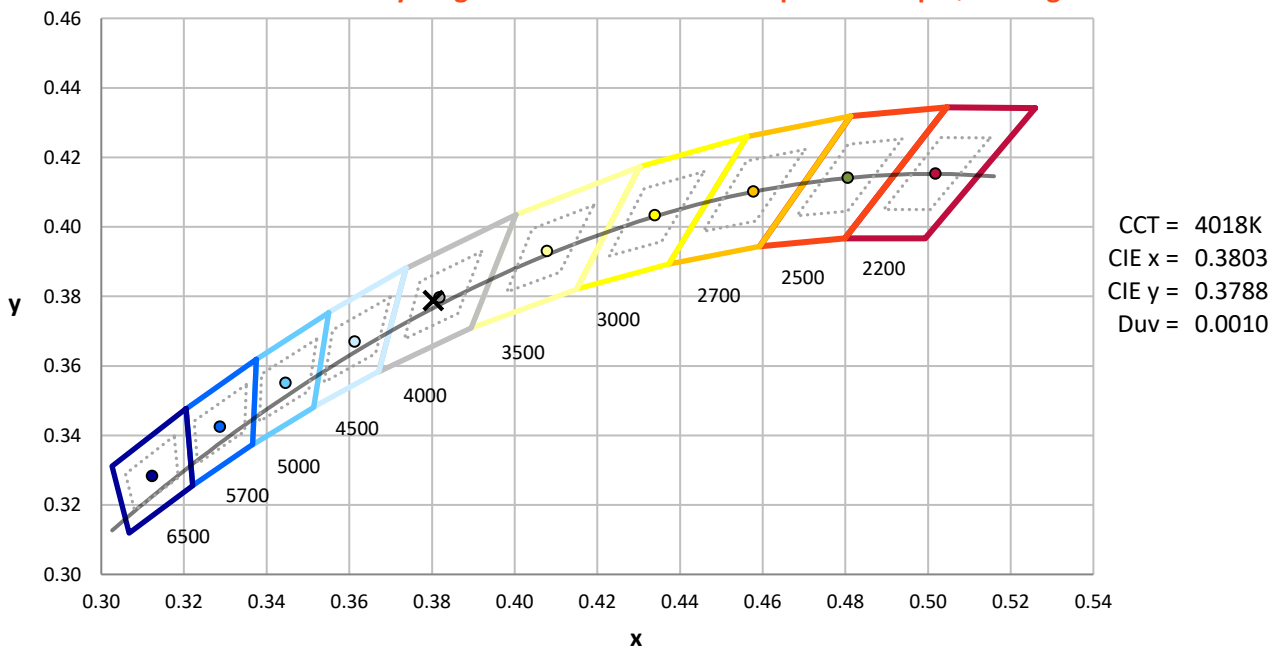
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 2/9/2023         | 8/9/2023             |
| 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**



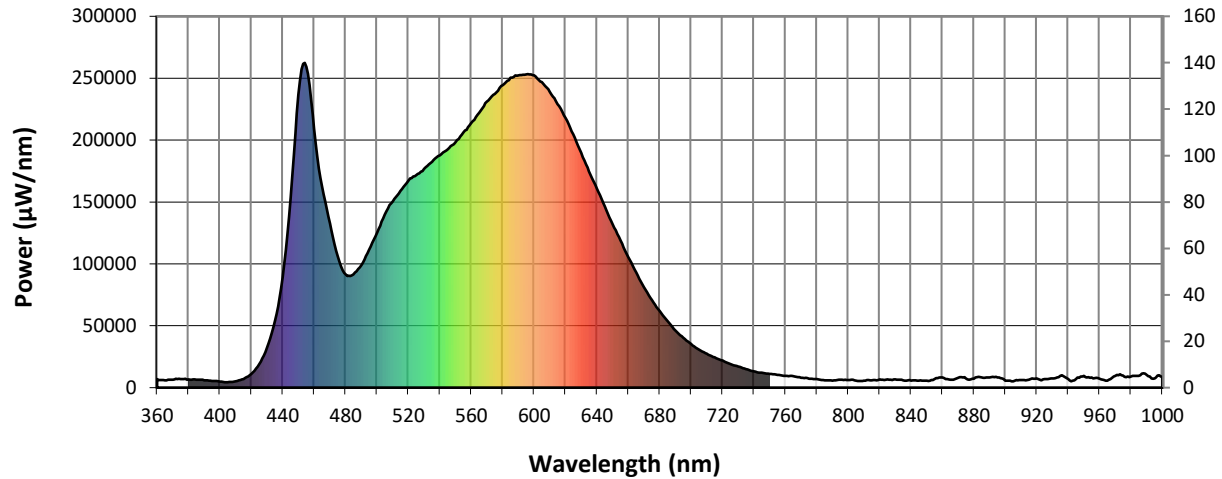
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 4000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

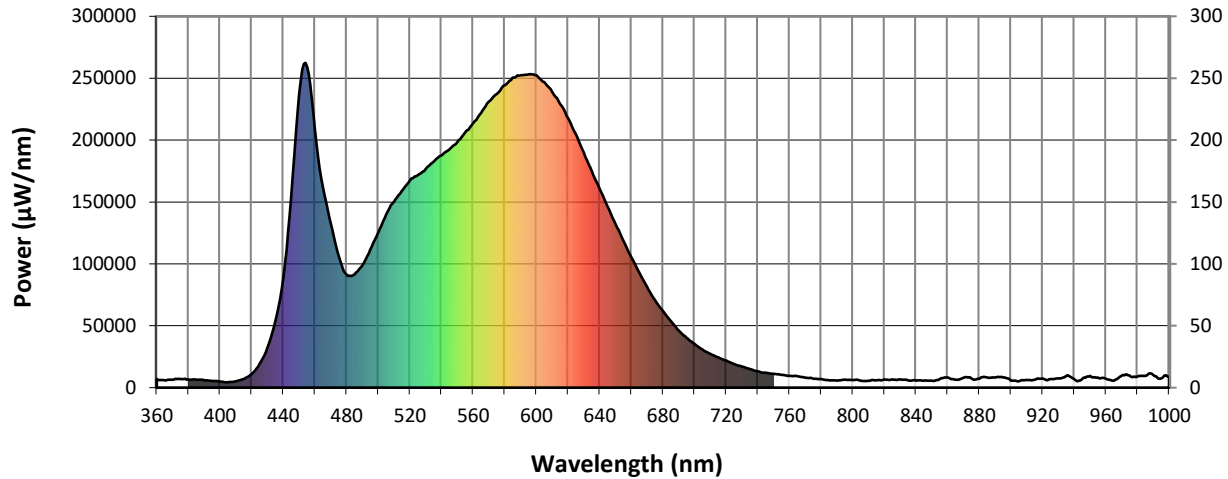


#####

| 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       | 6853             | NR               | 490       | 98921            | NR               | 620       | 217813           | NR               | 750       | 11077            | NR               | 880       | 7212             | NR               |
| 365       | 5941             | NR               | 495       | 111249           | NR               | 625       | 204757           | NR               | 755       | 10374            | NR               | 885       | 8336             | NR               |
| 370       | 6345             | NR               | 500       | 125186           | NR               | 630       | 189812           | NR               | 760       | 9527             | NR               | 890       | 8299             | NR               |
| 375       | 7044             | NR               | 505       | 139782           | NR               | 635       | 174714           | NR               | 765       | 9227             | NR               | 895       | 8295             | NR               |
| 380       | 6587             | NR               | 510       | 150374           | NR               | 640       | 160641           | NR               | 770       | 8071             | NR               | 900       | 5725             | NR               |
| 385       | 6443             | NR               | 515       | 158837           | NR               | 645       | 146146           | NR               | 775       | 7303             | NR               | 905       | 5085             | NR               |
| 390       | 5977             | NR               | 520       | 167163           | NR               | 650       | 132087           | NR               | 780       | 6839             | NR               | 910       | 6133             | NR               |
| 395       | 5473             | NR               | 525       | 171514           | NR               | 655       | 118817           | NR               | 785       | 5988             | NR               | 915       | 6429             | NR               |
| 400       | 4874             | NR               | 530       | 176783           | NR               | 660       | 105411           | NR               | 790       | 5761             | NR               | 920       | 7354             | NR               |
| 405       | 4470             | NR               | 535       | 182412           | NR               | 665       | 92911            | NR               | 795       | 6396             | NR               | 925       | 6889             | NR               |
| 410       | 5232             | NR               | 540       | 187578           | NR               | 670       | 81240            | NR               | 800       | 6049             | NR               | 930       | 7465             | NR               |
| 415       | 7030             | NR               | 545       | 192635           | NR               | 675       | 70762            | NR               | 805       | 5748             | NR               | 935       | 9430             | NR               |
| 420       | 11074            | NR               | 550       | 198282           | NR               | 680       | 61913            | NR               | 810       | 5571             | NR               | 940       | 6867             | NR               |
| 425       | 19121            | NR               | 555       | 206255           | NR               | 685       | 53742            | NR               | 815       | 5977             | NR               | 945       | 7026             | NR               |
| 430       | 32148            | NR               | 560       | 213621           | NR               | 690       | 46348            | NR               | 820       | 6580             | NR               | 950       | 9476             | NR               |
| 435       | 54073            | NR               | 565       | 222021           | NR               | 695       | 40313            | NR               | 825       | 6610             | NR               | 955       | 8237             | NR               |
| 440       | 89242            | NR               | 570       | 230974           | NR               | 700       | 35240            | NR               | 830       | 6652             | NR               | 960       | 7127             | NR               |
| 445       | 153497           | NR               | 575       | 237268           | NR               | 705       | 30635            | NR               | 835       | 5919             | NR               | 965       | 5614             | NR               |
| 450       | 236793           | NR               | 580       | 244317           | NR               | 710       | 27359            | NR               | 840       | 5707             | NR               | 970       | 9396             | NR               |
| 455       | 259282           | NR               | 585       | 250340           | NR               | 715       | 24401            | NR               | 845       | 5548             | NR               | 975       | 9700             | NR               |
| 460       | 209272           | NR               | 590       | 252316           | NR               | 720       | 21810            | NR               | 850       | 5560             | NR               | 980       | 8916             | NR               |
| 465       | 162456           | NR               | 595       | 253019           | NR               | 725       | 19005            | NR               | 855       | 6972             | NR               | 985       | 9548             | NR               |
| 470       | 132627           | NR               | 600       | 252244           | NR               | 730       | 17009            | NR               | 860       | 8311             | NR               | 990       | 10271            | NR               |
| 475       | 106283           | NR               | 605       | 246798           | NR               | 735       | 14940            | NR               | 865       | 6330             | NR               | 995       | 7323             | NR               |
| 480       | 91347            | NR               | 610       | 238764           | NR               | 740       | 13159            | NR               | 870       | 8019             | NR               | 1000      | 8719             | NR               |
| 485       | 91575            | NR               | 615       | 229100           | NR               | 745       | 12000            | NR               | 875       | 7419             | NR               |           |                  |                  |

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**Scotopic Flux vs. Wavelength**



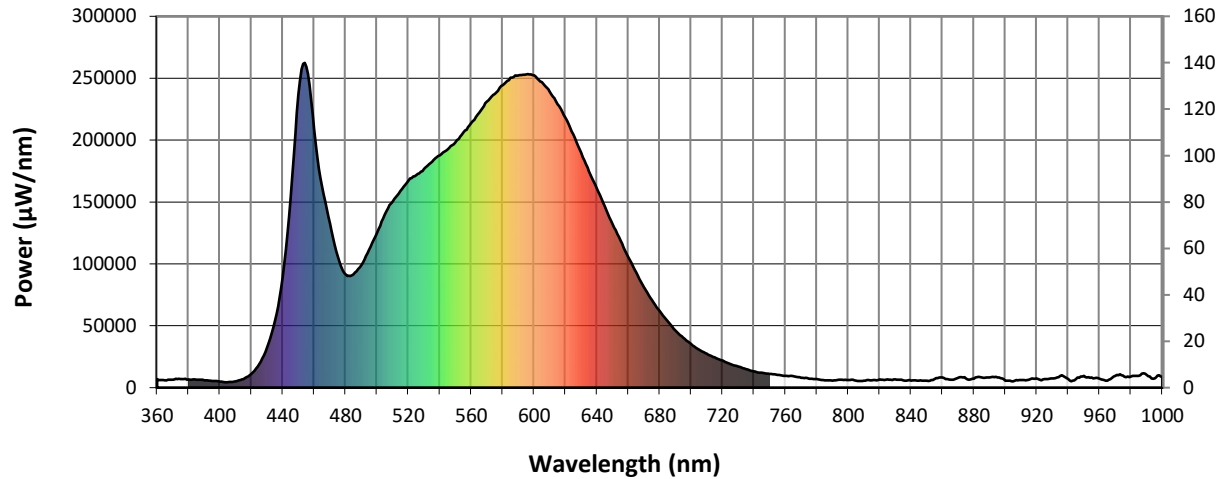
**Scotopic Lumens: 25258.1**

**S/P: 1.73**

| 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       | 6853             | NR               | 490       | 98921            | NR               | 620       | 217813           | NR               | 750       | 11077            | NR               | 880       | 7212             | NR               |
| 365       | 5941             | NR               | 495       | 111249           | NR               | 625       | 204757           | NR               | 755       | 10374            | NR               | 885       | 8336             | NR               |
| 370       | 6345             | NR               | 500       | 125186           | NR               | 630       | 189812           | NR               | 760       | 9527             | NR               | 890       | 8299             | NR               |
| 375       | 7044             | NR               | 505       | 139782           | NR               | 635       | 174714           | NR               | 765       | 9227             | NR               | 895       | 8295             | NR               |
| 380       | 6587             | NR               | 510       | 150374           | NR               | 640       | 160641           | NR               | 770       | 8071             | NR               | 900       | 5725             | NR               |
| 385       | 6443             | NR               | 515       | 158837           | NR               | 645       | 146146           | NR               | 775       | 7303             | NR               | 905       | 5085             | NR               |
| 390       | 5977             | NR               | 520       | 167163           | NR               | 650       | 132087           | NR               | 780       | 6839             | NR               | 910       | 6133             | NR               |
| 395       | 5473             | NR               | 525       | 171514           | NR               | 655       | 118817           | NR               | 785       | 5988             | NR               | 915       | 6429             | NR               |
| 400       | 4874             | NR               | 530       | 176783           | NR               | 660       | 105411           | NR               | 790       | 5761             | NR               | 920       | 7354             | NR               |
| 405       | 4470             | NR               | 535       | 182412           | NR               | 665       | 92911            | NR               | 795       | 6396             | NR               | 925       | 6889             | NR               |
| 410       | 5232             | NR               | 540       | 187578           | NR               | 670       | 81240            | NR               | 800       | 6049             | NR               | 930       | 7465             | NR               |
| 415       | 7030             | NR               | 545       | 192635           | NR               | 675       | 70762            | NR               | 805       | 5748             | NR               | 935       | 9430             | NR               |
| 420       | 11074            | NR               | 550       | 198282           | NR               | 680       | 61913            | NR               | 810       | 5571             | NR               | 940       | 6867             | NR               |
| 425       | 19121            | NR               | 555       | 206255           | NR               | 685       | 53742            | NR               | 815       | 5977             | NR               | 945       | 7026             | NR               |
| 430       | 32148            | NR               | 560       | 213621           | NR               | 690       | 46348            | NR               | 820       | 6580             | NR               | 950       | 9476             | NR               |
| 435       | 54073            | NR               | 565       | 222021           | NR               | 695       | 40313            | NR               | 825       | 6610             | NR               | 955       | 8237             | NR               |
| 440       | 89242            | NR               | 570       | 230974           | NR               | 700       | 35240            | NR               | 830       | 6652             | NR               | 960       | 7127             | NR               |
| 445       | 153497           | NR               | 575       | 237268           | NR               | 705       | 30635            | NR               | 835       | 5919             | NR               | 965       | 5614             | NR               |
| 450       | 236793           | NR               | 580       | 244317           | NR               | 710       | 27359            | NR               | 840       | 5707             | NR               | 970       | 9396             | NR               |
| 455       | 259282           | NR               | 585       | 250340           | NR               | 715       | 24401            | NR               | 845       | 5548             | NR               | 975       | 9700             | NR               |
| 460       | 209272           | NR               | 590       | 252316           | NR               | 720       | 21810            | NR               | 850       | 5560             | NR               | 980       | 8916             | NR               |
| 465       | 162456           | NR               | 595       | 253019           | NR               | 725       | 19005            | NR               | 855       | 6972             | NR               | 985       | 9548             | NR               |
| 470       | 132627           | NR               | 600       | 252244           | NR               | 730       | 17009            | NR               | 860       | 8311             | NR               | 990       | 10271            | NR               |
| 475       | 106283           | NR               | 605       | 246798           | NR               | 735       | 14940            | NR               | 865       | 6330             | NR               | 995       | 7323             | NR               |
| 480       | 91347            | NR               | 610       | 238764           | NR               | 740       | 13159            | NR               | 870       | 8019             | NR               | 1000      | 8719             | NR               |
| 485       | 91575            | NR               | 615       | 229100           | NR               | 745       | 12000            | NR               | 875       | 7419             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 10357.9 M/P: 0.71**

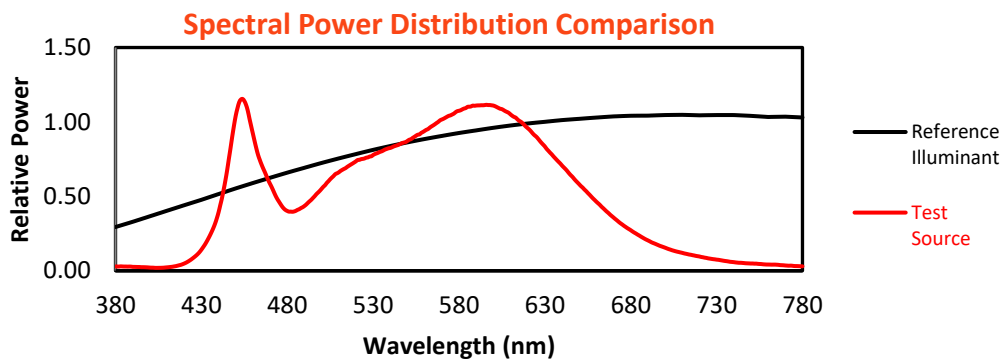
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6853             | NR               | 490       | 98921            | NR               | 620       | 217813           | NR               | 750       | 11077            | NR               | 880       | 7212             | NR               |
| 365       | 5941             | NR               | 495       | 111249           | NR               | 625       | 204757           | NR               | 755       | 10374            | NR               | 885       | 8336             | NR               |
| 370       | 6345             | NR               | 500       | 125186           | NR               | 630       | 189812           | NR               | 760       | 9527             | NR               | 890       | 8299             | NR               |
| 375       | 7044             | NR               | 505       | 139782           | NR               | 635       | 174714           | NR               | 765       | 9227             | NR               | 895       | 8295             | NR               |
| 380       | 6587             | NR               | 510       | 150374           | NR               | 640       | 160641           | NR               | 770       | 8071             | NR               | 900       | 5725             | NR               |
| 385       | 6443             | NR               | 515       | 158837           | NR               | 645       | 146146           | NR               | 775       | 7303             | NR               | 905       | 5085             | NR               |
| 390       | 5977             | NR               | 520       | 167163           | NR               | 650       | 132087           | NR               | 780       | 6839             | NR               | 910       | 6133             | NR               |
| 395       | 5473             | NR               | 525       | 171514           | NR               | 655       | 118817           | NR               | 785       | 5988             | NR               | 915       | 6429             | NR               |
| 400       | 4874             | NR               | 530       | 176783           | NR               | 660       | 105411           | NR               | 790       | 5761             | NR               | 920       | 7354             | NR               |
| 405       | 4470             | NR               | 535       | 182412           | NR               | 665       | 92911            | NR               | 795       | 6396             | NR               | 925       | 6889             | NR               |
| 410       | 5232             | NR               | 540       | 187578           | NR               | 670       | 81240            | NR               | 800       | 6049             | NR               | 930       | 7465             | NR               |
| 415       | 7030             | NR               | 545       | 192635           | NR               | 675       | 70762            | NR               | 805       | 5748             | NR               | 935       | 9430             | NR               |
| 420       | 11074            | NR               | 550       | 198282           | NR               | 680       | 61913            | NR               | 810       | 5571             | NR               | 940       | 6867             | NR               |
| 425       | 19121            | NR               | 555       | 206255           | NR               | 685       | 53742            | NR               | 815       | 5977             | NR               | 945       | 7026             | NR               |
| 430       | 32148            | NR               | 560       | 213621           | NR               | 690       | 46348            | NR               | 820       | 6580             | NR               | 950       | 9476             | NR               |
| 435       | 54073            | NR               | 565       | 222021           | NR               | 695       | 40313            | NR               | 825       | 6610             | NR               | 955       | 8237             | NR               |
| 440       | 89242            | NR               | 570       | 230974           | NR               | 700       | 35240            | NR               | 830       | 6652             | NR               | 960       | 7127             | NR               |
| 445       | 153497           | NR               | 575       | 237268           | NR               | 705       | 30635            | NR               | 835       | 5919             | NR               | 965       | 5614             | NR               |
| 450       | 236793           | NR               | 580       | 244317           | NR               | 710       | 27359            | NR               | 840       | 5707             | NR               | 970       | 9396             | NR               |
| 455       | 259282           | NR               | 585       | 250340           | NR               | 715       | 24401            | NR               | 845       | 5548             | NR               | 975       | 9700             | NR               |
| 460       | 209272           | NR               | 590       | 252316           | NR               | 720       | 21810            | NR               | 850       | 5560             | NR               | 980       | 8916             | NR               |
| 465       | 162456           | NR               | 595       | 253019           | NR               | 725       | 19005            | NR               | 855       | 6972             | NR               | 985       | 9548             | NR               |
| 470       | 132627           | NR               | 600       | 252244           | NR               | 730       | 17009            | NR               | 860       | 8311             | NR               | 990       | 10271            | NR               |
| 475       | 106283           | NR               | 605       | 246798           | NR               | 735       | 14940            | NR               | 865       | 6330             | NR               | 995       | 7323             | NR               |
| 480       | 91347            | NR               | 610       | 238764           | NR               | 740       | 13159            | NR               | 870       | 8019             | NR               | 1000      | 8719             | NR               |
| 485       | 91575            | NR               | 615       | 229100           | NR               | 745       | 12000            | NR               | 875       | 7419             | NR               |           |                  |                  |

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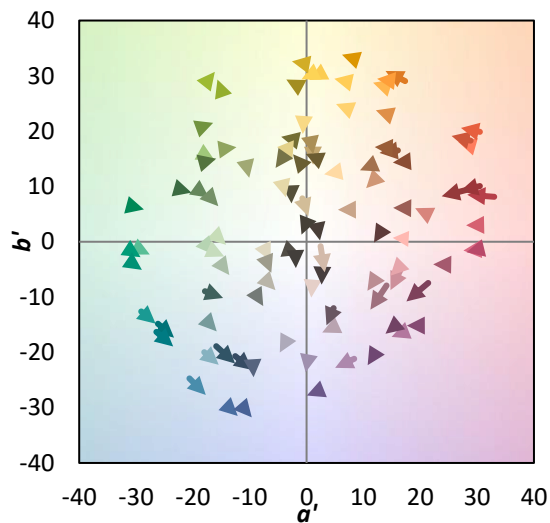
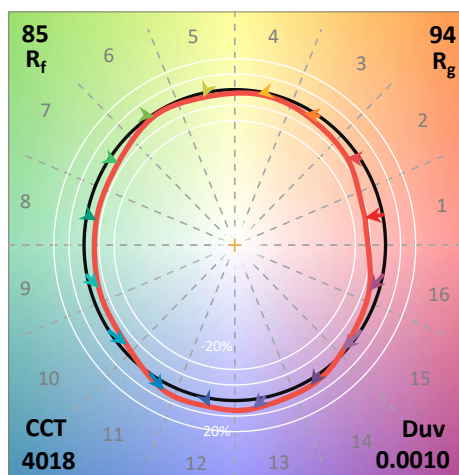
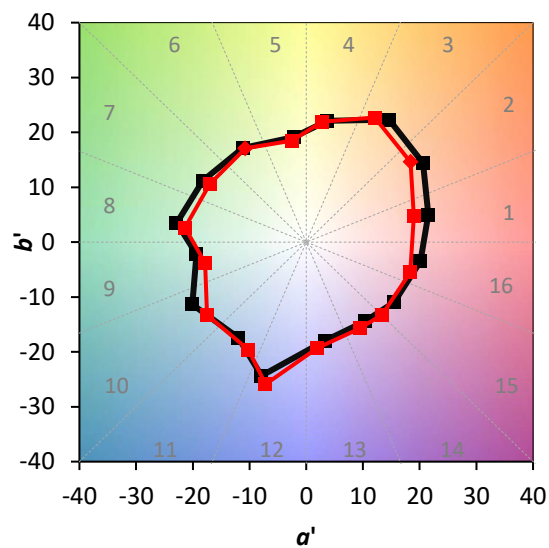
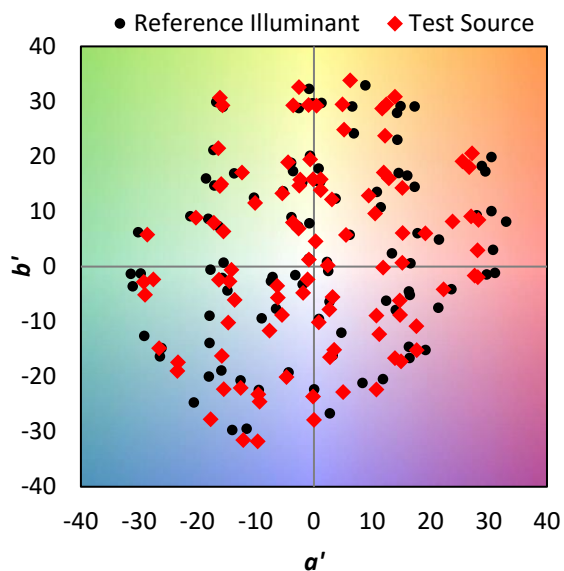
**TM-30-18**

**Summary**

$R_f = 84.5$   
 $R_g = 93.7$   
 CIE  $R_a = 84.0$   
 $R_9 = 11.5$



**Color Vector Graphics**

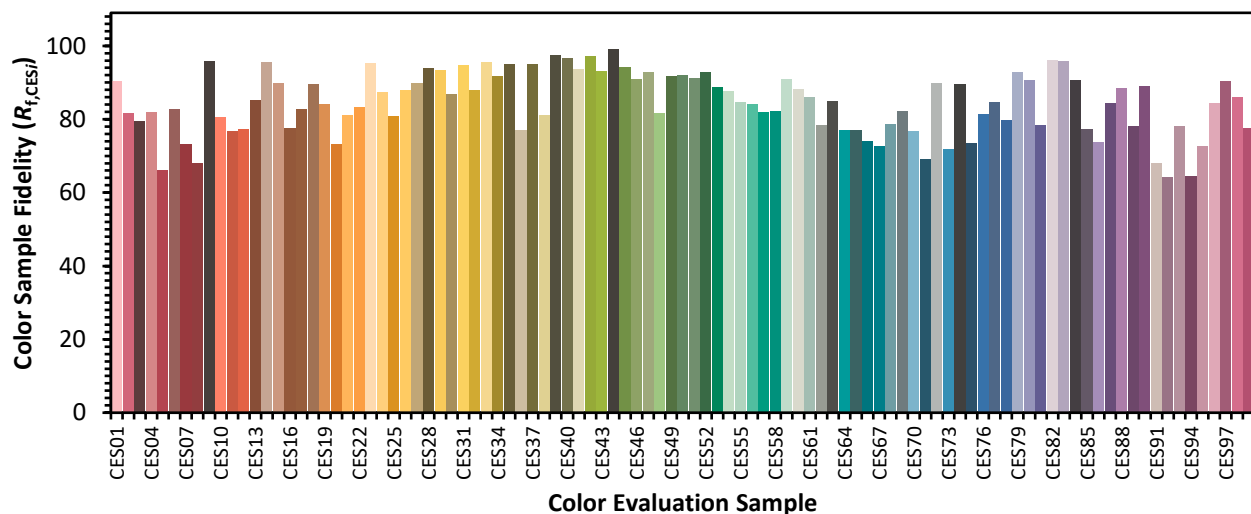


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

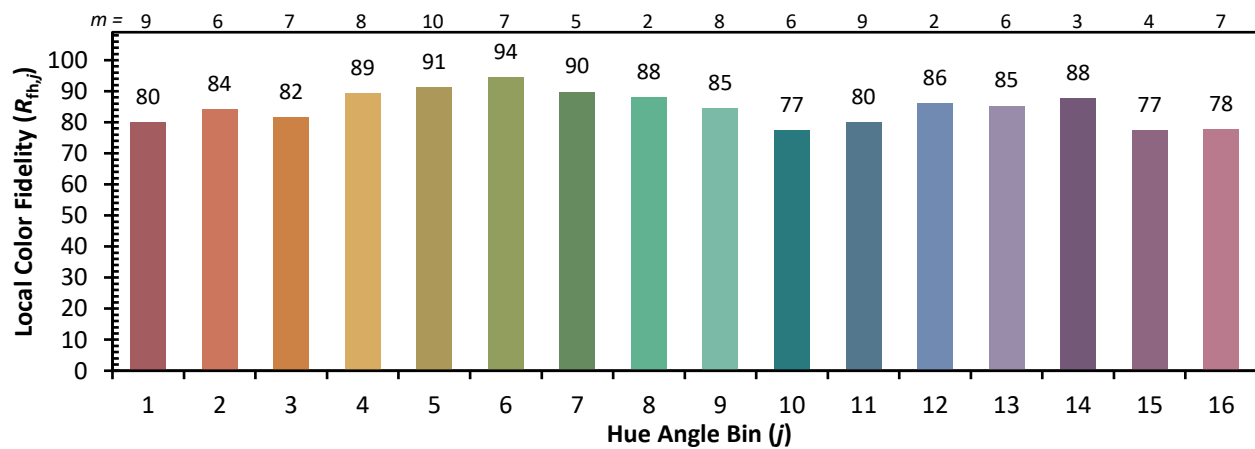
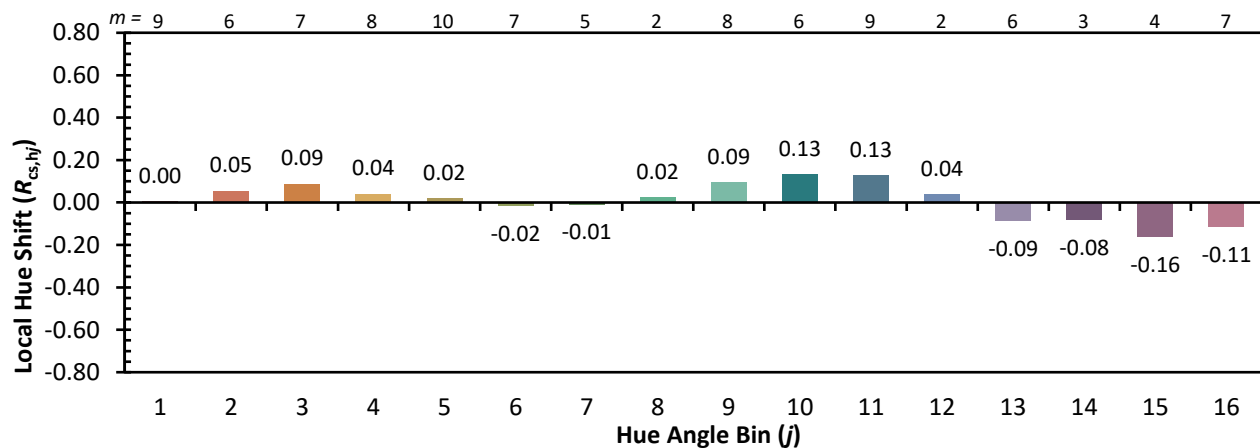
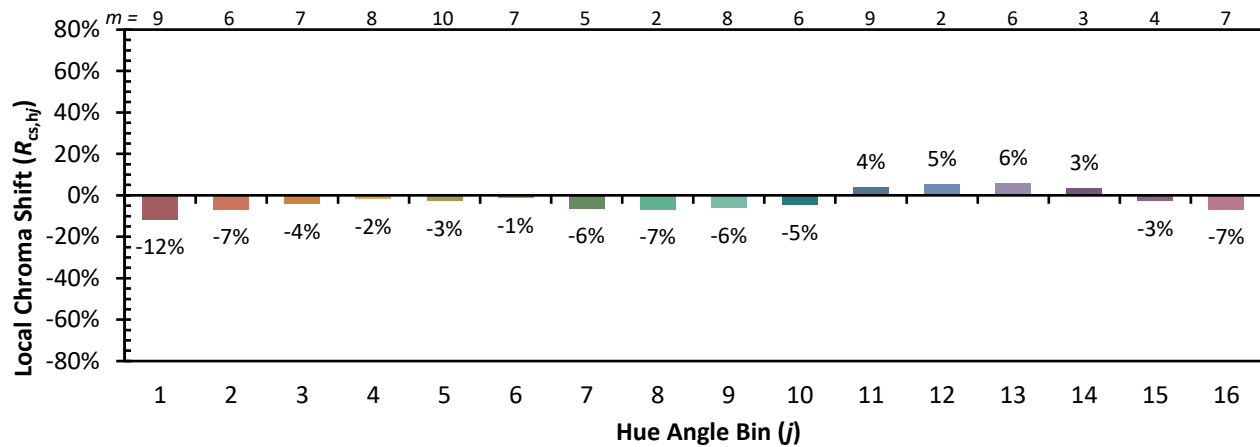
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 88 | CES51 = 91 | CES76 = 81 |
| CES02 = 61 | CES27 = 90 | CES52 = 93 | CES77 = 85 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 80 |
| CES04 = 69 | CES29 = 93 | CES54 = 88 | CES79 = 93 |
| CES05 = 48 | CES30 = 87 | CES55 = 85 | CES80 = 91 |
| CES06 = 50 | CES31 = 95 | CES56 = 84 | CES81 = 78 |
| CES07 = 41 | CES32 = 88 | CES57 = 82 | CES82 = 96 |
| CES08 = 40 | CES33 = 96 | CES58 = 82 | CES83 = 96 |
| CES09 = 29 | CES34 = 92 | CES59 = 91 | CES84 = 91 |
| CES10 = 74 | CES35 = 95 | CES60 = 88 | CES85 = 77 |
| CES11 = 57 | CES36 = 77 | CES61 = 86 | CES86 = 74 |
| CES12 = 63 | CES37 = 95 | CES62 = 78 | CES87 = 84 |
| CES13 = 42 | CES38 = 81 | CES63 = 85 | CES88 = 88 |
| CES14 = 74 | CES39 = 98 | CES64 = 77 | CES89 = 78 |
| CES15 = 71 | CES40 = 97 | CES65 = 77 | CES90 = 89 |
| CES16 = 47 | CES41 = 94 | CES66 = 74 | CES91 = 68 |
| CES17 = 49 | CES42 = 97 | CES67 = 73 | CES92 = 64 |
| CES18 = 56 | CES43 = 93 | CES68 = 79 | CES93 = 78 |
| CES19 = 71 | CES44 = 99 | CES69 = 82 | CES94 = 65 |
| CES20 = 65 | CES45 = 94 | CES70 = 77 | CES95 = 73 |
| CES21 = 86 | CES46 = 91 | CES71 = 69 | CES96 = 84 |
| CES22 = 78 | CES47 = 93 | CES72 = 90 | CES97 = 90 |
| CES23 = 91 | CES48 = 82 | CES73 = 72 | CES98 = 86 |
| CES24 = 90 | CES49 = 92 | CES74 = 90 | CES99 = 77 |
| CES25 = 71 | CES50 = 92 | CES75 = 74 |            |



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**Color Rendition by Hue-Angle Bin**

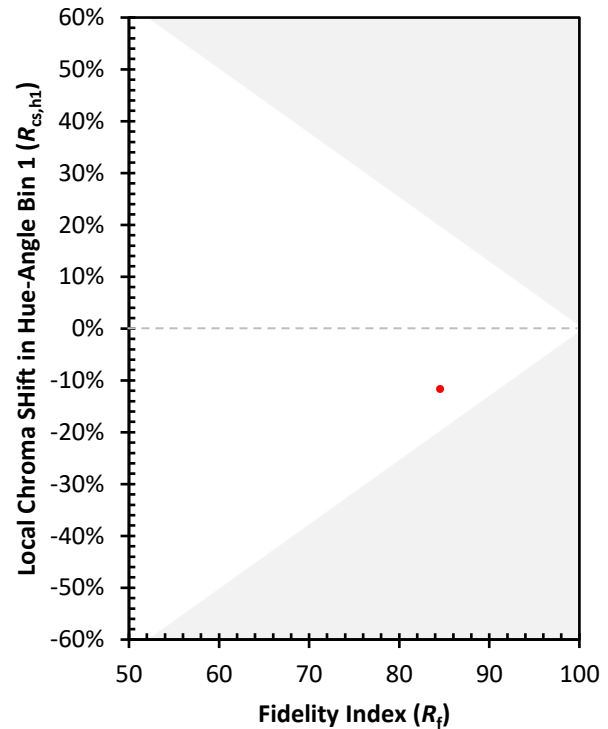
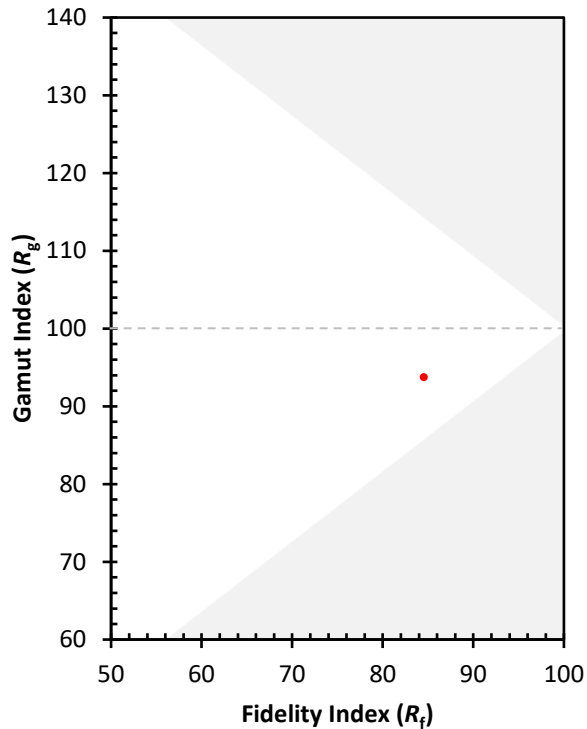




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**TM-30-18**

**Measure Comparisons**



(END OF REPORT)