

Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions

Brand: METALUX

Report Number: P1436283

Luminaire Tested: EHBR1-24-UNV-M-L840-UPL12

Issue Date: 3/25/2026

**Test Information**

Test Method: LM-79-2019  
Report Number: P1436283  
REPORT IS A COMBINATION OF REPORTS P1436067 AND P1431635  
Test Lab: INNOVATION CENTER  
Issue Date: 3/25/2026  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: EHBR1-24-UNV-M-L840-UPL12  
Description: Elevate Round Highbay at, 24000 lumens, 4000K 80CRI LEDs with M lens  
Light Source: -  
Ballast/Driver: -

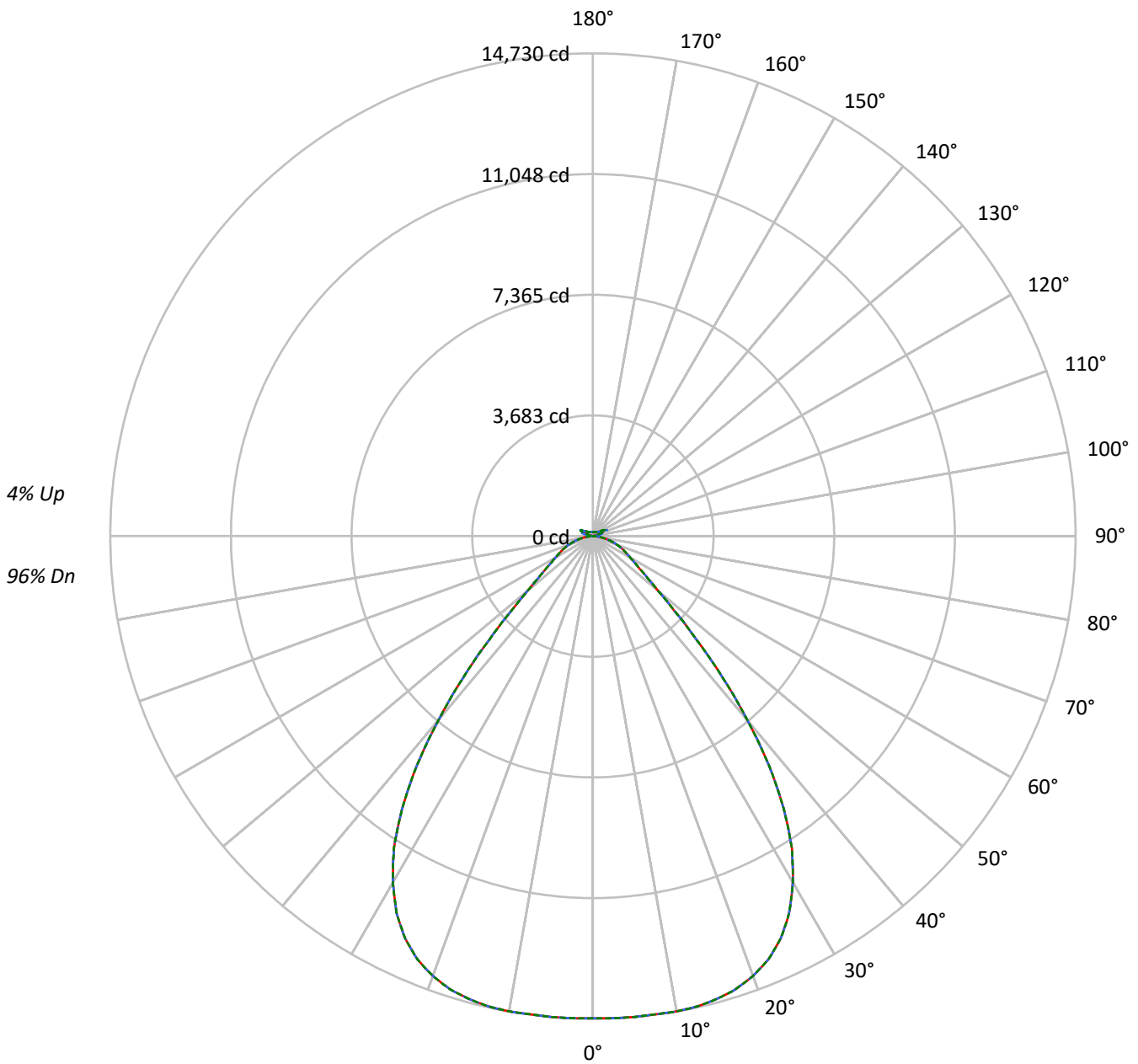
**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 26082.4 lumens  
Efficiency: N/A  
Efficacy: 192.2 lumens/watt  
Spacing Criteria (0/90/45): 1.21 / 1.21 / 1.15  
Luminous Opening: Vertical Cylinder (Dia: 1.71' x H: 0.1')  
CIE Type: Direct

Input Watts (W): 135.7  
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: 24 FT

TEST NUMBER: P1436283  
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### Luminous Intensity Polar Plot



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



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

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     | 20  |     |     |     | 20  |     |    |    | 20 |    |    |    |    |
| RC  | 80  |     |     |     | 70  |     |     |     | 50  |     |     |     | 30  |     |    |    | 10 |    |    | 0  |    |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50 | 30 | 10 | 50 | 30 | 10 | 0  |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |
| 0   | 118 | 118 | 118 | 118 | 115 | 115 | 115 | 115 | 109 | 109 | 109 | 103 | 103 | 103 | 98 | 98 | 98 | 98 | 98 | 98 | 96 |
| 1   | 110 | 107 | 104 | 101 | 107 | 104 | 101 | 99  | 99  | 97  | 95  | 95  | 93  | 91  | 91 | 89 | 88 | 88 | 88 | 88 | 86 |
| 2   | 103 | 97  | 91  | 87  | 100 | 95  | 90  | 86  | 90  | 87  | 83  | 87  | 83  | 81  | 83 | 81 | 78 | 78 | 78 | 78 | 76 |
| 3   | 96  | 88  | 81  | 76  | 93  | 86  | 80  | 75  | 83  | 78  | 74  | 79  | 75  | 72  | 76 | 73 | 70 | 70 | 70 | 70 | 68 |
| 4   | 90  | 80  | 73  | 68  | 87  | 78  | 72  | 67  | 76  | 70  | 66  | 73  | 68  | 64  | 70 | 66 | 63 | 63 | 63 | 63 | 61 |
| 5   | 84  | 73  | 66  | 61  | 81  | 72  | 65  | 60  | 69  | 64  | 59  | 67  | 62  | 58  | 65 | 61 | 57 | 57 | 57 | 57 | 55 |
| 6   | 78  | 67  | 60  | 55  | 76  | 66  | 59  | 54  | 64  | 58  | 53  | 62  | 57  | 53  | 60 | 56 | 52 | 52 | 52 | 52 | 50 |
| 7   | 73  | 62  | 55  | 50  | 72  | 61  | 54  | 49  | 59  | 53  | 49  | 58  | 52  | 48  | 56 | 51 | 47 | 47 | 47 | 47 | 46 |
| 8   | 69  | 57  | 50  | 45  | 67  | 57  | 50  | 45  | 55  | 49  | 44  | 54  | 48  | 44  | 52 | 47 | 43 | 43 | 43 | 43 | 42 |
| 9   | 65  | 53  | 46  | 41  | 63  | 53  | 46  | 41  | 51  | 45  | 41  | 50  | 44  | 40  | 49 | 44 | 40 | 40 | 40 | 40 | 38 |
| 10  | 61  | 50  | 43  | 38  | 60  | 49  | 42  | 38  | 48  | 42  | 38  | 47  | 41  | 37  | 46 | 41 | 37 | 37 | 37 | 37 | 35 |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 69106 | 69106 | 69106 |
| 5°  | 68988 | 68988 | 68988 |
| 10° | 69312 | 69312 | 69312 |
| 15° | 69710 | 69710 | 69710 |
| 20° | 69499 | 69499 | 69499 |
| 25° | 67876 | 67876 | 67876 |
| 30° | 63469 | 63469 | 63469 |
| 35° | 55276 | 55276 | 55276 |
| 40° | 42363 | 42363 | 42363 |
| 45° | 27674 | 27674 | 27674 |
| 50° | 17446 | 17446 | 17446 |
| 55° | 13005 | 13005 | 13005 |
| 60° | 10949 | 10949 | 10949 |
| 65° | 9956  | 9956  | 9956  |
| 70° | 9070  | 9070  | 9070  |
| 75° | 7765  | 7765  | 7765  |
| 80° | 5978  | 5978  | 5978  |
| 85° | 3136  | 3136  | 3136  |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 0°  
 Vertical Angle: 45°  
 Luminance: 27674 cd/sqm



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**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 1405.5  | 5.4       |
| 10°-20°   | 4127.5  | 15.8      |
| 20°-30°   | 6193.1  | 23.7      |
| 30°-40°   | 6230.9  | 23.9      |
| 40°-50°   | 3566.8  | 13.7      |
| 50°-60°   | 1631.4  | 6.3       |
| 60°-70°   | 1035.1  | 4.0       |
| 70°-80°   | 580.6   | 2.2       |
| 80°-90°   | 138.3   | 0.5       |
| 90°-100°  | 33.4    | 0.1       |
| 100°-110° | 209.6   | 0.8       |
| 110°-120° | 374.9   | 1.4       |
| 120°-130° | 219.9   | 0.8       |
| 130°-140° | 134.9   | 0.5       |
| 140°-150° | 93.6    | 0.4       |
| 150°-160° | 60.8    | 0.2       |
| 160°-170° | 34.6    | 0.1       |
| 170°-180° | 11.4    | 0.0       |
| 0°-30°    | 11726.1 | 45.0      |
| 0°-40°    | 17957.1 | 68.8      |
| 0°-60°    | 23155.2 | 88.8      |
| 0°-90°    | 24909.1 | 95.5      |
| 90°-120°  | 617.9   | 2.4       |
| 90°-150°  | 1066.4  | 4.1       |
| 90°-180°  | 1173.0  | 4.5       |
| 0°-180°   | 26082.4 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°    | 22.5° | 45°   | 67.5° | 90°   | Flux |
|------|-------|-------|-------|-------|-------|------|
| 0°   | 14716 | 14716 | 14716 | 14716 | 14716 |      |
| 5°   | 14730 | 14730 | 14730 | 14730 | 14730 | 1405 |
| 15°  | 14625 | 14625 | 14625 | 14625 | 14625 | 4127 |
| 25°  | 13555 | 13555 | 13555 | 13555 | 13555 | 6193 |
| 35°  | 10145 | 10145 | 10145 | 10145 | 10145 | 6231 |
| 45°  | 4478  | 4478  | 4478  | 4478  | 4478  | 3567 |
| 55°  | 1758  | 1758  | 1758  | 1758  | 1758  | 1631 |
| 65°  | 1039  | 1039  | 1039  | 1039  | 1039  | 1035 |
| 75°  | 547   | 547   | 547   | 547   | 547   | 581  |
| 85°  | 108   | 108   | 108   | 108   | 108   | 132  |
| 90°  | 9     | 14    | 24    | 15    | 9     | 8    |
| 95°  | 15    | 25    | 54    | 27    | 17    | 14   |
| 105° | 73    | 144   | 369   | 159   | 97    | 98   |
| 115° | 337   | 355   | 436   | 418   | 415   | 311  |
| 125° | 243   | 227   | 233   | 236   | 265   | 222  |
| 135° | 177   | 172   | 178   | 167   | 167   | 139  |
| 145° | 146   | 144   | 152   | 150   | 150   | 92   |
| 155° | 128   | 126   | 132   | 132   | 132   | 60   |
| 165° | 120   | 120   | 123   | 123   | 122   | 34   |
| 175° | 118   | 118   | 120   | 120   | 120   | 11   |
| 180° | 120   | 120   | 120   | 120   | 120   |      |



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**CANDELA DISTRIBUTION (FULL):**

|        | 0°      | 22.5°   | 45°     | 67.5°   | 90°     |
|--------|---------|---------|---------|---------|---------|
| 0°     | 14715.7 | 14715.7 | 14715.7 | 14715.7 | 14715.7 |
| 2.5°   | 14722.9 | 14722.9 | 14722.9 | 14722.9 | 14722.9 |
| 5°     | 14730.0 | 14730.0 | 14730.0 | 14730.0 | 14730.0 |
| 7.5°   | 14719.9 | 14719.9 | 14719.9 | 14719.9 | 14719.9 |
| 10°    | 14726.2 | 14726.2 | 14726.2 | 14726.2 | 14726.2 |
| 12.5°  | 14701.0 | 14701.0 | 14701.0 | 14701.0 | 14701.0 |
| 15°    | 14624.8 | 14624.8 | 14624.8 | 14624.8 | 14624.8 |
| 17.5°  | 14498.9 | 14498.9 | 14498.9 | 14498.9 | 14498.9 |
| 20°    | 14284.1 | 14284.1 | 14284.1 | 14284.1 | 14284.1 |
| 22.5°  | 13989.0 | 13989.0 | 13989.0 | 13989.0 | 13989.0 |
| 25°    | 13554.8 | 13554.8 | 13554.8 | 13554.8 | 13554.8 |
| 27.5°  | 12970.8 | 12970.8 | 12970.8 | 12970.8 | 12970.8 |
| 30°    | 12208.3 | 12208.3 | 12208.3 | 12208.3 | 12208.3 |
| 32.5°  | 11305.5 | 11305.5 | 11305.5 | 11305.5 | 11305.5 |
| 35°    | 10145.1 | 10145.1 | 10145.1 | 10145.1 | 10145.1 |
| 37.5°  | 8830.5  | 8830.5  | 8830.5  | 8830.5  | 8830.5  |
| 40°    | 7342.5  | 7342.5  | 7342.5  | 7342.5  | 7342.5  |
| 42.5°  | 5867.5  | 5867.5  | 5867.5  | 5867.5  | 5867.5  |
| 45°    | 4477.6  | 4477.6  | 4477.6  | 4477.6  | 4477.6  |
| 47.5°  | 3370.6  | 3370.6  | 3370.6  | 3370.6  | 3370.6  |
| 50°    | 2600.1  | 2600.1  | 2600.1  | 2600.1  | 2600.1  |
| 52.5°  | 2100.7  | 2100.7  | 2100.7  | 2100.7  | 2100.7  |
| 55°    | 1757.5  | 1757.5  | 1757.5  | 1757.5  | 1757.5  |
| 57.5°  | 1504.9  | 1504.9  | 1504.9  | 1504.9  | 1504.9  |
| 60°    | 1316.2  | 1316.2  | 1316.2  | 1316.2  | 1316.2  |
| 62.5°  | 1170.6  | 1170.6  | 1170.6  | 1170.6  | 1170.6  |
| 65°    | 1039.2  | 1039.2  | 1039.2  | 1039.2  | 1039.2  |
| 67.5°  | 918.3   | 918.3   | 918.3   | 918.3   | 918.3   |
| 70°    | 795.8   | 795.8   | 795.8   | 795.8   | 795.8   |
| 72.5°  | 672.4   | 672.4   | 672.4   | 672.4   | 672.4   |
| 75°    | 547.0   | 547.0   | 547.0   | 547.0   | 547.0   |
| 77.5°  | 427.8   | 427.8   | 427.8   | 427.8   | 427.8   |
| 80°    | 314.5   | 314.5   | 314.5   | 314.5   | 314.5   |
| 82.5°  | 205.1   | 205.1   | 205.1   | 205.1   | 205.1   |
| 85°    | 107.8   | 107.8   | 107.8   | 107.8   | 107.8   |
| 87.5°  | 30.7    | 30.7    | 30.7    | 30.7    | 30.7    |
| 90°    | 8.7     | 14.1    | 24.2    | 15.4    | 8.7     |
| 92.5°  | 12.8    | 21.5    | 39.0    | 20.1    | 11.4    |
| 95°    | 14.8    | 24.8    | 54.4    | 26.9    | 16.8    |
| 97.5°  | 18.8    | 27.5    | 62.5    | 32.9    | 26.2    |
| 100°   | 24.8    | 32.2    | 97.4    | 40.3    | 34.9    |
| 102.5° | 42.3    | 68.5    | 206.9   | 75.9    | 53.1    |
| 105°   | 73.2    | 144.4   | 368.7   | 159.2   | 96.7    |
| 107.5° | 126.9   | 258.6   | 486.2   | 282.1   | 183.4   |
| 110°   | 237.1   | 343.2   | 509.8   | 387.5   | 293.5   |



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**CANDELA DISTRIBUTION (continued):**

|        | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|--------|-------|-------|-------|-------|-------|
| 112.5° | 320.4 | 368.7 | 488.3 | 427.8 | 382.1 |
| 115°   | 337.2 | 354.6 | 435.9 | 417.7 | 415.1 |
| 117.5° | 325.7 | 323.7 | 370.1 | 375.4 | 401.0 |
| 120°   | 301.6 | 288.1 | 308.9 | 327.7 | 362.0 |
| 122.5° | 271.3 | 255.2 | 264.6 | 278.7 | 313.0 |
| 125°   | 243.1 | 227.0 | 233.1 | 236.4 | 265.3 |
| 127.5° | 218.3 | 207.5 | 210.9 | 206.9 | 225.0 |
| 130°   | 201.5 | 192.1 | 196.8 | 187.4 | 196.1 |
| 132.5° | 187.4 | 181.3 | 186.7 | 175.3 | 178.0 |
| 135°   | 177.3 | 171.9 | 178.0 | 167.2 | 166.6 |
| 137.5° | 168.6 | 163.9 | 169.9 | 161.9 | 159.8 |
| 140°   | 160.5 | 156.5 | 163.2 | 157.2 | 155.8 |
| 142.5° | 151.8 | 149.1 | 157.2 | 153.1 | 151.8 |
| 145°   | 145.7 | 143.7 | 152.5 | 150.4 | 149.8 |
| 147.5° | 140.4 | 139.0 | 147.1 | 146.4 | 146.4 |
| 150°   | 135.7 | 134.3 | 142.4 | 141.7 | 142.4 |
| 152.5° | 131.0 | 129.6 | 137.0 | 136.3 | 137.0 |
| 155°   | 127.6 | 126.3 | 132.3 | 132.3 | 132.3 |
| 157.5° | 124.9 | 124.2 | 129.0 | 129.0 | 129.0 |
| 160°   | 122.9 | 122.2 | 126.3 | 126.3 | 125.6 |
| 162.5° | 120.9 | 120.2 | 124.9 | 124.2 | 124.2 |
| 165°   | 119.5 | 119.5 | 122.9 | 122.9 | 122.2 |
| 167.5° | 119.5 | 118.9 | 122.2 | 122.2 | 121.6 |
| 170°   | 118.9 | 118.9 | 121.6 | 120.9 | 120.2 |
| 172.5° | 118.9 | 118.9 | 121.6 | 120.9 | 120.2 |
| 175°   | 118.2 | 118.2 | 120.2 | 120.2 | 120.2 |
| 177.5° | 118.9 | 118.9 | 120.2 | 120.2 | 119.5 |
| 180°   | 119.5 | 119.5 | 119.5 | 119.5 | 119.5 |



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**CIE UGR TABLE:**

| Reflectances:   |      |                  |       |       |       |       |                |       |       |       |       |
|-----------------|------|------------------|-------|-------|-------|-------|----------------|-------|-------|-------|-------|
| Ceiling         |      | 0.7              | 0.7   | 0.5   | 0.5   | 0.3   | 0.7            | 0.7   | 0.5   | 0.5   | 0.3   |
| Wall            |      | 0.5              | 0.3   | 0.5   | 0.3   | 0.3   | 0.5            | 0.3   | 0.5   | 0.3   | 0.3   |
| Reference plane |      | 0.2              | 0.2   | 0.2   | 0.2   | 0.2   | 0.2            | 0.2   | 0.2   | 0.2   | 0.2   |
| Room dimensions |      | Viewed crosswise |       |       |       |       | Viewed endwise |       |       |       |       |
| X=2H            | Y=2H | 17.23            | 18.43 | 17.68 | 18.84 | 19.27 | 17.23          | 18.43 | 17.68 | 18.84 | 19.27 |
|                 | 3H   | 18.72            | 19.78 | 19.18 | 20.21 | 20.69 | 18.72          | 19.78 | 19.18 | 20.21 | 20.69 |
|                 | 4H   | 19.24            | 20.24 | 19.73 | 20.68 | 21.17 | 19.24          | 20.24 | 19.73 | 20.68 | 21.17 |
|                 | 6H   | 19.57            | 20.48 | 20.07 | 20.94 | 21.45 | 19.57          | 20.48 | 20.07 | 20.94 | 21.45 |
|                 | 8H   | 19.64            | 20.50 | 20.15 | 20.98 | 21.50 | 19.64          | 20.50 | 20.15 | 20.98 | 21.50 |
|                 | 12H  | 19.65            | 20.48 | 20.17 | 20.95 | 21.49 | 19.65          | 20.48 | 20.17 | 20.95 | 21.49 |
| 4H              | 2H   | 17.68            | 18.67 | 18.16 | 19.11 | 19.60 | 17.68          | 18.67 | 18.16 | 19.11 | 19.60 |
|                 | 3H   | 19.37            | 20.19 | 19.87 | 20.68 | 21.19 | 19.37          | 20.19 | 19.87 | 20.68 | 21.19 |
|                 | 4H   | 20.00            | 20.73 | 20.52 | 21.24 | 21.79 | 20.00          | 20.73 | 20.52 | 21.24 | 21.79 |
|                 | 6H   | 20.43            | 21.06 | 20.97 | 21.59 | 22.16 | 20.43          | 21.06 | 20.97 | 21.59 | 22.16 |
|                 | 8H   | 20.52            | 21.11 | 21.07 | 21.64 | 22.22 | 20.52          | 21.11 | 21.07 | 21.64 | 22.22 |
|                 | 12H  | 20.55            | 21.07 | 21.12 | 21.64 | 22.22 | 20.55          | 21.07 | 21.12 | 21.64 | 22.22 |
| 8H              | 4H   | 20.18            | 20.77 | 20.73 | 21.30 | 21.88 | 20.18          | 20.77 | 20.73 | 21.30 | 21.88 |
|                 | 6H   | 20.69            | 21.17 | 21.27 | 21.75 | 22.33 | 20.69          | 21.17 | 21.27 | 21.75 | 22.33 |
|                 | 8H   | 20.83            | 21.26 | 21.43 | 21.85 | 22.45 | 20.83          | 21.26 | 21.43 | 21.85 | 22.45 |
|                 | 12H  | 20.90            | 21.28 | 21.49 | 21.85 | 22.52 | 20.90          | 21.28 | 21.49 | 21.85 | 22.52 |
| 12H             | 4H   | 20.17            | 20.69 | 20.73 | 21.25 | 21.83 | 20.17          | 20.69 | 20.73 | 21.25 | 21.83 |
|                 | 6H   | 20.69            | 21.12 | 21.29 | 21.72 | 22.31 | 20.69          | 21.12 | 21.29 | 21.72 | 22.31 |
|                 | 8H   | 20.87            | 21.24 | 21.46 | 21.82 | 22.49 | 20.87          | 21.24 | 21.46 | 21.82 | 22.49 |

Cooper Lighting Solutions Photometric Lab  
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Peachtree City, GA 30269



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

Report Prepared for

Cooper Lighting Solutions

Metalux

Report Number: SP1-2506-472-1

Test Date: 07/30/2025

Luminaire Tested: EHBR-60-L840-N

Data in this report applies to families of products including EHBR-60-L840-N

**Test Information**

Test Method: LM-79-2019  
 Report Number: SP1-2506-472-1  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry: 4π  
 Issue Date: 08/05/2025  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Metalux  
 Catalog Number: **EHBR-60-L840-N**  
 Description: Elevate Round Highbay at, 60000 lumens, 4000K 80CRI LEDs with N lens

**Spectral Parameters**

CCT (K): 3898  
 CIE u': 0.2263  
 CIE v': 0.5052  
 Duv: 0.0013  
 CIE x: 0.3861  
 CIE y: 0.3831  
 CIE z: 0.2308  
 Peak Wavelength (nm): 630  
 Dominant Wavelength (nm): 578  
 Purity: 30.85729  
 Rf: 80.7  
 Rg: 102.1

|           |      |      |      |
|-----------|------|------|------|
| CRI (Ra): | 82.1 |      |      |
| R1:       | 84.4 | R9:  | 38.5 |
| R2:       | 83.5 | R10: | 58.9 |
| R3:       | 80.8 | R11: | 83.6 |
| R4:       | 83.9 | R12: | 54.2 |
| R5:       | 82.1 | R13: | 82.8 |
| R6:       | 77.3 | R14: | 88.2 |
| R7:       | 86.4 | R15: | 81.2 |
| R8:       | 78.3 |      |      |



**Test Conditions**

Stabilization Time: 42M  
 Operation Time: 1H 42M  
 Sphere Temperature (°C): 25.0

REPORT NUMBER: SP1-2506-472-1

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 6/16/2025        | 12/16/2025           |
| Power Meter                    | XITRON INXT2011004    | 1/21/2025        | 1/21/2026            |
| AC Power Source                | CHROMA 61603 IN0063   | 10/22/2024       | 10/22/2025           |
| DC Power Source                | AGILENT E3634A IN0208 | 10/22/2024       | 10/22/2025           |
| Sphere Thermometer             | ONSET IN0085          | 10/22/2024       | 10/22/2025           |
| Room Thermometer               | ONSET IN0046          | 10/22/2024       | 10/22/2025           |

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CIE 1931 Chromaticity Diagram



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



CCT = 3898K  
 CIE x = 0.3861  
 CIE y = 0.3831  
 Duv = 0.0013

Point lies inside the ANSI 4000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**



**Photopic Lumens: NR**

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 60                       | NR            | 620    | 277                      | NR            | 750    | 6                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 87                       | NR            | 625    | 278                      | NR            | 755    | 5                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 124                      | NR            | 630    | 1000                     | NR            | 760    | 4                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 168                      | NR            | 635    | 623                      | NR            | 765    | 4                        | NR            | 895    | 0                        | NR            |
| 380    | 1                        | NR            | 510    | 209                      | NR            | 640    | 162                      | NR            | 770    | 3                        | NR            | 900    | 0                        | NR            |
| 385    | 1                        | NR            | 515    | 246                      | NR            | 645    | 158                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 2                        | NR            | 520    | 273                      | NR            | 650    | 134                      | NR            | 780    | 2                        | NR            | 910    | 0                        | NR            |
| 395    | 4                        | NR            | 525    | 292                      | NR            | 655    | 109                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 5                        | NR            | 530    | 305                      | NR            | 660    | 91                       | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 7                        | NR            | 535    | 313                      | NR            | 665    | 75                       | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 11                       | NR            | 540    | 319                      | NR            | 670    | 70                       | NR            | 800    | 1                        | NR            | 930    | 0                        | NR            |
| 415    | 21                       | NR            | 545    | 323                      | NR            | 675    | 56                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 42                       | NR            | 550    | 326                      | NR            | 680    | 47                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 76                       | NR            | 555    | 330                      | NR            | 685    | 41                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 125                      | NR            | 560    | 333                      | NR            | 690    | 35                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 193                      | NR            | 565    | 336                      | NR            | 695    | 30                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 302                      | NR            | 570    | 336                      | NR            | 700    | 26                       | NR            | 830    | 1                        | NR            | 960    | 0                        | NR            |
| 445    | 432                      | NR            | 575    | 335                      | NR            | 705    | 22                       | NR            | 835    | 1                        | NR            | 965    | 0                        | NR            |
| 450    | 380                      | NR            | 580    | 332                      | NR            | 710    | 19                       | NR            | 840    | 0                        | NR            | 970    | 0                        | NR            |
| 455    | 213                      | NR            | 585    | 326                      | NR            | 715    | 16                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 147                      | NR            | 590    | 319                      | NR            | 720    | 14                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 104                      | NR            | 595    | 307                      | NR            | 725    | 12                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 65                       | NR            | 600    | 299                      | NR            | 730    | 10                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 50                       | NR            | 605    | 291                      | NR            | 735    | 9                        | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 46                       | NR            | 610    | 317                      | NR            | 740    | 8                        | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 47                       | NR            | 615    | 336                      | NR            | 745    | 7                        | NR            | 875    | 0                        | NR            |        |                          |               |

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**Scotopic Flux vs. Wavelength**



**Scotopic Lumens: NR**

**S/P: 1.55**

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 60                       | NR            | 620    | 277                      | NR            | 750    | 6                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 87                       | NR            | 625    | 278                      | NR            | 755    | 5                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 124                      | NR            | 630    | 1000                     | NR            | 760    | 4                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 168                      | NR            | 635    | 623                      | NR            | 765    | 4                        | NR            | 895    | 0                        | NR            |
| 380    | 1                        | NR            | 510    | 209                      | NR            | 640    | 162                      | NR            | 770    | 3                        | NR            | 900    | 0                        | NR            |
| 385    | 1                        | NR            | 515    | 246                      | NR            | 645    | 158                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 2                        | NR            | 520    | 273                      | NR            | 650    | 134                      | NR            | 780    | 2                        | NR            | 910    | 0                        | NR            |
| 395    | 4                        | NR            | 525    | 292                      | NR            | 655    | 109                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 5                        | NR            | 530    | 305                      | NR            | 660    | 91                       | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 7                        | NR            | 535    | 313                      | NR            | 665    | 75                       | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 11                       | NR            | 540    | 319                      | NR            | 670    | 70                       | NR            | 800    | 1                        | NR            | 930    | 0                        | NR            |
| 415    | 21                       | NR            | 545    | 323                      | NR            | 675    | 56                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 42                       | NR            | 550    | 326                      | NR            | 680    | 47                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 76                       | NR            | 555    | 330                      | NR            | 685    | 41                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 125                      | NR            | 560    | 333                      | NR            | 690    | 35                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 193                      | NR            | 565    | 336                      | NR            | 695    | 30                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 302                      | NR            | 570    | 336                      | NR            | 700    | 26                       | NR            | 830    | 1                        | NR            | 960    | 0                        | NR            |
| 445    | 432                      | NR            | 575    | 335                      | NR            | 705    | 22                       | NR            | 835    | 1                        | NR            | 965    | 0                        | NR            |
| 450    | 380                      | NR            | 580    | 332                      | NR            | 710    | 19                       | NR            | 840    | 0                        | NR            | 970    | 0                        | NR            |
| 455    | 213                      | NR            | 585    | 326                      | NR            | 715    | 16                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 147                      | NR            | 590    | 319                      | NR            | 720    | 14                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 104                      | NR            | 595    | 307                      | NR            | 725    | 12                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 65                       | NR            | 600    | 299                      | NR            | 730    | 10                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 50                       | NR            | 605    | 291                      | NR            | 735    | 9                        | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 46                       | NR            | 610    | 317                      | NR            | 740    | 8                        | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 47                       | NR            | 615    | 336                      | NR            | 745    | 7                        | NR            | 875    | 0                        | NR            |        |                          |               |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: NR**

**M/P: 2.99**

| $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|
| 360               | 0                                      | NR                             | 490               | 60                                     | NR                             | 620               | 277                                    | NR                             | 750               | 6                                      | NR                             | 880               | 0                                      | NR                             |
| 365               | 0                                      | NR                             | 495               | 87                                     | NR                             | 625               | 278                                    | NR                             | 755               | 5                                      | NR                             | 885               | 0                                      | NR                             |
| 370               | 0                                      | NR                             | 500               | 124                                    | NR                             | 630               | 1000                                   | NR                             | 760               | 4                                      | NR                             | 890               | 0                                      | NR                             |
| 375               | 0                                      | NR                             | 505               | 168                                    | NR                             | 635               | 623                                    | NR                             | 765               | 4                                      | NR                             | 895               | 0                                      | NR                             |
| 380               | 1                                      | NR                             | 510               | 209                                    | NR                             | 640               | 162                                    | NR                             | 770               | 3                                      | NR                             | 900               | 0                                      | NR                             |
| 385               | 1                                      | NR                             | 515               | 246                                    | NR                             | 645               | 158                                    | NR                             | 775               | 3                                      | NR                             | 905               | 0                                      | NR                             |
| 390               | 2                                      | NR                             | 520               | 273                                    | NR                             | 650               | 134                                    | NR                             | 780               | 2                                      | NR                             | 910               | 0                                      | NR                             |
| 395               | 4                                      | NR                             | 525               | 292                                    | NR                             | 655               | 109                                    | NR                             | 785               | 2                                      | NR                             | 915               | 0                                      | NR                             |
| 400               | 5                                      | NR                             | 530               | 305                                    | NR                             | 660               | 91                                     | NR                             | 790               | 2                                      | NR                             | 920               | 0                                      | NR                             |
| 405               | 7                                      | NR                             | 535               | 313                                    | NR                             | 665               | 75                                     | NR                             | 795               | 2                                      | NR                             | 925               | 0                                      | NR                             |
| 410               | 11                                     | NR                             | 540               | 319                                    | NR                             | 670               | 70                                     | NR                             | 800               | 1                                      | NR                             | 930               | 0                                      | NR                             |
| 415               | 21                                     | NR                             | 545               | 323                                    | NR                             | 675               | 56                                     | NR                             | 805               | 1                                      | NR                             | 935               | 0                                      | NR                             |
| 420               | 42                                     | NR                             | 550               | 326                                    | NR                             | 680               | 47                                     | NR                             | 810               | 1                                      | NR                             | 940               | 0                                      | NR                             |
| 425               | 76                                     | NR                             | 555               | 330                                    | NR                             | 685               | 41                                     | NR                             | 815               | 1                                      | NR                             | 945               | 0                                      | NR                             |
| 430               | 125                                    | NR                             | 560               | 333                                    | NR                             | 690               | 35                                     | NR                             | 820               | 1                                      | NR                             | 950               | 0                                      | NR                             |
| 435               | 193                                    | NR                             | 565               | 336                                    | NR                             | 695               | 30                                     | NR                             | 825               | 1                                      | NR                             | 955               | 0                                      | NR                             |
| 440               | 302                                    | NR                             | 570               | 336                                    | NR                             | 700               | 26                                     | NR                             | 830               | 1                                      | NR                             | 960               | 0                                      | NR                             |
| 445               | 432                                    | NR                             | 575               | 335                                    | NR                             | 705               | 22                                     | NR                             | 835               | 1                                      | NR                             | 965               | 0                                      | NR                             |
| 450               | 380                                    | NR                             | 580               | 332                                    | NR                             | 710               | 19                                     | NR                             | 840               | 0                                      | NR                             | 970               | 0                                      | NR                             |
| 455               | 213                                    | NR                             | 585               | 326                                    | NR                             | 715               | 16                                     | NR                             | 845               | 0                                      | NR                             | 975               | 0                                      | NR                             |
| 460               | 147                                    | NR                             | 590               | 319                                    | NR                             | 720               | 14                                     | NR                             | 850               | 0                                      | NR                             | 980               | 0                                      | NR                             |
| 465               | 104                                    | NR                             | 595               | 307                                    | NR                             | 725               | 12                                     | NR                             | 855               | 0                                      | NR                             | 985               | 0                                      | NR                             |
| 470               | 65                                     | NR                             | 600               | 299                                    | NR                             | 730               | 10                                     | NR                             | 860               | 0                                      | NR                             | 990               | 0                                      | NR                             |
| 475               | 50                                     | NR                             | 605               | 291                                    | NR                             | 735               | 9                                      | NR                             | 865               | 0                                      | NR                             | 995               | 0                                      | NR                             |
| 480               | 46                                     | NR                             | 610               | 317                                    | NR                             | 740               | 8                                      | NR                             | 870               | 0                                      | NR                             | 1000              | 0                                      | NR                             |
| 485               | 47                                     | NR                             | 615               | 336                                    | NR                             | 745               | 7                                      | NR                             | 875               | 0                                      | NR                             |                   |                                        |                                |

**Summary**

$R_f = 80.7$   
 $R_g = 102.1$   
 CIE  $R_a = 82.1$   
 $R_9 = 38.5$



**Color Vector Graphics**



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

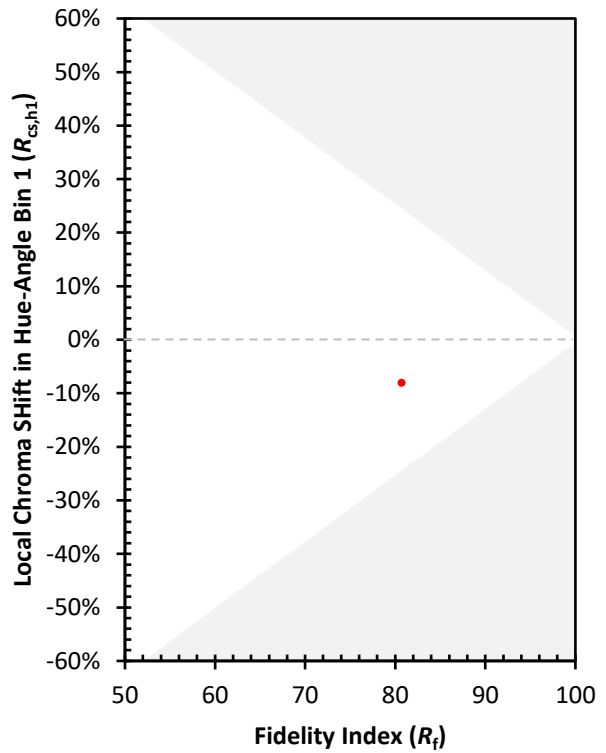
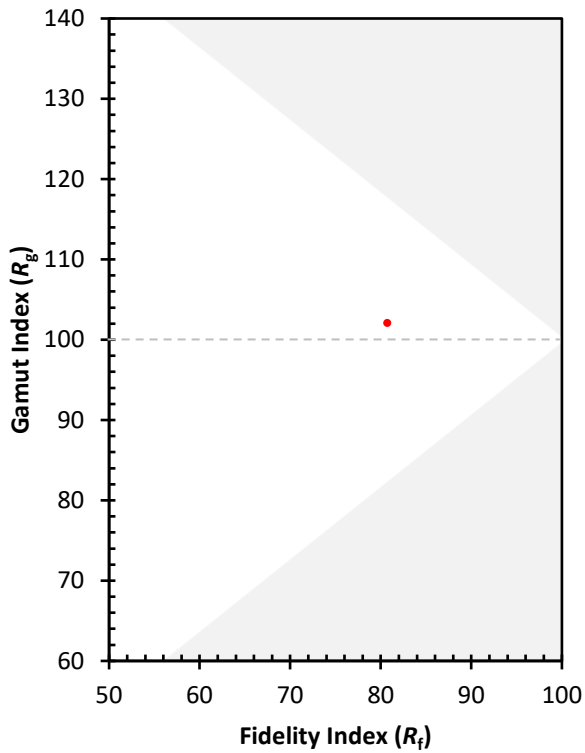
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 69 | CES51 = 90 | CES76 = 58 |
| CES02 = 61 | CES27 = 89 | CES52 = 90 | CES77 = 76 |
| CES03 = 31 | CES28 = 83 | CES53 = 80 | CES78 = 60 |
| CES04 = 69 | CES29 = 66 | CES54 = 91 | CES79 = 85 |
| CES05 = 48 | CES30 = 76 | CES55 = 89 | CES80 = 79 |
| CES06 = 50 | CES31 = 69 | CES56 = 79 | CES81 = 81 |
| CES07 = 41 | CES32 = 62 | CES57 = 77 | CES82 = 91 |
| CES08 = 40 | CES33 = 74 | CES58 = 79 | CES83 = 88 |
| CES09 = 29 | CES34 = 72 | CES59 = 93 | CES84 = 89 |
| CES10 = 74 | CES35 = 84 | CES60 = 95 | CES85 = 84 |
| CES11 = 57 | CES36 = 98 | CES61 = 92 | CES86 = 82 |
| CES12 = 63 | CES37 = 77 | CES62 = 89 | CES87 = 81 |
| CES13 = 43 | CES38 = 83 | CES63 = 80 | CES88 = 86 |
| CES14 = 74 | CES39 = 94 | CES64 = 80 | CES89 = 79 |
| CES15 = 71 | CES40 = 88 | CES65 = 77 | CES90 = 85 |
| CES16 = 47 | CES41 = 89 | CES66 = 74 | CES91 = 83 |
| CES17 = 49 | CES42 = 74 | CES67 = 72 | CES92 = 77 |
| CES18 = 56 | CES43 = 73 | CES68 = 78 | CES93 = 86 |
| CES19 = 71 | CES44 = 98 | CES69 = 83 | CES94 = 69 |
| CES20 = 65 | CES45 = 82 | CES70 = 69 | CES95 = 80 |
| CES21 = 86 | CES46 = 82 | CES71 = 64 | CES96 = 86 |
| CES22 = 78 | CES47 = 80 | CES72 = 88 | CES97 = 83 |
| CES23 = 91 | CES48 = 79 | CES73 = 60 | CES98 = 81 |
| CES24 = 90 | CES49 = 80 | CES74 = 98 | CES99 = 83 |
| CES25 = 71 | CES50 = 89 | CES75 = 62 |            |



Color Rendition by Hue-Angle Bin



Measure Comparisons



(END OF REPORT)