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Test report of

## IES LM-79-08

**Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products**

Rendered to:

ETI Solid State Lighting (Zhuhai) Ltd  
No.1, Zhongzhu Road South, Science & Technology Innovation  
Coast, High Tech District, Zhuhai City, Guangdong Prov., China

For products:

2x2 Luminaires for Ambient Lighting of Interior Commercial  
Spaces

Models No.:

558101###(##=11-30,#=0-9)

(Where ## can be 41-50 and 91-99 represent different client and sales districts.)

**Test Date:** Apr. 23, 2022 to Apr. 25, 2022

**Test Lab.:** **LCTECH Guangdong Testing Services Co., Ltd.**

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Zhongshan, Guangdong, China

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**Test Sites:** 1/F., Building I, Technology and Enterprise Development Center, Guangyuan Road,  
Xiaolan, Zhongshan, Guangdong, China

**Template No.:** LC-RT-PL-092 Rev.1.1

**Test Note:** 558101110 was selected for the test.

**Complied by:**

Fish Tan

May. 7, 2022

**Reviewed by:**

Lin Qiu

May. 7, 2022

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## Table of Contents

|                                                        |    |
|--------------------------------------------------------|----|
| <b>1. General</b>                                      | 3  |
| 1.1 Product Information                                | 3  |
| 1.2 Standards or methods                               | 4  |
| 1.3 Equipment list                                     | 4  |
| <b>2. Test conducted and method</b>                    | 5  |
| 2.1 Ambient Condition                                  | 5  |
| 2.2 Power Supply Characteristics                       | 5  |
| 2.3 Seasoning and Stabilization                        | 5  |
| 2.4 Electrical Instrumentation                         | 5  |
| 2.5 Color Measurement Method                           | 5  |
| 2.6 Total Luminous Flux Measurement Method             | 5  |
| 2.7 Luminous Intensity Distribution Measurement Method | 5  |
| 2.8 Spatial Non-uniformity of Chromaticity             | 5  |
| <b>3. Test Result Summary</b>                          | 6  |
| 3.1 Electrical data                                    | 6  |
| 3.2 Photometric data                                   | 6  |
| 3.3 Color Rendering Details of 3000K                   | 6  |
| 3.4 Electrical data on 277V of 3000K                   | 6  |
| <b>4. Test Data</b>                                    | 7  |
| 4.1 ANSI Chromaticity Quadrangles Diagram              | 7  |
| 4.2 ANSI/IES TM-30-18 Color Rendition                  | 8  |
| 4.3 Goniometry Test Data of 3000K                      | 12 |
| 4.4 Zonal Lumen Summary of 3000K                       | 12 |
| 4.5 Polar Curves of 3000K                              | 13 |
| 4.6 Candela Tabulation of 3000K                        | 14 |
| <b>Appendix A Product Photo</b>                        | 15 |

## 1. General

### 1.1 Product Information

|                              |                                                                                                                                                                                                                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brand Name                   | ETI, Silenitaire, Cleanaire, NVC, Cleanaire Pro, Blue Halo                                                                                                                                                                                                                              |
| Factory 1                    | Name: ETI Solid State Lighting (Zhuhai) Ltd<br>Address: No.1, Zhongzhu Road South, Science & Technology Innovation Coast, High Tech District, Zhuhai City, Guangdong Prov., China                                                                                                       |
| Factory 2                    | Name: NVC VIETNAM TECHNOLOGY AND LIGHTING COMPANY LIMITED<br>Address 1: Lot CN23-1, Yen Phong Industrial park, Dong Phong commune, Yen Phong district, Bac Ninh province VIETNAM<br>Address 2: Lot CN9-6, Yen Phong Industrial park, Yen Trung commune Yen Phong district 16000 Vietnam |
| Category                     | Indoor                                                                                                                                                                                                                                                                                  |
| General Application          | Troffer                                                                                                                                                                                                                                                                                 |
| Primary Use                  | 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces                                                                                                                                                                                                                       |
| Model Number                 | 558101###(##=11-30,#=0-9)                                                                                                                                                                                                                                                               |
| Rated Inputs                 | AC120-277V,50/60Hz                                                                                                                                                                                                                                                                      |
| Rated Power                  | Total power: 101W, lighting component: 39W                                                                                                                                                                                                                                              |
| Rated Light output           | 4375lm                                                                                                                                                                                                                                                                                  |
| Declared CCT                 | 3000K/3500K/4000K/5000K                                                                                                                                                                                                                                                                 |
| Power Supply                 | ETI-AD05001250036DDA                                                                                                                                                                                                                                                                    |
| LED Package, Array or Module | 67-23ST Series, EVERLIGHT ELECTRONICS CO., LTD                                                                                                                                                                                                                                          |
| Dimming                      | Continuous Dimming                                                                                                                                                                                                                                                                      |
| Integral Controls            | No                                                                                                                                                                                                                                                                                      |
| Controls Controllability     | No                                                                                                                                                                                                                                                                                      |
| Receipt Samples              | 1 unit                                                                                                                                                                                                                                                                                  |
| Sample Code of lab.          | 220414104013                                                                                                                                                                                                                                                                            |
| Date of Receipt Samples      | Apr. 14, 2022                                                                                                                                                                                                                                                                           |
| Note                         | This is a color tunable product, 3000K, 3500K, 4000K, 5000K settings are selected for the test.                                                                                                                                                                                         |

## 1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

| No.                               | Name                                                                               |
|-----------------------------------|------------------------------------------------------------------------------------|
| ANSI/NEMA/ ANSLG<br>C78.377- 2017 | Specifications for the Chromaticity of Solid State Lighting Products               |
| ANSI/IES TM-30-18 <sup>1</sup>    | IES Method for Evaluating Light Source Color Rendition                             |
| ANSI C82.77-2002                  | Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment |
| CIE Pub. No. 13.3-1995            | Method of Measuring and Specifying Color Rendering of Light Sources                |
| CIE Pub. No. 15:2004              | Colorimetry                                                                        |
| IES LM-79-08                      | Electrical and Photometric Measurements of Solid-State Lighting Products           |

Note:

1, For reference only and not in the scope of NVLAP.

## 1.3 Equipment list

| Instrument                                                                | ID          | Model name | Cal. date  | Next cal. Date |
|---------------------------------------------------------------------------|-------------|------------|------------|----------------|
| AC Power supply                                                           | LC-I-987    | APW-120N   | 2021-12-16 | 2022-12-15     |
| AC Power supply                                                           | LC-I-989    | APW-120N   | 2021-12-16 | 2022-12-15     |
| Power analyzer                                                            | LC-I-PL-024 | WT310E     | 2022-03-01 | 2023-02-28     |
| Power analyzer                                                            | LC-I-954    | WT210      | 2021-12-20 | 2022-12-19     |
| Multimeter                                                                | LC-I-972    | Fluke      | 2021-07-12 | 2022-07-11     |
| Photometric colorimetric electric system <sup>2</sup><br>(2 meter sphere) | LC-I-956    | HAAS-2000  | Before use | Before use     |
| Standard lamp <sup>3</sup>                                                | LC-I-PL-030 | D204C      | 2021-07-09 | 2022-07-08     |
| Luminous Flux Standard Lamp <sup>4</sup>                                  | LC-I-PL-027 | 24V/100W   | 2021-07-09 | 2022-07-08     |
| Goniophotometer(with mirror)                                              | LC-I-902    | GMS2000    | 2022-04-21 | 2023-04-20     |
| Wireless temperature transmitter                                          | LC-I-PL-009 | DWLR-DLR   | 2021-12-16 | 2022-12-15     |
| Wireless temperature transmitter                                          | LC-I-PL-008 | DWLR-DLR   | 2021-12-16 | 2022-12-15     |

Note:

2, Bandwidth of spectroradiometer is 1 nm.

3, halogen lamp, 100W, omni-directional type, and its traceability to NIM.

4, halogen lamp, 100W, omni-directional type, and its traceability to NIM.

## 2. Test conducted and method

The luminaire was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

### 2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ; the air flow around the sample(s) being tested did not affect the performance.

### 2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within  $\pm 0.2$  percent under load.

### 2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

### 2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent (95 % confidence interval,  $k=2$ ).

### 2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

### 2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured by type C goniophotometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

### 2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

### 2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

### 3. Test Result Summary

#### 3.1 Electrical data

| Criteria Item             | Result           |                  |                  |                  |
|---------------------------|------------------|------------------|------------------|------------------|
|                           | 3000K            | 3500K            | 4000K            | 5000K            |
| Input Voltage & Frequency | 119.99V<br>~60Hz | 119.99V<br>~60Hz | 119.98V<br>~60Hz | 119.98V<br>~60Hz |
| Input Current(A)          | 0.315            | 0.313            | 0.309            | 0.312            |
| Total Power(W)            | 36.92            | 36.71            | 36.27            | 36.63            |
| Power Factor              | 0.978            | 0.978            | 0.978            | 0.978            |
| I-THD                     | 15.96%           | 15.67%           | 16.01%           | 18.81%           |

#### 3.2 Photometric data

| Criteria Item                         | Result            |                   |                   |                   |
|---------------------------------------|-------------------|-------------------|-------------------|-------------------|
|                                       | 3000K             | 3500K             | 4000K             | 5000K             |
| Total Lumens(lm)                      | 4240.70           | 4407.60           | 4435.83           | 4502.24           |
| Luminaire Efficacy(lm/W)              | 114.86            | 120.07            | 122.30            | 122.91            |
| Correlated Color Temperature (CCT)(K) | 2936              | 3511              | 3917              | 5077              |
| Color Rendering Index (CRI)           | 83.8              | 86.4              | 87.1              | 85.6              |
| R <sub>9</sub>                        | 11                | 22                | 26                | 17                |
| R <sub>f</sub>                        | 85                | 86                | 86                | 85                |
| R <sub>g</sub>                        | 98                | 97                | 96                | 96                |
| R <sub>cs,h1</sub>                    | -11%              | -10%              | -10%              | -11%              |
| Chromaticity Coordinate (x,y)         | 0.4371,<br>0.3966 | 0.4007,<br>0.3796 | 0.3820,<br>0.3713 | 0.3433,<br>0.3542 |
| Chromaticity Coordinate (u',v')       | 0.2539,<br>0.5184 | 0.2373,<br>0.5059 | 0.2283,<br>0.4994 | 0.2092,<br>0.4857 |
| Duv                                   | -0.0030           | -0.0039           | -0.0030           | 0.0020            |
| Zone Lumens between 0-60°             | 77.85 %           | -                 | -                 | -                 |
| Spacing Criteria (0-180)              | 1.28              | -                 | -                 | -                 |
| Spacing Criteria (90-270)             | 1.28              | -                 | -                 | -                 |

#### 3.3 Color Rendering Details of 3000K

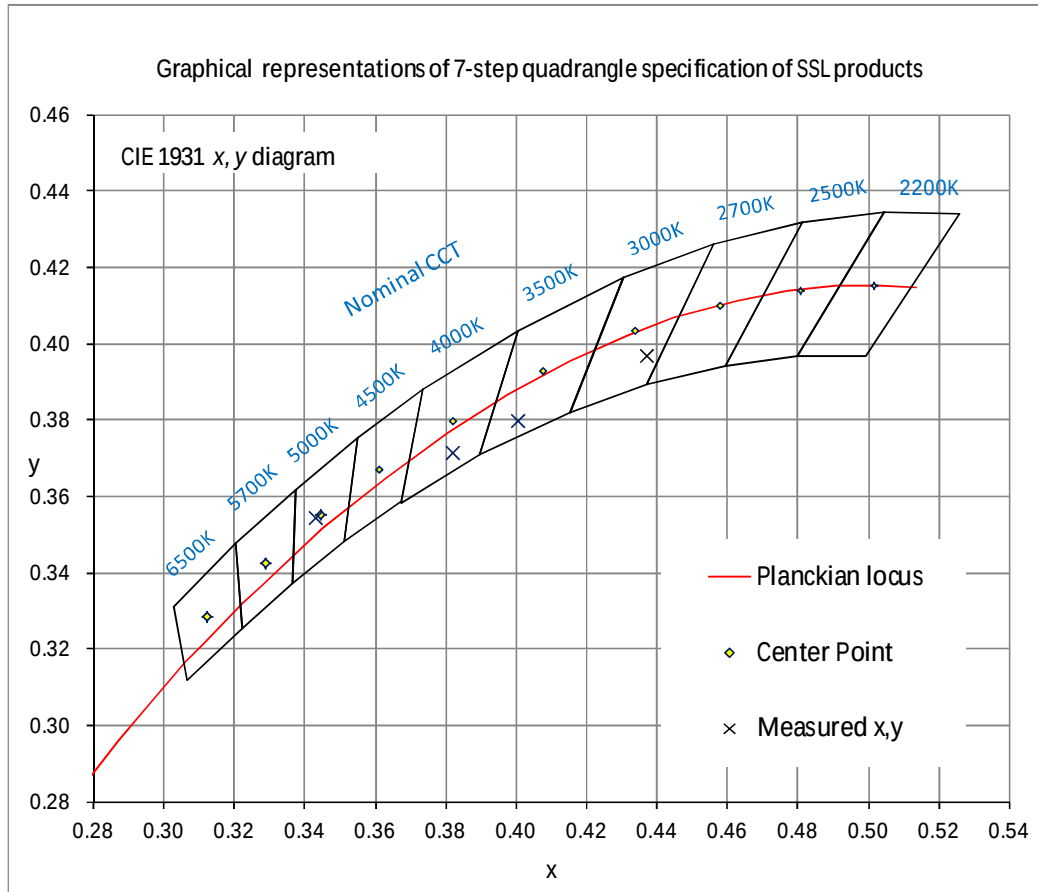
|    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
| R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
| 83 | 93 | 95 | 82 | 84 | 92 | 82 | 60 | 11 | 84  | 83  | 77  | 86  | 98  | 76  |

#### 3.4 Electrical data on 277V of 3000K

| Criteria Item             | Result        |
|---------------------------|---------------|
| Input Voltage & Frequency | 277.03 V~60Hz |
| Power Factor              | 0.882         |
| I-THD                     | 17.81 %       |

## 4. Test Data

### 4.1 ANSI Chromaticity Quadrangles Diagram



## 4.2 ANSI/IES TM-30-18 Color Rendition

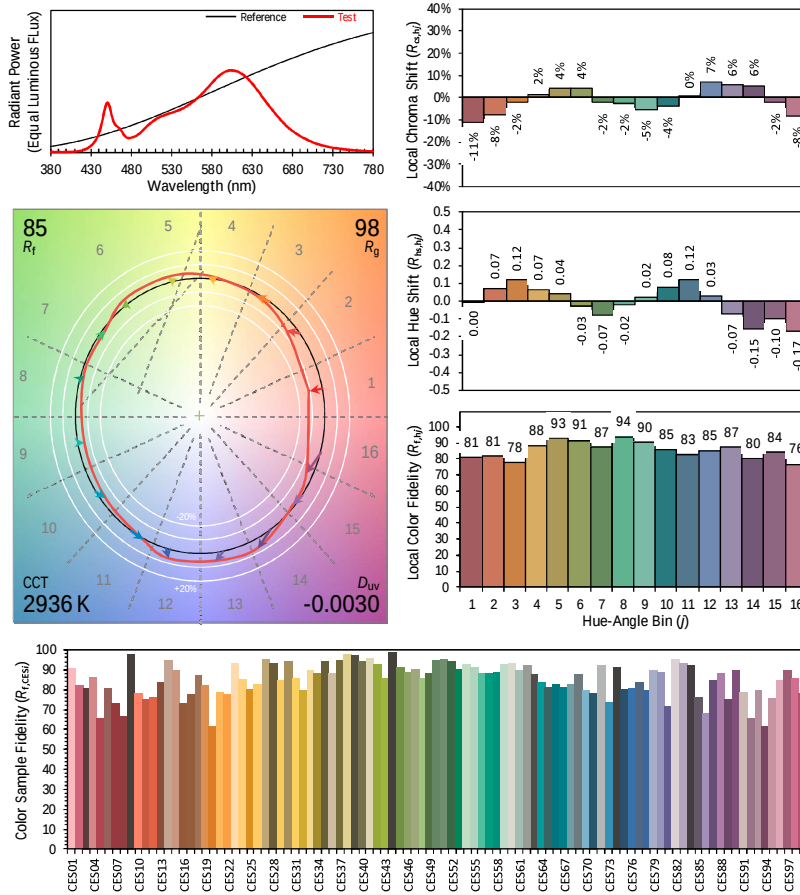
### ANSI/IES TM-30-18 Color Rendition Report

Source: User SPD

Manufacturer: ETI Solid State Lighting (Zhuhai) Ltd

Date: 2022/5/7

Model: 558101110(3000K)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

$x$  0.4371  
 $y$  0.3966  
 $u'$  0.2539  
 $v'$  0.5184



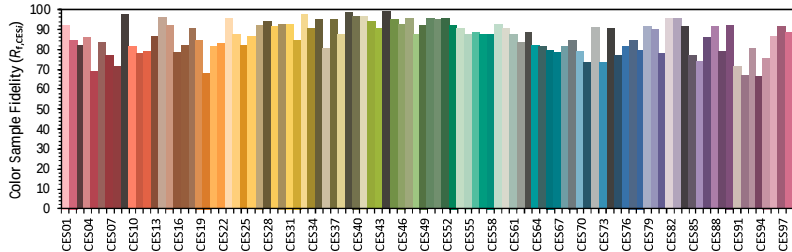
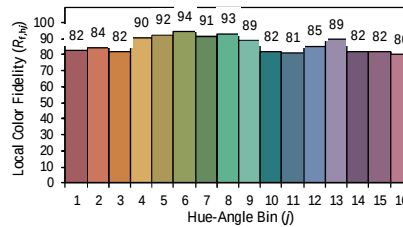
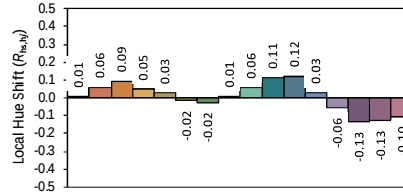
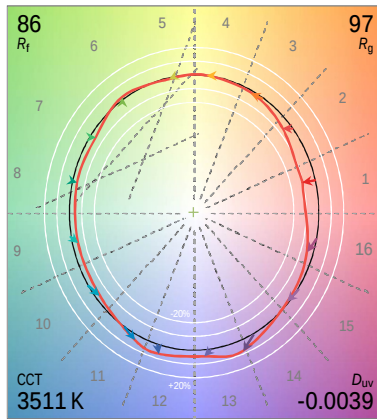
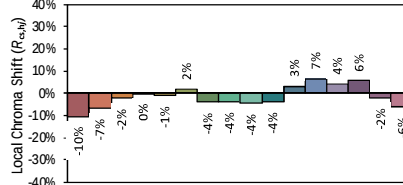
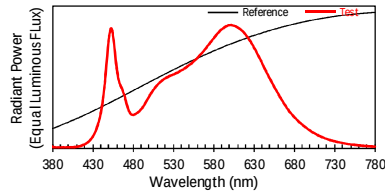
# ANSI/IES TM-30-18 Color Rendition Report

Source: User SPD

Manufacturer: ETI Solid State Lighting (Zhuhai) Ltd

Date: 2022/5/7

Model: 558101110(3500K)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.4007  
y 0.3796  
u' 0.2373  
v' 0.5059

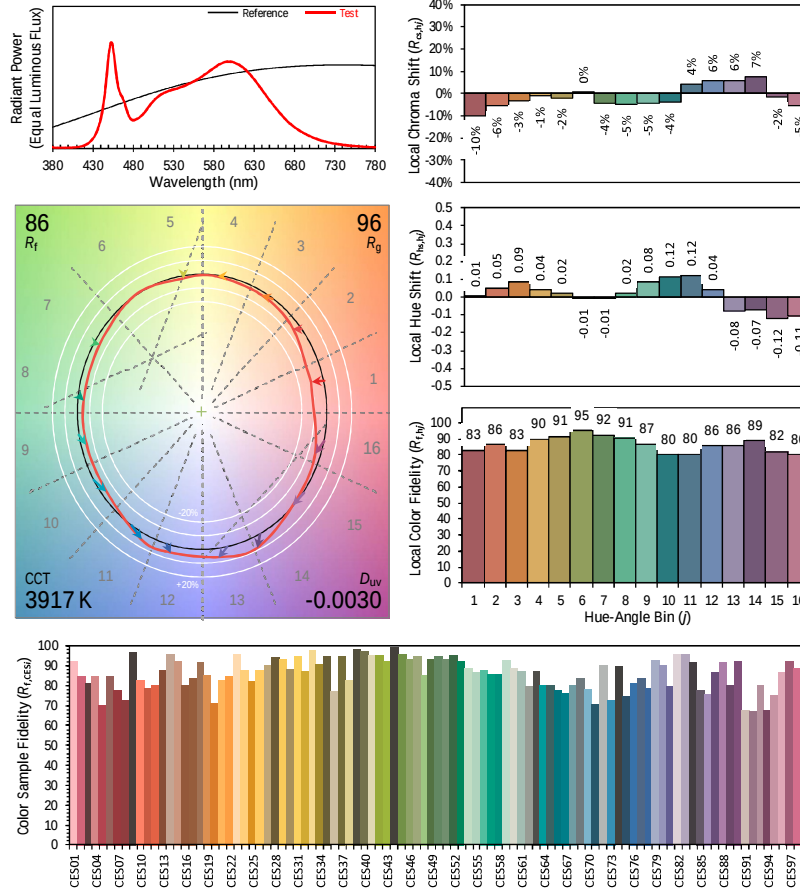
## ANSI/IES TM-30-18 Color Rendition Report

Source: User SPD

Manufacturer: ETI Solid State Lighting (Zhuhai) Ltd

Date: 2022/5/7

Model: 558101110(4000K)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

$x$  0.3820  
 $y$  0.3713  
 $u'$  0.2283  
 $v'$  0.4994

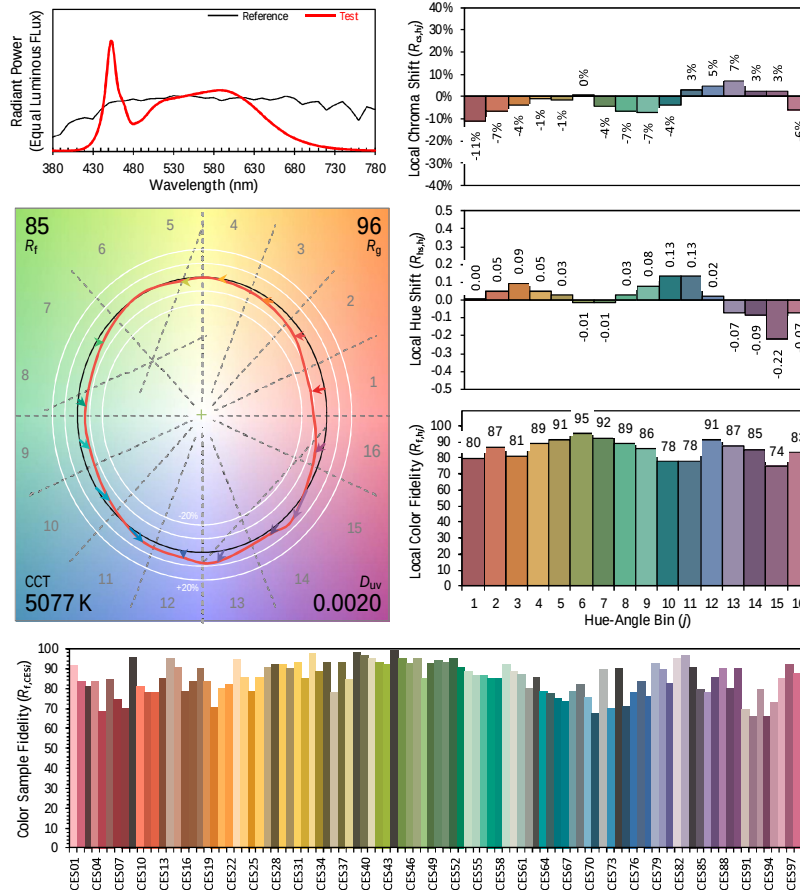
# ANSI/IES TM-30-18 Color Rendition Report

Source: User SPD

Manufacturer: ETI Solid State Lighting (Zhuhai) Ltd

Date: 2022/5/7

Model: 558101110(5000K)



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

$x$  0.3433  
 $y$  0.3542  
 $u'$  0.2092  
 $v'$  0.4857

Note:

Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

#### 4.3 Goniometry Test Data of 3000K

|                             |         |                      |             |
|-----------------------------|---------|----------------------|-------------|
| CIE Type                    | Direct  | Basic Luminous Shape | Rectangular |
| Spacing Criteria (0-180)    | 1.28    | Luminous Length      | 0.56 m      |
| Spacing Criteria (90-270)   | 1.28    | Luminous Width       | 0.56 m      |
| Spacing Criteria (Diagonal) | 1.40    | Luminous Height      | 0.00 m      |
| Test Distance               | 29.75 m |                      |             |

#### 4.4 Zonal Lumen Summary of 3000K

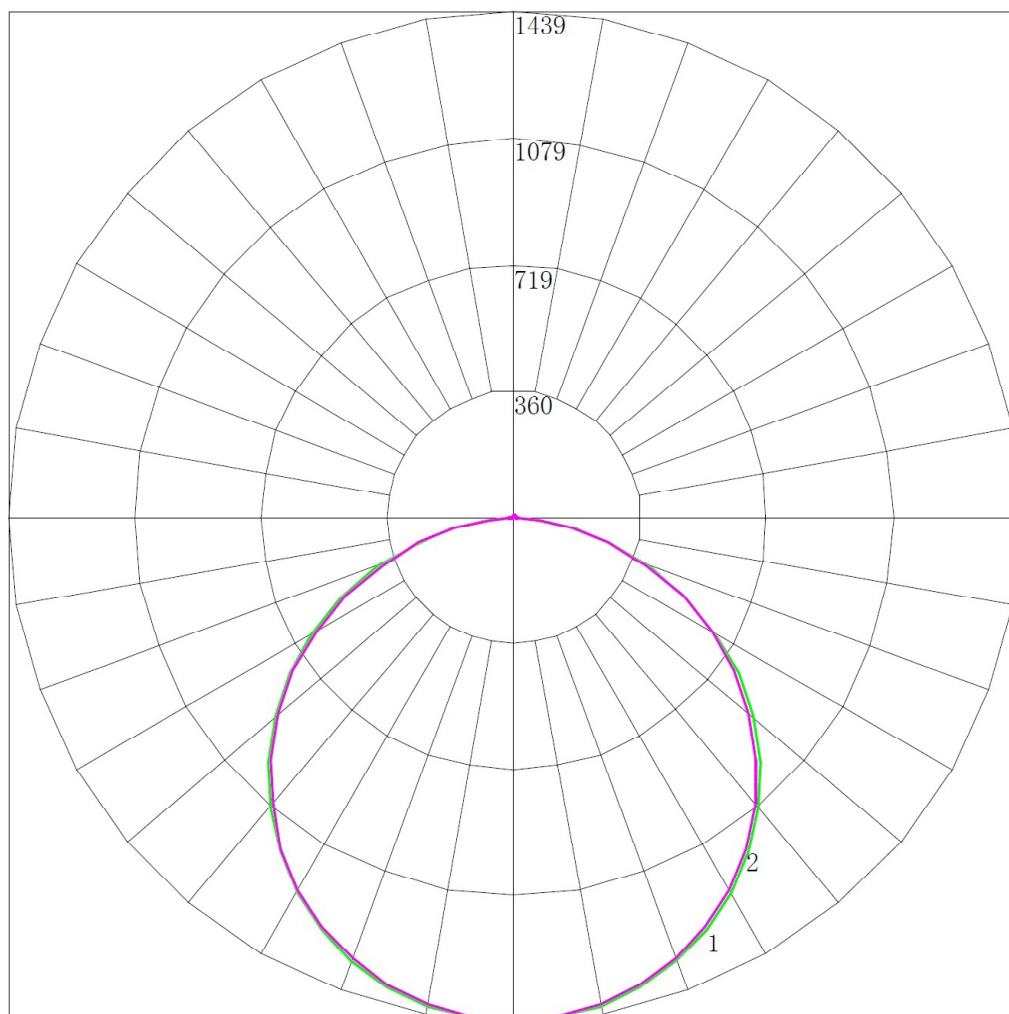
| Zone    | Lumens  | %Lamp  | %Fixt  |
|---------|---------|--------|--------|
| 0-20    | 527.98  | 12.50  | 12.50  |
| 0-30    | 1125.63 | 26.50  | 26.50  |
| 0-40    | 1851.92 | 43.70  | 43.70  |
| 0-60    | 3301.55 | 77.90  | 77.90  |
| 0-80    | 4133.04 | 97.50  | 97.50  |
| 0-90    | 4223.85 | 99.60  | 99.60  |
| 10-90   | 4087.58 | 96.40  | 96.40  |
| 20-40   | 1323.94 | 31.20  | 31.20  |
| 20-50   | 2083.65 | 49.10  | 49.10  |
| 40-70   | 1976.58 | 46.60  | 46.60  |
| 60-80   | 831.49  | 19.60  | 19.60  |
| 70-80   | 304.54  | 7.20   | 7.20   |
| 80-90   | 90.81   | 2.10   | 2.10   |
| 90-110  | 7.72    | 0.20   | 0.20   |
| 90-120  | 9.44    | 0.20   | 0.20   |
| 90-130  | 11.14   | 0.30   | 0.30   |
| 90-150  | 14.20   | 0.30   | 0.30   |
| 90-180  | 16.85   | 0.40   | 0.40   |
| 110-180 | 9.13    | 0.20   | 0.20   |
| 0-180   | 4240.7  | 100.00 | 100.00 |

Total Luminaire Efficiency = 100.00%

#### ZONAL LUMEN SUMMARY

| Zone    | Lumens |
|---------|--------|
| 0-10    | 136.26 |
| 10-20   | 391.72 |
| 20-30   | 597.65 |
| 30-40   | 726.29 |
| 40-50   | 759.71 |
| 50-60   | 689.92 |
| 60-70   | 526.95 |
| 70-80   | 304.54 |
| 80-90   | 90.81  |
| 90-100  | 5.57   |
| 100-110 | 2.15   |
| 110-120 | 1.72   |
| 120-130 | 1.70   |
| 130-140 | 1.55   |
| 140-150 | 1.52   |
| 150-160 | 1.38   |
| 160-170 | 0.94   |
| 170-180 | 0.33   |

#### 4.5 Polar Curves of 3000K



Maximum Candela = 1438.994 Located At Horizontal Angle = 0, Vertical Angle = 0  
 # 1 - Vertical Plane Through Horizontal Angles (0 - 180)  
 # 2 - Vertical Plane Through Horizontal Angles (90 - 270)



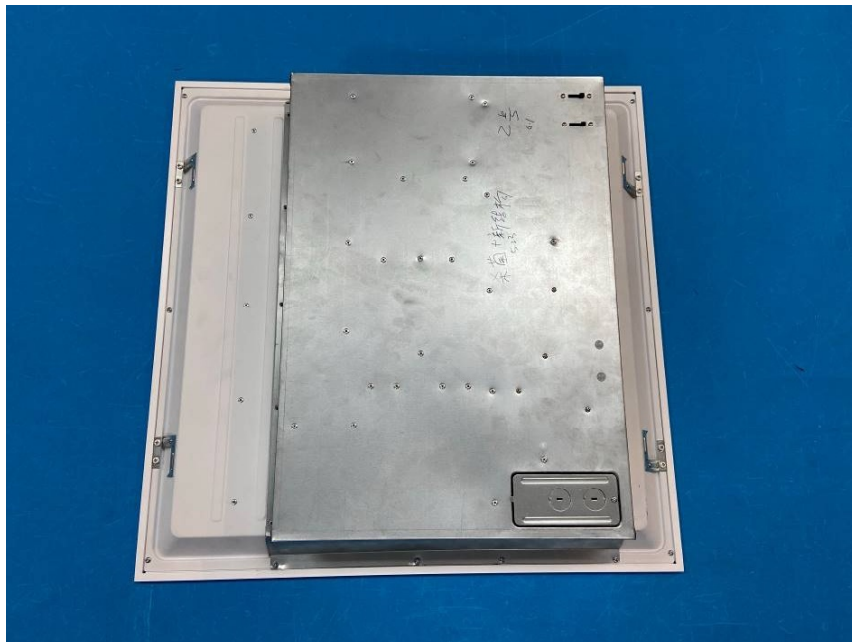
#### 4.6 Candela Tabulation of 3000K

|     | <u>0</u> | <u>15</u> | <u>30</u> | <u>45</u> | <u>60</u> | <u>75</u> | <u>90</u> |
|-----|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 0   | 1438.994 | 1438.994  | 1438.994  | 1438.994  | 1438.994  | 1438.994  | 1438.994  |
| 5   | 1433.109 | 1433.532  | 1433.573  | 1432.337  | 1432.990  | 1434.204  | 1431.852  |
| 10  | 1417.489 | 1417.136  | 1416.278  | 1415.930  | 1416.068  | 1415.447  | 1414.261  |
| 15  | 1389.302 | 1388.043  | 1389.183  | 1387.362  | 1386.366  | 1386.623  | 1385.473  |
| 20  | 1349.875 | 1349.459  | 1349.083  | 1347.294  | 1347.006  | 1345.957  | 1343.678  |
| 25  | 1300.139 | 1298.885  | 1298.454  | 1295.442  | 1294.158  | 1293.584  | 1292.229  |
| 30  | 1239.517 | 1238.374  | 1236.436  | 1233.153  | 1240.545  | 1229.840  | 1229.185  |
| 35  | 1165.974 | 1165.500  | 1162.894  | 1160.451  | 1158.318  | 1156.096  | 1154.590  |
| 40  | 1083.316 | 1083.417  | 1080.506  | 1077.951  | 1074.216  | 1073.301  | 1071.398  |
| 45  | 989.773  | 990.166   | 988.539   | 995.843   | 981.941   | 979.022   | 976.435   |
| 50  | 887.291  | 887.529   | 884.895   | 880.469   | 879.856   | 876.633   | 875.300   |
| 55  | 778.437  | 777.002   | 774.547   | 771.613   | 769.198   | 767.943   | 766.141   |
| 60  | 661.397  | 658.348   | 671.518   | 654.177   | 652.073   | 650.006   | 649.090   |
| 65  | 540.021  | 537.396   | 535.542   | 531.390   | 529.255   | 526.796   | 527.455   |
| 70  | 411.255  | 412.151   | 409.339   | 406.328   | 404.245   | 402.987   | 402.292   |
| 75  | 289.790  | 305.395   | 287.379   | 283.583   | 282.646   | 281.346   | 279.995   |
| 80  | 176.467  | 175.713   | 174.111   | 171.785   | 170.173   | 168.774   | 168.632   |
| 85  | 76.419   | 76.195    | 75.024    | 74.803    | 73.114    | 72.170    | 72.876    |
| 90  | 14.337   | 12.080    | 12.496    | 12.713    | 12.667    | 12.324    | 13.358    |
| 95  | 2.168    | 2.301     | 2.521     | 2.808     | 2.990     | 3.037     | 2.954     |
| 100 | 2.035    | 2.102     | 2.212     | 2.300     | 2.370     | 2.461     | 2.513     |
| 105 | 1.947    | 1.925     | 1.946     | 2.012     | 2.082     | 2.128     | 2.160     |
| 110 | 1.814    | 1.704     | 1.747     | 1.791     | 1.772     | 1.862     | 1.852     |
| 115 | 1.726    | 1.659     | 1.592     | 1.658     | 1.728     | 1.774     | 1.719     |
| 120 | 1.770    | 1.748     | 1.747     | 1.769     | 1.794     | 1.796     | 1.808     |
| 125 | 1.947    | 1.925     | 1.880     | 1.902     | 1.860     | 1.929     | 1.984     |
| 130 | 1.991    | 2.013     | 1.991     | 1.946     | 1.971     | 1.973     | 1.984     |
| 135 | 1.991    | 1.991     | 1.924     | 1.968     | 1.927     | 1.951     | 1.984     |
| 140 | 2.168    | 2.124     | 2.101     | 2.123     | 2.126     | 2.084     | 2.116     |
| 145 | 2.434    | 2.412     | 2.411     | 2.410     | 2.436     | 2.372     | 2.425     |
| 150 | 2.743    | 2.766     | 2.787     | 2.742     | 2.724     | 2.772     | 2.689     |
| 155 | 3.053    | 3.031     | 3.052     | 3.051     | 3.012     | 3.015     | 2.954     |
| 160 | 3.142    | 3.164     | 3.185     | 3.162     | 3.145     | 3.148     | 3.130     |
| 165 | 3.274    | 3.319     | 3.273     | 3.317     | 3.278     | 3.259     | 3.262     |
| 170 | 3.496    | 3.518     | 3.539     | 3.560     | 3.544     | 3.503     | 3.571     |
| 175 | 3.850    | 3.828     | 3.804     | 3.803     | 3.876     | 3.814     | 3.924     |
| 180 | 1.984    | 1.984     | 1.984     | 1.984     | 1.984     | 1.984     | 1.984     |

## Appendix A Product Photo



Picture 1



Picture 2

\*\*\*\*End of test report\*\*\*\*