



| <b>TEST REPORT</b><br><b>IEC 62471:2006 and EN 62471:2008</b><br><b>Photobiological safety of lamps and lamp systems</b>  |  |
|---|--|
| Report reference No .....   | RDG190429050-SF  |
| Compiled by (+ signature) .....   | Engineer: Phil Zhang <i>Phil Zhang</i>   |
| Approved by (+ signature) .....   | Project Engineer: Harrison Huang <i>Harrison Huang</i>   |
| Date of issue .....   | 2019-04-30   |
| Testing laboratory .....  | Bay Area Compliance Laboratories Corp. (Dongguan)  |
| Address .....   | No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China   |
| Testing location .....  | Same as above  |
| Applicant .....   | Guangzhou Tianxin Photoelectric Co., Ltd.  |
| Address .....   | #56 Magangling Shima Village Junhe Street Baiyun District Guangzhou P.R.China 510440   |
| Standard .....  | IEC 62471:2006<br>EN 62471:2008  |
| Test sample(s) received.....  | 2018-06-07   |
| Test in period.....   | 2018-06-11   |
| Procedure deviation .....   | N.A.   |
| Non-standard test method .....  | N.A.   |
| <p><b>Note:</b> The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the specific product described herein. It must not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).</p> |  |
| Type of test object .....   | Tunable White COB Series   |
| Trademark .....   | N.A.   |
| Model/type reference .....  | 1512SW   |
| Manufacturer.....   | Guangzhou Tianxin Photoelectric Co., Ltd.<br>#56 Magangling Shima Village Junhe Street Baiyun District<br>Guangzhou P.R.China 510440 |
| Rating .....  | Input: 34Vdc-37Vdc, 350mA  |
| Copy of marking plate:<br>None  |  |



**Test item particulars**

Tested lamp .....: Tunable White COB Series  
Tested lamp system .....: N.A

**Lamp classification group.....: Risk Group 1**

Lamp cap .....: N.A  
Bulb.....: N.A  
Rated of the lamp .....: See rating  
Furthermore marking on the lamp.....: N.A.  
Seasoning of lamps according EN standard .....: No seasoning  
Used measurement instrument.....: See appendix B for details  
Temperature by measurement.....: 25.5°C  
Information for safety use.....: N.A

**Possible test case verdicts:**

- test case does not apply to the test object.....:N(.A.)
- test object does meet the requirement.....:P(ass)
- test object does not meet the requirement.....:F(ail)

**General remarks:**

The test results presented in this report relate only to the object tested.  
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.  
"(See Enclosure #)" refers to additional information appended to the report.  
"(See appended table)" refers to a table appended to the report.  
Throughout this report a point is used as the decimal separator.  
List of test equipment must be kept on file and available for review.

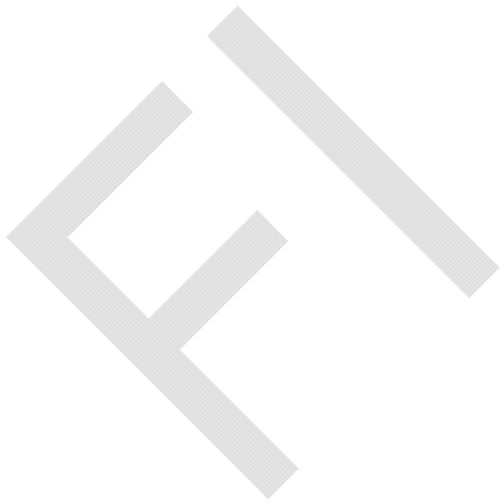
**Remark:**

- Appendix A - EUT photos**
- Appendix B - Test equipment list**

**General Product Information:**

"EUT" as referred in this report is Tunable White COB Series. Input: 34Vdc-37Vdc, 350mA.

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| IEC/EN 62471 |  |                   |         |
|--------------|--|-------------------|---------|
| Clause       | Requirement – Test   | Result - Remark   | Verdict |
|              | Operation of the test lamp shall be provided in accordance with:   |                   | P       |
|              | – the appropriate EN lamp standard, or   |                   | N       |
|              | – the manufacturer' s recommendation   |                   | P       |
| 5.1.5        | Lamp system operation  |                   | N       |
|              | The power source for operation of the test lamp shall be provided in accordance with:  |                   | N       |
|              | – the appropriate EN standard, or  |                   | N       |
|              | – the manufacturer' s recommendation   |                   | N       |
| 5.2          | Measurement procedure  |                   | P       |
| 5.2.1        | Irradiance measurements  |                   | P       |
|              | Minimum aperture diameter 7mm.   |                   | P       |
|              | Maximum aperture diameter 50 mm.   |                   | P       |
|              | The measurement shall be made in that position of the beam giving the maximum reading.   |                   | P       |
|              | The measurement instrument is adequate calibrated.   | See appendix B    | P       |
| 5.2.2        | Radiance measurements  |                   | P       |
| 5.2.2.1      | Standard method  |                   | P       |
|              | The measurements made with an optical system.  |                   | P       |
|              | The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument. |                   | P       |
| 5.2.2.2      | Alternative method   |                   | N       |
|              | Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.            |                   | N       |
| 5.2.3        | Measurement of source size   |                   | P       |
|              | The determination of $\alpha$ , the angle subtended by a source, requires the determination of the 50% emission points of the source.  | $\alpha = 0.0435$ | P       |
| 5.2.4        | Pulse width measurement for pulsed sources   |                   | N       |
|              | The determination of $\Delta t$ , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.                 |                   | N       |
| 5.3          | Analysis methods   |                   | P       |
| 5.3.1        | Weighting curve interpolations   |                   | N       |
|              | To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.                             |                   | N       |
| 5.3.2        | Calculations   |                   | P       |





| IEC/EN 62471 |   |                 |         |
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| Clause       | Requirement – Test  | Result - Remark | Verdict |
|              | This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose: |                 | N       |
|              | – an actinic ultraviolet hazard (ES) within 1000 s exposure, nor                                      |                 | N       |
|              | – a near ultraviolet hazard (EUVA) within 100 s, nor  |                 | N       |
|              | – a retinal blue-light hazard (LB) within 0,25 s (aversion response), nor                             |                 | N       |
|              | – a retinal thermal hazard (LR) within 0,25 s (aversion response), nor                                |                 | N       |

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| IEC/EN 62471 |                    |                 |         |
|--------------|--------------------|-----------------|---------|
| Clause       | Requirement – Test | Result - Remark | Verdict |

| Table 4.1                    |  | Spectral weighting function for assessing ultraviolet hazards for skin and eye |  | - |
|------------------------------|--|--|--|---|
| Wavelength <sup>1</sup> , nm | UV hazard function S <sub>uv</sub> ( ) | Wavelength, nm   | UV hazard function S <sub>uv</sub> ( ) |   |
| 200                          | 0,030                                  | 313*   | 0,006                                  |   |
| 205                          | 0,051                                  | 315  | 0,003                                  |   |
| 210                          | 0,075                                  | 316  | 0,0024                                 |   |
| 215                          | 0,095                                  | 317  | 0,0020                                 |   |
| 220                          | 0,120                                  | 318  | 0,0016                                 |   |
| 225                          | 0,150                                  | 319  | 0,0012                                 |   |
| 230                          | 0,190                                  | 320  | 0,0010                                 |   |
| 235                          | 0,240                                  | 322  | 0,00067                                |   |
| 240                          | 0,300                                  | 323  | 0,00054                                |   |
| 245                          | 0,360                                  | 325  | 0,00050                                |   |
| 250                          | 0,430                                  | 328  | 0,00044                                |   |
| 254*                         | 0,500                                  | 330  | 0,00041                                |   |
| 255                          | 0,520                                  | 333*   | 0,00037                                |   |
| 260                          | 0,650                                  | 335  | 0,00034                                |   |
| 265                          | 0,810                                  | 340  | 0,00028                                |   |
| 270                          | 1,000                                  | 345  | 0,00024                                |   |
| 275                          | 0,960                                  | 350  | 0,00020                                |   |
| 280*                         | 0,880                                  | 355  | 0,00016                                |   |
| 285                          | 0,770                                  | 360  | 0,00013                                |   |
| 290                          | 0,640                                  | 365*   | 0,00011                                |   |
| 295                          | 0,540                                  | 370  | 0,000093                               |   |
| 297*                         | 0,460                                  | 375  | 0,000077                               |   |
| 300                          | 0,300                                  | 380  | 0,000064                               |   |
| 303*                         | 0,120                                  | 385  | 0,000053                               |   |
| 305                          | 0,060                                  | 390  | 0,000044                               |   |
| 308                          | 0,026                                  | 395  | 0,000036                               |   |
| 310                          | 0,015                                  | 400  | 0,000030                               |   |

<sup>1</sup> Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.

\* Emission lines of a mercury discharge spectrum.

| IEC/EN 62471 |                    |                 |         |
|--------------|--------------------|-----------------|---------|
| Clause       | Requirement – Test | Result - Remark | Verdict |

| Table 4.2        | Spectral weighting functions for assessing retinal hazards from broadband optical sources |                                     | - |
|------------------|---|-------------------------------------|---|
| Wavelength<br>nm | Blue-light hazard function<br>B( )  | Burn hazard function<br>R( )        |   |
| 300              | 0,01  | -                                   |   |
| 305              | 0,01  | -                                   |   |
| 310              | 0,01  | -                                   |   |
| 315              | 0,01  | -                                   |   |
| 320              | 0,01  | -                                   |   |
| 325              | 0,01  | -                                   |   |
| 330              | 0,01  | -                                   |   |
| 335              | 0,01  | -                                   |   |
| 340              | 0,01  | -                                   |   |
| 345              | 0,01  | -                                   |   |
| 350              | 0,01  | -                                   |   |
| 355              | 0,01  | -                                   |   |
| 360              | 0,01  | -                                   |   |
| 365              | 0,01  | -                                   |   |
| 370              | 0,01  | -                                   |   |
| 375              | 0,01  | -                                   |   |
| 380              | 0,01  | 0,1                                 |   |
| 385              | 0,013   | 0,13                                |   |
| 390              | 0,025   | 0,25                                |   |
| 395              | 0,05  | 0,5                                 |   |
| 400              | 0,10  | 1,0                                 |   |
| 405              | 0,20  | 2,0                                 |   |
| 410              | 0,40  | 4,0                                 |   |
| 415              | 0,80  | 8,0                                 |   |
| 420              | 0,90  | 9,0                                 |   |
| 425              | 0,95  | 9,5                                 |   |
| 430              | 0,98  | 9,8                                 |   |
| 435              | 1,00  | 10,0                                |   |
| 440              | 1,00  | 10,0                                |   |
| 445              | 0,97  | 9,7                                 |   |
| 450              | 0,94  | 9,4                                 |   |
| 455              | 0,90  | 9,0                                 |   |
| 460              | 0,80  | 8,0                                 |   |
| 465              | 0,70  | 7,0                                 |   |
| 470              | 0,62  | 6,2                                 |   |
| 475              | 0,55  | 5,5                                 |   |
| 480              | 0,45  | 4,5                                 |   |
| 485              | 0,40  | 4,0                                 |   |
| 490              | 0,22  | 2,2                                 |   |
| 495              | 0,16  | 1,6                                 |   |
| 500-600          | $10^{[(450-\lambda)/50]}$   | 1,0                                 |   |
| 600-700          | 0,001   | 1,0                                 |   |
| 700-1050         | 0,013   | $10^{[(700-\lambda)/500]}$          |   |
| 1050-1150        | 0,025   | 0,2                                 |   |
| 1150-1200        | 0,05  | $0,2 \cdot 100,02^{(1150-\lambda)}$ |   |
| 1200-1400        | 0,10  | 0,02                                |   |

\* Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.

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| IEC/EN 62471 |                    |                 |         |
|--------------|--------------------|-----------------|---------|
| Clause       | Requirement – Test | Result - Remark | Verdict |

For IEC 62471:

|           |  |  |   |
|-----------|--|--|---|
| Table 6.1 | Emission limits for risk groups of continuous wave lamps |  | P |
| Risk      |  |  |   |

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| IEC/EN 62471 |                    |                 |         |
|--------------|--------------------|-----------------|---------|
| Clause       | Requirement – Test | Result - Remark | Verdict |

For EN 62471:

| Table 6.1                               | Emission limits for risk groups of continuous wave lamps based on Directive(2006/25/EC) |                                     |                  |  |        |  |                      |  | P      |
|---|---|-------------------------------------|------------------|--|--------|--|----------------------|--|--------|
| Risk                                    | Action spectrum   | Units                               | Symbol           | Exempt                                 |        | Low risk                               |                      | Mod risk                               |        |
|   |   |                                     |                  | Limit                                  | Result | Limit                                  | Result               | Limit                                  | Result |
| Actinic UV                              | Suv( $\lambda$ )  | W.m <sup>-2</sup>                   | E <sub>S</sub>   | 0.001                                  | -      | 0.003                                  | 4.3x10 <sup>-4</sup> | 0.03                                   | -      |
| Near UV                                 |   | W.m <sup>-2</sup>                   | E <sub>UVA</sub> | 0.33                                   | -      | 33                                     | 1.3x10 <sup>-3</sup> | 100                                    | -      |
| Blue light                              | B( $\lambda$ )  | W.m <sup>-2</sup> .sr <sup>-1</sup> | L <sub>B</sub>   | 100                                    | -      | 10000                                  | 8.63x10 <sup>3</sup> | 4000000                                | -      |
| Blue light,small source                 | B( $\lambda$ )  | W.m <sup>-2</sup>                   | E <sub>B</sub>   | 0.01                                   | -      | 1.0                                    | -                    | 400                                    | -      |
| Retinal thermal                         | R( $\lambda$ )  | W.m <sup>-2</sup> .sr <sup>-1</sup> | L <sub>R</sub>   | 28000/ $\alpha$<br>( $\alpha=0.0435$ ) | -      | 28000/ $\alpha$<br>( $\alpha=0.0435$ ) | 1.1x10 <sup>5</sup>  | 71000/ $\alpha$<br>( $\alpha=0.0435$ ) | -      |
| Retinal thermal, Weak visual stimulus** | R( $\lambda$ )  | W.m <sup>-2</sup> .sr <sup>-1</sup> | L <sub>IR</sub>  | 6000/ $\alpha$<br>( $\alpha=0.0435$ )  | -      | 6000/ $\alpha$<br>( $\alpha=0.0435$ )  | 4.7 x10 <sup>1</sup> | 6000/ $\alpha$<br>( $\alpha=0.0435$ )  | -      |
| IR radiation Eye                        |   | W.m <sup>-2</sup>                   | E <sub>IR</sub>  | 100                                    | -      | 570                                    | 4.4                  | 3200                                   | -      |

\* Small source defined as one with  $\alpha < 0,011$  radian. Averaging field of view at 10000 s is 0,1 radian.

\*\* Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2

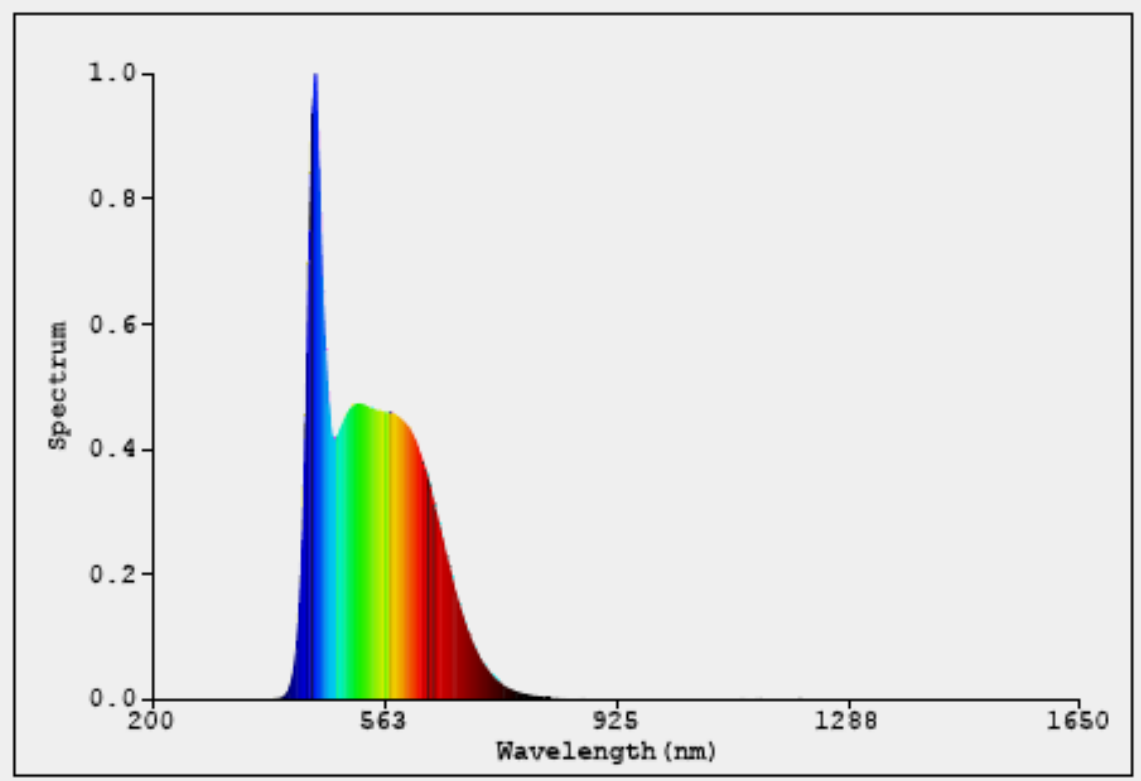
The applicance apertuer diameters: see 4.2.1

The limitations for the angular subtenses: see 4.2.2

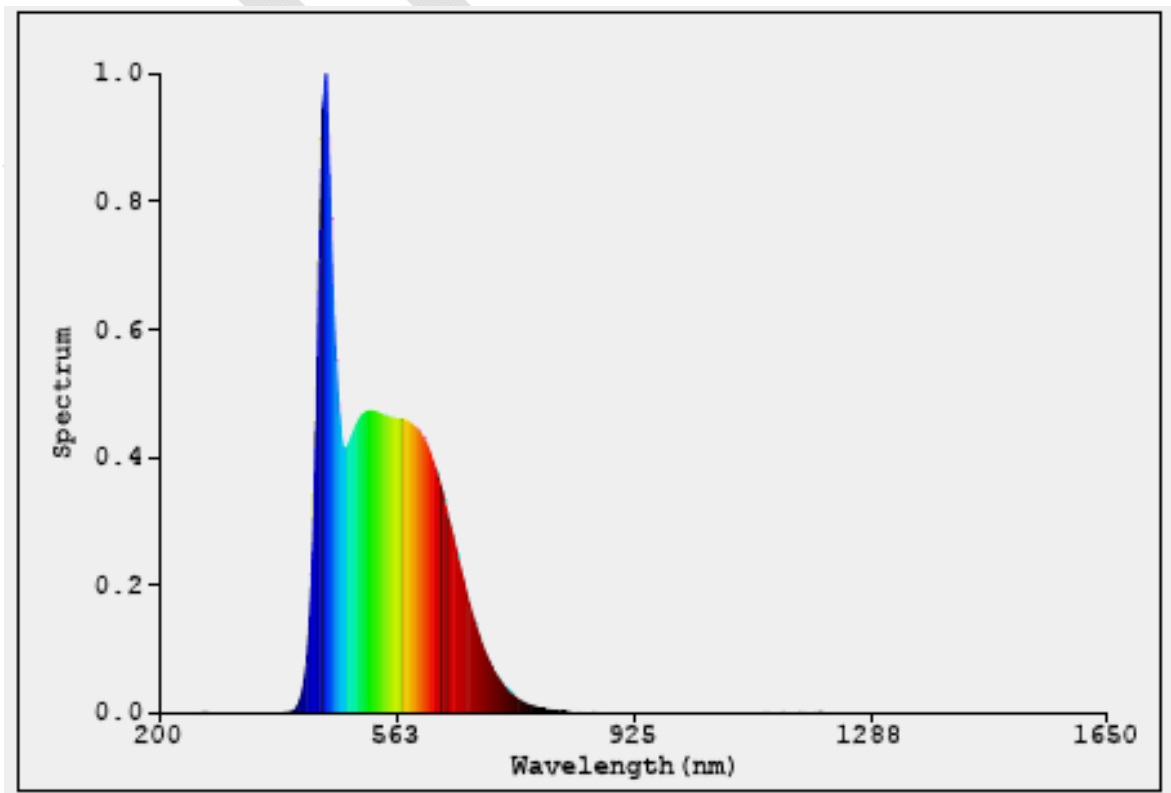
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5

### Figure of Spectral distribution

For IEC 62471

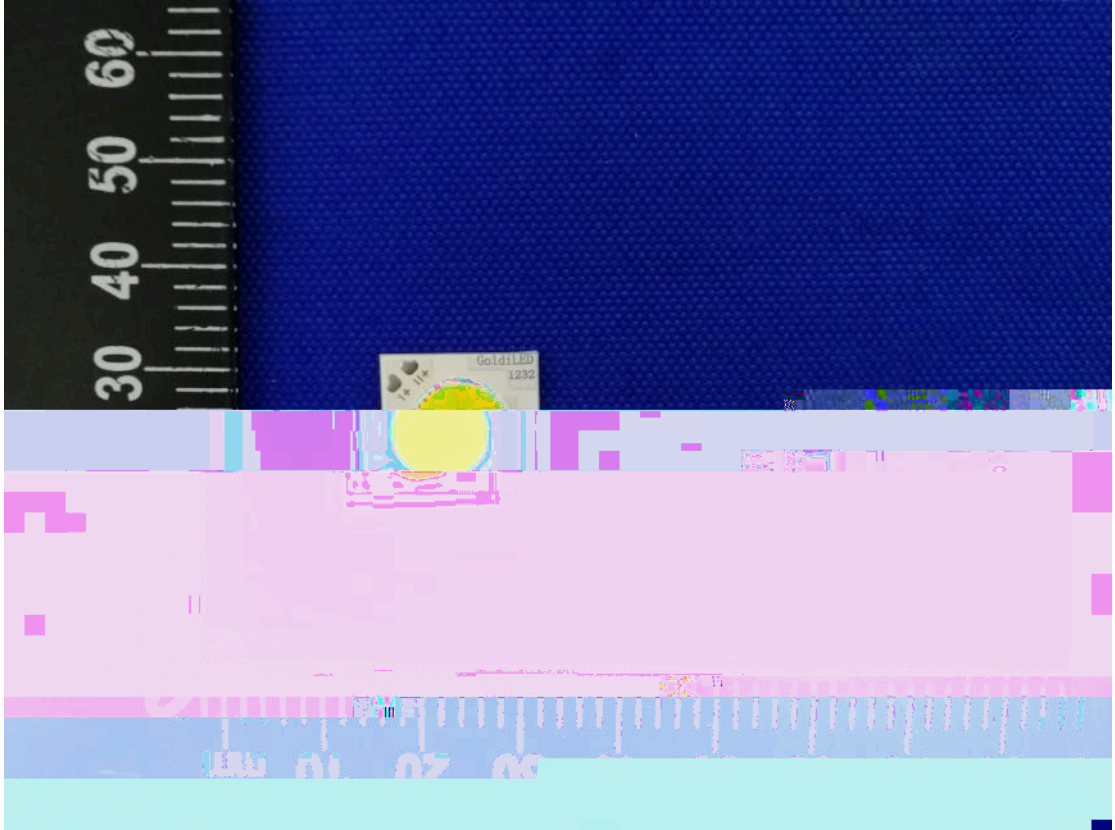


For EN 62471



## Appendix A - EUT Photos

The overall view of EUT





Report No.: RDG190429050-SF

## Appendix B - Test equipment list

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| Equipment Description | Model No | BACL# | Manufacturer | Last Cal | Cal Due |
|-----------------------|----------|-------|--------------|----------|---------|
|-----------------------|----------|-------|--------------|----------|---------|

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