

| <b>TEST REPORT</b><br><b>IEC TR 62778</b><br><b>Application of IEC TR 62778 for the assessment of blue light hazard to light sources and luminaires</b>  |  |
|--|--|
| Report reference No .....  | RXM190516051-SF  |
| Compiled by (+ signature) .....  | Test Engineer: Zero Gao <i>Zero Gao</i>                                      |
| Approved by (+ signature) .....  | Project Engineer: Harrison Huang <i>Harrison Huang</i>                       |
| Date of issue .....  | 2019-05-21   |
| 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 .....  | Bridgelux Inc.   |
| Address .....  | 46430 Fremont Boulevard, Fremont CA 94538 USA                                |
| Standard .....   | IEC TR 62778:2014  |
| Test sample(s) received.....   | 2019-05-17   |
| Test in period.....  | 2019-05-18   |
| Procedure deviation .....  | N.A.   |
| Non-standard test method .....   | N.A.   |
| <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). |  |
| Type of test object .....  | BXKC Series COB  |
| Trademark .....  | Bridgelux.   |
| Model/type reference .....   | BXKC-***080* *-1*, BXKC-***150* *-1*   |
| Manufacturer.....  | Bridgelux Inc.<br>46430 Fremont Boulevard, Fremont CA 94538 USA              |
| Rating .....   | Refer to " <b>General Product Information</b> " for details.                 |
| Copy of marking plate:   | None   |

|   |  |
|---|--|
| <b>Test item particulars</b> .....  |  |
| <b>Product evaluated</b> .....  | <input checked="" type="checkbox"/> LED package<br><input type="checkbox"/> LED module<br><input type="checkbox"/> Lamp<br><input type="checkbox"/> Luminaire      |
| <b>Rated voltage (V)</b> .....  | See rating   |
| <b>Rated current (mA)</b> .....   | See rating   |
| <b>Rated Luminance (Mcd/m<sup>2</sup>)</b> .....  | Not specified  |
| <b>Component report data used</b> .....   | <input checked="" type="checkbox"/> Not applicable<br><input type="checkbox"/> LED package<br><input type="checkbox"/> LED module<br><input type="checkbox"/> Lamp |
| <b>Possible test case verdicts:</b>   |  |
| -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)  |  |
| <b>General remarks:</b>   |  |
| <p>The test results presented in this report relate only to the object tested.<br/>         This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.<br/>         "(See Enclosure #)" refers to additional information appended to the report.<br/>         "(See appended table)" refers to a table appended to the report.<br/>         Throughout this report a point is used as the decimal separator.<br/>         List of test equipment must be kept on file and available for review.</p> <p><b>Remark:</b><br/>         This report consists of 9 pages and following appendixes:<br/>         Appendix A EUT photos<br/>         Appendix B Test equipment list</p> |  |

**General product information:**

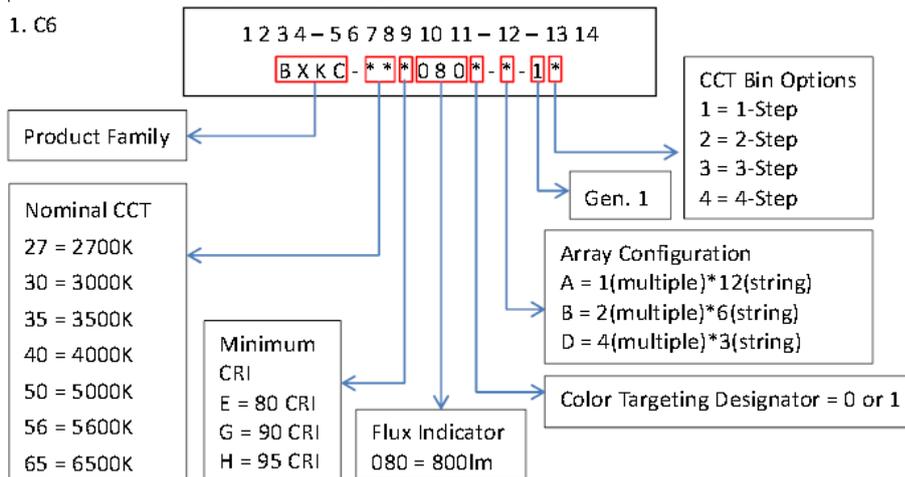
"EUT" as referred in this report are BXKC Series COB.

1. The difference of BXKC-\*\*\*080\* \*-1\* series are input rating, CCT and CRI. Specific information shown as below:

**Product Nomenclature**

[The part number designation for Bridgelux E Series LED arrays is explained as follows:

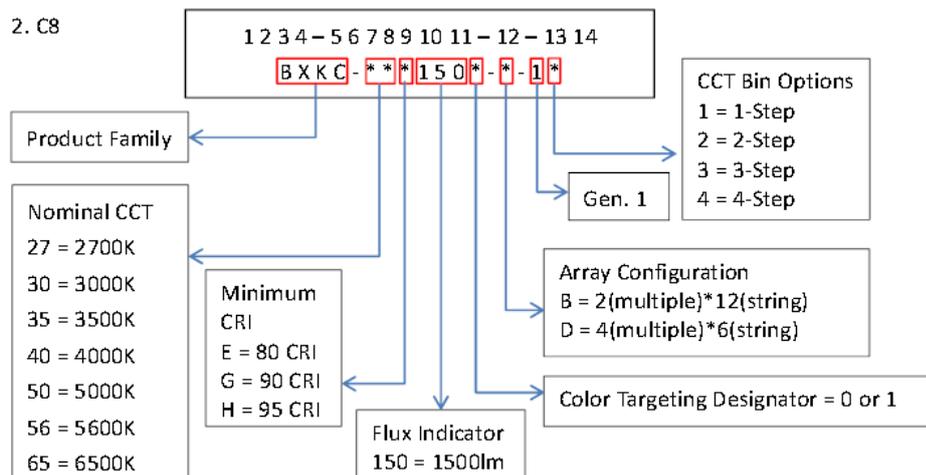
1. C6



| BXKC-***080* *-1* series | Input rating | Size                            |
|--------------------------|--------------|---------------------------------|
| BXKC-***080* -A-1*       | 36Vdc, 100mA | 13.35mm(L)*13.35mm(W)*1.54mm(H) |
| BXKC-***080* -B-1*       | 18Vdc, 200mA |                                 |
| BXKC-***080* -D-1*       | 9Vdc, 400mA  |                                 |

2. The difference of BXKC-\*\*\*150\* \*-1\* series are input rating, CCT and CRI. Specific information shown as below:

2. C8



| BXKC-***080* *-1* series | Input rating | Size                            |
|--------------------------|--------------|---------------------------------|
| BXKC-***150* -B-1*       | 36Vdc, 200mA | 15.85mm(L)*15.85mm(W)*1.54mm(H) |
| BXKC-***150* -D-1*       | 18Vdc, 400mA |                                 |

3. Unless otherwise specified, model **BXKC-65E0801-D-14** and **BXKC-65E1501-D-14** were chosen as the representative model No. to perform all tests.

| IEC TR 62778 |   |   |          |
|--------------|---|---|----------|
| Clause       | Requirement + Test  | Result - Remark                                   | Verdict  |
| <b>7</b>     | <b>MEASUREMENT INFORMATION FLOW</b>   |   | <b>P</b> |
| <b>7.1</b>   | <b>Basic flow</b>   |   | <b>P</b> |
|              | 'Law of conservation of luminance' applied  |   | P        |
|              | Use of only true luminance/radiance values  |   | P        |
|              | In case of luminaire:<br>The light source is operated in the luminaire under similar conditions as when tested as a component                                     |   | P        |
|              | In case $E_{thr}$ value for RG2 was established the peak value was derived from angular light distribution  |   | N        |
| <b>7.2</b>   | <b>Conditions for the radiance measurement</b>  |   | <b>P</b> |
|              | Standard condition applied<br>(200mm distance, 0,011rad field of view)  |   | P        |
|              | Non-standard condition applied  |   | N        |
| <b>7.3</b>   | <b>Special cases (I): Replacement by a lamp or LED module of another type</b>   |   | <b>N</b> |
|              | Light source is a white light source  |   | N        |
|              | Evaluation done based on highest luminance  |   | N        |
|              | Evaluation done based on CCT value  |   | N        |
| <b>7.4</b>   | <b>Special cases (II): Arrays and clusters of primary light sources</b>   |   | <b>N</b> |
|              | LED package is evaluated as ..... :<br><input type="checkbox"/> RG0 unlimited<br><input type="checkbox"/> RG1 unlimited<br><input type="checkbox"/> RG2 unlimited |   | N        |
|              | $E_{thr}$ of LED package applies to array   |   | N        |
| <b>8</b>     | <b>RISK GROUP CLASSIFICATION</b>  |   | <b>P</b> |
|              | Risk group achieved:  |   | P        |
|              | - .. Risk Group 0 unlimited   |   | N        |
|              | - .. Risk Group 1 unlimited   | For model BXKC-65E0801-D-14 and BXKC-65E1501-D-14 | P        |
|              | - Risk Group 2 unlimited  |   | N        |
|              | - $E_{thr}$ ..... (lx) :<br>Distance to reach RG1 .....(mm) :   |   | N        |

| IEC TR 62778 |  |   |          |
|--------------|--|---|----------|
| Clause       | Requirement + Test                           | Result - Remark   | Verdict  |
|              | <b>TABLE: Spectroradiometric measurement</b> |   | <b>P</b> |
|              | <b>Measurement performed on:</b>             | <input checked="" type="checkbox"/> LED package<br><input type="checkbox"/> LED module<br><input type="checkbox"/> Lamp<br><input type="checkbox"/> Luminaire | —        |
|              | <b>Model number</b> .....                    | For model BXKC-65E0801-D-14 and BXKC-65E1501-D-14   | —        |
|              | <b>Test voltage (V)</b> .....                | For model BXKC-65E0801-D-14: 9Vdc<br><br>For model BXKC-65E1501-D-14: 18Vdc   | —        |
|              | <b>Test current (mA)</b> .....               | For model BXKC-65E0801-D-14 and BXKC-65E1501-D-14: 400m A   | —        |
|              | <b>Test frequency (Hz)</b> .....             | --  | —        |
|              | <b>Ambient, t (°C)</b> .....                 | 25.0°C  | —        |
|              | <b>Measurement distance</b> .....            | <input checked="" type="checkbox"/> 20 cm<br><input type="checkbox"/> ... cm  | —        |
|              | <b>Source size</b> .....                     | <input checked="" type="checkbox"/> Non-small: For model BXKC-65E0801-D-14: 5.5mm<br>For model BXKC-65E1501-D-14: 7.8mm<br><input type="checkbox"/> Small: mm | —        |
|              | <b>Field of view</b> .....                   | <input type="checkbox"/> 100 mrad<br><input checked="" type="checkbox"/> 11 mrad<br><input type="checkbox"/> 1,7 mrad (for small sources)                     | —        |

| IEC TR 62778 |                    |                 |         |
|--------------|--------------------|-----------------|---------|
| Clause       | Requirement + Test | Result - Remark | Verdict |

For model BXKC-65E0801-D-14

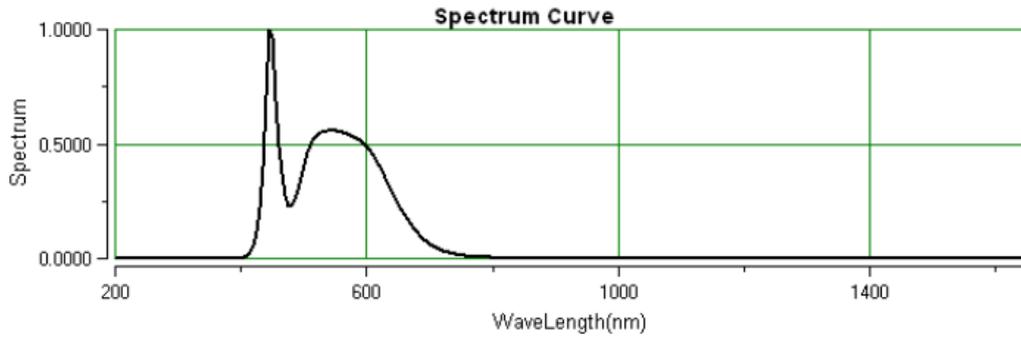
| Item                          | Symb<br>ol     | Units                                | Result                  | Remark |
|-------------------------------|----------------|--------------------------------------|-------------------------|--------|
| Correlated colour temperature | CCT            | K                                    | 5893                    | --     |
| x/y colour coordinates        | x/y            |                                      | 0.3235/0.3471           | --     |
| Blue light hazard radiance    | L <sub>B</sub> | W/(m <sup>2</sup> •sr <sup>1</sup> ) | 2616                    | --     |
| Blue light hazard irradiance  | E <sub>B</sub> | W/m <sup>2</sup>                     | --                      | --     |
| Luminance                     | L              | cd/m <sup>2</sup>                    | 3.451 x 10 <sup>6</sup> | --     |
| Illuminance                   | E              | lx                                   | 2886                    | --     |
| Supplementary information: NA |                |                                      |                         |        |

For model BXKC-65E1501-D-14

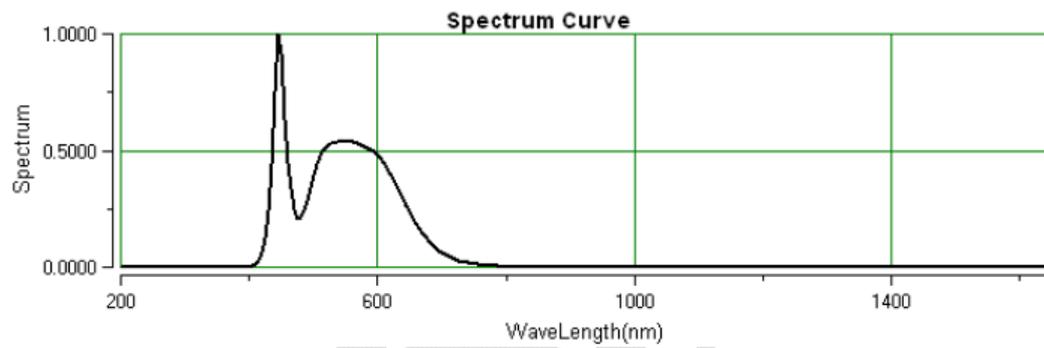
| Item                          | Symb<br>ol     | Units                                | Result                  | Remark |
|-------------------------------|----------------|--------------------------------------|-------------------------|--------|
| Correlated colour temperature | CCT            | K                                    | 5836                    | --     |
| x/y colour coordinates        | x/y            |                                      | 0.3248/0.3454           | --     |
| Blue light hazard radiance    | L <sub>B</sub> | W/(m <sup>2</sup> •sr <sup>1</sup> ) | 3268                    | --     |
| Blue light hazard irradiance  | E <sub>B</sub> | W/m <sup>2</sup>                     | --                      | --     |
| Luminance                     | L              | cd/m <sup>2</sup>                    | 4.257 x 10 <sup>6</sup> | --     |
| Illuminance                   | E              | lx                                   | 5784                    | --     |
| Supplementary information: NA |                |                                      |                         |        |

**TABLE: Angular light distribution**

For model BXKC-65E0801-D-14

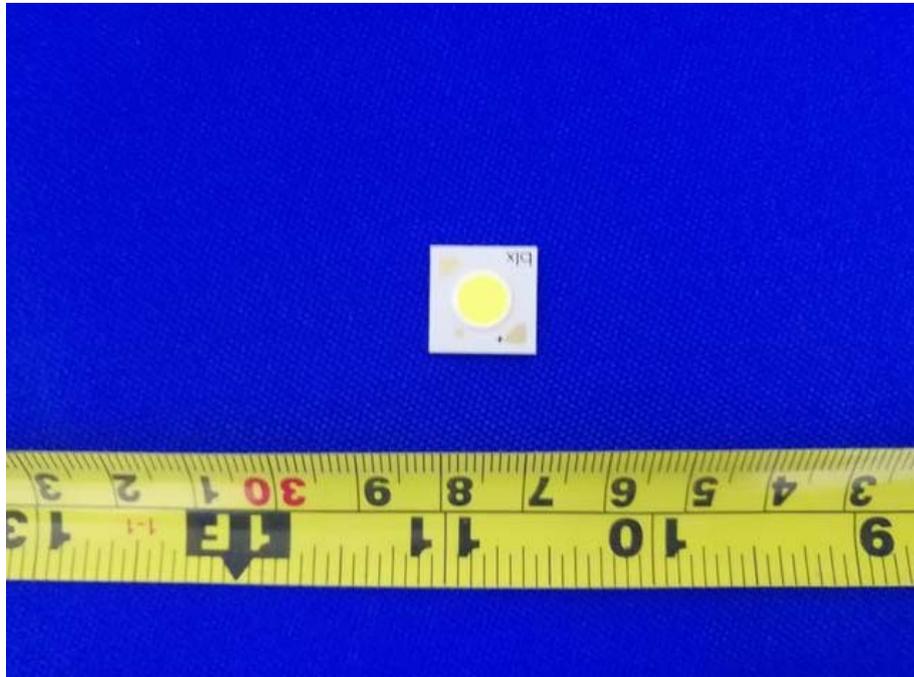


For model BXKC-65E1501-D-14

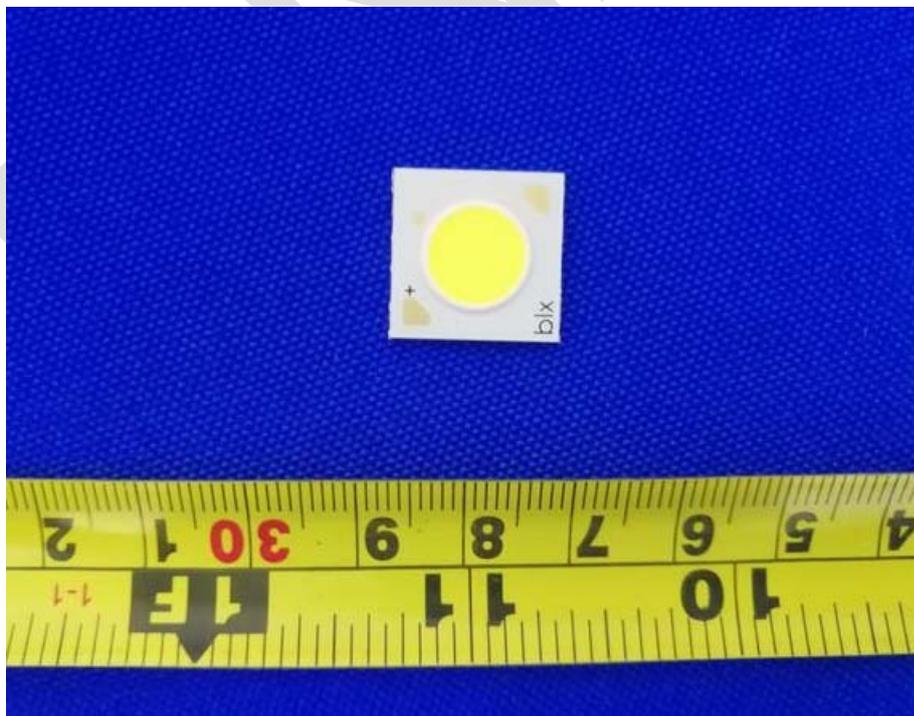


## Appendix A - EUT Photos

### 1. Overall view for model BXKC-65E0801-D-14



### 2. Overall view for model BXKC-65E1501-D-14



**Appendix B Test equipment list**

| <b>Equipment Description</b>         | <b>Model No</b> | <b>BACL#</b> | <b>Manufacturer</b> | <b>Last Cal</b> | <b>Cal Due</b> |
|--------------------------------------|-----------------|--------------|---------------------|-----------------|----------------|
| UV-VIS-near IR Spectrophotometer     | PMS-2000        | T-08-SF213   | EVERFINE            | 2018-09-03      | 2019-09-03     |
| Imaging luminance meter              | CX-2K           | T-08-SF213-1 | EVERFINE            | 2018-09-03      | 2019-09-03     |
| Radiation illuminance meter          | RD-2000         | T-08-SF213-2 | EVERFINE            | 2018-09-03      | 2019-09-03     |
| Radiation illuminance meter          | RD-2000         | T-08-SF213-3 | EVERFINE            | 2018-09-03      | 2019-09-03     |
| High Accuracy Array                  | HAAS-2000       | T-08-SF213-4 | EVERFINE            | 2018-09-03      | 2019-09-03     |
| 80mm sample integrating sphere       | SMS-300         | T-08-SF213-5 | EVERFINE            | 2018-09-03      | 2019-09-03     |
| Hygrothermograph                     | VC230           | T-08-QA015   | VICTOR              | 2019-03-17      | 2020-03-17     |
| Steel tape                           | 5m×19mm         | T-08-SF197   | B&Q                 | 2016-02-25      | 2021-02-23     |
| High power LED aging dc power supply | B12005          | T-08-SF205   | BACL                | 2019-03-26      | 2020-03-26     |
| AC power supply                      | HPA-1103        | F-08-SF129   | EVERFINE            | 2018-07-23      | 2019-07-23     |

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