



中国认可
国际互认
检测
TESTING
CNAS L6478



TEST REPORT

Reference No...... : WTX22F09185175N
Applicant..... : Guangzhou Tianxin photoelectric Co., Ltd.
Address..... : #15-1., Jingu Road South, Huadong Town, Huadu District, Guangzhou, China
Manufacturer : The same as above
Address..... : The same as above
Product Name..... : LED Chip
Model No...... : TX-5060RGBW
Test specification..... : ANSI/IES LM-80-15
Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules
Date of Receipt sample : 2021-05-18
Date of Test..... : 2021-05-18 to 2022-09-20
Date of Issue..... : 2022-09-20
Test Report Form No...... : WPL-LM8015A-01A
Test Result..... : **See following pages**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:

Waltek Testing Group (Foshan) Co., Ltd.

Address: No.13-19, 2/F., 2nd Building, Sunlink International Machinery City, Chencun, Shunde District, Foshan, Guangdong, China

Tel:+86-757-23811398 Fax:+86-757-23811381 E-mail:info@waltek.com.cn

Tested by:

Finn Yu

Approved by:

Akin Xu



1. Description of Test Samples

Sample Size:

Total 33 samples were selected in this test. The samples were numbered from A1 to A11, B12 to B22 and C23 to C33.

Part Type: LED Package
 Part Number: TX-5060RGBW
 Drive Level: DC 1500mA
 Nominal CCT: RGBW
 Power: 18.6W
 Average Current Density per LED die: 1500mA/mm²
 Average Power Density per LED die: 0.6823W/mm²
 CRI: /
 Die Spacing: 0.1mm

Family products covered by this report:

According to ENERGY STAR® Requirements for the Use of LM-80 Data, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of ENERGY STAR® Requirements for the Use of LM-80 Data (September 28, 2017)

This report covers the following models:

| Model Name | Current (mA) | Power (W) | CCT (K) | Number of dies | Driver Current per die (mA) | Current Density per die (mA/mm ²) | Power Density per PCB (W/mm ²) | Die Spacing (mm) |
|------------------------------|--------------|-----------|---------|----------------|-----------------------------|---|--|------------------|
| TX-5060RGBW | 1500 | 18.6 | RGBW | 4 | 1500 | 1500 | 0.6823 | 0.1 |
| TX-5060RGBW20FC120-NUVCNG- | 1500 | 18.6 | RGBW | 4 | 1500 | 1500 | 0.6823 | 0.1 |
| TX-5060RGBA20FC120-NUVCNG- | 1500 | 18.6 | RGBW | 4 | 1500 | 1500 | 0.6823 | 0.1 |
| TX-5060RGL20FC120-NUVCNG- | 1500 | 18.6 | RGBW | 4 | 1500 | 1500 | 0.6823 | 0.1 |
| TX-5060RGS20FC120-NUVCNG- | 1500 | 18.6 | RGBW | 4 | 1500 | 1500 | 0.6823 | 0.1 |
| TX-5060RGBW15FC120-NUVCNG-02 | 1000 | 12.4 | RGBW | 4 | 1000 | 1051 | 0.4549 | 0.1 |
| TX-5060RGS15FC120-NUVCNG- | 1000 | 12.4 | RGBW | 4 | 1000 | 1051 | 0.4549 | 0.1 |
| TX-5060RBY15FC120-NUVCNG- | 1000 | 12.4 | RGBW | 4 | 1000 | 1051 | 0.4549 | 0.1 |
| TX-5060RGBW12VCD1-NP4BG- | 1000 | 12.4 | RGBW | 4 | 1000 | 1051 | 0.4549 | 0.1 |



2. Standards Used

- IESNA LM-80-15: IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources
- CIE 127:2007: measurement of LEDs
- ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This method was not accredited by CNAS)
- IES TM-21-19: PROJECTING LONG-TERM LUMEN, PHOTON, AND RADIANT FLUX MAINTENANCE OF LED LIGHT SOURCES

3. Test Facility

The testing facility used by Waltek Testing Group (Foshan) Co., Ltd. is located at No. 13-19, 2/F, 2nd Building, Sunlink International Machinery City, Chencun Town, Shunde District, Foshan, Guangdong, China

4. Operating Cycle

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within $\pm 3\%$ of the specified value of the manufacturer during maintenance test, and was within $\pm 0.5\%$ during photometric and electrical measurement test.

5. Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} of the coldest LEDs were maintained at a temperature that was greater than or equal to $2^{\circ}C$ below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to $5^{\circ}C$ below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within $\pm 3\%$ of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to $25^{\circ}C \pm 2^{\circ}C$, RH <65%.

6. Photometric Measurement Method

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate $u'v'$. 2π measurement was used and sample was driven by DC power supply. The forward current was regulated to within $\pm 0.5\%$ of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to $25^{\circ}C \pm 2^{\circ}C$, RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

7. Measurement Uncertainty

The uncertainty of power meter DC current $U=0.08\%$ of rdg ($K=2$), multimeter DC current $U=0.20\%$ of rdg ($K=2$), at the 95% confidence level.

The uncertainty of the light output measurements is $U=1.8\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=20K$ ($K=2$), at the 95% confidence level.

The uncertainty of the temperature is $U=0.3^{\circ}C$ ($K=2$), at the 95% confidence level.



8. Decision Rules:

For the measurement parameters that need to be assessed for compliance, the measurement uncertainty should be fully considered. In order to avoid mis-judgment on whether the measurement results meet the requirements of the standard, the following decision rules should be used:

For measurements results with only the lower limit of tolerance interval:

- When $\eta_m \geq TI + U$, we directly determine the measurement result as PASS (P).
- When $\eta_m \leq TI - U$, we directly determine the measurement result as FAIL (F).
- When $TI - U \leq \eta_m \leq TI + U$, we determine the measurement result as UNCERTAIN (UC).

For measurements results with only the upper limit of tolerance interval:

- When $\eta_m \leq Tu - U$, we directly determine the measurement result as PASS (P).
- When $\eta_m \geq Tu + U$, we directly determine the measurement result as FAIL (F).
- When $Tu - U \leq \eta_m \leq Tu + U$, we determine the measurement result as UNCERTAIN (UC).

For measurements results with the lower and upper limit of tolerance interval:

- When $TI + U \leq \eta_m \leq Tu - U$, we directly determine the measurement result as PASS (P).
- When $\eta_m \leq TI - U$ and $\eta_m \geq Tu + U$, we directly determine the measurement result as FAIL (F).
- When $TI - U \leq \eta_m \leq TI + U$ and $Tu - U \leq \eta_m \leq Tu + U$ we determine the measurement result as UNCERTAIN (UC).

Here:

η_m : Measurement value

TI: Lower limit of tolerance interval

Tu: Upper limit of tolerance interval

U: Expanded uncertainty

9. Sample Set

Data Set 1: 55°C, 1500mA

| | |
|--------------------------------------|--------------------------|
| Part Number: | TX-5060RGBW |
| Number of Units: | 11 |
| Actual Case Temperature(T_S): | $T_S > 53^\circ\text{C}$ |
| Actual Ambient Temperature(T_A): | $T_A > 50^\circ\text{C}$ |
| Life Test Drive Current: | $I_F = 1500\text{mA}$ |
| Measurement Current: | $I_F = 1500\text{mA}$ |

Data Set 2: 85°C, 1500mA

| | |
|--------------------------------------|--------------------------|
| Part Number: | TX-5060RGBW |
| Number of Units: | 11 |
| Actual Case Temperature(T_S): | $T_S > 83^\circ\text{C}$ |
| Actual Ambient Temperature(T_A): | $T_A > 80^\circ\text{C}$ |
| Life Test Drive Current: | $I_F = 1500\text{mA}$ |
| Measurement Current: | $I_F = 1500\text{mA}$ |

Data Set 3: 105°C, 1500mA

| | |
|--------------------------------------|---------------------------|
| Part Number: | TX-5060RGBW |
| Number of Units: | 11 |
| Actual Case Temperature(T_S): | $T_S > 103^\circ\text{C}$ |
| Actual Ambient Temperature(T_A): | $T_A > 100^\circ\text{C}$ |
| Life Test Drive Current: | $I_F = 1500\text{mA}$ |
| Measurement Current: | $I_F = 1500\text{mA}$ |



10. Summary of Test Result

| Data Set | Sample Size | Failures Observed | Test Interval | Test Duration | α | β | TM-21 Lifetime | |
|----------|-------------|-------------------|---------------|---------------|------------|---------|-----------------|-----------------|
| | | | | | | | L ₇₀ | L ₉₀ |
| 1 | 25 | 0 | 1000h | 10000h | 2.8289E-06 | 1.0063 | >55000h | 39000h |
| 2 | 25 | 0 | 1000h | 10000h | 3.2401E-06 | 1.0051 | >55000h | 34000h |
| 3 | 25 | 0 | 1000h | 10000h | 4.3619E-06 | 0.9997 | >55000h | 24000h |

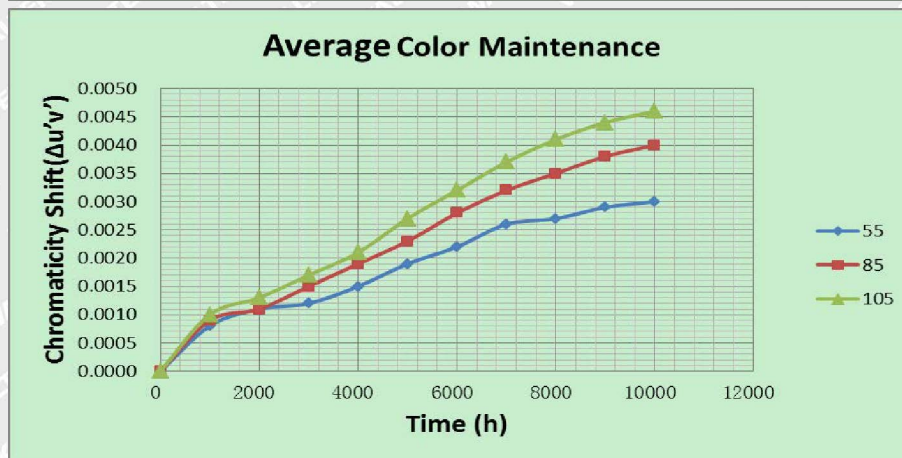
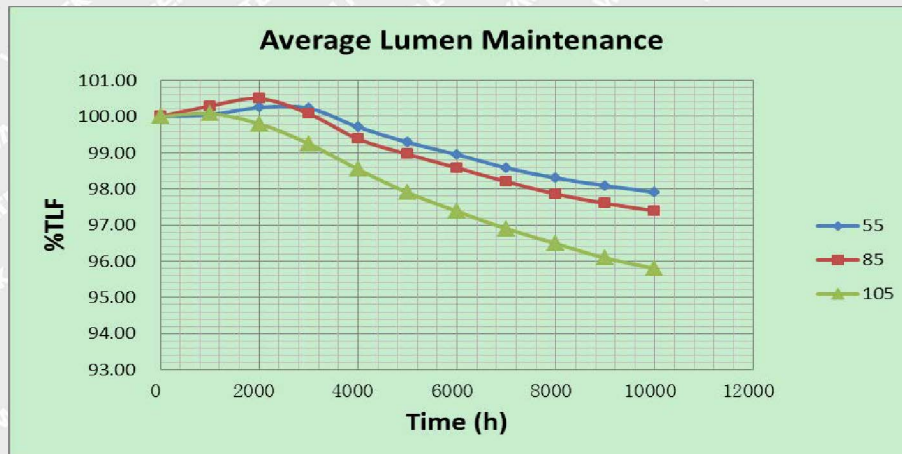
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

| Data Set | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
|----------|--------|--------|--------|-------|-------|-------|-------|-------|-------|--------|
| 1 | 100.05 | 100.25 | 100.23 | 99.71 | 99.29 | 98.95 | 98.58 | 98.30 | 98.09 | 97.91 |
| 2 | 100.29 | 100.50 | 100.08 | 99.38 | 98.96 | 98.58 | 98.20 | 97.86 | 97.60 | 97.39 |
| 3 | 100.08 | 99.80 | 99.25 | 98.54 | 97.90 | 97.38 | 96.90 | 96.49 | 96.09 | 95.80 |

Average Chromaticity Shift

| Data Set | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1 | 0.0008 | 0.0011 | 0.0012 | 0.0015 | 0.0019 | 0.0022 | 0.0026 | 0.0027 | 0.0029 | 0.0030 |
| 2 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0028 | 0.0032 | 0.0035 | 0.0038 | 0.0040 |
| 3 | 0.0010 | 0.0013 | 0.0017 | 0.0021 | 0.0027 | 0.0032 | 0.0037 | 0.0041 | 0.0044 | 0.0046 |

Average Lumen Maintenance and Chromaticity Shift VS. Time





Appendix: Data sheet

| Data Set 1, 55°C, 1500mA (Lumen Maintenance) | | | | | | | | | | | |
|--|---------------|-----------------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| S/N | TLF(lm) | Lumen Maintenance (%) | | | | | | | | | |
| | Initial(0hr) | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| A01 | 675.34 | 99.61 | 99.82 | 99.77 | 99.19 | 98.83 | 98.39 | 97.91 | 97.75 | 97.50 | 97.33 |
| A02 | 720.01 | 99.96 | 100.25 | 100.25 | 99.61 | 99.28 | 98.99 | 98.70 | 98.48 | 98.24 | 98.00 |
| A03 | 682.48 | 100.19 | 100.29 | 100.27 | 99.70 | 99.09 | 98.78 | 98.40 | 98.18 | 97.96 | 97.80 |
| A04 | 697.39 | 100.18 | 100.29 | 100.42 | 99.90 | 99.40 | 99.06 | 98.71 | 98.40 | 98.17 | 98.00 |
| A05 | 715.47 | 100.00 | 100.10 | 100.12 | 99.60 | 99.14 | 98.87 | 98.66 | 98.36 | 98.17 | 98.00 |
| A06 | 697.14 | 100.31 | 100.52 | 100.53 | 100.05 | 99.67 | 99.47 | 98.99 | 98.63 | 98.39 | 98.22 |
| A07 | 698.30 | 99.90 | 100.14 | 100.05 | 99.44 | 98.97 | 98.56 | 98.22 | 97.93 | 97.87 | 97.71 |
| A08 | 681.51 | 100.39 | 100.66 | 100.79 | 100.38 | 99.86 | 99.47 | 99.13 | 98.74 | 98.56 | 98.47 |
| A09 | 707.55 | 99.84 | 100.17 | 100.03 | 99.43 | 99.09 | 98.65 | 98.22 | 97.88 | 97.66 | 97.44 |
| A10 | 689.96 | 100.48 | 100.70 | 100.62 | 100.23 | 99.90 | 99.60 | 99.10 | 98.89 | 98.62 | 98.40 |
| A11 | 678.57 | 99.71 | 99.82 | 99.71 | 99.26 | 98.91 | 98.60 | 98.35 | 98.06 | 97.84 | 97.61 |
| Ave. | 694.88 | 100.05 | 100.25 | 100.23 | 99.71 | 99.29 | 98.95 | 98.58 | 98.30 | 98.09 | 97.91 |
| Max | 720.01 | 100.48 | 100.70 | 100.79 | 100.38 | 99.90 | 99.60 | 99.13 | 98.89 | 98.62 | 98.47 |
| Min | 675.34 | 99.61 | 99.82 | 99.71 | 99.19 | 98.83 | 98.39 | 97.91 | 97.75 | 97.50 | 97.33 |
| Med | 697.14 | 100.00 | 100.25 | 100.25 | 99.61 | 99.14 | 98.87 | 98.66 | 98.36 | 98.17 | 98.00 |
| Std.dev | 14.28 | 0.27 | 0.28 | 0.32 | 0.37 | 0.36 | 0.39 | 0.38 | 0.35 | 0.34 | 0.35 |

| Data Set 1, 55°C, 1500mA (Chromaticity Shift $\Delta u'v'$) | | | | | | | | | | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| S/N | Initial(0hr) | | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| | CIE u' | CIE v' | | | | | | | | | | |
| A01 | 0.2003 | 0.3674 | 0.0009 | 0.0012 | 0.0013 | 0.0017 | 0.0021 | 0.0024 | 0.0027 | 0.0029 | 0.0031 | 0.0032 |
| A02 | 0.2031 | 0.3680 | 0.0007 | 0.0010 | 0.0011 | 0.0014 | 0.0017 | 0.0021 | 0.0025 | 0.0026 | 0.0028 | 0.0028 |
| A03 | 0.2001 | 0.3664 | 0.0009 | 0.0013 | 0.0014 | 0.0017 | 0.0022 | 0.0025 | 0.0027 | 0.0029 | 0.0031 | 0.0032 |
| A04 | 0.2001 | 0.3668 | 0.0008 | 0.0010 | 0.0012 | 0.0015 | 0.0018 | 0.0022 | 0.0024 | 0.0025 | 0.0027 | 0.0027 |
| A05 | 0.2004 | 0.3663 | 0.0007 | 0.0009 | 0.0011 | 0.0015 | 0.0018 | 0.0021 | 0.0024 | 0.0027 | 0.0029 | 0.0029 |
| A06 | 0.2030 | 0.3682 | 0.0009 | 0.0011 | 0.0012 | 0.0015 | 0.0018 | 0.0023 | 0.0027 | 0.0030 | 0.0031 | 0.0031 |
| A07 | 0.2003 | 0.3671 | 0.0009 | 0.0010 | 0.0010 | 0.0013 | 0.0017 | 0.0020 | 0.0023 | 0.0024 | 0.0026 | 0.0026 |
| A08 | 0.2031 | 0.3681 | 0.0007 | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0021 | 0.0024 | 0.0025 | 0.0028 | 0.0029 |
| A09 | 0.2005 | 0.3665 | 0.0007 | 0.0011 | 0.0012 | 0.0016 | 0.0020 | 0.0022 | 0.0025 | 0.0028 | 0.0029 | 0.0030 |
| A10 | 0.2002 | 0.3660 | 0.0006 | 0.0009 | 0.0010 | 0.0014 | 0.0018 | 0.0020 | 0.0024 | 0.0026 | 0.0028 | 0.0029 |
| A11 | 0.2001 | 0.3672 | 0.0009 | 0.0013 | 0.0015 | 0.0020 | 0.0023 | 0.0027 | 0.0031 | 0.0033 | 0.0035 | 0.0036 |
| Ave. | 0.2010 | 0.3671 | 0.0008 | 0.0011 | 0.0012 | 0.0015 | 0.0019 | 0.0022 | 0.0026 | 0.0027 | 0.0029 | 0.0030 |
| Max | 0.2031 | 0.3682 | 0.0009 | 0.0013 | 0.0015 | 0.0020 | 0.0023 | 0.0027 | 0.0031 | 0.0033 | 0.0035 | 0.0036 |
| Min | 0.2001 | 0.3660 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0024 | 0.0026 | 0.0026 |
| Med | 0.2003 | 0.3671 | 0.0008 | 0.0010 | 0.0012 | 0.0015 | 0.0018 | 0.0022 | 0.0025 | 0.0027 | 0.0029 | 0.0029 |
| Std.dev | 0.0013 | 0.0007 | 0.0001 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0003 | 0.0002 | 0.0003 |



| Data Set 1, 55°C, 1500mA (Forward Voltage) | | | | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| S/N | VF(V) | | | | | | | | | | |
| | Initial(0hr) | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| A01 | 18.09 | 18.10 | 18.12 | 18.11 | 18.09 | 18.08 | 18.05 | 18.04 | 18.02 | 18.01 | 17.99 |
| A02 | 18.41 | 18.42 | 18.44 | 18.42 | 18.40 | 18.39 | 18.37 | 18.36 | 18.34 | 18.32 | 18.31 |
| A03 | 18.21 | 18.23 | 18.25 | 18.24 | 18.22 | 18.19 | 18.17 | 18.15 | 18.13 | 18.12 | 18.11 |
| A04 | 18.43 | 18.44 | 18.45 | 18.43 | 18.42 | 18.41 | 18.38 | 18.36 | 18.34 | 18.32 | 18.30 |
| A05 | 18.35 | 18.38 | 18.39 | 18.38 | 18.36 | 18.33 | 18.30 | 18.29 | 18.28 | 18.27 | 18.26 |
| A06 | 18.07 | 18.08 | 18.10 | 18.08 | 18.06 | 18.05 | 18.02 | 18.01 | 18.00 | 17.99 | 17.97 |
| A07 | 18.10 | 18.12 | 18.14 | 18.12 | 18.10 | 18.08 | 18.06 | 18.05 | 18.03 | 18.02 | 18.00 |
| A08 | 18.13 | 18.14 | 18.16 | 18.14 | 18.11 | 18.10 | 18.08 | 18.05 | 18.02 | 18.01 | 17.99 |
| A09 | 18.25 | 18.28 | 18.29 | 18.27 | 18.26 | 18.25 | 18.23 | 18.22 | 18.20 | 18.18 | 18.17 |
| A10 | 18.35 | 18.37 | 18.38 | 18.37 | 18.35 | 18.33 | 18.31 | 18.30 | 18.29 | 18.28 | 18.26 |
| A11 | 18.10 | 18.12 | 18.13 | 18.11 | 18.08 | 18.07 | 18.05 | 18.03 | 18.02 | 18.01 | 18.00 |
| Ave. | 18.23 | 18.24 | 18.26 | 18.24 | 18.22 | 18.21 | 18.18 | 18.17 | 18.15 | 18.14 | 18.12 |
| Max | 18.43 | 18.44 | 18.45 | 18.43 | 18.42 | 18.41 | 18.38 | 18.36 | 18.34 | 18.32 | 18.31 |
| Min | 18.07 | 18.08 | 18.10 | 18.08 | 18.06 | 18.05 | 18.02 | 18.01 | 18.00 | 17.99 | 17.97 |
| Med | 18.21 | 18.23 | 18.25 | 18.24 | 18.22 | 18.19 | 18.17 | 18.15 | 18.13 | 18.12 | 18.11 |
| Std.dev | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |

| Data Set 2, 85°C, 1500mA (Lumen Maintenance) | | | | | | | | | | | |
|--|---------------|-----------------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| S/N | TLF(lm) | Lumen Maintenance (%) | | | | | | | | | |
| | Initial(0hr) | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| B01 | 708.42 | 100.09 | 100.26 | 99.93 | 99.30 | 98.93 | 98.43 | 98.22 | 97.98 | 97.75 | 97.62 |
| B02 | 685.66 | 100.01 | 100.06 | 99.65 | 98.83 | 98.32 | 97.85 | 97.56 | 97.30 | 96.92 | 96.80 |
| B03 | 721.49 | 100.45 | 100.78 | 100.55 | 99.92 | 99.48 | 98.99 | 98.50 | 98.22 | 97.87 | 97.54 |
| B04 | 693.87 | 100.14 | 100.29 | 99.71 | 99.09 | 98.67 | 98.44 | 98.08 | 97.53 | 97.18 | 96.96 |
| B05 | 703.64 | 100.14 | 100.25 | 99.67 | 98.87 | 98.44 | 98.08 | 97.62 | 97.17 | 96.98 | 96.88 |
| B06 | 678.32 | 100.27 | 100.55 | 100.13 | 99.36 | 98.84 | 98.45 | 98.09 | 97.88 | 97.71 | 97.44 |
| B07 | 676.07 | 100.48 | 100.65 | 100.27 | 99.62 | 99.40 | 98.99 | 98.56 | 98.28 | 97.97 | 97.74 |
| B08 | 693.55 | 100.52 | 100.79 | 100.49 | 99.71 | 99.17 | 98.63 | 98.27 | 97.85 | 97.56 | 97.41 |
| B09 | 685.77 | 100.30 | 100.45 | 99.95 | 99.35 | 98.91 | 98.58 | 98.06 | 97.71 | 97.52 | 97.32 |
| B10 | 695.64 | 100.57 | 100.84 | 100.43 | 99.77 | 99.40 | 99.23 | 98.92 | 98.49 | 98.34 | 98.11 |
| B11 | 720.57 | 100.25 | 100.60 | 100.10 | 99.40 | 99.05 | 98.76 | 98.32 | 98.01 | 97.76 | 97.52 |
| Ave. | 696.64 | 100.29 | 100.50 | 100.08 | 99.38 | 98.96 | 98.58 | 98.20 | 97.86 | 97.60 | 97.39 |
| Max | 721.49 | 100.57 | 100.84 | 100.55 | 99.92 | 99.48 | 99.23 | 98.92 | 98.49 | 98.34 | 98.11 |
| Min | 676.07 | 100.01 | 100.06 | 99.65 | 98.83 | 98.32 | 97.85 | 97.56 | 97.17 | 96.92 | 96.80 |
| Med | 693.87 | 100.27 | 100.55 | 100.10 | 99.36 | 98.93 | 98.58 | 98.22 | 97.88 | 97.71 | 97.44 |
| Std.dev | 14.75 | 0.18 | 0.25 | 0.31 | 0.34 | 0.37 | 0.39 | 0.38 | 0.39 | 0.41 | 0.37 |



| Data Set 1, 85°C, 1500mA (Chromaticity Shift $\Delta u'v'$) | | | | | | | | | | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| S/N | Initial(Ohr) | | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| | CIE u' | CIE v' | | | | | | | | | | |
| B01 | 0.2005 | 0.3672 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0029 | 0.0032 | 0.0035 | 0.0037 | 0.0039 |
| B02 | 0.2002 | 0.3661 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0022 | 0.0025 | 0.0028 | 0.0032 | 0.0034 | 0.0035 |
| B03 | 0.2003 | 0.3664 | 0.0010 | 0.0012 | 0.0014 | 0.0018 | 0.0022 | 0.0027 | 0.0031 | 0.0036 | 0.0039 | 0.0039 |
| B04 | 0.2031 | 0.3678 | 0.0012 | 0.0015 | 0.0018 | 0.0022 | 0.0027 | 0.0032 | 0.0035 | 0.0038 | 0.0041 | 0.0041 |
| B05 | 0.2030 | 0.3683 | 0.0011 | 0.0013 | 0.0017 | 0.0022 | 0.0027 | 0.0033 | 0.0039 | 0.0043 | 0.0046 | 0.0047 |
| B06 | 0.2001 | 0.3662 | 0.0006 | 0.0009 | 0.0014 | 0.0018 | 0.0022 | 0.0028 | 0.0031 | 0.0033 | 0.0035 | 0.0038 |
| B07 | 0.2033 | 0.3683 | 0.0011 | 0.0014 | 0.0016 | 0.0020 | 0.0023 | 0.0026 | 0.0031 | 0.0035 | 0.0037 | 0.0041 |
| B08 | 0.2005 | 0.3675 | 0.0009 | 0.0010 | 0.0015 | 0.0019 | 0.0023 | 0.0027 | 0.0032 | 0.0035 | 0.0038 | 0.0041 |
| B09 | 0.2000 | 0.3662 | 0.0009 | 0.0011 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0035 | 0.0036 | 0.0036 |
| B10 | 0.2032 | 0.3680 | 0.0006 | 0.0008 | 0.0012 | 0.0017 | 0.0023 | 0.0028 | 0.0031 | 0.0035 | 0.0037 | 0.0040 |
| B11 | 0.2002 | 0.3663 | 0.0007 | 0.0008 | 0.0011 | 0.0015 | 0.0018 | 0.0023 | 0.0027 | 0.0032 | 0.0035 | 0.0038 |
| Ave. | 0.2013 | 0.3671 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0028 | 0.0032 | 0.0035 | 0.0038 | 0.0040 |
| Max | 0.2033 | 0.3683 | 0.0012 | 0.0015 | 0.0018 | 0.0022 | 0.0027 | 0.0033 | 0.0039 | 0.0043 | 0.0046 | 0.0047 |
| Min | 0.2000 | 0.3661 | 0.0006 | 0.0008 | 0.0011 | 0.0015 | 0.0018 | 0.0023 | 0.0027 | 0.0032 | 0.0034 | 0.0035 |
| Med | 0.2005 | 0.3672 | 0.0009 | 0.0011 | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0031 | 0.0035 | 0.0037 | 0.0039 |
| Std.dev | 0.0014 | 0.0009 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |

| Data Set 1, 85°C, 1500mA (Forward Voltage) | | | | | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--|
| S/N | VF(V) | | | | | | | | | | | |
| | Initial(Ohr) | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h | |
| B01 | 18.16 | 18.17 | 18.18 | 18.15 | 18.12 | 18.09 | 18.06 | 18.04 | 18.02 | 17.99 | 17.98 | |
| B02 | 18.12 | 18.13 | 18.14 | 18.11 | 18.08 | 18.06 | 18.03 | 18.02 | 18.01 | 17.99 | 17.98 | |
| B03 | 18.41 | 18.42 | 18.43 | 18.41 | 18.39 | 18.37 | 18.34 | 18.32 | 18.30 | 18.28 | 18.26 | |
| B04 | 18.15 | 18.17 | 18.17 | 18.16 | 18.15 | 18.12 | 18.10 | 18.09 | 18.06 | 18.05 | 18.03 | |
| B05 | 18.42 | 18.44 | 18.44 | 18.41 | 18.38 | 18.36 | 18.33 | 18.31 | 18.28 | 18.26 | 18.25 | |
| B06 | 18.21 | 18.22 | 18.22 | 18.19 | 18.17 | 18.15 | 18.12 | 18.09 | 18.08 | 18.06 | 18.05 | |
| B07 | 18.13 | 18.14 | 18.14 | 18.12 | 18.09 | 18.06 | 18.03 | 18.02 | 17.99 | 17.97 | 17.96 | |
| B08 | 18.08 | 18.10 | 18.10 | 18.08 | 18.05 | 18.03 | 18.00 | 17.98 | 17.97 | 17.95 | 17.94 | |
| B09 | 18.40 | 18.42 | 18.43 | 18.41 | 18.38 | 18.35 | 18.32 | 18.29 | 18.27 | 18.24 | 18.23 | |
| B10 | 18.34 | 18.36 | 18.37 | 18.35 | 18.32 | 18.29 | 18.27 | 18.26 | 18.24 | 18.21 | 18.20 | |
| B11 | 18.41 | 18.42 | 18.42 | 18.40 | 18.37 | 18.35 | 18.32 | 18.31 | 18.29 | 18.27 | 18.26 | |
| Ave. | 18.26 | 18.27 | 18.28 | 18.25 | 18.23 | 18.20 | 18.17 | 18.16 | 18.14 | 18.12 | 18.10 | |
| Max | 18.42 | 18.44 | 18.44 | 18.41 | 18.39 | 18.37 | 18.34 | 18.32 | 18.30 | 18.28 | 18.26 | |
| Min | 18.08 | 18.10 | 18.10 | 18.08 | 18.05 | 18.03 | 18.00 | 17.98 | 17.97 | 17.95 | 17.94 | |
| Med | 18.21 | 18.22 | 18.22 | 18.19 | 18.17 | 18.15 | 18.12 | 18.09 | 18.08 | 18.06 | 18.05 | |
| Std.dev | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | |



| Data Set 1, 105°C, 1500mA (Lumen Maintenance) | | | | | | | | | | | |
|---|---------------|-----------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| S/N | TLF(lm) | Lumen Maintenance (%) | | | | | | | | | |
| | Initial(0hr) | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| C01 | 686.98 | 100.21 | 99.82 | 99.45 | 98.66 | 98.11 | 97.78 | 97.31 | 97.02 | 96.81 | 96.67 |
| C02 | 695.36 | 100.16 | 100.03 | 99.32 | 98.45 | 97.91 | 97.28 | 96.63 | 96.32 | 95.83 | 95.63 |
| C03 | 710.30 | 100.00 | 99.87 | 99.35 | 98.50 | 97.65 | 96.98 | 96.44 | 95.88 | 95.55 | 95.23 |
| C04 | 692.87 | 100.14 | 99.69 | 99.28 | 98.75 | 98.13 | 97.76 | 97.20 | 96.93 | 96.55 | 96.11 |
| C05 | 715.63 | 100.23 | 100.04 | 99.39 | 98.76 | 98.26 | 97.66 | 97.24 | 96.66 | 96.29 | 96.05 |
| C06 | 686.58 | 100.18 | 100.08 | 99.49 | 98.70 | 97.95 | 97.19 | 96.70 | 96.35 | 95.85 | 95.68 |
| C07 | 679.42 | 99.74 | 99.39 | 98.70 | 97.95 | 97.09 | 96.58 | 96.03 | 95.61 | 95.24 | 95.02 |
| C08 | 704.69 | 100.08 | 99.69 | 99.01 | 98.40 | 97.80 | 97.35 | 97.01 | 96.48 | 96.03 | 95.70 |
| C09 | 682.57 | 100.21 | 99.77 | 99.38 | 98.57 | 98.09 | 97.61 | 97.27 | 96.88 | 96.37 | 95.98 |
| C10 | 686.69 | 99.95 | 99.64 | 99.23 | 98.65 | 97.95 | 97.45 | 97.17 | 96.93 | 96.58 | 96.26 |
| C11 | 687.35 | 100.03 | 99.74 | 99.13 | 98.56 | 98.00 | 97.50 | 96.88 | 96.32 | 95.84 | 95.49 |
| Ave. | 693.49 | 100.08 | 99.80 | 99.25 | 98.54 | 97.90 | 97.38 | 96.90 | 96.49 | 96.09 | 95.80 |
| Max | 715.63 | 100.23 | 100.08 | 99.49 | 98.76 | 98.26 | 97.78 | 97.31 | 97.02 | 96.81 | 96.67 |
| Min | 679.42 | 99.74 | 99.39 | 98.70 | 97.95 | 97.09 | 96.58 | 96.03 | 95.61 | 95.24 | 95.02 |
| Med | 687.35 | 100.14 | 99.77 | 99.32 | 98.57 | 97.95 | 97.45 | 97.01 | 96.48 | 96.03 | 95.70 |
| Std.dev | 11.25 | 0.14 | 0.19 | 0.22 | 0.22 | 0.30 | 0.34 | 0.39 | 0.43 | 0.46 | 0.45 |

| Data Set 1, 105°C, 1500mA (Chromaticity Shift_Δu'v') | | | | | | | | | | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| S/N | Initial(0hr) | | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| | CIE u' | CIE v' | | | | | | | | | | |
| C01 | 0.2035 | 0.3680 | 0.0009 | 0.0011 | 0.0016 | 0.0021 | 0.0026 | 0.0030 | 0.0036 | 0.0040 | 0.0044 | 0.0046 |
| C02 | 0.2003 | 0.3664 | 0.0008 | 0.0012 | 0.0017 | 0.0021 | 0.0026 | 0.0030 | 0.0034 | 0.0038 | 0.0041 | 0.0045 |
| C03 | 0.2002 | 0.3662 | 0.0007 | 0.0011 | 0.0016 | 0.0020 | 0.0025 | 0.0032 | 0.0038 | 0.0040 | 0.0044 | 0.0047 |
| C04 | 0.2004 | 0.3670 | 0.0013 | 0.0016 | 0.0021 | 0.0024 | 0.0029 | 0.0036 | 0.0042 | 0.0045 | 0.0047 | 0.0048 |
| C05 | 0.2033 | 0.3681 | 0.0011 | 0.0014 | 0.0016 | 0.0019 | 0.0024 | 0.0029 | 0.0034 | 0.0037 | 0.0040 | 0.0043 |
| C06 | 0.2003 | 0.3670 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0029 | 0.0035 | 0.0040 | 0.0044 | 0.0048 | 0.0049 |
| C07 | 0.2001 | 0.3663 | 0.0012 | 0.0014 | 0.0019 | 0.0023 | 0.0029 | 0.0034 | 0.0039 | 0.0044 | 0.0047 | 0.0050 |
| C08 | 0.2032 | 0.3679 | 0.0012 | 0.0016 | 0.0019 | 0.0024 | 0.0029 | 0.0034 | 0.0039 | 0.0042 | 0.0045 | 0.0049 |
| C09 | 0.2001 | 0.3662 | 0.0008 | 0.0012 | 0.0015 | 0.0019 | 0.0025 | 0.0030 | 0.0034 | 0.0039 | 0.0041 | 0.0044 |
| C10 | 0.2003 | 0.3671 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0024 | 0.0030 | 0.0033 | 0.0037 | 0.0040 | 0.0043 |
| C11 | 0.2005 | 0.3660 | 0.0012 | 0.0015 | 0.0019 | 0.0023 | 0.0028 | 0.0035 | 0.0040 | 0.0042 | 0.0046 | 0.0047 |
| Ave. | 0.2011 | 0.3669 | 0.0010 | 0.0013 | 0.0017 | 0.0021 | 0.0027 | 0.0032 | 0.0037 | 0.0041 | 0.0044 | 0.0046 |
| Max | 0.2035 | 0.3681 | 0.0013 | 0.0016 | 0.0021 | 0.0024 | 0.0029 | 0.0036 | 0.0042 | 0.0045 | 0.0048 | 0.0050 |
| Min | 0.2001 | 0.3660 | 0.0007 | 0.0011 | 0.0014 | 0.0017 | 0.0024 | 0.0029 | 0.0033 | 0.0037 | 0.0040 | 0.0043 |
| Med | 0.2003 | 0.3670 | 0.0011 | 0.0014 | 0.0017 | 0.0021 | 0.0026 | 0.0032 | 0.0038 | 0.0040 | 0.0044 | 0.0047 |
| Std.dev | 0.0014 | 0.0007 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0003 | 0.0003 | 0.0003 | 0.0002 |



| Data Set 1, 105°C, 1500mA (Forward Voltage) | | | | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| S/N | VF(V) | | | | | | | | | | |
| | Initial(0hr) | 1000h | 2000h | 3000h | 4000h | 5000h | 6000h | 7000h | 8000h | 9000h | 10000h |
| C01 | 18.30 | 18.29 | 18.26 | 18.22 | 18.17 | 18.13 | 18.10 | 18.07 | 18.05 | 18.02 | 18.00 |
| C02 | 18.42 | 18.42 | 18.41 | 18.37 | 18.34 | 18.31 | 18.28 | 18.26 | 18.23 | 18.21 | 18.19 |
| C03 | 18.12 | 18.13 | 18.10 | 18.06 | 18.04 | 17.99 | 17.94 | 17.92 | 17.90 | 17.87 | 17.86 |
| C04 | 18.33 | 18.33 | 18.32 | 18.28 | 18.26 | 18.21 | 18.16 | 18.13 | 18.10 | 18.08 | 18.07 |
| C05 | 18.34 | 18.33 | 18.31 | 18.29 | 18.27 | 18.23 | 18.19 | 18.15 | 18.12 | 18.11 | 18.09 |
| C06 | 18.13 | 18.14 | 18.13 | 18.09 | 18.05 | 18.02 | 17.99 | 17.97 | 17.93 | 17.91 | 17.90 |
| C07 | 18.22 | 18.22 | 18.20 | 18.17 | 18.13 | 18.08 | 18.06 | 18.03 | 17.99 | 17.97 | 17.96 |
| C08 | 18.28 | 18.27 | 18.26 | 18.23 | 18.18 | 18.13 | 18.09 | 18.07 | 18.05 | 18.04 | 18.03 |
| C09 | 18.11 | 18.10 | 18.07 | 18.04 | 18.00 | 17.98 | 17.93 | 17.88 | 17.85 | 17.82 | 17.80 |
| C10 | 18.40 | 18.41 | 18.40 | 18.38 | 18.33 | 18.30 | 18.25 | 18.21 | 18.19 | 18.18 | 18.16 |
| C11 | 18.30 | 18.31 | 18.28 | 18.26 | 18.23 | 18.21 | 18.19 | 18.14 | 18.12 | 18.10 | 18.08 |
| Ave. | 18.27 | 18.27 | 18.25 | 18.22 | 18.18 | 18.14 | 18.11 | 18.08 | 18.05 | 18.03 | 18.01 |
| Max | 18.42 | 18.42 | 18.41 | 18.38 | 18.34 | 18.31 | 18.28 | 18.26 | 18.23 | 18.21 | 18.19 |
| Min | 18.11 | 18.10 | 18.07 | 18.04 | 18.00 | 17.98 | 17.93 | 17.88 | 17.85 | 17.82 | 17.80 |
| Med | 18.30 | 18.29 | 18.26 | 18.23 | 18.18 | 18.13 | 18.10 | 18.07 | 18.05 | 18.04 | 18.03 |
| Std.dev | 0.10 | 0.10 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 |

WALTEK

**Attachment 1: Equipment List**

| Equipment | Model/Type | Cal. Due. Date |
|---|-------------------------|-----------------------|
| DC power supply | EVERFINE WY305-V1 | 2023-01-11 |
| Digital Power Meter | EVERFINE PF2010A-V1 | 2023-01-11 |
| High accuracy array spectroradio meter | EVERFINE HAAS-2000 | 2023-01-11 |
| Integrating Sphere | EVERFINE R98&R80&0.3m | 2023-01-11 |
| Standard light source | EVERFINE D204 | 2023-01-11 |
| Standard light source | EVERFINE D062 | 2023-01-11 |
| Temperature & Humidity Datalogger | Testo 608-H1 | 2023-01-11 |
| AC power supply | EVERFINE DPS 1060 | 2023-01-11 |
| DC power supply | EVERFINE WY12010 | 2023-01-11 |
| Digital Power Meter | EVERFINE PF2010A-V1-CAN | 2023-01-11 |
| Digital power meter | YOKOGAWA WT310E | 2023-01-11 |
| LED accelerated aging and longevity test system | EVERFINE LT-200A | 2023-01-11 |
| Walk-in Environmental Test Lab | Dongzhixu BUL-50-26 | 2023-01-11 |
| Environmental Chamber | KSON THS-D4C-100 | 2023-01-11 |
| Multimeter | FLUKE 15B | 2023-01-11 |
| Temperature Recorder | YOKOGAWA DR231-00-33-1R | 2023-01-11 |



Attachment 2: Photo document

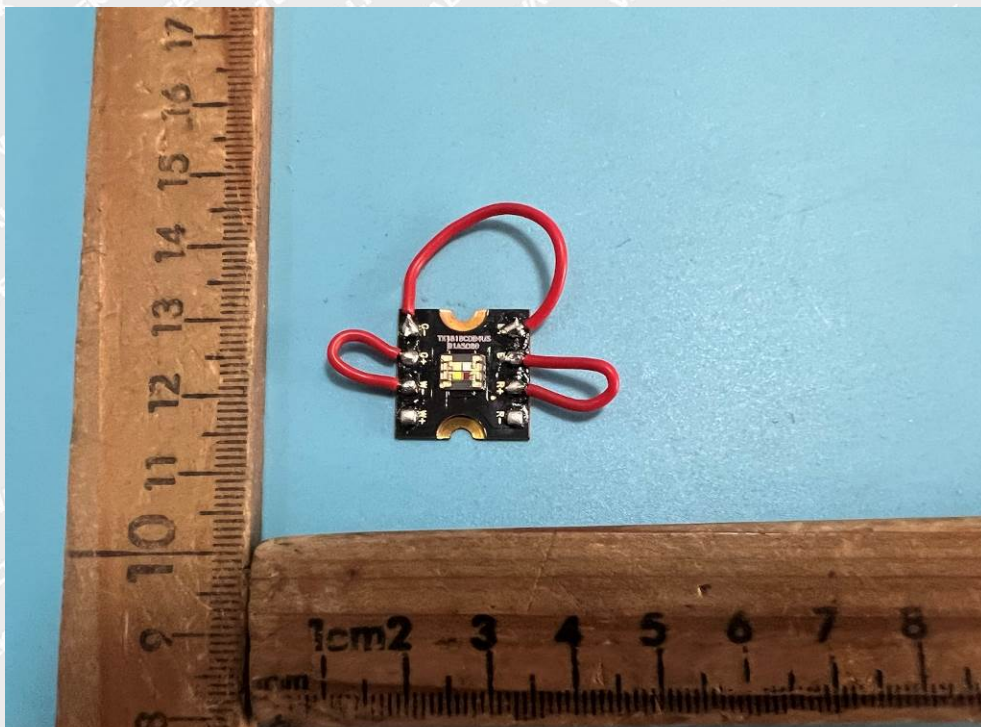


Photo 1



Photo 2

===== End of Report =====