



# IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

## MEASUREMENT AND TEST REPORT

For

**Shenzhen Refond Optoelectronic Co., Ltd.**

6<sup>th</sup> wing, 2<sup>nd</sup> block of Baiwangxin Industry Park, Songbai Road, Nanshan District, Shenzhen, China

**Model: RF-W2HI32DS-DF-N-Y**

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**Note:** The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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## 1 - GENERAL INFORMATION

### 1.1 Description of LED Light Sources

Devices tested

Part Number: RF-W2HI32DS-DF-N-Y  
 Part Type: LED Package  
 Nominal CCT: 2700K

Family products covered by this report:

According to ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, the following products can be covered by this report base on the declaration letter of manufacturer. The information of these models shows that the covered products meet all section 3 item 7 requirements of ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products (September 9, 2011)

Series name	Model name	CCT(K)	Current(mA)	Volt(V)
2835	RF- * * * * I32DS- * * - * N(-Y) (Test model: RF-W27HI32DS-DF-N-Y)	2700/3000/4000/ 5000/5700/6000/6500	60	3
2835	RT- * * * * I32DS- * * - * N(-Y)	2700/3000/4000/ 5000/5700/6000/6500	60	3

Model Number Format:

$$\frac{\text{RF}}{\text{A1}} - \frac{*}{\text{A2}} \frac{*}{\text{A3}} \frac{*}{\text{A4}} \frac{\text{I32DS}}{\text{A5}} - \frac{*}{\text{A6}} \frac{*}{\text{A7}} - \frac{* \text{N} (-\text{Y})}{\text{A8}}$$

Note:

A1: Letter RF can be RF or RT, It is an internal Market code which does not affect property;

A2: Letter \* represent customer name, it can be C, D, H, K, L, M, P, S, T, W, Y;

A3: Letter \*\* represent CCT, it can be 27, 30, 35, 40, 45, 50, 57, 60, 62, 65; \*\* don't mean only two numbers, it maybe also as mentioned 2, 3, 4, 5, 6, 7.

A4: Letter \* represent workshop code, it can be R, M, H, T or Q&S which does not affect product property;

A5: Letter I32DS is a fixed code;

A6: Letter \*\* can be BF, CF, DF, EF, FF or FH, it is an internal Market code which does not affect product property;

A7: Letter \*N can be 1N, 2N, 3N, it is an internal Market code which does not affect product property;

A8: A (-Y) on behalf of the centrifugal power equipment is not used. No (-Y) on behalf of using centrifugal power equipment

Disclaimer:

The truthfulness and accuracy of all the technical information above for the covered LED products is ensured by manufacturer of LED light source. Bay Area Compliance Laboratories Corp. (Dongguan) isn't responsible or gives any guarantees for the truthfulness of the technical information.

## 1.2 Standards Used:

- IESNA LM-80-08: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- ENERGY STAR® Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products(This test method was not accredited by IAS)

## 1.3 Test Facility

The testing facility used by Bay Area Compliance Laboratories Corp. (Dongguan). is located at No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

## 1.4 Description of Auxiliary Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-08
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-02
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-08
Standard Light Source	EVERFINE	D062	1011093	3000K	2017-09-13	2018-09-13
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ7321114	300VA	2017-03-03	2018-03-02
Multilayer aging machine	BACL	B2-270	20005	25 °C~130 °C	2017-09-01	2018-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50V/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	(50V/15A)	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50V/15A)	2017-03-03	2018-03-02

## 1.5 Operating Cycle

Samples are driven with a constant direct current (DC)

## 1.6 Ambient Conditions

For lumen maintenance test, samples were operated in thermal chambers with minimal ambient airflow. For long term reliability test, the case temperature was controlled by mounting several thermocouples on a sample reliability stress board at the designated thermal measurement point, as shown in APPENDIX. The ambient temperature  $T_A$  was measured by several thermocouples at a distance of 5 mm above the reliability test board. The relative humidity within chamber was less than 65%.

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

## 1.7 Photometry Measurement Uncertainty

The uncertainty of the light output measurements is  $U=1.59\%$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is  $U=21\text{K}$  ( $K=2$ ), at the 95% confidence level. This calibration results traceable to the NATIONAL INSTITUTE OF METROLOGY (NIM).

## 1.8 Sample Set

### Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

These manufacturing lots are picked to represent a wide parametric distribution.

Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

### Sample Size:

Total 90Pcs;

Each  $T_s$  test condition 30Pcs

The samples tested at  $T_s\ 55\text{ }^{\circ}\text{C}$ ,  $T_s\ 85\text{ }^{\circ}\text{C}$  and  $T_s\ 105\text{ }^{\circ}\text{C}$  were received at 2015-03-06 and tested during 2015-03-09 to 2017-04-02. The samples were numbered from 1 to 30, 31 to 60 and 61 to 90

#### Data Set 1: 55 °C, 60mA

Part Number:	RF-W2HI32DS-DF-N-Y
Number of Units:	30
Actual Case Temperature( $T_s$ ):	$T_s = 53.2\text{ }^{\circ}\text{C}$
Actual Ambient Temperature( $T_A$ ):	$T_A = 52.7\text{ }^{\circ}\text{C}$
Life Test Drive Current:	$I_F = 60\text{mA}$
Measurement Current:	$I_F = 60\text{mA}$

#### Data Set 2: 85 °C,60mA

Part Number:	RF-W2HI32DS-DF-N-Y
Number of Units:	30
Actual Case Temperature( $T_s$ ):	$T_s = 83.5\text{ }^{\circ}\text{C}$
Actual Ambient Temperature( $T_A$ ):	$T_A = 82.6\text{ }^{\circ}\text{C}$
Life Test Drive Current:	$I_F = 60\text{mA}$
Measurement Current:	$I_F = 60\text{mA}$

#### Data Set 3: 105 °C, 60mA

Part Number:	RF-W2HI32DS-DF-N-Y
Number of Units:	30
Actual Case Temperature( $T_s$ ):	$T_s = 104.1\text{ }^{\circ}\text{C}$
Actual Ambient Temperature( $T_A$ ):	$T_A = 103.4\text{ }^{\circ}\text{C}$
Life Test Drive Current:	$I_F = 60\text{mA}$
Measurement Current:	$I_F = 60\text{mA}$

## 2 - SUMMARY OF TEST RESULT

<b>Data Set:</b>	<b>Data Set 1, 55 °C, 60mA</b>
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h,10000h,11000h,12000h,13000h,14000h,15000h
Average. Lumen Maintenance at 6000 hours:	98.02%
Average. Lumen Maintenance at 9000 hours:	97.11%
Average. Lumen Maintenance at 10000 hours:	96.81%
Average. Lumen Maintenance at 15000 hours:	95.87%
Average Chromaticity Shift at 6000 hours ( $\Delta u'v'$ ):	0.0020
Average Chromaticity Shift at 9000 hours ( $\Delta u'v'$ ):	0.0025
Average Chromaticity Shift at 10000 hours ( $\Delta u'v'$ ):	0.0027
Average Chromaticity Shift at 15000 hours ( $\Delta u'v'$ ):	0.0038
Reported TM-21 L <sub>70</sub> Lifetime:	>90,000 hours

<b>Data Set:</b>	<b>Data Set 2, 85 °C, 60mA</b>
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h,10000h,11000h,12000h,13000h,14000h,15000h
Average. Lumen Maintenance at 6000 hours:	96.95%
Average. Lumen Maintenance at 9000 hours:	95.60%
Average. Lumen Maintenance at 10000 hours:	95.25%
Average. Lumen Maintenance at 15000 hours:	94.00%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0017
Average Chromaticity Shift at 9000 hours ( $\Delta u'v'$ ):	0.0026
Average Chromaticity Shift at 10000 hours ( $\Delta u'v'$ ):	0.0027
Average Chromaticity Shift at 15000 hours ( $\Delta u'v'$ ):	0.0040
Reported TM-21 L <sub>70</sub> Lifetime:	>90,000 hours

<b>Data Set:</b>	<b>Data Set 3, 105 °C, 60mA</b>
Number of Units:	30
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h,10000h,11000h,12000h,13000h,14000h,15000h
Average. Lumen Maintenance at 6000 hours:	96.04%
Average. Lumen Maintenance at 9000 hours:	94.54%
Average. Lumen Maintenance at 10000 hours:	94.15%
Average. Lumen Maintenance at 15000 hours:	92.65%
Average Chromaticity Shift at 6000 hours( $\Delta u'v'$ ):	0.0017
Average Chromaticity Shift at 9000 hours ( $\Delta u'v'$ ):	0.0028
Average Chromaticity Shift at 10000 hours ( $\Delta u'v'$ ):	0.0031
Average Chromaticity Shift at 15000 hours ( $\Delta u'v'$ ):	0.0043
Reported TM-21 L <sub>70</sub> Lifetime:	>90,000 hours

### 3 - Test Data

#### 3.1 Data Set 1, 55 °C, 60mA (Lumen Maintenance)

No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)						
			Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	2.941	24.44	100.20	99.92	99.55	98.98	98.61	98.20	97.91
2	2.950	24.37	100.70	100.33	99.84	99.14	98.89	98.52	98.11
3	2.945	24.71	99.31	99.03	98.46	97.98	97.37	97.05	96.72
4	2.950	23.85	99.37	98.95	98.28	97.78	97.15	96.98	96.52
5	2.949	24.40	100.08	99.80	99.75	99.30	98.98	98.44	97.70
6	2.939	24.28	100.62	100.16	99.88	99.63	99.18	98.64	98.27
7	2.940	24.67	100.45	100.16	99.55	99.35	98.99	98.42	97.97
8	2.935	24.12	99.21	99.05	98.59	98.18	97.76	97.39	96.97
9	2.933	24.53	99.31	99.06	98.65	98.12	97.76	97.11	96.66
10	2.933	24.90	99.48	99.40	99.04	98.59	97.99	97.71	97.63
11	2.939	24.24	100.58	100.04	99.67	99.13	98.60	98.35	98.02
12	2.950	23.68	102.96	102.07	100.21	99.70	99.16	98.86	98.18
13	2.950	24.21	99.17	98.80	97.89	97.60	97.27	96.78	96.53
14	2.936	24.38	99.38	98.97	98.48	97.99	97.50	97.17	97.09
15	2.938	23.16	100.39	100.04	99.78	99.53	99.27	99.01	98.88
16	2.948	24.37	100.62	100.21	99.75	99.34	99.18	98.97	98.73
17	2.942	23.67	100.25	98.94	98.27	97.80	97.42	97.17	96.75
18	2.945	24.49	99.43	99.06	98.90	98.49	98.04	97.80	97.75
19	2.937	24.81	99.07	98.87	98.43	98.11	97.78	97.38	97.10
20	2.945	24.77	99.43	99.35	99.31	98.91	98.71	98.30	98.06
21	2.934	24.23	100.50	100.17	99.88	99.38	98.89	98.80	98.72
22	2.937	23.85	100.96	100.29	99.75	99.33	99.12	98.87	98.74
23	2.944	24.13	99.30	98.80	98.38	98.05	97.51	97.10	96.77
24	2.939	24.15	99.50	99.21	98.96	98.80	98.47	98.05	97.60
25	2.942	24.49	99.71	99.55	99.39	99.10	98.73	98.45	98.12
26	2.927	24.17	99.26	98.84	98.68	98.30	97.97	97.68	97.35
27	2.941	24.65	100.00	99.80	99.39	99.03	98.58	98.38	98.22
28	2.947	24.61	100.12	99.84	99.39	98.98	98.58	98.29	98.01
29	2.938	24.72	100.04	99.76	99.35	98.95	98.58	98.22	97.98
30	2.936	24.79	100.08	99.88	99.39	98.99	98.71	98.43	97.98
Ave.	2.941	24.33	99.98	99.61	99.16	98.75	98.36	98.02	97.70
Med.	2.941	24.38	100.02	99.65	99.37	98.96	98.58	98.26	97.94
st dev	0.006	0.40	0.7913	0.7009	0.6177	0.6162	0.6635	0.6818	0.7031
Min.	2.927	23.16	99.07	98.80	97.89	97.60	97.15	96.78	96.52
Max.	2.950	24.90	102.96	102.07	100.21	99.70	99.27	99.01	98.88



No.	Lumen Maintenance (%)							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
1	97.55	97.26	97.05	97.01	96.85	96.69	96.28	96.07
2	97.87	97.54	97.29	97.17	97.05	96.88	96.80	96.64
3	96.68	96.40	95.95	95.83	95.55	95.22	94.98	94.62
4	96.10	95.85	95.68	95.60	95.43	95.05	94.76	94.47
5	97.25	96.93	96.84	96.64	96.52	96.43	96.35	96.23
6	98.02	97.78	97.57	97.36	97.12	97.03	96.87	96.50
7	97.73	97.45	97.24	97.04	96.80	96.76	96.55	96.23
8	96.68	96.31	95.90	95.77	95.56	95.36	95.19	94.94
9	96.45	96.00	95.68	95.47	95.27	95.11	94.90	94.62
10	97.31	97.11	96.83	96.63	96.39	96.22	96.10	95.94
11	97.69	97.40	97.19	96.95	96.66	96.53	96.37	96.12
12	98.02	97.55	97.42	97.30	96.96	96.71	96.66	96.33
13	96.41	96.12	95.75	95.46	95.42	95.29	95.13	95.00
14	96.96	96.64	96.43	96.19	95.90	95.73	95.49	95.32
15	98.53	98.19	97.88	97.80	97.67	97.41	97.24	96.98
16	98.48	98.11	97.83	97.74	97.54	97.29	97.17	96.92
17	96.49	96.24	96.16	96.03	95.99	95.86	95.56	95.35
18	97.59	97.43	96.98	96.73	96.49	96.33	96.08	95.92
19	96.82	96.57	96.25	96.17	96.13	96.09	95.89	95.81
20	97.82	97.62	97.30	97.21	97.05	96.97	96.81	96.65
21	98.39	98.10	97.73	97.65	97.40	97.23	97.07	96.82
22	98.32	97.95	97.74	97.61	97.53	97.27	97.15	96.98
23	96.35	96.06	95.57	95.40	95.19	95.07	94.94	94.70
24	97.31	97.06	96.60	96.44	96.19	95.98	95.86	95.45
25	97.71	97.43	96.82	96.73	96.57	96.41	96.12	96.08
26	97.10	96.77	96.57	96.40	96.24	96.07	95.90	95.70
27	97.81	97.40	97.08	96.84	96.75	96.63	96.31	96.11
28	97.64	97.40	97.24	96.95	96.67	96.46	96.18	96.14
29	97.61	97.29	96.93	96.68	96.56	96.36	96.28	95.91
30	97.54	97.26	96.81	96.69	96.33	96.05	95.68	95.44
Ave.	97.41	97.11	96.81	96.65	96.46	96.28	96.09	95.87
Med.	97.57	97.27	96.88	96.71	96.54	96.38	96.15	96.01
st dev	0.6762	0.6702	0.6897	0.7027	0.6968	0.7058	0.7287	0.7400
Min.	96.10	95.85	95.57	95.40	95.19	95.05	94.76	94.47
Max.	98.53	98.19	97.88	97.80	97.67	97.41	97.24	96.98

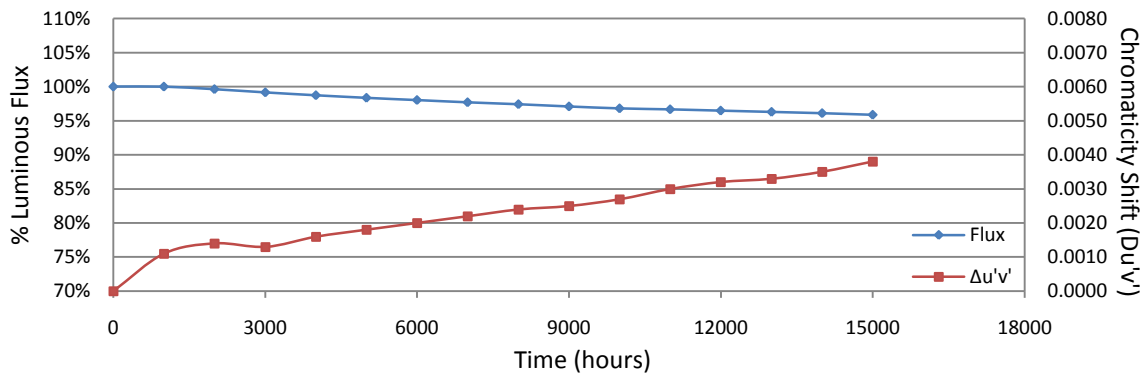
## TM-21 Projection:

**Test Duration:** 15,000 hours  
**Failures Observed:** 0  
 $\alpha$ : 2.289E-06  
 $\beta$ : 0.992  
**Reported L<sub>70</sub>:** >90,000 hours

**3.2 Data Set 1, 55 °C, 60mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )						
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
1	0.2583	0.5281	2785	0.0009	0.0012	0.0012	0.0017	0.0019	0.0022	0.0024
2	0.2612	0.5294	2720	0.0011	0.0013	0.0014	0.0017	0.0019	0.0021	0.0023
3	0.2598	0.5297	2747	0.0012	0.0013	0.0015	0.0018	0.0021	0.0024	0.0025
4	0.2619	0.5302	2702	0.0013	0.0014	0.0017	0.0020	0.0023	0.0026	0.0027
5	0.2604	0.5300	2732	0.0018	0.0020	0.0015	0.0011	0.0011	0.0012	0.0015
6	0.2601	0.5285	2745	0.0009	0.0011	0.0010	0.0016	0.0017	0.0020	0.0023
7	0.2620	0.5317	2694	0.0010	0.0013	0.0011	0.0016	0.0018	0.0020	0.0022
8	0.2595	0.5276	2763	0.0011	0.0014	0.0013	0.0019	0.0021	0.0023	0.0026
9	0.2605	0.5301	2730	0.0012	0.0014	0.0014	0.0020	0.0021	0.0025	0.0028
10	0.2597	0.5305	2746	0.0018	0.0019	0.0013	0.0012	0.0011	0.0013	0.0015
11	0.2622	0.5311	2693	0.0010	0.0013	0.0011	0.0017	0.0019	0.0021	0.0025
12	0.2621	0.5304	2697	0.0010	0.0013	0.0011	0.0016	0.0019	0.0021	0.0024
13	0.2604	0.5285	2739	0.0012	0.0014	0.0014	0.0020	0.0022	0.0025	0.0028
14	0.2612	0.5299	2716	0.0012	0.0014	0.0014	0.0019	0.0022	0.0024	0.0027
15	0.2579	0.5270	2801	0.0012	0.0019	0.0021	0.0013	0.0012	0.0011	0.0013
16	0.2612	0.5302	2716	0.0011	0.0013	0.0010	0.0017	0.0019	0.0021	0.0026
17	0.2593	0.5276	2767	0.0011	0.0014	0.0010	0.0015	0.0017	0.0019	0.0023
18	0.2595	0.5297	2754	0.0012	0.0017	0.0014	0.0019	0.0022	0.0025	0.0027
19	0.2587	0.5296	2771	0.0010	0.0016	0.0013	0.0018	0.0020	0.0023	0.0026
20	0.2579	0.5298	2787	0.0010	0.0016	0.0015	0.0011	0.0007	0.0006	0.0006
21	0.2598	0.5274	2757	0.0010	0.0012	0.0014	0.0019	0.0023	0.0025	0.0026
22	0.2596	0.5291	2755	0.0011	0.0013	0.0011	0.0016	0.0019	0.0021	0.0023
23	0.2602	0.5309	2733	0.0012	0.0016	0.0015	0.0022	0.0024	0.0026	0.0028
24	0.2598	0.5290	2750	0.0011	0.0014	0.0012	0.0016	0.0019	0.0021	0.0024
25	0.2605	0.5297	2732	0.0018	0.0020	0.0014	0.0012	0.0011	0.0012	0.0012
26	0.2601	0.5297	2741	0.0010	0.0019	0.0015	0.0011	0.0011	0.0013	0.0015
27	0.2607	0.5324	2716	0.0006	0.0009	0.0008	0.0014	0.0016	0.0019	0.0021
28	0.2616	0.5319	2700	0.0006	0.0009	0.0007	0.0013	0.0016	0.0018	0.0023
29	0.2588	0.5301	2766	0.0006	0.0008	0.0007	0.0013	0.0015	0.0018	0.0022
30	0.2584	0.5298	2776	0.0007	0.0008	0.0006	0.0011	0.0010	0.0012	0.0016
Ave.	0.2601	0.5297	2741	0.0011	0.0014	0.0013	0.0016	0.0018	0.0020	0.0022
Med.	0.2601	0.5298	2743	0.0011	0.0014	0.0013	0.0016	0.0019	0.0021	0.0023
st dev	0.0012	0.0013	29	0.0003	0.0003	0.0003	0.0003	0.0004	0.0005	0.0006
Min.	0.2579	0.5270	2693	0.0006	0.0008	0.0006	0.0011	0.0007	0.0006	0.0006
Max.	0.2622	0.5324	2801	0.0018	0.0020	0.0021	0.0022	0.0024	0.0026	0.0028

No.	Chromaticity Shift ( $\Delta u'v'$ )							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
1	0.0026	0.0028	0.0031	0.0034	0.0036	0.0037	0.0041	0.0041
2	0.0025	0.0026	0.0030	0.0032	0.0033	0.0034	0.0037	0.0038
3	0.0027	0.0028	0.0032	0.0035	0.0036	0.0037	0.0040	0.0041
4	0.0029	0.0030	0.0032	0.0037	0.0037	0.0039	0.0043	0.0044
5	0.0016	0.0017	0.0016	0.0020	0.0021	0.0022	0.0024	0.0026
6	0.0025	0.0026	0.0028	0.0033	0.0033	0.0034	0.0037	0.0041
7	0.0025	0.0026	0.0028	0.0032	0.0033	0.0035	0.0037	0.0039
8	0.0026	0.0028	0.0030	0.0034	0.0036	0.0037	0.0040	0.0043
9	0.0029	0.0030	0.0032	0.0036	0.0037	0.0039	0.0040	0.0043
10	0.0015	0.0015	0.0016	0.0020	0.0021	0.0022	0.0025	0.0026
11	0.0026	0.0027	0.0029	0.0034	0.0034	0.0035	0.0038	0.0040
12	0.0026	0.0026	0.0029	0.0032	0.0033	0.0035	0.0038	0.0040
13	0.0032	0.0029	0.0018	0.0021	0.0022	0.0022	0.0025	0.0027
14	0.0028	0.0029	0.0033	0.0037	0.0036	0.0039	0.0042	0.0044
15	0.0012	0.0012	0.0011	0.0016	0.0017	0.0017	0.0021	0.0023
16	0.0026	0.0027	0.0029	0.0033	0.0034	0.0035	0.0038	0.0042
17	0.0025	0.0026	0.0028	0.0032	0.0034	0.0035	0.0038	0.0041
18	0.0029	0.0030	0.0033	0.0037	0.0037	0.0039	0.0041	0.0046
19	0.0027	0.0028	0.0030	0.0034	0.0036	0.0037	0.0039	0.0043
20	0.0012	0.0013	0.0014	0.0016	0.0019	0.0019	0.0022	0.0025
21	0.0031	0.0030	0.0033	0.0037	0.0039	0.0040	0.0043	0.0047
22	0.0026	0.0027	0.0030	0.0033	0.0035	0.0036	0.0039	0.0043
23	0.0031	0.0031	0.0035	0.0037	0.0039	0.0039	0.0042	0.0047
24	0.0027	0.0027	0.0031	0.0035	0.0036	0.0037	0.0037	0.0044
25	0.0015	0.0015	0.0016	0.0019	0.0021	0.0022	0.0024	0.0030
26	0.0016	0.0015	0.0016	0.0019	0.0021	0.0022	0.0020	0.0025
27	0.0024	0.0024	0.0027	0.0031	0.0033	0.0033	0.0033	0.0039
28	0.0023	0.0025	0.0027	0.0030	0.0033	0.0034	0.0033	0.0039
29	0.0023	0.0024	0.0027	0.0031	0.0032	0.0033	0.0033	0.0039
30	0.0023	0.0024	0.0027	0.0030	0.0031	0.0033	0.0037	0.0039
Ave.	0.0024	0.0025	0.0027	0.0030	0.0032	0.0033	0.0035	0.0038
Med.	0.0026	0.0027	0.0029	0.0033	0.0034	0.0035	0.0038	0.0040
st dev	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
Min.	0.0012	0.0012	0.0011	0.0016	0.0017	0.0017	0.0020	0.0023
Max.	0.0032	0.0031	0.0035	0.0037	0.0039	0.0040	0.0043	0.0047



**3.3 Data Set 2, 85 °C, 60mA (Lumen Maintenance)**

No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)						
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
31	2.944	24.47	99.84	99.39	98.08	97.71	97.26	96.85	96.57
32	2.933	24.59	100.45	99.80	99.76	99.35	98.94	98.25	97.84
33	2.935	24.45	100.29	99.67	99.43	98.90	98.36	97.79	97.34
34	2.935	24.64	100.37	99.76	99.59	99.03	98.42	97.85	97.32
35	2.937	24.66	100.24	99.68	99.19	98.82	98.34	97.69	96.92
36	2.935	24.05	99.04	98.59	97.84	97.13	96.67	96.05	95.72
37	2.943	24.42	100.33	99.75	99.43	98.89	98.44	97.91	97.50
38	2.937	24.14	100.17	99.63	99.17	98.59	98.18	97.64	97.06
39	2.940	24.61	100.28	99.51	98.98	98.33	97.93	97.40	96.91
40	2.945	24.25	99.88	99.59	98.80	98.14	97.73	97.15	96.74
41	2.940	24.21	99.38	98.93	98.55	97.89	97.32	96.90	96.24
42	2.940	24.31	99.79	99.38	99.14	98.60	98.11	97.49	96.87
43	2.937	23.38	99.96	99.70	99.49	98.97	98.42	97.78	97.31
44	2.948	24.12	99.83	99.42	99.17	98.67	98.26	97.60	97.06
45	2.939	24.35	99.79	99.67	99.43	99.01	98.44	97.78	97.17
46	2.935	24.45	99.02	98.73	98.12	97.83	97.34	96.69	96.11
47	2.938	23.55	99.45	99.15	99.02	98.34	97.83	97.11	96.56
48	2.943	24.53	99.51	98.98	98.41	97.88	97.43	96.70	96.13
49	2.936	24.36	99.55	99.14	98.48	97.87	97.45	96.72	96.02
50	2.943	23.83	99.66	99.54	98.99	98.36	97.86	97.15	96.56
51	2.932	24.57	99.47	98.98	98.45	98.01	97.56	96.87	96.26
52	2.919	24.54	99.39	98.66	98.33	97.84	97.43	96.66	95.97
53	2.945	24.60	99.47	98.94	98.50	98.09	97.68	97.03	96.50
54	2.939	24.47	99.55	98.98	98.32	97.67	96.98	96.32	95.79
55	2.940	23.79	99.50	98.87	98.28	97.60	96.76	96.09	95.54
56	2.935	24.66	99.51	98.54	98.18	97.32	96.59	95.78	95.42
57	2.936	24.22	99.38	98.60	97.94	97.32	96.49	95.75	95.46
58	2.946	24.57	100.12	99.63	97.80	97.35	96.42	95.73	95.44
59	2.945	24.18	100.17	99.71	97.85	97.27	96.48	95.74	95.33
60	2.940	23.14	100.13	99.57	98.14	97.58	96.63	95.98	95.72
Ave.	2.939	24.27	99.78	99.28	98.70	98.15	97.59	96.95	96.45
Med.	2.939	24.39	99.79	99.40	98.53	98.05	97.62	96.97	96.53
st dev	0.006	0.39	0.3998	0.4166	0.5917	0.6240	0.7210	0.7542	0.7119
Min.	2.919	23.14	99.02	98.54	97.80	97.13	96.42	95.73	95.33
Max.	2.948	24.66	100.45	99.80	99.76	99.35	98.94	98.25	97.84

No.	Lumen Maintenance (%)							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
31	96.16	95.59	95.26	95.01	94.77	94.65	94.28	93.99
32	97.32	97.03	96.71	96.54	96.42	96.22	95.89	95.65
33	96.93	96.52	96.24	95.99	95.71	95.50	95.34	95.09
34	96.96	96.43	96.14	95.74	95.45	95.21	95.09	94.85
35	96.59	96.15	95.82	95.42	95.21	94.89	94.57	94.20
36	95.43	95.14	94.89	94.59	94.26	94.01	93.76	93.51
37	97.05	96.68	96.44	95.99	95.82	95.66	95.45	95.17
38	96.60	96.02	95.65	95.48	95.32	95.11	94.86	94.61
39	96.46	96.18	95.86	95.61	95.33	95.08	94.84	94.47
40	96.41	96.00	95.46	95.05	94.89	94.60	94.39	94.19
41	95.66	95.13	94.67	94.42	94.13	93.85	93.60	93.39
42	96.42	96.05	95.72	95.64	95.56	95.19	94.86	94.61
43	96.88	96.54	96.24	96.07	95.81	95.64	95.25	95.00
44	96.72	96.39	96.14	95.69	95.36	95.07	94.94	94.53
45	96.76	96.39	95.98	95.73	95.48	95.28	94.95	94.74
46	95.71	95.17	94.85	94.56	94.27	94.03	93.70	93.46
47	96.05	95.50	95.12	95.03	94.95	94.78	94.69	94.44
48	95.72	95.31	95.03	94.94	94.78	94.46	94.25	94.01
49	95.57	95.11	94.58	94.33	94.05	93.97	93.72	93.43
50	96.10	95.55	95.34	94.96	94.67	94.38	94.04	93.66
51	95.77	95.40	95.12	94.87	94.63	94.42	94.26	94.02
52	95.48	95.19	94.87	94.58	94.42	94.17	94.01	93.68
53	96.02	95.61	95.24	95.04	94.76	94.51	94.23	93.90
54	95.34	94.85	94.56	94.16	93.99	93.83	93.67	93.42
55	95.00	94.70	94.24	93.95	93.69	93.48	93.40	93.15
56	94.81	94.48	93.88	93.55	93.31	93.19	92.90	92.66
57	94.92	94.55	94.34	93.97	93.68	93.44	92.90	92.61
58	95.24	94.71	94.42	94.26	93.94	93.69	93.37	93.16
59	95.08	94.67	94.09	93.96	93.76	93.55	93.22	93.01
60	95.55	94.94	94.47	94.17	93.95	93.69	93.56	93.39
Ave.	96.02	95.60	95.25	94.98	94.75	94.52	94.27	94.00
Med.	96.03	95.53	95.18	94.99	94.76	94.48	94.26	94.00
st dev	0.7087	0.7199	0.7631	0.7618	0.7796	0.7727	0.7831	0.7734
Min.	94.81	94.48	93.88	93.55	93.31	93.19	92.90	92.61
Max.	97.32	97.03	96.71	96.54	96.42	96.22	95.89	95.65

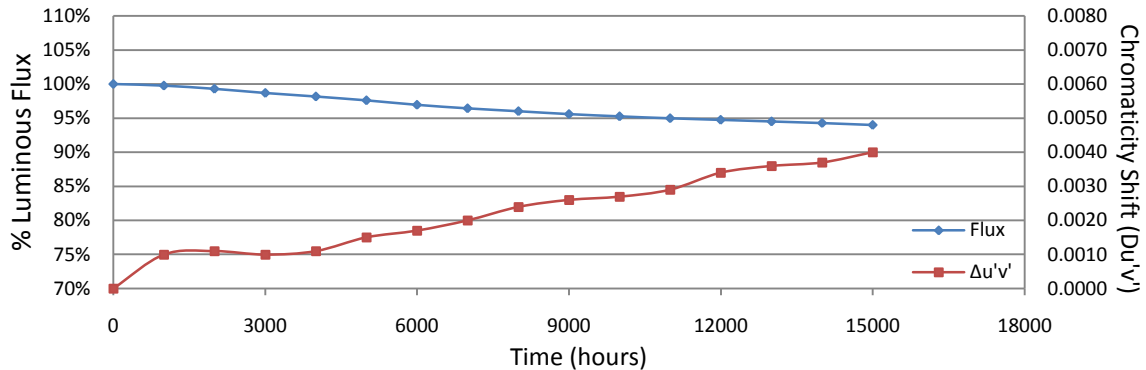
## TM-21 Projection:

**Test Duration:** 15,000 hours  
**Failures Observed:** 0  
 $\alpha$ : 3.101E-06  
 $\beta$ : 0.984  
**Reported L<sub>70</sub>:** >90,000 hours

**3.4 Data Set 2, 85 °C, 60mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )						
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
31	0.2616	0.5316	2701	0.0018	0.0019	0.0016	0.0013	0.0011	0.0012	0.0013
32	0.2592	0.5282	2767	0.0007	0.0010	0.0011	0.0011	0.0017	0.0019	0.0021
33	0.2606	0.5297	2730	0.0006	0.0009	0.0010	0.0010	0.0016	0.0017	0.0020
34	0.2605	0.5312	2726	0.0006	0.0009	0.0010	0.0011	0.0017	0.0019	0.0021
35	0.2581	0.5284	2788	0.0006	0.0009	0.0009	0.0010	0.0015	0.0018	0.0020
36	0.2628	0.5293	2687	0.0019	0.0018	0.0017	0.0013	0.0012	0.0013	0.0015
37	0.2596	0.5306	2746	0.0006	0.0010	0.0009	0.0009	0.0014	0.0016	0.0018
38	0.2595	0.5280	2761	0.0007	0.0009	0.0010	0.0011	0.0016	0.0018	0.0020
39	0.2602	0.5317	2730	0.0007	0.0009	0.0011	0.0012	0.0017	0.0019	0.0022
40	0.2618	0.5316	2699	0.0005	0.0008	0.0008	0.0010	0.0014	0.0017	0.0020
41	0.2600	0.5292	2745	0.0018	0.0018	0.0016	0.0011	0.0011	0.0012	0.0015
42	0.2590	0.5277	2772	0.0010	0.0008	0.0006	0.0010	0.0015	0.0018	0.0020
43	0.2586	0.5287	2777	0.0009	0.0008	0.0008	0.0011	0.0016	0.0018	0.0021
44	0.2615	0.5297	2711	0.0009	0.0009	0.0006	0.0010	0.0015	0.0018	0.0021
45	0.2588	0.5289	2772	0.0009	0.0009	0.0006	0.0012	0.0016	0.0018	0.0021
46	0.2605	0.5299	2732	0.0017	0.0021	0.0016	0.0011	0.0010	0.0011	0.0014
47	0.2594	0.5281	2762	0.0010	0.0009	0.0007	0.0010	0.0014	0.0018	0.0020
48	0.2595	0.5307	2748	0.0009	0.0009	0.0006	0.0009	0.0014	0.0016	0.0019
49	0.2593	0.5287	2762	0.0010	0.0009	0.0006	0.0009	0.0014	0.0016	0.0020
50	0.2623	0.5311	2690	0.0009	0.0009	0.0008	0.0013	0.0017	0.0020	0.0023
51	0.2605	0.5301	2730	0.0009	0.0012	0.0009	0.0012	0.0016	0.0018	0.0021
52	0.2595	0.5291	2755	0.0009	0.0012	0.0009	0.0011	0.0015	0.0018	0.0020
53	0.2582	0.5287	2784	0.0010	0.0011	0.0009	0.0010	0.0014	0.0017	0.0020
54	0.2604	0.5310	2728	0.0010	0.0011	0.0009	0.0012	0.0016	0.0019	0.0021
55	0.2607	0.5305	2724	0.0009	0.0012	0.0009	0.0010	0.0016	0.0017	0.0020
56	0.2612	0.5320	2708	0.0010	0.0011	0.0009	0.0012	0.0016	0.0018	0.0021
57	0.2605	0.5293	2734	0.0010	0.0012	0.0011	0.0010	0.0014	0.0017	0.0019
58	0.2603	0.5307	2732	0.0008	0.0012	0.0012	0.0012	0.0015	0.0018	0.0021
59	0.2610	0.5296	2723	0.0008	0.0011	0.0012	0.0012	0.0016	0.0018	0.0021
60	0.2595	0.5274	2764	0.0008	0.0012	0.0012	0.0011	0.0016	0.0017	0.0021
Ave.	0.2602	0.5297	2740	0.0010	0.0011	0.0010	0.0011	0.0015	0.0017	0.0020
Med.	0.2603	0.5297	2733	0.0009	0.0010	0.0009	0.0011	0.0015	0.0018	0.0020
st dev	0.0012	0.0013	28	0.0004	0.0003	0.0003	0.0001	0.0002	0.0002	0.0002
Min.	0.2581	0.5274	2687	0.0005	0.0008	0.0006	0.0009	0.0010	0.0011	0.0013
Max.	0.2628	0.5320	2788	0.0019	0.0021	0.0017	0.0013	0.0017	0.0020	0.0023

No.	Chromaticity Shift ( $\Delta u'v'$ )							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
31	0.0016	0.0019	0.0017	0.0019	0.0025	0.0025	0.0028	0.0031
32	0.0027	0.0028	0.0027	0.0031	0.0036	0.0037	0.0038	0.0042
33	0.0025	0.0026	0.0026	0.0030	0.0034	0.0036	0.0036	0.0040
34	0.0026	0.0027	0.0029	0.0031	0.0036	0.0038	0.0038	0.0042
35	0.0025	0.0027	0.0029	0.0031	0.0036	0.0037	0.0040	0.0042
36	0.0017	0.0018	0.0018	0.0021	0.0026	0.0027	0.0030	0.0033
37	0.0024	0.0024	0.0027	0.0030	0.0033	0.0035	0.0035	0.0040
38	0.0025	0.0026	0.0027	0.0030	0.0035	0.0036	0.0038	0.0041
39	0.0026	0.0027	0.0029	0.0031	0.0036	0.0037	0.0038	0.0042
40	0.0024	0.0032	0.0034	0.0036	0.0042	0.0044	0.0047	0.0051
41	0.0017	0.0019	0.0018	0.0020	0.0025	0.0027	0.0030	0.0031
42	0.0025	0.0026	0.0027	0.0030	0.0035	0.0038	0.0034	0.0042
43	0.0026	0.0026	0.0028	0.0030	0.0035	0.0037	0.0036	0.0042
44	0.0025	0.0027	0.0029	0.0031	0.0035	0.0038	0.0038	0.0042
45	0.0025	0.0028	0.0029	0.0031	0.0036	0.0038	0.0036	0.0043
46	0.0015	0.0015	0.0016	0.0018	0.0023	0.0024	0.0025	0.0029
47	0.0025	0.0026	0.0027	0.0032	0.0035	0.0037	0.0036	0.0041
48	0.0025	0.0026	0.0027	0.0030	0.0034	0.0037	0.0038	0.0041
49	0.0025	0.0026	0.0027	0.0030	0.0034	0.0037	0.0038	0.0040
50	0.0028	0.0029	0.0031	0.0034	0.0039	0.0042	0.0045	0.0045
51	0.0025	0.0028	0.0027	0.0031	0.0036	0.0038	0.0037	0.0041
52	0.0025	0.0026	0.0029	0.0030	0.0034	0.0037	0.0038	0.0041
53	0.0025	0.0027	0.0028	0.0030	0.0034	0.0037	0.0037	0.0041
54	0.0027	0.0028	0.0029	0.0031	0.0036	0.0038	0.0040	0.0042
55	0.0025	0.0027	0.0027	0.0030	0.0034	0.0037	0.0037	0.0040
56	0.0025	0.0026	0.0027	0.0030	0.0034	0.0037	0.0037	0.0040
57	0.0025	0.0026	0.0028	0.0030	0.0034	0.0036	0.0037	0.0040
58	0.0026	0.0028	0.0032	0.0030	0.0034	0.0037	0.0038	0.0040
59	0.0026	0.0027	0.0032	0.0031	0.0036	0.0039	0.0039	0.0041
60	0.0027	0.0028	0.0031	0.0032	0.0036	0.0038	0.0039	0.0042
Ave.	0.0024	0.0026	0.0027	0.0029	0.0034	0.0036	0.0037	0.0040
Med.	0.0025	0.0027	0.0028	0.0030	0.0035	0.0037	0.0038	0.0041
st dev	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Min.	0.0015	0.0015	0.0016	0.0018	0.0023	0.0024	0.0025	0.0029
Max.	0.0028	0.0032	0.0034	0.0036	0.0042	0.0044	0.0047	0.0051



**3.5 Data Set 3, 105 °C, 60mA (Lumen Maintenance)**

No.	V <sub>F</sub> (V)	Φ(lm)	Lumen Maintenance (%)						
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
61	2.936	24.43	100.16	99.30	98.12	97.46	96.85	96.07	95.42
62	2.940	24.49	100.20	99.43	98.12	97.47	96.90	96.12	95.51
63	2.950	24.27	99.71	99.05	98.35	97.69	97.03	96.46	95.76
64	2.948	24.67	99.76	99.07	98.34	97.69	96.96	96.35	95.62
65	2.932	24.47	99.84	99.14	98.37	97.63	96.98	96.32	95.75
66	2.946	24.40	99.80	99.02	98.24	97.54	96.89	96.23	95.45
67	2.946	24.21	99.55	99.01	98.31	97.52	96.86	96.28	95.83
68	2.936	24.61	99.47	98.70	98.25	97.60	96.87	96.06	95.81
69	2.945	24.41	99.39	98.69	98.20	97.54	96.89	96.11	95.62
70	2.940	24.26	99.79	98.76	98.31	97.44	96.70	95.92	95.63
71	2.938	24.21	99.50	98.68	98.27	97.69	96.94	96.12	95.66
72	2.947	24.72	100.20	99.51	97.98	97.41	96.84	96.00	95.63
73	2.940	24.46	100.16	99.43	98.20	97.51	96.97	96.20	95.67
74	2.949	24.43	99.96	99.10	98.61	97.95	97.18	96.44	95.99
75	2.950	24.58	99.27	98.45	98.25	97.56	96.87	96.05	95.61
76	2.935	24.28	99.30	98.48	98.02	97.36	96.87	96.09	95.63
77	2.949	24.13	99.30	98.47	97.97	97.18	96.81	96.10	95.57
78	2.940	24.10	99.67	98.55	98.09	97.30	96.56	95.89	95.35
79	2.937	24.39	99.63	98.77	98.07	97.21	96.47	95.86	94.92
80	2.939	24.15	99.83	99.05	98.30	97.47	96.73	96.02	95.28
81	2.944	24.41	99.34	98.65	98.03	97.34	96.64	95.90	95.41
82	2.920	24.65	99.11	98.42	97.77	97.20	96.55	95.86	95.33
83	2.939	24.47	99.06	98.41	97.63	97.02	96.40	95.75	95.34
84	2.946	24.66	99.15	98.54	97.81	97.20	96.55	95.90	95.62
85	2.933	23.97	99.04	98.46	97.71	97.12	96.41	95.79	95.29
86	2.944	23.97	99.33	98.50	97.79	96.95	96.58	95.87	95.16
87	2.943	24.20	99.42	98.47	97.77	97.07	96.61	95.95	95.12
88	2.944	24.46	99.39	98.36	97.75	96.93	96.28	95.58	94.97
89	2.927	24.06	99.42	98.46	98.21	97.34	96.72	96.05	95.34
90	2.945	24.55	99.27	98.33	97.76	97.19	96.42	95.72	95.44
Ave.	2.941	24.37	99.57	98.77	98.09	97.39	96.74	96.04	95.49
Med.	2.942	24.41	99.49	98.68	98.12	97.43	96.83	96.05	95.54
st dev	0.007	0.21	0.3457	0.3572	0.2459	0.2443	0.2199	0.2107	0.2510
Min.	2.920	23.97	99.04	98.33	97.63	96.93	96.28	95.58	94.92
Max.	2.950	24.72	100.20	99.51	98.61	97.95	97.18	96.46	95.99



No.	Lumen Maintenance (%)							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
61	94.88	94.47	93.90	93.74	93.41	93.21	93.00	92.75
62	95.22	94.65	94.32	93.88	93.63	93.34	93.14	92.81
63	95.30	94.77	94.40	94.03	93.65	93.28	92.91	92.71
64	95.05	94.49	93.84	93.60	93.47	93.23	92.74	92.46
65	95.22	94.56	94.28	94.07	93.75	93.46	93.13	92.77
66	95.00	94.59	94.22	93.81	93.61	93.36	92.99	92.62
67	95.58	94.96	94.67	94.26	93.97	93.60	93.31	93.06
68	95.49	95.04	94.56	94.15	93.99	93.70	93.21	92.97
69	95.37	94.76	94.43	94.18	93.90	93.57	93.24	92.71
70	95.42	94.81	94.31	94.19	93.78	93.36	93.16	92.70
71	95.50	95.04	94.47	94.22	93.85	93.64	93.43	93.18
72	95.47	94.94	94.54	94.17	93.77	93.57	93.45	93.12
73	95.38	94.93	94.56	94.15	93.91	93.70	93.38	93.09
74	95.58	95.09	94.68	94.43	94.15	93.86	93.37	93.00
75	95.08	94.67	94.43	94.18	93.82	93.57	93.17	92.72
76	95.06	94.69	94.32	93.95	93.70	93.45	93.20	92.83
77	95.19	94.74	94.53	94.16	93.95	93.74	93.37	93.16
78	94.98	94.40	94.11	93.94	93.73	93.44	93.32	92.90
79	94.51	93.89	93.44	93.07	92.78	92.58	92.29	92.17
80	94.58	94.20	93.91	93.62	93.37	93.00	92.67	92.38
81	94.76	94.35	94.06	93.85	93.61	93.36	92.87	92.42
82	94.73	94.20	93.59	93.39	93.18	92.90	92.74	92.49
83	94.89	94.28	93.95	93.71	93.26	92.81	92.64	92.36
84	94.89	94.44	94.04	93.88	93.55	93.07	92.66	92.46
85	94.87	94.41	94.20	93.99	93.66	93.28	93.03	92.74
86	94.79	94.12	93.74	93.37	93.12	92.82	92.57	92.12
87	94.75	94.13	93.60	93.22	92.93	92.77	92.40	92.11
88	94.48	94.07	93.66	93.25	92.89	92.68	92.35	92.15
89	94.85	94.35	93.97	93.56	93.10	92.89	92.60	92.23
90	94.70	94.01	93.65	93.20	92.83	92.67	92.59	92.30
Ave.	95.05	94.54	94.15	93.84	93.54	93.26	92.97	92.65
Med.	95.03	94.53	94.21	93.91	93.64	93.35	93.02	92.71
st dev	0.3270	0.3347	0.3569	0.3686	0.3763	0.3637	0.3473	0.3322
Min.	94.48	93.89	93.44	93.07	92.78	92.58	92.29	92.11
Max.	95.58	95.09	94.68	94.43	94.15	93.86	93.45	93.18

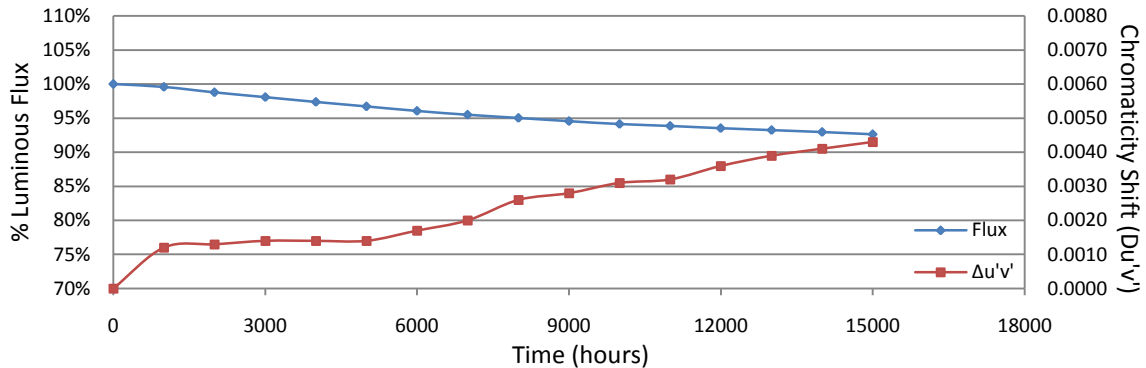
## TM-21 Projection:

**Test Duration:** 15,000 hours  
**Failures Observed:** 0  
 $\alpha$ : 3.682E-06  
 $\beta$ : 0.978  
**Reported L<sub>70</sub>:** >90,000 hours

**3.6 Data Set 3, 105 °C, 60mA (Chromaticity Shift)**

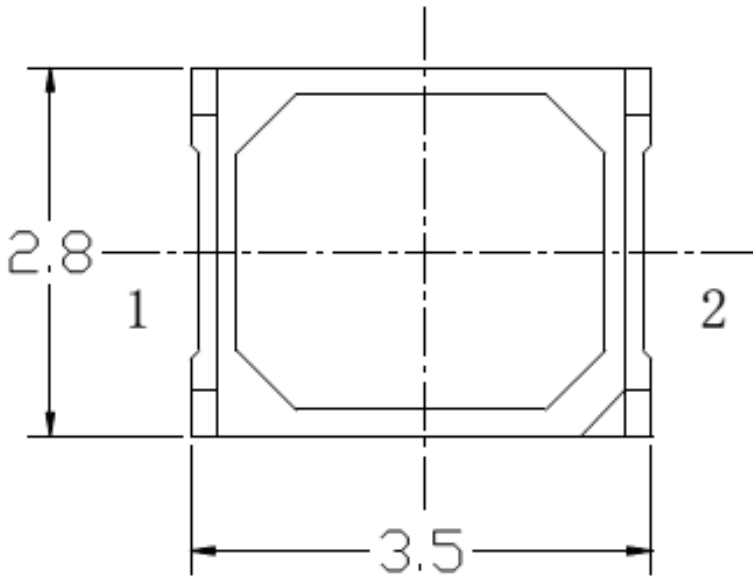
No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )						
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs
61	0.2605	0.5293	2735	0.0008	0.0009	0.0008	0.0009	0.0014	0.0016	0.0018
62	0.2595	0.5295	2755	0.0012	0.0010	0.0008	0.0011	0.0016	0.0018	0.0021
63	0.2618	0.5305	2702	0.0014	0.0014	0.0009	0.0010	0.0014	0.0017	0.0020
64	0.2582	0.5278	2789	0.0014	0.0013	0.0009	0.0009	0.0014	0.0016	0.0019
65	0.2608	0.5291	2728	0.0013	0.0013	0.0010	0.0011	0.0015	0.0017	0.0021
66	0.2622	0.5326	2686	0.0013	0.0014	0.0010	0.0011	0.0014	0.0017	0.0021
67	0.2616	0.5303	2708	0.0014	0.0015	0.0012	0.0010	0.0014	0.0016	0.0020
68	0.2590	0.5294	2765	0.0013	0.0015	0.0011	0.0011	0.0015	0.0017	0.0020
69	0.2624	0.5306	2689	0.0014	0.0015	0.0014	0.0010	0.0014	0.0016	0.0021
70	0.2603	0.5297	2735	0.0013	0.0015	0.0014	0.0009	0.0011	0.0014	0.0020
71	0.2599	0.5278	2754	0.0012	0.0015	0.0014	0.0013	0.0014	0.0017	0.0020
72	0.2585	0.5305	2771	0.0009	0.0013	0.0015	0.0013	0.0016	0.0019	0.0021
73	0.2599	0.5293	2746	0.0009	0.0012	0.0013	0.0013	0.0014	0.0017	0.0020
74	0.2597	0.5312	2744	0.0008	0.0013	0.0015	0.0016	0.0017	0.0019	0.0022
75	0.2587	0.5303	2768	0.0009	0.0012	0.0014	0.0013	0.0014	0.0016	0.0019
76	0.2607	0.5291	2731	0.0008	0.0011	0.0014	0.0014	0.0014	0.0017	0.0019
77	0.2598	0.5287	2750	0.0008	0.0010	0.0013	0.0017	0.0013	0.0016	0.0019
78	0.2608	0.5295	2727	0.0008	0.0012	0.0015	0.0018	0.0014	0.0016	0.0018
79	0.2575	0.5274	2806	0.0012	0.0013	0.0014	0.0017	0.0015	0.0017	0.0020
80	0.2607	0.5301	2725	0.0011	0.0013	0.0014	0.0017	0.0014	0.0016	0.0021
81	0.2600	0.5292	2744	0.0012	0.0014	0.0014	0.0018	0.0014	0.0017	0.0020
82	0.2593	0.5303	2754	0.0014	0.0014	0.0017	0.0017	0.0014	0.0016	0.0018
83	0.2607	0.5293	2730	0.0013	0.0014	0.0016	0.0017	0.0014	0.0018	0.0019
84	0.2581	0.5289	2786	0.0013	0.0014	0.0017	0.0018	0.0015	0.0017	0.0019
85	0.2587	0.5277	2780	0.0012	0.0014	0.0017	0.0017	0.0015	0.0017	0.0021
86	0.2620	0.5304	2697	0.0012	0.0013	0.0017	0.0017	0.0015	0.0018	0.0020
87	0.2595	0.5280	2761	0.0013	0.0013	0.0017	0.0018	0.0015	0.0017	0.0020
88	0.2617	0.5312	2701	0.0012	0.0014	0.0016	0.0017	0.0013	0.0016	0.0019
89	0.2590	0.5270	2775	0.0013	0.0013	0.0017	0.0018	0.0015	0.0018	0.0020
90	0.2593	0.5306	2754	0.0012	0.0013	0.0017	0.0017	0.0014	0.0017	0.0020
Ave.	0.2600	0.5295	2743	0.0012	0.0013	0.0014	0.0014	0.0014	0.0017	0.0020
Med.	0.2599	0.5295	2745	0.0012	0.0013	0.0014	0.0015	0.0014	0.0017	0.0020
st dev	0.0013	0.0013	31	0.0002	0.0002	0.0003	0.0003	0.0001	0.0001	0.0001
Min.	0.2575	0.5270	2686	0.0008	0.0009	0.0008	0.0009	0.0011	0.0014	0.0018
Max.	0.2624	0.5326	2806	0.0014	0.0015	0.0017	0.0018	0.0017	0.0019	0.0022

No.	Chromaticity Shift ( $\Delta u'v'$ )							
	8000hrs	9000hrs	10000hrs	11000hrs	12000hrs	13000hrs	14000hrs	15000hrs
61	0.0026	0.0028	0.0030	0.0030	0.0035	0.0038	0.0040	0.0041
62	0.0027	0.0029	0.0032	0.0031	0.0037	0.0040	0.0043	0.0043
63	0.0027	0.0028	0.0031	0.0030	0.0036	0.0038	0.0040	0.0043
64	0.0026	0.0028	0.0031	0.0030	0.0036	0.0039	0.0041	0.0043
65	0.0026	0.0030	0.0031	0.0033	0.0038	0.0040	0.0042	0.0044
66	0.0028	0.0029	0.0031	0.0033	0.0037	0.0039	0.0041	0.0044
67	0.0026	0.0028	0.0031	0.0031	0.0034	0.0039	0.0040	0.0043
68	0.0026	0.0029	0.0031	0.0033	0.0038	0.0040	0.0042	0.0044
69	0.0025	0.0028	0.0031	0.0032	0.0035	0.0038	0.0040	0.0043
70	0.0025	0.0028	0.0030	0.0031	0.0036	0.0038	0.0040	0.0043
71	0.0025	0.0028	0.0030	0.0031	0.0036	0.0038	0.0040	0.0044
72	0.0027	0.0029	0.0032	0.0033	0.0038	0.0039	0.0042	0.0044
73	0.0025	0.0026	0.0030	0.0031	0.0036	0.0038	0.0040	0.0042
74	0.0027	0.0030	0.0033	0.0034	0.0038	0.0040	0.0044	0.0045
75	0.0024	0.0025	0.0030	0.0032	0.0035	0.0038	0.0040	0.0043
76	0.0025	0.0028	0.0031	0.0031	0.0036	0.0038	0.0041	0.0043
77	0.0023	0.0028	0.0030	0.0031	0.0036	0.0037	0.0039	0.0042
78	0.0025	0.0028	0.0030	0.0031	0.0036	0.0039	0.0039	0.0043
79	0.0025	0.0028	0.0031	0.0031	0.0038	0.0040	0.0041	0.0044
80	0.0026	0.0028	0.0031	0.0033	0.0037	0.0039	0.0042	0.0044
81	0.0025	0.0028	0.0031	0.0033	0.0037	0.0038	0.0041	0.0043
82	0.0026	0.0029	0.0030	0.0033	0.0036	0.0037	0.0041	0.0043
83	0.0024	0.0029	0.0031	0.0032	0.0036	0.0038	0.0042	0.0044
84	0.0024	0.0028	0.0031	0.0033	0.0036	0.0038	0.0041	0.0043
85	0.0026	0.0028	0.0031	0.0034	0.0037	0.0039	0.0041	0.0043
86	0.0026	0.0029	0.0031	0.0033	0.0037	0.0039	0.0040	0.0044
87	0.0026	0.0028	0.0032	0.0033	0.0036	0.0038	0.0040	0.0043
88	0.0025	0.0027	0.0030	0.0032	0.0035	0.0037	0.0040	0.0042
89	0.0026	0.0030	0.0031	0.0034	0.0037	0.0039	0.0041	0.0044
90	0.0026	0.0028	0.0030	0.0032	0.0036	0.0038	0.0040	0.0043
Ave.	0.0026	0.0028	0.0031	0.0032	0.0036	0.0039	0.0041	0.0043
Med.	0.0026	0.0028	0.0031	0.0032	0.0036	0.0038	0.0041	0.0043
st dev	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.0023	0.0025	0.0030	0.0030	0.0034	0.0037	0.0039	0.0041
Max.	0.0028	0.0030	0.0033	0.0034	0.0038	0.0040	0.0044	0.0045



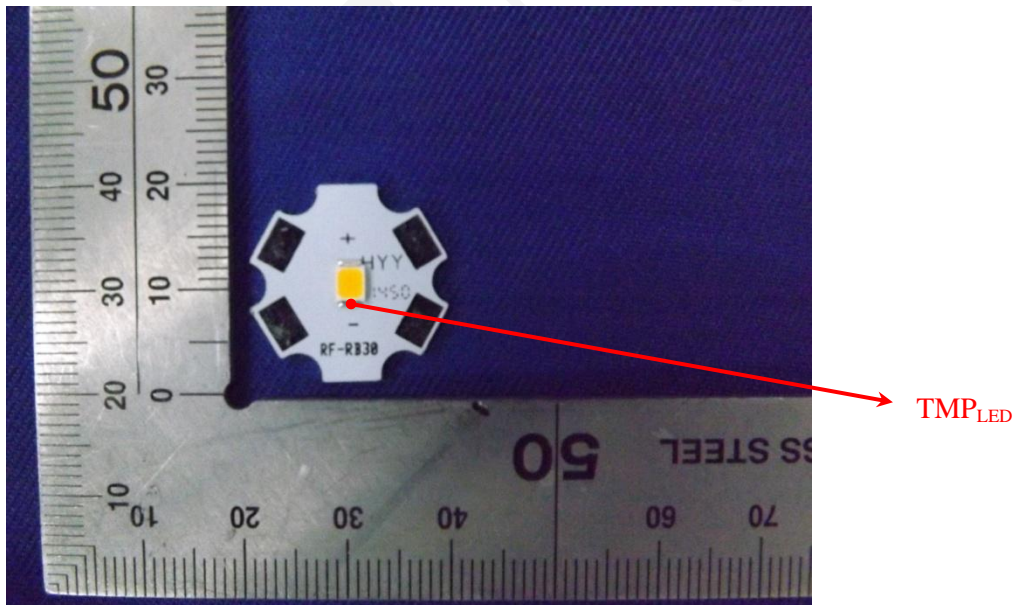
## Attachment A – EUT PHOTO

### A.1 Mechanical Dimensions (Ta = 25 °C)



All dimensions are in millimeter

### A.2 EUT Photo



\*\*\*\*\*END OF REPORT\*\*\*\*\*