



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Destar Opto-Electronics Co., LTD

6th floor, 3 building, HanHaiDa 7th Industry park, GongMing YuLv Village, Guangming New district, ShenZhen, GuangDong

Model: 3N128-ABKACK-ZJP-1

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Daniel Duan <i>Daniel Duan</i>		
Report Number:	R2DG141202062-10-9000		
Test Date:	2014-12-03 to 2016-03-09		
Report Date:	2017-03-08		
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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: 3N128-ABKACK-ZJP-1
 Part Type: LED Package
 Nominal CCT: 3000K

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 Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.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	2016-03-10	2017-03-09
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2016-03-04	2017-03-03
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2016-03-10	2017-03-09
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ 7321114	300VA	2016-03-04	2017-03-03
Multilayer aging machine	BACL	B2-270	20022	25°C~110°C	2016-11-22	2017-11-21
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50/15A)	2016-03-04	2017-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090005	(50/15A)	2016-03-04	2017-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50/15A)	2016-03-04	2017-03-03

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 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 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 75Pcs;

Each T_s test condition 25Pcs

The samples tested at T_s 55°C, T_s 85°C and T_s 105°C were received at 2014-12-02 and tested during 2014-12-03 to 2016-03-09. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75

Data Set 1: 55°C, 350mA

Part Number:	3N128-ABKACK-ZJP-1
Number of Units:	25
Actual Case Temperature(T_s):	$T_s = 54.6^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 51.9^\circ\text{C}$
Life Test Drive Current:	$I_F = 350\text{mA}$
Measurement Current:	$I_F = 350\text{mA}$

Data Set 2: 85°C, 350mA

Part Number:	3N128-ABKACK-ZJP-1
Number of Units:	25
Actual Case Temperature(T_s):	$T_s = 84.3^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 82.7^\circ\text{C}$
Life Test Drive Current:	$I_F = 350\text{mA}$
Measurement Current:	$I_F = 350\text{mA}$

Data Set 3: 105°C, 350mA

Part Number:	3N128-ABKACK-ZJP-1
Number of Units:	25
Actual Case Temperature(T_s):	$T_s = 104.7^\circ\text{C}$
Actual Ambient Temperature(T_A):	$T_A = 103.5^\circ\text{C}$
Life Test Drive Current:	$I_F = 350\text{mA}$
Measurement Current:	$I_F = 350\text{mA}$

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55°C, 350mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	96.26%
Average Chromaticity Shift at 9000 hours ($\Delta u'v'$):	0.0030
Reported TM-21 L70 Lifetime:	>54,000 hours

Data Set:	Data Set 2, 85°C, 350mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	95.19%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0035
Reported TM-21 L70 Lifetime:	>54,000 hours

Data Set:	Data Set 3, 105°C, 350mA
Number of Units:	25
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h,7000h,8000h,9000h
Average. Lumen Maintenance at 9000 hours:	94.07%
Average Chromaticity Shift at 9000 hours($\Delta u'v'$):	0.0042
Reported TM-21 L70 Lifetime:	47,000 hours

3 - Test Data

3.1 Data Set 1, 55°C, 350mA (Lumen Maintenance)

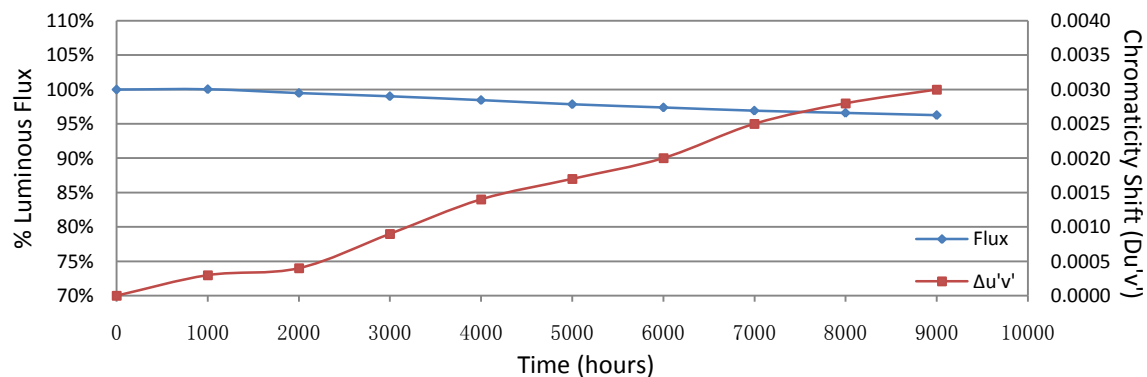
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.384	118.6	100.25	99.49	98.99	98.40	97.98	97.55	96.88	96.63	96.46
2	3.212	119.0	100.17	99.58	99.08	98.24	97.65	96.89	96.30	96.22	95.88
3	3.378	119.5	99.58	99.08	98.49	97.82	97.15	96.82	96.65	96.32	96.07
4	3.464	121.4	99.26	98.85	98.43	97.78	97.28	96.62	96.21	96.13	95.88
5	3.434	122.1	100.08	99.43	98.61	98.12	97.30	96.97	96.40	95.82	95.41
6	3.475	121.5	99.34	98.77	98.27	97.61	97.04	96.63	96.13	95.72	95.64
7	3.457	120.2	99.50	99.17	98.59	97.92	97.25	96.84	96.42	96.26	96.01
8	3.394	122.3	99.92	99.35	98.94	98.36	97.55	96.97	96.57	96.40	96.08
9	3.415	120.8	99.75	99.25	99.01	98.51	97.85	97.52	97.19	97.10	96.77
10	3.453	120.2	99.42	99.00	98.67	97.92	97.50	97.34	96.59	96.01	95.76
11	3.484	120.7	100.00	99.59	99.09	98.51	98.09	97.93	97.76	97.43	97.02
12	3.412	121.8	100.00	99.43	99.01	98.44	97.62	97.21	96.72	96.14	95.73
13	3.465	121.2	100.08	99.42	98.93	98.43	97.69	97.19	96.95	96.45	96.04
14	3.409	122.7	100.00	99.51	99.10	98.53	98.13	97.72	97.47	96.90	96.50
15	3.399	122.4	99.92	99.43	99.02	98.45	97.71	97.22	96.65	96.16	95.83
16	3.404	118.2	99.83	99.24	98.98	98.39	97.63	97.29	96.53	96.28	96.02
17	3.205	120.4	101.08	100.42	100.17	99.75	99.00	98.84	98.26	98.09	97.67
18	3.403	121.4	100.25	99.75	99.34	98.85	98.35	98.11	97.78	97.53	97.03
19	3.223	118.7	100.59	100.08	99.66	99.16	98.65	98.32	97.73	97.39	97.05
20	3.402	121.6	99.84	99.18	98.68	98.11	97.37	96.96	96.22	95.89	95.56
21	3.400	120.8	100.50	100.00	99.25	98.76	98.10	97.35	96.85	96.44	95.86
22	3.396	121.6	100.25	99.75	99.26	98.68	98.27	97.86	97.37	97.12	96.79
23	3.422	119.6	100.59	100.08	99.58	99.00	98.58	97.74	97.32	96.99	96.74
24	3.431	120.7	100.17	99.75	99.01	98.67	98.01	97.18	96.60	96.44	96.19
25	3.460	121.2	100.33	99.75	99.17	98.84	98.18	97.28	96.95	96.70	96.45
Ave.	3.399	120.7	100.03	99.49	99.01	98.45	97.84	97.37	96.90	96.58	96.26
Med.	3.409	120.8	100.00	99.43	99.01	98.44	97.71	97.28	96.72	96.44	96.07
st dev	0.076	1.2	0.4245	0.3988	0.4127	0.4750	0.5017	0.5400	0.5704	0.5982	0.5667
Min.	3.205	118.2	99.26	98.77	98.27	97.61	97.04	96.62	96.13	95.72	95.41
Max.	3.484	122.7	101.08	100.42	100.17	99.75	99.00	98.84	98.26	98.09	97.67

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 4.463E-06
 β : 1.001
Calculated L₇₀: 80,000hours
Reported L₇₀: >54,000hours

3.2 Data Set 1, 55°C, 350mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.2523	0.5204	2965	0.0005	0.0004	0.0008	0.0013	0.0014	0.0006	0.0018	0.0022	0.0024
2	0.2508	0.5219	2992	0.0007	0.0003	0.0007	0.0009	0.0010	0.0007	0.0010	0.0014	0.0017
3	0.2524	0.5224	2949	0.0004	0.0006	0.0012	0.0016	0.0019	0.0021	0.0024	0.0025	0.0019
4	0.2515	0.5225	2970	0.0004	0.0005	0.0010	0.0014	0.0017	0.0018	0.0023	0.0028	0.0028
5	0.2528	0.5235	2933	0.0001	0.0007	0.0011	0.0016	0.0020	0.0021	0.0025	0.0029	0.0034
6	0.2539	0.5229	2911	0.0004	0.0004	0.0013	0.0017	0.0020	0.0023	0.0026	0.0031	0.0034
7	0.2499	0.5191	3031	0.0005	0.0004	0.0011	0.0015	0.0019	0.0021	0.0025	0.0028	0.0031
8	0.2518	0.5208	2973	0.0005	0.0004	0.0012	0.0016	0.0019	0.0022	0.0024	0.0027	0.0030
9	0.2521	0.5210	2965	0.0003	0.0006	0.0014	0.0019	0.0022	0.0025	0.0027	0.0032	0.0034
10	0.2528	0.5220	2942	0.0002	0.0005	0.0011	0.0016	0.0020	0.0024	0.0027	0.0029	0.0031
11	0.2518	0.5212	2972	0.0002	0.0004	0.0011	0.0018	0.0023	0.0026	0.0029	0.0031	0.0035
12	0.2526	0.5214	2951	0.0002	0.0004	0.0008	0.0014	0.0019	0.0022	0.0026	0.0029	0.0032
13	0.2548	0.5249	2879	0.0003	0.0003	0.0008	0.0013	0.0018	0.0022	0.0025	0.0028	0.0033
14	0.2528	0.5237	2933	0.0002	0.0004	0.0009	0.0015	0.0020	0.0023	0.0026	0.0030	0.0030
15	0.2537	0.5231	2913	0.0003	0.0002	0.0006	0.0012	0.0017	0.0021	0.0024	0.0027	0.0036
16	0.2537	0.5223	2919	0.0004	0.0001	0.0006	0.0012	0.0017	0.0022	0.0026	0.0028	0.0030
17	0.2523	0.5233	2946	0.0004	0.0004	0.0004	0.0008	0.0013	0.0018	0.0024	0.0026	0.0028
18	0.2518	0.5207	2973	0.0003	0.0005	0.0009	0.0013	0.0016	0.0020	0.0025	0.0028	0.0027
19	0.2532	0.5230	2927	0.0003	0.0006	0.0010	0.0013	0.0015	0.0021	0.0026	0.0028	0.0030
20	0.2500	0.5176	3039	0.0001	0.0008	0.0012	0.0015	0.0018	0.0024	0.0030	0.0032	0.0034
21	0.2504	0.5190	3021	0.0003	0.0006	0.0009	0.0014	0.0015	0.0021	0.0026	0.0029	0.0033
22	0.2515	0.5194	2990	0.0003	0.0003	0.0007	0.0013	0.0014	0.0019	0.0025	0.0028	0.0029
23	0.2525	0.5206	2956	0.0005	0.0002	0.0008	0.0013	0.0015	0.0021	0.0025	0.0027	0.0030
24	0.2507	0.5188	3014	0.0003	0.0003	0.0008	0.0014	0.0016	0.0021	0.0027	0.0029	0.0030
25	0.2521	0.5215	2963	0.0003	0.0004	0.0008	0.0014	0.0017	0.0021	0.0027	0.0029	0.0034
Ave.	0.2522	0.5215	2961	0.0003	0.0004	0.0009	0.0014	0.0017	0.0020	0.0025	0.0028	0.0030
Med.	0.2523	0.5215	2963	0.0003	0.0004	0.0009	0.0014	0.0017	0.0021	0.0025	0.0028	0.0030
st dev	0.0012	0.0018	39.0469	0.0001	0.0002	0.0002	0.0002	0.0003	0.0005	0.0004	0.0003	0.0005
Min.	0.2499	0.5176	2879	0.0001	0.0001	0.0004	0.0008	0.0010	0.0006	0.0010	0.0014	0.0017
Max.	0.2548	0.5249	3039	0.0007	0.0008	0.0014	0.0019	0.0023	0.0026	0.0030	0.0032	0.0036



3.3 Data Set 2, 85°C, 350mA (Lumen Maintenance)

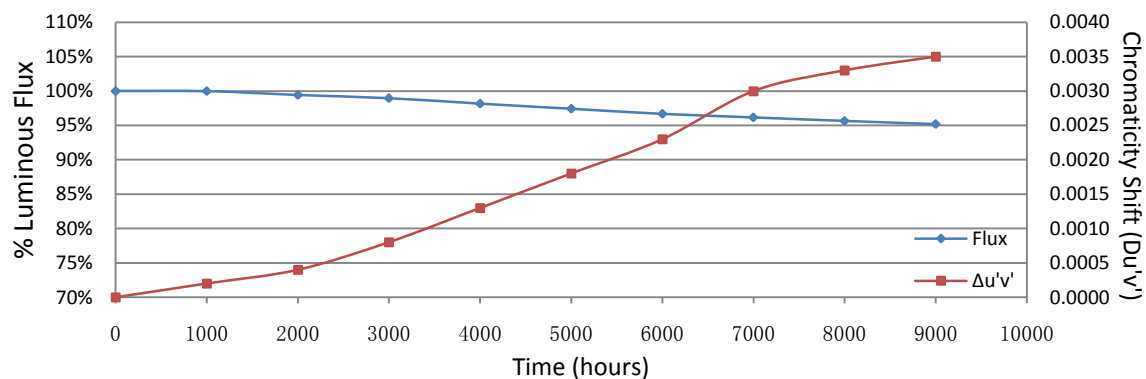
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	3.414	119.9	100.00	99.67	99.08	98.17	97.33	96.50	95.83	95.58	95.25
27	3.411	119.5	100.50	99.83	99.41	98.66	97.82	97.24	96.99	96.74	96.32
28	3.414	121.0	99.50	99.01	98.60	97.85	97.11	96.53	95.95	95.54	95.29
29	3.419	121.3	99.75	99.26	98.85	98.02	97.28	96.29	95.71	95.55	95.22
30	3.443	119.0	99.66	99.24	98.66	97.90	97.23	96.47	95.97	95.71	95.21
31	3.389	120.0	99.83	99.42	98.83	98.00	97.00	96.42	95.75	95.00	94.67
32	3.367	122.9	99.84	99.35	98.86	98.13	97.56	97.07	96.66	96.26	95.61
33	3.451	120.0	99.67	99.00	98.67	97.92	96.92	96.58	96.17	95.75	95.08
34	3.439	120.9	99.34	98.84	98.10	97.60	96.94	96.36	95.70	95.37	94.95
35	3.429	119.7	100.25	99.67	99.08	98.41	97.58	96.24	95.57	95.15	94.82
36	3.429	120.5	100.41	100.00	99.67	98.84	98.01	97.68	97.18	96.68	96.18
37	3.466	119.7	100.33	99.75	99.25	98.41	97.66	97.08	96.41	96.16	95.82
38	3.383	120.7	100.50	100.00	99.59	99.09	98.26	97.18	96.85	96.27	95.69
39	3.400	121.9	100.49	99.84	99.10	98.36	97.37	96.80	96.55	96.14	95.57
40	3.455	122.0	100.41	99.92	99.59	98.69	97.87	96.80	96.07	95.16	94.92
41	3.436	121.6	100.00	99.51	99.01	98.36	97.45	96.71	96.38	95.89	95.64
42	3.398	122.2	99.84	99.26	98.85	98.04	97.14	96.64	96.15	95.58	95.01
43	3.471	120.8	100.00	99.59	99.09	98.18	97.19	96.03	95.36	94.45	94.12
44	3.457	120.6	99.59	99.00	98.59	97.60	96.52	95.85	95.36	94.69	94.11
45	3.438	121.3	100.00	99.59	99.01	98.10	97.28	96.21	95.88	94.97	94.31
46	3.466	121.0	99.75	99.42	98.84	98.10	97.69	97.19	96.61	96.03	95.62
47	3.471	121.1	99.50	99.01	99.50	98.60	99.17	98.68	97.77	97.03	96.61
48	3.452	119.4	100.25	99.66	98.99	98.24	97.49	96.65	95.81	95.23	94.56
49	3.460	119.7	99.83	99.33	98.83	97.83	96.83	96.16	95.66	95.24	94.74
50	3.428	120.5	99.67	98.92	98.26	97.51	96.60	95.93	95.44	94.94	94.52
Ave.	3.431	120.7	99.96	99.44	98.97	98.18	97.41	96.69	96.15	95.64	95.19
Med.	3.436	120.7	99.84	99.42	98.99	98.13	97.33	96.58	95.97	95.58	95.21
st dev	0.029	1.0	0.3500	0.3517	0.3932	0.3924	0.5589	0.6104	0.6089	0.6549	0.6572
Min.	3.367	119.0	99.34	98.84	98.10	97.51	96.52	95.85	95.36	94.45	94.11
Max.	3.471	122.9	100.50	100.00	99.67	99.09	99.17	98.68	97.77	97.03	96.61

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 6.150E-06
 β : 1.005
Calculated L₇₀: 59,000 hours
Reported L₇₀: >54,000 hours

3.4 Data Set 2, 85°C, 350mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2529	0.5212	2946	0.0004	0.0003	0.0007	0.0018	0.0023	0.0025	0.0027	0.0029	0.0031
27	0.2518	0.5212	2970	0.0004	0.0003	0.0006	0.0012	0.0021	0.0025	0.0023	0.0029	0.0030
28	0.2538	0.5230	2913	0.0002	0.0005	0.0013	0.0014	0.0021	0.0029	0.0029	0.0032	0.0034
29	0.2547	0.5249	2881	0.0002	0.0005	0.0014	0.0015	0.0018	0.0031	0.0029	0.0032	0.0035
30	0.2543	0.5222	2904	0.0001	0.0004	0.0009	0.0011	0.0013	0.0030	0.0030	0.0033	0.0035
31	0.2522	0.5212	2962	0.0002	0.0004	0.0011	0.0014	0.0016	0.0022	0.0027	0.0031	0.0034
32	0.2515	0.5219	2975	0.0003	0.0003	0.0009	0.0013	0.0016	0.0019	0.0027	0.0029	0.0031
33	0.2536	0.5223	2921	0.0002	0.0002	0.0006	0.0013	0.0016	0.0019	0.0027	0.0028	0.0033
34	0.2519	0.5215	2968	0.0005	0.0004	0.0009	0.0017	0.0021	0.0022	0.0032	0.0033	0.0035
35	0.2470	0.5100	3175	0.0004	0.0002	0.0007	0.0017	0.0023	0.0027	0.0038	0.0039	0.0041
36	0.2525	0.5202	2961	0.0001	0.0005	0.0009	0.0015	0.0022	0.0027	0.0033	0.0037	0.0038
37	0.2542	0.5234	2900	0.0001	0.0002	0.0006	0.0012	0.0018	0.0022	0.0029	0.0033	0.0034
38	0.2519	0.5203	2973	0.0002	0.0002	0.0006	0.0012	0.0016	0.0021	0.0030	0.0033	0.0034
39	0.2512	0.5214	2986	0.0001	0.0005	0.0008	0.0014	0.0018	0.0024	0.0031	0.0034	0.0037
40	0.2515	0.5208	2982	0.0001	0.0003	0.0006	0.0013	0.0017	0.0023	0.0031	0.0034	0.0036
41	0.2533	0.5233	2922	0.0002	0.0004	0.0007	0.0013	0.0017	0.0023	0.0030	0.0033	0.0035
42	0.2530	0.5237	2928	0.0002	0.0002	0.0005	0.0010	0.0014	0.0019	0.0027	0.0031	0.0033
43	0.2529	0.5220	2940	0.0001	0.0004	0.0006	0.0011	0.0015	0.0020	0.0028	0.0032	0.0033
44	0.2543	0.5233	2899	0.0001	0.0006	0.0010	0.0017	0.0021	0.0024	0.0034	0.0037	0.0038
45	0.2528	0.5218	2942	0.0000	0.0002	0.0005	0.0010	0.0017	0.0021	0.0031	0.0034	0.0039
46	0.2503	0.5192	3020	0.0000	0.0004	0.0002	0.0007	0.0013	0.0019	0.0029	0.0031	0.0033
47	0.2530	0.5224	2935	0.0001	0.0007	0.0009	0.0011	0.0019	0.0022	0.0032	0.0035	0.0036
48	0.2515	0.5211	2979	0.0002	0.0004	0.0011	0.0013	0.0018	0.0024	0.0034	0.0037	0.0038
49	0.2531	0.5222	2933	0.0002	0.0002	0.0007	0.0012	0.0014	0.0021	0.0029	0.0032	0.0035
50	0.2525	0.5230	2943	0.0003	0.0002	0.0009	0.0013	0.0015	0.0022	0.0030	0.0033	0.0035
Ave.	0.2525	0.5215	2954	0.0002	0.0004	0.0008	0.0013	0.0018	0.0023	0.0030	0.0033	0.0035
Med.	0.2528	0.5219	2943	0.0002	0.0004	0.0007	0.0013	0.0017	0.0022	0.0030	0.0033	0.0035
st dev	0.0016	0.0027	56.4806	0.0001	0.0001	0.0003	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003
Min.	0.2470	0.5100	2881	0.0000	0.0002	0.0002	0.0007	0.0013	0.0019	0.0023	0.0028	0.0030
Max.	0.2547	0.5249	3175	0.0005	0.0007	0.0014	0.0018	0.0023	0.0031	0.0038	0.0039	0.0041



3.5 Data Set 3, 105°C, 350mA (Lumen Maintenance)

No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	3.470	119.5	100.00	99.58	98.91	97.99	97.07	95.98	95.56	95.06	94.39
52	3.457	121.2	100.00	99.42	98.93	97.94	96.95	95.79	95.05	94.47	93.81
53	3.432	121.1	100.00	99.67	98.93	97.85	96.78	95.87	94.96	94.47	93.81
54	3.425	121.0	99.92	99.42	98.93	97.85	97.02	96.61	96.12	95.54	95.12
55	3.420	121.0	100.08	99.34	98.68	97.69	97.02	95.87	95.29	94.63	94.21
56	3.441	120.0	99.67	98.92	98.42	97.58	96.58	95.33	94.75	94.08	93.58
57	3.467	119.6	99.83	99.33	98.91	97.91	96.66	94.98	94.48	93.90	93.31
58	3.438	121.4	99.59	99.18	98.60	97.53	96.46	95.47	94.73	94.48	93.99
59	3.403	121.3	99.75	99.26	98.76	97.86	96.54	95.47	94.64	93.98	93.40
60	3.415	121.0	99.83	99.17	98.76	97.60	96.78	95.29	94.55	93.80	93.31
61	3.458	120.7	99.42	98.92	98.34	97.43	96.27	95.28	94.53	94.03	93.54
62	3.477	120.5	99.59	99.17	98.51	97.43	96.76	95.19	94.44	93.69	92.95
63	3.430	118.7	100.17	99.66	99.16	98.15	96.97	95.70	95.20	94.86	94.10
64	3.459	120.1	99.83	99.33	98.75	97.75	96.84	95.92	95.42	94.92	94.67
65	3.436	121.9	100.08	99.67	99.02	98.03	96.88	95.73	94.83	94.42	94.18
66	3.183	120.4	100.08	99.50	99.17	98.09	97.01	96.76	96.01	95.27	95.02
67	3.376	119.6	100.42	100.00	99.50	98.58	97.41	96.66	96.07	95.74	95.40
68	3.453	119.4	100.17	99.66	98.83	97.82	96.90	96.06	95.48	95.06	94.47
69	3.362	118.6	99.92	99.24	98.82	98.06	96.96	95.70	94.94	94.52	93.93
70	3.410	120.6	99.42	99.00	98.51	97.60	96.68	96.19	95.36	94.94	94.53
71	3.397	121.1	99.42	98.93	98.10	96.94	96.20	95.38	94.80	94.38	94.05
72	3.416	119.9	99.92	99.08	98.83	97.83	97.00	96.41	95.58	95.00	94.50
73	3.433	120.3	99.75	99.09	98.59	97.51	96.59	95.34	94.51	94.26	93.85
74	3.379	122.1	99.51	99.02	98.61	97.71	96.64	95.66	95.25	94.68	94.10
75	3.485	121.2	99.59	98.93	98.27	97.11	96.04	95.21	94.72	94.06	93.48
Ave.	3.421	120.5	99.84	99.30	98.75	97.75	96.76	95.75	95.09	94.57	94.07
Med.	3.432	120.6	99.83	99.26	98.76	97.82	96.78	95.70	94.96	94.48	94.05
st dev	0.059	0.9	0.2658	0.2933	0.3069	0.3382	0.3053	0.4875	0.5102	0.5372	0.6047
Min.	3.183	118.6	99.42	98.92	98.10	96.94	96.04	94.98	94.44	93.69	92.95
Max.	3.485	122.1	100.42	100.00	99.50	98.58	97.41	96.76	96.12	95.74	95.40

TM-21 Projection:

Test Duration: 9000 hours
Failures Observed: 0
 α : 7.642E-06
 β : 1.005
Calculated L₇₀: 47,000 hours
Reported L₇₀: 47,000 hours

3.6 Data Set 3, 105°C, 350mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
51	0.2543	0.5235	2898	0.0004	0.0008	0.0014	0.0021	0.0025	0.0030	0.0035	0.0041	0.0047
52	0.2522	0.5213	2960	0.0004	0.0006	0.0011	0.0018	0.0021	0.0025	0.0032	0.0036	0.0039
53	0.2535	0.5226	2923	0.0005	0.0012	0.0018	0.0025	0.0028	0.0033	0.0038	0.0043	0.0045
54	0.2533	0.5217	2932	0.0004	0.0006	0.0012	0.0019	0.0023	0.0027	0.0033	0.0038	0.0040
55	0.2508	0.5222	2989	0.0003	0.0005	0.0013	0.0021	0.0025	0.0029	0.0035	0.0039	0.0042
56	0.2524	0.5204	2961	0.0002	0.0004	0.0010	0.0019	0.0023	0.0027	0.0034	0.0038	0.0040
57	0.2532	0.5213	2938	0.0003	0.0006	0.0009	0.0019	0.0022	0.0026	0.0033	0.0036	0.0040
58	0.2538	0.5212	2923	0.0004	0.0007	0.0012	0.0019	0.0022	0.0026	0.0034	0.0038	0.0041
59	0.2472	0.5109	3164	0.0006	0.0009	0.0013	0.0021	0.0024	0.0029	0.0036	0.0041	0.0044
60	0.2526	0.5196	2962	0.0003	0.0007	0.0011	0.0018	0.0023	0.0027	0.0033	0.0037	0.0041
61	0.2526	0.5214	2951	0.0005	0.0011	0.0016	0.0022	0.0026	0.0030	0.0036	0.0040	0.0044
62	0.2521	0.5220	2960	0.0005	0.0007	0.0009	0.0017	0.0021	0.0027	0.0033	0.0037	0.0041
63	0.2510	0.5190	3004	0.0003	0.0009	0.0012	0.0018	0.0024	0.0029	0.0036	0.0040	0.0044
64	0.2522	0.5225	2953	0.0004	0.0007	0.0011	0.0013	0.0019	0.0023	0.0029	0.0034	0.0037
65	0.2523	0.5213	2957	0.0002	0.0008	0.0016	0.0019	0.0024	0.0029	0.0036	0.0040	0.0044
66	0.2518	0.5228	2961	0.0005	0.0008	0.0012	0.0016	0.0022	0.0026	0.0031	0.0036	0.0040
67	0.2529	0.5219	2940	0.0004	0.0009	0.0011	0.0013	0.0016	0.0021	0.0030	0.0035	0.0037
68	0.2518	0.5211	2971	0.0002	0.0006	0.0011	0.0015	0.0018	0.0022	0.0031	0.0035	0.0040
69	0.2517	0.5210	2975	0.0005	0.0013	0.0020	0.0023	0.0021	0.0026	0.0033	0.0038	0.0041
70	0.2506	0.5190	3015	0.0004	0.0009	0.0016	0.0019	0.0021	0.0026	0.0035	0.0040	0.0043
71	0.2498	0.5196	3032	0.0004	0.0011	0.0021	0.0023	0.0025	0.0029	0.0038	0.0042	0.0047
72	0.2527	0.5221	2943	0.0004	0.0004	0.0010	0.0014	0.0016	0.0020	0.0028	0.0034	0.0037
73	0.2526	0.5214	2951	0.0004	0.0011	0.0015	0.0019	0.0021	0.0025	0.0034	0.0039	0.0044
74	0.2534	0.5222	2928	0.0004	0.0008	0.0013	0.0020	0.0021	0.0025	0.0034	0.0038	0.0041
75	0.2530	0.5213	2941	0.0004	0.0007	0.0012	0.0018	0.0019	0.0024	0.0032	0.0036	0.0040
Ave.	0.2522	0.5209	2965	0.0004	0.0008	0.0013	0.0019	0.0022	0.0026	0.0034	0.0038	0.0042
Med.	0.2524	0.5213	2957	0.0004	0.0008	0.0012	0.0019	0.0022	0.0026	0.0034	0.0038	0.0041
st dev	0.0015	0.0024	50.9906	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003
Min.	0.2472	0.5109	2898	0.0002	0.0004	0.0009	0.0013	0.0016	0.0020	0.0028	0.0034	0.0037
Max.	0.2543	0.5235	3164	0.0006	0.0013	0.0021	0.0025	0.0028	0.0033	0.0038	0.0043	0.0047

