



IESNA LM-80-2008

MEASURING LUMEN MAINTENANCE OF LED LIGHT SOURCES

MEASUREMENT AND TEST REPORT

For

Shenzhen Runlite Technology Co.,Ltd

Building 15,Tantou Wset Industrial Zone,Songgang Street,Baoan District,Shenzhen City,China.

Model: 67mm Filament LED

Report Type: 6000 Hours Test Report	Product Type: LED Array
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Report Number: RSZ141117507-10	
Test Date: 2014-11-23 to 2015-07-31	
Report Date: 2015-08-10	
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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: 67mm Filament LED
 Part Type: LED Array
 Nominal CCT: 2200K

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
1.0m integrating sphere	SENSING	SCD-20008	N/A	1.0 m	2015-05-04	2016-05-04
spectroradiometer	SENSING	SCD-20008	N/A	380-780 nm	2015-05-04	2016-05-04
DC Power Supply	XINGPU	HSPY-100-05	2013010210003	0~100V, 0~5A	2015-05-15	2016-05-15
Standard Light Source	EVERFINE	D062	1011093	N/A	2015-08-05	2016-08-05
Multilayer aging machine	BACL	B2-270	20022	25°C~110°C	2014-10-27	2015-10-27
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090006	(50V/15A)	2015-3-5	2016-3-4
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090009	(50V/15A)	2015-7-8	2016-7-7
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090004	(50V/15A)	2015-3-5	2016-3-4

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 40Pcs;

Each Ts test condition 20Pcs

The samples tested at Ts 55 °C and Ts 85 °C were received at 2014-11-17 and tested during 2014-11-23 to 2015-07-31. The samples were numbered from 1 to 20 and 21 to 40.

Data Set 1: 55 °C, 10mA

Part Number:	67mm Filament LED
Number of Units:	20
Actual Case Temperature(T_S):	$T_S = 54.4$ °C
Actual Ambient Temperature(T_A):	$T_A = 51.3$ °C
Life Test Drive Current:	$I_F = 10$ mA
Measurement Current:	$I_F = 10$ mA

Data Set 2: 85 °C,10mA

Part Number:	67mm Filament LED
Number of Units:	20
Actual Case Temperature(T_S):	$T_S = 84.3$ °C
Actual Ambient Temperature(T_A):	$T_A = 82.2$ °C
Life Test Drive Current:	$I_F = 10$ mA
Measurement Current:	$I_F = 10$ mA

2 - SUMMARY OF TEST RESULT

Data Set:	Data Set 1, 55 °C, 10mA
Number of Units:	20
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	96.70%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0022
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

Data Set:	Data Set 2, 85 °C, 10mA
Number of Units:	20
Failures Observed:	0
Test Interval and Test Duration:	0h,1000h,2000h,3000h,4000h,5000h,6000h
Average. Lumen Maintenance at 6000 hours:	95.43%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0027
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

3 - Test Data

3.1 Data Set 1, 55 °C, 10 mA (Lumen Maintenance)

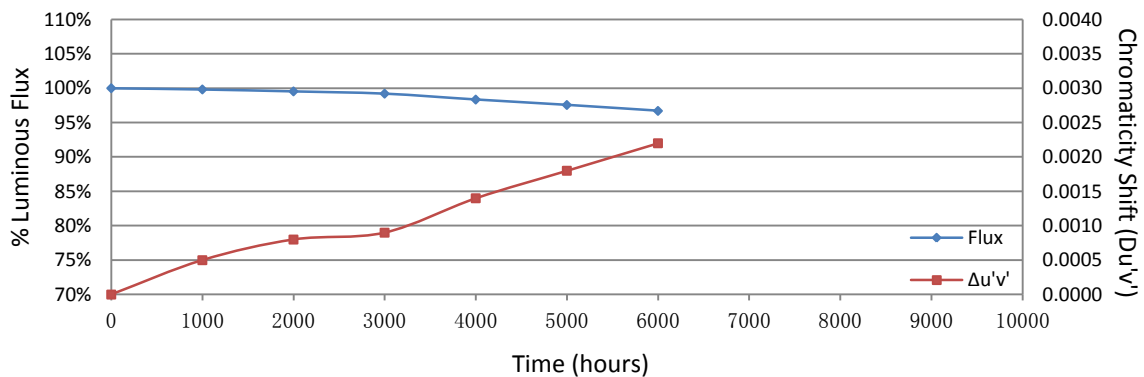
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	128.65	172.87	100.07	99.84	99.45	98.55	97.74	96.67
2	128.27	186.83	100.10	99.81	99.54	98.75	97.99	96.85
3	128.44	177.30	100.12	99.88	99.62	98.51	97.83	96.80
4	128.37	185.12	99.54	99.25	99.01	98.23	97.55	96.51
5	128.69	174.65	99.63	99.42	99.06	97.93	97.09	96.18
6	128.56	184.59	100.33	100.04	99.78	99.05	98.36	97.42
7	128.68	174.58	99.82	99.56	99.16	98.34	97.54	96.56
8	128.61	175.15	99.33	99.10	98.72	97.84	96.95	96.38
9	128.61	176.59	99.91	99.65	99.17	98.24	97.19	96.24
10	128.54	174.85	99.83	99.48	99.02	98.34	97.70	97.15
11	128.67	175.69	99.58	99.27	99.03	98.24	97.48	96.77
12	128.76	173.54	99.78	99.50	99.09	98.21	97.36	96.57
13	128.51	185.11	99.39	99.17	98.82	97.98	97.34	96.41
14	128.61	173.10	100.55	100.13	99.91	99.05	98.11	97.26
15	128.64	184.68	99.55	99.30	98.90	98.14	97.45	96.83
16	128.80	184.94	99.51	99.25	98.88	98.13	97.35	96.53
17	128.71	183.83	99.92	99.61	99.34	98.35	97.47	96.70
18	128.53	175.77	99.52	99.23	98.90	98.16	97.33	96.34
19	128.53	171.70	100.03	99.77	99.51	98.63	97.77	97.05
20	128.52	178.81	99.85	99.62	99.34	98.36	97.56	96.82
Ave.	128.59	178.49	99.82	99.54	99.21	98.35	97.56	96.70
Med.	128.61	176.18	99.83	99.53	99.12	98.29	97.51	96.69
st dev	0.13	5.1760	0.3196	0.2990	0.3347	0.3272	0.3443	0.3340
Min.	128.27	171.70	99.33	99.10	98.72	97.84	96.95	96.18
Max.	128.80	186.83	100.55	100.13	99.91	99.05	98.36	97.42

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 6.507E-06
 β : 1.008
Calculated L₇₀: 56,000hours
Reported L₇₀: >36,000hours

3.2 Data Set 1, 55 °C, 10 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2911	0.5381	2183	0.0002	0.0005	0.0007	0.0011	0.0014	0.0020
2	0.2868	0.5383	2246	0.0006	0.0009	0.0010	0.0012	0.0014	0.0016
3	0.2841	0.5367	2289	0.0006	0.0008	0.0007	0.0010	0.0016	0.0019
4	0.2855	0.5377	2266	0.0004	0.0006	0.0011	0.0014	0.0019	0.0024
5	0.2906	0.5385	2189	0.0004	0.0006	0.0008	0.0013	0.0018	0.0021
6	0.2856	0.5377	2264	0.0006	0.0010	0.0010	0.0013	0.0017	0.0022
7	0.2906	0.5382	2190	0.0003	0.0006	0.0005	0.0009	0.0012	0.0016
8	0.2866	0.5362	2251	0.0009	0.0010	0.0010	0.0017	0.0021	0.0024
9	0.2856	0.5378	2264	0.0006	0.0009	0.0011	0.0015	0.0018	0.0023
10	0.2894	0.5377	2208	0.0004	0.0006	0.0009	0.0017	0.0021	0.0025
11	0.2886	0.5367	2221	0.0004	0.0006	0.0009	0.0014	0.0018	0.0022
12	0.2912	0.5387	2181	0.0005	0.0008	0.0009	0.0013	0.0017	0.0021
13	0.2849	0.5369	2276	0.0004	0.0008	0.0010	0.0013	0.0017	0.0021
14	0.2896	0.5375	2205	0.0007	0.0012	0.0011	0.0018	0.0023	0.0027
15	0.2852	0.5370	2271	0.0004	0.0009	0.0011	0.0014	0.0019	0.0023
16	0.2855	0.5382	2264	0.0005	0.0009	0.0012	0.0016	0.0020	0.0025
17	0.2859	0.5386	2259	0.0004	0.0006	0.0010	0.0015	0.0019	0.0025
18	0.2853	0.5369	2270	0.0004	0.0006	0.0010	0.0016	0.0018	0.0021
19	0.2922	0.5390	2166	0.0004	0.0006	0.0007	0.0011	0.0018	0.0023
20	0.2823	0.5360	2318	0.0004	0.0007	0.0009	0.0013	0.0017	0.0024
Ave.	0.2873	0.5376	2239	0.0005	0.0008	0.0009	0.0014	0.0018	0.0022
Med.	0.2863	0.5377	2255	0.0004	0.0007	0.0010	0.0014	0.0018	0.0022
st dev	0.0028	0.0009	42.5892	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
Min.	0.2823	0.5360	2166	0.0002	0.0005	0.0005	0.0009	0.0012	0.0016
Max.	0.2922	0.5390	2318	0.0009	0.0012	0.0012	0.0018	0.0023	0.0027



3.3 Data Set 2, 85 °C, 10 mA (Lumen Maintenance)

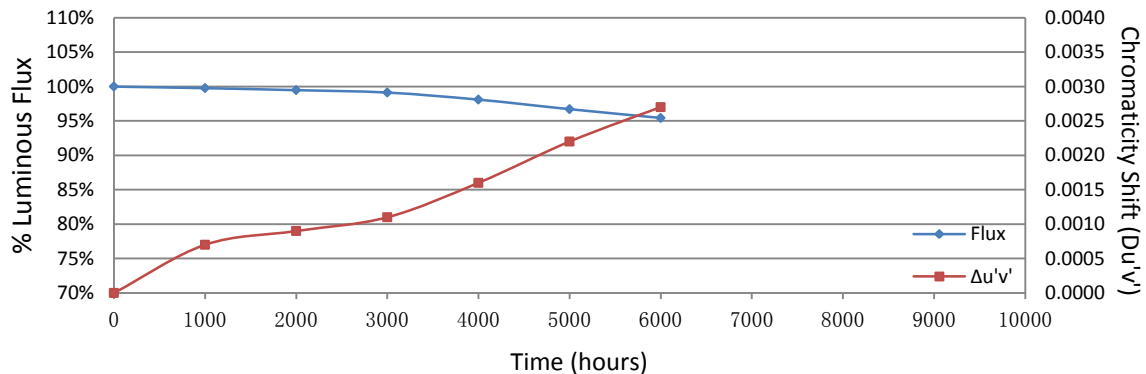
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
21	128.54	178.77	100.15	99.89	99.51	98.39	95.95	94.65
22	128.39	184.07	99.79	99.51	99.28	97.95	96.68	95.53
23	128.18	181.85	99.69	99.68	99.29	98.39	97.24	96.07
24	128.38	178.31	99.85	99.52	99.17	98.26	96.95	95.84
25	128.33	175.69	99.59	99.25	98.94	97.93	96.62	95.94
26	128.45	175.89	99.98	99.68	99.46	98.46	97.13	96.17
27	128.46	172.57	99.79	99.55	99.12	98.38	97.02	96.23
28	128.61	184.09	99.39	99.07	98.70	97.58	96.34	95.13
29	128.54	173.43	99.76	99.57	99.27	98.07	96.71	95.36
30	128.36	174.75	100.23	99.81	99.46	98.56	97.17	95.54
21	127.93	185.80	99.27	98.96	98.49	97.35	95.98	94.66
32	128.53	184.78	99.33	99.17	98.89	97.93	96.56	95.30
33	128.32	172.45	100.14	99.84	99.41	98.57	97.15	95.63
34	128.41	176.34	99.73	99.44	99.04	98.12	96.87	95.11
35	128.15	181.60	99.88	99.54	99.19	98.26	96.92	95.42
36	128.27	173.33	100.28	99.83	99.60	98.16	96.75	95.37
37	128.31	173.70	100.61	100.21	99.90	99.03	97.56	96.22
38	128.16	183.18	99.17	98.88	98.56	97.45	96.27	94.51
39	128.35	172.58	99.35	98.99	98.71	97.74	96.25	95.08
40	128.07	180.82	99.48	99.14	98.68	97.48	96.07	94.85
Ave.	128.34	178.20	99.77	99.48	99.13	98.10	96.71	95.43
Med.	128.36	177.33	99.77	99.53	99.18	98.14	96.73	95.39
st dev	0.17	4.6857	0.3821	0.3607	0.3791	0.4351	0.4534	0.5354
Min.	127.93	172.45	99.17	98.88	98.49	97.35	95.95	94.51
Max.	128.61	185.80	100.61	100.21	99.90	99.03	97.56	96.23

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
α: 9.072E-06
β: 1.013
Calculated L₇₀: 41,000hours
Reported L₇₀: >36,000hours

3.4 Data Set 2, 85 °C, 10 mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift ($\Delta u'v'$)					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
21	0.2816	0.5349	2330	0.0008	0.0009	0.0009	0.0012	0.0017	0.0021
22	0.2854	0.5372	2268	0.0005	0.0010	0.0013	0.0018	0.0025	0.0029
23	0.2889	0.5378	2215	0.0006	0.0007	0.0012	0.0017	0.0025	0.0032
24	0.2825	0.5357	2316	0.0004	0.0007	0.0004	0.0011	0.0016	0.0023
25	0.2853	0.5379	2268	0.0005	0.0009	0.0012	0.0018	0.0025	0.0031
26	0.2847	0.5363	2281	0.0004	0.0005	0.0009	0.0012	0.0018	0.0024
27	0.2911	0.5382	2184	0.0011	0.0014	0.0015	0.0019	0.0025	0.0031
28	0.2852	0.5370	2271	0.0010	0.0013	0.0015	0.0022	0.0029	0.0034
29	0.2877	0.5372	2234	0.0006	0.0009	0.0010	0.0019	0.0025	0.0030
30	0.2908	0.5395	2186	0.0006	0.0010	0.0013	0.0018	0.0024	0.0030
21	0.2865	0.5380	2250	0.0011	0.0013	0.0016	0.0018	0.0023	0.0028
32	0.2859	0.5381	2259	0.0004	0.0007	0.0010	0.0014	0.0021	0.0025
33	0.2906	0.5377	2191	0.0003	0.0006	0.0010	0.0016	0.0022	0.0027
34	0.2855	0.5380	2266	0.0006	0.0010	0.0014	0.0020	0.0026	0.0031
35	0.2887	0.5379	2218	0.0009	0.0009	0.0009	0.0015	0.0022	0.0025
36	0.2863	0.5354	2257	0.0002	0.0005	0.0006	0.0012	0.0018	0.0023
37	0.2849	0.5357	2279	0.0005	0.0008	0.0006	0.0004	0.0010	0.0015
38	0.2888	0.5383	2216	0.0006	0.0008	0.0012	0.0017	0.0023	0.0028
39	0.2906	0.5374	2191	0.0006	0.0007	0.0011	0.0017	0.0024	0.0028
40	0.2861	0.5371	2257	0.0011	0.0013	0.0016	0.0023	0.0030	0.0034
Ave.	0.2869	0.5373	2247	0.0007	0.0009	0.0011	0.0016	0.0022	0.0027
Med.	0.2862	0.5376	2257	0.0006	0.0009	0.0012	0.0017	0.0023	0.0028
st dev	0.0027	0.0011	41.6493	0.0003	0.0003	0.0003	0.0004	0.0005	0.0005
Min.	0.2816	0.5349	2184	0.0002	0.0005	0.0004	0.0004	0.0010	0.0015
Max.	0.2911	0.5395	2330	0.0011	0.0014	0.0016	0.0023	0.0030	0.0034



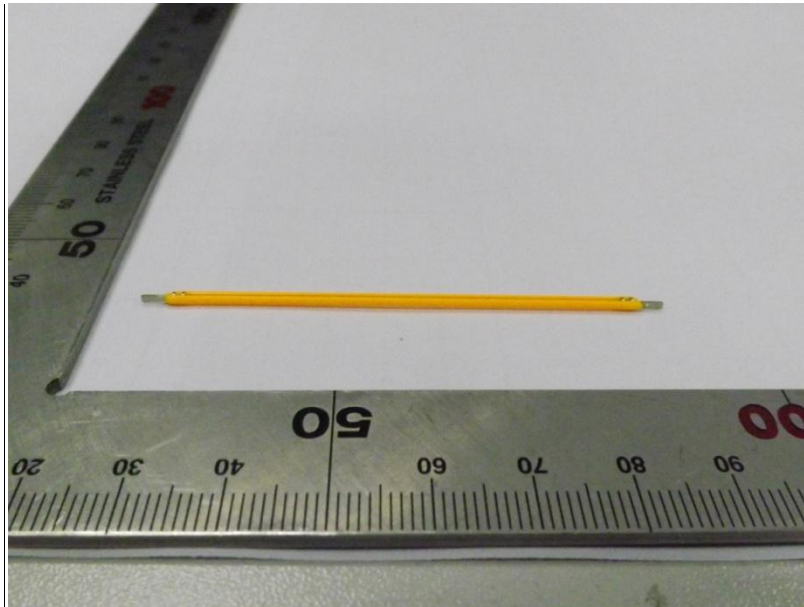
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



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