



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: 26mm Filament LED

Report Type: 6000 Hours Test Report	Product Type: LED Array
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Report Number: RSZ141117505-10	
Test Date: 2014-11-21 to 2015-07-29	
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: 26mm Filament LED
 Part Type: LED Array
 Nominal CCT: 2700K

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	20024	25°C~110°C	2015-03-05	2016-03-05
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060010	(50V/15A)	2015-03-05	2016-03-05
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	(50/15A)	2015-07-08	2016-07-07
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50V/15A)	2015-7-8	2016-07-07

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 2014-11-21 to 2015-07-29. The samples were numbered from 1to 20 and 21 to 40.

Data Set 1: 55 °C, 10mA

Part Number:	26mm Filament LED
Number of Units:	20
Actual Case Temperature(T_S):	$T_S = 54.2$ °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:	26mm Filament LED
Number of Units:	20
Actual Case Temperature(T_S):	$T_S = 84.1$ °C
Actual Ambient Temperature(T_A):	$T_A = 82.3$ °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:	97.25%
Average Chromaticity Shift at 6000 hours ($\Delta u'v'$):	0.0020
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:	96.53%
Average Chromaticity Shift at 6000 hours($\Delta u'v'$):	0.0022
Reported TM-21 L ₇₀ Lifetime:	>36,000 hours

3 - Test Data

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

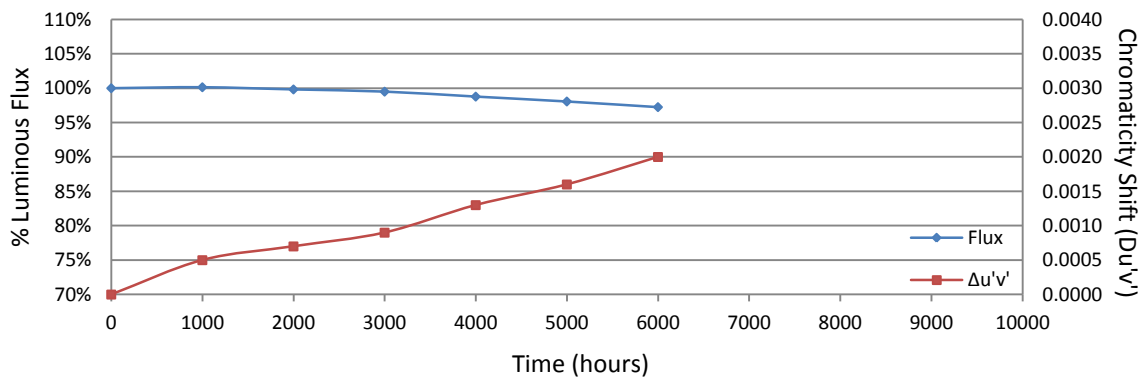
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	42.58	65.53	100.31	99.82	99.56	99.02	98.25	97.25
2	42.50	65.09	99.95	99.51	99.20	98.77	97.96	97.11
3	42.57	64.89	100.45	100.05	99.85	99.26	98.81	98.18
4	42.53	65.19	100.11	99.74	99.26	98.54	97.82	96.95
5	42.52	64.68	100.09	99.75	99.54	98.78	98.13	97.25
6	42.49	65.18	100.14	99.89	99.48	98.94	98.28	97.48
7	42.51	64.73	100.40	100.11	99.91	99.09	98.30	97.57
8	42.58	65.31	100.29	99.95	99.63	99.16	98.25	97.27
9	42.59	65.35	100.99	100.73	100.35	99.42	98.58	97.83
10	42.55	65.73	100.08	99.79	99.53	98.75	98.01	97.20
11	42.58	65.03	100.31	100.05	99.66	98.69	97.99	97.03
12	42.66	64.91	100.05	99.80	99.38	98.55	97.89	97.64
13	42.53	63.46	99.83	99.51	99.34	98.55	97.76	96.90
14	42.56	64.88	99.97	99.69	99.37	98.50	97.58	96.98
15	42.60	64.99	99.49	99.26	99.02	98.34	97.37	96.58
16	42.56	64.97	100.26	99.86	99.48	98.68	97.97	97.09
17	42.57	65.41	99.69	99.39	99.11	98.50	97.91	97.10
18	42.62	65.34	99.89	99.54	99.19	98.47	97.98	97.09
19	42.57	65.33	100.17	99.76	99.40	98.52	98.06	97.14
20	42.54	65.14	100.43	100.15	99.77	98.99	98.43	97.30
Ave.	42.56	65.06	100.14	99.82	99.50	98.78	98.07	97.25
Med.	42.57	65.12	100.12	99.79	99.48	98.72	98.00	97.17
st dev	0.04	0.4611	0.3185	0.3211	0.3101	0.2990	0.3323	0.3560
Min.	42.49	63.46	99.49	99.26	99.02	98.34	97.37	96.58
Max.	42.66	65.73	100.99	100.73	100.35	99.42	98.81	98.18

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
 α : 5.907E-06
 β : 1.010
Calculated L₇₀: 62,000hours
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	0.2635	0.5277	2680	0.0002	0.0004	0.0007	0.0008	0.0011	0.0013
2	0.2638	0.5263	2678	0.0004	0.0008	0.0011	0.0012	0.0012	0.0018
3	0.2635	0.5269	2682	0.0008	0.0010	0.0013	0.0016	0.0020	0.0024
4	0.2640	0.5267	2670	0.0006	0.0008	0.0010	0.0014	0.0017	0.0021
5	0.2635	0.5258	2684	0.0005	0.0007	0.0010	0.0012	0.0014	0.0018
6	0.2642	0.5268	2668	0.0006	0.0010	0.0012	0.0016	0.0021	0.0027
7	0.2631	0.5254	2696	0.0003	0.0004	0.0007	0.0011	0.0015	0.0019
8	0.2632	0.5263	2690	0.0003	0.0006	0.0009	0.0014	0.0018	0.0023
9	0.2642	0.5266	2668	0.0004	0.0007	0.0010	0.0015	0.0018	0.0020
10	0.2613	0.5254	2734	0.0004	0.0008	0.0008	0.0010	0.0014	0.0018
11	0.2643	0.5268	2666	0.0004	0.0006	0.0007	0.0010	0.0011	0.0013
12	0.2636	0.5255	2684	0.0003	0.0006	0.0007	0.0010	0.0011	0.0015
13	0.2642	0.5265	2668	0.0004	0.0005	0.0007	0.0009	0.0010	0.0015
14	0.2642	0.5262	2670	0.0004	0.0006	0.0009	0.0011	0.0014	0.0016
15	0.2637	0.5271	2676	0.0008	0.0011	0.0009	0.0011	0.0013	0.0017
16	0.2631	0.5265	2690	0.0004	0.0006	0.0009	0.0014	0.0018	0.0020
17	0.2638	0.5280	2670	0.0003	0.0004	0.0009	0.0014	0.0016	0.0020
18	0.2640	0.5276	2668	0.0005	0.0008	0.0011	0.0016	0.0022	0.0026
19	0.2642	0.5264	2668	0.0004	0.0006	0.0011	0.0016	0.0021	0.0027
20	0.2638	0.5269	2676	0.0005	0.0008	0.0011	0.0015	0.0018	0.0022
Ave.	0.2637	0.5266	2679	0.0005	0.0007	0.0009	0.0013	0.0016	0.0020
Med.	0.2638	0.5266	2676	0.0004	0.0007	0.0009	0.0013	0.0016	0.0019
st dev	0.0007	0.0007	15.6444	0.0002	0.0002	0.0002	0.0003	0.0004	0.0004
Min.	0.2613	0.5254	2666	0.0002	0.0004	0.0007	0.0008	0.0010	0.0013
Max.	0.2643	0.5280	2734	0.0008	0.0011	0.0013	0.0016	0.0022	0.0027



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

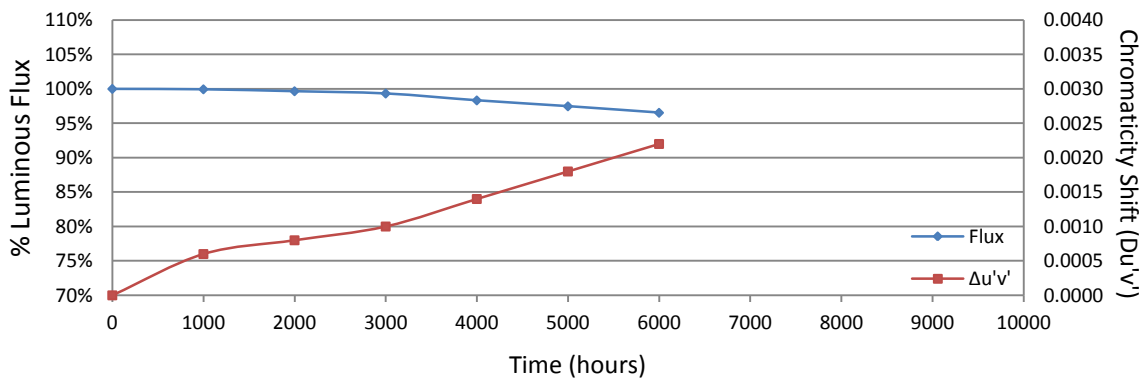
No.	V _F (V)	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
21	42.59	65.16	100.03	99.72	99.20	98.00	97.22	96.16
22	42.58	65.24	99.60	99.29	99.00	97.95	97.18	96.01
23	42.55	64.25	100.36	100.05	99.58	98.68	97.98	96.92
24	42.53	64.87	100.40	100.12	99.68	98.81	97.95	97.09
25	42.55	65.06	100.69	100.42	100.11	99.03	98.26	97.02
26	42.54	65.66	99.71	99.47	99.16	98.28	97.58	96.80
27	42.56	64.92	99.57	99.31	99.00	98.17	97.20	96.35
28	42.51	65.18	99.62	99.39	99.03	97.96	97.02	96.23
29	42.55	64.08	100.17	99.88	99.56	98.50	97.46	96.57
30	42.64	64.95	99.29	99.05	98.66	97.63	96.75	95.61
21	42.58	64.90	100.91	100.57	100.31	99.37	98.52	97.55
32	42.56	65.12	100.43	99.97	99.72	98.69	97.83	96.90
33	42.53	64.77	99.69	99.49	99.12	98.13	97.16	96.20
34	42.59	64.54	99.52	99.38	99.13	98.08	97.24	96.16
35	42.58	65.08	99.19	98.85	98.48	97.60	96.79	95.82
36	42.54	64.99	100.25	99.92	99.45	98.49	97.52	96.68
37	42.55	64.69	100.34	100.09	99.94	98.87	97.94	97.16
38	42.55	64.71	99.81	99.58	99.24	98.10	97.09	96.45
39	42.59	65.12	99.59	99.36	99.17	98.19	97.31	96.38
40	42.53	64.62	99.68	99.35	99.12	98.16	97.37	96.55
Ave.	42.56	64.90	99.94	99.66	99.33	98.33	97.47	96.53
Med.	42.55	64.94	99.76	99.54	99.19	98.18	97.34	96.50
st dev	0.03	0.3558	0.4755	0.4516	0.4599	0.4617	0.4767	0.4873
Min.	42.51	64.08	99.19	98.85	98.48	97.60	96.75	95.61
Max.	42.64	65.66	100.91	100.57	100.31	99.37	98.52	97.55

TM-21 Projection:

Test Duration: 6000 hours
Failures Observed: 0
α: 7.153E-06
β: 1.010
Calculated L₇₀: 51,000hours
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	0.2633	0.5266	2688	0.0004	0.0006	0.0010	0.0014	0.0018	0.0021
22	0.2637	0.5278	2672	0.0004	0.0009	0.0014	0.0019	0.0025	0.0028
23	0.2647	0.5272	2656	0.0006	0.0010	0.0014	0.0018	0.0022	0.0025
24	0.2626	0.5246	2710	0.0006	0.0006	0.0009	0.0014	0.0021	0.0025
25	0.2632	0.5274	2686	0.0003	0.0006	0.0008	0.0012	0.0018	0.0024
26	0.2631	0.5266	2692	0.0005	0.0009	0.0012	0.0018	0.0022	0.0027
27	0.2628	0.5262	2700	0.0006	0.0007	0.0010	0.0014	0.0018	0.0021
28	0.2640	0.5270	2670	0.0006	0.0008	0.0011	0.0014	0.0018	0.0023
29	0.2646	0.5276	2656	0.0004	0.0008	0.0009	0.0012	0.0015	0.0019
30	0.2641	0.5270	2668	0.0002	0.0003	0.0004	0.0009	0.0014	0.0017
21	0.2635	0.5269	2680	0.0010	0.0011	0.0015	0.0019	0.0023	0.0028
32	0.2636	0.5269	2680	0.0010	0.0011	0.0014	0.0021	0.0025	0.0030
33	0.2629	0.5248	2702	0.0006	0.0009	0.0012	0.0016	0.0019	0.0025
34	0.2643	0.5261	2668	0.0005	0.0008	0.0009	0.0012	0.0016	0.0021
35	0.2635	0.5259	2684	0.0005	0.0008	0.0010	0.0015	0.0019	0.0023
36	0.2631	0.5259	2692	0.0007	0.0012	0.0010	0.0012	0.0006	0.0005
37	0.2631	0.5259	2692	0.0002	0.0003	0.0007	0.0011	0.0015	0.0019
38	0.2641	0.5265	2670	0.0009	0.0010	0.0010	0.0011	0.0015	0.0018
39	0.2640	0.5266	2672	0.0008	0.0009	0.0008	0.0012	0.0016	0.0019
40	0.2636	0.5266	2680	0.0004	0.0005	0.0009	0.0013	0.0016	0.0019
Ave.	0.2636	0.5265	2681	0.0006	0.0008	0.0010	0.0014	0.0018	0.0022
Med.	0.2636	0.5266	2680	0.0006	0.0008	0.0010	0.0014	0.0018	0.0022
st dev	0.0006	0.0008	14.6607	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005
Min.	0.2626	0.5246	2656	0.0002	0.0003	0.0004	0.0009	0.0006	0.0005
Max.	0.2647	0.5278	2710	0.0010	0.0012	0.0015	0.0021	0.0025	0.0030



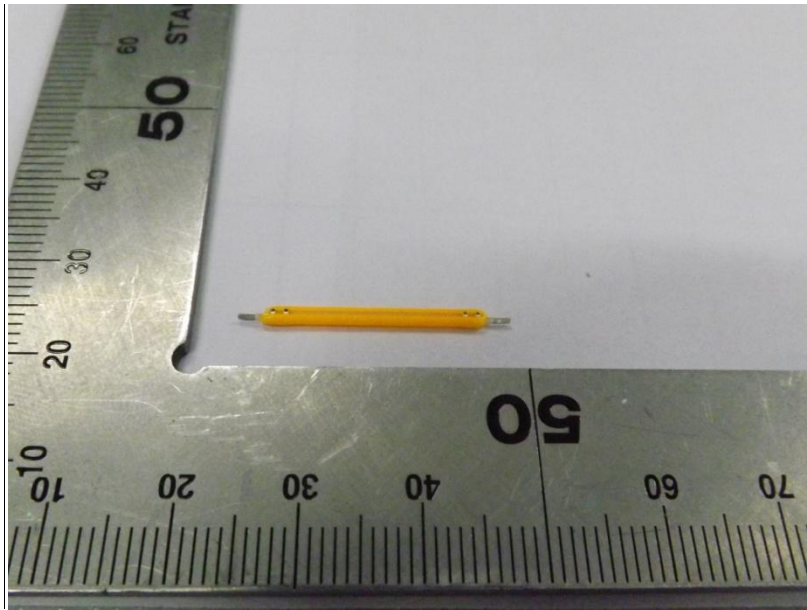
Appendix A – EUT PHOTO

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



All dimensions are in millimeter

A.2 EUT Photo



TMP_{LED}

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