



KILT
Korea Institute of
Lighting Technology

IESNA LM-80-08 Test Report



ACCREDITED
Testing Laboratory
Lab Code: TL-448

Measuring Lumen Maintenance of LED Light Sources

Manufacturer : SAMSUNG ELECTRONICS Co., Ltd.
San #24 Nongseo-Dong, Giheung-Gu, Uongin-city,
Gyeonggi-Do 446-711, Korea

Product Type : LED Package

Model Number : LH351B Series
(SPHWH1L3D3xxxxxxxxx, SPHWH2L3D3xxxxxxxxx,
SPHWH3L3D3xxxxxxxxx)

Report Number : KILT1304-U01296-5 (Revision_4.0)

Test Date : March 18th, 2013 through July 31th, 2014

Report Date : August 4th, 2014

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Test Summary

Required Temperature	Number of LED Packages	Drive Current	Actual Ts	Actual Ta	Average Lumen Maintenance at 9,000 H'rs	Average Chromaticity Shift at 9,000 H'rs
55.0 °C	25	1.0 A	54.7 °C	54.6 °C	96.8	0.0033
85.0 °C	25	1.0 A	84.8 °C	84.6 °C	94.3	0.0036
105.0 °C	25	1.0 A	104.7 °C	104.6 °C	92.6	0.0032

IES TM-21-11 Report : Calculator results have been validated by NIST

Table 1 : Report at each LM-80 Test Condition

Test Condition 1 - 54.7°C Case Temp		Test Condition 2 - 84.8°C Case Temp		Test Condition 3 - 104.7°C Case Temp	
Sample size	25	Sample size	25	Sample size	25
Number of failures	0	Number of failures	0	Number of failures	0
DUT drive current used in the test (mA)	1000	DUT drive current used in the test (mA)	1000	DUT drive current used in the test (mA)	1000
Test duration (hours)	9,000	Test duration (hours)	9,000	Test duration (hours)	9,000
Test duration used for projection (hour to hour)	4,000 - 9,000	Test duration used for projection (hour to hour)	4,000 - 9,000	Test duration used for projection (hour to hour)	4,000 - 9,000
Tested case temperature (°C)	54.7	Tested case temperature (°C)	84.8	Tested case temperature (°C)	104.7
Calculated L70(9k) (hours)	106,000	Calculated L70(9k) (hours)	65,000	Calculated L70(9k) (hours)	50,000
Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	50000

General Information : IES LM-80-08 Test Report Requirement

1. Number of LED light sources tested

- 25 Packages tested at actual case temperature 54.7 °C
- 25 Packages tested at actual case temperature 84.8 °C
- 25 Packages tested at actual case temperature 104.7 °C

Samples have been selected to be representative of the overall population being tested.

2. Description of LED light sources

- SAMSUNG ELECTRONICS LED Package : LH351B Series
IF = 1.0 A CCT (Nominal) = 3000 K
- Package Dimension : 3.5 mm X 3.5 mm

3. Description of auxiliary equipment

- Temperature controlling chamber for LED package/array/module
This chamber consists of the water cooling heat-sink plates to control the case temperature of each device and the power supply required by LM-80 test conditions.
- Photometric measurement tester for LED package/array/module
This test equipment consists of the integrating sphere in conjunction with the temperature controlling plate and programmable current-source meter.

4. Operating Cycle

- Number of units : 25 at 54.7 °C / 25 at 84.8 °C / 25 at 104.7 °C
- Drive current : 1.0 A
- Typical Voltage : 3.3 V

LED packages are driven with a constant direct current.

5. Ambient Conditions including airflow, temperature and relative humidity

- Case temperature: controlled to -2 °C
- Surrounding air temperature: controlled to -5 °C
- Relative humidity: < 65 RH

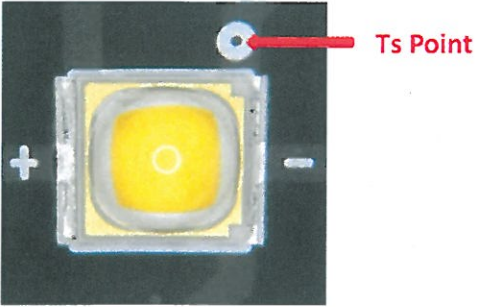
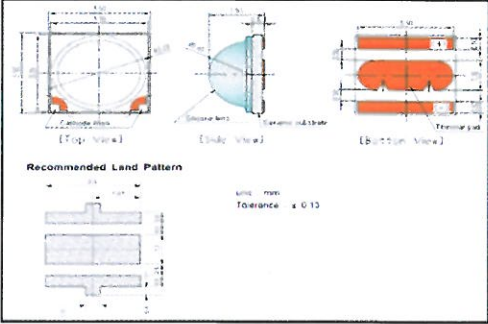
The minimal airflow is maintained in chamber. The ambient temperature around the LED packages inside chamber is controlled by air flowing and the thermocouple readings are monitored.

6. Standards Used

- IESNA LM-80-08 : IES Approved Method for Measuring Lumen Maintenance of LED Lights Sources.
- ENERGY STAR Program Guidance Regarding LED package, LED Array and Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products.

7. Case Temperature (Test Point Temperature)

- LED temperature measurement point is shown in the picture below.

TEST POINT	PKG DIMENSION
	

8. Drive Current of the LED light source during lifetime test

- See sub-clause Test Data 1, 2 and 3

9. Lumen Maintenance data and Chromaticity shift reported over the measurement

- See each table.

During the test of luminous flux and chromaticity, ambient temperature was set to $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

10. Observation of Failures

- No optical, electrical or mechanical failure of any LED Package was seen during the lifetime testing.

11. LED Light source monitoring interval

- Measurements have been taken after the following durations:

$$T_s = 54.7\text{ }^{\circ}\text{C}$$

0, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hours

$$T_s = 84.8\text{ }^{\circ}\text{C}$$

0, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hours

$$T_s = 104.7\text{ }^{\circ}\text{C}$$

0, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hours

12. Photometric Measurement Uncertainty

- The testers are calibrated monthly and the calibration data ensures $\pm 2\%$ uncertainty of measurement.

Test Data

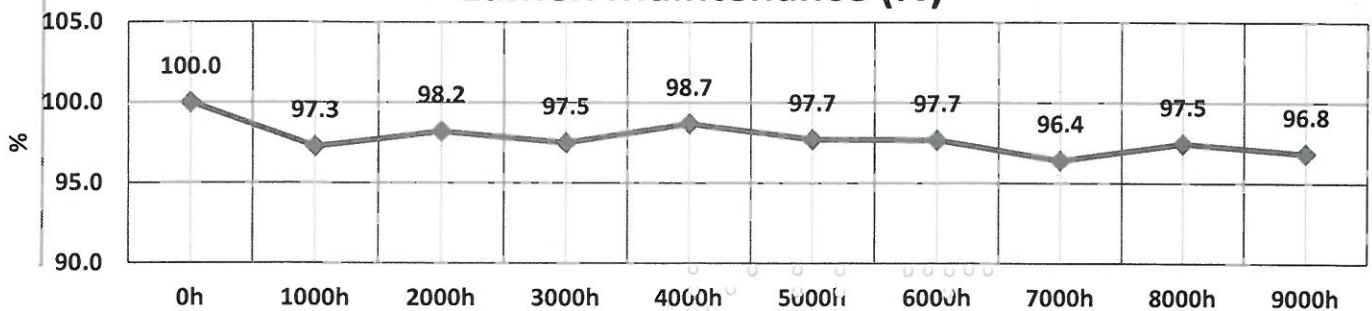
1. TEST CONDITION 1 [54.7 °C , IF = 1.0 A]

- Measurement Current : 1.0 A

[LUMEN MAINTENANCE]

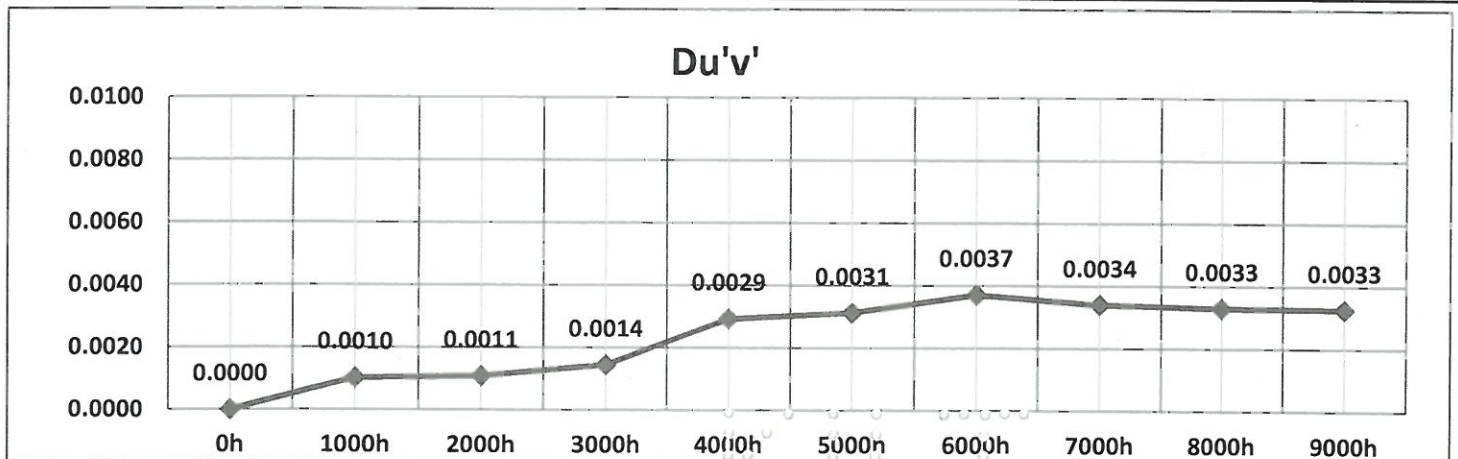
No.	Φ_v	V_f	Lumen Maintenance [%]									
	[lm]	[V]										
	0h (Initial)		0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	189.1	3.4	100.0	97.4	99.7	98.9	100.3	99.7	96.7	96.1	97.7	97.4
2	202.2	3.4	100.0	97.3	97.6	97.0	98.1	97.0	98.1	95.6	97.0	96.5
3	203.6	3.3	100.0	97.9	98.6	98.0	99.1	97.6	98.5	96.8	98.5	98.6
4	204.0	3.3	100.0	97.2	98.3	97.5	98.2	97.4	95.4	95.3	97.0	97.2
5	206.8	3.4	100.0	97.1	98.1	97.3	98.6	97.7	97.5	96.2	97.5	96.9
6	205.8	3.3	100.0	97.3	97.5	96.5	98.2	96.5	97.9	96.5	97.9	96.7
7	209.8	3.3	100.0	97.1	98.2	97.0	98.3	97.4	97.8	96.0	96.9	96.0
8	213.8	3.4	100.0	97.3	97.9	97.2	98.6	97.5	97.5	96.9	97.0	96.3
9	209.3	3.3	100.0	97.9	98.6	98.1	99.4	98.6	97.8	96.8	97.1	96.4
10	212.2	3.4	100.0	97.2	98.3	97.3	98.3	97.7	99.1	96.6	97.4	96.9
11	206.5	3.4	100.0	97.1	98.0	97.1	98.3	97.5	97.9	95.8	97.1	95.4
12	213.3	3.3	100.0	96.4	97.6	96.6	97.9	96.6	96.6	95.3	96.6	95.3
13	210.6	3.4	100.0	97.5	98.6	97.8	99.0	98.0	98.5	96.9	97.8	96.1
14	212.9	3.4	100.0	97.4	98.8	98.1	99.5	98.5	97.8	97.0	98.0	96.4
15	207.0	3.4	100.0	97.1	98.3	97.5	98.8	97.7	98.6	96.7	97.3	96.8
16	212.1	3.4	100.0	97.0	98.3	97.9	99.2	98.1	99.1	96.9	98.1	97.1
17	203.7	3.4	100.0	97.2	98.4	97.5	98.4	97.6	96.6	95.9	97.3	97.3
18	208.8	3.4	100.0	97.3	98.1	97.8	98.3	97.9	96.4	96.0	96.3	96.9
19	206.5	3.4	100.0	97.3	97.9	97.5	98.4	97.3	97.3	95.7	97.4	97.2
20	210.3	3.4	100.0	97.6	98.0	97.9	99.0	97.6	97.2	96.8	97.8	96.5
21	206.5	3.4	100.0	97.2	98.2	97.4	98.6	97.9	97.0	96.0	96.9	97.2
22	209.8	3.4	100.0	96.8	97.9	96.7	98.1	97.2	97.3	96.7	96.7	95.8
23	206.3	3.3	100.0	97.3	98.6	98.0	99.0	98.3	98.2	97.4	98.3	97.6
24	205.0	3.3	100.0	97.1	98.0	97.6	99.1	98.0	99.4	97.9	98.7	98.6
25	209.4	3.3	100.0	97.4	97.9	97.1	98.4	97.8	97.8	96.5	97.9	98.1
Ave.	207.4	3.3	100.0	97.3	98.2	97.5	98.7	97.7	97.7	96.4	97.5	96.8
Med.	207.0	3.4	100.0	97.3	98.2	97.5	98.6	97.7	97.8	96.5	97.4	96.9
σ	4.9	0.0	0.0	0.3	0.4	0.5	0.5	0.6	0.9	0.6	0.6	0.8
Min.	189.1	3.3	100.0	96.4	97.5	96.5	97.9	96.5	95.4	95.3	96.3	95.3
Max	213.8	3.4	100.0	97.9	99.7	98.9	100.3	99.7	99.4	97.9	98.7	98.6

Lumen Maintenance (%)



[CHROMATICITY SHIFT]

No.	CCT [K]	Chromaticity Shift $\Delta u'v'$									
	0h (Initial)	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3233	0.0000	0.0011	0.0013	0.0016	0.0033	0.0033	0.0038	0.0036	0.0035	0.0036
2	3214	0.0000	0.0010	0.0009	0.0012	0.0029	0.0030	0.0036	0.0033	0.0031	0.0034
3	3262	0.0000	0.0010	0.0011	0.0013	0.0029	0.0030	0.0037	0.0034	0.0032	0.0035
4	3259	0.0000	0.0010	0.0011	0.0014	0.0029	0.0032	0.0037	0.0034	0.0033	0.0034
5	3226	0.0000	0.0011	0.0012	0.0016	0.0030	0.0032	0.0038	0.0035	0.0034	0.0034
6	3271	0.0000	0.0011	0.0010	0.0015	0.0029	0.0032	0.0037	0.0035	0.0033	0.0031
7	3232	0.0000	0.0010	0.0011	0.0014	0.0029	0.0031	0.0037	0.0034	0.0032	0.0031
8	3262	0.0000	0.0010	0.0011	0.0015	0.0028	0.0032	0.0036	0.0034	0.0033	0.0032
9	3254	0.0000	0.0010	0.0011	0.0014	0.0029	0.0031	0.0038	0.0034	0.0032	0.0031
10	3275	0.0000	0.0009	0.0012	0.0014	0.0029	0.0031	0.0039	0.0035	0.0033	0.0033
11	3226	0.0000	0.0011	0.0012	0.0016	0.0030	0.0032	0.0038	0.0035	0.0034	0.0033
12	3221	0.0000	0.0011	0.0009	0.0014	0.0028	0.0031	0.0036	0.0032	0.0032	0.0030
13	3250	0.0000	0.0011	0.0012	0.0016	0.0031	0.0032	0.0039	0.0036	0.0035	0.0034
14	3237	0.0000	0.0011	0.0011	0.0013	0.0030	0.0031	0.0037	0.0034	0.0034	0.0029
15	3241	0.0000	0.0011	0.0013	0.0016	0.0029	0.0032	0.0039	0.0035	0.0035	0.0034
16	3210	0.0000	0.0010	0.0011	0.0015	0.0030	0.0031	0.0037	0.0034	0.0034	0.0033
17	3272	0.0000	0.0008	0.0010	0.0013	0.0027	0.0030	0.0035	0.0031	0.0030	0.0030
18	3259	0.0000	0.0010	0.0012	0.0015	0.0029	0.0032	0.0037	0.0033	0.0033	0.0033
19	3208	0.0000	0.0010	0.0011	0.0016	0.0031	0.0032	0.0038	0.0034	0.0034	0.0036
20	3246	0.0000	0.0011	0.0009	0.0015	0.0028	0.0031	0.0036	0.0033	0.0033	0.0031
21	3292	0.0000	0.0012	0.0011	0.0015	0.0029	0.0032	0.0037	0.0033	0.0033	0.0034
22	3222	0.0000	0.0009	0.0009	0.0013	0.0028	0.0030	0.0035	0.0034	0.0032	0.0031
23	3230	0.0000	0.0010	0.0011	0.0014	0.0029	0.0032	0.0037	0.0035	0.0034	0.0034
24	3237	0.0000	0.0009	0.0011	0.0014	0.0028	0.0030	0.0038	0.0034	0.0033	0.0033
25	3268	0.0000	0.0009	0.0009	0.0013	0.0028	0.0030	0.0037	0.0032	0.0032	0.0031
Ave.	3244	0.0000	0.0010	0.0011	0.0014	0.0029	0.0031	0.0037	0.0034	0.0033	0.0033
Med.	3241	0.0000	0.0010	0.0011	0.0014	0.0029	0.0031	0.0037	0.0034	0.0033	0.0033
σ	22	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Min.	3208	0.0000	0.0008	0.0009	0.0012	0.0027	0.0030	0.0035	0.0031	0.0030	0.0029
Max	3292	0.0000	0.0012	0.0013	0.0016	0.0033	0.0033	0.0039	0.0036	0.0035	0.0036

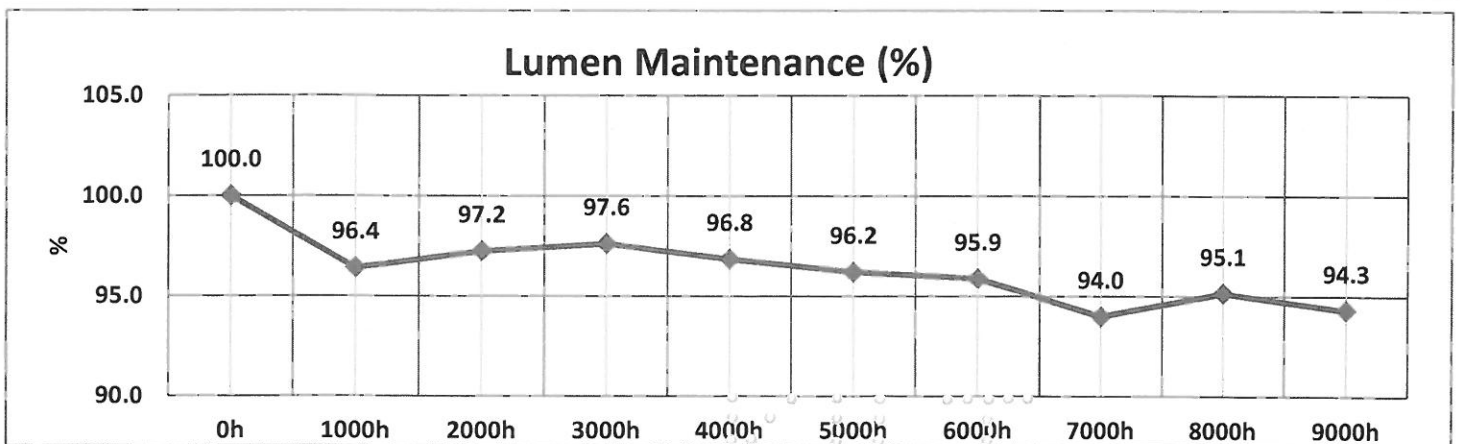


2. TEST CONDITION 2 [84.8 °C , IF = 1.0 A]

- Measurement Current : 1.0 A

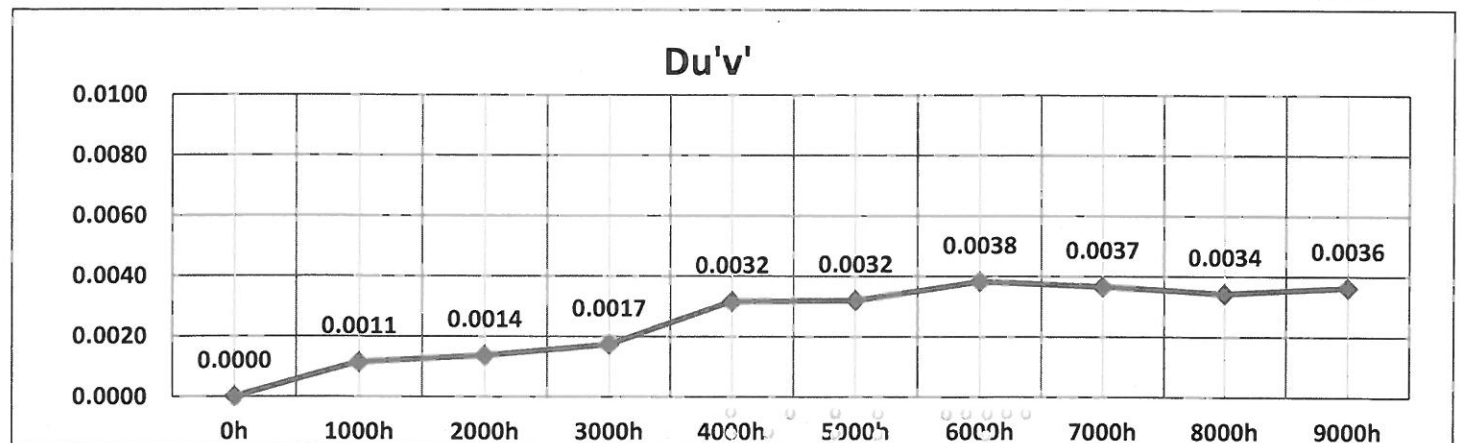
[LUMEN MAINTENANCE]

No.	Φ_v	V_f	Lumen Maintenance [%]									
	[lm]	[V]	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
	0h (Initial)		0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	206.1	3.3	100.0	97.0	98.4	98.8	98.9	97.9	95.8	93.4	95.0	94.5
2	208.2	3.3	100.0	96.4	97.6	98.1	97.7	97.0	96.2	93.9	95.3	94.6
3	213.3	3.3	100.0	96.8	98.2	97.9	97.5	97.1	96.8	93.3	95.1	93.9
4	212.9	3.3	100.0	96.4	97.1	97.3	96.5	96.3	95.2	93.4	94.8	92.6
5	213.0	3.4	100.0	96.7	97.3	97.8	97.2	96.5	97.3	95.1	96.4	95.3
6	213.4	3.3	100.0	97.0	97.4	97.5	97.6	96.3	96.7	94.3	95.4	92.8
7	209.8	3.3	100.0	95.9	96.7	97.3	95.9	95.5	95.8	93.1	94.0	93.3
8	209.5	3.4	100.0	96.6	97.2	97.3	96.5	96.1	95.5	93.8	94.6	93.3
9	211.3	3.4	100.0	95.9	96.6	97.0	96.5	96.2	95.8	93.4	94.7	93.8
10	210.2	3.3	100.0	96.0	96.4	96.4	95.4	94.7	94.7	93.5	94.4	92.8
11	212.7	3.4	100.0	96.6	97.5	98.0	97.1	96.2	96.7	94.2	95.1	94.3
12	211.1	3.4	100.0	96.9	97.3	97.7	97.2	96.7	95.8	94.9	96.3	94.7
13	199.4	3.4	100.0	96.6	97.1	97.0	95.7	94.9	95.1	93.2	94.0	93.9
14	198.6	3.3	100.0	96.2	96.8	97.3	95.9	95.2	94.7	93.0	93.7	93.5
15	205.5	3.4	100.0	96.0	96.4	97.3	96.7	95.5	94.9	94.3	94.8	95.3
16	198.4	3.3	100.0	96.1	96.6	97.0	95.8	95.0	95.8	94.0	94.6	94.5
17	209.3	3.4	100.0	97.0	98.2	98.1	97.5	96.4	96.7	95.0	95.3	95.1
18	204.1	3.3	100.0	96.2	97.2	97.6	96.6	96.1	96.0	93.8	95.7	94.4
19	205.6	3.3	100.0	96.6	97.6	98.2	97.4	96.5	95.9	95.0	95.8	96.2
20	202.8	3.4	100.0	96.1	97.3	97.7	96.4	96.3	95.5	94.5	95.1	94.5
21	202.8	3.4	100.0	97.0	97.7	98.3	97.6	97.1	96.7	95.4	96.5	95.9
22	206.1	3.3	100.0	95.9	97.1	97.4	96.4	95.7	95.9	93.3	94.6	94.3
23	205.4	3.3	100.0	96.2	96.8	97.3	96.7	96.3	95.2	93.8	94.9	94.5
24	207.5	3.4	100.0	95.8	96.9	98.1	97.3	96.8	96.5	94.3	96.3	95.0
25	207.4	3.3	100.0	96.4	97.8	97.9	96.9	96.5	96.0	93.9	96.1	94.4
Ave.	207.4	3.3	100.0	96.4	97.2	97.6	96.8	96.2	95.9	94.0	95.1	94.3
Med.	207.5	3.3	100.0	96.4	97.2	97.6	96.7	96.3	95.8	93.9	95.1	94.4
σ	4.5	0.0	0.0	0.4	0.5	0.5	0.8	0.7	0.7	0.7	0.8	0.9
Min.	198.4	3.3	100.0	95.8	96.4	96.4	95.4	94.7	94.7	93.0	93.7	92.6
Max	213.4	3.4	100.0	97.0	98.4	98.8	98.9	97.9	97.3	95.4	96.5	96.2



[CHROMATICITY SHIFT]

No.	CCT [K]	Chromaticity Shift $\Delta u'v'$									
	0h (Initial)	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3229	0.0000	0.0014	0.0016	0.0020	0.0035	0.0036	0.0041	0.0039	0.0037	0.0038
2	3256	0.0000	0.0011	0.0014	0.0016	0.0032	0.0032	0.0037	0.0035	0.0033	0.0033
3	3260	0.0000	0.0011	0.0014	0.0017	0.0032	0.0032	0.0039	0.0035	0.0033	0.0033
4	3286	0.0000	0.0011	0.0013	0.0017	0.0032	0.0032	0.0037	0.0036	0.0034	0.0034
5	3224	0.0000	0.0011	0.0012	0.0018	0.0031	0.0032	0.0039	0.0037	0.0036	0.0036
6	3264	0.0000	0.0013	0.0015	0.0020	0.0032	0.0036	0.0041	0.0038	0.0036	0.0037
7	3250	0.0000	0.0012	0.0015	0.0019	0.0033	0.0034	0.0040	0.0038	0.0036	0.0037
8	3223	0.0000	0.0011	0.0015	0.0018	0.0032	0.0032	0.0038	0.0037	0.0034	0.0035
9	3234	0.0000	0.0010	0.0013	0.0017	0.0031	0.0032	0.0038	0.0036	0.0035	0.0036
10	3249	0.0000	0.0010	0.0012	0.0015	0.0030	0.0030	0.0037	0.0035	0.0034	0.0034
11	3245	0.0000	0.0011	0.0013	0.0016	0.0030	0.0031	0.0038	0.0036	0.0033	0.0034
12	3247	0.0000	0.0012	0.0014	0.0019	0.0032	0.0032	0.0038	0.0037	0.0035	0.0037
13	3195	0.0000	0.0014	0.0015	0.0017	0.0033	0.0033	0.0040	0.0038	0.0034	0.0041
14	3214	0.0000	0.0009	0.0011	0.0016	0.0029	0.0029	0.0035	0.0034	0.0031	0.0037
15	3264	0.0000	0.0011	0.0013	0.0017	0.0031	0.0031	0.0038	0.0037	0.0034	0.0038
16	3215	0.0000	0.0012	0.0013	0.0017	0.0031	0.0032	0.0039	0.0038	0.0036	0.0038
17	3236	0.0000	0.0013	0.0016	0.0020	0.0033	0.0034	0.0039	0.0039	0.0038	0.0039
18	3258	0.0000	0.0011	0.0013	0.0016	0.0031	0.0031	0.0037	0.0036	0.0034	0.0037
19	3245	0.0000	0.0011	0.0015	0.0018	0.0032	0.0032	0.0038	0.0038	0.0034	0.0040
20	3243	0.0000	0.0011	0.0014	0.0017	0.0032	0.0032	0.0037	0.0036	0.0033	0.0035
21	3276	0.0000	0.0009	0.0013	0.0016	0.0029	0.0030	0.0037	0.0035	0.0032	0.0037
22	3276	0.0000	0.0011	0.0012	0.0015	0.0029	0.0030	0.0037	0.0035	0.0033	0.0035
23	3235	0.0000	0.0011	0.0013	0.0018	0.0032	0.0032	0.0039	0.0038	0.0035	0.0039
24	3239	0.0000	0.0010	0.0012	0.0016	0.0031	0.0031	0.0037	0.0035	0.0033	0.0036
25	3222	0.0000	0.0011	0.0014	0.0017	0.0032	0.0031	0.0038	0.0037	0.0035	0.0029
Ave.	3243	0.0000	0.0011	0.0014	0.0017	0.0032	0.0032	0.0038	0.0037	0.0034	0.0036
Med.	3245	0.0000	0.0011	0.0013	0.0017	0.0032	0.0032	0.0038	0.0037	0.0034	0.0037
σ	21	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0003
Min.	3195	0.0000	0.0009	0.0011	0.0015	0.0029	0.0029	0.0035	0.0034	0.0031	0.0029
Max	3286	0.0000	0.0014	0.0016	0.0020	0.0035	0.0036	0.0041	0.0039	0.0038	0.0041

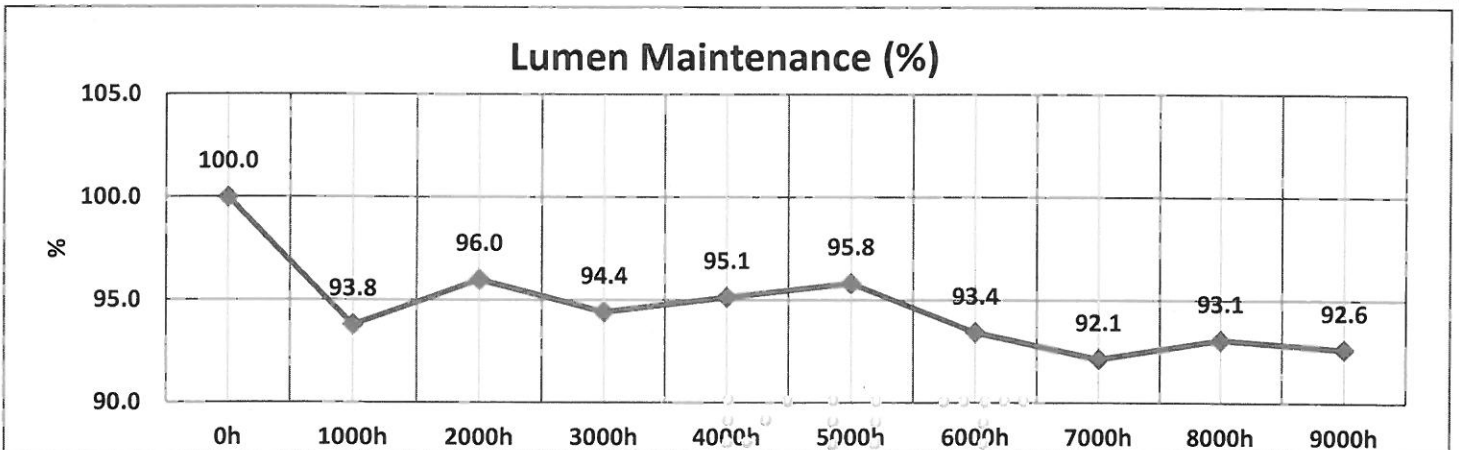


3. TEST CONDITION 3 [104.7 °C , IF = 1.0 A]

- Measurement Current : 1.0 A

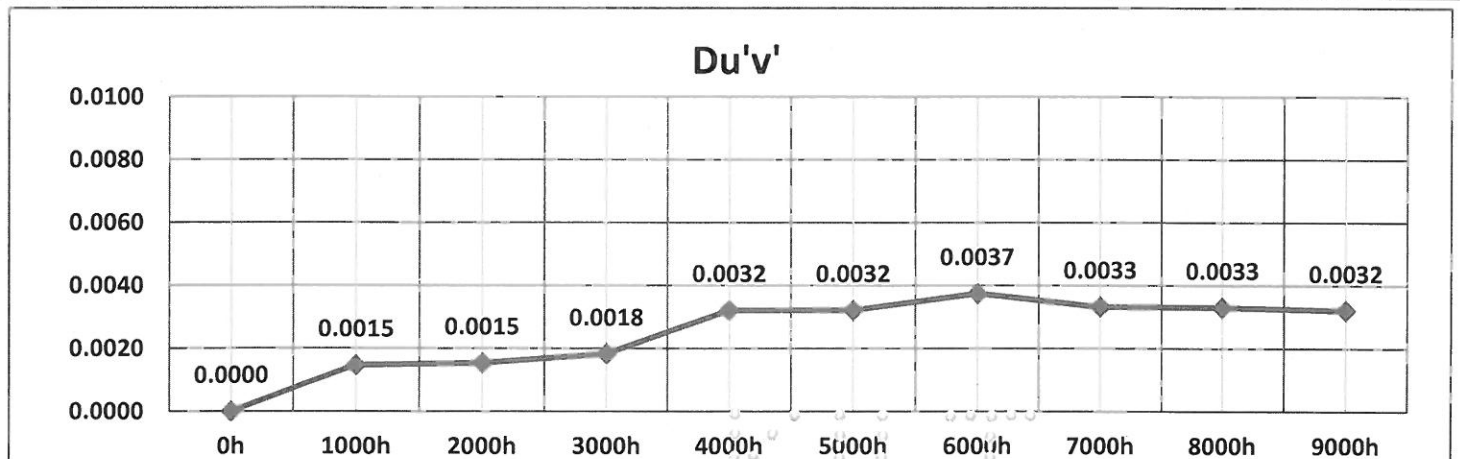
[LUMEN MAINTENANCE]

No.	Φ_v	V_f	Lumen Maintenance [%]									
	[lm]	[V]	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
	0h (Initial)		0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	198.0	3.3	100.0	93.2	97.0	95.1	96.1	96.5	91.6	90.4	91.9	91.6
2	207.0	3.3	100.0	93.8	95.7	94.1	94.9	95.5	93.3	92.6	94.1	94.6
3	204.6	3.4	100.0	94.0	95.8	94.5	95.0	95.7	92.9	91.1	93.0	93.4
4	212.4	3.3	100.0	93.8	95.7	94.2	94.9	95.2	93.7	92.5	93.6	91.9
5	206.6	3.4	100.0	93.9	96.2	94.5	95.3	95.8	92.9	91.8	93.0	92.1
6	206.0	3.4	100.0	92.3	94.5	92.9	93.3	94.0	91.8	91.4	91.3	92.4
7	212.0	3.4	100.0	94.1	96.5	95.0	95.8	96.5	93.8	92.9	93.5	92.7
8	212.1	3.4	100.0	93.3	96.0	94.5	95.3	95.8	94.1	92.7	93.3	92.9
9	208.7	3.3	100.0	93.2	94.6	94.0	94.4	95.4	94.5	92.1	92.9	93.6
10	214.2	3.4	100.0	93.9	96.0	94.7	94.7	95.5	93.6	92.4	92.6	92.6
11	208.1	3.4	100.0	94.3	96.1	95.0	96.5	97.5	94.7	94.0	94.9	94.5
12	214.3	3.3	100.0	93.2	95.8	93.6	94.4	95.2	92.3	91.7	92.7	92.3
13	212.4	3.3	100.0	94.1	96.0	94.3	95.0	95.8	93.3	91.5	92.6	91.4
14	209.6	3.3	100.0	94.3	96.4	94.9	96.1	96.7	94.2	92.5	94.0	93.2
15	208.9	3.3	100.0	94.2	96.6	95.4	96.3	96.6	94.8	93.5	94.5	94.4
16	205.9	3.3	100.0	93.4	95.5	92.9	92.6	93.1	93.0	90.6	91.6	89.5
17	206.9	3.4	100.0	94.2	96.3	94.7	95.1	96.2	94.0	91.8	92.7	93.2
18	212.2	3.3	100.0	93.9	96.4	94.3	95.6	96.1	94.0	92.5	93.3	91.8
19	209.3	3.4	100.0	94.1	96.1	94.9	95.5	96.3	93.7	92.4	93.4	93.8
20	215.7	3.3	100.0	94.2	96.3	94.8	95.8	96.8	93.9	93.2	93.8	92.7
21	208.2	3.4	100.0	93.9	96.1	95.3	95.9	97.0	93.7	92.8	93.4	93.4
22	208.6	3.3	100.0	93.8	96.1	94.4	95.3	95.9	93.1	92.6	93.0	93.1
23	213.6	3.3	100.0	93.7	96.0	94.3	94.8	95.2	93.4	91.6	93.0	90.8
24	211.0	3.3	100.0	94.1	95.8	94.1	94.9	95.5	92.8	91.3	92.2	92.0
25	209.9	3.3	100.0	94.0	96.2	94.1	94.8	95.7	92.6	91.4	92.4	91.8
Ave.	209.4	3.3	100.0	93.8	96.0	94.4	95.1	95.8	93.4	92.1	93.1	92.6
Med.	209.3	3.3	100.0	93.9	96.1	94.5	95.1	95.8	93.6	92.4	93.0	92.7
σ	3.7	0.0	0.0	0.5	0.5	0.6	0.9	0.9	0.8	0.8	0.8	1.2
Min.	198.0	3.3	100.0	92.3	94.5	92.9	92.6	93.1	91.6	90.4	91.3	89.5
Max	215.7	3.4	100.0	94.3	97.0	95.4	96.5	97.5	94.8	94.0	94.9	94.6



[CHROMATICITY SHIFT]

No.	CCT [K]	Chromaticity Shift $\Delta u'v'$									
	0h (Initial)	0h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	3235	0.0000	0.0015	0.0018	0.0021	0.0036	0.0036	0.0040	0.0036	0.0036	0.0038
2	3248	0.0000	0.0015	0.0016	0.0018	0.0032	0.0032	0.0038	0.0034	0.0034	0.0034
3	3245	0.0000	0.0014	0.0014	0.0018	0.0031	0.0032	0.0036	0.0032	0.0032	0.0031
4	3250	0.0000	0.0015	0.0015	0.0018	0.0033	0.0031	0.0038	0.0034	0.0033	0.0032
5	3258	0.0000	0.0014	0.0015	0.0016	0.0032	0.0032	0.0036	0.0032	0.0032	0.0031
6	3260	0.0000	0.0014	0.0016	0.0017	0.0031	0.0030	0.0036	0.0033	0.0032	0.0032
7	3232	0.0000	0.0014	0.0015	0.0019	0.0032	0.0032	0.0036	0.0032	0.0032	0.0030
8	3236	0.0000	0.0014	0.0016	0.0017	0.0032	0.0031	0.0037	0.0034	0.0034	0.0031
9	3237	0.0000	0.0016	0.0015	0.0020	0.0032	0.0033	0.0040	0.0035	0.0035	0.0034
10	3264	0.0000	0.0015	0.0015	0.0019	0.0030	0.0030	0.0036	0.0031	0.0032	0.0032
11	3228	0.0000	0.0015	0.0016	0.0019	0.0033	0.0034	0.0039	0.0034	0.0035	0.0036
12	3288	0.0000	0.0015	0.0015	0.0017	0.0030	0.0030	0.0036	0.0033	0.0034	0.0032
13	3282	0.0000	0.0014	0.0016	0.0018	0.0031	0.0030	0.0037	0.0032	0.0033	0.0030
14	3230	0.0000	0.0016	0.0016	0.0021	0.0034	0.0034	0.0039	0.0035	0.0034	0.0034
15	3236	0.0000	0.0014	0.0015	0.0017	0.0032	0.0032	0.0037	0.0034	0.0032	0.0034
16	3278	0.0000	0.0016	0.0018	0.0020	0.0034	0.0034	0.0040	0.0035	0.0035	0.0028
17	3260	0.0000	0.0014	0.0014	0.0017	0.0031	0.0032	0.0036	0.0032	0.0031	0.0030
18	3216	0.0000	0.0013	0.0014	0.0017	0.0031	0.0031	0.0036	0.0033	0.0034	0.0030
19	3259	0.0000	0.0016	0.0016	0.0019	0.0032	0.0033	0.0037	0.0034	0.0033	0.0033
20	3276	0.0000	0.0014	0.0014	0.0017	0.0032	0.0032	0.0037	0.0033	0.0033	0.0031
21	3257	0.0000	0.0014	0.0015	0.0018	0.0032	0.0033	0.0036	0.0033	0.0033	0.0032
22	3231	0.0000	0.0014	0.0015	0.0018	0.0032	0.0032	0.0037	0.0034	0.0033	0.0032
23	3248	0.0000	0.0015	0.0016	0.0019	0.0032	0.0033	0.0038	0.0034	0.0034	0.0032
24	3253	0.0000	0.0013	0.0013	0.0016	0.0031	0.0030	0.0035	0.0030	0.0030	0.0031
25	3265	0.0000	0.0015	0.0016	0.0018	0.0033	0.0033	0.0037	0.0032	0.0033	0.0032
Ave.	3251	0.0000	0.0015	0.0015	0.0018	0.0032	0.0032	0.0037	0.0033	0.0033	0.0032
Med.	3250	0.0000	0.0014	0.0015	0.0018	0.0032	0.0032	0.0037	0.0033	0.0033	0.0032
σ	18	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Min.	3216	0.0000	0.0013	0.0013	0.0016	0.0030	0.0030	0.0035	0.0030	0.0030	0.0028
Max	3288	0.0000	0.0016	0.0018	0.0021	0.0036	0.0036	0.0040	0.0036	0.0036	0.0038



Revision History

No.	Report Date	Report Number	Contents
0	2013.12.23	KILT1304-U01296-5	Issued after the completion of 6,000 Hours
1	2014.05.08	KILT1304-U01296-5 (Revision_1.0)	Issued after the completion of 7,000 Hours
2	2014.07.14	KILT1304-U01296-5 (Revision_2.0)	Revised the Original 6000 Hours TEST REPORT (KILT1304-U01296-5) Model Number at the manufacturer's request. (SPHWH2L3D3XXXXXXXXX => LH351B Series)
3	2014.07.14	KILT1304-U01296-5 (Revision_3.0)	Revised the Original 7000 Hours TEST REPORT(KILT1304-U01296-5 Revision_1.0) Model Number at the manufacturer's request. (SPHWH2L3D3XXXXXXXXX => LH351B Series)
4	2014.08.04	KILT1304-U01296-5 (Revision_4.0)	Issued after the completion of 9,000 Hours

