

Measuring Lumen Maintenance of LED Light Sources

Manufacturer : LG Innotek Co., Ltd.

Wollong Industry complex, Naepo-ri, Munsan-eup, Paju-city
Gyeonggi-Province, 413-901 Korea

Product Type : LED package

Model Name : LGIT 3030N 6V Package 3000 K

Model Number : LEMWS36X Series

Tested Part Number : LEMWS36X80LZ3200 (Nominal CCT : 3000 K)

Report Number : KILT1401-U00009-10 (Revision_2.0)

Test Date : May 29th, 2014 through June 14th, 2015

Report Date : June 20th, 2015

Testing Laboratory : Korea Institute of Lighting Technology

DAEWOO TECHNOPARK A-403, 261 DOYAK-RO,
WONMI-GU, BUCHEON CITY, GYEONGGIDO 420-806
SOUTH KOREA

Tel: +82-32-670-8888, Fax: +82-32-670-8889

Report Prepared by:



Junseok Oh
Research Engineer

Report Reviewed by:



Jungsu Kim
Technical Manager

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	0.15 A	55.1 °C	54.4 °C	95.93 %	0.0019
85.0 °C	25	0.15 A	85.3 °C	84.5 °C	95.74 %	0.0023
105.0 °C	25	0.15 A	105.0 °C	104.6 °C	95.31 %	0.0022

IES TM-21-11 Report (Rev. 08.28.14) : Calculator results have been validated by NIST

Table 1 : Report at each LM-80 Test Condition

Test Condition 1 - 55.1°C Case Temp		Test Condition 2 - 85.3°C Case Temp		Test Condition 3 - 105°C Case Temp	
Sample size	25	Sample size	25	Sample size	25
DUT drive current used in the test (mA)	150	DUT drive current used in the test (mA)	150	DUT drive current used in the test (mA)	150
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)	55.1	Tested case temperature (°C)	85.3	Tested case temperature (°C)	105.0
Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	>54000	Reported L70(9k) (hours)	>54000



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

1. Number of LED light sources tested

- 25 Packages tested at actual case temperature 55.1 °C
- 25 Packages tested at actual case temperature 85.3 °C
- 25 Packages tested at actual case temperature 105.0 °C

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

2. Applicable LEMWS36X Series part numbers

This test report is also applied to the following product:

Part Number	Nominal CCT	Part Number	Nominal CCT
LEMWS36X**MZ****	2700 K	LEMWS36X**HZ****	5000 K
LEMWS36X**LZ****	3000 K	LEMWS36X**GZ****	5700 K
LEMWS36X**KZ****	3500 K	LEMWS36X**FZ****	6500 K
LEMWS36X**JZ****	4000 K		

3. Description of LED light sources

- **LG Innotek LED Package** : LGIT 3030N 6V Package 3000 K
 $I_f = 0.15 \text{ A}$ CCT (Nominal) = 3000 K
- Package Dimension : 3.0 mm X 3.0 mm

4. 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.

5. Operating Cycle

- Number of units : 25 at 55.1 °C / 25 at 85.3 °C / 25 at 105.0 °C
- Drive current : 0.15 A
- Typical Voltage : 6.5 V

LED packages are driven with a constant direct current.

6. 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

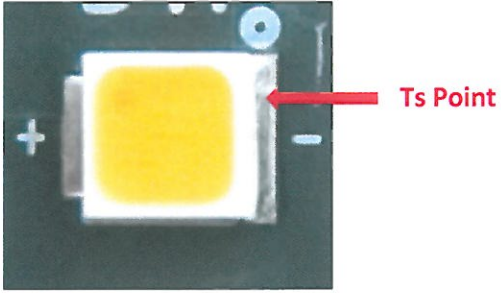
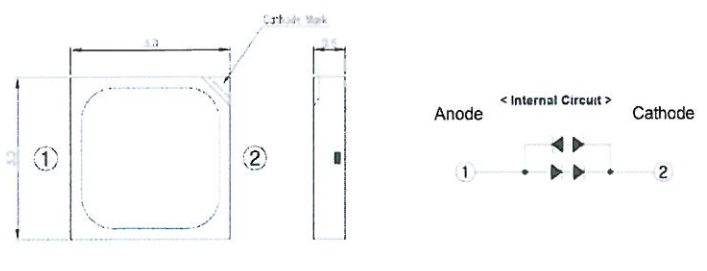
The minimal airflow is maintained in chamber. The ambient temperature around the LED packages inside chamber is controlled by air flowing and the thermocouple readings are monitored.

7. 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.

8. Case Temperature (Test Point Temperature)

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

TEST POINT	PKG DIMENSION
	

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

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

10. 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 °C ± 2 °C.

11. Observation of Failures

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

12. LED Light source monitoring interval

- Measurements have been taken after the following durations:

Ts = 55.1 °C

0, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hours

Ts = 85.3 °C

0, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hours

Ts = 105.0 °C

0, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 and 9000 hours

13. Photometric Measurement Uncertainty

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

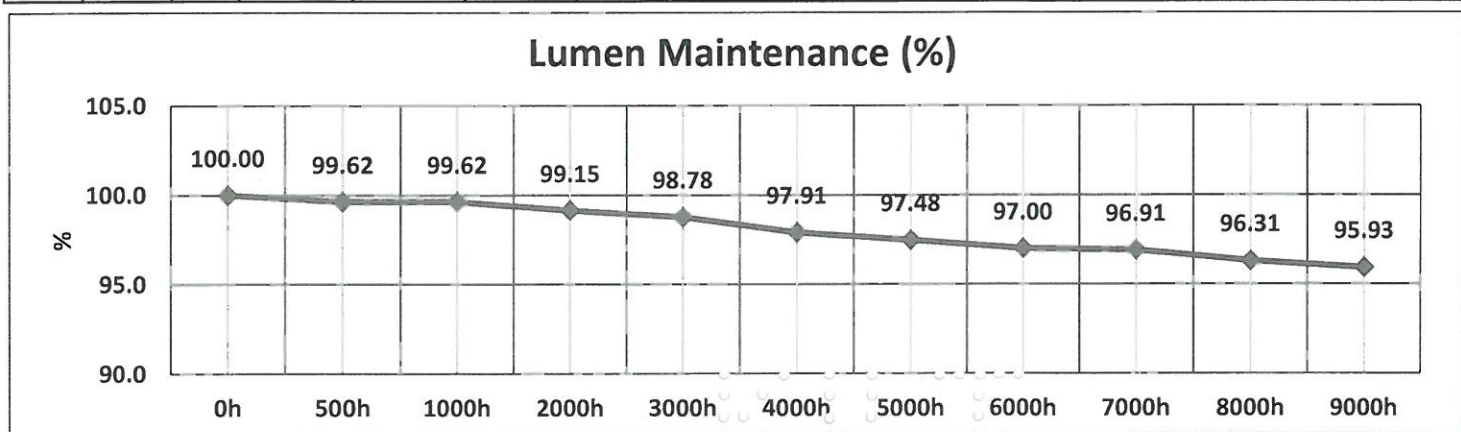
Test Data

1. TEST CONDITION 1 [55.1 °C , If = 0.15 A]

- Measurement Current : 0.15 A

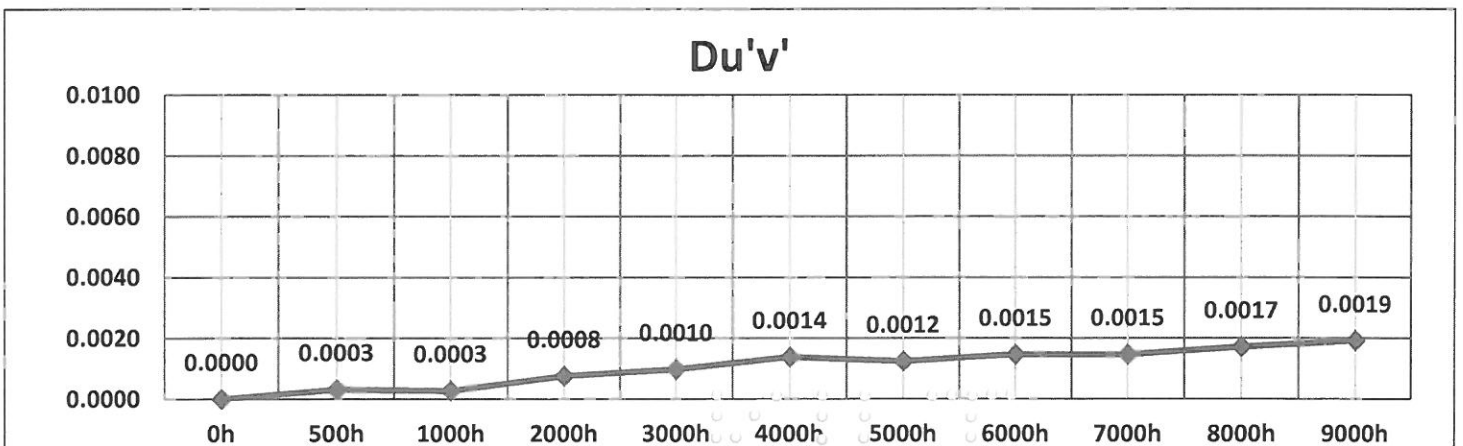
[LUMEN MAINTENANCE]

No.	Φ_v	VF	Lumen Maintenance [%]											
	[lm]	[V]	0h (Initial)	0h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	91.0	6.2	100.00	99.80	99.66	98.90	98.02	97.17	96.14	95.51	95.44	94.99	94.63	
2	93.0	6.2	100.00	99.69	99.53	98.88	98.48	97.52	96.20	95.88	95.81	95.15	94.68	
3	91.4	6.2	100.00	99.94	99.93	99.42	99.10	98.31	97.17	96.99	96.92	96.21	95.81	
4	93.6	6.2	100.00	99.57	99.40	98.58	98.13	97.41	96.44	95.82	95.87	95.31	94.89	
5	93.0	6.2	100.00	99.33	99.20	98.69	98.23	97.29	96.50	96.11	96.11	95.61	95.33	
6	91.8	6.2	100.00	99.53	99.65	99.08	98.61	97.36	96.75	96.16	96.19	95.64	95.27	
7	91.3	6.2	100.00	99.78	99.77	99.28	99.06	98.32	97.94	97.23	97.38	96.73	96.32	
8	95.2	6.2	100.00	99.38	99.20	98.62	97.91	97.16	96.74	96.35	96.49	95.85	95.36	
9	92.1	6.1	100.00	99.65	99.91	99.54	99.32	98.34	97.95	97.65	97.63	96.95	96.53	
10	93.2	6.2	100.00	99.70	99.65	99.12	98.73	97.97	97.00	96.56	96.67	96.10	95.80	
11	94.4	6.2	100.00	99.55	99.44	98.96	98.45	97.60	97.63	96.82	96.70	96.12	95.66	
12	92.0	6.2	100.00	99.75	100.01	99.51	99.26	98.29	98.03	97.67	97.56	96.98	96.58	
13	91.5	6.2	100.00	99.82	99.82	99.55	99.39	98.67	97.94	97.67	97.46	96.78	96.43	
14	92.0	6.2	100.00	99.63	99.69	99.32	98.92	98.19	97.76	97.36	97.12	96.53	96.18	
15	94.1	6.2	100.00	99.54	99.42	99.19	98.82	98.05	97.91	97.57	97.39	96.86	96.52	
16	91.3	6.2	100.00	99.75	99.77	99.36	99.28	98.44	98.07	97.66	97.53	96.89	96.47	
17	92.3	6.2	100.00	99.78	99.80	99.44	99.00	98.24	98.23	97.65	97.56	96.97	96.61	
18	93.6	6.2	100.00	99.60	99.52	99.11	98.71	97.72	97.58	97.08	97.09	96.46	96.04	
19	92.4	6.2	100.00	99.48	99.69	99.26	99.16	98.15	98.09	97.78	97.57	96.98	96.64	
20	91.7	6.2	100.00	99.74	99.76	99.52	99.31	98.55	98.32	97.72	97.53	96.97	96.67	
21	94.6	6.2	100.00	99.59	99.63	99.44	98.89	97.87	97.77	97.32	96.92	96.42	95.99	
22	94.0	6.2	100.00	99.32	99.40	98.57	98.36	97.43	97.27	96.85	96.96	96.35	95.95	
23	92.5	6.2	100.00	99.71	99.69	99.30	99.12	98.27	98.39	97.81	97.65	97.00	96.63	
24	93.7	6.2	100.00	99.49	99.41	98.90	98.25	97.46	97.44	96.46	96.15	95.57	95.18	
25	91.9	6.1	100.00	99.48	99.67	99.14	98.89	97.97	97.71	97.27	96.98	96.36	96.06	
Ave.	92.7	6.2	100.00	99.62	99.62	99.15	98.78	97.91	97.48	97.00	96.91	96.31	95.93	
Med.	92.4	6.2	100.00	99.63	99.66	99.19	98.89	97.97	97.71	97.23	96.98	96.42	96.04	
σ	1.2	0.0	0.00	0.16	0.21	0.31	0.43	0.45	0.67	0.69	0.65	0.62	0.63	
Min.	91.0	6.1	100.00	99.32	99.20	98.57	97.91	97.16	96.14	95.51	95.44	94.99	94.63	
Max	95.2	6.2	100.00	99.94	100.01	99.55	99.39	98.67	98.39	97.81	97.65	97.00	96.67	



[CHROMATICITY SHIFT]

No.	CCT [K]	Chromaticity Shift $\Delta u'v'$										
		0h (Initial)	0h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h
1	3037	0.0000	0.0004	0.0004	0.0009	0.0014	0.0018	0.0018	0.0021	0.0021	0.0023	0.0025
2	2989	0.0000	0.0003	0.0003	0.0008	0.0011	0.0015	0.0015	0.0018	0.0018	0.0021	0.0023
3	2904	0.0000	0.0003	0.0003	0.0008	0.0011	0.0015	0.0015	0.0017	0.0017	0.0020	0.0022
4	3037	0.0000	0.0004	0.0004	0.0008	0.0012	0.0016	0.0016	0.0018	0.0018	0.0021	0.0023
5	3030	0.0000	0.0004	0.0004	0.0008	0.0012	0.0016	0.0015	0.0017	0.0017	0.0020	0.0021
6	2966	0.0000	0.0003	0.0003	0.0008	0.0010	0.0016	0.0014	0.0016	0.0016	0.0019	0.0021
7	2965	0.0000	0.0003	0.0003	0.0008	0.0009	0.0013	0.0012	0.0014	0.0014	0.0017	0.0018
8	2949	0.0000	0.0004	0.0004	0.0008	0.0012	0.0017	0.0015	0.0017	0.0017	0.0019	0.0022
9	2946	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0013	0.0015	0.0015	0.0018	0.0020
10	2995	0.0000	0.0003	0.0002	0.0007	0.0009	0.0012	0.0012	0.0014	0.0014	0.0016	0.0018
11	2957	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0012	0.0014	0.0015	0.0017	0.0019
12	3033	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0012	0.0014	0.0015	0.0017	0.0019
13	2993	0.0000	0.0003	0.0003	0.0007	0.0008	0.0012	0.0010	0.0013	0.0013	0.0016	0.0017
14	2984	0.0000	0.0003	0.0002	0.0007	0.0009	0.0013	0.0011	0.0013	0.0013	0.0016	0.0018
15	3045	0.0000	0.0003	0.0002	0.0006	0.0009	0.0012	0.0009	0.0011	0.0012	0.0014	0.0015
16	2956	0.0000	0.0003	0.0002	0.0007	0.0007	0.0011	0.0010	0.0012	0.0012	0.0014	0.0017
17	3038	0.0000	0.0003	0.0002	0.0007	0.0009	0.0013	0.0011	0.0013	0.0013	0.0015	0.0017
18	2993	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0012	0.0014	0.0014	0.0017	0.0019
19	3028	0.0000	0.0003	0.0002	0.0007	0.0008	0.0012	0.0010	0.0012	0.0012	0.0014	0.0016
20	3000	0.0000	0.0003	0.0002	0.0007	0.0007	0.0011	0.0010	0.0012	0.0012	0.0015	0.0017
21	3048	0.0000	0.0003	0.0003	0.0009	0.0010	0.0015	0.0013	0.0015	0.0016	0.0018	0.0020
22	3027	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0012	0.0014	0.0014	0.0017	0.0019
23	2962	0.0000	0.0003	0.0002	0.0007	0.0008	0.0011	0.0010	0.0012	0.0012	0.0014	0.0015
24	2982	0.0000	0.0003	0.0002	0.0007	0.0009	0.0014	0.0011	0.0014	0.0015	0.0018	0.0020
25	2973	0.0000	0.0003	0.0003	0.0007	0.0008	0.0012	0.0011	0.0013	0.0013	0.0016	0.0018
Ave.	2993	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0012	0.0015	0.0015	0.0017	0.0019
Med.	2993	0.0000	0.0003	0.0003	0.0008	0.0010	0.0014	0.0012	0.0014	0.0014	0.0017	0.0019
σ	37	0.0000	0.0000	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003
Min.	2904	0.0000	0.0003	0.0002	0.0006	0.0007	0.0011	0.0009	0.0011	0.0012	0.0014	0.0015
Max	3048	0.0000	0.0004	0.0004	0.0009	0.0014	0.0018	0.0018	0.0021	0.0021	0.0023	0.0025

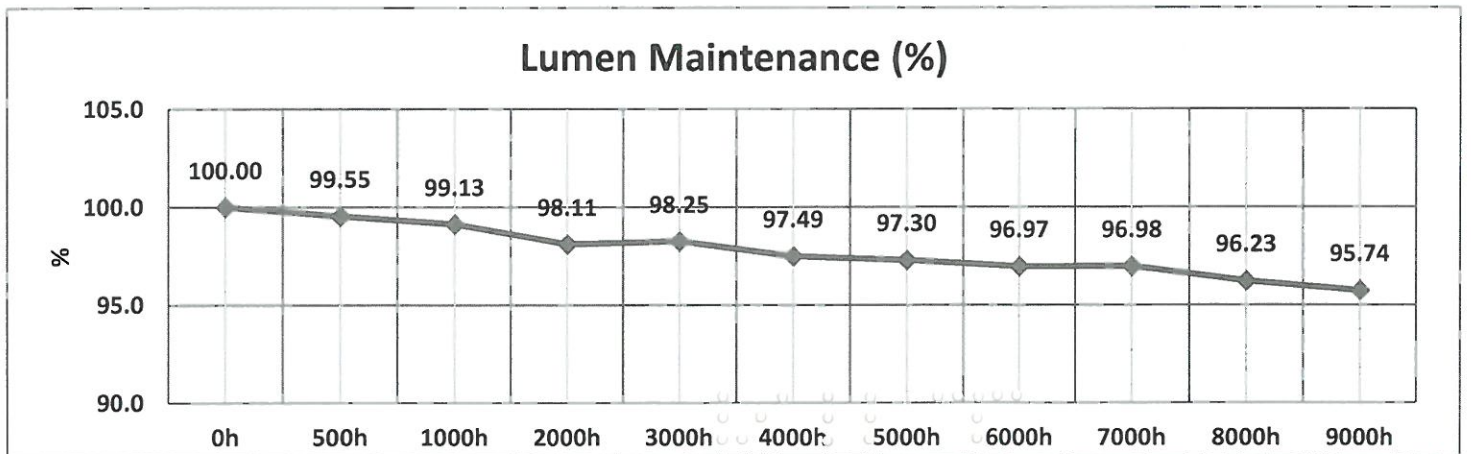


2. TEST CONDITION 2 [85.3 °C , If = 0.15 A]

- Measurement Current : 0.15 A

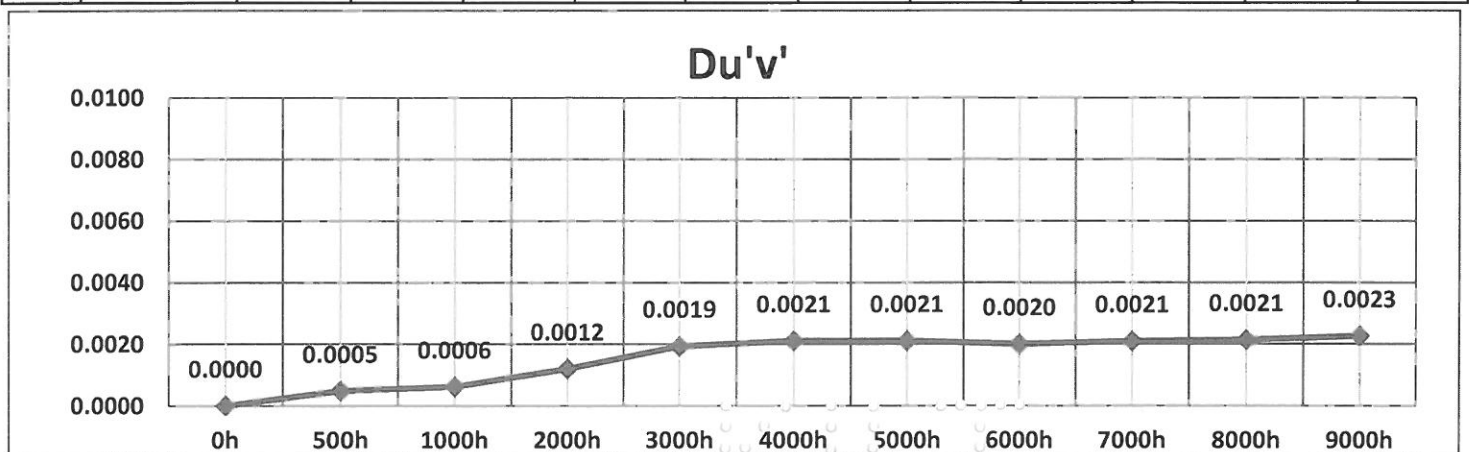
[LUMEN MAINTENANCE]

No.	Φ_v	VF	Lumen Maintenance [%]											
	[lm]	[V]	0h (Initial)	0h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
	1	91.5	6.2	100.00	98.83	98.57	97.16	97.39	96.58	95.70	96.14	95.75	94.95	94.40
2	90.8	6.2	100.00	99.50	99.08	98.10	98.35	97.46	96.84	96.98	97.24	96.43	95.89	
3	91.2	6.2	100.00	99.78	99.49	98.49	98.87	98.00	97.67	97.36	97.41	96.65	96.13	
4	90.6	6.2	100.00	99.39	99.13	97.99	98.32	97.82	97.12	97.00	97.03	96.32	95.75	
5	89.5	6.2	100.00	99.58	99.05	98.20	98.47	97.76	97.36	96.96	97.18	96.43	95.90	
6	93.5	6.2	100.00	99.13	98.52	97.30	97.07	96.51	96.06	96.09	96.22	95.50	94.91	
7	93.3	6.3	100.00	99.39	99.04	97.75	97.57	96.90	97.01	96.58	96.82	95.93	95.35	
8	93.4	6.2	100.00	99.74	99.11	98.06	98.00	97.21	97.18	96.79	96.95	96.24	95.84	
9	93.5	6.1	100.00	99.52	99.05	98.15	98.33	97.45	97.36	96.92	97.05	96.22	95.63	
10	92.8	6.2	100.00	99.87	99.56	98.45	98.40	97.58	97.62	97.24	97.34	96.56	96.09	
11	91.3	6.2	100.00	99.39	99.10	97.96	98.49	97.56	97.54	97.43	97.45	96.78	96.33	
12	93.5	6.2	100.00	99.46	98.81	97.78	97.96	97.05	97.10	96.57	96.46	95.73	95.23	
13	94.0	6.2	100.00	99.40	99.05	97.77	98.02	97.06	97.04	96.57	96.24	95.51	95.00	
14	93.8	6.2	100.00	99.47	99.07	98.01	98.07	97.53	97.30	96.80	96.73	96.02	95.54	
15	91.0	6.2	100.00	100.03	99.67	99.14	99.36	98.59	98.54	98.02	98.12	97.53	97.12	
16	94.5	6.2	100.00	99.67	98.97	97.72	97.49	96.78	96.42	96.35	96.39	95.63	95.15	
17	93.1	6.2	100.00	99.24	98.86	97.74	97.85	97.36	97.07	96.65	96.79	96.04	95.61	
18	92.9	6.2	100.00	99.73	99.24	98.20	98.41	97.61	97.74	97.01	97.19	96.33	95.81	
19	92.8	6.2	100.00	99.64	99.23	98.51	98.59	97.85	97.74	97.48	97.48	96.82	96.41	
20	91.1	6.2	100.00	99.59	99.38	98.48	98.81	98.07	98.22	97.67	97.75	97.10	96.68	
21	93.6	6.2	100.00	99.80	99.46	98.52	98.62	97.84	97.77	97.36	97.29	96.52	96.00	
22	93.1	6.2	100.00	99.99	99.43	98.39	98.50	97.64	97.33	96.99	96.78	96.03	95.55	
23	91.7	6.2	100.00	99.87	99.70	98.79	99.17	98.30	98.26	97.79	97.67	96.90	96.52	
24	93.3	6.2	100.00	99.30	98.92	98.02	98.32	97.54	97.41	96.89	96.71	95.93	95.44	
25	92.5	6.2	100.00	99.36	98.79	98.06	97.95	97.29	97.01	96.61	96.49	95.72	95.18	
Ave.	92.5	6.2	100.00	99.55	99.13	98.11	98.25	97.49	97.30	96.97	96.98	96.23	95.74	
Med.	92.9	6.2	100.00	99.52	99.08	98.06	98.33	97.54	97.33	96.96	97.03	96.24	95.75	
σ	1.3	0.0	0.00	0.27	0.30	0.43	0.53	0.49	0.62	0.48	0.53	0.56	0.60	
Min.	89.5	6.1	100.00	98.83	98.52	97.16	97.07	96.51	95.70	96.09	95.75	94.95	94.40	
Max	94.5	6.3	100.00	100.03	99.70	99.14	99.36	98.59	98.54	98.02	98.12	97.53	97.12	



[CHROMATICITY SHIFT]

No.	CCT [K]	Chromaticity Shift $\Delta u'v'$										
		0h (Initial)	0h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h
1	2916	0.0000	0.0006	0.0007	0.0014	0.0020	0.0022	0.0023	0.0022	0.0022	0.0022	0.0024
2	2988	0.0000	0.0005	0.0006	0.0011	0.0017	0.0020	0.0020	0.0019	0.0019	0.0019	0.0020
3	2989	0.0000	0.0005	0.0006	0.0012	0.0018	0.0020	0.0021	0.0020	0.0020	0.0020	0.0021
4	2974	0.0000	0.0005	0.0007	0.0012	0.0019	0.0021	0.0022	0.0020	0.0020	0.0021	0.0022
5	3075	0.0000	0.0005	0.0007	0.0013	0.0020	0.0021	0.0022	0.0021	0.0021	0.0021	0.0022
6	3012	0.0000	0.0007	0.0010	0.0017	0.0027	0.0028	0.0028	0.0026	0.0026	0.0027	0.0028
7	3007	0.0000	0.0005	0.0006	0.0012	0.0020	0.0022	0.0021	0.0020	0.0021	0.0022	0.0023
8	3021	0.0000	0.0006	0.0009	0.0016	0.0025	0.0027	0.0026	0.0025	0.0026	0.0026	0.0027
9	2978	0.0000	0.0004	0.0006	0.0011	0.0018	0.0019	0.0019	0.0018	0.0018	0.0019	0.0020
10	2978	0.0000	0.0004	0.0006	0.0013	0.0021	0.0023	0.0022	0.0021	0.0022	0.0023	0.0023
11	3042	0.0000	0.0005	0.0006	0.0011	0.0018	0.0020	0.0020	0.0018	0.0020	0.0020	0.0021
12	2948	0.0000	0.0004	0.0006	0.0010	0.0019	0.0021	0.0020	0.0019	0.0021	0.0022	0.0023
13	2973	0.0000	0.0005	0.0006	0.0011	0.0019	0.0021	0.0019	0.0019	0.0020	0.0021	0.0022
14	2976	0.0000	0.0004	0.0005	0.0010	0.0018	0.0019	0.0020	0.0019	0.0020	0.0020	0.0022
15	3000	0.0000	0.0004	0.0005	0.0010	0.0016	0.0017	0.0018	0.0017	0.0018	0.0018	0.0019
16	2993	0.0000	0.0004	0.0007	0.0014	0.0023	0.0026	0.0027	0.0025	0.0027	0.0028	0.0030
17	3025	0.0000	0.0006	0.0008	0.0015	0.0024	0.0025	0.0024	0.0023	0.0025	0.0025	0.0026
18	2968	0.0000	0.0004	0.0005	0.0010	0.0016	0.0018	0.0018	0.0017	0.0018	0.0018	0.0020
19	2982	0.0000	0.0006	0.0007	0.0013	0.0020	0.0022	0.0021	0.0021	0.0022	0.0022	0.0024
20	3066	0.0000	0.0004	0.0005	0.0011	0.0018	0.0019	0.0018	0.0018	0.0019	0.0019	0.0020
21	2998	0.0000	0.0005	0.0006	0.0012	0.0021	0.0022	0.0022	0.0021	0.0022	0.0022	0.0023
22	2933	0.0000	0.0004	0.0006	0.0013	0.0020	0.0023	0.0023	0.0022	0.0023	0.0024	0.0026
23	2985	0.0000	0.0004	0.0005	0.0010	0.0015	0.0017	0.0017	0.0016	0.0017	0.0018	0.0019
24	3065	0.0000	0.0004	0.0005	0.0009	0.0016	0.0018	0.0018	0.0017	0.0018	0.0019	0.0020
25	3061	0.0000	0.0005	0.0005	0.0010	0.0017	0.0018	0.0018	0.0017	0.0019	0.0020	0.0020
Ave.	2998	0.0000	0.0005	0.0006	0.0012	0.0019	0.0021	0.0021	0.0020	0.0021	0.0021	0.0023
Med.	2989	0.0000	0.0005	0.0006	0.0012	0.0019	0.0021	0.0021	0.0020	0.0020	0.0021	0.0022
σ	40	0.0000	0.0001	0.0001	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Min.	2916	0.0000	0.0004	0.0005	0.0009	0.0015	0.0017	0.0017	0.0016	0.0017	0.0018	0.0019
Max	3075	0.0000	0.0007	0.0010	0.0017	0.0027	0.0028	0.0028	0.0026	0.0027	0.0028	0.0030

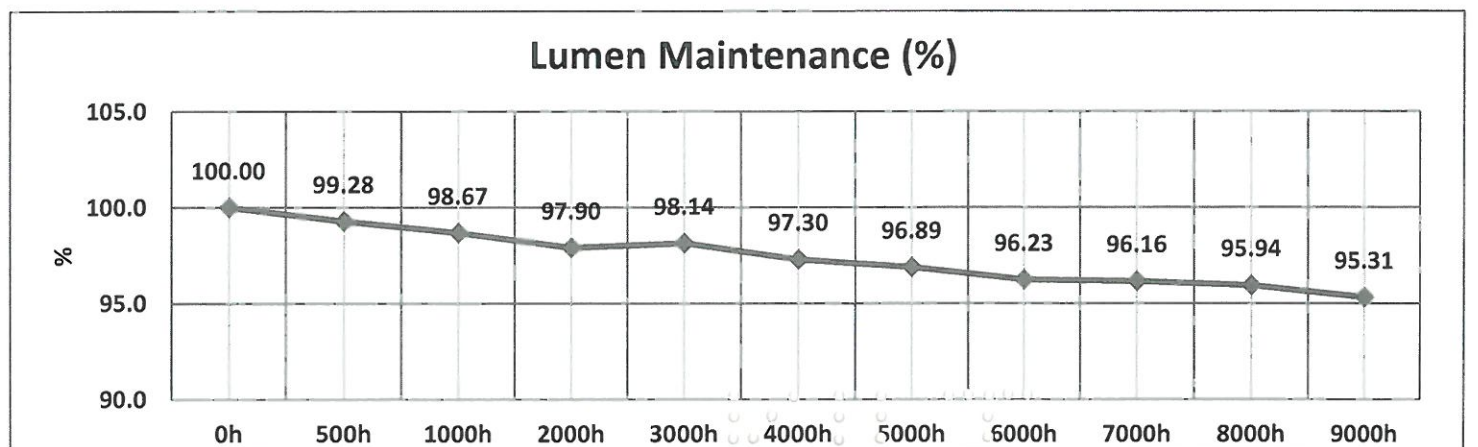


3. TEST CONDITION 3 [105.0 °C , If = 0.15 A]

- Measurement Current : 0.15 A

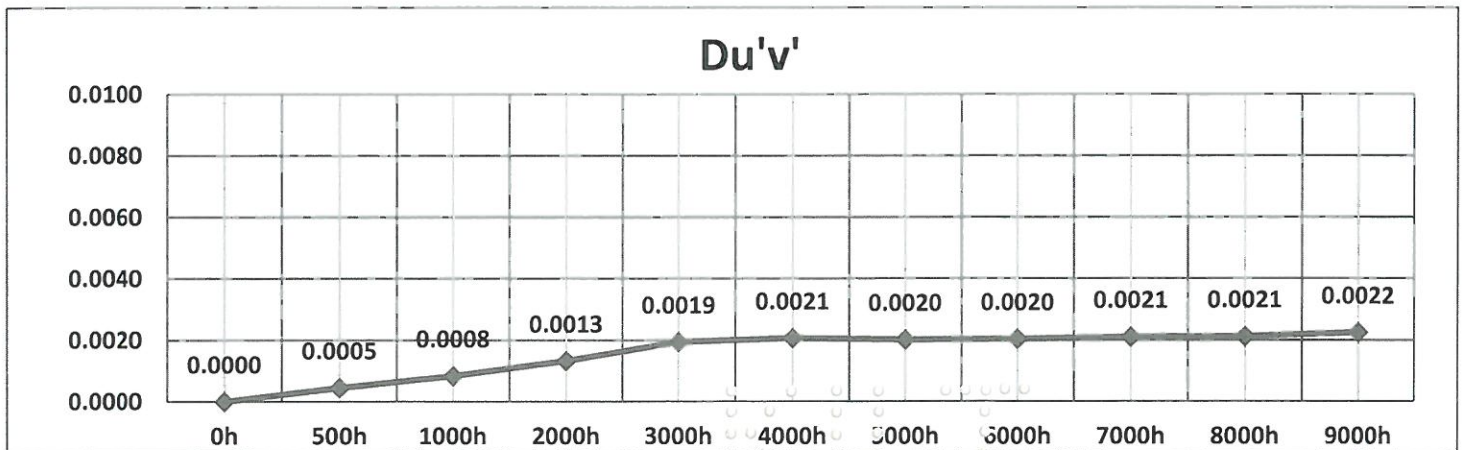
[LUMEN MAINTENANCE]

No.	Φ_v	VF	Lumen Maintenance [%]											
	[lm]	[V]	0h (Initial)	0h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h	9000h
1	93.0	6.2	100.00	98.87	98.32	97.12	96.84	96.07	95.66	95.06	94.91	94.66	93.94	
2	91.8	6.2	100.00	99.83	99.20	98.45	98.28	97.90	97.02	96.82	96.67	96.66	96.05	
3	92.8	6.2	100.00	99.07	98.42	97.76	97.48	96.63	96.28	96.11	95.96	95.77	95.17	
4	91.5	6.2	100.00	99.92	99.60	98.86	98.98	98.22	97.42	97.00	96.80	96.70	96.04	
5	92.7	6.2	100.00	99.10	98.48	97.65	97.56	96.51	96.18	95.46	95.53	95.40	94.81	
6	93.9	6.2	100.00	99.02	98.16	97.25	96.57	95.83	95.42	94.99	94.77	94.56	93.89	
7	91.8	6.2	100.00	99.84	99.47	98.56	98.43	97.82	97.30	96.68	96.46	96.34	95.66	
8	92.9	6.2	100.00	99.45	98.77	97.84	97.83	97.12	96.61	95.90	95.76	95.57	94.93	
9	93.8	6.2	100.00	99.06	98.51	97.88	97.64	96.74	96.45	95.74	95.72	95.54	94.98	
10	90.8	6.1	100.00	99.63	99.29	98.42	98.75	97.09	96.85	96.31	96.18	96.02	95.41	
11	93.5	6.2	100.00	99.20	98.60	97.51	97.39	96.47	96.51	95.64	95.67	95.36	94.78	
12	93.6	6.3	100.00	98.64	98.00	97.27	97.66	96.82	96.63	96.02	95.95	95.73	95.13	
13	93.8	6.2	100.00	98.91	98.04	97.57	97.85	96.88	96.86	96.06	96.06	95.89	95.33	
14	94.7	6.1	100.00	99.26	98.65	97.92	98.59	97.39	97.51	96.50	96.53	96.35	95.82	
15	91.6	6.2	100.00	99.76	99.53	99.02	99.72	98.67	98.33	97.49	97.40	97.21	96.55	
16	92.5	6.2	100.00	99.64	98.83	98.37	98.93	98.25	97.72	97.00	96.81	96.51	95.80	
17	94.9	6.2	100.00	99.09	98.54	97.64	98.17	97.36	96.72	96.13	96.19	95.84	95.21	
18	95.8	6.2	100.00	98.34	97.59	96.55	96.97	96.16	95.89	94.98	95.09	94.80	94.21	
19	92.1	6.2	100.00	99.71	98.93	98.61	98.97	97.97	97.78	96.99	96.99	96.84	96.22	
20	92.9	6.2	100.00	99.26	98.65	97.94	98.52	98.03	97.44	96.68	96.63	96.51	95.93	
21	95.3	6.2	100.00	98.96	98.03	96.89	97.59	96.73	96.41	95.73	95.63	95.13	94.55	
22	92.5	6.2	100.00	99.43	99.02	98.73	99.11	98.37	97.67	97.03	97.11	96.76	96.06	
23	94.1	6.2	100.00	99.20	98.56	97.52	98.07	96.96	96.53	95.76	95.65	95.34	94.61	
24	92.3	6.1	100.00	99.54	99.01	98.41	99.17	98.59	97.95	97.26	97.19	96.89	96.26	
25	92.9	6.2	100.00	99.22	98.58	97.82	98.43	97.81	96.98	96.38	96.31	96.13	95.49	
Ave.	93.1	6.2	100.00	99.28	98.67	97.90	98.14	97.30	96.89	96.23	96.16	95.94	95.31	
Med.	92.9	6.2	100.00	99.22	98.60	97.84	98.17	97.12	96.85	96.13	96.18	95.89	95.33	
σ	1.2	0.0	0.00	0.39	0.50	0.62	0.78	0.81	0.72	0.70	0.69	0.72	0.72	
Min.	90.8	6.1	100.00	98.34	97.59	96.55	96.57	95.83	95.42	94.98	94.77	94.56	93.89	
Max	95.8	6.3	100.00	99.92	99.60	99.02	99.72	98.67	98.33	97.49	97.40	97.21	96.55	



[CHROMATICITY SHIFT]

No.	CCT [K]	Chromaticity Shift $\Delta u'v'$										
		0h (Initial)	0h	500h	1000h	2000h	3000h	4000h	5000h	6000h	7000h	8000h
1	3057	0.0000	0.0005	0.0009	0.0014	0.0022	0.0023	0.0023	0.0021	0.0023	0.0023	0.0024
2	2963	0.0000	0.0005	0.0009	0.0014	0.0020	0.0021	0.0022	0.0022	0.0022	0.0022	0.0024
3	2970	0.0000	0.0005	0.0009	0.0013	0.0020	0.0021	0.0021	0.0020	0.0021	0.0021	0.0023
4	3006	0.0000	0.0003	0.0006	0.0012	0.0017	0.0018	0.0019	0.0019	0.0019	0.0020	0.0021
5	2993	0.0000	0.0004	0.0007	0.0012	0.0018	0.0020	0.0020	0.0020	0.0020	0.0021	0.0022
6	3019	0.0000	0.0004	0.0008	0.0013	0.0021	0.0022	0.0021	0.0020	0.0021	0.0021	0.0023
7	2942	0.0000	0.0003	0.0006	0.0012	0.0017	0.0019	0.0018	0.0019	0.0019	0.0020	0.0020
8	2999	0.0000	0.0003	0.0007	0.0012	0.0019	0.0020	0.0020	0.0020	0.0021	0.0021	0.0022
9	3021	0.0000	0.0004	0.0007	0.0012	0.0018	0.0020	0.0019	0.0019	0.0020	0.0019	0.0021
10	2921	0.0000	0.0003	0.0007	0.0012	0.0018	0.0019	0.0019	0.0019	0.0020	0.0020	0.0021
11	3039	0.0000	0.0004	0.0008	0.0013	0.0020	0.0022	0.0020	0.0021	0.0021	0.0021	0.0023
12	3000	0.0000	0.0006	0.0009	0.0013	0.0019	0.0020	0.0019	0.0019	0.0020	0.0020	0.0021
13	3061	0.0000	0.0005	0.0009	0.0012	0.0019	0.0020	0.0020	0.0020	0.0021	0.0021	0.0023
14	3163	0.0000	0.0007	0.0012	0.0016	0.0022	0.0023	0.0023	0.0023	0.0024	0.0024	0.0025
15	2946	0.0000	0.0003	0.0006	0.0011	0.0016	0.0017	0.0017	0.0018	0.0019	0.0019	0.0020
16	2999	0.0000	0.0004	0.0007	0.0012	0.0017	0.0019	0.0018	0.0019	0.0020	0.0020	0.0021
17	2989	0.0000	0.0004	0.0007	0.0012	0.0018	0.0019	0.0018	0.0019	0.0019	0.0019	0.0020
18	3025	0.0000	0.0008	0.0014	0.0019	0.0026	0.0027	0.0026	0.0025	0.0027	0.0027	0.0028
19	3041	0.0000	0.0004	0.0007	0.0012	0.0017	0.0019	0.0018	0.0019	0.0020	0.0020	0.0021
20	2970	0.0000	0.0007	0.0012	0.0017	0.0023	0.0024	0.0023	0.0023	0.0024	0.0024	0.0025
21	3028	0.0000	0.0006	0.0011	0.0017	0.0024	0.0025	0.0024	0.0024	0.0025	0.0025	0.0027
22	2999	0.0000	0.0004	0.0007	0.0012	0.0016	0.0017	0.0018	0.0019	0.0019	0.0019	0.0021
23	2987	0.0000	0.0004	0.0008	0.0013	0.0019	0.0020	0.0019	0.0020	0.0021	0.0021	0.0022
24	2985	0.0000	0.0005	0.0009	0.0014	0.0019	0.0020	0.0020	0.0020	0.0021	0.0022	0.0022
25	3018	0.0000	0.0005	0.0009	0.0013	0.0018	0.0019	0.0019	0.0019	0.0020	0.0020	0.0021
Ave.	3006	0.0000	0.0005	0.0008	0.0013	0.0019	0.0021	0.0020	0.0020	0.0021	0.0021	0.0022
Med.	2999	0.0000	0.0004	0.0008	0.0013	0.0019	0.0020	0.0020	0.0020	0.0021	0.0021	0.0022
σ	47	0.0000	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	2921	0.0000	0.0003	0.0006	0.0011	0.0016	0.0017	0.0017	0.0018	0.0019	0.0019	0.0020
Max	3163	0.0000	0.0008	0.0014	0.0019	0.0026	0.0027	0.0026	0.0025	0.0027	0.0027	0.0028



Revision History

No.	Issue Date	Report Number	Contents
0	2015.02.06	KILT1401-U00009-10	Issued after the completion of 6000 hours
1	2015.05.06	KILT1401-U00009-10 (Revision_1.0)	Issued after the completion of 8000 hours
2	2015.06.20	KILT1401-U00009-10 (Revision_2.0)	Issued after the completion of 9000 hours

