

TESTING CERTIFICATE



1493 Naepo-ri, Munsan-eup, Paju-city,
Gyeonggi-do, Republic of Korea
Tel: +82-02-3777-1114
Fax: +82-02-3777-0082
<http://www.lginnotek.co.kr>

Certificate No :
LGIT-13-021

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1. Client

- Name : LG INNOTEK
- Address : 1493, Naepo-ri, Munsan-eup, Paju-city, Gyeonggi-do, Republic of Korea
- Date of Receipt : February 1, 2013

2. Use of Report : Lifetime Prediction According With ENERGY STAR Specification

3. Test Sample : LGIT 5630 1in1 Package 2 700 K (LEMWS59R Series)

4. Date of Test : February 5, 2013 ~ October 31, 2013

- Issue date : November 13, 2013


5. Test method used : IES LM-80-08 Approved Method for Measuring Lumen Maintenance of LED Light Sources

6. Testing Environment

Temperature : (24.7 ± 0.7) °C , Humidity : (44.8 ± 4.3) % R.H.

7. Test Results : Attached "Test Results"

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Name : Duhyun Kim	 (Signature)	Technical Manager Name : Bockki Min	 (Signature)
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The above testing certificate is the accredited test result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

November 13, 2013

President, LG INNOTEK

Accredited by KOLAS, Republic of KOREA



Test Results



1. IES LM-80 Reporting Requirements

	Items	Contents
1	Number of LED light sources tested	28 units per test condition
2	Description of LED light sources	LGIT 5630 1in1 Package 2 700 K (LEMWS59R Series) (Number of chip die : 1)
3	Description of auxiliary equipment	See attached "Clause 7".
4	Operation cycle	Constant current
5	Ambient conditions	Minimal air flow (Temperature control using water) Temperature monitored during test with thermocouples - T_S : controlled to $- 2^{\circ}\text{C}$ of nominal T_S - T_A : controlled to $- 5^{\circ}\text{C}$ of nominal T_S - Humidity < 65 % R.H.
6	Case temperature	55 °C, 85 °C, 95 °C
7	Drive current of the LED light source during lifetime test	150 mA
8	Initial luminous flux and forward voltage at photometric measurement current	150 mA
9	Lumen maintenance data for each individual LED light source	See attached "Data Sets".
10	Observation of LED light source failures	No failures occurred during test
11	LED light source monitoring interval	See attached "Data Sets".
12	Photometric measurement uncertainty	$U = 3.15\%$ (confidence level about 95 %, $k = 2$)
13	Chromaticity shift reported over the measurement time	See attached "Data Sets".



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2. Test Results Summary

Items	Nominal Case Temperature		
	LM-80 Required Temperature		3 rd Temperature
	55 °C	85 °C	95 °C
Number of LED tested	28	28	28
Drive Current (I_F) (Current per Die)	150 mA (150 mA)	150 mA (150 mA)	150 mA (150 mA)
Average Case Temperature (T_S)	57.5 °C	86.5 °C	96.2 °C
Average Ambient Temperature (T_A)	56.3 °C	85.0 °C	94.6 °C
Average Lumen Maintenance (%) @ 6 000 h	99.03	98.66	97.01
Average Chromaticity Shift ($\Delta u'v'$) @ 6 000 h	0.001 9	0.001 7	0.001 7



3. Data Set #1 : Lumen Maintenance (Including Initial Lumen, V_F)

1. Nominal Case Temperature (T_S) : 55 °C
2. Drive Current (I_F) : 150 mA
3. Measurement Current : 150 mA
4. Failures Observed : None

Sample	Initial measurement		Lumen maintenance [%]							
	Φ_V [lm]	V_F [V]	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	47.76	3.218	100.00	100.24	100.67	100.93	100.27	100.81	99.88	98.93
2	47.79	3.212	100.00	100.36	100.78	101.13	100.63	101.39	100.52	99.58
3	47.82	3.187	100.00	100.64	100.75	99.46	98.85	99.44	98.33	97.48
4	48.07	3.207	100.00	100.18	100.55	100.74	99.59	99.92	99.29	98.41
5	47.31	3.225	100.00	100.32	100.61	100.68	100.03	100.79	100.02	98.81
6	48.18	3.210	100.00	100.09	100.44	100.73	100.16	100.87	99.96	99.04
7	47.99	3.177	100.00	100.86	101.22	100.97	100.18	100.74	99.84	99.00
8	47.10	3.190	100.00	99.63	100.39	100.51	99.74	100.38	99.23	98.53
9	47.64	3.177	100.00	101.02	101.17	101.32	100.64	101.27	100.55	99.65
10	47.71	3.199	100.00	100.47	100.70	100.69	100.00	100.48	99.61	98.67
11	47.97	3.210	100.00	100.38	100.70	100.89	100.36	100.97	100.11	99.20
12	48.44	3.192	100.00	100.33	100.60	100.67	100.09	100.71	99.87	99.00
13	47.21	3.206	100.00	100.42	100.59	100.94	100.27	100.82	100.08	98.78
14	48.04	3.180	100.00	100.81	100.98	100.98	100.21	100.68	99.25	98.28
15	47.92	3.196	100.00	100.34	100.64	100.85	100.29	100.83	99.96	99.07
16	46.92	3.187	100.00	100.58	100.85	101.33	100.88	101.45	100.45	99.17
17	47.47	3.207	100.00	100.20	100.53	100.87	100.47	101.04	100.19	99.36
18	48.03	3.210	100.00	100.41	100.77	101.15	100.85	101.58	100.89	100.19
19	48.07	3.182	100.00	100.17	100.42	100.45	99.82	100.17	99.15	98.19
20	47.87	3.208	100.00	100.79	101.14	101.51	101.18	101.81	100.94	100.05
21	46.81	3.217	100.00	100.39	100.75	101.16	100.64	101.13	100.10	99.31
22	47.75	3.191	100.00	100.76	101.15	101.36	100.76	101.33	100.50	99.67
23	48.05	3.187	100.00	100.47	100.71	100.81	100.24	100.71	99.89	98.95
24	46.55	3.179	100.00	100.78	101.12	101.52	100.99	101.71	100.93	99.42
25	48.06	3.215	100.00	100.66	100.97	101.17	100.57	101.15	100.25	99.42
26	48.31	3.225	100.00	100.08	100.46	100.77	100.38	101.02	100.14	99.21
27	48.15	3.197	100.00	100.54	100.87	100.99	100.32	100.80	99.94	99.03
28	48.05	3.195	100.00	99.88	100.29	100.44	99.95	100.47	99.55	98.53
n	28	28	28	28	28	28	28	28	28	28
Median	47.89	3.198	100.00	100.40	100.71	100.91	100.28	100.82	99.99	99.03
Average	47.75	3.199	100.00	100.42	100.74	100.89	100.30	100.87	99.98	99.03
Stdev	0.47	0.015	0.00	0.31	0.26	0.41	0.47	0.52	0.59	0.57
Min.	46.55	3.177	100.00	99.63	100.29	99.46	98.85	99.44	98.33	97.48
Max.	48.44	3.225	100.00	101.02	101.22	101.52	101.18	101.81	100.94	100.19



3. Data Set #1 : Chromaticity Shift (Including Initial Chromaticity, CCT)

1. Nominal Case Temperature (T_S) : 55 °C
2. Drive Current (I_F) : 150 mA
3. Measurement Current : 150 mA
4. Failures Observed : None

Sample	Initial measurement			$\Delta u'v'$							
	u'	v'	CCT [K]	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.258 4	0.525 0	2 798	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 7	0.001 7	0.002 0
2	0.262 1	0.527 4	2 709	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 6	0.001 6	0.001 9
3	0.258 5	0.523 9	2 801	0.000 0	0.001 0	0.001 2	0.001 8	0.002 0	0.001 9	0.002 0	0.002 2
4	0.258 1	0.523 7	2 811	0.000 0	0.001 2	0.001 3	0.001 5	0.001 7	0.001 9	0.002 0	0.002 2
5	0.259 3	0.525 2	2 778	0.000 0	0.001 2	0.001 3	0.001 7	0.001 8	0.001 8	0.001 8	0.002 0
6	0.259 4	0.525 7	2 772	0.000 0	0.001 1	0.001 2	0.001 5	0.001 6	0.001 7	0.001 7	0.001 9
7	0.258 8	0.524 7	2 789	0.000 0	0.001 0	0.001 2	0.001 4	0.001 7	0.001 7	0.001 7	0.001 9
8	0.258 7	0.524 0	2 795	0.000 0	0.001 1	0.001 3	0.001 5	0.001 7	0.001 7	0.001 7	0.001 9
9	0.260 2	0.525 1	2 758	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 6	0.001 6	0.001 8
10	0.258 5	0.524 1	2 800	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 6	0.001 7	0.001 9
11	0.258 4	0.525 4	2 795	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 6	0.001 8
12	0.257 7	0.522 7	2 823	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 6	0.001 6	0.001 8
13	0.259 5	0.526 0	2 768	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 7	0.002 0
14	0.259 2	0.525 4	2 777	0.000 0	0.001 0	0.001 1	0.001 4	0.001 6	0.001 6	0.001 7	0.002 0
15	0.259 7	0.526 9	2 761	0.000 0	0.001 3	0.001 4	0.001 6	0.001 8	0.001 8	0.001 8	0.002 0
16	0.259 1	0.522 9	2 792	0.000 0	0.001 1	0.001 2	0.001 5	0.001 6	0.001 6	0.001 6	0.001 9
17	0.259 7	0.526 6	2 762	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 5	0.001 6	0.001 8
18	0.258 0	0.524 9	2 806	0.000 0	0.001 1	0.001 1	0.001 4	0.001 5	0.001 4	0.001 4	0.001 6
19	0.258 7	0.523 0	2 801	0.000 0	0.001 2	0.001 2	0.001 4	0.001 7	0.001 7	0.001 8	0.002 1
20	0.257 0	0.522 4	2 840	0.000 0	0.001 1	0.001 1	0.001 4	0.001 5	0.001 4	0.001 4	0.001 6
21	0.260 9	0.526 8	2 736	0.000 0	0.001 1	0.001 2	0.001 5	0.001 6	0.001 6	0.001 7	0.001 9
22	0.259 1	0.524 8	2 782	0.000 0	0.001 0	0.001 1	0.001 4	0.001 6	0.001 5	0.001 6	0.001 8
23	0.258 9	0.524 8	2 787	0.000 0	0.001 2	0.001 3	0.001 5	0.001 7	0.001 6	0.001 6	0.001 9
24	0.260 0	0.525 8	2 759	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 6	0.001 7
25	0.258 0	0.524 8	2 806	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 6	0.001 8
26	0.259 0	0.525 5	2 783	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 7	0.001 7	0.001 9
27	0.258 2	0.523 4	2 810	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 6	0.001 7	0.001 9
28	0.257 6	0.522 8	2 825	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 7	0.001 9	0.002 1
n	28	28	28	28	28	28	28	28	28	28	28
Median	0.258 9	0.524 9	2 791	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 6	0.001 7	0.001 9
Average	0.259 0	0.524 8	2 787	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 7	0.001 9
Stdev	0.001 0	0.001 4	28	0.000 0	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Min.	0.257 0	0.522 4	2 709	0.000 0	0.001 0	0.001 1	0.001 4	0.001 5	0.001 4	0.001 4	0.001 6
Max.	0.262 1	0.527 4	2 840	0.000 0	0.001 3	0.001 4	0.001 8	0.002 0	0.001 9	0.002 0	0.002 2



4. Data Set #2 : Lumen Maintenance (Including Initial Lumen, V_F)

1. Nominal Case Temperature (T_S) : 85 °C
2. Drive Current (I_F) : 150 mA
3. Measurement Current : 150 mA
4. Failures Observed : None

Sample	Initial measurement		Lumen maintenance [%]							
	Φ_V [lm]	V_F [V]	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	47.14	3.220	100.00	100.33	100.26	100.49	99.84	100.58	99.69	99.07
2	47.56	3.206	100.00	99.88	99.45	99.16	98.56	99.49	98.60	98.03
3	47.91	3.203	100.00	100.14	99.86	99.94	99.37	100.31	99.39	98.95
4	47.83	3.187	100.00	99.99	99.84	99.92	99.31	100.20	99.16	98.58
5	47.33	3.195	100.00	100.33	100.31	100.38	99.62	100.44	99.52	98.86
6	48.23	3.220	100.00	99.96	99.90	100.06	99.51	100.39	99.42	98.88
7	47.91	3.198	100.00	100.14	100.04	100.20	99.67	100.64	99.61	99.07
8	47.11	3.205	100.00	99.24	99.24	99.81	99.18	100.12	98.99	98.04
9	48.11	3.220	100.00	100.34	100.07	100.26	99.72	100.67	99.68	99.22
10	47.67	3.201	100.00	100.28	100.08	100.22	99.60	100.56	99.65	99.08
11	48.22	3.194	100.00	99.76	99.50	99.65	99.04	99.95	98.96	98.41
12	48.09	3.182	100.00	100.32	100.07	100.10	99.51	100.40	99.37	98.77
13	47.17	3.202	100.00	100.82	100.40	100.49	99.92	100.65	99.80	98.99
14	47.83	3.190	100.00	100.52	100.22	100.18	99.53	100.32	99.36	98.73
15	47.81	3.210	100.00	98.78	98.73	98.84	98.35	99.19	98.36	97.73
16	46.63	3.201	100.00	100.28	100.34	101.00	100.22	100.92	100.23	98.95
17	47.87	3.198	100.00	100.04	99.78	99.81	99.27	100.07	99.14	98.55
18	47.80	3.214	100.00	100.46	100.24	100.37	99.94	100.91	100.04	99.53
19	48.02	3.195	100.00	100.10	99.80	99.80	99.21	100.10	99.10	98.50
20	48.44	3.198	100.00	99.63	99.49	99.58	99.02	99.86	98.90	98.25
21	47.35	3.203	100.00	100.96	100.59	100.68	100.07	100.89	99.98	99.17
22	48.44	3.215	100.00	100.32	100.11	100.17	99.71	100.59	99.76	99.12
23	47.94	3.173	100.00	100.80	100.44	100.40	99.83	100.68	99.67	98.95
24	46.66	3.192	100.00	100.56	100.51	100.67	100.20	100.09	99.73	99.00
25	47.91	3.215	100.00	99.95	99.72	99.81	99.28	100.08	99.05	98.44
26	48.47	3.218	100.00	100.35	100.15	100.27	99.79	100.69	99.77	99.29
27	48.19	3.215	100.00	99.67	99.49	99.58	99.11	100.05	99.15	98.60
28	47.94	3.192	100.00	94.11	96.42	96.59	96.15	97.08	96.15	95.62
n	28	28	28	28	28	28	28	28	28	28
Median	47.89	3.202	100.00	100.21	100.05	100.14	99.52	100.35	99.40	98.87
Average	47.77	3.202	100.00	99.93	99.82	99.94	99.38	100.21	99.29	98.66
Stdev	0.49	0.012	0.00	1.23	0.79	0.80	0.77	0.74	0.75	0.73
Min.	46.63	3.173	100.00	94.11	96.42	96.59	96.15	97.08	96.15	95.62
Max.	48.47	3.220	100.00	100.96	100.59	101.00	100.22	100.92	100.23	99.53



4. Data Set #2 : Chromaticity Shift (Including Initial Chromaticity, CCT)

1. Nominal Case Temperature (T_S) : 85 °C
2. Drive Current (I_F) : 150 mA
3. Measurement Current : 150 mA
4. Failures Observed : None

Sample	Initial measurement			$\Delta u'v'$							
	u'	v'	CCT [K]	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.259 2	0.524 8	2 781	0.000 0	0.000 9	0.001 0	0.001 3	0.001 4	0.001 4	0.001 4	0.001 5
2	0.259 0	0.524 3	2 787	0.000 0	0.001 2	0.001 3	0.001 8	0.001 9	0.001 9	0.001 9	0.002 1
3	0.257 4	0.521 5	2 838	0.000 0	0.001 2	0.001 3	0.001 6	0.001 8	0.001 6	0.001 6	0.001 7
4	0.257 4	0.522 1	2 833	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 5	0.001 6
5	0.260 0	0.524 6	2 765	0.000 0	0.001 2	0.001 2	0.001 6	0.001 8	0.001 6	0.001 5	0.001 7
6	0.257 4	0.523 9	2 824	0.000 0	0.001 1	0.001 1	0.001 5	0.001 6	0.001 6	0.001 6	0.001 6
7	0.258 3	0.524 7	2 802	0.000 0	0.001 2	0.001 2	0.001 5	0.001 6	0.001 5	0.001 4	0.001 6
8	0.259 4	0.525 5	2 773	0.000 0	0.001 2	0.001 2	0.001 6	0.001 8	0.001 6	0.001 6	0.001 7
9	0.257 0	0.522 9	2 839	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 5	0.001 6
10	0.260 4	0.526 0	2 749	0.000 0	0.001 0	0.001 0	0.001 3	0.001 5	0.001 4	0.001 3	0.001 5
11	0.257 8	0.522 2	2 825	0.000 0	0.001 3	0.001 3	0.001 7	0.001 8	0.001 8	0.001 7	0.001 9
12	0.259 0	0.525 7	2 781	0.000 0	0.001 1	0.001 0	0.001 3	0.001 5	0.001 4	0.001 3	0.001 5
13	0.257 2	0.522 7	2 835	0.000 0	0.001 0	0.001 0	0.001 4	0.001 6	0.001 4	0.001 4	0.001 5
14	0.258 0	0.523 8	2 813	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 6	0.001 7
15	0.258 3	0.524 6	2 801	0.000 0	0.001 4	0.001 4	0.001 7	0.001 9	0.001 9	0.001 9	0.002 0
16	0.257 2	0.521 8	2 841	0.000 0	0.001 1	0.001 1	0.001 5	0.001 6	0.001 5	0.001 4	0.001 6
17	0.259 9	0.525 9	2 761	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 6	0.001 5	0.001 7
18	0.261 1	0.527 5	2 730	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 4	0.001 6
19	0.258 9	0.524 6	2 789	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 6	0.001 5	0.001 7
20	0.257 0	0.522 1	2 843	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 6	0.001 6	0.001 8
21	0.258 6	0.524 8	2 794	0.000 0	0.001 0	0.001 0	0.001 3	0.001 5	0.001 3	0.001 3	0.001 5
22	0.260 9	0.526 8	2 735	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 4	0.001 3	0.001 5
23	0.260 7	0.526 7	2 741	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 4	0.001 4	0.001 6
24	0.258 9	0.525 3	2 785	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 4	0.001 4	0.001 6
25	0.259 6	0.525 1	2 771	0.000 0	0.001 2	0.001 3	0.001 6	0.001 8	0.001 6	0.001 5	0.001 7
26	0.261 5	0.527 4	2 720	0.000 0	0.001 0	0.001 0	0.001 3	0.001 5	0.001 3	0.001 3	0.001 4
27	0.257 8	0.524 3	2 814	0.000 0	0.001 4	0.001 4	0.001 7	0.001 9	0.001 7	0.001 7	0.001 8
28	0.261 7	0.526 6	2 721	0.000 0	0.002 4	0.002 3	0.002 5	0.002 7	0.002 6	0.002 5	0.002 6
n	28	28	28	28	28	28	28	28	28	28	28
Median	0.258 9	0.524 7	2 788	0.000 0	0.001 1	0.001 2	0.001 5	0.001 6	0.001 5	0.001 5	0.001 6
Average	0.258 9	0.524 6	2 789	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 6	0.001 5	0.001 7
Stdev	0.001 4	0.001 7	39	0.000 0	0.000 3	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2	0.000 2
Min.	0.257 0	0.521 5	2 720	0.000 0	0.000 9	0.001 0	0.001 3	0.001 4	0.001 3	0.001 3	0.001 4
Max.	0.261 7	0.527 5	2 843	0.000 0	0.002 4	0.002 3	0.002 5	0.002 7	0.002 6	0.002 5	0.002 6



1493 Naepo-ri, Munsan-eup, Paju-city,
Gyeonggi-do, Republic of Korea
Tel: +82-02-3777-1114
Fax: +82-02-3777-0082
<http://www.lginnotek.co.kr>

Certificate No :
LGIT-13-021

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5. Data Set #3 : Lumen Maintenance (Including Initial Lumen, V_F)

1. Nominal Case Temperature (T_S) : 95 °C
2. Drive Current (I_F) : 150 mA
3. Measurement Current : 150 mA
4. Failures Observed : None

Sample	Initial measurement		Lumen maintenance [%]							
	Φ_V [lm]	V_F [V]	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	47.76	3.227	100.00	99.73	99.08	98.73	98.17	99.08	97.68	97.09
2	47.53	3.209	100.00	99.08	98.39	98.05	97.42	98.24	96.84	96.19
3	46.50	3.211	100.00	100.51	99.86	99.67	98.88	99.73	98.36	97.77
4	47.29	3.185	100.00	99.89	99.22	99.04	98.20	99.03	97.60	96.82
5	47.22	3.213	100.00	100.68	99.99	99.79	98.84	99.66	98.33	97.46
6	47.75	3.195	100.00	99.36	98.68	98.55	97.69	98.49	97.05	96.43
7	48.03	3.211	100.00	100.01	99.42	99.35	98.37	99.28	97.95	97.36
8	46.91	3.196	100.00	99.47	98.61	98.65	97.65	98.52	96.96	95.99
9	47.79	3.199	100.00	100.45	99.70	99.55	98.57	99.42	97.97	97.32
10	47.79	3.210	100.00	99.95	99.13	99.00	98.13	98.88	97.49	96.96
11	47.66	3.214	100.00	100.42	99.60	99.32	98.58	99.43	97.98	97.38
12	48.01	3.193	100.00	99.40	98.45	98.28	97.38	98.24	96.93	96.48
13	46.97	3.203	100.00	100.72	99.88	99.95	98.97	99.60	98.11	97.45
14	47.96	3.202	100.00	99.91	99.07	98.90	98.09	98.97	97.36	96.95
15	47.84	3.199	100.00	100.05	99.32	99.24	98.43	99.17	97.74	97.07
16	46.67	3.195	100.00	99.64	98.85	98.88	98.22	98.67	97.26	96.42
17	47.45	3.218	100.00	100.14	99.54	99.60	98.80	99.56	98.19	97.59
18	47.86	3.212	100.00	99.68	98.96	98.94	98.15	98.71	97.47	96.90
19	48.38	3.198	100.00	99.43	98.68	98.61	97.81	98.49	97.12	96.54
20	47.99	3.201	100.00	99.87	97.15	99.06	96.88	98.00	97.43	97.02
21	47.79	3.217	100.00	99.75	98.90	98.89	97.94	98.61	97.36	96.50
22	47.73	3.211	100.00	100.23	99.49	99.40	98.43	99.07	98.05	97.42
23	48.04	3.212	100.00	100.65	100.00	99.84	99.07	99.62	98.59	98.05
24	47.01	3.187	100.00	99.56	99.19	99.14	98.35	99.03	97.58	96.93
25	47.99	3.226	100.00	99.55	98.61	98.44	97.76	98.50	97.29	96.66
26	47.77	3.216	100.00	100.12	99.38	99.12	98.26	98.95	97.58	96.90
27	48.15	3.200	100.00	100.19	99.46	99.25	98.41	99.11	97.78	97.05
28	48.04	3.201	100.00	100.12	99.58	99.46	98.66	99.45	98.16	97.49
n	28	28	28	28	28	28	28	28	28	28
Median	47.78	3.206	100.00	99.93	99.20	99.09	98.24	99.03	97.59	96.99
Average	47.64	3.206	100.00	99.95	99.15	99.10	98.22	98.98	97.65	97.01
Stdev	0.47	0.011	0.00	0.44	0.61	0.48	0.52	0.48	0.47	0.49
Min.	46.50	3.185	100.00	99.08	97.15	98.05	96.88	98.00	96.84	95.99
Max.	48.38	3.227	100.00	100.72	100.00	99.95	99.07	99.73	98.59	98.05



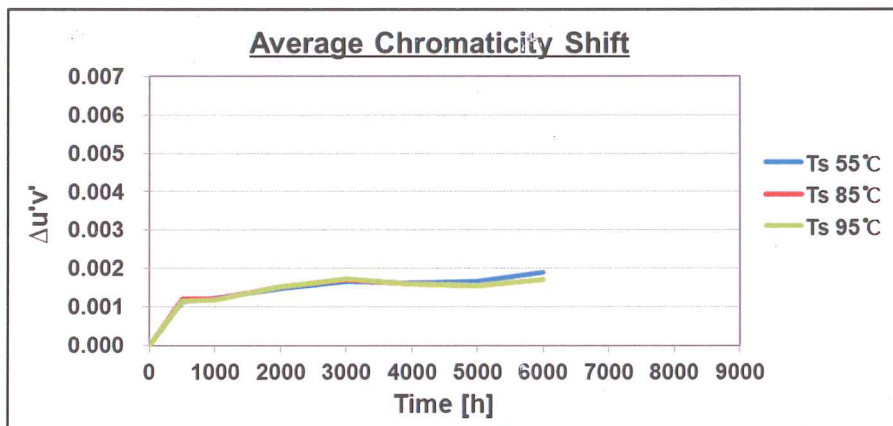
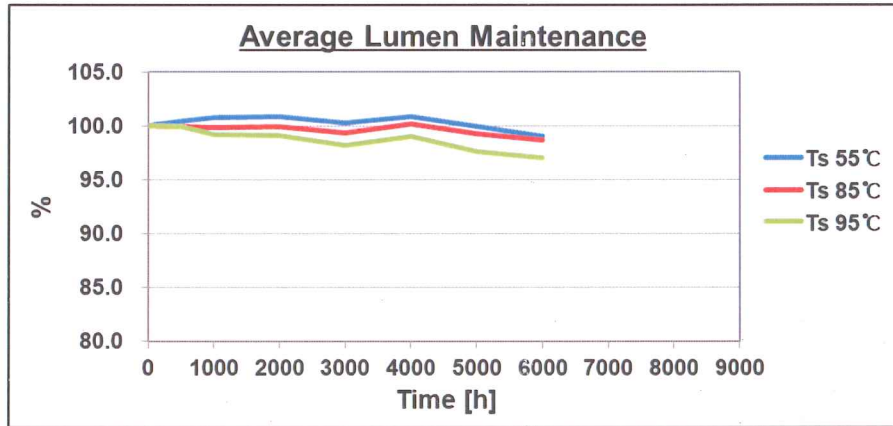
5. Data Set #3 : Chromaticity Shift (Including Initial Chromaticity, CCT)

1. Nominal Case Temperature (T_S) : 95 °C
2. Drive Current (I_F) : 150 mA
3. Measurement Current : 150 mA
4. Failures Observed : None

Sample	Initial measurement			$\Delta u'v'$							
	u'	v'	CCT [K]	0 h	500 h	1 000 h	2 000 h	3 000 h	4 000 h	5 000 h	6 000 h
1	0.257 0	0.522 3	2 842	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 6	0.001 6
2	0.259 7	0.526 0	2 766	0.000 0	0.001 3	0.001 4	0.001 7	0.001 9	0.001 9	0.001 8	0.001 9
3	0.261 0	0.527 6	2 729	0.000 0	0.000 8	0.000 9	0.001 2	0.001 4	0.001 3	0.001 2	0.001 4
4	0.259 2	0.524 7	2 781	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 6	0.001 5	0.001 7
5	0.258 8	0.525 3	2 788	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 5	0.001 4	0.001 7
6	0.258 3	0.523 7	2 805	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 6	0.001 6
7	0.257 4	0.523 7	2 826	0.000 0	0.001 2	0.001 2	0.001 5	0.001 8	0.001 6	0.001 6	0.001 7
8	0.260 4	0.527 3	2 743	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 5	0.001 5	0.001 7
9	0.258 1	0.523 9	2 810	0.000 0	0.001 1	0.001 1	0.001 5	0.001 6	0.001 5	0.001 5	0.001 6
10	0.258 0	0.524 0	2 811	0.000 0	0.001 2	0.001 2	0.001 5	0.001 7	0.001 6	0.001 6	0.001 7
11	0.261 9	0.528 3	2 708	0.000 0	0.001 1	0.001 2	0.001 4	0.001 6	0.001 5	0.001 5	0.001 7
12	0.257 4	0.522 1	2 833	0.000 0	0.001 2	0.001 1	0.001 5	0.001 6	0.001 6	0.001 6	0.001 7
13	0.257 2	0.523 2	2 834	0.000 0	0.001 1	0.001 1	0.001 5	0.001 7	0.001 4	0.001 4	0.001 6
14	0.257 2	0.521 1	2 844	0.000 0	0.001 2	0.001 2	0.001 5	0.001 8	0.001 7	0.001 8	0.001 8
15	0.257 8	0.524 1	2 815	0.000 0	0.001 1	0.001 1	0.001 5	0.001 7	0.001 5	0.001 5	0.001 6
16	0.257 0	0.523 3	2 838	0.000 0	0.001 4	0.001 4	0.001 8	0.002 0	0.002 0	0.001 8	0.002 0
17	0.258 2	0.524 8	2 803	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 5	0.001 5	0.001 6
18	0.257 6	0.523 4	2 823	0.000 0	0.001 2	0.001 2	0.001 6	0.001 7	0.001 6	0.001 6	0.001 7
19	0.257 8	0.521 6	2 826	0.000 0	0.001 2	0.001 3	0.001 6	0.001 8	0.001 6	0.001 6	0.001 8
20	0.258 2	0.524 5	2 805	0.000 0	0.001 2	0.001 2	0.001 7	0.001 9	0.001 7	0.001 6	0.001 8
21	0.257 2	0.521 7	2 840	0.000 0	0.001 1	0.001 2	0.001 5	0.001 8	0.001 7	0.001 6	0.001 8
22	0.257 7	0.523 4	2 821	0.000 0	0.001 1	0.001 1	0.001 5	0.001 7	0.001 6	0.001 5	0.001 6
23	0.258 7	0.525 6	2 788	0.000 0	0.001 0	0.001 1	0.001 4	0.001 6	0.001 5	0.001 4	0.001 6
24	0.259 7	0.525 1	2 768	0.000 0	0.001 1	0.001 1	0.001 4	0.001 6	0.001 5	0.001 4	0.001 6
25	0.258 4	0.525 0	2 798	0.000 0	0.001 2	0.001 3	0.001 7	0.002 0	0.001 7	0.001 7	0.001 9
26	0.258 0	0.523 7	2 814	0.000 0	0.001 1	0.001 2	0.001 5	0.001 8	0.001 6	0.001 5	0.001 8
27	0.259 5	0.525 2	2 773	0.000 0	0.001 1	0.001 1	0.001 5	0.001 6	0.001 5	0.001 4	0.001 6
28	0.258 1	0.525 5	2 802	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 5	0.001 5	0.001 7
n	28	28	28	28	28	28	28	28	28	28	28
Median	0.258 1	0.524 1	2 808	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 5	0.001 7
Average	0.258 4	0.524 3	2 801	0.000 0	0.001 1	0.001 2	0.001 5	0.001 7	0.001 6	0.001 6	0.001 7
Stdev	0.001 2	0.001 8	35	0.000 0	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1	0.000 1
Min.	0.257 0	0.521 1	2 708	0.000 0	0.000 8	0.000 9	0.001 2	0.001 4	0.001 3	0.001 2	0.001 4
Max.	0.261 9	0.528 3	2 844	0.000 0	0.001 4	0.001 4	0.001 8	0.002 0	0.002 0	0.001 8	0.002 0



6. Charts & TM-21 Report



Test Condition 1 - 55°C Case Temp		Test Condition 2 - 85°C Case Temp		Test Condition 3 - 95°C Case Temp	
Sample size	28	Sample size	28	Sample size	28
Number of failures	0	Number of failures	0	Number of failures	0
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)	6,000	Test duration (hours)	6,000	Test duration (hours)	6,000
Test duration used for projection (hour to hour)	1,000 - 6,000	Test duration used for projection (hour to hour)	1,000 - 6,000	Test duration used for projection (hour to hour)	1,000 - 6,000
Tested case temperature (°C)	55	Tested case temperature (°C)	85	Tested case temperature (°C)	95
α	3.062E-06	α	1.998E-06	α	4.161E-06
B	1.014	B	1.002	B	0.998
Calculated L70(6k) (hours)	121,000	Calculated L70(6k) (hours)	180,000	Calculated L70(6k) (hours)	85,000
Reported L70(6k) (hours)	>36000	Reported L70(6k) (hours)	>36000	Reported L70(6k) (hours)	>36000



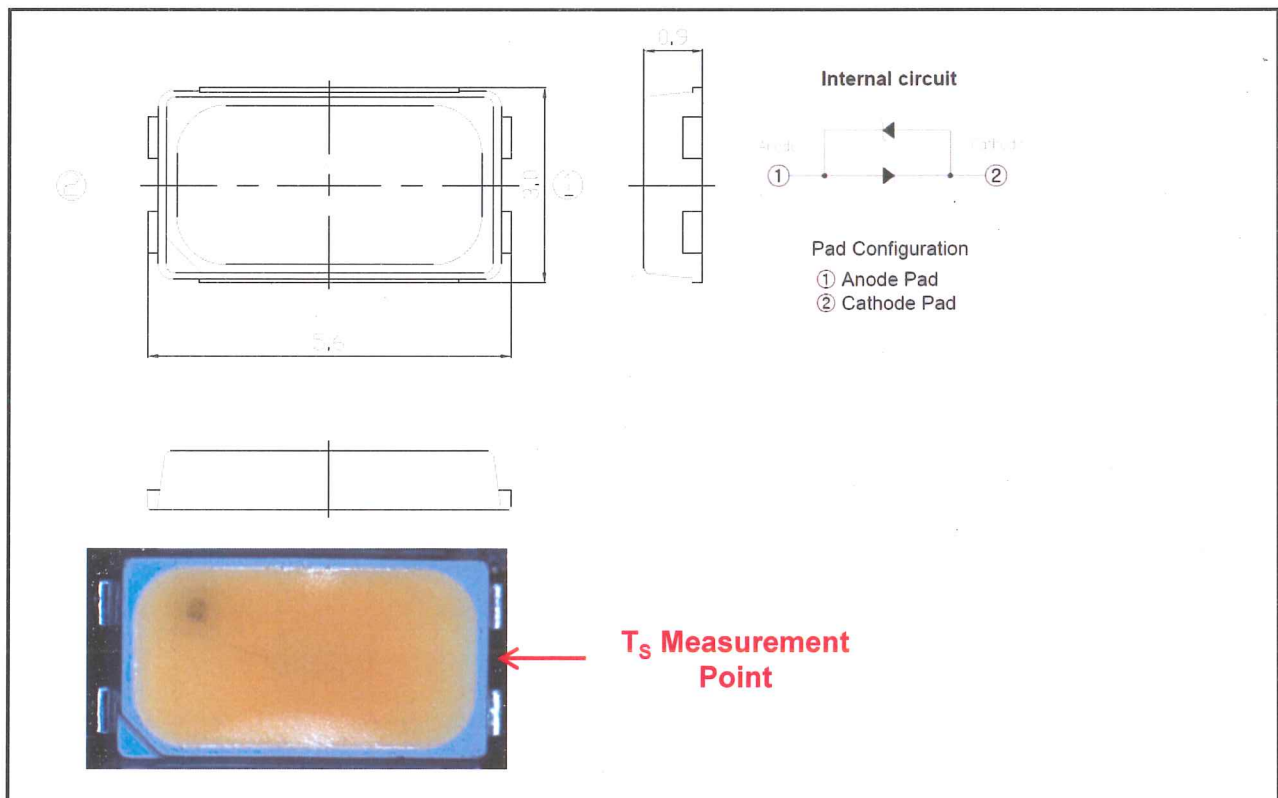
7. Description of auxiliary equipment

7.1 Vektrex ITCS (Integrated Thermal Control System) : Water-cooled thermal control

7.2 Vektrex ALMS (Automated Light Measurement System)

- Instrument systems CAS-140CT spectrometer
- Labsphere 1 m Hemisphere
- Current source SS200

8. Photograph & Dimension



- END OF REPORT -