

# TEST REPORT

According to ANSI/IES LM-80-15  
For

**#Lumileds Holding B.V.**

#370 W. Trimble Road, San Jose, CA 95131, USA

**#Model: L1MC-2780RA50000B1**

<b>Report Type:</b> 9000 Hours Test Report		<b>Product Type:</b> LED Package	
<b>Reviewed By:</b>	Pote Wang	<i>Pote Wang</i>	
<b>Report Number:</b>	DG3220823-38250E-EE		
<b>Test Date:</b>	2021-04-28 to 2022-05-17		
<b>Report Date:</b>	2022-08-25		
<b>Approved by:</b>	Blake Zhang / EE Engineer		
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<b>Test Facility:</b>	Test facility was located at No.12, Pulong East 1 <sup>st</sup> Road, Tangxia Town, Dongguan, Guangdong, China.		

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## 1 - General Information

### 1.1 Description of LED Light Sources<sup>#</sup>

#### Sample Size:

50 PCS test samples were in good condition and received on 2021-04-26. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer:	Lumileds Holding B.V.
Part Number:	L1MC-2780RA50000B1
Part Type:	LED Package
Drive Level:	DC 240mA
Wavelength(Red):	610-635nm
Wavelength(Green):	510-535nm
Wavelength(Blue):	450-475nm
Power:	0.72W
Average Current Density per LED die:	930.23mA/mm <sup>2</sup>
Average Power Density per LED die:	2.791W/mm <sup>2</sup>
Die Spacing:	0.22mm

#### 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.

#### Family products covered by this report:

According to *ENERGY STAR<sup>®</sup> Requirements for the Use of LM-80 Data*, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of *ENERGY STAR<sup>®</sup> Requirements for the Use of LM-80 Data* (September 28, 2017)

This report covers the following models:

Tested model	Multiple model	Total Input Current (mA)	Power (W)	Number of dies	Driver current per die(mA)	Current Density per Die(mA/mm <sup>2</sup> )	Power Density per PCB (W/mm <sup>2</sup> )	Die Spacing (mm)
L1MC-2780RA50000B1	L1MC-xxxxRA5000xxx	240	0.72	4	60	930.23	0.0288	0.22

#### Note:

1. The first and second x denote designates nominal CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 45=4500K, 50=5000K, 57=5700K, 60=6000K, 65=6500K).
2. The third and fourth x represent different solutions for product models (Color coordinate and applications and special solution etc...).
3. The last three x denote designates=Lumileds internal codes (0A1, 0B1, 0C1, etc. =shares the same base part).
4. The materials and workmanship of all series models are consistent with the test model.

#### Note:

1. The applicant Lumileds Holding B.V. declare that their products with model L1MC-2780RA50000B1 are the same to the products in report# DG3210426-10977-10-9000 and is authorized by original applicant to use their test data.
2. All the data in previous report (DG3210426-10977-10-9000) is shared in this report.

### 1.2 Standards and Reference Documentations

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- \*CIE 127:2007: Measurement of LEDs (This standard was not accredited by NVLAP)
- \*ENERGY STAR<sup>®</sup> Requirements for the Use of LM-80 Data (This standard was not accredited by NVLAP)

### 1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
High Accuracy Array Spectroradiometer	EVERFINE	HAAS 2000	P600674CM5391140	2021-09-27	2022-09-26
0.5M Integrating Sphere	EVERFINE	0.5m	NA	2021-09-27	2022-09-26
LED Test Source	EVERFINE	LTS-300	P185616CJ1391143	2022-01-05	2023-01-04
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2022-10-14
Multilayer aging machine	BACL	B2-270	20024	2022-01-04	2023-01-03
Programmable D.C. power supply	Xinnuoer	ATP-5005	N/A	2022-01-05	2023-01-04

### 1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within  $\pm 3\%$  of the specified value of the manufacturer during maintenance test, and was within  $\pm 0.5\%$  during photometric and electrical measurement test.

### 1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP<sub>LED</sub>) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP<sub>LED</sub> of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within  $\pm 3\%$  of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to 25°C  $\pm$  2°C, RH <65%.

### 1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate u'v'. 2 $\pi$  measurement was used and sample was driven by DC power supply. The forward current was regulated to within  $\pm 0.5\%$  of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to 25°C  $\pm$  2°C, RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

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=21K (K=2), at the 95% confidence level.

The uncertainty of the temperature is U=0.8671°C (K=2), at the 95% confidence level.

### 1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

## 1.8 Sample Set

### Data Set 1: 55°C, 60mA(Red)

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >53°C  
Ambient Temperature: >50°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

### Data Set 2: 85°C, 60mA(Red)

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >83°C  
Ambient Temperature: >80°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

### Data Set 3: 55°C, 60mA(Green)

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >53°C  
Ambient Temperature: >50°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

### Data Set 4: 85°C, 60mA(Green)

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >83°C  
Ambient Temperature: >80°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

**Data Set 5: 55°C, 60mA(Blue)**

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >53°C  
Ambient Temperature: >50°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

**Data Set 6: 85°C, 60mA(Blue)**

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >83°C  
Ambient Temperature: >80°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

**Data Set 7: 55°C, 60mA(White)**

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >53°C  
Ambient Temperature: >50°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

**Data Set 8: 85°C, 60mA(White)**

Part Number: L1MC-2780RA50000B1  
Number of Units: 25  
Case Temperature: >83°C  
Ambient Temperature: >80°C  
Life Test Drive Current: 60mA  
Measurement Current: 60mA

## 2 - Summary of Test Result

Data Set:	Tested case temperature	Sample Size	Failures Observed:	Test Interval	Test Duration	$\alpha$	$\beta$	Reported TM-21 L <sub>70</sub> Lifetime	Reported TM-21 L <sub>90</sub> Lifetime
1(Red)	55°C	25	0	1000hrs	9000hrs	2.388E-06	1.005	>54000 hours	46,000 hours
2(Red)	85°C	25	0	1000hrs	9000hrs	2.592E-06	1.004	>54000 hours	42,000 hours
3(Green)	55°C	25	0	1000hrs	9000hrs	2.462E-06	1.005	>54000 hours	45,000 hours
4(Green)	85°C	25	0	1000hrs	9000hrs	2.796E-06	1.005	>54000 hours	40,000 hours
5(Blue)	55°C	25	0	1000hrs	9000hrs	2.582E-06	1.005	>54000 hours	43,000 hours
6(Blue)	85°C	25	0	1000hrs	9000hrs	2.836E-06	1.005	>54000 hours	39,000 hours
7(White)	55°C	25	0	1000hrs	9000hrs	2.570E-06	1.004	>54000 hours	42,000 hours
8(White)	85°C	25	0	1000hrs	9000hrs	2.884E-06	1.006	>54000 hours	38,000 hours

### Average Lumen Maintenance (Percentage of Initial Luminous Flux)

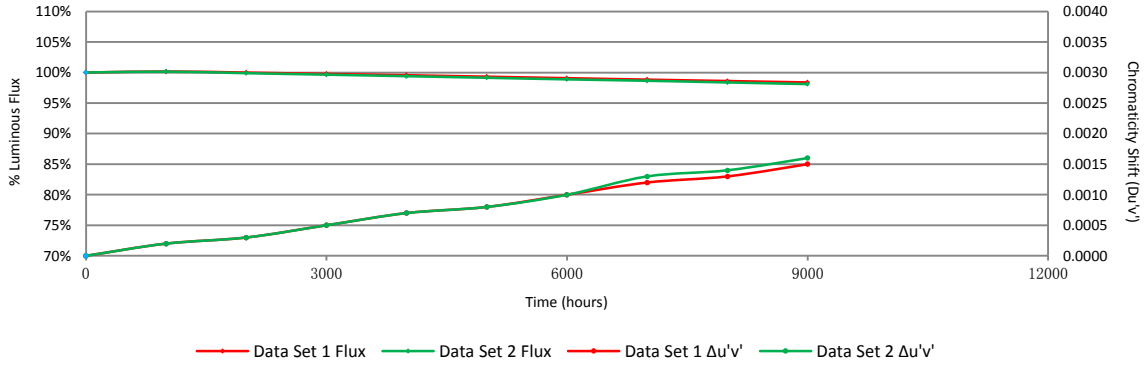
Data Set:	Tested case temperature	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1(Red)	55°C	100.18%	99.99%	99.77%	99.56%	99.32%	99.08%	98.84%	98.61%	98.38%
2(Red)	85°C	100.15%	99.89%	99.65%	99.40%	99.14%	98.88%	98.65%	98.38%	98.11%
3(Green)	55°C	100.18%	99.97%	99.69%	99.47%	99.24%	98.99%	98.74%	98.50%	98.26%
4(Green)	85°C	100.15%	99.90%	99.65%	99.41%	99.16%	98.89%	98.60%	98.32%	98.04%
5(Blue)	55°C	100.20%	99.94%	99.69%	99.47%	99.21%	98.95%	98.70%	98.45%	98.19%
6(Blue)	85°C	100.12%	99.86%	99.59%	99.33%	99.06%	98.77%	98.50%	98.22%	97.93%
7(White)	55°C	100.16%	99.89%	99.62%	99.36%	99.08%	98.82%	98.57%	98.32%	98.09%
8(White)	85°C	100.11%	99.87%	99.64%	99.39%	99.13%	98.85%	98.57%	98.27%	97.97%

### Average Chromaticity Shift

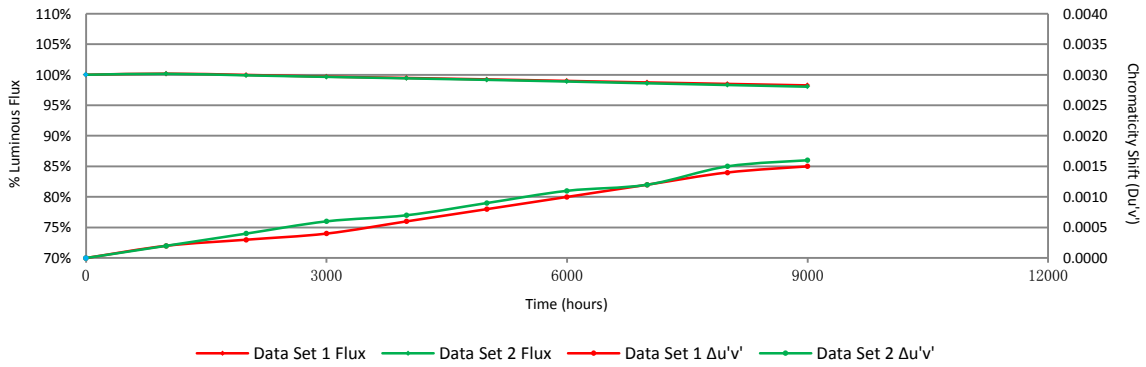
Data Set:	Tested case temperature	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1(Red)	55°C	0.0002	0.0003	0.0005	0.0007	0.0008	0.001	0.0012	0.0013	0.0015
2(Red)	85°C	0.0002	0.0003	0.0005	0.0007	0.0008	0.001	0.0013	0.0014	0.0016
3(Green)	55°C	0.0002	0.0003	0.0004	0.0006	0.0008	0.001	0.0012	0.0014	0.0015
4(Green)	85°C	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0015	0.0016
5(Blue)	55°C	0.0002	0.0004	0.0005	0.0007	0.0009	0.001	0.0012	0.0014	0.0015
6(Blue)	85°C	0.0002	0.0004	0.0005	0.0007	0.0009	0.0011	0.0012	0.0014	0.0016
7(White)	55°C	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014
8(White)	85°C	0.0002	0.0004	0.0005	0.0008	0.0009	0.0011	0.0012	0.0013	0.0015

Average Lumen Maintenance and Chromaticity Shift VS. Time

**Red**

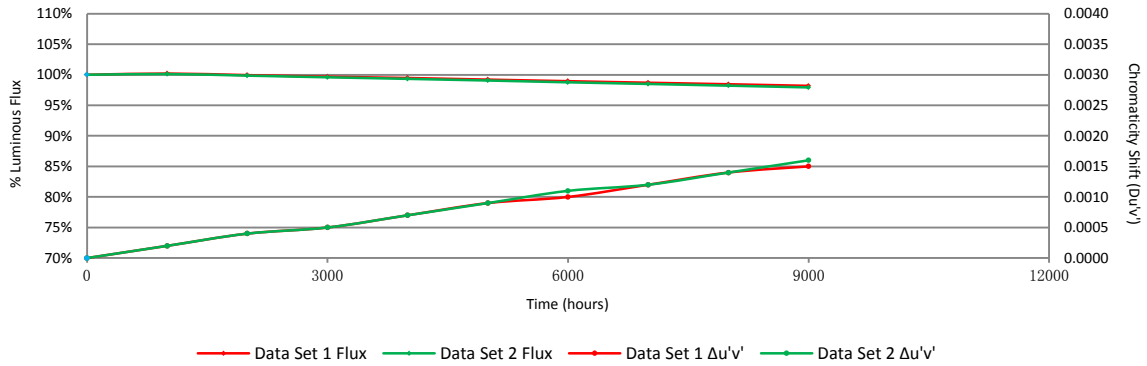


**Green**

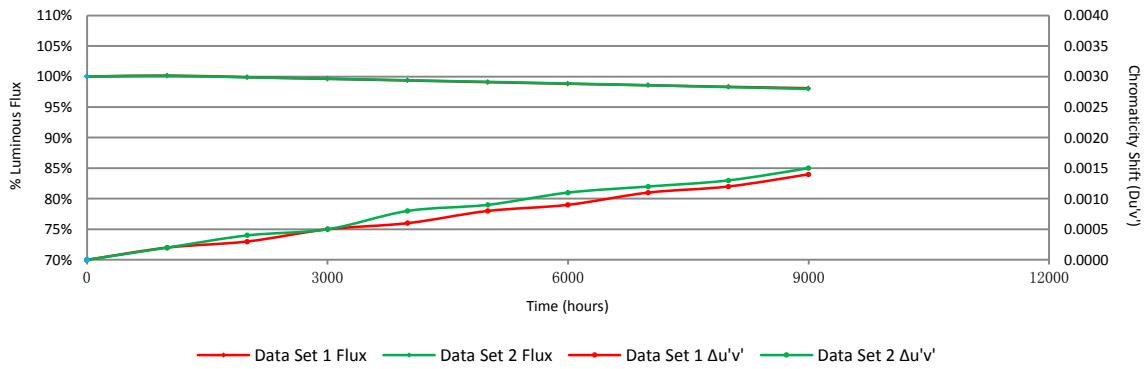




**Blue**



**White**



### 3 - Test Data

#### 3.1 Data Set 1(Red), 55°C, 60mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	10.94	100.27	100.09	99.82	99.63	99.45	99.18	98.99	98.81	98.45
2	10.68	100.28	100.09	99.91	99.63	99.34	99.16	98.88	98.60	98.31
3	11.06	100.27	100.09	99.91	99.64	99.37	99.10	98.73	98.55	98.28
4	10.90	100.37	100.09	99.91	99.63	99.27	99.08	98.72	98.44	98.35
5	10.86	100.09	99.91	99.63	99.26	99.17	98.80	98.62	98.34	98.16
6	10.79	100.28	100.09	99.91	99.63	99.35	99.07	98.80	98.42	98.33
7	10.97	100.27	100.18	99.91	99.54	99.36	99.09	98.81	98.45	98.18
8	10.96	100.27	100.09	99.91	99.82	99.54	99.18	98.91	98.63	98.36
9	10.87	100.18	99.91	99.72	99.54	99.26	99.08	98.90	98.53	98.44
10	10.61	100.38	100.19	100.00	99.81	99.72	99.43	99.25	99.15	98.87
11	10.89	100.09	99.91	99.63	99.54	99.27	98.99	98.62	98.26	98.07
12	11.05	100.09	99.91	99.73	99.37	99.00	98.73	98.37	98.10	97.83
13	11.18	100.36	100.09	99.91	99.64	99.46	99.11	98.84	98.57	98.39
14	11.00	99.91	99.73	99.64	99.45	99.18	98.91	98.64	98.45	98.18
15	10.96	99.82	99.54	99.36	99.27	99.00	98.72	98.63	98.45	98.18
16	11.11	99.91	99.82	99.55	99.37	99.28	99.10	99.01	98.74	98.65
17	11.05	99.73	99.64	99.37	99.28	99.10	98.91	98.64	98.46	98.28
18	10.90	100.18	100.00	99.72	99.45	99.17	99.08	98.81	98.72	98.53
19	11.06	100.27	100.09	99.82	99.55	99.37	99.19	98.92	98.73	98.46
20	11.02	99.91	99.82	99.64	99.46	99.27	99.09	99.00	98.82	98.55
21	11.12	100.09	99.91	99.73	99.64	99.55	99.46	99.28	98.92	98.83
22	11.05	100.36	100.09	99.82	99.64	99.55	99.37	99.10	98.73	98.46
23	10.82	100.28	100.18	100.09	99.82	99.54	99.26	99.08	98.89	98.61
24	11.04	100.36	100.09	100.00	99.73	99.37	99.00	98.64	98.55	98.37
25	10.98	100.36	100.18	99.73	99.64	99.18	99.00	98.91	98.82	98.36
Avg.	10.95	100.18	99.99	99.77	99.56	99.32	99.08	98.84	98.61	98.38
Med.	10.97	100.27	100.09	99.82	99.63	99.34	99.09	98.84	98.57	98.36
st dev	0.13	0.19	0.18	0.18	0.16	0.18	0.19	0.21	0.23	0.23
Min.	10.61	99.73	99.54	99.36	99.26	99.00	98.72	98.37	98.10	97.83
Max.	11.18	100.38	100.19	100.09	99.82	99.72	99.46	99.28	99.15	98.87

**3.2 Data Set 1(Red), 55°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	2.166	2.169	2.164	2.166	2.165	2.166	2.168	2.165	2.166	2.168
2	2.163	2.165	2.161	2.162	2.163	2.161	2.165	2.161	2.162	2.163
3	2.181	2.182	2.179	2.180	2.180	2.180	2.181	2.179	2.181	2.182
4	2.161	2.160	2.158	2.159	2.158	2.159	2.161	2.158	2.158	2.162
5	2.153	2.155	2.151	2.151	2.152	2.152	2.152	2.150	2.151	2.158
6	2.159	2.161	2.157	2.157	2.158	2.157	2.159	2.157	2.159	2.161
7	2.186	2.188	2.184	2.183	2.185	2.185	2.186	2.184	2.185	2.190
8	2.188	2.194	2.186	2.187	2.186	2.188	2.187	2.186	2.188	2.193
9	2.160	2.162	2.158	2.159	2.158	2.160	2.160	2.158	2.159	2.166
10	2.157	2.160	2.155	2.156	2.156	2.156	2.156	2.157	2.156	2.159
11	2.180	2.180	2.176	2.176	2.178	2.177	2.177	2.178	2.177	2.180
12	2.178	2.177	2.174	2.174	2.176	2.174	2.175	2.175	2.176	2.178
13	2.167	2.197	2.190	2.193	2.195	2.193	2.194	2.194	2.194	2.197
14	2.157	2.156	2.153	2.153	2.154	2.155	2.153	2.153	2.154	2.156
15	2.166	2.165	2.162	2.163	2.164	2.164	2.162	2.164	2.164	2.165
16	2.169	2.171	2.165	2.166	2.165	2.166	2.166	2.166	2.166	2.169
17	2.174	2.182	2.188	2.190	2.190	2.192	2.192	2.192	2.192	2.194
18	2.186	2.186	2.183	2.183	2.182	2.184	2.183	2.184	2.184	2.185
19	2.170	2.175	2.166	2.166	2.166	2.168	2.168	2.169	2.168	2.170
20	2.171	2.168	2.168	2.168	2.168	2.166	2.169	2.169	2.168	2.172
21	2.170	2.201	2.196	2.198	2.196	2.197	2.197	2.197	2.198	2.198
22	2.174	2.203	2.202	2.204	2.202	2.203	2.202	2.203	2.204	2.206
23	2.173	2.205	2.201	2.202	2.202	2.202	2.201	2.205	2.202	2.205
24	2.187	2.189	2.184	2.185	2.185	2.186	2.184	2.187	2.185	2.189
25	2.171	2.172	2.168	2.170	2.169	2.168	2.169	2.171	2.170	2.171
Avg.	2.171	2.177	2.173	2.174	2.174	2.174	2.175	2.174	2.175	2.177
Med.	2.170	2.175	2.168	2.170	2.169	2.168	2.169	2.171	2.170	2.172
st dev	0.010	0.015	0.015	0.016	0.015	0.016	0.015	0.016	0.016	0.015
Min.	2.153	2.155	2.151	2.151	2.152	2.152	2.152	2.150	2.151	2.156
Max.	2.188	2.205	2.202	2.204	2.202	2.203	2.202	2.205	2.204	2.206

**3.3 Data Set 1(Red), 55°C, 60mA (Chromaticity Shift)**

No.	u'	v'	Chromaticity Shift ( $\Delta u'v'$ )								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.5233	0.5214	0.0001	0.0002	0.0003	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015
2	0.5249	0.5211	0.0001	0.0002	0.0004	0.0006	0.0009	0.0010	0.0013	0.0014	0.0016
3	0.5232	0.5213	0.0001	0.0002	0.0004	0.0005	0.0006	0.0008	0.0008	0.0009	0.0013
4	0.5231	0.5214	0.0002	0.0003	0.0005	0.0006	0.0007	0.0010	0.0011	0.0012	0.0013
5	0.5239	0.5213	0.0001	0.0002	0.0005	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014
6	0.5241	0.5213	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0017
7	0.5236	0.5213	0.0001	0.0002	0.0003	0.0006	0.0008	0.0010	0.0012	0.0013	0.0015
8	0.5238	0.5213	0.0001	0.0003	0.0006	0.0009	0.0010	0.0011	0.0013	0.0015	0.0017
9	0.5241	0.5213	0.0001	0.0003	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015	0.0016
10	0.5261	0.5210	0.0002	0.0003	0.0004	0.0007	0.0008	0.0008	0.0010	0.0011	0.0013
11	0.5227	0.5214	0.0001	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0014
12	0.5232	0.5214	0.0003	0.0004	0.0006	0.0009	0.0011	0.0011	0.0013	0.0014	0.0016
13	0.5236	0.5213	0.0001	0.0003	0.0005	0.0008	0.0010	0.0012	0.0013	0.0014	0.0016
14	0.5232	0.5214	0.0002	0.0004	0.0005	0.0008	0.0009	0.0011	0.0013	0.0015	0.0016
15	0.5236	0.5213	0.0003	0.0004	0.0005	0.0006	0.0007	0.0011	0.0013	0.0016	0.0018
16	0.5226	0.5215	0.0001	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0015
17	0.5232	0.5214	0.0001	0.0002	0.0006	0.0008	0.0010	0.0011	0.0013	0.0014	0.0017
18	0.5246	0.5212	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017
19	0.5228	0.5214	0.0003	0.0004	0.0006	0.0008	0.0009	0.0012	0.0013	0.0015	0.0017
20	0.5228	0.5214	0.0001	0.0002	0.0003	0.0006	0.0010	0.0013	0.0016	0.0017	0.0017
21	0.5173	0.5222	0.0002	0.0004	0.0004	0.0006	0.0008	0.0012	0.0014	0.0014	0.0017
22	0.5237	0.5213	0.0001	0.0003	0.0004	0.0005	0.0008	0.0010	0.0011	0.0013	0.0016
23	0.5249	0.5211	0.0001	0.0003	0.0006	0.0007	0.0009	0.0010	0.0011	0.0012	0.0014
24	0.5234	0.5213	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0012	0.0014
25	0.5233	0.5213	0.0003	0.0005	0.0006	0.0006	0.0007	0.0008	0.0010	0.0012	0.0014
Avg.	0.5234	0.5213	0.0002	0.0003	0.0005	0.0007	0.0008	0.0010	0.0012	0.0013	0.0015
Med.	0.5234	0.5213	0.0001	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0014	0.0016
st dev	0.0015	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002
Min.	0.5173	0.5210	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0008	0.0009	0.0013
Max.	0.5261	0.5222	0.0003	0.0005	0.0007	0.0009	0.0011	0.0013	0.0016	0.0017	0.0018

**3.4 Data Set 2(Red), 85°C, 60mA (Lumen Maintenance)**

No.	Φ(m)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	11.02	100.27	100.09	99.91	99.73	99.36	99.09	98.82	98.55	98.46
27	10.91	99.91	99.73	99.54	99.36	99.18	98.99	98.90	98.63	98.17
28	10.99	100.36	100.18	99.73	99.55	99.27	99.09	99.00	98.82	98.36
29	10.75	99.81	99.63	99.53	99.35	99.16	98.98	98.79	98.60	98.42
30	11.01	100.27	100.09	99.91	99.73	99.55	99.18	98.91	98.55	98.37
31	10.61	99.91	99.72	99.53	99.34	99.15	98.96	98.77	98.59	98.40
32	11.00	100.36	100.18	99.91	99.55	99.18	98.73	98.55	98.45	98.27
33	10.81	100.19	99.91	99.72	99.44	99.07	98.80	98.70	98.43	98.15
34	11.01	99.91	99.64	99.46	99.27	99.09	98.82	98.55	98.27	98.09
35	11.00	100.27	100.09	99.91	99.73	99.36	99.00	98.64	98.27	98.00
36	10.84	100.18	99.91	99.63	99.35	99.08	98.80	98.43	98.15	97.79
37	10.89	100.18	100.00	99.82	99.72	99.36	98.99	98.81	98.62	98.44
38	10.78	100.19	99.91	99.54	99.35	99.17	98.79	98.42	98.14	97.87
39	10.80	100.09	99.91	99.63	99.26	99.07	98.80	98.61	98.43	98.15
40	10.99	100.18	99.91	99.55	99.18	98.91	98.73	98.45	98.18	97.91
41	10.86	100.09	99.82	99.54	99.08	98.90	98.71	98.53	98.16	98.07
42	10.88	100.18	99.91	99.82	99.54	99.17	98.90	98.62	98.25	97.89
43	10.78	100.19	100.09	99.81	99.63	99.35	98.98	98.79	98.52	98.33
44	10.94	100.18	99.91	99.82	99.36	99.27	98.99	98.90	98.54	98.08
45	11.05	100.18	99.91	99.55	99.28	98.91	98.82	98.46	98.19	97.74
46	10.77	100.28	99.81	99.54	99.26	98.98	98.79	98.51	98.24	97.96
47	10.90	100.09	99.91	99.54	99.45	99.27	98.99	98.72	98.35	98.07
48	10.99	100.27	99.91	99.64	99.27	99.09	98.82	98.54	98.27	97.82
49	10.98	100.18	99.64	99.36	99.09	98.72	98.54	98.27	98.09	97.91
50	10.81	100.09	99.54	99.44	99.17	98.98	98.80	98.52	98.24	98.06
Avg.	10.89	100.15	99.89	99.65	99.40	99.14	98.88	98.65	98.38	98.11
Med.	10.90	100.18	99.91	99.63	99.35	99.16	98.82	98.62	98.35	98.08
st dev	0.11	0.14	0.18	0.17	0.20	0.18	0.15	0.19	0.20	0.22
Min.	10.61	99.81	99.54	99.36	99.08	98.72	98.54	98.27	98.09	97.74
Max.	11.05	100.36	100.18	99.91	99.73	99.55	99.18	99.00	98.82	98.46

**3.5 Data Set 2(Red), 85°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.177	2.176	2.174	2.176	2.176	2.175	2.174	2.176	2.179	2.181
27	2.189	2.189	2.188	2.189	2.188	2.190	2.187	2.192	2.192	2.194
28	2.171	2.171	2.169	2.171	2.170	2.171	2.171	2.173	2.174	2.175
29	2.155	2.154	2.154	2.154	2.154	2.156	2.154	2.155	2.157	2.157
30	2.174	2.176	2.173	2.174	2.173	2.175	2.174	2.175	2.174	2.177
31	2.161	2.163	2.161	2.161	2.162	2.162	2.160	2.162	2.160	2.163
32	2.188	2.188	2.186	2.187	2.188	2.190	2.187	2.189	2.187	2.192
33	2.181	2.181	2.180	2.180	2.181	2.181	2.181	2.183	2.181	2.184
34	2.173	2.174	2.172	2.173	2.172	2.173	2.172	2.174	2.174	2.175
35	2.171	2.171	2.168	2.170	2.170	2.170	2.169	2.170	2.172	2.171
36	2.169	2.169	2.168	2.168	2.168	2.169	2.169	2.169	2.169	2.171
37	2.166	2.165	2.164	2.165	2.166	2.170	2.166	2.169	2.166	2.170
38	2.163	2.203	2.202	2.202	2.204	2.206	2.202	2.204	2.203	2.208
39	2.163	2.162	2.161	2.161	2.161	2.168	2.161	2.163	2.164	2.164
40	2.168	2.169	2.165	2.166	2.166	2.169	2.166	2.168	2.173	2.169
41	2.152	2.201	2.201	2.199	2.200	2.204	2.199	2.207	2.212	2.202
42	2.160	2.206	2.205	2.206	2.205	2.208	2.203	2.210	2.207	2.207
43	2.169	2.169	2.169	2.168	2.168	2.170	2.168	2.170	2.172	2.170
44	2.178	2.178	2.177	2.177	2.177	2.182	2.179	2.178	2.181	2.180
45	2.175	2.176	2.175	2.172	2.174	2.178	2.173	2.176	2.180	2.175
46	2.169	2.169	2.168	2.166	2.168	2.174	2.168	2.170	2.176	2.170
47	2.173	2.171	2.172	2.170	2.171	2.175	2.171	2.173	2.175	2.174
48	2.166	2.166	2.165	2.165	2.165	2.168	2.165	2.169	2.173	2.169
49	2.162	2.162	2.162	2.161	2.160	2.163	2.161	2.163	2.163	2.163
50	2.157	2.160	2.156	2.157	2.157	2.159	2.155	2.156	2.160	2.162
Avg.	2.169	2.175	2.173	2.174	2.174	2.176	2.173	2.176	2.177	2.177
Med.	2.169	2.171	2.169	2.170	2.170	2.173	2.171	2.173	2.174	2.174
st dev	0.009	0.013	0.014	0.014	0.014	0.014	0.013	0.015	0.014	0.014
Min.	2.152	2.154	2.154	2.154	2.154	2.156	2.154	2.155	2.157	2.157
Max.	2.189	2.206	2.205	2.206	2.205	2.208	2.203	2.210	2.212	2.208

**3.6 Data Set 2(Red), 85°C, 60mA (Chromaticity Shift)**

No.	u'	v'	Chromaticity Shift ( $\Delta u'v'$ )								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.5230	0.5214	0.0002	0.0004	0.0006	0.0007	0.0010	0.0012	0.0015	0.0017	0.0019
27	0.5240	0.5212	0.0001	0.0002	0.0005	0.0006	0.0009	0.0012	0.0015	0.0017	0.0018
28	0.5229	0.5214	0.0002	0.0004	0.0005	0.0008	0.0009	0.0012	0.0013	0.0016	0.0017
29	0.5246	0.5212	0.0001	0.0002	0.0003	0.0005	0.0007	0.0011	0.0012	0.0013	0.0015
30	0.5231	0.5213	0.0003	0.0005	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0013
31	0.5255	0.5210	0.0002	0.0004	0.0007	0.0009	0.0009	0.0011	0.0012	0.0013	0.0016
32	0.5235	0.5213	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0011	0.0013	0.0015
33	0.5254	0.5210	0.0001	0.0002	0.0004	0.0006	0.0008	0.0008	0.0009	0.0010	0.0013
34	0.5232	0.5214	0.0003	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0015	0.0017
35	0.5233	0.5213	0.0001	0.0002	0.0005	0.0006	0.0009	0.0010	0.0011	0.0013	0.0015
36	0.5240	0.5213	0.0002	0.0003	0.0006	0.0007	0.0009	0.0010	0.0012	0.0014	0.0014
37	0.5237	0.5213	0.0001	0.0002	0.0005	0.0007	0.0008	0.0009	0.0011	0.0012	0.0014
38	0.5250	0.5211	0.0002	0.0002	0.0005	0.0009	0.0010	0.0013	0.0015	0.0017	0.0020
39	0.5238	0.5213	0.0002	0.0003	0.0004	0.0005	0.0006	0.0009	0.0011	0.0012	0.0014
40	0.5228	0.5214	0.0002	0.0003	0.0004	0.0006	0.0007	0.0008	0.0010	0.0014	0.0015
41	0.5241	0.5212	0.0001	0.0004	0.0004	0.0005	0.0008	0.0009	0.0012	0.0013	0.0016
42	0.5242	0.5212	0.0002	0.0004	0.0005	0.0007	0.0007	0.0009	0.0010	0.0014	0.0016
43	0.5248	0.5211	0.0002	0.0003	0.0004	0.0008	0.0009	0.0011	0.0012	0.0013	0.0015
44	0.5235	0.5213	0.0001	0.0003	0.0005	0.0006	0.0008	0.0012	0.0013	0.0014	0.0015
45	0.5232	0.5214	0.0002	0.0004	0.0006	0.0007	0.0009	0.0012	0.0013	0.0015	0.0017
46	0.5245	0.5212	0.0002	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0019
47	0.5239	0.5213	0.0002	0.0004	0.0004	0.0006	0.0011	0.0012	0.0015	0.0017	0.0019
48	0.5232	0.5214	0.0003	0.0003	0.0004	0.0005	0.0008	0.0011	0.0014	0.0016	0.0018
49	0.5230	0.5214	0.0002	0.0002	0.0004	0.0006	0.0007	0.0011	0.0015	0.0015	0.0017
50	0.5246	0.5212	0.0002	0.0003	0.0004	0.0005	0.0008	0.0012	0.0013	0.0014	0.0015
Avg.	0.5239	0.5213	0.0002	0.0003	0.0005	0.0007	0.0008	0.0010	0.0013	0.0014	0.0016
Med.	0.5238	0.5213	0.0002	0.0003	0.0005	0.0006	0.0008	0.0011	0.0012	0.0014	0.0016
st dev	0.0008	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.5228	0.5210	0.0001	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0010	0.0013
Max.	0.5255	0.5214	0.0003	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0020

**3.7 Data Set 3(Green), 55°C, 60mA (Lumen Maintenance)**

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	20.23	100.15	99.90	99.75	99.51	99.31	99.11	98.81	98.52	98.27
2	20.34	100.25	99.95	99.71	99.46	99.21	98.97	98.67	98.43	98.13
3	20.19	100.20	99.95	99.70	99.41	99.26	99.16	98.86	98.66	98.42
4	20.29	100.25	99.95	99.70	99.46	99.21	98.97	98.72	98.47	98.23
5	20.41	100.05	99.85	99.51	99.27	98.92	98.78	98.63	98.38	98.09
6	20.34	100.15	99.90	99.71	99.61	99.56	99.31	99.26	99.07	98.82
7	20.19	100.35	100.05	99.26	98.96	98.66	98.37	98.07	97.82	97.57
8	20.18	100.15	100.05	99.80	99.50	99.31	99.01	98.81	98.51	98.36
9	20.39	100.20	100.05	99.85	99.61	99.36	99.07	98.63	98.28	98.14
10	20.17	100.15	99.90	99.50	99.36	99.01	98.76	98.31	98.07	97.87
11	19.27	100.16	100.05	99.84	99.69	99.48	99.17	98.81	98.55	98.29
12	20.34	100.15	99.95	99.66	99.41	99.26	99.12	98.82	98.72	98.38
13	20.14	100.25	100.15	99.80	99.45	99.26	98.91	98.81	98.61	98.31
14	20.23	100.15	99.85	99.46	99.26	99.06	98.81	98.52	98.27	97.97
15	20.06	100.30	100.10	99.90	99.80	99.65	99.40	99.10	98.80	98.60
16	20.27	100.10	99.95	99.80	99.65	99.51	99.31	99.06	98.91	98.62
17	20.15	100.25	100.15	99.95	99.65	99.35	99.01	98.66	98.36	98.11
18	20.20	100.20	100.05	99.90	99.70	99.55	99.46	99.16	98.86	98.61
19	20.33	100.05	99.80	99.56	99.41	99.26	99.02	98.77	98.57	98.38
20	20.35	100.05	99.75	99.41	99.26	98.87	98.53	98.28	97.94	97.84
21	20.25	100.20	100.05	99.85	99.65	99.36	99.01	98.81	98.62	98.27
22	20.01	100.20	99.95	99.65	99.35	99.10	98.80	98.60	98.40	98.15
23	19.95	100.30	100.15	99.95	99.70	99.45	99.20	99.10	98.80	98.60
24	20.21	100.20	99.95	99.65	99.51	99.21	98.96	98.76	98.66	98.37
25	20.35	100.20	99.71	99.41	99.02	98.82	98.62	98.43	98.18	97.99
Avg.	20.19	100.18	99.97	99.69	99.47	99.24	98.99	98.74	98.50	98.26
Med.	20.23	100.20	99.95	99.71	99.46	99.26	99.01	98.77	98.52	98.27
st dev	0.22	0.08	0.12	0.19	0.21	0.25	0.26	0.28	0.30	0.28
Min.	19.27	100.05	99.71	99.26	98.96	98.66	98.37	98.07	97.82	97.57
Max.	20.41	100.35	100.15	99.95	99.80	99.65	99.46	99.26	99.07	98.82



**3.8 Data Set 3(Green), 55°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	2.946	2.947	2.944	2.949	2.935	2.946	2.949	2.946	2.945	2.937
2	2.927	2.926	2.925	2.933	2.919	2.925	2.929	2.929	2.926	2.930
3	2.908	2.907	2.905	2.917	2.903	2.907	2.909	2.910	2.906	2.905
4	2.905	2.908	2.906	2.914	2.902	2.906	2.911	2.909	2.920	2.906
5	2.917	2.916	2.915	2.921	2.913	2.914	2.921	2.919	2.916	2.914
6	2.986	2.984	2.983	2.993	2.982	2.984	2.992	2.989	3.001	2.985
7	2.935	2.935	2.934	2.940	2.932	2.933	2.940	2.938	2.937	2.935
8	2.896	2.896	2.898	2.907	2.895	2.898	2.903	2.902	2.902	2.898
9	2.912	2.911	2.921	2.925	2.910	2.911	2.921	2.919	2.919	2.914
10	2.926	2.927	2.946	2.932	2.923	2.924	2.933	2.931	2.928	2.929
11	2.913	2.912	2.931	2.920	2.911	2.913	2.922	2.917	2.914	2.914
12	2.915	2.913	2.921	2.924	2.913	2.916	2.925	2.921	2.921	2.917
13	2.906	2.904	2.912	2.908	2.902	2.906	2.911	2.911	2.908	2.906
14	2.939	2.932	2.937	2.941	2.932	2.935	2.941	2.938	2.940	2.933
15	2.914	2.912	2.915	2.915	2.908	2.909	2.917	2.913	2.923	2.911
16	2.913	2.914	2.913	2.926	2.910	2.911	2.917	2.916	2.920	2.911
17	2.926	2.927	2.929	2.934	2.926	2.929	2.932	2.933	2.931	2.926
18	2.928	2.930	2.927	2.935	2.927	2.930	2.933	2.934	2.937	2.928
19	2.930	2.929	2.930	2.935	2.930	2.930	2.934	2.937	2.934	2.931
20	2.924	2.922	2.920	2.926	2.919	2.920	2.925	2.926	2.920	2.920
21	2.932	2.935	2.933	2.937	2.931	2.938	2.939	2.946	2.936	2.935
22	2.916	2.919	2.914	2.921	2.917	2.921	2.922	2.928	2.919	2.916
23	2.911	2.913	2.909	2.913	2.911	2.913	2.917	2.921	2.913	2.910
24	2.933	2.937	2.931	2.936	2.933	2.935	2.940	2.943	2.934	2.935
25	2.933	2.937	2.933	2.935	2.933	2.936	2.941	2.943	2.935	2.935
Avg.	2.924	2.924	2.925	2.929	2.921	2.924	2.929	2.929	2.927	2.923
Med.	2.924	2.922	2.925	2.926	2.919	2.921	2.925	2.928	2.923	2.920
st dev	0.018	0.018	0.017	0.017	0.017	0.018	0.018	0.018	0.019	0.017
Min.	2.896	2.896	2.898	2.907	2.895	2.898	2.903	2.902	2.902	2.898
Max.	2.986	2.984	2.983	2.993	2.982	2.984	2.992	2.989	3.001	2.985

**3.9 Data Set 3(Green), 55°C, 60mA (Chromaticity Shift)**

No.	u'	v'	Chromaticity Shift ( $\Delta u'v'$ )								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.0564	0.5739	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0011	0.0012	0.0013
2	0.0574	0.5741	0.0001	0.0003	0.0004	0.0005	0.0007	0.0010	0.0011	0.0013	0.0014
3	0.0560	0.5735	0.0001	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0014	0.0015
4	0.0558	0.5734	0.0001	0.0003	0.0004	0.0006	0.0007	0.0010	0.0012	0.0014	0.0016
5	0.0576	0.5741	0.0001	0.0002	0.0004	0.0005	0.0006	0.0009	0.0011	0.0013	0.0014
6	0.0554	0.5737	0.0001	0.0003	0.0004	0.0006	0.0007	0.0009	0.0011	0.0013	0.0015
7	0.0564	0.5736	0.0001	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0014	0.0015
8	0.0561	0.5735	0.0001	0.0003	0.0006	0.0007	0.0009	0.0010	0.0013	0.0014	0.0016
9	0.0564	0.5738	0.0002	0.0003	0.0005	0.0006	0.0009	0.0010	0.0013	0.0014	0.0016
10	0.0572	0.5739	0.0001	0.0003	0.0005	0.0007	0.0009	0.0010	0.0013	0.0014	0.0017
11	0.0556	0.5734	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0015
12	0.0564	0.5738	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0014	0.0016
13	0.0559	0.5735	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0014	0.0015
14	0.0556	0.5733	0.0001	0.0002	0.0003	0.0005	0.0008	0.0009	0.0011	0.0013	0.0014
15	0.0558	0.5735	0.0001	0.0002	0.0004	0.0006	0.0007	0.0008	0.0010	0.0013	0.0015
16	0.0572	0.5739	0.0001	0.0003	0.0004	0.0006	0.0009	0.0010	0.0011	0.0014	0.0016
17	0.0569	0.5738	0.0001	0.0003	0.0005	0.0007	0.0009	0.0010	0.0012	0.0014	0.0015
18	0.0575	0.5738	0.0002	0.0003	0.0005	0.0007	0.0010	0.0011	0.0013	0.0014	0.0016
19	0.0570	0.5740	0.0002	0.0004	0.0004	0.0007	0.0009	0.0011	0.0012	0.0013	0.0016
20	0.0574	0.5741	0.0001	0.0002	0.0004	0.0005	0.0008	0.0009	0.0011	0.0012	0.0014
21	0.0559	0.5735	0.0002	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0014	0.0016
22	0.0562	0.5734	0.0002	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0014	0.0016
23	0.0568	0.5737	0.0002	0.0003	0.0004	0.0006	0.0009	0.0011	0.0012	0.0014	0.0015
24	0.0569	0.5736	0.0002	0.0003	0.0004	0.0006	0.0008	0.0011	0.0012	0.0014	0.0016
25	0.0571	0.5740	0.0003	0.0004	0.0004	0.0006	0.0009	0.0011	0.0011	0.0014	0.0016
Avg.	0.0565	0.5737	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0015
Med.	0.0564	0.5737	0.0001	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011	0.0014	0.0015
st dev	0.0007	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.0554	0.5733	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0013
Max.	0.0576	0.5741	0.0003	0.0004	0.0006	0.0007	0.0010	0.0011	0.0013	0.0014	0.0017

**3.10 Data Set 4(Green), 85°C, 60mA (Lumen Maintenance)**

No.	Φ(m) Ohr(Initial)	Lumen Maintenance (%)								
		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	20.19	100.25	100.05	99.80	99.55	99.31	99.06	98.81	98.56	98.27
27	20.39	100.20	99.90	99.66	99.31	99.12	98.87	98.63	98.43	98.19
28	20.29	99.90	99.75	99.51	99.26	99.01	98.72	98.42	98.18	97.98
29	20.19	100.10	99.75	99.65	99.55	99.46	99.26	98.96	98.71	98.42
30	20.18	100.05	99.75	99.50	99.21	99.06	98.81	98.46	98.27	98.02
31	20.13	100.15	99.90	99.65	99.45	99.25	99.01	98.61	98.26	97.81
32	20.26	99.80	99.65	99.56	99.31	99.06	98.77	98.47	98.17	97.83
33	20.06	100.20	100.05	99.90	99.75	99.65	99.35	98.95	98.55	98.35
34	20.25	100.25	100.05	99.70	99.60	99.41	99.21	99.01	98.81	98.57
35	20.40	100.15	100.05	99.71	99.51	99.31	99.12	98.82	98.58	98.28
36	19.91	100.15	99.85	99.50	99.20	98.95	98.74	98.44	98.24	97.94
37	20.23	100.30	100.15	99.90	99.56	99.31	98.96	98.71	98.42	98.12
38	20.34	100.34	100.10	99.90	99.61	99.26	98.92	98.82	98.57	98.18
39	20.11	100.30	100.05	99.75	99.45	99.15	98.86	98.56	98.21	97.91
40	20.29	100.05	99.70	99.36	99.16	98.82	98.57	98.32	98.03	97.73
41	20.00	100.15	99.85	99.55	99.45	99.10	98.90	98.55	98.30	98.15
42	20.26	100.30	100.05	99.65	99.41	99.01	98.67	98.57	98.22	97.83
43	20.40	100.15	99.90	99.56	99.41	99.17	98.92	98.58	98.19	97.79
44	20.07	99.95	99.85	99.70	99.50	99.40	99.10	98.80	98.51	98.16
45	20.43	100.15	99.85	99.46	99.12	98.87	98.58	98.24	97.90	97.50
46	20.21	99.95	99.75	99.65	99.51	99.31	99.06	98.71	98.27	98.02
47	20.45	100.20	99.95	99.80	99.46	99.22	99.02	98.73	98.53	98.14
48	20.53	100.29	99.90	99.71	99.46	99.12	98.78	98.54	98.34	98.30
49	20.25	100.05	99.65	99.41	98.86	98.57	98.07	97.78	97.53	97.38
50	20.43	100.34	100.05	99.71	99.46	99.12	98.83	98.48	98.29	98.04
Avg.	20.25	100.15	99.90	99.65	99.41	99.16	98.89	98.60	98.32	98.04
Med.	20.25	100.15	99.90	99.65	99.45	99.15	98.90	98.58	98.29	98.04
st dev	0.15	0.14	0.15	0.15	0.19	0.23	0.26	0.26	0.27	0.28
Min.	19.91	99.80	99.65	99.36	98.86	98.57	98.07	97.78	97.53	97.38
Max.	20.53	100.34	100.15	99.90	99.75	99.65	99.35	99.01	98.81	98.57

**3.11 Data Set 4(Green), 85°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.907	2.910	2.909	2.912	2.913	2.910	2.920	2.915	2.910	2.917
27	2.899	2.901	2.899	2.903	2.902	2.901	2.908	2.906	2.905	2.917
28	2.913	2.921	2.917	2.920	2.919	2.915	2.926	2.921	2.916	2.940
29	2.937	2.941	2.935	2.941	2.939	2.937	2.950	2.944	2.944	2.944
30	2.920	2.924	2.922	2.922	2.922	2.921	2.930	2.925	2.925	2.941
31	2.914	2.917	2.913	2.917	2.914	2.912	2.924	2.917	2.914	2.931
32	2.900	2.905	2.908	2.903	2.904	2.900	2.909	2.903	2.902	2.928
33	2.905	2.907	2.912	2.908	2.909	2.906	2.912	2.908	2.905	2.922
34	2.934	2.935	2.938	2.933	2.937	2.933	2.943	2.935	2.933	2.945
35	2.906	2.905	2.908	2.905	2.908	2.904	2.912	2.906	2.904	2.919
36	2.922	2.923	2.926	2.923	2.924	2.919	2.930	2.925	2.921	2.932
37	2.940	2.940	2.941	2.949	2.950	2.937	2.947	2.941	2.938	2.952
38	2.910	2.919	2.912	2.910	2.914	2.909	2.917	2.912	2.909	2.922
39	2.939	2.949	2.943	2.938	2.944	2.937	2.948	2.940	2.939	2.953
40	2.956	2.962	2.960	2.958	2.961	2.956	2.964	2.958	2.953	2.963
41	2.925	2.931	2.931	2.927	2.927	2.929	2.934	2.927	2.935	2.932
42	2.906	2.914	2.914	2.908	2.908	2.911	2.916	2.912	2.913	2.912
43	2.919	2.924	2.925	2.915	2.921	2.920	2.927	2.923	2.923	2.929
44	2.924	2.930	2.929	2.924	2.927	2.929	2.934	2.927	2.927	2.935
45	2.906	2.913	2.909	2.903	2.907	2.909	2.914	2.910	2.910	2.920
46	2.930	2.935	2.934	2.941	2.935	2.940	2.940	2.933	2.937	2.934
47	2.913	2.916	2.914	2.914	2.916	2.923	2.921	2.917	2.916	2.915
48	2.911	2.915	2.913	2.911	2.912	2.921	2.917	2.912	2.913	2.915
49	2.934	2.940	2.938	2.935	2.938	2.943	2.944	2.937	2.938	2.938
50	2.923	2.930	2.926	2.926	2.928	2.931	2.932	2.928	2.929	2.929
Avg.	2.920	2.924	2.923	2.922	2.923	2.922	2.929	2.923	2.922	2.931
Med.	2.919	2.923	2.922	2.920	2.921	2.921	2.927	2.923	2.921	2.931
st dev	0.014	0.015	0.014	0.015	0.015	0.015	0.015	0.014	0.014	0.013
Min.	2.899	2.901	2.899	2.903	2.902	2.900	2.908	2.903	2.902	2.912
Max.	2.956	2.962	2.960	2.958	2.961	2.956	2.964	2.958	2.953	2.963

**3.12 Data Set 4(Green), 85°C, 60mA (Chromaticity Shift)**

No.	u'	v'	Chromaticity Shift ( $\Delta u'v'$ )								
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.0558	0.5735	0.0002	0.0004	0.0006	0.0008	0.0009	0.0012	0.0013	0.0014	0.0016
27	0.0572	0.5740	0.0002	0.0004	0.0005	0.0007	0.0009	0.0012	0.0013	0.0014	0.0015
28	0.0573	0.5740	0.0002	0.0005	0.0006	0.0008	0.0009	0.0012	0.0014	0.0016	0.0017
29	0.0555	0.5732	0.0002	0.0004	0.0005	0.0007	0.0009	0.0012	0.0013	0.0015	0.0017
30	0.0567	0.5737	0.0002	0.0004	0.0006	0.0007	0.0008	0.0011	0.0013	0.0015	0.0016
31	0.0563	0.5735	0.0001	0.0003	0.0005	0.0007	0.0009	0.0011	0.0012	0.0014	0.0016
32	0.0567	0.5739	0.0001	0.0004	0.0004	0.0006	0.0008	0.0010	0.0011	0.0014	0.0015
33	0.0576	0.5740	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0015	0.0017
34	0.0567	0.5737	0.0001	0.0003	0.0005	0.0008	0.0009	0.0010	0.0011	0.0014	0.0017
35	0.0571	0.5741	0.0001	0.0002	0.0005	0.0006	0.0008	0.0009	0.0011	0.0014	0.0016
36	0.0566	0.5737	0.0001	0.0002	0.0005	0.0006	0.0008	0.0011	0.0012	0.0014	0.0016
37	0.0568	0.5738	0.0001	0.0003	0.0006	0.0008	0.0009	0.0010	0.0012	0.0014	0.0017
38	0.0556	0.5733	0.0002	0.0003	0.0006	0.0008	0.0009	0.0010	0.0011	0.0014	0.0016
39	0.0563	0.5736	0.0002	0.0003	0.0005	0.0007	0.0009	0.0010	0.0011	0.0014	0.0016
40	0.0569	0.5736	0.0003	0.0004	0.0006	0.0008	0.0009	0.0011	0.0012	0.0015	0.0017
41	0.0563	0.5734	0.0001	0.0004	0.0004	0.0006	0.0010	0.0011	0.0011	0.0015	0.0016
42	0.0558	0.5734	0.0002	0.0004	0.0006	0.0006	0.0009	0.0011	0.0013	0.0016	0.0017
43	0.0571	0.5739	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0015	0.0017
44	0.0574	0.5739	0.0002	0.0004	0.0006	0.0007	0.0010	0.0012	0.0012	0.0015	0.0017
45	0.0558	0.5733	0.0002	0.0003	0.0005	0.0006	0.0009	0.0011	0.0012	0.0014	0.0017
46	0.0563	0.5736	0.0002	0.0003	0.0007	0.0008	0.0011	0.0012	0.0012	0.0014	0.0017
47	0.0558	0.5734	0.0001	0.0003	0.0006	0.0007	0.0010	0.0011	0.0012	0.0014	0.0017
48	0.0569	0.5739	0.0003	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0015	0.0017
49	0.0565	0.5734	0.0003	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0014	0.0017
50	0.0576	0.5735	0.0002	0.0004	0.0006	0.0007	0.0010	0.0012	0.0014	0.0015	0.0017
Avg.	0.0566	0.5737	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0015	0.0016
Med.	0.0567	0.5736	0.0002	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0014	0.0017
st dev	0.0006	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.0555	0.5732	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0014	0.0015
Max.	0.0576	0.5741	0.0003	0.0005	0.0007	0.0008	0.0011	0.0012	0.0014	0.0016	0.0017

**3.13 Data Set 5(Blue), 55°C, 60mA (Lumen Maintenance)**

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	4.878	100.27	100.10	99.90	99.73	99.43	99.16	98.93	98.69	98.48
2	4.960	100.10	99.84	99.62	99.40	99.11	98.91	98.61	98.25	97.96
3	4.939	100.22	99.90	99.72	99.43	99.23	98.91	98.62	98.28	97.91
4	4.879	100.18	99.94	99.88	99.65	99.26	99.00	98.67	98.36	98.11
5	5.016	100.04	99.80	99.70	99.40	99.14	98.82	98.60	98.39	98.15
6	4.923	100.16	99.88	99.72	99.49	99.31	99.07	98.82	98.54	98.17
7	4.918	100.33	100.10	99.86	99.63	99.39	99.11	99.02	98.72	98.41
8	4.984	100.12	99.82	99.60	99.40	99.14	98.92	98.60	98.27	98.15
9	4.982	100.08	99.84	99.66	99.44	99.20	99.00	98.72	98.41	98.15
10	4.880	100.06	99.88	99.57	99.39	99.10	98.91	98.71	98.57	98.20
11	4.999	100.34	100.02	99.72	99.34	98.96	98.68	98.34	98.10	97.92
12	4.902	100.06	99.90	99.63	99.39	99.12	98.78	98.63	98.39	98.06
13	4.922	100.26	99.98	99.65	99.37	99.15	98.98	98.74	98.52	98.29
14	4.918	100.14	99.92	99.65	99.45	99.29	99.11	98.92	98.74	98.56
15	4.930	100.26	99.94	99.63	99.35	99.07	98.78	98.48	98.19	97.89
16	4.923	100.26	99.92	99.67	99.39	99.13	98.84	98.56	98.27	97.99
17	4.927	100.37	100.06	99.76	99.53	99.29	98.99	98.78	98.52	98.25
18	5.290	100.08	99.77	99.55	99.26	99.00	98.83	98.79	98.58	98.39
19	4.920	100.35	99.96	99.74	99.45	99.31	99.11	98.86	98.70	98.54
20	4.929	100.18	99.90	99.61	99.33	99.01	98.70	98.42	98.11	97.83
21	4.897	100.06	99.75	99.49	99.24	98.94	98.67	98.41	98.31	98.02
22	4.951	100.28	99.98	99.70	99.64	99.47	99.19	98.85	98.57	98.28
23	4.960	100.20	99.96	99.72	99.48	99.38	99.11	98.87	98.55	98.19
24	5.565	100.25	100.13	99.68	99.86	99.57	99.25	98.94	98.56	98.33
25	4.930	100.26	100.18	99.94	99.68	99.21	98.82	98.66	98.56	98.46
Avg.	4.973	100.20	99.94	99.69	99.47	99.21	98.95	98.70	98.45	98.19
Med.	4.929	100.20	99.92	99.68	99.43	99.20	98.92	98.71	98.52	98.17
st dev	0.147	0.10	0.11	0.11	0.15	0.16	0.16	0.18	0.19	0.21
Min.	4.878	100.04	99.75	99.49	99.24	98.94	98.67	98.34	98.10	97.83
Max.	5.565	100.37	100.18	99.94	99.86	99.57	99.25	99.02	98.74	98.56

**3.14 Data Set 5(Blue), 55°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.025	3.057	3.055	3.061	3.052	3.062	3.077	3.057	3.050	3.062
2	3.021	3.025	3.023	3.033	3.014	3.025	3.049	3.022	3.012	3.027
3	3.009	3.009	3.011	3.014	3.004	3.014	3.030	3.010	3.002	3.017
4	3.026	3.056	3.060	3.060	3.051	3.058	3.068	3.054	3.049	3.059
5	3.017	3.020	3.020	3.023	3.012	3.023	3.043	3.018	3.011	3.024
6	3.043	3.046	3.044	3.047	3.041	3.047	3.054	3.042	3.035	3.048
7	3.009	3.013	3.012	3.014	3.007	3.017	3.022	3.009	3.002	3.018
8	3.021	3.026	3.023	3.025	3.018	3.025	3.031	3.020	3.012	3.027
9	3.026	3.028	3.029	3.033	3.024	3.032	3.035	3.025	3.020	3.031
10	3.016	3.024	3.017	3.025	3.013	3.023	3.025	3.018	3.011	3.024
11	3.019	3.013	3.010	3.019	3.005	3.012	3.013	3.006	3.001	3.013
12	3.038	3.059	3.060	3.070	3.052	3.060	3.061	3.054	3.049	3.059
13	3.027	3.023	3.022	3.029	3.016	3.024	3.027	3.017	3.011	3.024
14	3.026	3.051	3.051	3.056	3.045	3.054	3.055	3.046	3.042	3.054
15	3.040	3.036	3.033	3.040	3.029	3.037	3.036	3.028	3.024	3.036
16	3.048	2.952	2.954	2.955	2.945	2.954	2.955	2.945	2.937	2.956
17	3.017	3.011	3.022	3.020	3.005	3.016	3.018	3.008	3.002	3.017
18	3.005	3.001	3.011	3.008	2.996	3.004	3.007	2.998	2.993	3.005
19	3.014	3.007	3.023	3.019	3.006	3.014	3.018	3.006	3.001	3.014
20	3.020	3.014	3.025	3.021	3.011	3.018	3.029	3.010	3.008	3.017
21	3.023	3.054	3.054	3.058	3.046	3.053	3.056	3.046	3.041	3.052
22	2.943	2.946	2.954	2.939	2.934	2.941	2.945	2.934	2.932	2.938
23	3.019	2.975	3.024	2.961	2.955	2.965	2.965	2.953	2.953	2.960
24	3.031	3.028	3.077	3.030	3.016	3.025	3.027	3.010	3.013	3.020
25	2.957	2.958	2.965	2.951	2.940	2.952	2.955	2.934	2.934	2.947
Avg.	3.018	3.017	3.023	3.020	3.009	3.018	3.024	3.011	3.006	3.018
Med.	3.021	3.023	3.023	3.025	3.013	3.023	3.029	3.017	3.011	3.024
st dev	0.023	0.032	0.031	0.035	0.034	0.033	0.035	0.035	0.034	0.034
Min.	2.943	2.946	2.954	2.939	2.934	2.941	2.945	2.934	2.932	2.938
Max.	3.048	3.059	3.077	3.070	3.052	3.062	3.077	3.057	3.050	3.062

**3.15 Data Set 5(Blue), 55°C, 60mA (Chromaticity Shift)**

No.	u'	v'	Chromaticity Shift ( $\Delta u'v'$ )								
	0hr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	0.1637	0.1442	0.0002	0.0004	0.0005	0.0007	0.0009	0.0013	0.0014	0.0016	0.0018
2	0.1610	0.1488	0.0003	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0013	0.0015
3	0.1619	0.1474	0.0001	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011
4	0.1648	0.1428	0.0002	0.0004	0.0006	0.0009	0.0010	0.0011	0.0014	0.0015	0.0016
5	0.1606	0.1497	0.0002	0.0003	0.0006	0.0007	0.0009	0.0010	0.0013	0.0014	0.0016
6	0.1630	0.1459	0.0003	0.0004	0.0005	0.0008	0.0009	0.0010	0.0011	0.0013	0.0016
7	0.1611	0.1502	0.0002	0.0004	0.0005	0.0006	0.0009	0.0010	0.0011	0.0014	0.0015
8	0.1623	0.1495	0.0002	0.0002	0.0004	0.0008	0.0009	0.0010	0.0012	0.0013	0.0015
9	0.1605	0.1503	0.0003	0.0006	0.0006	0.0008	0.0009	0.0011	0.0013	0.0014	0.0016
10	0.1617	0.1472	0.0002	0.0005	0.0007	0.0009	0.0010	0.0011	0.0013	0.0014	0.0017
11	0.1622	0.1465	0.0002	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011	0.0012	0.0015
12	0.1653	0.1416	0.0002	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014
13	0.1621	0.1471	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0014	0.0016
14	0.1640	0.1437	0.0004	0.0005	0.0007	0.0010	0.0011	0.0014	0.0016	0.0018	0.0019
15	0.1633	0.1448	0.0002	0.0004	0.0005	0.0008	0.0010	0.0011	0.0013	0.0014	0.0017
16	0.1605	0.1505	0.0001	0.0003	0.0003	0.0005	0.0007	0.0010	0.0013	0.0015	0.0017
17	0.1611	0.1485	0.0001	0.0001	0.0003	0.0006	0.0008	0.0011	0.0012	0.0013	0.0016
18	0.1631	0.1588	0.0002	0.0005	0.0008	0.0009	0.0011	0.0012	0.0013	0.0014	0.0016
19	0.1613	0.1480	0.0001	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012
20	0.1621	0.1478	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0010	0.0011	0.0012
21	0.1645	0.1435	0.0001	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0012	0.0013
22	0.1598	0.1532	0.0001	0.0003	0.0004	0.0006	0.0008	0.0010	0.0011	0.0012	0.0015
23	0.1612	0.1497	0.0002	0.0002	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013
24	0.1607	0.1640	0.0001	0.0002	0.0003	0.0004	0.0007	0.0009	0.0013	0.0014	0.0018
25	0.1599	0.1510	0.0001	0.0003	0.0005	0.0008	0.0011	0.0014	0.0015	0.0016	0.0017
Avg.	0.1621	0.1486	0.0002	0.0004	0.0005	0.0007	0.0009	0.0010	0.0012	0.0014	0.0015
Med.	0.1619	0.1480	0.0002	0.0004	0.0005	0.0007	0.0009	0.0010	0.0012	0.0014	0.0016
st dev	0.0015	0.0049	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.1598	0.1416	0.0001	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011
Max.	0.1653	0.1640	0.0004	0.0006	0.0008	0.0010	0.0011	0.0014	0.0016	0.0018	0.0019



**3.16 Data Set 6(Blue), 85°C, 60mA (Lumen Maintenance)**

No.	Φ(lm)	Lumen Maintenance (%)								
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	4.992	100.30	100.06	99.70	99.40	99.10	98.78	98.48	98.16	97.88
27	5.016	100.32	99.92	99.62	99.30	99.06	98.72	98.41	98.09	97.77
28	4.974	100.24	99.96	99.66	99.36	99.08	98.75	98.49	98.21	97.89
29	4.981	100.06	99.70	99.34	98.98	98.67	98.39	98.19	97.85	97.55
30	5.017	100.06	99.80	99.46	99.20	98.92	98.64	98.41	98.17	97.91
31	4.932	100.24	99.86	99.51	99.33	99.03	98.72	98.46	98.26	97.99
32	5.043	100.16	99.90	99.60	99.31	98.95	98.71	98.43	98.20	97.96
33	4.904	100.12	99.96	99.71	99.47	99.18	98.78	98.59	98.25	98.02
34	5.142	100.19	99.90	99.63	99.34	99.05	98.74	98.44	98.17	97.90
35	4.977	100.04	99.76	99.38	99.16	98.98	98.63	98.45	98.23	97.91
36	4.935	100.12	99.96	99.70	99.57	99.31	99.05	98.76	98.46	98.20
37	4.934	100.02	99.78	99.53	99.31	99.07	98.84	98.60	98.38	98.16
38	4.890	100.04	99.75	99.51	99.28	99.06	98.83	98.61	98.38	98.16
39	4.883	100.08	99.71	99.59	99.39	99.08	98.75	98.46	98.14	97.85
40	5.847	100.07	99.86	99.59	99.33	99.08	98.80	98.53	98.29	98.00
41	4.860	100.02	99.92	99.71	99.51	99.20	98.89	98.72	98.40	98.15
42	4.925	100.12	99.90	99.80	99.61	99.45	99.07	98.62	98.34	98.09
43	4.965	100.18	99.88	99.62	99.38	99.15	98.89	98.61	98.37	98.19
44	4.885	100.04	99.86	99.57	99.45	99.26	99.12	98.92	98.61	98.18
45	4.984	100.28	100.04	99.76	99.48	99.10	98.64	98.17	97.87	97.67
46	4.889	100.02	99.86	99.73	99.35	98.98	98.75	98.45	98.18	97.79
47	5.052	100.20	99.96	99.64	99.43	99.23	98.93	98.54	98.18	97.84
48	4.957	100.06	99.76	99.50	99.23	98.93	98.63	98.33	98.00	97.72
49	5.633	100.02	99.84	99.45	99.20	98.88	98.63	98.37	98.12	97.78
50	4.991	100.08	99.72	99.48	99.00	98.80	98.64	98.38	98.18	97.80
Avg.	5.024	100.12	99.86	99.59	99.33	99.06	98.77	98.50	98.22	97.93
Med.	4.974	100.08	99.86	99.60	99.34	99.07	98.75	98.46	98.20	97.91
st dev	0.227	0.10	0.10	0.12	0.15	0.16	0.16	0.16	0.17	0.18
Min.	4.860	100.02	99.70	99.34	98.98	98.67	98.39	98.17	97.85	97.55
Max.	5.847	100.32	100.06	99.80	99.61	99.45	99.12	98.92	98.61	98.20

**3.17 Data Set 6(Blue), 85°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.943	2.947	2.939	2.936	2.938	2.948	2.938	2.926	2.933	2.930
27	2.949	2.956	2.956	2.957	2.955	2.960	2.964	2.948	2.951	2.958
28	2.992	2.979	2.968	2.965	2.961	2.979	2.970	2.950	2.957	2.962
29	2.942	2.951	2.938	2.944	2.938	2.947	2.944	2.931	2.933	2.938
30	3.012	3.000	2.983	2.994	2.992	3.005	2.998	2.985	2.992	2.990
31	2.959	2.936	2.927	2.928	2.929	2.940	2.936	2.922	2.927	2.926
32	3.030	3.060	3.055	3.057	3.056	3.035	3.038	3.050	3.052	3.053
33	3.047	3.048	3.043	3.047	3.044	3.052	3.045	3.040	3.037	3.044
34	3.035	3.045	3.060	3.035	3.040	3.039	3.064	3.055	3.056	3.059
35	3.023	3.022	3.019	3.023	3.022	3.030	3.021	3.026	3.014	3.019
36	3.017	3.014	3.011	3.016	3.013	3.021	3.012	3.027	3.028	3.012
37	3.021	3.019	3.021	3.024	3.020	3.026	3.020	3.012	3.019	3.017
38	3.012	3.010	3.014	3.018	3.010	3.027	3.011	3.013	3.018	3.019
39	3.045	3.043	3.045	3.045	3.043	3.050	3.043	3.036	3.038	3.042
40	3.020	3.005	3.007	3.007	3.006	3.011	3.004	2.999	3.001	3.000
41	3.030	3.050	3.053	3.051	3.056	3.058	3.051	3.042	3.046	3.048
42	3.035	3.027	3.028	3.026	3.031	3.033	3.024	3.020	3.022	3.023
43	3.037	3.031	3.032	3.030	3.035	3.043	3.027	3.023	3.026	3.027
44	3.021	3.045	3.045	3.047	3.044	3.056	3.048	3.036	3.041	3.043
45	3.005	3.002	3.001	3.002	3.002	3.023	3.002	2.996	2.998	2.998
46	3.045	3.049	3.046	3.040	3.041	3.048	3.042	3.034	3.040	3.037
47	3.021	3.024	3.022	3.017	3.017	3.025	3.021	3.009	3.014	3.011
48	3.036	3.038	3.033	3.030	3.034	3.043	3.034	3.026	3.029	3.027
49	3.008	3.011	3.008	3.004	3.008	3.012	3.006	3.000	3.003	3.001
50	3.020	3.055	3.049	3.045	3.046	3.055	3.048	3.042	3.045	3.043
Avg.	3.012	3.015	3.012	3.012	3.011	3.019	3.012	3.006	3.009	3.009
Med.	3.021	3.022	3.021	3.023	3.020	3.027	3.021	3.020	3.019	3.019
st dev	0.031	0.036	0.039	0.038	0.038	0.036	0.036	0.040	0.039	0.039
Min.	2.942	2.936	2.927	2.928	2.929	2.940	2.936	2.922	2.927	2.926
Max.	3.047	3.060	3.060	3.057	3.056	3.058	3.064	3.055	3.056	3.059

**3.18 Data Set 6(Blue), 85°C, 60mA (Chromaticity Shift)**

No.	u'	v'	Chromaticity Shift ( $\Delta u'v'$ )								
	Ohr(Initial)		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.1592	0.1523	0.0001	0.0002	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0016
27	0.1606	0.1531	0.0002	0.0004	0.0005	0.0007	0.0010	0.0013	0.0014	0.0015	0.0017
28	0.1610	0.1500	0.0001	0.0002	0.0003	0.0006	0.0007	0.0009	0.0010	0.0011	0.0013
29	0.1602	0.1503	0.0001	0.0004	0.0006	0.0007	0.0008	0.0011	0.0012	0.0014	0.0015
30	0.1617	0.1491	0.0002	0.0005	0.0007	0.0008	0.0010	0.0013	0.0014	0.0015	0.0017
31	0.1597	0.1515	0.0003	0.0006	0.0009	0.0010	0.0012	0.0015	0.0016	0.0016	0.0019
32	0.1625	0.1472	0.0003	0.0003	0.0007	0.0010	0.0011	0.0013	0.0015	0.0016	0.0017
33	0.1643	0.1436	0.0003	0.0005	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0015
34	0.1614	0.1495	0.0001	0.0005	0.0005	0.0006	0.0008	0.0009	0.0010	0.0013	0.0014
35	0.1610	0.1493	0.0002	0.0002	0.0004	0.0004	0.0007	0.0009	0.0010	0.0012	0.0013
36	0.1604	0.1502	0.0001	0.0002	0.0005	0.0008	0.0009	0.0011	0.0012	0.0013	0.0015
37	0.1618	0.1475	0.0002	0.0005	0.0007	0.0008	0.0010	0.0012	0.0014	0.0017	0.0019
38	0.1616	0.1474	0.0001	0.0003	0.0005	0.0008	0.0010	0.0011	0.0013	0.0014	0.0017
39	0.1644	0.1434	0.0001	0.0004	0.0004	0.0006	0.0008	0.0010	0.0013	0.0013	0.0017
40	0.1643	0.1732	0.0004	0.0004	0.0004	0.0007	0.0008	0.0010	0.0013	0.0014	0.0016
41	0.1650	0.1424	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013	0.0016
42	0.1626	0.1468	0.0003	0.0006	0.0006	0.0006	0.0008	0.0009	0.0011	0.0012	0.0015
43	0.1627	0.1464	0.0001	0.0003	0.0004	0.0006	0.0007	0.0008	0.0010	0.0012	0.0014
44	0.1651	0.1421	0.0002	0.0002	0.0004	0.0005	0.0006	0.0008	0.0010	0.0012	0.0014
45	0.1604	0.1497	0.0001	0.0002	0.0005	0.0006	0.0007	0.0009	0.0012	0.0013	0.0014
46	0.1644	0.1435	0.0002	0.0002	0.0006	0.0008	0.0009	0.0012	0.0013	0.0015	0.0016
47	0.1628	0.1503	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0013
48	0.1645	0.1434	0.0001	0.0003	0.0006	0.0007	0.0009	0.0012	0.0013	0.0015	0.0016
49	0.1623	0.1670	0.0002	0.0004	0.0007	0.0008	0.0010	0.0011	0.0012	0.0014	0.0015
50	0.1641	0.1442	0.0003	0.0005	0.0007	0.0008	0.0012	0.0014	0.0014	0.0016	0.0019
Avg.	0.1623	0.1493	0.0002	0.0004	0.0005	0.0007	0.0009	0.0011	0.0012	0.0014	0.0016
Med.	0.1623	0.1491	0.0002	0.0004	0.0005	0.0007	0.0008	0.0011	0.0012	0.0014	0.0016
st dev	0.0018	0.0071	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.1592	0.1421	0.0001	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0013
Max.	0.1651	0.1732	0.0004	0.0006	0.0009	0.0010	0.0012	0.0015	0.0016	0.0017	0.0019

**3.19 Data Set 7(White), 55°C, 60mA (Lumen Maintenance)**

No.	Φ(lm)	Lumen Maintenance (%)								
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	24.88	100.16	99.96	99.68	99.36	99.00	98.71	98.39	98.07	97.79
2	23.07	100.17	99.87	99.70	99.39	99.22	99.00	98.66	98.40	98.18
3	24.89	100.12	99.88	99.64	99.44	99.12	98.83	98.55	98.27	98.03
4	24.77	100.28	99.96	99.60	99.23	98.87	98.51	98.14	97.82	97.58
5	25.24	100.16	99.84	99.64	99.37	99.13	98.85	98.61	98.38	98.06
6	24.67	100.08	99.80	99.55	99.35	99.11	98.95	98.70	98.50	98.22
7	25.11	100.04	99.84	99.60	99.28	99.12	98.85	98.69	98.53	98.25
8	25.08	100.12	99.76	99.40	99.20	99.00	98.76	98.56	98.37	98.17
9	24.95	100.24	99.92	99.68	99.44	99.20	98.88	98.64	98.48	98.32
10	23.37	100.30	100.04	99.66	99.44	99.19	98.97	98.67	98.50	98.29
11	24.38	100.08	99.71	99.43	99.18	98.89	98.61	98.32	98.20	97.95
12	25.06	100.04	99.76	99.60	99.40	99.16	98.88	98.60	98.28	98.08
13	24.81	100.20	99.72	99.36	99.15	98.83	98.59	98.31	98.11	97.86
14	25.10	100.16	99.88	99.60	99.32	99.04	98.69	98.41	98.13	97.89
15	24.83	100.32	100.20	99.92	99.72	99.44	99.11	98.87	98.59	98.43
16	24.97	100.12	99.76	99.52	99.40	99.20	98.84	98.64	98.36	98.24
17	24.56	100.12	99.96	99.55	99.31	99.10	98.78	98.49	98.29	98.05
18	24.97	100.16	99.96	99.72	99.44	99.04	98.72	98.44	98.28	98.00
19	24.65	100.16	100.04	99.80	99.59	99.27	99.03	98.70	98.54	98.38
20	24.61	100.12	99.84	99.55	99.31	99.02	98.78	98.66	98.42	98.17
21	24.85	100.16	99.96	99.76	99.48	99.11	98.79	98.63	98.31	98.07
22	24.85	100.12	99.84	99.56	99.24	98.99	98.83	98.55	98.35	97.95
23	24.80	100.12	99.96	99.72	99.40	99.15	98.91	98.79	98.59	98.39
24	25.03	100.24	99.88	99.60	99.24	98.88	98.72	98.52	98.00	97.76
25	24.98	100.16	99.92	99.56	99.20	98.96	98.80	98.72	98.32	98.08
Avg.	24.74	100.16	99.89	99.62	99.36	99.08	98.82	98.57	98.32	98.09
Med.	24.85	100.16	99.88	99.60	99.36	99.11	98.83	98.61	98.35	98.08
st dev	0.50	0.07	0.11	0.12	0.13	0.14	0.14	0.16	0.19	0.21
Min.	23.07	100.04	99.71	99.36	99.15	98.83	98.51	98.14	97.82	97.58
Max.	25.24	100.32	100.20	99.92	99.72	99.44	99.11	98.87	98.59	98.43

**3.20 Data Set 7(White), 55°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	2.865	2.864	2.864	2.863	2.862	2.864	2.874	2.890	2.872	2.873
2	2.865	2.865	2.865	2.865	2.862	2.866	2.883	2.896	2.867	2.876
3	2.887	2.887	2.886	2.885	2.886	2.887	2.890	2.882	2.889	2.891
4	2.881	2.881	2.880	2.880	2.879	2.881	2.882	2.886	2.882	2.887
5	2.881	2.882	2.881	2.881	2.881	2.881	2.887	2.886	2.885	2.887
6	2.885	2.884	2.884	2.883	2.884	2.884	2.883	2.880	2.906	2.883
7	2.884	2.883	2.883	2.883	2.883	2.885	2.897	2.883	2.902	2.885
8	2.883	2.883	2.883	2.882	2.881	2.883	2.893	2.893	2.905	2.886
9	2.872	2.872	2.871	2.869	2.869	2.871	2.883	2.878	2.875	2.875
10	2.879	2.880	2.879	2.878	2.879	2.879	2.883	2.889	2.889	2.880
11	2.879	2.878	2.878	2.879	2.879	2.879	2.886	2.887	2.879	2.879
12	2.862	2.862	2.863	2.862	2.862	2.863	2.863	2.884	2.863	2.863
13	2.866	2.867	2.867	2.865	2.864	2.867	2.865	2.874	2.896	2.867
14	2.865	2.866	2.863	2.862	2.864	2.865	2.917	2.899	2.868	2.869
15	2.862	2.861	2.862	2.859	2.862	2.862	2.901	2.907	2.883	2.871
16	2.878	2.877	2.878	2.878	2.878	2.878	2.886	2.883	2.902	2.883
17	2.882	2.880	2.881	2.880	2.878	2.880	2.893	2.893	2.912	2.883
18	2.879	2.881	2.880	2.879	2.878	2.881	2.910	2.875	2.885	2.885
19	2.877	2.877	2.876	2.876	2.876	2.878	2.882	2.882	2.890	2.880
20	2.888	2.886	2.886	2.886	2.887	2.898	2.895	2.883	2.903	2.901
21	2.879	2.879	2.878	2.879	2.878	2.904	2.902	2.894	2.892	2.883
22	2.879	2.880	2.878	2.878	2.878	2.906	2.903	2.887	2.885	2.880
23	2.864	2.863	2.864	2.864	2.865	2.866	2.882	2.867	2.879	2.868
24	2.882	2.882	2.882	2.879	2.881	2.904	2.896	2.887	2.914	2.884
25	2.883	2.872	2.871	2.871	2.871	2.900	2.905	2.900	2.882	2.874
Avg.	2.876	2.876	2.875	2.875	2.875	2.880	2.890	2.887	2.888	2.880
Med.	2.879	2.879	2.878	2.878	2.878	2.880	2.887	2.886	2.885	2.880
st dev	0.008	0.008	0.008	0.008	0.008	0.014	0.013	0.009	0.014	0.008
Min.	2.862	2.861	2.862	2.859	2.862	2.862	2.863	2.867	2.863	2.863
Max.	2.888	2.887	2.886	2.886	2.887	2.906	2.917	2.907	2.914	2.901

**3.21 Data Set 7(White), 55°C, 60mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )								
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs
1	0.2601	0.5290	2743	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014
2	0.2581	0.5219	2818	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012
3	0.2616	0.5287	2712	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0013	0.0015	0.0016
4	0.2634	0.5300	2671	0.0001	0.0002	0.0002	0.0004	0.0006	0.0008	0.0010	0.0013	0.0014
5	0.2616	0.5292	2711	0.0002	0.0004	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011	0.0012
6	0.2628	0.5300	2684	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011
7	0.2623	0.5299	2694	0.0002	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011	0.0013	0.0014
8	0.2634	0.5288	2676	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011
9	0.2604	0.5300	2732	0.0001	0.0003	0.0006	0.0007	0.0009	0.0011	0.0012	0.0015	0.0017
10	0.2590	0.5290	2767	0.0001	0.0002	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0010
11	0.2625	0.5285	2695	0.0002	0.0005	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015	0.0016
12	0.2629	0.5292	2685	0.0002	0.0004	0.0007	0.0008	0.0009	0.0011	0.0012	0.0014	0.0016
13	0.2600	0.5299	2742	0.0003	0.0006	0.0007	0.0009	0.0010	0.0011	0.0013	0.0015	0.0017
14	0.2629	0.5289	2686	0.0001	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012
15	0.2631	0.5292	2680	0.0001	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0009	0.0011
16	0.2616	0.5293	2710	0.0002	0.0004	0.0007	0.0009	0.0010	0.0012	0.0013	0.0015	0.0017
17	0.2649	0.5295	2644	0.0001	0.0002	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011
18	0.2626	0.5297	2688	0.0002	0.0005	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0013
19	0.2618	0.5285	2710	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0010	0.0011
20	0.2597	0.5284	2754	0.0002	0.0003	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014	0.0015
21	0.2593	0.5274	2768	0.0001	0.0004	0.0007	0.0008	0.0010	0.0012	0.0014	0.0016	0.0018
22	0.2631	0.5287	2683	0.0001	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0010	0.0011
23	0.2611	0.5271	2731	0.0001	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012
24	0.2626	0.5302	2687	0.0001	0.0003	0.0005	0.0007	0.0008	0.0010	0.0011	0.0013	0.0014
25	0.2606	0.5289	2733	0.0001	0.0004	0.0006	0.0007	0.0009	0.0010	0.0012	0.0013	0.0014
Avg.	0.2617	0.5288	2712	0.0002	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014
Med.	0.2618	0.5290	2710	0.0001	0.0003	0.0005	0.0006	0.0008	0.0009	0.0011	0.0012	0.0014
st dev	0.0017	0.0016	39	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2581	0.5219	2644	0.0001	0.0002	0.0002	0.0003	0.0004	0.0006	0.0007	0.0009	0.0010
Max.	0.2649	0.5302	2818	0.0003	0.0006	0.0007	0.0009	0.0010	0.0012	0.0014	0.0016	0.0018

**3.22 Data Set 8(White), 85°C, 60mA (Lumen Maintenance)**

No.	Φ(m) Ohr(Initial)	Lumen Maintenance (%)								
		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	22.02	99.95	99.82	99.64	99.55	99.36	99.46	99.18	99.00	98.77
27	24.89	100.12	99.80	99.68	99.44	99.20	98.96	98.75	98.47	98.27
28	24.42	100.29	100.04	99.84	99.55	99.43	99.18	98.89	98.73	98.44
29	24.92	100.12	99.76	99.56	99.28	99.08	98.88	98.68	98.43	98.19
30	25.10	100.20	99.80	99.44	99.16	98.88	98.65	98.45	98.21	98.01
31	24.57	99.92	99.80	99.72	99.59	99.39	99.15	98.86	98.66	98.29
32	25.03	100.28	99.88	99.60	99.24	99.04	98.68	98.40	98.08	97.84
33	25.00	100.08	99.80	99.40	99.04	98.76	98.56	98.24	97.92	97.68
34	24.98	100.08	99.84	99.64	99.44	99.28	99.04	98.76	98.48	98.20
35	24.35	100.16	99.79	99.59	99.30	98.97	98.60	98.32	97.99	97.70
36	24.11	100.25	100.04	99.67	99.38	99.13	98.80	98.59	98.30	98.01
37	24.38	100.29	100.12	99.88	99.71	99.47	99.22	99.02	98.73	98.52
38	24.65	100.08	99.96	99.88	99.68	99.55	99.31	99.07	98.82	98.54
39	24.60	100.04	99.88	99.76	99.67	99.39	99.19	98.82	98.46	98.17
40	25.15	99.92	99.80	99.68	99.56	99.32	99.05	98.69	98.33	97.97
41	24.71	100.04	99.84	99.64	99.47	99.27	98.99	98.66	98.34	98.06
42	24.82	100.20	99.84	99.60	99.32	98.99	98.63	98.27	98.03	97.66
43	24.73	100.04	99.88	99.76	99.47	99.19	98.91	98.63	98.30	97.94
44	24.24	99.92	99.83	99.63	99.30	99.01	98.68	98.39	98.06	97.69
45	25.10	100.28	99.96	99.56	99.24	99.00	98.61	98.33	98.05	97.73
46	23.88	100.21	99.79	99.41	99.20	98.91	98.53	98.12	97.74	97.40
47	24.96	100.12	99.80	99.52	99.28	99.04	98.64	98.28	97.96	97.60
48	24.99	100.24	99.96	99.64	99.36	98.96	98.68	98.44	98.08	97.68
49	24.76	100.08	99.88	99.64	99.31	98.67	98.38	98.02	97.74	97.37
50	25.14	99.96	99.80	99.60	99.24	98.89	98.57	98.29	97.89	97.61
Avg.	24.62	100.11	99.87	99.64	99.39	99.13	98.85	98.57	98.27	97.97
Med.	24.76	100.12	99.84	99.64	99.36	99.08	98.80	98.59	98.30	97.97
st dev	0.64	0.12	0.09	0.12	0.17	0.23	0.29	0.31	0.34	0.37
Min.	22.02	99.92	99.76	99.40	99.04	98.67	98.38	98.02	97.74	97.37
Max.	25.15	100.29	100.12	99.88	99.71	99.55	99.46	99.18	99.00	98.77

**3.23 Data Set 8(White), 85°C, 60mA (Forward Voltage)**

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	2.865	2.868	2.866	2.868	2.866	2.873	2.876	2.883	2.871	2.868
27	2.880	2.882	2.882	2.882	2.882	2.881	2.894	2.885	2.882	2.882
28	2.875	2.876	2.876	2.877	2.875	2.900	2.895	2.899	2.880	2.883
29	2.867	2.868	2.868	2.867	2.867	2.893	2.878	2.890	2.872	2.872
30	2.861	2.862	2.860	2.863	2.861	2.896	2.904	2.875	2.864	2.867
31	2.866	2.867	2.866	2.868	2.866	2.897	2.885	2.891	2.866	2.874
32	2.884	2.884	2.884	2.883	2.883	2.886	2.893	2.886	2.882	2.886
33	2.892	2.892	2.892	2.893	2.892	2.902	2.894	2.903	2.898	2.896
34	2.886	2.886	2.886	2.886	2.885	2.888	2.872	2.888	2.891	2.889
35	2.890	2.889	2.891	2.892	2.891	2.904	2.897	2.904	2.893	2.893
36	2.876	2.876	2.876	2.877	2.875	2.907	2.879	2.883	2.884	2.877
37	2.879	2.880	2.879	2.881	2.879	2.909	2.889	2.907	2.881	2.881
38	2.871	2.873	2.874	2.874	2.873	2.886	2.893	2.893	2.873	2.878
39	2.868	2.869	2.869	2.871	2.871	2.884	2.881	2.883	2.871	2.872
40	2.873	2.879	2.875	2.883	2.887	2.887	2.883	2.886	2.891	2.887
41	2.883	2.885	2.884	2.885	2.884	2.897	2.884	2.872	2.888	2.895
42	2.867	2.867	2.867	2.868	2.867	2.879	2.886	2.883	2.876	2.876
43	2.872	2.872	2.871	2.873	2.873	2.882	2.880	2.893	2.883	2.877
44	2.883	2.882	2.883	2.883	2.884	2.917	2.897	2.892	2.893	2.882
45	2.873	2.873	2.873	2.874	2.874	2.895	2.884	2.884	2.886	2.875
46	2.890	2.890	2.890	2.890	2.890	2.901	2.904	2.894	2.892	2.890
47	2.881	2.879	2.881	2.880	2.882	2.896	2.880	2.891	2.896	2.883
48	2.890	2.890	2.890	2.891	2.891	2.898	2.898	2.889	2.897	2.891
49	2.886	2.885	2.888	2.887	2.888	2.886	2.892	2.892	2.905	2.887
50	2.884	2.884	2.885	2.885	2.887	2.896	2.901	2.891	2.892	2.889
Avg.	2.878	2.878	2.878	2.879	2.879	2.894	2.889	2.889	2.884	2.882
Med.	2.879	2.879	2.879	2.881	2.882	2.896	2.889	2.890	2.884	2.882
st dev	0.009	0.009	0.009	0.009	0.009	0.010	0.009	0.008	0.011	0.008
Min.	2.861	2.862	2.860	2.863	2.861	2.873	2.872	2.872	2.864	2.867
Max.	2.892	2.892	2.892	2.893	2.892	2.917	2.904	2.907	2.905	2.896

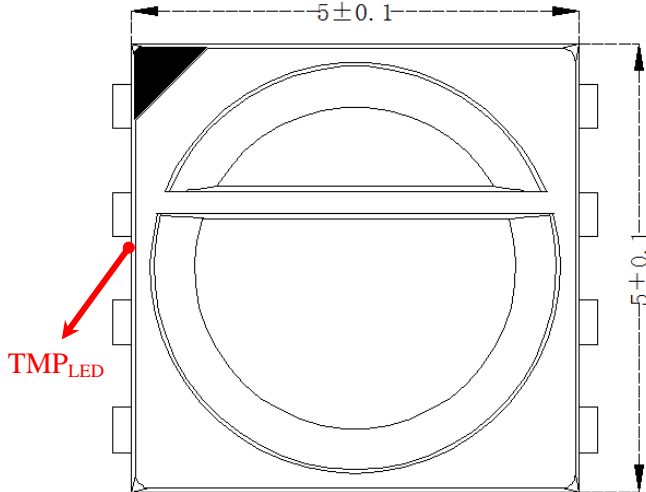


**3.24 Data Set 8(White), 85°C, 60mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )								
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
26	0.2622	0.5260	2711	0.0001	0.0002	0.0005	0.0008	0.0009	0.0010	0.0012	0.0013	0.0014
27	0.2623	0.5300	2694	0.0001	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0013
28	0.2629	0.5298	2681	0.0002	0.0004	0.0006	0.0008	0.0009	0.0010	0.0012	0.0013	0.0015
29	0.2606	0.5291	2732	0.0001	0.0002	0.0003	0.0005	0.0007	0.0008	0.0009	0.0010	0.0011
30	0.2589	0.5285	2772	0.0002	0.0002	0.0003	0.0006	0.0009	0.0009	0.0011	0.0011	0.0013
31	0.2608	0.5274	2735	0.0003	0.0006	0.0007	0.0011	0.0012	0.0015	0.0017	0.0018	0.0020
32	0.2606	0.5301	2728	0.0001	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0009	0.0010
33	0.2600	0.5290	2746	0.0002	0.0003	0.0004	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012
34	0.2626	0.5299	2687	0.0001	0.0002	0.0003	0.0005	0.0007	0.0008	0.0009	0.0011	0.0012
35	0.2650	0.5293	2642	0.0003	0.0006	0.0008	0.0011	0.0012	0.0013	0.0015	0.0016	0.0018
36	0.2608	0.5297	2726	0.0002	0.0006	0.0008	0.0012	0.0013	0.0014	0.0017	0.0018	0.0020
37	0.2620	0.5302	2698	0.0003	0.0004	0.0005	0.0008	0.0009	0.0010	0.0013	0.0014	0.0016
38	0.2616	0.5287	2714	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009	0.0011	0.0011	0.0013
39	0.2611	0.5287	2724	0.0002	0.0005	0.0008	0.0011	0.0013	0.0014	0.0016	0.0017	0.0019
40	0.2612	0.5284	2722	0.0001	0.0002	0.0003	0.0006	0.0007	0.0008	0.0009	0.0011	0.0012
41	0.2612	0.5286	2722	0.0002	0.0004	0.0006	0.0009	0.0010	0.0011	0.0014	0.0016	0.0018
42	0.2619	0.5293	2704	0.0002	0.0004	0.0006	0.0009	0.0010	0.0011	0.0014	0.0016	0.0018
43	0.2596	0.5288	2755	0.0001	0.0002	0.0003	0.0006	0.0007	0.0008	0.0010	0.0011	0.0013
44	0.2621	0.5298	2700	0.0001	0.0004	0.0005	0.0009	0.0012	0.0014	0.0016	0.0017	0.0018
45	0.2617	0.5292	2709	0.0001	0.0002	0.0004	0.0006	0.0009	0.0010	0.0011	0.0013	0.0014
46	0.2616	0.5309	2705	0.0001	0.0004	0.0004	0.0007	0.0008	0.0010	0.0011	0.0012	0.0013
47	0.2618	0.5279	2712	0.0002	0.0004	0.0007	0.0010	0.0012	0.0013	0.0015	0.0016	0.0018
48	0.2608	0.5297	2725	0.0001	0.0002	0.0003	0.0006	0.0007	0.0009	0.0009	0.0011	0.0012
49	0.2623	0.5298	2694	0.0003	0.0004	0.0005	0.0008	0.0009	0.0011	0.0011	0.0013	0.0014
50	0.2606	0.5296	2731	0.0002	0.0005	0.0006	0.0009	0.0012	0.0013	0.0014	0.0016	0.0019
Avg.	0.2614	0.5291	2715	0.0002	0.0004	0.0005	0.0008	0.0009	0.0011	0.0012	0.0013	0.0015
Med.	0.2616	0.5293	2714	0.0002	0.0004	0.0005	0.0008	0.0009	0.0010	0.0011	0.0013	0.0014
st dev	0.0012	0.0010	26	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003
Min.	0.2589	0.5260	2642	0.0001	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0009	0.0010
Max.	0.2650	0.5309	2772	0.0003	0.0006	0.0008	0.0012	0.0013	0.0015	0.0017	0.0018	0.0020

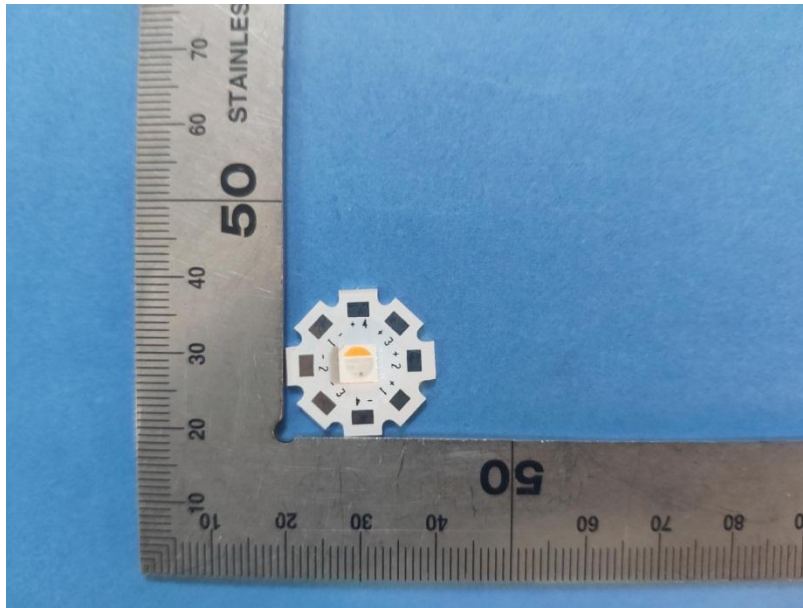
#### 4 - DUT Photo

##### 4.1 Mechanical Dimensions



All dimensions are in millimeter

##### 4.2 DUT Photo



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### Directions

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1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. This report includes some test methods are not in NVLAP accreditation scope marked \*.
3. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
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5. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor  $K=2$  with the 95% confidence interval.
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\*\*\*\*\*END OF REPORT\*\*\*\*\*