TEST REPORT

According to ANSI/IES LM-80-15
For

Jiangxi MTC Optronics Co.,Ltd

199 Hujia road, changdong industrial park, qingshanhu district, nanchang city, jiangxi province.

Model: MKXWM-CX

Report Type: 10000 Hours Test Report	**Product Type:** LED Package
Reviewed By:	Pote Wang
Report Number:	SZ2200910-55786E-10-10000
Test Date:	2020-09-12 to 2021-11-05
Report Date:	2022-01-18
Approved by:	Bill Xiong / EE Engineer
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1 - General Information

1.1 Description of LED Light Sources

Sample Size:

75 PCS test samples were in good condition and received on 2020-09-10. The samples were numbered from 1 to 25, 26 to 50 and 51 to 75.

Manufacturer:	Jiangxi MTC Optronics Co.,Ltd
Part Number:	MKXWM-CX
Part Type:	LED Package
#Drive Level:	DC 180mA
#Nominal CCT:	2700K
#Power:	0.5W
#Average Current Density per LED die:	581 mA/mm^2
#Average Power Density per LED die:	1.6 W/mm^2
#CRI:	80
#Die Spacing:	0.05mm

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® 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® Requirements for the Use of LM-80 Data* (September 28, 2017)

This report covers the following models:

Test Models	Multiple Models	Differences Items
MKXWM-CX	MKXxM-xx	x1=CCT, x2,x3=Lm Rank
	MTR-28XxM-xxx	x1=CCT .x2,x3,x4==Product specification

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
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

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	2021-09-24	2022-09-23
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2022-10-14
Multilayer aging machine	BACL	B2-270	20022	2021-02-24	2022-02-23
DC Power Supply	BACL	B12001-12	90023	2021-02-24	2022-02-23

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 ±3% of the specified value of the manufacturer during maintenance test, and was within ±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_{LED}) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP_{LED} 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 ±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 ± 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'. 2π measurement was used and sample was drived by DC power supply. The forward current was regulated to within ±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 ± 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. (Dongguan) 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: 85°C, 180mA

Part Number:	MKXWM-CX
Number of Units:	25
Case Temperature:	>83°C
Ambient Temperature:	>80°C
Life Test Drive Current:	180mA
Measurement Current:	180mA

Data Set 2: 105°C, 180mA

Part Number:	MKXWM-CX
Number of Units:	25
Case Temperature:	>103°C
Ambient Temperature:	>100°C
Life Test Drive Current:	180mA
Measurement Current:	180mA

Data Set 3: 115°C, 180mA

Part Number:	MKXWM-CX
Number of Units:	25
Case Temperature:	>113°C
Ambient Temperature:	>110°C
Life Test Drive Current:	180mA
Measurement Current:	180mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	α	β	Reported TM-21 L_{70} Lifetime
1	25	0	1000hrs	10000hrs	2.076E-06	1.004	>60000 hours
2	25	0	1000hrs	10000hrs	2.392E-06	1.003	>60000 hours
3	25	0	1000hrs	10000hrs	2.740E-06	1.004	>60000 hours

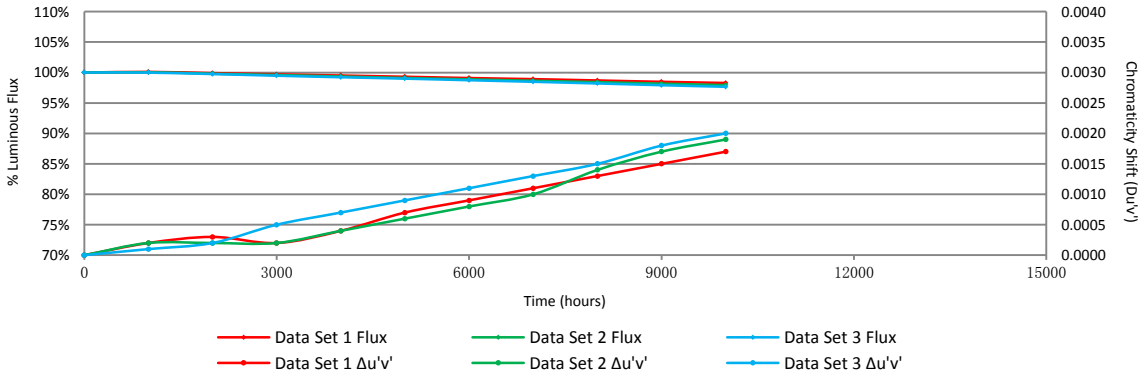
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	100.11%	99.91%	99.71%	99.51%	99.31%	99.10%	98.92%	98.70%	98.48%	98.29%
2	100.05%	99.81%	99.60%	99.35%	99.11%	98.89%	98.65%	98.43%	98.18%	97.93%
3	99.99%	99.75%	99.48%	99.23%	99.00%	98.74%	98.48%	98.21%	97.92%	97.66%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.0002	0.0003	0.0002	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017
2	0.0002	0.0002	0.0002	0.0004	0.0006	0.0008	0.0010	0.0014	0.0017	0.0019
3	0.0001	0.0002	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020

Average Lumen Maintenance and Chromaticity Shift VS. Time



3 - Test Data

3.1 Data Set 1, 85°C, 180mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	84.25	100.02	99.93	99.70	99.48	99.20	99.12	99.05	98.82	98.55	98.43
2	83.75	100.06	99.90	99.71	99.67	99.52	99.34	99.12	98.88	98.72	98.44
3	82.98	100.04	99.89	99.78	99.51	99.39	99.07	98.93	98.77	98.57	98.43
4	83.01	100.25	100.05	99.84	99.60	99.33	99.05	98.86	98.63	98.36	98.11
5	83.73	100.11	100.07	99.95	99.64	99.62	99.41	99.21	99.12	98.83	98.64
6	83.13	100.13	99.96	99.84	99.66	99.55	99.41	99.18	98.85	98.75	98.42
7	83.40	100.13	99.98	99.70	99.54	99.38	99.24	98.97	98.74	98.48	98.27
8	83.74	100.12	99.93	99.80	99.56	99.41	99.22	99.01	98.81	98.59	98.38
9	84.05	100.15	99.86	99.60	99.39	99.20	98.98	98.74	98.45	98.22	97.93
10	83.30	100.13	99.96	99.72	99.44	99.10	98.90	98.64	98.39	98.18	97.91
11	83.83	100.02	99.83	99.64	99.44	99.25	99.11	98.91	98.74	98.44	98.22
12	84.12	100.14	99.87	99.67	99.47	99.22	98.92	98.76	98.47	98.25	98.05
13	82.53	100.11	99.95	99.64	99.43	99.19	98.92	98.66	98.47	98.21	97.99
14	84.10	100.26	100.01	99.77	99.61	99.32	99.12	98.95	98.78	98.61	98.50
15	82.76	100.06	99.92	99.89	99.66	99.34	99.17	99.06	98.94	98.73	98.54
16	83.28	100.08	99.93	99.72	99.62	99.46	99.16	98.93	98.76	98.61	98.46
17	81.76	100.26	99.96	99.72	99.65	99.54	99.25	99.16	98.97	98.67	98.56
18	83.52	100.13	99.94	99.70	99.44	99.16	98.90	98.68	98.42	98.22	98.05
19	82.59	100.10	99.83	99.56	99.35	99.12	98.81	98.56	98.35	98.07	97.89
20	82.75	100.13	99.87	99.66	99.34	99.11	98.90	98.65	98.36	98.11	97.87
21	83.15	99.99	99.84	99.60	99.49	99.29	99.23	99.12	98.93	98.80	98.62
22	83.48	100.07	99.81	99.59	99.33	99.07	98.85	98.66	98.45	98.23	97.98
23	82.66	100.12	99.93	99.75	99.60	99.30	99.09	98.95	98.77	98.66	98.46
24	83.07	100.11	99.81	99.64	99.51	99.30	99.23	99.06	98.78	98.69	98.59
25	82.75	100.12	99.84	99.65	99.43	99.32	99.20	99.13	98.86	98.56	98.43
Avg.	83.27	100.11	99.91	99.71	99.51	99.31	99.10	98.92	98.70	98.48	98.29
Med.	83.28	100.12	99.93	99.70	99.51	99.30	99.12	98.95	98.77	98.56	98.42
st dev	0.60	0.07	0.07	0.10	0.11	0.15	0.17	0.20	0.22	0.24	0.26
Min.	81.76	99.99	99.81	99.56	99.33	99.07	98.81	98.56	98.35	98.07	97.87
Max.	84.25	100.26	100.07	99.95	99.67	99.62	99.41	99.21	99.12	98.83	98.64

3.2 Data Set 1, 85°C, 180mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	3.260	3.256	3.259	3.261	3.258	3.257	3.260	3.258	3.275	3.259	3.259
2	3.257	3.263	3.255	3.263	3.265	3.258	3.259	3.254	3.251	3.259	3.259
3	3.284	3.288	3.287	3.283	3.290	3.287	3.287	3.284	3.286	3.291	3.290
4	3.273	3.271	3.276	3.277	3.276	3.278	3.279	3.274	3.277	3.275	3.270
5	3.241	3.236	3.247	3.249	3.243	3.249	3.256	3.239	3.242	3.242	3.251
6	3.250	3.247	3.255	3.254	3.248	3.252	3.256	3.251	3.253	3.256	3.251
7	3.252	3.256	3.253	3.252	3.252	3.256	3.258	3.250	3.250	3.252	3.245
8	3.251	3.256	3.256	3.260	3.257	3.254	3.257	3.247	3.258	3.252	3.256
9	3.269	3.262	3.266	3.256	3.269	3.269	3.260	3.268	3.262	3.267	3.261
10	3.241	3.247	3.241	3.246	3.240	3.255	3.246	3.243	3.246	3.251	3.247
11	3.283	3.281	3.284	3.286	3.278	3.243	3.262	3.270	3.267	3.267	3.273
12	3.264	3.258	3.255	3.252	3.253	3.253	3.258	3.274	3.268	3.257	3.258
13	3.257	3.259	3.253	3.258	3.252	3.259	3.254	3.252	3.255	3.252	3.271
14	3.268	3.254	3.253	3.255	3.260	3.260	3.270	3.262	3.264	3.262	3.261
15	3.248	3.251	3.253	3.254	3.250	3.259	3.255	3.255	3.251	3.235	3.252
16	3.255	3.260	3.263	3.265	3.253	3.263	3.260	3.264	3.265	3.260	3.261
17	3.264	3.271	3.262	3.263	3.260	3.267	3.269	3.268	3.268	3.264	3.271
18	3.266	3.265	3.261	3.273	3.268	3.268	3.258	3.254	3.269	3.268	3.268
19	3.246	3.250	3.245	3.254	3.259	3.254	3.260	3.262	3.265	3.269	3.248
20	3.247	3.253	3.259	3.255	3.250	3.252	3.251	3.257	3.254	3.257	3.254
21	3.269	3.258	3.259	3.257	3.256	3.267	3.255	3.275	3.260	3.266	3.263
22	3.252	3.259	3.250	3.258	3.255	3.257	3.256	3.254	3.260	3.258	3.259
23	3.251	3.254	3.240	3.276	3.256	3.250	3.248	3.251	3.259	3.251	3.253
24	3.259	3.251	3.263	3.275	3.258	3.243	3.256	3.264	3.258	3.254	3.268
25	3.267	3.256	3.252	3.253	3.260	3.254	3.268	3.265	3.267	3.254	3.262
Avg.	3.259	3.258	3.258	3.261	3.259	3.259	3.260	3.260	3.261	3.259	3.260
Med.	3.257	3.256	3.255	3.258	3.257	3.257	3.258	3.258	3.260	3.258	3.259
st dev	0.012	0.011	0.011	0.011	0.011	0.010	0.009	0.011	0.010	0.011	0.010
Min.	3.241	3.236	3.240	3.246	3.240	3.243	3.246	3.239	3.242	3.235	3.245
Max.	3.284	3.288	3.287	3.286	3.290	3.287	3.287	3.284	3.286	3.291	3.290

3.3 Data Set 1, 85°C, 180mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
1	0.2577	0.5228	2823	0.0001	0.0003	0.0001	0.0003	0.0007	0.0006	0.0009	0.0010	0.0011	0.0014
2	0.2579	0.5231	2818	0.0000	0.0002	0.0001	0.0002	0.0004	0.0007	0.0009	0.0011	0.0012	0.0015
3	0.2601	0.5247	2762	0.0002	0.0004	0.0001	0.0002	0.0004	0.0007	0.0008	0.0009	0.0010	0.0014
4	0.2605	0.5223	2764	0.0001	0.0003	0.0001	0.0004	0.0005	0.0007	0.0009	0.0011	0.0014	0.0016
5	0.2598	0.5253	2766	0.0002	0.0003	0.0002	0.0004	0.0006	0.0008	0.0011	0.0012	0.0014	0.0016
6	0.2611	0.5247	2740	0.0002	0.0002	0.0003	0.0006	0.0006	0.0008	0.0010	0.0011	0.0013	0.0015
7	0.2589	0.5220	2801	0.0003	0.0004	0.0001	0.0004	0.0006	0.0006	0.0008	0.0011	0.0014	0.0016
8	0.2603	0.5261	2752	0.0002	0.0001	0.0003	0.0006	0.0008	0.0009	0.0012	0.0013	0.0016	0.0017
9	0.2584	0.5258	2794	0.0003	0.0003	0.0002	0.0005	0.0008	0.0008	0.0009	0.0011	0.0014	0.0016
10	0.2607	0.5250	2747	0.0002	0.0001	0.0002	0.0005	0.0009	0.0009	0.0011	0.0012	0.0014	0.0017
11	0.2589	0.5236	2793	0.0003	0.0005	0.0001	0.0003	0.0006	0.0006	0.0006	0.0009	0.0011	0.0013
12	0.2589	0.5253	2786	0.0002	0.0002	0.0001	0.0005	0.0008	0.0010	0.0012	0.0011	0.0014	0.0016
13	0.2602	0.5236	2765	0.0003	0.0003	0.0001	0.0004	0.0008	0.0011	0.0011	0.0011	0.0012	0.0015
14	0.2598	0.5258	2763	0.0002	0.0002	0.0001	0.0004	0.0009	0.0012	0.0014	0.0014	0.0016	0.0015
15	0.2596	0.5256	2769	0.0002	0.0003	0.0002	0.0004	0.0009	0.0011	0.0013	0.0013	0.0016	0.0017
16	0.2604	0.5252	2753	0.0002	0.0003	0.0001	0.0004	0.0007	0.0011	0.0013	0.0014	0.0016	0.0018
17	0.2599	0.5242	2768	0.0001	0.0004	0.0000	0.0003	0.0006	0.0009	0.0012	0.0012	0.0014	0.0017
18	0.2583	0.5231	2809	0.0004	0.0004	0.0003	0.0005	0.0009	0.0011	0.0014	0.0016	0.0018	0.0018
19	0.2603	0.5231	2765	0.0003	0.0006	0.0003	0.0001	0.0004	0.0007	0.0008	0.0011	0.0014	0.0015
20	0.2612	0.5249	2736	0.0004	0.0004	0.0002	0.0004	0.0007	0.0010	0.0012	0.0015	0.0017	0.0018
21	0.2588	0.5260	2785	0.0002	0.0003	0.0000	0.0003	0.0006	0.0010	0.0013	0.0015	0.0018	0.0021
22	0.2585	0.5240	2800	0.0003	0.0004	0.0002	0.0003	0.0008	0.0010	0.0013	0.0015	0.0016	0.0018
23	0.2589	0.5229	2796	0.0003	0.0003	0.0001	0.0004	0.0007	0.0011	0.0012	0.0015	0.0018	0.0020
24	0.2608	0.5249	2745	0.0002	0.0003	0.0000	0.0004	0.0007	0.0010	0.0013	0.0015	0.0018	0.0020
25	0.2586	0.5225	2806	0.0004	0.0004	0.0004	0.0003	0.0008	0.0010	0.0012	0.0014	0.0016	0.0019
Avg.	0.2595	0.5243	2776	0.0002	0.0003	0.0002	0.0004	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017
Med.	0.2598	0.5247	2768	0.0002	0.0003	0.0001	0.0004	0.0007	0.0009	0.0012	0.0012	0.0014	0.0016
st dev	0.0010	0.0013	25	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2577	0.5220	2736	0.0000	0.0001	0.0000	0.0001	0.0004	0.0006	0.0006	0.0009	0.0010	0.0013
Max.	0.2612	0.5261	2823	0.0004	0.0006	0.0004	0.0006	0.0009	0.0012	0.0014	0.0016	0.0018	0.0021

3.4 Data Set 2, 105°C, 180mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	84.36	99.98	99.81	99.61	99.36	99.18	98.94	98.68	98.46	98.16	97.94
27	83.40	100.06	99.81	99.63	99.35	99.04	98.80	98.63	98.38	98.19	97.91
28	82.69	100.10	99.78	99.59	99.37	99.07	98.81	98.60	98.39	98.11	97.94
29	83.28	99.96	99.77	99.53	99.27	99.02	98.80	98.62	98.55	98.33	98.10
30	84.09	99.99	99.76	99.54	99.19	98.98	98.75	98.55	98.45	98.20	97.94
31	82.81	100.07	99.78	99.57	99.31	99.12	98.80	98.58	98.37	98.13	97.89
32	81.80	100.07	99.77	99.57	99.35	99.03	98.86	98.64	98.35	98.11	97.90
33	84.11	99.93	99.81	99.66	99.36	99.10	98.82	98.75	98.50	98.18	97.91
34	83.14	99.96	99.70	99.46	99.21	98.94	98.75	98.58	98.30	98.06	97.85
35	83.48	100.17	99.88	99.64	99.34	99.13	98.92	98.67	98.37	98.17	97.98
36	83.11	100.14	99.89	99.71	99.52	99.22	98.88	98.65	98.35	98.07	97.77
37	83.48	100.17	99.88	99.57	99.31	99.10	98.93	98.60	98.35	98.22	97.94
38	83.34	100.18	99.89	99.70	99.42	99.21	98.93	98.72	98.46	98.19	97.92
39	83.49	99.99	99.87	99.72	99.38	99.14	98.93	98.73	98.54	98.44	98.19
40	84.25	100.11	99.93	99.76	99.61	99.24	99.01	98.72	98.65	98.42	98.17
41	83.64	100.08	99.93	99.61	99.43	99.21	98.98	98.74	98.43	98.27	97.97
42	82.62	100.01	99.78	99.59	99.31	99.03	98.86	98.62	98.34	98.11	97.80
43	83.99	100.15	99.79	99.54	99.27	98.98	98.75	98.52	98.31	98.05	97.82
44	82.43	100.19	99.96	99.79	99.56	99.25	99.04	98.77	98.53	98.33	98.03
45	82.61	99.96	99.73	99.53	99.33	99.10	98.87	98.56	98.27	98.00	97.75
46	81.57	99.95	99.79	99.52	99.22	99.11	98.93	98.59	98.44	98.15	97.89
47	82.08	99.94	99.66	99.38	99.31	99.21	99.03	98.93	98.71	98.43	98.17
48	79.58	99.90	99.69	99.45	99.11	98.84	98.68	98.34	98.13	97.75	97.50
49	80.02	99.93	99.75	99.61	99.48	99.28	99.03	98.69	98.55	98.21	97.86
50	79.58	100.18	99.92	99.67	99.47	99.25	99.07	98.77	98.62	98.24	98.13
Avg.	82.76	100.05	99.81	99.60	99.35	99.11	98.89	98.65	98.43	98.18	97.93
Med.	83.14	100.06	99.79	99.59	99.35	99.11	98.88	98.64	98.43	98.18	97.92
st dev	1.36	0.10	0.08	0.10	0.12	0.11	0.11	0.11	0.13	0.15	0.15
Min.	79.58	99.90	99.66	99.38	99.11	98.84	98.68	98.34	98.13	97.75	97.50
Max.	84.36	100.19	99.96	99.79	99.61	99.28	99.07	98.93	98.71	98.44	98.19

3.5 Data Set 2, 105°C, 180mA (Forward Voltage)

No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	3.249	3.256	3.251	3.258	3.258	3.251	3.257	3.251	3.252	3.255	3.255
27	3.246	3.245	3.247	3.253	3.252	3.252	3.256	3.251	3.255	3.254	3.259
28	3.257	3.253	3.257	3.252	3.262	3.256	3.258	3.257	3.259	3.251	3.255
29	3.269	3.270	3.269	3.256	3.270	3.265	3.266	3.265	3.268	3.261	3.266
30	3.251	3.254	3.252	3.254	3.253	3.265	3.258	3.252	3.265	3.260	3.258
31	3.256	3.257	3.251	3.259	3.258	3.258	3.259	3.252	3.253	3.259	3.255
32	3.274	3.272	3.267	3.275	3.279	3.275	3.273	3.276	3.273	3.272	3.272
33	3.259	3.254	3.254	3.257	3.256	3.254	3.256	3.256	3.257	3.257	3.264
34	3.262	3.270	3.265	3.259	3.259	3.264	3.262	3.266	3.269	3.262	3.263
35	3.246	3.252	3.251	3.251	3.257	3.258	3.254	3.267	3.253	3.253	3.252
36	3.264	3.262	3.270	3.260	3.264	3.265	3.260	3.266	3.264	3.267	3.264
37	3.248	3.259	3.250	3.250	3.253	3.235	3.253	3.256	3.258	3.259	3.258
38	3.232	3.246	3.247	3.245	3.247	3.246	3.242	3.242	3.231	3.242	3.242
39	3.231	3.236	3.238	3.233	3.233	3.237	3.241	3.242	3.236	3.247	3.236
40	3.249	3.254	3.241	3.252	3.257	3.259	3.255	3.251	3.252	3.253	3.259
41	3.280	3.276	3.272	3.272	3.269	3.266	3.272	3.275	3.275	3.273	3.277
42	3.231	3.232	3.236	3.235	3.235	3.238	3.240	3.239	3.233	3.237	3.238
43	3.253	3.259	3.259	3.256	3.265	3.255	3.256	3.251	3.255	3.261	3.255
44	3.280	3.284	3.286	3.287	3.279	3.284	3.286	3.286	3.281	3.283	3.287
45	3.236	3.240	3.245	3.249	3.248	3.261	3.248	3.245	3.243	3.243	3.247
46	3.262	3.264	3.252	3.264	3.261	3.263	3.262	3.265	3.260	3.274	3.261
47	3.247	3.248	3.243	3.247	3.251	3.249	3.263	3.246	3.251	3.256	3.257
48	3.233	3.242	3.241	3.259	3.249	3.245	3.257	3.257	3.252	3.260	3.268
49	3.273	3.272	3.272	3.278	3.273	3.269	3.271	3.275	3.266	3.268	3.275
50	3.241	3.254	3.246	3.249	3.252	3.259	3.259	3.257	3.261	3.252	3.251
Avg.	3.253	3.256	3.254	3.256	3.258	3.257	3.259	3.258	3.257	3.258	3.259
Med.	3.251	3.254	3.251	3.256	3.257	3.258	3.258	3.256	3.257	3.259	3.258
st dev	0.015	0.013	0.013	0.012	0.011	0.012	0.010	0.012	0.012	0.011	0.012
Min.	3.231	3.232	3.236	3.233	3.233	3.235	3.240	3.239	3.231	3.237	3.236
Max.	3.280	3.284	3.286	3.287	3.279	3.284	3.286	3.286	3.281	3.283	3.287

3.6 Data Set 2, 105°C, 180mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
26	0.2595	0.5251	2774	0.0002	0.0002	0.0003	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0021
27	0.2598	0.5244	2770	0.0004	0.0004	0.0004	0.0004	0.0009	0.0011	0.0014	0.0016	0.0019	0.0021
28	0.2605	0.5238	2758	0.0003	0.0004	0.0004	0.0005	0.0007	0.0010	0.0014	0.0016	0.0019	0.0019
29	0.2578	0.5258	2806	0.0002	0.0001	0.0002	0.0005	0.0008	0.0010	0.0014	0.0016	0.0019	0.0021
30	0.2594	0.5243	2779	0.0002	0.0003	0.0002	0.0004	0.0007	0.0009	0.0011	0.0016	0.0019	0.0019
31	0.2605	0.5247	2753	0.0002	0.0002	0.0001	0.0005	0.0009	0.0010	0.0012	0.0016	0.0020	0.0021
32	0.2610	0.5242	2744	0.0002	0.0002	0.0002	0.0004	0.0007	0.0010	0.0012	0.0016	0.0019	0.0022
33	0.2578	0.5219	2825	0.0002	0.0001	0.0002	0.0004	0.0007	0.0009	0.0011	0.0016	0.0018	0.0021
34	0.2589	0.5231	2795	0.0003	0.0002	0.0000	0.0003	0.0007	0.0008	0.0010	0.0014	0.0016	0.0019
35	0.2596	0.5254	2770	0.0003	0.0001	0.0001	0.0003	0.0009	0.0010	0.0011	0.0015	0.0018	0.0021
36	0.2602	0.5228	2768	0.0003	0.0001	0.0001	0.0000	0.0007	0.0008	0.0009	0.0013	0.0016	0.0019
37	0.2595	0.5236	2779	0.0004	0.0002	0.0001	0.0001	0.0006	0.0009	0.0010	0.0014	0.0016	0.0022
38	0.2591	0.5238	2788	0.0004	0.0003	0.0001	0.0001	0.0006	0.0008	0.0009	0.0013	0.0015	0.0021
39	0.2607	0.5255	2745	0.0002	0.0000	0.0001	0.0003	0.0008	0.0009	0.0011	0.0016	0.0017	0.0018
40	0.2580	0.5239	2813	0.0001	0.0002	0.0002	0.0004	0.0004	0.0007	0.0011	0.0016	0.0016	0.0018
41	0.2583	0.5231	2809	0.0003	0.0002	0.0001	0.0001	0.0003	0.0006	0.0010	0.0015	0.0017	0.0017
42	0.2594	0.5239	2781	0.0001	0.0002	0.0002	0.0005	0.0005	0.0008	0.0009	0.0013	0.0018	0.0018
43	0.2579	0.5256	2806	0.0002	0.0000	0.0002	0.0003	0.0004	0.0008	0.0009	0.0013	0.0018	0.0018
44	0.2603	0.5231	2764	0.0001	0.0002	0.0003	0.0005	0.0005	0.0007	0.0011	0.0015	0.0019	0.0020
45	0.2607	0.5248	2749	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006	0.0008	0.0013	0.0016	0.0019
46	0.2572	0.5234	2832	0.0001	0.0001	0.0004	0.0004	0.0005	0.0007	0.0008	0.0014	0.0016	0.0018
47	0.2592	0.5245	2783	0.0003	0.0000	0.0002	0.0002	0.0004	0.0004	0.0006	0.0009	0.0012	0.0015
48	0.2577	0.5228	2824	0.0002	0.0001	0.0004	0.0005	0.0006	0.0007	0.0008	0.0012	0.0015	0.0017
49	0.2579	0.5252	2808	0.0002	0.0002	0.0004	0.0004	0.0005	0.0005	0.0006	0.0010	0.0013	0.0016
50	0.2583	0.5249	2800	0.0001	0.0001	0.0003	0.0005	0.0004	0.0006	0.0008	0.0010	0.0013	0.0016
Avg.	0.2592	0.5241	2785	0.0002	0.0002	0.0002	0.0004	0.0006	0.0008	0.0010	0.0014	0.0017	0.0019
Med.	0.2594	0.5242	2781	0.0002	0.0002	0.0002	0.0004	0.0006	0.0008	0.0010	0.0015	0.0017	0.0019
st dev	0.0011	0.0010	26	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Min.	0.2572	0.5219	2744	0.0001	0.0000	0.0000	0.0000	0.0003	0.0004	0.0006	0.0009	0.0012	0.0015
Max.	0.2610	0.5258	2832	0.0004	0.0004	0.0004	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0022

3.7 Data Set 3, 115°C, 180mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
51	82.53	99.93	99.85	99.48	99.36	98.97	98.73	98.61	98.33	97.94	97.73
52	81.54	100.07	99.85	99.63	99.39	99.26	98.95	98.75	98.55	98.32	98.12
53	82.06	99.98	99.77	99.48	99.23	99.07	98.78	98.43	98.15	97.84	97.66
54	82.84	99.96	99.73	99.49	99.26	99.09	98.87	98.64	98.43	98.23	97.98
55	80.05	100.07	99.65	99.45	99.23	98.98	98.64	98.44	98.10	97.96	97.55
56	82.71	99.78	99.70	99.31	99.04	98.79	98.54	98.23	98.01	97.63	97.49
57	84.00	99.88	99.65	99.39	99.05	98.79	98.51	98.40	98.11	97.79	97.45
58	83.80	100.05	99.80	99.49	99.21	98.89	98.72	98.52	98.21	97.95	97.72
59	84.00	99.92	99.79	99.43	99.20	98.98	98.64	98.36	98.14	97.83	97.60
60	83.96	100.06	99.77	99.46	99.04	98.82	98.67	98.25	98.14	97.70	97.49
61	83.32	99.98	99.80	99.47	99.20	98.97	98.68	98.42	98.07	97.83	97.56
62	84.04	100.04	99.79	99.63	99.26	98.95	98.68	98.33	98.02	97.73	97.45
63	84.86	100.04	99.73	99.46	99.38	99.10	98.77	98.67	98.41	98.23	97.98
64	82.91	100.02	99.84	99.71	99.55	99.30	98.97	98.56	98.21	97.97	97.68
65	83.82	100.12	99.86	99.65	99.48	99.27	99.08	98.80	98.47	98.16	97.67
66	82.94	100.04	99.69	99.42	99.17	98.90	98.75	98.53	98.24	98.02	97.87
67	83.40	100.02	99.75	99.47	99.22	99.05	98.79	98.44	98.30	97.94	97.70
68	84.24	99.95	99.66	99.42	99.25	99.06	98.75	98.56	98.17	97.92	97.69
69	83.24	99.95	99.59	99.42	99.24	99.11	98.86	98.62	98.35	98.04	97.77
70	83.17	99.96	99.77	99.42	99.13	99.04	98.81	98.51	98.30	98.14	97.85
71	82.98	100.05	99.75	99.25	98.98	98.94	98.69	98.45	98.05	97.82	97.59
72	82.89	100.05	99.76	99.49	99.12	98.82	98.53	98.15	97.86	97.58	97.15
73	84.04	100.01	99.71	99.45	99.11	98.76	98.63	98.35	98.10	97.82	97.47
74	83.95	99.98	99.67	99.48	99.26	98.99	98.80	98.46	98.18	97.86	97.58
75	82.82	99.93	99.77	99.70	99.42	98.96	98.70	98.53	98.29	97.85	97.61
Avg.	83.20	99.99	99.75	99.48	99.23	99.00	98.74	98.48	98.21	97.92	97.66
Med.	83.24	100.01	99.76	99.47	99.23	98.98	98.73	98.46	98.18	97.92	97.66
st dev	0.99	0.07	0.07	0.11	0.14	0.15	0.14	0.16	0.16	0.19	0.20
Min.	80.05	99.78	99.59	99.25	98.98	98.76	98.51	98.15	97.86	97.58	97.15
Max.	84.86	100.12	99.86	99.71	99.55	99.30	99.08	98.80	98.55	98.32	98.12

3.8 Data Set 3, 115°C, 180mA (Forward Voltage)

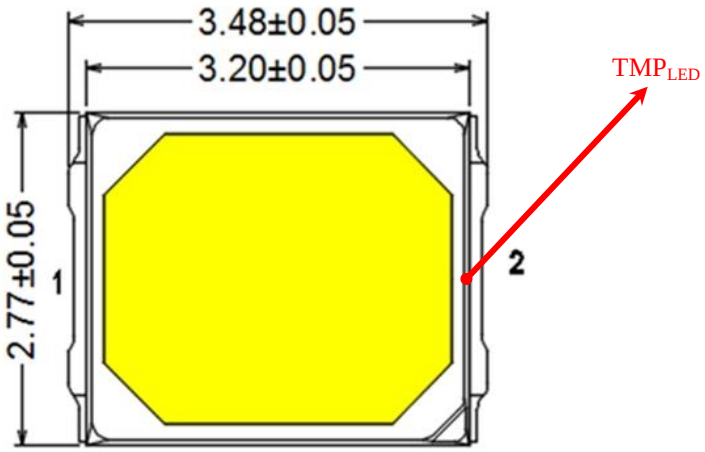
No.	Forward Voltage (V)										
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
51	3.264	3.262	3.269	3.268	3.261	3.270	3.265	3.260	3.261	3.265	3.261
52	3.272	3.270	3.268	3.275	3.268	3.275	3.273	3.271	3.273	3.274	3.269
53	3.269	3.265	3.262	3.263	3.265	3.262	3.267	3.262	3.268	3.264	3.268
54	3.244	3.247	3.246	3.251	3.256	3.252	3.256	3.248	3.242	3.250	3.258
55	3.268	3.264	3.271	3.269	3.265	3.263	3.265	3.272	3.275	3.266	3.269
56	3.284	3.267	3.266	3.263	3.274	3.262	3.269	3.255	3.258	3.231	3.266
57	3.244	3.246	3.249	3.244	3.245	3.248	3.253	3.248	3.244	3.256	3.257
58	3.249	3.262	3.243	3.253	3.253	3.241	3.251	3.259	3.259	3.255	3.250
59	3.247	3.252	3.248	3.252	3.249	3.250	3.255	3.259	3.253	3.258	3.258
60	3.247	3.242	3.247	3.262	3.246	3.245	3.248	3.254	3.257	3.258	3.255
61	3.243	3.253	3.251	3.253	3.261	3.252	3.261	3.263	3.266	3.262	3.257
62	3.288	3.267	3.260	3.263	3.260	3.269	3.265	3.265	3.266	3.261	3.264
63	3.246	3.246	3.247	3.243	3.244	3.241	3.247	3.241	3.246	3.245	3.246
64	3.238	3.241	3.245	3.242	3.246	3.255	3.242	3.260	3.231	3.241	3.257
65	3.245	3.243	3.250	3.244	3.252	3.256	3.253	3.238	3.251	3.258	3.251
66	3.251	3.252	3.254	3.253	3.248	3.253	3.252	3.258	3.254	3.250	3.256
67	3.246	3.257	3.247	3.244	3.248	3.248	3.256	3.249	3.241	3.248	3.249
68	3.255	3.257	3.252	3.253	3.255	3.266	3.254	3.259	3.256	3.255	3.240
69	3.256	3.262	3.251	3.258	3.256	3.266	3.255	3.254	3.255	3.256	3.253
70	3.256	3.247	3.268	3.252	3.255	3.252	3.257	3.252	3.253	3.242	3.253
71	3.226	3.245	3.251	3.243	3.253	3.249	3.247	3.250	3.238	3.242	3.242
72	3.249	3.241	3.244	3.255	3.258	3.252	3.255	3.256	3.252	3.256	3.252
73	3.249	3.252	3.245	3.244	3.248	3.248	3.256	3.254	3.258	3.255	3.258
74	3.260	3.261	3.255	3.253	3.258	3.259	3.252	3.259	3.253	3.259	3.251
75	3.253	3.253	3.265	3.259	3.253	3.252	3.259	3.259	3.258	3.240	3.252
Avg.	3.254	3.254	3.254	3.254	3.255	3.255	3.257	3.256	3.255	3.254	3.256
Med.	3.249	3.253	3.251	3.253	3.255	3.252	3.255	3.258	3.255	3.256	3.256
st dev	0.014	0.009	0.009	0.009	0.008	0.009	0.008	0.008	0.011	0.010	0.008
Min.	3.226	3.241	3.243	3.242	3.244	3.241	3.242	3.238	3.231	3.231	3.240
Max.	3.288	3.270	3.271	3.275	3.274	3.275	3.273	3.272	3.275	3.274	3.269

3.9 Data Set 3, 115°C, 180mA (Chromaticity Shift)

No.	u'	v'	CCT(K)	Chromaticity Shift (Δu'v')									
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	10000hrs
51	0.2596	0.5236	2778	0.0003	0.0001	0.0006	0.0006	0.0006	0.0007	0.0010	0.0012	0.0015	0.0018
52	0.2600	0.5243	2765	0.0003	0.0002	0.0004	0.0006	0.0006	0.0008	0.0008	0.0012	0.0015	0.0018
53	0.2583	0.5217	2816	0.0004	0.0002	0.0002	0.0005	0.0012	0.0011	0.0013	0.0015	0.0019	0.0022
54	0.2609	0.5262	2739	0.0002	0.0004	0.0006	0.0008	0.0011	0.0012	0.0012	0.0014	0.0018	0.0021
55	0.2596	0.5216	2786	0.0001	0.0001	0.0004	0.0006	0.0008	0.0010	0.0009	0.0012	0.0016	0.0018
56	0.2593	0.5228	2787	0.0001	0.0002	0.0004	0.0006	0.0007	0.0010	0.0012	0.0013	0.0014	0.0016
57	0.2597	0.5235	2776	0.0002	0.0001	0.0004	0.0007	0.0008	0.0010	0.0013	0.0014	0.0016	0.0016
58	0.2591	0.5237	2789	0.0001	0.0002	0.0005	0.0007	0.0009	0.0013	0.0014	0.0016	0.0018	0.0019
59	0.2591	0.5259	2778	0.0002	0.0001	0.0004	0.0006	0.0009	0.0011	0.0012	0.0014	0.0016	0.0017
60	0.2589	0.5230	2795	0.0000	0.0001	0.0004	0.0006	0.0008	0.0009	0.0012	0.0014	0.0016	0.0017
61	0.2610	0.5233	2749	0.0000	0.0001	0.0004	0.0006	0.0007	0.0009	0.0012	0.0014	0.0016	0.0018
62	0.2611	0.5247	2740	0.0001	0.0001	0.0004	0.0007	0.0008	0.0010	0.0012	0.0015	0.0016	0.0018
63	0.2586	0.5239	2798	0.0000	0.0002	0.0006	0.0007	0.0009	0.0011	0.0013	0.0016	0.0018	0.0019
64	0.2610	0.5239	2746	0.0001	0.0002	0.0005	0.0007	0.0009	0.0011	0.0013	0.0016	0.0018	0.0019
65	0.2607	0.5251	2747	0.0000	0.0002	0.0006	0.0008	0.0010	0.0011	0.0013	0.0016	0.0019	0.0019
66	0.2611	0.5254	2737	0.0001	0.0002	0.0006	0.0008	0.0009	0.0012	0.0013	0.0016	0.0020	0.0021
67	0.2603	0.5243	2759	0.0003	0.0002	0.0003	0.0005	0.0007	0.0009	0.0011	0.0014	0.0016	0.0019
68	0.2607	0.5248	2749	0.0001	0.0003	0.0006	0.0009	0.0010	0.0011	0.0014	0.0016	0.0020	0.0021
69	0.2606	0.5248	2751	0.0000	0.0002	0.0006	0.0008	0.0008	0.0011	0.0013	0.0016	0.0019	0.0021
70	0.2613	0.5251	2735	0.0001	0.0003	0.0006	0.0009	0.0010	0.0012	0.0014	0.0018	0.0020	0.0021
71	0.2616	0.5239	2733	0.0001	0.0003	0.0006	0.0009	0.0010	0.0013	0.0015	0.0017	0.0020	0.0022
72	0.2612	0.5240	2742	0.0001	0.0002	0.0006	0.0009	0.0010	0.0011	0.0013	0.0016	0.0018	0.0021
73	0.2568	0.5241	2838	0.0000	0.0002	0.0006	0.0008	0.0009	0.0011	0.0013	0.0016	0.0019	0.0021
74	0.2599	0.5245	2768	0.0001	0.0003	0.0007	0.0009	0.0011	0.0013	0.0016	0.0018	0.0021	0.0023
75	0.2593	0.5252	2777	0.0001	0.0002	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0021	0.0022
Avg.	0.2600	0.5241	2767	0.0001	0.0002	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0018	0.0020
Med.	0.2600	0.5241	2765	0.0001	0.0002	0.0006	0.0007	0.0009	0.0011	0.0013	0.0016	0.0018	0.0019
st dev	0.0011	0.0011	27	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.2568	0.5216	2733	0.0000	0.0001	0.0002	0.0005	0.0006	0.0007	0.0008	0.0012	0.0014	0.0016
Max.	0.2616	0.5262	2838	0.0004	0.0004	0.0007	0.0009	0.0012	0.0013	0.0016	0.0018	0.0021	0.0023

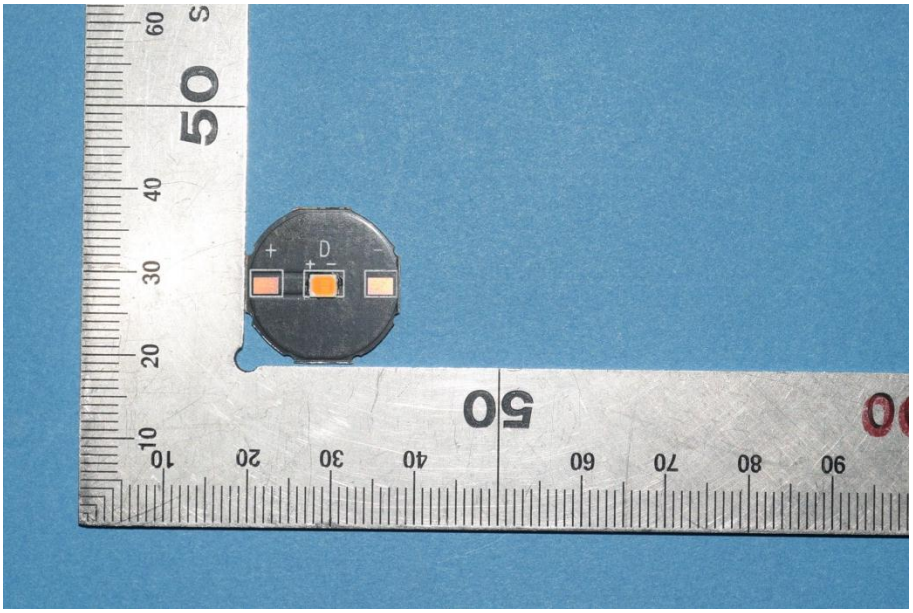
4 - DUT Photo

4.1 Mechanical Dimensions



All dimensions are in millimeter

4.2 DUT Photo



Directions

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. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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**********END OF REPORT**********