



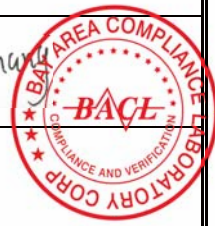
# TEST REPORT

According to ANSI/IES LM-80-15  
For

**Hongli Zhihui Group Co.,Ltd. Guangzhou Branch**  
Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China

**Model: HL-A-3014H416W-S1-08HL-HR6**

<b>Report Type:</b> 6000 Hours Test Report		<b>Product Type:</b> LED Package	
<b>Reviewed By:</b>	Pote Wang	<i>Pote Wang</i>	
<b>Report Number:</b>	SZ2220725-33705E-EE-6000		
<b>Test Date:</b>	2022-07-29 to 2023-04-05		
<b>Report Date:</b>	2023-05-06		
<b>Approved by:</b>	Blake Zhang / EE Engineer	<i>Blake Zhang</i>	
<b>Prepared By:</b>	Bay Area Compliance Laboratory Corp. (Shenzhen) 5/F(B-We )-7/F, the 3rd Phase of Wan Li Industrial Building D, Shihua Road, Foshan Free Trade Zone Shenzhen, Guangdong, China. Tel: +86-755-33320018 Fax: +86-755-33320008		
<b>Test Facility:</b>	Test facility is located at No.12, Pinglong East Road, Tangxia Town, Dongguan, Guangdong, China.		



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### 1 - General Information

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

##### Sample Size:

50 PCS test samples were in good condition and received on 2022-07-25. The samples were numbered from 1 to 25 and 26 to 50.

Manufacturer: Hongli Zhihui Group Co.,Ltd. Guangzhou Branch

- \*ENERGY STAR 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
0.5m integrating sphere	EVERFINE	AIS-2	G185304TA1381172	2022-11-18	2023-11-17
LED Test Source	EVERFINE	LTS-300	P185616CD1371113	2022-11-18	2023-11-17
High Accuracy Array Spectroradiometer	EVERFINE	HAAS-2000	P600674CM1381123	2022-06-07	2023-06-06
Standard Light Source	EVERFINE	D062	1011093	2021-10-15	2023-10-14
Multilayer aging machine	BACL	B2-270	20015	2022-10-19	2023-10-18
Program-controlled D.C. Stabilized Voltage Supply	Hanshenpuyuan	HSPY-60-03	N/A	2022-11-18	2023-11-17

### 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 ( $TMP_{LED}$ ) 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  $2^{\circ}C$  below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to  $5^{\circ}C$  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  $25^{\circ}C \pm 2^{\circ}C$ , 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  $25^{\circ}C \pm 2^{\circ}C$ , 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  $U=0.8671^{\circ}C$  ( $K=2$ ), 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).



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### 1.8 Sample Set

Data Set 1: 55°C, 30mA

## 2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	$\alpha$	$\beta$	Reported TM-21 L <sub>70</sub> Lifetime
1	25	0	1000hrs	6000hrs	1.981E-06	1.004	>36000 hours
2	25	0	1000hrs	6000hrs	2.111E-06	1.004	>36000 hours

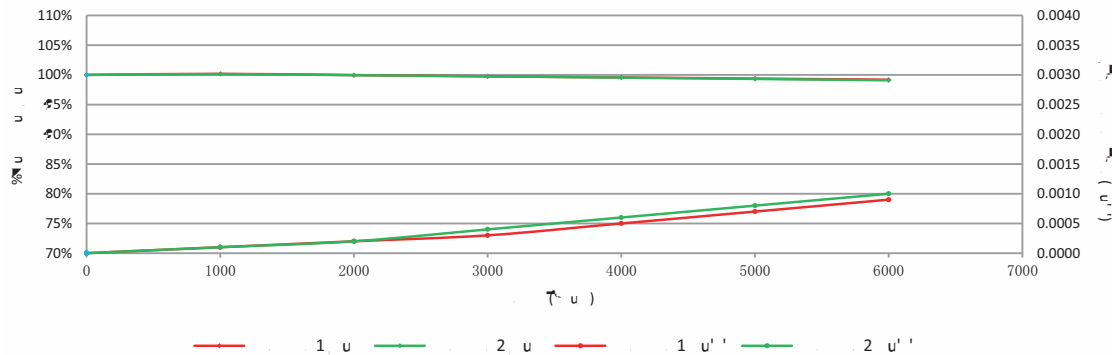
### Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	100.18%	99.97%	99.76%	99.57%	99.38%	99.19%
2	100.14%	99.95%	99.76%	99.54%	99.32%	99.09%

### Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.0001	0.0002	0.0003	0.0005	0.0007	0.0009
2	0.0001	0.0002	0.0004	0.0006	0.0008	0.0010

### Average Lumen Maintenance and Chromaticity Shift VS. Time



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**3.2 Data Set 1, 55°C, 30mA (Forward Voltage)**

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	2.913	2.919	2.915	2.916	2.919	2.906	2.914
2	2.919	2.915	2.922	2.918	2.900	2.923	2.900
3	2.916	2.934	2.919	2.917	2.907	2.914	2.916
4	2.913	2.911	2.914	2.901	2.916	2.906	2.914
5	2.909	2.919	2.909	2.902	2.927	2.908	2.912
6	2.904	2.913	2.905	2.902	2.900	2.929	2.902
7	2.906	2.924	2.907	2.916	2.913	2.925	2.913
8	2.909	2.916	2.909	2.908	2.906	2.919	2.911
9	2.906	2.917	2.907	2.904	2.900	2.918	2.910
10	2.910	2.914	2.912	2.916	2.918	2.919	2.912
11	2.905	2.909	2.906	2.904	2.917	2.909	2.919
12	2.919	2.918	2.921	2.905	2.908	2.903	2.919
13	2.906	2.921	2.909	2.915	2.900	2.900	2.918
14	2.912	2.922	2.915	2.911	2.901	2.918	





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**3.3 Data Set 1, 55°C, 30mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2591	0.5334	2745	0.0001	0.0002	0.0004	0.0005	0.0007	0.0009
2	0.2567	0.5292	2816	0.0001	0.0002	0.0004	0.0005	0.0008	0.0009
3	0.2585	0.5309	2768	0.0001	0.0002	0.0003	0.0005	0.0007	0.0008
4	0.2586								



**3.4 Data Set 2, 85°C, 30mA (Lumen Maintenance)**

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	9.525	100.25	100.08	99.93	99.64	99.41	99.20
27	9.764	100.18	99.97	99.76	99.59	99.37	99.18
28	9.743	100.10	99.78	99.60	99.24	99.07	98.80
29	9.729	99.95	99.87	99.72	99.48	99.23	98.94
30	9.678	100.25	99.98	99.60	99.26	99.06	98.82
31	9.686	100.27	100.03	99.86	99.74	99.64	99.45
32	9.724	100.10	99.77	99.59	99.30	99.16	98.97
33	9.605	99.96	99.86	99.74	99.70	99.43	99.30
34	9.558	99.96	99.90	99.82	99.67	99.48	99.15
35	9.705	100.33	100.06	99.79	99.42	99.17	98.90
36	9.535	100.21	100.02	99.66	99.42	99.26	99.02
37	9.792	100.12	100.06	99.87	99.72	99.41	99.26
38	9.795	100.29	100.02	99.64	99.51	99.13	98.89
39	9.611	100.24	100.03	99.76	99.40	99.02	98.92
40	9.636	100.22	99.91	99.64	99.46	99.28	99.06
41	9.503	100.29	99.98	99.74	99.64	99.40	99.06
42	9.899	100.17	99.87	99.75	99.40	99.28	99.02
43	9.690	100.10	99.92	99.81	99.68	99.57	99.25
44	9.669	100.09	100.01	99.74	99.56	99.31	99.14
45	9.570	100.07	100.03	99.94	99.79	99.54	99.40
46	9.611	99.89	99.76	99.69	99.57	99.51	99.21
47	9.693	100.11	100.04	99.88	99.63	99.38	99.08
48	9.753	100.02	99.97	99.76	99.59	99.26	99.11
49	9.511	99.93	99.98	99.86	99.50	99.23	98.90
50	9.599	100.27	99.96	99.77	99.60	99.39	99.08
Avg.	9.663	100.14	99.95	99.76	99.54	99.32	99.09
Med.	9.678	100.12	99.98	99.76	99.57	99.31	99.08
st dev	0.101	0.13	0.09	0.10	0.15	0.16	0.17
Min.	9.503	99.89	99.76	99.59	99.24	99.02	98.80
Max.	9.899	100.33	100.08	99.94	99.79	99.64	99.45



**3.5 Data Set 2, 85°C, 30mA (Forward Voltage)**

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
26	2.910	2.919	2.913	2.902	2.914	2.919	2.903
27	2.916	2.929	2.921	2.916	2.917	2.917	2.912
28	2.915	2.915	2.919	2.931	2.915	2.919	2.936
29	2.912	2.928	2.917	2.918	2.914	2.911	2.928
30	2.905	2.915	2.908	2.917	2.910	2.905	2.917
31	2.907	2.919	2.912	2.901	2.916	2.917	2.912
32	2.919	2.924	2.924	2.915	2.920	2.930	2.914
33	2.913	2.917	2.916	2.910	2.915	2.913	2.916
34	2.906	2.910	2.910	2.911	2.909	2.904	2.904
35	2.934	2.940	2.939	2.927	2.910	2.902	2.914
36	2.912	2.923	2.916	2.919	2.921	2.914	2.912
37	2.933	2.938	2.937	2.929	2.906	2.927	2.900
38	2.933	2.936	2.937	2.914	2.919	2.921	2.918
39	2.910	2.914	2.914	2.907	2.908	2.914	2.918
40	2.916	2.920	2.920	2.926	2.918	2.921	2.919
41	2.913	2.917	2.919	2.932	2.904	2.911	2.918
42	2.922	2.921	2.921	2.910	2.912	2.913	2.917
43	2.920	2.919	2.920	2.917	2.901	2.918	2.907
44	2.909	2.912	2.910	2.918	2.913	2.910	2.931
45	2.922	2.924	2.924	2.922	2.926	2.925	2.919
46	2.922	2.923	2.923	2.924	2.922	2.915	2.926
47	2.916	2.917	2.919	2.906	2.919	2.919	2.937
48	2.919	2.917	2.919	2.916	2.907	2.912	2.917
49	2.912	2.912	2.913	2.919	2.906	2.930	2.914
50	2.918	2.919	2.921	2.930	2.908	2.928	2.919
Avg.	2.917	2.921	2.920	2.917	2.913	2.917	2.917
Med.	2.916	2.919	2.919	2.917	2.914	2.917	2.917
st dev	0.008	0.008	0.008	0.009	0.006	0.008	0.009
Min.	2.905	2.910	2.908	2.901	2.901	2.902	2.900
Max.	2.934	2.940	2.939	2.932	2.926	2.930	2.937

**3.6 Data Set 2, 85°C, 30mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
				0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs
26	0.2603	0.5322	2726	0.0001	0.0002	0.0002	0.0005	0.0007	0.0010
27	0.2592	0.5331	2744	0.0001	0.0002	0.0007	0.0006	0.0006	0.0009
28	0.2598	0.5335	2731	0.0002	0.0003	0.0004	0.0007	0.0007	0.0008
29	0.2595	0.5329	2739	0.0001	0.0002	0.0004	0.0006	0.0008	0.0010
30	0.2610	0.5328	2709	0.0001	0.0002	0.0004	0.0006	0.0008	0.0010
31	0.2611	0.5331	2706	0.0001	0.0002	0.0004	0.0005	0.0007	0.0008
32	0.2601	0.5325	2728	0.0001	0.0002	0.0003	0.0005	0.0008	0.0009
33	0.2589	0.5328	2751	0.0001	0.0002	0.0003	0.0005	0.0006	0.0007
34	0.2599	0.5323	2734	0.0001	0.0002	0.0004	0.0006	0.0008	0.0009
35	0.2593	0.5335	2741	0.0001	0.0002	0.0003	0.0003	0.0005	0.0008
36	0.2593	0.5302	2755	0.0001	0.0002	0.0004	0.0004	0.0006	0.0009
37	0.2562	0.5315	2816	0.0001	0.0002	0.0002	0.0002	0.0005	0.0008
38	0.2586	0.5321	2762	0.0001	0.0002	0.0003	0.0003	0.0003	0.0008
39	0.2598	0.5314	2740	0.0001	0.0002	0.0003	0.0003	0.0003	0.0007
40	0.2581	0.5317	2774	0.0001	0.0002	0.0005	0.0006	0.0009	0.0009
41	0.2587	0.5309	2765	0.0001	0.0002	0.0004	0.0006	0.0007	0.0010
42	0.2577	0.5331	2777	0.0002	0.0003	0.0005	0.0006	0.0009	0.0011
43	0.2583	0.5321	2767	0.0002	0.0003	0.0005	0.0006	0.0007	0.0010
44	0.2589	0.5319	2756	0.0001	0.0002	0.0004	0.0005	0.0008	0.0011
45	0.2623	0.5315	2688	0.0001	0.0002	0.0004	0.0004	0.0008	0.0011
46	0.2617	0.5321	2697	0.0001	0.0002	0.0004	0.0007	0.0010	0.0014
47	0.2590	0.5331	2750	0.0001	0.0002	0.0004	0.0008	0.0010	0.0012
48	0.2579	0.5331	2771	0.0001	0.0002	0.0003	0.0008	0.0011	0.0012
49	0.2613	0.5321							

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