





TEST REPORT

ACCORDING TO IES LM-80-2015
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-AM-2835HW-S1-08-HR5

Report Type: 9000 Hours Test Report		Product Type: LED Package	
Test Engineer:	Pote Wang 		
Report Number:	RSZ160329508-10-M1		
Test Date:	2016-03-31 to 2017-04-10		
Report Date:	2019-01-14		
Revised Note:	The previous report RSZ160329508-10 is replaced by this report on 2019-01-14		
Reviewed By:	Daniel Duan / EE Manager 		
Test Facility:	Test facility was located at No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China.		
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588		

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).
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1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integral Sphere	EVERFINE	Diameter 0.3m	1011119	0.3m	2017-03-09	2018-03-08
Programmable Test Power for LEDs	EVERFINE	LED300E	1008002	15V/2000mA	2017-03-03	2018-03-02
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2017-03-09	2018-03-08
Standard Light Source	EVERFINE	D062	1011093	3000K	2016-09-13	2017-09-12
Precision digital stabilized DC power supply	EVERFINE	WY605-V110	G115987CJ73 21114	300VA	2017-03-03	2018-03-02
Multilayer aging machine	BACL	B2-270	20015	25°C~130°C	2017-03-03	2018-03-02
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090008	(50/15A)	2016-07-07	2017-07-06
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11060002	(50/15A)	2016-07-07	2017-07-06
Digital CC&CV DC Power Supply	EVERFINE	WY5015	11090007	(50/15A)	2017-03-03	2018-03-02

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 ^{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

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 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, RH <65%.

1.6 Measurement Uncertainty

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 $U=21\text{K}$ ($K=2$), at the 95% confidence level.

The uncertainty of the temperature is $U=0.8671^{\circ}\text{C}$ ($K=2$), 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: 55°C, 60mA

Part Number: HL-AM-2835HW-S1-08-HR5
Number of Units: 30
Case Temperature: >53°C
Ambient Temperature: >50°C
Life Test Drive Current: 60mA
Measurement Current: 60mA

Data Set 2: 85°C, 60mA

Part Number: HL-AM-2835HW-S1-08-HR5
Number of Units: 30
Case Temperature: >83°C
Ambient Temperature: >80°C
Life Test Drive Current: 60mA
Measurement Current: 60mA

Data Set 3: 105°C, 60mA

Part Number: HL-AM-2835HW-S1-08-HR5
Number of Units: 30
Case Temperature: >103°C
Ambient Temperature: >100°C
Life Test Drive Current: 60mA
Measurement Current: 60mA

2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	Reported TM-21 L ₇₀ Lifetime
1	30	0	1000	9000	>54,000 hours
2	30	0	1000	9000	>54,000 hours
3	30	0	1000	9000	>54,000 hours

Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
1	100.31%	100.04%	99.93%	99.72%	99.51%	99.33%	99.10%	98.88%	98.70%
2	100.18%	99.77%	99.58%	99.28%	98.97%	98.66%	98.41%	98.14%	97.88%
3	100.11%	99.61%	99.33%	98.90%	98.50%	98.13%	97.79%	97.46%	97.13%

Average Color Maintenance

Data Set:	1000	2000	3000	4000	5000	6000	7000	8000	9000
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3 - Test Data

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

No.	0hr(Initial)	Lumen Maintenance (%)								
		1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	26.43	100.15	99.96	99.81	99.66	99.51	99.24	98.86	98.75	98.56
2	27.07	100.22	99.89	99.78	99.52	99.30	99.08	98.74	98.52	98.23
3	27.01	100.37	100.22	100.11	99.81	99.56	99.26	98.89	98.70	98.48
4	27.18	100.44	100.22	100.15	99.85	99.71	99.37	99.08	98.79	98.57
5	27.25	100.33	100.11	100.07	99.89	99.67	99.41	99.12	98.86	98.68
6	27.13	100.18	99.82	99.71	99.48	99.34	99.26	99.12	98.86	98.64
7	26.76	100.41	100.30	100.22	99.96	99.78	99.48	99.10	98.92	98.77
8	27.26	100.40	100.18	100.07	99.85	99.67	99.63	99.30	99.23	99.12
9	27.26	100.22	99.93	99.89	99.74	99.63	99.56	99.45	99.23	99.01
10	26.97	100.37	100.11	100.04	99.78	99.70	99.63	99.44	99.18	99.00
11	27.00	100.30	100.15	100.07	100.00	99.85	99.67	99.56	99.37	99.15
12	27.54	100.40	100.29	100.18	99.85	99.75	99.64	99.38	99.16	98.95
13	25.99	100.19	99.92	99.85	99.73	99.58	99.50	99.31	99.15	99.00
14	26.21	100.23	99.85	99.77	99.69	99.43	99.35	99.12	99.08	99.01
15	26.80	100.34	100.04	99.81	99.59	99.25	99.07	98.77	98.58	98.47
16	27.31	100.22	100.11	99.93	99.74	99.49	99.27	98.97	98.76	98.68
17	26.79	100.41	100.07	100.04	99.93	99.59	99.40	99.14	98.88	98.77
18	27.42	100.36	100.04	99.93	99.78	99.49	99.27	98.98	98.76	98.65
19	27.04	100.44	100.18	100.07	99.85	99.63	99.37	99.11	98.89	98.71
20	26.85	100.37	99.93	99.81	99.66	99.55	99.40	99.29	99.03	98.88
21	27.01	100.33	100.19	100.04	99.81	99.56	99.37	99.33	99.15	98.89
22	26.14	100.31	100.11	99.96	99.77	99.62	99.50	99.27	99.12	98.93
23	27.15	100.29	99.93	99.78	99.56	99.30	99.15	99.08	98.78	98.64
24	27.40	100.22	99.96	99.85	99.60	99.38	99.23	99.20	98.94	98.76
25	27.10	100.18	99.85	99.82	99.52	99.37	99.11	98.67	98.45	98.41
26	27.61	100.33	99.89	99.71	99.60	99.46	99.38	99.09	98.73	98.55
27	27.19	100.29	99.78	99.63	99.49	99.19	99.12	98.93	98.75	98.49
28	27.05	100.26	99.93	99.85	99.63	99.33	98.96	98.67	98.37	98.23
29	26.88	100.33	100.04	99.89	99.67	99.40	99.22	99.11	98.85	98.55
30	26.98	100.30	100.15	99.96	99.59	99.30	99.07	99.00	98.67	98.37
Ave.	26.99	100.31	100.04	99.93	99.72	99.51	99.33	99.10	98.88	98.70
Med.	27.05	100.32	100.04	99.91	99.74	99.53	99.36	99.11	98.86	98.68
st dev	0.3854	0.0834	0.1458	0.1536	0.1445	0.1710	0.1903	0.2290	0.2472	0.2504
Min.	25.99	100.15	99.78	99.63	99.48	99.19	98.96	98.67	98.37	98.23
Max.	27.61	100.44	100.30	100.22	100.00	99.85	99.67	99.56	99.37	99.15

TM-21 Projection:

Test Duration: 9,000 hours

Failures Observed: 0

2.079E-06

1.006

Reported L₇₀: >54000 hours

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

No.	Forward Voltage (V)									
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs
1	3.015	3.029	2.975	3.021	3.009	3.011	3.013	3.018	3.018	3.023
2	3.035	3.081	3.031	3.026	3.024	3.022	3.026	3.028	3.029	3.041
3	3.018	3.046	3.119	3.061	3.011	3.010	3.014	3.018	3.018	3.015
4	3.030	3.052	3.036	3.024	3.023	3.022	3.024	3.029	3.029	3.025
5	3.028	3.056	3.126	3.027	3.020	3.018	3.024	3.026	3.029	3.022
6	3.029	3.060	3.047	3.023	3.022	3.021	3.023	3.030	3.030	3.019
7	3.017	3.049	3.199	3.009	3.006	3.006	3.008	3.013	3.015	3.009
8	3.034	3.088	3.062	3.027	3.026	3.026	3.028	3.032	3.035	3.026
9	3.027	3.130	3.103	3.012	3.010	3.010	3.014	3.017	3.019	3.011
10	3.025	3.156	3.129	3.043	3.018	3.016	3.018	3.024	3.024	3.023
11	3.035	3.094	3.175	3.032	3.030	3.029	3.030	3.035	3.035	3.027
12	3.024	3.067	3.023	3.020	3.018	3.018	3.022	3.027	3.025	3.018
13	2.834	2.880	2.847	2.832	2.813	2.813	2.815	2.821	2.820	2.817
14	2.823	2.860	2.979	2.820	2.816	2.816	2.819	2.826	2.822	2.818
15	3.025	3.039	3.117	3.023	3.017	3.016	3.020	3.025	3.027	3.032
16	3.036	3.088	3.113	3.027	3.020	3.018	3.025	3.030	3.030	3.032
17	3.026	3.037	3.074	3.023	3.017	3.013	3.019	3.024	3.024	3.037
18	3.059	3.036	3.171	3.022	3.019	3.021	3.024	3.029	3.029	3.019
19	3.025	3.102	3.108	3.020	3.018	3.015	3.019	3.026	3.023	3.016
20	3.031	3.054	3.061	3.020	3.018	3.017	3.021	3.024	3.026	3.028
21	3.016	3.034	3.031	3.019	3.012	3.012	3.013	3.021	3.018	3.018
22	2.816	2.829	2.773	2.814	2.810	2.810	2.812	2.815	2.815	2.819
23	3.021	3.033	3.002	3.015	3.011	3.010	3.018	3.021	3.020	3.019
24	3.030	3.049	3.062	3.029	3.023	3.023	3.025	3.030	3.032	3.034
25	3.025	3.049	3.066	3.024	3.020	3.023	3.025	3.032	3.031	3.031
26	3.023	3.041	3.023	3.052	3.014	3.016	3.020	3.024	3.025	3.022
27	3.029	3.049	3.171	3.025	3.023	3.023	3.028	3.035	3.035	3.028
28	3.030	3.045	3.130	3.049	3.023	3.025	3.029	3.036	3.034	3.034
29	3.011	3.023	3.103	3.008	3.010	3.007	3.013	3.018	3.016	3.030
30	3.019	3.031	3.092	3.018	3.018	3.016	3.022	3.027	3.027	3.038
Ave.	3.007	3.040	3.065	3.006	2.997	2.997	3.000	3.005	3.005	3.004
Med.	3.025	3.049	3.070	3.023	3.018	3.016	3.021	3.026	3.026	3.023
st dev	0.0624	0.0694	0.0905	0.0634	0.0627	0.0626	0.0630	0.0629	0.0634	0.0637
Min.	2.816	2.829	2.773	2.814	2.810	2.810	2.812	2.815	2.815	2.817
Max.	3.059	3.156	3.199	3.061	3.030	3.029	3.030	3.036	3.035	3.041

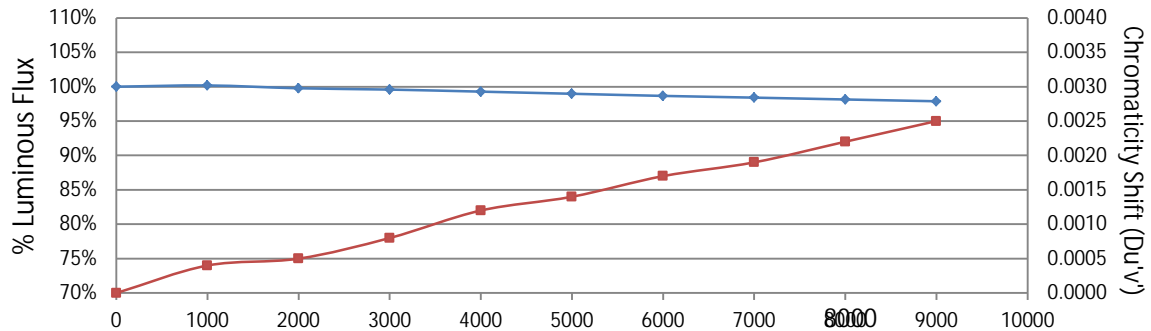
Bay Area Compliance Laboratories Corp. (Dongguan)

No.69, Pulongcun, Puxinhu

FINAL

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

No.			CCT(K)										
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	
31	0.2648	0.5272	2653	0.0003	0.0004	0.0005	0.0011	0.0014	0.0016	0.0017	0.0021	0.0023	
32	0.2605	0.5263	2747	0.0002	0.0004	0.0006	0.0010	0.0013	0.0016	0.0014	0.0021	0.0024	
33	0.2623	0.5277	2703	0.0003	0.0006	0.0007	0.0011	0.0015	0.0018	0.0019	0.0022	0.0025	
34	0.2646	0.5286	2652	0.0004	0.0005	0.0007	0.0011	0.0013	0.0016	0.0018	0.0022	0.0024	
35	0.2637	0.5268	2678	0.0004	0.0006	0.0009	0.0013	0.0015	0.0017	0.0017	0.0022	0.0025	
36	0.2594	0.5287	2761	0.0004	0.0005	0.0008	0.0013	0.0015	0.0017	0.0017	0.0022	0.0025	
37	0.2659	0.5288	2625	0.0004	0.0006	0.0010	0.0012	0.0014	0.0017	0.0019	0.0021	0.0024	
38	0.2640	0.5255	2677	0.0004	0.0004	0.0009	0.0011	0.0014	0.0017	0.0019	0.0022	0.0025	
39	0.2642	0.5266	2669	0.0004	0.0005	0.0009	0.0013	0.0015	0.0016	0.0020	0.0022	0.0024	
40	0.2613	0.5280	2723	0.0004	0.0005	0.0008	0.0012	0.0014	0.0016	0.0019	0.0021	0.0025	
41	0.2630	0.5273	2691	0.0004	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0022	0.0025	
42	0.2616	0.5261	2724	0.0004	0.0005	0.0009	0.0013	0.0015	0.0018	0.0021	0.0022	0.0026	
43	0.2618	0.5259	2721	0.0004	0.0006	0.0009	0.0013	0.0015	0.0018	0.0021	0.0022	0.0025	
44	0.2632	0.5284	2682	0.0003	0.0006	0.0009	0.0012	0.0014	0.0017	0.0020	0.0021	0.0025	
45	0.2631	0.5275	2687	0.0004	0.0005	0.0009	0.0013	0.0015	0.0017	0.0019	0.0022	0.0025	
46	0.2646	0.5294	2650	0.0004	0.0004	0.0008	0.0012	0.0015	0.0016	0.0019	0.0021	0.0024	
47	0.2611	0.5257	2736	0.0004	0.0006	0.0008	0.0012	0.0015	0.0017	0.0019	0.0022	0.0025	
48	0.2630	0.5281	2687	0.0004	0.0006	0.0009	0.0013	0.0015	0.0017	0.0020	0.0022	0.0026	
49	0.2619	0.5278	2710	0.0004	0.0005	0.0008	0.0013	0.0015	0.0017	0.0019	0.0022	0.0024	
50	0.2662	0.5276	2625	0.0003	0.0004	0.0008	0.0011	0.0014	0.0016	0.0019	0.0021	0.0024	
51	0.2603	0.5261	2751	0.0004	0.0005	0.0008	0.0014	0.0016	0.0018	0.0020	0.0022	0.0025	
52	0.2665	0.5285	2615	0.0004	0.0006	0.0009	0.0013	0.0015	0.0017	0.0021	0.0022	0.0025	
53	0.2627	0.5261	2702	0.0004	0.0006	0.0009	0.0014	0.0015	0.0018	0.0022	0.0023	0.0026	
54	0.2612	0.5260	2733	0.0005	0.0007	0.0009	0.0014	0.0016	0.0017	0.0022	0.0023	0.0026	
55	0.2632	0.5294	2678	0.0004	0.0004	0.0009	0.0012	0.0015	0.0017	0.0018	0.0021	0.0024	
56	0.2604	0.5265	2747	0.0004	0.0005	0.0008	0.0012	0.0014	0.0016	0.0020	0.0021	0.0025	
57	0.2637	0.5285	2671	0.0004	0.0005	0.0009	0.0012	0.0015	0.0017	0.0019	0.0022	0.0025	
58	0.2625	0.5273	2701	0.0003	0.0004	0.0008	0.0012	0.0014	0.0016	0.0019	0.0022	0.0024	
59	0.2603	0.5267	2748	0.0004	0.0005	0.0008	0.0012	0.0012	0.0017	0.0019	0.0021	0.0025	
60	0.2610	0.5276	2731	0.0004	0.0005	0.0009	0.0013	0.0015	0.0018	0.0021	0.0022	0.0026	
Ave.	0.2627	0.5274	2696	0.0004	0.0005	0.0008	0.0012	0.0014	0.0017	0.0019	0.0022	0.0025	
Med.	0.2629	0.5274	2696	0.0004	0.0005	0.0009	0.0012	0.0015	0.0017	0.0019	0.0022	0.0025	
st dev	0.0019	0.0011	40.2937	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Min.	0.2594	0.5255	2615	0.0002	0.0004	0.0005	0.0010	0.0012	0.0016	0.0014	0.0021	0.0023	
Max.	0.2665	0.5294	2761	0.0005	0.0007	0.0010	0.0014	0.0016	0.0018	0.0022	0.0023	0.0026	



3.9 Data Set 3, 105°C, 60mA (Chromaticity Shift)

No.			CCT(K)										
	Ohr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs	7000hrs	8000hrs	9000hrs	
61	0.2585	0.5251	2794	0.0004	0.0006	0.0009	0.0015	0.0017	0.0020	0.0021	0.0025	0.0028	
62	0.2629	0.5281	2688	0.0006	0.0006	0.0009	0.0014	0.0016	0.0020	0.0020	0.0025	0.0027	
63	0.2640	0.5274	2669	0.0004	0.0005	0.0009	0.0014	0.0016	0.0019	0.0021	0.0024	0.0027	
64	0.2650	0.5280	2647	0.0004	0.0006	0.0008	0.0013	0.0016	0.0017	0.0020	0.0022	0.0026	
65	0.2632	0.5287	2681	0.0004	0.0007	0.0008	0.0014	0.0016	0.0018	0.0020	0.0023	0.0026	
66	0.2623	0.5251	2713	0.0004	0.0007	0.0009	0.0014	0.0017	0.0018	0.0020	0.0024	0.0027	
67	0.2631	0.5270	2689	0.0005	0.0008	0.0009	0.0015	0.0018	0.0019	0.0022	0.0025	0.0028	
68	0.2672	0.5282	2603	0.0005	0.0008	0.0011	0.0013	0.0017	0.0019	0.0020	0.0023	0.0026	
69	0.2639	0.5283	2667	0.0004	0.0007	0.0009	0.0013	0.0016	0.0018	0.0020	0.0023	0.0026	
70	0.2641	0.5265	2671	0.0005	0.0006	0.0009	0.0013	0.0016	0.0018	0.0020	0.0022	0.0027	
71	0.2606	0.5240	2754	0.0005	0.0008	0.0009	0.0014	0.0017	0.0019	0.0021	0.0023	0.0027	
72	0.2591	0.5272	2773	0.0005	0.0007	0.0009	0.0014	0.0016	0.0019	0.0020	0.0026	0.0030	
73	0.2627	0.5265	2699	0.0005	0.0008	0.0010	0.0014	0.0016	0.0018	0.0021	0.0025	0.0027	
74	0.2645	0.5265	2662	0.0005	0.0007	0.0010	0.0013	0.0016	0.0018	0.0020	0.0022	0.0026	
75	0.2661	0.5280	2625	0.0005	0.0009	0.0011	0.0015	0.0018	0.0020	0.0022	0.0024	0.0028	
76	0.2646	0.5263	2662	0.0005	0.0006	0.0009	0.0013	0.0016	0.0019	0.0022	0.0023	0.0026	
77	0.2621	0.5260	2714	0.0004	0.0004	0.0009	0.0012	0.0016	0.0018	0.0021	0.0023	0.0025	
78	0.2635	0.5268	2681	0.0004	0.0005	0.0008	0.0012	0.0015	0.0017	0.0019	0.0022	0.0025	
79	0.2604	0.5259	2750	0.0005	0.0007	0.0009	0.0013	0.0016	0.0018	0.0021	0.0023	0.0026	
80	0.2643	0.5267	2666	0.0005	0.0008	0.0011	0.0013	0.0016	0.0019	0.0023	0.0024	0.0026	
81	0.2621	0.5232	2725	0.0005	0.0007	0.0009	0.0013	0.0016	0.0019	0.0020	0.0023	0.0027	
82	0.2653	0.5286	2639	0.0005	0.0006	0.0009	0.0013	0.0016	0.0018	0.0019	0.0022	0.0026	
83	0.2657	0.5278	2633	0.0006	0.0007	0.0010	0.0014	0.0017	0.0019	0.0021	0.0023	0.0026	
84	0.2644	0.5264	2665	0.0005	0.0008	0.0010	0.0015	0.0016	0.0019	0.0022	0.0022	0.0026	
85	0.2609	0.5282	2731	0.0005	0.0007	0.0011	0.0015	0.0016	0.0019	0.0021	0.0022	0.0026	
86	0.2603	0.5275	2745	0.0004	0.0005	0.0009	0.0012	0.0016	0.0018	0.0020	0.0024	0.0026	
87	0.2635	0.5268	2682	0.0005	0.0008	0.0011	0.0015	0.0017	0.0020	0.0022	0.0024	0.0027	

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4.3 Report Revision

Report Number	Report Date	Contents
RSZ160329508-10	2017-05-05	Original report.
RSZ160329508-10-M1	2019-01-14	Update the Logo of lab on the Page1 Update Company name and address on page 1.

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