



Photometric Test Report

Relevant Standards

- ☒ IES LM-79-2008
- ☒ ANSI C82.77-10-2014
- ☒ UL1598-2008

Prepared For

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Catalog Number

HBEL-2FT-162-40-F-XX

Project Number

4788965897

Report Number

4788965897_1a

Test Date

1/12/2018

Issue Date

4/16/2019

Revision Date

N/A

Prepared By

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Approved By

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The results contained in this report pertain only to the tested sample.

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1.0 Test Summary

☒ DLC Technical Requirements v4.2- issued 2017-04-28

Requirement Category	Test Method	Requirements	Test value	Results (Fail/Pass)
Minimum Light Output (lm)	IES LM-79-2008	10000	20517.60	Pass
Minimum Bare Lamp Output (lm)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (0-180°)	IES LM-79-2008	N/A	N/A	N/A
Spacing Criteria (90-270°)	IES LM-79-2008	N/A	N/A	N/A
Zonal Lumen Requirement 1 (20°-50°)	IES LM-79-2008	30%	53.1%	Pass
Zonal Lumen Requirement 2	IES LM-79-2008	N/A	N/A	N/A
Minimum Luminaire Efficacy (lm/W)	IES LM-79-2008	126.1	129.74	Pass
Minimum Bare Lamp Efficacy (lm/W)	IES LM-79-2008	N/A	N/A	N/A
Allowable CCTs* (K)	IES LM-79-2008 ANSI C78.377-2015	5029±283	5077	Pass
Minimum CRI	IES LM-79-2008 CIE 13.3-1995	≥70	83.13	Pass
L70 Lumen maintenance (hours)	IES TM-21-2011	≥50000	≥50000	Pass
L90 Lumen maintenance (hours)	IES TM-21-2011	≥36000	≥36000	Pass
Power Factor	ANSI C82.77-10-2014	≥0.9	0.9675	Pass
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	9.53%	Pass
In-Situ Temperature Measurement Test for LED (°C)	UL1598-2008	≤105	76.1	Pass
In-Situ Temperature Measurement Test for Driver (°C)	UL1598-2008	≤90	45.8	Pass
Minimum Luminaire Warranty (years)	N/A	5	5	Pass



2.0 Test List

Test Item	Test	Test Date	Model Number	Tests Conducted By
1	Integrating Sphere Test for the Lower CCT	1/12/2018	HBEL-2FT-162-40-F-XX	Blaire Xiong
2	Integrating Sphere Test for the Higher CCT	1/12/2018	HBEL-2FT-162-50-F-XX	Blaire Xiong
3	Goniophotometer Test	1/12/2018	HBEL-2FT-162-40-F-XX	Blaire Xiong
4	THD and PF Test	1/12/2018	HBEL-2FT-162-40-F-XX	Blaire Xiong
5	In-Situ Temperature Measurement Test	1/12/2018	HBEL-2FT-162-40-F-XX	Blaire Xiong

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.



3.0 Production Description

Luminaire Description: High-bay Luminares for Commercial and Industrial Buildings **Model Number:** HBEL-2FT-162-40-F-XX

Rated Voltage: 120-277V

Frequency: 50/60Hz

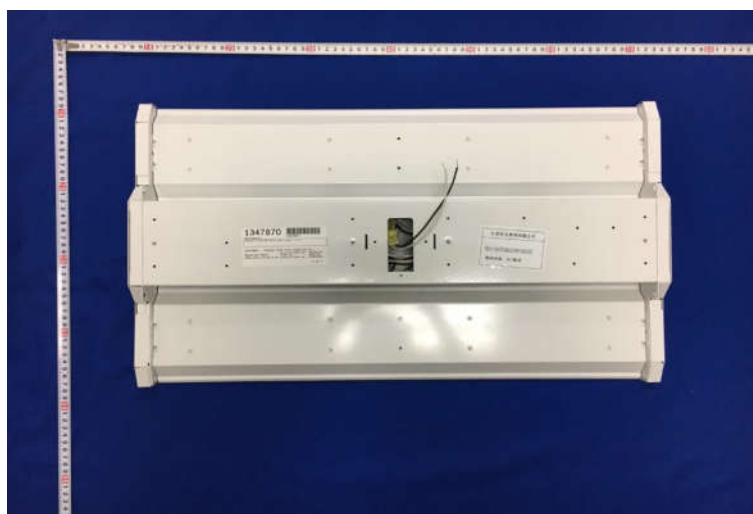
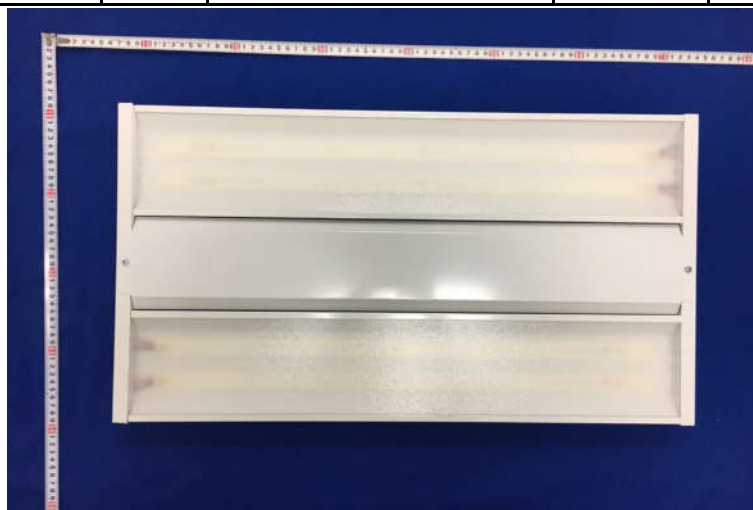
LED Package: STW8A2PD-XX

Family Model and Variation: HBEL-2FT-162-50-F-XX

Remark:

Photos of Luminaire Characteristics

Model Number	CCT (K)	Light Output (lm)	Power (W)	Luminous Efficacy (lm/W)
HBEL-2FT-162-40-F-XX	4000	21060	162	130
HBEL-2FT-162-50-F-XX	5000	21222	162	131





4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test for the lower CCT

Model No.	HBEL-2FT-162-40-F-XX	Sample ID.	1347869
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

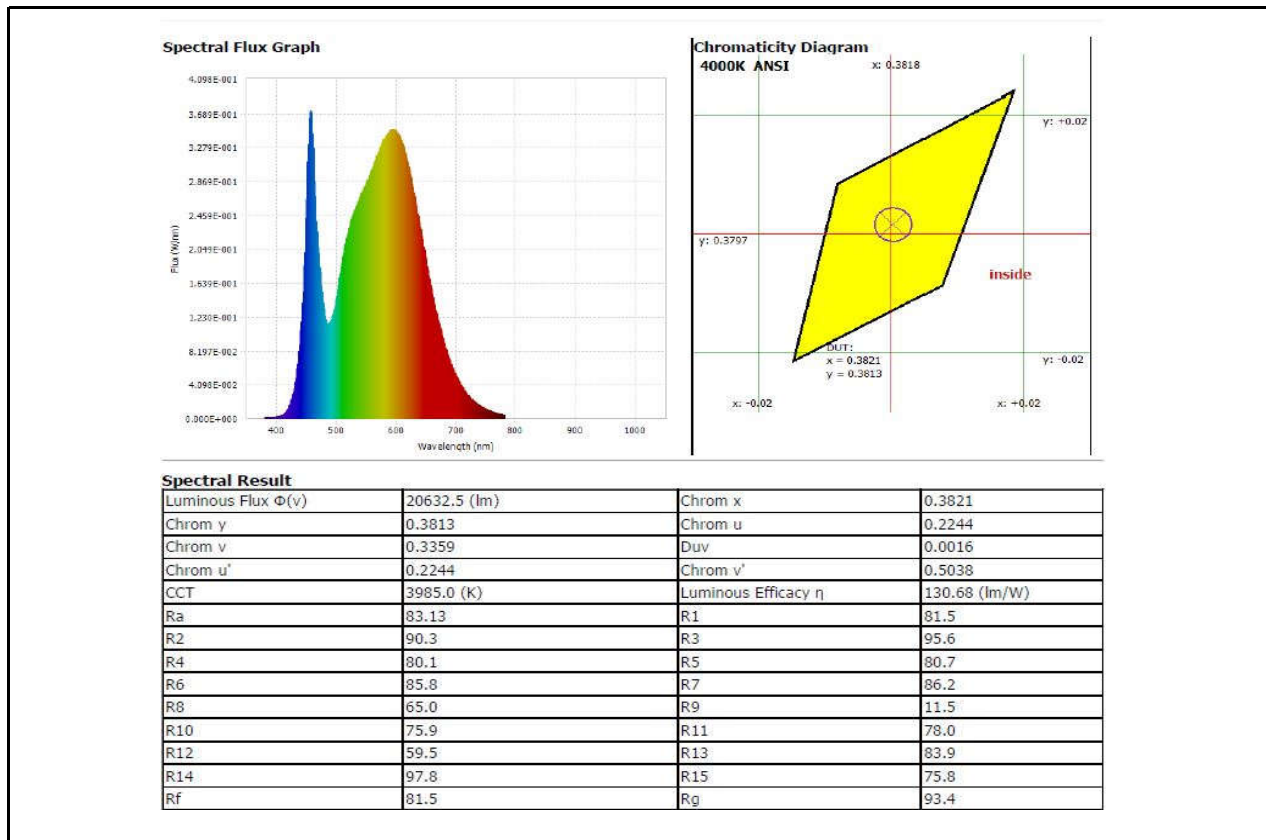
- 1.The sample was tested according to the IES LM-79-2008.
- 2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.The reference standard lamp is rated current 2.6A omni-directional Incandescent lamp and was calibrated by china seprei laboratory.
- 3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%.Photometric measurement conditions was using 4π geometry.The self-absorption factor is applied in the final test result.The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.2	120.05	60	1.3217	157.88	0.9951	8.00%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
3985	83.13	0.0016	20632.5	130.68	N/A





4.0 LM-79 Measurement and Test Results

4.2 Integrating Sphere Test for the higher CCT

Model No.	HBEL-2FT-162-50-F-XX	Sample ID.	1347870
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

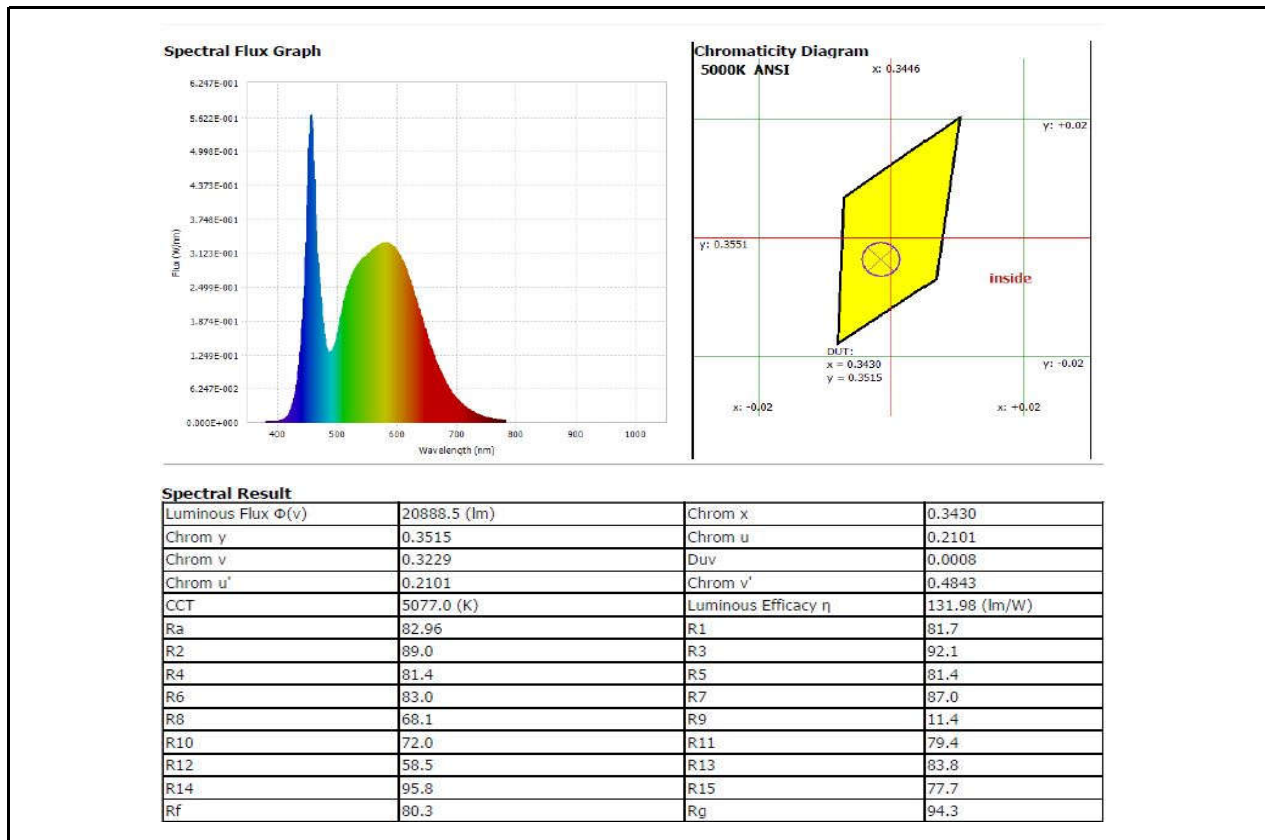
- 1.The sample was tested according to the IES LM-79-2008.
- 2.Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.The reference standard lamp is rated current 2.6A omni-directional Incandescent lamp and was calibrated by china seprei laboratory.
- 3.The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%.Photometric measurement conditions was using 4π geometry.The self-absorption factor is applied in the final test result.The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.2	120.04	60	1.3256	158.27	0.9947	8.40%

Test Results

CCT (K)	CRI (Ra)	Duv	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Luminous Efficacy (lm/ft)
5077	82.96	0.0008	20888.5	131.98	N/A





5.0 LM-79 Measurement and Test Results

Model No.	HBEL-2FT-162-40-F-XX			Sample ID.	1347869
Opreate time (Min.)		90		Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008.
- 2.Photometric paramters were measured using a type C goniophotometer and software.
- 3.The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample.The reference standard lamp is rated current 3.865A omni-directional Incandescent lamp and was calibrated by china seprei laboratory.
- 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals..Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.1	119.98	60	1.3247	158.15	0.9950	7.91%	Horizontal

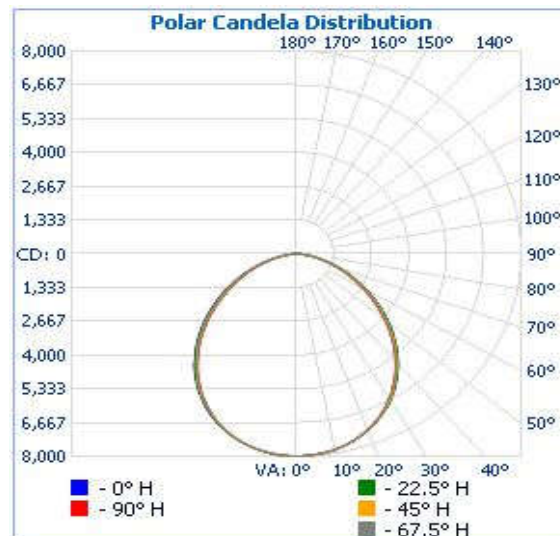
Test Result

Flux (lm)	Zonal Lumen Requirement 1 (20°-50°)	Zonal Lumen Requirement 2	Field Angle (10%)		Beam Angle (50%)		Luminous Efficacy (lm/W)
			Horizontal Spread	Vertical Spread	Horizontal Spread	Vertical Spread	
20517.6	53.1%	N/A	153.4	155.5	101.8	104.8	129.74
SC	SC						
0~180°	90°~270°						
N/A	N/A						

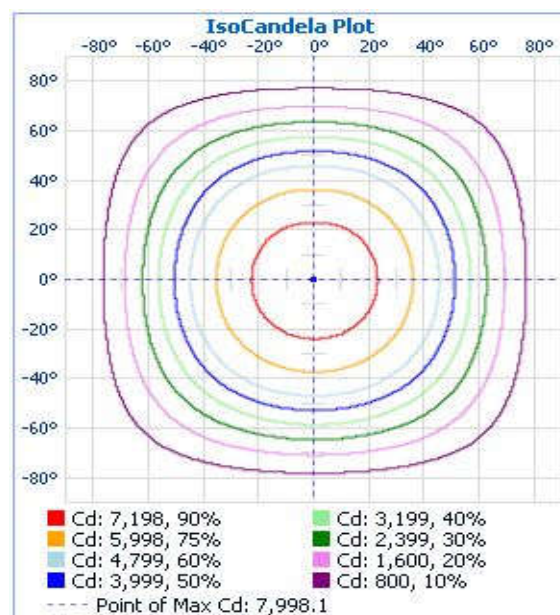


5.0 Goniophotometer Test (Cont'd)

Light Distribution Curve



IsoCandela Plot





5.0 Goniophotometer Test (Cont'd)
Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	6,173.6	30.1%
0-40	10,008.1	48.8%
0-60	16,951.5	82.6%
60-90	3,515.6	17.1%
70-100	1,355.6	6.6%
90-120	17.5	0.1%
0-90	20,467.1	99.8%
90-180	48.2	0.2%
0-180	20,515.3	100%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-5	190.6	0.9%	90-95	7.6	0%
5-10	565.5	2.8%	95-100	2.5	0%
10-15	920.6	4.5%	100-105	2.1	0%
15-20	1,242.9	6.1%	105-110	1.8	0%
20-25	1,519.1	7.4%	110-115	1.7	0%
25-30	1,734.9	8.5%	115-120	1.8	0%
30-35	1,882.8	9.2%	120-125	2.0	0%
35-40	1,951.7	9.5%	125-130	2.4	0%
40-45	1,939.6	9.5%	130-135	2.9	0%
45-50	1,848.3	9.0%	135-140	3.2	0%
50-55	1,686.2	8.2%	140-145	3.4	0%
55-60	1,469.2	7.2%	145-150	3.4	0%
60-65	1,219.4	5.9%	150-155	3.3	0%
65-70	950.7	4.6%	155-160	3.1	0%
70-75	677.7	3.3%	160-165	2.7	0%
75-80	418.9	2.0%	165-170	2.2	0%
80-85	198.0	1.0%	170-175	1.5	0%
85-90	50.8	0.2%	175-180	0.5	0%



5.0 Goniophotometer Test (Cont'd)
Intensity Data(cd)

	0	22.5	45	67.5	90	113	135	158	180	203	225	247.5	270	293	315	338	360
0	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998	7998
1	7992	7993	7991	7998	7993	7992	7979	7987	7995	7987	7979	7992	7993	7998	7991	7993	7992
2	7977	7981	7978	7993	7986	7986	7978	7984	7982	7984	7978	7986	7986	7993	7978	7981	7977
3	7967	7984	7972	7987	7986	7991	7973	7973	7986	7973	7973	7991	7986	7987	7972	7984	7967
4	7948	7963	7965	7982	7967	7972	7966	7966	7966	7966	7966	7972	7967	7982	7965	7963	7948
5	7947	7952	7956	7957	7956	7964	7956	7953	7962	7953	7956	7964	7956	7957	7956	7952	7947
6	7934	7933	7938	7954	7948	7942	7938	7941	7939	7941	7938	7942	7948	7954	7938	7933	7934
7	7921	7927	7922	7928	7924	7922	7911	7929	7921	7929	7911	7922	7924	7928	7922	7927	7921
8	7893	7906	7900	7903	7900	7909	7895	7898	7900	7898	7895	7909	7900	7903	7900	7906	7893
9	7876	7886	7874	7880	7877	7875	7874	7883	7873	7883	7874	7875	7877	7880	7874	7886	7876
10	7858	7858	7848	7846	7849	7854	7843	7847	7849	7847	7843	7854	7849	7846	7848	7858	7858
11	7816	7816	7820	7820	7818	7818	7815	7824	7819	7824	7815	7818	7818	7820	7820	7816	7816
12	7769	7788	7774	7789	7788	7776	7786	7789	7782	7789	7786	7776	7788	7789	7774	7788	7769
13	7766	7759	7749	7750	7753	7754	7750	7757	7751	7757	7750	7754	7753	7750	7749	7759	7766
14	7709	7713	7713	7710	7715	7712	7704	7715	7708	7715	7704	7712	7715	7710	7713	7713	7709
15	7675	7685	7662	7672	7666	7672	7660	7674	7673	7674	7660	7672	7666	7672	7662	7685	7675
16	7614	7637	7632	7624	7627	7622	7625	7628	7617	7628	7625	7622	7627	7624	7632	7637	7614
17	7576	7580	7575	7575	7568	7578	7565	7586	7576	7586	7565	7578	7568	7575	7575	7580	7576
18	7512	7538	7521	7513	7504	7520	7518	7545	7524	7545	7518	7520	7504	7513	7521	7538	7512
19	7457	7483	7466	7463	7452	7454	7464	7487	7493	7487	7464	7454	7452	7463	7466	7483	7457
20	7401	7433	7408	7408	7400	7394	7406	7426	7426	7426	7406	7394	7400	7408	7408	7433	7401
25	7075	7087	7078	7054	7045	7041	7065	7096	7109	7096	7065	7041	7045	7054	7078	7087	7075
30	6682	6682	6648	6614	6599	6613	6632	6679	6687	6679	6632	6613	6599	6614	6648	6682	6682
35	6170	6190	6149	6103	6075	6095	6136	6199	6197	6199	6136	6095	6075	6103	6149	6190	6170
40	5618	5627	5572	5504	5473	5497	5549	5628	5659	5628	5549	5497	5473	5504	5572	5627	5618
45	4982	4986	4930	4848	4822	4843	4917	4991	5022	4991	4917	4843	4822	4848	4930	4986	4982
50	4301	4311	4245	4155	4126	4160	4231	4311	4343	4311	4231	4160	4126	4155	4245	4311	4301
55	3611	3618	3540	3450	3407	3444	3532	3607	3658	3607	3532	3444	3407	3450	3540	3618	3611
60	2918	2927	2853	2761	2719	2759	2841	2921	2965	2921	2841	2759	2719	2761	2853	2927	2918
65	2261	2267	2197	2115	2076	2113	2191	2258	2305	2258	2191	2113	2076	2115	2197	2267	2261
70	1636	1647	1587	1517	1485	1515	1578	1638	1679	1638	1578	1515	1485	1517	1587	1647	1636
75	1067	1082	1034	984	958	980	1026	1069	1106	1069	1026	980	958	984	1034	1082	1067
80	568	590	563	535	519	530	550	574	598	574	550	530	519	535	563	590	568
85	189	208	202	192	186	191	195	200	210	200	195	191	186	192	202	208	189
90	4	129	128	96	102	74	15	116	94	116	15	74	102	96	128	129	4
95	5	4	6	4	4	5	6	6	6	6	6	5	4	4	6	4	5
100	4	4	3	4	5	3	6	6	6	6	6	3	5	4	3	4	4
105	3	3	4	4	4	2	4	5	6	5	4	2	4	4	4	3	3
110	3	3	3	4	2	3	3	4	4	4	3	3	2	4	3	3	3
115	3	4	3	5	4	4	4	3	2	3	4	4	4	5	3	4	3
120	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3
125	3	4	4	5	6	5	6	5	5	5	6	5	6	5	4	4	3
130	5	7	6	7	6	6	6	7	6	7	6	6	6	7	6	7	5
135	6	8	9	7	8	7	9	7	8	7	9	7	8	7	9	8	6
140	7	11	9	10	10	9	9	9	8	9	9	9	10	10	9	11	7
145	9	11	10	11	11	11	11	10	11	10	11	11	11	11	10	11	9
150	12	12	12	11	12	12	12	12	11	12	12	12	12	11	12	12	12
155	14	14	15	15	14	13	15	13	12	13	15	13	14	15	15	14	14
160	16	16	16	16	16	16	16	15	14	15	16	16	16	16	16	16	16
165	18	19	17	18	18	17	17	18	15	18	17	17	18	18	17	19	18
170	20	20	21	22	21	21	19	19	18	19	19	21	21	22	21	20	20
175	23	22	21	23	23	23	22	23	23	23	22	23	23	23	21	22	23
180	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23



6.0 THD and PF Test

Model No.	HBEL-2FT-162-40-F-XX	Sample ID.	1347869
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Test Method

1. The samples were tested according to the ANSI C82.77-2002.
2. The ambient temperature condition was maintained at 25° C ± 1° C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD
25.1	277.04	60	0.5747	153.99	0.9675	9.53%



7.0 In-Situ Temperature Measurement Test

Model No.	HBEL-2FT-162-40-F-XX	Sample ID.	1347869
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Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. The temperature was recorded after the lamp was operated by 3.5 hours in stability or by 7.5 hours.

In-Situ Temperature Measurement Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
25.3	119.98	60	1.3247	158.150	0.9950	Horizontal

Test Results(LED)

Thermocouple Location	Manufacturer Declared Current (mA)	Temperature for Lighting source ($^{\circ}\text{C}$)		LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp ($^{\circ}\text{C}$)
		Test Result Column	Test Result (Correct to 25°C)			
TMP of LEDs	100	76.4	76.1	STW8A2PD-XX	200	105
Ambient Temperature	N/A	25.3	25.0			

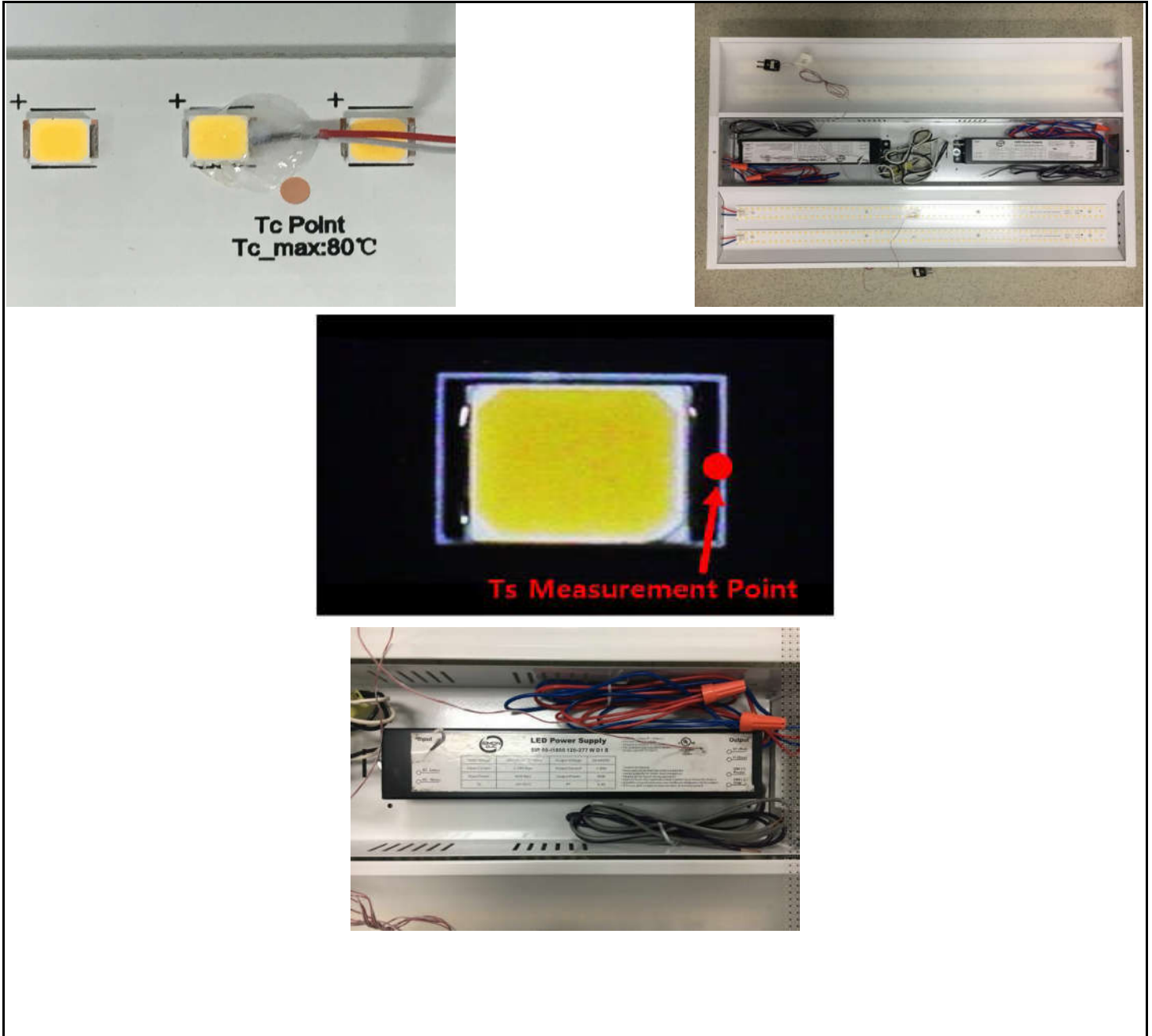
Test Results(Driver)

Thermocouple Location	Temperature for Driver ($^{\circ}\text{C}$)		Driver Model Number	Driver Limit Temp ($^{\circ}\text{C}$)
	Test result Column	Test result (Correct to 25°C)		
TMP of Driver	46.1	45.8	SIP80-I1800 120-277 W D1 S	90
Ambient Temperature	25.3	25.0		



7.0 In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of LED Packages & Tc Point of Driver





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