LM-79-08 Test Report

For

Beyond LED Technology

(Brand Name: Beyond LED Technology)

Internal Driver/Line Voltage (UL Type B) Lamps

Model name(s): ZS-T8-60P8FT-FA8-FT(5000K)
Remark: XXXX could be 3000/3500/4000/4500/5000, refers to CCT.

Representative (Tested) Model:
ZS-T8-60P8FT-FA8-FT(5000K)
ZS-T8-60P8FT-FA8-FT(5000K)
ZS-T8-60P8FT-FA8-FT(5000K)

Model Difference: All construction and rating are the same, except CCT

Test & Report By:

Garman Mo

Engineer: Garman Mo

Review By:

Manager: John Li

Date: Dec.06,2018

Note: 1.The results contained in this report pertain only to the tested samples.
2.This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

1.1 Product Information:

Organization Name	Beyond LED Technology	
Brand Name	Beyond LED Technology	
Model Number	ZS-T8-60P8FT-FA8-FT(5000K)	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	Internal Driver/Line Voltage (UL Type B) Lamps	
Rated Voltage / Frequency	100-277 Vac, 50/60 Hz	
Nominal Power	60W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,4500K,5000K	
LED Manufacturer	Hongli Zhihui Group Co.,Ltd.	
LED Model	HL-AM-2835HW-S1-08-HR3	
Sample Number	JBE181111-A1,A2(3000K),A3(5000K),A4,A5(1.2m,3000K)	
Lamp Length	2400	mm
Lamp Width	--	mm
Number of Units (modular products)	N/A	s

Photo

1.2 Test Specifications:

Date of Receipt	Nov.29, 2018
Date of Test	Nov.30, 2018
Test item	1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products 2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Color Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	QD25

1.3 Test Methods

1) Photometric and Light Distribution Measurement – Goniophotometer Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals.

2) Chromaticity Measurement – Sphere-Spectroradiometer Method:

Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.

3) Electrical Measurements:

Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25º C ± 1º C. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

2.1 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2018-11-30	Test Ambient:	25.2 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	ZS-T8-60P8FT-FA8-FT(5000K) Connected to line voltage		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JBE181111-A1	120.0	60	0.5240	60.71	0.9654	22.81
	277.0	60	0.2429	61.08	0.9078	22.65
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement for Bare-lamp - Sphere-Spectroradiometer Method:

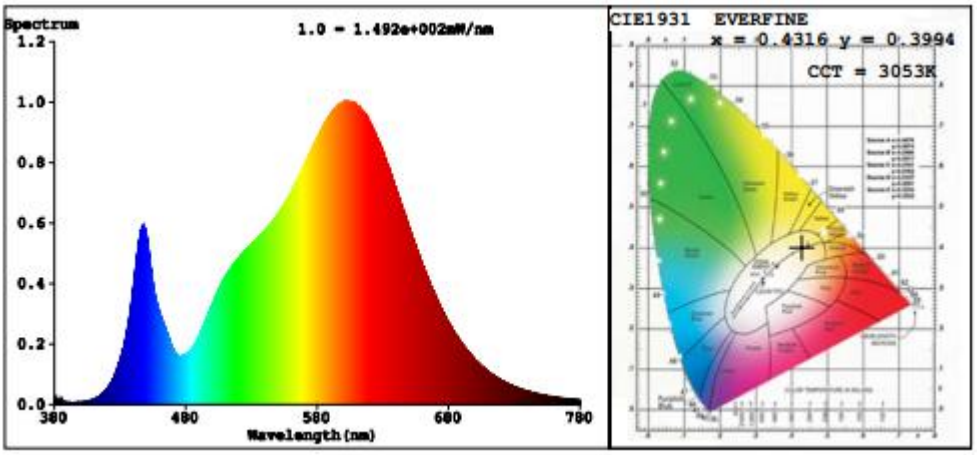
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3053
Duv	-0.0011
Chromaticity (x, y)	x=0.4316 y=0.3994
Chromaticity (u', v')	u'=0.2492 v'=0.5187
Color Rendering Index (CRI)	82.5
R9	7

Special Color Rendering Indices			
R1	81	R9	7
R2	90	R10	76
R3	96	R11	81
R4	81	R12	72
R5	81	R13	83
R6	87	R14	98
R7	83	R15	74
R8	60	--	--

Photometric Measurement for Bare-lamp –Sphere-Spectroradiometer Method:

Parameter	Result		DLC V4.4 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	8103	8074	Bare Lamp: >= 3200(-10%)
Luminous Efficacy (lm/W)	133.47	132.19	Bare lamp: >= 110(-3%)
Most worst Luminous/Highest Watts	132.19		

Spectral Power Distribution & Chromaticity Diagram



2.2 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2018-11-30	Test Ambient:	25.2 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	ZS-T8-60P8FT-FA8-FT(5000K) Connected to line voltage		

Electrical Measurement for 2-lamp in Lithonia C 2 32 MV:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JBE181111-A4,A5	120.0	60	0.5063	58.47	0.9623	22.92
	277.0	60	0.2366	59.18	0.9031	21.12
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement for 2-lamp in Lithonia C 2 32 MV - Sphere-Spectroradiometer Method:

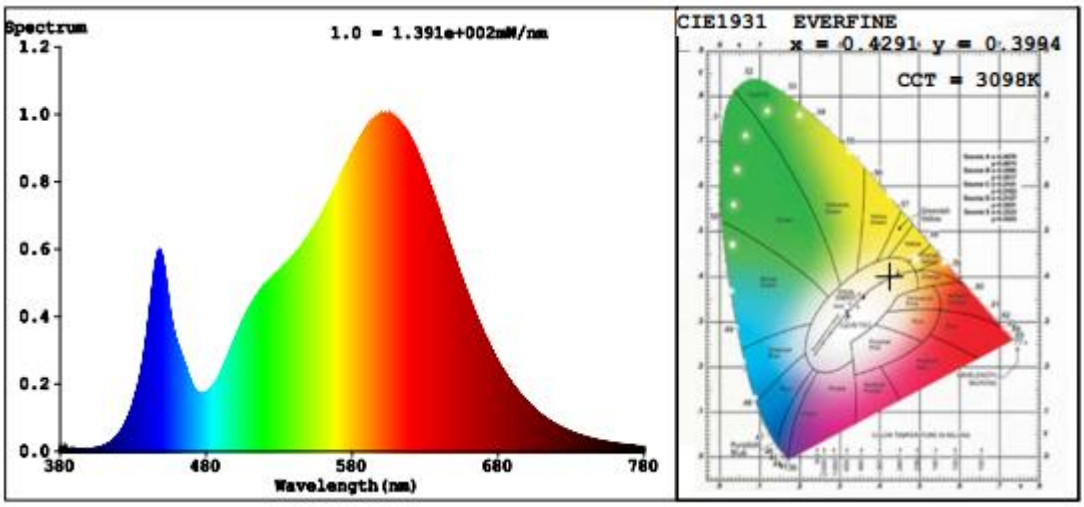
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3098
Duv	-0.0008
Chromaticity (x, y)	x=0.4291 y=0.3994
Chromaticity (u', v')	u'=0.2475 v'=0.5183
Color Rendering Index (CRI)	82.5
R9	7
Total Luminous (lm)	7692
Luminous Efficacy (lm/W)	128.61

Special Color Rendering Indices			
R1	81	R9	7
R2	90	R10	76
R3	96	R11	81
R4	81	R12	71
R5	81	R13	83
R6	87	R14	98
R7	83	R15	74
R8	60	--	--

Photometric Measurement 2-lamp in Lithonia C 2 32 MV – Goniophotometer Method:

Parameter	Result		DLC V4.4 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	7185.7	7172.1	In luminaire (2 lamps): >= 3000(-10%)
Luminous Efficacy (lm/W)	122.90	121.19	In luminaire: >= 100(-3%)
Most worst Luminous/Highest Watts	121.19		
Zonal lumens in the 0-60° zone (%)	78.9	--	>= 40(-3)

Spectral Power Distribution & Chromaticity Diagram



2.3 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2018-11-30	Test Ambient:	25.2 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	ZS-T8-60P8FT-FA8-FT(5000K) Connected to line voltage		

Electrical Measurement for 2-lamp in Lithonia C 2 96T8 MVOLT GEB10IS:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JBE181111-A1,A2	120.0	60	1.036	119.5	0.9611	23.64
	277.0	60	0.4836	121.0	0.9032	23.51
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement for 2-lamp in Lithonia C 2 96T8 MVOLT GEB10IS - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3071
Duv	-0.0013
Chromaticity (x, y)	x=0.4302 y=0.3985
Chromaticity (u', v')	u'=0.2486 v'=0.5182
Color Rendering Index (CRI)	82.8
R9	9
Total Luminous (lm)	15703
Luminous Efficacy (lm/W)	128.50

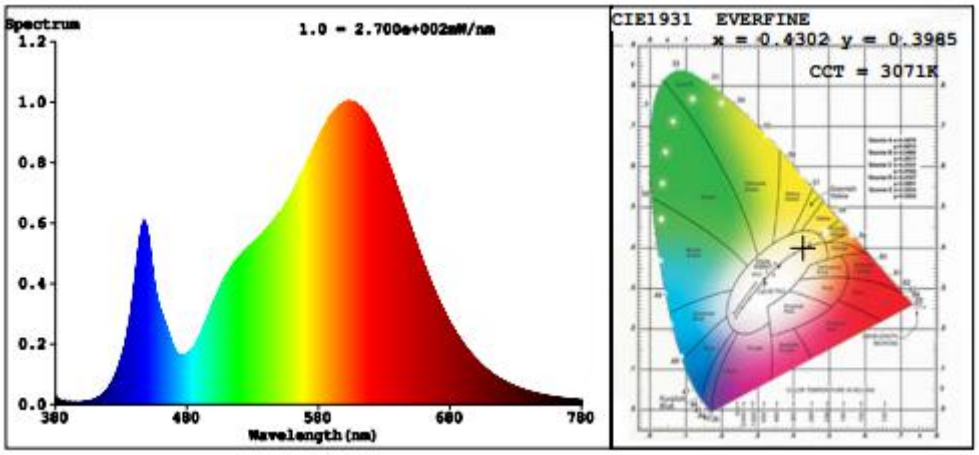
Special Color Rendering Indices			
R1	81	R9	9
R2	90	R10	77
R3	96	R11	82
R4	82	R12	72
R5	82	R13	83
R6	87	R14	98
R7	84	R15	74
R8	61	--	--

Photometric Measurement 2-lamp in Lithonia C 2 96T8 MVOLT GEB10IS – Goniophotometer Method:

Parameter	Result	DLC V4.4 Pass Criteria
Test Voltage (V)	120.0	--
Frequency (Hz)	60	
Total Luminous (lm)	14689**	In luminaire (2 lamps): >= 6000(-10%)
Luminous Efficacy (lm/W)	122.92	In luminaire: >= 100(-3%)
Beam Angle (°)	113.8	--
Center Beam Candle Power (cd)	5181	--

**The calculation method is on page 15.

Spectral Power Distribution & Chromaticity Diagram

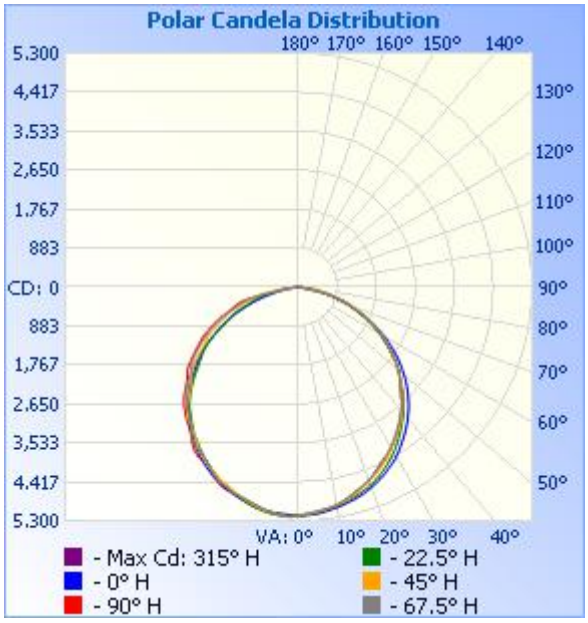


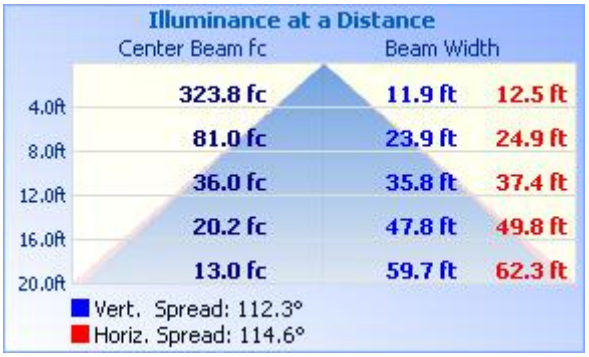
Zonal Lumen Tabulation

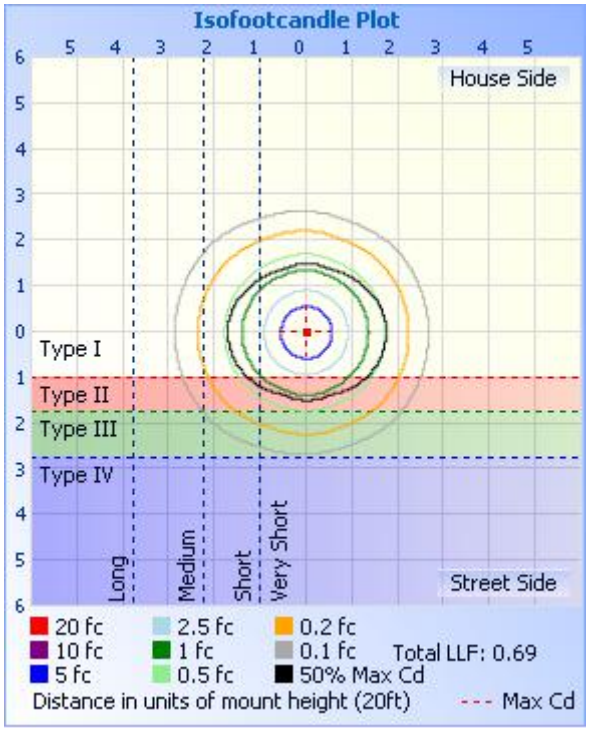
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	3,984.0	27.1%
0-40	6,529.8	44.5%
0-60	11,595.0	78.9%
60-90	3,001.1	20.4%
70-100	1,194.8	8.1%
90-120	55.2	0.4%
0-90	14,596.0	99.4%
90-180	91.5	0.6%
0-180	14,687.5	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	488.4	3.3%	90-100	30.2	0.2%
10-20	1,389.9	9.5%	100-110	13.4	0.1%
20-30	2,105.8	14.3%	110-120	11.5	0.1%
30-40	2,545.7	17.3%	120-130	9.9	0.1%
40-50	2,655.8	18.1%	130-140	8.4	0.1%
50-60	2,409.4	16.4%	140-150	7.1	0%
60-70	1,836.4	12.5%	150-160	5.5	0%
70-80	1,001.0	6.8%	160-170	3.9	0%
80-90	163.6	1.1%	170-180	1.5	0%

Photometric Data







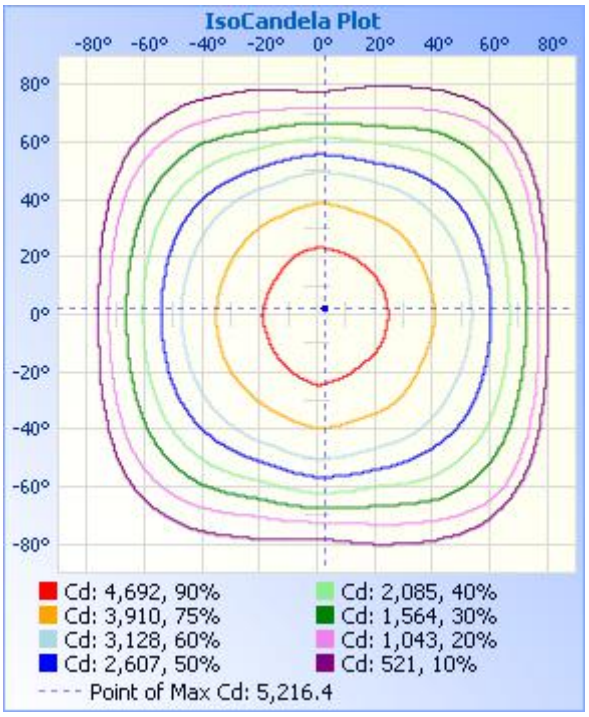


Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5
0	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181	5181
5	5177	5181	5198	5180	5154	5123	5107	5100	5097	5098	5102	5115	5147	5194	5181	5173
10	5070	5084	5096	5101	5068	5032	5015	5010	5009	5012	5021	5028	5098	5118	5085	5070
15	4956	4945	4954	4977	4973	4917	4870	4836	4840	4843	4893	4905	4983	4980	4943	4936
20	4874	4824	4797	4806	4829	4767	4679	4646	4673	4648	4692	4756	4845	4803	4769	4816
25	4663	4652	4635	4616	4652	4573	4471	4399	4438	4424	4469	4562	4671	4594	4605	4641
30	4473	4399	4442	4368	4435	4312	4215	4186	4206	4197	4218	4318	4450	4363	4411	4382
35	4233	4251	4127	4089	4158	4018	3951	3911	3942	3928	3940	4006	4174	4115	4109	4203
40	3944	3886	3885	3800	3861	3700	3659	3626	3632	3633	3636	3671	3866	3811	3893	3850
45	3682	3625	3557	3487	3520	3348	3320	3294	3271	3280	3299	3317	3541	3485	3523	3597
50	3311	3290	3170	3095	3134	2952	2953	2971	2983	2941	2922	2917	3143	3059	3187	3258
55	3031	2969	2838	2640	2717	2547	2553	2588	2564	2559	2506	2495	2727	2678	2843	2954
60	2621	2559	2413	2298	2261	2126	2198	2189	2176	2156	2154	2062	2265	2253	2423	2563
65	2230	2188	2058	1756	1771	1679	1759	1756	1726	1721	1715	1605	1765	1787	2041	2166
70	1767	1728	1634	1367	1266	1234	1335	1285	1286	1260	1293	1146	1256	1353	1646	1728
75	1398	1320	1166	945	769	838	906	821	766	817	844	768	751	967	1165	1312
80	496	527	824	597	346	476	388	115	90.2	114	381	428	331	577	800	496
85	68.0	78.1	120	294	66.2	84.5	62.3	65.1	66.4	64.7	58.8	115	64.2	190	109	73.0
90	52.5	55.6	50.8	41.6	7.30	42.3	55.7	61.2	63.7	62.2	53.7	37.2	6.77	39.4	49.1	54.3
95	45.2	43.8	30.8	16.2	4.84	17.3	24.6	31.5	32.8	31.6	22.8	13.9	6.57	15.7	31.8	43.9
100	17.4	17.6	15.8	12.9	5.69	14.2	16.5	17.1	15.5	15.6	15.0	10.7	8.95	11.8	14.5	16.8
105	13.3	14.5	14.1	12.3	8.38	12.4	15.1	15.1	12.7	13.6	13.6	9.27	10.2	11.5	12.5	13.3
110	11.9	13.1	13.6	12.2	8.67	11.7	14.2	14.1	11.9	12.3	11.8	9.12	10.7	11.8	12.3	11.9
115	11.3	12.5	13.4	12.1	9.26	11.7	13.1	13.4	9.34	11.4	10.2	9.41	11.7	11.7	12.2	11.2
120	11.1	12.4	13.5	12.3	10.3	11.9	12.5	12.3	10.2	10.4	9.73	9.95	11.8	11.7	11.6	10.7
125	11.1	11.7	13.4	12.7	9.87	9.98	12.1	11.7	9.06	9.55	9.65	10.2	11.2	11.7	12.6	10.2
130	10.4	11.1	12.5	12.6	9.92	4.86	11.5	10.9	8.98	9.55	9.57	10.5	11.7	12.2	11.8	10.1
135	10.2	10.9	11.9	12.6	10.5	11.9	11.5	10.7	8.84	9.55	9.64	11.1	12.6	12.1	11.4	10.2
140	9.86	10.6	12.1	12.8	11.5	12.1	11.5	10.7	8.85	9.56	9.75	11.4	13.5	12.3	11.0	10.2
145	9.33	10.3	12.2	12.9	12.0	12.3	11.5	10.6	8.94	9.80	10.1	11.6	13.9	13.3	11.4	10.2
150	9.23	10.4	12.2	13.5	12.5	12.5	11.5	10.5	9.53	10.2	10.4	11.6	14.1	14.0	12.3	11.1
155	9.26	10.5	12.6	13.9	12.8	13.0	12.2	10.5	9.69	10.4	10.8	11.9	13.9	14.2	13.7	11.4
160	9.29	10.5	13.0	14.4	13.8	13.0	12.5	10.9	9.86	10.7	11.3	12.2	14.3	14.5	14.4	12.1
165	10.3	12.4	14.2	15.5	14.7	15.7	14.3	12.5	11.5	11.7	13.0	14.3	16.8	16.3	16.7	14.4
170	11.8	13.8	15.5	16.9	17.1	17.3	16.0	13.8	13.0	13.1	13.9	16.3	18.3	18.3	18.3	16.7
175	13.6	14.8	16.5	18.2	18.1	18.1	17.1	15.2	13.9	13.8	14.4	16.2	18.5	18.7	18.5	17.3
180	14.1	14.8	16.5	18.1	18.2	18.0	17.3	14.8	14.0	13.8	14.4	16.2	18.0	18.2	18.1	17.1

2.4 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2018-11-30	Test Ambient:	25.2 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	ZS-T8-60P8FT-FA8-FT(5000K) Connected to line voltage		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JBE181111-A3	120.0	60	0.5319	61.54	0.9641	23.05
	277.0	60	0.2462	61.81	0.9063	22.96
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement for Bare-lamp - Sphere-Spectroradiometer Method:

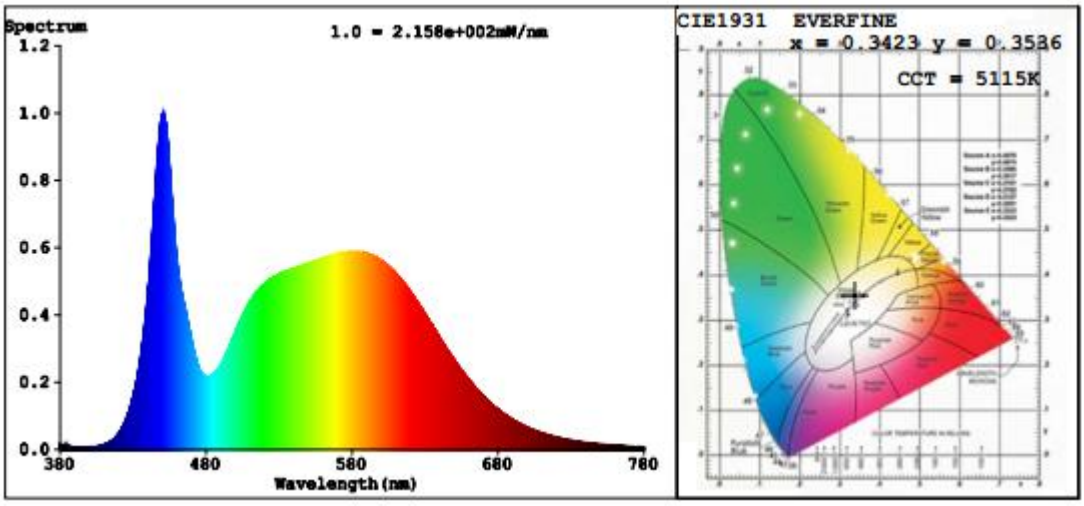
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	5115
Duv	0.0021
Chromaticity (x, y)	x=0.3423 y=0.3536
Chromaticity (u', v')	u'=0.2088 v'=0.4852
Color Rendering Index (CRI)	82.3
R9	5

Special Color Rendering Indices			
R1	81	R9	5
R2	87	R10	68
R3	91	R11	82
R4	83	R12	61
R5	82	R13	82
R6	82	R14	95
R7	87	R15	75
R8	67	--	--

Photometric Measurement for Bare-lamp –Sphere-Spectroradiometer Method:

Parameter	Result		DLC V4.4 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	8808	8775	Bare Lamp: >= 3200(-10%)
Luminous Efficacy (lm/W)	143.13	141.97	Bare lamp: >= 110(-3%)
Most worst Luminous/Highest Watts	141.97		

Spectral Power Distribution & Chromaticity Diagram



2.4 Performance Assessment:

Model name	CCT(K)	Total Luminous (lm)	Power (W)	Luminous Efficacy (lm/W)
ZS-T8-60P8FT-FA8-FT(5000K)	3000K	8103	60.71	133.47
ZS-T8-60P8FT-FA8-FT(5000K)	3500K	8279*1	61.13*2	135.43*3
ZS-T8-60P8FT-FA8-FT(5000K)	4000K	8456*1	61.13*2	138.33*3
ZS-T8-60P8FT-FA8-FT(5000K)	4500K	8632*1	61.13*2	141.21*3
ZS-T8-60P8FT-FA8-FT(5000K)	5000K	8808	61.54	143.13

*1: This value is calculated and the calculation formula is as below:
8279= (8808-8103)/4*1+8103
8456= (8808-8103)/4*2+8103
8632= (8808-8103)/4*3+8103

*2: This value is calculated and the calculation formula is as below:
61.13= (60.71+61.54)/2

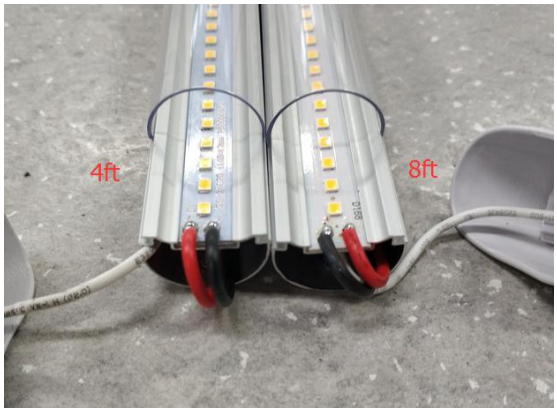
*3: This value is calculated and the calculation formula is as below:
135.43= 8279/61.13
138.33= 8456/61.13
141.21= 8632/61.13

Summary

Model	ZS-T8-60P8FT-FA8-FT(5000K)	ZS-T8-60P8FT-FA8-FT(5000K)
Overall Appearance	Picture 1	
Cross Section	Picture 2	
LED Spacing (mm)	3.48	3.50
Materials	Aluminium, PC	Aluminium, PC
Calculation Method	Please refer to below “Calculation method”	
LED Working Current (mA)	58.0	58.6

Picture 1

Picture 2



Calculation method

Model number	ZS-T8-60P8FT-FA8-FT(5000K)	ZS-T8-60P8FT-FA8-FT(5000K)
Strip fixture model	Lithonia C 2 32 MV	Lithonia C 2 96T8 MVOLT GEB10IS
Test Voltage (V)	120	120
Frequency (Hz)	60	60
Total Luminous of integrating sphere (lm)	7682	15703
Total Luminous of goniophotometer (lm)	7185.7	14689**
Scale factor= $\frac{\text{goniophotometer(lm)}}{\text{integrating sphere(lm)}}$	0.9354	--

** This value is calculated and the calculation formula is as below:

3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-331	2 meter Integrating Sphere	2018-07-02	2019-07-01
ST-R-418	3 meter Integrating Sphere	2018-07-02	2019-07-01
ST-R-327	Spectral analysis system HAAS-2000	2018-07-02	2019-07-01
ST-R-332	Standard Lamp	2018-07-04	2019-07-03
ST-R-333	Power Meter for Integrating Sphere	2018-06-28	2019-06-27
ST-R-355	Goniophotometer system	2018-07-01	2019-06-30
ST-R-359	Standard Lamp	2018-07-04	2019-07-03
ST-R-358	Power Meter for Goniophotometer	2018-06-28	2019-06-27
Expand Uncertainty: Photometric Measurement (Sphere):2.04%, k=2 Chromaticity Measurement(Sphere):28.8K, k=2 Photometric Measurement(Goniophotometer):2.36%, k=2			

******** END OF REPORT ********