LM-79-08 Test Report

For

Revolution Lighting Technologies, Inc.

(Brand Name: Revolution Lighting Technologies)

2280 Ward Ave. Simi Valley CA. 93065

Replacement Lamps ("Plug and Play") (UL Type A)

Model name(s): 204621-11C
Remark: "C" refers to CCT as below: 1=3000K, 2=3500K, 3=4000K, 5=5000K.

Representative (Tested) Model: 204621-111
204621-115

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

Test & Report By:

Garman Mo

Engineer: Garman Mo
Date: Nov.29,2017

Review By:

Tommy Liang

Manager: Tommy Liang

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	Revolution Lighting Technologies, Inc.	
Brand Name	Revolution Lighting Technologies	
Model Number	204621-11C	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	Replacement Lamps (“Plug and Play”) (UL Type A)	
Rated Voltage / Frequency	120 ~ 277 Vac, 50/60 Hz	
Nominal Power	14W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,5000K	
LED Manufacturer	EVERLIGHT ELECTRONICS CO., LTD	
LED Model	67-21S Series	
Test Ballast	OSRAM SYLVANIA QTP 2x32T8/UNV ISN-SC	
Sample Number	GZE1709047-H-B1,B2(3000K),B3(5000K)	
Lamp Length	1200	mm
Lamp Width	--	mm
Number of Units (modular products)	N/A	s

Photo

1.2 Test Specifications:

Date of Receipt	Nov.17,2017
Date of Test	Nov.18,2017
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 Colour 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 25 ºC ±1 ºC. 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 25 ºC ±1 ºC. 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	2017-11-18	**Test Ambient:**	25.2 ºC
Test Orientation	Horizontal	**Stabilization Time (min)**	90
Model Number	204621-111, With ballast OSRAM SYLVANIA QTP 2x32T8/UNV ISN-SC		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170904 7-H-B1	120.0	60	0.1205	14.28	0.9879	5.42
	277.0	60	0.0539	14.27	0.9558	9.29
DLC Pass Criteria					>= 0.9(-3%)	<= 20(+5)

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

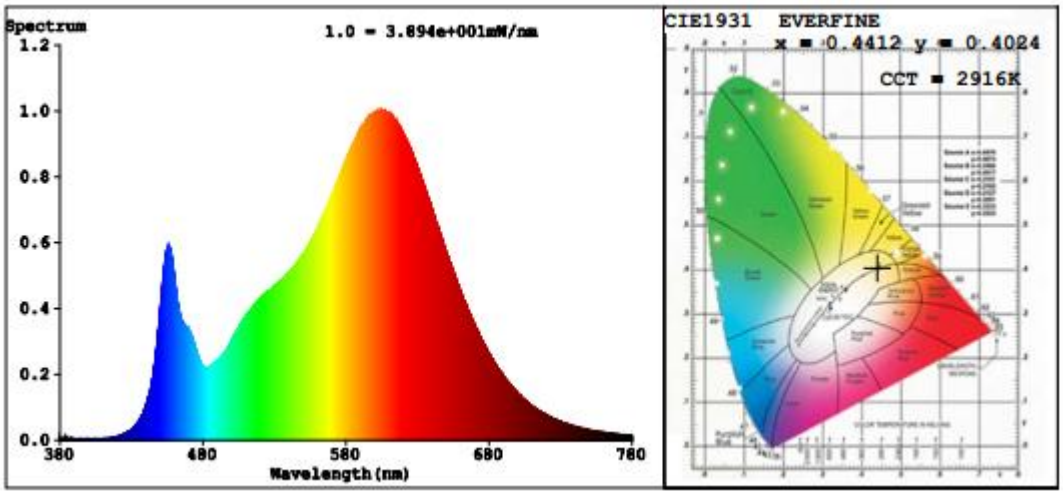
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	2916
Duv	-0.0012
Chromaticity (x, y)	x=0.4412 y=0.4024
Chromaticity (u', v')	u'=0.2541 v'=0.5214
Color Rendering Index (CRI)	82.7
R9	7

Special Color Rendering Indices			
R1	82	R9	7
R2	94	R10	86
R3	93	R11	79
R4	79	R12	73
R5	83	R13	86
R6	93	R14	97
R7	80	R15	74
R8	57	--	--

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

Parameter	Result		DLC V4.2 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	1727	1722	Bare Lamp: 1600(±10%)
Luminous Efficacy (lm/W)	120.97	120.68	Bare lamp: >= 110(-3%)
Most worst Luminous/Highest Watts	120.59		

Spectral Power Distribution & Chromaticity Diagram



2.2 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2017-11-18	Test Ambient:	25.2 ºC
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	204621-111, With ballast OSRAM SYLVANIA QTP 2x32T8/UNV ISN-SC		

Electrical Measurement for 2-lamp in Lithonia 2GT8 lensed 2x4:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170904	120.0	60	0.2415	28.56	0.9856	5.73
7-H-B1,B2	277.0	60	0.1080	28.53	0.9536	9.61
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement for 2-lamp in Lithonia 2GT8 lensed 2x4 - Sphere-Spectroradiometer Method:

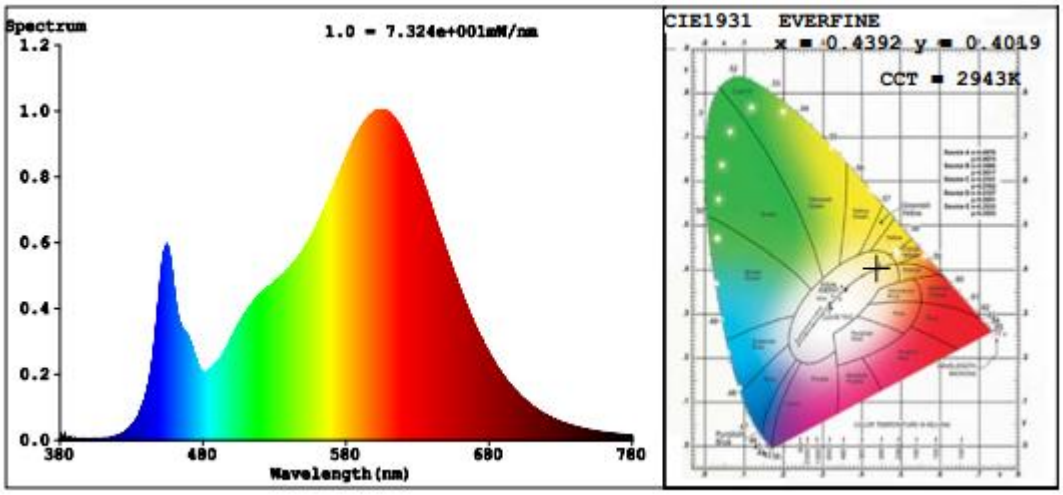
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	2943
Duv	-0.0012
Chromaticity (x, y)	x=0.4392 y=0.4019
Chromaticity (u', v')	u'=0.2530 v'=0.5209
Color Rendering Index (CRI)	82.7
R9	7

Special Color Rendering Indices			
R1	82	R9	7
R2	93	R10	84
R3	94	R11	80
R4	80	R12	73
R5	82	R13	85
R6	92	R14	97
R7	81	R15	74
R8	58	--	--

Photometric Measurement 2-lamp in Lithonia 2GT8 lensed 2x4 – Goniophotometer Method:

Parameter	Result		DLC V4.2 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	2875.7	2866.1	In luminaire (2 lamps): 3000(±10%)
Luminous Efficacy (lm/W)	100.69	100.46	In luminaire: >= 100(-3%)
Most worst Luminous/Highest Watts	100.35		
Zonal lumens in the 0-60 °zone (%)	84.3	--	>= 75(-3)
SC: 0-180 °(if applicable)	1.24	--	1.0-2.0(±0.1)
SC: 90-270 °(if applicable)	1.17	--	1.0-2.0(±0.1)
Beam Angle ( )	95.8	--	--
Center Beam Candle Power (cd)	1220	--	--

Spectral Power Distribution & Chromaticity Diagram

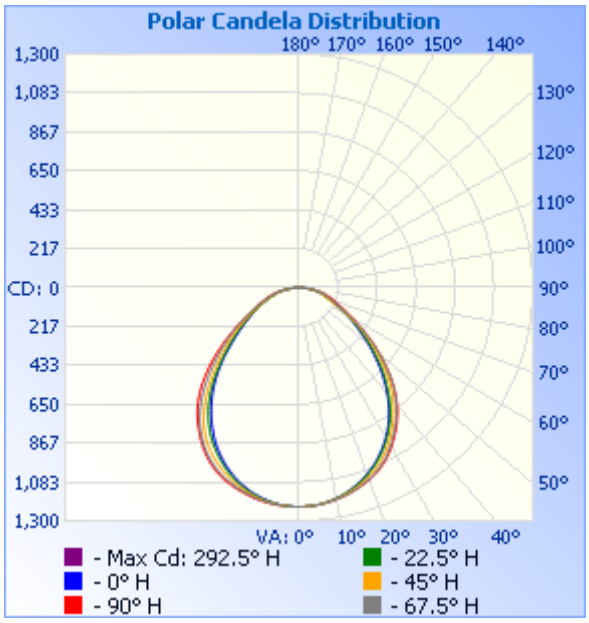


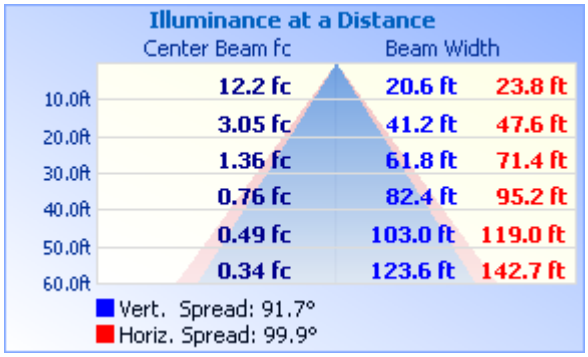
Zonal Lumen Tabulation

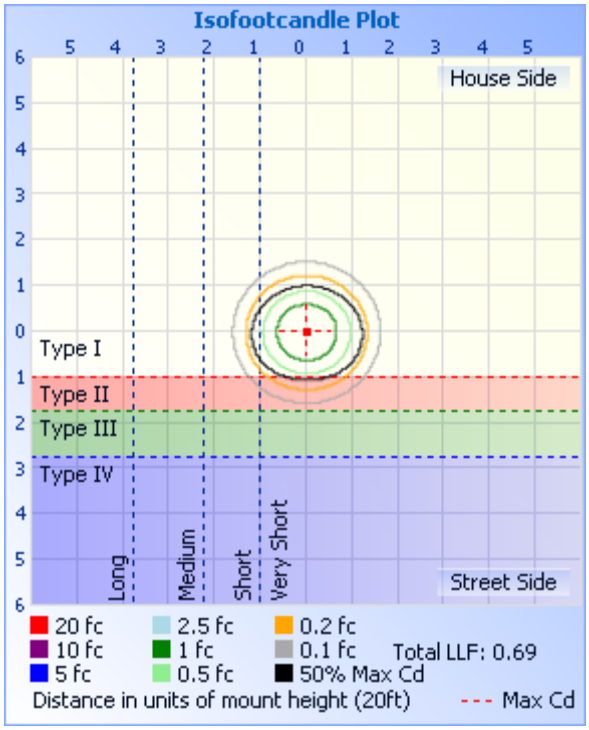
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	936.7	32.6%
0-40	1,505.3	52.4%
0-60	2,424.3	84.3%
60-90	445.7	15.5%
70-100	199.6	6.9%
90-120	2.7	0.1%
0-90	2,870.1	99.8%
90-180	5.3	0.2%
0-180	2,875.3	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	115.3	4.0%	90-100	1.2	0%
10-20	328.9	11.4%	100-110	0.8	0%
20-30	492.5	17.1%	110-120	0.8	0%
30-40	568.5	19.8%	120-130	0.7	0%
40-50	526.6	18.3%	130-140	0.6	0%
50-60	392.4	13.6%	140-150	0.5	0%
60-70	247.4	8.6%	150-160	0.4	0%
70-80	149.2	5.2%	160-170	0.3	0%
80-90	49.2	1.7%	170-180	0.1	0%

Photometric Data







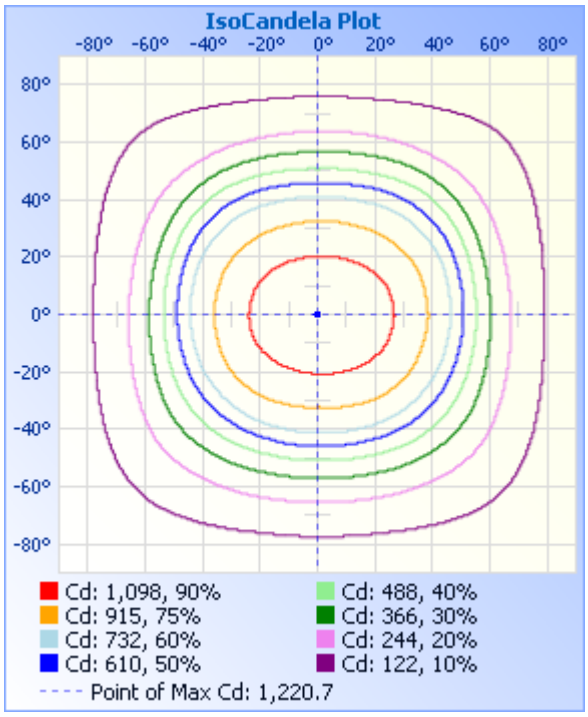


Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338		
0	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220		
5	1217	1218	1216	1215	1213	1213	1213	1214	1213	1212	1212	1212	1213	1213	1215	1216		
10	1205	1206	1200	1195	1191	1192	1194	1197	1197	1194	1191	1190	1190	1193	1198	1202		
15	1184	1185	1171	1161	1155	1157	1164	1171	1172	1167	1159	1154	1152	1159	1168	1178		
20	1155	1153	1131	1114	1105	1108	1122	1136	1138	1131	1117	1104	1100	1110	1127	1146		
25	1113	1108	1078	1053	1041	1047	1067	1086	1092	1085	1063	1041	1033	1048	1076	1103		
30	1051	1041	1008	978	964	972	994	1016	1025	1020	996	964	950	973	1011	1041		
35	971	959	922	888	871	881	906	932	941	933	905	870	853	879	924	957		
40	879	870	825	779	760	772	809	840	846	823	786	757	745	767	807	850		
45	763	754	710	662	639	655	694	725	727	695	651	624	624	635	674	723		
50	625	620	582	537	517	531	566	592	593	567	530	503	498	512	550	590		
55	486	480	459	423	403	416	440	457	460	452	420	398	395	406	434	469		
60	364	352	335	321	310	312	320	335	346	350	324	313	311	317	333	363		
65	271	250	230	231	232	225	222	241	259	266	245	243	243	246	251	276		
70	210	192	167	171	176	168	164	188	202	197	183	184	188	186	188	205		
75	160	151	134	132	133	130	133	148	156	144	136	136	141	138	140	149		
80	109	106	98.0	92.1	92.8	91.0	97.2	105	106	97.0	91.1	90.7	95.6	93.6	94.2	102		
85	43.0	46.6	44.2	46.8	47.4	46.2	44.8	46.5	42.2	43.9	39.5	44.6	46.5	46.4	40.9	45.6		
90	0.98	1.09	1.05	3.21	1.11	1.17	1.15	1.09	0.69	0.75	0.69	9.55	0.80	2.50	1.19	0.64		
95	0.53	0.54	0.59	1.10	0.74	0.85	0.64	0.54	0.66	0.55	0.69	5.91	0.69	1.30	0.81	0.53		
100	0.51	0.61	0.53	0.95	0.69	0.80	0.64	0.57	0.70	0.57	0.78	2.26	0.60	0.99	0.64	0.59		
105	0.48	0.64	0.59	0.80	0.69	0.72	0.69	0.74	0.79	0.75	0.91	0.82	0.53	0.75	0.80	0.80		
110	0.69	0.72	0.85	0.65	0.69	0.68	0.77	0.96	0.89	0.93	0.94	0.68	0.08	0.65	0.93	0.86		
115	0.85	0.86	0.96	0.55	0.65	0.65	0.80	0.91	1.07	0.97	0.99	0.59	0.26	0.52	0.92	0.86		
120	0.85	0.86	0.93	0.48	0.47	0.62	0.84	0.91	1.02	0.97	0.95	0.52	0.44	0.49	0.83	0.86		
125	0.86	0.90	0.91	0.49	0.43	0.59	0.96	0.91	1.02	0.97	0.91	0.53	0.49	0.49	0.79	0.86		
130	0.86	0.95	0.88	0.50	0.39	0.56	0.98	0.91	1.02	0.97	0.88	0.66	0.59	0.52	0.77	0.86		
135	0.86	0.96	0.85	0.52	0.41	0.53	0.85	0.91	1.02	0.97	0.82	0.68	0.70	0.65	0.76	0.86		
140	0.86	0.96	0.64	0.53	0.43	0.61	0.72	0.91	1.02	0.97	0.75	0.75	0.77	0.85	0.70	0.86		
145	0.96	0.96	0.58	0.48	0.64	0.69	0.69	0.91	1.02	0.97	0.80	0.86	0.90	0.88	0.77	0.86		
150	0.95	0.97	0.58	0.69	0.64	0.69	0.70	0.91	1.02	0.97	0.77	0.86	0.94	1.01	0.86	0.83		
155	0.94	0.87	0.59	0.83	0.85	0.81	0.76	0.91	1.02	0.97	0.74	0.87	0.94	1.03	0.91	0.83		
160	0.94	0.89	0.71	0.94	0.88	0.88	0.79	0.91	1.06	0.91	0.86	0.88	0.95	1.03	0.92	0.91		
165	0.93	1.05	0.85	0.94	0.95	0.94	0.80	0.91	1.10	0.91	0.91	0.89	0.95	1.02	0.93	0.91		
170	0.92	0.97	0.95	0.95	1.00	0.95	0.80	0.95	1.04	0.91	0.91	0.89	0.95	1.02	0.95	0.93		
175	0.91	0.91	0.92	0.96	1.01	0.96	0.80	0.96	0.98	0.91	0.91	0.90	0.96	1.01	0.96	0.96		
180	0.91	0.91	0.91	0.96	1.01	0.96	0.80	0.91	0.96	0.91	0.91	0.91	0.96	1.01	0.96	0.80		

2.3 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2017-11-18	Test Ambient:	25.2 ºC
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	204621-115, With ballast OSRAM SYLVANIA QTP 2x32T8/UNV ISN-SC		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170904 7-H-B3	120.0	60	0.1213	14.36	0.9863	5.64
	277.0	60	0.0542	14.34	0.9543	9.52
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

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

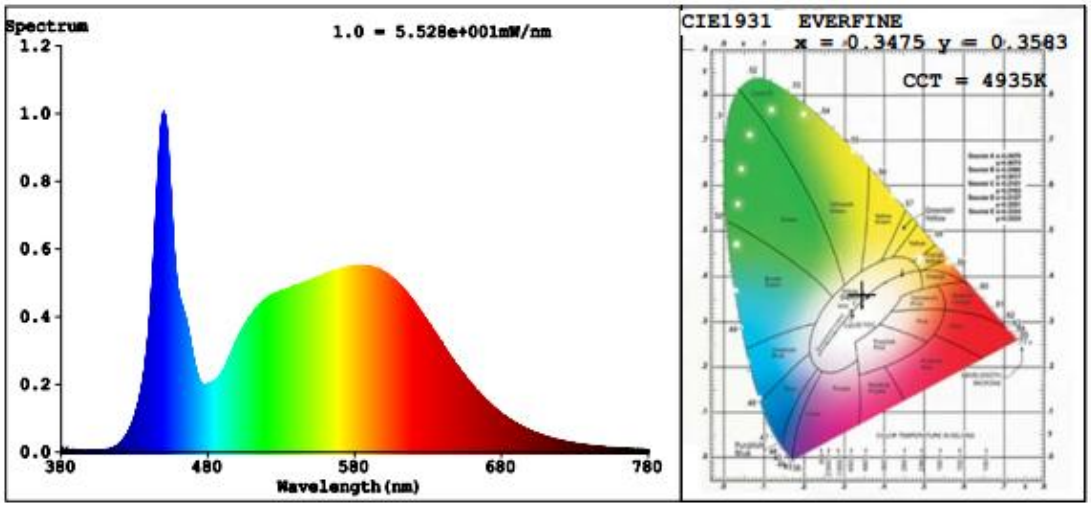
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	4935
Duv	0.0024
Chromaticity (x, y)	x=0.3475 y=0.3583
Chromaticity (u', v')	u'=0.2104 v'=0.4882
Color Rendering Index (CRI)	82.5
R9	6

Special Color Rendering Indices			
R1	81	R9	6
R2	88	R10	70
R3	92	R11	81
R4	82	R12	55
R5	81	R13	82
R6	82	R14	96
R7	88	R15	75
R8	67	--	--

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

Parameter	Result		DLC V4.2 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	1782	1776	Bare Lamp: 1600(±10%)
Luminous Efficacy (lm/W)	124.78	124.43	Bare lamp: >= 110(-3%)
Most worst Luminous/Highest Watts	124.37		

Spectral Power Distribution & Chromaticity Diagram



2.3 Performance Assessment:

Model name	CCT(K)	Total Luminous (lm)	Power (W)	Luminous Efficacy (lm/W)
204621-111	3000K	1727	14.28	120.97
204621-112	3500K	1741*1	14.32*2	121.58*3
204621-113	4000K	1755*1	14.32*2	122.56*3
204621-115	5000K	1782	14.36	124.78

*1: This value is calculated and the calculation formula is as below:
1741= (1782-1727)/4+1727
1755= (1782-1727)/4+1741

*2: This value is calculated and the calculation formula is as below:
14.32= (14.28+14.36)/2

*3: This value is calculated and the calculation formula is as below:
121.58= 1741/14.32
122.56= 1755/14.32

3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-331	2 meter Integrating Sphere	2017-07-01	2018-06-30
ST-R-327	Spectral analysis system HAAS-2000	2017-07-01	2018-06-30
D204	Standard Lamp	2017-07-12	2018-07-11
PF2010	Power Meter for Integrating Sphere	2017-07-01	2018-06-30
GO-R5000	Goniophotometer system	2017-07-01	2018-06-30
D908S	Standard Lamp	2017-07-12	2018-07-11
PF210	Power Meter for Goniophotometer	2017-07-07	2018-07-06
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 ********