LM-79-08 Test Report

For

IKIO LED LIGHTING

(Brand Name: IKIO)

8470 Allison Pointe Blvd, Suite 128
Indianapolis, IN 46250

2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Model name(s): IK-AT22-0036-XX-J

Representative (Tested) Model: IK-AT22-0036-30-J
IK-AT22-0036-35-J
IK-AT22-0036-40-J
IK-AT22-0036-50-J

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

Test & Report By:

Jack Luo

Engineer: Jack Luo
Date: Dec.26,2016

Review By:

Tommy Liang

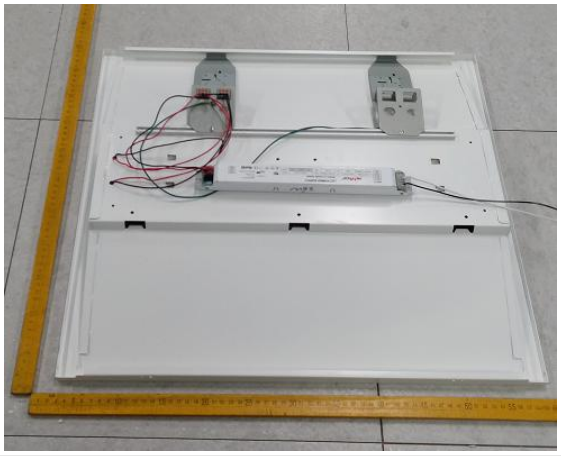
Manager: Tommy Liang

Note: 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	IKIO LED LIGHTING	
Brand Name	IKIO	
Model Number	IK-AT22-0036-XX-J	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	
Rated Voltage / Frequency	100-277 Vac, 50/60 Hz	
Nominal Power	36W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,5000K	
LED Manufacturer	EVERLIGHT ELECTRONICS CO.,LTD	
LED Model	67-21S Series	
Sample Number	GZE161295-C1(3000K),C2(3500K),C3(4000K), C4(5000K)	
Lamp Length	--	mm
Lamp Width	--	mm
Number of Units (modular products)	N/A	s

Photo



1.2 Test Specifications:

Date of Receipt	Dec.24, 2016
Date of Test	Dec.24, 2016
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 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	2016-12-24	Test Ambient:	25.2 º C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	IK-AT22-0036-30-J		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE161295 -C1	120.0	60	0.3093	36.33	0.9789	14.89
	277.0	60	0.1472	36.70	0.9002	20.52
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement - Sphere-Spectroradiometer Method:

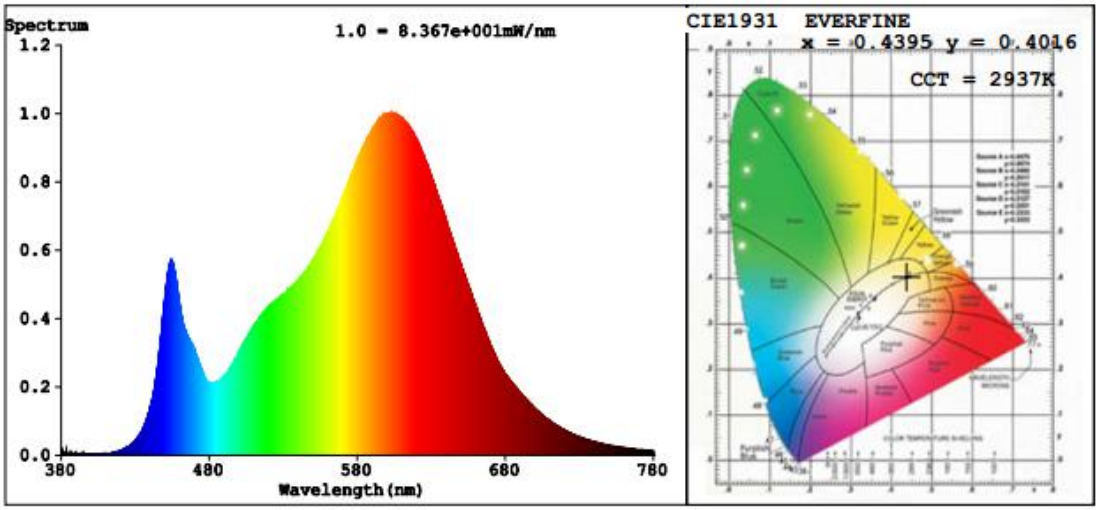
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	2937
Duv	-0.0013
Chromaticity (x, y)	x=0.4395 y=0.4016
Chromaticity (u', v')	u'=0.2533 v'=0.5208
Color Rendering Index (CRI)	81.8
R9	3

Special Color Rendering Indices			
R1	81	R9	3
R2	93	R10	84
R3	93	R11	78
R4	79	R12	72
R5	81	R13	84
R6	91	R14	97
R7	80	R15	73
R8	56	--	--

Photometric Measurement – Goniophotometer Method:

Parameter	Result		DLC V4.0 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	4735.7	4776.2	>= 2000(-10%)	
Luminous Efficacy (lm/W)	130.35	130.14	Standard: >= 100(-3%)	Premium: >= 125(-3%)
Zonal lumens in the 0-60° zone (%)	78.4	--	>= 75(-3)	
SC: 0-180° (if applicable)	1.26	--	1.0-2.0(±0.1)	
SC: 90-270° (if applicable)	1.21	--	1.0-2.0(±0.1)	
Beam Angle (°)	107.2	--	--	
Center Beam Candle Power (cd)	1716	--	--	

Spectral Power Distribution & Chromaticity Diagram

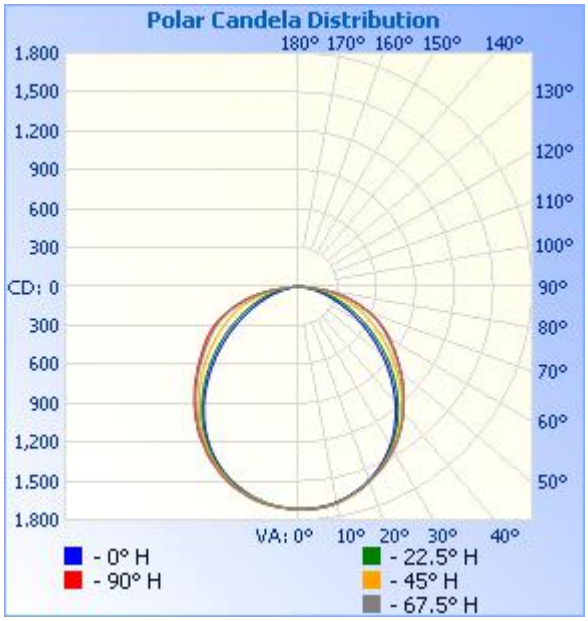


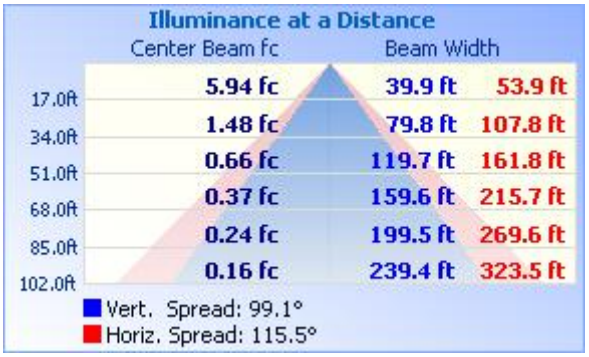
Zonal Lumen Tabulation

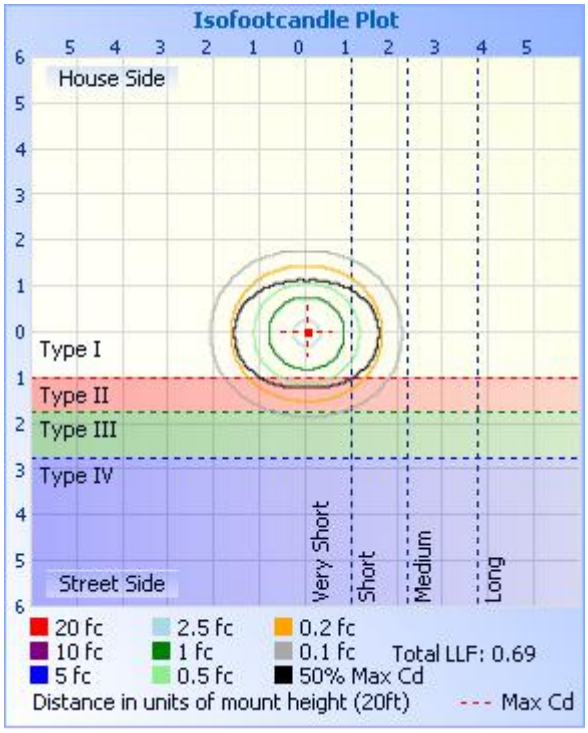
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1,325.2	28%
0-40	2,152.5	45.5%
0-60	3,710.9	78.4%
60-90	1,003.4	21.2%
70-100	441.9	9.3%
90-120	9.2	0.2%
0-90	4,714.3	99.6%
90-180	20.9	0.4%
0-180	4,735.2	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	162.5	3.4%	90-100	2.3	0%
10-20	464.4	9.8%	100-110	3.0	0.1%
20-30	698.3	14.7%	110-120	4.0	0.1%
30-40	827.3	17.5%	120-130	4.0	0.1%
40-50	830.8	17.5%	130-140	3.2	0.1%
50-60	727.6	15.4%	140-150	2.2	0%
60-70	563.8	11.9%	150-160	1.4	0%
70-80	349.2	7.4%	160-170	0.7	0%
80-90	90.5	1.9%	170-180	0.3	0%

Photometric Data







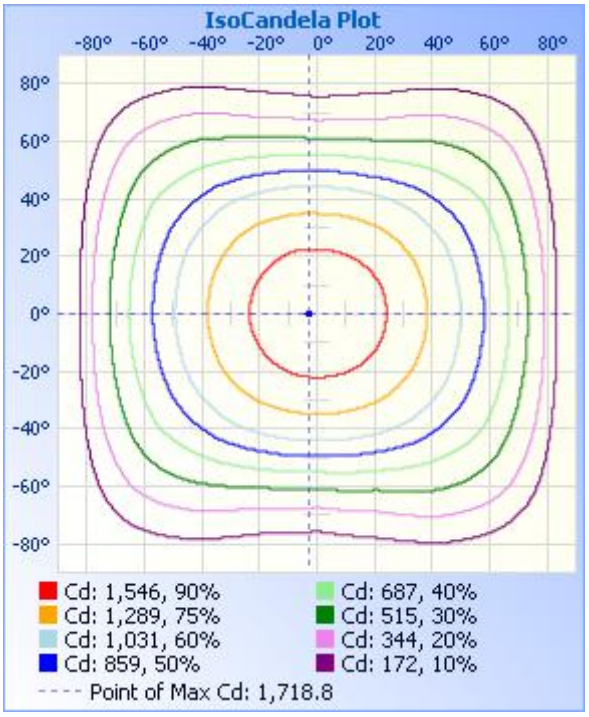


Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338
0	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716	1716
5	1708	1707	1707	1707	1710	1713	1717	1716	1715	1715	1713	1708	1705	1703	1705	1707
10	1688	1689	1687	1683	1687	1694	1696	1695	1694	1692	1688	1685	1677	1677	1681	1687
15	1650	1653	1650	1644	1646	1654	1655	1651	1651	1646	1645	1639	1632	1634	1643	1648
20	1599	1601	1594	1587	1586	1598	1598	1597	1595	1590	1581	1578	1569	1574	1582	1596
25	1527	1530	1523	1512	1509	1521	1526	1533	1534	1521	1508	1497	1489	1498	1511	1522
30	1443	1446	1436	1418	1414	1428	1443	1454	1457	1441	1419	1399	1389	1400	1420	1437
35	1351	1347	1331	1304	1296	1318	1349	1364	1363	1348	1319	1284	1269	1288	1318	1340
40	1245	1239	1214	1174	1162	1192	1241	1255	1256	1237	1206	1154	1132	1157	1202	1232
45	1133	1127	1085	1030	1012	1055	1115	1140	1147	1119	1076	1012	981	1016	1077	1118
50	1022	1011	954	880	856	907	981	1024	1029	1001	939	861	825	869	950	1005
55	916	897	823	730	700	756	847	905	917	882	803	711	672	725	824	894
60	820	791	697	587	549	611	717	797	812	770	674	566	525	587	702	791
65	721	692	580	454	411	475	597	693	706	666	552	433	393	459	590	694
70	594	570	471	335	290	351	485	569	582	544	441	314	276	342	482	572
75	456	432	348	228	186	243	360	435	447	413	322	211	176	240	357	434
80	302	286	224	135	100	145	234	289	298	272	204	122	94.4	144	231	287
85	81.6	88.9	90.1	49.1	34.7	56.0	96.0	92.4	84.6	84.2	79.3	43.5	32.0	52.9	88.7	85.7
90	4.24	3.57	3.00	1.13	0.03	1.84	3.32	4.16	3.37	4.08	2.44	0.91	0.00	6.06	2.29	3.67
95	2.87	2.64	1.47	0.56	0.00	1.54	2.49	2.76	2.76	3.50	2.08	1.26	0.00	0.91	2.39	2.75
100	2.81	2.55	1.47	0.91	0.00	1.77	2.90	2.95	2.85	3.21	2.79	1.82	0.25	1.88	3.10	2.89
105	3.06	3.36	2.38	1.46	0.46	2.38	4.01	3.26	3.53	3.76	4.01	2.48	0.91	2.74	4.07	3.21
110	3.88	3.87	3.60	2.07	1.26	3.45	5.24	3.87	4.35	4.64	4.65	2.93	1.52	3.50	5.09	3.78
115	4.73	4.54	4.42	2.43	1.77	3.70	5.59	4.69	5.37	4.97	4.92	2.80	2.12	3.55	5.17	4.49
120	5.21	4.95	4.59	2.47	2.13	3.30	5.90	5.25	5.93	5.40	4.67	2.83	2.13	3.17	5.10	4.89
125	6.18	5.40	4.62	3.01	2.92	3.70	5.29	5.96	6.30	5.58	4.21	2.81	3.19	3.35	4.64	5.15
130	5.88	5.17	4.29	3.13	3.19	3.82	4.99	5.81	6.31	5.35	3.80	2.80	3.55	3.52	4.46	5.06
135	5.05	4.28	3.51	3.23	3.44	3.76	4.43	5.29	6.13	4.89	3.55	2.56	3.76	3.50	4.01	4.89
140	5.67	4.32	3.15	2.58	3.44	3.70	3.92	5.25	5.52	4.64	2.94	1.75	3.79	3.39	3.30	4.53
145	4.76	4.03	3.05	2.23	3.04	2.29	2.85	4.49	4.90	4.23	2.74	1.70	3.19	2.48	3.14	4.02
150	4.35	3.47	2.83	2.32	2.99	2.28	2.78	4.13	4.40	3.80	2.73	1.64	3.12	2.69	3.31	3.52
155	3.74	3.16	2.17	2.83	3.46	2.74	2.75	3.66	3.73	3.62	2.74	1.58	3.01	3.14	1.77	3.01
160	3.32	2.34	1.36	2.83	3.57	2.63	1.68	3.26	2.96	3.21	2.20	2.13	2.88	3.24	1.85	1.82
165	1.96	1.48	1.57	2.43	2.89	2.29	2.18	1.58	1.84	1.73	2.03	2.68	2.83	2.84	2.38	1.82
170	2.55	2.29	2.24	2.57	2.83	2.41	2.87	2.50	2.48	2.60	2.84	2.73	3.45	3.55	2.84	3.36
175	2.71	2.35	2.11	2.80	3.29	2.43	3.05	2.53	2.82	2.81	2.59	2.27	3.24	3.67	2.90	3.03
180	2.45	2.29	2.08	2.78	3.19	2.43	2.70	2.24	2.96	2.96	2.28	2.07	2.73	3.19	2.44	2.85

2.2 Electrical, Photometric and Chromaticity Measurements
(Refer to Work Instruction QD25)

Test date	2016-12-24	Test Ambient:	25.2 º C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	IK-AT22-0036-35-J		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE161295 -C2	120.0	60	0.3080	36.14	0.9780	14.57
	277.0	60	0.1472	36.76	0.9016	20.33
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

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

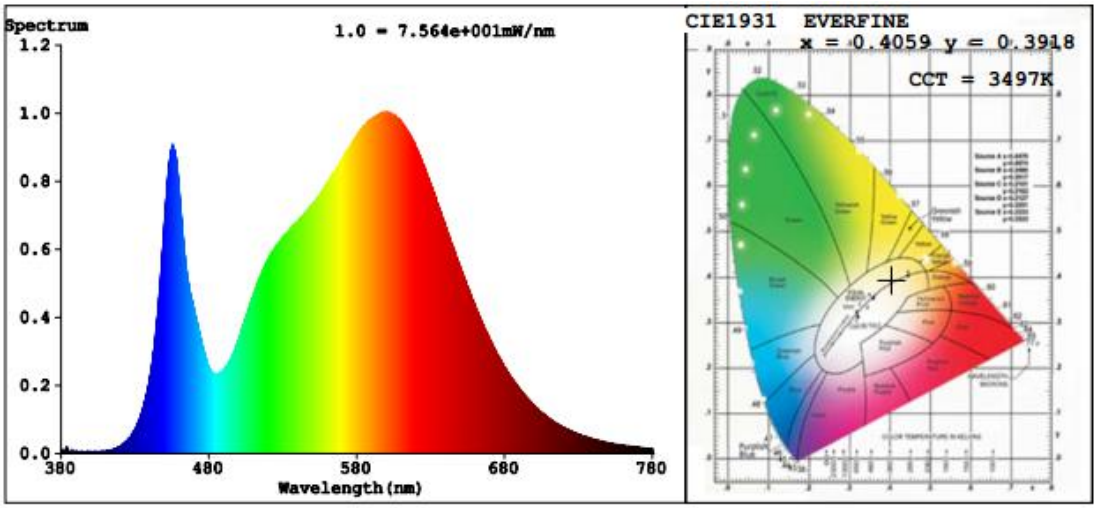
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3497
Duv	0.0003
Chromaticity (x, y)	x=0.4059 y=0.3918
Chromaticity (u', v')	u'=0.2356 v'=0.5118
Color Rendering Index (CRI)	82.2
R9	7

Special Color Rendering Indices			
R1	81	R9	7
R2	90	R10	75
R3	96	R11	77
R4	79	R12	59
R5	80	R13	83
R6	86	R14	98
R7	84	R15	75
R8	62	--	--

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

Parameter	Result		DLC V4.0 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	4798	4874	>= 2000(-10%)	
Luminous Efficacy (lm/W)	132.76	132.59	Standard: >= 100(-3%)	Premium: >= 125(-3%)

Spectral Power Distribution & Chromaticity Diagram



2.3 Electrical, Photometric and Chromaticity Measurements
(Refer to Work Instruction QD25)

Test date	2016-12-24	Test Ambient:	25.2 º C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	IK-AT22-0036-40-J		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE161295 -C3	120.0	60	0.3048	35.87	0.9806	14.56
	277.0	60	0.1458	36.35	0.9001	19.58
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

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

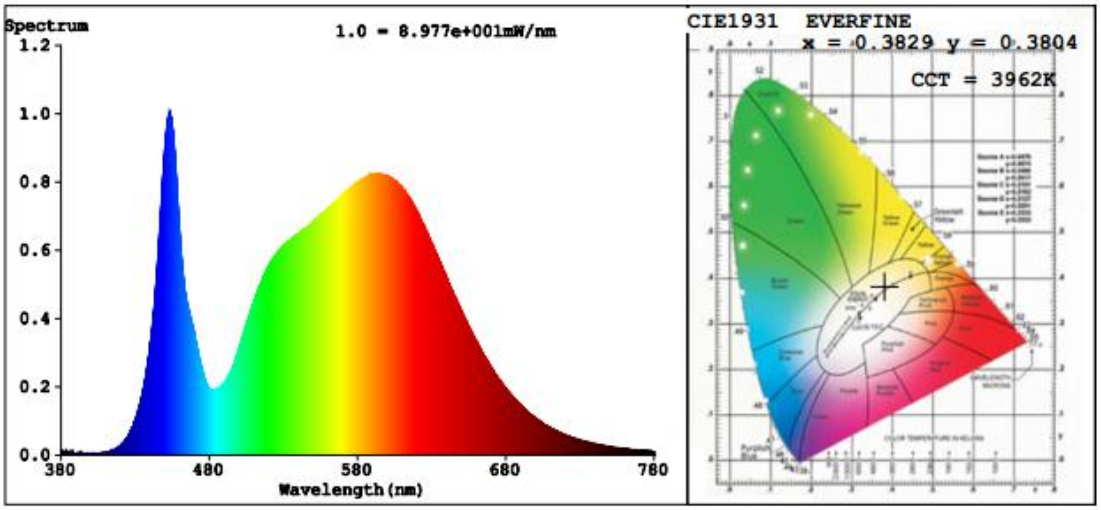
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3962
Duv	0.0010
Chromaticity (x, y)	x=0.3829 y=0.3804
Chromaticity (u', v')	u'=0.2252 v'=0.5036
Color Rendering Index (CRI)	81.0
R9	5

Special Color Rendering Indices			
R1	79	R9	5
R2	87	R10	68
R3	92	R11	77
R4	80	R12	53
R5	79	R13	81
R6	81	R14	96
R7	86	R15	74
R8	64	--	--

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

Parameter	Result		DLC V4.0 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	4829	4877	>= 2000(-10%)	
Luminous Efficacy (lm/W)	134.63	134.17	Standard: >= 100(-3%)	Premium: >= 125(-3%)

Spectral Power Distribution & Chromaticity Diagram



2.4 Electrical, Photometric and Chromaticity Measurements
(Refer to Work Instruction QD25)

Test date	2016-12-24	Test Ambient:	25.2 º C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	IK-AT22-0036-50-J		

Electrical Measurement for Bare-lamp:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE161295 -C4	120.0	60	0.3071	36.08	0.9790	14.19
	277.0	60	0.1463	36.48	0.9004	20.21
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

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

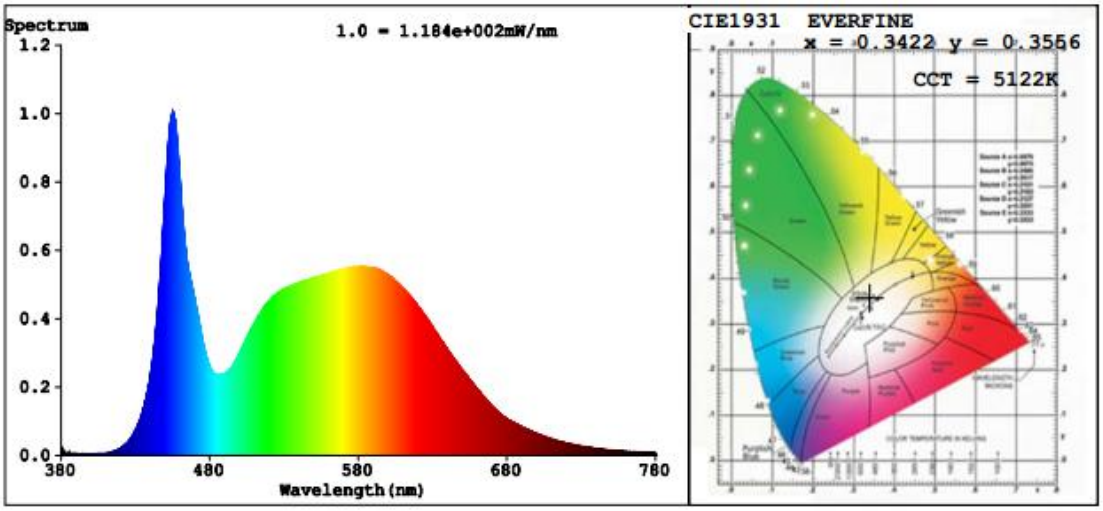
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	5122
Duv	0.0032
Chromaticity (x, y)	x=0.3422 y=0.3556
Chromaticity (u', v')	u'=0.2079 v'=0.4862
Color Rendering Index (CRI)	82.8
R9	6

Special Color Rendering Indices			
R1	81	R9	6
R2	90	R10	74
R3	94	R11	78
R4	80	R12	57
R5	81	R13	84
R6	85	R14	97
R7	86	R15	76
R8	66	--	--

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

Parameter	Result		DLC V4.0 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	4901	4938	>= 2000(-10%)	
Luminous Efficacy (lm/W)	135.84	135.36	Standard: >= 100(-3%)	Premium: >= 125(-3%)

Spectral Power Distribution & Chromaticity Diagram



3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-336	2 meter Integrating Sphere	2016-07-01	2017-06-30
ST-R-331	Spectral analysis system HAAS-2000	2016-07-01	2017-06-30
D204	Standard Lamp	2016-07-01	2017-06-30
PF2010	Power Meter for Integrating Sphere	2016-07-01	2017-06-30
EE-09	Goniophotometer system	2016-07-01	2017-06-30
D908S	Standard Lamp	2016-07-01	2017-06-30
PF210	Power Meter for Goniophotometer	2016-07-01	2017-06-30
ST-R-181A	Temperature Tester	2016-07-01	2017-06-30

Uncertainty:
Photometric Measurement (Sphere):1.74%
Chromaticity Measurement(Sphere):14.3K
Photometric Measurement(Goniophotometer):1.62%

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