NVLAP LAB CODE 201011-0

Report No.: GZE160710-B

LM-79-08 Test Report

For

AOK LED Light Company Limited

(Brand Name:AOK)

Building 1, St George's Science and Technology Industrial Park, Shajin Street, Shenzhen, Guangdong Province, China Zip 518104

High-bay Luminaires for Commercial and Industrial Buildings

Model name(s): AOK-150WiU-X

Representative (Tested) Model: AOK-150WiU-X (3000K)
AOK-150WiU-X (5700K)

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

Test & Report By:

Jamie Lin

Engineer: Jamie Lin

Date: Jul.26,2016

Review By:

Tommy Liang

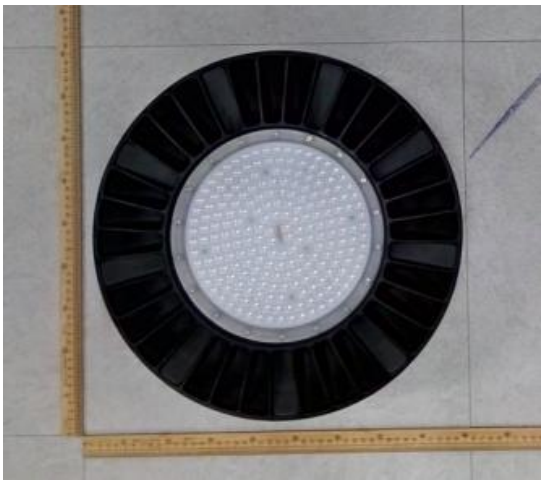
Manager: Tommy Liang

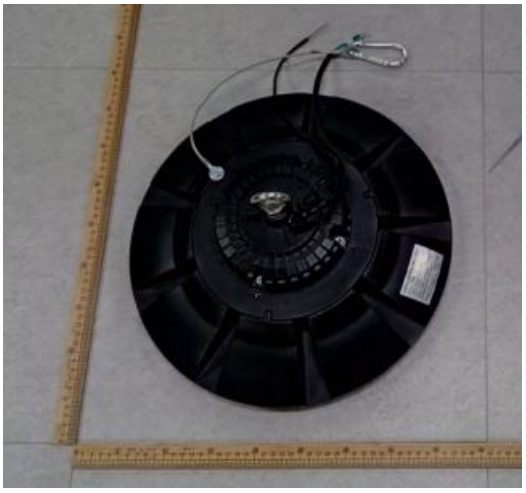
Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

1.1 Product Information:

Organization Name	AOK LED Light Company Limited	
Brand Name	AOK	
Model Number	AOK-150WiU-X	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	High-bay Luminaires for Commercial and Industrial Buildings	
Rated Voltage / Frequency	100-277Vac,50/ 60 Hz	
Nominal Power	150W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,4500K,5000K,5700K	
LED Manufacturer	Nichia Corporation	
LED Model	NF2L757DR	
Sample Number	GZE160710-B1(3000K), B2(5700K)	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	s

Photo





1.2 Test Specifications:

Date of Receipt	Jul.19,2016
Date of Test	Jul.21,2016
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 25°C ± 1°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 25°C ± 1°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.

NVLAP LAB CODE 201011-0

2.1 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2016-07-21	Test Ambient:	25.2 °C
Test Orientation	As intended	Stabilization Time (min)	90
Model Number	AOK-150WiU-X(3000K)		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE160710-B1	120.0	60	1.300	154.8	0.9923	7.88
	277.0	60	0.5542	149.7	0.9751	10.69
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement - Sphere-Spectroradiometer Method:

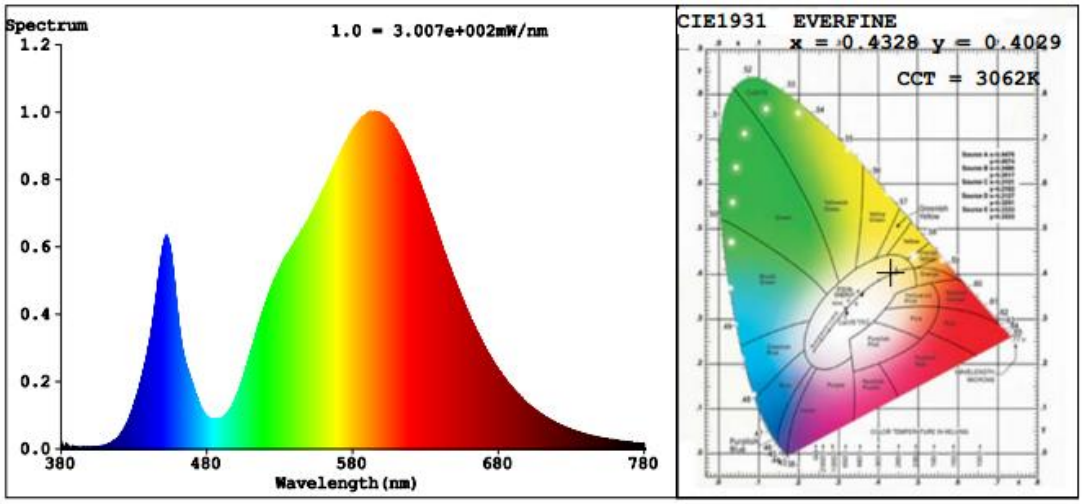
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	3062
Duv	0.0001
Chromaticity (x, y)	x=0.4328 y=0.4029
Chromaticity (u', v')	u'=0.2484 v'=0.5203
Color Rendering Index (CRI)	72.3
R9	0

Special Color Rendering Indices			
R1	69	R9	0
R2	81	R10	55
R3	91	R11	62
R4	69	R12	44
R5	67	R13	71
R6	73	R14	94
R7	80	R15	63
R8	48	--	--

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)	21018	20711	>=10000(-10%)	
Luminous Efficacy (lm/W)	135.78	138.35	Standard: >= 105(-3%)	Premium: >= 130(-3%)
Zonal lumens in the 20-50° zone (%)	68.4	--	>= 30(-10)	
Beam Angle (°)	107.1	--	--	
Center Beam Candle Power (cd)	5898	--	--	

Spectral Power Distribution & Chromaticity Diagram

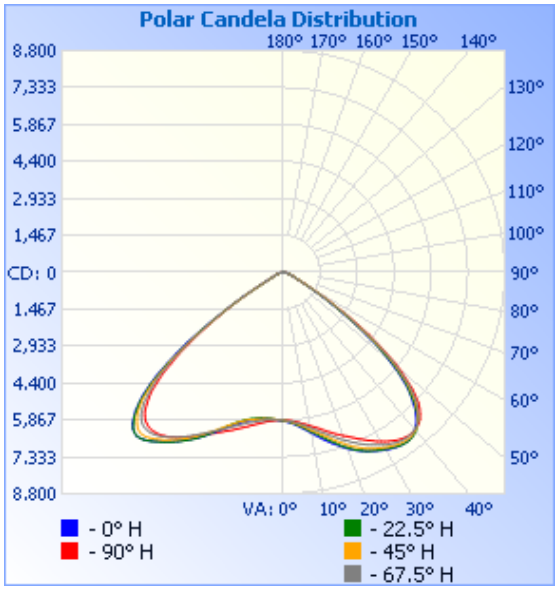


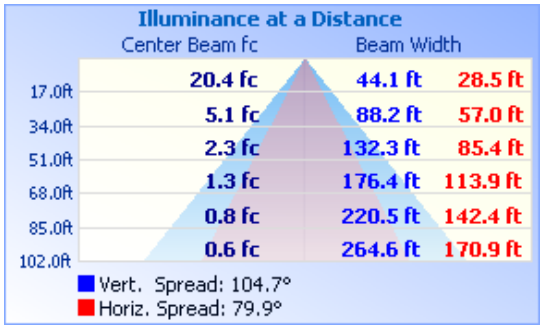
Zonal Lumen Tabulation

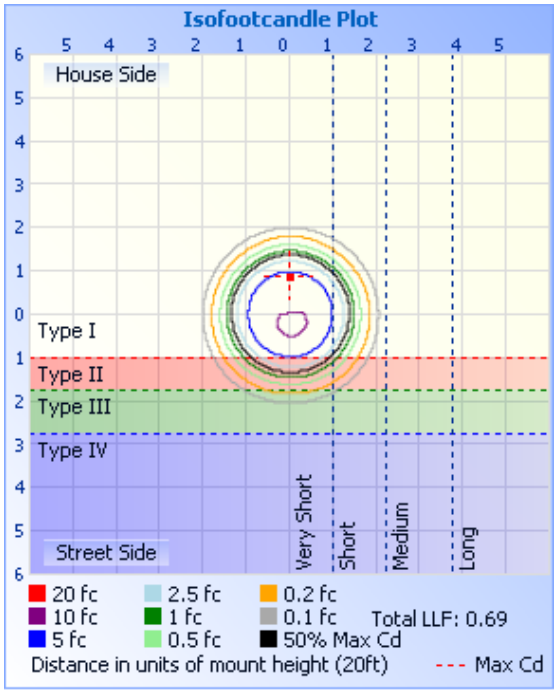
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	5,839.4	27.8%
0-40	10,953.6	52.1%
0-60	20,051.0	95.4%
60-90	948.6	4.5%
70-100	306.0	1.5%
90-120	4.3	0%
0-90	20,999.7	99.9%
90-180	16.7	0.1%
0-180	21,016.4	100%

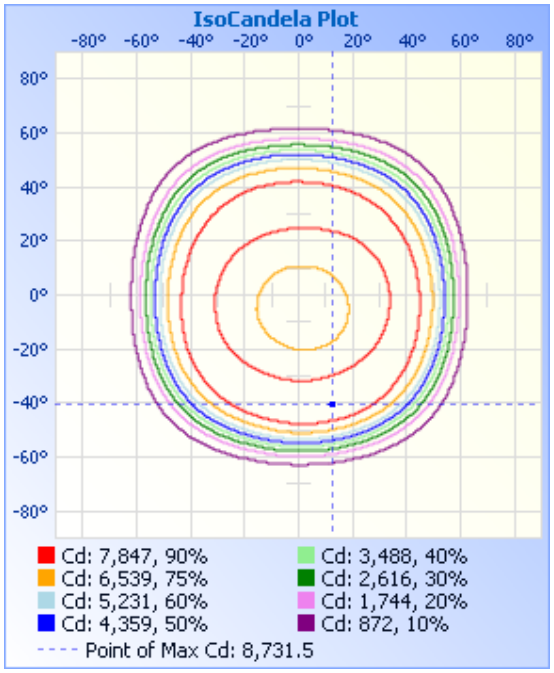
Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	574.2	2.7%	90-100	1.4	0%
10-20	1,852.9	8.8%	100-110	1.1	0%
20-30	3,412.4	16.2%	110-120	1.7	0%
30-40	5,114.1	24.3%	120-130	2.5	0%
40-50	5,872.6	27.9%	130-140	3.0	0%
50-60	3,224.9	15.3%	140-150	2.9	0%
60-70	644.1	3.1%	150-160	2.2	0%
70-80	251.6	1.2%	160-170	1.3	0%
80-90	53.0	0.3%	170-180	0.5	0%

Photometric Data









Candela Table - Type C

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	5898	5886	5870	5871	5861	5855	5843	5829	5898	5886	5870	5871	5861	5855	5843	5829	5898
1	5924	5907	5892	5884	5867	5851	5834	5815	5877	5867	5858	5863	5861	5863	5862	5854	5924
2	5952	5933	5916	5906	5882	5857	5830	5807	5866	5853	5847	5861	5870	5883	5884	5884	5952
3	5997	5972	5951	5929	5904	5869	5832	5804	5855	5844	5843	5863	5882	5905	5914	5929	5997
4	6038	6010	5984	5963	5927	5884	5843	5804	5848	5838	5841	5870	5903	5940	5959	5975	6038
5	6100	6066	6034	5996	5954	5904	5857	5812	5844	5834	5844	5879	5925	5972	6002	6038	6100
6	6157	6121	6081	6033	5994	5936	5876	5822	5845	5838	5849	5896	5951	6020	6064	6080	6157
7	6236	6197	6150	6089	6043	5977	5907	5838	5850	5843	5860	5909	5988	6065	6118	6156	6236
8	6306	6263	6212	6139	6084	6014	5940	5870	5865	5851	5871	5938	6023	6121	6171	6220	6306
9	6399	6353	6294	6210	6130	6052	5974	5904	5883	5865	5890	5964	6072	6168	6242	6306	6399
10	6481	6427	6362	6268	6194	6103	6021	5953	5914	5883	5909	6004	6112	6215	6300	6378	6481
11	6587	6504	6432	6347	6243	6148	6065	5997	5943	5910	5940	6037	6168	6280	6362	6474	6587
12	6672	6584	6506	6411	6305	6197	6123	6055	5988	5940	5970	6083	6214	6332	6441	6556	6672
13	6783	6688	6602	6499	6366	6263	6175	6107	6031	5976	6005	6124	6278	6398	6506	6658	6783
14	6872	6775	6682	6570	6444	6322	6248	6175	6090	6031	6055	6182	6332	6454	6588	6742	6872
15	6960	6889	6768	6644	6511	6385	6310	6236	6145	6081	6101	6233	6388	6511	6656	6846	6960
16	7067	6984	6879	6741	6595	6462	6390	6315	6219	6155	6168	6305	6458	6585	6743	6930	7067
17	7152	7080	6968	6818	6665	6524	6453	6386	6286	6221	6230	6364	6514	6647	6814	7013	7152
18	7257	7200	7078	6913	6750	6602	6536	6460	6377	6296	6316	6428	6587	6725	6905	7119	7257
19	7341	7314	7167	7011	6817	6667	6604	6555	6458	6398	6393	6510	6647	6791	6979	7204	7341
20	7441	7399	7274	7088	6898	6735	6692	6635	6543	6488	6475	6578	6705	6858	7075	7307	7441
21	7521	7501	7381	7168	6966	6818	6763	6742	6656	6613	6585	6668	6782	6943	7152	7389	7521
22	7616	7582	7466	7273	7057	6909	6862	6851	6752	6720	6679	6741	6846	7013	7232	7484	7616
23	7690	7677	7546	7353	7131	6983	6941	6939	6880	6832	6802	6836	6932	7103	7332	7581	7690
24	7757	7747	7639	7450	7228	7079	7045	7034	6985	6977	6903	6914	7002	7178	7416	7655	7757
25	7835	7814	7711	7524	7306	7160	7130	7157	7120	7092	7006	7016	7076	7256	7520	7750	7835
26	7893	7889	7795	7614	7405	7262	7244	7254	7228	7235	7138	7102	7171	7352	7602	7826	7893
27	7962	7942	7854	7683	7490	7348	7336	7386	7363	7345	7245	7192	7250	7434	7705	7917	7962
28	8014	8005	7911	7753	7572	7436	7431	7490	7468	7482	7376	7304	7354	7535	7782	7985	8014

29	8079	8052	7977	7837	7672	7548	7558	7620	7572	7588	7480	7396	7440	7617	7858	8048	8079
30	8128	8099	8027	7901	7750	7638	7658	7728	7696	7690	7608	7511	7548	7717	7945	8117	8128
31	8186	8156	8086	7980	7843	7748	7785	7836	7794	7811	7706	7601	7634	7794	8011	8169	8186
32	8228	8196	8132	8034	7910	7831	7879	7968	7914	7906	7802	7715	7718	7866	8081	8224	8228
33	8266	8250	8174	8081	7971	7913	7974	8071	8008	8020	7921	7801	7815	7948	8128	8262	8266
34	8307	8292	8218	8136	8040	8009	8083	8191	8125	8110	8013	7888	7888	8005	8175	8288	8307
35	8327	8318	8243	8163	8095	8078	8163	8281	8215	8226	8125	7988	7971	8064	8203	8309	8327
36	8332	8338	8265	8183	8132	8149	8250	8385	8305	8316	8212	8062	8029	8099	8222	8315	8332
37	8319	8337	8271	8194	8161	8205	8323	8456	8417	8404	8294	8146	8089	8131	8230	8305	8319
38	8291	8316	8262	8190	8170	8237	8367	8528	8501	8510	8387	8200	8126	8146	8224	8277	8291
39	8231	8259	8222	8168	8165	8262	8398	8571	8597	8588	8450	8253	8149	8145	8198	8221	8231
40	8138	8197	8168	8136	8149	8268	8417	8598	8663	8667	8514	8277	8160	8130	8161	8153	8138
41	8035	8089	8094	8082	8116	8257	8416	8598	8717	8711	8540	8285	8149	8099	8083	8064	8035
42	7910	7974	7974	7981	8049	8218	8389	8570	8731	8722	8537	8268	8105	8029	7992	7918	7910
43	7721	7825	7851	7875	7967	8162	8333	8492	8696	8684	8491	8227	8047	7942	7841	7766	7721
44	7542	7600	7654	7702	7820	8048	8243	8388	8615	8599	8377	8128	7928	7785	7683	7532	7542
45	7281	7394	7466	7531	7662	7910	8078	8189	8487	8431	8244	8006	7788	7616	7489	7310	7281
46	7043	7080	7251	7330	7468	7730	7895	7981	8266	8248	8073	7795	7555	7359	7203	6994	7043
47	6776	6820	6945	7030	7172	7452	7602	7732	8040	7962	7806	7577	7322	7111	6935	6712	6776
48	6399	6527	6670	6749	6887	7181	7314	7365	7700	7687	7542	7239	7045	6748	6552	6320	6399
49	6059	6113	6268	6344	6481	6765	6961	7016	7384	7274	7137	6919	6639	6404	6204	5968	6059
50	5584	5735	5895	5979	6110	6373	6439	6498	6921	6879	6746	6547	6264	6016	5716	5483	5584
51	5159	5204	5480	5573	5705	5936	5975	6030	6486	6303	6179	6017	5740	5485	5297	5063	5159
52	4705	4741	4910	5016	5153	5369	5382	5533	5861	5791	5672	5542	5280	5041	4750	4626	4705
53	4113	4271	4437	4547	4681	4898	4893	4887	5319	5113	5003	4908	4681	4467	4302	4068	4113
54	3646	3692	3845	3950	4199	4277	4385	4358	4755	4542	4453	4388	4187	4004	3852	3621	3646
55	3088	3253	3399	3478	3598	3788	3753	3696	4026	3951	3749	3731	3571	3418	3296	3081	3088
56	2625	2707	2981	3029	3132	3318	3263	3184	3445	3232	3200	3216	3086	2974	2875	2744	2625
57	2171	2345	2451	2470	2544	2665	2577	2508	2762	2718	2700	2685	2601	2529	2451	2285	2171
58	1839	1916	2089	2017	2154	2221	2137	2093	2371	2237	2232	2252	2193	2110	2065	1950	1839
59	1476	1607	1682	1691	1716	1769	1688	1645	1864	1816	1721	1772	1722	1655	1642	1578	1476

60	1232	1289	1409	1347	1426	1466	1364	1332	1418	1361	1360	1436	1399	1375	1314	1267	1232
61	989	1086	1136	1129	1134	1114	1035	1029	1139	1045	1036	1086	1080	1074	1093	1066	989
62	844	888	960	914	942	911	873	871	904	886	878	858	887	886	874	873	844
63	707	758	785	779	765	758	734	729	775	736	732	742	729	736	754	756	707
64	627	649	666	662	655	671	652	642	648	640	640	633	641	637	653	648	627
65	550	587	599	594	589	587	569	556	571	546	545	562	554	572	588	586	550
66	496	517	530	523	517	529	512	502	497	488	475	486	483	501	516	515	496
67	437	467	477	469	468	469	456	451	452	436	435	443	444	457	458	468	437
68	400	415	423	418	420	432	415	419	408	396	395	401	404	415	422	420	400
69	364	384	390	386	390	394	387	385	373	368	368	373	378	387	386	384	364
70	335	351	356	353	358	362	356	354	349	338	339	342	348	356	361	360	335
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72	289	303	307	303	308	311	306	306	300	291	292	294	300	307	312	313	289
73	271	280	288	283	289	291	286	286	275	271	268	269	276	282	288	289	271
74	249	262	265	259	265	266	261	261	255	247	248	249	257	262	264	271	249
75	230	239	243	236	247	247	241	241	231	223	224	225	233	238	245	248	230
76	209	221	224	218	223	223	216	217	207	204	205	201	214	219	222	226	209
77	187	200	203	196	201	200	193	199	188	181	182	182	191	196	204	208	187
78	170	179	186	178	184	181	174	175	165	163	160	160	169	173	181	186	170
79	149	162	165	157	162	158	151	152	147	141	142	142	150	154	159	169	149
80	132	141	144	140	144	140	133	133	125	119	120	120	128	131	141	147	132
81	113	125	128	120	122	118	111	111	104	102	103	100	110	109	119	125	113
82	97	105	108	100	101	101	95	93	88	81	82	84	89	93	103	108	97
83	78	89	91	85	85	80	74	71	68	65	61	64	67	72	82	86	78
84	58	68	71	66	64	60	54	50	48	46	46	49	51	57	61	64	58
85	43	48	55	50	48	45	38	33	32	27	27	31	32	37	45	47	43
86	24	32	35	32	29	26	19	15	16	14	14	15	18	19	26	27	24
87	11	15	17	15	12	13	8	5	6	4	5	5	6	8	13	14	11
88	2	5	6	4	3	3	2	2	3	3	3	3	3	3	4	4	2
89	1	2	2	2	2	1	1	2	2	2	2	2	2	2	2	3	1
90	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1

91	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1
92	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1
93	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1
94	1	1	1	1	1	1	1	1	2	1	2	2	2	2	2	2	1
95	1	1	1	1	1	1	1	1	2	1	2	2	2	2	2	2	1
96	1	1	1	1	1	1	1	1	2	1	1	1	2	1	2	2	1
97	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
98	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
99	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
101	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
102	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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2.2 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2016-07-21	Test Ambient:	25.2 °C
Test Orientation	As intended	Stabilization Time (min)	90
Model Number	AOK-150WiU-X(5000K)		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE160710-B2	120.0	60	1.307	155.8	0.9934	7.21
	277.0	60	0.5573	150.7	0.9762	10.05
				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)	5741
Duv	0.0011
Chromaticity (x, y)	x=0.3271 y=0.3385
Chromaticity (u', v')	u'=0.2042 v'=0.4754
Color Rendering Index (CRI)	77.0
R9	0

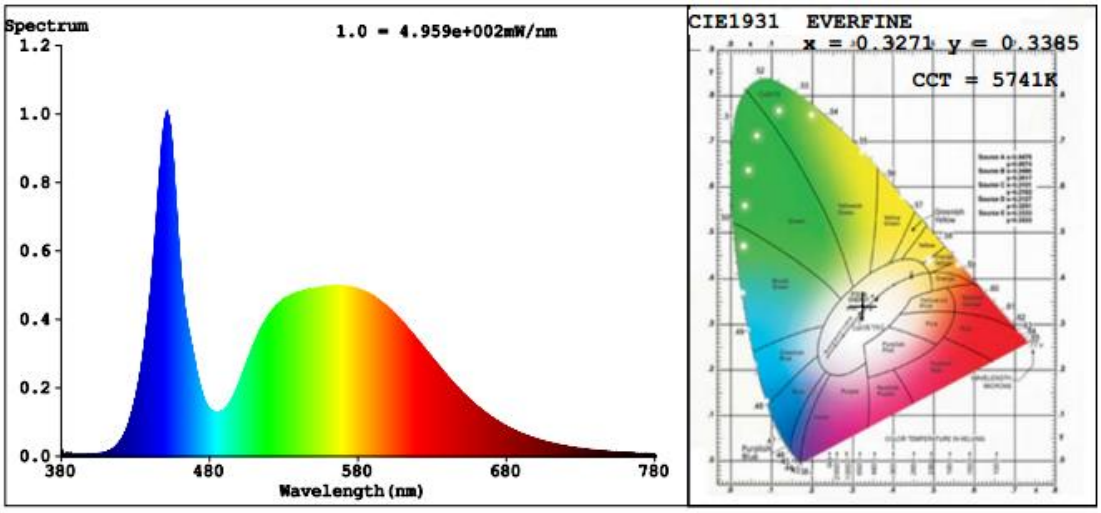
Special Color Rendering Indices			
R1	76	R9	0
R2	81	R10	53
R3	83	R11	75
R4	78	R12	47
R5	76	R13	76
R6	73	R14	91
R7	85	R15	72
R8	64	--	--

Photometric Measurement – Sphere-Spectroradiometer Method:

Parameter	Result		DLC V4.0 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	21572	21257	>=10000(-10%)	
Luminous Efficacy (lm/W)	138.46	141.06	Standard: >= 105(-3%)	Premium: >= 130(-3%)

NVLAP LAB CODE 201011-0

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 ******