IES LM-79-08

MEASUREMENT AND TEST REPORT

For

LEDVANCE LLC

200 Ballardvale Street Wilmington, MA 01887

#Test Model: LEDMD8R2A1600ST9SC3

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Hexy He
Report Number:	RSZ191009507-10
Test Date:	2019-09-10 to 2019-09-26
Report Date:	2019-10-11
Reviewed By:	Bill Xiong / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

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1. Product Description

General Information:

One test sample was in good condition and received on 2019-09-05 and used for testing. All tests and evaluations were performed at the least efficient white light setting.

#Model Tested:	LEDMD8R2A1600ST9SC3
#Manufacturer:	LEDVANCE LLC
#Product Designation:	LED recessed downLight
Burning Time Before Test:	0hour(For New Products)

#Rated Values:

Rated Voltage/Frequency:	120V AC 60Hz
Rated Power:	20 W
Nominal CCT:	2700K/3000K/3500K/4000K/5000K
Nominal Lumen Output:	1600lm

Note:

1. The applicant LEDVANCE LLCdeclare that their products with model LEDMD8R2A1600ST9SC3

are the same to the products in report#RSZ190905504-10-1-M1 and is authorized by original applicant to use their test data.

2. All the data in previous report (RSZ190905504-10-1-M1) is shared in this report.

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-18: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
2.0m integrating sphere	EVERFINE	R98	11010018	2018-12-13	2019-12-13
spectroradiometer	EVERFINE	HAAS-2000	20140912	2018-12-13	2019-12-13
Digital Power Meter	EVERFINE	PF2010A	1011004	2019-07-28	2020-07-27
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	2019-07-23	2020-07-22
Rapid Recording Photometer	EVERFINE	PHOTO-2000F	1007010	2018-12-13	2019-12-13
Standard Light Source	EVERFINE	D204	N/A	2019-07-19	2020-07-18
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	2019-03-08	2020-03-07
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2019-03-08	2020-03-07

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2019-04-10	2020-04-09
Digital power meter	YOKOGAWA	WT-210	91j926132	2019-03-08	2020-03-07
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2019-03-08	2020-03-07
Wireless Remote Sensor	N/A	433MHz	N/A	2019-03-08	2020-03-07
Standard Light Source	EVERFINE	D908	1012001	2018-12-24	2019-12-24

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at 25°C±1°C during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is U=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=22K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=2.1(K=2), at the 95% confidence level.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.18% of rdg, Power U=0.46%) (K=2), at the 95% confidence level.

Goniophotometer System

The luminaire was tested in a can.

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is U=2.82% (K=2) , at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f, R_g was calculated according to IES TM-30-18 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.1662	19.74	0.9894	1651.7	83.69

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
5.8459	2758	0.00268	0.4597	0.4179	0.2592	0.5301

Color Rendering Index

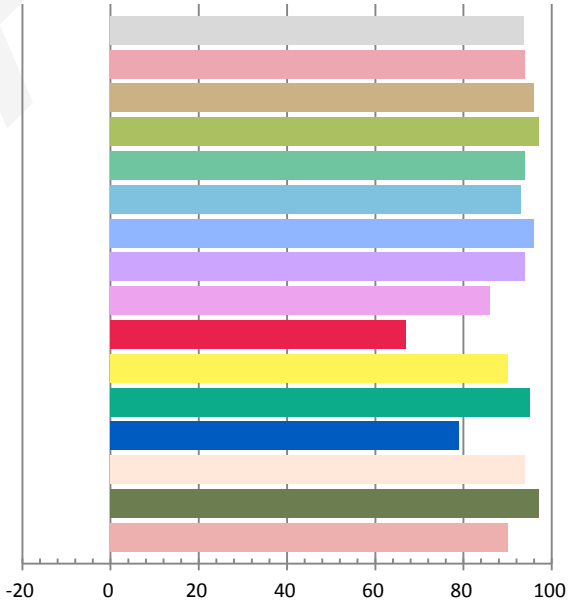
Ra
93.7

R1	R2	R3	R4
94	96	97	94

R5	R6	R7	R8
93	96	94	86

R9	R10	R11	R12
67	90	95	79

R13	R14	R15
94	97	90



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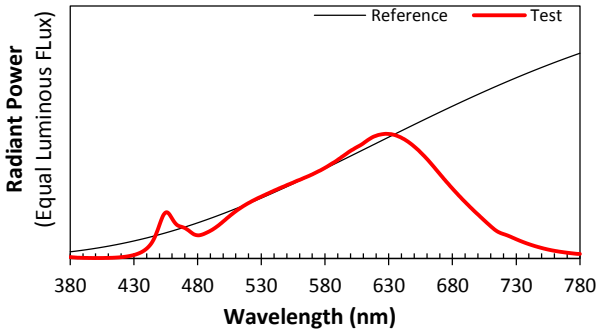
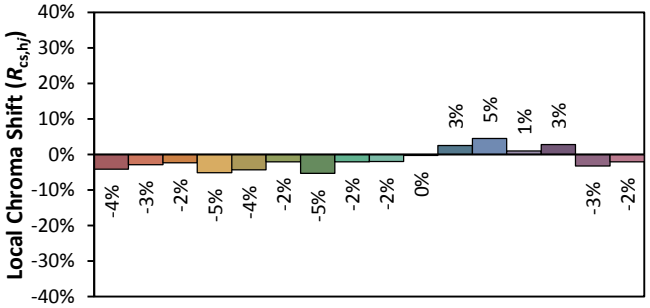
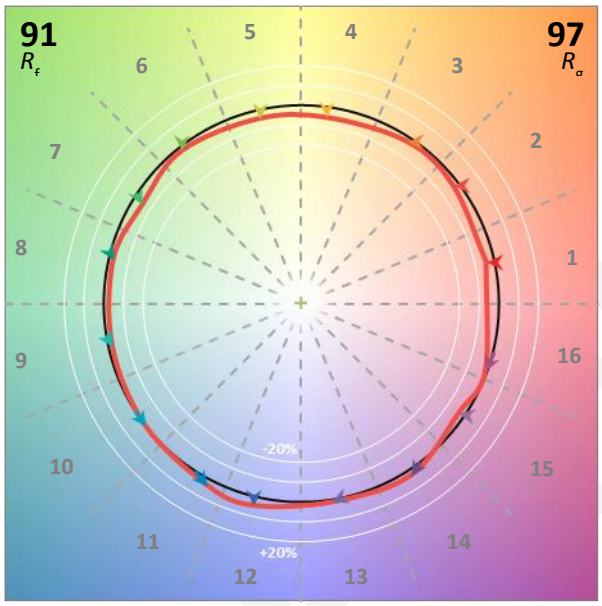
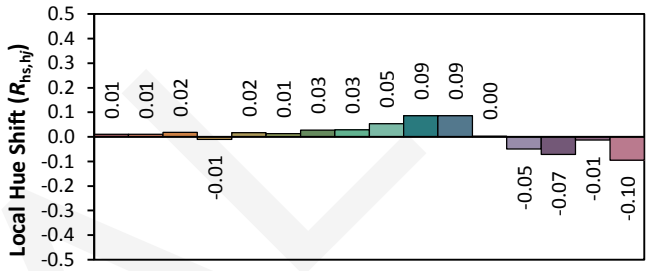
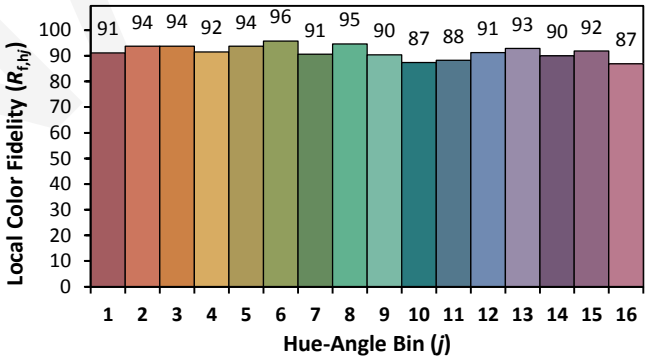
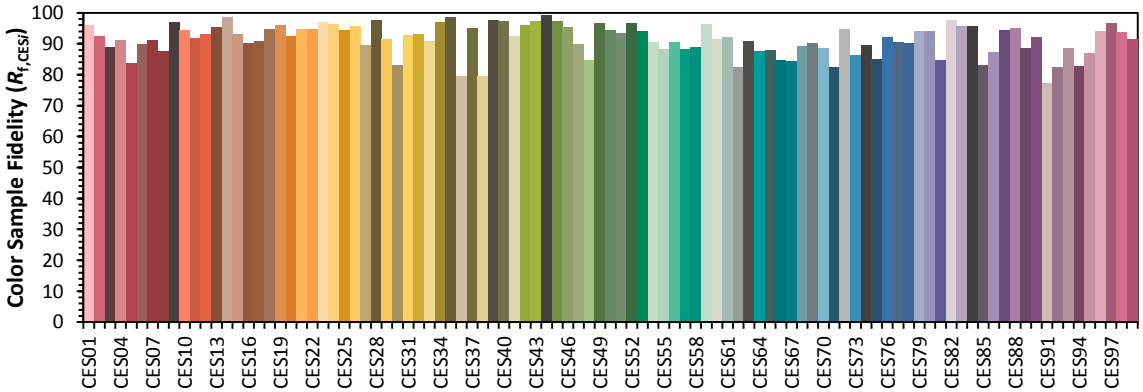

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
40% 30% 20% 10% 0% -10% -20% -30% -40%
-4% -3% -2% -5% -4% -2% -5% -2% -2% 0% 3% 5% 1% 3% -3% -2%

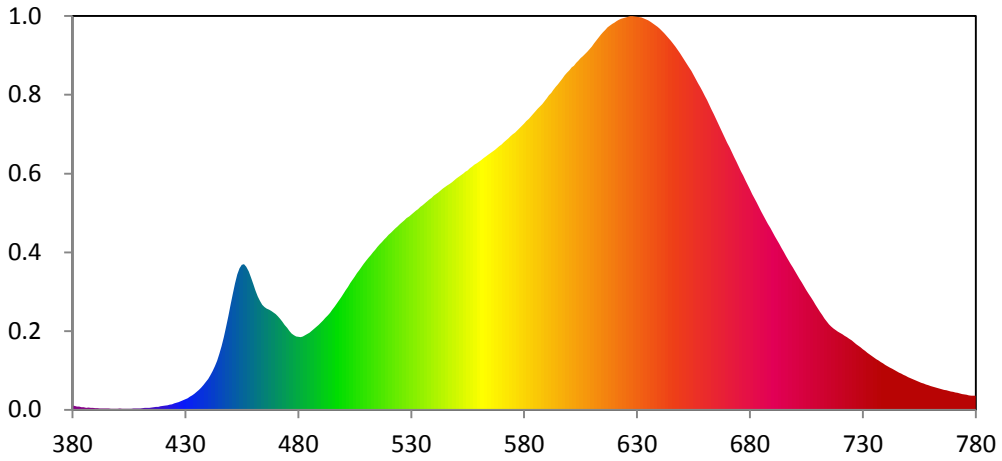

91
R_f
97
R_a
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
-20%
+20%


Local Hue Shift ($R_{hs,hj}$)
0.5 0.4 0.3 0.2 0.1 0.0 -0.1 -0.2 -0.3 -0.4 -0.5
0.01 0.01 0.02 -0.01 0.02 0.01 0.03 0.03 0.05 0.09 0.09 0.00 -0.05 -0.07 -0.01 -0.10


Local Color Fidelity ($R_{f,hj}$)
100 90 80 70 60 50 40 30 20 10 0
91 94 94 92 94 96 91 95 90 87 88 91 93 90 92 87
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue-Angle Bin (j)


Color Sample Fidelity ($R_{f,CESi}$)
100 90 80 70 60 50 40 30 20 10 0
CES01 CES04 CES07 CES10 CES13 CES16 CES19 CES22 CES25 CES28 CES31 CES34 CES37 CES40 CES43 CES46 CES49 CES52 CES55 CES58 CES61 CES64 CES67 CES70 CES73 CES76 CES79 CES82 CES85 CES88 CES91 CES94 CES97

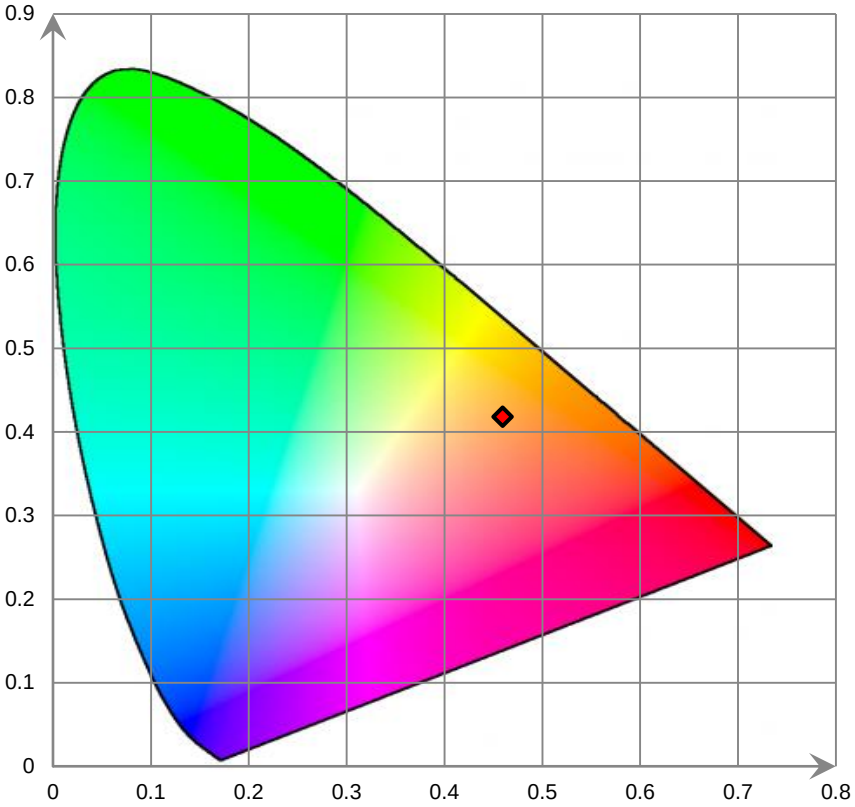
Relative Spectral Power Distribution



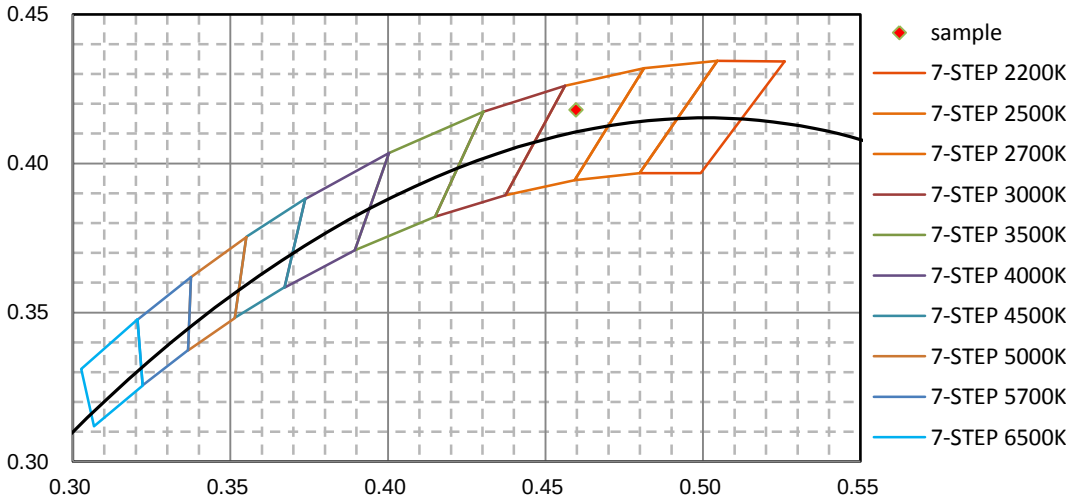
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.633E-01	421	3.704E-01	462	1.031E+01	503	1.151E+01	544	2.010E+01
381	3.436E-01	422	4.167E-01	463	9.884E+00	504	1.180E+01	545	2.024E+01
382	2.907E-01	423	4.562E-01	464	9.552E+00	505	1.211E+01	546	2.041E+01
383	2.797E-01	424	5.061E-01	465	9.351E+00	506	1.242E+01	547	2.055E+01
384	2.362E-01	425	5.657E-01	466	9.196E+00	507	1.270E+01	548	2.070E+01
385	2.184E-01	426	6.266E-01	467	9.094E+00	508	1.299E+01	549	2.086E+01
386	1.784E-01	427	6.974E-01	468	8.975E+00	509	1.327E+01	550	2.103E+01
387	1.905E-01	428	7.769E-01	469	8.850E+00	510	1.354E+01	551	2.119E+01
388	1.613E-01	429	8.625E-01	470	8.709E+00	511	1.382E+01	552	2.132E+01
389	1.609E-01	430	9.538E-01	471	8.488E+00	512	1.406E+01	553	2.148E+01
390	1.399E-01	431	1.055E+00	472	8.248E+00	513	1.431E+01	554	2.163E+01
391	1.301E-01	432	1.180E+00	473	8.003E+00	514	1.456E+01	555	2.177E+01
392	1.219E-01	433	1.314E+00	474	7.703E+00	515	1.480E+01	556	2.195E+01
393	1.262E-01	434	1.453E+00	475	7.432E+00	516	1.504E+01	557	2.211E+01
394	1.137E-01	435	1.619E+00	476	7.156E+00	517	1.525E+01	558	2.228E+01
395	1.028E-01	436	1.795E+00	477	6.926E+00	518	1.548E+01	559	2.241E+01
396	1.099E-01	437	2.003E+00	478	6.771E+00	519	1.569E+01	560	2.254E+01
397	9.801E-02	438	2.240E+00	479	6.674E+00	520	1.590E+01	561	2.269E+01
398	9.157E-02	439	2.507E+00	480	6.623E+00	521	1.608E+01	562	2.286E+01
399	8.931E-02	440	2.802E+00	481	6.614E+00	522	1.630E+01	563	2.302E+01
400	8.609E-02	441	3.134E+00	482	6.674E+00	523	1.650E+01	564	2.318E+01
401	1.012E-01	442	3.516E+00	483	6.769E+00	524	1.668E+01	565	2.332E+01
402	9.154E-02	443	3.956E+00	484	6.880E+00	525	1.687E+01	566	2.348E+01
403	9.606E-02	444	4.463E+00	485	7.021E+00	526	1.706E+01	567	2.363E+01
404	9.346E-02	445	5.083E+00	486	7.189E+00	527	1.724E+01	568	2.379E+01
405	9.722E-02	446	5.781E+00	487	7.357E+00	528	1.742E+01	569	2.397E+01
406	9.730E-02	447	6.593E+00	488	7.536E+00	529	1.758E+01	570	2.412E+01
407	1.156E-01	448	7.524E+00	489	7.708E+00	530	1.775E+01	571	2.431E+01
408	1.205E-01	449	8.489E+00	490	7.913E+00	531	1.792E+01	572	2.449E+01
409	1.237E-01	450	9.538E+00	491	8.114E+00	532	1.810E+01	573	2.468E+01
410	1.269E-01	451	1.054E+01	492	8.334E+00	533	1.825E+01	574	2.486E+01
411	1.400E-01	452	1.149E+01	493	8.585E+00	534	1.844E+01	575	2.505E+01
412	1.567E-01	453	1.232E+01	494	8.818E+00	535	1.860E+01	576	2.521E+01
413	1.595E-01	454	1.285E+01	495	9.099E+00	536	1.876E+01	577	2.540E+01
414	1.807E-01	455	1.318E+01	496	9.360E+00	537	1.893E+01	578	2.561E+01
415	2.002E-01	456	1.323E+01	497	9.648E+00	538	1.912E+01	579	2.581E+01
416	2.203E-01	457	1.300E+01	498	9.950E+00	539	1.926E+01	580	2.602E+01
417	2.459E-01	458	1.258E+01	499	1.024E+01	540	1.945E+01	581	2.623E+01
418	2.679E-01	459	1.200E+01	500	1.057E+01	541	1.960E+01	582	2.645E+01
419	3.051E-01	460	1.142E+01	501	1.087E+01	542	1.976E+01	583	2.668E+01
420	3.355E-01	461	1.083E+01	502	1.118E+01	543	1.992E+01	584	2.691E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.715E+01	626	3.572E+01	667	2.556E+01	708	9.886E+00	749	3.076E+00
586	2.737E+01	627	3.577E+01	668	2.514E+01	709	9.554E+00	750	2.980E+00
587	2.757E+01	628	3.578E+01	669	2.470E+01	710	9.217E+00	751	2.881E+00
588	2.780E+01	629	3.576E+01	670	2.427E+01	711	8.902E+00	752	2.785E+00
589	2.804E+01	630	3.574E+01	671	2.382E+01	712	8.599E+00	753	2.706E+00
590	2.831E+01	631	3.570E+01	672	2.340E+01	713	8.286E+00	754	2.610E+00
591	2.858E+01	632	3.568E+01	673	2.295E+01	714	8.025E+00	755	2.530E+00
592	2.880E+01	633	3.558E+01	674	2.254E+01	715	7.774E+00	756	2.450E+00
593	2.910E+01	634	3.550E+01	675	2.210E+01	716	7.574E+00	757	2.372E+00
594	2.934E+01	635	3.540E+01	676	2.169E+01	717	7.400E+00	758	2.296E+00
595	2.960E+01	636	3.527E+01	677	2.129E+01	718	7.233E+00	759	2.234E+00
596	2.986E+01	637	3.513E+01	678	2.085E+01	719	7.100E+00	760	2.159E+00
597	3.011E+01	638	3.497E+01	679	2.044E+01	720	6.972E+00	761	2.103E+00
598	3.039E+01	639	3.483E+01	680	2.004E+01	721	6.858E+00	762	2.044E+00
599	3.065E+01	640	3.464E+01	681	1.962E+01	722	6.729E+00	763	1.980E+00
600	3.088E+01	641	3.443E+01	682	1.923E+01	723	6.598E+00	764	1.919E+00
601	3.112E+01	642	3.425E+01	683	1.884E+01	724	6.446E+00	765	1.866E+00
602	3.129E+01	643	3.402E+01	684	1.845E+01	725	6.299E+00	766	1.815E+00
603	3.154E+01	644	3.378E+01	685	1.804E+01	726	6.145E+00	767	1.762E+00
604	3.175E+01	645	3.355E+01	686	1.767E+01	727	5.973E+00	768	1.711E+00
605	3.196E+01	646	3.328E+01	687	1.728E+01	728	5.818E+00	769	1.666E+00
606	3.216E+01	647	3.301E+01	688	1.689E+01	729	5.659E+00	770	1.618E+00
607	3.235E+01	648	3.273E+01	689	1.652E+01	730	5.495E+00	771	1.571E+00
608	3.256E+01	649	3.243E+01	690	1.616E+01	731	5.343E+00	772	1.524E+00
609	3.279E+01	650	3.212E+01	691	1.578E+01	732	5.188E+00	773	1.481E+00
610	3.304E+01	651	3.181E+01	692	1.543E+01	733	5.033E+00	774	1.438E+00
611	3.332E+01	652	3.148E+01	693	1.506E+01	734	4.891E+00	775	1.398E+00
612	3.357E+01	653	3.116E+01	694	1.468E+01	735	4.747E+00	776	1.357E+00
613	3.384E+01	654	3.081E+01	695	1.434E+01	736	4.604E+00	777	1.316E+00
614	3.409E+01	655	3.043E+01	696	1.397E+01	737	4.464E+00	778	1.278E+00
615	3.432E+01	656	3.007E+01	697	1.362E+01	738	4.330E+00	779	1.270E+00
616	3.454E+01	657	2.969E+01	698	1.327E+01	739	4.205E+00	780	1.272E+00
617	3.476E+01	658	2.933E+01	699	1.293E+01	740	4.077E+00		
618	3.494E+01	659	2.894E+01	700	1.260E+01	741	3.953E+00		
619	3.509E+01	660	2.855E+01	701	1.226E+01	742	3.835E+00		
620	3.521E+01	661	2.815E+01	702	1.190E+01	743	3.715E+00		
621	3.535E+01	662	2.772E+01	703	1.157E+01	744	3.602E+00		
622	3.546E+01	663	2.730E+01	704	1.122E+01	745	3.487E+00		
623	3.554E+01	664	2.688E+01	705	1.088E+01	746	3.385E+00		
624	3.561E+01	665	2.645E+01	706	1.055E+01	747	3.275E+00		
625	3.568E+01	666	2.602E+01	707	1.021E+01	748	3.181E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.5 hour**

Test orientation: **Downward**

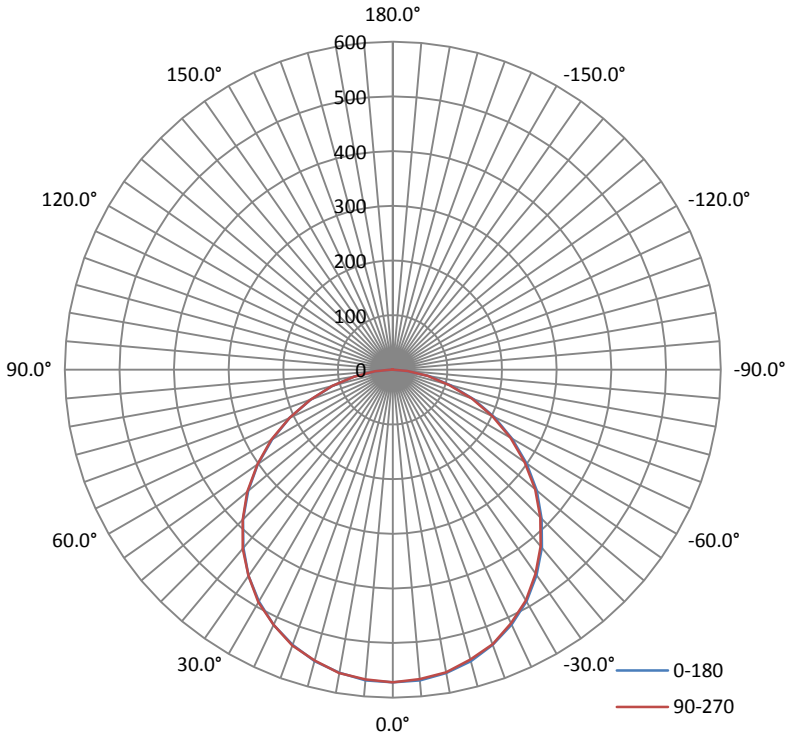
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1668	19.72	0.9855

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1656.39	84.00	573.4	1.27	1.27

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	113.0	112.9	112.8	112.9	112.9
Field Angle (10% I_{max}):	162.9	162.9	162.6	162.6	162.8

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	572	572	572	572	572	572	572	572
5.0°	570	570	570	569	568	571	569	571
10.0°	563	563	563	564	564	563	564	563
15.0°	552	551	552	551	551	552	551	552
20.0°	536	536	536	536	537	536	536	536
25.0°	515	515	516	515	515	517	515	516
30.0°	490	490	491	490	491	491	490	489
35.0°	460	460	461	460	460	462	460	460
40.0°	425	426	426	426	427	427	426	425
45.0°	387	388	389	388	388	389	387	387
50.0°	345	347	347	347	347	347	346	345
55.0°	301	302	303	302	302	303	300	300
60.0°	254	256	257	256	256	256	254	253
65.0°	207	209	210	209	208	209	206	205
70.0°	160	162	162	162	161	160	159	157
75.0°	114	116	116	116	115	114	112	111
80.0°	70	72	73	73	72	71	69	68
85.0°	31	33	34	34	33	32	30	29
90.0°	3	3	5	5	3	3	4	3
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	1	1	1	1	1	1	0
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

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Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	572	572	572	572	572	572	572	572
5.0°	570	569	570	569	568	570	569	570
10.0°	563	562	562	561	562	562	563	563
15.0°	552	550	550	550	549	551	550	552
20.0°	535	534	534	533	534	534	535	535
25.0°	515	513	513	512	512	513	513	514
30.0°	489	488	487	486	487	487	488	489
35.0°	459	457	457	455	455	457	457	458
40.0°	425	423	421	421	422	422	423	424
45.0°	386	383	383	382	382	383	384	386
50.0°	344	342	340	340	340	341	343	344
55.0°	299	297	296	295	295	296	297	299
60.0°	253	251	249	248	249	249	251	253
65.0°	205	203	202	201	201	202	203	206
70.0°	157	156	155	153	154	154	156	158
75.0°	110	109	108	107	107	108	109	112
80.0°	67	66	65	64	64	65	66	69
85.0°	28	27	27	27	27	27	29	30
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	1	1	0	0	0	0	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

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Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	13.6	0.82
5-10	40.5	2.45
10-15	66.1	3.99
15-20	89.5	5.41
20-25	110.1	6.64
25-30	127.0	7.67
30-35	139.6	8.43
35-40	147.4	8.89
40-45	150.0	9.06
45-50	147.5	8.91
50-55	139.9	8.44
55-60	127.6	7.71
60-65	111.4	6.72
65-70	91.9	5.55
70-75	70.3	4.25
75-80	48.0	2.89
80-85	26.5	1.60
85-90	7.6	0.46
90-95	0.2	0.01
95-100	0.1	0.00
100-105	0.1	0.01
105-110	0.1	0.00
110-115	0.1	0.01
115-120	0.1	0.00
120-125	0.1	0.01
125-130	0.1	0.01
130-135	0.1	0.00
135-140	0.1	0.01
140-145	0.1	0.01
145-150	0.1	0.01
150-155	0.1	0.01
155-160	0.1	0.01
160-165	0.1	0.00
165-170	0.1	0.01
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	13.6	0.82
0-10	54.2	3.27
0-15	120.2	7.26
0-20	209.8	12.67
0-25	319.9	19.31
0-30	446.9	26.98
0-35	586.5	35.41
0-40	733.8	44.30
0-45	883.9	53.36
0-50	1031.4	62.27
0-55	1171.3	70.71
0-60	1298.9	78.42
0-65	1410.3	85.14
0-70	1502.2	90.69
0-75	1572.5	94.94
0-80	1620.5	97.83
0-85	1646.9	99.43
0-90	1654.5	99.89
0-95	1654.7	99.90
0-100	1654.8	99.90
0-105	1654.8	99.91
0-110	1654.9	99.91
0-115	1655.0	99.92
0-120	1655.1	99.92
0-125	1655.2	99.93
0-130	1655.3	99.94
0-135	1655.4	99.94
0-140	1655.6	99.95
0-145	1655.7	99.96
0-150	1655.9	99.97
0-155	1656.0	99.98
0-160	1656.1	99.99
0-165	1656.3	99.99
0-170	1656.3	100.00
0-175	1656.4	100.00
0-180	1656.4	100.00

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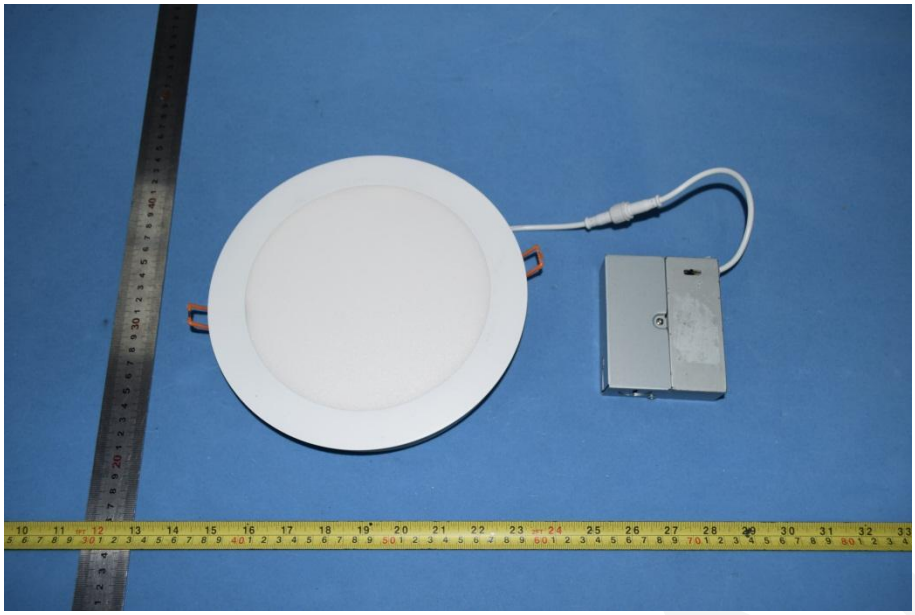
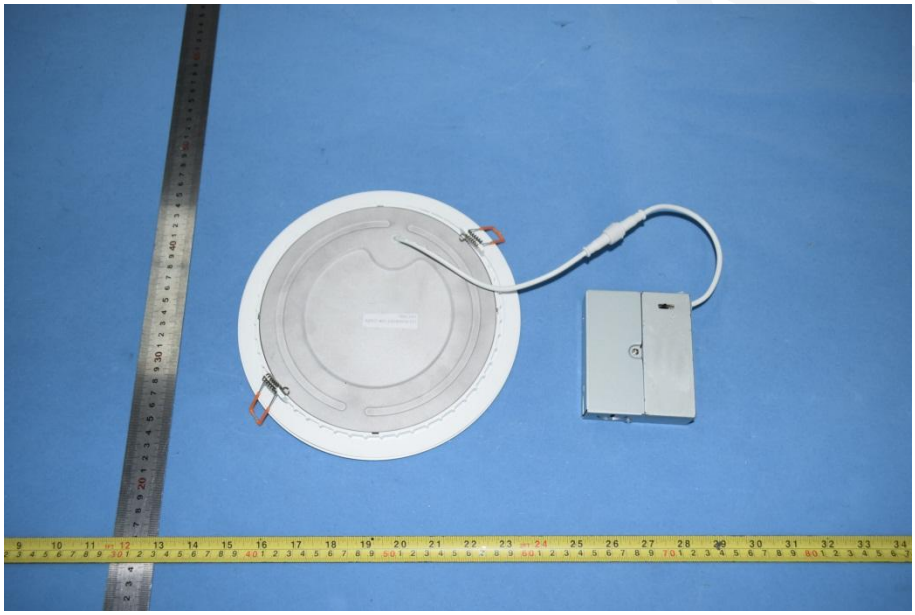
6. Product Photo





Directions

1. The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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**********END OF REPORT**********

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