



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

ATG Electronics Corp.

9020 Rancho Park Court Rancho Cucamonga, CA 91730

Test Model: LIFI-35F-4FT

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Carl Du <i>Carl Du</i>
Report Number:	RSZ161123530-10-M1
Test Date:	2016-11-26 to 2016-11-28
Report Date:	2016-12-08
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>
Revised Note:	The previous report RSZ161123530-10 is replaced by this report on 2016-12-08
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Accreditation:	The IAS Accreditation Number TL-460.

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

1. Product Description

General Information:

One sample was received on 2016-11-23 and used for testing.

Model Tested: LIFI-35F-4FT
 Manufacturer: ATG Electronics Co.,Ltd
 Brand Name: ATG
 Product Designation: Direct Linear Ambient Luminaires
 Burning Time Before Test: 0hour(For New Products)
 Length: 4ft

Rated Values:

Rated Voltage/Frequency: 120-277 V AC 50/60Hz
 Rated Power: 40 W
 Nominal CCT: 3500K
 Nominal Lumen Output: 4800 lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: 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	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50°C	2016-03-10	2017-03-09
High Accuracy Array spectroradiometer	EVERFINE	HAAS-2000	M112048CA1361125	380-780nm	2016-07-08	2017-07-07
Power meter	YOKOGAWA	WT310	C20E17024V	2kV/20A	2016-07-08	2017-07-07
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2016-03-04	2017-03-03
Thermal Meter	SENSING	N/A	N/A	25、50°C	2016-03-10	2017-03-09
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-09-24	2017-09-23
AC Power Supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2016-03-10	2017-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2016-03-21	2017-03-20

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-09-07	2017-09-06

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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ 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 $U=32\text{K}$ ($K=2$), 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 $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

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 $U=1.6\%$ ($K=2$), at the 95% confidence level.

Additional Test

The Additional Test item may not be covered by IESNA LM-79-2008. Additional test including power factor, off-state power and THD, was measured by Digital Power Meter after stabilized at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. Test voltage for THD and power factor test would be equal to rated voltage or, in case of a voltage range, maximum value of that range.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_i , R_g was calculated according to IES TM-30-15 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**

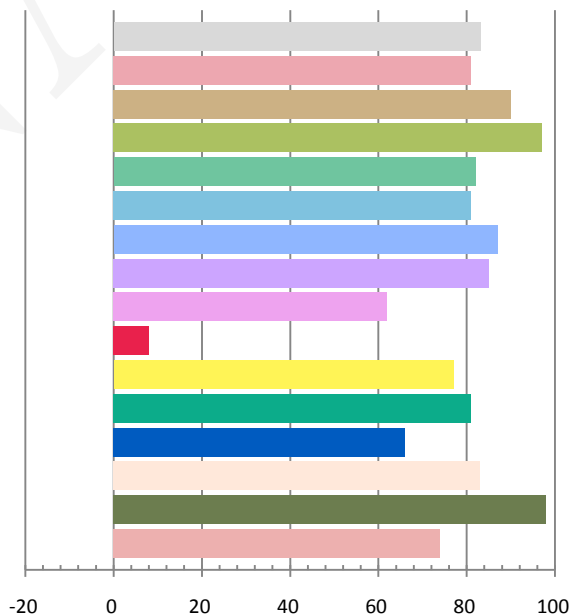
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.3559	42.25	0.9893	4801.3	113.65

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
14.444	3398	0.00113	0.4124	0.3968	0.2378	0.5148

Color Rendering Index

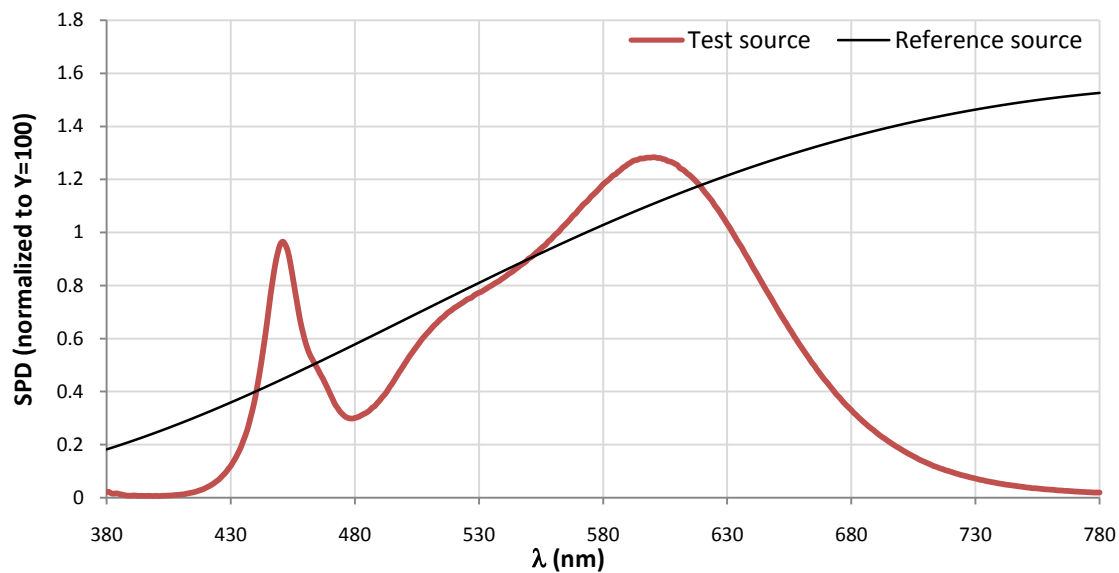
Ra			
83.1			
R1	R2	R3	R4
81	90	97	82
R5	R6	R7	R8
81	87	85	62
R9	R10	R11	R12
8	77	81	66
R13	R14	R15	
83	98	74	



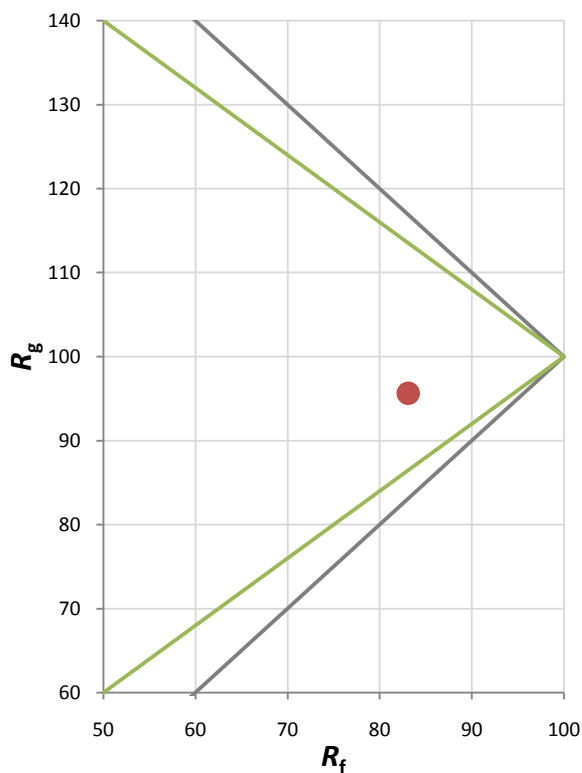
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	96

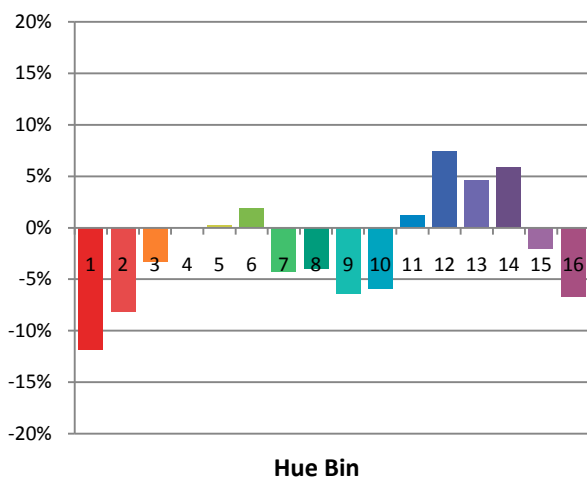
Spectral Power Distribution Comparison



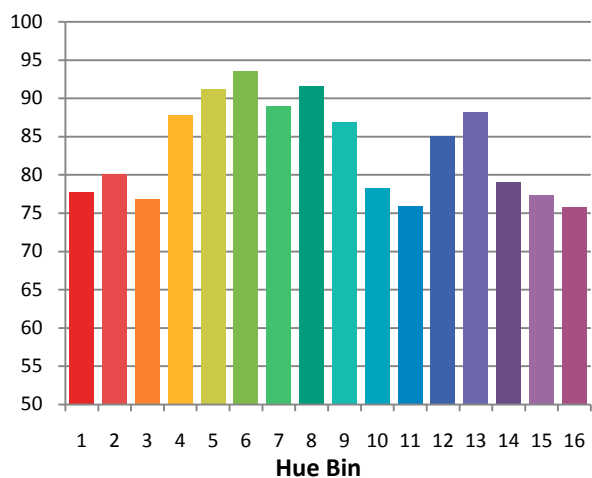
Plot of R_g versus R_f



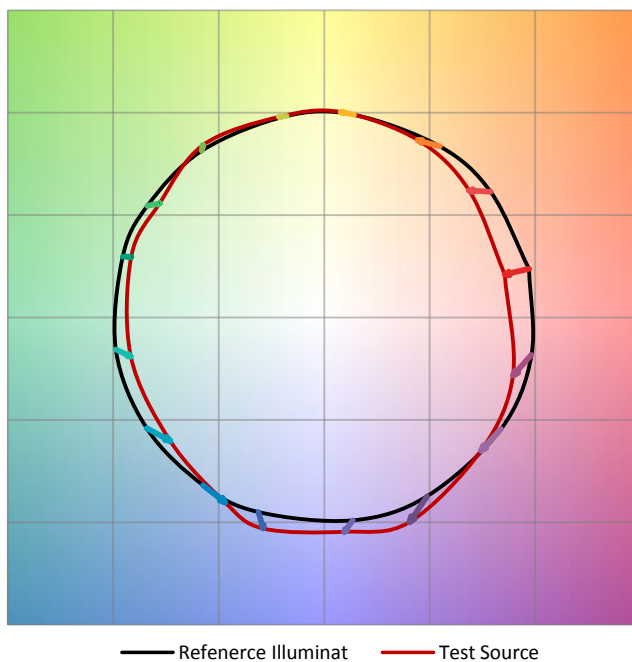
Chroma Shift by Hue



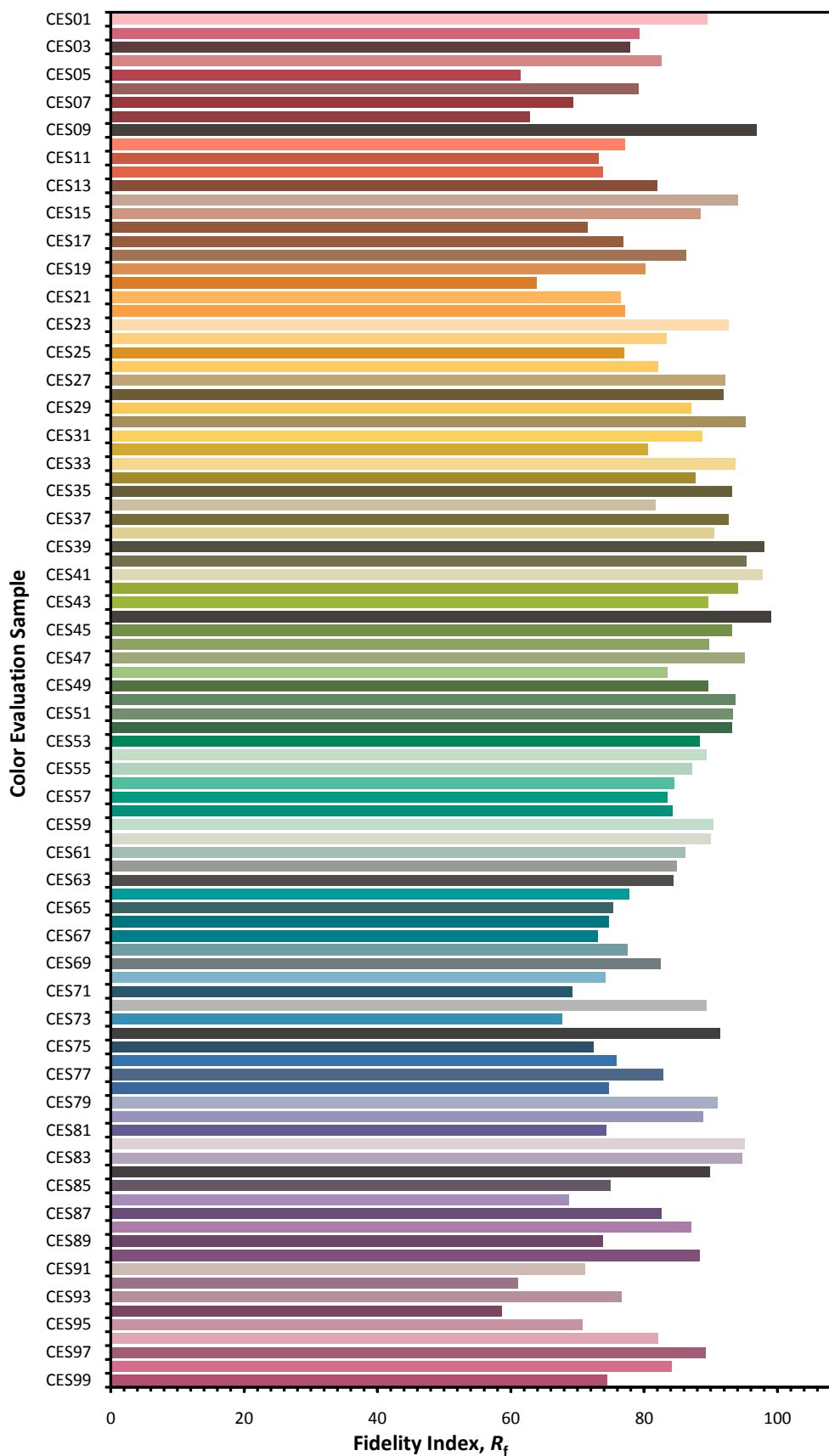
R_f by Hue



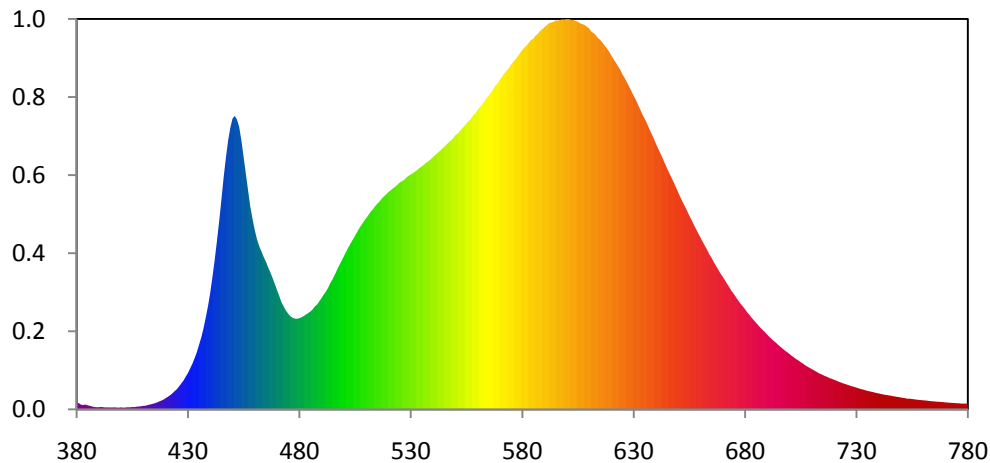
Color Vector Graphic



Color Fidelity by CES Sample



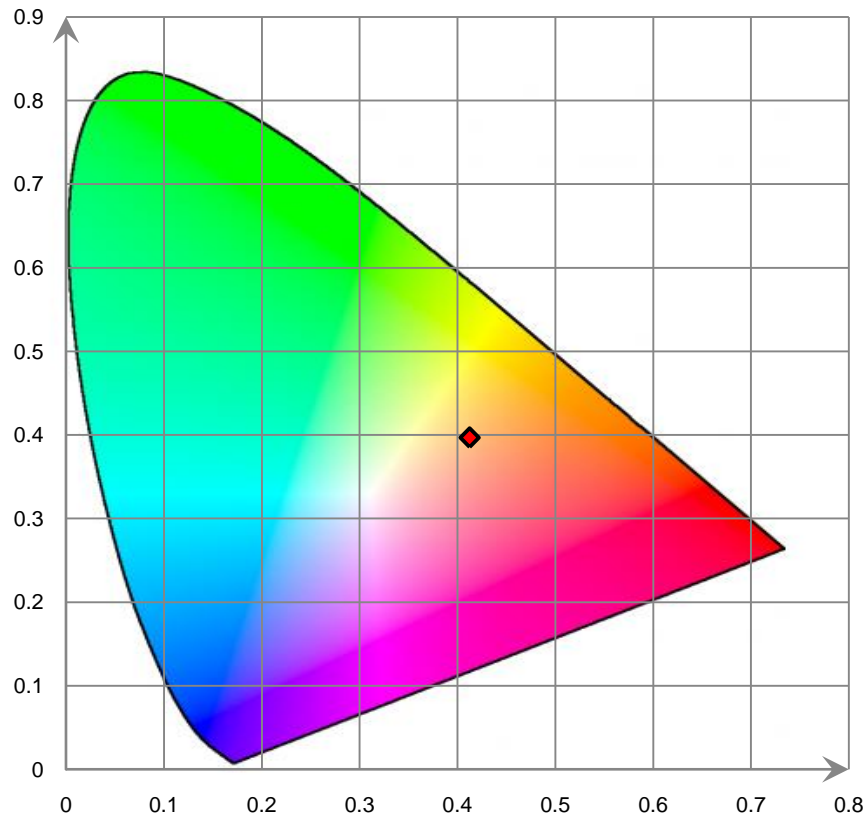
Relative Spectral Power Distribution



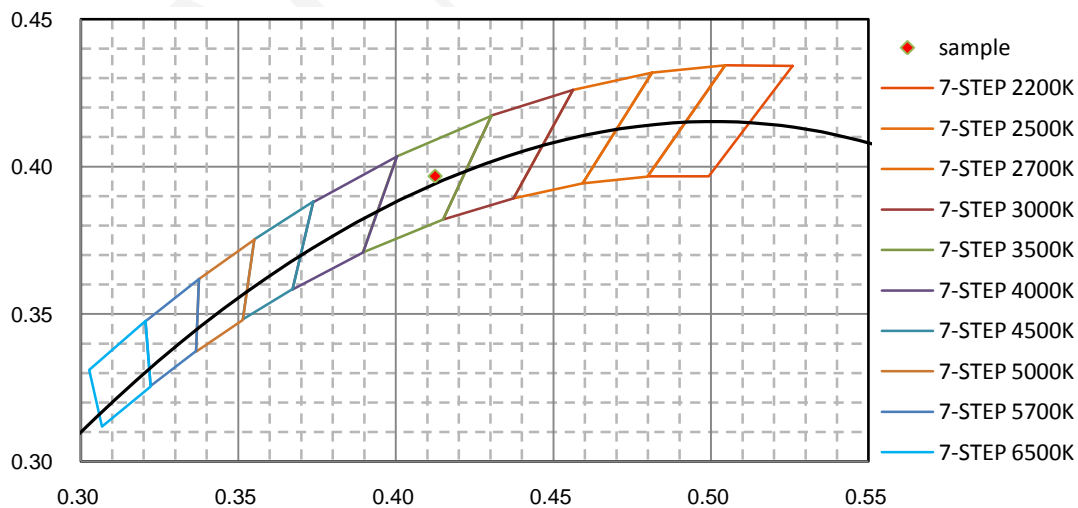
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.511E+00	421	2.920E+00	462	3.770E+01	503	3.833E+01	544	6.015E+01
381	1.466E+00	422	3.262E+00	463	3.649E+01	504	3.923E+01	545	6.067E+01
382	1.083E+00	423	3.687E+00	464	3.523E+01	505	4.013E+01	546	6.116E+01
383	1.020E+00	424	4.194E+00	465	3.413E+01	506	4.102E+01	547	6.168E+01
384	1.109E+00	425	4.646E+00	466	3.280E+01	507	4.194E+01	548	6.212E+01
385	9.426E-01	426	5.286E+00	467	3.168E+01	508	4.272E+01	549	6.261E+01
386	8.159E-01	427	5.975E+00	468	3.034E+01	509	4.345E+01	550	6.332E+01
387	6.654E-01	428	6.648E+00	469	2.899E+01	510	4.417E+01	551	6.368E+01
388	5.342E-01	429	7.559E+00	470	2.755E+01	511	4.492E+01	552	6.424E+01
389	4.918E-01	430	8.381E+00	471	2.619E+01	512	4.565E+01	553	6.489E+01
390	4.999E-01	431	9.456E+00	472	2.474E+01	513	4.624E+01	554	6.541E+01
391	5.552E-01	432	1.056E+01	473	2.380E+01	514	4.694E+01	555	6.606E+01
392	4.948E-01	433	1.185E+01	474	2.282E+01	515	4.755E+01	556	6.659E+01
393	4.441E-01	434	1.322E+01	475	2.213E+01	516	4.803E+01	557	6.711E+01
394	4.582E-01	435	1.493E+01	476	2.152E+01	517	4.872E+01	558	6.793E+01
395	4.409E-01	436	1.666E+01	477	2.115E+01	518	4.923E+01	559	6.842E+01
396	4.370E-01	437	1.870E+01	478	2.098E+01	519	4.968E+01	560	6.918E+01
397	4.656E-01	438	2.124E+01	479	2.094E+01	520	5.024E+01	561	6.985E+01
398	4.217E-01	439	2.383E+01	480	2.108E+01	521	5.061E+01	562	7.036E+01
399	3.997E-01	440	2.691E+01	481	2.128E+01	522	5.105E+01	563	7.117E+01
400	4.686E-01	441	3.056E+01	482	2.157E+01	523	5.147E+01	564	7.189E+01
401	3.844E-01	442	3.449E+01	483	2.193E+01	524	5.190E+01	565	7.254E+01
402	4.409E-01	443	3.884E+01	484	2.226E+01	525	5.241E+01	566	7.321E+01
403	4.872E-01	444	4.336E+01	485	2.264E+01	526	5.272E+01	567	7.397E+01
404	4.787E-01	445	4.834E+01	486	2.312E+01	527	5.299E+01	568	7.478E+01
405	5.438E-01	446	5.346E+01	487	2.381E+01	528	5.356E+01	569	7.530E+01
406	5.429E-01	447	5.798E+01	488	2.423E+01	529	5.396E+01	570	7.615E+01
407	6.238E-01	448	6.199E+01	489	2.501E+01	530	5.429E+01	571	7.687E+01
408	6.771E-01	449	6.502E+01	490	2.572E+01	531	5.455E+01	572	7.764E+01
409	7.243E-01	450	6.717E+01	491	2.657E+01	532	5.498E+01	573	7.820E+01
410	8.203E-01	451	6.783E+01	492	2.729E+01	533	5.536E+01	574	7.881E+01
411	8.515E-01	452	6.699E+01	493	2.817E+01	534	5.581E+01	575	7.965E+01
412	1.006E+00	453	6.528E+01	494	2.927E+01	535	5.617E+01	576	8.027E+01
413	1.129E+00	454	6.214E+01	495	3.016E+01	536	5.659E+01	577	8.089E+01
414	1.265E+00	455	5.835E+01	496	3.121E+01	537	5.702E+01	578	8.154E+01
415	1.388E+00	456	5.441E+01	497	3.231E+01	538	5.734E+01	579	8.229E+01
416	1.576E+00	457	5.058E+01	498	3.337E+01	539	5.784E+01	580	8.302E+01
417	1.798E+00	458	4.686E+01	499	3.434E+01	540	5.828E+01	581	8.358E+01
418	2.010E+00	459	4.399E+01	500	3.538E+01	541	5.875E+01	582	8.410E+01
419	2.245E+00	460	4.144E+01	501	3.640E+01	542	5.928E+01	583	8.471E+01
420	2.579E+00	461	3.934E+01	502	3.743E+01	543	5.966E+01	584	8.536E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	8.567E+01	626	7.661E+01	667	3.319E+01	708	9.885E+00	749	2.840E+00
586	8.631E+01	627	7.564E+01	668	3.231E+01	709	9.599E+00	750	2.741E+00
587	8.678E+01	628	7.460E+01	669	3.143E+01	710	9.314E+00	751	2.657E+00
588	8.743E+01	629	7.360E+01	670	3.069E+01	711	9.014E+00	752	2.580E+00
589	8.783E+01	630	7.253E+01	671	2.986E+01	712	8.738E+00	753	2.457E+00
590	8.835E+01	631	7.157E+01	672	2.903E+01	713	8.398E+00	754	2.470E+00
591	8.874E+01	632	7.042E+01	673	2.819E+01	714	8.188E+00	755	2.403E+00
592	8.919E+01	633	6.931E+01	674	2.735E+01	715	7.928E+00	756	2.330E+00
593	8.940E+01	634	6.817E+01	675	2.668E+01	716	7.683E+00	757	2.258E+00
594	8.953E+01	635	6.716E+01	676	2.592E+01	717	7.496E+00	758	2.194E+00
595	8.987E+01	636	6.613E+01	677	2.515E+01	718	7.216E+00	759	2.151E+00
596	8.984E+01	637	6.488E+01	678	2.446E+01	719	7.067E+00	760	2.096E+00
597	8.998E+01	638	6.380E+01	679	2.382E+01	720	6.841E+00	761	2.058E+00
598	9.011E+01	639	6.269E+01	680	2.318E+01	721	6.649E+00	762	2.001E+00
599	9.008E+01	640	6.145E+01	681	2.245E+01	722	6.410E+00	763	1.920E+00
600	9.018E+01	641	6.032E+01	682	2.187E+01	723	6.234E+00	764	1.880E+00
601	9.017E+01	642	5.924E+01	683	2.120E+01	724	6.014E+00	765	1.844E+00
602	8.999E+01	643	5.809E+01	684	2.060E+01	725	5.864E+00	766	1.773E+00
603	8.999E+01	644	5.693E+01	685	2.000E+01	726	5.692E+00	767	1.770E+00
604	8.973E+01	645	5.578E+01	686	1.943E+01	727	5.524E+00	768	1.706E+00
605	8.960E+01	646	5.466E+01	687	1.885E+01	728	5.328E+00	769	1.675E+00
606	8.922E+01	647	5.358E+01	688	1.833E+01	729	5.199E+00	770	1.605E+00
607	8.905E+01	648	5.251E+01	689	1.784E+01	730	5.043E+00	771	1.578E+00
608	8.882E+01	649	5.132E+01	690	1.727E+01	731	4.863E+00	772	1.523E+00
609	8.844E+01	650	5.022E+01	691	1.674E+01	732	4.697E+00	773	1.497E+00
610	8.809E+01	651	4.906E+01	692	1.624E+01	733	4.597E+00	774	1.471E+00
611	8.728E+01	652	4.799E+01	693	1.580E+01	734	4.413E+00	775	1.424E+00
612	8.697E+01	653	4.694E+01	694	1.536E+01	735	4.297E+00	776	1.397E+00
613	8.648E+01	654	4.593E+01	695	1.488E+01	736	4.162E+00	777	1.356E+00
614	8.585E+01	655	4.479E+01	696	1.443E+01	737	4.055E+00	778	1.327E+00
615	8.538E+01	656	4.384E+01	697	1.400E+01	738	3.929E+00	779	1.331E+00
616	8.477E+01	657	4.272E+01	698	1.357E+01	739	3.792E+00	780	1.334E+00
617	8.410E+01	658	4.173E+01	699	1.320E+01	740	3.678E+00		
618	8.344E+01	659	4.070E+01	700	1.280E+01	741	3.576E+00		
619	8.270E+01	660	3.975E+01	701	1.238E+01	742	3.452E+00		
620	8.181E+01	661	3.878E+01	702	1.201E+01	743	3.370E+00		
621	8.093E+01	662	3.782E+01	703	1.162E+01	744	3.280E+00		
622	8.017E+01	663	3.690E+01	704	1.130E+01	745	3.191E+00		
623	7.934E+01	664	3.585E+01	705	1.092E+01	746	3.104E+00		
624	7.852E+01	665	3.506E+01	706	1.060E+01	747	3.006E+00		
625	7.742E+01	666	3.407E+01	707	1.022E+01	748	2.913E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Downward**

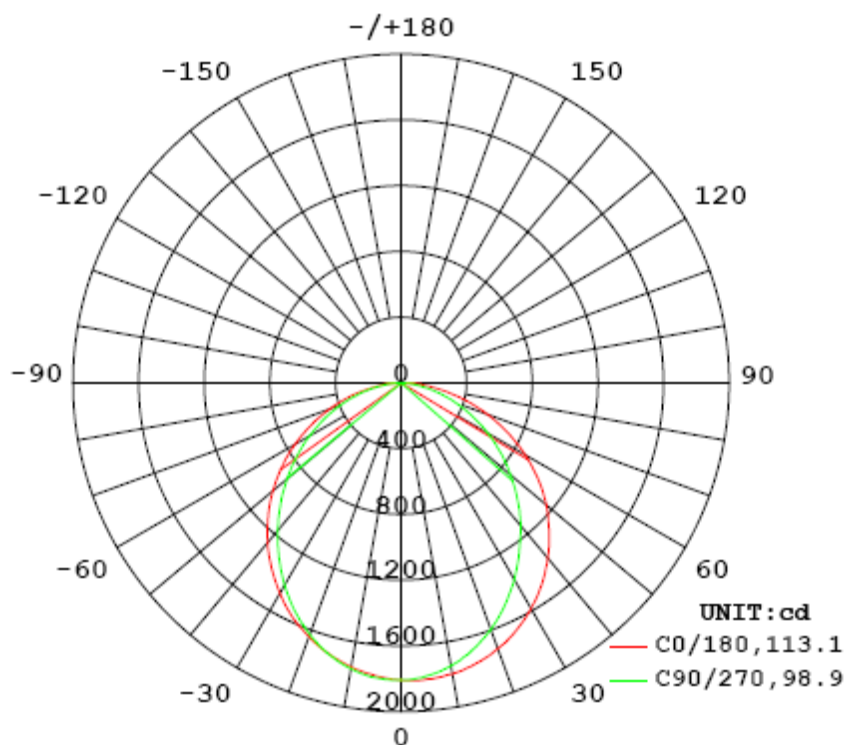
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.3556	42.26	0.9897

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
4818.05	114.01	1812.0	1.30	1.15

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	113.1	105.4	98.9	105.3	105.7
Field Angle (10% I_{max}):	163.0	159.5	156.5	159.4	159.6

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1808	1808	1808	1808	1808	1808	1808	1808
5.0°	1789	1793	1793	1796	1800	1804	1810	1810
10.0°	1754	1758	1759	1761	1766	1776	1788	1795
15.0°	1706	1709	1704	1702	1708	1722	1746	1763
20.0°	1642	1644	1631	1624	1629	1651	1686	1713
25.0°	1572	1570	1546	1528	1533	1559	1606	1648
30.0°	1478	1478	1445	1420	1422	1454	1512	1566
35.0°	1378	1371	1341	1301	1299	1337	1404	1471
40.0°	1267	1257	1214	1176	1172	1211	1285	1360
45.0°	1147	1136	1087	1046	1040	1079	1158	1240
50.0°	1021	1006	957	915	909	947	1026	1110
55.0°	887	874	824	783	777	812	888	971
60.0°	749	735	689	652	645	678	747	826
65.0°	607	595	554	524	518	543	604	675
70.0°	465	456	422	396	391	414	465	524
75.0°	324	318	293	273	269	288	327	373
80.0°	192	189	173	161	159	172	198	229
85.0°	78	77	69	64	64	71	84	102
90.0°	2	3	3	4	6	7	9	3
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	1	0	0	0	0	0	0	0
110.0°	1	1	0	0	0	0	0	0
115.0°	1	1	1	0	0	0	0	0
120.0°	1	1	1	1	1	1	1	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	2	1	1
150.0°	2	2	2	2	2	2	2	2
155.0°	2	2	2	2	2	2	2	2
160.0°	2	2	2	2	2	2	2	2
165.0°	2	2	2	2	2	2	2	2
170.0°	2	2	2	2	2	2	2	2
175.0°	2	2	2	2	2	2	2	2
180.0°	2	2	2	2	2	2	2	2

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1808	1808	1808	1808	1808	1808	1808	1808
5.0°	1809	1809	1801	1796	1789	1787	1787	1788
10.0°	1797	1788	1774	1759	1748	1744	1747	1751
15.0°	1766	1752	1725	1699	1680	1679	1687	1699
20.0°	1721	1699	1660	1620	1597	1593	1611	1632
25.0°	1661	1632	1575	1523	1493	1494	1518	1555
30.0°	1585	1548	1479	1415	1379	1380	1415	1459
35.0°	1496	1452	1369	1294	1256	1259	1304	1353
40.0°	1391	1342	1250	1174	1135	1143	1184	1239
45.0°	1276	1222	1131	1045	1004	1013	1063	1127
50.0°	1157	1100	999	913	872	881	932	998
55.0°	1019	962	860	779	741	749	799	863
60.0°	872	816	721	644	609	618	664	726
65.0°	718	667	580	511	481	488	529	585
70.0°	559	514	440	381	355	362	397	445
75.0°	402	364	302	257	237	242	270	309
80.0°	252	221	177	145	130	134	154	182
85.0°	118	95	67	49	42	43	53	71
90.0°	16	1	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°	1	1	1	1	1	0	0	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
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°	2	2	1	1	1	1	1	2
180.0°	2	2	2	2	2	2	2	2

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	43.1	0.89
5-10	127.5	2.65
10-15	206.5	4.29
15-20	277.1	5.75
20-25	336.6	6.99
25-30	383.1	7.95
30-35	415.0	8.61
35-40	432.3	8.98
40-45	435.2	9.03
45-50	423.6	8.79
50-55	398.3	8.27
55-60	360.7	7.48
60-65	312.3	6.49
65-70	255.6	5.30
70-75	193.0	4.01
75-80	128.4	2.66
80-85	67.2	1.40
85-90	17.6	0.36
90-95	0.4	0.01
95-100	0.2	0.00
100-105	0.2	0.01
105-110	0.2	0.00
110-115	0.2	0.01
115-120	0.2	0.00
120-125	0.3	0.01
125-130	0.3	0.00
130-135	0.3	0.01
135-140	0.3	0.01
140-145	0.4	0.00
145-150	0.4	0.01
150-155	0.4	0.01
155-160	0.3	0.01
160-165	0.3	0.00
165-170	0.2	0.01
170-175	0.1	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	43.1	0.89
0-10	170.6	3.54
0-15	377.1	7.83
0-20	654.2	13.58
0-25	990.9	20.57
0-30	1374.0	28.52
0-35	1789.0	37.13
0-40	2221.4	46.11
0-45	2656.6	55.14
0-50	3080.2	63.93
0-55	3478.6	72.20
0-60	3839.2	79.68
0-65	4151.5	86.17
0-70	4407.1	91.47
0-75	4600.1	95.48
0-80	4728.5	98.14
0-85	4795.7	99.54
0-90	4813.3	99.90
0-95	4813.7	99.91
0-100	4813.9	99.91
0-105	4814.1	99.92
0-110	4814.3	99.92
0-115	4814.5	99.93
0-120	4814.7	99.93
0-125	4815.0	99.94
0-130	4815.3	99.94
0-135	4815.6	99.95
0-140	4815.9	99.96
0-145	4816.3	99.96
0-150	4816.7	99.97
0-155	4817.1	99.98
0-160	4817.4	99.99
0-165	4817.7	99.99
0-170	4817.9	100.00
0-175	4818.0	100.00
0-180	4818.1	100.00

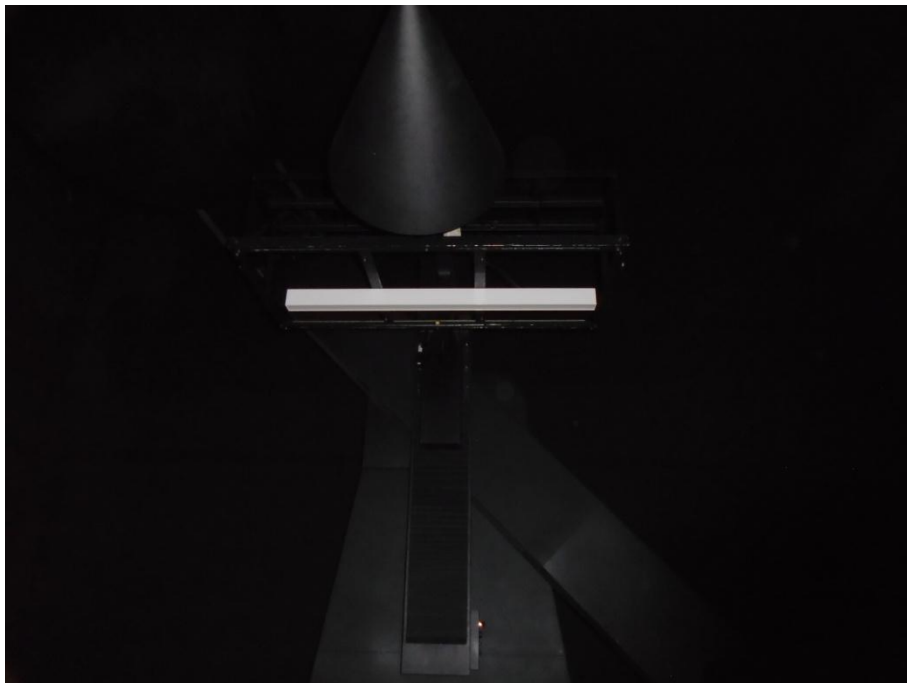
[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Power Factor:	277.0	60	0.9149
Total Harmonic Distortion:	277.0	60	16.02%
Total Harmonic Distortion:	120.0	60	8.92%

6. Product Photo



7. Product Test orientation in the Goniophotometer



8. Report Revision

Report Number	Report Date	Contents
RSZ161123530-10	2016-12-02	Original report.
RSZ161123530-10-M1	2016-12-08	Update the test model number.

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