IES LM-79-08

MEASUREMENT AND TEST REPORT

For

ATG Electronics Corp.

9020 Rancho Park Court Rancho Cucamonga, CA 91730

Test Model: LIFI-35F-2FT

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Carl Du
Report Number:	RSZ161123531-10
Test Date:	2016-11-26 to 2016-11-27
Report Date:	2016-12-03
Reviewed By:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

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

Model Tested:	LIFI-35F-2FT
Manufacturer:	ATG Electronics Co.,Ltd
Brand Name:	ATG
Product Designation:	Direct Linear Ambient Luminaires
Burning Time Before Test:	0hour(For New Products)
Length:	2 ft

Rated Values:

Rated Voltage/Frequency:	120-277 V AC 50/60Hz
Rated Power:	20 W
Nominal CCT:	3500K
Nominal Lumen Output:	2100 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°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=32K (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°C±1°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_f, 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)
120.1	60	0.1669	19.72	0.984	2368.6	120.13

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.142	3428	0.000554	0.4100	0.3943	0.2373	0.5135

Color Rendering Index

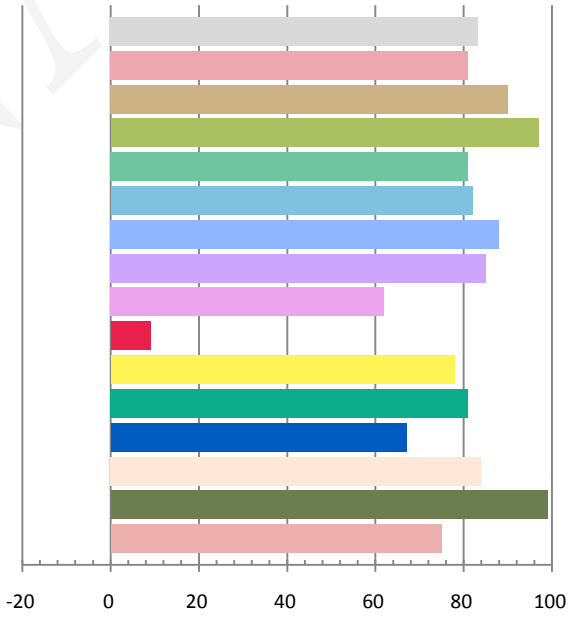
Ra
83.2

R1	R2	R3	R4
81	90	97	81

R5	R6	R7	R8
82	88	85	62

R9	R10	R11	R12
9	78	81	67

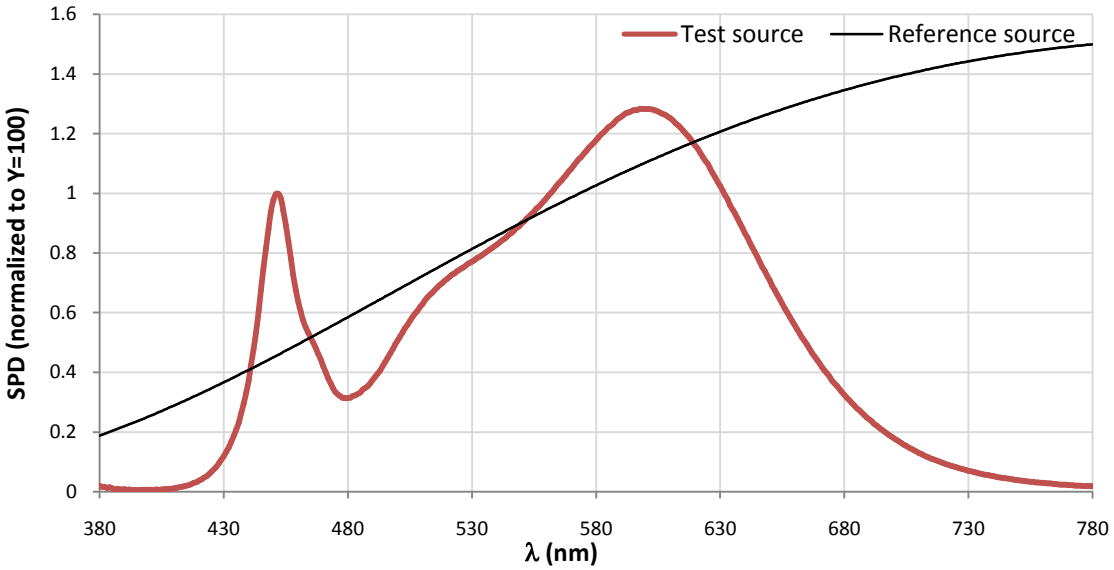
R13	R14	R15
84	99	75



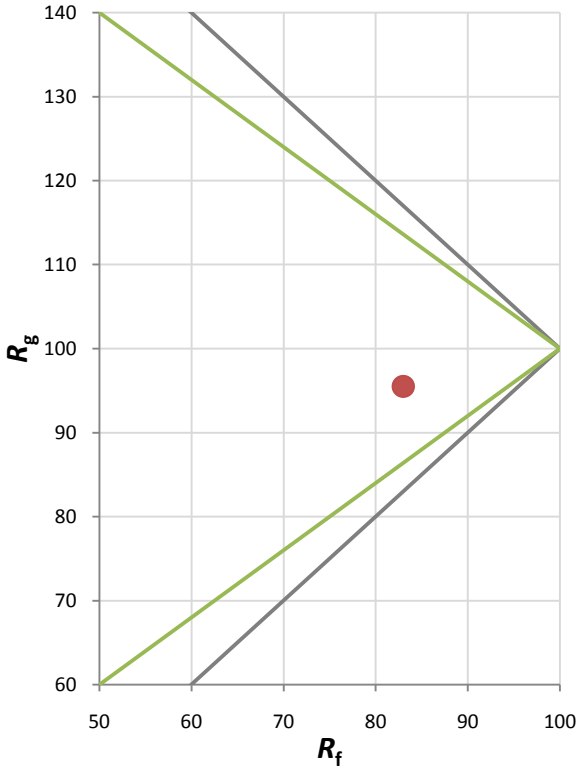
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	96

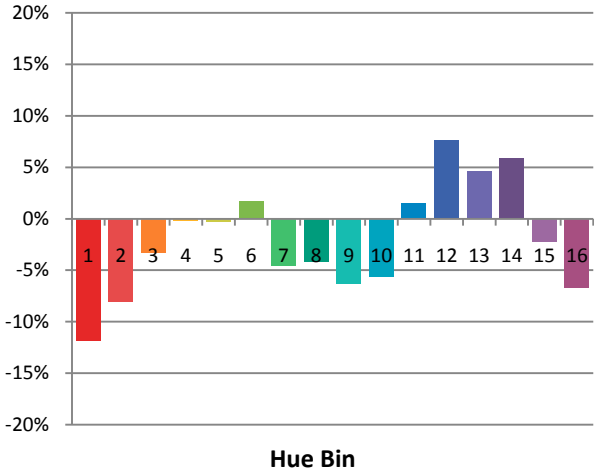
Spectral Power Distribution Comparison



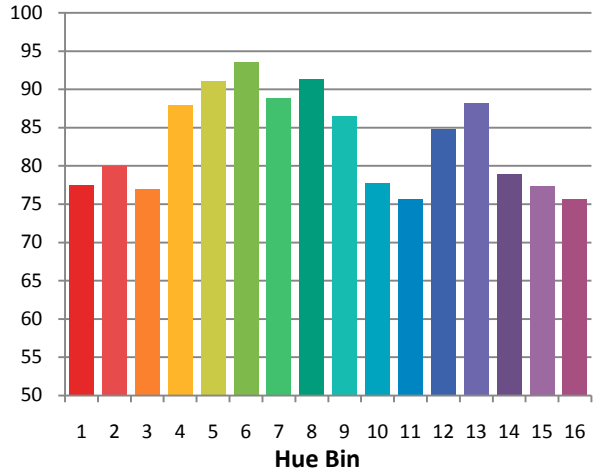
Plot of R_g versus R_f



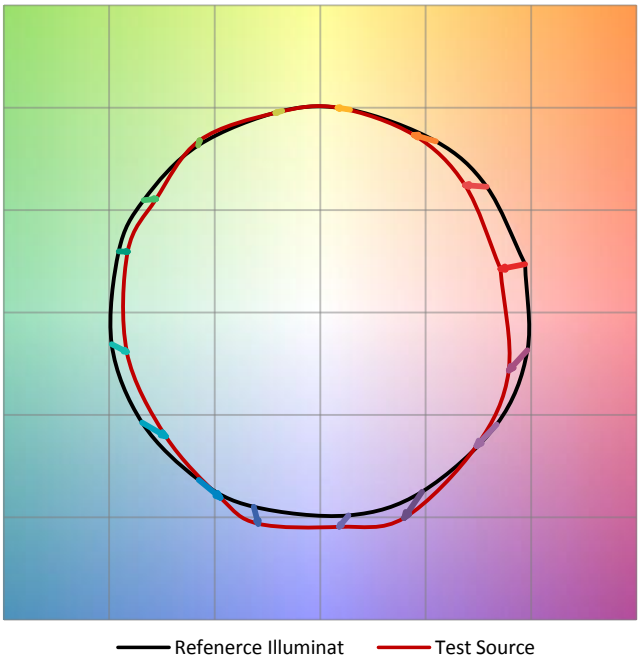
Chroma Shift by Hue

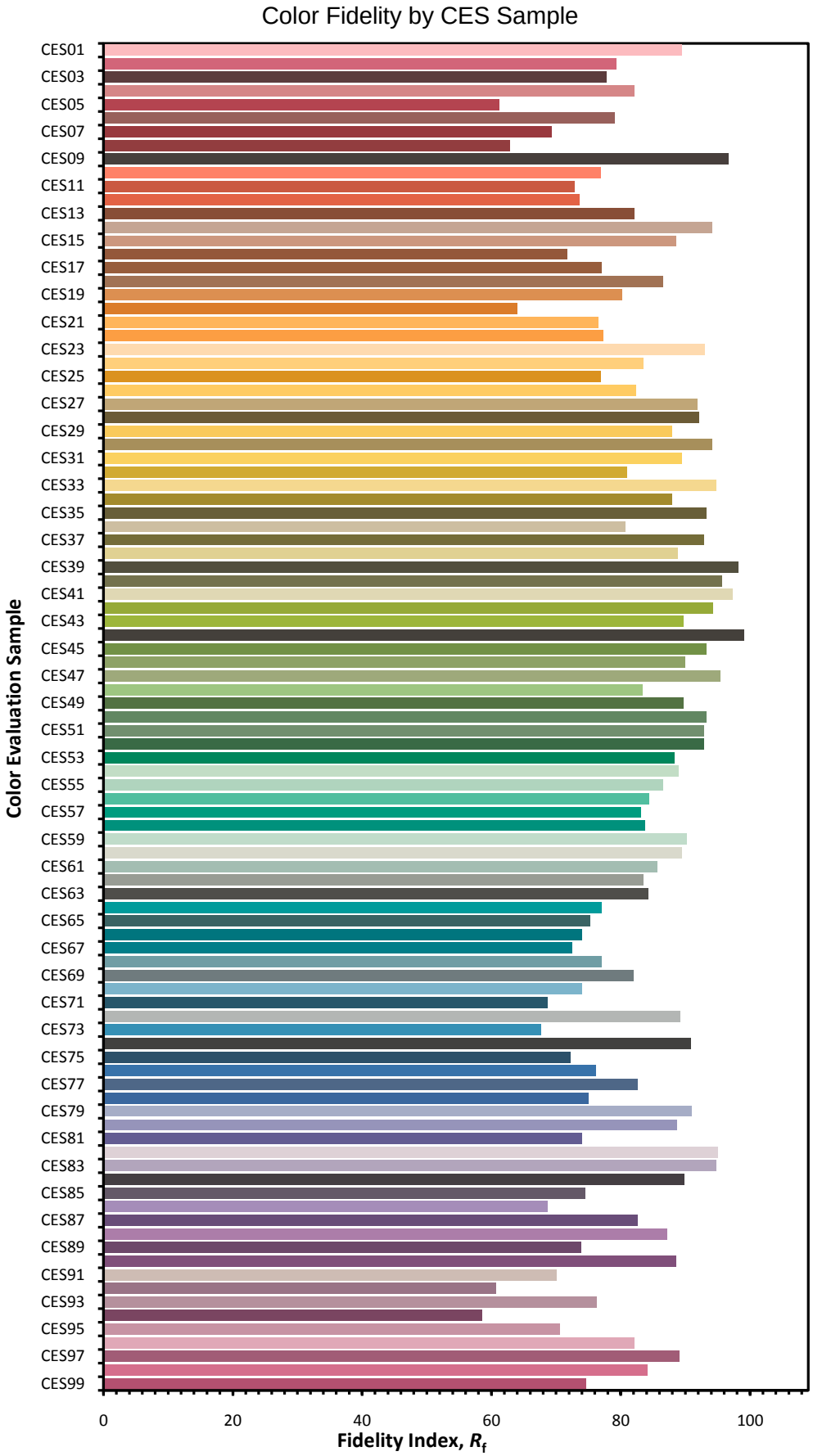


R_f by Hue



Color Vector Graphic




Color Fidelity by CES Sample
Color Evaluation Sample
CES01
CES03
CES05
CES07
CES09
CES11
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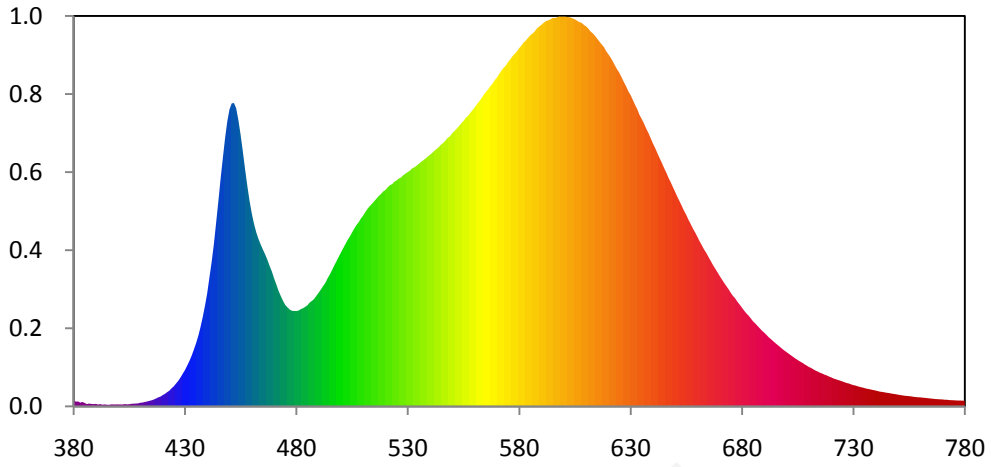
CES99
0
20
40
60
80
100
Fidelity Index, R_f

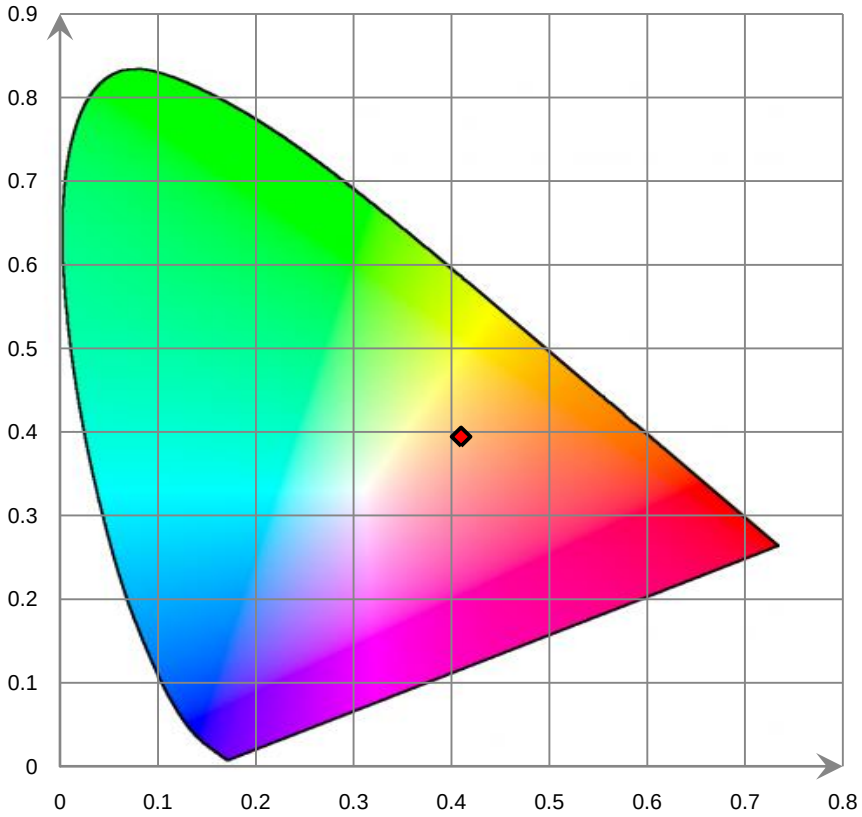
Relative Spectral Power Distribution



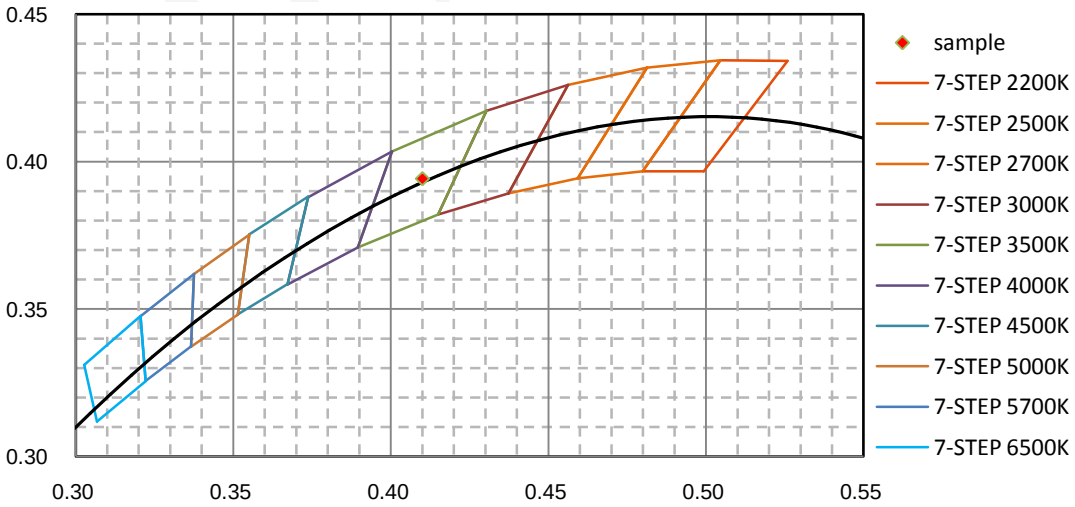
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	7.017E-01	421	1.427E+00	462	1.988E+01	503	1.898E+01	544	2.960E+01
381	5.420E-01	422	1.619E+00	463	1.911E+01	504	1.938E+01	545	2.989E+01
382	5.595E-01	423	1.792E+00	464	1.848E+01	505	1.984E+01	546	3.008E+01
383	4.322E-01	424	2.057E+00	465	1.789E+01	506	2.029E+01	547	3.036E+01
384	5.021E-01	425	2.296E+00	466	1.735E+01	507	2.069E+01	548	3.066E+01
385	3.892E-01	426	2.601E+00	467	1.674E+01	508	2.102E+01	549	3.084E+01
386	2.539E-01	427	2.909E+00	468	1.604E+01	509	2.145E+01	550	3.118E+01
387	3.256E-01	428	3.294E+00	469	1.541E+01	510	2.177E+01	551	3.143E+01
388	2.784E-01	429	3.721E+00	470	1.463E+01	511	2.219E+01	552	3.170E+01
389	2.574E-01	430	4.133E+00	471	1.394E+01	512	2.257E+01	553	3.199E+01
390	2.864E-01	431	4.648E+00	472	1.319E+01	513	2.286E+01	554	3.229E+01
391	2.182E-01	432	5.176E+00	473	1.262E+01	514	2.314E+01	555	3.256E+01
392	2.537E-01	433	5.777E+00	474	1.206E+01	515	2.343E+01	556	3.291E+01
393	1.934E-01	434	6.469E+00	475	1.158E+01	516	2.372E+01	557	3.314E+01
394	2.244E-01	435	7.207E+00	476	1.131E+01	517	2.401E+01	558	3.347E+01
395	1.913E-01	436	8.047E+00	477	1.106E+01	518	2.424E+01	559	3.378E+01
396	1.763E-01	437	9.055E+00	478	1.091E+01	519	2.452E+01	560	3.410E+01
397	2.302E-01	438	1.020E+01	479	1.089E+01	520	2.471E+01	561	3.446E+01
398	2.225E-01	439	1.149E+01	480	1.088E+01	521	2.500E+01	562	3.477E+01
399	2.248E-01	440	1.292E+01	481	1.093E+01	522	2.524E+01	563	3.513E+01
400	2.287E-01	441	1.472E+01	482	1.110E+01	523	2.536E+01	564	3.550E+01
401	2.202E-01	442	1.650E+01	483	1.120E+01	524	2.563E+01	565	3.586E+01
402	2.180E-01	443	1.855E+01	484	1.136E+01	525	2.579E+01	566	3.615E+01
403	2.602E-01	444	2.094E+01	485	1.154E+01	526	2.600E+01	567	3.652E+01
404	2.310E-01	445	2.340E+01	486	1.185E+01	527	2.613E+01	568	3.681E+01
405	2.453E-01	446	2.594E+01	487	1.203E+01	528	2.638E+01	569	3.721E+01
406	3.000E-01	447	2.829E+01	488	1.226E+01	529	2.657E+01	570	3.752E+01
407	3.094E-01	448	3.057E+01	489	1.262E+01	530	2.674E+01	571	3.792E+01
408	3.249E-01	449	3.251E+01	490	1.296E+01	531	2.691E+01	572	3.829E+01
409	3.471E-01	450	3.388E+01	491	1.333E+01	532	2.715E+01	573	3.863E+01
410	4.125E-01	451	3.458E+01	492	1.371E+01	533	2.729E+01	574	3.888E+01
411	4.421E-01	452	3.462E+01	493	1.409E+01	534	2.748E+01	575	3.928E+01
412	5.034E-01	453	3.403E+01	494	1.460E+01	535	2.769E+01	576	3.960E+01
413	5.548E-01	454	3.266E+01	495	1.504E+01	536	2.790E+01	577	3.994E+01
414	6.240E-01	455	3.098E+01	496	1.554E+01	537	2.809E+01	578	4.023E+01
415	6.903E-01	456	2.907E+01	497	1.607E+01	538	2.829E+01	579	4.051E+01
416	7.787E-01	457	2.706E+01	498	1.656E+01	539	2.852E+01	580	4.087E+01
417	8.959E-01	458	2.517E+01	499	1.705E+01	540	2.872E+01	581	4.117E+01
418	1.024E+00	459	2.347E+01	500	1.755E+01	541	2.893E+01	582	4.151E+01
419	1.115E+00	460	2.203E+01	501	1.803E+01	542	2.918E+01	583	4.175E+01
420	1.284E+00	461	2.084E+01	502	1.850E+01	543	2.939E+01	584	4.206E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.235E+01	626	3.755E+01	667	1.613E+01	708	4.822E+00	749	1.388E+00
586	4.255E+01	627	3.701E+01	668	1.572E+01	709	4.671E+00	750	1.341E+00
587	4.278E+01	628	3.653E+01	669	1.532E+01	710	4.507E+00	751	1.293E+00
588	4.313E+01	629	3.596E+01	670	1.490E+01	711	4.395E+00	752	1.258E+00
589	4.335E+01	630	3.554E+01	671	1.449E+01	712	4.237E+00	753	1.217E+00
590	4.354E+01	631	3.499E+01	672	1.410E+01	713	4.091E+00	754	1.190E+00
591	4.378E+01	632	3.443E+01	673	1.374E+01	714	3.978E+00	755	1.168E+00
592	4.397E+01	633	3.393E+01	674	1.337E+01	715	3.845E+00	756	1.141E+00
593	4.405E+01	634	3.327E+01	675	1.295E+01	716	3.752E+00	757	1.094E+00
594	4.416E+01	635	3.281E+01	676	1.260E+01	717	3.628E+00	758	1.063E+00
595	4.433E+01	636	3.230E+01	677	1.231E+01	718	3.540E+00	759	1.040E+00
596	4.432E+01	637	3.171E+01	678	1.193E+01	719	3.414E+00	760	1.029E+00
597	4.438E+01	638	3.121E+01	679	1.161E+01	720	3.317E+00	761	9.936E-01
598	4.449E+01	639	3.064E+01	680	1.127E+01	721	3.197E+00	762	9.756E-01
599	4.447E+01	640	3.002E+01	681	1.092E+01	722	3.110E+00	763	9.459E-01
600	4.448E+01	641	2.952E+01	682	1.062E+01	723	3.020E+00	764	9.186E-01
601	4.446E+01	642	2.893E+01	683	1.035E+01	724	2.947E+00	765	8.855E-01
602	4.442E+01	643	2.836E+01	684	1.003E+01	725	2.852E+00	766	8.655E-01
603	4.438E+01	644	2.782E+01	685	9.705E+00	726	2.762E+00	767	8.322E-01
604	4.428E+01	645	2.725E+01	686	9.465E+00	727	2.670E+00	768	8.189E-01
605	4.417E+01	646	2.670E+01	687	9.182E+00	728	2.609E+00	769	8.014E-01
606	4.401E+01	647	2.610E+01	688	8.912E+00	729	2.514E+00	770	7.940E-01
607	4.386E+01	648	2.561E+01	689	8.641E+00	730	2.430E+00	771	7.588E-01
608	4.378E+01	649	2.503E+01	690	8.419E+00	731	2.373E+00	772	7.580E-01
609	4.354E+01	650	2.449E+01	691	8.162E+00	732	2.292E+00	773	7.186E-01
610	4.338E+01	651	2.392E+01	692	7.896E+00	733	2.218E+00	774	7.102E-01
611	4.313E+01	652	2.341E+01	693	7.679E+00	734	2.160E+00	775	6.953E-01
612	4.280E+01	653	2.288E+01	694	7.448E+00	735	2.084E+00	776	6.823E-01
613	4.258E+01	654	2.234E+01	695	7.221E+00	736	2.019E+00	777	6.626E-01
614	4.231E+01	655	2.186E+01	696	7.019E+00	737	1.975E+00	778	6.723E-01
615	4.197E+01	656	2.130E+01	697	6.804E+00	738	1.916E+00	779	6.479E-01
616	4.165E+01	657	2.081E+01	698	6.581E+00	739	1.859E+00	780	6.491E-01
617	4.132E+01	658	2.030E+01	699	6.381E+00	740	1.807E+00		
618	4.102E+01	659	1.985E+01	700	6.195E+00	741	1.741E+00		
619	4.057E+01	660	1.936E+01	701	6.015E+00	742	1.680E+00		
620	4.020E+01	661	1.885E+01	702	5.827E+00	743	1.648E+00		
621	3.982E+01	662	1.838E+01	703	5.640E+00	744	1.601E+00		
622	3.939E+01	663	1.791E+01	704	5.465E+00	745	1.553E+00		
623	3.891E+01	664	1.751E+01	705	5.297E+00	746	1.518E+00		
624	3.845E+01	665	1.705E+01	706	5.130E+00	747	1.468E+00		
625	3.806E+01	666	1.660E+01	707	4.996E+00	748	1.426E+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**

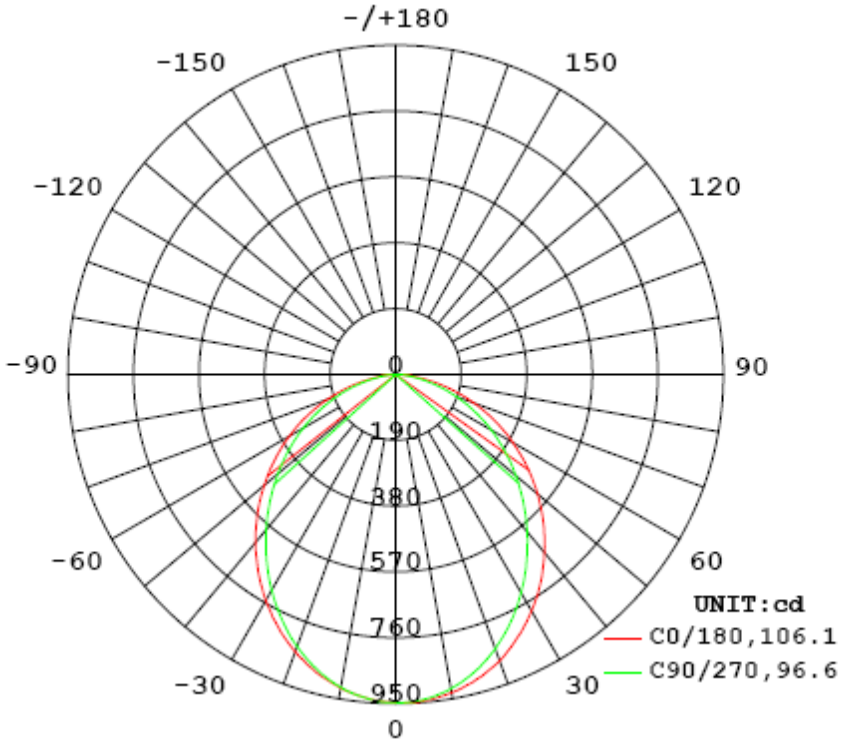
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1671	19.76	0.9849

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2378.41	120.43	948.1	1.24	1.15

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	106.1	101.1	96.6	101.2	101.3
Field Angle (10% I_{max}):	158.3	156.0	153.9	155.9	156.0

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	947	947	947	947	947	947	947	947
5.0°	938	939	939	939	939	939	942	943
10.0°	919	918	917	916	916	920	924	929
15.0°	890	889	884	882	882	887	896	904
20.0°	852	848	841	836	835	844	858	871
25.0°	806	801	791	781	781	791	809	826
30.0°	753	747	732	720	719	731	753	774
35.0°	695	687	670	656	653	667	691	717
40.0°	633	624	604	588	585	598	625	654
45.0°	567	557	536	519	516	529	556	587
50.0°	499	489	468	450	447	460	487	517
55.0°	428	418	398	381	378	389	416	445
60.0°	356	347	328	313	310	320	344	372
65.0°	284	276	259	245	242	252	273	298
70.0°	211	204	189	178	176	184	203	224
75.0°	140	134	123	115	113	119	134	151
80.0°	73	70	63	58	58	62	71	82
85.0°	20	20	19	18	18	20	23	27
90.0°	0	0	0	0	0	0	0	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°	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°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	947	947	947	947	947	947	947	947
5.0°	945	946	944	942	941	940	939	939
10.0°	932	932	928	924	921	919	920	921
15.0°	910	909	901	892	888	887	888	891
20.0°	880	875	862	849	843	842	848	854
25.0°	837	831	815	798	788	789	798	807
30.0°	787	780	759	738	727	728	741	753
35.0°	732	723	698	674	661	664	678	694
40.0°	671	660	633	606	592	595	613	631
45.0°	605	594	565	538	524	527	545	565
50.0°	536	525	495	469	455	458	476	496
55.0°	465	453	425	399	387	389	406	426
60.0°	392	381	354	330	319	321	336	355
65.0°	317	307	283	262	252	254	267	283
70.0°	241	233	213	195	186	188	198	211
75.0°	166	160	144	130	123	123	131	142
80.0°	94	91	80	71	67	67	70	76
85.0°	34	33	29	26	24	23	24	25
90.0°	2	2	1	1	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	1	1	1	1	0	0
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

Zonal Lumen Density Measurement

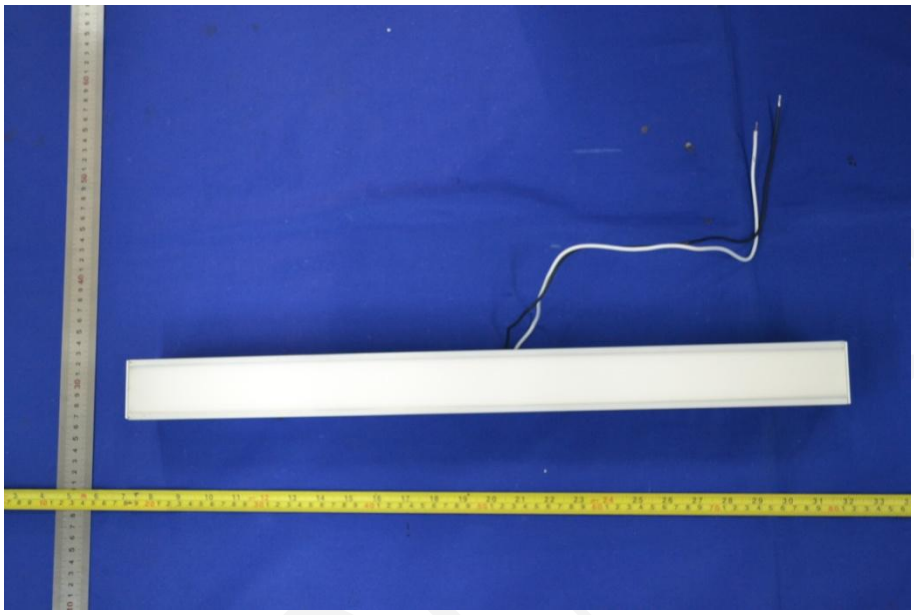
Deg	Flux (lm)	%
0-5	22.6	0.95
5-10	66.6	2.80
10-15	107.6	4.53
15-20	143.7	6.04
20-25	173.6	7.30
25-30	196.1	8.24
30-35	210.7	8.86
35-40	217.5	9.15
40-45	216.8	9.11
45-50	208.9	8.79
50-55	194.6	8.18
55-60	174.6	7.34
60-65	149.4	6.28
65-70	120.1	5.05
70-75	87.8	3.69
75-80	54.7	2.30
80-85	25.2	1.06
85-90	5.6	0.24
90-95	0.1	0.00
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	0.00
130-135	0.2	0.01
135-140	0.2	0.00
140-145	0.2	0.01
145-150	0.2	0.01
150-155	0.2	0.01
155-160	0.2	0.01
160-165	0.1	0.00
165-170	0.1	0.01
170-175	0.1	0.00
175-180	0.0	0.00

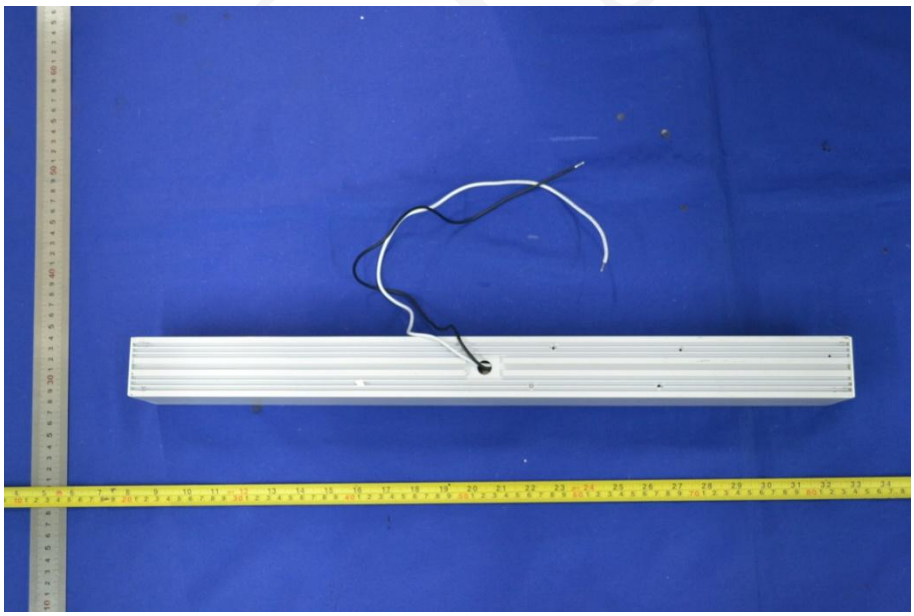
Deg	Flux (lm)	%
0-5	22.6	0.95
0-10	89.2	3.75
0-15	196.9	8.28
0-20	340.6	14.32
0-25	514.2	21.62
0-30	710.2	29.86
0-35	920.9	38.72
0-40	1138.5	47.87
0-45	1355.2	56.98
0-50	1564.2	65.77
0-55	1758.8	73.95
0-60	1933.4	81.29
0-65	2082.7	87.57
0-70	2202.8	92.62
0-75	2290.6	96.31
0-80	2345.3	98.61
0-85	2370.5	99.67
0-90	2376.2	99.91
0-95	2376.3	99.91
0-100	2376.3	99.91
0-105	2376.4	99.92
0-110	2376.5	99.92
0-115	2376.6	99.93
0-120	2376.7	99.93
0-125	2376.9	99.94
0-130	2377.0	99.94
0-135	2377.2	99.95
0-140	2377.3	99.95
0-145	2377.5	99.96
0-150	2377.7	99.97
0-155	2377.9	99.98
0-160	2378.1	99.99
0-165	2378.2	99.99
0-170	2378.3	100.00
0-175	2378.4	100.00
0-180	2378.4	100.00

[Additional Test]

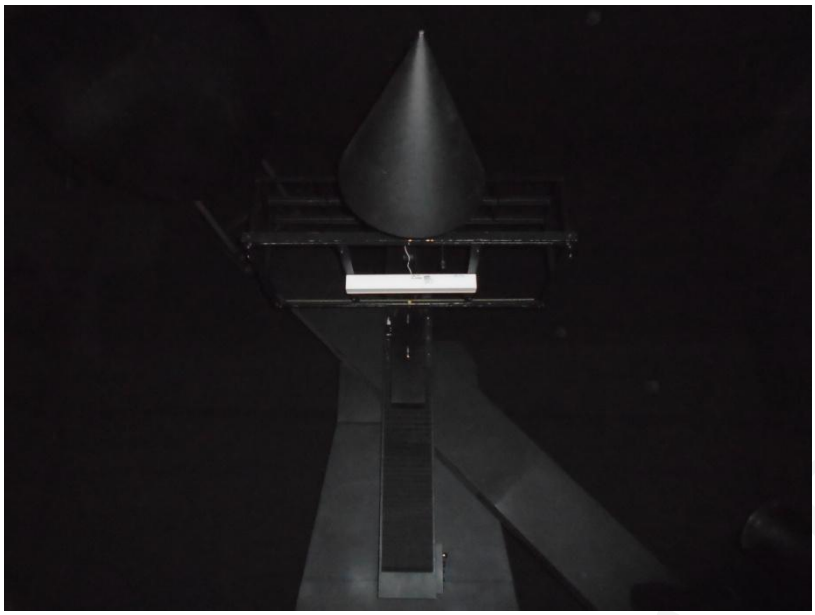
Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Total Harmonic Distortion:	120.0	60	14.52%
Total Harmonic Distortion:	277.0	60	17.64%
Power Factor:	277.0	60	0.9074

6. Product Photo





7. Product Test orientation in the Goniophotometer



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