LM-79-08 Test Report

For

ETI Solid State Lighting (Zhuhai) Ltd

No.1, Zhongzhu Road South, Science & Technology Innovation Coast, High Tech District, Zhuhai City, Guangdong Prov., China 519085

Direct Linear Ambient Luminaires

Model Name(s):
568021##

Representative (Tested) Model:
56802141

Model Difference: ##=41-50 or 91-99 identifies 4000K.

Prepare by:

Engineer: Alan Wang
Date: 2020-07-08

Review by:

Technical Lead: Vincent Yuan
Issue Date: 2020-07-15
Revised Date: N/A

Note:
1. The results contained in this report pertain only to the tested samples.
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3. This report does not imply product certification, approval, or endorsement by NVLAP, or any agency of the Federal Government.

Client Information:

Client Name:	ETI Solid State Lighting (Zhuhai) Ltd
Brand Name:	Commercial Electric
Factory 1 Name:	ETI Solid State Lighting (Zhuhai) Ltd
Factory 1 Address:	No.1, Zhongzhu Road South, Science & Technology Innovation Coast, High tech District, Zhuhai City, Guanggdong Prov., China 519085
Factory 2 Name:	NVC VIETNAM TECHNOLOGY AND LIGHTING COMPANY LIMITED
Factory 2 Address:	Lot CN23-1, Yen Phong Industrial park, Dong Phong commune, Yen Phong district, Bac Ninh province, Vietnam

Product Information:

Model Number:	568021##(##=41-50 or 91-99)
Product Type:	Direct Linear Ambient Luminaires
Rating Input:	120-277Vac, 50/60Hz, 48W
Declared CCT:	4000K
Declared Light Output:	5500 lm
LED Manufacturer:	Samsung
LED Model:	SPMWH1228FD5WAT0XX
LED Quantity:	300 pcs

Test Information:

Standard Lamp:	Total Spectral Radiant Flux Standard Lamp, trace to NIST. 1. D908S for Gonio 2. D215S for Integrating Sphere
Date of Receipt Samples:	2020-05-13
Quantity of Receipt Samples:	1 pc
Sample Number:	200513001-S1

Laboratory Information:

Test Laboratory:	Dongguan New Testing Centre Co., Ltd
Laboratory Address:	3F, No. 1 the 1st North Industry Road, Songshan Lake Science & Technology Park, Dongguan, Guangdong, China
Laboratory Contact Name:	Neil Zhong
Laboratory Contact E-mail:	Neil_zhong@ntc-cert.com

Report Information:

Issued Date of Test Report:	2020-07-15
Revised Date of Test Report:	N/A
Test Report No.:	NTCLR20050052
Remark *(If applicable)*:	N/A

Test Specification:	
Date of Test	2020-06-28
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. Fidelity Index 8. Gamut Index 9. Local Chroma Shift 10. THD and PF
Reference Standard	IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products ANSI C78.377-2017 Specifications for the Chromaticity of Solid State Lighting Products CIE 13.3-1995 Method of Measuring and Specifying Color Rendering Properties of Light Sources CIE 15-2004 Technical Report Colorimetry ANSI IES TM-30-18 IES Method for Evaluating Light Source Color Rendition ANSI C78.77-10-2014 Harmonic Emission Limits – Related Power Quality Requirements IES TM-15-11 Luminaire Classification System for Outdoor Luminaires Addendum A for IES TM-15-11 Backlight, Uplight, and Glare (BUG) Ratings

Test Methods:

1. Photometric and Electrical Measurements – Light Distribution 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 required Voltage and Frequency. It was stabilized before measurement was made. Luminous Flux, Luminaire Efficacy and Zonal Lumen were calculated from the software taken at 1° vertical intervals and 15° horizonal intervals.

2. Photometric and Electrical Measurements – Integrating Sphere Method:

Photometric parameters were measured using an integrating sphere, as spectroradiometer and software. The ambient temperature condition inside the sphere was measured 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 require Voltage and Frequency. It was stabilized before measurement was made. Chromaticity Coordinates, Correlated Color Temperature and Color Rendering Index were calculated from the spectral radiant flux measurements taken at least 1 nm intervals over the rage of 380 to 780 nm.

3. THD and PF Measurements:

The sample was tested according to the ANSI C82.77-2002, the sample was operated at requirement Voltage and Frequency, and was stabilized before measurement. The Total Harmonic Distortion was calculated from the Digital Power Meter.

Integrating Sphere Test Results:

Test Condition:

Test Ambient (°C)	Test Humidity (%)	Orientation	Stabilization Time (minute)	Test Time (minute)
25.3	32.3	Face Down	90	10

Electrical Data:

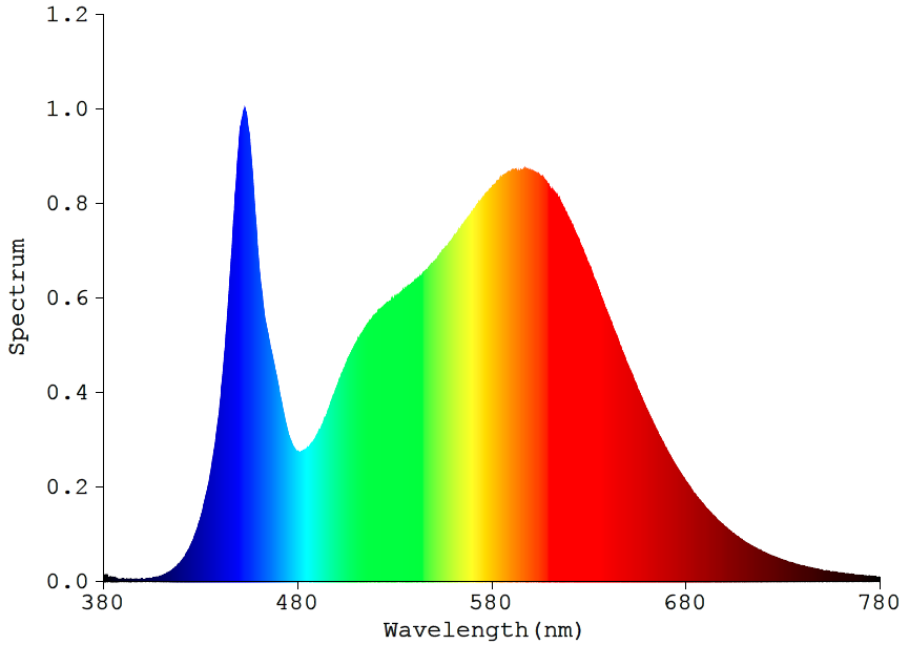
Voltage (V)	Frequency (Hz)	Current (A)	Wattage (W)	Power Factor
120.0	60	0.4037	47.96	0.9875

Color Data:

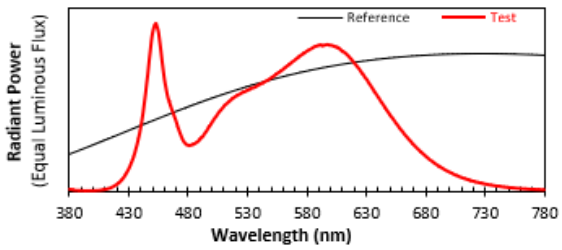
Parameter	Result
CCT(K)	3986
Ra	84.7
R_f	85
R_g	96
$R_{cs,\ h1}$	-11%
Chromaticity, (x, y)	(0.3796, 0.3719)
Chromaticity, (u', v')	(0.2265, 0.4993)
Duv	-0.0021

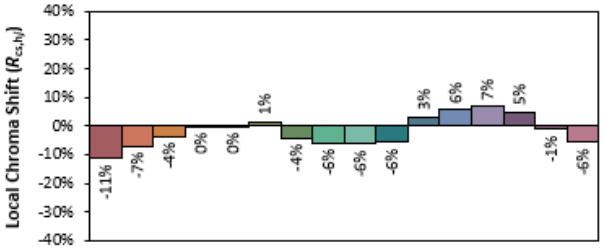
Specify Color Rendering			
R1	84	R9	16
R2	92	R10	79
R3	96	R11	82
R4	83	R12	65
R5	84	R13	86
R6	88	R14	98
R7	86	R15	78
R8	66	-	-

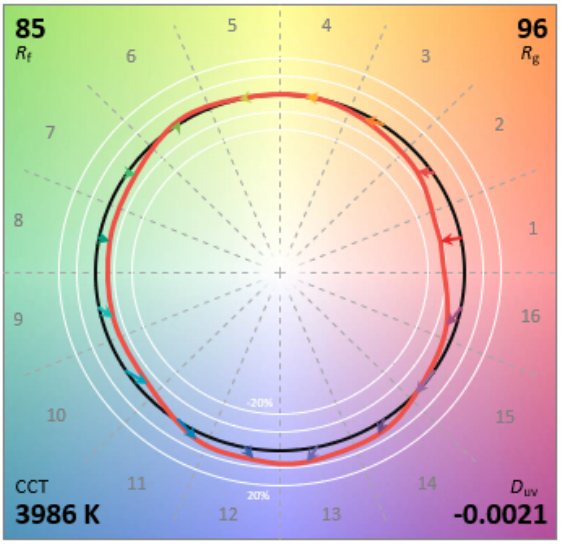
Spectrum Diagram:

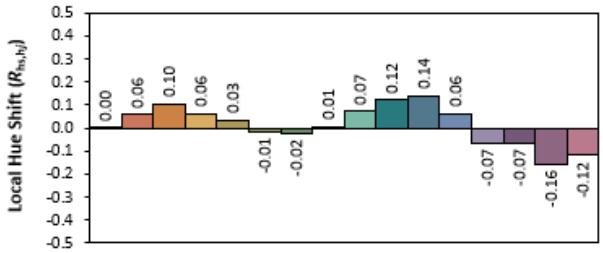


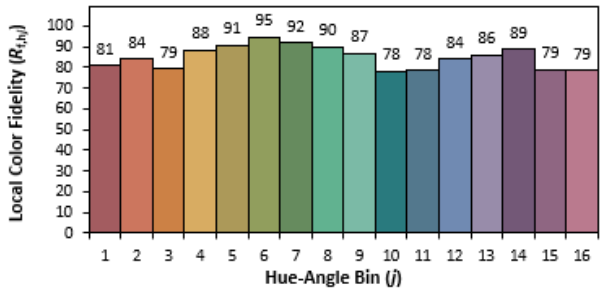
IES TM-30-18 Color Rendition Result:

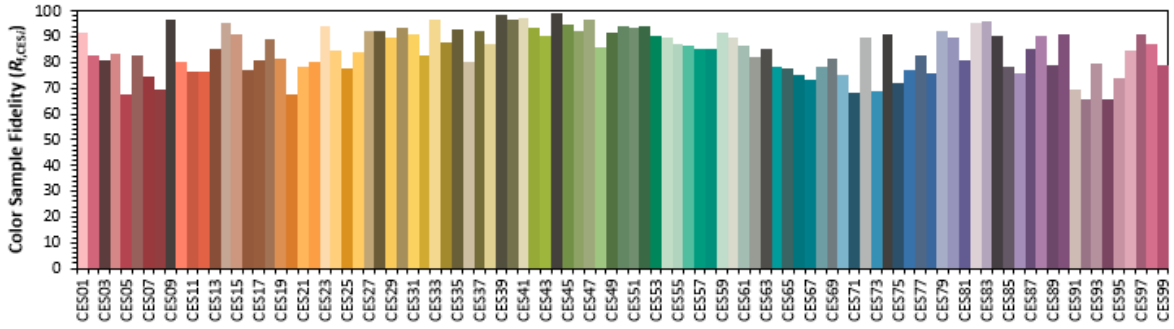












Spectrum Data:

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.0134	447	0.7684	514	0.5321	581	0.8383	648	0.4776	715	0.0726
381	0.0126	448	0.8308	515	0.5379	582	0.8405	649	0.4666	716	0.0704
382	0.0118	449	0.8947	516	0.5453	583	0.8471	650	0.4574	717	0.0678
383	0.0099	450	0.9422	517	0.5506	584	0.8498	651	0.4462	718	0.0661
384	0.0083	451	0.9724	518	0.5553	585	0.8530	652	0.4384	719	0.0636
385	0.0073	452	0.9933	519	0.5606	586	0.8589	653	0.4273	720	0.0618
386	0.0082	453	0.9951	520	0.5655	587	0.8618	654	0.4187	721	0.0602
387	0.0062	454	0.9737	521	0.5692	588	0.8645	655	0.4076	722	0.0580
388	0.0049	455	0.9459	522	0.5733	589	0.8654	656	0.3987	723	0.0563
389	0.0055	456	0.8936	523	0.5773	590	0.8683	657	0.3890	724	0.0546
390	0.0061	457	0.8373	524	0.5813	591	0.8710	658	0.3797	725	0.0532
391	0.0052	458	0.7754	525	0.5856	592	0.8715	659	0.3700	726	0.0516
392	0.0058	459	0.7196	526	0.5896	593	0.8655	660	0.3615	727	0.0499
393	0.0040	460	0.6666	527	0.5913	594	0.8676	661	0.3525	728	0.0483
394	0.0050	461	0.6265	528	0.5941	595	0.8704	662	0.3432	729	0.0466
395	0.0050	462	0.5892	529	0.5978	596	0.8710	663	0.3350	730	0.0453
396	0.0048	463	0.5569	530	0.6029	597	0.8735	664	0.3274	731	0.0440
397	0.0051	464	0.5358	531	0.6040	598	0.8712	665	0.3191	732	0.0424
398	0.0049	465	0.5142	532	0.6072	599	0.8699	666	0.3097	733	0.0411
399	0.0054	466	0.4912	533	0.6116	600	0.8690	667	0.3026	734	0.0398
400	0.0055	467	0.4739	534	0.6154	601	0.8687	668	0.2942	735	0.0390
401	0.0053	468	0.4531	535	0.6169	602	0.8655	669	0.2854	736	0.0375
402	0.0063	469	0.4347	536	0.6192	603	0.8624	670	0.2785	737	0.0364
403	0.0063	470	0.4140	537	0.6226	604	0.8614	671	0.2703	738	0.0352
404	0.0072	471	0.3902	538	0.6273	605	0.8567	672	0.2635	739	0.0339
405	0.0070	472	0.3697	539	0.6312	606	0.8563	673	0.2566	740	0.0331
406	0.0083	473	0.3501	540	0.6352	607	0.8502	674	0.2498	741	0.0323
407	0.0091	474	0.3318	541	0.6393	608	0.8460	675	0.2428	742	0.0311
408	0.0101	475	0.3137	542	0.6423	609	0.8404	676	0.2364	743	0.0304
409	0.0109	476	0.3004	543	0.6463	610	0.8316	677	0.2300	744	0.0293
410	0.0127	477	0.2904	544	0.6484	611	0.8296	678	0.2231	745	0.0284
411	0.0144	478	0.2835	545	0.6545	612	0.8250	679	0.2179	746	0.0275
412	0.0160	479	0.2771	546	0.6584	613	0.8195	680	0.2110	747	0.0263
413	0.0186	480	0.2754	547	0.6608	614	0.8125	681	0.2054	748	0.0261
414	0.0202	481	0.2731	548	0.6652	615	0.8061	682	0.1997	749	0.0248
415	0.0232	482	0.2751	549	0.6713	616	0.7972	683	0.1934	750	0.0244
416	0.0266	483	0.2771	550	0.6757	617	0.7892	684	0.1870	751	0.0233
417	0.0303	484	0.2793	551	0.6793	618	0.7814	685	0.1824	752	0.0232
418	0.0344	485	0.2837	552	0.6848	619	0.7719	686	0.1772	753	0.0220
419	0.0383	486	0.2861	553	0.6908	620	0.7640	687	0.1721	754	0.0213
420	0.0432	487	0.2926	554	0.6959	621	0.7555	688	0.1668	755	0.0211
421	0.0491	488	0.2963	555	0.7015	622	0.7472	689	0.1625	756	0.0204
422	0.0545	489	0.3025	556	0.7061	623	0.7375	690	0.1569	757	0.0198
423	0.0621	490	0.3111	557	0.7092	624	0.7290	691	0.1528	758	0.0191
424	0.0688	491	0.3197	558	0.7163	625	0.7194	692	0.1481	759	0.0186
425	0.0779	492	0.3252	559	0.7209	626	0.7087	693	0.1436	760	0.0181
426	0.0863	493	0.3346	560	0.7253	627	0.7005	694	0.1392	761	0.0173
427	0.0982	494	0.3461	561	0.7322	628	0.6897	695	0.1358	762	0.0168
428	0.1093	495	0.3542	562	0.7360	629	0.6786	696	0.1307	763	0.0164
429	0.1231	496	0.3659	563	0.7439	630	0.6699	697	0.1271	764	0.0159
430	0.1357	497	0.3776	564	0.7486	631	0.6603	698	0.1230	765	0.0157
431	0.1516	498	0.3889	565	0.7538	632	0.6480	699	0.1201	766	0.0149
432	0.1690	499	0.3977	566	0.7596	633	0.6370	700	0.1161	767	0.0145
433	0.1863	500	0.4105	567	0.7656	634	0.6275	701	0.1130	768	0.0141
434	0.2056	501	0.4218	568	0.7713	635	0.6161	702	0.1095	769	0.0136
435	0.2293	502	0.4317	569	0.7758	636	0.6051	703	0.1057	770	0.0134
436	0.2555	503	0.4421	570	0.7817	637	0.5947	704	0.1021	771	0.0128
437	0.2813	504	0.4510	571	0.7878	638	0.5831	705	0.0991	772	0.0127
438	0.3124	505	0.4616	572	0.7940	639	0.5731	706	0.0959	773	0.0121
439	0.3431	506	0.4723	573	0.8000	640	0.5626	707	0.0933	774	0.0117
440	0.3812	507	0.4803	574	0.8029	641	0.5519	708	0.0900	775	0.0116
441	0.4213	508	0.4886	575	0.8101	642	0.5404	709	0.0873	776	0.0113
442	0.4683	509	0.4967	576	0.8138	643	0.5297	710	0.0845	777	0.0109
443	0.5224	510	0.5045	577	0.8209	644	0.5192	711	0.0819	778	0.0106
444	0.5778	511	0.5142	578	0.8225	645	0.5102	712	0.0794	779	0.0103
445	0.6404	512	0.5185	579	0.8289	646	0.4977	713	0.0772	780	0.0100
446	0.6990	513	0.5257	580	0.8338	647	0.4877	714	0.0750		N/A

Goniophotometer Test Results:

Test Condition:

Test Ambient (°C)	Test Humidity (%)	Orientation	Stabilization Time (minute)	Test Time (minute)
25.3	32.3	Face Down	90	25

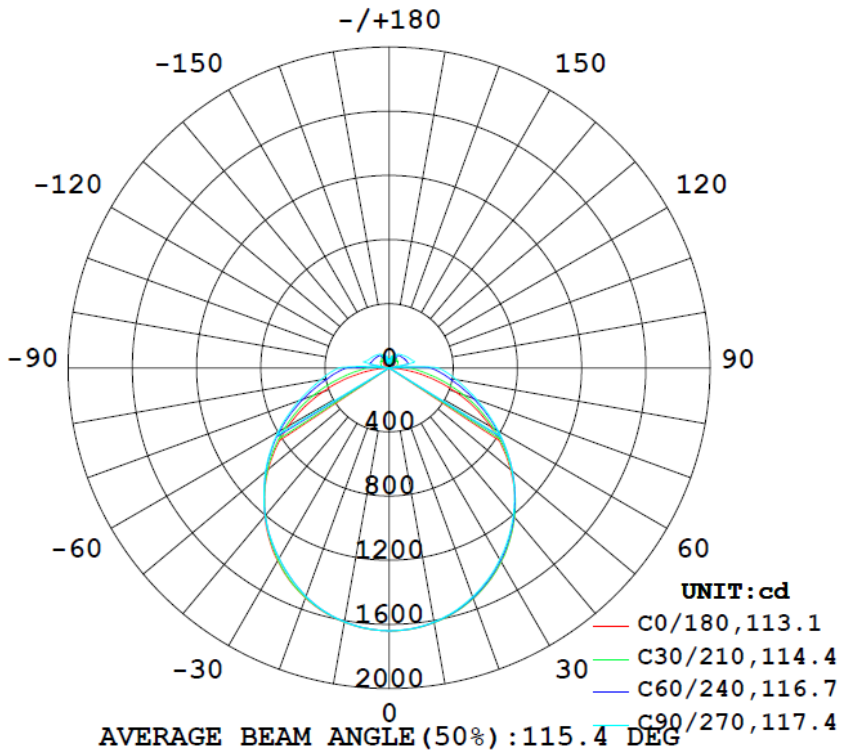
Electrical Data:

Voltage (V)	Frequency (Hz)	Current (A)	Wattage (W)	Power Factor
120.0	60	0.4037	47.96	0.9875

Goniophotometer Data:

Parameter	Results
Total Luminous (lm)	5544.1
Luminous per feet (lm/ft)	1386.0
Luminous Efficacy (lm/w)	115.60
Zonal Lumens Distribution (0-60°)	67.2%
Beam Angle (°)	115.4

Luminous Intensity Distribution Diagram:

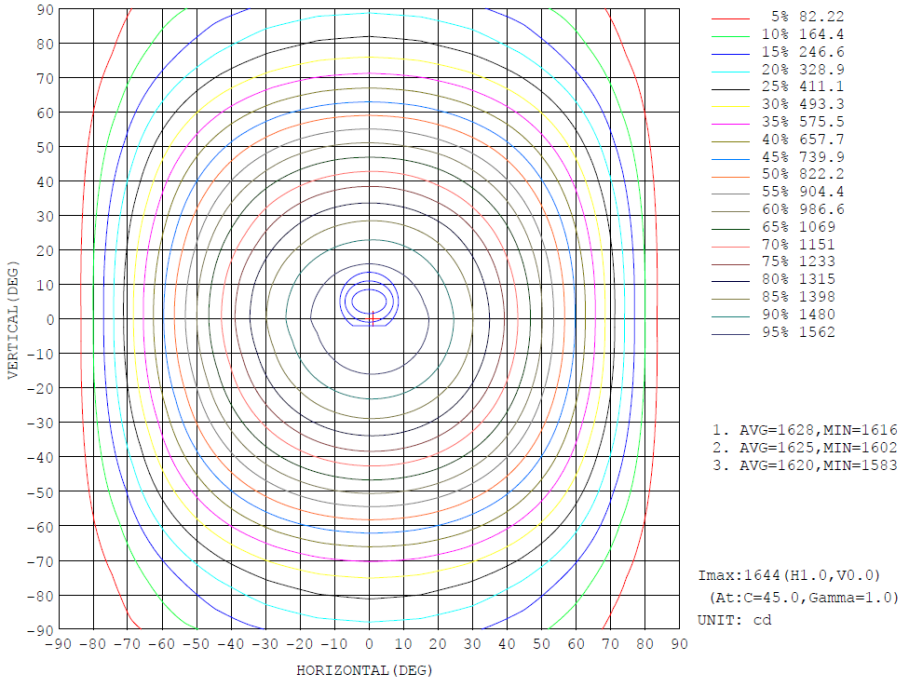


Zonal Flux Diagram:

ZONAL FLUX DIAGRAM:

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	Φ zone	Φ total	%lum,lamp
10	1612	1612	1609	1608	1611	1609	1608	1611	0- 10	155.1	155.1	2.8,2.8
20	1531	1528	1520	1520	1526	1521	1517	1526	10- 20	444.1	599.2	10.8,10.8
30	1396	1392	1380	1380	1390	1377	1372	1391	20- 30	672.9	1272	22.9,22.9
40	1213	1213	1203	1199	1207	1204	1203	1212	30- 40	813.6	2086	37.6,37.6
50	988.3	1001	999.7	986.8	982.9	995.5	1007	1003	40- 50	852.2	2938	53,53
60	728.3	766.8	785.1	753.7	725.8	773.3	800.2	777.1	50- 60	788.3	3726	67.2,67.2
70	444.0	529.0	582.8	519.3	443.8	541.6	596.9	541.3	60- 70	637.5	4364	78.7,78.7
80	162.2	328.9	425.6	324.0	163.5	339.5	433.3	338.6	70- 80	439.1	4803	86.6,86.6
90	3.842	198.6	301.7	187.7	0.6302	201.3	311.7	198.1	80- 90	263.9	5067	91.4,91.4
100	5.378	75.23	48.47	85.54	5.872	84.01	33.83	80.58	90-100	70.04	5137	92.7,92.7
110	21.71	88.90	148.5	90.66	21.25	87.39	142.8	86.84	100-110	85.24	5222	94.2,94.2
120	33.54	89.48	133.7	90.67	33.39	88.89	128.9	87.88	110-120	83.83	5306	95.7,95.7
130	46.97	89.29	120.1	89.18	49.59	89.25	118.6	88.01	120-130	75.70	5381	97.1,97.1
140	53.08	81.30	109.9	82.03	56.49	89.49	109.6	87.84	130-140	62.19	5444	98.2,98.2
150	62.88	88.59	81.04	86.57	64.58	86.30	82.02	85.78	140-150	49.21	5493	99.1,99.1
160	62.68	28.14	91.81	25.98	60.41	36.66	91.12	28.08	150-160	31.36	5524	99.6,99.6
170	54.16	42.94	54.59	35.56	50.81	47.19	71.02	44.45	160-170	14.83	5539	99.9,99.9
180	63.09	58.57	42.79	52.82	60.72	58.04	40.75	55.22	170-180	5.022	5544	100,100
DEG	LUMINOUS INTENSITY:cd Less than 35% Percent = 17.1 %									UNIT:lm		

Isocandela Diagram:



Luminous Distribution Intensity Data:

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270
0	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639	1639
5	1633	1633	1634	1633	1632	1632	1632	1632	1632	1631	1631	1631	1632	1631	1631	1631	1631	1631	1631
10	1612	1613	1613	1612	1610	1610	1609	1609	1608	1608	1609	1608	1611	1610	1610	1609	1608	1608	1608
15	1579	1579	1578	1577	1575	1573	1572	1571	1571	1570	1572	1572	1575	1574	1574	1572	1570	1569	1570
20	1531	1531	1530	1528	1525	1522	1520	1519	1520	1520	1521	1523	1526	1526	1524	1521	1516	1515	1517
25	1470	1470	1469	1466	1461	1458	1455	1454	1455	1456	1458	1459	1465	1464	1463	1455	1449	1447	1449
30	1396	1396	1396	1392	1387	1383	1380	1378	1380	1380	1383	1384	1390	1390	1384	1377	1373	1372	1372
35	1310	1310	1310	1307	1303	1298	1295	1293	1294	1294	1296	1297	1304	1304	1297	1293	1292	1291	1292
40	1213	1214	1215	1213	1209	1206	1203	1201	1200	1199	1200	1199	1207	1209	1201	1204	1203	1202	1203
45	1105	1107	1110	1110	1109	1106	1103	1102	1099	1096	1095	1092	1100	1103	1099	1105	1102	1103	1104
50	988	991	997	1001	1002	1002	1000	997	992	987	981	976	983	986	991	995	1004	1006	1007
55	862	866	877	886	891	894	892	889	882	872	862	852	858	860	874	887	897	903	905
60	728	735	751	767	778	784	785	780	769	754	737	721	726	730	751	773	788	797	800
65	588	598	622	647	666	677	680	673	658	635	609	585	587	599	628	657	678	692	696
70	444	459	493	529	559	577	583	574	552	519	482	447	444	464	503	542	572	591	597
75	299	321	370	421	462	488	496	486	457	413	361	311	300	328	381	433	474	499	508
80	162	194	261	329	382	415	426	413	378	324	256	187	164	203	272	340	391	423	433
85	50.6	95.0	181	260	318	353	364	351	315	256	178	93.0	52.4	102	189	269	327	362	373
90	3.84	42.0	123	199	257	291	302	288	249	188	112	38.2	0.63	47.5	130	201	266	301	312
95	0.78	1.87	15.4	42.4	13.7	73.5	71.5	15.1	40.9	70.8	57.2	3.51	1.11	1.33	12.5	2.55	41.8	55.3	59.7
100	5.38	8.88	37.2	75.2	65.3	48.3	48.5	66.8	96.4	85.5	46.0	11.8	5.87	10.6	42.5	84.0	77.8	44.3	33.8
105	13.2	18.2	50.5	86.7	121	149	162	150	123	89.0	54.1	19.7	13.1	19.3	49.9	86.5	122	149	158
110	21.7	25.7	55.1	88.9	118	139	149	140	120	90.7	58.1	25.6	21.3	25.6	54.5	87.4	116	136	143
115	29.4	31.5	58.7	89.5	115	133	141	133	116	90.9	60.9	30.8	29.4	30.6	58.6	88.3	112	128	135
120	33.5	38.5	62.5	89.5	112	127	134	127	112	90.7	64.2	37.1	33.4	35.3	62.2	88.9	109	123	129
125	41.2	43.9	66.6	89.2	108	121	127	121	109	89.2	67.8	42.9	42.6	44.6	66.4	89.0	106	119	124
130	47.0	26.7	69.3	89.3	105	115	120	115	104	89.2	70.9	27.6	49.6	34.8	68.1	89.2	104	114	119
135	53.4	29.5	59.7	89.5	102	111	114	111	102	89.1	60.7	25.5	51.0	27.0	58.7	89.7	102	110	114
140	53.1	54.7	73.5	81.3	100.0	107	110	107	99.8	82.0	75.5	57.7	56.5	52.0	75.6	89.5	100	107	110
145	55.7	51.2	77.2	71.6	96.0	104	106	104	97.8	69.6	77.9	61.2	59.2	62.5	76.9	69.0	97.7	104	106
150	62.9	38.1	25.8	88.6	75.9	78.9	81.0	79.0	74.1	86.6	25.5	39.7	64.6	38.3	25.9	86.3	73.3	78.0	82.0
155	70.5	42.7	45.3	84.2	91.7	94.1	95.4	95.4	91.0	85.8	30.7	41.1	68.2	51.5	67.5	66.5	90.1	94.5	94.2
160	62.7	58.2	60.8	28.1	62.8	90.7	91.8	91.5	72.9	26.0	65.6	45.7	60.4	58.5	41.0	36.7	34.2	91.4	91.1
165	57.6	64.9	45.8	69.8	43.6	27.5	27.4	27.7	35.3	69.2	37.2	54.1	57.1	56.6	49.4	40.6	73.8	30.0	28.2
170	54.2	57.2	59.3	42.9	44.6	46.8	54.6	48.8	42.3	35.6	52.8	52.2	50.8	50.6	52.5	47.2	37.0	47.7	71.0
175	61.3	60.5	62.8	61.2	59.7	58.1	53.8	53.3	54.2	57.2	57.3	58.6	56.7	56.5	58.6	57.9	58.1	55.2	53.4
180	63.1	61.3	57.2	58.6	51.5	38.0	42.8	32.8	51.8	52.8	58.1	58.1	60.7	60.5	59.8	58.0	56.0	55.0	40.7

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	285	300	315	330	345
0	1639	1639	1639	1639	1639
5	1631	1632	1632	1633	1634
10	1608	1610	1611	1613	1614
15	1571	1574	1575	1578	1580
20	1520	1523	1526	1530	1533
25	1453	1461	1464	1469	1471
30	1376	1384	1391	1395	1399
35	1293	1298	1307	1312	1314
40	1205	1206	1212	1217	1219
45	1110	1110	1110	1115	1113
50	1004	1008	1003	1003	999
55	902	897	893	884	877
60	797	788	777	760	747
65	691	677	657	633	611
70	591	571	541	506	471
75	500	474	432	382	332
80	422	390	339	272	205
85	361	326	267	187	102
90	300	263	198	128	45.9
95	54.6	40.5	57.1	12.8	1.58
100	45.4	80.1	80.6	39.6	9.15
105	147	120	85.5	49.4	18.3
110	135	115	86.8	54.0	25.5
115	128	112	87.5	57.6	31.8
120	123	109	87.9	61.7	35.6
125	118	106	87.8	65.4	40.4
130	114	103	88.0	68.3	27.4
135	110	101	88.2	58.8	30.3
140	106	99.2	87.8	66.6	55.4
145	103	97.3	66.1	73.4	57.5
150	79.3	73.6	85.8	30.1	45.0
155	93.1	91.2	87.1	28.9	44.1
160	90.6	89.1	28.1	62.6	44.7
165	27.9	28.5	52.3	68.6	43.8
170	74.0	62.9	44.4	42.5	60.1
175	56.5	59.3	60.9	63.3	61.1
180	47.9	41.4	55.2	55.5	56.5

THD and PF Measurement Test Results:

Electrical Measurement:

Voltage (V)	Frequency (Hz)	Current (A)	Wattage (W)	Power Factor	iTHD(%)
277.0	60	0.1818	45.35	0.9005	19.50

Photo of Sample:

Equipment List:

Equipment ID	Equipment Name	Last Cal.	Due Cal.
NTC-F01-001	Goniophotometer System	2019-11-13	2020-11-12
NTC-F01-006	2.0 meter Integrating Sphere	2019-11-13	2020-11-12
NTC-F01-012	Standard Lamp	2019-11-13	2020-11-12
NTC-F01-013	Standard Lamp	2019-11-13	2020-11-12
NTC-F01-031	Digital Power Meter	2019-08-22	2020-08-21
NTC-F01-019	Temperature & Humidity Meter	2019-11-15	2020-11-14

************End of Report************