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):
544651##-2

Representative (Tested) Model:
54465151-2

Model Difference: ##=61-70 identifies 5000K.

Prepare by:

Engineer: Alan Wang
Date: 2020-04-22

Review by:

Technical Lead: Vincent Yuan
Issue Date: 2020-05-13
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:	ETI
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:	544651##-2(##=61-70)
Product Type:	Direct Linear Ambient Luminaires
Rating Input:	120-277Vac, 50/60Hz, 51W
Declared CCT:	5000 K
Declared Light Output:	5865 lm
LED Manufacturer:	Samsung
LED Model:	SPMWH1228FD5WAR0XX
LED Quantity:	176 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:	2020-04-08
Quantity of Receipt Samples:	1 pc
Sample Number:	200408010-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:	2020-05-13
Revised Date of Test Report:	N/A
Test Report No.:	NTCLR20040067
Remark *(If applicable)*:	N/A

Test Specification:	
Date of Test	2020-04-09
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
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 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.

Integrating Sphere Test Results:

Test Condition:

Test Ambient (°C)	Test Humidity (%)	Orientation	Stabilization Time (minute)	Test Time (minute)
25.0	59.0	Face Down	90	10

Electrical Data:

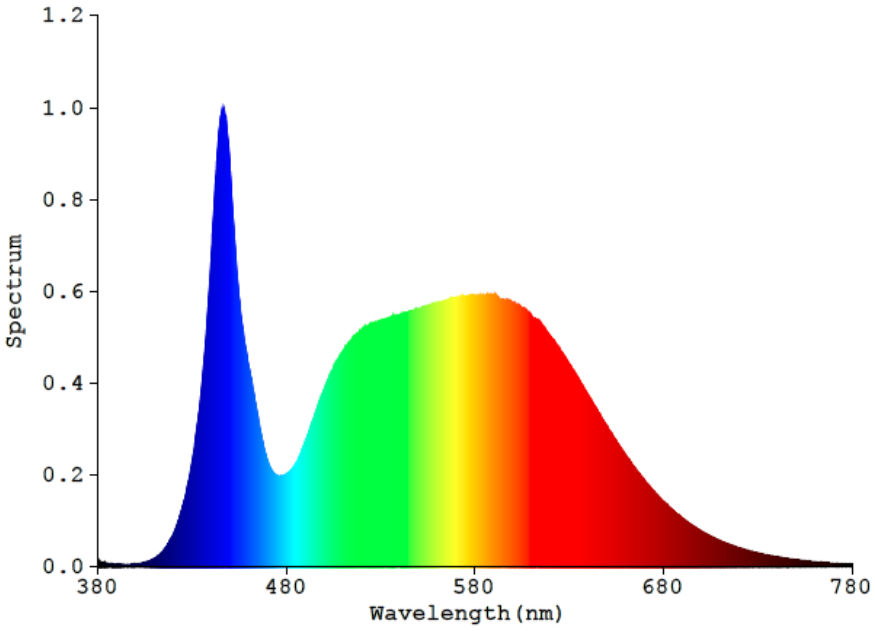
Voltage (V)	Frequency (Hz)	Current (A)	Wattage (W)	Power Factor
120.0	60	0.3962	47.06	0.9871

Color Data:

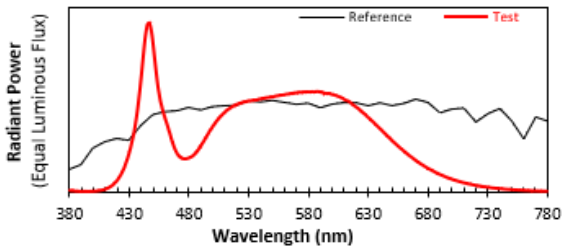
Parameter	Result
CCT(K)	4959
Ra	83.7
R_f	84
R_g	99
$R_{cs,\ h1}$	-10%
Chromaticity, (x, y)	(0.3466, 0.3560)
Chromaticity, (u', v')	(0.2107, 0.4870)
Duv	0.0016

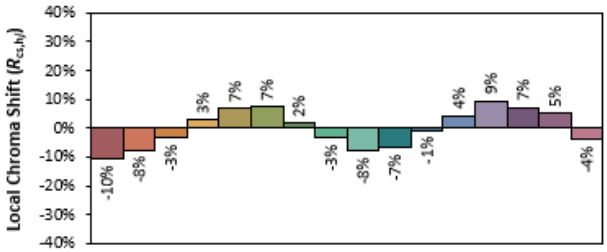
Specify Color Rendering			
R1	83	R9	18
R2	87	R10	69
R3	90	R11	85
R4	85	R12	63
R5	83	R13	83
R6	82	R14	94
R7	88	R15	78
R8	72	-	-

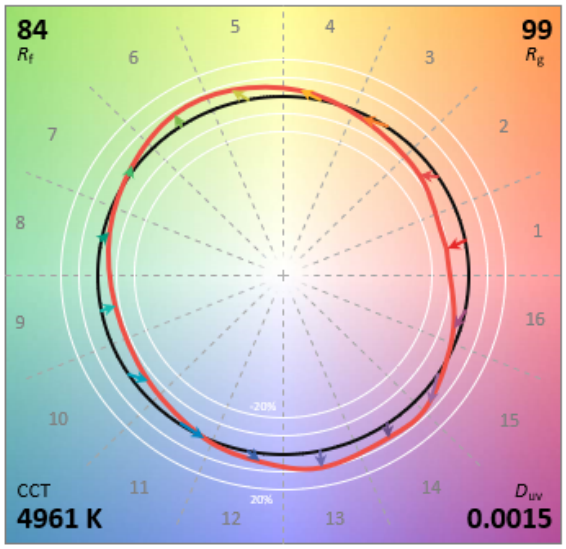
Spectrum Diagram:

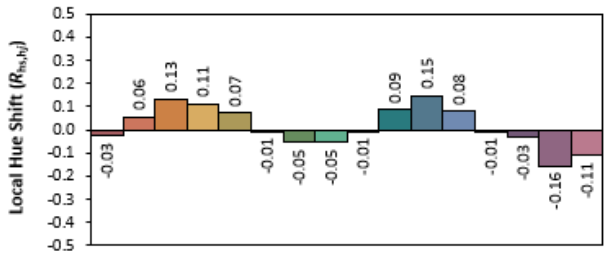


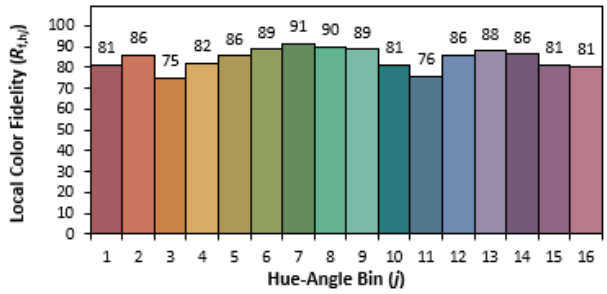
IES TM-30-18 Color Rendition Result:

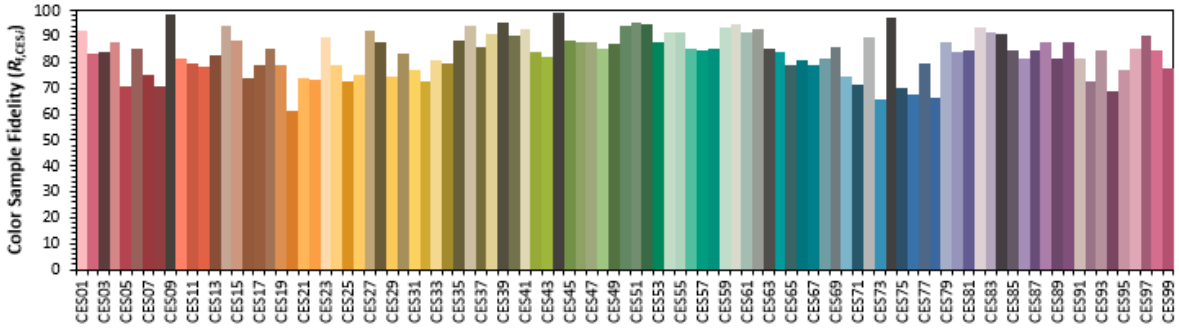












Spectrum Data:

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.0121	447	0.9917	514	0.4922	581	0.5905	648	0.3194	715	0.0492
381	0.0100	448	0.9654	515	0.4985	582	0.5900	649	0.3129	716	0.0475
382	0.0095	449	0.9237	516	0.5035	583	0.5919	650	0.3068	717	0.0462
383	0.0101	450	0.8664	517	0.5067	584	0.5914	651	0.2983	718	0.0447
384	0.0082	451	0.7989	518	0.5096	585	0.5897	652	0.2930	719	0.0432
385	0.0071	452	0.7366	519	0.5141	586	0.5921	653	0.2869	720	0.0419
386	0.0070	453	0.6764	520	0.5177	587	0.5925	654	0.2801	721	0.0407
387	0.0066	454	0.6200	521	0.5195	588	0.5930	655	0.2746	722	0.0395
388	0.0063	455	0.5792	522	0.5216	589	0.5917	656	0.2676	723	0.0382
389	0.0052	456	0.5386	523	0.5230	590	0.5889	657	0.2615	724	0.0369
390	0.0057	457	0.5104	524	0.5277	591	0.5918	658	0.2550	725	0.0357
391	0.0060	458	0.4807	525	0.5298	592	0.5885	659	0.2491	726	0.0345
392	0.0058	459	0.4582	526	0.5310	593	0.5810	660	0.2435	727	0.0336
393	0.0056	460	0.4344	527	0.5324	594	0.5824	661	0.2370	728	0.0323
394	0.0057	461	0.4137	528	0.5334	595	0.5823	662	0.2326	729	0.0315
395	0.0056	462	0.3913	529	0.5356	596	0.5805	663	0.2253	730	0.0306
396	0.0053	463	0.3673	530	0.5373	597	0.5820	664	0.2201	731	0.0295
397	0.0057	464	0.3455	531	0.5374	598	0.5802	665	0.2149	732	0.0287
398	0.0060	465	0.3209	532	0.5391	599	0.5779	666	0.2095	733	0.0278
399	0.0064	466	0.2960	533	0.5409	600	0.5753	667	0.2044	734	0.0264
400	0.0065	467	0.2774	534	0.5418	601	0.5755	668	0.1985	735	0.0259
401	0.0072	468	0.2576	535	0.5421	602	0.5709	669	0.1938	736	0.0253
402	0.0075	469	0.2430	536	0.5423	603	0.5713	670	0.1883	737	0.0244
403	0.0086	470	0.2288	537	0.5433	604	0.5673	671	0.1829	738	0.0238
404	0.0094	471	0.2183	538	0.5467	605	0.5641	672	0.1780	739	0.0231
405	0.0105	472	0.2107	539	0.5487	606	0.5628	673	0.1739	740	0.0223
406	0.0120	473	0.2050	540	0.5492	607	0.5586	674	0.1684	741	0.0218
407	0.0130	474	0.2016	541	0.5505	608	0.5555	675	0.1647	742	0.0210
408	0.0147	475	0.1989	542	0.5525	609	0.5528	676	0.1598	743	0.0201
409	0.0168	476	0.1969	543	0.5536	610	0.5470	677	0.1553	744	0.0195
410	0.0195	477	0.1976	544	0.5542	611	0.5417	678	0.1514	745	0.0189
411	0.0217	478	0.1984	545	0.5562	612	0.5407	679	0.1469	746	0.0184
412	0.0251	479	0.2004	546	0.5574	613	0.5380	680	0.1420	747	0.0179
413	0.0286	480	0.2027	547	0.5577	614	0.5345	681	0.1387	748	0.0175
414	0.0325	481	0.2049	548	0.5590	615	0.5295	682	0.1354	749	0.0169
415	0.0377	482	0.2089	549	0.5607	616	0.5238	683	0.1311	750	0.0162
416	0.0433	483	0.2141	550	0.5613	617	0.5184	684	0.1274	751	0.0159
417	0.0497	484	0.2196	551	0.5618	618	0.5132	685	0.1239	752	0.0154
418	0.0578	485	0.2261	552	0.5651	619	0.5075	686	0.1201	753	0.0149
419	0.0643	486	0.2336	553	0.5665	620	0.5023	687	0.1163	754	0.0146
420	0.0723	487	0.2432	554	0.5672	621	0.4967	688	0.1134	755	0.0141
421	0.0824	488	0.2524	555	0.5690	622	0.4921	689	0.1100	756	0.0135
422	0.0942	489	0.2628	556	0.5699	623	0.4853	690	0.1063	757	0.0132
423	0.1050	490	0.2740	557	0.5710	624	0.4806	691	0.1034	758	0.0129
424	0.1193	491	0.2851	558	0.5720	625	0.4743	692	0.1003	759	0.0123
425	0.1338	492	0.2965	559	0.5732	626	0.4673	693	0.0976	760	0.0120
426	0.1494	493	0.3085	560	0.5736	627	0.4617	694	0.0946	761	0.0116
427	0.1709	494	0.3206	561	0.5763	628	0.4562	695	0.0916	762	0.0112
428	0.1890	495	0.3317	562	0.5772	629	0.4481	696	0.0885	763	0.0111
429	0.2114	496	0.3436	563	0.5779	630	0.4421	697	0.0861	764	0.0107
430	0.2358	497	0.3566	564	0.5785	631	0.4361	698	0.0832	765	0.0102
431	0.2609	498	0.3672	565	0.5805	632	0.4284	699	0.0810	766	0.0100
432	0.2920	499	0.3765	566	0.5817	633	0.4216	700	0.0782	767	0.0096
433	0.3221	500	0.3883	567	0.5811	634	0.4160	701	0.0759	768	0.0094
434	0.3548	501	0.3983	568	0.5850	635	0.4094	702	0.0737	769	0.0092
435	0.3976	502	0.4072	569	0.5843	636	0.4015	703	0.0715	770	0.0089
436	0.4434	503	0.4178	570	0.5856	637	0.3956	704	0.0690	771	0.0087
437	0.4932	504	0.4254	571	0.5863	638	0.3879	705	0.0673	772	0.0083
438	0.5522	505	0.4349	572	0.5874	639	0.3816	706	0.0651	773	0.0081
439	0.6133	506	0.4435	573	0.5895	640	0.3744	707	0.0631	774	0.0079
440	0.6805	507	0.4506	574	0.5878	641	0.3680	708	0.0614	775	0.0076
441	0.7532	508	0.4583	575	0.5887	642	0.3607	709	0.0591	776	0.0073
442	0.8241	509	0.4649	576	0.5900	643	0.3537	710	0.0573	777	0.0072
443	0.8933	510	0.4703	577	0.5902	644	0.3471	711	0.0554	778	0.0071
444	0.9443	511	0.4790	578	0.5896	645	0.3402	712	0.0539	779	0.0069
445	0.9839	512	0.4820	579	0.5909	646	0.3339	713	0.0519	780	0.0067
446	0.9932	513	0.4890	580	0.5910	647	0.3262	714	0.0503		N/A

Goniophotometer Test Results:

Test Condition:

Test Ambient (°C)	Test Humidity (%)	Orientation	Stabilization Time (minute)	Test Time (minute)
25.0	59.0	Face Down	90	25

Electrical Data:

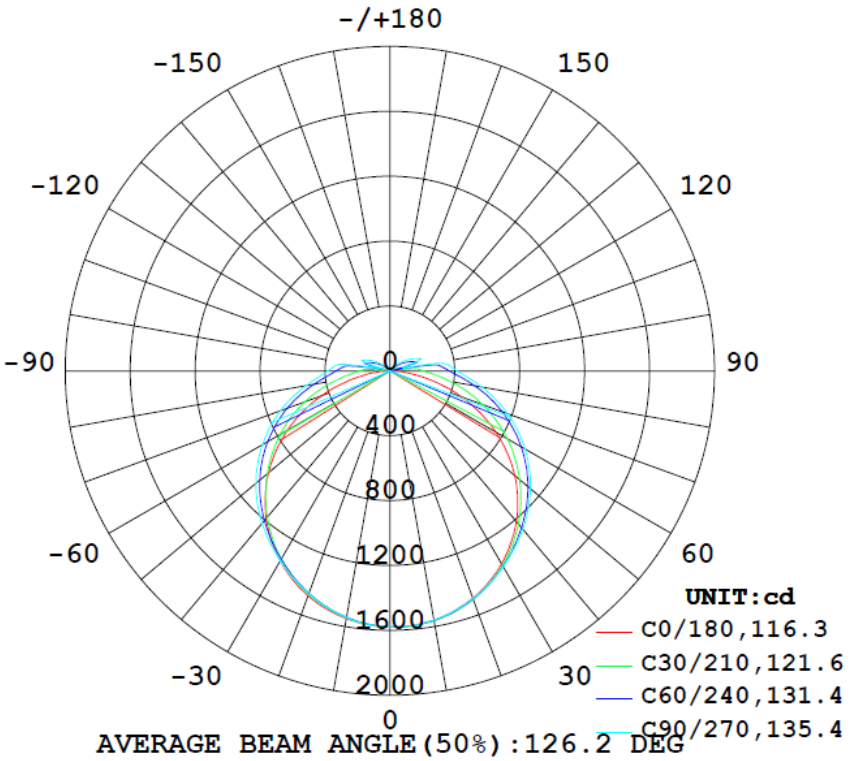
Voltage (V)	Frequency (Hz)	Current (A)	Wattage (W)	Power Factor
120.0	60	0.3962	47.06	0.9871

Goniophotometer Data:

Parameter	Results
Total Luminous (lm)	5843.2
Luminous per feet (lm/ft)	1460.8
Luminous Efficacy (lm/w)	124.16
Zonal Lumens Distribution (0-60°)	64.7%
Beam Angle (°)	126.2

Luminous Intensity Distribution Diagram:

LUMINOUS INTENSITY DISTRIBUTION DIAGRAM

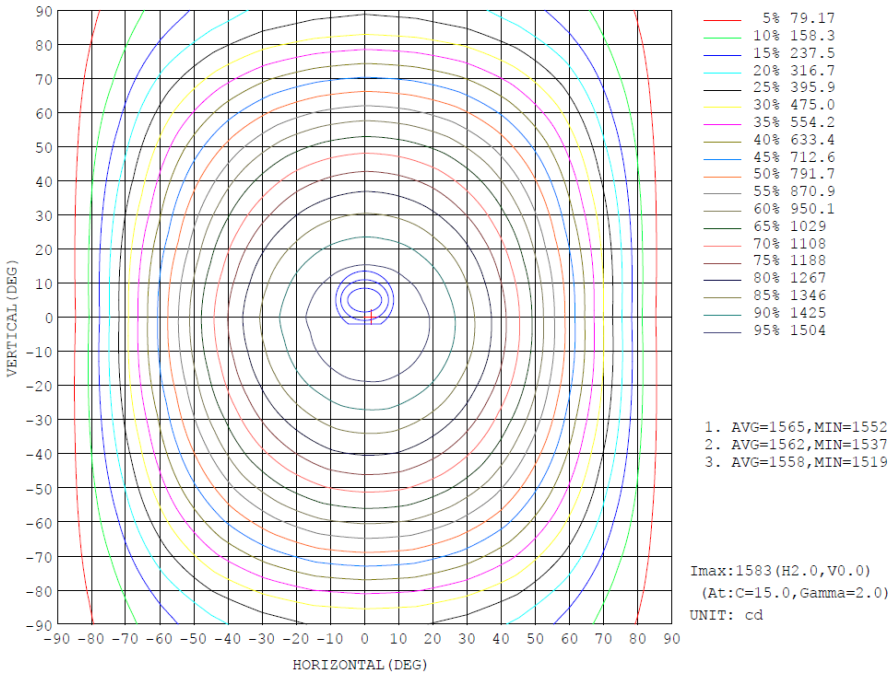


Zonal Flux Diagram:

ZONAL FLUX DIAGRAM:

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	Φ zone	Φ total	%lum,lamp
10	1559	1563	1561	1556	1550	1543	1543	1552	0- 10	149.5	149.5	2.56,2.56
20	1491	1499	1495	1484	1475	1460	1463	1474	10- 20	429.9	579.4	9.92,9.92
30	1375	1390	1394	1371	1353	1337	1352	1356	20- 30	658.4	1238	21.2,21.2
40	1212	1248	1274	1225	1187	1186	1226	1210	30- 40	811.9	2050	35.1,35.1
50	1003	1082	1130	1059	976.5	1018	1078	1044	40- 50	878.1	2928	50.1,50.1
60	752.8	894.1	960.7	872.3	727.7	828.9	907.1	855.5	50- 60	850.6	3778	64.7,64.7
70	470.1	685.2	771.7	666.0	449.0	623.2	718.4	647.8	60- 70	734.0	4512	77.2,77.2
80	188.2	470.6	574.6	456.7	174.5	416.6	525.6	436.9	70- 80	549.4	5062	86.6,86.6
90	28.59	301.6	414.9	296.1	29.23	271.7	384.6	281.1	80- 90	352.8	5415	92.7,92.7
100	20.13	25.16	249.2	12.68	20.85	19.24	193.3	38.18	90-100	214.9	5630	96.3,96.3
110	10.66	109.9	183.5	116.5	9.686	95.96	187.1	97.53	100-110	77.11	5707	97.7,97.7
120	1.076	60.88	144.8	64.05	1.234	49.46	129.2	51.67	110-120	79.96	5787	99,99
130	2.665	17.57	76.27	20.43	2.555	12.56	63.78	13.10	120-130	39.36	5826	99.7,99.7
140	1.701	4.641	21.57	5.200	1.683	4.462	15.63	4.615	130-140	12.24	5838	99.9,99.9
150	1.691	3.699	5.153	3.952	1.761	3.758	4.810	3.792	140-150	2.833	5841	100,100
160	1.709	1.295	3.668	1.231	1.950	1.660	3.741	1.717	150-160	1.387	5842	100,100
170	1.742	2.037	2.103	1.968	1.905	2.183	2.301	2.251	160-170	0.5901	5843	100,100
180	1.816	1.777	1.669	1.744	1.818	1.777	1.669	1.744	170-180	0.1846	5843	100,100
DEG	LUMINOUS INTENSITY:cd Less than 35% Percent = 19.4 %									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	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579	1579
5	1575	1577	1577	1577	1577	1578	1577	1576	1574	1574	1572	1571	1571	1569	1568	1567	1567	1567	1568
10	1559	1562	1563	1563	1563	1563	1561	1561	1557	1556	1553	1551	1550	1547	1545	1543	1542	1542	1543
15	1531	1536	1536	1537	1536	1536	1533	1532	1528	1526	1522	1520	1519	1513	1511	1507	1506	1506	1508
20	1491	1497	1497	1499	1498	1498	1495	1494	1488	1484	1479	1476	1475	1468	1464	1460	1459	1459	1463
25	1438	1447	1447	1449	1449	1451	1447	1445	1437	1433	1425	1421	1421	1410	1406	1403	1404	1406	1410
30	1375	1384	1385	1390	1393	1397	1394	1391	1379	1371	1360	1355	1353	1342	1339	1337	1341	1346	1352
35	1298	1310	1313	1322	1329	1338	1336	1331	1315	1301	1285	1278	1275	1263	1262	1265	1275	1282	1291
40	1212	1224	1231	1248	1262	1275	1274	1267	1246	1225	1201	1190	1187	1174	1177	1186	1204	1216	1226
45	1114	1128	1141	1167	1190	1206	1205	1198	1172	1144	1111	1093	1086	1075	1084	1105	1129	1145	1155
50	1003	1022	1044	1082	1110	1130	1130	1121	1093	1059	1014	986	976	967	988	1018	1048	1066	1078
55	883	907	941	991	1024	1048	1048	1039	1007	968	912	870	856	851	886	926	961	982	995
60	753	783	835	894	933	959	961	950	917	872	807	749	728	730	781	829	869	893	907
65	615	654	723	791	836	865	868	858	821	771	698	624	590	604	671	728	773	800	815
70	470	523	608	685	736	768	772	761	722	666	585	497	449	478	559	623	673	703	718
75	325	394	492	577	632	667	673	661	620	560	472	373	307	354	446	518	573	604	621
80	188	271	379	471	530	568	575	562	520	457	364	256	175	238	339	417	475	509	526
85	82.3	165	279	373	436	475	484	471	428	363	269	158	73.1	144	247	329	390	426	442
90	28.6	98.6	208	302	365	405	415	402	360	296	205	99.4	29.2	89.2	188	272	333	369	385
95	23.8	52.7	155	256	320	360	371	358	317	251	105	44.7	24.7	41.6	110	229	291	328	343
100	20.1	27.5	71.4	25.2	134	248	249	193	78.3	12.7	79.4	30.2	20.8	24.9	68.1	19.2	123	167	193
105	16.3	19.9	67.1	129	65.0	1.45	88.1	42.4	81.5	138	71.1	19.7	17.0	18.2	59.8	115	62.6	87.9	38.0
110	10.7	11.6	44.4	110	168	202	183	202	170	116	47.6	7.77	9.69	8.35	35.5	96.0	148	179	187
115	1.06	2.26	25.2	86.4	136	168	180	169	137	90.4	28.9	2.21	1.07	2.26	20.0	73.2	120	149	160
120	1.08	2.18	14.3	60.9	104	134	145	135	106	64.0	16.5	2.71	1.23	2.35	12.0	49.5	90.9	118	129
125	3.92	5.01	6.98	36.2	72.8	100	110	101	76.1	39.4	6.83	4.73	4.33	4.63	5.90	28.1	62.7	86.4	96.2
130	2.67	2.68	4.86	17.6	44.3	68.0	76.3	69.2	47.3	20.4	4.68	2.73	2.55	2.33	4.32	12.6	36.5	56.5	63.8
135	1.76	2.33	3.96	5.79	22.0	39.0	45.4	40.2	24.4	7.42	4.00	1.48	1.69	1.72	3.62	5.46	17.4	29.6	36.2
140	1.70	2.19	3.50	4.64	7.87	17.8	21.6	18.7	9.43	5.20	3.67	2.18	1.68	2.20	3.40	4.46	6.01	11.8	15.6
145	1.74	1.98	3.12	4.24	5.10	6.00	7.66	6.12	5.31	4.46	3.31	1.99	1.72	2.09	3.18	4.11	5.00	5.64	5.87
150	1.69	1.93	1.13	3.70	4.41	4.89	5.15	5.03	4.61	3.95	1.13	1.86	1.76	2.03	1.51	3.76	4.36	4.65	4.81
155	1.66	2.00	2.53	2.71	3.83	4.26	4.40	4.33	4.00	3.42	1.33	1.86	1.82	2.12	2.51	3.39	3.93	4.23	4.32
160	1.71	1.95	2.29	1.29	1.31	3.56	3.67	3.66	2.64	1.23	2.14	1.84	1.95	2.11	2.28	1.66	2.26	3.71	3.74
165	1.72	1.80	2.08	2.25	2.39	1.21	1.16	1.20	1.93	2.31	2.02	1.79	1.90	2.02	2.21	2.46	2.41	1.61	1.61
170	1.74	1.68	1.88	2.04	2.04	2.07	2.10	2.12	2.14	1.97	1.88	1.75	1.91	2.01	2.10	2.18	2.29	2.32	2.30
175	1.85	1.80	1.81	1.84	1.75	1.81	1.82	1.86	1.79	1.77	1.74	1.71	1.88	1.91	1.96	2.00	2.00	2.02	2.01
180	1.82	1.82	1.80	1.78	1.72	1.67	1.67	1.64	1.67	1.74	1.75	1.80	1.82	1.82	1.80	1.78	1.73	1.67	1.67

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	285	300	315	330	345
0	1579	1579	1579	1579	1579
5	1568	1569	1571	1572	1573
10	1545	1548	1552	1553	1557
15	1510	1514	1519	1523	1528
20	1464	1470	1474	1482	1487
25	1411	1416	1420	1427	1434
30	1352	1355	1356	1362	1370
35	1289	1290	1287	1288	1294
40	1225	1220	1210	1205	1207
45	1154	1146	1130	1115	1110
50	1076	1066	1044	1018	1004
55	992	980	953	917	888
60	902	887	855	812	766
65	808	791	753	702	639
70	712	691	648	587	511
75	613	589	541	473	384
80	517	490	437	362	263
85	431	401	344	265	161
90	374	340	281	197	96.7
95	331	297	238	135	47.1
100	175	161	38.2	63.3	28.5
105	82.4	44.4	107	61.8	18.8
110	171	143	97.5	38.9	9.67
115	148	120	75.3	22.4	2.17
120	118	90.5	51.7	12.7	2.27
125	86.0	62.5	29.6	5.76	4.95
130	55.9	36.4	13.1	4.39	2.63
135	29.8	17.4	5.35	3.69	1.89
140	11.8	6.09	4.61	3.47	2.35
145	5.58	4.99	4.14	3.21	2.29
150	4.69	4.29	3.79	1.52	2.19
155	4.20	3.93	3.41	2.39	2.34
160	3.71	2.46	1.72	2.51	2.35
165	1.64	2.46	2.43	2.36	2.15
170	2.33	2.28	2.25	2.18	2.00
175	2.00	1.93	2.03	1.98	1.96
180	1.64	1.67	1.74	1.75	1.80

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************