LM-79-08 Test Report

for

Elec-Tech International Co., Ltd

No.1 Jinfeng Rd.,Tangjiawan Town,
Xiangzhou District, Zhuhai City,
Guangdong province, China

Model: 520245, 520245XX

Laboratory: Leading Testing Laboratories Co., LTD
NVLAP CODE: 200960-0
No.1805, DongLiu road, BingJiang District, Hangzhou, China
Tel: +86-571-56680806
www.ledtestlab.com

Report No.: HZ12060002c/R2
This report is replaced the old report No. HZ12060002c/R1 dated June 20, 2012.

June 22, 2012

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Tested by: April. Zou

Engineer: April Zou
June 22, 2012

Approved by: Jim Zhang

Manager: Jim Zhang
June 22, 2012

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Sample Tested: **520245**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
65.2	1001	15.35	0.8635

CCT (K)	CRI	Stabilization Time (Light & Power)
3111	85	60

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:	
Date of Receipt	: June 11, 2012
Date of Test	: June 11, 2012 to June 12, 2012
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Color Spatial Uniformity, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

Model discrepancy: Model 520245xx is identical with Model 520245. “xx” could be 11-30, indicate for different packages, different costumer No. and different painting color of metal enclosure. Model 520245 is chosen to represent for both models in this report.

TABLE OF CONTENT

Sample Photos

Figure 1- Overview of the sample model: 520245

Equipment Under Test (EUT)	
Name	: LED LAMP
Model	: 520245
Electrical Ratings	: 120 V ac, 60Hz, 16W
Product Description	: PAR38, E26/ E25 base, Dimmable, 3000K Manufacturer of light source: Elec-Tech International Co., Ltd Quantity of light source: 14 pcs Model of light source: ET-51W37K
Manufacturer	: Elec-Tech Intertnational Co.,Ltd
Address	: No.18-1, Keji 6th Road, Gangwan Avenue, Tangjiawan Town, Xiangzhou District, Zhuhai City, Guangdong Province, P.R.China
Manufacturer (Alternative)	: Wuhu 3E Lighting Co., Ltd
Address	: No11.wei Rd.East Zone of wuhu Economice and Technological Development Area

Photometric Testing Photos

Figure 2: Testing in Integrating Sphere

Figure 3: Testing in Goniophotometer

TEST RESULTS

Test ambient temperature was 25.1℃.

Base orientation was Base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 110 minutes.

Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.1480
Power Factor	0.8635
Test Power (W)	15.35
Luminous Efficacy (lm/W)	65.2
Total Luminous Flux (lm)	1001
Color Rendering Index (CRI)	85
R9	26.1
Correlated Color Temperature (CCT) (K)	3111
Chromaticity (Chroma x, Chroma y)	(0.4254, 0.3932)
Chromaticity (Chroma u, Chroma v)	(0.2478, 0.3435)
Chromaticity (Chroma u', Chroma v')	(0.2478, 0.5153)
Duv	0.0032

Special Color Rendering Indices	
R1	83.9
R2	93.3
R3	95.9
R4	81.2
R5	83.8
R6	90.5
R7	84.7
R8	66.4
R9	26.1
R10	83.6
R11	79
R12	73.9
R13	86.2
R14	98.5

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u',v') diagram, u' = u = 4x/(-2x+12y+3), v' = 3v/2 = 9y/(-2x+12y+3).

Goniophotometer Method

The photometric distance is 2.475m.

Luminous data was taken at 1.0°vertical intervals and 10°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.1446
Power Factor	0.8913
Test Power (W)	15.36
Luminous Efficacy (lm/W)	65.8
Total Luminous Flux (lm)	1010.8
Spatial Non-uniformity of Chromaticity (Δu'v')	0.0025
Beam Angle (°)	39.6
Center Beam Candlepower (cd)	1453

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

SPECTRAL FLUX GRAPH:

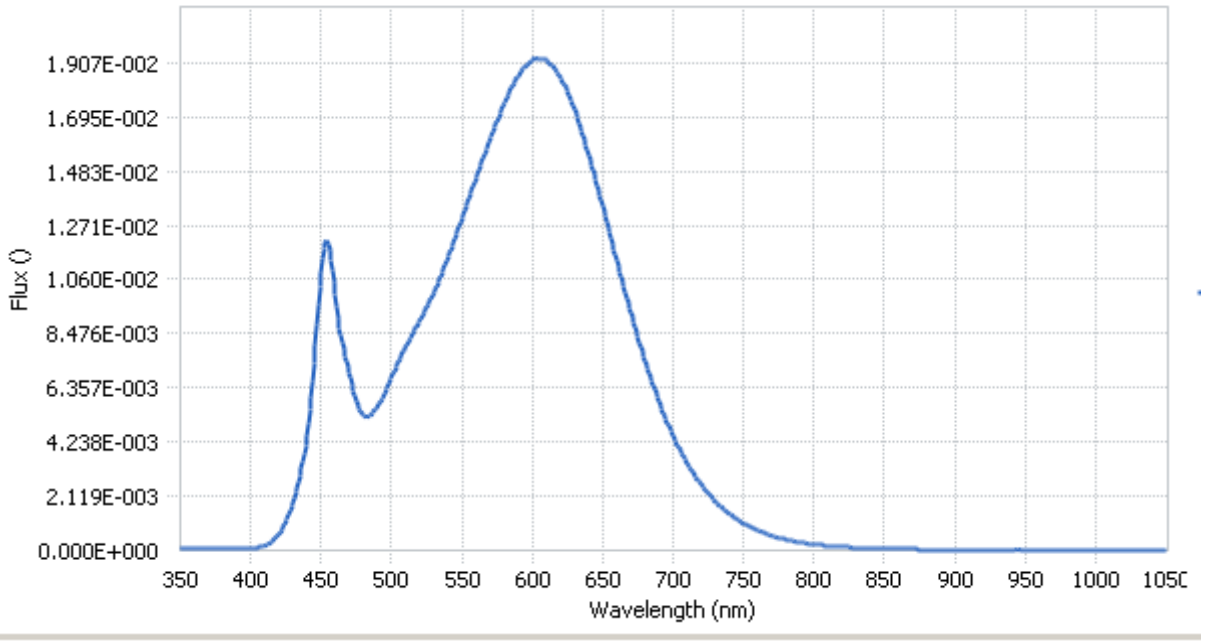
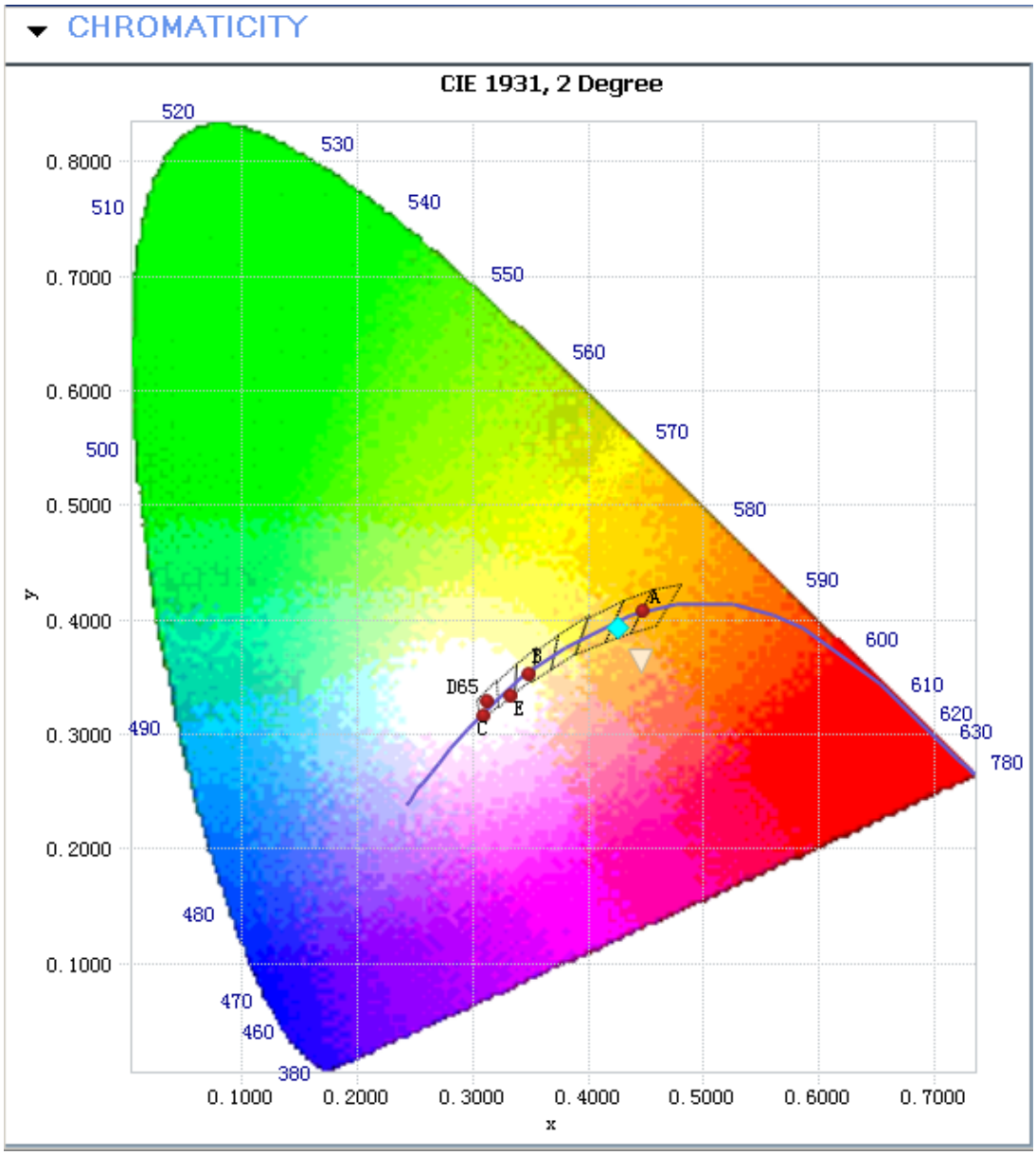


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.92E-05	485	5.30E-03	590	1.85E-02	695	5.12E-03
385	5.67E-05	490	5.63E-03	595	1.89E-02	700	4.48E-03
390	5.25E-05	495	6.12E-03	600	1.92E-02	705	3.90E-03
395	6.08E-05	500	6.78E-03	605	1.92E-02	710	3.41E-03
400	8.18E-05	505	7.40E-03	610	1.92E-02	715	2.95E-03
405	1.04E-04	510	7.95E-03	615	1.89E-02	720	2.57E-03
410	1.80E-04	515	8.49E-03	620	1.85E-02	725	2.23E-03
415	3.51E-04	520	8.96E-03	625	1.79E-02	730	1.93E-03
420	6.44E-04	525	9.52E-03	630	1.72E-02	735	1.65E-03
425	1.15E-03	530	1.01E-02	635	1.64E-02	740	1.42E-03
430	1.88E-03	535	1.07E-02	640	1.55E-02	745	1.22E-03
435	2.92E-03	540	1.15E-02	645	1.45E-02	750	1.05E-03
440	4.50E-03	545	1.22E-02	650	1.35E-02	755	9.09E-04
445	7.35E-03	550	1.30E-02	655	1.24E-02	760	7.76E-04
450	1.09E-02	555	1.38E-02	660	1.13E-02	765	6.69E-04
455	1.20E-02	560	1.45E-02	665	1.03E-02	770	5.69E-04
460	9.98E-03	565	1.53E-02	670	9.29E-03	775	4.96E-04
465	8.11E-03	570	1.61E-02	675	8.32E-03	780	4.27E-04
470	6.92E-03	575	1.68E-02	680	7.41E-03		
475	5.86E-03	580	1.75E-02	685	6.59E-03		
480	5.27E-03	585	1.81E-02	690	5.83E-03		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values (x, y) = (0.4254, 0.3932)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

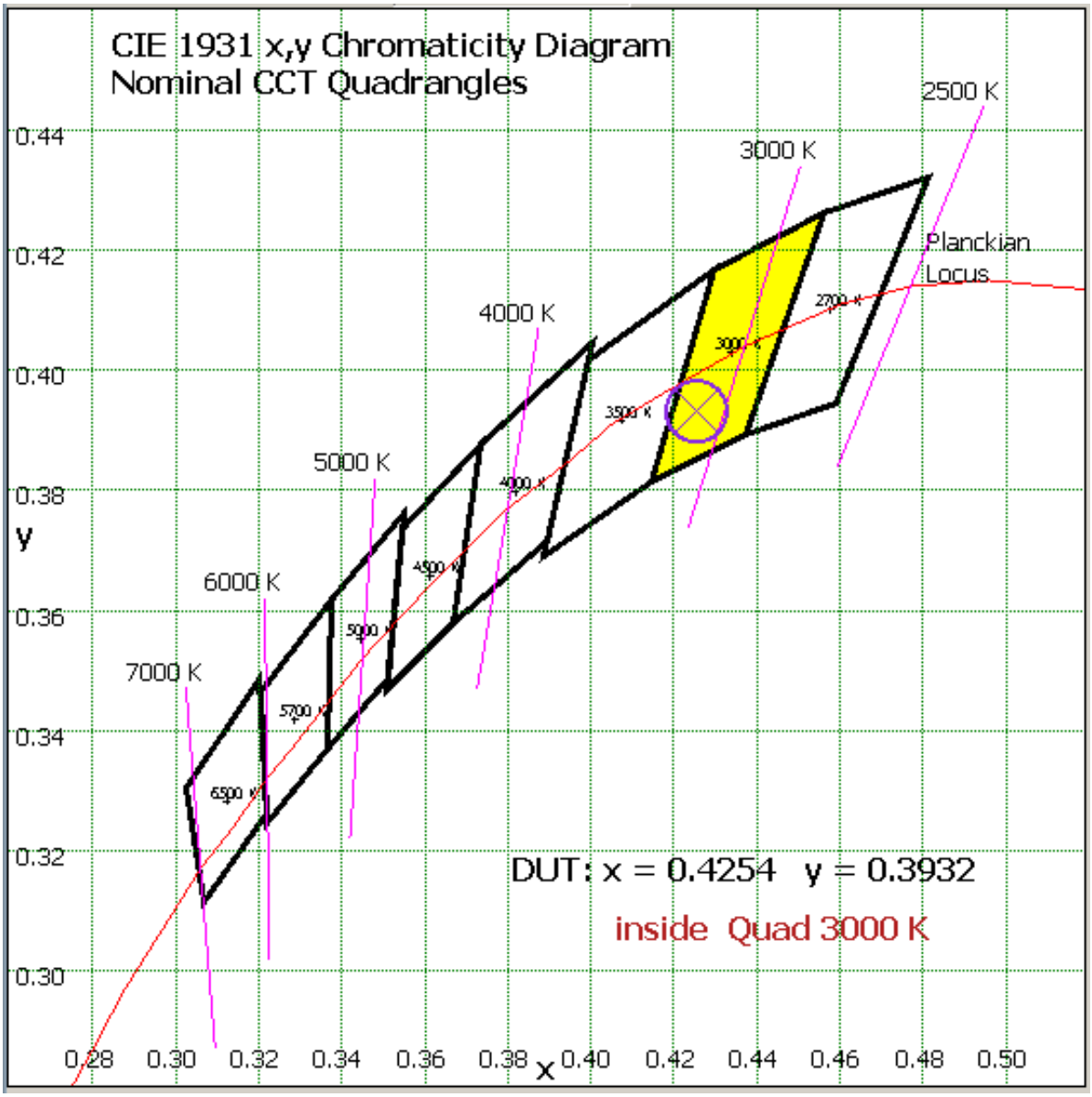


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	125.7	12.45%
10- 20	264.1	26.15%
20- 30	240.1	23.77%
30- 40	165.2	16.36%
40- 50	99.75	9.88%
50- 60	59.15	5.86%
60- 70	35.32	3.50%
70- 80	17.26	1.71%
80- 90	3.488	0.35%
Total	1010.8	100%

γ(°)	Lumens	% Total
0- 60	954	94.45%
60- 90	56.8	5.55%
0-90	1010.8	100%
90- 180	0	0%
0- 180	1010.8	100%

Table 5: Zonal Lumen Data

Luminous Intensity Distribution- Goniophotometer Method

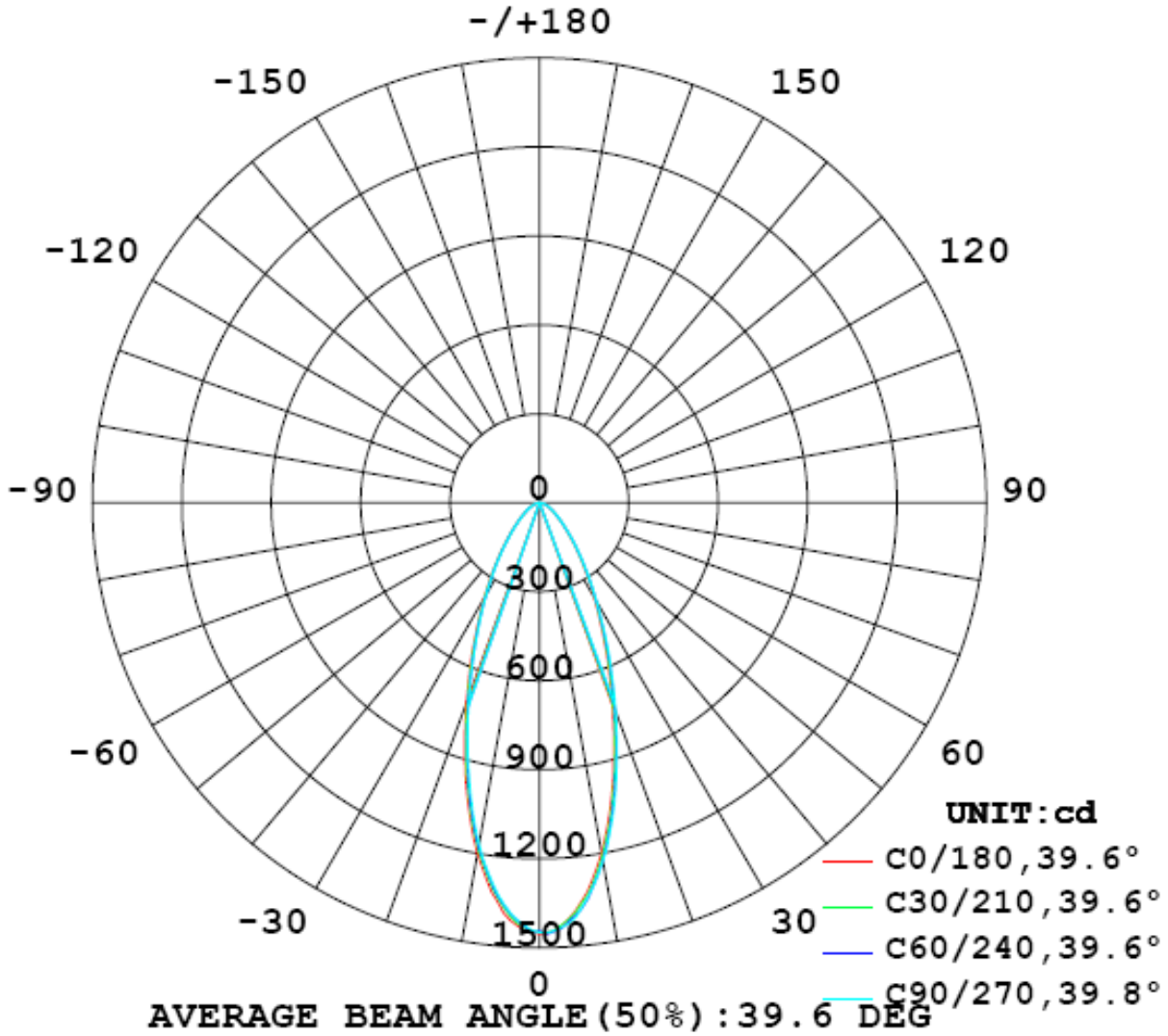


Chart 4: Polar Plot of Normalized Intensity Distribution at Axes of symmetry for 520245

ISOCANDELA DIAGRAM

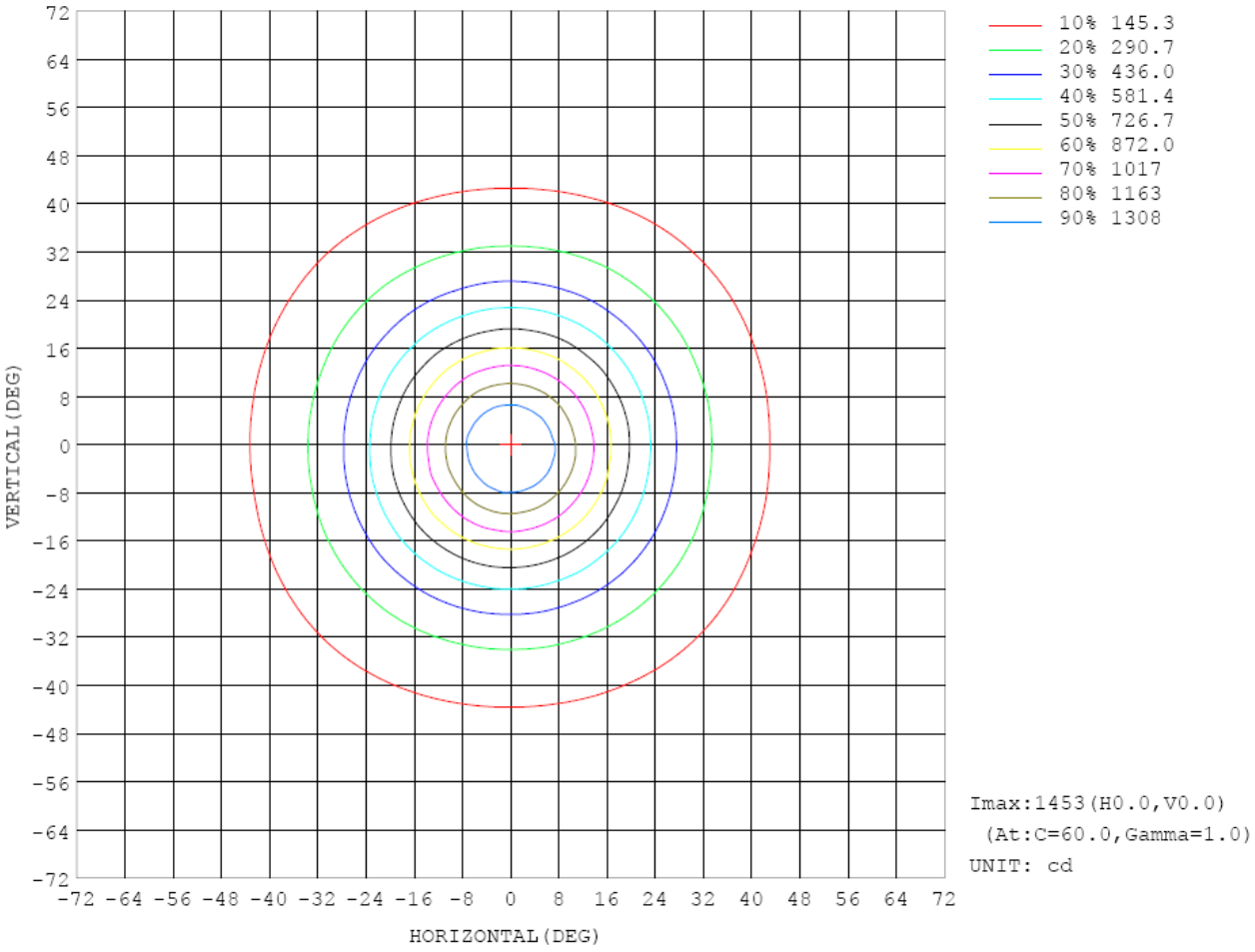


Chart 5: ISOCANDELA DIAGRAM for 520245#

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1453	1449	1450	1445	1445	1444	1444	1443	1441	1448	1442	1448	1442	1442	1443	1441	1441	1442	1453
5	1381	1388	1386	1386	1390	1393	1396	1394	1390	1403	1389	1397	1388	1389	1388	1383	1381	1379	1388
10	1200	1206	1206	1214	1215	1220	1224	1223	1229	1226	1232	1224	1226	1218	1214	1209	1207	1200	1201
15	956	960	965	971	974	979	983	984	987	992	989	989	987	981	977	972	972	960	960
20	714	716	723	726	733	737	741	742	745	747	749	748	746	744	741	735	732	728	721
25	514	518	525	528	532	535	538	540	543	545	545	545	543	542	540	536	532	530	523
30	367	370	372	375	378	380	382	383	385	386	386	386	386	383	384	381	379	377	373
35	258	260	262	264	266	268	269	271	272	272	272	272	271	271	270	268	267	265	264
40	181	182	183	184	186	186	187	188	190	190	190	190	190	189	188	187	185	184	184
45	126	127	127	128	129	130	130	131	132	132	132	132	132	132	131	130	129	128	128
50	89.2	89.7	90.0	90.1	90.9	91.8	91.9	92.5	93.4	93.3	93.4	93.2	93.3	93.2	92.6	92.0	91.2	90.2	89.7
55	64.5	64.8	65.0	65.1	65.7	66.3	66.4	67.2	67.4	67.5	67.6	67.6	67.7	67.5	67.1	66.4	66.0	65.2	65.0
60	47.7	48.0	48.1	48.3	48.7	49.0	49.4	49.6	50.0	50.0	50.0	50.3	50.3	50.3	49.8	49.5	49.0	48.4	48.0
65	34.8	35.1	35.2	35.5	35.8	36.1	36.3	36.6	36.8	36.9	37.0	37.0	37.2	37.0	36.7	36.5	36.3	35.9	35.3
70	24.6	24.8	25.0	25.2	25.4	25.6	25.8	25.9	26.1	26.3	26.3	26.4	26.4	26.3	26.1	25.9	25.7	25.4	25.1
75	15.9	16.0	16.2	16.4	16.6	16.8	16.9	17.1	17.2	17.3	17.3	17.2	17.2	17.2	17.1	16.9	16.8	16.5	16.4
80	8.35	8.49	8.66	8.83	9.02	9.14	9.25	9.34	9.43	9.48	9.53	9.49	9.47	9.38	9.26	9.10	9.02	8.82	8.74
85	2.52	2.63	2.75	2.87	2.97	3.07	3.15	3.22	3.26	3.29	3.29	3.27	3.23	3.17	3.10	2.99	2.88	2.78	2.78
90	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.04
95	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04
100	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.05
105	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05
110	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.06
115	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.06
120	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
125	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.06
130	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.07
135	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.11
140	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.14
145	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.18
150	0.25	0.25	0.25	0.25	0.25	0.25	0.24	0.25	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.23
155	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.27
160	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
165	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.35
170	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.34	0.34	0.34	0.35	0.35	0.34	0.35	0.35	0.35	0.35	0.37
175	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
180	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1449	1450	1445	1445	1444	1444	1443	1441	1448	1442	1448	1442	1442	1443	1441	1441	1442		
5	1383	1373	1370	1367	1364	1363	1365	1359	1360	1363	1359	1359	1362	1369	1364	1369	1370		
10	1197	1191	1186	1181	1181	1178	1172	1169	1169	1168	1168	1170	1174	1178	1179	1183	1188		
15	954	948	943	937	936	931	926	925	924	925	925	931	936	938	942	945	952		
20	716	710	705	700	701	695	692	693	693	690	694	698	696	704	705	709	715		
25	519	514	512	507	507	503	500	502	501	501	501	504	504	509	512	514	518		
30	372	369	368	364	363	358	357	358	358	359	357	360	360	361	364	368	369		
35	262	260	259	256	255	253	252	252	251	251	252	253	254	255	256	257	259		
40	183	181	180	178	177	176	175	176	175	175	176	176	177	177	179	179	181		
45	127	126	124	124	123	123	122	122	122	122	122	124	124	124	125	125	126		
50	89.4	88.8	88.1	87.1	87.1	86.6	86.4	86.2	86.2	86.3	86.9	87.4	87.7	88.1	88.6	88.8	89.5		
55	64.8	64.0	63.7	63.2	63.2	62.7	62.5	62.5	62.5	62.7	63.1	63.4	63.6	63.9	64.2	64.7	64.8		
60	47.8	47.2	47.0	46.7	46.5	46.3	46.1	46.1	46.1	46.2	46.4	46.6	46.9	47.2	47.4	47.7	48.0		
65	35.1	34.7	34.5	34.3	34.1	33.9	33.8	33.8	33.9	34.0	34.2	34.2	34.4	34.5	34.8	34.9	35.2		
70	24.8	24.5	24.4	24.1	24.0	24.0	23.9	23.7	23.8	23.8	23.9	24.0	24.1	24.3	24.5	24.6	24.8		
75	16.2	15.9	15.8	15.6	15.4	15.3	15.2	15.1	15.1	15.1	15.2	15.3	15.4	15.5	15.6	15.8	15.9		
80	8.59	8.41	8.24	8.11	7.95	7.87	7.77	7.72	7.68	7.71	7.73	7.79	7.88	7.97	8.09	8.23	8.35		
85	2.66	2.54	2.43	2.35	2.25	2.19	2.12	2.09	2.07	2.06	2.08	2.11	2.17	2.25	2.33	2.43	2.53		
90	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		
95	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		
100	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
105	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
110	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
115	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
120	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
125	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
130	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08		
135	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11		
140	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14		
145	0.18	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19		
150	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.23		
155	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.27	0.27	0.27	0.27		
160	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.31	0.31	0.31	0.31	0.31		
165	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35		
170	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37		
175	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37		
180	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37		

Table 7: Luminous Intensity Data-Continuous

Color Spatial Uniformity- Goniophotometer Method

Color uniformity was measured at two horizontal angles, 0°and 90°, the vertical intervals was 5°.

	C Angle = 0°		C Angle = 90°	
γ Angle (°)	Chromaticity Coordinate u'	Chromaticity Coordinate v'	Chromaticity Coordinate u'	Chromaticity Coordinate v'
-45	0.2478	0.5157	0.2479	0.5157
-40	0.2481	0.5159	0.2484	0.5160
-35	0.2486	0.5162	0.2488	0.5164
-30	0.2486	0.5163	0.2489	0.5164
-25	0.2485	0.5161	0.2487	0.5163
-20	0.2475	0.5155	0.2479	0.5157
-15	0.2467	0.5148	0.2468	0.5148
-10	0.2458	0.5140	0.2459	0.5140
-5	0.2452	0.5135	0.2452	0.5135
0	0.2451	0.5134	0.2451	0.5134
5	0.2454	0.5137	0.2454	0.5137
10	0.2462	0.5143	0.2462	0.5143
15	0.2472	0.5152	0.2468	0.5149
20	0.2483	0.5160	0.2480	0.5158
25	0.2489	0.5165	0.2487	0.5163
30	0.249	0.5165	0.2487	0.5163
35	0.2487	0.5163	0.2486	0.5162
40	0.2483	0.5160	0.2480	0.5159
45	0.2478	0.5157	0.2476	0.5157

Table 8: Chromaticity per Measurement Angle

Weighted Average	
u'	v'
0.2476	0.5154

The chromaticity measurements need to be made only for the γ angles where the average luminous intensity is more than 10 % of the peak intensity.

γ Angle (°)	C Angle = 0°/180°		C Angle = 90°/270°	
	Δu'	Δv'	Δu'	Δv'
-45	0.0002	0.0003	0.0003	0.0003
-40	0.0005	0.0005	0.0008	0.0006
-35	0.0010	0.0008	0.0012	0.0010
-30	0.0010	0.0009	0.0013	0.0010
-25	0.0009	0.0007	0.0011	0.0009
-20	0.0001	0.0001	0.0003	0.0003
-15	0.0009	0.0006	0.0008	0.0006
-10	0.0018	0.0014	0.0017	0.0014
-5	0.0024	0.0019	0.0024	0.0019
0	0.0025	0.0020	0.0025	0.0020
5	0.0022	0.0017	0.0022	0.0017
10	0.0014	0.0011	0.0014	0.0011
15	0.0004	0.0002	0.0008	0.0005
20	0.0007	0.0006	0.0004	0.0004
25	0.0013	0.0011	0.0011	0.0009
30	0.0014	0.0011	0.0011	0.0009
35	0.0011	0.0009	0.0010	0.0008
40	0.0007	0.0006	0.0004	0.0005
45	0.0002	0.0003	0.0000	0.0003

Table 9: Chromatic Spatial Uniformity

Spatial non-uniformity of chromaticity Δu'v': 0.0025.

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 10, 2011	Sep. 09, 2012
Digital Power Meter	PF2010A	HZTE028	Sep. 20, 2011	Sep. 19, 2012
AC Power Supply	DPS1060	HZTE001-6	Sep. 21, 2011	Sep. 20, 2012
DC Power Supply	WY12010	HZTE004-03	Sep. 21, 2011	Sep. 20, 2012
Temperature Meter	TES1310	HZTE017-01	Sep. 20, 2011	Sep. 19, 2012
Standard source	SCL-1400	HZTE012-02	Sep. 20, 2011	Sep. 19, 2012
Integrate Sphere system	2M	HZTE015	Sep. 20, 2011	Sep. 19, 2012
Digital Power Meter	WT210	HZTE008	Sep. 20, 2011	Sep. 19, 2012
AC Power Supply	APS6005	HZTE001-01	Sep. 21, 2011	Sep. 20, 2012
DC Power Supply	GPR--6030D	HZTE004-01	Sep. 20, 2011	Sep. 19, 2012
Temperature and humidity recorder	JR900	HZTE018-01	Sep. 21, 2011	Sep. 20, 2012
Standard source	D908	HZTE012-01	Sep. 20, 2011	Sep. 19, 2012

Table 10: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning.
Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π. Self-absorption correction is conducted in testing.
Bandwidth of spectroradiometer is 350nm-1050nm.
Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.
Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.
The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expended uncertainty is 1.39% with a coverage factor k=2.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.
The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.
Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.
Some graphics were created with Photometric Plus software.
The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.
The uncertainty of goniophotometer system reported in this document is expended uncertainty is 1.8% with a coverage factor k=2.

Color Characteristics Measurements

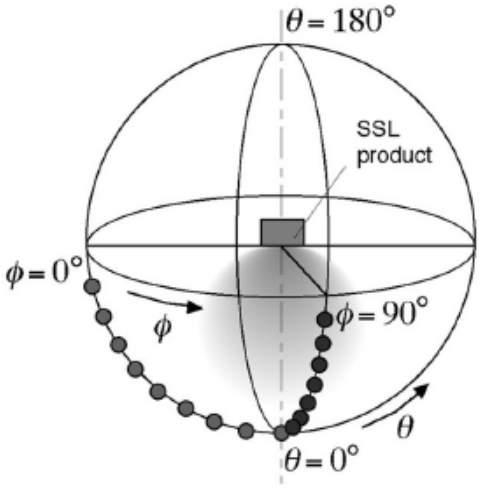
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes (C=0°/180° and C=90°/270°) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate was calculated from these points. The data was then analyzed to check for delta color differences of the u', v'

chromaticity coordinates. The spatial non-uniformity of chromaticity, Δu'v', is determined as the maximum deviation (distance on the CIE (u', v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***