



# IESNA LM79-2008 Test Report

TÜV SÜD America

## Photometric Testing and Evaluation in Accordance with LM79-2008

Report Prepared for:

**Ivars Lauzums**  
Certification Manager

### Lighting Science Group Corporation

1227 South Patrick Drive, Bldg. 2A  
Satellite Beach, FL 32937  
USA

Telephone: (321) 779-5528

**Sample Tested:** LS 20 50WE NW NFL 120 G1 BX  
**Manufacturer:** Lighting Science Group Corporation

**Technical Report Number:** JI1400199-06-LM79  
**Report Issue Date:** January 22<sup>nd</sup> 2014  
**Total Number of Pages:** 10 (including this page)

**Report Prepared by:**

**Byrd Evans**  
TÜV SÜD Project Handler

**Report Reviewed by:**

**Bryan Cubitt**  
TÜV SÜD Program Manager



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## Summary of Key Test Results

Model#                **LS 20 50WE NW NFL 120 G1 BX**  
 Manufacturer        **LSGC**  
 TÜV Sample#        **1183-6**  
 Date of Test         **January 13<sup>th</sup> 2014**



### Notes:

Tested in LBU orientation (Lamp-Base-Up)



<b>Parameter</b>	<b>Measured Result</b>
Luminous Flux	<b>580.3 Lumens</b>
Input Power	<b>7.93 Watts</b>
Efficacy	<b>73.21 Lumens/Watt</b>
C.C.T.	<b>3920 K</b>
C.R.I. (R <sub>a</sub> )	<b>82.9</b>
Stabilization Time	<b>60 minutes</b>

The above results are recorded / derived from measurements in accordance with LM79-08



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### Test Results –

The following results were obtained after stabilization of the sample in accordance with the requirements set forth in section 5.0 of IES LM79-2008. Stability is achieved when the variation of 3 readings of light output and electrical power over a period of 30 minutes, taken 15 minutes apart, is less than 0.5%.

Photometric Results	LS 20 50WE NW NFL 120 G1 BX	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	580.3	573.7
Luminous Efficacy (Lumens/Watt)	73.21	72.35
Total Radiant Flux (Watts)	1.8	-
Correlated Color Temperature (CCT)	3920	-
Color Rendering Index (CRI – R <sub>a</sub> )	82.9	-
R <sub>9</sub> Value	9.4	-
Chromaticity (Chroma x / Chroma y)	0.3845 / 0.3810	-
Chromaticity (Chroma u / Chroma v)	0.2261 / 0.3360	-
Chromaticity (Chroma u' / Chroma v')	0.2261 / 0.5040	-
D <sub>uv</sub> Value	0.00078	-

Electrical Results	LS 20 50WE NW NFL 120 G1 BX	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	7.93	7.93
Input Voltage (Volts AC)	120.06	120.08
Input Current (Amps)	0.069	0.070
Power Factor	0.954	0.954
Input Frequency (Hertz)	60.0	60.0
A-THD (Current %)	26.89 %	26.85 %

Additional Parameters	LS 20 50WE NW NFL 120 G1 BX	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	63 minutes
Test Geometry Configuration	4π	Type C
Spectroradiometer	Labsphere CDS1100	Gigahertz Optik P9801
Ambient Temperature	24.7 °C	25.1 °C
ISTMT (In-Situ Temperature Measurement)	Not tested	
Spacing Criteria	N/A	



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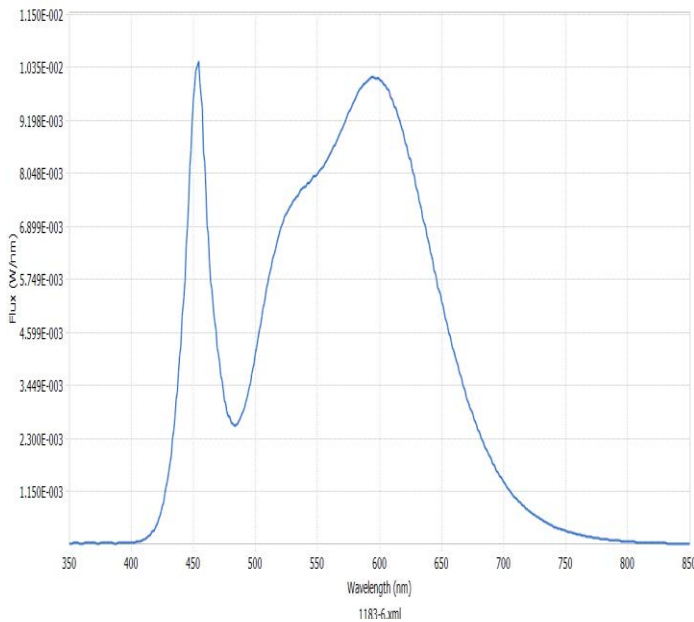
January 22, 2014

## Spectral Flux and Chromaticity Diagram

### Spectral Flux

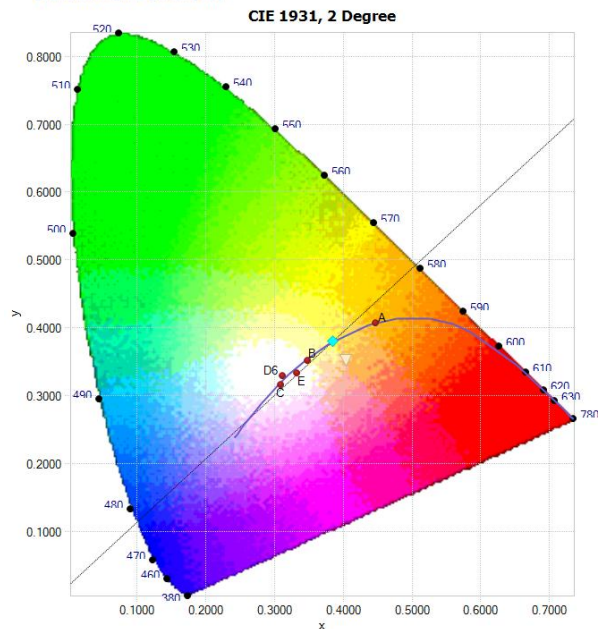
### Chromaticity Diagram

▼ SPECTRAL FLUX GRAPH:



**Spectral response of the Radiant Flux  
(350nm to 850nm)**

▼ CHROMATICITY DIAGRAM:



**Tristimulus values (from page 5):**

$$x / y = 0.3845 / 0.3810$$

The locations on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Parameter	Stable Data
Peak Wavelength (nm)	453.2
Dominant Wavelength (nm)	578.9

### Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	540.6	94.2 %
60 - 90	33.1	5.8 %
0 - 90	573.7	100 %
90 - 180	0.0	0.0 %
0 - 180	573.7	100 %

TUV SUD America, Inc.  
5945 Cabot Parkway, Suite 100,  
Alpharetta GA 30005

Telephone: 678-341-5900 www.tuvamerica.com

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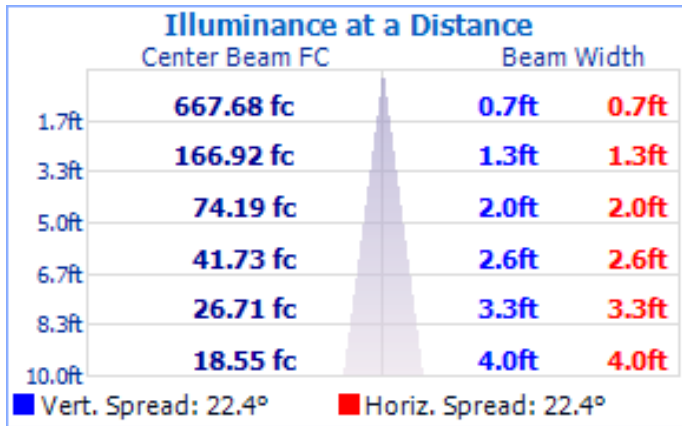


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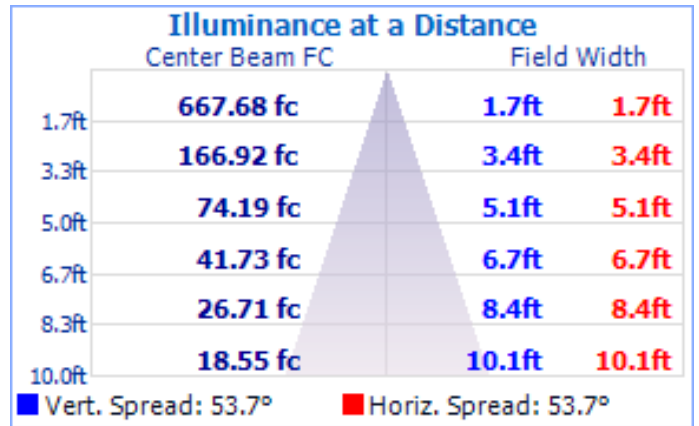
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## Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



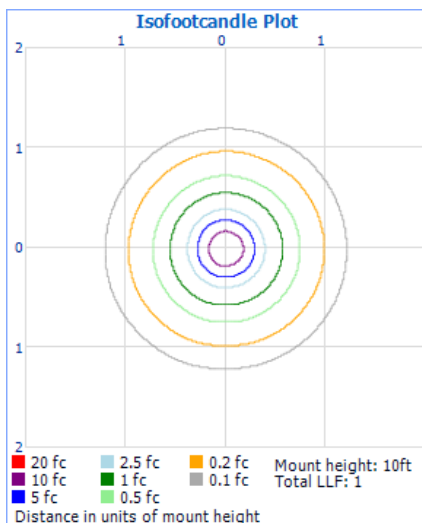
Beam Angle = 22.4°



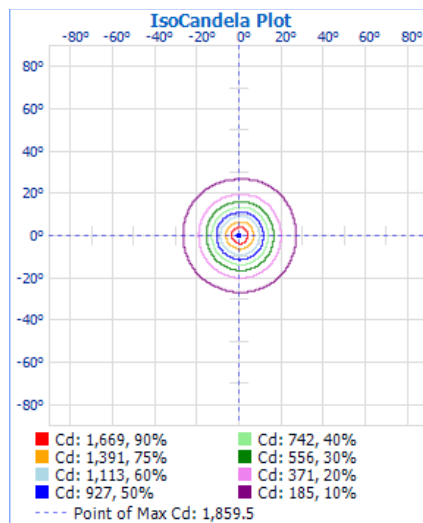
Field Angle = 53.7°

## Test Results – Candela Plots

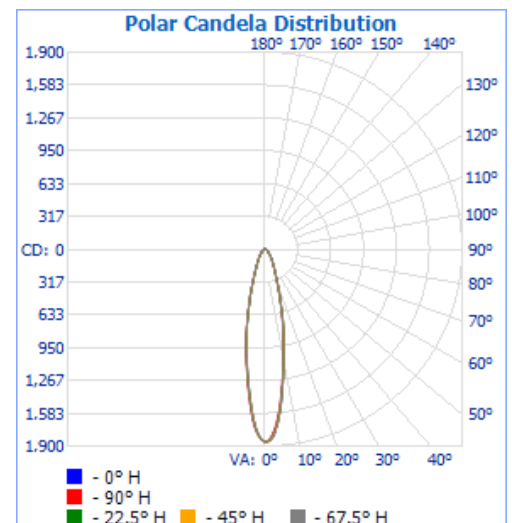
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela



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## Test Results – Candela Tabulation

The table below displays the tabulated Candela measurements from the IES file:

Horizontal (lateral) angles are shown in **red** across the top of the table, in increments of 22.5°.

Vertical (longitudinal) angles are shown in **blue** down the side of the table, in increments of 0.5 and 2.5°.

	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0	247.5	270.0	292.5	315.0	337.5	360.0
0.0	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855	1855
0.5	1854	1857	1859	1859	1854	1845	1844	1836	1847	1847	1847	1851	1850	1850	1855	1854	1854
1.0	1850	1854	1857	1849	1845	1835	1830	1822	1833	1833	1832	1836	1839	1846	1850	1855	1850
1.5	1846	1843	1843	1835	1829	1819	1805	1796	1814	1816	1815	1815	1822	1834	1839	1852	1846
2.0	1826	1826	1823	1814	1804	1794	1776	1765	1787	1791	1789	1792	1801	1814	1822	1838	1826
2.5	1811	1800	1799	1789	1775	1763	1742	1725	1758	1757	1760	1761	1775	1787	1802	1815	1811
3.0	1780	1772	1768	1761	1740	1723	1703	1681	1723	1719	1720	1727	1741	1752	1774	1790	1780
3.5	1729	1735	1735	1722	1702	1680	1662	1632	1682	1673	1677	1686	1704	1715	1740	1760	1729
4.0	1707	1696	1694	1681	1659	1632	1609	1582	1635	1625	1626	1640	1656	1673	1698	1724	1707
4.5	1642	1651	1649	1631	1611	1583	1556	1531	1583	1574	1574	1589	1606	1628	1653	1684	1642
5.0	1597	1600	1596	1579	1560	1532	1501	1478	1529	1520	1524	1534	1553	1579	1605	1638	1597
5.5	1549	1546	1539	1525	1503	1476	1445	1423	1474	1465	1470	1479	1500	1526	1555	1588	1549
6.0	1492	1484	1481	1469	1447	1421	1390	1366	1420	1411	1416	1427	1447	1472	1504	1528	1492
6.5	1425	1423	1423	1414	1390	1365	1339	1312	1367	1357	1362	1375	1394	1417	1452	1474	1425
7.0	1359	1364	1365	1358	1334	1310	1287	1258	1315	1304	1310	1324	1340	1363	1397	1416	1359
7.5	1306	1305	1309	1302	1278	1257	1234	1209	1263	1253	1257	1272	1285	1310	1339	1360	1306
8.0	1251	1248	1254	1244	1225	1207	1183	1161	1213	1203	1208	1221	1233	1258	1283	1305	1251
8.5	1188	1196	1199	1190	1172	1158	1134	1116	1163	1157	1161	1172	1183	1208	1229	1252	1188
9.0	1141	1141	1145	1136	1120	1108	1080	1067	1115	1111	1116	1119	1137	1159	1177	1198	1141
9.5	1085	1074	1092	1080	1069	1057	1028	1017	1066	1056	1070	1060	1091	1108	1129	1143	1085
10.0	1042	1024	1041	1028	1018	1008	993	979	1016	1008	1020	1019	1041	1050	1083	1092	1042
10.5	990	992	994	991	975	960	954	941	975	971	975	988	994	1001	1035	1041	990
11.0	945	950	950	949	933	914	909	899	935	931	933	946	951	962	986	994	945
11.5	903	907	907	903	889	872	866	858	893	889	892	904	908	920	941	949	903
12.0	860	867	864	859	845	831	823	818	853	849	852	862	865	878	897	908	860
12.5	820	826	824	817	803	790	784	779	813	810	814	822	824	837	856	864	820
13.0	780	786	784	778	762	748	746	739	775	772	775	782	784	795	814	823	780
13.5	742	747	745	739	723	707	708	702	738	734	736	742	743	753	774	783	742
14.0	706	710	708	701	685	670	671	666	702	695	698	701	703	714	734	743	706
14.5	670	672	671	662	649	635	634	631	667	660	660	664	663	675	695	706	670
15.0	634	636	634	623	612	600	599	597	631	626	625	627	627	639	656	668	634
17.5	471	476	475	468	458	448	449	449	475	472	472	470	470	474	490	501	471
20.0	357	358	357	351	344	337	334	333	356	353	351	351	351	356	367	374	357
22.5	273	274	274	271	265	261	259	255	270	269	267	268	269	273	279	285	273
25.0	219	221	220	218	215	210	206	203	212	211	210	211	213	218	222	227	219
27.5	179	181	180	178	176	171	168	165	171	169	169	171	174	178	182	186	179
30.0	147	148	148	147	144	141	139	136	140	139	139	140	144	147	150	152	147
32.5	125	125	125	125	123	120	118	116	119	118	118	119	122	125	127	128	125
35.0	106	106	106	106	105	102	100	98	101	100	99	101	103	106	108	109	106
37.5	89	90	90	90	89	87	85	83	85	85	84	85	88	90	91	92	89
40.0	75	76	76	77	76	74	72	70	73	72	71	72	74	76	77	77	75
42.5	62	63	63	64	63	61	60	59	60	60	59	60	62	63	64	64	62





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Test Results – Candela Tabulation cont'd																	
	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0	247.5	270.0	292.5	315.0	337.5	360.0
45.0	52	53	53	54	53	52	51	50	52	51	50	51	53	54	54	54	52
47.5	45	46	46	46	45	44	44	44	45	44	44	44	46	47	47	47	45
50.0	39	40	40	40	39	38	38	38	39	39	38	39	40	41	41	41	39
52.5	34	35	35	35	34	34	34	34	34	34	34	34	35	36	36	36	34
55.0	30	31	31	30	30	30	29	30	30	30	30	30	31	31	31	31	30
57.5	27	27	27	27	26	26	26	26	26	26	26	26	27	27	27	28	27
60.0	24	24	24	24	24	23	23	23	24	24	23	23	24	24	24	25	24
62.5	22	22	22	22	21	21	21	21	21	21	21	21	22	22	22	22	22
65.0	19	20	20	19	19	19	19	19	19	19	19	19	19	20	20	20	19
67.5	17	17	17	17	17	17	16	16	17	17	17	16	17	17	17	18	17
70.0	15	15	15	15	15	14	14	14	15	15	14	14	15	15	15	16	15
72.5	13	13	13	13	12	12	12	12	12	12	12	12	13	13	13	13	13
75.0	10	11	10	10	10	10	10	10	10	10	10	10	10	11	11	11	10
77.5	8	8	8	8	8	8	8	8	8	8	8	8	8	8	9	9	8
80.0	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	6
82.5	5	5	5	4	4	4	4	4	4	4	4	4	5	5	5	5	5
85.0	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	3	3
87.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Maximum Candela = **1859.5** at Horizontal 67.5°, Vertical: 0.5°





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## TÜV SÜD Photometric Testing Information

Testing is performed in accordance with the procedures outlined in IESNA LM79-2008. The sample is evaluated for photometric and electrical characteristics using an integrating sphere and a goniophotometer, located in an accredited, temperature and humidity-controlled, draft free photometric laboratory.

### *Sphere Geometry*

The integrating spheres used for measurement utilize a “ $4\pi$  geometry” configuration in accordance with section 9 of IES LM-79-2008 and is applicable for all types of SSL products (directional and non-directional light projections). The spectroradiometer is an array-type detector manufactured and calibrated by Labsphere (Model# CDS1100).

### *Self-Absorption Correction*

The integrating sphere uses self-absorption correction to eliminate errors due to mismatches between the standard reference lamp and the test samples being measured. This auxiliary correction lamp is a halogen type lamp powered by a calibrated Lamp Power Supply manufactured and calibrated by Labsphere (model LPS150). Ambient temperature is measured using a thermocouple located inside the integrating sphere at the same height as the sample under test (UUT) and not more than 1 meter in horizontal distance away from the sample (section 2.2 of LM79-2008). The thermocouple is located behind a baffle in order to eliminate any direct optical radiation from the sample under test.

### *Sample Stabilization*

The sample (UUT) is placed inside the integrating sphere and powered by a regulated and conditioned alternating or direct current supply. The stabilization times shown on the results pages of this report denote the time of the 3<sup>rd</sup> measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization in accordance with section 5.0 of LM79-2008.

### *Sphere Calibration*

The integrating sphere is calibrated using a quartzline halogen lamp with the following specifications:

Manufacturer: EYE Lighting International

Model# J94/JD28V75W

Voltage = 28.0 Volts DC

Wattage = 75.0 Watts

Calibration Current = 2.679 Amperes

Luminous Flux = 1685 Lumens

Calibration Date = 2-17-2011 (calibrated by Labsphere – NIST traceable).

Continued.....

**TÜV SÜD America, Inc.**

5945 Cabot Parkway, Suite 100,  
Alpharetta GA 30005

Telephone: 678-341-5900 [www.tuvamerica.com](http://www.tuvamerica.com)

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## TÜV SÜD Photometric Testing Information (continued)

### Goniophotometer

The Goniophotometer is a Type C optical measurement system in accordance with section 9.3.1 of IESNA LM79-2008.

### Goniophotometer Calibration

The Goniophotometer is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

- Manufacturer: General Electric
- Part Number: CSB-110
- Lamp Number: 105-A
- Voltage: 16.71 Volts DC
- Wattage: 150.0 Watts
- Calibration Current: 4.847 Amperes
- Luminous Intensity: 166.3 Candelas
- Calibration Date: 11-07-2011 (NIST traceable)

## TÜV SÜD Test Equipment List:

TÜV SÜD Sphere System – contains the following:			
Description	Manufacturer / Model#	TÜV SÜD Ref#	Calibration Due Date
Integrating Sphere	Labsphere LM760	SPH003	weekly
Spectroradiometer	Labsphere CDS1100	ATLE0048	9/7/2016
Power Analyzer	Yokogawa WT210	ATLE0058	3/7/2014
Power Source	Chroma 61602	AC003	N/A
Thermometer	Fluke 52-II	ATLE0008	11/17/2014
TÜV SÜD Goniophotometer System – contains the following:			
Goniophotometer	M.E. GONC01	GON001	weekly
Spectroradiometer	Gigahertz Optik P9801	GIG001	weekly
Power Analyzer	Yokogawa WT210	ATLE0031	11/16/2014
Power Source	Chroma 61602	AC006	N/A

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**TÜV SÜD America, Inc.**  
5945 Cabot Parkway, Suite 100,  
Alpharetta GA 30005

Telephone: 678-341-5900 www.tuvamerica.com

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