



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 38 120WE CW NFL G1 BX

Manufacturer:

Lighting Science Group Corporation

Technical Report Number:

JI1400199-16-LM79

Report Issue Date:

January 24th, 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

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

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

Page 1

NRG_F_10.04

Confidential Report



Lab Code: 500065-0

TÜV SÜD America is
accredited under the
NVLAP EEL program.



IESNA LM79-2008 TEST REPORT

Report# JI1400199-16-LM79

January 24, 2014

Summary of Key Test Results

Model# **LS 38 120WE CW NFL G1 BX**
Manufacturer **LSGC**
TÜV Sample# **1183-16**
Date of Test **January 14th 2014**

Notes:

Tested in LBU orientation (Lamp-Base-Up)



Parameter	Measured Result
Luminous Flux	1532.0 Lumens
Input Power	20.52 Watts
Efficacy	74.66 Lumens/Watt
C.C.T.	4983 K
C.R.I. (R _a)	86.6
Stabilization Time	60 minutes

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

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

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

Page 2

NRG_F_10.04

Confidential Report



TÜV SÜD America is
accredited under the
NVLAP EEL program.



IESNA LM79-2008 TEST REPORT

Report# JI1400199-16-LM79

January 24, 2014

TABLE OF CONTENTS

Test Results	4
Spectral Flux and Chromaticity Diagram	5
Zonal Lumen Summary	5
Illuminance Plots	6
Candela Plots	6
Candela Tabulation	7
Candela Tabulation	8
Photometric Testing Information	9
Equipment List:	10

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

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

NRG_F_10.04, Rev. 0, Effective: 2012-01-19

Page 3

NRG_F_10.04

Confidential Report



Lab Code: 500065-0

TÜV SÜD America is
accredited under the
NVLAP EEL program.





IESNA LM79-2008 TEST REPORT

January 24, 2014

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 38 120WE CW NFL G1 BX	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	1532.0	1507.3
Luminous Efficacy (Lumens/Watt)	74.66	73.56
Total Radiant Flux (Watts)	4.9	-
Correlated Color Temperature (CCT)	4983	-
Color Rendering Index (CRI – R _a)	86.6	-
R ₉ Value	26.3	-
Chromaticity (Chroma x / Chroma y)	0.3458 / 0.3551	-
Chromaticity (Chroma u / Chroma v)	0.2105 / 0.3243	-
Chromaticity (Chroma u' / Chroma v')	0.2105 / 0.4865	-
D _{uv} Value	0.00152	-

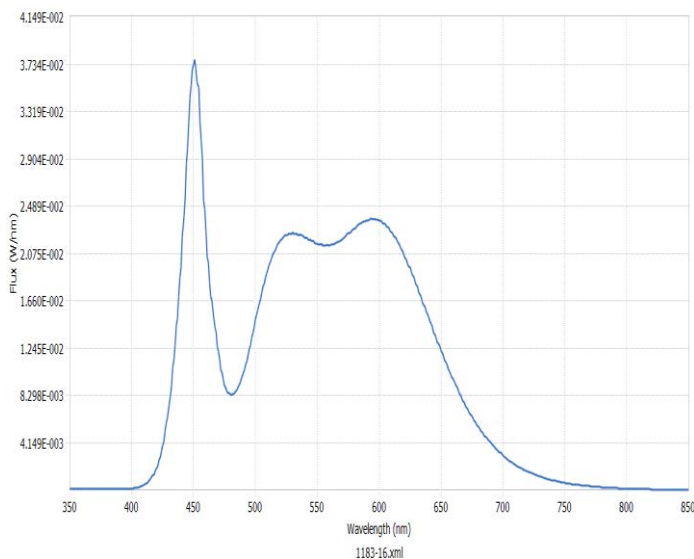
Electrical Results	LS 38 120WE CW NFL G1 BX	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	20.52	20.49
Input Voltage (Volts AC)	120.06	119.98
Input Current (Amps)	0.179	0.180
Power Factor	0.954	0.954
Input Frequency (Hertz)	60.0	60.0
A-THD (Current %)	30.02 %	29.80 %

Additional Parameters	LS 38 120WE CW NFL G1 BX	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	55 minutes
Test Geometry Configuration	4 π	Type C
Spectroradiometer	Labsphere CDS1100	Gigahertz Optik P9801
Ambient Temperature	24.7 °C	25.0 °C
ISTMT (In-Situ Temperature Measurement)	Not tested	
Spacing Criteria	N/A	

Spectral Flux and Chromaticity Diagram

Spectral Flux

▼ SPECTRAL FLUX GRAPH:



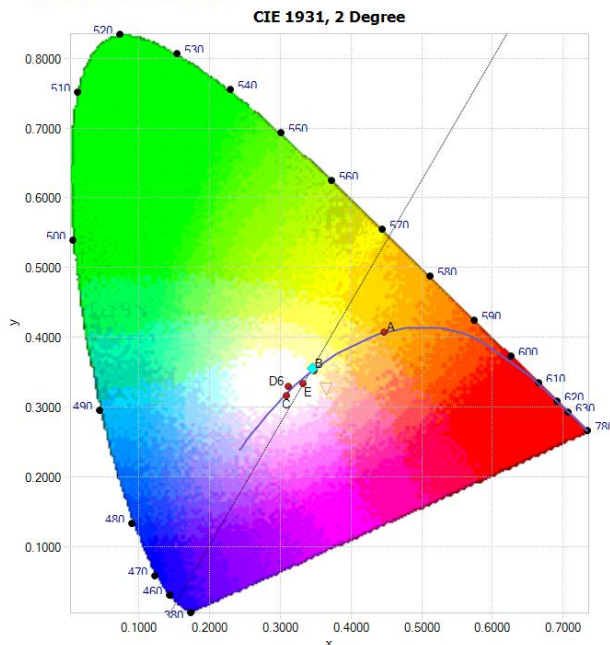
Spectral response of the Radiant Flux

(350nm to 850nm)

Parameter	Stable Data
Peak Wavelength (nm)	450.6
Dominant Wavelength (nm)	571.4

Chromaticity Diagram

▼ CHROMATICITY DIAGRAM:



Tristimulus values (from page 5):

$$x / y = 0.3458 / 0.3551$$

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

Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	1435.6	95.2 %
60 - 90	71.6	4.8 %
0 - 90	1507.3	100 %
90 - 180	0.0	0.0 %
0 - 180	1507.3	100 %

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

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

Page 5

NRG_F_10.04

Confidential Report

NVLAP[®]

Lab Code: 500065-0

TÜV SÜD America is
accredited under the
NVLAP EEL program.

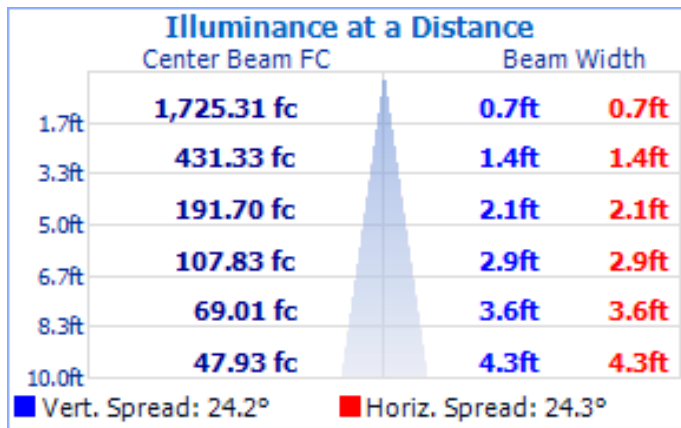
TÜV[®]

IESNA LM79-2008 TEST REPORT

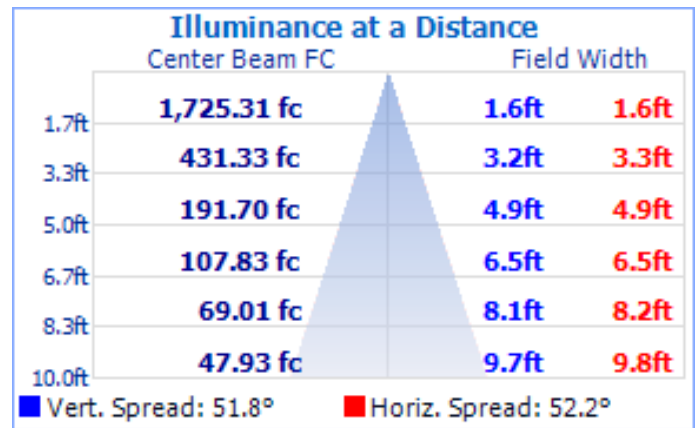
January 24, 2014

Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



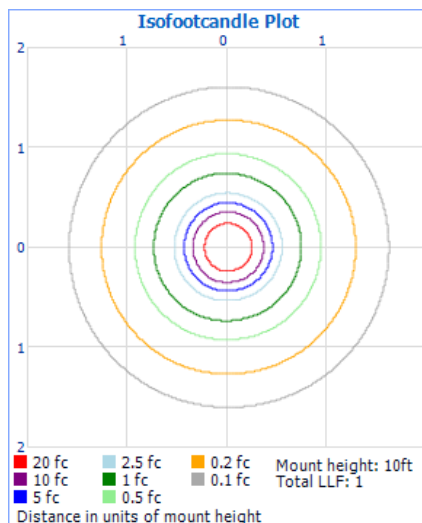
Beam Angle = 24.2°



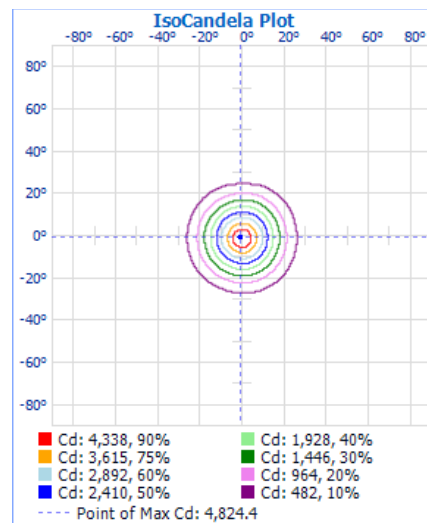
Field Angle = 51.8°

Test Results – Candela Plots

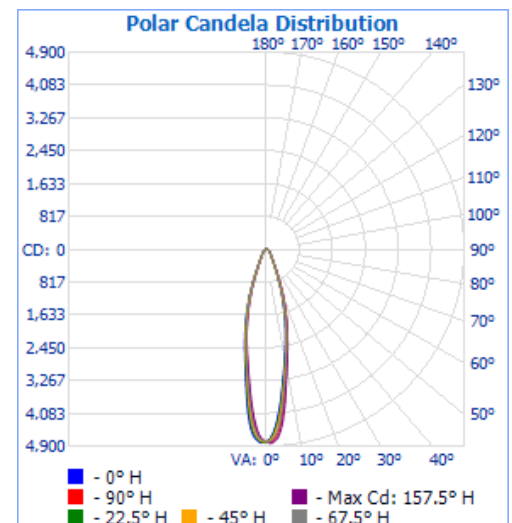
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela



IESNA LM79-2008 TEST REPORT

January 24, 2014

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	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793	4793
0.5	4745	4765	4780	4792	4800	4820	4813	4816	4798	4786	4780	4783	4781	4773	4784	4789	4745
1.0	4729	4727	4749	4784	4796	4809	4823	4823	4805	4802	4786	4770	4752	4750	4743	4745	4729
1.5	4657	4671	4707	4749	4789	4798	4819	4824	4819	4807	4779	4740	4728	4717	4699	4707	4657
2.0	4588	4621	4664	4705	4755	4788	4797	4800	4814	4779	4744	4711	4695	4656	4655	4659	4588
2.5	4490	4534	4596	4665	4708	4756	4771	4767	4778	4746	4702	4673	4621	4582	4580	4580	4490
3.0	4388	4431	4509	4599	4662	4704	4739	4737	4744	4708	4654	4603	4532	4500	4482	4486	4388
3.5	4269	4325	4412	4513	4601	4650	4680	4687	4708	4651	4587	4512	4439	4394	4374	4373	4269
4.0	4139	4216	4308	4415	4501	4579	4603	4603	4654	4580	4498	4415	4331	4271	4259	4262	4139
4.5	4008	4082	4176	4300	4382	4466	4514	4513	4569	4497	4402	4305	4205	4150	4117	4122	4008
5.0	3874	3947	4039	4161	4264	4342	4400	4398	4470	4389	4286	4169	4080	4020	3974	3989	3874
5.5	3737	3806	3903	4009	4123	4216	4267	4269	4350	4251	4146	4029	3945	3868	3837	3852	3737
6.0	3591	3658	3750	3859	3963	4068	4114	4113	4211	4119	3998	3896	3799	3726	3702	3705	3591
6.5	3442	3505	3598	3702	3811	3899	3965	3963	4066	3983	3857	3746	3652	3588	3552	3556	3442
7.0	3316	3370	3458	3546	3656	3742	3799	3808	3913	3822	3704	3591	3514	3444	3412	3418	3316
7.5	3191	3247	3326	3406	3496	3588	3633	3633	3750	3652	3544	3452	3378	3305	3282	3288	3191
8.0	3070	3125	3194	3273	3346	3432	3481	3473	3584	3494	3400	3315	3236	3176	3149	3158	3070
8.5	2949	3010	3071	3145	3221	3286	3330	3321	3427	3346	3265	3173	3111	3059	3026	3039	2949
9.0	2861	2909	2964	3028	3099	3160	3192	3180	3278	3199	3127	3043	2991	2939	2914	2932	2861
9.5	2752	2804	2856	2923	2980	3037	3057	3043	3144	3072	3001	2932	2873	2828	2815	2833	2752
10.0	2647	2701	2750	2816	2876	2920	2943	2937	3014	2961	2893	2825	2762	2726	2708	2720	2647
10.5	2545	2602	2654	2710	2778	2816	2837	2830	2904	2851	2787	2718	2663	2624	2610	2622	2545
11.0	2451	2507	2563	2611	2671	2719	2729	2726	2800	2739	2678	2619	2567	2521	2522	2528	2451
11.5	2359	2409	2468	2519	2570	2620	2628	2620	2688	2640	2576	2524	2465	2430	2426	2430	2359
12.0	2268	2315	2374	2424	2483	2522	2545	2531	2590	2546	2481	2419	2372	2340	2332	2341	2268
12.5	2183	2233	2290	2332	2392	2435	2453	2435	2493	2449	2385	2321	2284	2244	2244	2253	2183
13.0	2090	2145	2201	2245	2298	2343	2355	2336	2399	2352	2289	2232	2190	2152	2156	2168	2090
13.5	2000	2058	2110	2155	2208	2245	2266	2251	2300	2263	2200	2141	2098	2067	2063	2073	2000
14.0	1919	1972	2024	2065	2125	2155	2180	2161	2210	2175	2115	2050	2014	1984	1978	1987	1919
14.5	1850	1891	1944	1983	2038	2073	2095	2075	2125	2085	2028	1965	1932	1899	1903	1910	1850
15.0	1760	1805	1858	1905	1953	1984	2004	1989	2036	2002	1947	1887	1849	1821	1824	1829	1760
17.5	1356	1398	1449	1497	1559	1580	1604	1589	1634	1600	1544	1476	1455	1428	1429	1432	1356
20.0	1000	1039	1082	1122	1176	1196	1207	1196	1237	1211	1161	1110	1085	1036	1043	1057	1000
22.5	688	713	745	783	835	854	869	860	898	873	826	777	755	735	732	732	688
25.0	479	494	516	541	575	589	596	591	619	601	568	539	522	508	507	506	479
27.5	359	367	380	393	411	422	427	421	440	430	416	398	389	382	381	378	359
30.0	285	289	296	303	314	322	324	321	332	329	323	313	307	303	301	299	285
32.5	236	238	241	246	253	258	259	258	267	266	263	257	254	250	248	245	236
35.0	199	199	202	206	211	214	215	214	222	223	220	218	214	212	210	206	199
37.5	169	169	172	175	179	181	182	182	188	188	187	183	182	179	178	175	169
40.0	144	145	147	151	153	155	156	156	161	160	158	156	154	153	151	149	144
42.5	124	125	128	130	132	134	134	135	139	137	135	132	131	129	129	128	124



America

Report# JI1400199-16-LM79

IESNA LM79-2008 TEST REPORT

January 24, 2014

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	109	110	112	114	116	117	118	118	119	118	116	114	113	112	111	111	109
47.5	97	98	100	102	103	104	104	104	105	104	102	101	100	99	99	99	97
50.0	88	89	90	92	93	94	94	94	94	93	92	91	90	89	89	89	88
52.5	80	81	83	84	85	85	85	85	85	84	83	82	81	81	80	81	80
55.0	73	74	76	77	77	78	77	77	77	76	75	74	74	73	73	74	73
57.5	67	68	70	70	71	71	71	70	70	69	68	68	67	67	67	67	67
60.0	61	62	63	64	65	65	65	64	64	64	63	62	61	61	61	62	61
62.5	50	51	53	54	56	58	58	58	58	57	56	55	54	53	53	52	50
65.0	41	42	43	44	45	47	48	48	50	48	46	45	44	43	42	42	41
67.5	33	34	35	36	37	38	39	39	40	39	38	36	36	35	35	34	33
70.0	27	28	29	30	31	31	32	32	32	32	31	30	29	29	28	28	27
72.5	22	23	23	24	25	26	26	26	27	26	25	25	24	23	23	23	22
75.0	18	18	19	20	20	21	21	21	21	21	20	20	19	19	19	19	18
77.5	14	14	14	15	16	16	16	17	17	17	16	16	15	15	14	14	14
80.0	10	10	11	11	12	12	12	12	13	13	12	12	11	11	11	11	10
82.5	6	7	7	8	8	8	9	9	9	9	8	8	8	7	7	7	6
85.0	3	4	4	4	5	5	5	5	6	5	5	5	4	4	4	4	3
87.5	1	1	1	2	2	2	2	2	3	3	2	2	2	2	1	1	1
90.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Maximum Candela = **4824.4** at Horizontal 157.5°, Vertical: 1.5°

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

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

Page 8

NRG_F_10.04

Confidential Report



Lab Code: 500065-0

TÜV SÜD America is
accredited under the
NVLAP EEL program.

NRG_F_10.04, Rev. 0, Effective: 2012-01-19





IESNA LM79-2008 TEST REPORT

January 24, 2014

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 “ 4π 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 3rd 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

Page 9

NRG_F_10.04

Confidential Report



TÜV SÜD America is
accredited under the
NVLAP EEL program.



IESNA LM79-2008 TEST REPORT

January 24, 2014

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

This technical report may only be quoted in full. Any use for advertising purposes must be granted in writing. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

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

Page 10

NRG_F_10.04

Confidential Report



TÜV SÜD America is
accredited under the
NVLAP EEL program.