



# 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 NW NFL G1 BX  
**Manufacturer:** Lighting Science Group Corporation

**Technical Report Number:** JI1400199-19-LM79  
**Report Issue Date:** January 24<sup>th</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



# IESNA LM79-2008 TEST REPORT

Report# JI1400199-19-LM79

January 24, 2014

## Summary of Key Test Results

Model# **LS 38 120WE NW NFL G1 BX**  
Manufacturer **LSGC**  
TÜV Sample# **1183-19**  
Date of Test **January 14<sup>th</sup> 2014**



### Notes:

Tested in LBU orientation (Lamp-Base-Up)



<b>Parameter</b>	<b>Measured Result</b>
Luminous Flux	<b>1516.0 Lumens</b>
Input Power	<b>20.27 Watts</b>
Efficacy	<b>74.79 Lumens/Watt</b>
C.C.T.	<b>3923 K</b>
C.R.I. (R <sub>a</sub> )	<b>82.7</b>
Stabilization Time	<b>60 minutes</b>

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



# IESNA LM79-2008 TEST REPORT

Report# JI1400199-19-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



# 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 NW NFL G1 BX	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	1516.0	1504.5
Luminous Efficacy (Lumens/Watt)	74.79	74.30
Total Radiant Flux (Watts)	4.6	-
Correlated Color Temperature (CCT)	3923	-
Color Rendering Index (CRI – R <sub>a</sub> )	82.7	-
R <sub>9</sub> Value	4.6	-
Chromaticity (Chroma x / Chroma y)	0.3849 / 0.3829	-
Chromaticity (Chroma u / Chroma v)	0.2256 / 0.3366	-
Chromaticity (Chroma u' / Chroma v')	0.2256 / 0.5049	-
D <sub>uv</sub> Value	0.00045	-

Electrical Results	LS 38 120WE NW NFL G1 BX	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	20.27	20.25
Input Voltage (Volts AC)	120.03	119.98
Input Current (Amps)	0.178	0.180
Power Factor	0.956	0.956
Input Frequency (Hertz)	60.0	60.0
A-THD (Current %)	29.48 %	29.33 %

Additional Parameters	LS 38 120WE NW NFL G1 BX	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	61 minutes
Test Geometry Configuration	4π	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	



# IESNA LM79-2008 TEST REPORT

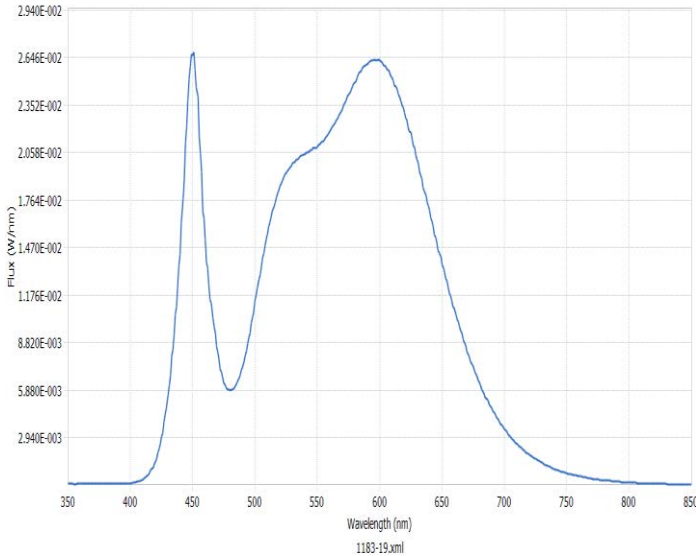
Report# JI1400199-19-LM79

January 24, 2014

## Spectral Flux and Chromaticity Diagram

### Spectral Flux

▼ SPECTRAL FLUX GRAPH:

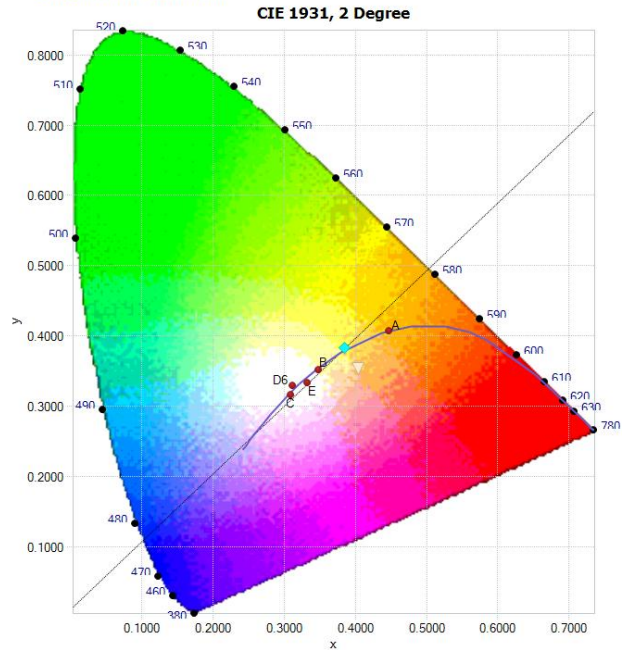


**Spectral response of the Radiant Flux  
(350nm to 850nm)**

Parameter	Stable Data
Peak Wavelength (nm)	449.9
Dominant Wavelength (nm)	578.6

### Chromaticity Diagram

▼ CHROMATICITY DIAGRAM:



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

$$x / y = 0.3849 / 0.3829$$

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

### Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	1430.0	95.0 %
60 - 90	74.6	5.0 %
0 - 90	1504.5	100 %
90 - 180	0.0	0.0 %
0 - 180	1504.5	100 %

TUV SUD 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



TUV SUD America is accredited under the NVLAP EEL program.



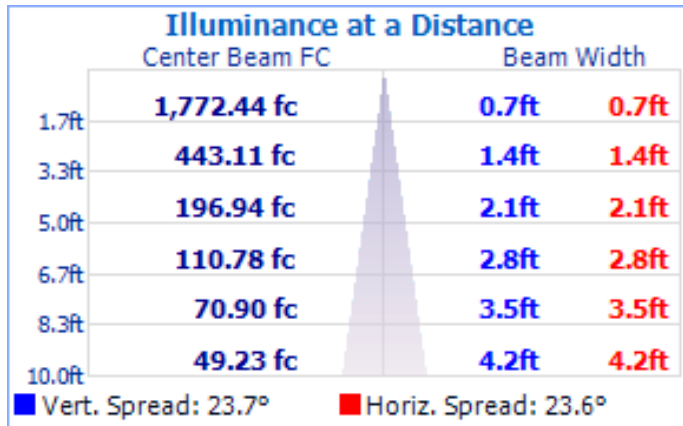


# IESNA LM79-2008 TEST REPORT

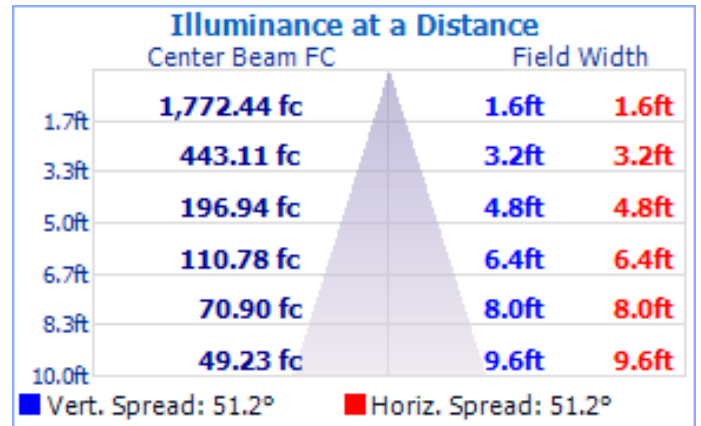
January 24, 2014

## Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



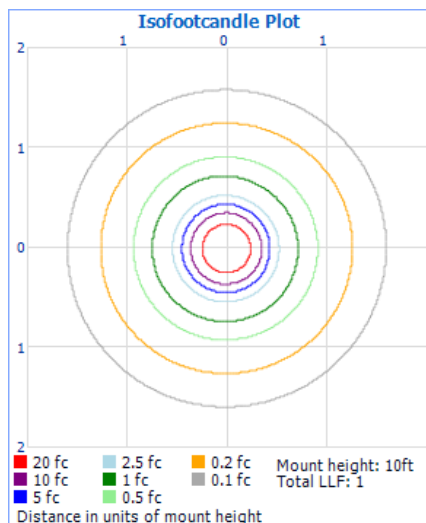
Beam Angle = 23.7°



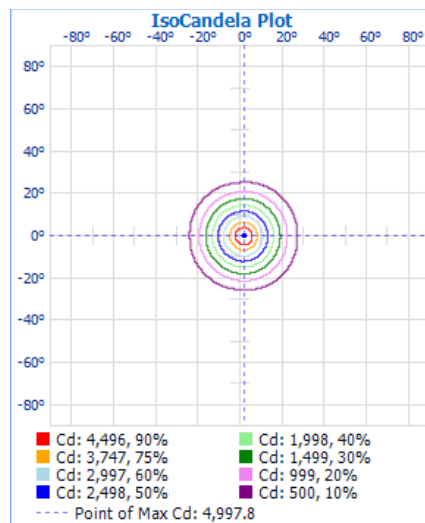
Field Angle = 51.2°

## Test Results – Candela Plots

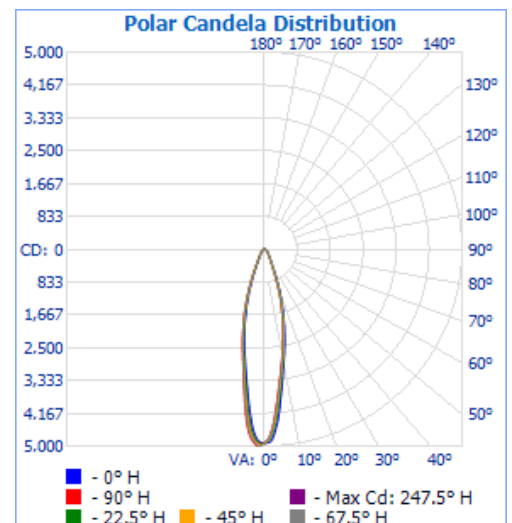
The following images depict the luminous intensity distribution characteristics of the luminaire:



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	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923	4923
0.5	4924	4909	4902	4881	4870	4884	4886	4899	4939	4950	4954	4955	4960	4942	4930	4923	4924
1.0	4912	4888	4862	4832	4830	4831	4841	4858	4915	4954	4979	4981	4978	4969	4949	4931	4912
1.5	4900	4844	4797	4772	4762	4756	4774	4805	4884	4921	4967	<b>4998</b>	4991	4979	4949	4925	4900
2.0	4864	4783	4716	4676	4652	4660	4687	4748	4850	4884	4929	4982	4996	4968	4929	4899	4864
2.5	4805	4699	4614	4552	4529	4528	4564	4633	4790	4847	4893	4933	4977	4954	4910	4872	4805
3.0	4706	4590	4492	4424	4400	4385	4435	4514	4704	4791	4855	4892	4929	4932	4884	4836	4706
3.5	4593	4463	4362	4289	4246	4241	4290	4387	4600	4700	4794	4853	4883	4875	4826	4762	4593
4.0	4472	4339	4222	4125	4076	4089	4141	4246	4476	4599	4714	4794	4827	4808	4754	4659	4472
4.5	4344	4190	4063	3964	3917	3918	3975	4077	4324	4482	4609	4710	4748	4737	4673	4548	4344
5.0	4203	4027	3901	3816	3768	3767	3818	3909	4177	4341	4475	4599	4649	4640	4561	4425	4203
5.5	4041	3868	3751	3670	3621	3625	3676	3769	4019	4189	4328	4460	4520	4496	4415	4278	4041
6.0	3866	3732	3607	3522	3484	3492	3529	3610	3860	4031	4185	4307	4369	4348	4269	4122	3866
6.5	3720	3587	3466	3387	3362	3358	3397	3465	3704	3866	4026	4146	4201	4200	4117	3978	3720
7.0	3577	3449	3334	3276	3239	3235	3270	3336	3550	3696	3850	3975	4034	4030	3948	3814	3577
7.5	3440	3319	3222	3160	3120	3129	3160	3222	3421	3547	3690	3800	3869	3854	3781	3653	3440
8.0	3303	3197	3111	3046	3014	3019	3047	3101	3280	3410	3543	3636	3700	3695	3618	3506	3303
8.5	3167	3078	3007	2946	2916	2914	2938	2996	3158	3269	3396	3485	3536	3540	3469	3367	3167
9.0	3058	2972	2912	2852	2815	2817	2843	2893	3044	3142	3253	3341	3392	3381	3326	3229	3058
9.5	2948	2878	2816	2748	2715	2721	2746	2793	2934	3029	3130	3200	3249	3237	3192	3108	2948
10.0	2844	2779	2709	2647	2625	2621	2641	2690	2823	2918	3014	3073	3107	3115	3069	2997	2844
10.5	2750	2677	2608	2556	2531	2528	2551	2597	2724	2811	2898	2961	2984	2999	2958	2889	2750
11.0	2659	2582	2513	2462	2433	2439	2464	2515	2636	2719	2795	2851	2875	2881	2848	2780	2659
11.5	2555	2487	2418	2364	2340	2345	2369	2417	2543	2631	2705	2740	2764	2775	2737	2680	2555
12.0	2459	2389	2323	2274	2253	2247	2272	2323	2447	2534	2610	2642	2660	2673	2641	2592	2459
12.5	2370	2295	2234	2190	2161	2160	2182	2234	2357	2438	2509	2550	2568	2570	2542	2493	2370
13.0	2274	2208	2154	2100	2068	2074	2092	2141	2267	2348	2415	2455	2479	2474	2441	2398	2274
13.5	2179	2123	2068	2009	1984	1987	2000	2051	2168	2251	2323	2360	2383	2385	2346	2306	2179
14.0	2088	2037	1983	1926	1902	1900	1914	1964	2080	2150	2228	2269	2291	2294	2258	2214	2088
14.5	2015	1957	1902	1843	1818	1820	1838	1888	1994	2059	2131	2174	2203	2200	2169	2123	2015
15.0	1924	1872	1819	1753	1736	1738	1755	1806	1906	1977	2045	2078	2113	2109	2075	2033	1924
17.5	1511	1459	1400	1351	1335	1331	1341	1399	1497	1578	1647	1675	1688	1688	1661	1640	1511
20.0	1142	1085	1034	976	954	955	973	1022	1117	1184	1244	1277	1306	1308	1270	1246	1142
22.5	793	745	700	658	637	638	652	698	784	852	906	930	944	946	918	885	793
25.0	537	507	481	454	441	438	445	470	525	575	620	650	660	653	625	598	537
27.5	385	369	354	339	328	325	327	340	374	403	429	443	450	449	432	419	385
30.0	301	290	278	266	259	256	257	266	289	308	325	335	339	337	328	320	301
32.5	245	237	228	219	213	211	211	218	234	249	262	270	273	272	265	258	245
35.0	206	199	191	184	180	178	179	184	197	210	221	228	231	231	224	217	206
37.5	174	167	161	156	155	154	154	158	168	177	186	192	195	195	189	182	174
40.0	147	142	137	134	134	133	133	136	144	151	158	163	166	165	160	155	147
42.5	125	121	118	116	117	117	117	118	124	129	134	137	139	139	135	131	125





# 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	106	104	104	104	104	104	105	109	112	116	117	118	119	116	113	109
47.5	97	94	93	93	93	94	93	93	97	99	102	103	103	104	102	100	97
50.0	87	85	85	84	85	85	85	85	87	89	91	92	92	93	91	89	87
52.5	79	78	77	77	78	78	77	77	79	81	82	83	83	84	83	81	79
55.0	73	71	71	71	71	72	71	71	72	74	75	76	76	76	76	74	73
57.5	67	66	65	66	66	66	66	65	67	68	69	69	70	70	69	68	67
60.0	61	60	60	60	60	60	60	60	61	62	63	63	64	64	64	63	61
62.5	54	52	52	51	51	51	51	52	54	55	56	57	57	58	57	56	54
65.0	45	44	43	43	43	43	43	43	45	47	48	49	49	49	49	48	45
67.5	38	37	36	36	36	36	36	36	38	39	40	41	41	41	41	40	38
70.0	32	31	30	30	30	29	30	30	32	33	34	35	35	35	35	34	32
72.5	26	25	25	24	24	24	24	25	26	27	28	29	29	29	29	28	26
75.0	21	20	20	19	19	19	19	20	21	22	23	23	24	24	23	23	21
77.5	17	16	15	15	15	15	15	15	16	17	18	19	19	19	19	18	17
80.0	12	12	11	11	11	11	11	11	12	13	14	14	15	14	14	14	12
82.5	9	8	8	7	7	7	7	7	9	9	10	10	11	11	10	10	9
85.0	5	5	4	4	4	4	4	4	5	6	6	7	7	7	7	6	5
87.5	2	2	2	1	1	1	1	1	2	3	3	3	4	4	4	3	2
90.0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0

Maximum Candela = **4997.8** at Horizontal 247.5°, Vertical: 1.5°





# 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 “ $4\pi$  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)

Page 9

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# JI1400199-19-LM79

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.

