



# IESNA LM79-2008 Test Report

TÜV SÜD America

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

Report Prepared for:

**Bill Dixon**

Director of Engineering & Operations

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3250 Corporate Way, Unit B

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United States

Telephone: 954-442-6189

**Sample Tested:**

**Draco 710 4100K Narrow 40W**

**Manufacturer:**

**Beghelli North America**

**Technical Report Number:**

**JI306325-2-LM79**

**Report Issue Date:**

**June 24<sup>th</sup>, 2013**

**Total Number of Pages:**

**10** (including this page)

**Report Prepared by:**

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## IESNA LM79-2008 TEST REPORT

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June 24, 2013

### Summary of Key Test Results

Model# **Draco 710 4100K Narrow 40W**  
Manufacturer **Beghelli North America**  
TÜV Sample# **808-3**  
Date of Test **June 21, 2013**



### Notes:

Tested in intended orientation

Parameter	Measured Result
Luminous Flux	<b>2430 Lumens</b>
Input Power	<b>35.06 Watts</b>
Efficacy	<b>69.31 Lumens/Watt</b>
C.C.T.	<b>4054 K</b>
C.R.I. (R <sub>a</sub> )	<b>84.54</b>
Beam Angle	<b>12.5°</b>
Stabilization Time	<b>60 minutes</b>
In-Situ Temp Test (ISTMT)**	<b>Not Tested</b>

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

\*\*ISTMT in accordance with "Energy Star Program Requirements for Integral LED Lamps – Version 1.4".

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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	Draco 710 4100K Narrow 40W	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	2430.0	2513.4
Luminous Efficacy (Lumens/Watt)	69.31	71.61
Total Radiant Flux (Watts)	7.7	-
Correlated Color Temperature (CCT)	4054	-
Color Rendering Index (CRI – R <sub>a</sub> )	84.54	-
R <sub>9</sub> Value	24.0	-
Chromaticity (Chroma x / Chroma y)	0.3795 / 0.3812	-
Chromaticity (Chroma u / Chroma v)	0.2227 / 0.3356	-
Chromaticity (Chroma u' / Chroma v')	0.2227 / 0.5034	-
D <sub>uv</sub> Value	0.00237	-

Electrical Results	Draco 710 4100K Narrow 40W	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	35.06	35.10
Input Voltage (Volts AC)	120.00	120.06
Input Current (Amps)	0.293	0.290
Power Factor (120V / 277V)	0.996 / 0.913	0.997
Input Frequency (Hertz)	60.0	60.0
A-THD (Current %) (120V / 277V)	2.27 % / 6.12 %	2.83 %

Additional Parameters	Draco 710 4100K Narrow 40W	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	59 minutes
Test Geometry Configuration	4 $\pi$	Type C
Spectroradiometer	Labsphere CDS1100	Gigahertz Optik P9801
Ambient Temperature	25.1 °C	25.3 °C
ISTMT (In-Situ Temperature Measurement)	Not tested	
Spacing Criteria	0.18 (0° – 180°) / 0.18 (90° – 270°)	

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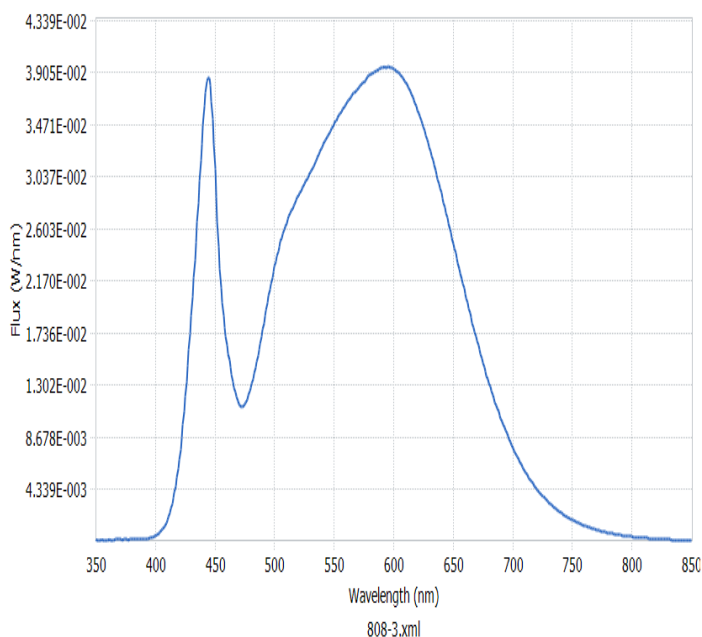
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## Spectral Flux and Chromaticity Diagram

### Spectral Flux

#### ▼ SPECTRAL FLUX GRAPH:

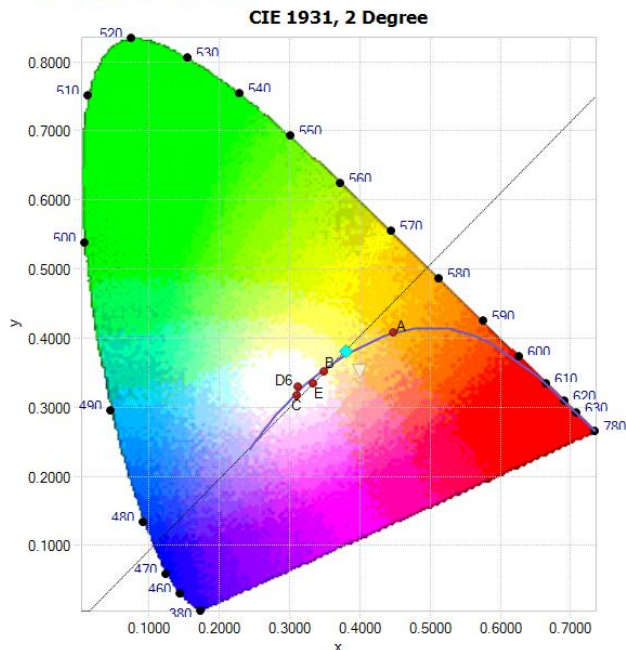


Spectral response of the Radiant Flux

(350nm to 850nm)

### Chromaticity Diagram

#### ▼ CHROMATICITY DIAGRAM:



Tristimulus values (from page 5):

$x / y = 0.3795 / 0.3812$

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

## Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	2252.7	89.6 %
60 - 90	98.1	3.9 %
0 - 90	2350.7	93.5 %
90 - 180	162.7	6.5 %
0 - 180	2513.4	100.0 %

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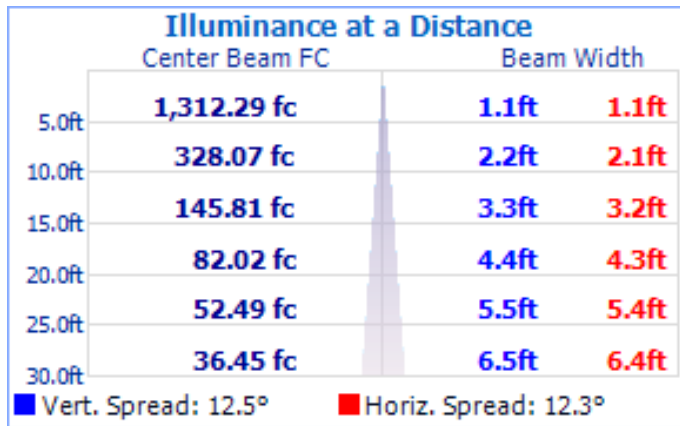
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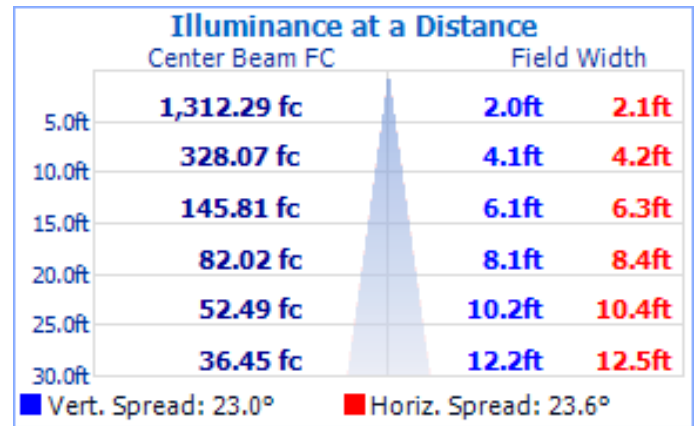
June 24, 2013

## Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



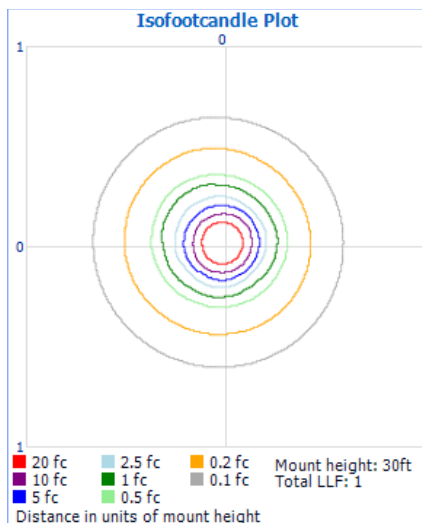
Beam Angle = 12.5°



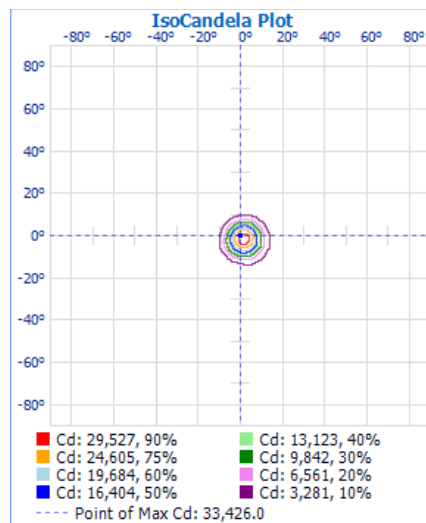
Field Angle = 23.0°

## Test Results – Candela Plots

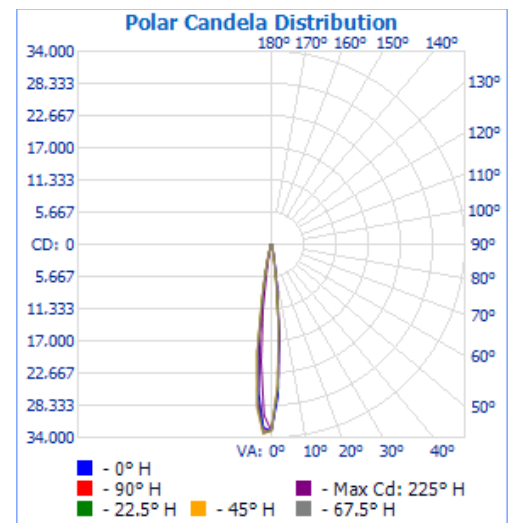
The following images depict the luminous intensity distribution characteristics of the luminaire:



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 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	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807	32807
2.5	26604	25292	24701	24891	25853	27349	29291	31014	32258	33067	<b>33426</b>	33246	32579	31532	30087	28313	26608
5.0	15574	14313	14103	14420	15976	18130	20618	23510	26051	28113	28964	28612	27243	24321	20746	17711	15570
7.5	7331	6138	6067	6466	7524	9457	11741	14253	16909	18997	19710	18632	15848	13345	11434	9088	7331
10.0	3225	2666	2330	2578	3165	3992	5257	6673	7952	8892	10032	9226	7973	6920	4738	4047	3227
12.5	1322	1056	1032	1219	1394	1873	2124	2805	3619	4743	4889	4902	4303	2764	2296	1723	1318
15.0	629	591	570	590	773	890	1048	1249	1950	2385	2734	2463	2169	1493	1059	850	630
17.5	415	377	380	395	412	515	565	691	884	1371	1420	1450	1066	767	593	465	415
20.0	296	283	277	280	287	307	373	404	515	630	805	673	611	474	383	334	297
22.5	246	235	230	230	233	244	263	294	341	413	430	423	382	335	293	265	246
25.0	206	197	194	194	197	205	217	238	274	314	329	328	305	273	242	221	206
27.5	174	167	164	164	167	173	183	199	224	252	263	263	247	226	203	186	174
30.0	148	143	140	140	142	148	156	168	186	206	215	215	204	188	171	158	149
32.5	128	123	121	120	123	127	134	143	157	171	178	179	171	159	146	136	128
35.0	114	109	107	106	108	111	116	123	134	144	150	151	144	137	127	120	114
37.5	103	99	97	96	97	100	104	109	116	124	130	130	126	121	114	108	103
40.0	94	91	89	88	89	91	95	99	105	111	115	116	112	108	103	99	94
42.5	87	84	83	82	83	85	88	92	96	101	105	105	102	99	94	91	87
45.0	79	76	75	75	76	78	82	85	89	93	96	97	93	90	86	82	79
47.5	71	69	68	68	69	72	75	78	81	85	88	88	84	81	77	74	71
50.0	65	64	63	63	64	66	68	71	74	77	80	80	76	73	70	68	65
52.5	60	59	59	59	59	61	63	65	68	70	73	73	69	67	64	62	60
55.0	56	55	55	55	56	57	59	61	62	65	67	67	64	62	60	58	56
57.5	52	51	51	52	52	53	55	57	58	59	62	62	59	57	55	54	52
60.0	49	48	48	48	49	49	51	53	54	55	57	57	55	53	51	50	49
62.5	45	44	45	45	45	46	48	49	50	51	52	52	50	49	48	46	45
65.0	41	41	41	42	42	43	44	45	46	47	48	48	46	45	44	43	41
67.5	38	38	38	38	39	39	41	42	42	43	44	44	43	42	41	39	38
70.0	35	34	34	35	35	36	37	38	39	40	40	40	38	38	37	36	35
72.5	32	31	32	32	32	33	34	35	35	36	36	36	35	34	33	32	31
75.0	28	28	28	28	29	29	31	33	32	33	33	33	31	31	30	29	28
77.5	25	25	25	25	25	26	27	29	29	30	29	29	28	27	27	26	25
80.0	23	22	22	23	23	24	24	25	25	26	26	26	25	24	24	23	23
82.5	21	20	20	20	21	21	22	22	23	24	23	23	22	22	22	22	21
85.0	19	18	19	19	19	19	19	20	20	21	21	21	20	20	19	19	19
87.5	18	18	18	18	18	18	18	18	18	18	19	18	18	18	18	18	18
90.0	30	23	20	21	22	21	18	17	17	17	17	17	17	18	18	19	30

Maximum Candela = **33,426.0** at Horizontal: 225.0°, Vertical: 2.5°

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## Test Results – Candela Tabulation (Continued....)

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92.5	24	20	21	22	21	21	20	26	37	37	26	24	23	26	23	27	24
95.0	21	21	21	21	21	21	20	21	22	30	27	25	20	21	20	21	20
97.5	21	22	22	22	21	21	21	20	20	20	21	20	20	20	21	21	21
100.0	22	23	23	23	22	22	22	21	21	21	21	21	21	21	22	22	22
102.5	24	24	24	24	24	23	23	22	22	22	22	22	22	22	23	23	24
105.0	25	25	25	25	25	25	24	24	23	23	23	23	23	24	24	24	25
107.5	25	26	26	26	26	26	25	25	24	25	24	24	24	25	25	25	25
110.0	26	26	26	26	26	26	26	26	26	26	26	25	25	25	26	26	26
112.5	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
115.0	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
117.5	26	26	26	26	26	26	26	26	26	26	26	26	26	26	27	27	26
120.0	26	26	26	26	26	26	26	26	26	26	26	26	26	26	27	27	26
122.5	26	26	26	26	26	26	26	26	26	26	27	26	26	26	27	27	26
125.0	26	25	26	25	25	26	26	26	26	26	27	26	27	26	27	26	26
127.5	25	25	25	25	25	25	26	26	26	26	26	26	26	26	26	26	26
130.0	25	25	25	25	25	25	26	25	26	26	26	26	26	26	26	26	25
132.5	25	25	25	25	25	25	25	25	25	26	26	26	26	25	26	26	25
135.0	25	25	25	24	24	24	25	25	25	25	26	26	26	25	26	26	25
137.5	25	24	24	24	24	24	25	25	25	25	26	26	26	25	26	25	25
140.0	25	24	24	24	24	24	25	25	25	25	26	26	26	25	26	25	25
142.5	25	25	25	24	24	24	25	25	25	25	26	26	26	26	26	26	25
145.0	26	26	25	25	25	25	25	25	25	26	26	26	26	26	26	26	26
147.5	27	27	26	26	26	26	26	26	26	26	27	27	27	27	27	27	27
150.0	29	29	28	28	28	28	28	28	28	27	28	28	28	28	29	29	29
152.5	31	31	30	30	30	30	30	30	30	29	30	30	30	30	31	31	31
155.0	34	33	33	33	32	32	32	32	32	32	32	32	32	33	33	34	34
157.5	36	36	35	35	35	35	35	35	35	35	35	35	35	36	36	36	36
160.0	38	37	37	37	36	36	37	37	37	37	37	38	38	38	39	39	38
162.5	39	38	37	37	37	37	38	38	38	39	39	40	40	40	40	40	39
165.0	38	37	36	36	36	37	37	38	38	39	40	40	40	40	39	39	37
167.5	35	34	33	33	33	34	35	36	37	37	38	38	38	37	37	36	35
170.0	32	31	30	30	30	30	31	32	33	34	34	34	34	34	34	33	32
172.5	30	29	28	27	27	27	28	29	30	31	31	32	32	32	32	31	30
175.0	29	28	26	26	25	25	25	26	27	28	29	30	30	30	30	30	28
177.5	28	26	25	25	24	23	23	24	25	26	26	27	28	28	29	28	27
180.0	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26





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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.....

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## TÜV SÜD Photometric Testing Information (continued)

### Goniophotometer

The Goniophotometer is a Mirror based 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: 112-A  
Voltage: 16.52 Volts DC  
Wattage: 150.0 Watts  
Calibration Current: 4.816 Amperes  
Luminous Intensity: 151.5 Candelas  
Calibration Date: 02-13-2011 (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	11/17/2013
TÜV SÜD Mirror Goniophotometer System – contains the following:			
Goniophotometer	M.E. GONC02	GON002	weekly
Spectroradiometer	Gigahertz Optik P9801	GIG002	weekly
Power Analyzer	Yokogawa WT210	ATLE0031	11/16/2013
Power Source	Chroma 61603	AC007	N/A

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