

Report of Test LLI-15076-2

TLS International - 2 x 2 LED sign light fixture. Catalog Number: NET-FM-35-1X-24x24.

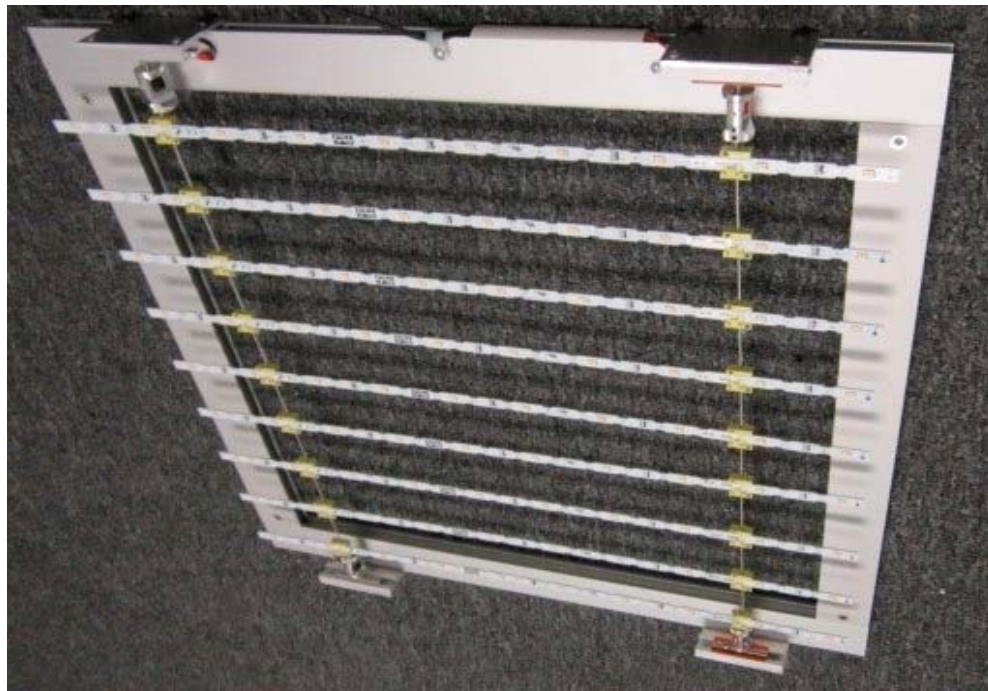
Extruded aluminum frame with extents of 24" x 24".

90 LEDs mounted on 9 horizontal PCB strips with 10 on each. Light array extents 24" Wide x 22" Tall.

PCBs suspended on frame and powered by two stainless steel vertical wires.

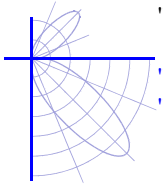
One Mean Well LED driver. Model: HLG-100H-24B. Operating at 120 Vac and 60 Hz

Tested with frame vertical and PCB's horizontal.



Performance Summary

Total Light Output	1831 lm	Min Power Factor	0.63 @ 277 V
Luminaire Power	26.5 W	Max THD(i)*	26.6 % @ 277 V
Luminous Efficacy	69.1 lm/W		
CCT	3560 K		
CIE(x,y) 1931	(0.403, 0.392)		
CRI	82		



Nki j vNcd
 "KP"VGT"PC"VKQ"PC"N



Vj kuT qewo gpvku'kuugf 'kp'ceetf cpeg"
 y kj 'y g'ceetgf kckqp'tgs vktgo gpu'qht"
 P XNCR0Vj g'rcdqtvcqt ('ku'ceetgf ksf 'hq"
 eqo r nkepeg'y kj "LUQJKE"392470
 Vj g'tgumnu'qht'y g'gum'u'ecrkdckqpucpf 'qht"
 o gcuwtgo gpu'kpenwf gf 'kp'y kuT qewo gpv"
 ctg'tcegedng'q'y g'UKu(ungo 'qht'vku0

*****Ncd'Eqf g'422; ; /2

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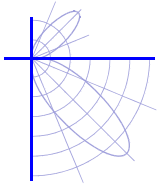
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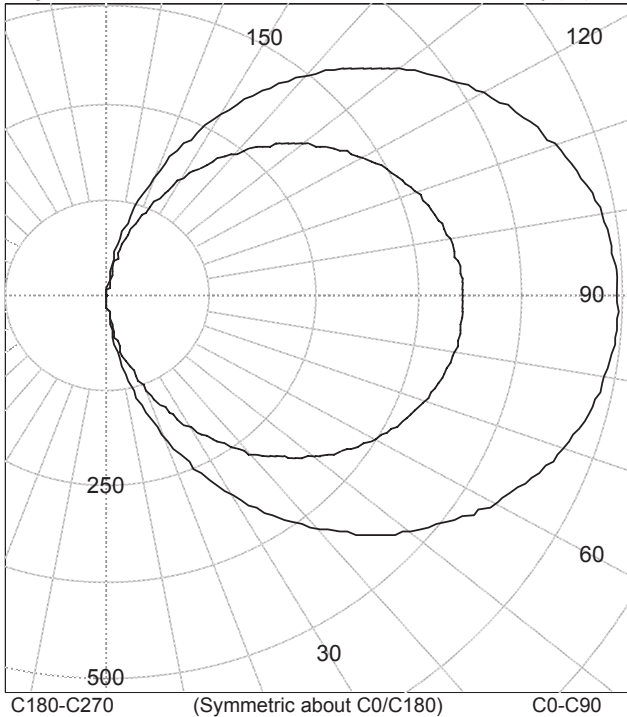
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Legend: C0/C180-Solid, C45/C225-Dashed, C90/C270-Grey (cd)



INTENSITY SUMMARY (cd)

Gamma	C-Plane					Flux (lm)
	C0	C22.5	C45	C67.5	C90	
0.0	0	0	0	0	0	
5.0	38	34	26	16	0	2
10.0	83	76	55	29	1	
15.0	137	124	89	43	1	12
20.0	193	174	125	59	1	
25.0	249	225	162	75	1	35
30.0	303	276	200	92	1	
35.0	352	322	235	109	1	67
40.0	399	366	269	125	1	
45.0	441	406	300	141	0	104
50.0	480	442	328	155	1	
55.0	512	473	353	168	1	141
60.0	543	501	374	178	0	
65.0	567	524	392	188	0	173
70.0	587	543	407	195	0	
75.0	603	557	418	201	0	196
80.0	613	567	426	205	0	
85.0	618	573	430	206	0	208
90.0	619	575	431	206	0	

ZONAL FLUX AND PERCENTAGES

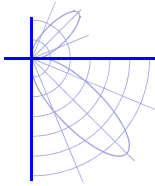
Zone	Flux (lm)	% Lamp	% Luminaire
0-30	49	N / A	2.6
0-40	115	N / A	6.3
0-60	361	N / A	19.7
0-90	937	N / A	51.2
40-90	822	N / A	44.9
60-90	577	N / A	31.5
90-180	894	N / A	48.8
0-180	1831	N / A	100.0

Total Light Output = 1,831 lm

Signed:

Ryder Tunney
Authorized Signatory

Date of test 2-Apr-2015
Date of report 3-Apr-2015



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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	0	0	0	0	0
2.5	18	18	14	9	1
5.0	38	34	26	16	0
7.5	60	54	40	21	1
10.0	83	76	55	29	1
12.5	110	99	72	36	1
15.0	137	124	89	43	1
17.5	165	149	106	51	1
20.0	193	174	125	59	1
22.5	221	200	143	67	1
25.0	249	225	162	75	1
27.5	276	251	182	84	1
30.0	303	276	200	92	1
32.5	328	299	217	100	1
35.0	352	322	235	109	1
37.5	376	345	252	118	1
40.0	399	366	269	125	1
42.5	421	387	285	133	0
45.0	441	406	300	141	0
47.5	461	424	314	149	0
50.0	480	442	328	155	1
52.5	497	458	341	161	0
55.0	512	473	353	168	1
57.5	528	487	364	173	0
60.0	543	501	374	178	0
62.5	556	513	384	184	0
65.0	567	524	392	188	0
67.5	577	534	401	192	0
70.0	587	543	407	195	0
72.5	594	550	414	198	0
75.0	603	557	418	201	0
77.5	607	562	423	203	0
80.0	613	567	426	205	0
82.5	617	570	429	205	0
85.0	618	573	430	206	0
87.5	619	574	430	206	0
90.0	619	575	431	206	0

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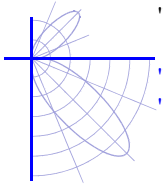
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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
90.0	619	575	431	206	0
92.5	618	573	430	204	0
95.0	615	571	427	203	0
97.5	612	566	424	201	0
100.0	607	562	421	199	0
102.5	601	557	415	196	0
105.0	593	549	410	192	0
107.5	585	542	403	188	0
110.0	576	532	396	184	0
112.5	565	522	388	180	0
115.0	553	511	379	174	0
117.5	540	499	369	169	0
120.0	527	486	358	163	0
122.5	511	472	347	156	0
125.0	495	456	334	149	0
127.5	478	439	320	142	0
130.0	459	422	307	134	0
132.5	440	403	291	127	0
135.0	418	384	276	119	0
137.5	398	363	260	111	0
140.0	375	342	243	103	0
142.5	351	319	226	94	0
145.0	327	296	208	86	0
147.5	300	272	190	78	0
150.0	273	247	171	69	0
152.5	247	222	153	61	0
155.0	219	196	134	53	0
157.5	190	171	116	45	0
160.0	162	145	97	37	0
162.5	135	120	80	30	0
165.0	107	95	62	22	0
167.5	81	72	48	16	0
170.0	57	51	32	9	0
172.5	36	32	18	4	0
175.0	18	15	7	0	0
177.5	3	1	0	0	0
180.0	0	0	0	0	0



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Intensity data (cd)

Gamma	C-Plane				
	C90	C112.5	C135	C157.5	C180
90.0	0	0	0	0	0
92.5	0	0	0	0	0
95.0	0	0	0	0	0
97.5	0	0	0	0	0
100.0	0	0	0	0	0
102.5	0	0	0	0	0
105.0	0	0	0	0	0
107.5	0	0	0	0	0
110.0	0	0	0	0	0
112.5	0	0	0	0	0
115.0	0	0	0	0	0
117.5	0	0	0	0	0
120.0	0	0	0	0	0
122.5	0	0	0	0	0
125.0	0	0	0	0	0
127.5	0	0	0	0	0
130.0	0	0	0	0	0
132.5	0	0	0	0	0
135.0	0	0	0	0	0
137.5	0	0	0	0	0
140.0	0	0	0	0	0
142.5	0	0	0	0	0
145.0	0	0	0	0	0
147.5	0	0	0	0	0
150.0	0	0	0	0	0
152.5	0	0	0	0	0
155.0	0	0	0	0	0
157.5	0	0	0	0	0
160.0	0	0	0	0	0
162.5	0	0	0	0	0
165.0	0	0	0	0	0
167.5	0	0	0	0	0
170.0	0	0	0	0	0
172.5	0	0	0	0	0
175.0	0	0	0	0	0
177.5	0	0	0	0	0
180.0	0	0	0	0	0

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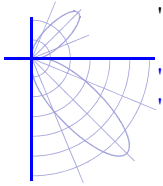
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.403, 0.392)	
	CIE 1976 (u', v') ⁽¹⁾	(0.234, 0.511)	
	Correlated Color Temperature (CCT) ⁽¹⁾	3560 K	
	Color Spatial Uniformity ⁽²⁾	0.0123	
	Color Rendering Index (Ra) ⁽¹⁾	82	
	Special CRI 9 (R ₉) ^{(1),(3)}	4	
	Distance from Planckian Locus (Duv) ^{(1),(3)}	0.0010	
	Scotopic/Photopic Ratio ^{(1),(3)}	1.52	
Electrical	Voltage	120 V	(Setpoint 1)
	Frequency	60 Hz	
	Current	0.231 A	
	Power	26.5 W	
	Power Factor	0.957	
	Current THD	14.66 %	
	Voltage	277 V	(Setpoint 2)
	Frequency	60 Hz	
	Current	0.154 A	
	Power	27.1 W	
Power Factor	0.634		
Current THD	26.57 %		

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer
Photometric and spectral values were measured at Setpoint 1

- (1) Value is computed from the weighted average of the spatial measurements
- (2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average
- (3) Quantity is in addition to the scope of IESNA LM-79-08



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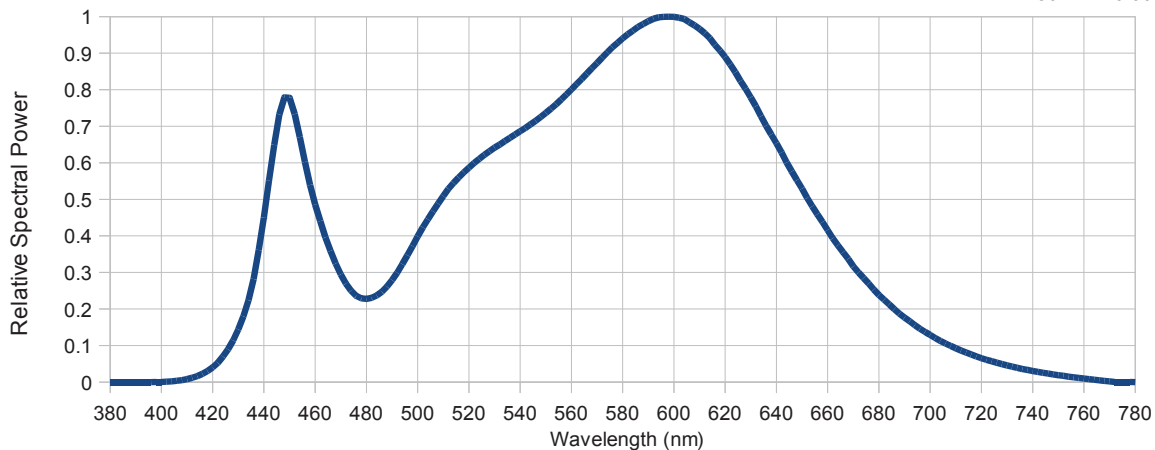
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LM-79 Performance Data

Summary Relative Spectral Irradiance Distribution (wavelength – nm, irradiance – relative to peak = 1)

380	0.00E+00	480	2.28E-01	580	9.40E-01	680	2.39E-01
385	0.00E+00	485	2.42E-01	585	9.67E-01	685	2.06E-01
390	0.00E+00	490	2.79E-01	590	9.88E-01	690	1.77E-01
395	0.00E+00	495	3.35E-01	595	9.99E-01	695	1.51E-01
400	2.64E-04	500	3.98E-01	600	1.00E+00	700	1.29E-01
405	2.61E-03	505	4.56E-01	605	9.89E-01	705	1.09E-01
410	8.00E-03	510	5.09E-01	610	9.66E-01	710	9.25E-02
415	1.93E-02	515	5.52E-01	615	9.32E-01	715	7.80E-02
420	4.01E-02	520	5.87E-01	620	8.89E-01	720	6.51E-02
425	7.97E-02	525	6.16E-01	625	8.36E-01	725	5.49E-02
430	1.44E-01	530	6.41E-01	630	7.79E-01	730	4.56E-02
435	2.53E-01	535	6.64E-01	635	7.15E-01	735	3.74E-02
440	4.50E-01	540	6.86E-01	640	6.53E-01	740	3.03E-02
445	6.91E-01	545	7.10E-01	645	5.89E-01	745	2.41E-02
450	7.78E-01	550	7.37E-01	650	5.29E-01	750	1.86E-02
455	6.36E-01	555	7.67E-01	655	4.70E-01	755	1.38E-02
460	4.86E-01	560	8.01E-01	660	4.16E-01	760	9.71E-03
465	3.77E-01	565	8.36E-01	665	3.65E-01	765	5.34E-03
470	2.95E-01	570	8.73E-01	670	3.17E-01	770	1.56E-03
475	2.43E-01	575	9.09E-01	675	2.77E-01	775	3.69E-05
						780	0.00E+00



* The spectral power distribution combines the weighted spectral power distributions of all spatial measurements.

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Tested with frame vertical and PCB's horizontal.

LM-79 Performance Data

Spatial measurements

Vertical angle (deg)	CIE 1976 (u',v') coordinates	
	Horizontal 0 plane	Horizontal 90 plane
0	I <= 10 %	I <= 10 %
10	(0.236, 0.524)	I <= 10 %
20	(0.235, 0.520)	I <= 10 %
30	(0.235, 0.517)	I <= 10 %
40	(0.234, 0.515)	I <= 10 %
50	(0.234, 0.513)	I <= 10 %
60	(0.234, 0.511)	I <= 10 %
70	(0.234, 0.510)	I <= 10 %
80	(0.233, 0.509)	I <= 10 %
90	(0.233, 0.509)	I <= 10 %

Spatial measurements

Vertical angle (deg)	CIE 1976 (u',v') coordinates	
	Horizontal 0 plane	Horizontal 90 plane
90	(0.233, 0.509)	I <= 10 %
100	(0.233, 0.509)	I <= 10 %
110	(0.234, 0.510)	I <= 10 %
120	(0.234, 0.512)	I <= 10 %
130	(0.234, 0.513)	I <= 10 %
140	(0.234, 0.516)	I <= 10 %
150	(0.235, 0.518)	I <= 10 %
160	(0.235, 0.521)	I <= 10 %
170	I <= 10 %	I <= 10 %
-	-	-

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimize stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilized supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer, spectral irradiance. The distribution locus comprises points in two or more planes (as indicated in the table above) at no more than 10° vertical intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

Sample Orientation	Vertical	Stabilization Time	7.25 hour
		Total Operation Time	12 hour

Equipment and uncertainties

LightLab International R80A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

Luminous Intensity	± 4 %	Temperature	± 1 °C
Luminous Flux	± 4 %	Luminous Efficacy	± 4.5 %
Horizontal, Vertical Angles	± 0.25°		

PhotoResearch PR-670 spectroradiometer (380 - 780 nm., 2 nm. per pixel) measuring at a distance from the sample deemed greater than five times the maximum observed luminous opening dimension.

CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Δ (u', v') Color difference	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Relative Spectral Irradiance *	± 2 %	R9 *	± 2

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage	± 0.5 %	Frequency *	± 0.1 Hz
Current	± 0.5 %	Power	± 0.5 %
Current THD *	± 3 %	Power Factor	± 0.02

This report contains data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.
IESNA LM-79-08 Calculator v4.9 (23rd Sep 2014)

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Test Distance 8.0 m
Test Temperature 25.0 °C

Notes The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of IESNA publication LM-79-08.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the CIE Gamma coordinate system as defined in CIE publication number 121.

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