

Report of Test LLI-16217-1

Greenstar Products - Pole arm mounted roadway luminaire. Product ID: XAVX08431SNDXX

Grey painted cast aluminum housing with fins. Fixture extends ~ 25" x 10" x 4.5".

8 LEDs mounted in 2 x 4 array on white PCB with clear plastic sheet of individual lenses.

One Inventronics driver. Model: EUC-096S210DT

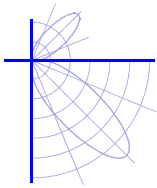
Operating at 120 Vac and 60 Hz with dimming disconnected.



Performance Summary

Total Light Output	10160 lm	Min Power Factor	0.96 @ 277 V
Luminaire Power	107.9 W	Max THD(i)*	6.3 % @ 277 V
Luminous Efficacy	94.2 lm/W	0-90° Zonal Flux %	100.0 %
CCT	4070 K	80-90° Zonal Flux %	0.7 %
CIE(x,y) 1931	(0.377, 0.374)	BUG Rating*	B2-U0-G2
CRI	73	Street Classification*	Type III Medium

PREPARED FOR : Greenstar Products, Inc., 6900 Alamo Downs Pkwy, San Antonio, TX 78238



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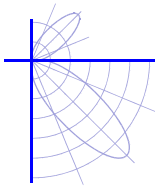
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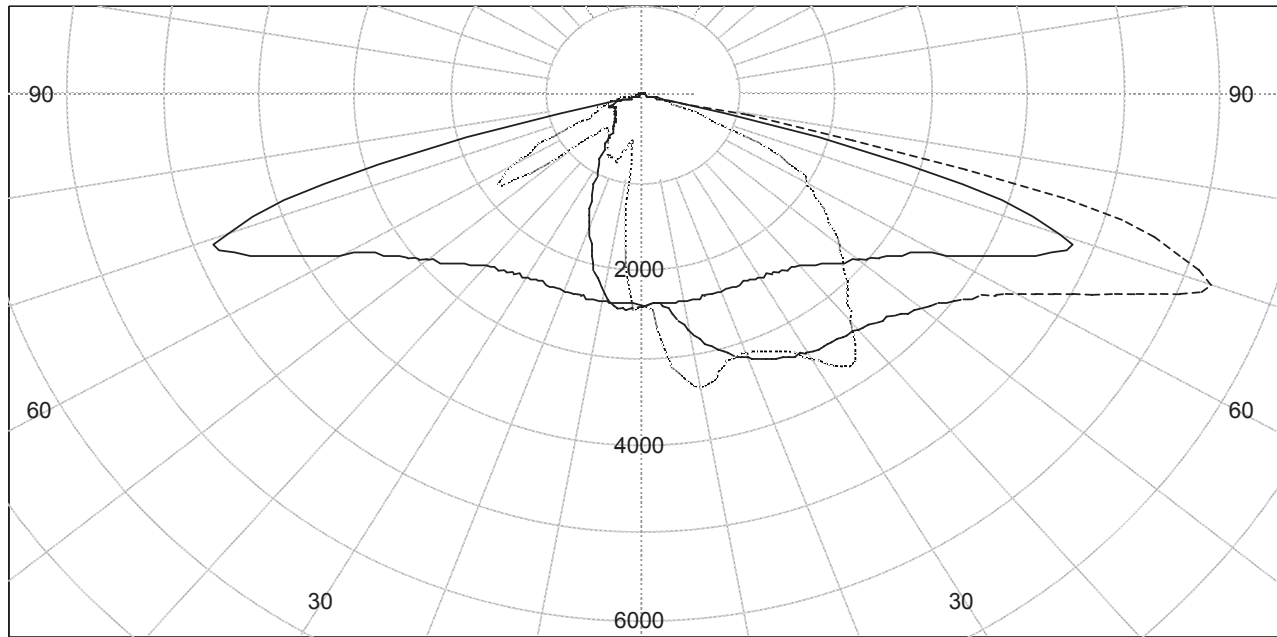
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Polar Light Distribution Curves



House side / L270

L90 / 270 - Solid, Plane of maximum - Dashed, L0 / 180 - Grey (cd)

Street side / L90

Percentage Outputs

	Upward	Downward	Total
Street Side	0.0 %	78.3 %	78.3 %
House Side	0.0 %	21.7 %	21.7 %
	0.0 %	100.0 %	100.0 %

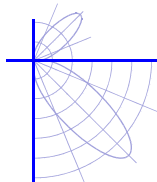
Report data based on absolute values as measured.

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test
Date of report

20-Aug-2016
24-Aug-2016



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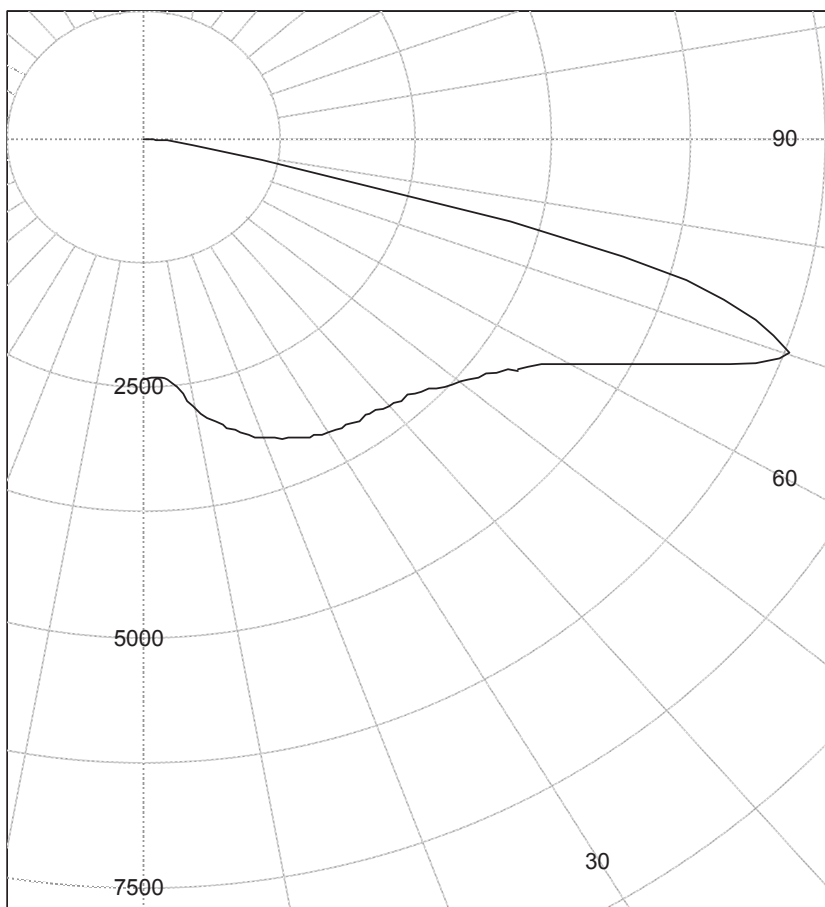
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Operating at 120 Vac and 60 Hz with dimming disconnected.

Intensity
in principal plane

Vertical Angle (°)	Intensity (cd)
0.0	2406.8
10.0	2735.0
20.0	3189.1
30.0	3402.0
35.0	3445.3
40.0	3493.4
45.0	3606.8
47.5	3687.7
50.0	3786.0
52.5	3907.0
55.0	4058.4
57.5	4261.6
60.0	4532.5
62.5	4927.9
65.0	5400.7
67.5	5922.0
70.0	6291.9
72.5	5736.9
75.0	4544.5
77.5	1627.9
80.0	219.8
82.5	105.5
85.0	41.6
87.5	8.5
90.0	0.0
92.5	0.0
95.0	0.0
97.5	0.0
100.0	0.0
102.5	0.0
105.0	0.0
120.0	0.0
135.0	0.0
150.0	0.0
165.0	0.0
180.0	0.0

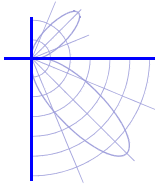
Principal Vertical Plane



Plane of maximum intensity (cd)

	Maximum Intensity
House Side	4785 cd @ (270.0°, 68.5°)
Street Side	6299 cd @ (290.0°, 69.5°)

Coordinates expressed in the C Type coordinate system
Data for the two symmetric halves of the luminaire has been averaged.



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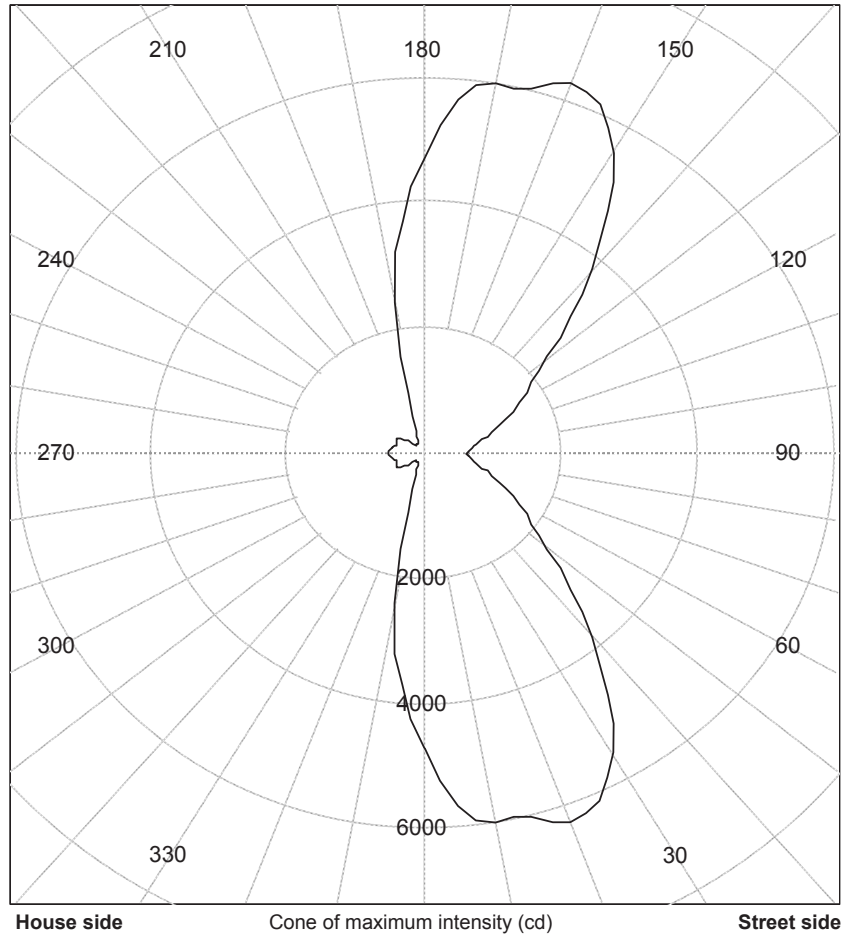
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Intensity
in principal cone

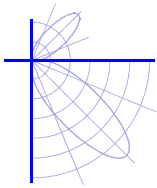
Lateral Plane (°)	Intensity (cd)
0	618.7
15	865.2
30	1594.7
40	2376.8
45	3036.5
50	3817.2
55	4708.3
60	5540.3
65	6122.8
70	6299.0
75	6053.6
80	5986.7
85	5675.1
90	4723.7
95	3716.8
100	2439.3
105	986.7
110	370.0
115	231.2
120	169.3
125	168.5
130	181.1
135	186.5
140	233.0
150	454.5
165	439.1
180	506.5

Principal Conical Surface



	<u>Maximum Intensity</u>
House Side	4785 cd @ (270.0°, 68.5°)
Street Side	6299 cd @ (290.0°, 69.5°)

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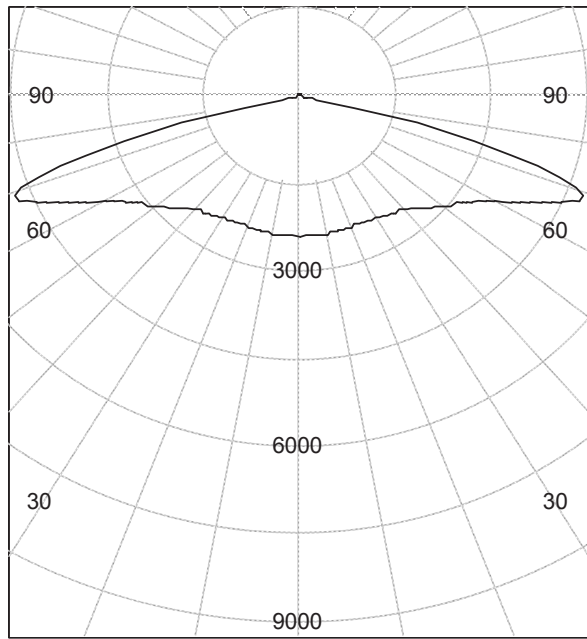
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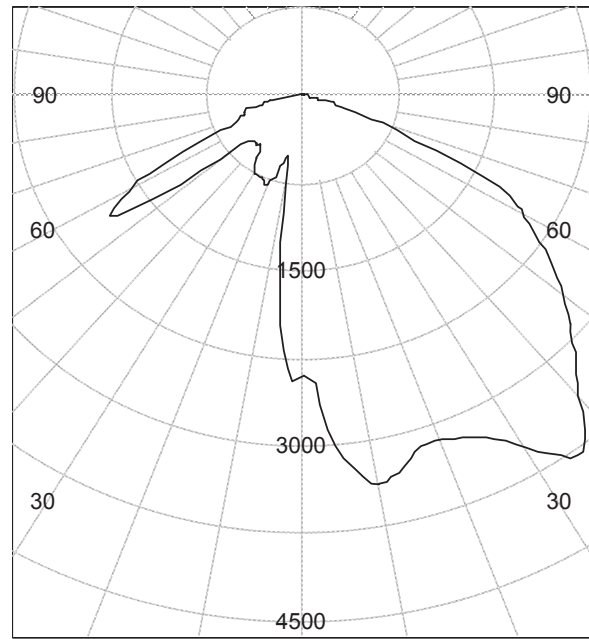
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Polar curve through L90 / L270

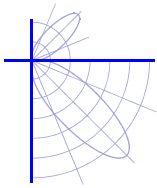


(L90) (cd) (L270)

Polar curve through L0 / L180



House side (L180) (cd) Street side (L0)



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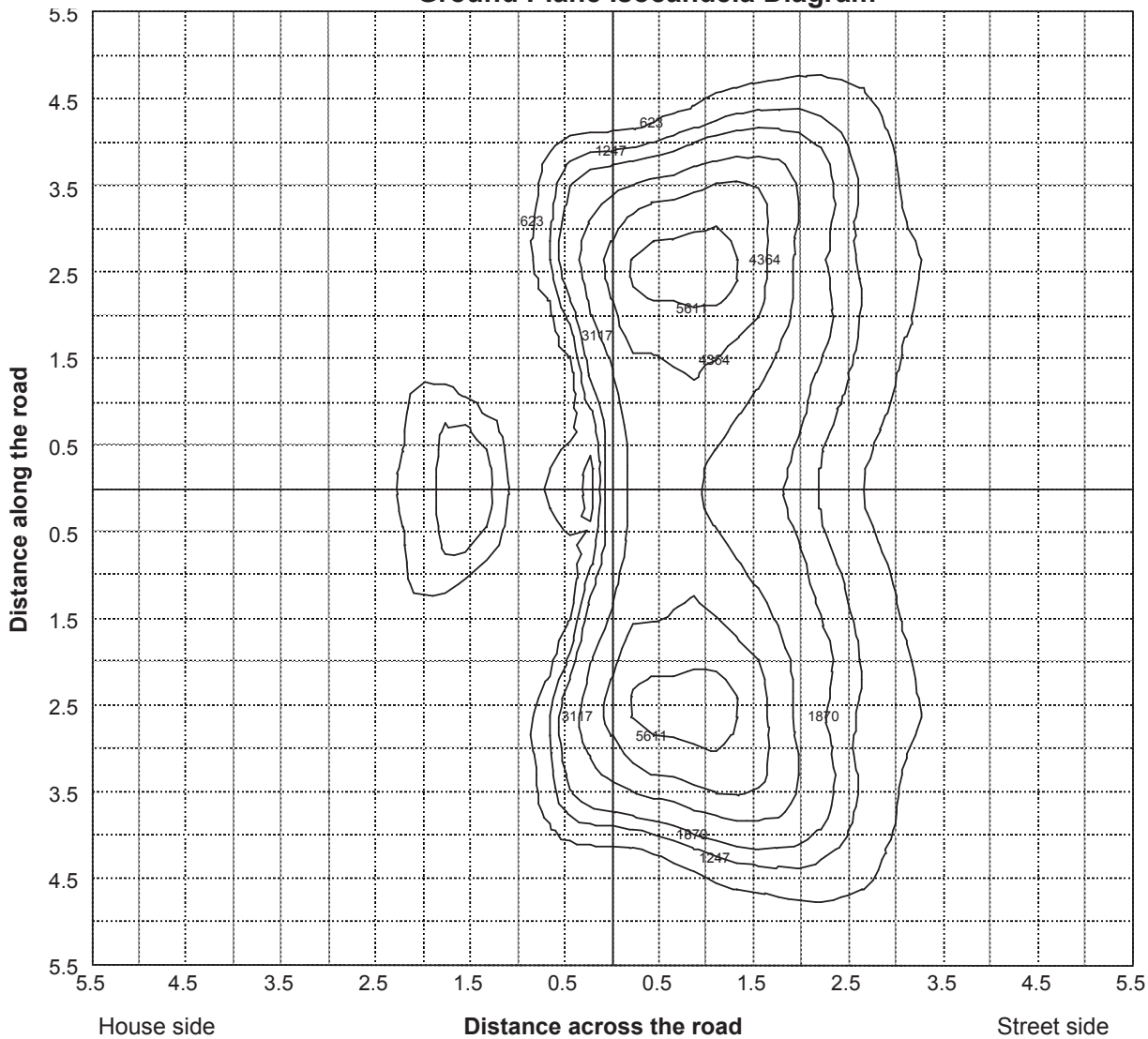
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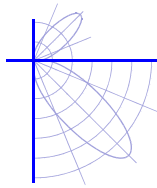
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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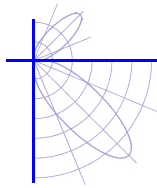
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House side intensity data (cd)

Vertical	L-Plane								
	L180	L195	L210	L220	L225	L230	L235	L240	L245
0.0	2407	2407	2407	2407	2407	2407	2407	2407	2407
10.0	761	843	1100	1366	1510	1662	1830	1990	2156
20.0	795	782	712	628	578	539	602	849	1237
30.0	757	777	767	769	744	703	633	558	563
35.0	598	616	638	658	655	633	598	542	488
40.0	546	537	493	477	481	470	458	444	422
45.0	543	529	453	377	352	348	356	365	368
47.5	607	539	434	353	316	307	318	336	347
50.0	854	714	418	327	293	279	285	302	322
52.5	1345	1084	465	303	274	261	259	270	296
55.0	1778	1560	626	289	256	246	240	249	277
57.5	1708	1655	776	292	248	238	230	235	262
60.0	1482	1493	921	304	244	232	224	225	254
62.5	1140	1220	1009	314	244	222	216	210	241
65.0	719	796	898	301	237	210	200	198	236
67.5	558	541	610	264	216	198	184	183	242
70.0	502	429	433	228	177	174	165	166	225
72.5	490	403	328	203	152	142	148	155	195
75.0	450	392	272	174	135	119	114	128	155
77.5	342	344	235	163	109	97	94	97	106
80.0	285	287	214	162	92	81	75	71	73
82.5	241	244	173	151	70	62	81	52	52
85.0	19	26	60	50	30	28	35	32	30
87.5	11	12	13	13	12	12	13	12	11
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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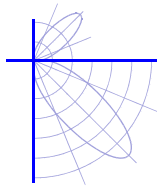
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Vertical	House side			Intensity data (cd)					Street side	
	L250	L255	L260	L-Plane					L285	L290
	L265	L270	L275	L280	L285	L290				
0.0	2407	2407	2407	2407	2407	2407	2407	2407	2407	2407
10.0	2292	2396	2443	2433	2390	2392	2435	2563	2735	2735
20.0	1629	1990	2282	2395	2378	2488	2759	3014	3189	3189
30.0	916	1519	2059	2343	2409	2704	3079	3307	3402	3402
35.0	639	1290	1962	2335	2462	2847	3237	3433	3445	3445
40.0	485	1081	1905	2349	2548	3012	3414	3559	3493	3493
45.0	420	919	1871	2416	2712	3249	3643	3719	3607	3607
47.5	396	858	1871	2464	2817	3383	3772	3805	3688	3688
50.0	371	814	1881	2520	2929	3526	3909	3901	3786	3786
52.5	352	787	1900	2581	3047	3676	4052	4004	3907	3907
55.0	337	774	1925	2658	3186	3853	4220	4130	4058	4058
57.5	330	772	1972	2770	3368	4078	4439	4316	4262	4262
60.0	333	789	2050	2948	3641	4408	4753	4583	4533	4533
62.5	330	819	2177	3198	3989	4833	5165	4966	4928	4928
65.0	348	879	2311	3443	4332	5256	5569	5382	5401	5401
67.5	378	969	2419	3659	4690	5679	5968	5843	5922	5922
70.0	365	975	2393	3643	4609	5566	5898	5998	6292	6292
72.5	303	557	1658	2843	3695	4635	5016	5323	5737	5737
75.0	201	264	857	1614	1885	2276	2827	3828	4544	4544
77.5	129	145	179	211	228	268	492	1012	1628	1628
80.0	83	96	106	123	138	158	186	211	220	220
82.5	50	57	67	69	74	93	101	110	105	105
85.0	29	27	32	33	34	39	41	42	42	42
87.5	12	12	13	13	13	12	11	10	8	8
90.0	0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0	0



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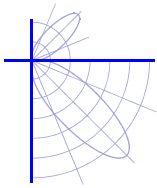
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Street side intensity data (cd)

Vertical	L-Plane								
	L295	L300	L305	L310	L315	L320	L330	L345	L0
0.0	2407	2407	2407	2407	2407	2407	2407	2407	2407
10.0	2885	2986	3079	3138	3200	3269	3313	3375	3388
20.0	3315	3363	3359	3290	3238	3204	3121	3120	3133
30.0	3368	3268	3212	3169	3180	3208	3265	3399	3480
35.0	3358	3279	3269	3264	3300	3347	3437	3669	3770
40.0	3409	3374	3409	3449	3515	3556	3567	3528	3350
45.0	3562	3593	3690	3756	3796	3755	3527	3152	2992
47.5	3671	3754	3878	3918	3905	3803	3478	2998	2821
50.0	3820	3935	4042	4042	3961	3801	3393	2854	2659
52.5	3991	4125	4198	4132	3975	3759	3291	2702	2477
55.0	4186	4309	4332	4184	3949	3673	3163	2537	2299
57.5	4391	4461	4417	4167	3859	3555	3016	2378	2113
60.0	4612	4615	4452	4107	3752	3424	2878	2222	1963
62.5	4935	4811	4504	4063	3666	3318	2727	2017	1787
65.0	5373	5107	4608	4077	3620	3184	2419	1641	1359
67.5	5845	5457	4816	4069	3394	2823	1913	1189	868
70.0	6148	5483	4579	3668	2897	2271	1508	807	562
72.5	5503	4649	3517	2545	1994	1691	925	486	319
75.0	4547	3550	2476	1544	1143	936	558	357	242
77.5	2043	1825	1209	708	563	488	362	256	174
80.0	356	430	391	277	229	222	243	154	109
82.5	95	94	87	92	119	159	181	107	75
85.0	39	37	34	37	59	87	81	60	44
87.5	8	8	7	8	8	8	10	15	14
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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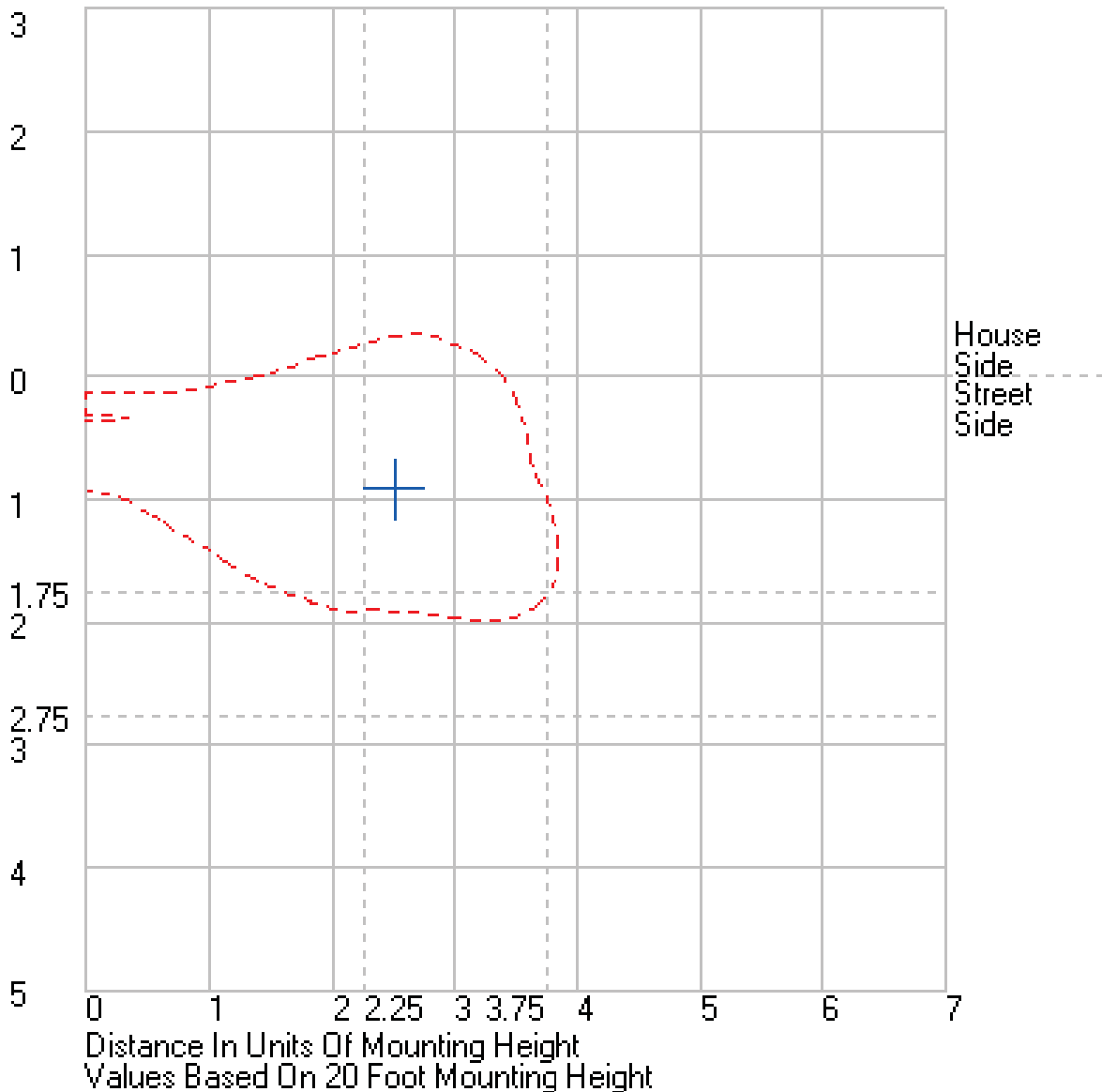
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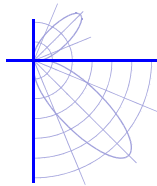
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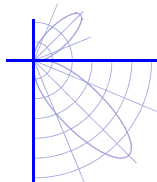
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.377, 0.374)	
	CIE 1976 (u', v') ⁽¹⁾	(0.224, 0.500)	
	Correlated Color Temperature (CCT) ⁽¹⁾	4070 K	
	Color Spatial Uniformity ⁽²⁾	0.0198	
	Color Rendering Index (Ra) ⁽¹⁾	72.8	
	Special CRI 9 (R _g) ^{(1),(3)}	-23	
	Distance from Planckian Locus (Duv) ^{(1),(3)}	-0.0003	
	Scotopic/Photopic Ratio ^{(1),(3)}	1.54	
Electrical	Voltage	120 V	(Setpoint 1)
	Frequency	60 Hz	
	Current	0.900 A	
	Power	108 W	
	Power Factor	0.999	
	Current THD	2.19 %	
	Voltage	277 V	(Setpoint 2)
	Frequency	60 Hz	
	Current	0.394 A	
	Power	104 W	
	Power Factor	0.957	
	Current THD	6.26 %	

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



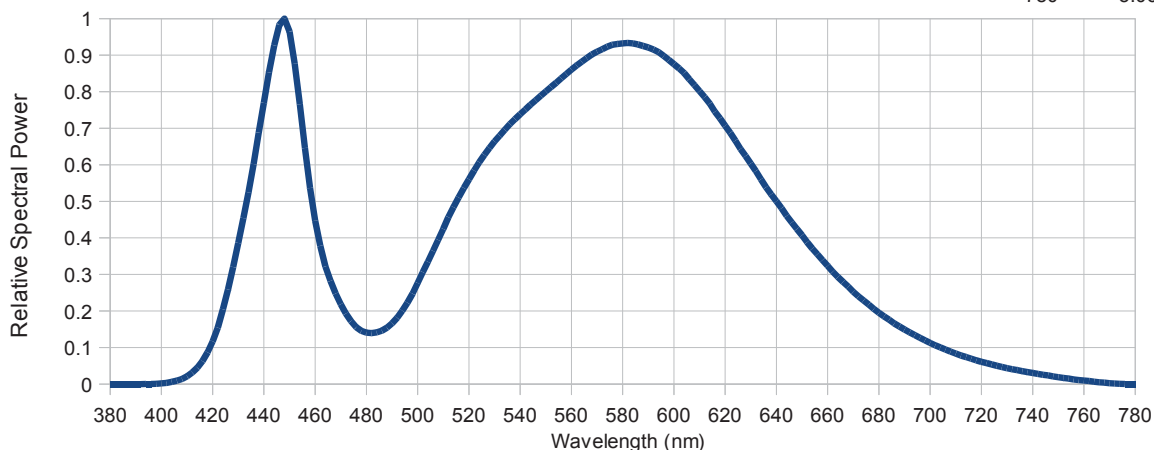
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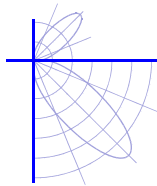
LM-79 Performance Data

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

380	0.00E+00	480	1.41E-01	580	9.32E-01	680	1.95E-01
385	0.00E+00	485	1.44E-01	585	9.31E-01	685	1.71E-01
390	0.00E+00	490	1.66E-01	590	9.21E-01	690	1.49E-01
395	5.34E-05	495	2.12E-01	595	9.03E-01	695	1.30E-01
400	1.63E-03	500	2.77E-01	600	8.76E-01	700	1.13E-01
405	7.37E-03	505	3.49E-01	605	8.43E-01	705	9.73E-02
410	2.13E-02	510	4.24E-01	610	8.02E-01	710	8.33E-02
415	5.38E-02	515	4.97E-01	615	7.57E-01	715	7.15E-02
420	1.17E-01	520	5.60E-01	620	7.07E-01	720	6.09E-02
425	2.32E-01	525	6.17E-01	625	6.55E-01	725	5.19E-02
430	3.86E-01	530	6.64E-01	630	6.04E-01	730	4.35E-02
435	5.63E-01	535	7.04E-01	635	5.49E-01	735	3.66E-02
440	7.70E-01	540	7.38E-01	640	5.00E-01	740	3.01E-02
445	9.55E-01	545	7.70E-01	645	4.51E-01	745	2.44E-02
450	9.64E-01	550	8.01E-01	650	4.07E-01	750	1.88E-02
455	7.06E-01	555	8.31E-01	655	3.63E-01	755	1.38E-02
460	4.47E-01	560	8.60E-01	660	3.23E-01	760	9.81E-03
465	3.02E-01	565	8.87E-01	665	2.86E-01	765	5.39E-03
470	2.18E-01	570	9.10E-01	670	2.52E-01	770	2.31E-03
475	1.64E-01	575	9.26E-01	675	2.23E-01	775	5.39E-04
						780	5.06E-05



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



Test Report No. LLI-16217-1

Greenstar Products - Pole arm mounted roadway luminaire. Product ID: XAVX08431SNDXX
 Grey painted cast aluminum housing with fins. Fixture extents ~ 25" x 10" x 4.5".
 8 LEDs mounted in 2 x 4 array on white PCB with clear plastic sheet of individual lenses.
 One Inventronics driver. Model: EUC-096S210DT
 Operating at 120 Vac and 60 Hz with dimming disconnected.

LM-79 Performance Data

Spatial measurements

Vertical angle (deg)	CIE 1976 (u',v') coordinates	
	Horizontal 0 plane	Horizontal 90 plane
0	(0.223, 0.482)	(0.223, 0.480)
10	(0.223, 0.483)	(0.223, 0.480)
20	(0.223, 0.484)	(0.223, 0.481)
30	(0.223, 0.487)	(0.223, 0.486)
40	(0.224, 0.490)	(0.224, 0.494)
50	(0.224, 0.495)	(0.224, 0.502)
60	(0.225, 0.503)	(0.225, 0.511)
70	(0.225, 0.514)	(0.224, 0.508)
80	I <= 10 %	I <= 10 %
-	-	-

Spatial measurements

Vertical angle (deg)	CIE 1976 (u',v') coordinates	
	Horizontal 0 plane	Horizontal 90 plane
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

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	Horizontal	Stabilization Time	19.0 hour
		Total Operation Time	23.0 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°		

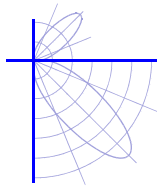
PhotoResearch PR-670 spectroradiometer (380 - 780 nm., 2 nm. per pixel) measuring at a distance from the sample deemed greater than five times the maximum observed luminous opening dimension.

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 v5.1 (28th Jun 2016)



Test Report No. LLI-16217-1

Greenstar Products - Pole arm mounted roadway luminaire. Product ID: XAVX08431SNDXX
Grey painted cast aluminum housing with fins. Fixture extents ~ 25" x 10" x 4.5".
8 LEDs mounted in 2 x 4 array on white PCB with clear plastic sheet of individual lenses.
One Inventronics driver. Model: EUC-096S210DT
Operating at 120 Vac and 60 Hz with dimming disconnected.

Test Distance 8.0 m
Test Temperature 24.9 °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 publications: IES LM-79-08 (Sec. 12), IES LM-16-93, IES LM-58-13, CIE 13.3:1995, CIE 15:2004, ANSI C78.377:2011, ANSI C82.77:2002.

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 IESNA Type C coordinate system (L, V) as defined in IESNA publication LM-75.

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