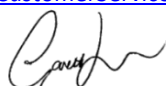


astro

PHOTOMETRIC
TEST REPORT

Report Number	GNC-2113
Customer	Astro Lighting Limited
Contact	David Green
Product Type	LED Wall light
Test Purpose	Generation of photometric data
Quote Reference	Q-LUX18-300381
Works Order Number	WO-2113
Test Item Reference	TI-20195
LAB Test Method Reference	Goniometric (Type C) Intensity Scan - IES/LDT Files & Report - Scan Increments 15 degrees Azimuth by 2.5 degrees inclination
Test Standards	LM-79-08; (BS) EN 13032-4:2015; CIE S025:2015
Lab Location Reference	LUX-TSI
Tested by	Mike Sewell
Date of Test	18-12-18
Reviewed by	Gareth Jones
Number of products tested	1

Address: LUX-TSI Ltd.,
Pencoed Technology Park,
Pencoed, Bridgend,
CF35 5AQ, UK
Telephone: +44 (0) 1656 864618
Authorised by: G. Jones
Email: CustomerService@lux-tsi.com
Signed:



Date: 18/12/2018



Fuse LED

Disclaimers

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Nomenclature

Lamp Orientation described below relates to the position in which a lamp is designed to operate for maximum performance and safety, these include:

BD - Base Down (bulb is vertically positioned with the metal base at the bottom, glass up)

BU - Base Up (bulb is vertically positioned with the metal base at the top, glass hanging down)

HBD - Horizontal $+15^{\circ}$ to Base Down

H45 - Horizontal to -45° only

VBU - Vertical Base Up $\pm 15^{\circ}$

VBD - Vertical Base Down $\pm 15^{\circ}$

HBU - Base Up $\pm 90^{\circ}$ (bulb can be operated in a base up or horizontal position)

HOR - Horizontal Burn (bulb is positioned with the metal base parallel to the ground)

H75 - Horizontal $\pm 75^{\circ}$ (bulb should not be operated within 15° of vertical)

U - Universal Burn (burn can be operated in any position)

Test Conditions

Measurements were made with an ambient temperature of $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. Measurements were taken only after sufficient time for thermal stabilisation has been allowed. Thermal stabilisation according to LM-79-08 was achieved before measurements are measured and reported.

Calibrations

The far field Type C Goniophotometer is calibrated using an intensity lamp calibrated by a NVLAP accredited calibration laboratory.

Test Equipment

UL LSI Custom Far-Field Type C Moving Mirror Goniophotometer measures intensity as a function of angle. Spectral measurements are measured using a Labsphere 1 metre integrating sphere.

Data Formats

IES (15 deg azimuth and 2.5 deg inclination) and LDT (15 deg C planes and 2.5 deg gamma angles)

Spectral Data file from which the calculation of chromaticity and CRI etc. have been performed and the derived results from the LightMtrX software are provided as a text file format.

All photometric data for LED products will be provided in ABSOLUTE photometric format and all non-LED data will be in relative photometric format with lamp lumens measured separately, where possible, for LOR estimation.

Product Name	Fuse Switched LED II
Part/Serial Number	1215039
Type of Product	LED Wall light
Base Type	Not Applicable - Luminaire
Driver Type	Internal
Test Time	30 mins
Operating Orientation	Base Up
Test Orientation	Base Up
Ambient Temperature	25.2°C
Manufacturer	Astro Lighting Limited
Date of Manufacture	Not Available
Thermal Management	Passive
Dimmable	No
Pre-Burning Time	0 hours
Stabilisation Time	60 mins
Humidity	29.9% RH
Averaging Applied	NONE



Driver Details		
Manufacturer		N/A
Model		N/A
Part/Serial #		N/A
Rated Voltage		N/A
Output	Current	N/A
	Voltage	N/A

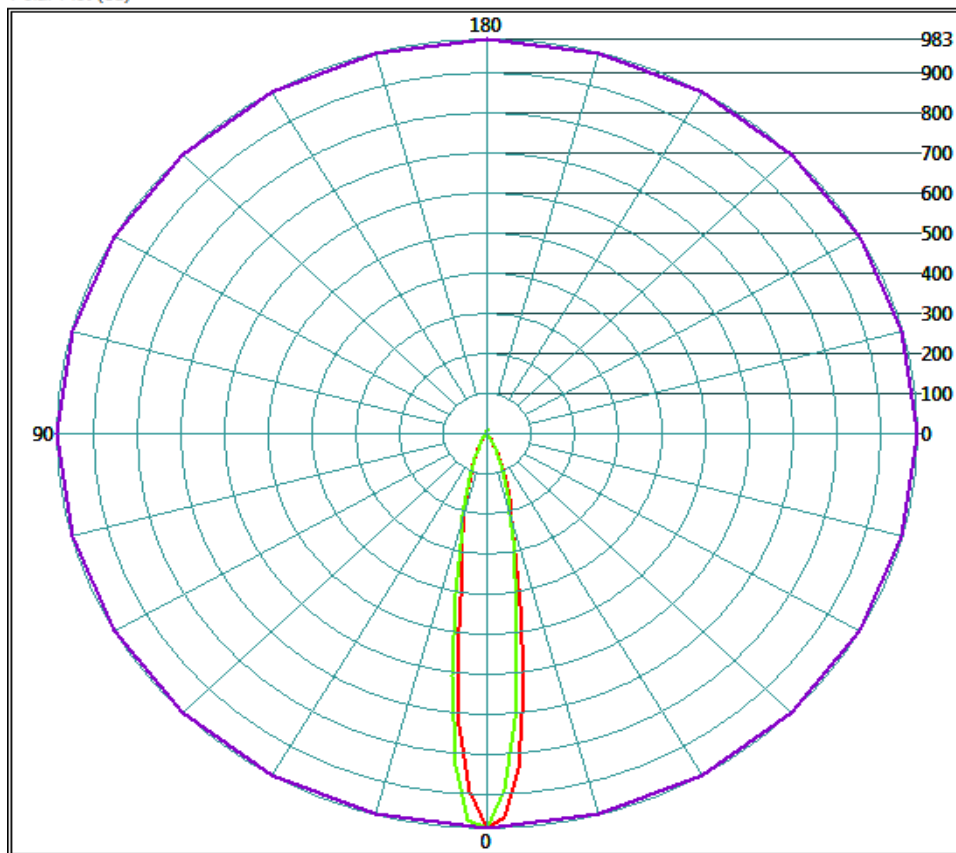
Photometric Measurements	
Luminous Flux	171 lm
Luminous Efficacy	41 lm/W

Dimension	Sample	Luminous Opening
Diameter/Width	75 mm	20 mm Φ
Length	71 mm	
Height/Depth	180 mm	0 mm

Electrical Measurements	
Frequency	50 Hz
Voltage	230.1 V
Current	0.050 A
Power	4.2 W
Power Factor	0.365
Apparent Power	11.6 VA

Goniophotometric Measurements		
Beam Angle	Horizontal	17°
	Vertical	17°
On-axis Intensity		982 cd
Peak Intensity		983 cd
Peak Direction	Horizontal	120°
	Vertical	3°

Polar Plot (cd)



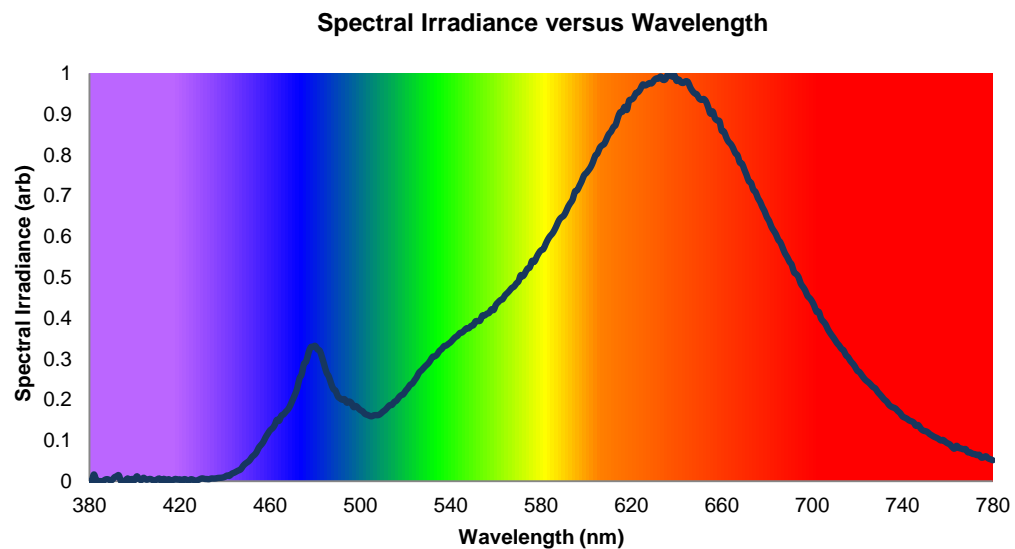
0.00	
180.00	
90.00	
270.00	
0.00	

Mounting Height (m)	Beam Width (m)		Projected Illuminance (lux)
	C0-C180 plane	C90-270 plane	
0.5	0.1	0.1	3927
1	0.3	0.3	982
2	0.6	0.6	245
3	0.9	0.9	109
4	1.2	1.2	61
5	1.5	1.5	39
7.5	2.2	2.2	17
10	3.0	3.0	10
20	6.0	6.0	2

Spectral Results

Integrated Spectral Measurement using spectroradiometer and 1 metre integrating sphere

The following data was determined from an integrated spectral measurement using a spectrometer. This will produce spatially averaged spectroradiometric results measured in an integrating sphere.



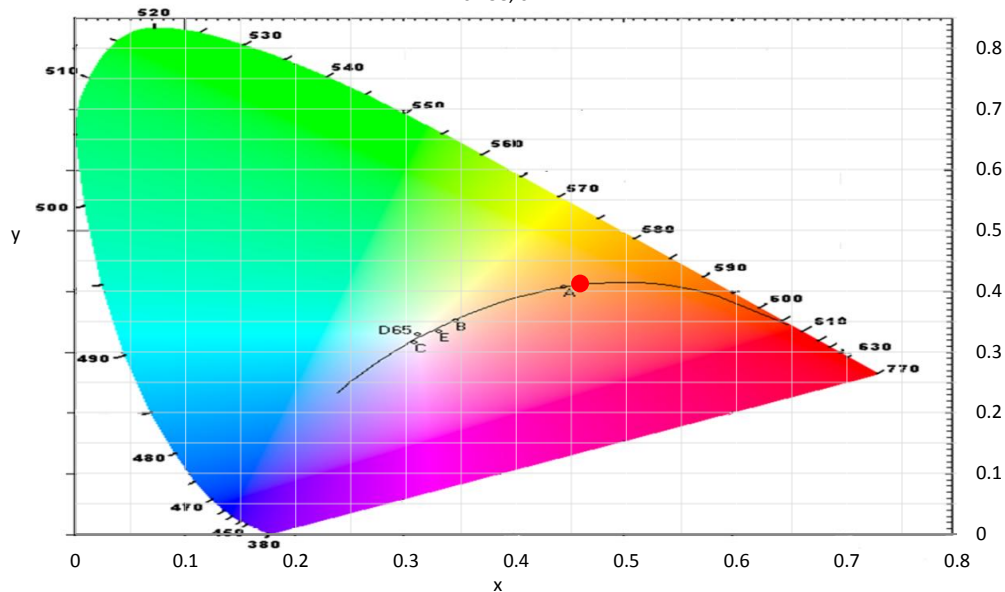
Colour Rendering Index Detail			
R1	79	R8	58
R2	90	R9	8
R3	96	R10	79
R4	79	R11	77
R5	80	R12	76
R6	89	R13	82
R7	82	R14	98

Colorimetric Details	
CCT	2733K
CRI (Ra)	82

Chromaticity Coordinates		
CIE 1931	x	0.4581
	y	0.4120
CIE 1960	u	0.2608
	v	0.3517
CIE 1976	u'	0.2608
	v'	0.5276
Duv		0.0004

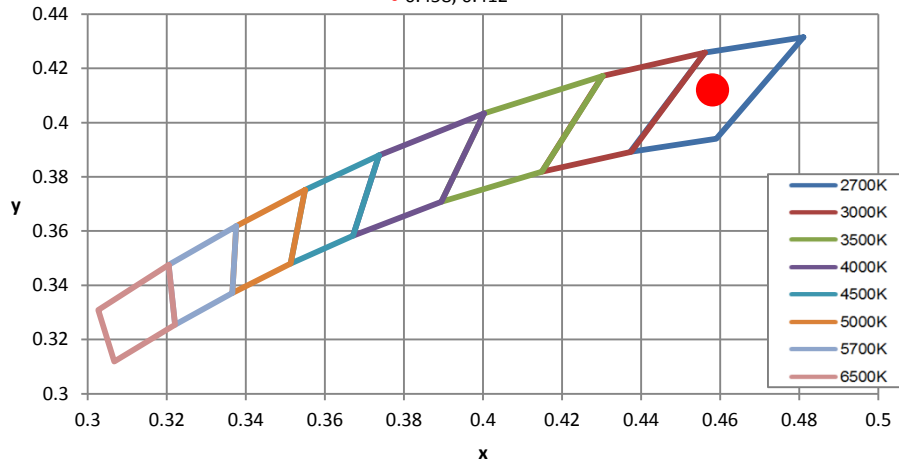
CIE 1931 Colour Chart

• 0.458, 0.412



CIE 1931 x, y Chromaticity Diagram - Nominal CCT Quadrangles

• 0.458, 0.412



Spectral Power Distribution

λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units
380	0.00E+00	430	6.88E-03	480	3.32E-01	530	2.88E-01
381	7.01E-04	431	5.49E-03	481	3.23E-01	531	2.96E-01
382	1.65E-02	432	5.15E-03	482	3.20E-01	532	3.05E-01
383	2.76E-03	433	4.74E-03	483	3.04E-01	533	3.06E-01
384	3.61E-04	434	6.58E-03	484	2.85E-01	534	3.11E-01
385	0.00E+00	435	6.38E-03	485	2.66E-01	535	3.20E-01
386	2.14E-04	436	6.81E-03	486	2.57E-01	536	3.24E-01
387	3.75E-03	437	7.90E-03	487	2.40E-01	537	3.31E-01
388	4.83E-03	438	8.21E-03	488	2.26E-01	538	3.33E-01
389	2.64E-03	439	8.87E-03	489	2.22E-01	539	3.37E-01
390	2.59E-03	440	1.07E-02	490	2.08E-01	540	3.41E-01
391	9.24E-03	441	1.39E-02	491	2.03E-01	541	3.47E-01
392	1.18E-02	442	1.29E-02	492	2.00E-01	542	3.53E-01
393	1.44E-02	443	1.81E-02	493	2.01E-01	543	3.56E-01
394	0.00E+00	444	2.04E-02	494	1.92E-01	544	3.63E-01
395	0.00E+00	445	2.34E-02	495	1.95E-01	545	3.65E-01
396	2.42E-03	446	2.62E-02	496	1.92E-01	546	3.70E-01
397	6.65E-03	447	2.90E-02	497	1.82E-01	547	3.75E-01
398	0.00E+00	448	3.70E-02	498	1.84E-01	548	3.75E-01
399	5.49E-03	449	4.26E-02	499	1.79E-01	549	3.81E-01
400	2.15E-03	450	4.66E-02	500	1.74E-01	550	3.82E-01
401	1.19E-02	451	5.14E-02	501	1.71E-01	551	3.92E-01
402	5.27E-03	452	5.94E-02	502	1.65E-01	552	3.93E-01
403	2.51E-03	453	6.41E-02	503	1.63E-01	553	3.94E-01
404	8.34E-03	454	7.09E-02	504	1.60E-01	554	4.06E-01
405	3.69E-03	455	8.22E-02	505	1.59E-01	555	4.06E-01
406	4.12E-03	456	8.88E-02	506	1.62E-01	556	4.11E-01
407	5.64E-03	457	9.62E-02	507	1.62E-01	557	4.13E-01
408	2.56E-03	458	1.07E-01	508	1.62E-01	558	4.21E-01
409	1.57E-03	459	1.16E-01	509	1.66E-01	559	4.20E-01
410	4.50E-03	460	1.25E-01	510	1.71E-01	560	4.32E-01
411	6.37E-03	461	1.29E-01	511	1.75E-01	561	4.39E-01
412	0.00E+00	462	1.37E-01	512	1.81E-01	562	4.44E-01
413	5.72E-03	463	1.50E-01	513	1.86E-01	563	4.46E-01
414	5.15E-04	464	1.48E-01	514	1.87E-01	564	4.56E-01
415	4.86E-03	465	1.61E-01	515	1.94E-01	565	4.61E-01
416	2.15E-03	466	1.64E-01	516	1.97E-01	566	4.67E-01
417	2.54E-03	467	1.71E-01	517	2.05E-01	567	4.74E-01
418	5.52E-03	468	1.76E-01	518	2.11E-01	568	4.77E-01
419	3.46E-03	469	1.86E-01	519	2.13E-01	569	4.84E-01
420	4.63E-03	470	1.99E-01	520	2.21E-01	570	4.90E-01
421	1.28E-03	471	2.12E-01	521	2.28E-01	571	5.05E-01
422	5.12E-03	472	2.27E-01	522	2.36E-01	572	5.03E-01
423	3.40E-03	473	2.51E-01	523	2.40E-01	573	5.12E-01
424	1.86E-03	474	2.62E-01	524	2.48E-01	574	5.21E-01
425	4.86E-03	475	2.88E-01	525	2.56E-01	575	5.24E-01
426	3.13E-03	476	2.94E-01	526	2.66E-01	576	5.40E-01
427	1.36E-03	477	3.14E-01	527	2.71E-01	577	5.38E-01
428	2.51E-03	478	3.28E-01	528	2.78E-01	578	5.49E-01
429	5.13E-03	479	3.29E-01	529	2.83E-01	579	5.59E-01
						580	5.66E-01

Spectral Power Distribution

λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units	λ (nm)	Arb units
581	5.69E-01	631	9.88E-01	681	6.38E-01	731	2.07E-01
582	5.81E-01	632	9.87E-01	682	6.24E-01	732	2.00E-01
583	5.92E-01	633	9.92E-01	683	6.14E-01	733	1.95E-01
584	6.01E-01	634	9.84E-01	684	6.05E-01	734	1.88E-01
585	6.07E-01	635	9.85E-01	685	5.92E-01	735	1.83E-01
586	6.17E-01	636	9.96E-01	686	5.85E-01	736	1.80E-01
587	6.28E-01	637	1.00E+00	687	5.72E-01	737	1.78E-01
588	6.40E-01	638	9.92E-01	688	5.59E-01	738	1.72E-01
589	6.47E-01	639	9.96E-01	689	5.49E-01	739	1.67E-01
590	6.51E-01	640	9.82E-01	690	5.38E-01	740	1.59E-01
591	6.61E-01	641	9.85E-01	691	5.31E-01	741	1.56E-01
592	6.73E-01	642	9.78E-01	692	5.12E-01	742	1.53E-01
593	6.82E-01	643	9.77E-01	693	5.08E-01	743	1.49E-01
594	6.91E-01	644	9.80E-01	694	5.00E-01	744	1.47E-01
595	7.10E-01	645	9.79E-01	695	4.84E-01	745	1.44E-01
596	7.13E-01	646	9.66E-01	696	4.76E-01	746	1.36E-01
597	7.25E-01	647	9.57E-01	697	4.67E-01	747	1.38E-01
598	7.36E-01	648	9.51E-01	698	4.54E-01	748	1.30E-01
599	7.50E-01	649	9.48E-01	699	4.49E-01	749	1.25E-01
600	7.55E-01	650	9.38E-01	700	4.41E-01	750	1.23E-01
601	7.62E-01	651	9.35E-01	701	4.29E-01	751	1.21E-01
602	7.71E-01	652	9.37E-01	702	4.15E-01	752	1.16E-01
603	7.83E-01	653	9.31E-01	703	4.15E-01	753	1.12E-01
604	7.98E-01	654	9.17E-01	704	3.98E-01	754	1.09E-01
605	8.04E-01	655	9.01E-01	705	3.91E-01	755	1.07E-01
606	8.18E-01	656	9.07E-01	706	3.84E-01	756	1.04E-01
607	8.23E-01	657	8.90E-01	707	3.72E-01	757	9.97E-02
608	8.27E-01	658	8.85E-01	708	3.63E-01	758	1.01E-01
609	8.39E-01	659	8.83E-01	709	3.55E-01	759	9.65E-02
610	8.51E-01	660	8.59E-01	710	3.48E-01	760	9.29E-02
611	8.57E-01	661	8.57E-01	711	3.39E-01	761	9.00E-02
612	8.68E-01	662	8.43E-01	712	3.33E-01	762	8.39E-02
613	8.73E-01	663	8.32E-01	713	3.25E-01	763	7.95E-02
614	8.91E-01	664	8.27E-01	714	3.20E-01	764	8.67E-02
615	9.04E-01	665	8.17E-01	715	3.09E-01	765	8.14E-02
616	9.06E-01	666	8.05E-01	716	3.04E-01	766	8.00E-02
617	9.18E-01	667	7.99E-01	717	2.95E-01	767	7.81E-02
618	9.10E-01	668	7.81E-01	718	2.88E-01	768	7.87E-02
619	9.34E-01	669	7.78E-01	719	2.81E-01	769	7.08E-02
620	9.36E-01	670	7.64E-01	720	2.71E-01	770	7.08E-02
621	9.40E-01	671	7.51E-01	721	2.67E-01	771	6.69E-02
622	9.52E-01	672	7.36E-01	722	2.60E-01	772	6.65E-02
623	9.54E-01	673	7.31E-01	723	2.52E-01	773	6.38E-02
624	9.62E-01	674	7.14E-01	724	2.46E-01	774	6.47E-02
625	9.73E-01	675	7.09E-01	725	2.42E-01	775	5.76E-02
626	9.70E-01	676	6.94E-01	726	2.37E-01	776	5.86E-02
627	9.73E-01	677	6.85E-01	727	2.31E-01	777	6.10E-02
628	9.76E-01	678	6.72E-01	728	2.28E-01	778	5.58E-02
629	9.75E-01	679	6.61E-01	729	2.19E-01	779	5.38E-02
630	9.83E-01	680	6.47E-01	730	2.13E-01	780	5.12E-02

Measurement Uncertainty

The following is the reported expanded uncertainty of the UL 6440T Type C Mirror Goniophotometer.

Parameter	Uncertainty
Total Luminous Flux (%)	± 4.9
Luminous Intensity (%)	± 4.9
Temperature ($^{\circ}\text{C}$)	± 1.0
Voltage DC TY720 (%)	± 0.017
Current DC TY720 (%)	± 0.10
Voltage AC WT210 (%)	± 0.059
Current AC WT210 (%)	± 0.025
Power AC WT210 (%)	± 0.23
Frequency (50/60 Hz) WT210 (%)	± 0.004
Power Factor WT210 (%)	± 0.06

The reported expanded uncertainty is based on the combined standard uncertainty multiplied by a coverage factor of $k = 2$. This value of k gives a coverage probability of approximately 95%, assuming a normal distribution. This determination of the measurement uncertainty has been done in accordance with international requirements including UKAS, BIPM Guide to the Expression of Uncertainty in Measurement and CIE 198:2011 and CIE S 025/E:2015.

Electrical measurement equipment used for the determination of results for this report, are compliant and meet the performance requirements of the measurement standards used.

----- END OF REPORT -----