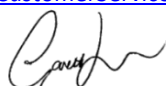


astro

PHOTOMETRIC
TEST REPORT

Report Number	GNC-3753
Customer	Astro Lighting Limited
Contact	David Green
Product Type	LED Downlight
Test Purpose	Generation of photometric data
Quote Reference	Q-LUX18-300167
Works Order Number	WO-3753
Test Item Reference	TI-21049
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	29-01-19
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: 29/01/2019



Yuma 70 White

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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. The integrating sphere spectroradiometer system has been calibrated using a Reference Standard Lamp traceable to NPL.

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	Yuma Surface 250
Part/Serial Number	1399013
Type of Product	LED Downlight
Base Type	Not Applicable - Luminaire
Driver Type	Internal
Test Time	30 mins
Operating Orientation	Base Up
Test Orientation	Base Up
Ambient Temperature	25.8°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	26.5% RH
Averaging Applied	NONE



Driver Details		
Manufacturer	HEP	
Model	LNTC10W500LR	
Part/Serial #	N/A	
Rated Voltage	N/A	
Output	Current	N/A
	Voltage	N/A

Photometric Measurements	
Luminous Flux	632 lm
Luminous Efficacy	61 lm/W

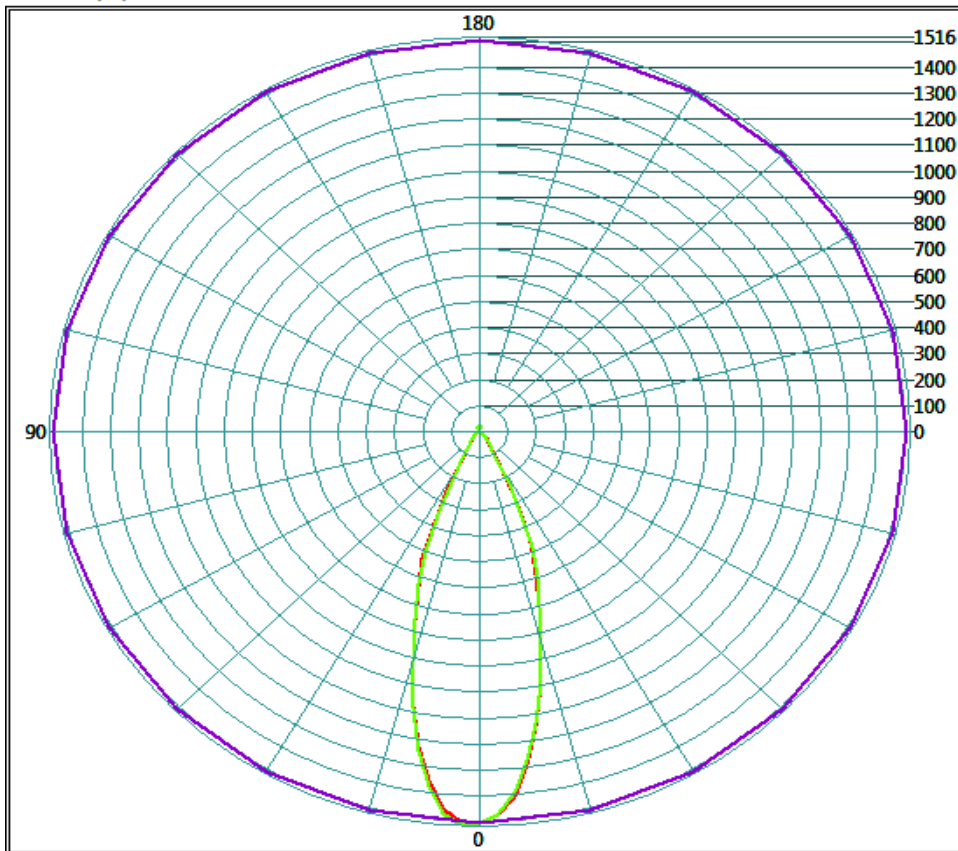
Dimension	Sample	Luminous Opening
Diameter/Width	70 mm Φ	35 mm Φ
Length		
Height/Depth	250 mm	0 mm

Electrical Measurements	
Frequency	50 Hz
Voltage	230.0 V
Current	0.046 A
Power	10.3 W
Power Factor	0.983
Apparent Power	10.5 VA

Goniophotometric Measurements

Beam Angle	Horizontal	34°
	Vertical	34°
On-axis Intensity		1506 cd
Peak Intensity		1516 cd
Peak Direction	Horizontal	60°
	Vertical	3°

Polar Plot (cd)



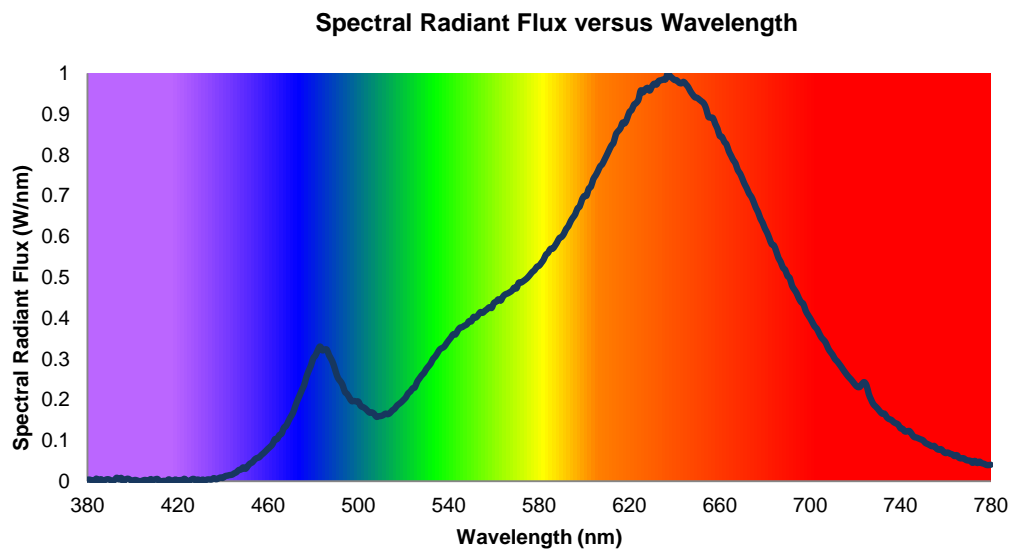
0.00	
180.00	
90.00	
270.00	
0.00	

Mounting Height (m)	Beam Width (m)		Projected Illuminance (lux)
	C0-C180 plane	C90-270 plane	
0.5	0.3	0.3	6025
1	0.6	0.6	1506
2	1.2	1.2	377
3	1.8	1.8	167
4	2.5	2.5	94
5	3.1	3.1	60
7.5	4.6	4.6	27
10	6.1	6.2	15
20	12.3	12.3	4

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.



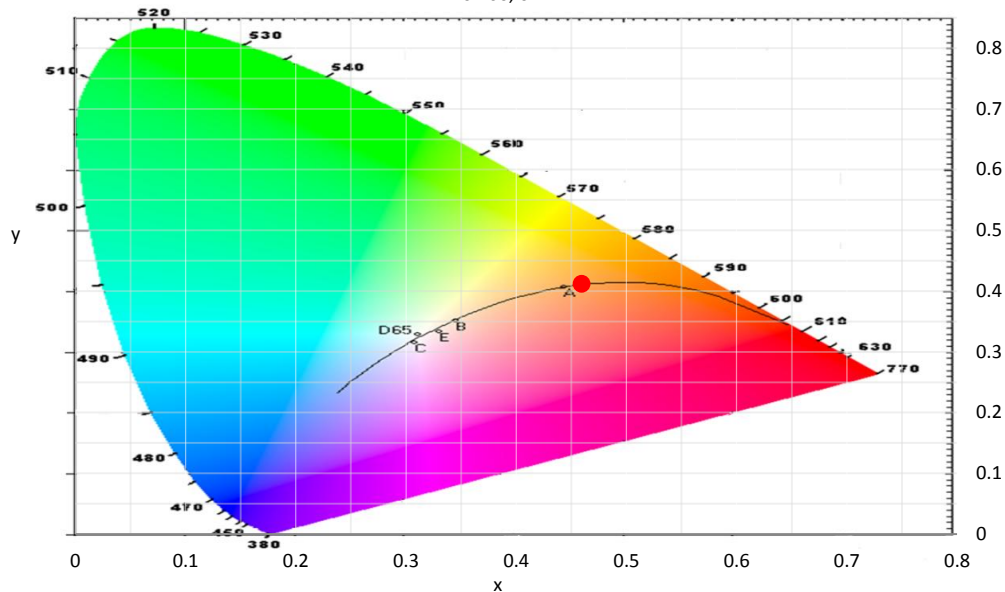
Colour Rendering Index Detail			
R1	82	R8	59
R2	92	R9	10
R3	96	R10	83
R4	82	R11	82
R5	82	R12	78
R6	92	R13	85
R7	82	R14	98

Colorimetric Details	
CCT	2711K
CRI (Ra)	83

Chromaticity Coordinates		
CIE 1931	x	0.4596
	y	0.4117
CIE 1960	u	0.2618
	v	0.3518
CIE 1976	u'	0.2618
	v'	0.5277
Duv		0.0001

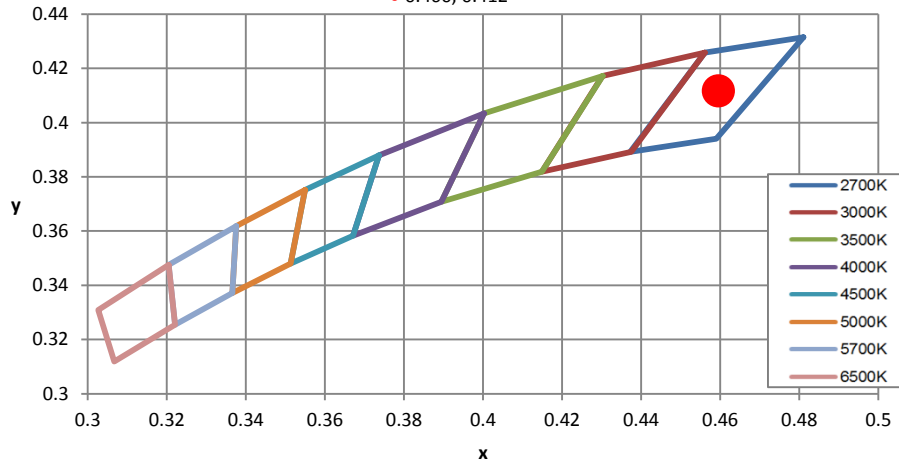
CIE 1931 Colour Chart

• 0.460, 0.412



CIE 1931 x, y Chromaticity Diagram - Nominal CCT Quadrangles

• 0.460, 0.412



Spectral Power Distribution

λ (nm)	W/nm	λ (nm)	W/nm	λ (nm)	W/nm	λ (nm)	W/nm
380	3.50E-03	430	6.29E-04	480	3.01E-01	530	2.74E-01
381	3.78E-03	431	3.90E-03	481	3.09E-01	531	2.81E-01
382	1.90E-03	432	1.59E-03	482	3.21E-01	532	2.89E-01
383	1.06E-03	433	4.01E-03	483	3.30E-01	533	2.99E-01
384	6.22E-03	434	4.16E-03	484	3.21E-01	534	3.05E-01
385	0.00E+00	435	3.89E-03	485	3.23E-01	535	3.14E-01
386	4.81E-03	436	7.49E-03	486	3.22E-01	536	3.23E-01
387	0.00E+00	437	4.50E-03	487	3.09E-01	537	3.26E-01
388	3.18E-03	438	6.86E-03	488	2.99E-01	538	3.30E-01
389	4.84E-03	439	9.07E-03	489	2.86E-01	539	3.38E-01
390	3.06E-03	440	7.96E-03	490	2.68E-01	540	3.45E-01
391	0.00E+00	441	1.23E-02	491	2.52E-01	541	3.52E-01
392	2.72E-03	442	1.34E-02	492	2.45E-01	542	3.60E-01
393	8.46E-03	443	1.49E-02	493	2.36E-01	543	3.60E-01
394	4.09E-03	444	1.57E-02	494	2.19E-01	544	3.69E-01
395	7.96E-03	445	1.91E-02	495	2.14E-01	545	3.76E-01
396	0.00E+00	446	2.19E-02	496	2.05E-01	546	3.78E-01
397	4.19E-03	447	2.72E-02	497	1.96E-01	547	3.82E-01
398	6.11E-03	448	2.85E-02	498	1.97E-01	548	3.84E-01
399	2.90E-03	449	3.38E-02	499	1.95E-01	549	3.93E-01
400	1.27E-03	450	3.02E-02	500	1.95E-01	550	3.92E-01
401	3.03E-03	451	3.70E-02	501	1.85E-01	551	4.03E-01
402	1.81E-03	452	4.31E-02	502	1.82E-01	552	4.01E-01
403	0.00E+00	453	4.59E-02	503	1.78E-01	553	4.07E-01
404	4.54E-04	454	5.25E-02	504	1.73E-01	554	4.15E-01
405	2.56E-03	455	5.65E-02	505	1.68E-01	555	4.13E-01
406	2.55E-03	456	5.81E-02	506	1.69E-01	556	4.18E-01
407	0.00E+00	457	6.39E-02	507	1.65E-01	557	4.22E-01
408	5.15E-03	458	6.86E-02	508	1.58E-01	558	4.27E-01
409	1.95E-03	459	7.40E-02	509	1.59E-01	559	4.25E-01
410	4.30E-03	460	7.97E-02	510	1.60E-01	560	4.37E-01
411	5.32E-03	461	8.46E-02	511	1.62E-01	561	4.40E-01
412	0.00E+00	462	9.08E-02	512	1.66E-01	562	4.46E-01
413	0.00E+00	463	1.03E-01	513	1.64E-01	563	4.43E-01
414	8.49E-04	464	1.03E-01	514	1.67E-01	564	4.52E-01
415	0.00E+00	465	1.13E-01	515	1.74E-01	565	4.58E-01
416	4.40E-03	466	1.16E-01	516	1.77E-01	566	4.60E-01
417	1.70E-03	467	1.31E-01	517	1.85E-01	567	4.63E-01
418	2.69E-04	468	1.36E-01	518	1.89E-01	568	4.67E-01
419	4.11E-03	469	1.47E-01	519	1.94E-01	569	4.75E-01
420	0.00E+00	470	1.58E-01	520	1.99E-01	570	4.73E-01
421	2.70E-03	471	1.67E-01	521	2.05E-01	571	4.87E-01
422	2.49E-03	472	1.83E-01	522	2.15E-01	572	4.87E-01
423	5.85E-03	473	1.98E-01	523	2.20E-01	573	4.91E-01
424	2.27E-04	474	2.11E-01	524	2.28E-01	574	4.95E-01
425	9.58E-04	475	2.24E-01	525	2.30E-01	575	5.00E-01
426	3.68E-03	476	2.36E-01	526	2.43E-01	576	5.06E-01
427	5.72E-03	477	2.56E-01	527	2.52E-01	577	5.13E-01
428	1.85E-03	478	2.71E-01	528	2.59E-01	578	5.17E-01
429	4.04E-03	479	2.84E-01	529	2.65E-01	579	5.26E-01
						580	5.28E-01

Spectral Power Distribution

λ (nm)	W/nm	λ (nm)	W/nm	λ (nm)	W/nm	λ (nm)	W/nm
581	5.35E-01	631	9.75E-01	681	6.09E-01	731	1.70E-01
582	5.43E-01	632	9.73E-01	682	5.95E-01	732	1.65E-01
583	5.55E-01	633	9.81E-01	683	5.81E-01	733	1.65E-01
584	5.60E-01	634	9.83E-01	684	5.78E-01	734	1.56E-01
585	5.70E-01	635	9.85E-01	685	5.64E-01	735	1.52E-01
586	5.70E-01	636	9.85E-01	686	5.48E-01	736	1.50E-01
587	5.77E-01	637	1.00E+00	687	5.37E-01	737	1.45E-01
588	5.86E-01	638	9.93E-01	688	5.23E-01	738	1.42E-01
589	5.96E-01	639	9.88E-01	689	5.18E-01	739	1.39E-01
590	5.99E-01	640	9.84E-01	690	5.03E-01	740	1.30E-01
591	6.07E-01	641	9.83E-01	691	4.98E-01	741	1.28E-01
592	6.18E-01	642	9.77E-01	692	4.80E-01	742	1.22E-01
593	6.25E-01	643	9.76E-01	693	4.70E-01	743	1.22E-01
594	6.38E-01	644	9.79E-01	694	4.61E-01	744	1.23E-01
595	6.46E-01	645	9.73E-01	695	4.49E-01	745	1.16E-01
596	6.54E-01	646	9.67E-01	696	4.39E-01	746	1.08E-01
597	6.68E-01	647	9.56E-01	697	4.35E-01	747	1.07E-01
598	6.74E-01	648	9.48E-01	698	4.19E-01	748	1.05E-01
599	6.90E-01	649	9.41E-01	699	4.08E-01	749	1.02E-01
600	6.99E-01	650	9.40E-01	700	4.00E-01	750	1.00E-01
601	7.00E-01	651	9.35E-01	701	3.90E-01	751	9.40E-02
602	7.17E-01	652	9.31E-01	702	3.80E-01	752	9.12E-02
603	7.22E-01	653	9.26E-01	703	3.74E-01	753	8.83E-02
604	7.40E-01	654	9.13E-01	704	3.63E-01	754	8.55E-02
605	7.49E-01	655	8.93E-01	705	3.52E-01	755	8.64E-02
606	7.60E-01	656	8.92E-01	706	3.46E-01	756	8.00E-02
607	7.72E-01	657	8.90E-01	707	3.39E-01	757	7.70E-02
608	7.77E-01	658	8.76E-01	708	3.26E-01	758	7.86E-02
609	7.89E-01	659	8.64E-01	709	3.17E-01	759	7.24E-02
610	8.00E-01	660	8.46E-01	710	3.10E-01	760	6.88E-02
611	8.12E-01	661	8.44E-01	711	3.00E-01	761	7.01E-02
612	8.23E-01	662	8.32E-01	712	2.94E-01	762	6.72E-02
613	8.30E-01	663	8.26E-01	713	2.86E-01	763	6.55E-02
614	8.50E-01	664	8.09E-01	714	2.79E-01	764	6.13E-02
615	8.58E-01	665	7.98E-01	715	2.71E-01	765	6.38E-02
616	8.65E-01	666	7.87E-01	716	2.63E-01	766	5.71E-02
617	8.79E-01	667	7.79E-01	717	2.56E-01	767	5.59E-02
618	8.78E-01	668	7.63E-01	718	2.50E-01	768	5.62E-02
619	8.89E-01	669	7.54E-01	719	2.43E-01	769	5.20E-02
620	9.05E-01	670	7.42E-01	720	2.36E-01	770	5.07E-02
621	9.10E-01	671	7.28E-01	721	2.31E-01	771	4.98E-02
622	9.23E-01	672	7.18E-01	722	2.31E-01	772	4.48E-02
623	9.27E-01	673	7.05E-01	723	2.38E-01	773	4.98E-02
624	9.35E-01	674	6.97E-01	724	2.43E-01	774	4.43E-02
625	9.58E-01	675	6.85E-01	725	2.35E-01	775	4.79E-02
626	9.53E-01	676	6.70E-01	726	2.14E-01	776	4.41E-02
627	9.61E-01	677	6.59E-01	727	2.00E-01	777	4.26E-02
628	9.64E-01	678	6.44E-01	728	1.89E-01	778	4.00E-02
629	9.58E-01	679	6.34E-01	729	1.83E-01	779	3.93E-02
630	9.68E-01	680	6.20E-01	730	1.77E-01	780	4.02E-02

Measurement Uncertainty

The following is the reported expanded uncertainty of the UL 6440T Type C Mirror Goniophotometer. Colrimetric expanded uncertainty is estimated using the 1 metre integrating sphere

Parameter	Uncertainty
Total Luminous Flux (%)	± 4.9
Luminous Intensity (%)	± 4.9
Correlated Color Temperature	± 100 K
CRI	± 2
Chromaticity x	± 0.005
Chromaticity y	± 0.005
Temperature ($^{\circ}$ 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 -----