

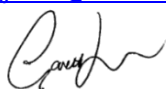
astro

PHOTOMETRIC  
TEST REPORT

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<b>Report Number</b>	GNC-21153
<b>Customer</b>	Astro Lighting Limited
<b>Contact</b>	Ross Dickson
<b>Product Type</b>	LED Pendant light
<b>Test Purpose</b>	Generation of photometric data
<b>Quote Reference</b>	Q-LUX17-21659
<b>Works Order Number</b>	WO-11800
<b>Test Item Reference</b>	TI-15097
<b>LAB Test Method Reference</b>	TES-102000
<b>Test Standards</b>	LM-79-08; (BS) EN 13032-4:2015; CIE S025:2015
<b>Lab Location Reference</b>	LUX-TSI
<b>Tested by</b>	Mike Sewell
<b>Date of Test</b>	06/06/2018
<b>Reviewed by</b>	Menno Schakel
<b>Number of products tested</b>	1

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Date: 07/06/2018



8523 Kyoto Pendant LED

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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  $-45^{\circ}$  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  $15^{\circ}$  of vertical)

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

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## 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.

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## Calibrations

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

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## Test Equipment

UL LSI Custom Far-Field Type C Moving Mirror Goniophotometer measures intensity as a function of angle. On-axis spectral measurements taken using spectrometer, for which these measurements and outputs are not accredited.

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## 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.

<b>Product Name</b>	Kyoto LED Pendant
<b>Part/Serial Number</b>	1060007
<b>Type of Product</b>	LED Pendant light
<b>Base Type</b>	Not Applicable - Luminaire
<b>Driver Type</b>	Internal
<b>Test Time</b>	30 mins
<b>Operating Orientation</b>	Base Up
<b>Test Orientation</b>	Base Up
<b>Ambient Temperature</b>	25.2°C
<b>Manufacturer</b>	Astro Lighting Limited
<b>Date of Manufacture</b>	Not available
<b>Thermal Management</b>	Passive
<b>Dimmable</b>	No
<b>Pre-Burning Time</b>	0 hours
<b>Stabilisation Time</b>	60 mins
<b>Humidity</b>	48.3% RH
<b>Averaging Applied</b>	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	412 lm
Luminous Efficacy	52 lm/W

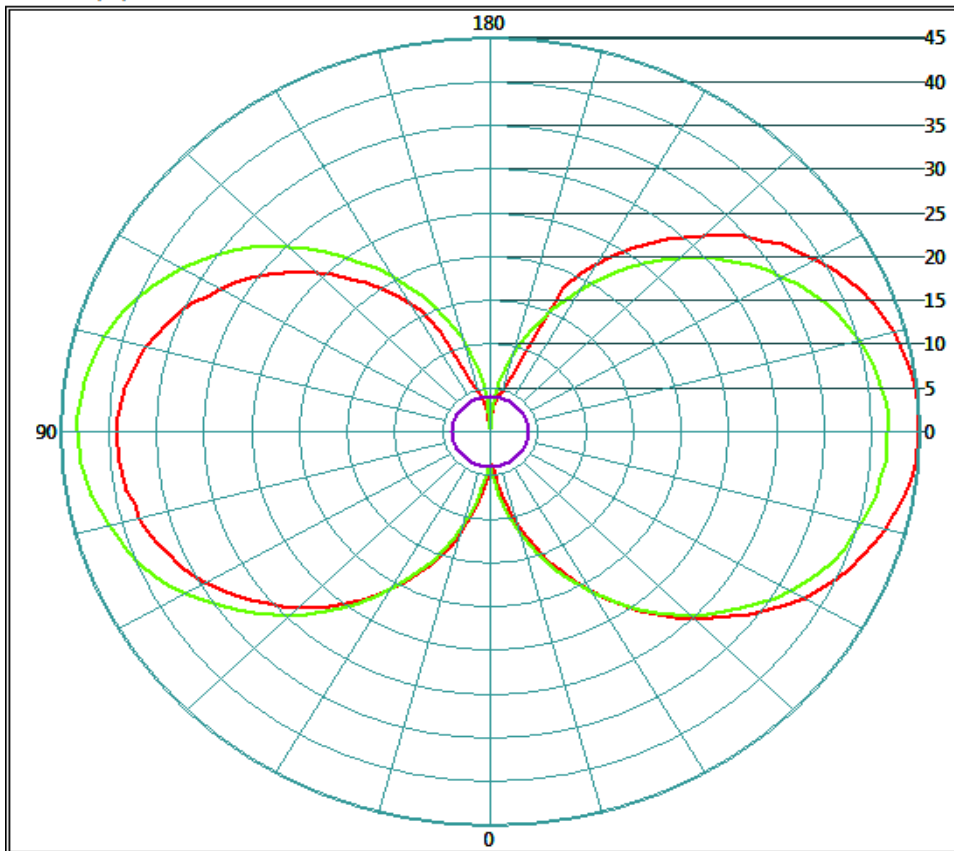
Dimension	Sample	Luminous Opening
Diameter/Width	100 mm Φ	75 mm Φ
Length		
Height/Depth	865 mm	280 mm

Electrical Measurements	
Frequency	50 Hz
Voltage	230.1 V
Current	0.038 A
Power	7.9 W
Power Factor	0.908
Apparent Power	8.7 VA

### Goniophotometric Measurements

Beam Angle	Horizontal	180°
	Vertical	180°
On-axis Intensity		4 cd
Peak Intensity		45 cd
Peak Direction	Horizontal	165°
	Vertical	93°

Polar Plot (cd)



0.00	
180.00	
90.00	
270.00	
0.00	

## Appendices & non-accredited results

### *On-axis Spectral Measurement*

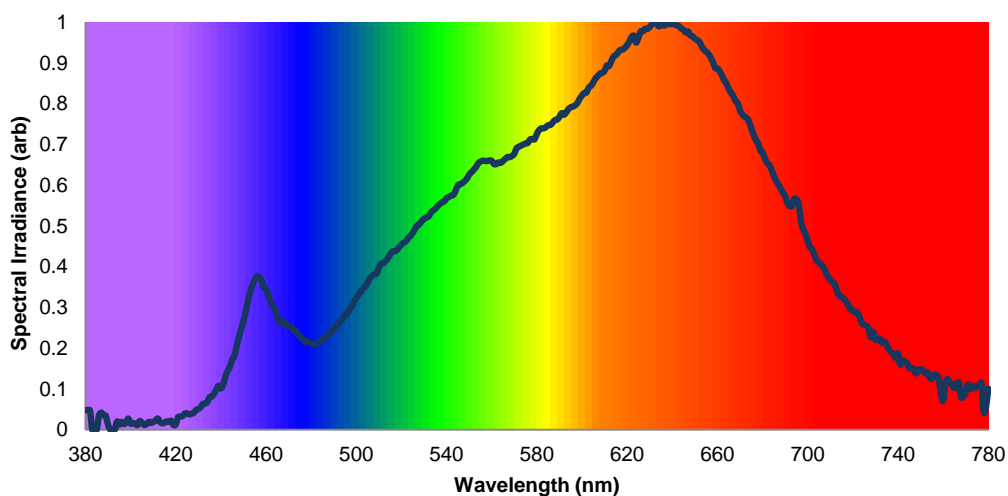
The following data was determined from an on-axis spectral measurement using a SP1000 spectrometer at a distance of 1500mm, for which these measurements and outputs are not accredited.  
Results may differ if compared to spatially averaged colourimetric result (e.g. measured in an integrating sphere).

LM79 requires spatially averaged colourimetric results (i.e. from a sphere, or from a full goniometric scan).

The colourimetric results in this report do not follow those requirements.

BS (EN) 13032 and CIE S025 do not state this requirement.

**Spectral Irradiance versus Wavelength**



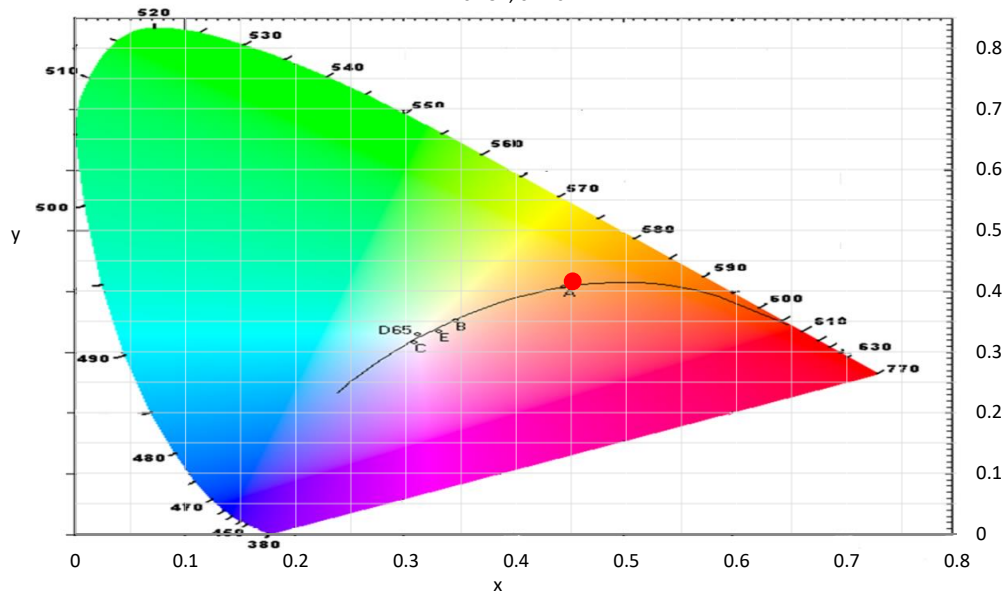
Colour Rendering Index Detail			
R1	96	R8	92
R2	96	R9	80
R3	95	R10	90
R4	95	R11	95
R5	94	R12	80
R6	95	R13	96
R7	98	R14	96

Colorimetric Details	
CCT	2862K
CRI (Ra)	95

Chromaticity Coordinates		
CIE 1931	x	0.4513
	y	0.4157
CIE 1960	u	0.2547
	v	0.3520
CIE 1976	u'	0.2547
	v'	0.5280
Duv		0.0022

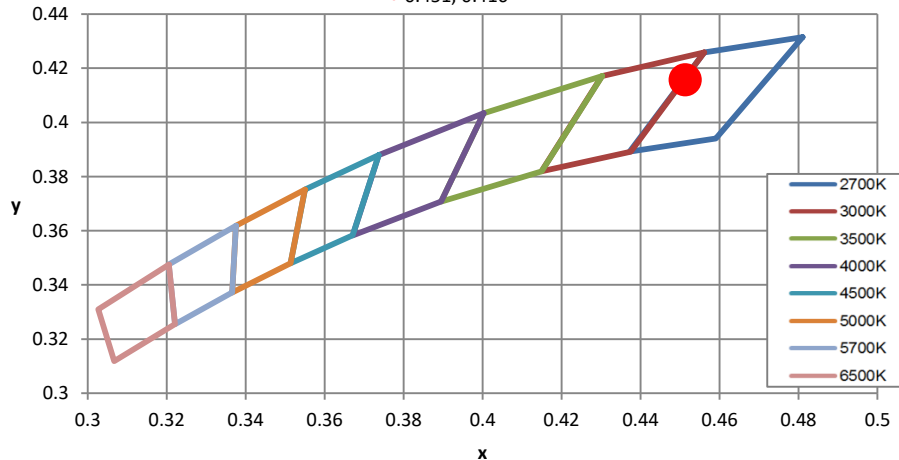
CIE 1931 Colour Chart

• 0.451, 0.416



CIE 1931 x, y Chromaticity Diagram - Nominal CCT Quadrangles

• 0.451, 0.416



### Spectral Power Distribution

$\lambda$ (nm)	Arb units	$\lambda$ (nm)	Arb units	$\lambda$ (nm)	Arb units	$\lambda$ (nm)	Arb units
380	4.80E-02	430	5.08E-02	480	2.12E-01	530	5.17E-01
381	4.82E-02	431	5.50E-02	481	2.10E-01	531	5.22E-01
382	4.74E-02	432	6.34E-02	482	2.11E-01	532	5.23E-01
383	0.00E+00	433	6.37E-02	483	2.14E-01	533	5.33E-01
384	0.00E+00	434	6.82E-02	484	2.16E-01	534	5.38E-01
385	0.00E+00	435	8.00E-02	485	2.20E-01	535	5.42E-01
386	3.54E-02	436	8.15E-02	486	2.25E-01	536	5.49E-01
387	4.20E-02	437	8.84E-02	487	2.30E-01	537	5.54E-01
388	3.51E-02	438	9.85E-02	488	2.34E-01	538	5.59E-01
389	3.44E-02	439	1.08E-01	489	2.40E-01	539	5.61E-01
390	1.23E-02	440	1.01E-01	490	2.47E-01	540	5.69E-01
391	0.00E+00	441	1.11E-01	491	2.54E-01	541	5.71E-01
392	0.00E+00	442	1.31E-01	492	2.60E-01	542	5.75E-01
393	0.00E+00	443	1.44E-01	493	2.66E-01	543	5.76E-01
394	2.02E-02	444	1.55E-01	494	2.74E-01	544	5.87E-01
395	1.24E-02	445	1.72E-01	495	2.81E-01	545	6.00E-01
396	1.93E-02	446	1.81E-01	496	2.87E-01	546	6.03E-01
397	1.36E-02	447	2.06E-01	497	2.95E-01	547	6.06E-01
398	1.79E-02	448	2.28E-01	498	3.03E-01	548	6.10E-01
399	2.73E-02	449	2.47E-01	499	3.15E-01	549	6.17E-01
400	1.48E-02	450	2.67E-01	500	3.23E-01	550	6.26E-01
401	1.64E-02	451	2.90E-01	501	3.31E-01	551	6.32E-01
402	1.45E-02	452	3.16E-01	502	3.38E-01	552	6.38E-01
403	1.13E-02	453	3.38E-01	503	3.46E-01	553	6.45E-01
404	2.14E-02	454	3.55E-01	504	3.52E-01	554	6.54E-01
405	1.73E-02	455	3.67E-01	505	3.60E-01	555	6.58E-01
406	1.17E-02	456	3.77E-01	506	3.72E-01	556	6.60E-01
407	1.32E-02	457	3.75E-01	507	3.77E-01	557	6.60E-01
408	1.92E-02	458	3.67E-01	508	3.82E-01	558	6.60E-01
409	1.65E-02	459	3.49E-01	509	3.83E-01	559	6.61E-01
410	1.89E-02	460	3.46E-01	510	3.97E-01	560	6.60E-01
411	2.22E-02	461	3.30E-01	511	4.08E-01	561	6.52E-01
412	2.75E-02	462	3.14E-01	512	4.09E-01	562	6.52E-01
413	1.93E-02	463	3.04E-01	513	4.14E-01	563	6.56E-01
414	1.57E-02	464	2.94E-01	514	4.21E-01	564	6.55E-01
415	1.71E-02	465	2.78E-01	515	4.30E-01	565	6.60E-01
416	2.04E-02	466	2.63E-01	516	4.38E-01	566	6.65E-01
417	1.92E-02	467	2.68E-01	517	4.38E-01	567	6.70E-01
418	2.20E-02	468	2.64E-01	518	4.41E-01	568	6.69E-01
419	1.15E-02	469	2.55E-01	519	4.48E-01	569	6.72E-01
420	1.26E-02	470	2.55E-01	520	4.55E-01	570	6.78E-01
421	3.07E-02	471	2.53E-01	521	4.59E-01	571	6.91E-01
422	3.20E-02	472	2.44E-01	522	4.63E-01	572	6.95E-01
423	3.34E-02	473	2.43E-01	523	4.71E-01	573	6.98E-01
424	3.96E-02	474	2.36E-01	524	4.76E-01	574	7.00E-01
425	3.99E-02	475	2.29E-01	525	4.83E-01	575	7.03E-01
426	3.75E-02	476	2.24E-01	526	4.93E-01	576	7.04E-01
427	3.91E-02	477	2.16E-01	527	5.02E-01	577	7.13E-01
428	4.12E-02	478	2.18E-01	528	5.05E-01	578	7.14E-01
429	4.84E-02	479	2.15E-01	529	5.13E-01	579	7.13E-01
						580	7.26E-01



### Spectral Power Distribution

$\lambda$ (nm)	Arb units	$\lambda$ (nm)	Arb units	$\lambda$ (nm)	Arb units	$\lambda$ (nm)	Arb units
581	7.36E-01	631	9.96E-01	681	6.66E-01	731	2.22E-01
582	7.40E-01	632	9.98E-01	682	6.55E-01	732	2.23E-01
583	7.40E-01	633	9.98E-01	683	6.50E-01	733	2.13E-01
584	7.43E-01	634	9.90E-01	684	6.38E-01	734	2.16E-01
585	7.48E-01	635	9.93E-01	685	6.23E-01	735	2.08E-01
586	7.48E-01	636	9.93E-01	686	6.12E-01	736	1.97E-01
587	7.54E-01	637	9.93E-01	687	6.02E-01	737	1.90E-01
588	7.60E-01	638	1.00E+00	688	5.92E-01	738	1.85E-01
589	7.61E-01	639	9.96E-01	689	5.82E-01	739	1.77E-01
590	7.68E-01	640	9.99E-01	690	5.74E-01	740	1.87E-01
591	7.77E-01	641	9.95E-01	691	5.57E-01	741	1.60E-01
592	7.73E-01	642	9.93E-01	692	5.48E-01	742	1.70E-01
593	7.79E-01	643	9.91E-01	693	5.50E-01	743	1.66E-01
594	7.87E-01	644	9.85E-01	694	5.67E-01	744	1.64E-01
595	7.92E-01	645	9.82E-01	695	5.66E-01	745	1.51E-01
596	7.93E-01	646	9.75E-01	696	5.55E-01	746	1.50E-01
597	7.97E-01	647	9.78E-01	697	5.13E-01	747	1.50E-01
598	8.03E-01	648	9.69E-01	698	4.92E-01	748	1.38E-01
599	8.13E-01	649	9.66E-01	699	4.81E-01	749	1.45E-01
600	8.21E-01	650	9.60E-01	700	4.65E-01	750	1.49E-01
601	8.27E-01	651	9.57E-01	701	4.48E-01	751	1.45E-01
602	8.28E-01	652	9.53E-01	702	4.43E-01	752	1.39E-01
603	8.40E-01	653	9.42E-01	703	4.29E-01	753	1.41E-01
604	8.44E-01	654	9.34E-01	704	4.15E-01	754	1.29E-01
605	8.53E-01	655	9.29E-01	705	4.12E-01	755	1.25E-01
606	8.63E-01	656	9.23E-01	706	4.04E-01	756	1.34E-01
607	8.68E-01	657	9.14E-01	707	3.99E-01	757	1.34E-01
608	8.75E-01	658	9.03E-01	708	3.87E-01	758	1.27E-01
609	8.76E-01	659	8.88E-01	709	3.76E-01	759	8.95E-02
610	8.81E-01	660	8.87E-01	710	3.68E-01	760	7.10E-02
611	8.94E-01	661	8.80E-01	711	3.63E-01	761	1.16E-01
612	8.93E-01	662	8.70E-01	712	3.57E-01	762	1.25E-01
613	9.05E-01	663	8.58E-01	713	3.40E-01	763	1.15E-01
614	9.17E-01	664	8.51E-01	714	3.30E-01	764	1.10E-01
615	9.19E-01	665	8.38E-01	715	3.25E-01	765	1.02E-01
616	9.27E-01	666	8.28E-01	716	3.22E-01	766	1.14E-01
617	9.33E-01	667	8.19E-01	717	3.14E-01	767	1.16E-01
618	9.33E-01	668	8.08E-01	718	3.06E-01	768	7.89E-02
619	9.38E-01	669	8.02E-01	719	2.95E-01	769	8.18E-02
620	9.44E-01	670	7.84E-01	720	2.93E-01	770	9.24E-02
621	9.54E-01	671	7.75E-01	721	2.88E-01	771	1.12E-01
622	9.64E-01	672	7.69E-01	722	2.89E-01	772	1.00E-01
623	9.67E-01	673	7.65E-01	723	2.76E-01	773	1.08E-01
624	9.50E-01	674	7.56E-01	724	2.61E-01	774	1.01E-01
625	9.63E-01	675	7.40E-01	725	2.58E-01	775	1.07E-01
626	9.78E-01	676	7.24E-01	726	2.55E-01	776	1.09E-01
627	9.78E-01	677	7.12E-01	727	2.48E-01	777	1.15E-01
628	9.85E-01	678	7.04E-01	728	2.26E-01	778	4.24E-02
629	9.84E-01	679	6.86E-01	729	2.41E-01	779	5.41E-02
630	9.89E-01	680	6.80E-01	730	2.21E-01	780	1.01E-01

### Measurement Uncertainty

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

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

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 -----