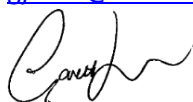


astro

PHOTOMETRIC
TEST REPORT

astrolighting.co.uk

Report Number	TRN-16790
Customer	Astro Lighting Limited
Contact	Stuart Wells
Product Type	LED Wall light
Test Purpose	Generation of Photometric Data
Sales Order Ref	Q-LUX16-20616
Works Order Number	WO-7437
Test Item Reference	TI-11649
LAB Test Method Reference	TES-10050
Test Standards	LM-79-08
Lab Location Reference	LUX-TSI
Tested by	Mike Sewell
Date of Test	4/21/2016
Analysed by	Andrew Thomas
Number of products tested	1

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



Palermo LED 600

Date: 7/1/2016

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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 Spectrometer System is calibrated using total spectral flux lamp calibrated by NPL.

Test Equipment

UL LSI Custom Far-Field Type C Moving Mirror Goniophotometer measures intensity as a function of angle. 1m Integrating Sphere Spectrometer System for Total Spectral Flux.

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	Palermo LED 600
Part/Serial Number	7619
Type of Product	LED Wall light
Base Type	Not Applicable - Luminaire
Driver Type	Internal DC
Test Time	30 mins
Operating Orientation	Horizontal
Test Orientation	Horizontal
Ambient Temperature	25.0°C
Manufacturer	Astro Lighting Limited
Date of Manufacture	Not Available
Thermal Management	Passive
Dimmable	No
Pre-Burning Time	0 hours
Stabilisation Time	45 mins
Humidity	33.2% RH
Averaging Applied	Symmetry in upper and lower lobes

Photometric Measurements	
Luminous Flux	364 lm
Luminous Efficacy	45 lm/W

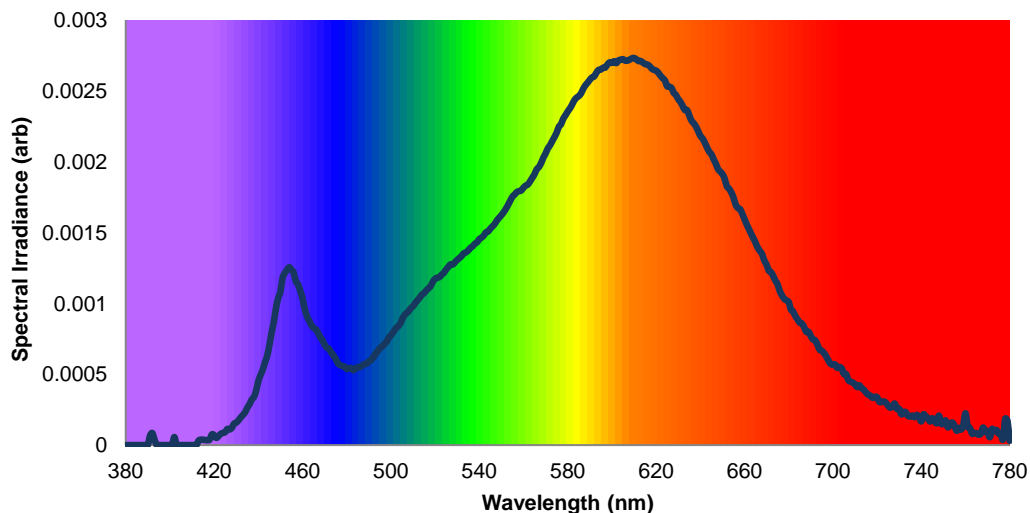
Dimension	Sample	Luminous Opening
Diameter/Width	40 mm	39 mm
Length	600 mm	400 mm
Height/Depth	60 mm	35 mm



Driver Details		
Manufacturer	HEP Group	
Model	LMV12W12 UNI	
Part/Serial #	N/A	
Rating	100-240	
Output	Current	1 A max
	Voltage	12.000 V

Electrical Measurements	
Frequency	50 Hz
Voltage	239.820 V
Current	0.071 A
Power	8.1 W
Power Factor	0.472
Peak Power VA	17.1

Spectral Irradiance versus Wavelength



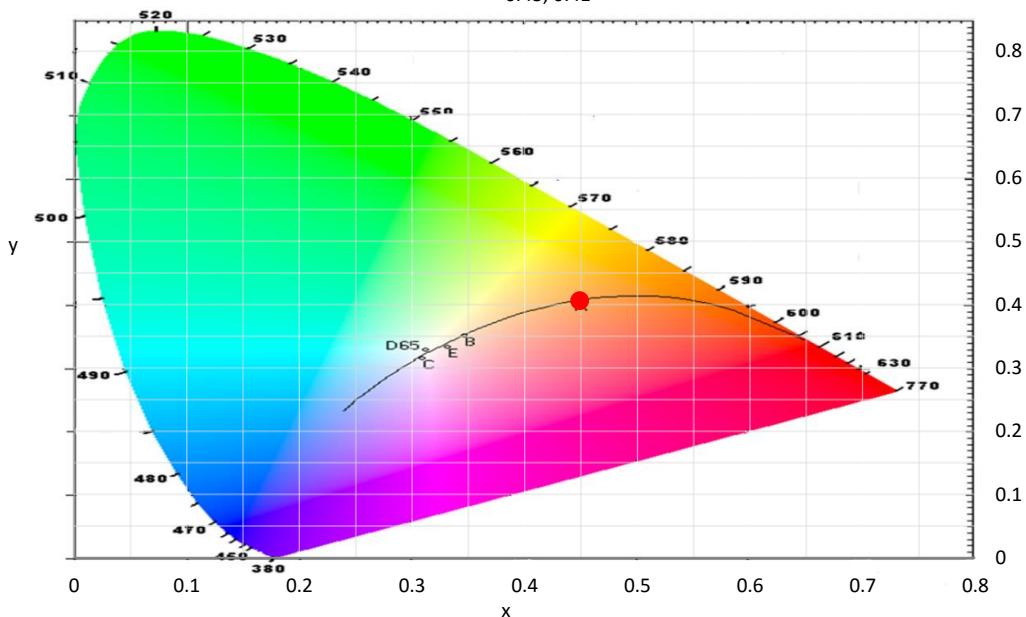
Colour Rendering Index Detail			
R1	82.9	R8	62.9
R2	92.5	R9	19.4
R3	96.3	R10	82.5
R4	81.2	R11	80.0
R5	82.7	R12	73.8
R6	90.8	R13	85.2
R7	83.8	R14	98.8

Colorimetric Details	
CCT	2824K
CRI (Ra)	84

Chromaticity Coordinates		
CIE 1931	x	0.4488
	y	0.4061
CIE 1960	u	0.2573
	v	0.3493
CIE 1976	u'	0.2573
	v'	0.5240
Duv		0.0007

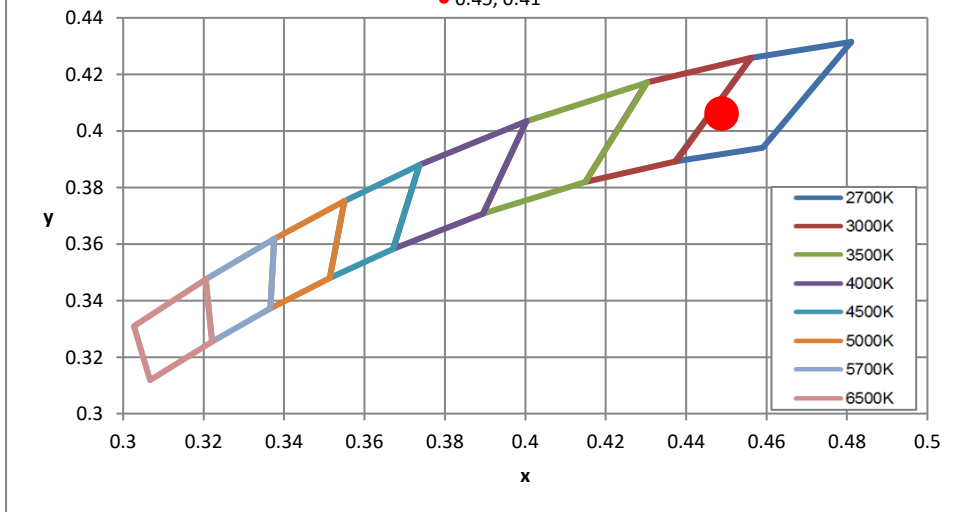
CIE 1931 Colour Chart

● 0.45, 0.41



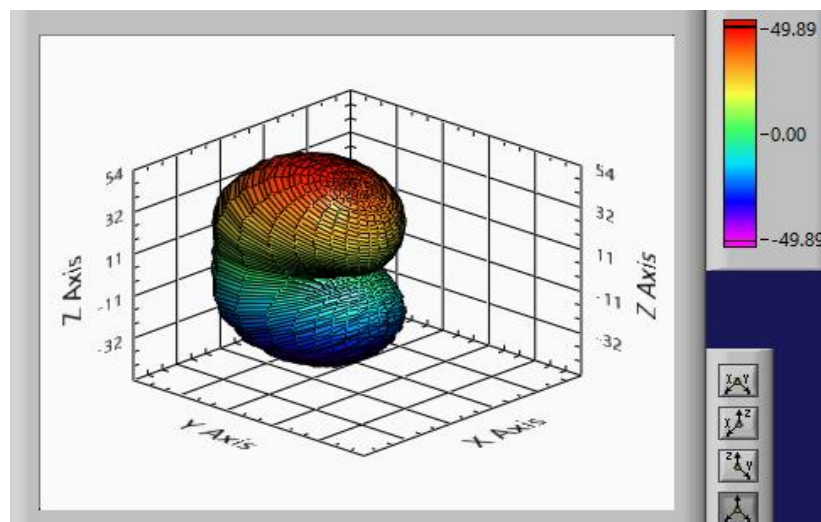
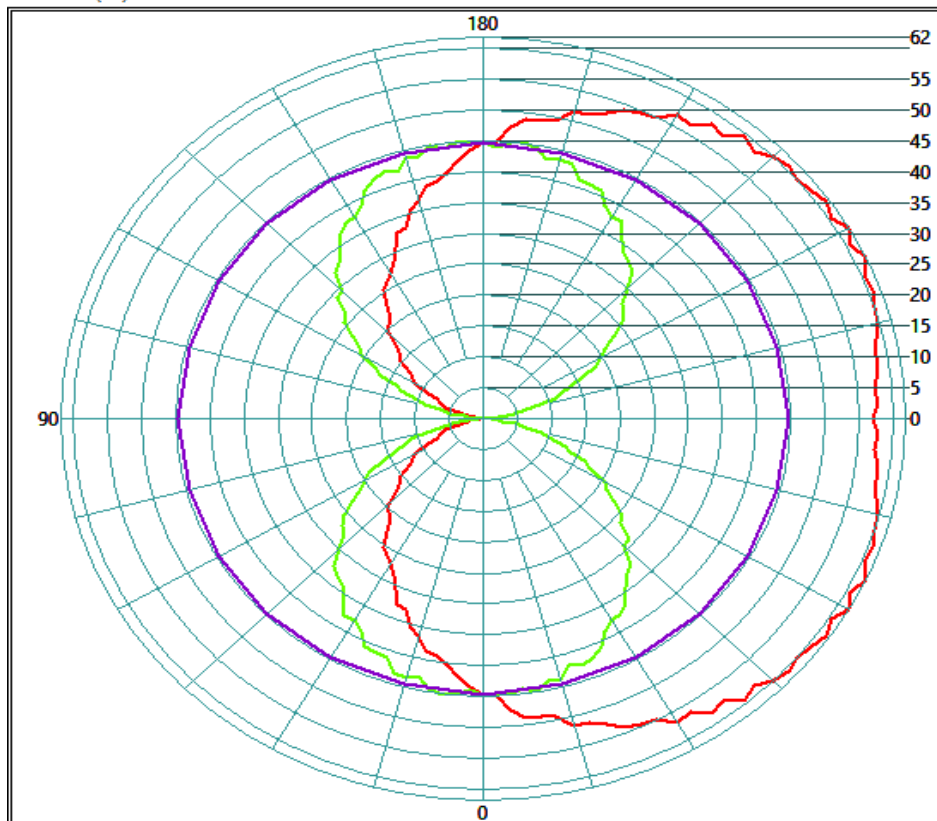
CIE 1931 x, y Chromaticity Diagram - Nominal CCT Quadrangles

● 0.45, 0.41

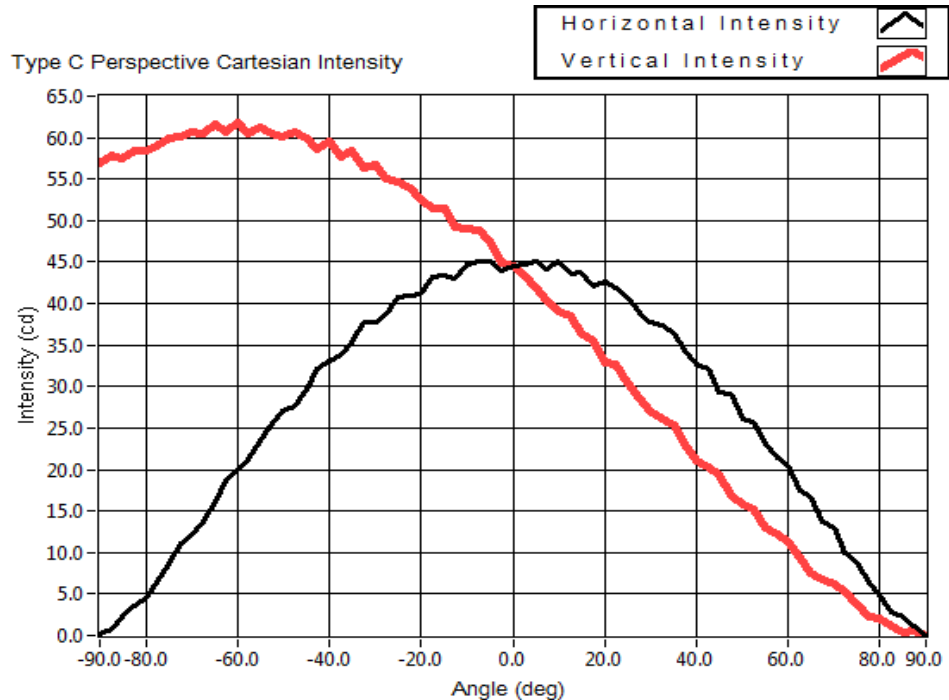


Goniophotometric Measurements		
Beam Angle	Horizontal	N/A
	Vertical	N/A
On-axis Intensity		45 cd
Peak Intensity		62 cd
Peak Direction	Horizontal	180°
	Vertical	60°

Polar Plot (cd)



Mounting Height (m)	Beam Cone Width (m)	Orthogonal Beam Cone Width (m)	Projected Illuminance (lux)
0.5	0.33	1.50	178.4
1	0.65	2.99	44.6
2	1.30	5.99	11.2
3	1.95	8.98	5.0
4	2.60	11.97	2.8
5	3.25	14.97	1.8
6	3.90	17.96	1.2
8	5.20	23.95	0.7
10	6.50	29.93	0.4
20	13.01	59.86	0.1



Spectral Power Distribution										
λ (nm)	W		λ (nm)	W		λ (nm)	W		λ (nm)	W
380	0.000000		430	1.59E-04		480	5.38E-04		530	1.31E-03
381	0.00E+00		431	1.74E-04		481	5.44E-04		531	1.32E-03
382	0.00E+00		432	1.95E-04		482	5.43E-04		532	1.34E-03
383	0.00E+00		433	2.12E-04		483	5.28E-04		533	1.35E-03
384	0.00E+00		434	2.31E-04		484	5.41E-04		534	1.36E-03
385	0.00E+00		435	2.63E-04		485	5.50E-04		535	1.37E-03
386	0.00E+00		436	2.88E-04		486	5.50E-04		536	1.39E-03
387	0.00E+00		437	3.21E-04		487	5.61E-04		537	1.40E-03
388	0.00E+00		438	3.39E-04		488	5.72E-04		538	1.42E-03
389	0.00E+00		439	3.83E-04		489	5.76E-04		539	1.43E-03
390	0.00E+00		440	4.50E-04		490	5.89E-04		540	1.45E-03
391	6.60E-05		441	4.94E-04		491	6.01E-04		541	1.46E-03
392	8.54E-05		442	5.32E-04		492	6.20E-04		542	1.48E-03
393	4.04E-05		443	5.83E-04		493	6.44E-04		543	1.50E-03
394	0.00E+00		444	6.29E-04		494	6.63E-04		544	1.51E-03
395	0.00E+00		445	7.04E-04		495	6.83E-04		545	1.53E-03
396	0.00E+00		446	7.94E-04		496	6.96E-04		546	1.54E-03
397	0.00E+00		447	8.68E-04		497	7.14E-04		547	1.56E-03
398	0.00E+00		448	9.67E-04		498	7.29E-04		548	1.59E-03
399	0.00E+00		449	1.04E-03		499	7.57E-04		549	1.61E-03
400	0.00E+00		450	1.08E-03		500	7.74E-04		550	1.62E-03
401	0.00E+00		451	1.18E-03		501	7.96E-04		551	1.64E-03
402	5.71E-05		452	1.21E-03		502	8.19E-04		552	1.67E-03
403	0.00E+00		453	1.24E-03		503	8.35E-04		553	1.70E-03
404	0.00E+00		454	1.26E-03		504	8.51E-04		554	1.73E-03
405	0.00E+00		455	1.24E-03		505	8.84E-04		555	1.75E-03
406	0.00E+00		456	1.22E-03		506	9.15E-04		556	1.77E-03
407	0.00E+00		457	1.16E-03		507	9.31E-04		557	1.79E-03
408	0.00E+00		458	1.13E-03		508	9.45E-04		558	1.79E-03
409	0.00E+00		459	1.09E-03		509	9.67E-04		559	1.80E-03
410	0.00E+00		460	1.04E-03		510	9.80E-04		560	1.82E-03
411	0.00E+00		461	9.63E-04		511	1.00E-03		561	1.83E-03
412	0.00E+00		462	9.11E-04		512	1.02E-03		562	1.84E-03
413	3.24E-05		463	8.79E-04		513	1.04E-03		563	1.86E-03
414	3.81E-05		464	8.47E-04		514	1.06E-03		564	1.89E-03
415	3.81E-05		465	8.28E-04		515	1.07E-03		565	1.91E-03
416	3.58E-05		466	8.18E-04		516	1.09E-03		566	1.95E-03
417	3.46E-05		467	7.94E-04		517	1.11E-03		567	1.96E-03
418	3.91E-05		468	7.62E-04		518	1.12E-03		568	1.99E-03
419	7.57E-05		469	7.42E-04		519	1.15E-03		569	2.03E-03
420	7.01E-05		470	7.08E-04		520	1.17E-03		570	2.06E-03
421	5.07E-05		471	6.88E-04		521	1.18E-03		571	2.09E-03
422	6.35E-05		472	6.79E-04		522	1.19E-03		572	2.12E-03
423	7.95E-05		473	6.53E-04		523	1.20E-03		573	2.15E-03
424	8.62E-05		474	6.34E-04		524	1.22E-03		574	2.17E-03
425	9.15E-05		475	6.09E-04		525	1.24E-03		575	2.21E-03
426	1.14E-04		476	5.78E-04		526	1.26E-03		576	2.25E-03
427	1.10E-04		477	5.65E-04		527	1.28E-03		577	2.27E-03
428	1.22E-04		478	5.60E-04		528	1.28E-03		578	2.30E-03
429	1.51E-04		479	5.54E-04		529	1.29E-03		579	2.33E-03
									580	2.35E-03

Spectral Power Distribution										
λ (nm)	W		λ (nm)	W		λ (nm)	W		λ (nm)	W
581	2.38E-03		631	2.42E-03		681	9.57E-04		731	2.17E-04
582	2.40E-03		632	2.39E-03		682	9.43E-04		732	2.34E-04
583	2.43E-03		633	2.37E-03		683	9.11E-04		733	2.31E-04
584	2.45E-03		634	2.37E-03		684	8.88E-04		734	2.06E-04
585	2.46E-03		635	2.33E-03		685	8.65E-04		735	2.02E-04
586	2.48E-03		636	2.29E-03		686	8.58E-04		736	2.08E-04
587	2.51E-03		637	2.27E-03		687	8.32E-04		737	1.97E-04
588	2.54E-03		638	2.25E-03		688	7.99E-04		738	2.13E-04
589	2.56E-03		639	2.22E-03		689	8.00E-04		739	1.98E-04
590	2.58E-03		640	2.18E-03		690	7.70E-04		740	1.67E-04
591	2.60E-03		641	2.17E-03		691	7.47E-04		741	2.17E-04
592	2.60E-03		642	2.14E-03		692	7.39E-04		742	2.02E-04
593	2.63E-03		643	2.10E-03		693	7.09E-04		743	1.91E-04
594	2.65E-03		644	2.07E-03		694	6.74E-04		744	1.67E-04
595	2.65E-03		645	2.05E-03		695	6.65E-04		745	1.90E-04
596	2.66E-03		646	2.02E-03		696	6.49E-04		746	1.74E-04
597	2.67E-03		647	1.99E-03		697	6.26E-04		747	1.55E-04
598	2.69E-03		648	1.95E-03		698	5.97E-04		748	2.08E-04
599	2.70E-03		649	1.93E-03		699	5.74E-04		749	1.51E-04
600	2.70E-03		650	1.91E-03		700	5.67E-04		750	1.51E-04
601	2.71E-03		651	1.88E-03		701	5.69E-04		751	1.74E-04
602	2.70E-03		652	1.83E-03		702	5.45E-04		752	1.25E-04
603	2.72E-03		653	1.81E-03		703	5.51E-04		753	1.42E-04
604	2.72E-03		654	1.78E-03		704	5.40E-04		754	1.60E-04
605	2.72E-03		655	1.75E-03		705	5.01E-04		755	1.38E-04
606	2.71E-03		656	1.70E-03		706	5.01E-04		756	1.01E-04
607	2.71E-03		657	1.67E-03		707	4.59E-04		757	1.22E-04
608	2.72E-03		658	1.67E-03		708	4.48E-04		758	1.09E-04
609	2.73E-03		659	1.63E-03		709	4.41E-04		759	1.40E-04
610	2.73E-03	660	1.60E-03	710	4.28E-04	760	2.25E-04			
611	2.72E-03	661	1.56E-03	711	4.10E-04	761	1.28E-04			
612	2.71E-03	662	1.53E-03	712	4.22E-04	762	1.21E-04			
613	2.71E-03	663	1.49E-03	713	4.02E-04	763	8.04E-05			
614	2.70E-03	664	1.46E-03	714	3.91E-04	764	8.55E-05			
615	2.69E-03	665	1.43E-03	715	3.71E-04	765	8.31E-05			
616	2.69E-03	666	1.39E-03	716	3.56E-04	766	7.33E-05			
617	2.68E-03	667	1.37E-03	717	3.48E-04	767	8.13E-05			
618	2.66E-03	668	1.35E-03	718	3.33E-04	768	1.24E-04			
619	2.65E-03	669	1.30E-03	719	3.41E-04	769	9.36E-05			
620	2.64E-03	670	1.27E-03	720	3.38E-04	770	9.84E-05			
621	2.63E-03	671	1.23E-03	721	3.06E-04	771	5.52E-05			
622	2.61E-03	672	1.22E-03	722	3.04E-04	772	1.13E-04			
623	2.59E-03	673	1.19E-03	723	3.08E-04	773	9.83E-05			
624	2.57E-03	674	1.16E-03	724	2.97E-04	774	1.07E-04			
625	2.53E-03	675	1.13E-03	725	2.78E-04	775	8.16E-05			
626	2.53E-03	676	1.09E-03	726	2.64E-04	776	7.24E-05			
627	2.52E-03	677	1.06E-03	727	2.75E-04	777	4.12E-05			
628	2.49E-03	678	1.03E-03	728	2.93E-04	778	1.86E-04			
629	2.47E-03	679	1.02E-03	729	2.55E-04	779	1.70E-04			
630	2.44E-03	680	1.01E-03	730	2.56E-04	780	3.04E-05			

Measurement Uncertainty

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

Parameter	Uncertainty
Total Luminous Flux (%)	± 3.25
Luminous Intensity (%)	± 3.25
Correlated Color Temperature (K)	± 100
CRI	± 2
Chromaticity x	± 0.005
Chromaticity y	± 0.005
Temperature (°C)	± 0.5
Voltage DC TY720 (%)	± 0.02
Current DC TY720 (%)	± 0.10
Voltage AC WT210 (%)	± 0.0585
Current AC WT210 (%)	± 0.0251
Power AC WT210 (%)	± 0.2261
Frequency (50/60 Hz) WT210 (%)	± 0.0040
Power Factor WT210 (%)	± 0.0601

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.

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

Notes

The polar plot in the above report has been created by measuring the lower lobe of the item's light distribution and mirroring this to create the upper lobe. This is to give a complete polar plot of the test item's light distribution, based on the symmetry of the test item's luminous opening. This was done due to the wide distribution of light from the test item, causing some light to be blocked by the Goniophotometer system.

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