

astro

PHOTOMETRIC
TEST REPORT

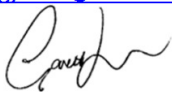


LUX-TSI Ltd., Pencoed Technology Park,
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Test Report Number: TRN-18316
Test Item: TI-12886



Report Number	TRN-18316
Customer	Astro Lighting Limited
Contact	Stuart Wells
Product Type	LED Downlight
Test Purpose	Generation of Photometric Data
Sales Order Ref	Q-LUX16-21059
Works Order Number	WO-8963
Test Item Reference	TI-12886
LAB Test Method Reference	TES-10050
Test Standards	LM-79-08
Lab Location Reference	LUX-TSI
Tested by	Mike Sewell
Date of Test	16-12-16
Reviewed by	Menno Schakel
Number of products tested	1

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Date: 16-12-16



Mallon LED 7933

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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° 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. On-axis spectral measurements taken using spectrometer, for which these measurements and outputs are not accredited.

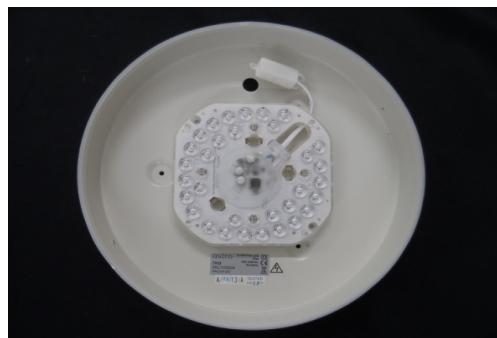
Data Formats

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	Mallon LED
Part/Serial Number	1125004
Type of Product	LED Downlight
Base Type	Not Applicable - Luminaire
Driver Type	Mains
Test Time	30 mins
Operating Orientation	Base Up
Test Orientation	Base Up
Ambient Temperature	24.4 °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	39.6% 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

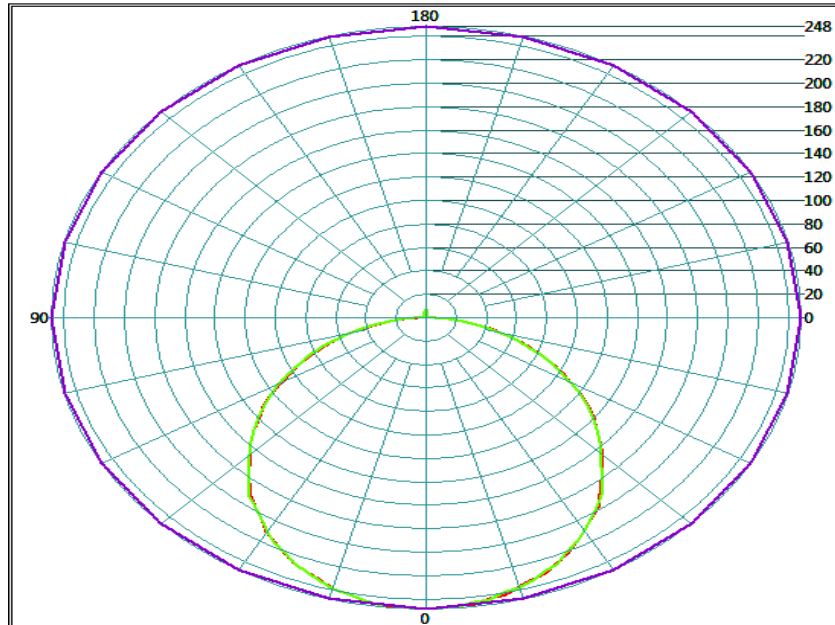
Photometric Measurements	
Luminous Flux	732 lm
Luminous Efficacy	45 lm/W

Dimension	Sample	Luminous Opening
Diameter/Width	325 mm Φ	305 mm Φ
Length		
Height/Depth	55 mm	0 mm

Electrical Measurements	
Frequency	50 Hz
Voltage	229.840 V
Current	0.118 A
Power	16.2 W
Power Factor	0.598
Apparent Power	27.1 VA

Goniophotometric Measurements		
Beam Angle	Horizontal	114°
	Vertical	114°
On-axis Intensity		248 cd
Peak Intensity		249 cd
Peak Direction	Horizontal	330°
	Vertical	3°

Polar Plot (cd)



0.00	Red
180.00	Red
90.00	Green
270.00	Green
0.00	Purple

Mounting Height (m)	Beam Cone Width (m)	Orthogonal Beam Cone Width (m)	Projected Illuminance (lux)
0.5	1.54	1.53	992.0
1	3.07	3.07	248.0
2	6.15	6.13	62.0
3	9.22	9.20	27.6
4	12.30	12.26	15.5
5	15.37	15.33	9.9
6	18.45	18.40	6.9
8	24.59	24.53	3.9
10	30.74	30.66	2.5
20	61.48	61.32	0.6



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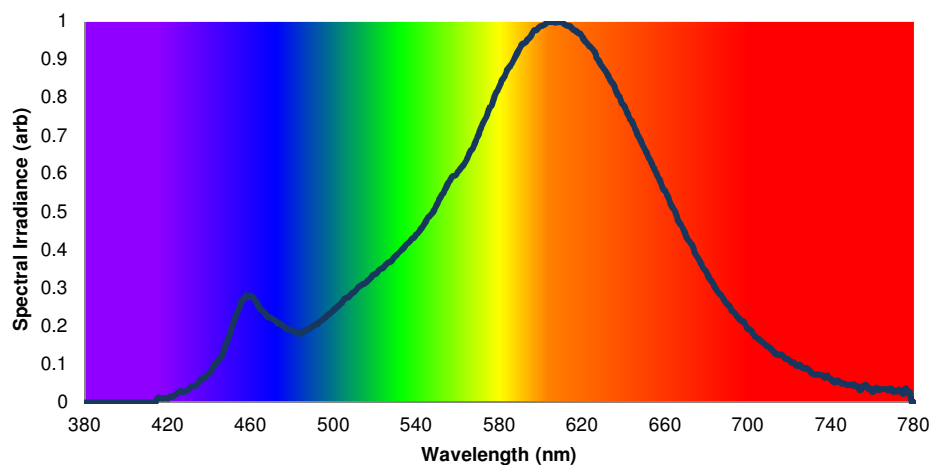


Appendix

On-axis Spectral Measurement

The following data was determined from an on-axis spectral measurement using a SP1000 spectrometer at a distance of 500mm, for which these measurements and outputs are not accredited.

Spectral Irradiance versus Wavelength





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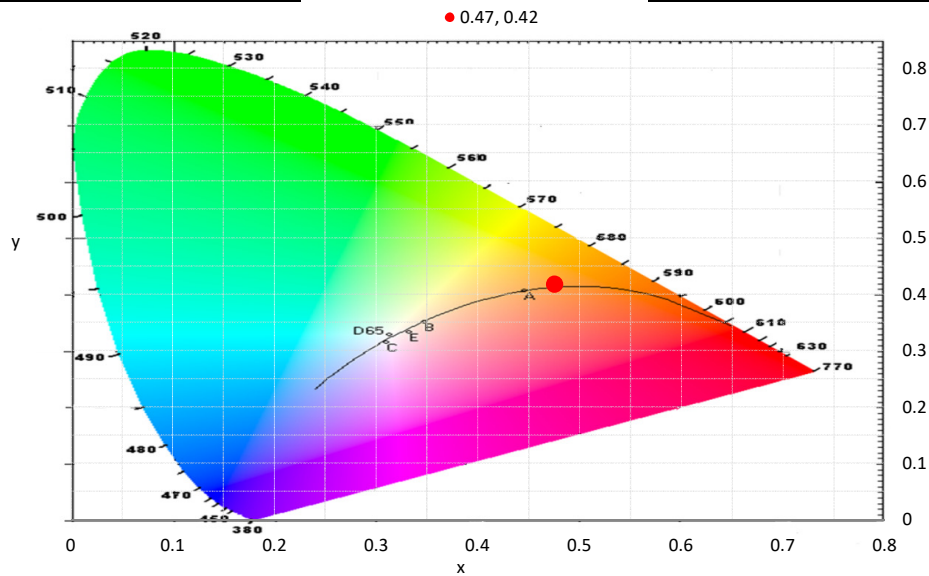
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Colour Rendering Index Detail			
R1	79	R8	55
R2	92	R9	5
R3	94	R10	82
R4	76	R11	74
R5	79	R12	75
R6	91	R13	82
R7	80	R14	97

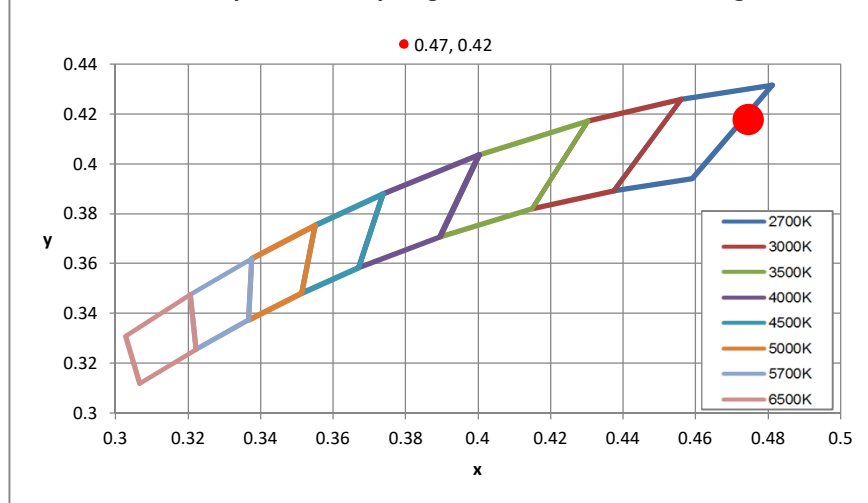
Colorimetric Details	
CCT	2557K
CRI (Ra)	81

Chromaticity Coordinates		
CIE 1931	x	0.4746
	y	0.4177
CIE 1960	u	0.2688
	v	0.3548
CIE 1976	u'	0.2688
	v'	0.5322
Duv		0.0013

CIE 1931 Colour Chart



CIE 1931 x, y Chromaticity Diagram - Nominal CCT Quadrangles



λ (nm)	Arb units		λ (nm)	Arb units		λ (nm)	Arb units		λ (nm)	Arb units
380	0.000000		430	3.45E-02		480	1.89E-01		530	3.85E-01
381	0.00E+00		431	4.06E-02		481	1.87E-01		531	3.91E-01
382	0.00E+00		432	4.39E-02		482	1.84E-01		532	3.96E-01
383	0.00E+00		433	4.41E-02		483	1.82E-01		533	4.02E-01
384	0.00E+00		434	4.57E-02		484	1.80E-01		534	4.07E-01
385	0.00E+00		435	5.35E-02		485	1.84E-01		535	4.14E-01
386	0.00E+00		436	6.11E-02		486	1.89E-01		536	4.19E-01
387	0.00E+00		437	6.31E-02		487	1.91E-01		537	4.25E-01
388	0.00E+00		438	6.47E-02		488	1.93E-01		538	4.30E-01
389	0.00E+00		439	7.24E-02		489	1.96E-01		539	4.34E-01
390	0.00E+00		440	7.62E-02		490	2.01E-01		540	4.42E-01
391	0.00E+00		441	8.42E-02		491	2.04E-01		541	4.47E-01
392	0.00E+00		442	9.43E-02		492	2.06E-01		542	4.55E-01
393	0.00E+00		443	1.02E-01		493	2.11E-01		543	4.62E-01
394	0.00E+00		444	1.09E-01		494	2.14E-01		544	4.70E-01
395	0.00E+00		445	1.14E-01		495	2.18E-01		545	4.81E-01
396	0.00E+00		446	1.21E-01		496	2.23E-01		546	4.87E-01
397	0.00E+00		447	1.38E-01		497	2.29E-01		547	4.93E-01
398	0.00E+00		448	1.54E-01		498	2.33E-01		548	5.00E-01
399	0.00E+00		449	1.66E-01		499	2.37E-01		549	5.10E-01
400	0.00E+00	450	1.82E-01	500	2.42E-01	550	5.22E-01			
401	0.00E+00	451	2.02E-01	501	2.47E-01	551	5.34E-01			
402	0.00E+00	452	2.15E-01	502	2.53E-01	552	5.44E-01			
403	0.00E+00	453	2.30E-01	503	2.57E-01	553	5.51E-01			
404	0.00E+00	454	2.42E-01	504	2.62E-01	554	5.63E-01			
405	0.00E+00	455	2.59E-01	505	2.71E-01	555	5.73E-01			
406	0.00E+00	456	2.68E-01	506	2.75E-01	556	5.82E-01			
407	0.00E+00	457	2.75E-01	507	2.76E-01	557	5.92E-01			
408	0.00E+00	458	2.82E-01	508	2.82E-01	558	5.95E-01			
409	0.00E+00	459	2.77E-01	509	2.87E-01	559	5.97E-01			
410	0.00E+00	460	2.80E-01	510	2.91E-01	560	6.07E-01			
411	0.00E+00	461	2.76E-01	511	2.96E-01	561	6.13E-01			
412	0.00E+00	462	2.68E-01	512	3.03E-01	562	6.19E-01			
413	0.00E+00	463	2.60E-01	513	3.07E-01	563	6.26E-01			
414	0.00E+00	464	2.49E-01	514	3.11E-01	564	6.36E-01			
415	1.08E-02	465	2.43E-01	515	3.12E-01	565	6.49E-01			
416	1.25E-02	466	2.40E-01	516	3.18E-01	566	6.60E-01			
417	1.08E-02	467	2.33E-01	517	3.23E-01	567	6.66E-01			
418	1.04E-02	468	2.25E-01	518	3.27E-01	568	6.79E-01			
419	1.17E-02	469	2.24E-01	519	3.35E-01	569	6.92E-01			
420	1.02E-02	470	2.21E-01	520	3.37E-01	570	7.05E-01			
421	1.48E-02	471	2.17E-01	521	3.41E-01	571	7.20E-01			
422	1.52E-02	472	2.14E-01	522	3.48E-01	572	7.33E-01			
423	1.74E-02	473	2.07E-01	523	3.51E-01	573	7.44E-01			
424	2.11E-02	474	2.08E-01	524	3.54E-01	574	7.53E-01			
425	2.68E-02	475	2.03E-01	525	3.61E-01	575	7.71E-01			
426	2.96E-02	476	2.00E-01	526	3.67E-01	576	7.79E-01			
427	2.75E-02	477	1.95E-01	527	3.68E-01	577	7.93E-01			
428	2.87E-02	478	1.92E-01	528	3.72E-01	578	8.11E-01			
429	2.97E-02	479	1.91E-01	529	3.81E-01	579	8.18E-01			
						580	8.31E-01			

λ (nm)	Arb units		λ (nm)	Arb units		λ (nm)	Arb units		λ (nm)	Arb units
581	8.44E-01		631	8.71E-01		681	3.29E-01		731	7.52E-02
582	8.53E-01		632	8.62E-01		682	3.21E-01		732	7.44E-02
583	8.63E-01		633	8.53E-01		683	3.13E-01		733	7.31E-02
584	8.76E-01		634	8.42E-01		684	3.01E-01		734	7.30E-02
585	8.82E-01		635	8.36E-01		685	2.94E-01		735	7.24E-02
586	8.90E-01		636	8.22E-01		686	2.87E-01		736	7.12E-02
587	9.00E-01		637	8.08E-01		687	2.81E-01		737	6.51E-02
588	9.12E-01		638	8.03E-01		688	2.73E-01		738	7.07E-02
589	9.22E-01		639	7.87E-01		689	2.64E-01		739	6.55E-02
590	9.33E-01		640	7.80E-01		690	2.58E-01		740	6.08E-02
591	9.42E-01		641	7.69E-01		691	2.53E-01		741	5.45E-02
592	9.43E-01		642	7.56E-01		692	2.42E-01		742	5.34E-02
593	9.48E-01		643	7.44E-01		693	2.37E-01		743	5.81E-02
594	9.56E-01		644	7.37E-01		694	2.32E-01		744	5.45E-02
595	9.60E-01		645	7.25E-01		695	2.23E-01		745	4.99E-02
596	9.71E-01		646	7.11E-01		696	2.18E-01		746	4.99E-02
597	9.78E-01		647	6.99E-01		697	2.14E-01		747	4.83E-02
598	9.78E-01		648	6.90E-01		698	2.11E-01		748	4.54E-02
599	9.85E-01		649	6.76E-01		699	2.01E-01		749	4.68E-02
600	9.88E-01		650	6.67E-01		700	1.93E-01		750	4.47E-02
601	9.90E-01		651	6.56E-01		701	1.91E-01		751	4.78E-02
602	9.93E-01		652	6.43E-01		702	1.85E-01		752	4.20E-02
603	9.99E-01		653	6.34E-01		703	1.75E-01		753	4.23E-02
604	9.99E-01		654	6.20E-01		704	1.71E-01		754	3.16E-02
605	9.99E-01		655	6.11E-01		705	1.67E-01		755	4.01E-02
606	9.99E-01		656	5.98E-01		706	1.63E-01		756	4.52E-02
607	9.98E-01		657	5.87E-01		707	1.57E-01		757	4.57E-02
608	9.99E-01		658	5.76E-01		708	1.53E-01		758	3.54E-02
609	9.99E-01		659	5.60E-01		709	1.49E-01		759	3.64E-02
610	1.00E+00	660	5.56E-01	710	1.45E-01	760	2.70E-02			
611	9.94E-01	661	5.44E-01	711	1.40E-01	761	3.42E-02			
612	9.91E-01	662	5.31E-01	712	1.36E-01	762	3.91E-02			
613	9.89E-01	663	5.17E-01	713	1.28E-01	763	3.26E-02			
614	9.89E-01	664	5.09E-01	714	1.27E-01	764	3.48E-02			
615	9.82E-01	665	4.98E-01	715	1.24E-01	765	3.51E-02			
616	9.78E-01	666	4.81E-01	716	1.26E-01	766	3.57E-02			
617	9.76E-01	667	4.71E-01	717	1.21E-01	767	3.28E-02			
618	9.70E-01	668	4.63E-01	718	1.15E-01	768	3.28E-02			
619	9.68E-01	669	4.52E-01	719	1.14E-01	769	3.63E-02			
620	9.60E-01	670	4.38E-01	720	1.11E-01	770	2.76E-02			
621	9.50E-01	671	4.28E-01	721	1.04E-01	771	3.17E-02			
622	9.45E-01	672	4.20E-01	722	1.05E-01	772	2.85E-02			
623	9.38E-01	673	4.14E-01	723	9.69E-02	773	3.36E-02			
624	9.33E-01	674	3.97E-01	724	9.57E-02	774	2.56E-02			
625	9.27E-01	675	3.86E-01	725	9.95E-02	775	2.29E-02			
626	9.20E-01	676	3.78E-01	726	9.19E-02	776	3.77E-02			
627	9.05E-01	677	3.68E-01	727	8.92E-02	777	2.55E-02			
628	8.97E-01	678	3.55E-01	728	9.05E-02	778	2.70E-02			
629	8.86E-01	679	3.48E-01	729	8.60E-02	779	0.00E+00			
630	8.79E-01	680	3.41E-01	730	8.22E-02	780	0.00E+00			



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Measurement Uncertainty

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

Parameter	Uncertainty
Total Luminous Flux (%)	± 7.5
Luminous Intensity (%)	± 7.5
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 and CIE S 025/E:2015 (based on RGB type LEDs).

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 -----