



Les Industries Spectralux Inc. Spectralux Industries Inc.

2750 Sabourin, Saint-Laurent (Quebec) H4S 1M2 Canada
Tel.: (514) 332-0082 Fax: (514) 332-3590 www.spectralux.ca

ISO/IEC 17025
NVLAP
NVLAP LAB CODE: 200899-0

Sphere Test Report

Standard(s) CIE 84-1989, IESNA LM-16-93, IESNA LM-58-94, IES LM-79-08, ANSI C82.77-2002

Customer Lumenpulse, 1751 Richardson, suite 1505, Montréal, Québec, Canada, H3K 1G6

General Information		Lamp Details: CY2403	Driver Details: CY938	
Test Report	L1512075-C1	Description	Clusters of 24 Cree XPE2 LED's	Type Commercial
Test Date	7 December 2015	Manufacturer	Cree	Description 20W
Report Date	8 December 2015	Catalog No.	LOGI-ASHRAE-120/277-48-40K-10x60-SI-NO	Manufacturer Magtech Industries
Sphere Temperature	23.0 °C	Serial No.	SRIS 2228	Catalog No. 20-3871
Humidity	22.6 %	Diameter	N/A mm	Voltage 120.00 V
Lamp Type	SSL	Color	White	Power Factor 0.9900

Stabilization Time: () 'a]bi hYg

Tested By: AUFWJ]k cbci 'GYbU

Approved Signatory: Chrisnel Blot

Signature:

Notes

- 1) Field performance may differ from laboratory measurements. Results are valid for tested material only.
- 2) The original electronic file or paper report cannot be edited in whole or in part without written consent of Spectralux Industries Inc.
- 3) This test report describes the performance of a single product and does not necessarily represent the average performance of a group of the same SSL product.



Realization of Sphere Test

A 4π sphere-spectroradiometer equipped with auxiliary lamp to correct self-absorption was used during the measurements of electrical, photometric and colorimetric properties of the sample under test. The size of the integrating sphere used is large enough to ensure that the measurement errors due to effects of baffle and self-absorption by the sample test are not significant.

During the test, a commercial driver was used and adjusted to nominal electrical characteristics specified by the driver manufacturer or the client. Good electrical contacts have been used to ensure the control of electrical parameters of the commercial driver and an adequate stabilization period prior to collecting data. The self-absorbance was measured and a geometrical correction factor was applied to the luminous flux value to take into account the sphere configuration.

Results of the measurements are traceable to reference standards developed and maintained by the National Institute of Standards and Technology (NIST) and National Research Council of Canada (NRC).





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Electrical Equipment

Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Auxiliary Power Supply	American Reliance	SPS150-7	B10155	N.P.C.R.	N.P.C.R.
Test Power Supply	iRDC	CIF-3000A	974997	N.P.C.R.	N.P.C.R.
Input Power Meter	Yokogawa	WT210	91L236540	2015/10/22	2016/10/22
Output Power Meter	N/A	N/A	N/A	N.P.C.R.	N.P.C.R.
Shunt Resistor	Fluke	Y5020	5675014	2015/08/06	2016/08/06
Current Multimeter	HP Agilent	HP34401A	US36121202	2015/08/06	2016/08/06
Voltage Multimeter	Fluke	Fluke8842A	4282317	2014/10/31	2016/10/31

Spectrometer Equipment

Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrometer	Ocean Optics	USB2000N	USB2E3864	2015/08/24	2016/08/24

Environment Equipment

Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Temperature Humidity Sensor	Omega	HH311	120504176	2014/04/16	2016/04/16



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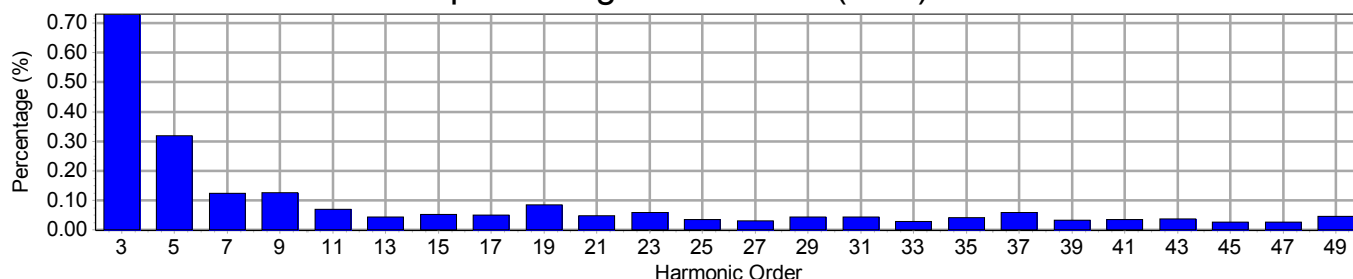
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Electrical Measurements

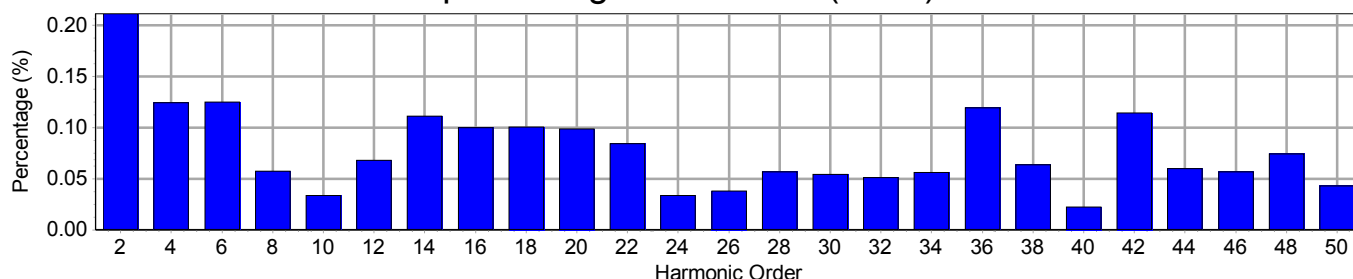
Input

Frequency	60 Hz	Active Power	18.28 W	THDV [ANSI]	0.93 %
Voltage	120.1 V(rms)	Apparent Power	18.46 VA	THDA [ANSI]	8.11 %
Current	0.1537 A(rms)	Power Factor	0.990	Max. Harmonic At	3rd order

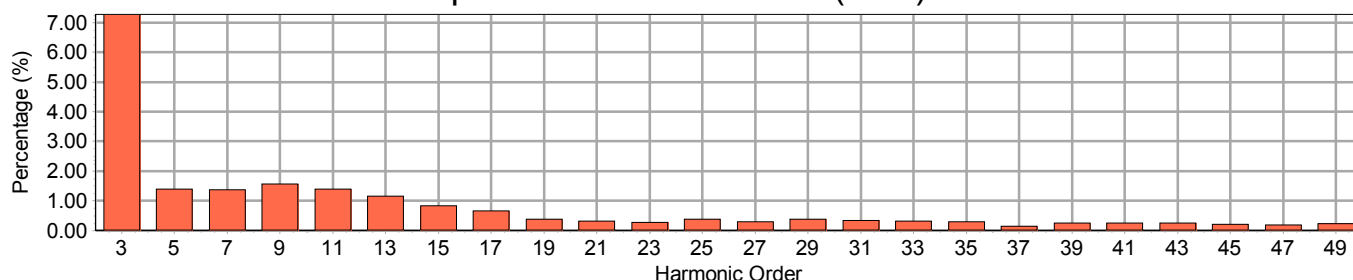
Input Voltage Harmonics (Odd)



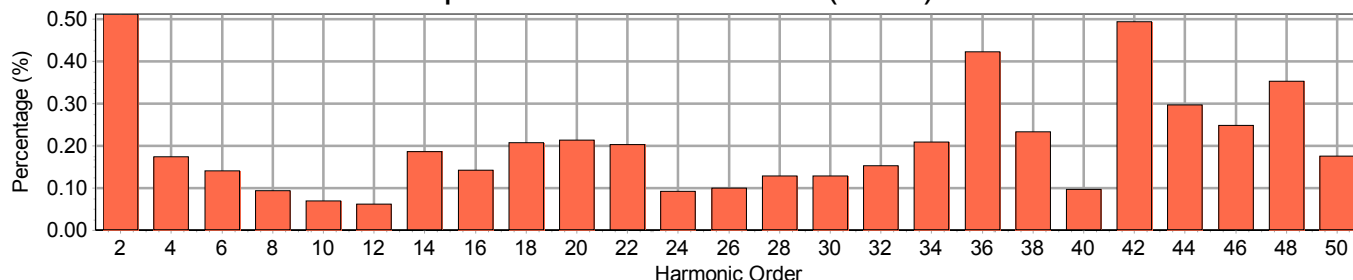
Input Voltage Harmonics (Even)



Input Current Harmonics (Odd)



Input Current Harmonics (Even)





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Harmonic Measurements

Odd Harmonics				Even Harmonics			
Harmonic Order	Frequency (HZ)	Voltage Harmonics (%)	Current Harmonics (%)	Harmonic Order	Frequency (HZ)	Voltage Harmonics (%)	Current Harmonics (%)
1	60	100.000	100.000	2	120	0.212	0.513
3	180	0.731	7.287	4	240	0.124	0.174
5	300	0.318	1.401	6	360	0.125	0.141
7	420	0.123	1.374	8	480	0.058	0.093
9	540	0.126	1.570	10	600	0.034	0.069
11	660	0.071	1.381	12	720	0.068	0.062
13	780	0.044	1.144	14	840	0.111	0.186
15	900	0.053	0.827	16	960	0.100	0.142
17	1020	0.051	0.660	18	1080	0.101	0.208
19	1140	0.086	0.369	20	1200	0.099	0.214
21	1260	0.048	0.306	22	1320	0.084	0.202
23	1380	0.060	0.273	24	1440	0.033	0.092
25	1500	0.036	0.385	26	1560	0.038	0.100
27	1620	0.031	0.299	28	1680	0.057	0.128
29	1740	0.045	0.385	30	1800	0.054	0.129
31	1860	0.044	0.333	32	1920	0.051	0.153
33	1980	0.029	0.323	34	2040	0.056	0.209
35	2100	0.043	0.290	36	2160	0.119	0.423
37	2220	0.060	0.137	38	2280	0.063	0.232
39	2340	0.034	0.246	40	2400	0.023	0.096
41	2460	0.035	0.252	42	2520	0.114	0.494
43	2580	0.038	0.254	44	2640	0.060	0.296
45	2700	0.028	0.205	46	2760	0.057	0.248
47	2820	0.027	0.189	48	2880	0.074	0.352
49	2940	0.046	0.224	50	3000	0.043	0.175



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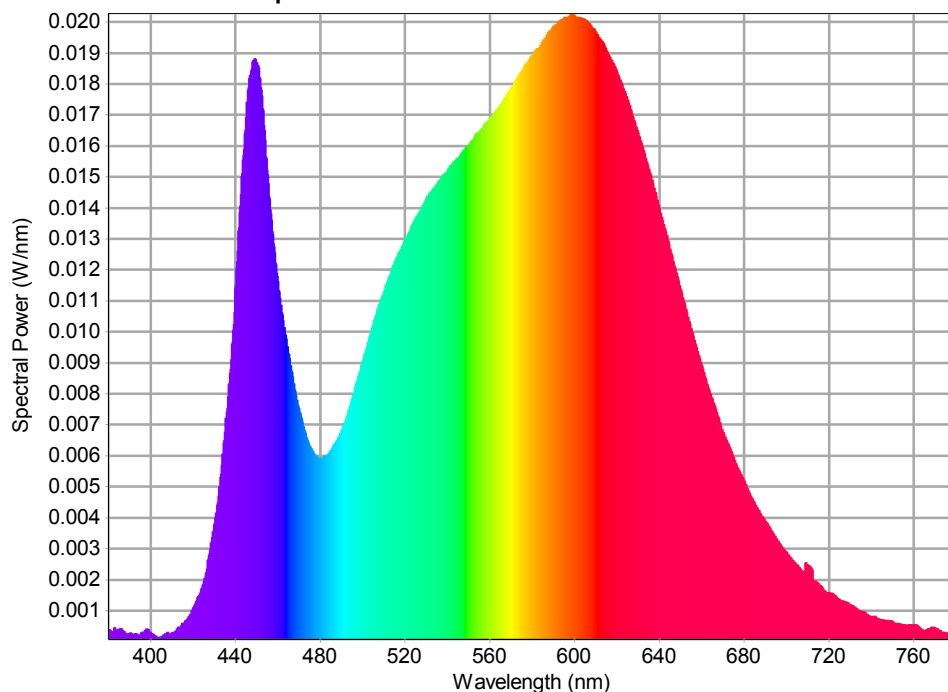
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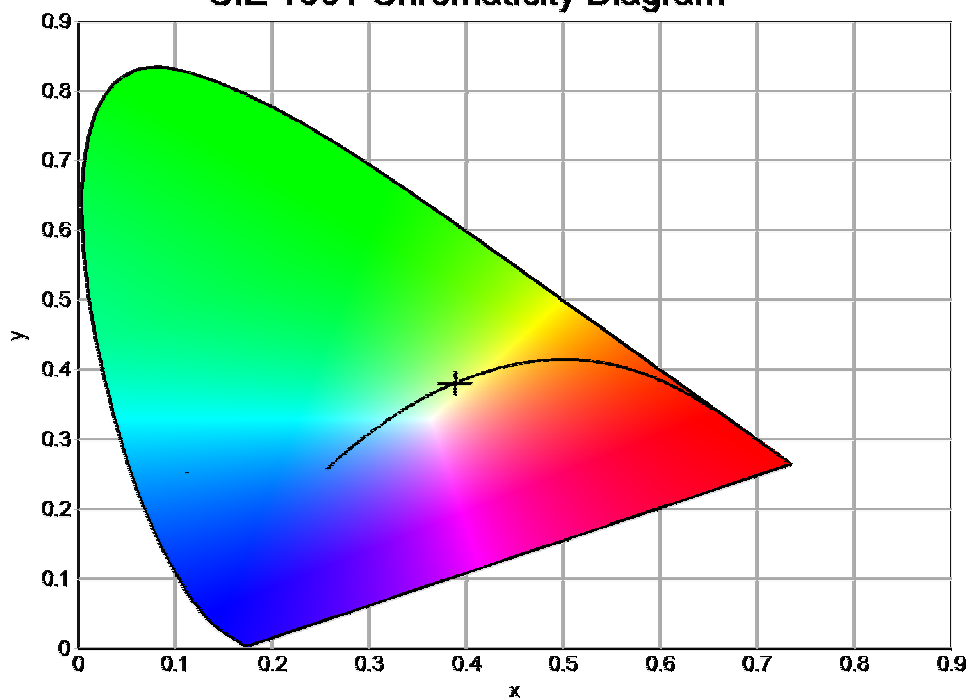
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Spectral Power Distribution



Peak Wavelength	599 nm
Luminous Flux	1156 lm
Input Power	18.28 W
Lumens/Watt	63.2
Full Width/Half Maximum	150.51
Center Wavelength	580 nm
Centroid Wavelength	373 nm
Dominant Wavelength	487 nm
Excitation Purity	0.1529
Colorimetric Purity	0.0929

CIE 1931 Chromaticity Diagram



x	0.3884	CCT	3819 K
y	0.3805	CRI	85
u	0.2288	L*	25.67
v	0.3363	a*	-4.35
u'	0.2288	b*	-14.01
v'	0.5044	Duv	0.0005
R1	83.7	R9	18.9
R2	90.0	R10	75.5
R3	94.3	R11	83.4
R4	84.4	R12	66.6
R5	83.5	R13	85.2
R6	86.1	R14	96.6
R7	87.3		
R8	68.3		



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Spectral Power Distribution Table (1/4)

Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)
380	0.00031	405	0.00015	430	0.00378	455	0.01523
381	0.00038	406	0.00023	431	0.00416	456	0.01438
382	0.00034	407	0.00027	432	0.00473	457	0.01362
383	0.00045	408	0.00032	433	0.00531	458	0.01286
384	0.00040	409	0.00026	434	0.00605	459	0.01224
385	0.00042	410	0.00030	435	0.00679	460	0.01164
386	0.00044	411	0.00030	436	0.00743	461	0.01110
387	0.00033	412	0.00037	437	0.00831	462	0.01063
388	0.00030	413	0.00048	438	0.00912	463	0.01015
389	0.00021	414	0.00046	439	0.01007	464	0.00979
390	0.00024	415	0.00061	440	0.01140	465	0.00932
391	0.00028	416	0.00063	441	0.01263	466	0.00893
392	0.00022	417	0.00070	442	0.01386	467	0.00855
393	0.00027	418	0.00081	443	0.01503	468	0.00815
394	0.00024	419	0.00092	444	0.01592	469	0.00781
395	0.00020	420	0.00109	445	0.01693	470	0.00752
396	0.00032	421	0.00122	446	0.01781	471	0.00727
397	0.00032	422	0.00142	447	0.01829	472	0.00697
398	0.00041	423	0.00152	448	0.01873	473	0.00674
399	0.00039	424	0.00171	449	0.01882	474	0.00651
400	0.00031	425	0.00194	450	0.01870	475	0.00634
401	0.00026	426	0.00219	451	0.01854	476	0.00621
402	0.00021	427	0.00263	452	0.01790	477	0.00609
403	0.00016	428	0.00299	453	0.01721	478	0.00601
404	0.00010	429	0.00338	454	0.01621	479	0.00593



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Spectral Power Distribution Table (2/4)

Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)
480	0.00593	505	0.01028	530	0.01431	555	0.01647
481	0.00594	506	0.01051	531	0.01441	556	0.01655
482	0.00599	507	0.01073	532	0.01451	557	0.01662
483	0.00600	508	0.01094	533	0.01460	558	0.01675
484	0.00609	509	0.01113	534	0.01468	559	0.01680
485	0.00618	510	0.01128	535	0.01478	560	0.01688
486	0.00630	511	0.01151	536	0.01489	561	0.01698
487	0.00641	512	0.01171	537	0.01496	562	0.01706
488	0.00651	513	0.01185	538	0.01506	563	0.01716
489	0.00666	514	0.01208	539	0.01513	564	0.01723
490	0.00682	515	0.01226	540	0.01521	565	0.01734
491	0.00698	516	0.01240	541	0.01533	566	0.01743
492	0.00717	517	0.01256	542	0.01540	567	0.01757
493	0.00737	518	0.01268	543	0.01550	568	0.01766
494	0.00759	519	0.01281	544	0.01557	569	0.01778
495	0.00784	520	0.01299	545	0.01561	570	0.01789
496	0.00807	521	0.01310	546	0.01569	571	0.01797
497	0.00835	522	0.01324	547	0.01580	572	0.01811
498	0.00857	523	0.01341	548	0.01588	573	0.01820
499	0.00880	524	0.01354	549	0.01598	574	0.01834
500	0.00905	525	0.01368	550	0.01603	575	0.01841
501	0.00930	526	0.01378	551	0.01614	576	0.01854
502	0.00954	527	0.01389	552	0.01621	577	0.01866
503	0.00980	528	0.01402	553	0.01636	578	0.01872
504	0.01002	529	0.01416	554	0.01641	579	0.01886



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Spectral Power Distribution Table (3/4)

Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)
580	0.01892	605	0.02009	630	0.01644	655	0.01012
581	0.01906	606	0.02003	631	0.01621	656	0.00988
582	0.01914	607	0.01997	632	0.01599	657	0.00963
583	0.01917	608	0.01987	633	0.01577	658	0.00940
584	0.01926	609	0.01980	634	0.01550	659	0.00916
585	0.01941	610	0.01970	635	0.01527	660	0.00893
586	0.01947	611	0.01957	636	0.01505	661	0.00870
587	0.01960	612	0.01946	637	0.01480	662	0.00845
588	0.01973	613	0.01939	638	0.01453	663	0.00823
589	0.01977	614	0.01927	639	0.01426	664	0.00802
590	0.01987	615	0.01911	640	0.01399	665	0.00783
591	0.01991	616	0.01897	641	0.01373	666	0.00764
592	0.01998	617	0.01881	642	0.01348	667	0.00742
593	0.02005	618	0.01870	643	0.01325	668	0.00721
594	0.02010	619	0.01857	644	0.01298	669	0.00698
595	0.02014	620	0.01839	645	0.01268	670	0.00679
596	0.02016	621	0.01822	646	0.01245	671	0.00662
597	0.02018	622	0.01806	647	0.01216	672	0.00645
598	0.02025	623	0.01787	648	0.01192	673	0.00632
599	0.02026	624	0.01771	649	0.01165	674	0.00614
600	0.02022	625	0.01751	650	0.01139	675	0.00595
601	0.02017	626	0.01732	651	0.01113	676	0.00577
602	0.02015	627	0.01708	652	0.01087	677	0.00562
603	0.02015	628	0.01685	653	0.01063	678	0.00547
604	0.02012	629	0.01664	654	0.01036	679	0.00534



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Spectral Power Distribution Table (4/4)

Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)	Wavelength (nm)	Spectral Power (W/nm)
680	0.00520	706	0.00240	732	0.00113	758	0.00056
681	0.00503	707	0.00231	733	0.00108	759	0.00055
682	0.00488	708	0.00228	734	0.00103	760	0.00057
683	0.00472	709	0.00255	735	0.00100	761	0.00056
684	0.00460	710	0.00249	736	0.00098	762	0.00051
685	0.00447	711	0.00244	737	0.00095	763	0.00046
686	0.00435	712	0.00236	738	0.00089	764	0.00040
687	0.00424	713	0.00198	739	0.00083	765	0.00034
688	0.00410	714	0.00194	740	0.00081	766	0.00040
689	0.00401	715	0.00189	741	0.00082	767	0.00043
690	0.00390	716	0.00182	742	0.00081	768	0.00045
691	0.00380	717	0.00174	743	0.00076	769	0.00046
692	0.00370	718	0.00165	744	0.00073	770	0.00046
693	0.00358	719	0.00160	745	0.00072	771	0.00044
694	0.00346	720	0.00159	746	0.00070	772	0.00037
695	0.00336	721	0.00157	747	0.00069	773	0.00032
696	0.00325	722	0.00155	748	0.00068	774	0.00032
697	0.00315	723	0.00149	749	0.00067	775	0.00031
698	0.00304	724	0.00142	750	0.00066	776	0.00027
699	0.00297	725	0.00137	751	0.00061	777	0.00032
700	0.00289	726	0.00133	752	0.00059	778	0.00037
701	0.00280	727	0.00132	753	0.00059	779	0.00036
702	0.00272	728	0.00129	754	0.00058	780	0.00031
703	0.00263	729	0.00126	755	0.00057		
704	0.00256	730	0.00120	756	0.00054		
705	0.00249	731	0.00118	757	0.00054		



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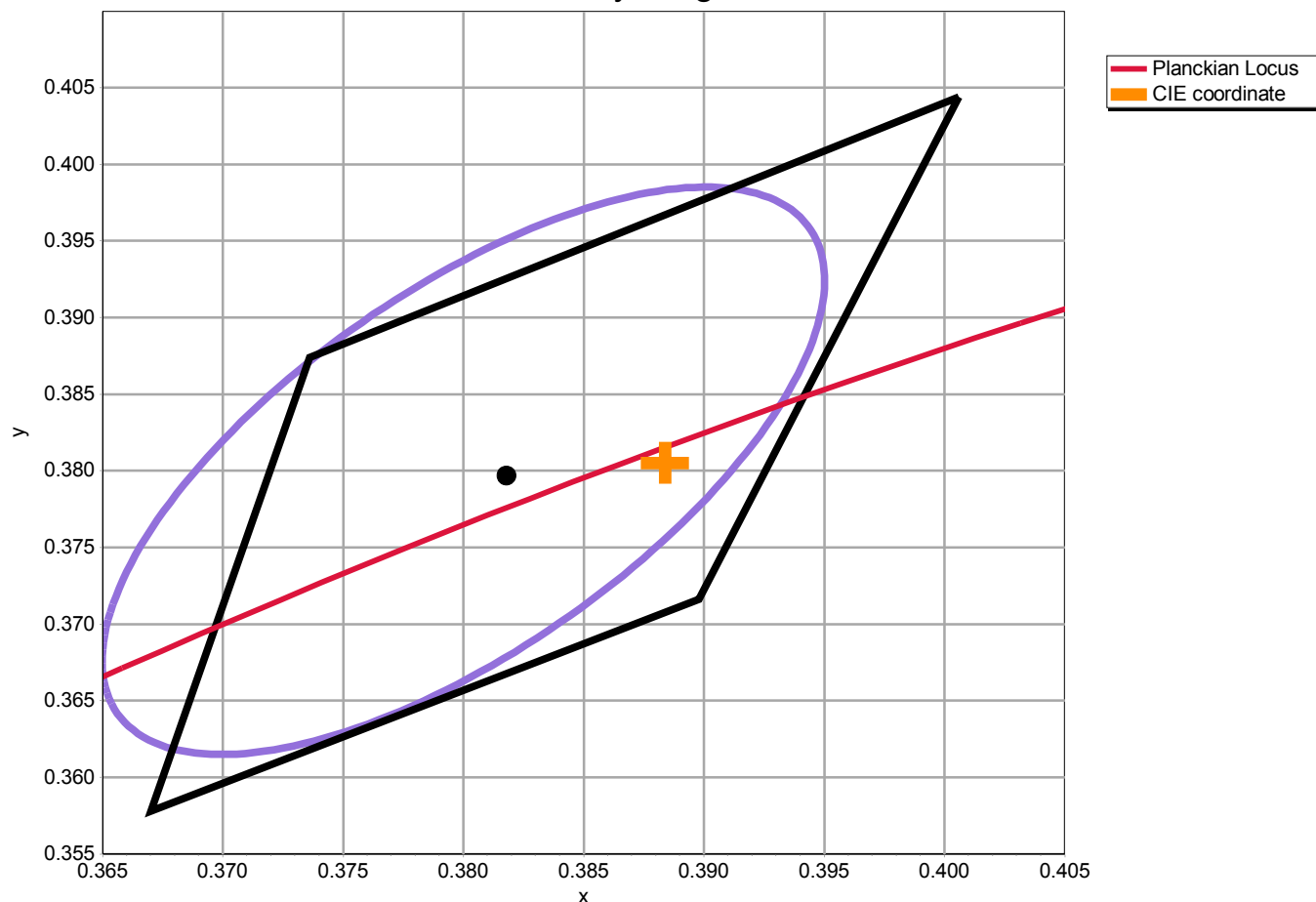
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CIE Chromaticity Diagram for Indoor SSL products

CIE 1931 Chromaticity Diagram



Chromaticity tolerance for 4000K nominal CCT

Min CCT	3710
Max CCT	4260
Delta T	275
Center Duv	0.0010