



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 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: CY2391	Driver Details: CY938	
Test Report	L1512013-C1	Description	Clusters of 24 Cree XPE2 LED's	Type Commercial
Test Date	1 December 2015	Manufacturer	Cree	Description 20W
Report Date	8 December 2015	Catalog No.	LOG-ASHRAE-120-48-40K-10x60-SI-NO	Manufacturer Magtech Industries
Sphere Temperature	23.0 °C	Serial No.	SRIS 2230	Catalog No. 20-3871
Humidity	16.1 %	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.

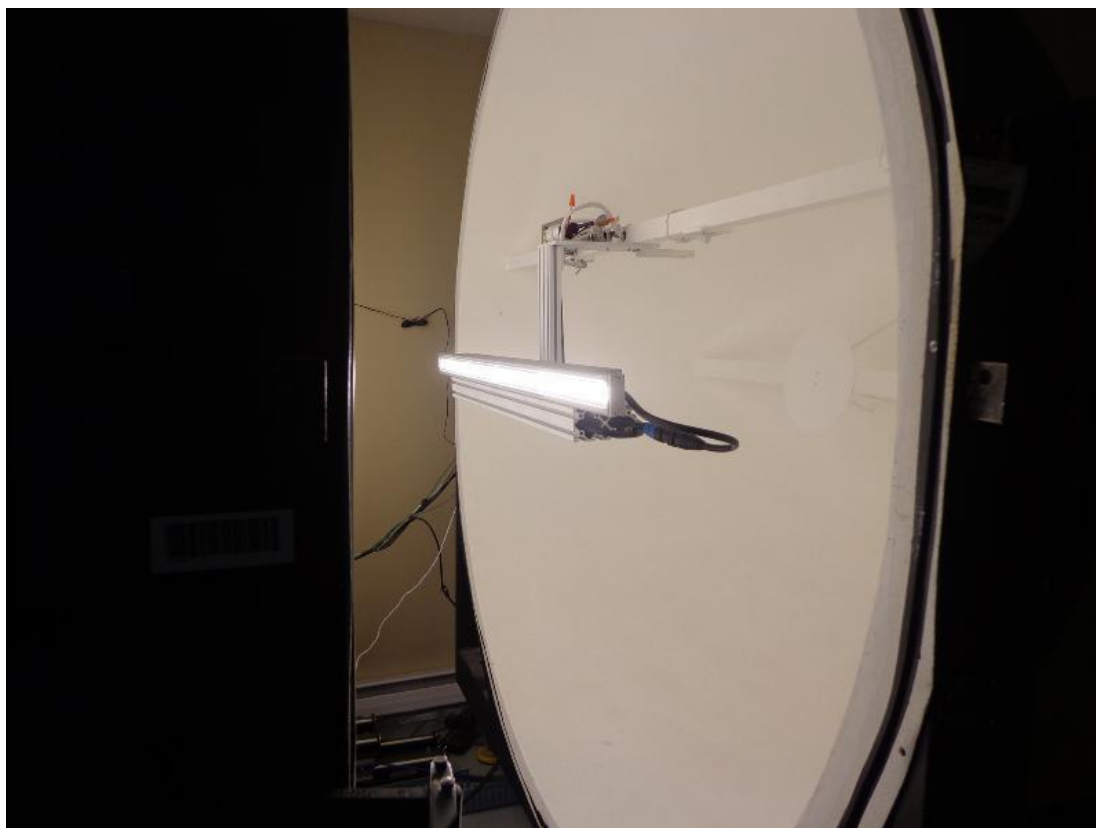


Realization of Sphere Test

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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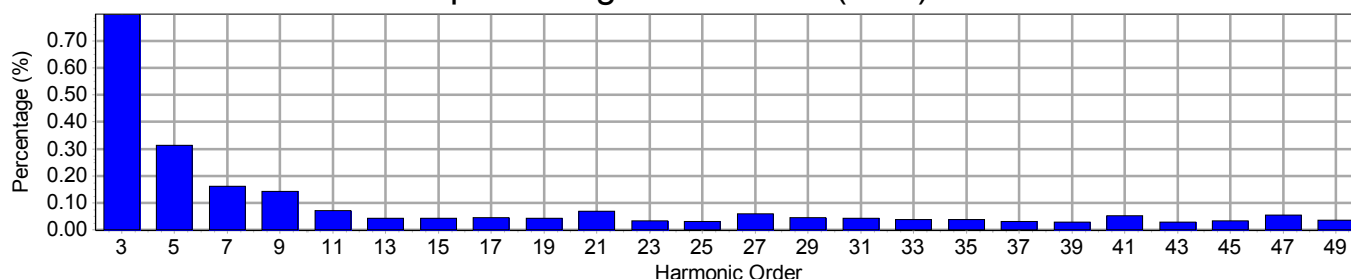
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Electrical Measurements

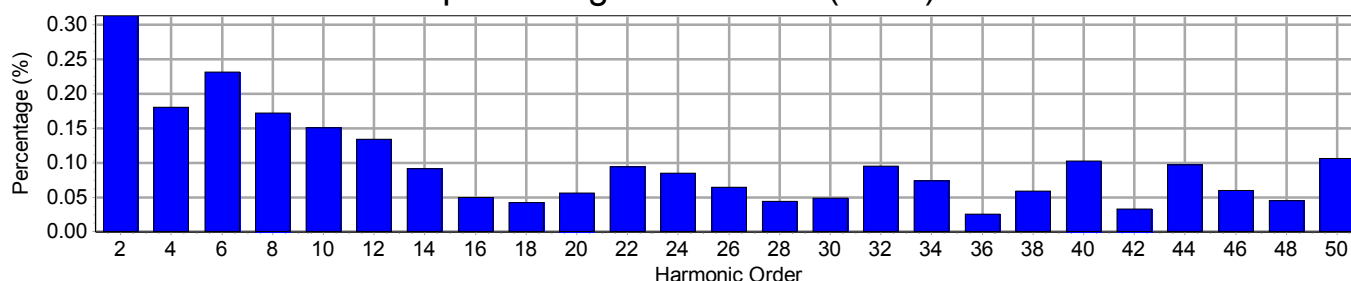
Input

Frequency	60 Hz	Active Power	18.40 W	THDV [ANSI]	1.07 %
Voltage	120.0 V(rms)	Apparent Power	18.60 VA	THDA [ANSI]	8.43 %
Current	0.1551 A(rms)	Power Factor	0.989	Max. Harmonic At	3rd order

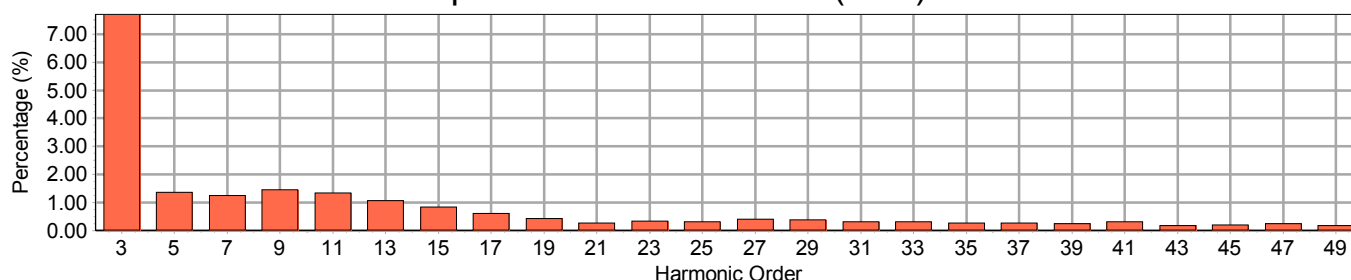
Input Voltage Harmonics (Odd)



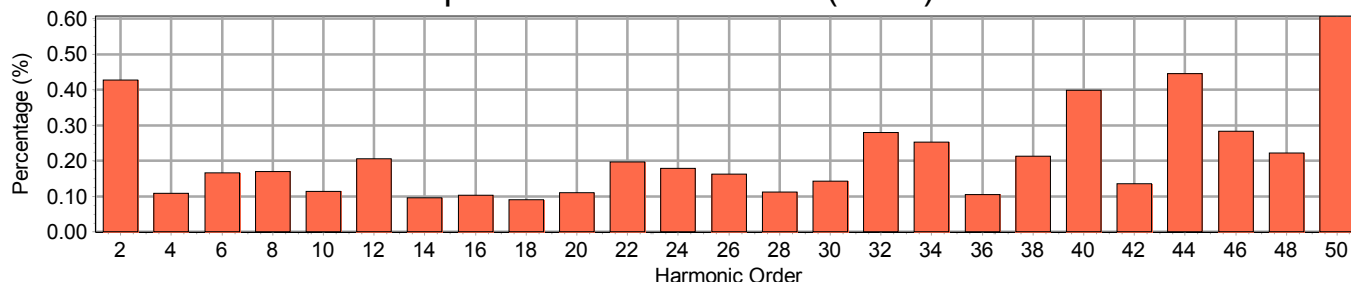
Input Voltage Harmonics (Even)



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	0.314	0.428
3	180	0.800	7.721	4	240	0.181	0.109
5	300	0.314	1.363	6	360	0.232	0.167
7	420	0.161	1.236	8	480	0.173	0.171
9	540	0.143	1.452	10	600	0.151	0.114
11	660	0.073	1.335	12	720	0.134	0.207
13	780	0.043	1.055	14	840	0.091	0.097
15	900	0.044	0.827	16	960	0.050	0.104
17	1020	0.047	0.603	18	1080	0.042	0.090
19	1140	0.045	0.423	20	1200	0.057	0.111
21	1260	0.070	0.252	22	1320	0.094	0.198
23	1380	0.035	0.328	24	1440	0.085	0.179
25	1500	0.032	0.309	26	1560	0.064	0.163
27	1620	0.060	0.410	28	1680	0.044	0.112
29	1740	0.047	0.366	30	1800	0.049	0.144
31	1860	0.044	0.315	32	1920	0.095	0.280
33	1980	0.040	0.317	34	2040	0.074	0.253
35	2100	0.040	0.270	36	2160	0.025	0.105
37	2220	0.033	0.263	38	2280	0.059	0.214
39	2340	0.030	0.230	40	2400	0.103	0.399
41	2460	0.053	0.311	42	2520	0.033	0.136
43	2580	0.030	0.181	44	2640	0.097	0.445
45	2700	0.034	0.201	46	2760	0.059	0.283
47	2820	0.055	0.237	48	2880	0.045	0.223
49	2940	0.038	0.169	50	3000	0.106	0.609



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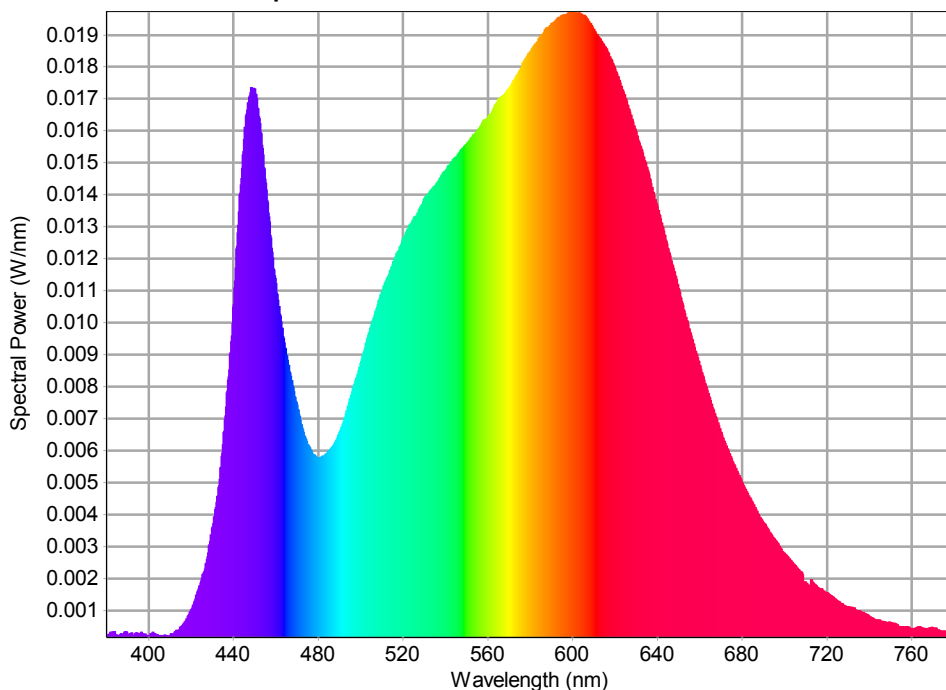
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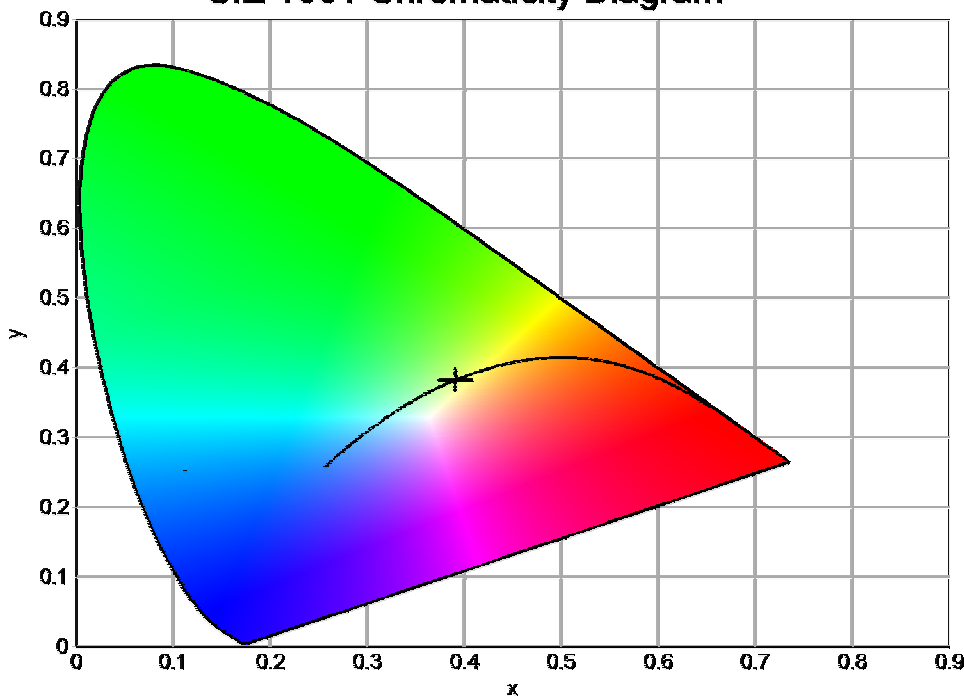
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Spectral Power Distribution



Peak Wavelength	599 nm
Luminous Flux	1125 lm
Input Power	18.40 W
Lumens/Watt	61.1
Full Width/Half Maximum	150.30
Center Wavelength	580 nm
Centroid Wavelength	374 nm
Dominant Wavelength	487 nm
Excitation Purity	0.1465
Colorimetric Purity	0.0924

CIE 1931 Chromaticity Diagram



x	0.3904	CCT	3787 K
y	0.3832	CRI	84
u	0.2291	L*	25.67
v	0.3372	a*	-4.44
u'	0.2291	b*	-13.23
v'	0.5059	Duv	0.0002
R1	83.3	R9	17.4
R2	89.9	R10	75.3
R3	94.5	R11	83.0
R4	84.1	R12	66.4
R5	83.2	R13	84.9
R6	86.1	R14	96.8
R7	87.3		
R8	67.6		



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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	0.00021	405	0.00024	430	0.00359	455	0.01451
381	0.00027	406	0.00023	431	0.00395	456	0.01384
382	0.00033	407	0.00022	432	0.00440	457	0.01316
383	0.00033	408	0.00025	433	0.00485	458	0.01234
384	0.00035	409	0.00019	434	0.00548	459	0.01171
385	0.00025	410	0.00024	435	0.00620	460	0.01124
386	0.00025	411	0.00029	436	0.00699	461	0.01074
387	0.00030	412	0.00031	437	0.00783	462	0.01029
388	0.00028	413	0.00039	438	0.00855	463	0.00985
389	0.00036	414	0.00041	439	0.00943	464	0.00938
390	0.00027	415	0.00051	440	0.01050	465	0.00900
391	0.00028	416	0.00057	441	0.01172	466	0.00869
392	0.00032	417	0.00065	442	0.01283	467	0.00835
393	0.00024	418	0.00076	443	0.01400	468	0.00805
394	0.00031	419	0.00090	444	0.01485	469	0.00770
395	0.00030	420	0.00105	445	0.01574	470	0.00744
396	0.00030	421	0.00119	446	0.01649	471	0.00713
397	0.00030	422	0.00138	447	0.01690	472	0.00684
398	0.00027	423	0.00161	448	0.01720	473	0.00659
399	0.00025	424	0.00178	449	0.01725	474	0.00639
400	0.00022	425	0.00202	450	0.01733	475	0.00620
401	0.00030	426	0.00221	451	0.01703	476	0.00610
402	0.00033	427	0.00247	452	0.01648	477	0.00596
403	0.00030	428	0.00282	453	0.01598	478	0.00588
404	0.00026	429	0.00319	454	0.01526	479	0.00583



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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	0.00578	505	0.00995	530	0.01389	555	0.01601
481	0.00580	506	0.01015	531	0.01398	556	0.01611
482	0.00585	507	0.01037	532	0.01406	557	0.01621
483	0.00587	508	0.01058	533	0.01415	558	0.01634
484	0.00593	509	0.01079	534	0.01423	559	0.01636
485	0.00599	510	0.01097	535	0.01429	560	0.01643
486	0.00609	511	0.01116	536	0.01439	561	0.01653
487	0.00616	512	0.01133	537	0.01449	562	0.01661
488	0.00627	513	0.01147	538	0.01460	563	0.01676
489	0.00642	514	0.01165	539	0.01471	564	0.01687
490	0.00658	515	0.01183	540	0.01477	565	0.01700
491	0.00675	516	0.01200	541	0.01488	566	0.01704
492	0.00694	517	0.01219	542	0.01496	567	0.01712
493	0.00716	518	0.01229	543	0.01504	568	0.01717
494	0.00739	519	0.01245	544	0.01515	569	0.01727
495	0.00763	520	0.01265	545	0.01520	570	0.01735
496	0.00786	521	0.01277	546	0.01528	571	0.01743
497	0.00809	522	0.01292	547	0.01538	572	0.01759
498	0.00829	523	0.01306	548	0.01547	573	0.01767
499	0.00852	524	0.01315	549	0.01554	574	0.01778
500	0.00875	525	0.01329	550	0.01560	575	0.01790
501	0.00899	526	0.01334	551	0.01570	576	0.01802
502	0.00922	527	0.01344	552	0.01578	577	0.01819
503	0.00950	528	0.01361	553	0.01588	578	0.01830
504	0.00971	529	0.01371	554	0.01594	579	0.01842



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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	0.01848	605	0.01962	630	0.01599	655	0.00983
581	0.01860	606	0.01961	631	0.01573	656	0.00960
582	0.01871	607	0.01950	632	0.01554	657	0.00937
583	0.01877	608	0.01939	633	0.01533	658	0.00913
584	0.01889	609	0.01932	634	0.01509	659	0.00893
585	0.01900	610	0.01919	635	0.01490	660	0.00869
586	0.01904	611	0.01905	636	0.01466	661	0.00846
587	0.01919	612	0.01897	637	0.01437	662	0.00823
588	0.01925	613	0.01890	638	0.01411	663	0.00802
589	0.01928	614	0.01877	639	0.01388	664	0.00781
590	0.01936	615	0.01867	640	0.01365	665	0.00758
591	0.01939	616	0.01858	641	0.01340	666	0.00737
592	0.01947	617	0.01844	642	0.01315	667	0.00718
593	0.01955	618	0.01828	643	0.01289	668	0.00698
594	0.01955	619	0.01813	644	0.01261	669	0.00680
595	0.01962	620	0.01794	645	0.01235	670	0.00659
596	0.01964	621	0.01779	646	0.01210	671	0.00641
597	0.01965	622	0.01762	647	0.01184	672	0.00624
598	0.01971	623	0.01741	648	0.01162	673	0.00607
599	0.01973	624	0.01724	649	0.01137	674	0.00593
600	0.01973	625	0.01704	650	0.01110	675	0.00576
601	0.01970	626	0.01682	651	0.01082	676	0.00561
602	0.01969	627	0.01660	652	0.01056	677	0.00547
603	0.01971	628	0.01639	653	0.01030	678	0.00531
604	0.01966	629	0.01618	654	0.01008	679	0.00517



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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	0.00502	706	0.00235	732	0.00111	758	0.00051
681	0.00487	707	0.00226	733	0.00109	759	0.00047
682	0.00475	708	0.00222	734	0.00103	760	0.00044
683	0.00461	709	0.00192	735	0.00102	761	0.00046
684	0.00451	710	0.00190	736	0.00098	762	0.00048
685	0.00438	711	0.00182	737	0.00095	763	0.00051
686	0.00425	712	0.00180	738	0.00092	764	0.00050
687	0.00413	713	0.00193	739	0.00089	765	0.00048
688	0.00399	714	0.00184	740	0.00084	766	0.00045
689	0.00388	715	0.00179	741	0.00080	767	0.00045
690	0.00377	716	0.00173	742	0.00076	768	0.00043
691	0.00370	717	0.00167	743	0.00072	769	0.00048
692	0.00359	718	0.00165	744	0.00072	770	0.00047
693	0.00347	719	0.00161	745	0.00071	771	0.00045
694	0.00336	720	0.00157	746	0.00069	772	0.00040
695	0.00327	721	0.00152	747	0.00067	773	0.00039
696	0.00319	722	0.00148	748	0.00064	774	0.00038
697	0.00309	723	0.00143	749	0.00064	775	0.00037
698	0.00298	724	0.00138	750	0.00064	776	0.00034
699	0.00287	725	0.00132	751	0.00063	777	0.00033
700	0.00279	726	0.00128	752	0.00061	778	0.00031
701	0.00273	727	0.00125	753	0.00059	779	0.00029
702	0.00266	728	0.00117	754	0.00052	780	0.00023
703	0.00258	729	0.00114	755	0.00048		
704	0.00249	730	0.00115	756	0.00051		
705	0.00242	731	0.00112	757	0.00051		