PRELIMINARY

Soraa Internal Report: IES LM79-08

Test results reported for:

Part Number: SM16-09-36D-827-03

Soraa MR16, GU5.3/12V, 2700K, 80CRI, 9W, 36degree

Relevant Standards
IES LM-79
ANSI C78.377
IES PR-16

Soraa Lamp Lab

6500 Kaiser Dr., Fremont, CA 94555 TEL: (510) 456-2200

1.0 Description of test sample

Customer reference ID	SM16-09-36D-827-03
Manufacturer reference ID	SM16-09-36D-827-03
Lamp description	Brilliant 2700K 80CRI 9W 36 degree
Rated voltage	12V
Rated power	9W
Nominal CCT	2700K

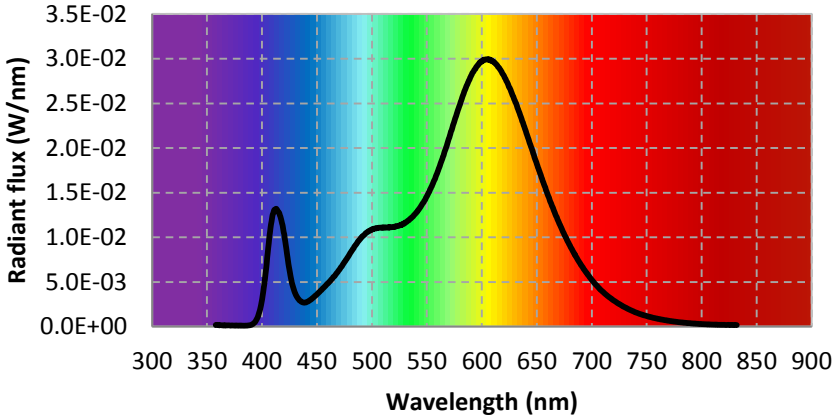
2.0 Results - Sphere Measurements

Test conditions	
Orientation	Horizontal
Stabilization time (min)	50-55
Correction factor applied	Self absorption correction
Sphere geometry	65" Sphere
	95% coating reflectance
	2pi geometry
Ambient temperature (°C)	25±1

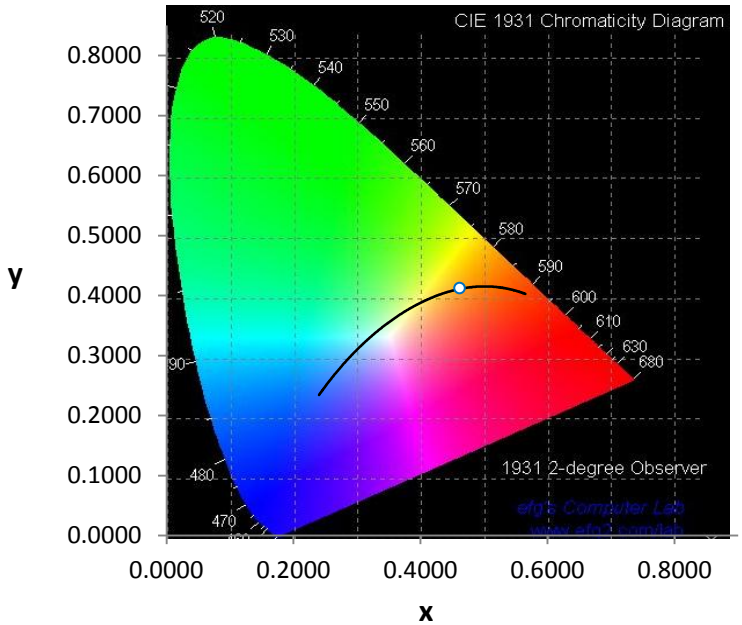
Instrument				
	Instrument	Manufacture	Model	
Photometric	Spectrometer	Instrument systems	CAS 140T	
	Integrating sphere	Labsphere	65"	
	Standard lamp	Labsphere	CSFS-1400 lamp	
Electrical instrument	Power supply for standard lamp	Labsphere	LPS-150-0268	
	Power supply for aux lamp	Labsphere	LPS-100-0833	
	Power supply for test lamps	APT	Variplus 105	
	Power meter for test lamps	Chroma	66202	
Thermometer	Digital multimeter	YOKOGAWA	TY720	

Measurement results				
Photometric			Electrical	
Total lumen (lm)	560		Input voltage (V)	12.0
Luminous efficacy (lm/W)	62		Current (A)	0.820
Chromaticity coordinates	u' = 0.2631		Power (W)	9.0
	v' = 0.5282		pf	0.915
	x = 0.4619			
	y = 0.4121			
CCT (K)	2683			
CRI	83			
R9	8			
Duv				

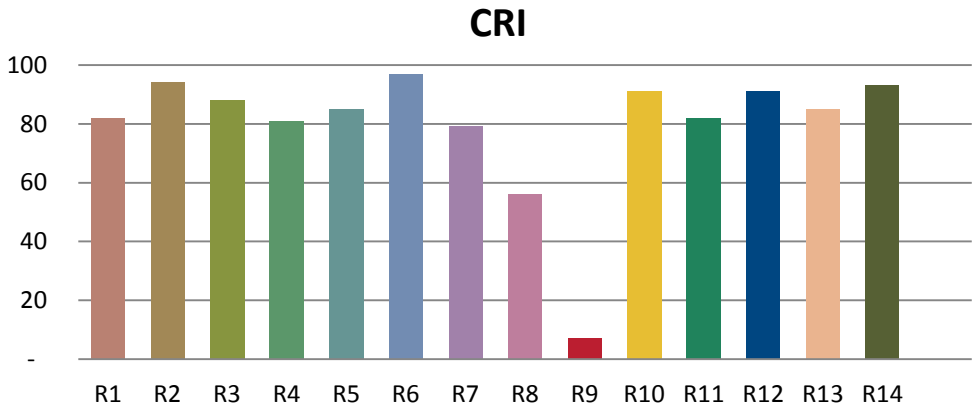
Spectral power distribution



Chromaticity on CIE1931



CRI	
R1	82
R2	94
R3	88
R4	81
R5	85
R6	97
R7	79
R8	56
R9	7
R10	91
R11	82
R12	91
R13	85
R14	93
Ra	83



Spectral Power Distribution									
WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)
380	1.17E-04	421	9.65E-03	462	5.10E-03	503	1.10E-02	544	1.34E-02
381	1.09E-04	422	8.82E-03	463	5.27E-03	504	1.10E-02	545	1.36E-02
382	1.14E-04	423	7.92E-03	464	5.40E-03	505	1.10E-02	546	1.38E-02
383	1.08E-04	424	7.06E-03	465	5.57E-03	506	1.11E-02	547	1.39E-02
384	1.08E-04	425	6.33E-03	466	5.66E-03	507	1.11E-02	548	1.41E-02
385	1.15E-04	426	5.64E-03	467	5.83E-03	508	1.11E-02	549	1.44E-02
386	1.16E-04	427	5.02E-03	468	6.01E-03	509	1.11E-02	550	1.46E-02
387	1.25E-04	428	4.55E-03	469	6.15E-03	510	1.11E-02	551	1.49E-02
388	1.43E-04	429	4.14E-03	470	6.33E-03	511	1.11E-02	552	1.51E-02
389	1.62E-04	430	3.79E-03	471	6.49E-03	512	1.11E-02	553	1.54E-02
390	1.94E-04	431	3.51E-03	472	6.68E-03	513	1.11E-02	554	1.56E-02
391	2.52E-04	432	3.29E-03	473	6.84E-03	514	1.11E-02	555	1.59E-02
392	3.29E-04	433	3.12E-03	474	7.04E-03	515	1.11E-02	556	1.62E-02
393	4.38E-04	434	2.96E-03	475	7.24E-03	516	1.11E-02	557	1.65E-02
394	5.77E-04	435	2.87E-03	476	7.40E-03	517	1.11E-02	558	1.68E-02
395	7.95E-04	436	2.78E-03	477	7.58E-03	518	1.11E-02	559	1.71E-02
396	1.03E-03	437	2.72E-03	478	7.77E-03	519	1.11E-02	560	1.74E-02
397	1.41E-03	438	2.69E-03	479	7.96E-03	520	1.11E-02	561	1.78E-02
398	1.81E-03	439	2.70E-03	480	8.18E-03	521	1.12E-02	562	1.81E-02
399	2.34E-03	440	2.72E-03	481	8.37E-03	522	1.12E-02	563	1.85E-02
400	3.00E-03	441	2.78E-03	482	8.56E-03	523	1.13E-02	564	1.88E-02
401	3.81E-03	442	2.83E-03	483	8.74E-03	524	1.13E-02	565	1.91E-02
402	4.71E-03	443	2.92E-03	484	8.95E-03	525	1.13E-02	566	1.95E-02
403	5.70E-03	444	3.00E-03	485	9.12E-03	526	1.14E-02	567	1.99E-02
404	6.77E-03	445	3.08E-03	486	9.28E-03	527	1.14E-02	568	2.03E-02
405	8.04E-03	446	3.19E-03	487	9.47E-03	528	1.15E-02	569	2.07E-02
406	9.20E-03	447	3.30E-03	488	9.62E-03	529	1.15E-02	570	2.11E-02
407	1.03E-02	448	3.41E-03	489	9.77E-03	530	1.16E-02	571	2.14E-02
408	1.13E-02	449	3.51E-03	490	9.93E-03	531	1.17E-02	572	2.19E-02
409	1.20E-02	450	3.62E-03	491	1.01E-02	532	1.18E-02	573	2.22E-02
410	1.26E-02	451	3.74E-03	492	1.02E-02	533	1.19E-02	574	2.26E-02
411	1.30E-02	452	3.86E-03	493	1.03E-02	534	1.20E-02	575	2.30E-02
412	1.31E-02	453	3.99E-03	494	1.04E-02	535	1.21E-02	576	2.34E-02
413	1.32E-02	454	4.10E-03	495	1.05E-02	536	1.22E-02	577	2.38E-02
414	1.30E-02	455	4.23E-03	496	1.06E-02	537	1.23E-02	578	2.42E-02
415	1.28E-02	456	4.36E-03	497	1.07E-02	538	1.24E-02	579	2.45E-02
416	1.26E-02	457	4.48E-03	498	1.08E-02	539	1.26E-02	580	2.48E-02
417	1.22E-02	458	4.61E-03	499	1.08E-02	540	1.27E-02	581	2.52E-02
418	1.17E-02	459	4.75E-03	500	1.09E-02	541	1.29E-02	582	2.56E-02
419	1.11E-02	460	4.84E-03	501	1.09E-02	542	1.30E-02	583	2.60E-02
420	1.04E-02	461	4.98E-03	502	1.10E-02	543	1.32E-02	584	2.63E-02

Spectral Power Distribution									
WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)	WL (nm)	SPD(W/nm)
585	2.66E-02	626	2.66E-02	667	1.25E-02	708	4.13E-03	749	1.23E-03
586	2.69E-02	627	2.62E-02	668	1.23E-02	709	4.02E-03	750	1.19E-03
587	2.72E-02	628	2.59E-02	669	1.20E-02	710	3.91E-03	751	1.15E-03
588	2.75E-02	629	2.56E-02	670	1.17E-02	711	3.80E-03	752	1.11E-03
589	2.77E-02	630	2.53E-02	671	1.14E-02	712	3.69E-03	753	1.09E-03
590	2.80E-02	631	2.50E-02	672	1.11E-02	713	3.58E-03	754	1.06E-03
591	2.83E-02	632	2.47E-02	673	1.09E-02	714	3.48E-03	755	1.02E-03
592	2.85E-02	633	2.43E-02	674	1.06E-02	715	3.38E-03	756	9.88E-04
593	2.87E-02	634	2.40E-02	675	1.03E-02	716	3.29E-03	757	9.63E-04
594	2.88E-02	635	2.36E-02	676	1.01E-02	717	3.20E-03	758	9.38E-04
595	2.91E-02	636	2.33E-02	677	9.84E-03	718	3.10E-03	759	9.13E-04
596	2.92E-02	637	2.29E-02	678	9.57E-03	719	3.01E-03	760	8.73E-04
597	2.94E-02	638	2.26E-02	679	9.35E-03	720	2.92E-03	761	8.64E-04
598	2.96E-02	639	2.22E-02	680	9.12E-03	721	2.85E-03	762	8.29E-04
599	2.96E-02	640	2.19E-02	681	8.87E-03	722	2.77E-03	763	8.13E-04
600	2.97E-02	641	2.15E-02	682	8.65E-03	723	2.68E-03	764	7.88E-04
601	2.98E-02	642	2.12E-02	683	8.41E-03	724	2.60E-03	765	7.64E-04
602	2.98E-02	643	2.08E-02	684	8.20E-03	725	2.53E-03	766	7.39E-04
603	2.99E-02	644	2.04E-02	685	7.99E-03	726	2.46E-03	767	7.21E-04
604	2.99E-02	645	2.01E-02	686	7.77E-03	727	2.38E-03	768	7.08E-04
605	2.99E-02	646	1.97E-02	687	7.56E-03	728	2.30E-03	769	6.74E-04
606	2.99E-02	647	1.93E-02	688	7.35E-03	729	2.24E-03	770	6.60E-04
607	2.99E-02	648	1.89E-02	689	7.16E-03	730	2.18E-03	771	6.39E-04
608	2.98E-02	649	1.86E-02	690	6.95E-03	731	2.12E-03	772	6.25E-04
609	2.98E-02	650	1.82E-02	691	6.77E-03	732	2.05E-03	773	6.04E-04
610	2.97E-02	651	1.79E-02	692	6.61E-03	733	1.99E-03	774	5.93E-04
611	2.96E-02	652	1.75E-02	693	6.40E-03	734	1.92E-03	775	5.69E-04
612	2.95E-02	653	1.72E-02	694	6.23E-03	735	1.87E-03	776	5.58E-04
613	2.94E-02	654	1.68E-02	695	6.06E-03	736	1.81E-03	777	5.40E-04
614	2.92E-02	655	1.65E-02	696	5.91E-03	737	1.76E-03	778	5.21E-04
615	2.90E-02	656	1.61E-02	697	5.73E-03	738	1.71E-03	779	5.05E-04
616	2.89E-02	657	1.58E-02	698	5.56E-03	739	1.64E-03	780	4.95E-04
617	2.87E-02	658	1.55E-02	699	5.40E-03	740	1.59E-03		
618	2.85E-02	659	1.51E-02	700	5.23E-03	741	1.55E-03		
619	2.83E-02	660	1.48E-02	701	5.10E-03	742	1.50E-03		
620	2.81E-02	661	1.45E-02	702	4.94E-03	743	1.45E-03		
621	2.78E-02	662	1.41E-02	703	4.79E-03	744	1.41E-03		
622	2.76E-02	663	1.38E-02	704	4.66E-03	745	1.38E-03		
623	2.74E-02	664	1.35E-02	705	4.53E-03	746	1.33E-03		
624	2.71E-02	665	1.32E-02	706	4.40E-03	747	1.29E-03		
625	2.68E-02	666	1.29E-02	707	4.24E-03	748	1.26E-03		

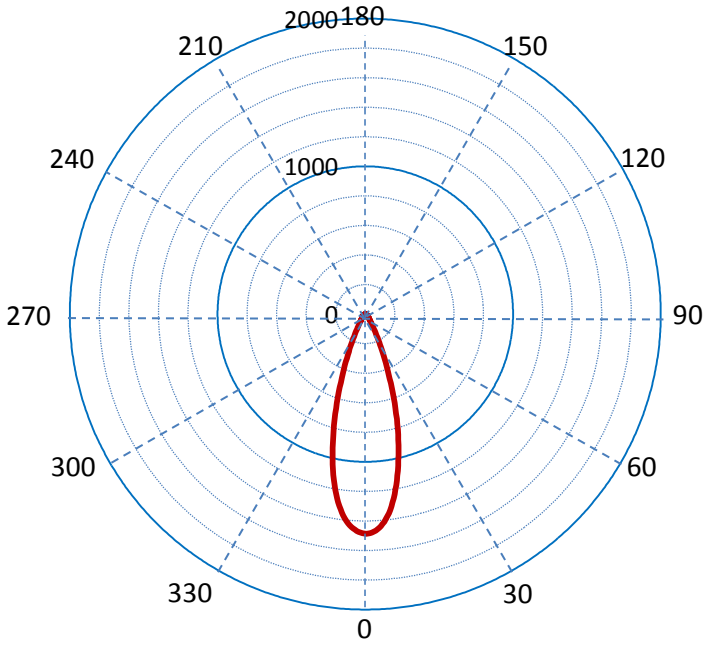
3.0 Results - Goniometric Measurements

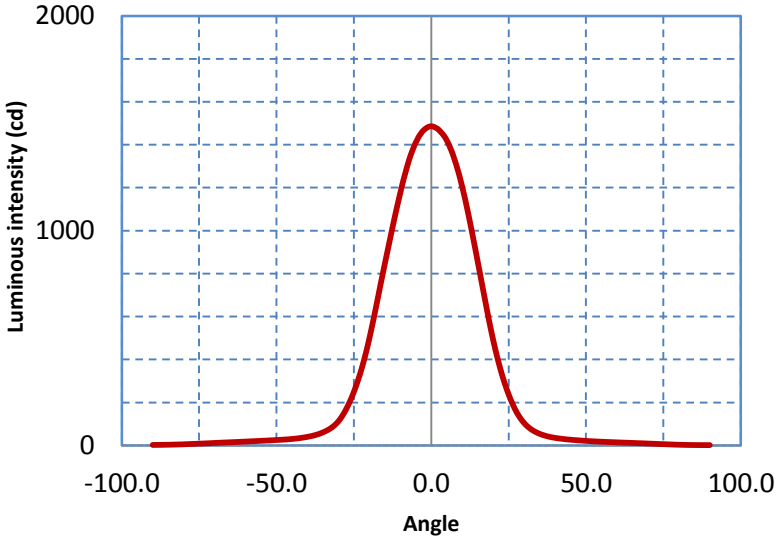
Test conditions	
Goniometer distance (m)	1
Temperature (°C)	25±1
Stabilization time (min)	50

Instrument				
	Instrument	Manufacture	Model	
Photometric	Photometer and color meter	Minolta	CL-200A	
Electrical instrument	Power supply for test lamps	APT	Variplus 105	
	Power meter for test lamps	Chroma	66202	
Thermometer	Digital multimeter	YOKOGAWA	TY720	

Measurement results				
Photometric			Electrical	
Central beam candle power(cd)	1486		Input voltage (V)	12.0
Beam Angle (°)	33		Current (A)	0.820
Field Angle (°)	57		Power (W)	9.0
Chromaticity coordinates	u'= 0.2631		pf	0.9150
	v'= 0.5282			
	x = 0.4619			
	y = 0.4121			
CCT (K)	2683			

Luminous intensity distribution

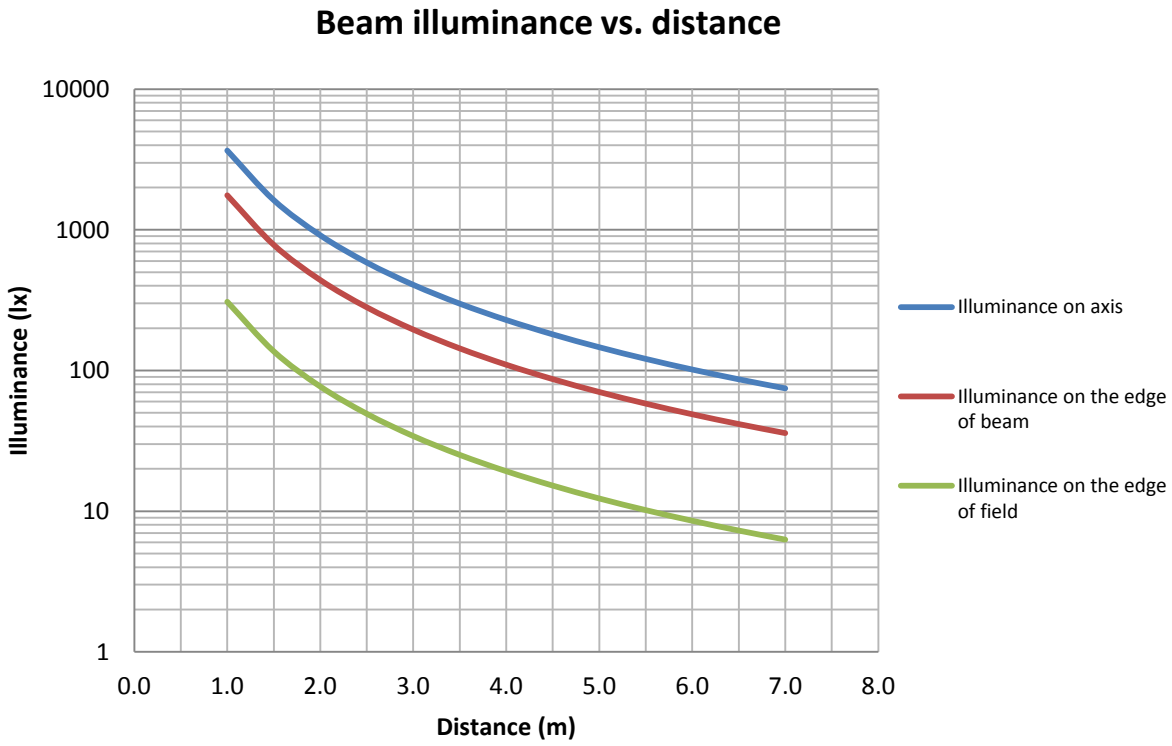




Zonal Lumen Tabulation					
Zones (°)	Lumens	%lamp	Zones (°)	Lumens	%lamp
0-5	34.6	6.2%	45-50	9.4	1.7%
5-10	94.0	16.8%	50-55	8.1	1.5%
10-15	121.7	21.7%	55-60	7.2	1.3%
15-20	108.6	19.4%	60-65	6.2	1.1%
20-25	71.8	12.8%	65-70	5.1	0.9%
25-30	39.1	7.0%	70-75	3.7	0.7%
30-35	21.1	3.8%	75-80	2.3	0.4%
35-40	13.9	2.5%	80-85	1.2	0.2%
40-45	11.0	2.0%	85-90	0.8	0.1%
				Total lumen	560

Accumulated Zonal Lumen Tabulation					
Zones (°)	Lumens	%lamp	Zones (°)	Lumens	%lamp
0-5	34.6	6.2%	0-50	525.3	93.8%
0-10	128.6	23.0%	0-55	533.4	95.3%
0-15	250.3	44.7%	0-60	540.5	96.6%
0-20	358.9	64.1%	0-65	546.7	97.7%
0-25	430.6	76.9%	0-70	551.8	98.6%
0-30	469.8	83.9%	0-75	555.5	99.2%
0-35	490.9	87.7%	0-80	557.8	99.7%
0-40	504.8	90.2%	0-85	559.0	99.9%
0-45	515.8	92.1%	0-90	559.8	100.0%

Center and edge illuminance, beam and field diameter					
Distance (m)	E on axis (lx)	Beam D(m)	E on the edge of beam (lx)	Field D(m)	E on the edge of field (lx)
1.0	3657	0.33	1758	0.7	308
1.5	1626	0.49	781	1.0	137
2.0	914	0.65	440	1.4	77
2.5	585	0.81	281	1.7	49
3.0	406	0.98	195	2.1	34
3.5	299	1.14	144	2.4	25
4.0	229	1.30	110	2.8	19
4.5	181	1.47	87	3.1	15
5.0	146	1.63	70	3.5	12
5.5	121	1.79	58	3.8	10
6.0	102	1.95	49	4.2	9
6.5	87	2.12	42	4.5	7
7.0	75	2.28	36	4.9	6
7.5	65	2.44	31	5.2	5
8.0	57	2.61	27	5.6	5
8.5	51	2.77	24	5.9	4
9.0	45	2.93	22	6.3	4
9.5	41	3.09	19	6.6	3
10.0	37	3.26	18	7.0	3



Luminous Intensity Distribution									
Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)
-90.0	2.2	-69.5	11.7	-49.0	25.9	-28.5	143.1	-8.0	1288.0
-89.5	2.3	-69.0	12.1	-48.5	26.3	-28.0	155.5	-7.5	1313.8
-89.0	2.3	-68.5	12.5	-48.0	26.7	-27.5	168.6	-7.0	1336.9
-88.5	2.4	-68.0	12.9	-47.5	27.2	-27.0	182.9	-6.5	1357.6
-88.0	2.6	-67.5	13.1	-47.0	27.7	-26.5	198.0	-6.0	1376.9
-87.5	2.6	-67.0	13.5	-46.5	28.2	-26.0	213.9	-5.5	1394.9
-87.0	2.7	-66.5	13.8	-46.0	28.7	-25.5	231.1	-5.0	1410.4
-86.5	2.8	-66.0	14.0	-45.5	29.4	-25.0	249.4	-4.5	1424.5
-86.0	3.0	-65.5	14.3	-45.0	30.0	-24.5	268.7	-4.0	1438.7
-85.5	3.1	-65.0	14.7	-44.5	30.7	-24.0	288.9	-3.5	1449.0
-85.0	3.2	-64.5	14.9	-44.0	31.4	-23.5	310.5	-3.0	1459.3
-84.5	3.3	-64.0	15.2	-43.5	32.2	-23.0	333.2	-2.5	1467.0
-84.0	3.5	-63.5	15.6	-43.0	33.1	-22.5	357.2	-2.0	1473.5
-83.5	3.7	-63.0	15.8	-42.5	34.0	-22.0	382.7	-1.5	1478.6
-83.0	3.9	-62.5	16.2	-42.0	35.0	-21.5	409.7	-1.0	1482.5
-82.5	4.1	-62.0	16.5	-41.5	36.2	-21.0	437.5	-0.5	1485.1
-82.0	4.3	-61.5	16.9	-41.0	37.4	-20.5	467.3	0.0	1486.4
-81.5	4.5	-61.0	17.1	-40.5	38.5	-20.0	498.5	0.5	1485.1
-81.0	4.8	-60.5	17.5	-40.0	39.8	-19.5	530.9	1.0	1482.5
-80.5	4.9	-60.0	17.9	-39.5	41.2	-19.0	564.3	1.5	1478.6
-80.0	5.3	-59.5	18.2	-39.0	42.8	-18.5	598.5	2.0	1474.8
-79.5	5.5	-59.0	18.5	-38.5	44.3	-18.0	633.4	2.5	1468.3
-79.0	5.8	-58.5	18.9	-38.0	46.1	-17.5	668.9	3.0	1460.6
-78.5	6.1	-58.0	19.2	-37.5	48.0	-17.0	704.8	3.5	1452.9
-78.0	6.4	-57.5	19.6	-37.0	50.2	-16.5	741.0	4.0	1443.8
-77.5	6.7	-57.0	20.0	-36.5	52.4	-16.0	776.3	4.5	1433.5
-77.0	7.0	-56.5	20.4	-36.0	55.0	-15.5	811.2	5.0	1420.7
-76.5	7.2	-56.0	20.6	-35.5	57.7	-15.0	845.8	5.5	1406.5
-76.0	7.6	-55.5	21.0	-35.0	60.7	-14.5	880.2	6.0	1389.8
-75.5	7.9	-55.0	21.4	-34.5	63.9	-14.0	914.5	6.5	1373.0
-75.0	8.1	-54.5	21.8	-34.0	67.4	-13.5	948.7	7.0	1353.7
-74.5	8.5	-54.0	22.0	-33.5	71.1	-13.0	982.9	7.5	1331.8
-74.0	8.8	-53.5	22.4	-33.0	75.2	-12.5	1016.6	8.0	1309.9
-73.5	9.0	-53.0	22.8	-32.5	79.7	-12.0	1050.0	8.5	1285.4
-73.0	9.4	-52.5	23.2	-32.0	84.9	-11.5	1082.7	9.0	1261.0
-72.5	9.7	-52.0	23.6	-31.5	90.7	-11.0	1114.6	9.5	1232.6
-72.0	10.0	-51.5	24.0	-31.0	97.0	-10.5	1145.7	10.0	1204.3
-71.5	10.3	-51.0	24.2	-30.5	104.2	-10.0	1176.1	10.5	1173.4
-71.0	10.7	-50.5	24.6	-30.0	112.3	-9.5	1206.9	11.0	1142.5
-70.5	11.1	-50.0	25.1	-29.5	121.5	-9.0	1235.2	11.5	1109.0
-70.0	11.5	-49.5	25.5	-29.0	131.8	-8.5	1262.2	12.0	1075.5

Luminous Intensity Distribution									
Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)		
12.5	1040.1	33.0	68.3	53.5	18.2	74.0	6.3		
13.0	1004.4	33.5	64.1	54.0	17.8	74.5	6.1		
13.5	968.2	34.0	60.5	54.5	17.5	75.0	5.8		
14.0	931.5	34.5	57.2	55.0	17.1	75.5	5.5		
14.5	894.1	35.0	54.1	55.5	16.9	76.0	5.3		
15.0	856.5	35.5	51.4	56.0	16.6	76.5	4.9		
15.5	819.0	36.0	48.8	56.5	16.2	77.0	4.6		
16.0	781.3	36.5	46.5	57.0	16.0	77.5	4.4		
16.5	743.4	37.0	44.4	57.5	15.7	78.0	4.1		
17.0	705.7	37.5	42.4	58.0	15.5	78.5	3.7		
17.5	668.1	38.0	40.7	58.5	15.1	79.0	3.5		
18.0	630.7	38.5	39.0	59.0	14.8	79.5	3.3		
18.5	593.8	39.0	37.6	59.5	14.6	80.0	3.1		
19.0	558.2	39.5	36.3	60.0	14.2	80.5	3.0		
19.5	524.1	40.0	35.0	60.5	13.9	81.0	2.7		
20.0	490.9	40.5	34.0	61.0	13.7	81.5	2.6		
20.5	459.2	41.0	33.0	61.5	13.4	82.0	2.3		
21.0	429.0	41.5	31.9	62.0	13.1	82.5	2.2		
21.5	400.3	42.0	31.0	62.5	12.9	83.0	2.1		
22.0	373.0	42.5	30.1	63.0	12.6	83.5	2.1		
22.5	347.0	43.0	29.4	63.5	12.4	84.0	1.9		
23.0	322.3	43.5	28.5	64.0	12.1	84.5	1.8		
23.5	299.2	44.0	27.8	64.5	11.8	85.0	1.7		
24.0	277.3	44.5	27.2	65.0	11.6	85.5	1.7		
24.5	256.6	45.0	26.5	65.5	11.3	86.0	1.5		
25.0	237.1	45.5	25.9	66.0	10.9	86.5	1.5		
25.5	218.8	46.0	25.2	66.5	10.7	87.0	1.4		
26.0	201.7	46.5	24.7	67.0	10.4	87.5	1.4		
26.5	185.5	47.0	24.2	67.5	10.2	88.0	1.4		
27.0	170.5	47.5	23.7	68.0	9.9	88.5	1.4		
27.5	156.7	48.0	23.2	68.5	9.7	89.0	1.3		
28.0	144.1	48.5	22.5	69.0	9.4	89.5	1.3		
28.5	132.7	49.0	22.0	69.5	9.0	90.0	1.3		
29.0	122.2	49.5	21.5	70.0	8.8				
29.5	112.8	50.0	21.1	70.5	8.4				
30.0	104.2	50.5	20.6	71.0	8.1				
30.5	96.5	51.0	20.2	71.5	7.9				
31.0	89.5	51.5	19.7	72.0	7.5				
31.5	83.3	52.0	19.3	72.5	7.2				
32.0	77.7	52.5	18.9	73.0	6.8				
32.5	72.6	53.0	18.5	73.5	6.6				