

PRELIMINARY



## Soraa Internal Report: IES LM79-08

Test results reported for:

Customer Reference P/N: **SR111-18-36D-950-03**

Manufacturing P/N: SR111-18-36D-950-03

**Soraa AR111, G53/12V, 5000K, 95CRI, 18.5W, 36degree**

Relevant Standards

IES LM-79

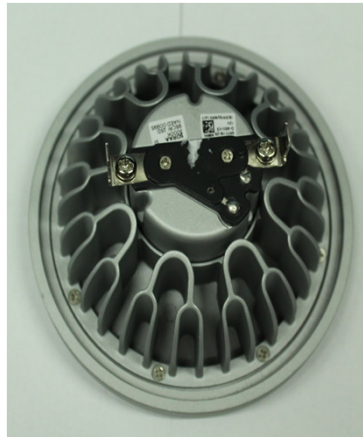
ANSI C78.377

IES PR-16

Soraa Lamp Lab

## 1.0 Description of test sample

Customer reference ID	SR111-18-36D-950-03
Manufacturer reference ID	SR111-18-36D-950-03
Lamp description	Vivid 5000K 90CRI 18.5W 36 degree
Rated voltage	AC 12V
Rated power	18.5W
Nominal CCT	5000K



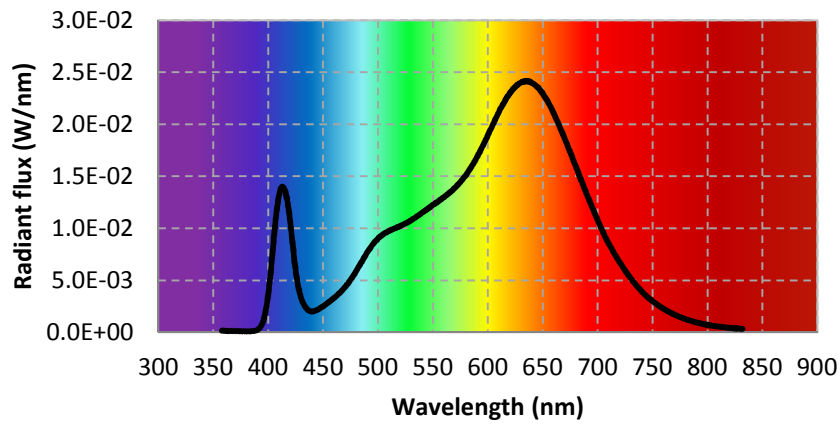
## 2.0 Results - Sphere Measurements

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

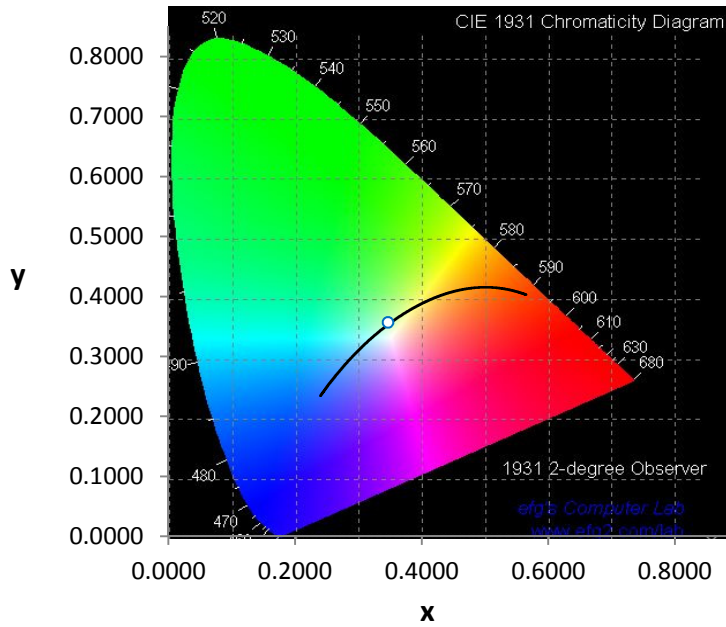
Instrument				
	Instrument	Manufacture	Model	
Photometric	Spectrometer	Instrument systems	CAS 140T	
	Integrating sphere	Labsphere	65"	
	Standard lamp	Labsphere	CSFS-1400 lamp	
Electrical instrument	Power supply for standard lamp	Labsphere	LPS-150-0268	
	Power supply for aux lamp	Labsphere	LPS-100-0833	
	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)	989		Input voltage (V)	119.6
Luminous efficacy (lm/W)	53		Current (A)	0.156
Chromaticity coordinates	$u' = 0.2109$		Power (W)	18.5
	$v' = 0.4871$		pf	0.989
	$x = 0.3469$			
	$y = 0.3561$			
CCT (K)	5000			
CRI	93			
R9	88			
Duv				

### Spectral power distribution

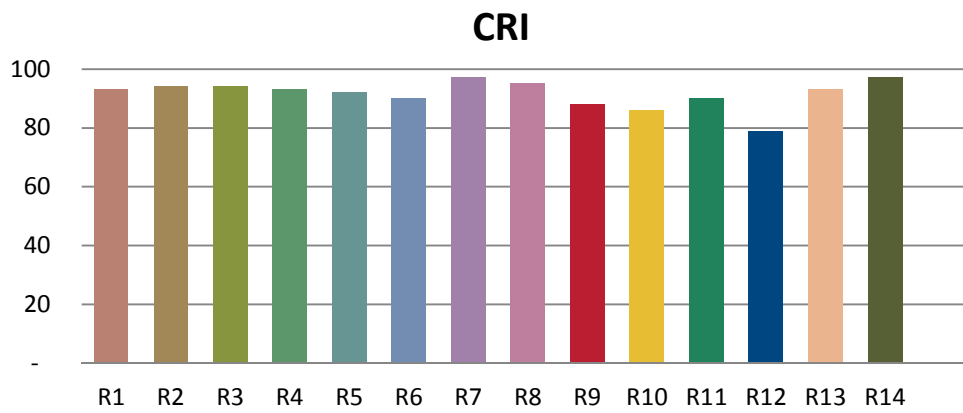


### Chromaticity on CIE1931



CRI

R1	93
R2	94
R3	94
R4	93
R5	92
R6	90
R7	97
R8	95
R9	88
R10	86
R11	90
R12	79
R13	93
R14	97
Ra	93



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	1.01E-04	421	9.75E-03	462	3.49E-03	503	9.30E-03	544	1.18E-02
381	1.00E-04	422	8.80E-03	463	3.60E-03	504	9.36E-03	545	1.18E-02
382	1.04E-04	423	7.78E-03	464	3.68E-03	505	9.45E-03	546	1.19E-02
383	1.05E-04	424	6.78E-03	465	3.79E-03	506	9.53E-03	547	1.20E-02
384	1.03E-04	425	5.98E-03	466	3.88E-03	507	9.57E-03	548	1.21E-02
385	1.10E-04	426	5.25E-03	467	3.99E-03	508	9.64E-03	549	1.22E-02
386	1.20E-04	427	4.61E-03	468	4.11E-03	509	9.69E-03	550	1.23E-02
387	1.29E-04	428	4.12E-03	469	4.23E-03	510	9.74E-03	551	1.23E-02
388	1.43E-04	429	3.66E-03	470	4.36E-03	511	9.80E-03	552	1.24E-02
389	1.76E-04	430	3.31E-03	471	4.47E-03	512	9.84E-03	553	1.25E-02
390	2.16E-04	431	3.01E-03	472	4.61E-03	513	9.89E-03	554	1.25E-02
391	2.89E-04	432	2.78E-03	473	4.75E-03	514	9.92E-03	555	1.26E-02
392	3.93E-04	433	2.58E-03	474	4.90E-03	515	9.97E-03	556	1.27E-02
393	5.32E-04	434	2.41E-03	475	5.05E-03	516	1.00E-02	557	1.27E-02
394	7.12E-04	435	2.29E-03	476	5.20E-03	517	1.01E-02	558	1.29E-02
395	9.49E-04	436	2.17E-03	477	5.36E-03	518	1.01E-02	559	1.29E-02
396	1.28E-03	437	2.09E-03	478	5.52E-03	519	1.01E-02	560	1.30E-02
397	1.72E-03	438	2.04E-03	479	5.68E-03	520	1.02E-02	561	1.31E-02
398	2.23E-03	439	2.01E-03	480	5.87E-03	521	1.03E-02	562	1.32E-02
399	2.83E-03	440	2.00E-03	481	6.04E-03	522	1.03E-02	563	1.32E-02
400	3.57E-03	441	2.03E-03	482	6.22E-03	523	1.04E-02	564	1.33E-02
401	4.47E-03	442	2.04E-03	483	6.39E-03	524	1.04E-02	565	1.34E-02
402	5.44E-03	443	2.08E-03	484	6.59E-03	525	1.05E-02	566	1.35E-02
403	6.49E-03	444	2.13E-03	485	6.75E-03	526	1.05E-02	567	1.36E-02
404	7.57E-03	445	2.17E-03	486	6.93E-03	527	1.06E-02	568	1.37E-02
405	8.84E-03	446	2.23E-03	487	7.13E-03	528	1.07E-02	569	1.38E-02
406	9.90E-03	447	2.30E-03	488	7.29E-03	529	1.07E-02	570	1.39E-02
407	1.10E-02	448	2.37E-03	489	7.46E-03	530	1.07E-02	571	1.40E-02
408	1.19E-02	449	2.43E-03	490	7.66E-03	531	1.08E-02	572	1.41E-02
409	1.26E-02	450	2.50E-03	491	7.82E-03	532	1.09E-02	573	1.42E-02
410	1.32E-02	451	2.57E-03	492	7.97E-03	533	1.10E-02	574	1.43E-02
411	1.37E-02	452	2.66E-03	493	8.11E-03	534	1.10E-02	575	1.45E-02
412	1.39E-02	453	2.73E-03	494	8.27E-03	535	1.11E-02	576	1.46E-02
413	1.40E-02	454	2.80E-03	495	8.42E-03	536	1.12E-02	577	1.47E-02
414	1.39E-02	455	2.90E-03	496	8.54E-03	537	1.13E-02	578	1.49E-02
415	1.37E-02	456	2.97E-03	497	8.70E-03	538	1.13E-02	579	1.50E-02
416	1.34E-02	457	3.05E-03	498	8.80E-03	539	1.14E-02	580	1.51E-02
417	1.29E-02	458	3.14E-03	499	8.89E-03	540	1.15E-02	581	1.53E-02
418	1.23E-02	459	3.23E-03	500	9.02E-03	541	1.16E-02	582	1.54E-02
419	1.16E-02	460	3.30E-03	501	9.14E-03	542	1.16E-02	583	1.56E-02
420	1.07E-02	461	3.39E-03	502	9.21E-03	543	1.17E-02	584	1.57E-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	1.59E-02	626	2.37E-02	667	1.94E-02	708	8.95E-03	749	3.07E-03
586	1.61E-02	627	2.38E-02	668	1.91E-02	709	8.75E-03	750	2.98E-03
587	1.62E-02	628	2.39E-02	669	1.89E-02	710	8.55E-03	751	2.91E-03
588	1.65E-02	629	2.39E-02	670	1.86E-02	711	8.35E-03	752	2.84E-03
589	1.66E-02	630	2.40E-02	671	1.83E-02	712	8.16E-03	753	2.75E-03
590	1.68E-02	631	2.41E-02	672	1.81E-02	713	7.97E-03	754	2.68E-03
591	1.70E-02	632	2.41E-02	673	1.78E-02	714	7.78E-03	755	2.61E-03
592	1.72E-02	633	2.41E-02	674	1.76E-02	715	7.60E-03	756	2.54E-03
593	1.74E-02	634	2.41E-02	675	1.73E-02	716	7.44E-03	757	2.46E-03
594	1.76E-02	635	2.41E-02	676	1.71E-02	717	7.24E-03	758	2.39E-03
595	1.79E-02	636	2.41E-02	677	1.68E-02	718	7.08E-03	759	2.33E-03
596	1.80E-02	637	2.41E-02	678	1.65E-02	719	6.89E-03	760	2.26E-03
597	1.83E-02	638	2.41E-02	679	1.62E-02	720	6.74E-03	761	2.21E-03
598	1.85E-02	639	2.41E-02	680	1.60E-02	721	6.58E-03	762	2.14E-03
599	1.87E-02	640	2.40E-02	681	1.57E-02	722	6.41E-03	763	2.07E-03
600	1.89E-02	641	2.39E-02	682	1.55E-02	723	6.25E-03	764	2.03E-03
601	1.92E-02	642	2.39E-02	683	1.52E-02	724	6.08E-03	765	1.97E-03
602	1.94E-02	643	2.38E-02	684	1.49E-02	725	5.95E-03	766	1.90E-03
603	1.96E-02	644	2.37E-02	685	1.46E-02	726	5.79E-03	767	1.86E-03
604	1.98E-02	645	2.36E-02	686	1.44E-02	727	5.64E-03	768	1.80E-03
605	2.01E-02	646	2.35E-02	687	1.41E-02	728	5.48E-03	769	1.75E-03
606	2.03E-02	647	2.34E-02	688	1.38E-02	729	5.34E-03	770	1.69E-03
607	2.05E-02	648	2.32E-02	689	1.36E-02	730	5.22E-03	771	1.64E-03
608	2.07E-02	649	2.31E-02	690	1.33E-02	731	5.08E-03	772	1.61E-03
609	2.10E-02	650	2.30E-02	691	1.30E-02	732	4.92E-03	773	1.56E-03
610	2.11E-02	651	2.28E-02	692	1.28E-02	733	4.81E-03	774	1.51E-03
611	2.14E-02	652	2.26E-02	693	1.25E-02	734	4.67E-03	775	1.46E-03
612	2.16E-02	653	2.25E-02	694	1.23E-02	735	4.54E-03	776	1.42E-03
613	2.18E-02	654	2.23E-02	695	1.20E-02	736	4.42E-03	777	1.38E-03
614	2.20E-02	655	2.21E-02	696	1.18E-02	737	4.29E-03	778	1.33E-03
615	2.21E-02	656	2.19E-02	697	1.15E-02	738	4.18E-03	779	1.30E-03
616	2.24E-02	657	2.17E-02	698	1.13E-02	739	4.07E-03	780	1.27E-03
617	2.25E-02	658	2.15E-02	699	1.10E-02	740	3.93E-03		
618	2.27E-02	659	2.13E-02	700	1.08E-02	741	3.84E-03		
619	2.28E-02	660	2.11E-02	701	1.05E-02	742	3.71E-03		
620	2.30E-02	661	2.08E-02	702	1.03E-02	743	3.63E-03		
621	2.31E-02	662	2.06E-02	703	1.01E-02	744	3.52E-03		
622	2.33E-02	663	2.04E-02	704	9.83E-03	745	3.42E-03		
623	2.34E-02	664	2.01E-02	705	9.61E-03	746	3.33E-03		
624	2.35E-02	665	1.99E-02	706	9.39E-03	747	3.25E-03		
625	2.36E-02	666	1.96E-02	707	9.14E-03	748	3.17E-03		

### 3.0 Results - Goniometric Measurements

### Test conditions

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

### Instrument

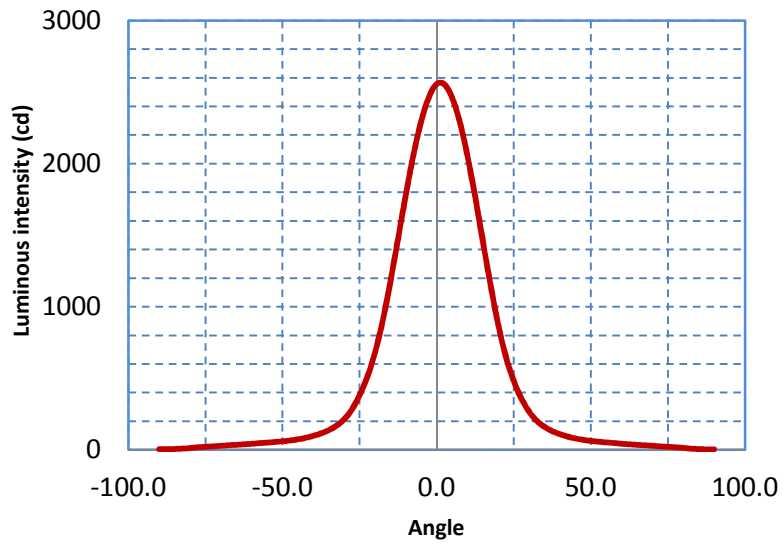
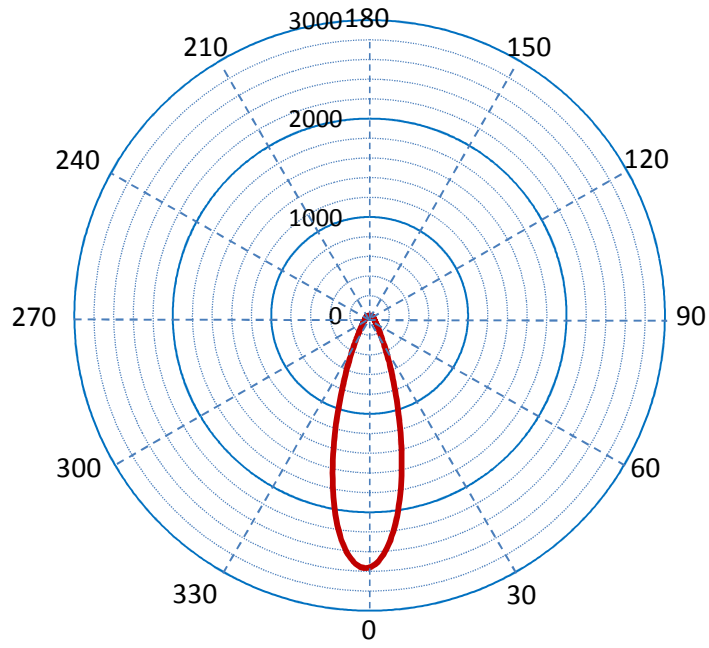
	Instrument	Manufacture	Model	
Photometric	Photometer and color meter	Minolta	CL-200A	
Electrical instrument	Power supply for test lamps	APT	Variplus 105	
	Power meter for test lamps	Chroma	66202	
Thermometer	Digital multimeter	YOKOGAWA	TY720	

### Measurement results

Photometric		Electrical	
Central beam candle power(cd)	2566	Input voltage (V)	119.6
Beam Angle (°)	31	Current (A)	0.156
Field Angle (°)	59	Power (W)	18.4900
Chromaticity coordinates	u'= 0.2109	pf	0.9890
	v'= 0.4871		
	x = 0.3469		
	y = 0.3561		
CCT (K)	5000		



# Luminous intensity distribution



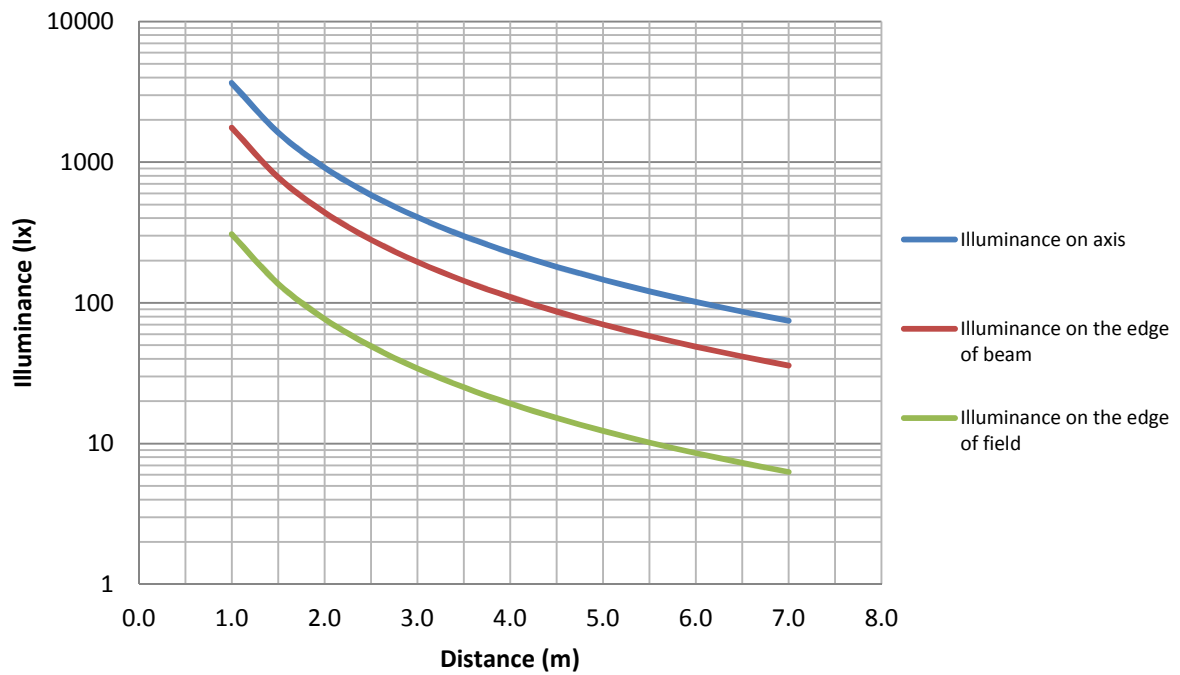
Zonal Lumen Tabulation					
Zones (°)	Lumens	%lamp	Zones (°)	Lumens	%lamp
0-5	32.2	5.4%	45-50	15.0	2.5%
5-10	86.5	14.5%	50-55	13.1	2.2%
10-15	110.7	18.6%	55-60	11.6	2.0%
15-20	99.9	16.8%	60-65	9.9	1.7%
20-25	71.8	12.1%	65-70	8.4	1.4%
25-30	47.8	8.0%	70-75	6.8	1.1%
30-35	31.5	5.3%	75-80	5.0	0.8%
35-40	23.0	3.9%	80-85	2.4	0.4%
40-45	18.1	3.0%	85-90	1.0	0.2%
Total lumen					595

Accumulated Zonal Lumen Tabulation					
Zones (°)	Lumens	%lamp	Zones (°)	Lumens	%lamp
0-5	32.2	5.4%	0-50	536.6	90.2%
0-10	118.8	20.0%	0-55	549.6	92.4%
0-15	229.4	38.6%	0-60	561.3	94.4%
0-20	329.4	55.4%	0-65	571.2	96.0%
0-25	401.1	67.4%	0-70	579.6	97.4%
0-30	449.0	75.5%	0-75	586.4	98.6%
0-35	480.4	80.8%	0-80	591.4	99.4%
0-40	503.5	84.6%	0-85	593.8	99.8%
0-45	521.6	87.7%	0-90	594.8	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

### Beam illuminance vs. distance



### 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	4.2	-69.5	28.9	-49.0	61.9	-28.5	251.6	-8.0	2011.6
-89.5	4.3	-69.0	29.6	-48.5	63.1	-28.0	266.5	-7.5	2064.1
-89.0	4.3	-68.5	30.3	-48.0	64.4	-27.5	282.7	-7.0	2115.6
-88.5	4.4	-68.0	31.1	-47.5	65.6	-27.0	300.1	-6.5	2163.9
-88.0	4.5	-67.5	31.7	-47.0	67.1	-26.5	318.5	-6.0	2211.1
-87.5	4.7	-67.0	32.4	-46.5	68.6	-26.0	338.2	-5.5	2255.2
-87.0	4.9	-66.5	33.2	-46.0	70.2	-25.5	359.0	-5.0	2297.2
-86.5	5.1	-66.0	33.9	-45.5	71.9	-25.0	381.0	-4.5	2337.1
-86.0	5.4	-65.5	34.5	-45.0	73.7	-24.5	404.0	-4.0	2372.8
-85.5	5.7	-65.0	35.2	-44.5	75.6	-24.0	428.4	-3.5	2407.5
-85.0	6.1	-64.5	35.9	-44.0	77.5	-23.5	454.0	-3.0	2437.9
-84.5	6.5	-64.0	36.5	-43.5	79.6	-23.0	481.1	-2.5	2466.3
-84.0	6.9	-63.5	37.3	-43.0	81.8	-22.5	509.6	-2.0	2491.5
-83.5	7.6	-63.0	37.9	-42.5	84.1	-22.0	540.0	-1.5	2513.5
-83.0	8.1	-62.5	38.6	-42.0	86.5	-21.5	572.0	-1.0	2531.4
-82.5	8.6	-62.0	39.4	-41.5	89.1	-21.0	606.0	-0.5	2545.0
-82.0	9.2	-61.5	40.1	-41.0	91.9	-20.5	642.0	0.0	2556.6
-81.5	9.9	-61.0	40.8	-40.5	94.7	-20.0	680.2	0.5	2562.9
-81.0	10.5	-60.5	41.6	-40.0	97.9	-19.5	720.2	1.0	2566.0
-80.5	11.3	-60.0	42.4	-39.5	101.0	-19.0	762.0	1.5	2566.0
-80.0	12.4	-59.5	43.3	-39.0	104.3	-18.5	806.5	2.0	2562.9
-79.5	13.5	-59.0	44.0	-38.5	107.7	-18.0	853.6	2.5	2554.5
-79.0	14.9	-58.5	44.8	-38.0	111.4	-17.5	902.2	3.0	2542.9
-78.5	16.2	-58.0	45.7	-37.5	115.2	-17.0	953.2	3.5	2527.2
-78.0	17.1	-57.5	46.5	-37.0	119.2	-16.5	1006.9	4.0	2509.3
-77.5	17.8	-57.0	47.4	-36.5	123.5	-16.0	1061.5	4.5	2486.2
-77.0	18.6	-56.5	48.2	-36.0	128.0	-15.5	1117.1	5.0	2461.0
-76.5	19.2	-56.0	48.8	-35.5	132.8	-15.0	1174.9	5.5	2432.7
-76.0	19.9	-55.5	49.8	-35.0	137.9	-14.5	1233.7	6.0	2402.2
-75.5	20.7	-55.0	50.6	-34.5	143.1	-14.0	1293.5	6.5	2367.6
-75.0	21.3	-54.5	51.3	-34.0	149.0	-13.5	1353.3	7.0	2329.8
-74.5	22.0	-54.0	52.2	-33.5	155.0	-13.0	1415.3	7.5	2290.9
-74.0	22.7	-53.5	53.0	-33.0	161.6	-12.5	1476.2	8.0	2246.8
-73.5	23.4	-53.0	53.9	-32.5	168.6	-12.0	1538.1	8.5	2202.7
-73.0	24.0	-52.5	54.8	-32.0	176.1	-11.5	1600.1	9.0	2155.5
-72.5	24.7	-52.0	55.6	-31.5	184.5	-11.0	1662.0	9.5	2104.0
-72.0	25.4	-51.5	56.6	-31.0	193.3	-10.5	1724.0	10.0	2052.6
-71.5	26.1	-51.0	57.6	-30.5	203.1	-10.0	1783.8	10.5	1999.0
-71.0	26.8	-50.5	58.6	-30.0	213.7	-9.5	1842.6	11.0	1943.4
-70.5	27.5	-50.0	59.6	-29.5	225.2	-9.0	1900.4	11.5	1885.7
-70.0	28.1	-49.5	60.8	-29.0	237.8	-8.5	1956.0	12.0	1826.9

### Luminous Intensity Distribution

Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)	Angle (°C)	CP (cd)		
12.5	1767.0	33.0	192.5	53.5	54.9	74.0	22.5		
13.0	1705.1	33.5	183.3	54.0	54.0	74.5	21.8		
13.5	1644.2	34.0	175.0	54.5	53.0	75.0	21.2		
14.0	1581.2	34.5	167.1	55.0	52.1	75.5	20.5		
14.5	1518.2	35.0	159.9	55.5	51.2	76.0	19.8		
15.0	1455.2	35.5	153.3	56.0	50.4	76.5	19.2		
15.5	1392.2	36.0	147.1	56.5	49.6	77.0	18.5		
16.0	1330.2	36.5	141.3	57.0	48.6	77.5	17.8		
16.5	1268.3	37.0	136.0	57.5	47.7	78.0	17.1		
17.0	1208.5	37.5	130.8	58.0	46.7	78.5	16.5		
17.5	1148.6	38.0	126.0	58.5	45.7	79.0	15.7		
18.0	1090.9	38.5	121.5	59.0	44.7	79.5	15.0		
18.5	1033.1	39.0	117.2	59.5	43.8	80.0	14.2		
19.0	976.4	39.5	113.1	60.0	42.8	80.5	12.9		
19.5	922.9	40.0	109.2	60.5	41.9	81.0	11.5		
20.0	870.0	40.5	105.6	61.0	41.1	81.5	10.2		
20.5	821.0	41.0	102.2	61.5	40.1	82.0	9.1		
21.0	774.3	41.5	98.9	62.0	39.4	82.5	8.3		
21.5	730.0	42.0	95.8	62.5	38.5	83.0	7.7		
22.0	687.9	42.5	92.7	63.0	37.8	83.5	7.0		
22.5	648.4	43.0	90.0	63.5	37.1	84.0	6.5		
23.0	610.9	43.5	87.2	64.0	36.3	84.5	6.0		
23.5	575.7	44.0	84.6	64.5	35.6	85.0	5.5		
24.0	542.6	44.5	82.2	65.0	35.0	85.5	4.9		
24.5	511.2	45.0	79.9	65.5	34.2	86.0	4.4		
25.0	481.6	45.5	77.8	66.0	33.6	86.5	4.1		
25.5	454.0	46.0	75.7	66.5	32.9	87.0	3.8		
26.0	427.8	46.5	73.7	67.0	32.2	87.5	3.6		
26.5	403.3	47.0	71.9	67.5	31.5	88.0	3.4		
27.0	380.0	47.5	70.1	68.0	30.9	88.5	3.1		
27.5	358.0	48.0	68.5	68.5	30.1	89.0	3.0		
28.0	337.4	48.5	66.9	69.0	29.5	89.5	2.9		
28.5	317.9	49.0	65.4	69.5	28.8	90.0	2.8		
29.0	299.6	49.5	63.9	70.0	28.0				
29.5	282.3	50.0	62.6	70.5	27.3				
30.0	266.3	50.5	61.4	71.0	26.6				
30.5	251.4	51.0	60.2	71.5	25.9				
31.0	237.6	51.5	59.0	72.0	25.2				
31.5	224.9	52.0	58.0	72.5	24.6				
32.0	213.1	52.5	56.9	73.0	23.8				
32.5	202.4	53.0	56.6	73.5	23.2				