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Test report of
IES LM-79-08
Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Applicant:

IGT Lighting Inc.

Address:

3755 Lincoln St, Suite B, Riverside, CA 92503

For Product:

LED Tube Light

Product Model:

IGTTU-3003650-8D

Test Model No.:

IGTTU-3003630-8D 3000K / IGTTU-3003640-8D 4000K / IGTTU-3003650-8D 5000K

Test laboratory: Shenzhen Belling Efficiency Testing Lab., 1/F., Building 1, 1F, No.1 building, Meibaohe industrial park, Dalang street, Shenzhen, Guangdong Prov.518101, China.

Zac.Kuang

Jasonzhou

Complied by: Zac Kuang **Review by: Jason zhou**

Project Engineer **Technical Manager**

1 General

1.1 Product Information

Manufacturer	**IGT LIGHTING INC.**
Manufacturer Address	3755 Lincoln St, Suite B, Riverside, CA 92503
Brand Name	IGT
Luminaire Type	LED Tube Light
Test Model Number	IGTTU-3003630-8D 3000K / IGTTU-3003640-8D 4000K / IGTTU-3003650-8D 5000K
Rated Inputs	AC 100-277V 50/60Hz
Rated Power	36W
Nominal CCT	3000K /4000K / 5000K
Date of Receipt Samples	2017-09-03

1.2 Standards or methods

- ANSI C78.377-2015:Specifications for the Chromaticity of Solid State Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits-Related Power Quality Requirements for Lighting Equipment
- CIE Publication No.13.3-1995:Method of Measuring and Specifying Color Rendering of Light Sources
- IESNA LM-79-08 Approved Method: Electric & Photometric Measurement of Solid-state Lighting Products

1.3 Equipment list

Device	Manufacture	Model No.	Serial No.	Calibration due date
Goniophotometeric System	SENSING	GMS-3000	N.A	2017-09-21
AC Power Source	ALL POWER	APW-110N	992257	2018-08-27
Total Luminous Flux Standard Lamp	SENSING	110V/100W	S13100234	2018-09-14
Digital Power Meter	YOKOGAWA	WT310	C2QM02030V	2018-08-28
Integral Sphere	SENSING	SPR-600M	N.A	2018-08-26
Digital Power Meter	YOKOGAWA	WT210	91L929742	2018-08-28
Optical Color and Electrical Measurement System	SENSING	SPR-3000	N.A	2018-08-26
Temperature/humidity/clock	VICTOR	VC230	57636	2018-09-12
Digital Anemometer	TECMAN	TD8901	026141	2018-09-12

Statement of Traceability: Shenzhen Belling Efficiency Testing Lab attests that all calibration has been performed using suitable standards traceable to national primary standards and International System of Unit (SI).

2 Test conducted and method

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at 25°C ±1°C, the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (60 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within±0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard light source before measurement. The system and standard light source has been calibrated regularly and traceable to the National Primary Standards. 4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

2.5 Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement. The standard light source has been calibrated regularly and traceable to the National Primary Standards.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The method according to IESNA LM-79-08 following chapter.

3 Test Result Summary

3.1 Integrating Sphere System

3.1.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
IGTTU-3003630-8D 3000K	120.01	60	0327	35.7	0.908
IGTTU-3003640-8D 4000K	120.01	60	0.325	35.2	0.903
IGTTU-3003650-8D 5000K	120.03	60	0.325	35.1	0.901

3.1.2 Additional Test

Test Item	Model	Test Voltage (V)	Frequency (Hz)	Test Result
Total harmonic distortion	IGTTU-3003630-8D 3000K	120	60	13.3%
	IGTTU-3003640-8D 4000K	120	60	13.1%
	IGTTU-3003650-8D 5000K	120	60	12.6%
Off state power (W)	IGTTU-3003630-8D 3000K	120	60	0

3.1.3 Photometric data

Model Number	Luminous Flux (lm)	Efficacy (lm/W)	CCT (K)	CRI	R9
IGTTU-3003630-8D 3000K	4662.42	130.6	2994	81.4	3
IGTTU-3003640-8D 4000K	4667.52	132.6	4010	83.2	14
IGTTU-3003650-8D 5000K	4752.54	135.4	5216	81.4	9

3.1.4 Chromaticity Coordinate

Model Number	Duv	x	y	u'	v'
IGTTU-3003630-8D 3000K	-0.0010	0.4362	0.4017	0.2511	0.5203
IGTTU-3003640-8D 4000K	0.0017	0.3812	0.3808	0.2240	0.5035
IGTTU-3003650-8D 5000K	-0.0010	0.3392	0.3446	0.2101	0.4803

3.2 Goniophotometer System

3.2.1 Electrical data

Model Number	Input Voltage(V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
IGTTU-3003630-8D 3000K	120.08	60	0.3248#1	35.36#2	0.9067

3.2.2 Photometric data

Luminous Flux (lm)	Efficacy (lm/W)	Zonal Lumen in 0-60°(%lm)
4614.92#3	130.51#4	69.456

Note:

#1: This value is calculated and the calculation formula is as below:
Current(A): 0.1624*2=0.3248
#2: This value is calculated and the calculation formula is as below:
Power(W): 17.6800*2=35.36
#3: This value is calculated and the calculation formula is as below:
Luminous Flux(lm): 2307.46*2=4614.92
#4: This value is calculated and the calculation formula is as below:

Efficacy(lm/W): 4614.92/35.36=130.51

4 Test Data

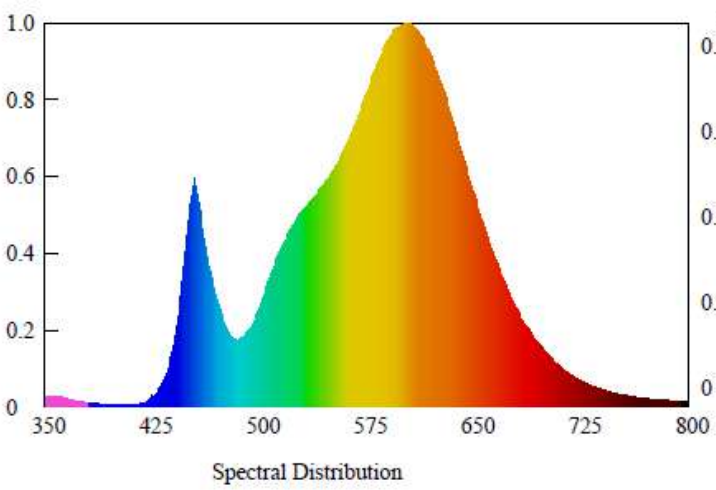
IGTTU-3003630-8D 3000K test data

Test Condition

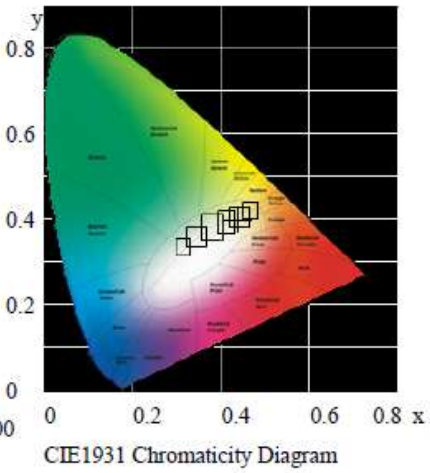
Temperature: 25°C RH: 58%

Spectrum Range: 350-800 nm Scan Step: 5 nm

Spectroradiometric Parameters



Spectral Distribution



CIE1931 Chromaticity Diagram

Chromaticity Coordinates: x=0.4362 y=0.4017 u'=0.2511 v'=0.5203

Correlated Color Temperature: 2994 K Dominant Wavelength: 582.0 nm(E)

Colour Fidelity Index: Rf=70 Gamut Index: Rg=79

Luminous Flux: 4662.42 lm Purity: 0.5157

Chromaticity Difference: -0.001Duv Peak Wavelength: 605.0 nm

Color Ratio: Kr=45.2% Kg=48.0% Kb=6.8%

Bandwidth: 132nm Radiant Flux: 6.765 W

Photosynthetically Active Radiation(PAR): 6.23W Photosynthetic Photon Flux(PPF):31.55μmol/s

Rendering Index: Ra=81.4

R1=80	R2=91	R3=96	R4=78	R5=80	R6=88	R7=82	R8=57
R9=3	R10=78	R11=77	R12=65	R13=84	R14=99	R15=73	Re=75

Electric Parameters

Voltage: 120.01 V Current: 0.327 A

Power Factor: 0.908 Power: 35.7 W

Luminous Efficacy: 130.6 lm/W

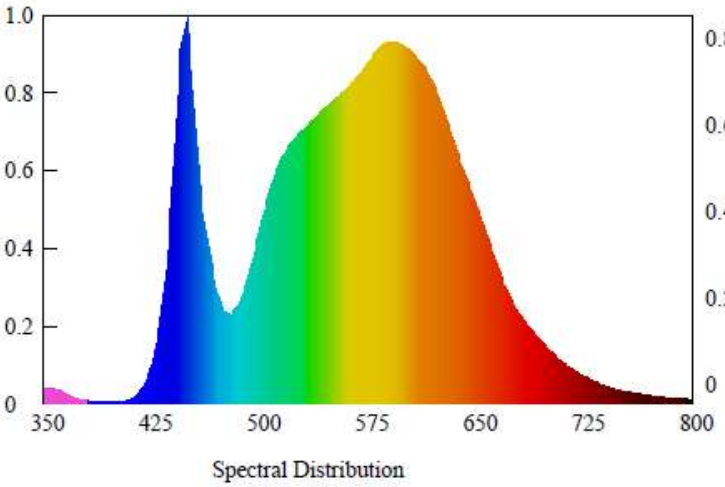
IGTTU-3003640-8D 4000K test data

Test Condition

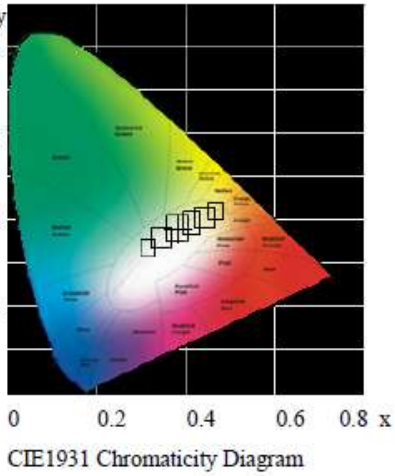
Temperature: 25°C RH: 58%

Spectrum Range: 350-800 nm Scan Step: 5 nm

Spectroradiometric Parameters



Spectral Distribution



CIE1931 Chromaticity Diagram

Chromaticity Coordinates: x=0.3812 y=0.3808 u'=0.2240 v'=0.5035

Correlated Color Temperature: 4010 K Dominant Wavelength: 577.0 nm(E)

Luminous Flux: 4667.52 lm Purity: 0.2870

Chromaticity Difference: 0.0017Duv Peak Wavelength: 440.1 nm

Color Ratio: Kr=37.7% Kg=52.9% Kb=9.4%

Bandwidth: -435.5nm Radiant Flux: 9.011 W

Rendering Index: Ra=83.2

R1=82	R2=88	R3=92	R4=84	R5=82	R6=83	R7=88	R8=68
R9=14	R10=71	R11=83	R12=62	R13=84	R14=96	R15=76	

Electric Parameters

Voltage: 120.01 V Current: 0.325 A

Power Factor: 0.903 Power: 35.2 W

Luminous Efficacy: 132.6 lm/W

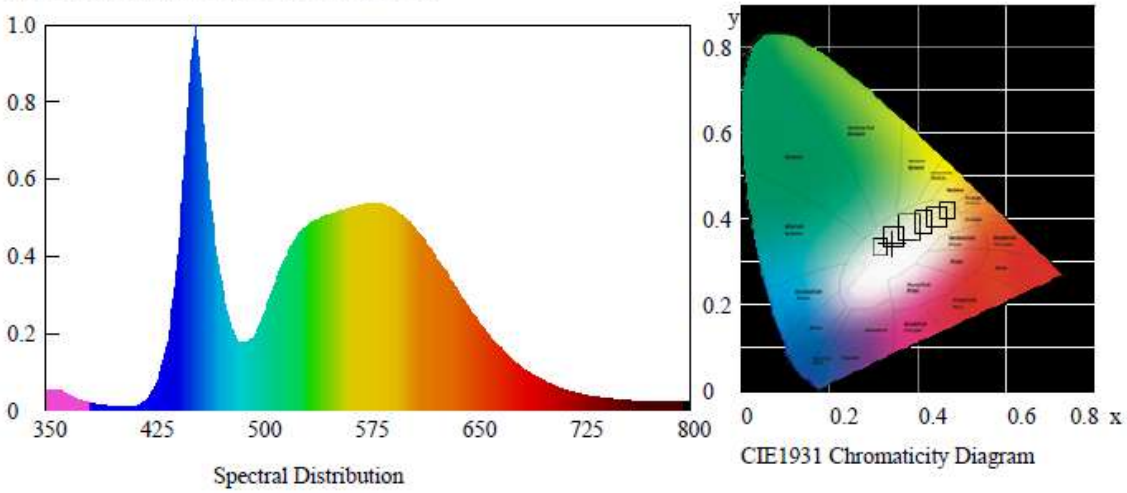
IGTTU-3003650-8D 5000K test data

Test Condition

Temperature: 25°C RH: 58%

Spectrum Range: 350-800 nm Scan Step: 5 nm

Spectroradiometric Parameters



Chromaticity Coordinates: x=0.3392 y=0.3446 u'=0.2101 v'=0.4803

Correlated Color Temperature: 5216 K Dominant Wavelength: 569.0 nm(E)

Colour Fidelity Index: Rf=58 Gamut Index: Rg=70

Luminous Flux: 4752.54 lm Purity: 0.0515

Chromaticity Difference: -0.001Duv Peak Wavelength: 455.0 nm

Color Ratio: Kr=33.6% Kg=56.3% Kb=10.1%

Bandwidth: 24.3nm Radiant Flux: 7.338 W

Photosynthetically Active Radiation(PAR): 6.84W Photosynthetic Photon Flux(PPF):32.91μmol/s

Rendering Index: Ra=81.4

R1=81	R2=87	R3=89	R4=80	R5=80	R6=80	R7=87	R8=68
R9=9	R10=67	R11=77	R12=53	R13=83	R14=94	R15=78	Re=74

Electric Parameters

Voltage: 120.03 V Current: 0.325 A

Power Factor: 0.901 Power: 35.1 W

Luminous Efficacy: 135.4 lm/W

(Reference: IGTTU-3003630-8D 3000K)

Zonal Flux Diagram

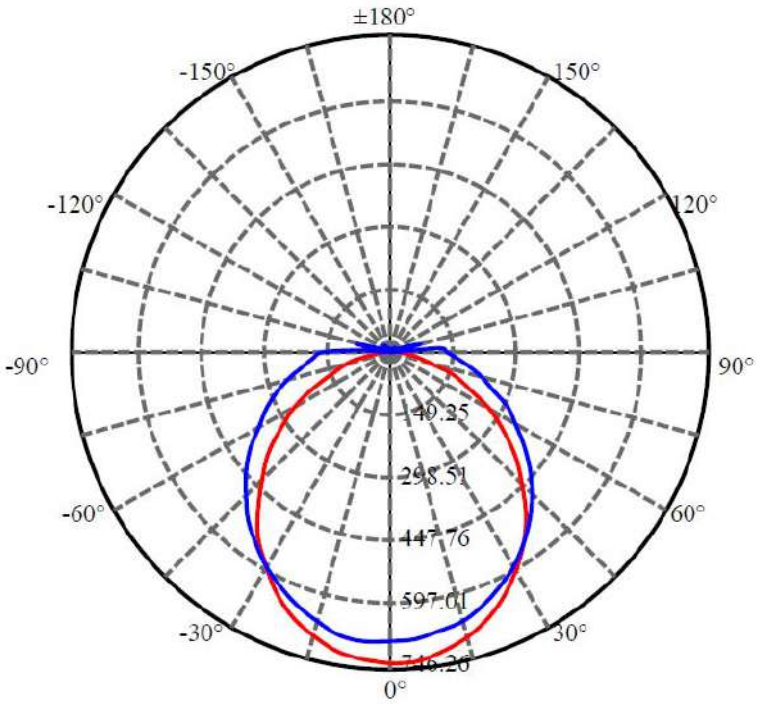
Zonal flux distribution table

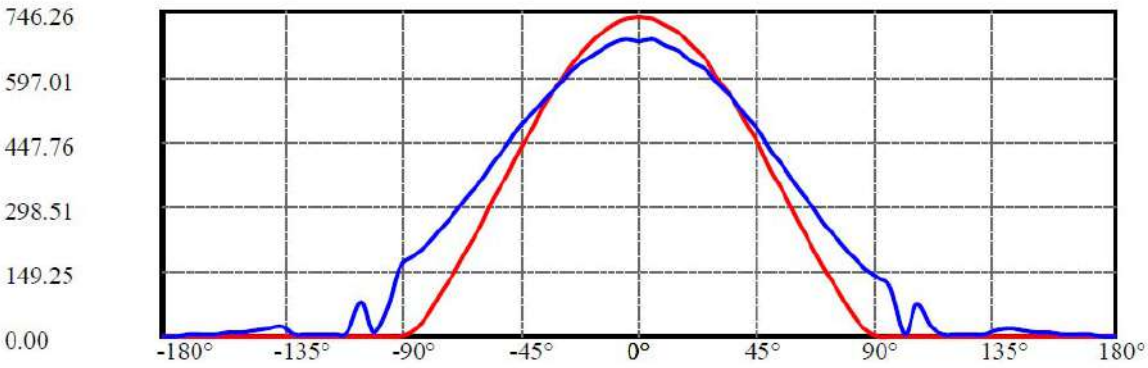
γ(°)	Average I(cd)	Zonal F(lm)	Sum F(lm)	Eff Flux(%)	Eff Sum(%)
0.0	723.792	.000	.000	.000%	.000%
5.0	720.291	17.264	17.264	.748%	.748%
10.0	710.394	51.180	68.444	2.218%	2.966%
15.0	692.723	83.232	151.676	3.607%	6.573%
20.0	668.528	112.186	263.862	4.862%	11.435%
25.0	638.205	137.052	400.914	5.940%	17.375%
30.0	602.195	156.974	557.888	6.803%	24.178%
35.0	561.010	171.290	729.178	7.423%	31.601%
40.0	516.673	179.803	908.981	7.792%	39.393%
45.0	469.117	182.527	1091.508	7.910%	47.303%
50.0	419.541	179.567	1271.075	7.782%	55.085%
55.0	370.249	171.727	1442.801	7.442%	62.528%
60.0	321.406	159.874	1602.675	6.929%	69.456%
65.0	273.800	144.696	1747.371	6.271%	75.727%
70.0	227.815	127.012	1874.383	5.504%	81.231%
75.0	186.489	108.292	1982.676	4.693%	85.925%
80.0	149.191	89.819	2072.494	3.893%	89.817%
85.0	117.389	72.436	2144.930	3.139%	92.956%
90.0	93.450	57.729	2202.659	2.502%	95.458%
95.0	43.707	37.555	2240.214	1.628%	97.086%
100.0	18.314	16.853	2257.067	.730%	97.816%
105.0	28.108	12.421	2269.488	.538%	98.354%
110.0	7.581	9.329	2278.817	.404%	98.759%
115.0	5.869	3.405	2282.222	.148%	98.906%
120.0	5.187	2.688	2284.910	.116%	99.023%
125.0	7.246	2.874	2287.784	.125%	99.147%
130.0	8.288	3.378	2291.161	.146%	99.294%
135.0	11.570	4.013	2295.174	.174%	99.468%
140.0	9.756	3.949	2299.123	.171%	99.639%
145.0	7.915	2.948	2302.071	.128%	99.766%
150.0	6.229	2.083	2304.154	.090%	99.857%
155.0	4.826	1.399	2305.553	.061%	99.917%
160.0	3.720	.896	2306.449	.039%	99.956%
165.0	2.780	.536	2306.985	.023%	99.979%
170.0	2.123	.291	2307.275	.013%	99.992%
175.0	1.827	.141	2307.417	.006%	99.998%
180.0	1.776	.043	2307.460	.002%	100.000%

(Reference: IGTTU-3003630-8D 3000K)

Luminous Intensity Distribution Diagram

Light Distribution Curve [Unit:cd]





C0/C180:

C90/C270:

Field angle(10%Imax):C0/180Left:77.6 Right:78.5

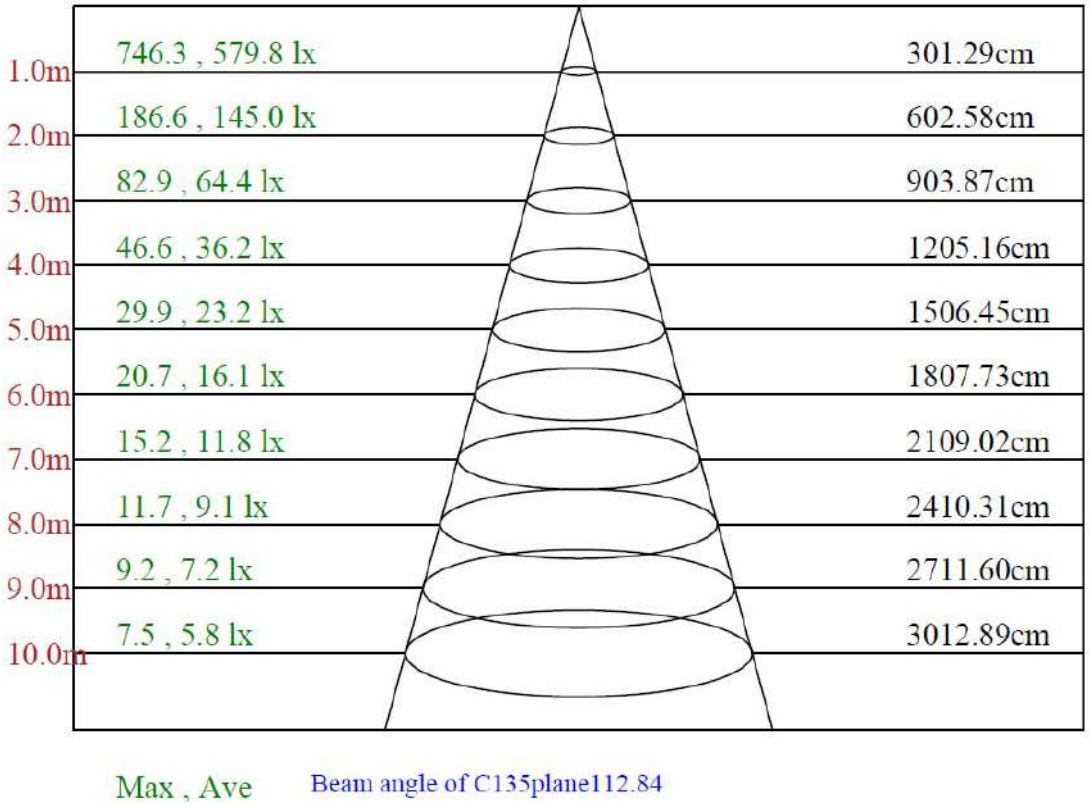
:C90/270Left:100.6 Right:110.7

Beam Angle(50%Imax):C0/180Left:50.6 Right:51.4

:C90/270Left:57.3 Right:65.2

(Reference: IGTTU-3003630-8D 3000K)

Lux distance Curve



(Reference: IGTTU-3003630-8D 3000K)

Luminous Intensity Distribution Data

C/γ(°)	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0
0.0	731.85	728.14	715.79	696.02	668.84	633.21	590.79	544.87	494.21
22.5	743.17	740.91	729.58	710.64	683.46	649.48	608.09	560.73	512.95
45.0	743.17	741.32	732.67	716.41	693.14	662.66	629.92	589.14	544.05
67.5	699.31	693.14	691.69	681.40	663.89	638.15	609.33	571.44	532.52
90.0	677.90	679.54	667.81	653.60	632.59	610.15	580.50	547.55	510.89
112.5	705.29	704.05	698.49	682.22	662.04	636.10	602.94	566.29	525.93
135.0	746.26	743.79	733.70	716.61	693.14	662.25	624.36	581.94	534.16
157.5	743.38	740.09	728.35	708.17	681.40	647.21	605.41	556.82	506.98
180.0	731.85	725.88	712.49	690.87	661.84	625.39	583.38	535.61	482.68
202.5	743.17	736.17	722.17	700.75	670.69	635.48	593.06	544.87	495.04
225.0	743.17	737.61	724.85	706.73	681.40	649.48	613.44	572.26	525.72
247.5	699.31	696.64	684.08	670.48	650.72	624.15	592.85	560.52	522.22
270.0	677.90	682.63	674.40	655.45	633.42	609.53	579.47	548.78	514.19
292.5	705.29	695.61	694.58	680.16	660.39	636.71	607.68	570.41	535.19
315.0	746.26	740.09	729.38	709.40	682.63	649.07	612.83	570.41	524.69
337.5	743.38	739.06	726.29	704.67	676.87	642.27	601.09	554.55	505.33
360.0	731.85	728.14	715.79	696.02	668.84	633.21	590.79	544.87	494.21

C/γ(°)	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
0.0	440.06	382.19	323.92	267.91	210.66	157.33	104.82	59.10	19.36
22.5	459.21	403.81	344.92	292.41	239.28	191.10	145.18	106.67	74.75
45.0	497.10	441.91	389.61	338.13	289.12	241.75	199.13	162.47	129.94
67.5	489.27	441.09	394.96	351.10	307.85	261.52	223.84	188.01	157.33
90.0	471.56	427.70	384.46	342.86	301.68	259.26	222.60	188.21	159.80
112.5	479.39	431.82	388.99	344.10	298.59	256.79	219.72	184.92	154.24
135.0	481.65	429.76	381.37	330.30	280.47	233.72	192.54	156.09	126.03
157.5	452.41	397.02	341.42	288.09	235.16	182.04	136.94	98.23	68.16
180.0	426.47	372.72	314.65	255.96	201.60	147.65	96.99	51.48	16.06
202.5	442.73	390.84	337.92	286.44	236.19	187.18	146.00	106.46	75.37
225.0	477.33	429.35	382.19	334.62	290.15	246.49	207.98	171.53	139.62
247.5	481.04	441.91	398.25	353.78	314.65	274.08	237.22	203.86	173.80
270.0	479.80	439.03	399.28	358.72	320.21	281.91	246.90	214.16	183.27
292.5	495.04	451.18	410.20	365.72	323.09	282.53	244.22	210.66	178.33
315.0	479.59	432.64	386.31	339.36	292.62	250.61	211.28	174.01	143.53
337.5	453.24	399.70	345.54	293.03	239.49	191.10	148.47	111.20	78.66
360.0	440.06	382.19	323.92	267.91	210.66	157.33	104.82	59.10	19.36

C/γ(°)	90.0	95.0	100.0	105.0	110.0	115.0	120.0	125.0	130.0
0.0	1.44	1.03	1.03	1.44	1.24	1.44	1.44	1.44	1.44
22.5	50.66	13.59	5.97	4.12	3.71	8.44	7.21	6.18	5.35
45.0	104.61	59.10	33.36	16.68	6.59	5.35	4.53	9.88	14.62
67.5	131.38	108.32	12.56	65.69	9.68	6.18	5.77	4.74	5.15
90.0	134.67	112.23	6.80	74.96	23.48	5.15	4.74	4.12	3.50
112.5	128.50	102.34	8.44	58.48	6.59	5.56	5.15	4.74	5.56
135.0	99.87	32.12	45.51	10.91	6.18	5.15	4.32	12.77	14.00
157.5	45.51	14.00	5.56	3.91	6.18	7.41	5.97	5.77	4.74
180.0	1.44	1.44	1.44	1.65	1.65	1.65	1.65	1.65	1.85
202.5	52.51	20.18	6.18	4.32	10.30	8.44	7.21	6.18	5.35
225.0	115.73	22.86	56.42	9.06	7.21	5.97	5.77	18.33	15.65
247.5	148.68	40.57	19.15	51.28	6.59	5.97	5.15	4.94	14.83
270.0	155.88	67.13	8.24	77.02	7.00	5.77	5.35	4.53	5.77
292.5	152.38	61.57	18.33	56.42	8.44	7.00	5.97	5.35	13.80
315.0	117.38	23.89	57.45	9.47	7.21	5.97	5.35	18.95	15.65
337.5	54.57	18.95	6.59	4.32	9.27	8.44	7.41	6.38	5.35
360.0	1.44	1.03	1.03	1.44	1.24	1.44	1.44	1.44	1.44

(Reference: IGTTU-3003630-8D 3000K)

C/γ(°)	135.0	140.0	145.0	150.0	155.0	160.0	165.0	170.0	175.0
0.0	1.65	1.85	1.65	1.65	1.65	1.65	1.65	1.85	1.85
22.5	4.53	3.91	3.50	3.09	2.27	2.06	1.85	1.65	1.65
45.0	12.15	9.68	7.83	6.38	4.94	3.91	2.68	1.85	1.85
67.5	18.53	15.03	11.94	9.27	7.00	5.35	3.71	2.47	1.85
90.0	14.83	16.47	13.18	10.09	7.83	5.77	3.91	2.47	1.85
112.5	18.53	14.83	11.74	9.06	7.00	5.15	3.30	1.85	1.65
135.0	11.53	9.47	7.83	5.97	4.32	3.50	2.47	1.85	1.85
157.5	4.12	3.71	3.30	2.68	2.27	2.06	1.85	2.06	1.85
180.0	1.85	1.65	1.85	1.85	2.06	1.65	1.85	1.65	1.85
202.5	4.74	3.91	3.50	2.88	2.47	2.27	1.85	1.85	1.65
225.0	12.36	10.09	8.24	6.18	4.74	3.50	2.68	2.27	1.85
247.5	19.77	16.06	12.77	9.88	7.21	5.15	3.30	2.47	1.85
270.0	22.65	18.53	14.62	10.91	8.24	5.97	4.12	2.68	2.06
292.5	20.39	16.47	12.77	9.88	7.21	5.35	3.91	2.68	1.85
315.0	12.77	10.30	8.65	6.59	5.35	3.91	3.09	2.27	1.85
337.5	4.74	4.12	3.30	3.30	2.68	2.27	2.27	2.06	1.85
360.0	1.65	1.85	1.65	1.65	1.65	1.65	1.65	1.85	1.85

C/γ(°)	180.0
0.0	1.85
22.5	1.85
45.0	1.65
67.5	1.85
90.0	1.85
112.5	1.65
135.0	1.85
157.5	1.65
180.0	1.85
202.5	1.85
225.0	1.65
247.5	1.85
270.0	1.85
292.5	1.65
315.0	1.85
337.5	1.65
360.0	1.85

Photo Document

****End of test report****