



Brochure

Moving Detector

Goniospectroradiometer

(LSG-5000CCD)

Global Office of Lisun Electronics Inc.

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[Lead in CFL & LED Test Instruments](#)

Rev. 1/28/2019

1. System Configuration

A. LSG-5000CCD Goniophotometric System:

- Goniometric Rotating Console: [Japanese Mitsubishi Motor and German Angle encoder System](#) to keep the test accuracy. Both Far Field and Near Field Test.
- [High Reflective Moving Mirror](#): Special design and produced to keep high reflective value.
- Goniometric Rotating Control Instrument in 19inch cabinet: It connects to the PC and was controlled by the software.
- Goniometric Rotating Control Instrument in dark room: This can allow the customer to control the rotating in the dark room when install the luminaires but no need to control in the PC.
- Double Channel & High Precision Photometer
- [Germany produced Class L Constant Temperature Photo Detector](#)
- Cross-beam Laser System for Calibrating
- English Measuring Software
- Automatic Adjust Diaphragm: remote control to adjust the size of diaphragm for the different diameter size luminaries test
- Two sets of luminaries Clamps: multi-functions
- Oversea Delivery and Packing: all of the instruments and accessories will be packed with Fumigation free three plywood, include the delivery cost to Shanghai sea port

B. SLS-150W DC Standard Light Intensity Lamp

C. **LS2010 Digital Power Meter:** High Accuracy to measure AC and DC voltage, current, power and power factor, also measure harmonic

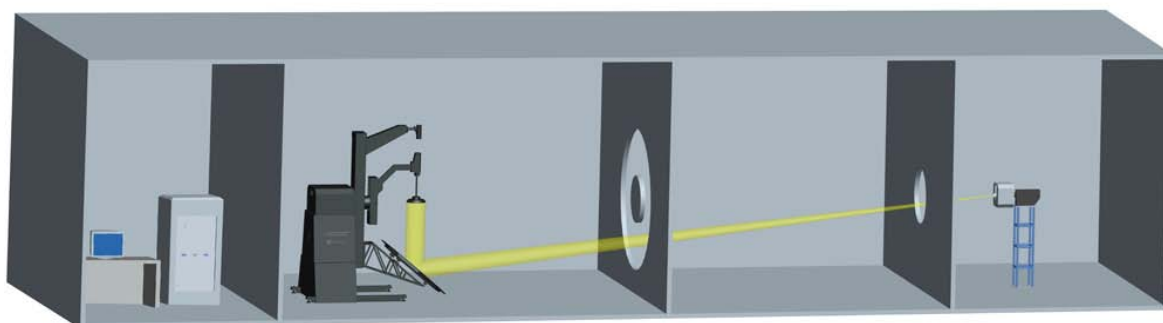
D. **DC3010 CC & CV DC Power Source:** DC3010 output is 30V/10A, Option can be DC6010 (output is 60V/10A) and DC12010 (output is 120V/10A)

E. **LSP-1KVAR AC Power Source:** 1KVA Pure Sine Wave AC Power Source

F. **CASE-19IN 19inch Standard Instruments Cabinet.**

G. [LMS-9000B High Precision CCD Spectraidomeeter](#)

H. [CLAMP-9000 Accessories and Adjustable Tripod for LMS-9000B](#)



[Full View for LSG-5000CCD Moving Detector Goniospectroradiometer](#)

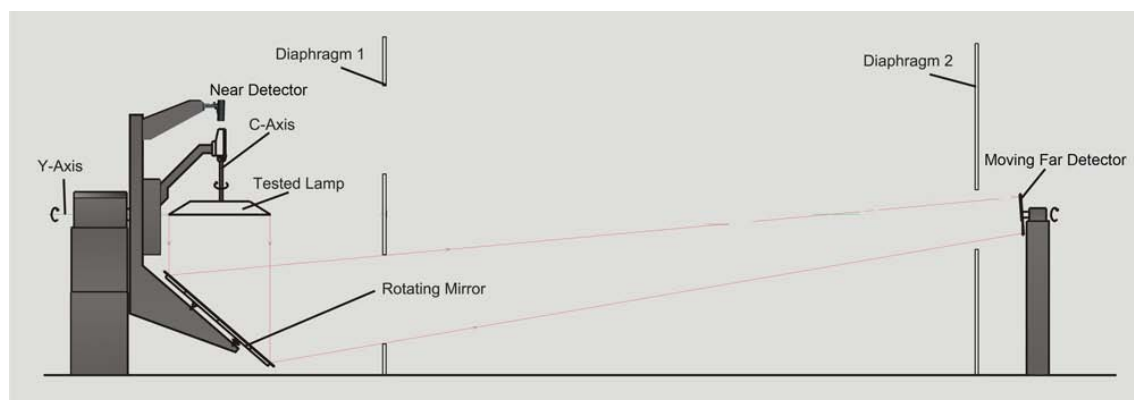
Note: PC and Printer prepared by the customer (request at least one USB port)

2. Measurement Principle

LSG-5000CCD Moving Detector Goniophotometer fully meets LM-79 Clause 9.3.1 request. The tested lamp will keep burning position and be fixed, near field detector move together with the big mirror in a line, and the far field detector will move with the big mirror synchronously. The detector will always sense the light directly from the luminaries.

The rotation priority is determined by the software. If mirror axle is took precedence of rotation, the goniophotometer will continuously measure the luminous intensity at each γ angle on a vertical plane determined by the C angle, the measuring trace is equivalent to the longitude. Similarly, while the luminaries axle is priority, the system will continuously measure the luminous intensity at each C angle on a conical surface determined by the γ angle, the trace can be looked upon the woolf.

See the following figure.



Measurement Principle

3. System Functions



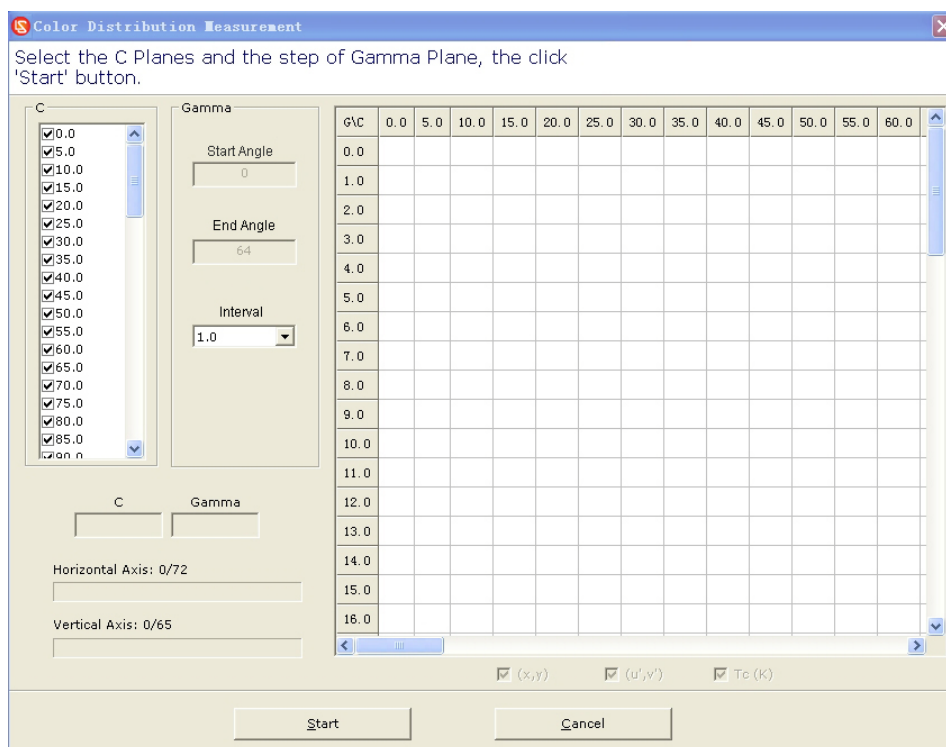
The LSG-5000CCD fully meets LM-79 Clause 9.3.1, CIE and GB standards for Goniophotometric of luminaires, this system is used to measure spatial luminous intensity distribution of luminaires for floodlight, street lighting and interior lighting, and other photometric parameters such as spatial iso-intensity curve, intensity distribution curve of each section (shown in rectangular coordinate system or polar coordinate system), iso-illuminance distribution curve, luminance limitation curve, luminaires efficiency, glare grade, effective beam angles, upward luminous flux ratio, downward luminous flux ratio, total luminous flux, effective luminous flux, utilization factor and electric parameters (wattage, power factor, voltage and current) of luminaires etc.



LSG-5000CCD Can test all of the above luminaires

4. Specifications

- 1) The tested luminaire rotates around the mirror with an angle of $(\gamma)\pm 180^\circ$ (or $0-360^\circ$) and the tested luminaire rotates around itself with an angle of $(C)\pm 180^\circ$ (or $0-360^\circ$)
- 2) The accuracy of angle: **0.05° Resolution of angle: 0.001°**
- 3) Luminosity Testing Range: Illuminance $0.001\text{lx} \sim 99,999\text{lx}$; Light Intensity $1.0\text{cd} \sim 10^7\text{cd}$ (detector)
- 4) Accuracy of photometry: **Germany produced constant temperature photo detector DIN5032-6/CIE pub1. No. 69 Class L**
- 5) Testing Accuracy: 2% (Under Standard lamp); Stray Light: less than 0.1%
- 6) **Work with high accuracy and quick CCD Spectroradiometer to measure spatial color parameters.**
- 7) **Accuracy of chromaticity coordinate: ± 0.0015 or ± 0.0005 (under standard A lamp)**
- 8) **Spectral Range Wavelength: $380\text{nm} \sim 780\text{nm}$; Accuracy of wavelength: $\pm 0.5\text{nm}$**
- 9) English version software can run in Win7, Win8 or Win10.



Model Number	LSG-5000BCCD (Special Size)	LSG-5000CCD (Big Size)	LSG-5000SCCD (Standard Size)
Measure Size (mm)	Diameter=1600	Diameter=1400	Diameter=900
Measure Weight (Kg)	50	40	30
Measure Power(W)	600V/10A, AC/DC	600V/10A, AC/DC	600V/10A, AC/DC

PS. The LSG-5000XCCD are special size which According to customer's request

5. Laboratory Requirements

1) Room Requirements according to CIE

Model	Dark Room (W*H*L)	Operation Room(W*L)
LSG-5000BCCD	5*5*8~30m	4*4m
LSG-5000CCD	4*4*8~30m	4*4m
LSG-5000SCCD	4*3*8~30m	4*4m

P.S. The LSG-5000XCCD Lab room size will special design

- The dark room wall, ceiling and floor should be all coated with dull black paint or be covered by black cloth and black carpet.
- Air-conditioner: be set in the dark room to control the temperature around lamps to the standard value upon the CIE requirements.

Note: LISUN GROUP engineer dept will submit the Lab Design support documents according to the customer's real lab size after the formal purchase order was confirmed

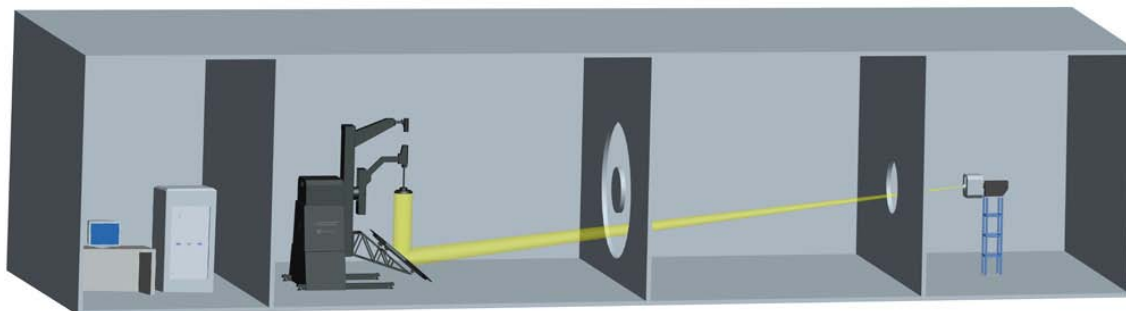
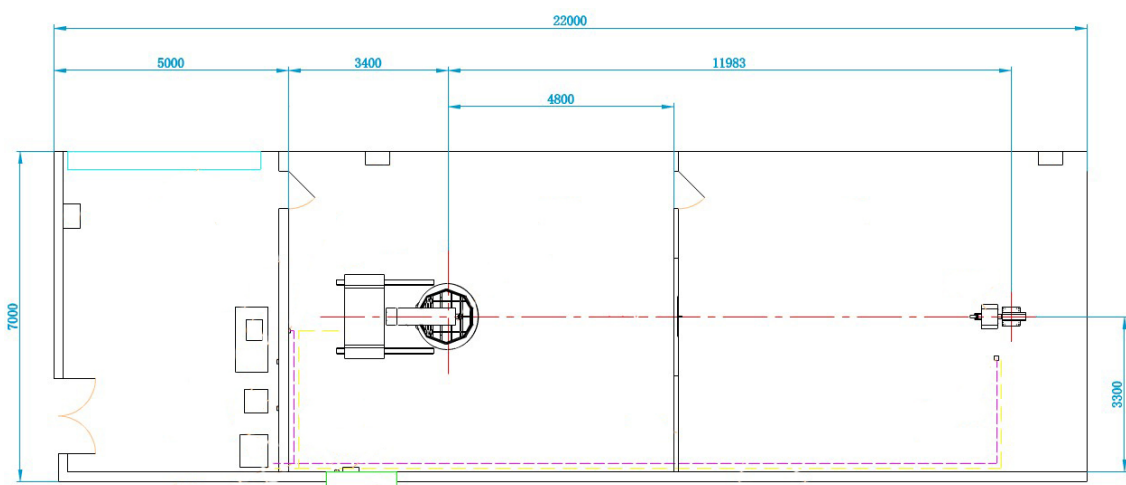
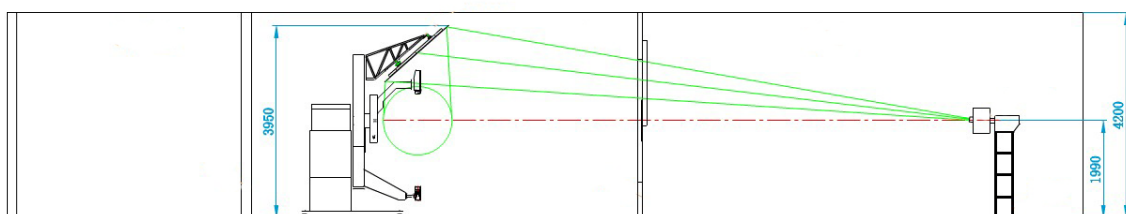


Fig: LSG-5000CCD lab dark room view



2) Requirements of Eliminating the stray Light

Luminaires must be where the photodetector can only receive the light reflected by the two moving mirror in the LSG-5000CCD system. The light given off directly by the luminaires and reflected by the wall and floor is warded off by the light fence. Internal surface of the dark room and dark path together with the surface of the light fence should be painted unpolished black or be covered by black cloth and black carpet.

3) Temperature of the Environment

Temperature around the lamp or luminaries must be $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ during the test. Exceptions can be given according to relative lamps as following.

- Tungsten Incandescent Lamp: $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- Double-caps Fluorescent Lamp: $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- High Pressure Mercury Lamp: $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- Metal Halogen Lamp: $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$

- e. High Pressure Sodium Lamp: $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- f. Low Pressure Sodium Lamp: $25^{\circ}\text{C} \pm 2$

4) Airflow

Airflow may be induced by natural aeration, air conditioner or movement of the luminaries in the goniophotometer, but the speed of the airflow couldn't exceed 0.2m/s.

5) Vibration and shock

When the lamp is in lighting, the vibration couldn't exceed 10m/s^2 (4 ~ 3000Hz), or the moving scope of the lamp couldn't exceed 30mm (at most 4Hz)

6) Smoke, Dust and Moisture

The test environment must free from smoke, dust or moisture. At the same time, even not during the measurement, smoke, dust or moisture will also influence the reflectance of the reflecting mirror and induce more stray light. So, the test room must be kept clean, no smoke and dry. The humidity should be less than 60% RH.

6. Service

1) Installation and Training

LISUN GROUP engineers will take responsibility for installation and Training of the system at the customer's

2) Period of Guarantee: 24 months

The service is for free except technician's travel payment if the service provided by LISUN GROUP implement at the customer's.

3) Upgrading the applications software for free

7. Design Standard of Device

The construction, technical parameter, test & operate steps as well as data processing software of LSG-5000CCD Moving Detector Goniospectroradiometer meet the following requirements:

3.1 CIE Pub. NO.70, "The Measurement of Absolute Luminous Intensity Distributions"

3.2 CIE DIV. II-TC10, "Photometry of Luminaires"

3.3 IES LM-35-1989, "IES Approved Method for Photometric Testing of Floodlights"

3.4 IES LM-31, "IES Approved Method for Photometric Testing of Roadway Luminaires"

3.5 IES-LM-79, "Electrical & Photometric Measurements of Solid-State Lighting Products"

3.6 GB/T 7002-1986, "Luminosity Test of Flood Luminaires"

3.7 GB/T 9467-1988, "Luminosity Test of Indoor Luminaires"

3.8 GB/T 9468-1988, "Luminosity Test of Street Luminaires"

3.9 IES 61341 "Method of Measurement of Center Beam Intensity and Beam Angle(s) of Reflector Lamp"

3.10 CIE Pub.NO.76, "Photometry-the CIE System of Physical Photometry"

8. Typical oversea market customers:

There are many world famous company and lab institute choose Lisun Goniophotometer, Please get the reference customers' information from Lisun Group Oversea Sales Dept.

9. Application Software

This system can export data files as following formats:

IESNA Files (*.ies)
EULUMDAT Files (*.ldt)
CIEBSE TM14 Files (*.cib)
CIEBSE TM14 Files (*.tm4)
CIE Files (*.cie)
DIN CEN Files (*.cen)
Excel File(*.csv)

This kind of format files can be transferred by other illumination and luminaire design software such as Dialux

Application software can also implement essential calculation for lighting design as iso-illuminance distribution curve on a working plane, luminance limitation curve, luminaire efficiency, effective beam angle, upward luminous flux ratio, downward luminous flux ratio, effective luminous flux, utilization factor curve etc.

The Next Page is the Test Report by the software:

Report No.: LS1711

Test Time: 8/28/2017 17:02

Luminaire Property

Luminaire Manufacturer: LISUN
 Luminaire Category: LED Philips 112
 Lamp Catalog: LUMINUS
 Number of Lamps: 1
 Luminous Length (mm): 50
 Luminous Height (mm): 100
 Current: 0.530 A
 Power Factor: 0.999

Luminaire Description: LS-71-83-8077
 Lamp Description: LUMINUS001
 Lumens per Lamp: 550
 Luminous Width (mm): 50
 Voltage: 119.9 V
 Power: 63.55 W

Photometric Results

CIE Class: Direct
 Measurement Flux: 539.5 lm
 Downward Ratio: 98.08%
 Horizontal Diffuse Angle(50%): H99.2
 Vertical Diffuse Angle(50%): V101.5
 Luminaire Efficacy Rating (LER): 8.54
 Max. Intensity: 429.28 cd/klm
 S/MH(C0/C180): 1.14

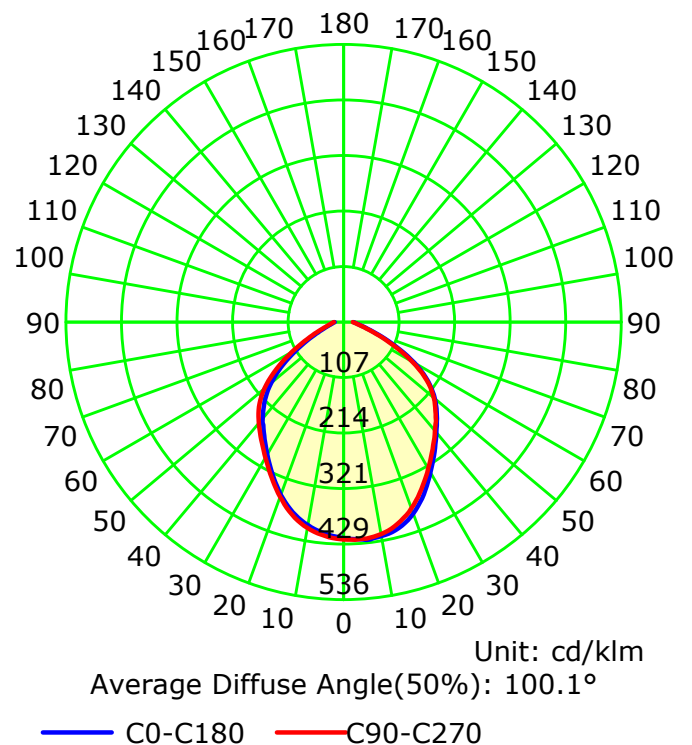
Total Rated Lamp Lumens: 550.0 lm
 Efficiency: 98.08%
 Upward Ratio: 0.00%

Central Intensity: 417.76 cd/klm
 Pos of Max. Intensity: H45 V8
 S/MH(C90/C270): 1.13

Picture Of Luminaire



Luminous Intensity Distribution Curve

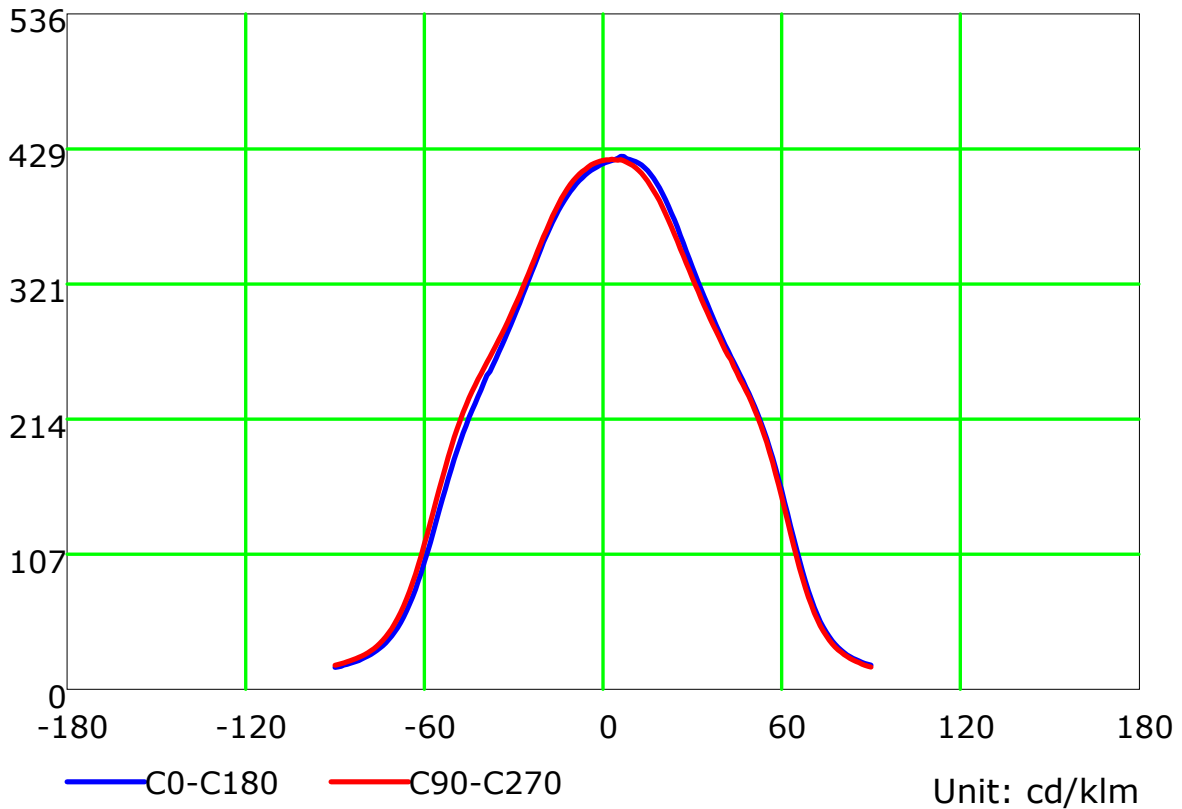
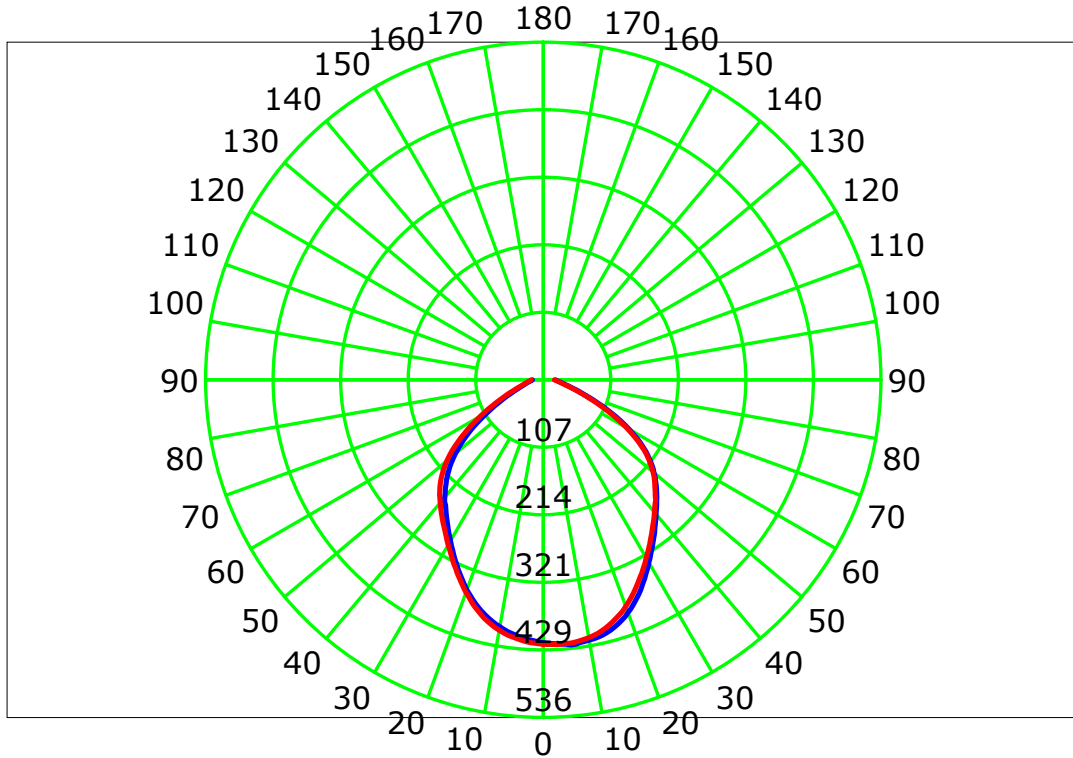


C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



Luminous Intensity Distribution Curve

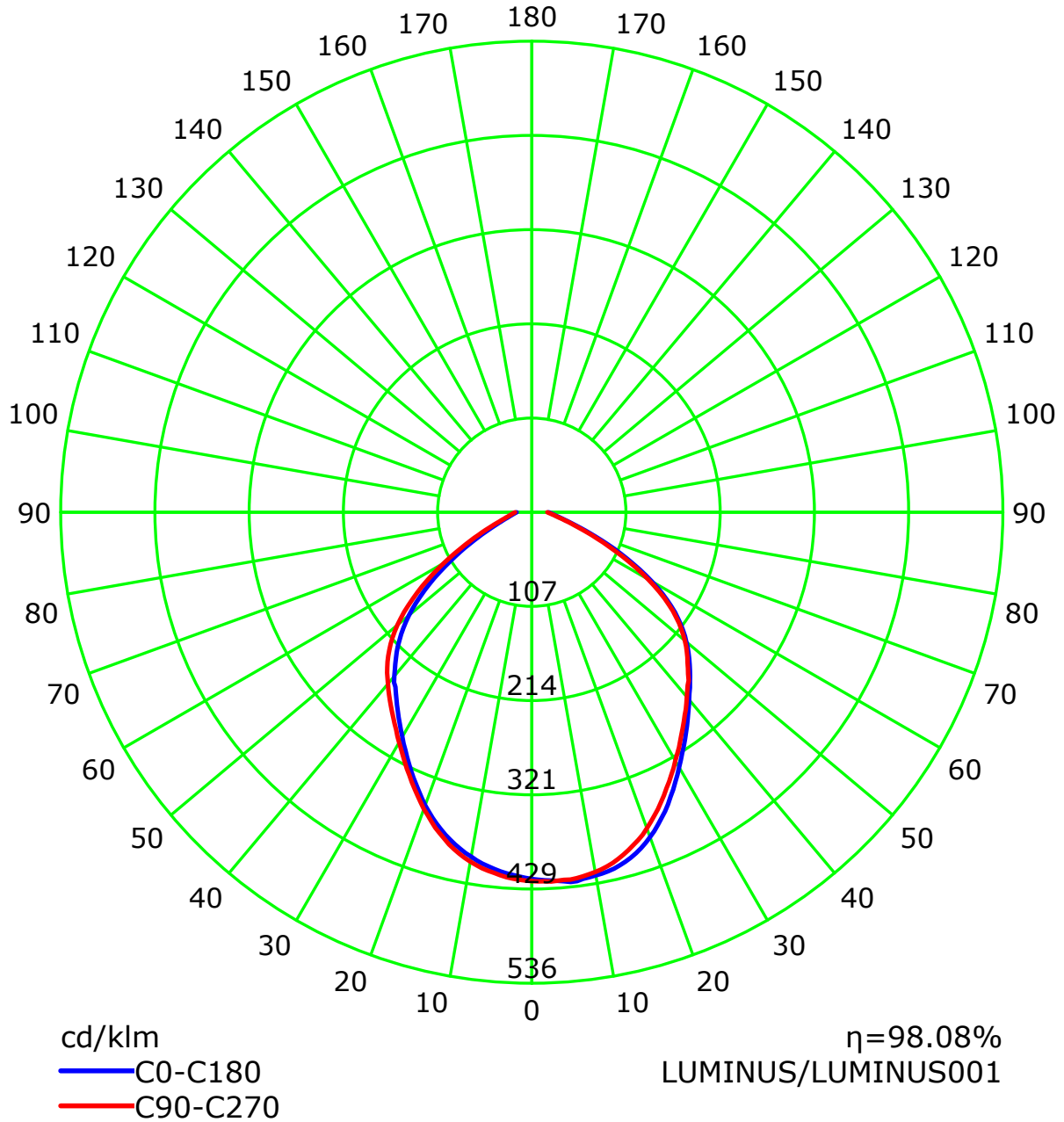


C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



Luminous Intensity Distribution Curve(cd/klm)



C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

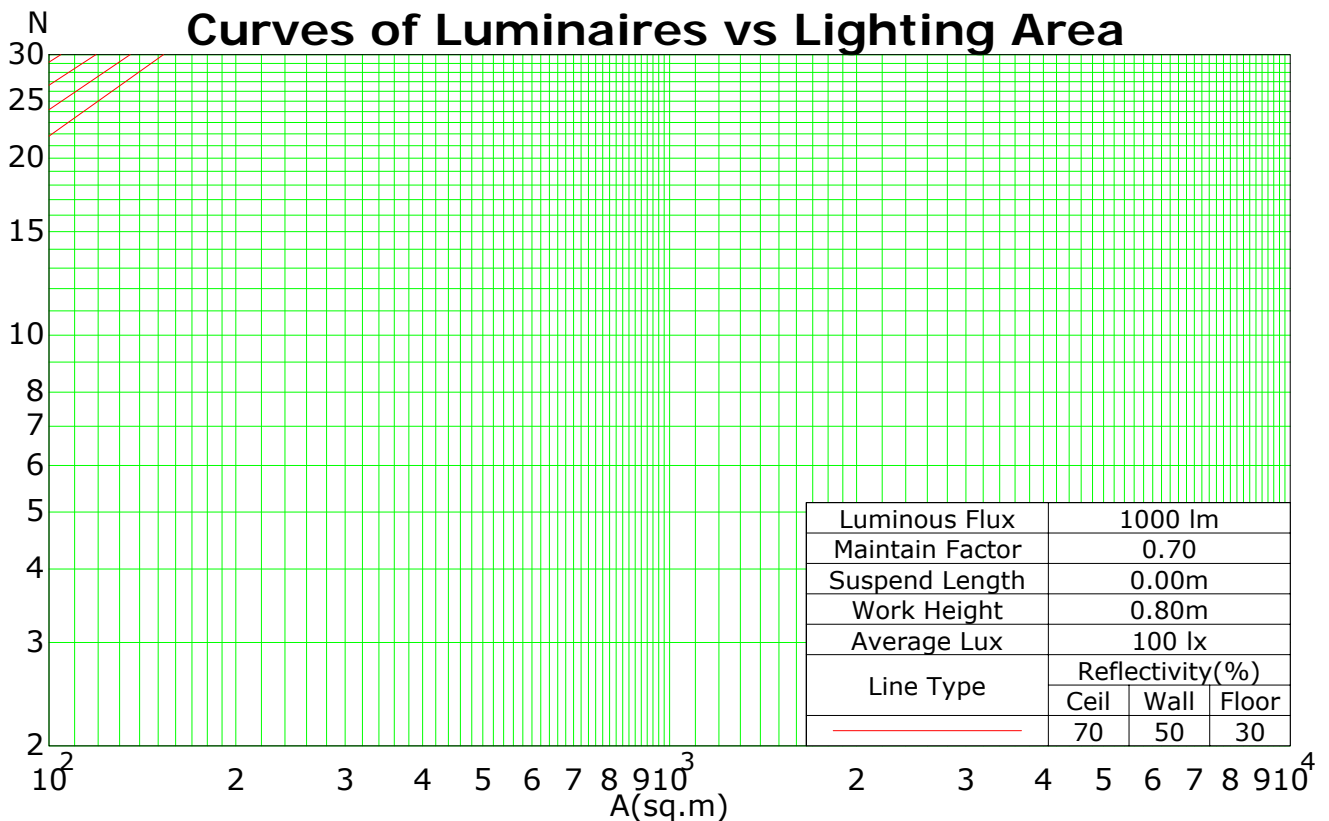
Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



Coefficients Of Utilization - Zonal Cavity Method

RC	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.3	0.3	0.3	0.1	0.1	0.1	0
RW	0.7	0.5	0.3	0.1	0.7	0.5	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1	0
RCR	RF = 0.2																	
0	117	117	117	117	114	114	114	114	109	109	109	104	104	104	100	100	100	98
1	107	103	99	95	105	101	97	94	96	93	91	93	90	88	89	87	85	83
2	98	91	84	79	96	89	83	78	85	80	76	82	78	74	79	76	73	71
3	90	80	73	67	88	79	72	66	76	70	65	73	68	64	71	66	63	61
4	83	72	63	57	81	70	63	57	68	61	56	66	60	55	64	59	55	52
5	76	64	56	50	74	63	55	49	61	54	49	59	53	48	58	52	48	46
6	71	58	50	44	69	57	49	44	56	48	43	54	48	43	52	47	42	40
7	66	53	45	39	64	52	44	39	51	44	38	49	43	38	48	42	38	36
8	61	49	40	35	60	48	40	35	47	40	35	45	39	34	44	38	34	32
9	57	45	37	32	56	44	37	31	43	36	31	42	36	31	41	35	31	29
10	54	41	34	29	53	41	34	29	40	33	29	39	33	28	38	32	28	27

Spacing Criteria (0-180): 1.14
 Spacing Criteria (90-270): 1.13
 Spacing Criteria (Diagonal): 1.27

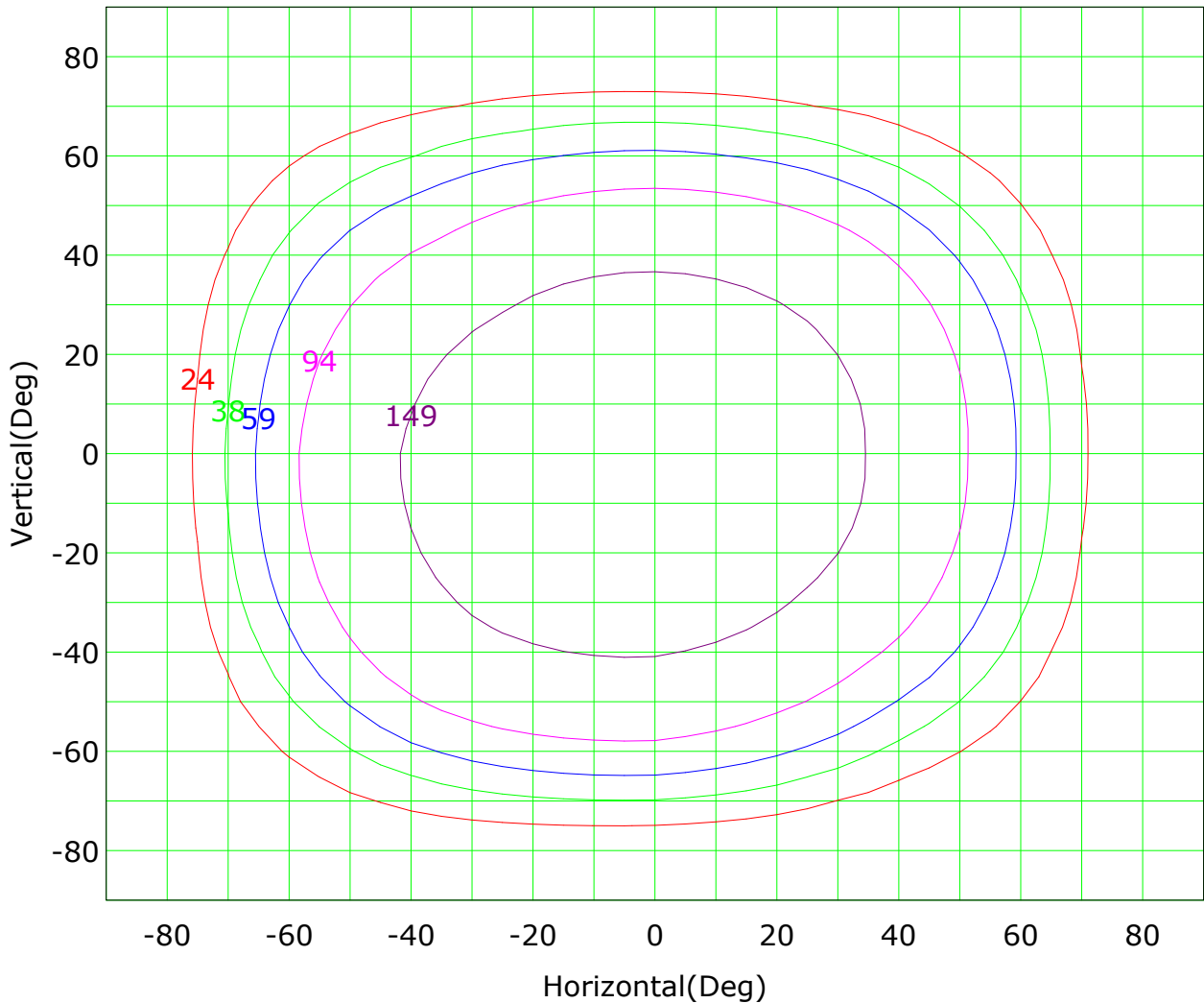


C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



Isocandela (rectangle)



Imax (100%): 236 cd

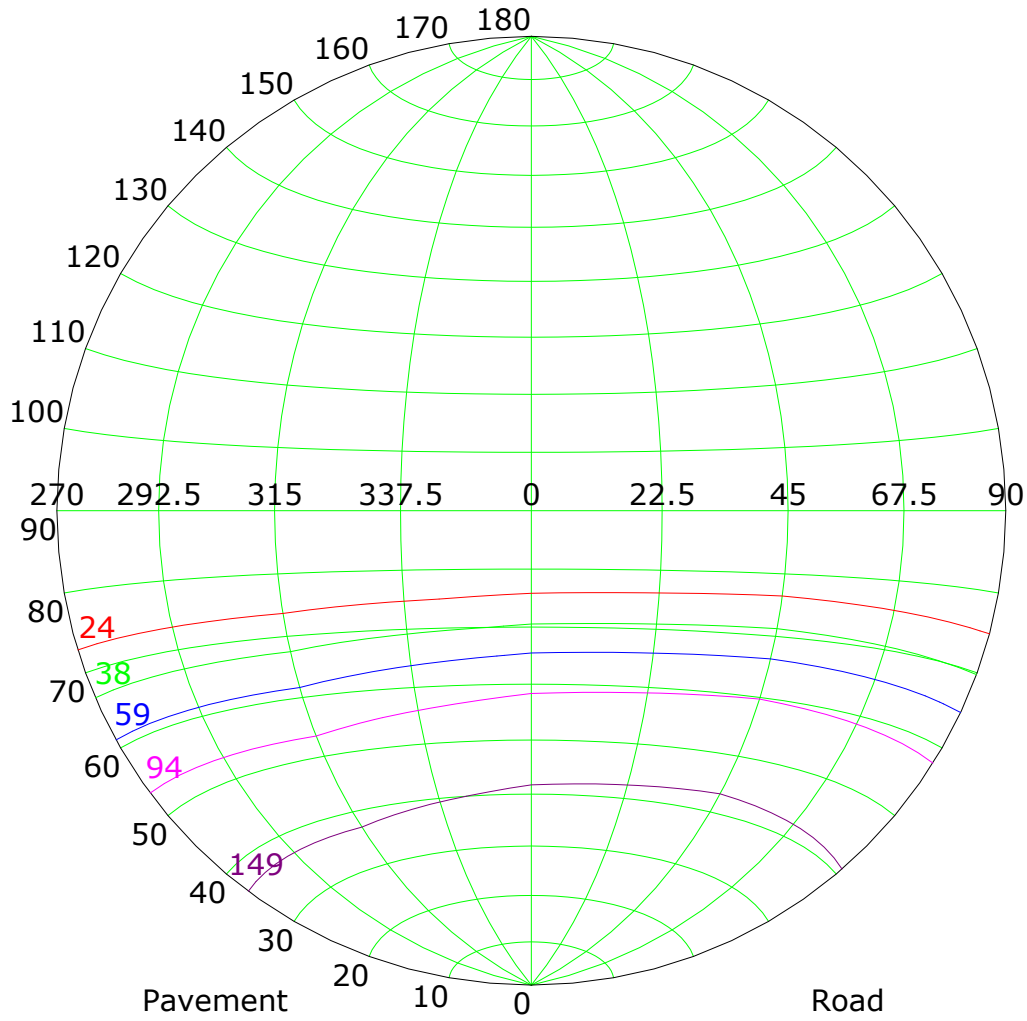
- | | | | |
|-----------|--------|-----------|--------|
| — (10%): | 24 cd | — (16%): | 38 cd |
| — (25%): | 59 cd | — (40%): | 94 cd |
| — (63%): | 149 cd | — (100%): | 236 cd |

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



Isocandela (sphere)



Imax (100%): 236 cd

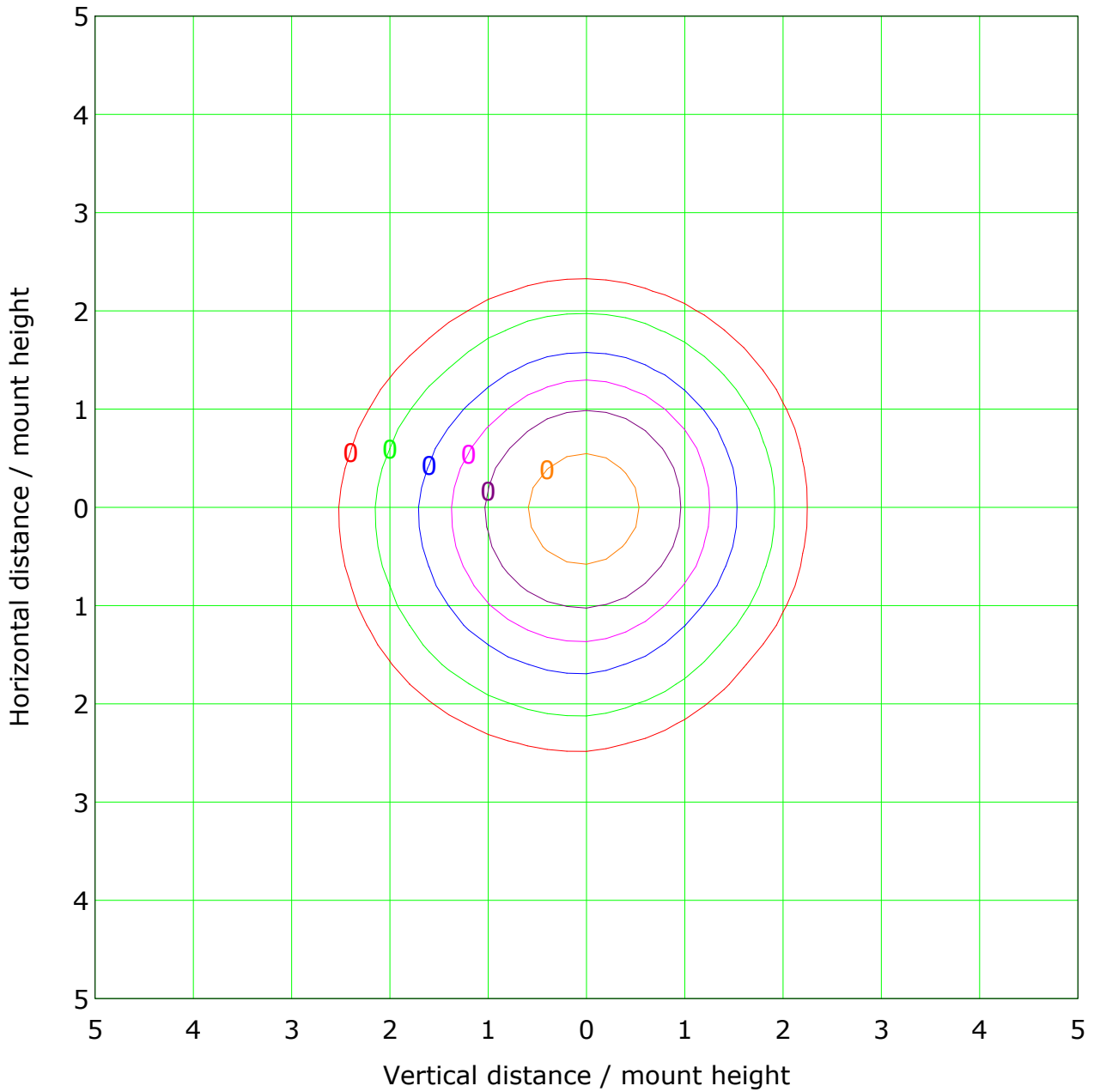
- (10%): 24 cd
- (16%): 38 cd
- (25%): 59 cd
- (40%): 94 cd
- (63%): 149 cd
- (100%): 236 cd

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



IsoPPFD Plot



Mounting Height: 10.0m Max PPFD(100%): 0.048 $\mu\text{mol/s/m}^2$
 — (1%): 0.000 $\mu\text{mol/s/m}^2$ — (2%): 0.001 $\mu\text{mol/s/m}^2$
 — (5%): 0.002 $\mu\text{mol/s/m}^2$ — (10%): 0.005 $\mu\text{mol/s/m}^2$
 — (20%): 0.010 $\mu\text{mol/s/m}^2$ — (50%): 0.024 $\mu\text{mol/s/m}^2$
 — (100%): 0.048 $\mu\text{mol/s/m}^2$

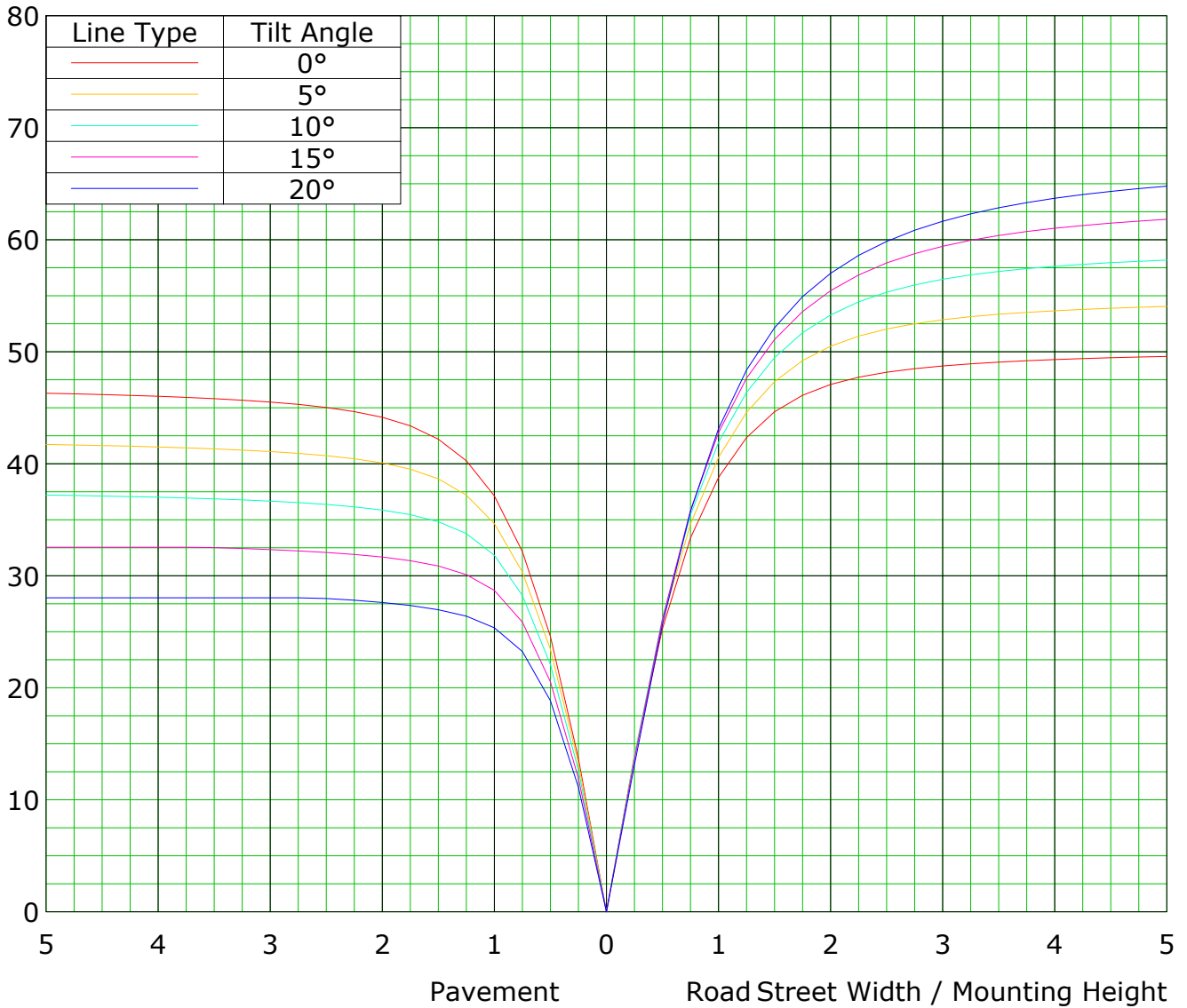
C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



Roadway CU Curve

Efficiency(%)



C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

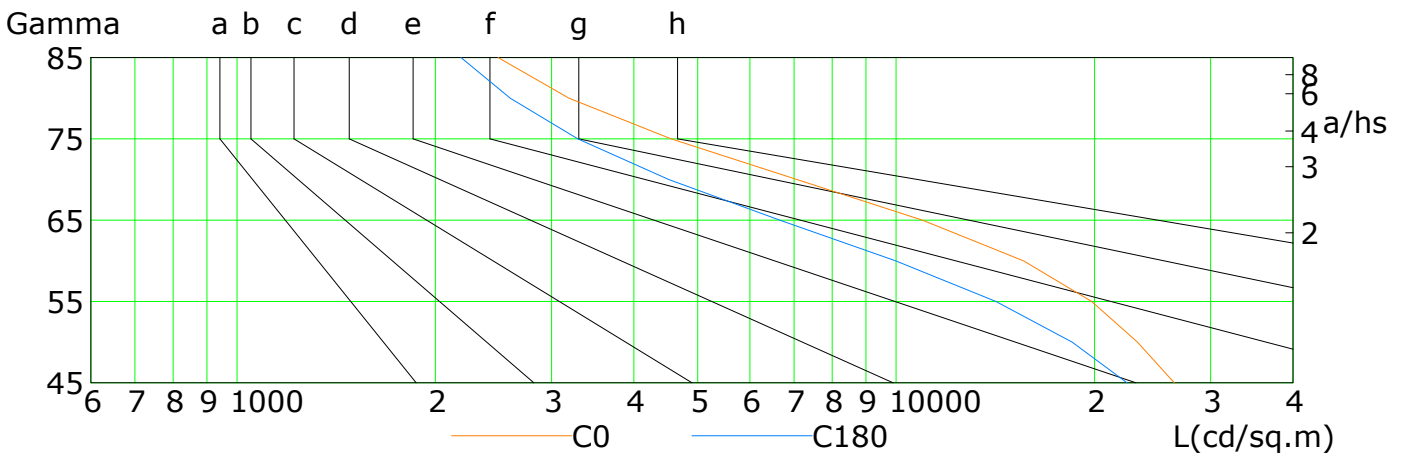
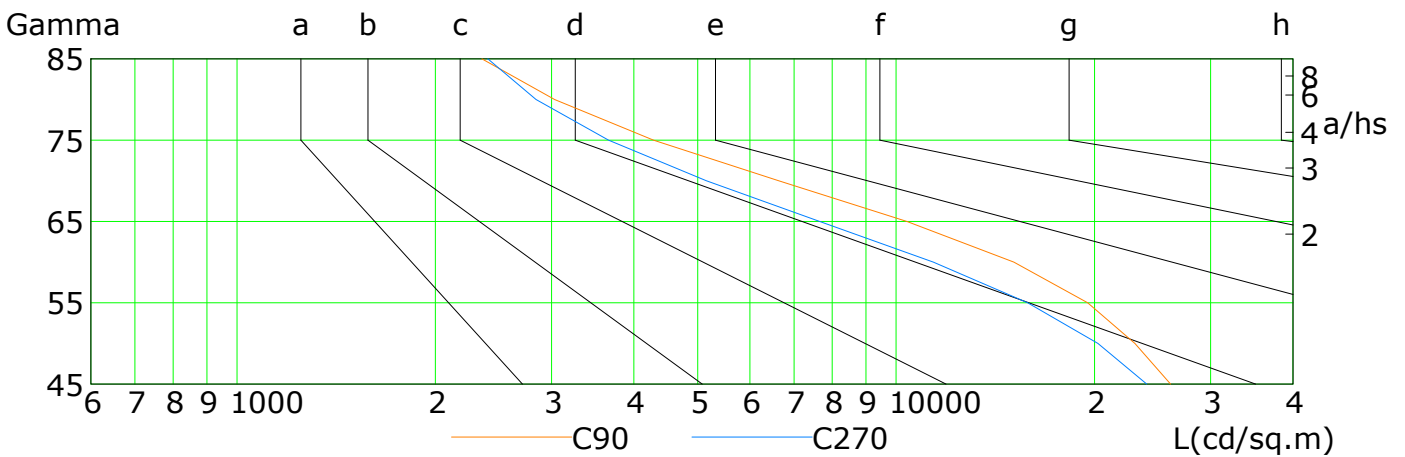
Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



Lum Limit Curve

Dazzle	Quality	Illuminance (lx)								
		2000	1000	500	<=300					
1.15	A									
1.50	B									
1.85	C									
2.20	D									
2.55	E									

a b c d e f g h



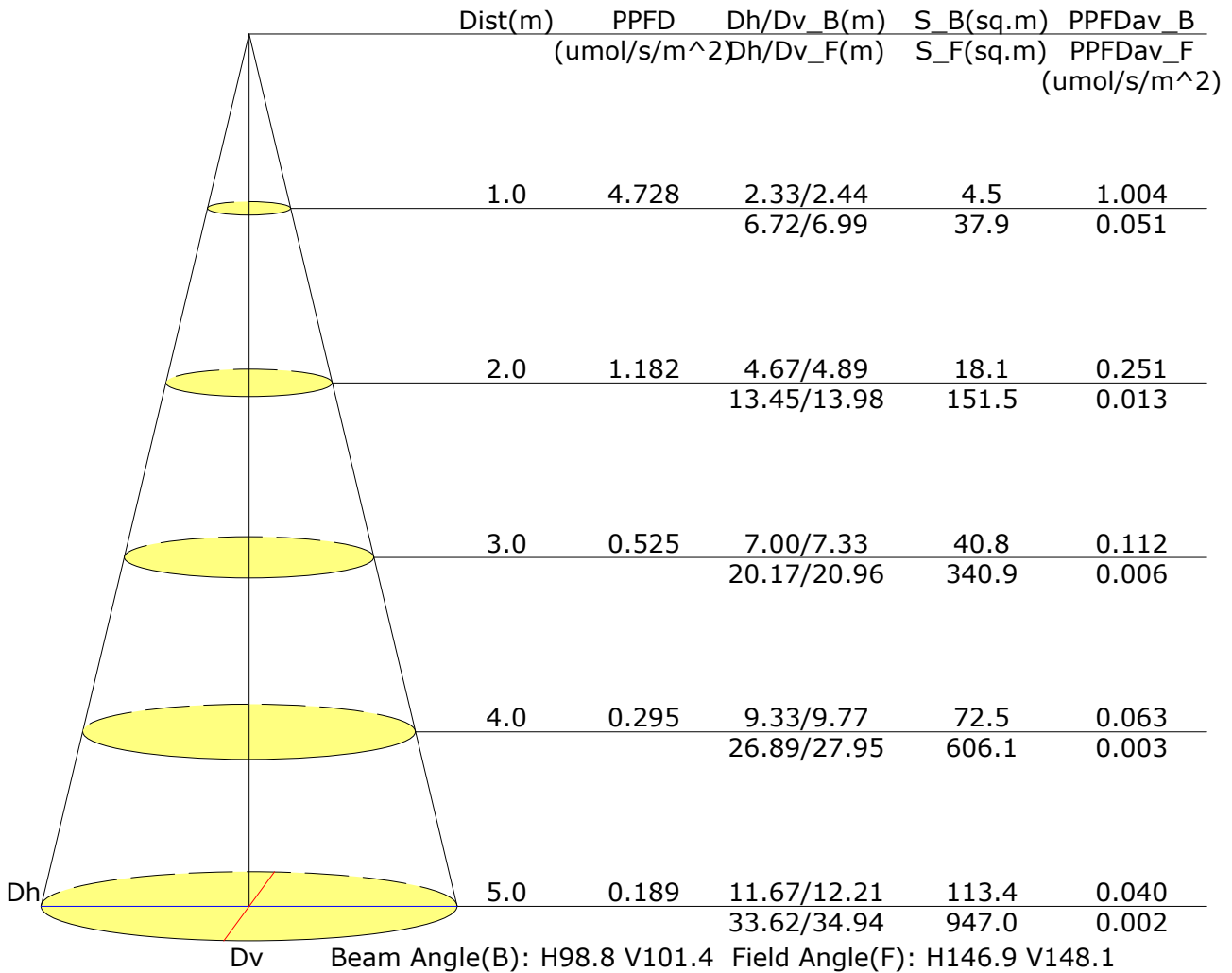
L(cd/sq.m)	G45	G50	G55	G60	G65	G70	G75	G80	G85
C0	26425	23238	19800	15600	10964	7073	4558	3190	2489
C90	26091	23021	19522	15087	10385	6637	4285	3033	2352
C180	22409	18493	14174	9978	6661	4520	3288	2598	2187
C270	24002	20235	15829	11389	7657	5155	3661	2842	2402

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:

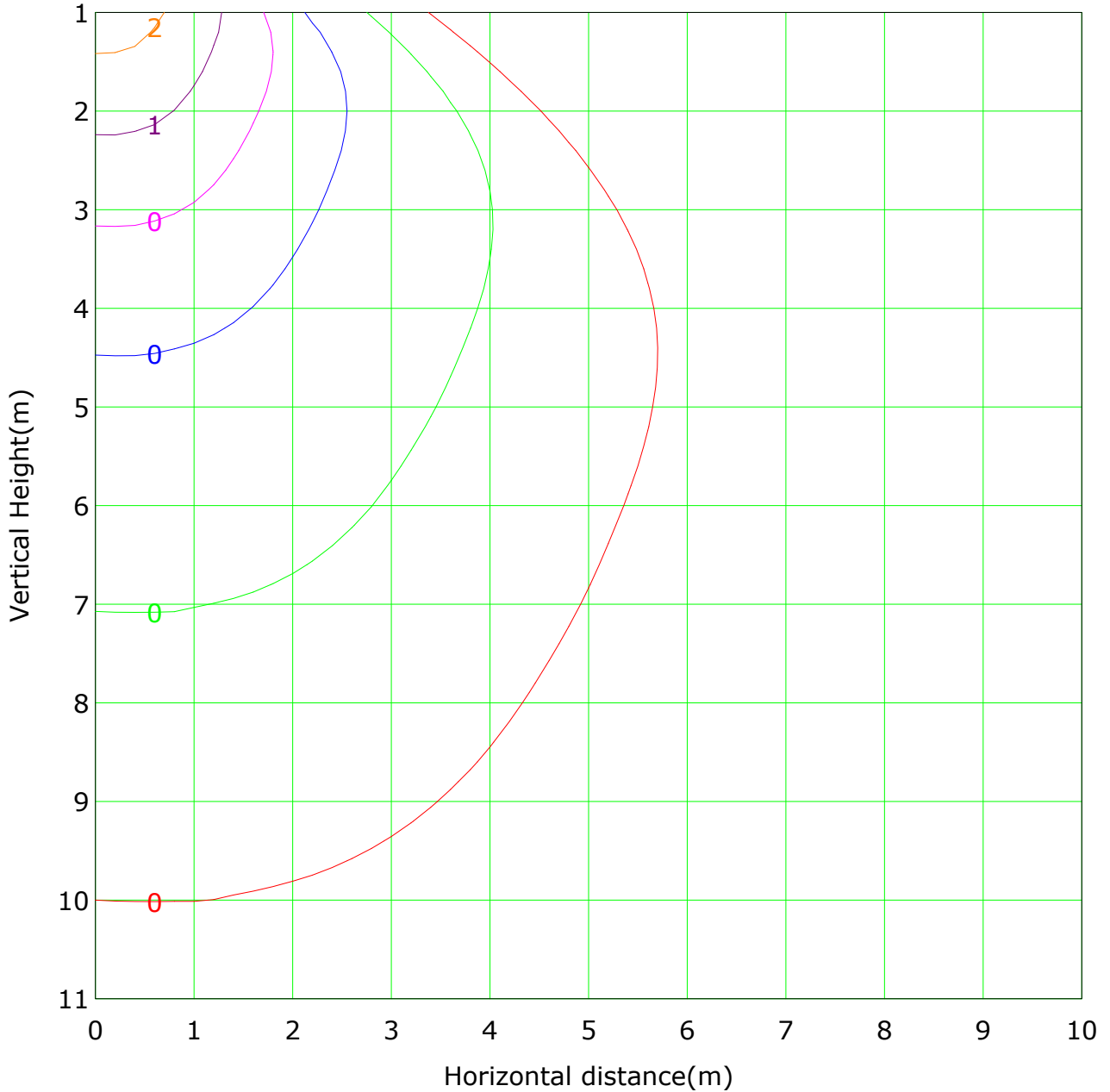


PPFD at a Distance





Vertical IsoPPFD Plot



Lowest(m): 1.0m Highest(m): 11.000m Max PPFD: 4.7 $\mu\text{mol/s/m}^2$
 — (1%): 0.047 $\mu\text{mol/s/m}^2$ — (2%): 0.095 $\mu\text{mol/s/m}^2$
 — (5%): 0.236 $\mu\text{mol/s/m}^2$ — (10%): 0.473 $\mu\text{mol/s/m}^2$
 — (20%): 0.946 $\mu\text{mol/s/m}^2$ — (50%): 2.364 $\mu\text{mol/s/m}^2$
 — (100%): 4.728 $\mu\text{mol/s/m}^2$

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



Area Flux Table

Unit: lm/klm

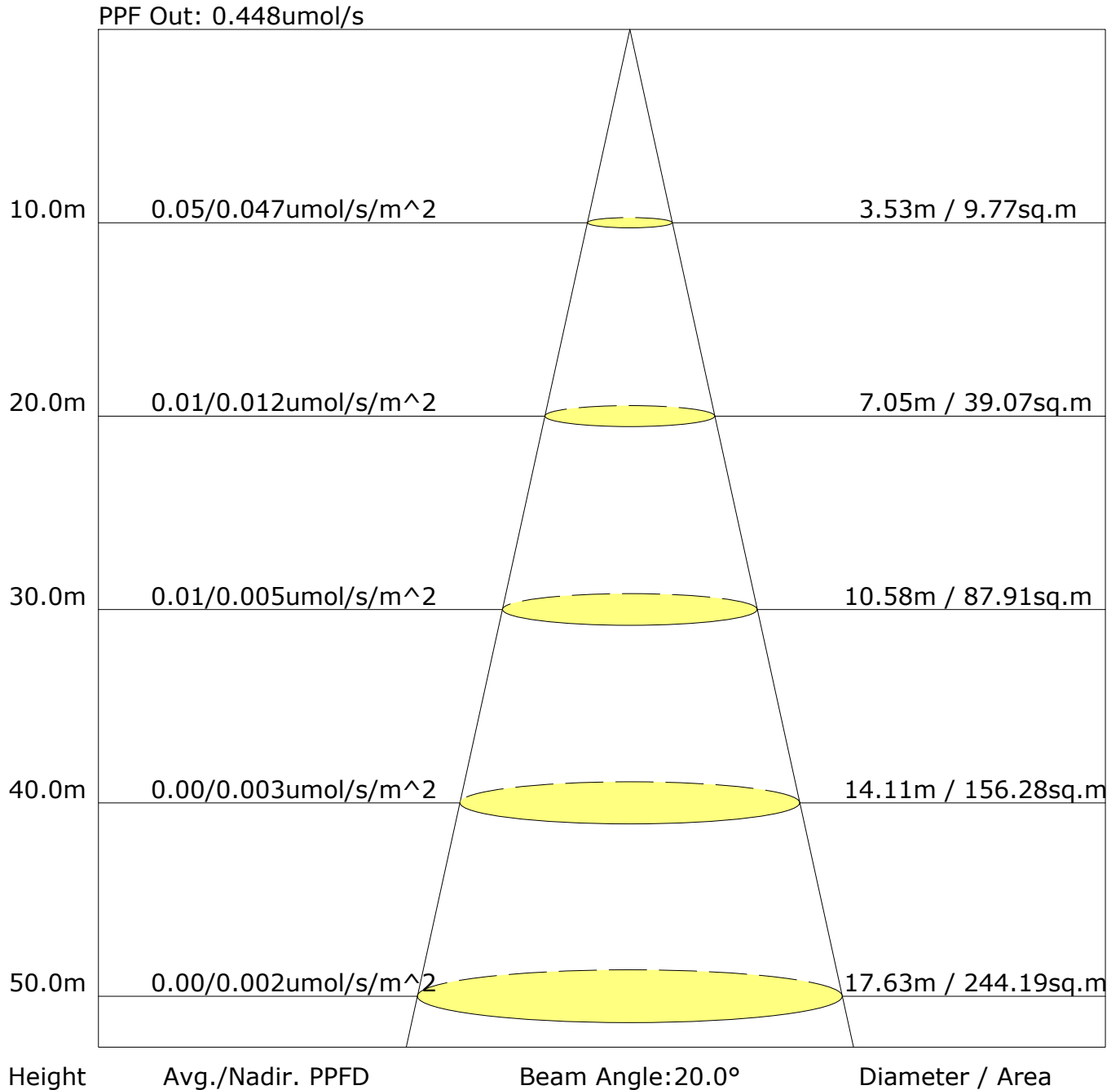
Table with 18 columns (Flux(E), Flux(T), 90, 80, 70, 60, 50, 40, 30, 20, 10, 0, -10, -20, -30, -40, -50, -60, -70, -80, -90) and 18 rows. Includes 'Vertical plane' and 'Horizontal plane' labels.

C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



The Average PPFD Effective Figure



C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



UGR Table

Reflectance:										
Ceiling (cavity)	0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
Wall	0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3
Reference plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Room dimensions	Viewed crosswise					Viewed endwise				
X=2H Y=2H	22.5	23.8	22.8	24.1	24.3	22.1	23.4	22.4	23.6	23.9
3H	23.1	24.3	23.4	24.6	24.9	22.6	23.8	22.9	24.1	24.3
4H	23.3	24.4	23.6	24.7	25.0	22.7	23.8	23.1	24.1	24.4
6H	23.3	24.4	23.7	24.7	25.0	22.8	23.8	23.1	24.1	24.5
8H	23.4	24.4	23.7	24.7	25.0	22.8	23.8	23.2	24.1	24.5
12H	23.4	24.3	23.8	24.7	25.0	22.8	23.8	23.2	24.1	24.5
X=4H Y=2H	22.8	23.9	23.1	24.2	24.5	22.4	23.5	22.7	23.8	24.1
3H	23.5	24.4	23.8	24.8	25.1	23.0	24.0	23.4	24.3	24.6
4H	23.7	24.5	24.1	24.9	25.2	23.2	24.0	23.6	24.4	24.8
6H	23.8	24.6	24.2	24.9	25.3	23.3	24.1	23.7	24.5	24.9
8H	23.9	24.6	24.3	25.0	25.4	23.4	24.1	23.8	24.5	24.9
12H	23.9	24.6	24.4	25.0	25.4	23.4	24.1	23.9	24.5	24.9
X=8H Y=4H	23.7	24.4	24.1	24.8	25.2	23.2	23.9	23.7	24.3	24.7
6H	23.9	24.5	24.3	24.9	25.4	23.4	24.0	23.9	24.4	24.9
8H	24.0	24.5	24.5	24.9	25.4	23.5	24.0	24.0	24.5	25.0
12H	24.1	24.5	24.6	25.0	25.5	23.7	24.1	24.2	24.6	25.1
X=12H Y=4H	23.6	24.3	24.1	24.7	25.1	23.2	23.8	23.7	24.3	24.7
6H	23.9	24.4	24.4	24.8	25.3	23.4	23.9	23.9	24.4	24.9
8H	24.0	24.4	24.5	24.9	25.4	23.6	24.0	24.1	24.5	25.0
Variations with the observer position at spacings:										
S=1.0H	+0.2/-0.3					+0.3/-0.5				
S=1.5H	+0.6/-1.1					+0.8/-1.6				
S=2.0H	+1.6/-2.7					+1.8/-2.7				

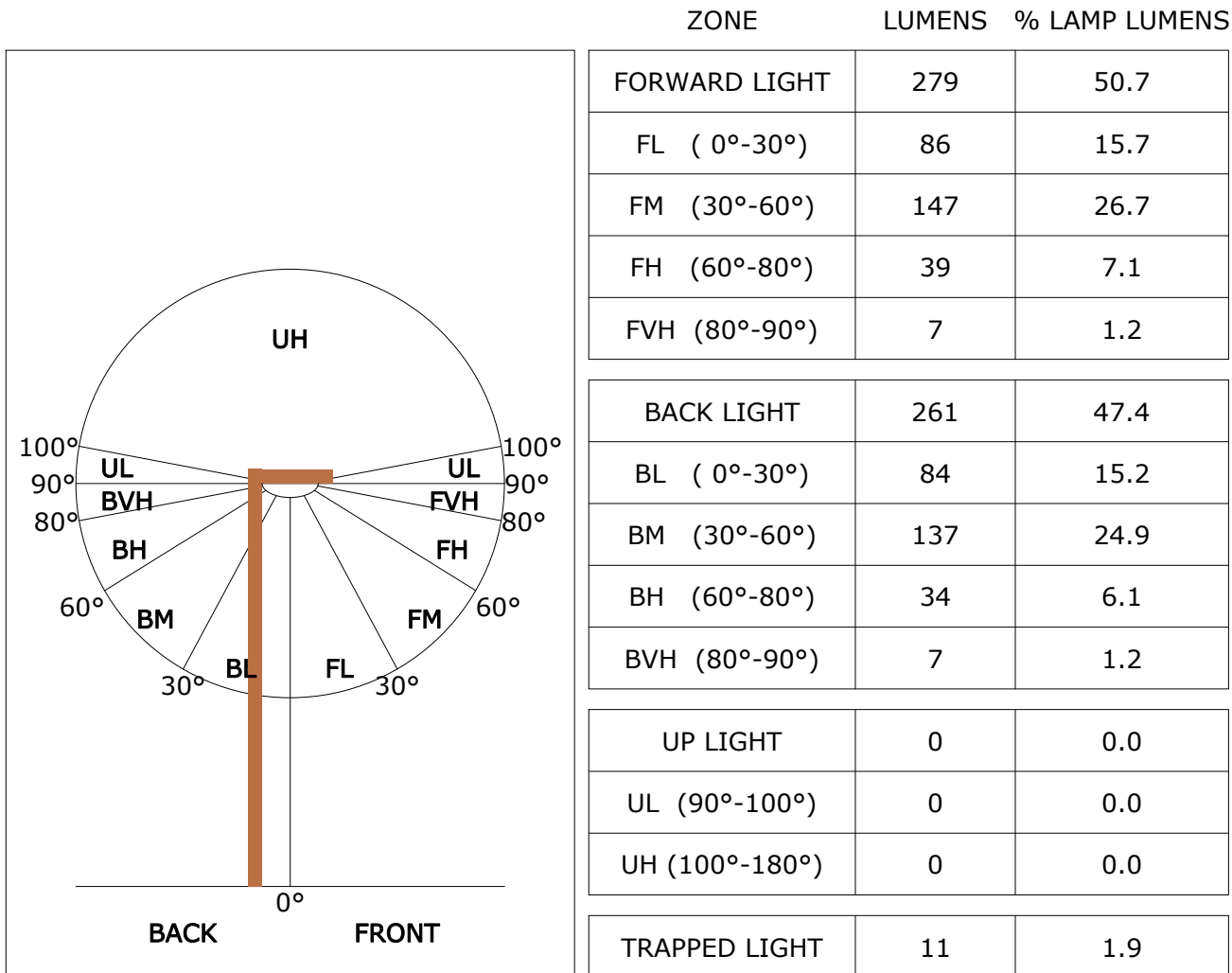
Calculate in accordance with CIE Pub.117. The table is revised with 550lm ($8\log(F/F_0) = -2.1$).

C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



FLUX DISTRIBUTION TABLE BASED ON THE IESNA LUMINAIRE CLASSIFICATION SYSTEM



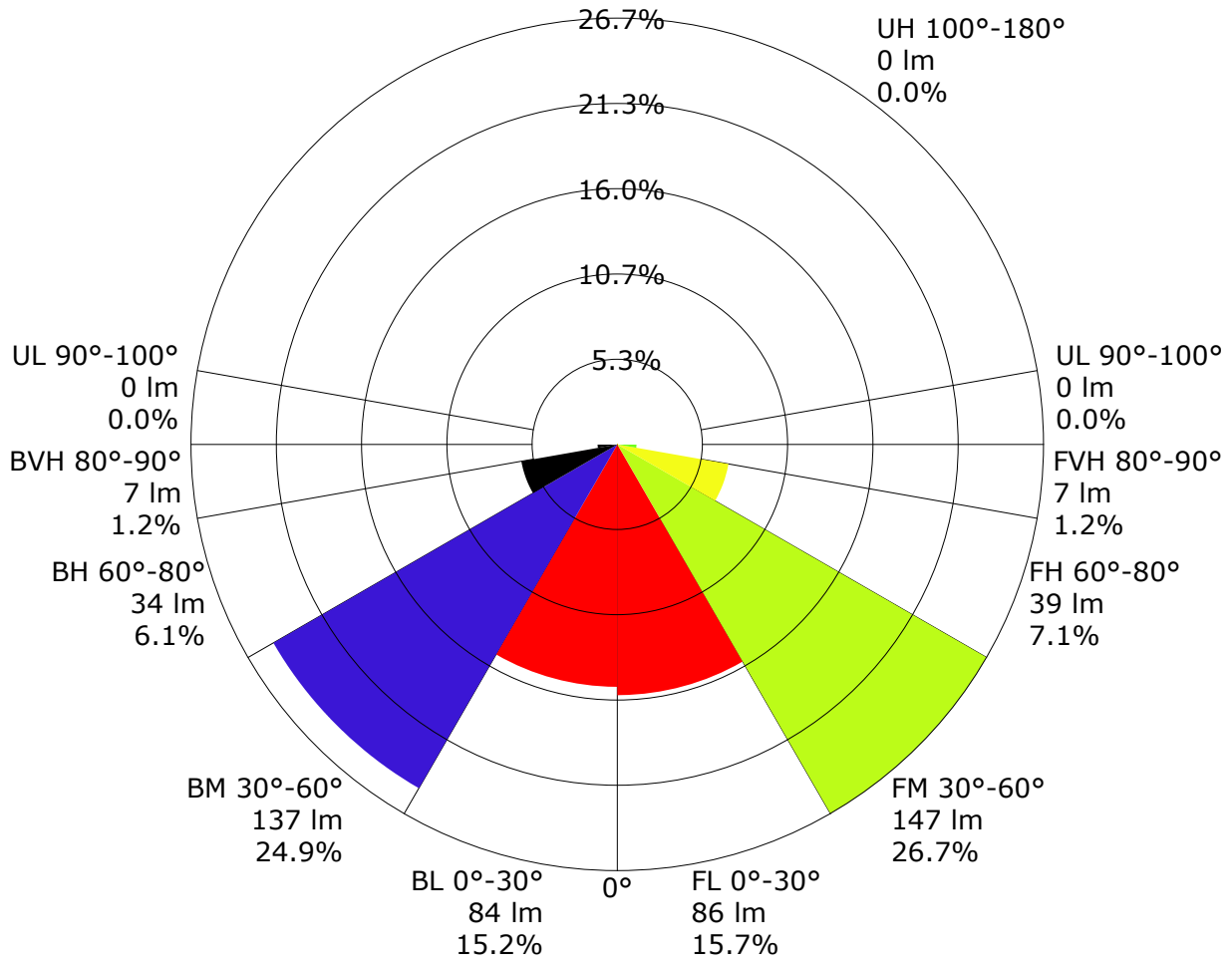
BUG(Backlight,Uplight,Glare) Rating Base On TM-15-07	
Asymmetrical Luminaire Types (Type I,II,III,IV)	B0 U0 G0
Quadrilateral Symmetrical Luminaire Types (Type V,Area Light)	B0 U0 G0

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



LCS Graph



Back Light

Forward Light

Scale= MAX LCS%

Trapped Light:11 lm,1.9%



Color Properties

Chromaticity Coordinate: $x=0.4651$ $y=0.4138$ $u(u')=0.2645$ $v=0.3529$ $v'=0.5293$
Correlated Color Temperature: $T_c=2653K$ ($duv=0.00074$)

Measurement Flux: 539.5lm, PAR: 2.189W, PPF: 11.100umol/s

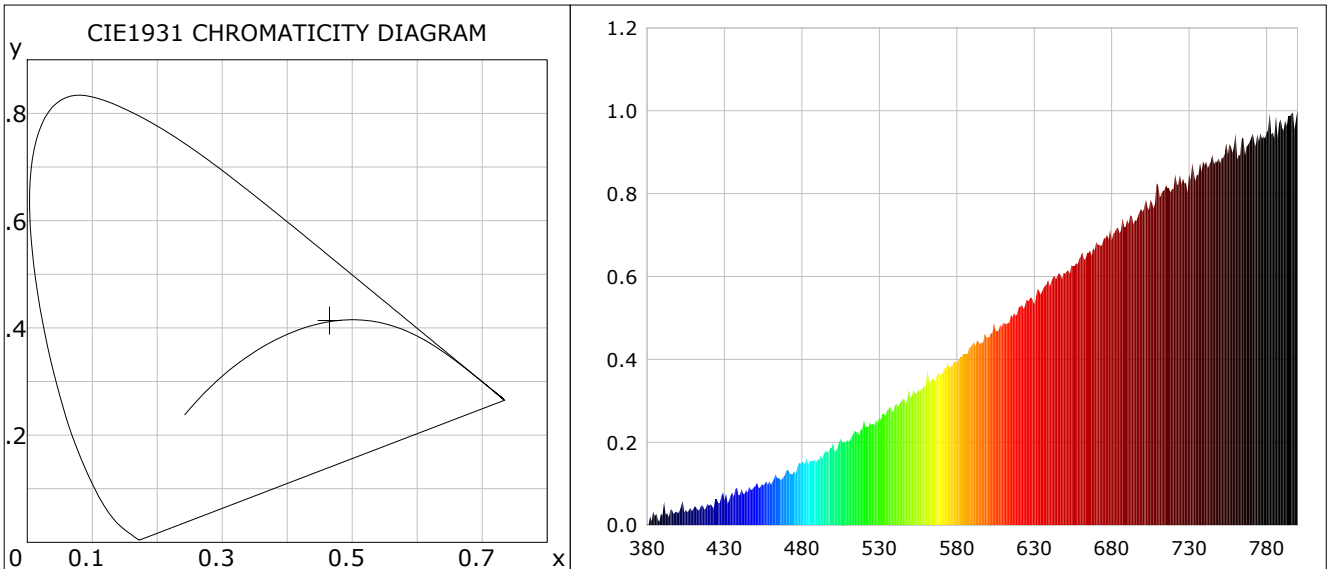
Peak Wavelength: 800nm Half Bandwidth: 185.4nm
Dominant Wavelength: 584.2nm Color Purity: 0.638

Color Ratio: R=0.269 G=0.704 B=0.027

TM30: Rf=99, Rg=99

Color Render Index: Ra= 99.5
R1 =99.5 R2 =99.5 R3 =99.5 R4 =99.4 R5 =99.3 R6 =99.1 R7 =99.7 R8 =99.6
R9 =98.8 R10=98.8 R11=99.3 R12=98.1 R13=99.4 R14=99.7 R15=99.3

Color Quality Scale: Qa= 96.2 Qf= 98.8 Qp= 98.5 Qg= 96.4
Q1 =96.7 Q2 =97.2 Q3 =97.1 Q4 =96.9 Q5 =96.6 Q6 =96.2 Q7 =95.9 Q8 =95.7
Q9 =95.0 Q10=95.5 Q11=96.0 Q12=96.5 Q13=96.7 Q14=97.2 Q15=0.0



C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



Utilisation Factor Table(Floor cavity)

Utilisation Factors UF(F)			SHR NOM = 1.25									
Room Reflectance			Room Index(RI)									
Ceiling	Wall	Floor	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00	
0.70	0.50	0.20	0.59	0.69	0.76	0.81	0.88	0.92	0.96	1.00	1.02	
	0.30		0.52	0.62	0.70	0.75	0.82	0.87	0.91	0.96	0.99	
	0.20		0.47	0.57	0.64	0.70	0.78	0.83	0.87	0.92	0.96	
0.50	0.50	0.20	0.58	0.67	0.74	0.79	0.85	0.89	0.92	0.96	0.98	
	0.30		0.51	0.61	0.68	0.73	0.80	0.85	0.88	0.93	0.95	
	0.20		0.46	0.56	0.64	0.69	0.76	0.81	0.85	0.90	0.93	
0.30	0.50	0.20	0.56	0.66	0.72	0.76	0.82	0.86	0.89	0.92	0.94	
	0.30		0.51	0.60	0.67	0.72	0.78	0.82	0.86	0.90	0.92	
	0.20		0.46	0.56	0.63	0.68	0.75	0.79	0.83	0.87	0.90	
0.00	0.00	0.00	0.44	0.54	0.60	0.65	0.71	0.76	0.79	0.83	0.86	
<p>Rating:64W Photometrically tested without ceiling board. Multiply UF values by service correction factors Calculate in accordance with CIBSE Technical Memorandum NO.5 1980</p>												



Utilisation Factor Table(Wall)

Utilisation Factors UF(W)			SHR NOM = 1.25									
Room Reflectance			Room Index(RI)									
Ceiling	Wall	Floor	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00	
0.70	0.50	0.20	0.92	0.75	0.64	0.55	0.44	0.37	0.31	0.25	0.20	
	0.30		0.77	0.64	0.56	0.49	0.40	0.34	0.29	0.23	0.19	
	0.20		0.66	0.56	0.49	0.44	0.36	0.31	0.27	0.22	0.18	
0.50	0.50	0.20	0.89	0.72	0.61	0.53	0.42	0.38	0.30	0.23	0.19	
	0.30		0.75	0.63	0.54	0.47	0.38	0.32	0.28	0.22	0.18	
	0.20		0.65	0.55	0.48	0.43	0.35	0.30	0.26	0.21	0.18	
0.30	0.50	0.20	0.86	0.69	0.59	0.51	0.40	0.33	0.29	0.22	0.18	
	0.30		0.74	0.61	0.52	0.46	0.37	0.31	0.27	0.21	0.18	
	0.20		0.65	0.55	0.47	0.42	0.34	0.29	0.25	0.20	0.17	
0.00	0.00	0.00	0.54	0.45	0.38	0.33	0.27	0.23	0.19	0.15	0.13	
<p>Rating:64W Photometrically tested without ceiling board. Multiply UF values by service correction factors Calculate in accordance with CIBSE Technical Memorandum NO.5 1980</p>												



Utilisation Factor Table(Ceiling cavity)

Utilisation Factors UF(C)			SHR NOM = 1.25								
Room Reflectance			Room Index(RI)								
Ceiling	Wall	Floor	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00
0.70	0.50	0.20	0.16	0.17	0.18	0.18	0.19	0.20	0.20	0.21	0.21
	0.30		0.09	0.11	0.12	0.13	0.15	0.16	0.17	0.18	0.19
	0.20		0.05	0.06	0.08	0.09	0.11	0.13	0.14	0.16	0.17
0.50	0.50	0.20	0.15	0.16	0.17	0.18	0.19	0.19	0.19	0.20	0.20
	0.30		0.09	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18
	0.20		0.05	0.06	0.08	0.09	0.11	0.12	0.14	0.15	0.16
0.30	0.50	0.20	0.15	0.16	0.16	0.17	0.18	0.18	0.19	0.19	0.19
	0.30		0.09	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18
	0.20		0.05	0.06	0.08	0.09	0.11	0.12	0.13	0.15	0.16
0.00	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
<p>Rating:64W Photometrically tested without ceiling board. Multiply UF values by service correction factors Calculate in accordance with CIBSE Technical Memorandum NO.5 1980</p>											

Zonal Lumen

Gamma [°]	I _{mean} [cd/klm]	Zonal Flux [lm]	Sum Zonal Flux [lm]	Rel Zonal Flux [%]	Sum Rel Zonal Flux [%]
0.0-1.0	419.2	0.2	0.2	0.04	0.04
1.0-2.0	419.0	0.7	0.9	0.12	0.16
2.0-3.0	418.8	1.1	2.0	0.20	0.36
3.0-4.0	418.4	1.5	3.5	0.28	0.64
4.0-5.0	417.8	2.0	5.5	0.36	1.00
5.0-6.0	417.0	2.4	7.9	0.44	1.44
6.0-7.0	416.1	2.8	10.8	0.52	1.96
7.0-8.0	414.7	3.3	14.0	0.59	2.55
8.0-9.0	413.0	3.7	17.7	0.67	3.22
9.0-10.0	411.1	4.1	21.8	0.74	3.96
10.0-11.0	409.0	4.5	26.3	0.82	4.78
11.0-12.0	406.6	4.9	31.2	0.89	5.67
12.0-13.0	403.9	5.3	36.4	0.96	6.63
13.0-14.0	400.7	5.6	42.1	1.03	7.65
14.0-15.0	397.1	6.0	48.1	1.09	8.74
15.0-16.0	393.3	6.3	54.4	1.15	9.90
16.0-17.0	389.1	6.7	61.1	1.21	11.11
17.0-18.0	384.7	7.0	68.1	1.27	12.38
18.0-19.0	379.9	7.3	75.3	1.32	13.70
19.0-20.0	374.9	7.5	82.9	1.37	15.07
20.0-21.0	369.6	7.8	90.7	1.42	16.49
21.0-22.0	364.0	8.0	98.7	1.46	17.95
22.0-23.0	358.4	8.3	107.0	1.50	19.46
23.0-24.0	352.7	8.5	115.5	1.54	21.00
24.0-25.0	346.9	8.7	124.2	1.58	22.58
25.0-26.0	341.0	8.9	133.0	1.61	24.19
26.0-27.0	335.1	9.0	142.0	1.64	25.83
27.0-28.0	329.1	9.2	151.2	1.67	27.49
28.0-29.0	323.2	9.3	160.5	1.69	29.18
29.0-30.0	317.4	9.4	169.9	1.71	30.90
30.0-31.0	311.6	9.5	179.5	1.73	32.63
31.0-32.0	306.0	9.6	189.1	1.75	34.39
32.0-33.0	300.5	9.7	198.9	1.77	36.16
33.0-34.0	295.1	9.8	208.7	1.79	37.94
34.0-35.0	289.8	9.9	218.6	1.80	39.74
35.0-36.0	284.6	10.0	228.6	1.81	41.55

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector:



Zonal Lumen (Continue 1)

Gamma [°]	I _{mean} [cd/klm]	Zonal Flux [lm]	Sum Zonal Flux [lm]	Rel Zonal Flux [%]	Sum Rel Zonal Flux [%]
36.0-37.0	279.5	10.0	238.6	1.82	43.38
37.0-38.0	274.5	10.1	248.7	1.83	45.21
38.0-39.0	269.7	10.1	258.8	1.84	47.05
39.0-40.0	264.9	10.2	268.9	1.85	48.90
40.0-41.0	259.8	10.2	279.1	1.85	50.75
41.0-42.0	254.9	10.2	289.3	1.85	52.60
42.0-43.0	250.1	10.2	299.5	1.85	54.46
43.0-44.0	245.1	10.2	309.7	1.85	56.31
44.0-45.0	240.0	10.1	319.8	1.84	58.15
45.0-46.0	234.7	10.1	329.9	1.84	59.99
46.0-47.0	229.3	10.0	340.0	1.82	61.81
47.0-48.0	223.6	9.9	349.9	1.81	63.62
48.0-49.0	217.8	9.8	359.7	1.79	65.41
49.0-50.0	211.7	9.7	369.4	1.77	67.17
50.0-51.0	205.1	9.5	379.0	1.74	68.91
51.0-52.0	198.2	9.4	388.3	1.70	70.61
52.0-53.0	191.1	9.1	397.5	1.66	72.27
53.0-54.0	183.6	8.9	406.4	1.62	73.89
54.0-55.0	175.9	8.6	415.0	1.57	75.46
55.0-56.0	167.8	8.3	423.4	1.52	76.98
56.0-57.0	159.5	8.0	431.4	1.46	78.43
57.0-58.0	151.0	7.7	439.1	1.40	79.83
58.0-59.0	142.4	7.3	446.4	1.33	81.16
59.0-60.0	133.8	7.0	453.3	1.26	82.43
60.0-61.0	125.2	6.6	459.9	1.19	83.62
61.0-62.0	116.6	6.2	466.1	1.12	84.75
62.0-63.0	108.3	5.8	471.9	1.05	85.80
63.0-64.0	100.2	5.4	477.3	0.98	86.78
64.0-65.0	92.5	5.0	482.3	0.92	87.70
65.0-66.0	85.2	4.7	487.0	0.85	88.55
66.0-67.0	78.3	4.3	491.4	0.79	89.34
67.0-68.0	71.9	4.0	495.4	0.73	90.07
68.0-69.0	66.0	3.7	499.1	0.67	90.74
69.0-70.0	60.6	3.4	502.5	0.62	91.36
70.0-71.0	55.7	3.2	505.6	0.58	91.94
71.0-72.0	51.2	2.9	508.6	0.53	92.47

C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



Candlepower Table

Unit: cd/klm

G\C	C0.0	C45.0	C90.0	C135.0	C180.0	C225.0	C270.0	C315.0	C360.0	
G0.0	417.8	423.7	420.2	415.6	417.8	423.7	420.2	415.6	417.8	
G1.0	418.7	424.6	420.7	414.8	416.6	422.4	419.6	415.9	418.7	
G2.0	419.5	425.7	420.7	414.2	415.1	421.1	418.8	415.9	419.5	
G3.0	420.2	427.1	421.2	413.2	413.8	419.7	417.9	415.8	420.2	
G4.0	421.0	428.1	420.7	412.2	412.4	418.8	416.7	415.4	421.0	
G5.0	421.9	428.2	420.5	410.8	410.7	416.9	415.0	414.7	421.9	
G6.0	423.5	428.6	420.8	409.3	408.7	414.9	413.1	414.4	423.5	
G7.0	423.3	429.1	419.9	407.2	406.4	413.2	411.4	413.2	423.3	
G8.0	421.6	429.3	418.8	405.1	404.3	411.0	409.4	411.6	421.6	
G9.0	420.9	429.0	417.5	402.8	401.6	408.1	406.9	409.7	420.9	
G10.0	420.1	428.6	416.2	400.2	398.4	405.5	404.1	407.9	420.1	
G11.0	419.3	427.9	414.5	397.3	395.6	402.0	401.2	405.8	419.3	
G12.0	418.1	426.7	412.3	394.1	392.1	398.3	397.7	402.9	418.1	
G13.0	416.7	425.2	410.0	391.1	388.6	394.1	394.0	400.1	416.7	
G14.0	414.5	422.8	407.0	386.9	384.6	389.4	390.0	396.8	414.5	
G15.0	412.1	420.1	403.7	383.1	380.4	384.4	385.2	393.2	412.1	
G16.0	409.3	416.9	400.1	378.9	375.8	379.0	380.6	389.5	409.3	
G17.0	406.1	412.8	396.2	374.6	371.1	373.5	375.9	385.5	406.1	
G18.0	402.4	409.1	392.5	369.8	366.0	367.7	370.5	381.1	402.4	
G19.0	398.4	404.2	388.3	365.4	360.7	361.7	364.7	376.5	398.4	
G20.0	393.8	399.0	383.1	360.1	355.4	355.9	359.7	371.4	393.8	
G21.0	389.1	393.1	378.1	355.0	349.4	349.7	353.9	366.2	389.1	
G22.0	383.8	387.7	372.8	349.6	343.2	343.3	348.1	361.4	383.8	
G23.0	378.3	381.9	367.6	344.1	337.2	337.5	342.1	355.4	378.3	
G24.0	373.1	376.4	361.6	338.7	331.5	331.7	336.4	349.9	373.1	
G25.0	367.2	370.3	356.1	332.9	325.2	325.6	330.3	344.1	367.2	
G26.0	360.6	364.3	349.9	327.3	319.3	320.1	324.9	338.3	360.6	
G27.0	354.6	358.0	344.6	320.8	313.3	314.5	319.0	332.1	354.6	
G28.0	348.1	352.1	338.6	315.0	307.1	308.9	313.3	325.7	348.1	
G29.0	342.0	346.3	333.1	309.5	301.3	303.3	307.9	319.2	342.0	
G30.0	335.5	340.2	327.0	303.6	295.3	298.1	302.7	312.7	335.5	
G31.0	329.6	334.4	321.5	297.8	289.7	292.9	297.5	306.5	329.6	
G32.0	323.4	329.1	316.2	292.4	284.1	288.1	292.0	300.5	323.4	
G33.0	317.8	323.7	310.5	287.0	278.7	283.3	287.1	294.4	317.8	
G34.0	312.0	317.9	305.0	281.6	273.2	278.7	282.4	287.9	312.0	
G35.0	306.3	312.5	299.8	276.4	267.9	274.6	277.8	282.2	306.3	
G36.0	300.7	307.2	294.6	271.1	262.6	270.5	273.2	276.7	300.7	

C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:



Candlepower Table (Continue 1)

Unit: cd/klm

G\C	C0.0	C45.0	C90.0	C135.0	C180.0	C225.0	C270.0	C315.0	C360.0
G37.0	294.9	302.1	289.5	265.8	257.5	266.5	268.7	271.0	294.9
G38.0	289.4	296.6	284.9	260.6	252.6	262.3	264.2	265.6	289.4
G39.0	284.1	291.3	279.9	255.6	249.6	258.6	259.8	259.9	284.1
G40.0	278.8	286.3	274.7	250.7	243.8	254.5	255.2	254.9	278.8
G41.0	273.7	281.2	269.8	245.4	237.9	250.4	250.7	249.1	273.7
G42.0	269.1	276.5	265.3	240.3	232.6	246.3	246.3	244.0	269.1
G43.0	264.1	271.8	262.0	234.9	227.0	241.8	241.5	238.7	264.1
G44.0	259.6	266.9	256.2	229.1	221.7	236.8	236.7	233.3	259.6
G45.0	254.8	262.4	251.6	223.6	216.1	231.4	231.4	227.7	254.8
G46.0	250.1	258.8	246.5	217.6	209.6	225.7	225.7	222.2	250.1
G47.0	245.3	253.6	242.3	211.5	203.6	219.5	220.0	216.4	245.3
G48.0	240.2	249.4	237.6	205.2	196.9	212.6	213.7	210.4	240.2
G49.0	235.3	244.7	233.0	198.3	190.0	205.9	207.0	204.8	235.3
G50.0	229.7	240.2	227.6	191.4	182.8	198.2	200.0	198.0	229.7
G51.0	224.5	235.2	221.8	184.1	175.1	189.9	192.5	190.7	224.5
G52.0	218.6	230.2	216.1	176.4	167.3	181.6	184.6	183.4	218.6
G53.0	212.6	224.4	210.1	168.3	159.0	172.8	176.2	175.7	212.6
G54.0	205.9	218.4	203.1	160.6	151.1	164.0	167.7	168.3	205.9
G55.0	199.1	211.4	196.3	152.0	142.5	154.7	159.1	160.3	199.1
G56.0	191.5	204.0	188.3	143.7	134.1	145.2	150.6	152.2	191.5
G57.0	183.9	196.0	180.4	135.0	125.2	135.8	141.4	143.9	183.9
G58.0	175.7	187.9	171.4	126.6	116.8	127.0	132.8	135.8	175.7
G59.0	166.9	178.7	162.5	117.9	108.7	118.3	123.7	127.8	166.9
G60.0	158.3	169.4	153.1	109.9	101.2	109.5	115.5	119.5	158.3
G61.0	148.7	159.3	143.6	101.6	93.4	101.2	107.0	111.6	148.7
G62.0	139.5	149.3	133.9	93.9	86.6	93.4	99.1	103.8	139.5
G63.0	129.9	138.9	124.3	86.4	79.6	86.1	91.5	96.4	129.9
G64.0	120.7	129.1	114.7	79.9	73.4	79.2	84.6	89.0	120.7
G65.0	111.4	118.9	105.5	73.3	67.7	72.7	77.8	82.5	111.4
G66.0	102.8	109.5	96.6	67.3	62.5	67.2	72.0	76.0	102.8
G67.0	93.9	99.8	88.5	61.9	57.5	61.8	66.1	70.0	93.9
G68.0	86.1	91.4	80.8	56.9	53.0	57.3	61.1	64.5	86.1
G69.0	78.3	83.3	73.3	52.1	49.1	52.8	56.5	59.6	78.3
G70.0	71.4	75.8	67.0	48.2	45.6	49.1	52.1	55.2	71.4
G71.0	64.9	69.1	60.7	44.4	42.4	45.6	48.1	51.2	64.9
G72.0	59.2	62.5	55.5	41.2	39.6	42.4	44.9	47.4	59.2
G73.0	53.9	56.7	50.6	38.0	36.9	39.6	41.8	44.2	53.9

C Plane (°):0.0-360.0: 45.0
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5°
Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-5000CCD
Distance: 8.000 m
Humidity: 60%
Inspector:

Candlepower Table (Continue 2)

Unit: cd/klm

G\C	C0.0	C45.0	C90.0	C135.0	C180.0	C225.0	C270.0	C315.0	C360.0
G74.0	49.4	51.9	46.3	35.2	34.7	37.2	38.9	41.2	49.4
G75.0	45.4	47.4	42.7	32.8	32.7	34.9	36.5	38.6	45.4
G76.0	41.8	43.7	39.3	30.9	30.9	32.9	34.3	36.3	41.8
G77.0	38.5	40.4	36.2	28.9	29.3	31.1	32.3	34.3	38.5
G78.0	35.8	37.4	33.7	27.4	27.8	29.6	30.7	32.3	35.8
G79.0	33.2	34.7	31.3	25.8	26.5	28.2	29.1	30.8	33.2
G80.0	31.1	32.4	29.5	24.4	25.3	26.7	27.7	29.3	31.1
G81.0	29.2	30.6	27.7	23.1	24.2	25.5	26.5	28.0	29.2
G82.0	27.3	28.6	26.1	22.2	22.9	24.5	25.4	26.7	27.3
G83.0	26.0	27.1	24.6	20.9	22.1	23.5	24.5	25.5	26.0
G84.0	24.6	25.7	23.3	20.1	21.4	22.7	23.5	24.6	24.6
G85.0	23.5	24.5	22.2	19.1	20.7	21.7	22.7	23.5	23.5
G86.0	22.6	23.4	21.2	18.3	19.9	20.9	21.9	22.8	22.6
G87.0	21.5	22.3	20.0	17.7	19.4	20.4	21.1	22.0	21.5
G88.0	20.6	21.4	19.2	17.0	18.4	19.6	20.4	21.3	20.6
G89.0	19.9	20.4	18.4	16.4	17.9	19.0	19.8	20.6	19.9
G90.0	19.2	19.7	17.7	15.9	17.4	18.4	19.1	19.9	19.2

C Plane (°):0.0-360.0: 45.0
 Test Lab: LISUN
 Test Type: TYPE C
 Temperature: 24.5°
 Operator: Jacky

Gamma Plane (°):0.0-90.0:1.0
 Test Device: LSG-5000CCD
 Distance: 8.000 m
 Humidity: 60%
 Inspector: