QAV Technologies Sdn. Bhd. (616788-U)
116, Lintang Kampong Jawa NFIZ3,
Taman Perindustrian Bayan Lepas,
Mk. 12, 11900 Penang. MALAYSIA.
Tel No: 604 – 6438317 Fax No: 604 – 6438597
Website: www.qavtech.com

Test Report

Photometric Test

Customer	:	Dialight Penang Sdn. Bhd.
Address	:	1666, Lorong Perusahaan Maju 8, Kawasan Perusahaan Perai, 13600 Perai, Pulau Pinang
Requestor Name	:	Dialight Penang Sdn. Bhd.
Product	:	21AMB0001
Test Prime	:	Nur Awanis Binti Abdul Razak
Receive Date	:	24th February 2021
Perform Date	:	24th February 2021
Report Number	:	QAV-0221-0186
Test Location	:	116, Lintang Kg. Jawa, NFIZ 3, Taman Perindustrian Bayan Lepas, Mk. 12, 11900 Pulau Pinang.

ABSTRACT: This summary report contains the **Photometric Test** result of the **21AMB0001** provided by **Dialight Penang Sdn. Bhd.**

Prepared by: Nur Awanis Binti Abdul Razak Issue Date: 26th February 2021

INSTRUMENTATION:

Sphere Spectroradiometry instrumentation:

- CCD Spectroradiometer (S/N: 1303292)
- LS2008R Digital Power Meter (S/N: 1304003)
- LSP – 500VA AC Power Source (S/N: 9905112493)
- Calibrated Thermometer (S/N: 990038136)
- 2.0 meter Sphere with High Reflectance Coating
- HP 6622A Power Supply (S/N: 3010A-02122)
- D204 Standard Light Source traceability to National Institute of Metrology (S/N: M133806CM5401210)

Goniometry instrumentation:

- Type C Data Goniometer – 20’ (S/N: 1308095)
- LS2008R Digital Power Meter (S/N: 1307091)
- LSP-500VAR AC Power Source (S/N: 1307091)
- Calibrated Thermometer (S/N: 990038120)
- HP 6633A DC Power Supply (S/N: 3524A-05692)
- D204 Standard Light Source traceability to National Institute of Metrology (S/N: M133806CM5401210)

TEST OBJECTIVE:

The measurement in this document is carried out in accordance with the measurement method specified in IES LM-79-08.

Goniometric measurement:

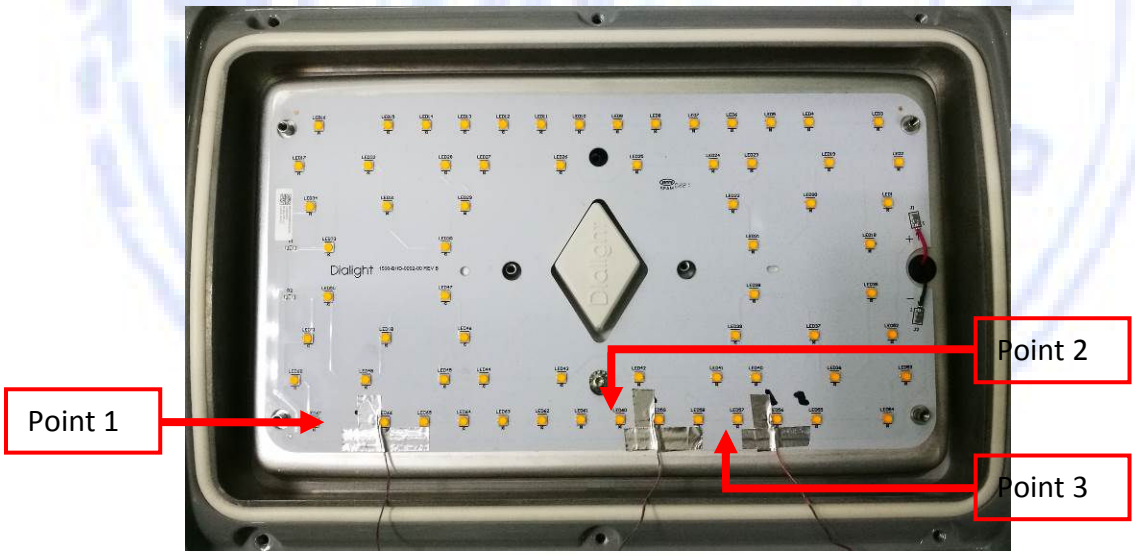
Measure distribution photometry and input electrical parameters and report candela distribution, calculated lumen output, voltage (V), current (A) and power (W).

Sphere Spectroradiometric measurement:

Measure sphere photometry and input electrical parameters and report the total flux output (lumens), Correlated Color Temperature (CCT), Color Rendering Index (CRI), Chromaticity Coordinates (x,y), Spectral Power Distribution (SPD), voltage (V), current (A) and power (W).

Additional information:

IN-SITU Temperature Measurement Testing (ISTMT) as below:



Thermocouple location on the product (S/N: 21AMB0001)

S/N: 21AMB0001		
LED No.	**Temperature measured**	**Temperature corrected at 25°C**
Point 1	46.99°C	45.93°C
Point 2	48.62°C	47.56°C
Point 3	47.00°C	45.94°C
Ambient Temperature	26.06°C	25°C
Remark: The highest in-situ measured temperature of LED is 47.56°C. The temperature measurement point measured according to the LED datasheet provided by applicant		

TEST PROCEDURES AND CONDITIONS:

Goniometry measurement:

- The test procedure will follow SOP 107-106-001
- Electrical conditions and physical orientation were set as required by the lamp manufacturer or the customer.
- Ambient temperature was controlled at 25+/-1 degree Celsius and measured at the approximate height of the sample mounted on the Goniometer equipment.
- Calibration was based on National Institute of Standards and Technology certified total luminous flux standard and maintained by a set of incandescent reflector working standard lamps.
- Lamps were stabilized per LM-79 requirements.
- Type C Goniometer was used to measure intensity at each angle of distribution.
- Burn time during testing for each lamp: 0 Hours
- Stabilization time during testing for each lamp: 1.00 Hours

Sphere Spectroradiometry measurement:

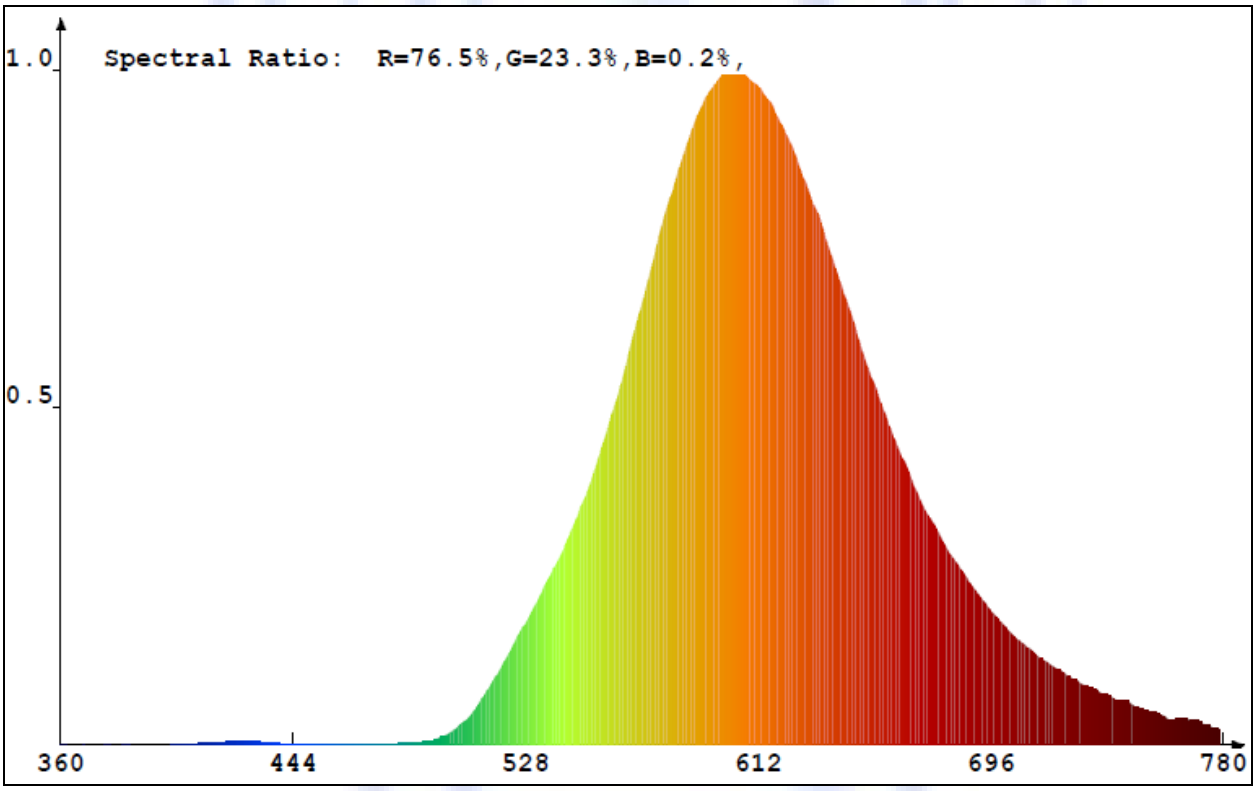
- The test procedure will follow SOP 107-106-001
- Electrical conditions and physical orientation were set as required by the lamp manufacturer or the customer.
- Ambient temperature was controlled at 25+/-1 degree Celsius and measured inside of the sphere, shielded from direct radiation of the lamp.
- Calibration was based on National Institute of Standards and Technology certified total spectral flux standard and maintained by a set of incandescent working standard lamps.
- Lamps were stabilized per LM-79 requirements.
- CCD Spectroradiometer attached to a 2.0 meter sphere painted with high reflectance paint was used to measure correlated colour temperature, chromaticity coordinated, colour rendering index, total luminous flux, and spectral power distribution. Sphere measurement was set up in 4π geometry and used continuous self-absorption correction.
- Burn time during testing for each lamp: 0 Hours
- Stabilization time during testing for each lamp: 1.00 Hours
- Spatial correction factor applied to lamp measurement: 1

SPHERE SPECTRORADIOMETRY TEST DATA:

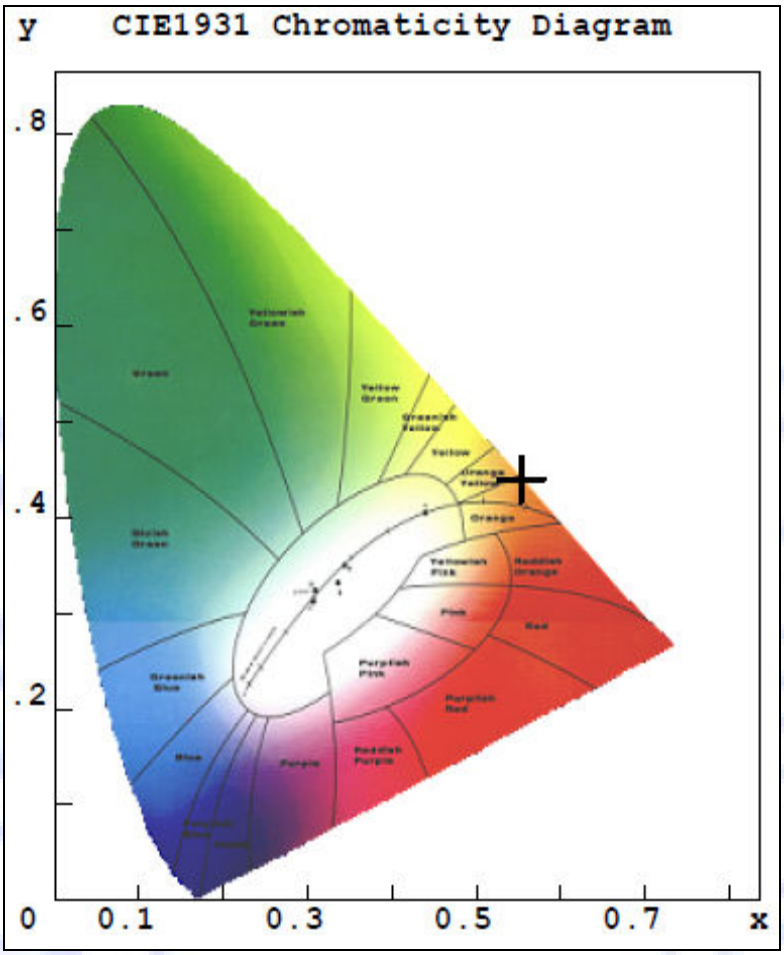
Main (nm)	Peak (nm)	Color Temp (K)	CIE-X	CIE-Y	Lumen (lm)	Efficacy	Power (W)	Vf (V)	I (A)	Ra	PF
586.9	602.74	1955	0.5536	0.4413	4112.86	89.06	46.18	240.16	0.195	57.4	0.986

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
51	71	84	45	47	64	72	24	0	41	27	22	53	90	44

SPECTRAL POWER DISTRIBUTION:



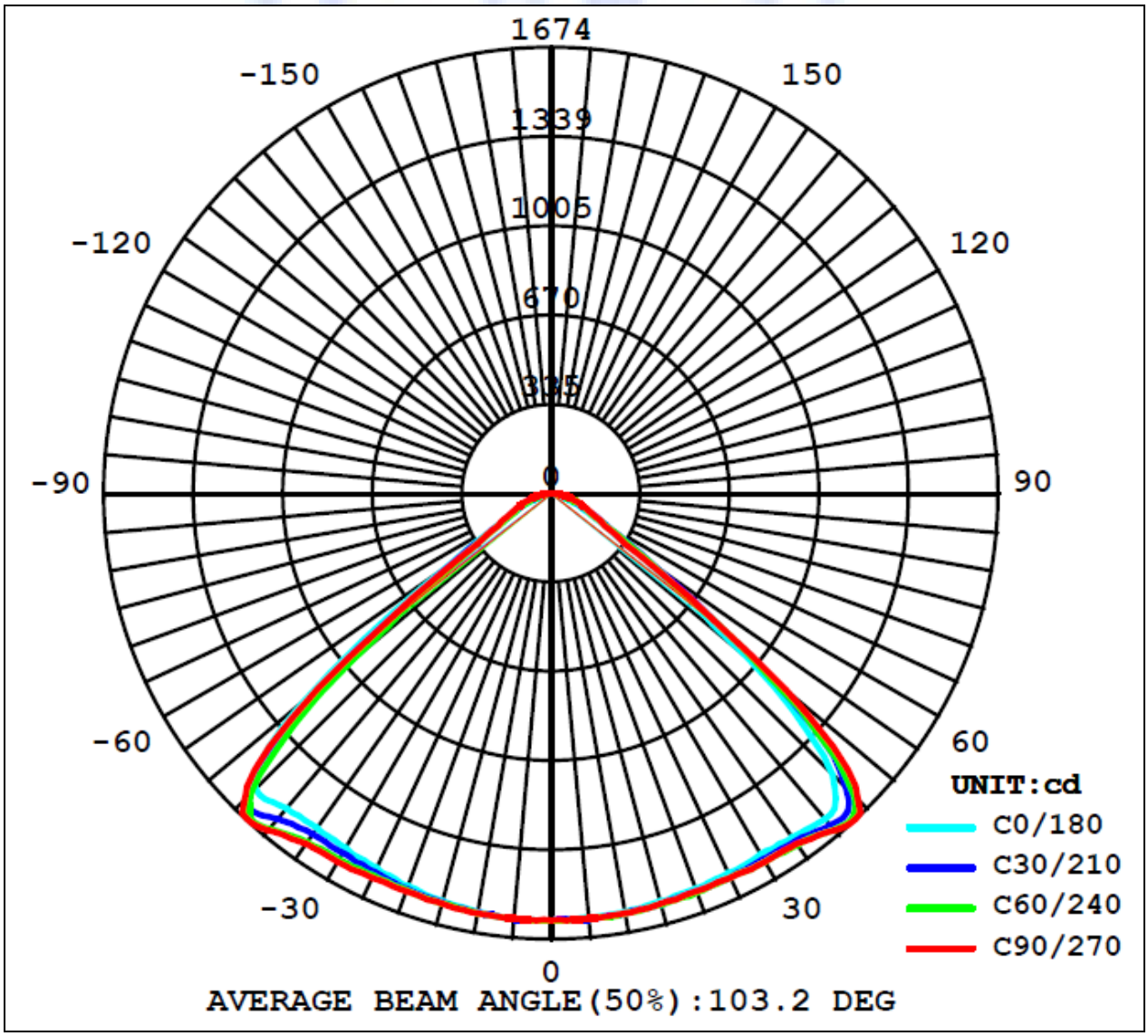
CIE CHROMATICITY DIAGRAM:



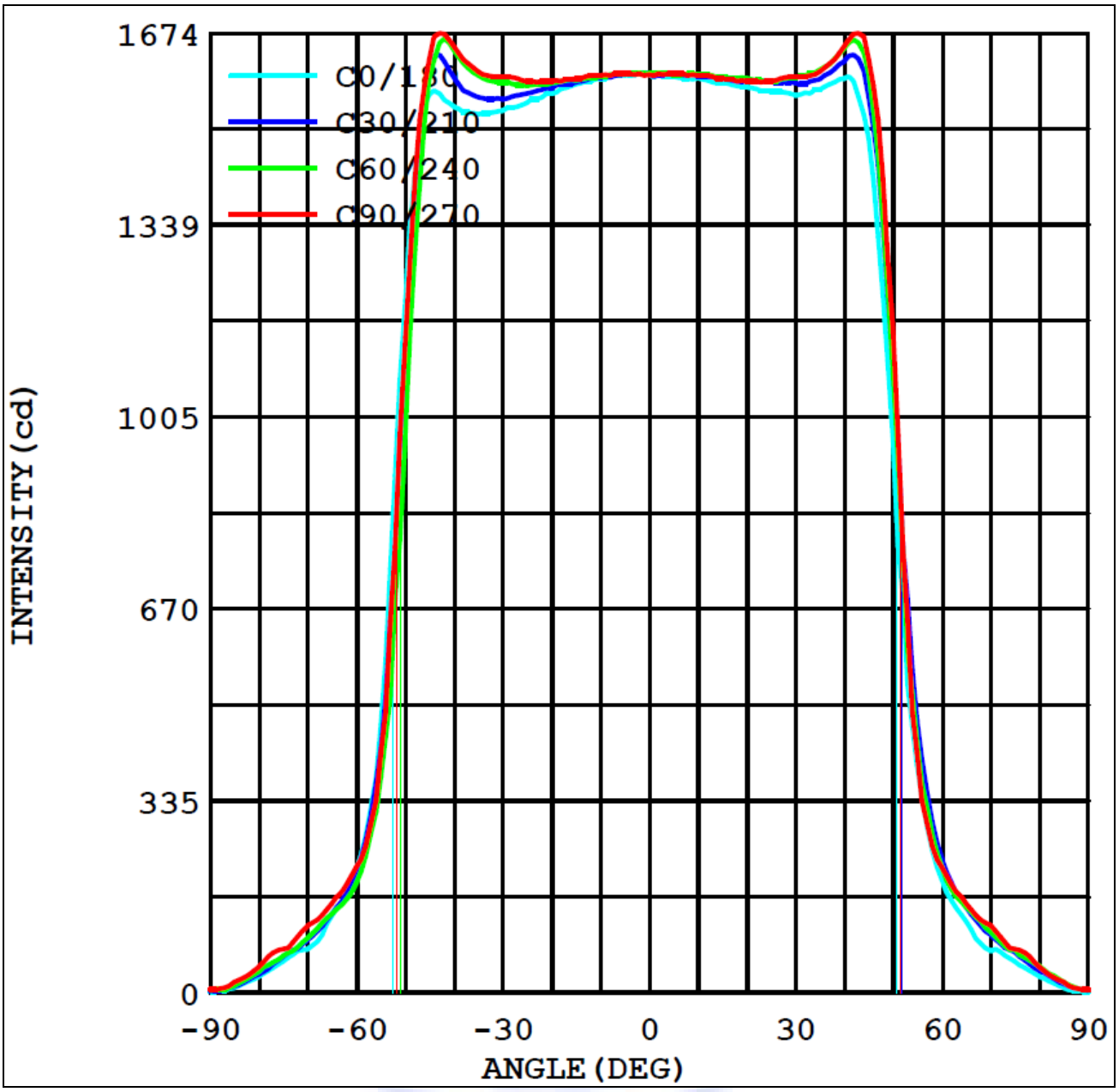
GONIOMETRIC TEST DATA:

Luminous Flux (lm)	:	4173.4	**Power (W)**	:	46.29
Efficiency (lm/W)	:	90.2	**Voltage (V)**	:	240.0
Imax (cd)	:	1674	**Current (A)**	:	0.196
Maximum (C, γ)	:	(90,43.0)	**Power Factor (PF)**	:	0.984

LUMINOUS INTENSITY DISTRIBUTION (POLAR) DIAGRAM



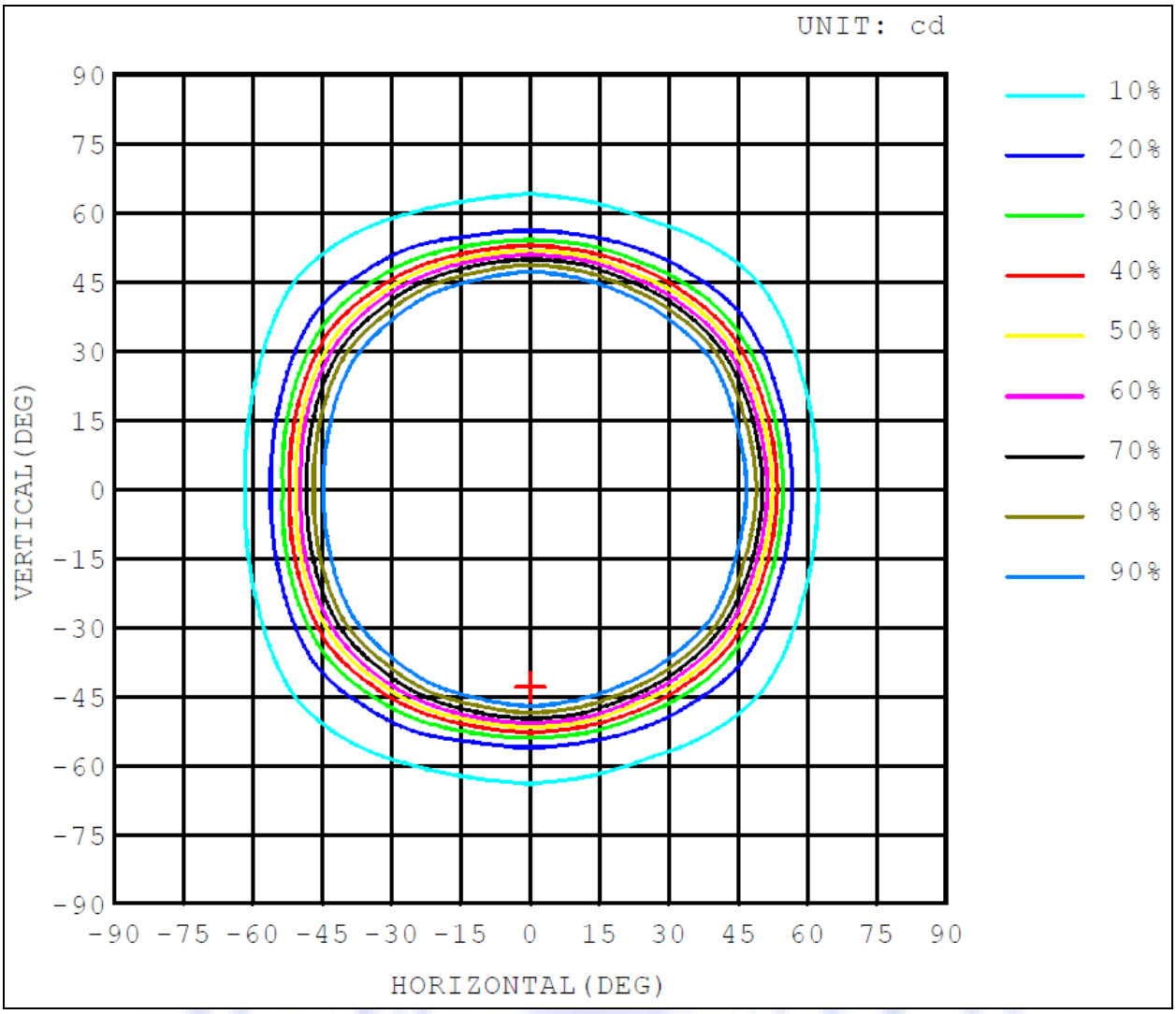
LUMINOUS INTENSITY DISTRIBUTION DIAGRAM



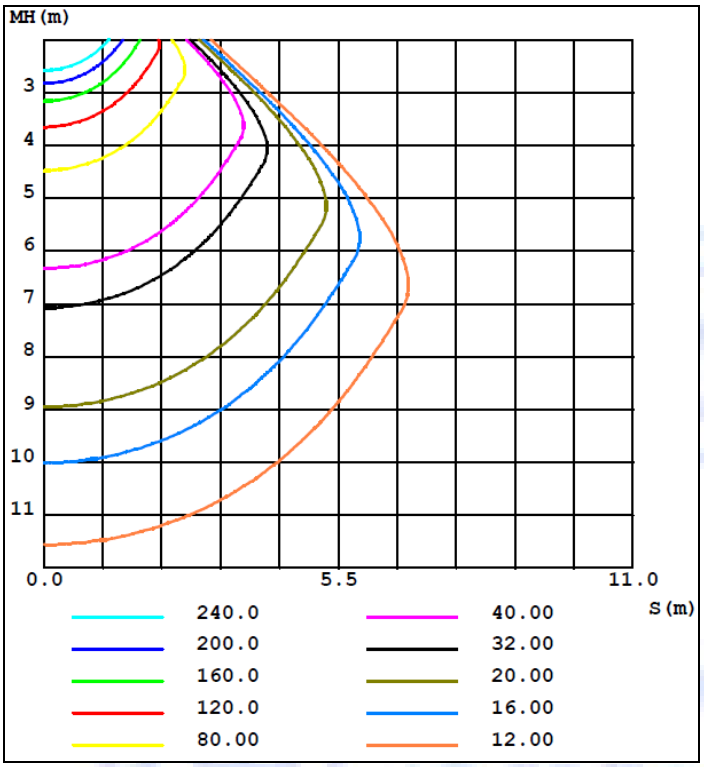
ZONAL FLUX TABLE

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	φ Zone	φ Total
5	1599	1601	1602	1603	1597	1603	1602	1601	**0-5**	38.3	38.3
10	1594	1598	1599	1601	1596	1601	1599	1598	**5-10**	114.4	152.7
15	1585	1589	1594	1595	1586	1595	1594	1589	**10-15**	189.2	341.9
20	1569	1582	1590	1594	1579	1594	1590	1582	**15-20**	261.7	603.7
25	1552	1579	1590	1589	1572	1589	1590	1579	**20-25**	331.9	935.7
30	1539	1577	1597	1591	1565	1591	1597	1577	**25-30**	399.8	1336
35	1532	1584	1606	1608	1575	1608	1606	1584	**30-35**	466	1802
40	1545	1628	1651	1637	1595	1637	1651	1628	**35-40**	535.1	2337
45	1567	1582	1628	1554	1489	1554	1628	1582	**40-45**	601.1	2938
50	1209	996.4	1144	1090	954.3	1090	1144	996.4	**45-50**	552.9	3491
55	467.7	378.5	418	428.6	397.8	428.6	418	378.5	**50-55**	305.5	3796
60	215.1	199.8	219.3	225.7	198.4	225.7	219.3	199.8	**55-60**	134	3930
65	133.9	127.3	155.8	142.5	123.9	142.5	155.8	127.3	**60-65**	83.44	4014
70	76.39	90.68	116.9	95.04	73.58	95.04	116.9	90.68	**65-70**	58.78	4073
75	55.15	62.92	76.13	69.58	54.46	69.58	76.13	62.92	**70-75**	42.45	4115
80	28.62	30.42	44.56	37.04	29.23	37.04	44.56	30.42	**75-80**	27.41	4143
85	9.576	8.856	18.5	13.1	9.18	13.1	18.5	8.856	**80-85**	12.94	4156
90	2.304	2.412	5.832	3.024	2.34	3.024	5.832	2.412	**85-90**	3.507	4159
95	1.836	1.368	4.284	1.764	1.836	1.764	4.284	1.368	**90-95**	1.558	4161
100	1.62	0.9	3.132	1.008	1.62	1.008	3.132	0.9	**95-100**	1.056	4162
105	1.512	0.792	2.376	0.828	1.512	0.828	2.376	0.792	**100-105**	0.802	4162
110	1.476	0.756	2.052	0.792	1.512	0.792	2.052	0.756	**105-110**	0.684	4163
115	1.476	0.9	1.908	0.9	1.512	0.9	1.908	0.9	**110-115**	0.641	4164
120	1.656	1.188	1.98	1.188	1.836	1.188	1.98	1.188	**115-120**	0.673	4164
125	2.052	1.62	2.268	1.584	2.196	1.584	2.268	1.62	**120-125**	0.788	4165
130	2.484	2.088	2.628	2.052	2.592	2.052	2.628	2.088	**125-130**	0.922	4166
135	2.844	2.484	2.916	2.448	2.916	2.448	2.916	2.484	**130-135**	1.009	4167
140	3.24	2.808	3.204	2.808	3.276	2.808	3.204	2.808	**135-140**	1.052	4168
145	3.456	3.132	3.492	3.096	3.528	3.096	3.492	3.132	**140-145**	1.052	4169
150	3.708	3.456	3.708	3.384	3.744	3.384	3.708	3.456	**145-150**	1.013	4170
155	3.888	3.564	3.852	3.564	3.852	3.564	3.852	3.564	**150-155**	0.927	4171
160	3.96	3.636	3.924	3.636	3.888	3.636	3.924	3.636	**155-160**	0.786	4172
165	3.996	3.744	3.96	3.708	3.924	3.708	3.96	3.744	**160-165**	0.627	4173
170	4.032	3.816	3.996	3.78	3.96	3.78	3.996	3.816	**165-170**	0.459	4173
175	4.032	3.816	4.032	3.816	3.996	3.816	4.032	3.816	**170-175**	0.28	4173
180	3.996	3.888	4.032	3.888	4.032	3.888	4.032	3.888	**175-180**	0.094	4173
DEG	**LUMINOUS INTENSITY: cd**									**UNIT: lm**	

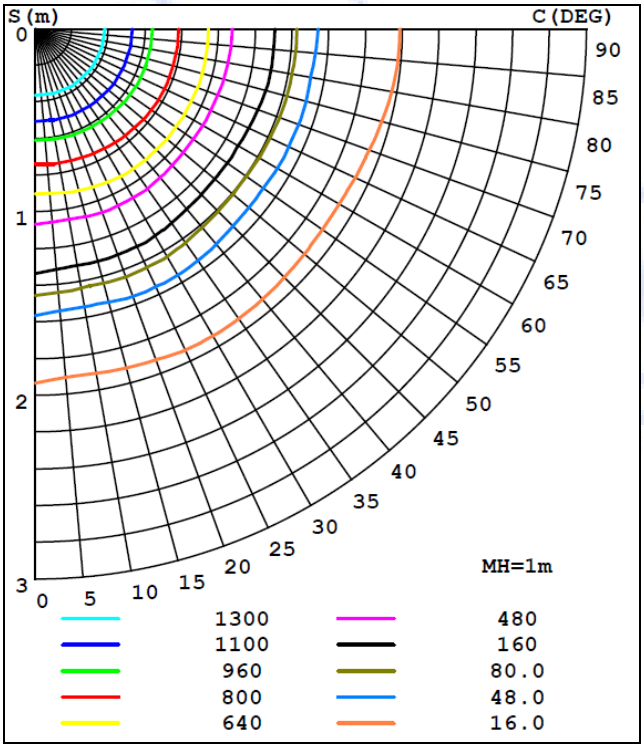
ISONCANDELA DIAGRAM



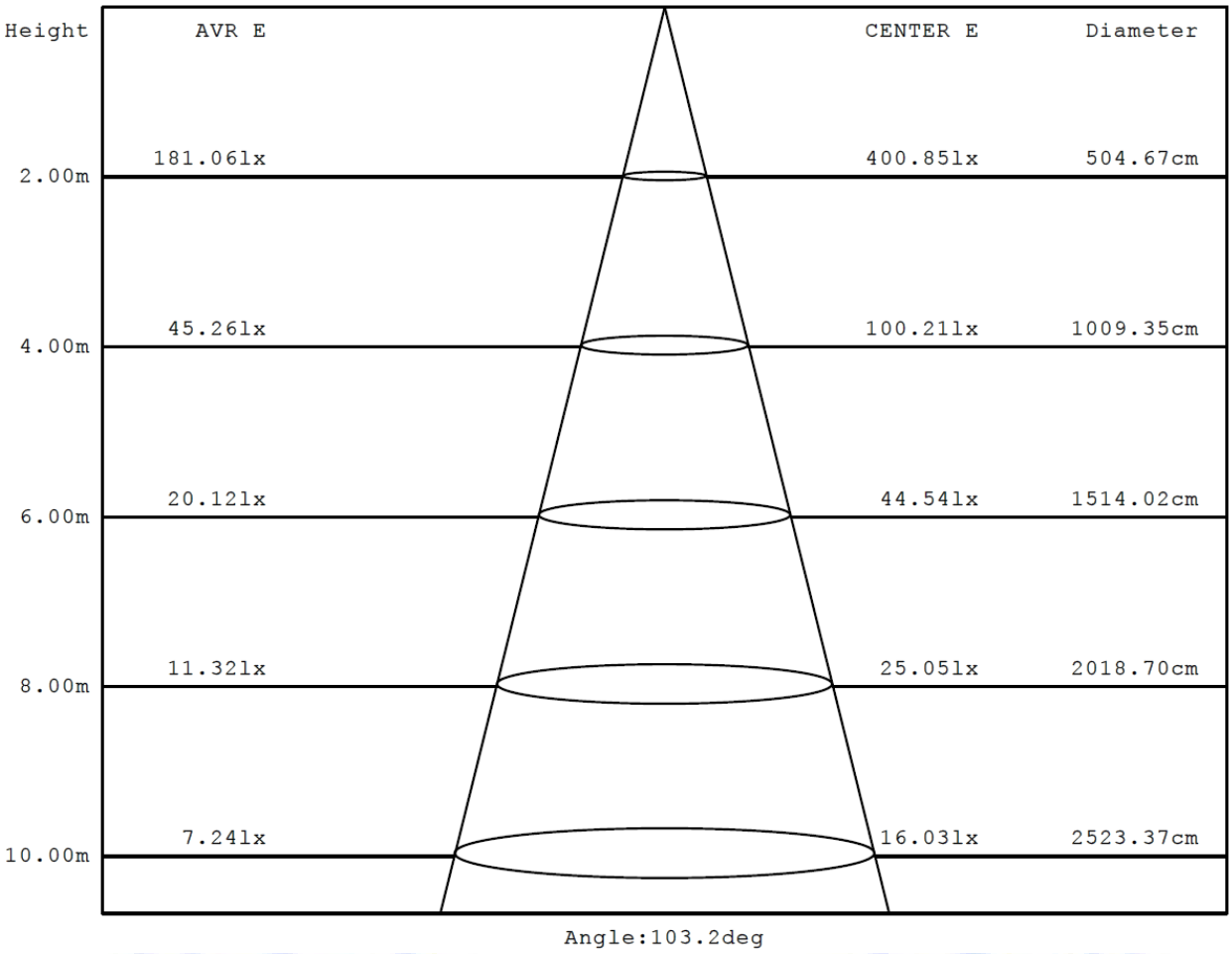
C0 PLANE ISOLUX DIAGRAM (UNIT: 1x)



PLANAR ISOLUX DIAGRAM (UNIT: 1x)



ILLUMINANCE AT A DISTANCE



LUMINOUS DISTRIBUTION INTENSITY DATA

Gamma\C	0DEG	15DEG	30DEG	45DEG	60DEG	75DEG	90DEG	105DEG	120DEG	135DEG
0.0DEG	1603	1604	1603	1603	1603	1600	1601	1601	1599	1598
5.0DEG	1599	1603	1603	1601	1602	1602	1602	1603	1600	1603
10.0DEG	1594	1596	1597	1598	1598	1598	1599	1599	1601	1601
15.0DEG	1585	1586	1588	1589	1591	1593	1594	1594	1596	1595
20.0DEG	1569	1576	1577	1582	1586	1588	1590	1589	1594	1594
25.0DEG	1552	1562	1568	1579	1582	1585	1590	1591	1590	1589
30.0DEG	1539	1551	1559	1577	1587	1592	1597	1596	1597	1591
35.0DEG	1532	1547	1562	1584	1599	1602	1606	1609	1610	1608
40.0DEG	1545	1567	1596	1628	1644	1647	1651	1653	1647	1637
45.0DEG	1567	1569	1601	1582	1594	1614	1628	1600	1603	1554
50.0DEG	1209	1153	1104	996.4	985	1140	1144	1124	1072	1090
55.0DEG	467.7	432.7	426.4	378.5	377	392	418	394.9	437	428.6
60.0DEG	215.1	202.7	211.9	199.8	192.3	199.5	219.3	204.1	218.9	225.7
65.0DEG	133.9	126.5	136.7	127.3	137.6	145.5	155.8	148.9	148.5	142.5
70.0DEG	76.39	89.42	92.8	90.68	96.62	104.3	116.9	105.9	106.7	95.04
75.0DEG	55.15	51.4	64	62.92	65.23	67.1	76.13	70.41	76.89	69.58
80.0DEG	28.62	25.05	32.86	30.42	36.54	38.19	44.56	40.28	46.76	37.04
85.0DEG	9.576	7.092	11.23	8.856	12.81	13.24	18.5	15.55	19.58	13.1
90.0DEG	2.304	0.972	3.672	2.412	4.932	3.6	5.832	3.816	5.544	3.024
95.0DEG	1.836	0.504	2.268	1.368	3.384	2.376	4.284	2.556	3.888	1.764
100.0DEG	1.62	0.504	1.872	0.9	2.484	1.584	3.132	1.728	2.772	1.008
105.0DEG	1.512	0.504	1.62	0.792	2.052	1.152	2.376	1.224	2.124	0.828
110.0DEG	1.476	0.648	1.512	0.756	1.8	1.044	2.052	1.044	1.908	0.792
115.0DEG	1.476	0.756	1.548	0.9	1.728	1.044	1.908	1.044	1.764	0.9
120.0DEG	1.656	1.08	1.764	1.188	1.944	1.26	1.98	1.26	1.908	1.188
125.0DEG	2.052	1.548	2.124	1.62	2.268	1.692	2.268	1.692	2.232	1.584
130.0DEG	2.484	2.016	2.52	2.088	2.628	2.088	2.628	2.124	2.628	2.052
135.0DEG	2.844	2.484	2.916	2.484	2.916	2.448	2.916	2.448	2.916	2.448
140.0DEG	3.24	2.808	3.204	2.808	3.24	2.772	3.204	2.772	3.168	2.808
145.0DEG	3.456	3.132	3.492	3.132	3.528	3.096	3.492	3.132	3.492	3.096
150.0DEG	3.708	3.42	3.78	3.456	3.78	3.42	3.708	3.456	3.744	3.384
155.0DEG	3.888	3.564	3.888	3.564	3.888	3.6	3.852	3.6	3.888	3.564
160.0DEG	3.96	3.708	3.924	3.636	3.924	3.636	3.924	3.6	3.888	3.636
165.0DEG	3.996	3.744	3.96	3.744	3.96	3.708	3.96	3.708	3.924	3.708
170.0DEG	4.032	3.816	4.032	3.816	4.032	3.78	3.996	3.78	3.996	3.78
175.0DEG	4.032	3.852	3.996	3.816	4.032	3.816	4.032	3.816	3.996	3.816
180.0DEG	3.996	3.888	3.996	3.888	4.032	3.888	4.032	3.888	3.996	3.888

Gamma\C	150DEG	165DEG	180DEG
0.0DEG	1597	1596	1597
5.0DEG	1603	1600	1597
10.0DEG	1598	1595	1596
15.0DEG	1597	1589	1586
20.0DEG	1591	1581	1579
25.0DEG	1590	1572	1572
30.0DEG	1586	1577	1565
35.0DEG	1594	1584	1575
40.0DEG	1625	1610	1595
45.0DEG	1562	1513	1489
50.0DEG	1088	1078	954.3
55.0DEG	474.8	431	397.8
60.0DEG	235.1	208.2	198.4
65.0DEG	148.7	130.4	123.9
70.0DEG	101.2	91.65	73.58
75.0DEG	72.18	58.06	54.46
80.0DEG	39.09	29.48	29.23
85.0DEG	15.8	10.04	9.18
90.0DEG	4.5	1.512	2.34
95.0DEG	2.7	0.504	1.836
100.0DEG	1.944	0.468	1.62
105.0DEG	1.728	0.504	1.512
110.0DEG	1.584	0.612	1.512
115.0DEG	1.584	0.756	1.512
120.0DEG	1.764	1.08	1.836
125.0DEG	2.124	1.548	2.196
130.0DEG	2.556	2.052	2.592
135.0DEG	2.88	2.448	2.916
140.0DEG	3.168	2.772	3.276
145.0DEG	3.456	3.132	3.528
150.0DEG	3.708	3.42	3.744
155.0DEG	3.888	3.528	3.852
160.0DEG	3.888	3.636	3.888
165.0DEG	3.96	3.708	3.924
170.0DEG	3.996	3.816	3.96
175.0DEG	4.032	3.852	3.996
180.0DEG	4.032	3.924	4.032

Machine Specification

MEASUREMENT ITEMS			
Photometry Measurement		**Electrical Measurement**	
Description	**Unit**	**Description**	**Unit**
Wavelength	nm	Voltage	V
Luminous flux	lm	Current	A
Chromaticity	-	Power Factor	pf
Correlated Colour Temperature	K		
Rendering Index	-		
Luminous Intensity	cd		
Illuminance	lux		
Luminous flux	lm		

CCD SPECTRORADIOMETER SPECIFICATIONS	
Photodetector	Class 1
Spectral Range	200nm ~ 780nm
Spectral Resolution	±2nm
Reproducibility	±5nm
Accuracy of Chromaticity Coordinate (Δx, Δy)	±0.003
Correlated Colour Temperature Range	1500 ~ 25000K
CCT Accuracy	±0.5%
Accuracy of Rendering Index	±(0.5%+0.5)

GONIOMETER SPECIFICATIONS	
Photometric accuracy	Class 1
C-plane Axis (C1)	± 360º
Gamma Axis (γ1)	± 180º
Angle Accuracy	0.01º
Test range of illuminance	0.001Lx to 100,000Lx
Test range of light intensity	1cd to 10^7cd
Testing accuracy	3% (Under Standard Lamp); Stray Light: less than 0.2%
Electric meter accuracy	class 0.5

PROGRAMMABLE AC POWER SUPPLY	
LSP-500VAR / LSP-500VA	500VA, 300V Programmable AC Power Supply
Output Voltage Range	0 – 300 V RMS
Output Voltage Stability	≤ 0.2% / ≤ 0.5%
Output Voltage Frequency	45 – 65 Hz / 45 – 70 Hz
Output Frequency Stability	≤ 0.03% / 0.1%
Maximum Output Power	500VA
Harmonic Distortion	≤ 2% the resistive load is fully loaded

PROGRAMMABLE DC POWER SUPPLY						
SOURCE SPECIFICATIONS				**MEASUREMENT SPECIFICATIONS**		
VOLTAGE PROGRAMMING ACCURACY				**VOLTAGE MEASUREMENT ACCURACY**		
Range	Resolution	Accuracy at 23ºC±2ºC ±(% of reading + Volts)		Range	Resolution	Accuracy at 23ºC±2ºC ±(% of reading + Volts)
60V	1mV	0.05% + 10 mV		60 V	10 mV	0.1% + 10 mV
CURRENT PROGRAMMING ACCURACY				**CURRENT MEASUREMENT ACCURACY**		
Range	Resolution	Accuracy at 23ºC±2ºC ±(% of reading + Volts)		Range	Resolution	Accuracy at 23ºC±2ºC ±(% of reading + Volts)
1500 mA	0.1 mA	0.3% + 5 mA		1500 mA	1 mA	0.3% + 3 mA

This test is accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI National Accreditation Board/ANAB. Refer to certificate and scope of accreditation AT1511.

Test Conducted by

Approved Signatory

…… ……

Nur Awanis Binti Abdul Razak
Project Engineer

See Keat Siang
Technical Manager

APPENDIX 1:
Test Product Information:

21AMB0001

Sample Log Code of DUT: DUT 1/4
***This sample log code is identified by QAV Technologies.**