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	:	21AMB0003
Test Prime	:	Nur Awanis Binti Abdul Razak
Receive Date	:	24th February 2021
Perform Date	:	25th February 2021
Report Number	:	QAV-0221-0188
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 **21AMB0003** 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:

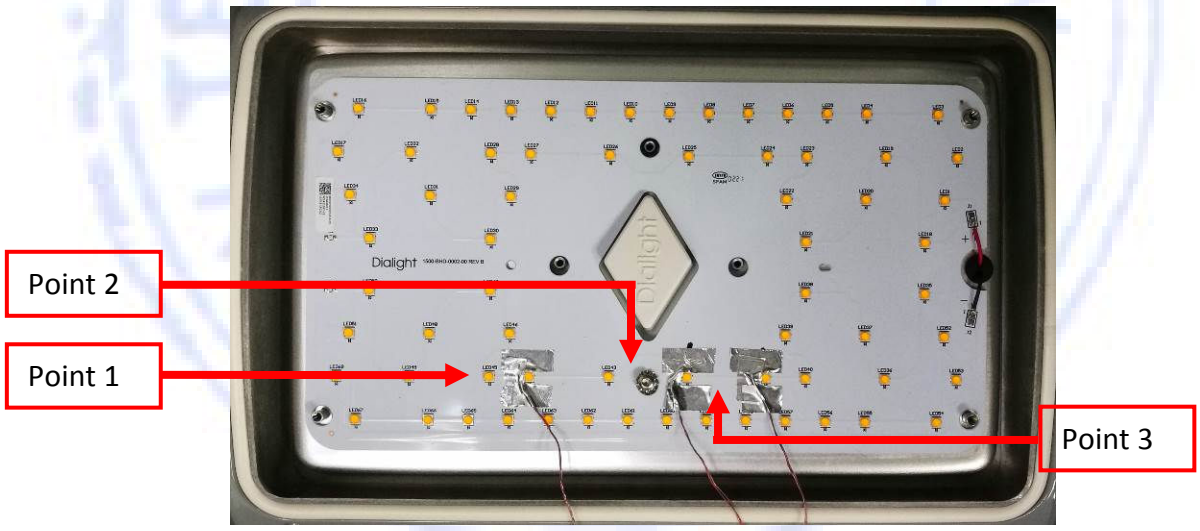
Measure distribution photometry and input electrical parameters and report candela distribution, calculated lumen output, voltage (V), current (A) and power (W).

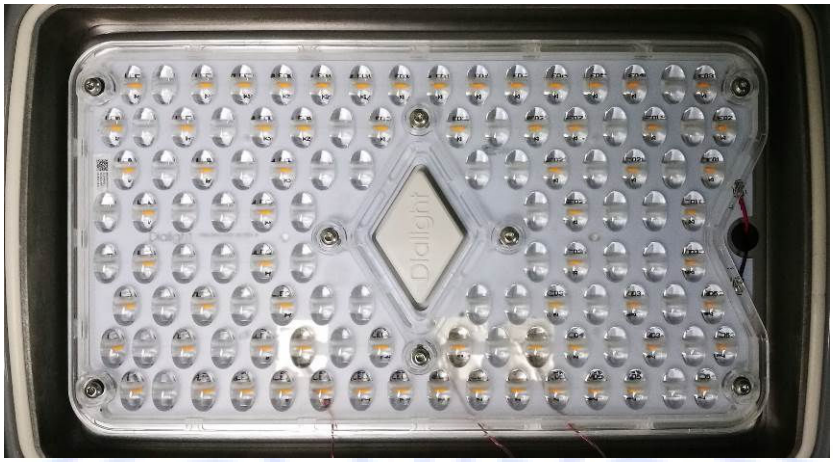
Sphere Spectroradiometric measurement:

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: 21AMB0003)

S/N: 21AMB0003		
LED No.	**Temperature measured**	**Temperature corrected at 25°C**
Point 1	48.76°C	48.93°C
Point 2	49.26°C	49.43°C
Point 3	48.19°C	48.36°C
Ambient Temperature	24.83°C	25°C
Remark: The highest in-situ measured temperature of LED is 49.43°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: 1.25 Hours

Sphere Spectroradiometry measurement:

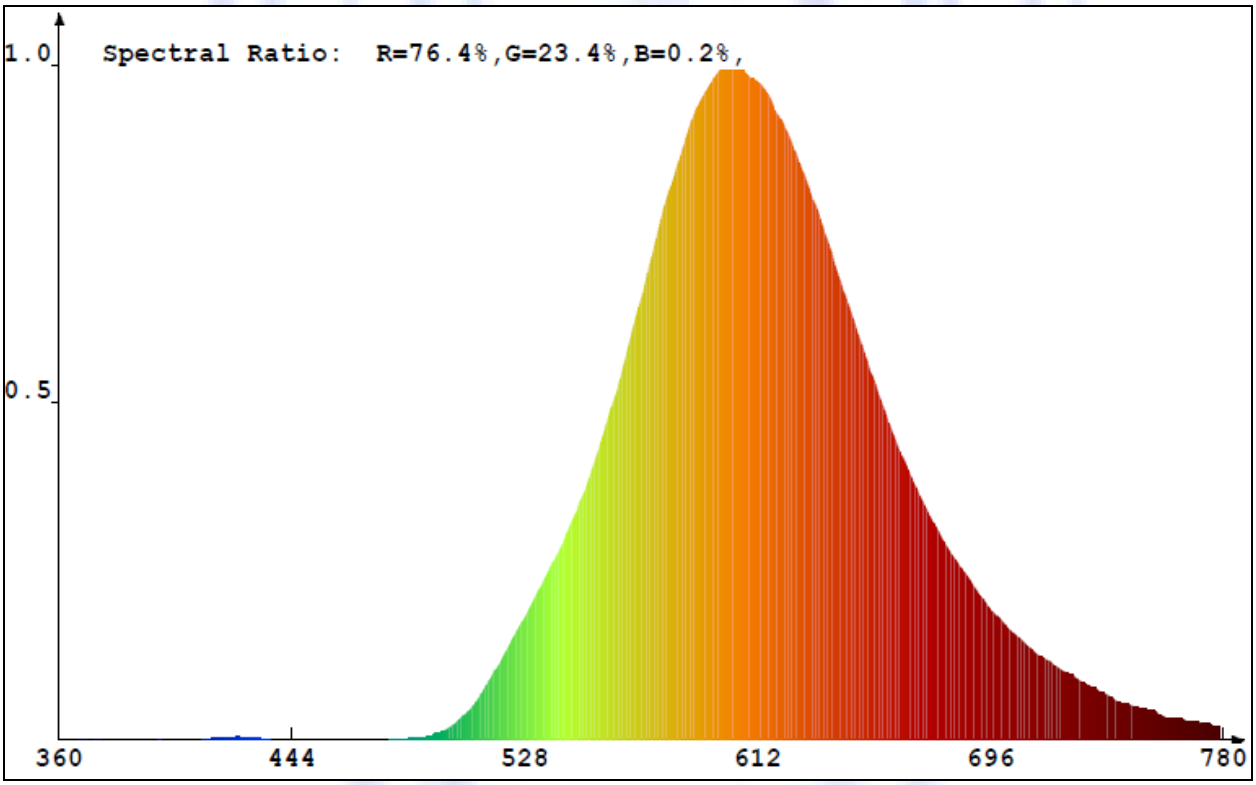
- The test procedure will follow SOP 107-106-001
- Electrical conditions and physical orientation were set as required by the lamp manufacturer or the customer.
- Ambient temperature was controlled at 25+/-1 degree Celsius and measured inside of the sphere, shielded from direct radiation of the lamp.
- 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: 1.25 Hours
- Spatial correction factor applied to lamp measurement: 1

SPHERE SPECTRORADIOMETRY TEST DATA:

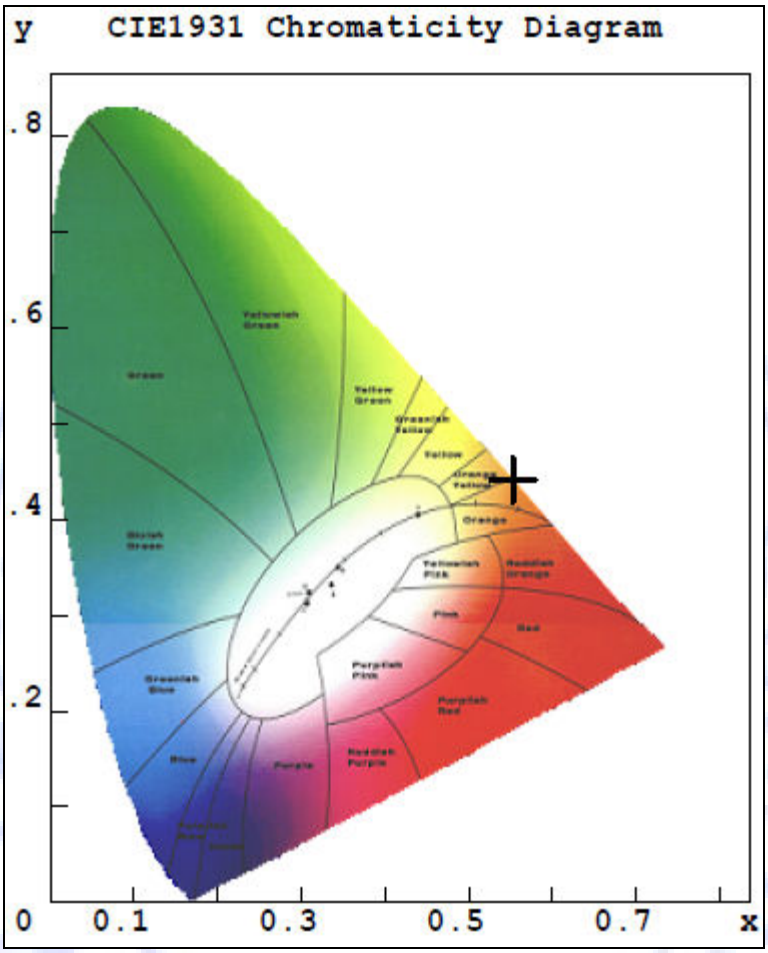
Main (nm)	Peak (nm)	Color Temp (K)	CIE-X	CIE-Y	Lumen (lm)	Efficacy	Power (W)	Vf (V)	I (A)	Ra	PF
586.8	602.7	1960	0.5532	0.4417	3935.41	85.03	46.28	240.22	0.195	57.4	0.988

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
52	72	85	46	48	62	71	25	0	41	28	20	54	92	45

SPECTRAL POWER DISTRIBUTION:



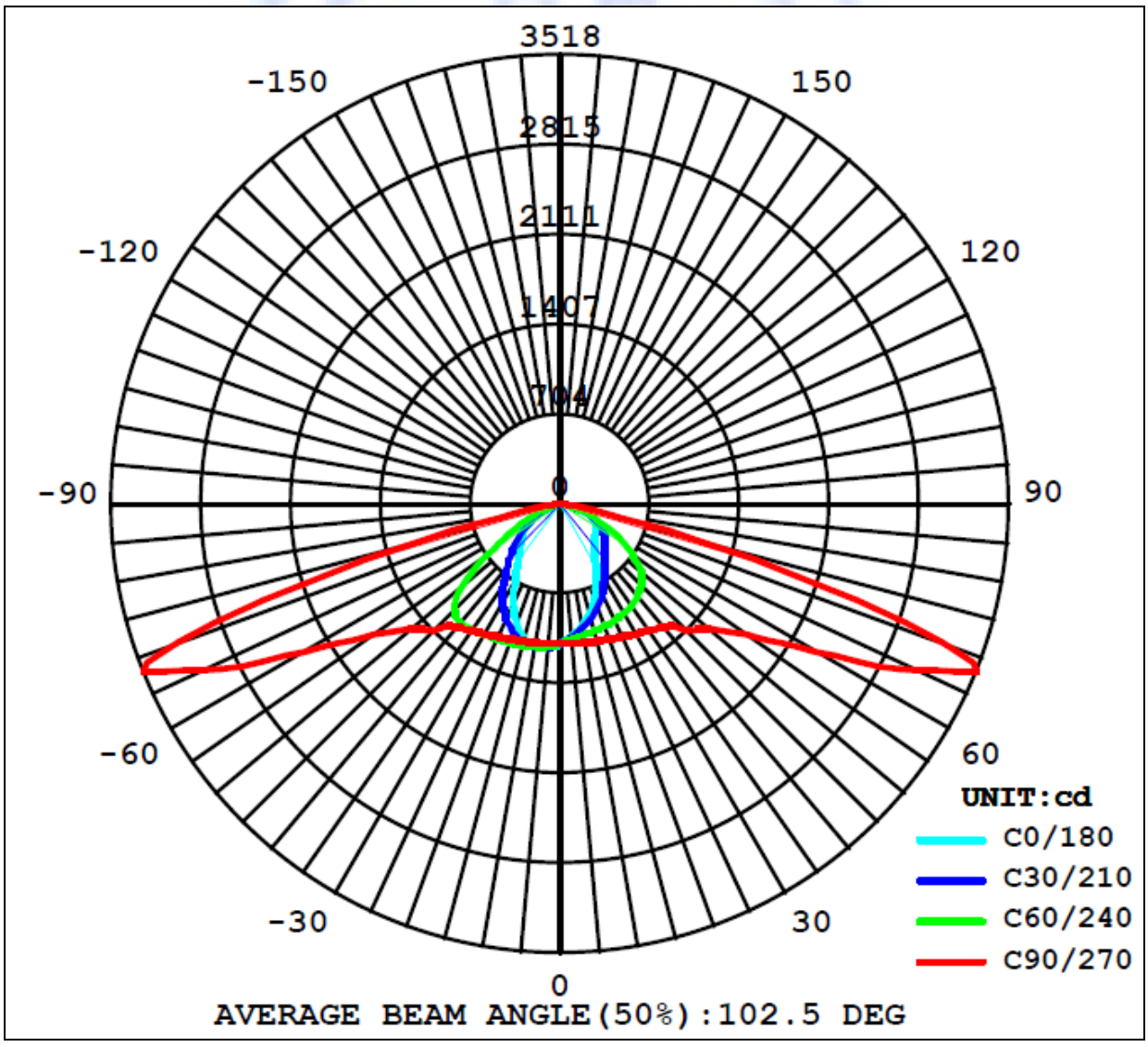
CIE CHROMATICITY DIAGRAM:



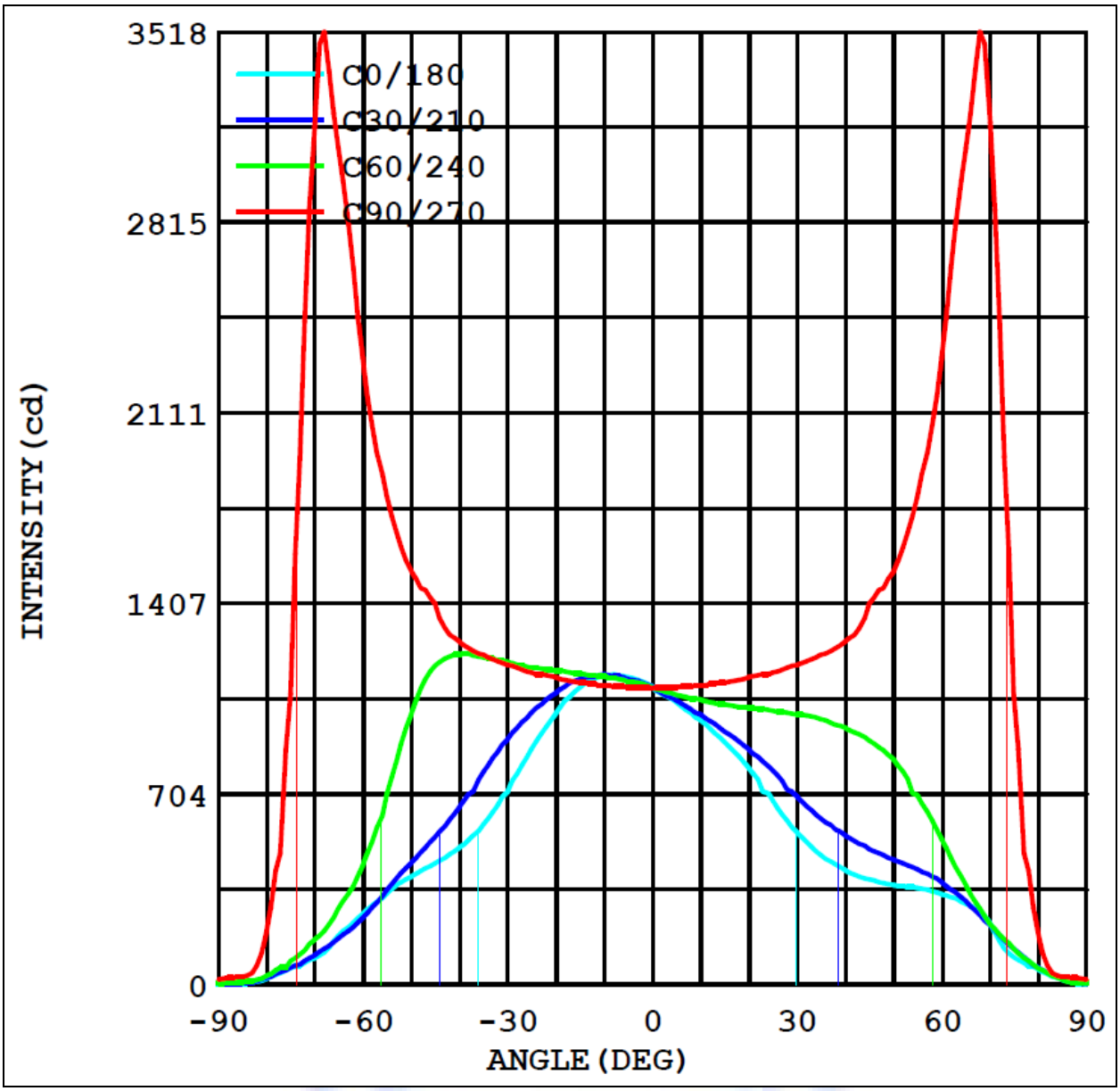
GONIOMETRIC TEST DATA:

Luminous Flux (lm)	:	3715.9	**Power (W)**	:	46.59
Efficiency (lm/W)	:	79.8	**Voltage (V)**	:	240.1
Imax (cd)	:	3518	**Current (A)**	:	0.197
Maximum (C, γ)	:	(90,68.0)	**Power Factor (PF)**	:	0.985

LUMINOUS INTENSITY DISTRIBUTION (POLAR) DIAGRAM



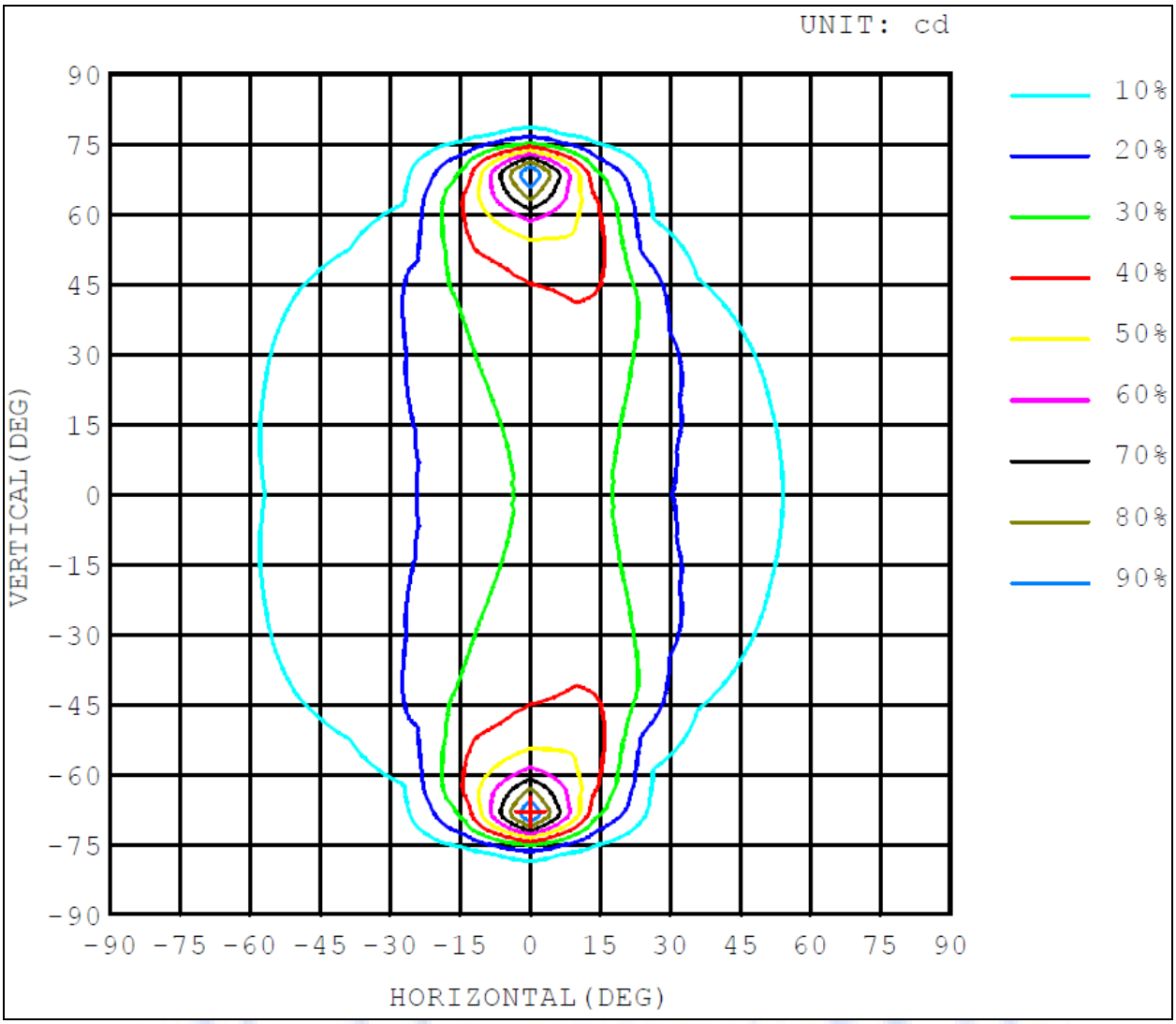
LUMINOUS INTENSITY DISTRIBUTION DIAGRAM



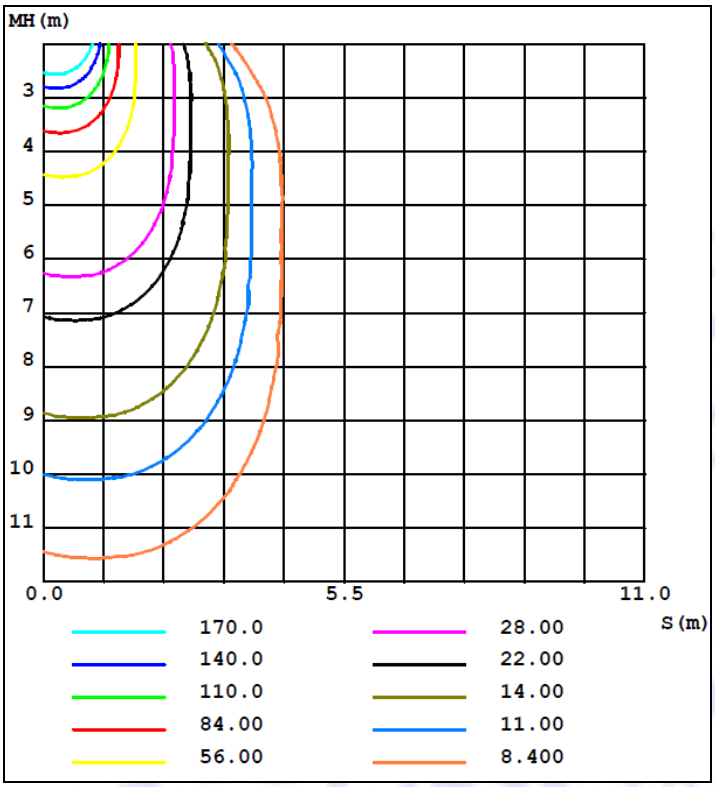
ZONAL FLUX TABLE

γ	C0	C45	C90	C135	C180	C225	C270	C315	γ	φ Zone	φ Total
5	1136	1127	1099	1055	1042	1055	1099	1127	**0-5**	26.17	26.17
10	1142	1142	1104	1016	976.2	1016	1104	1142	**5-10**	77.75	103.9
15	1097	1142	1115	980.9	896.3	980.9	1115	1142	**10-15**	126.9	230.8
20	1002	1128	1134	940.5	801.1	940.5	1134	1128	**15-20**	171.9	402.8
25	870.5	1104	1153	898.8	679.6	898.8	1153	1104	**20-25**	210.6	613.5
30	712	1059	1181	839.1	562.1	839.1	1181	1059	**25-30**	242.3	855.8
35	592.5	988.4	1217	765.9	480	765.9	1217	988.4	**30-35**	267.8	1124
40	505.5	876	1267	691.8	423.4	691.8	1267	876	**35-40**	289.5	1413
45	447.5	689.5	1407	613.9	387.7	613.9	1407	689.5	**40-45**	309.4	1723
50	398.2	518.7	1526	538	369.2	538	1526	518.7	**45-50**	328.4	2051
55	336.9	373.6	1798	461.9	357	461.9	1798	373.6	**50-55**	336.1	2387
60	261.1	260.2	2314	383.3	334	383.3	2314	260.2	**55-60**	337.8	2725
65	181.9	173.8	3087	286.5	298.5	286.5	3087	173.8	**60-65**	342.1	3067
70	99.1	108.2	3183	190.6	226.1	190.6	3183	108.2	**65-70**	327.1	3394
75	61.27	66.02	1073	111.6	102.6	111.6	1073	66.02	**70-75**	211.5	3606
80	22.71	20.41	192.2	68.4	55.79	68.4	192.2	20.41	**75-80**	70.84	3677
85	4.14	4.716	30.74	17.56	18.64	17.56	30.74	4.716	**80-85**	17.39	3694
90	2.052	2.52	17.71	3.996	3.348	3.996	17.71	2.52	**85-90**	5.08	3699
95	1.764	1.476	11.98	2.088	1.98	2.088	11.98	1.476	**90-95**	2.502	3702
100	1.656	1.224	9.468	1.26	1.728	1.26	9.468	1.224	**95-100**	1.744	3704
105	1.62	1.152	8.316	1.008	1.62	1.008	8.316	1.152	**100-105**	1.468	3705
110	1.584	1.224	6.876	0.936	1.512	0.936	6.876	1.224	**105-110**	1.325	3706
115	1.584	1.368	6.156	1.008	1.548	1.008	6.156	1.368	**110-115**	1.225	3708
120	1.62	1.512	5.472	1.08	1.584	1.08	5.472	1.512	**115-120**	1.15	3709
125	1.656	1.656	4.68	1.26	1.584	1.26	4.68	1.656	**120-125**	1.058	3710
130	1.692	1.8	4.176	1.44	1.692	1.44	4.176	1.8	**125-130**	0.966	3711
135	1.656	1.908	3.672	1.62	1.764	1.62	3.672	1.908	**130-135**	0.885	3712
140	1.692	1.98	3.456	1.764	1.872	1.764	3.456	1.98	**135-140**	0.817	3712
145	1.8	2.088	3.312	1.908	1.98	1.908	3.312	2.088	**140-145**	0.746	3713
150	1.908	2.196	3.168	2.016	2.16	2.016	3.168	2.196	**145-150**	0.677	3714
155	2.016	2.304	3.096	2.16	2.304	2.16	3.096	2.304	**150-155**	0.6	3714
160	2.196	2.376	3.024	2.304	2.448	2.304	3.024	2.376	**155-160**	0.514	3715
165	2.304	2.412	2.988	2.448	2.628	2.448	2.988	2.412	**160-165**	0.418	3715
170	2.484	2.556	2.952	2.592	2.7	2.592	2.952	2.556	**165-170**	0.311	3716
175	2.628	2.592	2.988	2.664	2.772	2.664	2.988	2.592	**170-175**	0.193	3716
180	2.7	2.664	2.952	2.7	2.808	2.7	2.952	2.664	**175-180**	0.065	3716
DEG	**LUMINOUS INTENSITY: cd**									**UNIT: lm**	

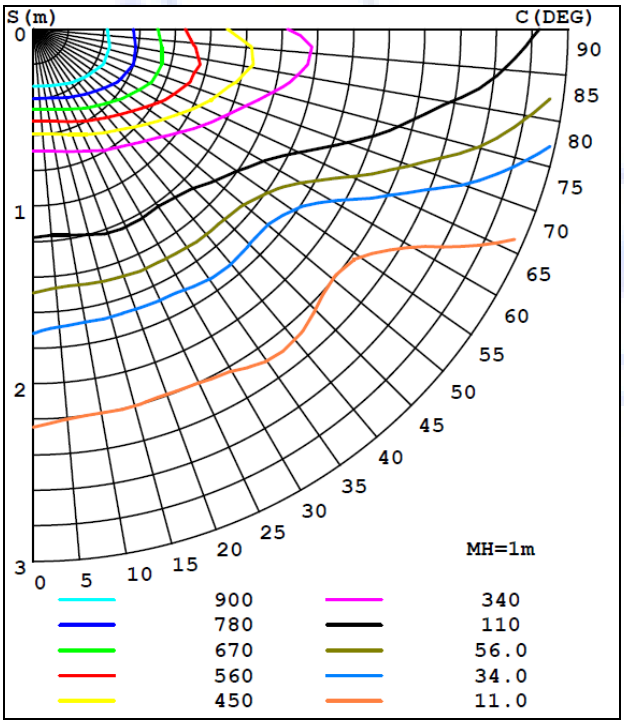
ISONCANDELA DIAGRAM



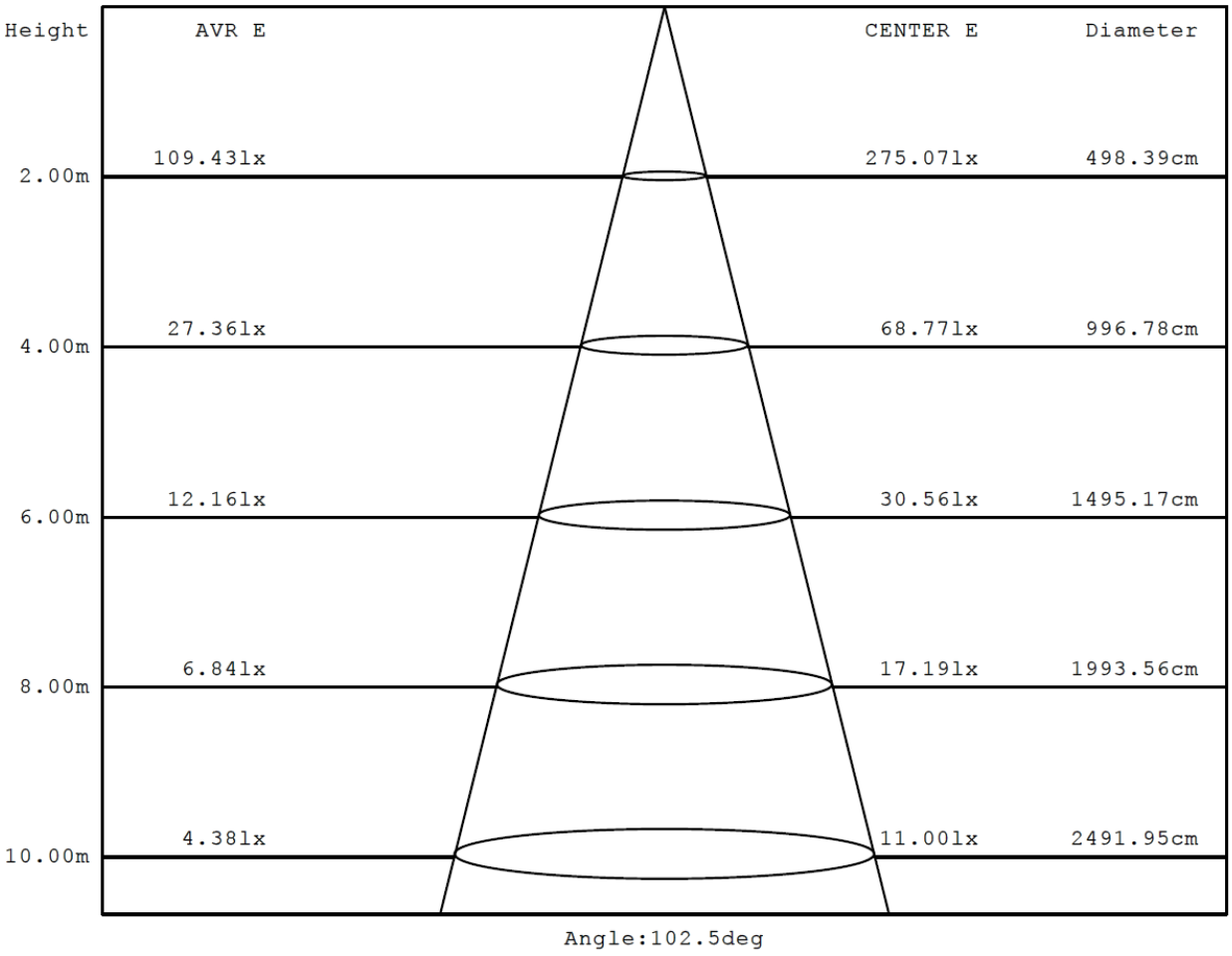
C0 PLANE ISOLUX DIAGRAM (UNIT: 1x)



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	1100	1101	1101	1100	1099	1100	1095	1100	1097	1093
5.0DEG	1136	1135	1129	1127	1119	1112	1099	1086	1071	1055
10.0DEG	1142	1142	1144	1142	1139	1124	1104	1080	1051	1016
15.0DEG	1097	1106	1127	1142	1150	1140	1115	1084	1034	980.9
20.0DEG	1002	1025	1078	1128	1159	1158	1134	1087	1022	940.5
25.0DEG	870.5	906.4	1006	1104	1171	1185	1153	1098	1013	898.8
30.0DEG	712	769.9	906.4	1059	1190	1219	1181	1116	996.6	839.1
35.0DEG	592.5	642.8	786.8	988.4	1208	1272	1217	1135	979	765.9
40.0DEG	505.5	545.8	655.8	876	1219	1365	1267	1173	948.7	691.8
45.0DEG	447.5	480.1	543.3	689.5	1175	1527	1407	1249	901.7	613.9
50.0DEG	398.2	416.8	451.9	518.7	1001	1658	1526	1343	832.6	538
55.0DEG	336.9	331.6	349.6	373.6	707.4	1715	1798	1431	699.2	461.9
60.0DEG	261.1	239.5	246.4	260.2	440.9	1622	2314	1496	538.6	383.3
65.0DEG	181.9	162	169.9	173.8	282	1407	3087	1458	366.9	286.5
70.0DEG	99.1	94.5	110.3	108.2	166.6	1042	3183	1101	223.9	190.6
75.0DEG	61.27	49.24	62.56	66.02	86.58	412.5	1073	497.7	134.2	111.6
80.0DEG	22.71	15.87	24.48	20.41	32.29	93.92	192.2	123.1	61.88	68.4
85.0DEG	4.14	2.304	5.796	4.716	9.72	14.97	30.74	15.19	18.68	17.56
90.0DEG	2.052	0.612	3.204	2.52	6.192	8.784	17.71	9.504	7.74	3.996
95.0DEG	1.764	0.468	2.304	1.476	4.284	6.048	11.98	5.292	4.896	2.088
100.0DEG	1.656	0.576	1.908	1.224	3.672	5.148	9.468	3.816	3.312	1.26
105.0DEG	1.62	0.684	1.728	1.152	3.528	4.896	8.316	3.528	2.772	1.008
110.0DEG	1.584	0.756	1.728	1.224	3.492	4.716	6.876	3.276	2.52	0.936
115.0DEG	1.584	0.936	1.728	1.368	3.492	4.572	6.156	3.132	2.412	1.008
120.0DEG	1.62	1.008	1.8	1.512	3.348	4.32	5.472	2.916	2.412	1.08
125.0DEG	1.656	1.152	1.872	1.656	3.204	3.672	4.68	2.628	2.448	1.26
130.0DEG	1.692	1.224	1.98	1.8	3.06	3.168	4.176	2.52	2.484	1.44
135.0DEG	1.656	1.332	1.98	1.908	2.952	2.916	3.672	2.484	2.52	1.62
140.0DEG	1.692	1.44	2.088	1.98	2.88	2.7	3.456	2.484	2.556	1.764
145.0DEG	1.8	1.584	2.16	2.088	2.844	2.628	3.312	2.52	2.592	1.908
150.0DEG	1.908	1.728	2.268	2.196	2.772	2.628	3.168	2.52	2.628	2.016
155.0DEG	2.016	1.872	2.34	2.304	2.808	2.592	3.096	2.592	2.7	2.16
160.0DEG	2.196	2.016	2.412	2.376	2.808	2.592	3.024	2.628	2.7	2.304
165.0DEG	2.304	2.196	2.52	2.412	2.808	2.628	2.988	2.628	2.808	2.448
170.0DEG	2.484	2.376	2.664	2.556	2.844	2.7	2.952	2.7	2.808	2.592
175.0DEG	2.628	2.484	2.7	2.592	2.844	2.7	2.988	2.7	2.88	2.664
180.0DEG	2.7	2.592	2.736	2.664	2.808	2.7	2.952	2.772	2.88	2.7

Gamma\C	150DEG	165DEG	180DEG
0.0DEG	1095	1094	1095
5.0DEG	1049	1040	1042
10.0DEG	996.5	974	976.2
15.0DEG	936.3	902.1	896.3
20.0DEG	868.3	807.3	801.1
25.0DEG	789.2	698.3	679.6
30.0DEG	694.2	588	562.1
35.0DEG	615	507.8	480
40.0DEG	552.3	454.5	423.4
45.0DEG	500.7	416.5	387.7
50.0DEG	462.6	395	369.2
55.0DEG	425.6	381.3	357
60.0DEG	378.5	351.2	334
65.0DEG	308.5	297.9	298.5
70.0DEG	218.6	221	226.1
75.0DEG	131.6	99.07	102.6
80.0DEG	65.3	49.1	55.79
85.0DEG	24.08	15.12	18.64
90.0DEG	5.436	1.908	3.348
95.0DEG	2.952	0.468	1.98
100.0DEG	2.16	0.432	1.728
105.0DEG	1.8	0.504	1.62
110.0DEG	1.692	0.648	1.512
115.0DEG	1.584	0.756	1.548
120.0DEG	1.656	0.9	1.584
125.0DEG	1.728	1.008	1.584
130.0DEG	1.8	1.152	1.692
135.0DEG	1.908	1.26	1.764
140.0DEG	1.98	1.404	1.872
145.0DEG	2.088	1.584	1.98
150.0DEG	2.196	1.8	2.16
155.0DEG	2.34	1.98	2.304
160.0DEG	2.52	2.16	2.448
165.0DEG	2.592	2.376	2.628
170.0DEG	2.772	2.52	2.7
175.0DEG	2.844	2.628	2.772
180.0DEG	2.844	2.7	2.808

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:

21AMB0003

Sample Log Code of DUT: DUT 3/4
***This sample log code is identified by QAV Technologies.**