FCC Test Report

Report No.:	RF160317C23
FCC ID:	2AH3O-RBB10
Test Model:	RBB1.0
Received Date:	Mar. 17, 2016
Test Date:	Mar. 21 to Apr. 08, 2016
Issued Date:	Apr. 29, 2016
Applicant:	Rapsodo Pte Ltd
Address:	Block 67, Ayer Rajah Crescent, #04-10, Singapore 139950
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF160317C23	Original release.	Apr. 29, 2016

1 Certificate of Conformity

Product:	BaseBall Launch Monitor
Brand:	Rapsodo BaseBall
Test Model:	RBB1.0
Sample Status:	ENGINEERING SAMPLE
Applicant:	Rapsodo Pte Ltd
Test Date:	Mar. 21 to Apr. 08, 2016
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.245) ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Apr. 29, 2016

Claire Kuan / Specialist

Approved by : _____ , **Date:** Apr. 29, 2016

May Chen / Manager

2 Summary of Test Results

APPLIED STANDARD: FCC PART 15, SUBPART C			
Standard Paragraph	**Test Type**	**Result**	**Remark**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -9.09dB at 0.53281MHz.
15.245	Radiated Emission Test	PASS	Meet the requirement of limit Minimum passing margin is -3.4dB at 66.42MHz
15.215 (c)	20dB Bandwidth	PASS	Meet the requirement of limit
15.203	Antenna Requirement	PASS	No antenna connector is used.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	5.31 dB
	200MHz ~1000MHz	3.40 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	3.73 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	BaseBall Launch Monitor
Brand	Rapsodo BaseBall
Test Model	RBB1.0
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 5V from Adapter / DC 3.7V from battery
Modulation Type	CW
Carrier Frequency	24126 MHz
Number of Channel	1
Antenna Type	Refer to Note
Antenna Connector	NA
Accessory Device	Adapter x 1
Data Cable Supplied	USB cable (unshielded, 3m)

Note:

1. There are 24GHz wireless transceiver and WLAN 2.4GHz technology used for the EUT.
2. The EUT inside has one WLAN 2.4GHz module (FCC ID: O7P-362)
3. The emission of the simultaneous operation has been evaluated and no non-compliance was found.
4. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Type	Gain (dBi)	Antenna Connector
Innosent	IPS-946	PCB	15	Solder

5. The EUT could be supplied with DC 3.7V battery or power adapter as the following table:

Item	Brand	Model No.	Spec.
Battery 1	Yoku Energy Co Ltd	805058	DC 3.7V
Battery 2	Howell Energy Co Ltd	985056	DC 3.7V
Adapter	Golden Profit Electronics Ltd	-	AC input: 100-240V 50/60Hz 0.2A DC output: DC 5V, 1000mA DC output cable (unshielded, 3m)

For the above batteries, the battery 1 was chose was selected as representative battery for the test and its data was recorded in this report.

6. The EUT was pre-tested under following test modes:

Pre-test Mode	Power Source
Mode A	**With Adapter**
Mode B	With Battery

The worst radiated emission was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

7. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

1 channel is provided:

Channel	Frequency
1	24126 MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	BW	
-	√	√	√	√	With Adapter

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
BW: 20dB Bandwidth Measurement

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

TESTED CHANNEL	MODULATION TYPE
1	CW

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

TESTED CHANNEL	MODULATION TYPE
1	CW

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

TESTED CHANNEL	MODULATION TYPE
1	CW

20dB Bandwidth Measurement:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

TESTED CHANNEL	MODULATION TYPE
1	CW

Test Condition:

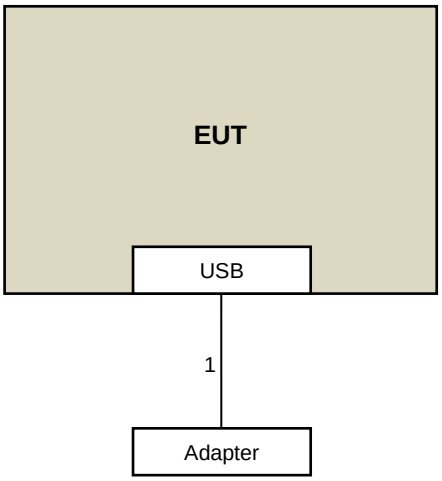
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	20deg. C, 64%RH	120Vac, 60 Hz	Tim Ho
RE<1G	20deg. C, 60%RH	120Vac, 60 Hz	Tim Ho
PLC	23deg. C, 82%RH	120Vac, 60 Hz	Wythe Lin
BW	20deg. C, 60%RH	120Vac, 60 Hz	Tim Ho

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB	1	3	Yes	0	Supplied by client

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.245)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

According to 15.245 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)	
	Peak	Average
24075 ~ 24175	147.9	127.9
	Field Strength of Harmonics (dBuV/m)	
	107.9	87.9

Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

Application	Field Strength of Harmonics (dBuV/m)
Field disturbance sensors operating in the 24075-24175 MHz band and for Other field disturbance sensors designed for use only within a building or to open building doors.	87.9
All other field disturbance sensors	77.5

Note: Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in Section15.209.

(1) Field strength limits are specified at a distance of 3 meters.
(2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

For below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 12, 2015	Aug. 11, 2016
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2014	Dec. 15, 2016
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-07	May 08, 2015	May 07, 2016
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-156	Jan. 04, 2016	Jan. 03, 2017
RF Cable	8D	966-3-1 966-3-2 966-3-3	Apr. 03, 2015	Apr. 02, 2016
Software	ADT_Radiated_V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 3.
3. The FCC Site Registration No. is 147459
4. The CANADA Site Registration No. is 20331-1
5. Tested Date: Mar. 21, 2016

For above 1GHz~40GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	Aug. 12, 2015	Aug. 11, 2016
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Jan. 20, 2016	Jan. 19, 2017
Pre-Amplifier Agilent	8449B	3008A02465	Apr. 06, 2015	Apr. 05, 2016
RF Cable	EMC104-SM-SM-2000 EMC104-SM-SM-5000 EMC104-SM-SM-5000	150317 150321 150322	Mar. 31, 2015	Mar. 30, 2016
Spectrum Analyzer Keysight	N9030A	MY54490520	July 26, 2015	July 25, 2016
Pre-Amplifier EMCI	EMC184045	980143	Jan. 15, 2016	Jan. 14, 2017
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Jan. 08, 2016	Jan. 07, 2017
RF Cable	SUCOFLEX 102	36432/2 36441/2	Jan. 16, 2016	Jan. 15, 2017
Software	ADT_Radiated_V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
Boresight Antenna Fixture	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 3.
3. The FCC Site Registration No. is 147459
4. The CANADA Site Registration No. is 20331-1
5. Tested Date: Mar. 21, 2016

For above 40GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250253	Dec. 22, 2015	Dec. 21, 2016
*Harmonic Mixer (33~55GHz) OML	M22HWD	110215-1	Apr. 07, 2015	Apr. 06, 2017
*Horn Antenna (33~55GHz) OML	M22RH	110215-1	Apr. 07, 2015	Apr. 06, 2017
*Harmonic Mixer (50~75GHz) OML	M15RH	110215-1	Apr. 09, 2015	Apr. 08, 2017
*Horn Antenna (50~75GHz) OML	M15HWD	110215-1	Apr. 09, 2015	Apr. 08, 2017
*Harmonic Mixer (75~110GHz) OML	M10HWD	110215-1	Apr. 14, 2015	Apr. 13, 2017
*Horn Antenna (75~110GHz) OML	M10RH	110215-1	Apr. 14, 2015	Apr. 13, 2017
*Diplexer EMCI	DPL26	DPL26_01	Apr. 06, 2015	Apr. 05, 2017
*Diplexer EMCI	DPL26	DPL26_02	Apr. 06, 2015	Apr. 05, 2017
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Test Date: Mar. 21, 2016

4.1.3 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set suitable distance away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note:

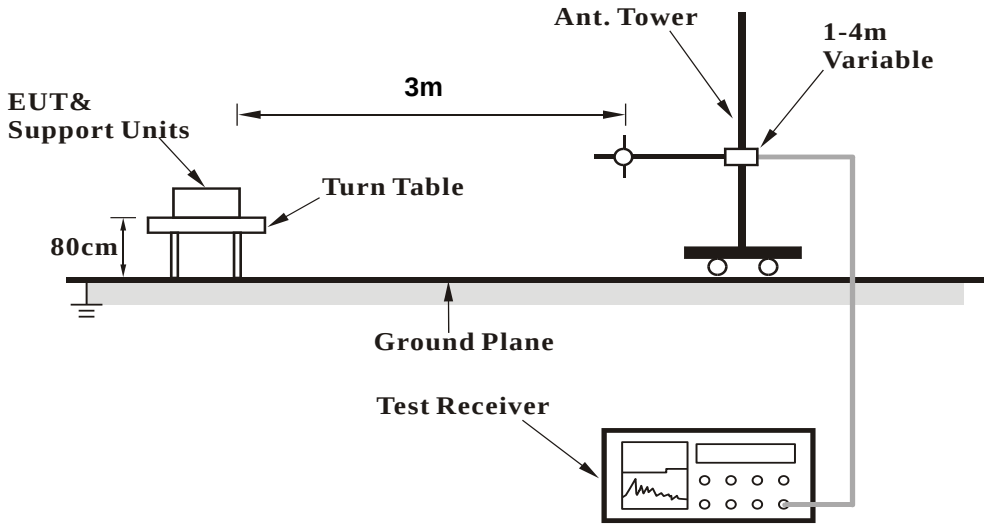
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

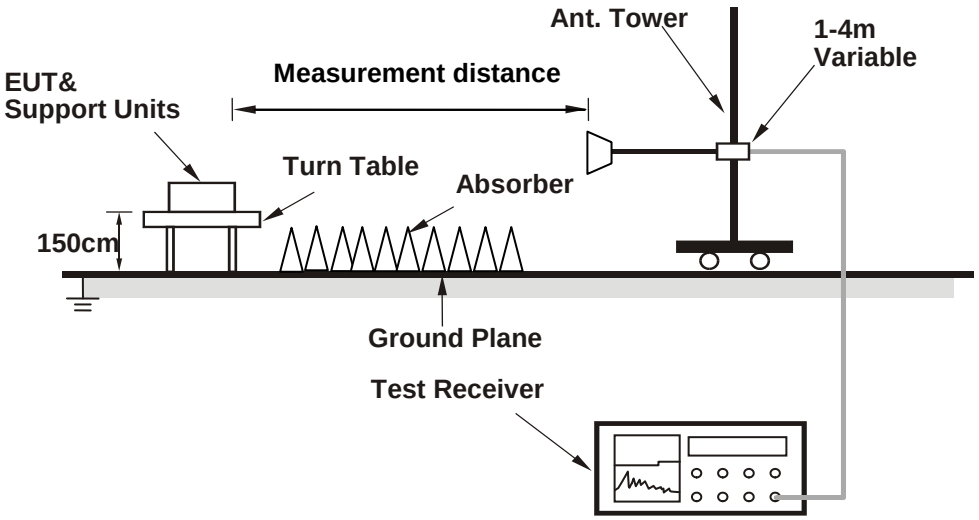
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

EUT was under transmission/receiving condition continuously.

4.1.7 Test Results

Above 1GHz Data：

CHANNEL	TX Channel 1	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 18GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	1968.15	41.4 PK	74.0	-32.6	1.50 H	86	47.28	-5.90
2	1968.15	22.7 AV	54.0	-31.4	1.50 H	86	28.55	-5.90
3	14090.42	55.3 PK	74.0	-18.7	2.00 H	0	36.06	19.22
4	14090.42	41.7 AV	54.0	-12.3	2.00 H	0	22.47	19.22
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	3618.43	56.5 PK	74.0	-17.6	1.00 V	40	57.62	-1.17
2	3618.43	26.9 AV	54.0	-27.1	1.00 V	40	28.07	-1.17
3	14387.50	54.7 PK	74.0	-19.3	1.50 V	222	35.47	19.25
4	14387.50	42.0 AV	54.0	-12.0	1.50 V	222	22.71	19.25

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	18GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 1M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	24075.00	57.4 PK	83.5	-26.1	1.59 H	26	67.03	-9.63
2	24075.00	43.9 AV	63.5	-19.6	1.59 H	26	53.53	-9.63
3	*24126.00	104.3 PK	157.4	-53.1	1.59 H	26	113.81	-9.51
4	*24126.00	103.8 AV	137.4	-33.6	1.59 H	26	113.31	-9.51
5	24715.00	59.2 PK	83.5	-24.3	1.58 H	26	68.51	-9.31
6	24715.00	46.0 AV	63.5	-17.5	1.58 H	26	55.31	-9.31
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 1 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	24075.00	57.4 PK	83.5	-26.1	1.60 V	336	67.03	-9.63
2	24075.00	44.1 AV	63.5	-19.4	1.60 V	336	53.73	-9.63
3	*24126.00	121.4 PK	157.4	-36.0	1.60 V	336	130.91	-9.51
4	*24126.00	121.2 AV	137.4	-16.2	1.60 V	336	130.71	-9.51
5	24715.00	58.5 PK	83.5	-25.0	1.60 V	336	67.81	-9.31
6	24715.00	45.9 AV	63.5	-17.6	1.60 V	336	55.21	-9.31

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. Shorter measurement distances may be used to improve the measurement system's noise floor. As Subpart C description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was compared to the calculate limit for 1-m distance:
   Limit at 1-meter distance (dBuV)
   = Limit at 3 meter distance (dBuV) -20log(1/3)(dB)
   = Limit at 3 meter distance (dBuV)+9.5(dB).

※Measurements made at 1 meter distance and Limit converted to account for 1-meter measurement distance.

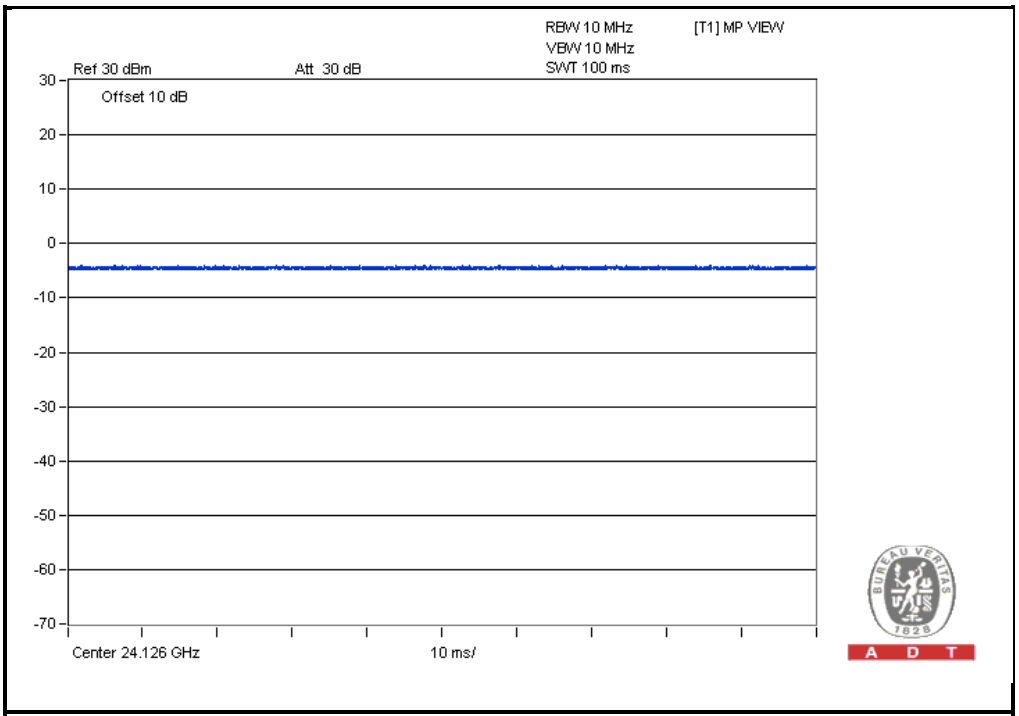
CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	40GHz ~ 100GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 0.8 M							
NO.	FREQ. (GHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	EIRP Level (dBm)	Measured Power (dBm)	Receiver Antenna Gain (dBi)
1	48.252 PK	87.5	109	-21.5	-19.2	-59.5	23.9
2	48.252 AV	72.8	89	-16.2	-33.9	-74.2	23.9
3	72.378 PK	88.8	109	-20.2	-17.9	-61.7	23.9
4	72.378 AV	73.8	89	-15.2	-32.9	-76.7	23.9
5	96.504	-	-	-	-	-	-
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 0.8 M							
NO.	FREQ. (GHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	EIRP Level (dBm)	Measured Power (dBm)	Receiver Antenna Gain (dBi)
1	48.252 PK	86	109	-23.0	-20.7	-61.0	23.9
2	48.252 AV	73.4	89	-15.6	-33.3	-73.6	23.9
3	72.378 PK	87.5	109	-21.5	-19.2	-63.0	23.9
4	72.378 AV	74	89	-15.0	-32.7	-76.5	23.9
5	96.504	-	-	-	-	-	-

REMARKS:

1. The measured power level is converted to EIRP using the Friis equation:
   EIRP = PT * GT = (PR / GR) * (4 * Pi * D/ λ)^ 2
   where:
   PR is the power of the receive measurement
   GR is the gain of the receive measurement antenna
   D is the measurement distance
   λ is the wavelength
2. Field strength is then converted to EIRP as follows:
   EIRP = ((E*D)^2) / 30
   Working in dB units, the above equation is equivalent to:
   EIRP[dBm] = E[dBμV/m] + 20 log(D[meters]) - 104.8
   E = EIRP – 20 * log(D) + 104.8
3. " - ": The emission levels were too low to be detected.
4. Shorter measurement distances may be used to improve the measurement system's noise floor. As Subpart C description is based on the measurement in distance of 3 meters, the data obtained at 0.8-meter distance was compared to the calculate limit for 0.8-m distance:
   Limit at 0.8-meter distance (dBuV)
   = Limit at 3 meter distance (dBuV)-20log(0.8/3)(dB)
   = Limit at 3 meter distance (dBuV)+11.5(dB).

※ Measurements made at 0.8 meter distance and Limit converted to account for 0.8-meter measurement distance.



Duty cycle of test signal is 100 %, duty factor is not required.

Below 1GHz Data:

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	35.29	33.7 QP	40.0	-6.3	1.00 H	274	33.37	0.30
2	**66.42**	**36.6 QP**	**40.0**	**-3.4**	**1.50 H**	**230**	**36.68**	**-0.09**
3	159.71	27.0 QP	43.5	-16.5	1.00 H	360	25.49	1.55
4	195.19	25.9 QP	43.5	-17.6	1.00 H	251	27.64	-1.78
5	438.37	30.7 QP	46.0	-15.3	2.00 H	51	25.20	5.51
6	854.99	36.6 QP	46.0	-9.4	2.00 H	135	24.15	12.49
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	34.73	32.8 QP	40.0	-7.2	1.00 V	194	32.47	0.33
2	66.40	35.3 QP	40.0	-4.7	1.50 V	114	35.40	-0.08
3	162.24	27.8 QP	43.5	-15.7	1.50 V	168	26.34	1.47
4	609.41	34.2 QP	46.0	-11.8	2.00 V	41	25.18	9.04
5	768.39	35.3 QP	46.0	-10.7	1.50 V	185	23.76	11.56
6	890.75	37.7 QP	46.0	-8.3	1.00 V	241	24.40	13.33

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100375	May 06, 2015	May 05, 2016
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 01, 2015	Aug. 31, 2016
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 11, 2015	June 10, 2016
RF Cable	5D-FB	COCCAB-001	Mar. 08, 2016	Mar. 07, 2017
50 ohms Terminator	N/A	EMC-03	Sep. 23, 2015	Sep. 22, 2016
50 ohms Terminator	N/A	EMC-02	Oct. 01, 2015	Sep. 30, 2016
50 ohms Terminator	E1-011315	13	Dec. 11 2015	Dec. 10 2016
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: Apr. 08, 2016

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

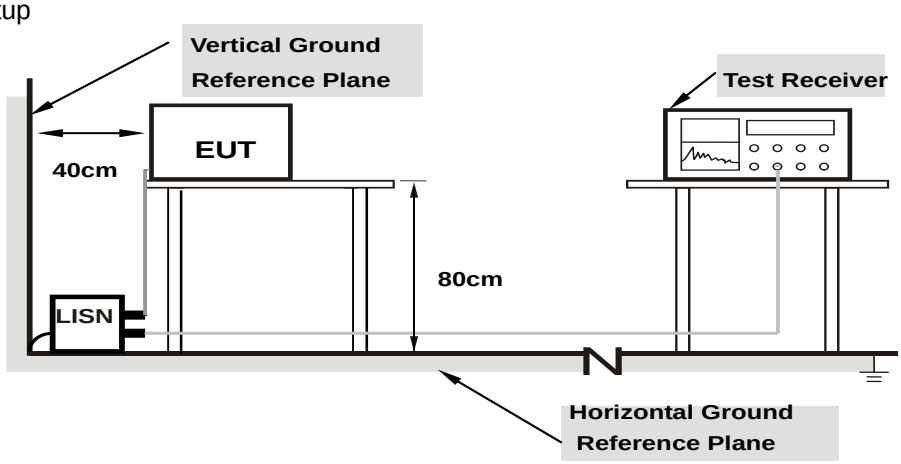
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

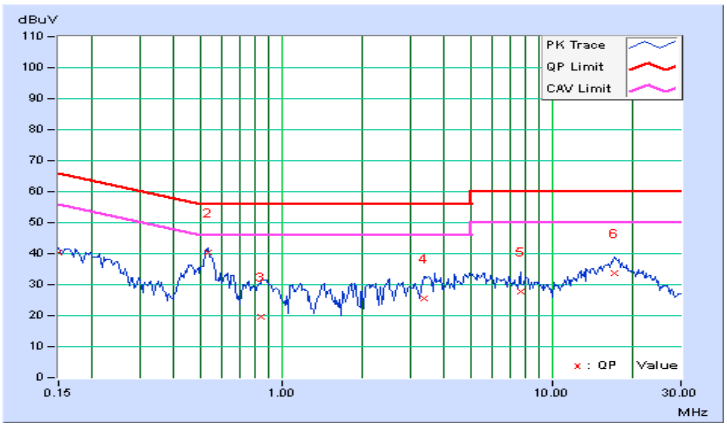
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.44	30.01	21.88	40.45	32.32	66.00	56.00	-25.55	-23.68
2	**0.53281**	**10.42**	**29.86**	**26.49**	**40.28**	**36.91**	**56.00**	**46.00**	**-15.72**	**-9.09**
3	0.83750	10.39	9.29	5.63	19.68	16.02	56.00	46.00	-36.32	-29.98
4	3.35938	10.57	14.84	6.27	25.41	16.84	56.00	46.00	-30.59	-29.16
5	7.62891	10.81	17.14	9.18	27.95	19.99	60.00	50.00	-32.05	-30.01
6	16.98828	11.35	22.21	11.99	33.56	23.34	60.00	50.00	-26.44	-26.66

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

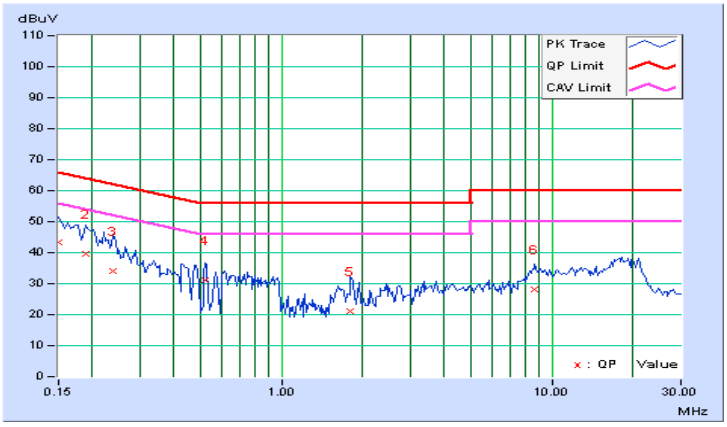


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.44	32.75	21.74	43.19	32.18	66.00	56.00	-22.81	-23.82
2	0.18906	10.45	29.10	2.54	39.55	12.99	64.08	54.08	-24.53	-41.09
3	0.23984	10.46	23.79	10.27	34.25	20.73	62.10	52.10	-27.86	-31.38
4	0.52109	10.47	20.60	6.89	31.07	17.36	56.00	46.00	-24.93	-28.64
5	1.80078	10.49	10.46	-0.06	20.95	10.43	56.00	46.00	-35.05	-35.57
6	8.67188	10.89	17.15	5.35	28.04	16.24	60.00	50.00	-31.96	-33.76

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



4.3 20dB bandwidth Measurement

4.3.1 Limits of 20dB bandwidth Measurement

According to 15.215(c), the requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.3.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP40	100060	May 08, 2015	May 07, 2016

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date : Mar. 21, 2016

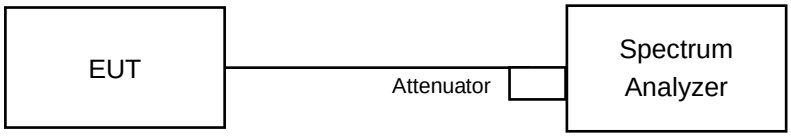
4.3.3 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300 kHz RBW and 1 MHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.
Set both RBW and VBW of spectrum analyzer to 300 kHz and 1 MHz with suitable frequency span from band edge. The bandedge was measured and recorded.

4.3.4 Deviation from Test Standard

No deviation

4.3.5 Test Setup

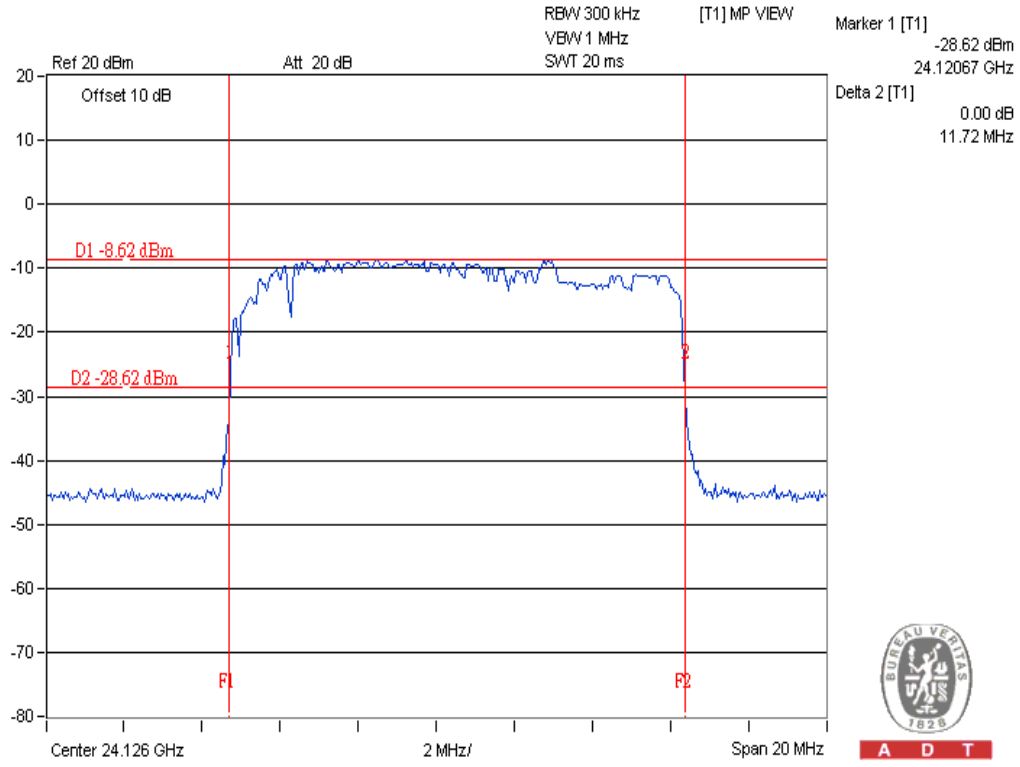


4.3.6 EUT Operating Conditions

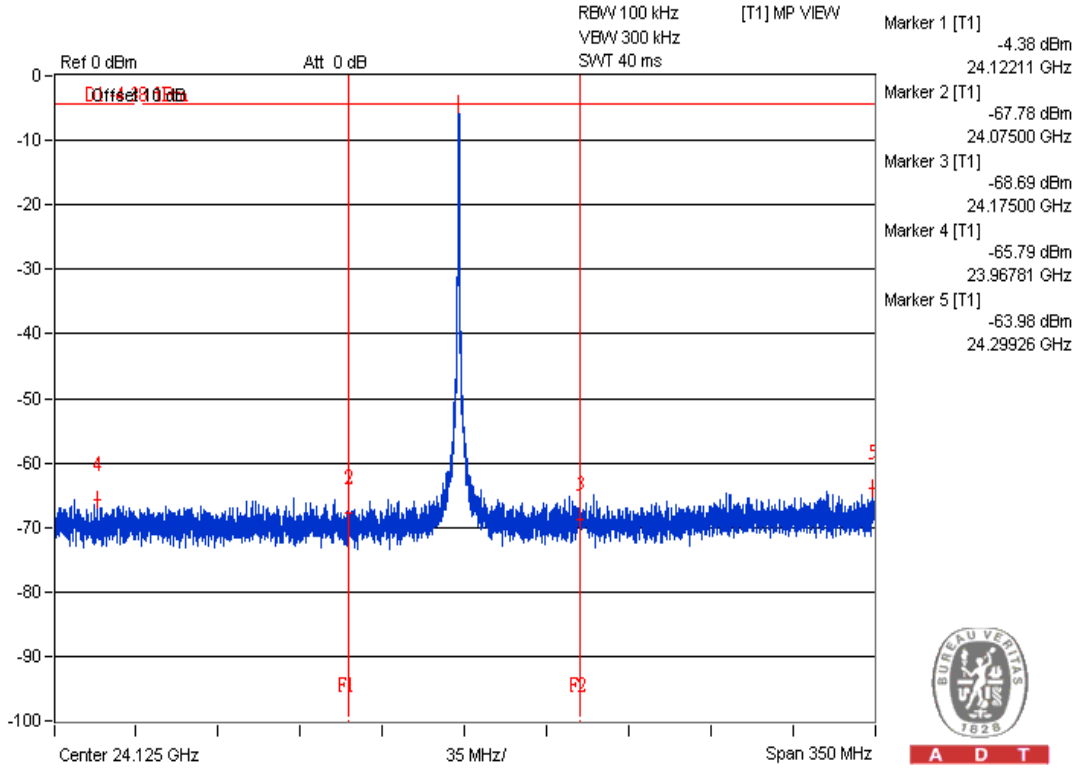
Set the EUT under transmission / receiver condition continuously.

4.3.7 Test Results

FOR 20dB BANDWIDTH



FOR BANDEDGE



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

--- END ---