FCC Test Report (15.249, GFSK)

Report No.: RF150124E01-1

FCC ID: JNZMR0057

Test Model: M-R0057

Received Date: Jan. 26, 2015

Test Date: Jan. 29 to Feb. 06, 2015

Issued Date: Feb. 11, 2015

Applicant: LOGITECH FAR EAST LTD.

Address: #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

Lab Address: No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

Test Location (1): No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, 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.

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agenci

Table of Contents

Release Control Record **3**

1 Certificate of Conformity **4**

2 Summary of Test Results **5**

2.1 Measurement Uncertainty 5
2.2 Modification Record 5

3 General Information **6**

3.1 General Description of EUT (GFSK) 6
3.2 Description of Test Modes 7
3.2.1 Test Mode Applicability and Tested Channel Detail 8
3.3 Description of Support Units 9
3.3.1 Configuration of System under Test 9
3.4 General Description of Applied Standards 10

4 Test Types and Results **11**

4.1 Radiated Emission and Bandedge Measurement 11
4.1.1 Limits of Radiated Emission and Bandedge Measurement 11
4.1.2 Test Instruments 12
4.1.3 Test Procedures 14
4.1.4 Deviation from Test Standard 14
4.1.5 Test Set Up 15
4.1.6 EUT Operating Conditions 16
4.1.7 Test Results 17
4.2 Conducted Emission Measurement 22
4.2.1 Limits of Conducted Emission Measurement 22
4.2.2 Test Instruments 22
4.2.3 Test Procedures 23
4.2.4 Deviation From Test Standard 23
4.2.5 Test Setup 23
4.2.6 EUT Operating Condition 23
4.2.7 Test Results 24

5 Pictures of Test Arrangements **26**

Appendix – Information on the Testing Laboratories **27**

Release Control Record

Issue No.	Description	Date Issued
RF150124E01-1	Original release.	Feb. 11, 2015

1 Certificate of Conformity

Product: 2.4GHz Cordless Mouse

Brand: Logitech

Test Model: M-R0057

Sample Status: ENGINEERING SAMPLE

Applicant: LOGITECH FAR EAST LTD.

Test Date: Jan. 29 to Feb. 06, 2015

Standards: FCC Part 15, Subpart C (Section 15.249)
ANSI C63.10-2009

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:** Feb. 11, 2015
Midoli Peng / Specialist

Approved by : _____, **Date:** Feb. 11, 2015
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -3.74dB at 0.60313MHz.
15.209 15.249 15.249 (d)	Radiated Emissions Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -2.0dB at 2400.00MHz.

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 ~ 1000MHz	5.43 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.65 dB
	6GHz ~ 18GHz	3.88 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 (GFSK)

Product	2.4GHz Cordless Mouse
Brand	Logitech
Test Model	M-R0057
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 3.7V from battery or DC 5V from USB interface
Modulation Type	GFSK
Operating Frequency	2405MHz ~ 2474MHz
Number of Channel	12
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Rechargeable battery x1
Data Cable Supplied	USB charging cable (shielded, 0.7m) x 1

Note:

1. There are Bluetooth 4.0(LE only) and GFSK technology used for the EUT.
2. The USB port of the EUT is only for charging the rechargeable battery. And the EUT has wireless function under charging mode.
3. The EUT must be supplied with a rechargeable battery, please refer to the following table:

Brand	Model No.	Spec.
Synergy	AHB572535PJT (533-000120)	3.7V 500mAh 2.0Wh

4. The antenna provided to the EUT, please refer to the following table:

Antenna Type	Antenna Connector	Gain (dBi)
PCB printed antenna	NA	1.87

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

Test Mode	Description
Mode A	Power from Battery
Mode B	**Power from Adapter**

For the above modes, the worst radiated emission test was found in **Mode B**. Therefore only the test data of the modes were recorded in this report.

6. 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

12 channels are provided to this EUT:

Channel	Frequency	Channel	Frequency
1	2405	7	2441
2	2408	8	2444
3	2414	9	2462
4	2417	10	2465
5	2432	11	2471
6	2435	12	2474

3.2.1 Test Mode Applicability and Tested Channel Detail

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

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

NOTE: "-"means no effect.

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 12	1, 8, 12	GFSK

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 12	1	GFSK

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1 to 12	1	GFSK

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	22deg. C, 69%RH	120Vac, 60Hz	Tim Ho
RE<1G	22deg. C, 70%RH	120Vac, 60Hz	Tim Ho
PLC	22deg. C, 65%RH	120Vac, 60Hz	Barry Lee

3.3 Description of Support Units

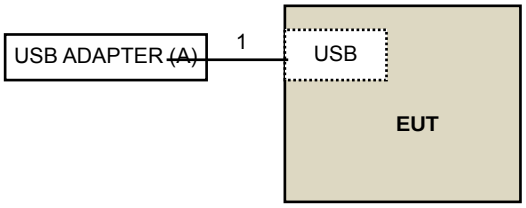
No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	USB Adapter	NICELINK	US-T128	NA	NA	Provided by Lab

NOTE:

1. All power cords of the above support units are non-shielded (1.8 m).

No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	USB charging	1	0.7	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 (Section 15.249)

ANSI C63.10-2009

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500

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 as below table, whichever is the lesser attenuation

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

Below 1GHz test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Aug. 11, 2014	Aug. 10, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Feb. 27, 2014	Feb. 26, 2015
RF Cable	NA	CHHCAB_001	Oct. 05, 2014	Oct. 04, 2015
Horn_Antenna AISI	AIH.8018	0000220091110	Aug. 26, 2014	Aug. 25, 2015
Pre-Amplifier Agilent	8449B	300801923	Oct. 28, 2014	Oct. 27, 2015
RF Cable	NA	131206 131215 SNMY23685/4	Jan. 15, 2015	Jan. 14, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier EMCI	EMC184045	980143	Jan. 16, 2015	Jan. 15, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Aug. 26, 2014	Aug. 25, 2015
RF Cable	NA	RF104-121 RF104-204	Dec. 11, 2014	Dec. 10, 2015
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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3 The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5 The CANADA Site Registration No. is IC 7450H-3.
6 Tested Date: Jan. 29, 2015

Above 1GHz test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	July 21,2014	July 20,2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 26, 2014	Feb. 25, 2015
RF Cable	NA	CHGCAB_001	Oct. 04, 2014	Oct. 03, 2015
Horn_Antenna AISI	AIH.8018	0000320091110	Aug. 27, 2014	Aug. 26, 2015
Pre-Amplifier Agilent	8449B	3008A02578	June 24, 2014	June 23, 2015
RF Cable	NA	131205 131214 SNMY23684/4	Jan. 15, 2015	Jan. 14, 2016
Spectrum Analyzer R&S	FSV40	100964	July 05, 2014	July 04, 2015
Pre-Amplifier EMCI	EMC184045	980143	Jan. 16, 2015	Jan. 15, 2016
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Aug. 26, 2014	Aug. 25, 2015
RF Cable	NA	RF104-121 RF104-204	Dec. 11, 2014	Dec. 10, 2015
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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
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 Tested Date: Feb. 06, 2015

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 3 meters 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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note:

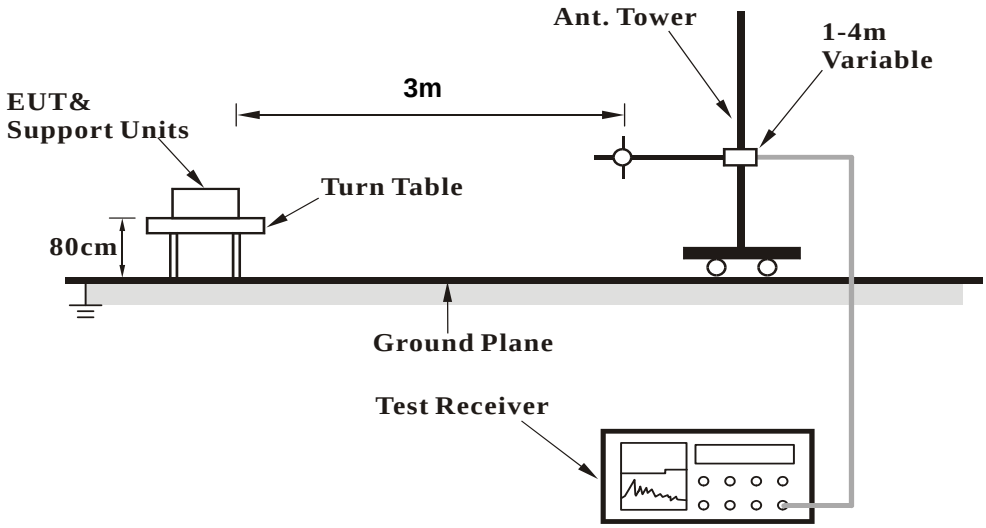
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

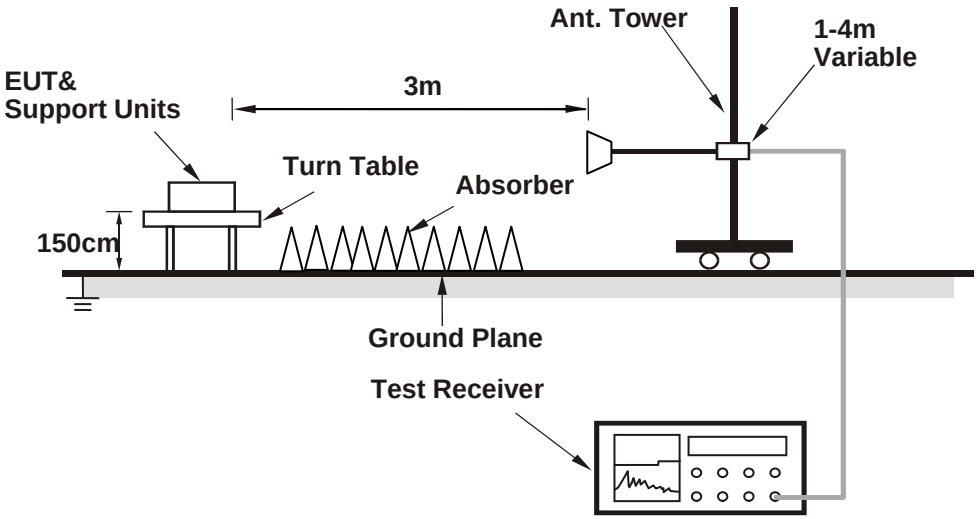
No deviation.

4.1.5 Test Set Up

<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

1. Placed the EUT on testing table.
2. Controlling software (RF Sample with Receiver C-U0012[Number Lock]) has been activated to set the EUT under transmission/receiving condition continuously.

4.1.7 Test Results

ABOVE 1GHz DATA

CHANNEL	TX Channel 1	**DETECTOR FUNCTION**	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	**2400.00**	**72.0 PK**	**74.0**	**-2.0**	**1.41 H**	**360**	**74.42**	**-2.42**
2	2400.00	26.2 AV	54.0	-27.8	1.41 H	360	28.62	-2.42
3	*2405.00	104.7 PK	114.0	-9.3	1.41 H	360	107.11	-2.41
4	*2405.00	58.9 AV	94.0	-35.1	1.41 H	360	61.31	-2.41
5	4810.00	51.5 PK	74.0	-22.5	1.01 H	233	45.85	5.65
6	4810.00	5.7 AV	54.0	-48.3	1.01 H	233	0.05	5.65
7	7215.00	52.0 PK	74.0	-22.0	1.02 H	157	38.76	13.24
8	7215.00	6.2 AV	54.0	-47.8	1.02 H	157	-7.04	13.24
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	2400.00	65.6 PK	74.0	-8.4	1.00 V	351	68.02	-2.42
2	2400.00	19.8 AV	54.0	-34.2	1.00 V	351	22.22	-2.42
3	*2405.00	96.3 PK	114.0	-17.7	1.00 V	351	98.71	-2.41
4	*2405.00	50.5 AV	94.0	-43.5	1.00 V	351	52.91	-2.41
5	4810.00	51.2 PK	74.0	-22.8	1.08 V	333	45.55	5.65
6	4810.00	5.4 AV	54.0	-48.6	1.08 V	333	-0.25	5.65
7	7215.00	50.2 PK	74.0	-23.8	1.04 V	322	36.96	13.24
8	7215.00	4.4 AV	54.0	-49.6	1.04 V	322	-8.84	13.24

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. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.07 ms / 13.65 ms) = -45.8 dB
   Please see page 20 for plotted duty.

CHANNEL	TX Channel 8	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2444.00	104.0 PK	114.0	-10.0	1.36 H	360	106.21	-2.21
2	*2444.00	58.2 AV	94.0	-35.8	1.36 H	360	60.41	-2.21
3	4888.00	51.2 PK	74.0	-22.8	1.01 H	244	45.23	5.97
4	4888.00	5.4 AV	54.0	-48.6	1.01 H	244	-0.57	5.97
5	7332.00	51.6 PK	74.0	-22.4	1.05 H	138	38.42	13.18
6	7332.00	5.8 AV	54.0	-48.2	1.05 H	138	-7.38	13.18
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	*2444.00	96.5 PK	114.0	-17.5	1.00 V	345	98.71	-2.21
2	*2444.00	50.7 AV	94.0	-43.3	1.00 V	345	52.91	-2.21
3	4888.00	51.1 PK	74.0	-22.9	1.07 V	360	45.13	5.97
4	4888.00	5.3 AV	54.0	-48.7	1.07 V	360	-0.67	5.97
5	7332.00	50.7 PK	74.0	-23.3	1.01 V	298	37.52	13.18
6	7332.00	4.9 AV	54.0	-49.1	1.01 V	298	-8.28	13.18

REMARKS:

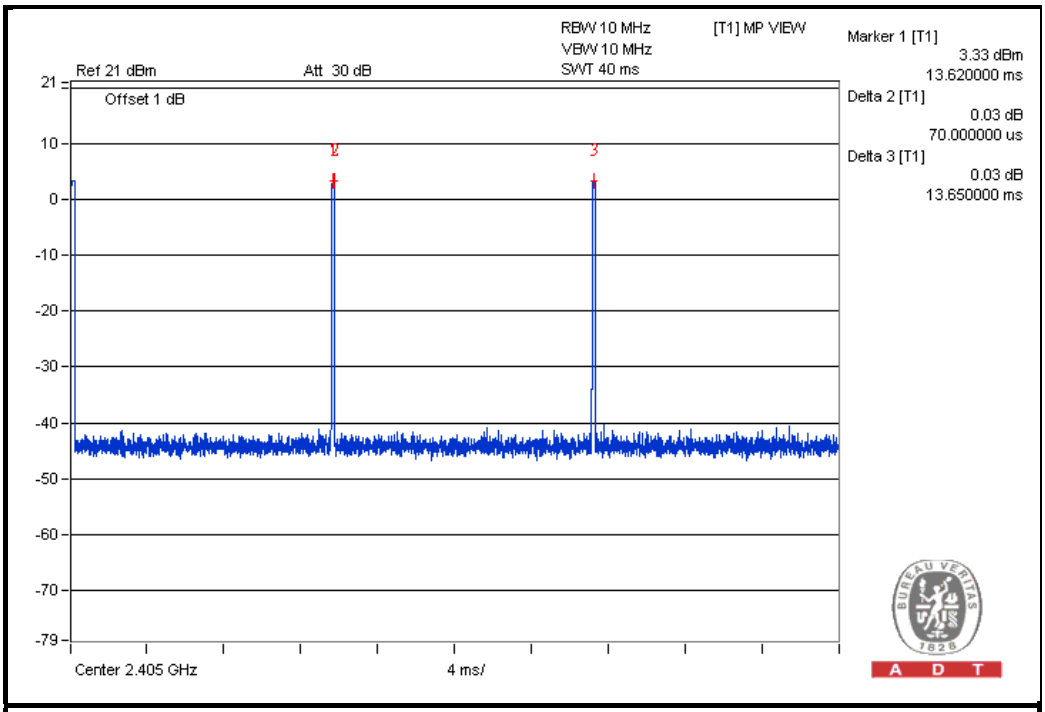
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.07 ms / 13.65 ms) = -45.8 dB
   Please see page 20 for plotted duty.

CHANNEL	TX Channel 12	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2474.00	104.0 PK	114.0	-10.0	1.52 H	215	106.08	-2.08
2	*2474.00	58.2 AV	94.0	-35.8	1.52 H	215	60.28	-2.08
3	2483.50	68.6 PK	74.0	-5.4	1.52 H	215	70.63	-2.03
4	2483.50	22.8 AV	54.0	-31.2	1.52 H	215	24.83	-2.03
5	4948.00	51.4 PK	74.0	-22.6	1.00 H	236	45.20	6.20
6	4948.00	5.6 AV	54.0	-48.4	1.00 H	236	-0.60	6.20
7	7422.00	51.5 PK	74.0	-22.5	1.00 H	145	38.34	13.16
8	7422.00	5.7 AV	54.0	-48.3	1.00 H	145	-7.46	13.16
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	*2474.00	96.3 PK	114.0	-17.7	1.00 V	360	98.38	-2.08
2	*2474.00	50.5 AV	94.0	-43.5	1.00 V	360	52.58	-2.08
3	2483.50	60.0 PK	74.0	-14.0	1.00 V	360	62.03	-2.03
4	2483.50	14.2 AV	54.0	-39.8	1.00 V	360	16.23	-2.03
5	4948.00	50.8 PK	74.0	-23.2	1.00 V	344	44.60	6.20
6	4948.00	5.0 AV	54.0	-49.0	1.00 V	344	-1.20	6.20
7	7422.00	50.8 PK	74.0	-23.2	1.00 V	311	37.64	13.16
8	7422.00	5.0 AV	54.0	-49.0	1.00 V	311	-8.16	13.16

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. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.07 ms / 13.65 ms) = -45.8 dB
   Please see page 20 for plotted duty.



20 log (Duty cycle) = 20 log (0.07 ms / 13.65 ms) = -45.8 dB

BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Channel 1	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	Below 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	172.54	35.0 QP	43.5	-8.5	1.50 H	110	48.67	-13.68
2	562.19	35.6 QP	46.0	-10.5	1.50 H	347	41.62	-6.07
3	629.80	38.4 QP	46.0	-7.6	1.50 H	283	42.62	-4.21
4	702.70	37.8 QP	46.0	-8.2	2.00 H	254	41.20	-3.36
5	772.73	41.0 QP	46.0	-5.0	1.00 H	129	42.72	-1.68
6	843.30	42.8 QP	46.0	-3.2	1.50 H	86	43.59	-0.83
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	210.76	39.9 QP	43.5	-3.6	1.00 V	360	55.96	-16.10
2	279.97	36.1 QP	46.0	-9.9	1.50 V	0	48.75	-12.62
3	491.87	40.0 QP	46.0	-6.0	1.50 V	173	47.40	-7.42
4	629.80	39.2 QP	46.0	-6.8	1.50 V	327	43.37	-4.21
5	769.82	39.2 QP	46.0	-6.9	2.00 V	347	40.87	-1.72
6	797.32	39.4 QP	46.0	-6.6	1.50 V	10	40.88	-1.45

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 ROHDE & SCHWARZ	ESCS 30	100375	Apr. 29, 2014	Apr. 28, 2015
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable (JYEBAO)	5DFB	COCCAB-001	Mar. 10, 2014	Mar. 09, 2015
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 2015
Software ADT	BV ADT_Cond_V7.3.7.3	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 Shielded Room No. C.
3 The VCCI Con C Registration No. is C-3611.
4 Tested Date: Feb. 02, 2015

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.

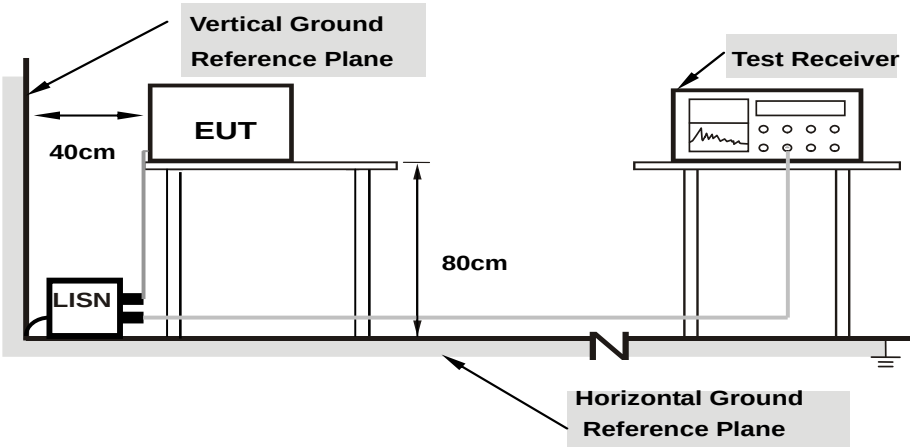
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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 Condition

Same as 4.1.6.

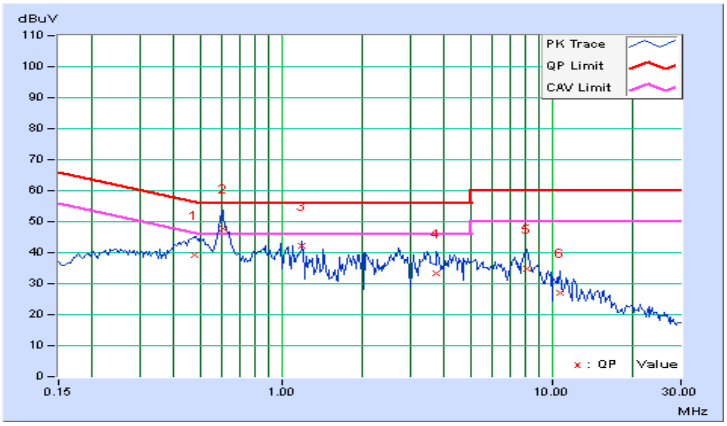
4.2.7 Test Results

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	0.47422	0.09	39.21	30.18	39.30	30.27	56.44	46.44	-17.13	-16.16
2	0.60703	0.10	47.67	37.03	47.77	37.13	56.00	46.00	-8.23	-8.87
3	1.18750	0.14	41.95	31.32	42.09	31.46	56.00	46.00	-13.91	-14.54
4	3.75781	0.24	32.91	23.65	33.15	23.89	56.00	46.00	-22.85	-22.11
5	8.04688	0.38	34.40	28.13	34.78	28.51	60.00	50.00	-25.22	-21.49
6	10.72656	0.47	26.44	19.55	26.91	20.02	60.00	50.00	-33.09	-29.98

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

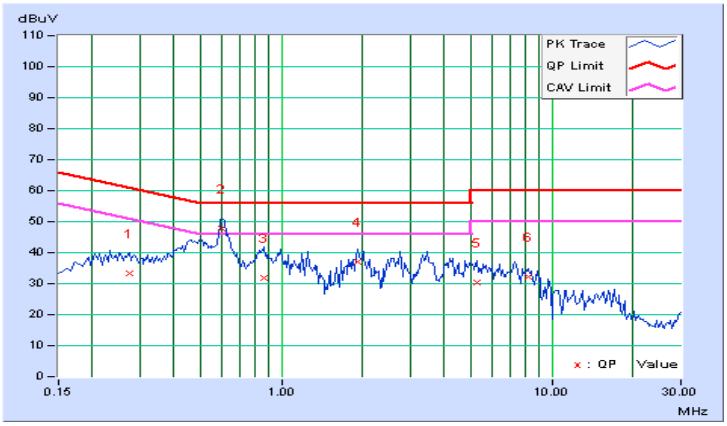


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.27500	0.07	33.12	27.72	33.19	27.79	60.97	50.97	-27.77	-23.17
2	**0.60313**	**0.10**	**47.63**	**42.16**	**47.73**	**42.26**	**56.00**	**46.00**	**-8.27**	**-3.74**
3	0.85703	0.12	31.65	22.40	31.77	22.52	56.00	46.00	-24.23	-23.48
4	1.92578	0.18	36.74	31.40	36.92	31.58	56.00	46.00	-19.08	-14.42
5	5.28906	0.30	30.03	18.87	30.33	19.17	60.00	50.00	-29.67	-30.83
6	8.19141	0.40	32.00	23.27	32.40	23.67	60.00	50.00	-27.60	-26.33

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



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 Lab/Telecom Lab
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety
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 ---