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FCC TEST REPORT

REPORT NO.: RF130417C24

MODEL NO.: 1560

FCC ID: C3K1560

RECEIVED: Apr. 17, 2013

TESTED: Apr. 19, 2013

ISSUED: Apr. 30, 2013

APPLICANT: Microsoft Corporation

ADDRESS: One Microsoft Way, Redmond WA 98052-6399,
U.S.A.

ISSUED BY: Bureau Veritas Consumer Products Services
(H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist.,
New Taipei City, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei
Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130417C24	Original release	Apr. 30, 2013



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1. CERTIFICATION

PRODUCT: Wireless Mouse

MODEL NO.: 1560

BRAND: Microsoft

APPLICANT: Microsoft Corporation

TESTED: Apr. 19, 2013

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 15, Subpart C (Section 15.249)

ANSI C63.10-2009

The above equipment (model: 1560) 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 : Celine Chou , **DATE** : Apr. 30, 2013
Celine Chou / Specialist

APPROVED BY : Ken Liu , **DATE** : Apr. 30, 2013
Ken Liu / Senior Manager



2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Section 15.249)			
STANDARD PARAGRAPH	TEST TYPE	RESULT	REMARK
15.207	Conducted Emission Test	NA	Power supply is 3Vdc from battery.
15.209 15.249 15.249 (d)	Radiated Emission Test 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 -3.1dB at 33.88MHz.

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	UNCERTAINTY
Radiated emission	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Wireless Mouse
MODEL NO.	1560
POWER SUPPLY	3.0Vdc (battery)
MODULATION TYPE	GFSK
OPERATING FREQUENCY	2403 ~ 2480MHz
NUMBER OF CHANNEL	24
ANTENNA TYPE	PIFA antenna with 2.25dBi gain
DATA CABLE	N/A
I/O PORT	N/A
ACCESSORY DEVICES	N/A

NOTE:

1. The EUT has transmitter and receiver functions.
2. The following samples are provided for final test.

SAMPLE	SERIAL NO.
Sample A	211
Sample B	216
Sample C	224

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

3.2 DESCRIPTION OF TEST MODES

24 channels are provided to this EUT:

Index	Channel Group	Frequency (MHz)	Index	Channel Group	Frequency (MHz)
0	Subset A	2403	1	Subset A	2419
4	Subset B	2429	5	Subset B	2450
8	Subset C	2421	9	Subset C	2431
12	Subset D	2405	13	Subset D	2425
16	Subset E	2423	17	Subset E	2446
20	Subset F	2417	21	Subset F	2427

Index	Channel Group	Frequency (MHz)	Index	Channel Group	Frequency (MHz)
2	Subset A	2478	3	Subset A	2468
6	Subset B	2470	7	Subset B	2480
10	Subset C	2472	11	Subset C	2454
14	Subset D	2444	15	Subset D	2452
18	Subset E	2456	19	Subset E	2474
22	Subset F	2448	23	Subset F	2476



3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE $<$ 1G	BM	FF	
A	√	√	√	√	Serial No.: 211
B	√	√	-	-	Serial No.: 216
C	√	√	-	-	Serial No.: 224

Where **RE $<$ 1G**: Radiated Emission below 1GHz **RE \geq 1G**: Radiated Emission above 1GHz

BM: Bandedge Measurement

FF: Fundamental Frequency

NOTE: "-" means no effect.

RADIATED EMISSION TEST (ABOVE 1 GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED FREQUENCY (MHZ)	MODULATION TYPE
A, B, C	2403 to 2480	2403, 2444, 2480	GFSK

RADIATED EMISSION TEST (BELOW 1 GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED FREQUENCY (MHZ)	MODULATION TYPE
A, B, C	2403 to 2480	2403	GFSK

BANDEDGE MEASUREMENT:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED FREQUENCY (MHZ)	MODULATION TYPE
A	2403 to 2480	2403, 2480	GFSK



FUNDAMENTAL MEASUREMENT:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED FREQUENCY (MHZ)	MODULATION TYPE
A	2403 to 2480	2403, 2444, 2480	GFSK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	25deg. C, 71%RH	3Vdc	Alan Wu
RE $<$ 1G	25deg. C, 71%RH	3Vdc	Martin Lee
BM	25deg. C, 71%RH	3Vdc	Alan Wu
FF	25deg. C, 71%RH	3Vdc	Alan Wu



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.

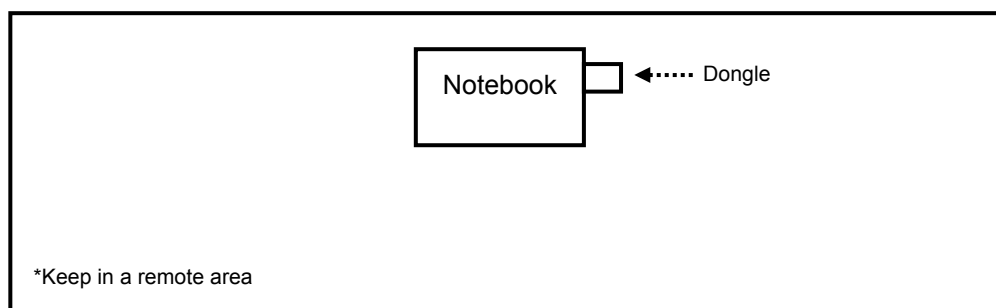
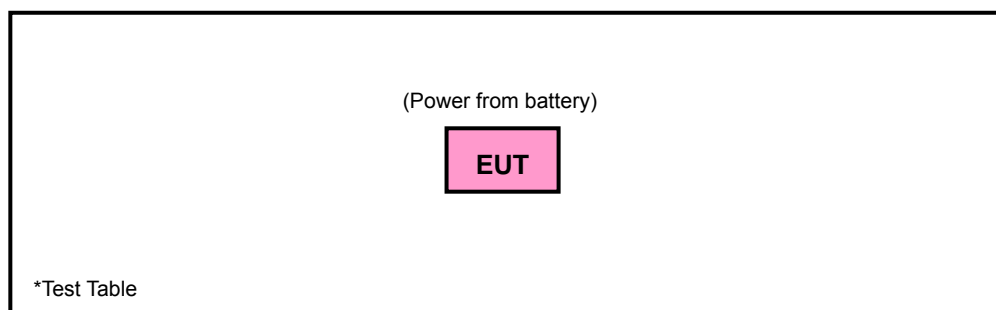
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	E5420	33MJMQ1	NA
2	DONGLE	Microsoft	1461C	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA

NOTE:

- 1. All power cords of the above support units are non shielded (1.8m).
- 2. Item 1-2 acted as communication partner to transfer data.
- 3. Item 2 was provided 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 BAND EDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BAND EDGE 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
24 ~ 24.25 GHz	250	2500

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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 16, 2012	Nov. 15, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jan. 28, 2013	Jan. 27, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Mar. 22, 2013	Mar. 21, 2014
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-209	Sep. 03, 2012	Sep. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier Agilent	8449B	3008A01911	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8447D	2944A10638	Oct. 25, 2012	Oct. 24, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295013/4 283403/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 11, 2012	Aug. 10, 2013
Software BV ADT	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	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 loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. The test was performed in HwaYa Chamber 9.
 4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 5. The FCC Site Registration No. is 215374.
 6. The IC Site Registration No. is IC 7450F-9.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

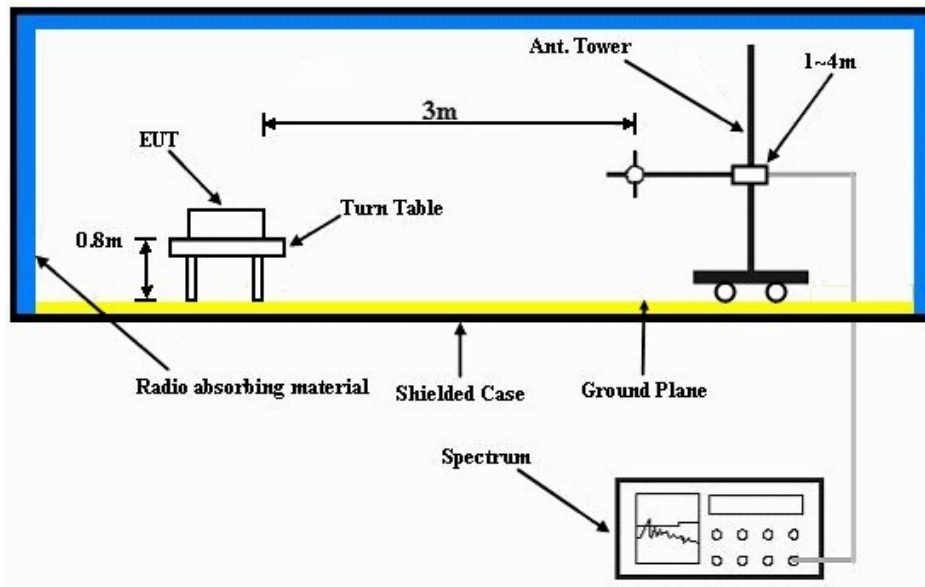
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection 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



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

4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at specific channel frequency.



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4.1.7 TEST RESULTS

ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2403 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	A		

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	2390.00	50.8 PK	74.0	-23.2	1.34 H	97	15.10	35.70
2	2390.00	28.8 AV	54.0	-25.2	1.34 H	97	-6.90	35.70
3	2400.00	57.2 PK	74.0	-16.8	1.34 H	97	21.50	35.70
4	2400.00	27.6 AV	54.0	-26.4	1.34 H	97	-8.10	35.70
5	*2403.00	98.9 PK	114.0	-15.1	1.34 H	97	63.20	35.70
6	*2403.00	69.3 AV	94.0	-24.7	1.34 H	97	33.60	35.70
7	4806.00	51.6 PK	74.0	-22.4	1.53 H	116	8.50	43.10
8	4806.00	22.0 AV	54.0	-32.0	1.53 H	116	-21.10	43.10

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	2390.00	51.7 PK	74.0	-22.3	1.07 V	299	16.00	35.70
2	2390.00	29.9 AV	54.0	-24.1	1.07 V	299	-5.80	35.70
3	2400.00	49.4 PK	74.0	-24.6	1.07 V	299	13.70	35.70
4	2400.00	19.8 AV	54.0	-34.2	1.07 V	299	-15.90	35.70
5	*2403.00	91.9 PK	114.0	-22.1	1.07 V	299	56.20	35.70
6	*2403.00	62.3 AV	94.0	-31.7	1.07 V	299	26.60	35.70
7	4806.00	50.9 PK	74.0	-23.1	1.00 V	21	7.80	43.10
8	4806.00	21.3 AV	54.0	-32.7	1.00 V	21	-21.80	43.10

REMARKS:

- Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
- Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
- The other emission levels were very low against the limit.
- Margin value = Emission level – Limit value.
- * * *: Fundamental frequency.
- The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
 Please see page 25 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2444 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	A		

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	99.8 PK	114.0	-14.2	1.33 H	104	64.00	35.80
2	*2444.00	70.2 AV	94.0	-23.8	1.33 H	104	34.40	35.80
3	4888.00	52.7 PK	74.0	-21.3	1.56 H	114	9.40	43.30
4	4888.00	23.1 AV	54.0	-30.9	1.56 H	114	-20.20	43.30

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	90.3 PK	114.0	-23.7	1.00 V	286	54.50	35.80
2	*2444.00	60.7 AV	94.0	-33.3	1.00 V	286	24.90	35.80
3	4888.00	51.9 PK	74.0	-22.1	1.00 V	23	8.60	43.30
4	4888.00	22.3 AV	54.0	-31.7	1.00 V	23	-21.00	43.30

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).
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 + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
Please see page 25 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2480 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	A		

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	*2480.00	98.7 PK	114.0	-15.3	1.32 H	115	62.80	35.90
2	*2480.00	69.1 AV	94.0	-24.9	1.32 H	115	33.20	35.90
3	2483.50	53.1 PK	74.0	-20.9	1.32 H	115	17.20	35.90
4	2483.50	23.5 AV	54.0	-30.5	1.32 H	115	-12.40	35.90
5	4960.00	50.9 PK	74.0	-23.1	1.50 H	116	7.40	43.50
6	4960.00	21.3 AV	54.0	-32.7	1.50 H	116	-22.20	43.50

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	*2480.00	91.0 PK	114.0	-23.0	1.00 V	286	55.10	35.90
2	*2480.00	61.4 AV	94.0	-32.6	1.00 V	286	25.50	35.90
3	2483.50	44.9 PK	74.0	-29.1	1.00 V	286	9.00	35.90
4	2483.50	15.3 AV	54.0	-38.7	1.00 V	286	-20.60	35.90
5	4960.00	50.0 PK	74.0	-24.0	1.00 V	26	6.50	43.50
6	4960.00	20.4 AV	54.0	-33.6	1.00 V	26	-23.10	43.50

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).
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 + 20log(Duty cycle) Where the duty factor is calculated from following formula:
$$20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$$
Please see page 25 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2403 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	B		

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	4806.00	51.5 PK	74.0	-22.5	1.00 H	25	8.40	43.10
2	4806.00	21.9 AV	54.0	-32.1	1.00 H	25	-21.20	43.10
3	7209.00	55.0 PK	74.0	-19.0	1.00 H	335	7.70	47.30
4	7209.00	25.4 AV	54.0	-28.6	1.00 H	335	-21.90	47.30
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	4806.00	52.9 PK	74.0	-21.1	1.05 V	109	9.80	43.10
2	4806.00	23.3 AV	54.0	-30.7	1.05 V	109	-19.80	43.10
3	7209.00	55.5 PK	74.0	-18.5	1.00 V	5	8.20	47.30
4	7209.00	25.9 AV	54.0	-28.1	1.00 V	5	-21.40	47.30

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
$$20 \log (\text{Duty cycle}) = 20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$$
Please see page 25 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2444 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	B		

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	4888.00	51.3 PK	74.0	-22.7	1.00 H	15	8.00	43.30
2	4888.00	21.7 AV	54.0	-32.3	1.00 H	15	-21.60	43.30
3	7332.00	54.4 PK	74.0	-19.6	1.00 H	337	6.50	47.90
4	7332.00	24.8 AV	54.0	-29.2	1.00 H	337	-23.10	47.90

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	4888.00	52.7 PK	74.0	-21.3	1.00 V	109	9.40	43.30
2	4888.00	23.1 AV	54.0	-30.9	1.00 V	109	-20.20	43.30
3	7332.00	55.9 PK	74.0	-18.1	1.00 V	8	8.00	47.90
4	7332.00	26.3 AV	54.0	-27.7	1.00 V	8	-21.60	47.90

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
Please see page 25 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2480 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	B		

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	4960.00	54.1 PK	74.0	-19.9	1.00 H	21	10.60	43.50
2	4960.00	24.5 AV	54.0	-29.5	1.00 H	21	-19.00	43.50
3	7440.00	54.0 PK	74.0	-20.0	1.00 H	333	5.80	48.20
4	7440.00	24.4 AV	54.0	-29.6	1.00 H	333	-23.80	48.20

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	4960.00	54.7 PK	74.0	-19.3	1.00 V	94	11.20	43.50
2	4960.00	25.1 AV	54.0	-28.9	1.00 V	94	-18.40	43.50
3	7440.00	56.4 PK	74.0	-17.6	1.00 V	2	8.20	48.20
4	7440.00	26.8 AV	54.0	-27.2	1.00 V	2	-21.40	48.20

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
Please see page 25 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2403 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	C		

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	4806.00	49.6 PK	74.0	-24.4	1.25 H	19	6.50	43.10
2	4806.00	20.0 AV	54.0	-34.0	1.25 H	19	-23.10	43.10
3	7209.00	54.4 PK	74.0	-19.6	1.35 H	37	7.10	47.30
4	7209.00	24.8 AV	54.0	-29.2	1.35 H	37	-22.50	47.30

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	4806.00	52.7 PK	74.0	-21.3	1.22 V	52	9.60	43.10
2	4806.00	23.1 AV	54.0	-30.9	1.22 V	52	-20.00	43.10
3	7209.00	55.8 PK	74.0	-18.2	1.47 V	65	8.50	47.30
4	7209.00	26.2 AV	54.0	-27.8	1.47 V	65	-21.10	47.30

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
Please see page 25 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2444 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	C		

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	4888.00	49.9 PK	74.0	-24.1	1.25 H	54	6.60	43.30
2	4888.00	20.3 AV	54.0	-33.7	1.25 H	54	-23.00	43.30
3	7332.00	53.5 PK	74.0	-20.5	1.04 H	214	5.60	47.90
4	7332.00	23.9 AV	54.0	-30.1	1.04 H	214	-24.00	47.90

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	4888.00	51.6 PK	74.0	-22.4	1.00 V	25	8.30	43.30
2	4888.00	22.0 AV	54.0	-32.0	1.00 V	25	-21.30	43.30
3	7332.00	55.2 PK	74.0	-18.8	1.58 V	65	7.30	47.90
4	7332.00	25.6 AV	54.0	-28.4	1.58 V	65	-22.30	47.90

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
Please see page 25 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2480 MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Alan Wu
TEST MODE	C		

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	4960.00	52.6 PK	74.0	-21.4	1.02 H	223	9.10	43.50
2	4960.00	23.0 AV	54.0	-31.0	1.02 H	223	-20.50	43.50
3	7440.00	55.3 PK	74.0	-18.7	1.35 H	6	7.10	48.20
4	7440.00	25.7 AV	54.0	-28.3	1.35 H	6	-22.50	48.20

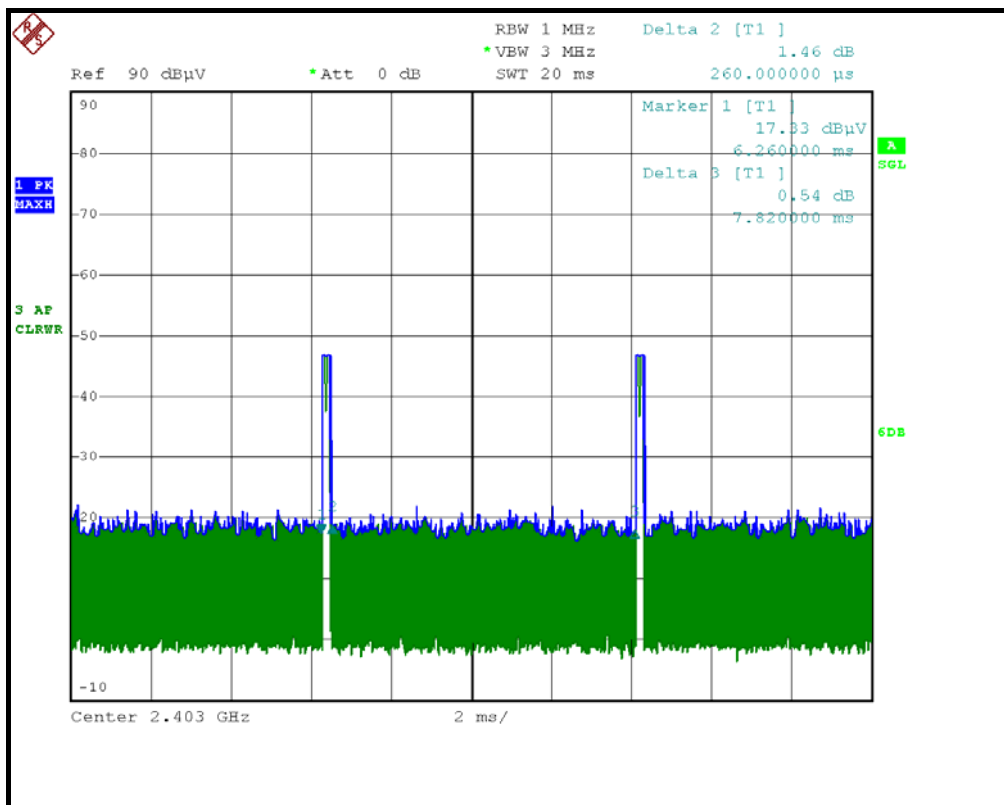
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	4960.00	52.9 PK	74.0	-21.1	1.05 V	235	9.40	43.50
2	4960.00	23.3 AV	54.0	-30.7	1.05 V	235	-20.20	43.50
3	7440.00	55.4 PK	74.0	-18.6	1.54 V	52	7.20	48.20
4	7440.00	25.8 AV	54.0	-28.2	1.54 V	52	-22.40	48.20

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:
 $20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$
Please see page 25 for plotted duty.



A D T



$$20 \log (\text{Duty cycle}) = 20 \log (0.26 \text{ ms} / 7.82 \text{ ms}) = -29.6 \text{ dB}$$



A D T

BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2403 MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Martin Lee
TEST MDDE	A		

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	105.66	36.4 QP	43.5	-7.1	1.54 H	211	26.10	10.30
2	144.46	33.9 QP	43.5	-9.6	1.24 H	271	20.60	13.30
3	225.94	30.7 QP	46.0	-15.3	1.34 H	294	19.00	11.70
4	336.52	30.9 QP	46.0	-15.1	1.00 H	108	15.40	15.50
5	431.58	29.9 QP	46.0	-16.1	1.55 H	276	11.80	18.10
6	666.32	37.2 QP	46.0	-8.8	2.14 H	251	13.90	23.30

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	33.88	33.2 QP	40.0	-6.8	1.03 V	61	20.20	13.00
2	99.84	33.8 QP	43.5	-9.7	1.00 V	220	24.00	9.80
3	144.46	34.0 QP	43.5	-9.5	1.45 V	269	20.70	13.30
4	192.96	32.2 QP	43.5	-11.3	1.00 V	63	21.30	10.90
5	336.52	32.5 QP	46.0	-13.5	1.64 V	261	17.00	15.50
6	431.58	30.8 QP	46.0	-15.2	1.25 V	323	12.70	18.10
7	664.38	31.7 QP	46.0	-14.3	1.77 V	182	8.50	23.20

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2403 MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Martin Lee
TEST MDDE	B		

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	99.84	35.8 QP	43.5	-7.7	1.35 H	249	26.00	9.80
2	144.46	33.3 QP	43.5	-10.2	1.25 H	266	20.00	13.30
3	227.88	30.2 QP	46.0	-15.8	1.14 H	295	18.40	11.80
4	431.58	31.3 QP	46.0	-14.7	2.15 H	281	13.20	18.10
5	528.58	31.9 QP	46.0	-14.1	1.25 H	285	11.30	20.60
6	666.32	34.8 QP	46.0	-11.2	2.23 H	239	11.50	23.30
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	33.88	36.9 QP	40.0	-3.1	1.35 V	6	23.90	13.00
2	99.84	33.9 QP	43.5	-9.6	1.00 V	235	24.10	9.80
3	144.46	34.4 QP	43.5	-9.1	1.14 V	283	21.10	13.30
4	233.70	28.1 QP	46.0	-17.9	1.00 V	84	16.10	12.00
5	336.52	31.0 QP	46.0	-15.0	1.68 V	258	15.50	15.50
6	431.58	30.7 QP	46.0	-15.3	2.15 V	4	12.60	18.10

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TESTED FREQUENCY	2403 MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	3 Vdc	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 71%RH	TESTED BY	Martin Lee
TEST MDDE	C		

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	99.84	37.3 QP	43.5	-6.2	1.75 H	277	27.50	9.80
2	144.46	31.9 QP	43.5	-11.6	1.25 H	256	18.60	13.30
3	233.70	31.0 QP	46.0	-15.0	1.00 H	285	19.00	12.00
4	336.52	28.9 QP	46.0	-17.1	1.44 H	328	13.40	15.50
5	431.58	30.8 QP	46.0	-15.2	1.50 H	290	12.70	18.10
6	664.38	36.9 QP	46.0	-9.1	2.15 H	242	13.70	23.20
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	33.88	33.1 QP	40.0	-6.9	1.25 V	339	20.10	13.00
2	99.84	33.9 QP	43.5	-9.6	1.00 V	219	24.10	9.80
3	144.46	32.2 QP	43.5	-11.3	1.64 V	289	18.90	13.30
4	231.76	31.0 QP	46.0	-15.0	1.00 V	106	19.00	12.00
5	336.52	33.7 QP	46.0	-12.3	1.78 V	249	18.20	15.50
6	431.58	31.7 QP	46.0	-14.3	2.14 V	16	13.60	18.10

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



6. 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:

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Web Site: www.bureauveritas-adt.com

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

7. APPENDIX A – MODIFICATION RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---