



# FCC TEST REPORT

**REPORT NO. :** RF980814L17

**MODEL NO. :** FHA-0510

**RECEIVED :** Sep. 15, 2009

**TESTED :** Sep. 24 ~ Sep. 25, 2009

**ISSUED :** Sep. 30, 2009

**APPLICANT :** CHENG UEI PRECISION INDUSTRY CO., LTD.

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Tu Cheng City, Taipei Hsien, Taiwan, R.O.C.

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

**LAB ADDRESS :** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou  
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**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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# 1. CERTIFICATION

**PRODUCT:** 2.4GHz Wireless Mobile Mouse Dongle

**MODEL NO.:** FHA-0510

**BRAND:** Foxlink

**APPLICANT:** CHENG UEI PRECISION INDUSTRY CO., LTD.

**TESTED:** Sep. 24 ~ Sep. 25, 2009

**TEST SAMPLE:** ENGINEERING SAMPLE

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

ANSI C63.4-2003

The above equipment (model: FHA-0510) have 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 :** Suntee Liu , **DATE :** Sep. 30, 2009  
Suntee Liu / Specialist

**TECHNICAL ACCEPTANCE :** Long Chen , **DATE :** Sep. 30, 2009  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY :** Gary Chang , **DATE :** Sep. 30, 2009  
Gary Chang / Assistant 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	Meet the requirement of limit. Minimum passing margin is -13.74dB at 3.773MHz.
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 -6.10dB at 788.17MHz.

### 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
Conducted emissions	150kHz~30MHz	2.44 dB
Radiated emissions	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

<b>PRODUCT</b>	2.4GHz Wireless Mobile Mouse Dongle
<b>MODEL NO.</b>	FHA-0510
<b>FCC ID</b>	M6E-FHA0510
<b>POWER SUPPLY</b>	5Vdc from host equipment
<b>MODULATION TYPE</b>	GFSK
<b>DATA RATE</b>	1Mbps
<b>OPERATING FREQUENCY</b>	2403~2477MHz
<b>NUMBER OF CHANNEL</b>	38
<b>ANTENNA TYPE</b>	Chip antenna with -2dBi gain
<b>DATA CABLE</b>	NA
<b>I/O PORT</b>	USB
<b>ACCESSORY DEVICES</b>	NA

**NOTE:**

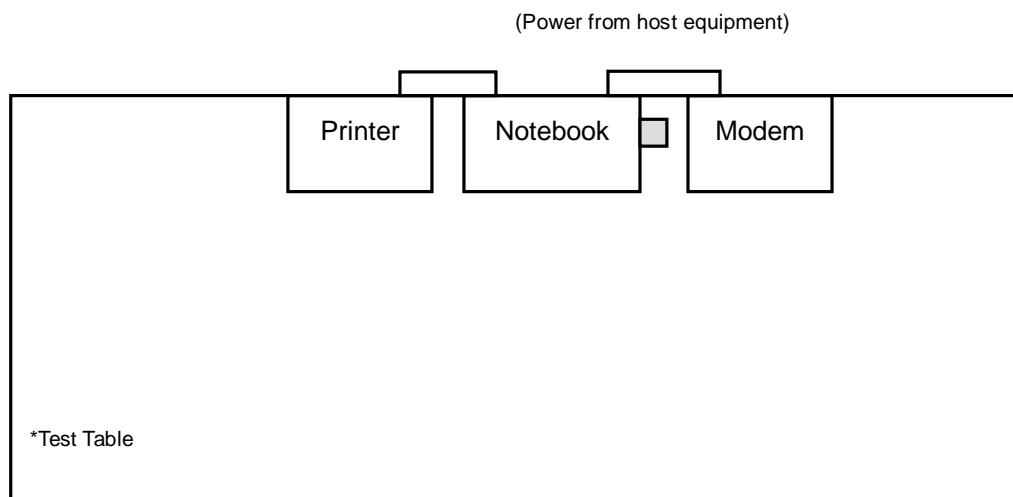
1. The EUT is a 2.4GHz Wireless Mobile Mouse Dongle with transmitter and receiver functions.
2. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

38 channels are provided to this EUT:

FREQUENCY GROUP 1		FREQUENCY GROUP 2	
FREQ. (MHz)		FREQ. (MHz)	
2403	2443	2405	2445
2407	2447	2409	2449
2411	2451	2413	2453
2415	2455	2417	2457
2419	2459	2421	2461
2423	2463	2425	2465
2427	2467	2429	2469
2431	2471	2433	2473
2435	2475	2437	2477
2439		2441	

#### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST





### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE <sup>3</sup> 1G	RE<1G	PLC	BM	
-	√	√	√	√	-

Where **PLC**: Power Line Conducted Emission

**RE<1G**: Radiated Emission below 1GHz

**RE<sup>3</sup>1G**: Radiated Emission above 1GHz

**BM**: Bandedge Measurement

#### **RADIATED EMISSION TEST (ABOVE 1 GHz):**

- 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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
2403~2477	2403, 2441, 2477	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 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
2403~2477	2403	GFSK

#### **POWER LINE CONDUCTED EMISSION TEST:**

- 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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
2403~2477	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
2403~2477	2403, 2477	GFSK



### 3.3 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 C63.4-2003**

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

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

### 3.4 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	D600	CN-0G5152-48643-47H-7666	NA
2	MODEM	ACEEX	1414V/3	0401008253	IFAXDM1414
3	PRINTER	EPSON	LQ-300+	DCGY054011	FCC DoC Approved

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.2 m braid shielded wire, DB25 & DB9 connector, w/o core.
3	1.8 m braid shielded wire, DB25 connector, w/o core.

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



## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209, 15.249 as following:

15.209 Limit		
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
15.249 Limit		
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

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), 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	ESIB7	100212	May 25, 2009	May 24, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Apr. 30, 2009	Apr. 29, 2010
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Aug. 10, 2009	Aug. 09, 2010
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 06, 2009	Jan. 05, 2010
Preamplifier Agilent	8449B	3008A01960	Nov. 03, 2008	Nov. 02, 2009
Preamplifier Agilent	8447D	2944A10638	Dec. 26, 2008	Dec. 25, 2009
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	218190/4 231241/4	May 13, 2009	May 12, 2010
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 17, 2009	Aug. 16, 2010
Software	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 test was performed in HwaYa Chamber 9.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 460141.
  5. The IC Site Registration No. is IC 7450F-4.

#### 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.

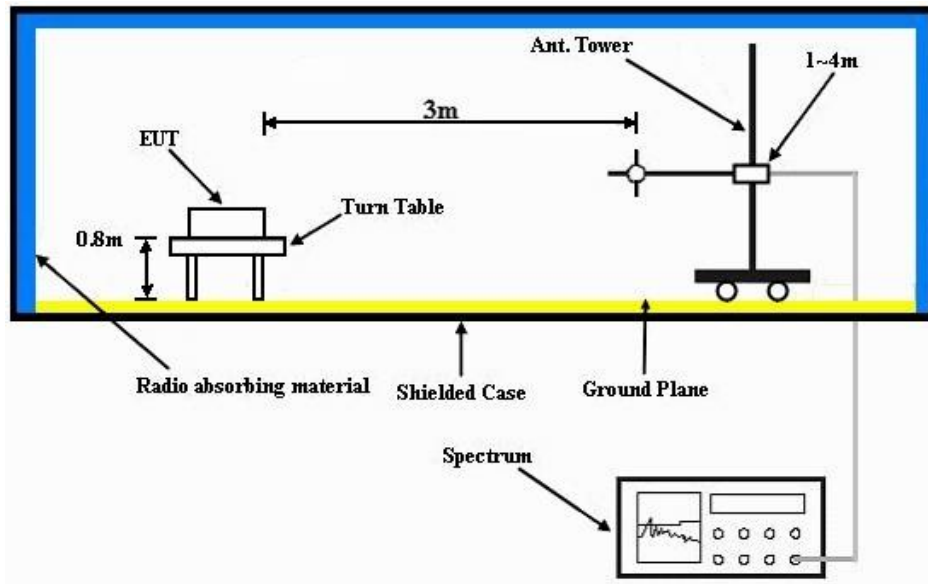
**NOTE:**

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 1 MHz 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

- a. Plugged the EUT to a notebook and placed on a testing table.
- b. The notebook ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the system in full functions.



## 4.1.7 TEST RESULTS

### ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2403MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65%RH 980 hPa	TESTED BY	Lori Chiu

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	2323.00	51.34 PK	74.00	-22.66	1.34 H	289	19.38	31.96
2	2323.00	47.23 AV	54.00	-6.77	1.34 H	289	15.27	31.96
3	2398.00	58.01 PK	74.00	-15.99	1.55 H	19	25.76	32.25
4	2398.00	37.99 AV	54.00	-16.01	1.55 H	19	5.74	32.25
5	2400.00	45.99 PK	74.00	-28.01	1.55 H	19	13.73	32.26
6	2400.00	10.48 AV	54.00	-43.52	1.55 H	19	-21.78	32.26
7	*2403.00	87.96 PK	114.00	-26.04	1.55 H	19	55.69	32.27
8	*2403.00	52.45 AV	94.00	-41.55	1.55 H	19	20.18	32.27
9	4806.00	50.50 PK	74.00	-23.50	1.08 H	54	12.20	38.30
10	4806.00	14.99 AV	54.00	-39.01	1.08 H	54	-23.31	38.30

- 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:  
 $20 \log (\text{Duty cycle}) = 20 \log (1.677 \text{ ms} / 100 \text{ ms}) = -35.51 \text{ dB}$   
 Please see page 17 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2403MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65%RH 980 hPa	TESTED BY	Lori Chiu

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	2323.00	47.07 PK	74.00	-26.93	1.55 V	19	15.11	31.96
2	2323.00	43.56 AV	54.00	-10.44	1.55 V	19	11.60	31.96
3	2398.00	55.41 PK	74.00	-18.59	1.34 V	280	23.16	32.25
4	2398.00	32.33 AV	54.00	-21.67	1.34 V	280	0.08	32.25
5	2400.00	41.60 PK	74.00	-32.40	1.55 V	19	9.34	32.26
6	2400.00	6.09 AV	54.00	-47.91	1.55 V	19	-26.17	32.26
7	*2403.00	83.57 PK	114.00	-30.43	1.55 V	19	51.30	32.27
8	*2403.00	48.06 AV	94.00	-45.94	1.55 V	19	15.79	32.27
9	4806.00	47.94 PK	74.00	-26.06	1.08 V	100	9.64	38.30
10	4806.00	12.43 AV	54.00	-41.57	1.08 V	100	-25.87	38.30

- 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:  
 $20 \log (\text{Duty cycle}) = 20 \log (1.677 \text{ ms} / 100 \text{ ms}) = -35.51 \text{ dB}$   
 Please see page 17 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2441MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65%RH 980 hPa	TESTED BY	Lori Chiu

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	*2441.00	89.12 PK	114.00	-24.88	1.44 H	235	56.71	32.41
2	*2441.00	53.61 AV	94.00	-40.39	1.44 H	235	21.20	32.41
3	4882.00	51.93 PK	74.00	-22.07	1.09 H	71	13.51	38.42
4	4882.00	16.42 AV	54.00	-37.58	1.09 H	71	-22.00	38.42
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	*2441.00	83.45 PK	114.00	-30.55	1.54 V	27	51.04	32.41
2	*2441.00	47.94 AV	94.00	-46.06	1.54 V	27	15.53	32.41
3	4882.00	49.42 PK	74.00	-24.58	1.09 V	71	11.00	38.42
4	4882.00	13.91 AV	54.00	-40.09	1.09 V	71	-24.51	38.42

- 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:  
 $20 \log (\text{Duty cycle}) = 20 \log (1.677 \text{ ms} / 100 \text{ ms}) = -35.51 \text{ dB}$   
 Please see page 17 for plotted duty.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2477MHz	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25 deg. C, 65%RH 980 hPa	TESTED BY	Lori Chiu

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	*2477.00	89.00 PK	114.00	-25.00	1.34 H	233	56.46	32.54
2	*2477.00	53.49 AV	94.00	-40.51	1.34 H	233	20.95	32.54
3	2483.50	41.74 PK	74.00	-32.26	1.34 H	233	9.18	32.56
4	2483.50	6.23 AV	54.00	-47.77	1.34 H	233	-26.33	32.56
5	2485.50	55.16 PK	74.00	-18.84	1.34 H	233	22.59	32.57
6	2485.50	35.01 AV	54.00	-18.99	1.34 H	233	2.44	32.57
7	4954.00	50.93 PK	74.00	-23.07	1.08 H	74	12.33	38.60
8	4954.00	15.42 AV	54.00	-38.58	1.08 H	74	-23.18	38.60

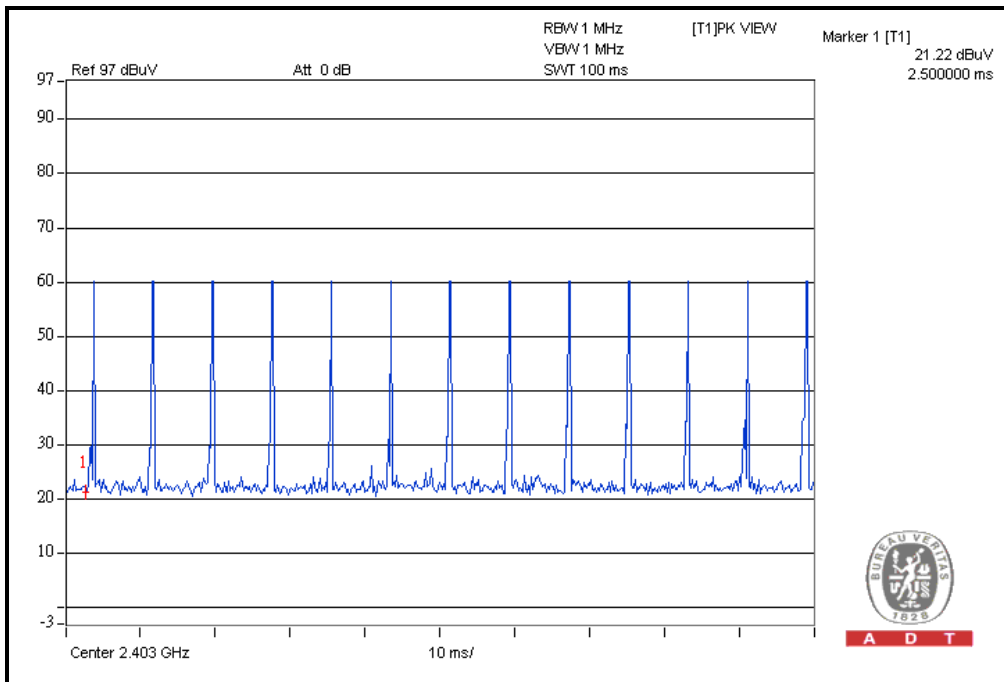
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2477.00	83.61 PK	114.00	-30.39	1.82 V	25	51.07	32.54
2	*2477.00	48.10 AV	94.00	-45.90	1.82 V	25	15.56	32.54
3	2483.50	36.35 PK	74.00	-37.65	1.82 V	25	3.79	32.56
4	2483.50	0.84 AV	54.00	-53.16	1.82 V	25	-31.72	32.56
5	2485.50	51.94 PK	74.00	-22.06	1.82 V	25	19.37	32.57
6	2485.50	30.85 AV	54.00	-23.15	1.82 V	25	-1.72	32.57
7	4954.00	49.61 PK	74.00	-24.39	1.30 V	353	11.01	38.60
8	4954.00	14.10 AV	54.00	-39.90	1.30 V	353	-24.50	38.60

- 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:  
 $20 \log (\text{Duty cycle}) = 20 \log (1.677 \text{ ms} / 100 \text{ ms}) = -35.51 \text{ dB}$   
 Please see page 17 for plotted duty.

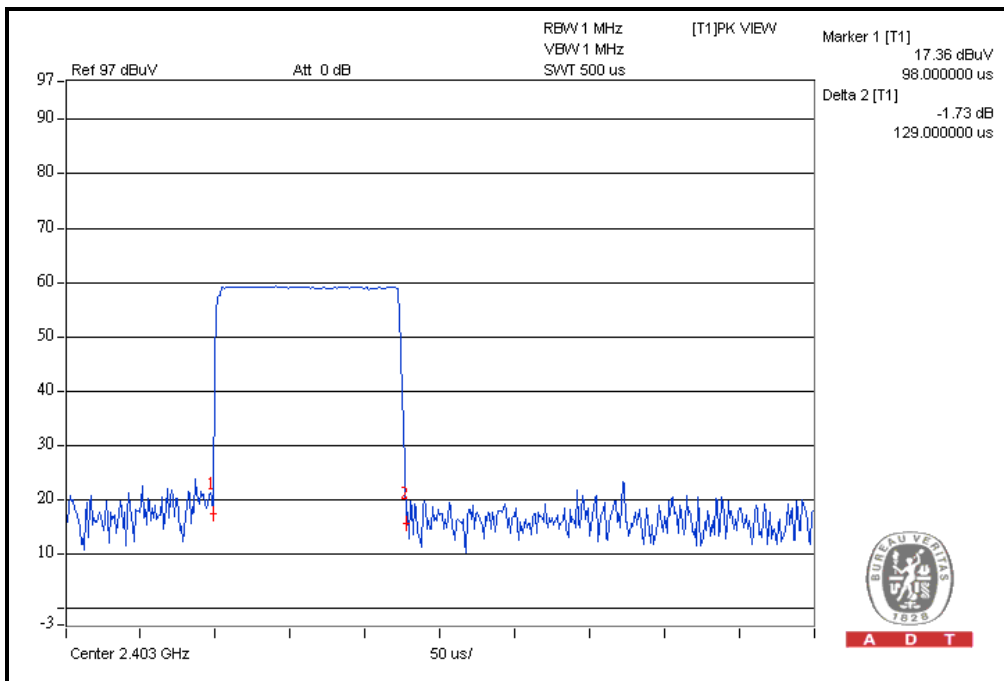




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$$20 \log (\text{Duty cycle}) = 20 \log (13 \cdot 0.129 \text{ ms} / 100 \text{ ms}) = -35.51 \text{ dB}$$



### BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2403MHz	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120 Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25 deg. C, 65%RH 980 hPa	TESTED BY	Mark Liao

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	96.01	29.45 QP	43.50	-14.05	2.00 H	154	20.16	9.29
2	158.22	29.31 QP	43.50	-14.19	1.50 H	304	15.57	13.74
3	354.60	33.50 QP	46.00	-12.50	2.00 H	19	18.54	14.96
4	624.85	30.16 QP	46.00	-15.84	1.50 H	67	8.04	22.11
5	665.68	31.95 QP	46.00	-14.05	1.25 H	328	9.50	22.45
6	788.17	39.90 QP	46.00	-6.10	1.00 H	118	14.90	24.99
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	31.00	33.42 QP	40.00	-6.58	1.02 V	55	21.17	12.25
2	94.06	36.66 QP	43.50	-6.84	1.50 V	70	27.39	9.26
3	164.06	37.18 QP	43.50	-6.32	1.00 V	142	23.78	13.40
4	401.26	30.96 QP	46.00	-15.04	1.00 V	40	14.86	16.10
5	630.69	34.94 QP	46.00	-11.06	2.00 V	139	12.78	22.16
6	788.17	37.14 QP	46.00	-8.86	1.00 V	10	12.15	24.99

- 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.

## 4.2 CONDUCTED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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 0.50 MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Nov. 19, 2008	Nov. 18, 2009
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 31, 2008	Dec. 30, 2009
LISN SCHWARZBECK	NNBL 8226-2	8226-142	Jun. 03, 2009	Jun. 02, 2010
LISN ROHDE & SCHWARZ	ESH2-Z5	100104	Dec. 04, 2008	Dec. 03, 2009
Software ADT	ADT_Cond_ V7.3.7	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 HwaYa Shielded Room 1.
  3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 TEST PROCEDURES

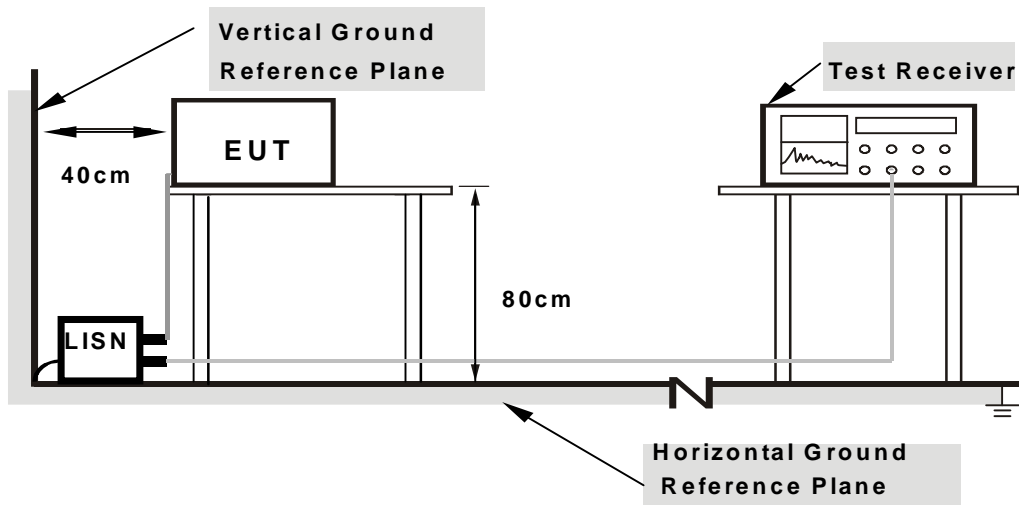
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
  2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

#### 4.2.6 EUT OPERATING CONDITIONS

Same as item 4.1.6.

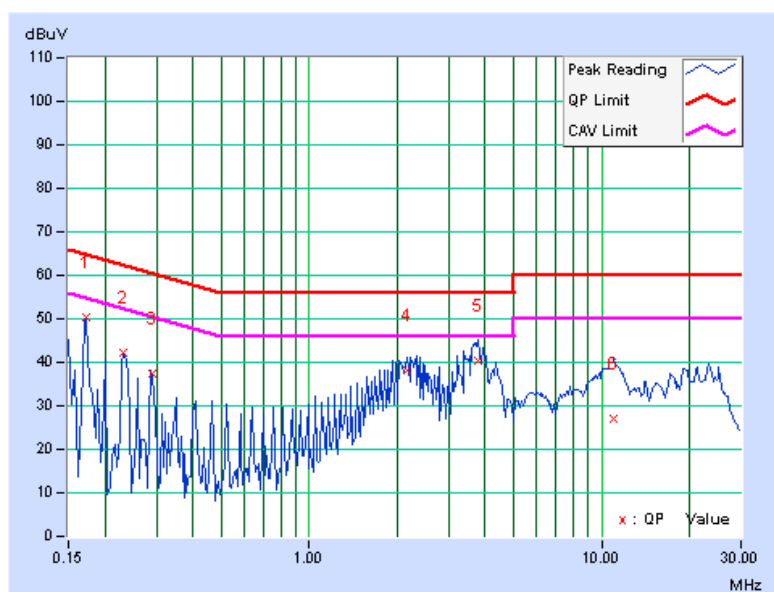
## 4.2.7 TEST RESULTS

### CONDUCTED WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2403MHz	PHASE	Line 1
MODULATION TYPE	GFSK	INPUT POWER (STSTEM)	120 Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25 deg. C, 65% RH, 980 hPa	6dB BANDWIDTH	9 kHz
TESTED BY	Lori Chiu		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.173	0.13	50.42	-	50.55	-	64.79	54.79	-14.24	-
2	0.232	0.13	41.94	-	42.07	-	62.38	52.38	-20.31	-
3	0.289	0.13	37.13	-	37.26	-	60.54	50.54	-23.28	-
4	2.152	0.24	37.77	-	38.01	-	56.00	46.00	-17.99	-
5	3.781	0.35	40.10	-	40.45	-	56.00	46.00	-15.55	-
6	11.000	0.71	26.51	-	27.22	-	60.00	50.00	-32.78	-

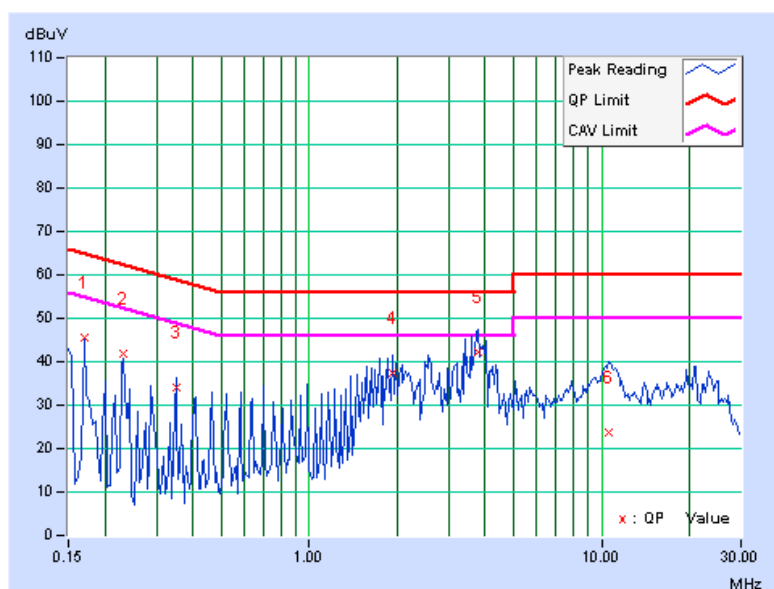
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
TEST FREQUENCY	2403MHz	PHASE	Line 2
MODULATION TYPE	GFSK	INPUT POWER (STSTEM)	120 Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25 deg. C, 65% RH, 980 hPa	6dB BANDWIDTH	9 kHz
TESTED BY	Lori Chiu		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.170	0.14	45.44	-	45.58	-	64.98	54.98	-19.40	-
2	0.232	0.15	41.68	-	41.83	-	62.38	52.38	-20.55	-
3	0.349	0.16	33.84	-	34.00	-	58.98	48.98	-24.98	-
4	1.918	0.25	37.21	-	37.46	-	56.00	46.00	-18.54	-
<b>5</b>	<b>3.773</b>	<b>0.37</b>	<b>41.89</b>	-	<b>42.26</b>	-	<b>56.00</b>	<b>46.00</b>	<b>-13.74</b>	-
6	10.629	0.68	22.90	-	23.58	-	60.00	50.00	-36.42	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.





### 4.3 BAND EDGES MEASUREMENT

#### 4.3.1 LIMITS OF BAND EDGES MEASUREMENT

Below –50dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

#### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots are attached on the following pages.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

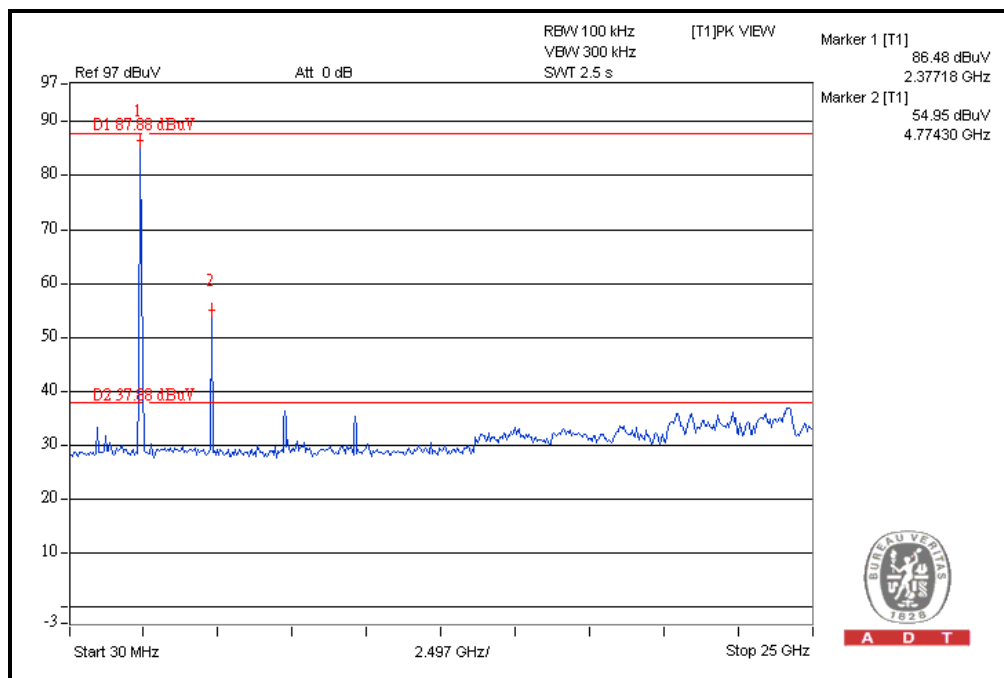
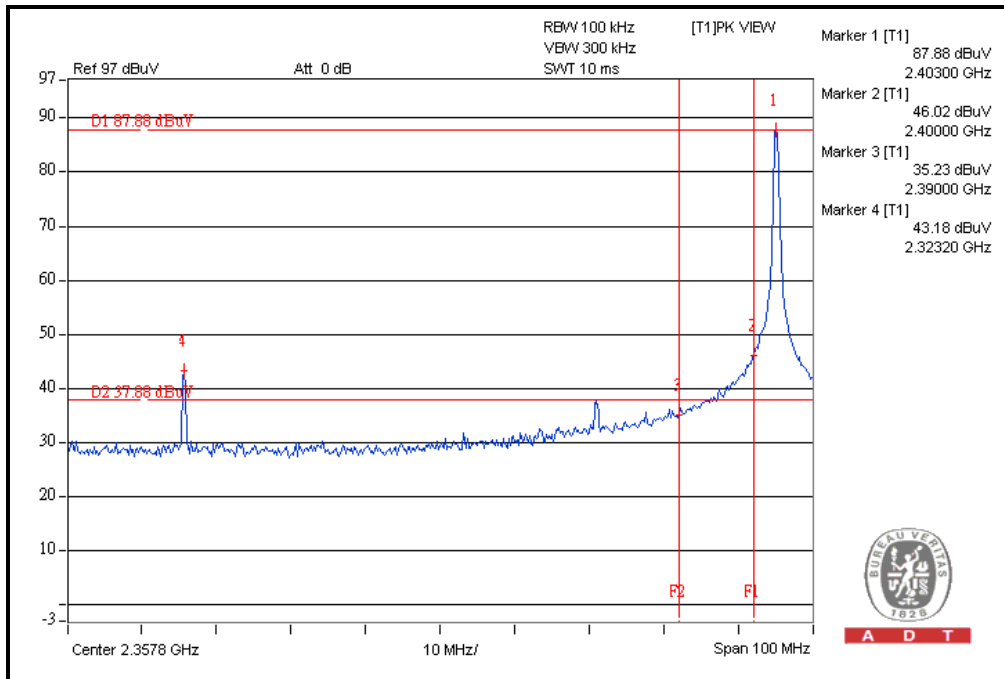
#### 4.3.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest and highest channel frequencies individually.



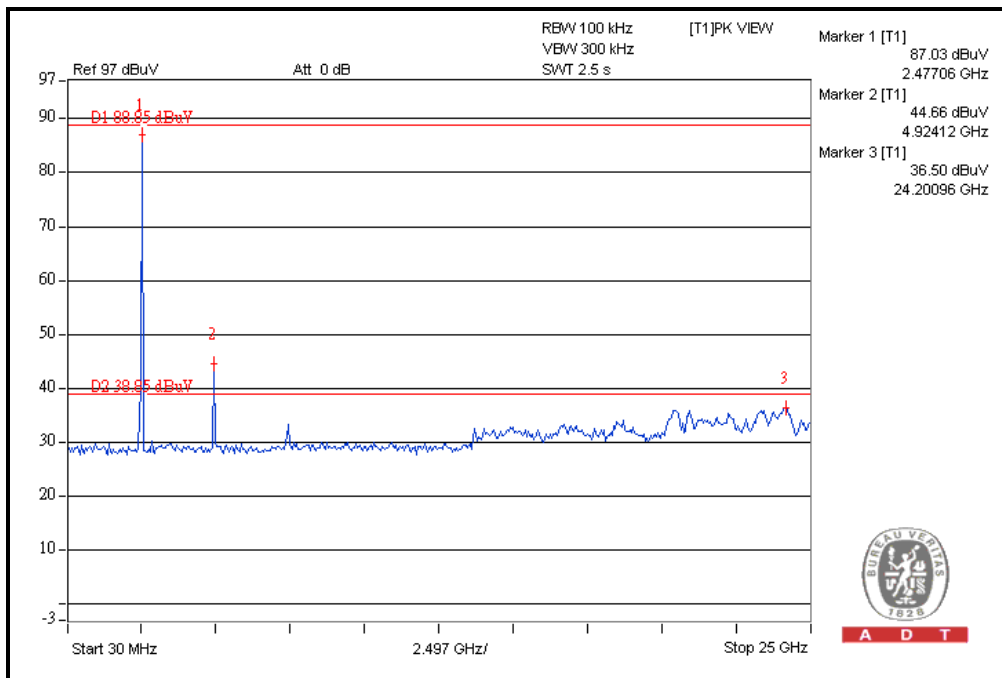
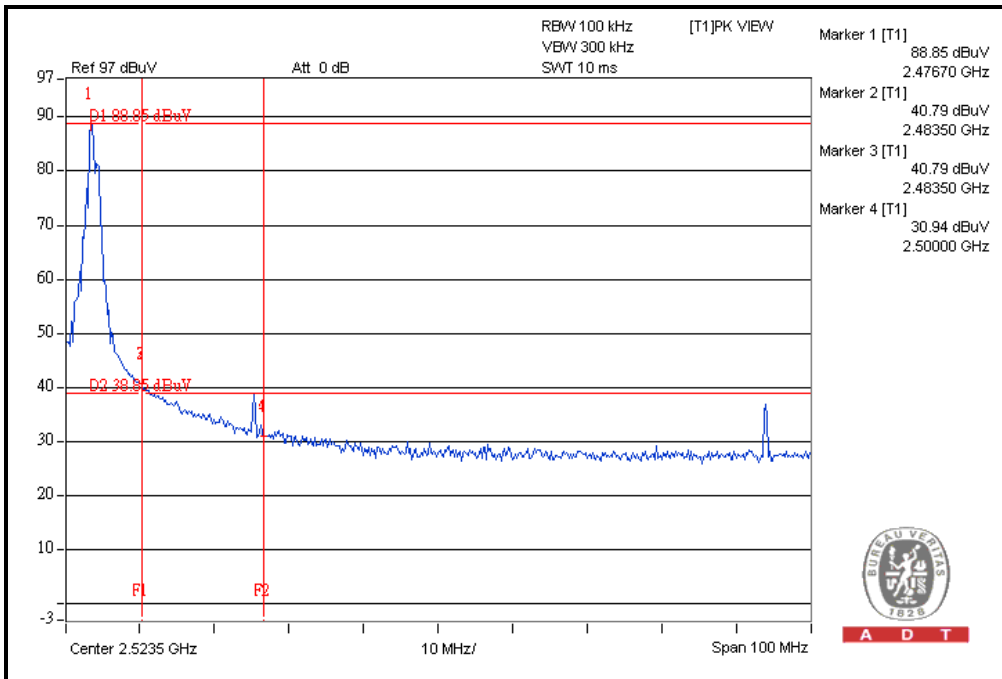
### 4.3.6 TEST RESULTS

The spectrum plots are attached on the following 4 images. D1 line indicates the highest level, and D2 line indicates the 50dB offset below D1. It shows compliance with the requirement in part 15.249 (d).





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## 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 by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC, NVLAP
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA, CSA
<b>R.O.C.</b>	TAF, BSMI, NCC
<b>Netherlands</b>	Telefication
<b>Singapore</b>	GOST-ASIA(MOU)
<b>Russia</b>	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: [www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml). 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**  
Tel: 886-3-5935343  
Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab**  
Tel: 886-3-3183232  
Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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



## **7. APPENDIX A – MODIFICATIONS 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 ---**