



# FCC TEST REPORT

**REPORT NO. :** RF970110L18

**MODEL NO. :** MX W1-R

**RECEIVED :** Dec. 24, 2007

**TESTED :** Dec. 24, 2007 ~ Jan. 14, 2008

**ISSUED :** Feb. 18, 2008

**PREPARE BY :** Sennheiser electronic GmbH & Co. KG

**ADDRESS :** Am Labor 1, D-30900 Wedemark, Germany

**ISSUED BY :** Advance Data Technology Corporation

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

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## 1. CERTIFICATION

**PRODUCT:** Digital wireless earphone system

**MODEL:** MX W1-R

**BRAND:** Sennheiser

**PREPARE BY:** Sennheiser electronic GmbH & Co. KG

**TESTED:** Dec. 24, 2007 ~ Jan. 14, 2008

**TEST SAMPLE:** ENGINEERING SAMPLE

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

ANSI C63.4-2003

The above equipment (model: MX W1-R) have been tested by **Advance Data Technology Corporation**, 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** : Andrea Hsia , **DATE:** Feb. 18, 2008  
Andrea Hsia / Specialist

**TECHNICAL ACCEPTANCE** : Long Chen , **DATE:** Feb. 18, 2008  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY** : Gary Chang , **DATE:** Feb. 18, 2008  
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	Power supply is 3.7Vdc 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 -1.87dB at 2399.50MHz.

### 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	9kHz ~ 30MHz	2.44 dB
	30MHz ~ 200MHz	3.34 dB
Radiated emissions	200MHz ~1000MHz	3.35 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>EUT</b>	Digital wireless earphone system
<b>MODEL NO.</b>	MX W1-R
<b>FCC ID</b>	DMOMXW1R
<b>POWER SUPPLY</b>	3.7Vdc from battery (for earphone) 5.0Vdc from host equipment or adapter (for docking station)
<b>MODULATION TYPE</b>	MSK
<b>FREQUENCY RANGE</b>	2400 ~ 2483.5MHz
<b>NUMBER OF CHANNEL</b>	16
<b>ANTENNA TYPE</b>	Monopole antenna with 0dBi gain Ceramic antenna with 0.5dBi gain
<b>DATA CABLE</b>	2.0 m shielded USB cable
<b>I/O PORT</b>	NA
<b>ACCESSORY DEVICE</b>	NA

**NOTE:**

1. The EUT is a digital wireless earphone system. It is including a set of earphone, a docking station and a transmitter. This report is only covered the earphone and the docking station. For the transmitter is covered in another test report (Report no.: RF961224L09).
2. There is no function during the charging mode.
3. The EUT was powered by the following battery:

**Battery:**

<b>EUT</b>	<b>Battery Spec.</b>
Earphone	3.7 Vdc, 120mAh

4. The docking station was powered by the following adapter:

<b>BRAND</b>	PHIHONG
<b>MODEL</b>	PSC03R-050
<b>INPUT POWER</b>	100-240Vac, 50-60Hz, 0.2A
<b>OUTPUT POWER</b>	5Vdc, 0.5A

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

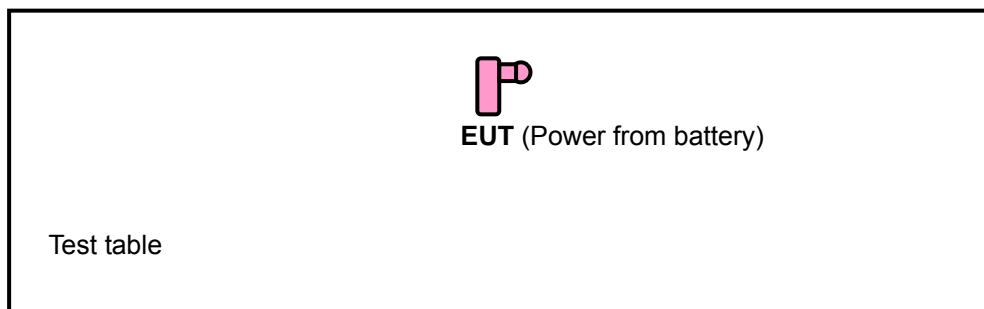
### 3.2 DESCRIPTION OF TEST MODES

16 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2403.00	8	2443.00
1	2408.00	9	2448.00
2	2413.00	10	2453.00
3	2418.00	11	2458.00
4	2423.00	12	2463.00
5	2428.00	13	2468.00
6	2433.00	14	2473.00
7	2438.00	15	2478.00

#### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

##### TEST MODE A & B





### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE $<$ 1G	PLC	BM	
A	√	√	-	√	For Monopole antenna
B	√	√	-	√	For Ceramic antenna

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

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

**PLC**: Power Line Conducted Emission

**BM**: Bandedge Measurement

**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, data rates, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	AXIS
A	0 to 15	0, 7, 15	MSK	Y
B	0 to 15	0, 7, 15	MSK	Z

#### RADIATED EMISSION TEST (BELOW 1 GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	AXIS
A	0 to 15	0, 7, 15	MSK	Y
B	0 to 15	0, 7, 15	MSK	Z

#### 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 CHANNEL	MODULATION TYPE
A	0 to 15	0, 15	MSK
B	0 to 15	0, 15	MSK



### 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	Mine cassette recorder	Panasonic	RQ-L11	NA	NA
2	Transmitter	Sennheiser	MX W1-T	NA	DMOMXW1T

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

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



## 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.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Jul. 27, 2008
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Feb. 26, 2008
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	May 31, 2008
HORN Antenna SCHWARZBECK	9120D	9120D-209	Jun. 28, 2008
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 24, 2008
Preamplifier Agilent	8447D	2944A10633	Oct. 28, 2008
Preamplifier Agilent	8449B	3008A01964	Oct. 23, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283402/4	Dec. 06, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	251644/4	Dec. 06, 2008
Software ADT.	ADT_Radiated_V7.6	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA
Turn Table ADT.	TT100.	TT93021703	NA
Turn Table Controller ADT.	SC100.	SC93021703	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 3.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The VCCI Site Registration No. is R-237.
  5. The IC Site Registration No. is IC3789B-3.

#### 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.

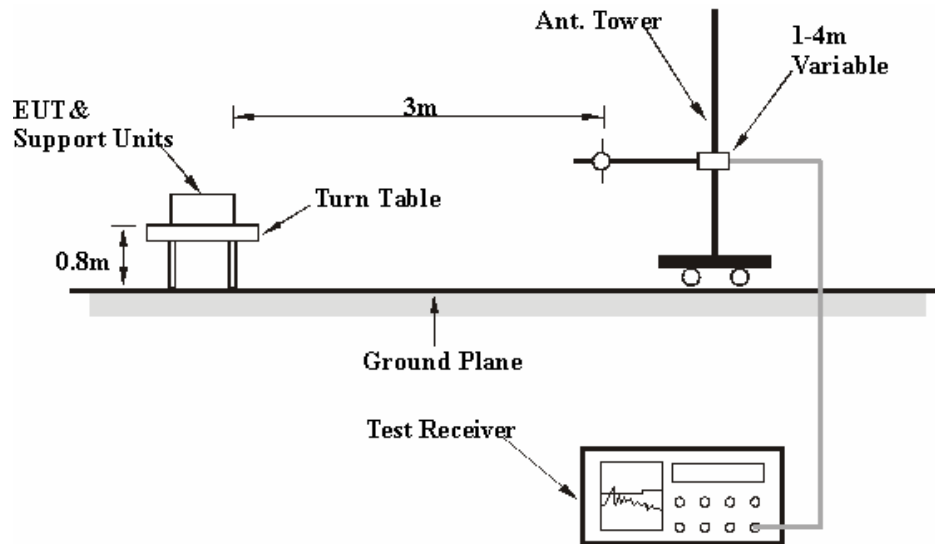
**NOTE:**

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

##### TEST MODE A & B

- a. Placed the EUT on the testing table.
- b. Set the EUT under transmitting condition.

#### 4.1.7 TEST RESULTS

##### ABOVE 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	A
TESTED BY	Dean Wang		

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	57.56 PK	74.00	-16.44	1.37 H	297	25.32	32.24
2	2390.00	47.09 AV	54.00	-6.91	1.37 H	297	14.85	32.24
3	<b>2399.50</b>	<b>72.13 PK</b>	<b>74.00</b>	<b>-1.87</b>	<b>1.37 H</b>	<b>297</b>	<b>39.85</b>	<b>32.28</b>
4	2399.50	48.17 AV	54.00	-5.83	1.37 H	297	15.89	32.28
5	*2403.00	94.51 PK	114.00	-19.49	1.37 H	298	62.22	32.29
6	*2403.00	71.17 AV	94.00	-22.83	1.37 H	298	38.88	32.29
7	4806.00	50.11 PK	74.00	-23.89	1.00 H	16	12.05	38.06
8	4806.00	26.77 AV	54.00	-27.23	1.00 H	16	-11.29	38.06

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	57.08 PK	74.00	-16.92	1.31 V	206	24.84	32.24
2	2390.00	46.79 AV	54.00	-7.21	1.31 V	206	14.55	32.24
3	2399.50	70.02 PK	74.00	-3.98	1.31 V	206	37.74	32.28
4	2399.50	46.34 AV	54.00	-7.66	1.31 V	206	14.06	32.28
5	2403.00	90.39 PK	114.00	-23.61	1.31 V	206	58.10	32.29
6	2403.00	67.05 AV	94.00	-26.95	1.31 V	206	34.76	32.29
7	4806.00	51.48 PK	74.00	-22.52	1.13 V	214	13.42	38.06
8	4806.00	28.14 AV	54.00	-25.86	1.13 V	214	-9.92	38.06

- 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:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.162 \times 42}{100 \text{ ms}} = -23.34\text{dB}$$

Please see page 20 for plotted duty

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 7	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	A
TESTED BY	Dean Wang		

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	*2438.00	94.41 PK	114.00	-19.59	1.32 H	38	62.00	32.41
2	*2438.00	71.07 AV	94.00	-22.93	1.32 H	38	38.66	32.41
3	4876.00	49.84 PK	74.00	-24.16	1.13 H	216	11.51	38.33
4	4876.00	26.50 AV	54.00	-27.50	1.13 H	216	-11.83	38.33

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	*2438.00	90.86 PK	114.00	-23.14	1.18 V	187	58.45	32.41
2	*2438.00	67.52 AV	94.00	-26.48	1.18 V	187	35.11	32.41
3	4876.00	51.67 PK	74.00	-22.33	1.00 V	315	13.34	38.33
4	4876.00	28.33 AV	54.00	-25.67	1.00 V	315	-10.00	38.33

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
  2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
  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:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.162 \times 42}{100 \text{ ms}} = -23.34\text{dB}$$

Please see page 20 for plotted duty

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 15	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	A
TESTED BY	Dean Wang		

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	*2478.00	94.09 PK	114.00	-19.91	1.00 H	307	61.55	32.54
2	*2478.00	70.75 AV	94.00	-23.25	1.00 H	307	38.21	32.54
3	2483.50	62.84 PK	74.00	-11.16	1.00 H	307	30.28	32.56
4	2483.50	48.43 AV	54.00	-5.57	1.00 H	307	15.87	32.56
5	4956.00	50.11 PK	74.00	-23.89	1.05 H	23	11.60	38.51
6	4956.00	26.77 AV	54.00	-27.23	1.05 H	23	-11.74	38.51

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	*2478.00	90.57 PK	114.00	-23.43	1.20 V	192	58.03	32.54
2	*2478.00	67.23 AV	94.00	-26.77	1.20 V	192	34.69	32.54
3	2483.50	60.38 PK	74.00	-13.62	1.20 V	192	27.82	32.56
4	2483.50	45.80 AV	54.00	-8.20	1.20 V	192	13.24	32.56
5	4956.00	51.51 PK	74.00	-22.49	1.00 V	264	13.00	38.51
6	4956.00	28.17 AV	54.00	-25.83	1.00 V	264	-10.34	38.51

- 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:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.162 \times 42}{100 \text{ ms}} = -23.34\text{dB}$$

Please see page 20 for plotted duty

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	B
TESTED BY	Dean Wang		

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	56.24 PK	74.00	-17.76	1.68 H	333	24.86	31.38
2	2390.00	44.38 AV	54.00	-9.62	1.68 H	333	13.00	31.38
3	2399.50	58.24 PK	74.00	-15.76	1.68 H	333	26.82	31.42
4	2399.50	44.13 AV	54.00	-9.87	1.68 H	333	12.71	31.42
5	*2403.00	81.69 PK	114.00	-32.31	1.69 H	333	50.26	31.43
6	*2403.00	58.35 AV	94.00	-35.65	1.69 H	333	26.92	31.43
7	4806.00	48.90 PK	74.00	-25.10	1.00 H	115	11.28	37.62
8	4806.00	25.56 AV	54.00	-28.44	1.00 H	115	-12.06	37.62
9	12015.00	54.45 PK	74.00	-19.55	1.00 H	360	5.51	48.94
10	12015.00	31.11 AV	54.00	-22.89	1.00 H	360	-17.83	48.94

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	57.09 PK	74.00	-16.91	1.03 V	3	25.71	31.38
2	2390.00	44.92 AV	54.00	-9.08	1.03 V	3	13.54	31.38
3	2399.50	60.28 PK	74.00	-13.72	1.03 V	3	28.86	31.42
4	2399.50	46.02 AV	54.00	-7.98	1.03 V	3	14.60	31.42
5	*2403.00	84.43 PK	114.00	-29.57	1.00 V	3	53.00	31.43
6	*2403.00	61.09 AV	94.00	-32.91	1.00 V	3	29.66	31.43
7	4806.00	51.71 PK	74.00	-22.29	1.22 V	123	14.09	37.62
8	4806.00	28.37 AV	54.00	-25.63	1.22 V	123	-9.25	37.62
9	12015.00	57.31 PK	74.00	-16.69	1.20 V	360	8.37	48.94
10	12015.00	33.97 AV	54.00	-20.03	1.20 V	360	-14.97	48.94

- 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:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.162 \times 42}{100 \text{ ms}} = -23.34\text{dB}$$

Please see page 20 for plotted duty



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 7	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	B
TESTED BY	Dean Wang		

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	*2438.00	80.27 PK	114.00	-33.73	1.14 H	53	48.72	31.55
2	*2438.00	56.93 AV	94.00	-37.07	1.14 H	53	25.38	31.55
3	4876.00	49.62 PK	74.00	-24.38	1.14 H	100	11.82	37.80
4	4876.00	26.28 AV	54.00	-27.72	1.14 H	100	-11.52	37.80

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	*2438.00	82.67 PK	114.00	-31.33	1.22 V	334	51.12	31.55
2	*2438.00	59.33 AV	94.00	-34.67	1.22 V	334	27.78	31.55
3	4876.00	50.44 PK	74.00	-23.56	1.22 V	200	12.64	37.80
4	4876.00	27.10 AV	54.00	-26.90	1.22 V	200	-10.70	37.80

- 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:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.162 \times 42}{100 \text{ ms}} = -23.34\text{dB}$$

Please see page 20 for plotted duty

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 15	FREQUENCY RANGE	1 ~ 25GHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	B
TESTED BY	Dean Wang		

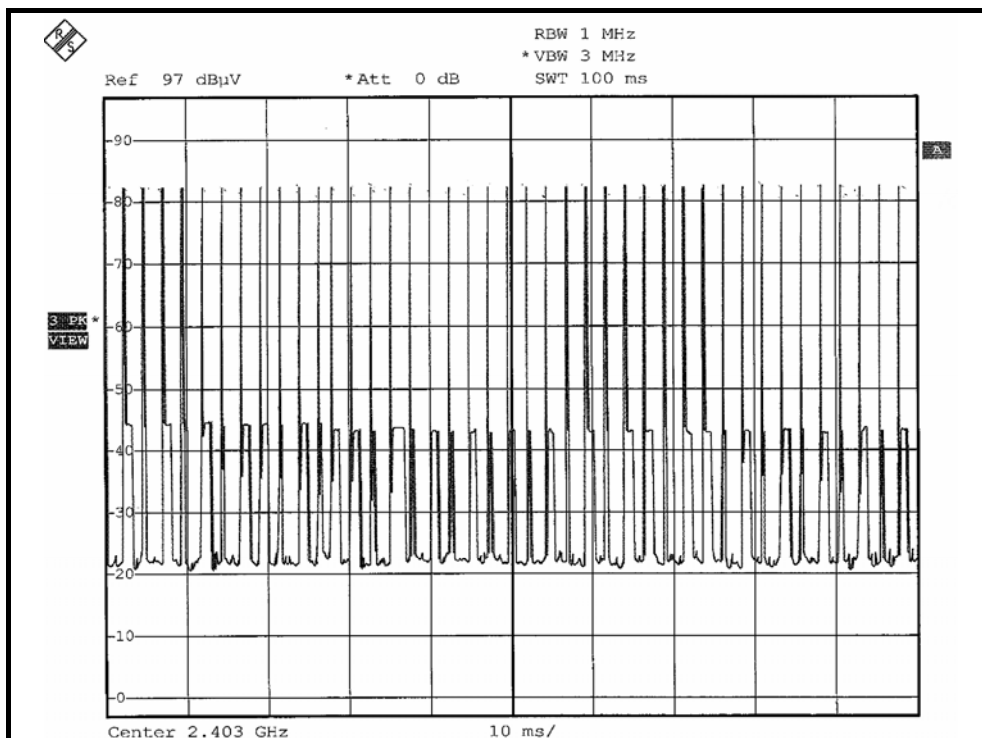
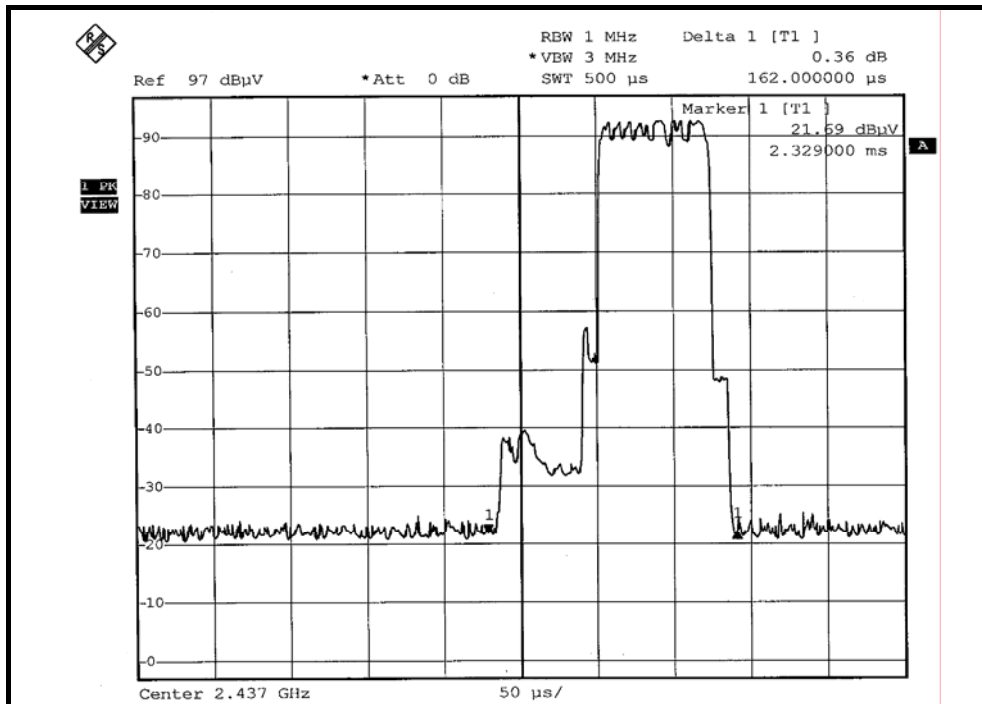
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2478.00	80.07 PK	114.00	-33.93	1.11 H	100	47.53	32.54
2	*2478.00	56.73 AV	94.00	-37.27	1.11 H	100	24.19	32.54
3	2483.50	55.47 PK	74.00	-18.53	1.11 H	0	22.91	32.56
4	2483.50	32.13 AV	54.00	-21.87	1.11 H	0	-0.43	32.56
5	4956.00	48.57 PK	74.00	-25.43	1.14 H	360	10.06	38.51
6	4956.00	25.23 AV	54.00	-28.77	1.14 H	360	-13.28	38.51

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	*2478.00	82.22 PK	114.00	-31.78	1.08 V	343	49.68	32.54
2	*2478.00	58.88 AV	94.00	-35.12	1.08 V	343	26.34	32.54
3	2483.50	56.41 PK	74.00	-17.59	1.08 V	343	23.85	32.56
4	2483.50	43.28 AV	54.00	-10.72	1.08 V	343	10.72	32.56
5	4956.00	52.44 PK	74.00	-21.56	1.08 V	337	13.93	38.51
6	4956.00	29.10 AV	54.00	-24.90	1.08 V	337	-9.41	38.51

- 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:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.162 \times 42}{100 \text{ ms}} = -23.34\text{dB}$$

Please see page 20 for plotted duty



$$\text{Duty factor} = 20\log(\text{Duty cycle}) = 20\log \frac{0.162 \cdot 42}{100 \text{ ms}} = -23.34\text{dB}$$

**RADIATED WORST-CASE DATA: BELOW 1GHZ**

EUT TEST CONDITION		MEASUREMENT DETAIL	
<b>CHANNEL</b>	Channel 0	<b>FREQUENCY RANGE</b>	Below 1000MHz
<b>MODULATION TYPE</b>	MSK	<b>DETECTOR FUNCTION</b>	Quasi-Peak
<b>ENVIRONMENTAL CONDITIONS</b>	23deg. C, 62%RH, 991hPa	<b>TEST MODE</b>	A
<b>TESTED BY</b>	Dean Wang		

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	228.22	17.38 QP	46.00	-28.62	1.25 H	205	4.86	12.52
2	286.55	19.76 QP	46.00	-26.24	1.00 H	187	4.94	14.83
3	358.48	19.81 QP	46.00	-26.19	2.00 H	229	3.14	16.67
4	747.34	26.16 QP	46.00	-19.84	2.00 H	325	0.59	25.57
5	813.45	25.59 QP	46.00	-20.41	1.50 H	349	-0.58	26.17
6	830.95	26.58 QP	46.00	-19.42	1.25 H	154	0.04	26.55
7	864.00	26.98 QP	46.00	-19.02	1.50 H	49	-0.16	27.14
8	899.00	27.14 QP	46.00	-18.86	1.25 H	301	-0.44	27.59
9	932.05	28.74 QP	46.00	-17.26	1.25 H	295	0.68	28.06

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	103.78	14.48 QP	43.50	-29.02	1.25 V	28	3.83	10.65
2	286.55	18.99 QP	46.00	-27.01	1.50 V	310	4.16	14.83
3	329.32	17.40 QP	46.00	-28.60	1.50 V	190	1.48	15.92
4	591.80	22.24 QP	46.00	-23.76	1.50 V	31	-0.02	22.26
5	720.12	24.82 QP	46.00	-21.18	1.50 V	346	0.04	24.78
6	846.50	27.50 QP	46.00	-18.50	1.50 V	214	0.61	26.88
7	881.50	28.92 QP	46.00	-17.08	1.00 V	10	1.55	27.36
8	916.50	27.99 QP	46.00	-18.01	1.25 V	88	0.15	27.84

- 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	
CHANNEL	Channel 0	FREQUENCY RANGE	Below 1000MHz
MODULATION TYPE	MSK	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	23deg. C, 62%RH, 991hPa	TEST MODE	B
TESTED BY	Dean Wang		

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	66.84	19.24 QP	40.00	-20.76	1.50 H	157	6.55	12.69
2	138.78	24.20 QP	43.50	-19.30	2.00 H	139	10.85	13.35
3	315.71	23.23 QP	46.00	-22.77	1.50 H	10	8.08	15.15
4	599.58	21.93 QP	46.00	-24.07	1.50 H	169	-1.21	23.13
5	743.45	24.78 QP	46.00	-21.22	1.50 H	313	-0.98	25.75
6	947.60	30.15 QP	46.00	-15.85	1.50 H	265	1.66	28.49

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.84	21.84 QP	40.00	-18.16	1.00 V	313	9.15	12.69
2	101.84	22.18 QP	43.50	-21.32	1.50 V	232	11.90	10.29
3	315.71	17.17 QP	46.00	-28.83	1.50 V	220	2.01	15.15
4	599.58	22.53 QP	46.00	-23.47	1.00 V	145	-0.60	23.13
5	735.68	24.12 QP	46.00	-21.88	1.50 V	115	-1.55	25.66
6	955.38	30.65 QP	46.00	-15.35	2.00 V	184	2.07	28.59

- 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 BAND EDGES MEASUREMENT

### 4.2.1 LIMITS OF BAND EDGES MEASUREMENT

Below  $-50\text{dB}$  of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSP40	100040	Jun. 28, 2008

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

### 4.2.3 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 100 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.

### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

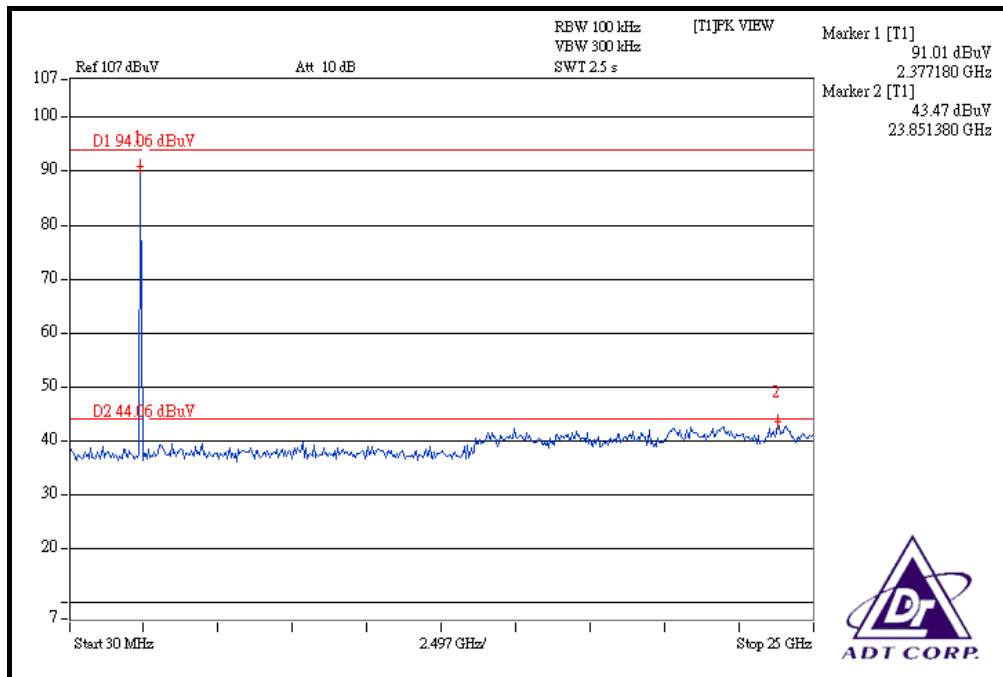
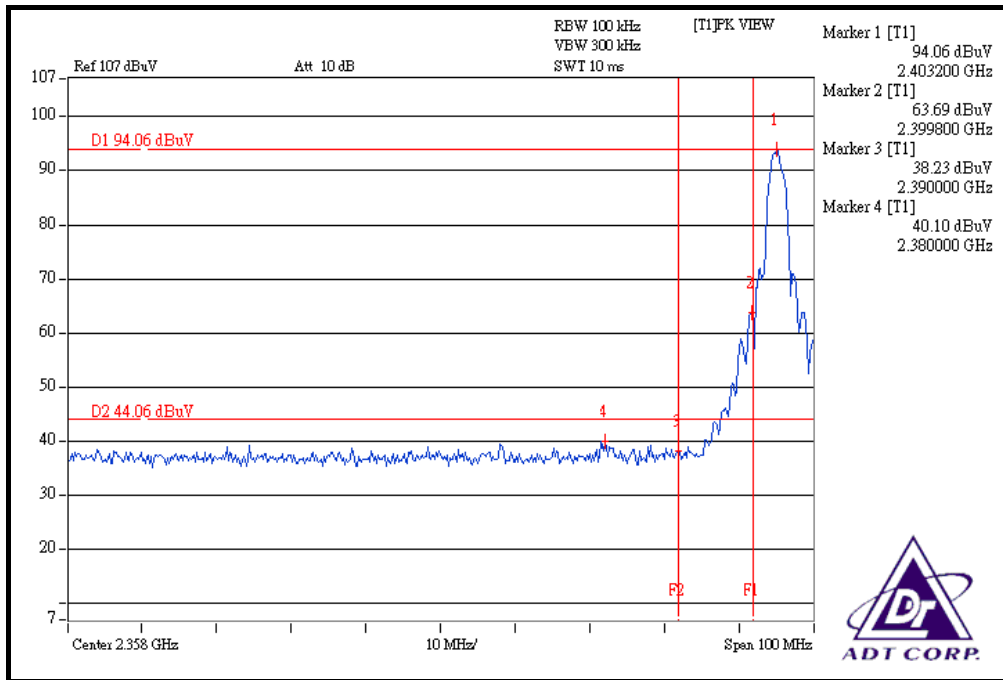
### 4.2.5 EUT OPERATING CONDITION

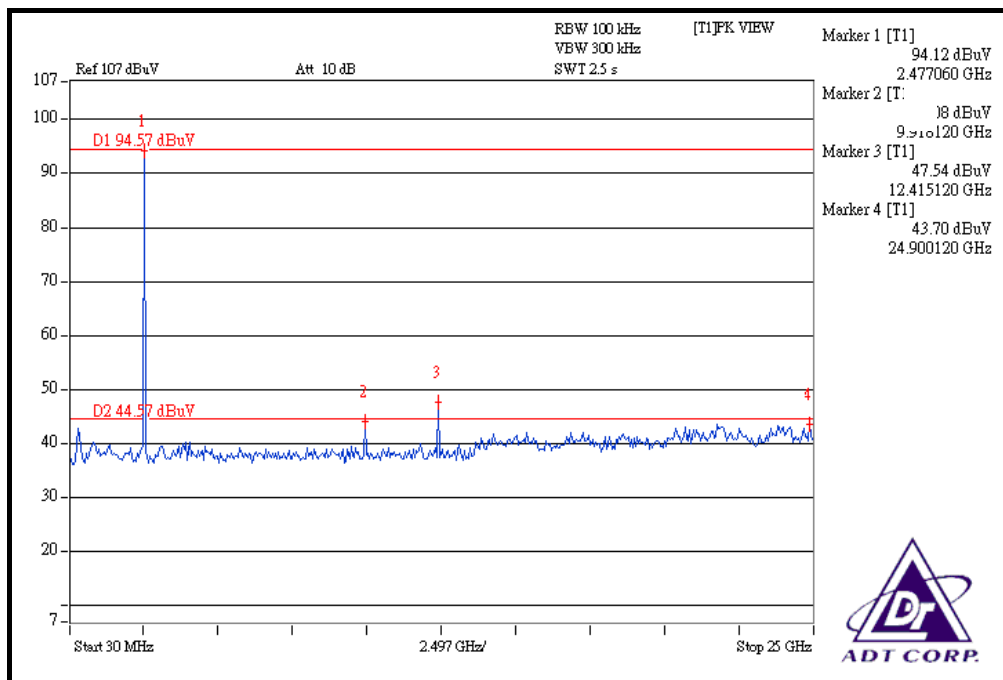
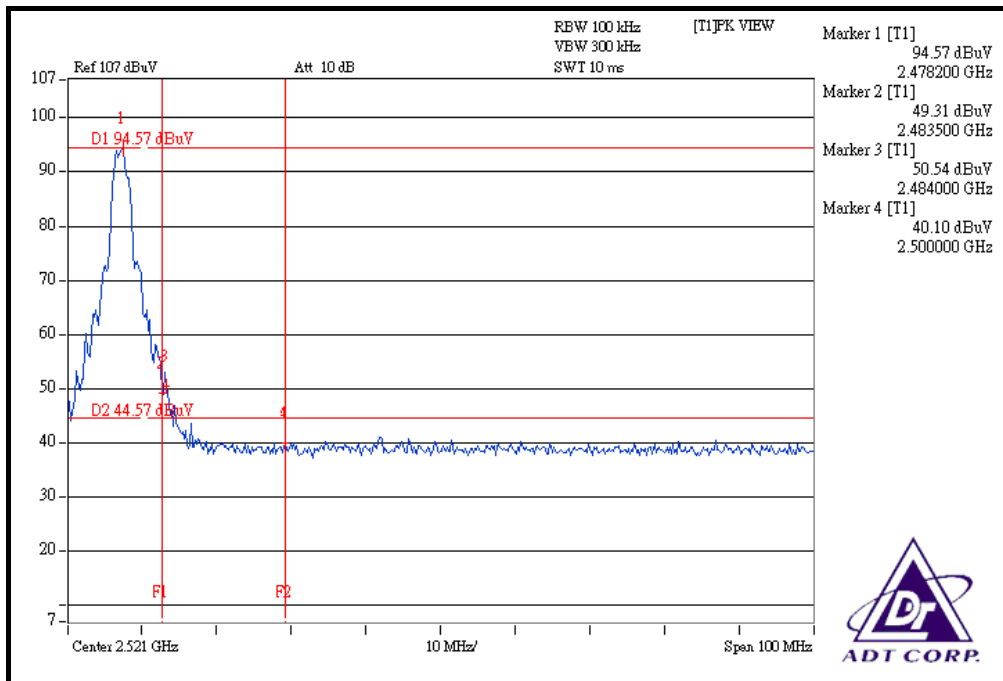
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.2.6 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).

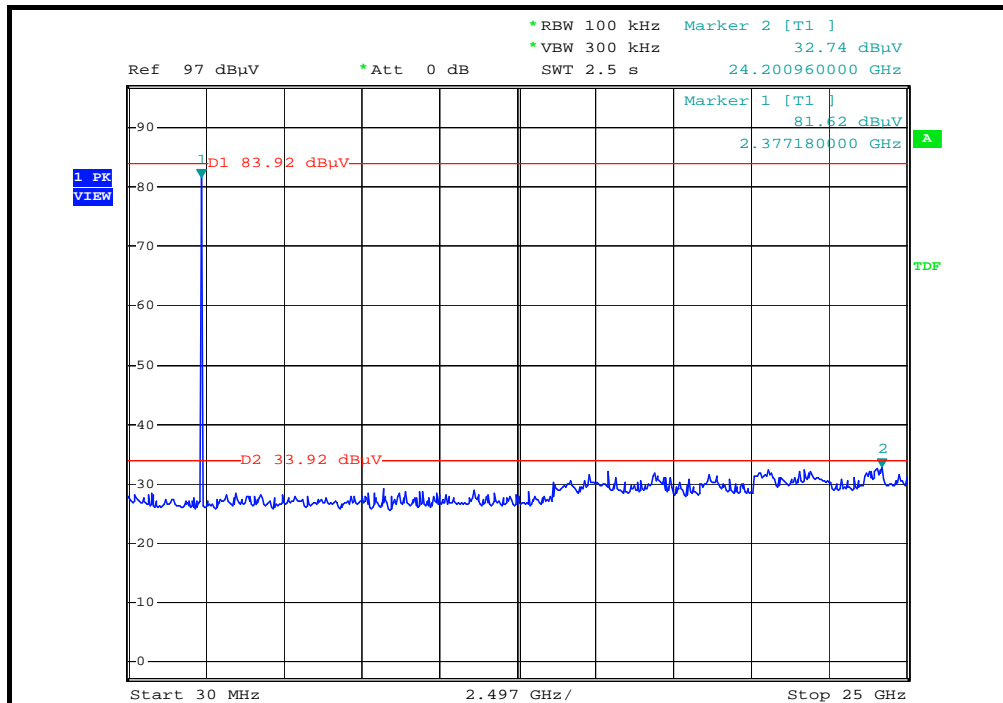
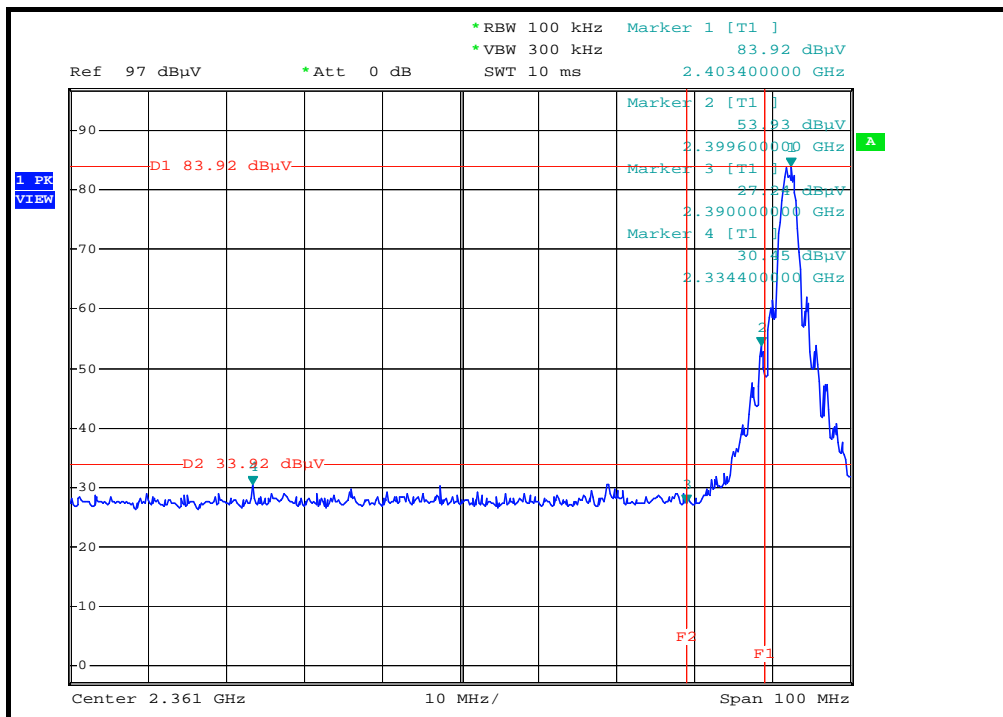
### TEST MODE A

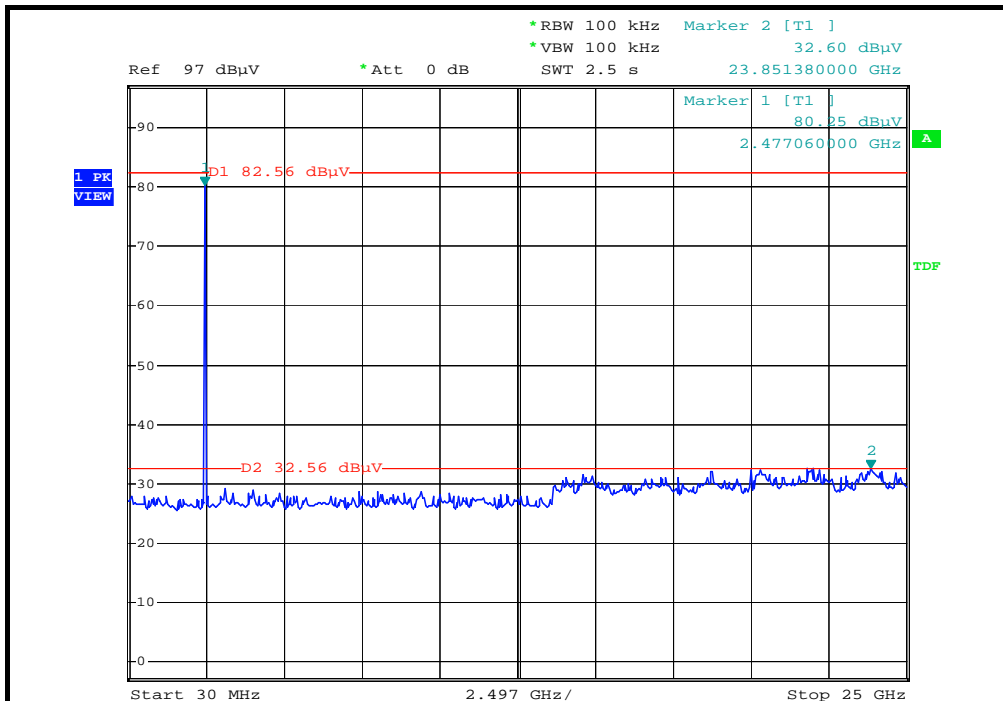
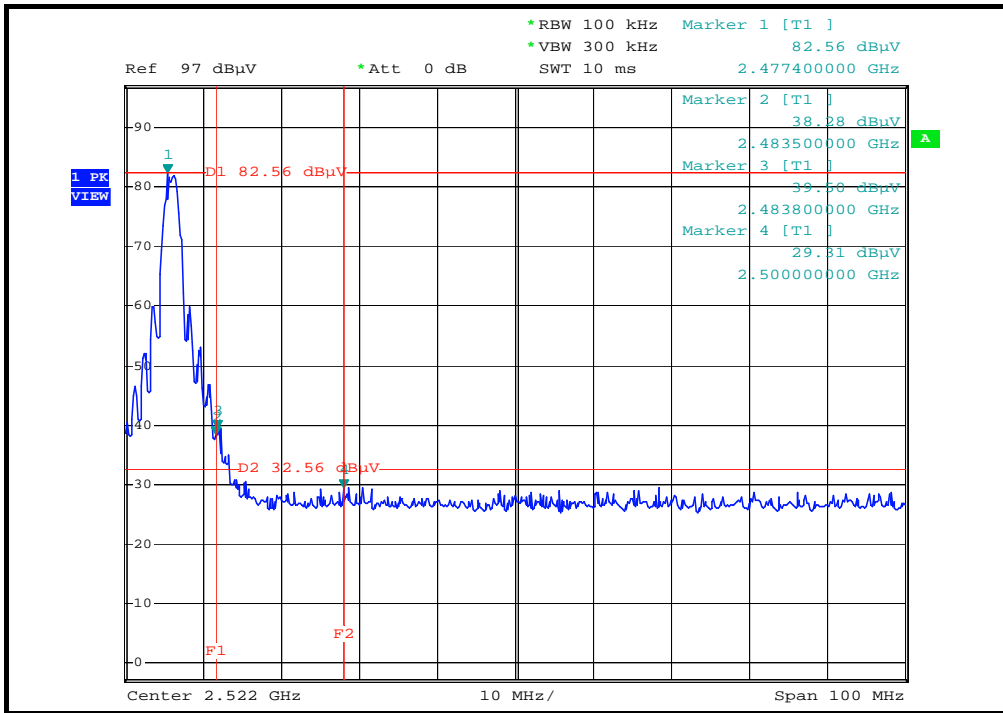






### TEST MODE B







## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 6. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., 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, UL, A2LA
<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.