FCC TEST REPORT

REPORT NO. : RF961224L09
MODEL NO. : MX W1-T
RECEIVED : Dec. 24, 2007
TESTED : Dec. 24, 2007 ~ Jan. 30, 2008
ISSUED : Feb. 04, 2008

PREPARE BY : Sennheiser electronic GmbH & Co. KG

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

ISSUED BY : Advance Data Technology Corporation

LAB ADDRESS : No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang 244, Taipei Hsien, 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.

Testing Laboratory 0528

ACCREDITED No.: 2177-01

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1. CERTIFICATION

PRODUCT:	Digital wireless earphone system
MODEL:	MX W1-T
BRAND:	Sennheiser
PREPARE BY:	Sennheiser electronic GmbH & Co. KG
TESTED:	Dec. 24, 2007 ~ Jan. 30, 2008
TEST SAMPLE:	ENGINEERING SAMPLE
STANDARDS:	**FCC Part 15, Subpart C (Section 15.249)**
	ANSI C63.4-2003

The above equipment (model: MX W1-T) 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 : Peggy Chen , **DATE:** Feb. 04, 2008
Peggy Chen / Specialist

TECHNICAL ACCEPTANCE : Long Chen , **DATE:** Feb. 04, 2008
Responsible for RF Long Chen / Senior Engineer

APPROVED BY : Gary Chang , **DATE:** Feb. 04, 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	PASS	Meet the requirement of limit. Minimum passing margin is -15.43dB at 0.206MHz.
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 -1.15dB at 2399.5MHz.

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
Radiated emissions	30MHz ~ 200MHz	3.34 dB
	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

EUT	Digital wireless earphone system
MODEL NO.	MX W1-T
FCC ID	DMOMXW1T
POWER SUPPLY	3.7Vdc from battery 5.0Vdc from adapter or host equipment
MODULATION TYPE	MSK
FREQUENCY RANGE	2400 ~ 2483.5MHz
NUMBER OF CHANNEL	16
ANTENNA TYPE	PIFA antenna with 0dBi gain
DATA CABLE	2.0 m shielded USB cable
I/O PORT	NA
ACCESSORY DEVICE	Adapter

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 transmitter. For the earphone and the docking station is covered in another test report (Report no.: RF970110L18).
2. The EUT was powered by the following battery and adapter:

   Battery:

EUT	Battery Spec.
Transmitter	3.7 Vdc, 120mAh

   Adapter:

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

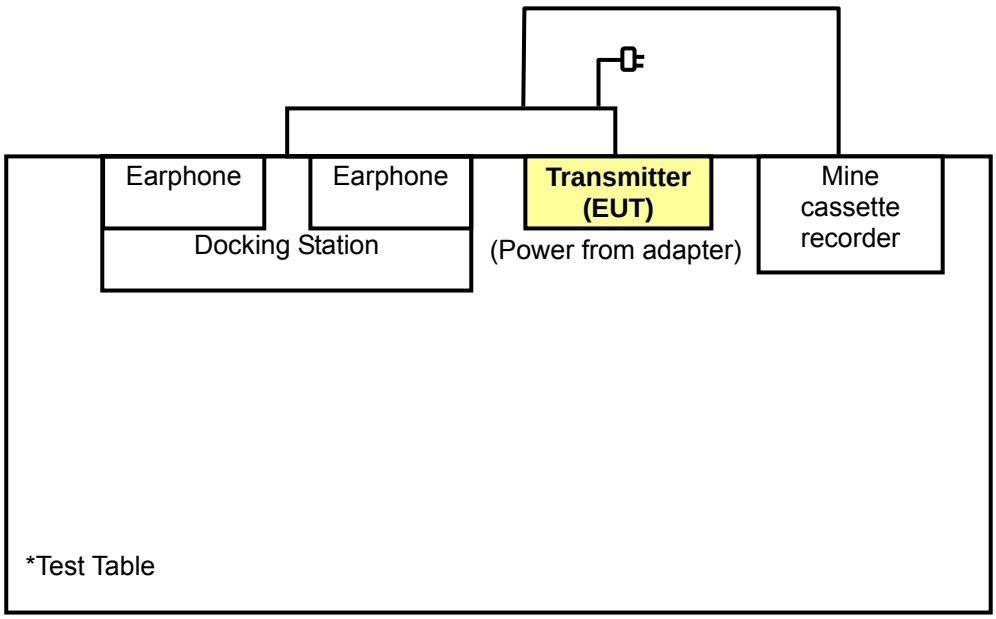
3. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

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



3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

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

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **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, XYZ axis 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	AXIS
0 to 15	0, 7, 15	MSK	Y

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis 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	AXIS
0 to 15	0	MSK	Y

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
0 to 15	0	MSK

BANDEDGE MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis 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	AXIS
0 to 15	0, 15	MSK	Y

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	Digital wireless earphone system	Sennheiser	MX W1-R	NA	NA
3	Docking station	Sennheiser	NA	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
3	2.0m shielded USB cable

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.

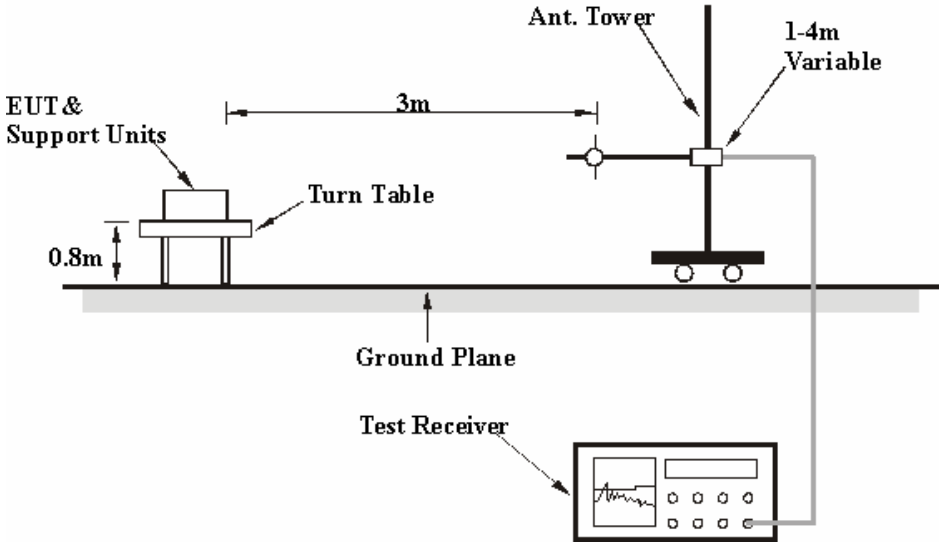
NOTE:

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

a. Connected the EUT with mine cassette recorder and placed on a testing table.
b. The mine cassette recorder sent audio messages to EUT to enable EUT under transmission condition continuously at specific channel frequency.
c. The EUT sent audio messages to earphone.

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	**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	60.87 PK	74.00	-13.13	1.11 H	351	28.63	32.24
2	2390.00	46.56 AV	54.00	-7.44	1.11 H	351	14.32	32.24
3	**2399.50**	**72.85 PK**	**74.00**	**-1.15**	**1.05 H**	**315**	**40.57**	**32.28**
4	2399.50	51.23 AV	54.00	-2.77	1.05 H	315	18.95	32.28
5	*2403.00	97.72 PK	114.00	-16.28	1.31 H	67	65.43	32.29
6	*2403.00	84.20 AV	94.00	-9.80	1.31 H	67	51.91	32.29
7	4806.00	57.91 PK	74.00	-16.09	1.12 H	254	19.84	38.06
8	4806.00	44.39 AV	54.00	-9.61	1.12 H	254	6.32	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:

$$20\log(\text{Duty cycle}) = 20\log\frac{0.852*21+0.16*20}{100\ \text{ms}} = -13.52\text{dB}$$

Please see page 20, 21 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	**TESTED BY**	Dean Wang

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	66.59 PK	74.00	-7.41	1.07 V	351	34.35	32.24
2	2390.00	44.43 AV	54.00	-9.57	1.07 V	351	12.19	32.24
3	2399.50	71.20 PK	74.00	-2.80	1.07 V	351	38.92	32.28
4	2399.50	49.96 AV	54.00	-4.04	1.07 V	351	17.68	32.28
5	*2403.00	95.71 PK	114.00	-18.29	1.07 V	351	63.42	32.29
6	*2403.00	82.19 AV	94.00	-11.81	1.07 V	351	49.90	32.29
7	4806.00	58.25 PK	74.00	-15.75	1.08 V	205	20.18	38.06
8	4806.00	44.73 AV	54.00	-9.27	1.08 V	205	6.66	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:

$$20\log(\text{Duty cycle}) = 20\log\frac{0.852*21+0.16*20}{100\ \text{ms}} = -13.52\text{dB}$$

Please see page 20, 21 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	**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	97.61 PK	114.00	-16.39	1.33 H	35	65.20	32.41
2	*2438.00	84.09 AV	94.00	-9.91	1.33 H	35	51.68	32.41
3	4876.00	57.29 PK	74.00	-16.71	1.15 H	32	18.96	38.33
4	4876.00	43.77 AV	54.00	-10.23	1.15 H	32	5.44	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:

$$20\log(\text{Duty cycle}) = 20\log\frac{0.852*21+0.16*20}{100\ \text{ms}} = -13.52\text{dB}$$

Please see page 20, 21 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	**TESTED BY**	Dean Wang

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	95.09 PK	114.00	-18.91	1.24 V	65	62.68	32.41
2	*2438.00	81.57 AV	94.00	-12.43	1.24 V	65	49.16	32.41
3	4876.00	57.62 PK	74.00	-16.38	1.08 V	116	19.29	38.33
4	4876.00	44.10 AV	54.00	-9.90	1.08 V	116	5.77	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:

$$20\log(\text{Duty cycle}) = 20\log\frac{0.852*21+0.16*20}{100\ \text{ms}} = -13.52\text{dB}$$

Please see page 20, 21 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	**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	97.95 PK	114.00	-16.05	1.00 H	307	65.41	32.54
2	*2478.00	84.43 AV	94.00	-9.57	1.00 H	307	51.89	32.54
3	2483.50	65.02 PK	74.00	-8.98	1.00 H	307	32.46	32.56
4	2483.50	48.23 AV	54.00	-5.77	1.00 H	307	15.67	32.56
5	4956.00	54.84 PK	74.00	-19.16	1.13 H	269	16.33	38.51
6	4956.00	41.32 AV	54.00	-12.68	1.13 H	269	2.81	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:

$$20\log(\text{Duty cycle}) = 20\log\frac{0.852*21+0.16*20}{100\ \text{ms}} = -13.52\text{dB}$$

Please see page 20, 21 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	**TESTED BY**	Dean Wang

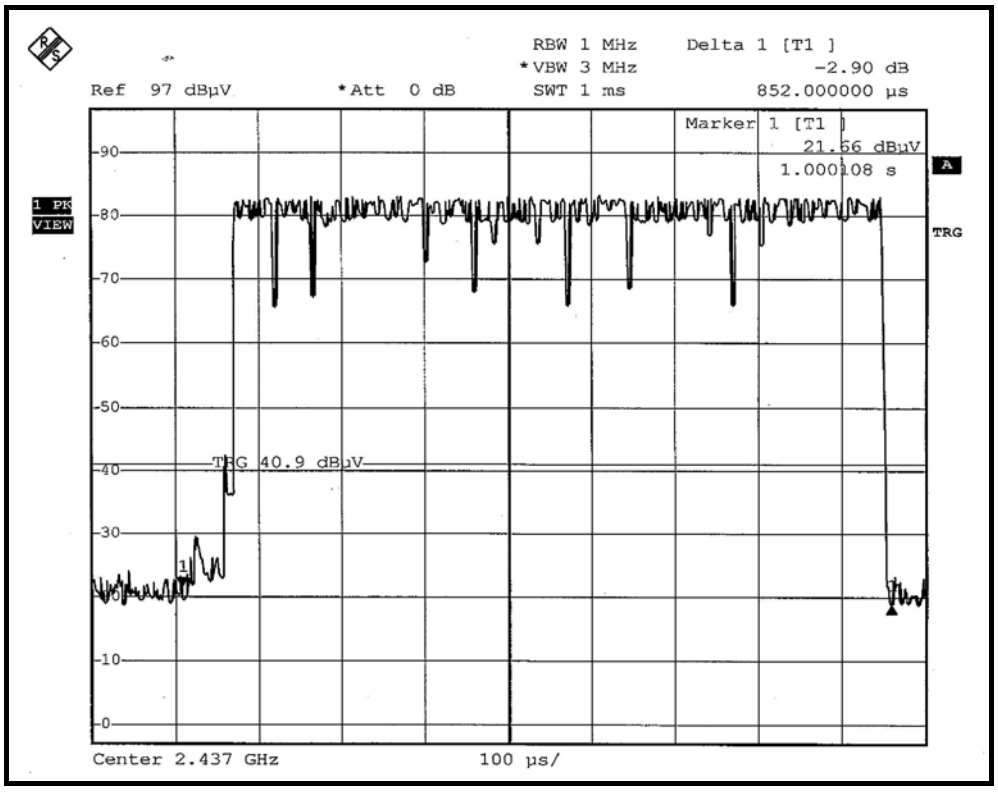
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2478.00	95.89 PK	114.00	-18.11	1.11 V	304	63.35	32.54
2	*2478.00	82.37 AV	94.00	-11.63	1.11 V	304	49.83	32.54
3	2483.50	62.98 PK	74.00	-11.02	1.11 V	304	30.42	32.56
4	2483.50	46.41 AV	54.00	-7.59	1.11 V	304	13.85	32.56
5	4956.00	57.97 PK	74.00	-16.03	1.02 V	294	19.46	38.51
6	4956.00	44.45 AV	54.00	-9.55	1.02 V	294	5.94	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:

$$20\log(\text{Duty cycle}) = 20\log\frac{0.852*21+0.16*20}{100\ \text{ms}} = -13.52\text{dB}$$

Please see page 20, 21 for plotted duty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*VBW 3 MHz
SWT 1 ms
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-2.90 dB
852.000000 µs
Ref 97 dBµV
*Att 0 dB
Marker 1 [T1]
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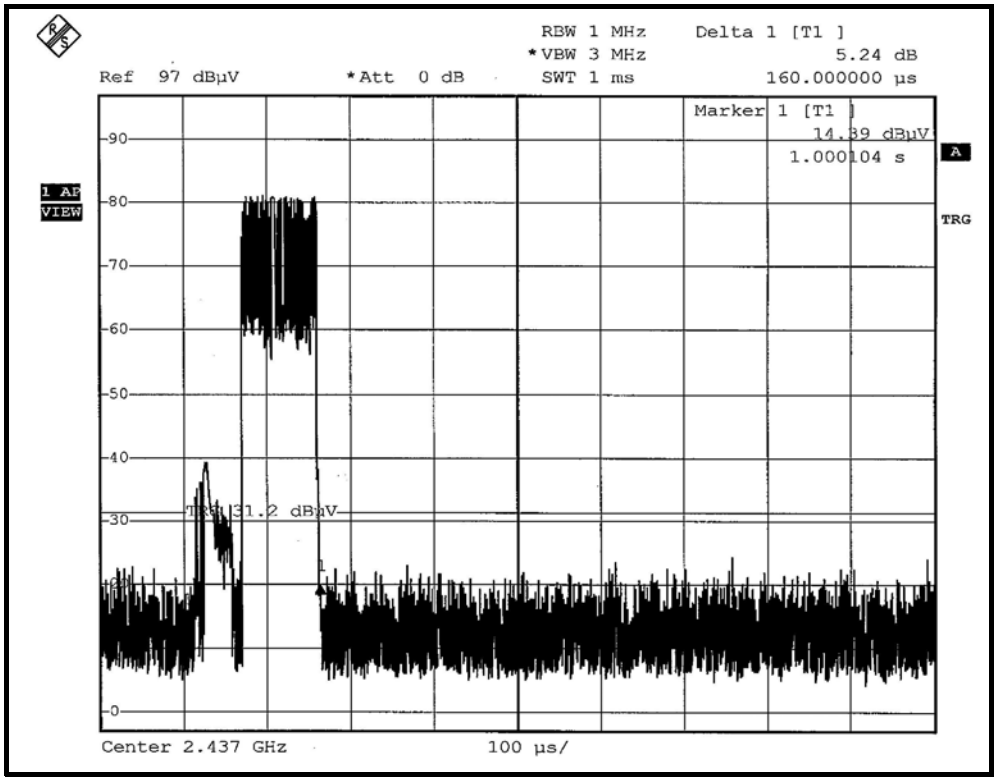
VIEW
A
TRG
TRG 40.9 dBµV
Center 2.437 GHz
100 µs/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*VBW 3 MHz
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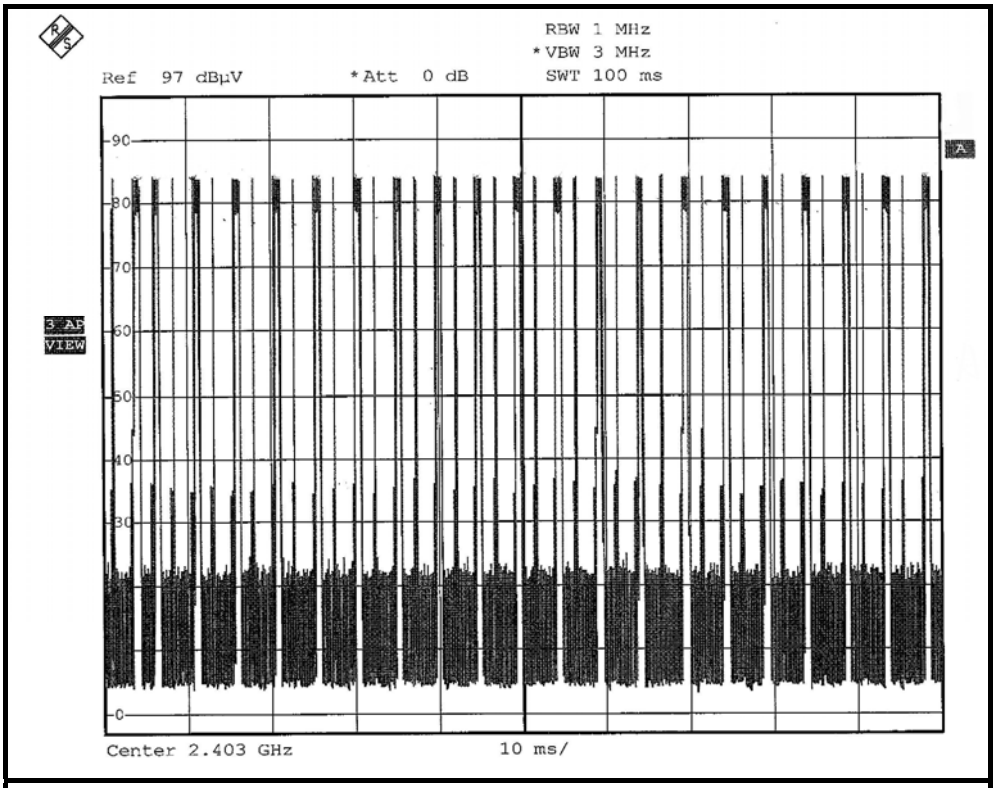
VIEW
A
TRG
Center 2.437 GHz
100 µs/



Duty factor =20log(Duty cycle) = $20\log \frac{0.852*21+0.16*20}{100\ \text{ms}}$ = -13.52dB

RADIATED WORST-CASE DATA: BELOW 1GHz

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	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	111.56	34.50 QP	43.50	-9.00	2.00 H	334	22.90	11.61
2	218.50	35.50 QP	46.00	-10.50	1.50 H	202	23.42	12.08
3	533.47	33.60 QP	46.00	-12.40	1.25 H	334	12.67	20.93
4	663.74	33.49 QP	46.00	-12.51	1.50 H	13	9.73	23.76
5	700.68	33.47 QP	46.00	-12.53	1.50 H	10	9.25	24.22
6	834.84	42.35 QP	46.00	-3.65	1.50 H	322	15.72	26.63
7	906.77	41.73 QP	46.00	-4.27	1.25 H	352	14.04	27.70
8	932.05	39.80 QP	46.00	-6.20	1.00 H	235	11.74	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	111.56	31.25 QP	43.50	-12.25	1.00 V	175	19.65	11.61
2	667.63	35.31 QP	46.00	-10.69	1.25 V	109	11.51	23.80
3	712.35	34.10 QP	46.00	-11.90	1.25 V	250	9.55	24.56
4	834.99	40.01 QP	46.00	-5.99	1.37 V	67	13.37	26.64
5	850.39	36.99 QP	46.00	-9.01	1.25 V	286	10.03	26.96
6	933.99	38.16 QP	46.00	-7.84	1.00 V	220	10.07	28.09
7	953.44	37.83 QP	46.00	-8.17	1.00 V	220	9.49	28.34

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 (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5 0.5 ~ 5 5 ~ 30	66 to 56 56 60	56 to 46 46 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.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 06, 2008
RF signal cable Woken	5D-FB	Cable-HYC01-01	Jan. 06, 2009
LISN ROHDE & SCHWARZ	ESH3-Z5	100312	Feb. 13, 2008
LISN ROHDE & SCHWARZ	NNBL 8226-2	8226-142	May 07, 2008
Software ADT	ADT_Cond_V3	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.

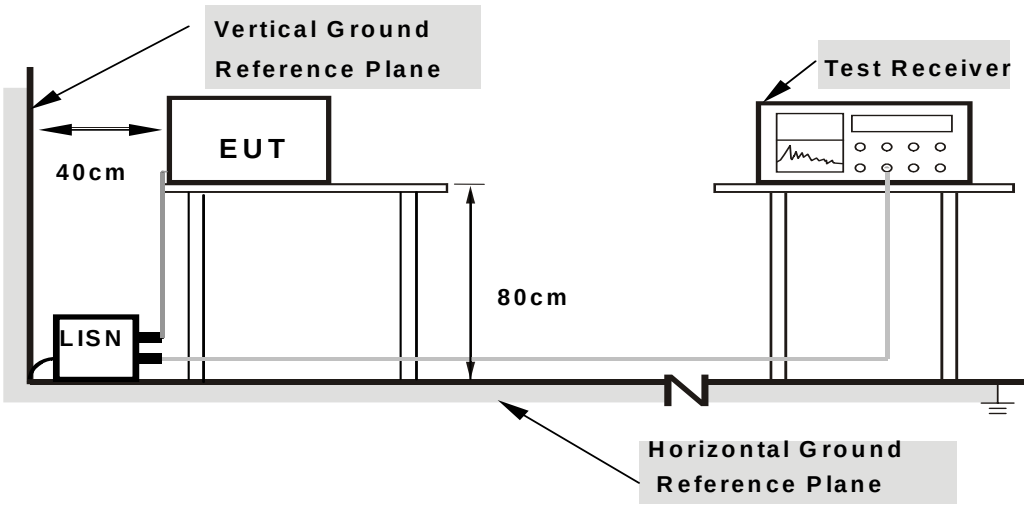
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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 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 4.1.6

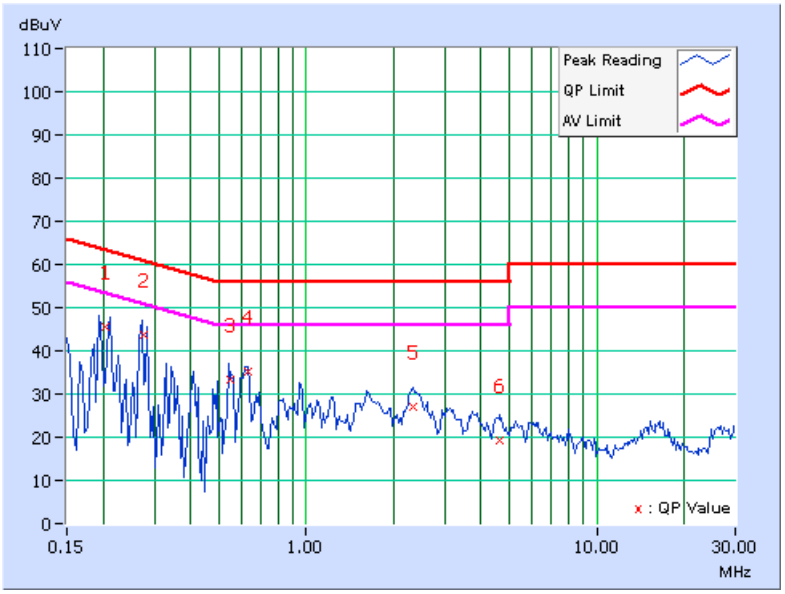
4.2.7 TEST RESULTS

CONDUCTED WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	PHASE	Line 1
MODULATION TYPE	MSK	6dB BANDWIDTH	9 kHz
		ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 981hPa
TESTED BY	Kevin Liang	INPUT POWER	120Vac, 60 Hz

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.204	0.21	45.07	-	45.28	-	63.43	53.43	-18.15	-
2	0.275	0.21	43.44	-	43.65	-	60.97	50.97	-17.32	-
3	0.547	0.22	32.91	-	33.13	-	56.00	46.00	-22.87	-
4	0.628	0.22	34.68	-	34.90	-	56.00	46.00	-21.10	-
5	2.334	0.28	26.69	-	26.97	-	56.00	46.00	-29.03	-
6	4.660	0.41	18.82	-	19.23	-	56.00	46.00	-36.77	-

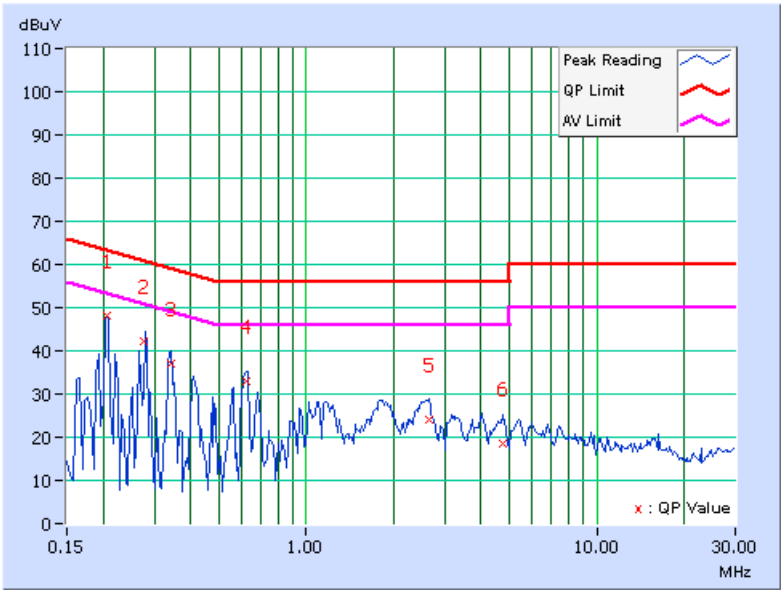
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	PHASE	Line 2
MODULATION TYPE	MSK	6dB BANDWIDTH	9 kHz
		ENVIRONMENTAL CONDITIONS	20deg. C, 60%RH, 981hPa
TESTED BY	Kevin Liang	INPUT POWER	120Vac, 60 Hz

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.206**	**0.21**	**47.72**	**-**	**47.93**	**-**	**63.36**	**53.36**	**-15.43**	**-**
2	0.275	0.21	41.87	-	42.08	-	60.96	50.96	-18.88	-
3	0.341	0.21	36.71	-	36.92	-	59.17	49.17	-22.25	-
4	0.620	0.22	32.47	-	32.69	-	56.00	46.00	-23.31	-
5	2.634	0.30	23.71	-	24.01	-	56.00	46.00	-31.99	-
6	4.734	0.41	17.94	-	18.35	-	56.00	46.00	-37.65	-

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.	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.

4.3.3 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 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.

4.3.4 DEVIATION FROM TEST STANDARD

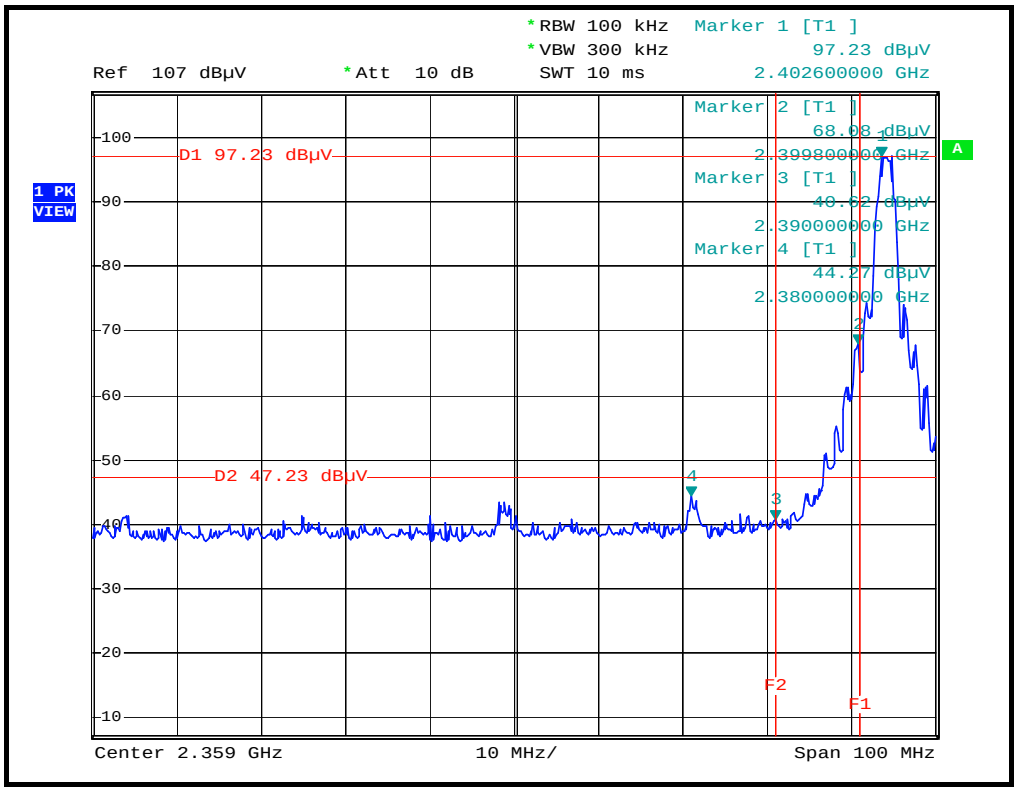
No deviation.

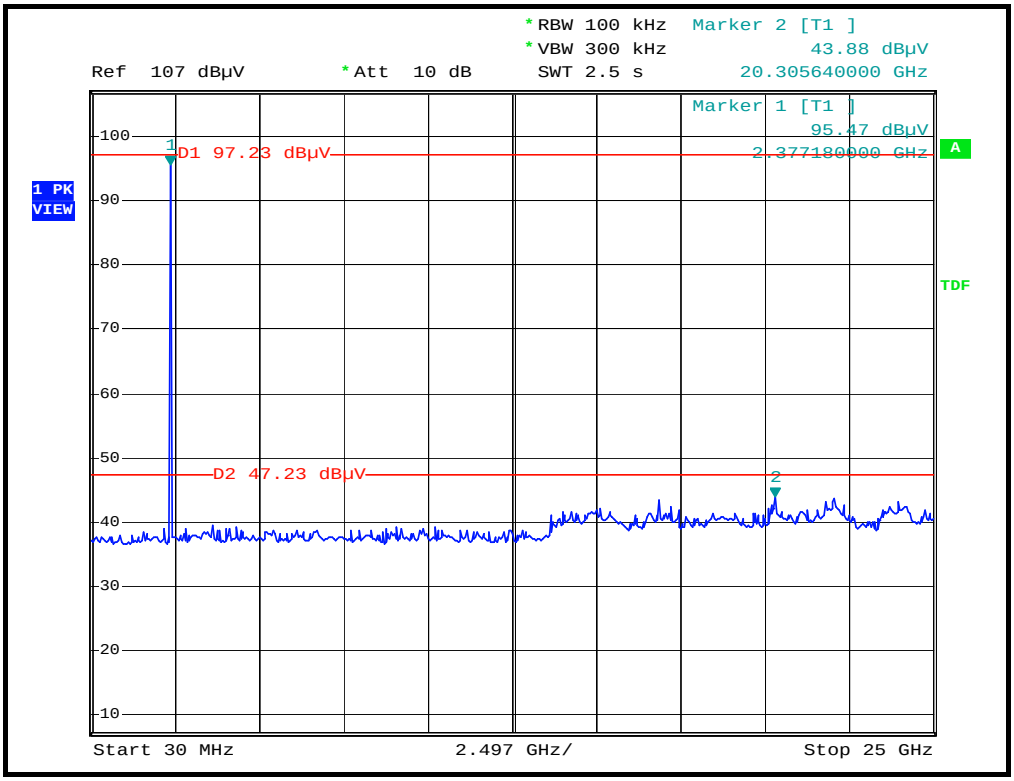
4.3.5 EUT OPERATING CONDITION

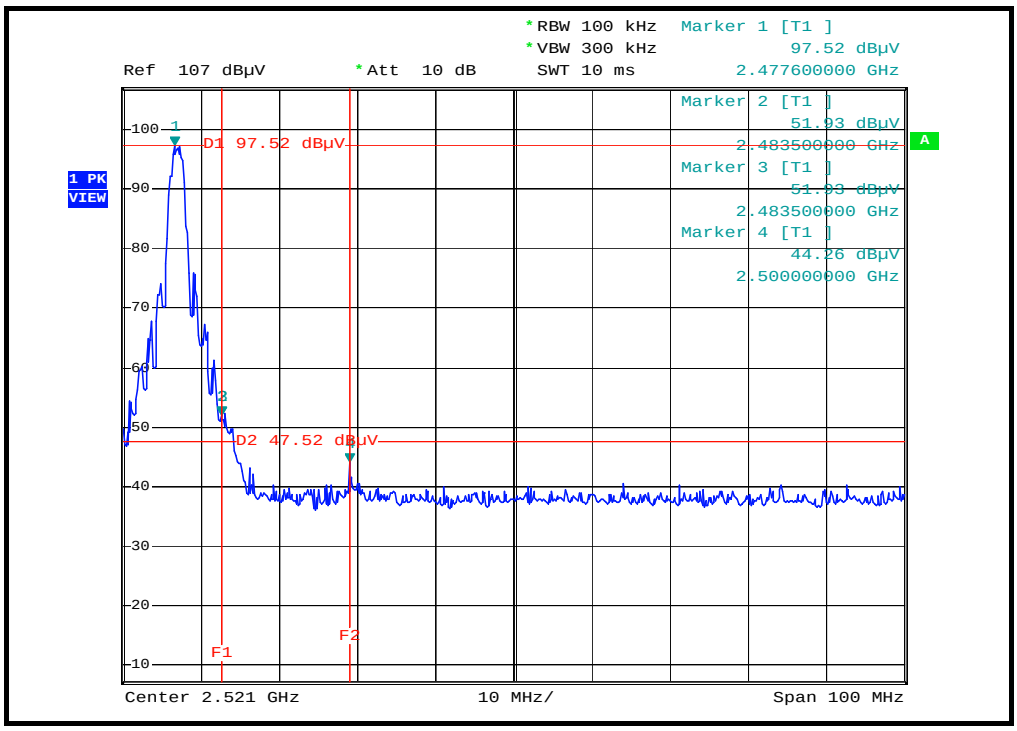
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

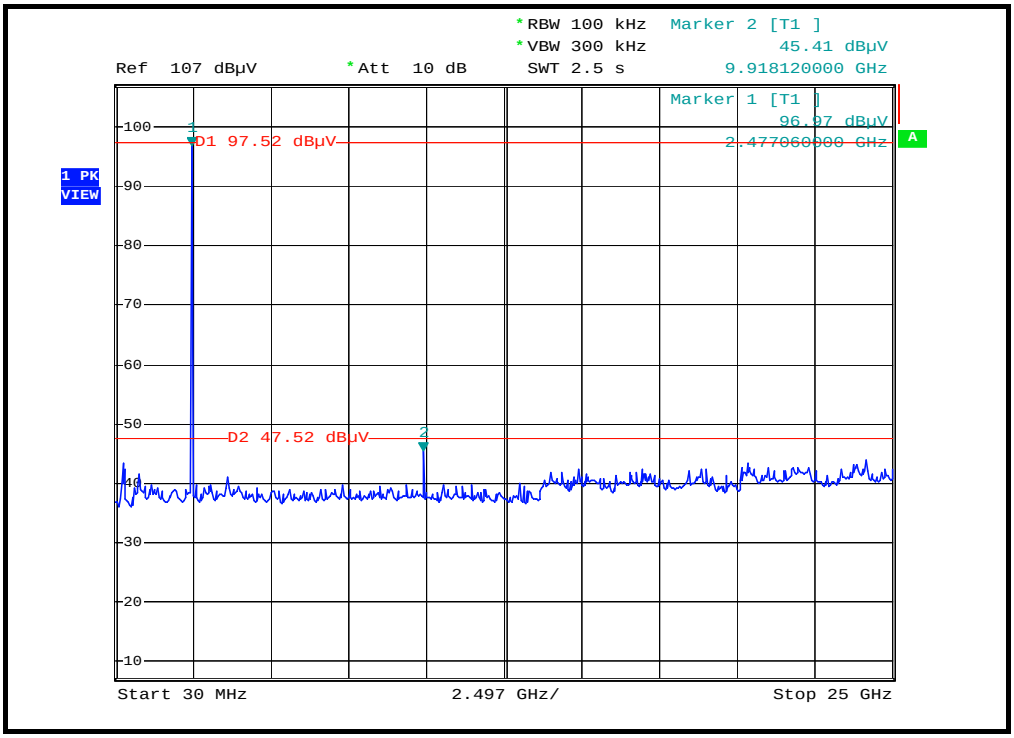
4.3.6 TEST RESULTS

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).


*RBW 100 kHz
*VBW 300 kHz
Ref 107 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1]
97.23 dBµV
2.402600000 GHz
Marker 2 [T1]
68.08 dBµV
2.399800000 GHz
Marker 3 [T1]
40.62 dBµV
2.390000000 GHz
Marker 4 [T1]
44.27 dBµV
2.380000000 GHz
1 PK
VIEW
A
D1 97.23 dBµV
D2 47.23 dBµV
F2
F1
Center 2.359 GHz
10 MHz/
Span 100 MHz


*RBW 100 kHz
*VBW 300 kHz
Ref 107 dBµV
*Att 10 dB
SWT 2.5 s
Marker 2 [T1]
43.88 dBµV
20.305640000 GHz
Marker 1 [T1]
95.47 dBµV
2.377180000 GHz
1 PK
VIEW
A
TDF
D1 97.23 dBµV
D2 47.23 dBµV
Start 30 MHz
2.497 GHz/
Stop 25 GHz


*RBW 100 kHz
*VBW 300 kHz
Ref 107 dBµV
*Att 10 dB
SWT 10 ms
Marker 1 [T1]
97.52 dBµV
2.477600000 GHz
Marker 2 [T1]
51.93 dBµV
2.483500000 GHz
Marker 3 [T1]
51.93 dBµV
2.483500000 GHz
Marker 4 [T1]
44.26 dBµV
2.500000000 GHz
1 PK
VIEW
D1 97.52 dBµV
D2 47.52 dBµV
F1
F2
A
Center 2.521 GHz
10 MHz/
Span 100 MHz


*RBW 100 kHz
*VBW 300 kHz
Ref 107 dBµV
*Att 10 dB
SWT 2.5 s
Marker 2 [T1]
45.41 dBµV
9.918120000 GHz
Marker 1 [T1]
96.97 dBµV
2.477060000 GHz
1 PK
VIEW
D1 97.52 dBµV
D2 47.52 dBµV
A
Start 30 MHz
2.497 GHz/
Stop 25 GHz

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.

USA	FCC, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA, CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	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. 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

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.