



# FCC TEST REPORT

**REPORT NO.:** RF981126L12

**MODEL NO.:** T4GP

**RECEIVED:** Nov. 27, 2009

**TESTED:** Dec. 04 ~ Dec. 07, 2009

**ISSUED:** Dec. 18, 2009

**APPLICANT:** GRAND WING SERVO-TECH CO.,LTD

**ADDRESS:** 4F, 183, Sec. 1, Ta-Tung Rd., Shi-Jr City, Taipei Hsien, 221, 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 Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

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

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## 1. CERTIFICATION

**PRODUCT:** Radio Control Transmitter

**MODEL NO.:** T4GP

**BRAND:** GWS

**APPLICANT:** GRAND WING SERVO-TECH CO.,LTD

**TESTED:** Dec. 04 ~ Dec. 07, 2009

**TEST SAMPLE:** ENGINEERING SAMPLE

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

ANSI C63.4-2003

The above equipment (model: T4GP) 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** : Andrea Hsia, DATE: Dec. 18, 2009  
Andrea Hsia / Specialist

**TECHNICAL  
ACCEPTANCE** : Long Chen, DATE: Dec. 18, 2009  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY** : Gary Chang, DATE: Dec. 18, 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	Power supply is 6Vdc from batteries.
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 -2.6dB at 3602.00MHz.

### 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB

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



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### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	Radio Control Transmitter
<b>MODEL NO.</b>	T4GP
<b>FCC ID</b>	P80GWT4GP24G
<b>POWER SUPPLY</b>	6Vdc (1.5Vdc AA battery*4)
<b>MODULATION TYPE</b>	DSSS
<b>OPERATING FREQUENCY</b>	2402MHz ~ 2474MHz
<b>NUMBER OF CHANNEL</b>	13
<b>ANTENNA TYPE</b>	Dipole antenna
<b>DATA CABLE</b>	NA
<b>I/O PORT</b>	NA
<b>ACCESSORY DEVICES</b>	NA

**NOTE:**

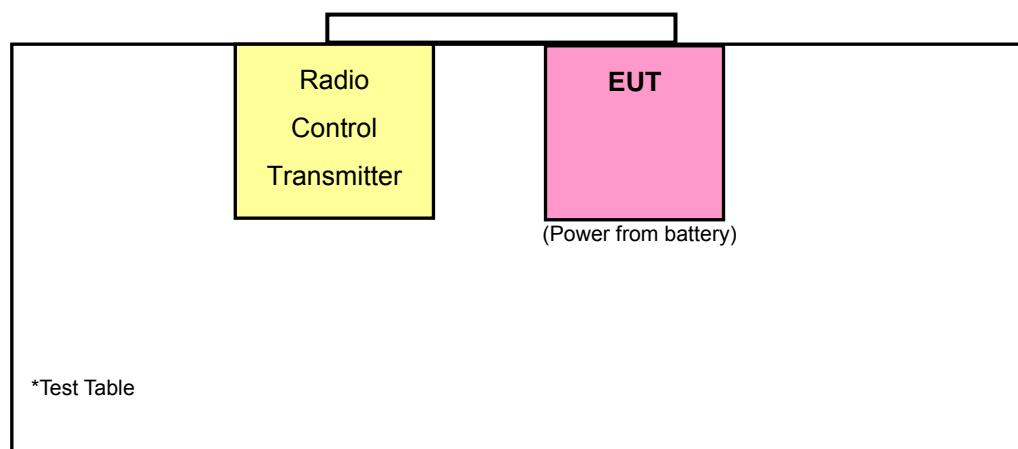
The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

13 channels are provided to this EUT.

CHANNEL	FREQ. (MHz)
1	2402
2	2408
3	2414
4	2420
5	2426
6	2432
7	2438
8	2444
9	2450
10	2456
11	2462
12	2468
13	2474

#### 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 $\geq$ 1G	RE $<$ 1G	BM	
-	✓	✓	✓	-

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

**RE $\geq$ 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, 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
1 to 13	1, 6, 13	DSSS	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
1 to 13	1	DSSS	Y

#### 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
1 to 13	1,13	DSSS

#### TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	25deg. C, 66%RH, 1008 hPa	6.0Vdc	Lori Chiu
RE $<$ 1G	25deg. C, 66%RH, 1008 hPa	6.0Vdc	Lori Chiu
BM	25deg. C, 66%RH, 1008 hPa	6.0Vdc	Lori Chiu



### 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.

### 3.4 DESCRIPTION OF SUPPORT UNITS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	RADIO CONTROL TRANSMITTER	GWS	T4GP	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	2.0m non-shielded cable

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

**NOTE:** 2. Item 1 & non-shielded cable were supplied from client

## 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:

<b>15.209 Limit</b>		
<b>Frequencies (MHz)</b>	<b>Field strength (microvolts/meter)</b>	<b>Measurement distance (meters)</b>
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

<b>15.249 Limit</b>		
<b>Fundamental Frequency</b>	<b>Field Strength of Fundamental (millivolts/meter)</b>	<b>Field Strength of Harmonics (microvolts/meter)</b>
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 (dB<sub>uV</sub>/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.



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#### 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	3008A01910	Sep. 11, 2009	Sep. 10, 2010
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.

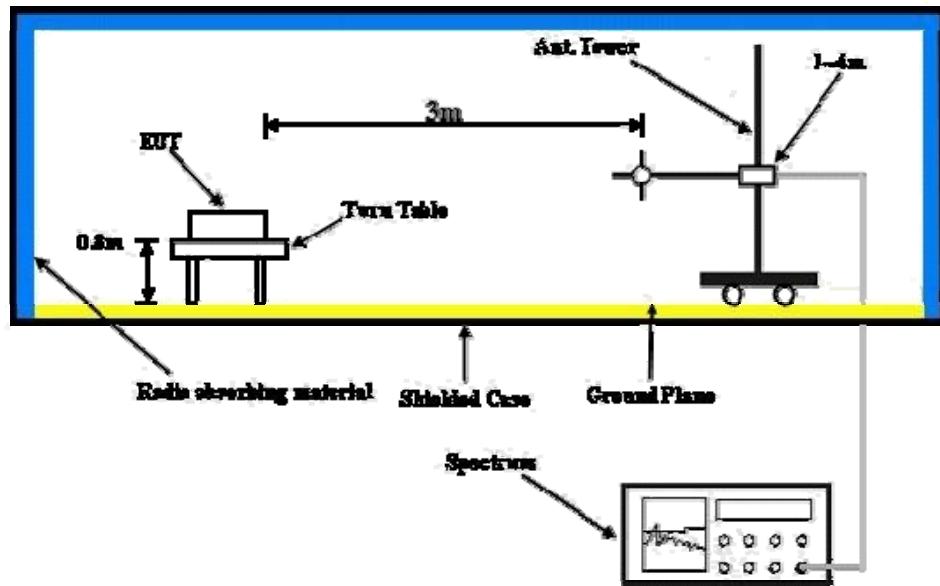
#### NOTE:

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 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITIONS

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



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#### 4.1.7 TEST RESULTS

##### ABOVE 1GHz DATA ABOVE 1GHz DATA

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		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	1600.00	59.1 PK	74.0	-14.9	1.60 H	227	29.50	29.56
2	1600.00	41.1 AV	54.0	-12.9	1.60 H	227	11.50	29.56
3	2390.00	57.1 PK	74.0	-17.0	1.42 H	103	24.82	32.22
4	2390.00	29.0 AV	54.0	-25.0	1.42 H	103	-3.19	32.22
5	2397.50	65.5 PK	74.0	-8.5	1.42 H	103	33.22	32.25
6	2397.50	35.2 AV	54.0	-18.8	1.42 H	103	2.96	32.25
7	2400.00	56.0 PK	74.0	-18.0	1.42 H	103	23.74	32.26
8	2400.00	38.0 AV	54.0	-16.0	1.42 H	103	5.74	32.26
9	*2402.00	90.4 PK	114.0	-23.6	1.42 H	103	58.16	32.27
10	*2402.00	72.4 AV	94.0	-21.6	1.42 H	103	40.16	32.27
11	3200.00	51.9 PK	74.0	-22.1	1.26 H	345	17.36	34.54
12	3200.00	33.9 AV	54.0	-20.1	1.26 H	345	-0.64	34.54
13	3602.00	63.9 PK	74.0	-10.1	1.11 H	304	28.69	35.23
14	3602.00	45.9 AV	54.0	-8.1	1.11 H	304	10.69	35.23
15	4804.00	60.8 PK	74.0	-13.2	1.23 H	106	22.49	38.30
16	4804.00	42.8 AV	54.0	-11.2	1.23 H	106	4.49	38.30
17	7206.00	54.0 PK	74.0	-20.1	1.03 H	325	9.58	44.37
18	7206.00	36.0 AV	54.0	-18.1	1.03 H	325	-8.42	44.37

**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:  

$$20 \log (\text{Duty cycle}) = 20 \log (12.6 \text{ ms} / 100 \text{ ms}) = -17.99 \text{ dB}$$
Please see page 19-20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH 1000 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	1600.00	60.8 PK	74.0	-13.2	1.31 V	0	31.26	29.56
2	1600.00	42.8 AV	54.0	-11.2	1.31 V	0	13.26	29.56
3	2390.00	52.2 PK	74.0	-21.8	1.00 V	205	19.96	32.22
4	2390.00	28.6 AV	54.0	-25.4	1.00 V	205	-3.60	32.22
5	2397.50	59.3 PK	74.0	-14.7	1.00 V	202	27.05	32.25
6	2397.50	31.4 AV	54.0	-22.6	1.00 V	202	-0.89	32.25
7	2400.00	50.3 PK	74.0	-23.8	1.00 V	205	17.99	32.26
8	2400.00	32.3 AV	54.0	-21.8	1.00 V	205	-0.01	32.26
9	*2402.00	84.7 PK	114.0	-29.3	1.00 V	205	52.41	32.27
10	*2402.00	66.7 AV	94.0	-27.3	1.00 V	205	34.41	32.27
11	3200.00	60.6 PK	74.0	-13.4	1.04 V	19	26.09	34.54
12	3200.00	42.6 AV	54.0	-11.4	1.04 V	19	8.09	34.54
13	3602.00	69.4 PK	74.0	-4.6	1.06 V	1	34.15	35.23
14	<b>3602.00</b>	<b>51.4 AV</b>	<b>54.0</b>	<b>-2.6</b>	<b>1.06 V</b>	<b>1</b>	<b>16.15</b>	<b>35.23</b>
15	4804.00	67.5 PK	74.0	-6.5	1.11 V	205	29.24	38.30
16	4804.00	49.5 AV	54.0	-4.5	1.11 V	205	11.24	38.30
17	7206.00	56.5 PK	74.0	-17.5	2.03 V	55	12.16	44.37
18	7206.00	38.5 AV	54.0	-15.5	2.03 V	55	-5.84	44.37

**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 +  $20\log(\text{Duty cycle})$  Where the duty factor is calculated from following formula:  
 $20 \log (\text{Duty cycle}) = 20 \log (12.6 \text{ ms} / 100 \text{ ms}) = -17.99 \text{ dB}$   
Please see page 19-20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH 1000 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	1620.00	56.9 PK	74.0	-17.1	1.52 H	256	27.25	29.62
2	1620.00	38.9 AV	54.0	-15.1	1.52 H	256	9.25	29.62
3	*2432.00	90.2 PK	114.0	-23.8	1.16 H	104	57.85	32.38
4	*2432.00	72.2 AV	94.0	-21.8	1.16 H	104	39.85	32.38
5	3244.00	55.2 PK	74.0	-18.8	1.07 H	339	20.57	34.62
6	3244.00	37.2 AV	54.0	-16.8	1.07 H	339	2.57	34.62
7	3647.00	59.4 PK	74.0	-14.6	1.01 H	137	24.06	35.37
8	3647.00	41.4 AV	54.0	-12.6	1.01 H	137	6.06	35.37
9	4864.00	60.3 PK	74.0	-13.7	1.00 H	227	21.94	38.39
10	4864.00	42.3 AV	54.0	-11.7	1.00 H	227	3.94	38.39
11	7296.00	52.6 PK	74.0	-21.4	1.10 H	51	7.98	44.60
12	7296.00	34.6 AV	54.0	-19.4	1.10 H	51	-10.02	44.60

**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 (Duty cycle) = 20 log (12.6 ms / 100 ms) = -17.99 dB  
Please see page 19-20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH 1000 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	1620.00	62.0 PK	74.0	-12.0	1.12 V	15	32.39	29.62
2	1620.00	44.0 AV	54.0	-10.0	1.12 V	15	14.39	29.62
3	*2432.00	84.1 PK	114.0	-29.9	1.00 V	211	51.75	32.38
4	*2432.00	66.1 AV	94.0	-27.9	1.00 V	211	33.75	32.38
5	3244.00	62.5 PK	74.0	-11.5	1.03 V	0	27.85	34.62
6	3244.00	44.5 AV	54.0	-9.5	1.03 V	0	9.85	34.62
7	3647.00	68.3 PK	74.0	-5.7	1.49 V	297	32.95	35.37
8	3647.00	50.3 AV	54.0	-3.7	1.49 V	297	14.95	35.37
9	4864.00	62.3 PK	74.0	-11.7	1.06 V	45	23.87	38.39
10	4864.00	44.3 AV	54.0	-9.7	1.06 V	45	5.87	38.39
11	7296.00	55.3 PK	74.0	-18.7	1.77 V	28	10.66	44.60
12	7296.00	37.3 AV	54.0	-16.7	1.77 V	28	-7.34	44.60

**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 (Duty cycle) = 20 log (12.6 ms / 100 ms) = -17.99 dB  
Please see page 19-20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 13	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH 1000 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	1648.00	60.6 PK	74.0	-13.4	1.48 H	156	30.91	29.71
2	1648.00	42.6 AV	54.0	-11.4	1.48 H	156	12.91	29.71
3	*2474.00	88.8 PK	114.0	-25.2	1.13 H	105	56.29	32.53
4	*2474.00	70.8 AV	94.0	-23.2	1.13 H	105	38.29	32.53
5	2483.50	38.9 PK	74.0	-35.1	1.13 H	105	6.34	32.56
6	2483.50	20.9 AV	54.0	-33.1	1.13 H	105	-11.66	32.56
7	2486.00	39.3 PK	74.0	-34.7	1.13 H	105	6.77	32.57
8	2486.00	27.0 AV	54.0	-27.0	1.13 H	105	-5.61	32.57
9	3300.00	56.9 PK	74.0	-17.1	1.00 H	349	22.20	34.72
10	3300.00	38.9 AV	54.0	-15.1	1.00 H	349	4.20	34.72
11	3710.00	52.9 PK	74.0	-21.1	1.17 H	295	17.38	35.56
12	3710.00	34.9 AV	54.0	-19.1	1.17 H	295	-0.62	35.56
13	4948.00	60.0 PK	74.0	-14.0	1.24 H	213	21.46	38.58
14	4948.00	42.0 AV	54.0	-12.0	1.24 H	213	3.46	38.58
15	7422.00	54.1 PK	74.0	-20.0	1.00 H	48	9.13	44.92
16	7422.00	36.1 AV	54.0	-18.0	1.00 H	48	-8.87	44.92

**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 (Duty cycle) = 20 log (12.6 ms / 100 ms) = -17.99 dB  
Please see page 19-20 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 13	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH 1000 hPa	TESTED BY	Lori Chiu

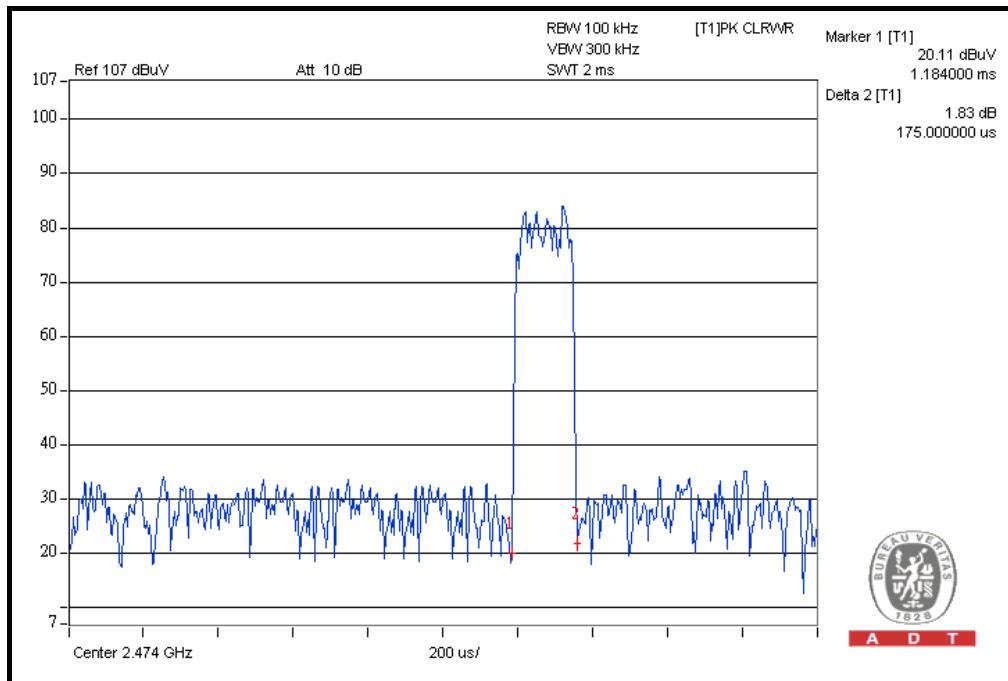
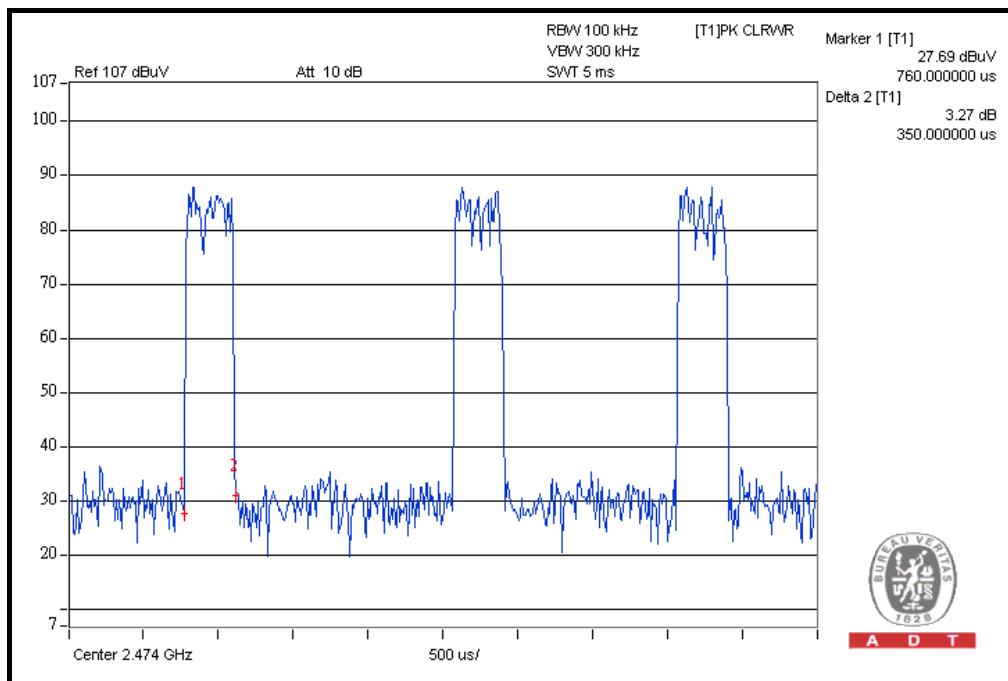
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	1648.00	62.4 PK	74.0	-11.6	1.41 V	1	32.69	29.71
2	1648.00	44.4 AV	54.0	-9.6	1.41 V	1	14.69	29.71
3	*2474.00	82.6 PK	114.0	-31.4	1.72 V	29	50.05	32.53
4	*2474.00	64.6 AV	94.0	-29.4	1.72 V	29	32.05	32.53
5	2483.50	32.7 PK	74.0	-41.3	1.72 V	29	0.10	32.56
6	2483.50	14.7 AV	54.0	-39.3	1.72 V	29	-17.90	32.56
7	2486.00	38.8 PK	74.0	-35.2	1.72 V	29	6.19	32.57
8	2486.00	25.6 AV	54.0	-28.4	1.72 V	29	-6.98	32.57
9	3300.00	63.9 PK	74.0	-10.2	1.00 V	313	29.13	34.72
10	3300.00	45.9 AV	54.0	-8.2	1.00 V	313	11.13	34.72
11	3710.00	59.4 PK	74.0	-14.7	1.34 V	192	23.79	35.56
12	3710.00	41.4 AV	54.0	-12.7	1.34 V	192	5.79	35.56
13	4948.00	61.2 PK	74.0	-12.8	1.20 V	228	22.60	38.58
14	4948.00	43.2 AV	54.0	-10.8	1.20 V	228	4.60	38.58
15	7422.00	55.8 PK	74.0	-18.2	1.63 V	12	10.88	44.92
16	7422.00	37.8 AV	54.0	-16.2	1.63 V	12	-7.12	44.92

**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:  
$$20 \log (\text{Duty cycle}) = 20 \log (12.6 \text{ ms} / 100 \text{ ms}) = -17.99 \text{ dB}$$
  
Please see page 19-20 for plotted duty.

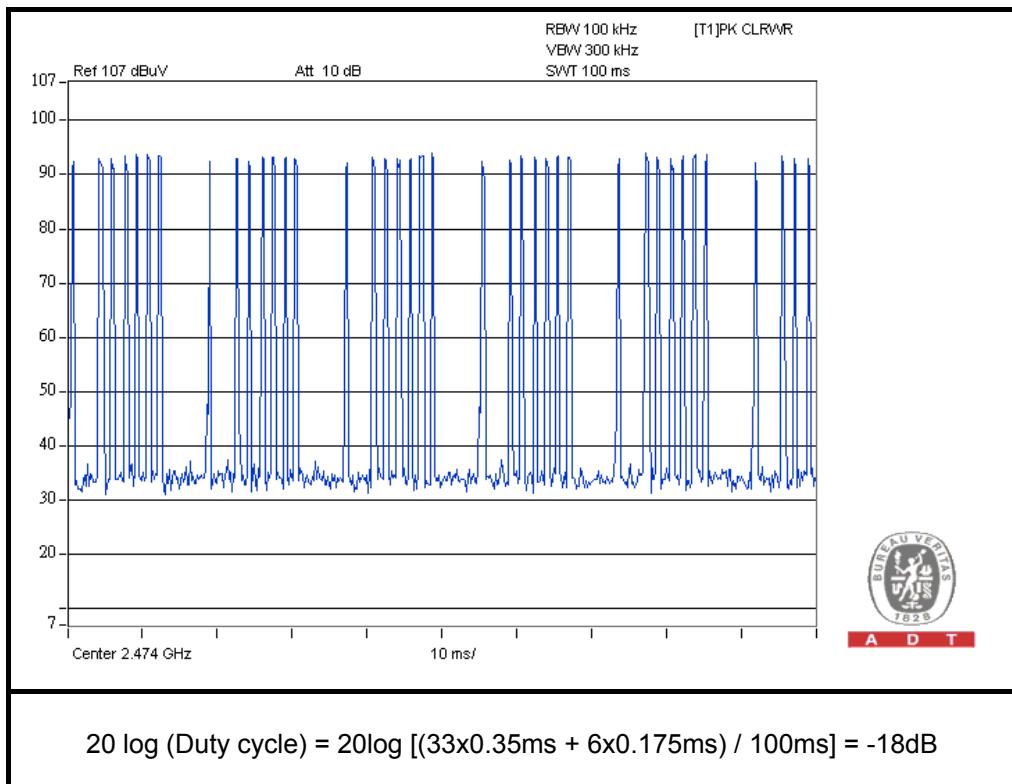


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## BELOW 1GHZ WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 78		FREQUENCY RANGE Below 1000MHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Quasi-Peak
ENVIRONMENTAL CONDITIONS		25deg. C, 66%RH 999 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	144.61	21.9 QP	43.5	-21.6	1.00 H	307	8.74	13.16
2	515.97	24.7 QP	46.0	-21.3	2.00 H	73	4.97	19.73
3	525.69	24.2 QP	46.0	-21.8	1.75 H	298	4.18	20.02
4	545.14	26.4 QP	46.0	-19.6	1.00 H	40	5.78	20.62
5	801.78	32.0 QP	46.0	-14.0	1.75 H	58	6.67	25.33
6	834.84	28.9 QP	46.0	-17.1	1.50 H	94	3.36	25.54
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	144.61	23.7 QP	43.5	-19.8	1.50 V	43	10.54	13.16
2	541.25	23.0 QP	46.0	-23.0	1.00 V	118	2.50	20.50
3	564.58	25.5 QP	46.0	-20.5	1.75 V	154	4.40	21.10
4	589.86	25.2 QP	46.0	-20.8	1.00 V	196	3.52	21.68
5	801.78	35.0 QP	46.0	-11.0	1.25 V	334	9.67	25.33
6	877.61	26.1 QP	46.0	-19.9	1.50 V	19	0.20	25.90

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

## 4.2 BAND EDGES MEASUREMENT

### 4.2.1 LIMITS OF BAND EDGES MEASUREMENT

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

### 4.2.2 TEST INSTRUMENTS

Same as 4.1.2

### 4.2.3 TEST PROCEDURE

- 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. Set both RBW and VBW of spectrum analyzer to 100kHz and 300kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (Peak RBW = 100kHz, VBW = 300kHz) are attached on the following pages.

**NOTE:** The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.

### 4.2.4 DEVIATION FROM TEST STANDARD

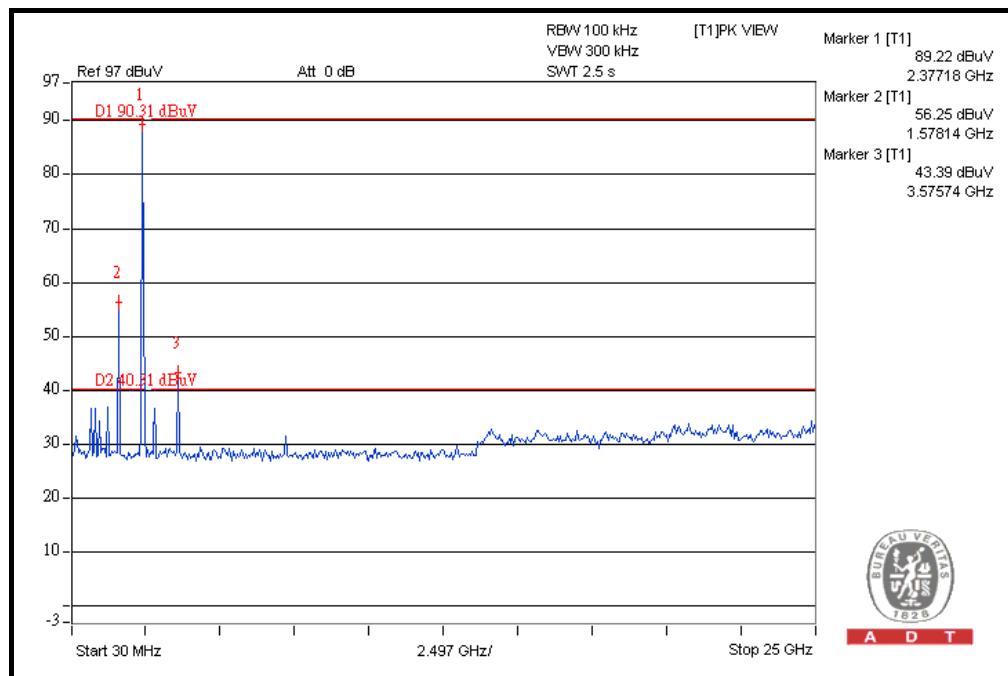
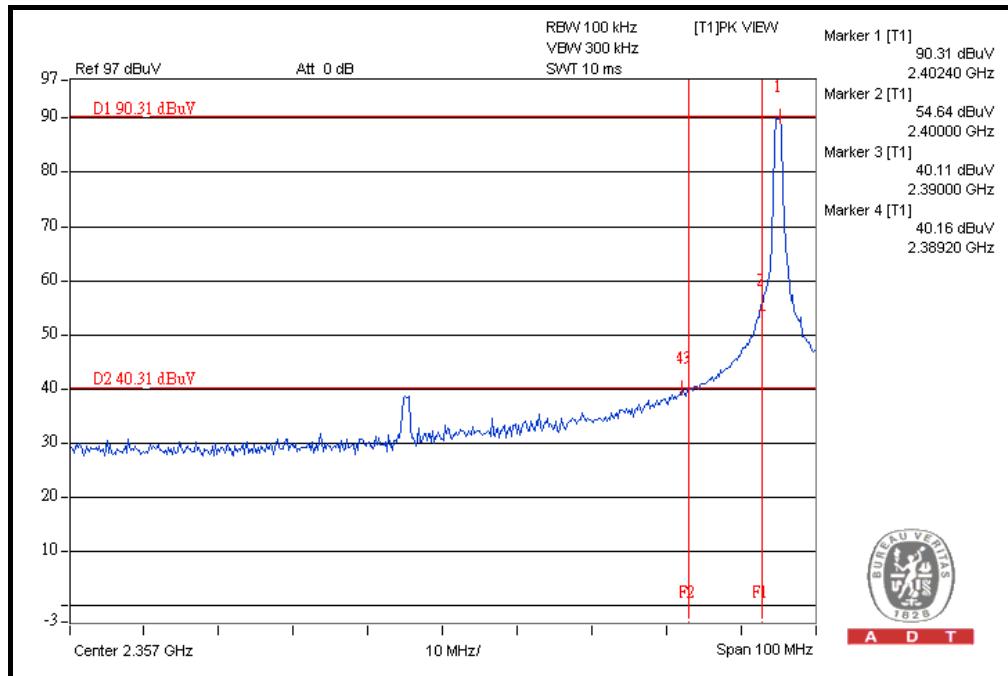
No deviation.

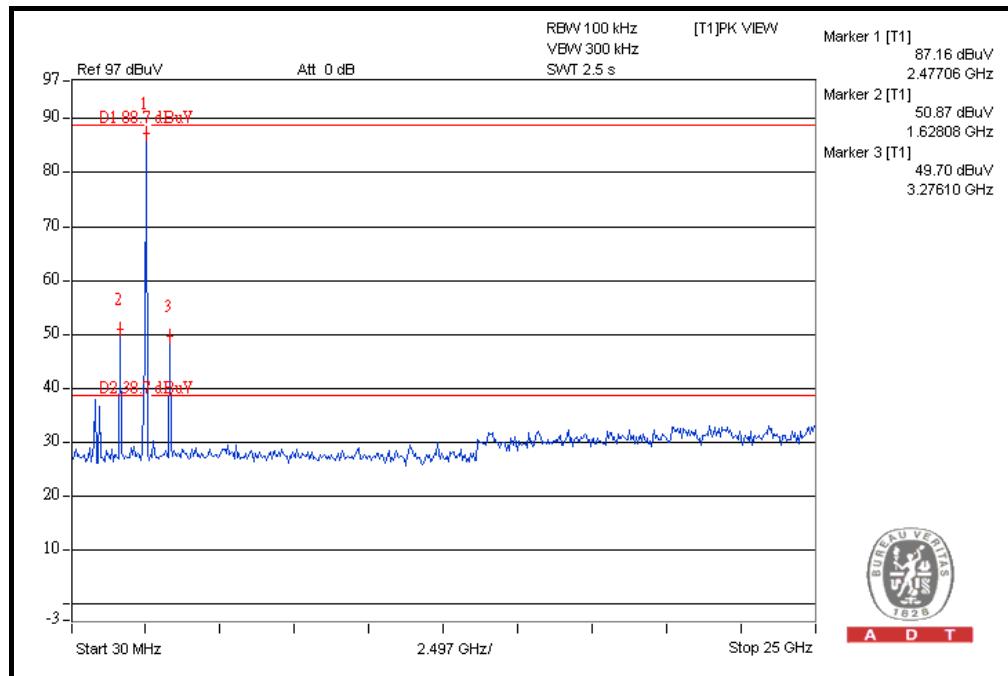
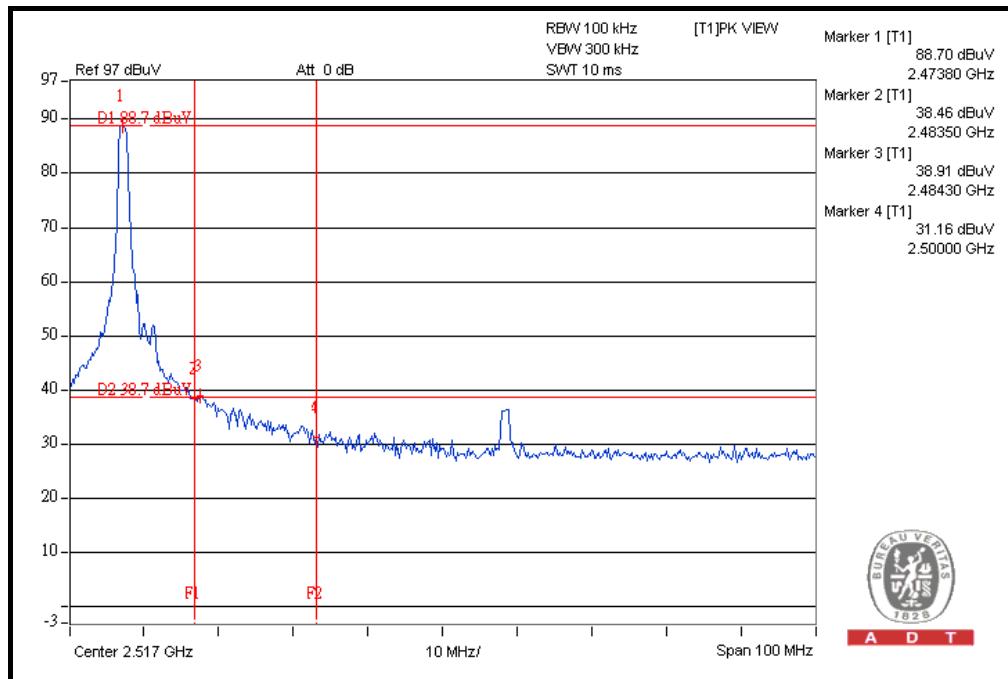
### 4.2.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest 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).







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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.



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## **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 ---**