

MEASUREMENT REPORT of Wireless Audio Video Transmitter

Applicant : GRANDTEC ELECTRONIC CORP.

Product Name : 2.4GHz Wireless Audio/Video Transmitter with USB
Video Capture

Model No. : GRAND RF Grabber USB; GRAND RF CMOS USB;
GRAND RF CCD USB

FCC ID : PFCGTP218

EUT : Audio/Video Transmitter

Report No. : GA215139

Followed by : 47 CFR, Part 15, Subpart C

Test by :

Training Research Co., Ltd.

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15, Lane 530 Pa-Lian Rd., Sec. 1, Hsichih, Taipei Hsien 221, Taiwan, R.O.C.

CERTIFICATION

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (1992) as a reference. All test were conducted by **Training Research Co., Ltd.**, 2, Lane 194, Huan-Ho Street, Hsi-chih, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

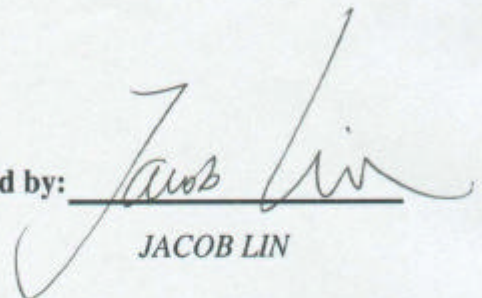
We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with the technical requirements set forth in the FCC Rules Part 15 Subpart C Section 15.249.

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Test Date : July 12, 2002

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CONTENTS

I. GENERAL

1.1 Introduction	5
1.2 Description of EUT	5
1.3 Description of Support Equipment	6
1.4 Configuration of System Under Test	7
1.5 Test Procedure	8
1.6 Location of the Test Site	8
1.7 General Test Condition	8

II. Conducted Emissions Measurements

2.1 Test Condition & Setup	9
2.2 List of Test Instruments	9
2.3 Test Configuration	10
2.4 Test Result of Conducted Emissions	12

III. Radiated Emissions Measurements

3.1 Test Condition & Setup	14
3.2 List of Test Instruments	15
3.3 Test Instruments Configuration	16
3.4 Test Result of Radiated Emissions	18
3.5 Test Result of Spurious Radiated Emissions	19

. Verify Frequencies and Channels.....	24
--	----

Appendix A	25
------------------	----

Appendix B	27
------------------	----

TABLES

Table 1	Power Line Conducted Emissions	
	[Channel 1]	12
Table 2	Power Line Conducted Emissions	
	[Channel 3]	13
Table 3	Open Field Radiated Emissions	
	[Channel 1, Horizontal, 30MHz - 1GHz]	19
Table 4	Open Field Radiated Emissions	
	[Channel 1, Vertical, 30MHz - 1GHz]	19
Table 5	Anechoic Chamber Radiated Emissions	
	[Channel 1, Horizontal, 1GHz - 24GHz]	20
Table 6	Anechoic Chamber Radiated Emissions	
	[Channel 1, Vertical, 1GHz - 24GHz]	20
Table 7	Anechoic Chamber Radiated Emissions	
	[Channel 3, Horizontal, 1GHz - 24GHz]	21
Table 8	Anechoic Chamber Radiated Emissions	
	[Channel 3, Vertical, 1GHz - 24GHz]	21
Table 9	Anechoic Chamber Radiated Emissions	
	[Channel 4, Horizontal, 1GHz - 24GHz]	22
Table 10	Anechoic Chamber Radiated Emissions	
	[Channel 4, Vertical, 1GHz - 24GHz]	22

I. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of audio/video transmitter certification in accordance with Part 2 Subpart J and Part 15 Subpart A and C of the Commission's Rules and Regulations.

1.2 Description of EUT

Product Name	: 2.4GHz Wireless Audio/Video Transmitter with USB Video Capture
Model No.	: GRAND RF Grabber USB; GRAND RF CMOS USB; GRAND RF CCD USB
FCC ID	: PvcGTP218
Frequency Range	: 2410 – 2470 MHz
Support Channel	: 4 Channel
Power Type	: Powered by adaptor Model: YAD-0600800C I/P: 120Vac, 60Hz, 9.5W O/P: 6Vdc, 800mA
Power Cable	: 190cm long, non-shielded, no ferrite core
Audio/Video Cable	: 1.75 m long, non-shielded, no ferrite core
Applicant	: GRANDTEC ELECTRONIC CORP. 8F, No. 268, Lian Cheng Rd., Chung Ho City, Taipei Hsien 235, Taiwan, R.O.C.

Features :

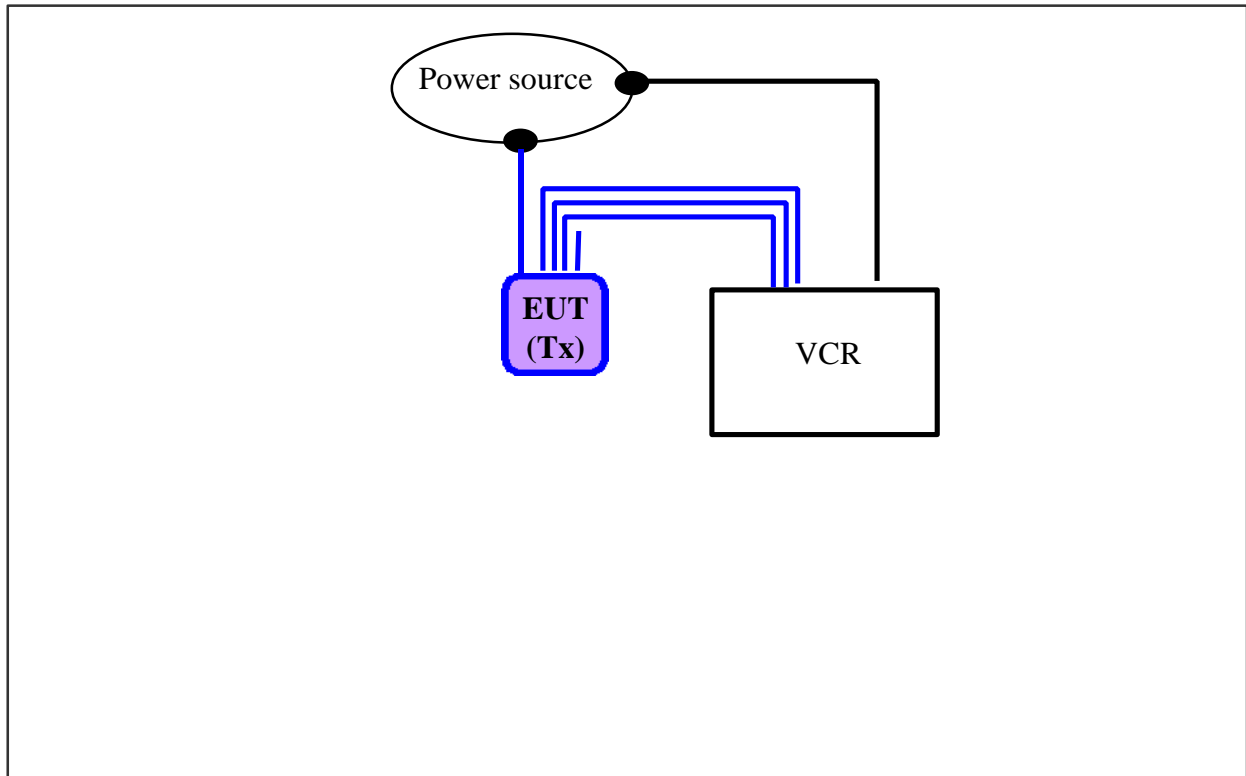
2.4GHz A/V Module uses FM modulation technology to provide ISM band wireless audio and video connection. Multi channels are specially designed to enhance the function of channel switching as well as digital PLL and uP Technology.

ITEM	SPEC	REMARK
Frequency	2400MHz ~ 2483MHz	
Tx Power	1dBm	Typical
Channel Number	4	2410,2430,2450,2470MHz
Frequency Stability	±100KHz	Typical
Video Input Level	1Vp-p	Typical
Audio Input Level	1Vrms	Typical
Supply Voltage	3.3V	+/-0.05V
Current Consumption	50mA	Typical
Antenna Port	Half Pitch Pin Header	1.27mm Pitch
Baseband Interface	Half Pitch Pin Header	1.27mm Pitch
Dimension (mm)	44Wx17Dx6H	Unit is mm
Operating Temperature	10 ~ 50	

1.3 Description of Support Equipment

Color TV : SANYO 20" COLOR TELEVISION
Model No. : ST-20S1
Serial No. : 0619202K92676
Power type : AC110V 60Hz 75W
Power cord : Non-shielded, 2.70m long, No ferrite core

1.4 Configuration of System Under Test



Connections:

EUT:

- *Power Jack --- via a power adapter that the power cable is 1.80m long, non-shielded connected to the AC power source
- *VIDEO IN port --- connected with a 1.75 m long Video cable to Video Out port of the VCR.
- *AUDIO-R IN jack --- connected with a 1.75 m long Video cable to Audio-R Out port of the VCR.
- *AUDIO-L IN jack --- connected with a 1.75 m long Video cable to Audio-L Out port of the VCR.

Test Method:

1. Make the EUT operating and transmitting video and audio signal to the receiver.
2. See the TV connected with Receiver which is far away from the turn table and test antenna to make sure that the device is modulated with video and audio signal.

1.5 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in Measurement procedure ANSI C63.4 (1992).

1.6 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter, Anechoic Chamber (Registration Number: 93906) and ten-meter OATS (Registration Number: 91035)** maintained by *Training Research Co., Ltd.* 1F., No. 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at Training Research Co., Ltd. 1F, No. 2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.7 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions, which the EUT was considered likely to encounter in normal use were investigated.

In test, the base and handset are tested separately. They were set in Ch1, Ch3 and Ch4 of EUT and continuously transmitting mode that controlled by test mode of EUT.

II. Conducted Emissions Measurements

2.1 Test Condition & Setup

The power line conducted emission measurements were performed in an anechoic chamber. The EUT was assembled on a wooden table, which is 80 centimeters high, was placed 40 centimeters from the backwall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and Line Impedance Stabilization Networks (LISNs). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer (or EMI receiver) was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPER quasi-peak detection mode. The analyzer's 6dB bandwidth was set to 9kHz. No post-detector video filter was used.

The spectrum was scanned from 450kHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in test result.

2.2 List of Test Instruments

<u>Instrument Name</u>	<u>Model No.</u>	<u>Brand</u>	<u>Serial No.</u>	<u>Calibration Date</u>	
				<u>Last time</u>	<u>Next time</u>
Receiver	SCR3102	SCHAFFNER	012	03/29/02	03/28/03
LISN (EUT)	3825/2	EMCO	9411-2284	06/17/02	06/16/03
LISN (Support E.)	3825/2	EMCO	9210-2007	08/30/02	08/29/03
Preamplifier	EQ3-006	TRC	-----	05/29/02	05/28/03
Line switch box	EQ3-007	TRC	-----	05/29/02	05/28/03

2.3 Test configuration





2.4 Test Result of Conducted Emissions

EUT station transmit only

The following table shows a summary of the highest emissions of power line conducted emissions on the HOT and NATURAL conductors of the EUT power cord.

Table 1 Power Line Conducted Emissions (Channel 1)

<i>Power Connected Emissions</i>				<i>FCC Class B</i>	
<i>Conductor</i>	<i>Frequency (kHz)</i>	<i>Peak Amplitude (dB μ V)</i>	<i>QP Amplitude (dB μ V)</i>	<i>Limit (dB μ V)</i>	<i>Margin (dB)</i>
Line 1	168.00	21.45	---	55.49	-34.04
	171.00	22.64	---	55.40	-32.76
	208.00	20.00	---	54.34	-34.34
	257.00	21.95	---	52.94	-30.99
	267.00	21.92	---	52.66	-30.73
	347.00	20.34	---	50.37	-30.03
	354.00	20.93	---	50.17	-29.24
	20000.00	24.39	---	50.00	-25.61
	---	---	---	---	---
	---	---	---	---	---
Line 2	167.00	23.33	---	55.51	-32.18
	173.00	23.00	---	55.34	-32.35
	177.00	22.53	---	55.23	-32.70
	248.00	22.81	---	53.20	-30.39
	259.00	22.51	---	52.89	-30.38
	264.00	21.76	---	52.74	-30.98
	352.00	22.25	---	50.23	-27.98
	20000.00	27.49	---	50.00	-22.51
	---	---	---	---	---
	---	---	---	---	---

NOTE:

1. Margin = Peak Amplitude – Limit
2. A "+" sign in the margin column means the emission is OVER the Class B Limit and "-" sign of means UNDER the Class B limit

Table 2 Power Line Conducted Emissions (Channel 3)

<i>Power Connected Emissions</i>				<i>FCC Class B</i>	
<i>Conductor</i>	<i>Frequency (kHz)</i>	<i>Peak Amplitude (dB μ V)</i>	<i>QP Amplitude (dB μ V)</i>	<i>Limit (dB μ V)</i>	<i>Margin (dB)</i>
Line 1	20000.00	36.98	---	48.00	-11.02
	28770.00	21.35	---	48.00	-26.65
	30000.00	21.54	---	48.00	-26.46
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
Line 2	20000.00	35.20	---	48.00	-12.80
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---
	---	---	---	---	---

NOTE:

1. Margin = Peak Amplitude – Limit
2. A "+" sign in the margin column means the emission is OVER the Class B Limit and "-" sign of means UNDER the Class B limit
3. The conduction emissions are similar with each other from channel 1 to 4.

. Radiated Emissions Measurements

3.1 Test Condition & Setup

The EUT was placed in an anechoic chamber and scanned at 3-meter distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration, which produced the highest emission was noted so it could be reproduced later during the final tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

Final radiation measurement (frequency above 1GHz) was made in a three-meter anechoic chamber. The frequency below 1GHz was made in a three-meter OATS. The EUT system was placed on a nonconductive turntable, which is 0.8 meters height, top surface 1.0 x 1.5 meter.

The spectrum was examined from 30MHz to 1000MHz using an Hewlett Packard 8546A & 85460A EMI Receiver, CHASE whole range Bi-Log antenna (Model No.: CBL6141A) is used to measure frequency from 30 MHz to 1GHz. The final test is used the spectrum HP 8546A & 85460A and spectrum was examined from 1GHz to 24GHz using an Hewlett Packard 8564E Spectrum Analyzer, EMCO Horn Antenna for 1G to 24 G Hz.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. There are two spectrum analyzers use on this testing, HP 8546A & 85460A for frequency 30MHz to 1000MHz, and 8564E for frequency 1GHz to 24GHz. No post-detector video filters were used in the test. The spectrum analyzer's was set in the quasi-peak mode. (spectrum was examined from 30MHz to 1000MHz), the spectrum analyzer's bandwidth was set to 1MHz (spectrum was examined from 1GHz to 24GHz) and the analyzer was operated in the peak and average mode.

The actual field intensity in decibels referenced to 1 microvolt per meter (dB μ V/m) is determined by algebraically adding the measured reading in dB μ V, the antenna factor (dB), and cable loss (dB) at the appropriate frequency.

For frequency between 30MHz to 1000MHz

$F_{Ia} \text{ (dB } \mu \text{ V/m)} = F_{Ir} \text{ (dB } \mu \text{ V)} - \text{Correction Factors}$

F_{Ia} : Actual Field Intensity

F_{Ir} : Reading of the Field Intensity

Correction Factor = Antenna Factor + (Cable Loss – Amplitude Gain)

For frequency between 1GHz to 24GHz

$F_{Ia} \text{ (dB } \mu \text{ V/m)} = F_{Ir} \text{ (dB } \mu \text{ V)} + \text{Correction Factor}$

F_{Ia} : Actual Field Intensity

F_{Ir} : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

3.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	<u>Calibration Date</u>	
				Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
Bi-log Antenna	CBL6141A	SCHAFFNER	4188	11/29/01	11/28/02
Switch/Control Unit	3488A	HP	N/A	11/20/01	11/20/02
(> 30MHz)					
Auto Switch Box	ASB-01	TRC	9904-01	11/20/01	11/20/02
(> 30MHz)					
Spectrum Analyzer	8564E	HP	US36433002	08/01/01	08/01/02
Microwave Preamplifier	83051A	HP	3232A00347	08/01/01	08/01/02
Horn Antenna	3115	EMCO	9704 – 5178	08/01/01	08/01/02
Anechoic Chamber (cable calibrated together)				05/20/02	05/20/03

3.3 Test Configuration of Radiated Emission



Picture 1 Front View of the Test Configuration



Picture 2 Rear View of the Test Configuration

3.4 Test Result of Radiated Emissions

The peak values of fundamental emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Product Name : 2.4GHz Wireless Audio/Video Transmitter with USB Video Capture

Model No. : GRAND RF Grabber USB; GRAND RF CMOS USB; GRAND RF CCD USB

Anechoic Chamber Fundamental Emissions

Channel	Frequency (MHz)	A. P. (H/V)	A.H. (m)	Table (degree)	Reading (Peak) (dBV/m)	Correction Factors (dB/m)	Amplitude (Peak) (dB μ V/m)	Limit (dB μ V)	Margin (dB μ V)
1	2414.80	H	1.00	8	82.47	6.40	76.07	94.00	-17.93
	2415.09	V	1.00	142	87.97	6.40	81.57	94.00	-12.43
3	2450.01	H	1.00	63	80.84	6.60	74.24	94.00	-19.76
	2450.07	V	1.00	220	86.34	6.60	79.74	94.00	-14.26
4	2470.19	H	1.00	17	80.37	6.80	73.57	94.00	-20.43
	2470.38	V	1.00	95	85.87	6.80	79.07	94.00	-14.93

Note:

1. A. P. means antenna polarization, horizontal and vertical.
2. A. H. means antenna height.
3. Table means turntable turning position.
4. Amplitude means the fundamental emission measured.
5. Margin = Amplitude-limit.

3.5 Test Result of Spurious Radiated Emissions

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Test Conditions:

Testing site : Temperature : 25° C

Humidity : 85% RH

Table 3 Open Field Radiated Emissions for 30MHz ~ 1GHz [Channel 1, Horizontal]

Radiated Emission				Correction Factors (dB/m)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)			Limit (dB μ V/m)	Margin (dB)
40.0040	17.08	2.51	279	0.74	17.82	30.00	-12.18
150.5260	24.74	3.97	80	-4.33	20.41	30.00	-9.59
211.2247	24.53	1.00	225	-4.71	19.82	30.00	-10.18
422.2798	20.35	3.97	120	2.99	23.34	37.00	-13.66

Table 4 Open Field Radiated Emissions for 30MHz ~ 1GHz [Channel 1, Vertical]

Radiated Emission				Correction Factors (dB/m)	Corrected Amplitude (dB μ V/m)	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)			Limit (dB μ V/m)	Margin (dB)
40.0013	23.90	3.97	358	0.74	24.64	30.00	-5.36
43.7420	24.41	3.97	327	-0.88	23.53	30.00	-6.47
94.4014	27.99	1.00	244	-7.32	20.67	30.00	-9.33
96.8494	27.26	1.00	0	-7.02	20.24	30.00	-9.76
100.5155	26.18	2.49	294	-6.63	19.55	30.00	-10.45
211.2747	24.87	3.97	318	-4.70	20.17	30.00	-9.83

Note:

1. Margin = Amplitude – limit, *if margin is minus means under limit.*
2. Corrected Amplitude = Reading Amplitude – Correction Factors.
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain)
(For example: 30MHz correction factor = 15.5 + (–15.26) = 0.24 dB/m)
4. **The emissions of channel 3 and channel 4 are similar to channel 1 so we only recorded the data of channel 1.**

Table 5 Anechoic Chamber Radiated Emissions for 1GHz ~ 24GHz [Channel 1, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)		FCC Class B (3 m)		
Frequency (GHz)	Peak Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)				Limit		Margin (dB)
					Peak	Average	Peak	Average	
*4.829	46.77	1.00	138	4.00	50.77	---	74.0	54.00	-3.23

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected
3. The “ * “ means restricted bands.
4. Above emissions of 10GHz, passed by more than 20dB margin.
5. Peak: RBW=1M, VBM=1M; Average: RBW=1M, VBW=10Hz

Table 6 Anechoic Chamber Radiated Emissions for 1GHz ~ 24GHz [Channel 1, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)		FCC Class B (3 m)		
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)				Limit		Margin (dB)
					Peak	Average	Peak	Average	
*4.832	49.71	1.00	32	4.00	53.71	---	74.00	54.00	-0.29

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected.
3. The “ * “ means restricted bands.
4. Above emissions of 10GHz, passed by more than 20dB margin.
5. Peak: RBW=1M, VBM=1M; Average: RBW=1M, VBW=10Hz

Table 7 Anechoic Chamber Radiated Emissions for 1GHz ~ 24GHz [Channel 3 Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)		FCC Class B (3 m)		
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)		Limit		Margin (dB)		
					Peak	Average		Peak	Average
*4.895	46.67	1.00	64	4.10	50.77	---	74.00	54.00	-3.23

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected.
3. The “ * ” means restricted bands.
4. Above emissions of 10GHz, passed by more than 20dB margin.
5. Peak: RBW=1M, VBM=1M; Average: RBW=1M, VBW=10Hz

Table 8 Anechoic Chamber Radiated Emissions for 1GHz ~ 24GHz [Channel 3, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)		FCC Class B (3 m)		
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)		Limit		Margin (dB)		
					Peak	Average		Peak	Average
*4.901	49.67	1.00	136	4.10	53.77	---	74.0	54.00	-0.23

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected.
3. The “ * ” means restricted bands.
4. Above emissions of 10GHz, passed by more than 20dB margin.
5. Peak: RBW=1M, VBM=1M; Average: RBW=1M, VBW=10Hz

Table 9 Anechoic Chamber Radiated Emissions for 1GHz ~ 24GHz [Channel 4, Horizontal]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)		FCC Class B (3 m)		
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)				Limit		Margin (dB)
					Peak	Average	Peak	Average	
*4.937	48.24	1.00	246	4.20	50.44	---	74.0	54.00	-1.56

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected.
3. The “ * ” means restricted bands.
4. Above emissions of 10GHz, passed by more than 20dB margin.
5. Peak: RBW=1M, VBM=1M; Average: RBW=1M, VBW=10Hz

Table 10 Anechoic Chamber Radiated Emissions for 1GHz ~ 24GHz [Channel 4, Vertical]

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dB μ V/m)		FCC Class B (3 m)		
Frequency (GHz)	Amplitude (dB μ V/m)	Ant. H. (m)	Table (°)				Limit		Margin (dB)
					Peak	Average	Peak	Average	
*4.901	49.44	1.00	93	4.10	53.54	---	74.0	54.00	-0.46

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected.
3. The “ * ” means restricted bands.
4. Above emissions of 10GHz, passed by more than 20dB margin.
5. Peak: RBW=1M, VBM=1M; Average: RBW=1M, VBW=10Hz

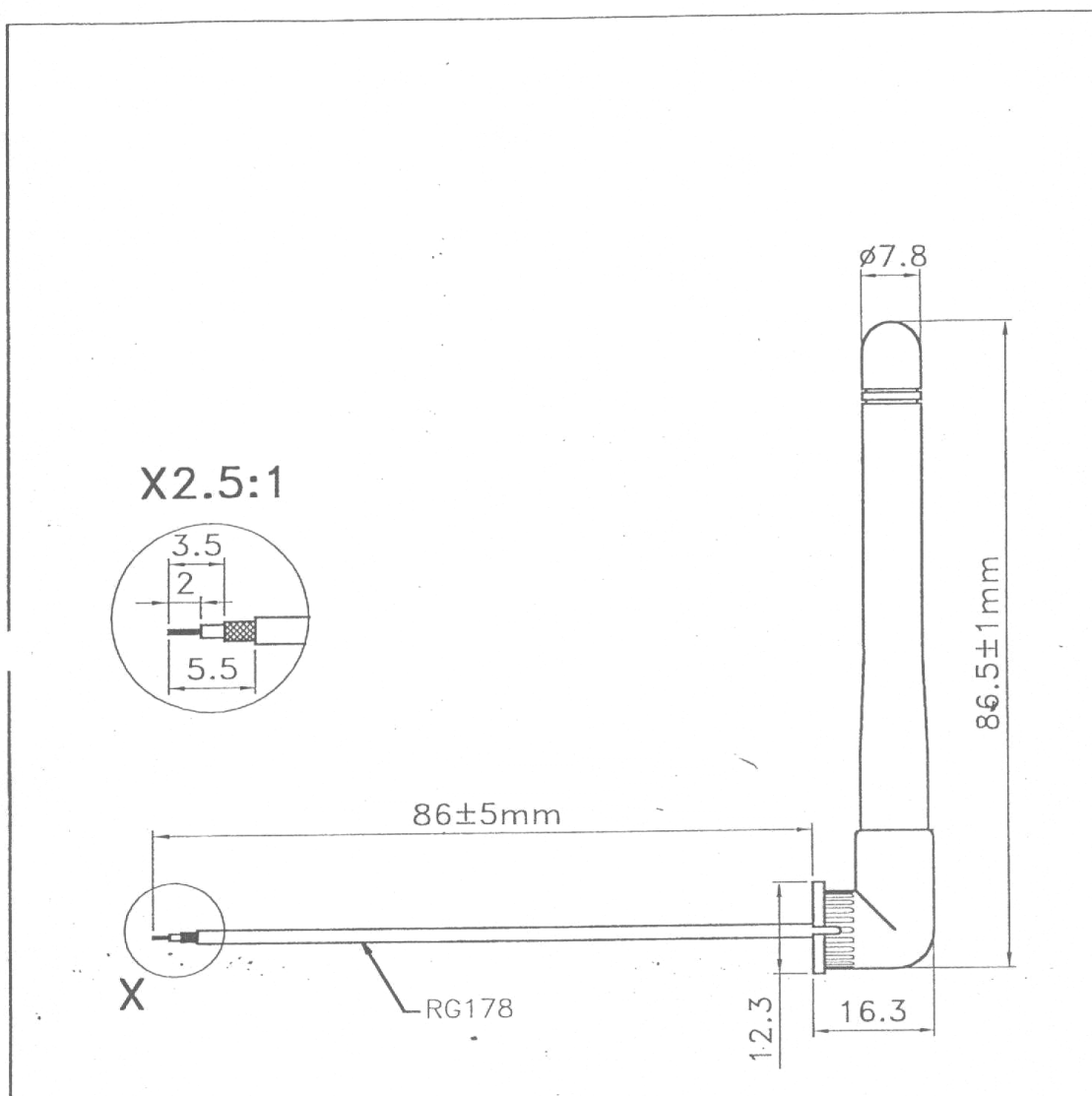
. Verify Frequencies and Channels

This is for sure that all frequencies are in 2410MHz to 2470MHz that verifies the frequency as follow.

Channel	Frequency (MHz)
1	2410
2	2430
3	2450
4	2470

Appendix A

The antenna of the device is solder inside the device, the user can not remove it freely without any tools from outside the device. This is comply with the FCC rules part 15.203



TOLERANCES:	
X	± 1
X.X	± 0.5
X.XX	± 0.25
ANG.	± 0.5°

REV DESCRIPTION	MATERIAL	MODEL IM-243FL-118(GR)		
	FINISH	NAME Right Angle Antenna		
	UNIT: mm	PART No IM-243FL-118(GR)		
	SCALE: 1=0.8	DESIGN	APPROVE	REV
	DATE: 10/13/2001	J.F.Lin	<div style="border: 1px solid black; border-radius: 50%; padding: 5px; text-align: center;"> 工程 部 90.10.14 鄒美蘭 </div>	



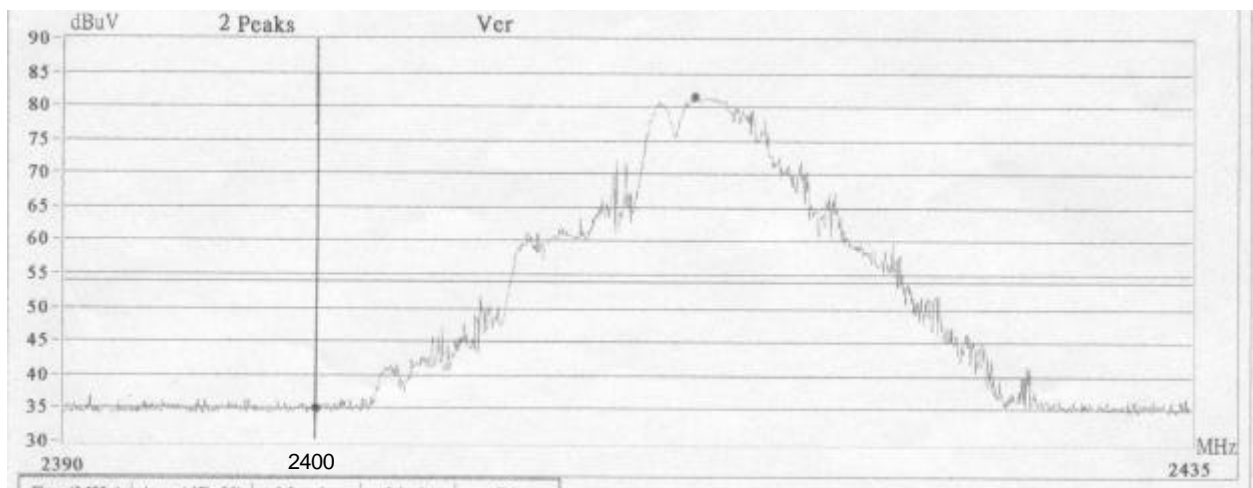
士誼科技事業有限公司
TRAINING RESEARCH CO., LTD.

Appendix B

§ 15.249 (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation. See as next page.

These plots were set to peak detector and RBW = 1MHz, VBW = 1MHz. The EUT was set to modulated.

Channel 1



Channel 4

