CONFORMANCE TEST REPORT
FOR
FCC 47 CFR, Part 15 Subpart C

Report No.: ET94S-08-049-02

Client:	Spectec Computer Co.,Ltd
Product:	Mini SDIO Wireless Lan Card
Model:	SDW-822
FCC ID:	S2Y-MINIWLAN11B
Manufacturer/supplier:	Spectec Computer Co.,Ltd.

Date test item received:	2005/08/03
Date test campaign completed:	2005/08/16
Date of issue:	2005/08/31

Total number of pages of this test report: 50 pages

Total number of pages of photos: External photos 1 pages

Internal photos 1 pages

Setup photos 3 pages

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Manufacturer	: Spectec Computer Co.,Ltd
Address	: 6F No.92 Nanking E. Rd. Sec.5 , Taipei , Taiwan , R.O.C
EUT	: Mini SDIO Wireless Lan Card
Trade name	: Spectec
Model No.	: SDW-822
Power Source	: 3.3V DC
Regulations applied	: FCC 47 CFR, Part 15 Subpart C (2005)

The testing described in this report has been carried out to the best of our knowledge and ability, and our responsibility is limited to the exercise of reasonable care. This certification is not intended to believe the sellers from their legal and/or contractual obligations.

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⑤ FCC Registration Number: 90588, 91094, 91095

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : Mini SDIO Wireless Lan Card
b) Trade Name : Spectec
c) Model No. : SDW-822
d) Power Supply : 3.3V DC

1.2 Characteristics of Device

The EUT is a 2.4 GHz Mini SDIO Wireless Lan Card. It conforms to the IEEE 802.11b protocal and operates in the unlicensed ISM Band at 2.4 GHz. Support for 11 and 5.5 Mbps CCK and legacy 2 and 1 Mbps data rates.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

1.3 Test Methodology

All testing were performed according to the procedures in ANSI C63.4 and FCC CFR 47 Part 2 and Part 15.

1.4 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.
This site has been accreditation as a FCC filing site.

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For unintentional device, according to §15.107(a) Line Conducted Emission Limits is as following:

Frequency MHz	Quasi Peak dB μV	Average dB μV
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

*Decreases with the logarithm of the frequency.

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dB μV/m	Radiated μV/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

(4) Bandwidth Requirement

According to 15.247 (a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

(5) Output Power Requirement

For systems using digital modulation , according to 15.247(b), the maximum peak output power of the intentional radiator shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) Spurious Emissions Measurement

According to 15.247 (c) , in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

(7) Power Density Requirement

According to 15.247 (d) , for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission..

2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Devices for Tested System

Device	Manufacture	Model No.	S/N No.	Cable Description
Mini SDIO Wireless Lan Card*	Spectec Computer Co.,Ltd	SDW-822	----	----
Notebook PC	TOSHIBA	PP160T-00KTP	----	3.3m Unshielded Power Line/Adapter
Mini SD Adaptor	SanDisk	N/A	----	----

Note:

1.Remark "*" means equipment under test.

2.Test Software: INPROCOMM RF Test Utility

Parameter setting: Tx Power (hex): bf

4 CONDUCTED EMISSION MEASUREMENT

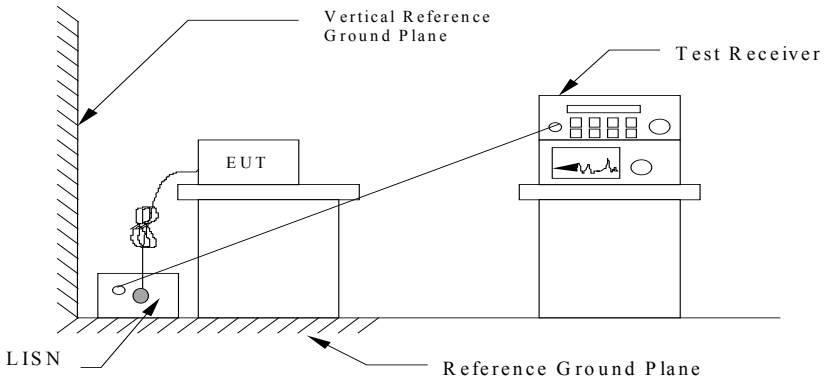
4.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and §15.207(a) respectively. Both Limits are identical specification.

4.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 1 : Conducted emissions measurement configuration



4.3 Conducted Emission Data

4.3.1
Operation Mode: TX (CH 1)

Test Date : Aug. 08, 2005 Temperature : 23℃ Humidity : 56%

Freq. (MHz)	Meter Reading (dBuV)				Factor (dB)	Result (dBuV)				Limit (dBuV)		Margins (dB)
	Q.P Value		AVG. Value			Q.P Value		AVG. Value		Q.P Value	AVG. Value	Q.P. or AVG.
	L1	L2	L1	L2		L1	L2	L1	L2			
0.154	49.9	***	----	----	0.2	50.1	***	----	----	65.8	55.8	-15.7
0.162	***	39.6	----	----	0.2	***	39.8	----	----	65.4	55.4	-25.6
0.170	47.4	***	----	----	0.2	47.6	***	----	----	65.0	55.0	-17.4
0.173	***	38.4	----	----	0.2	***	38.6	----	----	64.8	54.8	-26.2
0.213	***	46.7	----	----	0.2	***	46.9	----	----	63.1	53.1	-16.2
0.220	49.4	***	----	----	0.2	49.6	***	----	----	62.8	52.8	-13.2
0.224	***	48.0	----	----	0.2	***	48.2	----	----	62.7	52.7	-14.5
0.236	***	46.8	----	----	0.2	***	47.0	----	----	62.2	52.2	-15.2
0.365	38.2	***	----	----	0.2	38.4	***	----	----	58.6	48.6	-20.2
0.263	***	41.7	----	----	0.2	***	41.9	----	----	61.3	51.3	-19.4
0.392	41.0	***	----	----	0.2	41.2	***	----	----	58.0	48.0	-16.8
0.420	37.1	***	----	----	0.2	37.3	***	----	----	57.4	47.4	-20.1

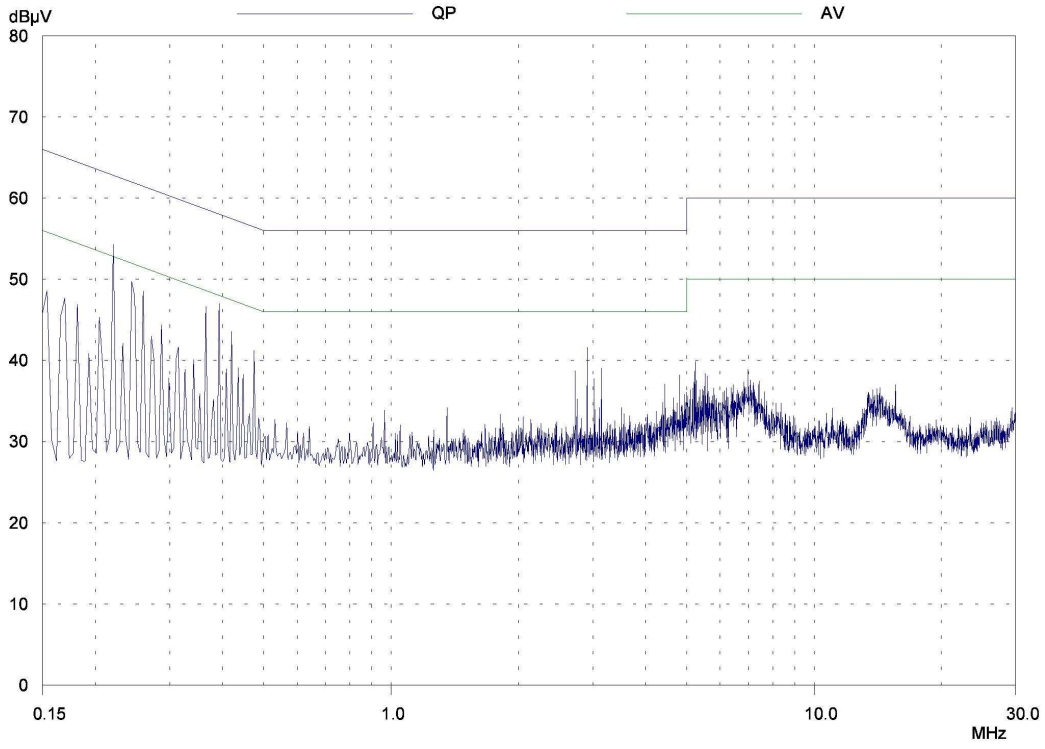
Note:

1. Place of measurement: EMC LAB. of the ETC.
2. "***" means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. "#" means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is ±2.5dB.
6. Please refer to page 14 to page 15 for chart

CONDUCTED EMISSION TEST
PEAK VALUE

EUT:	Mini SD WLAN Card Mini-11b
Manuf:	
Op Cond:	CH01
Operator:	JAMES
Test Spec:	FCC
Comment:	L1
Result File:	ce_l1.dat :

Prescan Measurement:	Detector:	X PK
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	6 dB

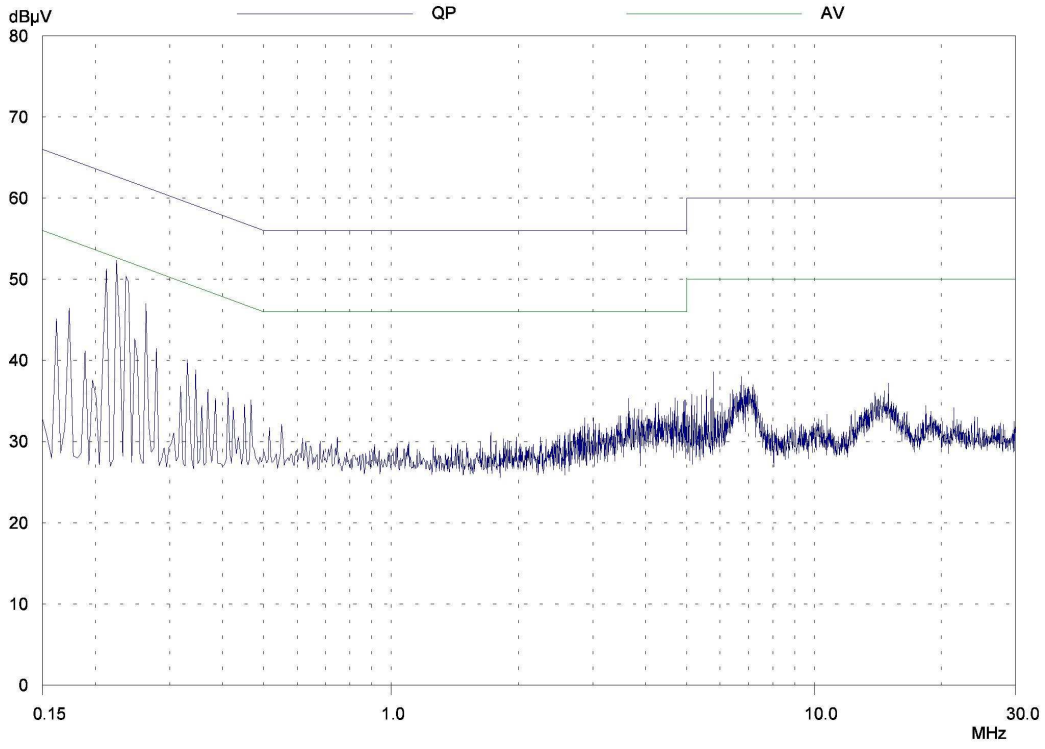


CONDUCTED EMISSION TEST

PEAK VALUE

EUT:	Mini SD WLAN Card Mini-11b
Manuf:	
Op Cond:	CH01
Operator:	JAMES
Test Spec:	FCC
Comment:	L2
Result File:	ce_l2.dat :

Final Measurement:	Detector:	X QP
	Meas Time:	1sec
	Peaks:	8
	Acc Margin:	6 dB



4.3.2

Operation Mode: TX (CH 6)

Test Date : Aug. 08, 2005 Temperature : 23℃ Humidity : 56%

Freq. (MHz)	Meter Reading (dBuV)				Factor (dB)	Result (dBuV)				Limit (dBuV)		Margins (dB)
	Q.P Value		AVG. Value			Q.P Value		AVG. Value		Q.P Value	AVG. Value	Q.P. or AVG.
	L1	L2	L1	L2		L1	L2	L1	L2			
0.185	***	33.8	----	----	0.2	***	34.0	----	----	64.3	54.3	-30.3
0.193	37.2	36.4	----	----	0.2	37.4	36.6	----	----	63.9	53.9	-26.5
0.209	45.4	45.4	----	----	0.2	45.6	45.6	----	----	63.2	53.2	-17.6
0.220	47.4	***	----	----	0.2	47.6	***	----	----	62.8	52.8	-15.2
0.224	47.0	47.5	----	----	0.2	47.2	47.7	----	----	62.7	52.7	-15.0
0.236	45.6	***	----	----	0.2	45.8	***	----	----	62.2	52.2	-16.4
0.248	***	43.6	----	----	0.2	***	43.8	----	----	61.8	51.8	-18.0
0.263	38.5	39.1	----	----	0.2	38.7	39.3	----	----	61.3	51.3	-22.0

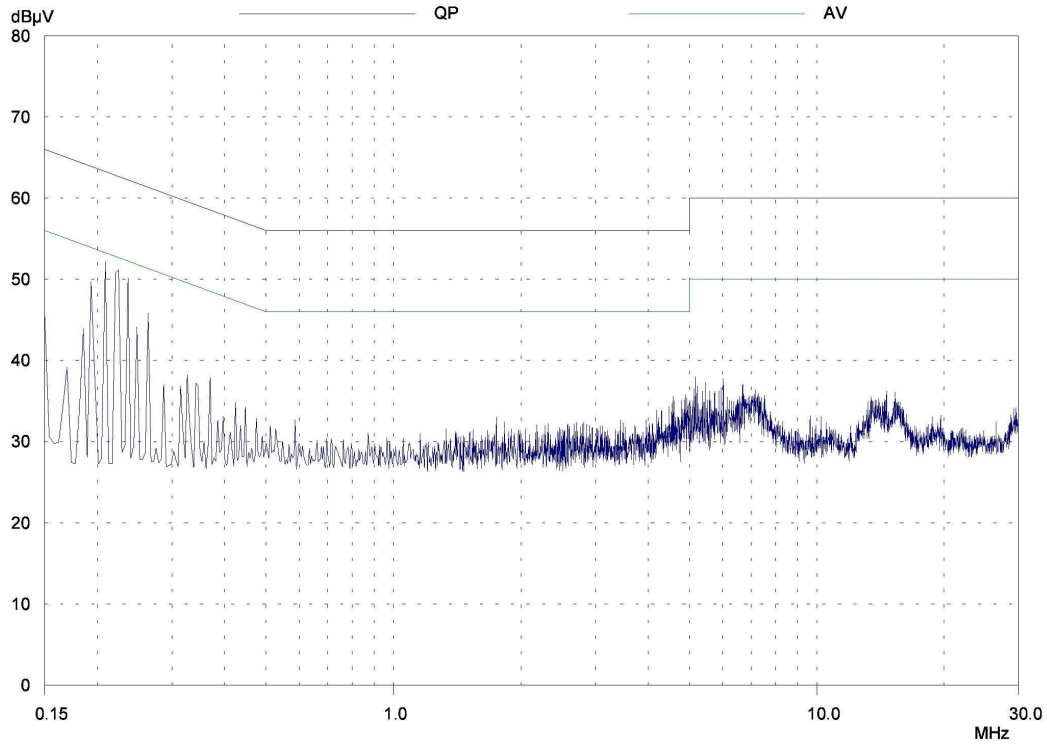
Note:

1. Place of measurement: EMC LAB. of the ETC.
2. "***" means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. "#" means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is ±2.5dB.
6. Please refer to page 17 to page 18 for chart

CONDUCTED EMISSION TEST
PEAK VALUE

EUT:	Mini SD WLAN Card Mini-11b
Manuf:	
Op Cond:	CH06
Operator:	JAMES
Test Spec:	FCC
Comment:	L1
Result File:	ce_l1.dat :

Prescan Measurement:	Detector:	X PK
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	6 dB

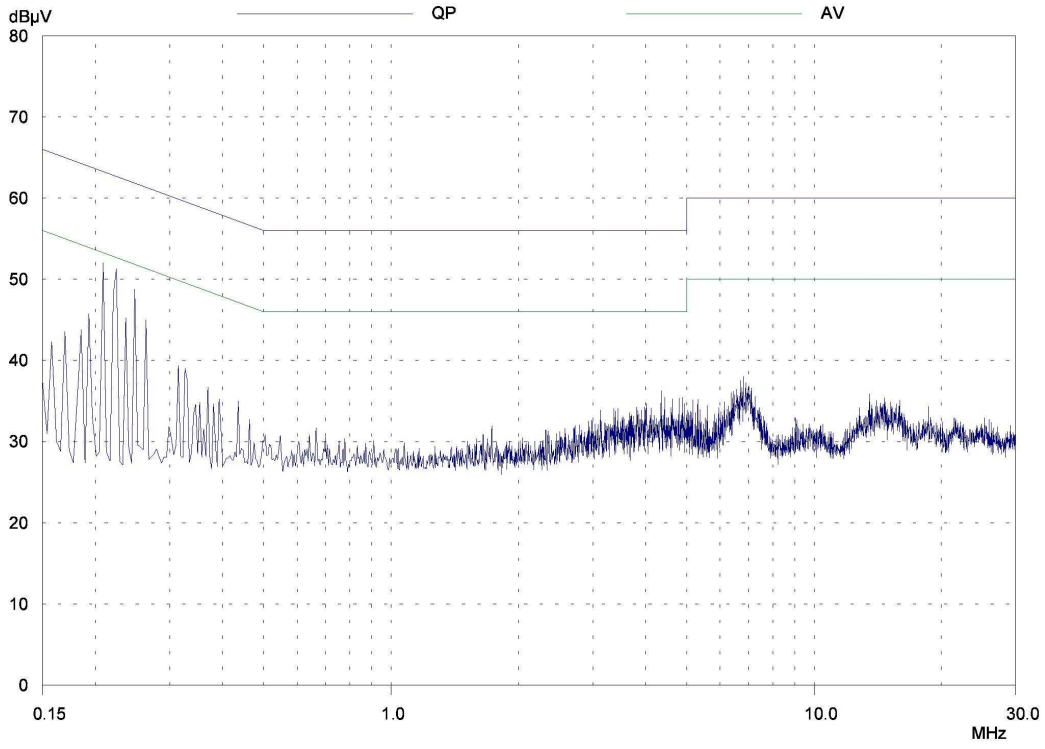


CONDUCTED EMISSION TEST

PEAK VALUE

EUT:	Mini SD WLAN Card Mini-11b
Manuf:	
Op Cond:	CH06
Operator:	JAMES
Test Spec:	FCC
Comment:	L2
Result File:	ce_l2.dat :

Prescan Measurement:	Detector:	X PK
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	6 dB



4.3.3

Operation Mode: TX (CH 11)

Test Date : Aug. 08, 2005 Temperature : 23℃ Humidity : 56%

Freq. (MHz)	**Meter Reading** (dBuV)				**Factor** (dB)	**Result** (dBuV)				**Limit** (dBuV)		**Margins** (dB)
	Q.P Value		AVG. Value			Q.P Value		AVG. Value		Q.P Value	AVG. Value	Q.P. or AVG.
	L1	L2	L1	L2		L1	L2	L1	L2			
0.162	36.5	***	----	----	0.2	36.7	***	----	----	65.4	55.4	-28.7
0.173	***	34.6	----	----	0.2	***	34.8	----	----	64.8	54.8	-30.0
0.213	43.2	***	----	----	0.2	43.4	***	----	----	63.1	53.1	-19.7
0.224	***	37.4	----	----	0.2	***	37.6	----	----	62.7	52.7	-25.1
0.228	46.2	***	----	----	0.2	46.4	***	----	----	62.5	52.5	-16.1
0.236	45.5	40.4	----	----	0.2	45.7	40.6	----	----	62.2	52.2	-16.5
0.252	42.7	43.4	----	----	0.2	42.9	43.6	----	----	61.7	51.7	-18.1
0.263	***	42.6	----	----	0.2	***	42.8	----	----	61.3	51.3	-18.5
0.267	41.3	***	----	----	0.2	41.5	***	----	----	61.2	51.2	-19.7
0.279	***	39.5	----	----	0.2	***	39.7	----	----	60.8	50.8	-21.1

Note:

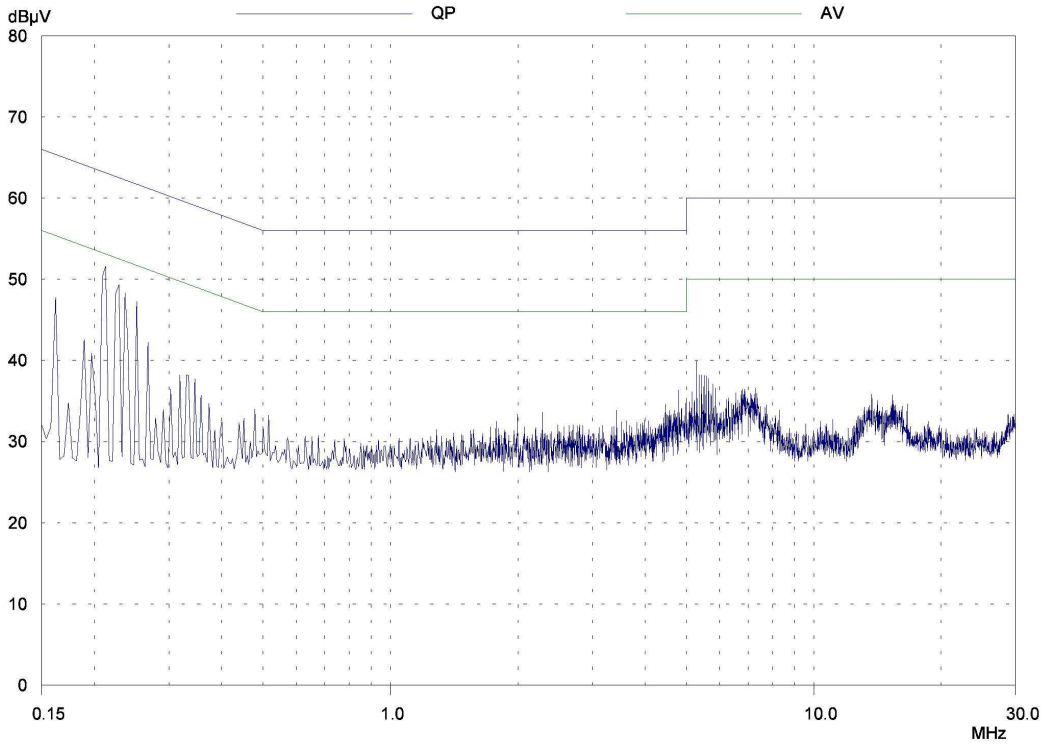
1. Place of measurement: EMC LAB. of the ETC.
2. "***" means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. "#" means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is ±2.5dB.
6. Please refer to page 20 to page 21 for chart

CONDUCTED EMISSION TEST

PEAK VALUE

EUT:	Mini SD WLAN Card Mini-11b
Manuf:	
Op Cond:	CH11
Operator:	JAMES
Test Spec:	FCC
Comment:	L1
Result File:	ce_l1.dat :

Prescan Measurement:	Detector:	X PK
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	6 dB

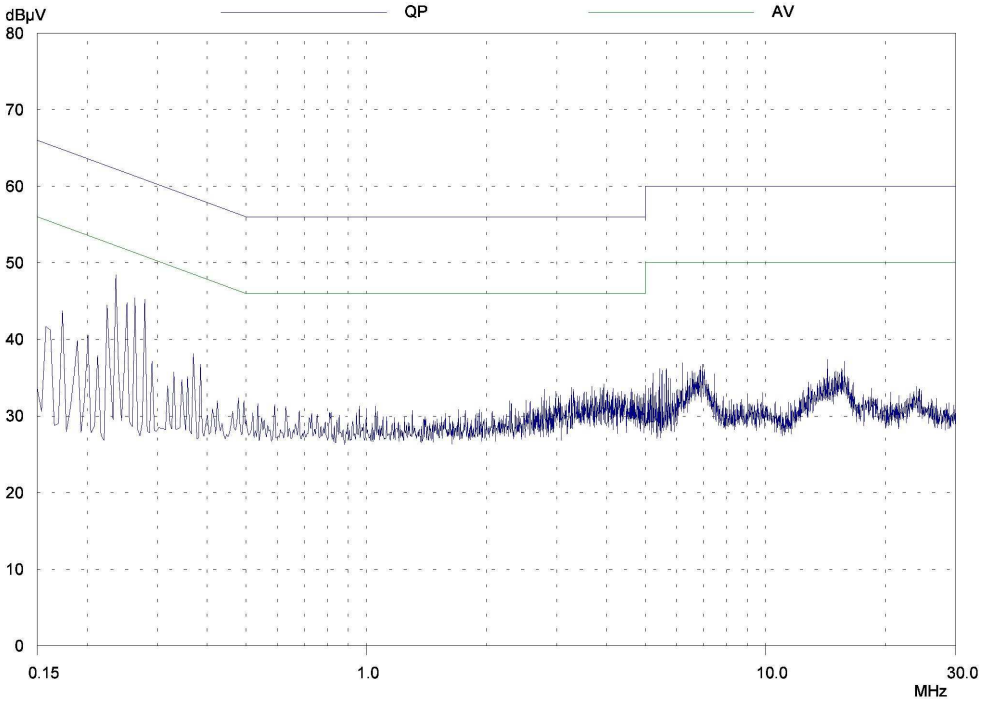


CONDUCTED EMISSION TEST

PEAK VALUE

EUT:	Mini SD WLAN Card Mini-11b
Manuf:	
Op Cond:	CH11
Operator:	JAMES
Test Spec:	FCC
Comment:	L2
Result File:	ce_l2.dat :

Prescan Measurement:	Detector:	X PK
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	6 dB



4.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR (Included Cable Loss)

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

RESULT = 22.5 + 0.1 = 22.6 dB μ V

Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]

= 13.48 μ V

4.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	Next Cal. Due
RF Test Receiver	Rohde and Schwarz	ESCS30	04/01/2006
Line Impedance Stabilization network	EMCO	3825	11/09/2005

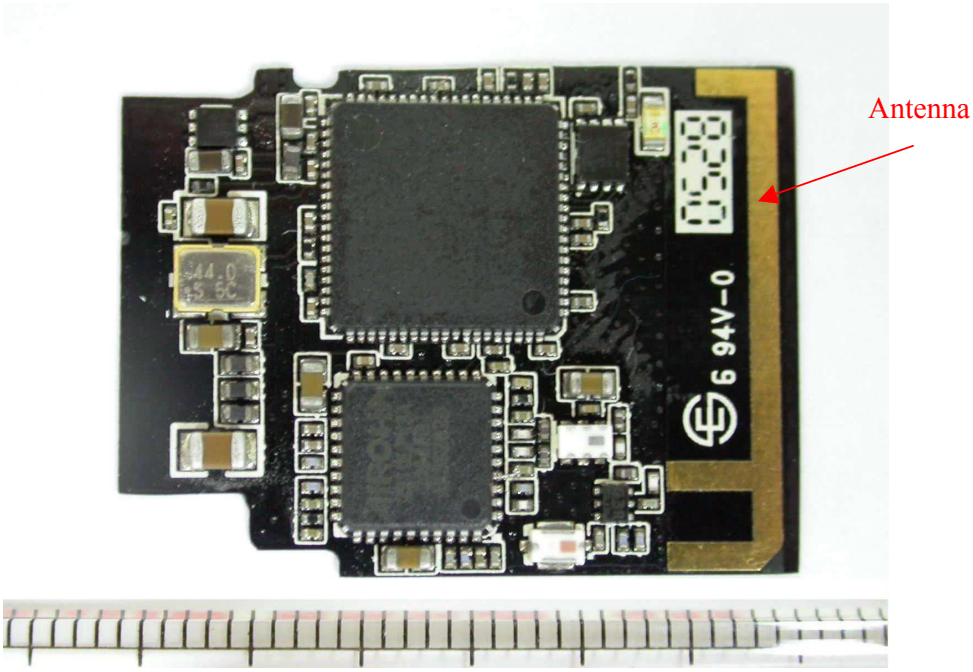
5 ANTENNA REQUIREMENT

5.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And according to §15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna Construction and Directional Gain

Antenna type: Inverted-F Antenna.
Antenna gain: 3.4 dBi.



6 EMISSION BANDWIDTH MEASUREMENT

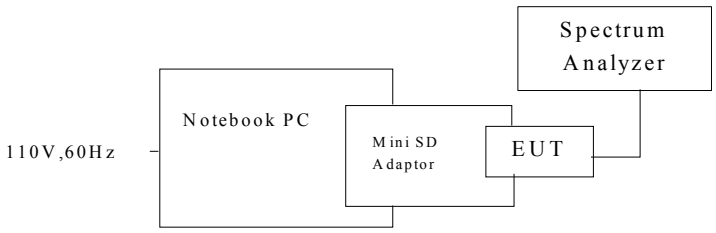
6.1 Standard Applicable

According to 15.247(a)(2), system using digital modulation techniques, the minimum 6dB bandwidth shall be at least 500 kHz.

6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Figure 2: Emission bandwidth measurement configuration.



6.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSU46	10/03/2005

6.4 Measurement Data

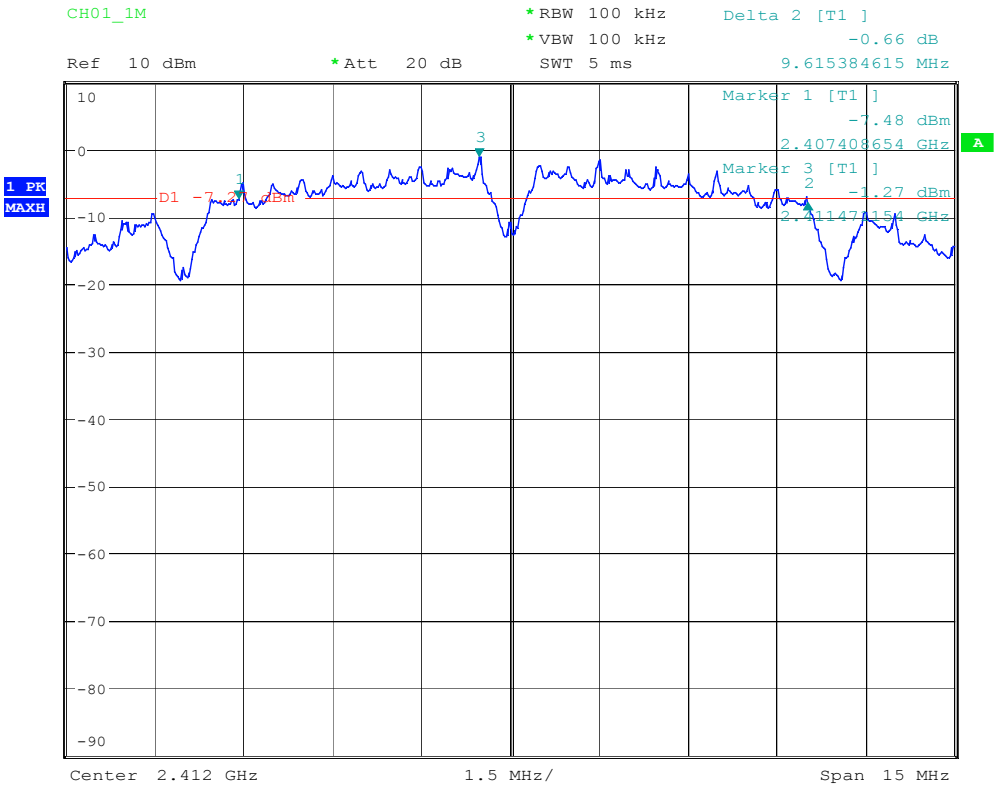
Test Date: Aug. 16, 2005 Temperature: 23℃ Humidity: 58 %

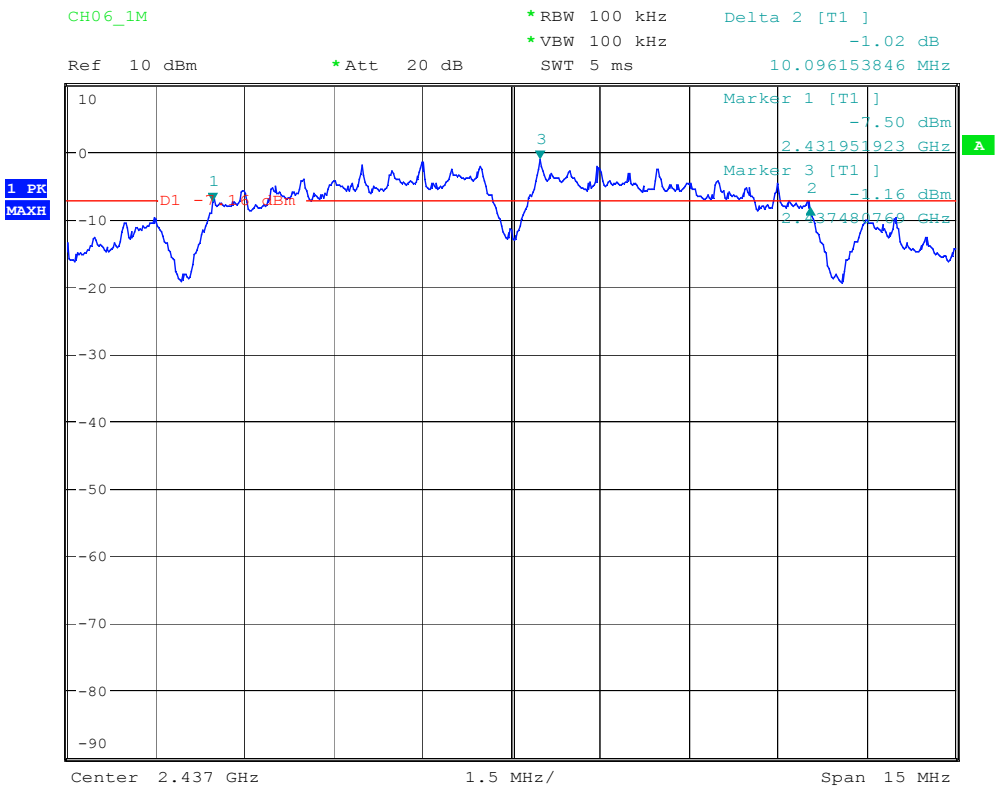
Channel	Frequency (MHz)	Data Transfer Rate (Mbps)	6dB Bandwidth (MHz)	FCC Limit (kHz)	Chart
1	2412	1	9.62	500	Page 26
		2	9.87	500	-
		5.5	10.02	500	-
		11	10.12	500	-
6	2437	1	10.10	500	Page 27
		2	10.12	500	-
		5.5	10.17	500	-
		11	10.11	500	-
11	2462	1	10.02	500	Page 28
		2	10.17	500	-
		5.5	10.03	500	-
		11	10.12	500	-

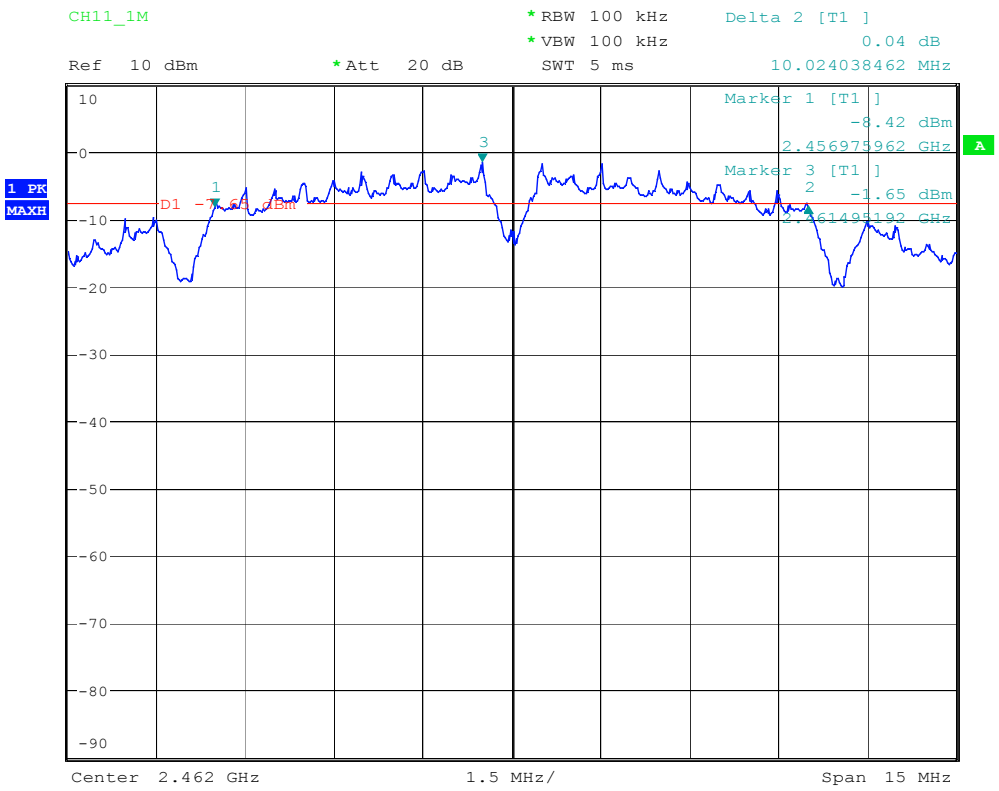
Note:

1.Please refer to page 26 to page 28 for chart

2. The estimated measurement uncertainty of the result measurement is 8.25×10^{-7} *(1GHz ≦f≦ 18GHz)*


CH01_1M
*RBW 100 kHz
*VBW 100 kHz
Ref 10 dBm
*Att 20 dB
SWT 5 ms
Delta 2 [T1]
-0.66 dB
9.615384615 MHz
Marker 1 [T1]
-7.48 dBm
2.407408654 GHz
Marker 3 [T1]
-1.27 dBm
1 PK
MAXH
A
D1 -7.32 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.412 GHz
1.5 MHz/
Span 15 MHz


CH06_1M
*RBW 100 kHz
*VBW 100 kHz
Delta 2 [T1]
-1.02 dB
10.096153846 MHz
Ref 10 dBm
*Att 20 dB
SWT 5 ms
Marker 1 [T1]
-7.50 dBm
2.431951923 GHz
Marker 3 [T1]
-1.16 dBm
2.437480769 GHz
1 PK
MAXH
A
D1 -7.18 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.437 GHz
1.5 MHz/
Span 15 MHz


CH11_1M
*RBW 100 kHz
*VBW 100 kHz
Delta 2 [T1]
0.04 dB
Ref 10 dBm
*Att 20 dB
SWT 5 ms
10.024038462 MHz
Marker 1 [T1]
-8.42 dBm
2.456975962 GHz
Marker 3 [T1]
-1.65 dBm
1 PK
MAXH
A
D1 -7.65 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.462 GHz
1.5 MHz/
Span 15 MHz

7 OUTPUT POWER MEASUREMENT

7.1 Standard Applicable

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range.
3. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.
4. Repeat above procedures until all frequencies measured were complete.

7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	8564EC	09/16/2005
Power Meter	Boonton	4532	06/13/2006
Peak Power Sensor	Boonton	56518	07/21/2006

7.4 Measurement Data

Test Date: Aug. 16, 2005 Temperature: 23℃ Humidity: 58 %

Channel	Frequency (MHz)	Data Transfer Rate (Mbps)	Reading (dBm)	Attenuator & Cable Loss (dB)	Maximum Peak Output Power (dBm)	Maximum Peak Output Power (mW)	FCC Limit (mW)
1	2412	1	3.09	6.1	9.19	8.30	1000
		2	3.02	6.1	9.12	8.17	1000
		5.5	2.32	6.1	8.42	6.95	1000
		11	-0.13	6.1	5.97	3.95	1000
6	2437	1	305	6.1	9.15	8.22	1000
		2	3.02	6.1	9.12	8.17	1000
		5.5	2.38	6.1	8.48	7.05	1000
		11	-0.12	6.1	5.98	3.96	1000
11	2462	1	2.89	6.1	8.99	7.93	1000
		2	2.78	6.1	8.88	7.73	1000
		5.5	1.85	6.1	7.95	6.24	1000
		11	-0.61	6.1	5.49	3.54	1000

Note:

The estimated measurement uncertainty of the result measurement is ±1.5dB(1GHz≦f≦18GHz)

8 POWER DENSITY MEASUREMENT

8.1 Standard Applicable

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on highest level appearing on spectral display within a 300 kHz frequency span.
4. Set the spectrum analyzer on a 3 kHz resolution bandwidth and 10 kHz video bandwidth as well as max. hold function, then record the measurement result.
5. Repeat above procedures until all measured frequencies were complete.

8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSU46	10/03/2005

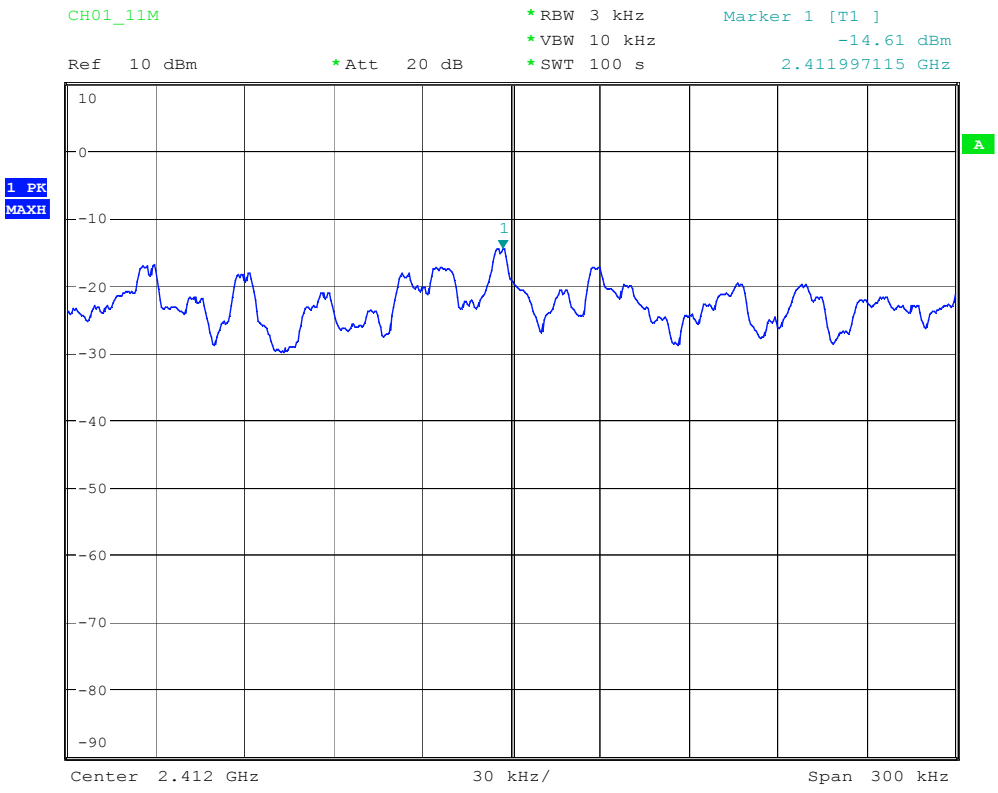
8.4 Measurement Data

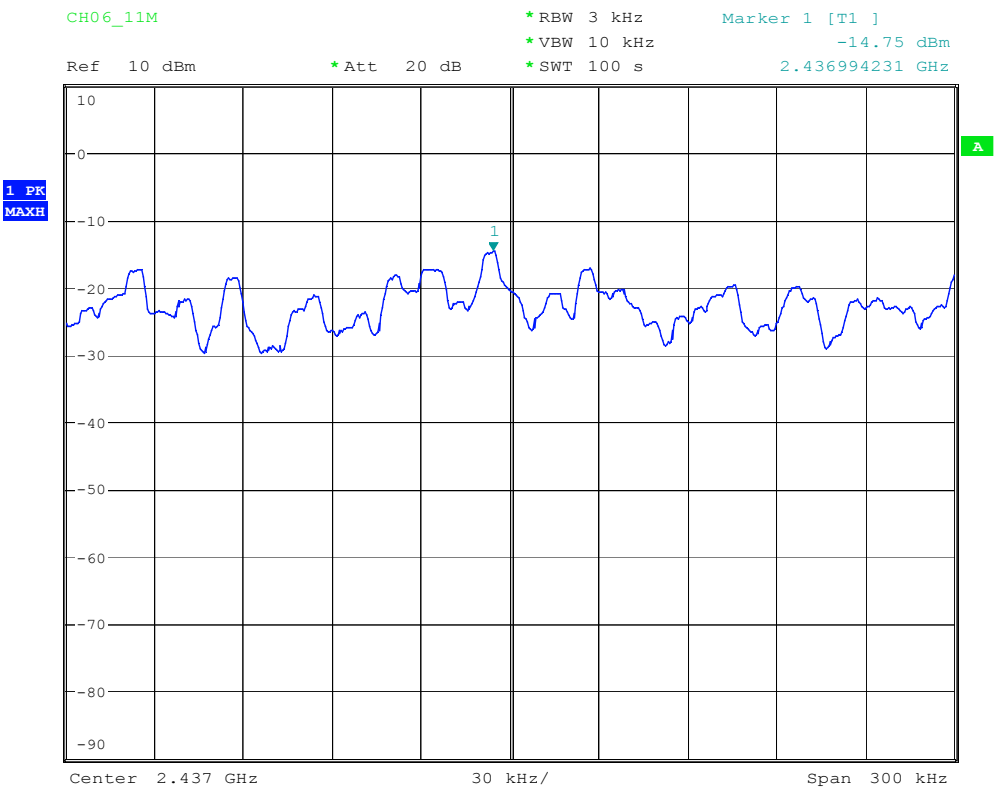
Test Date: Aug. 16, 2005 Temperature: 23 ℃ Humidity: 58 %

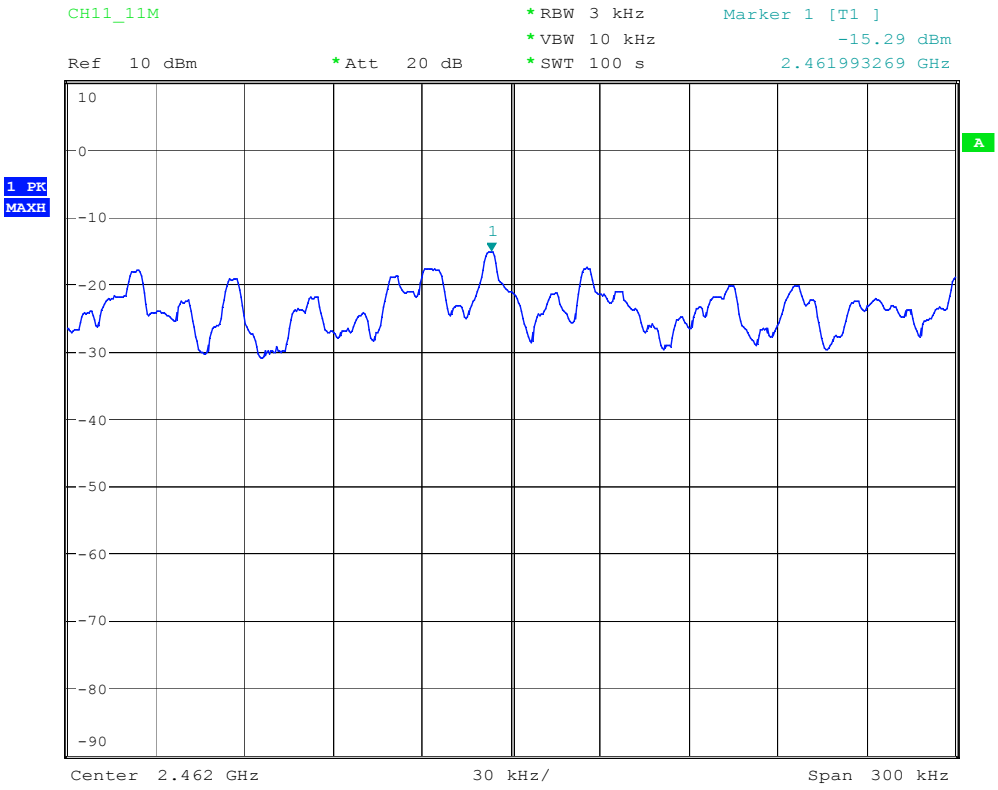
Channel	Frequency (MHz)	Data Transfer Rate (Mbps)	Reading (dBm)	Cable Loss (dB)	Peak Power Spectral Density (dBm)	FCC Limit (dBm)	Chart
1	2412	1	-20.88	0.8	-20.08	8	-
		2	-18.85	0.8	-18.05	8	-
		5.5	-15.79	0.8	-14.99	8	-
		11	-14.61	0.8	-13.81	8	Page 33
6	2437	1	-20.39	0.8	-19.59	8	-
		2	-19.28	0.8	-18.48	8	-
		5.5	-15.84	0.8	-15.04	8	-
		11	-14.75	0.8	-13.95	8	Page 34
11	2462	1	-20.75	0.8	-19.95	8	-
		2	-19.48	0.8	-18.68	8	-
		5.5	-16.27	0.8	-15.47	8	-
		11	-15.29	0.8	-14.49	8	Page 35

Note:

1. *Please refer to page 33 to page 35 for chart*
2. *The estimated measurement uncertainty of the result measurement is ±1.5dB(1GHz≦f≦ 18GHz)*


CH01_11M
*RBW 3 kHz
*VBW 10 kHz
*SWT 100 s
Marker 1 [T1]
-14.61 dBm
2.411997115 GHz
Ref 10 dBm
*Att 20 dB
1 PK
MAXH
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.412 GHz
30 kHz/
Span 300 kHz


CH06_11M
*RBW 3 kHz
*VBW 10 kHz
*SWT 100 s
Marker 1 [T1]
-14.75 dBm
2.436994231 GHz
Ref 10 dBm
*Att 20 dB
1 PK
MAXH
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.437 GHz
30 kHz/
Span 300 kHz


CH11_11M
*RBW 3 kHz
*VBW 10 kHz
*SWT 100 s
Marker 1 [T1]
-15.29 dBm
2.461993269 GHz
Ref 10 dBm
*Att 20 dB
1 PK
MAXH
A
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.462 GHz
30 kHz/
Span 300 kHz

9 SPURIOUS EMISSION - RF CONDUCTED MEASUREMENT

9.1 Standard Applicable

According to 12.247 (c) , in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Rohde & Schwarz	FSU46	10/03/2005

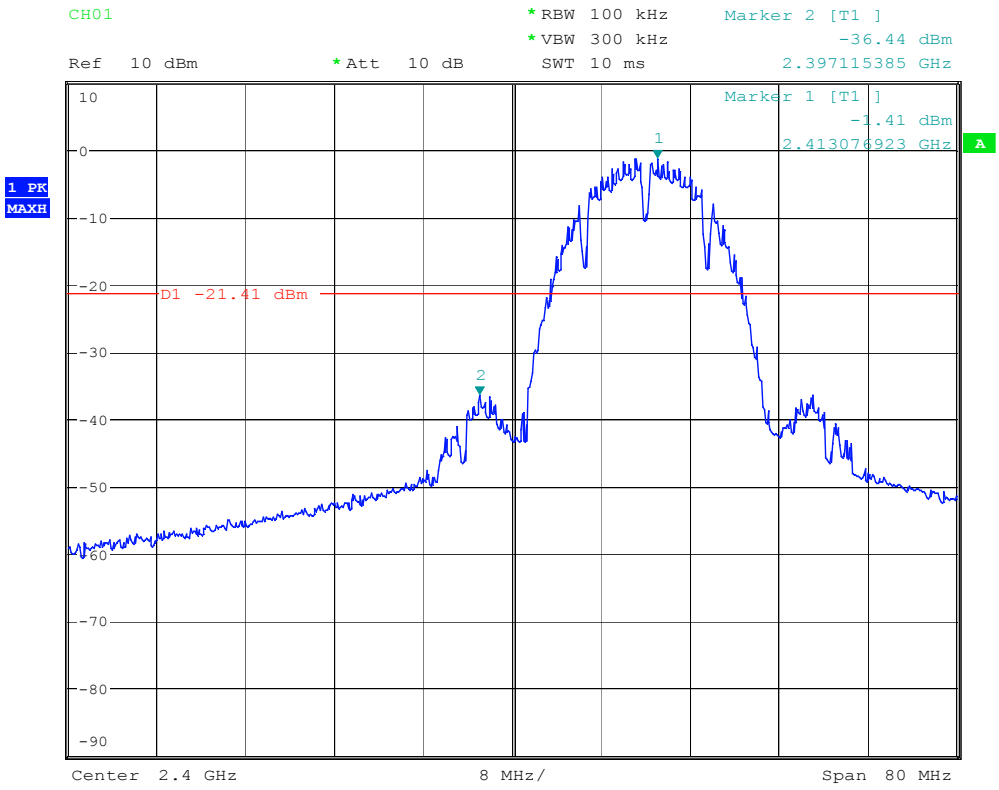
9.4 Measurement Data

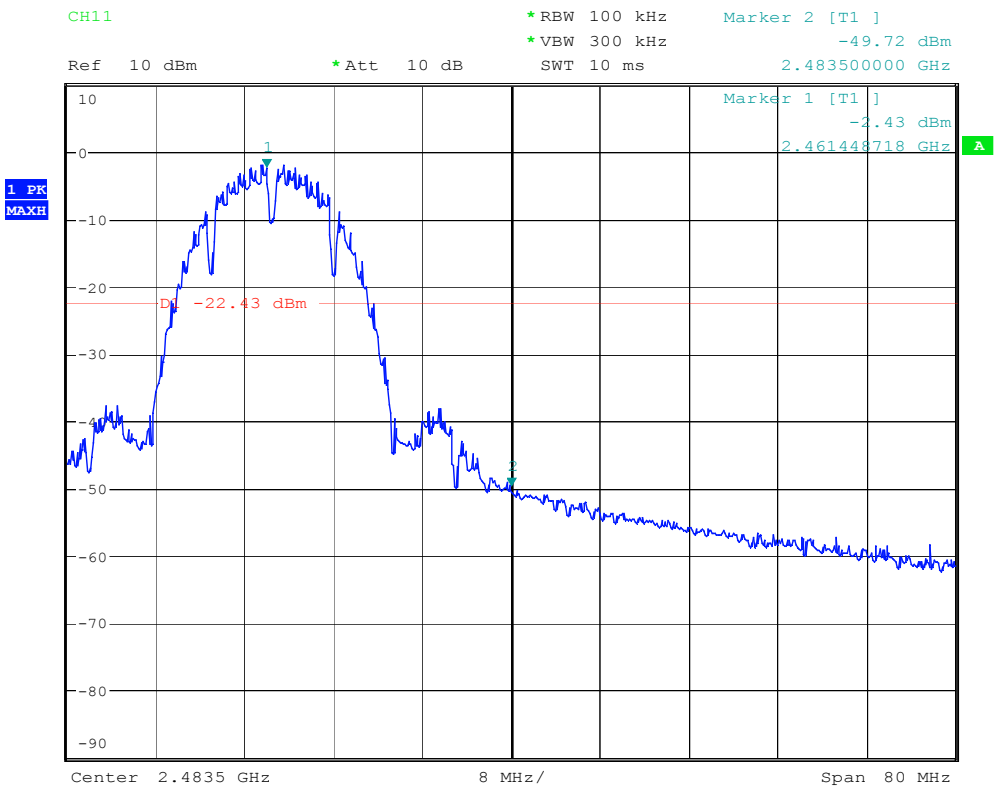
Test Date: Aug. 16, 2005 Temperature: 23 ℃ Humidity: 58 %

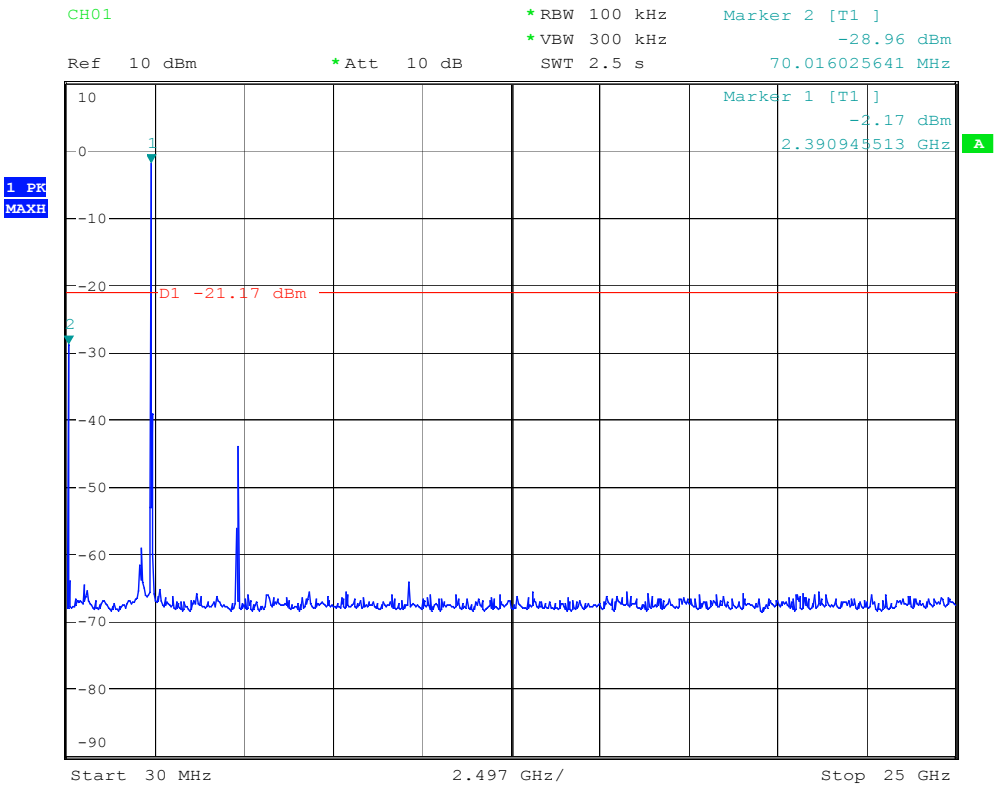
Channel	Frequency(MHz)	Chart
1	2412	Page 38, Page 40
6	2437	Page 41
11	2462	Page 39Page 42

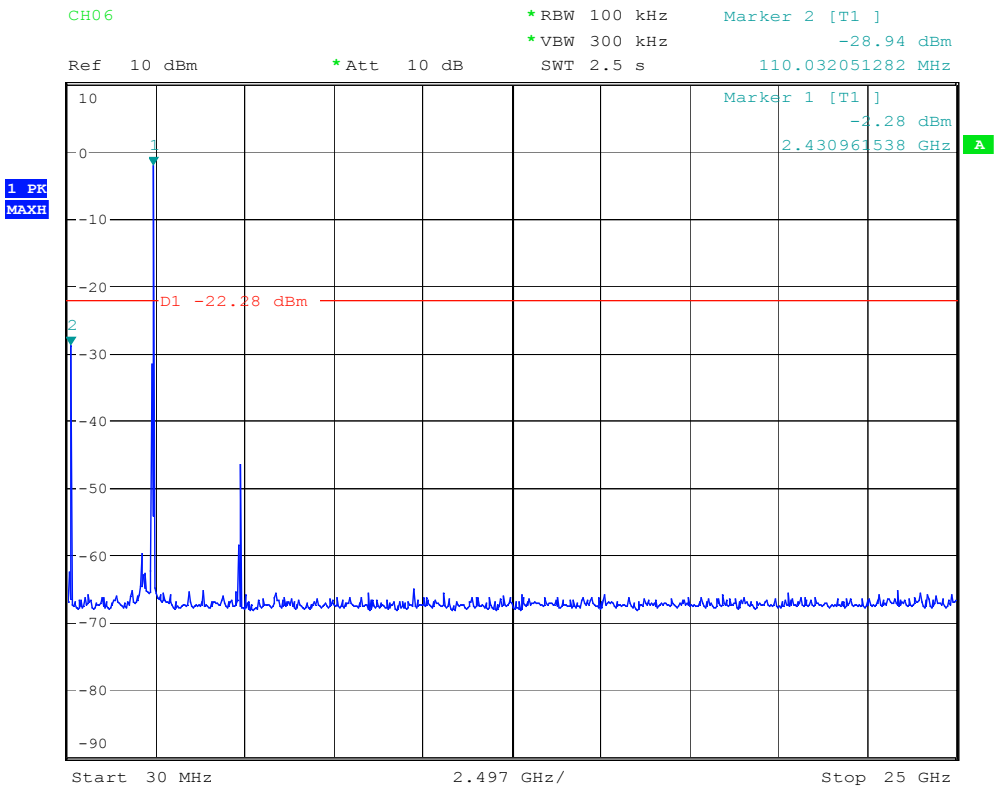
All out-of –band conducted emissions were more than 20dB below the carrier.

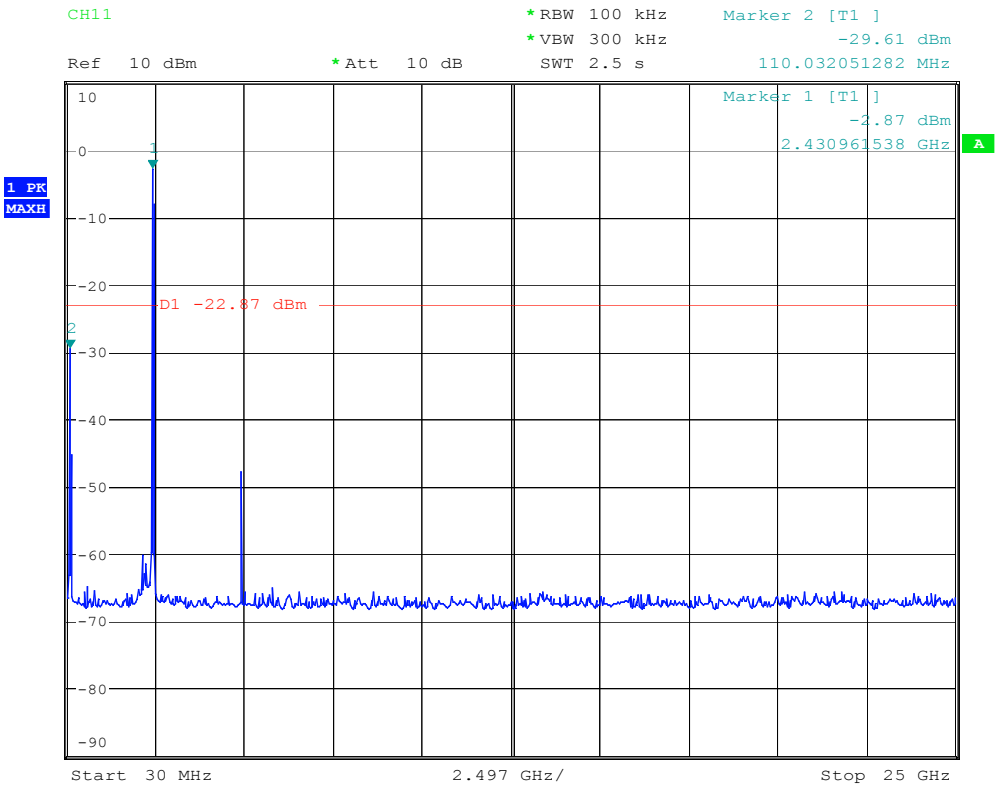
Note: Please refer to page 38 to page 42 for chart


CH01
*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 10 ms
Marker 2 [T1]
-36.44 dBm
2.397115385 GHz
Marker 1 [T1]
-1.41 dBm
2.413076923 GHz
1 PK
MAXH
A
D1 -21.41 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4 GHz
8 MHz/
Span 80 MHz


CH11
*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 10 ms
Marker 2 [T1]
-49.72 dBm
2.483500000 GHz
Marker 1 [T1]
-2.43 dBm
2.461448718 GHz
A
1 PK
MAXH
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
D1 -22.43 dBm
Center 2.4835 GHz
8 MHz/
Span 80 MHz


CH01
*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 2.5 s
Marker 2 [T1]
-28.96 dBm
70.016025641 MHz
Marker 1 [T1]
-2.17 dBm
2.390945513 GHz
A
1 PK
MAXH
D1 -21.17 dBm
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Start 30 MHz
2.497 GHz/
Stop 25 GHz


CH06
*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 2.5 s
Marker 2 [T1]
-28.94 dBm
110.032051282 MHz
Marker 1 [T1]
-2.28 dBm
2.430961538 GHz
A
1 PK
MAXH
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
D1 -22.28 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz


CH11
*RBW 100 kHz
*VBW 300 kHz
Ref 10 dBm
*Att 10 dB
SWT 2.5 s
Marker 2 [T1]
-29.61 dBm
110.032051282 MHz
Marker 1 [T1]
-2.87 dBm
2.430961538 GHz
A
1 PK
MAXH
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
D1 -22.87 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

10 RADIATED EMISSION MEASUREMENT

10.1 Standard Applicable

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

10.2 Measurement Procedure

A.Preliminary Measurement For Portable Devices.

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT (X,Y and Z axis):

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antennna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. The axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.
4. The position in which the maximum noise occurred was “Y axis”. (Please see the test setup photos)

B. Final Measurement

1. Setup the configuration per figure 4 and 5 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, it is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions. For emission frequencies measured above 1 GHz, a pre-scan be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

   Note : A filter was used to avoid pre-amplifier saturated when measure TX operation mode.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the datarate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 3 : Frequencies measured below 1 GHz configuration

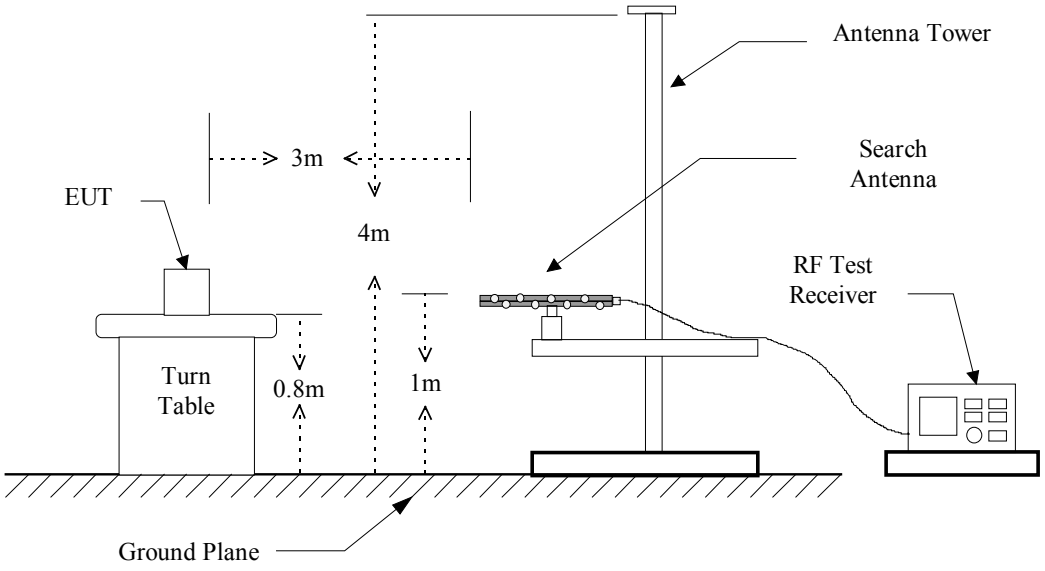
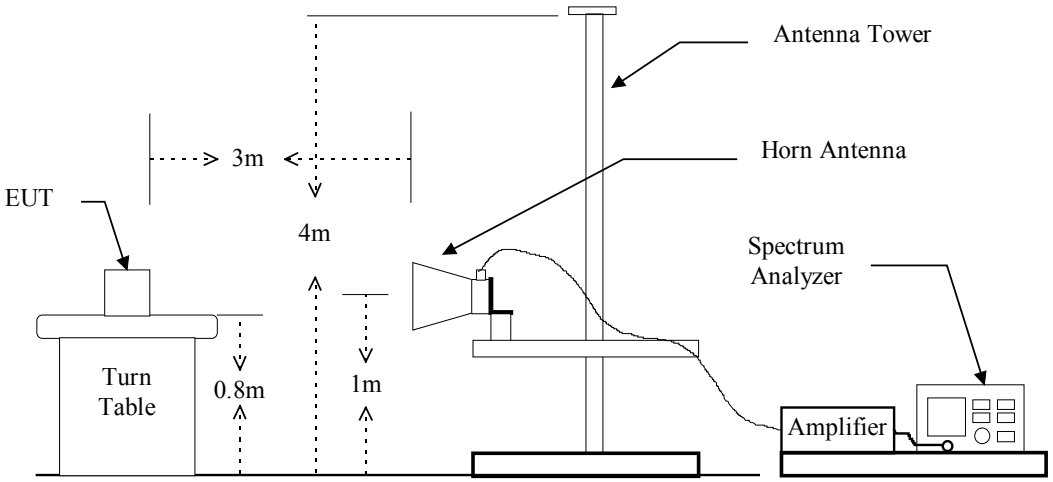


Figure 4 : Frequencies measured above 1 GHz configuration



10.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Next Cal. Due
EMI Test Receiver	Hewlett-Packard	8546A	09/06/2005
BiLog Antenna	Schaffner	CBL 6112B	02/14/2006
Horn Antenna	EMCO	3115	06/04/2006
Horn Antenna	EMCO	3116	07/19/2006
Preamplifier	Hewlett-Packard	8449B	09/16/2005
Spectrum Analyzer	Hewlett-Packard	8564EC	09/15/2005
Spectrum Analyzer	Rohde & Schwarz	FSU46	10/03/2005

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	300 kHz
	Spectrum Analyzer	Peak	120 kHz	300 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

10.4 Radiated Emission Data

10.4.1 Harmonic

Operation Mode: TX
Test Date: Aug. 15, 2005 Temperature: 24 ℃ Humidity: 54 %

a) Channel 1
Fundamental Frequency: 2412 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m	
	H		V		(dB)	(dBuV/m)		(dBuV/m)	
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.
4824.000	47.6	41.4	51.6	47.2	0.5	52.1	47.7	74.0	54.0
12060.000	---	---	---	---	5.8	---	---	74.0	54.0
14472.000	---	---	---	---	10.5	---	---	74.0	54.0
19296.000	---	---	---	---	13.3	---	---	74.0	54.0

b) Channel 6
Fundamental Frequency: 2437 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m	
	H		V		(dB)	(dBuV/m)		(dBuV/m)	
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.
4874.000	---	---	---	---	0.5	---	---	74.0	54.0
7311.000	---	---	---	---	3.7	---	---	74.0	54.0
12185.000	---	---	---	---	5.8	---	---	74.0	54.0
19496.000	---	---	---	---	13.3	---	---	74.0	54.0

c) Channel 11
Fundamental Frequency: 2462 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m	
	H		V		(dB)	(dBuV/m)		(dBuV/m)	
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.
4924.000	---	---	49.3	43.2	0.5	49.8	43.7	74.0	54.0
7386.000	---	---	---	---	3.7	---	---	74.0	54.0
12310.000	---	---	---	---	5.8	---	---	74.0	54.0
19696.000	---	---	---	---	13.3	---	---	74.0	54.0
22158.000	---	---	---	---	13.5	---	---	74.0	54.0

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emissions level is too low to be measured.

10.4.2 Spurious Emission

10.4.2.1

Test Date: Aug. 15, 2005 Temperature: 24 ℃ Humidity: 54 %

Operation Mode: TX(CH 1)

a) Emission frequencies below 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
85.290	V	24.0#	10.1	34.1#	40.0	-5.9
264.740	H	22.8#	15.7	38.5#	46.0	-7.5
305.480	H	20.6#	16.8	37.4#	46.0	-8.6
405.390	V	16.8#	19.4	36.2#	46.0	-9.8
439.340	H	17.5#	20.7	38.2#	46.0	-7.8
460.580	V	20.2#	20.7	40.9#	46.0	-5.1
528.580	V	17.6#	22.3	39.9#	46.0	-6.1
630.430	H	17.5#	24.5	42.0#	46.0	-4.0
630.430	V	18.1#	24.5	42.6#	46.0	-3.4
822.490	H	12.0#	27.8	39.8#	46.0	-6.2
916.580	H	11.7#	29.4	41.1#	46.0	-4.9
916.580	V	13.6#	29.4	43.0#	46.0	-3.0

b) Emission frequencies above 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

10.4.2.2

Test Date: Aug. 15, 2005 Temperature: 24 ℃ Humidity: 54 %

Operation Mode: TX(CH 6)

a) Emission frequencies below 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
305.480	H	20.7#	16.8	37.5#	46.0	-8.5
329.730	H	20.7#	17.5	38.2#	46.0	-7.8
329.730	V	16.8#	17.5	34.3#	46.0	-11.7
407.330	H	18.0#	19.4	37.4#	46.0	-8.6
463.590	H	17.3#	21.1	38.4#	46.0	-7.6
463.590	V	20.6#	21.1	41.7#	46.0	-4.3
526.640	V	18.7#	22.3	41.0#	46.0	-5.0
628.490	H	17.0#	24.5	41.5#	46.0	-4.5
630.430	V	18.0#	24.5	42.5#	46.0	-3.5
659.530	V	13.8#	25.2	39.0#	46.0	-7.0
916.580	H	11.6#	29.4	41.0#	46.0	-5.0
919.490	V	12.2#	29.4	41.6#	46.0	-4.4

b) Emission frequencies above 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

10.4.2.3

Test Date: Aug. 15, 2005 Temperature: 24 ℃ Humidity: 54 %

Operation Mode: TX(CH 11)

a) Emission frequencies below 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
266.680	H	21.3#	15.7	37.0#	46.0	-9.0
329.730	V	20.6#	17.5	38.1#	46.0	-7.9
332.640	H	20.4#	17.5	37.9#	46.0	-8.1
407.330	H	18.2#	19.4	37.6#	46.0	-8.4
460.680	V	20.3#	20.7	41.0#	46.0	-5.0
507.240	V	17.3#	21.5	38.8#	46.0	-7.2
528.580	V	17.5#	22.3	39.8#	46.0	-6.2
629.460	V	18.0#	24.5	42.5#	46.0	-3.5
630.430	H	16.7#	24.5	41.2#	46.0	-4.8
727.430	H	12.7#	26.6	39.3#	46.0	-6.7
916.580	H	11.6#	29.4	41.0#	46.0	-5.0
919.490	V	11.7#	29.4	41.1#	46.0	-4.9

b) Emission frequencies above 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

Test Date: Aug. 15, 2005 Temperature: 24 ℃ Humidity: 54 %

Operation Mode: TX

Operation Channel	Test Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.
1	2387.474	34.8	19.1	34.3	19.0	30.3	65.1	49.4	74.0	54.0
11	2488.628	35.1	19.1	34.9	19.1	30.3	65.4	49.4	74.0	54.0

Note :

1. Remark "---" means that the emissions level is too low to be measured.
2. The result is the highest value of radiated emission from restrict band of 2310 ~ 2390 MHz and 2483.5 ~ 2500 MHz.

10.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

where

Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Amplifier Gain