

FCC TEST REPORT

for

47 CFR Part 15 Subpart C and RSS-210

Equipment : U.S. Robotics Wireless Maxg USB Adapter

Trade Name : USR

Model No. : USR5421

FCC ID : IXM-USGBR01

IC ID : 550A-15027

Filing Type : Certification

Applicant : Universal Scientific Industrial Co., Ltd.

141, Lane 351, Taiping Road, Sec. 1, Tsao Tuen, Nan-Tou,
Taiwan

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
- **Certificate or Test Report must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of U.S. government.**
- The data shown in this test report were carried out on Feb. 24, 2005 at **Sporton International Inc. LAB.**



Dr. Daniel Lee
EMC/SAR Manager

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

SPORTON International Inc.

TEL : 886-2-2696-2468

FAX : 886-2-2696-2255



Table of Contents

History of this test report.....ii

1. General Description of Equipment under Test..... 1

 1.1. Applicant..... 1

 1.2. Manufacturer..... 1

 1.3. Basic Description of Equipment under Test..... 1

 1.4. Feature of Equipment under Test..... 2

2 Test Configuration of Equipment under Test.....3

 2.1 Test Manner..... 3

 2.2 Test Mode..... 3

 2.3 Connection Diagram of Test System 4

 2.4 Ancillary Equipment List..... 4

3. RF Utility5

4. General Information of Test.....6

 4.1 Test Voltage..... 6

 4.2 Standard for Methods of Measurement 6

 4.3 Test in Compliance with 6

 4.4 Frequency Range Investigated..... 6

 4.5 Test Distance..... 6

5. Test Data and Test Result.....7

 5.1 List of Measurements and Examinations 7

 5.2 6dB Bandwidth Measurement 8

 5.3 Power Spectral Density Measurement..... 16

 5.4 Band Edges Measurement..... 24

 5.5 Peak Output Power Measurement..... 31

 5.6 Conducted Emission Measurement..... 33

 5.7 Radiated Emission Measurement..... 36

 5.8 Antenna Requirements 46

6. List of Measuring Equipments Used47

7. Uncertainty Evaluation.....48

Appendix A. Photographs of EUT External

Appendix B. Photographs of EUT Internal

Appendix C. Photographs of Setup



1. General Description of Equipment under Test

1.1. Applicant

Universal Scientific Industrial Co., Ltd.

141, Lane 351, Taiping Road, Sec. 1, Tsao Tuen, Nan-Tou, Taiwan

1.2 Manufacturer

Universal Scientific Industrial Co., Ltd.

141, Lane 351, Taiping Road, Sec. 1, Tsao Tuen, Nan-Tou, Taiwan

1.3 Basic Description of Equipment under Test

Equipment	: U.S. Robotics Wireless Maxg USB Adapter
Trade Name	: USR
Model No.	: USR5421
FCC ID	: IXM-USGBR01
IC ID	: 550A-15027
Power Supply Type	: DC 5V

**1.4 Feature of Equipment under Test**

Product Feature & Specification				
1. Modulation Type/Data Rate	802.11b: CCK / 11 Mbps 802.11g: OFDM / 54 Mbps			
2. Freq.Range/Carrier Freqs.	2400 MHz ~ 2483.5 MHz			
3. Number of Channels	USA/Canada: 11	V	European: 13	
	Japan: 13, 14		Other:	
4. Carrier Frequency of each channel	$2412 + (n-1) \times 5$ MHz; n = 1~11			
5. Channel Spacing	5 MHz			
6. Maximum Output Power to Antenna (Normal condition)	802.11b: 21.4 dBm 802.11g: 21.9 dBm			
7. Type of Antenna Connector	N/A			
8. Antenna Type	On board printed antenna			
9. Antenna Gain	-1 dBi			
10. Function Type	Transmitter		Transceiver	V
11. Power Rating (DC/AC , Voltage)	DC 5V			



2 Test Configuration of Equipment under Test

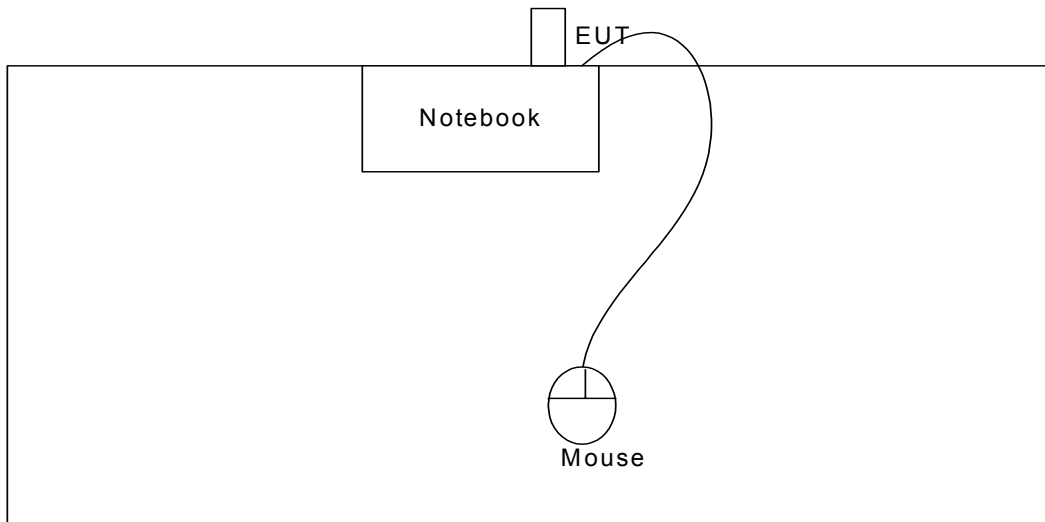
2.1 Test Manner

- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.
- b. For spurious emission below 1GHz, only one channel of each application was tested because it is not related to channel selection.
- c. The EUT is programmed to transmit signal continuously for all testings.
- d. Frequency range investigated: conduction 150 kHz to 30 MHz, radiation 30 MHz to 25000MHz.

2.2 Test Mode

Application	802.11b	802.11g
Data Rate	11 Mbps	54 Mbps
Radiated Emission	Mode 1: Tx Ch01(2412MHz)	Mode 4: Tx Ch01(2412MHz)
	Mode 2: Tx Ch06(2437MHz)	Mode 5: Tx Ch06(2437MHz)
	Mode 3: Tx Ch11(2462MHz)	Mode 6: Tx Ch11(2462MHz)
Conducted Emission	Mode 1: Wireless Operating Mode	

2.3 Connection Diagram of Test System



2.4 Ancillary Equipment List

Item	Equipment	Model No.	Serial No.
1.	Notebook (DELL)	PP05L	N/A
2.	(USB) Mouse (LOGITECH)	M-BE58	N/A



3. RF Utility

The programmed RF Utility is either installed in EUT or Notebook to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testings.



4. General Information of Test

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-318-0055

Test Site No : CO01-HY, 03CH06-HY

4.1 Test Voltage

120V/ 60Hz

4.2 Standard for Methods of Measurement

ANSI C63.4-2003

4.3 Test in Compliance with

47 CFR Part 15 Subpart C and RSS-210

4.4 Frequency Range Investigated

- a. Conduction: from 150 kHz to 30 MHz
- b. Radiation: from 30 MHz to 25000 MHz

4.5 Test Distance

The test distance of radiated emission from antenna to EUT is 3 m.



5. Test Data and Test Result

5.1 List of Measurements and Examinations

FCC Rule	IC RSS-210 Issue 5	Description of Test	Result	Section
15.247(a)(2)	Amendment 1	6dB Bandwidth	Pass	5.2
15.247(d)	§ 6.2.2 (o) (b) & Amendment 1	Power Spectral Density	Pass	5.3
15.247 (c)	§ 6.3	100kHz Bandwidth of Frequency Band Edges	Pass	5.4
15.247(b)	§ 6.2.2 (o) (b) & Amendment 1	Maximum Peak Output Power	Pass	5.5
15.207	§ 6.6	Conducted Emission	Pass	5.6
15.209(a)	§ 6.3	Radiated Emission	Pass	5.7
15.203 15.247(b)(4)	NA	Antenna Requirement	Pass	5.8

5.2 6dB Bandwidth Measurement

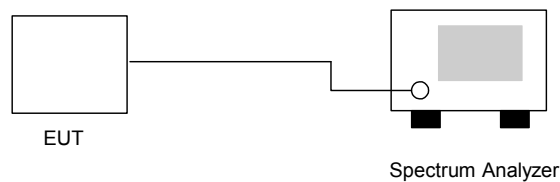
5.2.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.2.2 Test Procedure :

1. The transmitter output was connected to the spectrum analyzer directly.
2. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz.
3. The 6 dB bandwidth is defined as the frequency range where the power is higher than the peak power minus 6dB.

5.2.3 Test Setup Layout :



5.2.4 Test Result :

- Application Type : 802.11b
- Temperature : 24°C
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	11.12	0.5	Mode 1
06	2437	10.60	0.5	Mode 2
11	2462	10.68	0.5	Mode 3



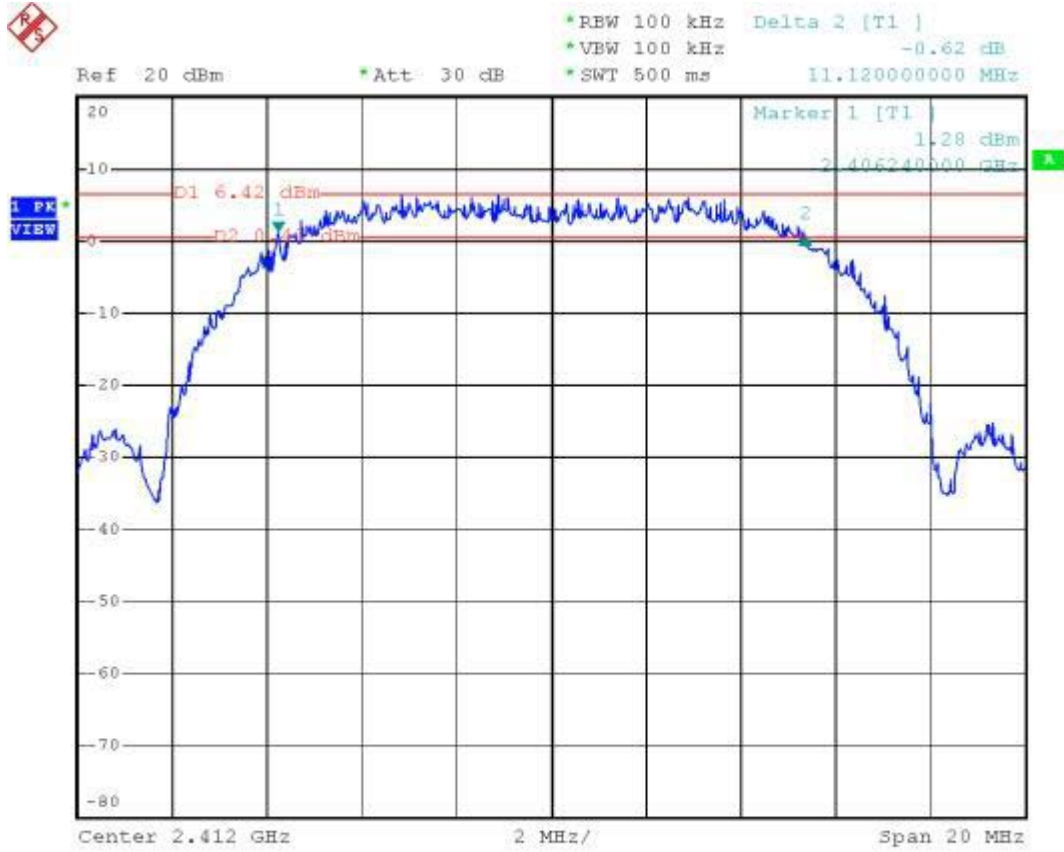
- Application Type : 802.11g
- Temperature : 24°C
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	16.36	0.5	Mode 4
06	2437	16.32	0.5	Mode 5
11	2462	16.36	0.5	Mode 6



5.2.5 6dB Bandwidth

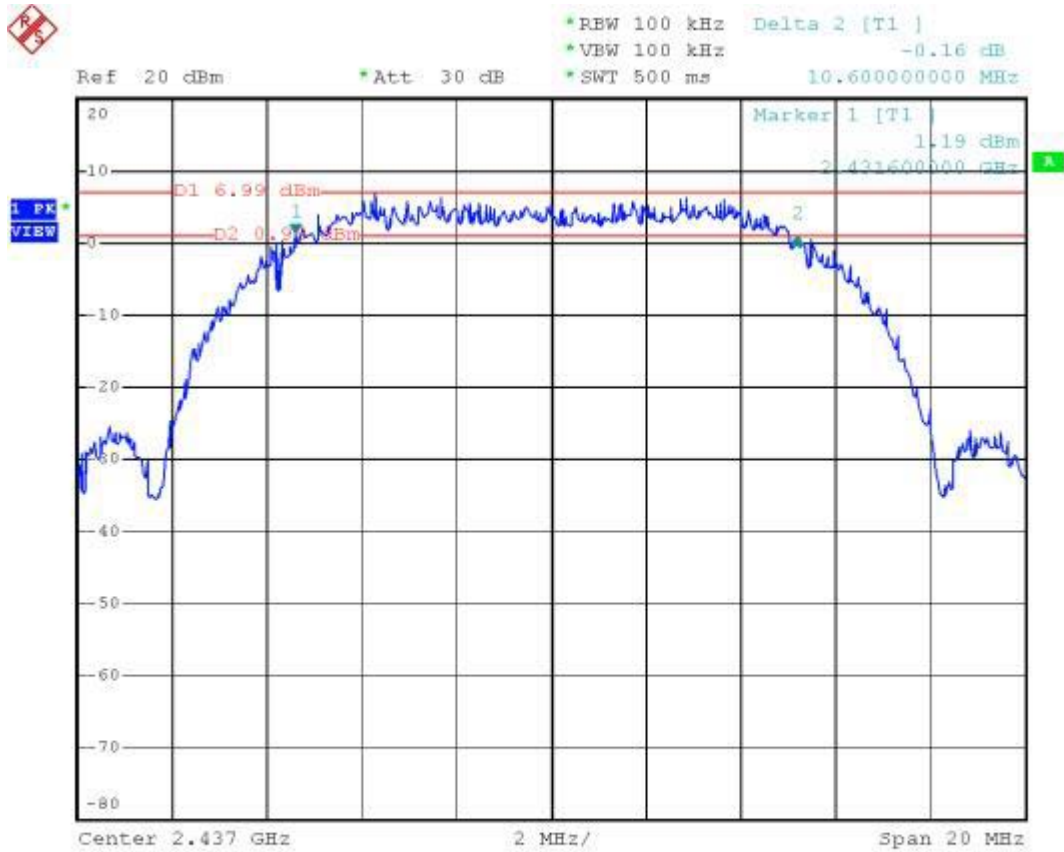
Mode 1 : 802.11b Tx CH01 (2412MHz)



Date: 25.FEB.2005 21:18:56



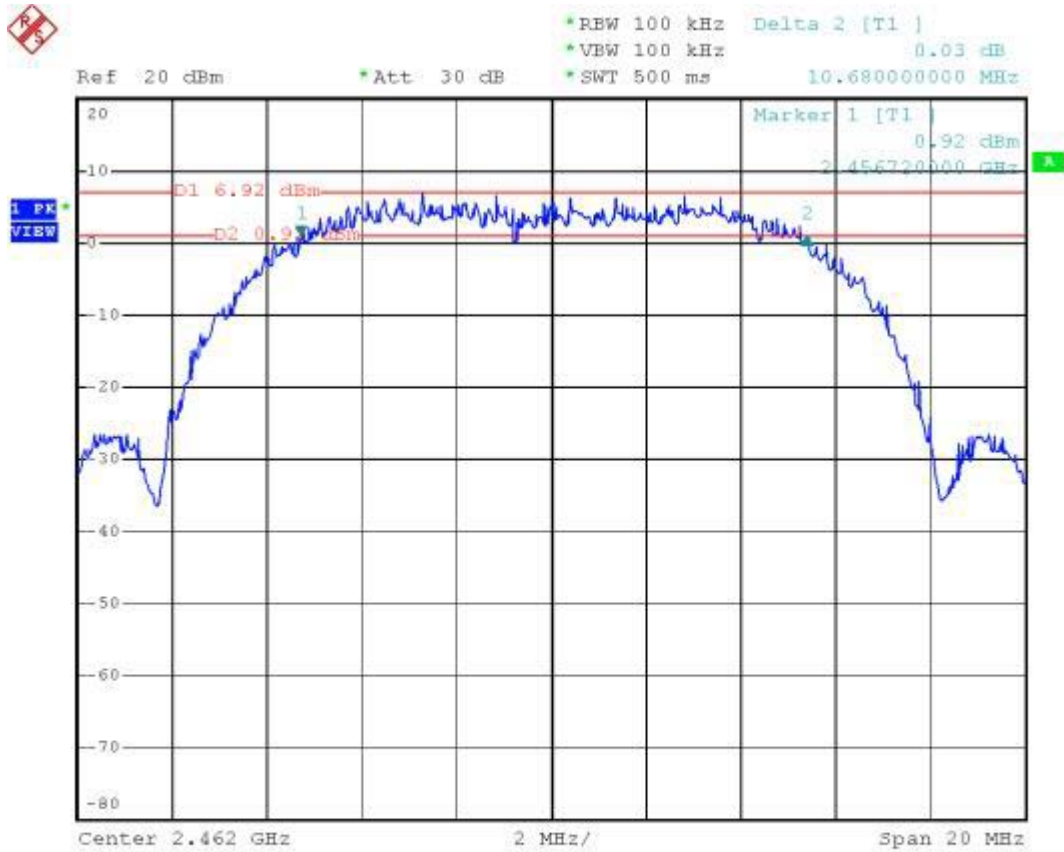
Mode 2 : 802.11b Tx CH06 (2437MHz)



Date: 25.FEB.2005 21:23:14



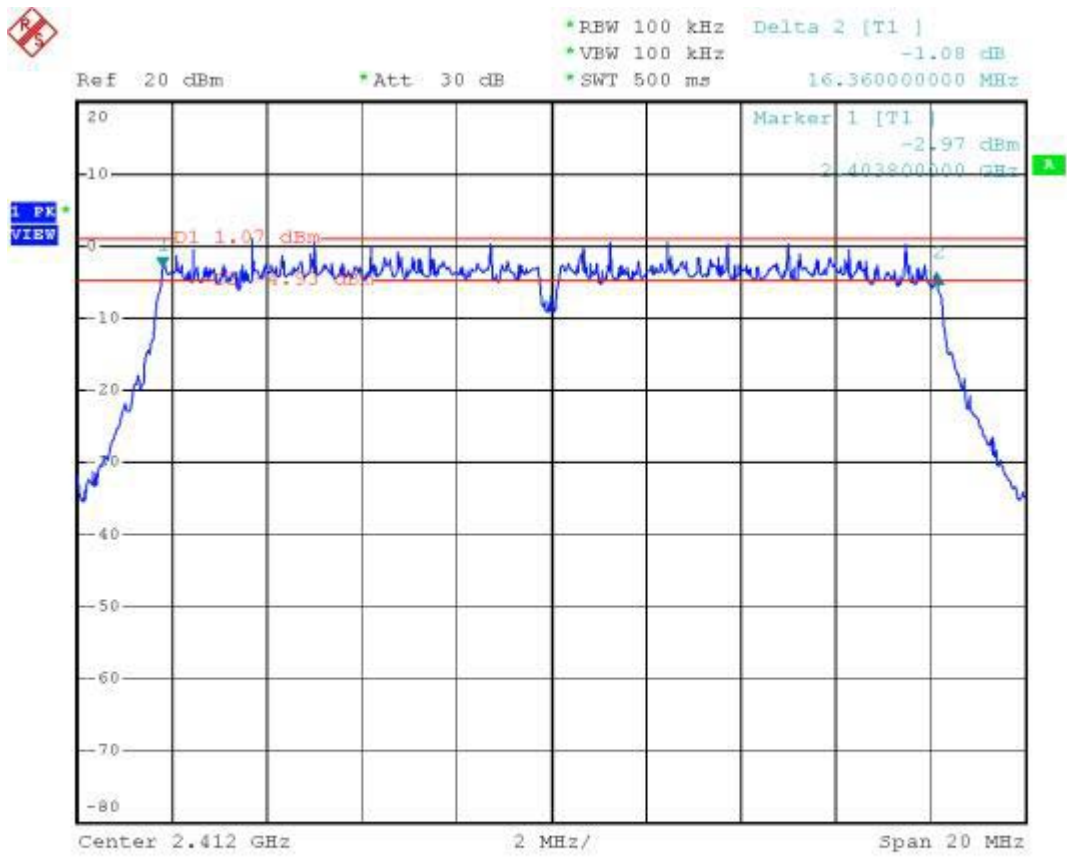
Mode 3 : 802.11b Tx CH11(2462MHz)



Date: 25.FEB.2005 21:25:18



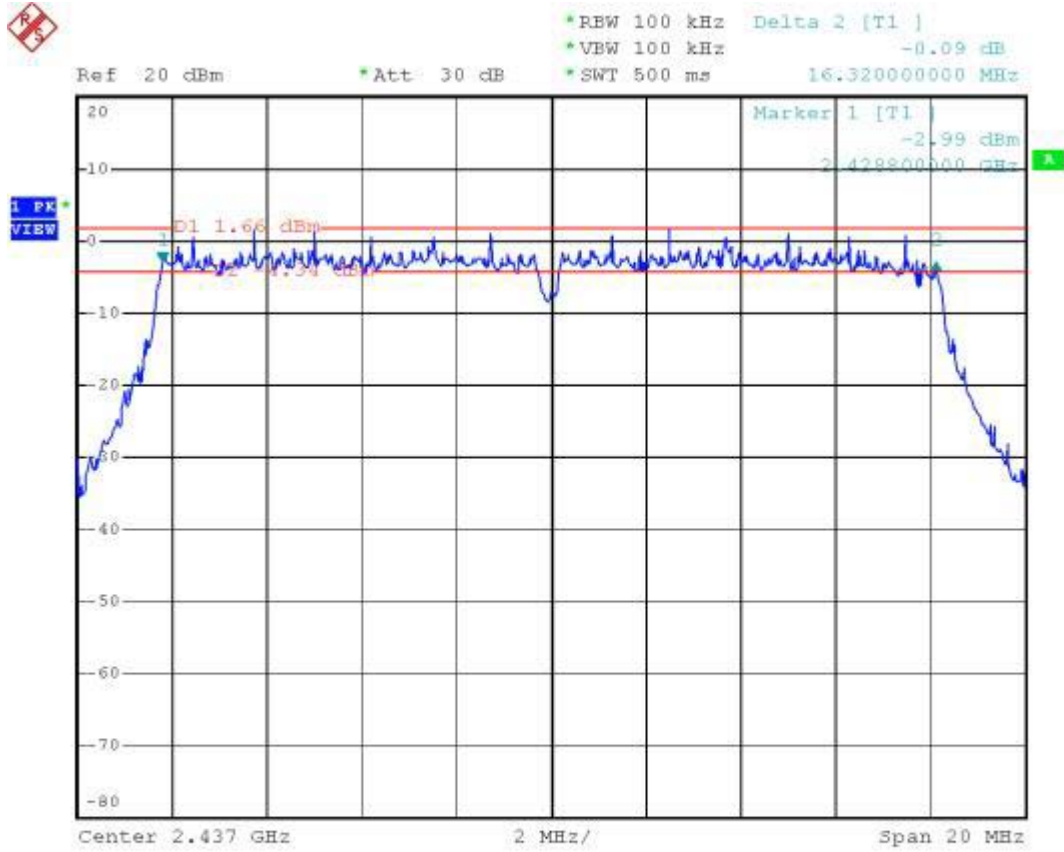
Mode 4 : 802.11g Tx CH01 (2412MHz)



Date: 25.FEB.2005 21:39:48



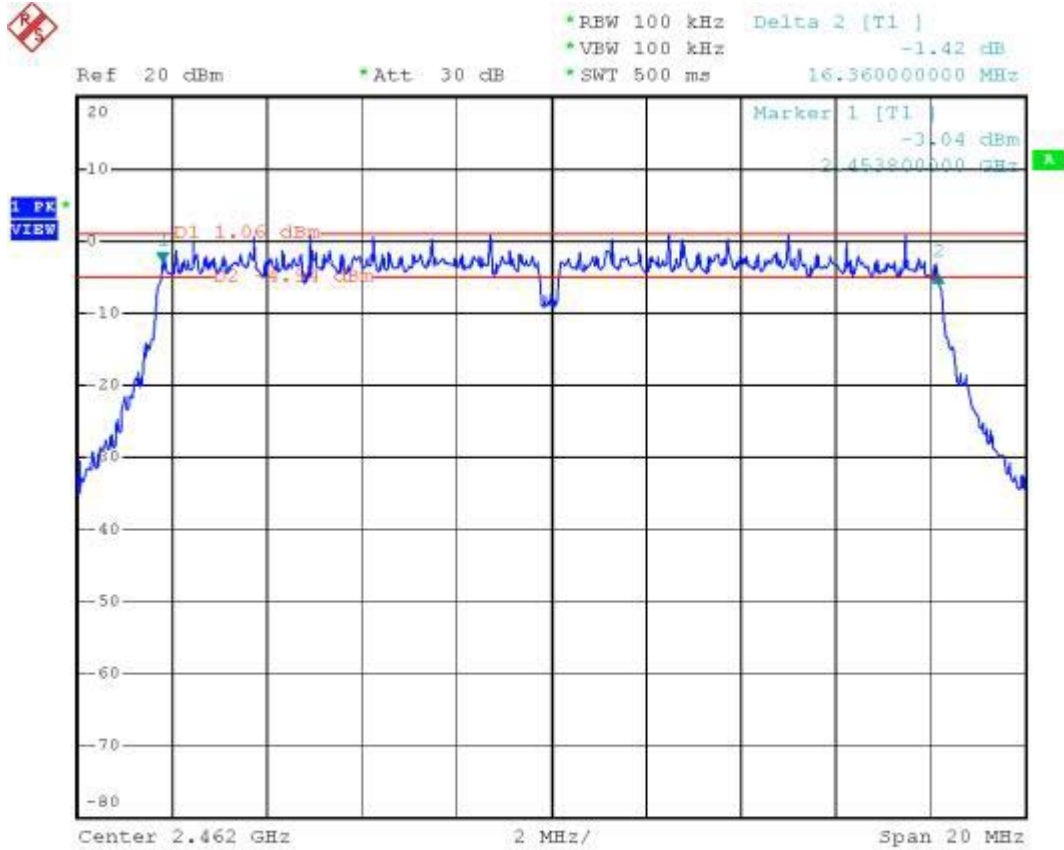
Mode 5 : 802.11g Tx CH06 (2437MHz)



Date: 25.FEB.2005 21:35:58



Mode 6 : 802.11g Tx CH11(2462MHz)



Date: 25.FEB.2005 21:30:44

5.3 Power Spectral Density Measurement

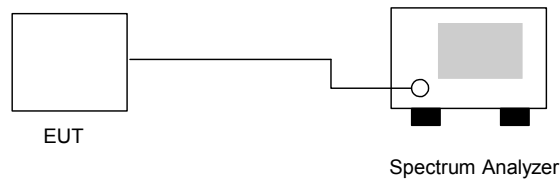
5.3.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.3.2 Test Procedure :

1. The transmitter output was connected to spectrum analyzer directly.
2. The spectrum analyzer's resolution bandwidth was set at 3kHz RBW and 30kHz VBW as that of the fundamental frequency. Set the sweep time=span/3kHz.
3. The power spectral density was measured and recorded.
4. The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

5.3.3 Test Setup Layout :



5.3.4 Test Result :

- Application Type : 802.11b
- Temperature : 24°C,
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-5.11	8	Mode 1
06	2437	-4.81	8	Mode 2
11	2462	-3.26	8	Mode 3



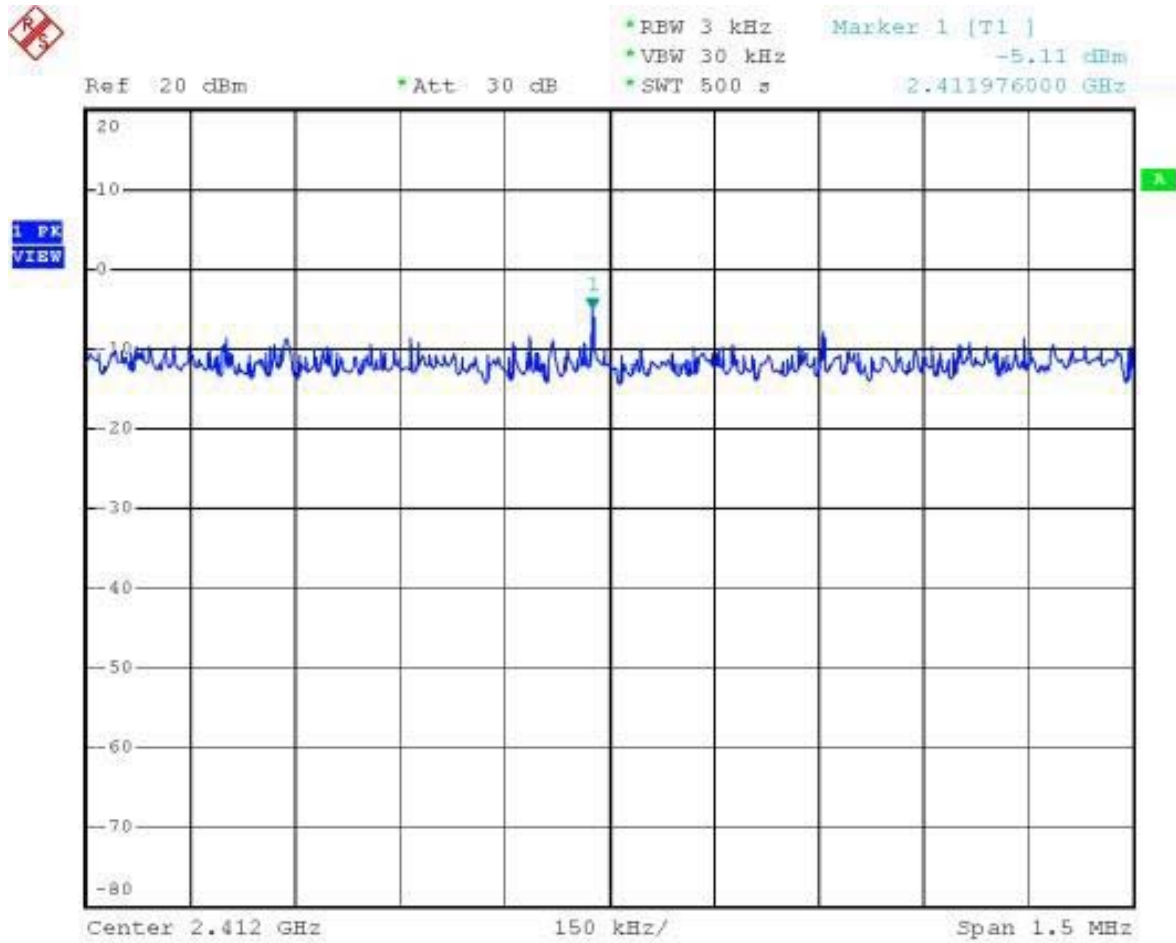
- Application Type : 802.11g
- Temperature : 24°C,
- Relative Humidity : 47%
- Test Enginner : Jay

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-12.62	8	Mode 4
06	2437	-12.71	8	Mode 5
11	2462	-12.89	8	Mode 6



5.3.5 Power Spectral Density

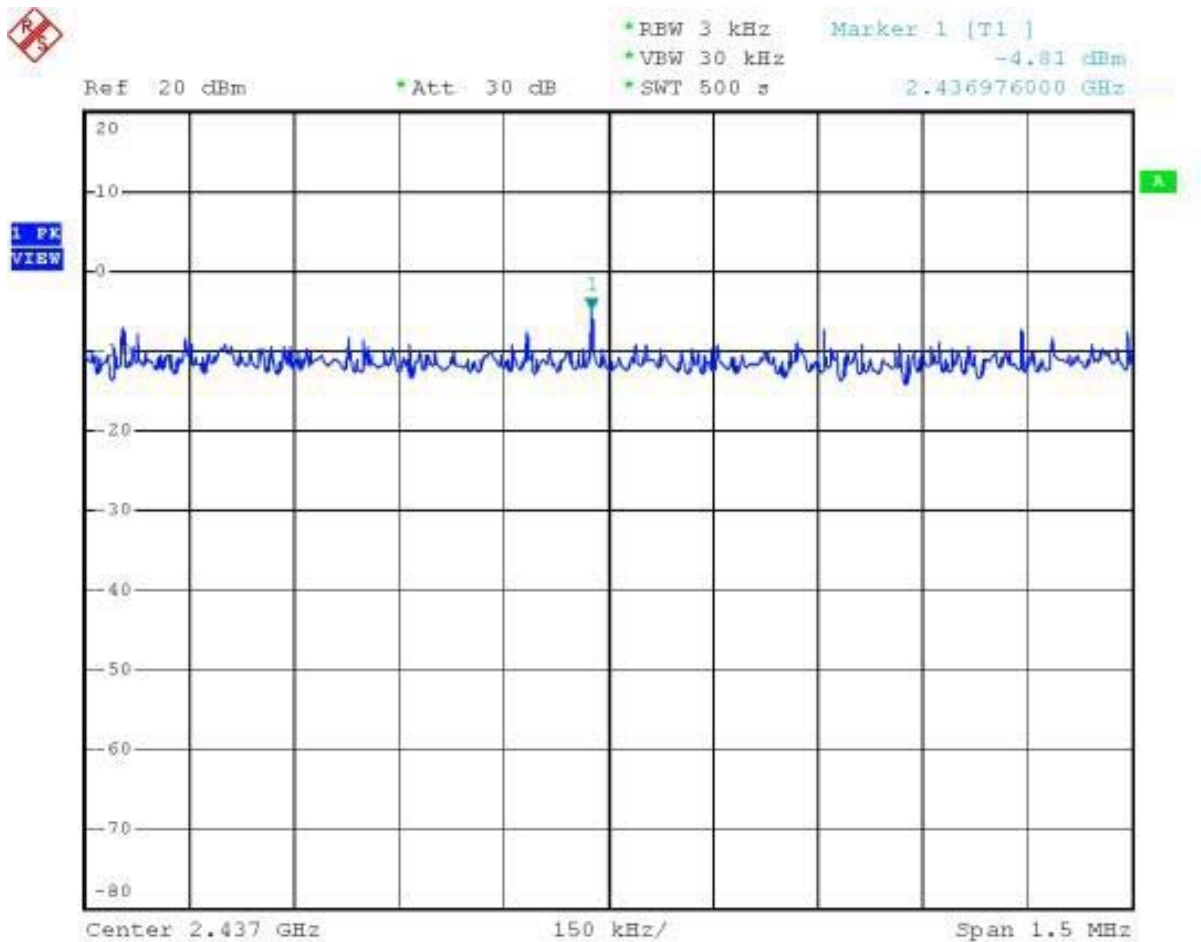
Mode 1 : 802.11b Tx CH01(2412MHz)



Date: 25.FEB.2005 21:20:30



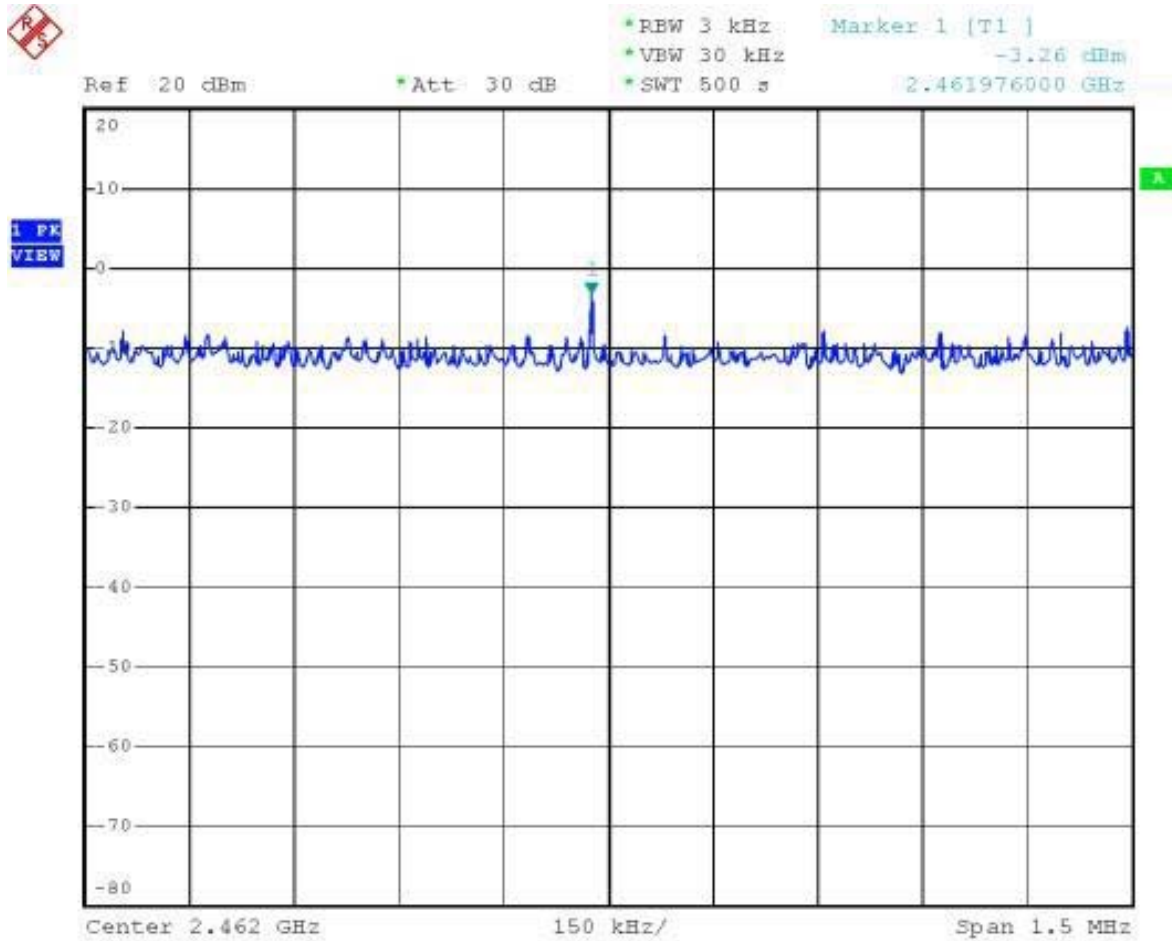
Mode 2 : 802.11b Tx CH06 (2437MHz)



Date: 25.FEB.2005 21:22:23



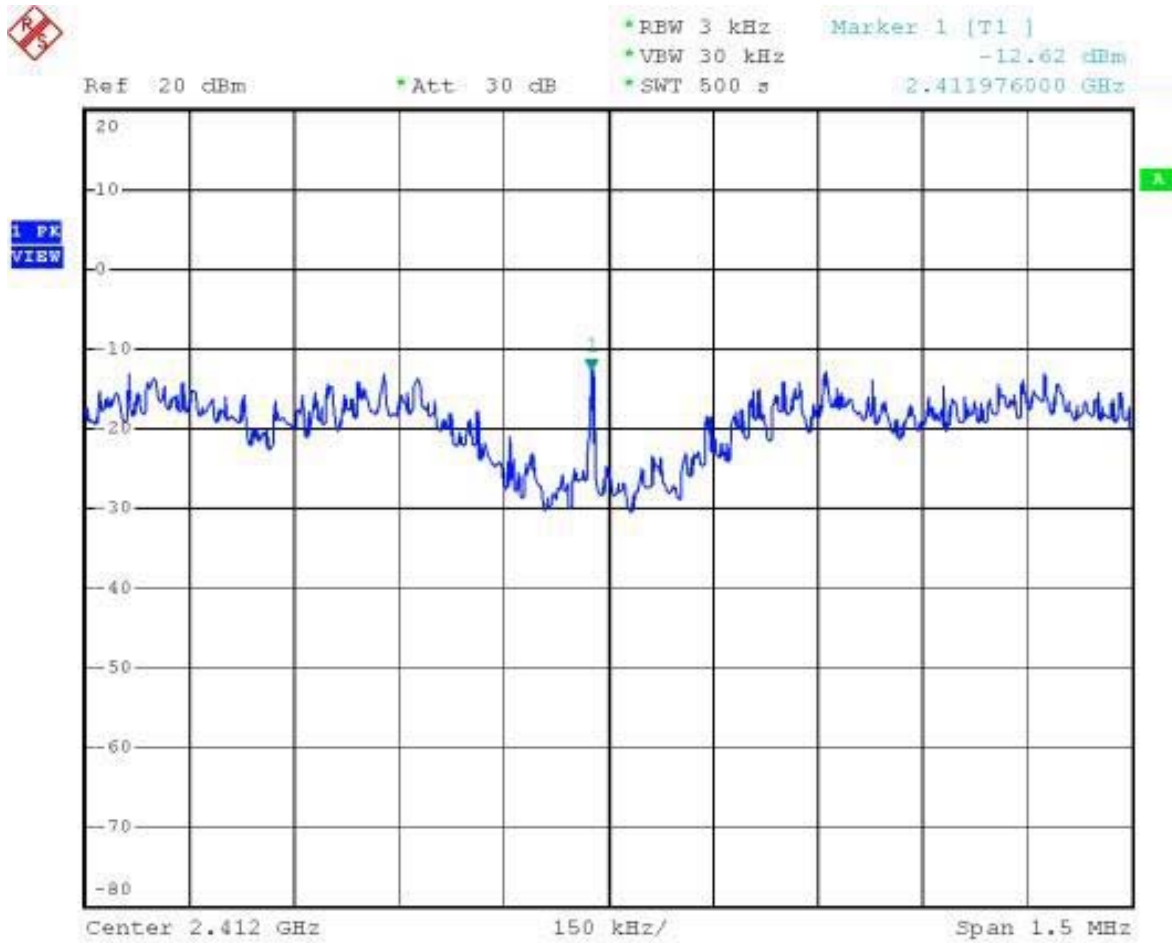
Mode 3 : 802.11b Tx CH11 (2462MHz)



Date: 25.FEB.2005 21:27:05



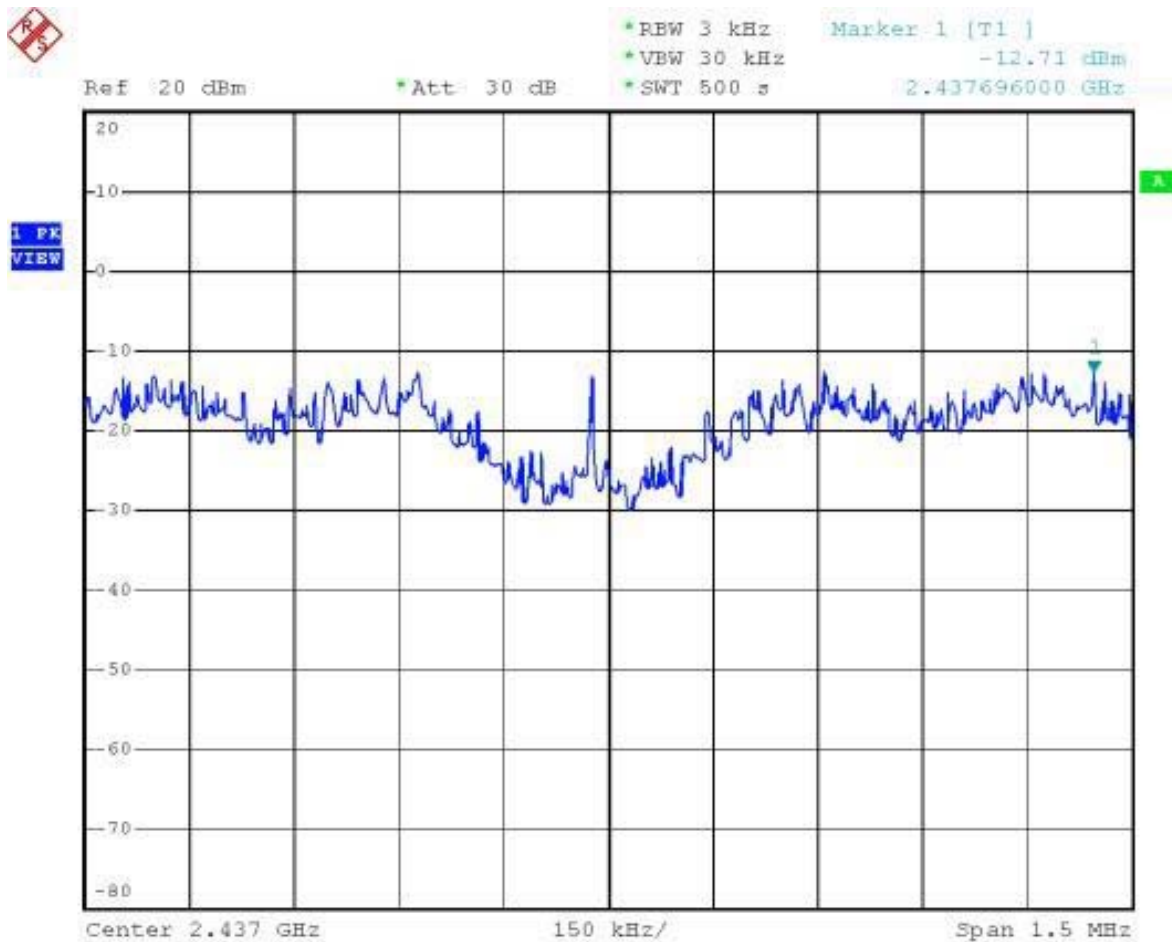
Mode 4 : 802.11g Tx CH01(2412MHz)



Date: 25.FEB.2005 21:38:55



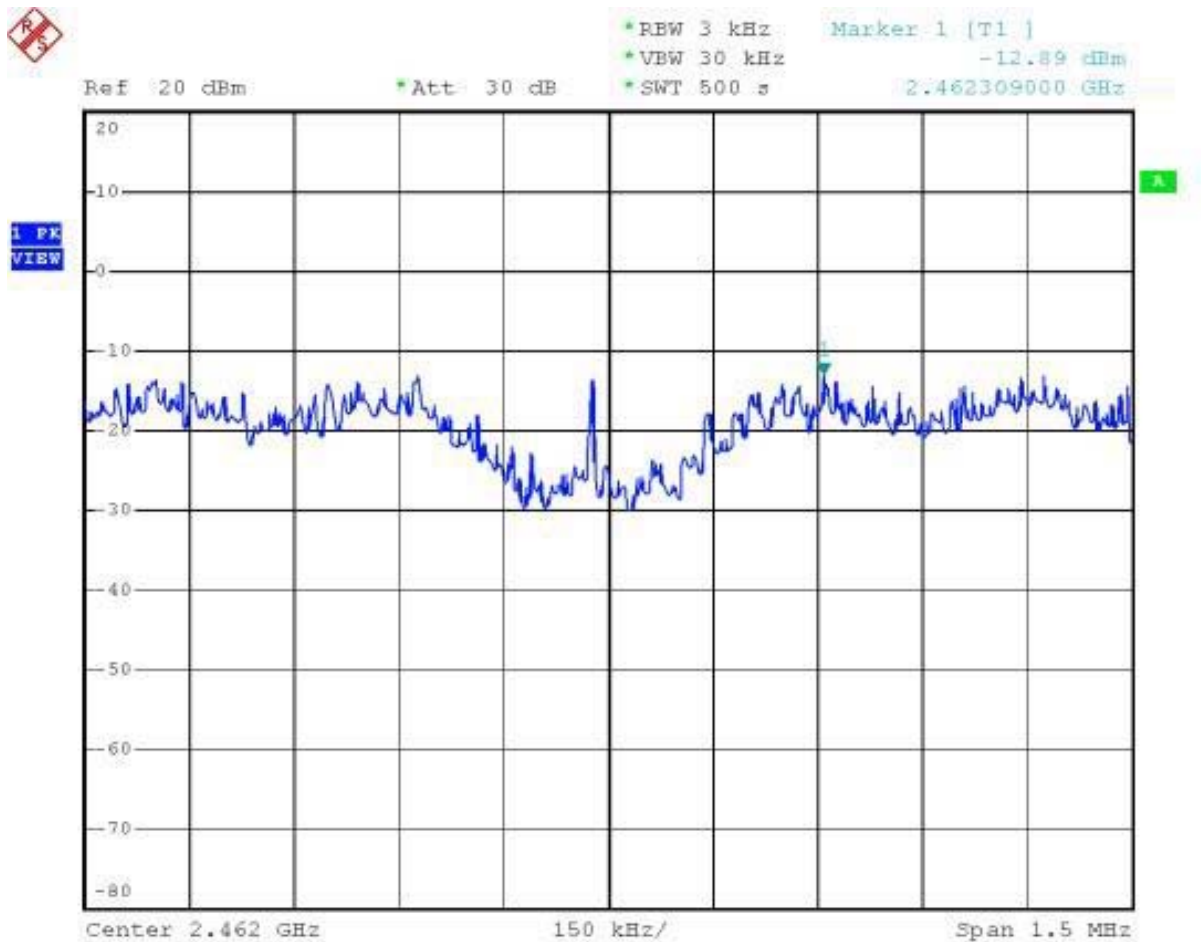
Mode 5 : 802.11g Tx CH06 (2437MHz)



Date: 25.FEB.2005 21:34:52



Mode 6 : 802.11g Tx CH11 (2462MHz)



Date: 25.FEB.2005 21:32:59



5.4 Band Edges Measurement

5.4.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.4.2 Test Procedure :

- 1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100 kHz bandwidth from band edge.
3. The band edges was measured and recorded.

5.4.3 Test Result :

- Application Type : 802.11b & g
Temperature : 24°C,
Relative Humidity : 47%
Test Enginner : Jay
Test Result in lower band (Channel 1) : PASS
Test Result in higher band (Channel 11) : PASS

5.4.4 Note on Band Edge Emission

➤802.11b

CH01 (Horizontal)

Table with 7 columns: Frequency, Level, Over Limit, Limit Line, Read Level, Factor, Detect Mode. Rows for 2390.00 MHz showing Peak and Average measurements.

CH01 (Vertical)

Table with 7 columns: Frequency, Level, Over Limit, Limit Line, Read Level, Factor, Detect Mode. Rows for 2390.00 MHz showing Peak and Average measurements.



CH11 (Horizontal)

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Factor (dB)	Detect Mode
2483.50	56.72	-17.28	74.00	56.97	-0.25	Peak
2483.50	47.70	-6.30	54.00	47.95	-0.25	Average

CH11 (Vertical)

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Factor (dB)	Detect Mode
2483.50	54.25	-19.75	74.00	54.50	-0.25	Peak
2483.50	44.14	-9.86	54.00	44.39	-0.25	Average

➤802.11g

CH01 (Horizontal)

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Factor (dB)	Detect Mode
2390.00	59.46	-14.54	74.00	59.69	-0.23	Peak
2390.00	47.41	-6.59	54.00	47.64	-0.23	Average

CH01 (Vertical)

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Factor (dB)	Detect Mode
2390.00	58.17	-15.83	74.00	58.40	-0.23	Peak
2390.00	46.07	-7.93	54.00	46.30	-0.23	Average



CH11 (Horizontal)

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Factor (dB)	Detect Mode
2483.50	56.68	-17.32	74.00	56.93	-0.25	Peak
2483.50	47.62	-6.38	54.00	47.87	-0.25	Average

CH11 (Vertical)

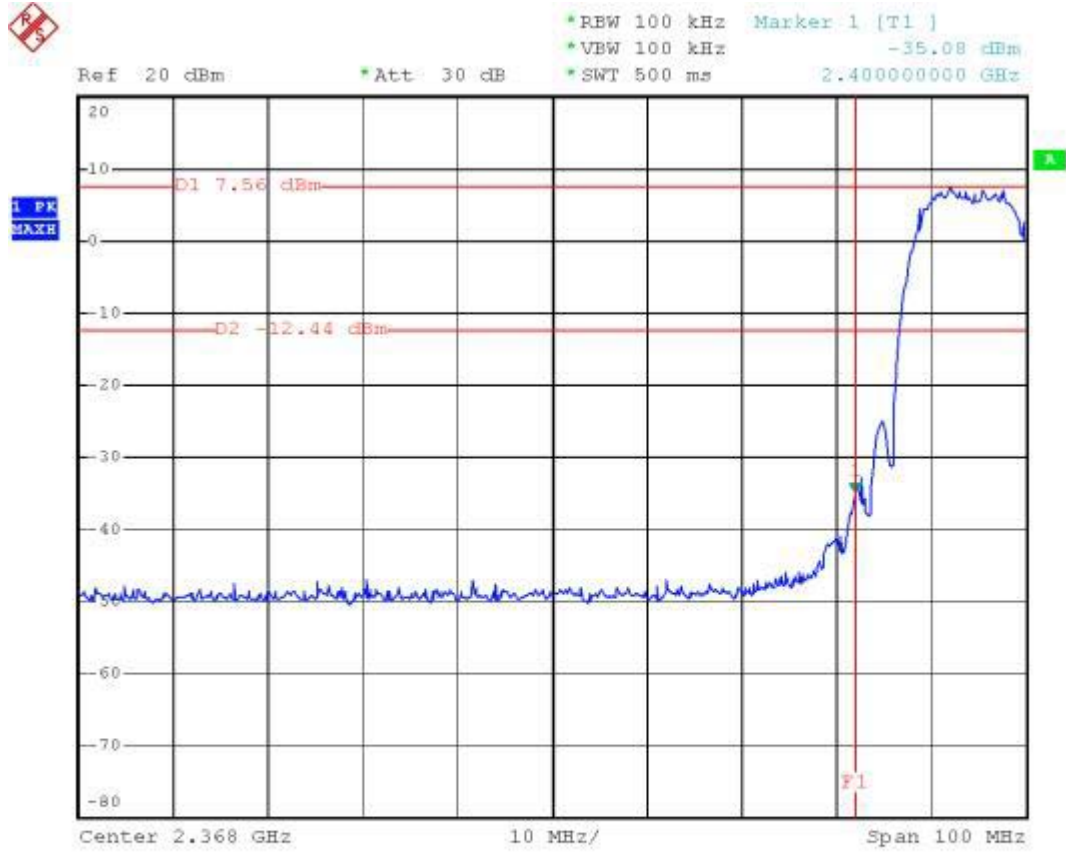
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Factor (dB)	Detect Mode
2483.50	58.03	-15.97	74.00	58.28	-0.25	Peak
2483.50	46.58	-7.42	54.00	46.83	-0.25	Average

*Remark: The data above can refer to radiated emission in section 5.7.



5.4.5 20dB Band Edge

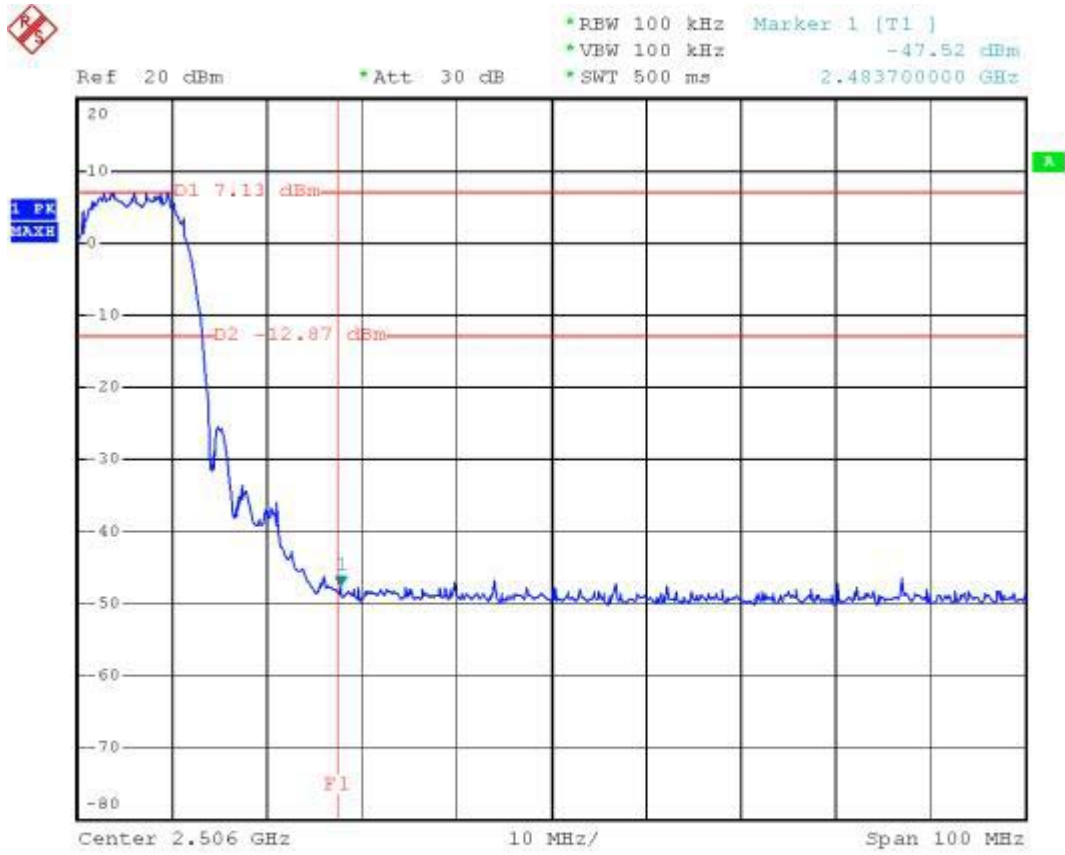
802.11b Tx CH01 (2412MHz)



Date: 25.FEB.2005 21:19:42



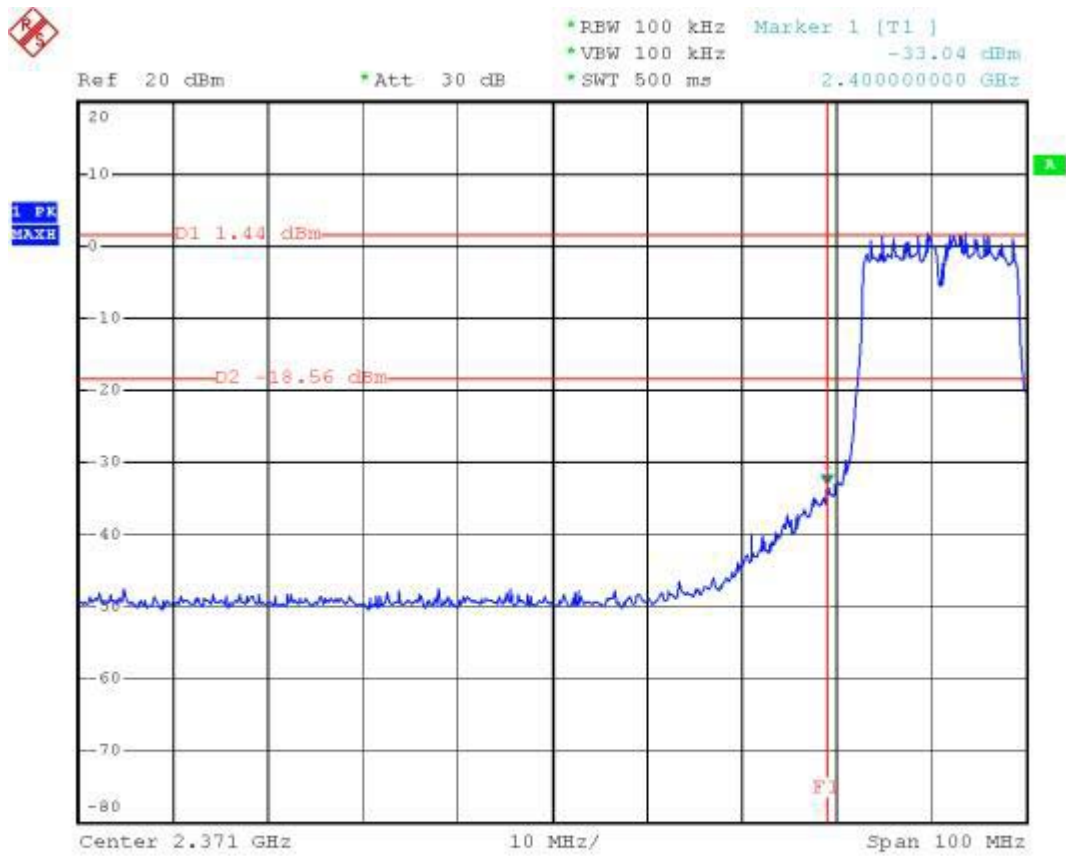
802.11b Tx CH11 (2462MHz)



Date: 25.FEB.2005 21:26:08



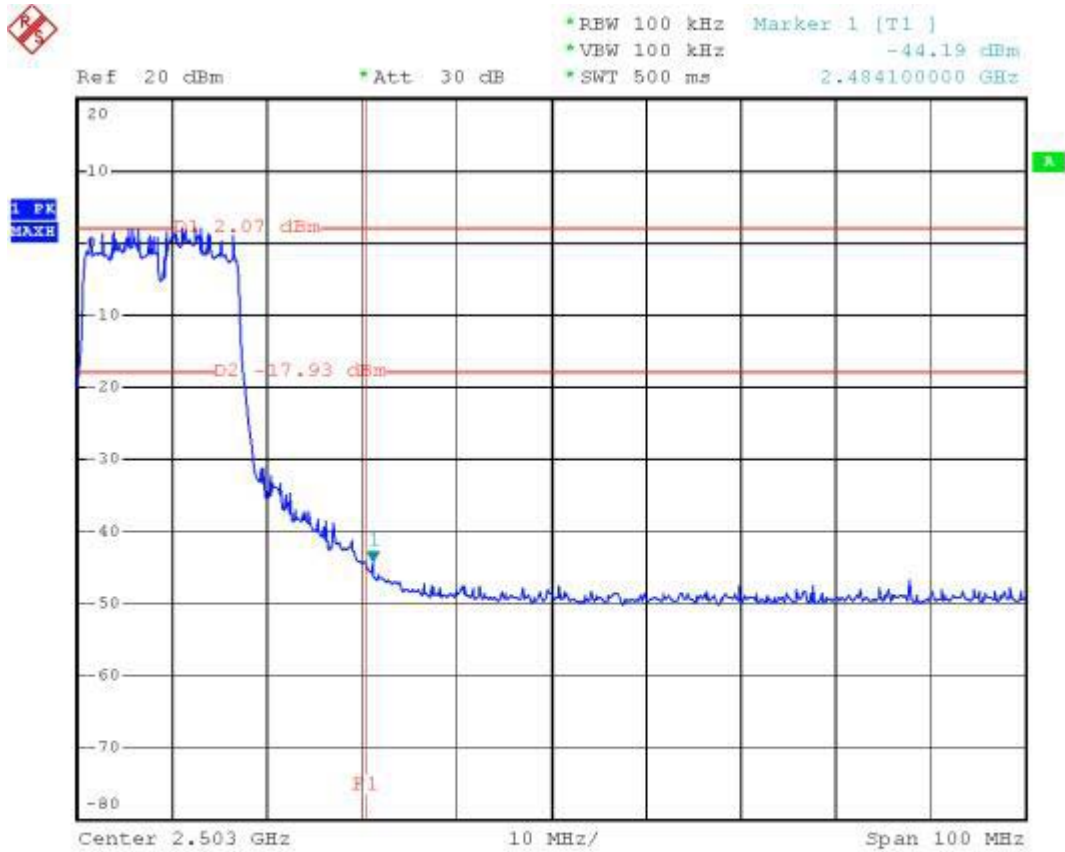
802.11g Tx CH01 (2412MHz)



Date: 25.FEB.2005 21:40:41



802.11g Tx CH11 (2462MHz)



Date: 25.FEB.2005 21:31:49

5.5 Peak Output Power Measurement

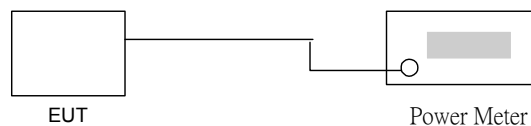
5.5.1 Measuring Instruments :

As described in chapter 6 of this test report.

5.5.2 Test Procedure :

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter.
The power is equal to the reading level on power meter plus cable loss at the EUT antenna terminal.

5.5.3 Test Setup Layout :



5.5.4 Test Result :

- Application Type : 802.11b
- Temperature : 24°C
- Relative Humidity : 47 %
- Test Enginner : Jay

Channel	Frequency (MHz)	Measured Output Power (dBm)	Limits (Watt/dBm)
01	2412	21.4	1W/30 dBm
06	2437	21.4	1W/30 dBm
11	2462	21.4	1W/30 dBm



- Application Type : 802.11g
- Temperature : 24°C
- Relative Humidity : 47 %
- Test Enginner : Jay

Channel	Frequency (MHz)	Measured Output Power (dBm)	Limits (Watt/dBm)
01	2412	21.2	1W/30 dBm
06	2437	21.9	1W/30 dBm
11	2462	21.6	1W/30 dBm



5.6 Conducted Emission Measurement

5.6.1 Measuring Instruments

As described in chapter 6 of this test Report.

5.6.2 Test Procedures

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power port of the line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

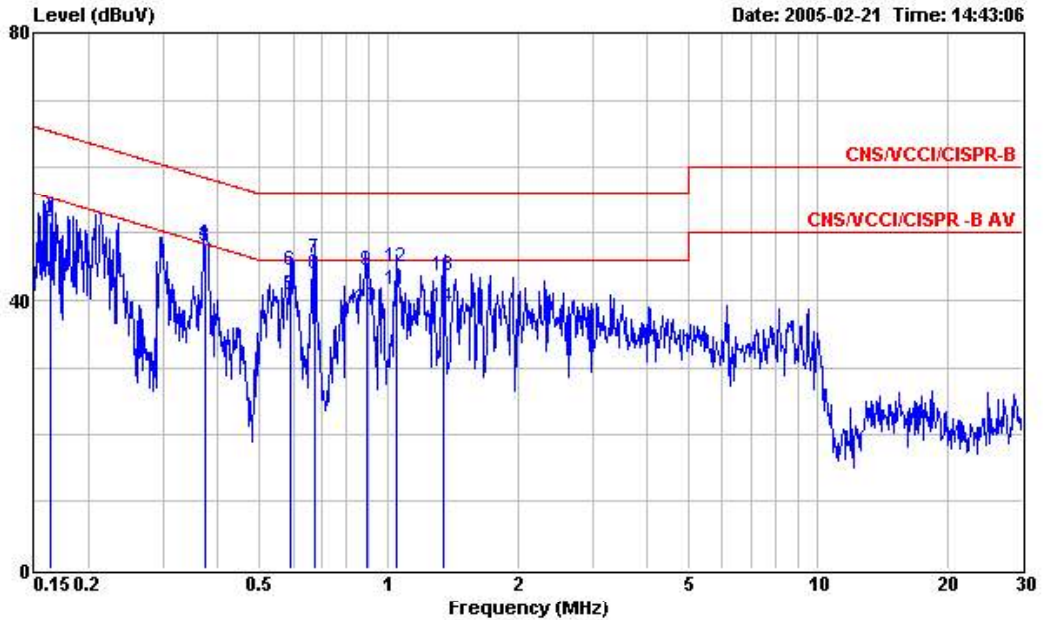


5.6.3 Test Data

5.4.1 Frequency Range of Test : 150kHz to 30 MHz

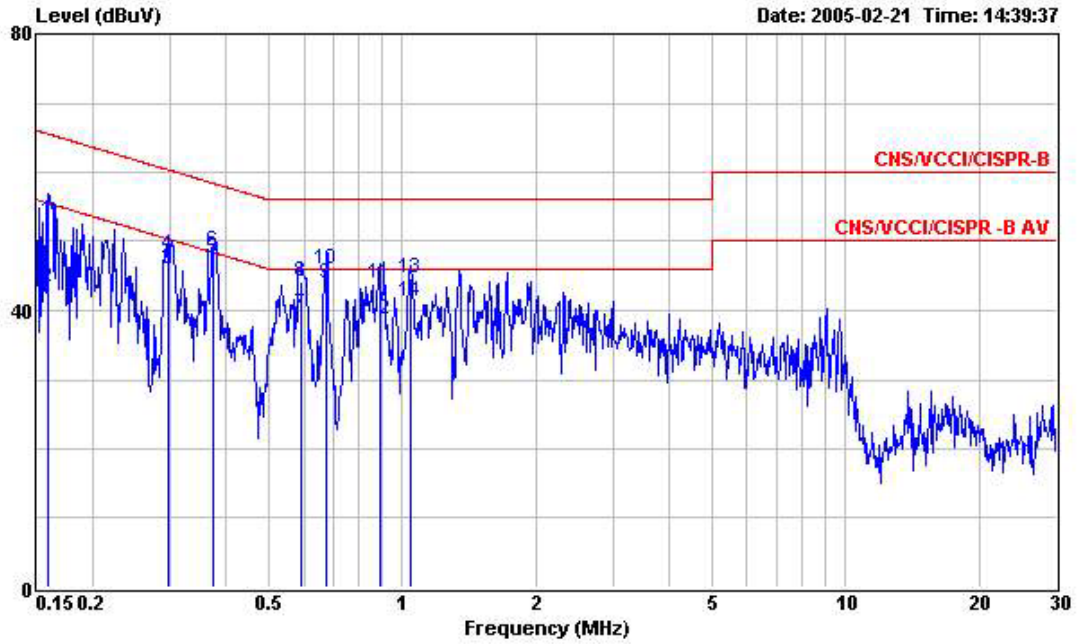
- Test Mode : Mode 1
- Temperature : 24°C
- Relative Humidity : 47%

The test that passed at minimum margin was marked by the frame in the following table.



Site : CO01-HY
 Condition : CNS/VCCI/CISPR-B 2003 2001/008 LINE
 EUT : USR Wireless LAN USB adapter
 Power : 120V 60Hz
 Model : FD521613
 Memo : Wireless on

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.163	42.74	-12.58	55.32	42.61	0.10	0.03	Average
2	0.163	51.70	-13.62	65.32	51.57	0.10	0.03	QP
3	0.374	47.98	-0.44	48.42	47.87	0.10	0.01	Average
4	0.374	48.37	-10.05	58.42	48.26	0.10	0.01	QP
5	0.593	40.74	-5.26	46.00	40.62	0.10	0.02	Average
6	0.593	44.52	-11.48	56.00	44.40	0.10	0.02	QP
7	0.672	46.19	-9.81	56.00	46.06	0.10	0.03	QP
8	0.672	43.95	-2.05	46.00	43.82	0.10	0.03	Average
9	0.889	44.38	-11.62	56.00	44.24	0.10	0.04	QP
10	0.889	39.00	-7.00	46.00	38.86	0.10	0.04	Average
11	1.046	41.44	-4.56	46.00	41.30	0.10	0.04	Average
12	1.046	44.99	-11.01	56.00	44.85	0.10	0.04	QP
13	1.344	43.68	-12.32	56.00	43.54	0.10	0.04	QP
14	1.344	39.07	-6.93	46.00	38.93	0.10	0.04	Average



Site : CO01-HY
 Condition : CNS/VCCI/CISPR-B 2003 2001/008 NEUTRAL
 EUT : USB Wireless LAN USB adapter
 Power : 120V 60Hz
 Model : FD521613
 Memo : Wireless on

	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.159	53.06	-12.46	65.52	52.93	0.10	0.03	QP
2	0.159	43.46	-12.06	55.52	43.33	0.10	0.03	Average
3	0.296	45.88	-4.47	50.35	45.76	0.10	0.02	Average
4	0.296	48.10	-12.25	60.35	47.98	0.10	0.02	QP
5	0.374	47.43	-0.98	48.41	47.32	0.10	0.01	Average
6	0.374	48.49	-9.92	58.41	48.38	0.10	0.01	QP
7	0.592	39.56	-6.44	46.00	39.44	0.10	0.02	Average
8	0.592	44.20	-11.80	56.00	44.08	0.10	0.02	QP
9	0.671	43.78	-2.22	46.00	43.65	0.10	0.03	Average
10	0.671	45.91	-10.09	56.00	45.78	0.10	0.03	QP
11	0.895	43.81	-12.19	56.00	43.67	0.10	0.04	QP
12	0.895	38.79	-7.21	46.00	38.65	0.10	0.04	Average
13	1.046	44.62	-11.38	56.00	44.48	0.10	0.04	QP
14	1.046	41.34	-4.66	46.00	41.20	0.10	0.04	Average

Test Engineer : Jay
 Jay

5.7 Radiated Emission Measurement

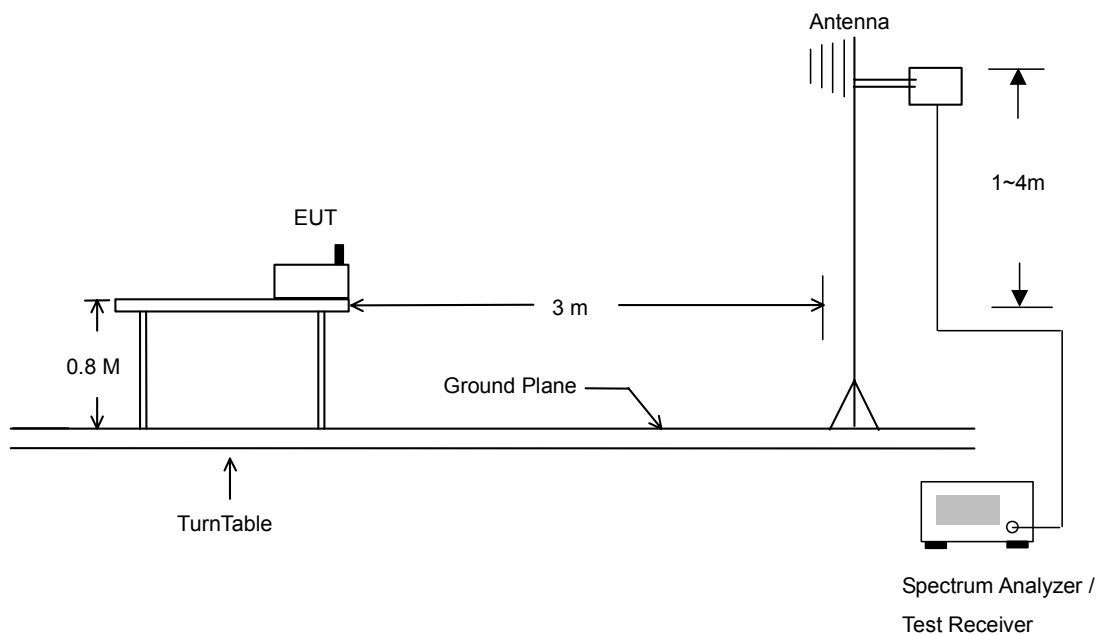
5.7.1 Measuring Instruments

As described in chapter 6 of this Report.

5.7.2 Test Procedures

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. For testing below 1GHz, If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

5.7.3 Typical Test Setup Layout of Radiated Emission





5.7.4 Test Data

- Temperature : 26°C
- Relating Humidity : 53%
- Test Enginner : Jay
- Test Mode : Mode 1
- Polarization : Horizontal

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	2390.00	54.99	-19.01	74.00	55.22	-0.23	Peak
2	2390.00	45.31	-8.69	54.00	45.54	-0.23	Average
3 @	2412.00	100.46			100.70	-0.24	Average
4 @	2412.00	107.26			107.50	-0.24	Peak
5	2483.50	54.55	-19.45	74.00	54.80	-0.25	Peak
6	2483.50	43.67	-10.33	54.00	43.92	-0.25	Average

Remark: # 3 and #4 Fundamental Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	9648.00	67.90	-6.10	74.00	56.49	11.40	Peak
2	9648.00	47.85	-6.15	54.00	36.45	11.40	Average

- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	2390.00	55.60	-18.40	74.00	55.83	-0.23	Peak
2	2390.00	45.13	-8.87	54.00	45.36	-0.23	Average
3 @	2412.00	98.00			98.24	-0.24	Average
4 @	2412.00	105.76			106.00	-0.24	Peak
5	2483.50	54.22	-19.78	74.00	54.48	-0.25	Peak
6	2483.50	43.69	-10.31	54.00	43.94	-0.25	Average

Remark: # 3 and #4 Fundamental Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	9648.00	66.53	-7.47	74.00	55.13	11.40	Peak
2 @	9648.00	48.52	-5.48	54.00	37.12	11.40	Average



- Test Mode : Mode 2
- Polarization : Horizontal

The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	199.83	34.27	-9.23	43.50	54.56	-20.29	Peak
2 @	254.64	35.63	-10.37	46.00	53.11	-17.47	Peak
3 @	259.23	34.50	-11.50	46.00	51.46	-16.95	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	479.90	40.01	-5.99	46.00	51.93	-11.92	Peak
2 @	595.40	37.74	-8.26	46.00	47.55	-9.80	Peak
3 @	924.40	37.93	-8.07	46.00	43.44	-5.52	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	44.31	-9.69	54.00	44.54	-0.23	Average
2 @	2390.00	53.34	-20.66	74.00	53.57	-0.23	Peak
3 @	2437.00	106.64			106.90	-0.26	Peak
4 @	2437.00	96.04			96.30	-0.26	Average
5 @	2483.50	52.63	-21.37	74.00	52.88	-0.25	Peak
6 @	2483.50	44.41	-9.59	54.00	44.66	-0.25	Average

Remark: #3 and #4 Fundamental Signal



- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	199.83	29.48	-14.02	43.50	49.77	-20.29	Peak
2	249.78	32.22	-13.78	46.00	50.33	-18.10	Peak
3	264.63	32.65	-13.35	46.00	49.45	-16.80	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	659.80	34.37	-11.63	46.00	43.60	-9.23	Peak
2	731.90	34.28	-11.72	46.00	41.80	-7.52	Peak
3	798.40	33.19	-12.81	46.00	38.48	-5.29	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	52.67	-21.33	74.00	52.90	-0.23	Peak
2 @	2390.00	44.89	-9.11	54.00	45.12	-0.23	Average
3 @	2437.00	105.84			106.10	-0.26	Peak
4 @	2437.00	94.24			94.50	-0.26	Average
5 @	2483.50	52.18	-21.82	74.00	52.43	-0.25	Peak
6 @	2483.50	44.72	-9.28	54.00	44.97	-0.25	Average

Remark: #3 and #4 Fundamental Signal



- Test Mode : Mode 3
- Polarization : Horizontal

The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	54.65	-19.35	74.00	54.88	-0.23	Peak
2 @	2390.00	44.07	-9.93	54.00	44.30	-0.23	Average
3 @	2462.00	100.95			101.20	-0.25	Average
4 @	2462.00	107.65			107.90	-0.25	Peak
5 @	2483.50	56.72	-17.28	74.00	56.97	-0.25	Peak
6 @	2483.50	47.70	-6.30	54.00	47.95	-0.25	Average

Remark: #3 and #4 Fundamental Signal.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	4924.00	50.41	-23.59	74.00	45.41	5.01	Peak

- Polarization : Vertical

The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	54.30	-19.70	74.00	54.53	-0.23	Peak
2 @	2390.00	43.60	-10.40	54.00	43.83	-0.23	Average
3 @	2462.00	93.87			94.12	-0.25	Average
4 @	2462.00	103.07			103.32	-0.25	Peak
5 @	2483.50	54.25	-19.75	74.00	54.50	-0.25	Peak
6 @	2483.50	44.14	-9.86	54.00	44.39	-0.25	Average

Remark: #3 and #4 Fundamental Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	3284.00	47.71	-26.29	74.00	47.03	0.69	Peak



- Test Mode : Mode 4
- Polarization : Horizontal

The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	2390.00	59.46	-14.54	74.00	59.69	-0.23	Peak
2	2390.00	47.41	-6.59	54.00	47.64	-0.23	Average
3 X	2412.00	102.46			102.70	-0.24	Peak
4 @	2412.00	96.29			96.53	-0.24	Average
5	2483.50	53.97	-20.03	74.00	54.22	-0.25	Peak
6	2483.50	43.54	-10.46	54.00	43.79	-0.25	Average

Remark: #3 and #4 Fundamental Signal.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	4824.00	50.81	-23.19	74.00	46.08	4.73	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 !	9648.00	69.29	-4.71	74.00	57.89	11.40	Peak
2 !	9648.00	48.61	-5.39	54.00	37.21	11.40	Average



- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	2390.00	58.17	-15.83	74.00	58.40	-0.23	Peak
2	2390.00	46.07	-7.93	54.00	46.30	-0.23	Average
3 X	2412.00	93.57			93.81	-0.24	Average
4 X	2412.00	101.46			101.70	-0.24	Peak
5	2483.50	54.13	-19.87	74.00	54.38	-0.25	Peak
6	2483.50	43.49	-10.51	54.00	43.74	-0.25	Average

Remark: #3 and #4 Fundamental Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	4824.00	50.01	-23.99	74.00	45.28	4.73	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	9648.00	66.50	-7.50	74.00	55.10	11.40	Peak
2	9648.00	47.60	-6.40	54.00	36.20	11.40	Average



- Test Mode : Mode 5
- Polarization : Horizontal

The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	225.48	33.66	-12.34	46.00	53.57	-19.92	Peak
2	232.23	35.40	-10.60	46.00	54.85	-19.45	Peak
3 @	264.63	39.71	-6.29	46.00	56.52	-16.80	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	491.80	40.28	-5.72	46.00	51.66	-11.38	Peak
2 @	504.40	41.98	-4.02	46.00	53.15	-11.16	Peak
3 @	516.30	39.81	-6.19	46.00	51.10	-11.29	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	43.55	-10.45	54.00	43.78	-0.23	Average
2 @	2390.00	53.44	-20.56	74.00	53.67	-0.23	Peak
3 @	2437.00	94.15			94.41	-0.26	Average
4 @	2437.00	101.61			101.87	-0.26	Peak
5 @	2483.50	43.82	-10.18	54.00	44.07	-0.25	Average
6 @	2483.50	53.67	-20.33	74.00	53.92	-0.25	Peak

Remark: #3 and #4 Fundamental Signal.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	4874.00	51.76	-22.24	74.00	46.89	4.87	Peak
2 @	4874.00	46.02	-7.98	54.00	41.15	4.87	Average



- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	32.43	35.96	-4.04	40.00	49.66	-13.70	Peak
2	231.69	33.25	-12.75	46.00	52.71	-19.46	Peak
3	265.44	36.00	-10.00	46.00	52.80	-16.81	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1	491.80	38.43	-7.57	46.00	49.82	-11.38	Peak
2 @	504.40	38.95	-7.05	46.00	50.11	-11.16	Peak
3	663.30	36.92	-9.08	46.00	45.93	-9.02	Peak

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	53.56	-20.44	74.00	53.78	-0.23	Peak
2 @	2390.00	43.22	-10.78	54.00	43.45	-0.23	Average
3 @	2437.00	93.86			94.12	-0.26	Average
4 @	2437.00	101.09			101.34	-0.26	Peak
5 @	2483.50	53.64	-20.36	74.00	53.89	-0.25	Peak
6 @	2483.50	43.53	-10.47	54.00	43.78	-0.25	Average

Remark: #3 and #4 Fundamental Signal

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	4874.00	50.08	-23.92	74.00	45.21	4.87	Peak



- Test Mode : Mode 6
- Polarization : Horizontal

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	54.22	-19.78	74.00	54.45	-0.23	Peak
2 @	2390.00	43.55	-10.45	54.00	43.78	-0.23	Average
3 @	2462.00	94.06			94.31	-0.25	Average
4 @	2462.00	101.85			102.10	-0.25	Peak
5 @	2483.50	56.68	-17.32	74.00	56.93	-0.25	Peak
6 @	2483.50	47.62	-6.38	54.00	47.87	-0.25	Average

Remark: #3 and #4 Fundamental Signal.

- Polarization : Vertical

■ The test that passed at minimum margin was marked by the frame in the following table.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	2390.00	54.44	-19.56	74.00	54.67	-0.23	Peak
2 @	2390.00	43.70	-10.30	54.00	43.93	-0.23	Average
3 @	2462.00	100.15			100.40	-0.25	Peak
4 @	2462.00	93.37			93.62	-0.25	Average
5 @	2483.50	58.03	-15.97	74.00	58.28	-0.25	Peak
6 @	2483.50	46.58	-7.42	54.00	46.83	-0.25	Average

Remark: #3 and #4 Fundamental Signal.

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	
1 @	3284.00	48.57	-25.43	74.00	47.88	0.69	Peak



5.8 Antenna Requirements

5.8.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no other antenna except assembled by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

5.8.2 Antenna Connected Construction

The antennas used in this product are on board printed antenna without connector and it is considered to meet antenna requirement of FCC.



6. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 23, 2004	Jun. 23, 2005	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001/008	9 KHz – 30 MHz	May 03, 2004	May 03, 2005	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9 KHz – 30 MHz	Apr. 19, 2004	Apr. 19, 2005	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Dec. 23, 2004	Dec. 23, 2005	Conduction (CO01-HY)
Spectrum analyzer	Agilent	E4408B	MY44211030	9KHz-26.5GHz	Jul. 27, 2004	Jul. 26, 2005	Radiation (03CH06-HY)
Receiver	R&S	ESCS30	100356	9KHz-2.75GHz	Jul,09,2004	Jul, 10,2005	Radiation (03CH06-HY)
Controller	CT	SC100	N/A	N/A	N/A	N/A	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Nov. 22, 2004	Nov. 21, 2005	Radiation (03CH06-HY)
Horn Antenna	Com-Power	AH118	071025	1G-18G	Feb. 22, 2005	Feb. 22, 2006	Radiation (03CH06-HY)
SHF-EHF Horn	SCHWARZBECK	BBHA 9170	9170-249	14G - 40G	Jun. 22, 2004	Jun. 22, 2005	Radiation (03CH06-HY)
PreAmplifier	Com-Power	PA-103	161055	1MHz - 1000MHz	Apr. 26, 2004	Apr. 26, 2005	Radiation (03CH06-HY)
HF Amplifier	MITEQ	AFS44	973248	0.1G - 26.5G	May. 20, 2004	May 20, 2005	Radiation (03CH06-HY)
Amplifier	MITEQ	AMF-6F	997165	26G - 40G	Jun. 24, 2004	Jun. 24, 2005	Radiation (03CH06-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	N/A	Radiation (03CH06-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	N/A	Radiation (03CH06-HY)



7. Uncertainty Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.10	Normal(k=2)	0.05
Cable loss	0.10	Normal(k=2)	0.05
AMN insertion loss	2.50	Rectangular	0.63
Receiver Spec	1.50	Rectangular	0.43
Site imperfection	1.39	Rectangular	0.80
Mismatch	+0.34/-0.35	U-shape	0.24
combined standard uncertainty Uc(y)	1.13		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	2.26		

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.41	Normal(k=2)	0.21
Antenna factor calibration	0.83	Normal(k=2)	0.42
Cable loss calibration	0.25	Normal(k=2)	0.13
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14
RCV/SPA specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site imperfection	1.43	Rectangular	0.83
Mismatch	+0.39/-0.41	U-shaped	0.28
combined standard uncertainty Uc(y)	1.27		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	2.54		



Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of x_i		$u(x_i)$	C_i	$C_i * u(x_i)$
	dB	Probability Distribution			
Receiver reading	±0.10	Normal(k=1)	0.10	1	0.10
Antenna factor calibration	±1.70	Normal(k=2)	0.85	1	0.85
Cable loss calibration	±0.50	Normal(k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20 \log(1 - \Gamma_1 * \Gamma_2 * \Gamma_3)$	+0.34/-0.35	U-shaped	0.244	1	0.244
Combined standard uncertainty $U_c(y)$	2.36				
Measuring uncertainty for a level of confidence of 95% $U = 2U_c(y)$	4.72				