

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Pure PCI Wireless LAN Card

Model No. : 73-TMWBP-002

FCC ID : QS3WBPRP1

Filing Type : Certification

Applicant : **TwinMOS Technologies Inc.**
303 No. 3, Tzu Chiang Rd.,
Hu Kou Xiang, Hsin Chu, Taiwan, R.O.C.

- 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.**

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
CERTIFICATE OF COMPLIANCE.....	1
1. General Description of Equipment under Test.....	2
1.1. Applicant.....	2
1.2. Manufacturer	2
1.3. Basic Description of Equipment under Test	2
1.4. Feature of Equipment under Test	3
2. Test Configuration of Equipment under Test.....	4
2.1. Test Manner	4
2.2. Description of Test System	4
2.3. Connection Diagram of Test System	6
3. Operation of Equipment under Test	7
4. General Information of Test.....	8
4.1. Test Voltage	8
4.2. Standard for Methods of Measurement.....	8
4.3. Test in Compliance with	8
4.4. Frequency Range Investigated	8
4.5. Test Distance	8
5. Report of Measurements and Examinations	9
5.1. List of Measurements and Examinations	9
5.2. 6dB Bandwidth	10
5.3. Peak Output Power	14
5.4. Power Spectral Density	15
5.5. Test of Conducted Emission	19
5.6. Test of Radiated Emission	26
5.7. Band Edges Measurement.....	57
5.8. Antenna Requirements	60
5.9. RF Exposure	61
6. EMI Suppression Component List.....	64
7. Antenna Factor & Cable Loss	65
8. List of Measuring Equipments Used	67
9. Uncertainty of Test Site	68

History of this test report

Original Report Issue Date: Jun. 24, 2003

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : Pure PCI Wireless LAN Card

Model No. : 73-TMWBP-002

FCC ID : QS3WBPRP1

Filing Type : Certification

Applicant : **TwinMOS Technologies Inc.**
303 No. 3, Tzu Chiang Rd.,
Hu Kou Xiang, Hsin Chu, Taiwan, R.O.C.

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** and the equipment under test was **passed** all test items required in FCC Part 15 subpart C, relative to the equipment under test. Testing was carried out on Jun. 20, 2003 at **SPORTON International Inc.** LAB.



K. J. Lin
Manager

SPORTON International Inc.

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

1. General Description of Equipment under Test

1.1. Applicant

TwinMOS Technologies Inc.
303 No. 3, Tzu Chiang Rd.,
Hu Kou Xiang, Hsin Chu, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment : Pure PCI Wireless LAN Card
Model No. : 73-TMWBP-002
FCC ID. : QS3WBPRP1
Trade Name : TwinMOS
Power Supply Type : From system
AC Power Input : N/A

1.4. Feature of Equipment under Test

Physical Specification

Dimensions	119.91 x 77.75 x 22.52 mm (wxdhxt)
Weight	70 g
Host Interface	PCI Rev. 2.3

Power Characteristics

Operating Voltage	3.3V±5%
Current Consumption	Nominal 240mA, Max. 300mA

Networking Characteristics

Compatibility	<ul style="list-style-type: none"> ● IEEE 802.11 Standard for WLAN (DSSS) ● Internal Wi-Fi certified by TwinMOS
Host OS	Windows 98/98SE/ME/NT/2000/XP
Media Access Protocol	CSMA/CA with ACK
Network Protocol	TCP/IP, IPX, NetBEUI

RF Characteristics

Frequency Range	2.400-2.4835 GHz, Direct Sequence Spread Spectrum (DSSS)
Operating Channels	<ul style="list-style-type: none"> ● 1-11 United States (FCC) ● 1-11 Canada (DOC) ● 1-14 Japan (MKG) ● 1-13 Europe (Except Spain and France) (ETSI)
Modulation Technique	<ul style="list-style-type: none"> ● 11 Mbps: CCK ● 5.5 Mbps: CCK ● 2 Mbps: DQPSK ● 1 Mbps: DBPSK
Spreading	11-chip Barker Sequence
Transmit Power	16 dBm @ Nominal Temp Range
Receive Sensitivity	Nominal Temp Range: 11 Mbps 10 ⁻⁵ BER @ -83 dBm, minimum
Security	<ul style="list-style-type: none"> ● 64/128-bit WEP Encryption ● 64/128-bit TKIP Data Encryption ● 64/128-bit AES Data Encryption
Antenna	1/4 λ Dipole Antenna, Average Gain : 2dBi
Operating Range	Open Space: 100 ~ 300m; Indoor: 30m ~ 100m The transmission speed varies in the surrounding environment.

Antenna Characteristics

Frequency Range	2.4~2.5GHz
Impedance	50Ohms nominal
VSWR	≤2.0
Average Gain	2dBi
Standard Connector	SMA Connector Reversed Polarity

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been associated with personal computer and peripherals pursuant to ANSI C63.4-1992 and configuration operated in a manner, which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included COMPAQ PC, VIEWSONIC Monitor, LOGITECH PS/2 Keyboard, LOGITECH PS/2 Mouse, EPSON Printer, ACEEX Modem and EUT for EMI test.
- c. The EUT can operate on eleven channels from 2412.0MHz to 2462.0MHz. (as listed in section 1.4). According to 15.31(m), three channels (one near top, one near middle and one near bottom) were performed as following:
Mode 1: 2412MHz (Channel 01)
Mode 2: 2437MHz (Channel 06)
Mode 3: 2462MHz (Channel 11)
- d. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 24620MHz.

2.2. Description of Test System

Support Unit 1. -- Personal Computer (COMPAQ)

FCC ID	: N/A
Model No.	: D380MX
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0037
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC)

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0051
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Keyboard (LOGITECH)

FCC ID : N/A
Model No. : Y-SJ17
Serial No. : SP0054
Data Cable : Shielded, 360 degree via metal backshells, 1.7m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 4. -- PS/2 Mouse (LOGITECH)

FCC ID : DZL211029
Model No. : M-S34
Serial No. : SP0041
Data Cable : Shielded, 1.7m

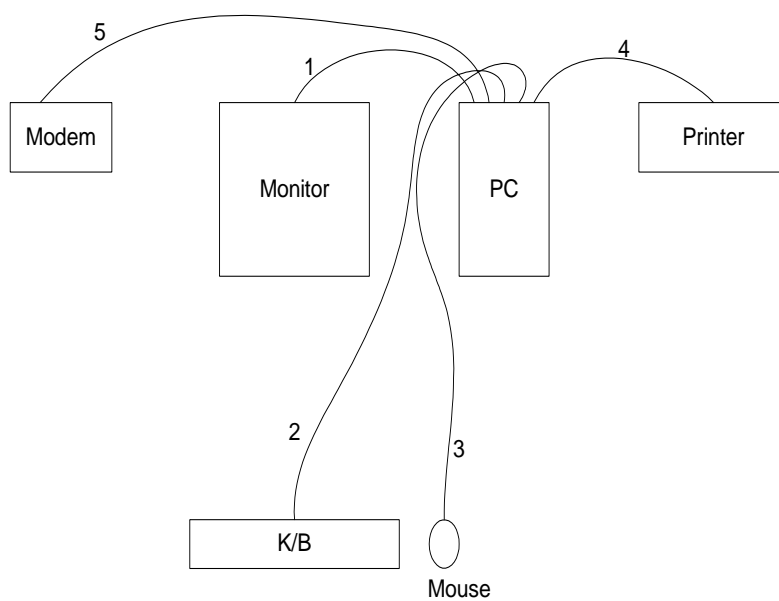
Support Unit 5. -- Printer (EPSON)

FCC ID : N/A
Model No. : STYLUS COLOR 680
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0048
Data Cable : Shielded, 1.35m

Support Unit 6. -- Modem (ACEEX)

FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0015
Data Cable : Shielded, 1.15m

2.3. Connection Diagram of Test System



1. The power cable is connected from the PC to the support unit 2.
2. The power cable is connected from the PC to the support unit 3.
3. The power cable is connected from the PC to the support unit 4.
4. The power cable is connected from the PC to the support unit 5.
5. The power cable is connected from the PC to the support unit 6.

3. Operation of Equipment under Test

An executive programs, EMCTEST.EXE under WIN XP, which generate a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows:

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the hard disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the modem.
- f. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from c to f.

At the same time, "rt8180 " was executed to keep transmitting signals at fixed frequency.

4. General Information of Test

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,
Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-327-3456
FAX : 886-3-318-0055
Test Site No : CO01-HY, 03CH03-HY

4.1. Test Voltage

115V/ 60Hz

4.2. Standard for Methods of Measurement

ANSI C63.4-1992

4.3. Test in Compliance with

FCC Part 15, Subpart C

4.4. Frequency Range Investigated

- a. Conduction: from 150 kHz to 30 MHz
- b. Radiation: from 30 MHz to 24620MHz

4.5. Test Distance

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

5. Report of Measurements and Examinations

5.1. List of Measurements and Examinations

FCC Rule	Description of Test	Result
15.207	Conducted Emission	Pass
<u>15.247(a)(2)</u>	6dB Bandwidth	Pass
<u>15.247(b)</u>	Maximum Peak Output Power	Pass
15.209	Radiated Emission	Pass
<u>15.247(c)</u>	100kHz Bandwidth of Frequency Band Edges	Pass
<u>15.247(d)</u>	Power Spectral Density	Pass
<u>15.203</u>	Antenna Requirement	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass

5.2. 6dB Bandwidth

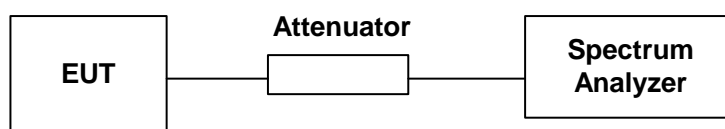
5.2.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.2.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

5.2.3. Test Setup Layout :

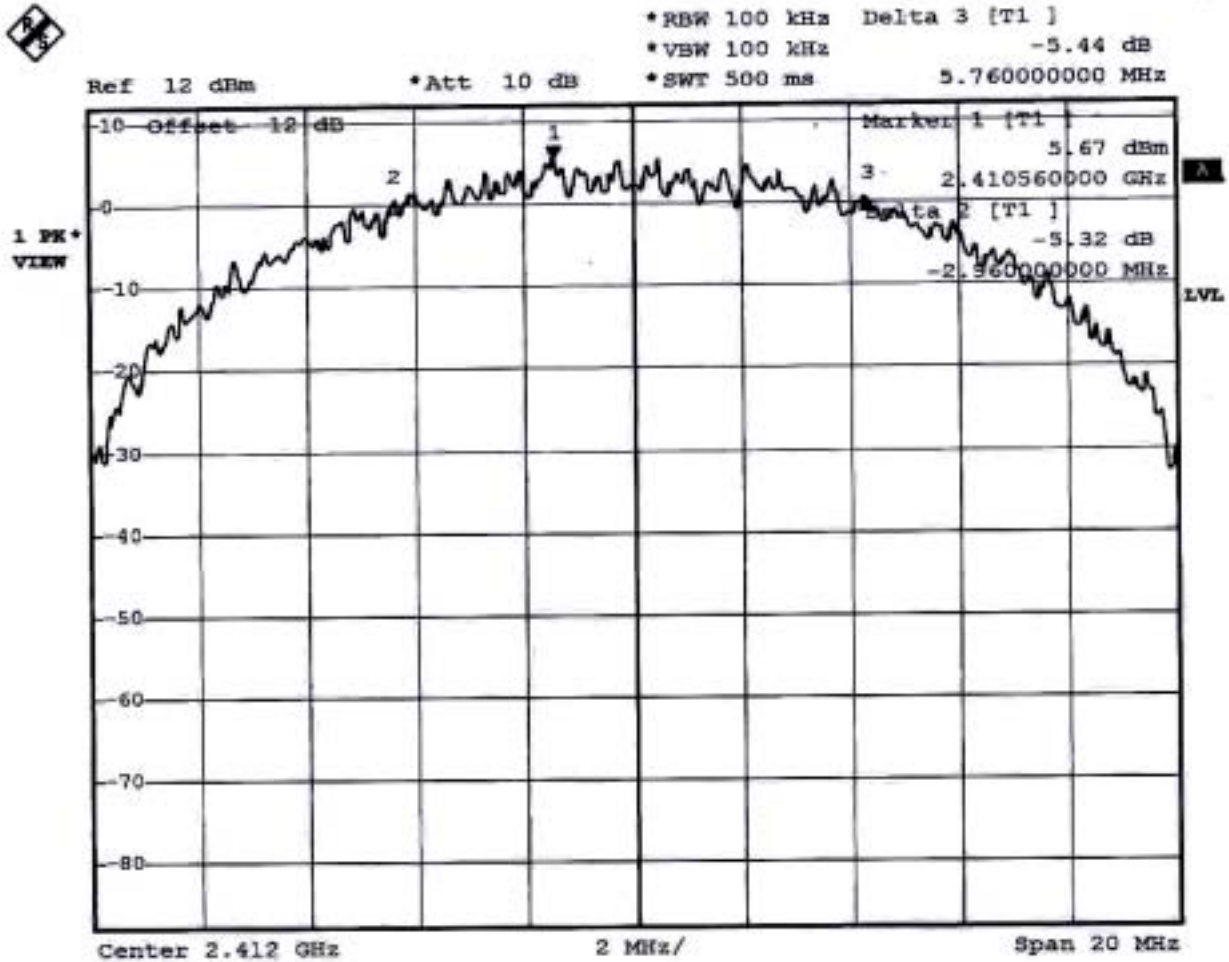


5.2.4. Test Result : The spectrum analyzer plots are attached as below

- Temperature : 27 °C
- Relative Humidity : 65%

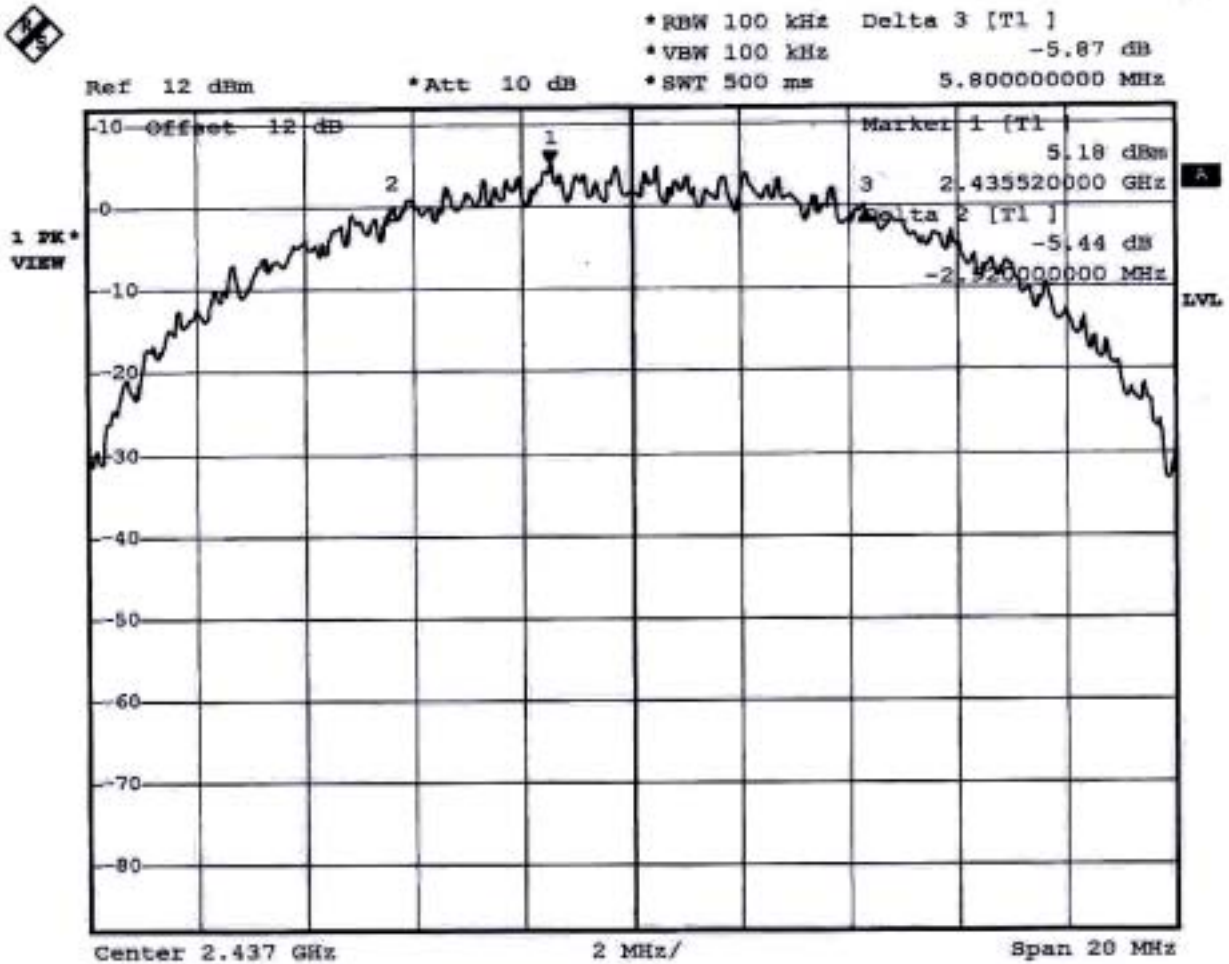
Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	8.72	0.5	1
06	2437	8.72	0.5	2
11	2462	8.72	0.5	3

Plot1(Channel 01) :



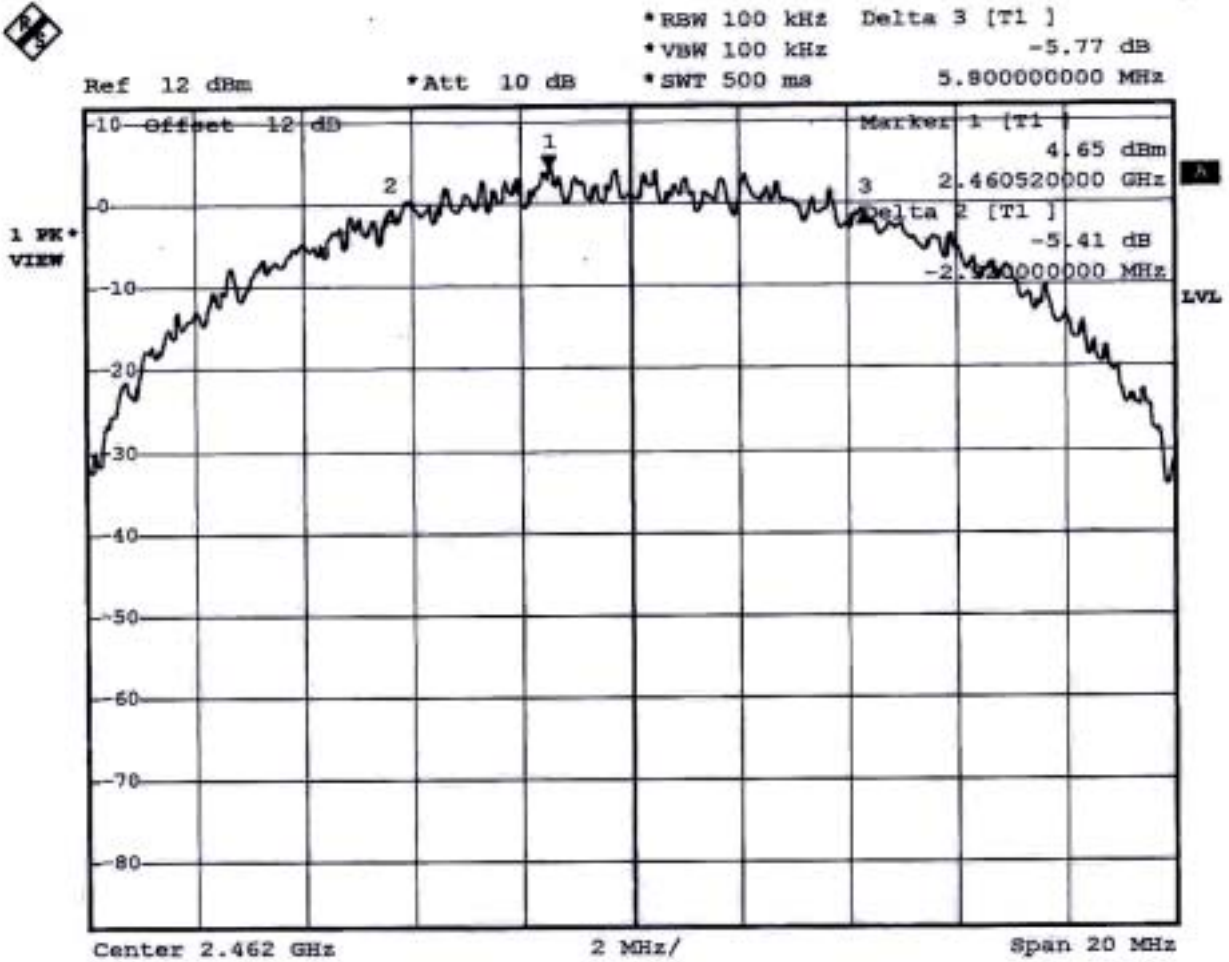
Date: 20.JUN.2003 11:44:15

Plot2(Channel 06) :



Date: 20.JUN.2003 12:11:52

Plot3(Channel 11) :



Date: 20.JUN.2003 12:09:45

Comments : 6dB Emission bandwidth>500kHz

5.3. Peak Output Power

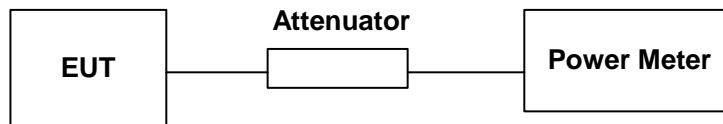
5.3.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.3.2. Test Procedure :

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

5.3.3. Test Setup Layout :



5.3.4. Test Result : See spectrum analyzer plots below

- Temperature : 27°C
- Relative Humidity : 65 %
- Antenna Gain: 2 dBi

Channel	Frequency (MHz)	Measured Output Power (mWatt)	Measured Output Power (dBm)	Limits (Watt/dBm)
01	2412	31.26	14.95	1W/30 dBm
06	2437	30.06	14.78	1W/30 dBm
11	2462	25.94	14.14	1W/30 dBm

- Comments : Maximum Peak Output Power < 30dBm (1Watt)

5.4. Power Spectral Density

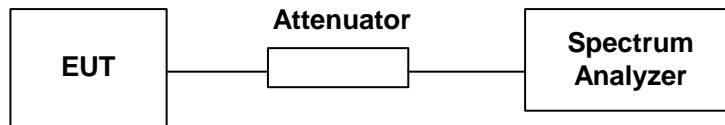
5.4.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.4.2. Test Procedure :

1. The transmitter output was connected to spectrum analyzer through an attenuator.
2. The spectrum analyzer's resolution bandwidth were 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.

5.4.3. Test Setup Layout :

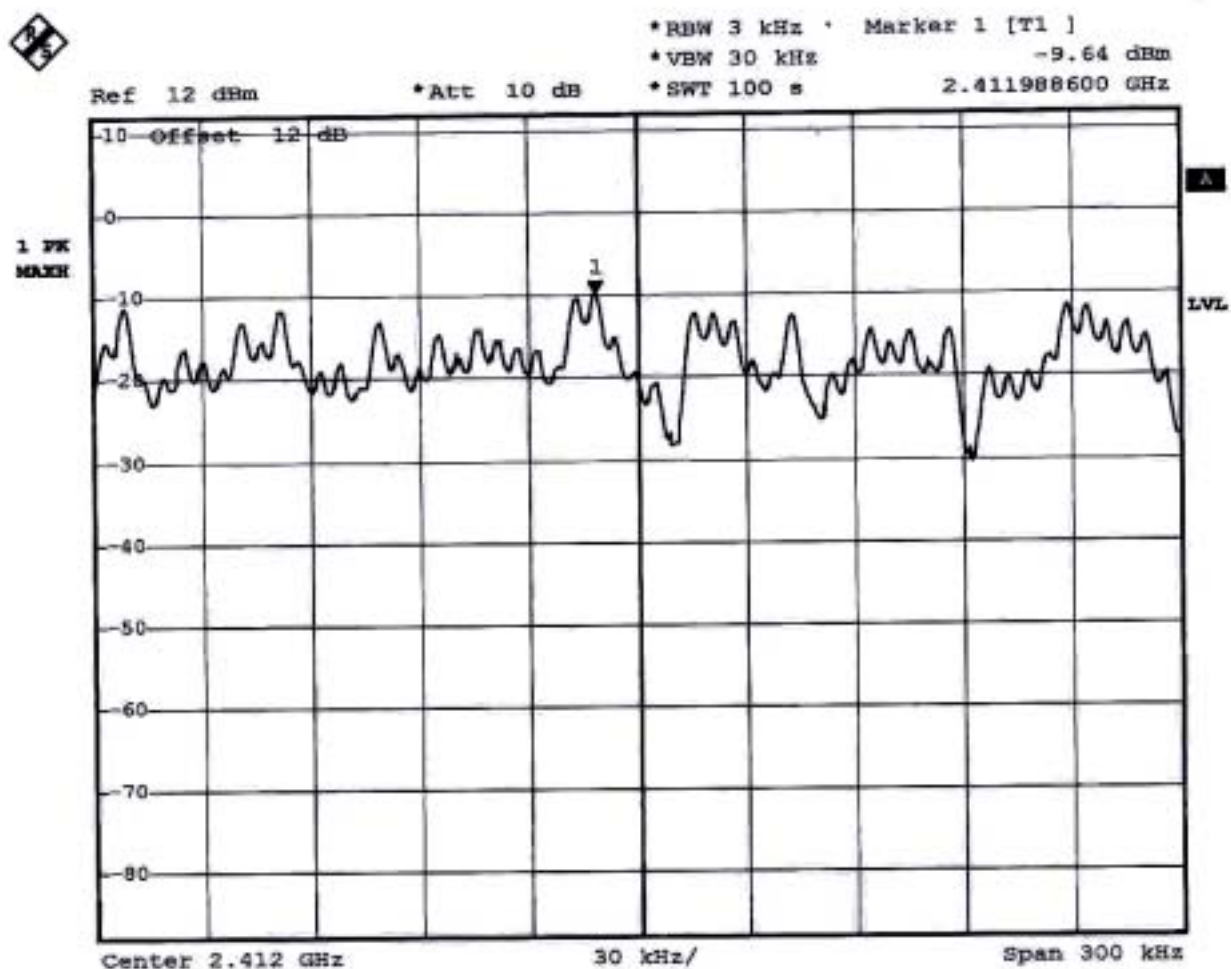


5.4.4. Test Result : See spectrum analyzer plots below

- Temperature : 27°C
- Relative Humidity : 65 %

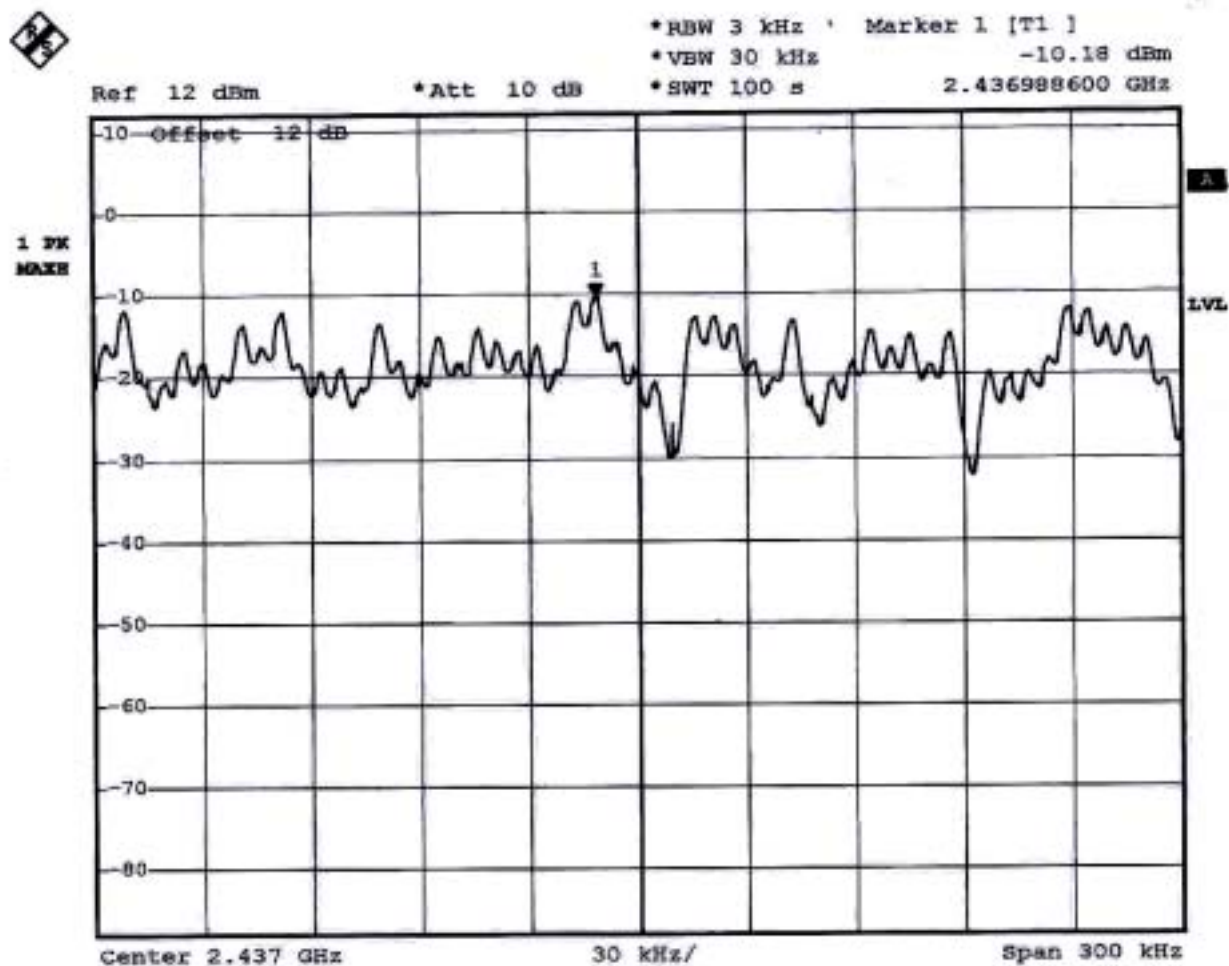
Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-9.64	8	1
06	2437	-10.18	8	2
11	2462	-10.68	8	3

Plot1(Channel 01):



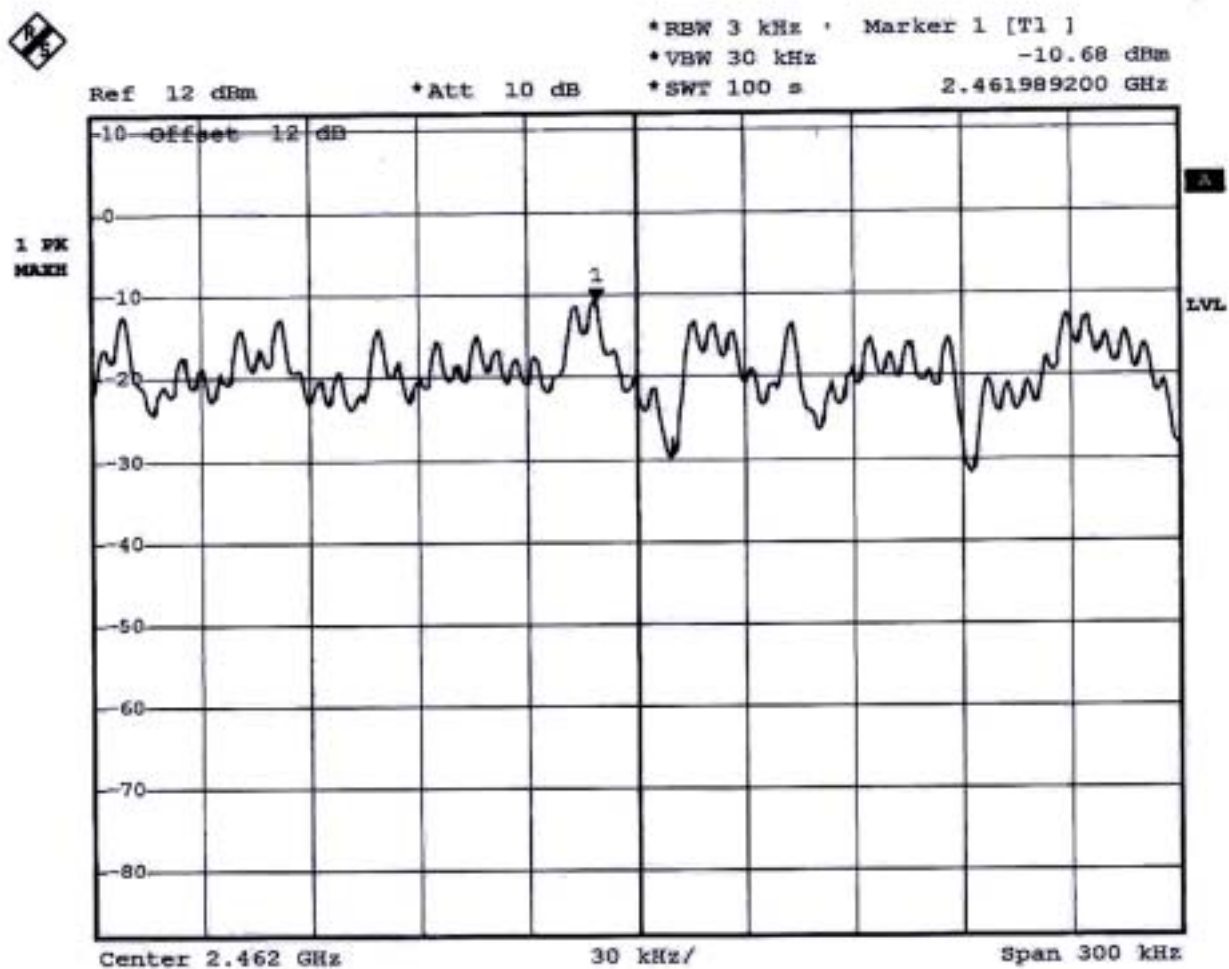
Date: 20.JUN.2003 11:54:01

Plot2(Channel 06):



Date: 20.JUN.2003 12:00:30

Plot3(Channel 11):



Date: 20.JUN.2003 12:05:55

5.5. Test of Conducted Emission

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz and return leads of the EUT according to the methods defined in ANSI C63.4-1992 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

5.5.1. Major Measuring Instruments :

● Test Receiver	(R&S ESCS 30)
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

5.5.2. 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 mains through a 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.

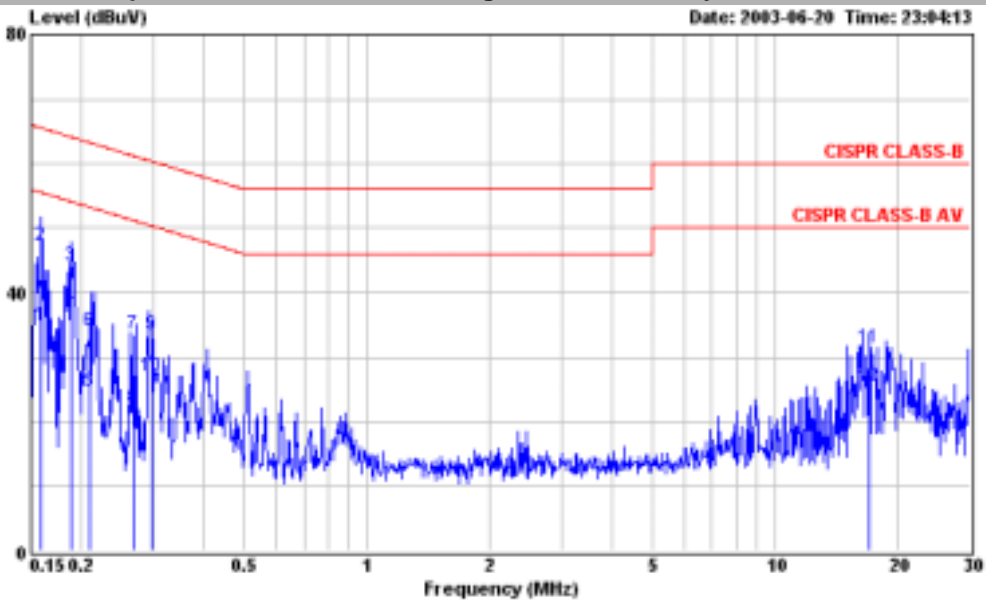
5.5.3. Test Result of Conducted Emission :

Frequency Range of Test : from 150KHz to 30 MHz

6dB Bandwidth : 9KHz

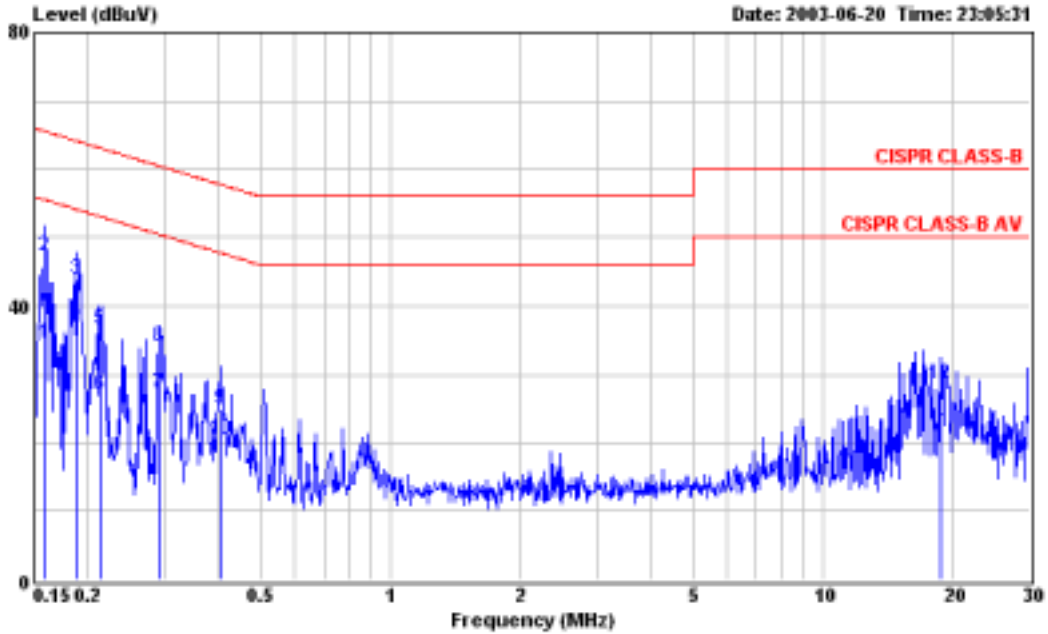
- Test Mode : Mode 1
- Temperature : 27°C
- Relative Humidity : 65 %

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



Site : COOL-HY
 Condition : CISPR CLASS-B 2003 2001/008 LINE
 EUT : Wireless Lan Product
 Power : 110V/60Hz
 Model : xx
 Memo : TX CH01
 Memo :

	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
		dBuV	dB	dBuV	dBuV	dB	dB	
1	0.159	34.71	-20.81	55.52	34.52	0.10	0.09	Average
2	0.159	47.24	-18.28	65.52	47.05	0.10	0.09	QP
3	0.188	44.20	-19.92	64.12	44.05	0.10	0.05	QP
4	0.188	37.60	-16.52	54.12	37.45	0.10	0.05	Average
5	0.210	24.74	-28.47	53.21	24.60	0.10	0.04	Average
6	0.210	33.90	-29.31	63.21	33.76	0.10	0.04	QP
7	0.267	33.57	-27.64	61.21	33.42	0.10	0.05	QP
8	0.267	21.95	-29.26	51.21	21.80	0.10	0.05	Average
9	0.297	33.62	-26.72	60.34	33.47	0.10	0.05	QP
10	0.297	27.05	-23.29	50.34	26.90	0.10	0.05	Average
11	16.972	31.53	-28.47	60.00	30.92	0.24	0.37	QP
12	16.972	25.39	-24.61	50.00	24.78	0.24	0.37	Average



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : Wireless Lan Product
 Power : 110V/60Hz
 Model : xx
 Memo : TX CH01
 Memo :

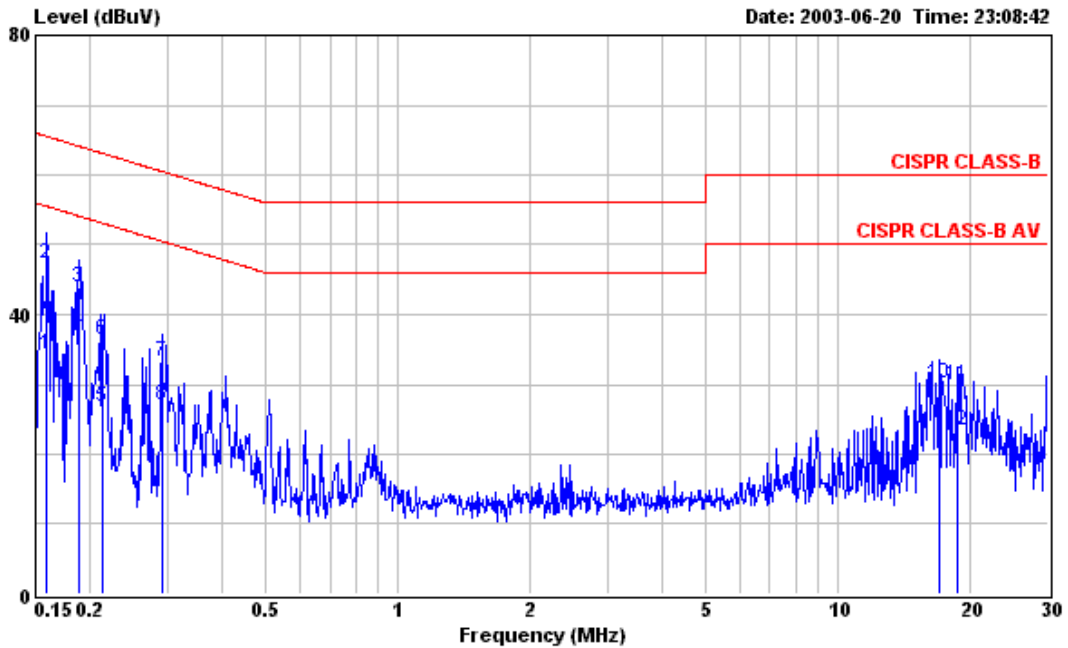
	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.159	34.54	-20.98	55.52	34.35	0.10	0.09	Average
2	0.159	47.22	-18.30	65.52	47.03	0.10	0.09	QP
3	0.188	43.96	-20.16	64.12	43.01	0.10	0.05	QP
4	0.188	37.60	-16.52	54.12	37.45	0.10	0.05	Average
5	0.214	36.73	-26.33	63.06	36.59	0.10	0.04	QP
6	0.214	26.92	-26.14	53.06	26.78	0.10	0.04	Average
7	0.292	27.40	-23.08	50.48	27.25	0.10	0.05	Average
8	0.292	34.14	-26.34	60.48	33.99	0.10	0.05	QP
9	0.406	24.04	-32.89	57.73	24.68	0.10	0.06	QP
10	0.406	20.59	-27.14	47.73	20.43	0.10	0.06	Average
11	18.634	21.51	-28.49	50.00	20.82	0.30	0.39	Average
12	18.634	28.50	-31.50	60.00	27.01	0.30	0.39	QP

Test Engineer : _____

Murray Lu

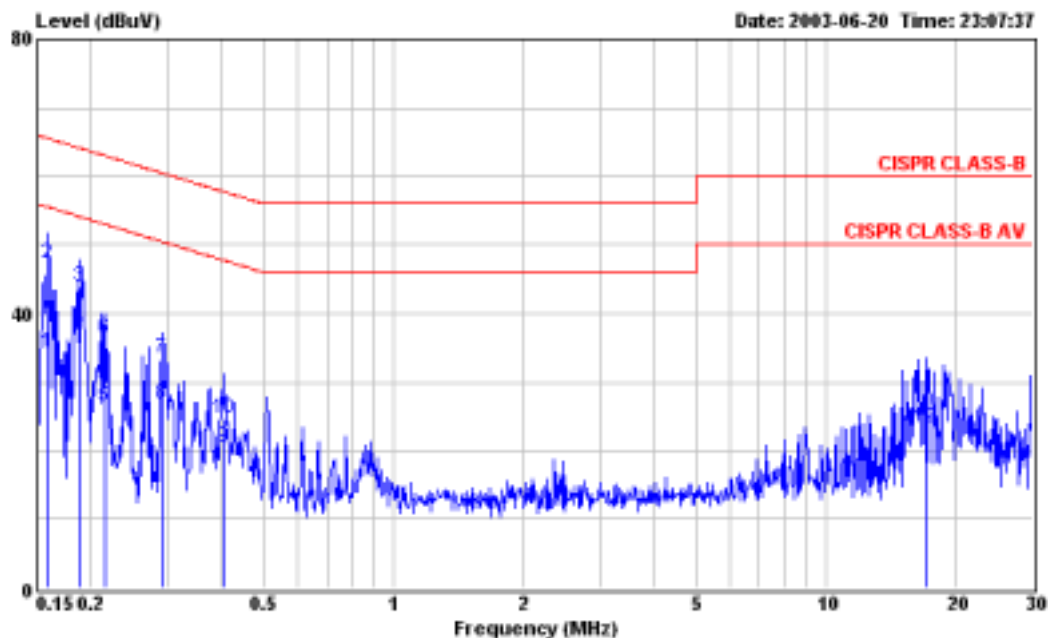
- Test Mode : Mode 2
- Temperature : 27°C
- Relative Humidity : 65 %

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



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 LINE
 EUT : Wireless Lan Product
 Power : 110V/60Hz
 Model : xx
 Memo : TX CH06
 Memo :

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.159	34.36	-21.16	55.52	34.17	0.10	0.09	Average
2	0.159	47.16	-18.36	65.52	46.97	0.10	0.09	QP
3	0.188	43.96	-20.16	64.12	43.81	0.10	0.05	QP
4	0.188	37.60	-16.52	54.12	37.45	0.10	0.05	Average
5	0.214	26.82	-26.24	53.06	26.68	0.10	0.04	Average
6	0.214	36.47	-26.59	63.06	36.33	0.10	0.04	QP
7	0.291	33.32	-27.18	60.50	33.17	0.10	0.05	QP
8	0.291	26.90	-23.60	50.50	26.75	0.10	0.05	Average
9	16.933	24.29	-25.71	50.00	23.68	0.24	0.37	Average
10	16.933	30.01	-29.99	60.00	29.40	0.24	0.37	QP
11	18.640	29.97	-30.03	60.00	29.30	0.28	0.39	QP
12	18.640	23.32	-26.68	50.00	22.65	0.28	0.39	Average



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : Wireless Lan Product
 Power : 110V/60Hz
 Model : xx
 Memo : TX CH06
 Memo :

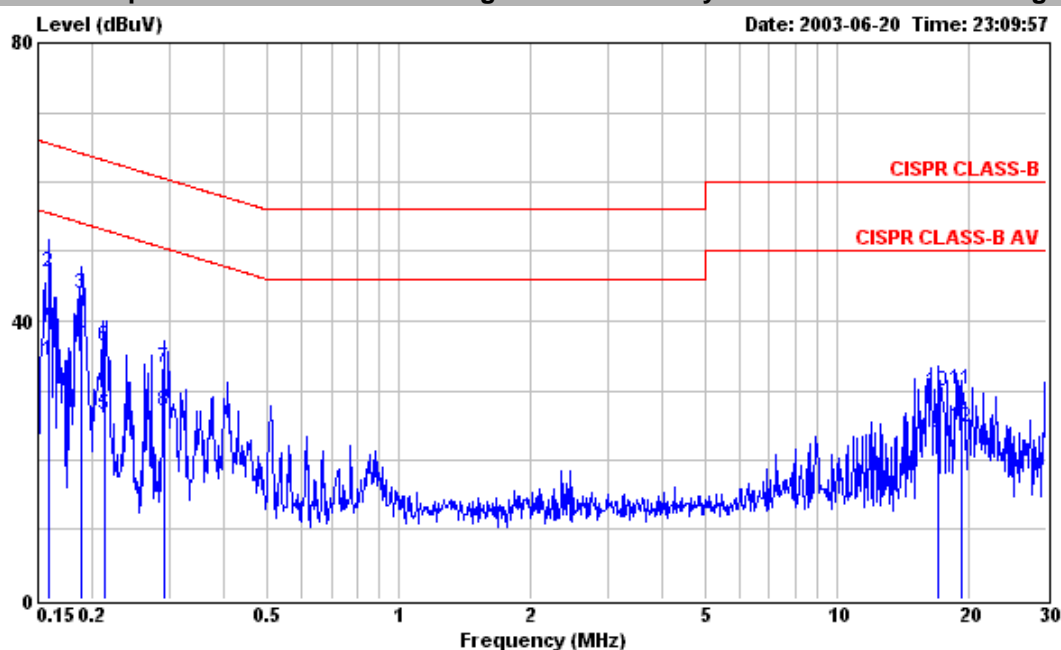
	Freq	Level	Over	Limit	Read	Probe	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.159	34.32	-21.20	55.52	34.13	0.10	0.09	Average
2	0.159	47.26	-18.26	65.52	47.07	0.10	0.09	QP
3	0.188	43.84	-20.28	64.12	43.69	0.10	0.05	QP
4	0.188	37.66	-16.46	54.12	37.51	0.10	0.05	Average
5	0.215	26.59	-26.42	53.01	26.45	0.10	0.04	Average
6	0.215	36.33	-26.68	63.01	36.19	0.10	0.04	QP
7	0.291	33.46	-27.04	60.50	33.31	0.10	0.05	QP
8	0.291	26.80	-23.70	50.50	26.65	0.10	0.05	Average
9	0.406	20.43	-27.30	47.73	20.27	0.10	0.06	Average
10	0.406	24.60	-33.13	57.73	24.44	0.10	0.06	QP
11	16.930	29.19	-30.81	60.00	28.52	0.30	0.37	QP
12	16.930	23.42	-26.58	50.00	22.75	0.30	0.37	Average

Test Engineer : _____

Murray Lu

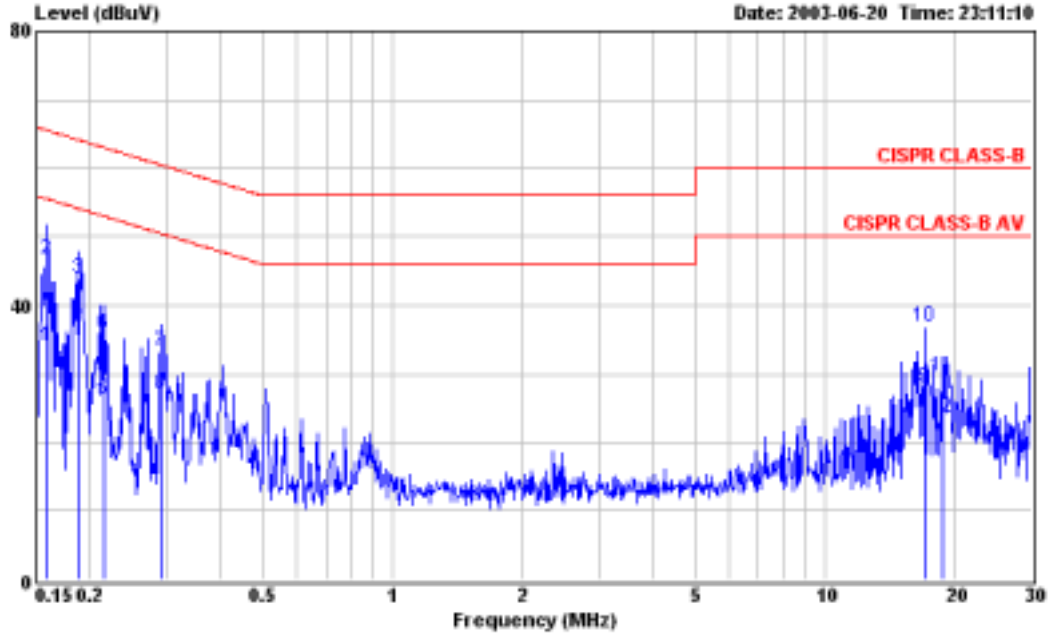
- Test Mode : Mode 3
- Temperature : 27°C
- Relative Humidity : 65 %

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



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 LINE
 EUT : Wireless Lan Product
 Power : 110V/60Hz
 Model : XX
 Memo : TX CH11
 Memo :

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.159	34.19	-21.33	55.52	34.00	0.10	0.09	Average
2	0.159	46.89	-18.63	65.52	46.70	0.10	0.09	QP
3	0.188	43.80	-20.32	64.12	43.65	0.10	0.05	QP
4	0.188	37.60	-16.52	54.12	37.45	0.10	0.05	Average
5	0.212	26.59	-26.52	53.11	26.45	0.10	0.04	Average
6	0.212	36.45	-26.66	63.11	36.31	0.10	0.04	QP
7	0.291	33.34	-27.16	60.50	33.19	0.10	0.05	QP
8	0.291	26.95	-23.55	50.50	26.80	0.10	0.05	Average
9	16.931	23.99	-26.01	50.00	23.38	0.24	0.37	Average
10	16.931	29.75	-30.25	60.00	29.14	0.24	0.37	QP
11	19.169	30.02	-29.98	60.00	29.35	0.28	0.39	QP
12	19.169	24.74	-25.26	50.00	24.07	0.28	0.39	Average



Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : Wireless Lan Product
 Power : 110V/60Hz
 Model : xx
 Memo : TX CH11
 Memo :

	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.159	34.01	-21.50	55.51	33.82	0.10	0.09	Average
2	0.159	46.65	-18.86	65.51	46.46	0.10	0.09	QP
3	0.188	43.78	-20.34	64.12	43.63	0.10	0.05	QP
4	0.188	37.60	-16.52	54.12	37.45	0.10	0.05	Average
5	0.215	26.27	-26.74	53.01	26.13	0.10	0.04	Average
6	0.215	35.96	-27.05	63.01	35.02	0.10	0.04	QP
7	0.291	33.28	-27.22	60.50	33.13	0.10	0.05	QP
8	0.291	26.90	-23.60	50.50	26.75	0.10	0.05	Average
9	16.971	28.04	-21.96	50.00	27.37	0.30	0.37	Average
10	16.971	37.01	-22.99	60.00	36.34	0.30	0.37	QP
11	18.601	29.54	-30.46	60.00	28.85	0.30	0.39	QP
12	18.601	23.59	-26.41	50.00	22.90	0.30	0.39	Average

Test Engineer : _____

Murray Lu

5.6. Test of Radiated Emission

Radiated emissions from 30 MHz to 24.62 GHz were measured according to the methods defines in ANSI C63.4-1992. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

5.6.1. Major Measuring Instruments

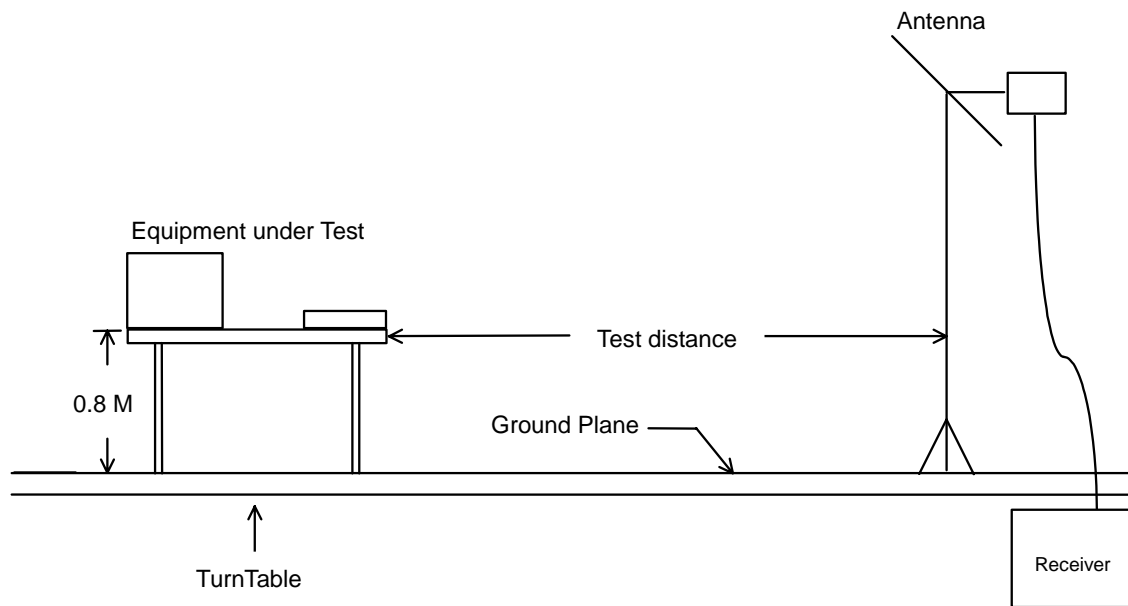
- Amplifier (MITEQ AFS44)
 - RF Gain 40 dB
 - Signal Input 100 MHz to 26.5 GHz

- Spectrum analyzer (R&S FSP40)
 - Attenuation 10 dB
 - Start Frequency 1 GHz
 - Stop Frequency 24.62 GHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 9 KHz to 40 GHz

5.6.2. 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 both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
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 turn table (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. 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 which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.

5.6.3. Typical Test Setup Layout of Radiated Emission

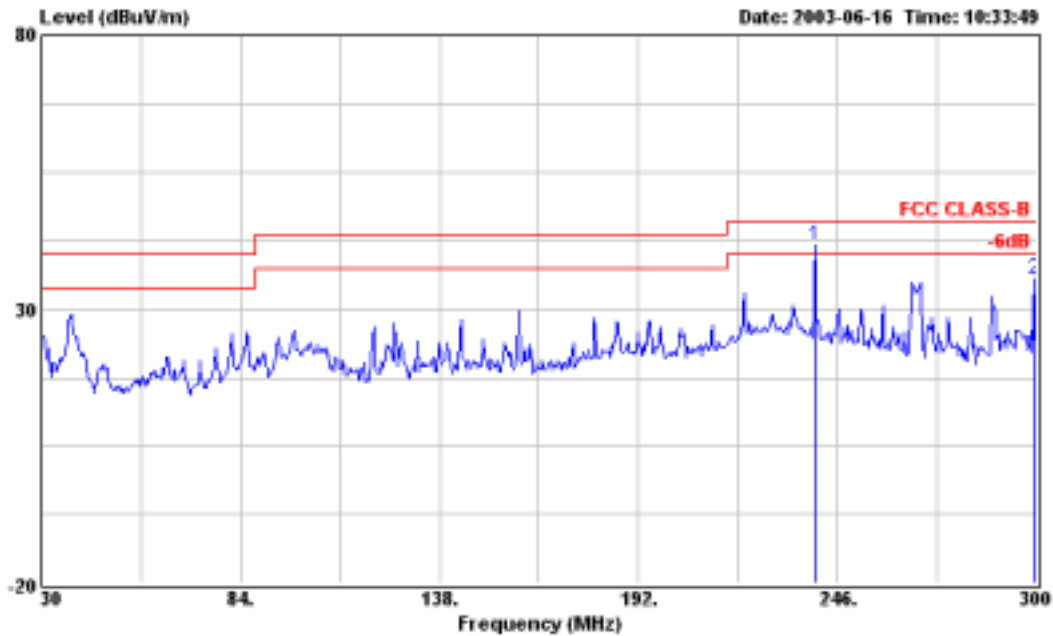


5.6.4. Test Result of Radiated Emission

- Test Mode: Mode 1 (2412MHz)
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

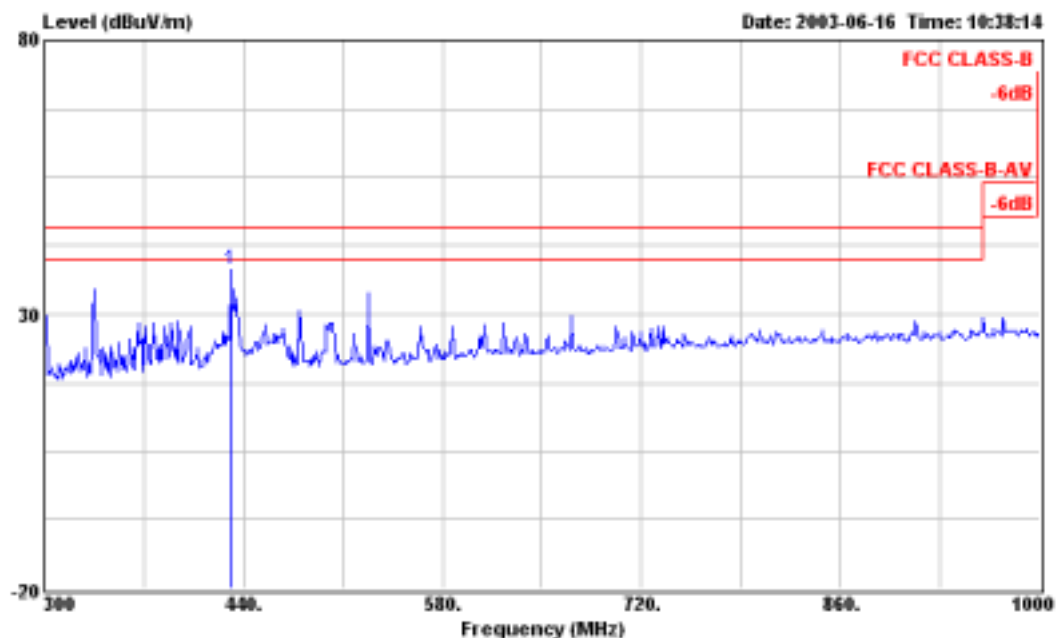
The test was passed at the minimum margin that marked by the frame in the following table

■ Spurious Emission



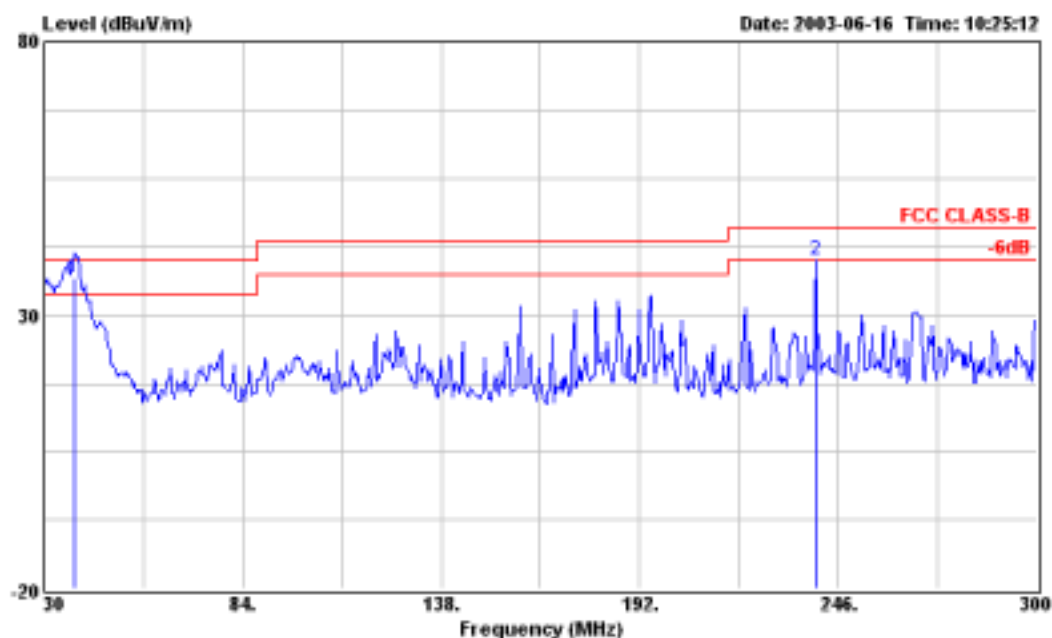
Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : xx
 MEMO : TX CH01 2412MHz
 : F360506

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		ca	deg
1	240.060	41.60	-4.40	46.00	54.19	10.92	3.09	26.60	Peak	---	---
2	299.730	35.44	-10.56	46.00	47.17	11.36	3.51	26.60	Peak	---	---



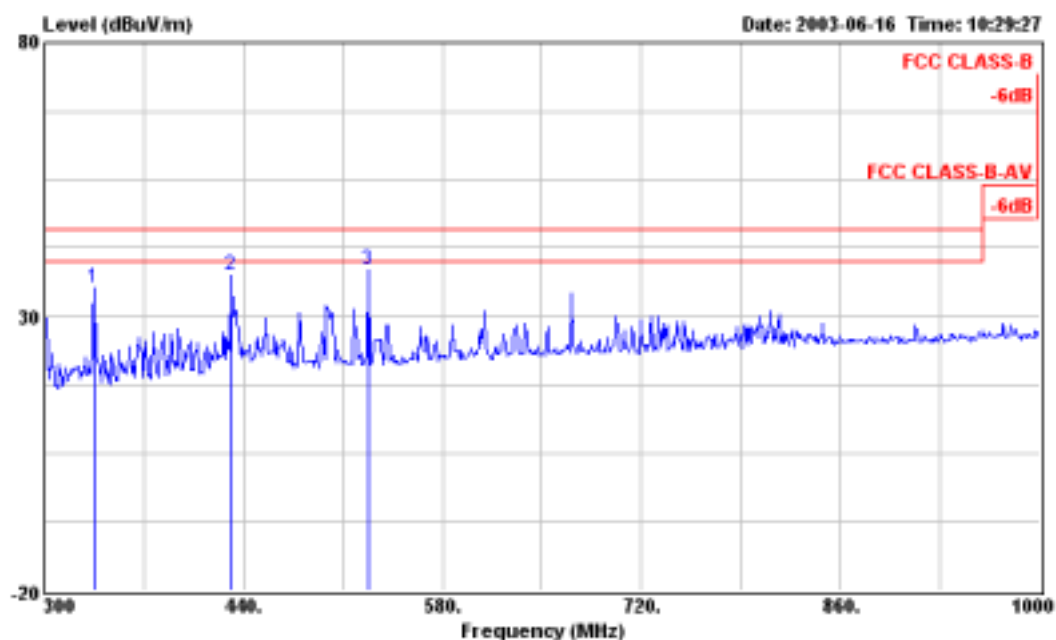
Site : 03CH03-HY
 Condition : 3a 03CH03-MAT HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH01 2412MHz
 : F360506

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	430.900	38.05	-7.95	46.00	46.07	15.07	4.26	27.35	Peak	---	---



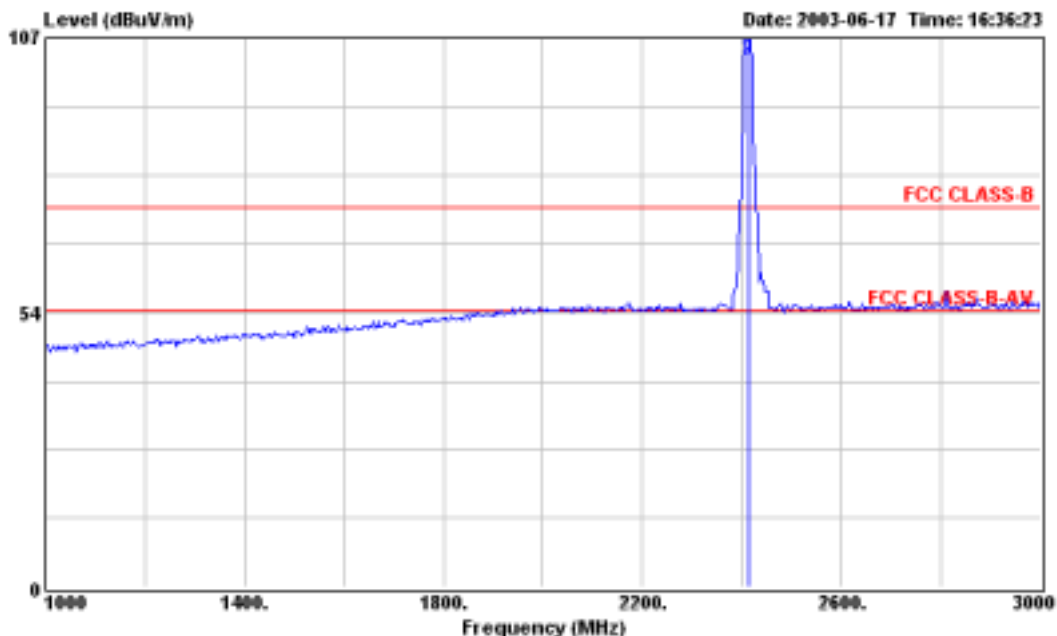
Site : 03CH03-NY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : xx
 MEMO : TX CH01 2412MHz
 : F360506

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	38.370	36.87	-3.13	40.00	51.28	11.53	1.16	27.10	QP	100	170
2	240.060	40.20	-5.80	46.00	52.79	10.92	3.09	26.60	Peak	---	---



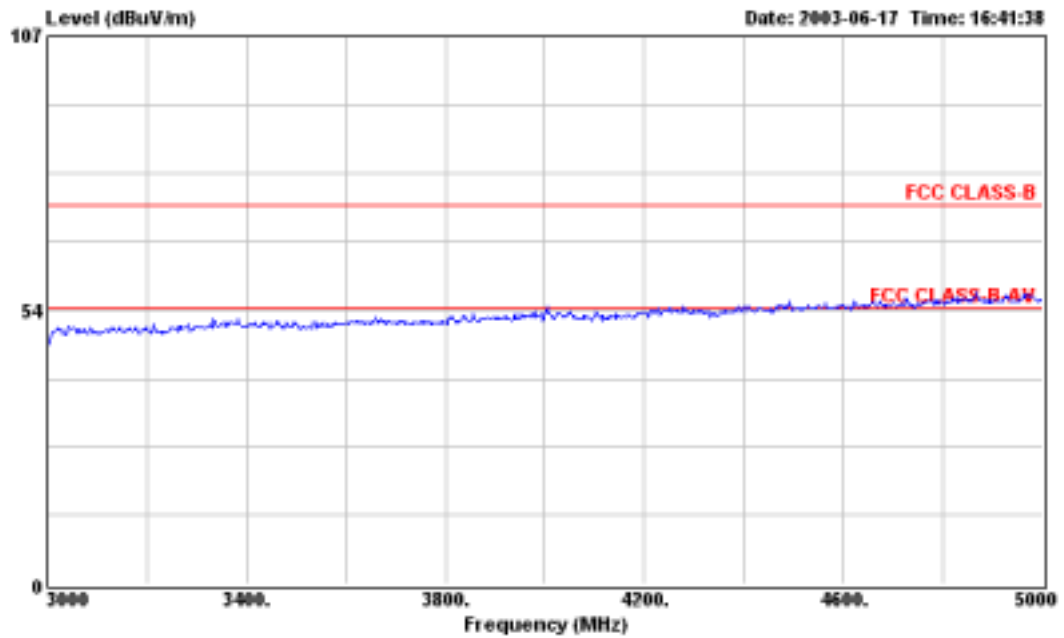
Site : 03CH03-HY
 Condition : 3a 03CH03-MAT VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH01 2412MHz
 : F360506

Peak	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	335.000	35.34	-10.66	46.00	45.92	12.52	3.71	26.01	Peak	---	---
2	430.900	37.43	-8.57	46.00	45.45	15.07	4.26	27.35	Peak	---	---
3	528.200	38.32	-7.68	46.00	44.89	16.33	4.88	27.78	Peak	---	---

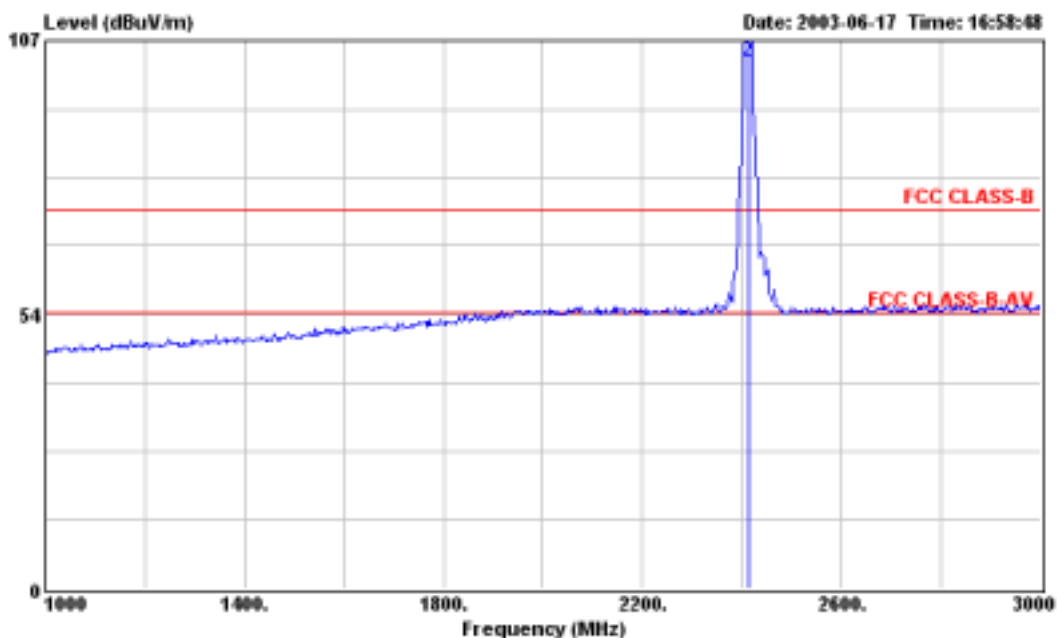


Site : 03CH03-NY
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH01 2412MHz
 : F360506

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg

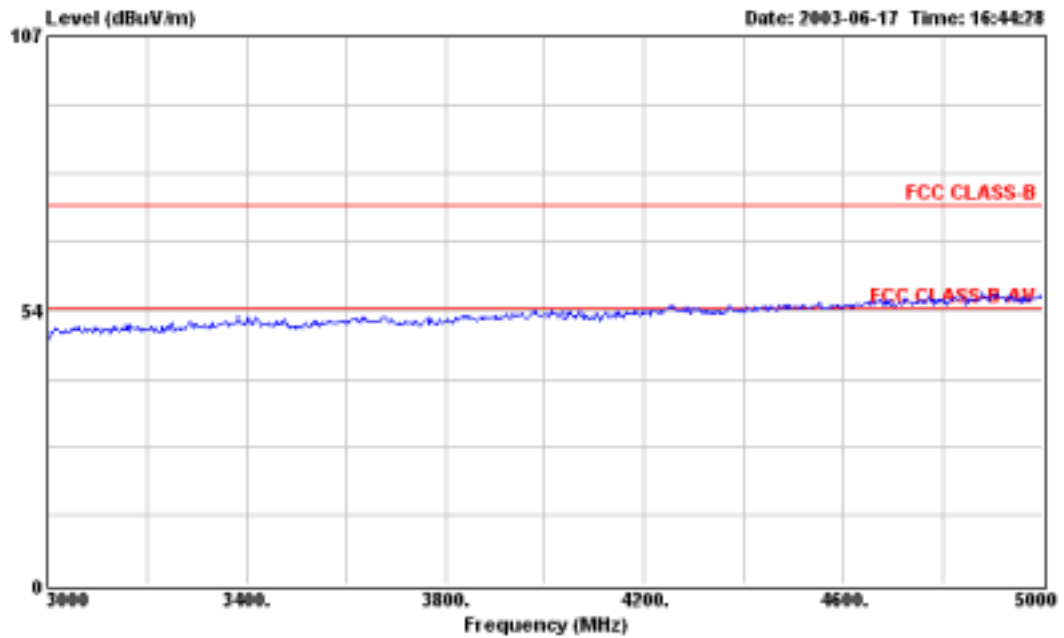


Site : 03CH03-NY
Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH01 2412MHz
: F360506



Site : 03CH03-HY
 Condition : 3a HORN-ANT-10094-0417 VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH01 2412MHz
 : F360506

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg




Site : 03CH03-NY
Condition : 3m HORN-ANT-10094-0417 VERTICAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH01 2412MHz
: F360506

■ Field strength of fundamental and harmonics

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2412.000	H	30.18	5.98	72.73	-	-	108.89	278291.54		Peak
2412.000	H	30.18	5.98	66.60	-	-	102.76	137404.20		AV
2414.000	V	30.18	5.98	72.81	-	-	108.97	280866.54		Peak
2414.000	V	30.18	5.98	66.69	-	-	102.85	138835.33		AV
4824.000	V/H						-			AV/Peak
7236.000	V/H						-			AV/Peak
9648.000	V/H						-			AV/Peak
12060.000	V/H						-			AV/Peak
14472.000	V/H						-			AV/Peak
16884.000	V/H						-			AV/Peak
19296.000	V/H						-			AV/Peak
21708.000	V/H						-			AV/Peak
24120.000	V/H						-			AV/Peak

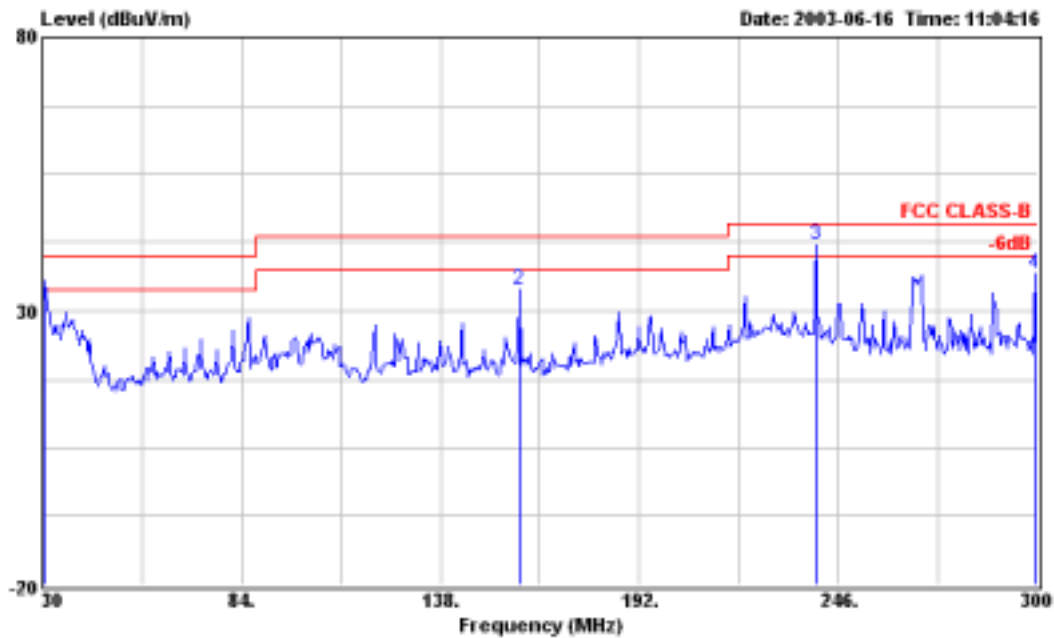
Remark: The emission emitted by the EUT is too low to be measured except the emission listed above,

Test Engineer : 
 Murray Lu

- Test Mode: Mode 2 (2437 MHz)
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

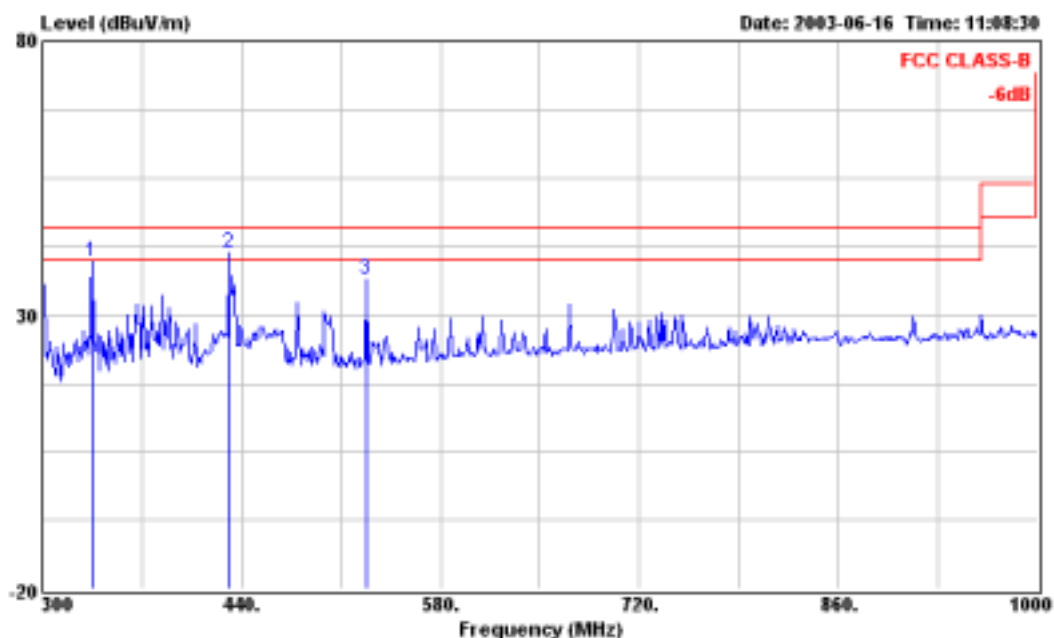
The test was passed at the minimum margin that marked by the frame in the following table

■ Spurious Emission



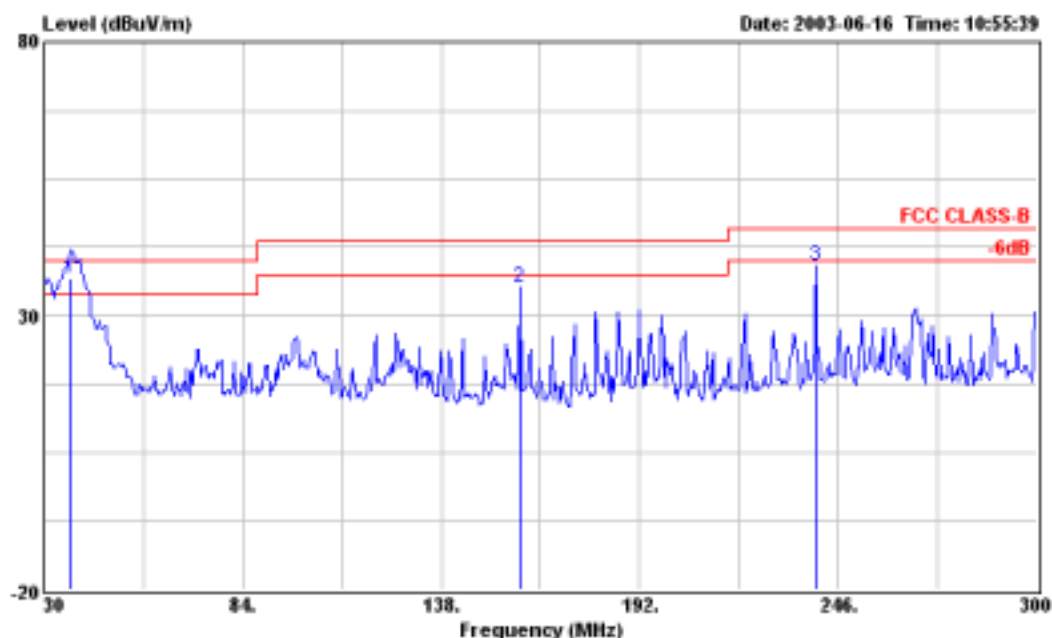
Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH06 2437MHz
 : F360506

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 !	30.540	35.52	-4.48	40.00	46.67	14.93	1.02	27.10	Peak	---	---
2	159.930	39.98	-9.52	49.50	50.16	8.16	2.42	26.76	Peak	---	---
3 !	240.060	41.95	-4.05	46.00	54.54	10.92	3.09	26.60	Peak	---	---
4	299.730	36.75	-9.25	46.00	48.48	11.36	3.51	26.60	Peak	---	---



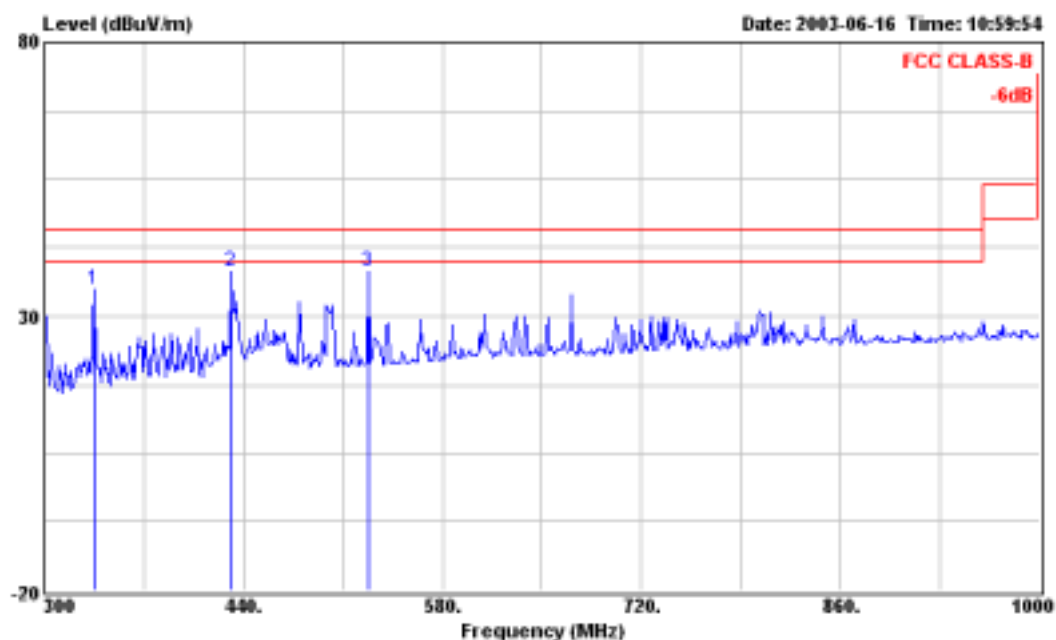
Site : 03CH03-NY
 Condition : 3a 03CH03-MAT HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : xx
 MEMO : TX CH06 2437MHz
 : F360506

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	395.000	39.69	-6.31	46.00	50.27	12.52	3.71	26.81	Peak	---	---
2	430.900	41.30	-4.70	46.00	49.32	15.07	4.26	27.35	Peak	---	---
3	528.200	36.44	-9.56	46.00	43.01	16.33	4.88	27.78	Peak	---	---



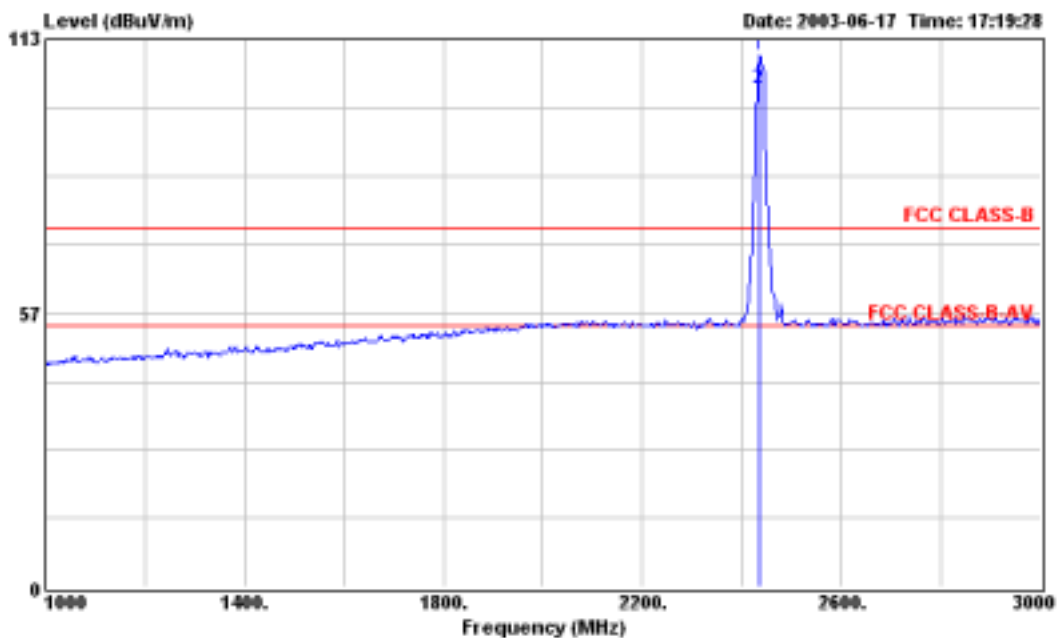
Site : 03CH03-HY
 Condition : 3a 03CH03-NAT VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH06 2437MHz
 : F360506

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	37.290	36.00	-3.12	40.00	50.00	11.96	1.14	27.10	QP	100	175
2	159.330	35.31	-8.19	43.50	51.49	8.16	2.42	26.76	Peak	---	---
3	240.060	39.04	-6.96	46.00	51.63	10.92	3.09	26.60	Peak	---	---



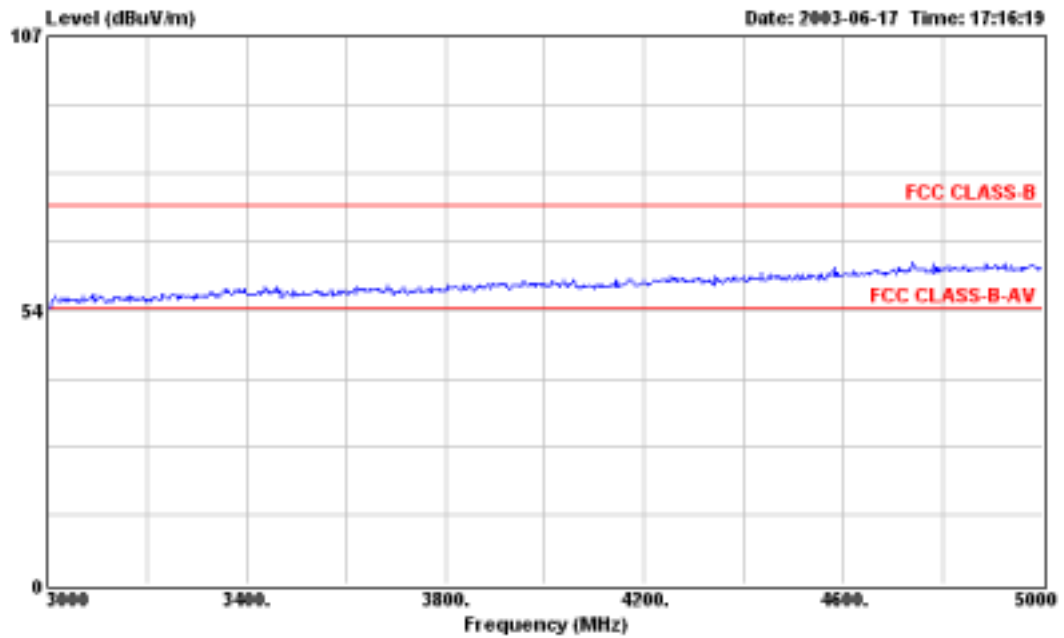
Site : 03CH03-HY
 Condition : 3a 03CH03-MAT VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : xx
 MEMO : TX CH06 2437MHz
 : F360506

	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table		
Freq	Level	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg	
1	335.000	34.89	-11.11	46.00	45.47	12.52	3.71	26.81	Peak	---	---
2	430.900	38.18	-7.82	46.00	46.20	15.07	4.26	27.35	Peak	---	---
3	520.200	38.17	-7.83	46.00	44.74	16.33	4.80	27.70	Peak	---	---

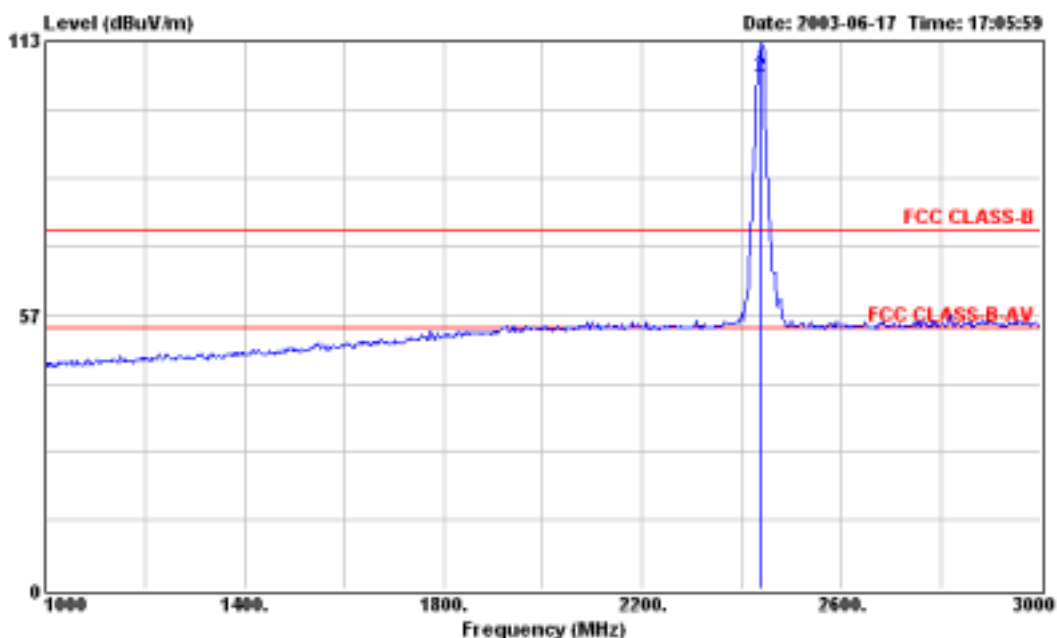


Site : 03CH03-NY
 Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH06 2437MHz
 : F360506

Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
2437	113									

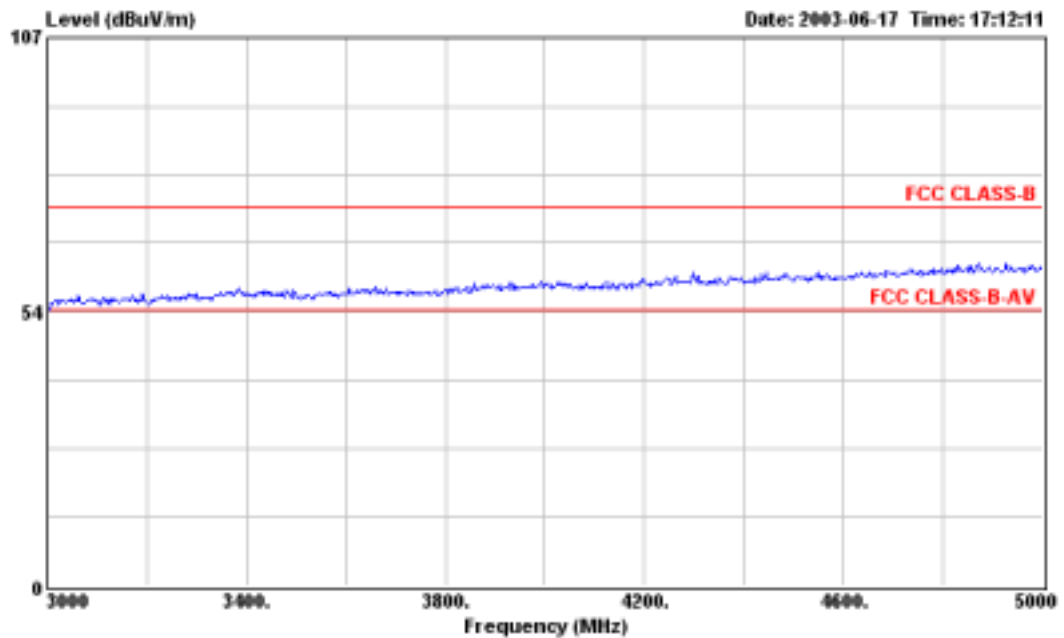


Site : 03CH03-NY
Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH06 2437MHz
: F360506



Site : 03CH03-NY
 Condition : 3m HORN-ANT-10094-0417 VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH06 2437MHz
 : F360506

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg



Site : 03CH03-HY
Condition : 3m HORN-ANT-10094-0417 VERTICAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH06 2437MHz
: F360506

■ Field strength of fundamental and harmonics

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2436.000	H	30.15	6.01	73.59	-	-	109.75	307255.74		Peak
2436.000	H	30.15	6.01	66.45	-	-	102.61	135051.68		AV
2440.000	V	30.15	6.01	76.80	-	-	112.96	444631.27		Peak
2440.000	V	30.15	6.01	69.66	-	-	105.82	195433.95		AV
4874.000	V/H						-			AV/Peak
7311.000	V/H						-			AV/Peak
9748.000	V/H						-			AV/Peak
12185.000	V/H						-			AV/Peak
14622.000	V/H						-			AV/Peak
17059.000	V/H						-			AV/Peak
19496.000	V/H						-			AV/Peak
21933.000	V/H						-			AV/Peak
24370.000	V/H						-			AV/Peak

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above,

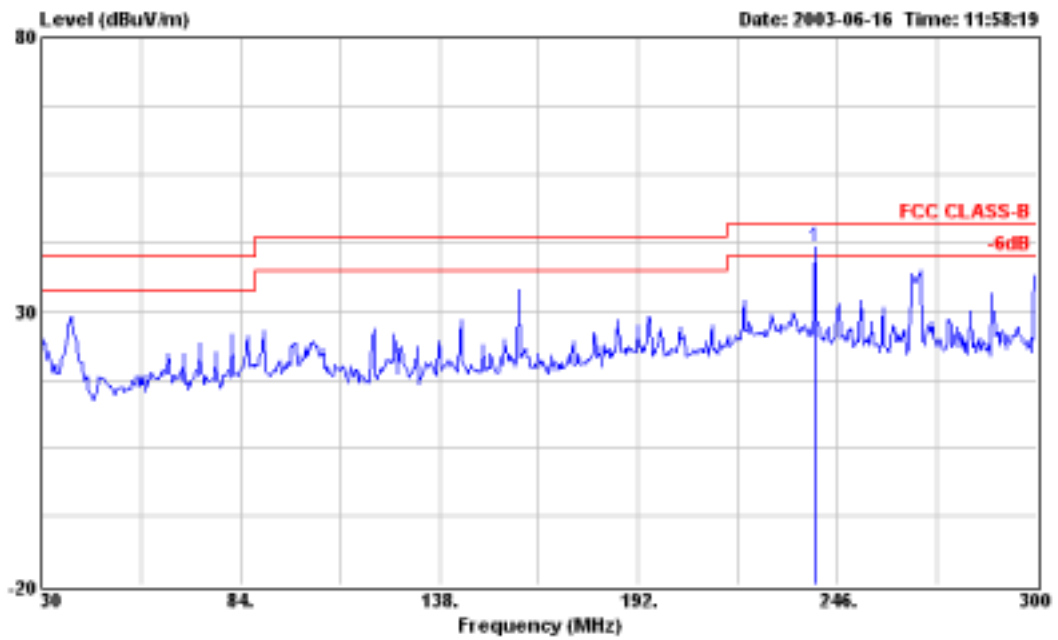


Test Engineer : _____

Murray Lu

- Test Mode: Mode 3 (2462 MHz)
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

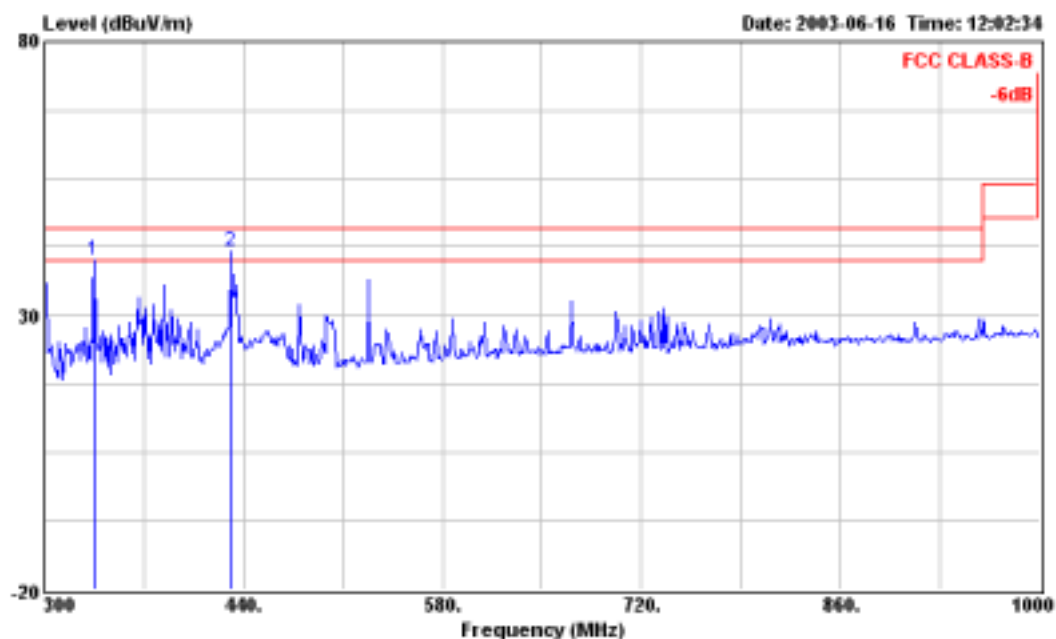
The test was passed at the minimum margin that marked by the frame in the following table



```

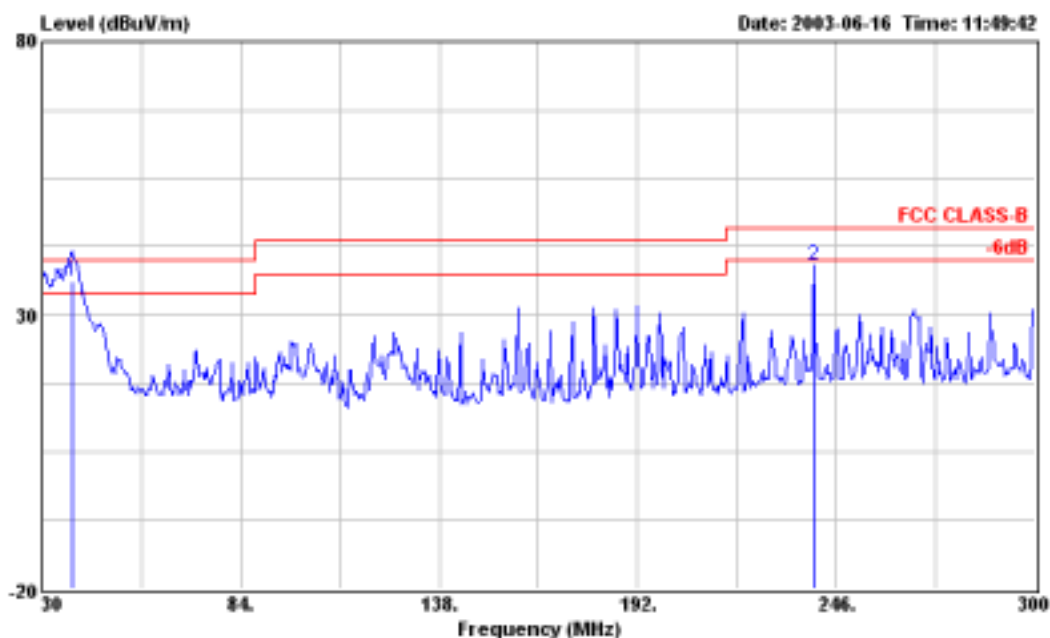
Site      : 03CH03-NY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT       : Wireless Lan Product
Power     : From System
MODEL     : xx
MEMO     : TX CH11 2462MHz
           : F360506
    
```

	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
Freq	Level	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm
1 240.060	41.69	-4.91	46.00	54.28	10.92	3.09	26.60	Peak	---



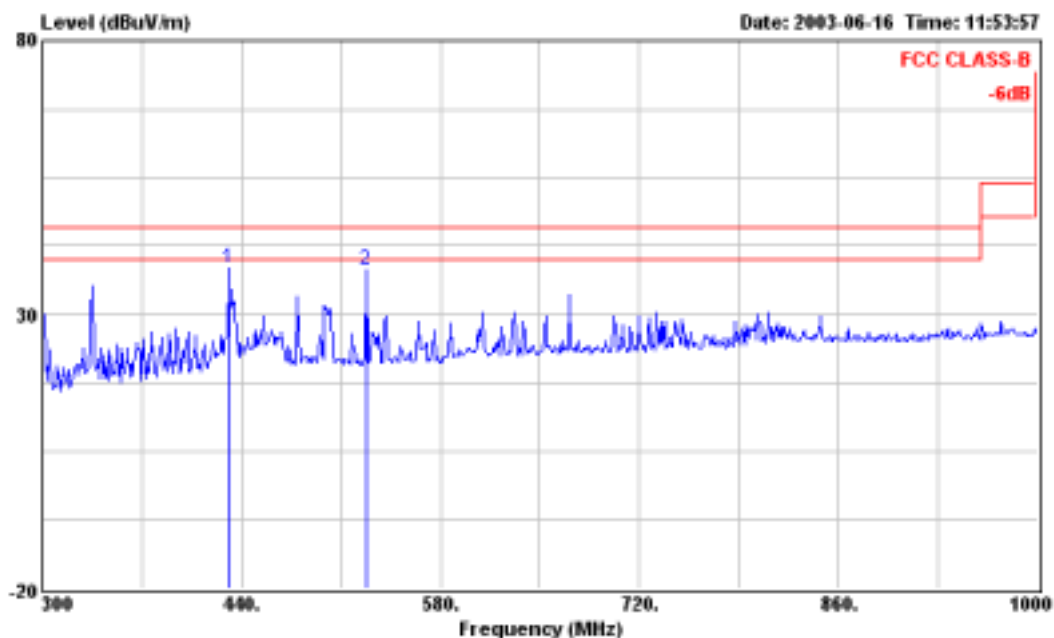
Site : 03CH03-HY
 Condition : 3a 03CH03-MAT HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : xx
 MEMO : TX CH11 2462MHz
 : F360506

Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 : 335.000	40.17	-5.83	46.00	50.75	12.52	3.71	26.01	Peak	---	---
2 : 430.900	41.70	-4.30	46.00	49.72	15.07	4.26	27.35	Peak	---	---



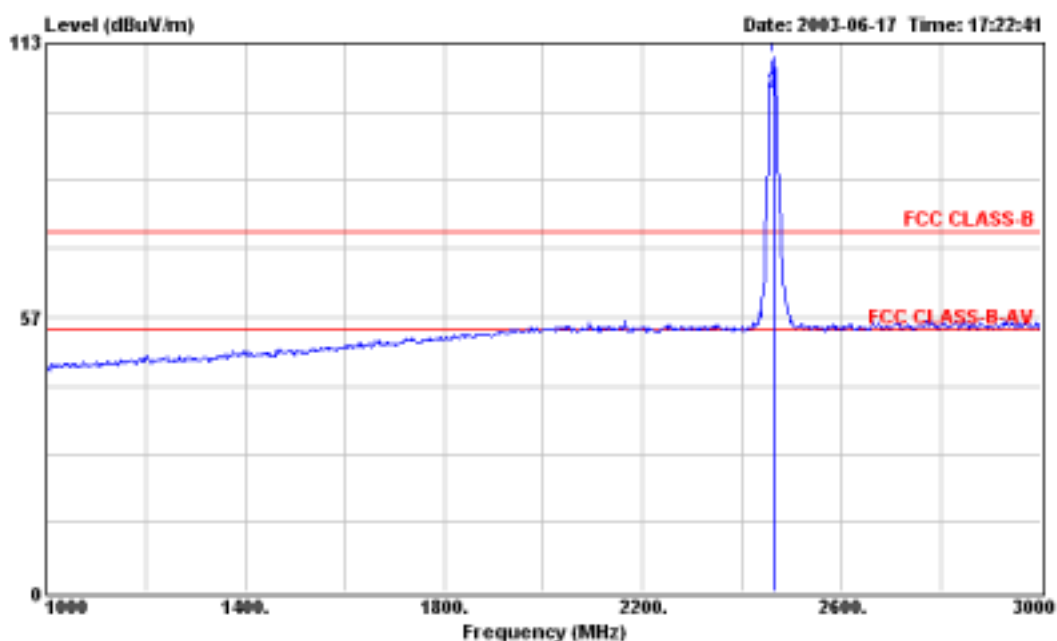
Site : 03CH03-HY
 Condition : 3a 03CH03-MAT VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH11 2462MHz
 : F360506

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	30.100	36.15	-3.85	40.00	50.45	11.64	1.16	27.10	Peak	100	170
2	240.060	39.16	-6.84	46.00	51.75	10.92	3.09	26.60	Peak	---	---



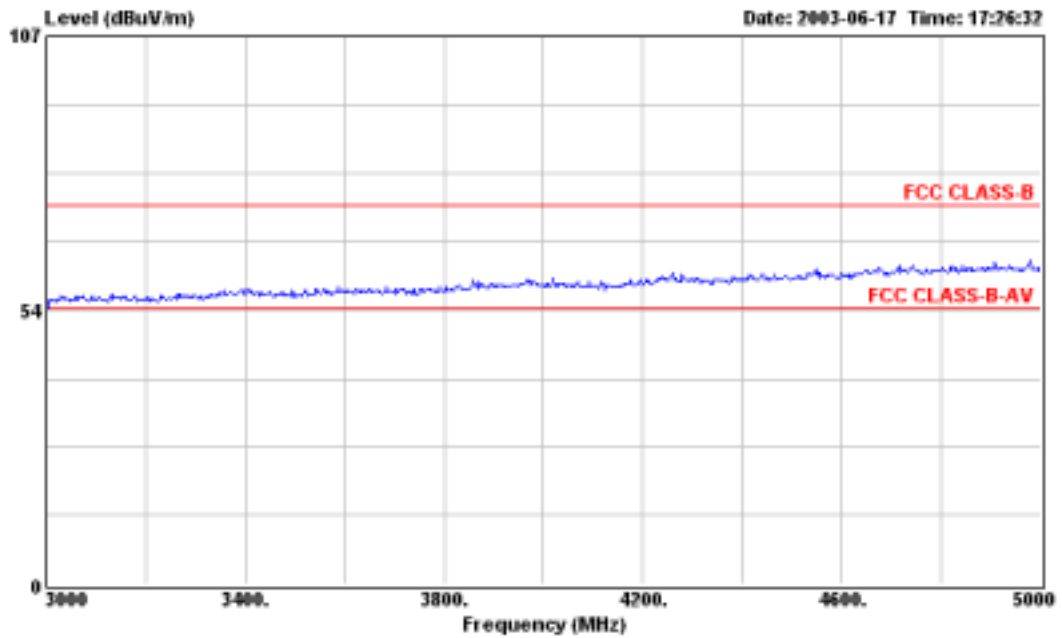
Site : 03CH03-HY
 Condition : 3a 03CH03-MAT VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH11 2462MHz
 : F360506

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	430.900	38.54	-7.46	46.00	46.56	15.07	4.26	27.35	Peak	---
2	528.200	38.19	-7.81	46.00	44.76	16.33	4.88	27.78	Peak	---

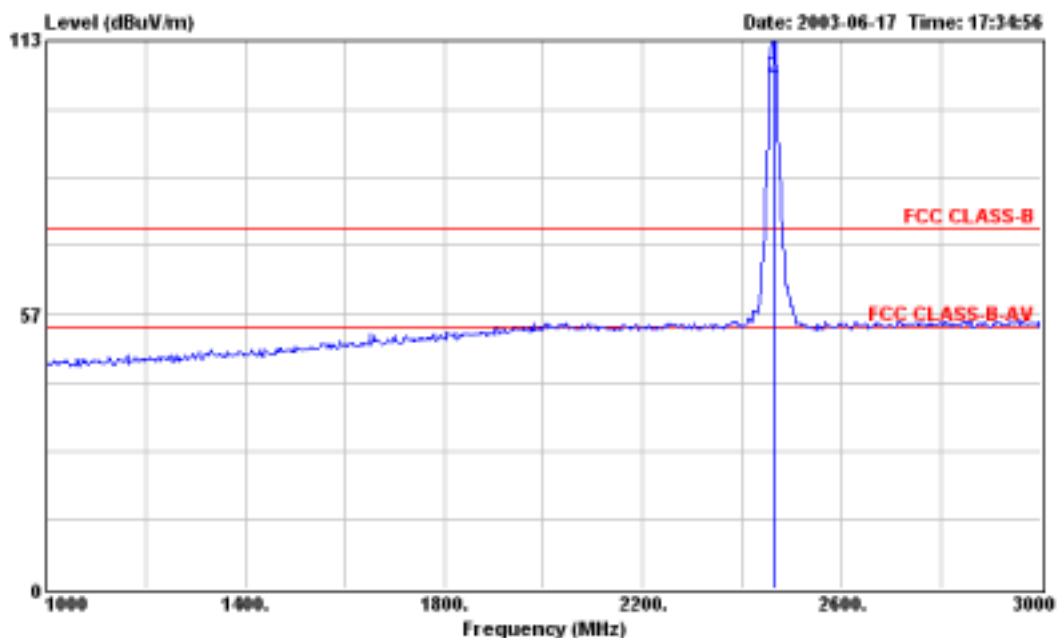


Site : 03CH03-HY
 Condition : 3a HORN-ANT-10094-0417 HORIZONTAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH11 2462MHz
 : F360506

Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		ca	deg

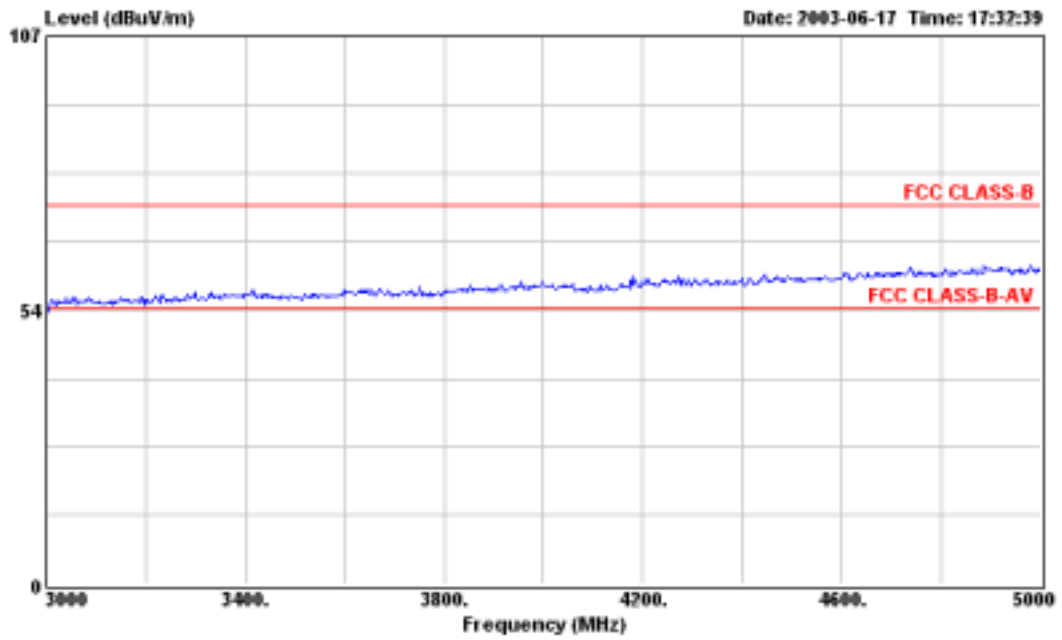


Site : 03CH03-NY
Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH11 2462MHz
: F360506

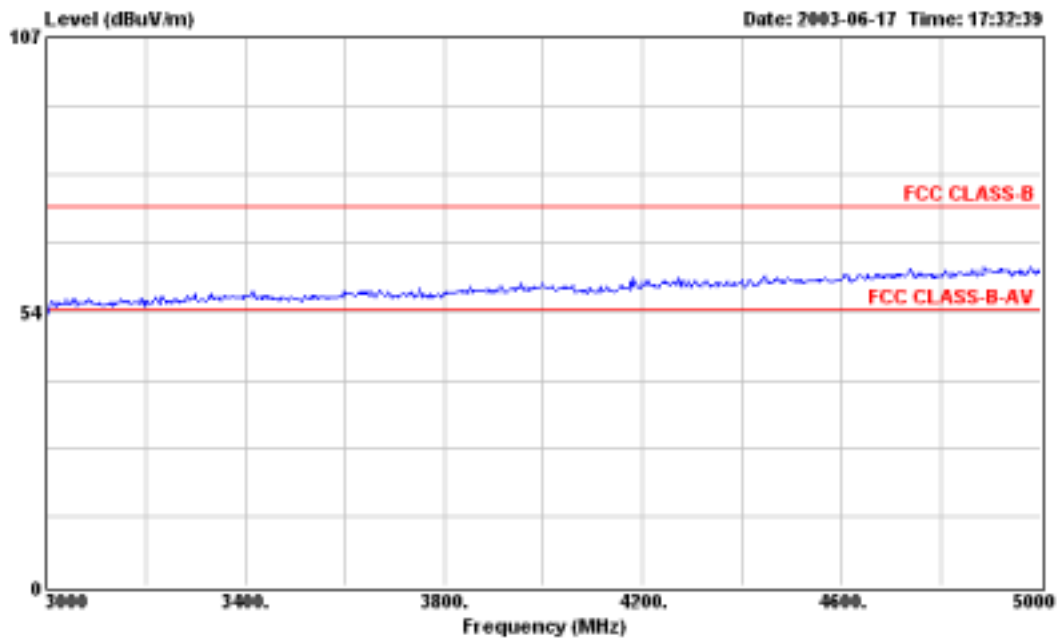


Site : 03CH03-HY
 Condition : 3a HORN-ANT-10094-0417 VERTICAL
 EUT : Wireless Lan Product
 Power : From System
 MODEL : XX
 MEMO : TX CH11 2462MHz
 : F360506

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg



Site : 03CH03-NY
Condition : 3m HORN-ANT-10094-0417 VERTICAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH11 2462MHz
: F360506




Site : 03CH03-NY
Condition : 3m HORN-ANT-10094-0417 VERTICAL
EUT : Wireless Lan Product
Power : From System
MODEL : XX
MEMO : TX CH11 2462MHz
: F360506

■ Field strength of fundamental and harmonics

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2462.000	H	30.13	6.04	73.76	-	-	109.93	313689.51		Peak
2462.000	H	30.13	6.04	66.67	-	-	102.84	138675.58		AV
2462.000	V	30.13	6.04	78.55	-	-	114.72	544502.65		Peak
2462.000	V	30.13	6.04	69.05	-	-	105.22	182389.57		AV
4924.000	V/H						-			AV/ Peak
7386.000	V/H						-			AV/ Peak
9848.000	V/H						-			AV/ Peak
12310.000	V/H						-			AV/ Peak
14772.000	V/H						-			AV/ Peak
17234.000	V/H						-			AV/ Peak
19696.000	V/H						-			AV/ Peak
22158.000	V/H						-			AV/ Peak
24620.000	V/H						-			AV/ Peak

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above,

Test Engineer : 
 Murray Lu

5.7. Band Edges Measurement

5.7.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.7.2. 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 convenient frequency span including 100 KHz bandwidth from band edge.
3. The band edges was measured and recorded.

5.7.3. Test Result :

- Test Result in lower band (Channel 1) : PASS
- Test Result in higher band(Channel 11) : PASS

5.7.4. Note on Band edge Emission

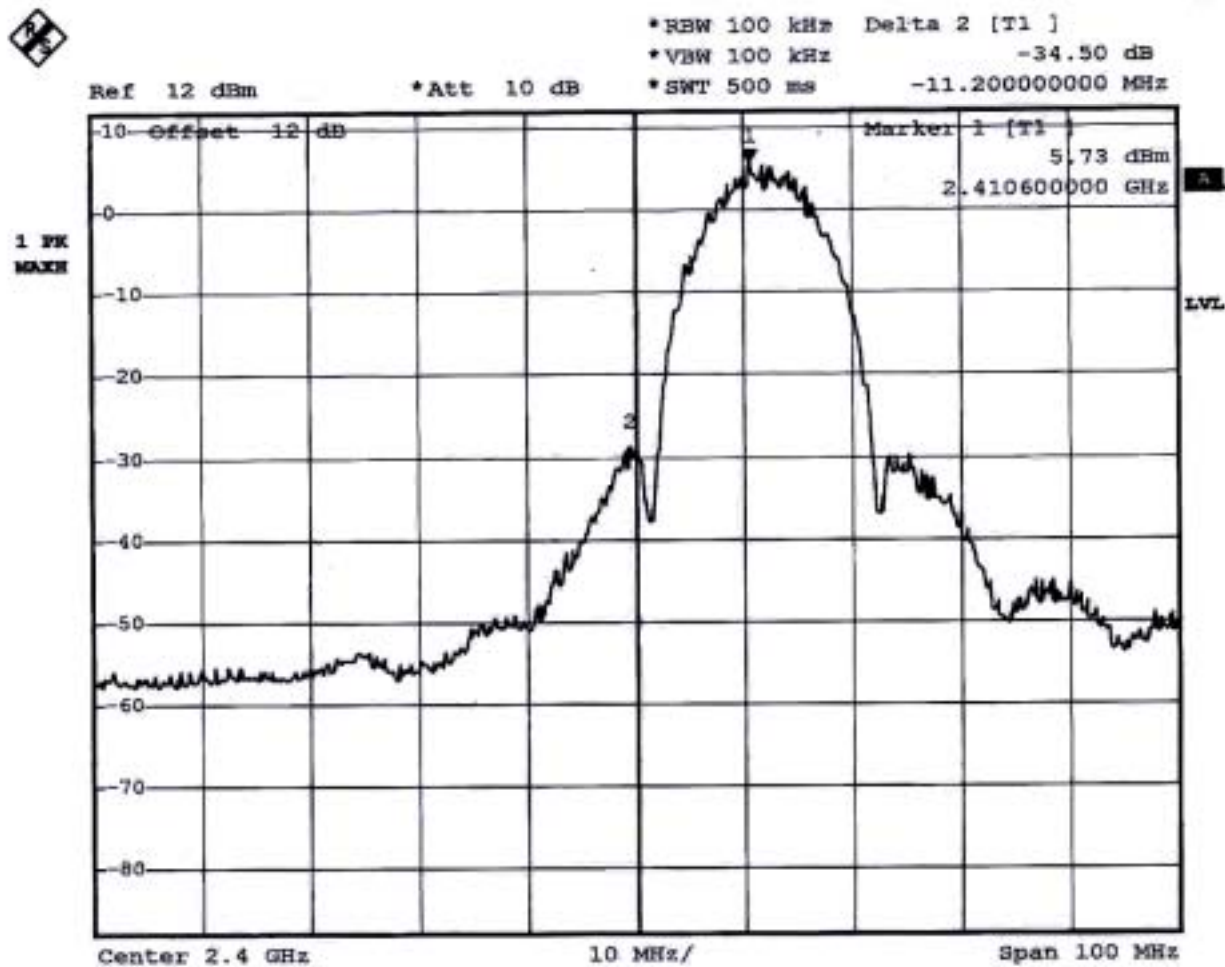
The band edge emission plot on page 62. shows 52.10dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

Polarity	The emission of carrier power strength (dB μ V/m)	The maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
H	109.93	57.83	74.00	-16.17	Peak
H	102.84	50.74	54.00	-3.26	Average
V	114.72	62.62	74.00	-11.38	Peak
V	105.22	53.12	54.00	-0.88	Average

* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

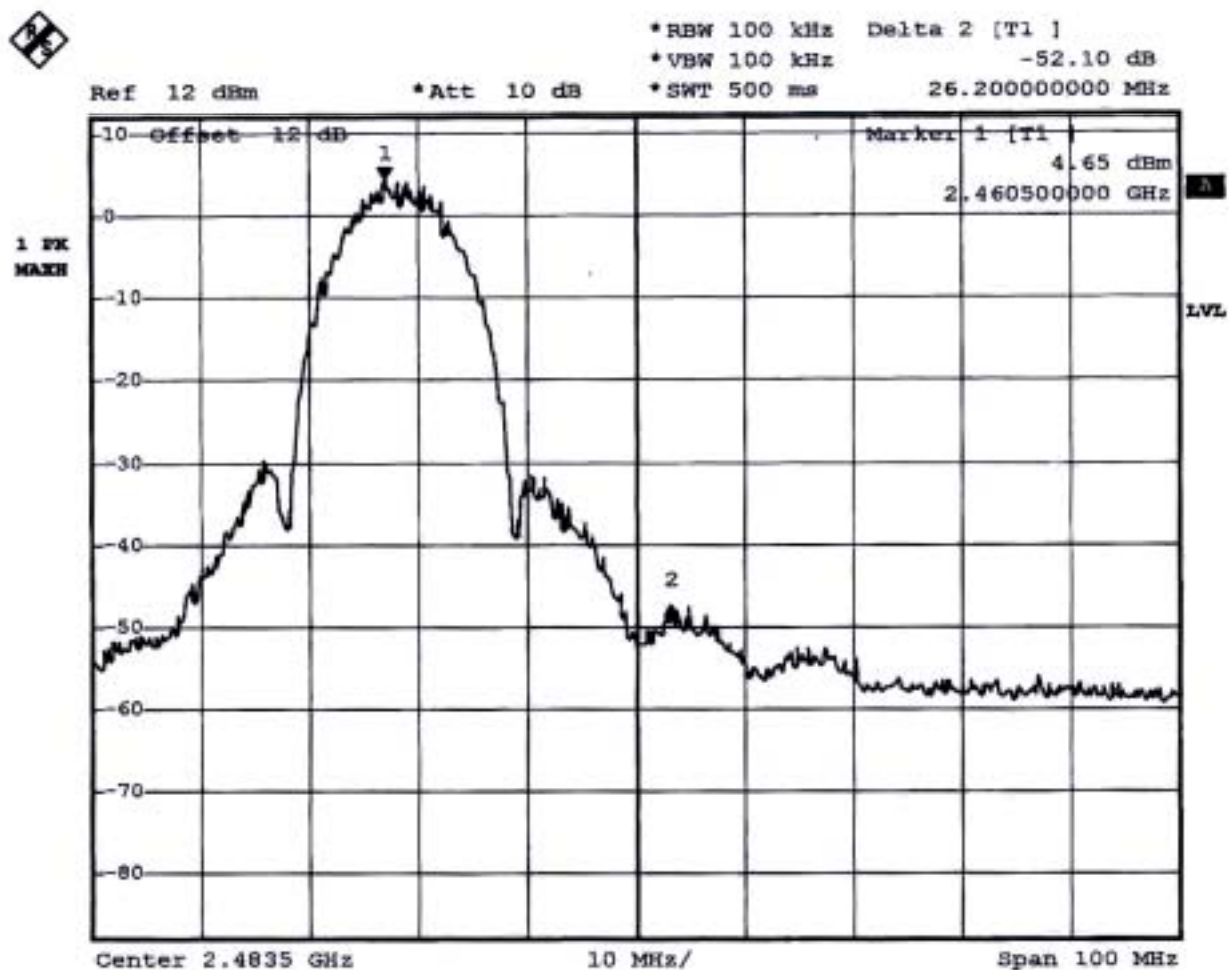
The spectrum analyzer plots are attached as below :

Plot1 (Channel 01) :



Date: 20.JUN.2003 11:46:48

Plot2 (Channel 11) :



Date: 20.JUN.2003 12:07:30

Comments : All emissions in any 100kHz bandwidth outside the band edge are attenuated more then 20dB from the carrier.

5.8. Antenna Requirements

The EUT use a detachable antenna via inverse-SMA external connector. It is considered meet antenna requirement of FCC.

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 antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.8.2. Antenna Connected Construction

The maximum Gain antenna used in this product is dipole antenna. The antenna connector type is inverse-SMA.

5.9. RF Exposure

FCC Rules and Regulations Part 1.1307,1.1310,2.1091,2.1093:

RF Exposure Compliance

5.9.1. Limit For Maximum Permissible Exposure (MPE)

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F=frequency in MHz

*Plane-wave equivalent power density

5.9.2. MPE Calculations

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (mW/cm}^2\text{)} = \frac{E^2}{3770}$$

- E = Electric field (V/m)
- P = Peak output power (mW)
- G = Antenna numeric gain (numeric)
- d = Separation distance (m)

Because the EUT is belong to General Population/ Uncontrolled Exposure. So the Limit of Power Density is 10 W/m². We can change the formula to:

$$d = \sqrt{\frac{30 \times P \times G}{3770}}$$

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (W)	Calculated RF Exposure Separation Distance (m)	Minimum RF Exposure Separation Distance (m)
Channel 01	2.00	1.58	0.0313	0.0199	0.0200
Channel 06	2.00	1.58	0.0301	0.0195	0.0200
Channel 11	2.00	1.58	0.0259	0.0181	0.0200

5.9.3. FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.

6. EMI Suppression Component List

Bandpass Filiter is added on TX trace of antenna.

7. Antenna Factor & Cable Loss

- from 30MHz to 1GHz

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.00
35	13.63	1.08
40	11.11	1.18
45	10.59	1.24
50	6.47	1.30
55	5.83	1.38
60	5.18	1.44
65	4.81	1.52
70	4.43	1.59
75	5.10	1.68
80	5.91	1.75
85	7.33	1.77
90	8.74	1.83
95	9.05	1.85
100	9.36	1.90
110	9.65	2.01
120	9.97	2.06
130	10.51	2.16
140	10.32	2.24
150	9.42	2.34
160	8.09	2.42
170	7.43	2.56
180	7.60	2.62
190	7.43	2.67
200	7.26	2.76
220	9.11	2.92
240	10.88	3.09
260	11.75	3.23
280	11.55	3.38
300	11.36	3.51
320	12.03	3.63
340	12.69	3.73
360	13.33	4.03
380	14.00	4.00
400	14.63	4.09
450	15.33	4.31
500	16.03	4.64
550	16.65	5.09
600	17.29	5.49
650	17.64	5.82
700	18.00	5.94
750	18.39	6.16
800	18.79	6.58
850	19.10	6.72
900	19.42	6.81
950	19.58	7.10
1000	19.75	7.41

- above 1GHz

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
1000	24.30	3.49
2000	31.10	4.70
3000	29.60	5.67
4000	30.80	6.56
5000	34.20	7.59
6000	33.30	8.80
7000	37.80	9.46
8000	39.40	10.26
9000	38.40	10.53
10000	38.90	11.73
11000	41.10	12.25
12000	42.70	13.56
13000	39.90	13.58
14000	43.70	13.76
15000	43.40	14.30
16000	40.90	15.16
17000	44.40	15.88
18000	47.10	16.09
19000	37.60	16.98
20000	37.30	16.21
21000	37.00	20.13
22000	38.00	19.24
23000	38.70	19.64
24000	38.60	20.54
25000	38.90	20.14

8. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 12, 2003	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Jan. 07, 2003	Conduction (CO01-HY)
50 ohm BNC type Terminal	NOBLE	50ohm	TM013	50 ohm	Apr. 24, 2003	Conduction (CO01-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 22, 2002	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHz	Aug. 07, 2002	Radiation (03CH03-HY)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	Radiation (03CH03-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 10, 2003	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	Radiation (03CH03-HY)

Calibration Interval of instruments listed above is one year, except for Horn Antenna, BBHA9170.

9. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	±0.54
combined standard uncertainty $U_e(y)$	normal	±2.7
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±5.4

$U = \{((1/2)^2+(0.3/2)^2+(2^2+0.5^2+2^2+0.25^2+2^2)/3+(0.54)^2/2)\} = 2.2$ for 10m test distance

$U = \{((1/2)^2+(0.3/2)^2+(2^2+3^2+2^2+0.25^2+2^2)/3+(0.54)^2/2)\} = 2.7$ for 3m test distance

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	0.2
combined standard uncertainty $U_e(y)$	normal	±1.66
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±3.32

$U = \{(0.3/2)^2 + (2^2+1.5^2+0.2^2)/3+(0.2)^2/2\} = 1.66$