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FCC RADIO TEST REPORT

Applicant's company	**SYMBOL Technologies, INC.**
Applicant Address	One Symbol plaza Holtsville, New York, 11742-1300 U.S.A.
FCC ID	**H9PMC3090BT**
Manufacturer's company	**Universal Scientific Industrial CO., LTD**
Manufacturer Address	141, Lane 351, Taiping Rd., Sec, 1. Tsao Tuen, Nan-Tou, Taiwan

Product Name	Mobile Computer
Brand Name	SYMBOL
Model Name	MC3090BT
Multiple Listing	MC3070BT; MC3000BT; MC3070; MC3090
Test Rule Part(s)	47 CFR Part 15 Subpart C 15.247
Test Freq. Range	WLAN: 2412 ~ 2462MHz BT: 2402 ~2480MHz
Receive Date	Sep. 15, 2005
Test Date	Sep. 21, 2005
Submission Type	Original Equipment

Statement

Test result included in this report is only for the 802.11b/g and Bluetooth part of the product.

The test result in this report refers exclusively to the presented test model / sample. There are 5 models listed on the report.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Table of Contents

History of This Test Report

Original Issue Date: Sep. 22, 2005

Report No.: FR591501

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**Mobile Computer**
Brand Name	:	**SYMBOL**
Model Name	:	**MC3090BT**
Multiple-Listing	:	**MC3070BT; MC3000BT; MC3070; MC3090**
Applicant	:	**SYMBOL Technologies, INC.**
Test Rule Part(s)	:	**47 CFR Part 15 Subpart C 15.247**

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Sep. 15, 2005 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Wayne Hsu / Supervisor
Sporton International Inc.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	14.84 dB
4.2	15.247(b)(3)	Maximum Peak Conducted Output Power	Complies	10.73 dB
4.3	15.247(e)	Power Spectral Density	Complies	13.72 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	9.84 dB
4.6	15.247(d)	Band Edge Emissions	Complies	2.05 dB
4.7	15.203	Antenna Requirements	Complies	-

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	14.84 dB
4.2	15.247(b)(1)	Maximum Peak Conducted Output Power	Complies	0.72 dB
4.3	15.247(a)(1)	Hopping Channel Separation	Complies	-
4.4	15.247(b)(1)	Number of Hopping Frequency	Complies	-
4.5	15.247(a)(1)	Dwell Time	Complies	-
4.6	15.247(d)	Radiated Emissions	Complies	6.49 dB
4.7	15.247(d)	Band Edge Emissions	Complies	1.40 dB
4.8	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.26dB	Confidence levels of 95%
Maximum Peak Conducted Output Power	±0.5dB	Confidence levels of 95%
Power Spectral Density	±0.71dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±6.25×10-7	Confidence levels of 95%
Radiated Emissions/ Band Edge Emissions	±3.72dB	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Details

EUT is a multi-function Mobile Computer with IEEE 802.11a/b/g and Bluetooth radio function. Only the radio detail of **IEEE 802.11b/g** and **Bluetooth** are shown in the table below.

Items	Description
Product Type	Mobile Computer
Radio Type	Intentional Transceiver
Power Type	Battery & Power Adapter
Interface Type	Please refer to Symbol User's Manual
Modulation	WLAN: DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g BT: FHSS (GFSK / QPSK /8PPSK)
Data Modulation	WLAN: DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM) BT: FHSS (GFSK / QPSK /8PPSK)
Data Rate (Mbps)	WLAN: DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54) BT: GFSK: (1)
Frequency Range	WLAN: 2412 ~ 2462MHz BT: 2402 ~2480MHz
Channel Number	WLAN: 11 BT: 79
Channel Band Width (99%) Maximum	WLAN: 11b: 15.32 MHz ; 11g: 16.40 MHz BT: 884 MHz
Conducted Output Power Maximum	WLAN: 11b: 19.27 dBm (2437MHz); 11g: 19.14 dBm (2437MHz) BT: 0.72 dBm (2480MHz)
Carrier Frequencies	Please refer to section 3.5
Antenna	Please refer to section 3.4

3.2. Configuration of the Host

There are 3 different configurations, Gun type, Brick and Rotating.

Mechanical	GUN type	Brick
Processor	Intel 520MHz	Intel 520MHz
Flash	64MB	64MB
SDRAM	64MB	128MB
LCD Panel	Sharp LQ030B7DD01 (Color)	Sharp LQ030B7DD01 (Color)
Touch Panel	Liyitec TR4-030F-14G	Liyitec TR4-030F-14G
Option Board	BT Only	BT & Audio
Keypad	48 Key	38 Key
Scanning	Symbol PICO Imager (20-60000-XX)	Symbol PICO Imager (20-60000-XX)
WLAN	Symbol Photon 802.11b/g/a (21-21160)	Symbol Photon 802.11b/g/a (21-21160)
Battery	Symbol 55-060112-86 3.7V 4400mAh	Symbol 55-060112-86 3.7V 4400mAh
Accessory	USB Charge, Slave cable (25-67868-01)	USB Charge, Slave cable (25-67868-01)
Power Adapter	Delta ADP-16GB A, Symbol 50-14000-147	Delta ADP-16GB A, Symbol 50-14000-147

Mechanical	Rotating	
Processor	Intel 520MHz	
Flash	64MB	
SDRAM	128MB	
LCD Panel	Sharp LQ030B7DD01 (Color)	
Touch Panel	Liyitec TR4-030F-14G	
Option Board	BT & Audio	
Keypad	38 Key	
Scanning	Symbol SE800	
WLAN	Symbol Photon 802.11b/g/a (21-21160)	
Battery	Symbol 55-060112-86 3.7V 4400mAh	
Accessory	USB Charge, Slave cable (25-67868-01)	
Power Adapter	Delta ADP-16GB A, Symbol 50-14000-147	

3.3. Accessories

Power	Brand	Model	Rating
Adapter	Delta	ADP-16GB A	AC input 100~240V, DC output 5.4V
Battery	Symbol	55-060112-86	3.7V 4400mAh
Others	**Description**		
USB Charge	This is a desktop charger.		
Slave cable	This cable enables USB communication between EUT and a host PC.		

3.4. Table for Filed Antenna

Ant.	Ver.	Antenna Type	Connector	Gain (dBi)	Remark
1	-	Chip Antenna	NA	2.70	For Bluetooth
2	V1.7 (for Brick and Rotating type)	PIFA Antenna	MHF	3.00	At 2.4GHz band
				5.00	At 5GHz band
3	V 2.1 (for Gun type)	PIFA Antenna	MHF	2.70	At 2.4GHz
				4.90	At 5GHz band

3.5. Table for Carrier Frequencies

EUT is a multi-function Mobile Computer with IEEE 802.11a/b/g and Bluetooth radio function. Only the carrier frequencies of **IEEE 802.11b/g** and **Bluetooth** are shown in the table below.

WLAN

Freqeuncy Band	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz
	2	2417 MHz
	3	2422 MHz
	4	2427 MHz
	5	2432 MHz
	6	2437 MHz
	7	2442 MHz
	8	2447 MHz
	9	2452 MHz
	10	2457 MHz
	11	2462 MHz

BLUETOOTH

Freqeuncy Band	Channel No.	Frequency
2400~2483.5MHz	0	2402 MHz
	1	2403 MHz
	:	:
	38	2440 MHz
	39	2441 MHz
	40	2442 MHz
	:	:
	77	2479 MHz
	78	2480 MHz

3.6. Table for Test Modes

MC3090 in Gun-type configuration and MC3090BT in Brick confiauration were chosen as representatives for all models. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

WLAN

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Line Conducted Emissions	Normal Link	11 Mbps	6	2/3
Maximum Peak Conducted Output Power	11b/CCK	11 Mbps	1/6/11	N/A
Power Spectral Density 6dB Spectrum Bandwidth	11g/BPSK	6 Mbps	1/6/11	N/A
Radiated Emissions 9kHz~1GHz	11g/BPSK	6 Mbps	6	2/3
Radiated Emissions 1GHz~10th Harmonic	11b/CCK	11 Mbps	1/6/11	2/3
Band Edge Emissions	11g/BPSK	6 Mbps	1/6/11	2/3

BLUETOOTH

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Conducted Emissions	Normal Link	3 Mbps	Hopping 0~78	1
Max. Conducted Output Power	GFSK	3 Mbps	0/39/78	NA
Hopping Channel Separation	GFSK	3 Mbps	0~1/39~40/77~78	NA
Number of Hopping Frequency	GFSK	3 Mbps	0~78	NA
Dwell Time	DH1/DH3/DH5	3 Mbps	0/39/78	NA
Radiated Emissions Below 1GHz	GFSK	3 Mbps	39	1
Radiated Emissions Above 1GHz Band Edge Emissions	GFSK	3 Mbps	0/39/78	1

3.7. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH03-HY	SAC	Hwa Ya	101377	IC 4088	-
CO04-HY	Conduction	Hwa Ya	101377	IC 4088	-
TH01-HY	OVEN Room	Hwa Ya	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

3.8. Difference between Each Model

Function / Model	Configuration	Bluetooth	WLAN b/g	WLAN	Audio
Mc3090 BT	R	✓	✓	✓	✓
	B	✓	✓	✓	✓
	G	✓	✓	✓	N/A
MC3070BT	R	✓	✓	N/A	✓
	B	✓	✓	N/A	✓
	G	✓	✓	N/A	N/A
MC3090	R	N/A	✓	✓	N/A
	B	N/A	✓	✓	N/A
	G	N/A	✓	✓	N/A
MC3070	R	N/A	✓	N/A	N/A
	B	N/A	✓	N/A	N/A
	G	N/A	✓	N/A	N/A
MC300BT	R	✓	N/A	N/A	✓
	B	✓	N/A	N/A	✓
	G	✓	N/A	N/A	N/A

Different models have different functions. The differences between each model are shown above.

MC3090BT in Brick configuration was chosen in all final test items because it is the full function version.

Symbol Photon 802.11b/g/a (21-21160) was configured to have 802.11 a/b/g or 802.11 b/g function.

802.11a function was terminated while the EUT is with only 802.11 b/g function.

G: Gun Type; B: Brick; R: Rotating

MC3090BT in Brick configuration was chosen as representative for all models.

3.9. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
LCD Monitor	VIEWSONIC	VLCDS6104-3W	DoC
Printer	EPSON	EPSON STYLUS C61	DoC
1394 HDD	TeraSys	F12-UF	DoC
PS/2 Keyboard	COMPAQ	6511-VA	DoC
PS/2 Mouse	COMPAQ	M-S69	DoC
Mic+SPK	KOKA	HD-305	DoC
SD Card	San Disk	256MB	DoC
Personal Computer	COMPAQ	Evo D380MX	DoC
Mobil Computer	SYMBOL	MC3090BT	DoC

3.10. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer to control the operating channel as well as the output power level. The RF output power is set by the customer and the power setting parameters are indentical to the ones in the firmware of the end product.

Power Parameters of IEEE 802.11b/g

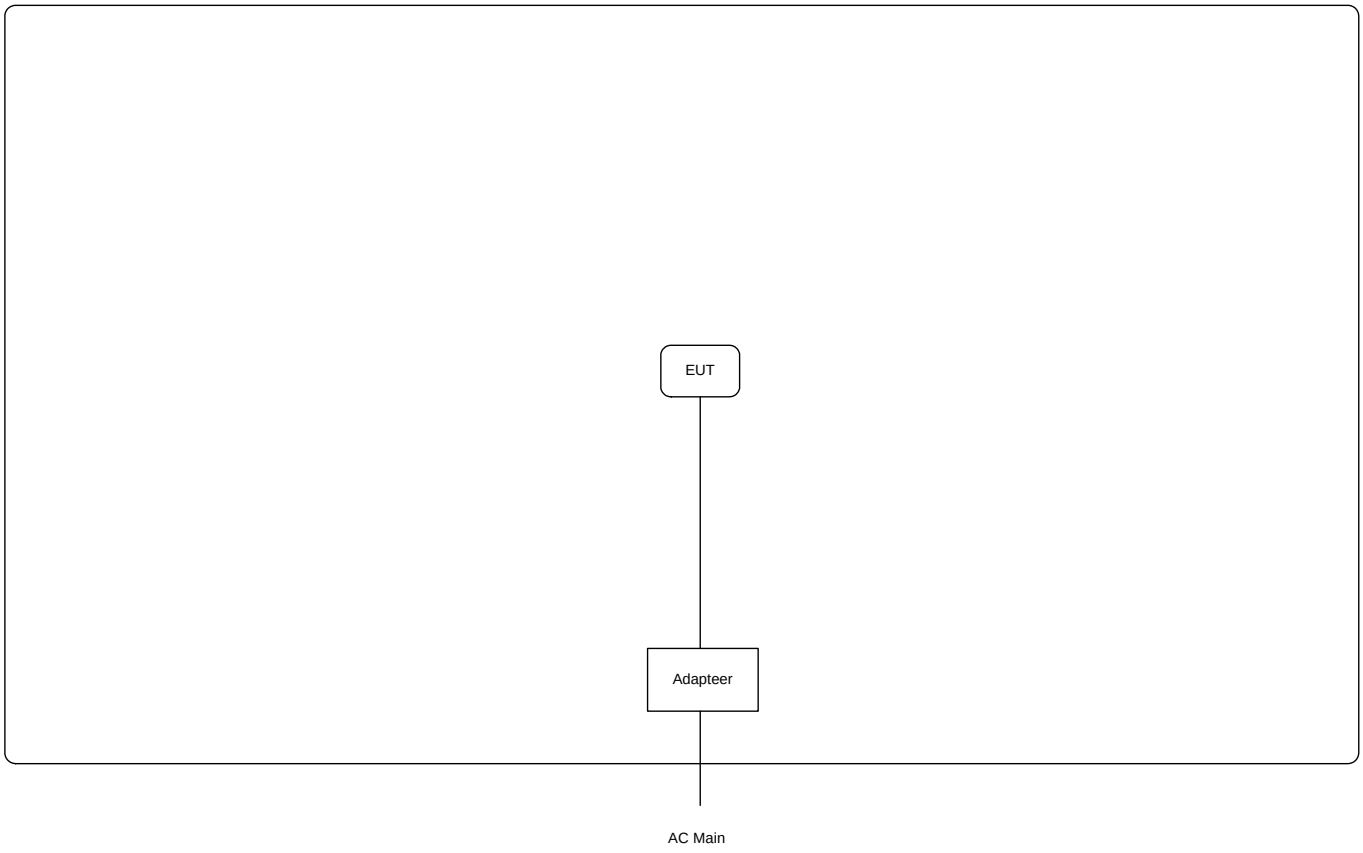
Test Software Version	CEcTxRx1.301		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	183	178	177
IEEE 802.11g	125	146	125

Power Parameters BLUETOOTH

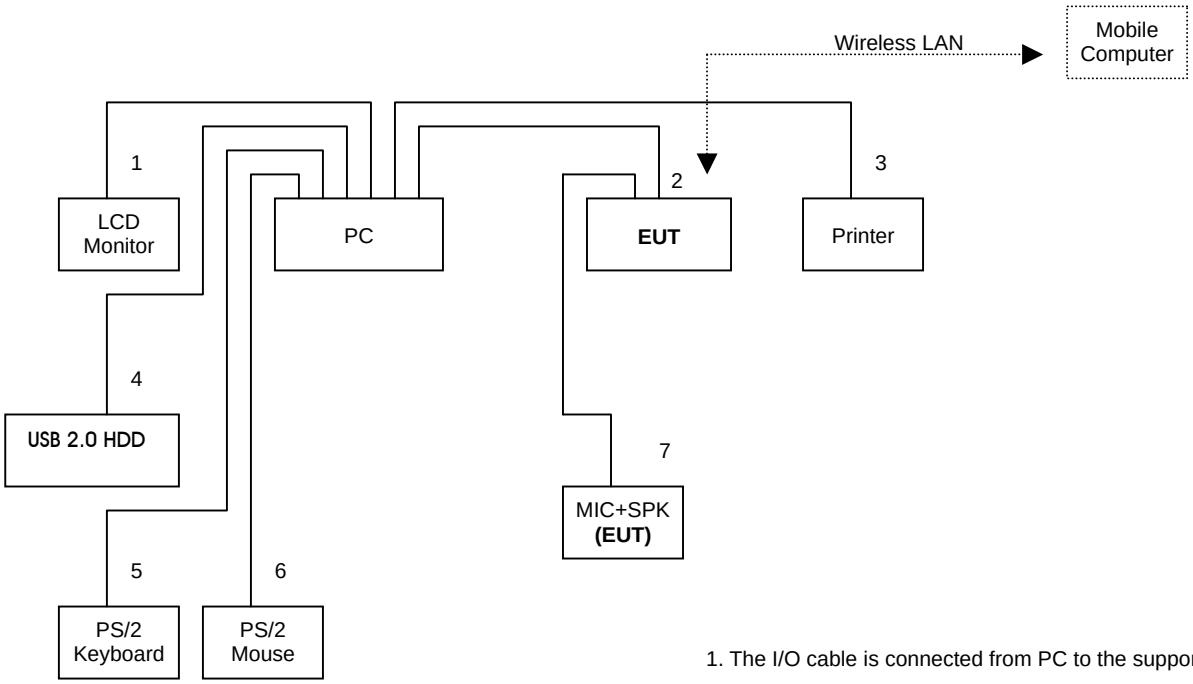
Test Software Version	BTREGTEST		
Frequency	2402 MHz	2441 MHz	2480 MHz
Power Parameters	7	7	7

3.11. Test Configurations

3.11.1. Radiation Emissions Test Configuration



3.11.2. AC Power Line Conduction Emissions Test Configuration



1. The I/O cable is connected from PC to the support unit 1.
2. The RS232 cable is connected from PC to the EUT.
3. The I/O cable is connected from PC to the support unit 2.
4. The I/O cable is connected from PC to the support unit 3.
5. The I/O cable is connected from PC to the support unit 4.
6. The I/O cable is connected from PC to the support unit 5.
7. The Audio cable is connected to EUT.

4. TEST RESULT-WLAN COLLOCATE WITH BLUETOOTH

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For a Low-power Radio-frequency Device which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

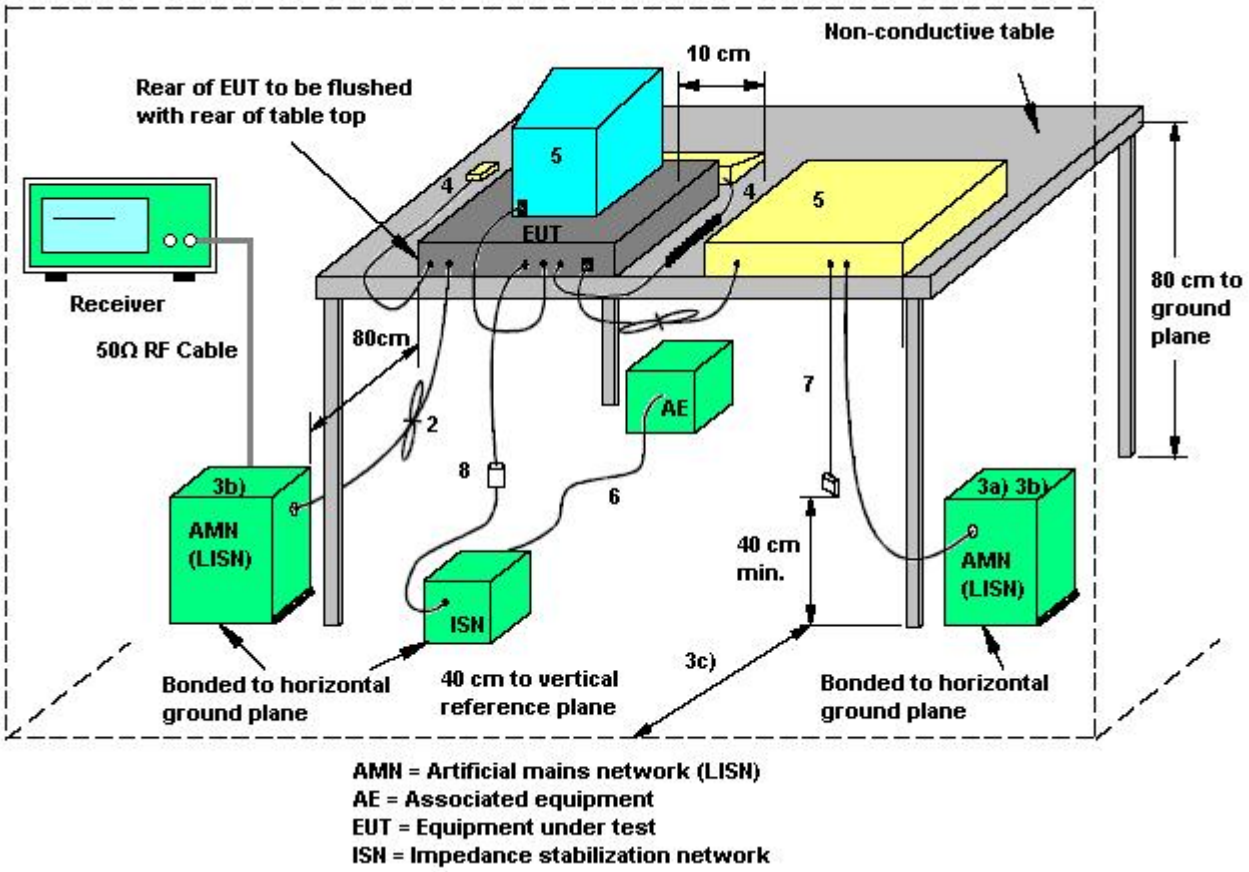
Please refer to section 6 in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



1. If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
2. Excess mains cord shall be bundled in the centre or shortened to appropriate length.
3. EUT is connected to one artificial mains network (AMN). All AMNs and ISNs may alternatively be connected to a vertical reference plane or metal wall.
4. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
5. AMN and ISN are 80 cm from the EUT and at least 80 cm from other units and other metal planes.
6. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
7. Cables of hand operated devices, such as keyboards, mouses, etc. shall be placed as for normal usage.
8. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
9. I/O signal cable intended for external connection.
10. The end of the I/O signal cables which are not connected to an AE may be terminated, if required, using correct terminating impedance.
11. If used, the current probe shall be placed at 0,1 m from the ISN.

4.1.5. Test Deviation

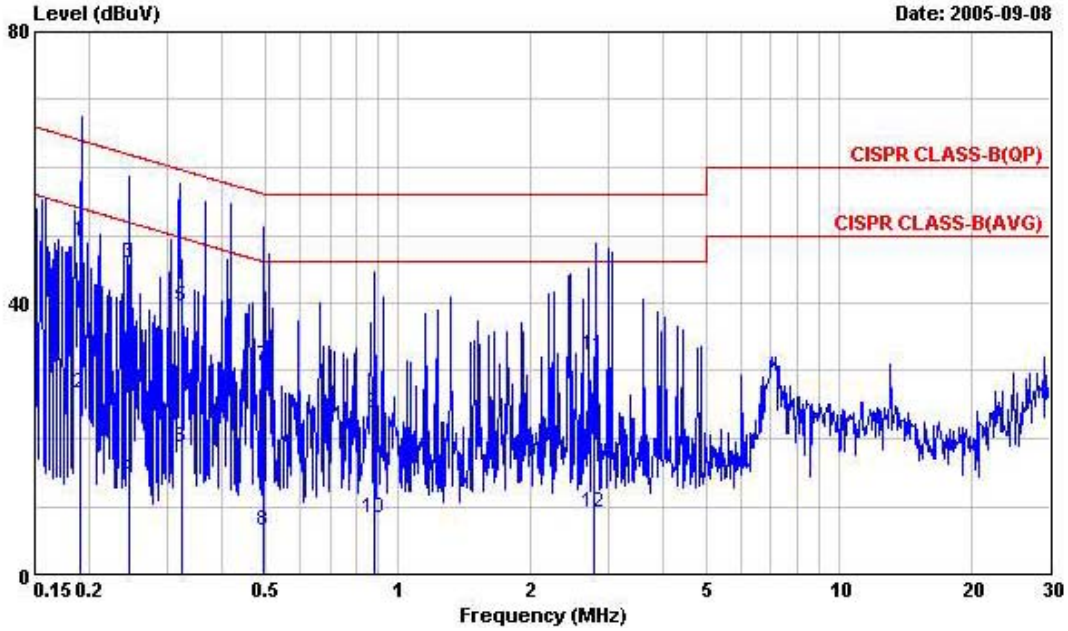
There are no deviations with the original standard.

4.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

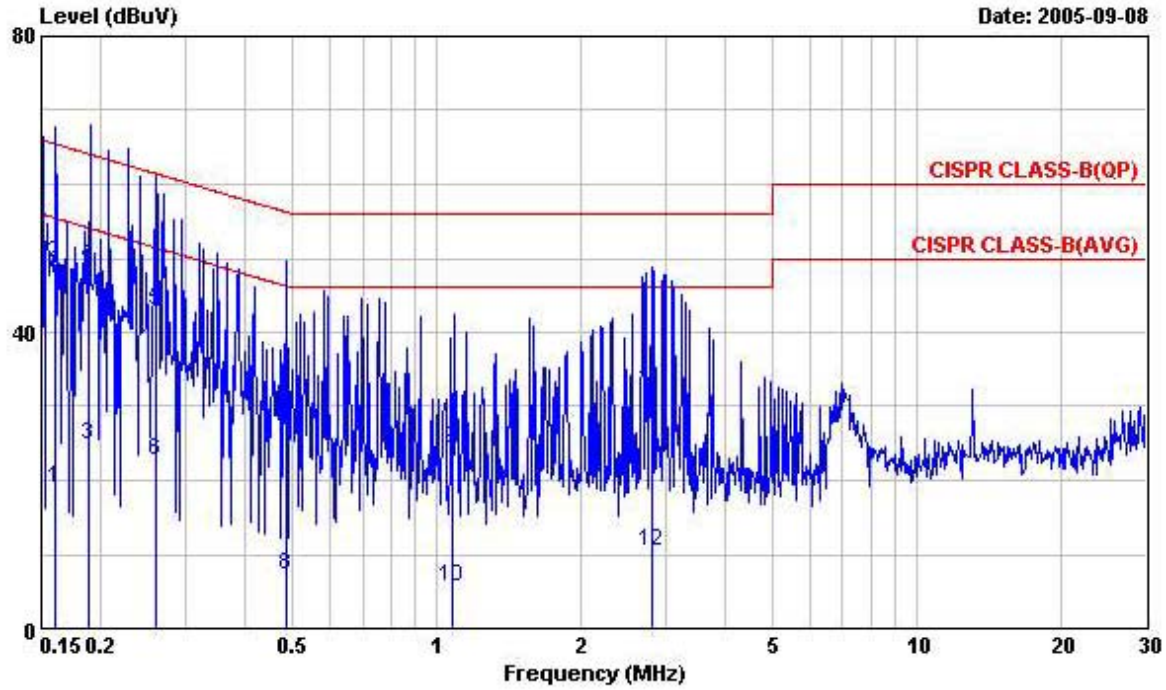
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	20℃	Humidity	60%
Test Engineer	Sky Wu	Phase	Line
Configuration	802.11g / Channel 6		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Cable Loss	LISN Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	dB	
1 @	0.191	49.15	-14.84	63.99	49.00	0.15	0.05	0.10	QP
2	0.191	26.57	-27.42	53.99	26.42	0.15	0.05	0.10	Average
3	0.246	45.83	-16.06	61.89	45.63	0.20	0.10	0.10	QP
4	0.246	14.24	-37.65	51.89	14.04	0.20	0.10	0.10	Average
5	0.322	39.52	-20.14	59.66	39.42	0.10	0.00	0.10	QP
6	0.322	18.59	-31.07	49.66	18.49	0.10	0.00	0.10	Average
7	0.494	30.70	-25.40	56.10	30.60	0.10	0.00	0.10	QP
8	0.494	6.45	-39.65	46.10	6.35	0.10	0.00	0.10	Average
9	0.885	23.65	-32.35	56.00	23.47	0.18	0.08	0.10	QP
10	0.885	8.28	-37.72	46.00	8.10	0.18	0.08	0.10	Average
11	2.790	32.36	-23.64	56.00	32.11	0.25	0.10	0.15	QP
12	2.790	8.98	-37.02	46.00	8.73	0.25	0.10	0.15	Average

Temperature	20℃	Humidity	60%
Test Engineer	Sky Wu	Phase	Neutral
Configuration	802.11g / Channel 6		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Cable Loss	LISN Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	dB	
1	0.161	18.84	-36.57	55.41	18.74	0.10	0.00	0.10	Average
2	0.161	49.42	-15.99	65.41	49.32	0.10	0.00	0.10	QP
3	0.189	24.71	-29.37	54.08	24.56	0.15	0.05	0.10	Average
4	0.189	49.03	-15.05	64.08	48.88	0.15	0.05	0.10	QP
5	0.259	42.92	-18.54	61.46	42.77	0.15	0.05	0.10	QP
6	0.259	22.65	-28.81	51.46	22.50	0.15	0.05	0.10	Average
7	0.484	29.24	-27.03	56.27	29.14	0.10	0.00	0.10	QP
8	0.484	7.07	-39.20	46.27	6.97	0.10	0.00	0.10	Average
9	1.080	24.19	-31.81	56.00	24.01	0.18	0.08	0.10	QP
10	1.080	5.48	-40.52	46.00	5.30	0.18	0.08	0.10	Average
11	2.810	32.30	-23.70	56.00	32.05	0.25	0.10	0.15	QP
12	2.810	10.40	-35.60	46.00	10.15	0.25	0.10	0.15	Average

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum Peak Output Power Measurement

4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

4.2.2. Measuring Instruments and Setting

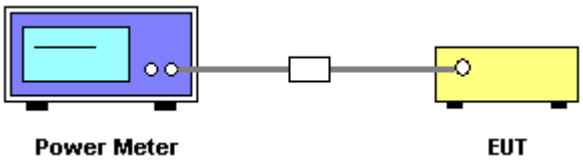
Please refer to section 6 in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Peak Sensor	NRV-Z32 (model 04)

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There are no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Maximum Peak Output Power

Temperature	20℃	Humidity	60%
Test Engineer	Eason Lu	Configurations	802.11b/g

Configuration IEEE 802.11b

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	18.92	30.00	Complies
6	2437 MHz	19.27	30.00	Complies
11	2462 MHz	19.14	30.00	Complies

Configuration IEEE 802.11g

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.47	30.00	Complies
6	2437 MHz	19.14	30.00	Complies
11	2462 MHz	17.14	30.00	Complies

4.3. Power Spectral Density Measurement

4.3.1. Limit

For digitally modulated systems, the 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.

4.3.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	1.5MHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	500s

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.

4.3.4. Test Setup Layout

4.3.5. Test Deviation

There are no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Power Spectral Density

Temperature	20℃	Humidity	60%
Test Engineer	Eason Lu	Configurations	802.11b/g

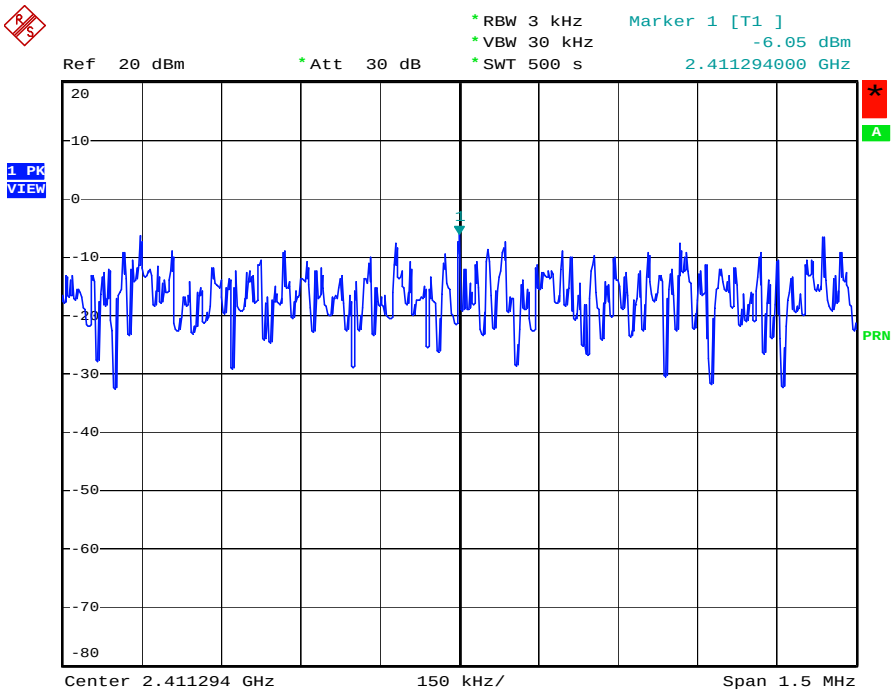
Configuration IEEE 802.11b

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-6.05	8.00	Complies
6	2437 MHz	-5.72	8.00	Complies
11	2462 MHz	-6.08	8.00	Complies

Configuration IEEE 802.11g

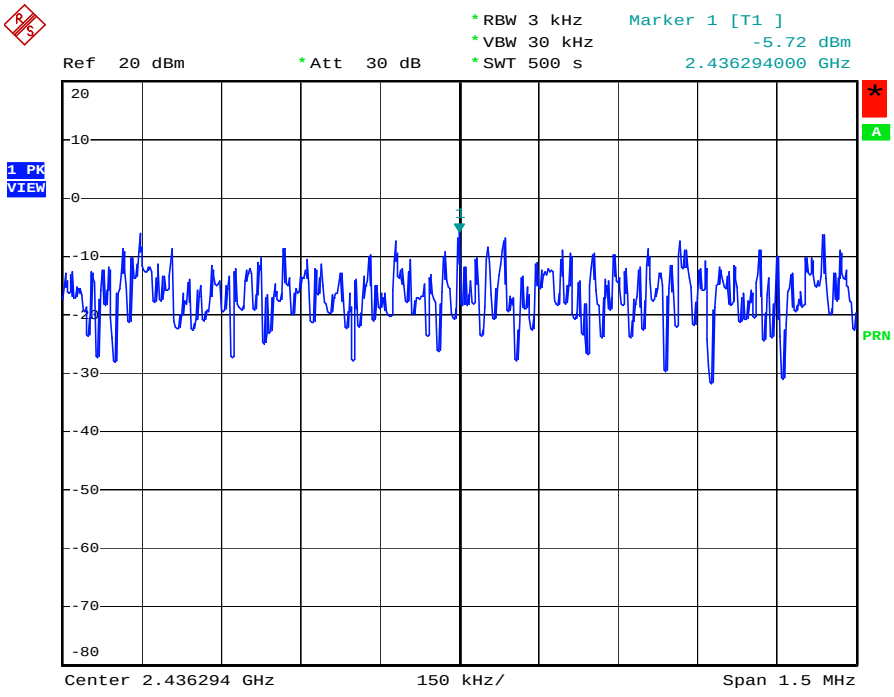
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-16.68	8.00	Complies
6	2437 MHz	-13.47	8.00	Complies
11	2462 MHz	-16.29	8.00	Complies

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz



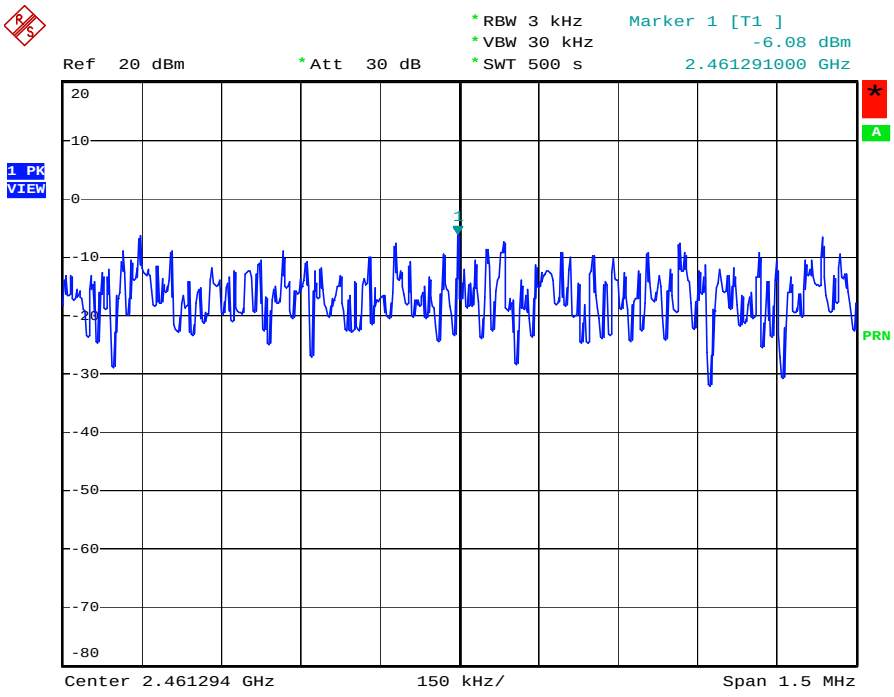
Date: 14.SEP.2005 11:16:17

Power Density Plot on Configuration IEEE 802.11b / 2437 MHz

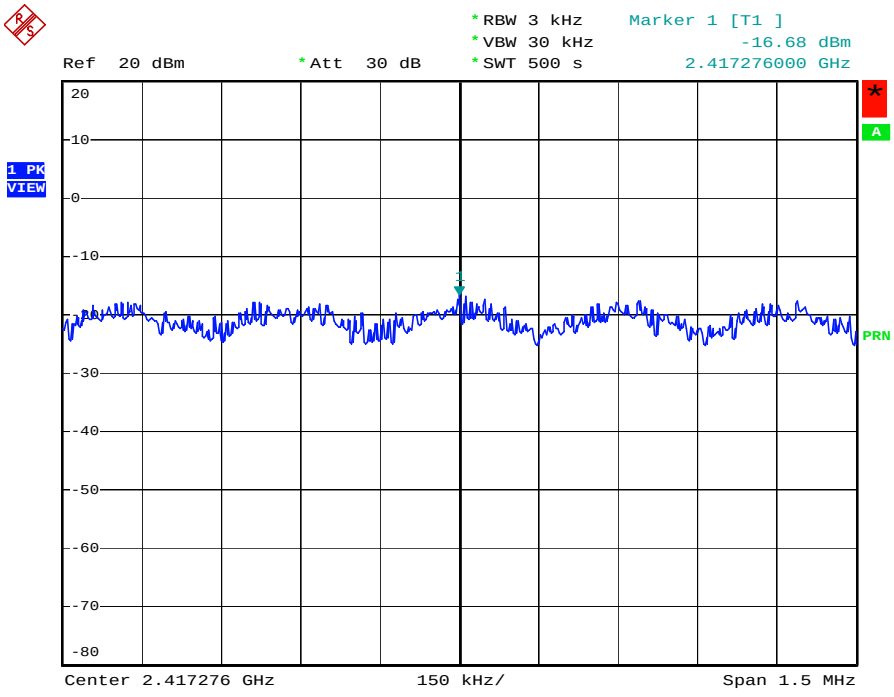


Date: 14.SEP.2005 11:17:35

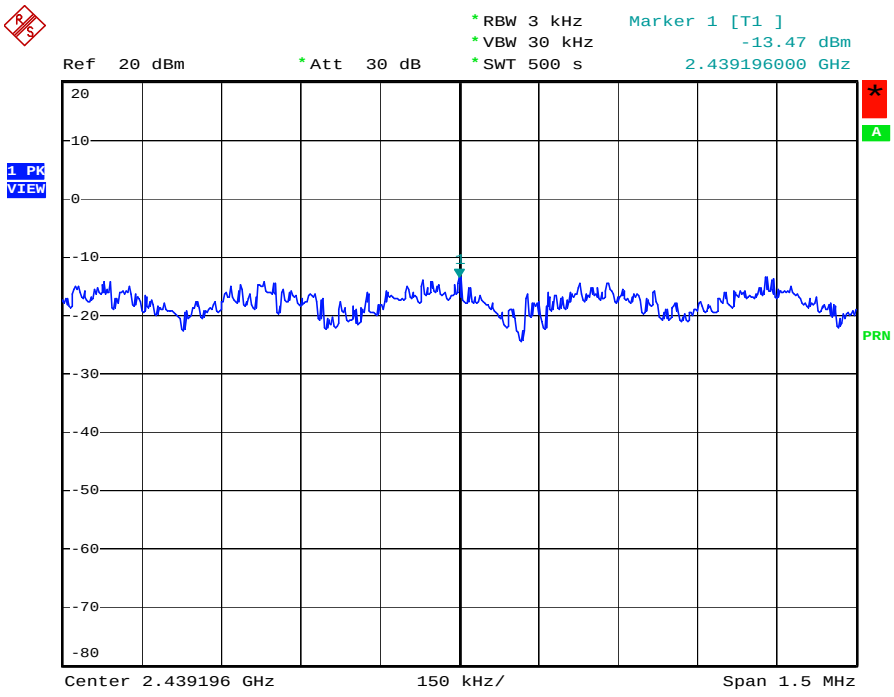
Power Density Plot on Configuration IEEE 802.11b / 2462 MHz



Power Density Plot on Configuration IEEE 802.11g / 2412 MHz

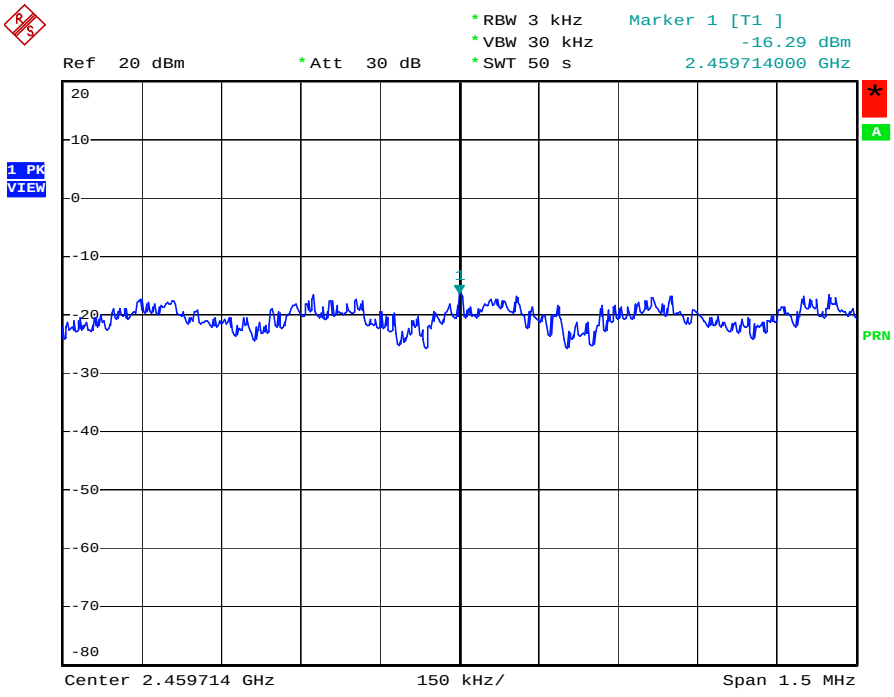


Power Density Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 14.SEP.2005 11:31:06

Power Density Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 14.SEP.2005 11:37:42

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

4.4.2. Measuring Instruments and Setting

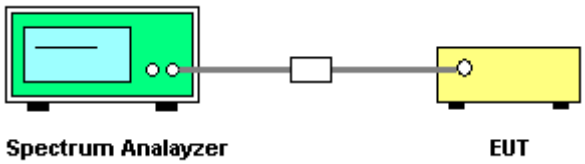
Please refer to section 6 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There are no deviations with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of 6dB Spectrum Bandwidth

Temperature	20℃	Humidity	60%
Test Engineer	Eason Lu	Configurations	802.11b/g

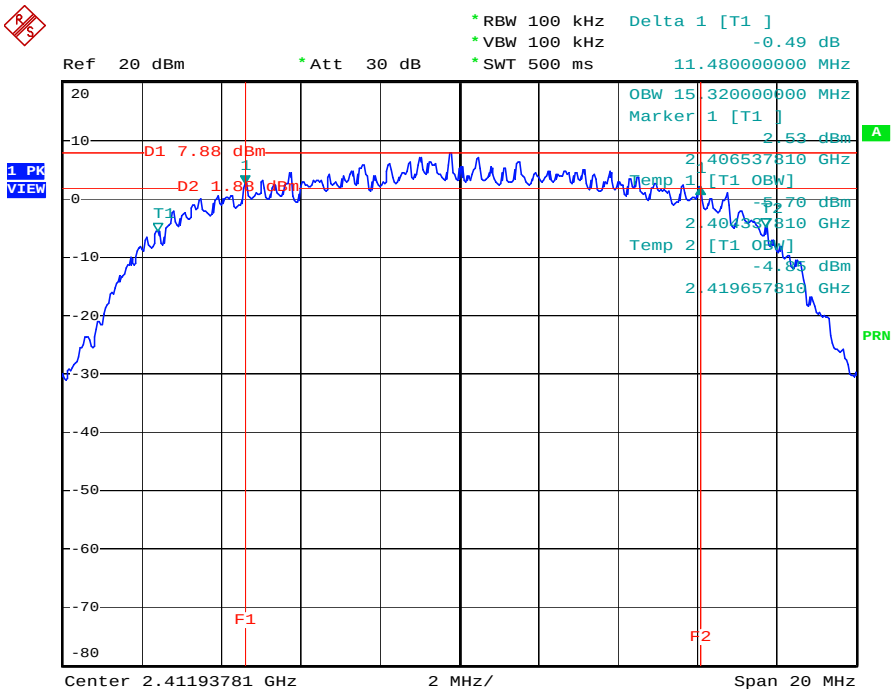
Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	11.48	15.32	500	Complies
6	2437 MHz	11.08	15.32	500	Complies
11	2462 MHz	11.08	15.28	500	Complies

Configuration IEEE 802.11g

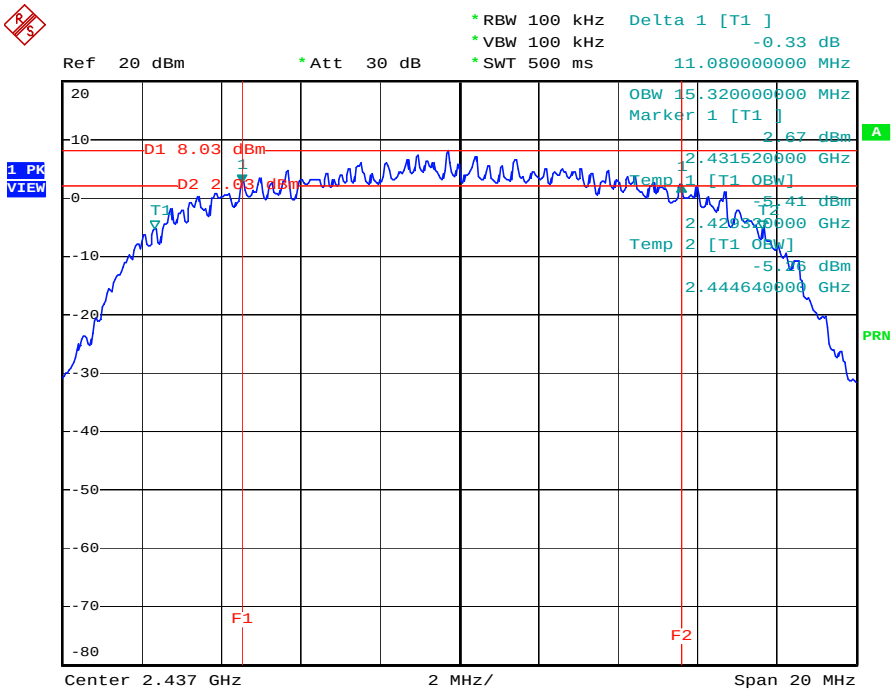
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.40	16.40	500	Complies
6	2437 MHz	16.40	16.40	500	Complies
11	2462 MHz	16.40	16.40	500	Complies

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz



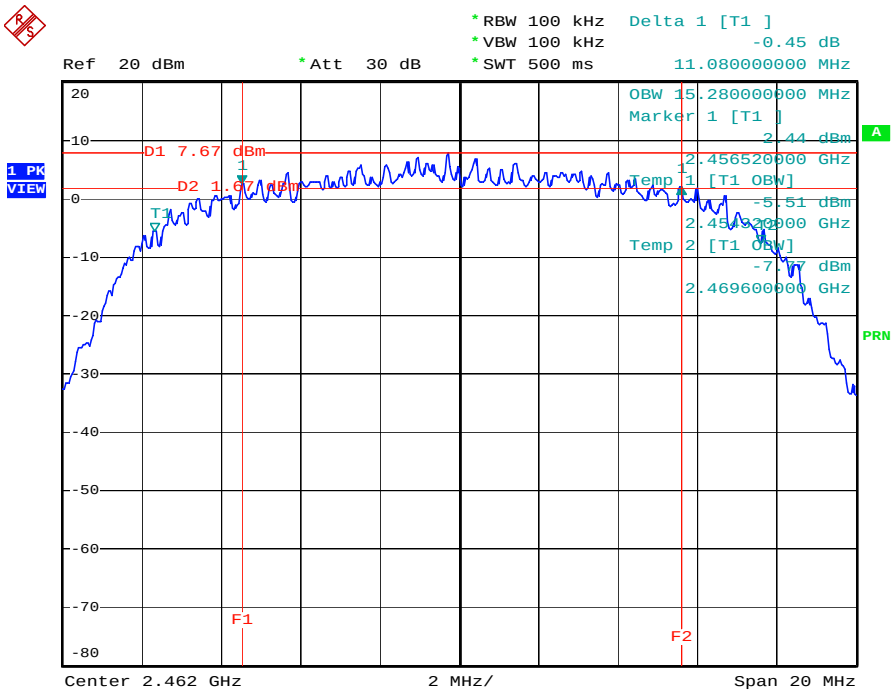
Date: 14.SEP.2005 11:13:42

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz



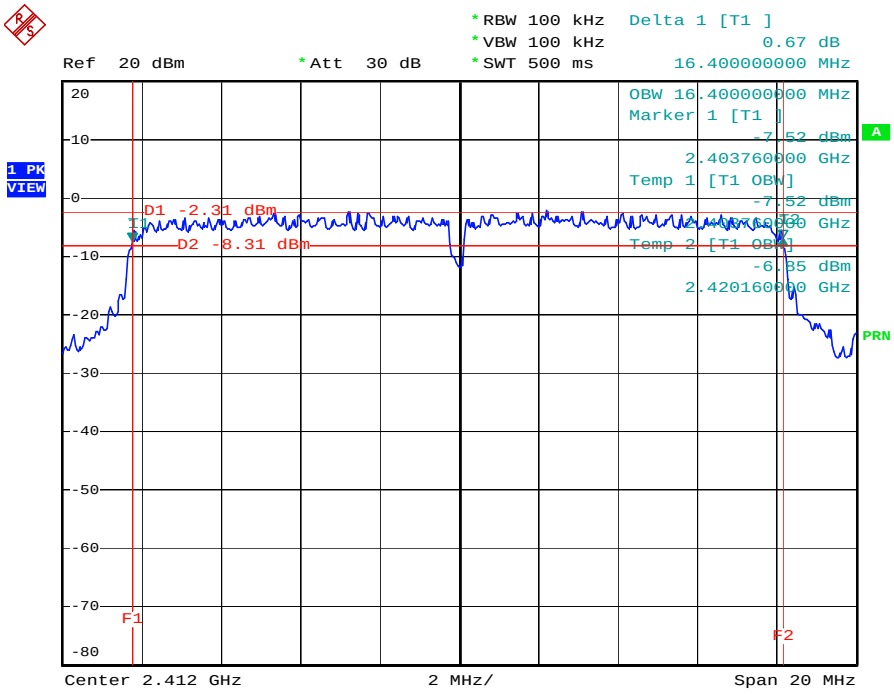
Date: 14.SEP.2005 11:18:59

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz



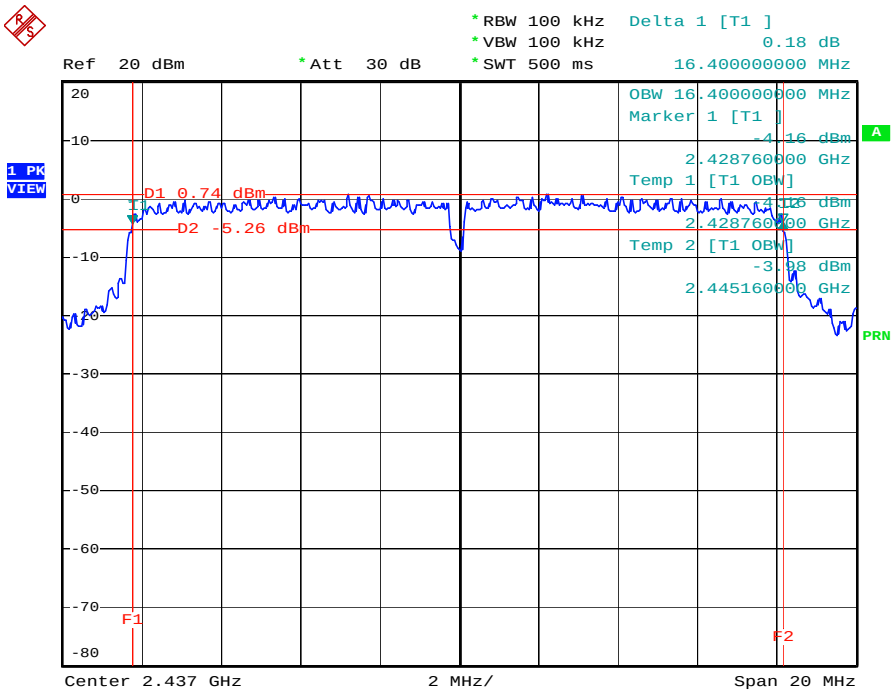
Date: 14.SEP.2005 11:21:26

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz



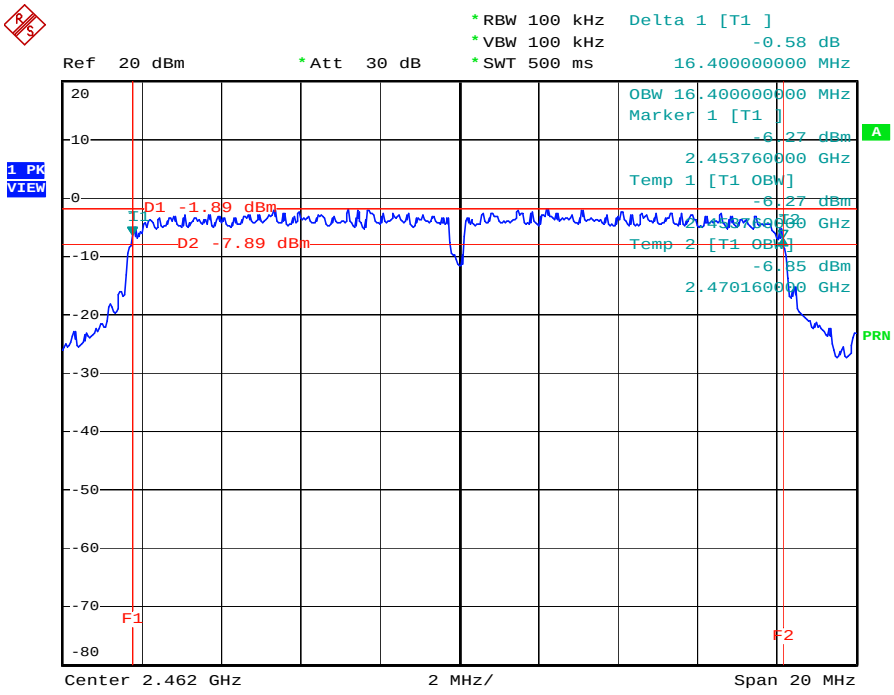
Date: 14.SEP.2005 11:27:28

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 14.SEP.2005 11:34:00

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 14.SEP.2005 11:35:28

4.5. Radiated Emissions Measurement

4.5.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.5.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	100KHz / 100KHz for peak

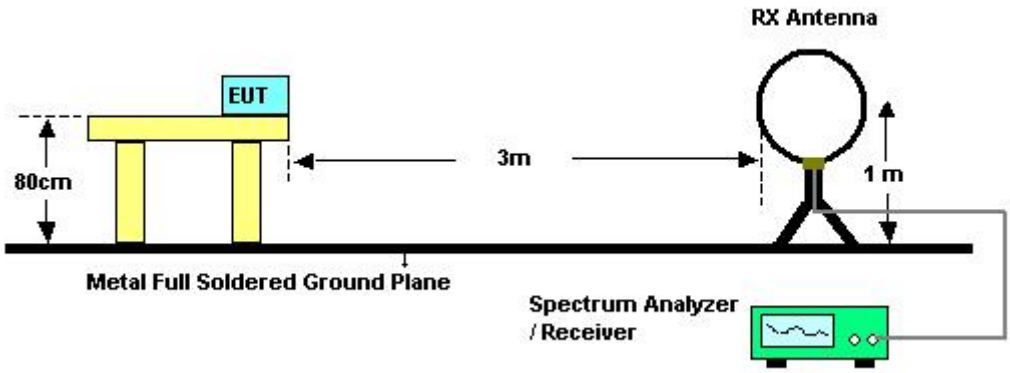
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

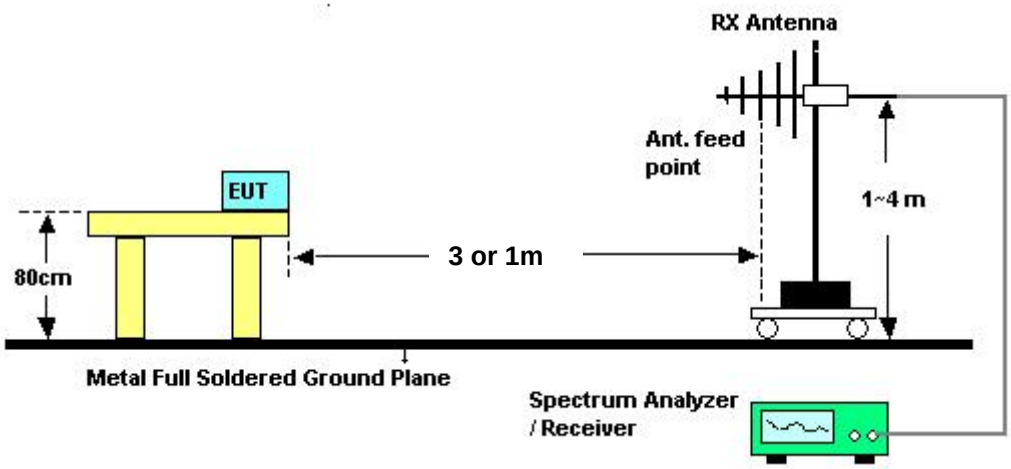
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average 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 for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak 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.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.5.4. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

4.5.5. Test Deviation

There are no deviations with the original standard.

4.5.6. EUT Operation during Test

The EUT was programed to be in continuously transmitting mode with WLAN and Bluetooth at the same time.

4.5.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	802.11g channel 6

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

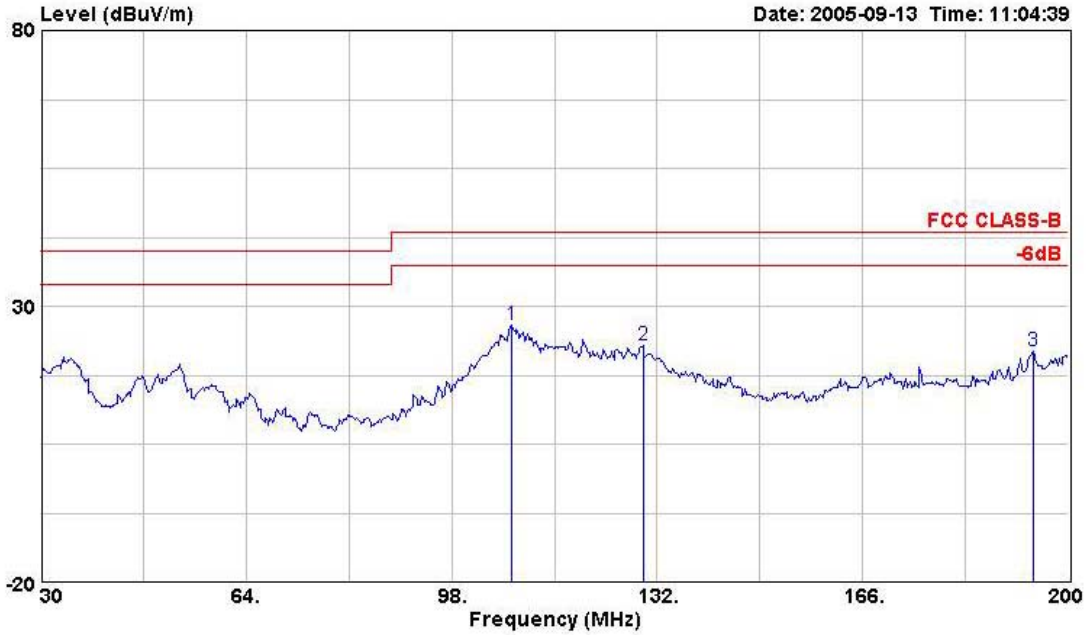
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

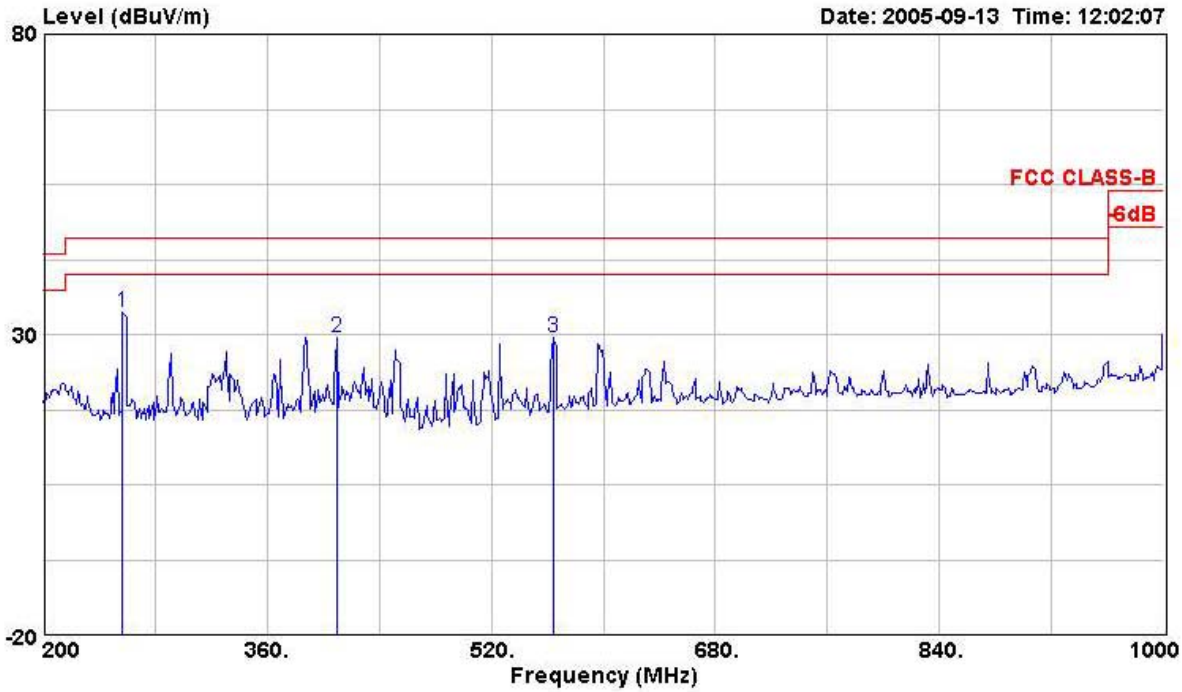
4.5.8. Results of Radiated Emissions (30MHz~1GHz)

Test Mode	802.11g / ch 6		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal

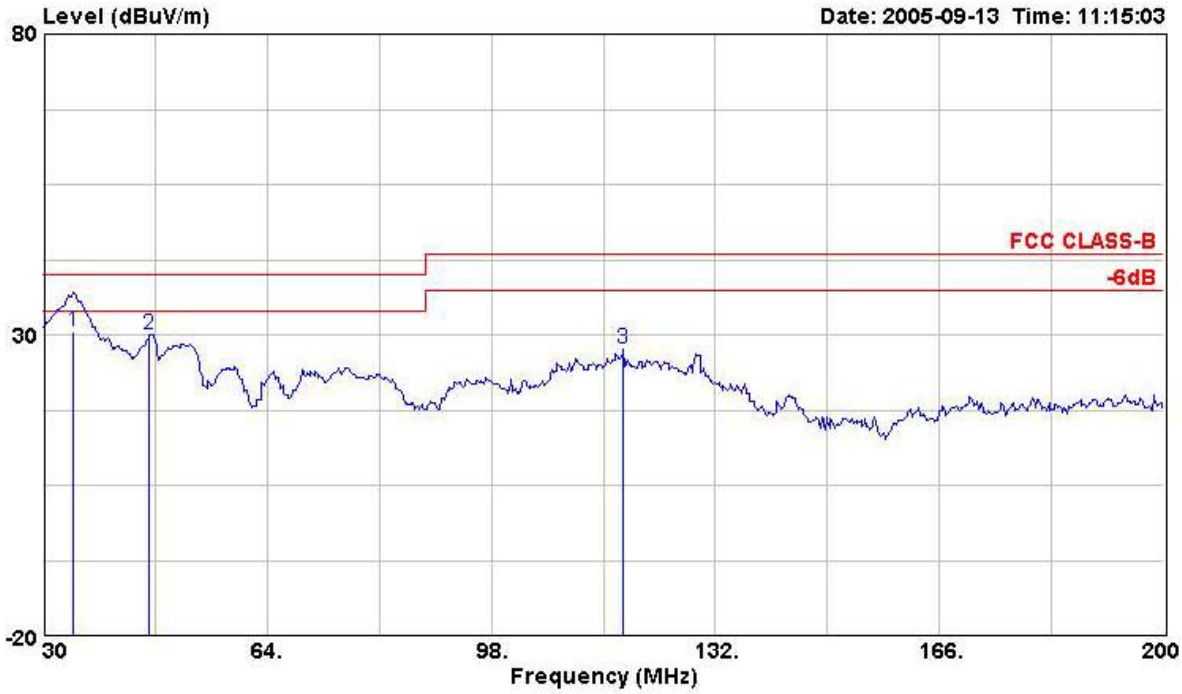


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	107.860	26.67	-16.83	45.90	43.50	1.01	10.12	30.36	Peak	---	---
2 @	129.620	22.83	-20.67	40.03	43.50	1.13	12.32	30.65	Peak	---	---
3 @	194.220	21.92	-21.58	35.85	43.50	1.30	15.33	30.56	Peak	---	---

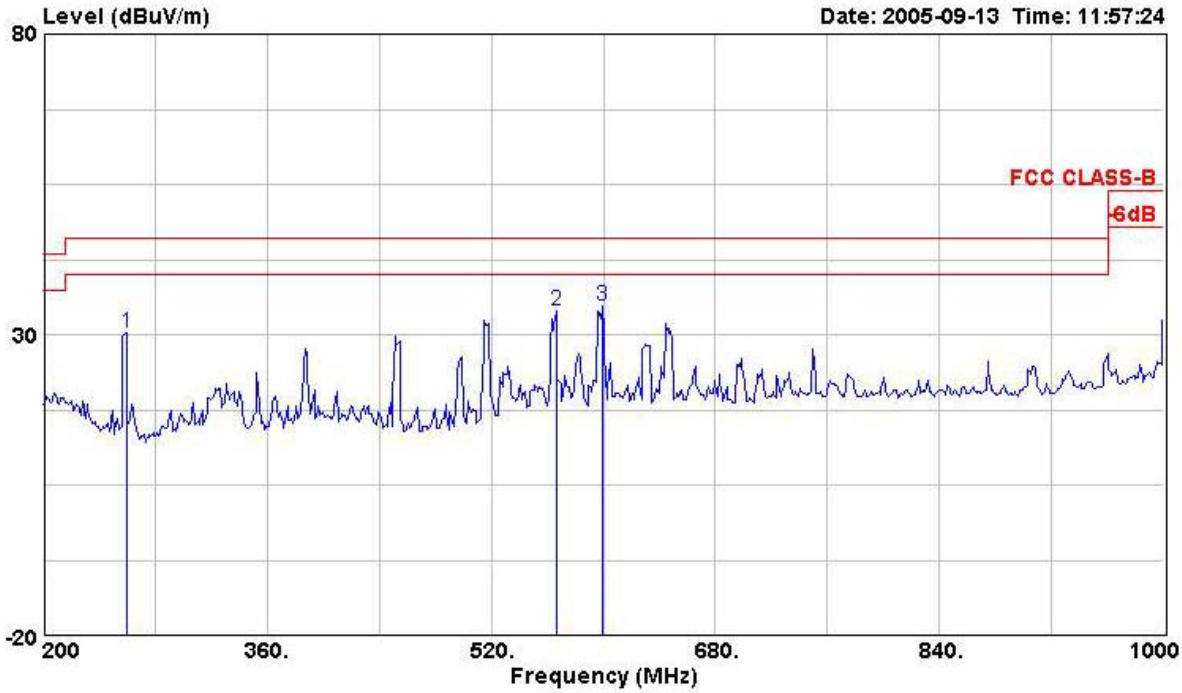


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	256.800	33.68	-12.32	49.81	46.00	1.59	12.52	30.24	Peak	---	---
2 @	409.600	29.48	-16.52	41.69	46.00	1.96	16.72	30.89	Peak	---	---
3 @	564.000	29.37	-16.63	39.42	46.00	2.29	18.81	31.15	Peak	---	---

Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	34.590	30.41	-9.59	48.39	40.00	0.55	11.98	30.51	QP	---	---
2 @	46.150	30.13	-9.87	47.54	40.00	0.66	12.16	30.23	Peak	---	---
3 @	118.060	27.54	-15.96	45.13	43.50	1.07	11.62	30.28	Peak	---	---



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	259.200	30.30	-15.70	46.30	46.00	1.60	12.60	30.19	Peak	---	---
2 @	566.400	33.83	-12.17	43.76	46.00	2.29	18.92	31.14	Peak	---	---
3 @	599.200	34.79	-11.21	43.12	46.00	2.40	20.36	31.09	Peak	---	---

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

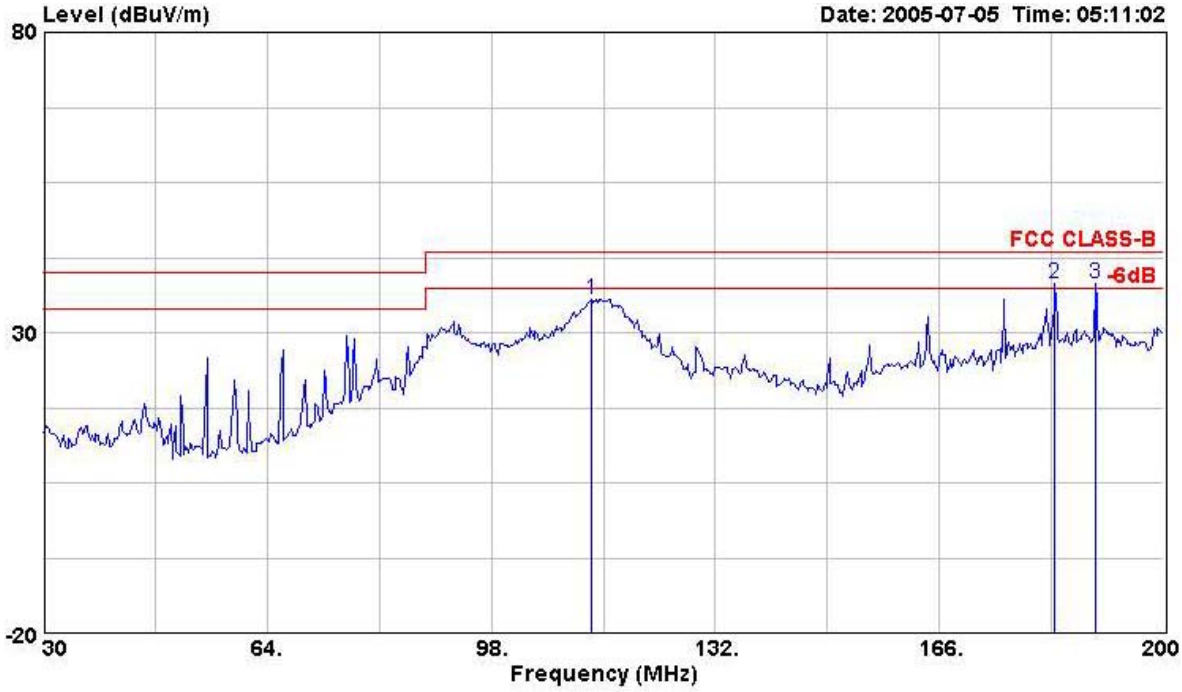
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

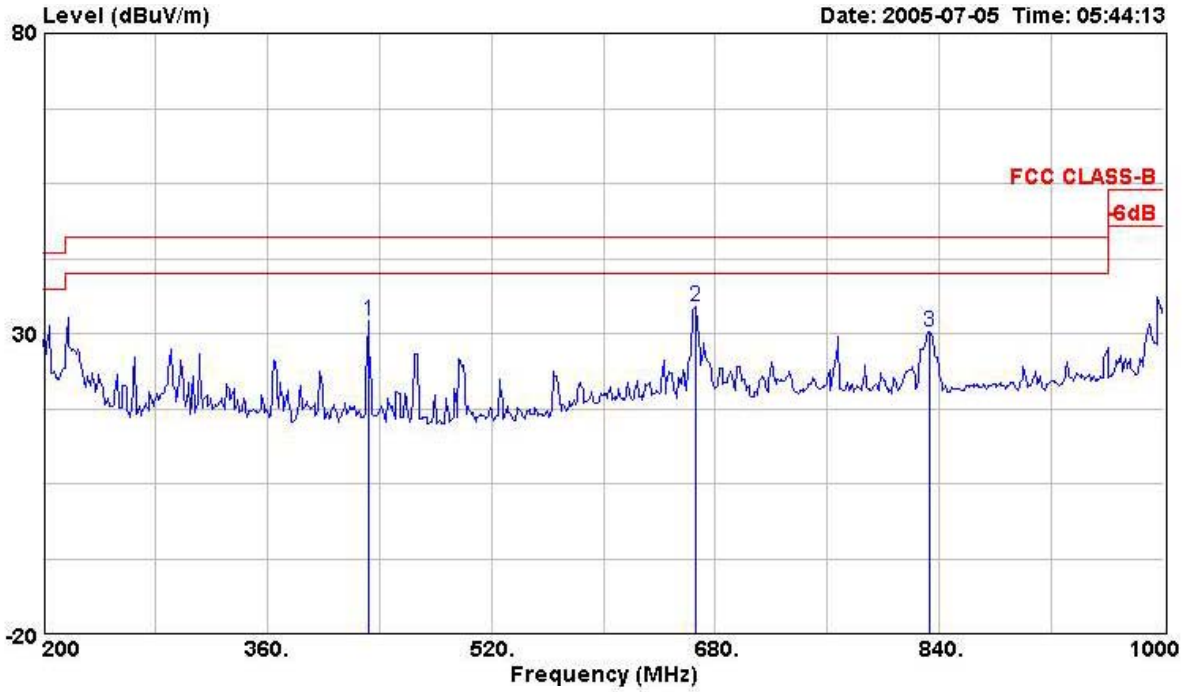
Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

Test Mode	802.11g / ch 64		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal

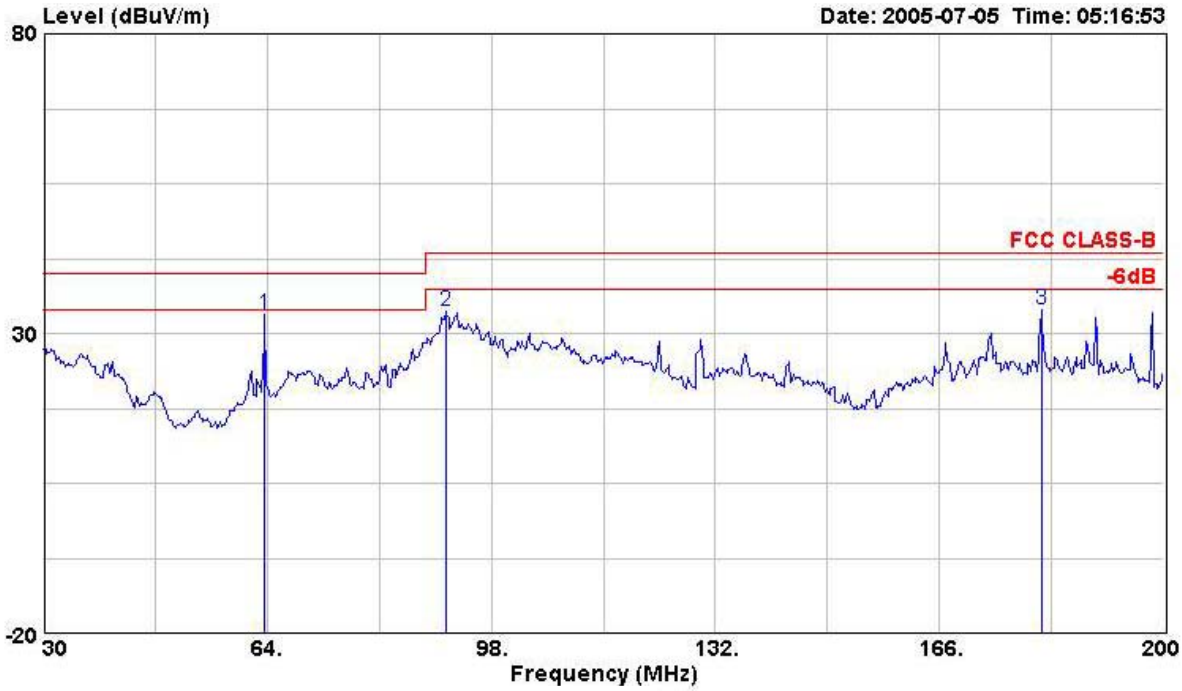


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Table Pos	Ant Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	113.300	35.63	-7.87	53.93	43.50	1.05	10.93	30.29	Peak	---	---
2 @	183.510	38.16	-5.34	52.46	43.50	1.27	14.48	30.05	Peak	---	---
3 !	189.630	38.13	-5.37	51.99	43.50	1.27	14.97	30.10	Peak	---	---

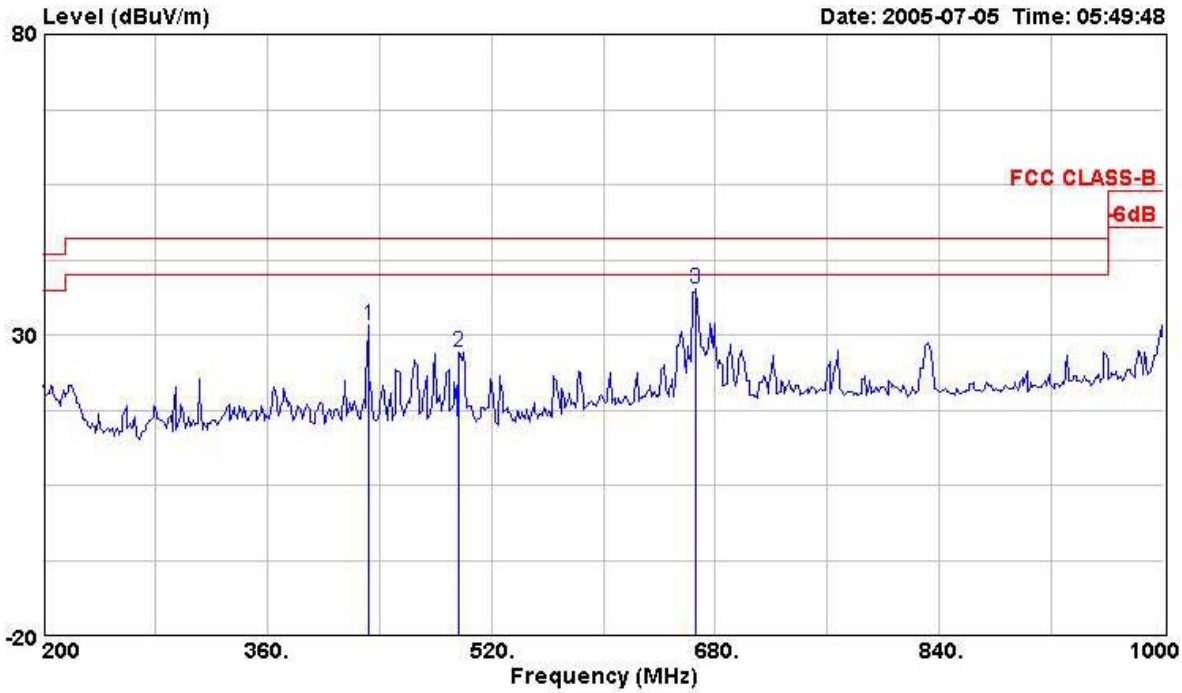


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Table Pos	Ant Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	432.000	32.19	-13.81	44.27	46.00	2.04	16.54	30.66	Peak	---	---
2	665.600	34.47	-11.53	41.90	46.00	2.52	20.60	30.54	Peak	---	---
3	832.800	30.35	-15.65	36.05	46.00	2.88	21.83	30.41	Peak	---	---

Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Table Pos	Ant Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	63.660	33.16	-6.84	52.65	40.00	0.81	10.24	30.54	Peak	---	---
2	91.030	33.59	-9.91	53.62	43.50	0.91	8.55	29.49	Peak	---	---
3	181.470	33.96	-9.54	48.41	43.50	1.27	14.31	30.03	Peak	---	---



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Table Pos	Ant Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		deg	cm
1	432.000	31.52	-14.48	43.60	46.00	2.04	16.54	30.66	Peak	---	---
2	496.800	27.24	-18.76	39.82	46.00	2.17	16.03	30.78	Peak	---	---
3	666.400	37.65	-8.35	45.08	46.00	2.52	20.60	30.54	Peak	---	---

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

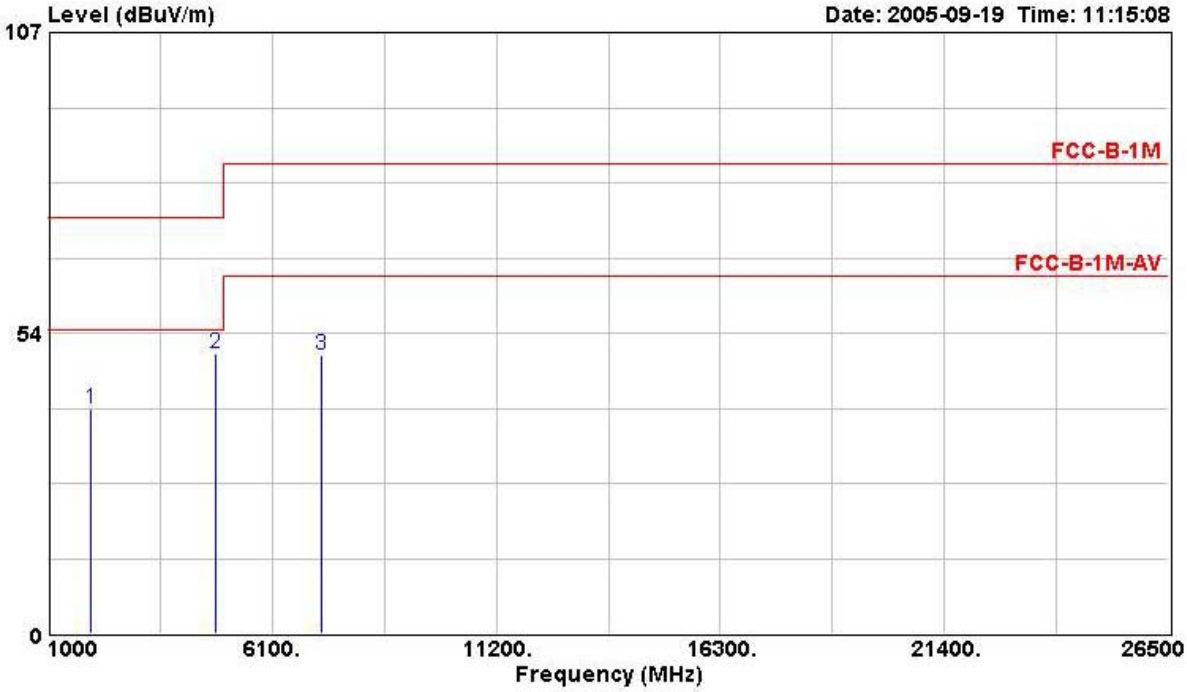
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

4.5.9. Results for Radiated Emissions (1GHz~10th Harmonic)

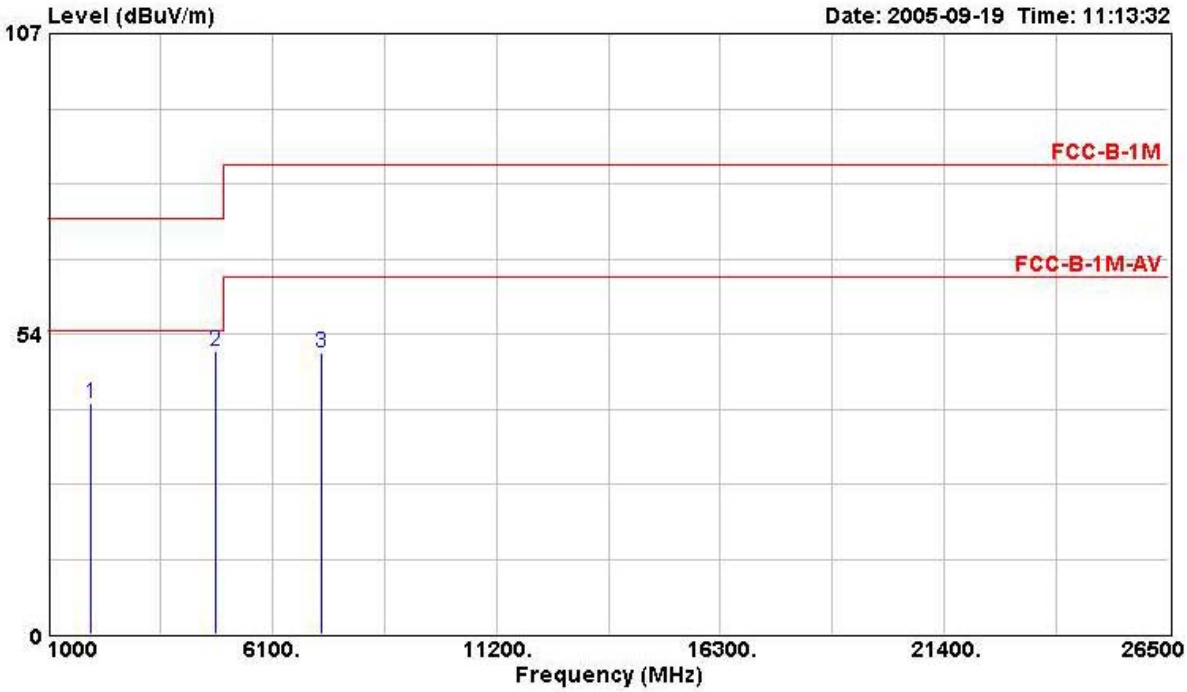
Test Mode	802.11b / ch 1		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1972.000	40.02	-33.98	43.35	74.00	2.02	27.35	32.70	Peak	---	---
2 @	4824.000	49.80	-24.20	46.12	74.00	3.10	33.12	32.54	PEAK	---	---
3	7236.000	49.52	-34.02	41.91	83.54	4.09	35.98	32.46	PEAK	---	---

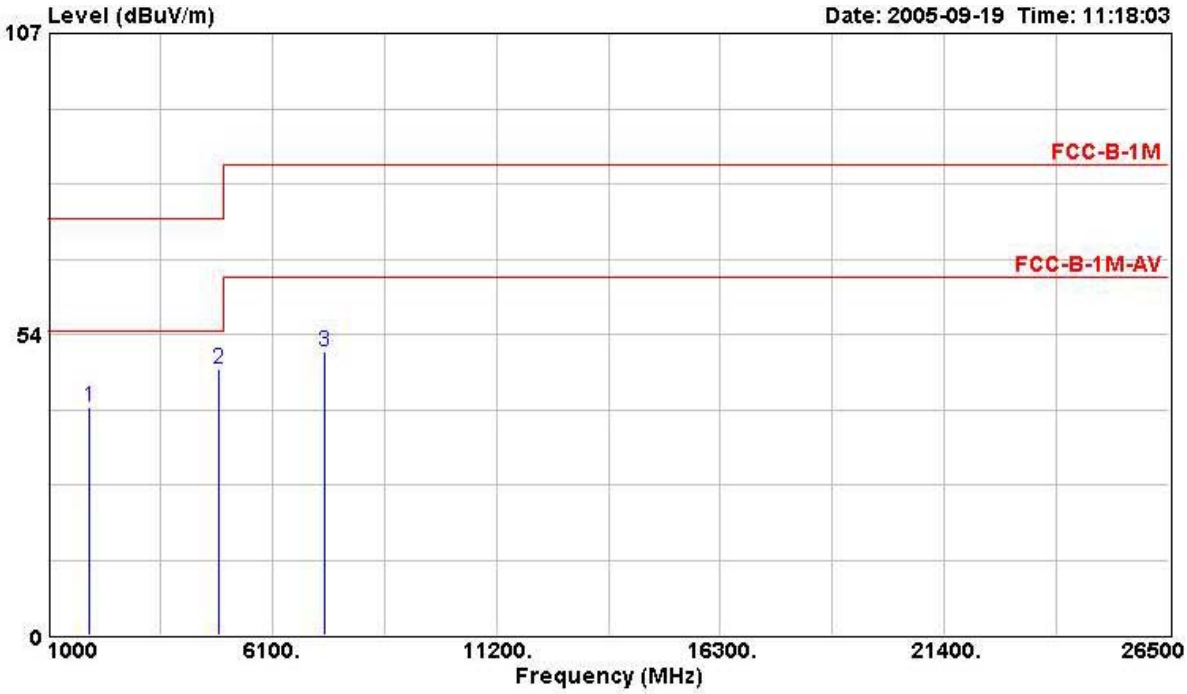
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1966.000	41.04	-32.96	44.37	74.00	2.02	27.35	32.70	Peak	---	---
2 @	4824.000	50.55	-23.45	46.87	74.00	3.10	33.12	32.54	PEAK	---	---
3	7236.000	50.18	-33.36	42.57	83.54	4.09	35.98	32.46	PEAK	---	---

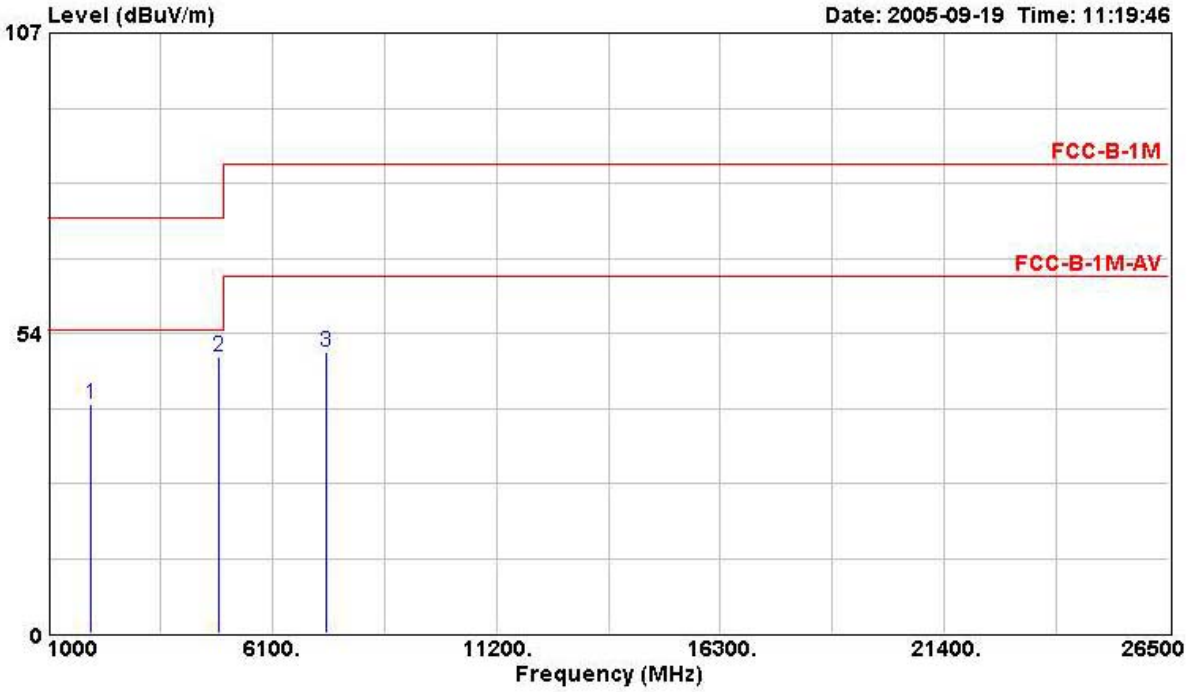
Test Mode	802.11b / ch 6		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1940.000	40.43	-33.57	43.96	74.00	1.98	27.21	32.72	Peak	---	---
2 @	4876.000	47.27	-26.73	43.50	74.00	3.11	33.21	32.55	PEAK	---	---
3	7308.000	50.44	-33.10	42.80	83.54	4.06	36.14	32.56	PEAK	---	---

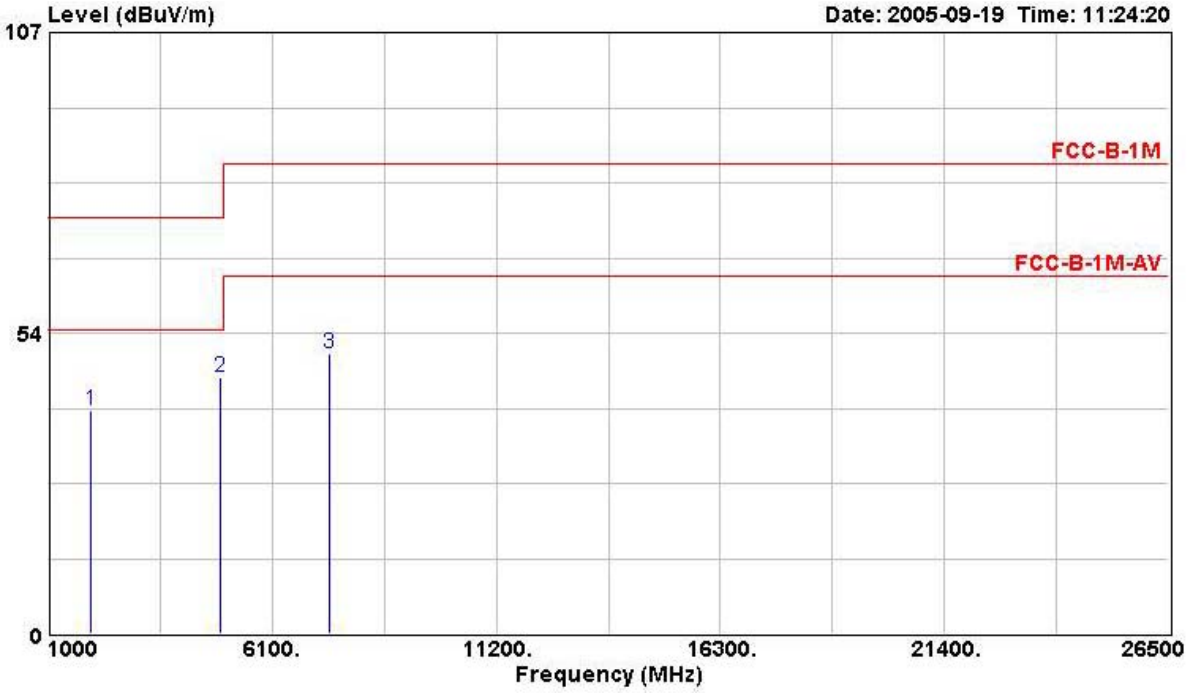
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1972.000	40.93	-33.07	44.26	74.00	2.02	27.35	32.70	Peak	---	---
2 @	4876.000	49.33	-24.67	45.55	74.00	3.11	33.21	32.55	PEAK	---	---
3	7312.000	50.18	-33.36	42.58	83.54	4.06	36.14	32.61	PEAK	---	---

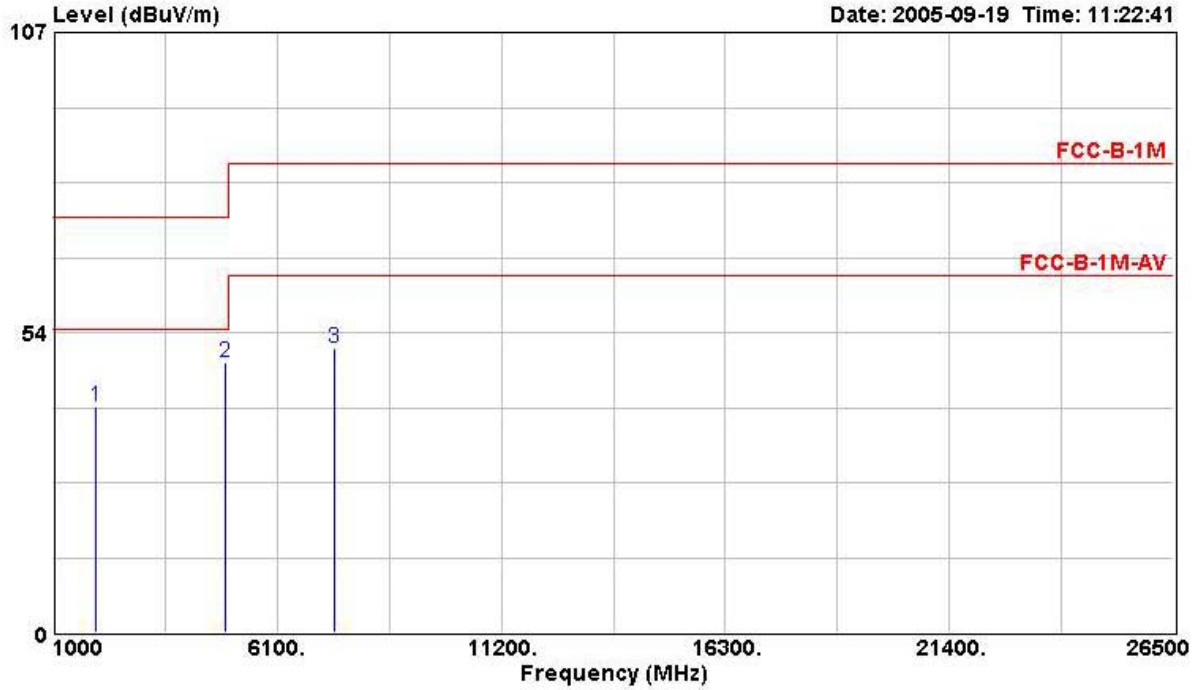
Test Mode	802.11b / ch 11		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1982.000	39.68	-34.32	42.87	74.00	2.06	27.43	32.68	Peak	---	---
2 @	4928.000	45.61	-28.39	41.75	74.00	3.12	33.29	32.55	PEAK	---	---
3	7384.000	49.96	-33.58	42.29	83.54	4.03	36.35	32.71	PEAK	---	---

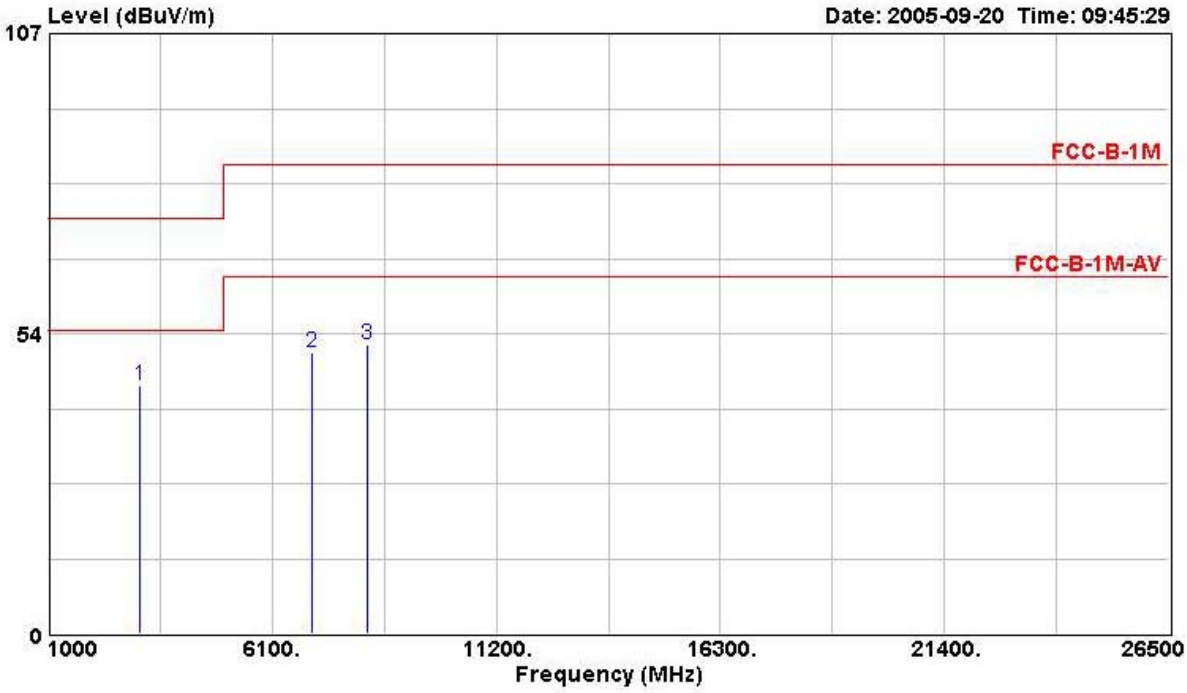
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1982.000	40.19	-33.81	43.38	74.00	2.06	27.43	32.68	Peak	---	---
2 @	4924.000	48.11	-25.89	44.25	74.00	3.12	33.29	32.55	PEAK	---	---
3	7384.000	50.66	-32.88	42.99	83.54	4.03	36.35	32.71	PEAK	---	---

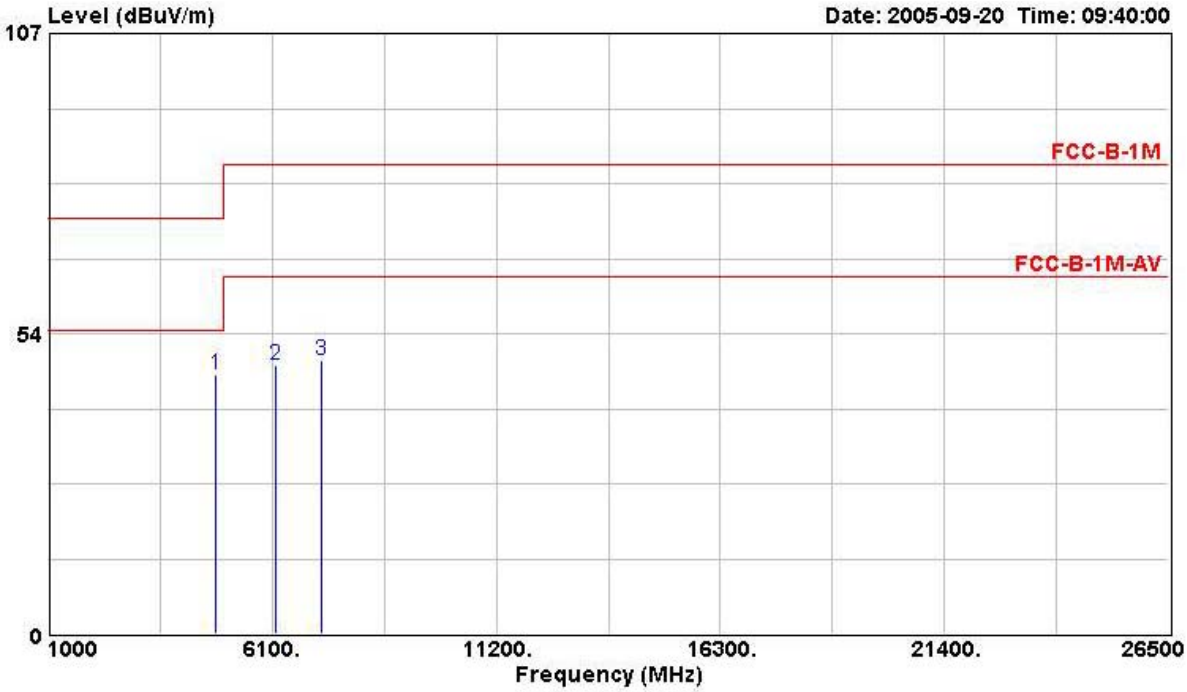
Test Mode	802.11g / ch 1		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3092.000	44.14	-29.86	43.85	74.00	2.69	30.29	32.68	PEAK	---	---
2	6996.000	50.20	-33.34	42.57	83.54	4.17	35.40	31.94	PEAK	---	---
3	8268.000	51.66	-31.88	42.99	83.54	4.12	37.54	32.99	PEAK	---	---

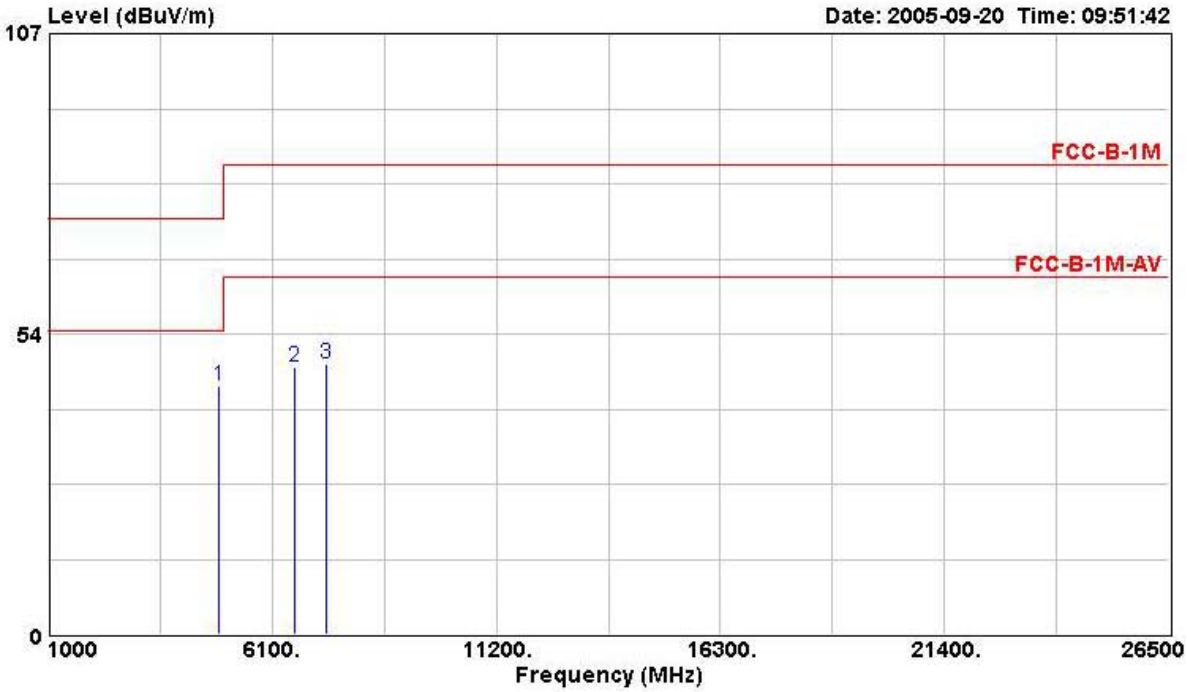
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	4820.000	46.33	-27.67	42.65	74.00	3.10	33.12	32.54	PEAK	---	---
2	6188.000	47.76	-35.78	42.23	83.54	3.72	34.30	32.49	PEAK	---	---
3	7236.000	48.66	-34.88	41.05	83.54	4.09	35.98	32.46	PEAK	---	---

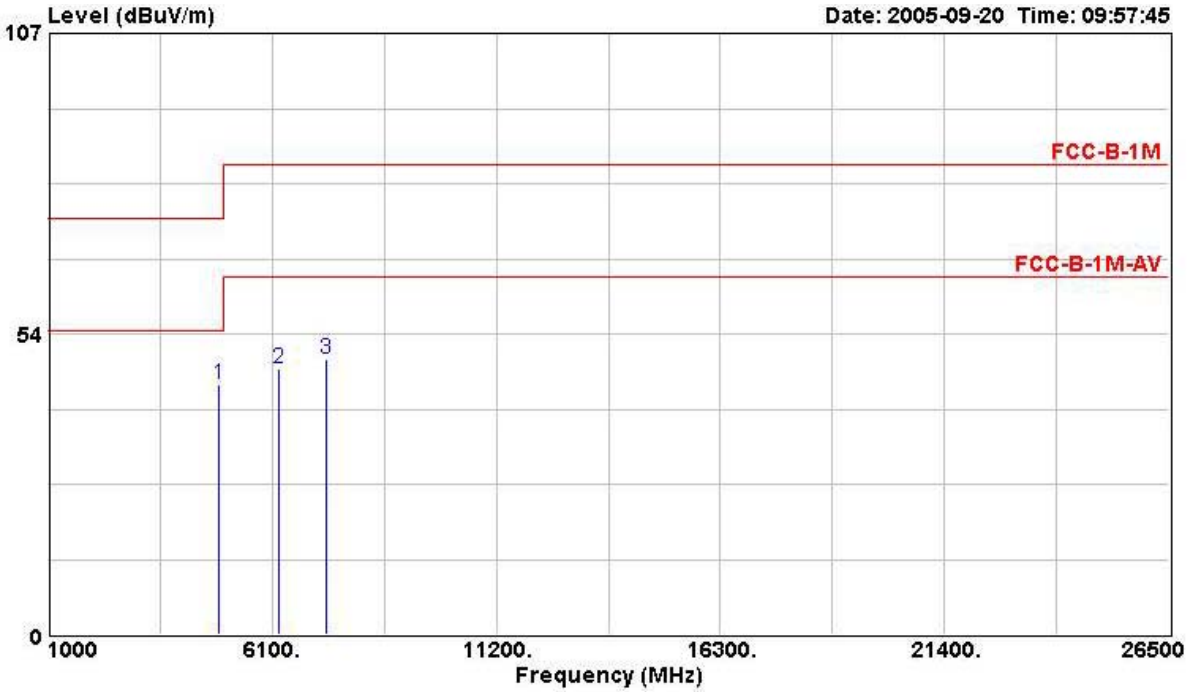
Test Mode	802.11g / ch 6		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	4874.000	44.08	-29.92	40.31	74.00	3.11	33.21	32.55	PEAK	---	---
2	6608.000	47.68	-35.86	41.56	83.54	3.94	34.53	32.35	PEAK	---	---
3	7311.000	48.12	-35.42	40.47	83.54	4.06	36.14	32.56	PEAK	---	---

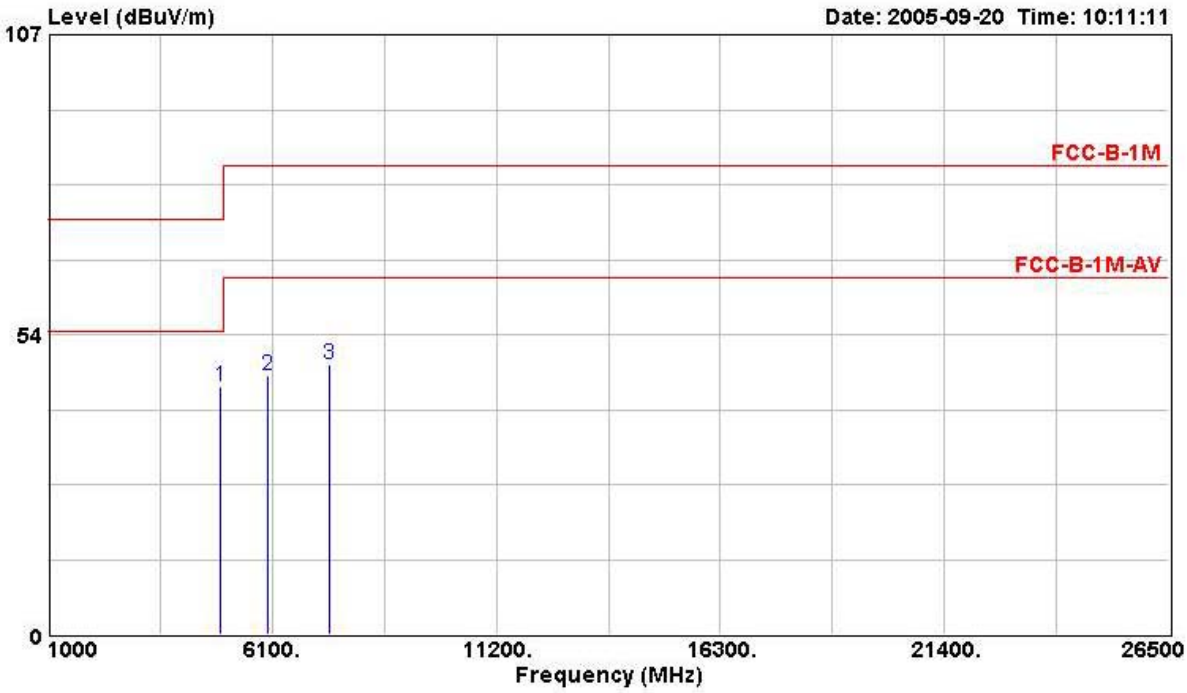
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	4874.000	44.37	-29.63	40.59	74.00	3.11	33.21	32.55	PEAK	---	---
2	6236.000	47.27	-36.27	41.71	83.54	3.74	34.30	32.48	PEAK	---	---
3	7311.000	49.08	-34.46	41.44	83.54	4.06	36.14	32.56	PEAK	---	---

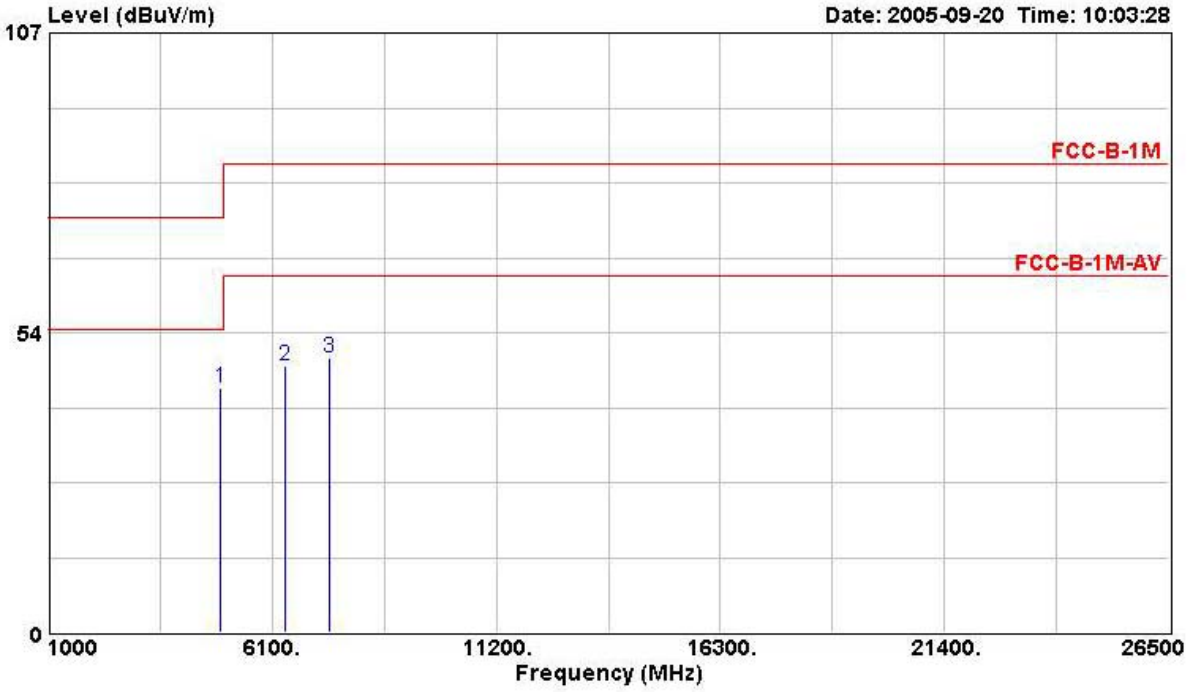
Test Mode	802.11g / ch 11		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	Brick

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	4924.000	44.25	-29.75	40.39	74.00	3.12	33.29	32.55	PEAK	---	---
2	6012.000	46.27	-37.27	40.84	83.54	3.62	34.30	32.50	PEAK	---	---
3	7386.000	48.12	-35.42	40.45	83.54	4.03	36.35	32.71	PEAK	---	---

Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	4924.000	43.72	-30.28	39.86	74.00	3.12	33.29	32.55	PEAK	---	---
2	6392.000	47.47	-36.07	41.82	83.54	3.81	34.30	32.47	PEAK	---	---
3	7386.000	48.87	-34.67	41.20	83.54	4.03	36.35	32.71	PEAK	---	---

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

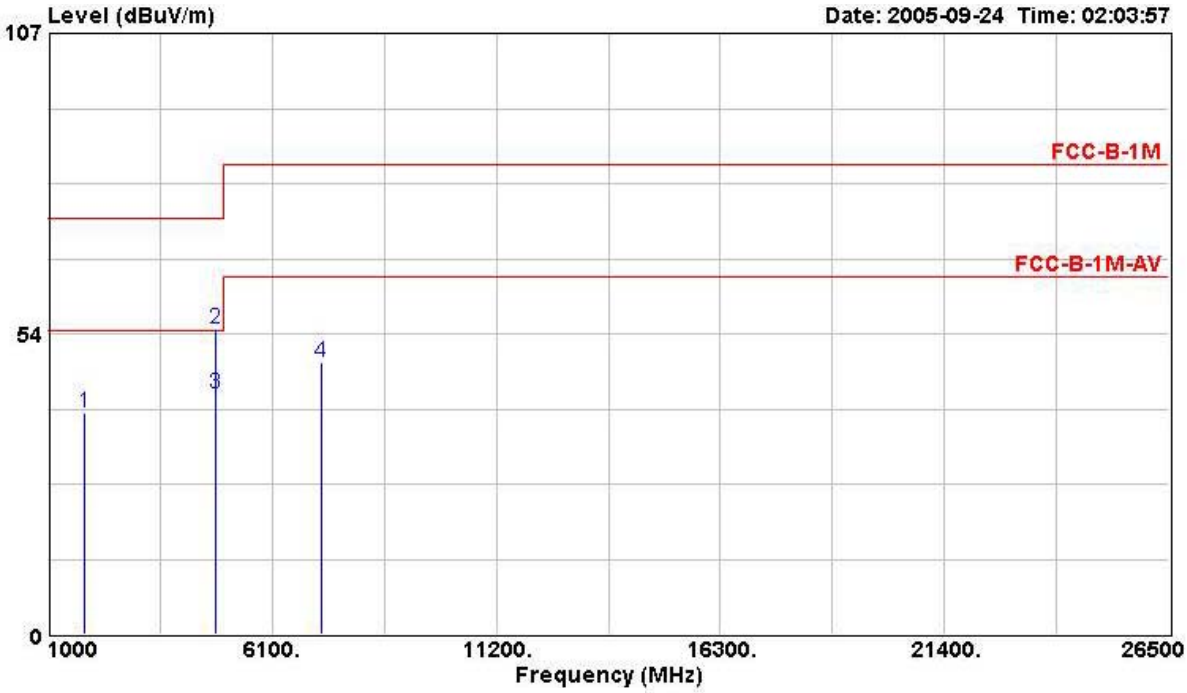
The limits above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

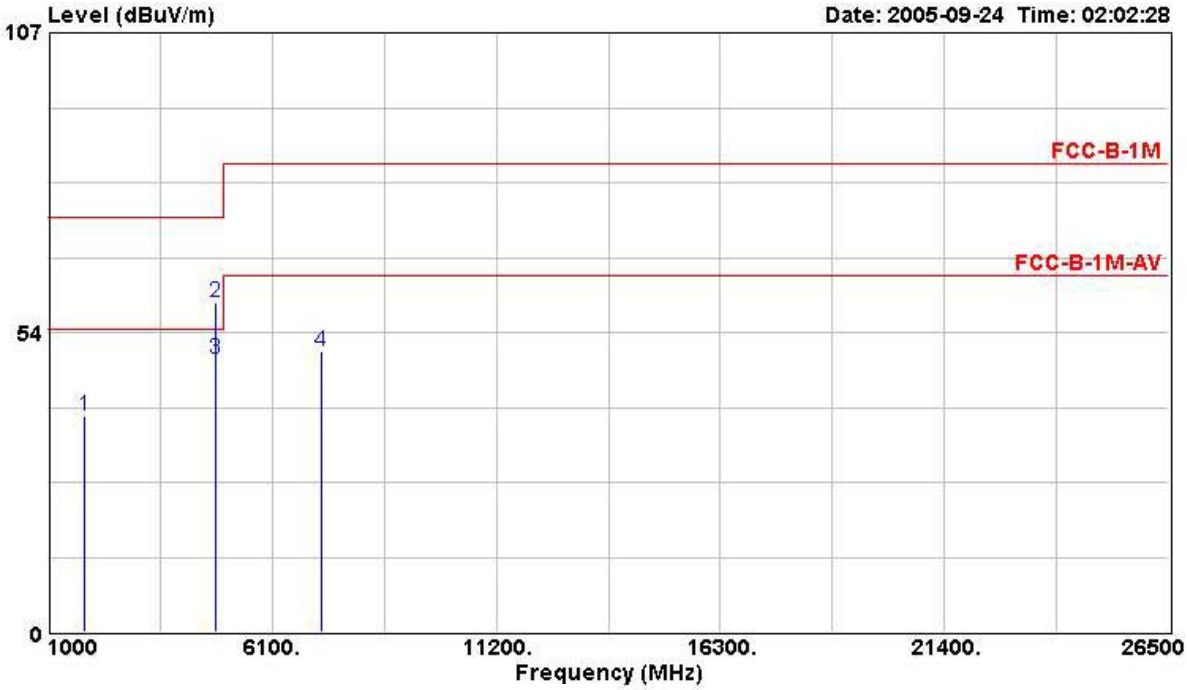
Test Mode	802.11b / ch 1		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1812.000	39.37	-34.63	43.63	74.00	1.86	26.69	32.81	Peak	---	---
2	4824.000	54.23	-19.77	50.55	74.00	3.10	33.12	32.54	PEAK	---	---
3 @	4824.000	42.69	-11.31	39.01	54.00	3.10	33.12	32.54	Average	---	---
4	7236.000	48.49	-35.05	40.88	83.54	4.09	35.98	32.46	PEAK	---	---

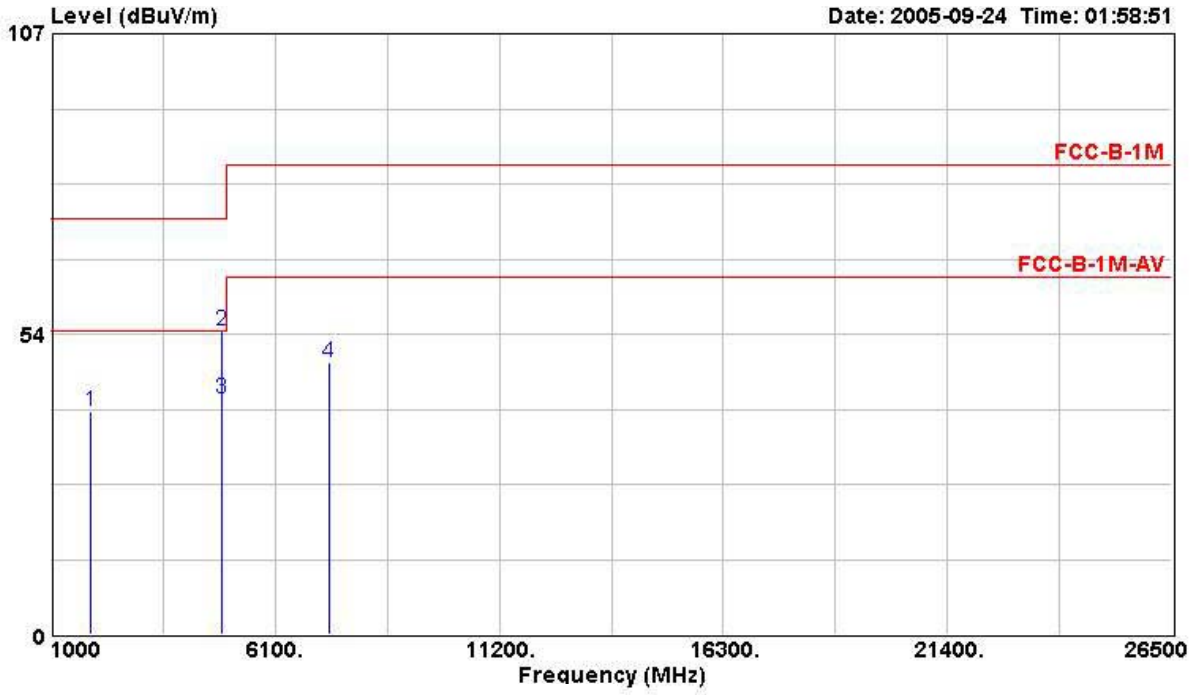
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1812.000	38.66	-35.34	42.92	74.00	1.86	26.69	32.81	Peak	---	---
2	4824.000	58.80	-15.20	55.12	74.00	3.10	33.12	32.54	PEAK	---	---
3 @	4824.000	48.78	-5.22	45.10	54.00	3.10	33.12	32.54	Average	---	---
4	7236.000	50.00	-33.54	42.39	83.54	4.09	35.98	32.46	PEAK	---	---

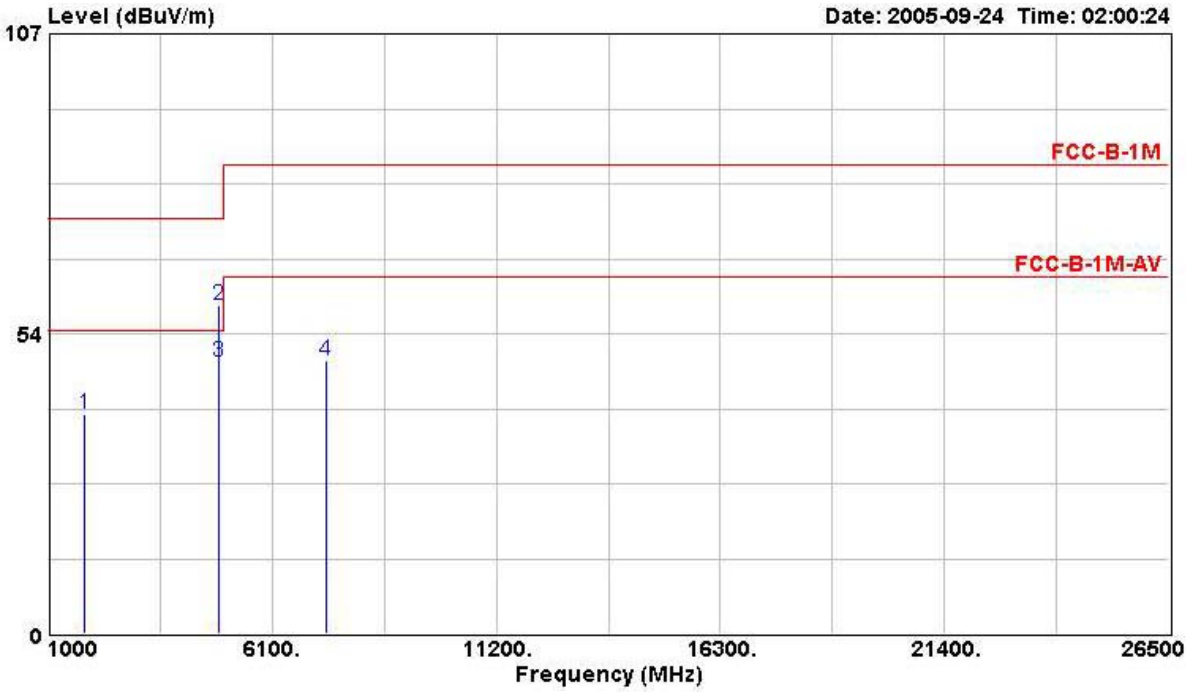
Test Mode	802.11b / ch 6		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1882.000	39.82	-34.18	43.65	74.00	1.94	26.99	32.76	Peak	---	---
2	4876.000	54.08	-19.92	50.30	74.00	3.11	33.21	32.55	PEAK	---	---
3	4876.000	42.08	-11.92	38.31	54.00	3.11	33.21	32.55	Average	---	---
4	7312.000	48.48	-35.06	40.88	83.54	4.06	36.14	32.61	PEAK	---	---

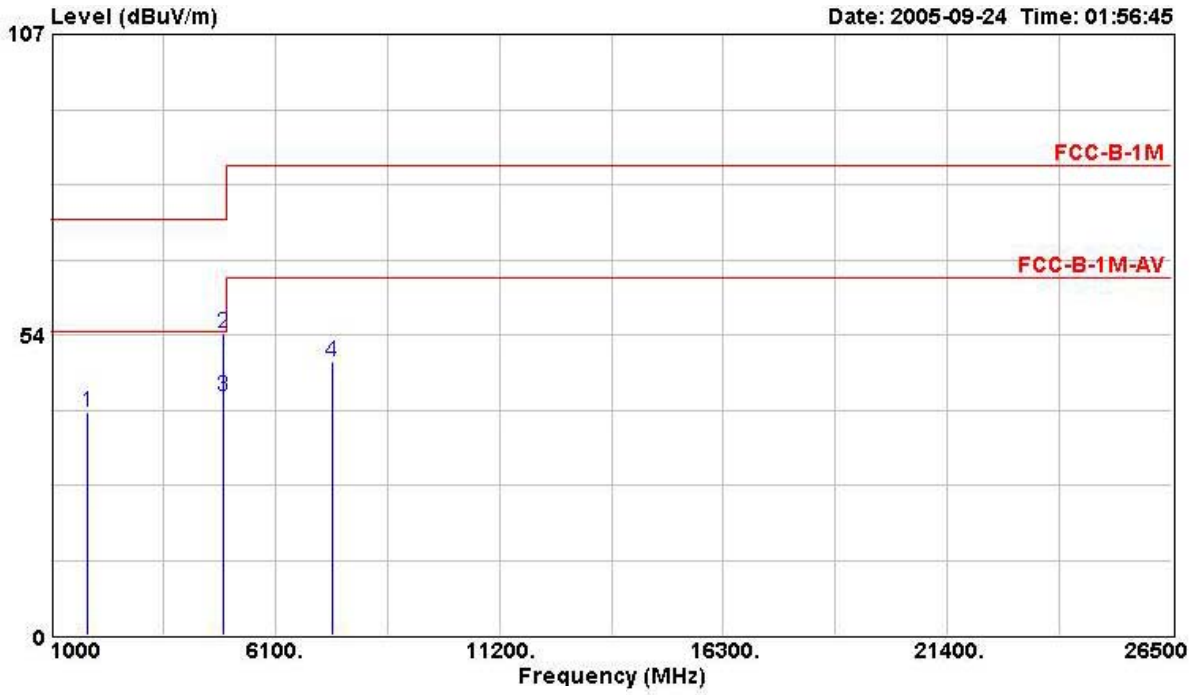
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1812.000	39.24	-34.76	43.50	74.00	1.86	26.69	32.81	Peak	---	---
2	4876.000	58.71	-15.29	54.93	74.00	3.11	33.21	32.55	PEAK	---	---
3 @	4876.000	48.39	-5.61	44.62	54.00	3.11	33.21	32.55	Average	---	---
4	7312.000	48.75	-34.79	41.15	83.54	4.06	36.14	32.61	PEAK	---	---

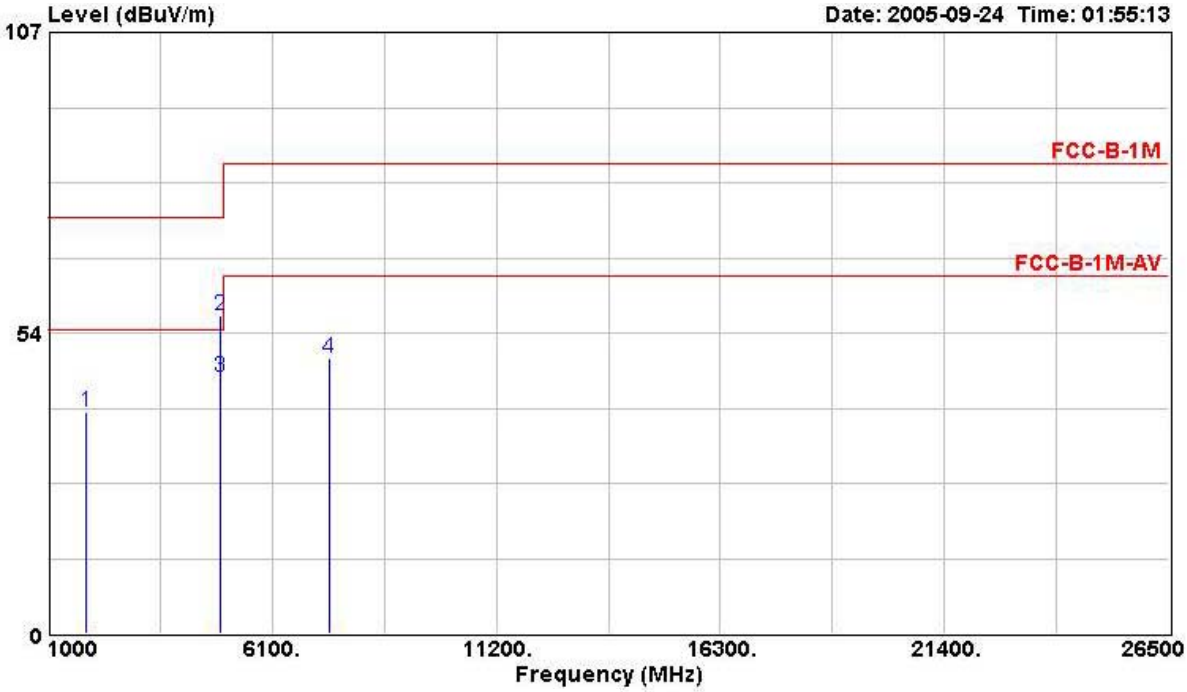
Test Mode	802.11b / ch 11		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1812.000	39.59	-34.41	43.85	74.00	1.86	26.69	32.81	Peak	---	---
2	4924.000	53.77	-20.23	49.91	74.00	3.12	33.29	32.55	PEAK	---	---
3	4924.000	42.67	-11.33	38.81	54.00	3.12	33.29	32.55	Average	---	---
4	7392.000	48.77	-34.77	41.15	83.54	4.03	36.35	32.76	PEAK	---	---

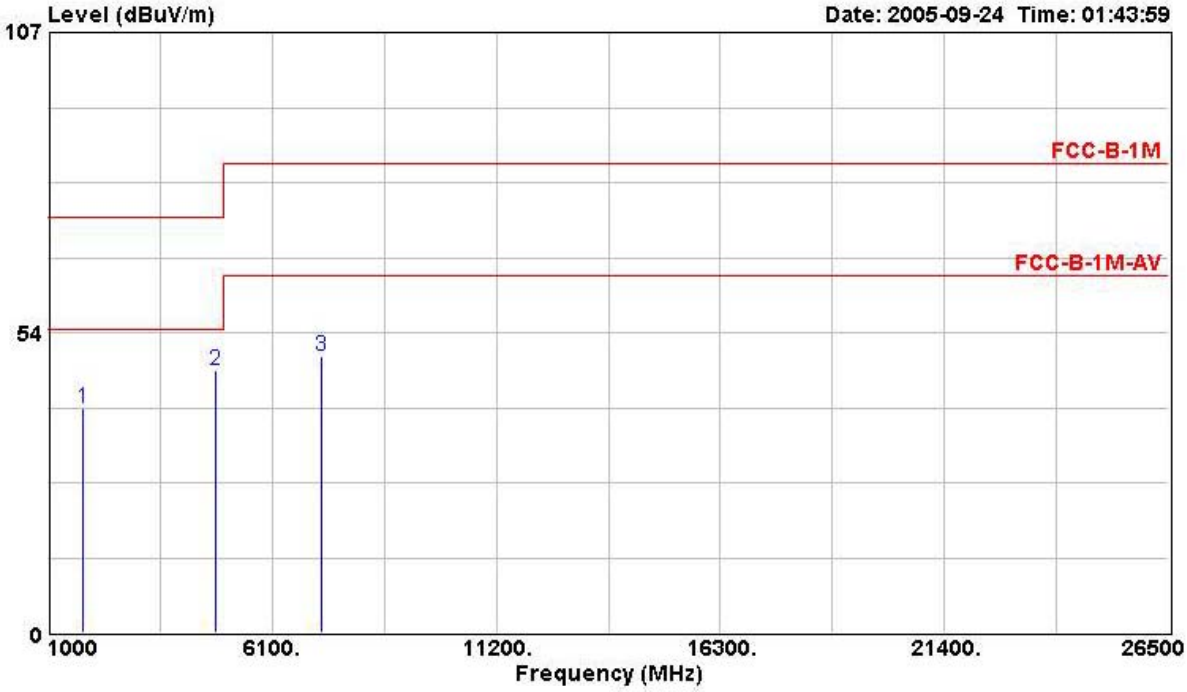
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1878.000	39.49	-34.51	43.34	74.00	1.94	26.99	32.77	Peak	---	---
2	4924.000	56.58	-17.42	52.72	74.00	3.12	33.29	32.55	PEAK	---	---
3 @	4924.000	45.68	-8.32	41.82	54.00	3.12	33.29	32.55	Average	---	---
4	7392.000	49.08	-34.46	41.46	83.54	4.03	36.35	32.76	PEAK	---	---

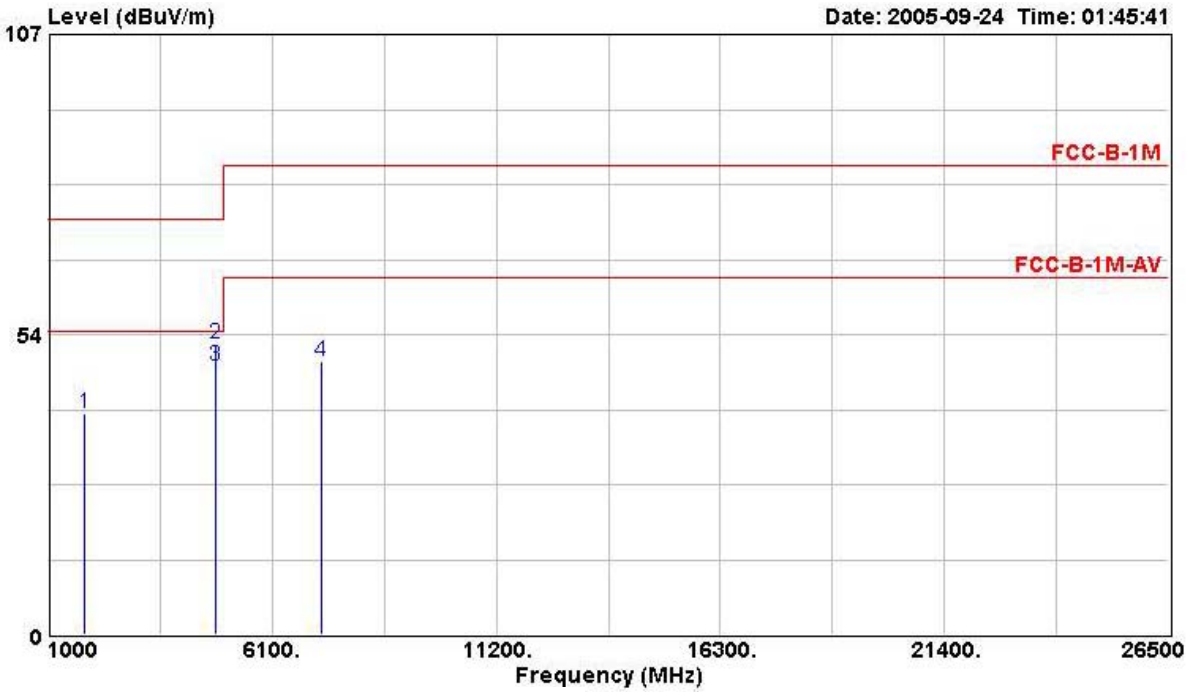
Test Mode	802.11g / ch 1		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1806.000	40.05	-33.95	44.38	74.00	1.86	26.62	32.81	Peak	---	---
2	4828.000	46.66	-27.34	42.98	74.00	3.10	33.12	32.54	PEAK	---	---
3	7236.000	49.41	-34.13	41.80	83.54	4.09	35.98	32.46	PEAK	---	---

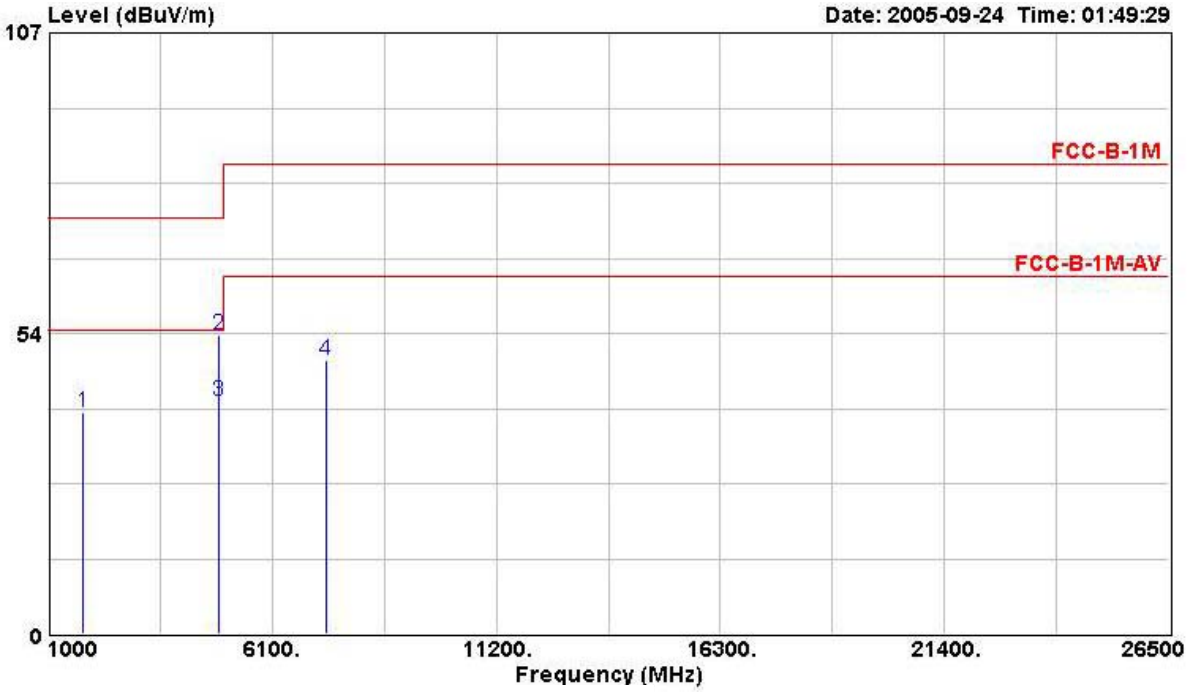
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1812.000	39.50	-34.50	43.76	74.00	1.86	26.69	32.81	Peak	---	---
2	4824.000	51.92	-22.08	48.24	74.00	3.10	33.12	32.54	PEAK	---	---
3 @	4824.000	47.78	-6.22	44.10	54.00	3.10	33.12	32.54	Average	---	---
4	7236.000	48.64	-34.90	41.03	83.54	4.09	35.98	32.46	PEAK	---	---

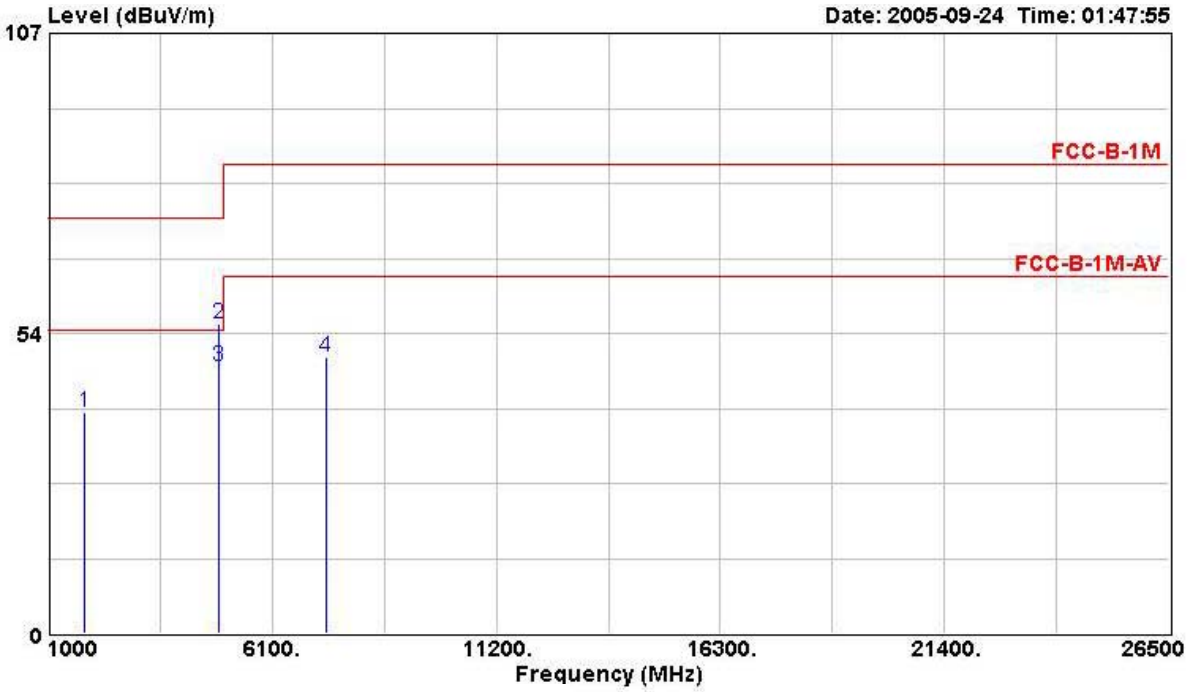
Test Mode	802.11g / ch 6		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1806.000	39.56	-34.44	43.89	74.00	1.86	26.62	32.81	Peak	---	---
2	4872.000	53.11	-20.89	49.34	74.00	3.11	33.21	32.55	PEAK	---	---
3	4872.000	41.34	-12.66	37.57	54.00	3.11	33.21	32.55	Average	---	---
4	7312.000	48.75	-34.79	41.15	83.54	4.06	36.14	32.61	PEAK	---	---

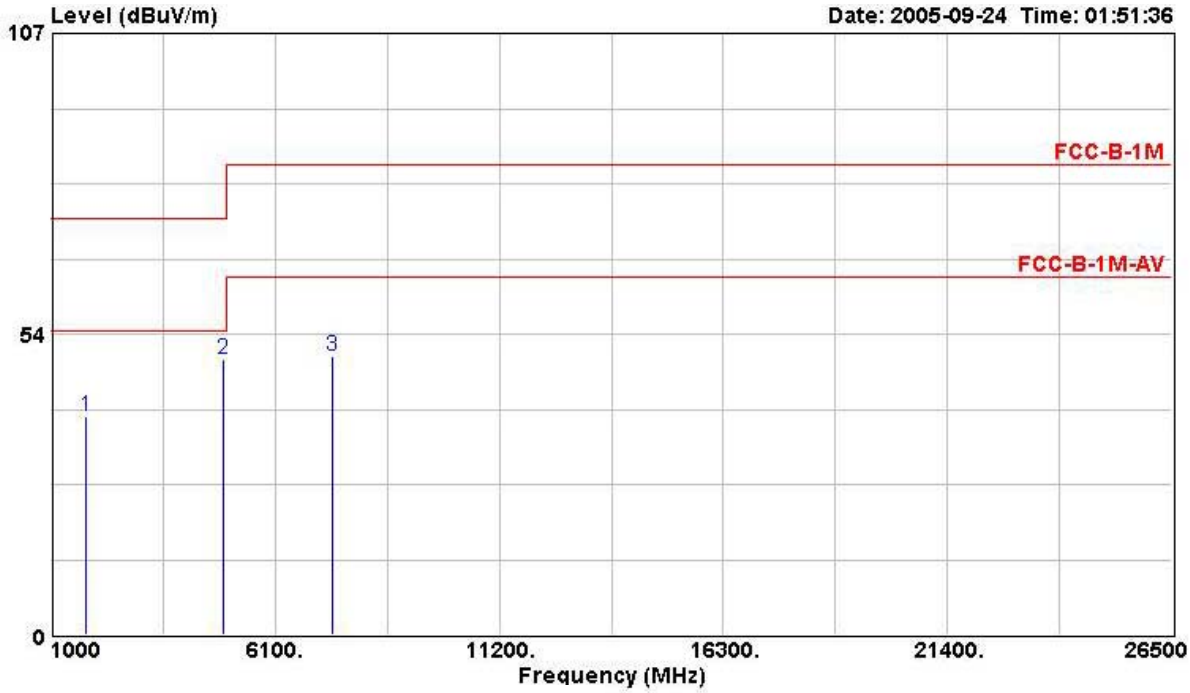
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1812.000	39.36	-34.64	43.62	74.00	1.86	26.69	32.81	Peak	---	---
2	4876.000	55.22	-18.78	51.44	74.00	3.11	33.21	32.55	PEAK	---	---
3 @	4876.000	47.69	-6.31	43.92	54.00	3.11	33.21	32.55	Average	---	---
4	7312.000	49.36	-34.18	41.76	83.54	4.06	36.14	32.61	PEAK	---	---

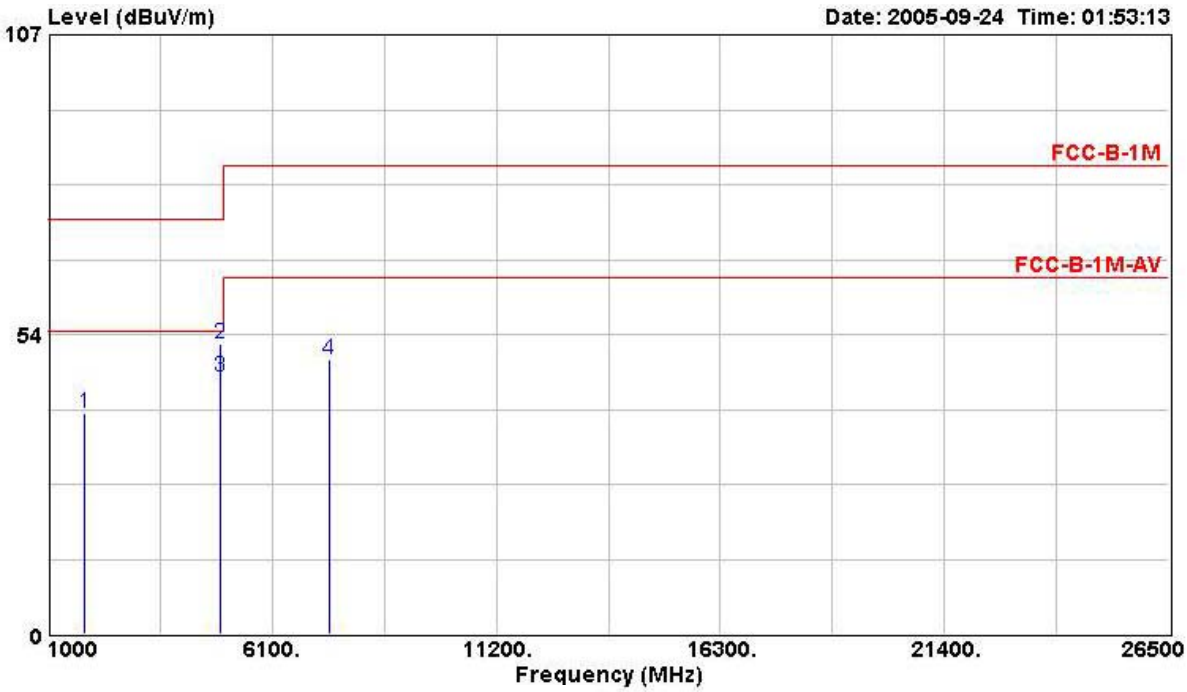
Test Mode	802.11g / ch 11		
Temperature	28℃	Humidity	54%
Test Engineer	Ted Chiu	Configurations	GUN type

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1806.000	38.97	-35.03	43.30	74.00	1.86	26.62	32.81	Peak	---	---
2	4928.000	48.88	-25.12	45.02	74.00	3.12	33.29	32.55	PEAK	---	---
3	7392.000	49.61	-33.93	41.99	83.54	4.03	36.35	32.76	PEAK	---	---

Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1822.000	39.57	-34.43	43.83	74.00	1.86	26.69	32.81	Peak	---	---
2	4924.000	51.85	-22.15	47.99	74.00	3.12	33.29	32.55	PEAK	---	---
3 @	4924.000	45.97	-8.03	42.11	54.00	3.12	33.29	32.55	Average	---	---
4	7392.000	49.04	-34.50	41.42	83.54	4.03	36.35	32.76	PEAK	---	---

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

The limits above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

4.6. Band Edge Emissions Measurement

4.6.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.6.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	100 KHz /100 KHz for Peak

4.6.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the freqeuncy range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

4.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Test Result of Band Edge Emissions

For Emission in Restricted Band

Test Mode	802.11b / ch 1		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	Brick

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2390.000	64.48	-9.52	33.99	74.00	2.28	28.21	0.00	Peak	---	---
2390.000	51.88	-2.12	21.39	54.00	2.28	28.21	0.00	Average	---	---

Test Mode	802.11b / ch 11		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	Brick

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2483.500	65.09	-8.91	34.38	74.00	2.34	28.37	0.00	Peak	---	---
2486.130	51.95	-2.05	21.24	54.00	2.34	28.37	0.00	Average	---	---

Test Mode	802.11g / ch 1		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	Brick

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2390.000	48.33	-5.67	17.84	54.00	2.28	28.21	0.00	Average	---	---
2390.000	63.41	-10.59	32.92	74.00	2.28	28.21	0.00	Peak	---	---

Test Mode	802.11g / ch 11		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	Brick

Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2483.500	63.75	-10.25	33.04	74.00	2.34	28.37	0.00	Peak	---	---
2483.500	49.79	-4.21	19.08	54.00	2.34	28.37	0.00	Average	---	---

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Receiving maximum band edge emissions is Vertical.

For Emission in Restricted Band

Test Mode	802.11b / ch 1		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	GUN Type

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	2390.000	63.74	-10.26	33.25	74.00	2.28	28.21	0.00	Peak	---	---
1 @	2390.000	51.35	-2.65	20.86	54.00	2.28	28.21	0.00	Average	---	---

Test Mode	802.11b / ch 11		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	GUN Type

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2 @	2483.500	65.26	-8.74	34.55	74.00	2.34	28.37	0.00	Peak	---	---
2 @	2483.500	51.68	-2.32	20.97	54.00	2.34	28.37	0.00	Average	---	---

Test Mode	802.11g / ch 1		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	GUN Type

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	2390.000	65.53	-8.47	35.04	74.00	2.28	28.21	0.00	Peak	---	---
1 @	2390.000	49.97	-4.03	19.48	54.00	2.28	28.21	0.00	Average	---	---

Test Mode	802.11g / ch 11		
Temperature	20℃	Humidity	60%
Test Engineer	Ted Chiu	Configurations	GUN Type

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2 @	2483.500	68.30	-5.70	37.59	74.00	2.34	28.37	0.00	Peak	---	---
2 @	2483.500	52.91	-1.09	22.20	54.00	2.34	28.37	0.00	Average	---	---

Note:

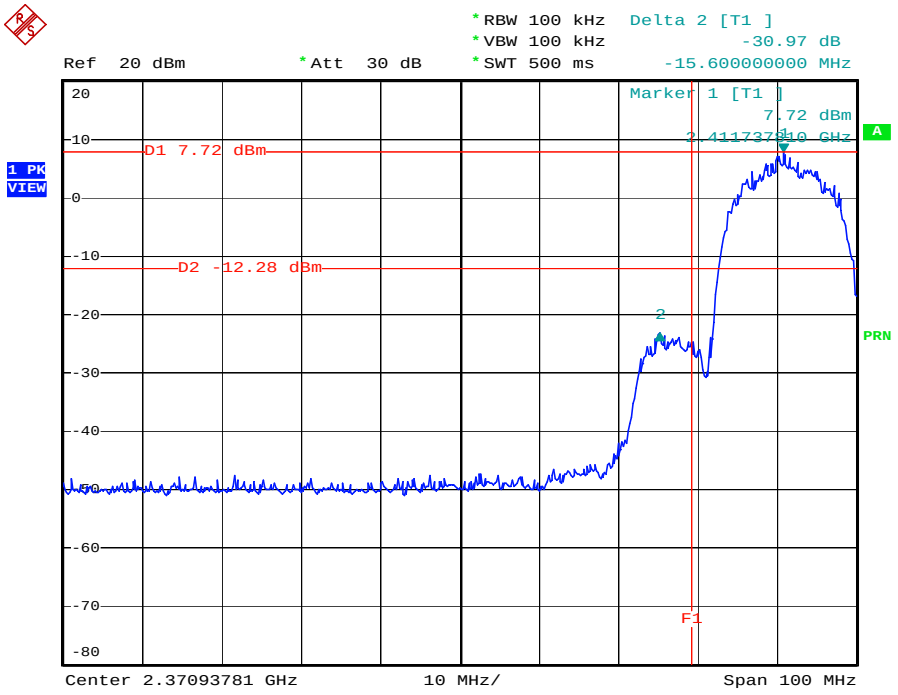
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Receiving maximum band edge emissions is Vertical.

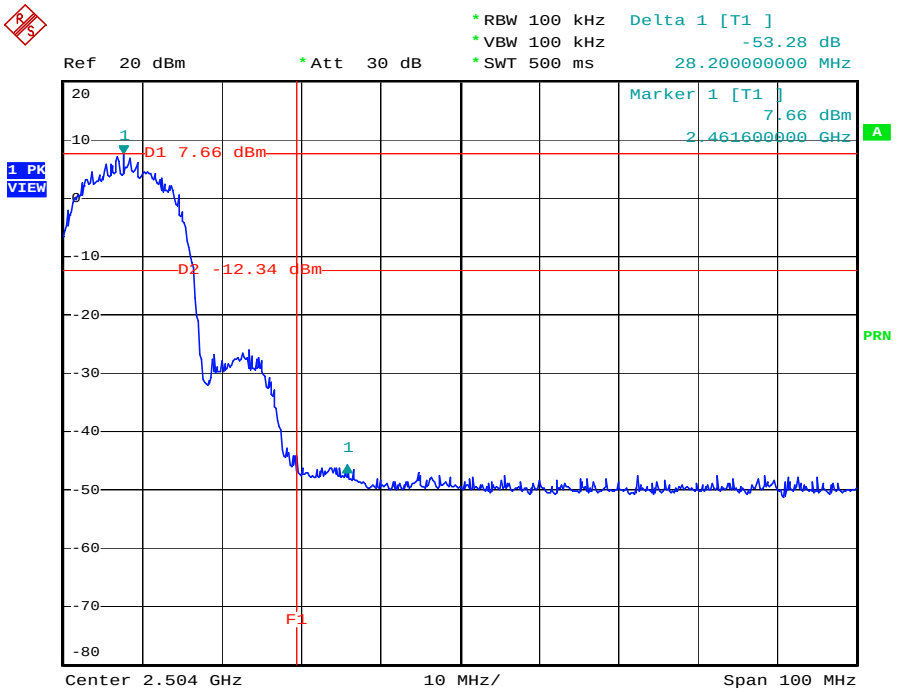
For Emission not in Restricted Band

Low Band Edge Plot on Configuration IEEE 802.11b / 2412 MHz



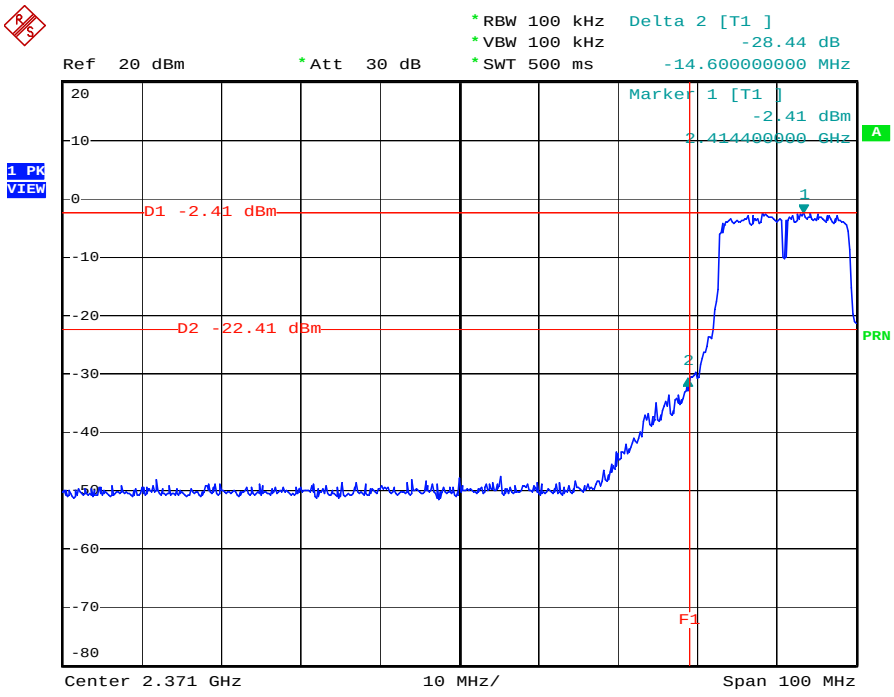
Date: 14.SEP.2005 11:14:47

High Band Edge Plot on Configuration IEEE 802.11b / 2462 MHz



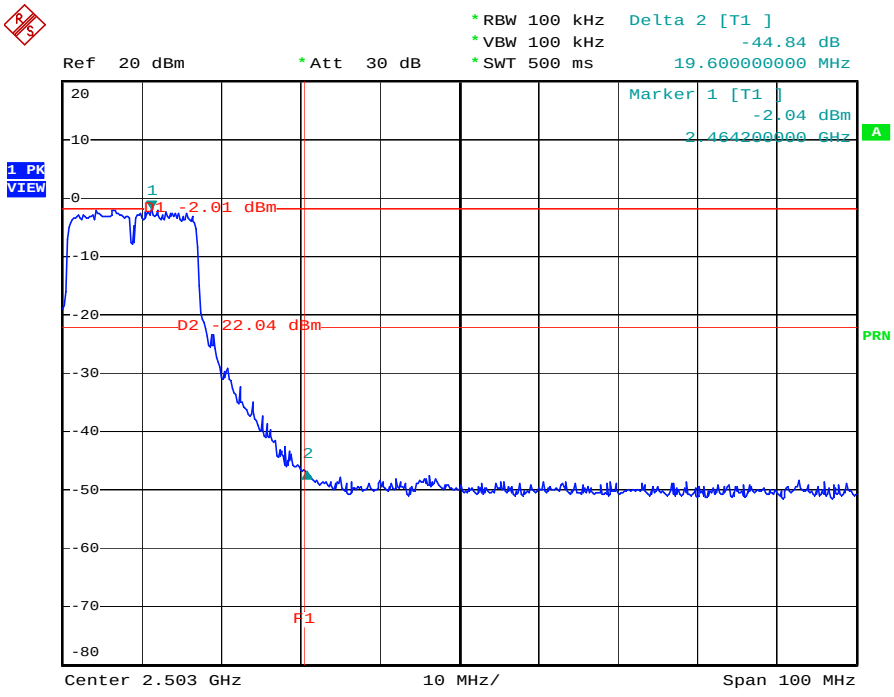
Date: 14.SEP.2005 11:22:28

Low Band Edge Plot on Configuration IEEE 802.11g / 2412 MHz



Date: 14.SEP.2005 11:28:26

High Band Edge Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 14.SEP.2005 11:36:24

4.7. Antenna Requirements

4.7.1. Limit

Standard antenna jack or electrical connector is prohibited, but this requirement does not apply to intentional radiators that must be professionally installed.

4.7.2. Antenna Connector Construction

Please refer to section 3.3 in this test report, all antenna connectors comply with the requirements.

5. TEST RESULT-BLUETOOTH

5.1. AC Power Line Conducted Emissions Measurement

5.1.1. Limit

For a Low-power Radio-frequency Device which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

5.1.2. Measuring Instruments and Setting

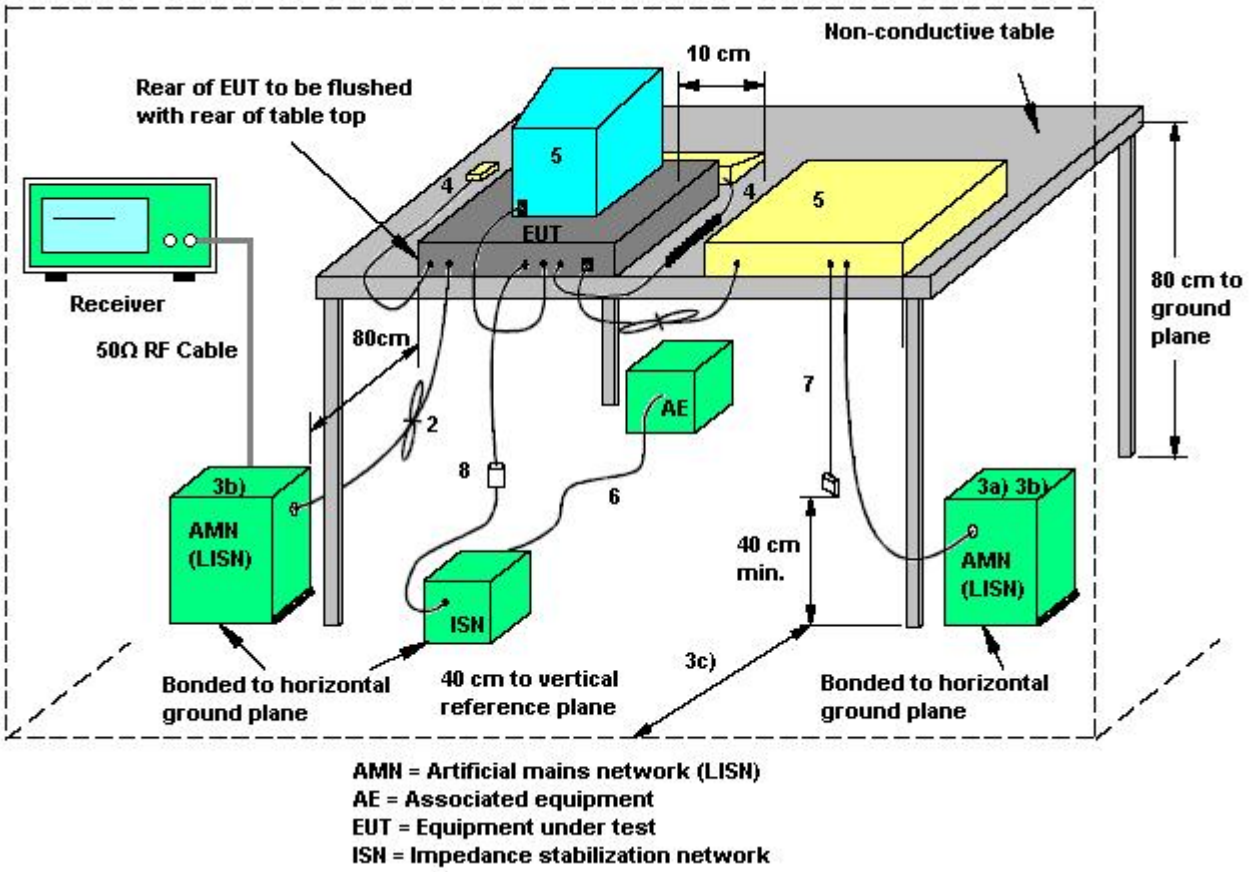
Please refer to section 6 in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

5.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

5.1.4. Test Setup Layout



1. If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
2. Excess mains cord shall be bundled in the centre or shortened to appropriate length.
3. EUT is connected to one artificial mains network (AMN). All AMNs and ISNs may alternatively be connected to a vertical reference plane or metal wall.
4. All other units of a system are powered from a second AMN. A multiple outlet strip can be used for multiple mains cords.
5. AMN and ISN are 80 cm from the EUT and at least 80 cm from other units and other metal planes.
6. Mains cords and signal cables shall be positioned for their entire lengths, as far as possible, at 40 cm from the vertical reference plane.
7. Cables of hand operated devices, such as keyboards, mouses, etc. shall be placed as for normal usage.
8. Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if this is an acceptable installation practice, shall be placed directly on the top of the controller.
9. I/O signal cable intended for external connection.
10. The end of the I/O signal cables which are not connected to an AE may be terminated, if required, using correct terminating impedance.
11. If used, the current probe shall be placed at 0,1 m from the ISN.

5.1.5. Test Deviation

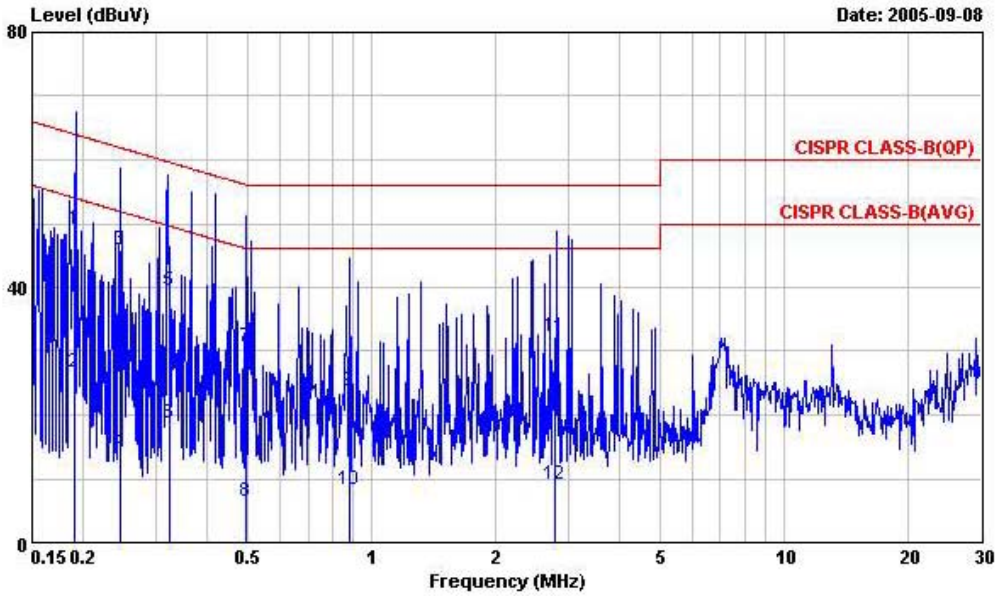
There are no deviations with the original standard.

5.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

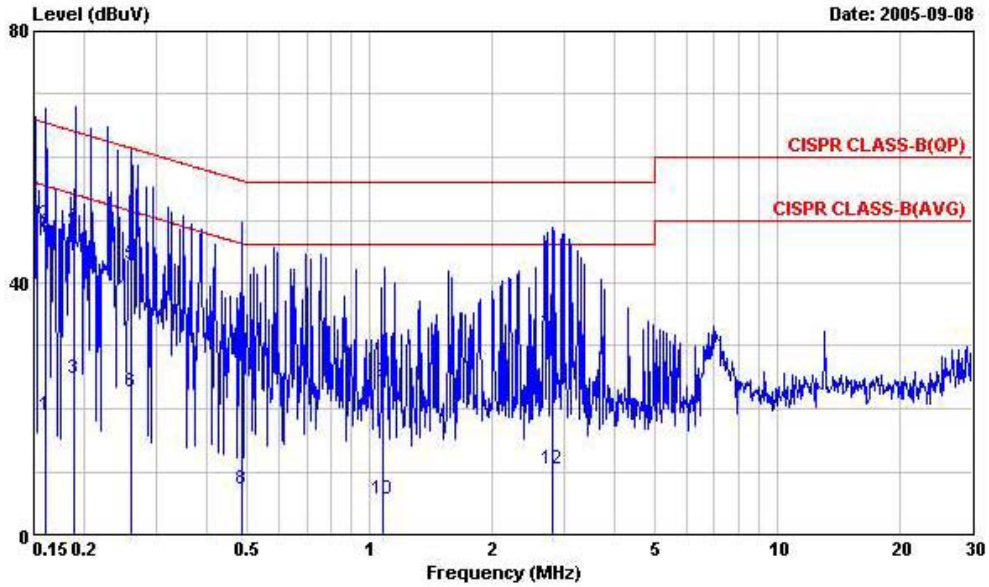
5.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	20℃	Humidity	70%
Test Engineer	Sky Wu	Phase	Line
Configuration	Normal Link/Adapter 1		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Cable Loss	LISN Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	dB	
1 @	0.191	49.15	-14.84	63.99	49.00	0.15	0.05	0.10	QP
2	0.191	26.57	-27.42	53.99	26.42	0.15	0.05	0.10	Average
3	0.246	45.83	-16.06	61.89	45.63	0.20	0.10	0.10	QP
4	0.246	14.24	-37.65	51.89	14.04	0.20	0.10	0.10	Average
5	0.322	39.52	-20.14	59.66	39.42	0.10	0.00	0.10	QP
6	0.322	18.59	-31.07	49.66	18.49	0.10	0.00	0.10	Average
7	0.494	30.70	-25.40	56.10	30.60	0.10	0.00	0.10	QP
8	0.494	6.45	-39.65	46.10	6.35	0.10	0.00	0.10	Average
9	0.885	23.65	-32.35	56.00	23.47	0.18	0.08	0.10	QP
10	0.885	8.28	-37.72	46.00	8.10	0.18	0.08	0.10	Average
11	2.790	32.36	-23.64	56.00	32.11	0.25	0.10	0.15	QP
12	2.790	8.98	-37.02	46.00	8.73	0.25	0.10	0.15	Average

Temperature	20℃	Humidity	70%
Test Engineer	Sky Wu	Phase	Neutral
Configuration	Normal Link/Adapter 1		



	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Cable Loss	LISN Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	dB	
1	0.161	18.84	-36.57	55.41	18.74	0.10	0.00	0.10	Average
2	0.161	49.42	-15.99	65.41	49.32	0.10	0.00	0.10	QP
3	0.189	24.71	-29.37	54.08	24.56	0.15	0.05	0.10	Average
4	0.189	49.03	-15.05	64.08	48.88	0.15	0.05	0.10	QP
5	0.259	42.92	-18.54	61.46	42.77	0.15	0.05	0.10	QP
6	0.259	22.65	-28.81	51.46	22.50	0.15	0.05	0.10	Average
7	0.484	29.24	-27.03	56.27	29.14	0.10	0.00	0.10	QP
8	0.484	7.07	-39.20	46.27	6.97	0.10	0.00	0.10	Average
9	1.080	24.19	-31.81	56.00	24.01	0.18	0.08	0.10	QP
10	1.080	5.48	-40.52	46.00	5.30	0.18	0.08	0.10	Average
11	2.810	32.30	-23.70	56.00	32.05	0.25	0.10	0.15	QP
12	2.810	10.40	-35.60	46.00	10.15	0.25	0.10	0.15	Average

Note:

Level = Read Level + LISN Factor + Cable Loss.

5.2. Maximum Peak Output Power Measurement

5.2.1. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, the limit for peak output power is 30dBm. The limited has to be

reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

5.2.2. Measuring Instruments and Setting

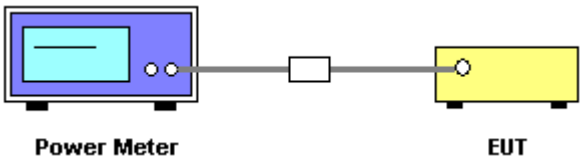
Please refer to section 6 in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Peak Sensor	NRV-Z32 (model 04)

5.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.

5.2.4. Test Setup Layout



5.2.5. Test Deviation

There are no deviation with the original standard.

5.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.7. Test Result of Maximum Peak Output Power

Temperature	20℃	Humidity	70%
Test Engineer	Sam Lee	Configurations	FHSS (GFSK)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
0	2402 MHz	-0.77	30.00	Complies
39	2441 MHz	0.26	30.00	Complies
78	2480 MHz	0.72	30.00	Complies

5.3. Hopping Channel Separation Measurement

5.3.1. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency

hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

5.3.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
3. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

5.3.4. Test Setup Layout

5.3.5. Test Deviation

There are no deviation with the original standard.

5.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

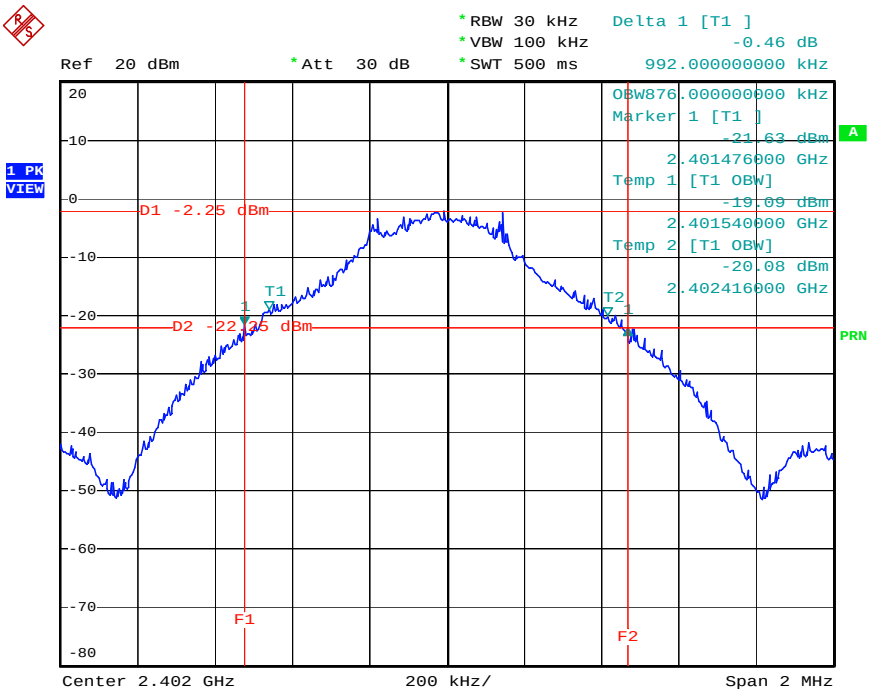
5.3.7. Test Result of Hopping Channel Separation

Temperature	20℃	Humidity	70%
Test Engineer	Sam Lee	Configurations	FHSS (GFSK)

Frequency	Ch. Separation (MHz)	20dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Result
2402 MHz	1.00	992.00	876.00	Complies
2441 MHz	1.00	972.00	872.00	Complies
2480 MHz	1.00	1000.00	884.00	Complies

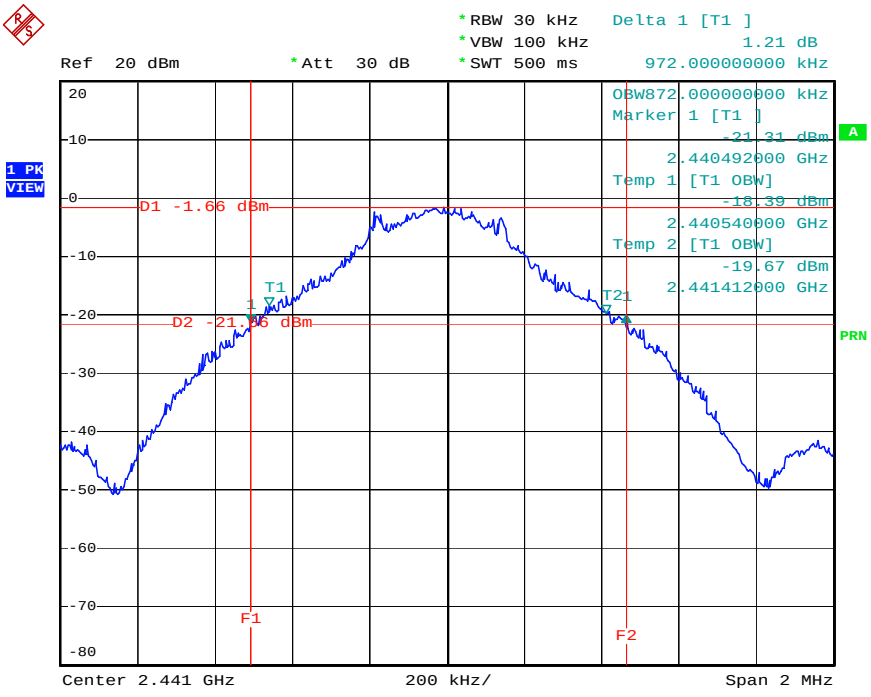
Ch. Separation Limits: >20dB bandwidth or >2/3 of 20dB bandwidth

20 dB Bandwidth Plot on Channel 0 / 2402 MHz



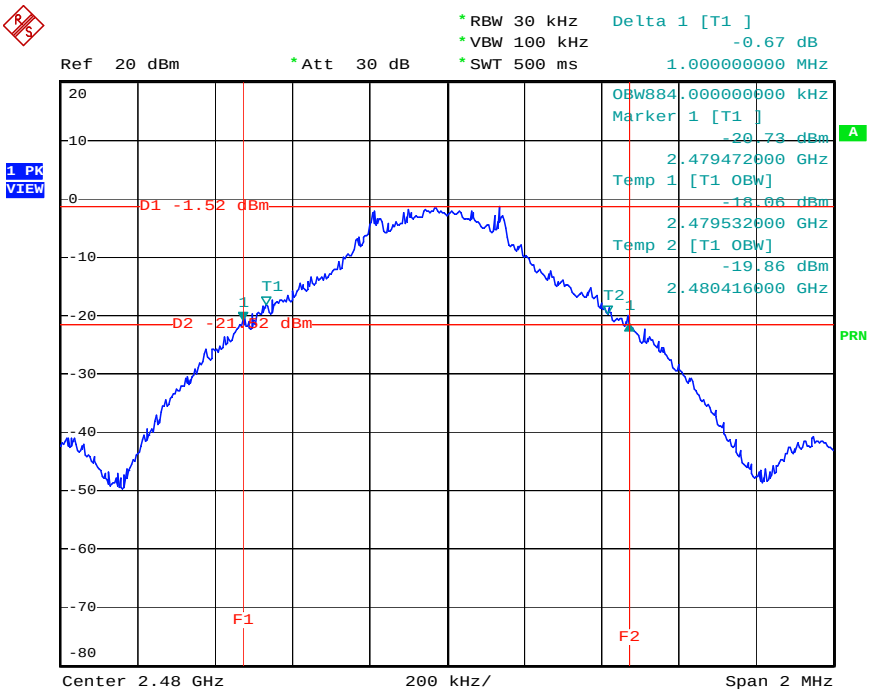
Date: 14.SEP.2005 12:11:01

20 dB Bandwidth Plot on Channel 39 / 2441 MHz



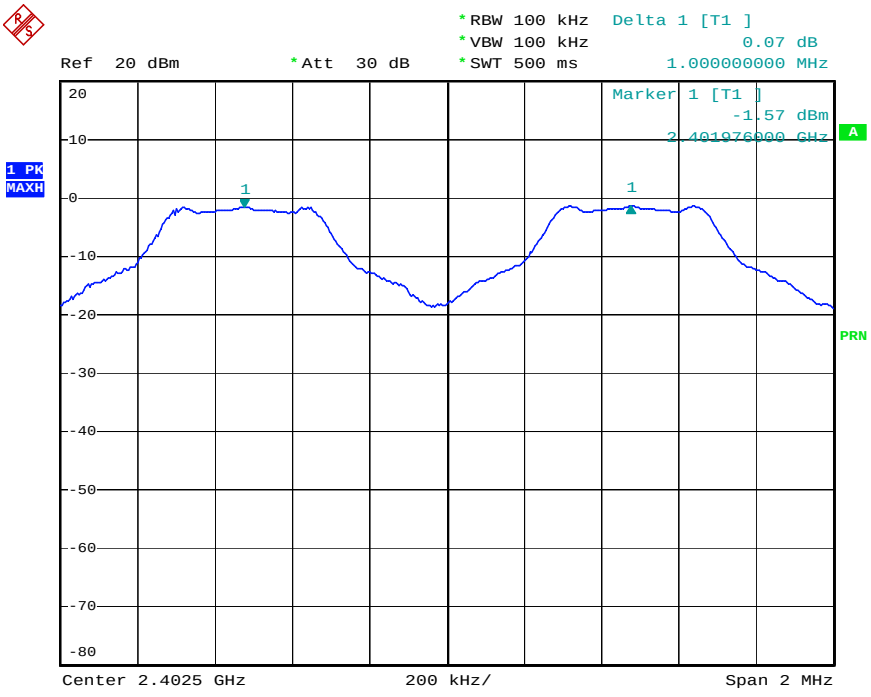
Date: 14.SEP.2005 12:05:01

20 dB Bandwidth Plot on Channel 78 / 2480 MHz



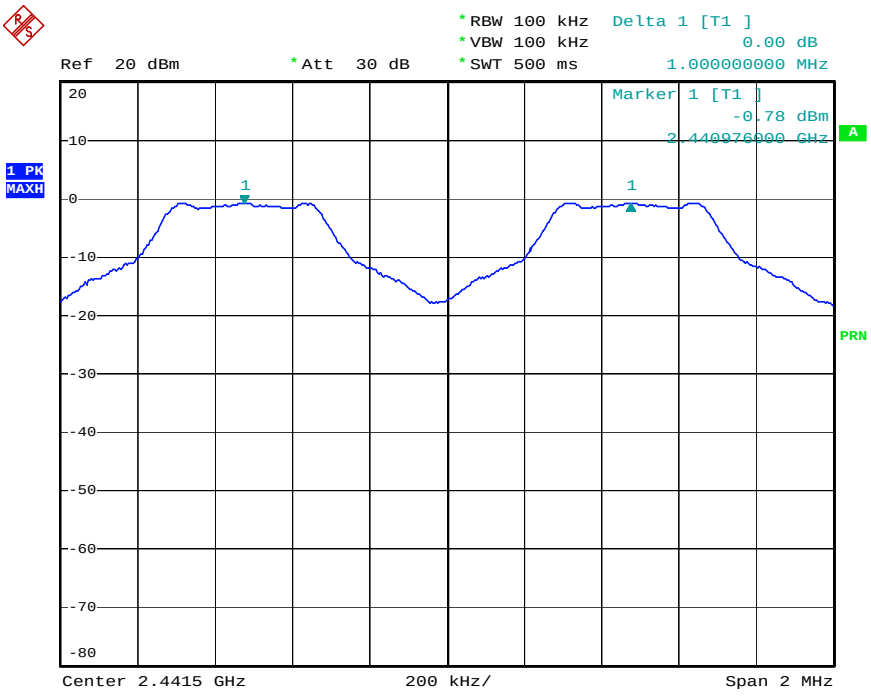
Date: 14.SEP.2005 12:12:38

Channel Separation Plot on Channel 0~1 / 2402 MHz ~ 2403 MHz



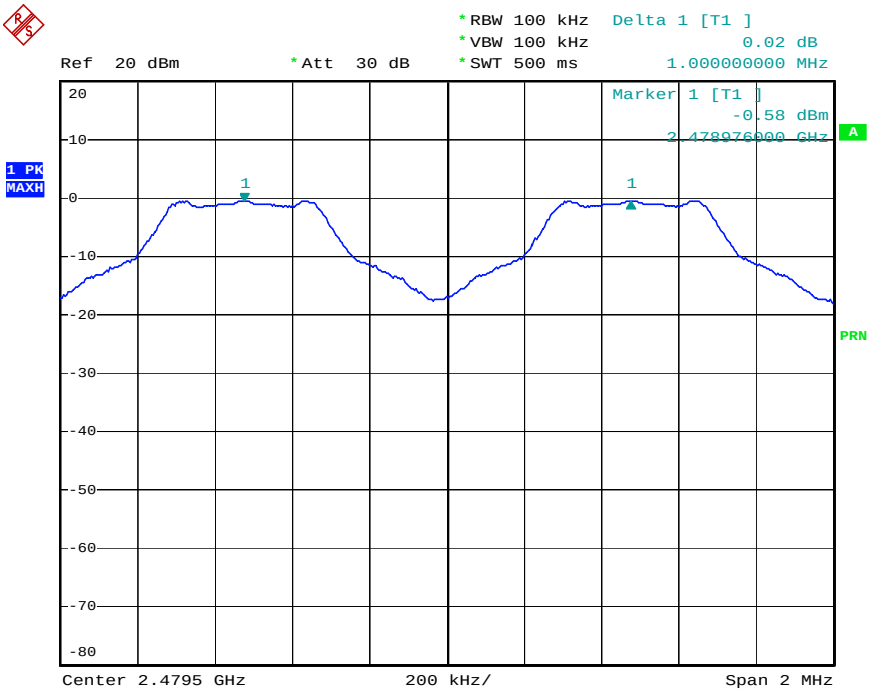
Date: 19.SEP.2005 10:33:53

Channel Separation Plot on Channel 39~40 / 2441 MHz ~ 2442 MHz



Date: 19.SEP.2005 10:36:38

Channel Separation Plot on Channel 77~78 / 2479 MHz ~ 2480 MHz



Date: 19.SEP.2005 10:38:32

5.4. Number of Hopping Frequency Measurement

5.4.1. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels.

5.4.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilised.
3. Observe frequency hopping in 2400MHz~2483.5MHz, there are at least 75 non-overlapping channels.

5.4.4. Test Setup Layout

5.4.5. Test Deviation

There are no deviations with the original standard.

5.4.6. EUT Operation during Test

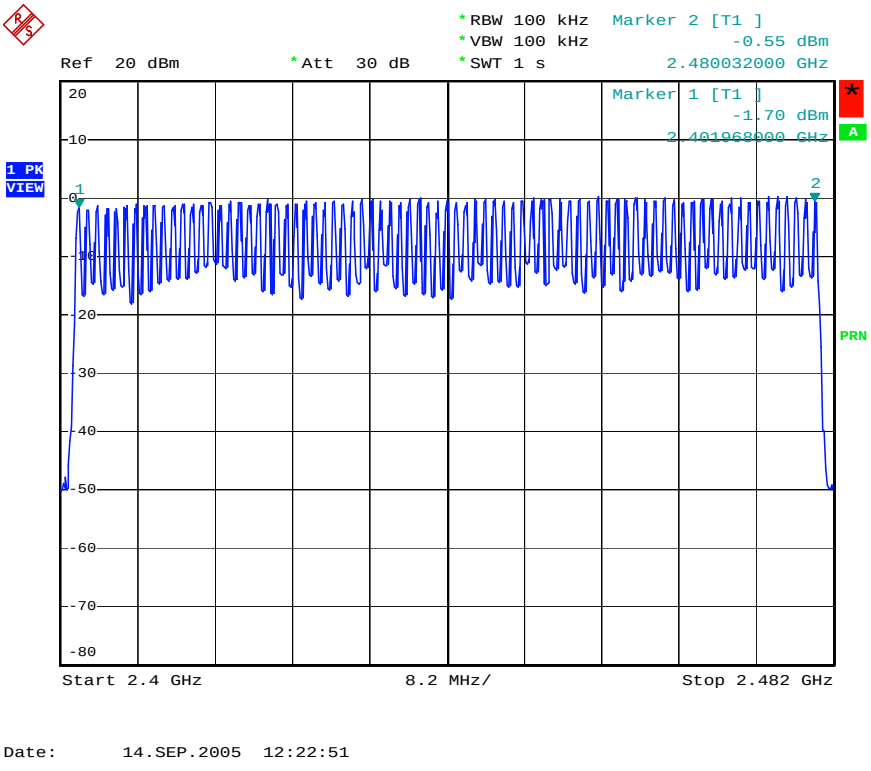
The EUT was programmed to be in continuously transmitting mode.

5.4.7. Test Result of Number of Hopping Frequency

Temperature	20℃	Humidity	70%
Test Engineer	Sam Lee	Configurations	FHSS (GFSK)

Modulation Type	Channel No.	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
GFSK	0 ~ 78	2402 ~ 2480	79	75	Complies

Number of Hopping Channel Plot on Channel 0~78 / 2402 MHz ~ 2480 MHz



5.5. Dwell Time Measurement

5.5.1. Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

5.5.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	0 MHz
RB	1000 kHz
VB	1000 kHz
Detector	Peak
Trace	Single Trigger

5.5.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser
2. Set RBW of spectrum analyzer to 1000kHz and VBW to 1000kHz.
3. Use a video trigger with the trigger level set to enable triggering only on full pulses.
4. Sweep Time is more than once pulse time.
5. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
6. Measure the maximum time duration of one single pulse.
7. Set the EUT for DH5, DH3 and DH1 packet transmitting.
8. Measure the maximum time duration of one single pulse.
9. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds
10. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
11. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.

5.5.4. Test Setup Layout

5.5.5. Test Deviation

There are no deviation with the original standard.

5.5.6. EUT Operation during Test

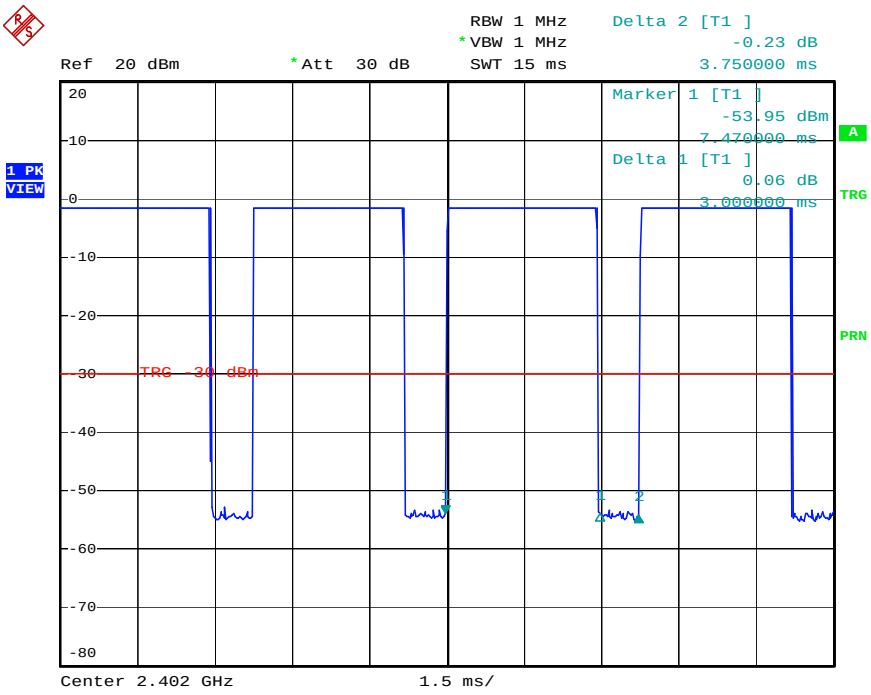
The EUT was programmed to be in continuously transmitting mode.

5.5.7. Test Result of Dwell Time

Temperature	20℃	Humidity	70%
Test Engineer	Sam Lee	Configurations	FHSS (GFSK)

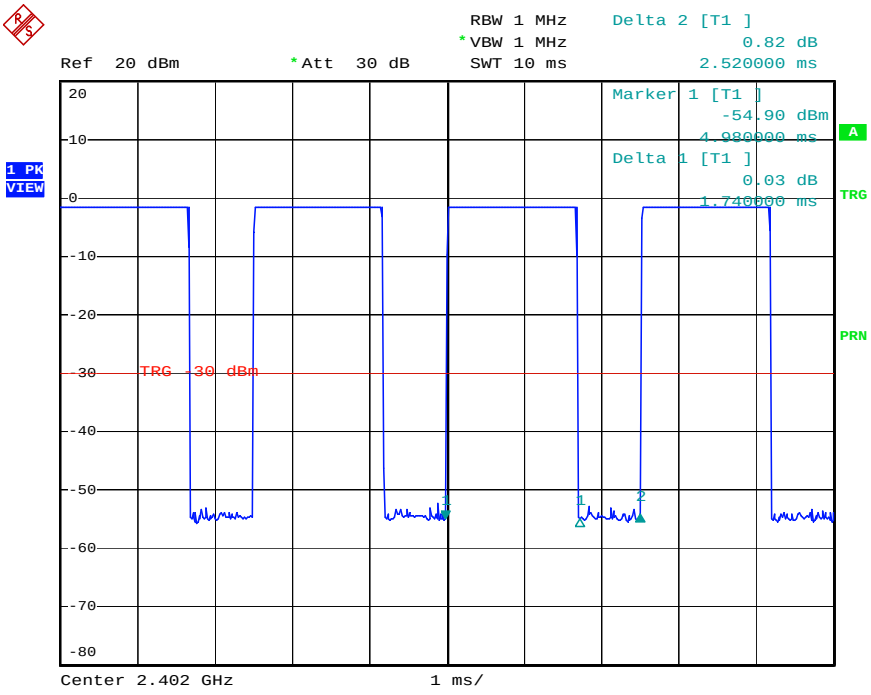
Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
DH5	2402 MHz	3.0000	0.3200	0.4000	Complies
DH3	2402 MHz	1.7400	0.2784	0.4000	Complies
DH1	2402 MHz	0.4800	0.1536	0.4000	Complies
DH5	2441 MHz	3.0000	0.3200	0.4000	Complies
DH3	2441 MHz	1.7400	0.2784	0.4000	Complies
DH1	2441 MHz	0.4800	0.1536	0.4000	Complies
DH5	2480 MHz	3.0000	0.3200	0.4000	Complies
DH3	2480 MHz	1.7400	0.2784	0.4000	Complies
DH1	2480 MHz	0.4800	0.1536	0.4000	Complies

DH5 Dwell Time Plot on Channel 0 / 2402 MHz



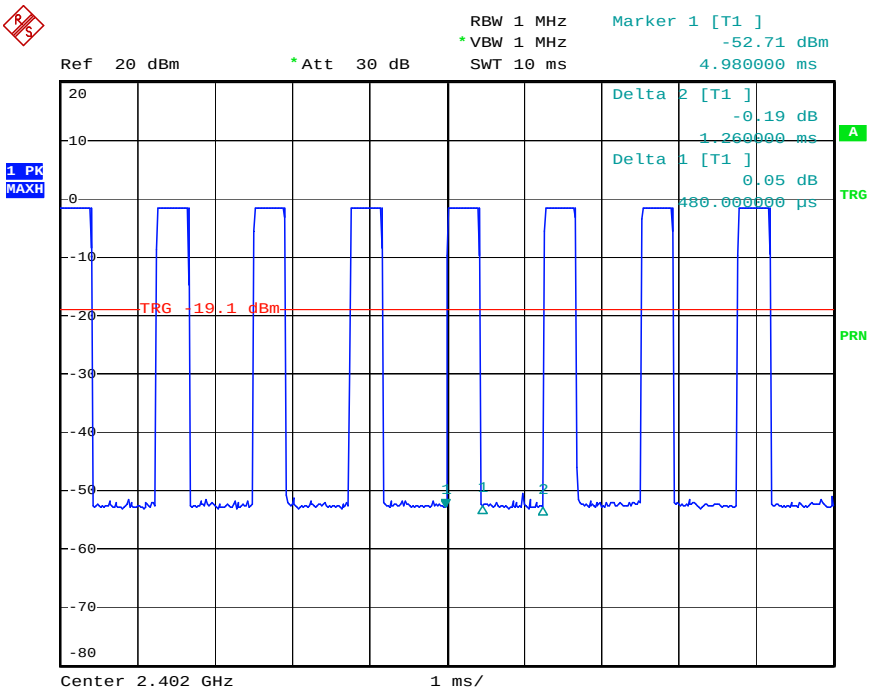
Date: 19.SEP.2005 10:26:08

DH3 Dwell Time Plot on Channel 0 / 2402 MHz



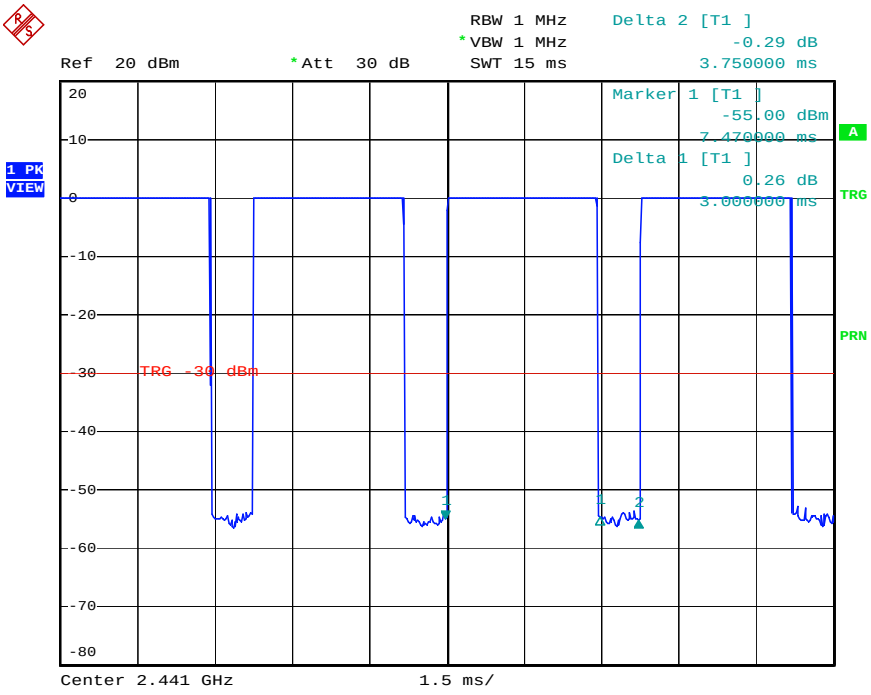
Date: 19.SEP.2005 10:22:04

DH1 Dwell Time Plot on Channel 0 / 2402 MHz



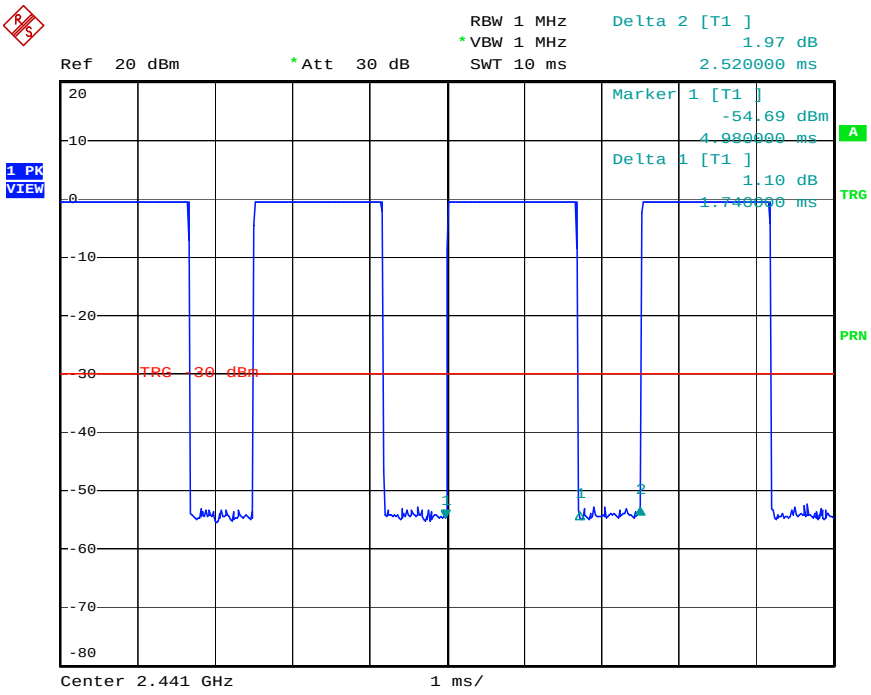
Date: 19.SEP.2005 10:17:44

DH5 Dwell Time Plot on Channel 39 / 2441 MHz



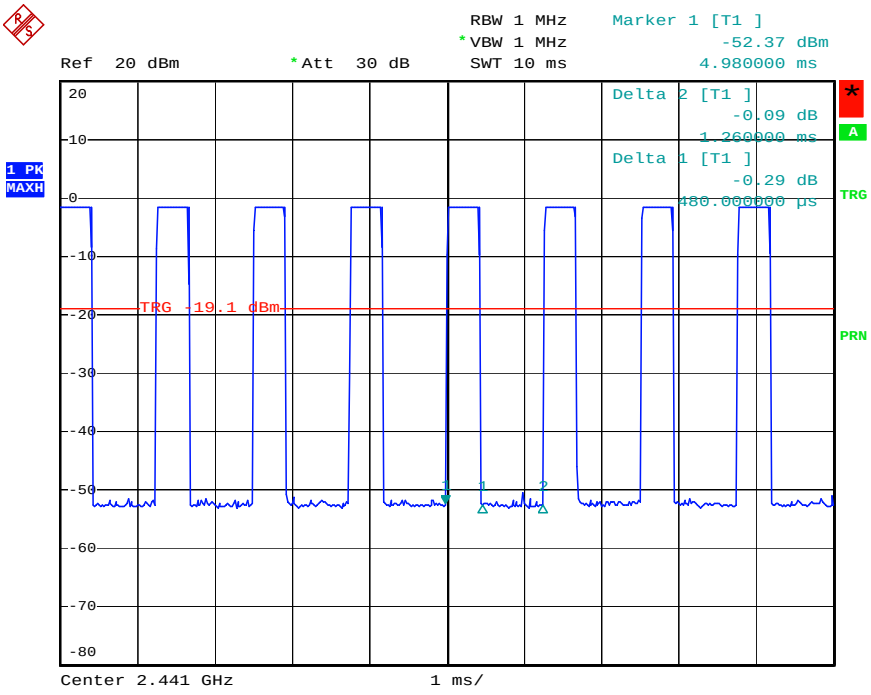
Date: 14.SEP.2005 12:19:55

DH3 Dwell Time Plot on Channel 39 / 2441 MHz



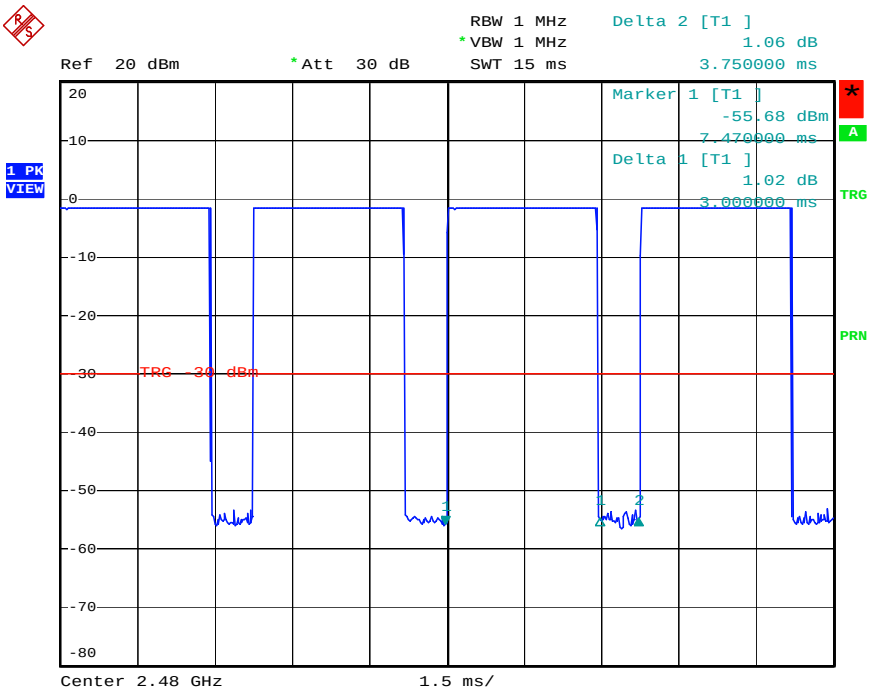
Date: 19.SEP.2005 14:37:25

DH1 Dwell Time Plot on Channel 39 / 2441 MHz



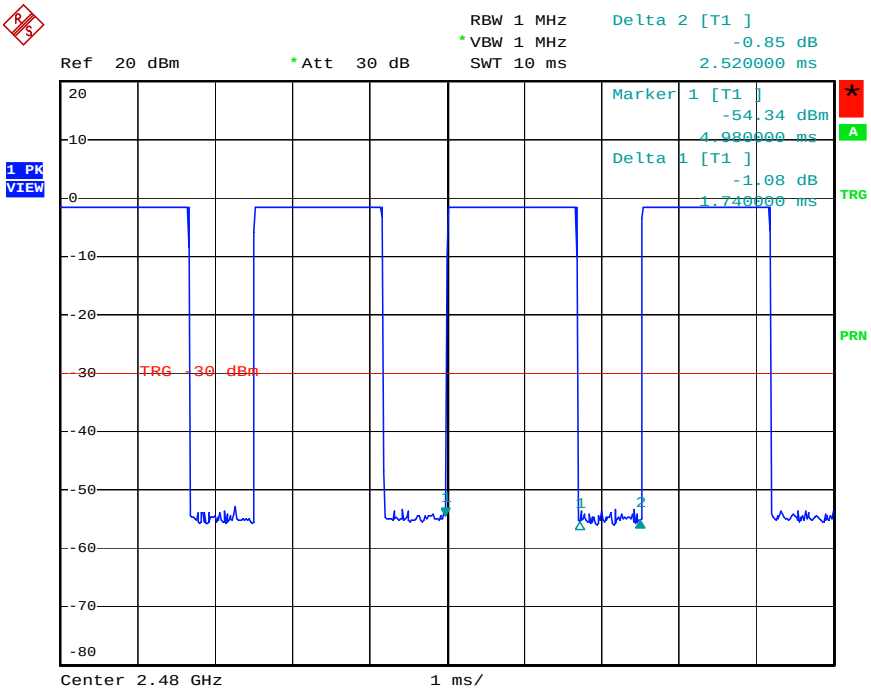
Date: 19.SEP.2005 10:18:21

DH5 Dwell Time Plot on Channel 78 / 2480 MHz



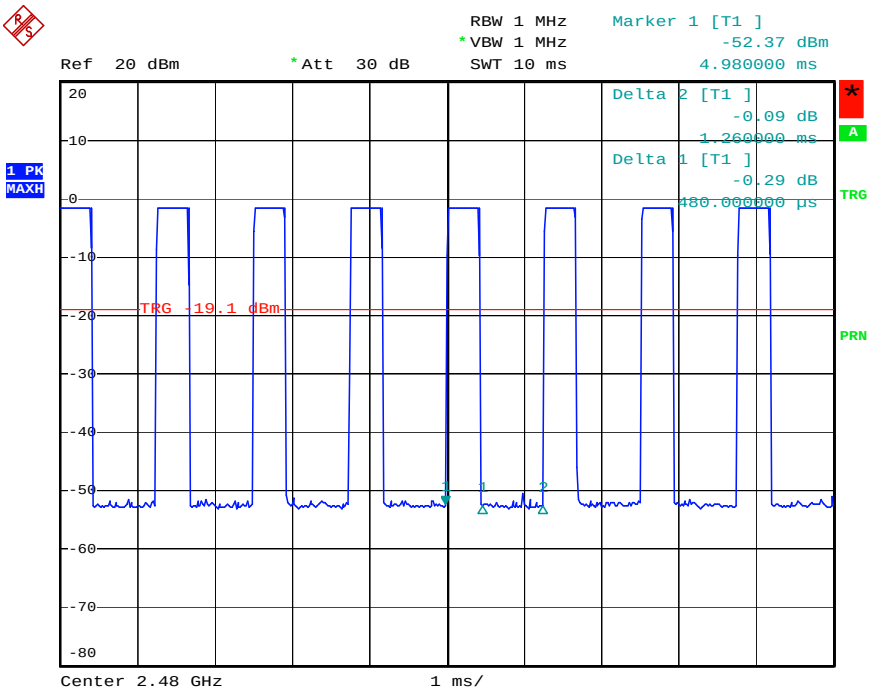
Date: 19.SEP.2005 10:27:54

DH3 Dwell Time Plot on Channel 78 / 2480 MHz



Date: 19.SEP.2005 10:25:12

DH1 Dwell Time Plot on Channel 78 / 2480 MHz



Date: 19.SEP.2005 10:18:56

5.6. Radiated Emissions Measurement

5.6.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.6.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	100KHz / 100KHz for peak

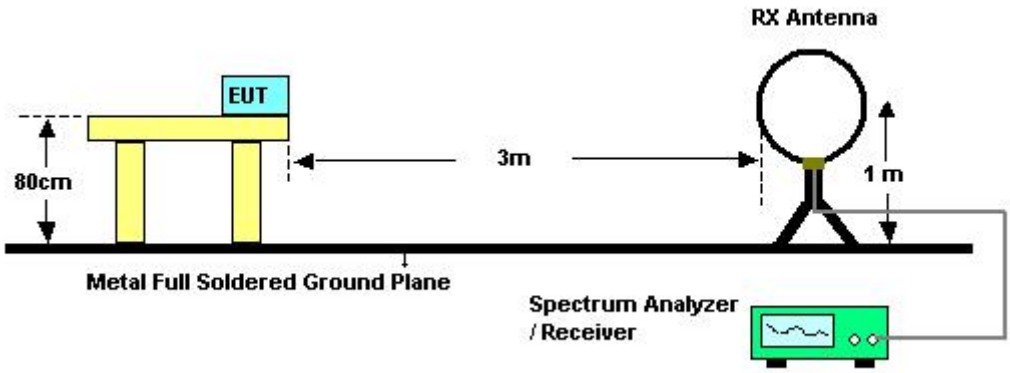
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.6.3. Test Procedures

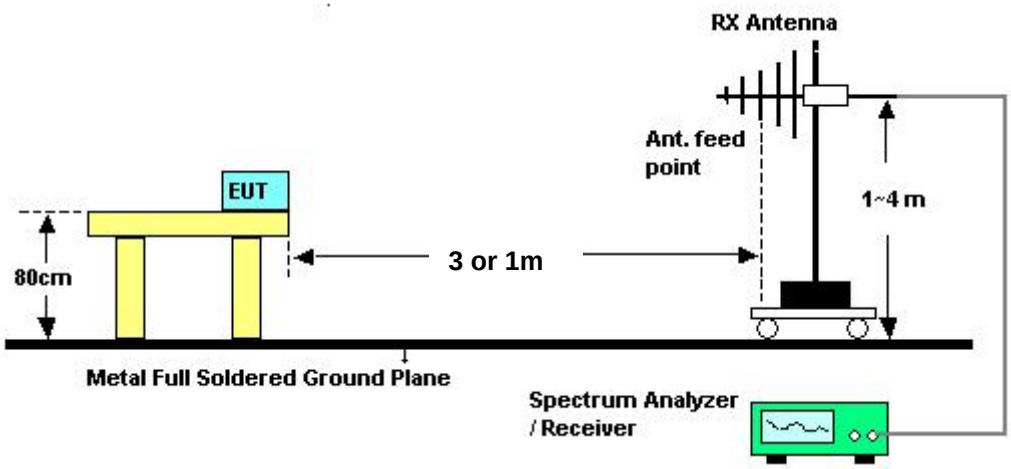
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average 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 for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak 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.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

5.6.4. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

5.6.5. Test Deviation

There are no deviations with the original standard.

5.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.6.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	20℃	Humidity	70%
Test Engineer	Ted Chiu	Configurations	channel 39

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

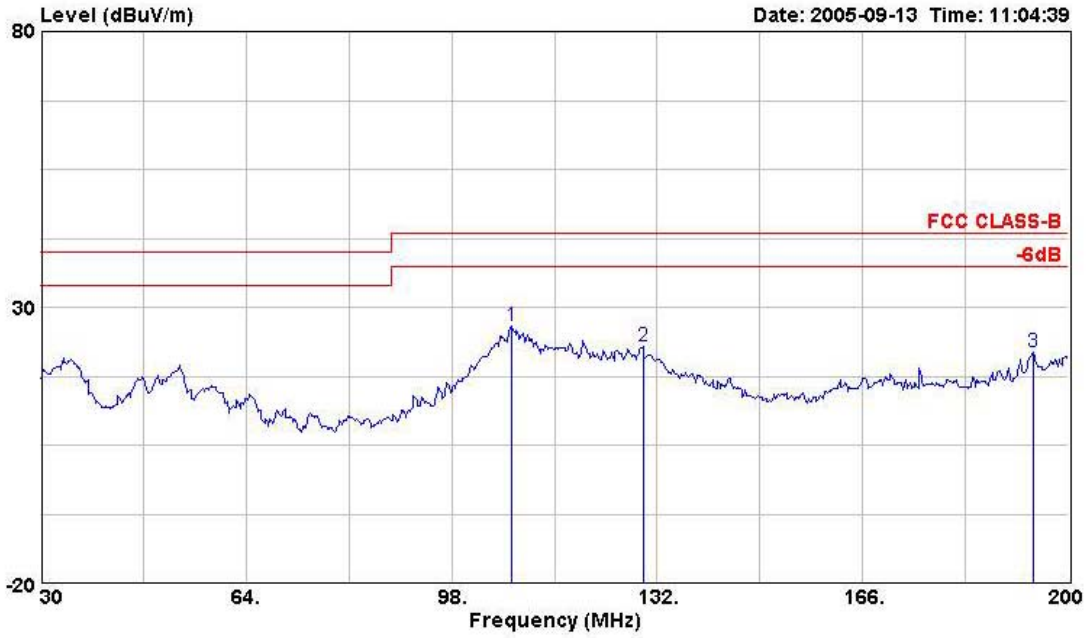
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

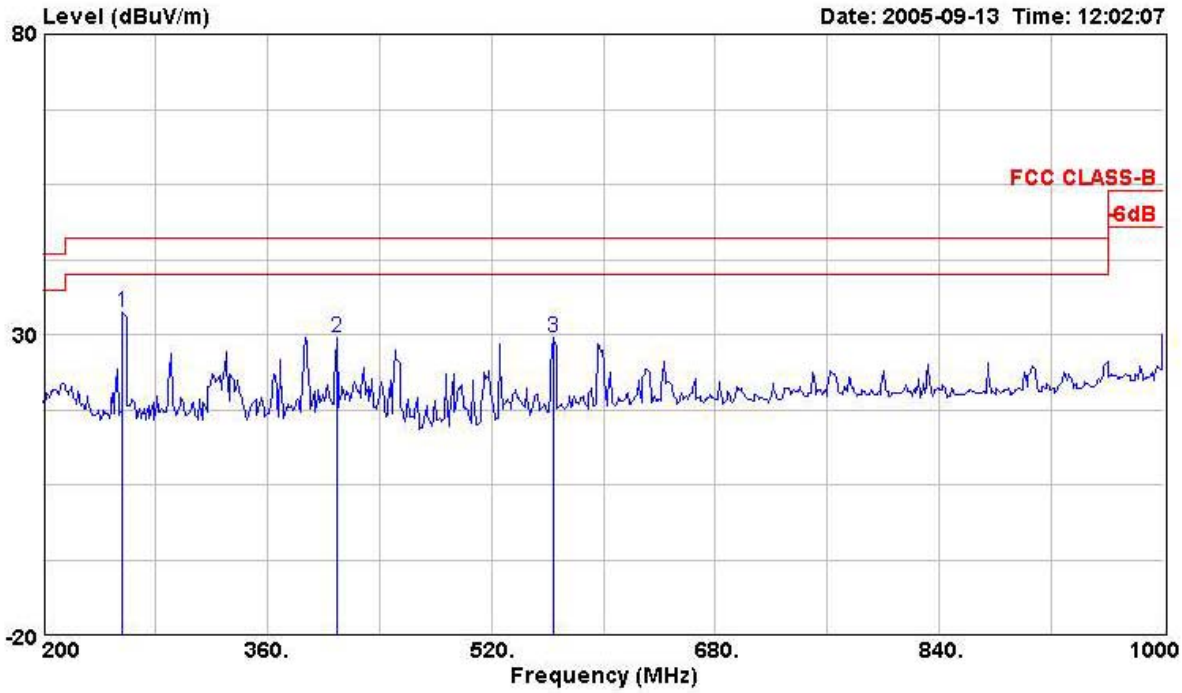
5.6.8. Results of Radiated Emissions (30MHz~1GHz)

Temperature	20℃	Humidity	70%
Test Engineer	Ted Chiu	Configurations	channel 39

Horizontal

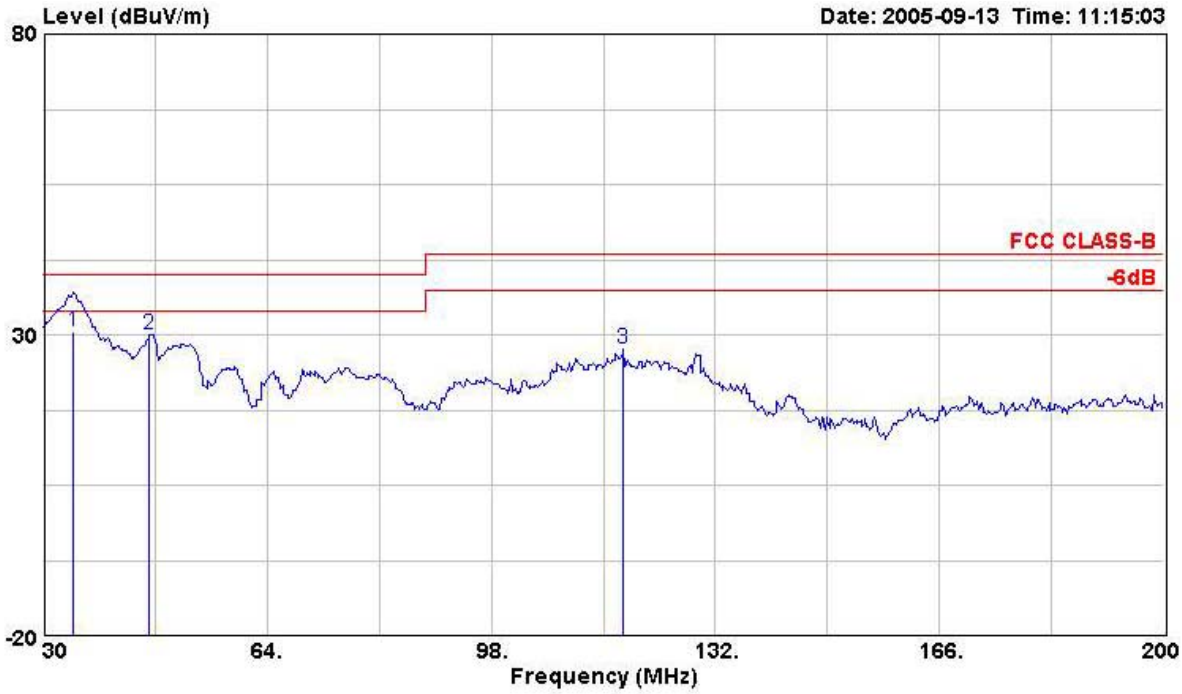


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	107.860	26.67	-16.83	45.90	43.50	1.01	10.12	30.36	Peak	---	---
2 @	129.620	22.83	-20.67	40.03	43.50	1.13	12.32	30.65	Peak	---	---
3 @	194.220	21.92	-21.58	35.85	43.50	1.30	15.33	30.56	Peak	---	---

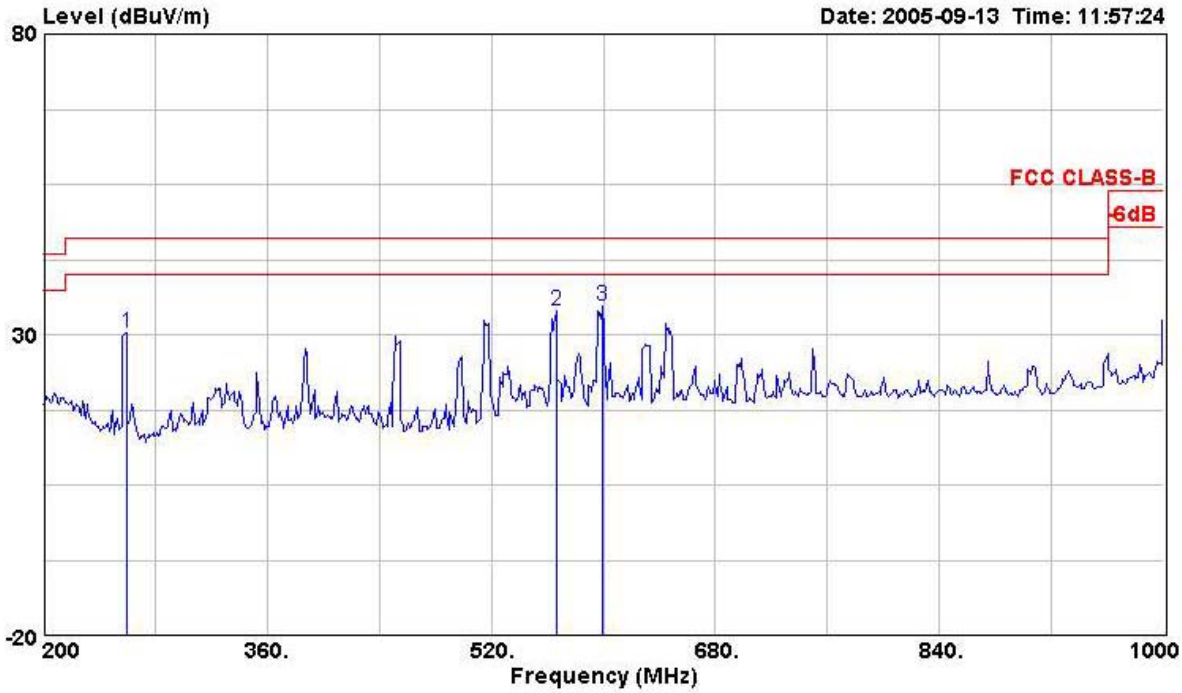


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	256.800	33.68	-12.32	49.81	46.00	1.59	12.52	30.24	Peak	---	---
2 @	409.600	29.48	-16.52	41.69	46.00	1.96	16.72	30.89	Peak	---	---
3 @	564.000	29.37	-16.63	39.42	46.00	2.29	18.81	31.15	Peak	---	---

Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	34.590	30.41	-9.59	48.39	40.00	0.55	11.98	30.51	QP	---	---
2 @	46.150	30.13	-9.87	47.54	40.00	0.66	12.16	30.23	Peak	---	---
3 @	118.060	27.54	-15.96	45.13	43.50	1.07	11.62	30.28	Peak	---	---



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	259.200	30.30	-15.70	46.30	46.00	1.60	12.60	30.19	Peak	---	---
2 @	566.400	33.83	-12.17	43.76	46.00	2.29	18.92	31.14	Peak	---	---
3 @	599.200	34.79	-11.21	43.12	46.00	2.40	20.36	31.09	Peak	---	---

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

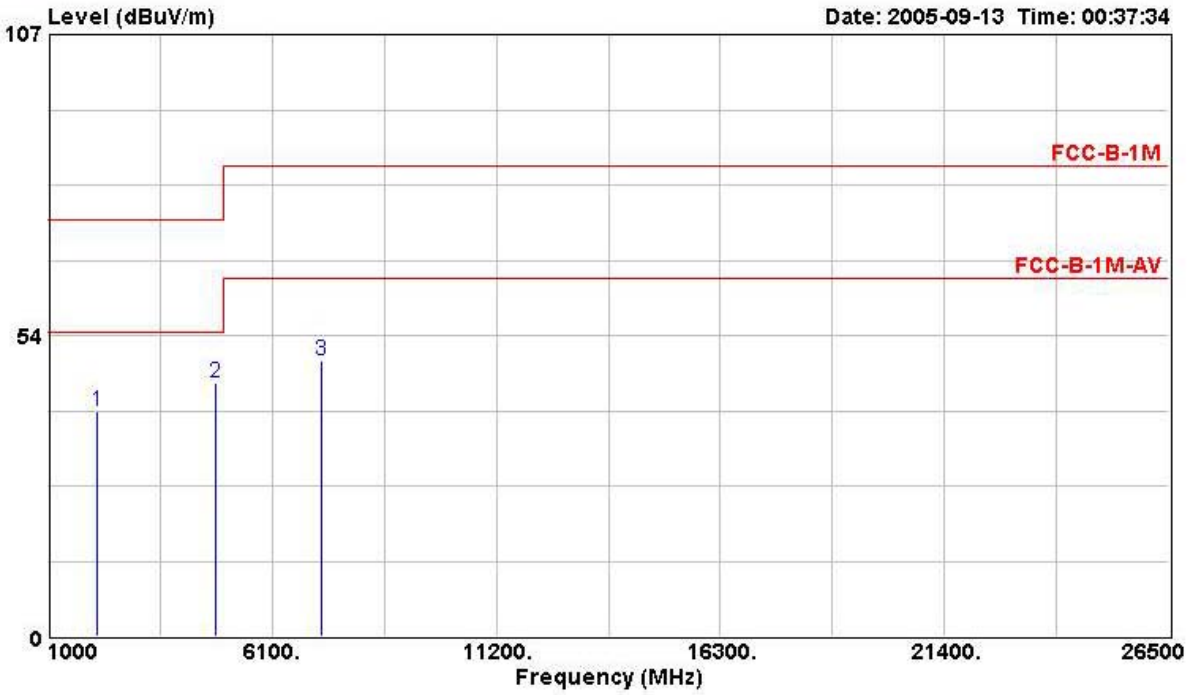
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

5.6.9. Results for Radiated Emissions (1GHz~10th Harmonic)

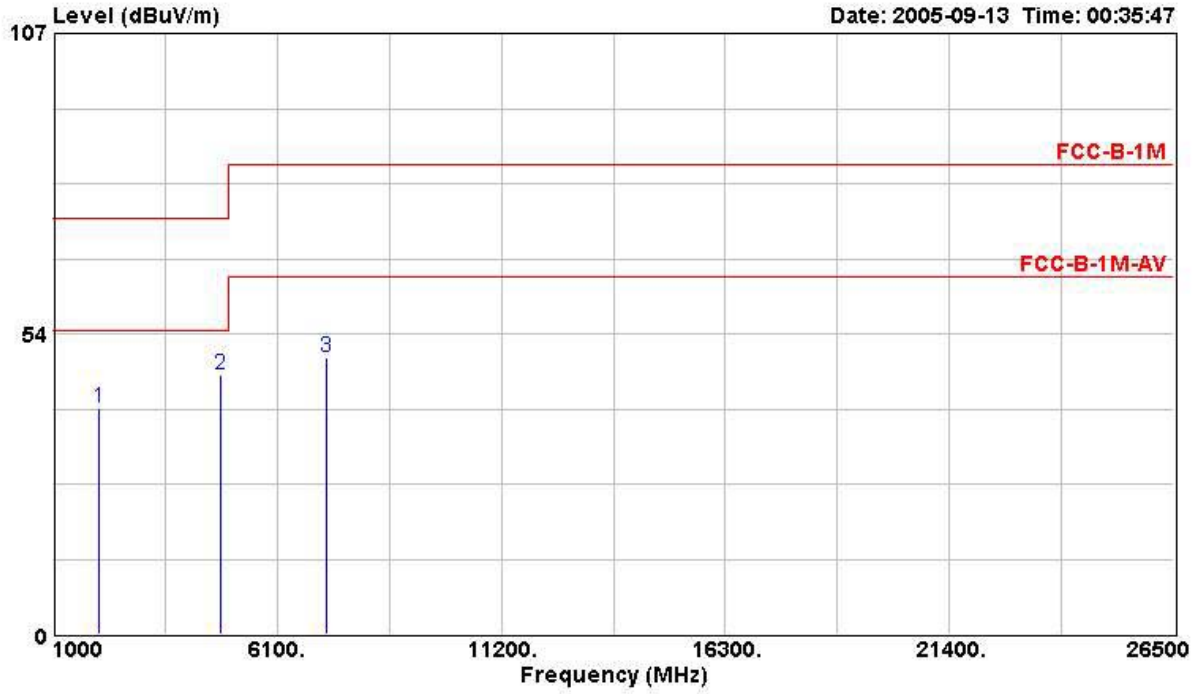
Temperature	20℃	Humidity	70%
Test Engineer	Ted Chiu	Configurations	channel 0

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	2102.000	39.89	-34.11	42.87	74.00	2.12	27.69	32.79	Peak	---	---
2 @	4804.000	45.01	-28.99	41.36	74.00	3.10	33.10	32.54	PEAK	---	---
3	7206.000	48.92	-34.62	41.27	83.54	4.10	35.90	32.35	PEAK	---	---

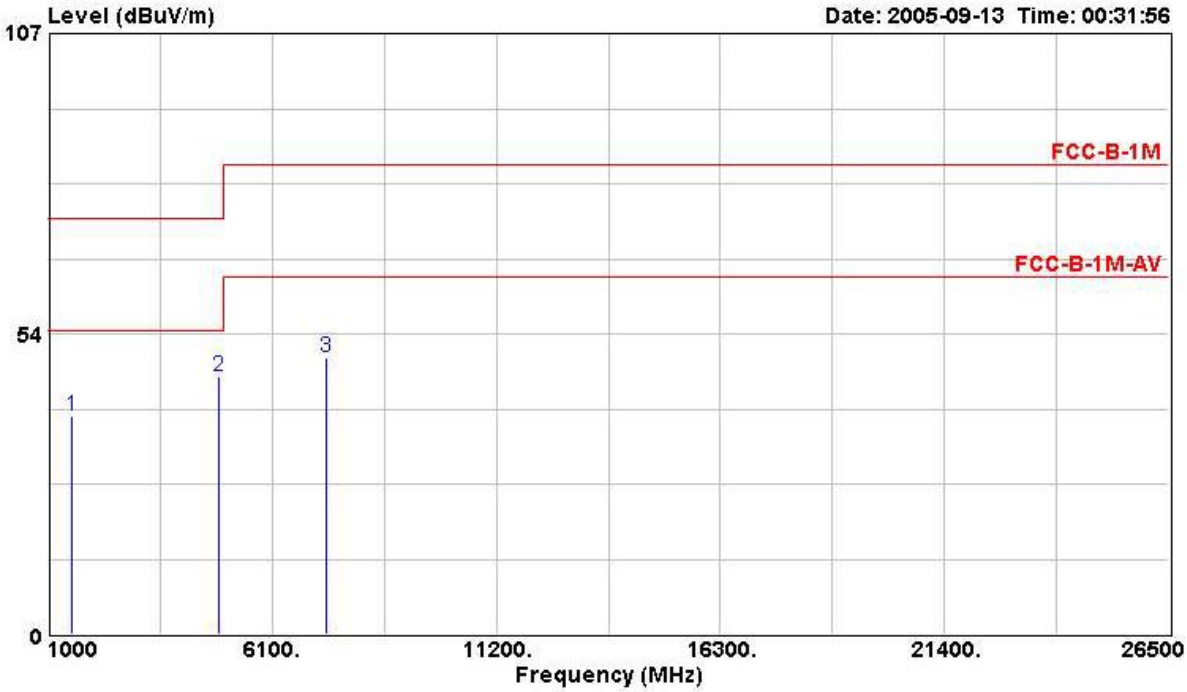
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	2028.000	40.28	-33.72	43.37	74.00	2.08	27.53	32.71	Peak	---	---
2 @	4796.000	46.10	-27.90	42.47	74.00	3.10	33.07	32.54	PEAK	---	---
3	7206.000	49.27	-34.27	41.62	83.54	4.10	35.90	32.35	PEAK	---	---

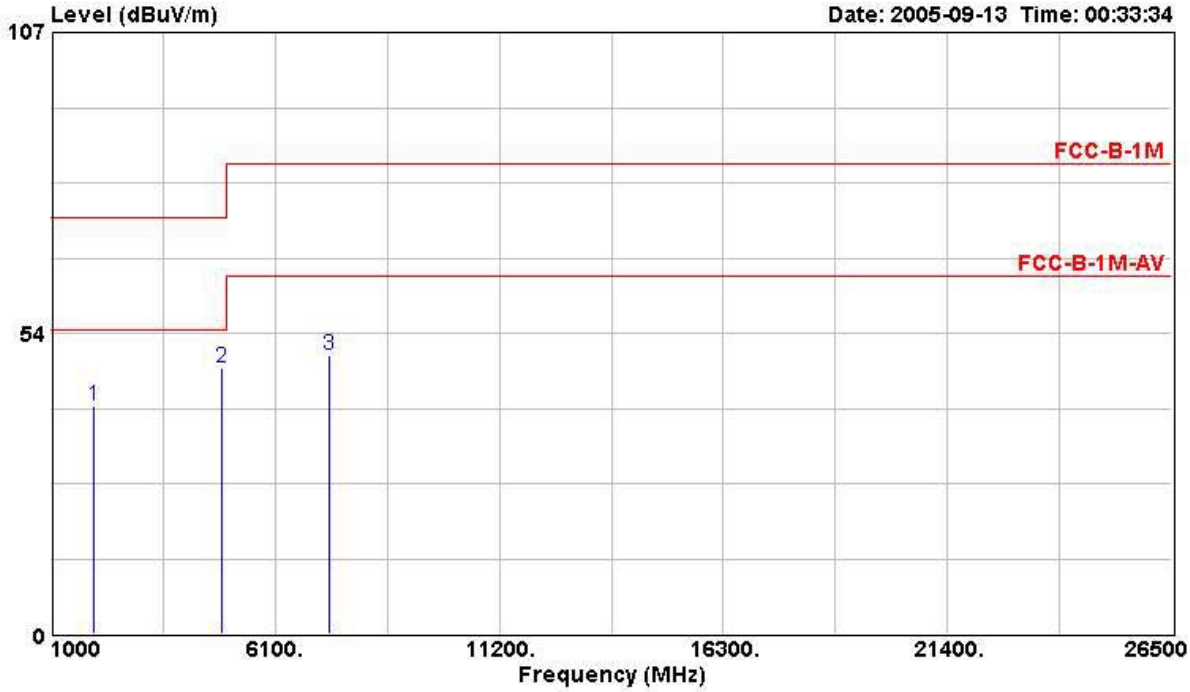
Temperature	20℃	Humidity	70%
Test Engineer	Ted Chiu	Configurations	channel 39

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1550.000	38.80	-35.20	44.70	74.00	1.58	25.52	33.00	Peak	---	---
2 @	4882.000	46.04	-27.96	42.26	74.00	3.11	33.21	32.55	PEAK	---	---
3	7323.000	49.22	-34.32	41.58	83.54	4.06	36.19	32.61	PEAK	---	---

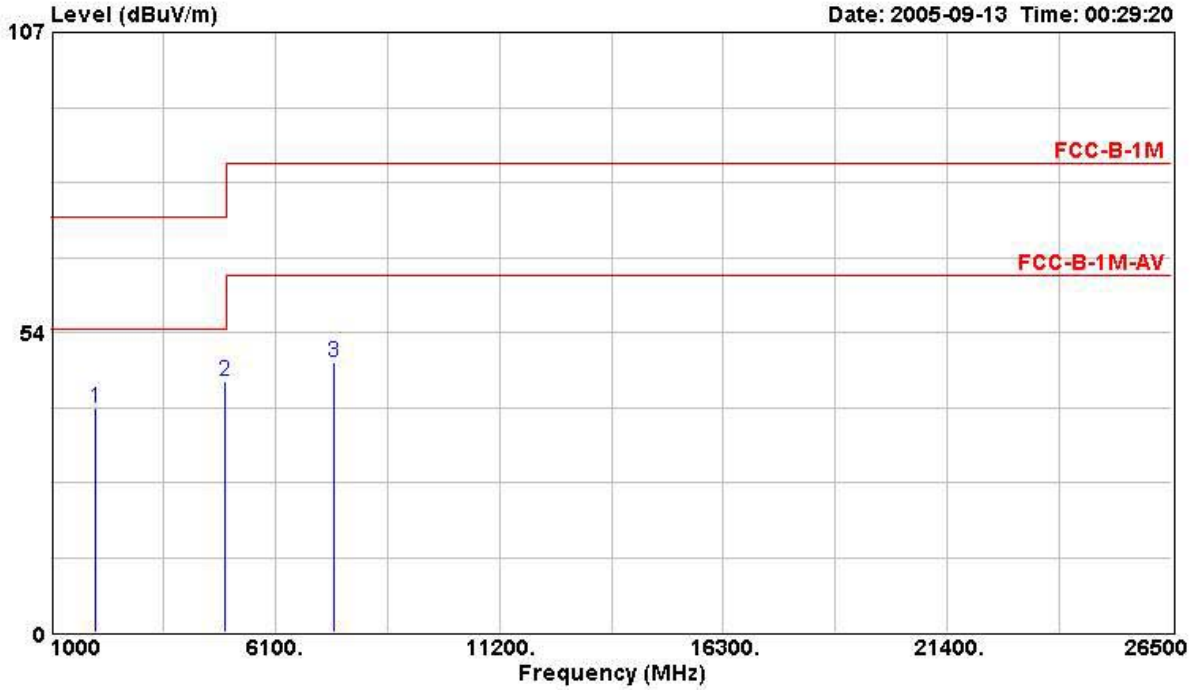
Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1956.000	40.52	-33.48	43.94	74.00	2.02	27.28	32.72	Peak	---	---
2 @	4882.000	47.20	-26.80	43.43	74.00	3.11	33.21	32.55	PEAK	---	---
3	7323.000	49.44	-34.10	41.80	83.54	4.06	36.19	32.61	PEAK	---	---

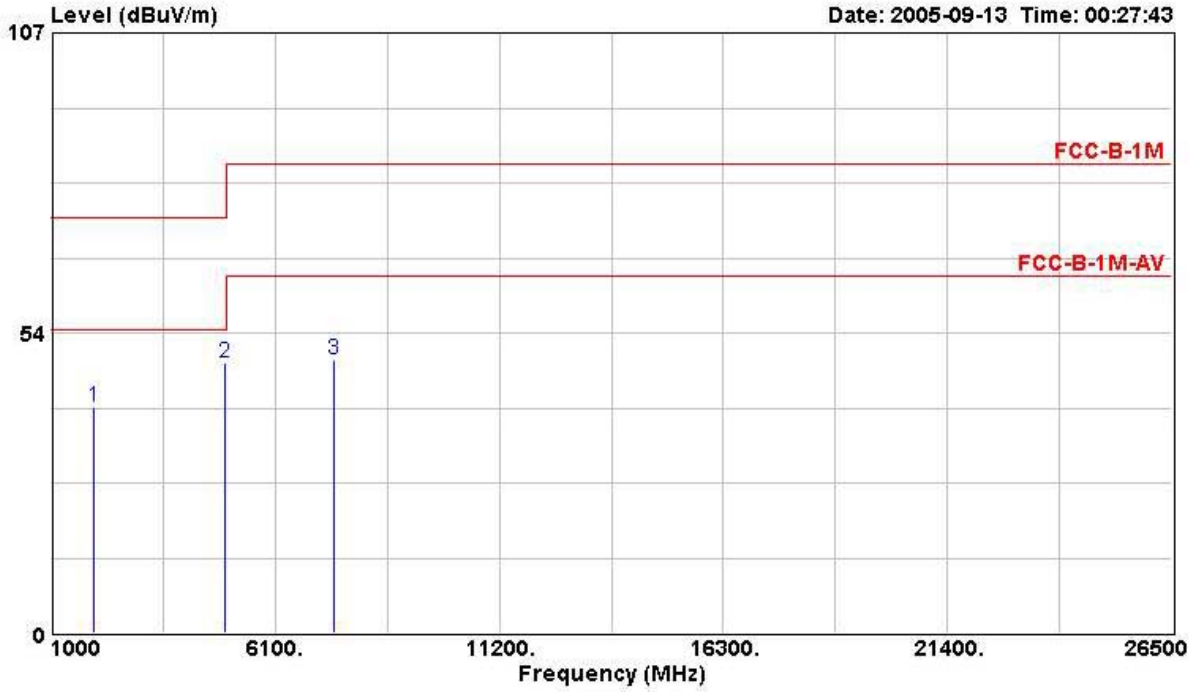
Temperature	20℃	Humidity	70%
Test Engineer	Ted Chiu	Configurations	channel 78

Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	2020.000	39.98	-34.02	43.10	74.00	2.06	27.53	32.71	Peak	---	---
2 @	4960.000	44.84	-29.16	40.92	74.00	3.13	33.34	32.56	PEAK	---	---
3	7440.000	48.16	-35.38	40.53	83.54	4.02	36.48	32.87	PEAK	---	---

Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1966.000	40.30	-33.70	43.63	74.00	2.02	27.35	32.70	Peak	---	---
2 @	4960.000	48.10	-25.90	44.18	74.00	3.13	33.34	32.56	PEAK	---	---
3	7440.000	48.85	-34.69	41.22	83.54	4.02	36.48	32.87	PEAK	---	---

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Pol. : V is Vertical Polarization ; H is Horizontal Polarization.

5.7. Band Edge Emissions Measurement

5.7.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.7.2. Measuring Instruments and Setting

Please refer to section 6 in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (other emission)	100 KHz /100 KHz for Peak

5.7.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the freqeuncy range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

5.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

5.7.5. Test Deviation

There is no deviation with the original standard.

5.7.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.7.7. Test Result of Band Edge Emissions

For Emission in Restricted Band

Temperature	20℃	Humidity	70%
Test Engineer	Ted Chiu	Configurations	channel 0, 78

2402MHz

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1 @	2390.000	54.45	-19.55	23.96	74.00	2.28	28.21	0.00	Peak	---	---
1 @	2390.000	52.60	-1.40	22.11	54.00	2.28	28.21	0.00	Average	---	---

2482MHz

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2 @	2483.500	59.59	-14.41	28.88	74.00	2.34	28.37	0.00	Peak	---	---
2 @	2483.500	51.28	-2.72	20.57	54.00	2.34	28.37	0.00	Average	---	---

Note:

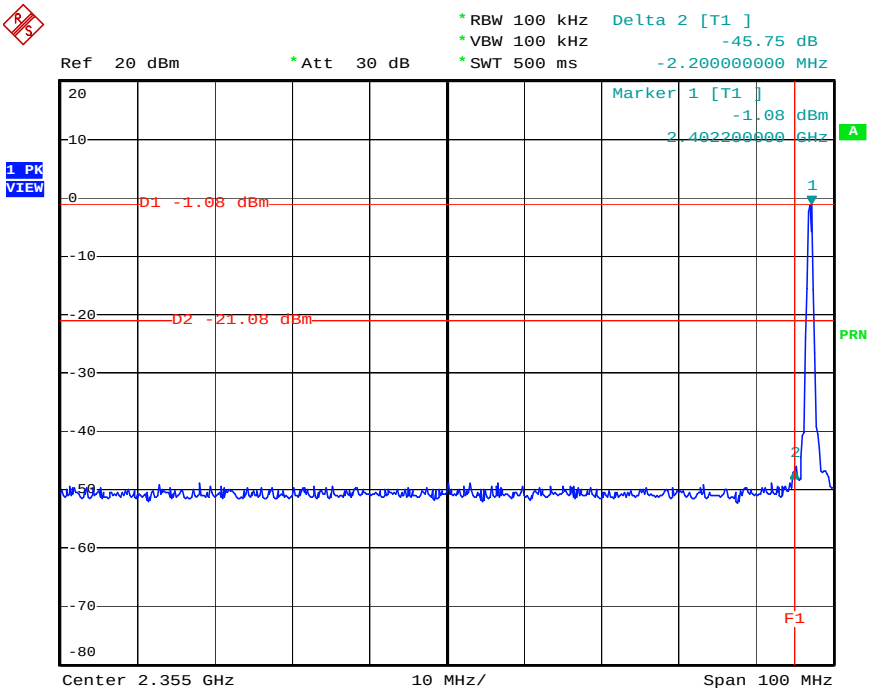
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Receiving maximum band edge emissions are Vertical.

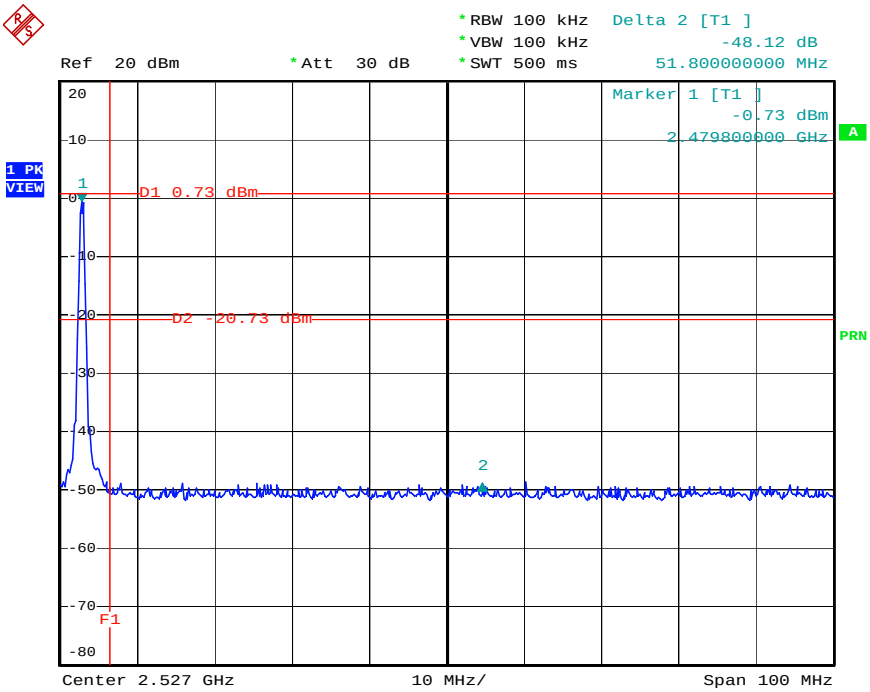
For Emission not in Restricted Band

Low Band Edge Plot on Channel 0 / 2402 MHz



Date: 14.SEP.2005 12:15:14

High Band Edge Plot on Channel 78 / 2480 MHz



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5.8. Antenna Requirements

5.8.1. Limit

Standard antenna jack or electrical connector is prohibited, but this requirement does not apply to intentional radiators that must be professionally installed.

5.8.2. Antenna Connector Construction

Please refer to section 3.3 in this test report, all antenna connectors comply with the requirements.

6. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Feb. 16, 2005	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	May. 05, 2005	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100019	9KHZ~40GHz	Jul. 21, 2005	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	CPA9231A	18667	9KHz ~ 2GHz	Jan. 10, 2005	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	May 31, 2005	Radiation (03CH03-HY)
Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz ~ 200MHz	Jul. 22, 2005	Radiation (03CH03-HY)
Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz ~ 1GHz	Jul. 22, 2005	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	Apr. 22, 2005	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Feb. 22, 2005	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec.01, 2004	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)
Spectrum Analyzer	R&S	FSP40	100019	9KHZ~40GHz	Jul. 21, 2005	Conducted (TH01-HY)
Power Meter	R&S	NRVS	100444	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z55	100049	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 28, 2005	Conducted (TH01-HY)
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 – 300V	Apr. 21, 2005	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V – 60V	Dec. 28, 2004	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2004	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz – 7GHz	Jan. 01, 2005	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz – 1GHz	Jan. 01, 2005	Conducted (TH01-HY)
Data Generator	Tektronix	J310345	J310345	400Mbps	Dec. 21, 2004	Conducted (TH01-HY)
OscilloScope	Tektronix	TDS1012	C038520	100MHz-1Gs/s	Jan. 02, 2005	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	MITEQ	AMF-6F-260400	923364	26.5GHz ~ 40GHz	Jan. 05, 2004*	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9kHz ~ 30MHz	May 24, 2004*	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jun. 09, 2004*	Radiation (03CH03-HY)

Note: Calibration Interval of instruments listed above is two year.

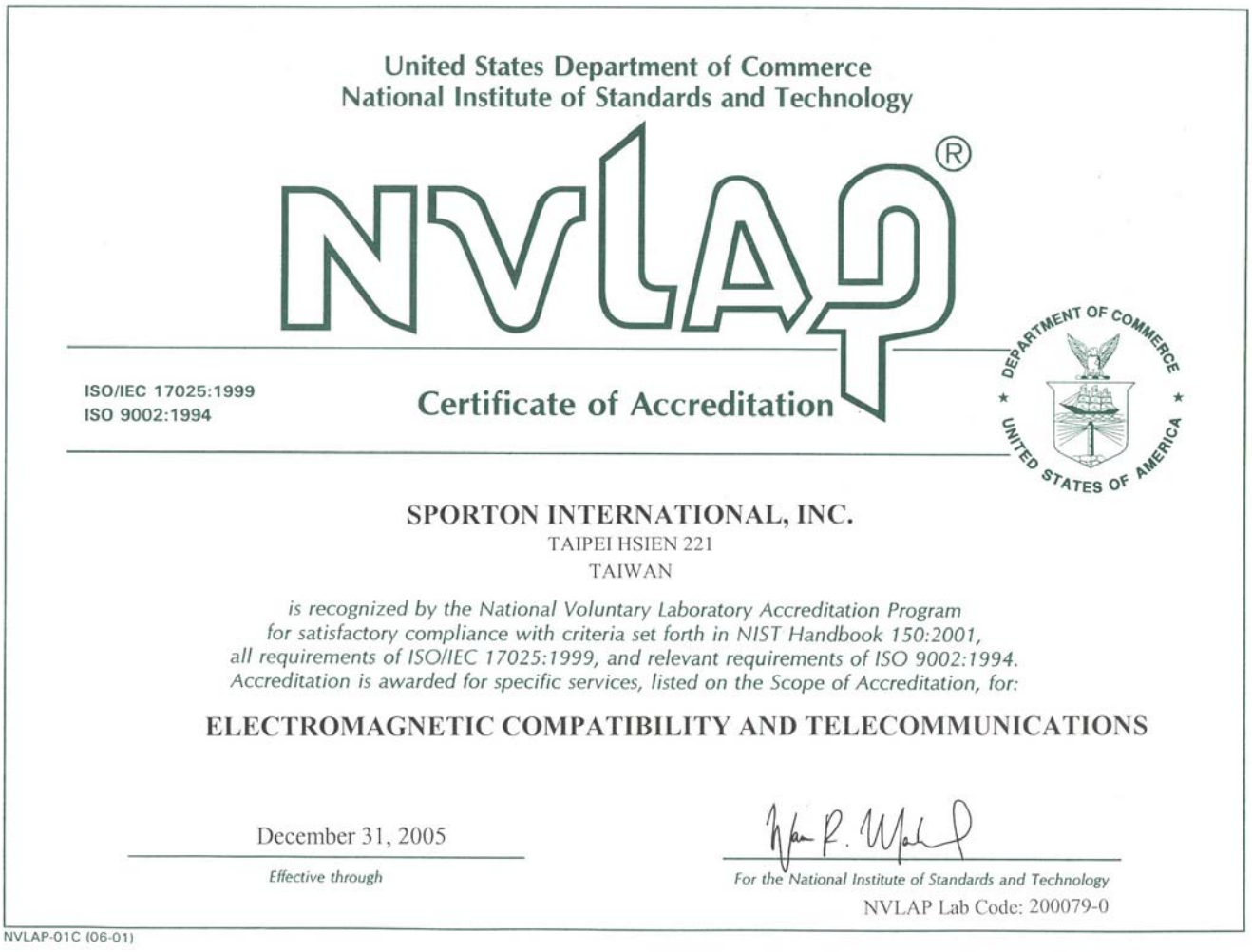
7. SPORTON COMPANY PROFILE

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test familial apart from ERSO. In 1988, one 3M and 10M/3M open area test site were setup and also obtained official accreditation from FCC, VCCI and NEMKO. In 1993, a Safety laboratory was founded and obtained accreditation from UL of USA, CSA of Canada and TUV (Rhineland & PS) of Germany. In 1995, one EMC lab, including EMI and EMS test facilities was setup. In 1997, SPORTON Group has provided financial expense to relocate the headquarter to Orient Scientific Park in Taipei Hsien to offer more comprehensive, more qualified and better service to local suppliers and manufactures. In 1999, Safety Group and Component Group were setup. In 2001, SPORTON has established 3M/10M chamber in Hwa Ya Technology Park.

7.1. Test Location

SHIJR	ADD	: 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	: 02-2696-2468
	FAX	: 02-2696-2255
HWA YA	ADD	: No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	: 03-327-3456
	FAX	: 03-318-0055
LINKOU	ADD	: No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	: 02-2601-1640
	FAX	: 02-2601-1695
DUNGHU	ADD	: No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	: 02-2631-4739
	FAX	: 02-2631-9740
JUNGHE	ADD	: 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	: 02-8227-2020
	FAX	: 02-8227-2626
NEIHU	ADD	: 4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	: 02-2794-8886
	FAX	: 02-2794-9777
JHUBEI	ADD	: No.8, Lane 728, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
	TEL	: 03-656-9065
	FAX	: 03-656-9085

8. CERTIFICATE OF NVLAP ACCREDITATION



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC 17025:1999
ISO 9002:1994

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

SPORTON INTERNATIONAL, INC.
TAIPEI HSIEN 221
TAIWAN

is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

December 31, 2005
Effective through

For the National Institute of Standards and Technology

NVLAP Lab Code: 200079-0

NVLAP-01C (06-01)