



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

**Report No.: 08-02-MAS-116-01**

Client: PRO-NETS Technology Corp.  
 Product: WIRELESS PCI ADAPTER  
 Model: WP81RL1  
 FCC ID: RXZ-WP81RL1  
 Manufacturer/supplier: PRO-NETS Technology Corp.

Date test item received: 2008/02/22  
 Date test campaign completed: 2008/02/29  
 Date of issue: 2008/02/29




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*Internal photos 3 pages*

*Setup photos 2 pages*

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Manufacturer : PRO-NETS Technology Corp.  
Address : 7F, No.95, Lide St, Chung Ho City 235, Taipei, Taiwan, R.O.C.  
EUT : WIRELESS PCI ADAPTER  
Trade name : PRO-NETS, Speed Com+, Jet Com, Medilink, Encore  
Model No. : WP81RL1  
Power Source : DC 3.3V  
Regulations applied : FCC 47 CFR, Part 15 Subpart C (2006)

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## 1 GENERAL INFORMATION

### 1.1 Product Description

- a) Type of EUT : WIRELESS PCI ADAPTER  
 b) Trade Name : PRO-NETS, Speed Com+, Jet Com, Medilink, Encore  
 c) Model No. : WP81RL1  
 d) FCC ID : RXZ-WP81RL1

### 1.2 Characteristics of Device

The EUT is a 2.4 GHz WIRELESS PCI ADAPTER. It conforms to the IEEE 802.11b/g/n protocol and operates in the unlicensed ISM Band at 2.4 GHz.

RF chain	1T2R
Frequency Range	IEEE 802.11b/g, 802.11n HT20: 2412MHz~2462MHz IEEE 802.11n HT40: 2422MHz~2452MHz
Channel Spacing	IEEE 802.11b/g, 802.11n HT20/HT40: 5MHz
Channel Number	IEEE 802.11b/g, 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Transmit Data Rate	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6 Mbps IEEE 802.11n HT20: 65, 58.5, 52, 39, 26, 19.5, 13, 6.5Mbps IEEE 802.11n HT40: 135, 121.5, 108, 81, 54, 40.5, 27, 13.5 Mbps
Type of Modulation	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20/40: OFDM (64QAM, 16QAM, QPSK, BPSK)
Emission Designators	IEEE 802.11b: 15M2G1D IEEE 802.11g: 16M5W7D IEEE 802.11n HT20: 17M6W7D IEEE 802.11n HT40: 36M2W7D

### 1.3 Test Methodology

All testing were performed according to the procedures in ANSI C63.4 (2003) and FCC CFR 47 Part 2 and Part 15.

### 1.4 Test Facility

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

This site has been accreditation as a FCC filing site.

## 2 PROVISIONS APPLICABLE

### 2.1 Definition

**Unintentional radiator:**

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

**Class A Digital Device:**

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

**Class B Digital Device :**

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

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

**Intentional radiator:**

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

## 2.2 Requirement for Compliance

### (1) Conducted Emission Requirement

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

Frequency MHz	Quasi Peak dB $\mu$ V	Average dB $\mu$ V
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

\*Decreases with the logarithm of the frequency.

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

### (2) Radiated Emission Requirement

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

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

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

### (3) Antenna Requirement

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

**(4) Bandwidth Requirement**

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

**(5) Output Power Requirement**

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

**(6) Spurious Emissions Measurement**

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

**(7) Power Density Requirement**

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



## 2.3 Restricted Bands of Operation

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

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

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

## 2.4 Labeling Requirement

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

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

## 2.5 User Information

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

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

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

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

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

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

### 3. SYSTEM TEST CONFIGURATION

#### 3.1 Devices for Tested System

Device	Manufacture	Model No.	Cable Description
WIRELESS PCI ADAPTER*	PRO-NETS Technology Corp.	WP81RL1	----
PC	HP	DC5100MT	1.8m Unshielded Power Line
Keyboard	Logitech	Y-SM48	2.0m Unshielded Signal Line
Monitor	Lemel	L1520	1.8m Unshielded Signal Line with a core 1.8m Unshielded Power Line
Mouse	Lemel	M857C	1.8m Unshielded Power Line

Note:

1.Remark "\*" means equipment under test.

2.

Test Software:	RT2860QA.exe Rev.1.2.0.7		
Power setting:	802.11b/g/n HT20	Low	TX power 0 = (02)h
		Mid	TX power 0 = (02)h
		High	TX power 0 = (02)h
	802.11b/g/n HT40	Low	TX power 0 = (02)h
		Mid	TX power 0 = (02)h
		High	TX power 0 = (02)h

#### 3.2 Description of Test modes

3.2.1 IEEE 802.11b, 802.11g, 802.11n HT20 mode:

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low = 1	2412
Middle = 6	2437
High = 11	2462

IEEE 802.11b mode: 1 Mbps data rate is the worst case for full testing.

IEEE 802.11g mode: 6 Mbps data rate is the worst case for full testing.

IEEE 802.11n HT20 mode: 6.5 Mbps data rate is the worst case for full testing.

3.2.2 IEEE 802.11n HT40 mode:

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low = 3	2422
Middle = 6	2437
High = 9	2452

IEEE 802.11n HT40 mode: 13.5 Mbps data rate is the worst case for full testing.

## 4 CONDUCTED EMISSION MEASUREMENT

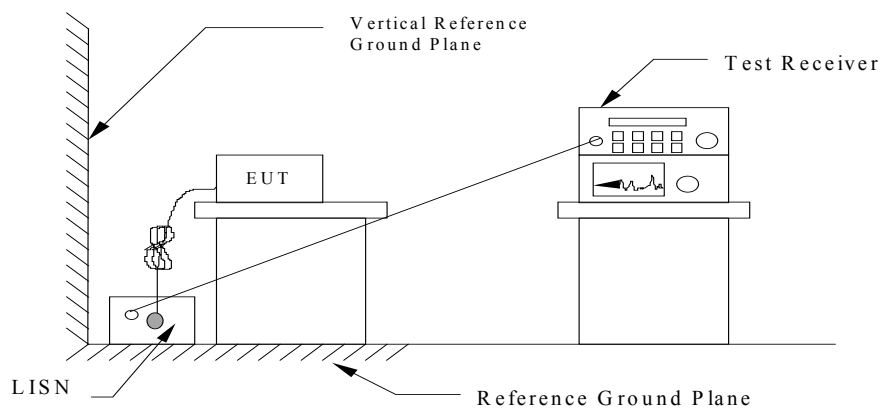
### 4.1 Standard Applicable

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

### 4.2 Measurement Procedure

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

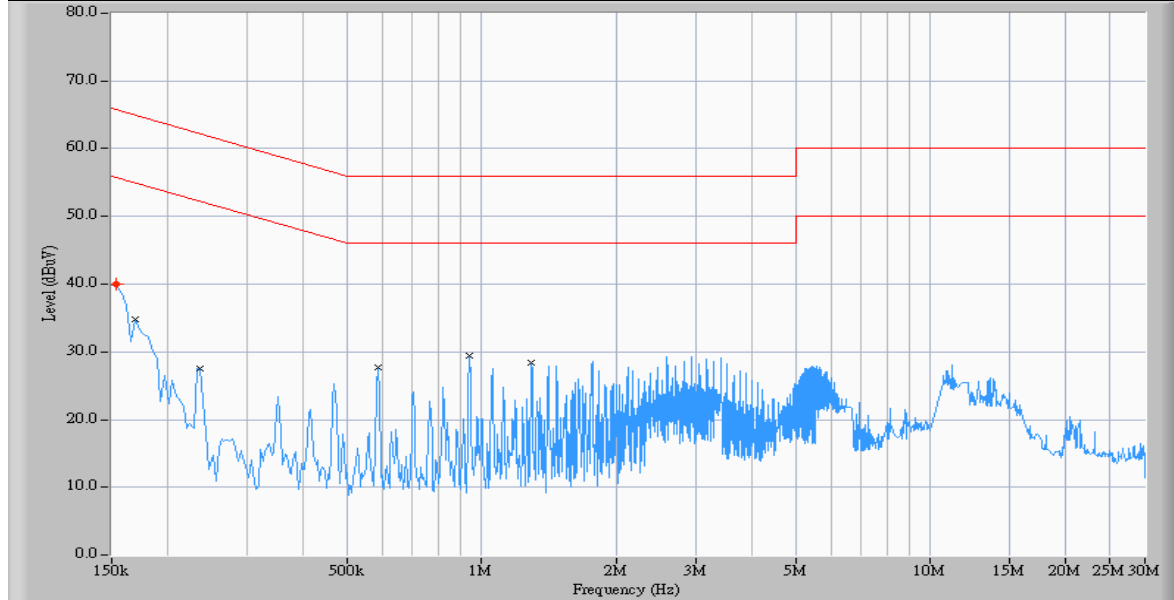
Figure 1 : Conducted emissions measurement configuration



### 4.3 Conducted Emission Data

#### 4.3.1 Operation Mode: IEEE 802.11b

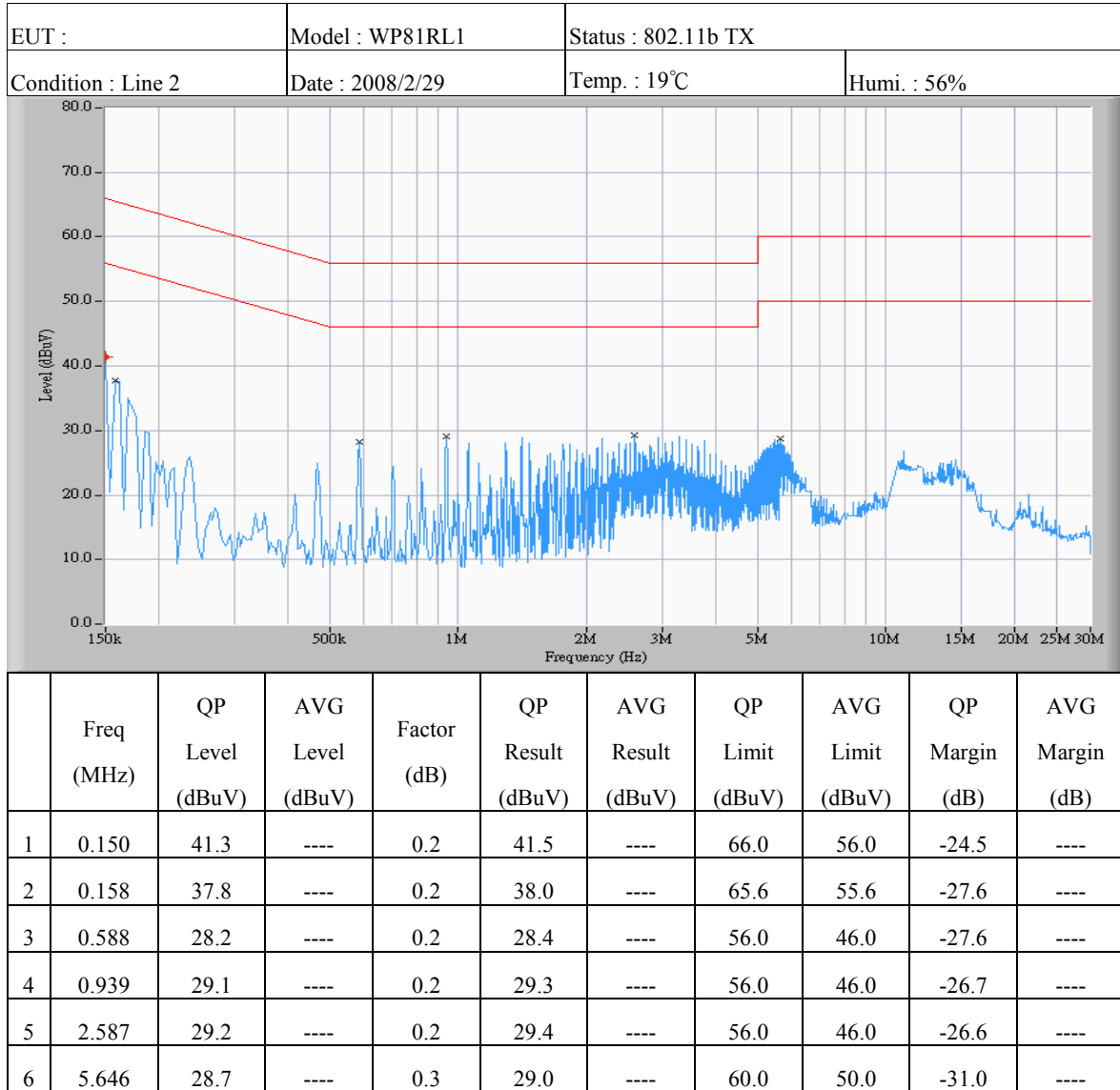
EUT :	Model : WP81RL1	Status : 802.11b TX	
Condition : Line 1	Date : 2008/2/29	Temp. : 19°C	Humi. : 56%



	Freq (MHz)	QP Level (dBuV)	AVG Level (dBuV)	Factor (dB)	QP Result (dBuV)	AVG Result (dBuV)	QP Limit (dBuV)	AVG Limit (dBuV)	QP Margin (dB)	AVG Margin (dB)
1	0.154	40.0	----	0.2	40.2	----	65.8	55.8	-25.6	----
2	0.170	34.8	----	0.2	35.0	----	65.0	55.0	-30.0	----
3	0.236	27.6	----	0.2	27.8	----	62.2	52.2	-34.4	----
4	0.588	27.8	----	0.2	28.0	----	56.0	46.0	-28.0	----
5	0.939	29.4	----	0.2	29.6	----	56.0	46.0	-26.4	----
6	1.291	28.4	----	0.2	28.6	----	56.0	46.0	-27.4	----

Note:

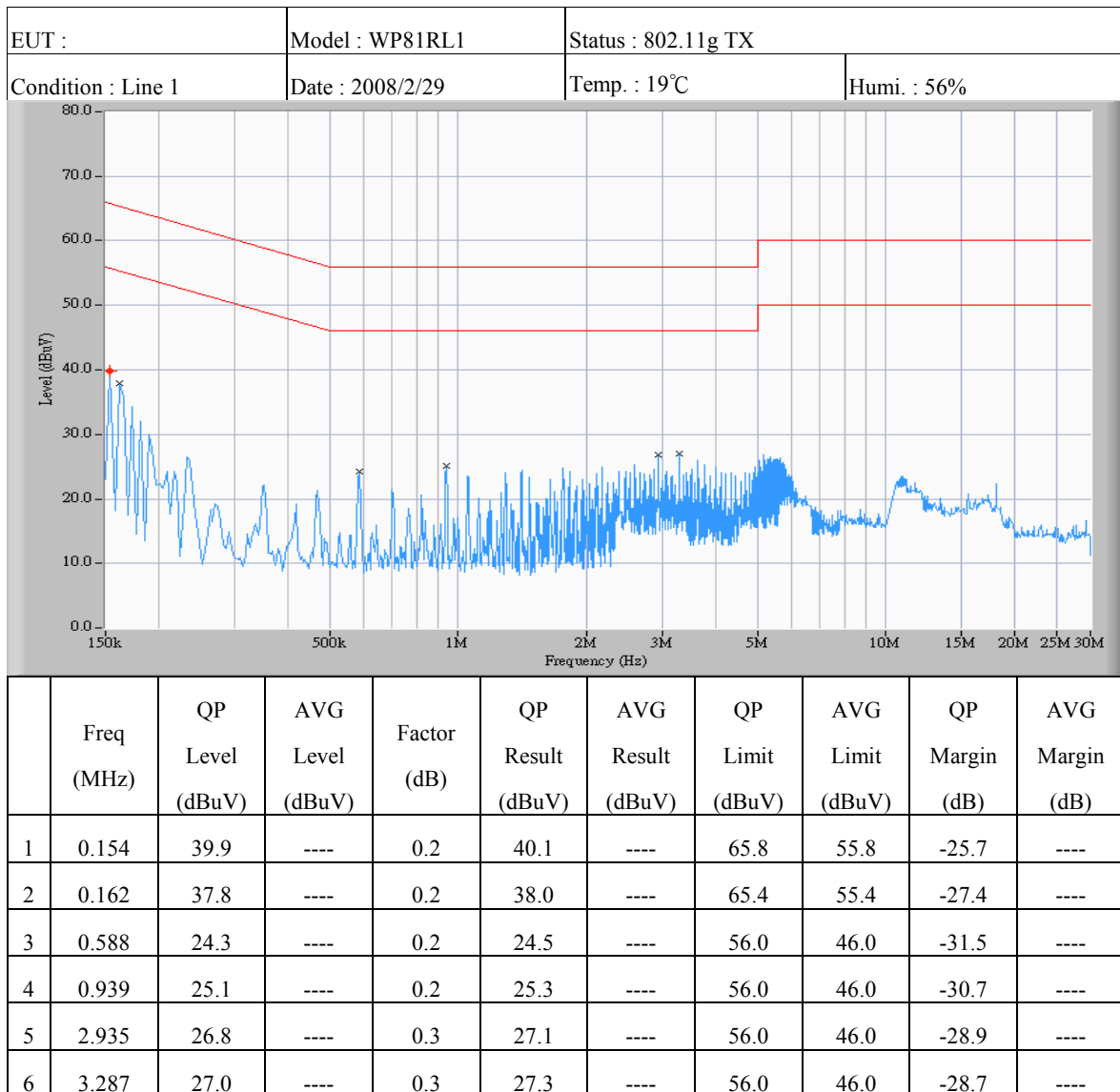
1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.



Note:

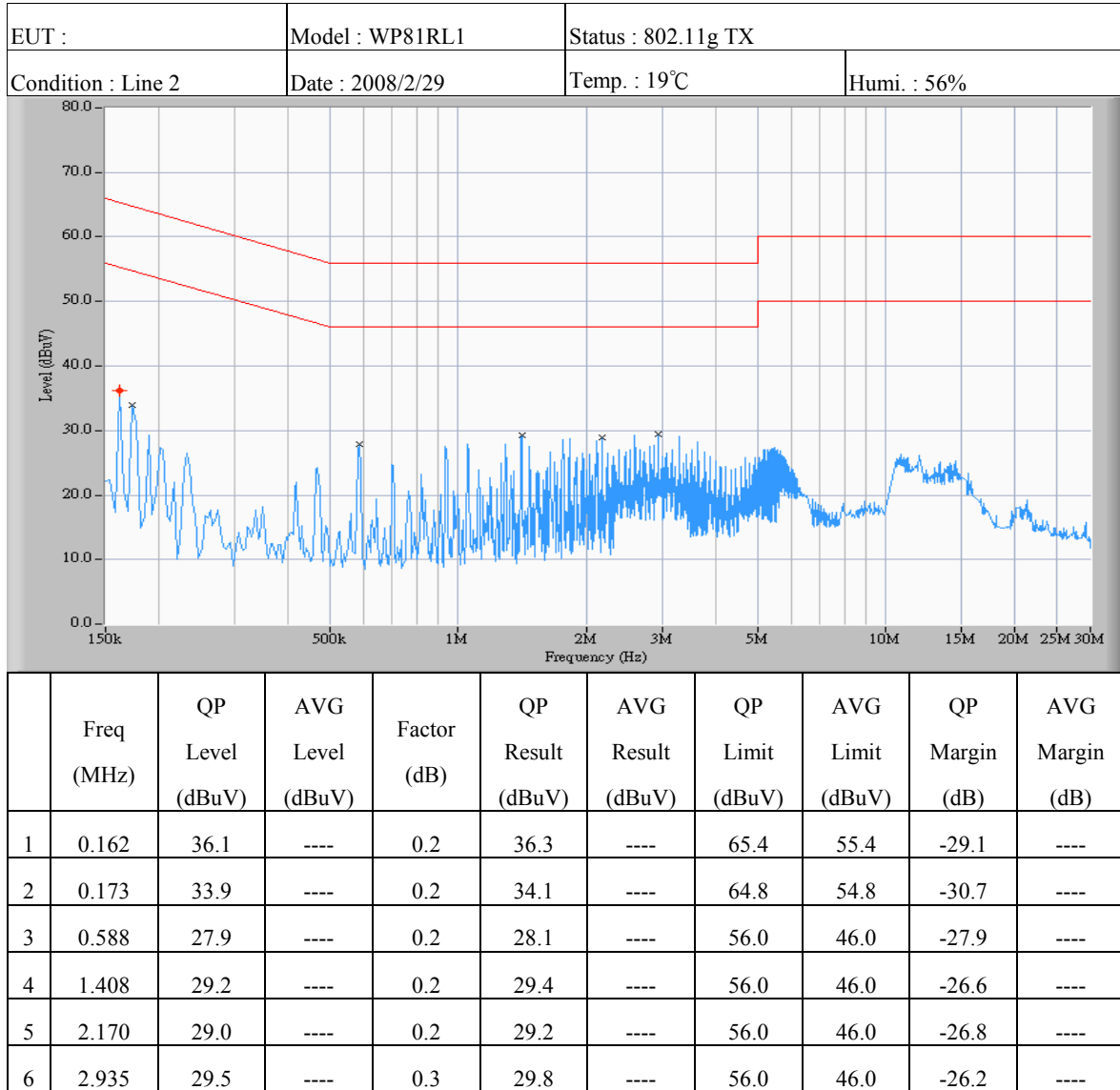
1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.

4.3.2 Operation Mode: IEEE 802.11g



Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of “----” means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.

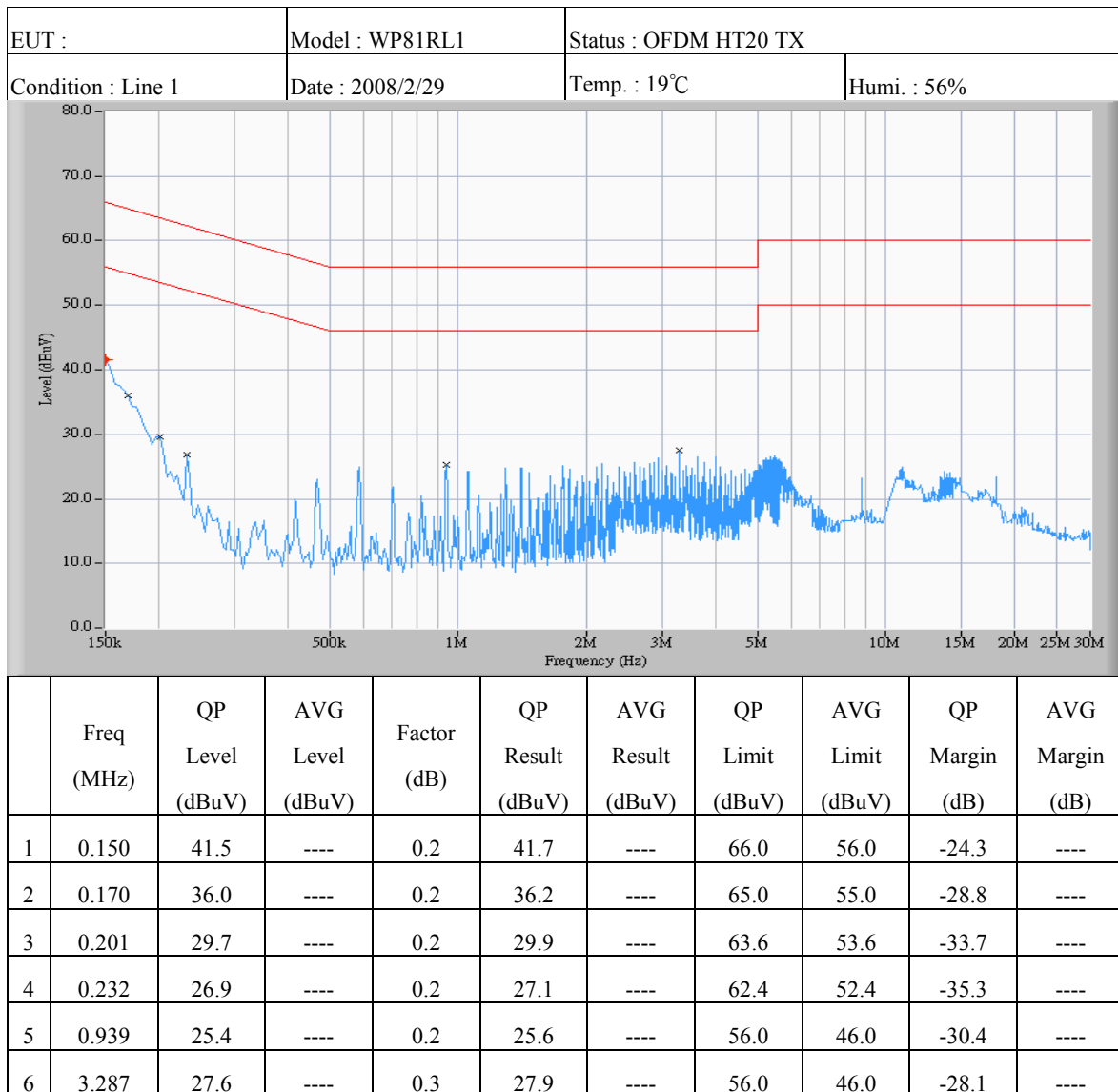


Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5\text{dB}$ .

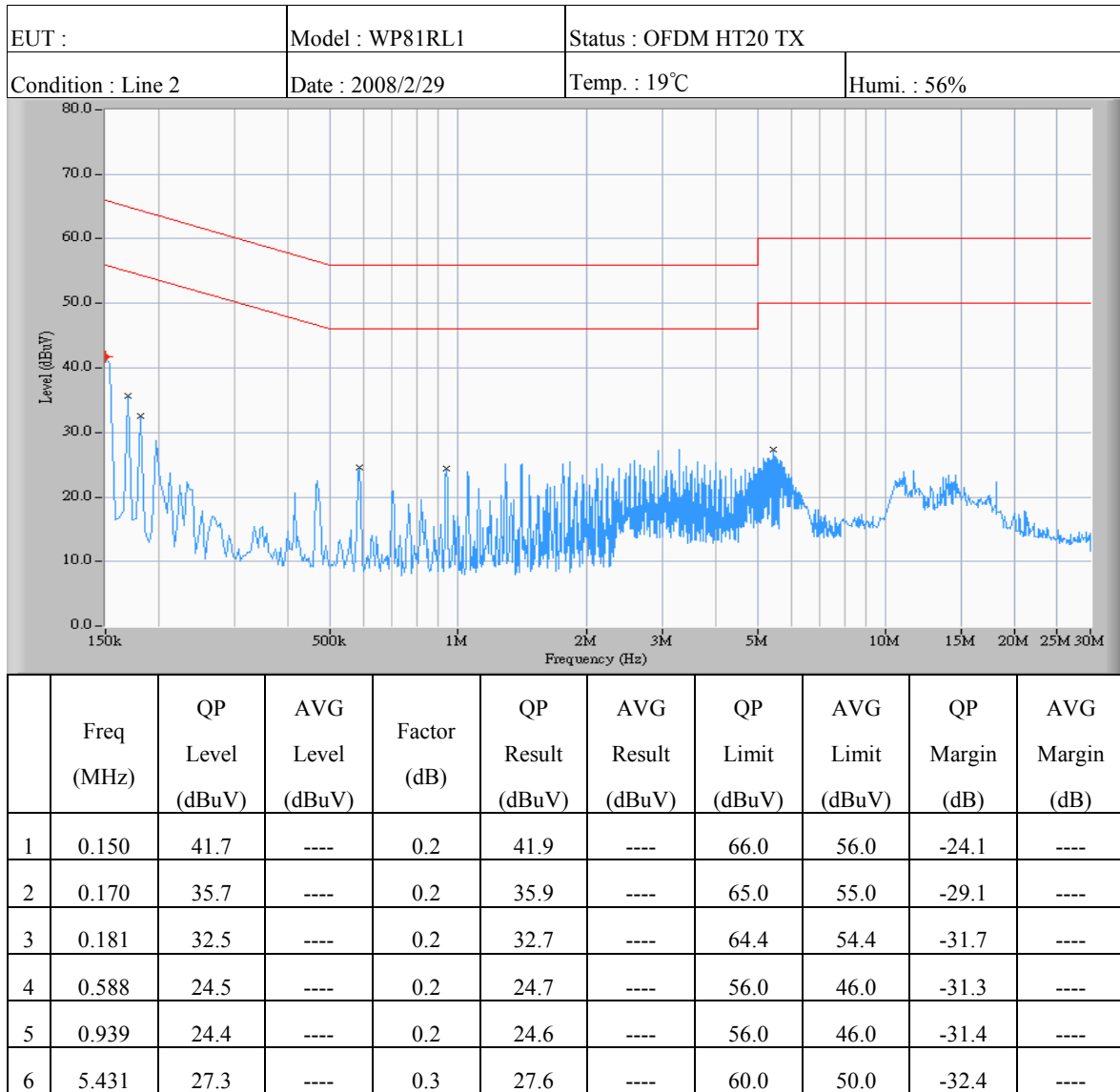


4.3.3 Operation Mode: IEEE 802.11n, HT20



Note:

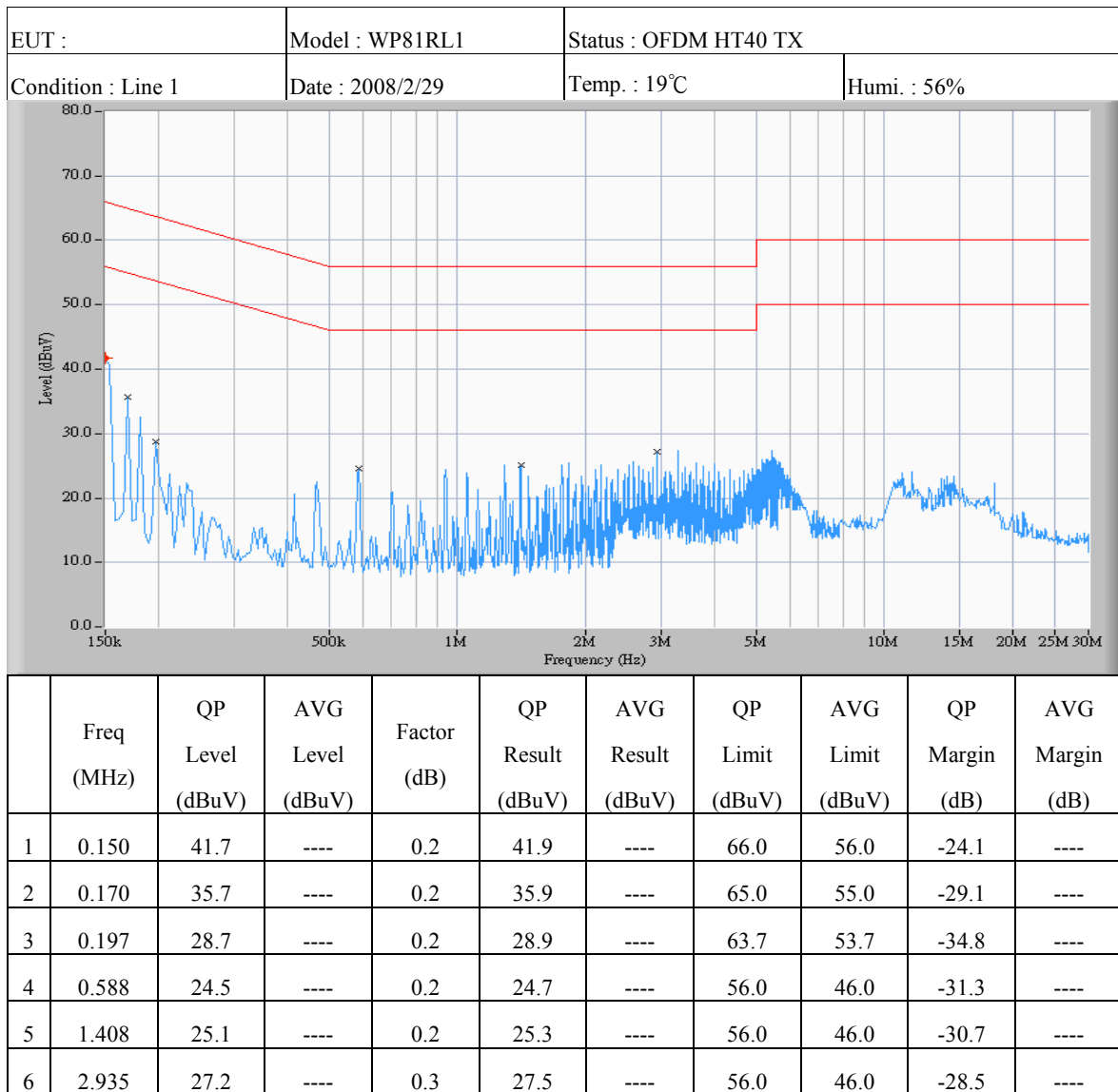
1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.



Note:

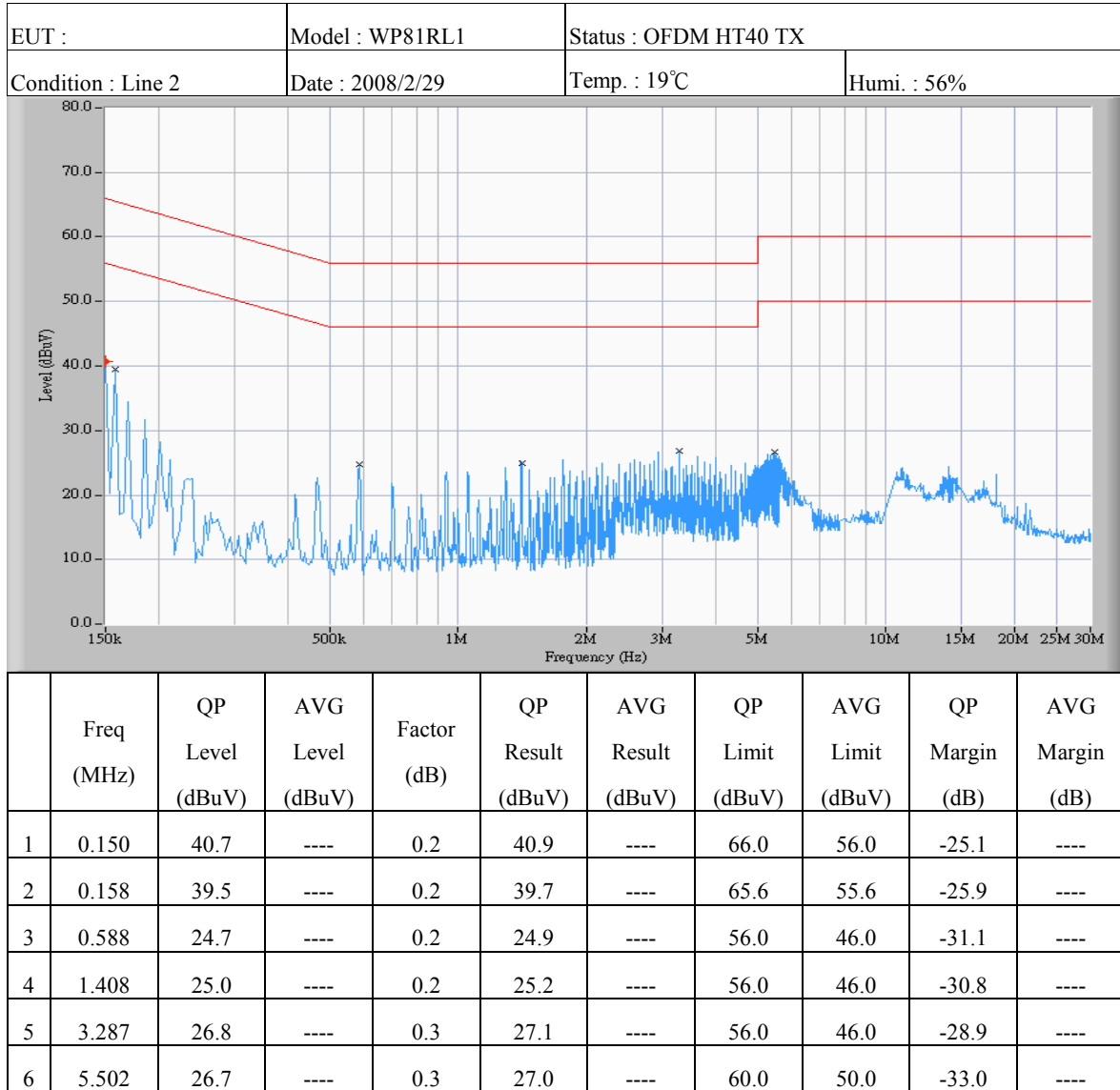
1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.

4.3.4 Operation Mode: IEEE 802.11n, HT40



Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of “----” means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.



Note:

1. Place of measurement: EMC LAB. of the ETC.
2. “\*\*\*” means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit of AVG. so, the AVG. value doesn't need to be measured.
4. “#” means the noise was too low, so record the peak value.
5. The estimated measurement uncertainty of the result measurement is  $\pm 2.5$ dB.

#### 4.4 Result Data Calculation

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

$$\mathbf{RESULT = READING + LISN FACTOR (Included Cable Loss)}$$

#### 4.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Next Cal. Due</b>
RF Test Receiver	Rohde and Schwarz	ESCS30	08/07/2008
LISN	EMCO	37100/2M	02/12/2009

## **5 ANTENNA REQUIREMENT**

### **5.1 Standard Applicable**

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

### **5.2 Antenna Construction and Directional Gain**

Antenna type: Dipole Antenna.

Antenna gain: 2.09 dBi.

RF Chain: 1T2R

## 6 EMISSION BANDWIDTH MEASUREMENT

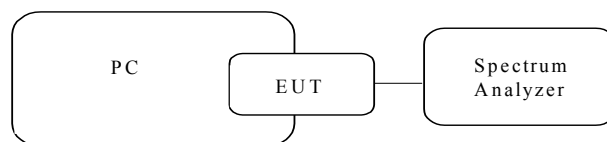
### 6.1 Standard Applicable

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

### 6.2 Measurement Procedure

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

Figure 2: Emission bandwidth measurement configuration.



### 6.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	8564EC	10/10/2008

## 6.4 Measurement Data

### 6.4.1 IEEE 802.11b

Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			FCC Limit (kHz)
		Chain 0	Chain 1	Chain 2	
1	2412	12.434	n/a	n/a	500
6	2437	12.334	n/a	n/a	500
11	2462	12.300	n/a	n/a	500

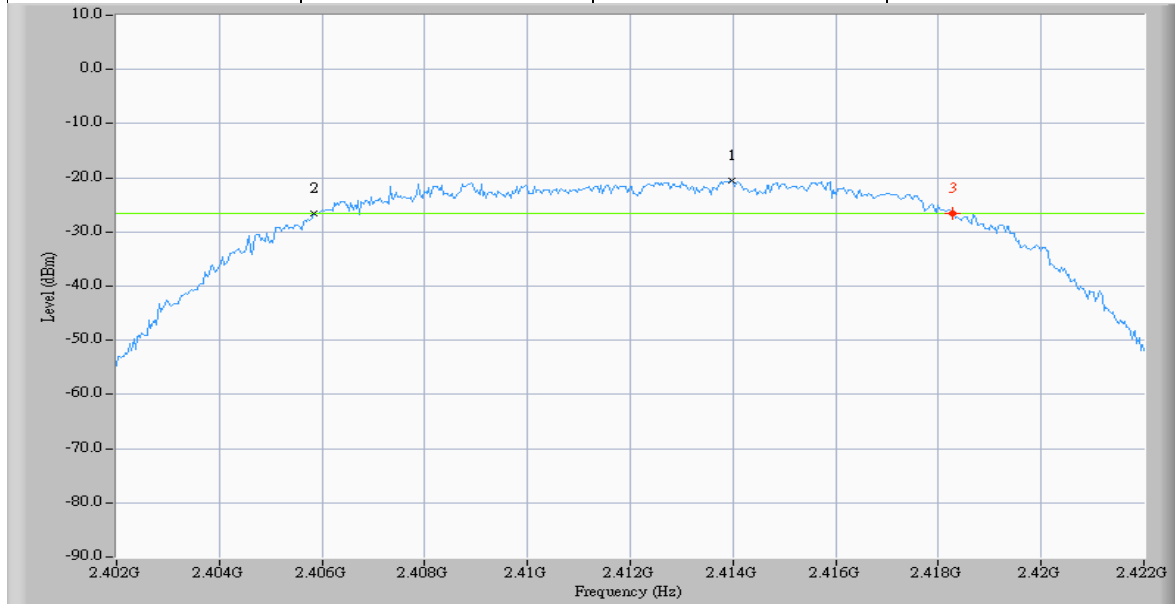
**Note:**

1. Please refer to page 25 to page 27 for chart

2. The estimated measurement uncertainty of the result measurement is  $8.25 \times 10^{-7}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



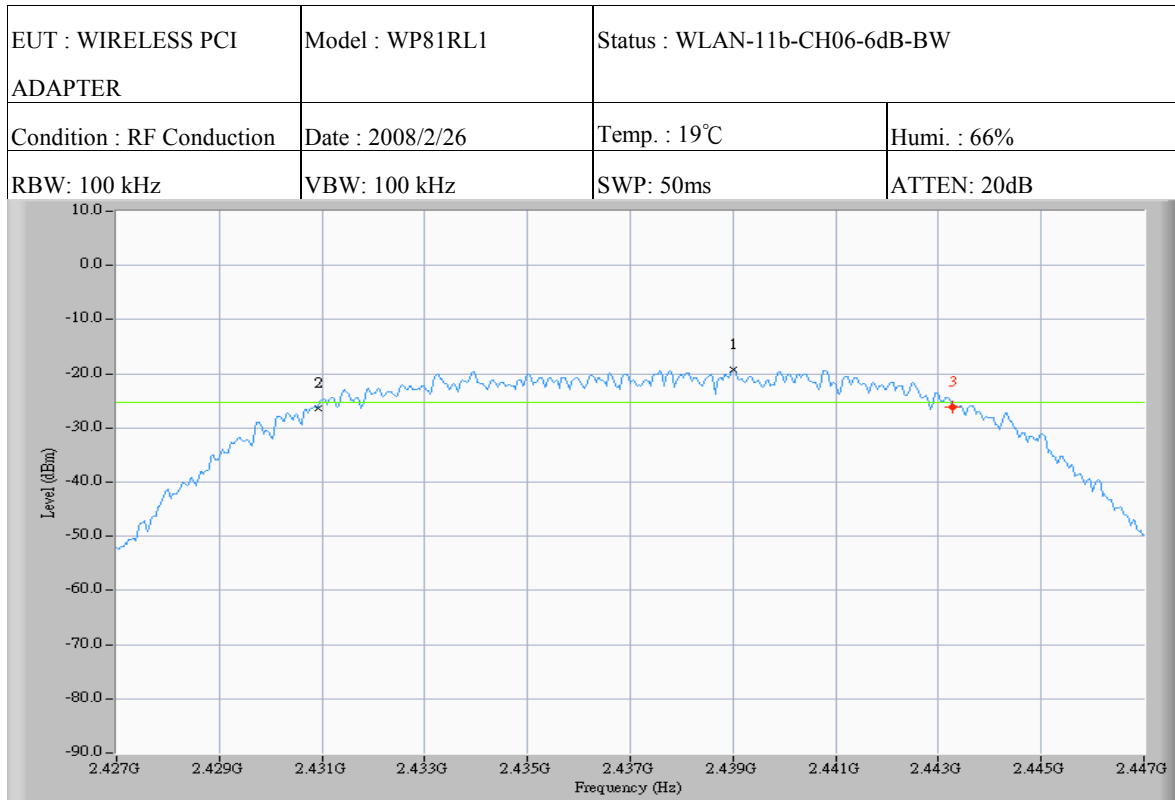
EUT : WIRELESS PCI ADAPTER	Model : WP81RL1	Status : WLAN-11b-CH01-6dB-BW	
Condition : RF Conduction	Date : 2008/2/26	Temp. : 19°C	Humi. : 66%
RBW: 100 kHz	VBW: 100 kHz	SWP: 50ms	ATTEN: 20dB



Test Request: (-26.5dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2413.967	-20.5
2	2405.833	-26.5
3	2418.267	-26.5

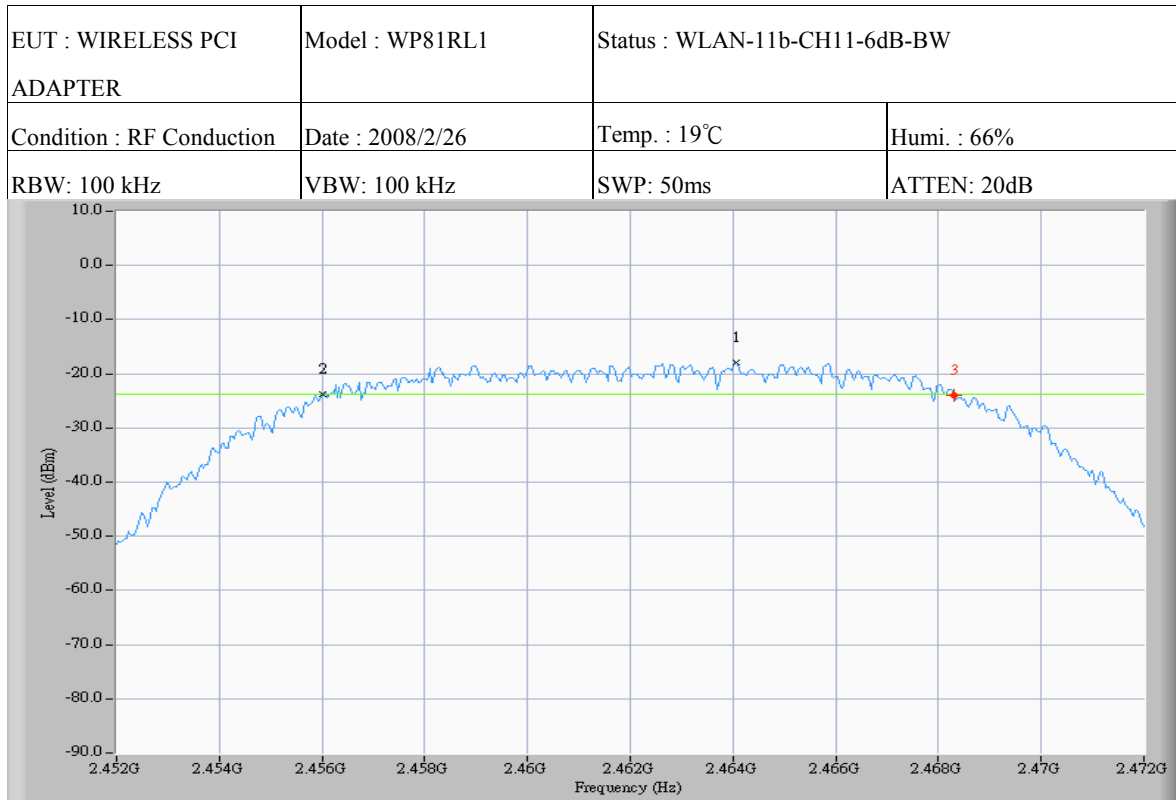
		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 3 - Mkr 2	12.434	0.0



Test Request: (-25.2dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2439.000	-19.2
2	2430.933	-26.3
3	2443.267	-26.2

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	12.334	0.1



Test Request: (-23.8dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2464.067	-17.8
2	2456.000	-23.8
3	2468.300	-24.0

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	12.300	-0.2

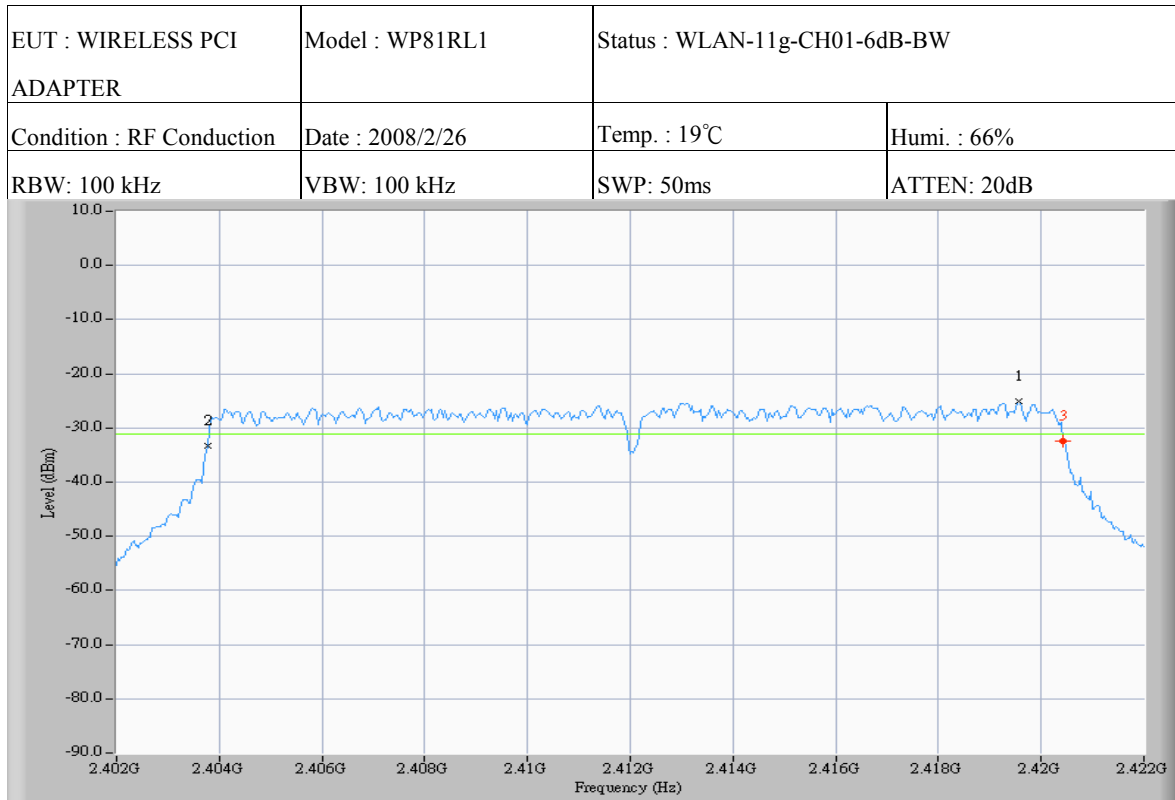
**6.4.2 IEEE 802.11g**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			FCC Limit (kHz)
		Chain 0	Chain 1	Chain 2	
1	2412	16.666	n/a	n/a	500
6	2437	16.667	n/a	n/a	500
11	2462	17.000	n/a	n/a	500

**Note:**

1. Please refer to page 29 to page 31 for chart

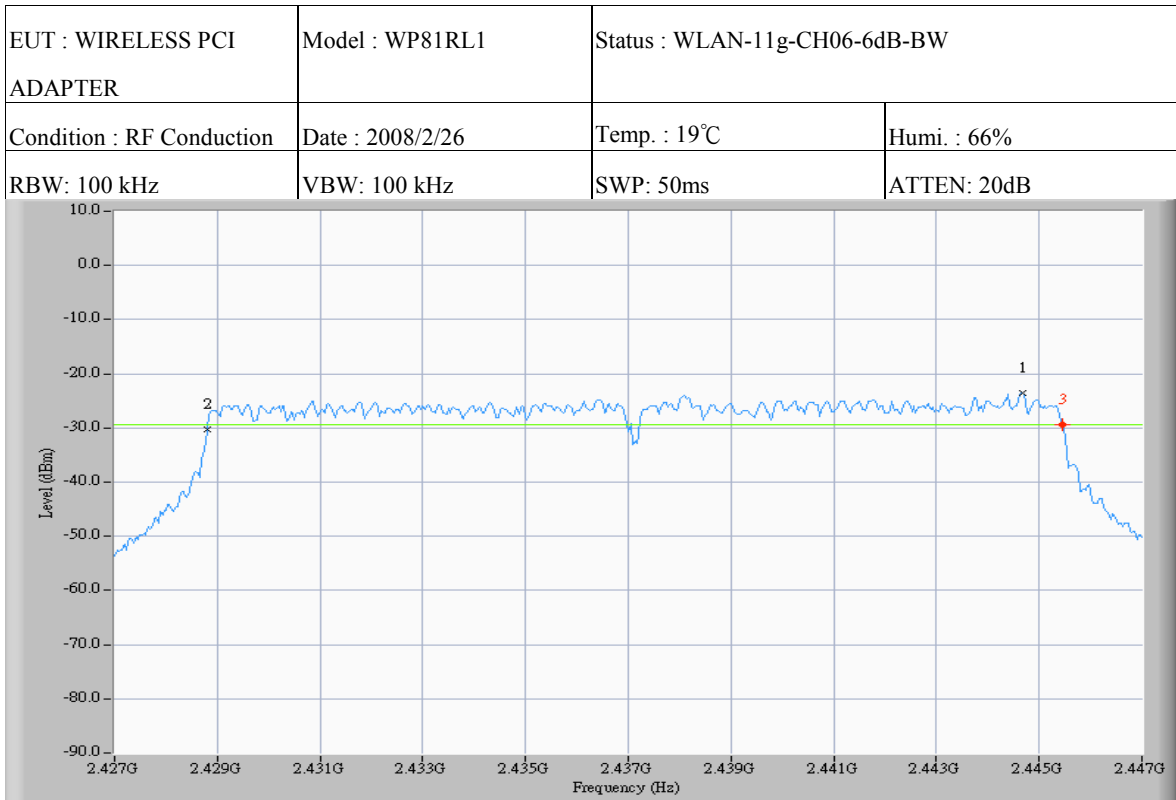
2. The estimated measurement uncertainty of the result measurement is  $8.25 \times 10^{-7}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



Test Request: (-31.2dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2419.567	-25.2
2	2403.767	-33.3
3	2420.433	-32.3

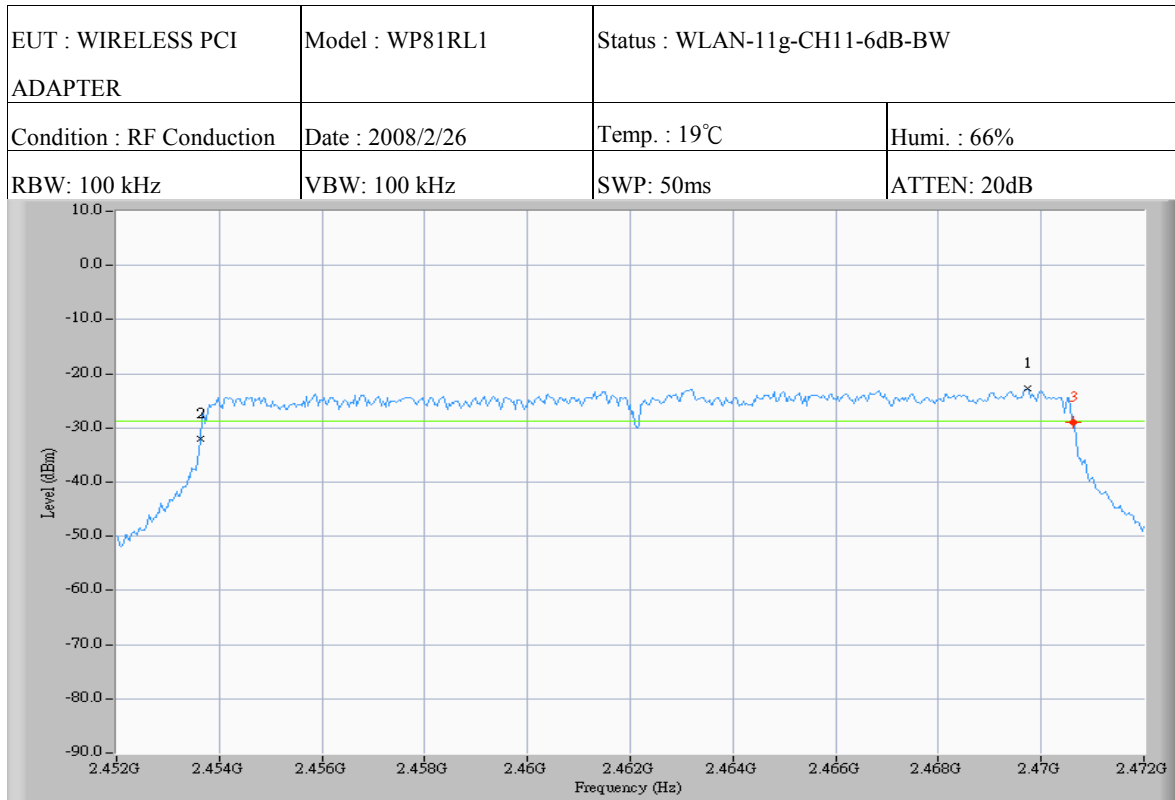
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	16.666	1.0



Test Request: (-29.5dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2444.667	-23.5
2	2428.800	-30.3
3	2445.467	-29.5

		△Frequency (MHz)	△Level (dB)
1	Mkr 3 - Mkr 2	16.667	0.8



Test Request: (-28.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2469.733	-22.7
2	2453.633	-32.0
3	2470.633	-29.0

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	17.000	3.0

**6.4.3 IEEE 802.11n, HT20**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

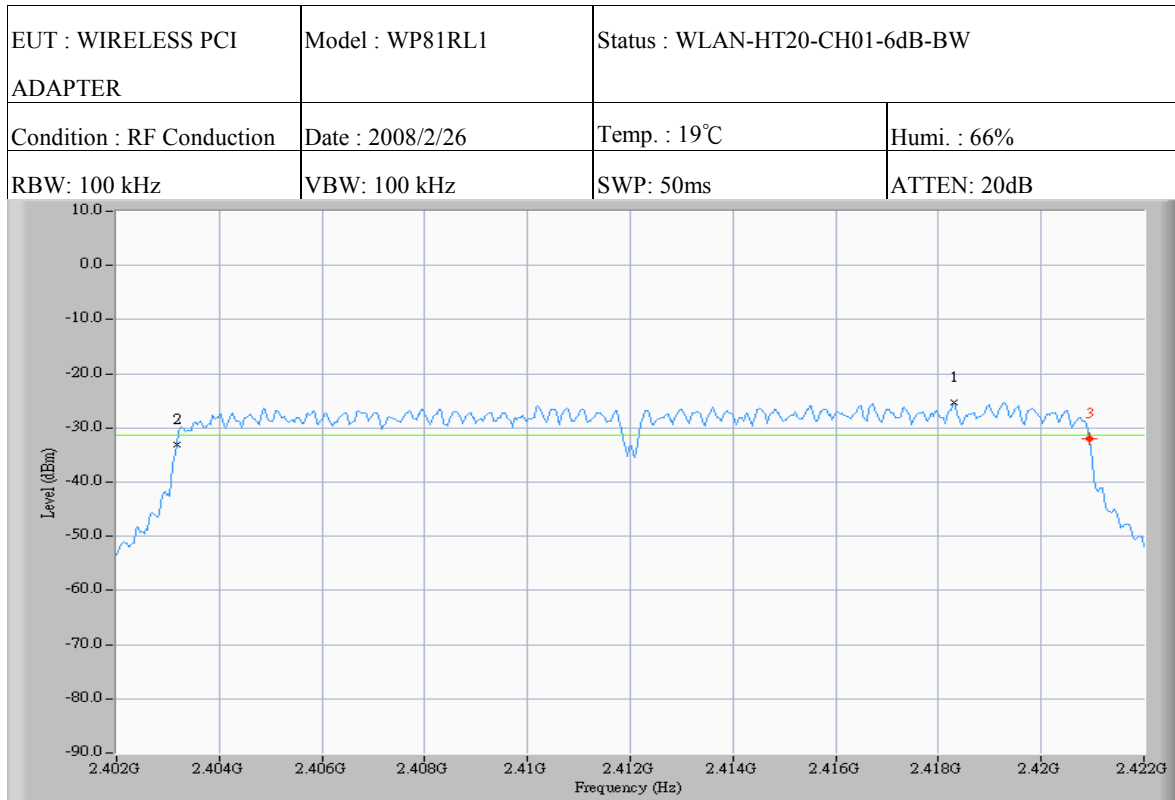
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			FCC Limit (kHz)
		Chain 0	Chain 1	Chain 2	
1	2412	17.766	n/a	n/a	500
6	2437	17.933	n/a	n/a	500
11	2462	18.133	n/a	n/a	500

**Note:**

1. Please refer to page 33 to page 35 for chart

2. The estimated measurement uncertainty of the result measurement is  $8.25 \times 10^{-7}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )

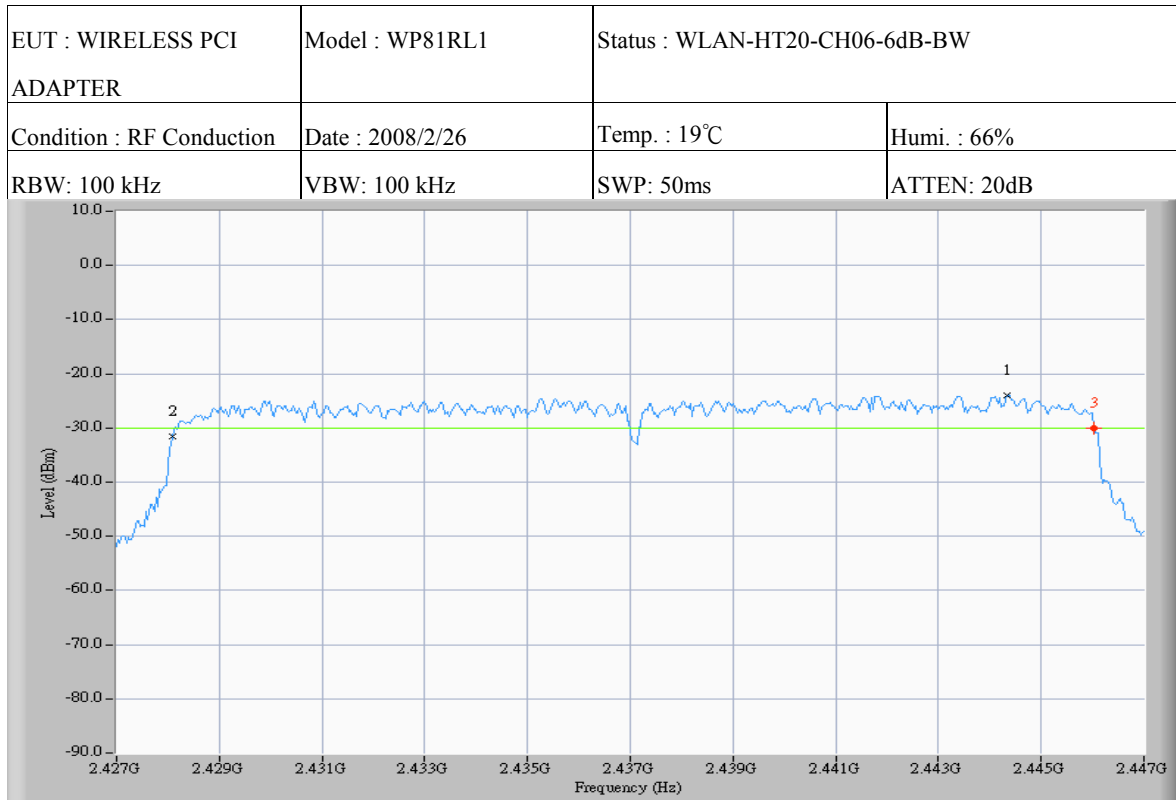




Test Request: (-31.3dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2418.300	-25.3
2	2403.167	-33.2
3	2420.933	-32.0

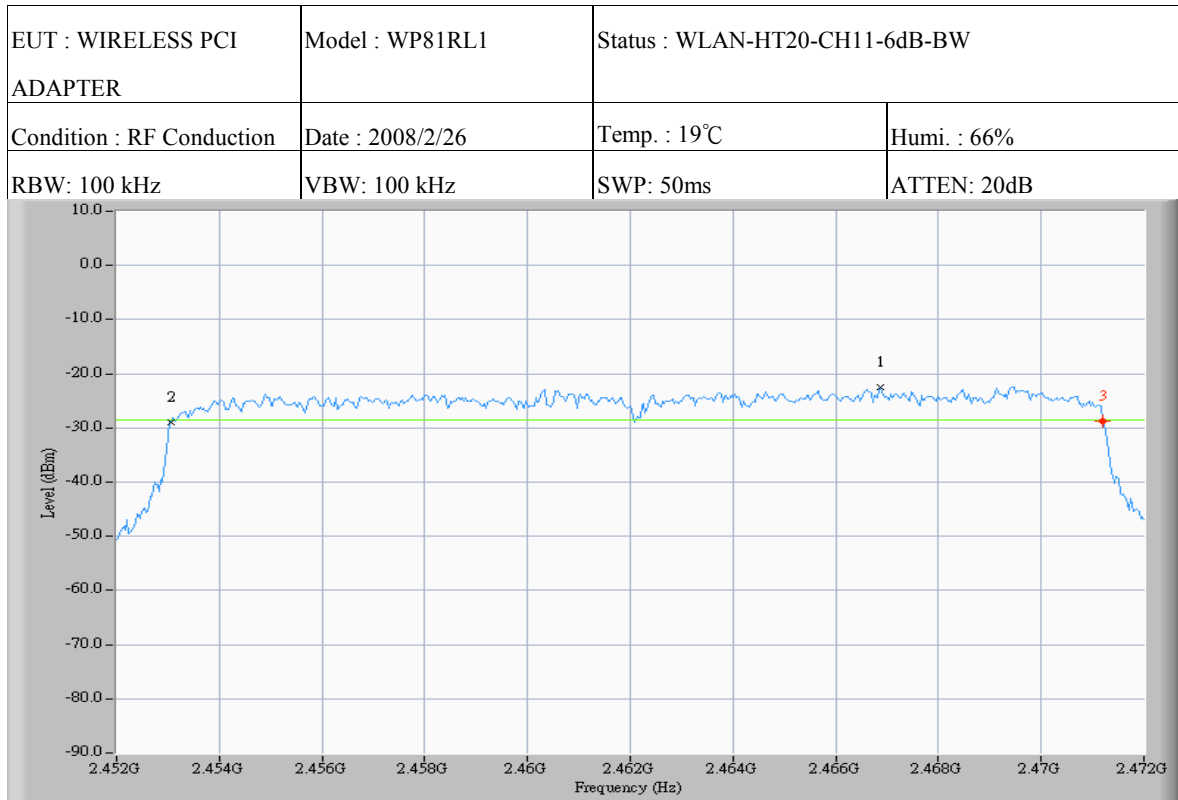
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	17.766	1.2



Test Request: (-30.0dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2444.333	-24.0
2	2428.100	-31.7
3	2446.033	-30.0

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	17.933	1.7



Test Request: (-28.5dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2466.867	-22.5
2	2453.067	-29.0
3	2471.200	-28.8

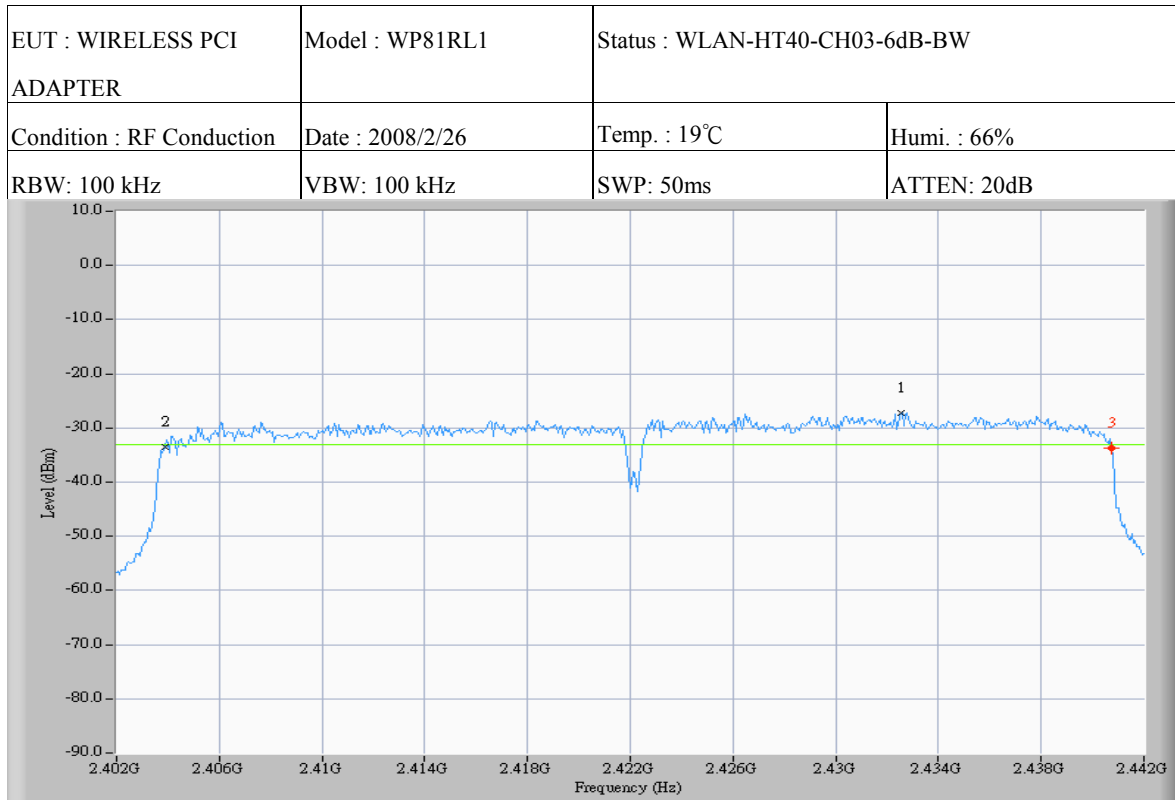
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	18.133	0.2

**6.4.4 IEEE 802.11n, HT40**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			FCC Limit (kHz)
		Chain 0	Chain 1	Chain 2	
3	2422	36.866	n/a	n/a	500
6	2437	37.000	n/a	n/a	500
9	2452	37.134	n/a	n/a	500

**Note:**

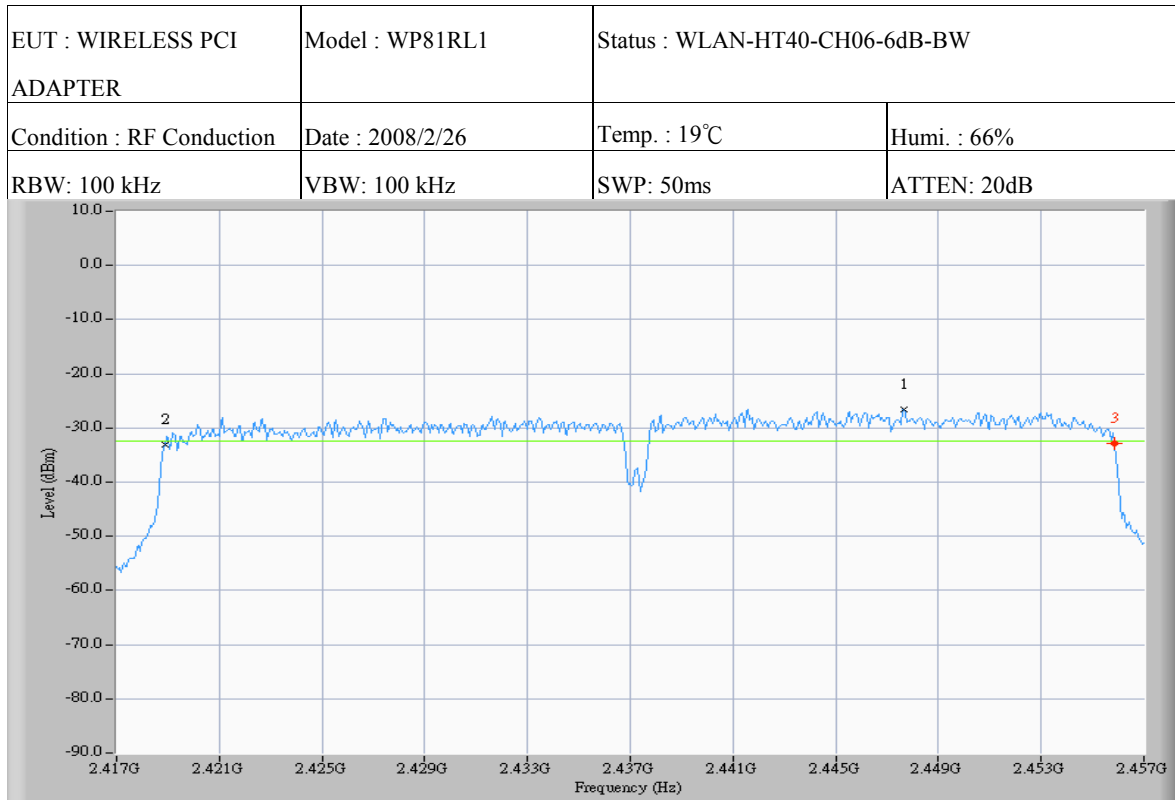
1. Please refer to page 37 to page 39 for chart
2. The estimated measurement uncertainty of the result measurement is  $8.25 \times 10^{-7}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



Test Request: (-33.16dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2432.533	-27.2
2	2403.867	-33.5
3	2440.733	-33.7

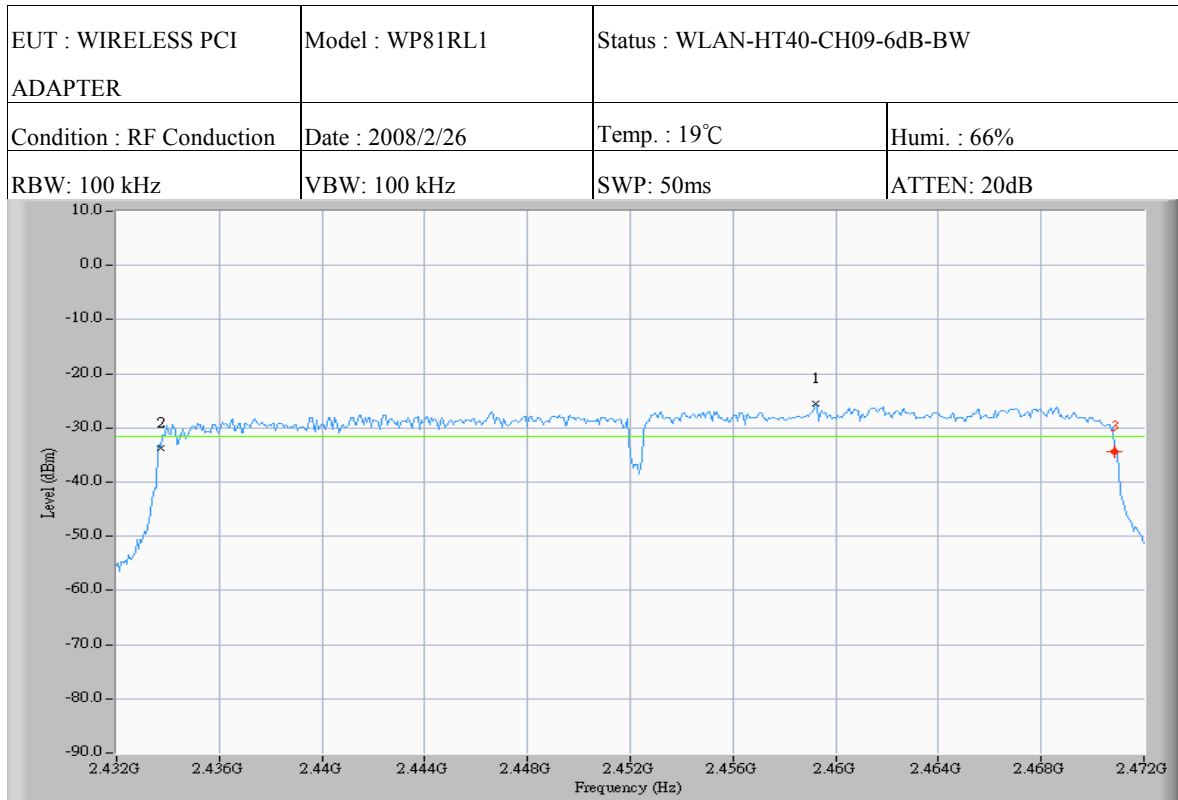
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	36.866	-0.2



Test Request: (-32.50dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2447.667	-26.5
2	2418.867	-33.0
3	2455.867	-32.8

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	37.000	0.2



Test Request: (-31.50dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2459.200	-25.5
2	2433.733	-33.7
3	2470.867	-34.3

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 3 - Mkr 2	37.134	-0.6

## 7 OUTPUT POWER MEASUREMENT

### 7.1 Standard Applicable

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

### 7.2 Measurement Procedure

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

### 7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	8564EC	10/10/2008



## 7.4 Measurement Data

### 7.4.1 IEEE 802.11b

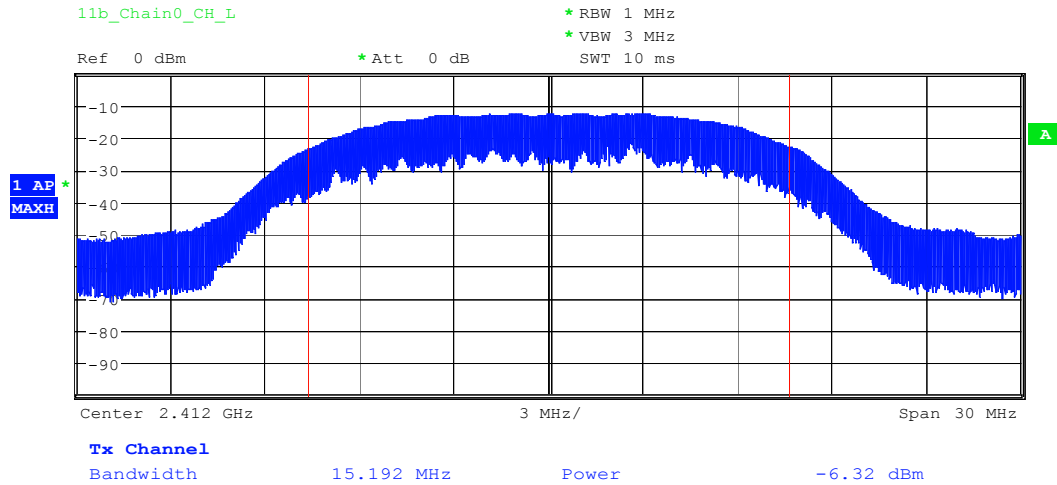
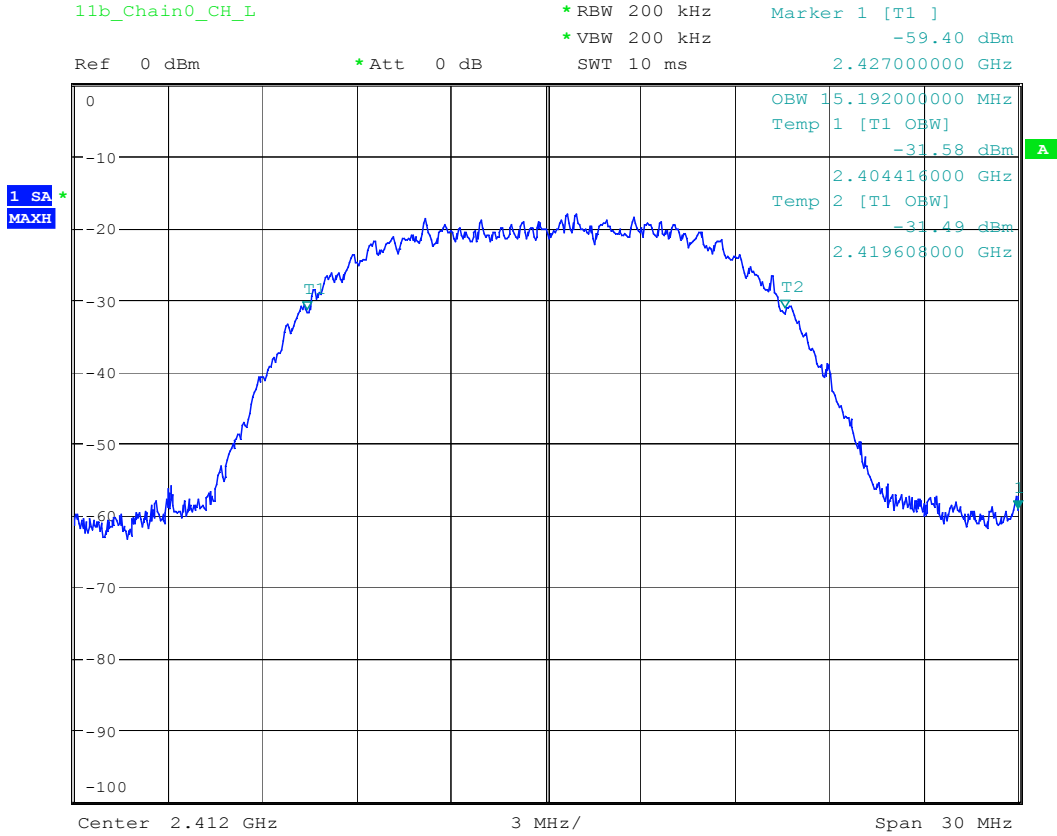
Test Date: Feb. 25, 2008Temperature: 19°CHumidity: 62%

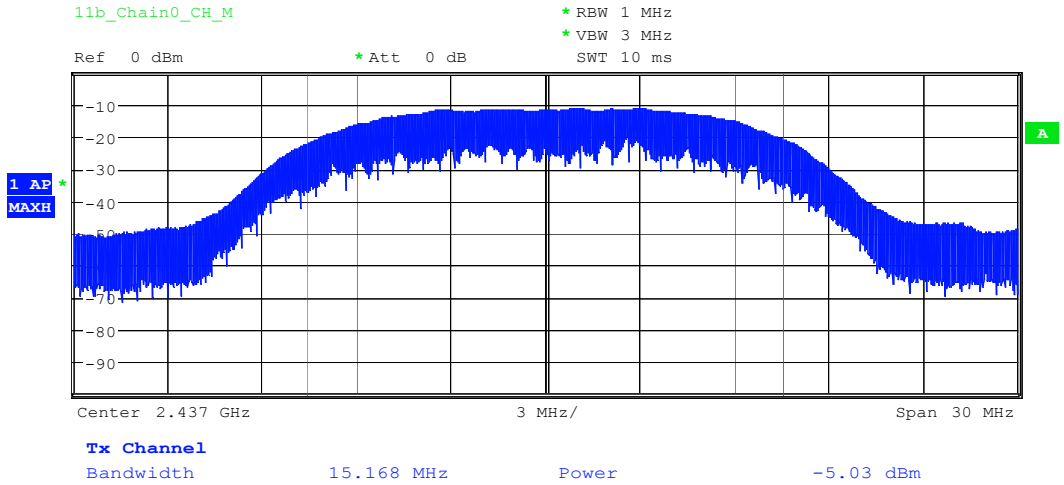
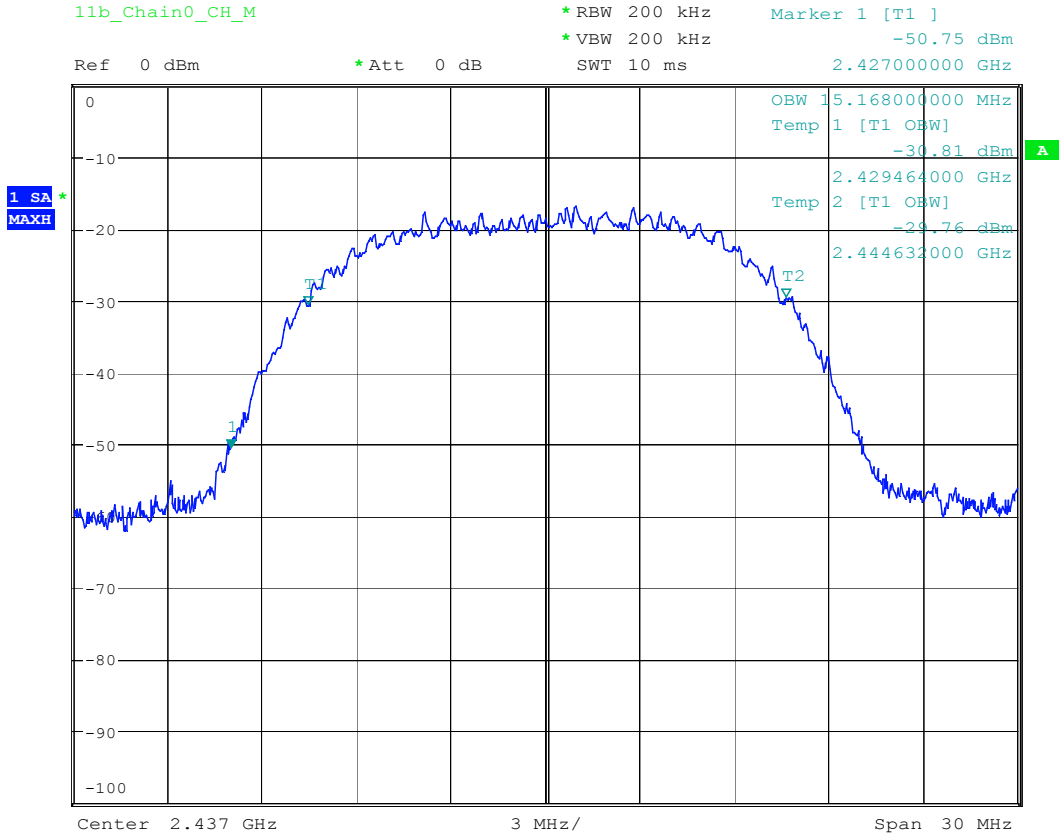
Channel	Frequency (MHz)	Attenuator & Cable Loss (dB)	Maximum Peak Output Power (dBm)			Total Maximum Peak Output Power (dBm)	Total Maximum Peak Output Power (mW)	FCC Limit (mW)
			Chain 0	Chain 1	Chain 2			
1	2412	20.0	13.68	n/a	n/a	13.68	23.3	1000
6	2437	20.0	14.97	n/a	n/a	14.97	31.4	1000
11	2462	20.0	16.42	n/a	n/a	16.42	43.9	1000

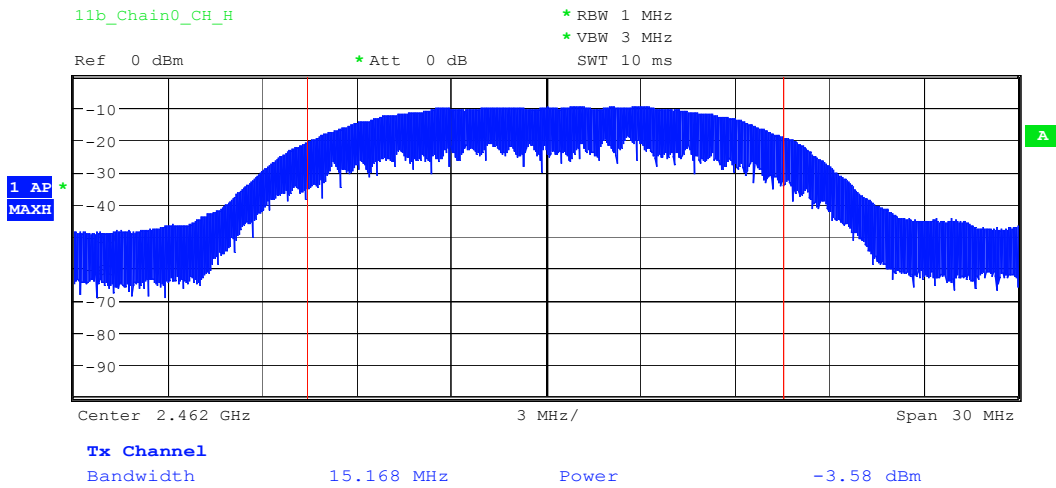
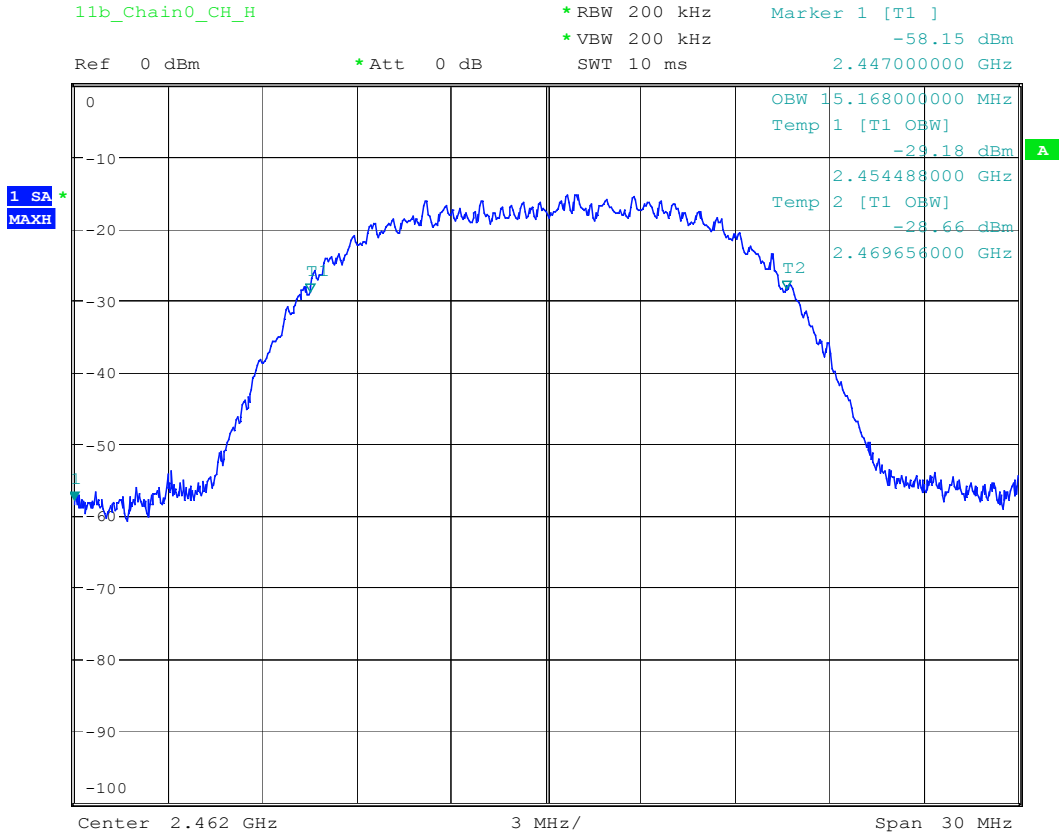
**Note:**

1. Please refer to page 42 to page 44 for chart

2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )







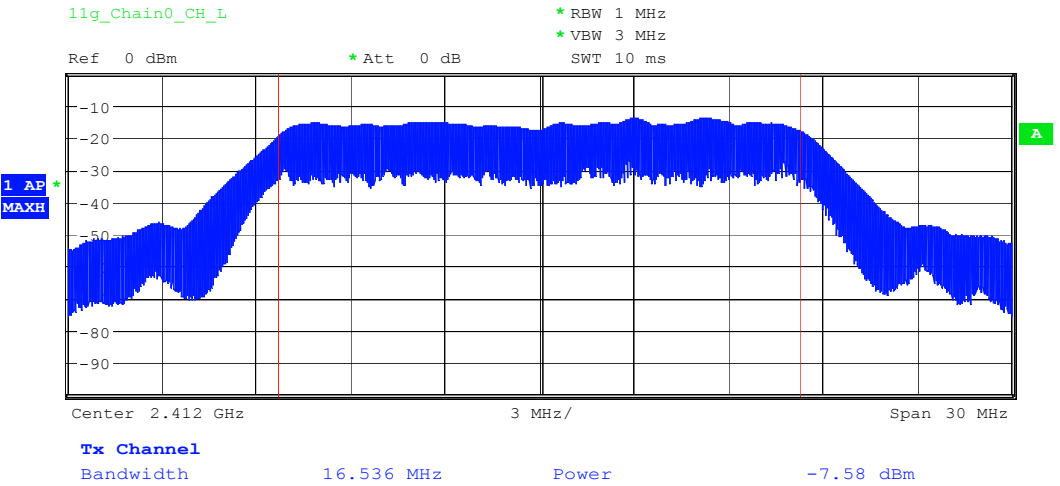
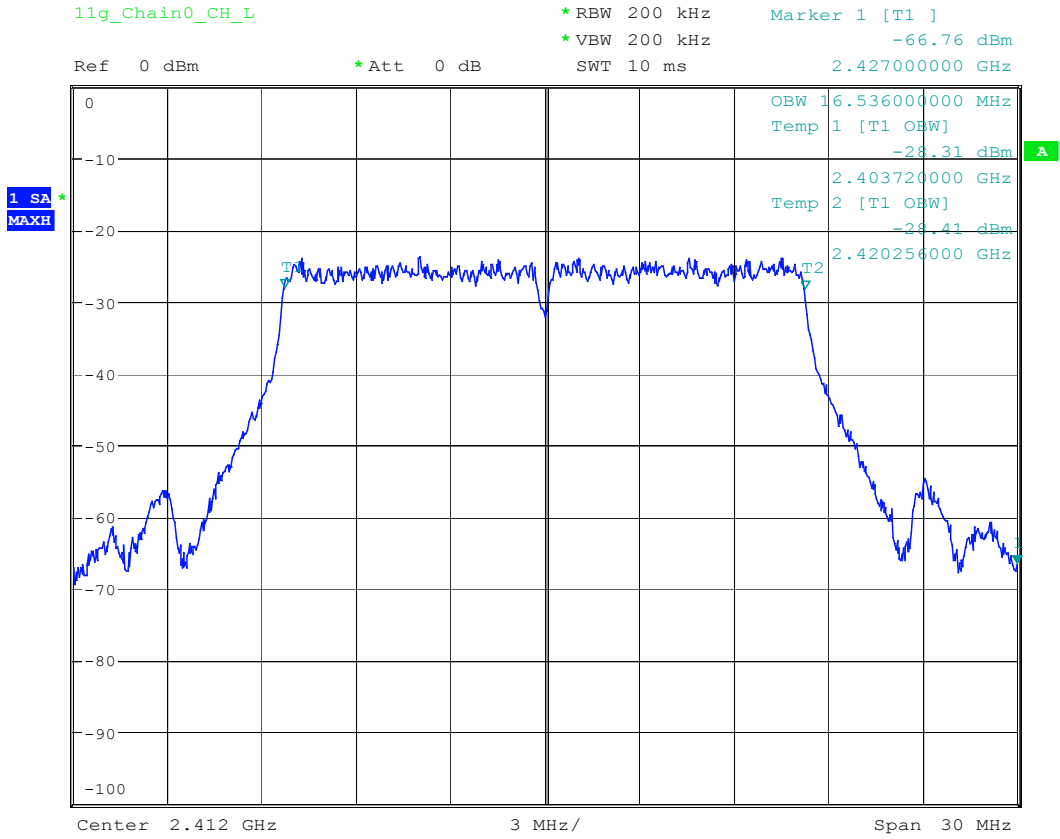
**7.4.2 IEEE 802.11g**Test Date: Feb. 25, 2008Temperature: 19°CHumidity: 62%

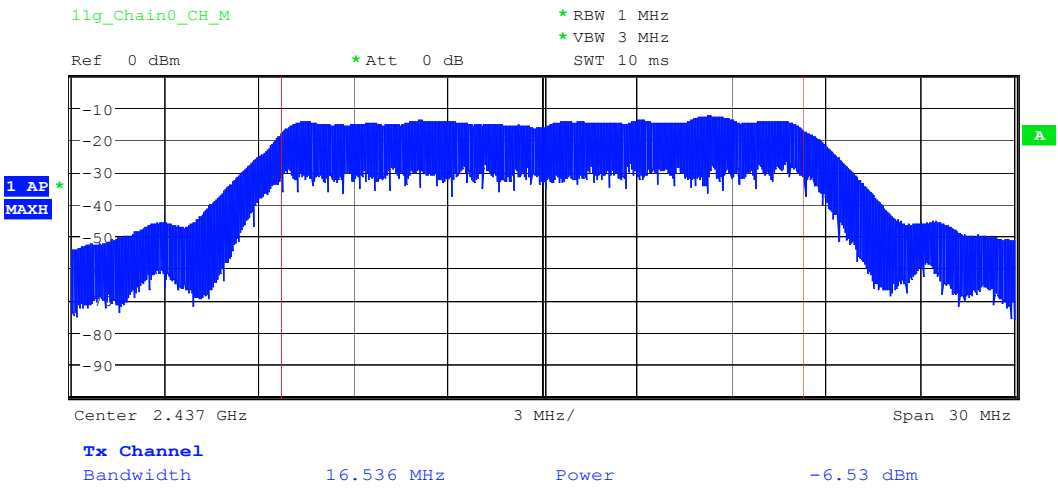
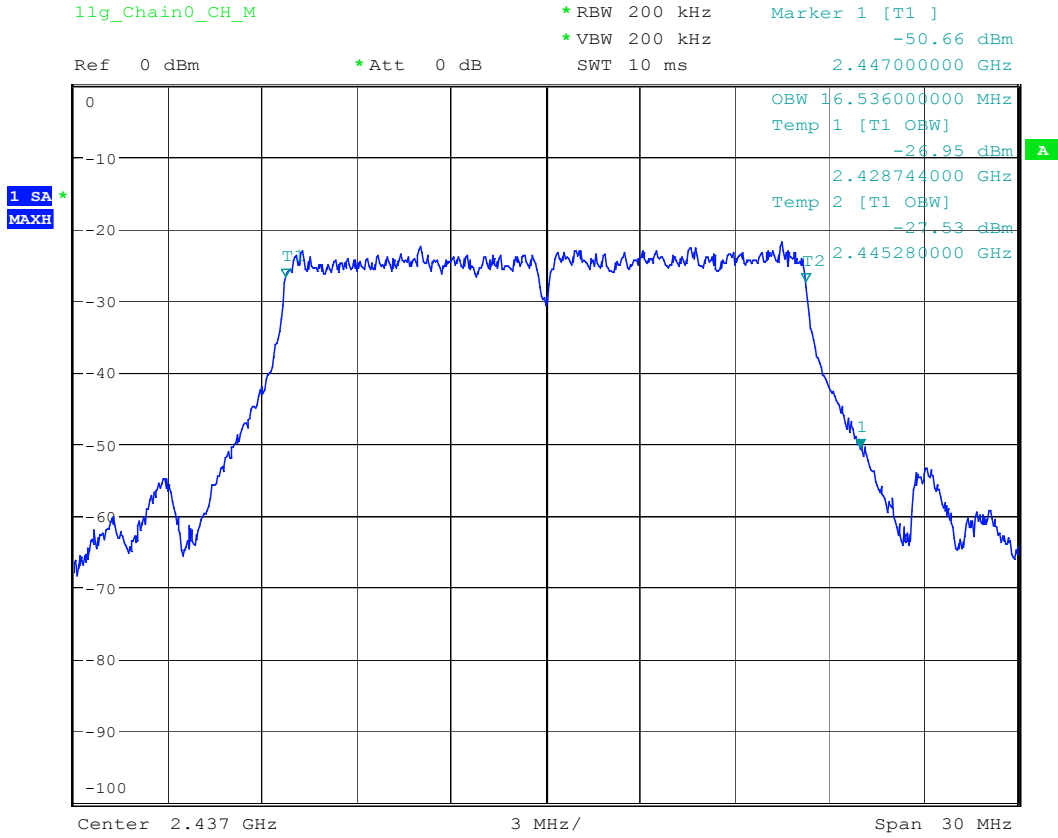
Channel	Frequency (MHz)	Attenuator & Cable Loss (dB)	Maximum Peak Output Power (dBm)			Total Maximum Peak Output Power (dBm)	Total Maximum Peak Output Power (mW)	FCC Limit (mW)
			Chain 0	Chain 1	Chain 2			
1	2412	20.0	12.42	n/a	n/a	12.42	17.5	1000
6	2437	20.0	13.47	n/a	n/a	13.47	22.2	1000
11	2462	20.0	15.30	n/a	n/a	15.30	33.9	1000

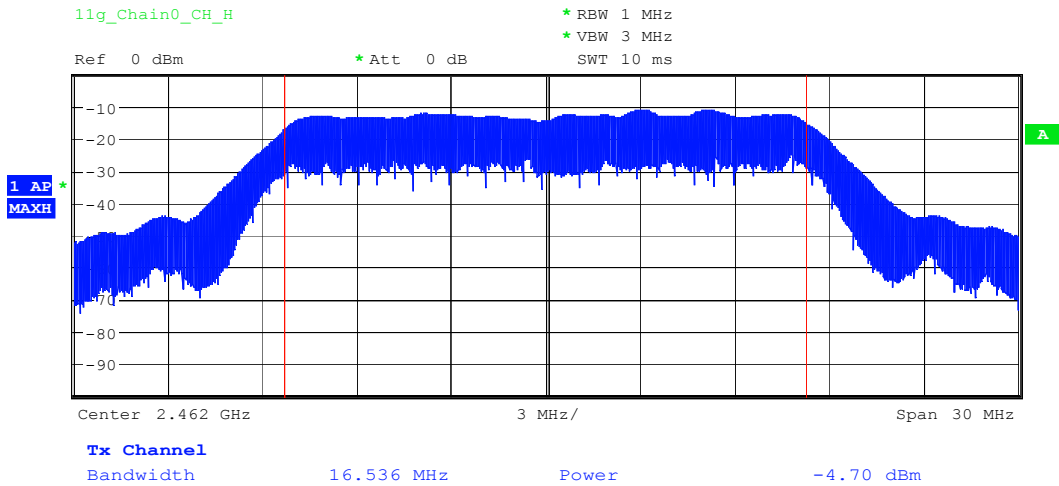
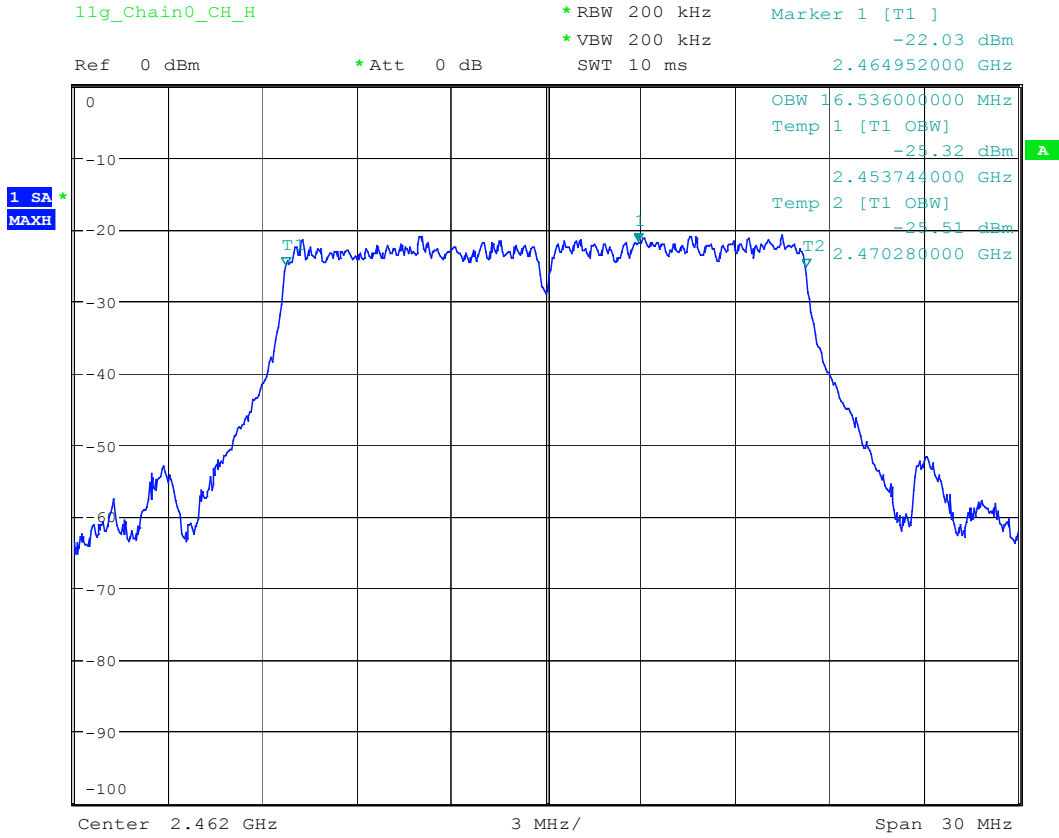
**Note:**

1. Please refer to page 46 to page 48 for chart

2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )









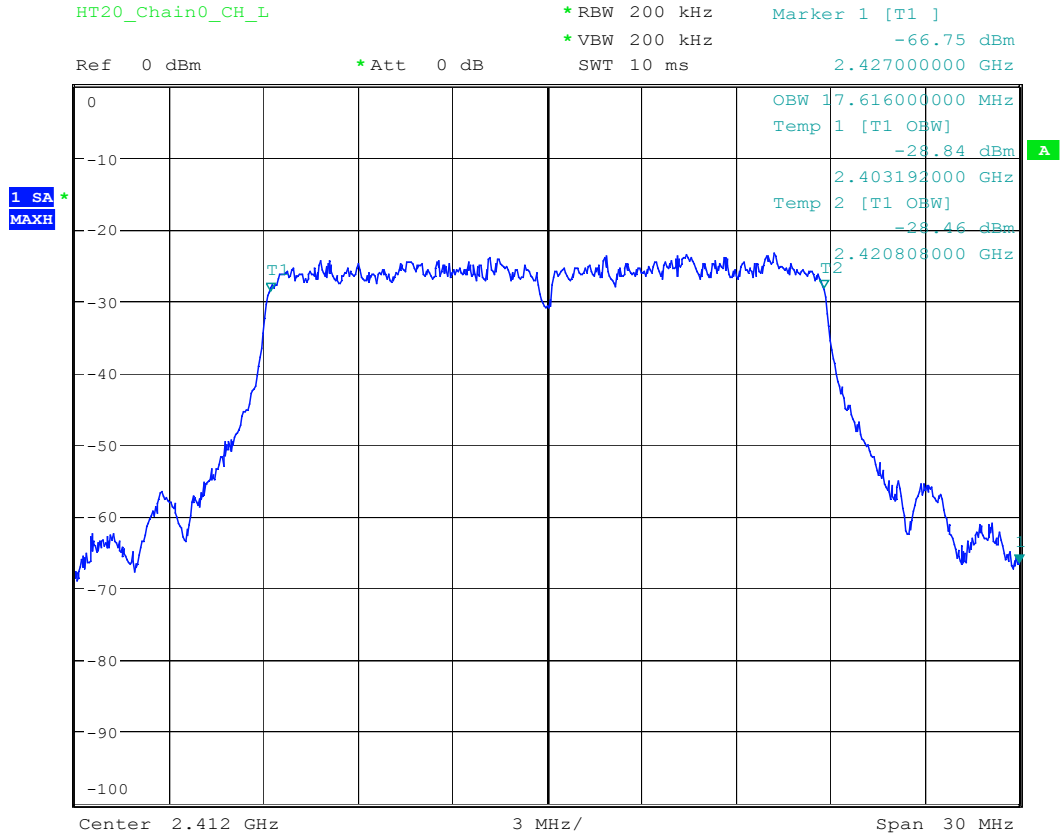
**7.4.3 IEEE 802.11n, HT20**Test Date: Feb. 25, 2008Temperature: 19°CHumidity: 62%

Channel	Frequency (MHz)	Attenuator & Cable Loss (dB)	Maximum Peak Output Power (dBm)			Total Maximum Peak Output Power (dBm)	Total Maximum Peak Output Power (mW)	FCC Limit (mW)
			Chain 0	Chain 1	Chain 2			
1	2412	20.0	12.34	n/a	n/a	12.34	17.1	1000
6	2437	20.0	13.43	n/a	n/a	13.43	22.0	1000
11	2462	20.0	15.16	n/a	n/a	15.16	32.8	1000

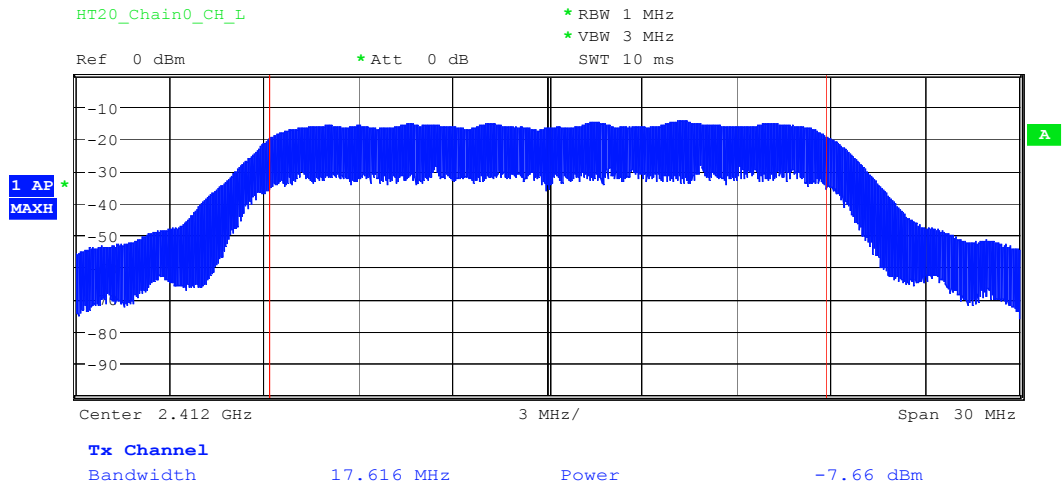
**Note:**

1. Please refer to page 50 to page 52 for chart

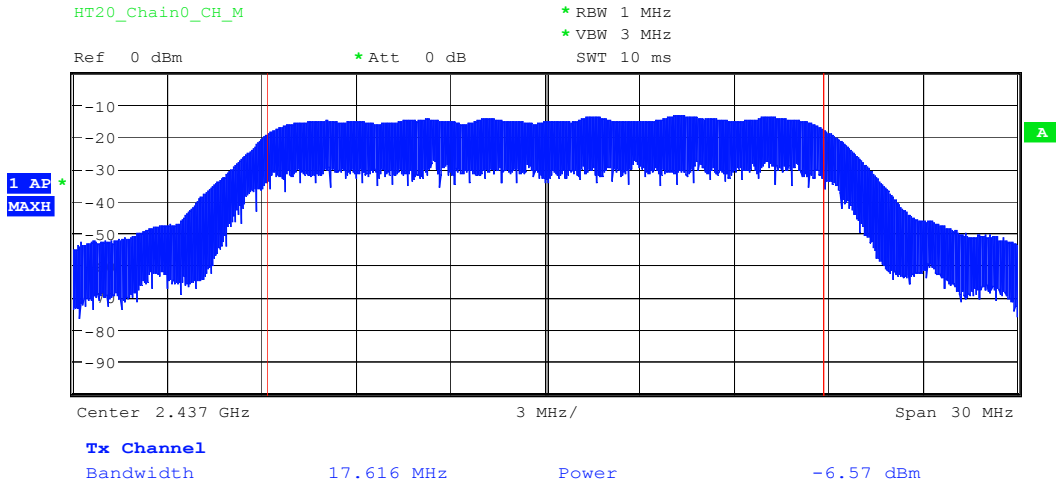
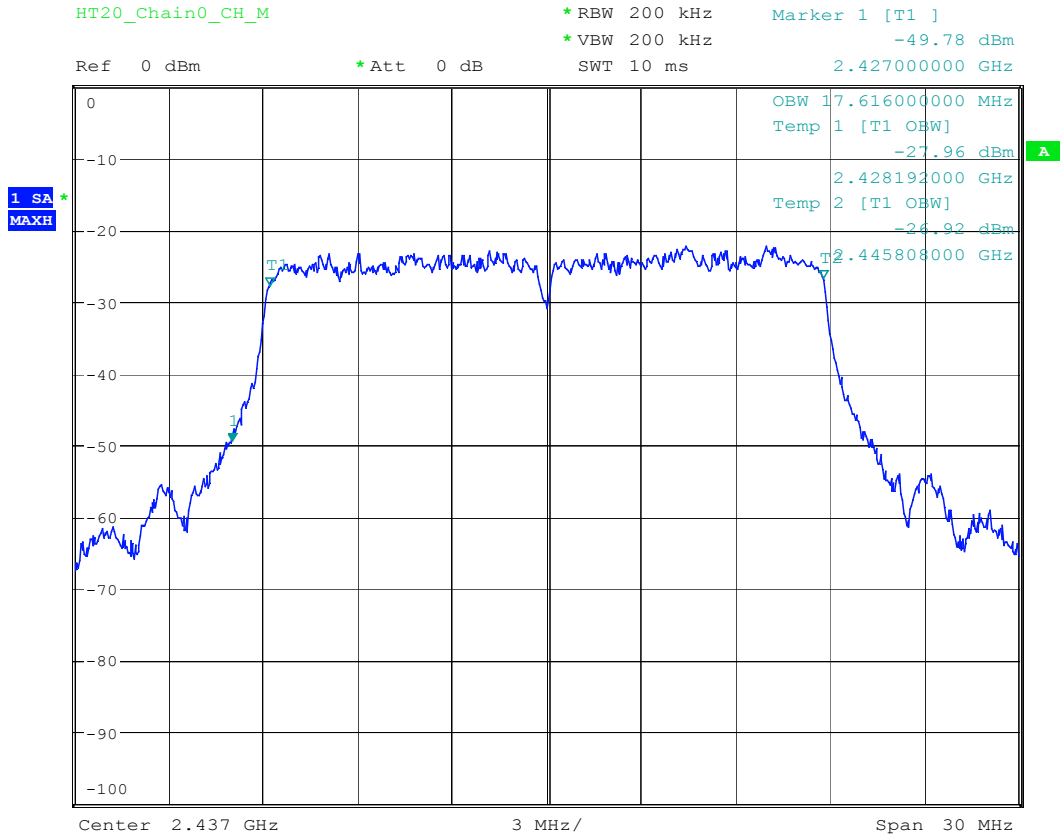
2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )

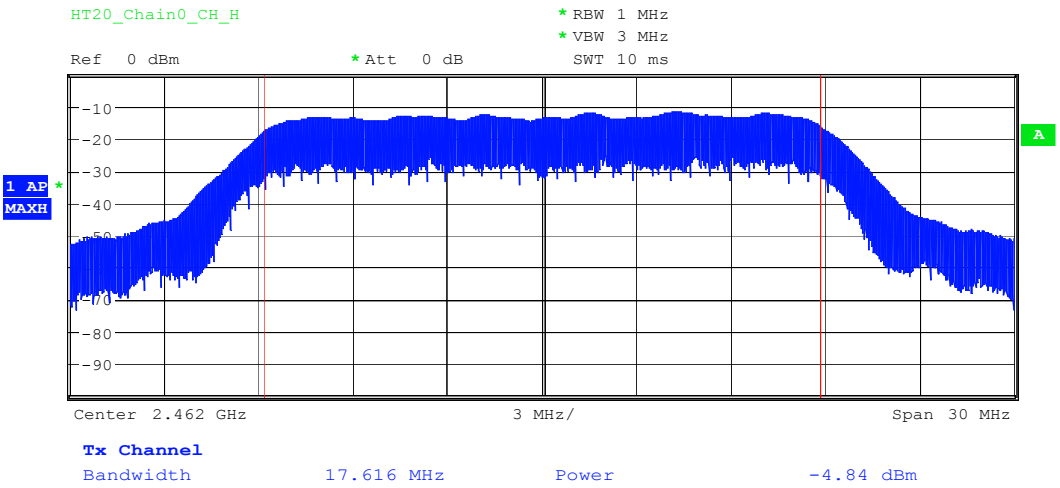
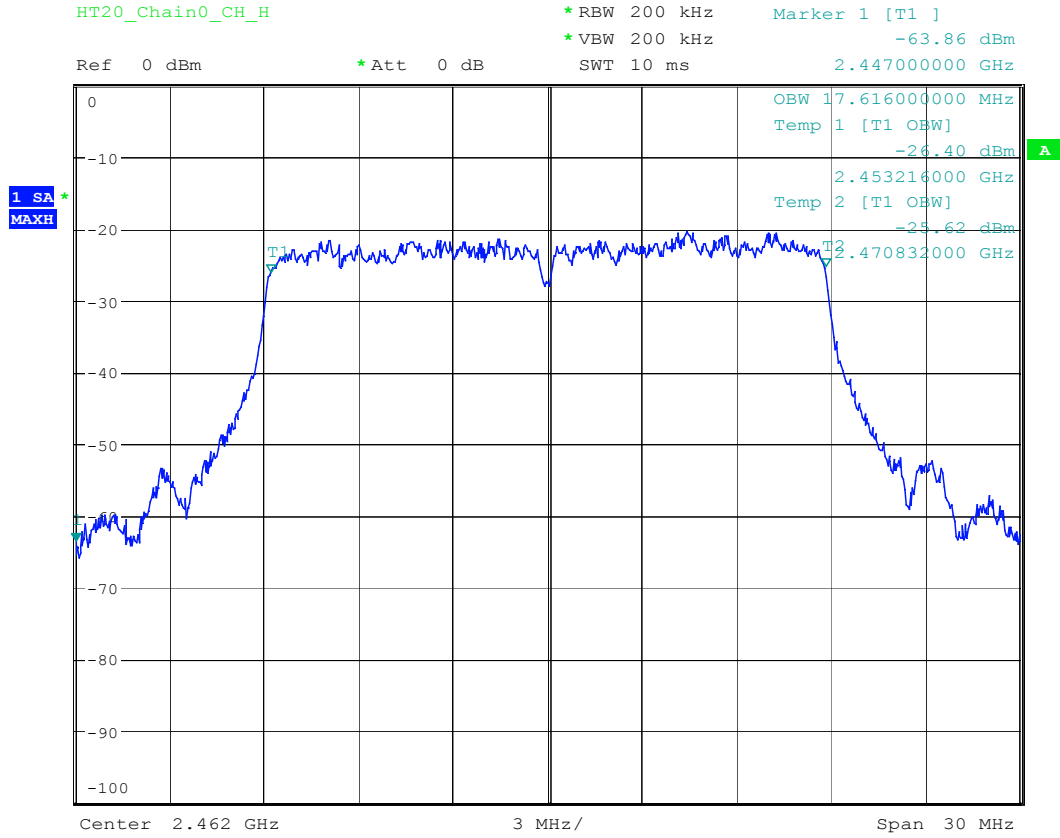


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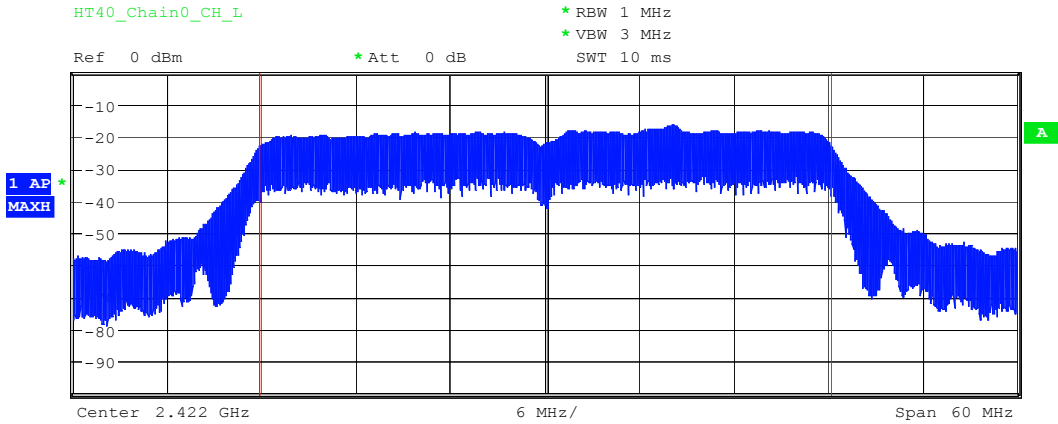
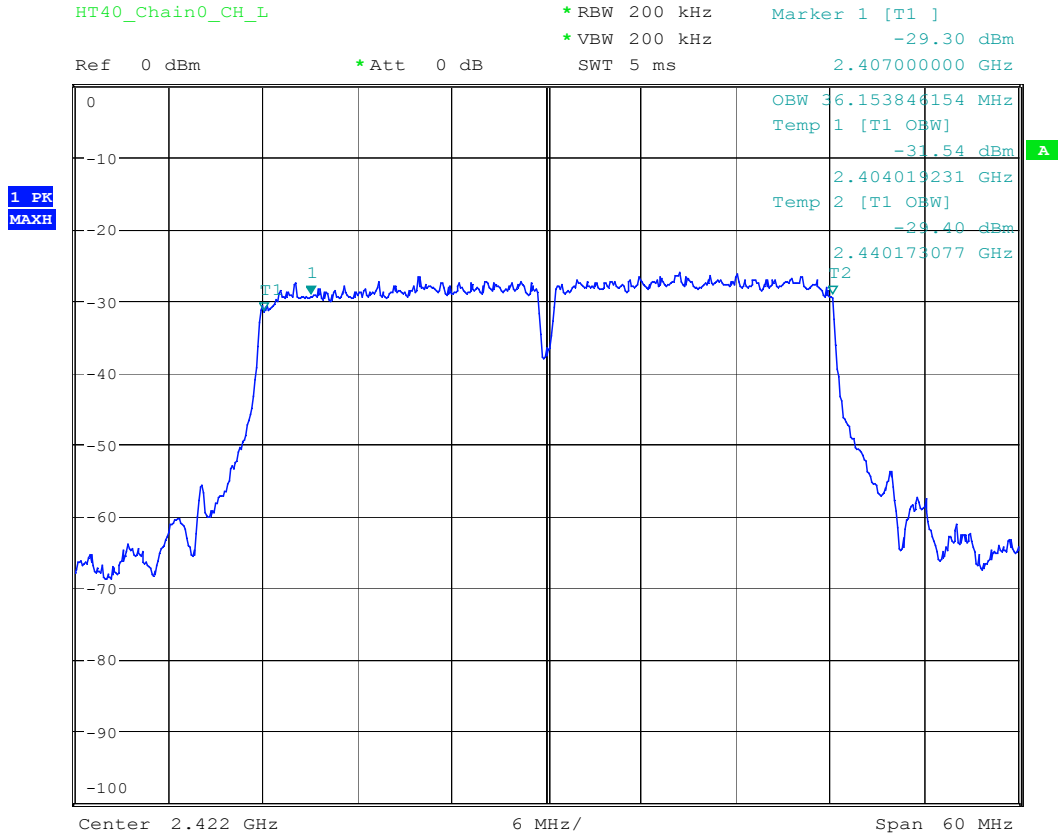
**7.4.4 IEEE 802.11n, HT40**Test Date: Feb. 25, 2008Temperature: 19°CHumidity: 62%

Channel	Frequency (MHz)	Attenuator & Cable Loss (dB)	Maximum Peak Output Power (dBm)			Total Maximum Peak Output Power (dBm)	Total Maximum Peak Output Power (mW)	FCC Limit (mW)
			Chain 0	Chain 1	Chain 2			
3	2422	20.0	12.41	n/a	n/a	12.41	17.4	1000
6	2437	20.0	13.15	n/a	n/a	13.15	20.7	1000
9	2452	20.0	14.12	n/a	n/a	14.12	25.8	1000

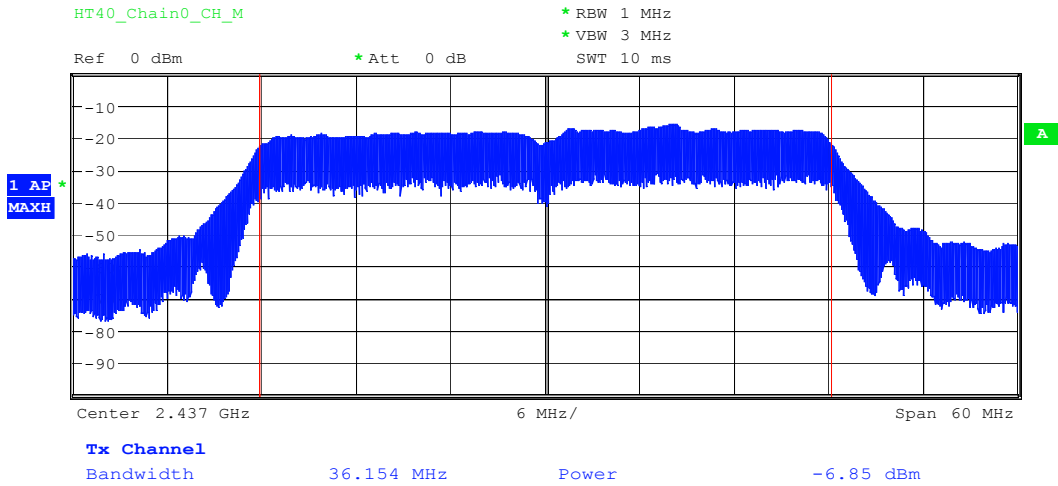
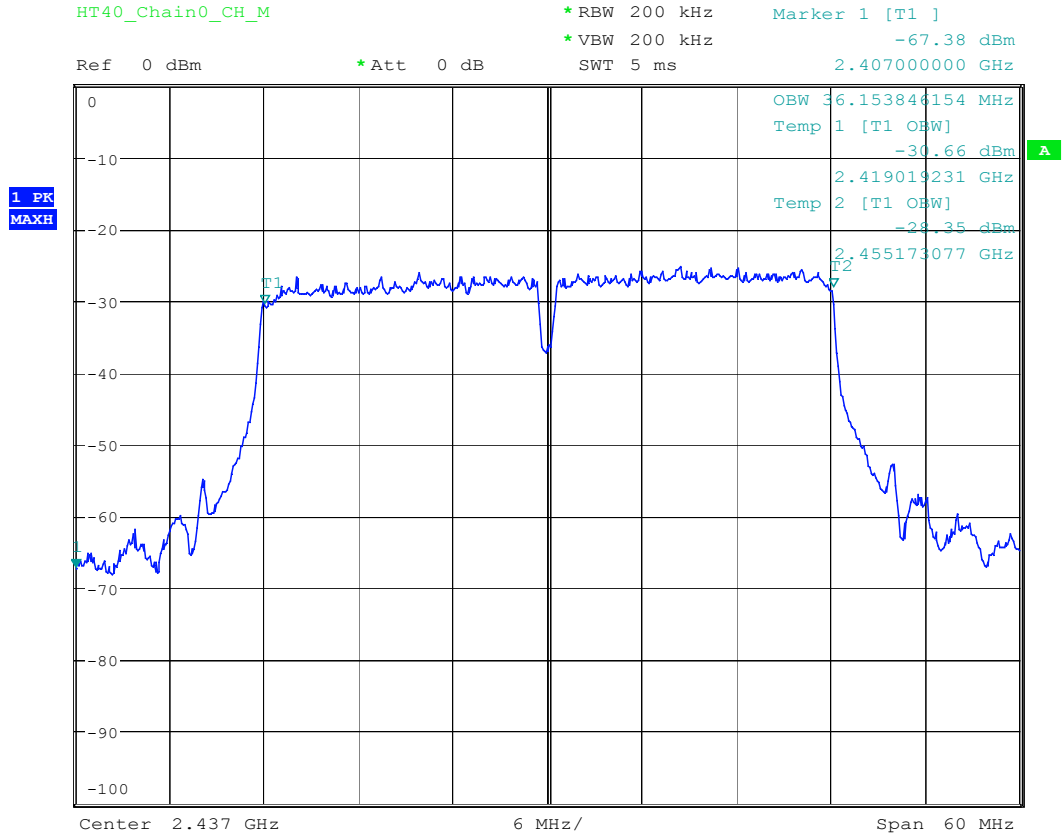
**Note:**

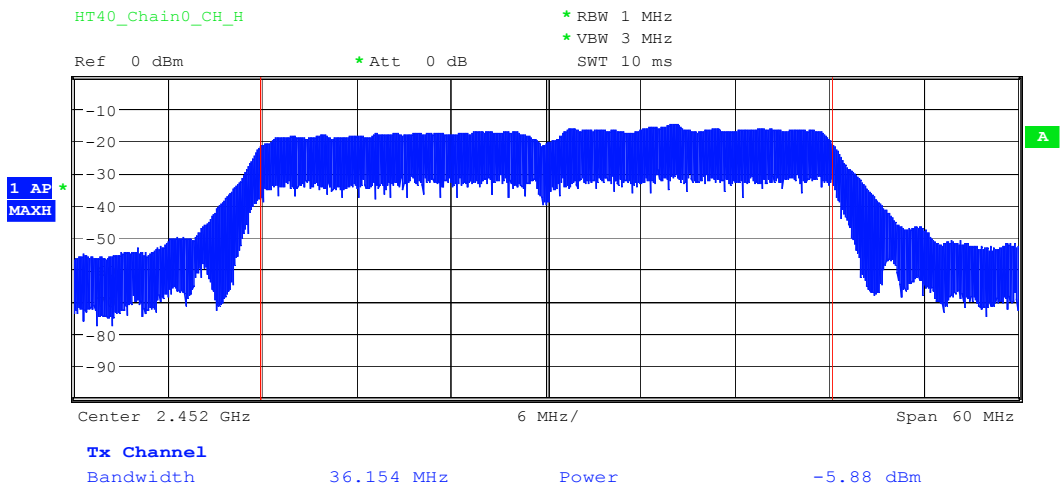
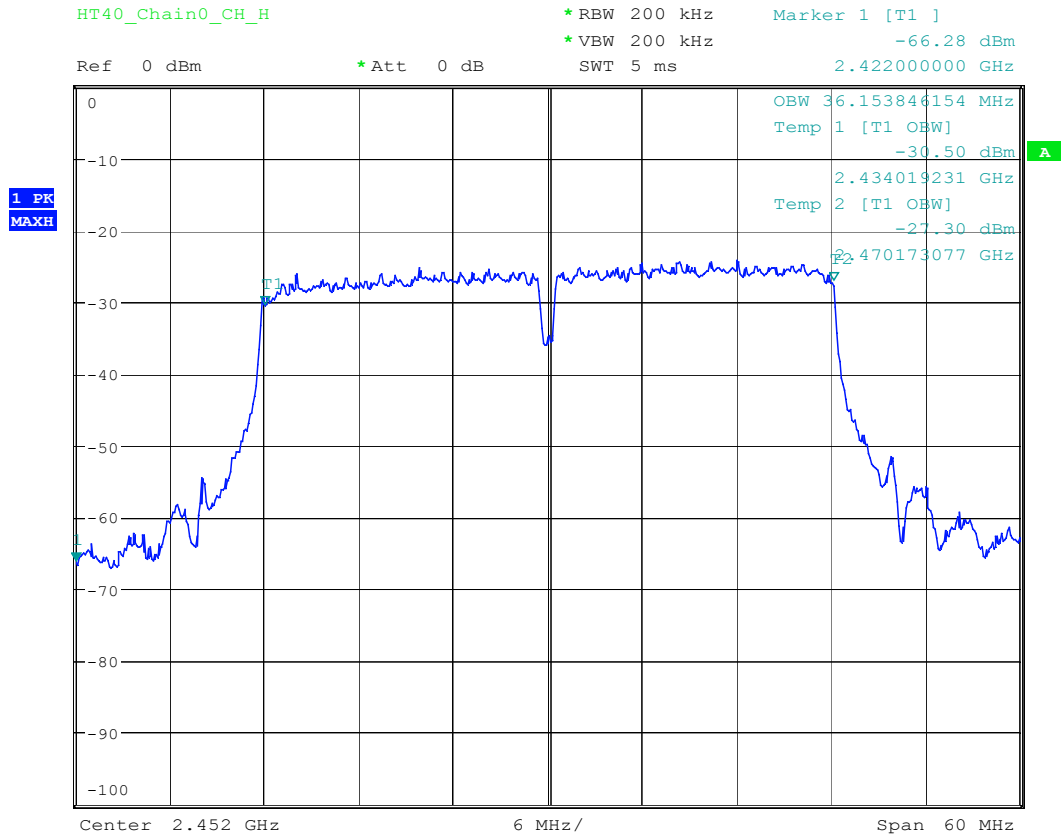
1. Please refer to page 54 to page 56 for chart

2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



**Tx Channel**  
Bandwidth      36.154 MHz      Power      -7.59 dBm







## 8 POWER DENSITY MEASUREMENT

### 8.1 Standard Applicable

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

### 8.2 Measurement Procedure

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

### 8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	8564EC	10/10/2008

## 8.4 Measurement Data

### 8.4.1 IEEE 802.11b

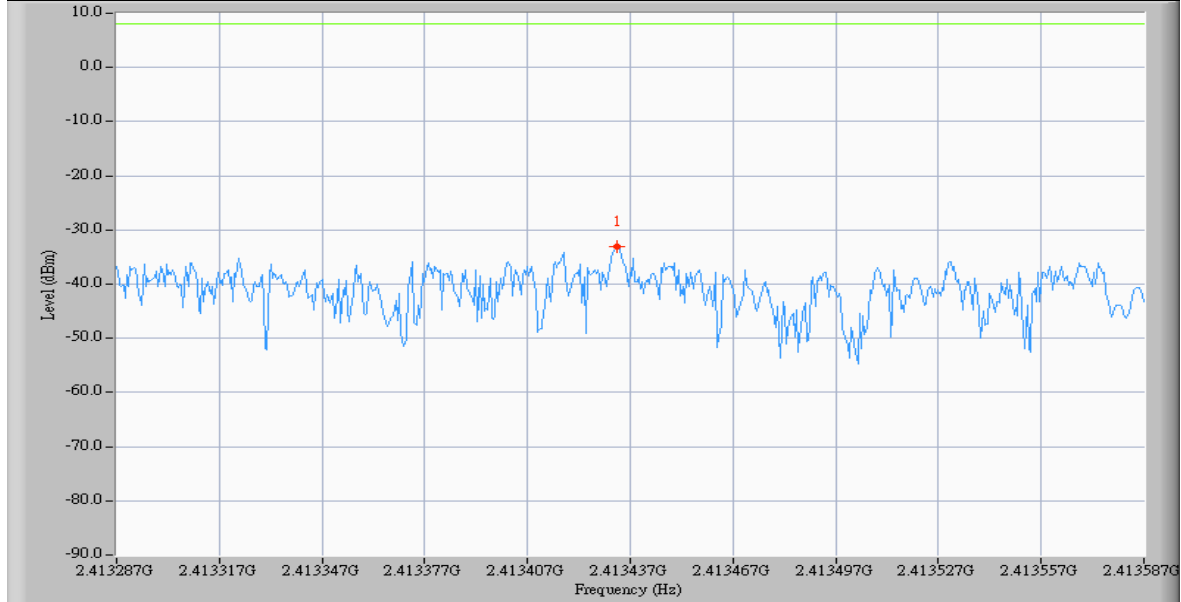
Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	Cable Loss(dB)	Peak Power Spectral Density (dBm)			Total Peak Power Spectral Density (dBm)	FCC Limit (dBm)
			Chain 0	Chain 1	Chain 2		
1	2412	20.0	-13.2	n/a	n/a	-13.2	8
6	2437	20.0	-11.8	n/a	n/a	-11.8	8
11	2462	20.0	-10.5	n/a	n/a	-10.5	8

**Note:**

1. Please refer to page 59 to page 61 for chart
2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )

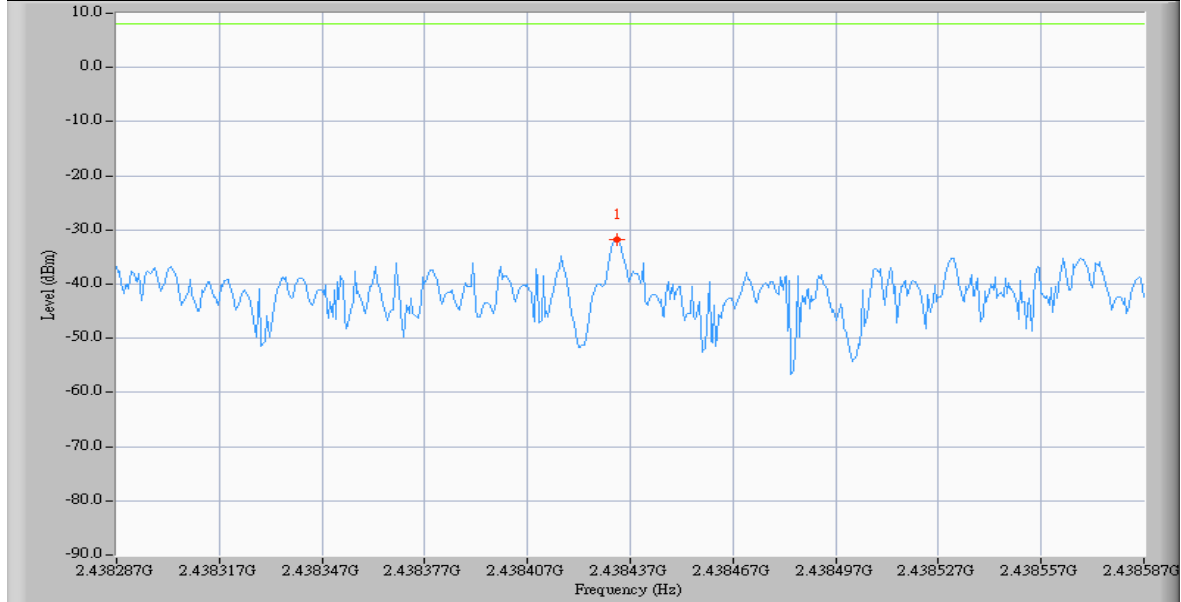
EUT : WIRELESS PCI ADAPTER	Model : WP81RL1	Status : WLAN-11b-CH01-PwrDensity	
Condition : RF Conduction	Date : 2008/2/26	Temp. : 19°C	Humi. : 66%
RBW: 3 kHz	VBW: 10 kHz	SWP: 100000ms	ATTEN: 20dB



Test Request: (8dBm)

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2413.433	-33.2	20.0	-13.2	8.0	-21.2

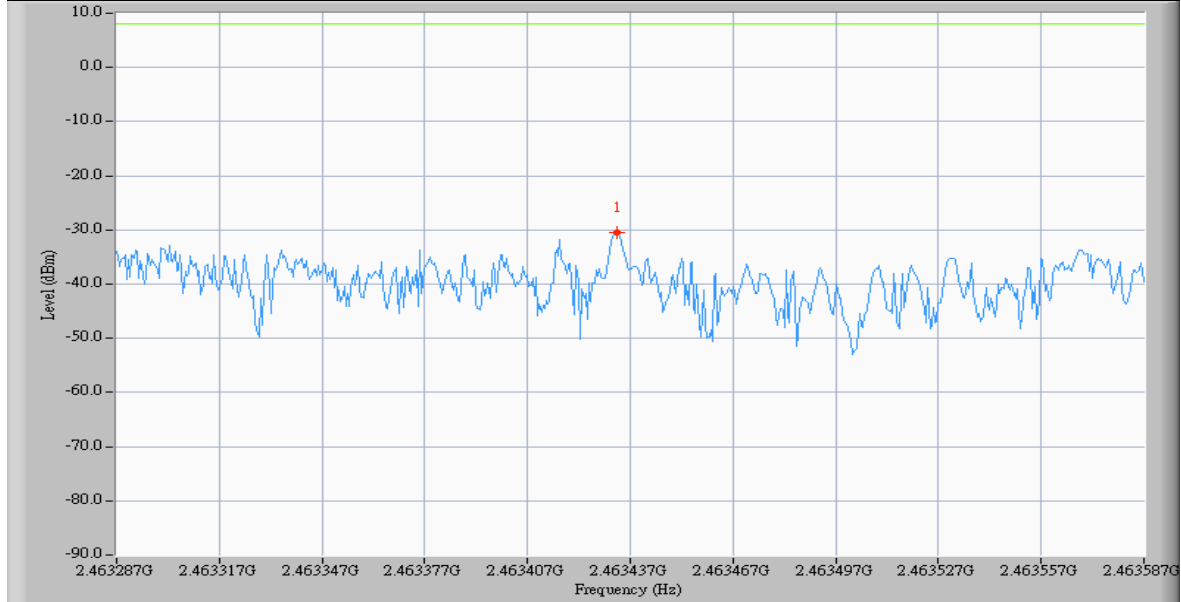
EUT : WIRELESS PCI ADAPTER	Model : WP81RL1	Status : WLAN-11b-CH06-PwrDensity	
Condition : RF Conduction	Date : 2008/2/26	Temp. : 19°C	Humi. : 66%
RBW: 3 kHz	VBW: 10 kHz	SWP: 100000ms	ATTEN: 20dB



Test Request: (8dBm)

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2438.433	-31.8	20.0	-11.8	8.0	-19.8

EUT : WIRELESS PCI ADAPTER	Model : WP81RL1	Status : WLAN-11b-CH11-PwrDensity	
Condition : RF Conduction	Date : 2008/2/26	Temp. : 19°C	Humi. : 66%
RBW: 3 kHz	VBW: 10 kHz	SWP: 100000ms	ATTEN: 20dB



Test Request: (8dBm)

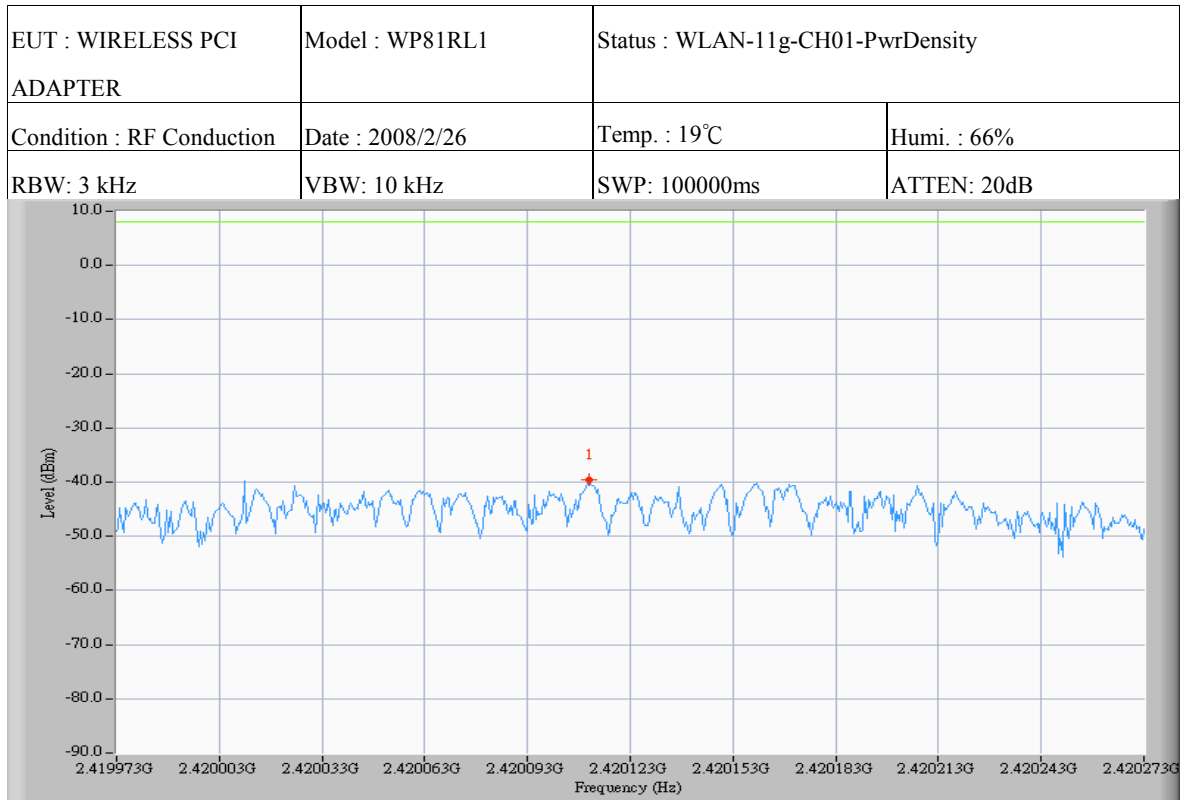
	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2463.433	-30.5	20.0	-10.5	8.0	-18.5

**8.4.2 IEEE 802.11g**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	Cable Loss(dB)	Peak Power Spectral Density (dBm)			Total Peak Power Spectral Density (dBm)	FCC Limit (dBm)
			Chain 0	Chain 1	Chain 2		
1	2412	20.0	-19.7	n/a	n/a	-19.7	8
6	2437	20.0	-17.7	n/a	n/a	-17.7	8
11	2462	20.0	-16.7	n/a	n/a	-16.7	8

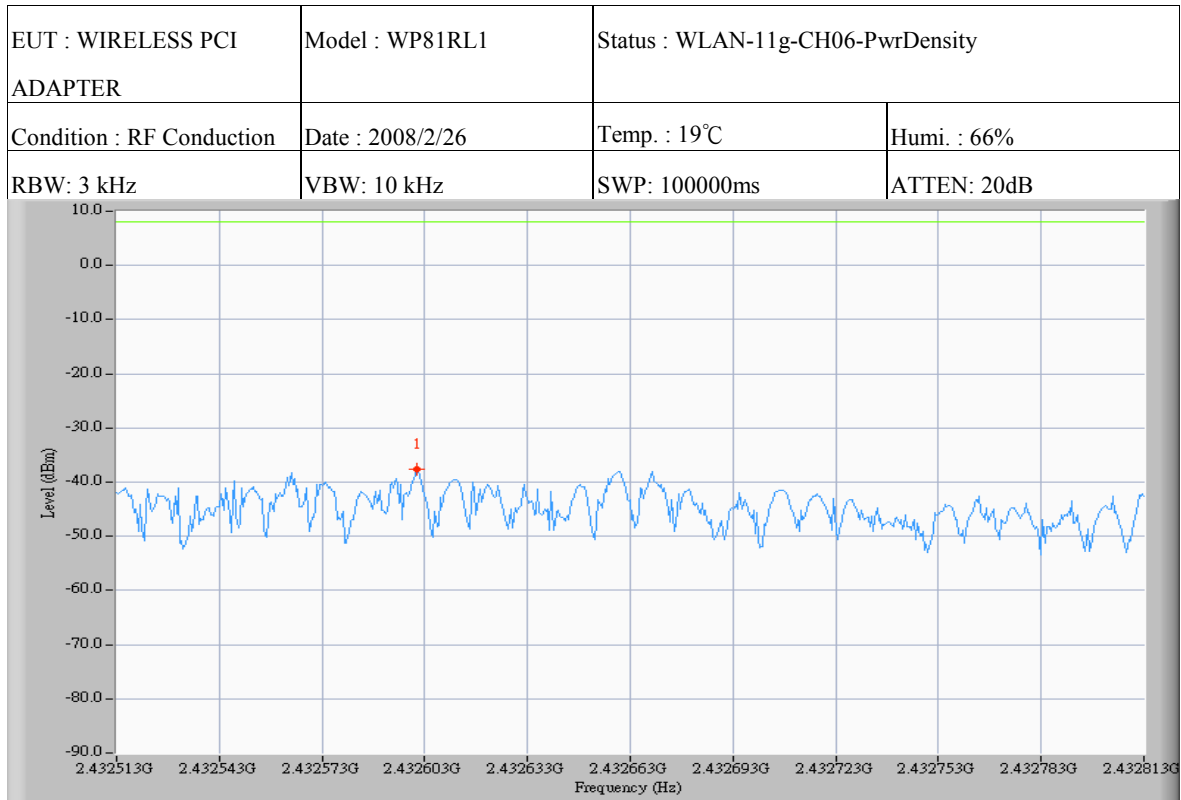
**Note:**

1. Please refer to page 63 to page 65 for chart
2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



Test Request: (8dBm)

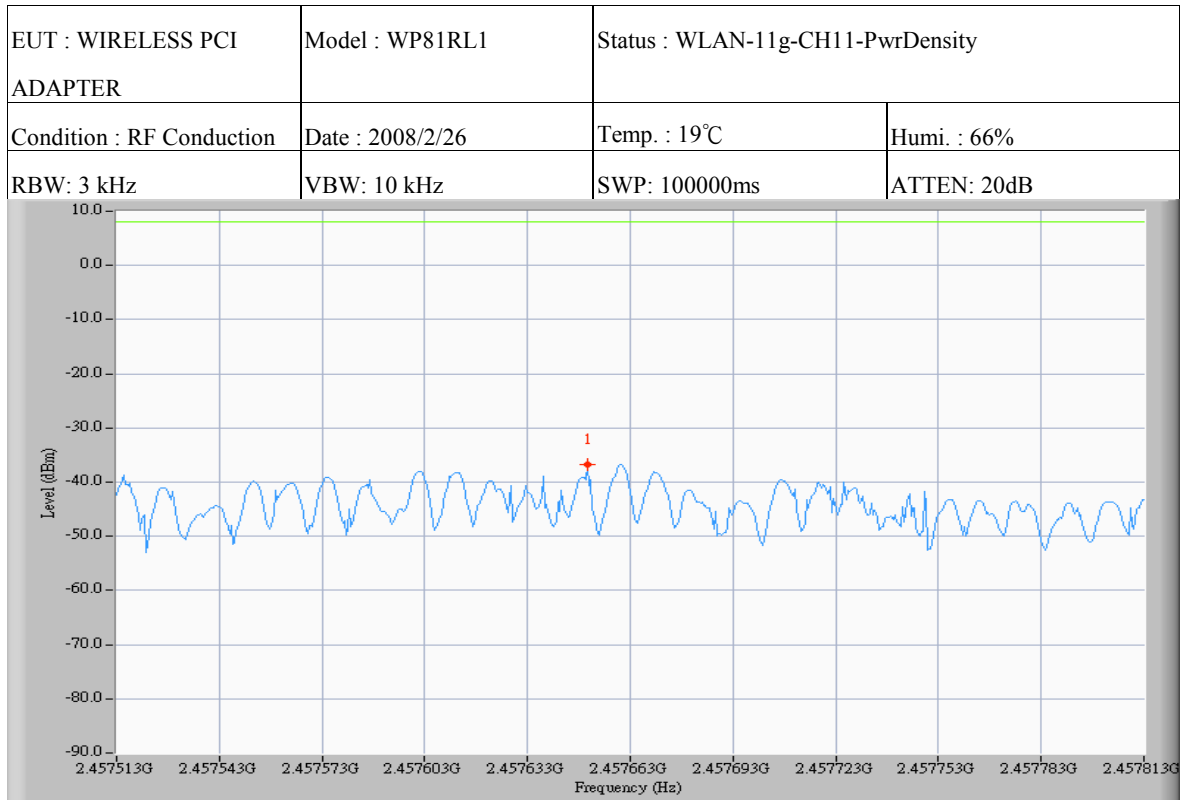
	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2420.111	-39.7	20.0	-19.7	8.0	-27.7



Test Request: (8dBm)

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2432.601	-37.7	20.0	-17.7	8.0	-25.7





Test Request: (8dBm)

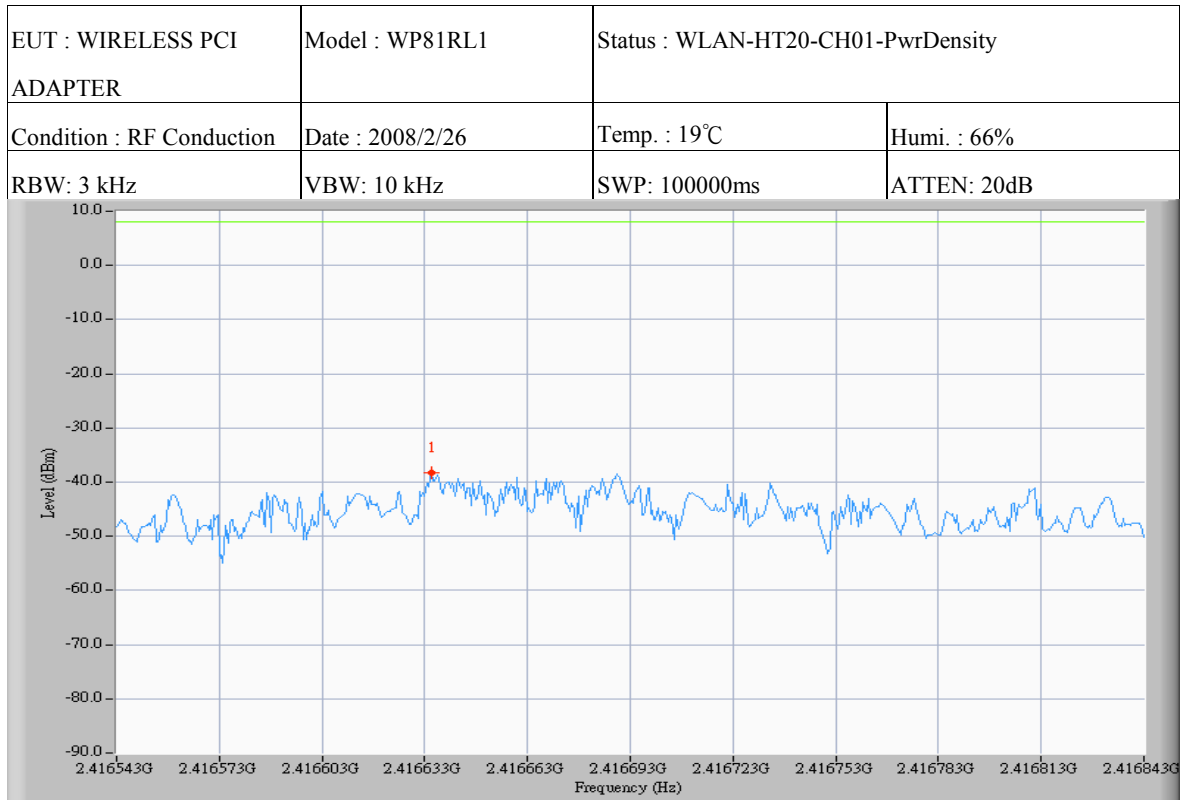
#	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2457.651	-36.7	20.0	-16.7	8.0	-24.7

**8.4.3 IEEE 802.11n, HT20**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	Cable Loss(dB)	Peak Power Spectral Density (dBm)			Total Peak Power Spectral Density (dBm)	FCC Limit (dBm)
			Chain 0	Chain 1	Chain 2		
1	2412	20.0	-18.3	n/a	n/a	-18.3	8
6	2437	20.0	-18.7	n/a	n/a	-18.7	8
11	2462	20.0	-15.2	n/a	n/a	-15.2	8

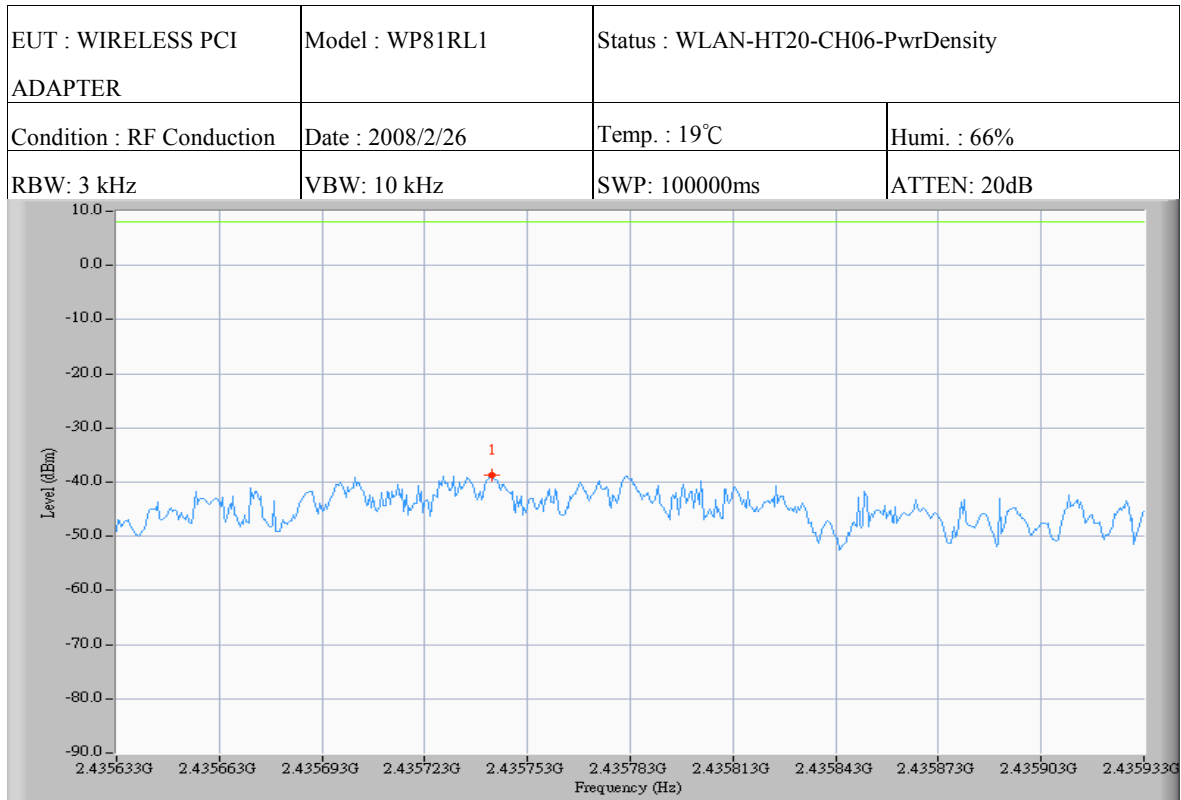
**Note:**

1. Please refer to page 67 to page 69 for chart
2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



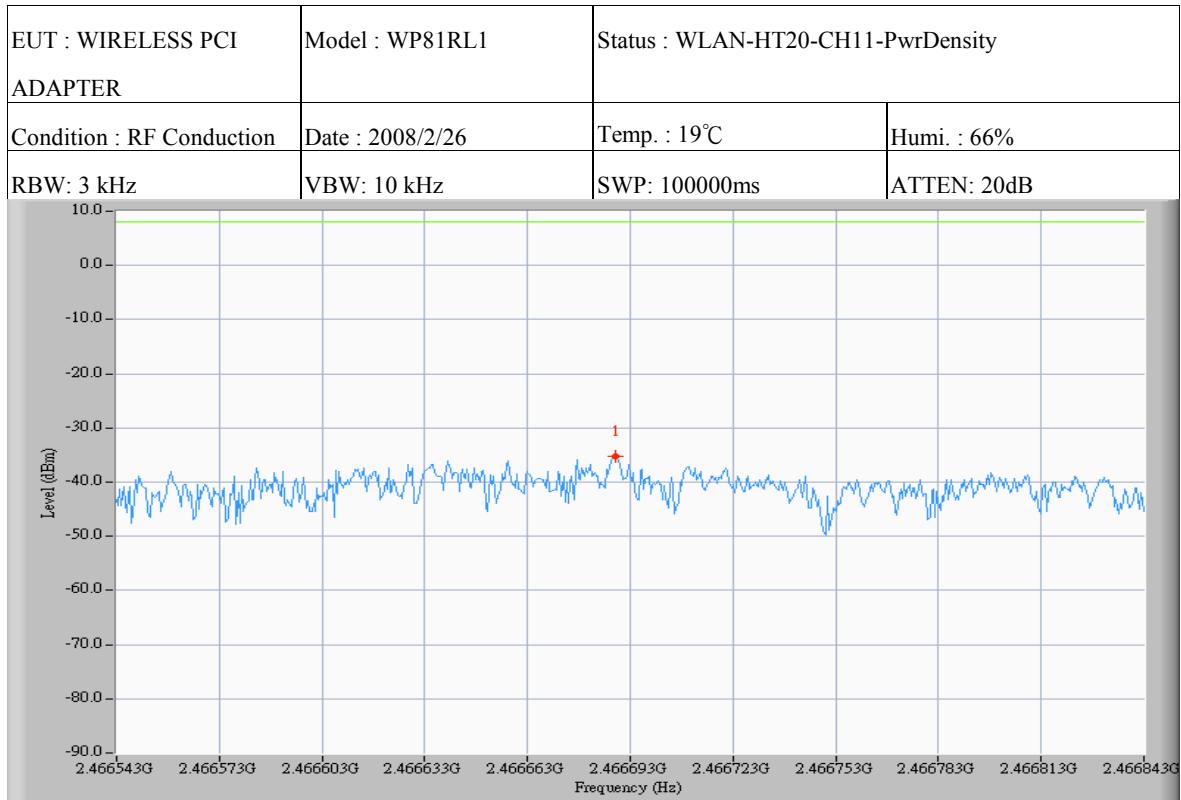
Test Request: (8dBm)

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2416.635	-38.3	20.0	-18.3	8.0	-26.3



Test Request: (8dBm)

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2435.743	-38.7	20.0	-18.7	8.0	-26.7



Test Request: (8dBm)

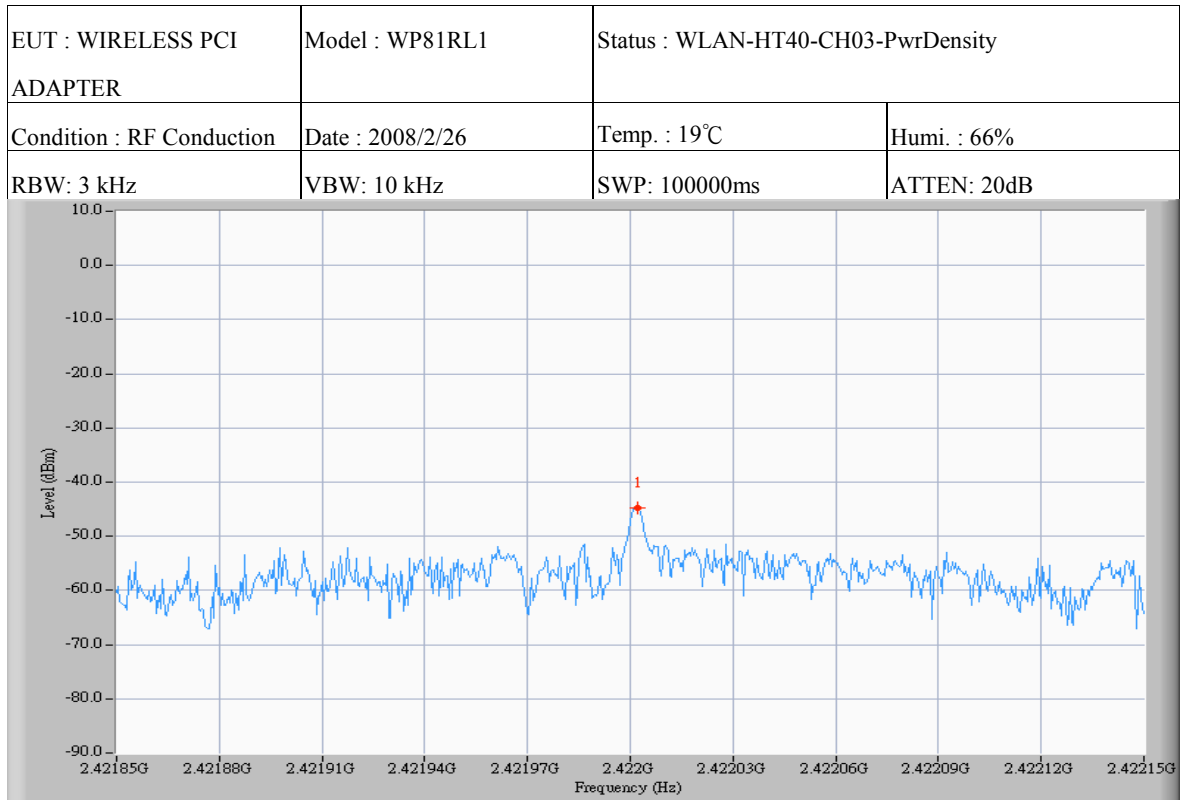
	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2466.689	-35.2	20.0	-15.2	8.0	-23.2

**8.4.4 IEEE 802.11n, HT40**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency (MHz)	Cable Loss(dB)	Peak Power Spectral Density (dBm)			Total Peak Power Spectral Density (dBm)	FCC Limit (dBm)
			Chain 0	Chain 1	Chain 2		
3	2422	20.0	-24.7	n/a	n/a	-24.7	8
6	2437	20.0	-24.0	n/a	n/a	-24.0	8
9	2452	20.0	-23.2	n/a	n/a	-23.2	8

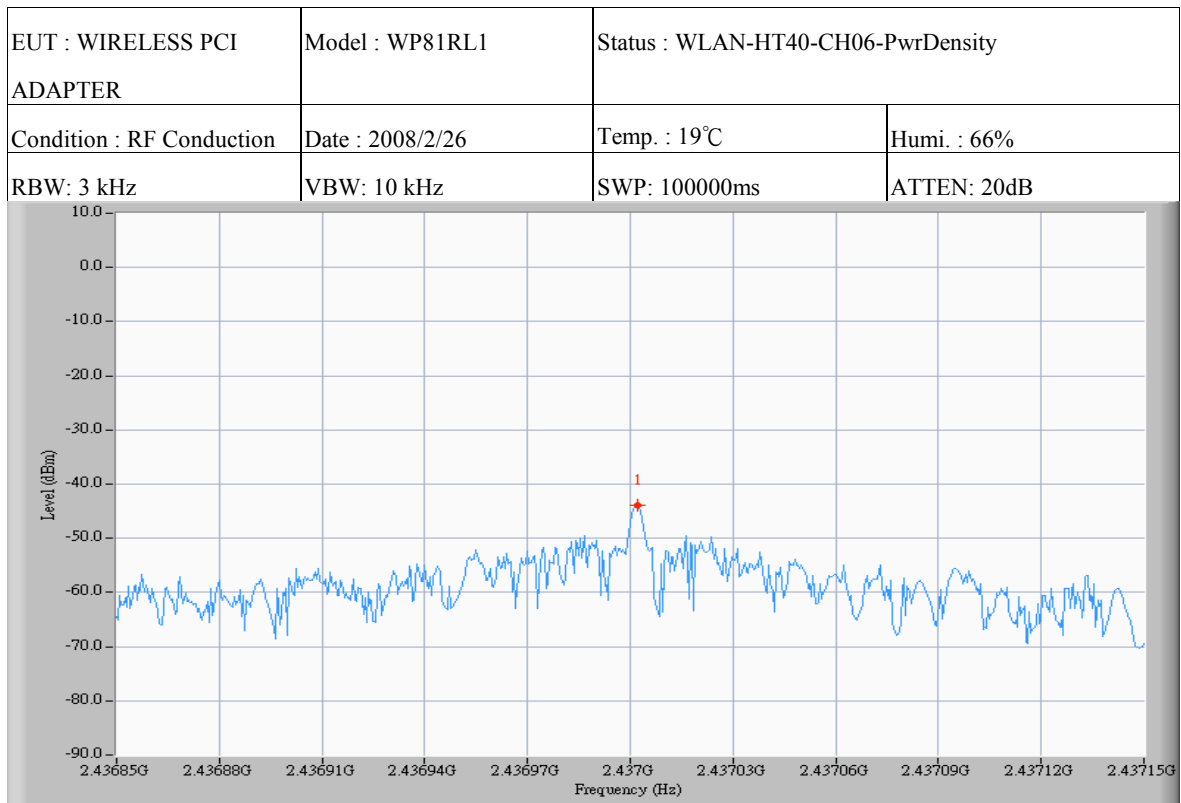
**Note:**

1. Please refer to page 71 to page 73 for chart
2. The estimated measurement uncertainty of the result measurement is  $\pm 1.5\text{dB}$  ( $1\text{GHz} \leq f \leq 18\text{GHz}$ )



Test Request: None

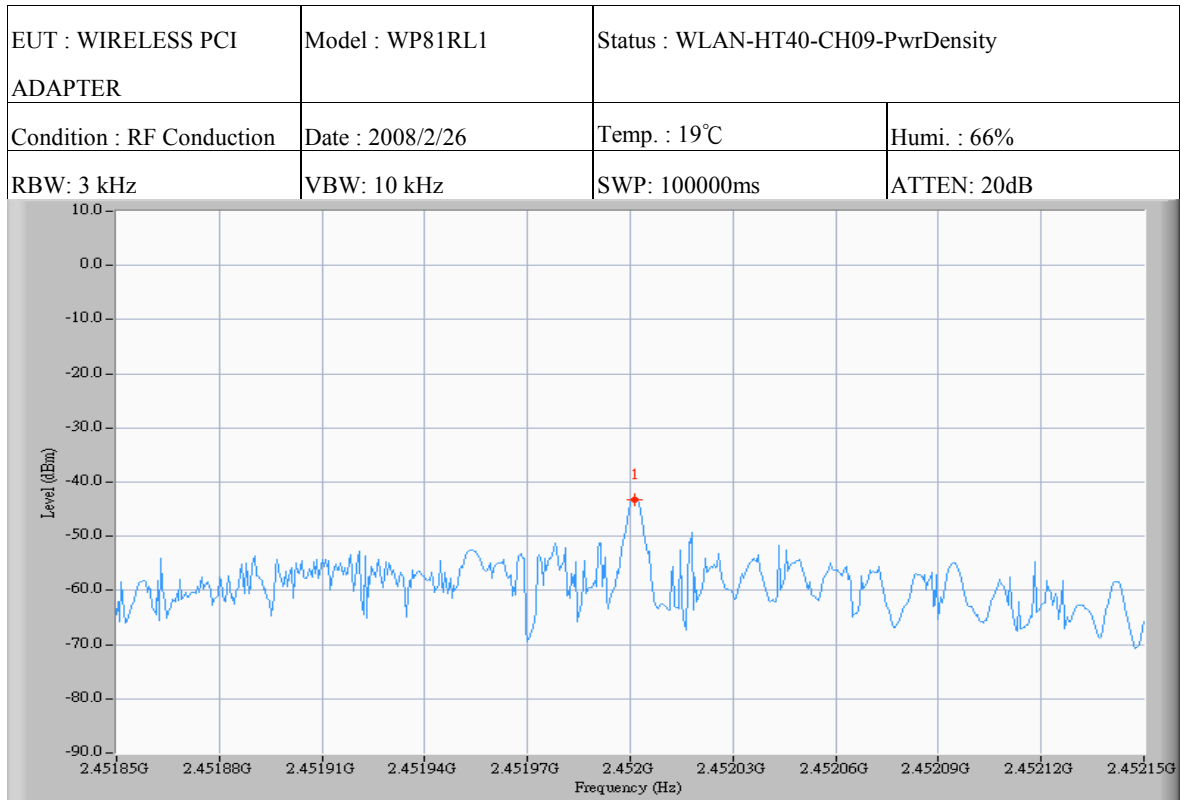
	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2422.002	-44.7	20.0	-24.7	8.0	-32.7



Test Request: None

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2437.002	-44.0	20.0	-24.0	8.0	-32.0





Test Request: None

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2452.001	-43.2	20.0	-23.2	8.0	-31.2

## 9 SPURIOUS EMISSION - RF CONDUCTED MEASUREMENT

### 9.1 Standard Applicable

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

### 9.2 Measurement Procedure

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

### 9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Agilent	8564EC	10/10/2008

## 9.4 Measurement Data

### 9.4.1 IEEE 802.11b

Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency(MHz)	Chart
1	2412	Page 77, Page 79
6	2437	Page 80
11	2462	Page 78, Page 81

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

*Note: Please refer to page 77 to page 81 for chart*

### 9.4.2 IEEE 802.11g

Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency(MHz)	Chart
1	2412	Page 82, Page 84
6	2437	Page 85
11	2462	Page 83, Page 86

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

*Note: Please refer to page 82 to page 86 for chart*

**9.4.3 IEEE 802.11n, HT20**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency(MHz)	Chart
1	2412	Page 87, Page 89
6	2437	Page 90
11	2462	Page 88 Page 91

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

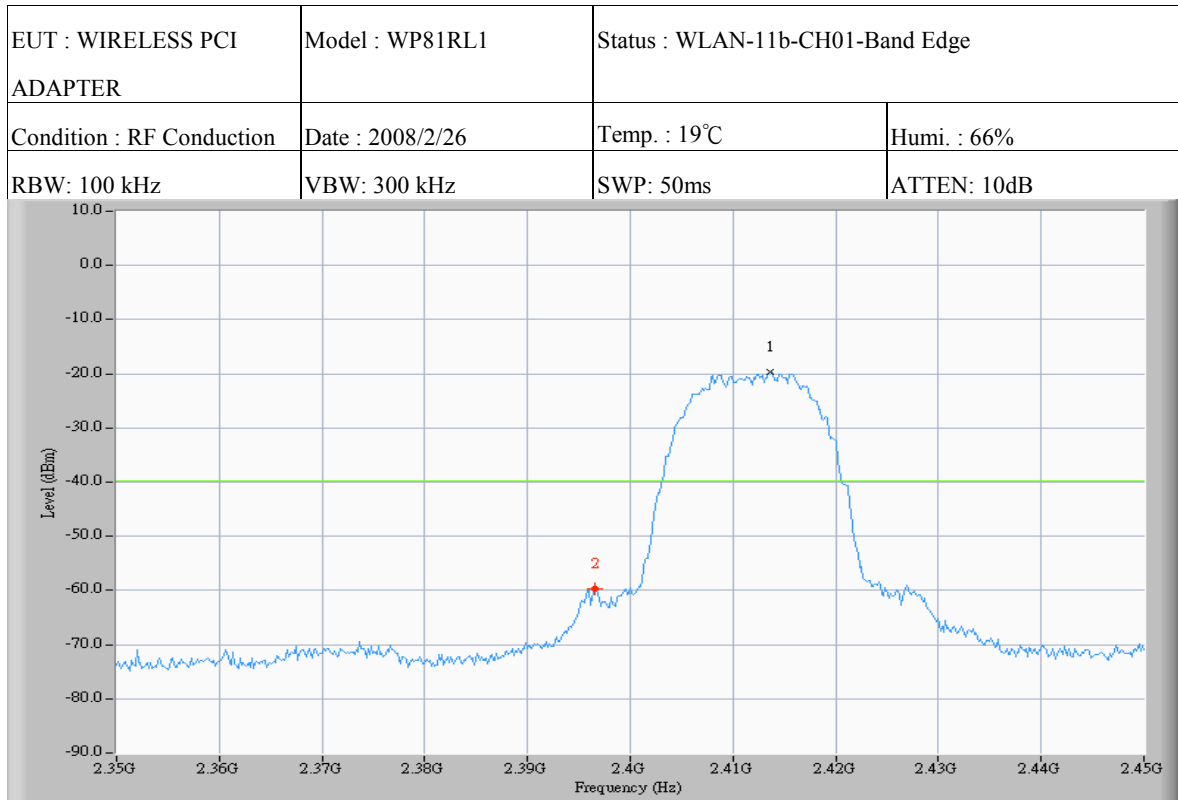
*Note: Please refer to page 87 to page 91 for chart*

**9.4.4 IEEE 802.11n, HT40**Test Date: Feb. 26, 2008Temperature: 19°CHumidity: 66%

Channel	Frequency(MHz)	Chart
3	2422	Page 92, Page 94
6	2437	Page 95
9	2452	Page 93, Page 96

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

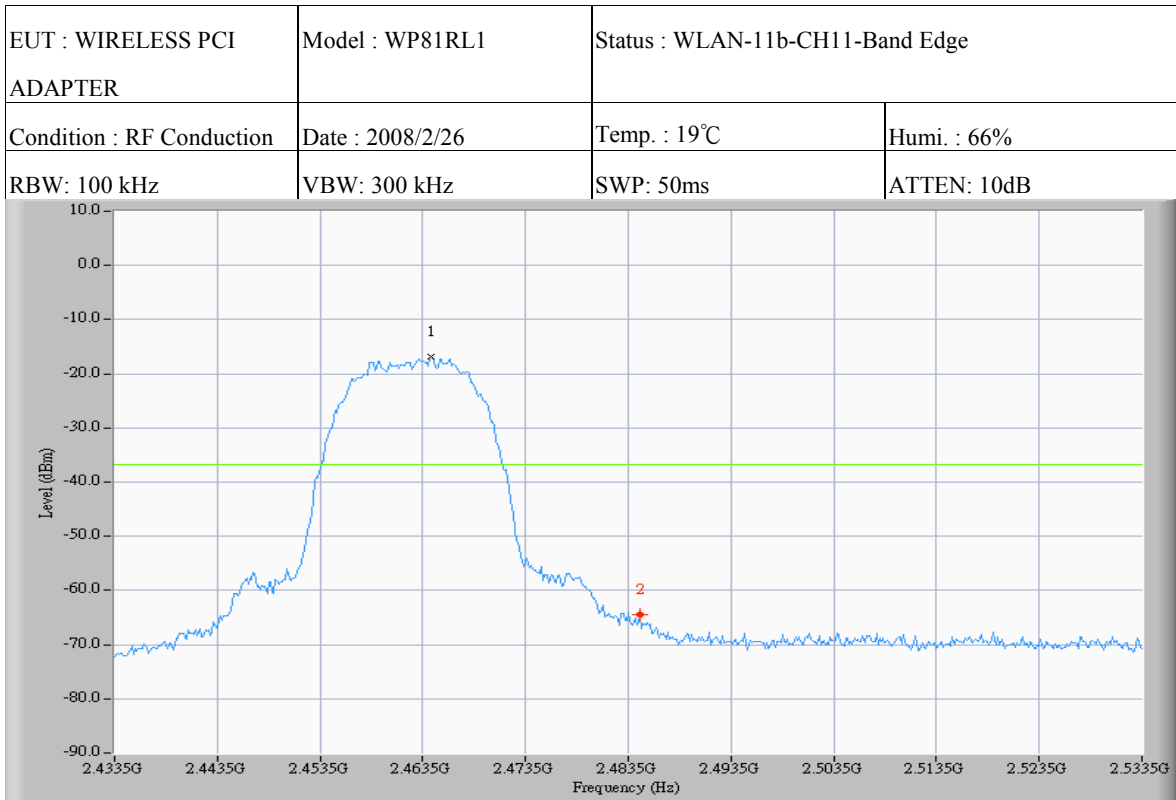
*Note: Please refer to page 92 to page 96 for chart*



Test Request: (-39.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2413.667	-19.7
2	2396.500	-59.7

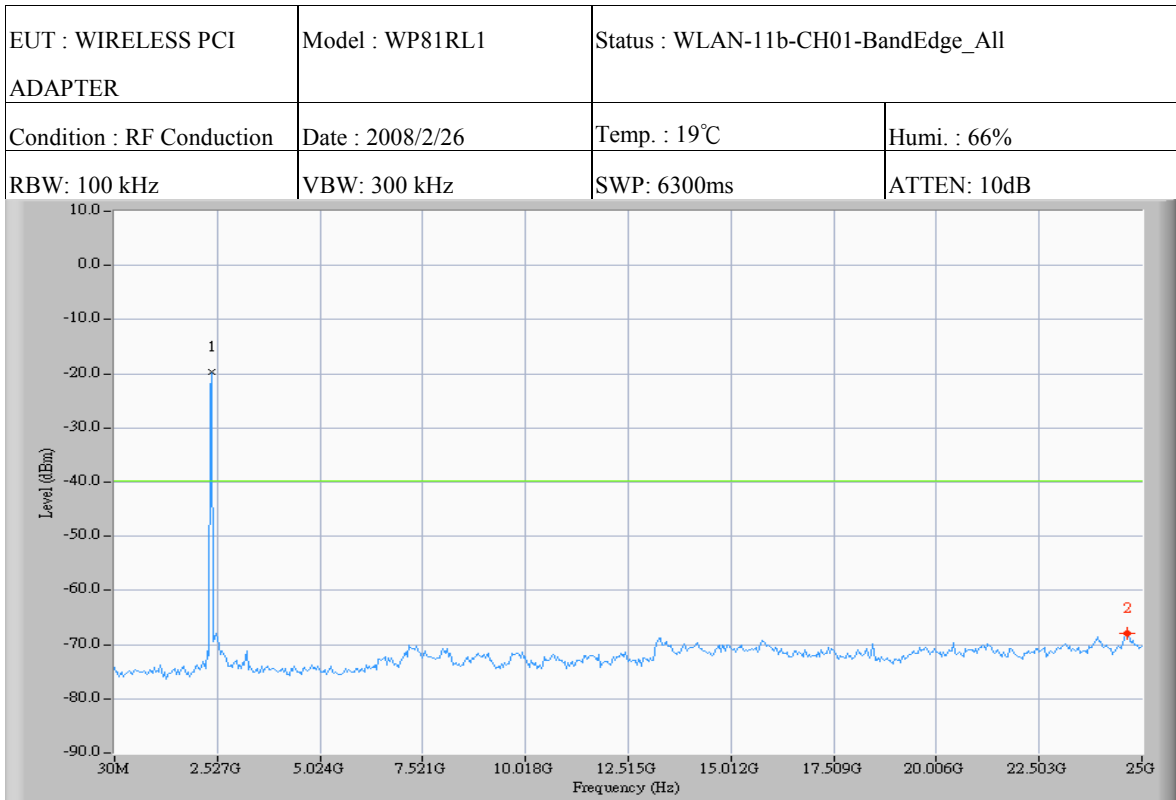
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	17.167	40.0



Test Request: (-36.8dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2464.333	-16.8
2	2484.667	-64.5

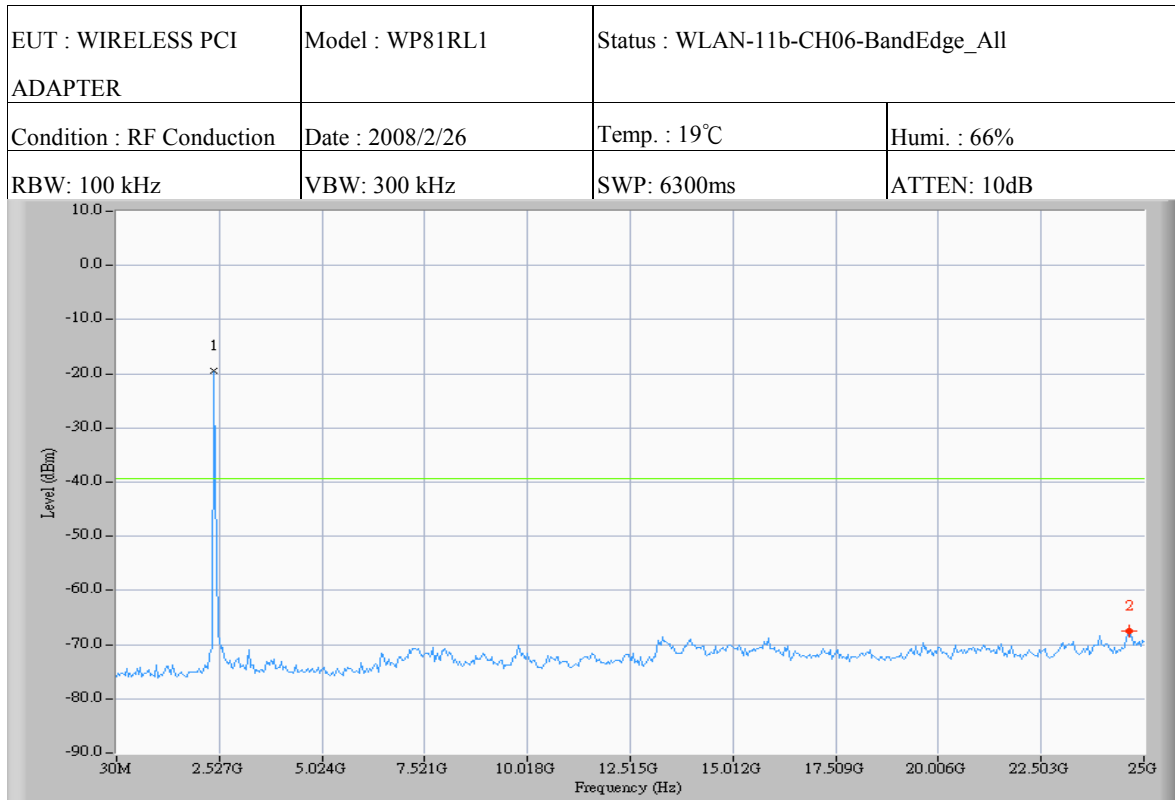
	Mkr 1 - Mkr 2	ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-20.334	47.7



Test Request: (-39.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-19.7
2	24625.450	-67.8

		△Frequency (MHz)	△Level (dB)
1	Mkr 1 - Mkr 2	-22223.300	48.1

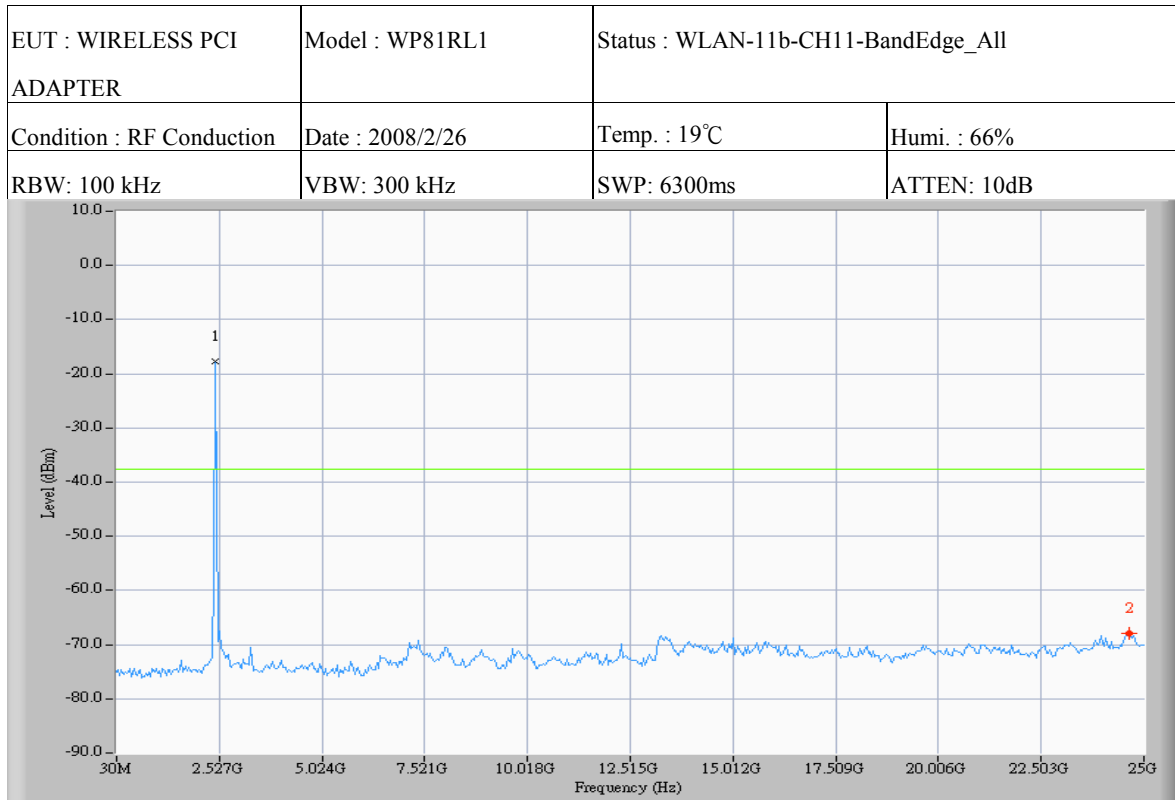


Test Request: (-39.3dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-19.3
2	24625.450	-67.5

		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	-22223.300	48.2

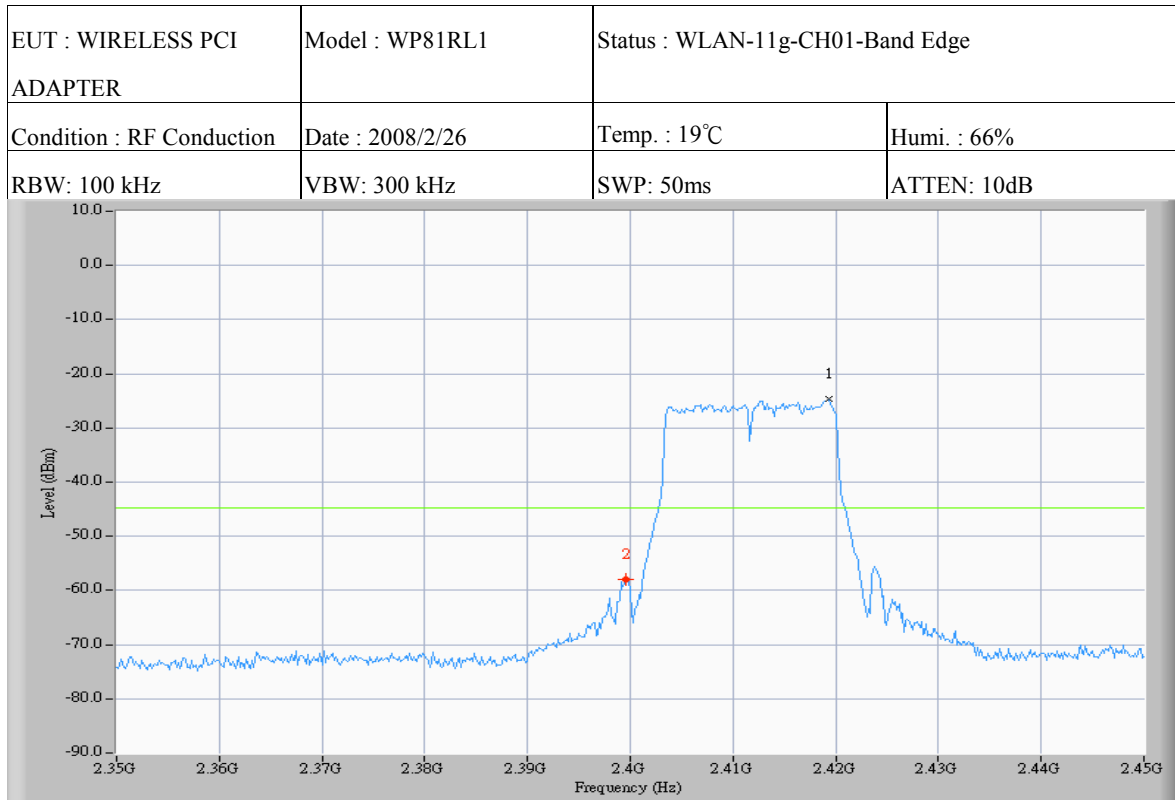




Test Request: (-37.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2443.767	-17.7
2	24625.450	-68.0

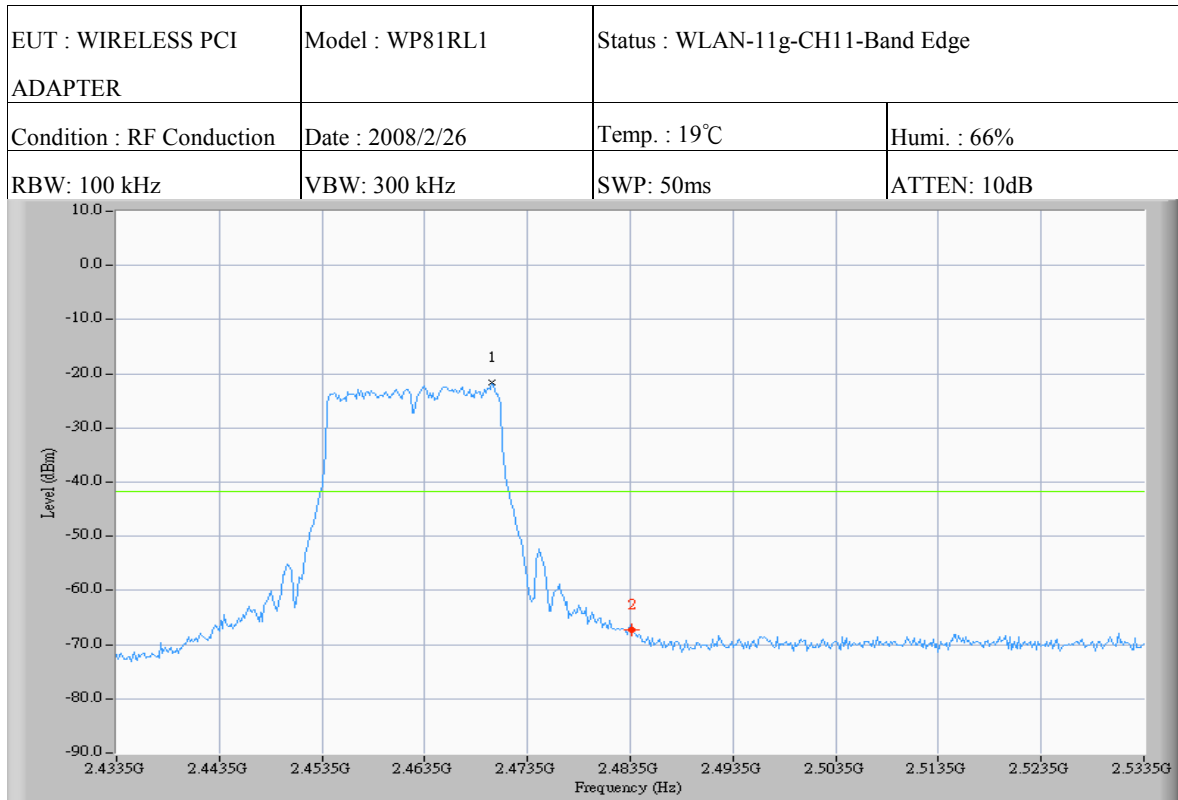
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-22181.683	50.3



Test Request: (-44.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2419.333	-24.7
2	2399.500	-58.0

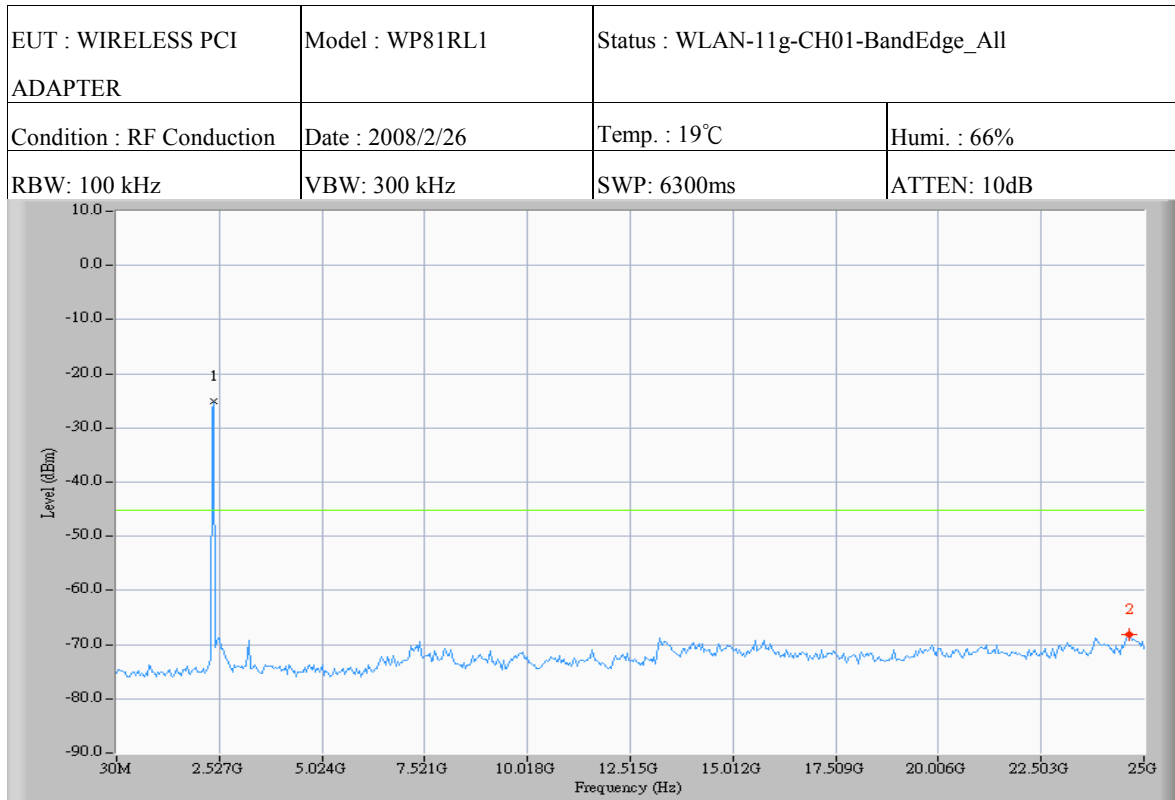
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	19.833	33.3



Test Request: (-41.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2470.000	-21.7
2	2483.667	-67.3

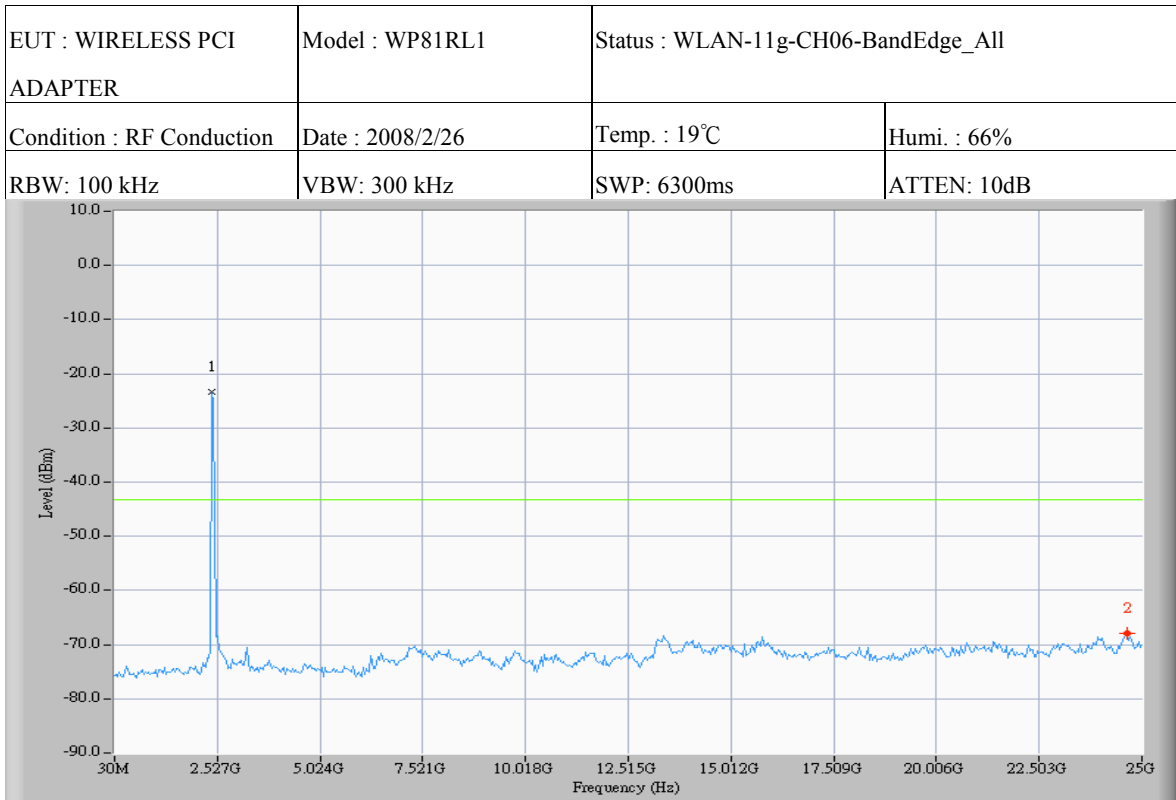
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-13.667	45.6



Test Request: (-45.2dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-25.2
2	24625.450	-68.2

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-22223.300	43.0

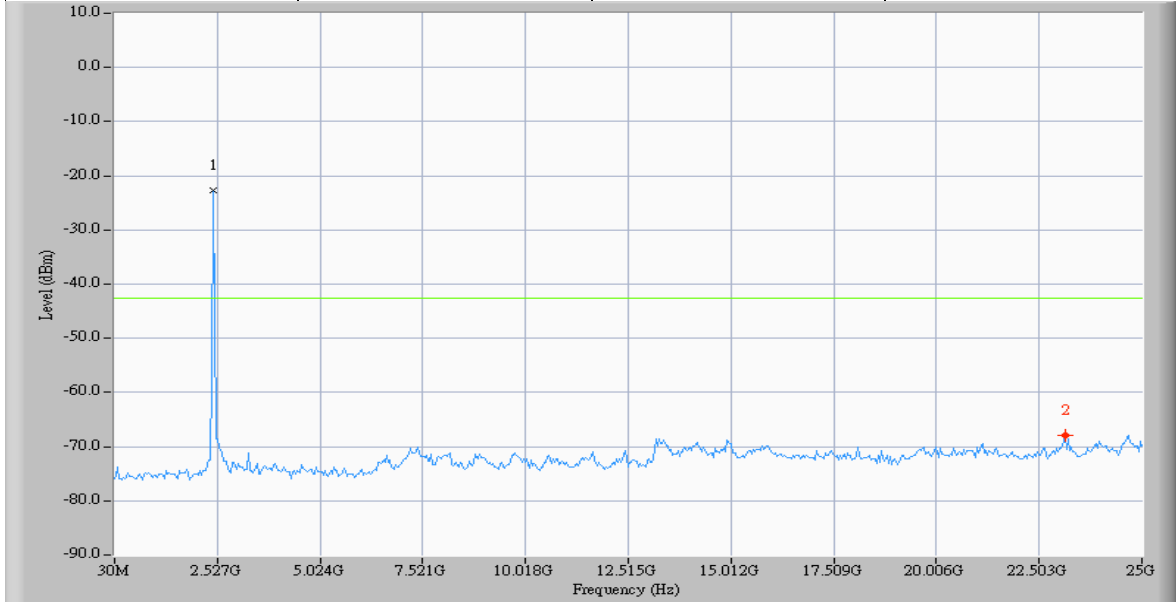


Test Request: (-43.3dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-23.3
2	24625.450	-67.8

	Mkr 1 - Mkr 2	ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-22223.300	44.5

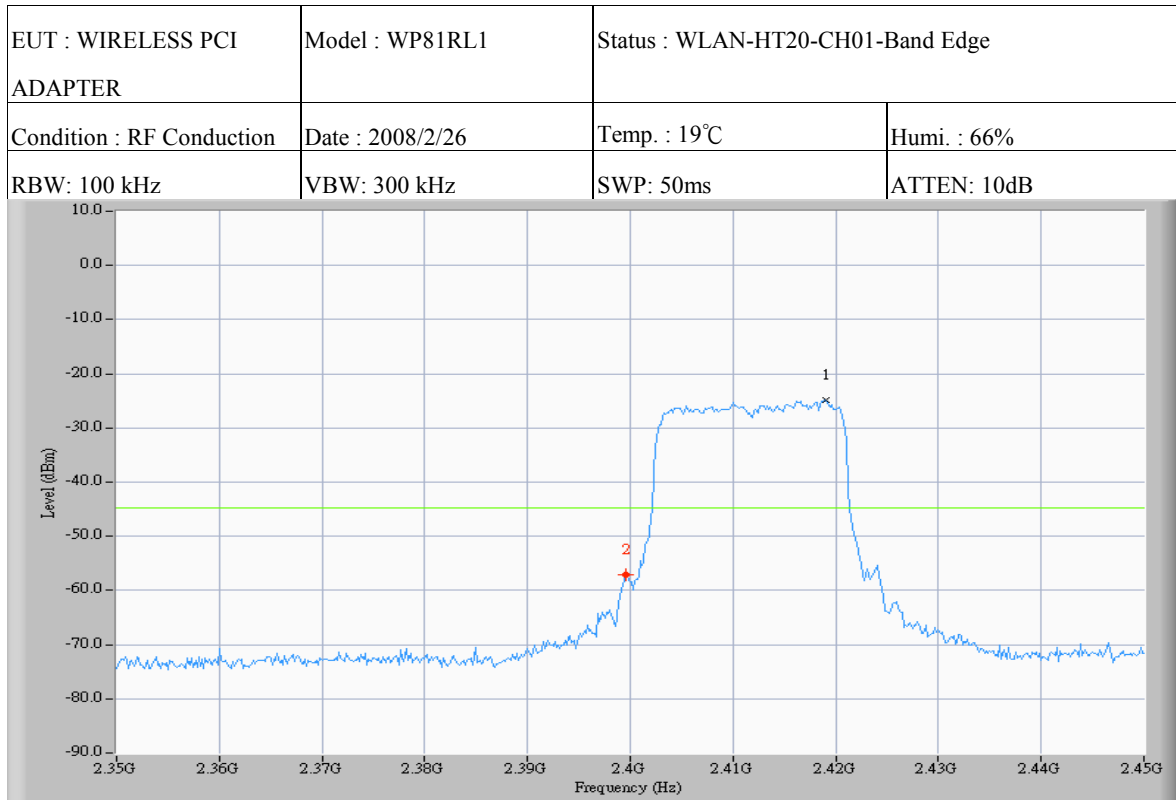
EUT : WIRELESS PCI ADAPTER	Model : WP81RL1	Status : WLAN-11g-CH11-BandEdge_All	
Condition : RF Conduction	Date : 2008/2/26	Temp. : 19°C	Humi. : 66%
RBW: 100 kHz	VBW: 300 kHz	SWP: 6300ms	ATTEN: 10dB



Test Request: (-42.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2443.767	-22.7
2	23127.250	-68.0

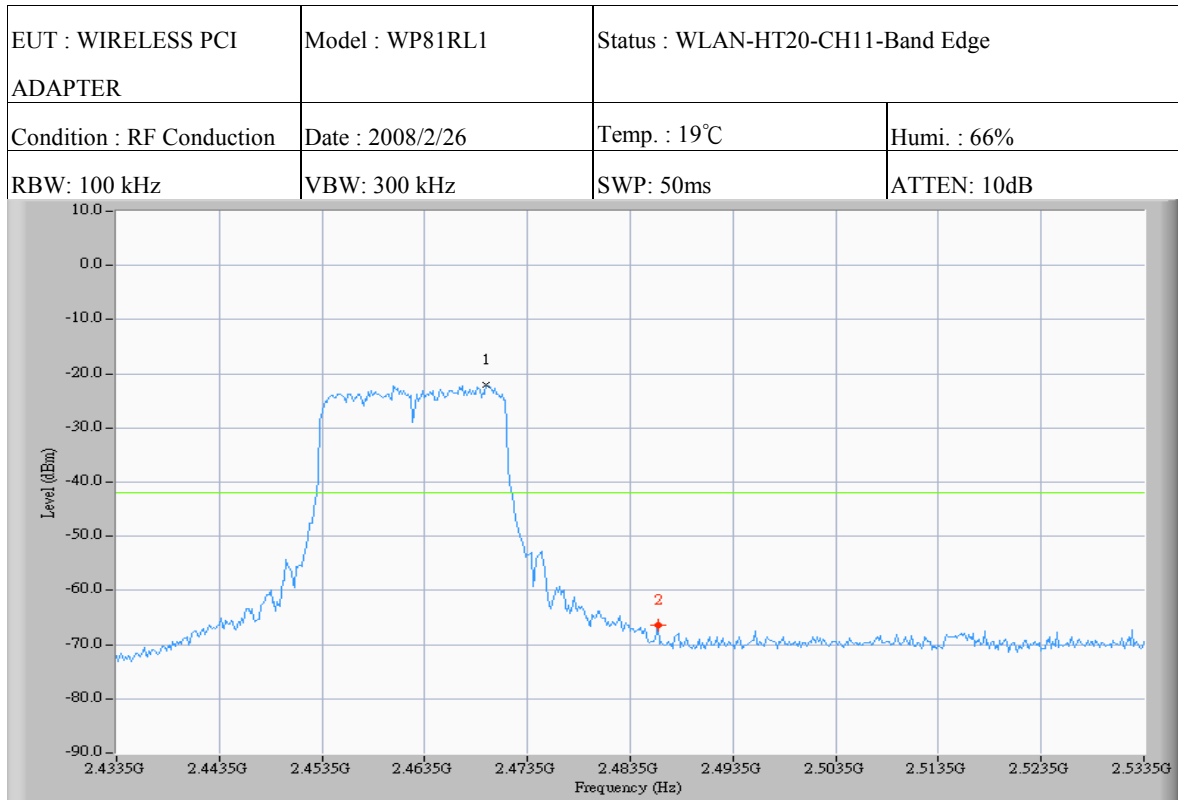
		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	-20683.483	45.3



Test Request: (-44.8dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2419.000	-24.8
2	2399.500	-57.0

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	19.500	32.2

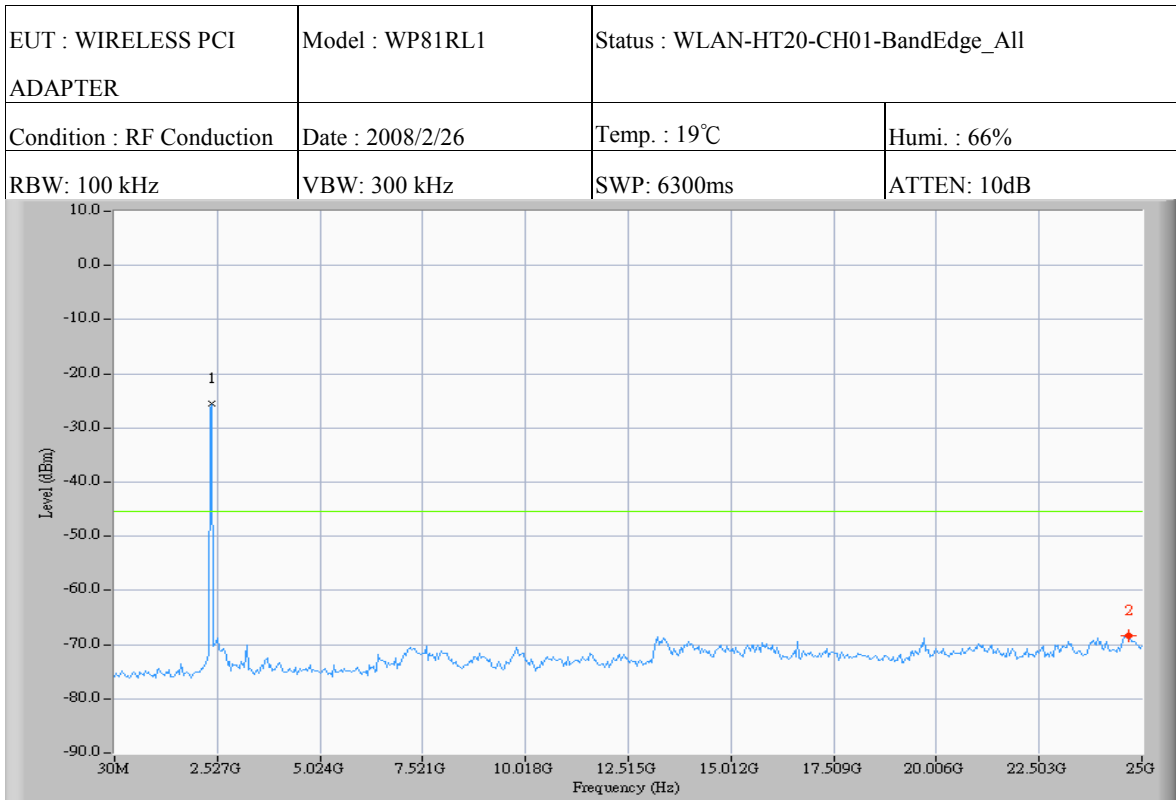


Test Request: (-42.0dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2469.500	-22.0
2	2486.167	-66.3

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-16.667	44.3

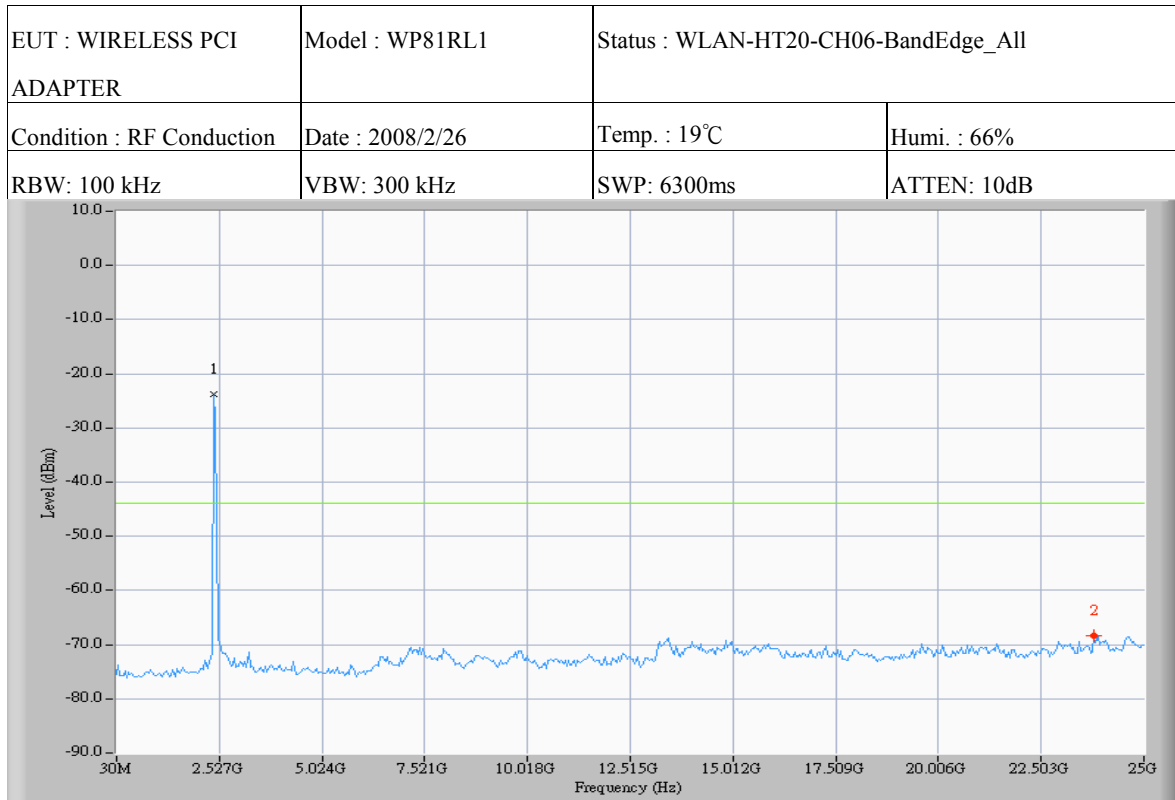




Test Request: (-45.5dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-25.5
2	24667.067	-68.3

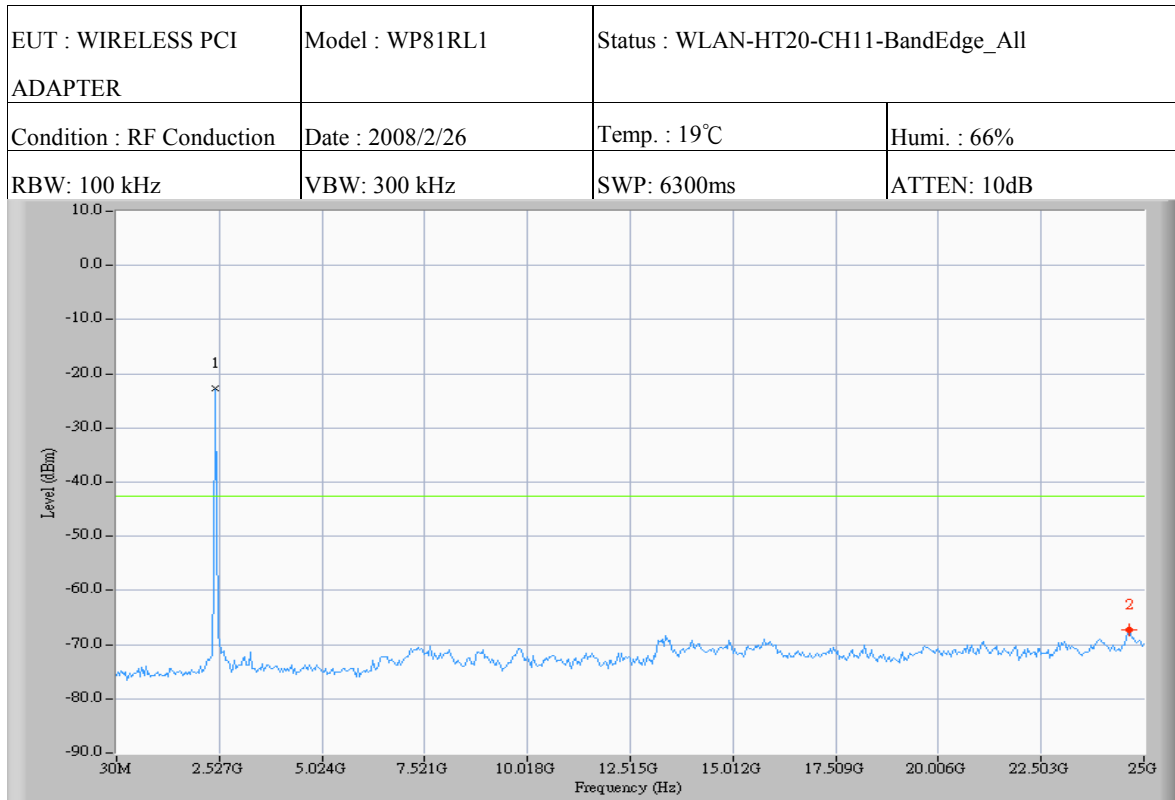
	Mkr 1 - Mkr 2	ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-22264.917	42.8



Test Request: (-43.8dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-23.8
2	23793.117	-68.3

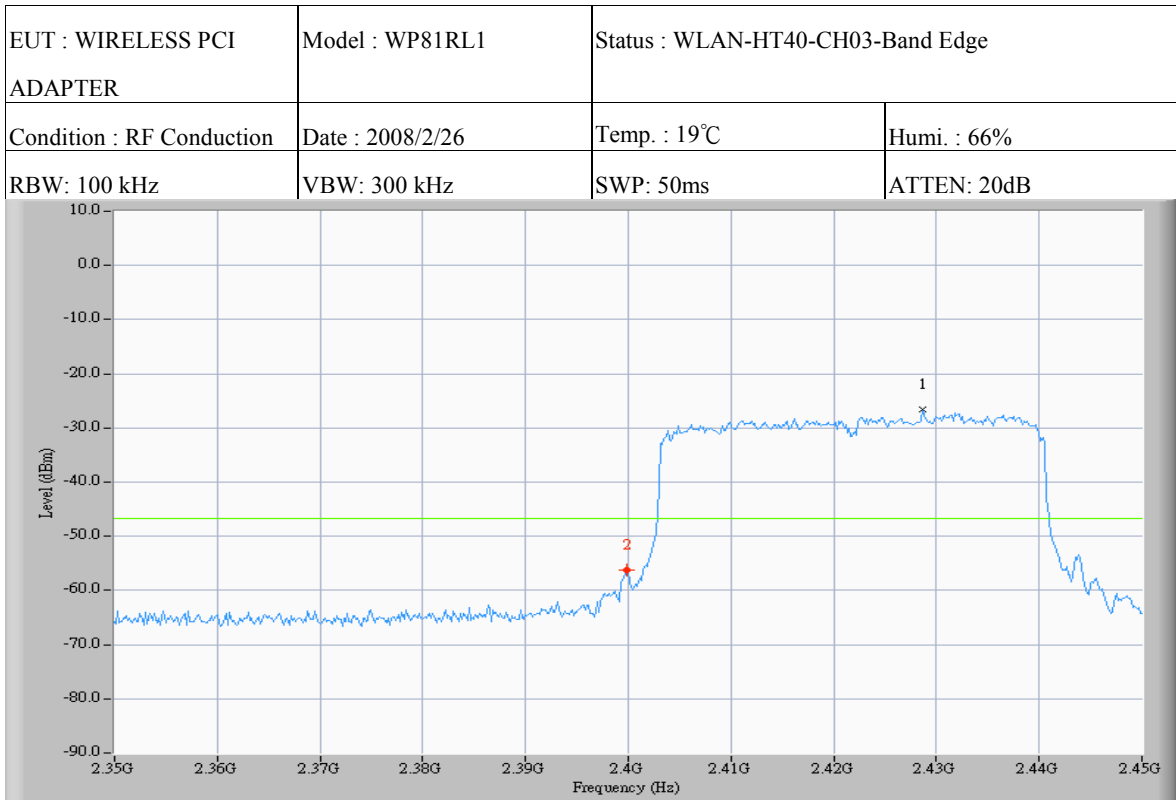
		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-21390.967	44.5



Test Request: (-42.7dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2443.767	-22.7
2	24625.450	-67.3

		ΔFrequency (MHz)	ΔLevel (dB)
1	Mkr 1 - Mkr 2	-22181.683	44.6

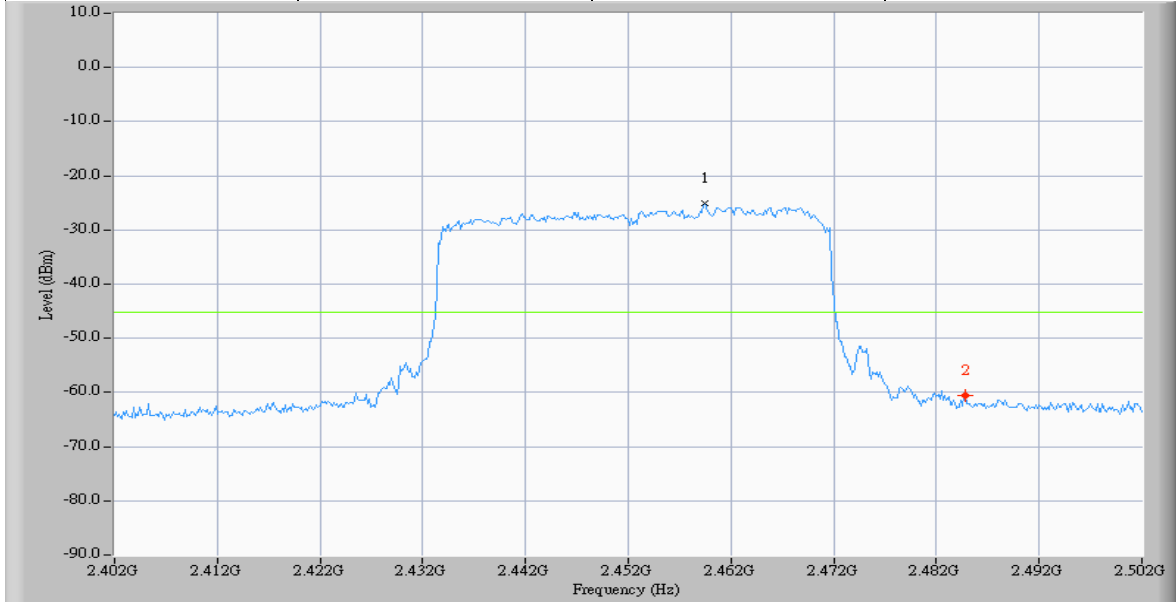


Test Request: (-46.66dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2428.667	-26.7
2	2399.833	-56.2

		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	28.834	29.5

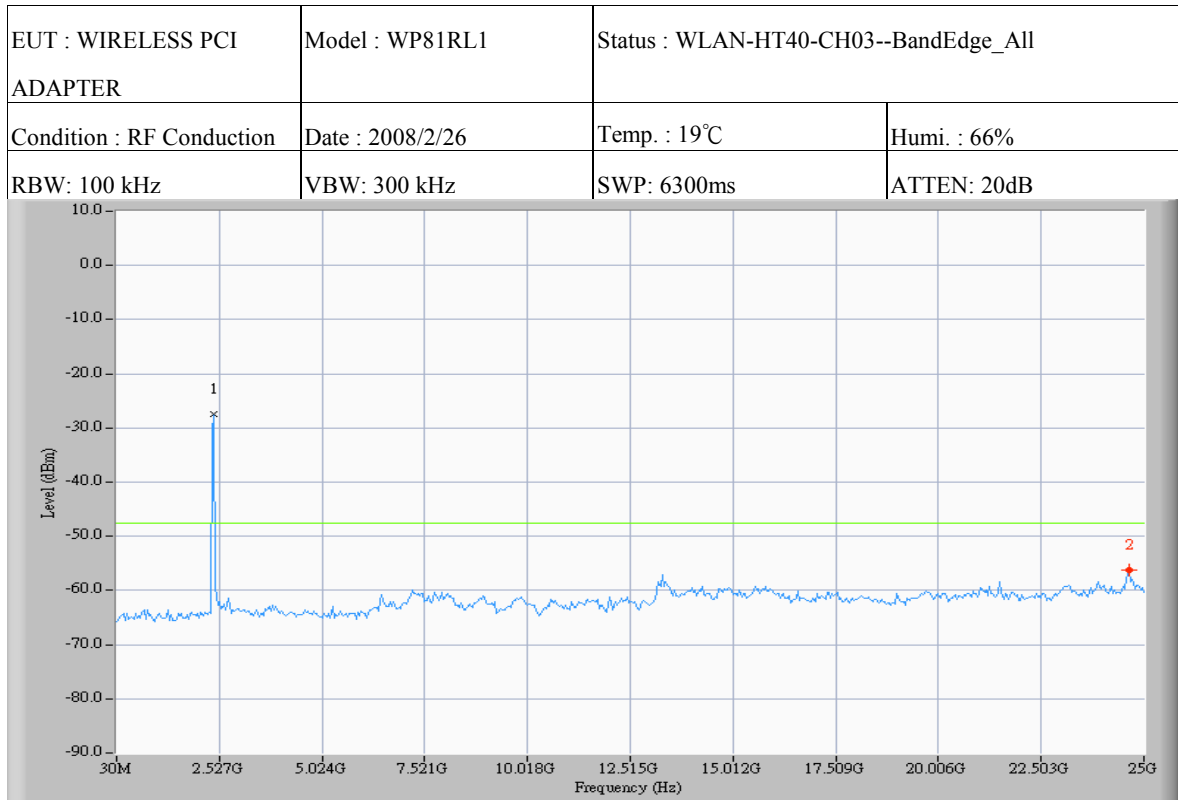
EUT : WIRELESS PCI ADAPTER	Model : WP81RL1	Status : WLAN-HT40-CH09-Band Edge	
Condition : RF Conduction	Date : 2008/2/26	Temp. : 19°C	Humi. : 66%
RBW: 100 kHz	VBW: 300 kHz	SWP: 50ms	ATTEN: 20dB



Test Request: (-45.16dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2459.500	-25.2
2	2484.833	-60.7

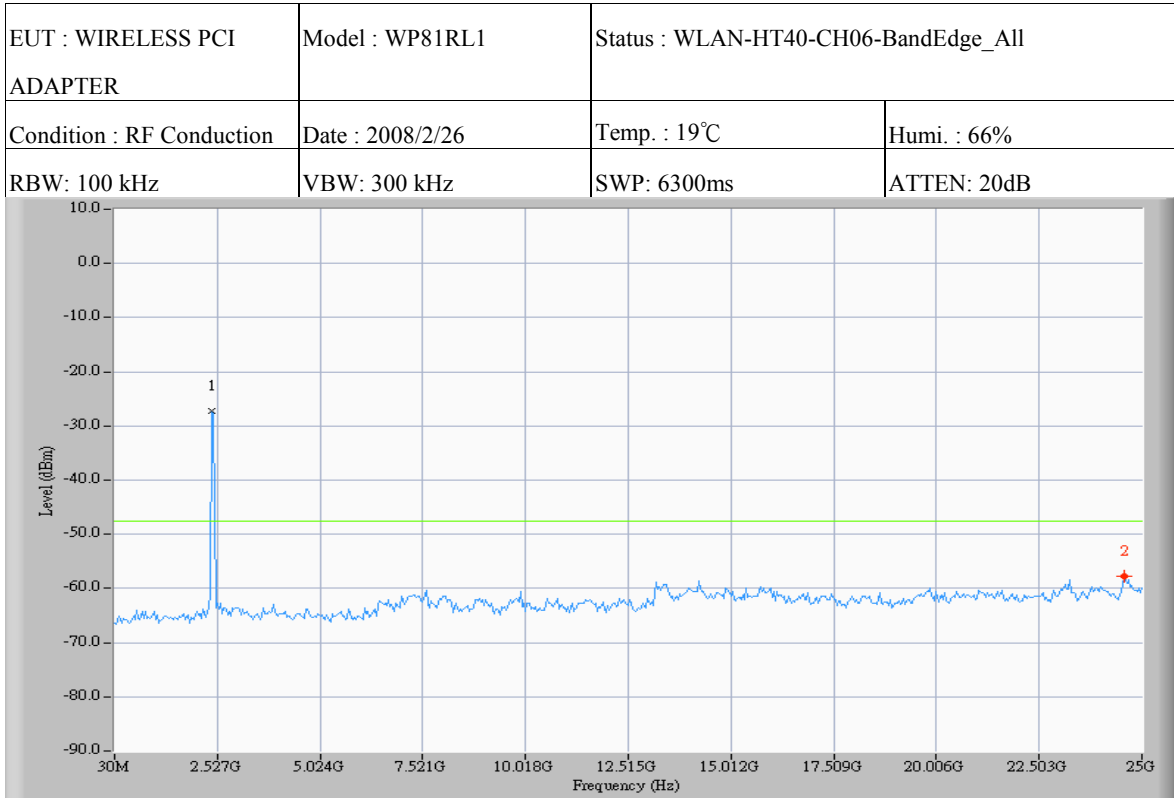
		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	-25.333	35.5



Test Request: (-47.50dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-27.5
2	24625.450	-56.3

		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	-22223.300	28.8

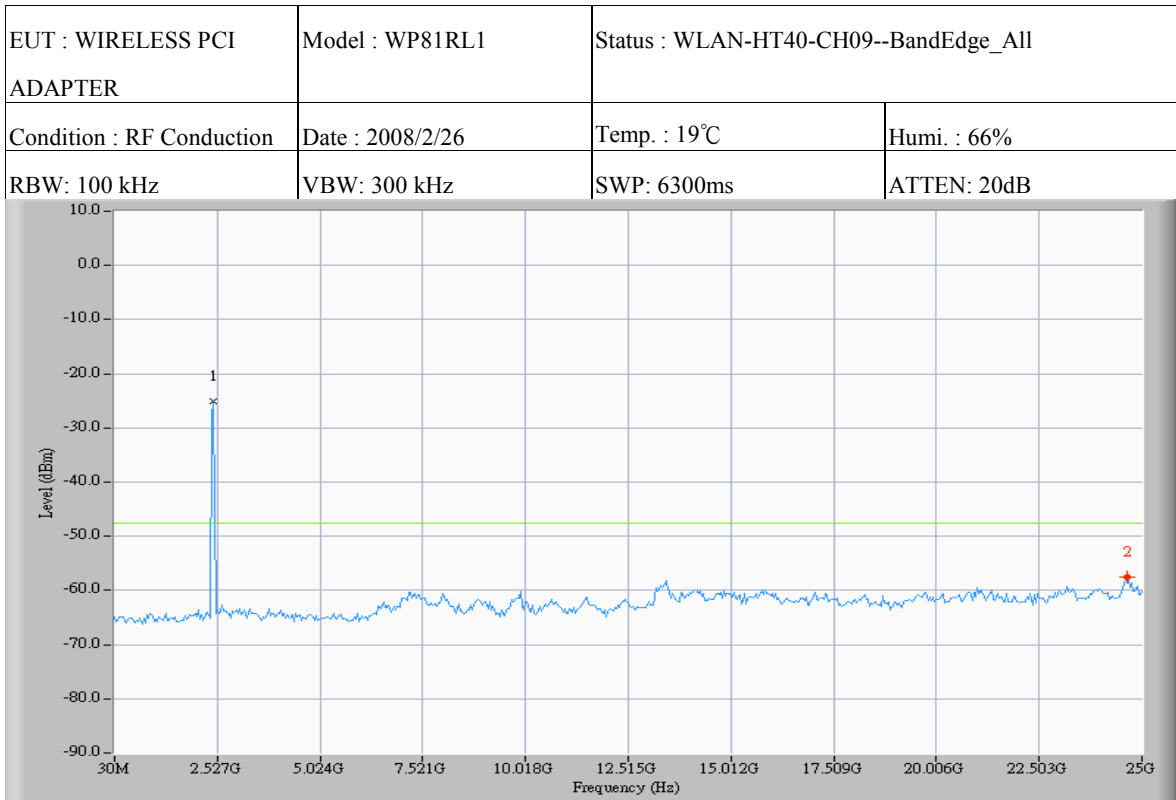


Test Request: (-47.50dBm)

	Freq (MHz)	PK Level (dBm)	Factor (dB)	PK Result (dBm)	PK Limit (dBm)	PK Margin (dB)
1	2402.150	-27.3	10.0	-17.3	-47.5	30.2
2	24583.833	-57.7	10.0	-47.7	-47.5	-0.2

Mkr	Frequency (MHz)	Level (dBm)
1	2402.150	-27.3
2	24583.833	-57.7

		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	-22181.683	30.4



Test Request: (-47.50dBm)

Mkr	Frequency (MHz)	Level (dBm)
1	2443.767	-25.2
2	24625.450	-57.5

		$\Delta$ Frequency (MHz)	$\Delta$ Level (dB)
1	Mkr 1 - Mkr 2	-22181.683	32.3



## 10 RADIATED EMISSION MEASUREMENT

### 10.1 Standard Applicable

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

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

### 10.2 Measurement Procedure

#### A.Preliminary Measurement For Portable Devices.

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

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

#### B. Final Measurement

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

Note : A filter was used to avoid pre-amplifier saturated when measure TX operation mode.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the datarate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 3 : Frequencies measured below 1 GHz configuration

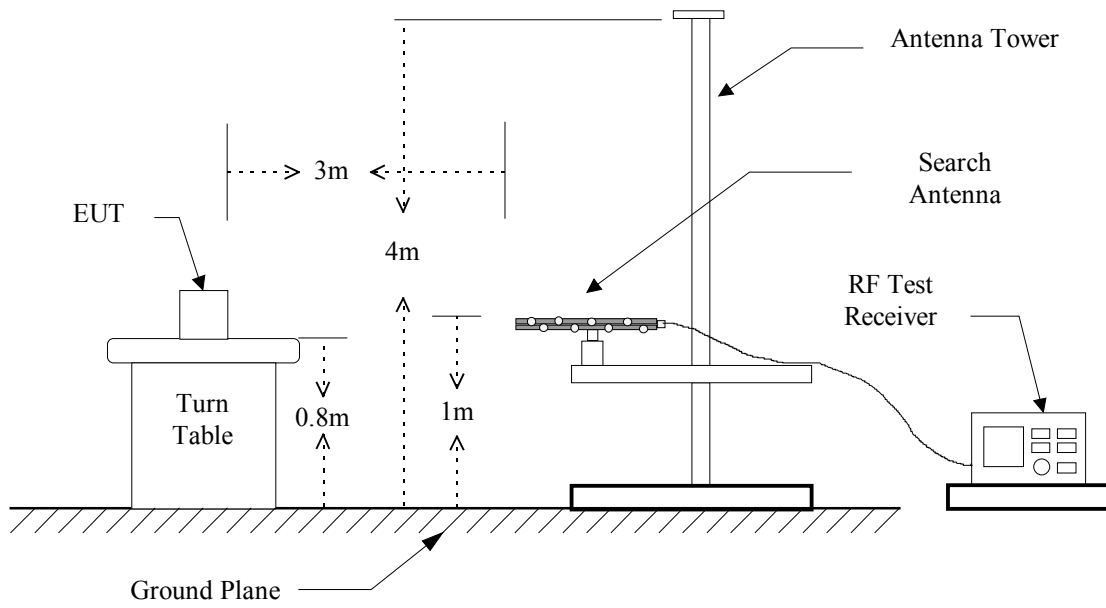
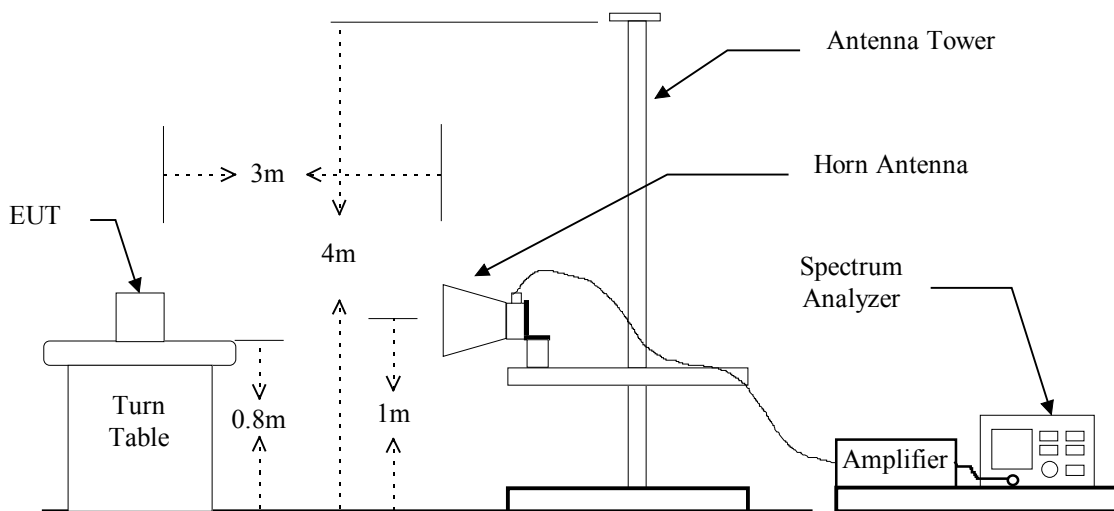


Figure 4 : Frequencies measured above 1 GHz configuration



### 10.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
EMI Receiver	R&S	ESIB 7	100328	May 18, 2008
BiLog Antenna	Schaffner	CBL 6112B	2927	Jun. 19, 2008
Horn Antenna	EMCO	3115	9107-3729	Jul. 06, 2008
PRE-Amplifier	Agilent	8449B	3008A01648	Sep. 20, 2008
Spectrum Analyzer	R&S	FSU46	13040904-001	Nov. 23, 2008
Spectrum Analyzer	Agilent	8564EC	4123A00585	Oct. 10, 2008

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

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

**10.4 Radiated Emission Data****10.4.1 Harmonic**

10.4.1.1 IEEE 802.11b

Operation Mode: TXTest Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%

## a) Channel 1

Fundamental Frequency: 2412 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4824.000	38.5	38.4	61.0	52.8	0.5	61.5	53.3	74.0	54.0
12060.000	38.6	38.5	52.4	46.3	5.8	58.2	52.1	74.0	54.0
14472.000	---	---	---	---	10.5	---	---	74.0	54.0
19296.000	---	---	---	---	13.3	---	---	74.0	54.0

## b) Channel 6

Fundamental Frequency: 2437 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4874.000	41.3	39.1	58.6	45.3	0.5	59.1	45.8	74.0	54.0
7311.000	40.5	39.8	67.1	42.9	3.7	70.8	46.6	74.0	54.0
12185.000	---	---	---	---	5.8	---	---	74.0	54.0
19496.000	---	---	---	---	13.3	---	---	74.0	54.0

## c) Channel 11

Fundamental Frequency: 2462 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4924.000	42.9	41.5	70.5	43.5	0.5	71.0	44.0	74.0	54.0
7386.000	42.9	41.4	68.3	48.1	3.7	72.0	51.8	74.0	54.0
12310.000	---	---	---	---	5.8	---	---	74.0	54.0
19696.000	---	---	---	---	13.3	---	---	74.0	54.0
22158.000	---	---	---	---	13.5	---	---	74.0	54.0

Note :

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

## 10.4.1.2 IEEE 802.11g

Operation Mode: TXTest Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%

## a) Channel 1

Fundamental Frequency: 2412 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4824.000	35.7	33.4	52.9	45.1	0.5	53.4	45.6	74.0	54.0
12060.000	48.1	38.6	56.1	46.9	5.8	61.9	52.7	74.0	54.0
14472.000	---	---	---	---	10.5	---	---	74.0	54.0
19296.000	---	---	---	---	13.3	---	---	74.0	54.0

## b) Channel 6

Fundamental Frequency: 2437 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4874.000	34.6	34.1	46.2	46.1	0.5	46.7	46.6	74.0	54.0
7311.000	38.7	37.3	50.3	49.2	3.7	54.0	52.9	74.0	54.0
12185.000	---	---	---	---	5.8	---	---	74.0	54.0
19496.000	---	---	---	---	13.3	---	---	74.0	54.0

## c) Channel 11

Fundamental Frequency: 2462 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4924.000	40.2	35.4	63.8	52.1	0.5	64.3	52.6	74.0	54.0
7386.000	40.7	36.6	68.3	48.4	3.7	73.0	52.1	74.0	54.0
12310.000	---	---	---	---	5.8	---	---	74.0	54.0
19696.000	---	---	---	---	13.3	---	---	74.0	54.0
22158.000	---	---	---	---	13.5	---	---	74.0	54.0

Note :

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

## 10.4.1.3 IEEE 802.11n, HT20

Operation Mode: TXTest Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%

## a) Channel 1

Fundamental Frequency: 2412 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4824.000	36.8	33.7	52.6	44.9	0.5	53.1	45.4	74.0	54.0
7236.000	39.2	35.1	55.9	46.1	5.8	61.7	51.9	74.0	54.0
14472.000	---	---	---	---	10.5	---	---	74.0	54.0
19296.000	---	---	---	---	13.3	---	---	74.0	54.0

## b) Channel 6

Fundamental Frequency: 2437 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4874.000	36.7	34.1	54.1	48.2	0.5	54.6	48.7	74.0	54.0
7311.000	39.3	35.2	58.5	48.3	3.7	62.2	52.0	74.0	54.0
12185.000	---	---	---	---	5.8	---	---	74.0	54.0
19496.000	---	---	---	---	13.3	---	---	74.0	54.0

## c) Channel 11

Fundamental Frequency: 2462 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4924.000	43.3	36.7	64.5	48.3	0.5	65.0	52.0	74.0	54.0
7386.000	41.9	38.3	68.9	48.4	3.7	72.6	52.1	74.0	54.0
12310.000	---	---	---	---	5.8	---	---	74.0	54.0
19696.000	---	---	---	---	13.3	---	---	74.0	54.0
22158.000	---	---	---	---	13.5	---	---	74.0	54.0

Note :

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

## 10.4.1.4 IEEE 802.11n, HT40

Operation Mode: TXTest Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%

## a) Channel 3

Fundamental Frequency: 2422 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4844.000	35.9	33.9	41.1	40.9	0.5	41.6	41.4	74.0	54.0
7266.000	37.1	34.5	41.7	41.5	5.8	47.5	47.3	74.0	54.0
12110.000	---	---	---	---	10.5	---	---	74.0	54.0
19376.000	---	---	---	---	13.3	---	---	74.0	54.0

## b) Channel 6

Fundamental Frequency: 2437 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4874.000	38.4	33.8	53.5	44.9	0.5	54.0	45.4	74.0	54.0
7311.000	37.8	35.3	55.4	46.2	3.7	59.1	49.9	74.0	54.0
12185.000	---	---	---	---	5.8	---	---	74.0	54.0
19496.000	---	---	---	---	13.3	---	---	74.0	54.0

## c) Channel 9

Fundamental Frequency: 2452 MHz

Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
	H		V			Peak	Ave	Peak	Ave.
	Peak	Ave	Peak	Ave					
4904.000	39.3	35.7	57.7	48.2	0.5	58.2	48.7	74.0	54.0
7356.000	38.7	35.3	59.4	49.0	3.7	63.1	52.7	74.0	54.0
12260.000	---	---	---	---	5.8	---	---	74.0	54.0
19616.000	---	---	---	---	13.3	---	---	74.0	54.0
22068.000	---	---	---	---	13.5	---	---	74.0	54.0

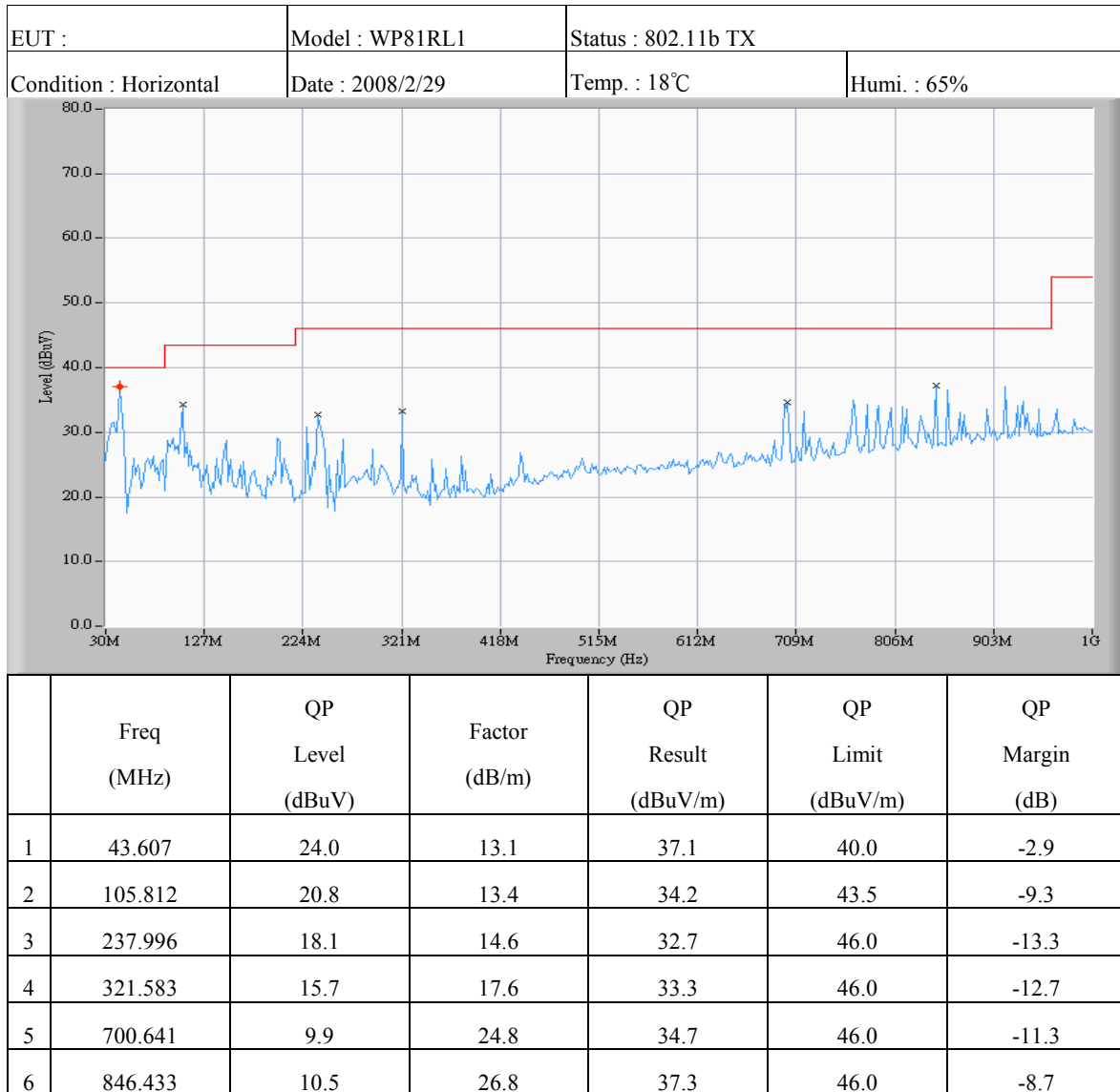
Note :

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

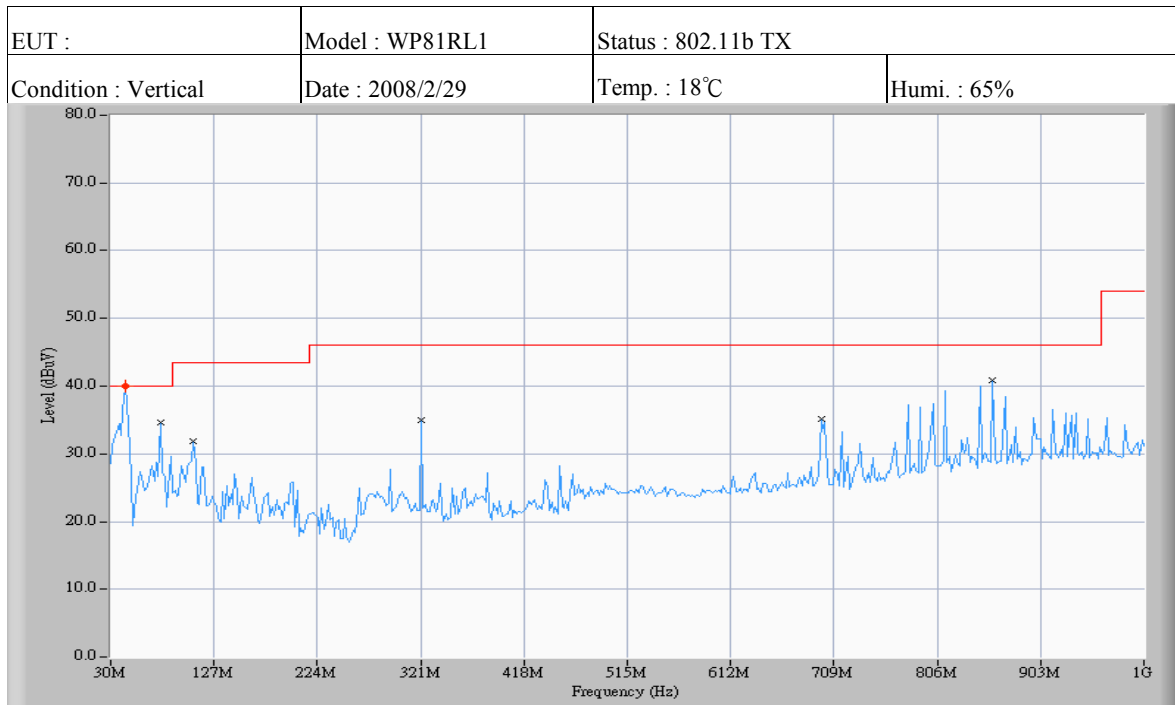
### 10.4.2 Spurious Emission

#### 10.4.2.1 Operation Mode: IEEE 802.11b

##### a) Emission frequencies below 1 GHz







	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	43.607	26.3	13.1	39.4	40.0	-0.6
2	76.653	26.3	8.3	34.6	40.0	-5.4
3	107.756	18.1	13.7	31.8	43.5	-11.7
4	321.583	17.4	17.6	35.0	46.0	-11.0
5	696.754	10.4	24.8	35.2	46.0	-10.8
6	858.096	13.9	27.0	40.9	46.0	-5.1

b) Emission frequencies above 1 GHz

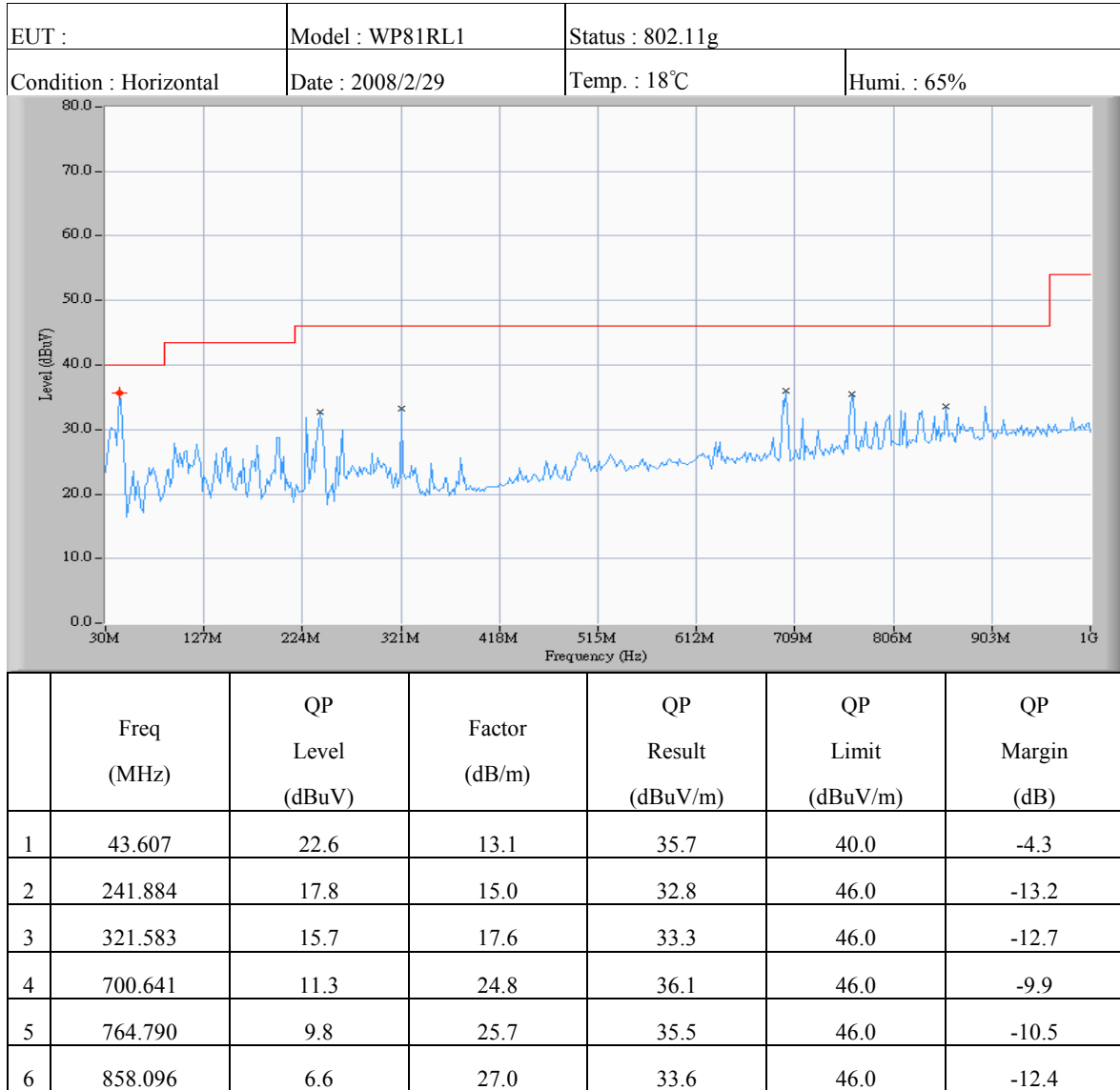
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

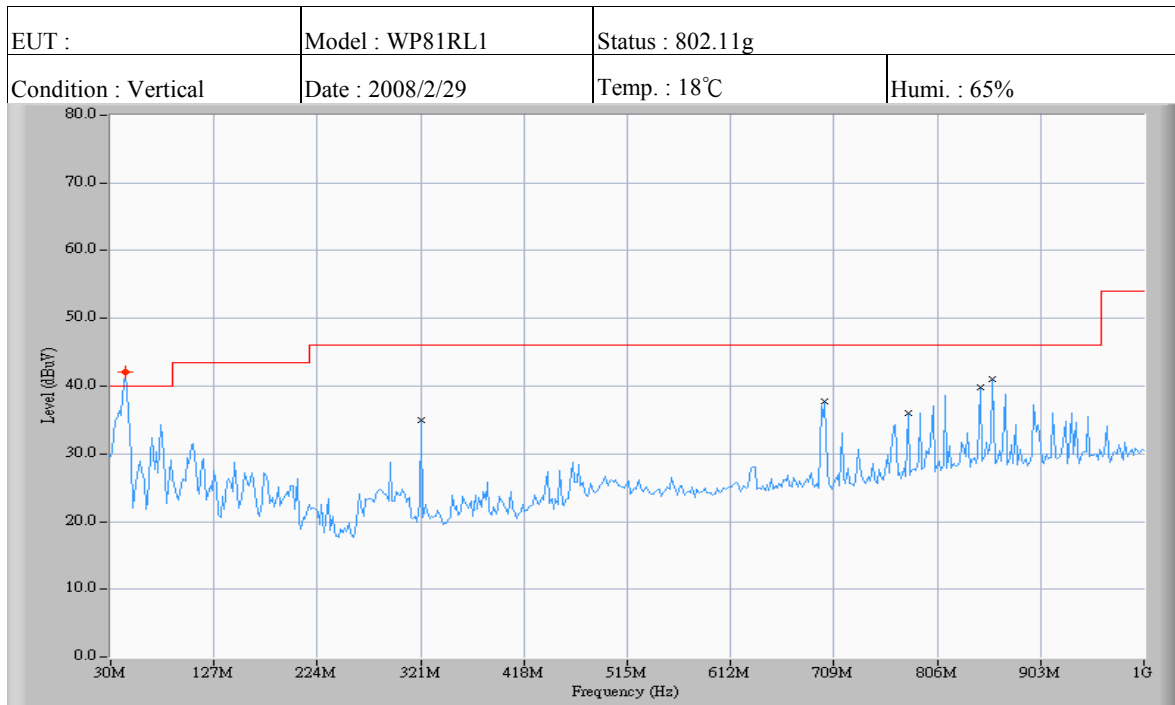
Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "\*\*\*" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is  
 $\pm 4.6\text{dB}$  ( $30\text{MHz} \leq f < 300\text{MHz}$ ).  
 $\pm 4.4\text{dB}$  ( $300\text{MHz} \leq f \leq 1000\text{MHz}$ ).

10.4.2.2 Operation Mode: IEEE 802.11g

a) Emission frequencies below 1 GHz





	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	43.607	26.5	13.1	39.6	40.0	-0.4
2	321.583	17.4	17.6	35.0	46.0	-11.0
3	700.641	13.0	24.8	37.8	46.0	-8.2
4	778.397	10.2	25.9	36.1	46.0	-9.9
5	846.433	13.0	26.8	39.8	46.0	-6.2
6	858.096	14.1	27.0	41.1	46.0	-4.9

b) Emission frequencies above 1 GHz

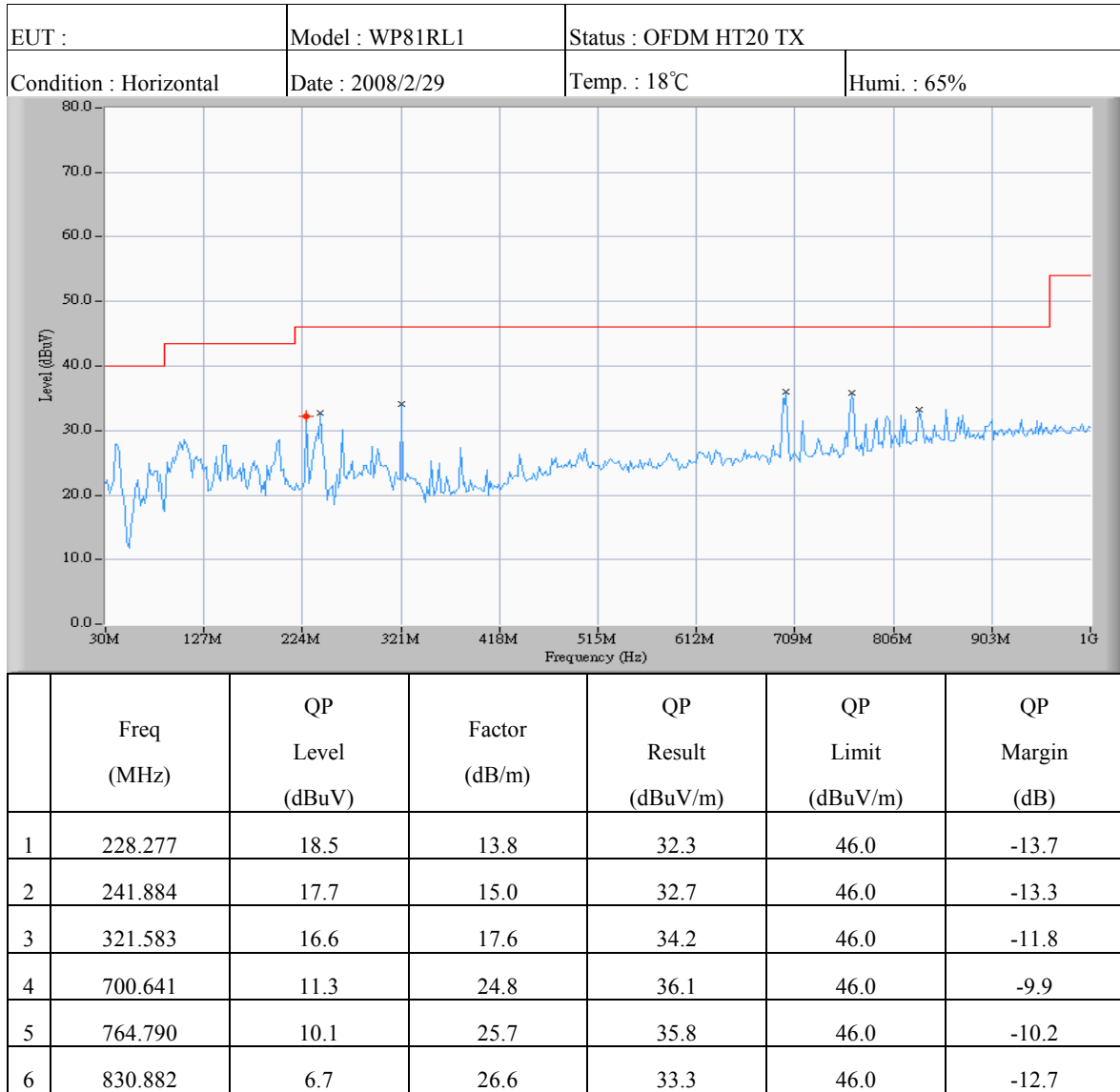
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

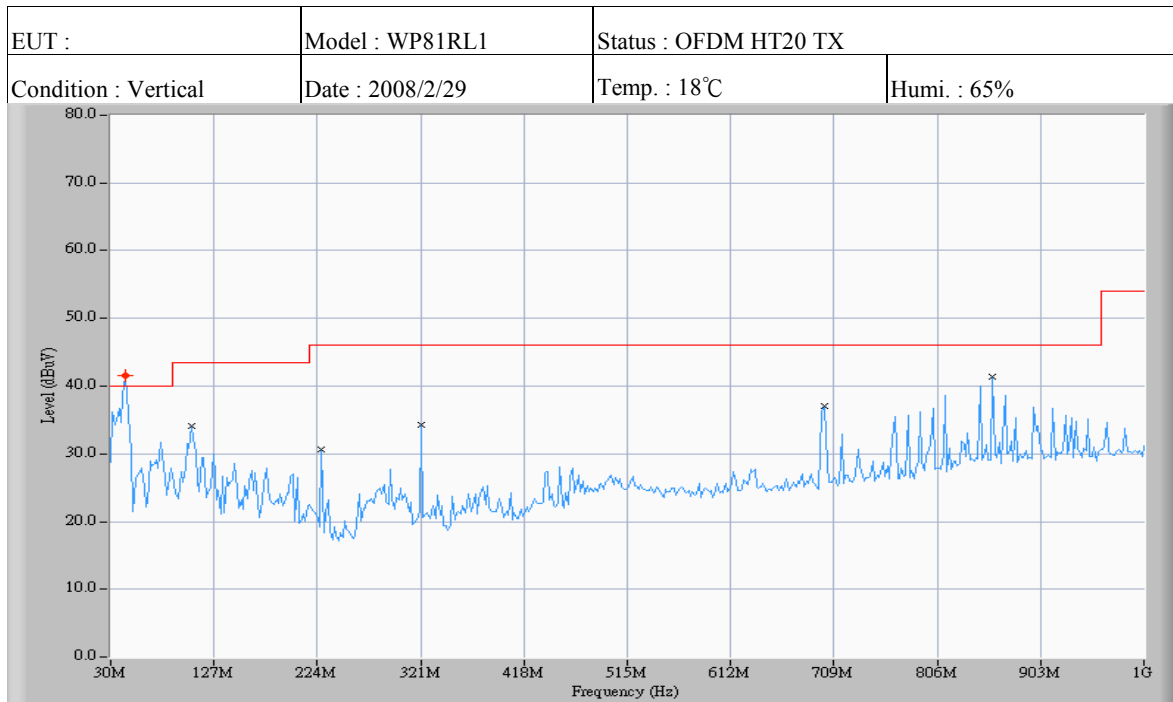
Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "\*\*\*" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is  
 $\pm 4.6\text{dB}$  ( $30\text{MHz} \leq f < 300\text{MHz}$ ).  
 $\pm 4.4\text{dB}$  ( $300\text{MHz} \leq f \leq 1000\text{MHz}$ ).

10.4.2.3 Operation Mode: IEEE 802.11n, HT20

a) Emission frequencies below 1 GHz





	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	43.607	26.4	13.1	39.5	40.0	-0.5
2	105.812	20.8	13.4	34.2	43.5	-9.3
3	228.277	16.8	13.8	30.6	46.0	-15.4
4	321.583	16.7	17.6	34.3	46.0	-11.7
5	700.641	12.3	24.8	37.1	46.0	-8.9
6	858.096	14.4	27.0	41.4	46.0	-4.6

b) Emission frequencies above 1 GHz

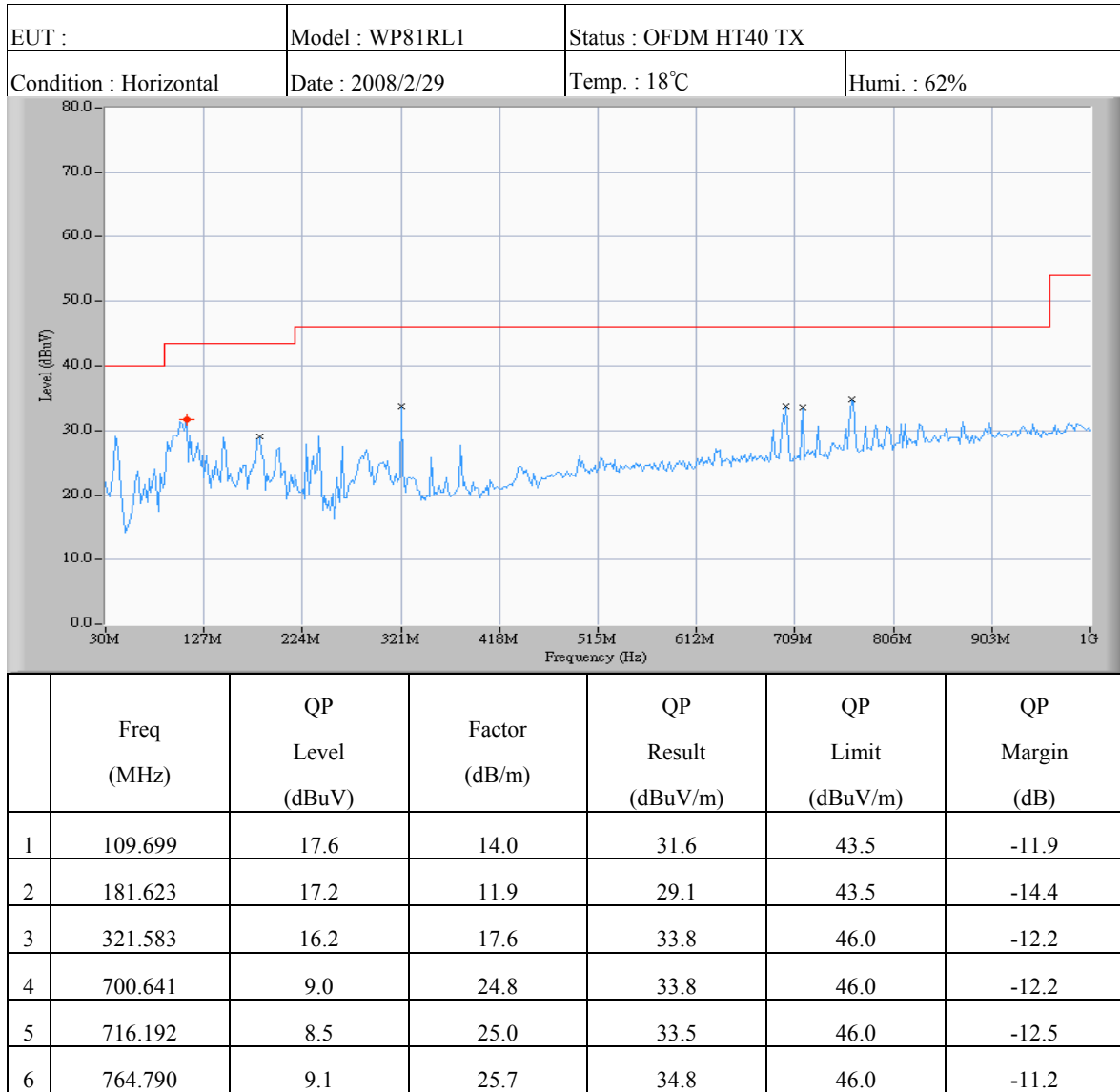
Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "\*\*\*" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is  
 $\pm 4.6\text{dB}$  ( $30\text{MHz} \leq f < 300\text{MHz}$ ).  
 $\pm 4.4\text{dB}$  ( $300\text{MHz} \leq f \leq 1000\text{MHz}$ ).

10.4.2.4 Operation Mode: IEEE 802.11n, HT40

a) Emission frequencies below 1 GHz





	Freq (MHz)	QP Level (dBuV)	Factor (dB/m)	QP Result (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dB)
1	41.663	24.5	14.1	38.6	40.0	-1.4
2	76.653	28.1	8.3	36.4	40.0	-3.6
3	105.812	24.3	13.4	37.7	43.5	-5.8
4	321.583	15.2	17.6	32.8	46.0	-13.2
5	700.641	13.3	24.8	38.1	46.0	-7.9
6	858.096	10.7	27.0	37.7	46.0	-8.3

b) Emission frequencies above 1 GHz

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

Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "\*\*\*" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is  
 $\pm 4.6\text{dB}$  ( $30\text{MHz} \leq f < 300\text{MHz}$ ).  
 $\pm 4.4\text{dB}$  ( $300\text{MHz} \leq f \leq 1000\text{MHz}$ ).

## 10.4.2.5 IEEE 802.11b

Test Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%Operation Mode: TX

Operation Channel	Test Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
		H		V			Peak	Ave	Peak	Ave.
		Peak	Ave	Peak	Ave					
1	2390.149	23.3	22.2	26.6	22.6	30.3	56.9	52.6	74.0	54.0
11	2483.350	22.8	20.7	27.6	21.4	30.3	57.9	51.7	74.0	54.0

## 10.4.2.6 IEEE 802.11g

Test Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%Operation Mode: TX

Operation Channel	Test Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
		H		V			Peak	Ave	Peak	Ave.
		Peak	Ave	Peak	Ave					
1	2390.149	23.5	21.9	23.5	21.8	30.3	53.8	52.2	74.0	54.0
11	2482.900	24.4	22.4	29.6	22.7	30.3	59.9	53.0	74.0	54.0

Note :

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



## 10.4.2.7 IEEE 802.11n, HT20

Test Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%Operation Mode: TX

Operation Channel	Test Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
		H		V			Peak	Ave	Peak	Ave.
		Peak	Ave	Peak	Ave					
1	2390.449	22.9	20.2	24.5	21.7	30.3	54.8	52.0	74.0	54.0
11	2483.050	23.4	20.6	27.4	21.9	30.3	57.7	52.2	74.0	54.0

## 10.4.2.8 IEEE 802.11n, HT40

Test Date: Feb. 28, 2008Temperature: 19°CHumidity: 65%Operation Mode: TX

Operation Channel	Test Frequency (MHz)	Reading (dBuV)				Factor (dB) Corr.	Result @3m (dBuV/m)		Limit @3m (dBuV/m)	
		H		V			Peak	Ave	Peak	Ave.
		Peak	Ave	Peak	Ave					
3	2390.149	23.6	20.4	26.8	21.3	30.3	57.1	51.6	74.0	54.0
9	2483.350	25.6	20.6	33.9	22.7	30.3	64.2	53.0	74.0	54.0

Note :

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

## 10.5 Field Strength Calculation

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

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$