

# EMC TEST REPORT

**Report No.** : TS9030012-EME

**Model No.** : WR5204

**Issued Date** : Mar. 31, 2009

**Applicant:** AboCom System, Inc.  
77, Yu-Yih Rd., Chu-Nan Chen, Miao-Lih Hsuan,  
Taiwan

**Test Method/  
Standard:** 47 CFR FCC Part 15.247 & ANSI C63.4 2003

**Test By:** Intertek Testing Services Taiwan Ltd.  
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,  
Shiang-Shan District, Hsinchu City, Taiwan

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Laboratory. The test result(s) in this report only applies to the tested sample(s).

**The test report was prepared by:** Sign on File  
Sunny Liu/ Sr. Officer

**These measurements were taken by:** Sign on File  
Leon Cheng/ Engineer

**The test report was reviewed by:**

**Name** Kevin Chen  
**Title** Chief Engineer

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## 1. Summary of Test Data

Test/Requirement Description	Applicable Rule	Result
Minimum 6 dB Bandwidth	15.247(a)(2)	Pass
Maximum Output Power	15.247(b)	Pass
Power Spectral Density	15.247(e)	Pass
RF Antenna Conducted Spurious	15.247(d)	Pass
Radiated Spurious Emission	15.247(d), 15.205, 15.209	Pass
Emission on the Band Edge	15.247(d)	Pass
AC Power Line Conducted Emission	15.207	Pass

## 2. General Information

### Identification of the EUT

Product:	WR5204 802.11b/g/n Compact Wireless Router
Model No.:	WR5204
FCC ID.:	MQ4WR5204
Frequency Range:	1. 2412 MHz to 2462 MHz for 802.11b, 802.11g, 802.11n HT20 2. 2422 MHz to 2452 MHz for 802.11n HT40
Channel Number:	1. 11 channels for 802.11b, 802.11g, 802.11n HT20 2. 7 channels for 802.11n HT40
Frequency of Each Channel:	1. 2412 MHz+5k MHz; k=0~12 2. 2422 MHz+5k MHz; k=0~9
Type of Modulation:	DSSS, OFDM
Rated Power:	DC 3.3 V from adapter (Model No.: UL305-3315, I/P Voltage: 100-240 Vac, 50-60Hz)
Power Cord:	N/A
Data Cable:	RJ-45 UTP Cat.5 3 meter × 2
Sample Received:	Mar. 2, 2009
Test Date(s):	Mar. 20, 2009 ~ Mar. 23, 2009
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Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

## **Description of EUT**

The EUT is a WR5204 802.11b/g/n Compact Wireless Router, it supports one transmitted and one received MIMO functions (1T1R) and was defined as information technology equipment.

The EUT has two types of antenna which for replacement purpose.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

## **Antenna description**

### **(1) Antenna 1**

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : 1.8 dBi  
Antenna Type : Dipole antenna  
Connector Type : SMA Plug Reverse

### **(2) Antenna 2**

The EUT uses a permanently connected antenna.

Antenna Gain : 2 dBi  
Antenna Type : CERAMIC antenna  
Connector Type : N/A

## Operation mode

The EUT was supplied with DC 3.3 V from adapter (Test voltage: 120 Vac, 60 Hz) and it was run in TX mode that was controlled by “QA” program.

The EUT was transmitted continuously during the test.

With individual verifying, the maximum output power was found at 1 Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n HT20 mode and 13 Mbps data rate for 802.11n HT40 mode. The final tests were executed under these conditions and recorded in this report individually.

The following test mode(s) were pre- test antenna:

Ant.	Pre-Test
1	Dipole antenna
2	Ceramic antenna

After pre-testing, the following test mode was found to produce the highest emission level.

Final Test Antenna	
Minimum 6 dB Bandwidth	Antenna 1
99 % Occupied Bandwidth	Antenna 1
Maximum Output Power	Antenna 1, Antenna 2
Power Spectral Density	Antenna 1
RF Antenna Conducted Spurious	Antenna 1
Radiated Spurious Emission	Antenna 1, Antenna 2
Emission on the Band Edge	Antenna 1, Antenna 2

The final test was executed under test mode with highest emission and recorded in this report individually.

Antenna 1		Antenna 2	
802.11b (ch6 2437 MHz)		802.11b (ch6 2437 MHz)	
Data rate	PK (dBi)	Data rate	PK (dBi)
1Mbps	18.01	1Mbps	17.08
2Mbps	17.94	2Mbps	17.04
5.5Mbps	17.9	5.5Mbps	16.93
11Mbps	17.83	11Mbps	16.95
802.11g (ch6 2437 MHz)		802.11g (ch6 2437 MHz)	
Data rate	PK (dBi)	Data rate	PK (dBi)
6Mbps	25.91	6Mbps	20.75
9Mbps	25.85	9Mbps	20.69
12Mbps	25.79	12Mbps	20.61
18Mbps	25.82	18Mbps	20.44
24Mbps	25.74	24Mbps	20.4
36Mbps	25.65	36Mbps	20.51
48Mbps	25.6	48Mbps	20.36
54Mbps	25.51	54Mbps	20.16
802.11n HT20 (ch6 2437 MHz)		802.11n HT20 (ch6 2437 MHz)	
Data rate	PK (dBi)	Data rate	PK (dBi)
6.5Mbps	25.83	6.5Mbps	20.85
13Mbps	25.76	13Mbps	20.8
19.5Mbps	25.70	19.5Mbps	20.72
26Mbps	25.64	26Mbps	20.6
39Mbps	25.69	39Mbps	20.65
52Mbps	25.58	52Mbps	20.51
58.5Mbps	25.50	58.5Mbps	20.44
65Mbps	25.42	65Mbps	20.32
802.11n HT40 (ch6 2437 MHz)		802.11n HT40 (ch6 2437 MHz)	
Data rate	PK (dBi)	Data rate	PK (dBi)
13Mbps	23.59	13Mbps	18.50
26Mbps	23.52	26Mbps	18.44
39Mbps	23.44	39Mbps	18.41
52Mbps	23.4	52Mbps	18.31
78Mbps	23.32	78Mbps	18.18
104Mbps	23.29	104Mbps	18.02
117Mbps	23.16	117Mbps	17.93
130Mbps	23.10	130Mbps	17.84

### 3. Maximum 6 dB Bandwidth

<b>Name of Test</b>	Maximum 6 dB Bandwidth
<b>Base Standard</b>	FCC 15.247 (a)(2)

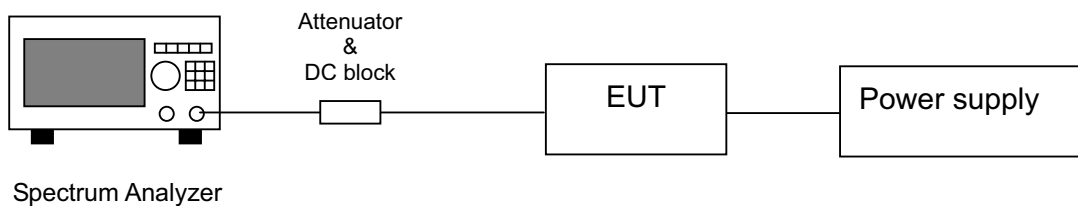
**Test Result:** Complies  
**Measurement Data:** See Table 1 & plots below

**Method of Measurement:**

**Reference FCC document: KDB558074**

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1 % of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform. The appropriate bandwidth mask is applied to the output waveform to verify compliance.

**Test Diagram:**

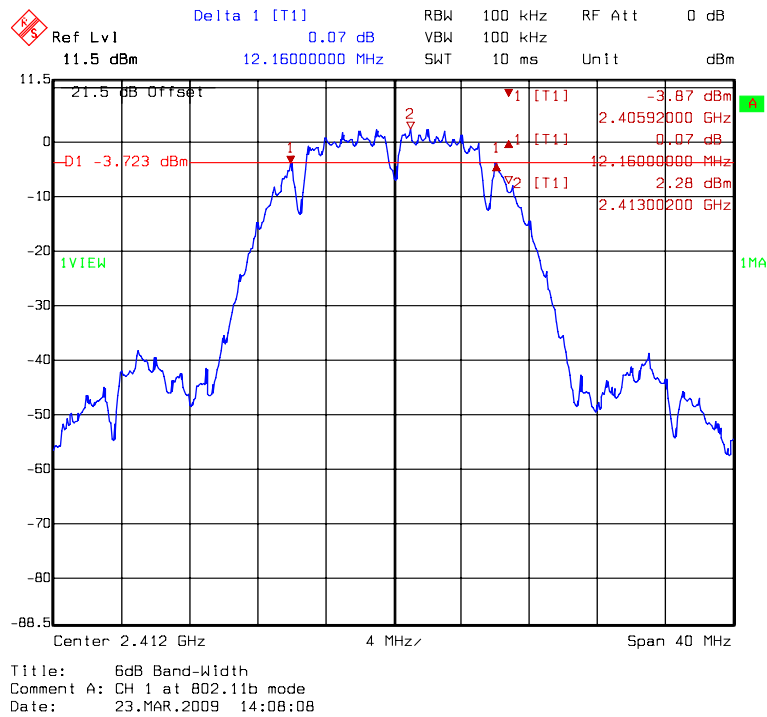


**Note:** The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

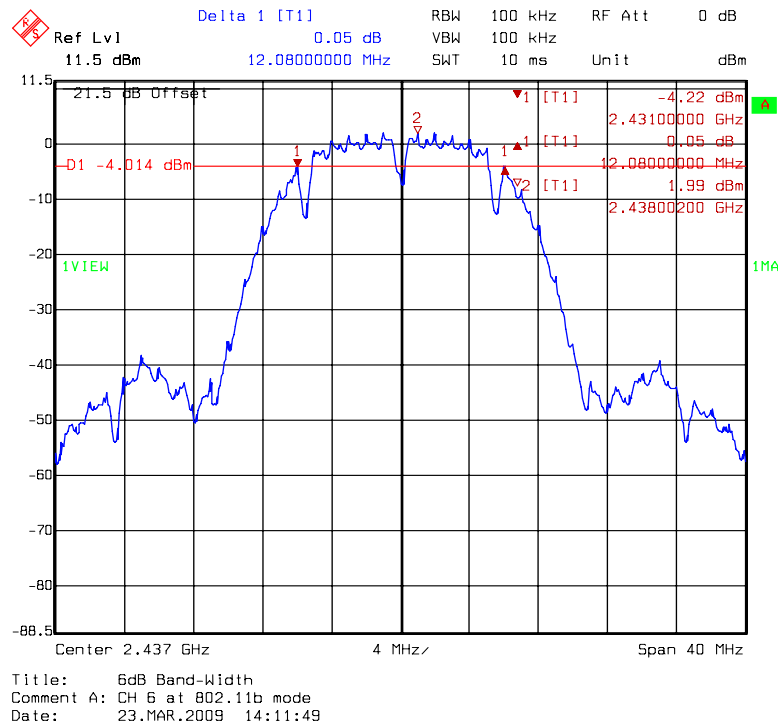
Table1. Maximum 6 dB Bandwidth

Mode	Channel	Frequency (MHz)	Bandwidth (MHz)	Min. Limit (MHz)	Pass/Fail
802.11b	1	2412	12.16	0.5	Pass
	6	2437	12.08	0.5	Pass
	11	2462	12.24	0.5	Pass
802.11g	1	2412	16.88	0.5	Pass
	6	2437	16.56	0.5	Pass
	11	2462	16.64	0.5	Pass
802.11n (HT20)	1	2412	17.76	0.5	Pass
	6	2437	17.52	0.5	Pass
	11	2462	17.60	0.5	Pass
802.11n (HT40)	3	2422	36.16	0.5	Pass
	6	2437	36.16	0.5	Pass
	9	2452	35.52	0.5	Pass

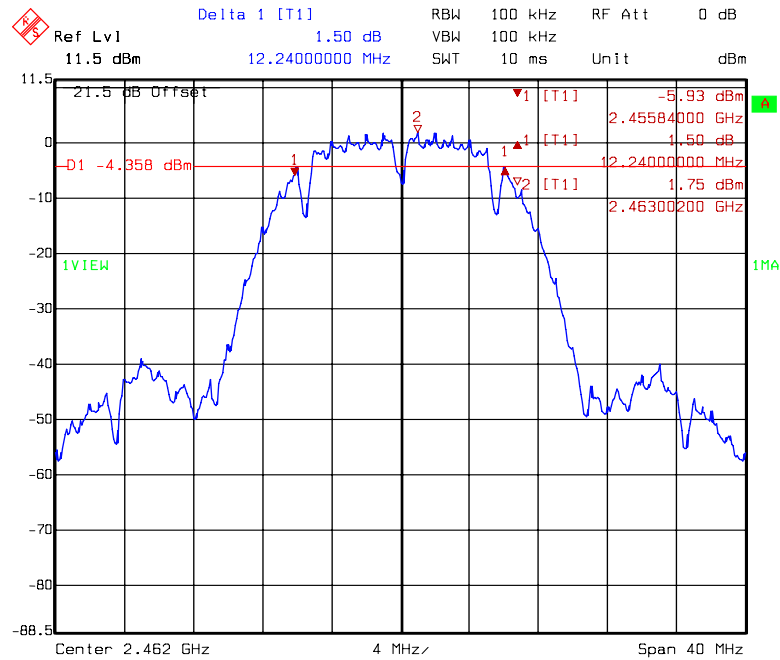
### 6 dB Bandwidth @ 802.11b mode channel 1



### 6 dB Bandwidth @ 802.11b mode channel 6

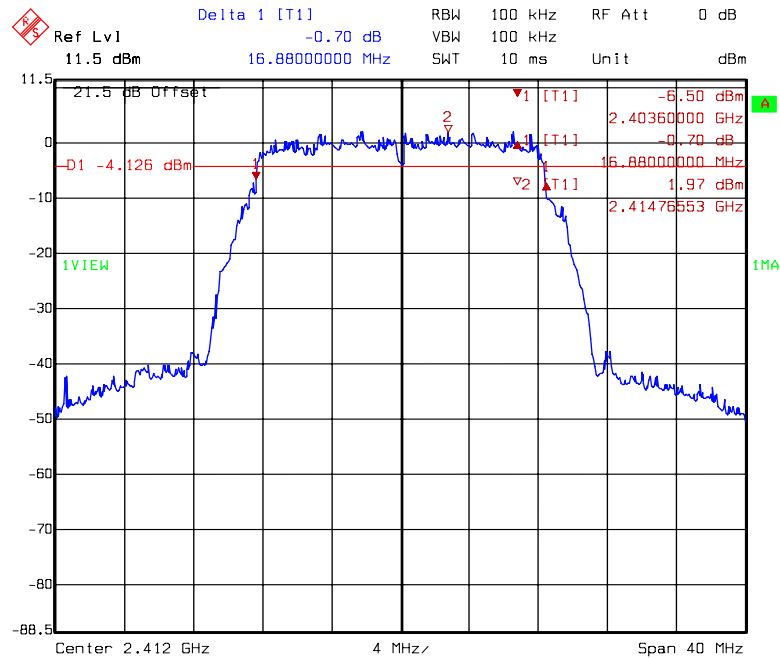


### 6 dB Bandwidth @ 802.11b mode channel 11



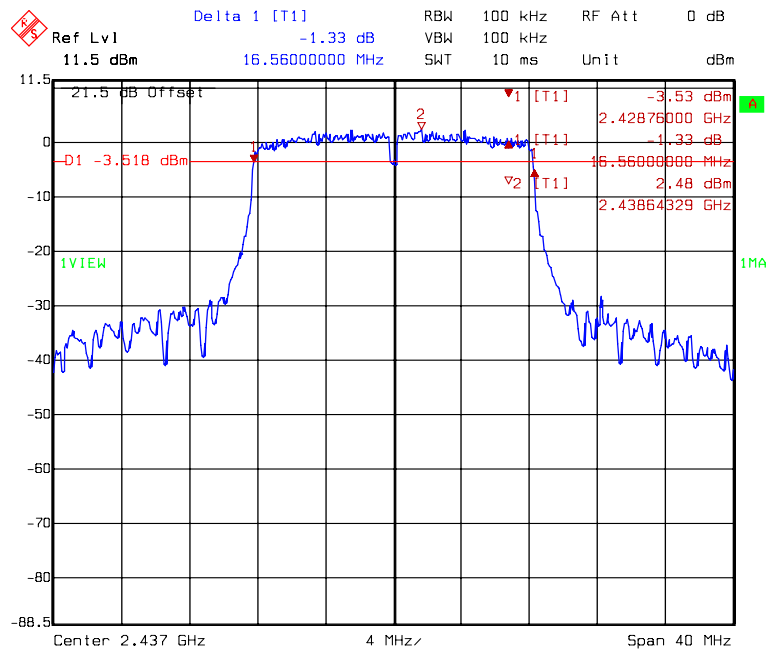
Title: 6dB Band-Width  
Comment A: CH 11 at 802.11b mode  
Date: 23.MAR.2009 14:14:59

### 6 dB Bandwidth @ 802.11g mode channel 1



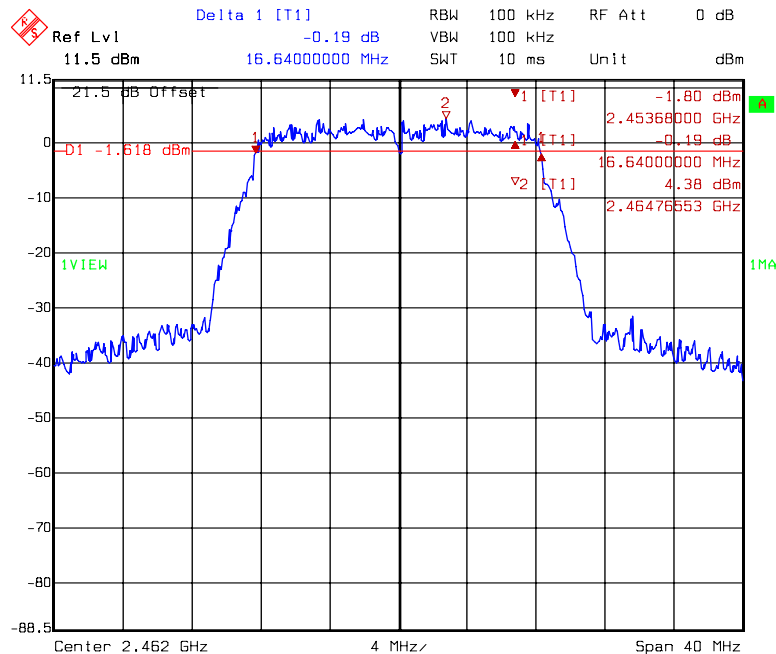
Title: 6dB Band-Width  
Comment A: CH 1 at 802.11g mode  
Date: 23.MAR.2009 14:25:11

### 6 dB Bandwidth @ 802.11g mode channel 6



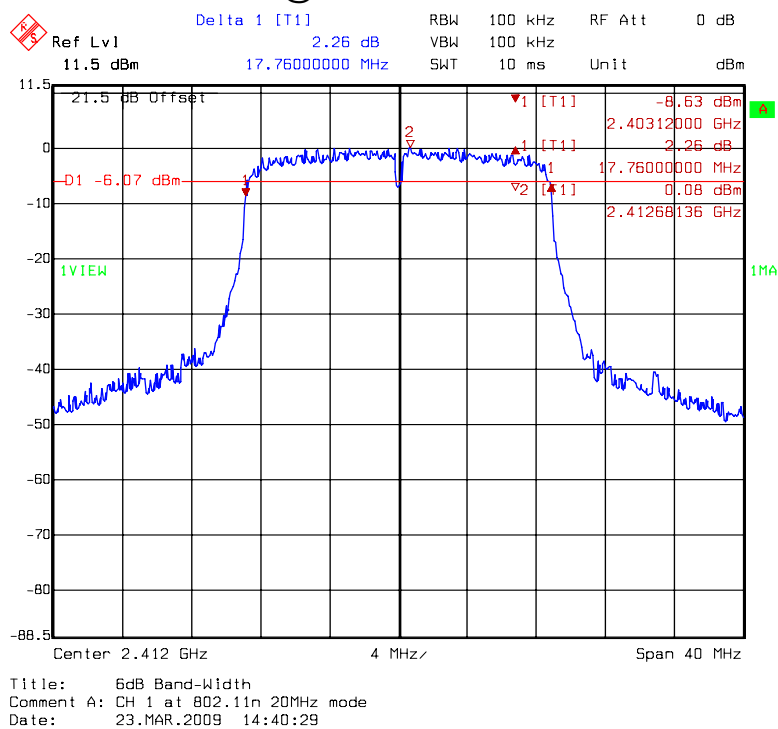
Title: 6dB Band-Width  
Comment A: CH 6 at 802.11g mode  
Date: 23.MAR.2009 14:31:12

### 6 dB Bandwidth @ 802.11g mode channel 11

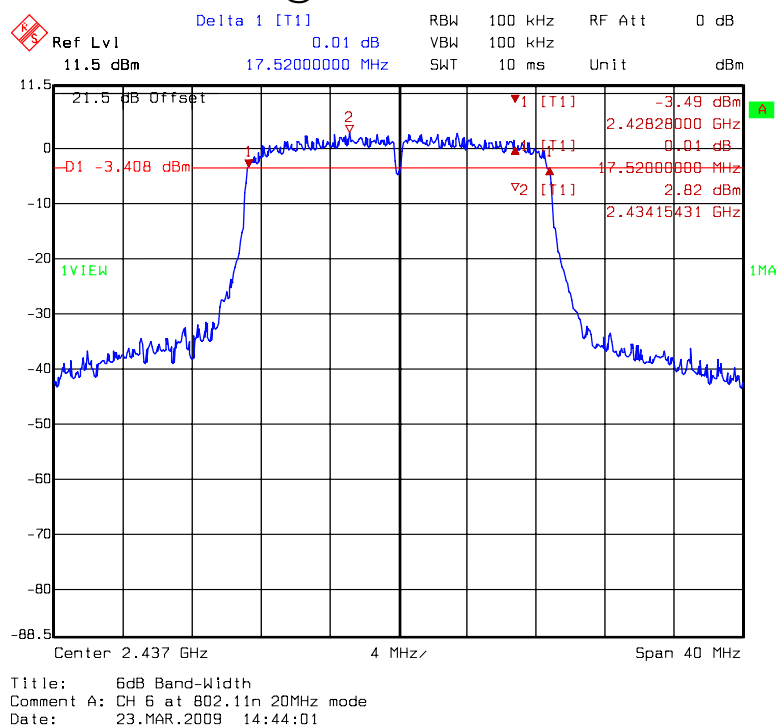


Title: 6dB Band-Width  
Comment A: CH 11 at 802.11g mode  
Date: 23.MAR.2009 14:34:36

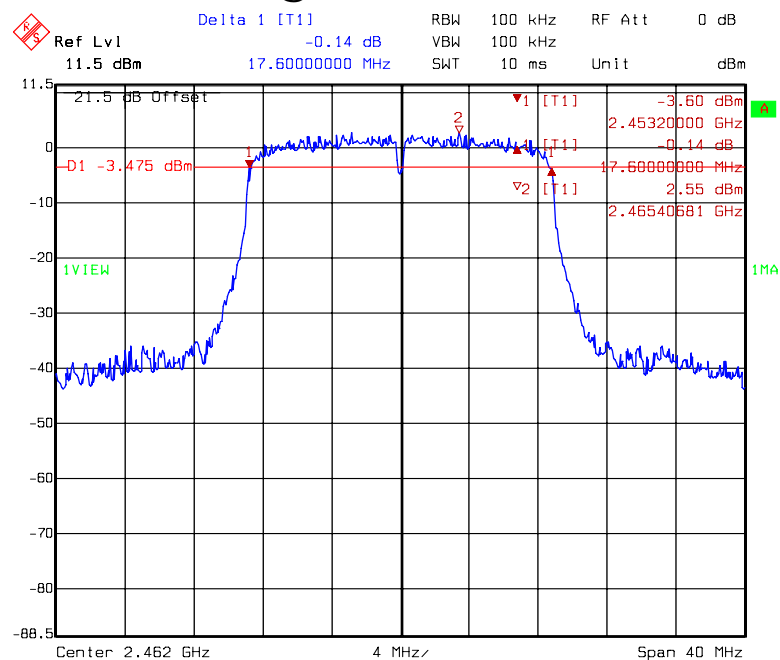
## 6 dB Bandwidth @ 802.11n HT20 mode channel 1



## 6 dB Bandwidth @ 802.11n HT20 mode channel 6

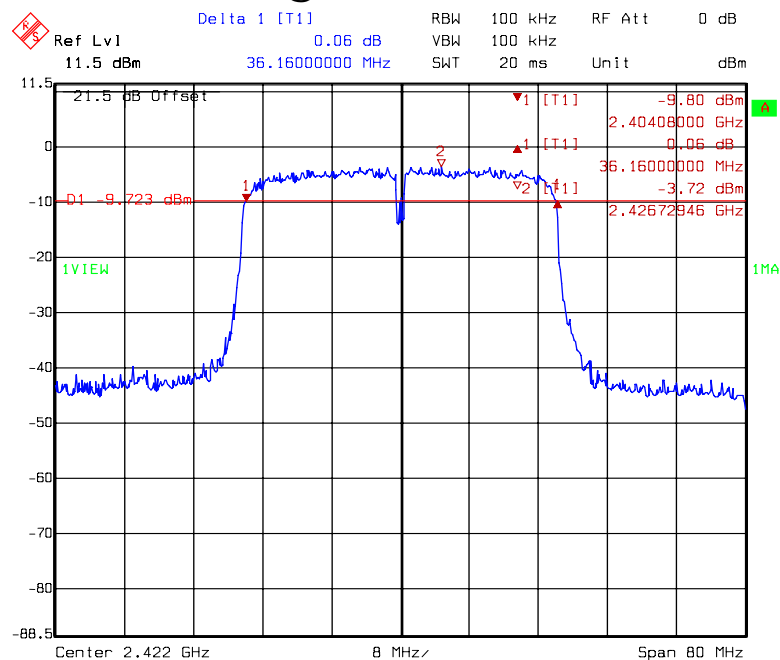


## 6 dB Bandwidth @ 802.11n HT20 mode channel 11



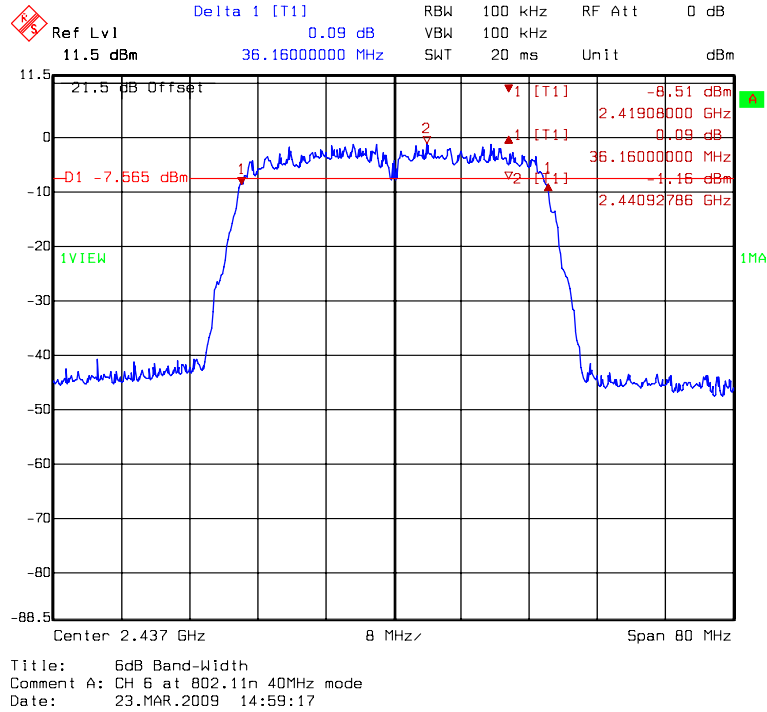
Title: 6dB Band-Width  
Comment A: CH 11 at 802.11n 20MHz mode  
Date: 23.MAR.2009 14:48:33

## 6 dB Bandwidth @ 802.11n HT40 mode channel 3

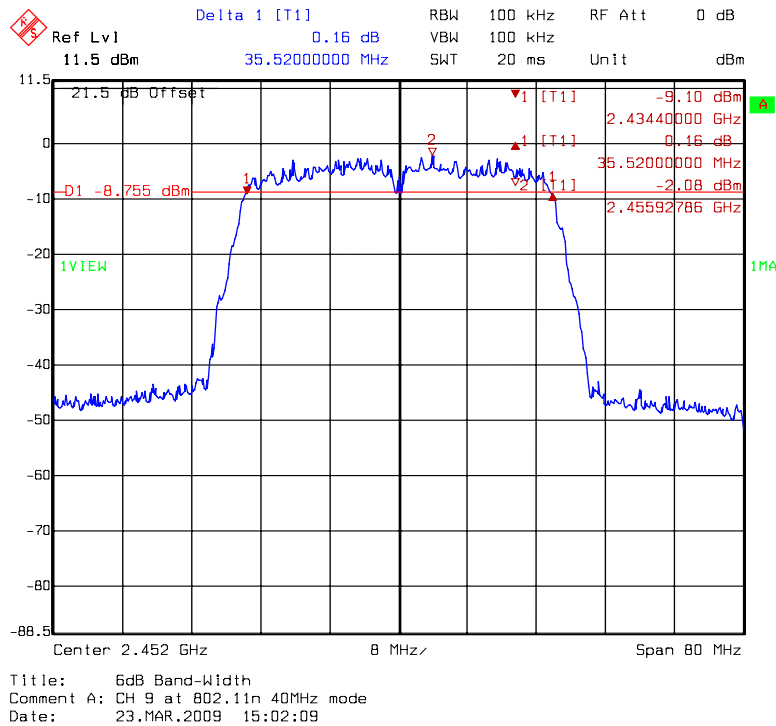


Title: 6dB Band-Width  
Comment A: CH 3 at 802.11n 40MHz mode  
Date: 23.MAR.2009 14:56:07

### 6 dB Bandwidth @ 802.11n HT40 mode channel 6



### 6 dB Bandwidth @ 802.11n HT40 mode channel 9



#### 4. 99 % Occupied Bandwidth

<b>Name of Test</b>	99 % Occupied Bandwidth
<b>Base Standard</b>	None; for reporting purposes only

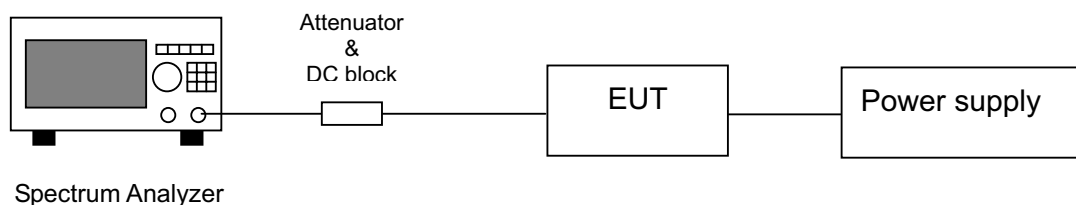
**Test Result:** Complies  
**Measurement Data:** See Table & plots below

#### Method of Measurement:

#### Reference FCC document: KDB558074

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1 % of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform. The appropriate bandwidth mask is applied to the output waveform to verify compliance.

#### Test Diagram:

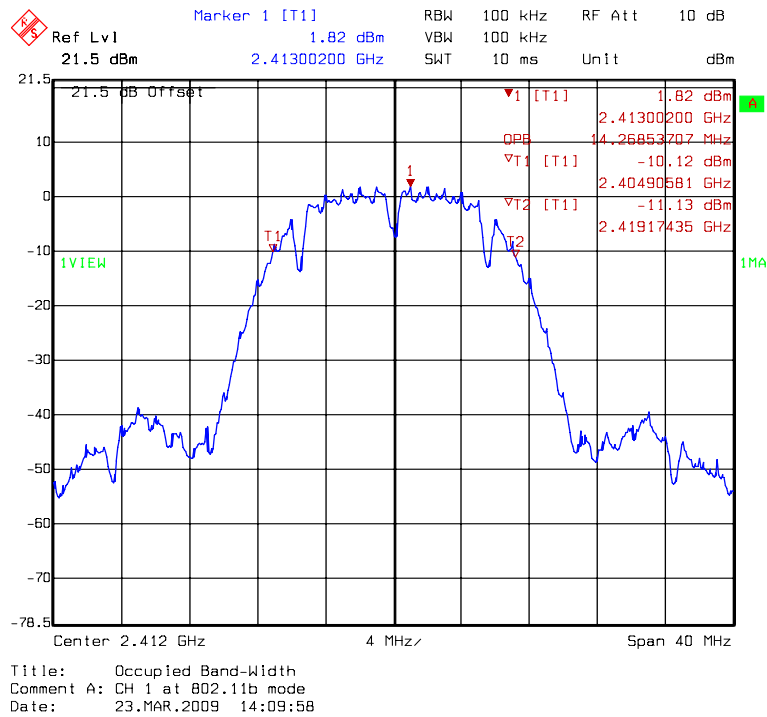


**Note:** The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

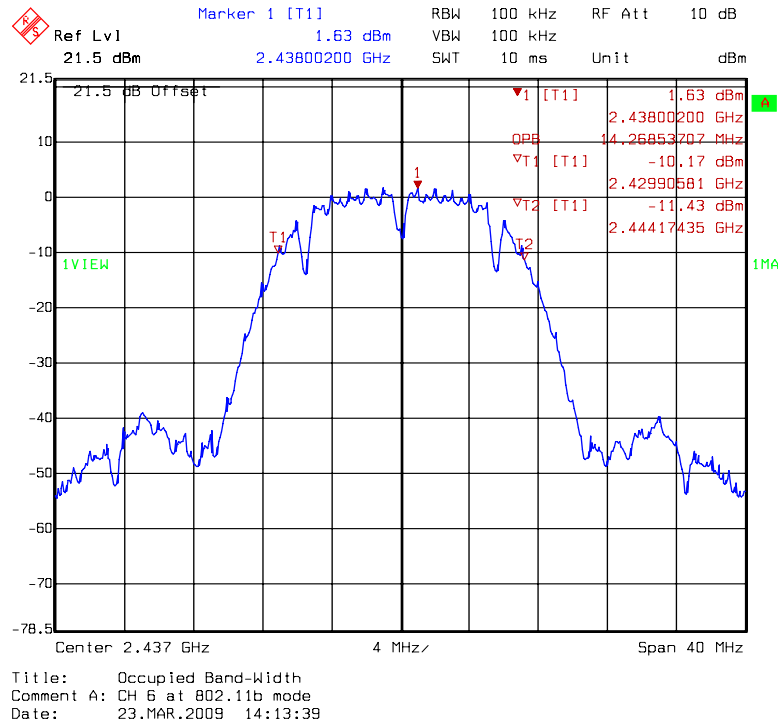
Table 2. 99 % Occupied Bandwidth

Mode	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
802.11b	1	2412	14.27
	6	2437	14.27
	11	2462	14.35
802.11g	1	2412	17.15
	6	2437	16.35
	11	2462	17.07
802.11n (HT20)	1	2412	17.47
	6	2437	17.47
	11	2462	17.47
802.11n (HT40)	3	2422	35.75
	6	2437	36.23
	9	2452	36.23

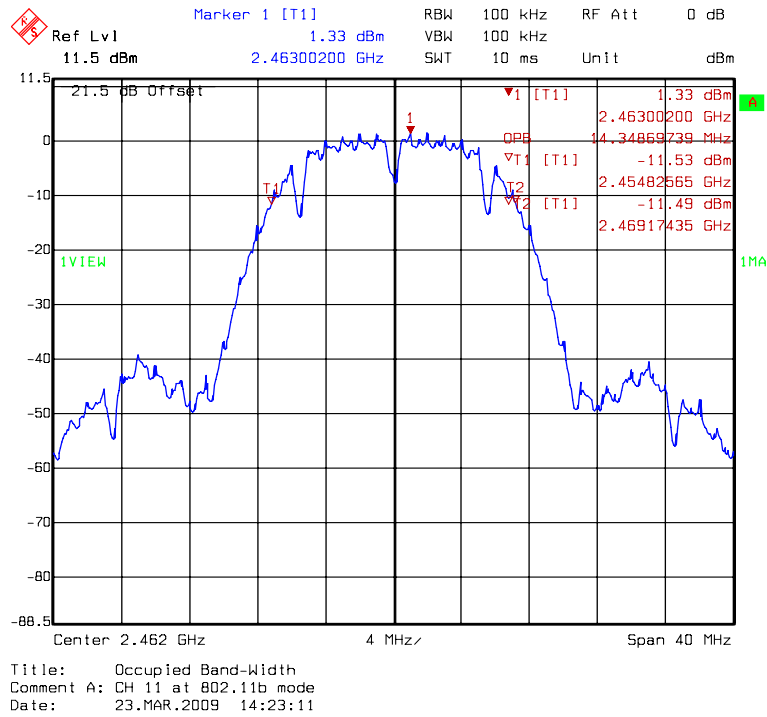
### 99 % Occupied Bandwidth @ 802.11b mode channel 1



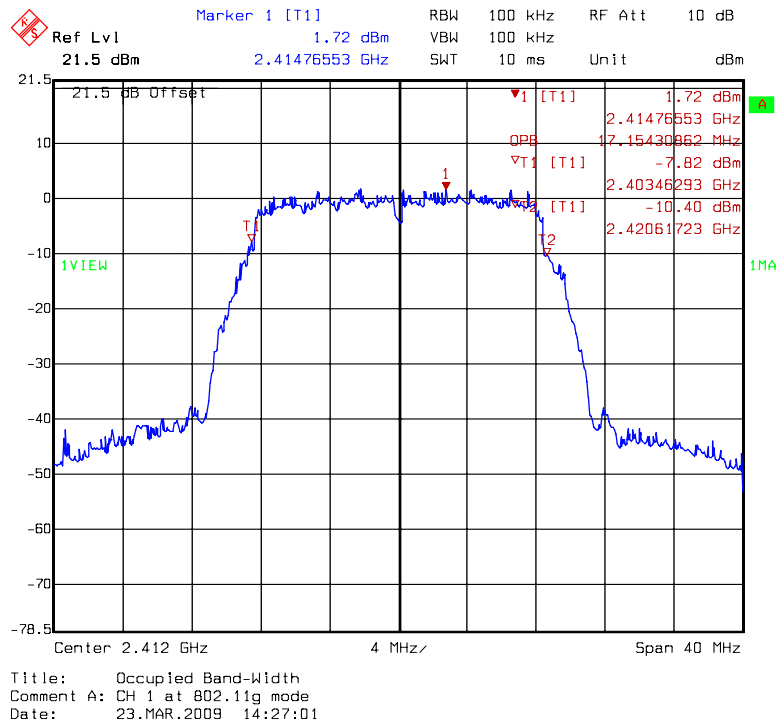
### 99 % Occupied Bandwidth @ 802.11b mode channel 6



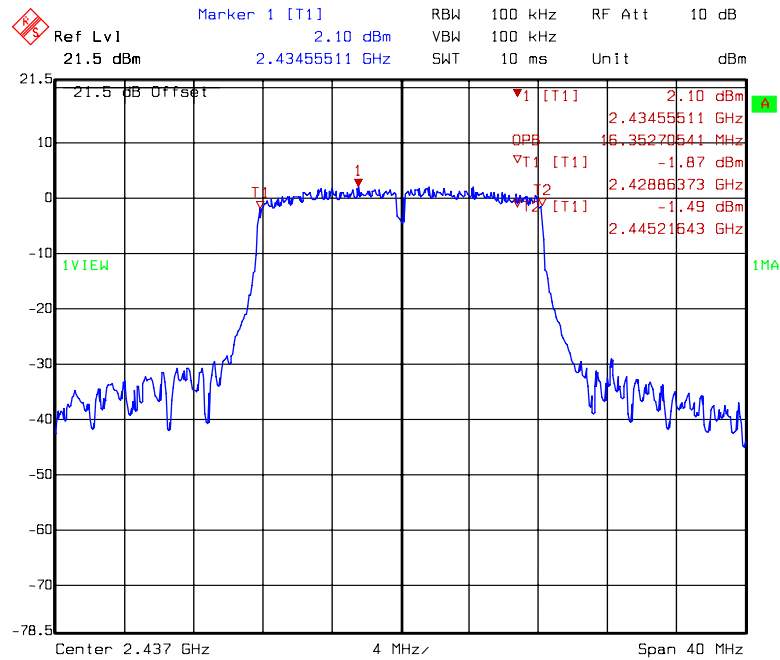
### 99 % Occupied Bandwidth @ 802.11b mode channel 11



### 99 % Occupied Bandwidth @ 802.11g mode channel 1

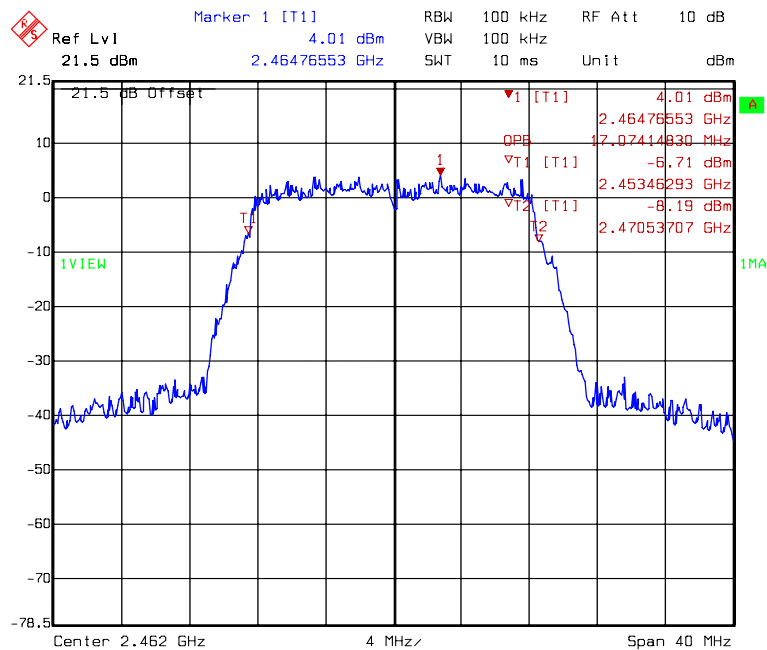


### 99 % Occupied Bandwidth @ 802.11g mode channel 6



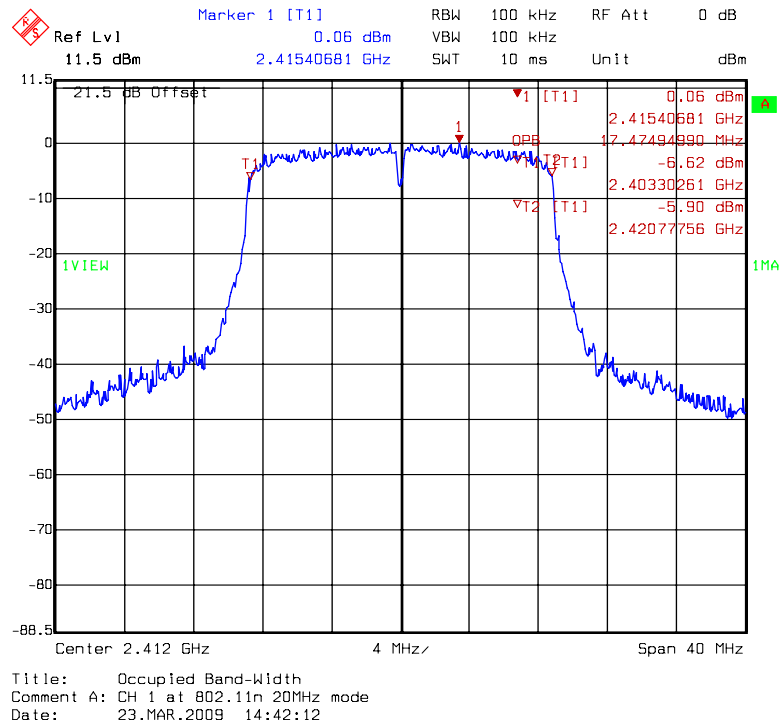
Title: Occupied Band-Width  
Comment A: CH 6 at 802.11g mode  
Date: 23.MAR.2009 14:33:02

### 99 % Occupied Bandwidth @ 802.11g mode channel 11

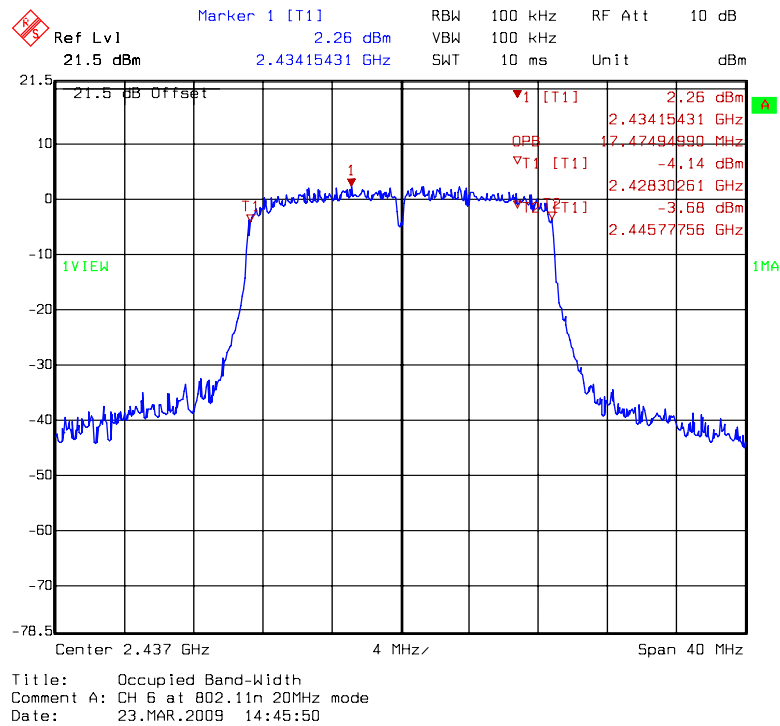


Title: Occupied Band-Width  
Comment A: CH 11 at 802.11g mode  
Date: 23.MAR.2009 14:36:26

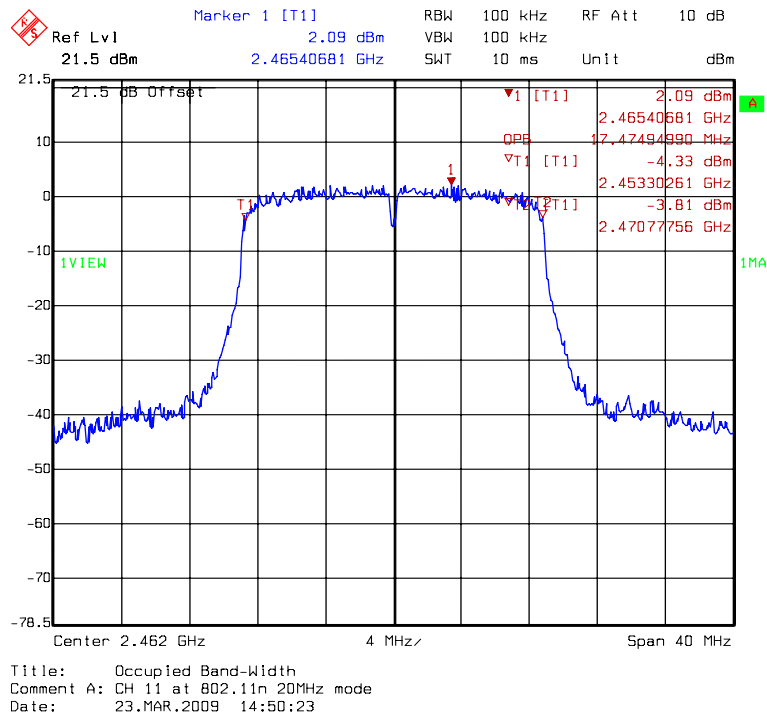
### 99 % Occupied Bandwidth @ 802.11n HT20 mode channel 1



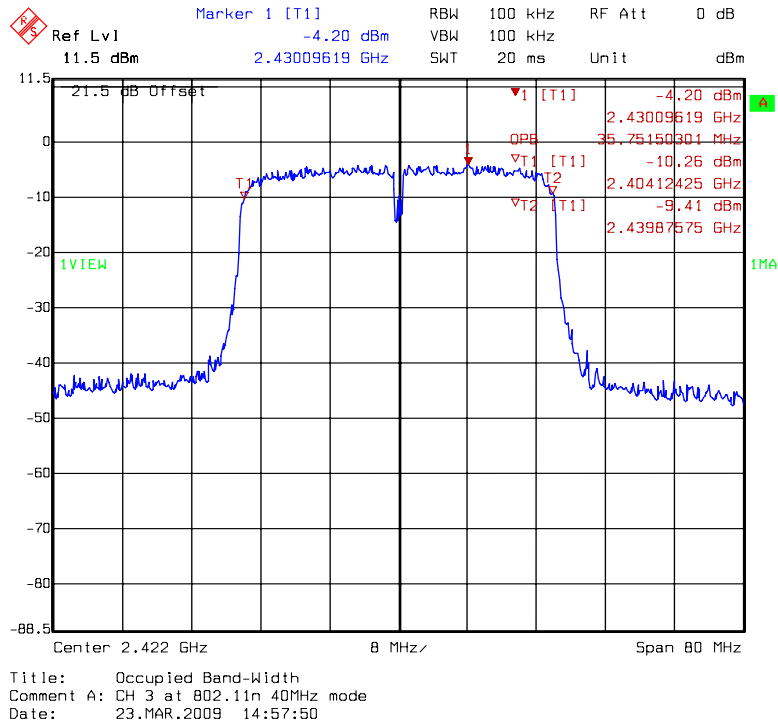
### 99 % Occupied Bandwidth @ 802.11n HT20 mode channel 6



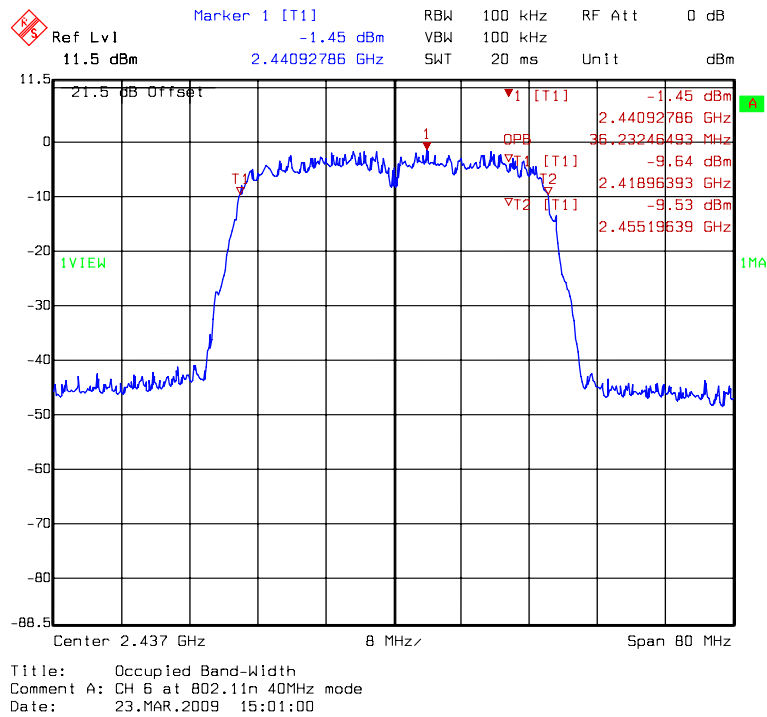
### 99 % Occupied Bandwidth @ 802.11n HT20 mode channel 11



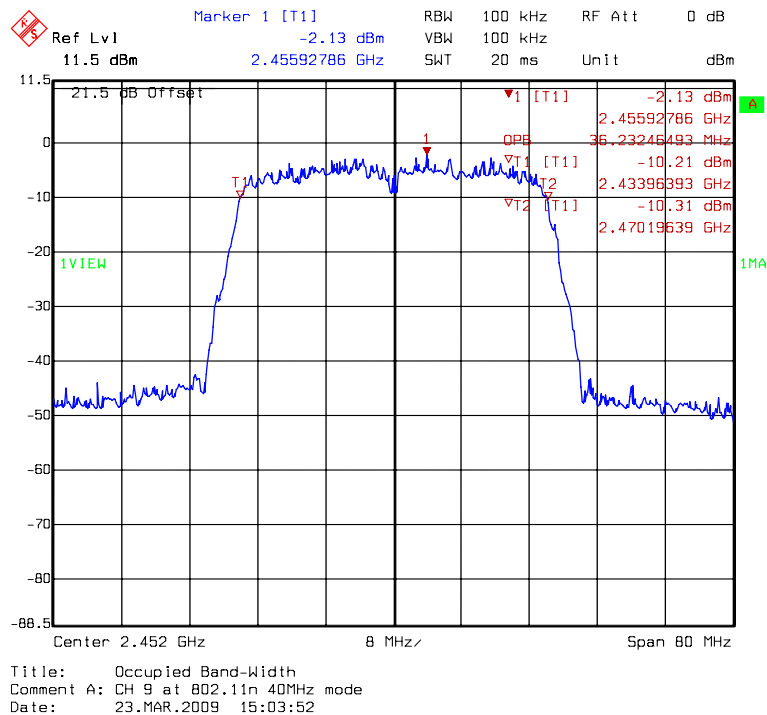
### 99 % Occupied Bandwidth @ 802.11n HT40 mode channel 3



### 99 % Occupied Bandwidth @ 802.11n HT40 mode channel 6



### 99 % Occupied Bandwidth @ 802.11n HT40 mode channel 9



## 5. Maximum Output Power

<b>Name of Test</b>	Maximum output power
<b>Base Standard</b>	FCC 15.247(b)

**Measurement Uncertainty:**  $\pm 2\text{dB}$  (k=2)  
**Test Result:** Complies  
**Measurement Data:** See Table below

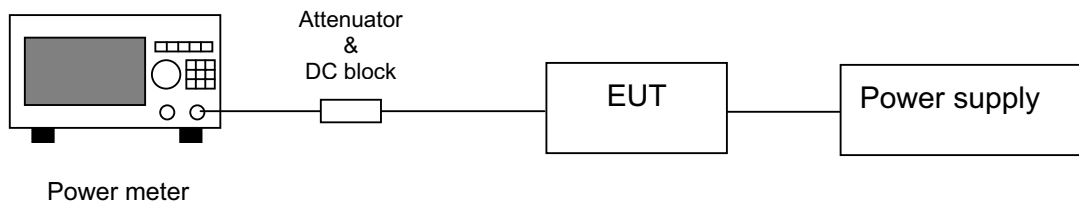
### Method of Measurement:

#### Reference FCC document: KDB558074

The peak power at antenna terminals is measured using a Wideband Peak Power Meter which the video bandwidth can be up to 65MHz. Power output is measured with the maximum rated input level.

Note: 1. The above equipments are within the valid calibration period.

### Test Diagram:



**Note 1:** The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

**Note 2:** §15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Table 3. Maximum output power

**For Antenna 1**

Mode	Channel	Frequency (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
					(dBm)	(mW)	
802.11b	1	2412	2	15.96	17.96	62.52	1
	6	2437	2	16.01	18.01	63.24	1
	11	2462	2	15.94	17.94	62.23	1
802.11g	1	2412	2	23.57	25.57	360.58	1
	6	2437	2	23.91	25.91	389.94	1
	11	2462	2	23.97	25.97	395.37	1
802.11n HT20	1	2412	2	23.45	25.45	350.75	1
	6	2437	2	23.83	25.83	382.82	1
	11	2462	2	23.85	25.85	384.59	1
802.11n HT40	3	2422	2	21.69	23.69	233.88	1
	6	2437	2	21.59	23.59	228.56	1
	9	2452	2	20.42	22.42	174.58	1

**For Antenna 2**

Mode	Channel	Frequency (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
					(dBm)	(mW)	
802.11b	1	2412	2	14.40	16.40	43.65	1
	6	2437	2	15.08	17.08	51.05	1
	11	2462	2	14.72	16.72	46.99	1
802.11g	1	2412	2	18.79	20.79	119.95	1
	6	2437	2	18.75	20.75	118.85	1
	11	2462	2	17.82	19.82	95.94	1
802.11n HT20	1	2412	2	19.35	21.35	136.46	1
	6	2437	2	18.85	20.85	121.62	1
	11	2462	2	17.45	19.45	88.10	1
802.11n HT40	3	2422	2	16.56	18.56	71.78	1
	6	2437	2	16.50	18.50	70.79	1
	9	2452	2	15.03	17.03	50.47	1

## 6. Power Spectral Density

<b>Name of Test</b>	Power Spectral Density
<b>Base Standard</b>	FCC 15.247(e)

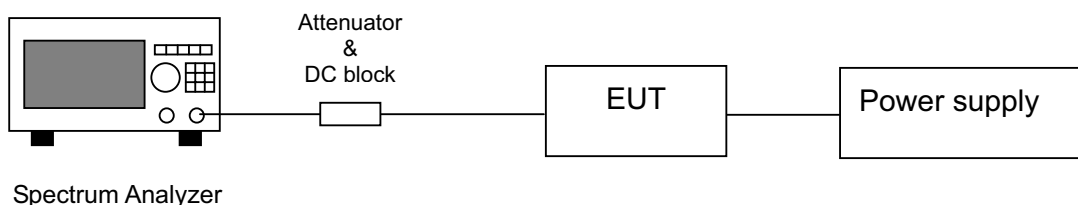
**Test Result:** Complies  
**Measurement Data:** See Table & plots below

### Method of Measurement:

#### Reference FCC document: KDB558074

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1 % of the bandwidth of the transmitted signal. The resolution bandwidth is chosen so as not to reduce the peak level of the measured waveform. The appropriate bandwidth mask is applied to the output waveform to verify compliance.

### Test Diagram:

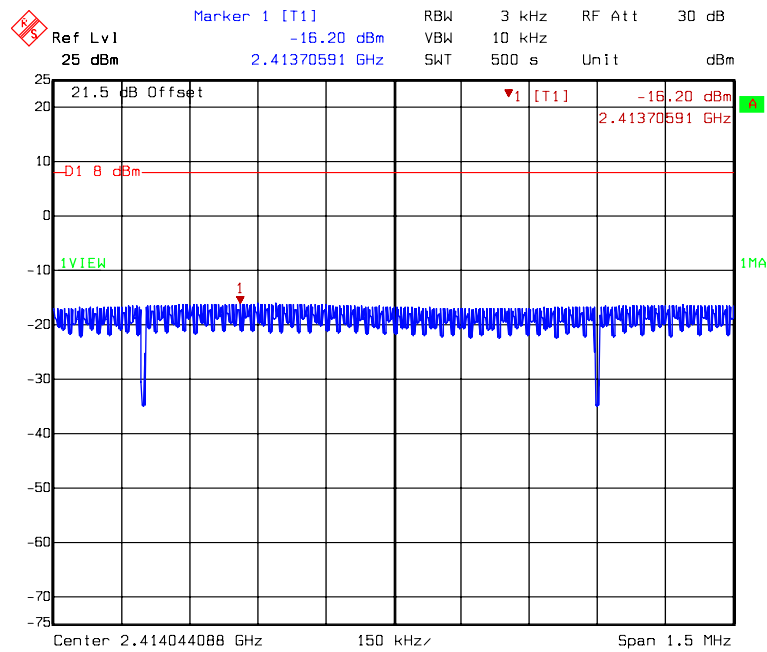


**Note:** The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

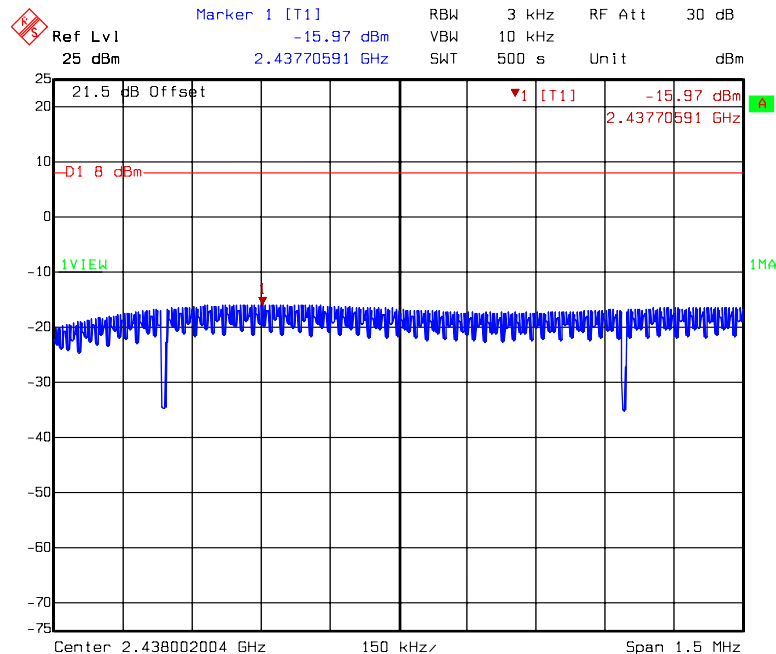
Table 4. Power Spectral Density

Mode	Channel	Frequency (MHz)	Power spectrum density (dBm)	Limit (dBm)
802.11b	1	2412	-16.20	8
	6	2437	-15.97	8
	11	2462	-16.25	8
802.11g	1	2412	-13.70	8
	6	2437	-12.15	8
	11	2462	-10.37	8
802.11n HT20	1	2412	-12.77	8
	6	2437	-10.55	8
	11	2462	-11.29	8
802.11n HT40	3	2422	-15.13	8
	6	2437	-15.94	8
	9	2452	-16.19	8

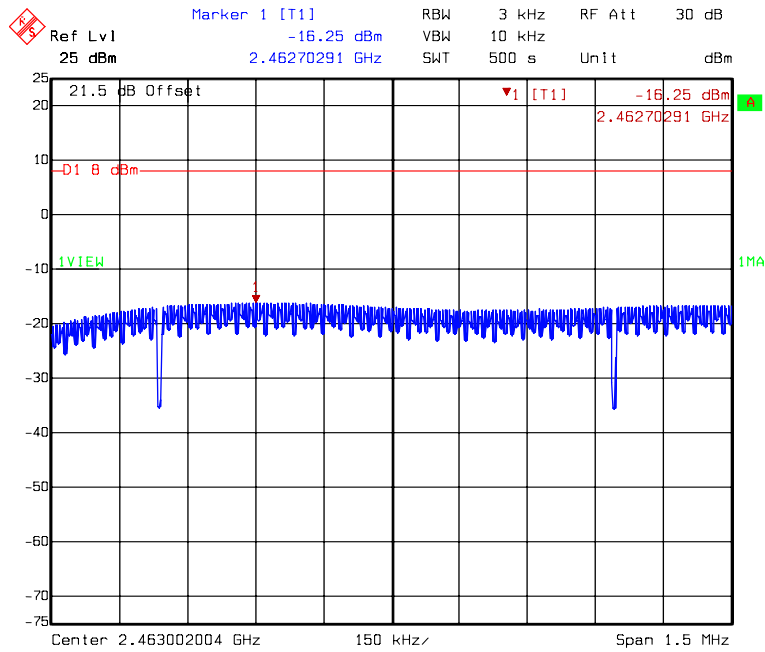
### Power Spectral Density @ 802.11b mode channel 1



### Power Spectral Density @ 802.11b mode channel 6

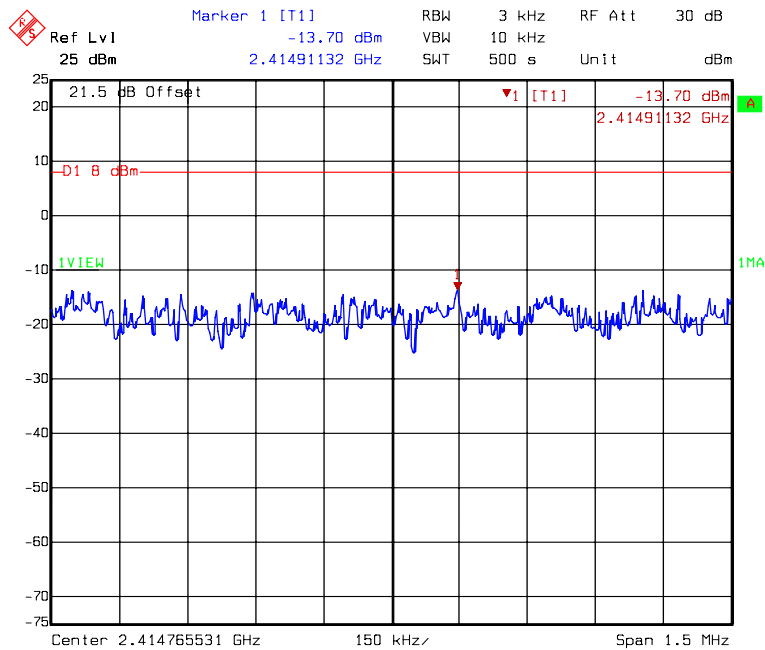


### Power Spectral Density @ 802.11b mode channel 11



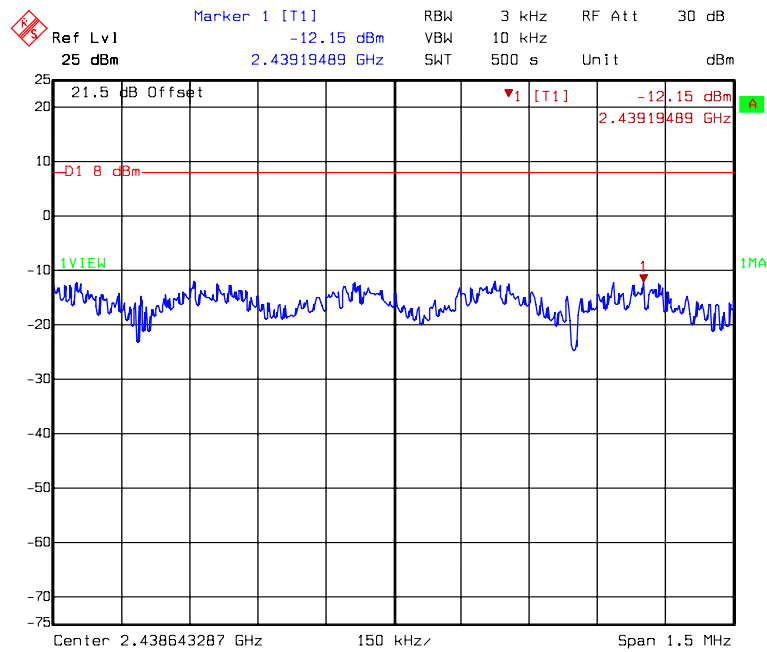
Title: Power density  
 Comment A: CH 11 at 802.11b mode  
 Date: 23.MAR.2009 14:15:15

### Power Spectral Density @ 802.11g mode channel 1



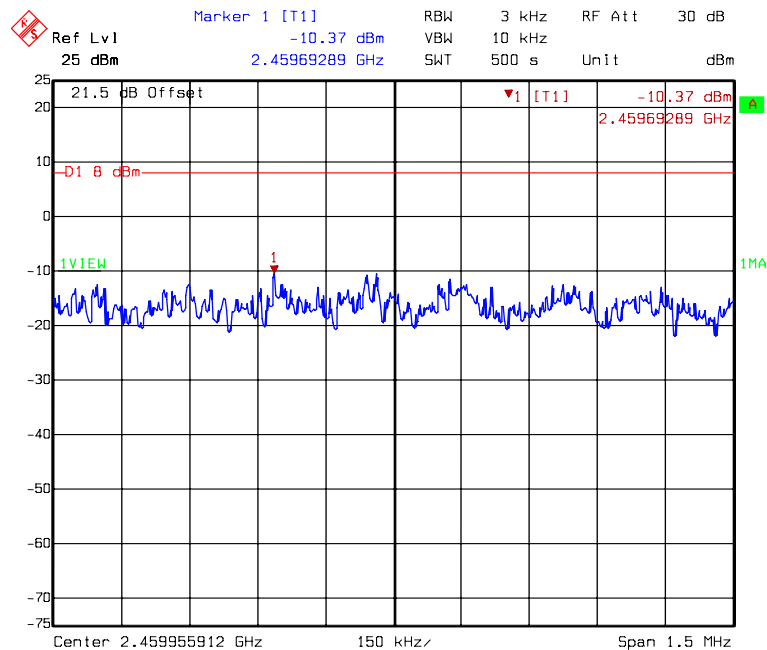
Title: Power density  
 Comment A: CH 1 at 802.11g mode  
 Date: 23.MAR.2009 14:25:27

### Power Spectral Density @ 802.11g mode channel 6



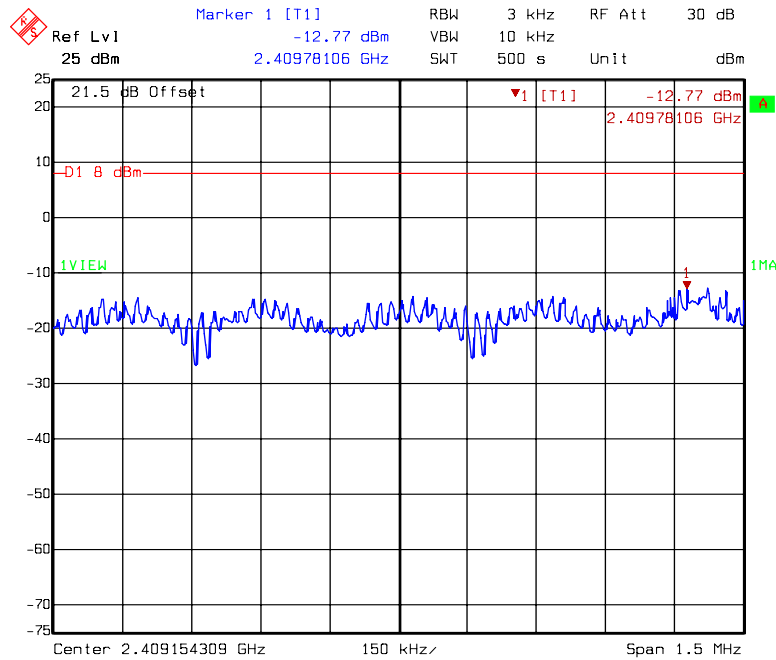
Title: Power density  
Comment A: CH 6 at 802.11g mode  
Date: 23.MAR.2009 14:31:28

### Power Spectral Density @ 802.11g mode channel 11



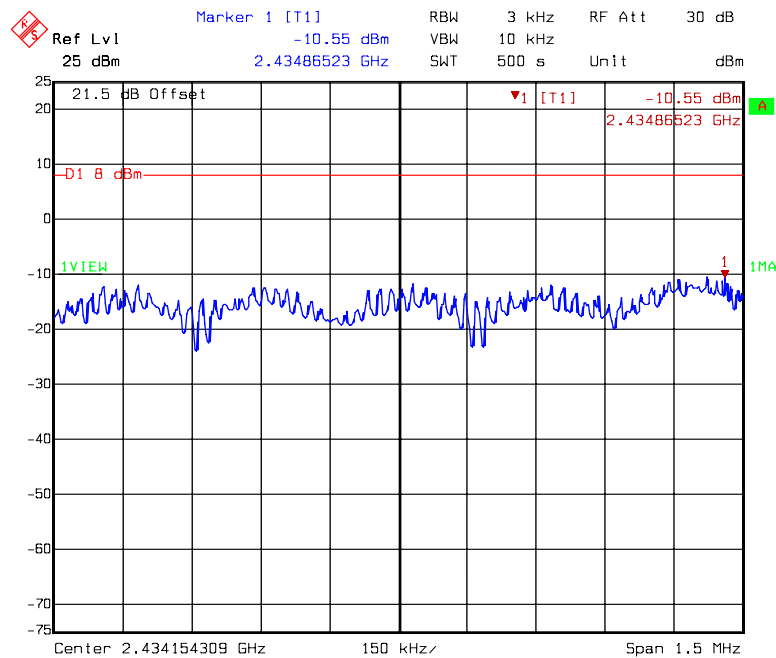
Title: Power density  
Comment A: CH 11 at 802.11g mode  
Date: 23.MAR.2009 14:34:52

### Power Spectral Density @ 802.11n HT20 mode channel 1



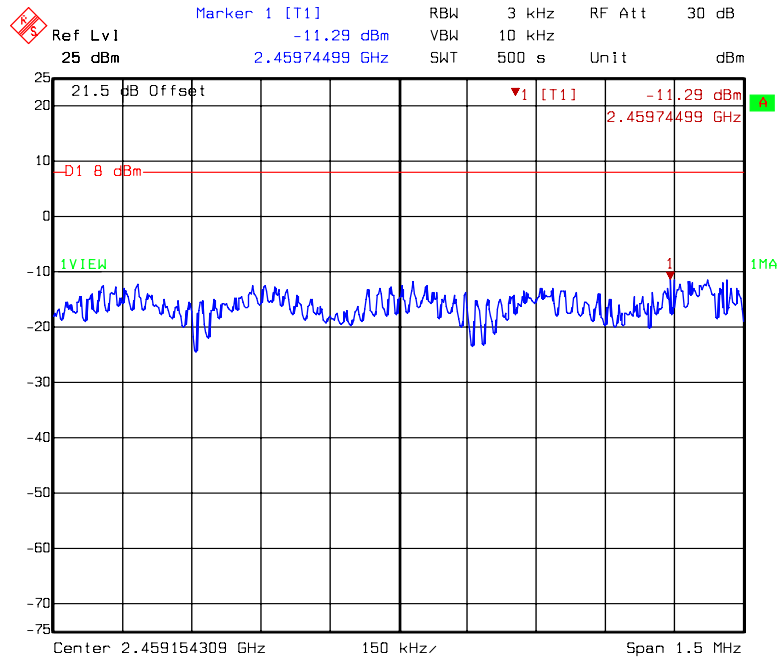
Title: Power density  
Comment A: CH 1 at 802.11n 20MHz mode  
Date: 23.MAR.2009 14:40:44

### Power Spectral Density @ 802.11n HT20 mode channel 6



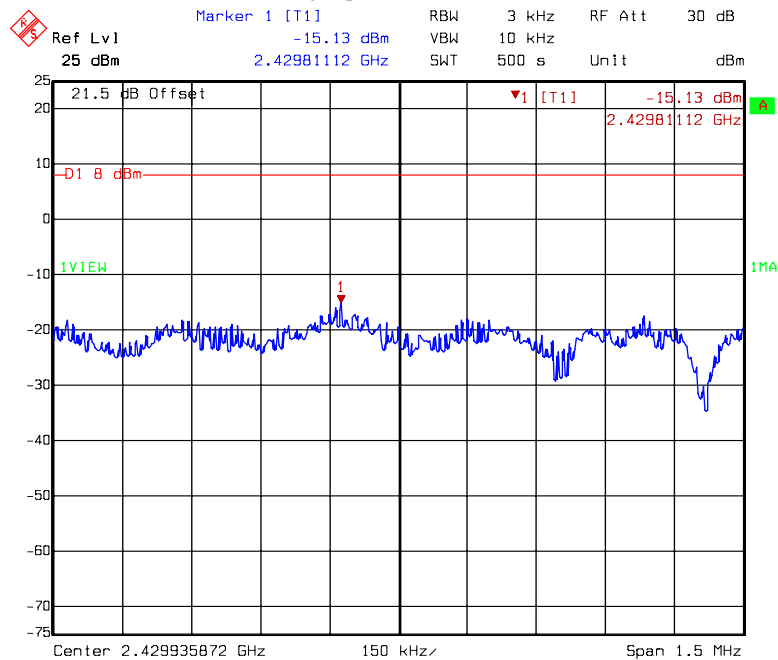
Title: Power density  
Comment A: CH 6 at 802.11n 20MHz mode  
Date: 23.MAR.2009 14:44:17

### Power Spectral Density @ 802.11n HT20 mode channel 11



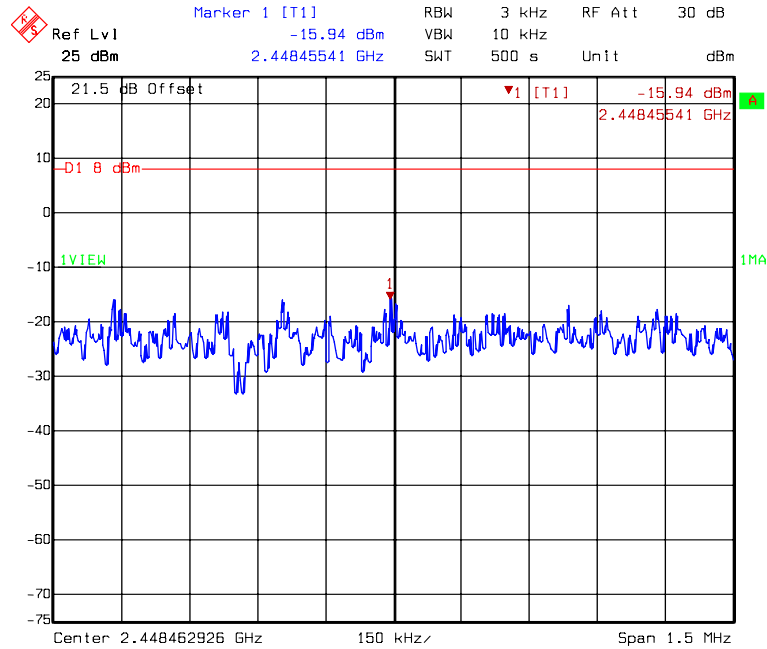
Title: Power density  
Comment A: CH 11 at 802.11n 20MHz mode  
Date: 23.MAR.2009 14:48:49

### Power Spectral Density @ 802.11n HT40 mode channel 3

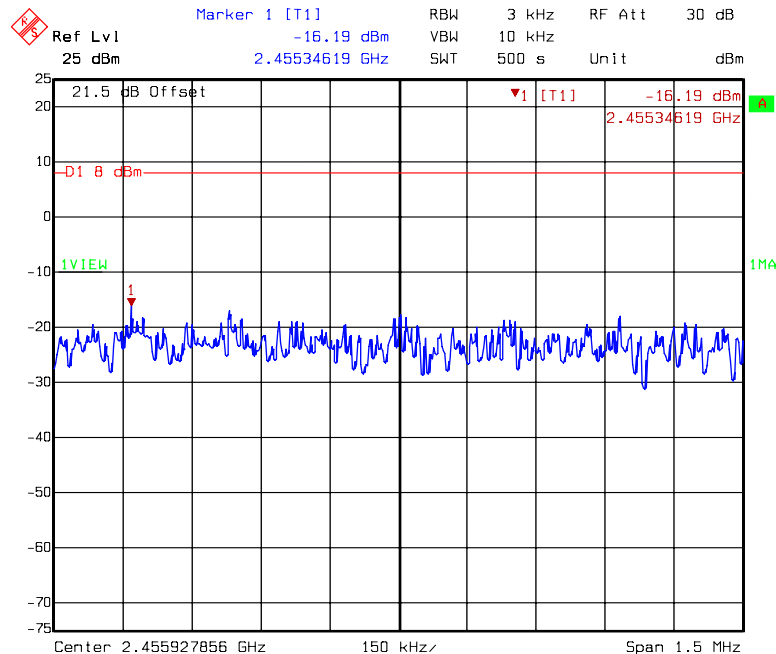


Title: Power density  
Comment A: CH 3 at 802.11n 40MHz mode  
Date: 23.MAR.2009 14:56:23

### Power Spectral Density @ 802.11n HT40 mode channel 6



### Power Spectral Density @ 802.11n HT40 mode channel 9



## 7. RF Antenna conducted Spurious

<b>Name of Test</b>	RF Antenna Conducted Spurious
<b>Base Standard</b>	FCC 15.247(d)

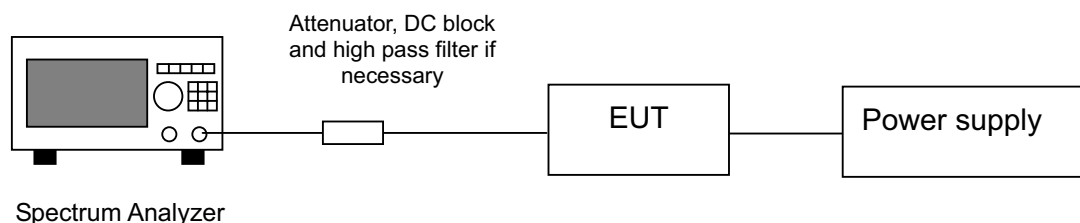
**Test Result:** Complies  
**Measurement Data:** See plots below

### Method of Measurement:

#### Reference FCC document: KDB558074

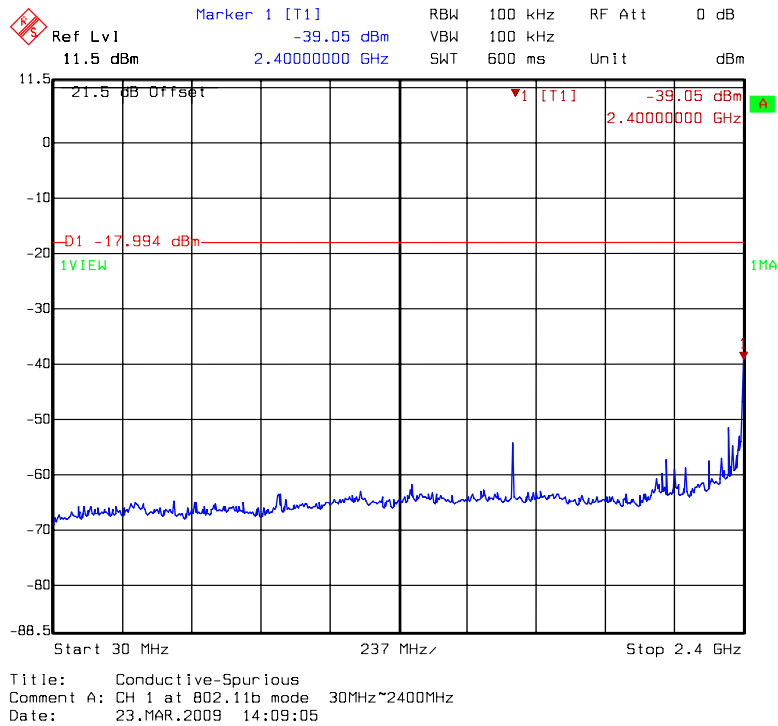
The measurements were performed from 30 MHz to 25 GHz RF antenna conducted per FCC 15.247 (d) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. Harmonics and spurious noise must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

### Test Diagram:

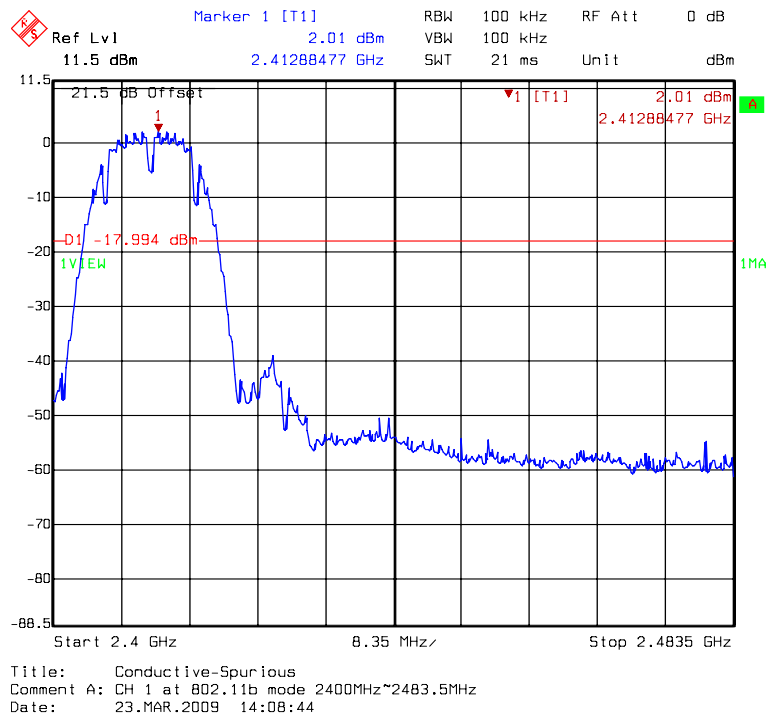


- Note:**
- (1) The EUT was tested while in a continuous transmit mode and the worst case data rates are 1Mbps for 802.11b and 6Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.
  - (2) The EUT operating at 2.4 GHz ISM band. Frequency Range scanned from 30 MHz to 25 GHz.

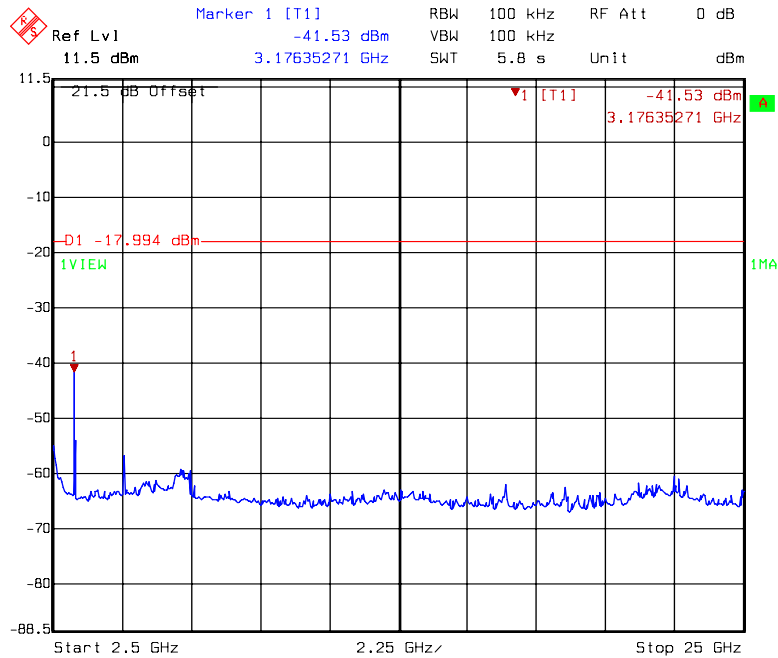
conducted spurious @ 802.11b mode channel 1 (1 of 3)



conducted spurious @ 802.11b mode channel 1 (2 of 3)

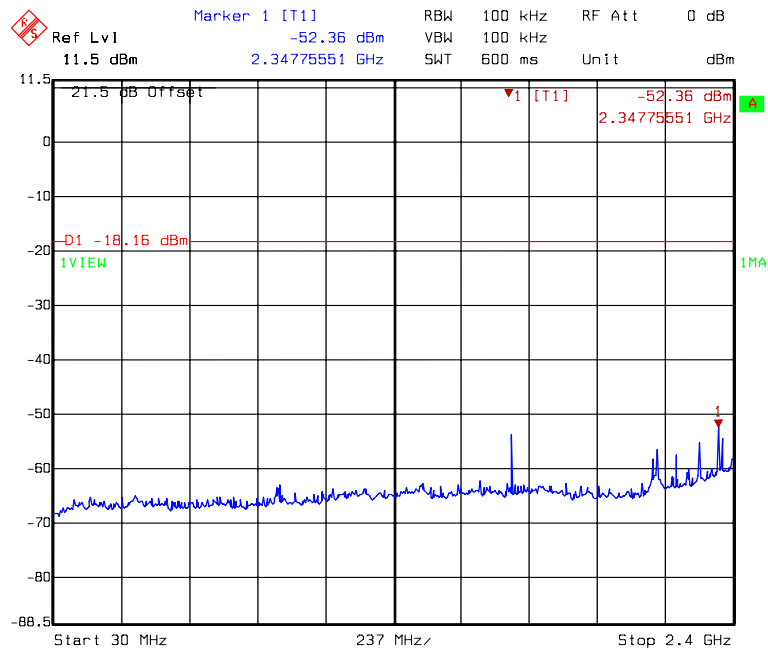


conducted spurious @ 802.11b mode channel 1 (3 of 3)



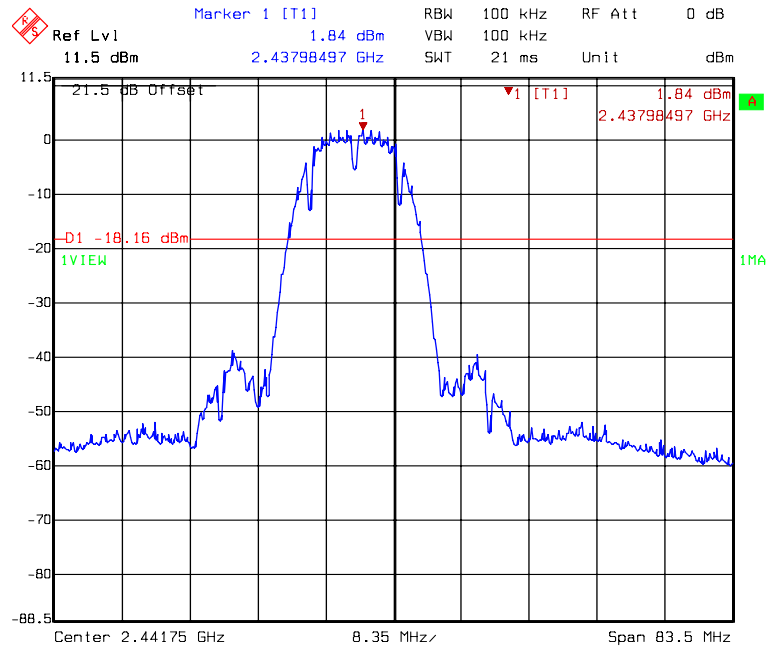
Title: Conductive-Spurious  
Comment A: CH 1 at 802.11b mode 2483.5MHz~25GHz  
Date: 23.MAR.2009 14:09:32

conducted spurious @ 802.11b mode channel 6 (1 of 3)



Title: Conductive-Spurious  
Comment A: CH 6 at 802.11b mode 30MHz~2400MHz  
Date: 23.MAR.2009 14:12:46

conducted spurious @ 802.11b mode channel 6 (2 of 3)



Title: Conductive-Spurious  
Comment A: CH 6 at 802.11b mode 2400MHz~2483.5MHz  
Date: 23.MAR.2009 14:12:25

conducted spurious @ 802.11b mode channel 6 (3 of 3)



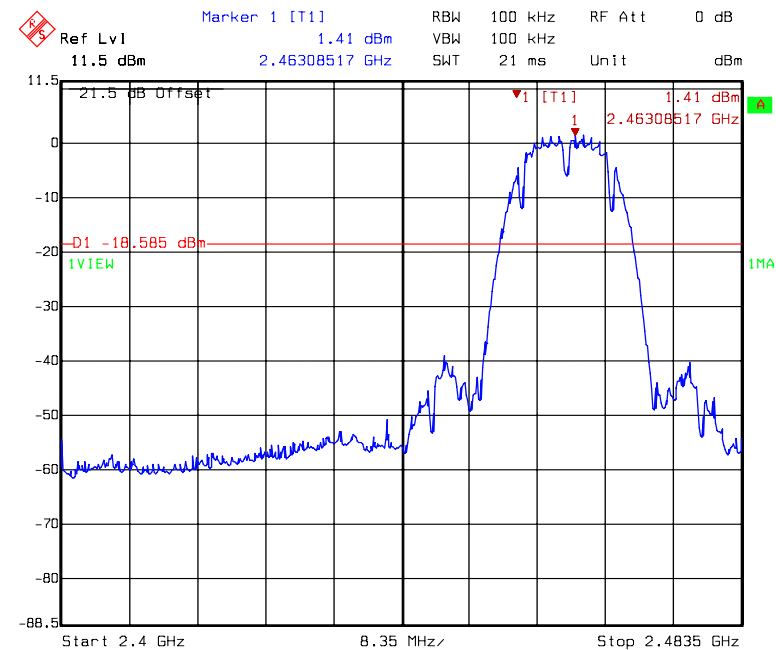
Title: Conductive-Spurious  
Comment A: CH 6 at 802.11b mode 2483.5MHz~25GHz  
Date: 23.MAR.2009 14:13:13

conducted spurious @ 802.11b mode channel 11 (1 of 3)



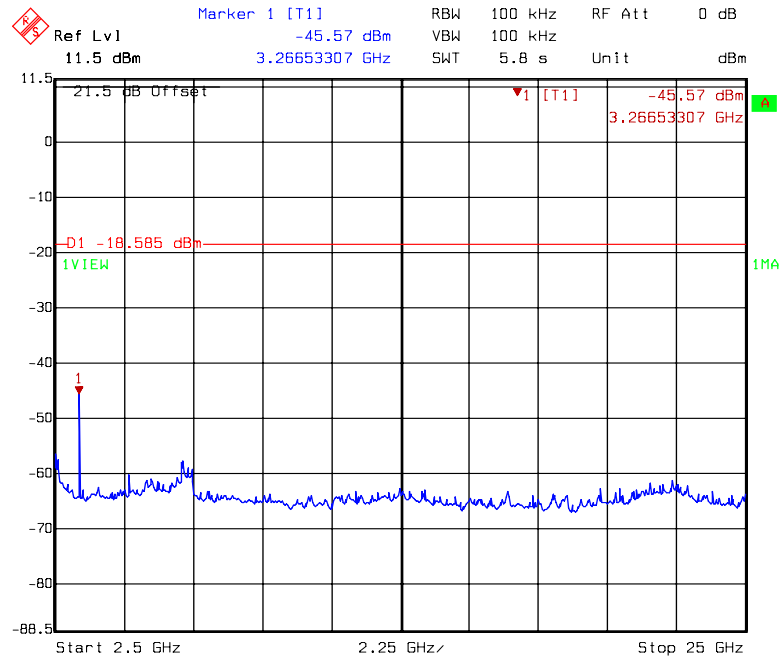
Title: Conductive-Spurious  
Comment A: CH 11 at 802.11b mode 30MHz~2400MHz  
Date: 23.MAR.2009 14:22:25

conducted spurious @ 802.11b mode channel 11 (2 of 3)

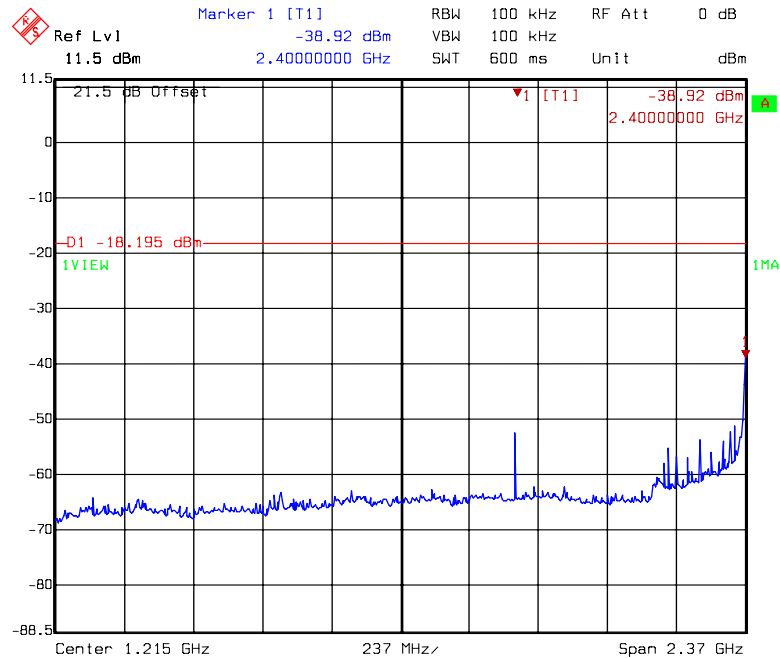


Title: Conductive-Spurious  
Comment A: CH 11 at 802.11b mode 2400MHz~2483.5MHz  
Date: 23.MAR.2009 14:22:03

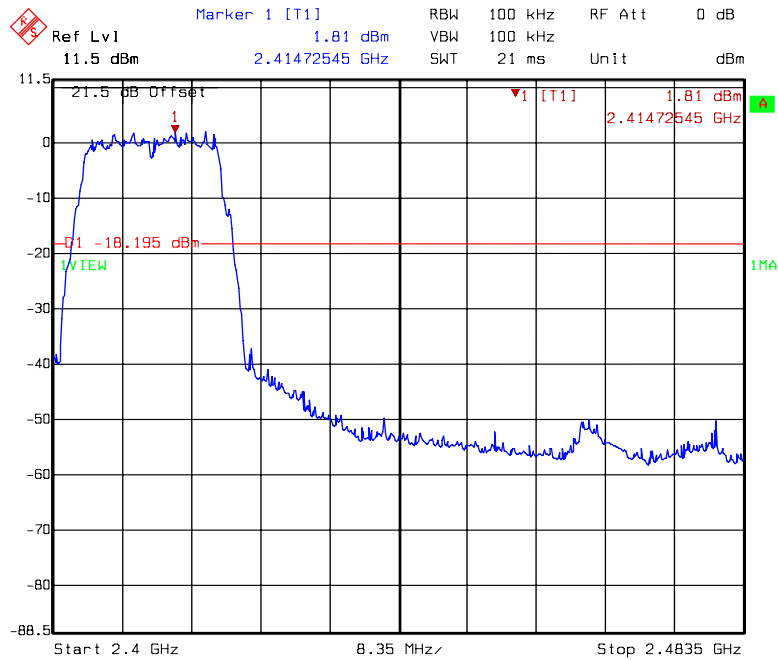
conducted spurious @ 802.11b mode channel 11 (3 of 3)



conducted spurious @ 802.11g mode channel 1 (1 of 3)

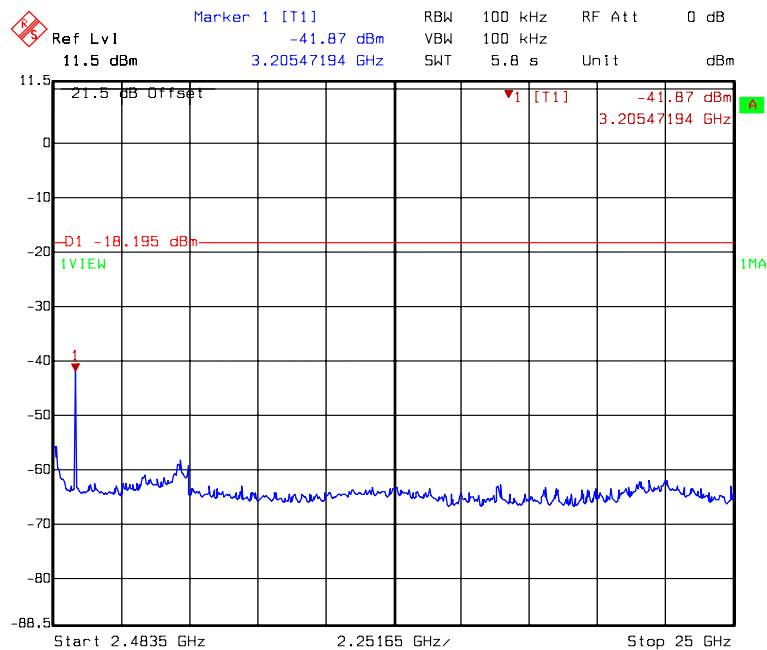


conducted spurious @ 802.11g mode channel 1 (2 of 3)



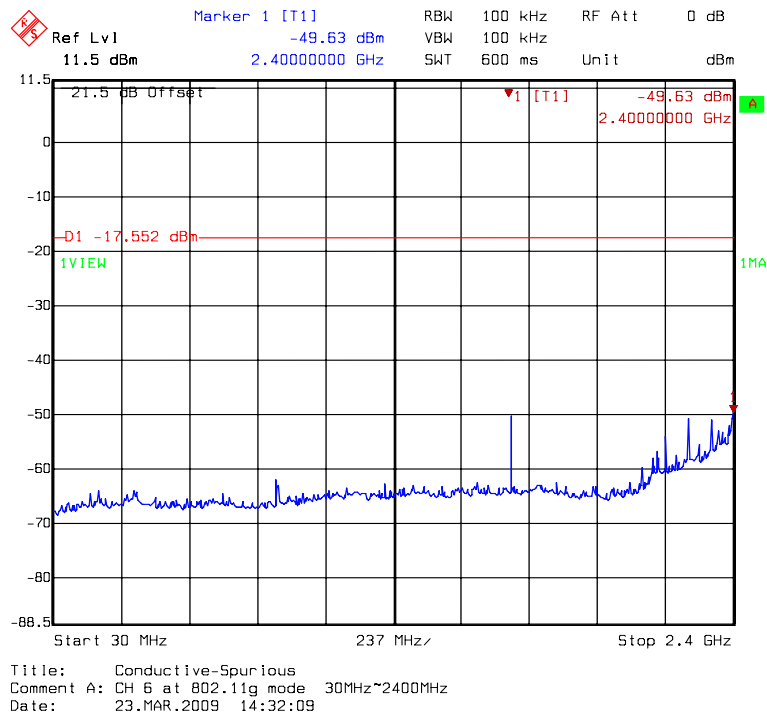
Title: Conductive-Spurious  
Comment A: CH 1 at 802.11g mode 2400MHz~2483.5MHz  
Date: 23.MAR.2009 14:25:47

conducted spurious @ 802.11g mode channel 1 (3 of 3)

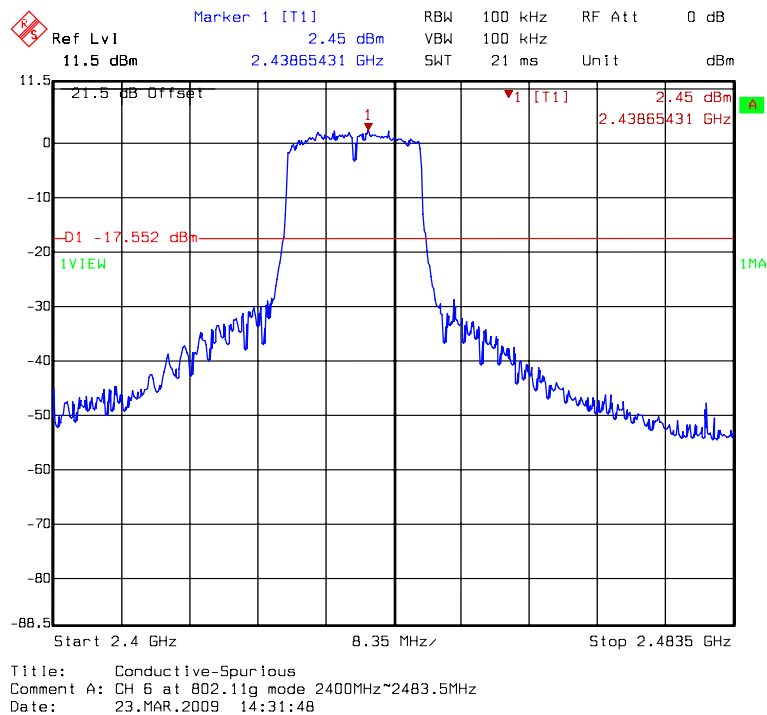


Title: Conductive-Spurious  
Comment A: CH 1 at 802.11g mode 2483.5MHz~25000MHz  
Date: 23.MAR.2009 14:26:35

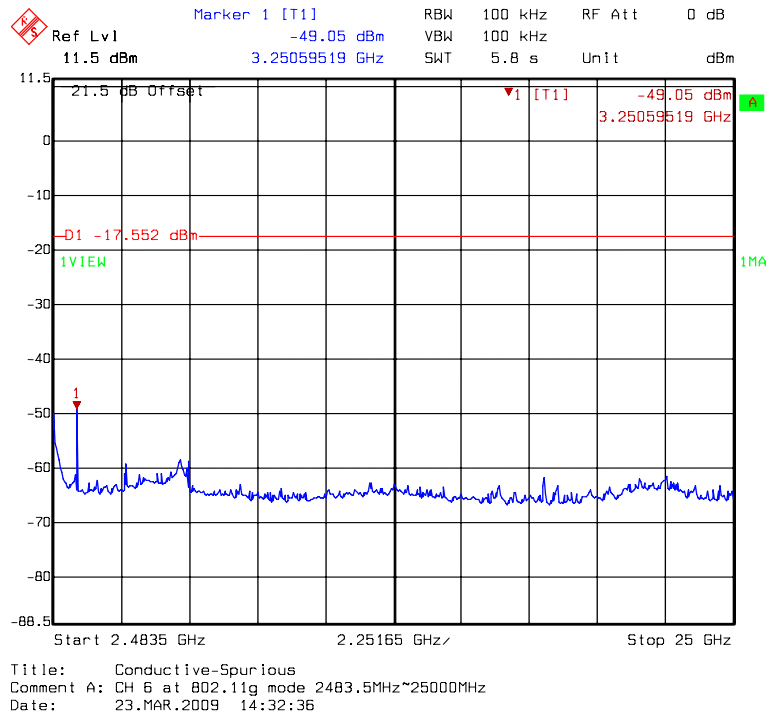
conducted spurious @ 802.11g mode channel 6 (1 of 3)



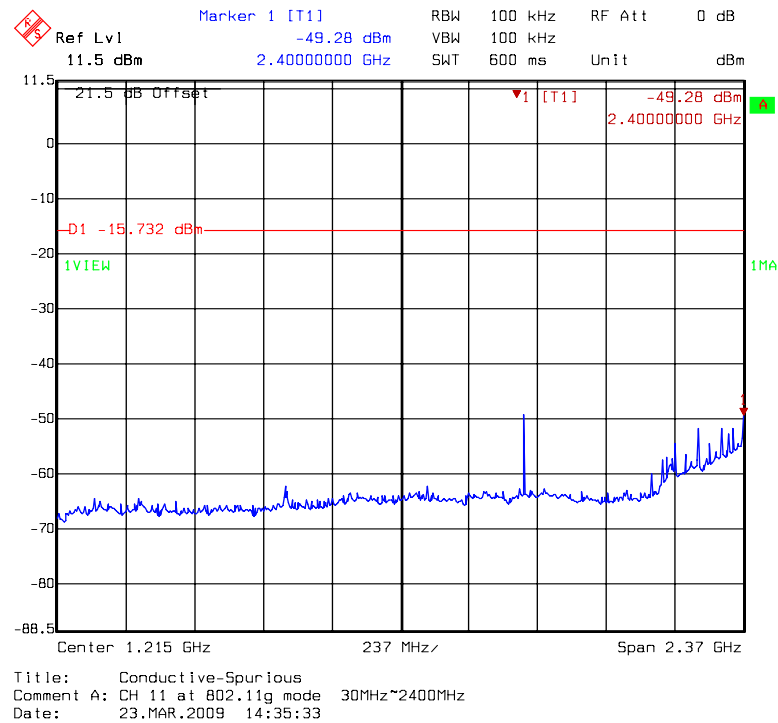
conducted spurious @ 802.11g mode channel 6 (2 of 3)



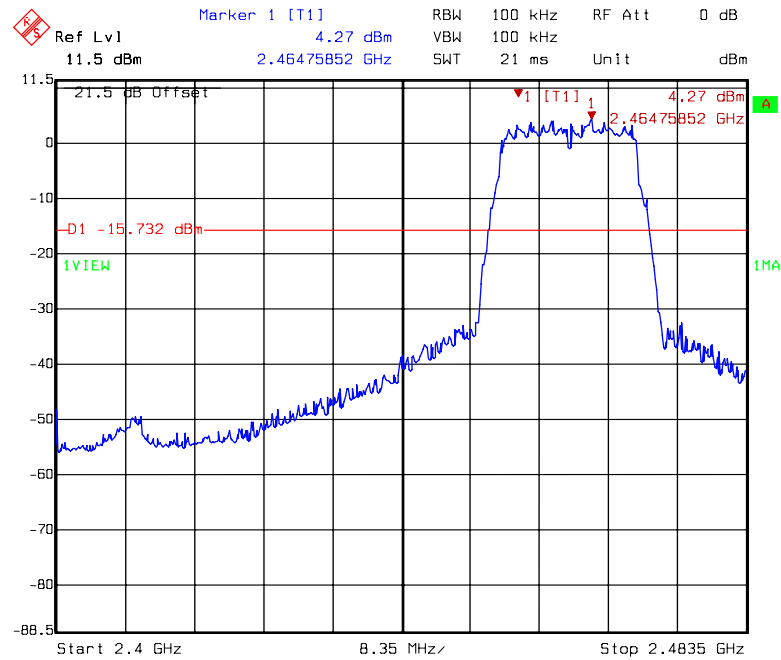
conducted spurious @ 802.11g mode channel 6 (3 of 3)



conducted spurious @ 802.11g mode channel 11 (1 of 3)

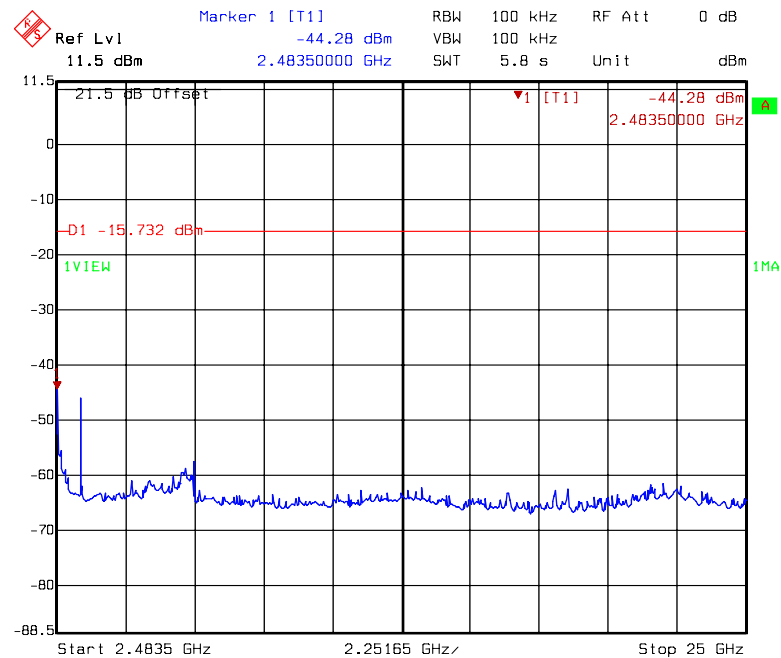


### conducted spurious @ 802.11g mode channel 11 (2 of 3)



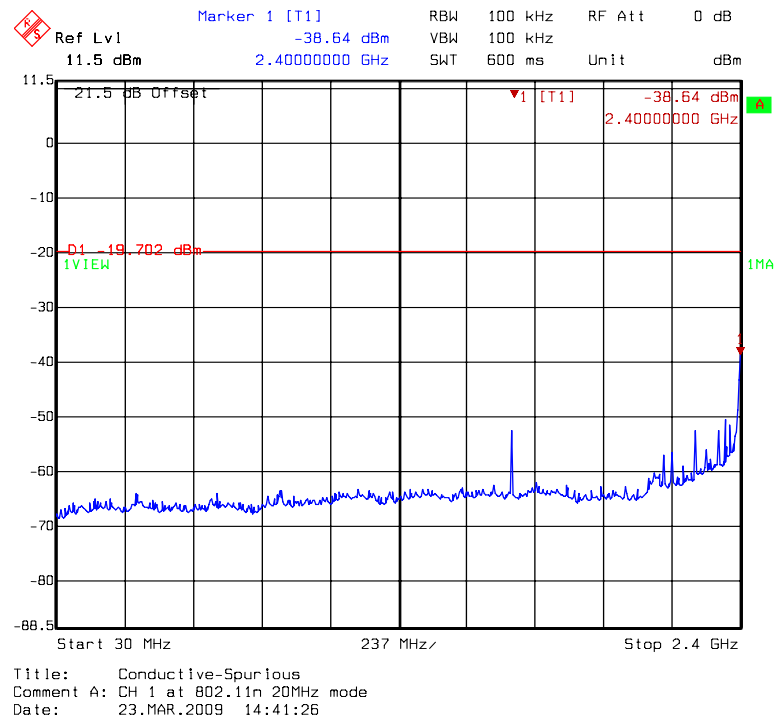
Title: Conductive-Spurious  
Comment A: CH 11 at 802.11g mode 2400MHz~2483.5MHz  
Date: 23.MAR.2009 14:35:12

### conducted spurious @ 802.11g mode channel 11 (3 of 3)

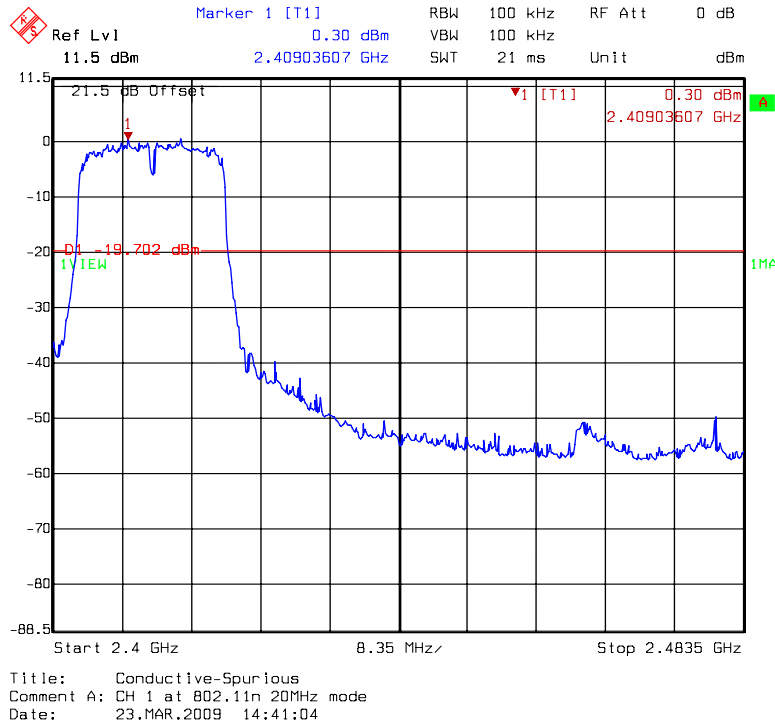


Title: Conductive-Spurious  
Comment A: CH 11 at 802.11g mode 2483.5MHz~25000MHz  
Date: 23.MAR.2009 14:36:00

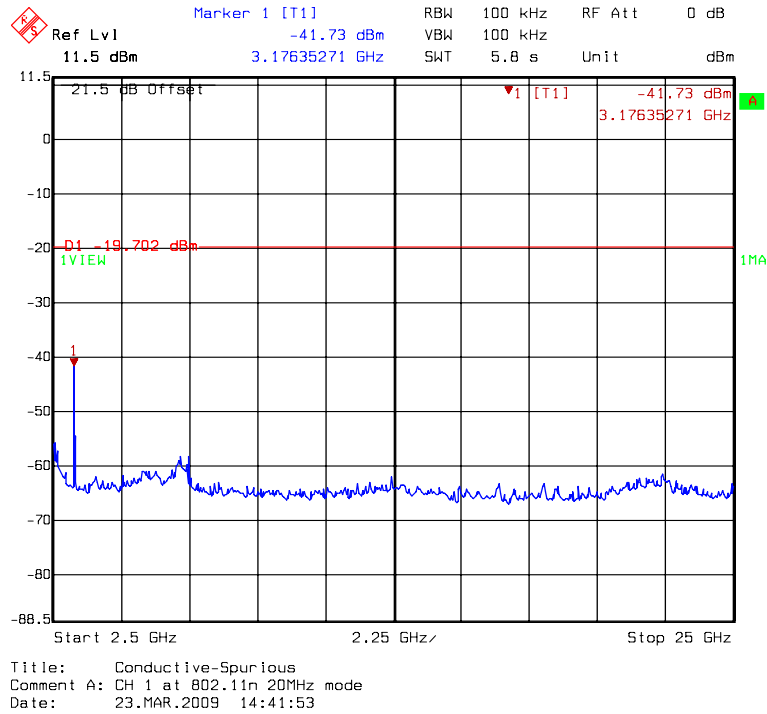
conducted spurious @ 802.11n HT20 mode channel 1 (1 of 3)



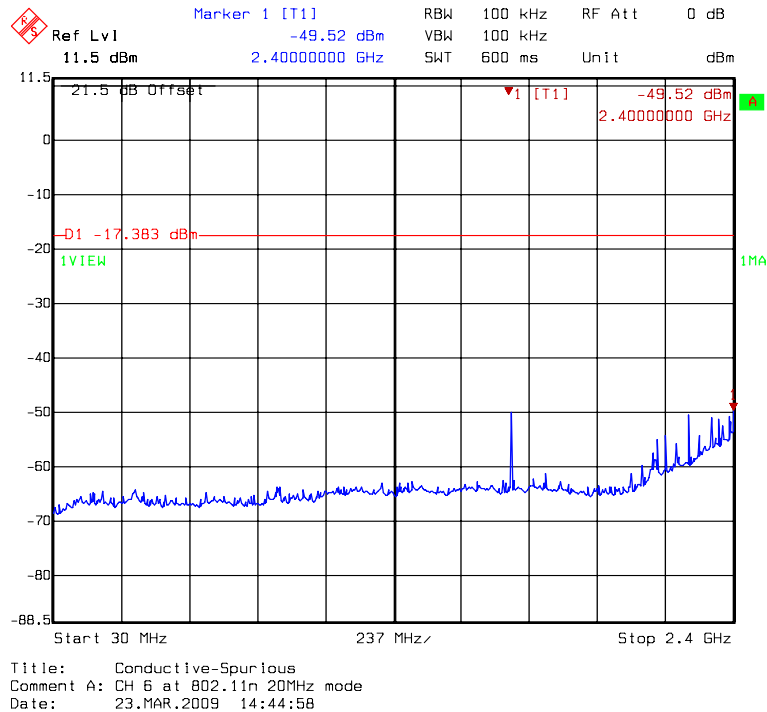
conducted spurious @ 802.11n HT20 mode channel 1 (2 of 3)



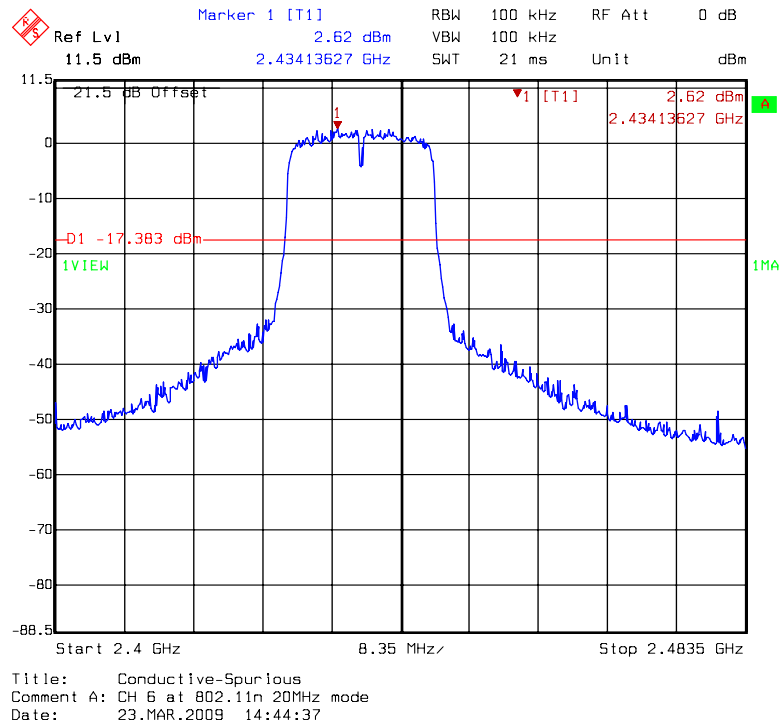
conducted spurious @ 802.11n HT20 mode channel 1 (3 of 3)



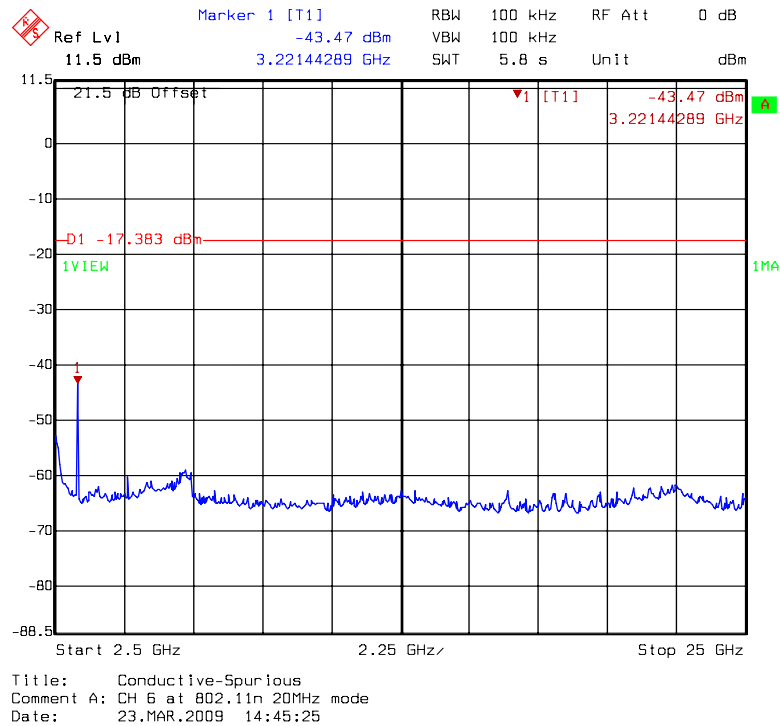
conducted spurious @ 802.11n HT20 mode channel 6 (1 of 3)



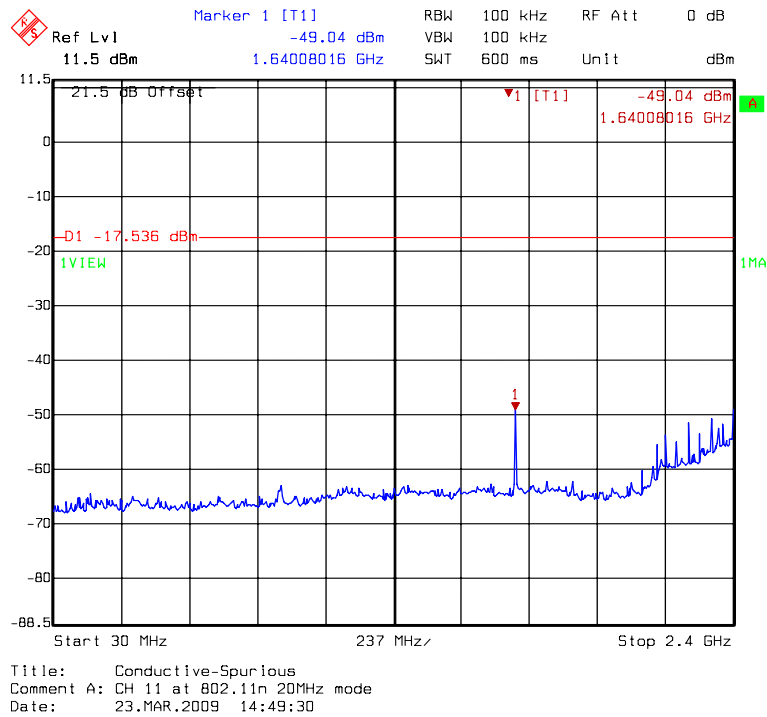
conducted spurious @ 802.11n HT20 mode channel 6 (2 of 3)



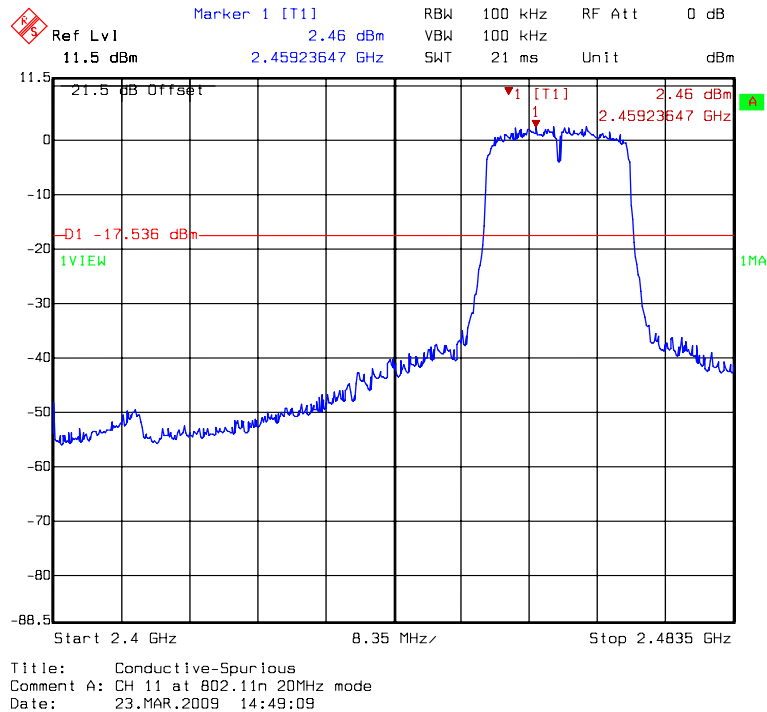
conducted spurious @ 802.11n HT20 mode channel 6 (3 of 3)



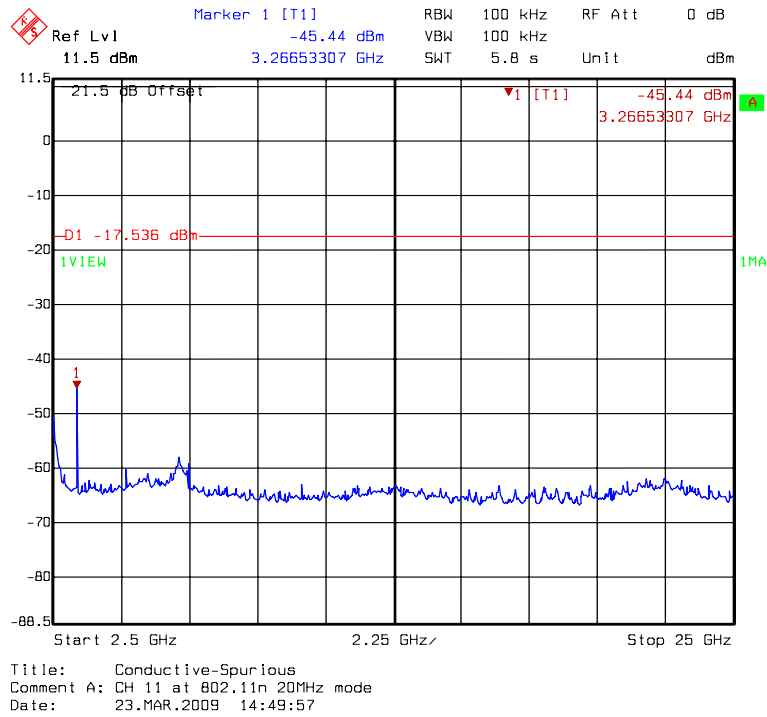
conducted spurious @ 802.11n HT20 mode channel 11 (1 of 3)



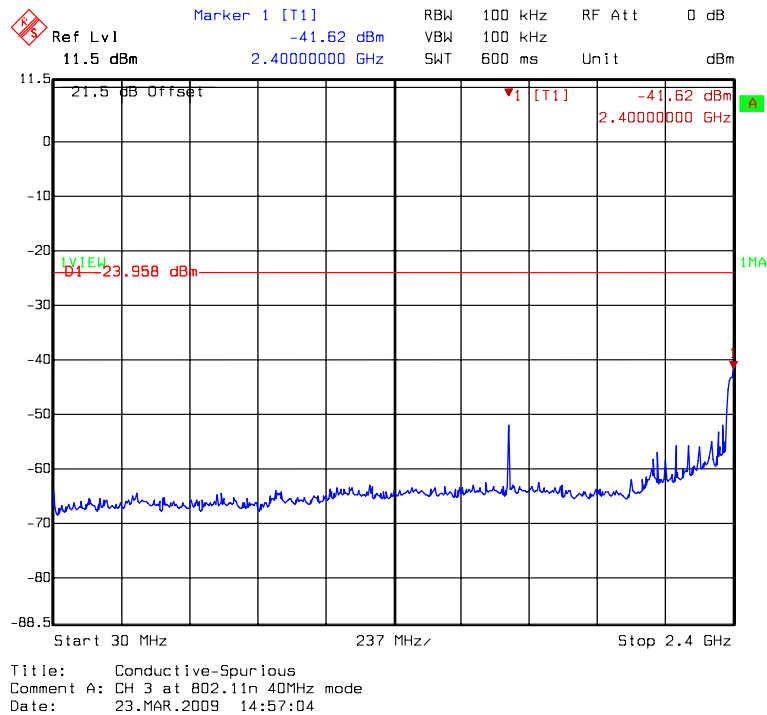
conducted spurious @ 802.11n HT20 mode channel 11 (2 of 3)



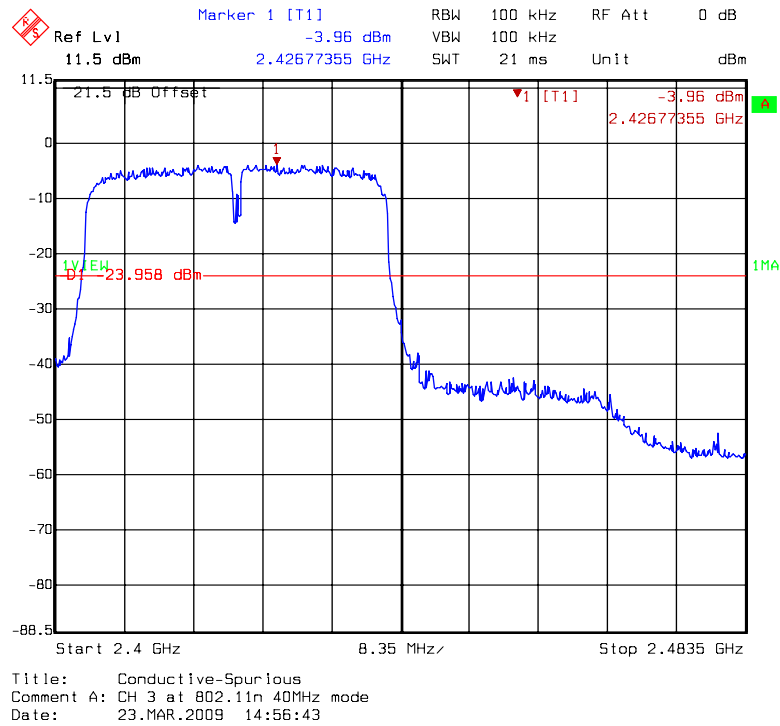
conducted spurious @ 802.11n HT20 mode channel 11 (3 of 3)



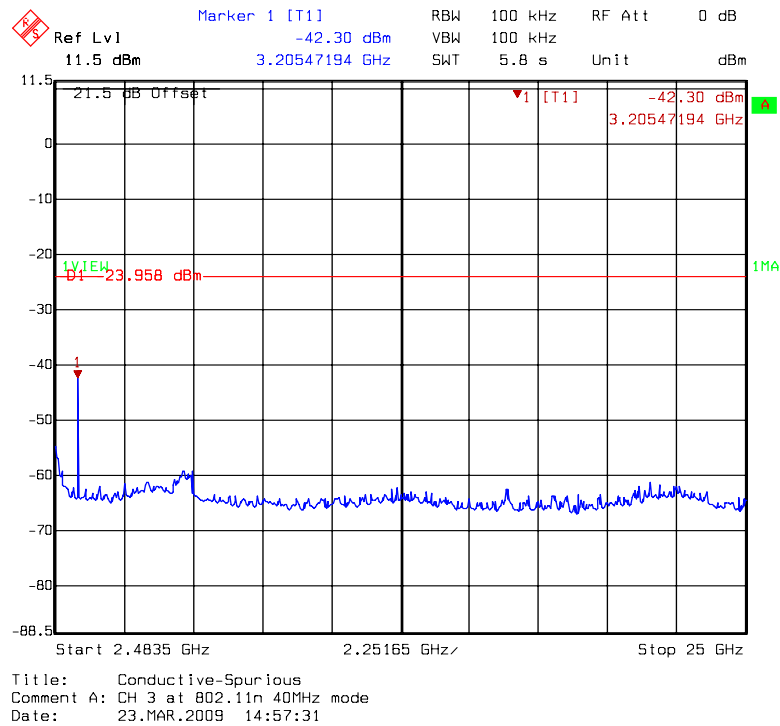
conducted spurious @ 802.11n HT40 mode channel 3 (1 of 3)



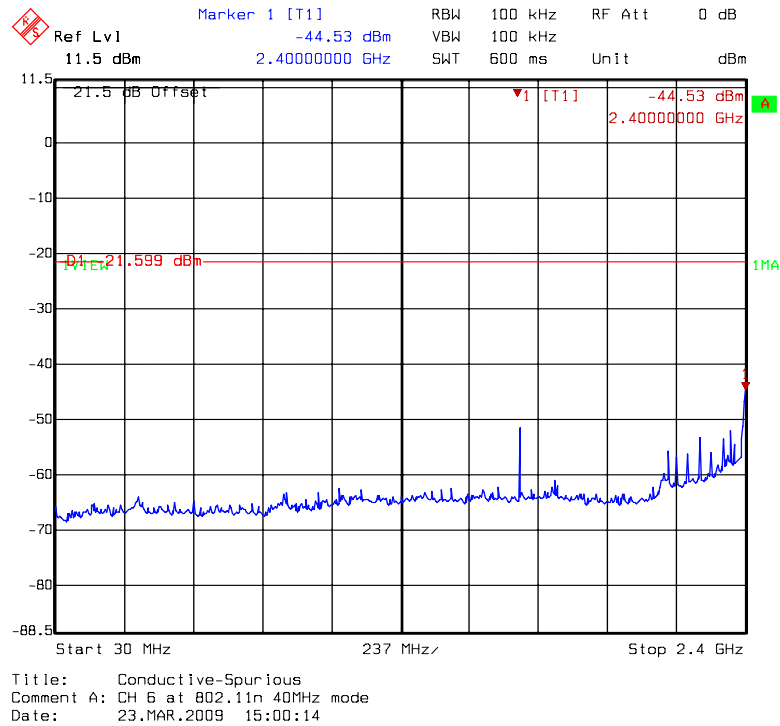
conducted spurious @ 802.11n HT40 mode channel 3 (2 of 3)



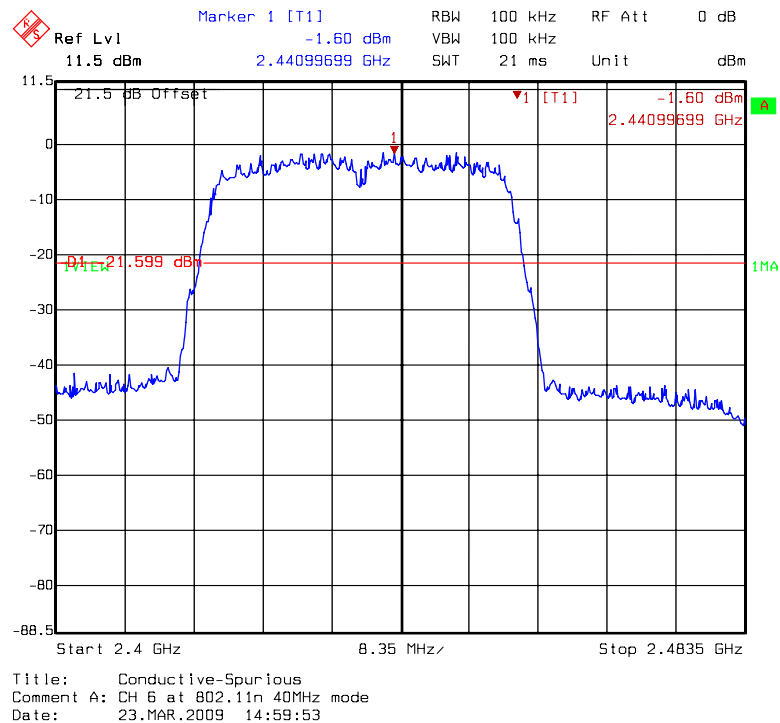
conducted spurious @ 802.11n HT40 mode channel 3 (3 of 3)



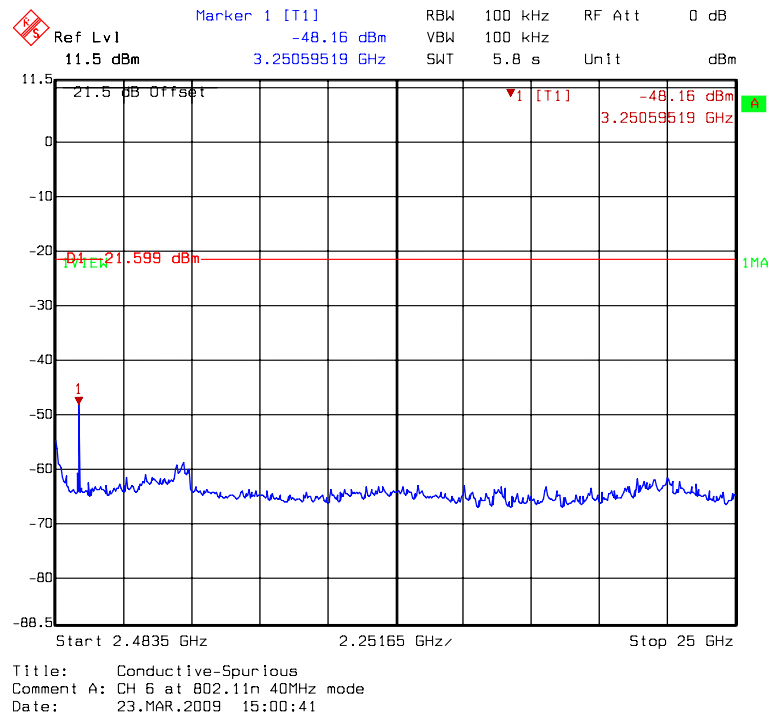
conducted spurious @ 802.11n HT40 mode channel 6 (1 of 3)



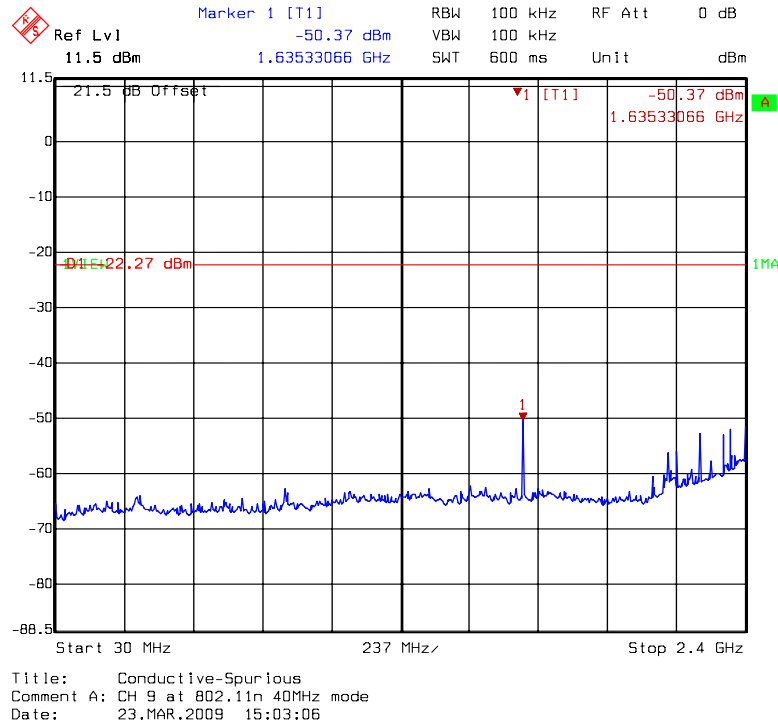
conducted spurious @ 802.11n HT40 mode channel 6 (2 of 3)



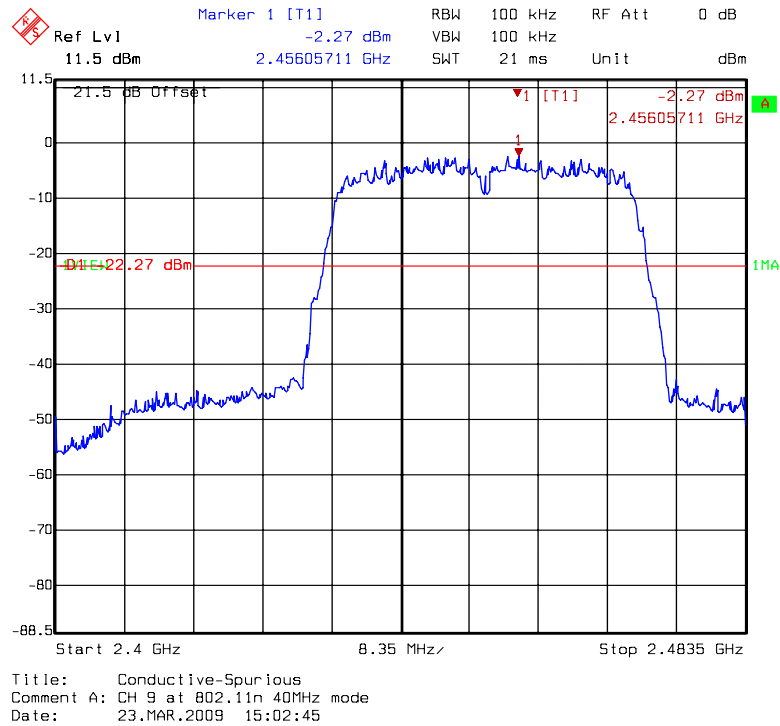
conducted spurious @ 802.11n HT40 mode channel 6 (3 of 3)



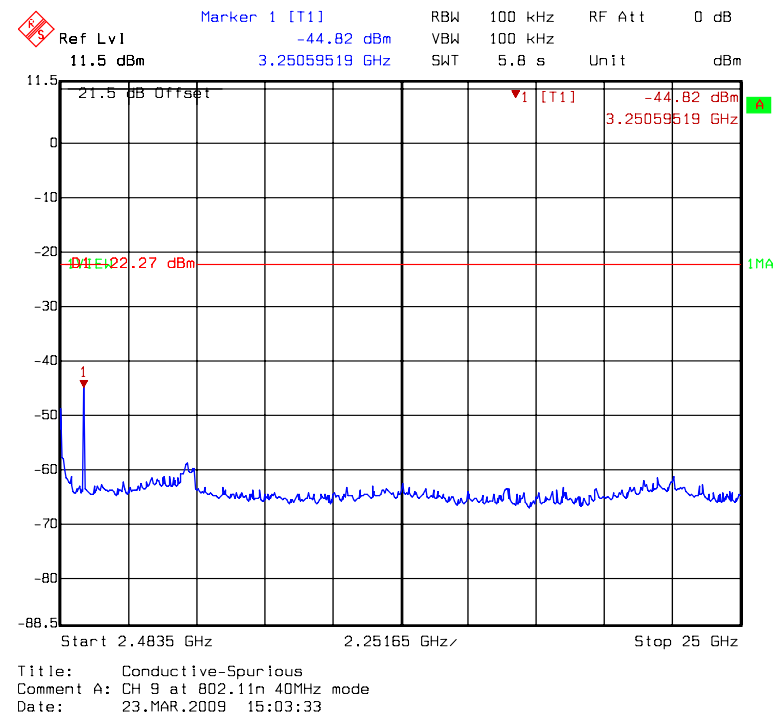
conducted spurious @ 802.11n HT40 mode channel 9 (1 of 3)



conducted spurious @ 802.11n HT40 mode channel 9 (2 of 3)



conducted spurious @ 802.11n HT40 mode channel 9 (3 of 3)



## 8. Radiated Spurious Emission

<b>Name of Test</b>	Radiated Spurious Emission
<b>Base Standard</b>	FCC 15.247(d), 15.209, 15.205

**Test Result:** Complies  
**Measurement Data:** See Tables below

### Method of Measurement:

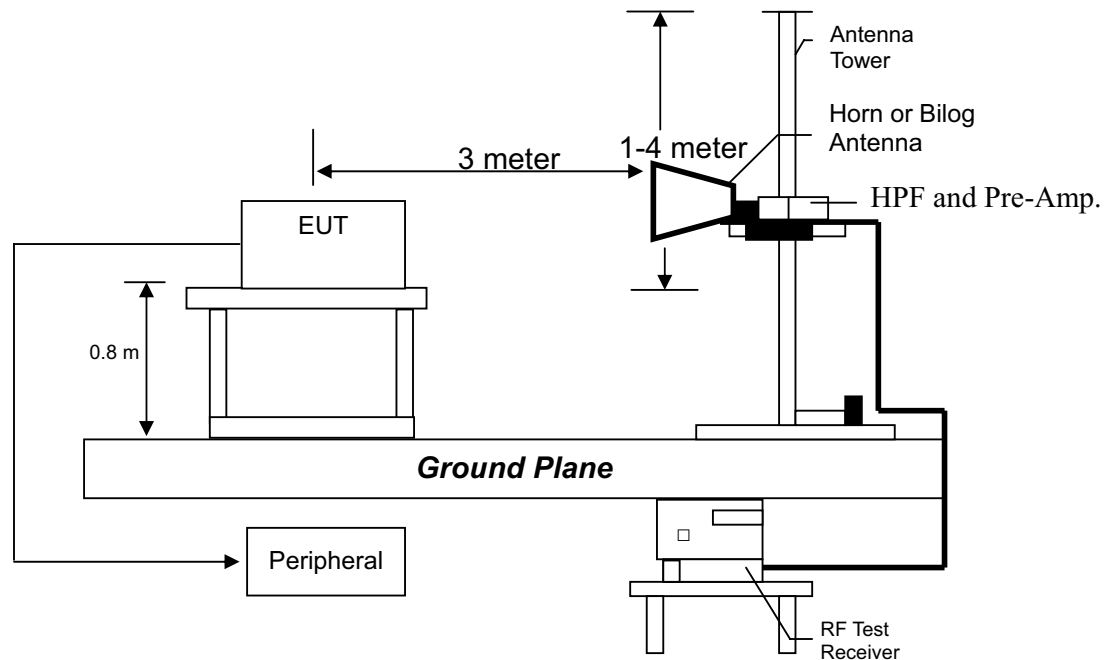
#### Reference FCC document: KDB558074, ANSI C63.4

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.  
The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were investigated cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/VBW) recorded also on the report. The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter. The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent 3 meters reading using inverse scaling with distance.

The EUT configuration please refer to the "Spurious set-up photo.pdf".

**Test Diagram:**



**Emission Limit:**

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dBμV/m@ 3 meter)
30-88	40
88-216	43.5
216-960	46
Above 960	54

**Remark:**

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

- Note:**
- (1) The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.
  - (2) The EUT operating at 2.4 GHz ISM band. Frequency Range scanned from 30 MHz to 25 GHz.

### Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under 802.11b/g/n continuously transmitting mode. The worst case occurred at 802.11b Tx channel 1.

EUT : WR5204  
Worst Case : 802.11b Tx at channel 1  
Antenna 1 : Dipole antenna

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	38.730	QP	12.620	21.92	34.54	40.00	-5.46
V	51.340	QP	12.895	21.98	34.87	40.00	-5.13
V	70.740	QP	10.390	25.16	35.55	40.00	-4.45
V	74.620	QP	10.390	25.06	35.45	40.00	-4.55
V	151.250	QP	15.830	25.12	40.95	43.50	-2.55
V	168.710	QP	15.700	21.92	37.62	43.50	-5.88
H	106.630	QP	9.03	27.87	36.89	43.50	-6.61
H	147.370	QP	13.24	23.97	37.20	43.50	-6.30
H	189.080	QP	12.08	23.77	35.85	43.50	-7.65
H	320.030	QP	14.32	25.57	39.88	46.00	-6.12
H	639.160	QP	21.55	15.48	37.02	46.00	-8.98
H	852.560	QP	24.12	15.80	39.91	46.00	-6.09

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : WR5204  
Worst Case : 802.11b Tx at channel 1  
Antenna 2 : Ceramic antenna

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	57.160	QP	12.90	24.05	36.94	40.00	-3.06
V	151.250	QP	15.83	18.39	34.22	43.50	-9.28
V	426.730	QP	17.64	16.06	33.70	46.00	-12.30
V	499.480	QP	18.43	21.94	40.36	46.00	-5.64
V	533.430	QP	19.46	17.91	37.37	46.00	-8.63
V	639.160	QP	21.53	15.13	36.66	46.00	-9.34
H	110.510	QP	10.54	23.71	34.24	43.50	-9.26
H	159.010	QP	13.60	20.02	33.62	43.50	-9.88
H	320.030	QP	14.32	23.92	38.23	46.00	-7.77
H	426.730	QP	18.12	22.06	40.18	46.00	-5.82
H	533.430	QP	19.65	24.01	43.66	46.00	-2.34
H	639.160	QP	21.55	19.98	41.52	46.00	-4.48

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

### Measurement results: frequency above 1GHz

EUT : WR5204  
Test Condition : 802.11b Tx at channel 1  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3210.00	PK	V	33.8	36.24	49.6	52.04	54	-1.96
4824.00	PK	V	35.1	38.54	52.14	55.58	74	-18.42
4824.00	AV	V	35.1	38.54	50.24	53.68	54	-0.32
7236.00	PK	V	33.0	44.6	37.37	48.97	54	-5.03
3210.00	PK	H	33.8	36.24	41.27	43.71	54	-10.29
4824.00	PK	H	35.1	38.54	43.78	47.22	54	-6.78

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11b Tx at channel 6  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3240.00	PK	V	33.8	36.24	50.52	52.96	54	-1.04
4874.00	PK	V	35.1	38.54	51.04	54.48	74	-19.52
4874.00	AV	V	35.1	38.54	49.07	52.51	54	-1.49
3240.00	PK	H	33.8	36.24	50.52	44.52	54	-9.48
4874.00	PK	H	35.1	38.54	49.07	46.53	54	-7.47

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11b Tx at channel 11  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3270.00	PK	V	33.8	36.24	50.52	53.31	54	-0.69
4924.00	PK	V	35.1	38.54	49.07	51.76	54	-2.24
3270.00	PK	H	33.8	36.24	50.52	44.06	54	-9.94
4924.00	PK	H	35.1	38.54	49.07	45.88	54	-8.12

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11g Tx at channel 1  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3210.00	PK	V	33.8	36.24	50.87	53.31	54	-0.69
4824.00	PK	V	35.1	38.54	49.46	52.90	54	-1.10
4824.00	PK	H	35.1	38.54	42.34	45.78	54	-8.22

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11g Tx at channel 6  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3240.00	PK	V	33.8	36.24	50.46	52.90	54	-1.10
4874.00	PK	V	35.1	38.54	56.19	59.63	74	-14.37
4874.00	AV	V	35.1	38.54	45.80	49.24	54	-4.76
7311.00	PK	V	33.0	44.6	41.04	52.64	54	-1.36
4874.00	PK	H	35.1	38.54	45.98	49.42	54	-4.58
7311.00	PK	H	33.0	44.60	37.11	48.71	54	-5.29

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11g Tx at channel 11  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3270.00	PK	V	33.80	36.24	50.13	52.57	54	-1.43
4924.00	PK	V	35.10	38.54	54.80	58.24	74	-15.76
4924.00	AV	V	35.10	38.54	37.79	41.23	54	-12.77
7386.00	PK	V	33.00	44.60	45.13	56.73	74	-17.27
7386.00	AV	V	33.00	44.60	29.15	40.75	54	-13.25
4924.00	PK	H	35.10	38.54	37.79	47.42	54	-6.58
7386.00	PK	H	33.00	44.60	29.15	48.91	54	-5.09

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT20 Tx at channel 1  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3210.00	PK	V	33.8	36.24	50.85	53.29	54	-0.71
4824.00	PK	V	35.1	38.54	48.52	51.96	54	-2.04
3210.00	PK	H	33.8	36.24	42.04	44.48	54	-9.52
4824.00	PK	H	35.1	38.54	42.25	45.69	54	-8.31

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT20 Tx at channel 6  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3240.00	PK	V	33.8	36.24	50.60	53.04	54	-0.96
4874.00	PK	V	35.1	38.54	50.34	53.78	54	-0.22
7311.00	PK	V	33.0	44.60	41.86	53.46	54	-0.54
4874.00	PK	H	35.1	38.54	45.30	48.74	54	-5.26
7311.00	PK	H	33.0	44.60	36.55	48.15	54	-5.85

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT20 Tx at channel 11  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3270.00	PK	V	33.8	36.24	50.52	52.27	54	-1.73
4924.00	PK	V	35.1	38.54	49.07	57.64	74	-16.36
4924.00	AV	V	35.1	38.54	49.07	42.13	54	-11.87
7386.00	PK	V	35.1	38.54	49.07	52.65	54	-1.35
4924.00	PK	H	35.1	38.54	49.07	48.28	54	-5.72

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT40Tx at channel 3  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3210.00	PK	V	33.8	36.24	50.57	53.01	54	-0.99
4844.00	PK	V	35.1	38.54	43.97	47.41	54	-6.59
4844.00	PK	H	35.1	38.54	38.96	42.4	54	-11.60

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT40 Tx at channel 6  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3240.00	PK	V	33.8	36.24	50.83	53.27	54	-0.73
4874.00	PK	V	35.1	38.54	42.59	46.03	54	-7.97
4874.00	PK	H	35.1	38.54	39.51	42.95	54	-11.05

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT40 Tx at channel 9  
Antenna 1 : Dipole antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3270.00	PK	V	33.8	36.24	50.05	52.49	54	-1.51
4904.00	PK	V	35.1	38.54	40.16	43.6	54	-10.40
4904.00	PK	H	35.1	38.54	37.71	41.15	54	-12.85

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11b Tx at channel 1  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824.00	PK	V	35.1	38.54	51.66	55.1	74	-18.90
4824.00	AV	V	35.1	38.54	49.53	52.97	54	-1.03
4824.00	PK	H	35.1	38.54	46.44	49.88	54	-4.12

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11b Tx at channel 6  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874.00	PK	V	35.1	38.54	52.34	55.78	74	-18.22
4874.00	AV	V	35.1	38.54	49.21	52.65	54	-1.35
7311.00	PK	V	33.0	44.6	37.65	49.25	54	-4.75
4874.00	PK	H	35.1	38.54	45.24	48.68	54	-5.32

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11b Tx at channel 11  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924.00	PK	V	35.1	38.54	51.18	54.62	74	-19.38
4924.00	AV	V	35.1	38.54	49.27	52.71	54	-1.29
7386.00	PK	V	33.8	36.24	50.52	52.01	54	-1.99
4924.00	PK	H	35.1	38.54	49.07	47.38	54	-6.62

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11g Tx at channel 1  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824.00	PK	V	35.1	38.54	43.89	47.33	54	-6.67
7236.00	PK	V	33.0	44.6	37.37	48.97	54	-5.03
4824.00	PK	H	35.1	38.54	40.28	43.72	54	-10.28

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11g Tx at channel 6  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874.00	PK	V	35.1	38.54	45.91	49.35	54	-4.65
7311.00	PK	V	33.0	44.60	40.40	52.00	54	-2.00
4874.00	PK	H	35.1	38.54	38.73	42.17	54	-11.83

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11g Tx at channel 11  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924.00	PK	V	35.1	38.54	42.59	46.03	54	-7.97
7386.00	PK	V	33.0	44.60	38.33	49.93	54	-4.07
4924.00	PK	H	35.1	38.54	37.79	43.93	54	-10.07

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT20 Tx at channel 1  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4824.00	PK	V	35.1	38.54	45.32	48.76	54	-5.24
7236.00	PK	V	33.0	44.60	37.19	48.79	54	-5.21
4824.00	PK	H	35.1	38.54	41.10	44.54	54	-9.46

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT20 Tx at channel 6  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874.00	PK	V	35.1	38.54	49.70	53.14	54	-0.86
7311.00	PK	V	33.0	44.60	44.82	56.42	74	-17.58
7311.00	AV	V	33.0	44.60	32.61	44.21	54	-9.79
4874.00	PK	H	35.1	38.54	41.38	44.82	54	-9.18

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT20 Tx at channel 11  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4924.00	PK	V	35.1	38.54	49.07	46.75	54	-7.25
4924.00	PK	H	35.1	38.54	49.07	41.99	54	-12.01

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT40Tx at channel 3  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4844.00	PK	V	35.1	38.54	39.73	43.17	54	-10.83
4844.00	PK	H	35.1	38.54	37.37	40.81	54	-13.19

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT40 Tx at channel 6  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4874.00	PK	V	35.1	38.54	38.46	41.90	54	-12.10
4874.00	PK	H	35.1	38.54	37.74	41.18	54	-12.82

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : WR5204  
Test Condition : 802.11n HT40 Tx at channel 9  
Antenna 2 : Ceramic antenna

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4904.00	PK	V	35.1	38.54	39.01	42.45	54	-11.55
4904.00	PK	H	35.1	38.54	38.43	41.87	54	-12.13

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

## 9. Emission on Band Edge

<b>Name of Test</b>	Emission Band Edge
<b>Base Standard</b>	FCC 15.247(d)

**Test Result:** Complies

**Measurement Data:** See Tables & plots below

### Method of Measurement:

#### Reference FCC document: KDB558074, ANSI C63.4

The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.

The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were investigated cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/VBW) recorded also on the report.

**Note:** The EUT was tested while in a continuous transmit mode and the worst case data rates are 1 Mbps for 802.11b and 6 Mbps for 802.11g. The EUT was tuned to a low, middle and high channel.

**Test Mode: 802.11b with antenna 1**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	60.99	74	-13.01
		AV	51.10	54	-2.90
11 (highest)	2483.5-2500	PK	62.28	74	-11.72
		AV	51.86	54	-2.14

**Test Mode: 802.11g with antenna 1**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	61.27	74	-12.73
		AV	48.96	54	-5.04
11 (highest)	2483.5-2500	PK	67.53	74	-6.47
		AV	50.58	54	-3.42

**Test Mode: 802.11n HT20 with antenna 1**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	63.39	74	-10.61
		AV	49.47	54	-4.53
11 (highest)	2483.5-2500	PK	65.15	74	-8.85
		AV	50.50	54	-3.50

**Test Mode: 802.11n HT40 with antenna 1**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3 (lowest)	2310-2390	PK	63.99	74	-10.01
		AV	52.08	54	-1.92
9 (highest)	2483.5-2500	PK	62.89	74	-11.11
		AV	50.23	54	-3.77

**Test Mode: 802.11b with antenna 2**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	61.29	74	-12.71
		AV	52.53	54	-1.47
11 (highest)	2483.5-2500	PK	62.43	74	-11.57
		AV	51.07	54	-2.93

**Test Mode: 802.11g with antenna 2**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	72.72	74	-1.28
		AV	49.12	54	-4.88
11 (highest)	2483.5-2500	PK	71.48	74	-2.52
		AV	51.57	54	-2.43

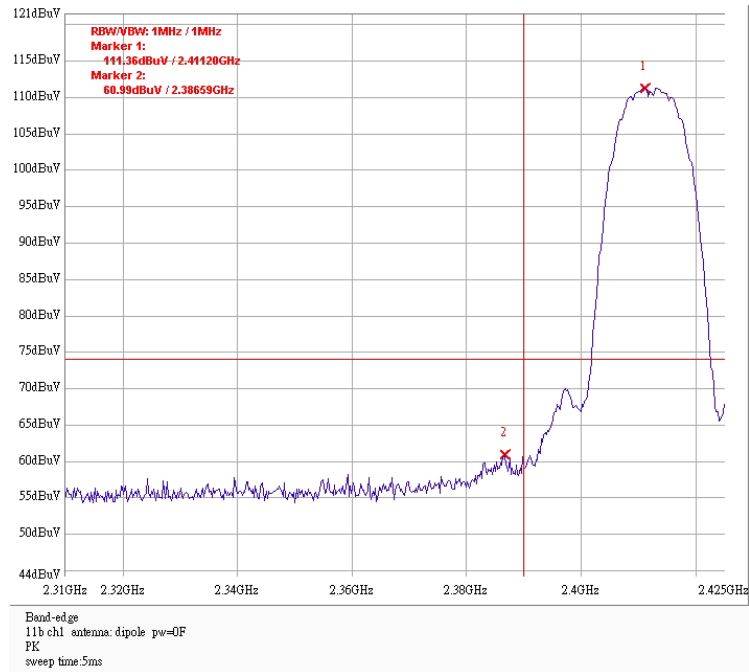
**Test Mode: 802.11n HT20 with antenna 2**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	73.18	74	-0.82
		AV	51.47	54	-2.53
11 (highest)	2483.5-2500	PK	70.69	74	-3.31
		AV	51.78	54	-2.22

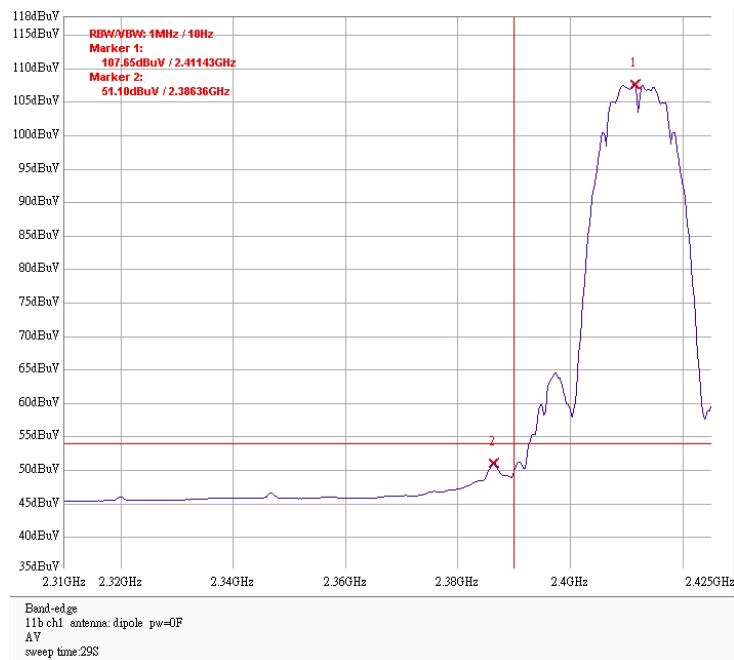
**Test Mode: 802.11n HT40 with antenna 2**

Channel	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
3 (lowest)	2310-2390	PK	66.23	74	-7.77
		AV	53.10	54	-0.90
9 (highest)	2483.5-2500	PK	65.75	74	-8.25
		AV	52.32	54	-1.68

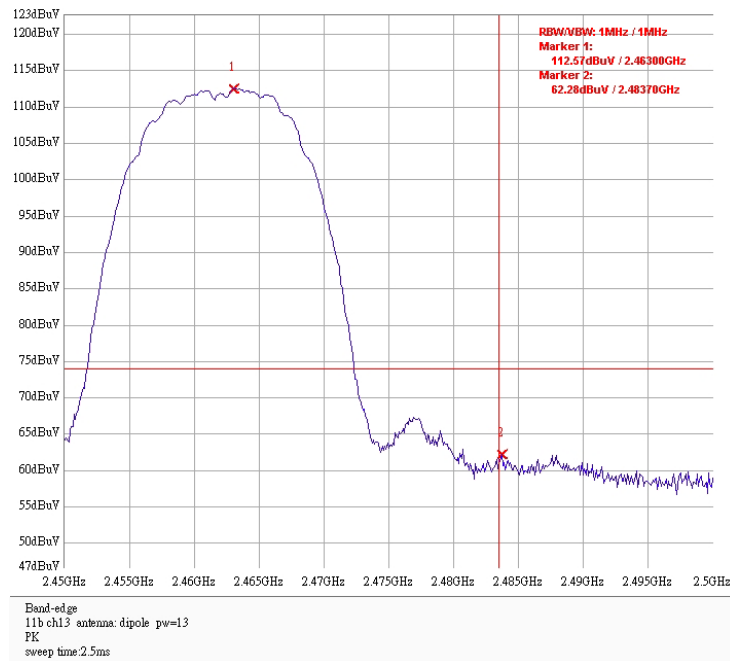
Band edge @ 802.11b mode channel 1 PK with antenna 1



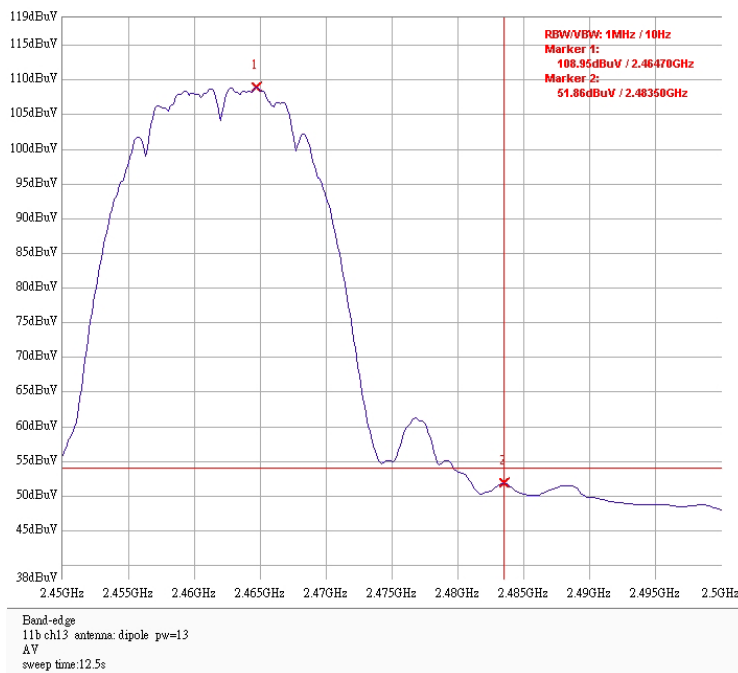
Band edge @ 802.11b mode channel 1 AV with antenna 1



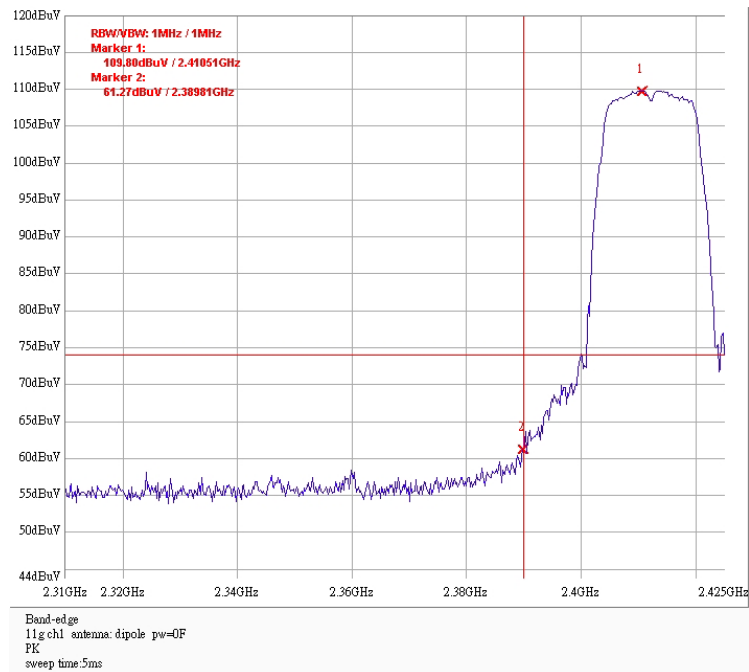
### Band edge @ 802.11b mode channel 11 PK with antenna 1



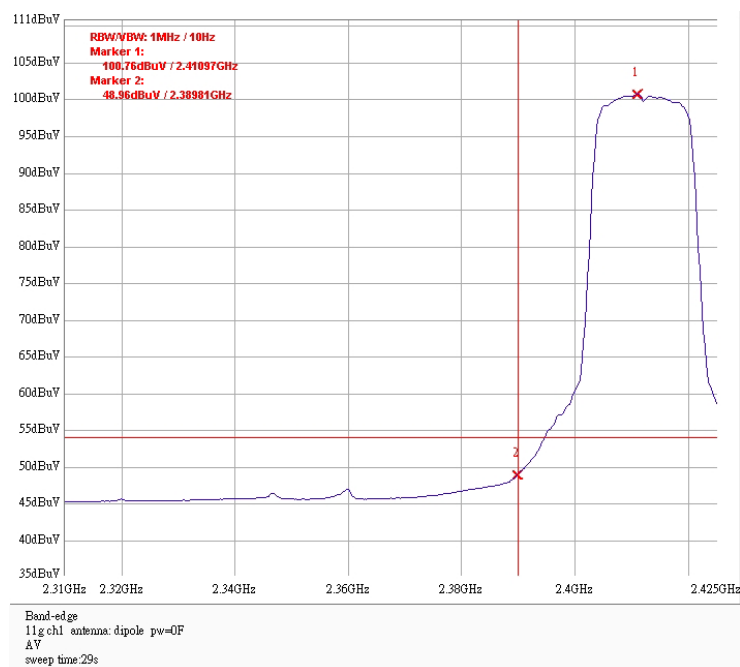
### Band edge @ 802.11b mode channel 11 AV with antenna 1



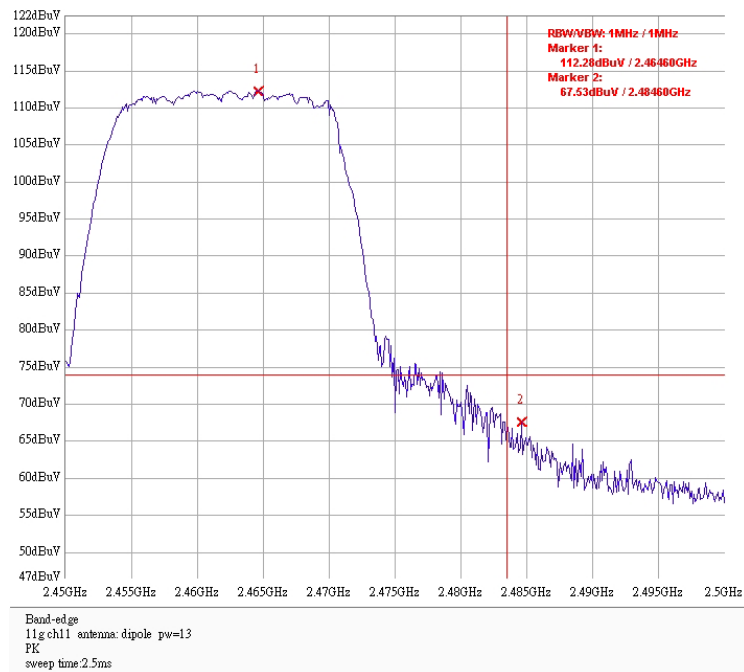
### Band edge @ 802.11g mode channel 1 PK with antenna 1



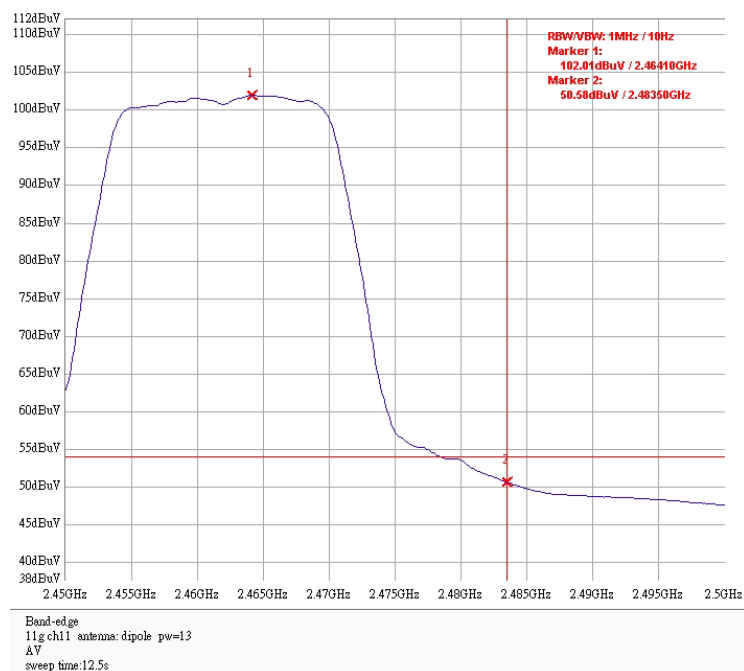
### Band edge @ 802.11g mode channel 1 AV with antenna 1



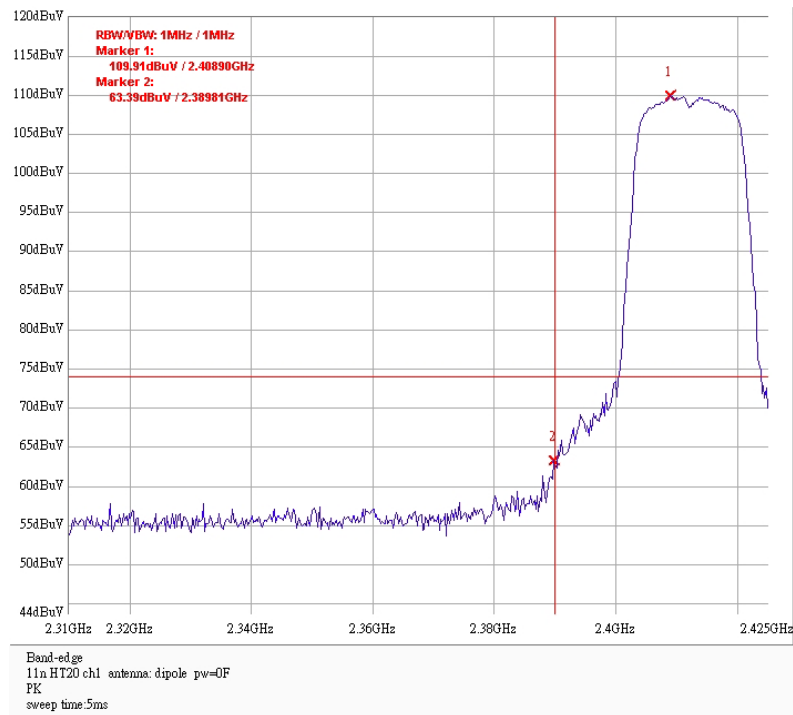
### Band edge @ 802.11g mode channel 11 PK with antenna 1



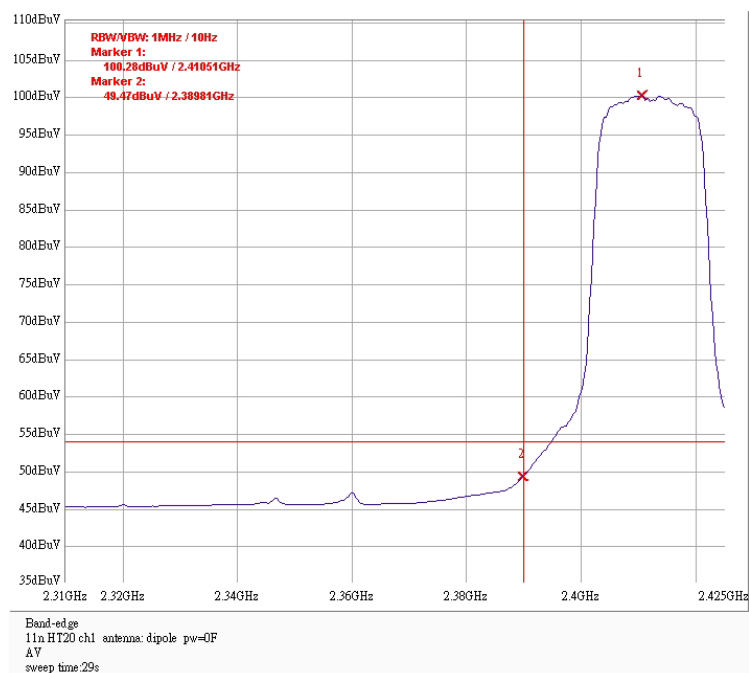
### Band edge @ 802.11g mode channel 11 AV with antenna 1



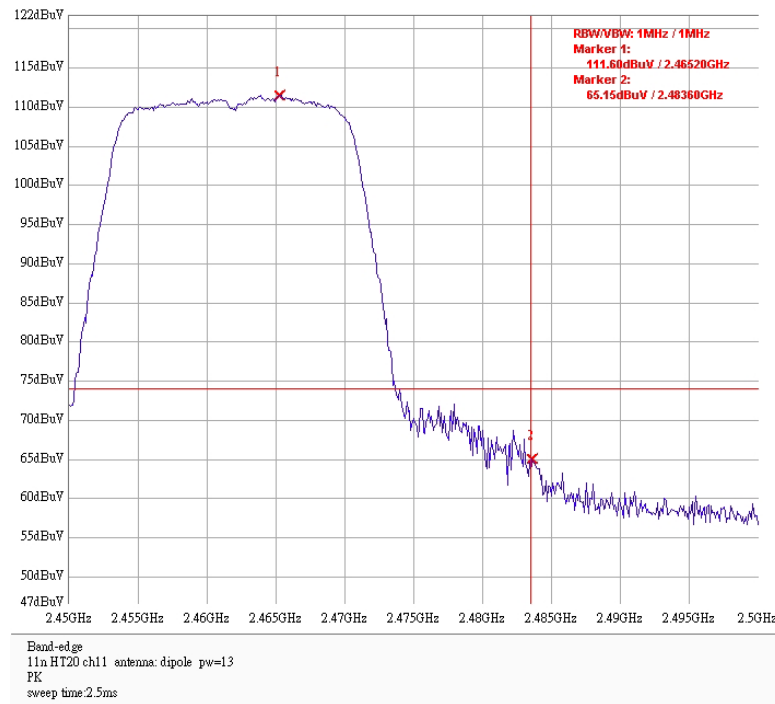
Band edge @802.11n HT20 mode channel 1 PK with antenna 1



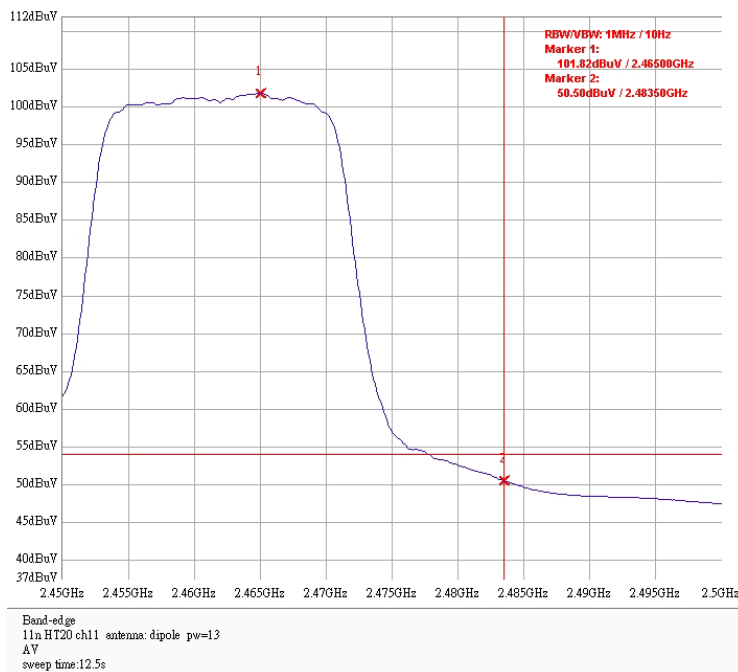
Band edge @802.11n HT20 mode channel 1 AV with antenna 1



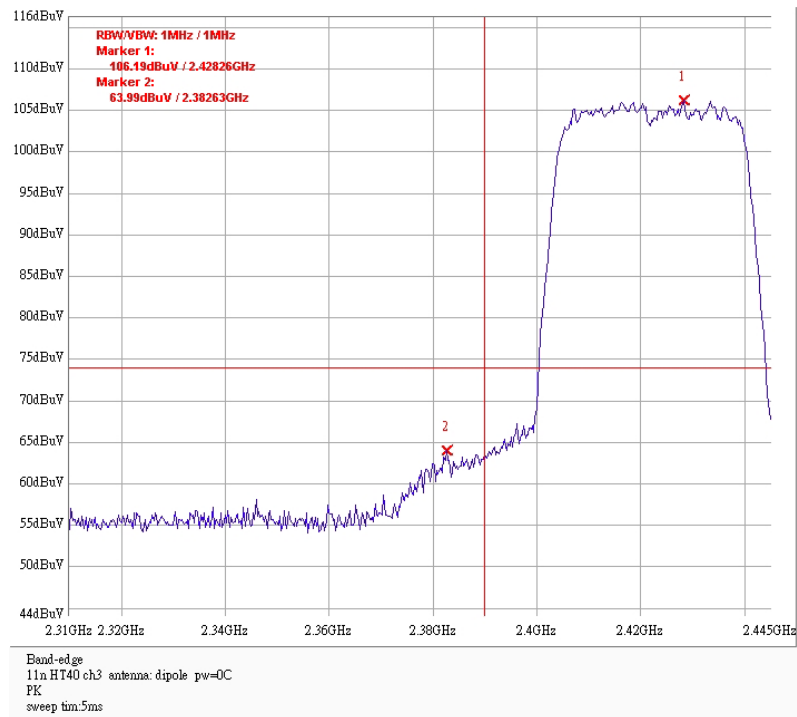
### Band edge @802.11n HT20 mode channel 11 PK with antenna 1



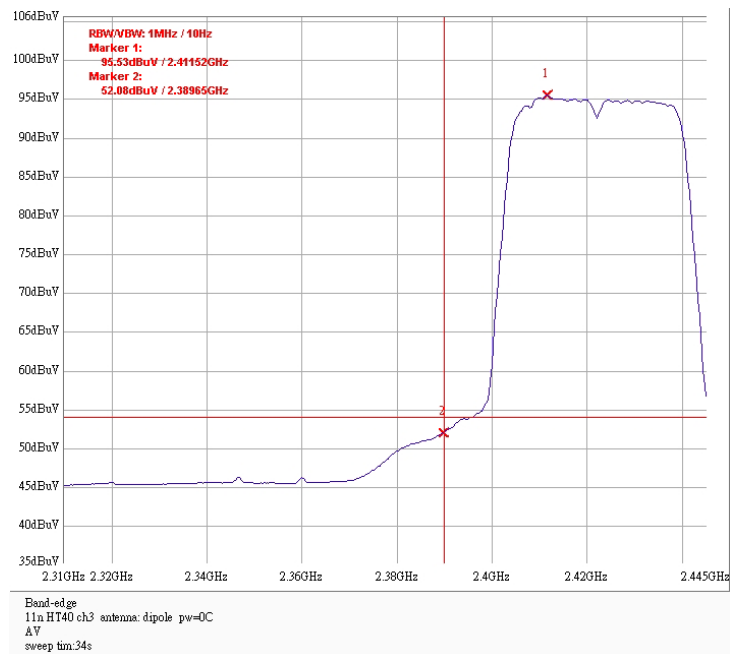
### Band edge @802.11n HT20 mode channel 11 AV with antenna 1



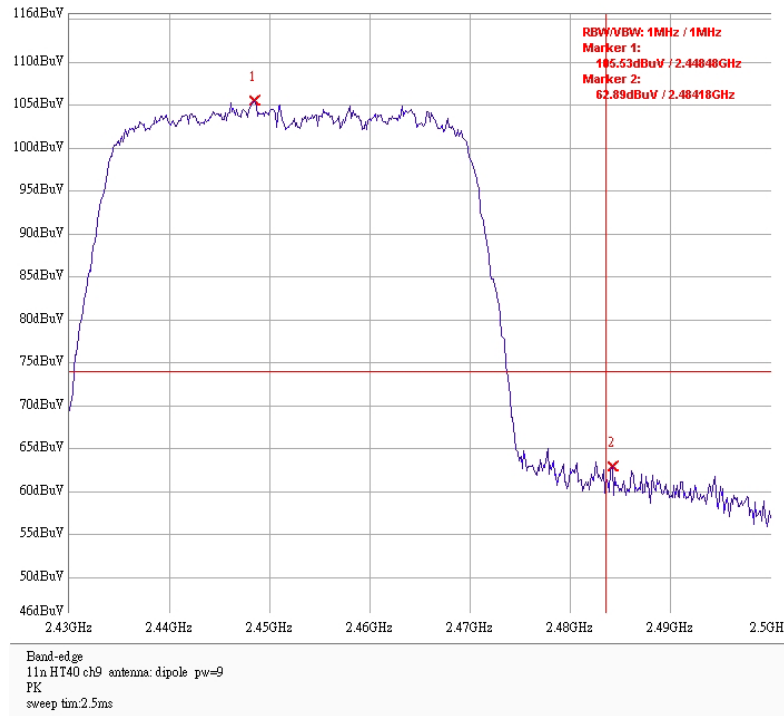
### Band edge @802.11n HT40 mode channel 3 PK with antenna 1



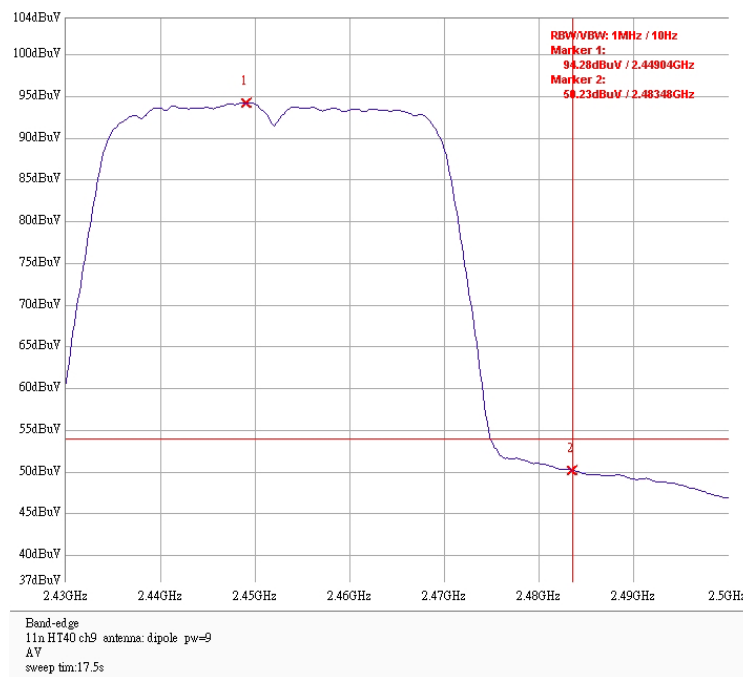
### Band edge @802.11n HT40 mode channel 3 AV with antenna 1



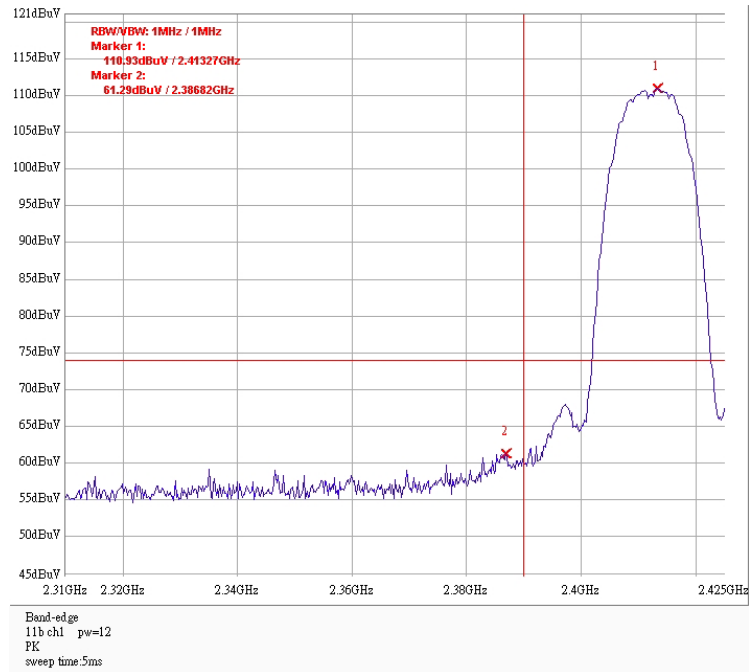
Band edge @802.11n HT40 mode channel 9 PK with antenna 1



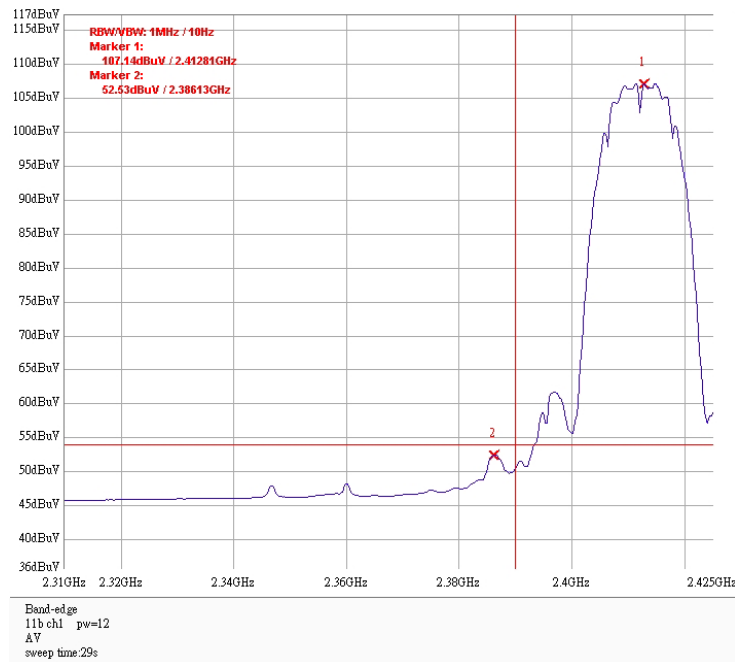
Band edge @802.11n HT40 mode channel 9 AV with antenna 1



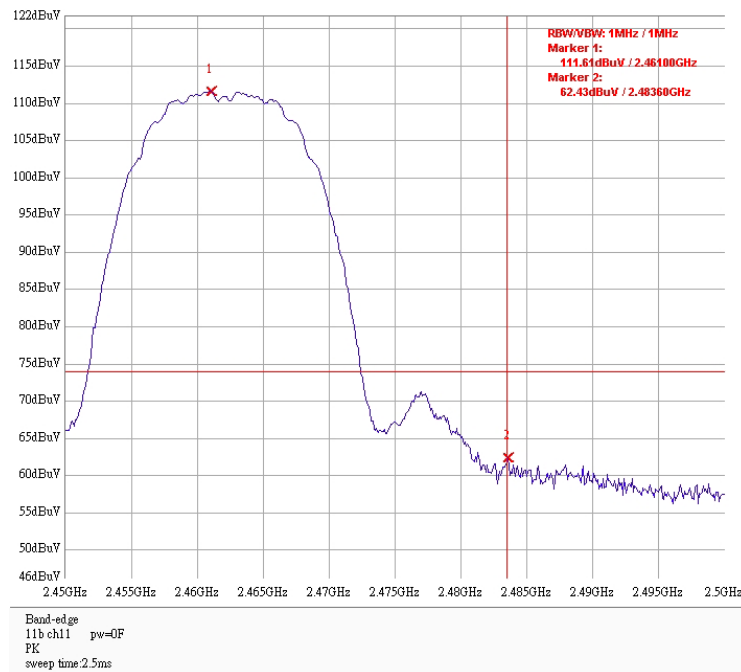
Band edge @ 802.11b mode channel 1 PK with antenna 2



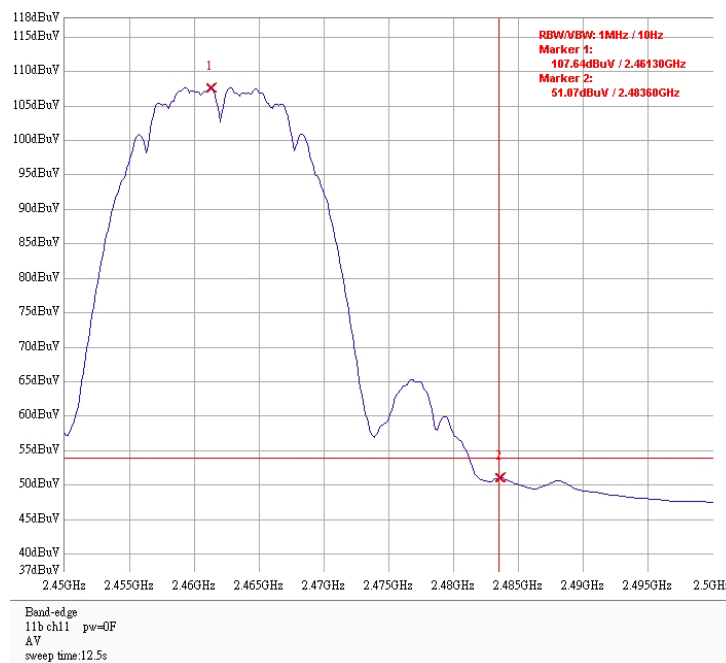
Band edge @ 802.11b mode channel 1 AV with antenna 2



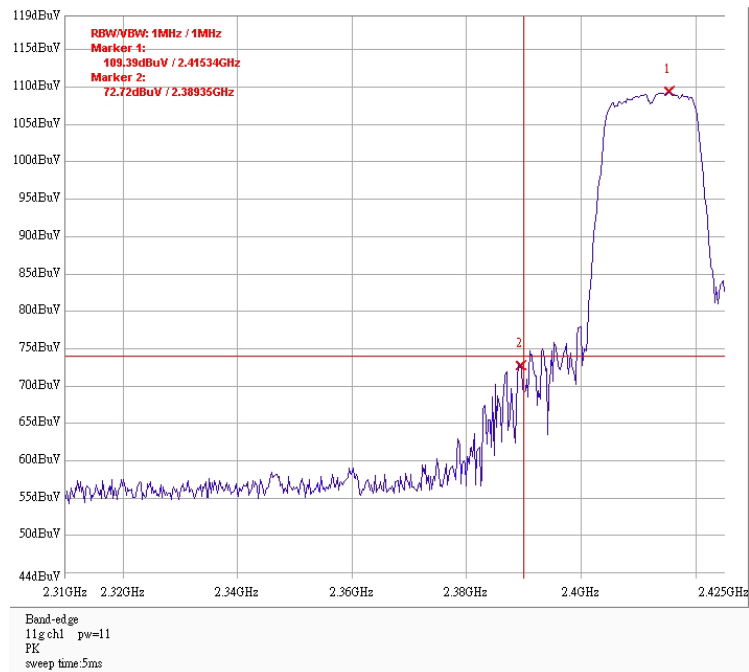
Band edge @ 802.11b mode channel 11 PK with antenna 2



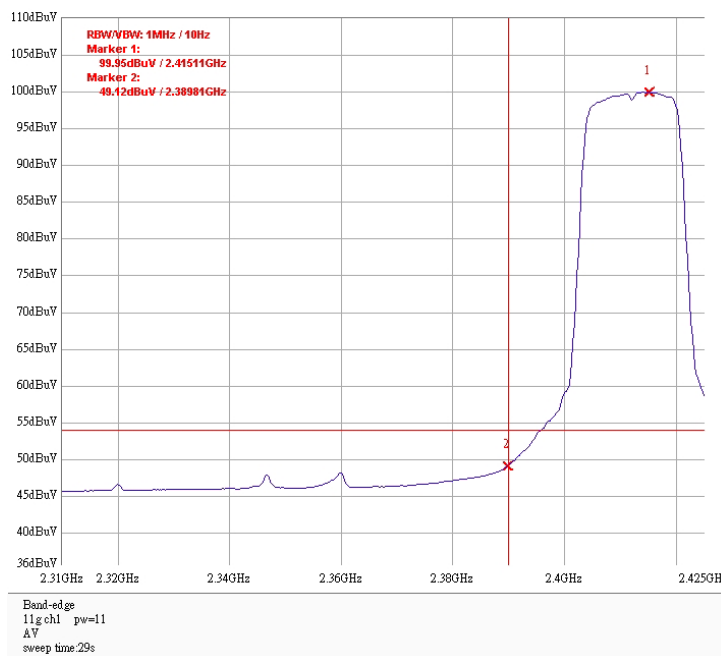
Band edge @ 802.11b mode channel 11 AV with antenna 2



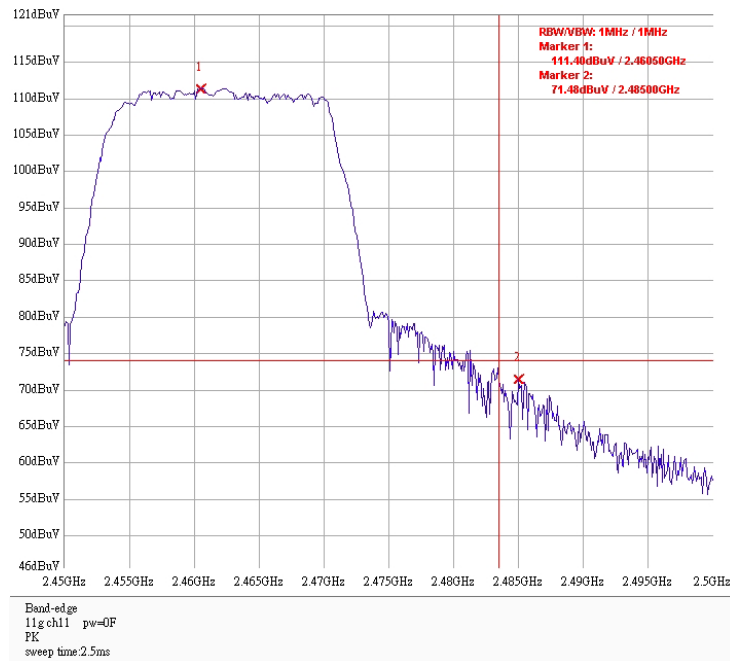
Band edge @ 802.11g mode channel 1 PK with antenna 2



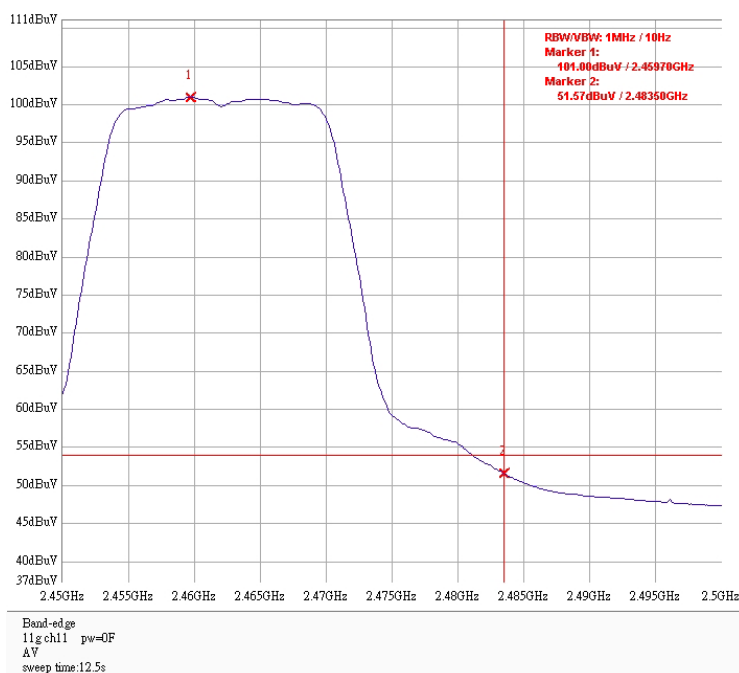
Band edge @ 802.11g mode channel 1 AV with antenna 2



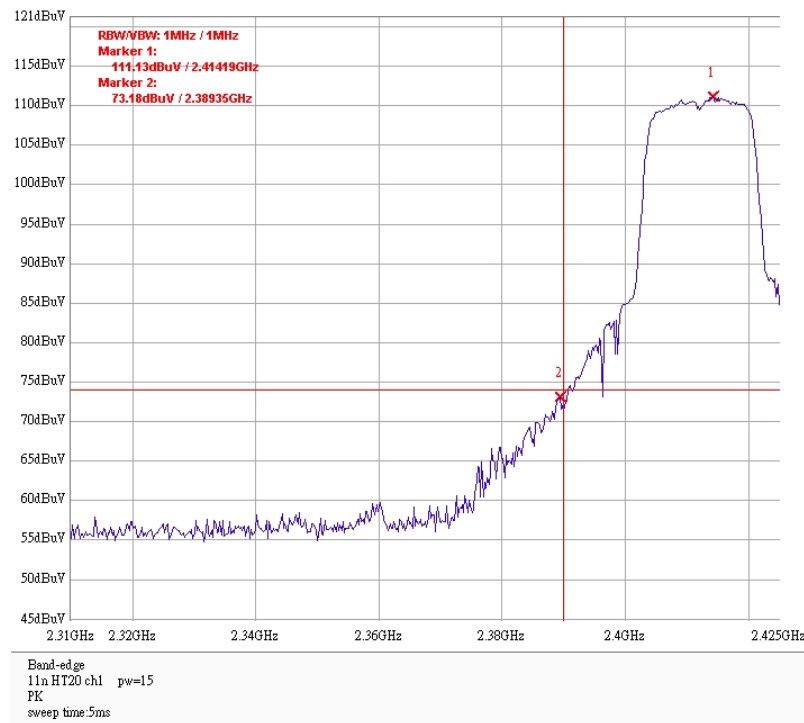
Band edge @ 802.11g mode channel 11 PK with antenna 2



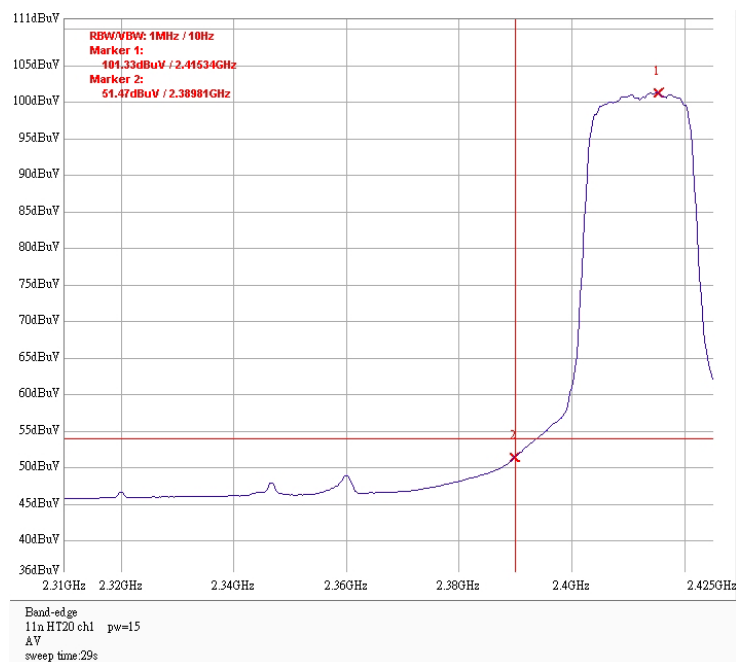
Band edge @ 802.11g mode channel 11 AV with antenna 2



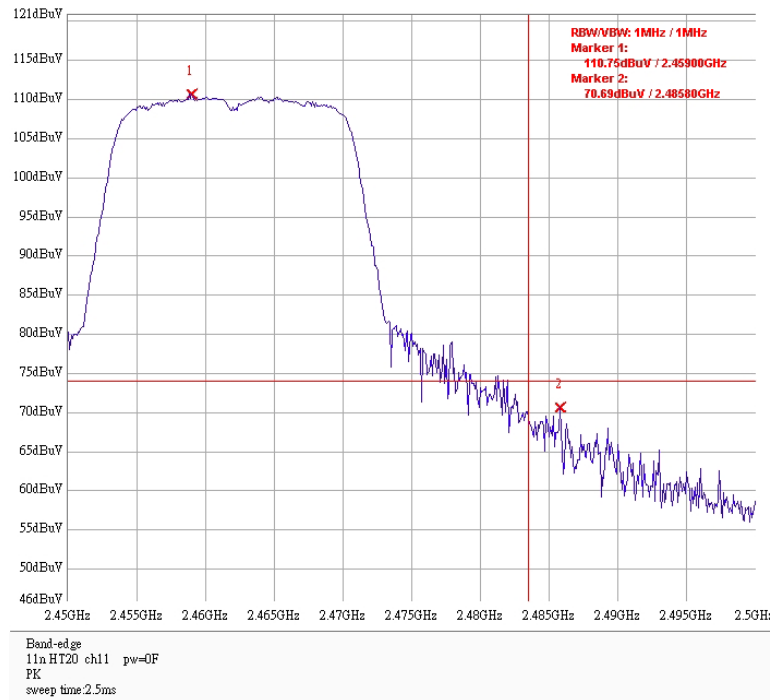
### Band edge @802.11n HT20 mode channel 1 PK with antenna 2



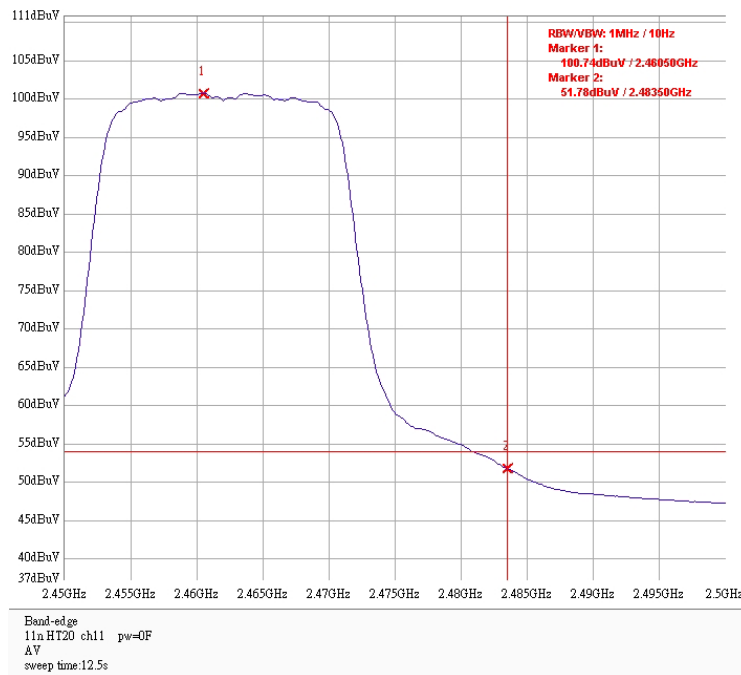
### Band edge @802.11n HT20 mode channel 1 AV with antenna 2



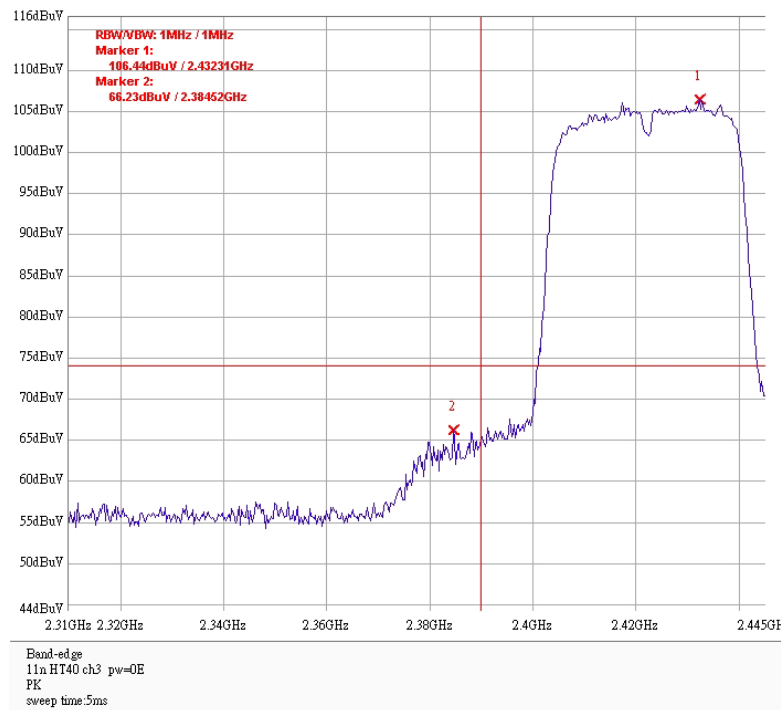
Band edge @802.11n HT20 mode channel 11 PK with antenna 2



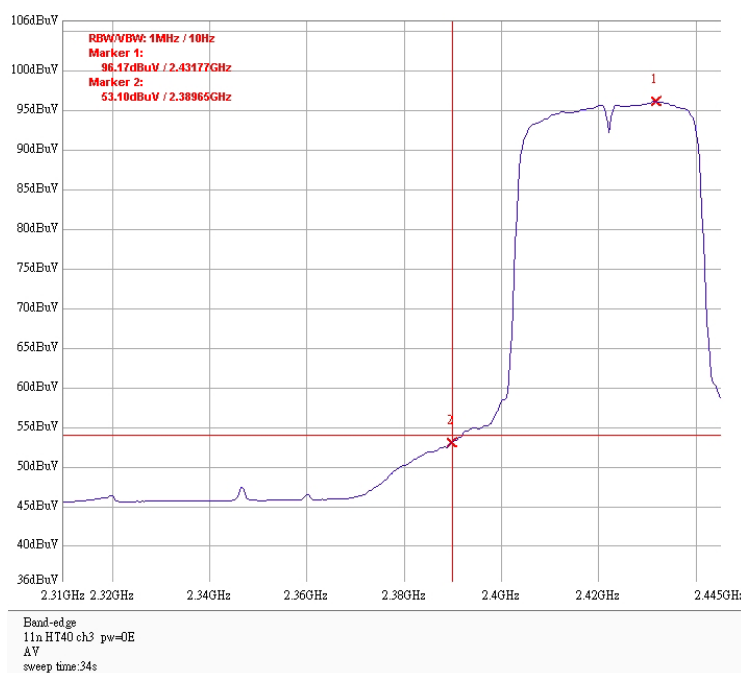
Band edge @802.11n HT20 mode channel 11 AV with antenna 2



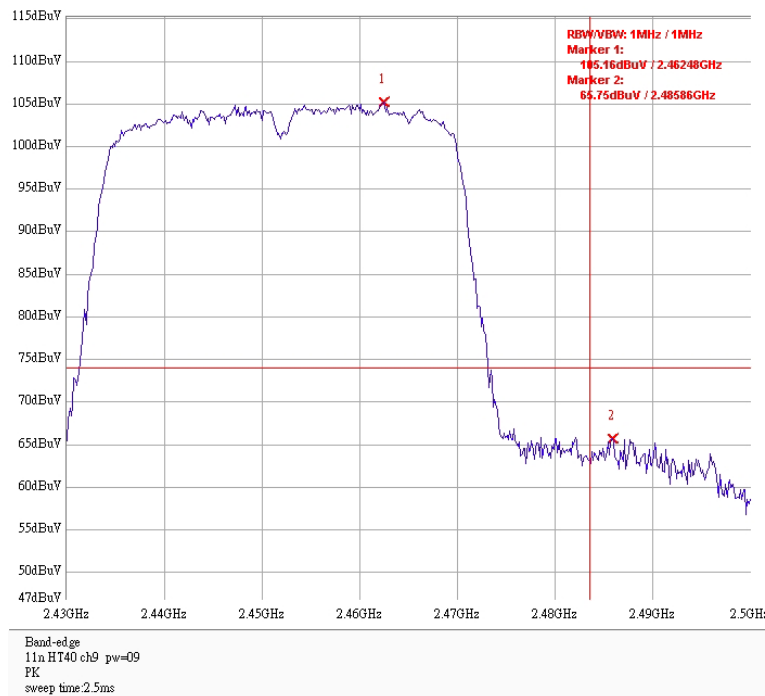
### Band edge @802.11n HT40 mode channel 3 PK with antenna 2



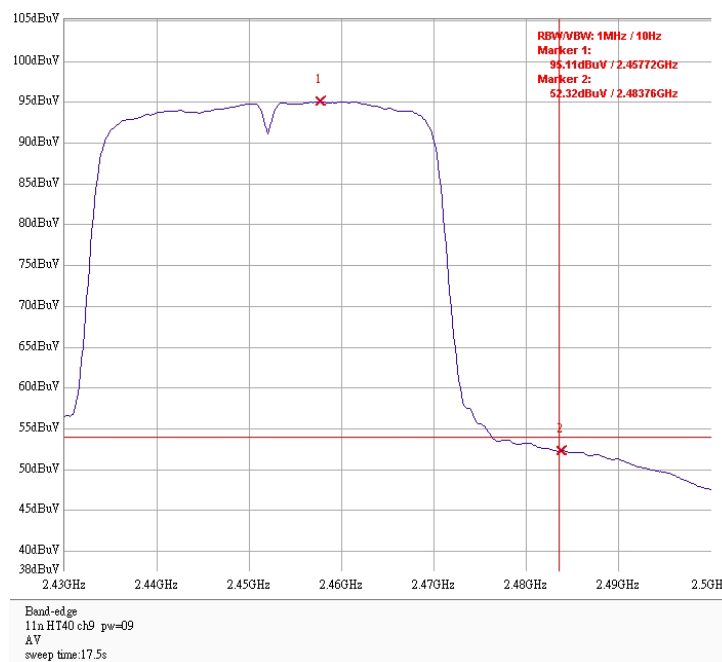
### Band edge @802.11n HT40 mode channel 3 AV with antenna 2



### Band edge @802.11n HT40 mode channel 9 PK with antenna 2



### Band edge @802.11n HT40 mode channel 9 AV with antenna 2



## 10. AC power line conducted emission

<b>Name of Test</b>	AC power line conducted emission
<b>Base Standard</b>	FCC 15.207

**Test Result:** Complies  
**Measurement Data:** See Tables & plots below

### Method of Measurement:

**Reference FCC document: KDB558074, ANSI C63.4**

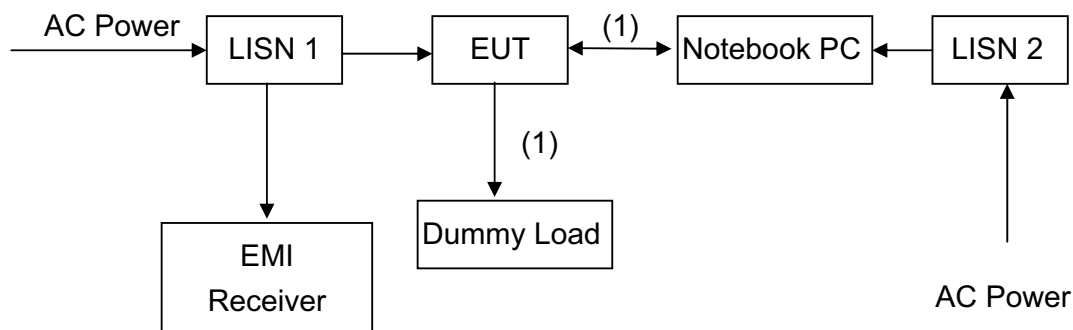
The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/ 50 uH coupling impedance with 50 ohm termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the "Conducted set-up photo.pdf".

### Test Diagram:



(1) RJ-45 UTP Cat.5 10 meter

**Emission Limit:**

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

\*Decreases with the logarithm of the frequency.

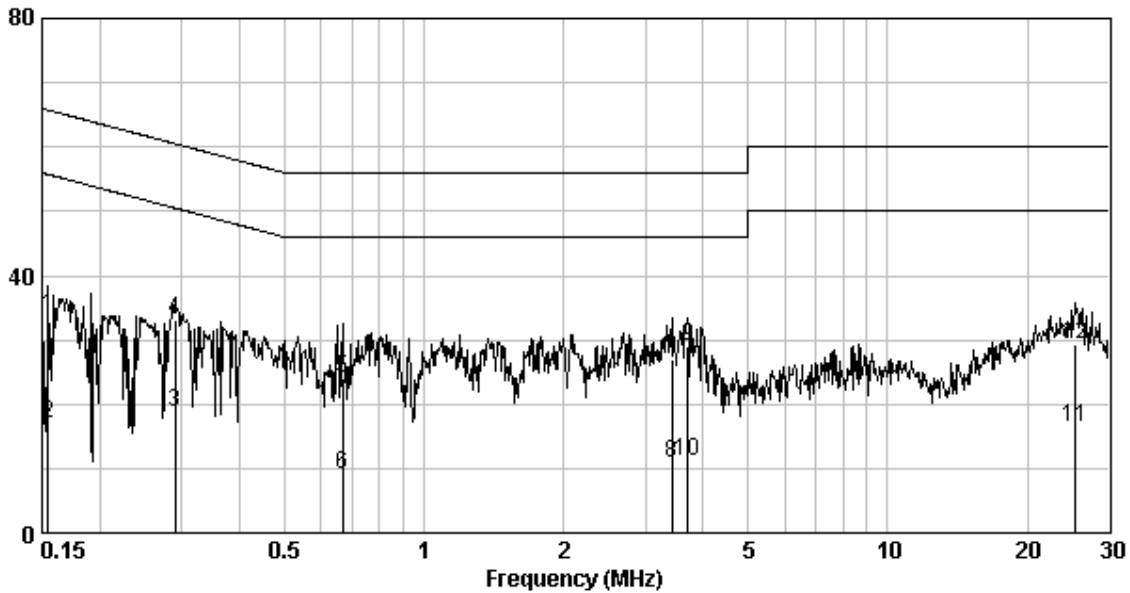
**Note:** The EUT was tested while in normal communication mode.

Phase : Line  
EUT : WR5204  
Worst case : Communication mode with dipole antenna

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.15	0.81	33.61	65.74	16.97	55.74	-32.13	-38.77
0.29	0.43	33.22	60.50	18.70	50.50	-27.28	-31.80
0.67	0.11	23.98	56.00	8.97	46.00	-32.02	-37.03
3.42	0.26	26.88	56.00	10.99	46.00	-29.12	-35.01
3.70	0.27	28.92	56.00	11.18	46.00	-27.08	-34.82
25.32	1.13	29.20	60.00	16.37	50.00	-30.80	-33.63

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

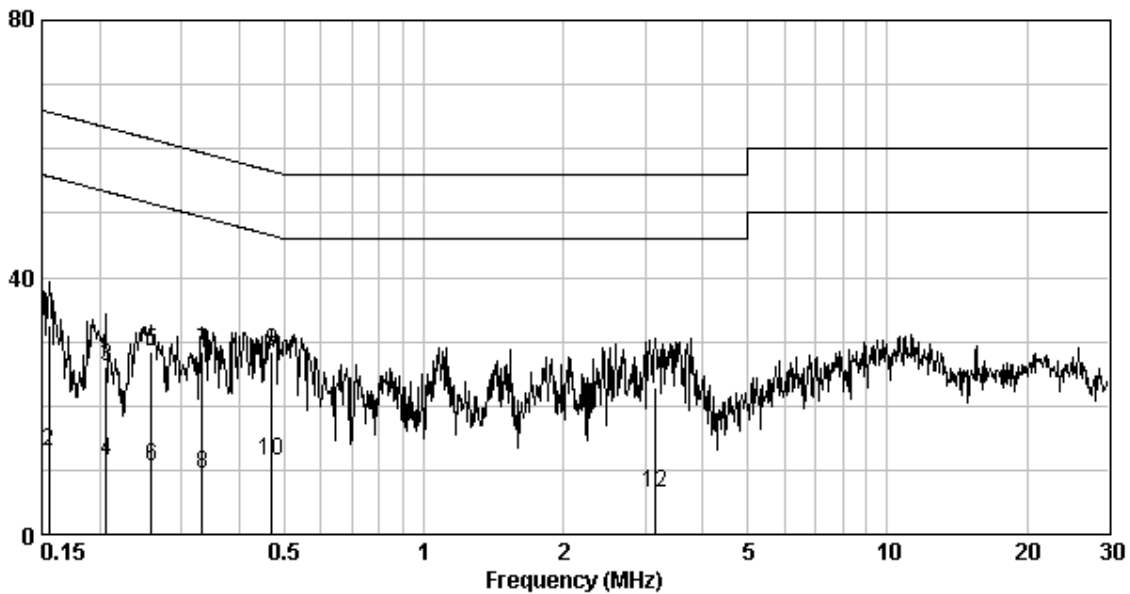


Phase : Neutral  
EUT : WR5204  
Worst case : Communication mode with dipole antenna

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.16	0.11	32.67	65.69	12.98	55.69	-33.03	-42.72
0.21	0.11	26.02	63.36	11.37	53.36	-37.34	-41.99
0.26	0.11	28.37	61.47	10.57	51.47	-33.10	-40.90
0.33	0.11	28.39	59.40	9.43	49.40	-31.01	-39.97
0.47	0.11	28.35	56.49	11.48	46.49	-28.15	-35.02
3.16	0.24	22.75	56.00	6.33	46.00	-33.25	-39.67

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



## Appendix A: Test Equipment List

Equipment	Brand	Model No.
EMI Test Receiver	Rohde & Schwarz	ESCS 30
Spectrum Analyzer	Rohde & Schwarz	FSP 30
Spectrum Analyzer	Rohde & Schwarz	FSEK 30
Signal Generator	Rohde & Schwarz	SMR27
Horn Antenna	SCHWARZBECK	BBHA 9120 D
Horn Antenna	SCHWARZBECK	BBHA 9170
Bilog Antenna	SCHWARZBECK	VULB 9168
Pre-Amplifier	MITEQ	919981
Pre-Amplifier	MITEQ	828825
Controller	HDGmbH	CM 100
Antenna Tower	HDGmbH	MA 2400
LISN	Rohde & Schwarz	ESH3-Z5
Wideband Peak Power Meter/ Sensor	Anritsu	ML2495A/ MA2411B
Temperature Humidity Test Chamber	Juror	TR-4010

- Note: 1. The above equipments are within the valid calibration period.  
2. The test antennas (receiving antenna) are calibration per 3 years.  
3. The video bandwidth of the power meter and sensor can be up to 65 MHz

### Measurement Uncertainty:

Measurement uncertainty was calculated in accordance with NAMAS NIS 81.

Parameter	Uncertainty
Radiated Emission	$\pm 4.98$ dB
Conducted Emission	$\pm 2.6$ dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k=2$ .