

TECHNICAL CONSULTING



**ISO/IEC17025Accredited Lab.**

Report No:

FCC 1312088-02

File reference No:

2013-12-20

Applicant: GamePop, Inc.

Product: MINI PC

Model No: Z1

Trademark: N/A

Test Standards: FCC Part 15 Subpart C, Paragraph 15.247

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.4,FCC Part 15 Subpart C, Paragraph 15.247 regulations for the evaluation of electromagnetic compatibility

Approved By

*Jack Chung*

Jack Chung

Manager

Dated: December 20, 2013

**Results appearing herein relate only to the sample tested**

**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**

**SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO., LTD**

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## **Special Statement:**

The testing quality ability of our laboratory meet with “Quality Law of People’s Republic of China” Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

### **CNAL-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAL/AC01:2002 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

### **FCC-Registration No.: 899988**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 899988.

### **IC- Registration No.: IC5205A-02**

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration IC No.: 5205A-02.

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## Test Report Conclusion

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## 1.0 General Details

### 1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO., LTD  
Address: 5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District, Shenzhen,CHINA.

Telephone: (755) 83448688

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Site on File with the Federal Communications Commission – United States

Registration Number: 899988

For 3m & 10 m OATS

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A-02

For 3m & 10 m OATS

### 1.2 Applicant Details

Applicant: GamePop, Inc.

Address: 2105S.Bascom Ave. #380, Campbell, California. 95008, USA

Telephone: 6506199110

Fax: --

### 1.3 Description of EUT

Product: MINI PC

Manufacturer: GamePop, Inc.

Address: 2105S.Bascom Ave. #380, Campbell, California. 95008, USA

Brand Name: N/A

Additional Brand Name: N/A

Model Number: Z1

Additional Model Name: N/A

Type of Modulation IEEE 802.11b : DSSS (CCK, QPSK, DBPSK)

IEEE 802.11g/n (HT20) : OFDM(64QAM, 16QAM, QPSK, BPSK)

Frequency range IEEE 802.11b/g/n (HT20) : 2412-2462MHz;

Channel Spacing IEEE 802.11b/g/n (HT20) : 5MHz

Air Data Rate IEEE 802.11b : 11, 5.5, 2, 1 Mbps

IEEE 802.11g : 54, 48, 36, 24, 18, 12, 9, 6 Mbps

IEEE 802.11n HT20 : 150, 117, 104, 78, 65, 58.5, 52, 39, 26, 19.5, 13, 6 Mbps

Frequency Selection By software

Channel Number IEEE 802.11b/g/n (HT20) : 11 Channels;

Antenna: Integral Antenna with maximum gain 2.0dBi

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1.4 Submitted Sample: 2 Samples

1.5 Test Duration

2013-12-16 to 2013-12-19

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions Uncertainty =4.7dB

1.7 Test Engineer

*Terry Tang*

The sample tested by \_\_\_\_\_

Print Name: Terry Tang

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2.0	Test Equipments				
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2013-08-23	2014-08-22
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100294	2013-08-23	2014-08-22
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100253	2013-08-23	2014-08-22
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2013-08-25	2014-08-24
ESDV Test Receiver	ROHDE&SCHWARZ	ESDV	100008	2013-08-23	2014-08-22
Impuls-Begrenzer	ROHDE&SCHWARZ	ESH3-Z2	100281	2013-08-24	2014-08-23
System Controller	CT	SC100	-	--	--
Printer	EPSON	PHOTO EX3	CFNH234850	--	--
Computer	IBM	8434	1S8434KCE99BLXL O*	-	-
Loop Antenna	EMCO	6502	00042960	2013-08-23	2014-08-22
ESPI Test Receiver	ROHDE&SCHWARZ	ESI26	838786/013	2013-08-23	2014-08-22
3m OATS	--	--	N/A	2013-08-22	2014-08-21
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170265	2013-08-24	2014-08-23
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-631	2013-08-24	2014-08-23
Power meter	Anritsu	ML2487A	6K00003613	2013-08-24	2014-08-23
Power sensor	Anritsu	MA2491A	32263	2013-08-24	2014-08-23
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2013-08-24	2014-08-23
LISN	AFJ	LS16C	10010947251	2013-08-23	2014-08-22
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2013-08-23	2014-08-22
9*6*6 Anechoic	--	--	N/A	2013-08-22	2014-08-21
EMI Test Receiver	RS	ESCS30	100139	2013-08-23	2014-08-22
LISN	AFJ	LS16C	10010947251	2013-08-23	2014-08-22
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2013-08-23	2014-08-22

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## 2.1 Auxiliary Equipment

Name	Model No.	Serial No.	Manufacturer	Cable	FCC ID/DOC
TF Card	--	--	Kingston	--	--
U-Disk	--	--	Kingston	--	DOC
LCD Monitor	PH2450	--	SAMSUNG		DOC

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## DESCRIPTION OF TEST MODES

### IEEE 802.11b, 802.11g, 802.11n (HT20) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 11Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n (HT20) mode: 65Mbps data rate (worst case) were chosen for full testing

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### 3.0 Technical Details

#### 3.1 Summary of test results

The EUT has been tested according to the following specifications:			
Standard	Test Type	Result	Notes
<b>FCC Part 15, Paragraph 15.107 &amp; 15.207 &amp; RSS-210 Issue 8</b>	Conducted Emission Test	PASS	Complies
<b>FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit &amp; RSS-210 Issue 8</b>	<b>Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth&gt;500kHz</b>	PASS	Complies
<b>FCC Part 15, Paragraph 15.247(b) &amp; RSS-210 Issue 8</b>	<b>Maximum peak output power Limit: max. 30dBm</b>	PASS	Complies
<b>FCC Part 15, Paragraph 15.109,15.205 &amp; 15.209 &amp; RSS-210 Issue 8</b>	<b>Transmitter Radiated Emission Limit: Table 15.209</b>	PASS	Complies
<b>FCC Part 15, Paragraph 15.247(e) &amp; RSS-210 Issue 8</b>	<b>Power Spectral Density Limit: max. 8dBm</b>	PASS	Complies
<b>FCC Part 15, Paragraph 15.247(d) &amp; RSS-210 Issue 8</b>	<b>Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209</b>	PASS	Complies

#### 3.2 Test Standards

**FCC Part 15 Subpart & Subpart C, Paragraph 15.247**

#### 4.0 EUT Modification

**No modification by Shenzhen Timeway Technology Consulting Co., Ltd**

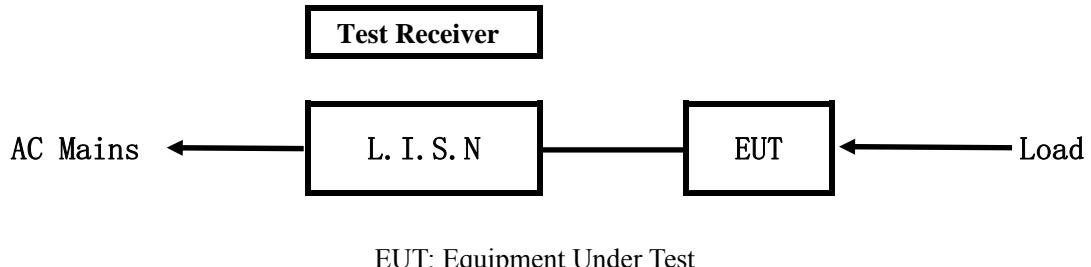
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## 5. Power Line Conducted Emission Test

### 5.1 Schematics of the test

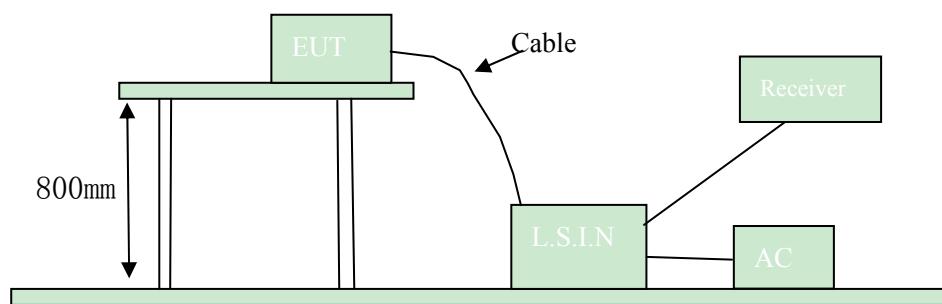


### 5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2003. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 –2003.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



### 5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

#### A. EUT

Device	Manufacturer	Model	FCC ID
MINI PC	GamePop, Inc.	Z1	2ABLR-1218

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B. Internal Device

Device	Manufacturer	Model	Rating

C. Peripherals

Device	Manufacturer	Model	Rating
--	--	--	--

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4 -2003.

A Setup the EUT and simulators as shown on follow  
B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207 and 15.107

Frequency (MHz)	Class A Limits (dB $\mu$ V)		Class B Limits (dB $\mu$ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

Notes: 1. \*Decreasing linearly with logarithm of frequency.  
2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

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**A: Conducted Emission on Live Terminal (150kHz to 30MHz)**

**EUT Operating Environment**

Temperature: 26°C      Humidity: 65%RH      Atmospheric Pressure: 101 KPa

**EUT set Condition: Keep WIFI Transmitting**

**Equipment Level: Class B**

**Results: PASS**

Please refer to following diagram for individual



Frequency (MHz)	Line	Reading(dB $\mu$ V)		Limit(dB $\mu$ V)	
		Quasi-peak	Average	Quasi-peak	Average
0.154	Live	60.65	39.42	65.77	55.77
0.197	Live	56.94	35.42	63.74	53.74
0.256	Live	54.59	33.90	61.54	51.54
1.006	Live	51.18	33.39	56.00	46.00
1.703	Live	51.48	32.36	56.00	46.00
4.471	Live	50.94	31.94	56.00	46.00

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**B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)**

**EUT Operating Environment**

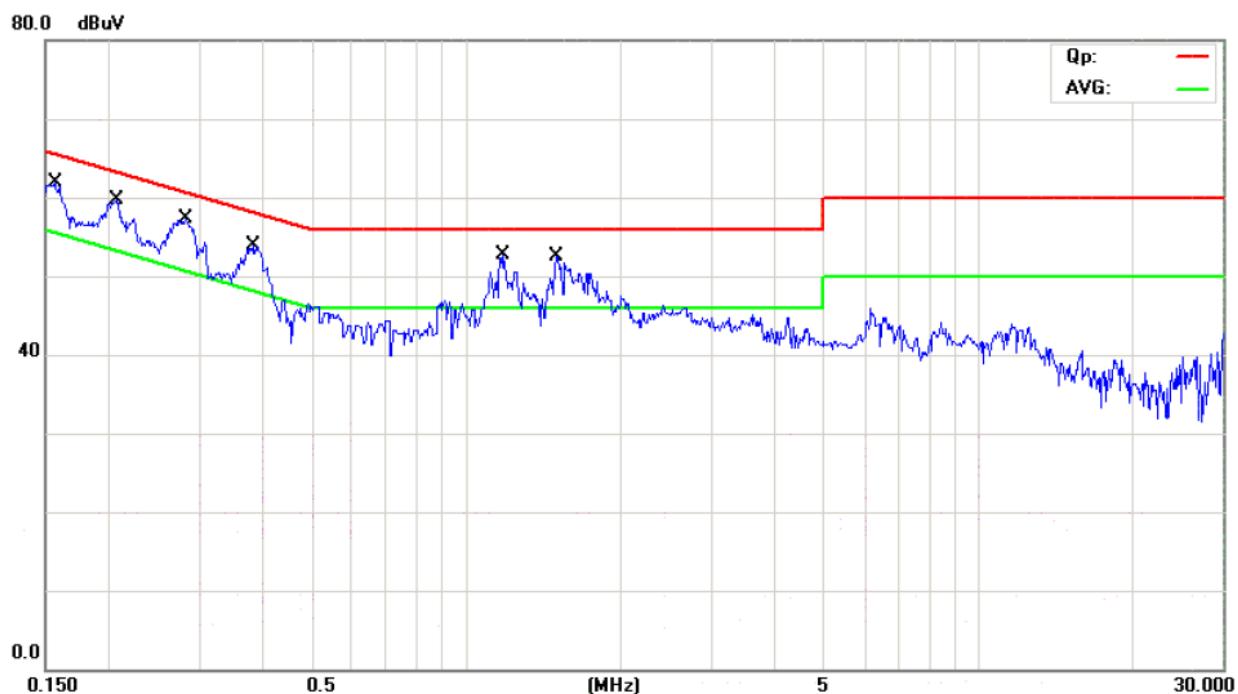
Temperature: 26°C      Humidity: 65%RH      Atmospheric Pressure: 101 KPa

**EUT set Condition: Keep WIFI Transmitting**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual



Frequency (MHz)	Line	Reading(dB $\mu$ V)		Limit(dB $\mu$ V)	
		Quasi-peak	Average	Quasi-peak	Average
0.156	Neutral	59.95	40.32	65.67	55.67
0.206	Neutral	57.61	37.78	63.37	53.37
0.281	Neutral	54.25	33.70	60.78	50.78
0.383	Neutral	51.82	30.86	58.21	48.21
1.175	Neutral	50.63	34.16	56.00	46.00
1.501	Neutral	50.49	35.83	56.00	46.00

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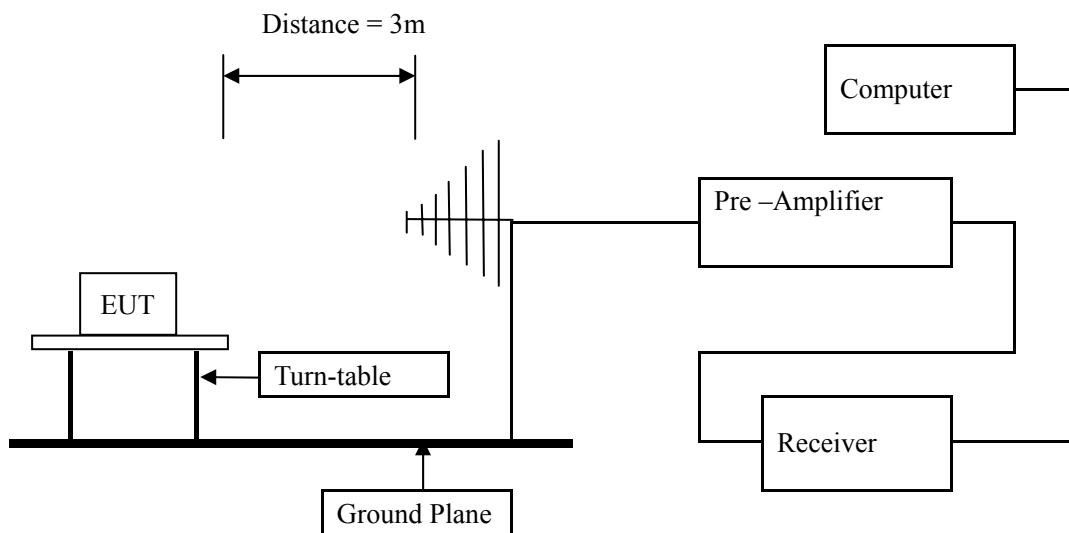
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## 6 Radiated Emission Test

### 6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.4 –2003. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2003.
- (3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a “QP” in the data table.
- (6) The antenna polarization : Vertical polarization and Horizontal polarization.

### Block diagram of Test setup



### 6.2 Configuration of The EUT

Same as section 5.3 of this report

### 6.3 EUT Operating Condition

Same as section 5.4 of this report.

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#### 6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

#### **Frequencies in restricted band are complied to limit on Paragraph 15.209 and 15.109 and RSS-210**

Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note:

1. RF Voltage (dBuV) =  $20 \log_{10} \text{RF Voltage (uV)}$
2. In the Above Table, the higher limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

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**Test result**

**General Radiated Emission Data and Harmonics Radiated Emission Data**

**Radiated Emission In Horizontal (30MHz----1000MHz)**

**EUT set Condition: Keep WIFI Transmitting**

**Results: Pass**

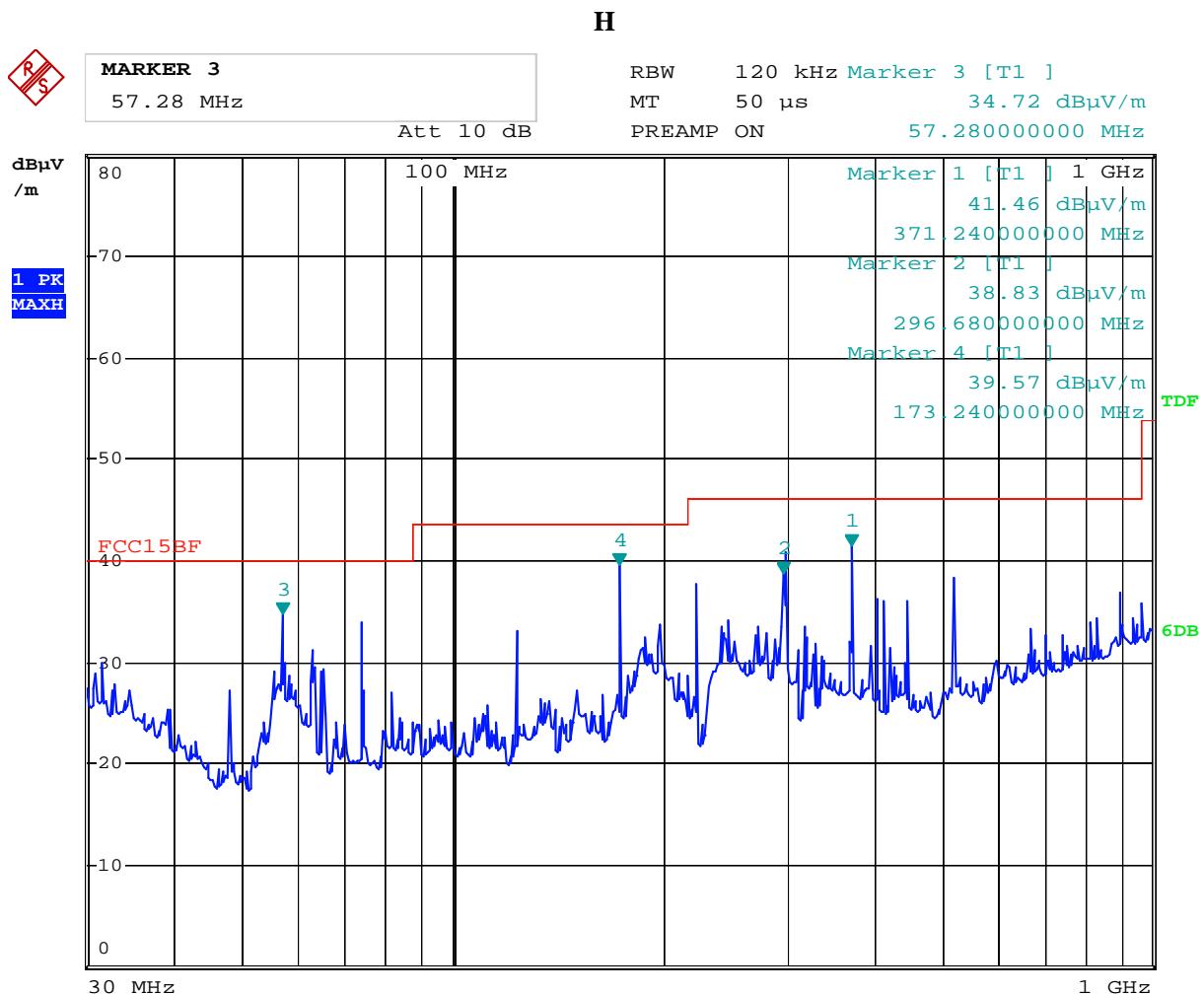
Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
371.240	41.46	H	46.00
296.680	38.83	H	46.00
57.280	34.72	H	40.00
173.240	39.57	H	43.50
300.040	41.28	V	46.00
123.760	39.30	V	43.50
74.240	36.01	V	40.00

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Test Figure:



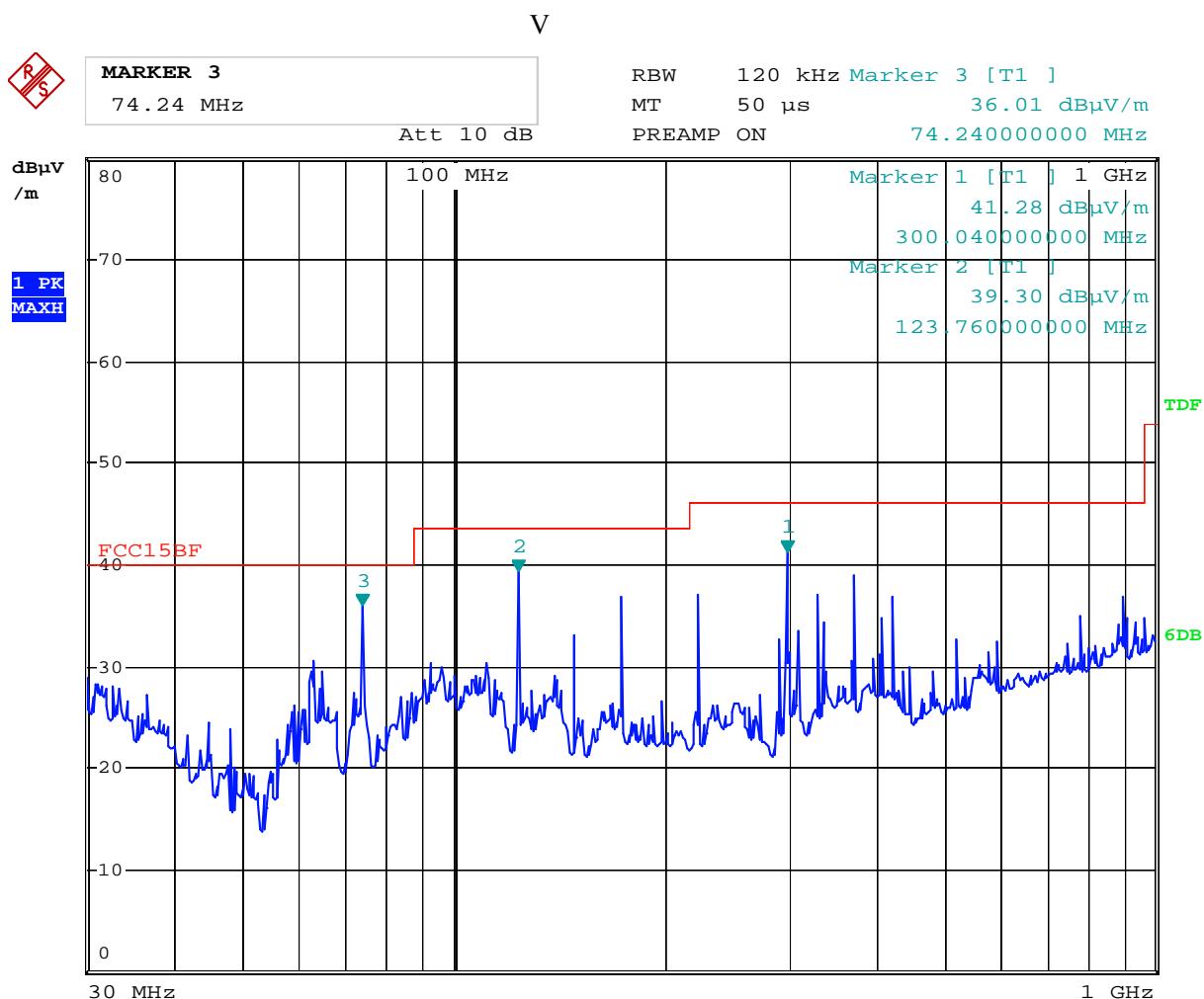
Date: 16.DEC.2013 16:06:01

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### Test Figure:



Date: 16.DEC.2013 16:15:25

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**Operation Mode: Keeping Transmitting under CH01 for 11g at 6Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2412.00	105.74 (PK)	H	Fundamental Frequency
2412.00	105.69 (PK)	V	
4824.00	48.28 (PK)	H	74(Peak)/ 54(AV)
4824.00	48.32 (PK)	V	74(Peak)/ 54(AV)
7236.00	--	H/V	74(Peak)/ 54(AV)
9648.00	--	H/V	74(Peak)/ 54(AV)
12060	--	H/V	74(Peak)/ 54(AV)
14472	--	H/V	74(Peak)/ 54(AV)
16884	--	H/V	74(Peak)/ 54(AV)
19296	--	H/V	74(Peak)/ 54(AV)
21708	--	H/V	74(Peak)/ 54(AV)
24120	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11g mode 6Mbps

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**Operation Mode: Keeping Transmitting under CH06 for 11g at 6Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2437.00	106.88 (PK)	H	Fundamental Frequency
2437.00	106.20 (PK)	V	
4874.00	48.47 (PK)	H	74(Peak)/ 54(AV)
4874.00	48.57 (PK)	V	74(Peak)/ 54(AV)
7311.00	--	H/V	74(Peak)/ 54(AV)
9748.00	--	H/V	74(Peak)/ 54(AV)
12185	--	H/V	74(Peak)/ 54(AV)
14622	--	H/V	74(Peak)/ 54(AV)
17059	--	H/V	74(Peak)/ 54(AV)
19496	--	H/V	74(Peak)/ 54(AV)
21933	--	H/V	74(Peak)/ 54(AV)
24370	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11g mode 6 Mbps

**Operation Mode: Transmitting under CH11 for 11g at 6Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2462.00	104.43 (PK)	H	Fundamental Frequency
2462.00	104.36 (PK)	V	
4924	47.58 (PK)	H	74(Peak)/ 54(AV)
4924	47.64 (PK)	V	74(Peak)/ 54(AV)
7368	--	H/V	74(Peak)/ 54(AV)
9848	--	H/V	74(Peak)/ 54(AV)
12310	--	H/V	74(Peak)/ 54(AV)
14772	--	H/V	74(Peak)/ 54(AV)
17234	--	H/V	74(Peak)/ 54(AV)
19696	--	H/V	74(Peak)/ 54(AV)
22158	--	H/V	74(Peak)/ 54(AV)
24650	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11g mode at 6 Mbps

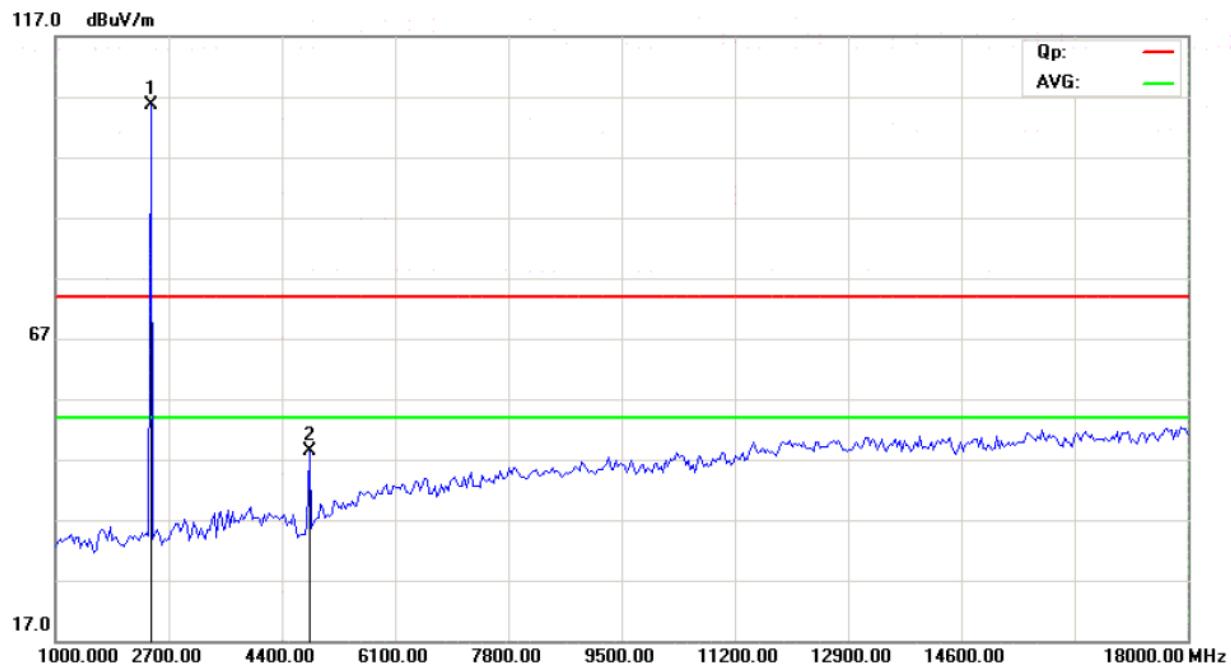
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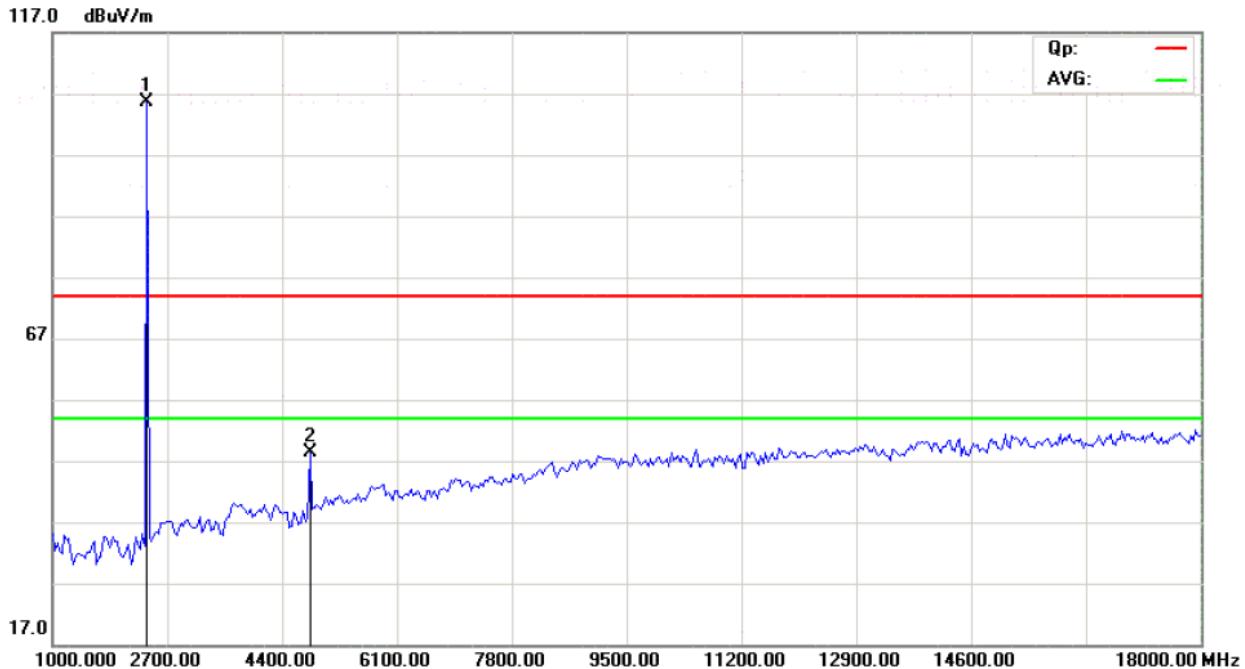
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Please refer to the following test plots for details:

**CH01 for 11g at 6Mbps: Horizontal**



**CH01 for 11g at 6Mbps: Vertical**

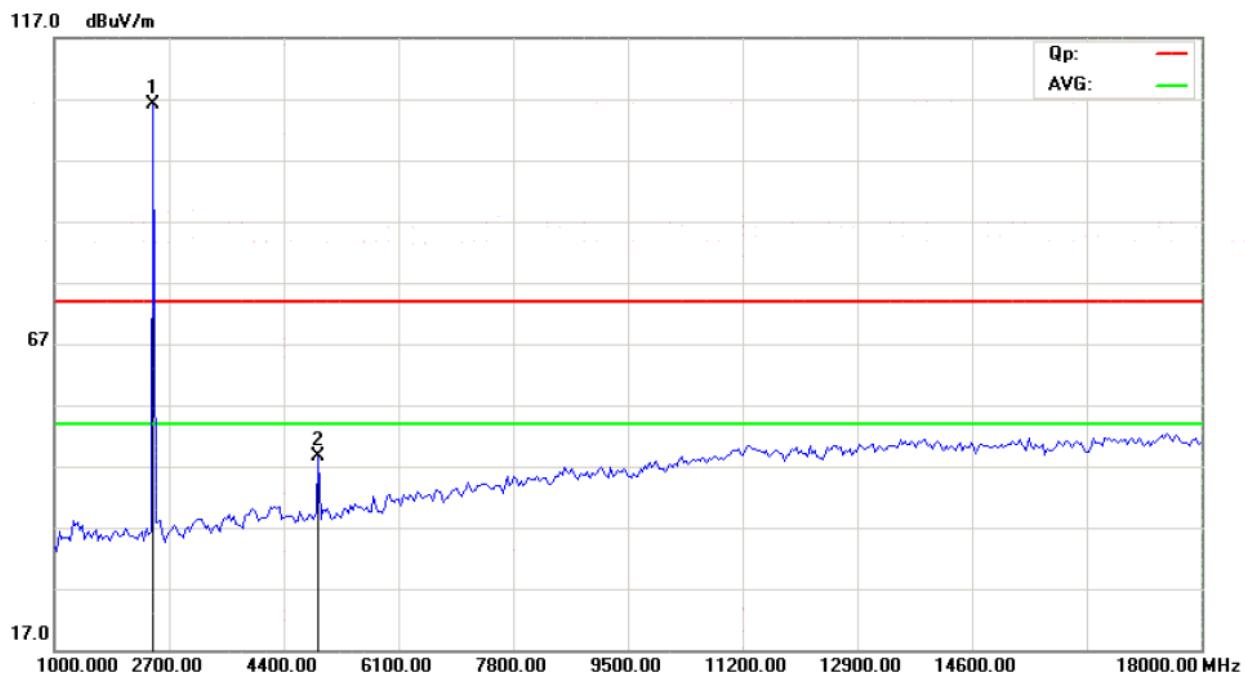


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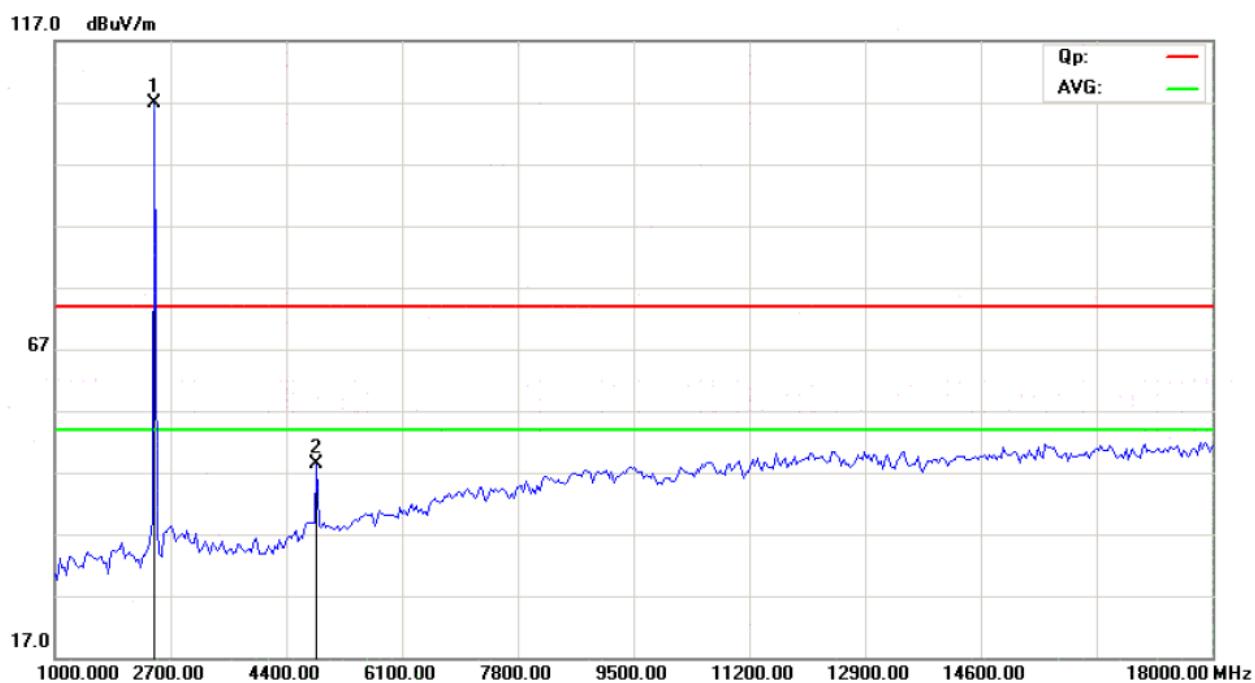
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### CH06 for 11g at 6Mbps: Vertical



### CH06 for 11g at 6Mbps: Horizontal

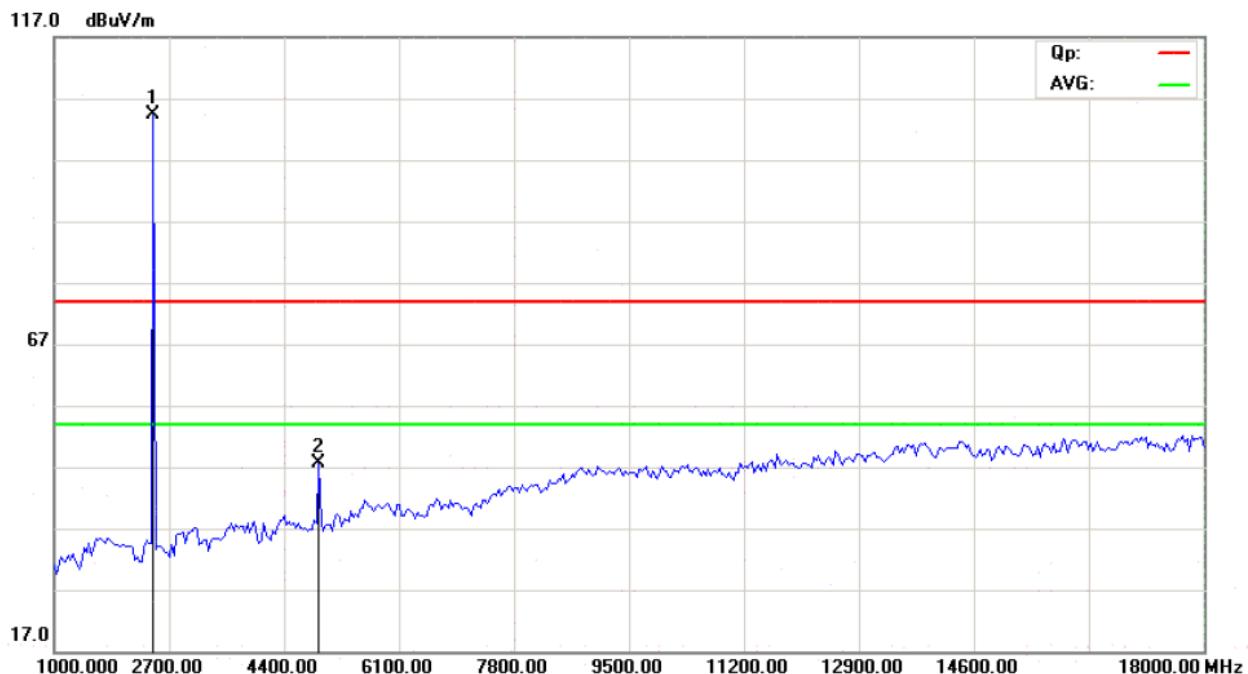


The report refers only to the sample tested and does not apply to the bulk.

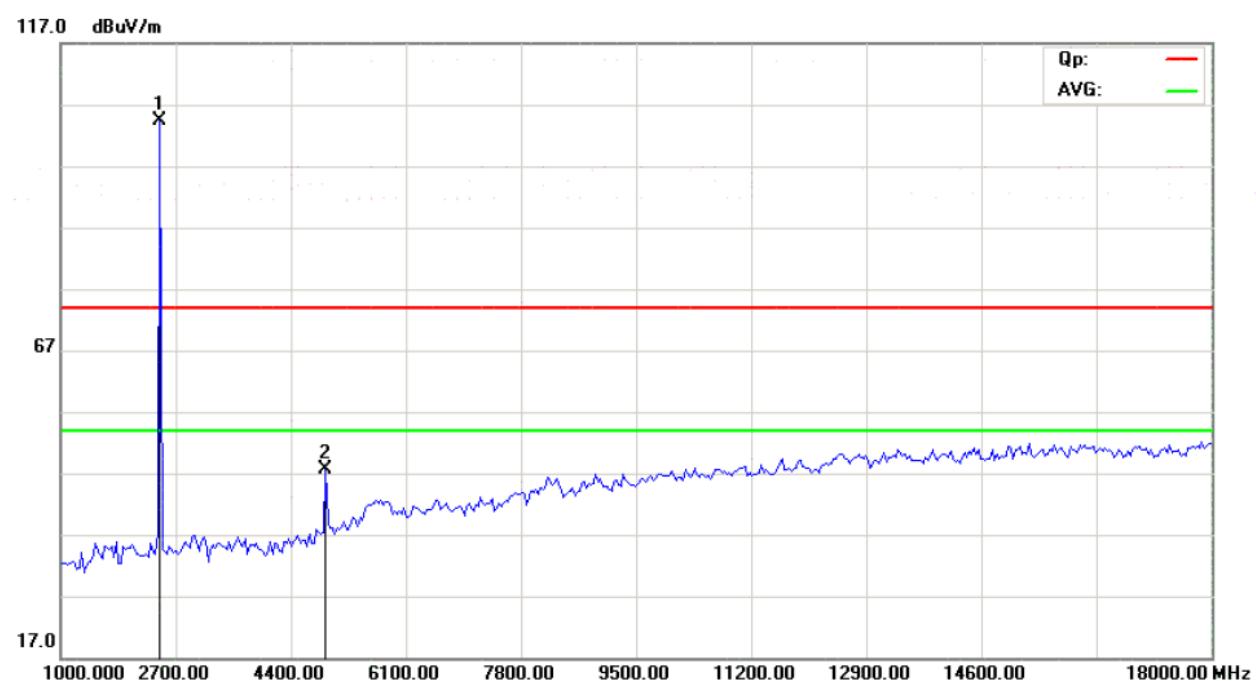
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### CH11 for 11g at 6Mbps: Vertical



### CH11 for 11g at 6Mbps: Horizontal



Note: For radiated Emissions from 18-25GHz, it is only the floor noise.

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**Operation Mode: Keeping Transmitting under CH01 for 11b at 11Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2412.00	104.31 (PK)	V	Fundamental Frequency
2412.00	104.26 (PK)	H	
4824.00	47.82 (PK)	H	74(Peak)/ 54(AV)
4824.00	47.59 (PK)	V	74(Peak)/ 54(AV)
7236.00	--	H/V	74(Peak)/ 54(AV)
9648.00	--	H/V	74(Peak)/ 54(AV)
12060	--	H/V	74(Peak)/ 54(AV)
14472	--	H/V	74(Peak)/ 54(AV)
16684	--	H/V	74(Peak)/ 54(AV)
19296	--	H/V	74(Peak)/ 54(AV)
21708	--	H/V	74(Peak)/ 54(AV)
24120	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11b mode 11Mbps

**Operation Mode: Keeping Transmitting under CH06 for 11b at 11Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2437.00	105.13 (PK)	H	Fundamental Frequency
2437.00	105.15 (PK)	V	
4874.00	47.62 (PK)	H	74(Peak)/ 54(AV)
4874.00	47.81 (PK)	V	74(Peak)/ 54(AV)
7311.00	--	H/V	74(Peak)/ 54(AV)
9748.00	--	H/V	74(Peak)/ 54(AV)
12185	--	H/V	74(Peak)/ 54(AV)
14622	--	H/V	74(Peak)/ 54(AV)
17059	--	H/V	74(Peak)/ 54(AV)
19496	--	H/V	74(Peak)/ 54(AV)
21933	--	H/V	74(Peak)/ 54(AV)
24370	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11b mode 11Mbps

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**Operation Mode: Keeping Transmitting under CH11 for 11b at 11Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2462.00	106.38 (PK)	H	Fundamental Frequency
2462.00	106.67 (PK)	V	
4924	48.72 (PK)	H	74(Peak)/ 54(AV)
4924	48.13 (PK)	V	74(Peak)/ 54(AV)
7368	--	H/V	74(Peak)/ 54(AV)
9848	--	H/V	74(Peak)/ 54(AV)
12310	--	H/V	74(Peak)/ 54(AV)
14772	--	H/V	74(Peak)/ 54(AV)
17234	--	H/V	74(Peak)/ 54(AV)
19696	--	H/V	74(Peak)/ 54(AV)
22158	--	H/V	74(Peak)/ 54(AV)
24650	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11b mode at 11Mbps

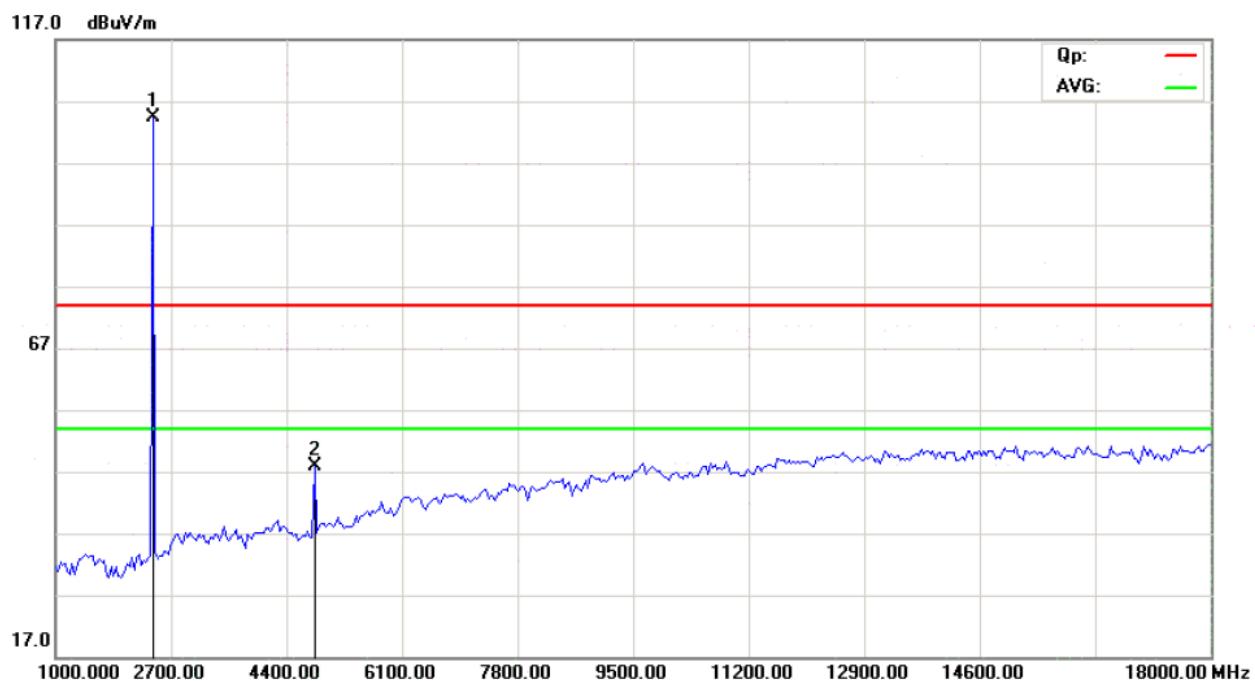
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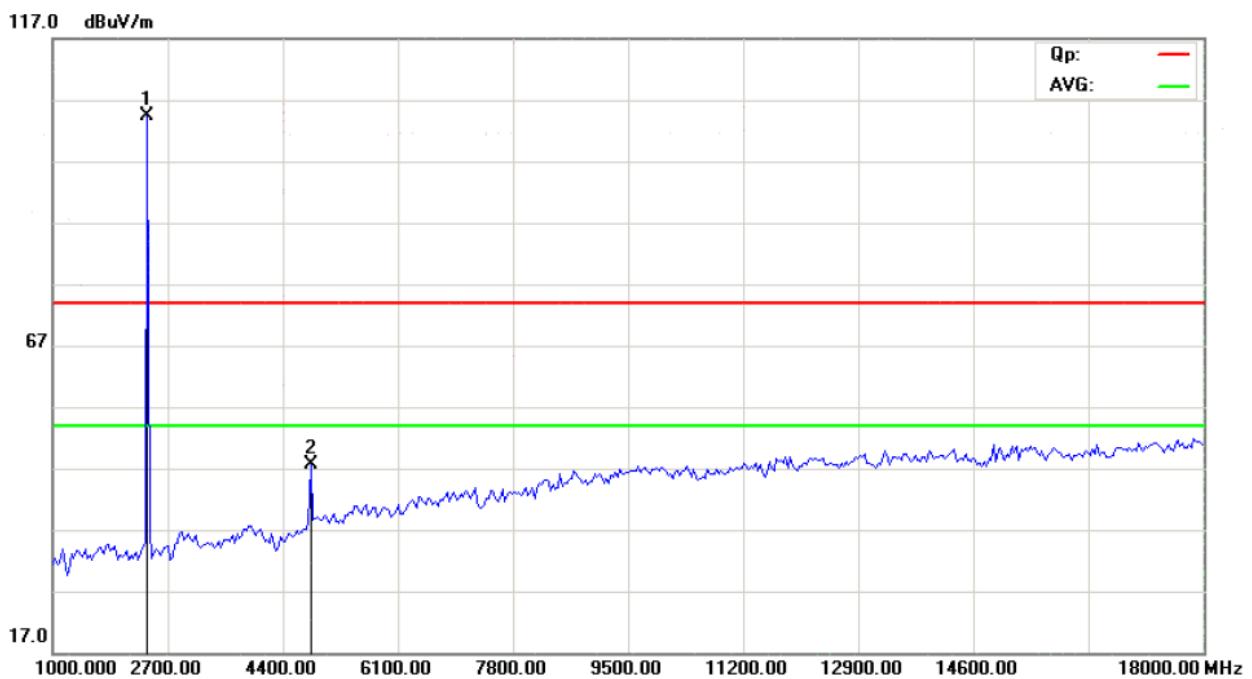
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Please refer to the following test plots for details:

**CH01 for 11b at 11Mbps: Horizontal**



**CH01 for 11b at 11Mbps: Vertical**

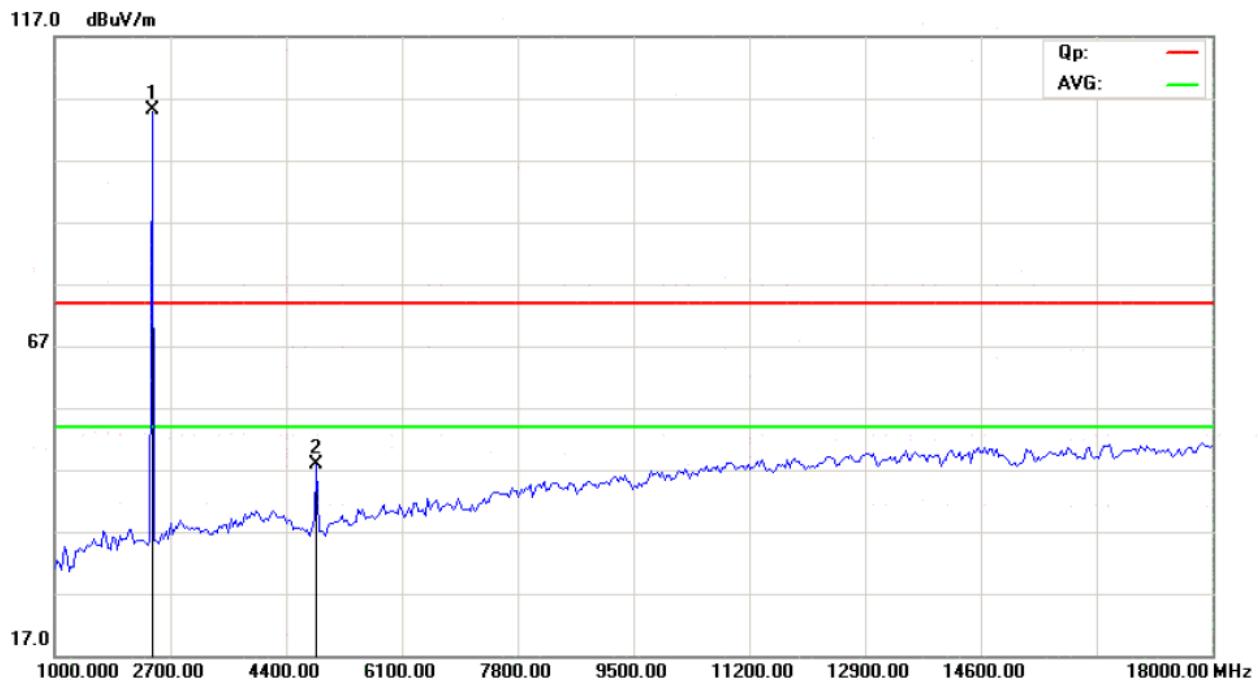


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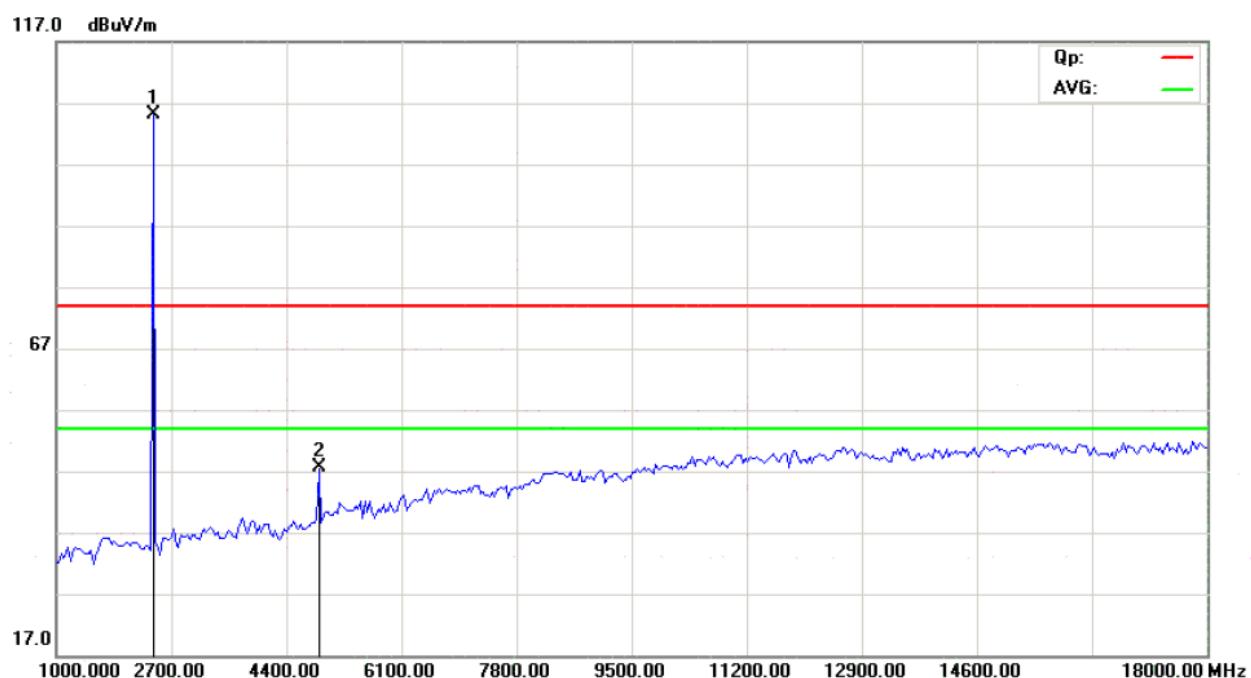
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### CH06 for 11b at 11Mbps: Vertical



### CH06 for 11b at 11Mbps: Horizontal

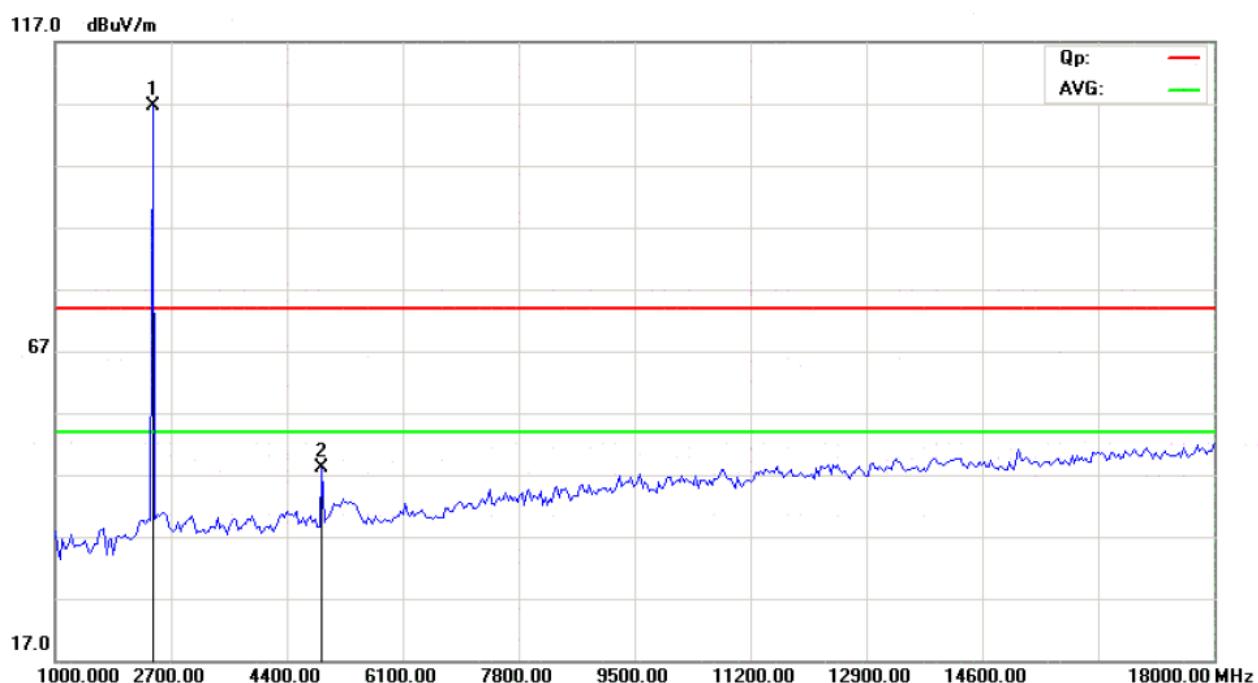


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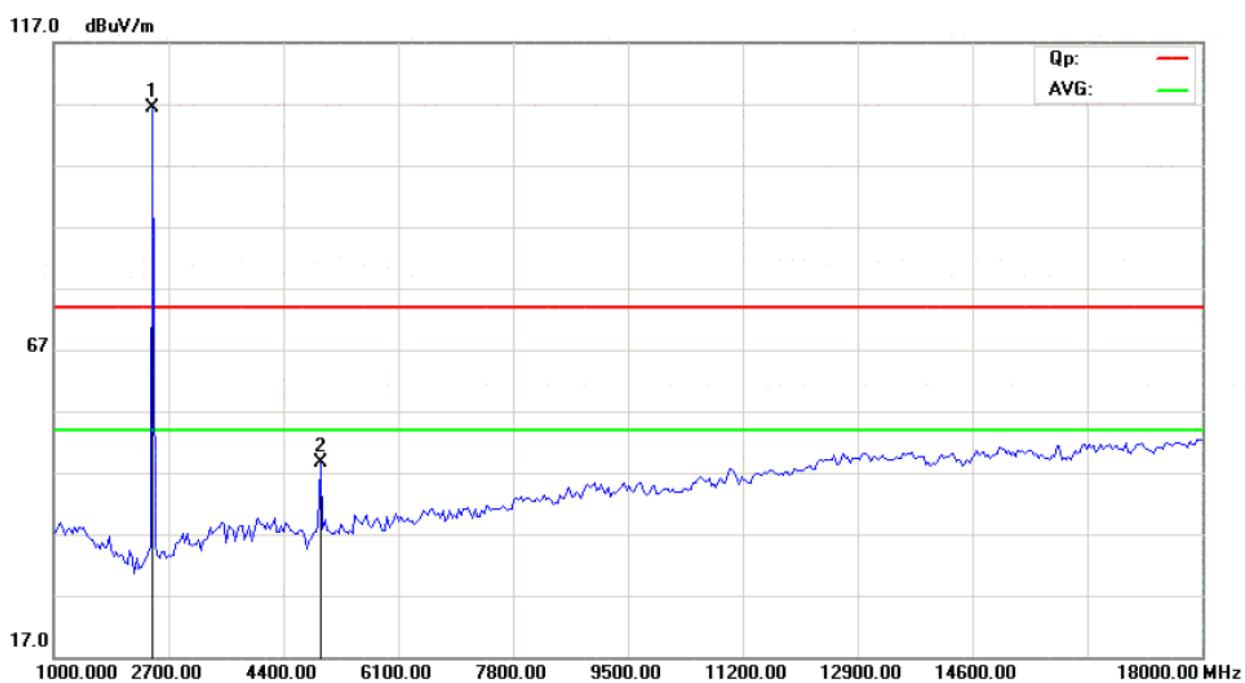
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### CH11 for 11b at 11Mbps: Vertical



### CH11 for 11b at 11Mbps: Horizontal



Note: For radiated Emissions from 18-25GHz, it is only the floor noise.

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**Operation Mode: Keeping Transmitting under CH01 for 11n HT20 at 65Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2412.00	106.36 (PK)	H	Fundamental Frequency
2412.00	106.42 (PK)	V	
4824.00	47.35 (PK)	H	74(Peak)/ 54(AV)
4824.00	49.09 (PK)	V	74(Peak)/ 54(AV)
7236.00	--	H/V	74(Peak)/ 54(AV)
9648.00	--	H/V	74(Peak)/ 54(AV)
12060	--	H/V	74(Peak)/ 54(AV)
14472	--	H/V	74(Peak)/ 54(AV)
16684	--	H/V	74(Peak)/ 54(AV)
19296	--	H/V	74(Peak)/ 54(AV)
21708	--	H/V	74(Peak)/ 54(AV)
24120	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11n (HT20) mode 65Mbps

**Operation Mode: Keeping Transmitting under CH06 for 11n HT20 at 65Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2437.00	104.55 (PK)	H	Fundamental Frequency
2437.00	104.51 (PK)	V	
4874.00	47.54 (PK)	H	74(Peak)/ 54(AV)
4874.00	47.69 (PK)	V	74(Peak)/ 54(AV)
7311.00	--	H/V	74(Peak)/ 54(AV)
9748.00	--	H/V	74(Peak)/ 54(AV)
12185	--	H/V	74(Peak)/ 54(AV)
14622	--	H/V	74(Peak)/ 54(AV)
17059	--	H/V	74(Peak)/ 54(AV)
19496	--	H/V	74(Peak)/ 54(AV)
21933	--	H/V	74(Peak)/ 54(AV)
24370	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “--” means that the emissions level is too low to be measured

3. For 802.11n (HT20) mode 65Mbps

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**Operation Mode: Keeping Transmitting under CH11 for 11n HT20 at 65Mbps**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2462.00	105.12 (PK)	H	Fundamental Frequency
2462.00	105.31 (PK)	V	
4924	48.69 (PK)	H	74(Peak)/ 54(AV)
4924	47.64 (PK)	V	74(Peak)/ 54(AV)
7368	--	H/V	74(Peak)/ 54(AV)
9848	--	H/V	74(Peak)/ 54(AV)
12310	--	H/V	74(Peak)/ 54(AV)
14772	--	H/V	74(Peak)/ 54(AV)
17234	--	H/V	74(Peak)/ 54(AV)
19696	--	H/V	74(Peak)/ 54(AV)
22158	--	H/V	74(Peak)/ 54(AV)
24650	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit  
2. Remark “---” means that the emissions level is too low to be measured  
3. For 802.11n (HT20) mode 65Mbps

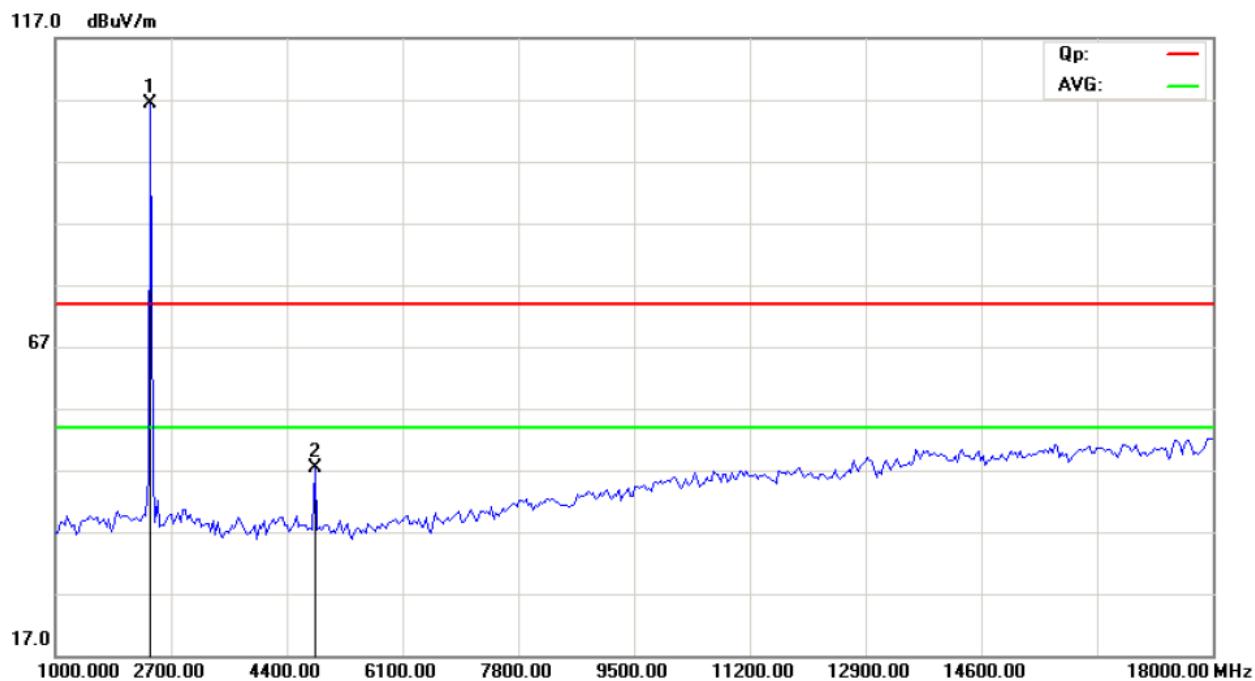
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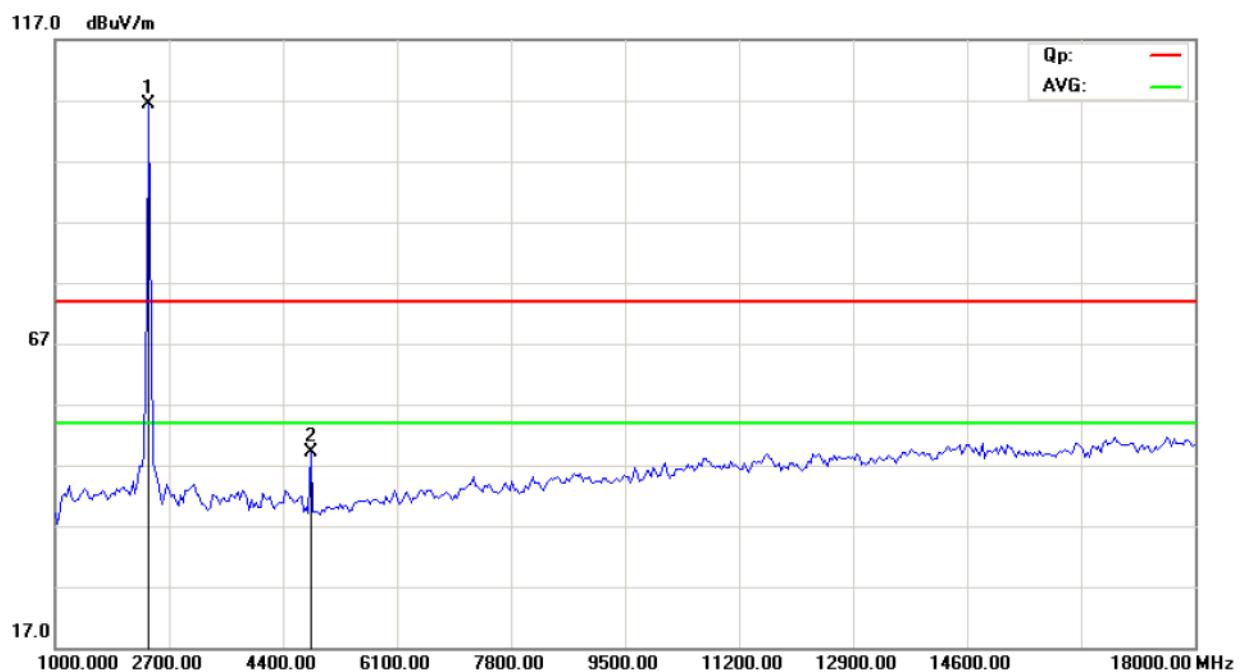
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Please refer to the following test plots for details:

**CH01 for 11n HT20 at 65Mbps: Horizontal**



**CH01 for 11n HT20 at 65Mbps: Vertical**

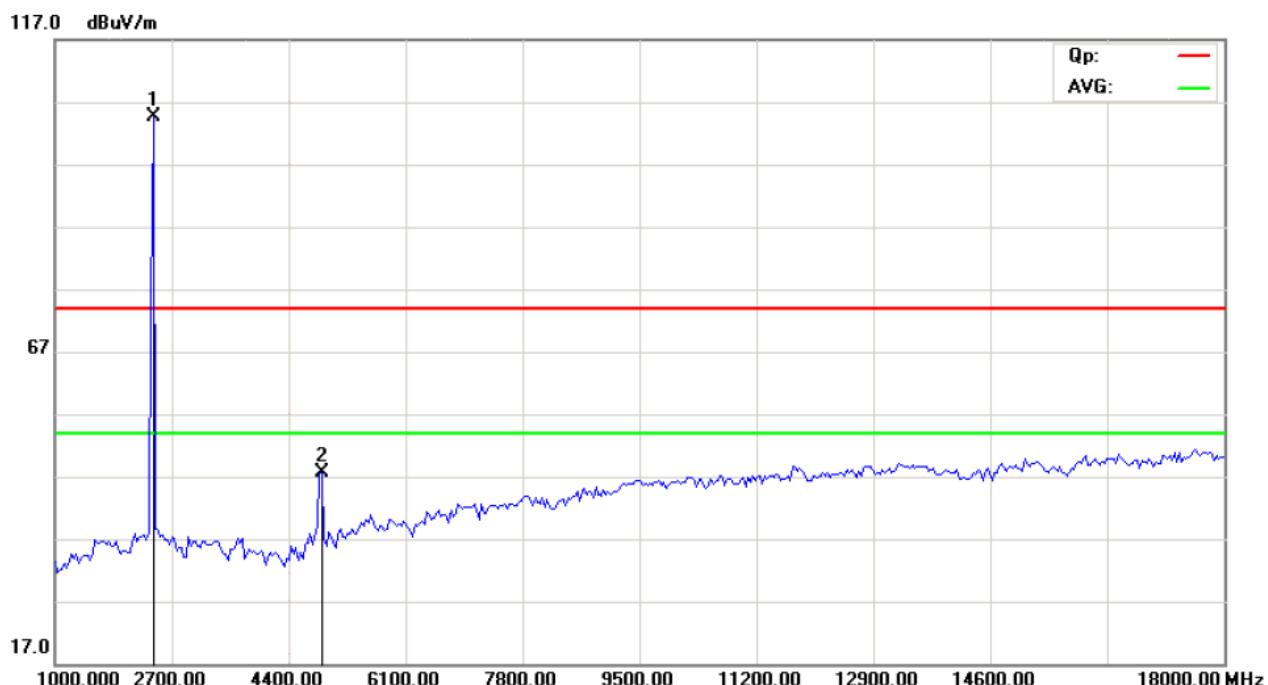


The report refers only to the sample tested and does not apply to the bulk.

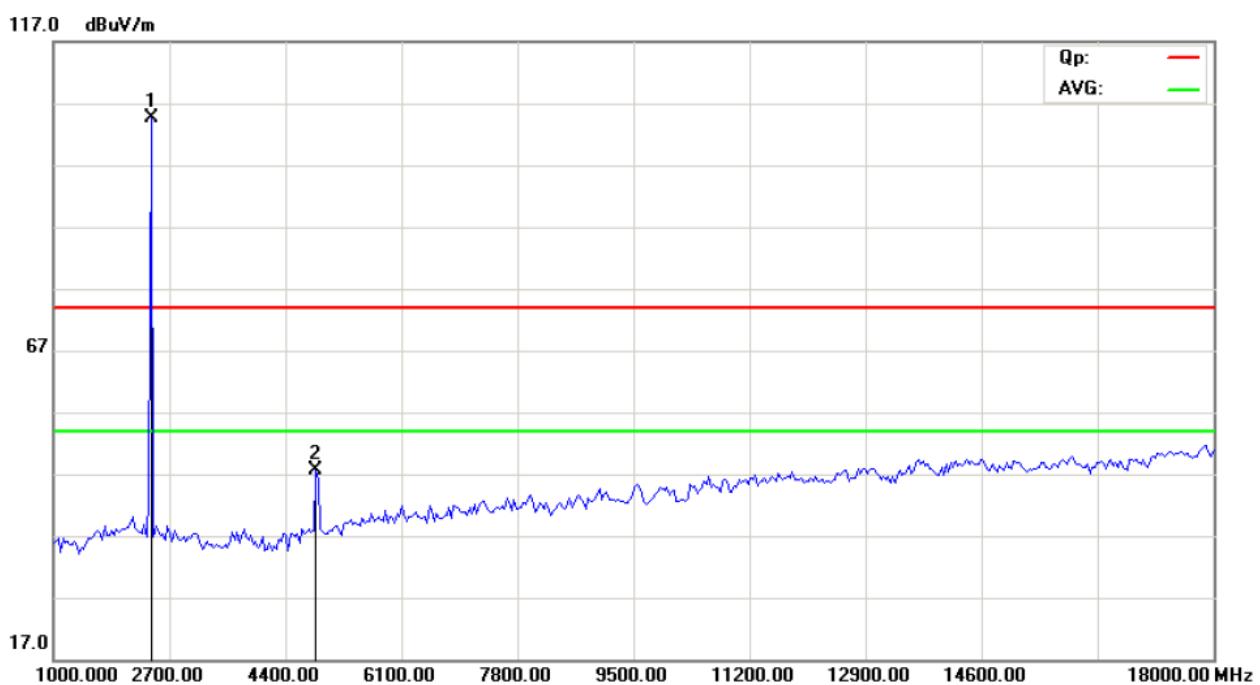
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**CH06 for 11n HT20 at 65Mbps: Vertical**



**CH06 for 11n HT20 at 65Mbps: Horizontal**

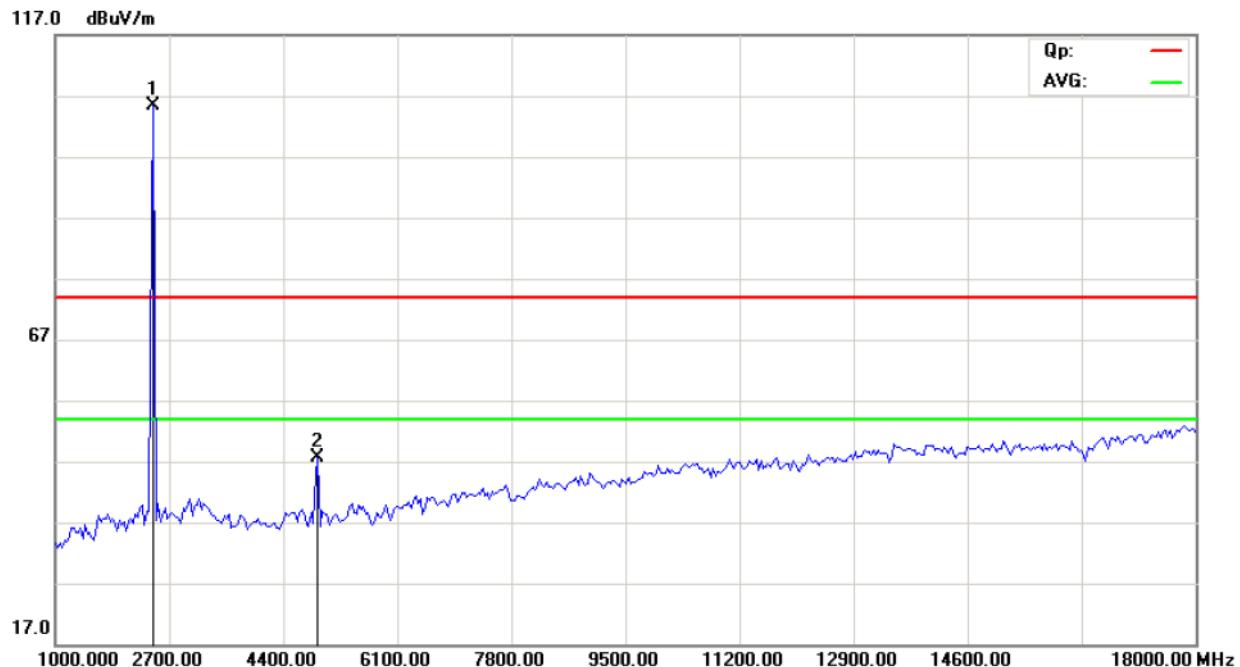


The report refers only to the sample tested and does not apply to the bulk.

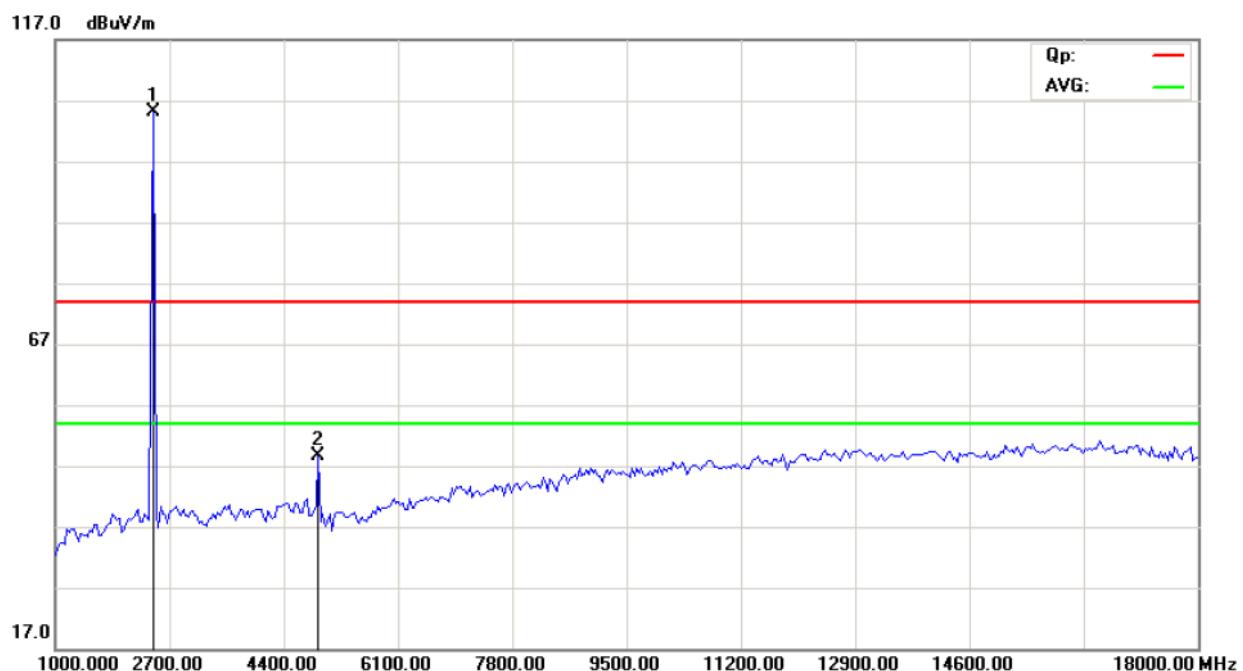
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**CH11 for 11n HT20 at 65Mbps: Vertical**



**CH11 for 11n HT20 at 65Mbps: Horizontal**



Note: For radiated Emissions from 18-25GHz, it is only the floor noise.

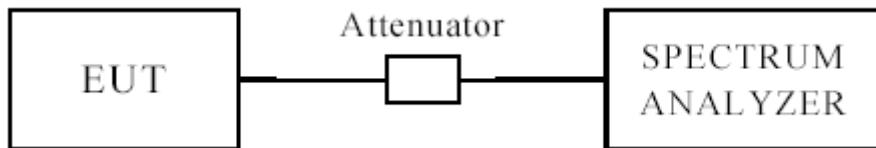
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## 7.0 6dB Bandwidth Measurement

### 7.1 Test Setup



### 7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

### 7.3 Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 7.4 Test Result

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### 6dB Occupied Bandwidth

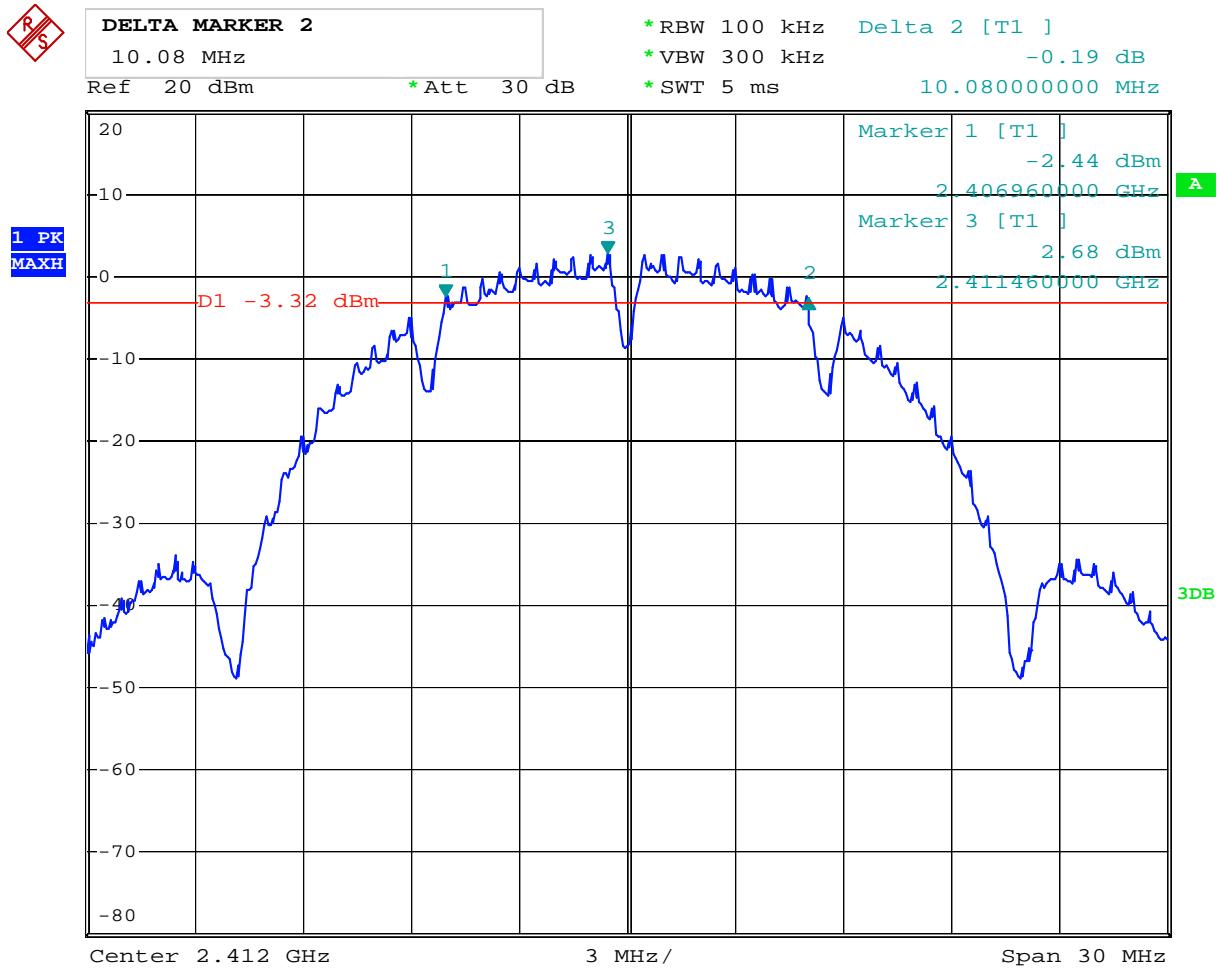
EUT		MINI PC		Model	
Mode		802.11b		Input Voltage	
Temperature		24 deg. C,		Humidity	
Channel	Channel Frequency (MHz)	Data Transfer Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/ Fail
1	2412	1	10.08	0.5	Pass
6	2437	1	10.08	0.5	Pass
11	2462	1	10.08	0.5	Pass
1	2412	11	9.48	0.5	Pass
6	2437	11	9.42	0.5	Pass
11	2462	11	9.48	0.5	Pass

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### 1. 802.11b at 1Mbps of CH01



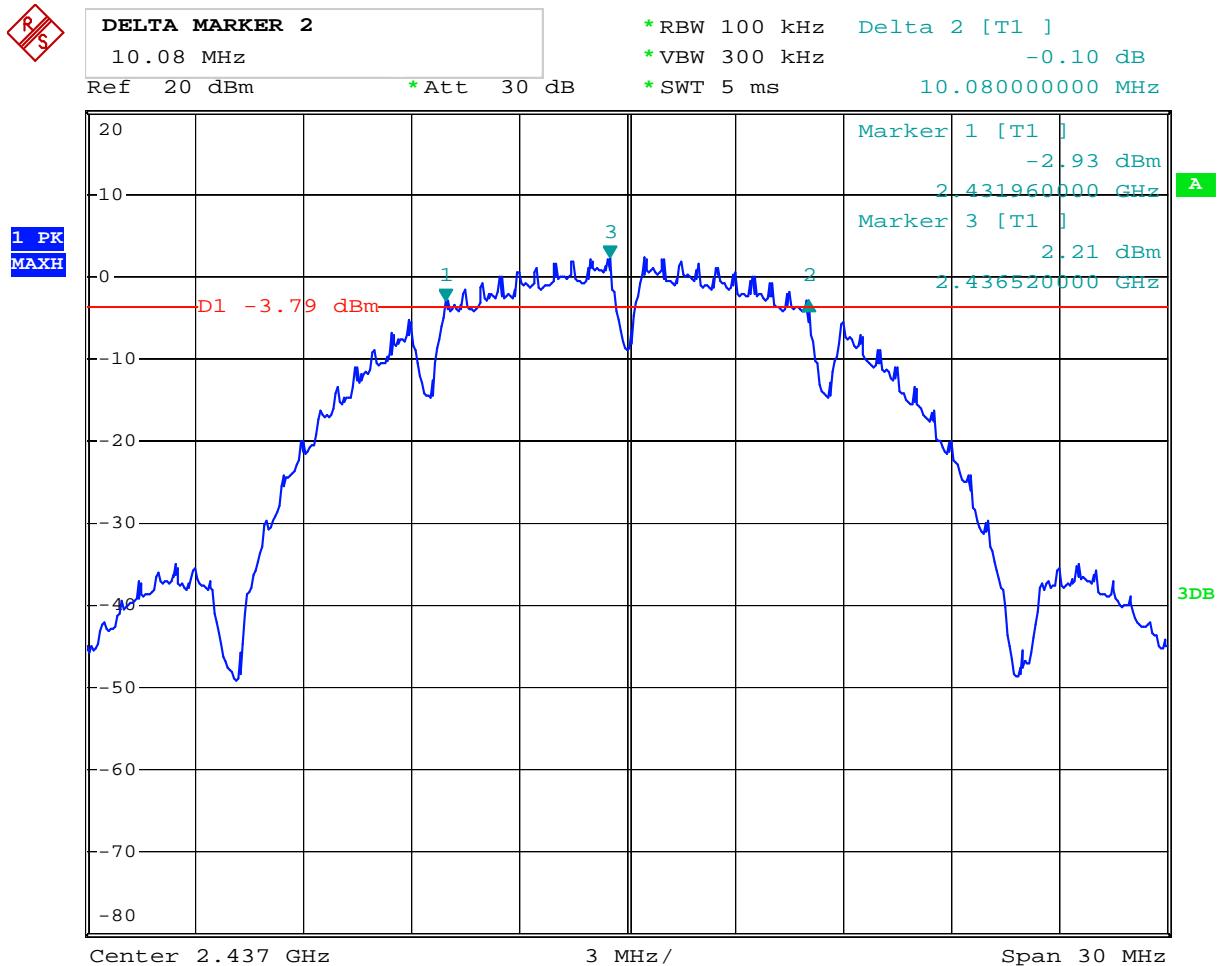
Date: 18.DEC.2013 10:51:33

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## 2. 802.11b at 1Mbps of CH06



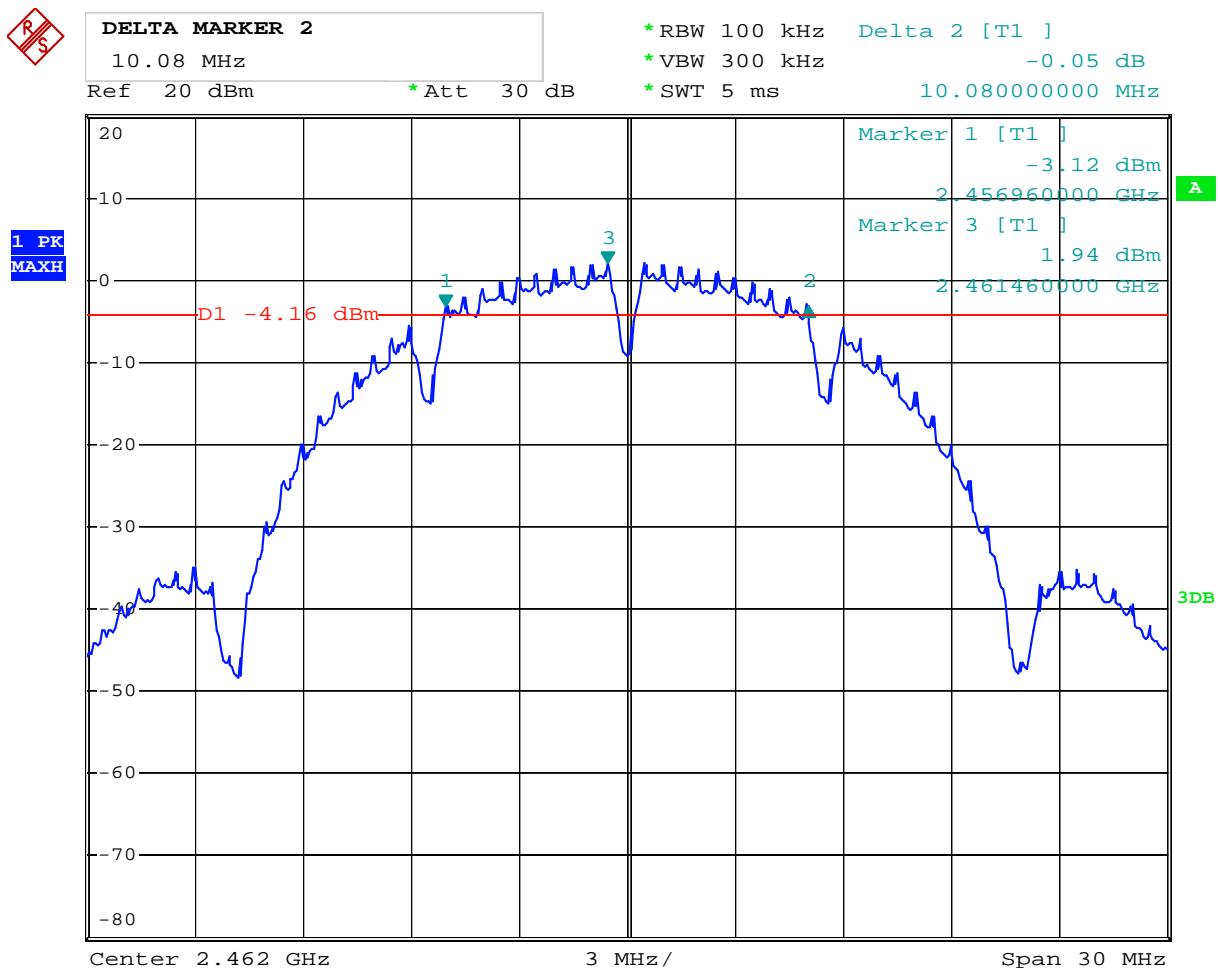
Date: 18.DEC.2013 10:58:56

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### 3. 802.11b at 1Mbps of CH11



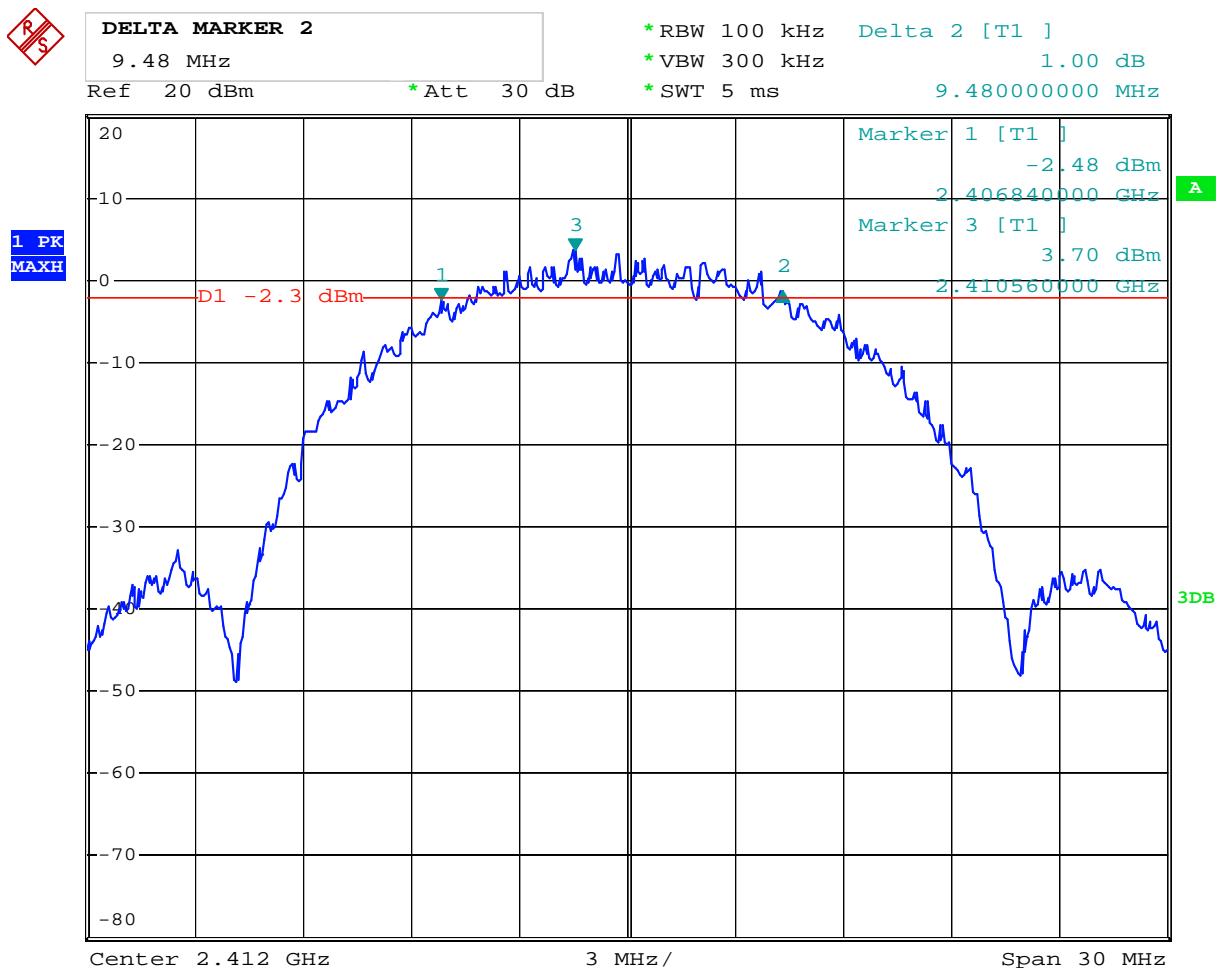
Date: 18.DEC.2013 11:00:16

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#### 4. 802.11b at 11Mbps of CH01



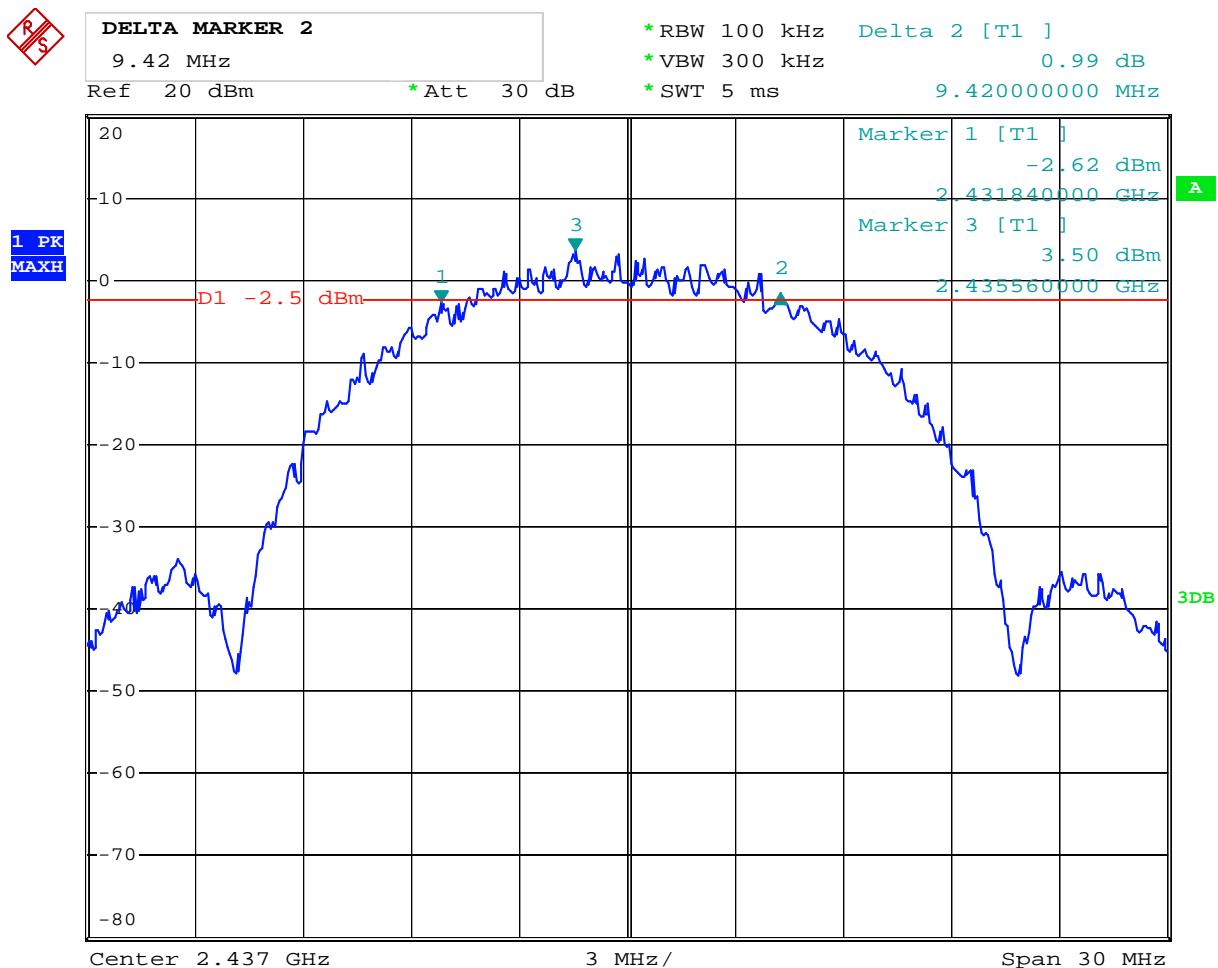
Date: 18.DEC.2013 10:54:40

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## 5. 802.11b at 11Mbps of CH06



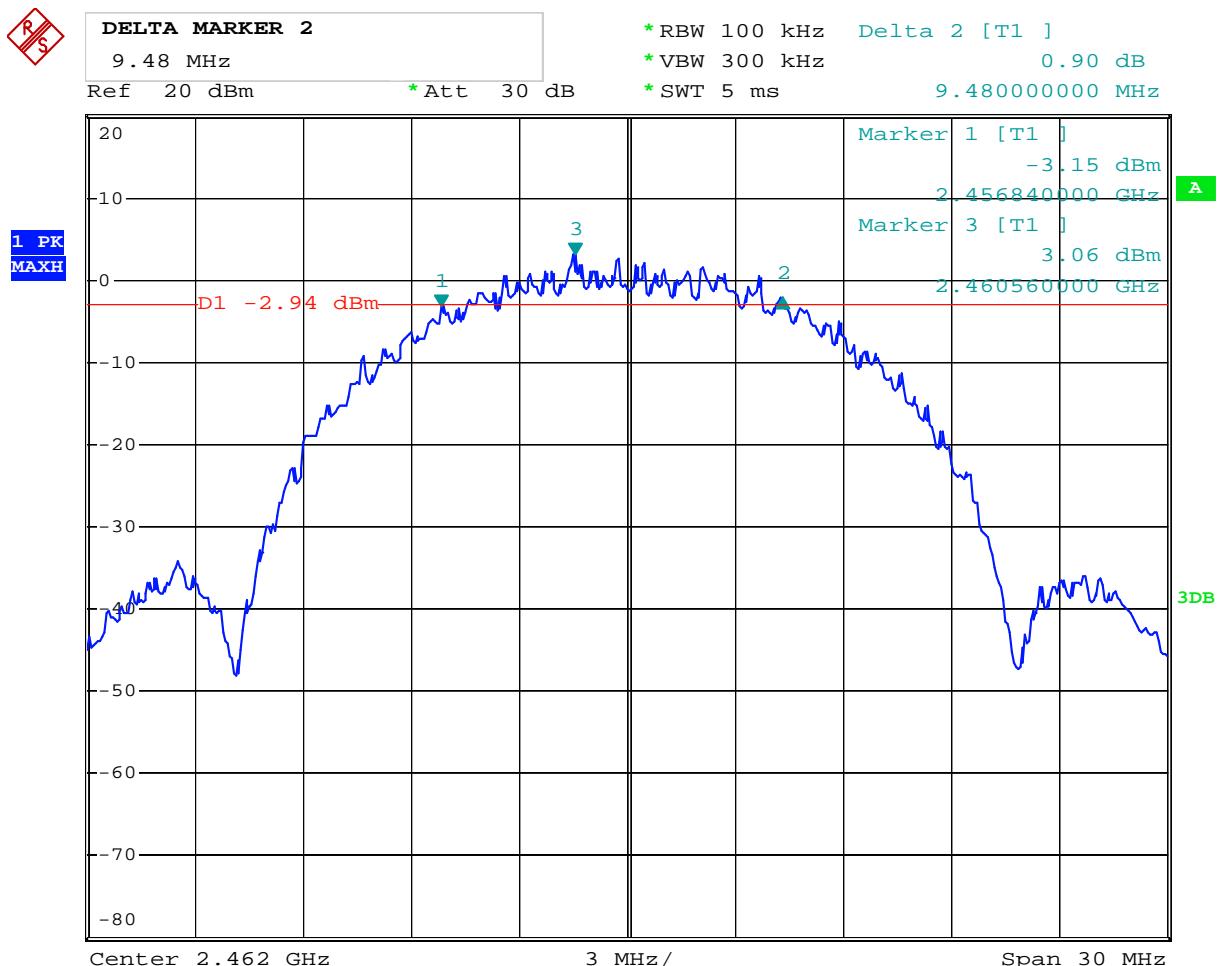
Date: 18.DEC.2013 10:56:29

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## 6. 802.11b at 11Mbps of CH11



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### 6dB Occupied Bandwidth

EUT		MINI PC		Model		Z1	
Mode		802.11g		Input Voltage		AC120V	
Temperature		24 deg. C,		Humidity		56% RH	
Channel	Channel Frequency (MHz)		Data Transfer Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/ Fail	
1	2412		6	16.56	0.5	Pass	
6	2437		6	16.56	0.5	Pass	
11	2462		6	16.56	0.5	Pass	

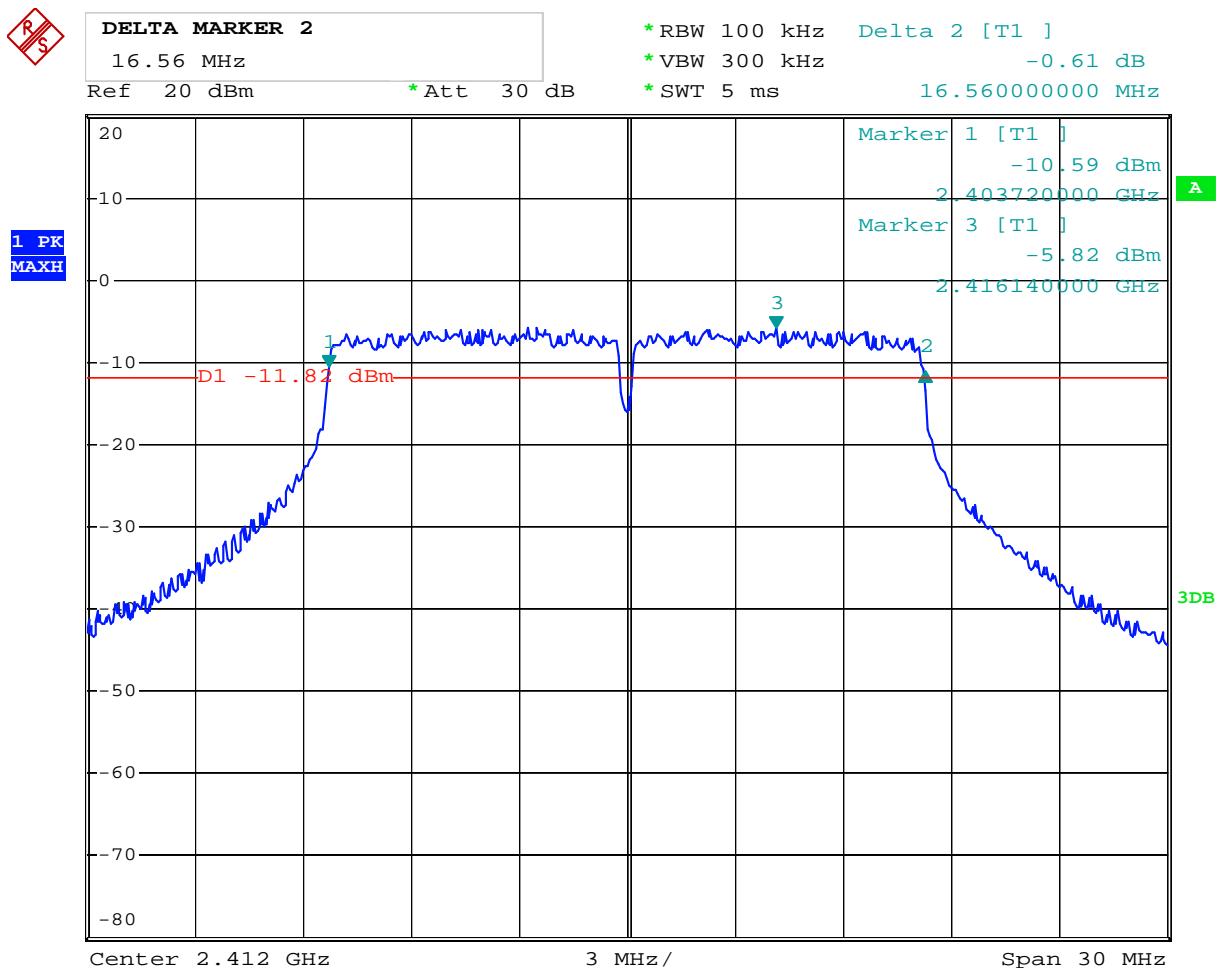
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**Test Plots:**

**1. 802.11g at 6Mbps of CH01**



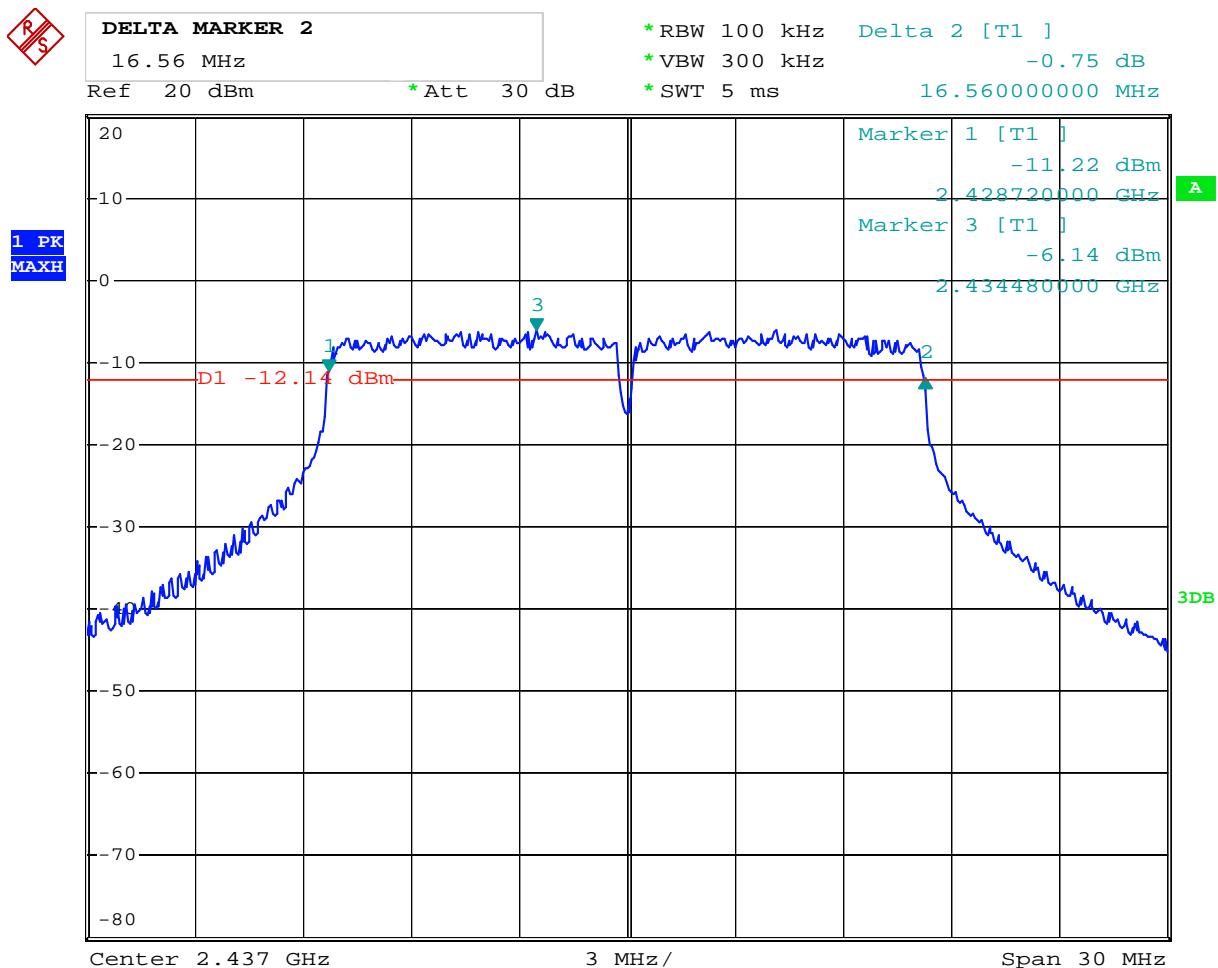
Date: 18.DEC.2013 10:53:12

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## 2. 802.11g at 6Mbps of CH06



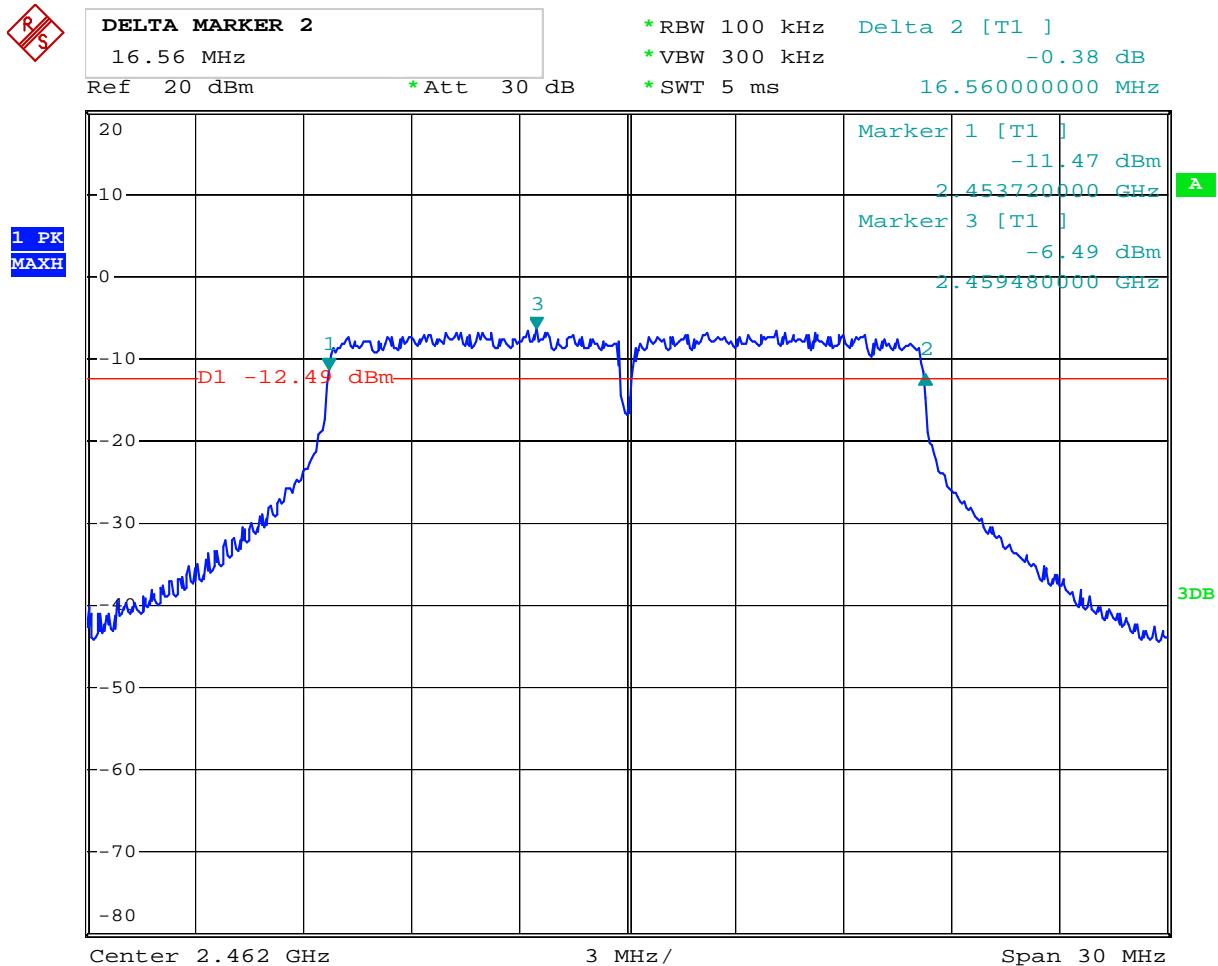
Date: 18.DEC.2013 10:57:56

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### 3. 802.11g at 6Mbps of CH11



Date: 18.DEC.2013 11:01:14

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### 6dB Occupied Bandwidth

EUT		MINI PC		Model	Z1
Mode		802.11n HT20		Input Voltage	AC120V
Temperature		24 deg. C,		Humidity	56% RH
Channel	Channel Frequency (MHz)	Data Transfer Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/ Fail
1	2412	65	17.76	0.5	Pass
6	2437	65	17.76	0.5	Pass
11	2462	65	17.76	0.5	Pass

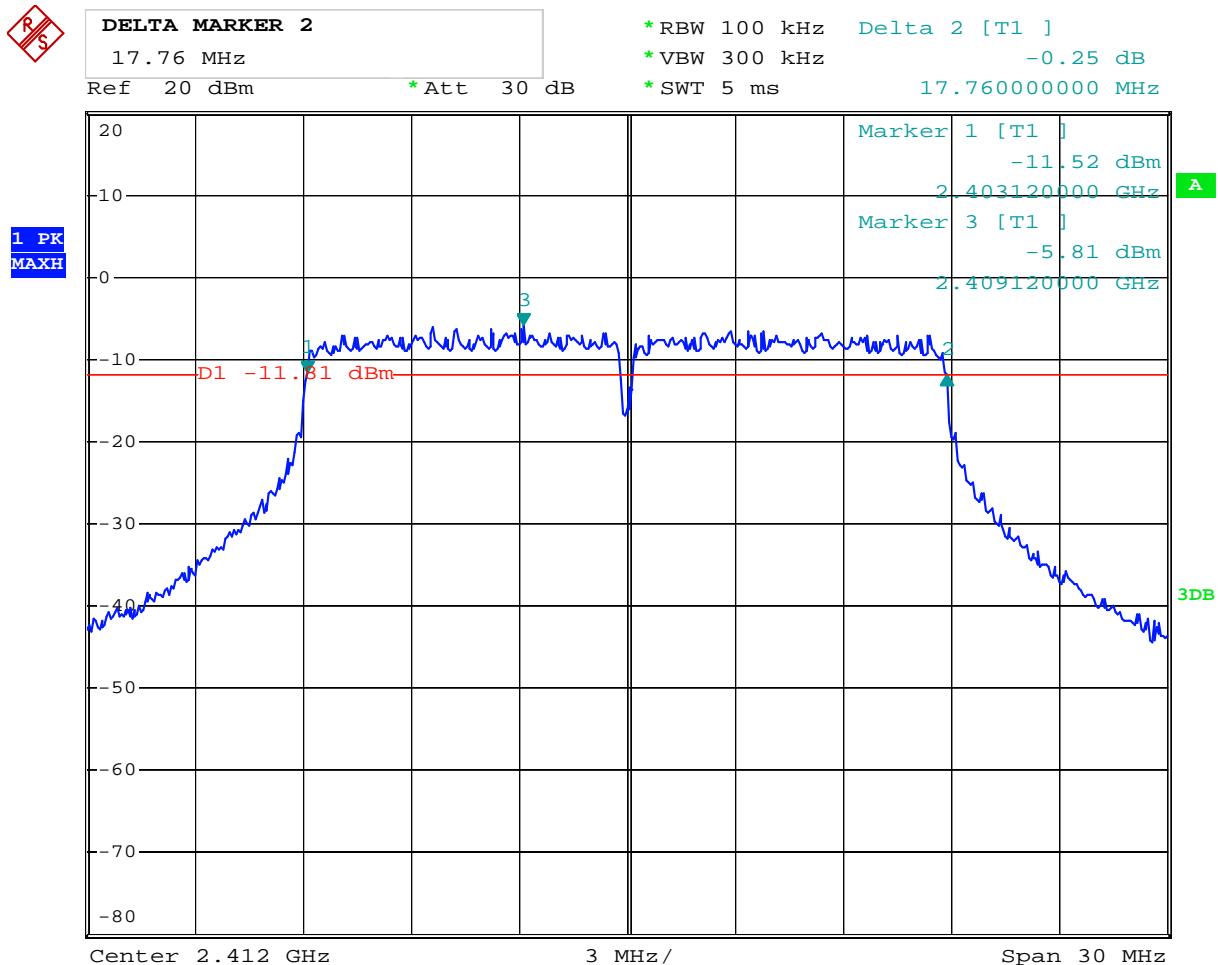
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**Test Plots:**

**1. 802.11n at HT20 of CH01**



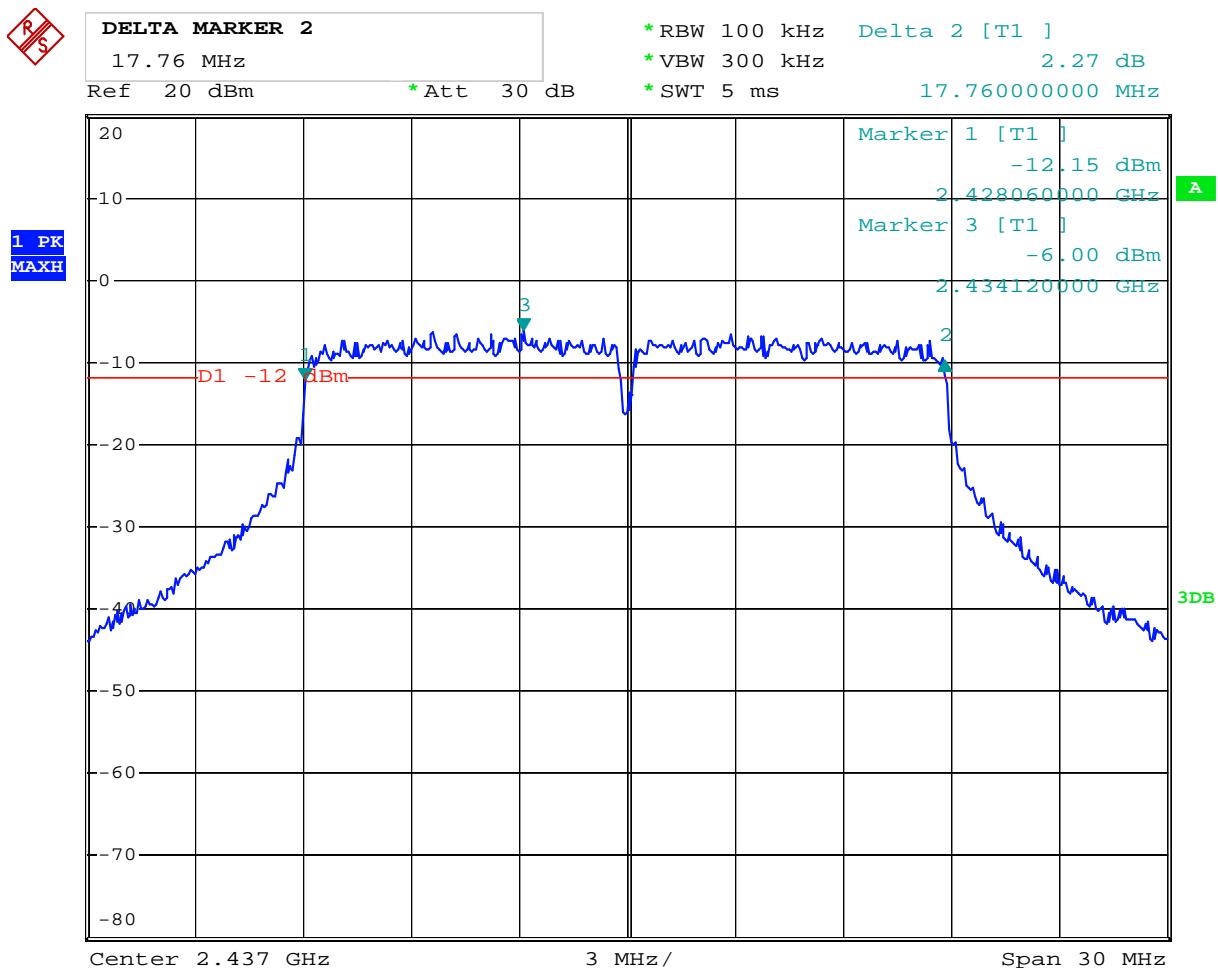
Date: 18.DEC.2013 11:06:41

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## 2. 802.11n at HT20 of CH06



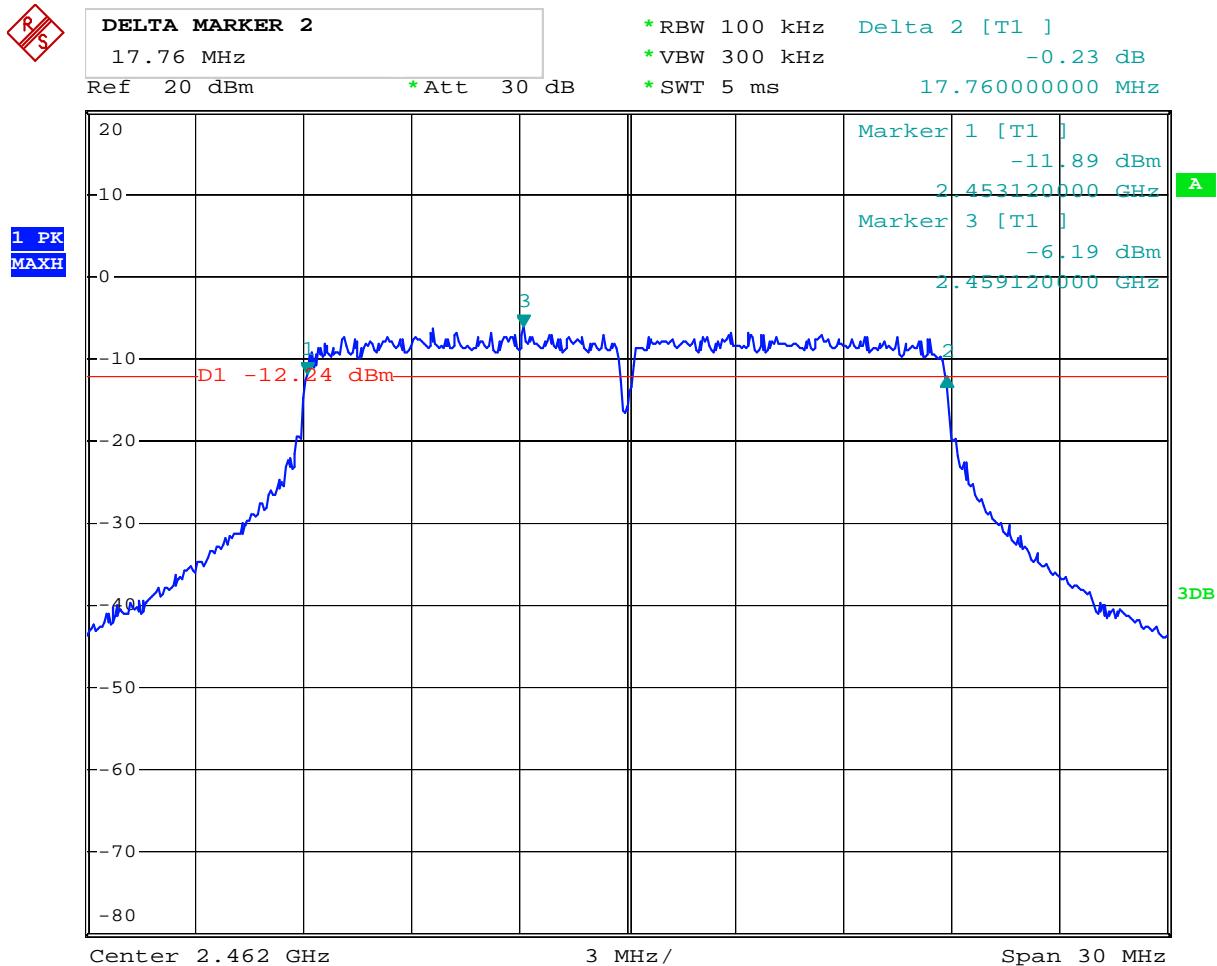
Date: 18.DEC.2013 11:05:32

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### 3. 802.11n at HT20 of CH11



Date: 18.DEC.2013 11:04:14

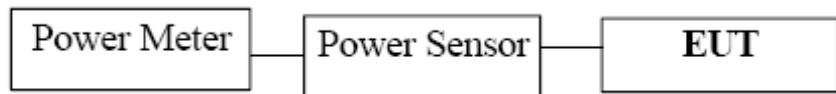
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## 8. Maximum Peak Output Power

### 8.1 Test Setup



### 8.2 Limits of Maximum Peak Output Power

The Maximum Peak Output Power Measurement is 30dBm.

### 8.3 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector ( conducted measurement ) while EUT was operating in transmit mode at the appropriate centre frequency.

**Note: the peak power was measured**

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#### 8.4 Test Results

EUT	MINI PC		Model	Z1	
Mode	802.11b		Input Voltage	AC120V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel		Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
1		2412	18.47	30	Pass
6		2437	18.20	30	Pass
11		2462	18.01	30	Pass

Note: 1. At final test to get the worst-case emission at 11Mbps for CH01, CH06 and CH11

2. The result basic equation calculation as follow:

$$\text{Peak Power Output} = \text{Peak Power Reading} + \text{Cable loss} + \text{Attenuator}$$

3. The worse case was recorded

EUT	MINI PC		Model	Z1	
Mode	802.11g		Input Voltage	AC120V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel	Channel Frequency (MHz)		Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
1	2412		16.25	30	Pass
6	2437		15.96	30	Pass
11	2462		15.72	30	Pass

Note: 1. At final test to get the worst-case emission at 6Mbps for CH01, CH06 and CH11

2. The result basic equation calculation as follow:

$$\text{Peak Power Output} = \text{Peak Power Reading} + \text{Cable loss} + \text{Attenuator}$$

3. The worse case was recorded

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EUT		MINI PC		Model		Z1	
Mode		802.11n (HT20)		Input Voltage		AC120V	
Temperature		24 deg. C,		Humidity		56% RH	
Channel	Channel Frequency (MHz)		Peak Power Output (dBm)		Peak Power Limit (dBm)	Pass/ Fail	
1	2412		16.44		30	Pass	
6	2437		16.26		30	Pass	
11	2462		15.99		30	Pass	

Note: 1. At final test to get the worst-case emission at 65Mbps 11n HT20 for CH01, CH06 and CH11  
2. The result basic equation calculation as follow:  
Peak Power Output = Peak Power Reading + Cable loss + Attenuator  
3. The worse case was recorded

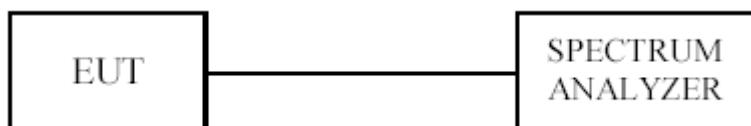
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## 9. Power Spectral Density Measurement

### 9.1 Test Setup



### 9.2 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density Measurement is 8dBm.

### 9.3 Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 10 kHz.
3. Set the VBW  $\geq$  30 kHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be  $\leq$  8 dBm.

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#### 9.4 Test Result

EUT		MINI PC		Model		Z1	
Mode		802.11b 11Mbps		Input Voltage		AC120V	
Temperature		24 deg. C,		Humidity		56% RH	
Channel	Channel Frequency (MHz)		Final Power Spectral Density (dBm)	Maximum Limit (dBm)		Pass/ Fail	
11Mbps							
1	2412		-6.57	8		Pass	
6	2437		-6.86	8		Pass	
11	2462		-6.97	8		Pass	

EUT		MINI PC		Model		Z1	
Mode		802.11b 1Mbps		Input Voltage		AC120V	
Temperature		24 deg. C,		Humidity		56% RH	
Channel	Channel Frequency (MHz)		Final Power Spectral Density (dBm)	Maximum Limit (dBm)		Pass/ Fail	
1Mbps							
1	2412		-8.16	8		Pass	
6	2437		-8.51	8		Pass	
11	2462		-8.50	8		Pass	

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EUT		MINI PC		Model		Z1			
Mode		802.11g 6Mbps		Input Voltage		AC120V			
Temperature		24 deg. C,		Humidity		56% RH			
Channel	Channel Frequency (MHz)		Final Power Spectral Density (dBm)	Maximum Limit (dBm)	Pass/ Fail				
6Mbps									
1	2412		-14.20	8	Pass				
6	2437		-14.25	8	Pass				
11	2462		-14.60	8	Pass				

EUT		MINI PC		Model		Z1			
Mode		802.11n HT20 65Mbps		Input Voltage		AC120V			
Temperature		24 deg. C,		Humidity		56% RH			
Channel	Channel Frequency (MHz)		Final Power Spectral Density (dBm)	Maximum Limit (dBm)	Pass/ Fail				
HT20									
1	2412		-13.49	8	Pass				
6	2437		-14.07	8	Pass				
11	2462		-14.04	8	Pass				

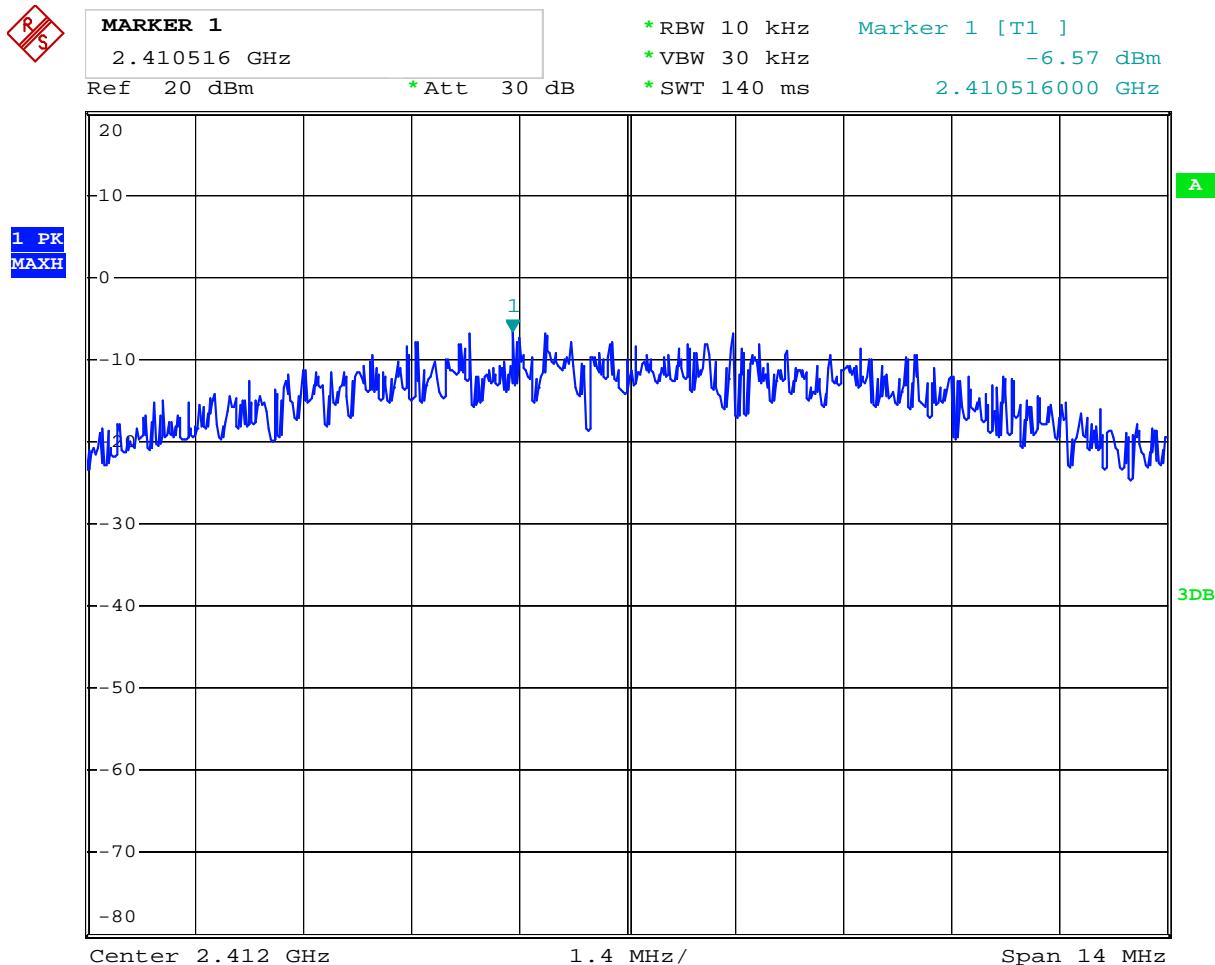
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## 9.5 Photo of Power Spectral Density Measurement

1.802.11b at 11Mbps of CH01



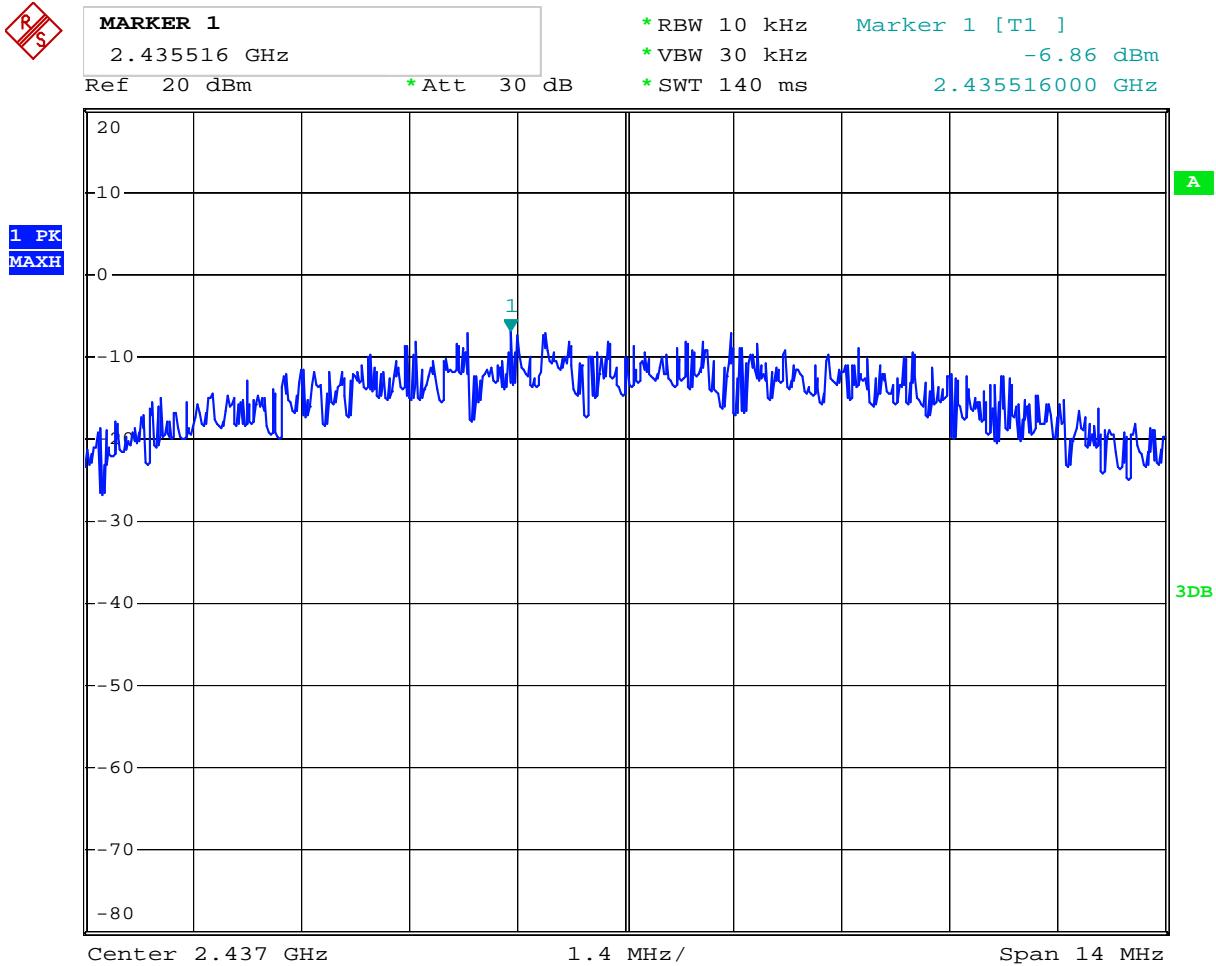
Date: 18.DEC.2013 11:44:14

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2. 802.11b at 11Mbps at CH06



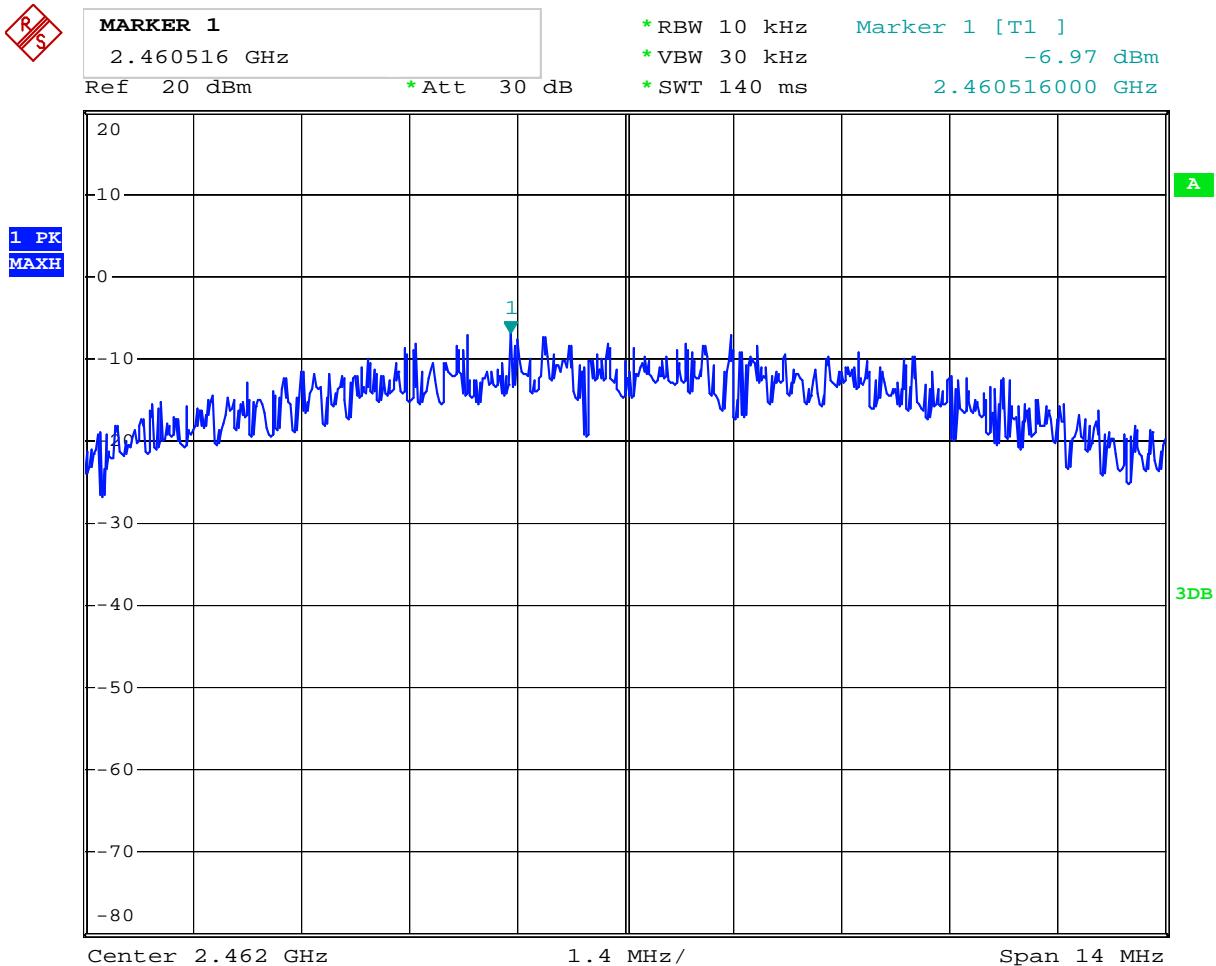
Date: 18.DEC.2013 11:45:45

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3. 802.11b at 11Mbps of CH11



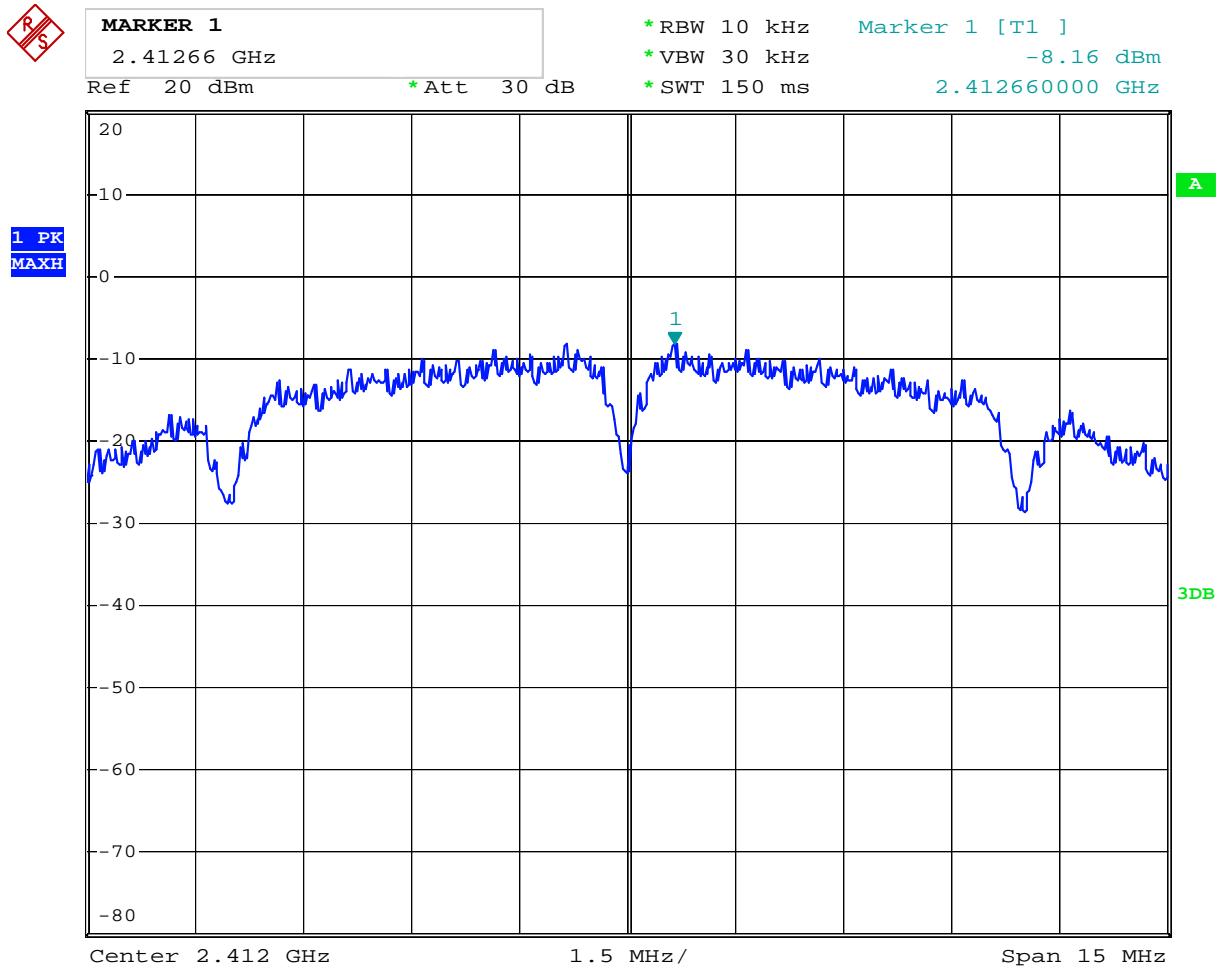
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4. 802.11b at 1Mbps of CH1



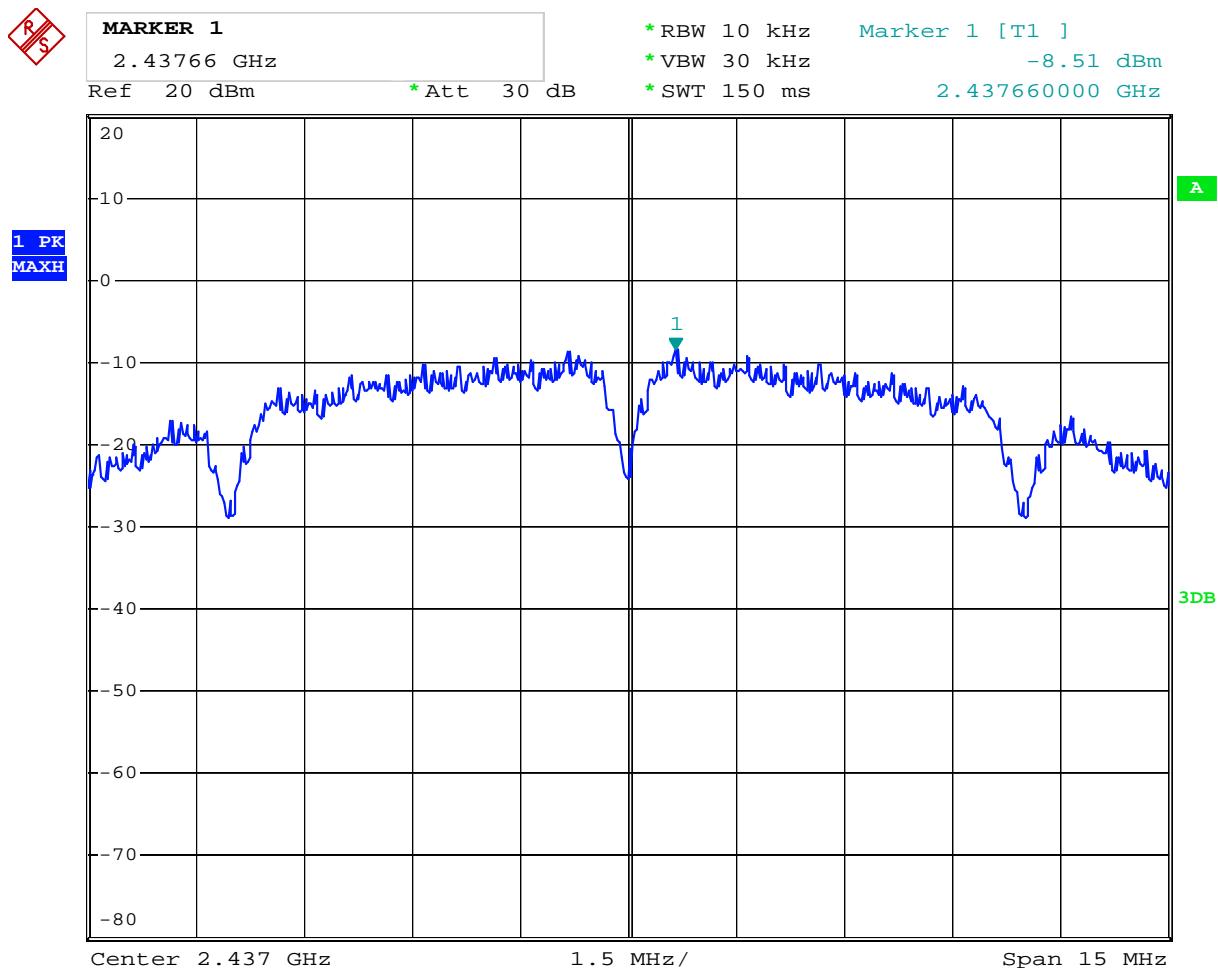
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5. 802.11b at 1Mbps of CH6



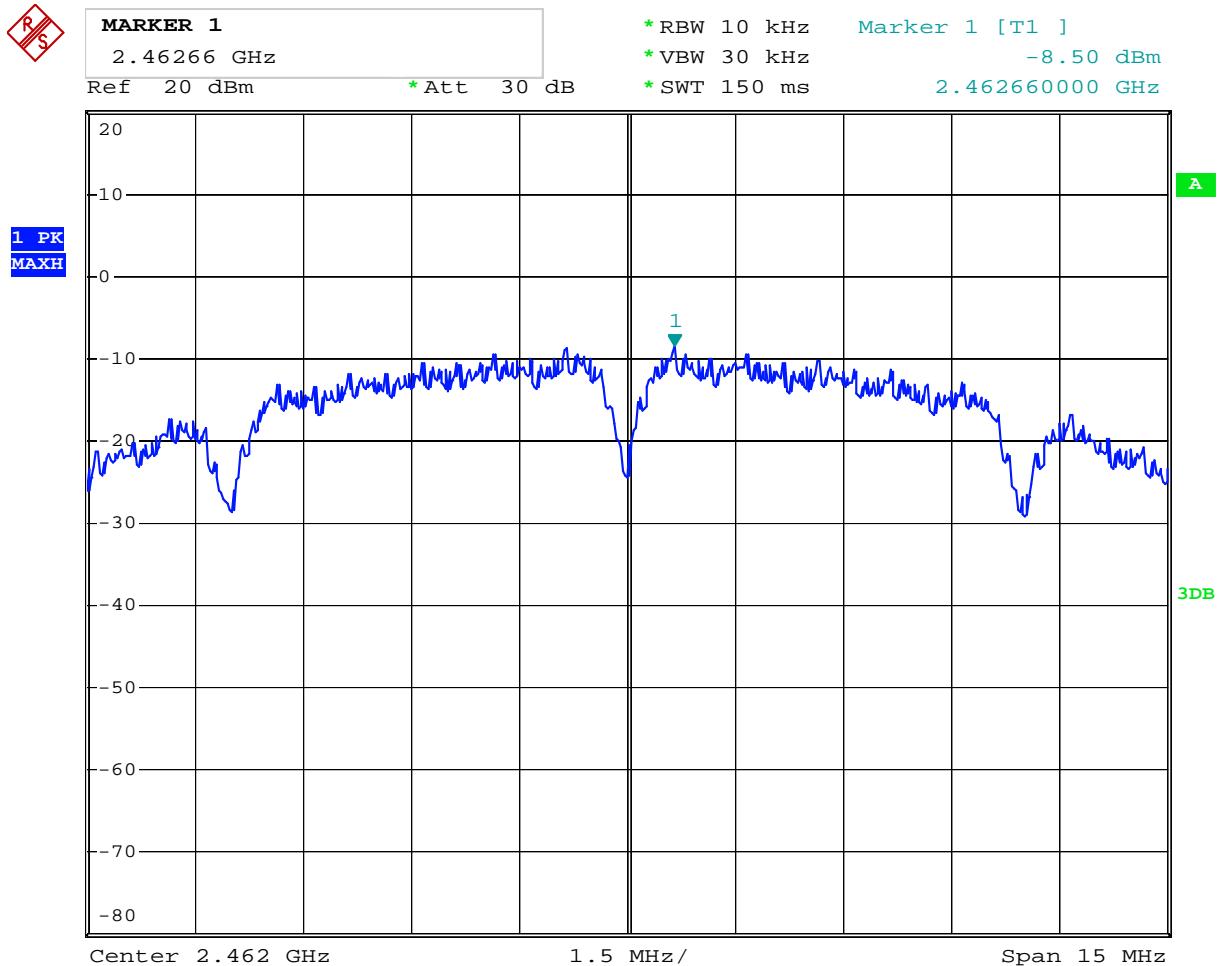
Date: 18.DEC.2013 11:48:19

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6. 802.11b at 1Mbps of CH11



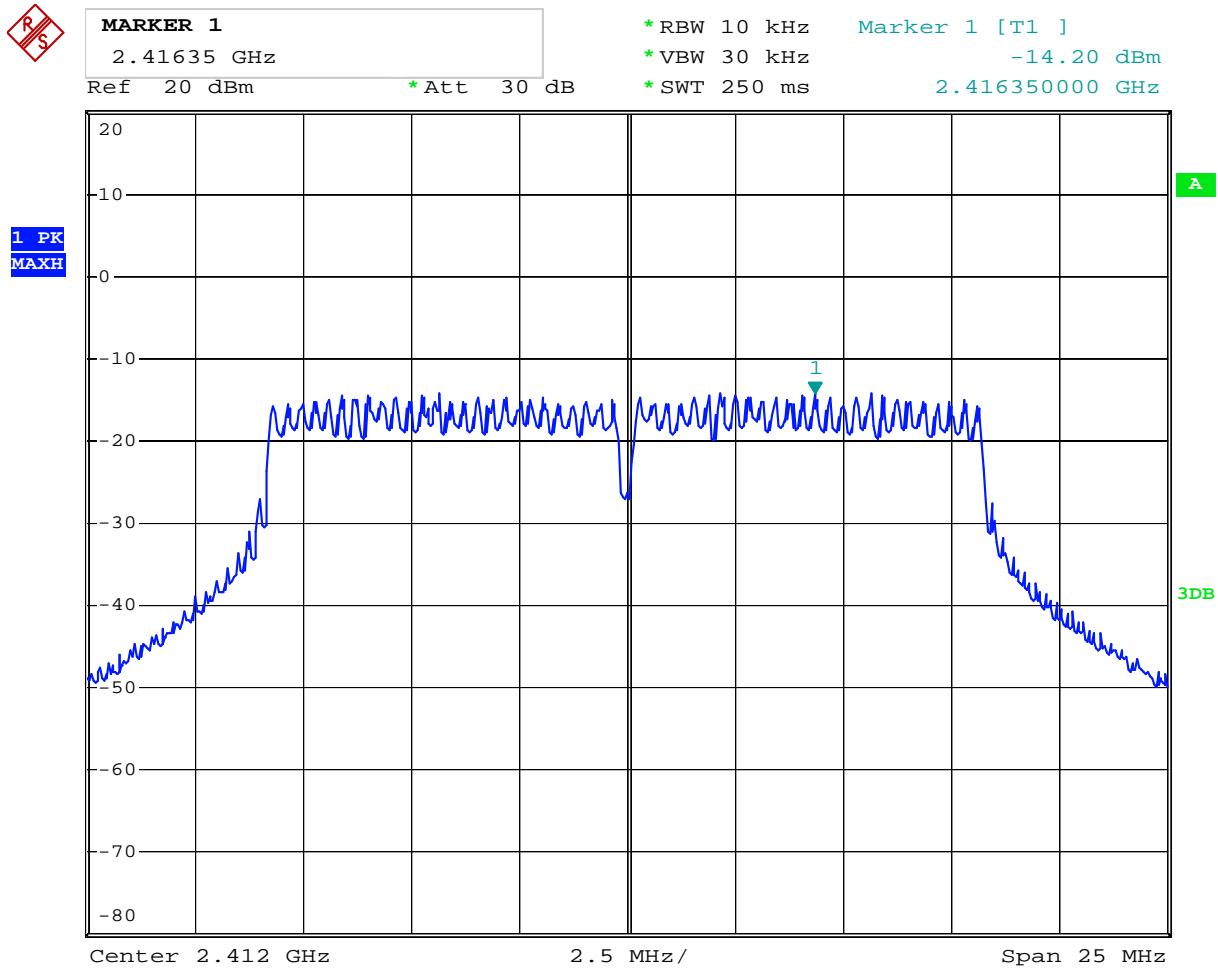
Date: 18.DEC.2013 11:48:54

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7. 802.11g at 6Mbps of CH1



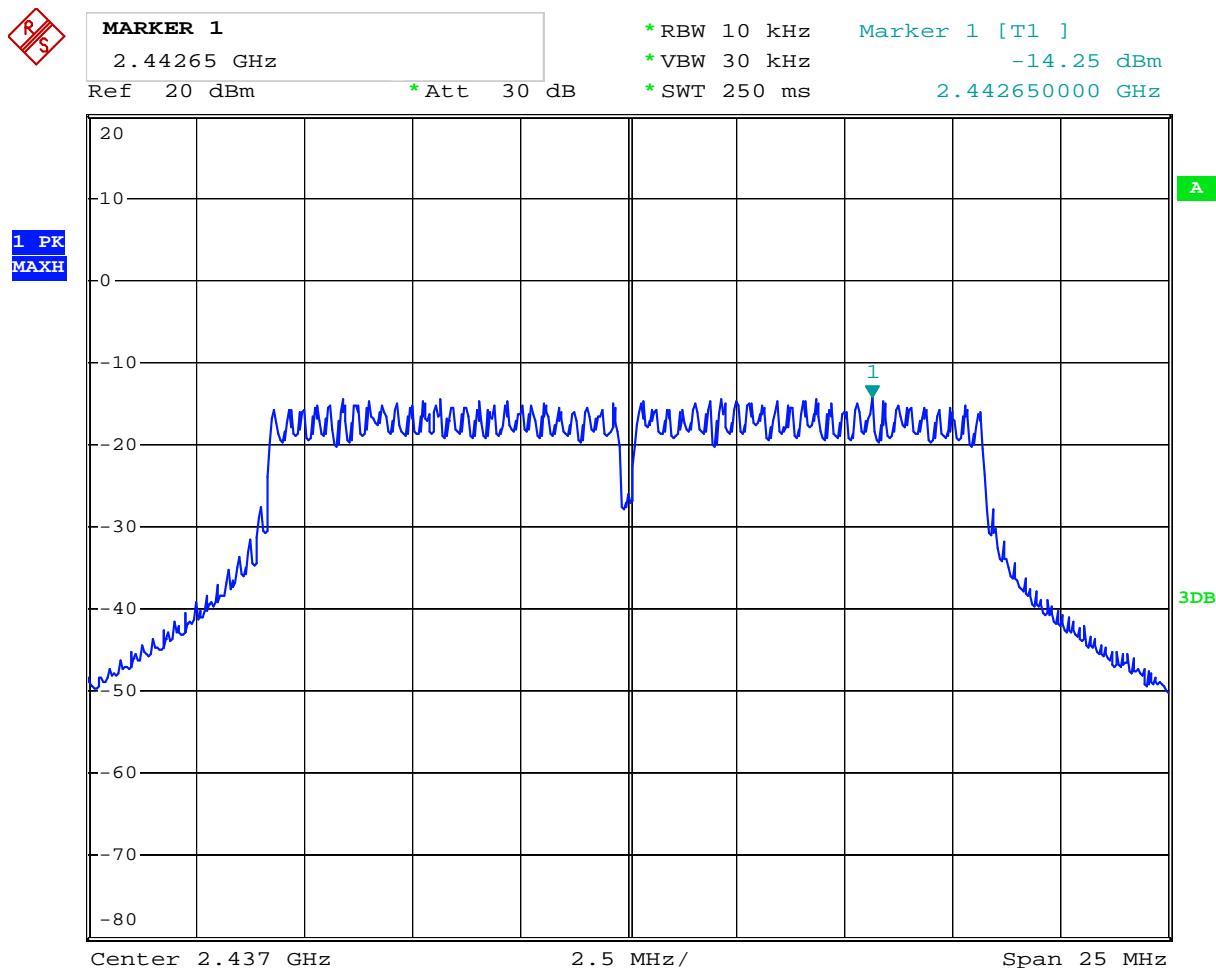
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8. 802.11g at 6 Mbps of CH6



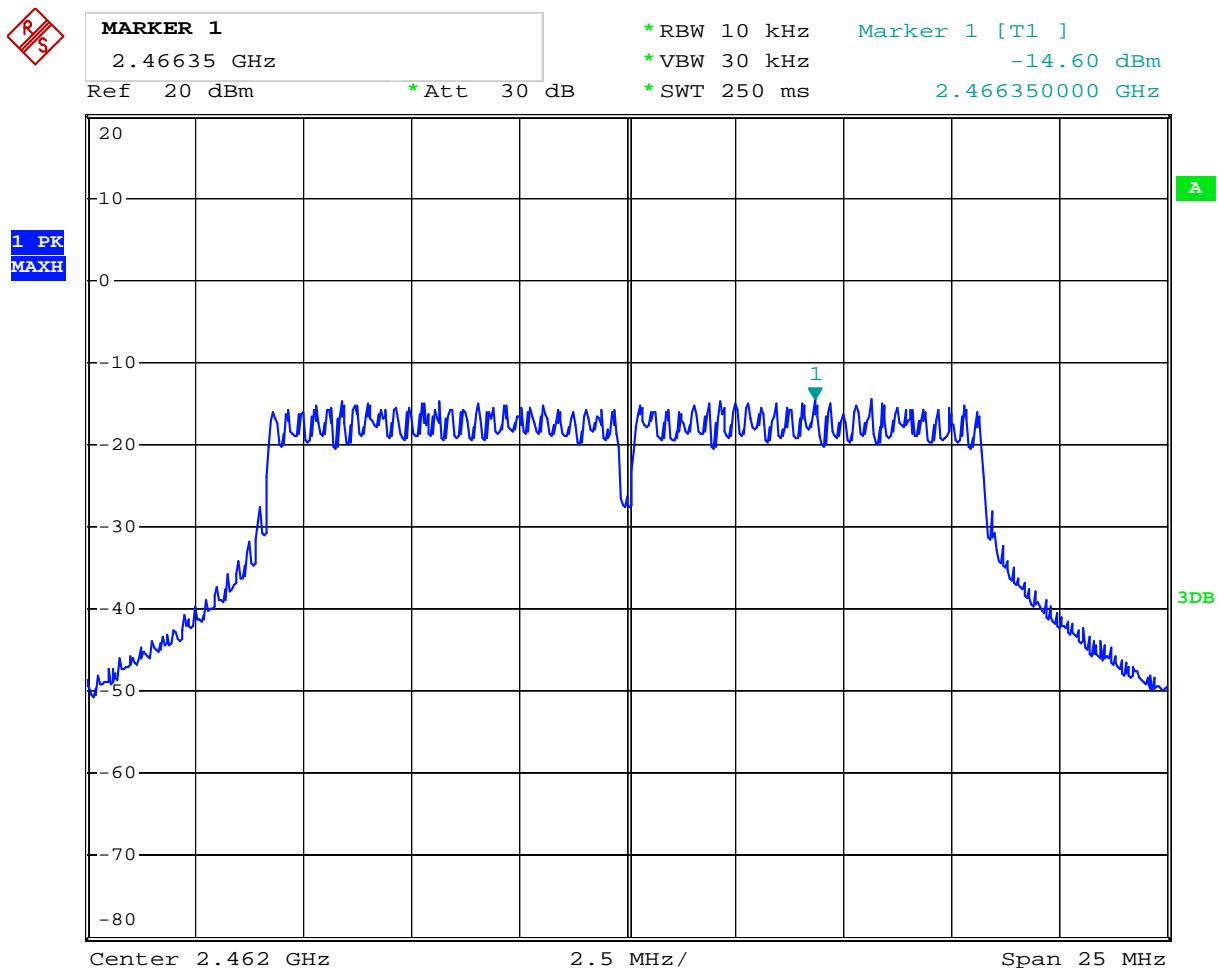
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9. 802.11g at 6 Mbps of CH11



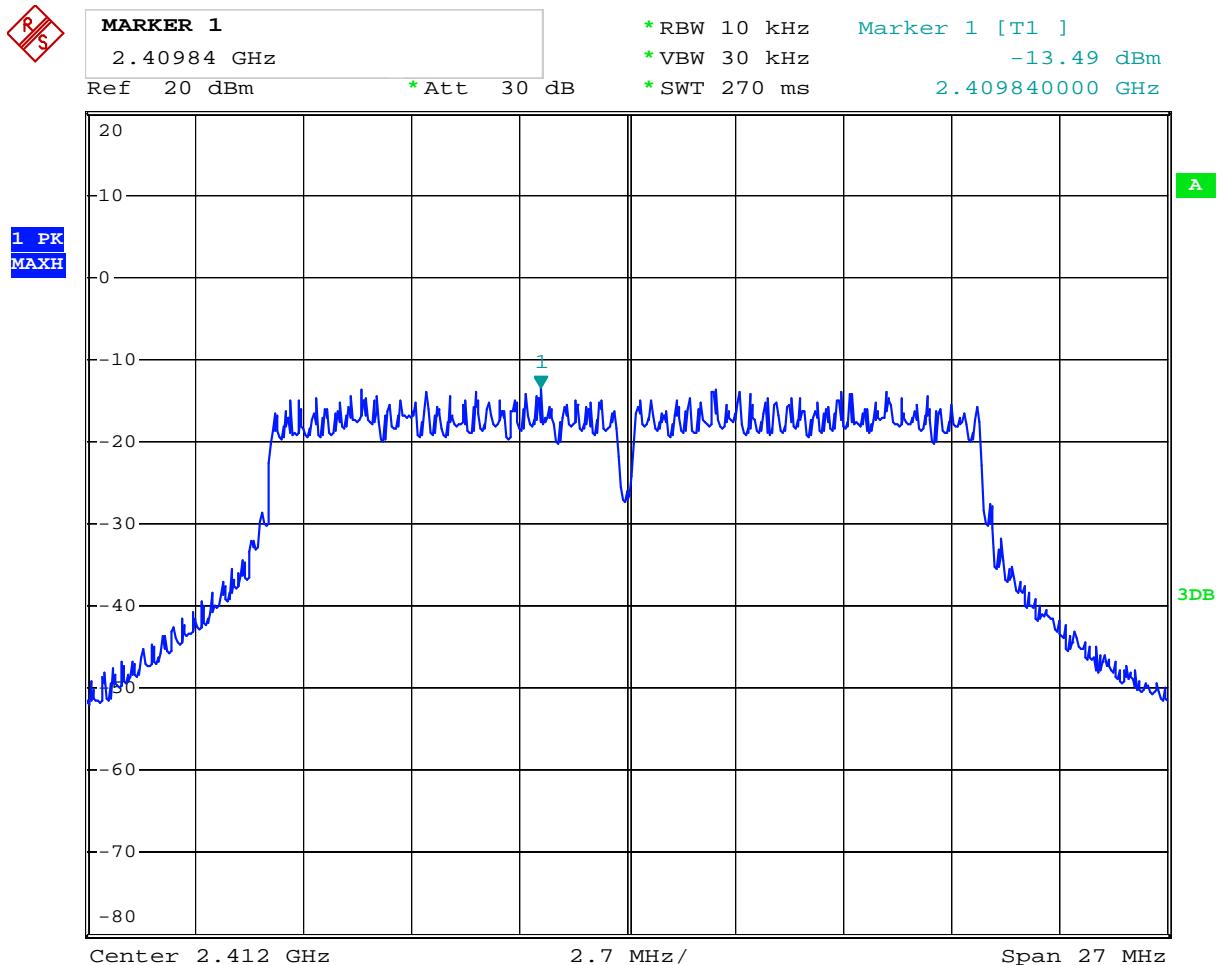
Date: 18.DEC.2013 11:50:13

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10. 802.11n at HT20 of CH01



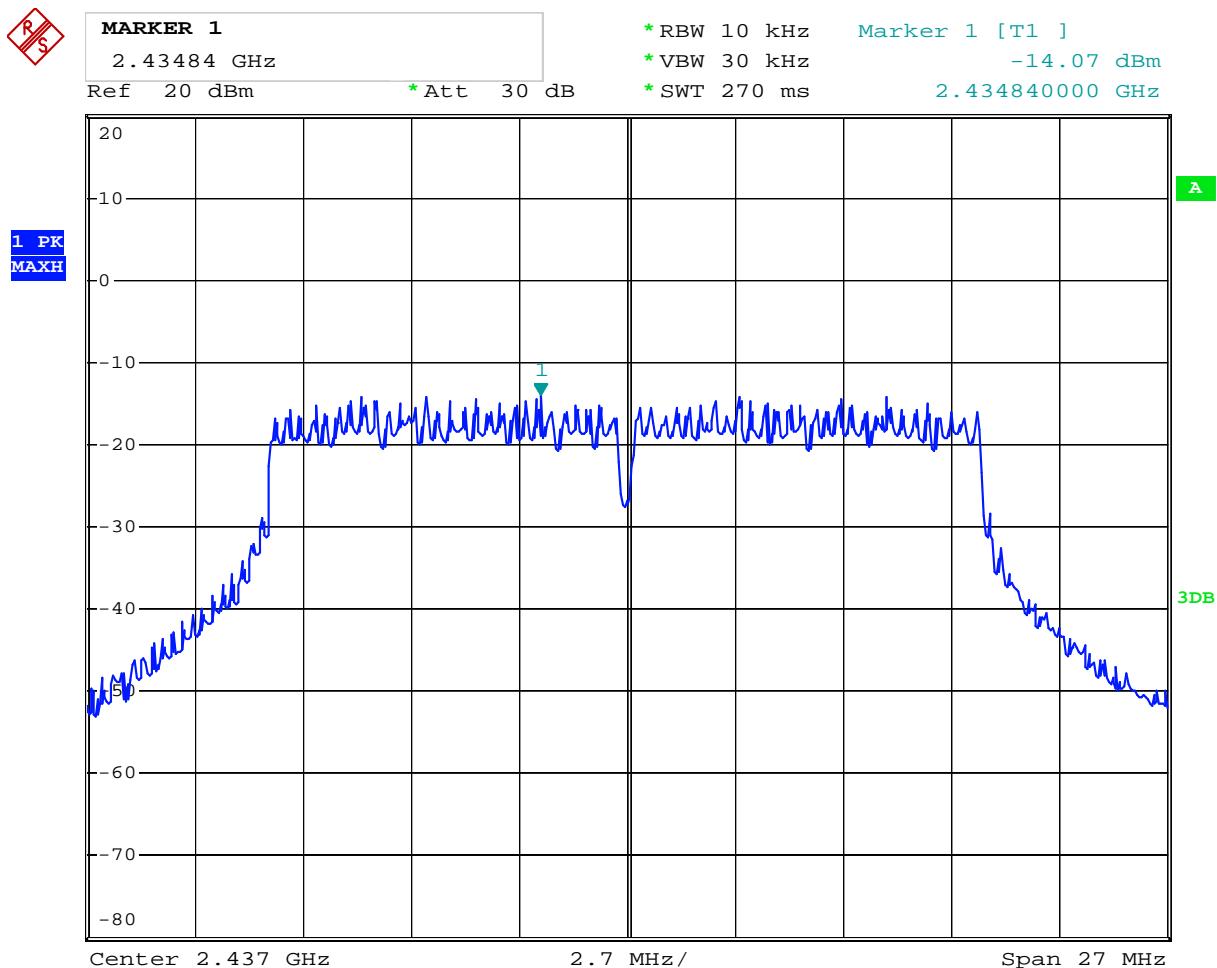
Date: 18.DEC.2013 11:54:19

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11. 802.11n at HT20 of CH06



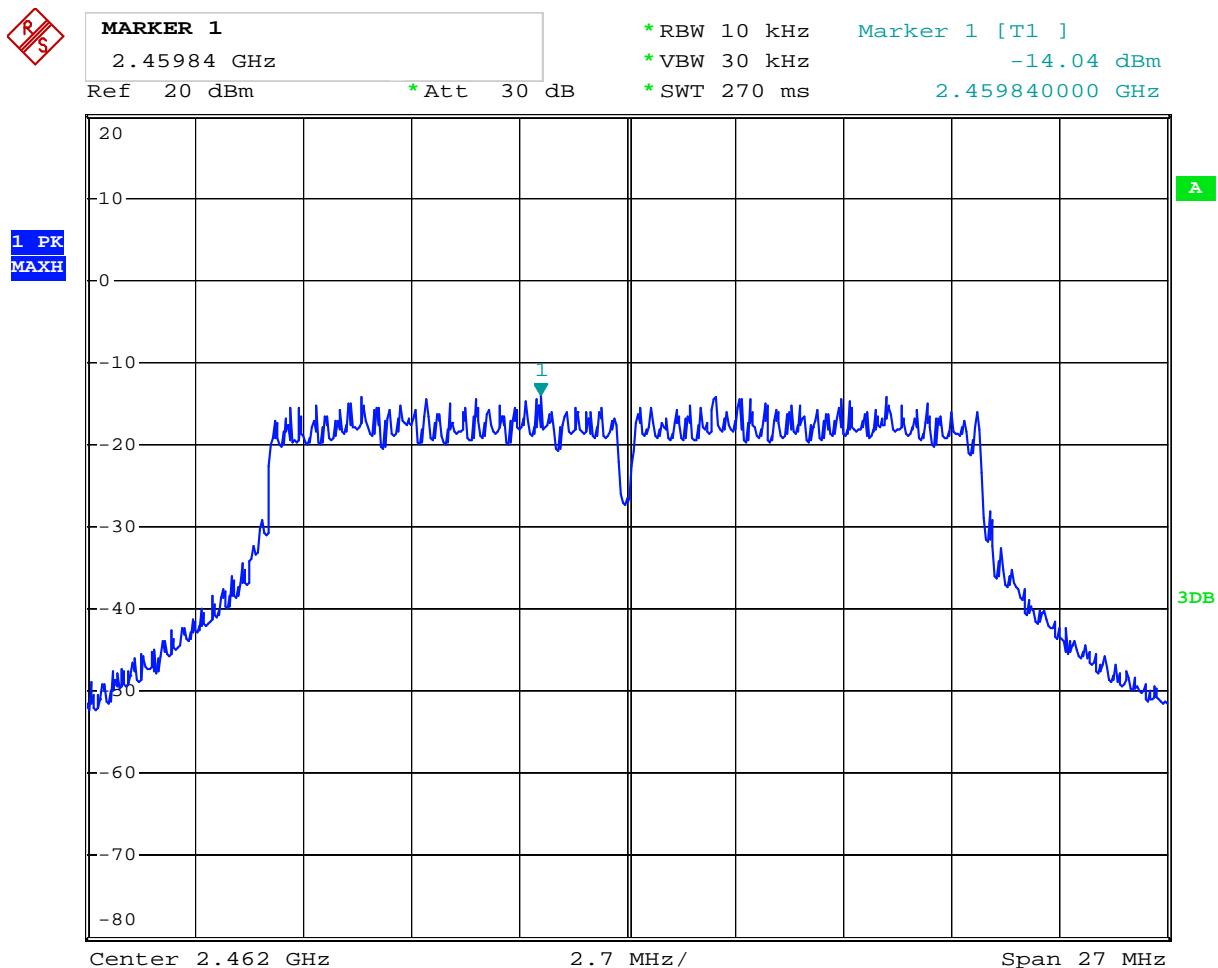
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12. 802.11n at HT20 of CH11



Date: 18.DEC.2013 11:52:36

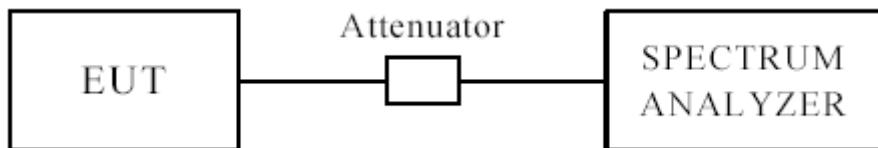
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## 10 Out of Band Measurement

### 10.1 Test Setup for band edge



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

### 10.2 Limits of Out of Band Emissions Measurement

1. Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

### 10.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test.( Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector)

For bandage test, the spectrum set as follows: RBW=VBW=100 kHz. A conducted measurement used

### 10.4 Test Result

Please see next pages

Note: For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

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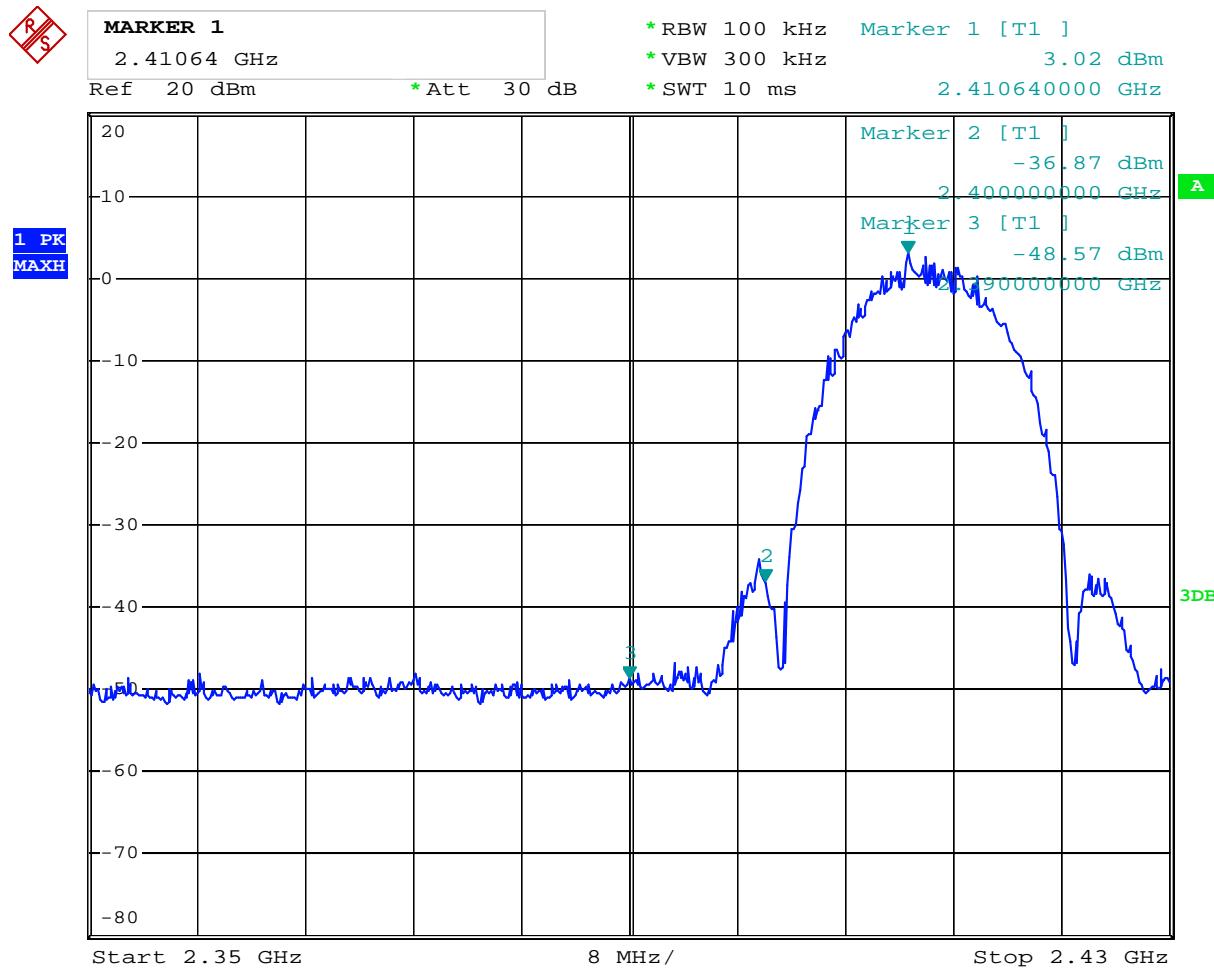
For 802.11b mode

CH01 at 11Mbps

#### 10.4 Band-edge and Restricted band Measurement

EUT	MINI PC		Model	Z1
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
2400	PK (dB $\mu$ V/m)	67.5	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	48.9		54(dB $\mu$ V/m)
2390	PK (dB $\mu$ V/m)	47.3	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 18.DEC.2013 12:00:48

Note: The Max. FS in Restrict Band are measured in conventional method.

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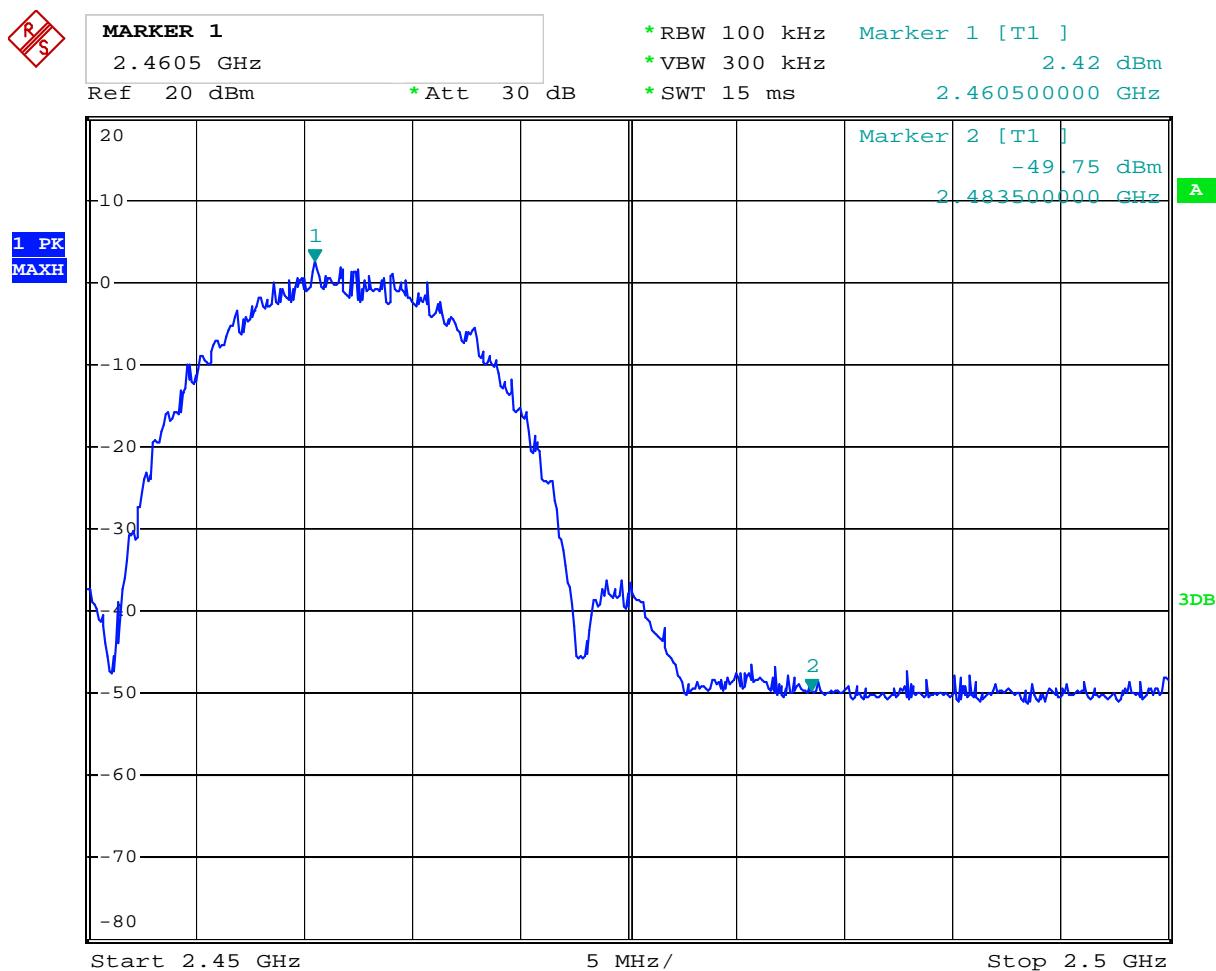
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CH11 at 11Mbps

#### 10.4 Band-edge and Restricted band Measurement

EUT	MINI PC		Model	Z1
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
2483.5	PK (dB $\mu$ V/m)	51.9	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 18.DEC.2013 12:08:04

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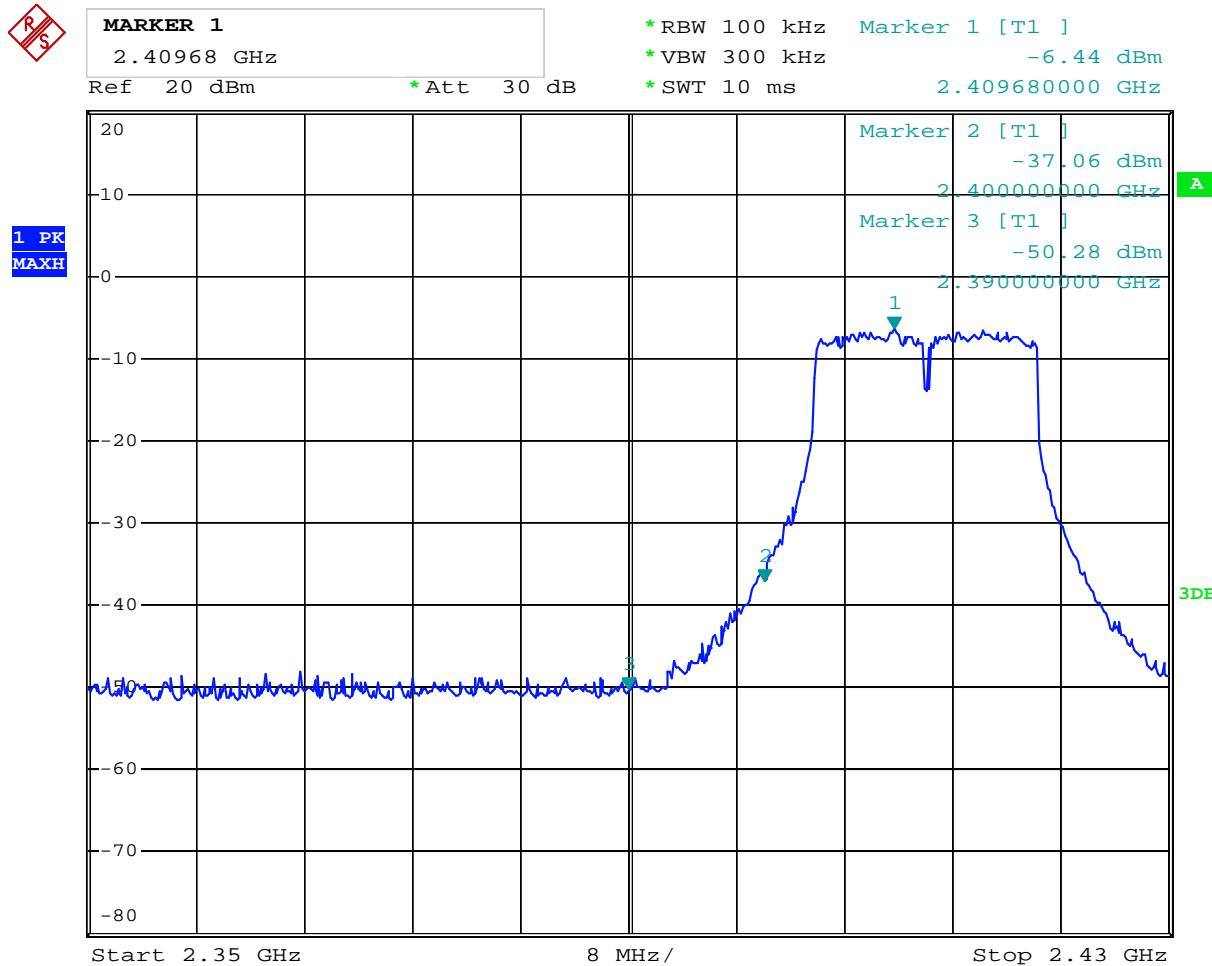
For 802.11g mode

CH01 at 6Mbps

#### 10.4 Band-edge and Restricted band Measurement

EUT	MINI PC		Model	Z1	
Mode	Keeping Transmitting		Input Voltage	AC120V	
Temperature	24 deg. C,		Humidity	56% RH	
Test Result:	Pass		Detector	PK	
2400	PK (dB $\mu$ V/m)		66.3	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)		47.8		54(dB $\mu$ V/m)
2390	PK (dB $\mu$ V/m)		46.5	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)		--		54(dB $\mu$ V/m)

Test Figure:



Date: 18.DEC.2013 12:00:12

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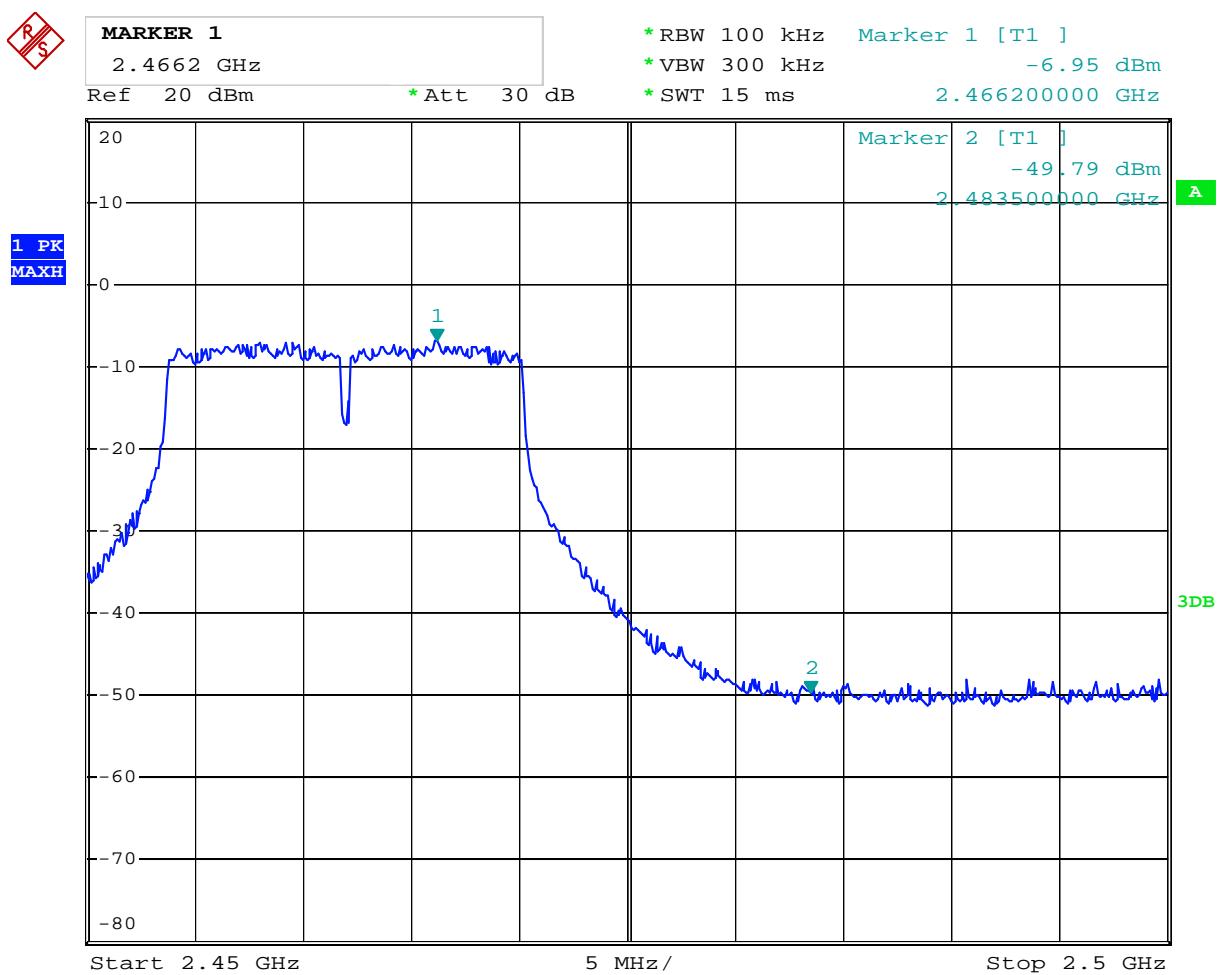
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CH11 at 6Mbps

#### 10.4 Band-edge and Restricted band Measurement

EUT	MINI PC		Model	Z1
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
2483.5	PK (dB $\mu$ V/m)	50.6	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 18.DEC.2013 12:07:19

Note: The Max. FS in Restrict Band are measured in conventional method.

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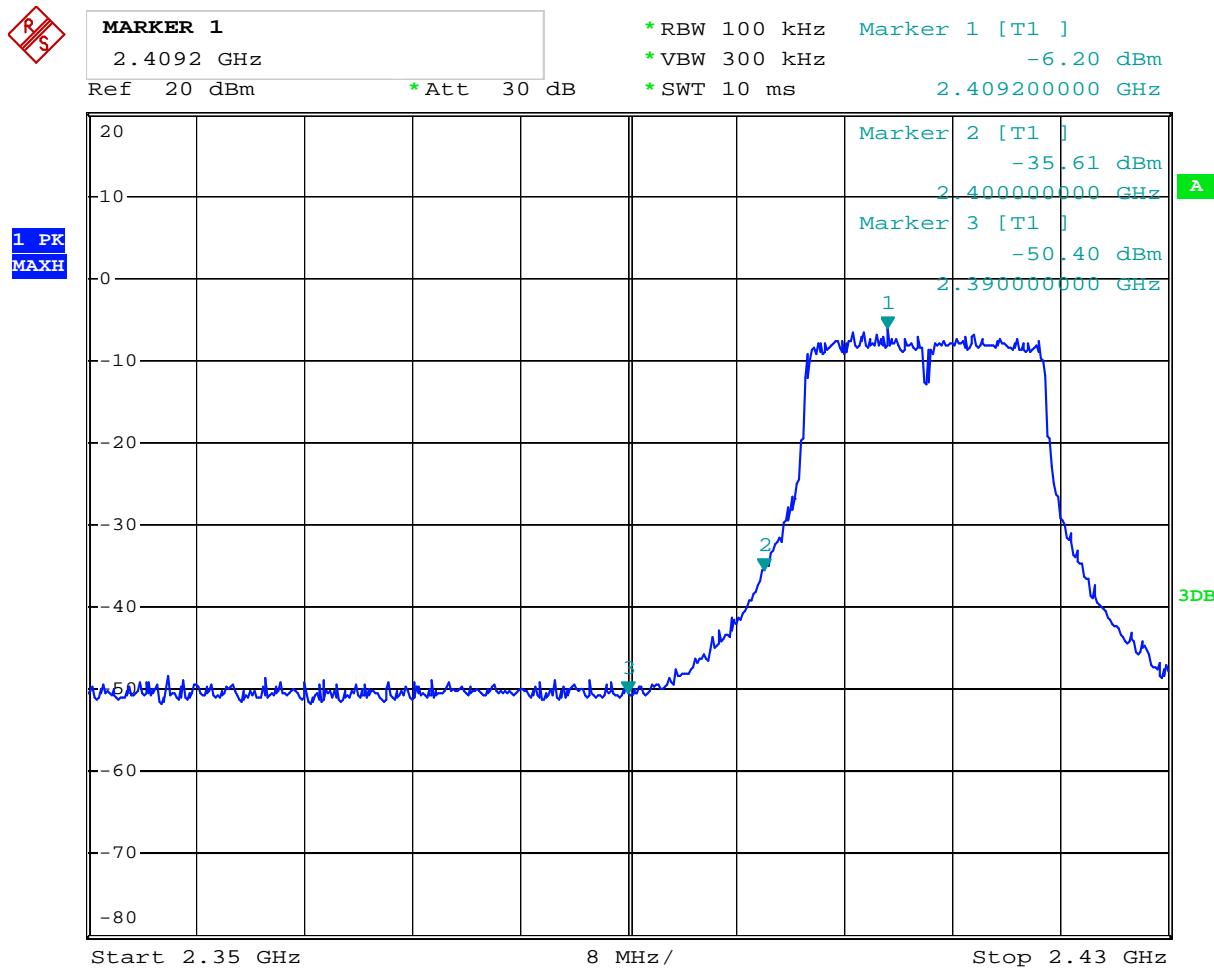
For 802.11n (HT20) mode

CH01 at 65Mbps

#### 10.4 Band-edge and Restricted band Measurement

EUT	MINI PC		Model	Z1
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
2400	PK (dB $\mu$ V/m)	67.8	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	49.3		54(dB $\mu$ V/m)
2390	PK (dB $\mu$ V/m)	48.7	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	--		54(dB $\mu$ V/m)

Test Figure:



Date: 18.DEC.2013 12:02:30

Note: The Max. FS in Restrict Band are measured in conventional method.

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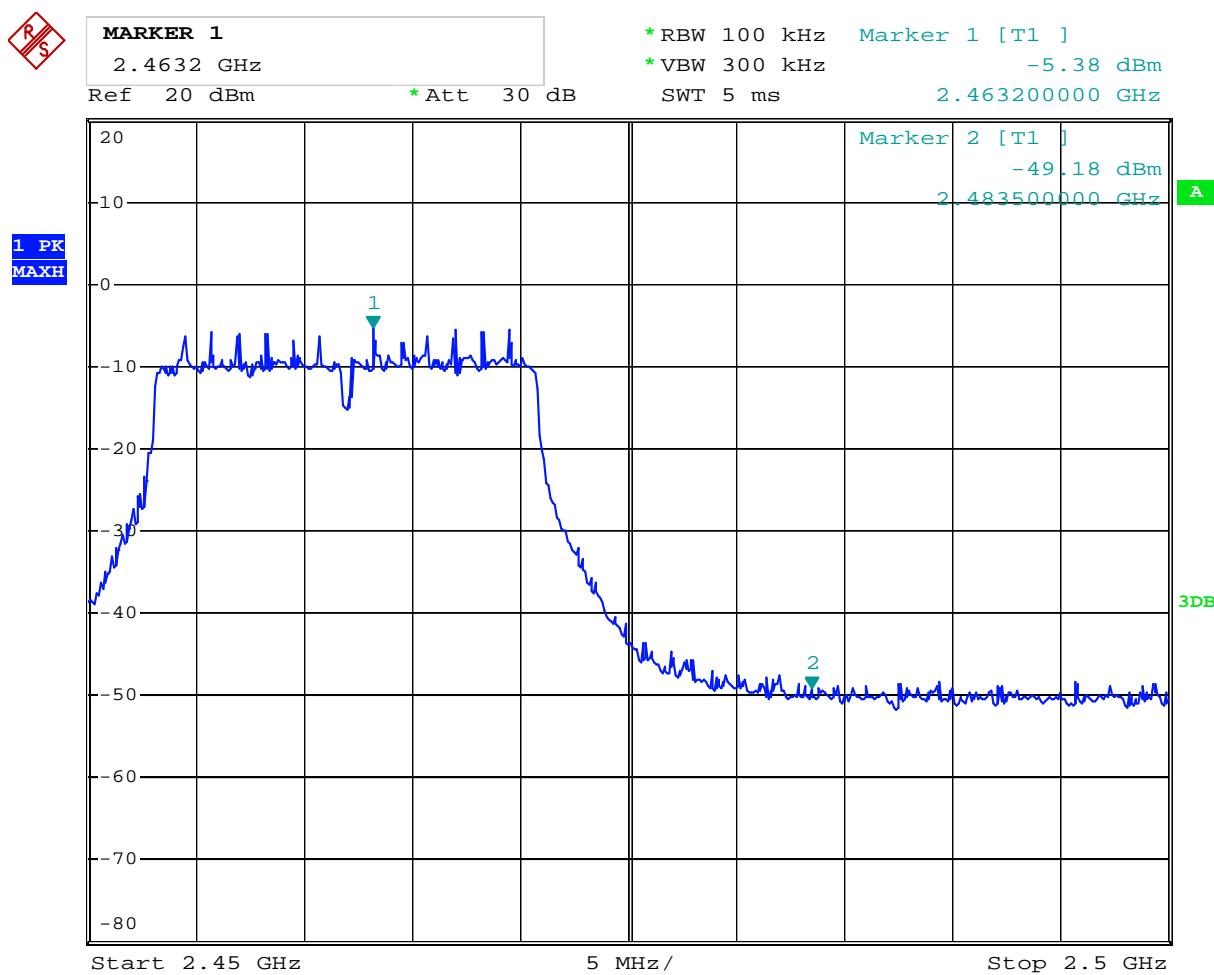
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CH11 at 65Mbps

#### 10.4 Band-edge and Restricted band Measurement

EUT	MINI PC		Model	Z1
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
2483.5	PK (dB $\mu$ V/m)	52.6	Limit	74(dB $\mu$ V/m)
	AV (dB $\mu$ V/m)	34.8		54(dB $\mu$ V/m)

Test Figure:



Date: 18.DEC.2013 12:13:50

Note: The Max. FS in Restrict Band are measured in conventional method.

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## 11.0 Antenna Requirement

### 11.1 Standard Applicable

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

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

### 11.2 Antenna Connected construction

Integral antenna used. The maximum Gain of the antennas is 2.0 dBi.

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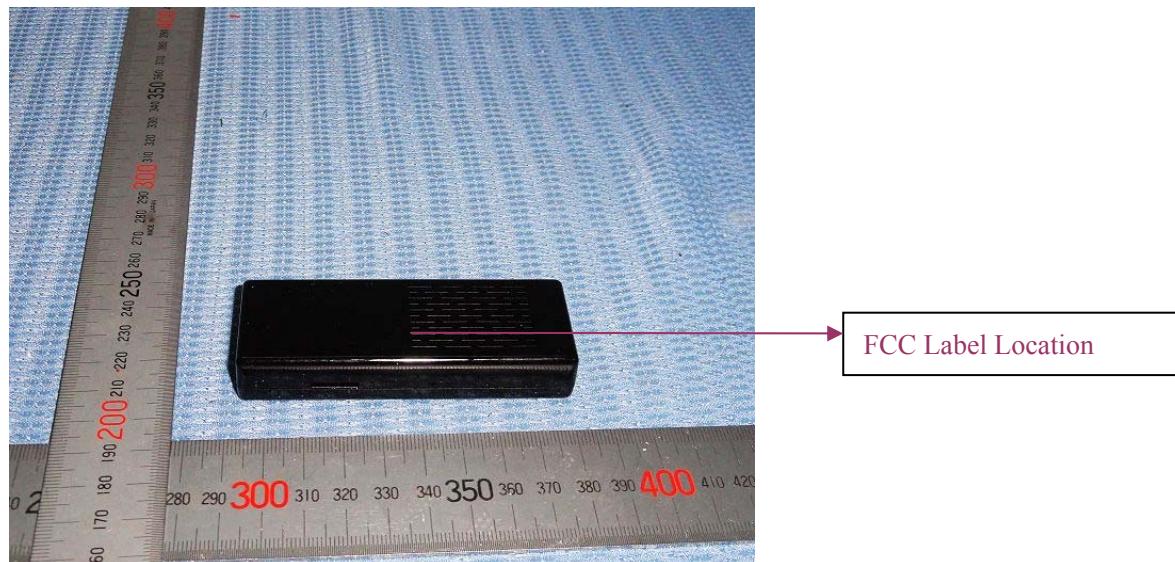
## 12.0 FCC Label

**FCC ID: 2ABLR-1218**

**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.**

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

### Mark Location:



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### 13.0 Photo of testing

Conducted Emission Test Setup:

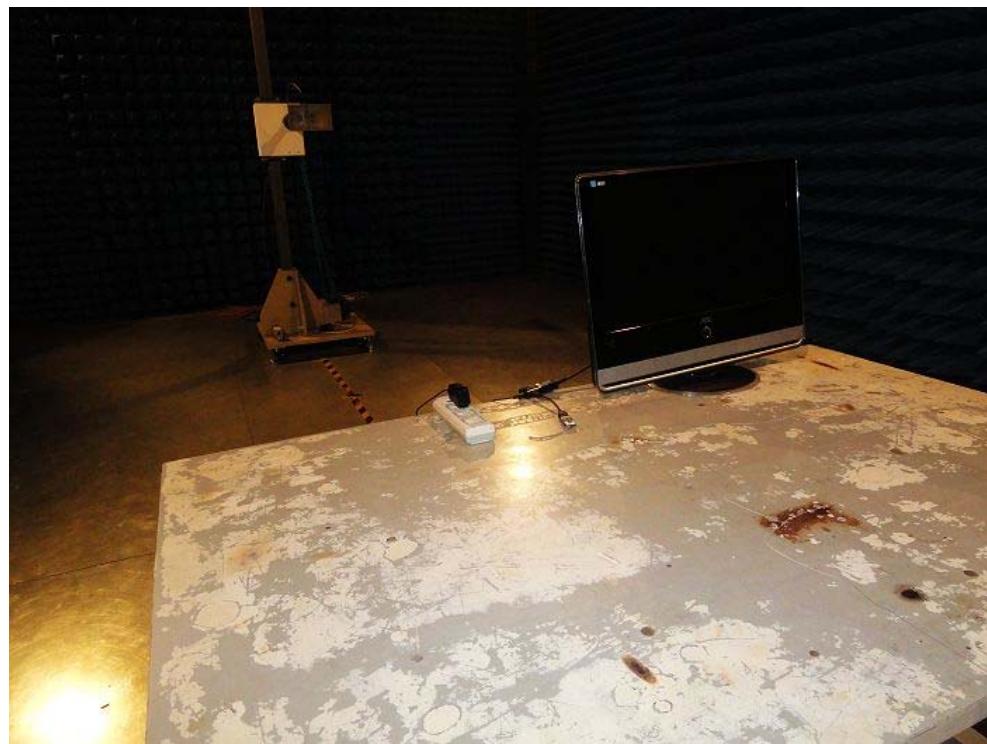


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Radiated Emission Test Setup:



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Photo for the EUT



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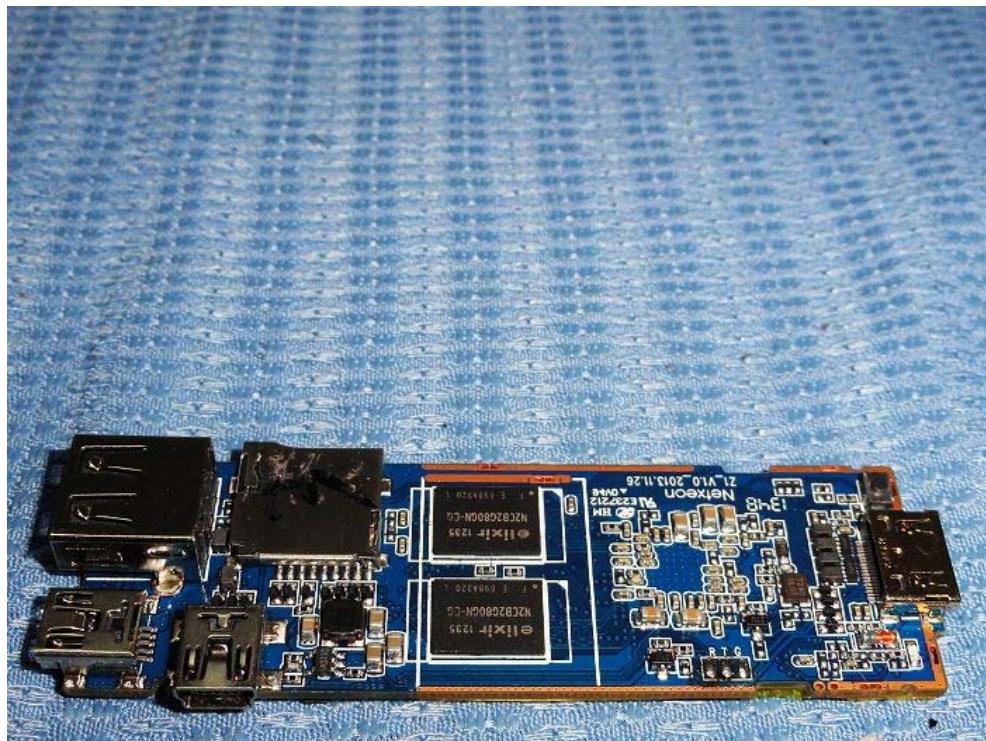


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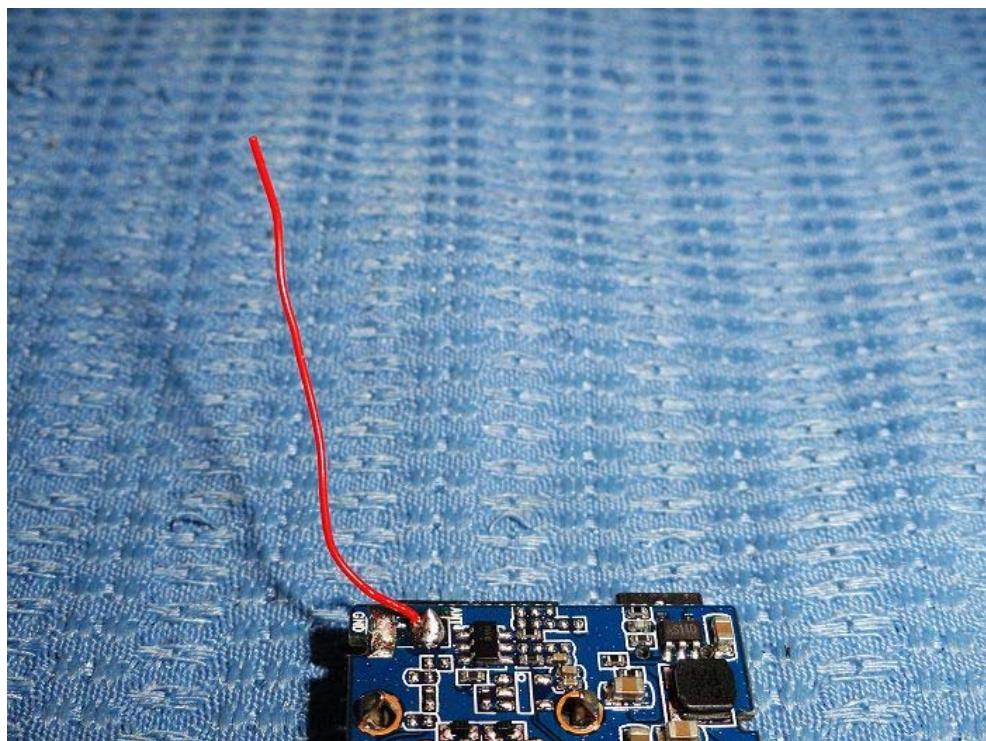
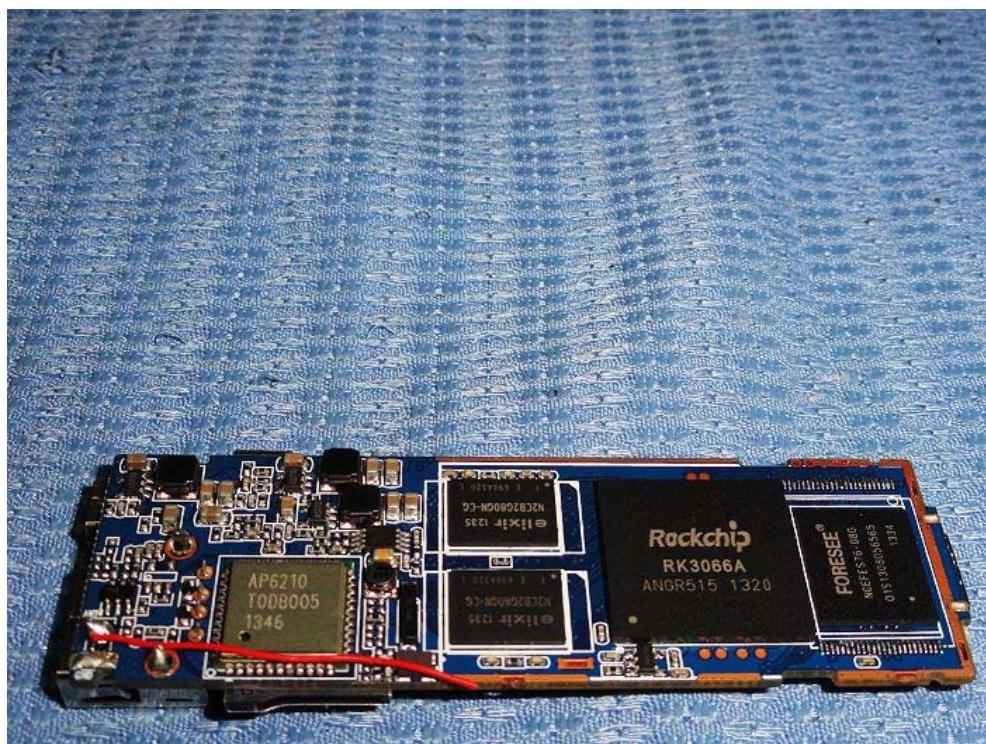


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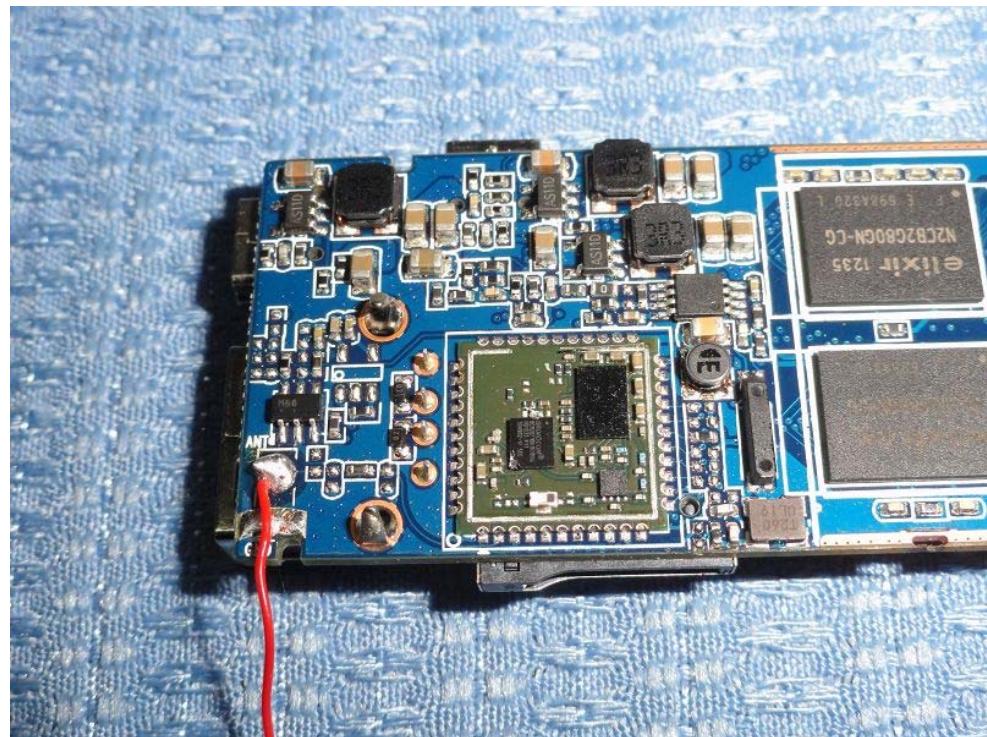
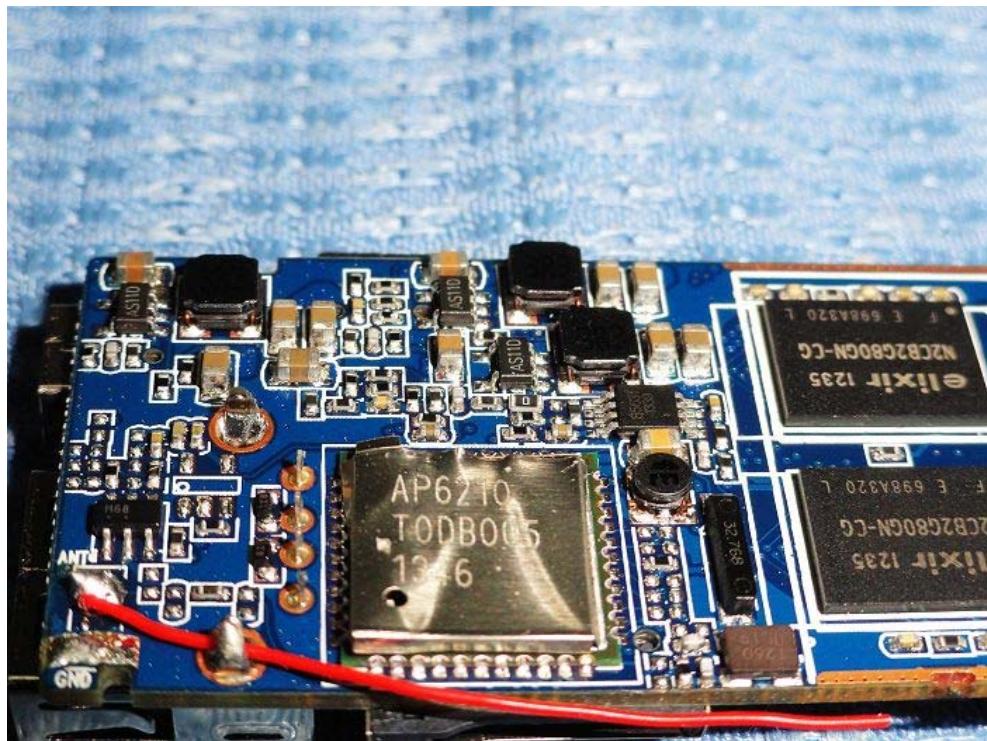


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