



## PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

### EMC TEST REPORT - Addendum

**Test Report Number** –24609-1 WLAN

**Report Date** – 2011-07-29

The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

Signature:

Name: Lei Yang

Title: EMC Project Manager

Test: 2011-07-16 to 2011-07-29

As the responsible test lab manager, I hereby declare that the model tested as specified in this report conforms to the requirements indicated.

Signature:

Name: Yilin Zhao

Title: Test Lab Manager

Date: 2011-08-02

This report must not be reproduced, except in full, without written approval from this laboratory.

FCC Registration Number: 177885

IC Registration Number: 109AW-1

ADR Testing Service location ADR BJ

ISO/IEC-17025:2005 accredited by UKAS



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## **Test Report Details**

Tests Performed By: Motorola (Beijing) Mobility Technologies Co., Ltd.  
Asia Global Compliance Labs  
No.1 Wang Jing East Road  
Chao Yang District  
Beijing, 100102, P. R. China  
Phone: +86 10 8499 5891  
FCC Registration Number: 177885  
IC Registration Number: 109AW-1

Tests Requested By: MOTOROLA MOBILITY, INC.  
600 North US Hwy 45  
Libertyville, IL 60048  
United States

Product Type: Cell phone with embedded WLAN

Signaling Capability: GSM 850/1900, Edge 850/1900, Bluetooth, 802.11b/g/n

IMEI: 3564720400015403

FCC ID: IHDP56MA4

Project number: 24609-1

Testing Complete Date: 2011-07-29

## **Applicable Standards**

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

  X   Part 15 Subpart C – Intentional Radiators

Applicable Standards: ANSI C63.4-2003, RSS-Gen Issue 3, RSS-210 Issue 8.

**Summary of Testing**

Test	Test Name	Pass/Fail
1	Spectrum Bandwidth	Pass
2	Peak Power	Pass
3	Power Spectral Density	Pass
4	Spurious RF Conducted Emissions	Pass
5	AC Line Conducted Emissions	Pass

Test	Test Name	Results
1	Spectrum Bandwidth	See plots
2	Peak Power	See plots
3	Power Spectral Density	See tables
4	Spurious RF Conducted Emissions	See plots
5	AC Line Conducted Emissions	See Plots

**General and Special Conditions**

The Cellular Phone hereinafter referred to as the Equipment under Test or EUT was tested using a fully charged model SNN5891A 1550mAH battery when applicable. Where a battery could not be used due to the need for a controlled variation of input voltage, an external power supply was utilized.

All testing was done in an indoor controlled environment. The temperature and the relative humidity were maintained within the ANSI C63.4-2003 Standard requirements during the entire duration of testing.

**Equipment and Cable Configurations**

The EUT was tested in a stand-alone configuration that is representative of typical use.

**Measuring Equipment and Calibration Information**

Manufacturer	Equipment Type	Model No.	Serial Number	Date of Calibration
Rohde Schwarz	Receiver	FSU26	200353	03/03/11
Rohde Schwarz	Receiver	ESCI	100650	03/08/11
Agilent	Attenuator	8491A	MY39263202	NCR
Rohde Schwarz	LISN	ENV216	100055	12/19/2010

All test equipment was within their calibration date during the time of testing. When equipment went out of calibration during testing it was replaced using a similar piece of calibrated equipment. All these equipments are listed in the equipment list. The LISI is on a two-year calibration cycle. All other equipments are on a one-year calibration cycle.

**Description of WLAN Transmitter**

The EUT offers WLAN as a feature. The WLAN antenna is mounted inside of the EUT. The antenna installation is permanent. For a more thorough description of the functionality please refer to Exhibit 12 of this package.

As a WLAN transmitter, it is designed operate with other WLAN devices as defined by the industrial standard. In this application, the device is battery operated.

**De Facto EIRP Limit – Pursuant 47 CFR 15.247(b)(4); RSS-210 Section A8.4.**

Criterion: The conducted output power limit of 1-watt is based on the use of antennas with directional gains that do not exceed 6 dB<sub>i</sub>. If transmitting antennas of directional gain greater than 6 dB<sub>i</sub> are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB<sub>i</sub>.

The antenna employed by this transmitter is intended to be omni-directional, and thus will not exhibit directional gain in excess of 6 dB<sub>i</sub>. The conducted power is less than the limits set forth (see elsewhere in this report for details).

## **Measurement Procedures and Data**

### **Spectrum Bandwidth**

CFR 47 Part 15.247

### **Measurement Procedure**

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage.

The WLAN emission of the EUT was enabled. The spectrum analyzer used the following settings:

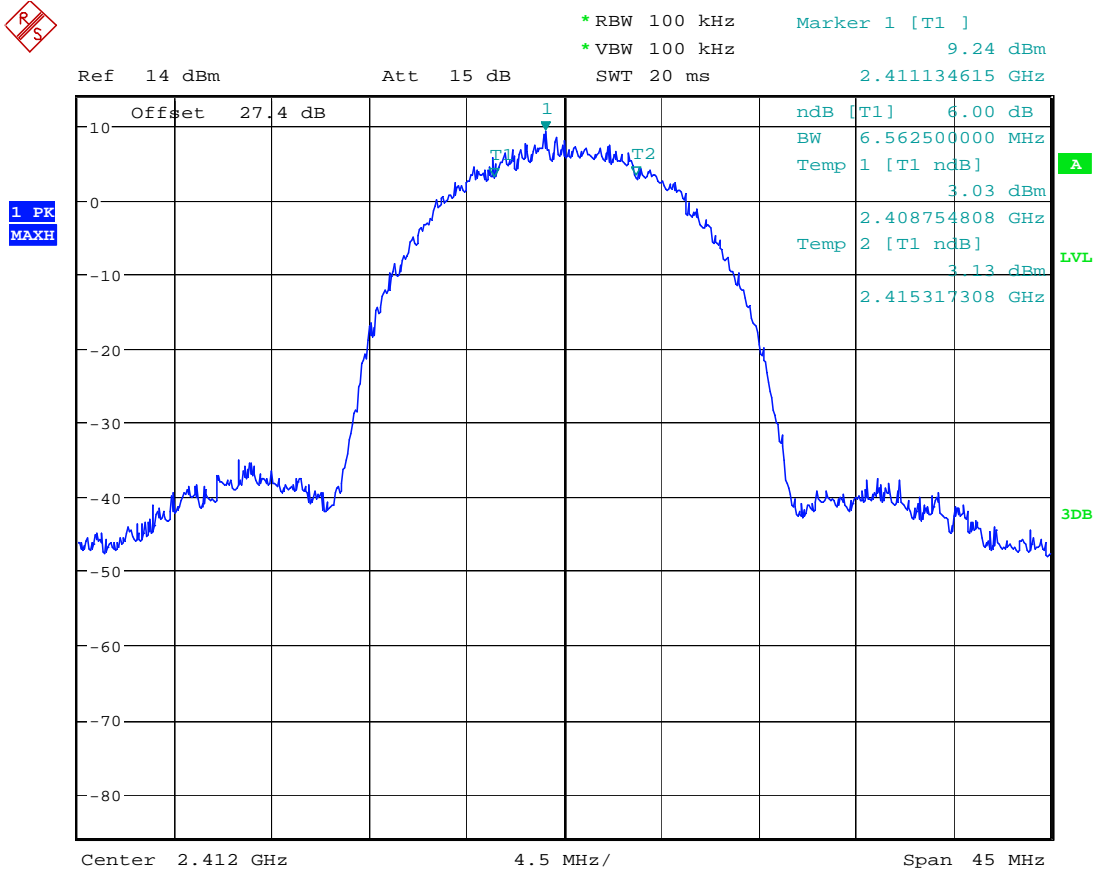
1. RBW  $\geq$  100 kHz
2. VBW  $\geq$  RBW
3. Sweep = auto
4. Detector function = peak
5. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The n dB down function was used to measure 6 dB down one side of the emission. The n dB down function and marker was moved to the other side of the emission until it was even with the reference marker. The 6 dB down reading at this point was the 6 dB bandwidth of the emission. The same procedure was repeated for 20 dB bandwidth.

### **Measurement Results**

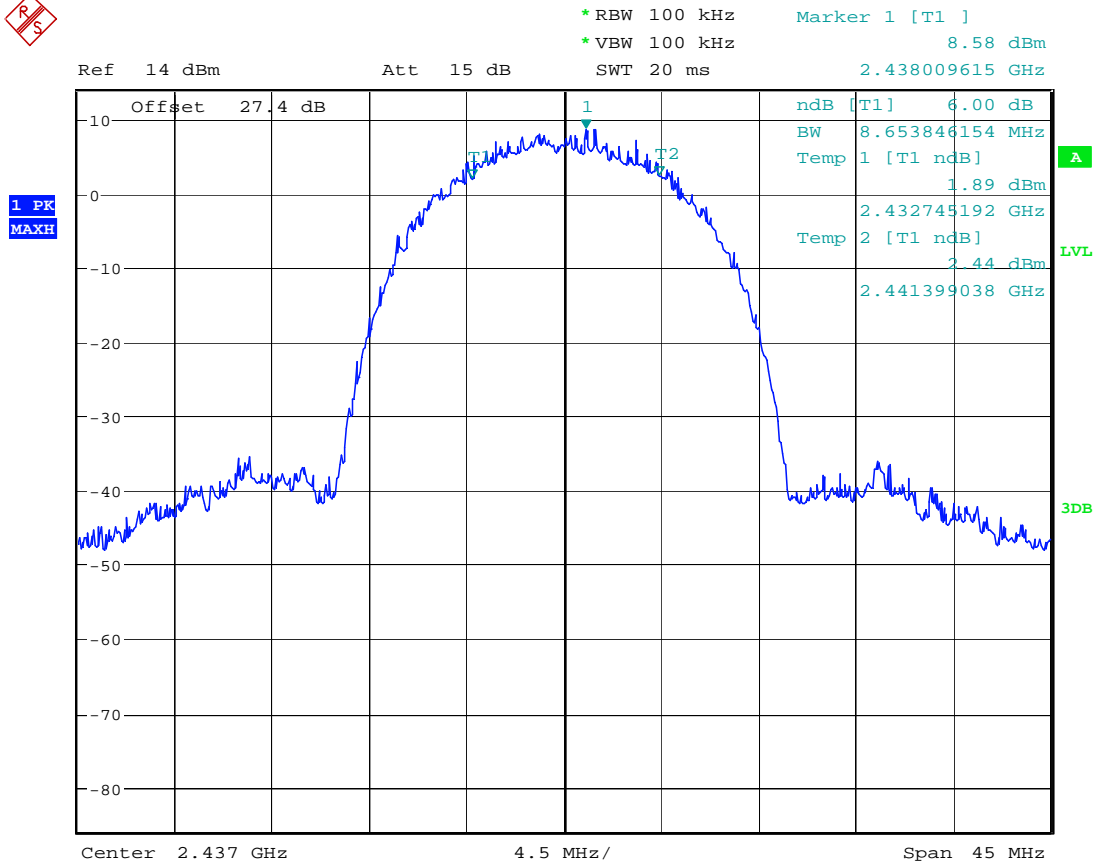
See attached

**802.11 b @ 11Mbps**



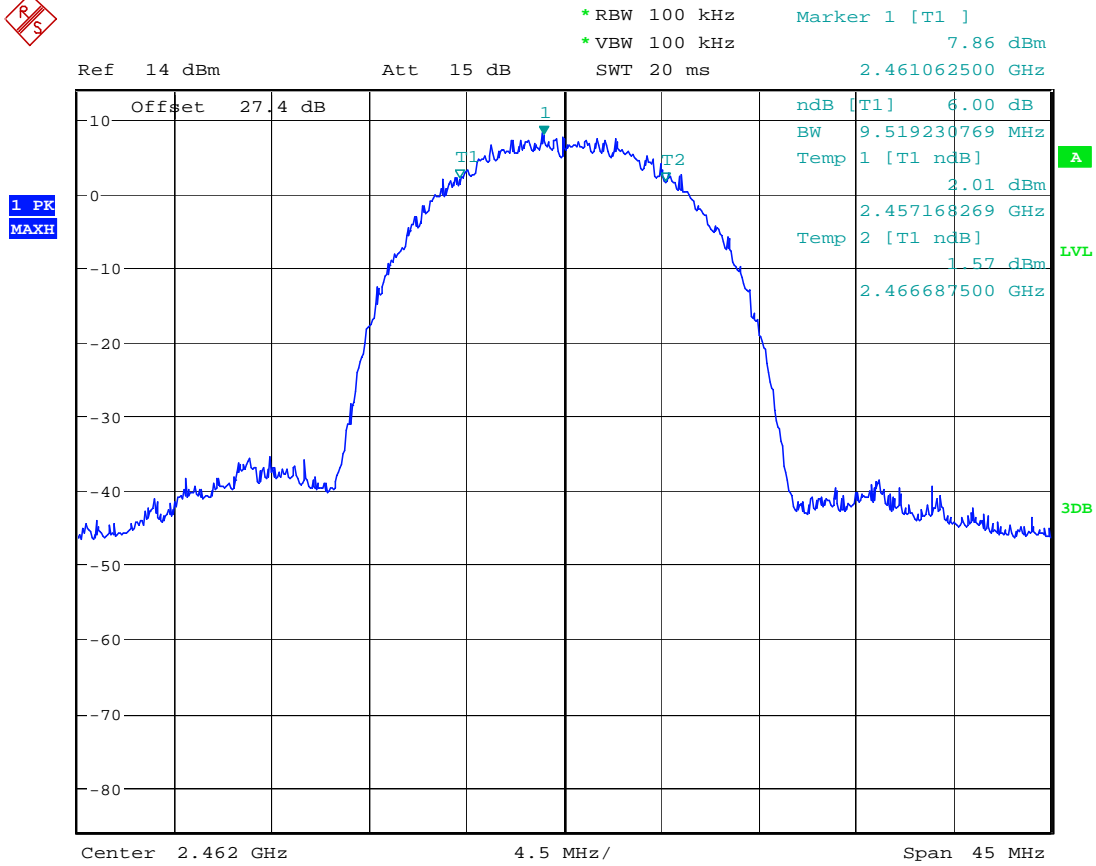
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**6dB Bandwidth Channel 1 @ 11Mbps**



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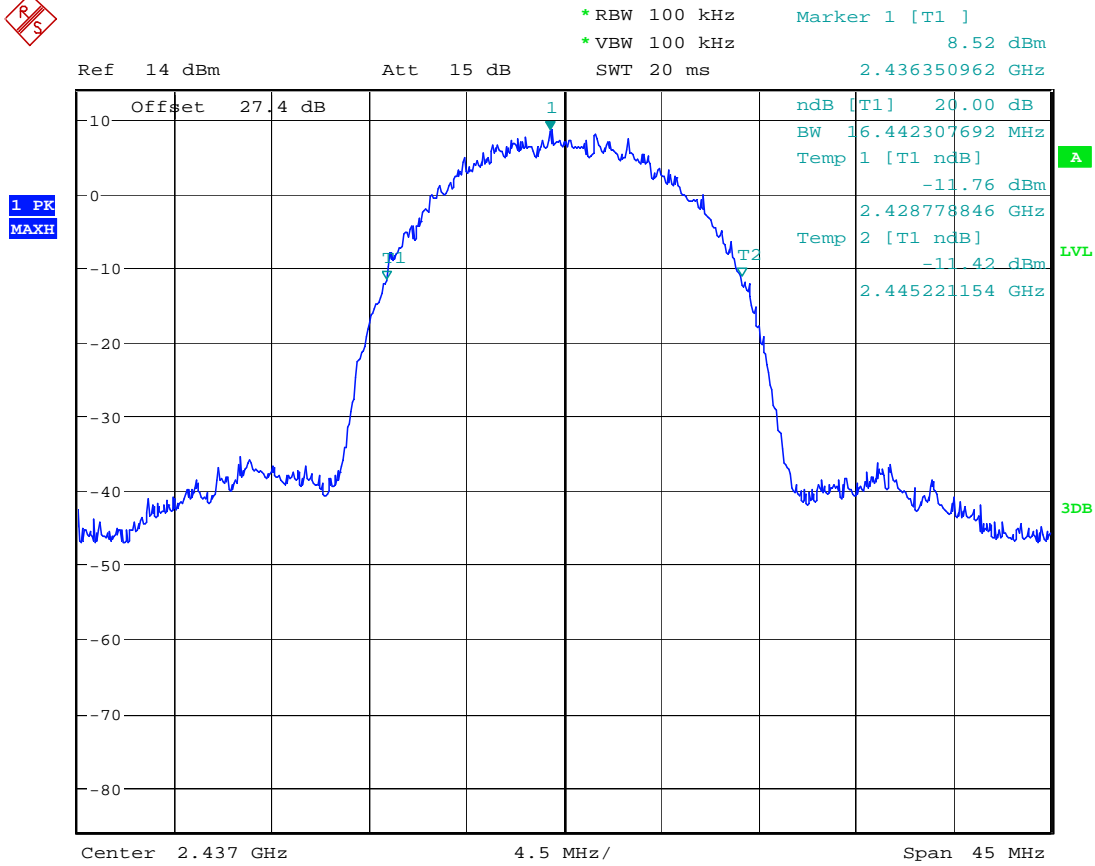
**6dB Bandwidth Channel 6 @ 11Mbps**



Date: 18.JUL.2011 07:09:41

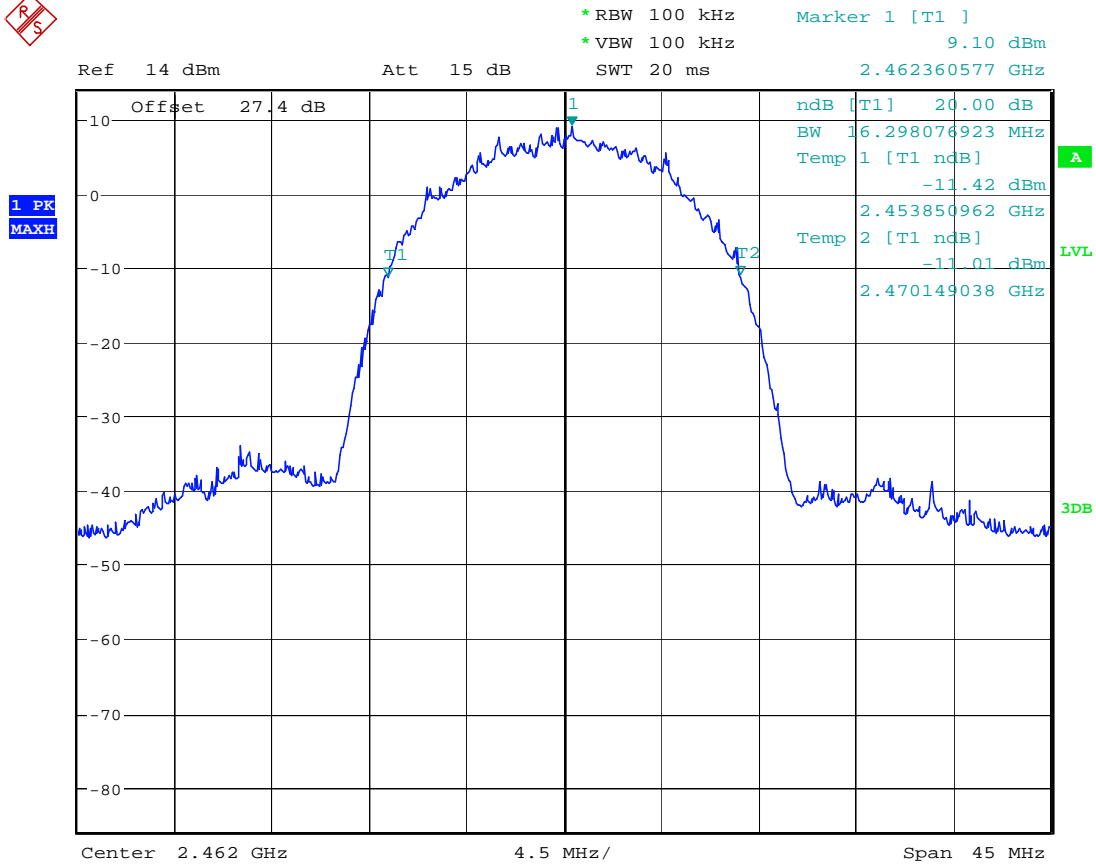
**6dB Bandwidth Channel 11 @ 11Mbps**





Date: 18.JUL.2011 07:06:10

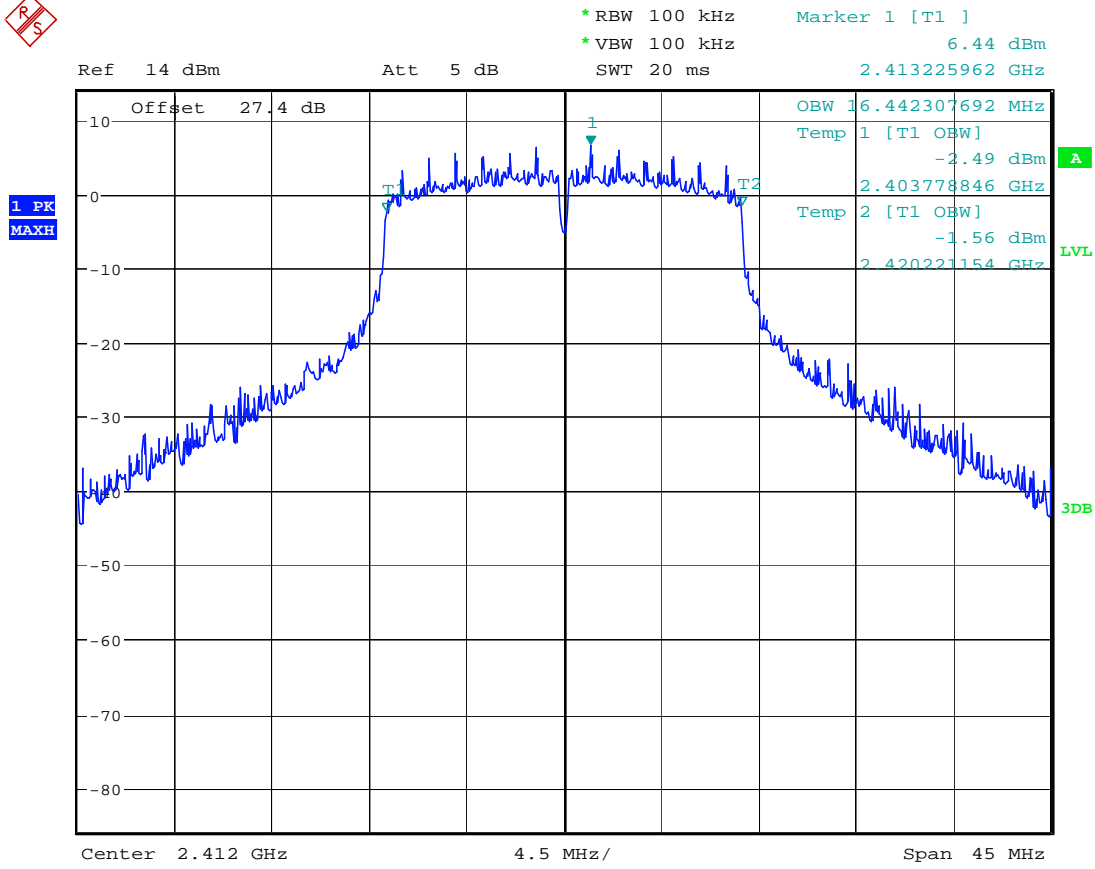
**20dB Bandwidth Channel 6 @ 11Mbps**



Date: 18.JUL.2011 06:45:52

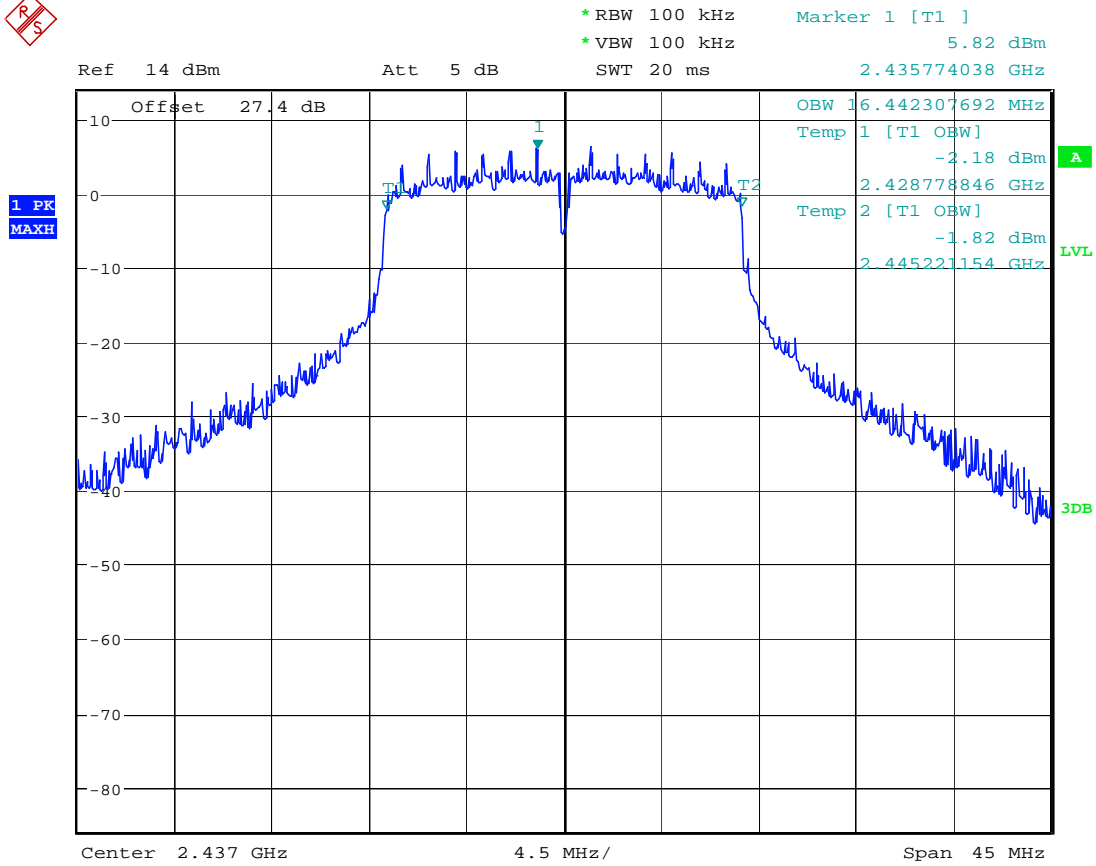
**20dB Bandwidth Channel 11 @ 11Mbps**

**802.11 g @ 6Mbps**



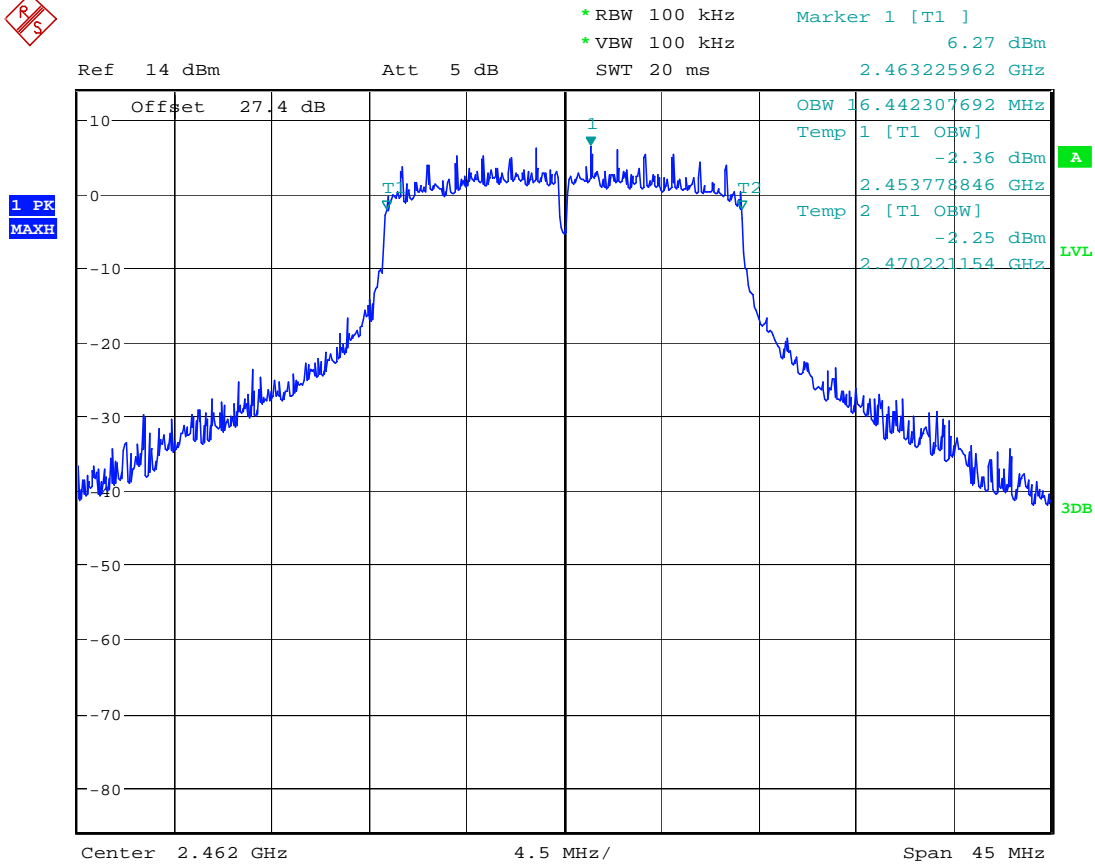
Date: 18.JUL.2011 07:04:34

**6dB Bandwidth Channel 1 @6Mbps**



Date: 18.JUL.2011 07:03:47

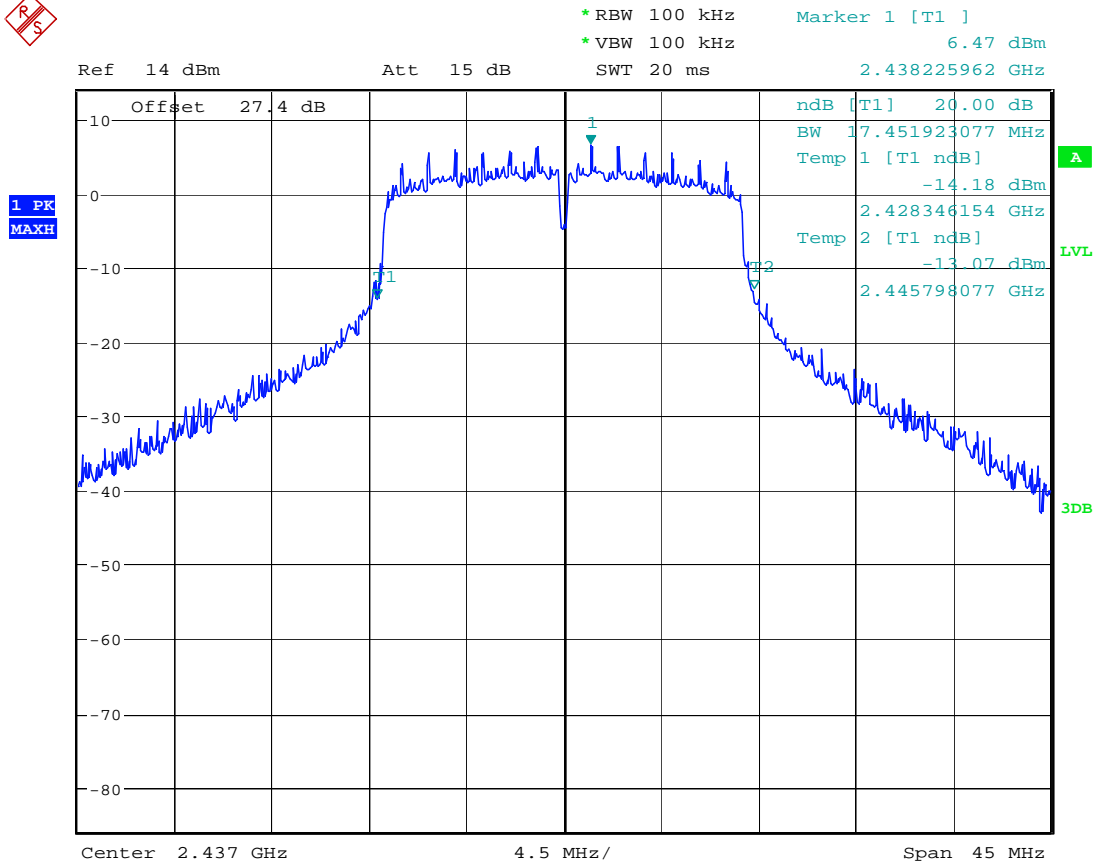
**6dB Bandwidth Channel 6@ 6Mbps**



Date: 18.JUL.2011 06:51:33

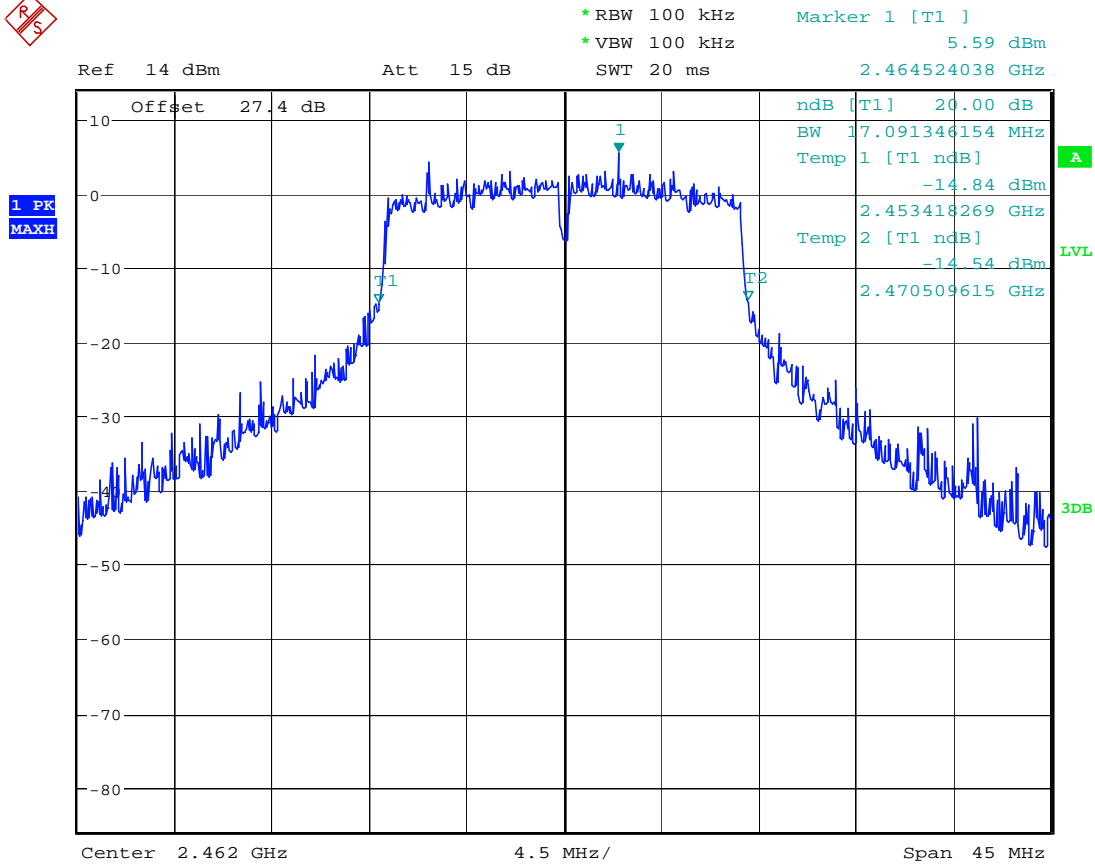
### 6dB Bandwidth Channel 11 @ 6Mbps





Date: 18.JUL.2011 07:03:15

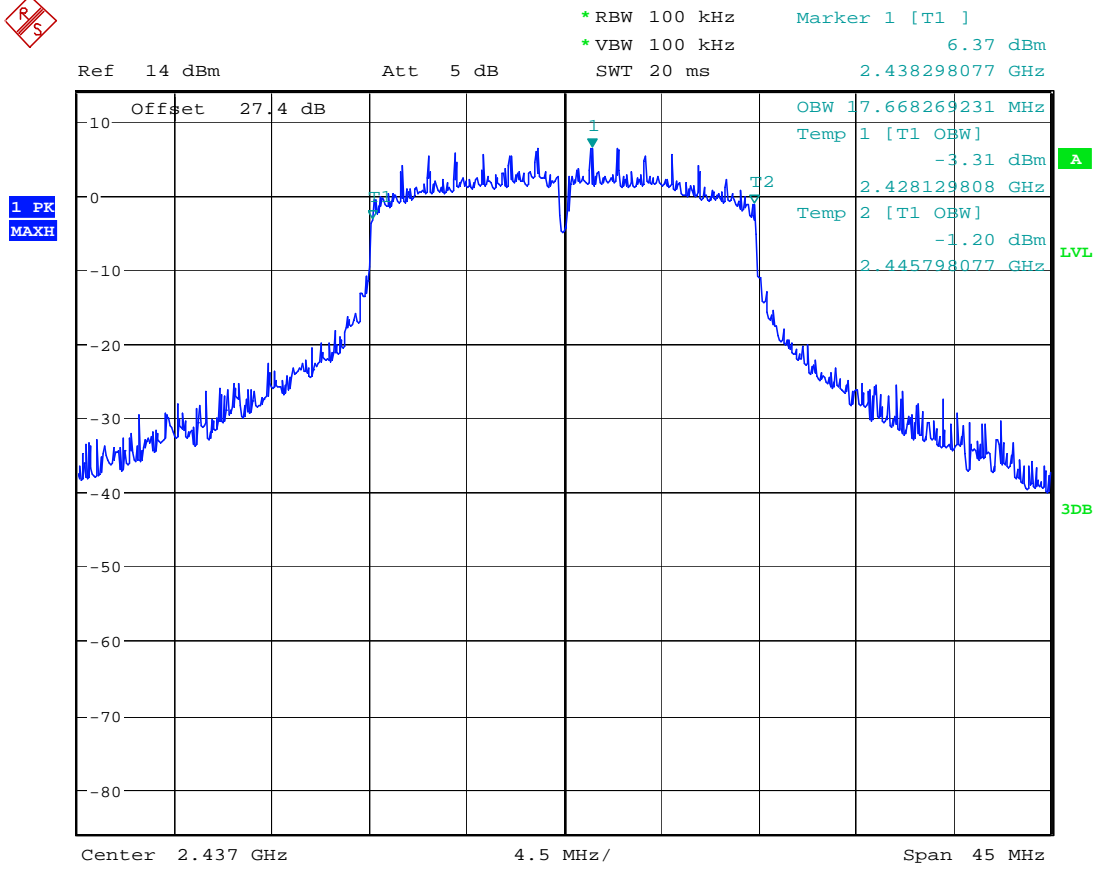
**20dB Bandwidth Channel 6 @ 6Mbps**



Date: 18.JUL.2011 06:50:56

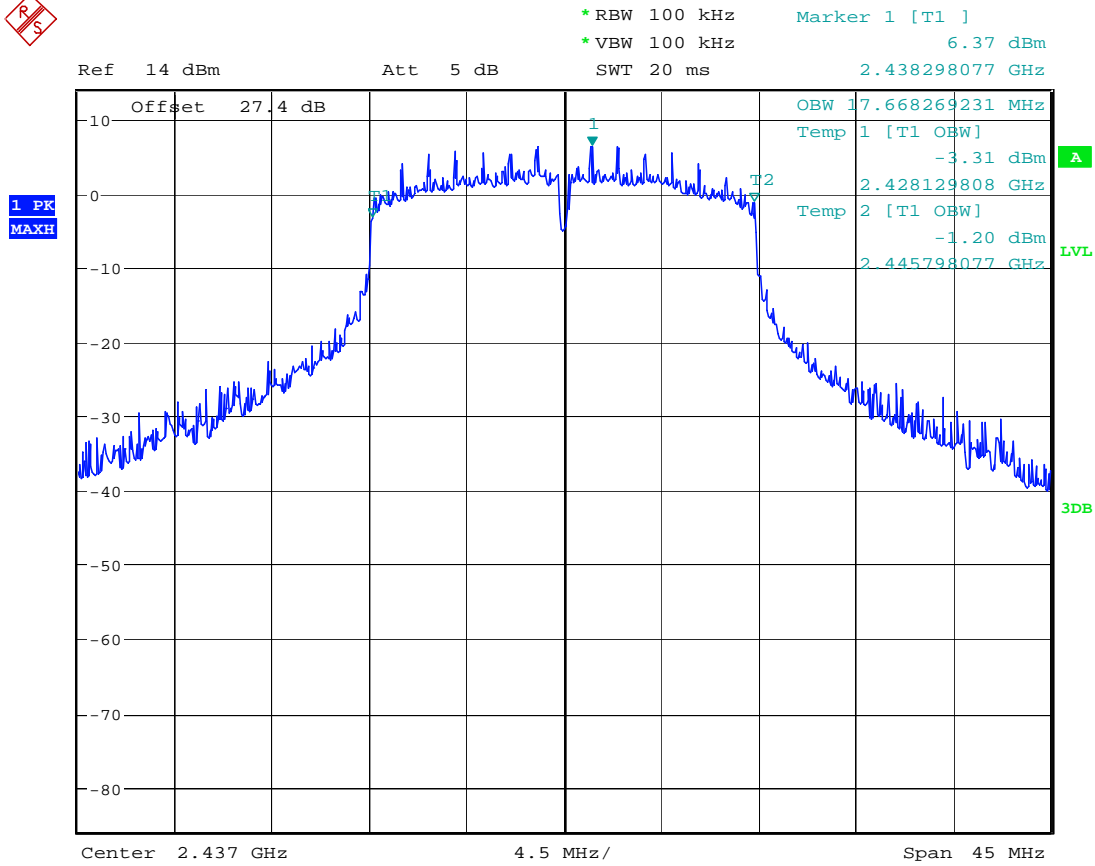
**20dB Bandwidth Channel 11 @ 6Mbps**

**802.11 n @ 6.5 Mbps**



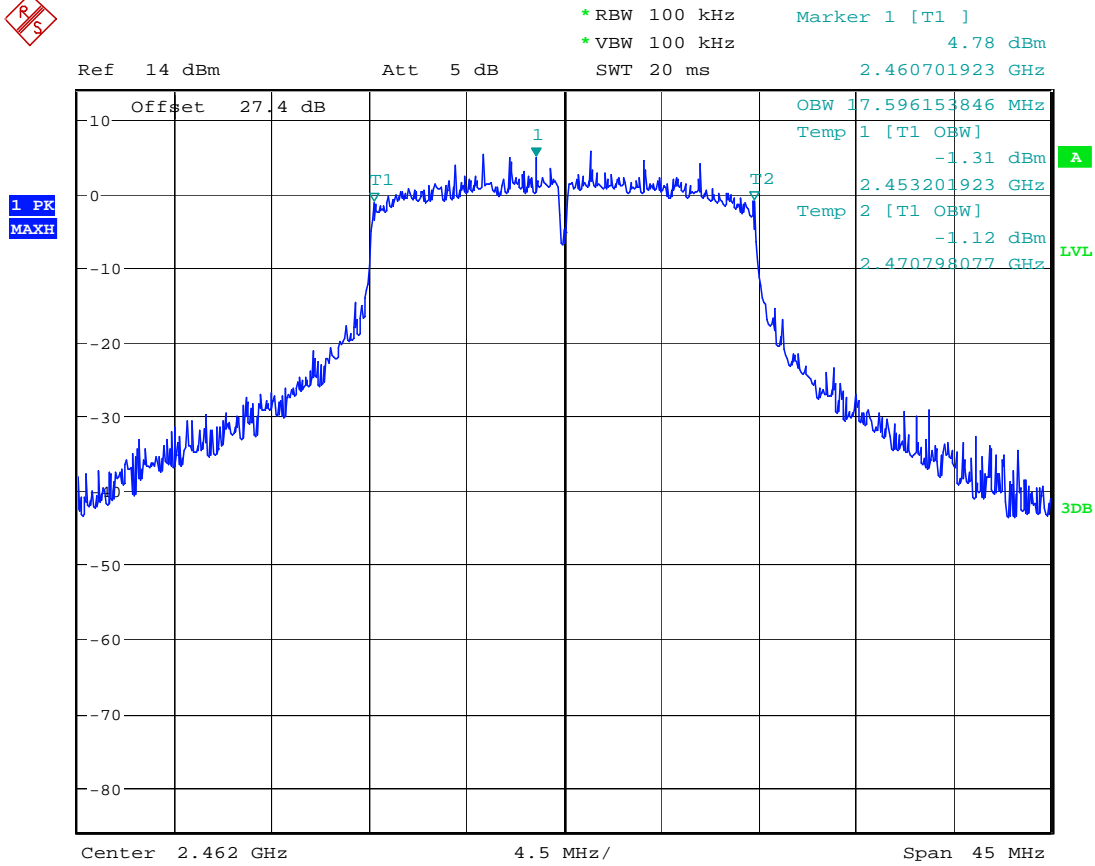
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**6dB Bandwidth Channel 1 @ 6.5Mbps**



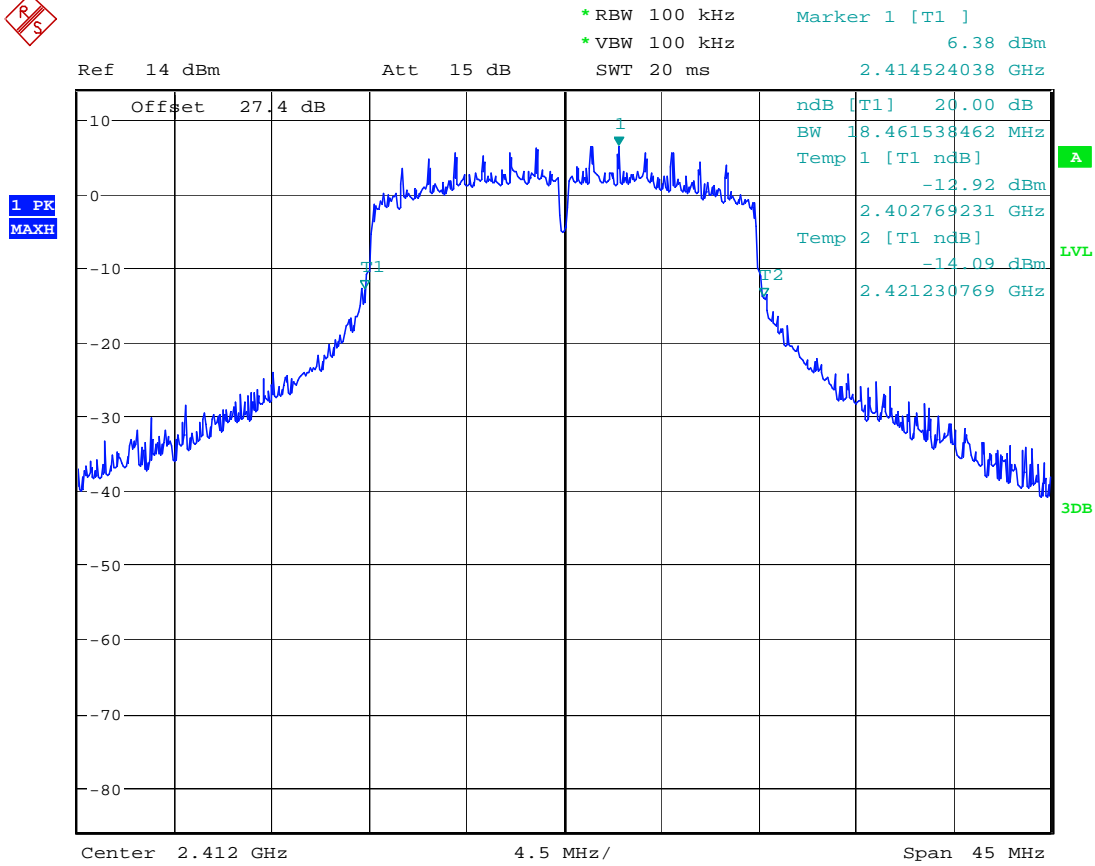
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**6dB Bandwidth Channel 6 @ 6.5Mbps**



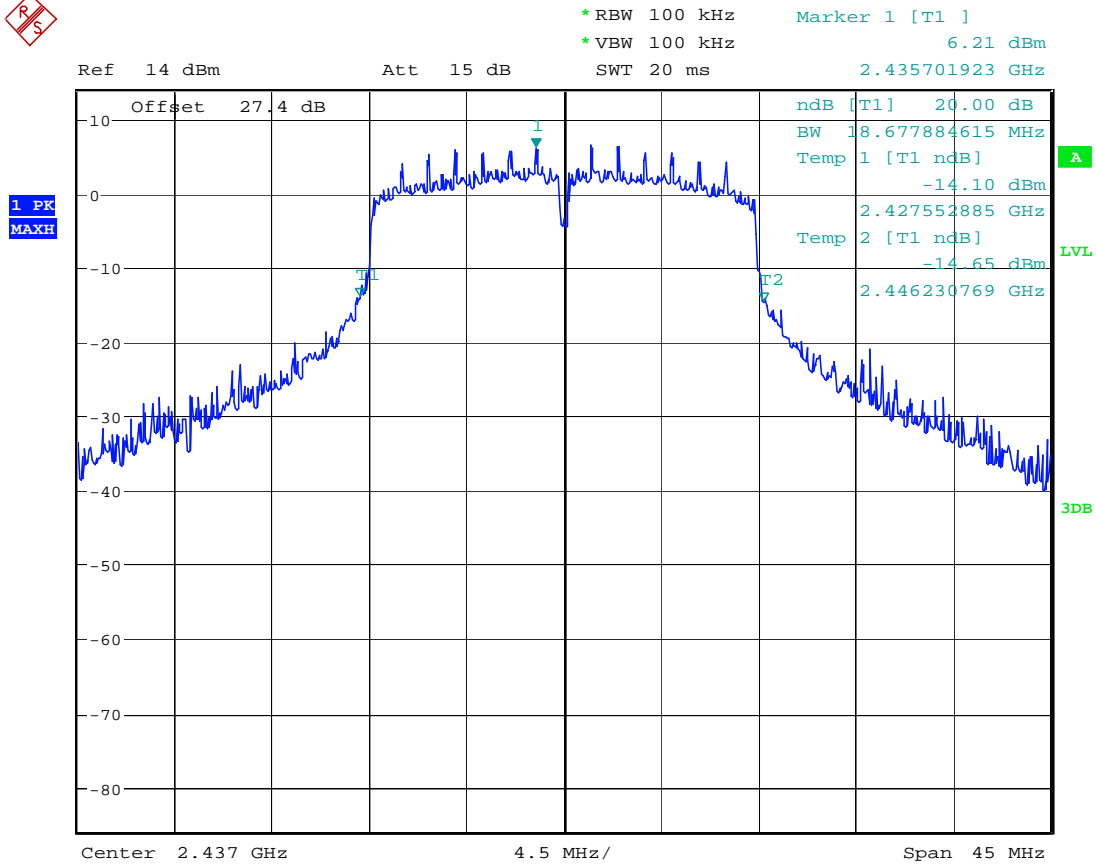
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**6dB Bandwidth Channel 11 @ 6.5Mbps**



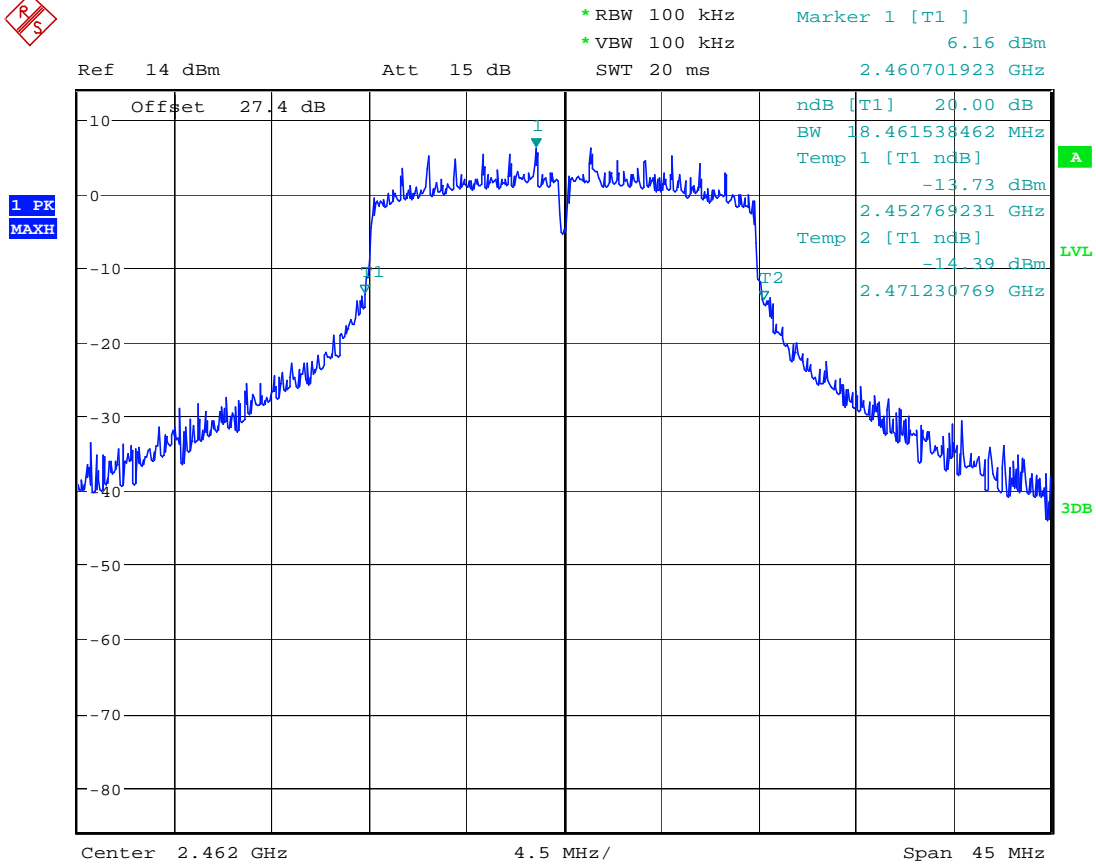
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**20dB Bandwidth Channel 1 @ 6.5Mbps**



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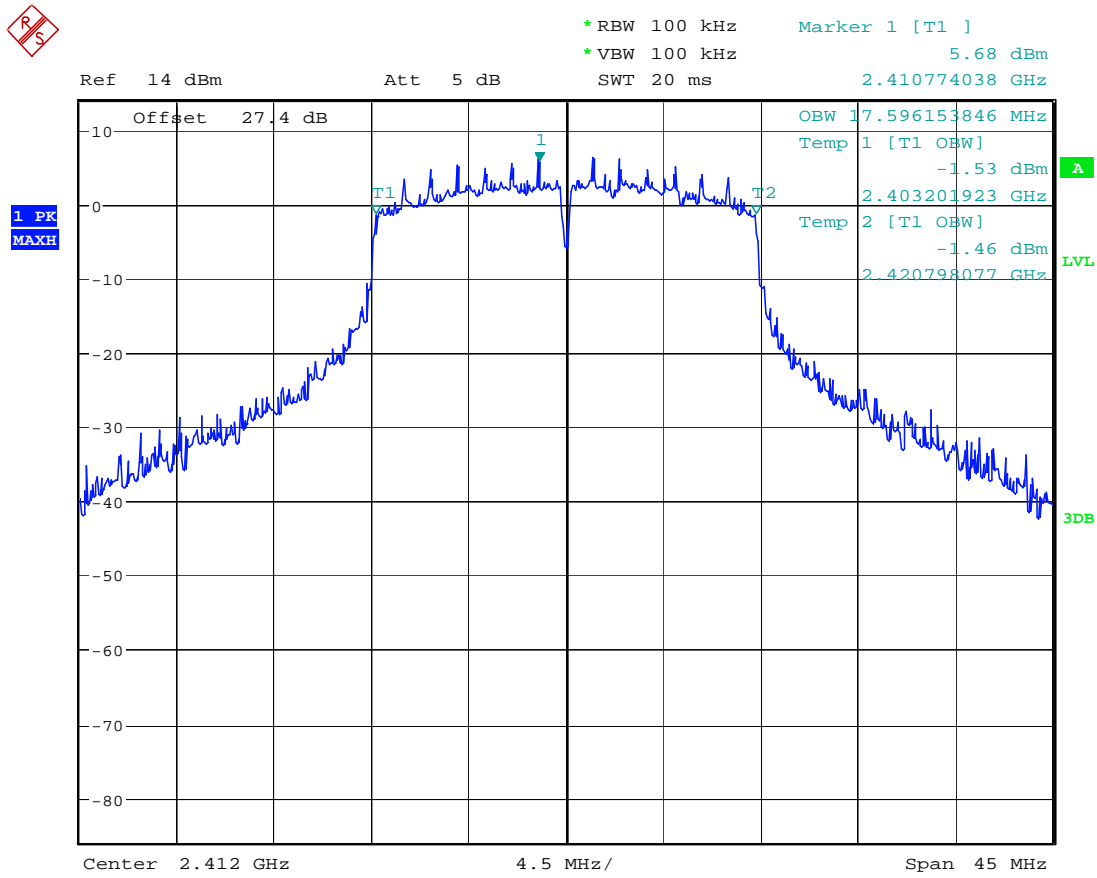
**20dB Bandwidth Channel 6 @ 6.5Mbps**



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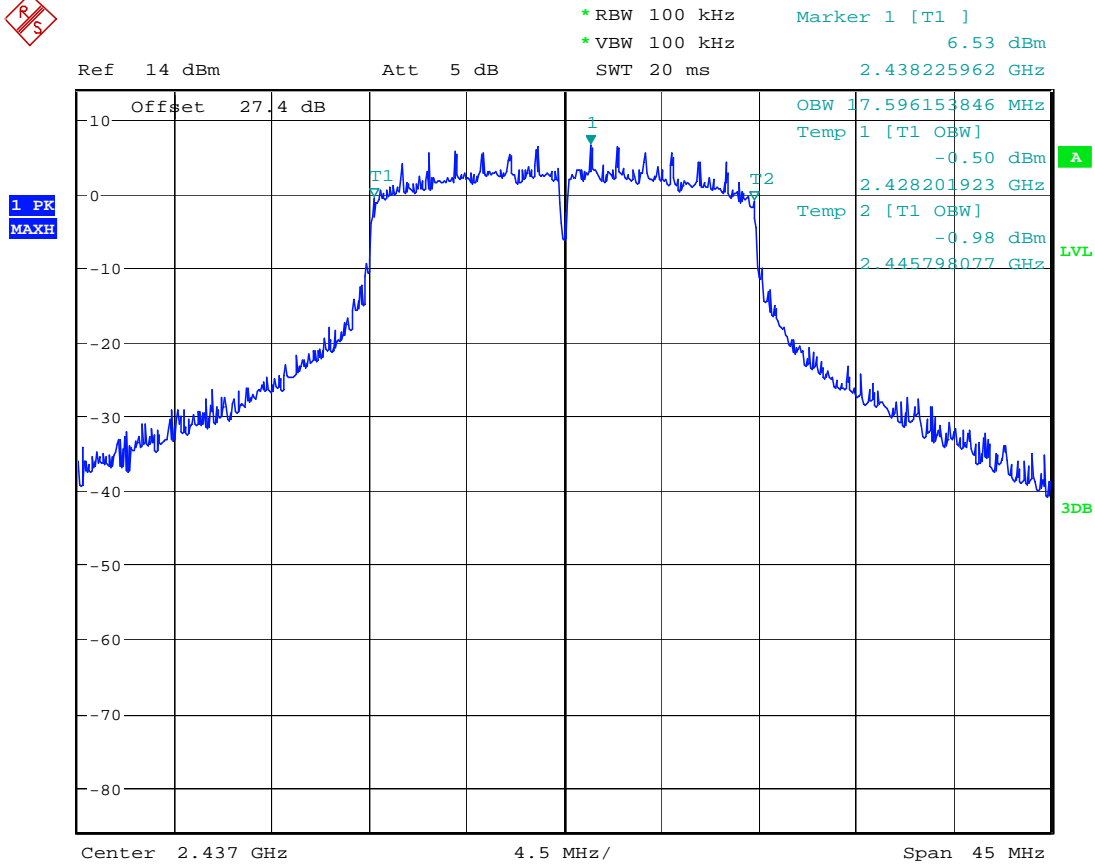
**20dB Bandwidth Channel 11 @ 6.5Mbps**

**802.11 n @ 7.2 Mbps**



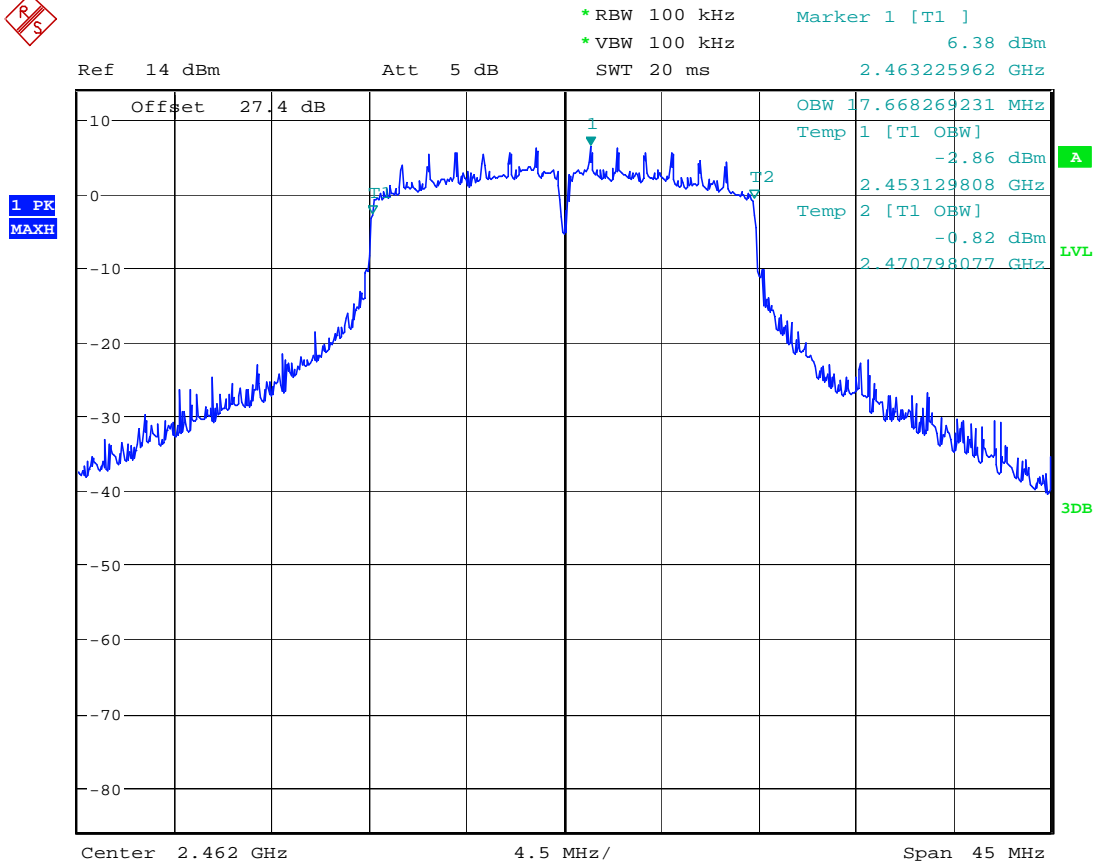
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**6dB Bandwidth Channel 1 @ 7.2Mbps**



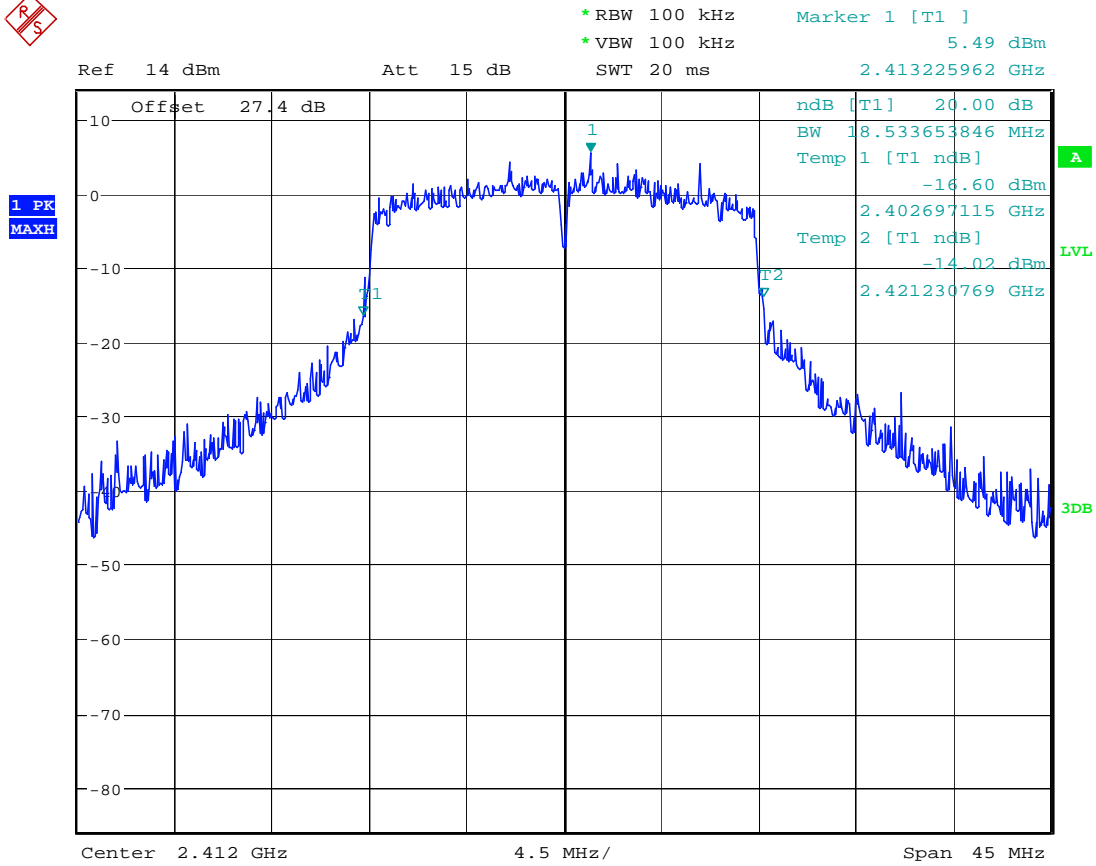
Date: 18.JUL.2011 07:14:02

**6dB Bandwidth Channel 6 @ 7.2Mbps**



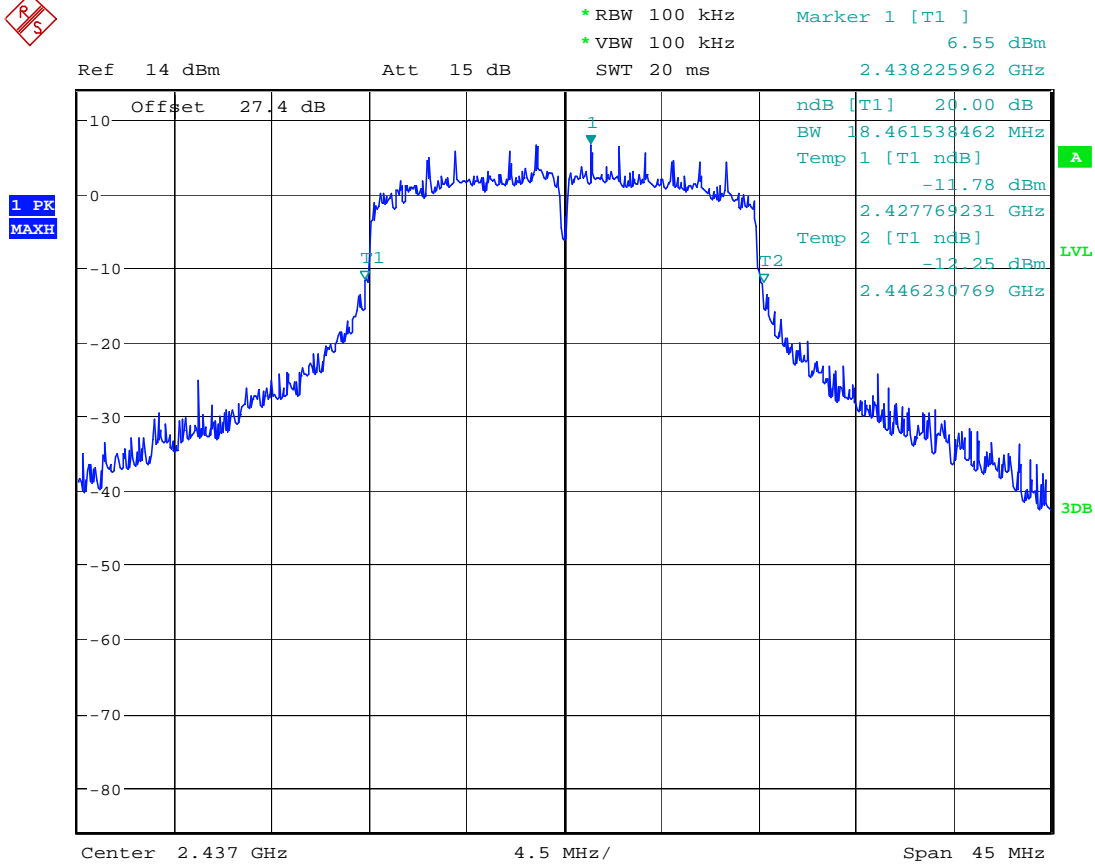
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**6dB Bandwidth Channel 11 @ 7.2Mbps**



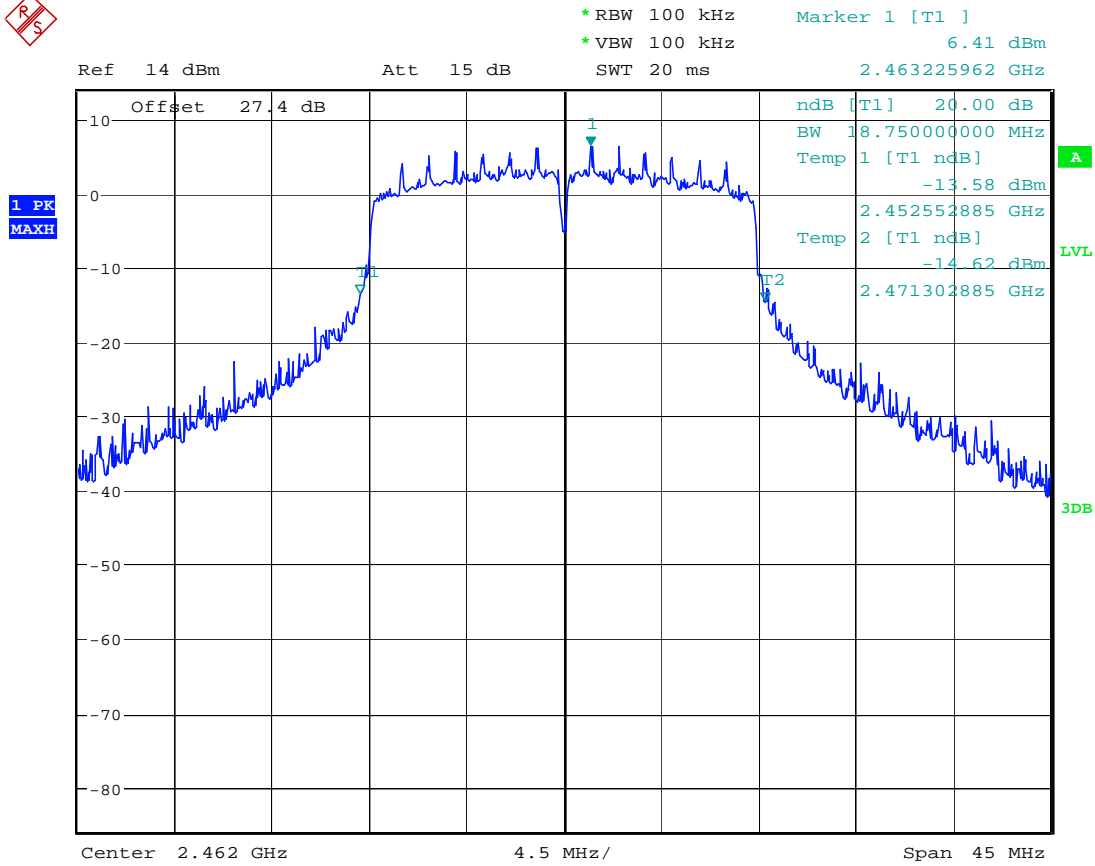
Date: 18.JUL.2011 07:16:41

**20dB Bandwidth Channel 1 @ 7.2Mbps**



Date: 18.JUL.2011 07:13:39

**20dB Bandwidth Channel 6 @ 7.2Mbps**



Date: 18.JUL.2011 07:15:35

**20dB Bandwidth Channel 11 @ 7.2Mbps**

## **PEAK OUTPUT POWER**

CFR 47 Part 15.247

### **Measurement Procedure**

The RF output port of the Equipment-Under-Test is directly coupled to the input of the Spectrum analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage. Initially, an average detector is used to measure power in the low, middle and high channels for all data rate. The average measurements are used to determine which data rate is to be fully tested for each supported mode. Using a peak detector, the power is then measured for the applicable data rates.

### **Measurement Results**

See Attached

Initial average power measurements

Band	Frequency (MHz)	CH	Average power (dBm) for 802.11b in 2.4GHz Data Rates			
			1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
WLAN (WIFI)	2412	1	17.73	17.88	18.91	19.01
	2437	6	17.97	18.13	19.12	<b>19.17</b>
	2462	11	17.83	17.86	19.04	18.89

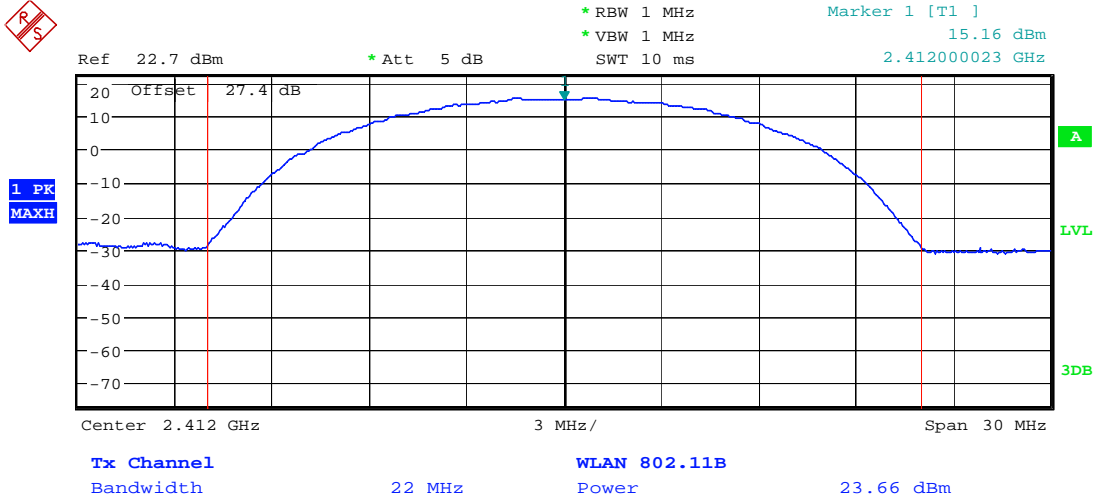
Band	Frequency (MHz)	CH	Average power (dBm) for 802.11g in 2.4GHz Data Rates							
			6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
WLAN (WIFI)	2412	1	17.68	17.65	17.18	17.2	15.73	15.69	14.38	14.34
	2437	6	<b>17.91</b>	17.84	17.43	17.42	15.93	15.87	14.55	14.55
	2462	11	17.63	17.71	17.27	17.37	15.82	15.85	14.38	14.75

Band	Frequency (MHz)	CH	Average power (dBm) for 802.11n in 2.4GHz							
			20MHz BW, 400ns GI Data Rates							
			7.2 Mbps	14.4 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps
WLAN (WIFI)	2412	1	17.59	17.23	17.22	15.65	15.64	14.17	14.1	13.24
	2437	6	<b>17.83</b>	17.43	17.46	15.74	15.87	14.18	14.29	13.45
	2462	11	17.68	17.16	17.36	15.74	15.75	14.14	14.15	13.23

Band	Frequency (MHz)	CH	Average power (dBm) for 802.11n in 2.4GHz							
			20MHz BW, 800ns GI Data Rates							
			6.5 Mbps	13 Mbps	19.5 Mbps	26 Mbps	39 Mbps	52 Mbps	58.5 Mbps	65 Mbps
WLAN (WIFI)	2412	1	17.53	17.1	17.13	15.56	15.71	14.17	14.15	13.32
	2437	6	<b>17.74</b>	17.34	17.34	15.87	15.85	14.51	14.39	13.53
	2462	11	17.59	17.09	17.17	15.54	15.69	15.2	14.18	13.37

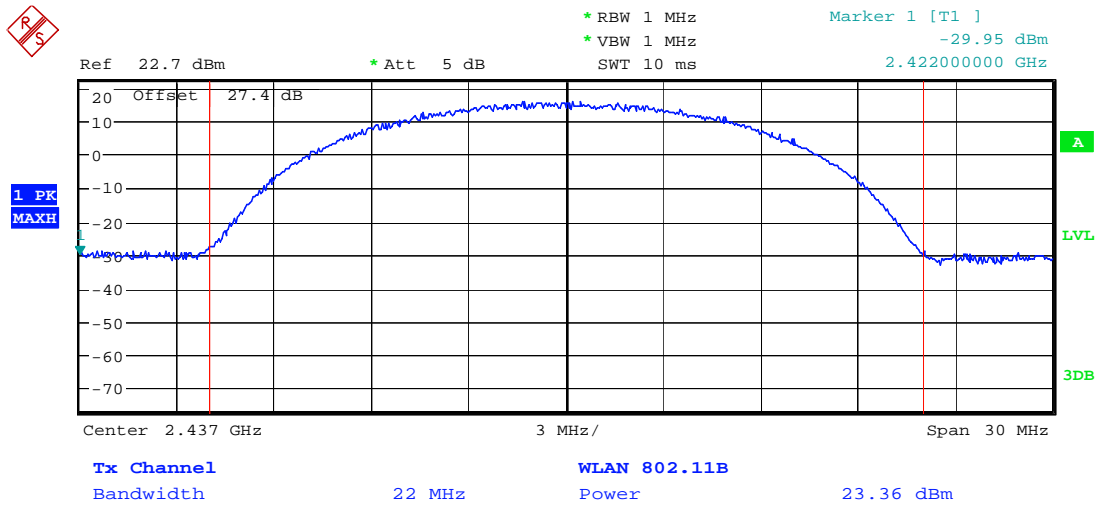
Based on these initial measurements, it was determined that testing will be performed in the 11Mbps data for the 802.11b mode, the 6Mbps data rate for the 802.11g mode, the 6.5Mbps data rate for 802.11n 800ns GI mode, the 7.2Mbps data rate for 802.11n 400ns GI mod, Plots showing the peak power measurements for the applicable data rates follow.

**802.11 b @ 11Mbps**



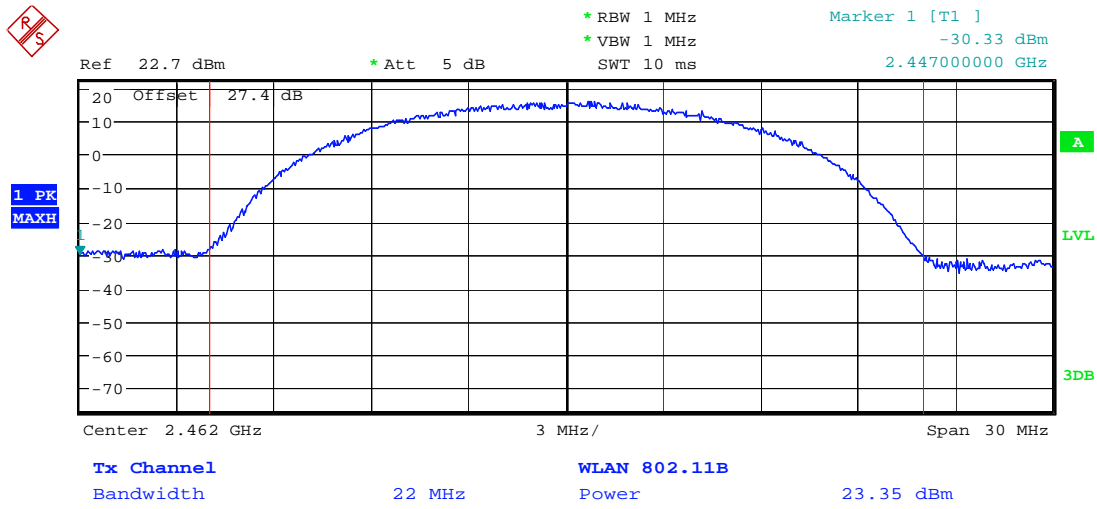
Date: 18.JUL.2011 07:25:53

**Max. Power Channel 1 @ 11Mbps**



Date: 18.JUL.2011 07:26:27

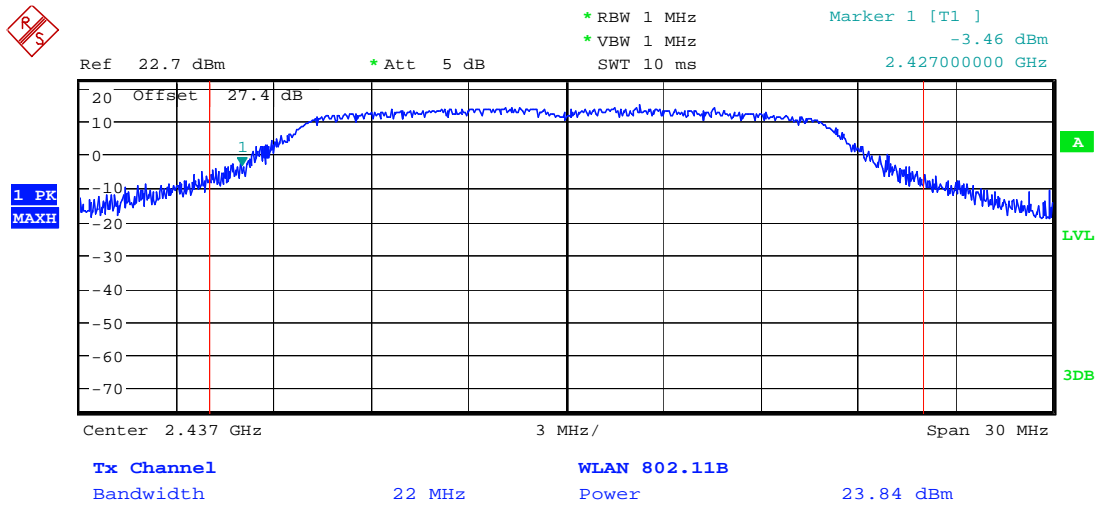
**Max. Power Channel 6 @ 11Mbps**



Date: 18.JUL.2011 07:27:03

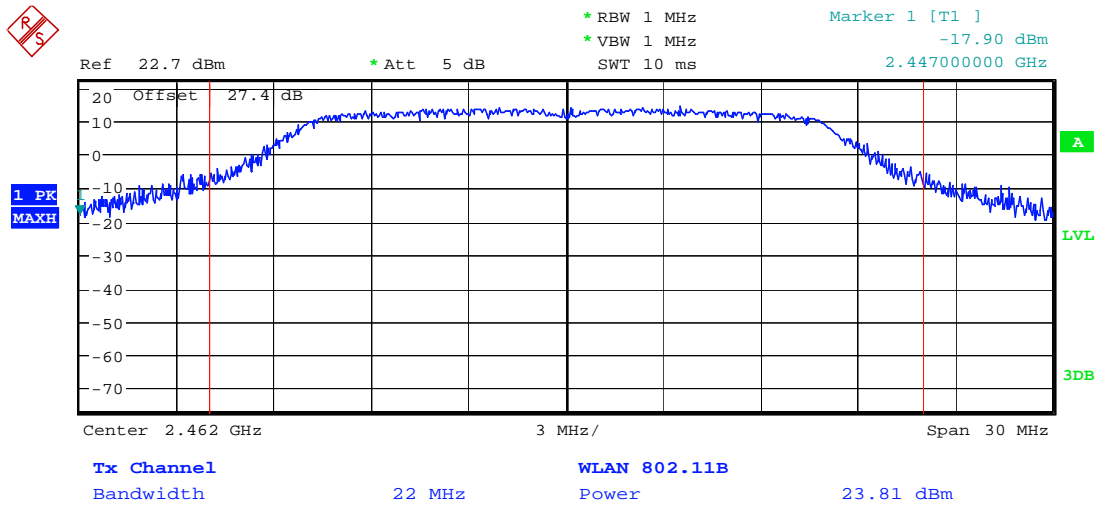
**Max. Power Channel 11 @ 11Mbps**





Date: 18.JUL.2011 07:28:59

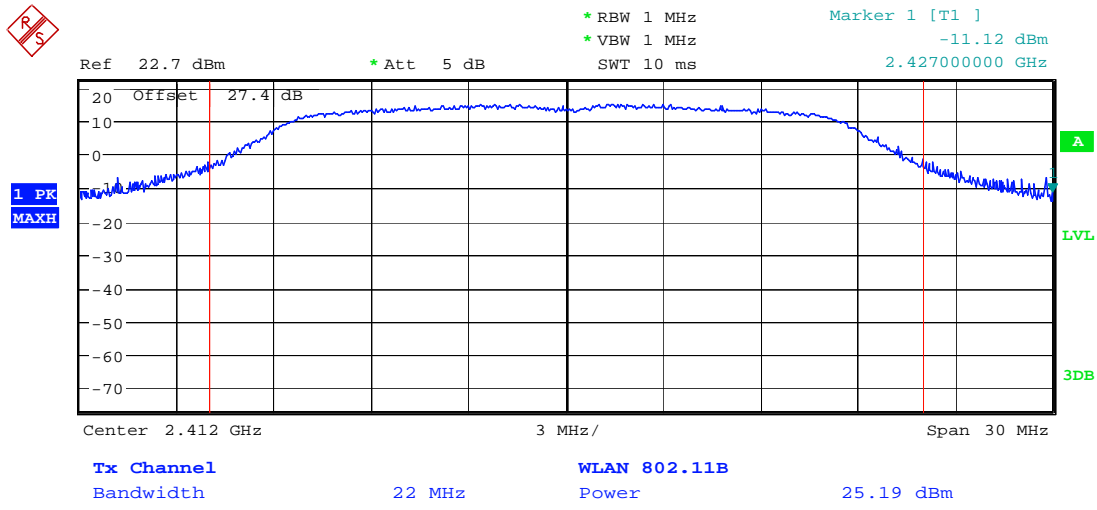
**Max. Power Channel 6 @ 6Mbps**



Date: 18.JUL.2011 07:29:39

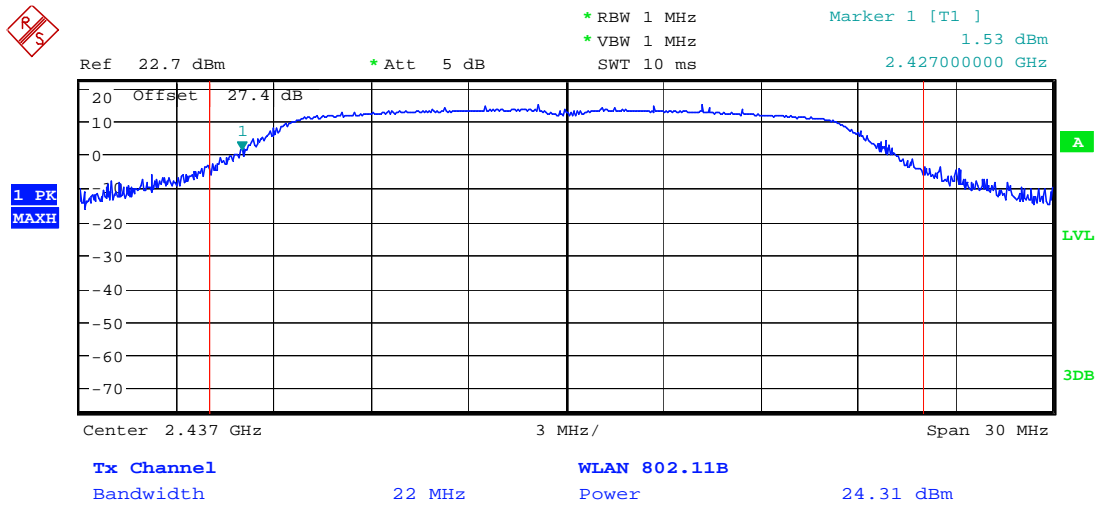
**Max. Power Channel 11 @ 6Mbps**

**802.11 n @ 6.5Mbps**



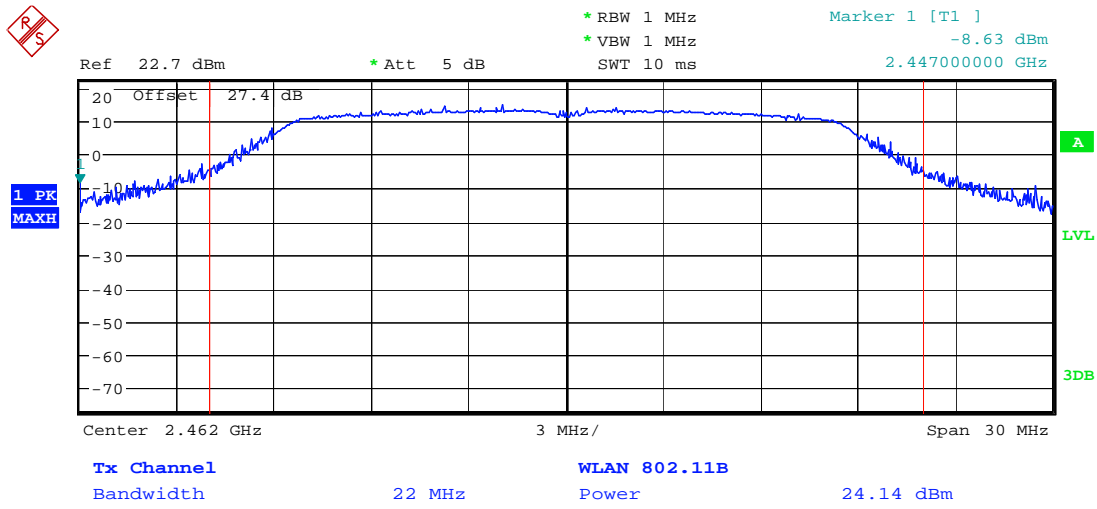
Date: 18.JUL.2011 07:32:00

**Max. Power Channel 1 @ 6.5Mbps**



Date: 18.JUL.2011 07:32:31

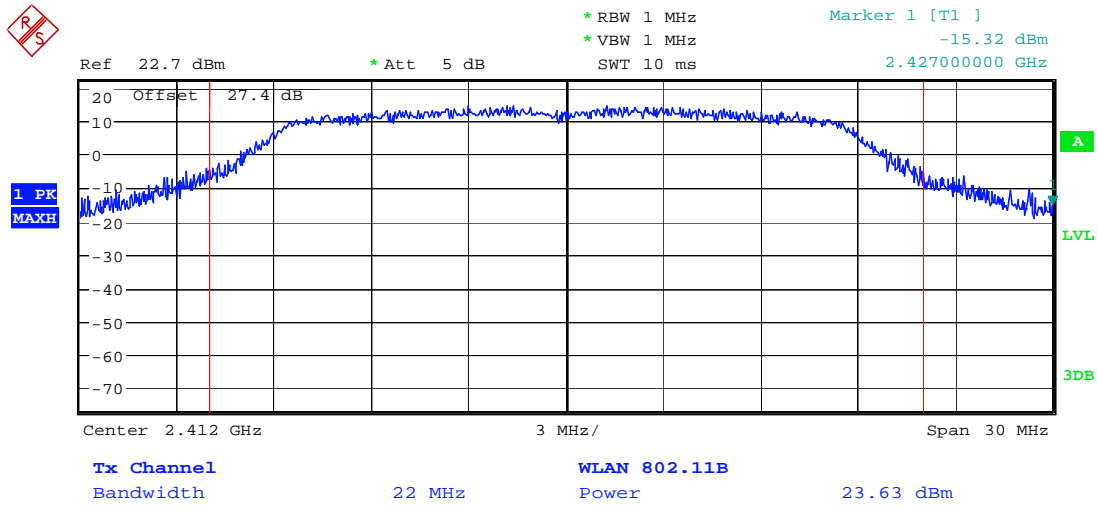
**Max. Power Channel 6 @ 6.5Mbps**



Date: 18.JUL.2011 07:33:02

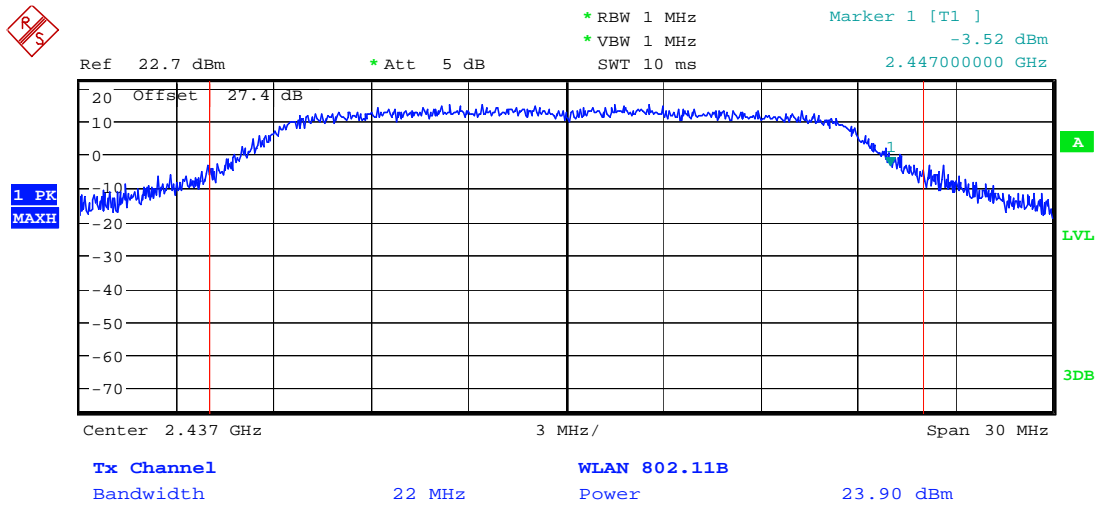
**Max. Power Channel 11 @ 6.5Mbps**

**802.11 n @ 7.2Mbps**



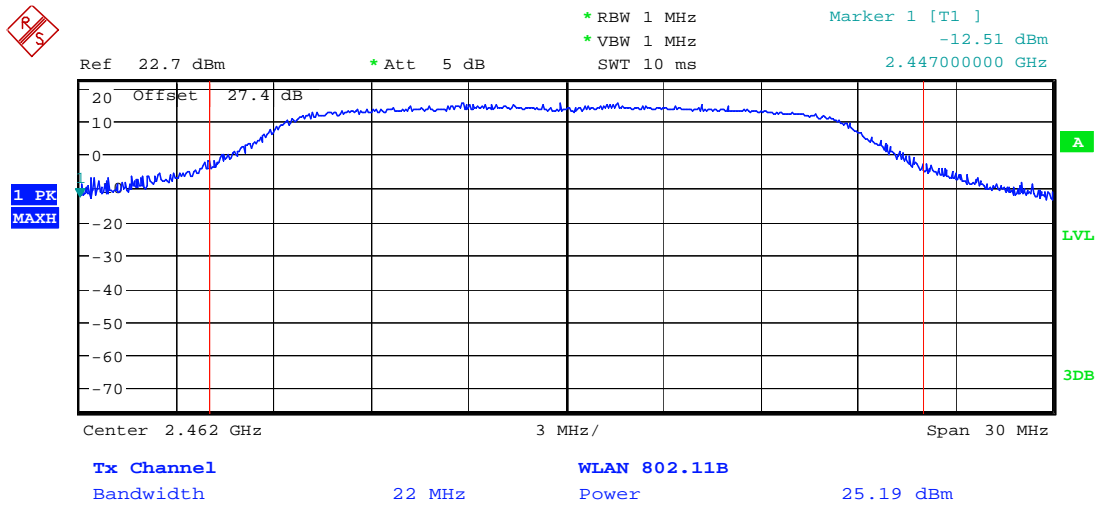
Date: 18.JUL.2011 07:31:28

**Max. Power Channel 1 @7.2Mbps**



Date: 18.JUL.2011 07:31:03

**Max. Power Channel 6 @ 7.2Mbps**



Date: 18.JUL.2011 07:30:31

**Max. Power Channel 11 @ 7.2Mbps**

**Power Spectral Density**

CFR 47 Part 15.247 (d)

**Measurement Procedure**

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage.

The WLAN DSSS function of the EUT was enabled. The spectrum analyzer used the following settings:

- Span = 300kHz
- VBW =30kHz
- RBW=3kHz
- Sweep = 50ms
- Detector function = peak
- Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate.

**Measurement Results**

<b>2412 MHz</b>	<b>2437MHz</b>	<b>2462MHz</b>
-5.98	-6.16	-6.75

**802.11 b 11Mbps**

<b>2412 MHz</b>	<b>2437MHz</b>	<b>2462MHz</b>
-13.95	-13.08	-13.92

**802.11 g 54Mbps**

<b>2412 MHz</b>	<b>2437MHz</b>	<b>2462MHz</b>
-13.05	-12.37	-12.69

**802.11 n 400ns GI 7.2Mbps**

<b>2412 MHz</b>	<b>2437MHz</b>	<b>2462MHz</b>
-13.52	-12.05	-13.85

**802.11 n 800ns GI 6.5Mbps**

## **SPURIOUS RF CONDUCTED EMISSIONS**

CFR 47 Part 15.247

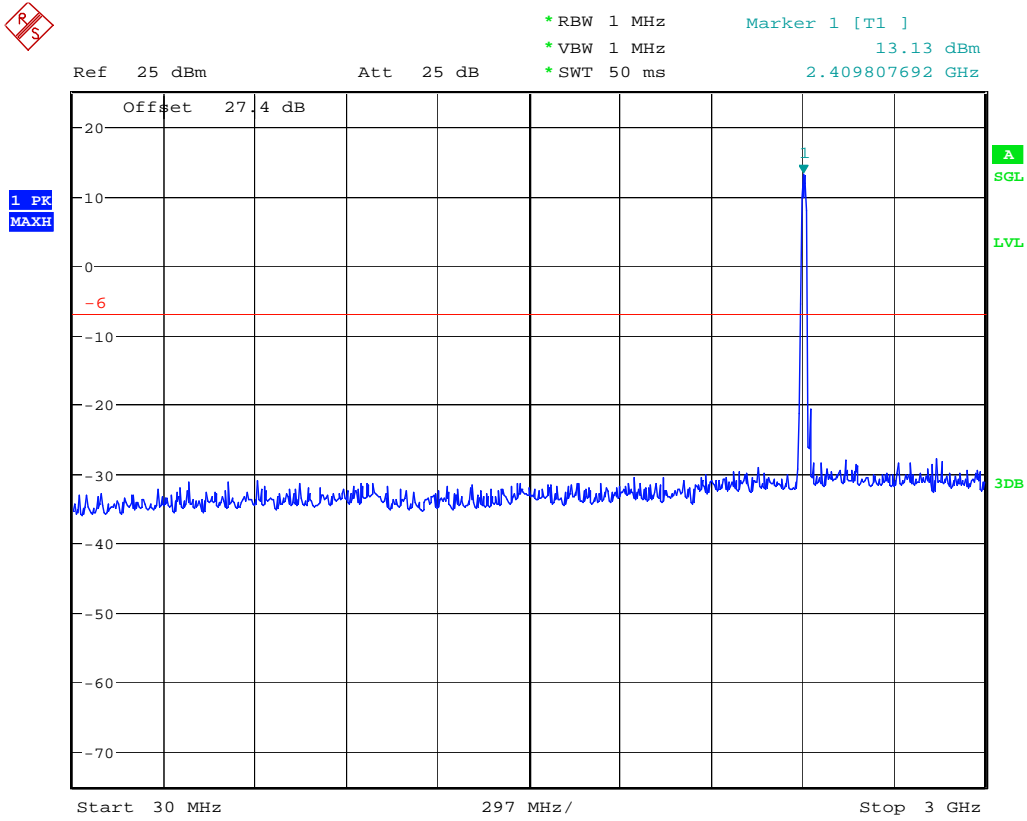
### **Measurement Procedure**

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20dB passive attenuator. A fully charged battery was used for the supply voltage.

### **Measurement Results**

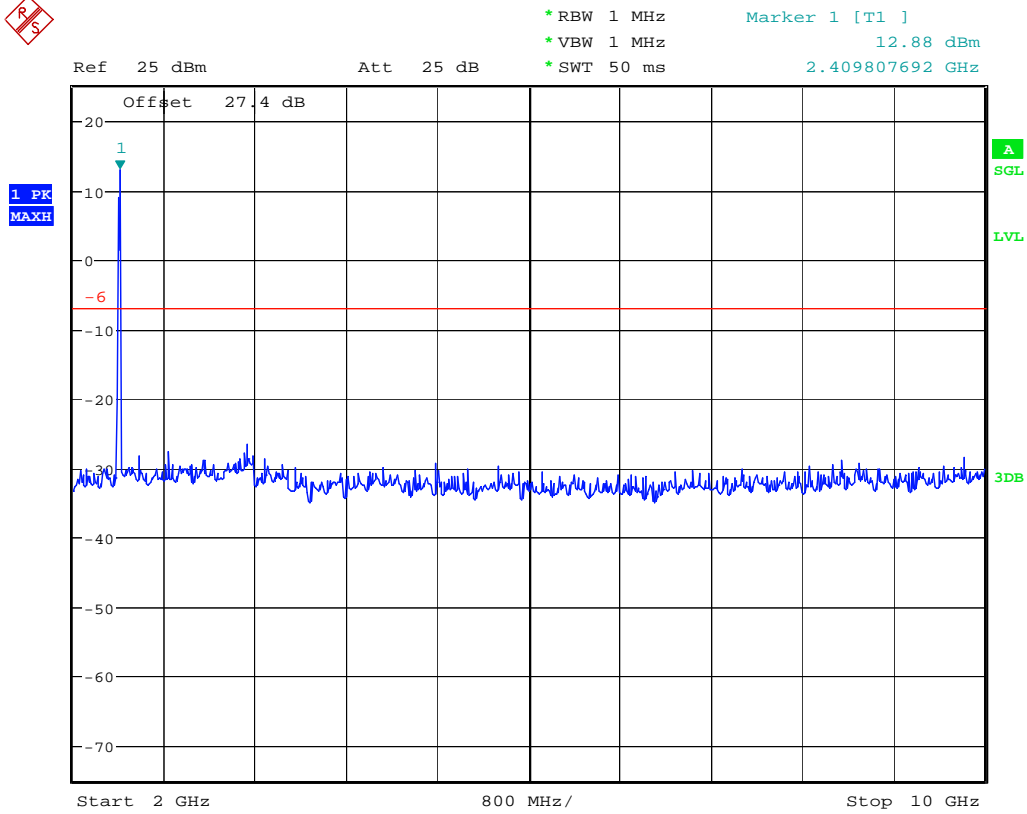
See attached:

**802.11 b @ 11Mbps**



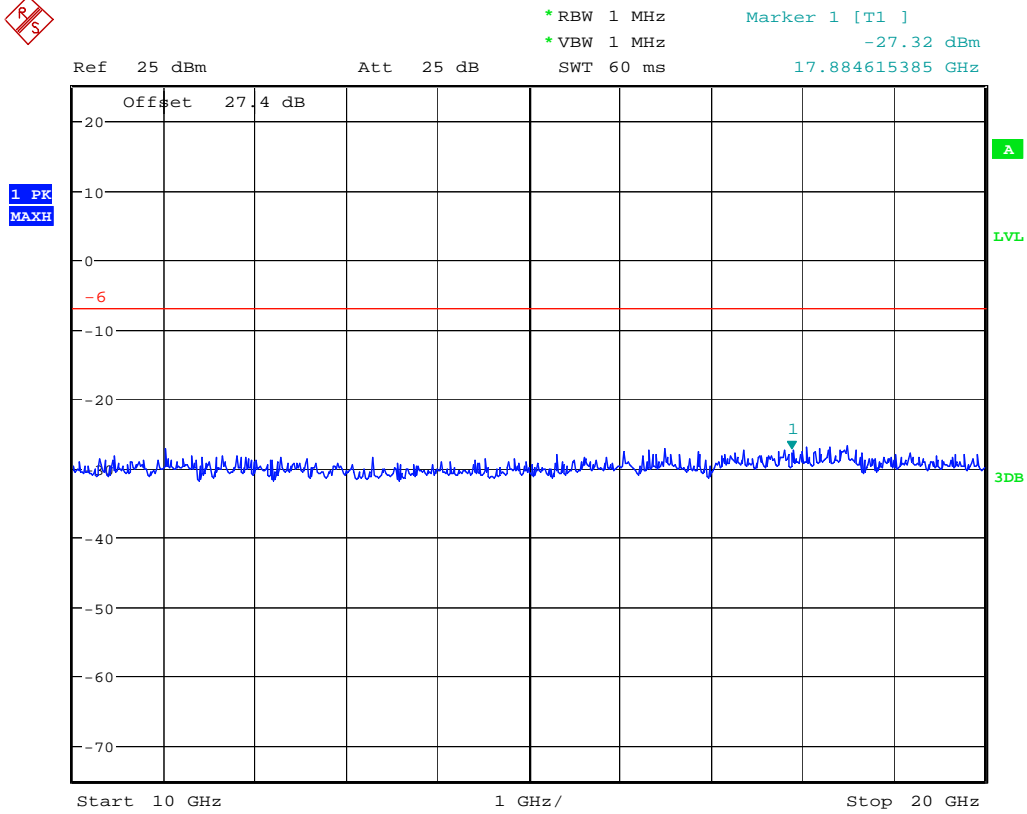
Date: 18.JUL.2011 07:47:35

**Conducted Spurious Emissions 30-3000MHz (Low Channel)**



Date: 18.JUL.2011 07:48:28

### Conducted Spurious Emissions 2-10GHz (Low Channel)



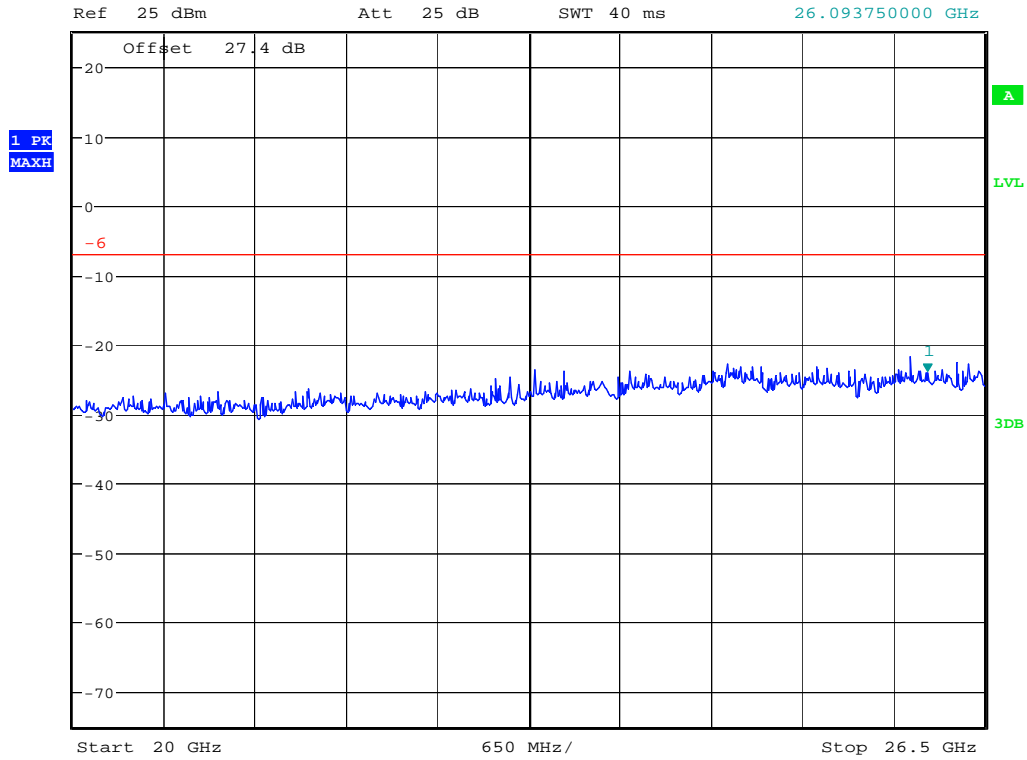
Date: 18.JUL.2011 07:49:33

### Conducted Spurious Emissions 10-20GHz (Low Channel)



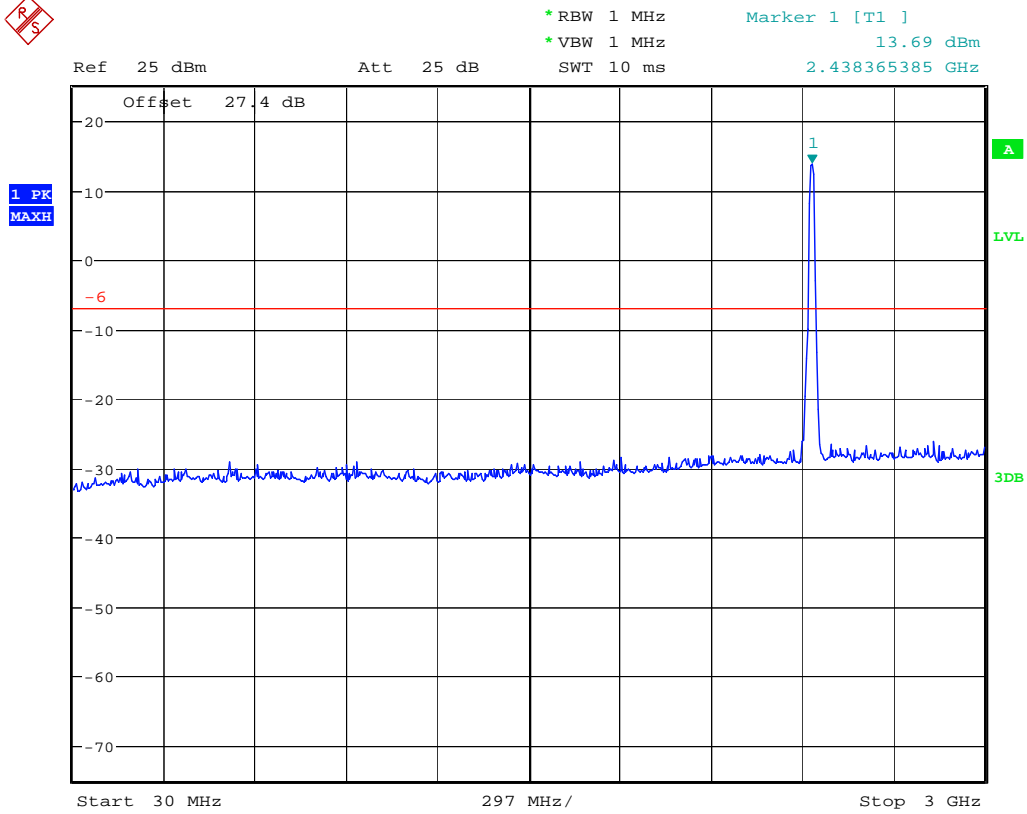
\*RBW 1 MHz  
\*VBW 1 MHz  
SWT 40 ms

Marker 1 [T1 ]  
-23.98 dBm  
26.093750000 GHz



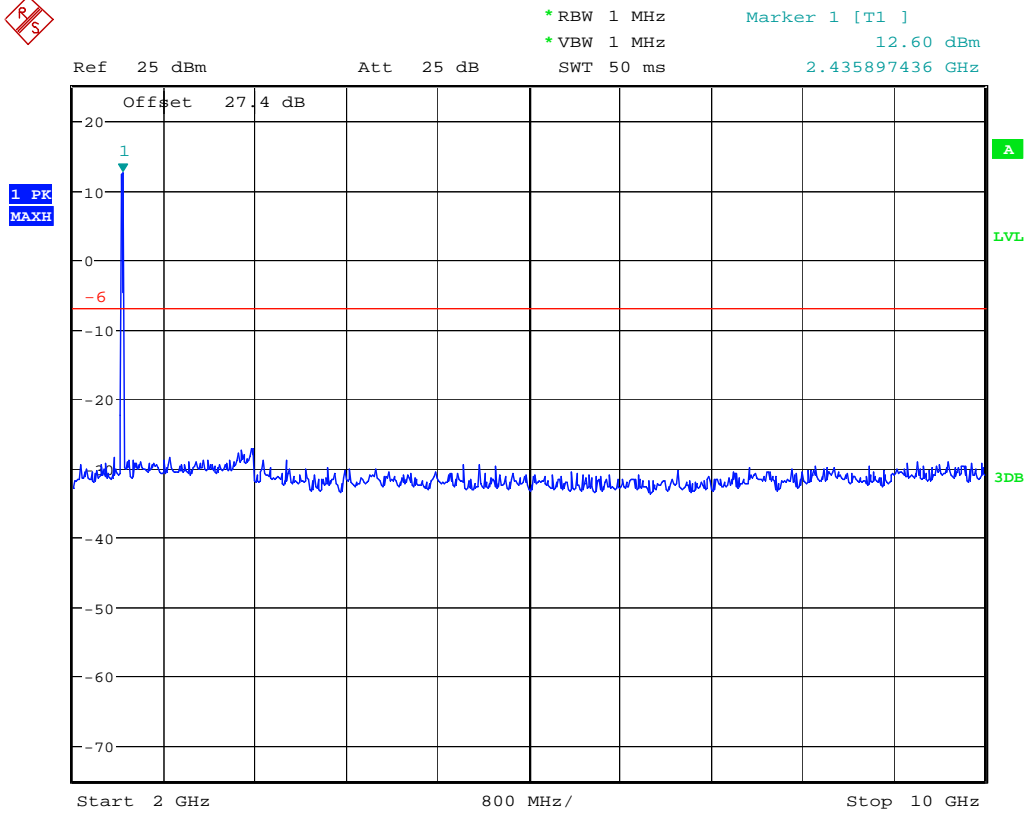
Date: 18.JUL.2011 07:49:55

### Conducted Spurious Emissions 20-26.5GHz (Low Channel)



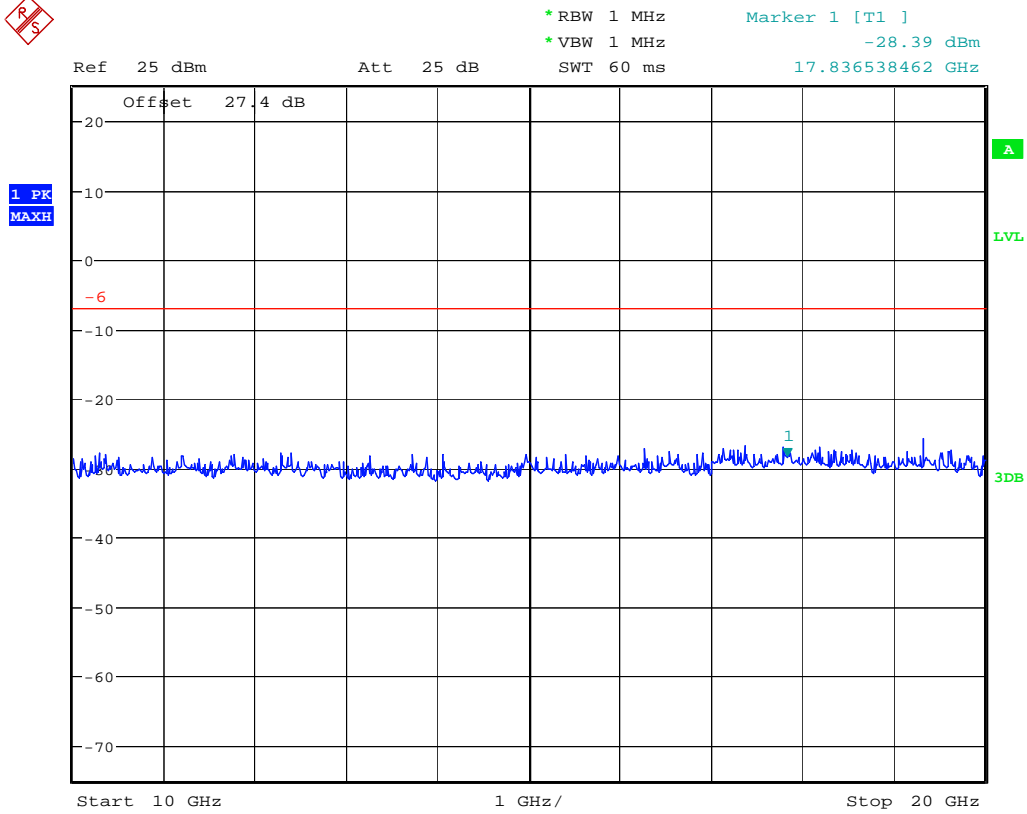
Date: 18.JUL.2011 07:52:11

### Conducted Spurious Emissions 30-3000MHz (Mid Channel)



Date: 18.JUL.2011 07:52:32

### Conducted Spurious Emissions 2-10GHz (Mid Channel)



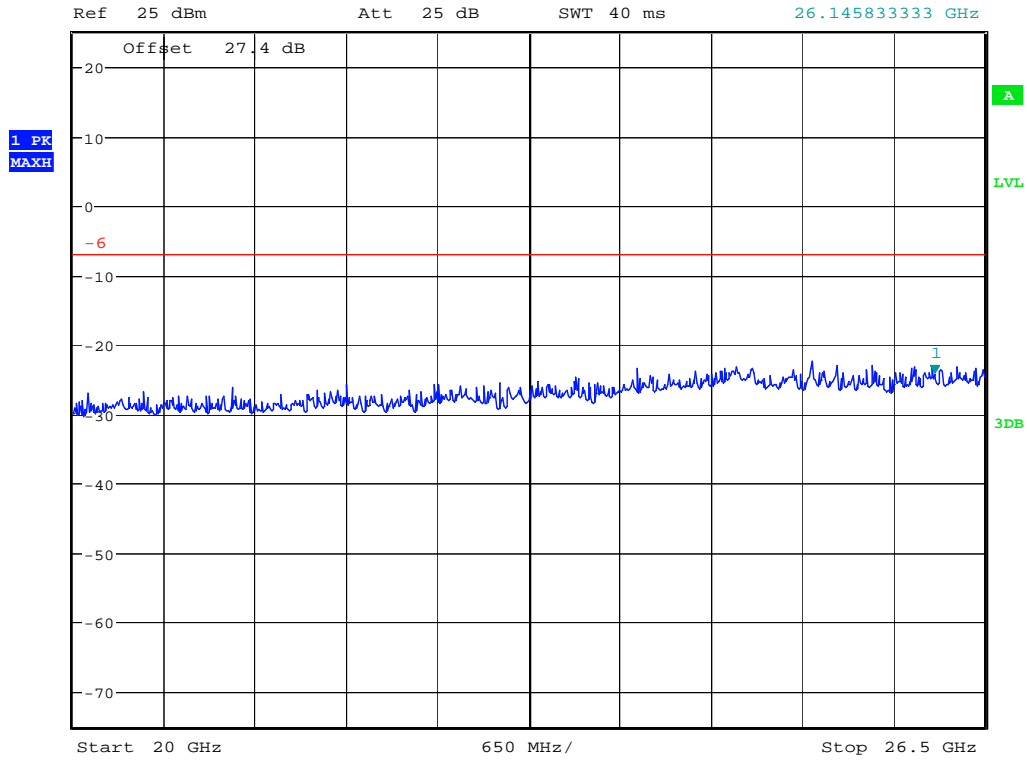
Date: 18.JUL.2011 07:52:48

### Conducted Spurious Emissions 10-20GHz (Mid Channel)



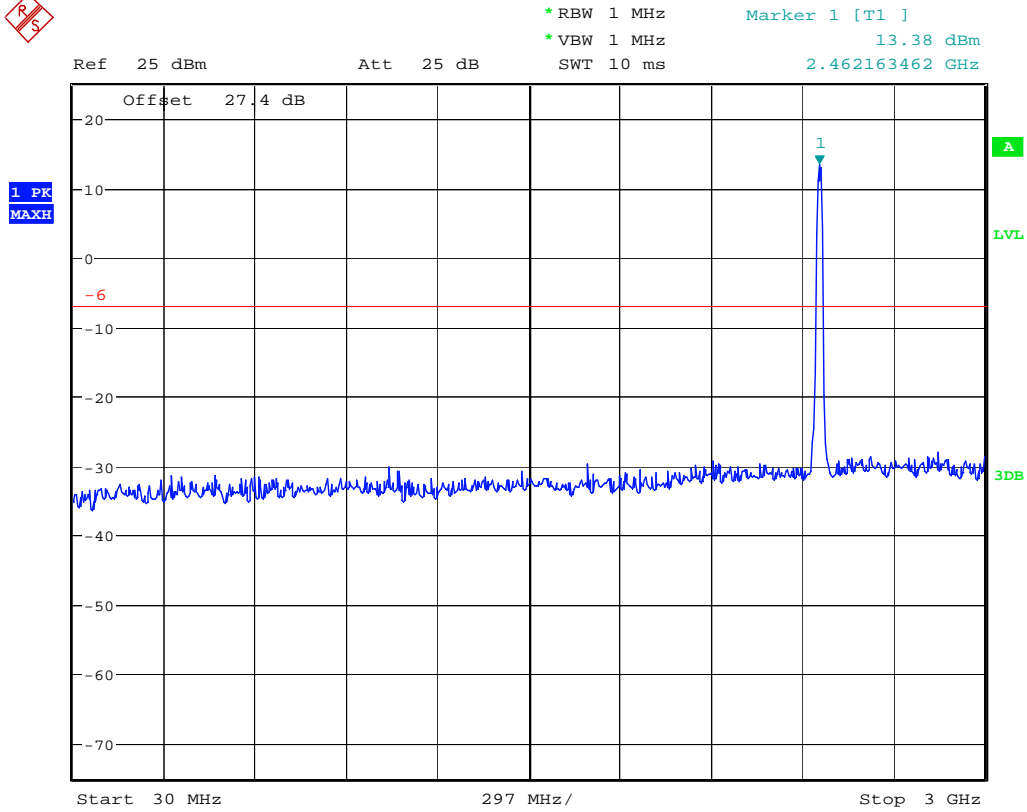
\*RBW 1 MHz  
\*VBW 1 MHz  
SWT 40 ms

Marker 1 [T1 ]  
-24.22 dBm  
26.145833333 GHz



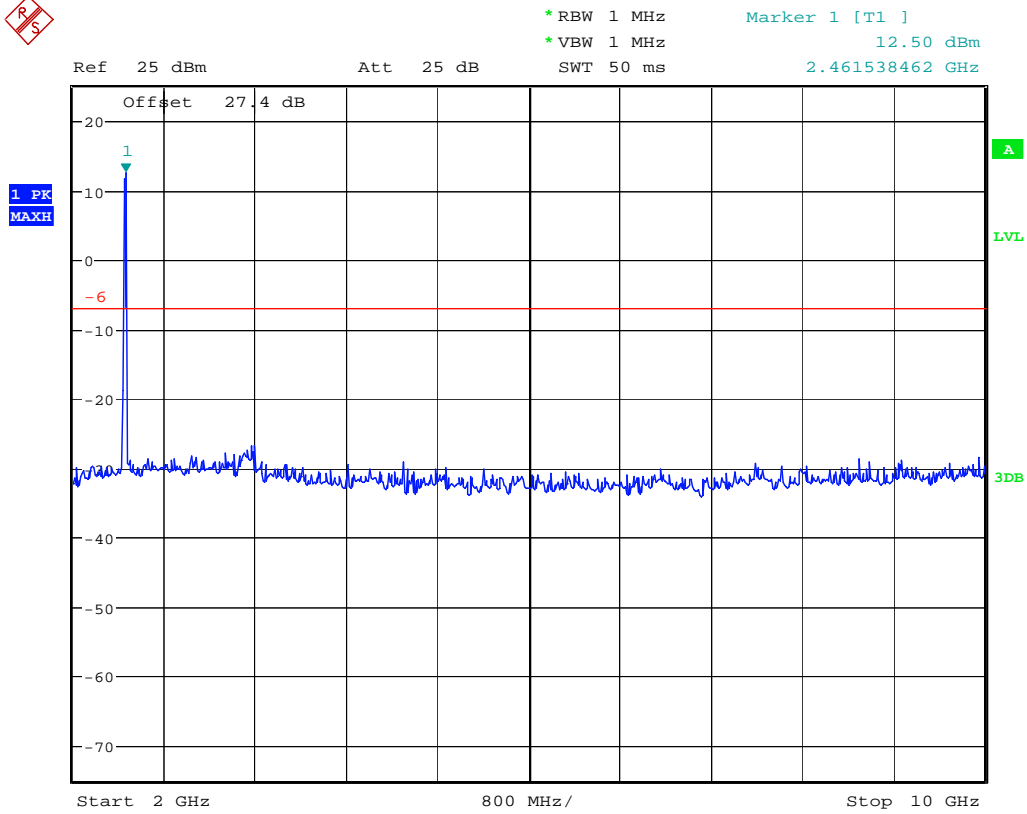
Date: 18.JUL.2011 07:53:08

### Conducted Spurious Emissions 20-26.5GHz (Mid Channel)



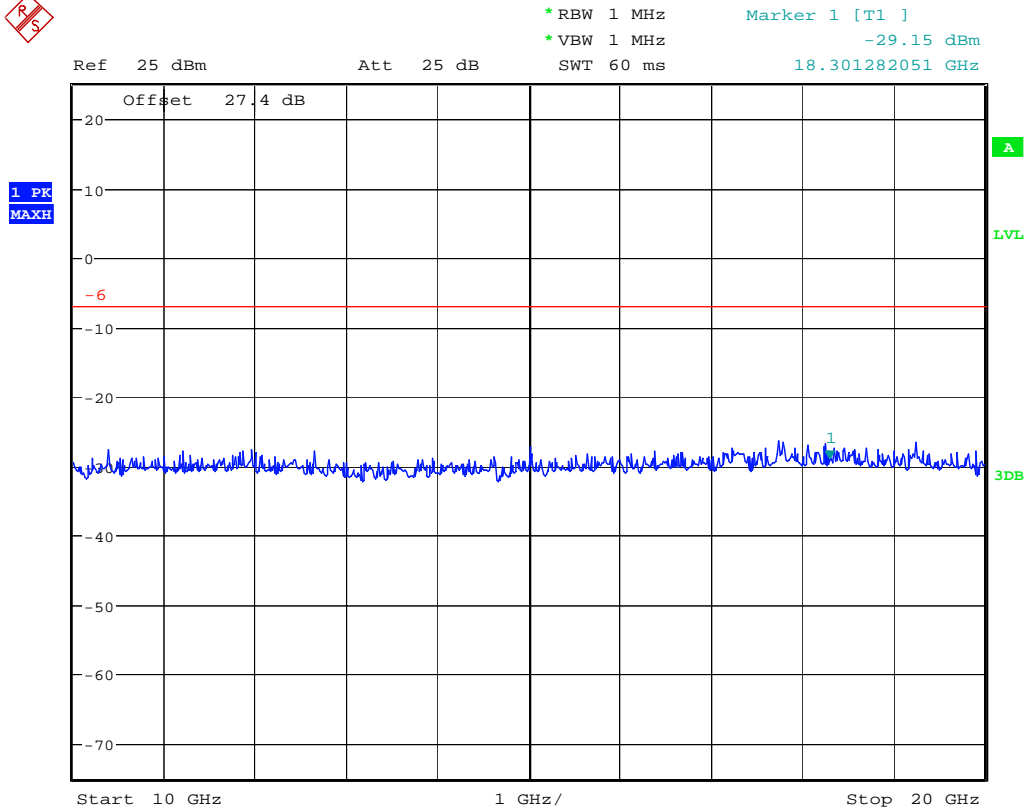
Date: 18.JUL.2011 07:55:04

### Conducted Spurious Emissions 30-3000MHz (High Channel)



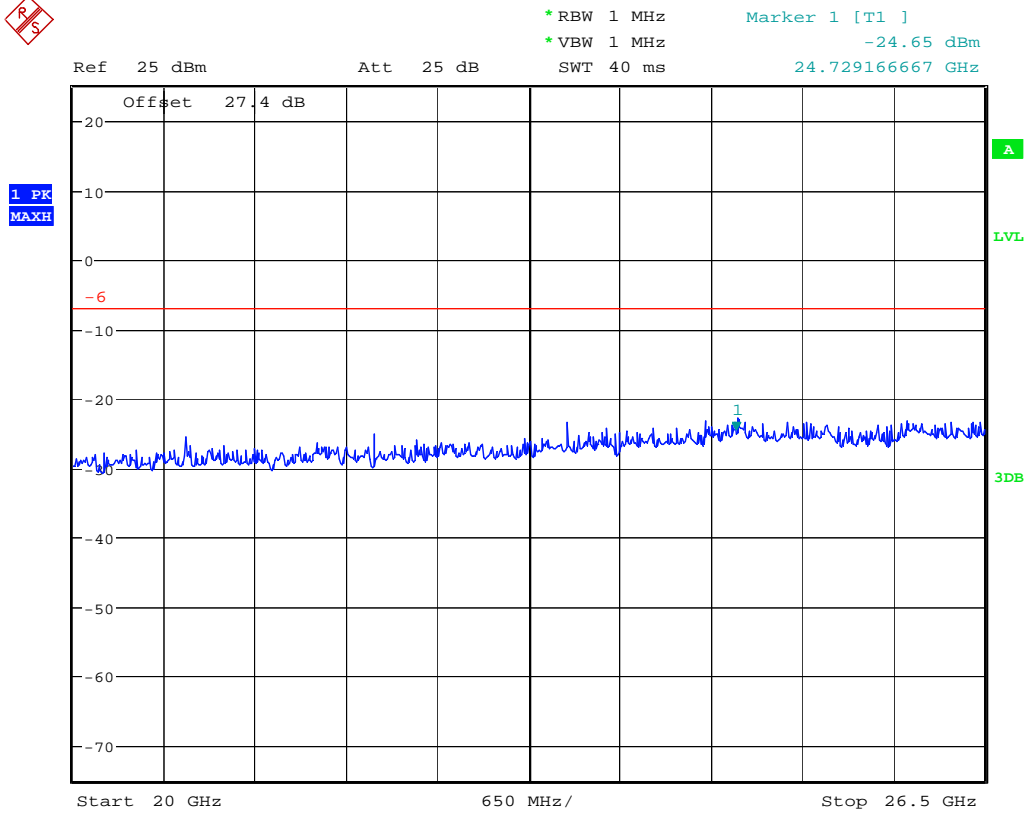
Date: 18.JUL.2011 07:55:38

### Conducted Spurious Emissions 2-10GHz (High Channel)



Date: 18.JUL.2011 07:56:03

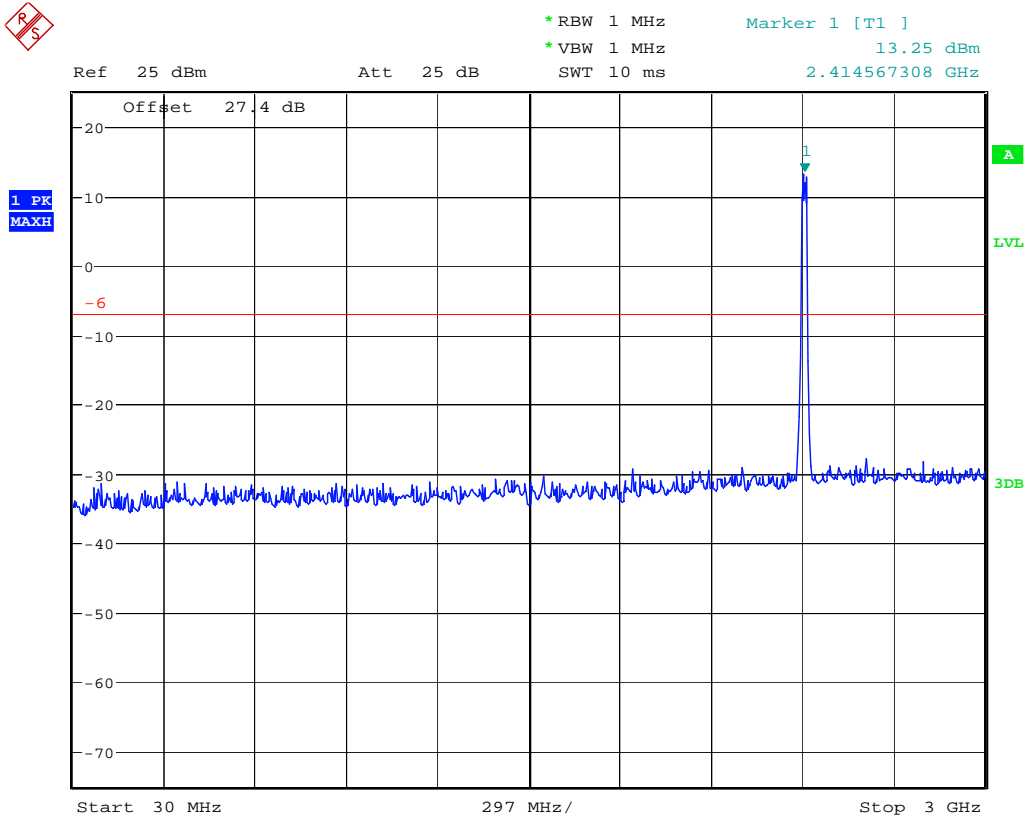
### Conducted Spurious Emissions 10-20GHz (High Channel)



Date: 18.JUL.2011 07:56:21

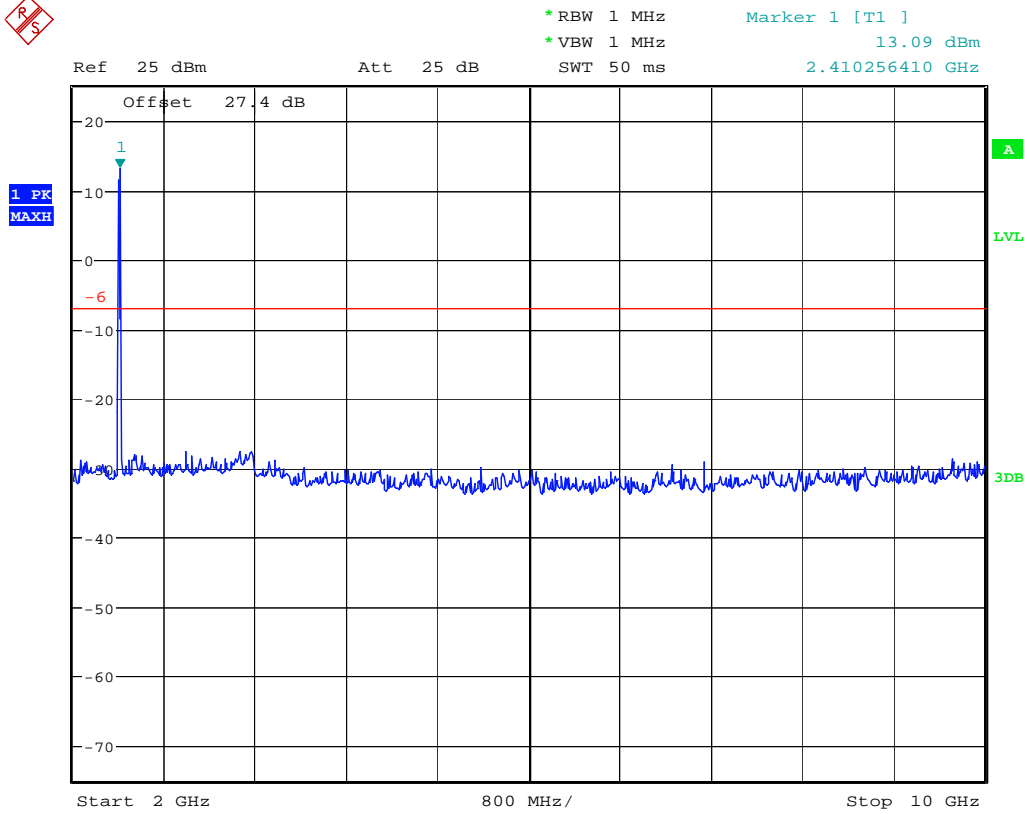
### Conducted Spurious Emissions 20-26.5GHz (High Channel)

**802.11 g @ 6Mbps**



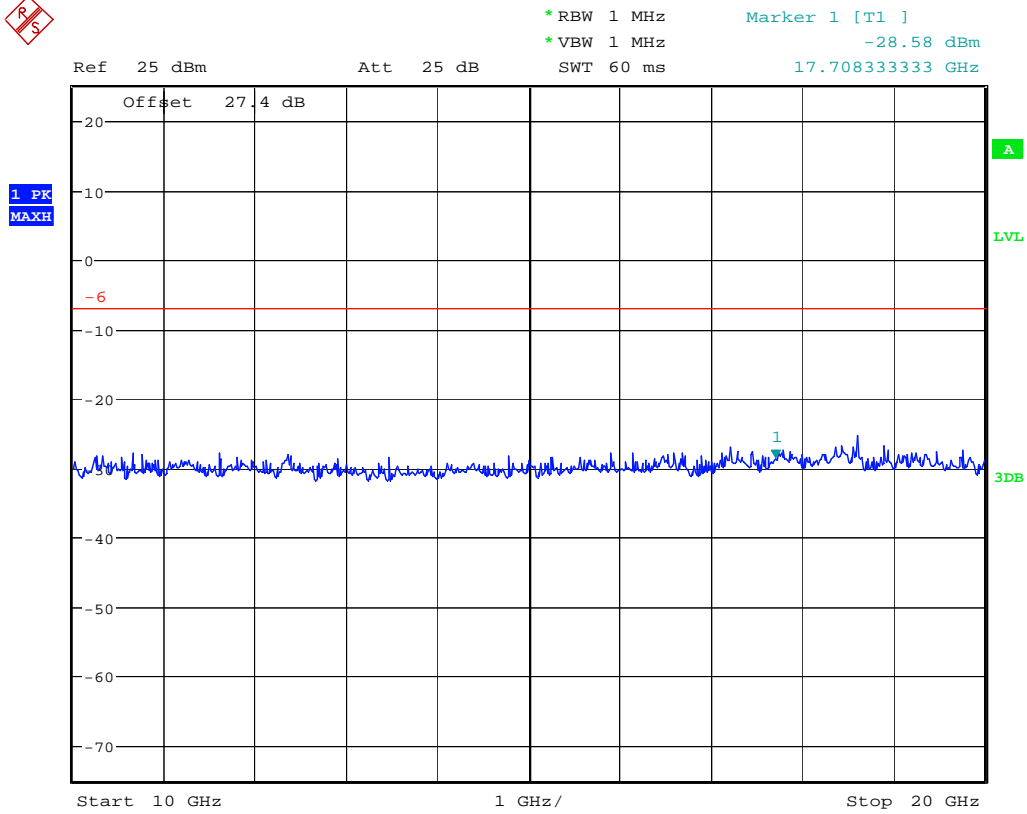
Date: 18.JUL.2011 07:57:08

**Conducted Spurious Emissions 30-3000MHz (Low Channel)**



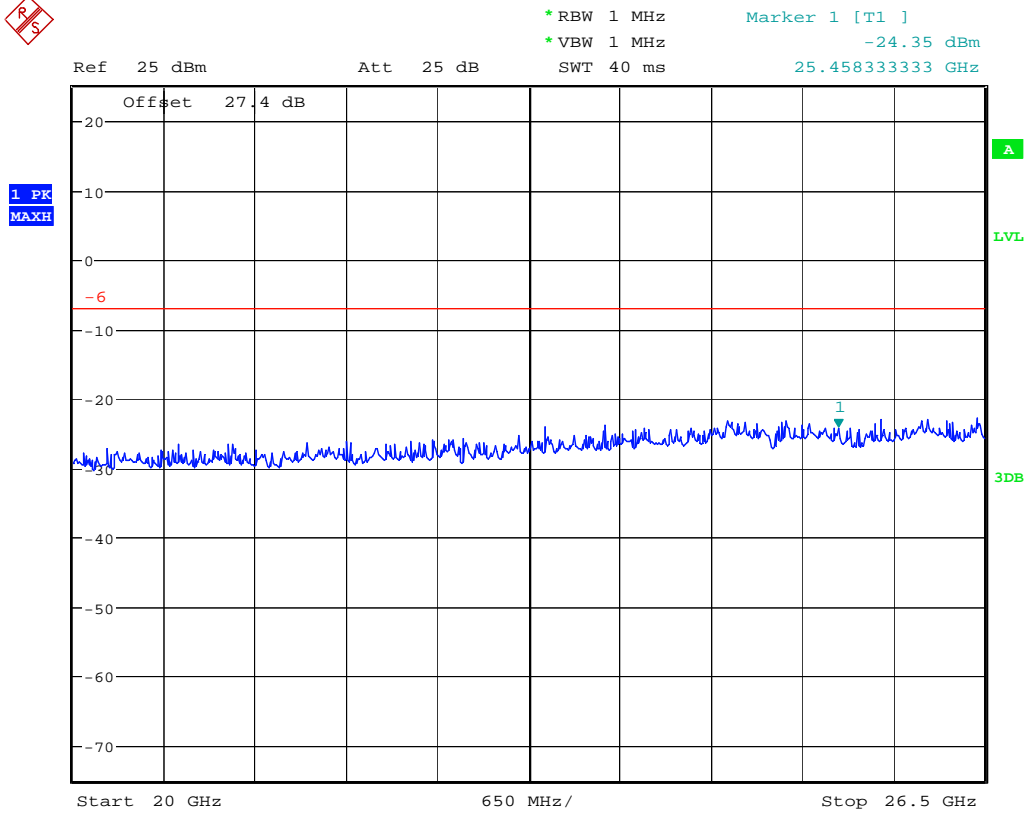
Date: 18.JUL.2011 07:57:27

### Conducted Spurious Emissions 2-10GHz (Low Channel)



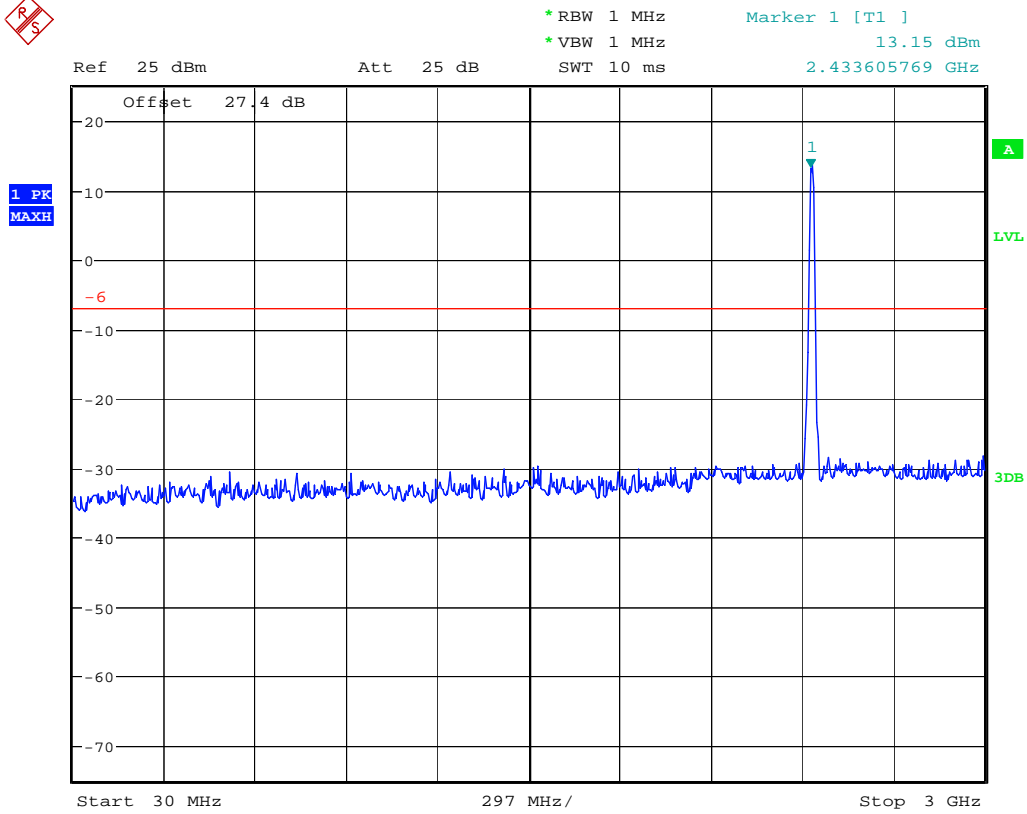
Date: 18.JUL.2011 07:57:47

### Conducted Spurious Emissions 10-20GHz (Low Channel)



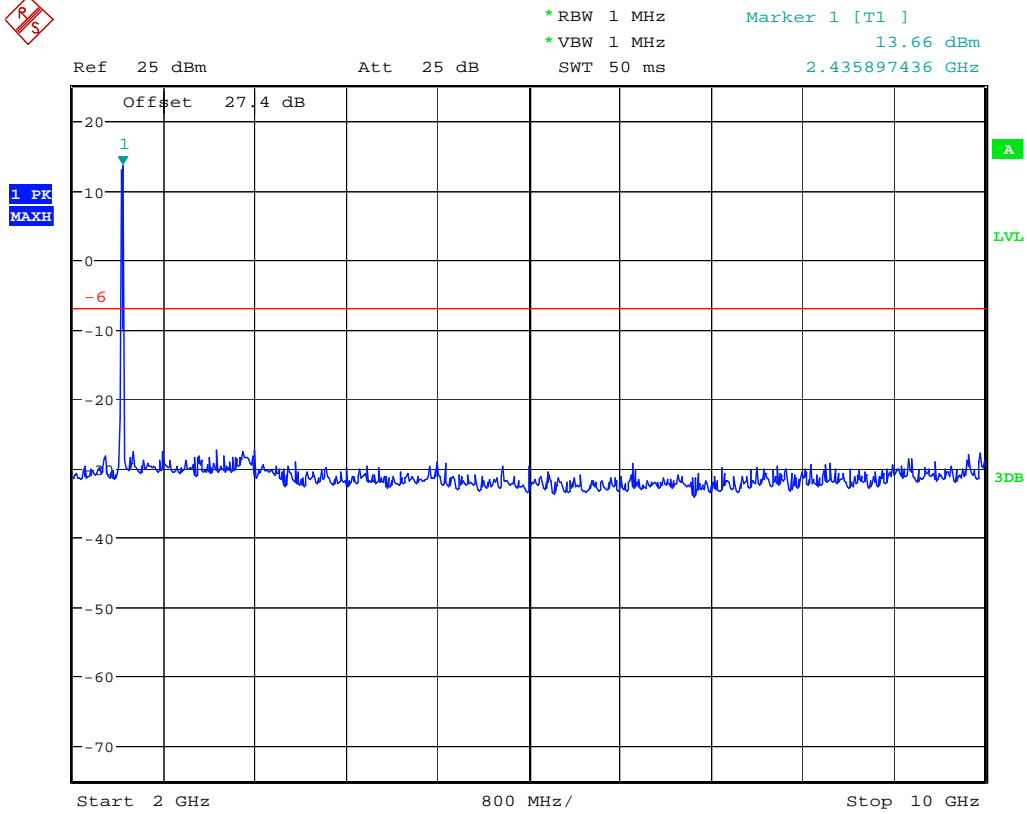
Date: 18.JUL.2011 07:58:06

### Conducted Spurious Emissions 20-26.5GHz (Low Channel)



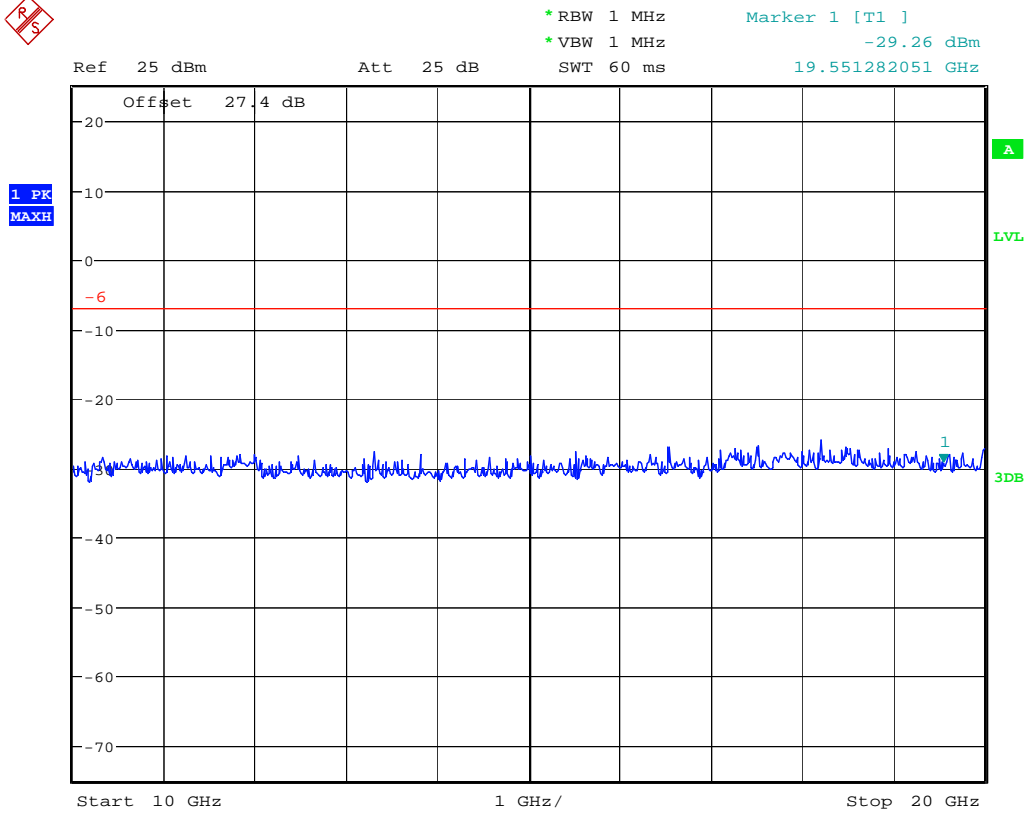
Date: 18.JUL.2011 07:58:35

### Conducted Spurious Emissions 30-3000MHz (Mid Channel)



Date: 18.JUL.2011 07:58:54

### Conducted Spurious Emissions 2-10GHz (Mid Channel)



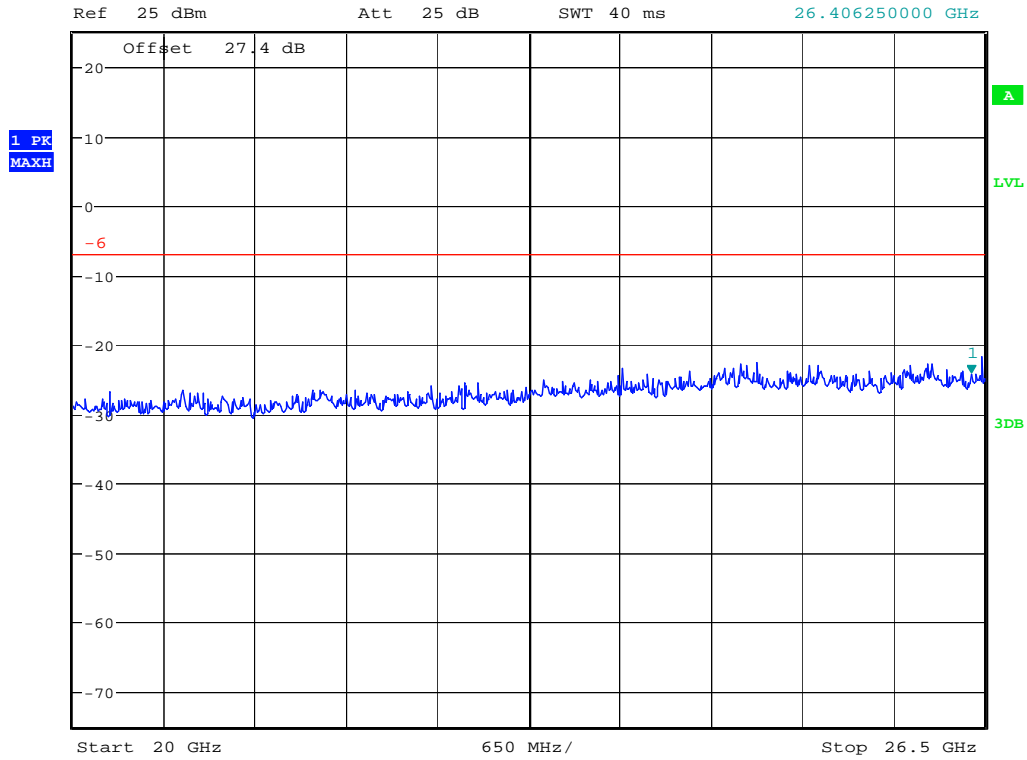
Date: 18.JUL.2011 07:59:11

### Conducted Spurious Emissions 10-20GHz (Mid Channel)



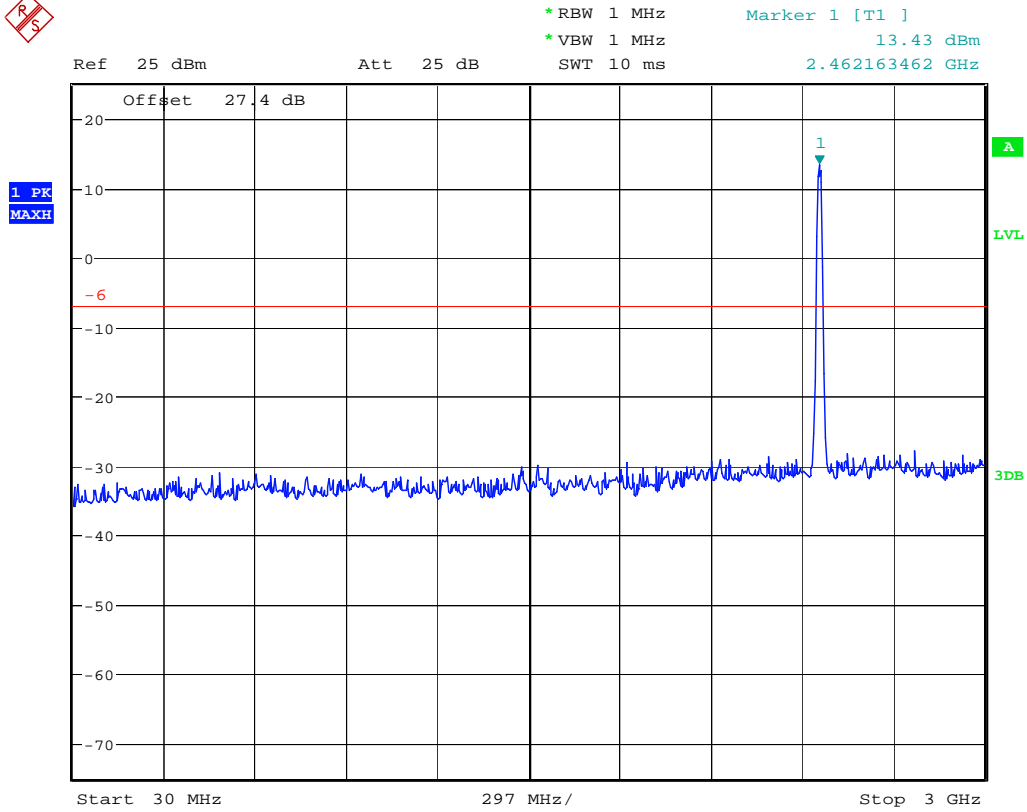
\*RBW 1 MHz  
\*VBW 1 MHz  
SWT 40 ms

Marker 1 [T1 ]  
-24.27 dBm  
26.406250000 GHz



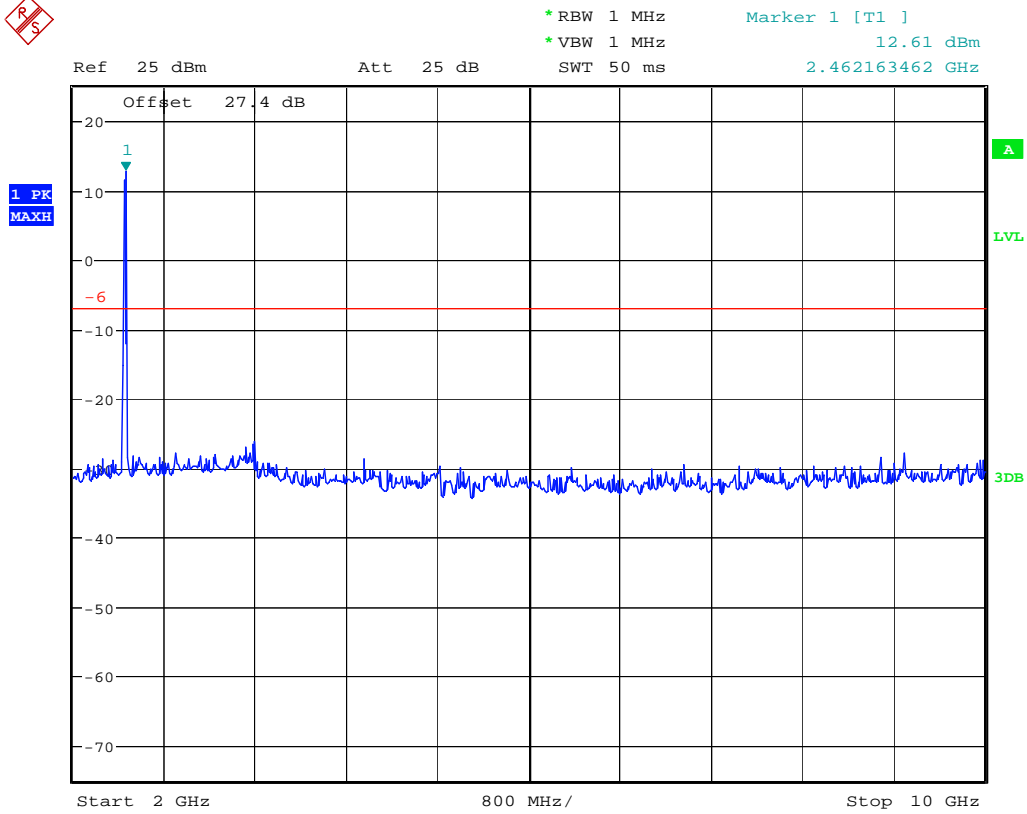
Date: 18.JUL.2011 07:59:33

### Conducted Spurious Emissions 20-26.5GHz (Mid Channel)



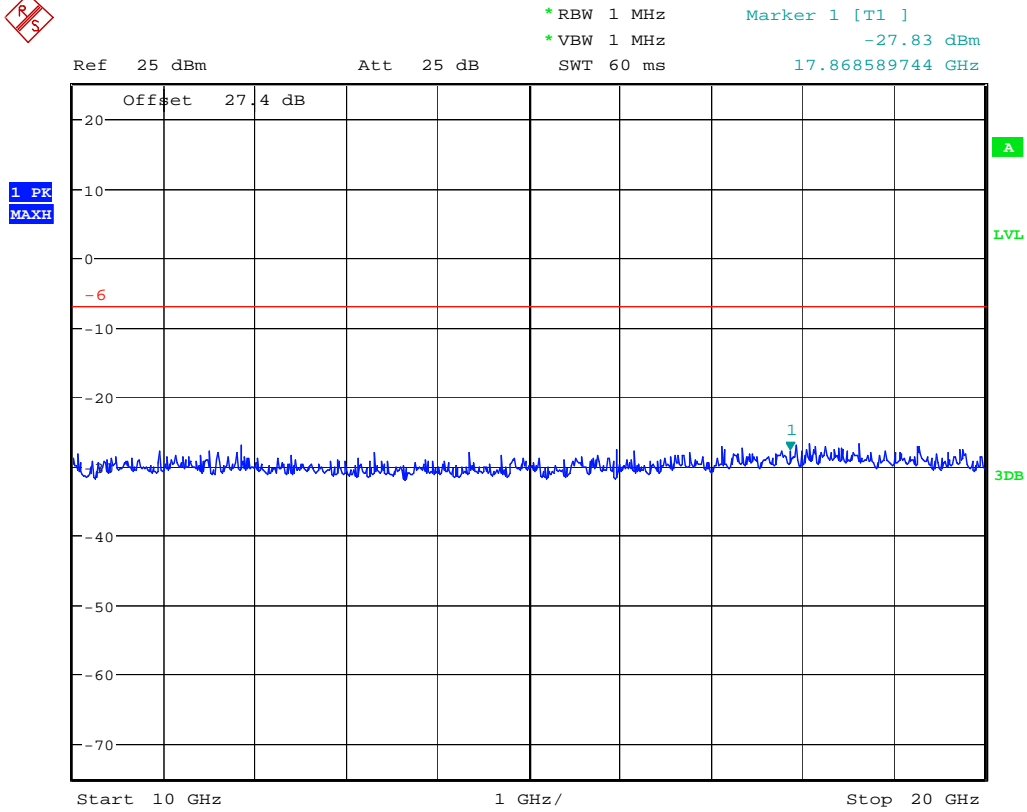
Date: 18.JUL.2011 08:00:07

### Conducted Spurious Emissions 30-3000MHz (High Channel)



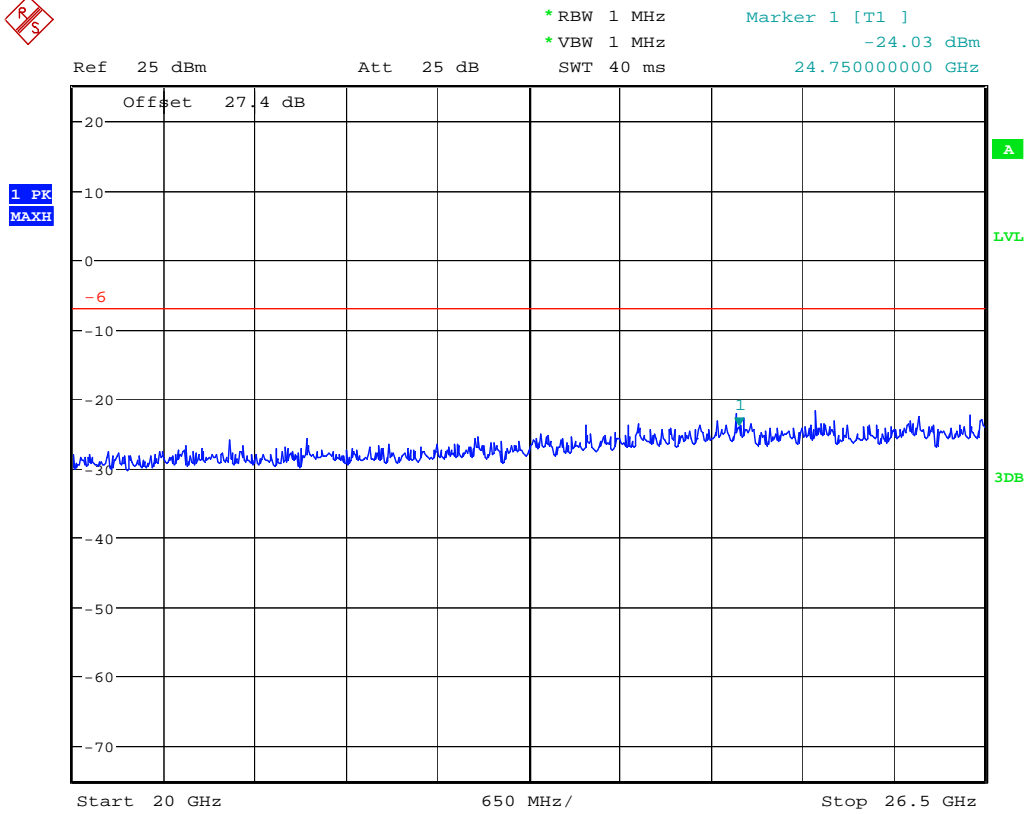
Date: 18.JUL.2011 08:00:25

### Conducted Spurious Emissions 2-10GHz (High Channel)



Date: 18.JUL.2011 08:00:43

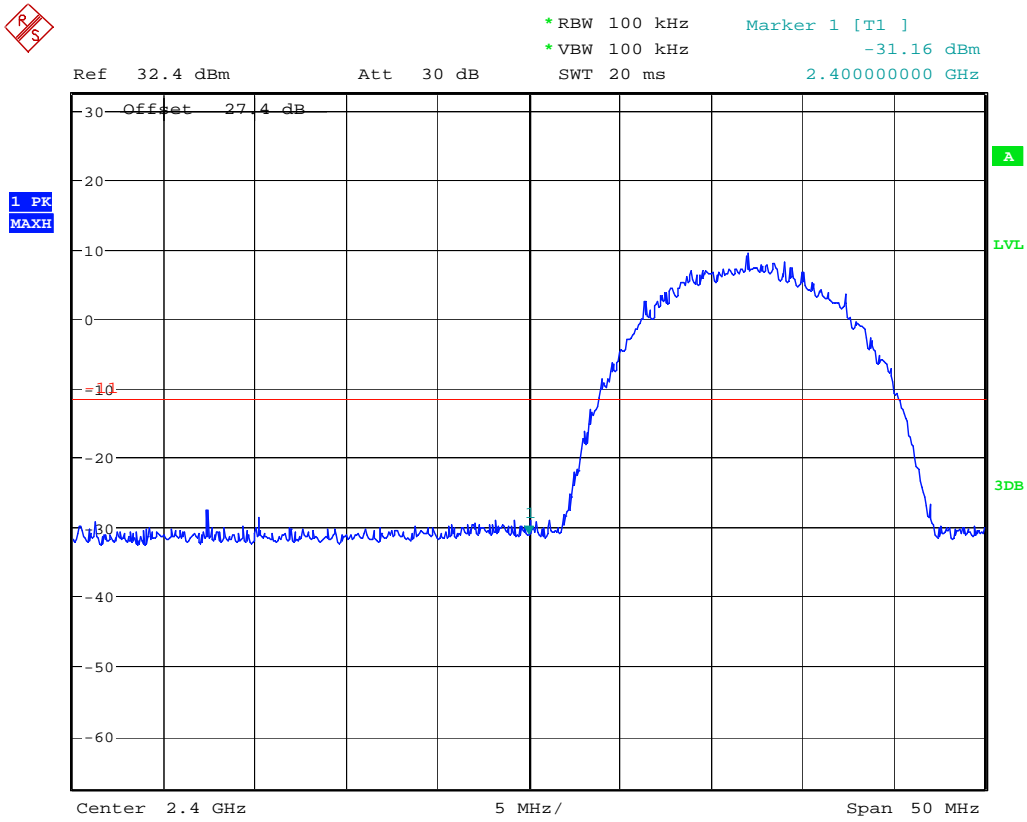
### Conducted Spurious Emissions 10-20GHz (High Channel)



Date: 18.JUL.2011 08:01:06

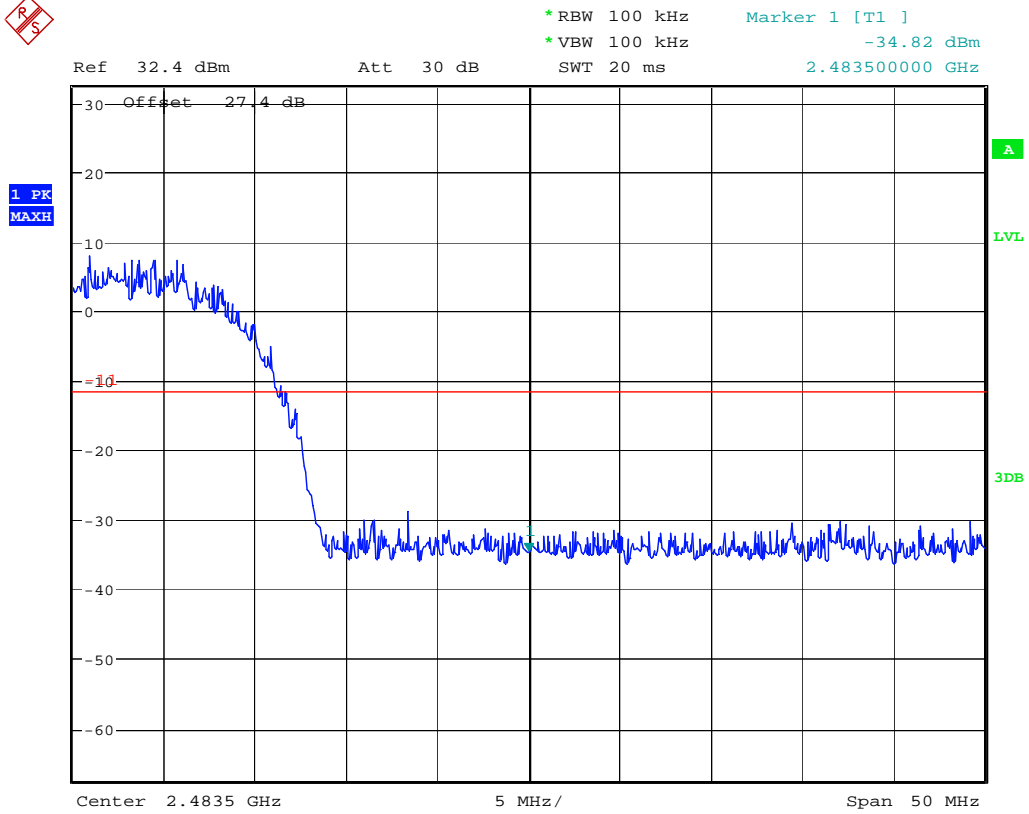
### Conducted Spurious Emissions 20-26.5GHz (High Channel)

**802.11 b @ 11 Mbps Band Edge**



Date: 8.JAN.14502 06:49:31

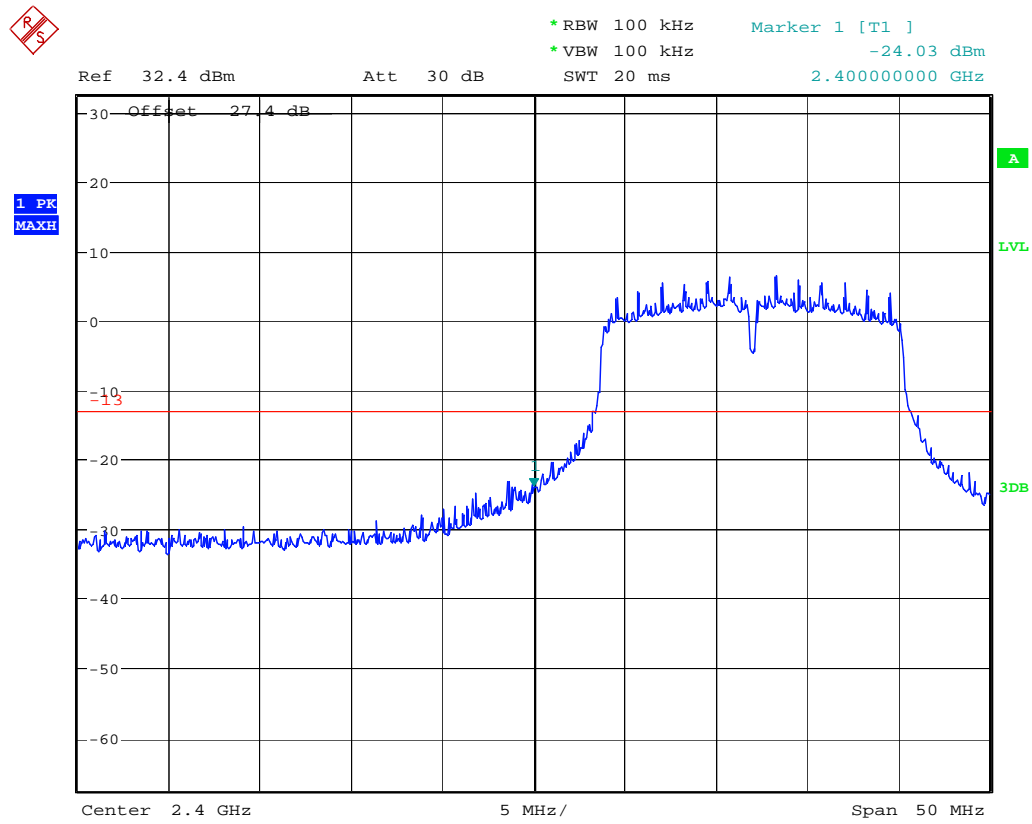
**Channel 1 @ 11 Mbps – Lower Band Edge**



Date: 8.JAN.14502 06:50:14

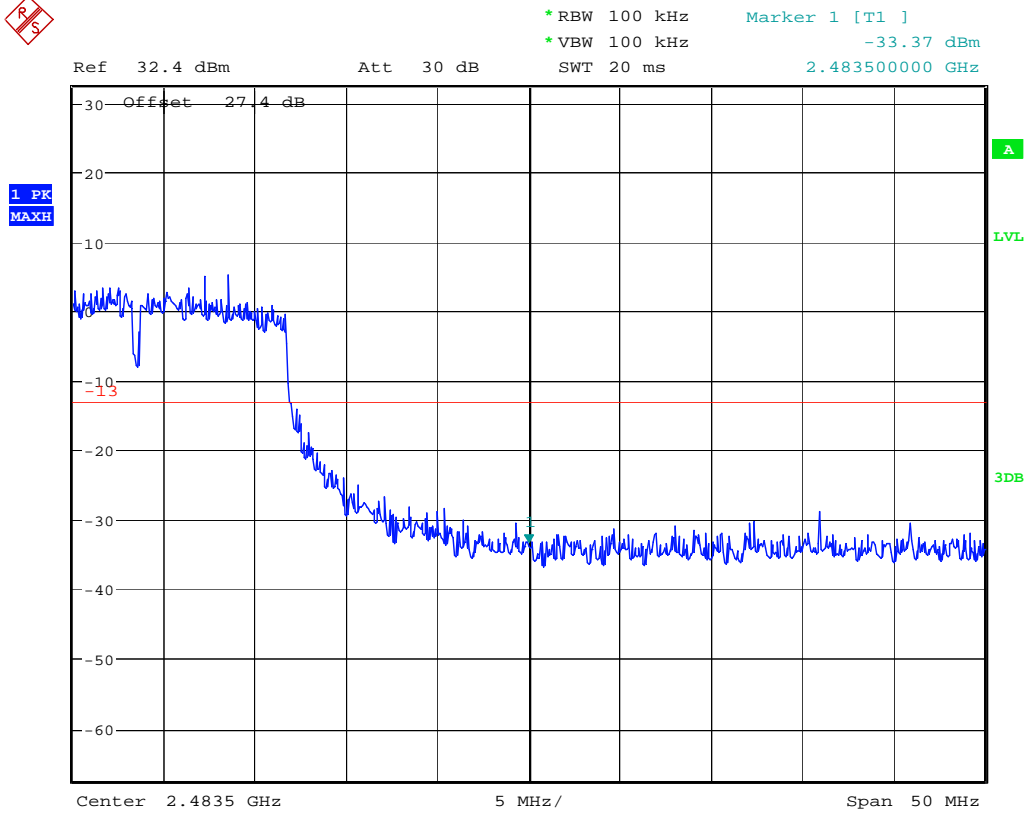
**Channel 11 @ 11 Mbps – Upper Band Edge**

**802.11 g @ 6 Mbps Band Edge**



Date: 8.JAN.14502 06:55:15

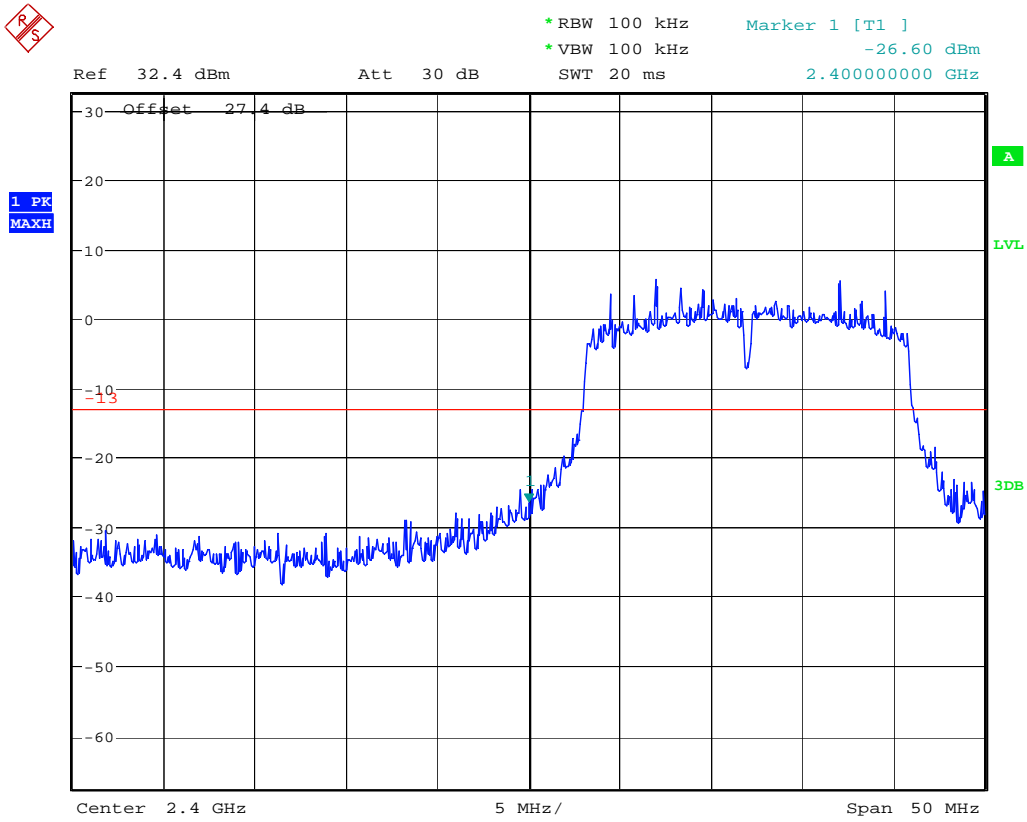
**Channel 1 @ 6 Mbps – Lower Band Edge**



Date: 8.JAN.14502 06:56:08

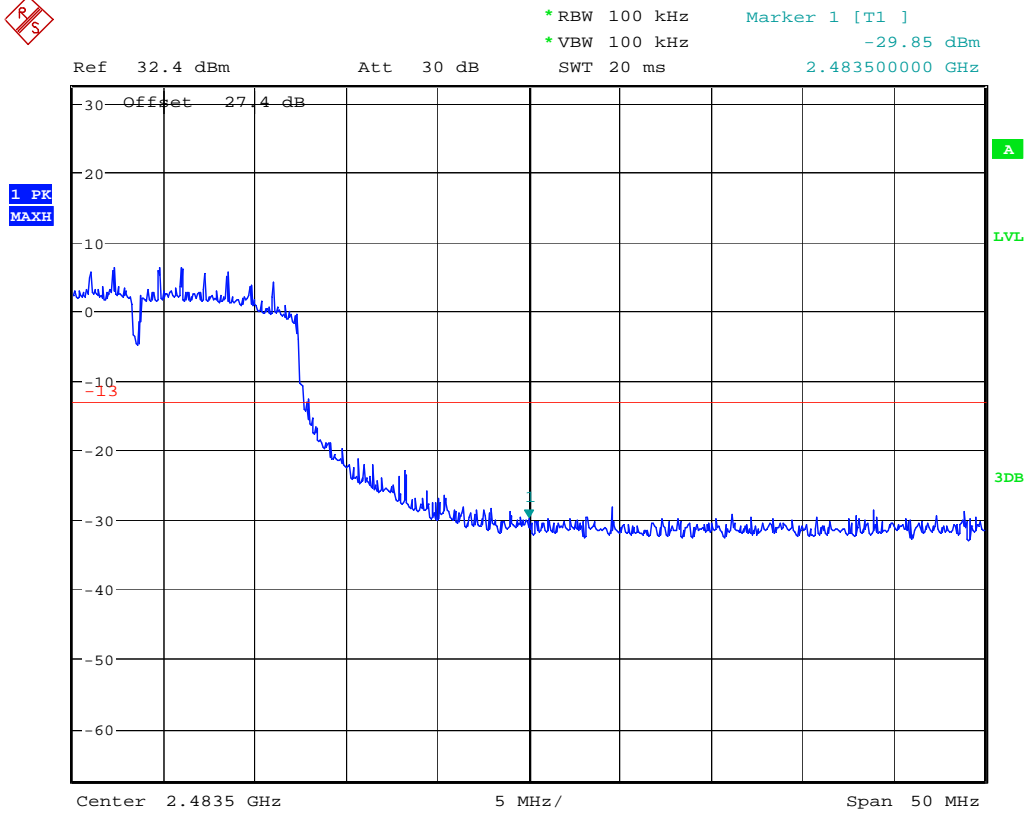
**Channel 11 @ 6 Mbps – Upper Band Edge**

**802.11 n @ 6.5 Mbps Band Edge**



Date: 8.JAN.14502 06:58:09

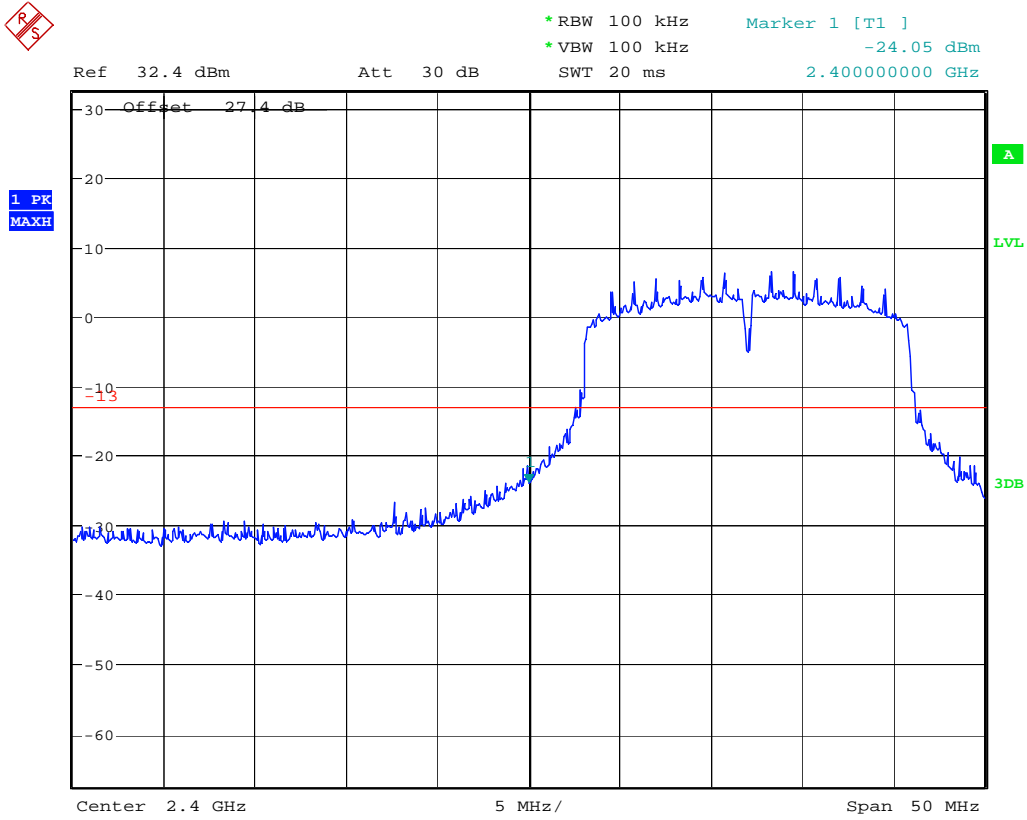
**Channel 1 @ 6.5 Mbps – Lower Band Edge**



Date: 8.JAN.14502 06:57:17

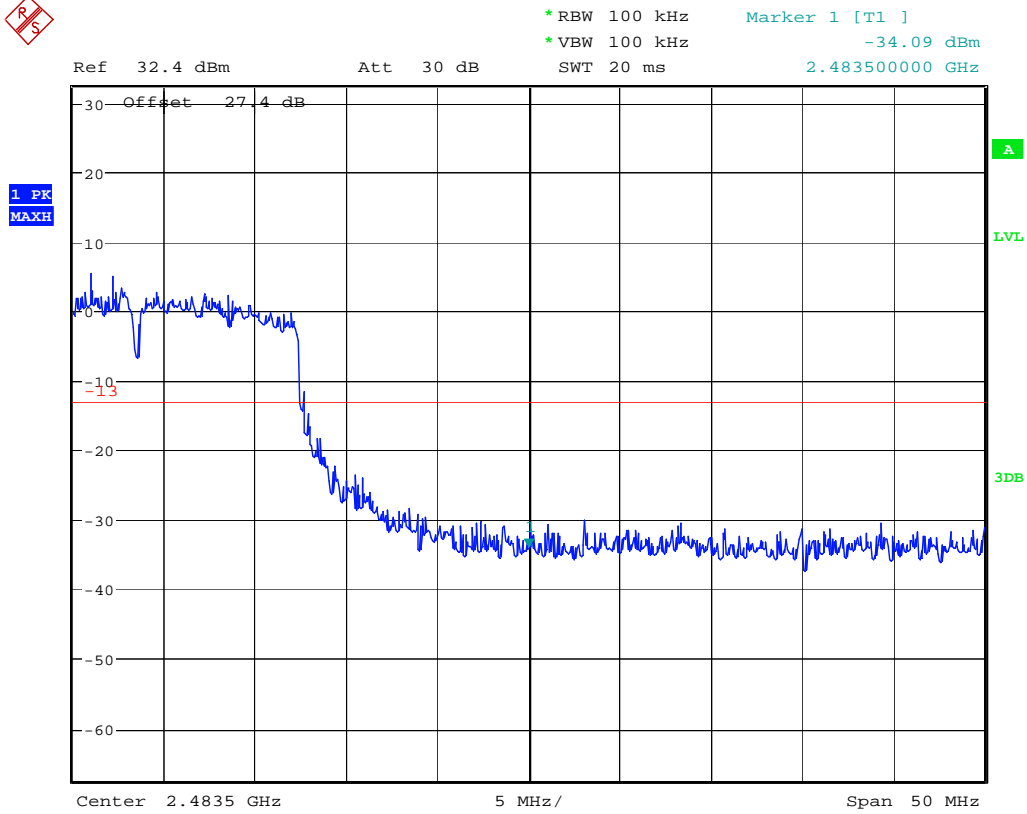
**Channel 11 @ 6.5 Mbps – Upper Band Edge**

**802.11 n @ 7.2 Mbps Band Edge**



Date: 8.JAN.14502 06:59:18

**Channel 1 @ 7.2 Mbps – Lower Band Edge**



Date: 8.JAN.14502 07:00:01

**Channel 11 @ 7.2 Mbps – Upper Band Edge**

## **AC LINE CONDUCTED EMISSIONS**

CFR 47 Part 15.207

### **Measurement Procedure**

Measured levels of ac power line conducted emission shall be the radio-noise voltage from the line probe or across the 50  $\Omega$  LISN port, where permitted, terminated into a 50  $\Omega$  noise meter, or where permitted or required, the radio-noise current on the power line sensed by a current probe.

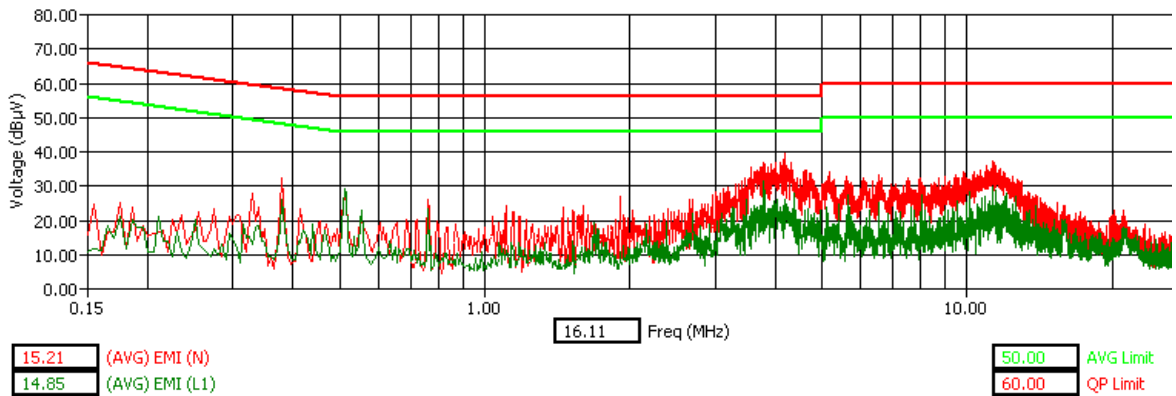
All radio-noise voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN. Equipment shall be tested with power cords that are normally supplied using an LISN, the 50  $\Omega$  measuring port is terminated by a 50  $\Omega$  radio-noise meter or a 50  $\Omega$  resistive load. All other ports are terminated in 50  $\Omega$ .

Detectors – Peak and Average Detector

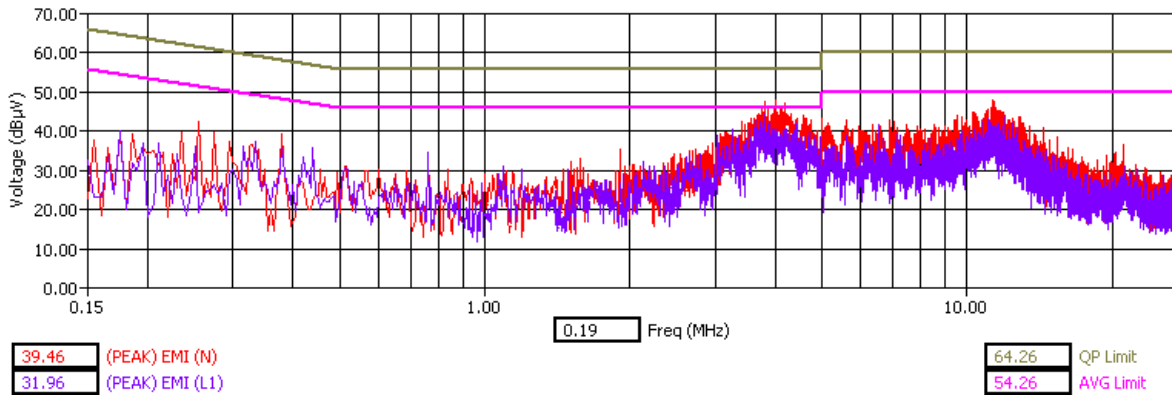
### **Measurement Results**

See attached:

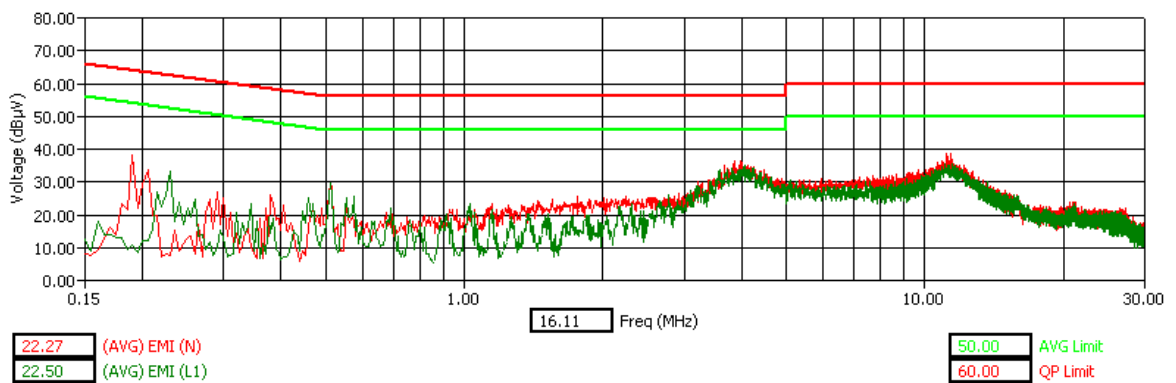
**802.11b @ 11Mbps**



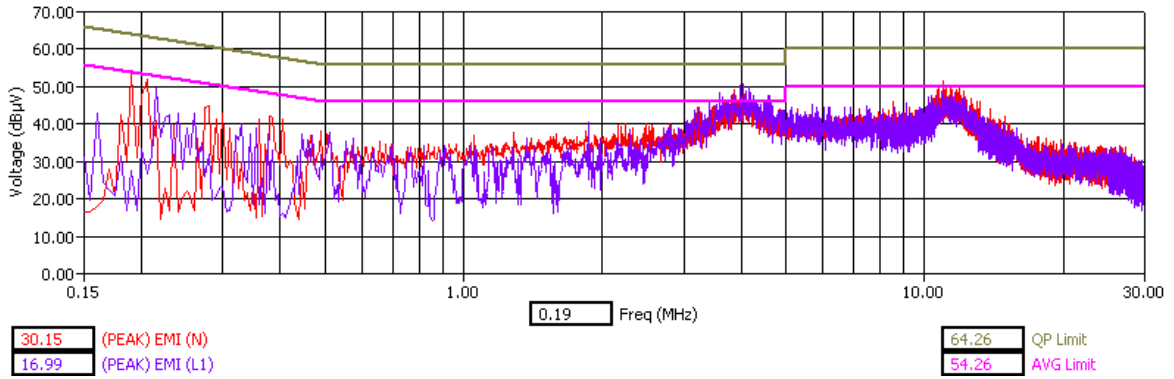
**WLAN Channel 1 - Tx Mode - AVG Detector**



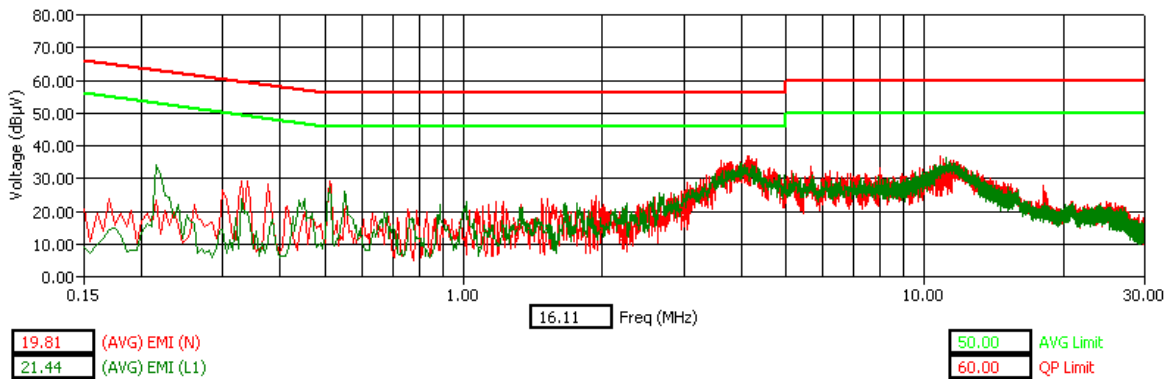
**WLAN Channel 1 - Tx Mode - Peak Detector**



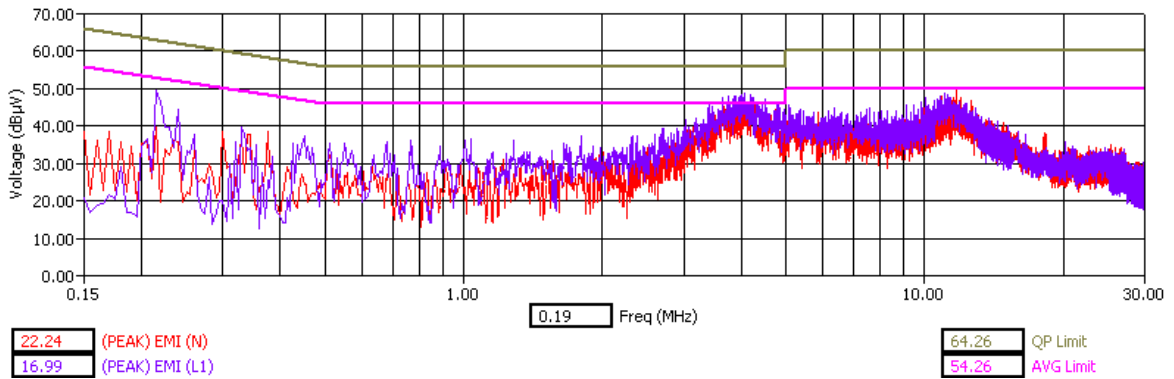
**WLAN Channel 6 - Tx Mode - AVG Detector**



WLAN Channel 6 - Tx Mode - Peak Detector

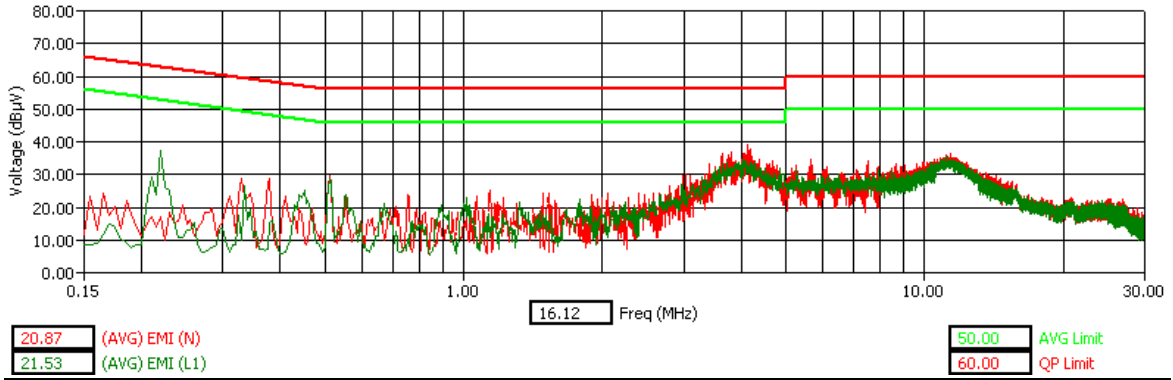


WLAN Channel 11 - Tx Mode - AVG Detector

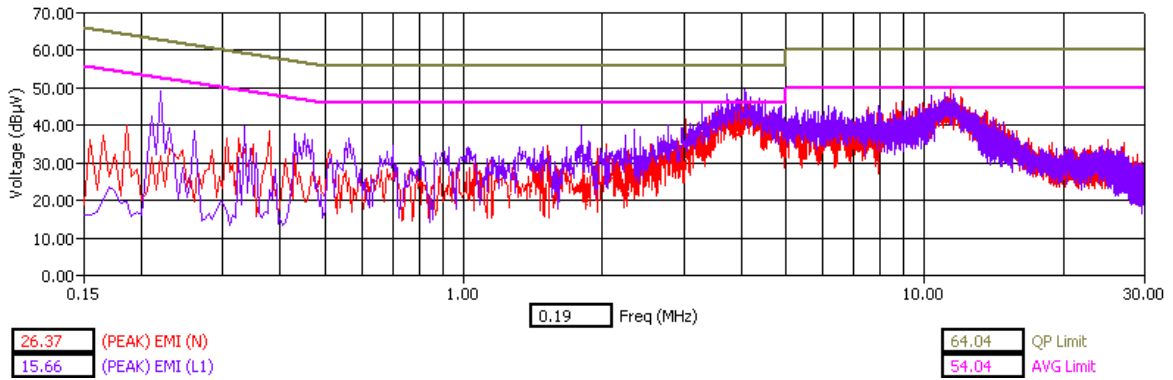


WLAN Channel 11 - Tx Mode - Peak Detector

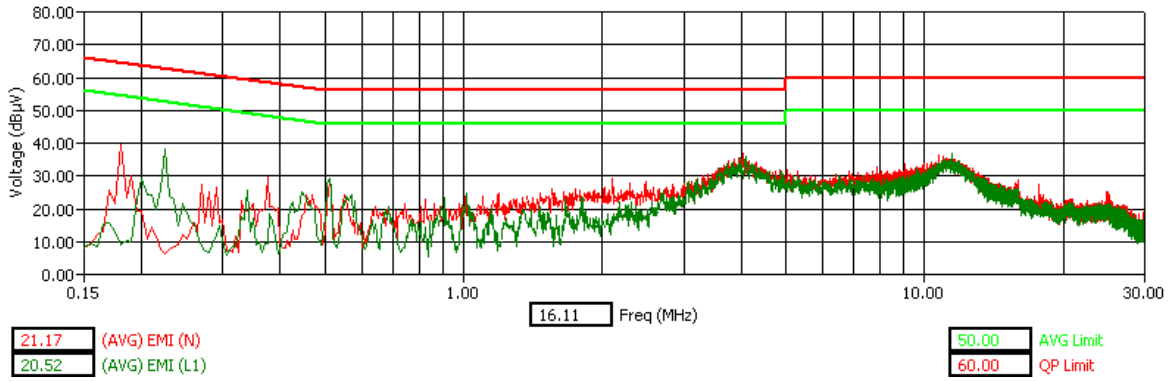
**802.11g @ 6Mbps**



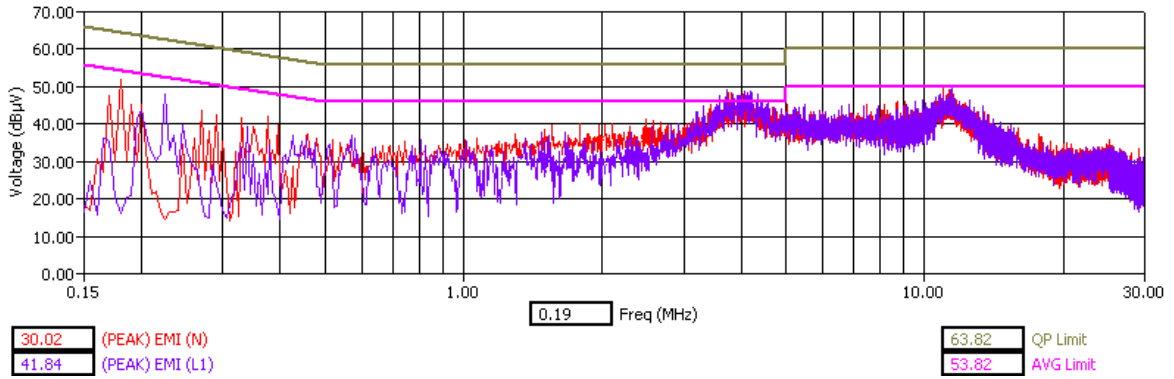
**WLAN Channel 1 - Tx Mode - AVG Detector**



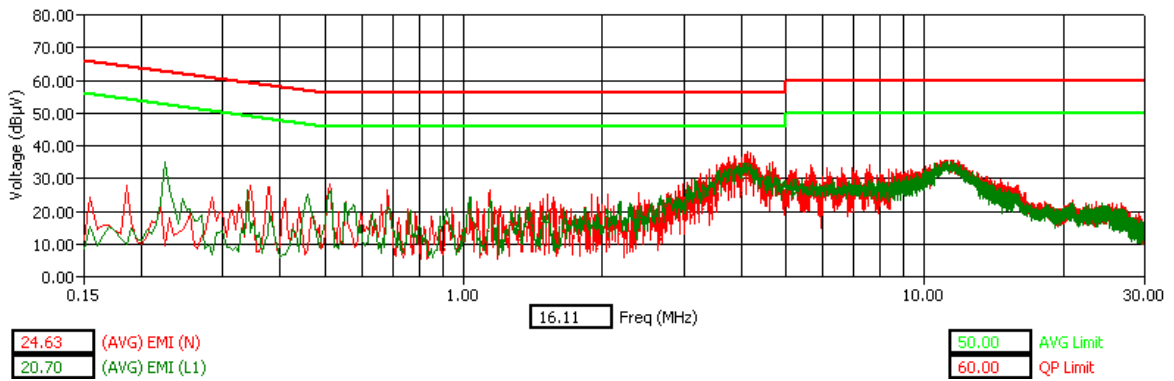
**WLAN Channel 1 - Tx Mode - Peak Detector**



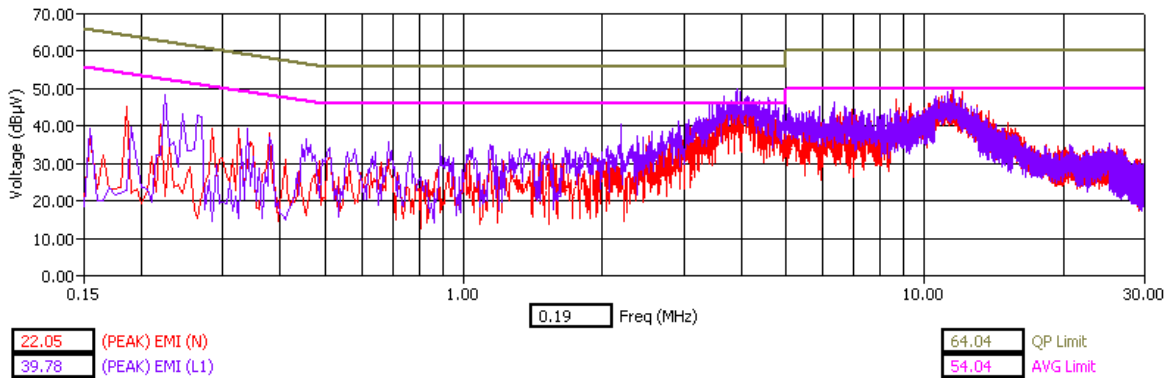
**WLAN Channel 6 - Tx Mode - AVG Detector**



**WLAN Channel 6 - Tx Mode - Peak Detector**



**WLAN Channel 11 - Tx Mode - AVG Detector**



**WLAN Channel 11 - Tx Mode - Peak Detector**

**End of Test Report**