



**Nemko Test Report:** 2014\_251898\_FCC\_15247

**Applicant:** Texas Instruments, Inc.  
12500 TI Blvd.  
Dallas, TX 75243  
USA

**Equipment Under Test:  
(E.U.T.)** CC3200-LAUNCHXL

**FCC Identifier:** Z64-CC3X0XKIT

**Industry Canada Identifier:** 4511-CC3X0XKIT

**In Accordance With:** **FCC Part 15, Subpart C, 15.247 and  
Industry Canada RSS-210, Issue 8**  
Digital Transmission Systems

**Tested By:** Nemko USA, Inc.  
2210 Faraday Ave.  
Suite 150  
Carlsbad, CA 92008

**TESTED BY:**

A handwritten signature in black ink, appearing to read "David Light".

David Light, Wireless Engineer

**DATE:** 17 February 2014

**APPROVED BY:**

A handwritten signature in black ink, appearing to read "TB Kesterling".

**DATE:** 17 February 2014

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**Section 1. Summary of Test Results**

Manufacturer: Texas Instruments, Inc.

Model No.: CC3200-LAUNCHXL

Serial No.: K251

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 and Industry Canada RSS-210, Issue 8 for Digital Transmission Systems. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and Industry Canada.

- |                                     |                            |                                     |                     |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission             | <input type="checkbox"/>            | Production Unit     |
| <input type="checkbox"/>            | Class II Permissive Change | <input checked="" type="checkbox"/> | Pre-Production Unit |
| <input checked="" type="checkbox"/> | Family Listing             |                                     |                     |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".



NVLAP Lab Code 200116-0

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**Summary Of Test Data**

<b>NAME OF TEST</b>	<b>PARA. NO.</b>	<b>RESULT</b>
Powerline Conducted Emissions	FCC 15.207(a) / RSS-Gen 7.2.4	Complies
Minimum 6 dB Bandwidth	FCC 15.247(a)(2) / RSS-210 A8.2(a)	Complies
Maximum Peak Power Output	FCC 15.247(b)(3) / RSS-210 A8.4(4)	Complies
Spurious Emissions (Antenna Conducted)	FCC 15.247(d) / RSS-210 A8.5	Complies
Spurious Emissions (Restricted Bands)	FCC 15.209(a) / RSS-Gen 7.2.2	Complies
Peak Power Spectral Density	FCC 15.247(e) / RSS-210 A8.2(b)	Complies

**Footnotes:**

## Section 2. Equipment Under Test (E.U.T.)

### General Equipment Information

Frequency Band (MHz):	902-928	2400-2483.5	5725-5850
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Operating Frequency of Test Sample: 2412 to 2462 MHz

Channel Spacing: 5 MHz

Modulation Types: OFDM

User Frequency Adjustment: Software controlled

### Description of EUT

The CC3200-LAUNCHXL is an evaluation board for the CC3200 device from Texas Instruments. The CC3200 device is an ARM Cortex M4 microcontroller with an on-chip 802.11bgn Wi-Fi Network Processor. The ARM Cortex M4 microcontroller is available for application development and therefore allows a single chip embedded Wi-Fi solution. The CC3200-LAUNCHXL evaluation board allows a developer to evaluate the CC3200 and to execute application code on the on-chip microcontroller. The CC3200-LAUNCHXL interfaces to a PC host using a USB cable.

**Section 3. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: FCC 15.247(a)(2) RSS-210 A8.2(a)
TESTED BY: David Light	DATE: 16 January 2014

**Test Results:** Complies.

**Measurement Data:** See 6 dB BW plot  
Measured 6 dB bandwidth: 10 MHz (802.11b)  
16 MHz (802.11g)  
17 MHz (802.11n)  
Channel Separation: 5 MHz

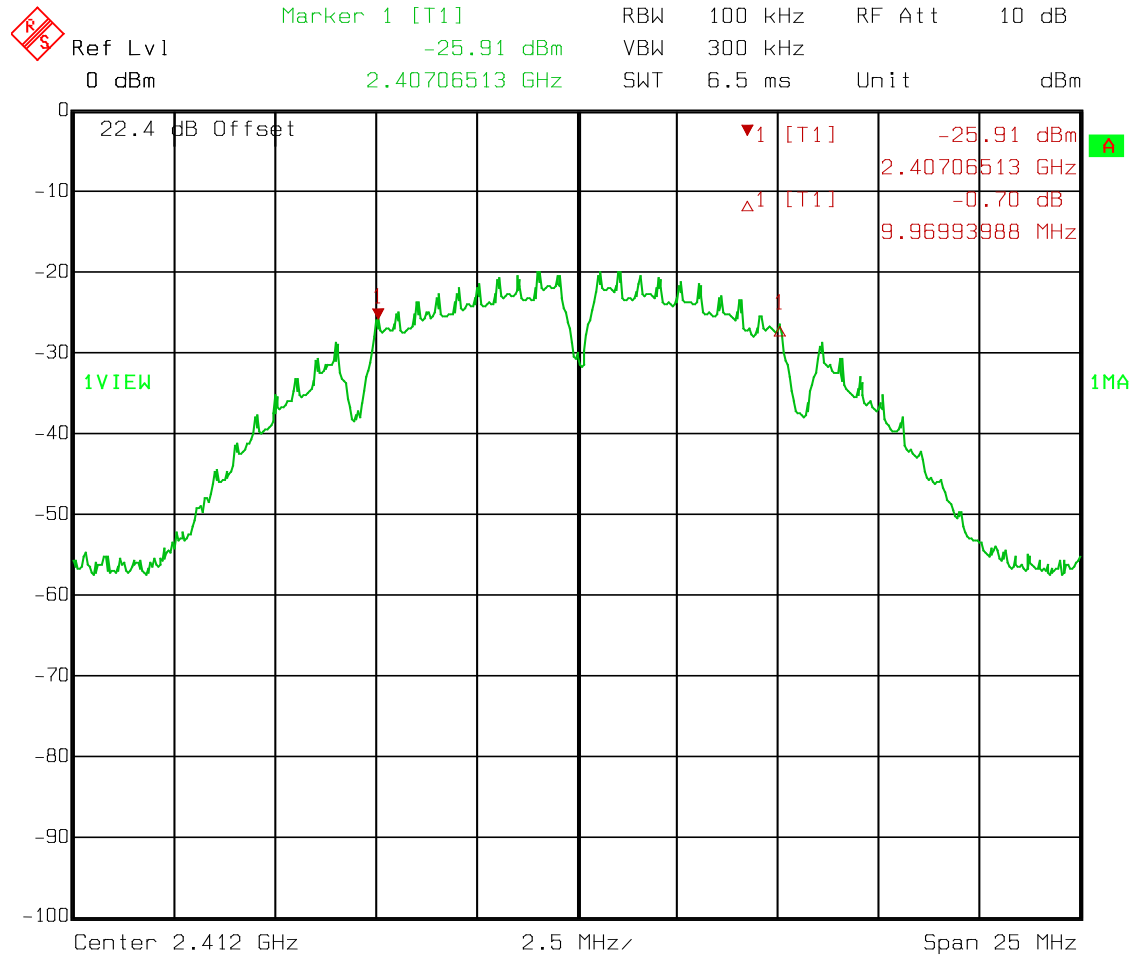
**Test Conditions:** 29 %RH  
22 °C

**Measurement Uncertainty:** +/-1x10<sup>-7</sup> ppm

**Test Equipment Used:** 1036-1082-1472

Test Data – Occupied Bandwidth

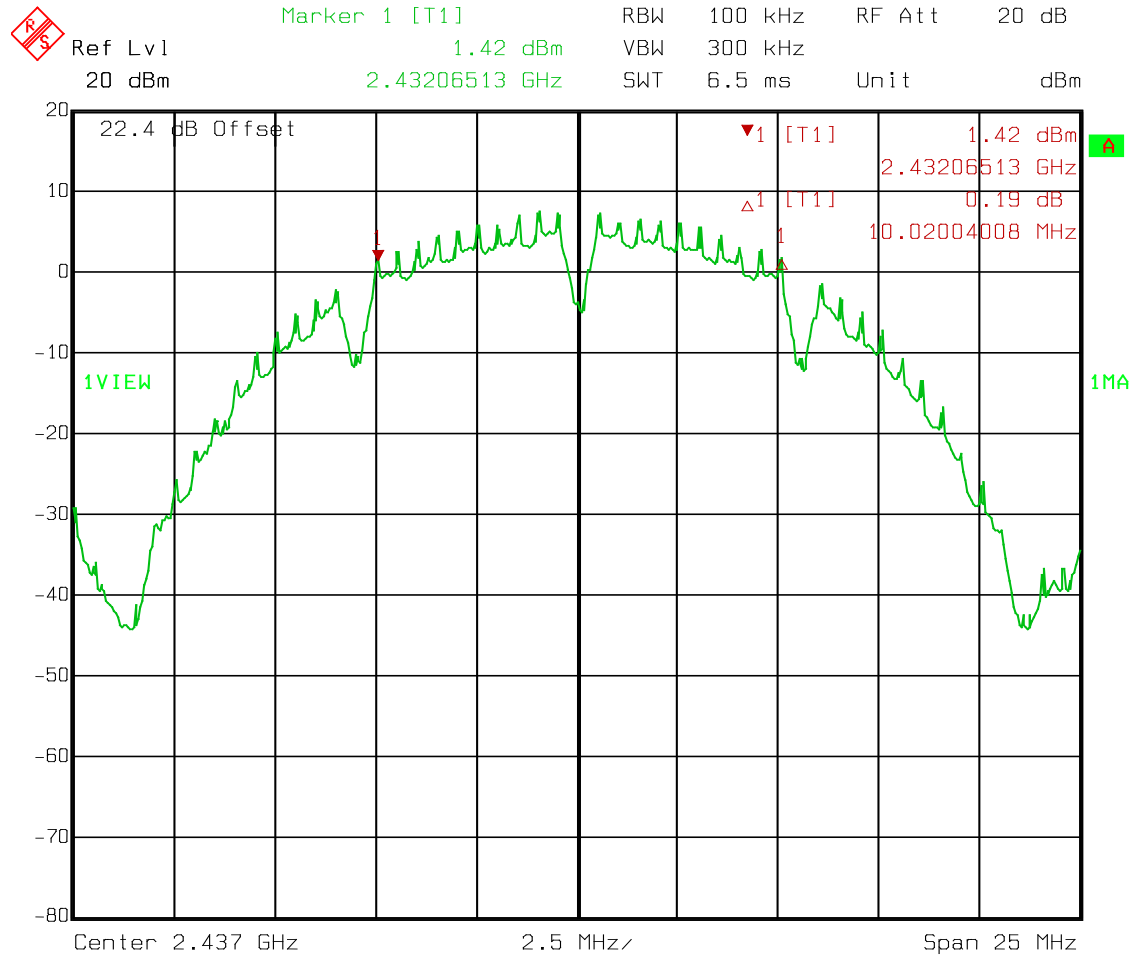
Low Channel  
Emission Bandwidth  
802.11b  
1 Mbps



Date: 16.JAN.2014 08:57:34

**Test Data – Occupied Bandwidth**

Mid Channel  
Emission Bandwidth  
802.11b  
1 Mbps

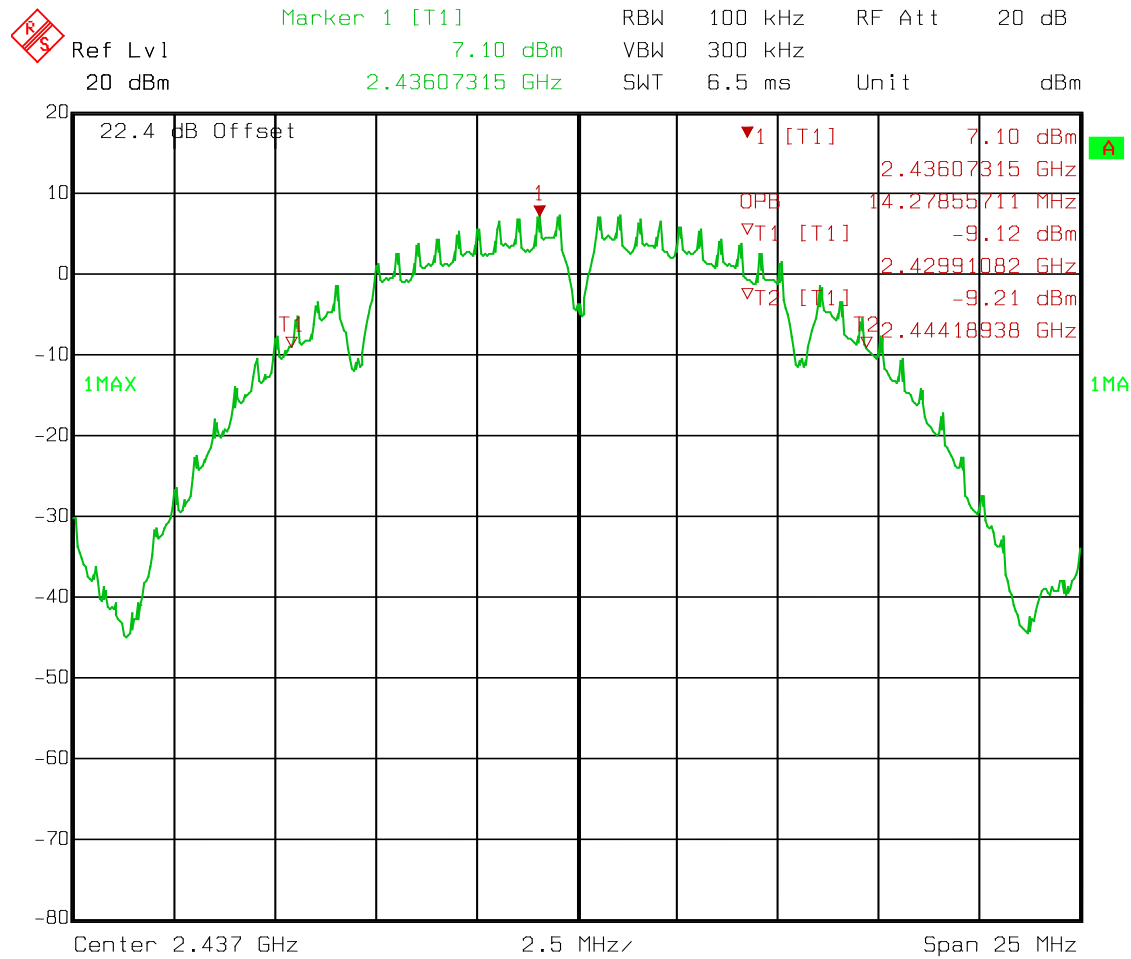


Date: 16.JAN.2014 09:46:28



**Test Data – Occupied Bandwidth**

99% Bandwidth  
802.11b  
1 Mbps



Date: 16.JAN.2014 09:49:36

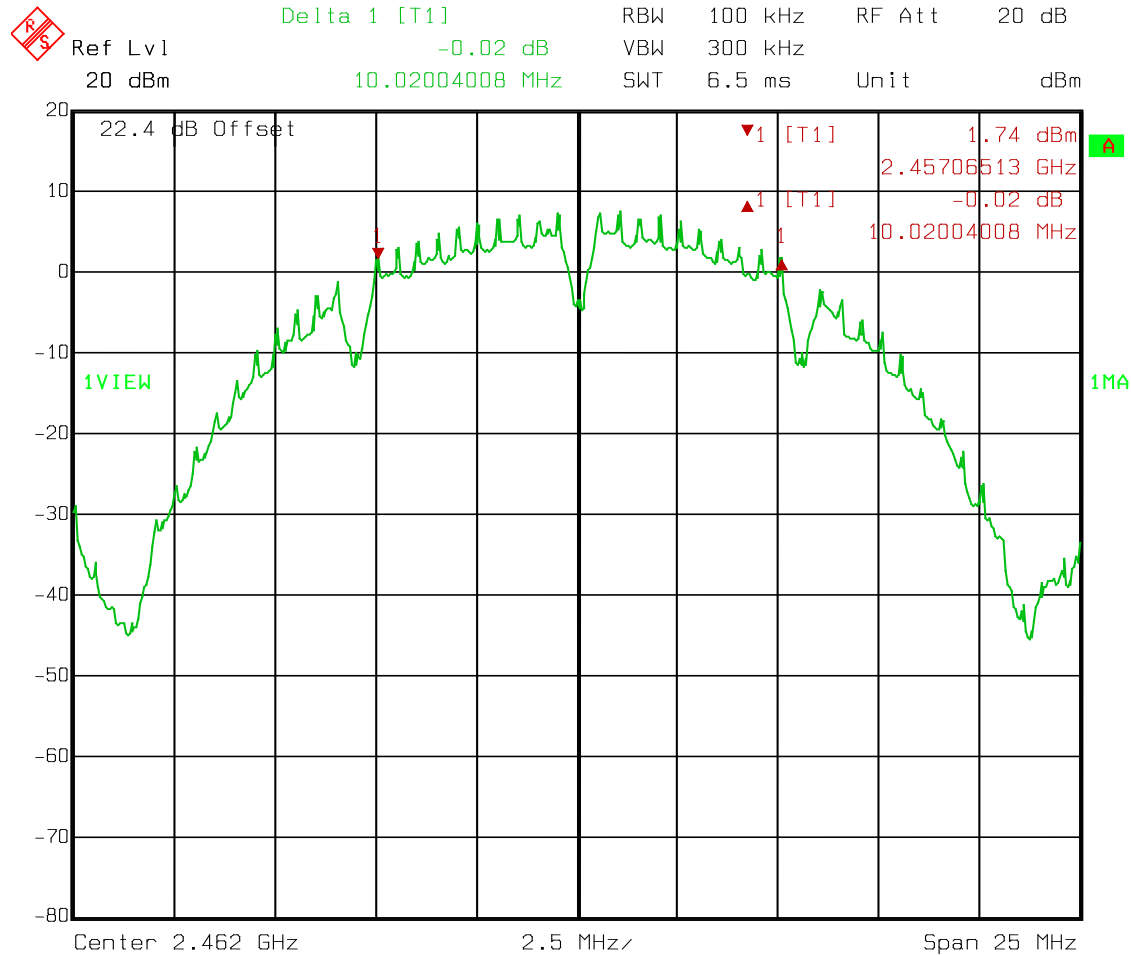
Test Data – Occupied Bandwidth

Emission Bandwidth

Upper Channel

802.11b

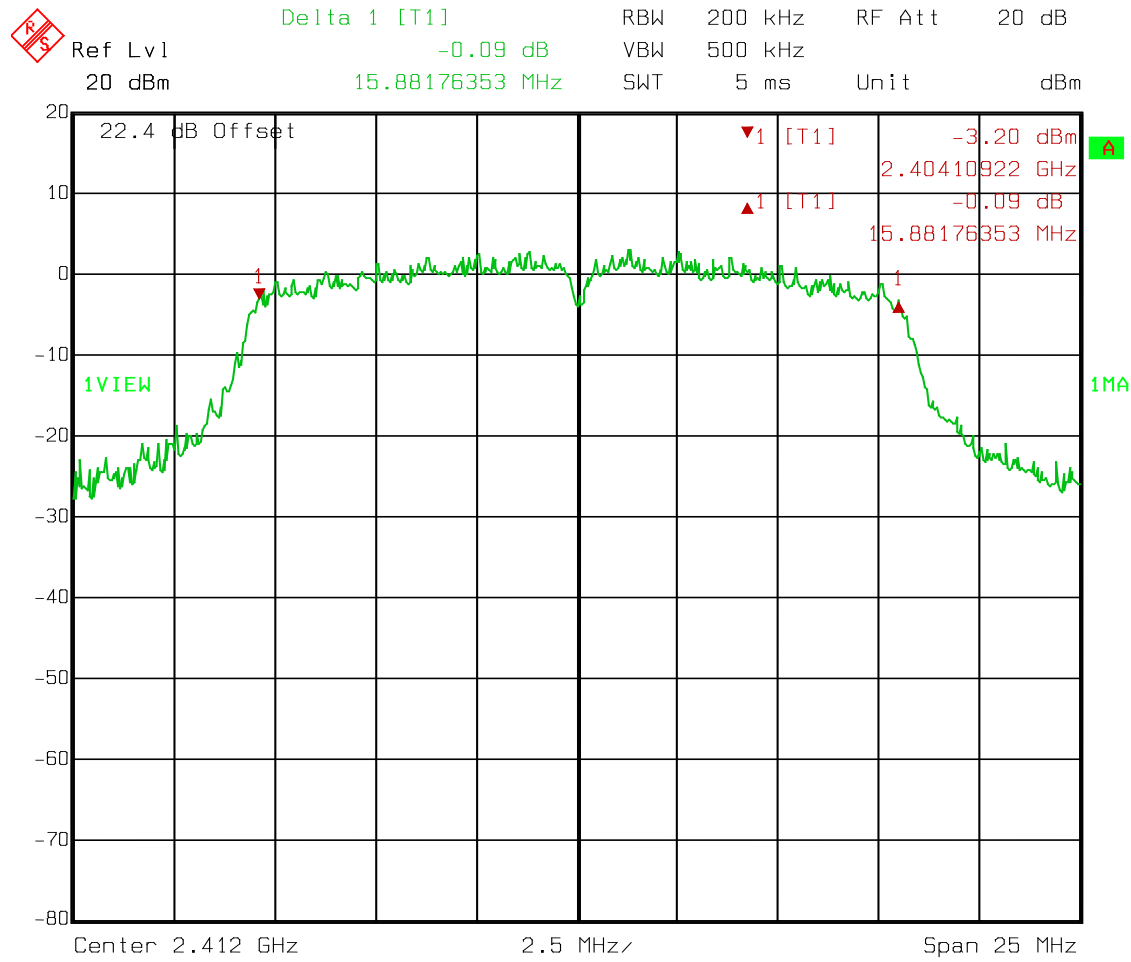
1 Mbps



Date: 16.JAN.2014 09:53:33

**Test Data – Occupied Bandwidth**

Low Channel  
Emission Bandwidth  
802.11g  
6 Mbps

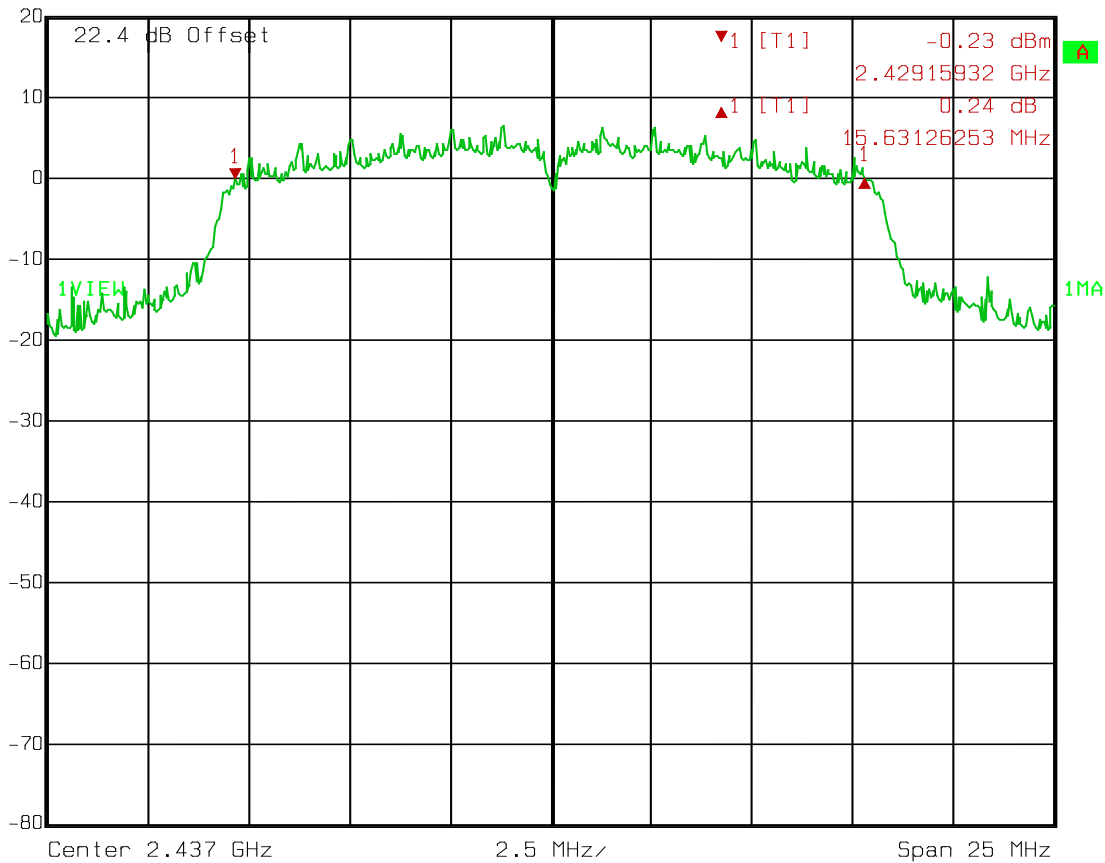


Date: 16.JAN.2014 10:10:32

**Test Data – Occupied Bandwidth**

Mid Channel  
Emission Bandwidth  
802.11g  
6 Mbps

	Delta 1 [T1]	RBW	200 kHz	RF Att	20 dB
	Ref Lvl	0.24 dB	VBW	500 kHz	
	20 dBm	15.63126253 MHz	SWT	5 ms	Unit dBm



Date: 16.JAN.2014 10:18:27

**Test Data – Occupied Bandwidth**

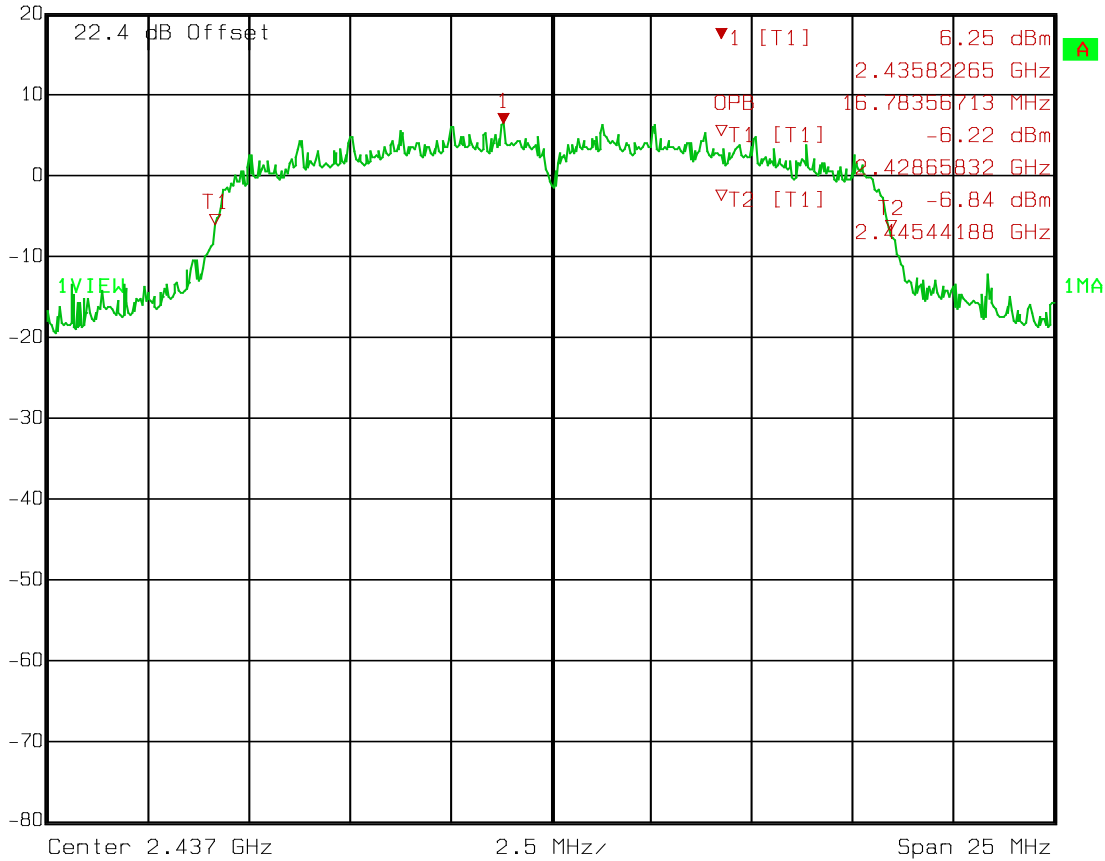
99% Bandwidth

802.11g

6 Mbps



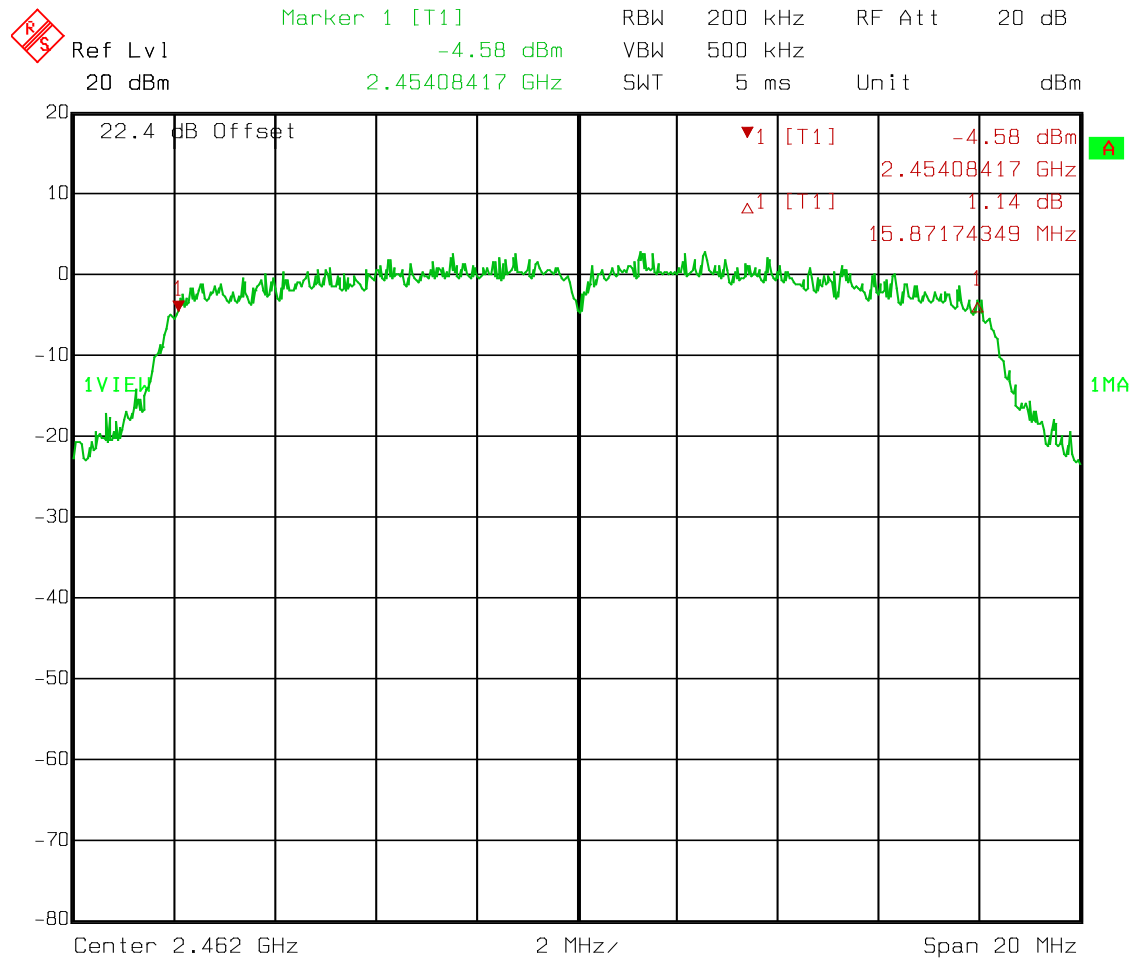
Ref Lvl	Marker 1 [T1]	RBW	200 kHz	RF Att	20 dB
20 dBm	6.25 dBm	VBW	500 kHz		
	2.43582265 GHz	SWT	5 ms	Unit	dBm



Date: 16.JAN.2014 10:18:58

**Test Data – Occupied Bandwidth**

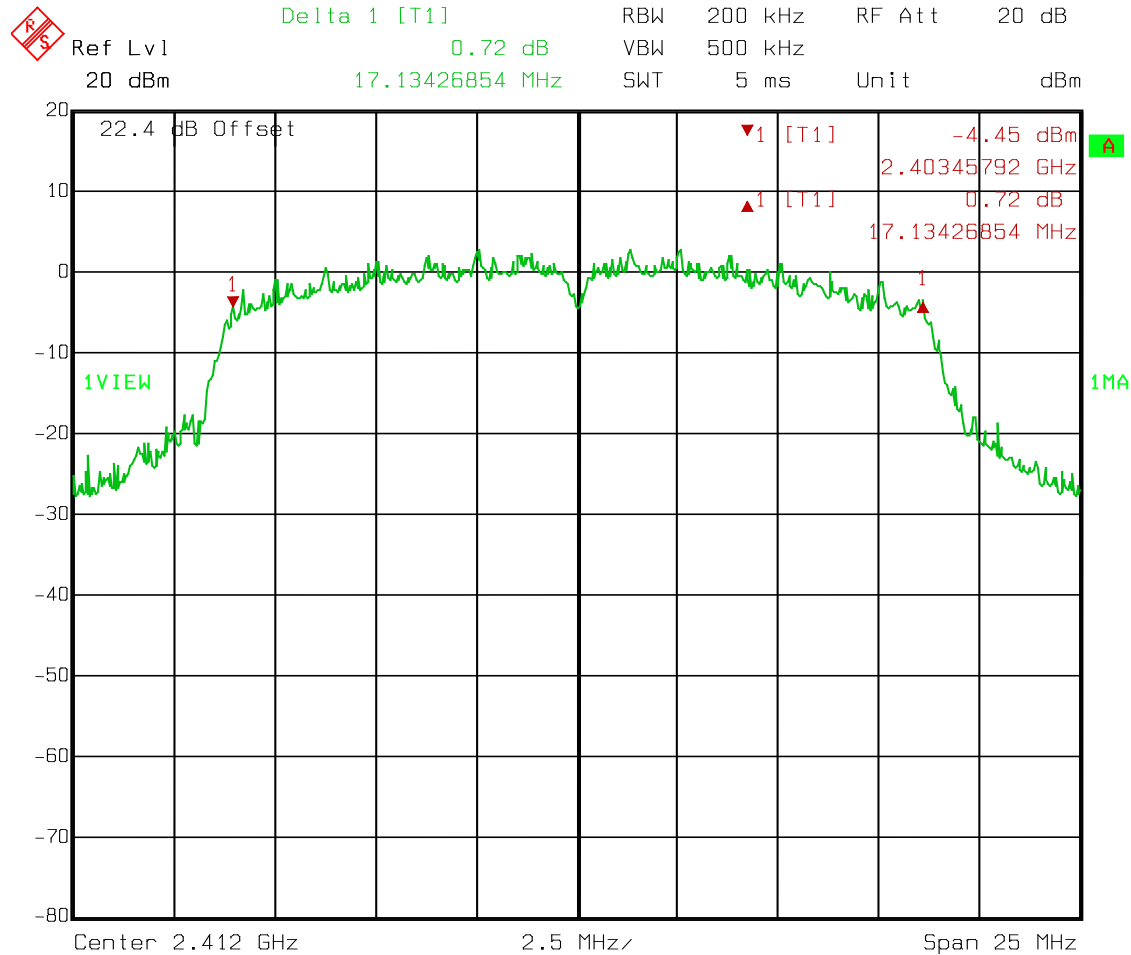
Upper Channel  
802.11g  
6 Mbps



Date: 16.JAN.2014 10:24:10

**Test Data – Occupied Bandwidth**

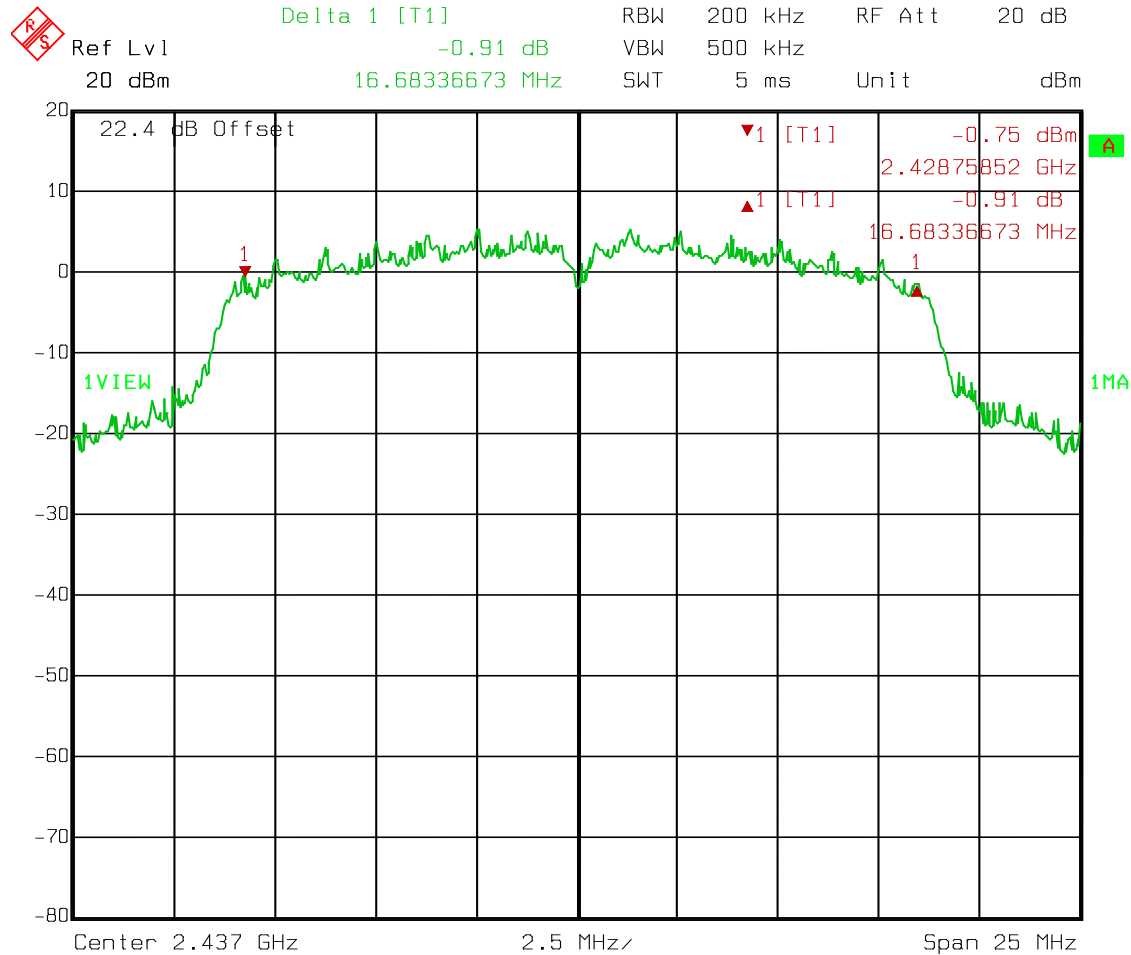
Low Channel  
Emission Bandwidth  
802.11n  
MCS0



Date: 16.JAN.2014 10:37:05

**Test Data – Occupied Bandwidth**

Mid Channel  
Emission Bandwidth  
802.11n  
MCS0



Date: 16.JAN.2014 10:42:48



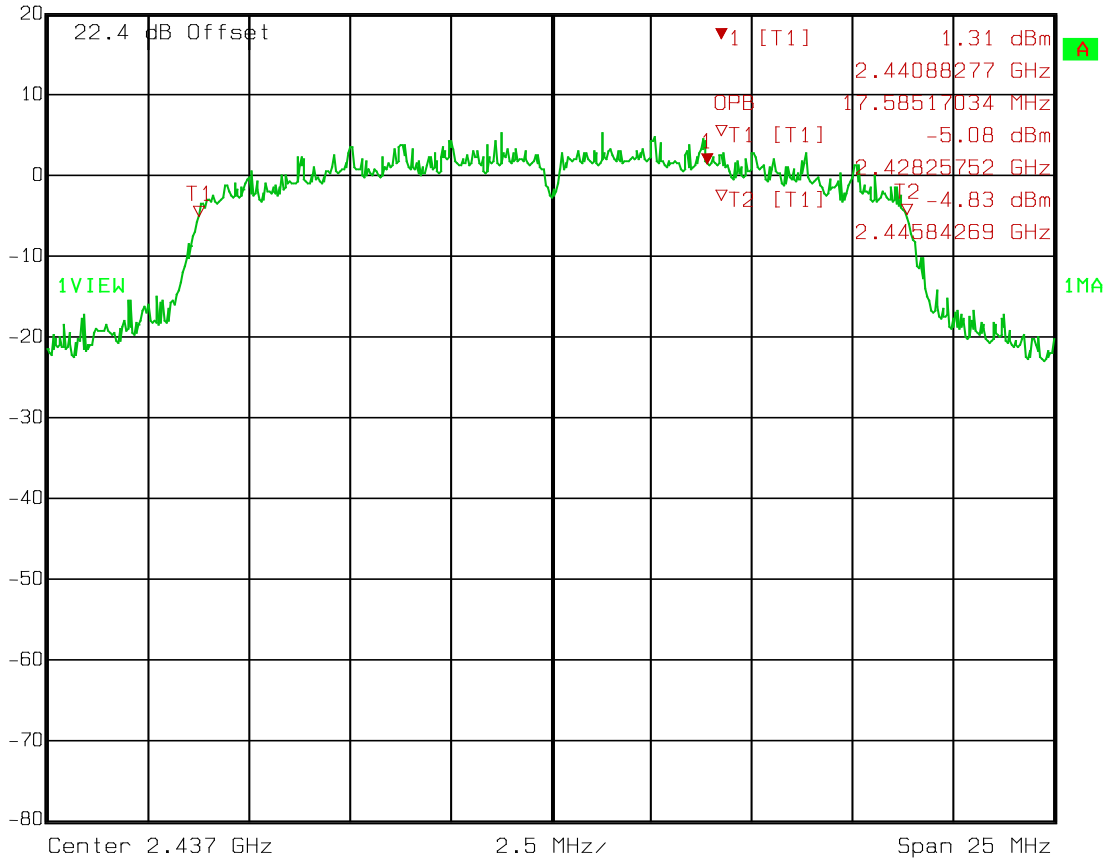
**Test Data – Occupied Bandwidth**

99% Bandwidth

802.11n

MCS0

	Marker 1 [T1]	RBW	200 kHz	RF Att	20 dB
	Ref Lvl	1.31 dBm	VBW	500 kHz	
	20 dBm	2.44088277 GHz	SWT	5 ms	Unit dBm



Date: 16.JAN.2014 10:43:14

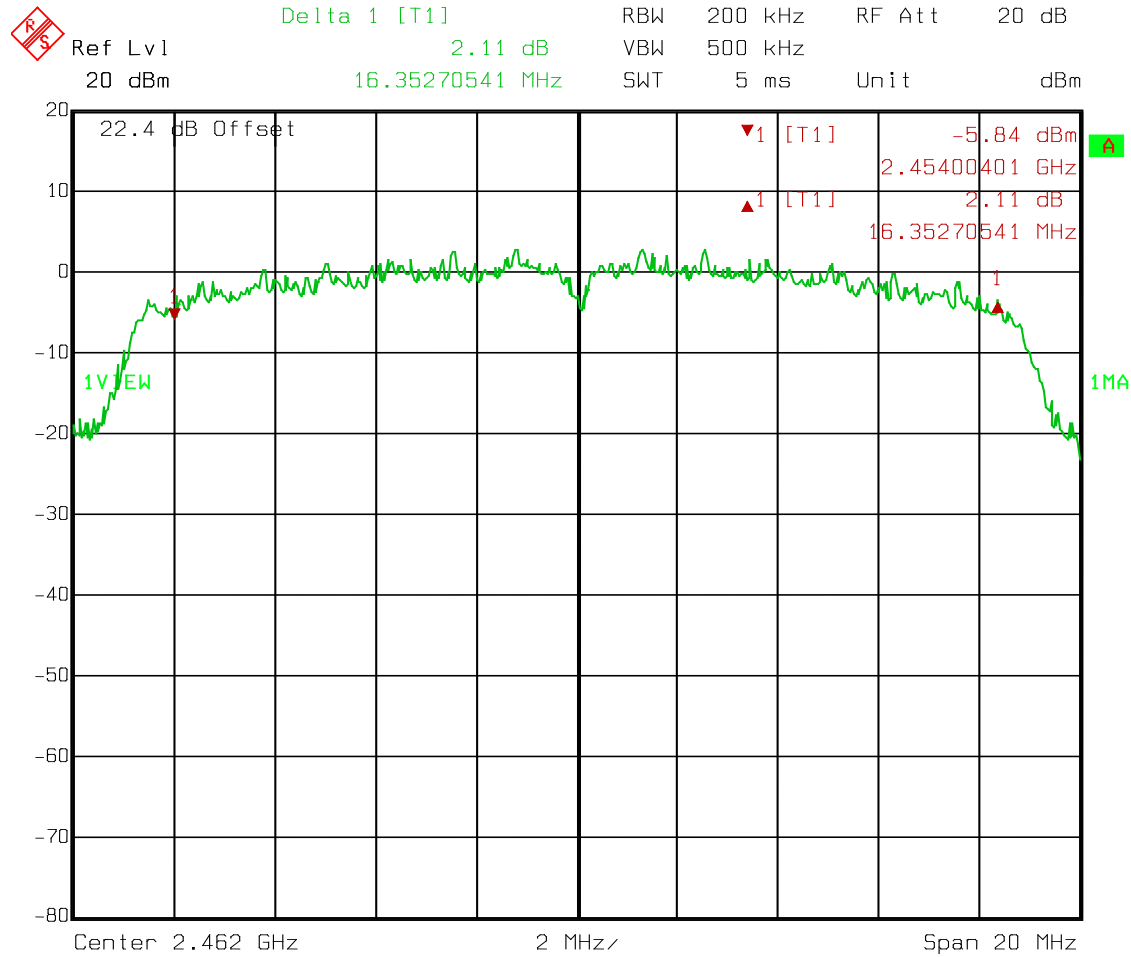
**Test Data – Occupied Bandwidth**

Emission Bandwidth

Upper Channel

802.11n

MCS0



Date: 16.JAN.2014 10:48:46

**Section 4. Maximum Peak Output Power**

NAME OF TEST: Maximum Peak Output power	PARA. NO.: FCC 15.247(b)(3) RSS-210 A8.4(4)
TESTED BY: David Light	DATE: 16 January 2014

**Test Results:** Complies.

**Measurement Data:** Refer to attached data

**Test Conditions:** 29 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

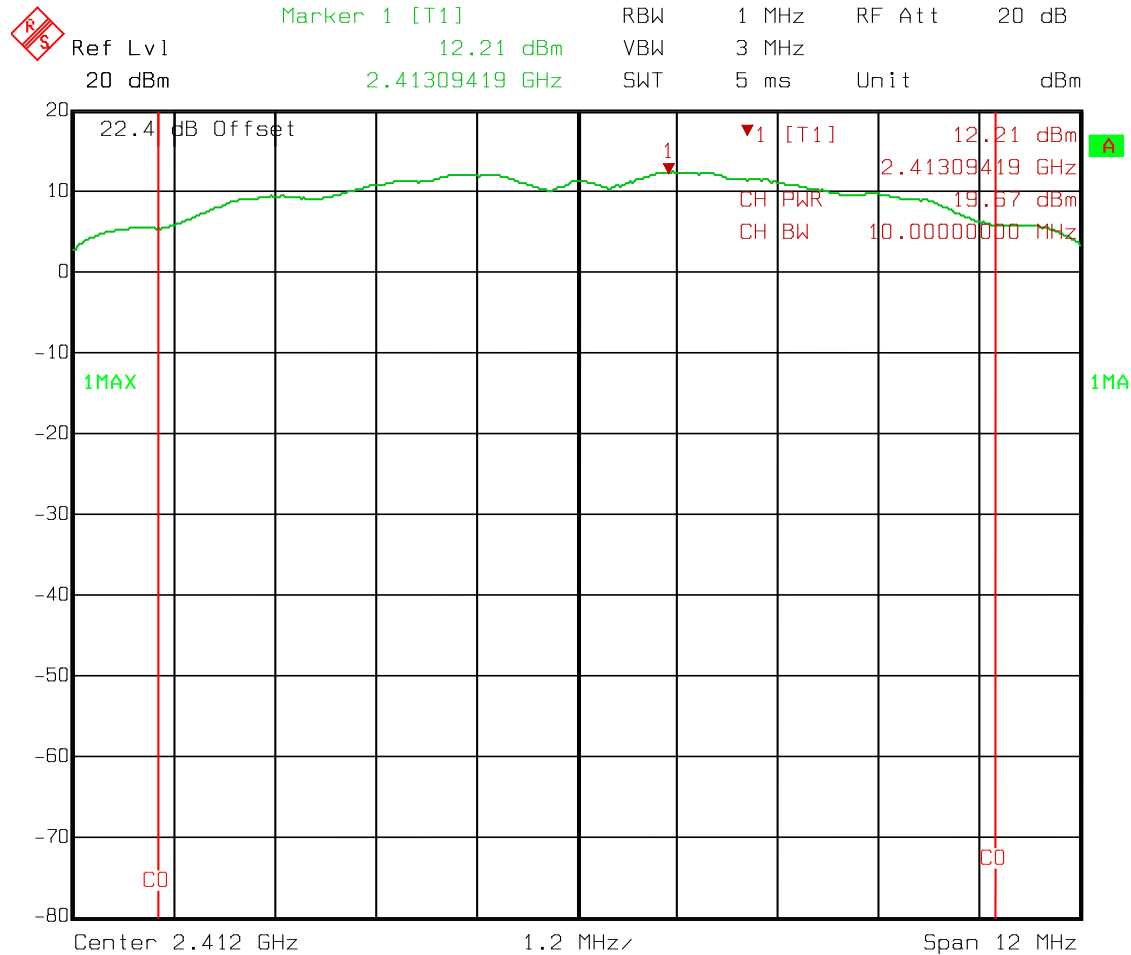
**Test Equipment Used:** 1036-1082-1472

- This device was tested at +/- 15% input power per 15.31(e), with no variation in output power.
- For battery powered equipment, the device was tested with a fresh battery per 15.31(e).
- The device was tested on three channels per 15.31(l).
- This test was performed radiated.

**The highest EIRP is 23.8 dBm (232.8 mW) based on manufacturer's stated antenna gain of 2 dBm maximum.**

**Test Data – Peak Power**

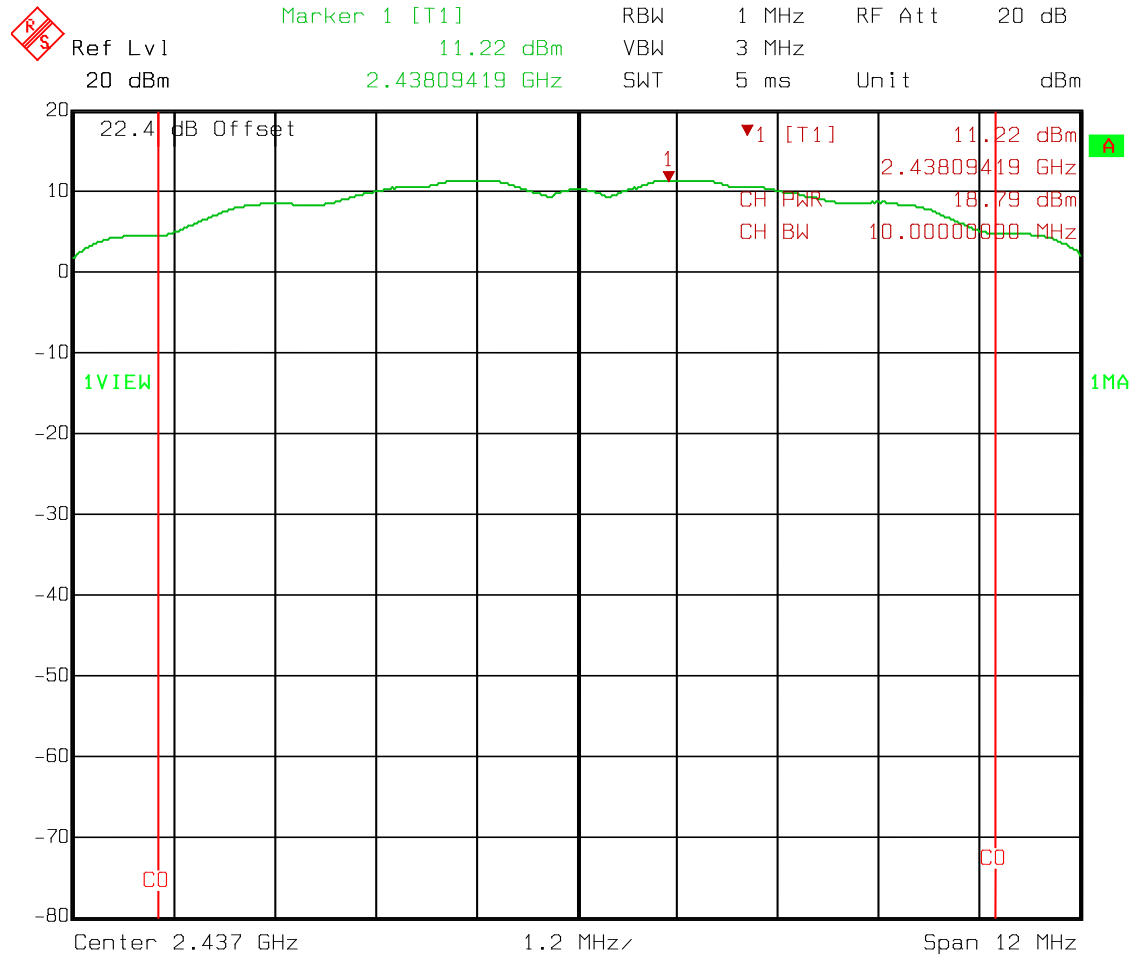
Low Channel  
Peak Power  
802.11b  
1 Mbps



Date: 16.JAN.2014 09:33:00

**Test Data – Peak Power**

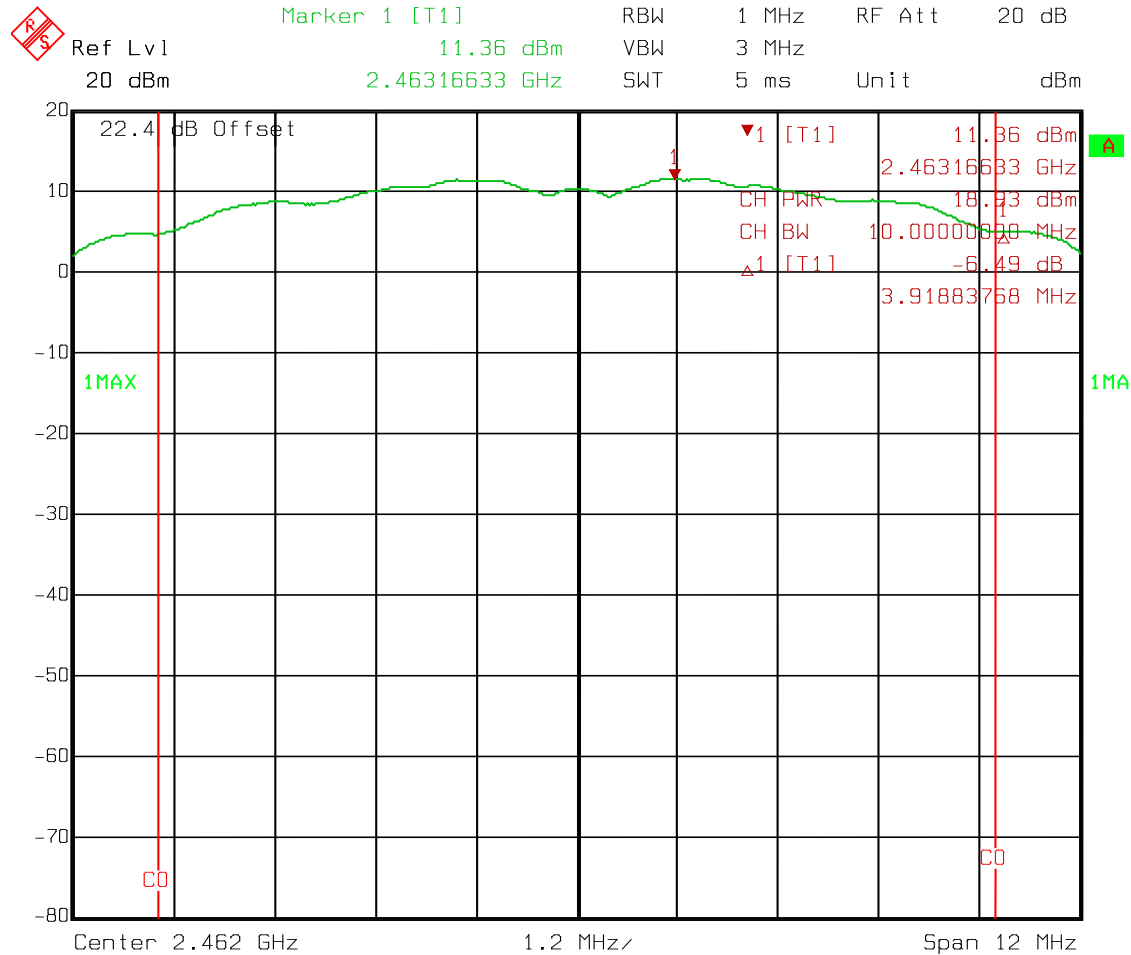
Mid Channel  
Peak Power  
802.11b  
1 Mbps



Date: 16.JAN.2014 09:47:34

Test Data – Peak Power

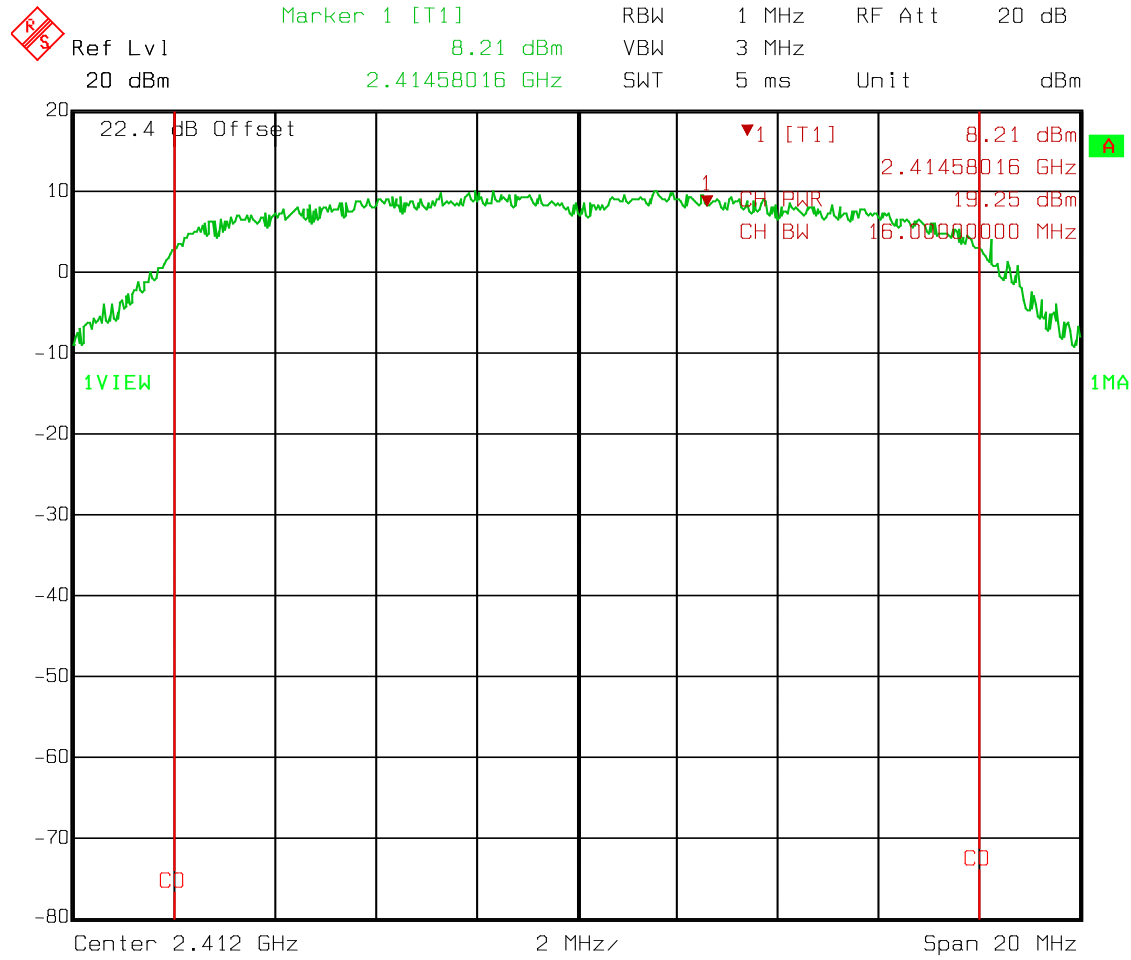
Peak Power  
Upper Channel  
802.11b  
1 Mbps



Date: 16.JAN.2014 09:54:46

**Test Data – Peak Power**

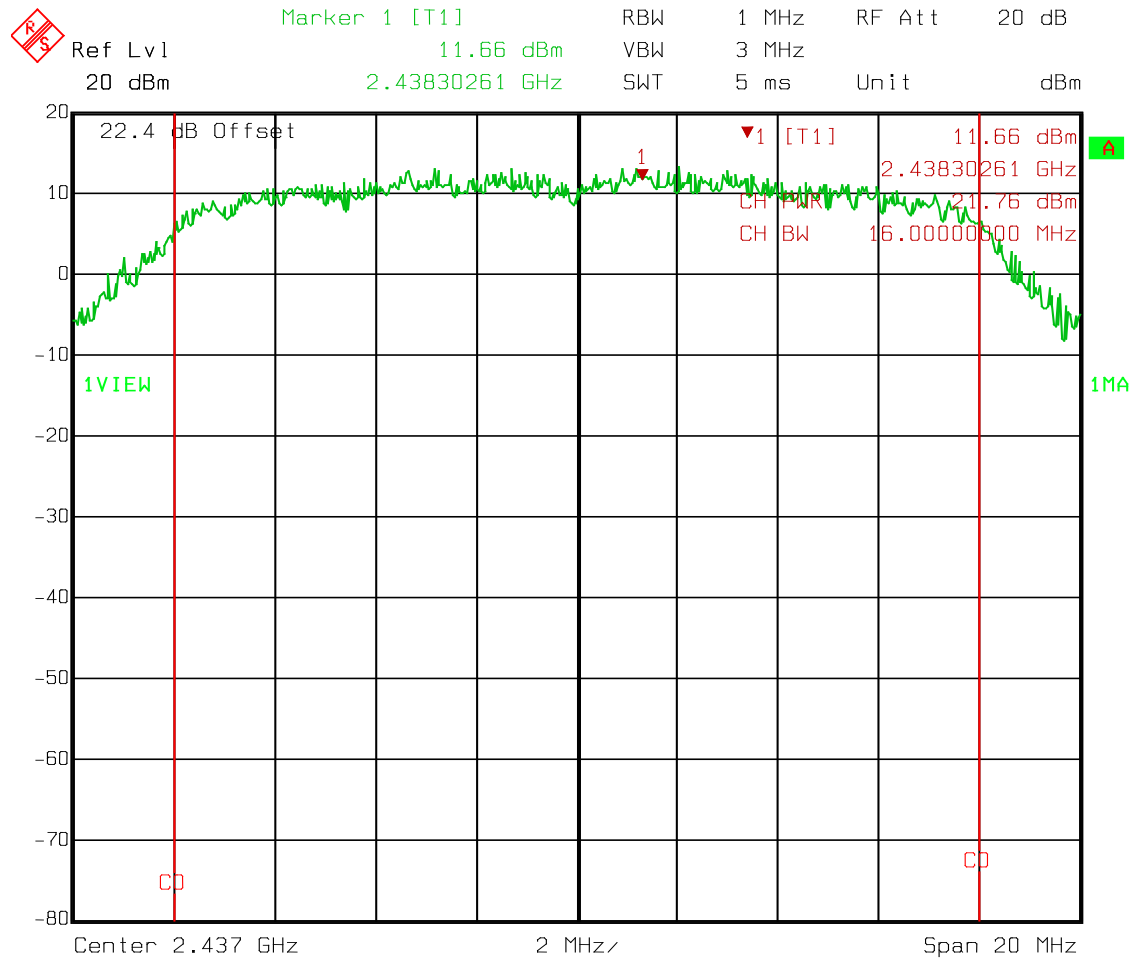
Low Channel  
Peak Power  
802.11g  
6 Mbps



Date: 16.JAN.2014 10:12:21

**Test Data – Peak Power**

Mid Channel  
Peak Power  
802.11g  
6 Mbps

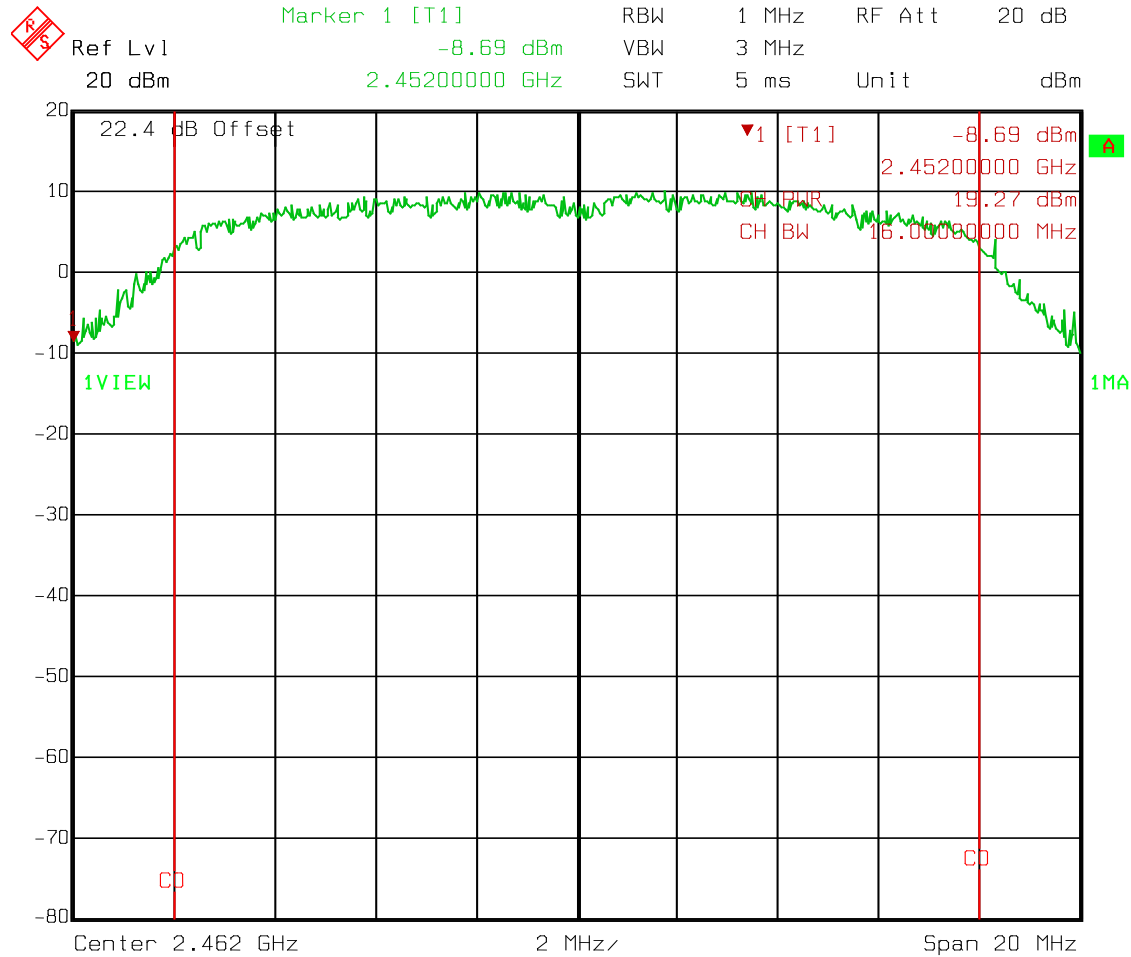


Date: 16.JAN.2014 10:20:48



Test Data – Peak Power

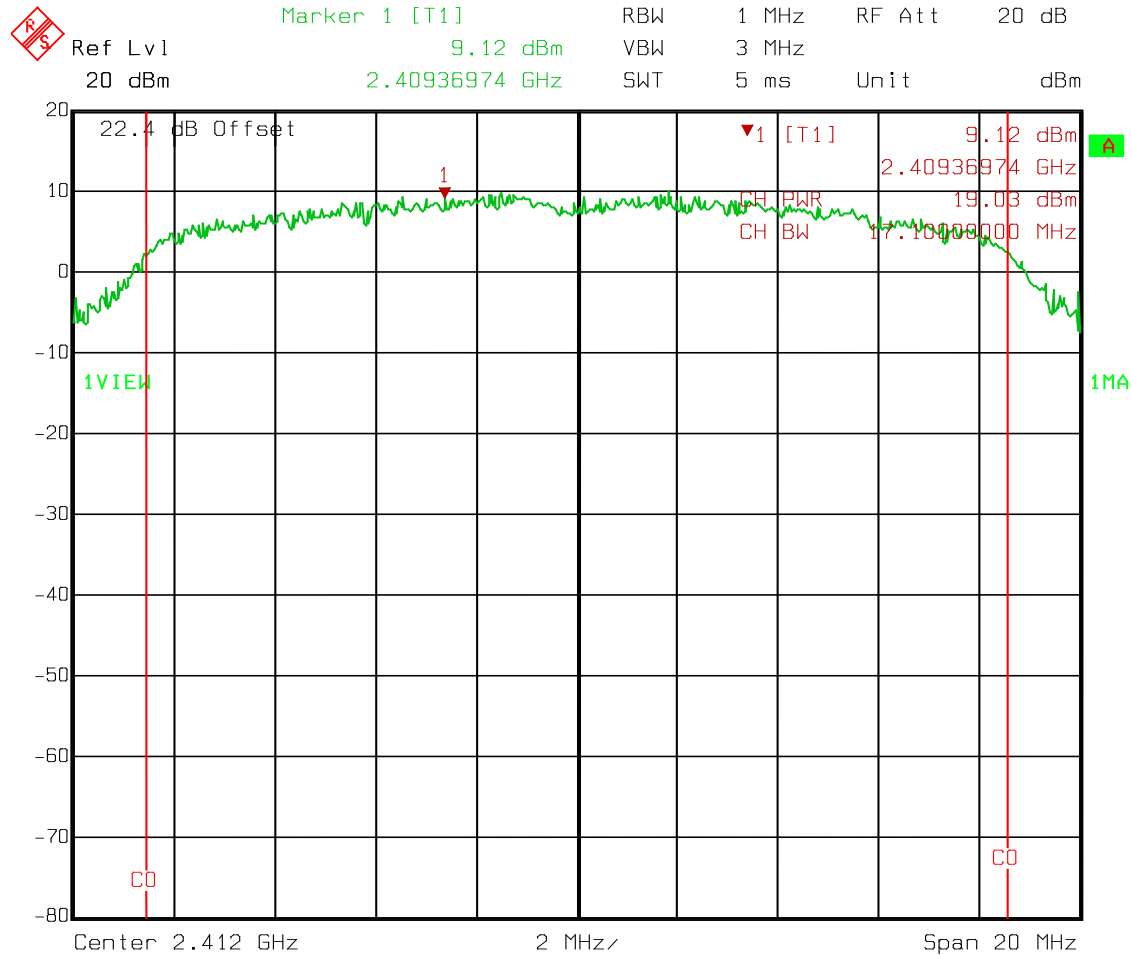
Peak Power  
Upper Channel  
802.11g  
6 Mbps



Date: 16.JAN.2014 10:22:40

**Test Data – Peak Power**

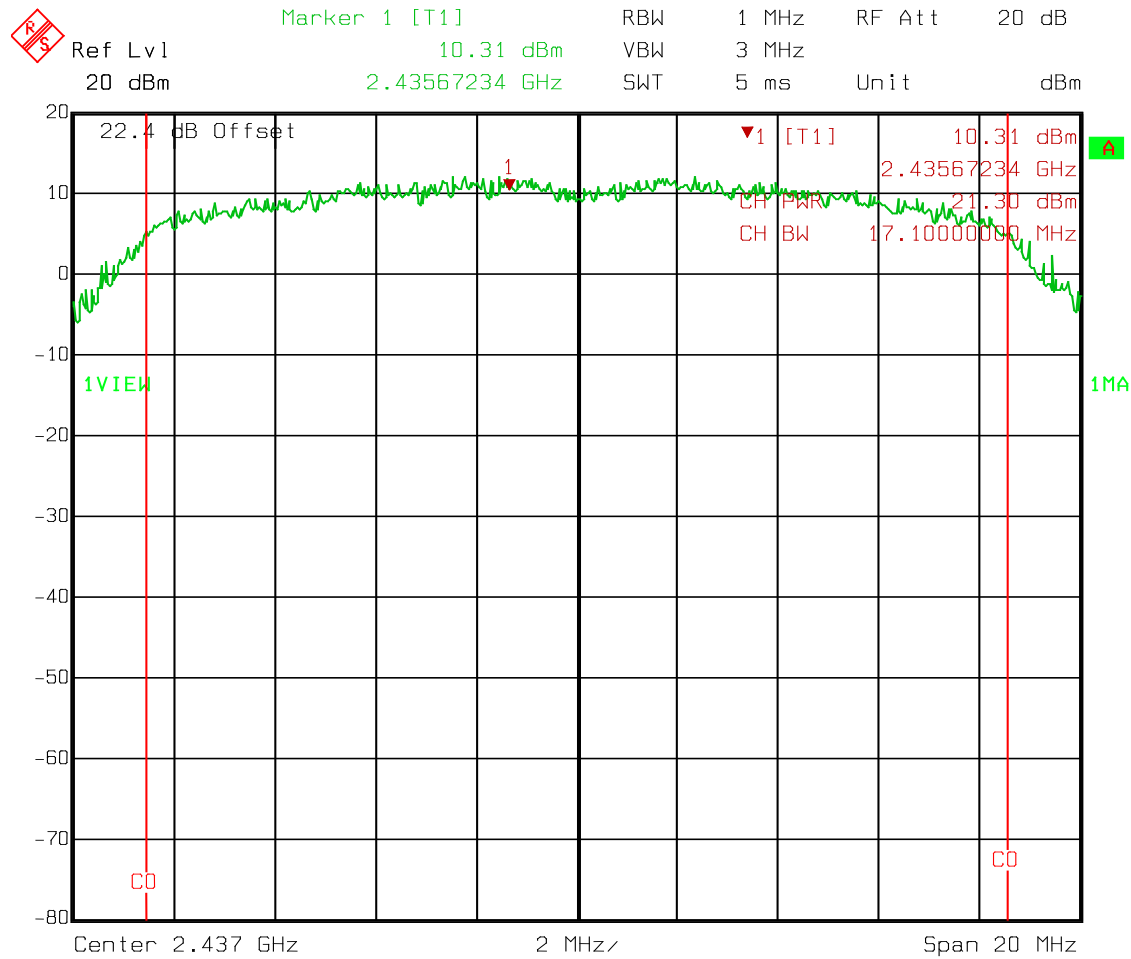
Low Channel  
Peak Power  
802.11n  
MCS0



Date: 16.JAN.2014 10:38:41

Test Data – Peak Power

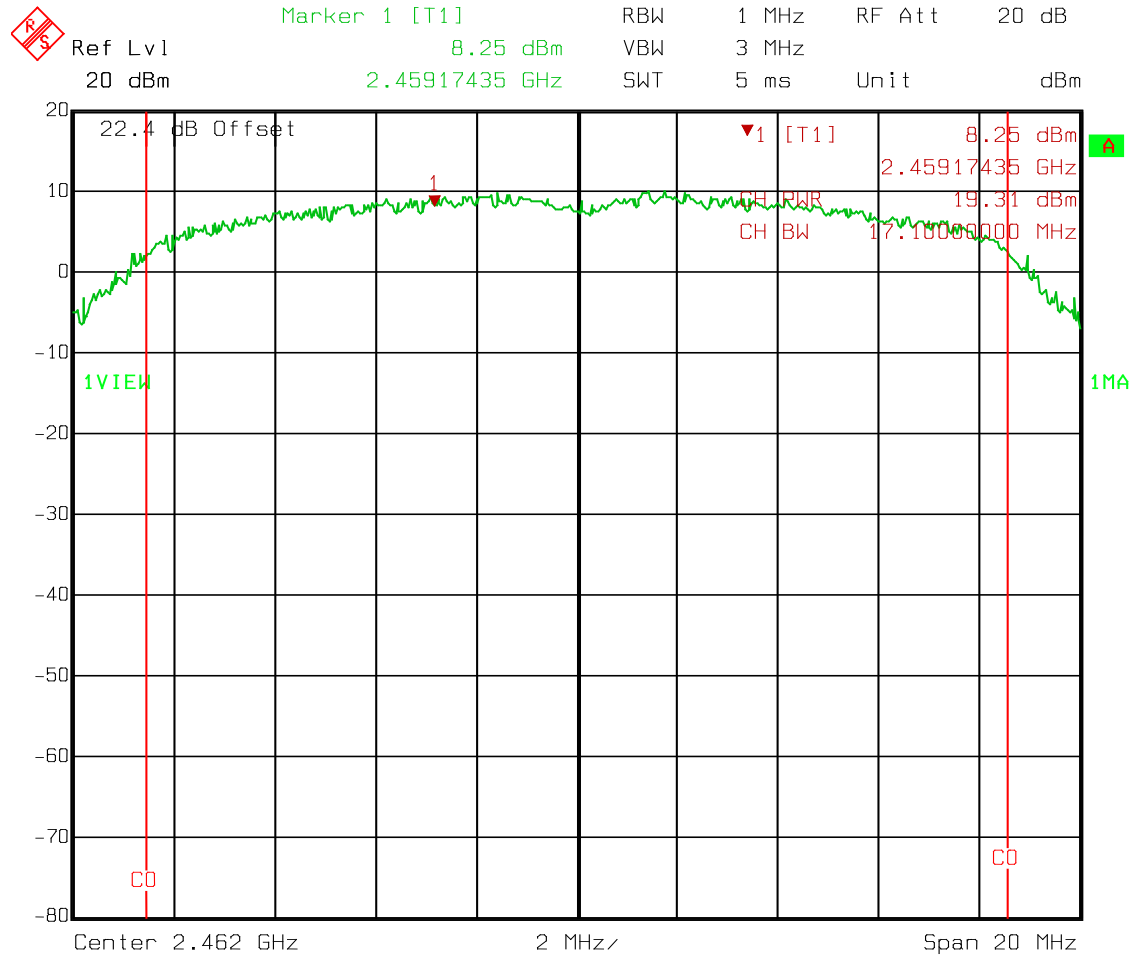
Mid Channel  
Peak Power  
802.11n  
MCS0



Date: 16.JAN.2014 10:44:14

Test Data – Peak Power

Peak Power  
Upper Channel  
802.11n  
MCS0



Date: 16.JAN.2014 10:49:20

## **Section 5      Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 15.247 (d)
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TESTED BY: David Light
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DATE: 16 January 2014
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**Test Results:**                      Complies.

**Measurement Data:**    See attached plots.

**Test Conditions:**                29 %RH  
    22 °C

**Measurement Uncertainty:**    +/-1.7    dB

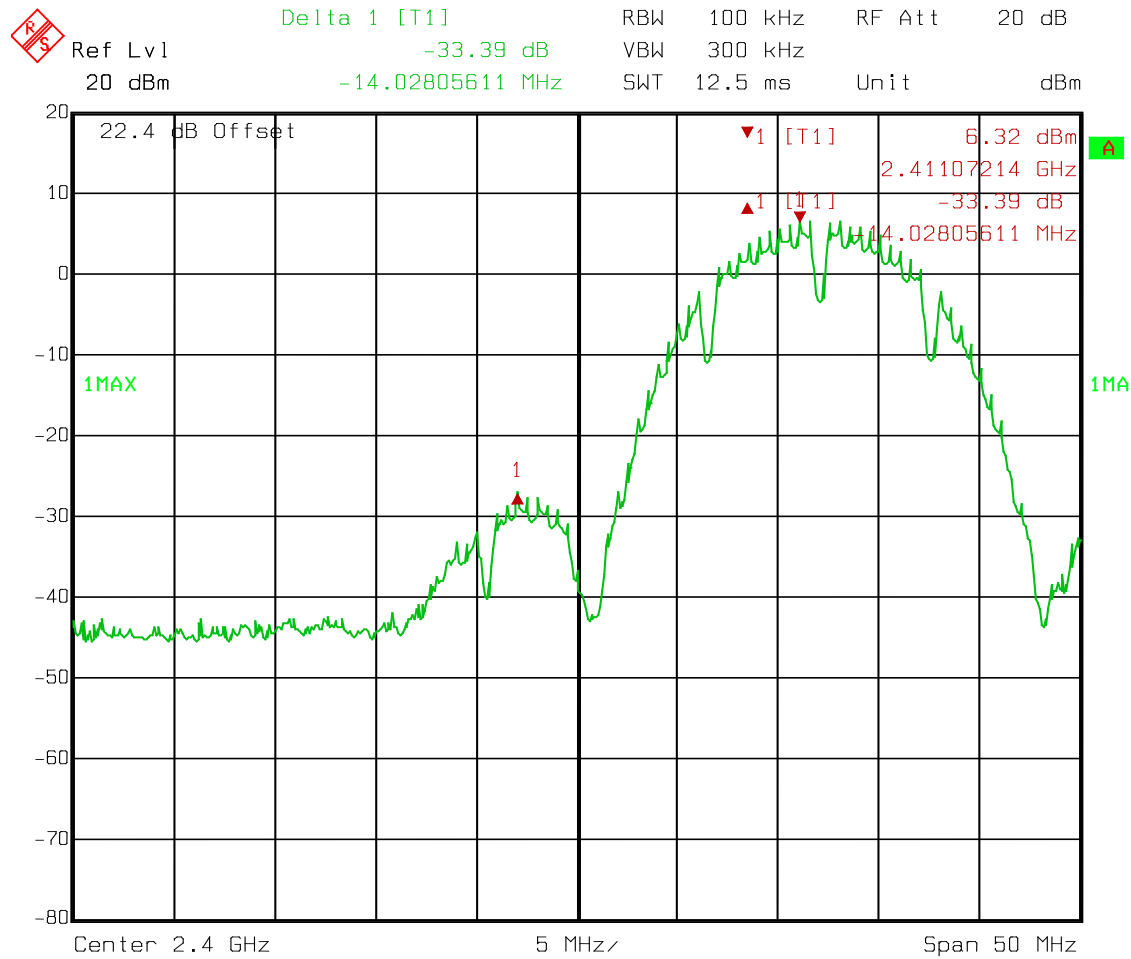
**Test Equipment Used:**    1036-1082-1472

Test Data – Spurious Emissions at Antenna Terminals

Lower Band Edge

802.11b

1 Mbps



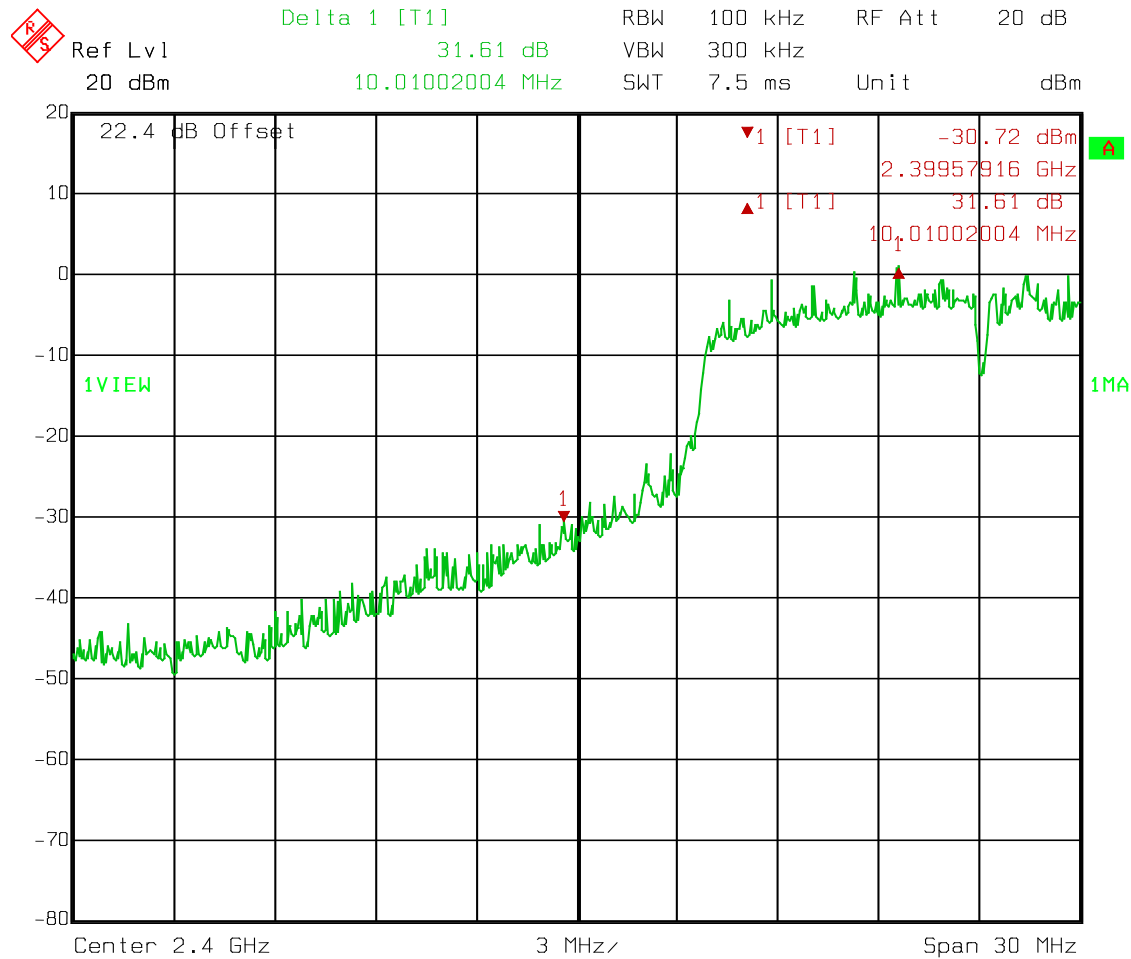
Date: 16.JAN.2014 09:41:10

**Test Data – Spurious Emissions at Antenna Terminals**

Lower Band Edge

802.11g

6 Mbps



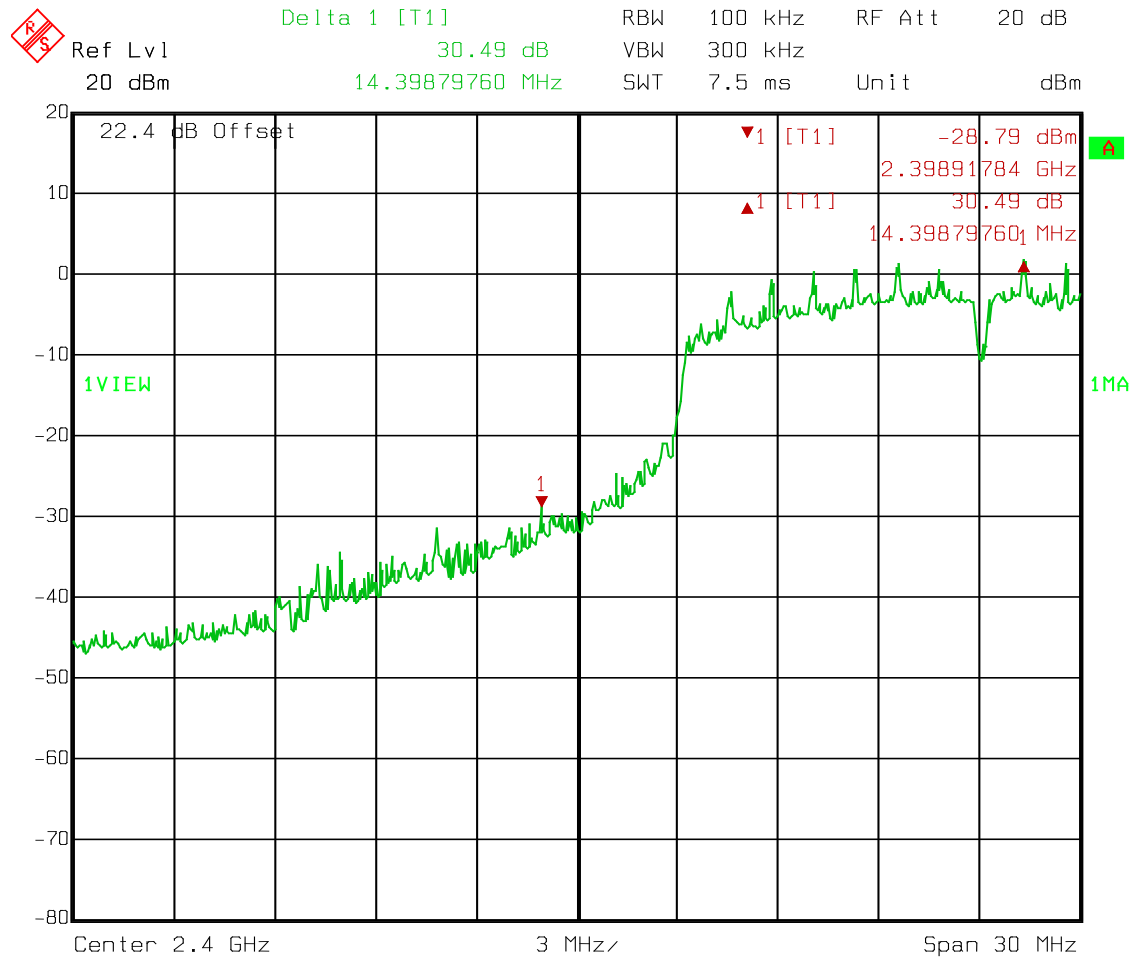
Date: 16.JAN.2014 10:13:42

Test Data – Spurious Emissions at Antenna Terminals

Lower Band Edge

802.11n

MCS0

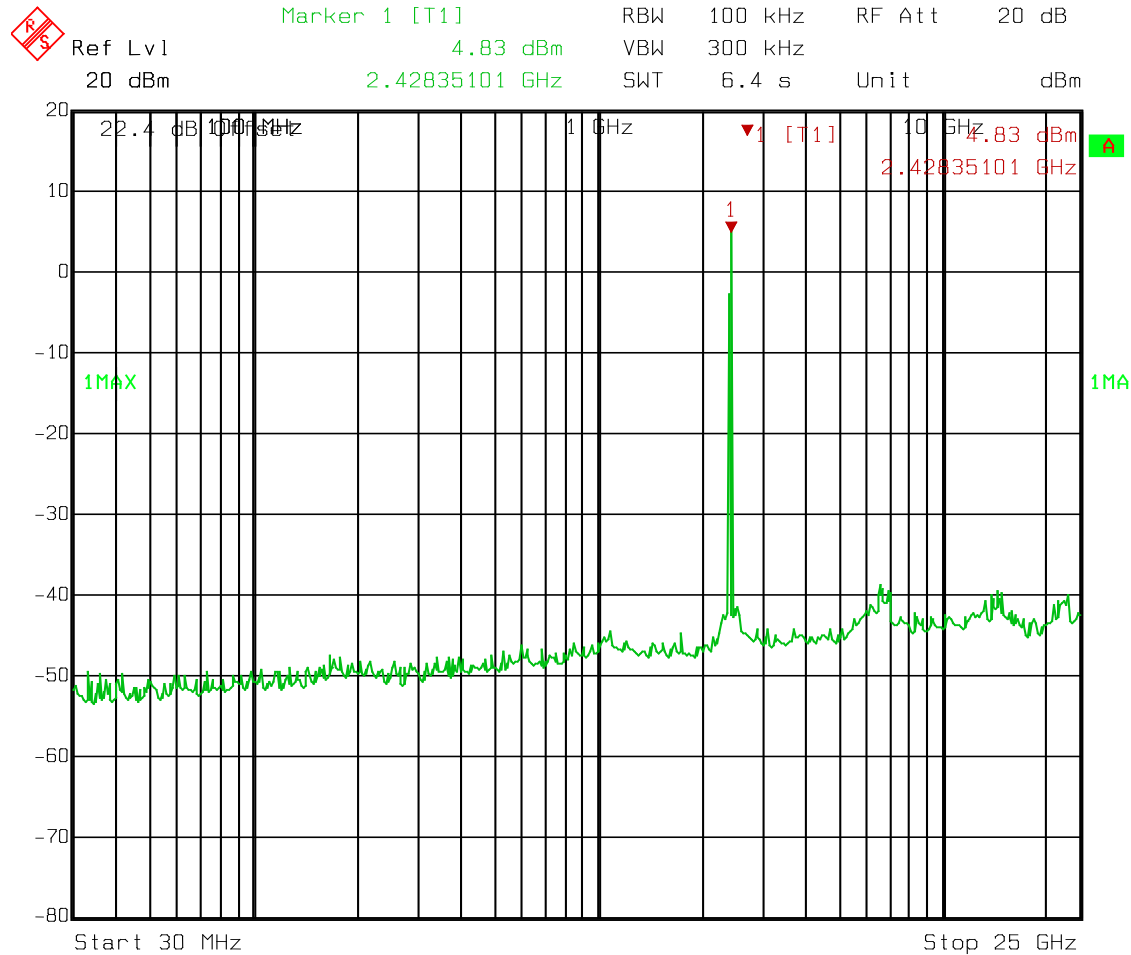


Date: 16.JAN.2014 10:39:54



**Test Data – Spurious Emissions at Antenna Terminals**

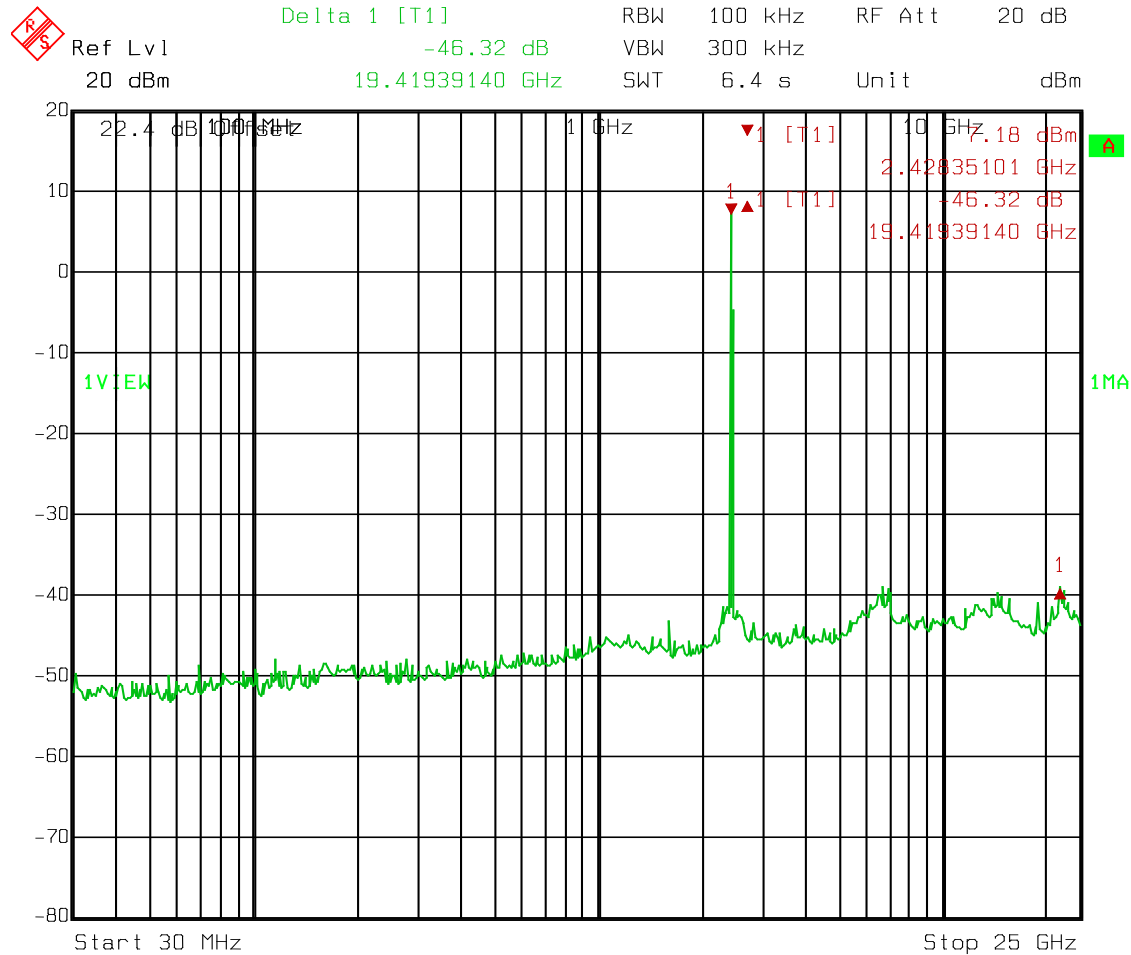
Spurious Emission  
Low Channel  
802.11b  
1 Mbps



Date: 16.JAN.2014 09:39:35

Test Data – Spurious Emissions at Antenna Terminals


Spurious Emissions  
Mid Channel  
802.11b  
1 Mbps

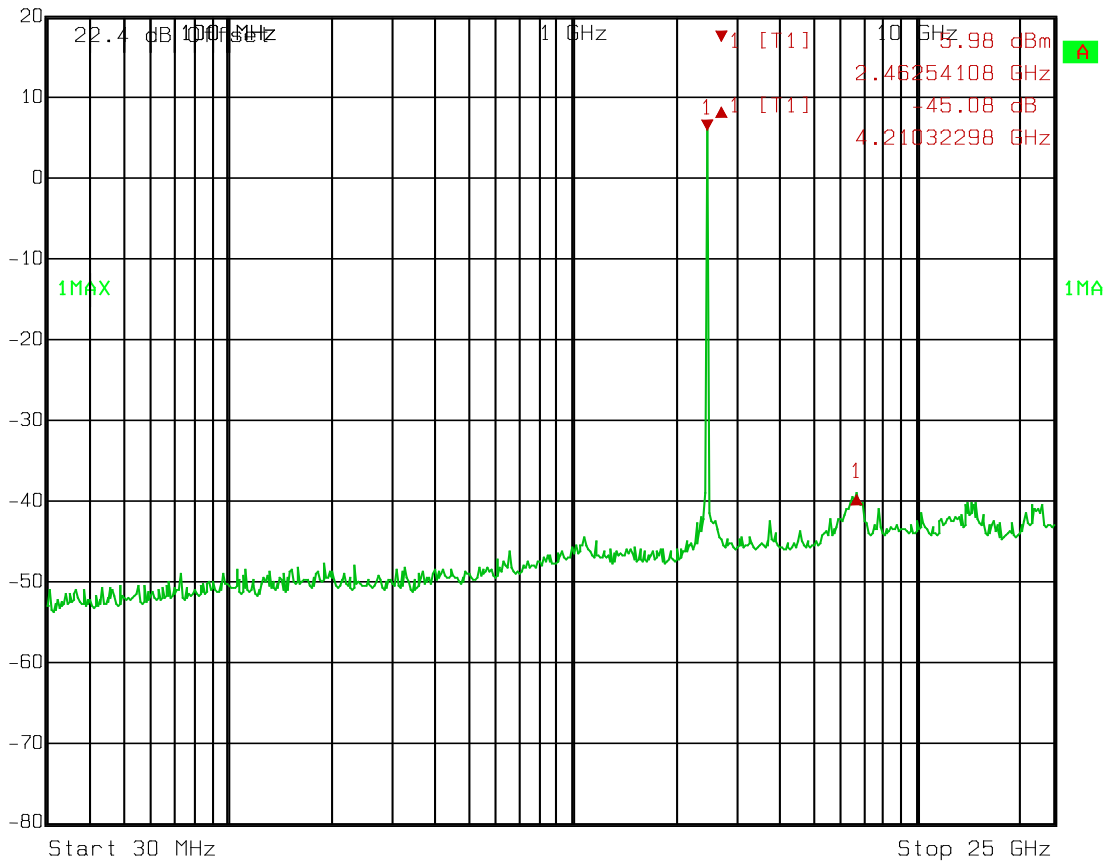


Date: 16.JAN.2014 09:51:00

**Test Data – Spurious Emissions at Antenna Terminals**

Spurious Emissions  
Upper Channel  
802.11b  
1 Mbps

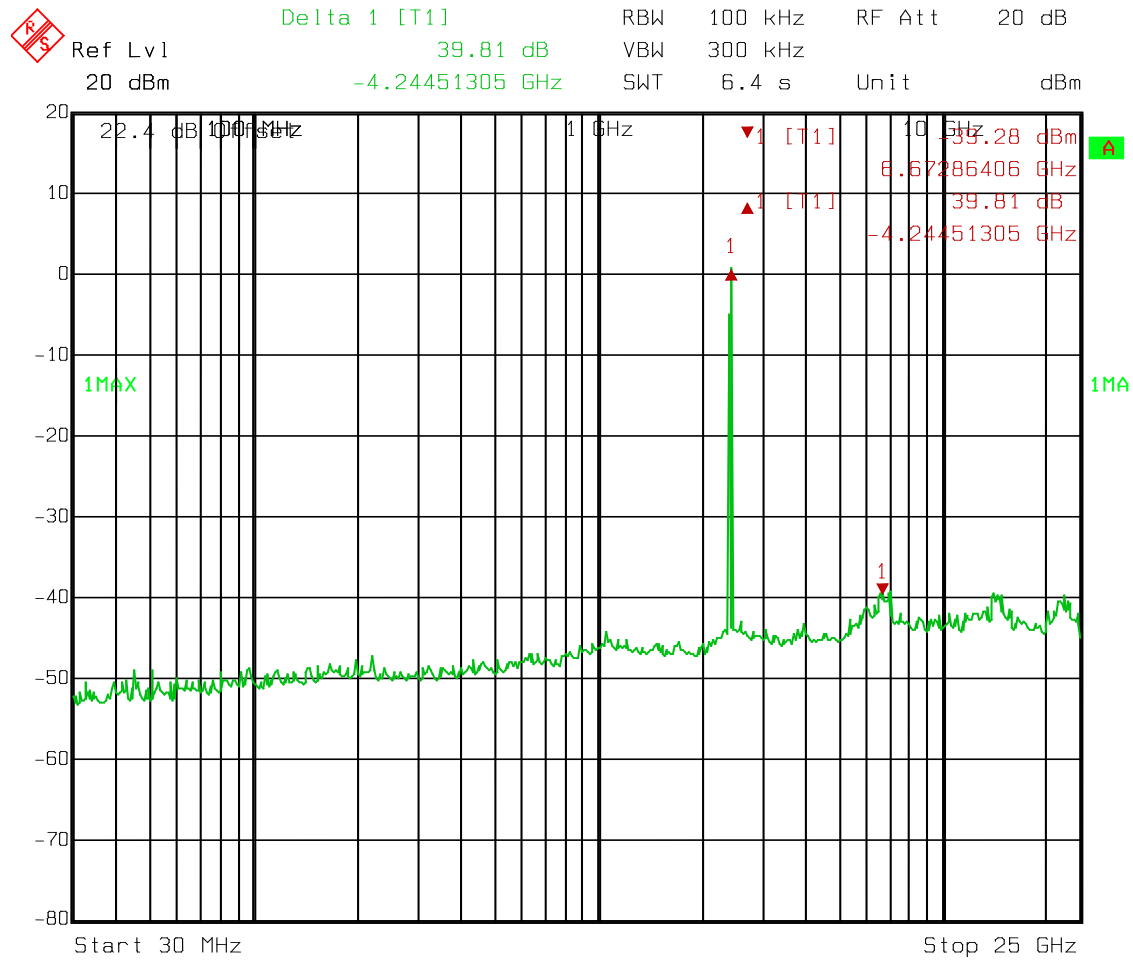
	Delta 1 [T1]	RBW	100 kHz	RF Att	20 dB
	Ref Lvl	-45.08 dB	VBW	300 kHz	
	20 dBm	4.21032298 GHz	SWT	6.4 s	Unit dBm



Date: 16.JAN.2014 09:56:42

Test Data – Spurious Emissions at Antenna Terminals

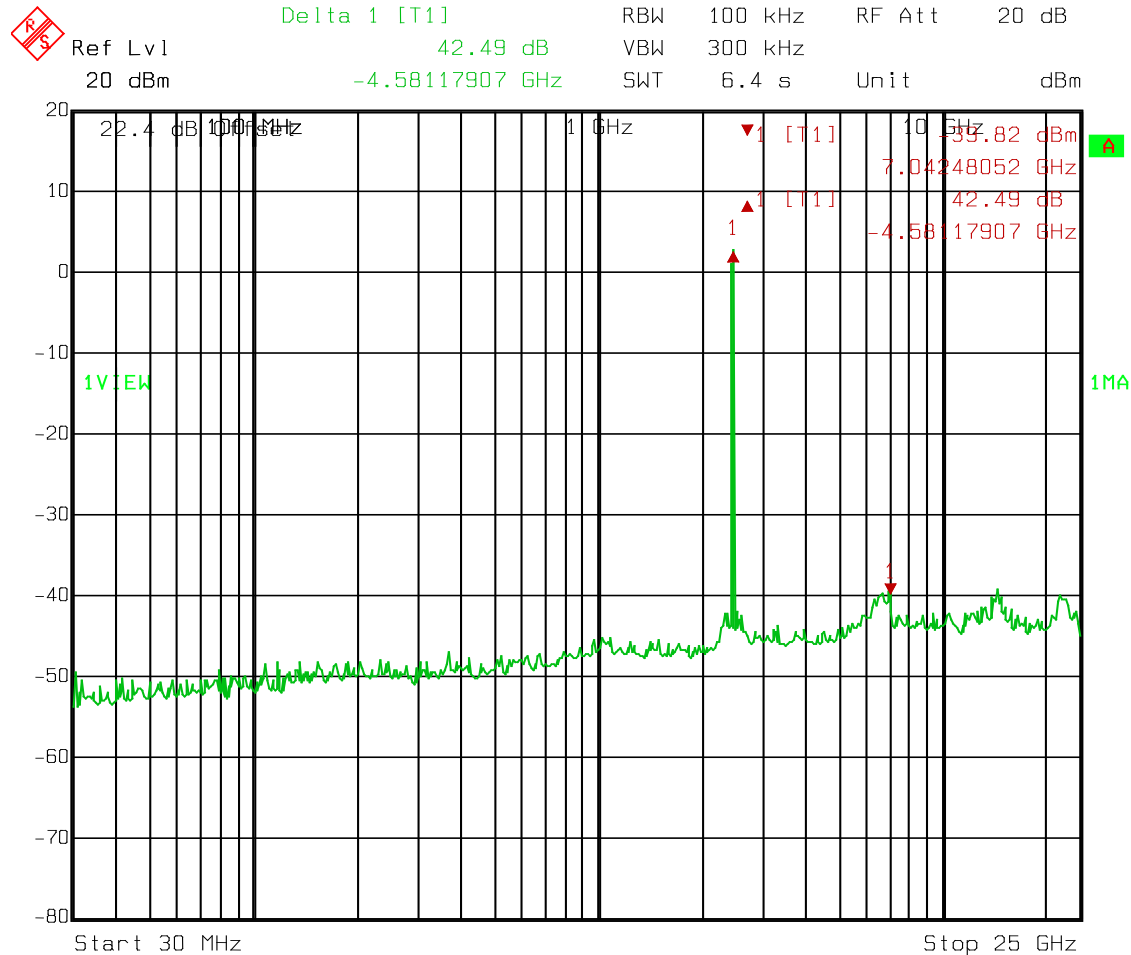
Spurious Emission  
Low Channel  
802.11g  
6 Mbps



Date: 16.JAN.2014 10:15:10

**Test Data – Spurious Emissions at Antenna Terminals**

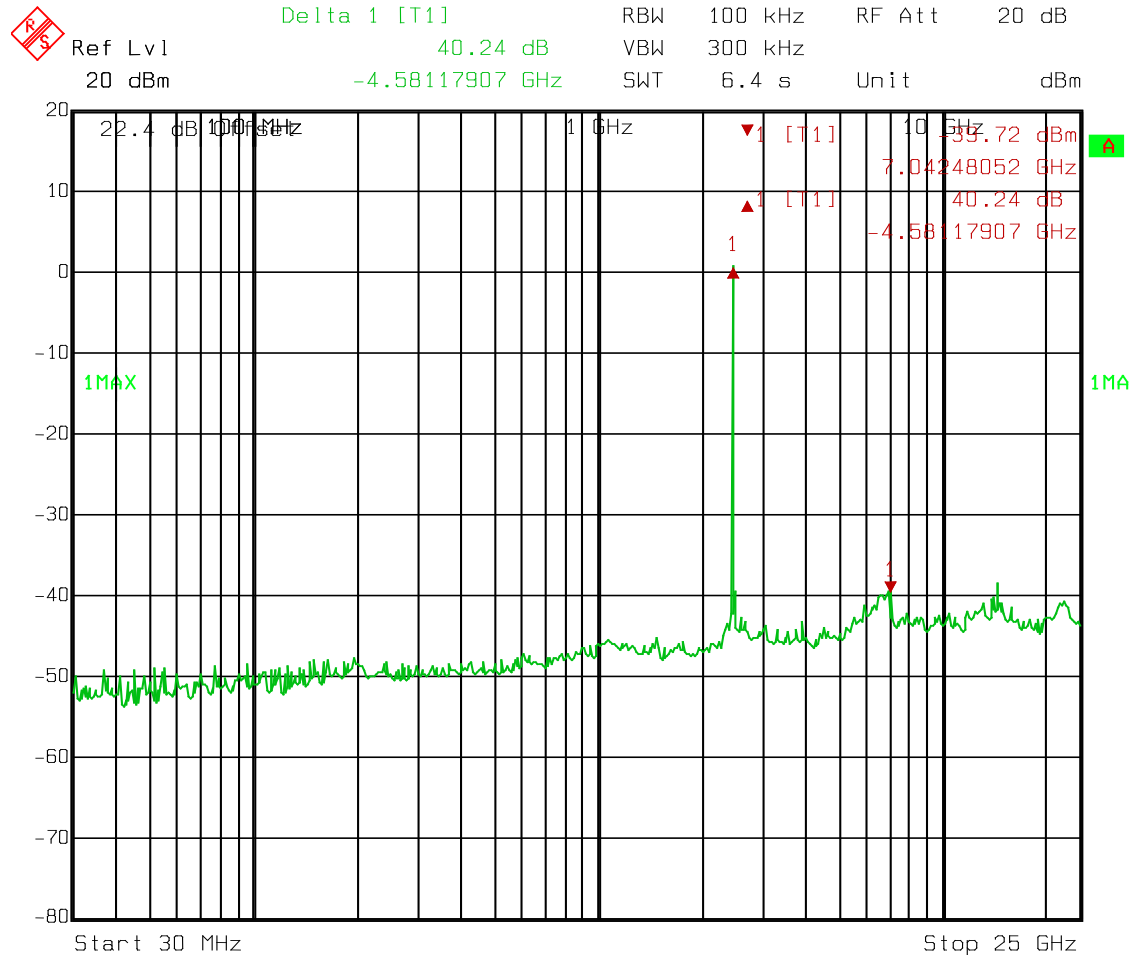
Spurious Emissions  
 Mid Channel  
 802.11g  
 6 Mbps



Date: 16.JAN.2014 10:17:20

Test Data – Spurious Emissions at Antenna Terminals

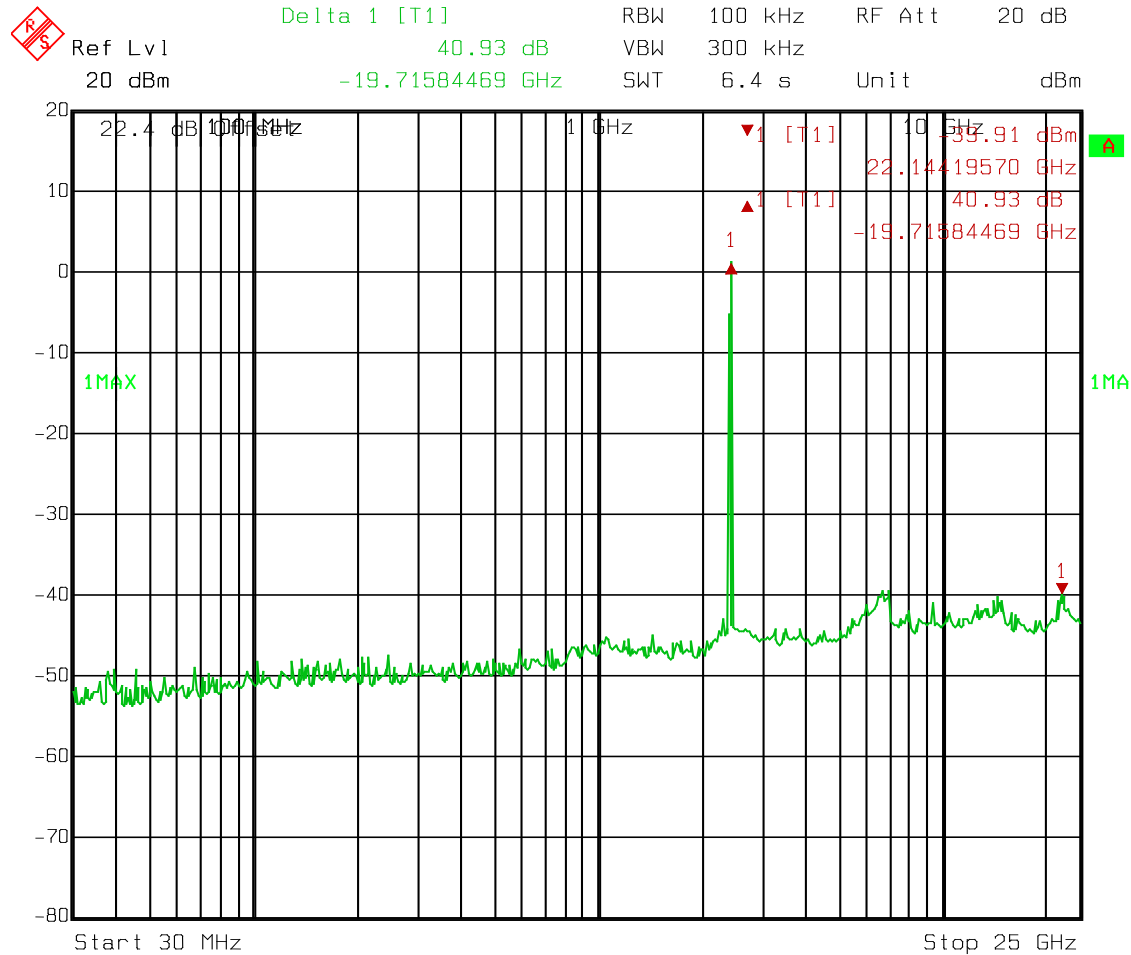
Spurious Emissions  
Upper Channel  
802.11g  
6 Mbps



Date: 16.JAN.2014 10:25:32

Test Data – Spurious Emissions at Antenna Terminals

Spurious Emission  
Low Channel  
802.11n  
MCS0

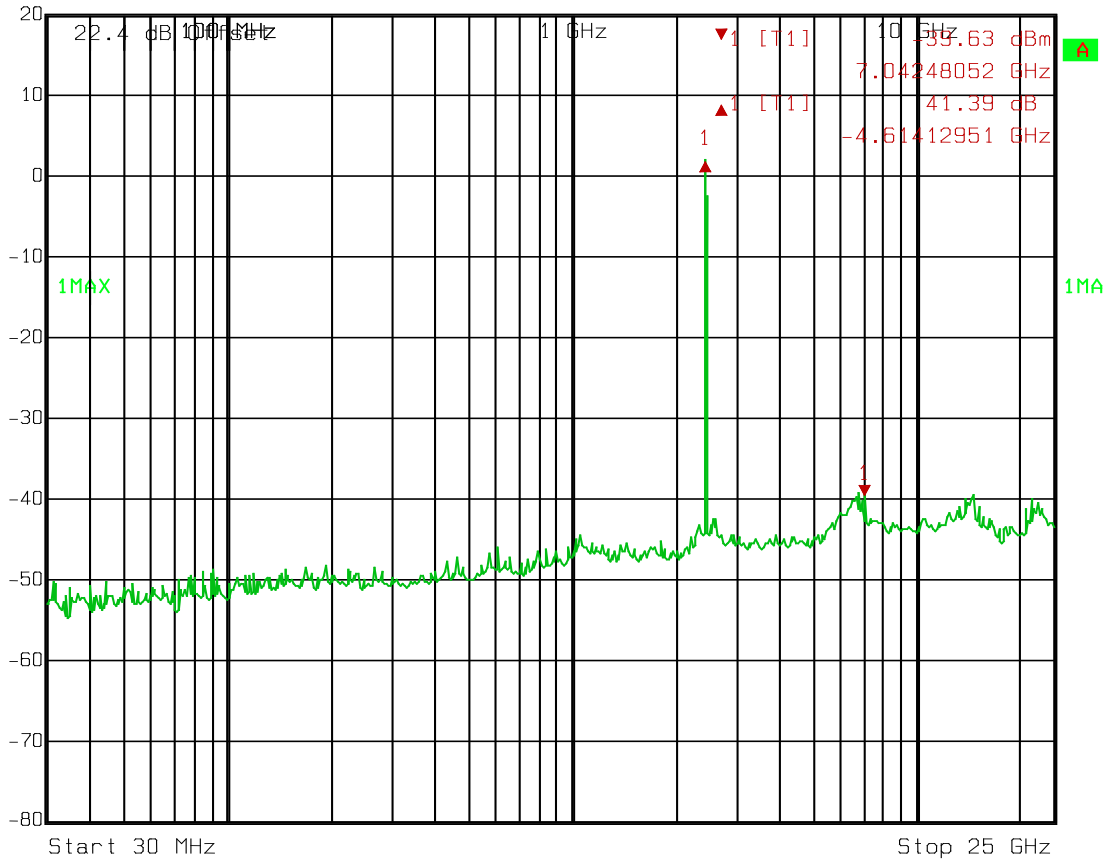


Date: 16.JAN.2014 10:40:38

Test Data – Spurious Emissions at Antenna Terminals

Spurious Emissions  
Mid Channel  
802.11n  
MCS0

 Delta 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 41.39 dB VBW 300 kHz  
20 dBm -4.61412951 GHz SWT 6.4 s Unit dBm

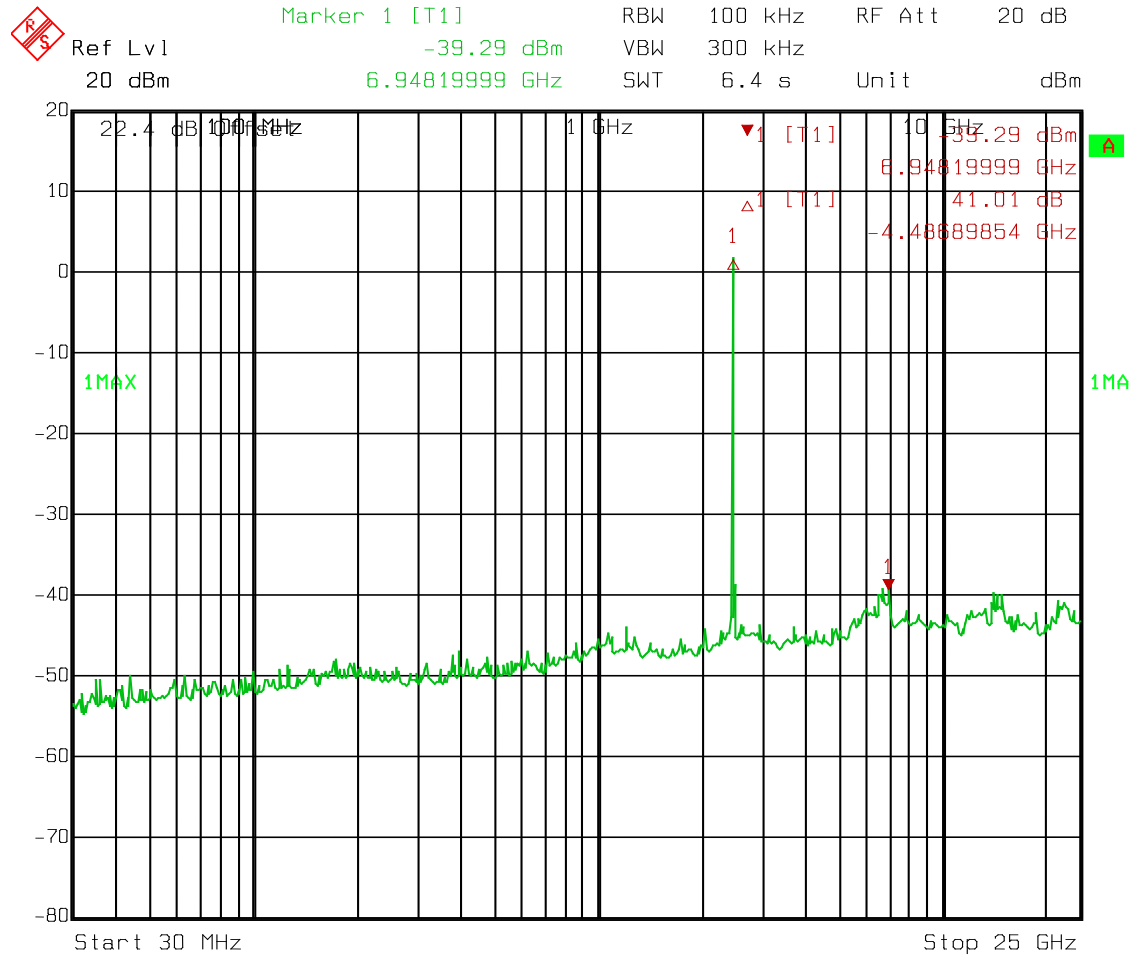


Date: 16.JAN.2014 10:45:20



Test Data – Spurious Emissions at Antenna Terminals

Spurious Emissions  
Upper Channel  
802.11n  
MCS0



Date: 16.JAN.2014 10:46:43

**Section 6. Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: FCC 15.209(a) RSS-Gen 7.2.2
TESTED BY:	DATE: 16 January 2014

**Test Results:** Complies.

**Measurement Data:** See attached table.

**Test Conditions:** 29 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1036-1763-529-901-1016-1766

Notes:

- For handheld devices, the EUT was tested on three orthogonal axis'
- The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33
- The device was tested on three channels per 15.31(l).
- No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o). Band edge data is presented below.

RBW (MHz)	VBW (MHz)	Freq. Range (MHz)	Detector Function	Measurement Peak/Avg)
0.100	0.300	<1000	Peak	Peak/Avg)
1.0	3.0	>1000	Peak	Peak
1.0	10.0	>1000	RMS	Avg

**Radiated Emissions**

CC3200-LAUNCHXL

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											802.11b
2483.5	H	0.0	47.9	28.6	8.8	31.8	53.5	74.0	-20.5	Pass	Ch 11
2483.5	H	0.0	44.8	28.6	8.8	31.8	50.4	54.0	-3.6	Pass	
2483.5	V	0.0	46.8	28.6	8.8	31.8	52.4	74.0	-21.6	Pass	
2483.5	V	0.0	39.1	28.6	8.8	31.8	44.7	54.0	-9.3	Pass	
											802.11g
2483.5	H	0.0	57.5	28.6	8.8	31.8	63.1	74.0	-10.9	Pass	Ch 11
2483.5	H	0.0	46.3	28.6	8.8	31.8	51.9	54.0	-2.1	Pass	
2483.5	V	0.0	50.2	28.6	8.8	31.8	55.8	74.0	-18.2	Pass	
2483.5	V	0.0	41	28.6	8.8	31.8	46.6	54.0	-7.4	Pass	
											802.11n
2483.5	H	0.0	53.4	28.6	8.8	31.8	59.0	74.0	-15.0	Pass	Ch 11
2483.5	H	0.0	43	28.6	8.8	31.8	48.6	54.0	-5.4	Pass	
2483.5	V	0.0	53	28.6	8.8	31.8	58.6	74.0	-15.4	Pass	
2483.5	V	0.0	42	28.6	8.8	31.8	47.6	54.0	-6.4	Pass	

**Section 7. Peak Power Spectral Density**

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(e)
TESTED BY: David Light	DATE: 16 January 2014

**Test Results:** Complies.

**Measurement Data:** See attached data..

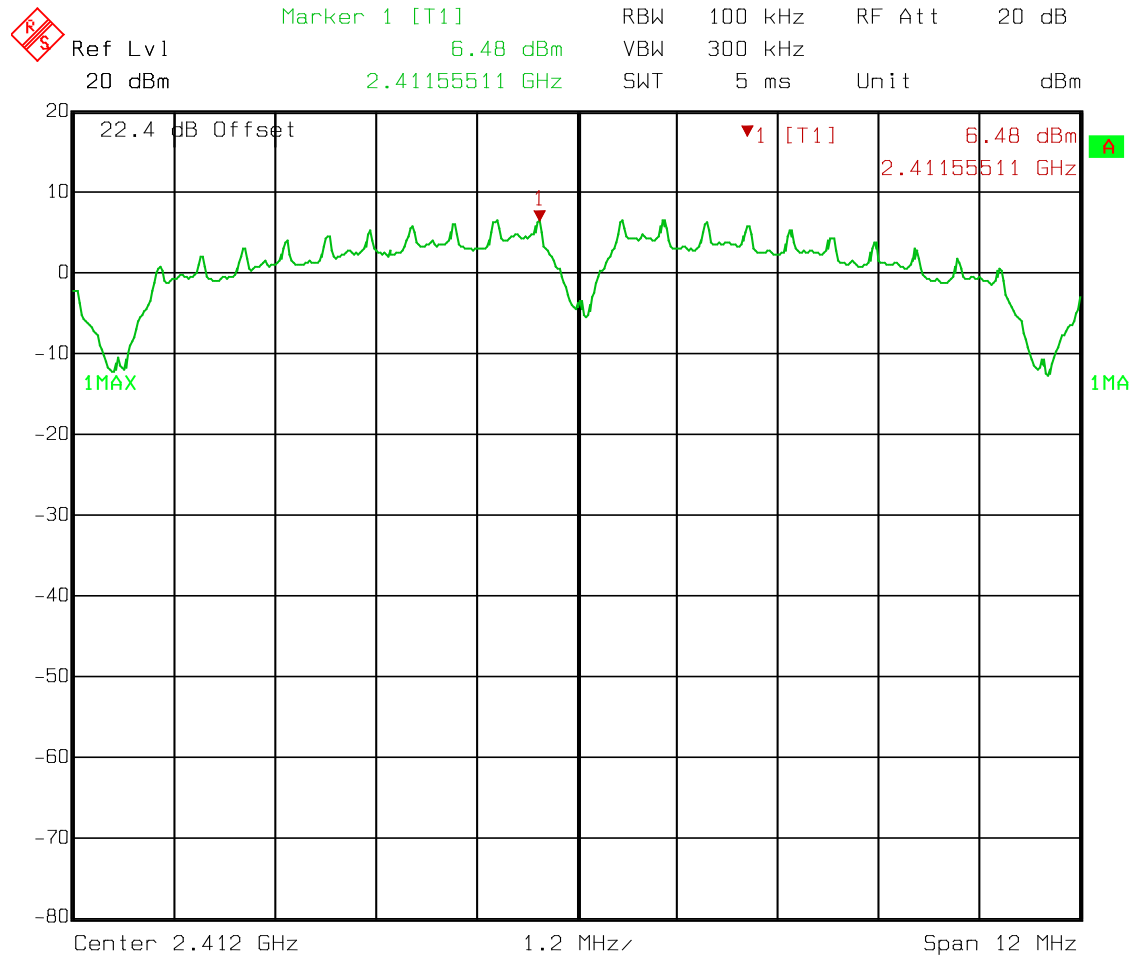
**Test Conditions:** 29 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1036-1082-1472

### Peak Power Spectral Density

Low Channel  
Density  
802.11b  
1 Mbps

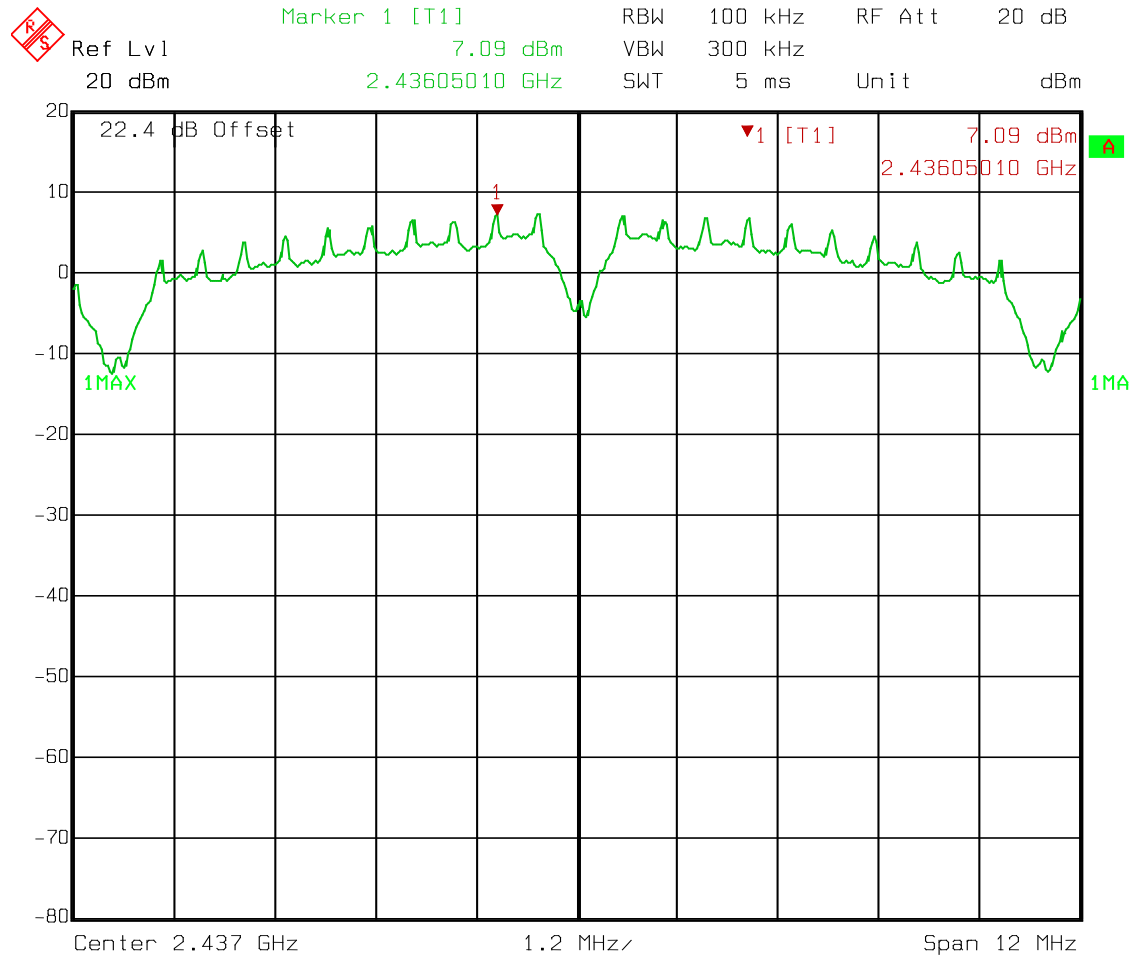


Date: 16.JAN.2014 09:37:50

Spectral Density = 6.48 dBm - 15.2 dB = -8.72 dBm

### Peak Power Spectral Density

Density  
Mid Channel  
802.11b  
1 Mbps

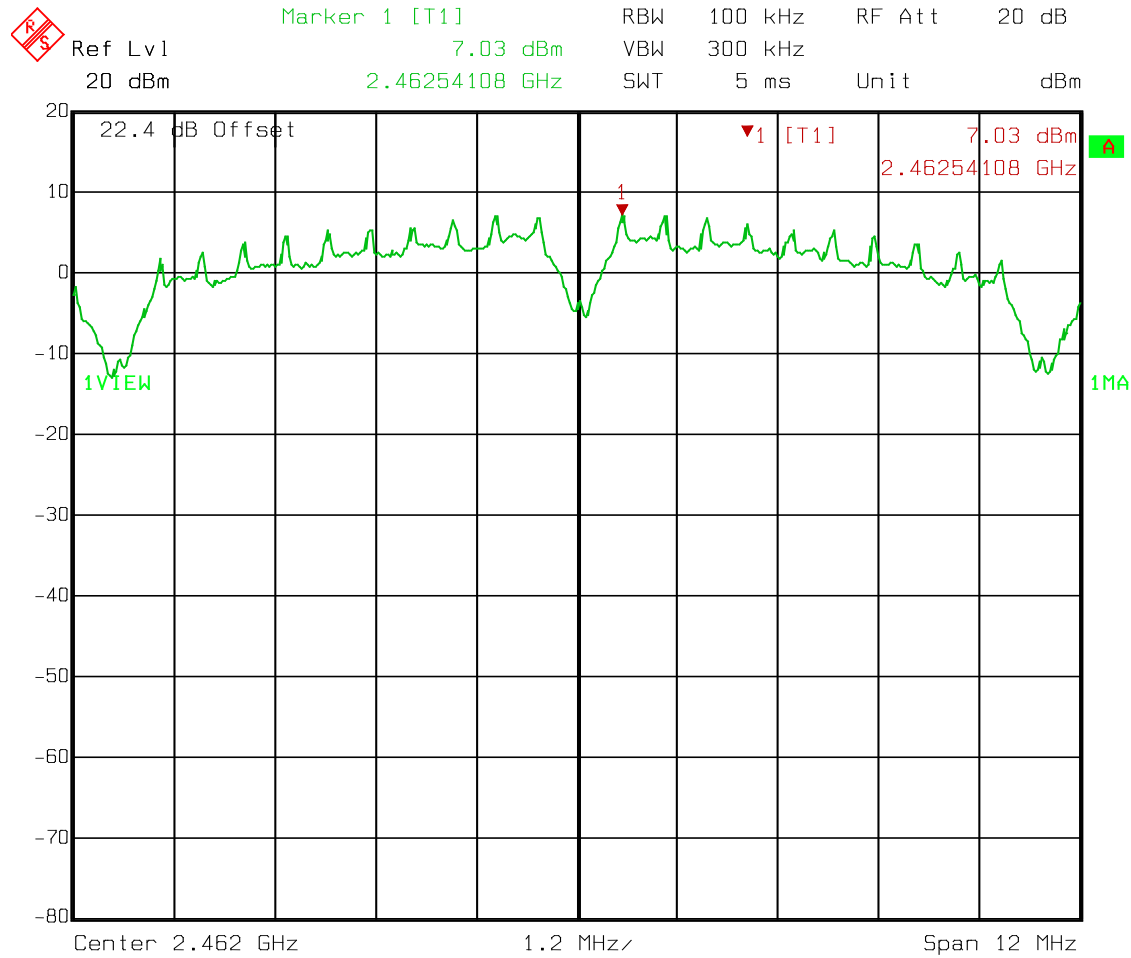


Date: 16.JAN.2014 09:48:19

Spectral Density = 7.09 dBm - 15.2 dB = -8.11 dBm

### Peak Power Spectral Density

Density  
Upper Channel  
802.11b  
1 Mbps

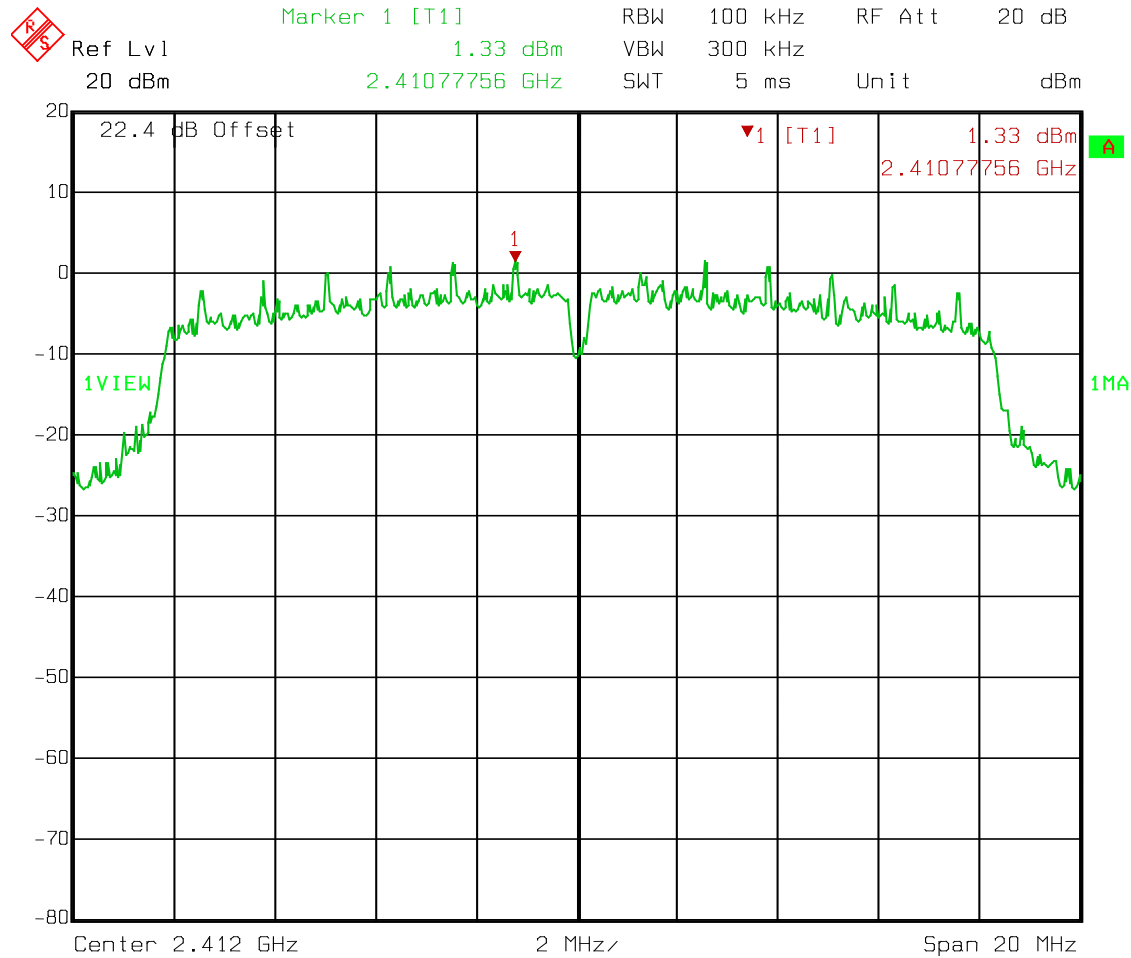


Date: 16.JAN.2014 09:55:32

Spectral Density = 7.03 dBm - 15.2 dB = -8.17 dBm

### Peak Power Spectral Density

Low Channel  
Density  
802.11g  
6 Mbps



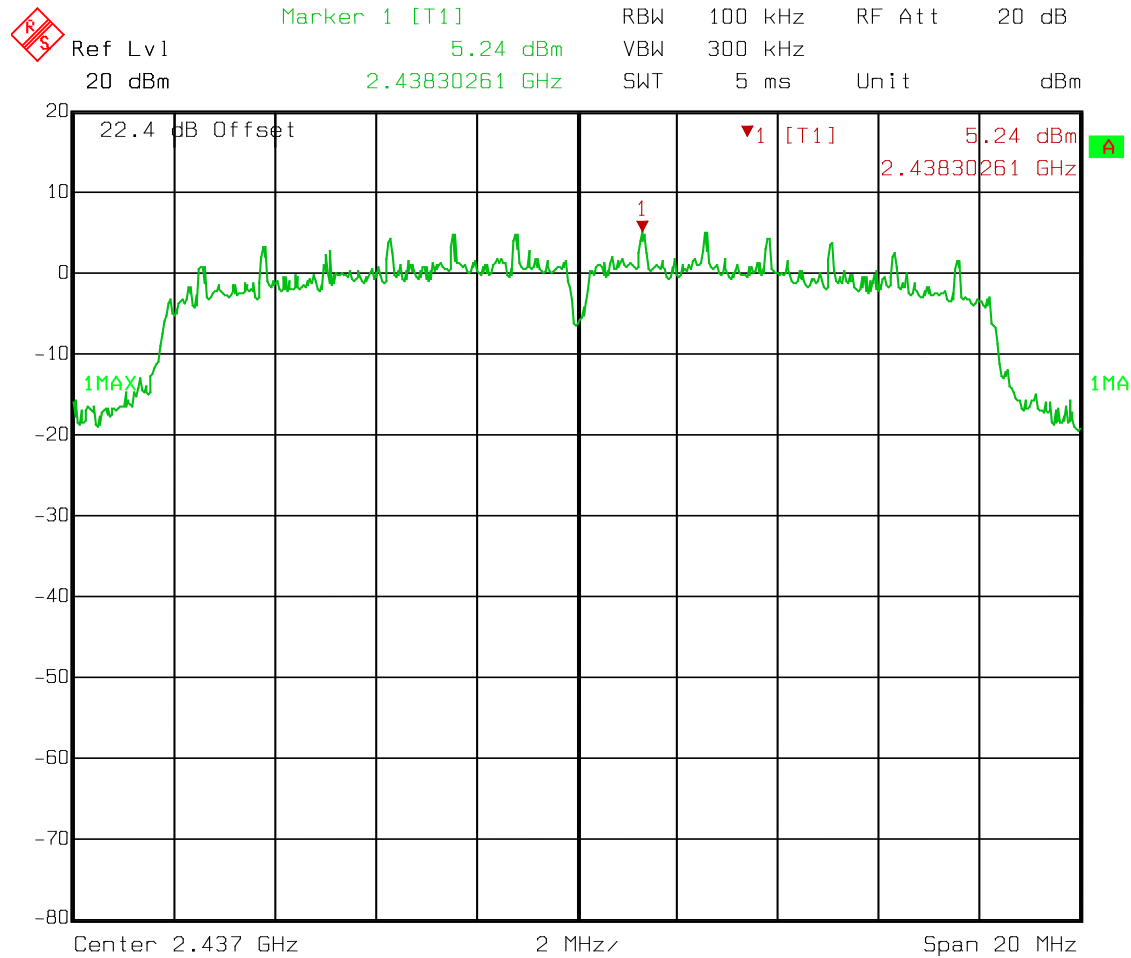
Date: 16.JAN.2014 10:12:48

Spectral Density = 1.33 dBm - 15.2 dB = -13.87 dBm



### Peak Power Spectral Density

Density  
Mid Channel  
802.11g  
6 Mbps

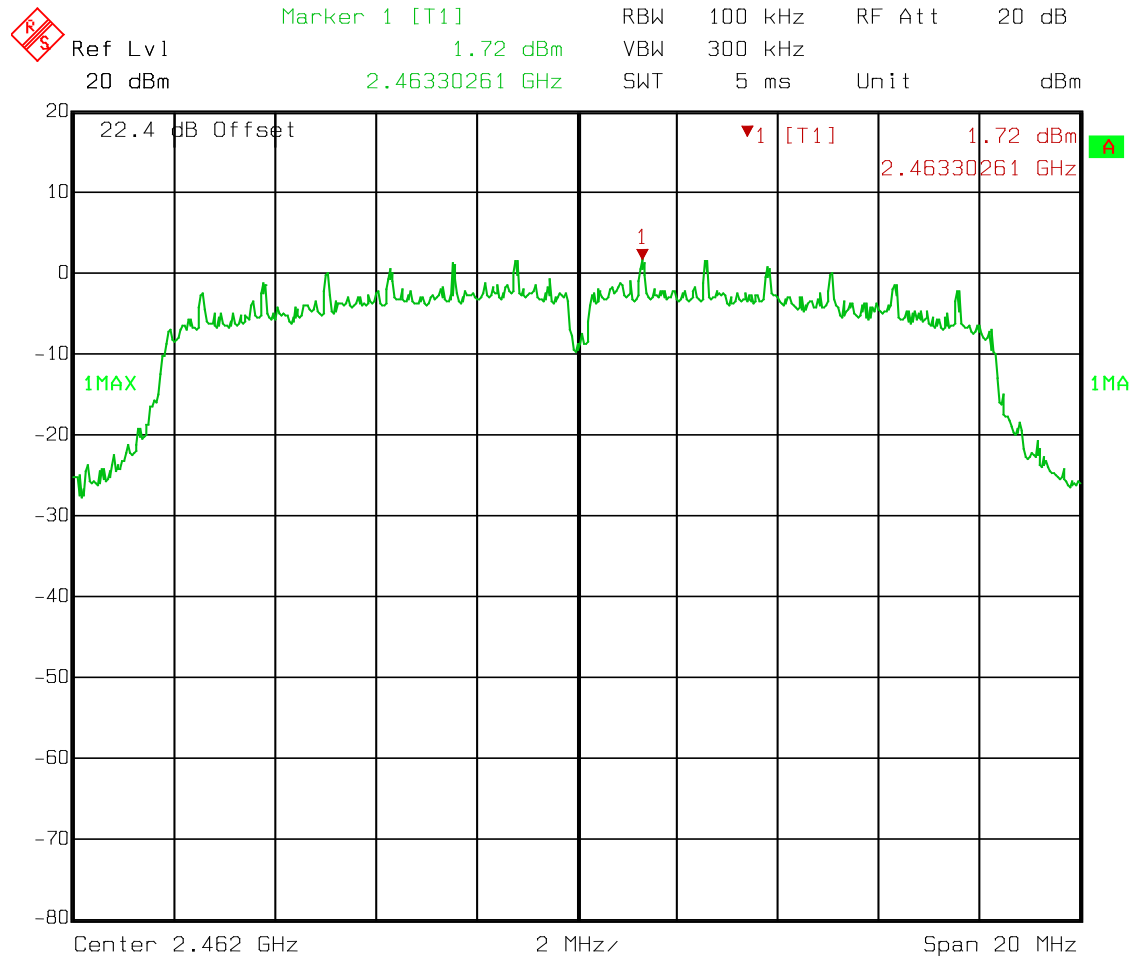


Date: 16.JAN.2014 10:20:12

Spectral Density = 5.24 dBm - 15.2 dB = -9.96 dBm

### Peak Power Spectral Density

Density  
Upper Channel  
802.11g  
6 Mbps

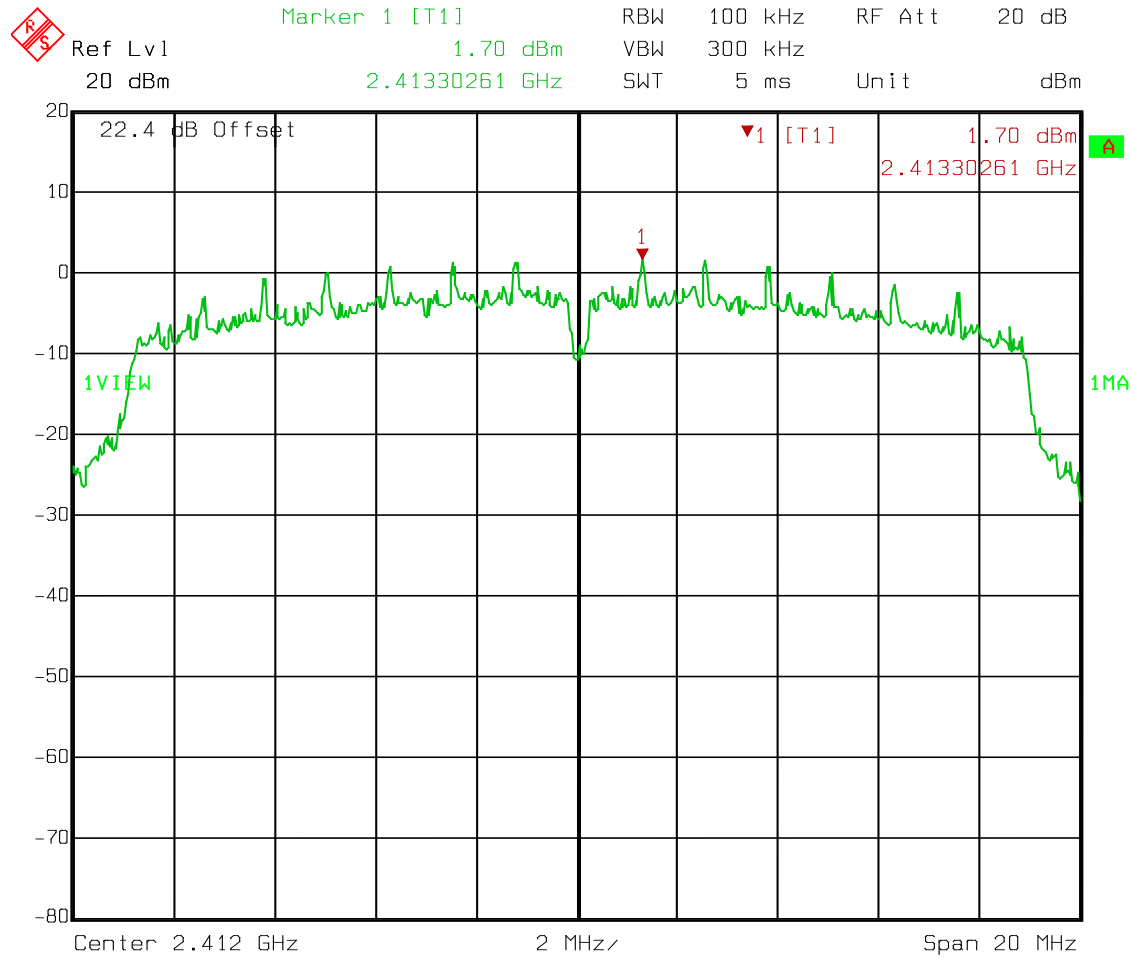


Date: 16.JAN.2014 10:24:40

Spectral Density = 1.72 dBm - 15.2 dB = -13.48 dBm

**Peak Power Spectral Density**

Low Channel  
Density  
802.11n  
MCS0

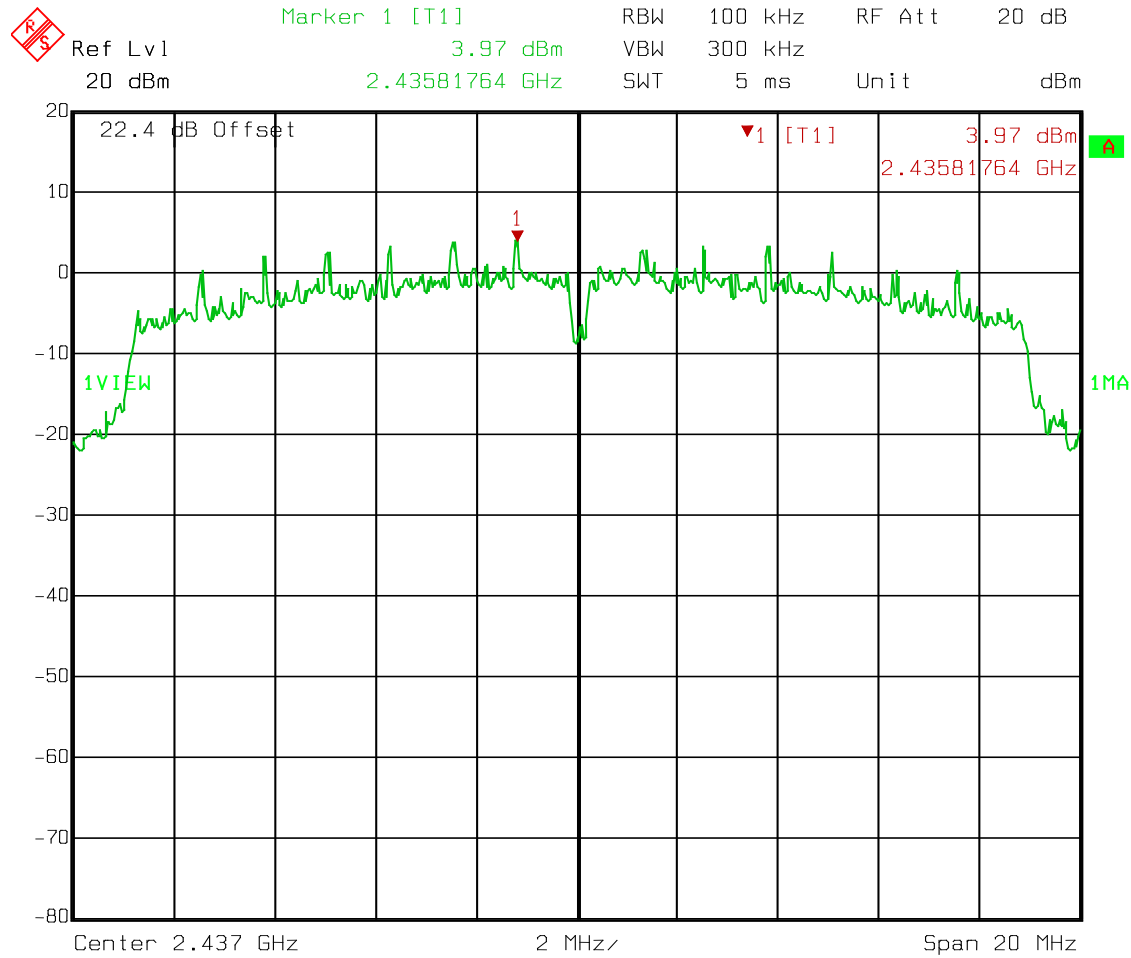


Date: 16.JAN.2014 10:39:09

Spectral Density = 1.70 dBm - 15.2 dB = -13.50 dBm

### Peak Power Spectral Density

Density  
Mid Channel  
802.11n  
MCS0

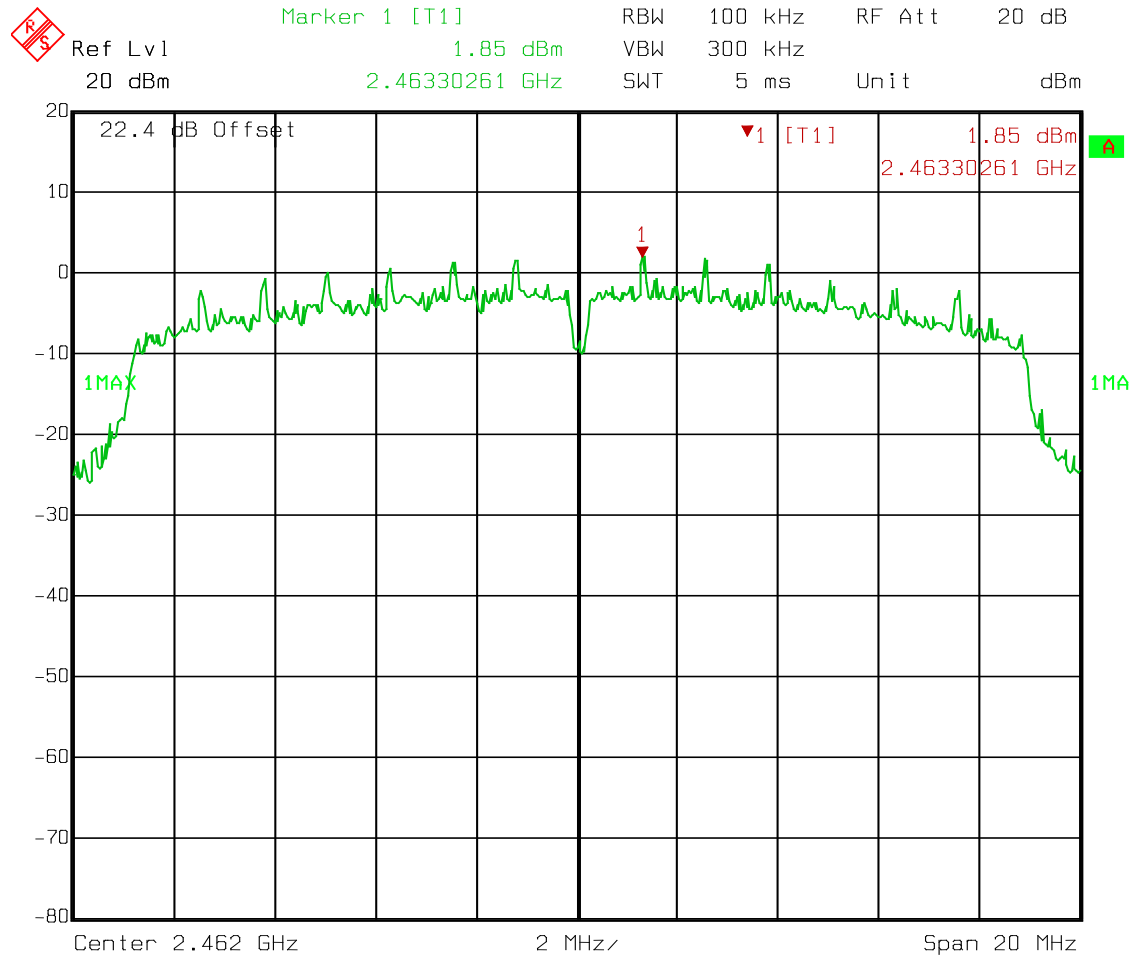


Date: 16.JAN.2014 10:44:40

Spectral Density = 3.97 dBm - 15.2 dB = -11.23 dBm

### Peak Power Spectral Density

Density  
Upper Channel  
802.11n  
MCS0



Date: 16.JAN.2014 10:47:11

Spectral Density = 1.85 dBm - 15.2 dB = -13.35 dBm

**Section 8. Powerline Conducted Emissions**

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: FCC 15.207(a) RSS-Gen 7.2.4
TESTED BY: Mark Phillips	DATE: 05 February 2014

**Test Results:** Complies.

**Measurement Data:** See attached data..

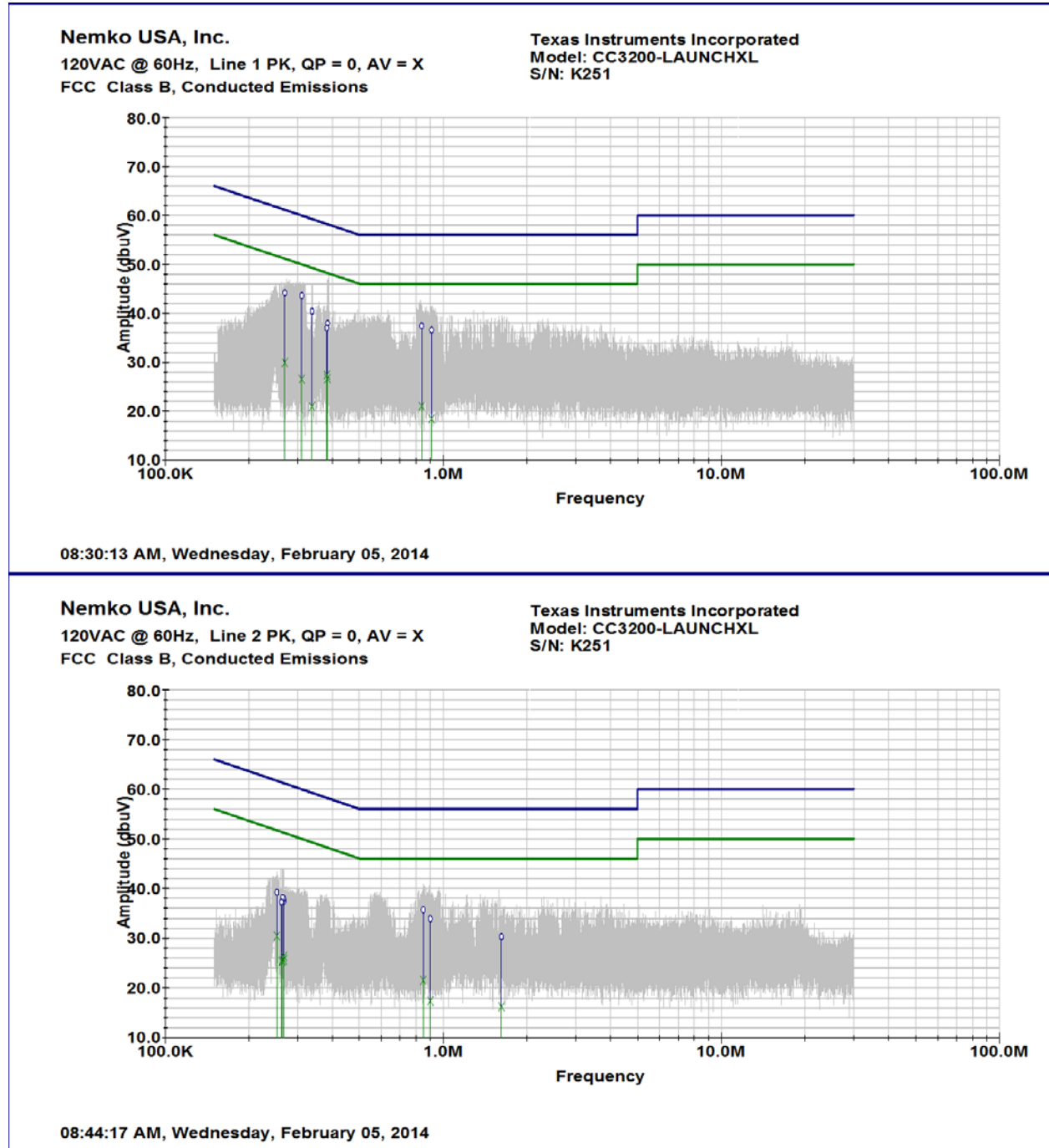
**Test Conditions:** 29 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** E1029-E1026

Test Data – Powerline Conducted Emissions

CC3200-LAUNCHXL



**Test Data – Powerline Conducted Emissions**

CC3200-LAUNCHXL

Frequency	QP	Average	QP	Average	QP	Average	
	Corrected	Corrected	Limit	Limit	Margin	Margin	
kHz	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	Line
269.3	44.3	29.9	62.6	51.1	18.3	21.2	1
309.7	43.7	26.5	61.4	50.0	17.7	23.5	1
337.0	40.5	20.9	60.7	49.3	20.2	28.4	1
381.0	37.0	27.4	59.4	48.3	22.4	20.9	1
383.1	38.0	26.6	59.3	48.2	21.3	21.6	1
836.1	37.5	21.0	56.0	46.0	18.5	25.0	1
907.6	36.6	18.4	56.0	46.0	19.4	27.6	1
252.3	39.3	30.4	63.1	51.7	23.8	21.3	2
261.9	37.3	25.4	62.8	51.4	25.5	26.0	2
264.5	38.2	25.4	62.7	51.3	24.5	25.9	2
267.1	38.0	25.7	62.7	51.2	24.7	25.5	2
267.4	37.5	26.3	62.6	51.2	25.1	24.9	2
846.7	35.8	21.5	56.0	46.0	20.2	24.5	2
898.0	34.0	17.4	56.0	46.0	22.0	28.6	2
1618.0	30.3	16.2	56.0	46.0	25.7	29.8	2



**Section 9. Test Equipment List**

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
529	Antenna, DRWG	EMCO	3115	2505	31-Oct-2012	31-Oct-2014
901	Preamplifier	Sonoma	310 N	130607	21-Nov-2013	21-Nov-2014
E1019	Two Line V- Network	Rohde & Schwarz	ENV216	101045	13-Apr-2013	13-Apr-2014
E1026	EMI Test Receiver 9kHz to 7GHz	Rohde & Schwarz	ESCI 7	100800	15-Jul-2013	15-Jul-2014
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	20-Aug-2013	20-Aug-2014
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	15-Jul-2013	15-Jul-2015
1472	Attenuator, 20dB, DC 18 Ghz	Omni Spectra	20600-20db		31-Dec-1969	
1763	Antenna, Bilog	Schaffner	CBL 6111D	22926	07-Mar-2013	07-Mar-2014
1082	Cable	Astrolab	32027-2- 29024-72TC	None	Verify before use	NA
1766	Filter	Microlab	BRM50702	041	Verify before use	NA

## **ANNEX A - TEST DETAILS**

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a) / 7.2.4
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**Minimum Standard:** Conducted limits.

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Conducted Emission (MHz)	Limit (dBmV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

NAME OF TEST: Maximum Peak Output Power	PARA. NO.: 15.247(b)(3) / A8.4(4)
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**Minimum Standard:** The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

## Measurement Method

### 5.2.1 Maximum Peak Conducted Output Power Level

§15.247(b)(3) specifies that the maximum peak conducted output power for DTS transmitters in any of the three authorized frequency bands is 1 watt (30 dBm). The following procedures can be used to determine the maximum peak conducted output power from a DTS EUT using a spectrum analyzer.

#### 5.2.1.1 Measurement Procedure PK1:

1. This procedure requires availability of a spectrum analyzer resolution bandwidth that is  $\geq$  EBW.
2. Set the RBW  $\geq$  EBW.
3. Set VBW  $\geq$  3 x RBW.
4. Set span = zero.
5. Sweep time = auto couple.
6. Detector = peak.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use peak marker function to determine the peak amplitude level within the fundamental emission.

**5.2.1.2 Measurement Procedure PK2:**

1. This procedure provides an integrated measurement alternative when the maximum available RBW < EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Set the span to a value that is 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at 1 MHz intervals extending across the EBW of the spectrum.

**5.2.2 Maximum Conducted (Average) Output Power Level**

**§15.247(b)(3)** permits the maximum conducted output power to be measured as an alternative to a peak power measurement to demonstrate compliance to the one watt (30 dBm) output power limit. The maximum conducted output power is the highest total transmit power occurring in any mode when averaged over the EUT EBW. This measurement requires that the EUT be configured to transmit continuously (at a minimum duty cycle of 98%) at full power over the measurement duration. Time intervals during which the transmitter is off or transmitting at reduced power levels shall not be included.

The spectrum analyzer must be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW in order to ensure bin-to-bin spacing of  $\leq$  RBW/2 so that narrowband signals are not lost between frequency bins (the use of a greater number of measurement points than the minimum requirement is recommended).

The following procedures are acceptable for determining the maximum conducted output power with a spectrum analyzer.

**5.2.2.1 Measurement Procedure AVG1** (power averaging over the EBW with slow sweep speed):

1. Set the analyzer span to 5-30% greater than the EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW  $\geq$  3 MHz.
4. Detector = power average (RMS).
5. Ensure that the number of measurement points in the sweep  $\geq$  2 x (span/RBW).
6. Manually set the sweep time to:  $\geq$ 10 x (number of measurement points in sweep) x (transmission symbol period).
7. Perform the measurement over a single sweep.
8. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges to determine the maximum conducted output power of the EUT over the EBW.

Note: If the analyzer does not have a band power function, sum the spectral levels (in linear power units) at 1 MHz intervals extending across the entire EBW.

**5.2.2.2 Measurement Procedure AVG2** (trace averaging over the EBW):

1. Set the analyzer span to 5-30% greater than the EBW.
2. Set the RBW = 1 MHz.
3. Set the VBW  $\geq$  3 MHz.
4. Ensure that the number of measurement points in the sweep  $\geq$  2 x (span/RBW).
5. Sweep time = auto couple.
6. Detector = power averaging (RMS) or sample.
7. Employ trace averaging in power averaging (RMS) mode over a minimum of 100 traces.
8. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges to determine the maximum conducted output power of the EUT over the EBW. If the analyzer does not have a band power function, sum the spectral levels (in linear power units) at 1 MHz intervals extending across the entire EBW.

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2) / A8.2(a)
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**Minimum Standard:** Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

**Method Of Measurement:**

**5.1.1 EBW Measurement Procedure:**

1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).
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. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.

**5.1.2 Alternate EBW Measurement Procedure:**

The automatic bandwidth measurement capability of a spectrum analyzer may be employed if it implements the functionality described above (e.g., RBW = 1-5% of EBW, VBW  $\geq 3 \times$  RBW, peak detector with maximum hold). When using this capability, care should be taken to ensure that the bandwidth measurement is not influenced by any nulls in the fundamental emission.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Spurious Emissions(conducted)	PARA. NO.: 15.247(d)/A8.5
---	---------------------------

**Minimum Standard:** In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

**5.4.1.1 Measurement Procedure – Reference Level**

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Set the span to 5-30 % greater than the EBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW. Next, determine the power in 100 kHz band segments outside of the authorized frequency band using the following measurement:

**5.4.1.2 Measurement Procedure - Unwanted Emissions**

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified above.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom



NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.209/7.2.2
---	-------------------------

**Minimum Standard:** In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

**Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:**

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

**THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC**

**15.205 Restricted Bands**

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)/A8.2(b)
---	------------------------------

**Minimum Standard:** The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

**Method of Measurement:**

**5.3.1 Measurement Procedure PKPSD:**

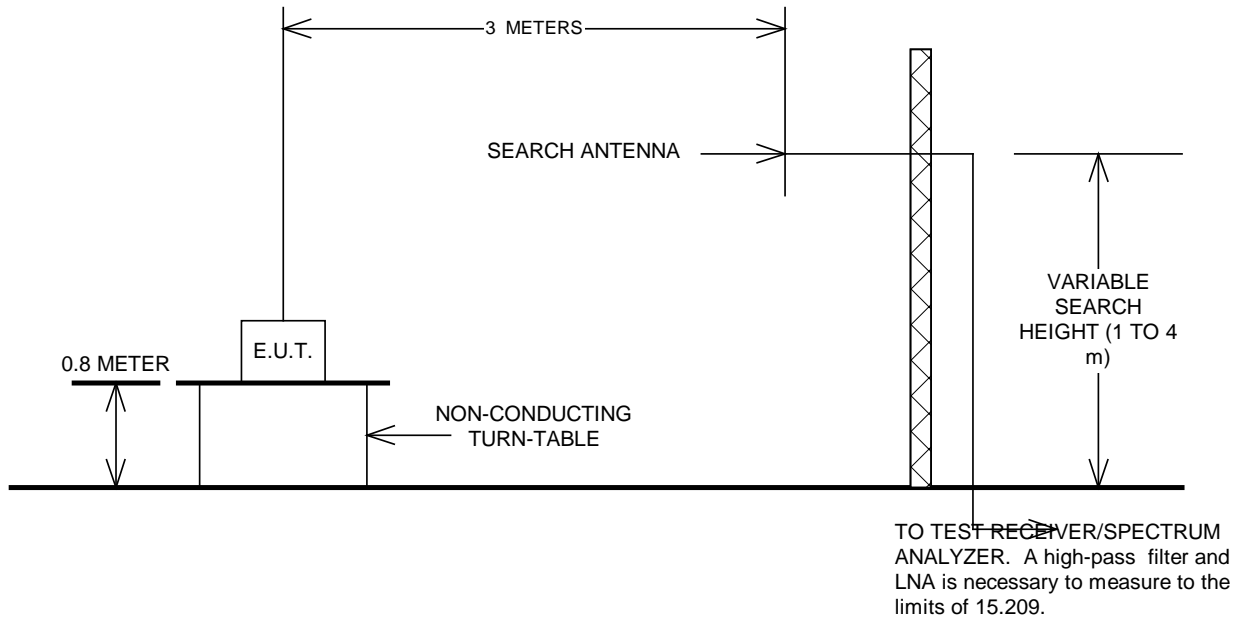
1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW  $\geq$  300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where  $BWCF = 10\log(3\text{ kHz}/100\text{ kHz} = -15.2\text{ dB})$ .
11. The resulting peak PSD level must be  $\leq$  8 dBm.

**5.3.2 Measurement Procedure AVGPSD:**

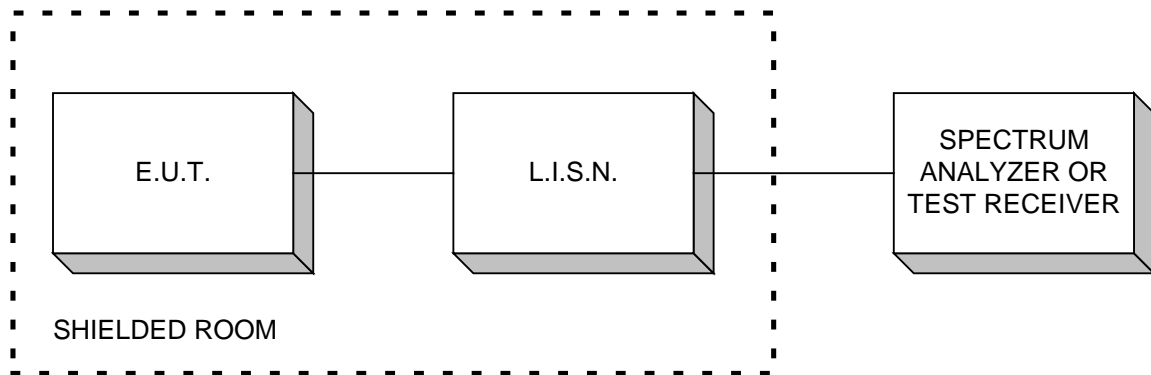
1. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
2. Set the analyzer span to 5-30% greater than the EBW.
3. Set the RBW = 100 kHz.
4. Set the VBW  $\geq$  300 kHz.
5. Detector = power average (RMS).
6. Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$  (use of a greater number of measurement points than this minimum requirement is recommended).
7. Manually set the sweep time to:  $\geq 10 \times$  (number of measurement points in sweep)  $\times$  (transmission symbol period).
8. Perform the measurement over a single sweep.
9. Use the peak marker function to determine the maximum level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent level in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where  $BWCF = 10\log(3\text{ kHz}/100\text{ kHz} = -15.2\text{ dB})$ .
11. The resulting PSD level must be  $\leq$  8 dBm

## **ANNEX B - TEST DIAGRAMS**

**Test Site For Radiated Emissions**



**Conducted Emissions**



**Peak Power at Antenna Terminals**  
**Minimum 6 dB Bandwidth**  
**Peak Power Spectral Density**  
**Spurious Emissions (conducted)**

