TRANZEO
EMC LABS INC

EMC Test Report

FCCID: QRF-24QGFKT3

2.4 GHz Wireless Network Adapter
Tranzeo Wireless Technologies Inc.

Testing body:	Tranzeo EMC Labs Inc. 19473 Fraser Way, Pitt Meadows, BC, Canada V3Y 2V4
Client:	Tranzeo Wireless Technologies Inc. 19473 Fraser Way, Pitt Meadows, BC, Canada V3Y 2V4

The test results indicated in this report refer exclusively to the equipment under test specified below. It is not permitted to transfer the results to other systems or configurations.

Order number: 75

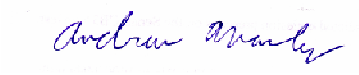
Type of test: Testing of electromagnetic disturbances characteristics

Date the EUT was received: March 10th, 2009

Date of test: March 11th, 2009 to March 17th, 2009

Report No.: 031709.1

Pitt Meadows, 17 March, 2009



EMC Manager: Andrew Marles EMC Engineer: Andrei Moldavanov

Revision History

1. Conducted output power testing for 20 MHz bandwidth b-mode was redone to meet the FCC requirement on maximum difference in results applied for Class 2 change.
2. Conducted output power testing for 5 and 10 MHz bandwidth in b-mode was redone to meet the FCC requirement on maximum difference in results applied for Class 2 change.

Table of Contents

1.0 General Information

1.1 EUT Description

Product Name	Wireless Network Adapter
Company Name	Tranzeo Wireless Technologies Inc.
FCC ID	QRF-24QGFKT3
Model No.	TR-CPQ-19W
Standard	802.11b/g
Radio Card	XG623
Board	IP3K
Bandwidth	5, 10, and 20 MHz
Frequency Range	2400-2483.5 MHz
Radio Mode	Customer Premise Equipment
Communication Method	Half-Duplex
Number of Channels	11
Transmit Rate	54 Mbps maximum bit rate specification
Type of Modulation	2.4 GHz: DSSS, OFDM
Antenna Type	Integrated
Antenna Gain	19 dBi
Product Software Revision	TR6-4.0.2CPQ
Test Software	Bandwidth test software
Operator Channel Selection	By software
Power Adapter	Model: PA1024-3DU
	Input: 100-240V ~50-60 Hz
	Output: 18V 1.1A 20W Max

Product samples tested:

Manufacturer	Model No.	Serial No.
Tranzeo Wireless	TR-CPQ-19W	XG623-ENGR1

Frequency of each channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1	2412	Channel 5	2432	Channel 9	2452
Channel 2	2417	Channel 6	2437	Channel 10	2457
Channel 3	2422	Channel 7	2442	Channel 11	2462
Channel 4	2427	Channel 8	2447		

The product TR-CPQ-19W is fitted with an integrated 2.4 GHz 19 dBi panel antenna. This device operates at 2.4 GHz.

As an IEEE 802.11b/g compliant wireless bridge, this device includes a 2.4 GHz receive function as well as a 2.4 GHz digital modulation transmit function. There are no user serviceable parts inside the unit. It is factory sealed in a one-time use manner and inaccessible to the end user.

The tests were performed on production sample models to demonstrate compliance with FCC Part 15, Subpart B, and Subpart C, as well as Industry Canada RSS-210 Issue 6 for digitally modulated devices.

1.2 Operational Description

The device is a wireless network bridge designed specifically for outdoor applications. The device provides a bridge between IEEE802.3 wired Ethernet LANs and IEEE802.11b/g compliant wireless networks. It uses an integrated antenna coupled with an 802.11b/g transceiver to connect to remote wireless clients. The transceiver operates in the frequency band 2400-2483.5 MHz. The device transmits digital network data. The unit is mounted externally in fixed point-to-point installations. It is mounted on the exterior of a building typically for broadband internet access.

The type of RF modulation is DSSS and OFDM both used at 2.4 GHz. The device can transmit data at a bit rate of 11 Mbps in DSSS mode and 54 Mbps in OFDM mode or at a real-world data rate of approximately 6.3 and 26.6 Mbps respectively. A 40/64 bits and 128 bits Wired Equivalent Protection (WEP) encryption, Media Access Control address filter (MAC), WPA and WPA2 (TKIP/AES) encryption algorithms are used for secure communications. The device's standard compliance ensures that it can communicate with any 802.11b/g network.

The firmware used with the device prevents the use of channels outside the specified frequency bands.

The product is used exclusively in a professionally installed, fixed point-to-point environment.

1.3 EUT Testing Configuration

The product TR-6019 is fitted with an integrated antenna. Data is presented for the worst case configuration.

The EUT was mounted to a custom non-metallic stand to ease polarization changes and to best represent a typical user installation. The EUT was connected to the host PC so that it could be cycled through the various test modes and channels.

The EUT was tested in the following modes:

- **Standby/Receive mode:** In this mode the EUT beacons at the lowest possible rate while searching for a client with which to establish communication.
- **Data transfer mode:** In this mode the EUT is exercised with commercially available bandwidth test software. A link is established between two PCs through the unit and an access point and data is transmitted at the highest possible rate.

- **Beaconing Mode:** In this mode the EUT is set to transmit network configuration beacons at the highest possible rate.

1.4 EUT Modifications

No modifications were necessary for this unit to comply with FCC Part 15 and Industry Canada RSS-210 Issue 7.

1.5 Test Facilities

Tranzeo EMC Labs
19473 Fraser Way
Pitt Meadows, BC V3Y 2V4
Canada

Phone: (604) 460-6002
Fax: (604) 460-6005

FCC registration number: 960532
Industry Canada Number: 5238A

1.6 Test Equipment

1.7 Test System Details

Manufacturer	Model	Description	Serial Number	Cal Due Date
Rohde & Schwarz	ESU 40	EMI Test Reciever	10011	29-Mar-09
Rohde & Schwarz	SMJ 100A	Vector Signal Generator	100645	12-Sep-09
ETS-Lindgren	2165	Turntable	00043883	N/R
ETS-Lindgren	2175	Mast Motor	00077487	N/R
Sunol Sciences	JB3	Antenna	A042004	05-May-09
Sunol Sciences	DRH-118	Antenna	A052804	02-Jun-09
Com-Power	LI-115	LISN	241037	30-Jan-09
Agilent	8648C	Signal Generator	3623A03622	28-Feb-09
ETS Lindgren	2090	Multi-Device Controller	00058942	07-Dec-09

The following auxiliary equipment and cables were used for performing the tests:

Manufacturer	Model	Description	Serial No.
Soyo	PW-930S	Laptop PC	6188
Pheenet	SW-05P	5 port switch	C0104260954
Tranzeo	POE-1	DC injection unit	n/a

Signal Cable Type	Signal Cable Description	Length
Cat 5 LAN	EUT to DC injection unit	50 m
Cat 5 LAN	DC injection unit to Ethernet switch	2 m

1.8 Test Results

The EUT complies with FCC Part 15, Subparts B and C, as well as Industry Canada RSS-210 Issue 7.

2.0 Conducted Emissions

2.1 Test Standard

FCC Part 15, Subpart C, Section 15.207a.

| *a) 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 µH/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.* |

2.2 Test Limits

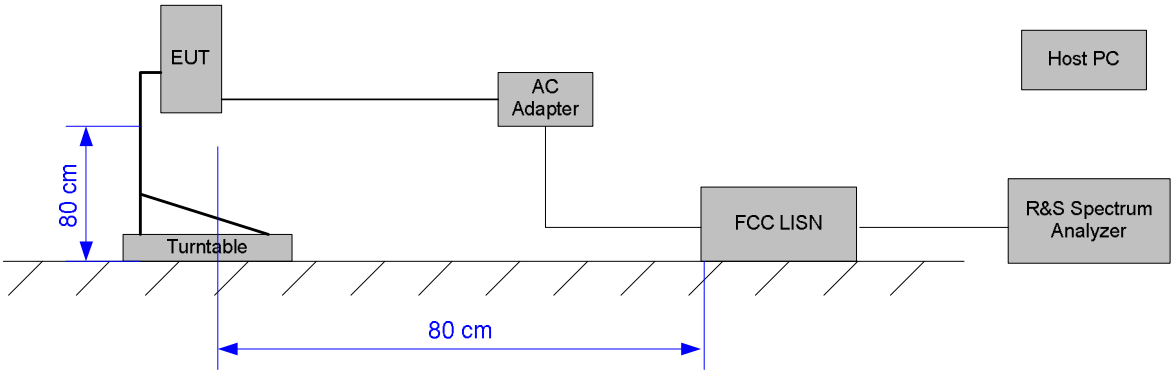
Frequency (MHz)	Maximum Level (dBuV) Quasi-Peak	Maximum Level (dBuV) Average
0.15-0.50	66-56 (Log Delta)	56-46 (Log Delta)
0.50-5.00	56	46
5.00-30.0	60	50

2.3 Test Setup

The EUT was exercised using bandwidth test software at the highest possible data rate. The test is performed at low, middle and high channels using both OFDM and DSSS modulations in 5, 10, and 20 MHz bandwidths. Only worst case data is shown below.

Note: For testing purposes only, to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.

2.3.1 Test Setup Block Diagram

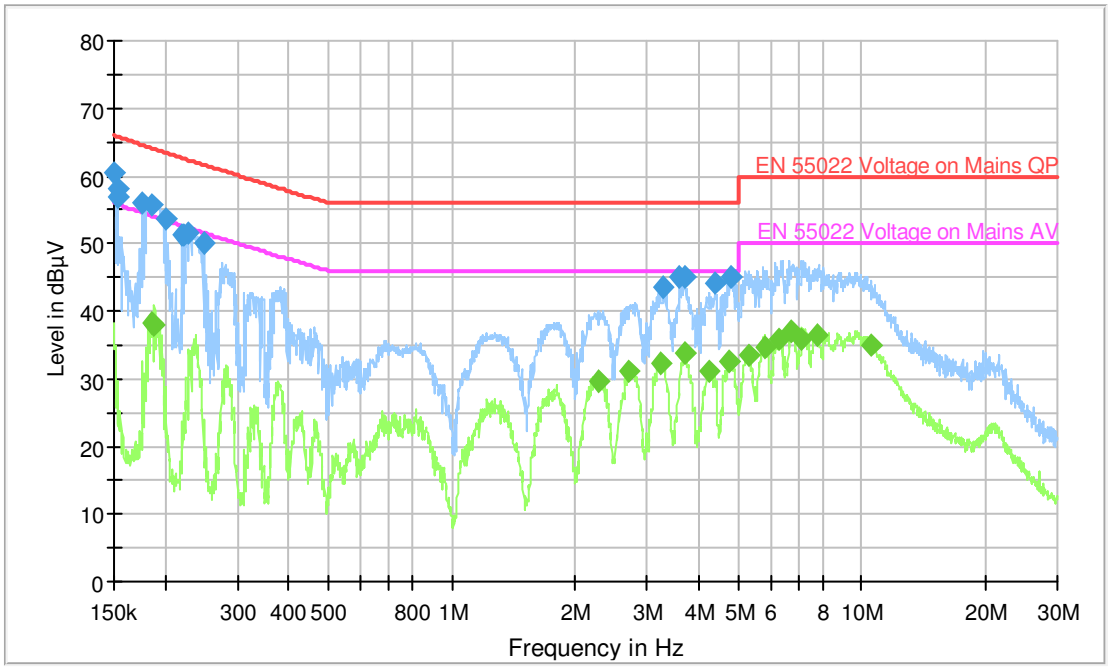


Note: The unused LISN terminal is terminated with a 50 ohms terminator.

2.4 Test Results

2.4.1 Test Data

EUT – Channel 11 Neutral G-mode



Peak detector

Frequency (MHz)	MaxPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150601	60.3	1000.00	9.000	On	L1	-0.3	5.7	66.0
0.153027	58.2	1000.00	9.000	On	L1	-0.3	7.6	65.8
0.153640	56.9	1000.00	9.000	On	L1	-0.3	8.9	65.8
0.175999	55.9	1000.00	9.000	On	L1	-0.2	8.7	64.6
0.186125	55.8	1000.00	9.000	On	L1	-0.2	8.3	64.1
0.201209	53.8	1000.00	9.000	On	L1	-0.2	9.6	63.4
0.219698	51.3	1000.00	9.000	On	L1	-0.1	11.4	62.7
0.221904	51.3	1000.00	9.000	On	L1	-0.1	11.3	62.6
0.228655	51.4	1000.00	9.000	On	L1	-0.1	10.9	62.3
0.248174	50.1	1000.00	9.000	On	L1	-0.1	11.5	61.6
3.266765	43.6	1000.00	9.000	On	L1	-0.1	12.4	56.0
3.595576	45.1	1000.00	9.000	On	L1	-0.1	10.9	56.0
3.690191	45.1	1000.00	9.000	On	L1	-0.1	10.9	56.0
4.373259	44.1	1000.00	9.000	On	L1	-0.1	11.9	56.0
4.775127	45.0	1000.00	9.000	On	L1	-0.1	11.0	56.0

Average detector

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186125	38.3	1000.00	9.000	On	L1	-0.2	15.8	54.1
0.188747	37.9	1000.00	9.000	On	L1	-0.2	16.0	53.9
2.279964	29.5	1000.00	9.000	On	L1	-0.1	16.5	46.0
2.707398	31.2	1000.00	9.000	On	L1	-0.1	14.8	46.0
3.240761	32.2	1000.00	9.000	On	L1	-0.1	13.8	46.0
3.697572	33.9	1000.00	9.000	On	L1	-0.1	12.1	46.0
4.252625	31.2	1000.00	9.000	On	L1	-0.1	14.8	46.0
4.727661	32.5	1000.00	9.000	On	L1	-0.1	13.5	46.0
5.297933	33.5	1000.00	9.000	On	L1	-0.1	16.5	50.0
5.784772	34.8	1000.00	9.000	On	L1	-0.2	15.2	50.0
6.278600	35.9	1000.00	9.000	On	L1	-0.2	14.1	50.0
6.719939	37.0	1000.00	9.000	On	L1	-0.2	13.0	50.0
7.135049	35.8	1000.00	9.000	On	L1	-0.2	14.2	50.0
7.744147	36.3	1000.00	9.000	On	L1	-0.2	13.7	50.0
10.534227	34.8	1000.00	9.000	On	L1	-0.3	15.2	50.0

Note: All data points are corrected for insertion loss.

3.0 Peak Power Output

3.1 Test Standard

FCC CFR47, Part 15, Subpart B 15.247b.

| *(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:*

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the 1 watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in Paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in Paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in Paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(iii) Fixed, point-to-point operation, as used in Paragraphs (c)(4)(i) and (c)(4)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility. |

3.2 Test Limits

The maximum conducted output power shall not exceed 30 dBm.

3.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The test is performed at low, middle and high channels using both OFDM and DSSS modulations in 5, 10, and 20 MHz bandwidths.

Power is measured using the channel power measurement feature of the spectrum analyzer.

3.3.1 Test Setup Block Diagram

3.4 Test Results

Mode DSSS/ Channel BW = 5MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
2412	19.21	30	PASS
2437	17.98	30	PASS
2462	19.38	30	PASS

Mode OFDM/ Channel BW = 5MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
2412	17.23	30	PASS
2437	16.47	30	PASS
2462	16.16	30	PASS

Mode DSSS/ Channel BW = 10MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
2412	19.30	30	PASS
2437	17.87	30	PASS
2462	18.85	30	PASS

Mode OFDM/ Channel BW = 10MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
2412	17.06	30	PASS
2437	16.14	30	PASS
2462	15.89	30	PASS

Mode DSSS/ Channel BW = 20MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
2412	19.49	30	PASS
2437	19.60	30	PASS
2462	19.63	30	PASS

Mode OFDM/ Channel BW = 20MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
2412	19.53	30	PASS
2437	17.21	30	PASS
2462	16.92	30	PASS

4.0 Radiated Emissions, General Requirements

4.1 Test Standard

FCC Part 15, Subpart C, Section 15.209, Radiated Emission Limits, General Requirements.

| *(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:*

Frequency (MHz)	Field Strength (Microvolts/Meter)	Measurement Distance (Meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

*** Except as provided in Paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Sections 15.231 and 15.241.*

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. |

4.2 Test Limits

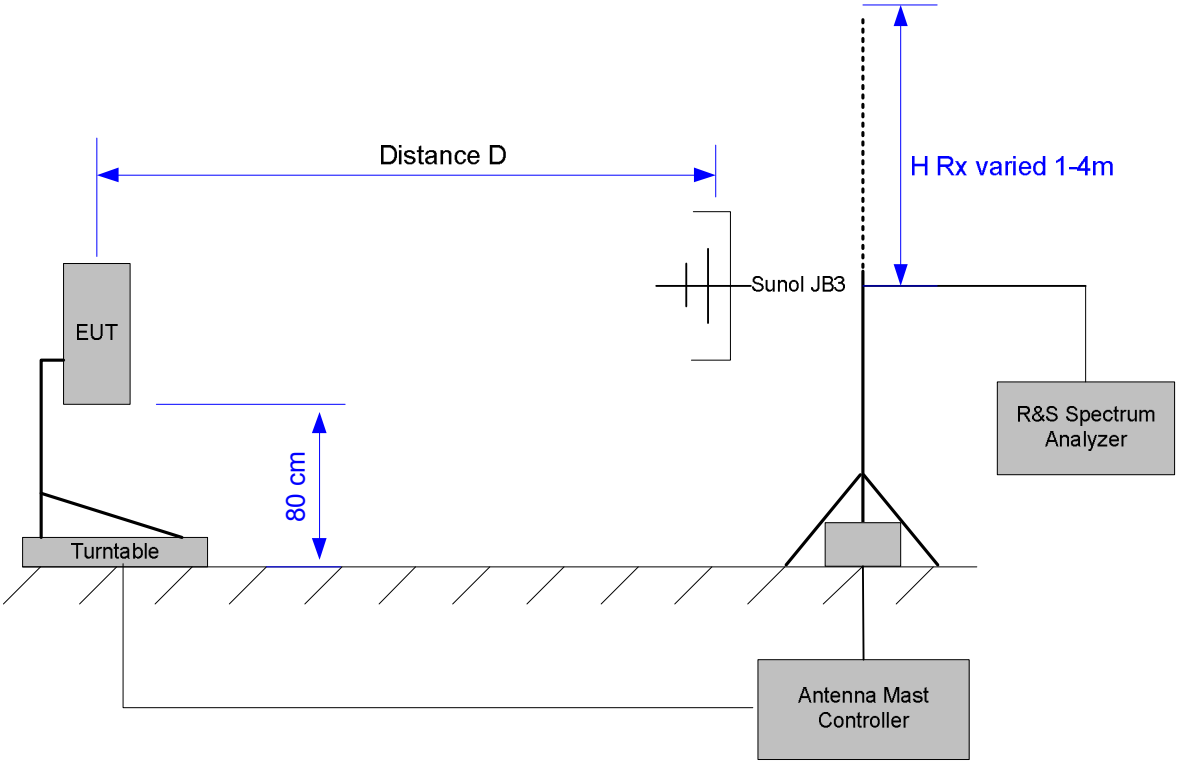
Frequency (MHz)	Maximum Field Strength (uV/m @ 3m)	Maximum Field Strength (dBuV/m @ 3m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-1000	500	54.0

4.3 Test Setup

The product was tested at low, middle and high channels using both OFDM and DSSS modulations in 5,10, and 20 MHz bandwidths. The EUT was exercised using transmit mode at the highest possible rate. Only worst case data is shown below.

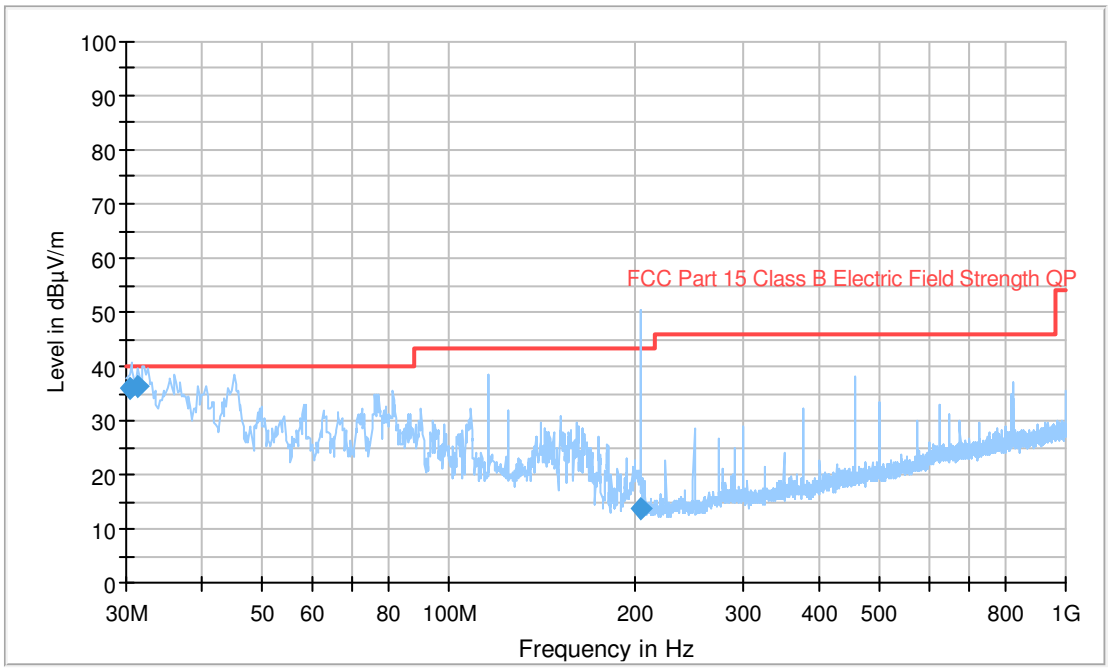
Note: For testing purposes only, to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.

4.3.1 Test Setup Block Diagram



Note: Measurements below 1 GHz were performed with the Sunol JB3 antenna with a measurement distance of 3 m. Compliance above 1 GHz is covered in Section 5.0.

4.4 Test Results



Integrated 19 dBi 2.4 GHz antenna

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
31.441760	36.2	1000.00	100.000	100.0	V	19.0	19.9	3.80	40.00
30.565705	35.8	1000.00	100.000	100.0	V	260.0	20.6	4.20	40.00
204.800560	13.5	1000.00	100.000	140.0	V	130.0	13.0	30.00	43.50

Note: All data points are corrected for insertion loss.

The data above is for 10 MHz bandwidth in 802.11g mode at channel 11 (2462MHz) which is the worst case configuration.

5.0 Harmonic and Spurious Emissions

5.1 Test Standard

FCC CFR 47, Part 15, Subpart B 15.247d.

| *(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).* |

5.2 Test Limits

2400-2483.5 MHz limits:

- Fundamental Limit = 30 dBm
- Harmonics and Spurious Emissions = 30 dBc
- Restricted Band Emissions = AVG 54 dBuV, PK 74dBuV

5.3 Test Setup – Spurious Emissions

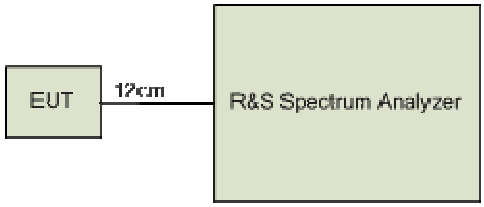
Both radiated and conducted measurements are made on the EUT to ensure compliance with the required emission levels. Conducted scans are used to determine compliance with the 20 dBc limit for peak detector for emissions outside of the operational frequency band.

In addition to conducted measurements, extensive radiated testing above 1 GHz is performed. The measurement antenna is scanned around all sides of the EUT to identify signals of interest. Additional measurements at an appropriate measurement distance are performed to ensure that emissions were at maximum.

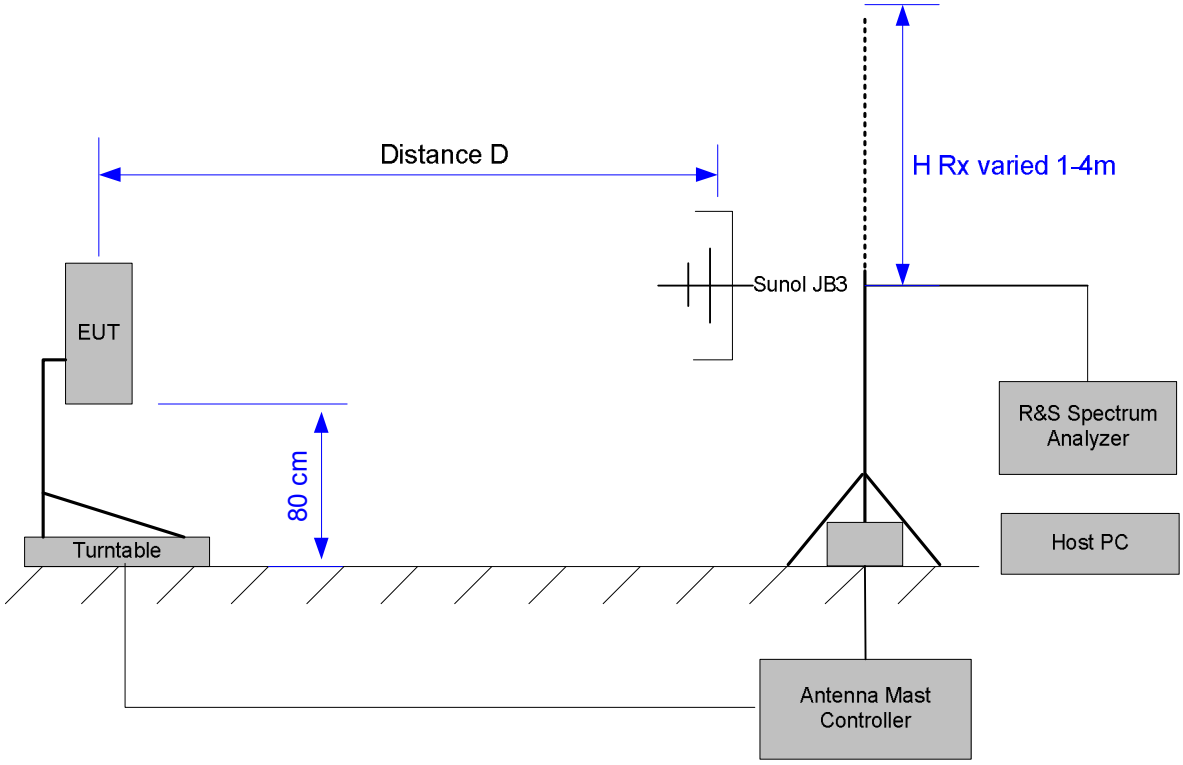
The EUT was exercised using transmit mode at the highest possible rate. The product was tested at low, middle and high channels using both OFDM and DSSS modulations in 5,10, and 20 MHz bandwidths.

Note: For testing purposes only, to ensure worst case performance in all configurations, the radio is configured to transmit at the maximum possible RF power.

5.3.1 Test Setup Block Diagram – Conducted Measurements (Harmonics)



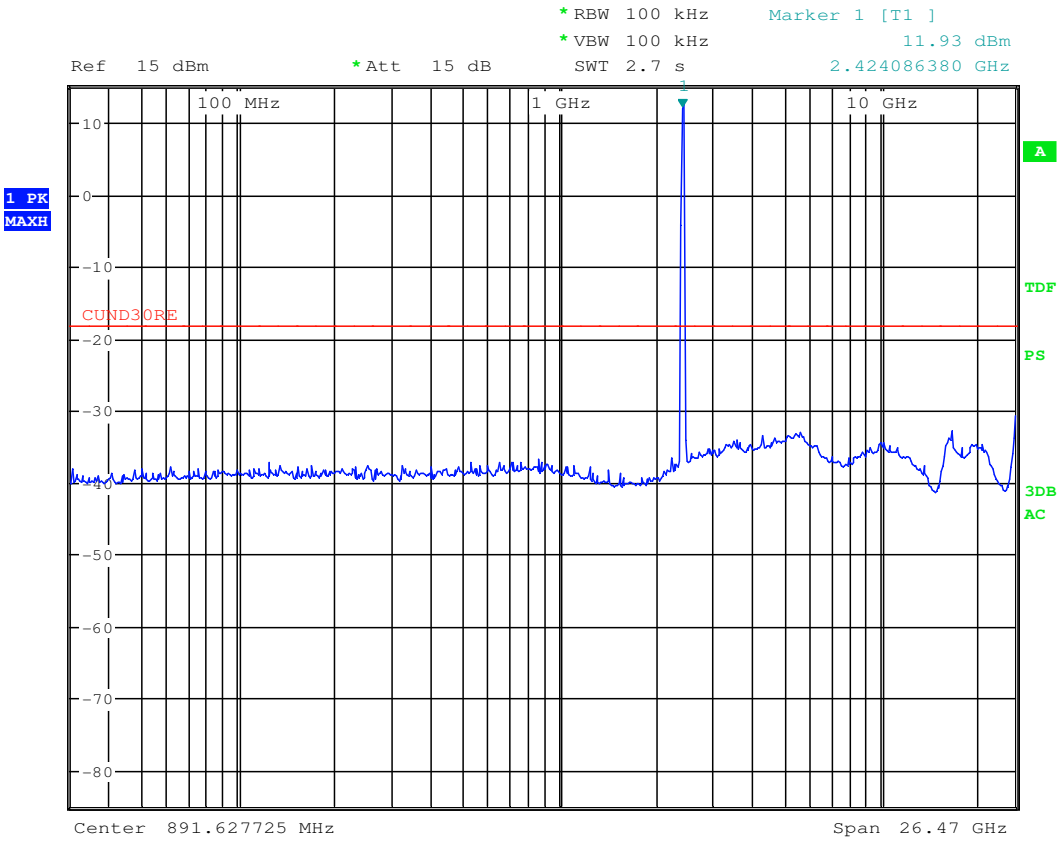
5.3.2 Test Setup Block Diagram – Radiated Measurements (Spurious)



5.4 Test Results

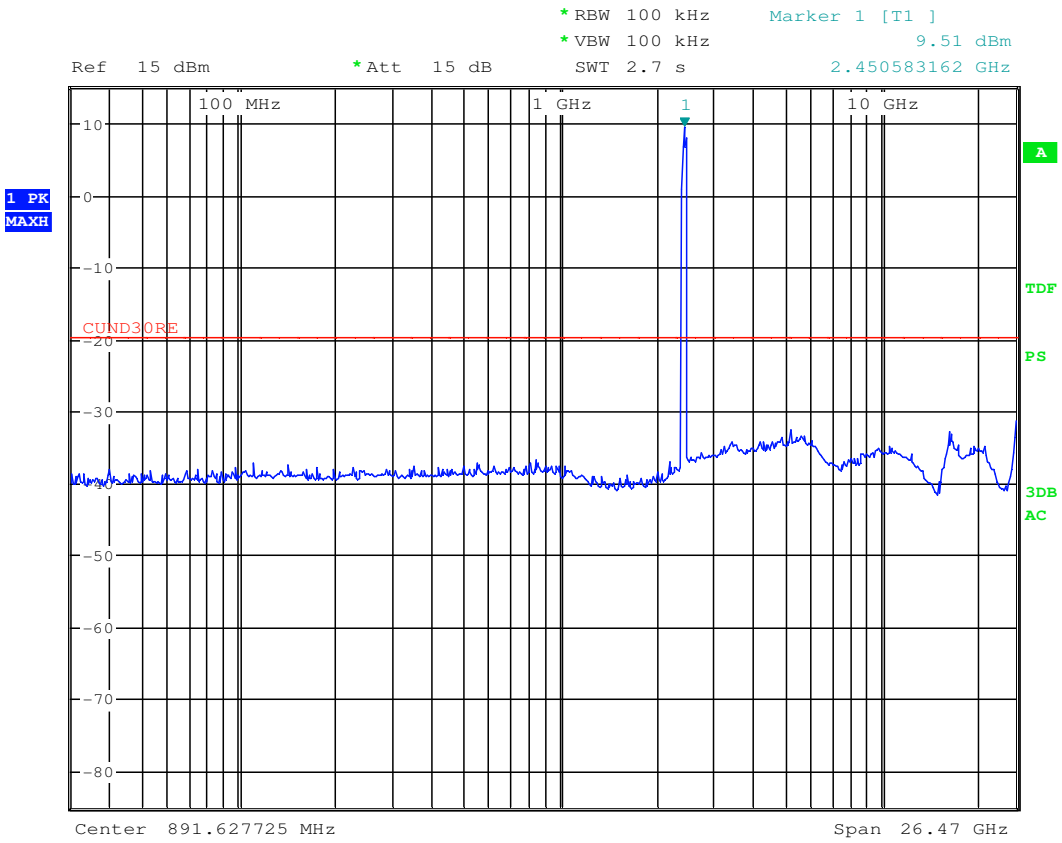
5.4.1 Test Results 15.247–Harmonics -30 dBc

B-mode



Date: 18.MAR.2009 12:47:06

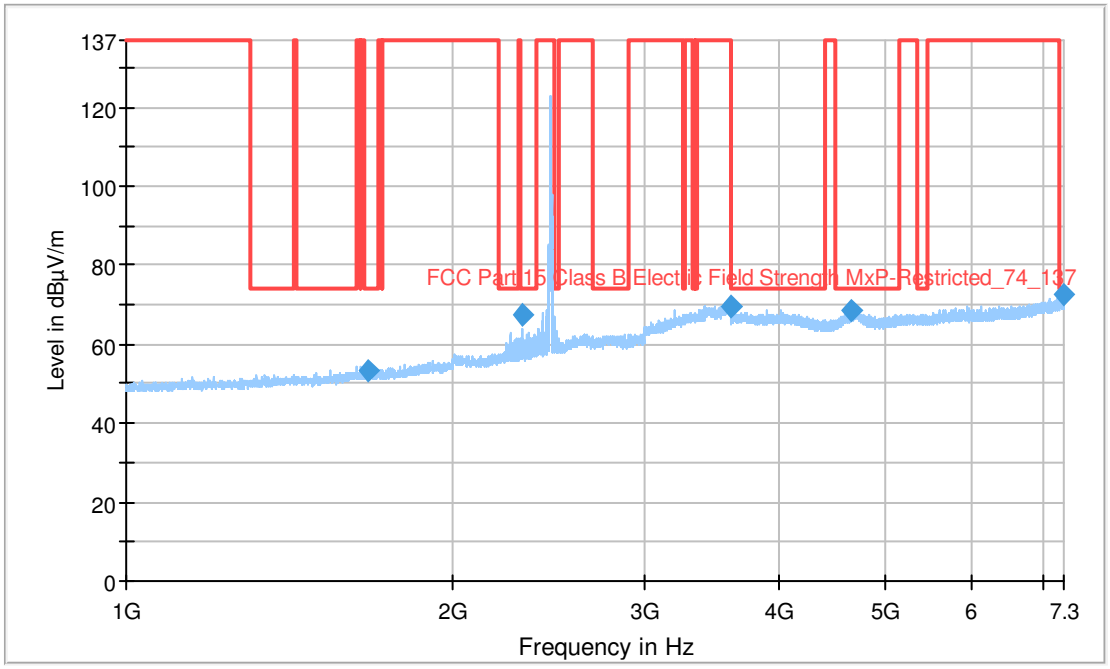
G-mode



The above plots show the conducted output of the transmitter. There are no conducted harmonics within the 30 dBc limit.

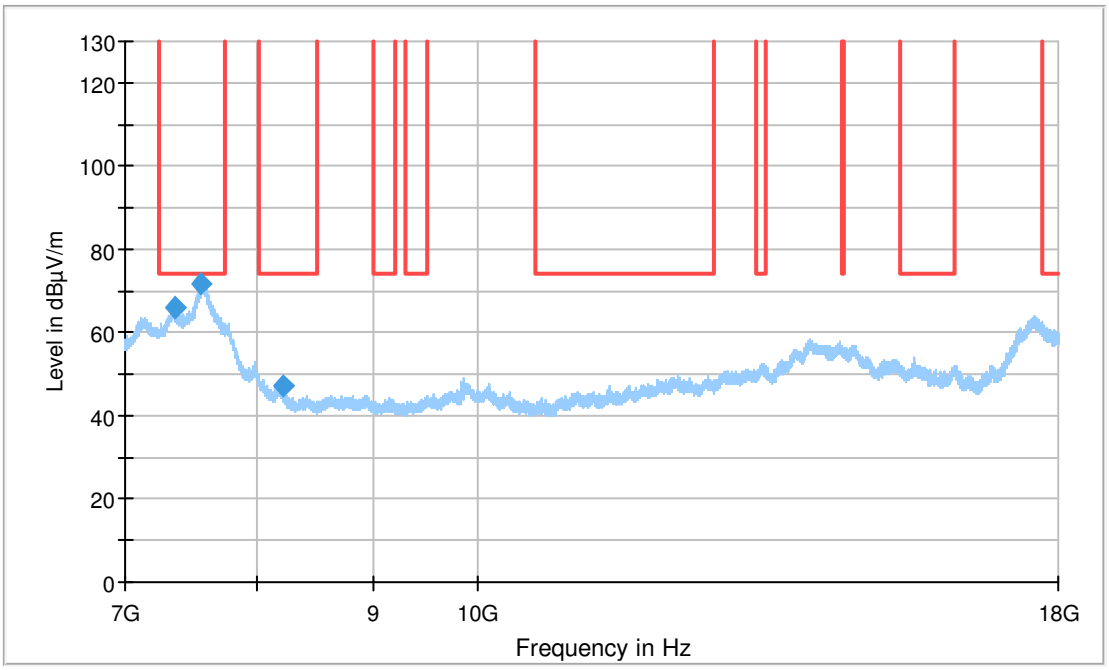
5.4.2 Test Results 15.247– Restricted Bands (Spurious Emissions)

The following data is taken from frequencies identified during radiated pre-testing at 3 m. Data presented below was taken at a measurement distance of 3 m. Data is presented for the worst case configurations.



Peak detector

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
7295.60000	72.3	1000.000	130.0	V	210.0	42.0	1.7	74.0
3600.00000	69.4	1000.000	180.0	V	30.0	37.4	4.6	74.0
4658.40000	68.5	1000.000	130.0	V	300.0	38.7	5.5	74.0
2320.00000	67.3	1000.000	100.0	V	90.0	31.6	6.7	74.0
1675.20000	53.4	1000.000	100.0	H	284.0	28.4	20.6	74.0



Peak detector

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
7556.80000	71.8	1000.000	150.0	V	90.0	32.9	2.2	74.0
7361.20000	66.1	1000.000	100.0	H	180.0	27.3	7.9	74.0
8208.00000	47.0	1000.000	100.0	H	0.0	9.7	27.0	74.0

6.0 Band Edge

6.1 Test Standard

FCC CFR 47, Part 15, Subpart B 15.247d.

| *(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).* |

6.2 Test Limits

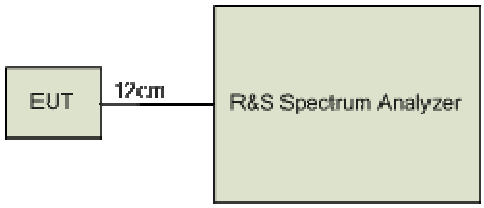
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). (See Section 15.205(c).)

6.3 Test Setup

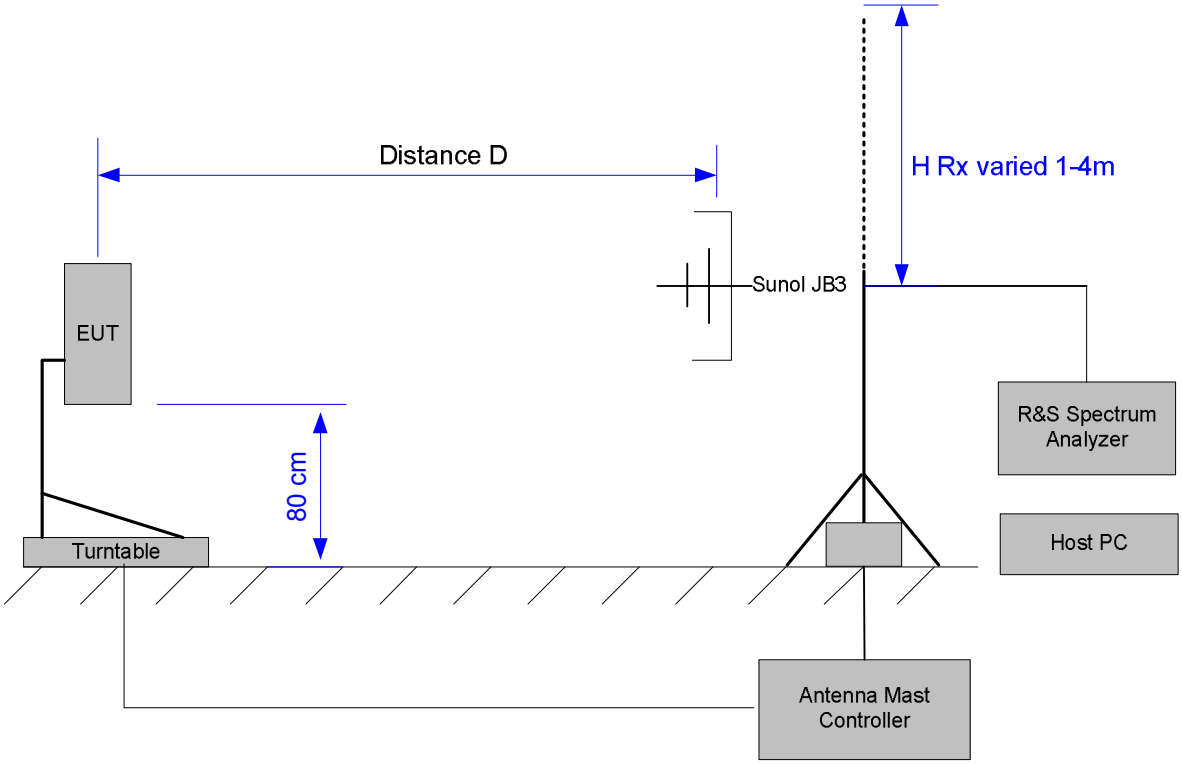
Radiated measurements are made on the EUT to ensure compliance with the required emission levels.

The product was tested at low and high channels using both OFDM and DSSS modulations in 5,10, and 20 MHz bandwidths. Compliance with the 15.209 restricted band requirements of the 2400-2483.5 MHz band is established through radiated measurements. Data is presented for all the configurations.

6.3.1 Test Setup Block Diagram – Conducted Measurements)



6.3.2 Test Setup Block Diagram – Radiated Measurements



6.4 Test Results

6.4.1 2400-2483.5 MHz, Radiated Measurements

This measurement is performed using the peak-delta method. The delta is measured using bandwidth settings of RBW, VBW = 100 KHz. This delta is then subtracted from the peak radiated power which is measured using settings of RBW, VBW = 1 MHz.

Bandwidth, MHz	Freq (MHz)	Mode	Peak 1M/1M @3m (dBuV/m)	100k/100k Delta (dB)	BE Reading (dBuV/m@3m)	Limit (dBuV/m@3m)	Mark
5	2412	b Mode	102.59	40.78	61.81	74	Pass
		g Mode	103.5	33.88	68.77	74	Pass
	2462	b Mode	103.14	37.03	65.48	74	Pass
		g Mode	102.92	34.09	68.83	74	Pass
10	2412	b Mode	101.27	40.41	60.86	74	Pass
		g Mode	101.53	31.88	69.65	74	Pass
	2462	b Mode	101.70	35.81	65.89	74	Pass
		g Mode	100.44	32.17	68.27	74	Pass
20	2412	b Mode	97.61	31.90	65.71	74	Pass
		g Mode	96.02	28.03	67.99	74	Pass
	2462	b Mode	97.07	31.40	65.67	74	Pass
		g Mode	96.01	27.66	68.35	74	Pass

7.0 Occupied Bandwidth

7.1 Test Standard

FCC CFR47, Part 15, Subpart B 15.247a.

| *(a) Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:*

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

7.2 Test Limits

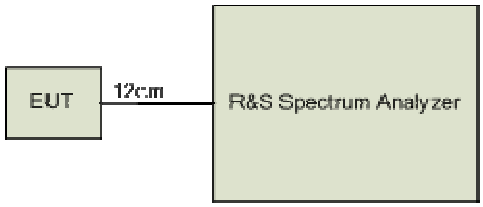
The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

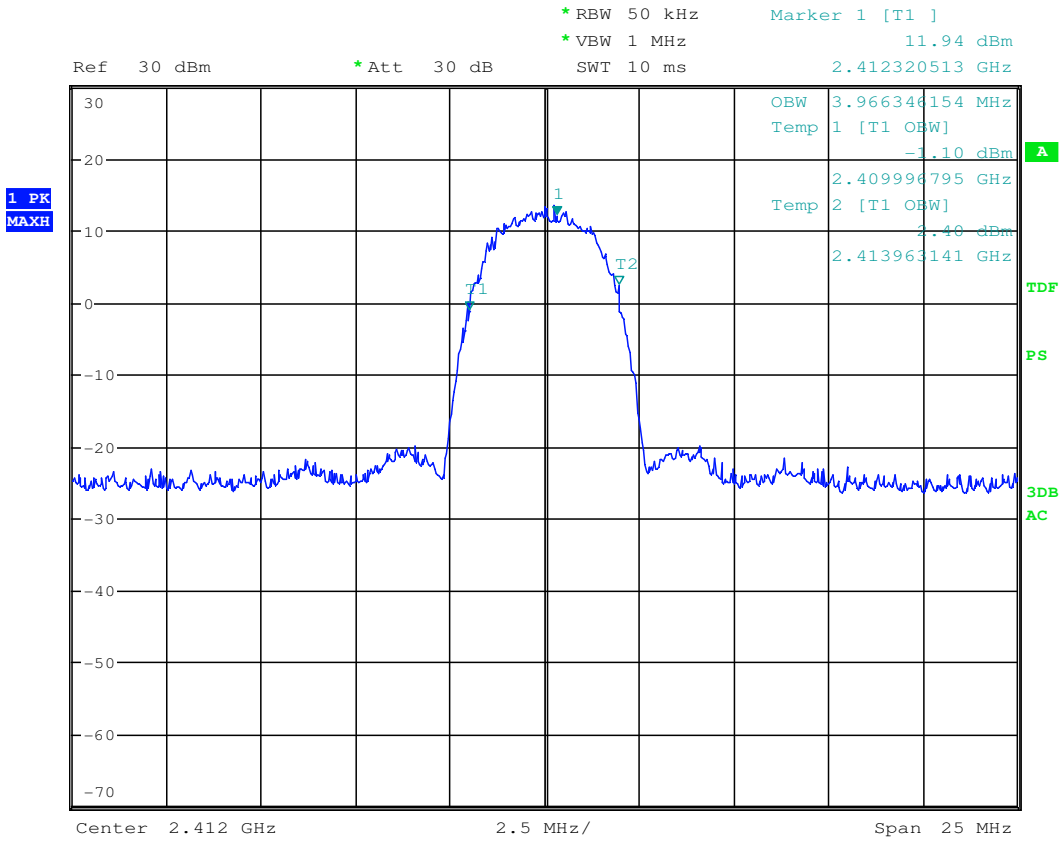
The product was tested at low and high channels using both OFDM and DSSS modulations in 5,10, and 20 MHz bandwidths.

7.3.1 Test Setup Block Diagram

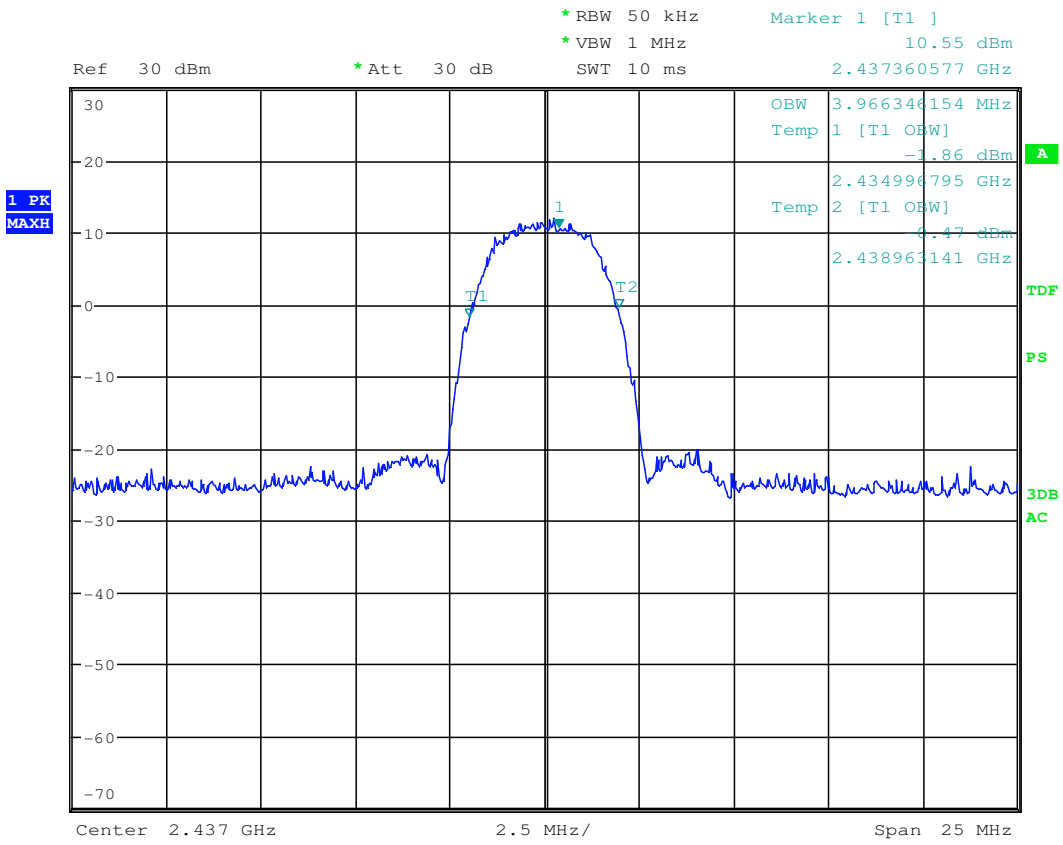


7.4 Test Results, Occupied Bandwidth

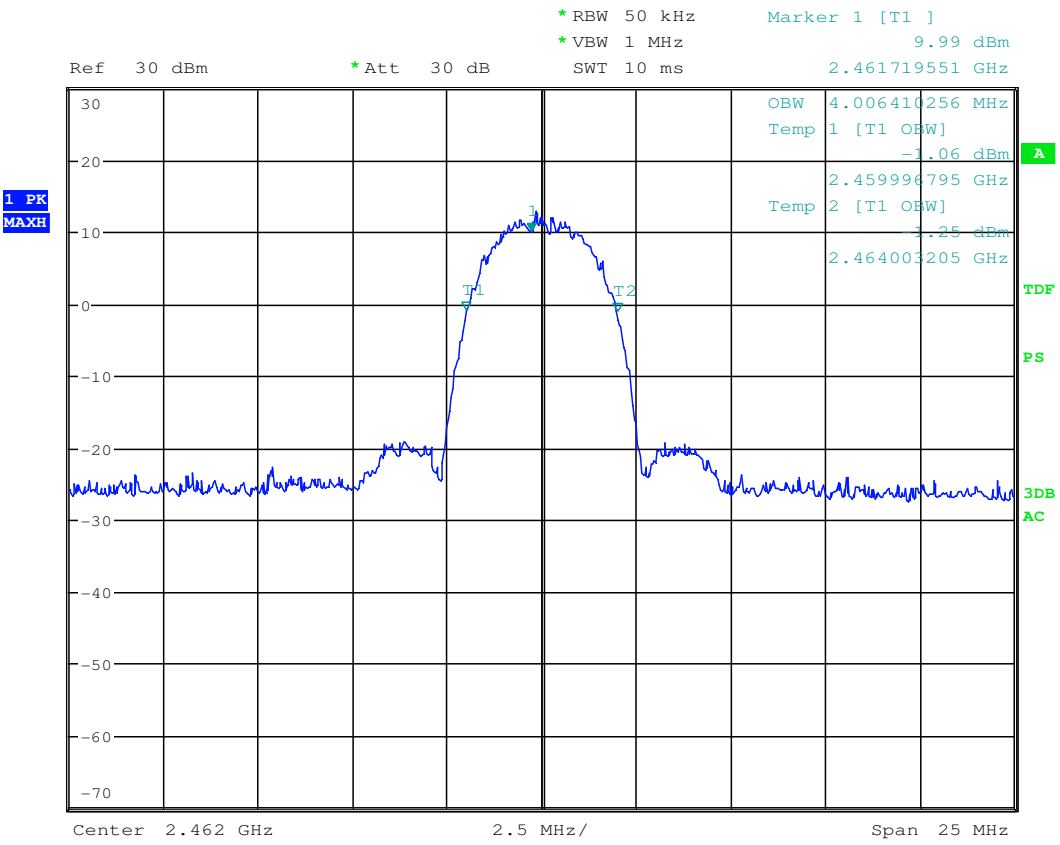
7.4.1 802.11b



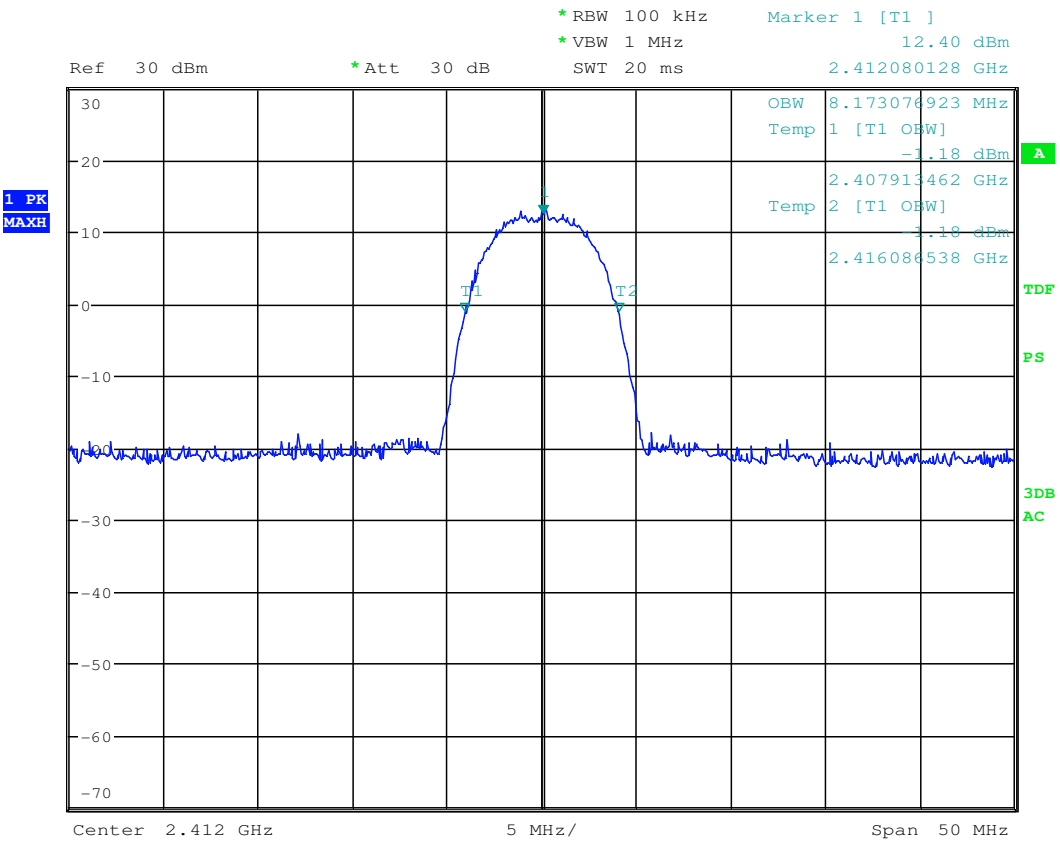
Date: 13.MAR.2009 19:33:58



Date: 13.MAR.2009 19:32:38



Date: 13.MAR.2009 19:31:07



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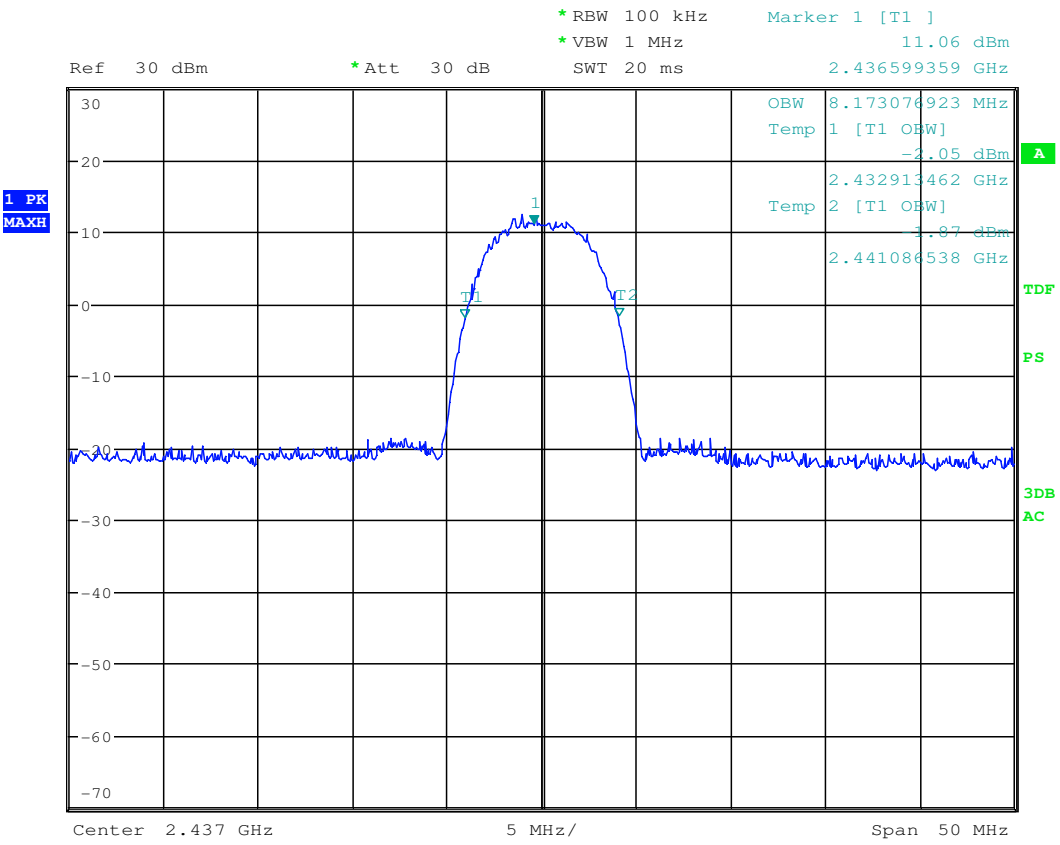

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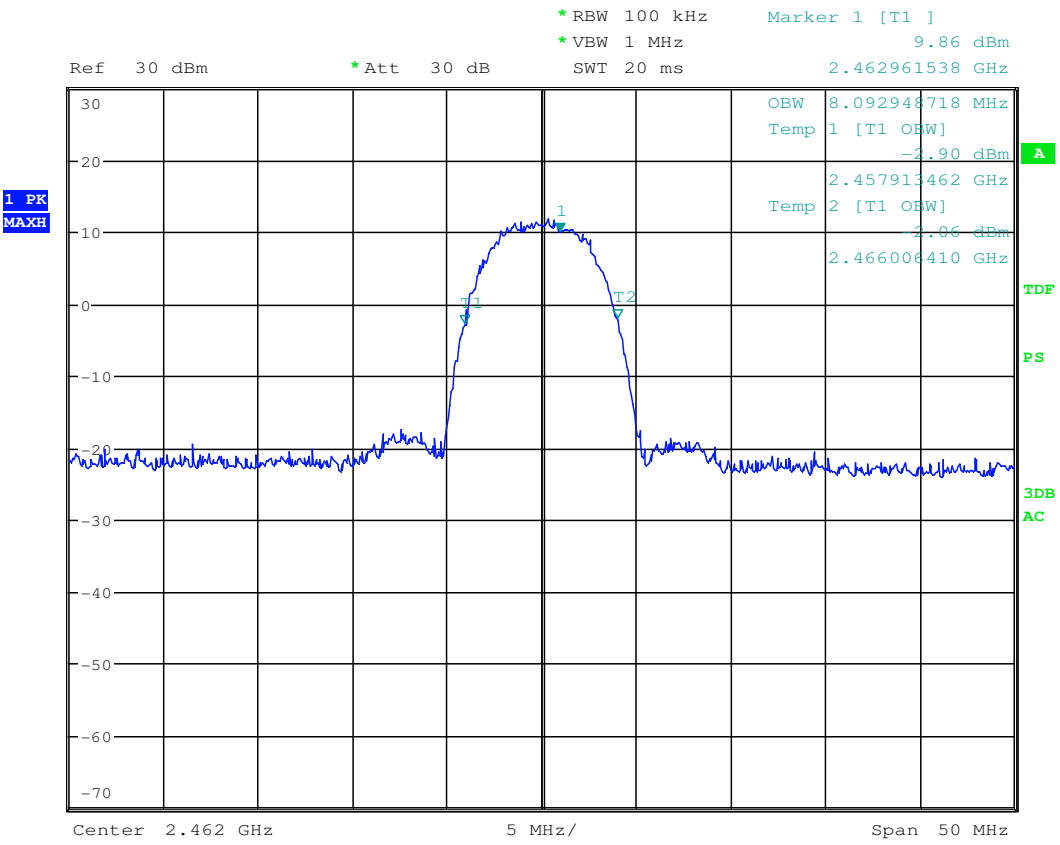

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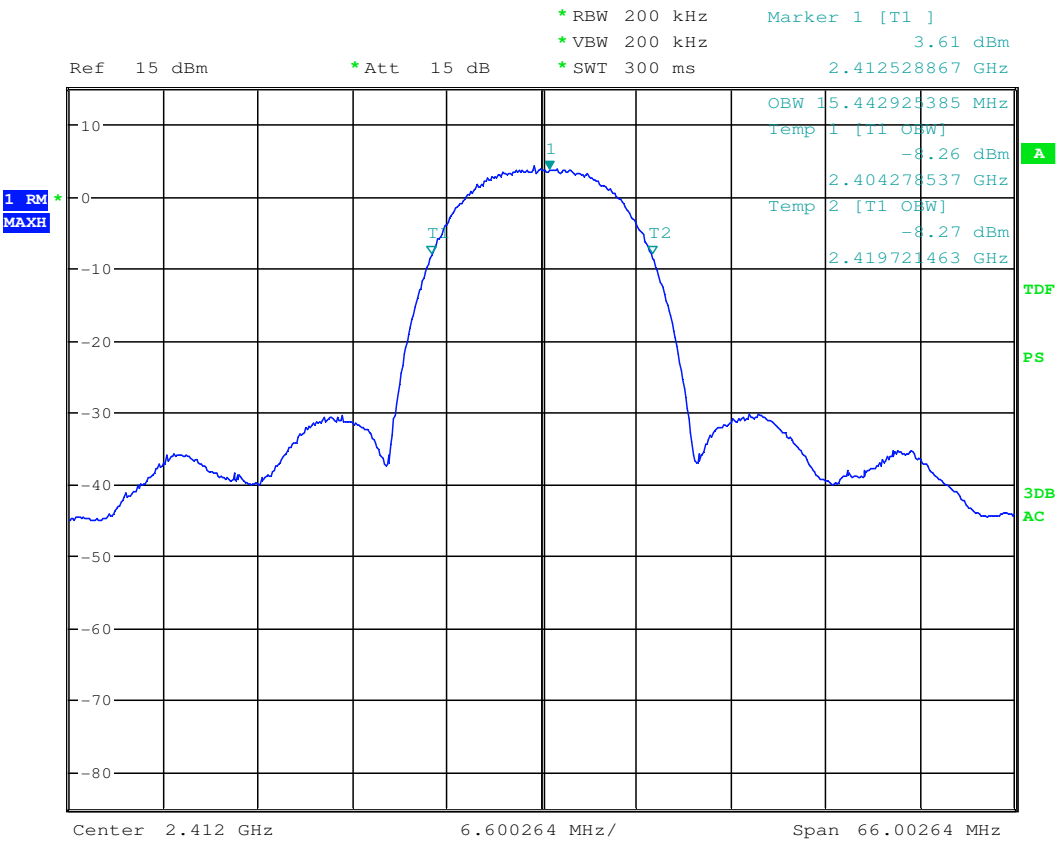
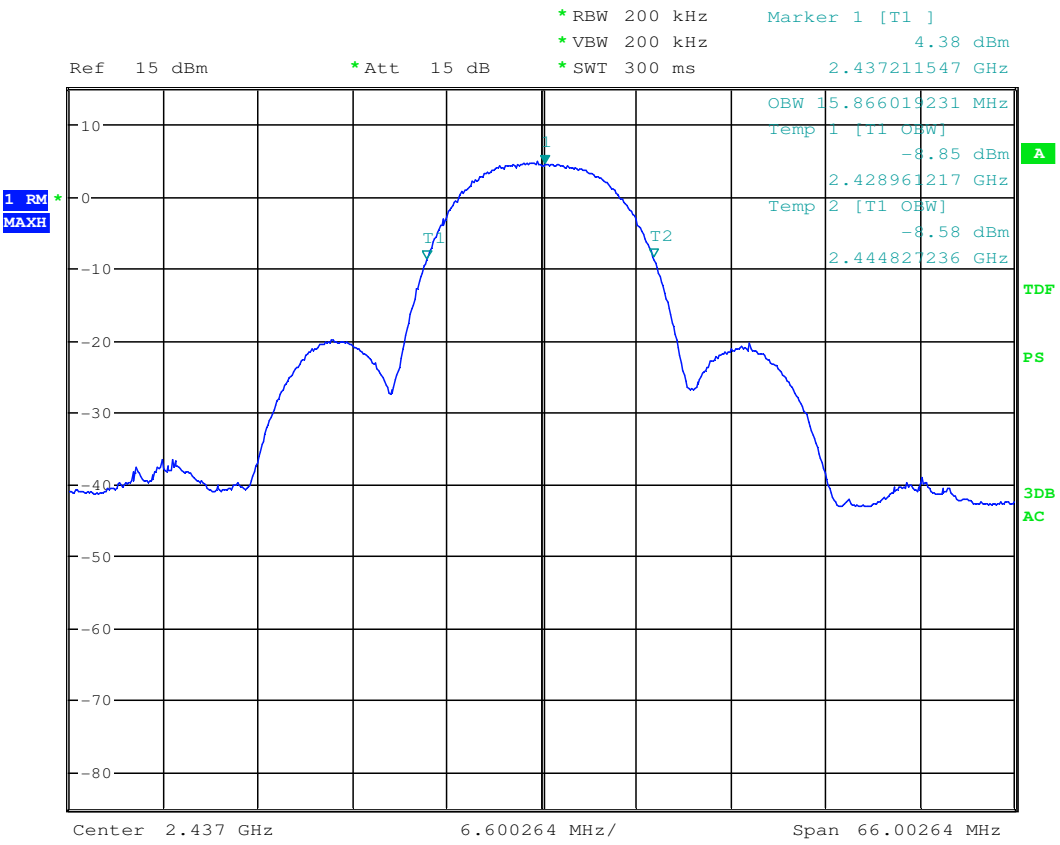


Date: 18.MAR.2009 13:58:31



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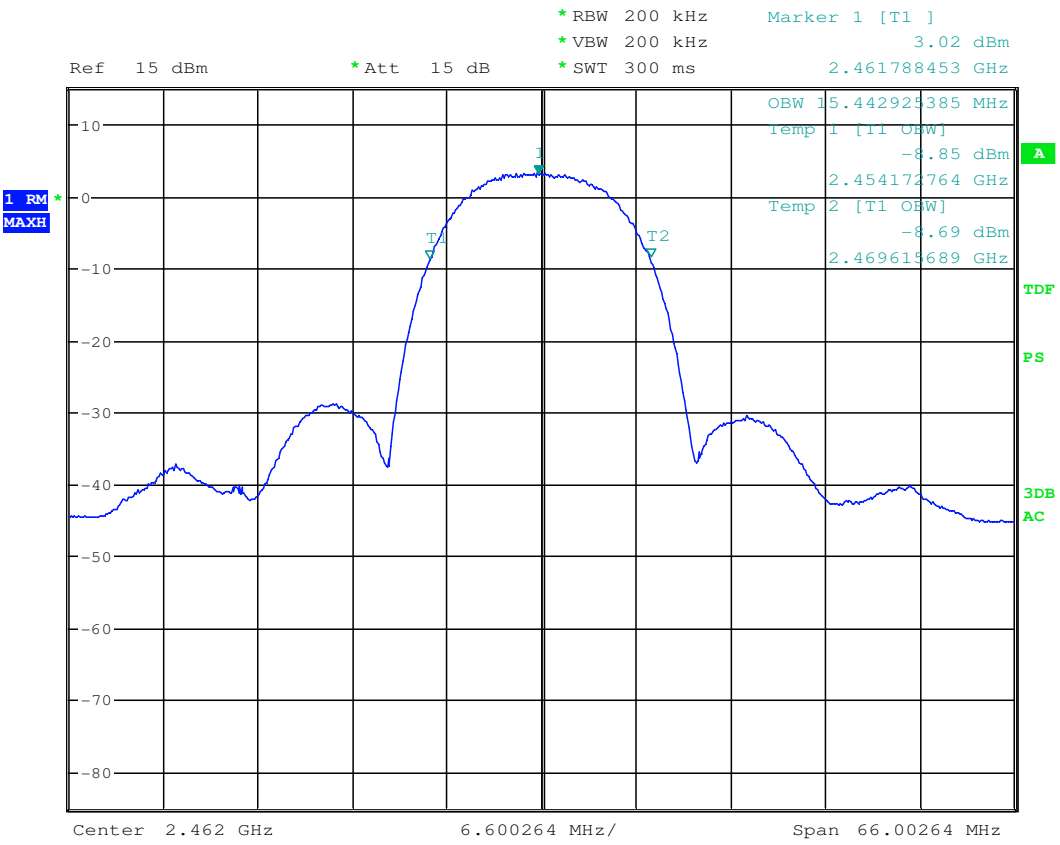
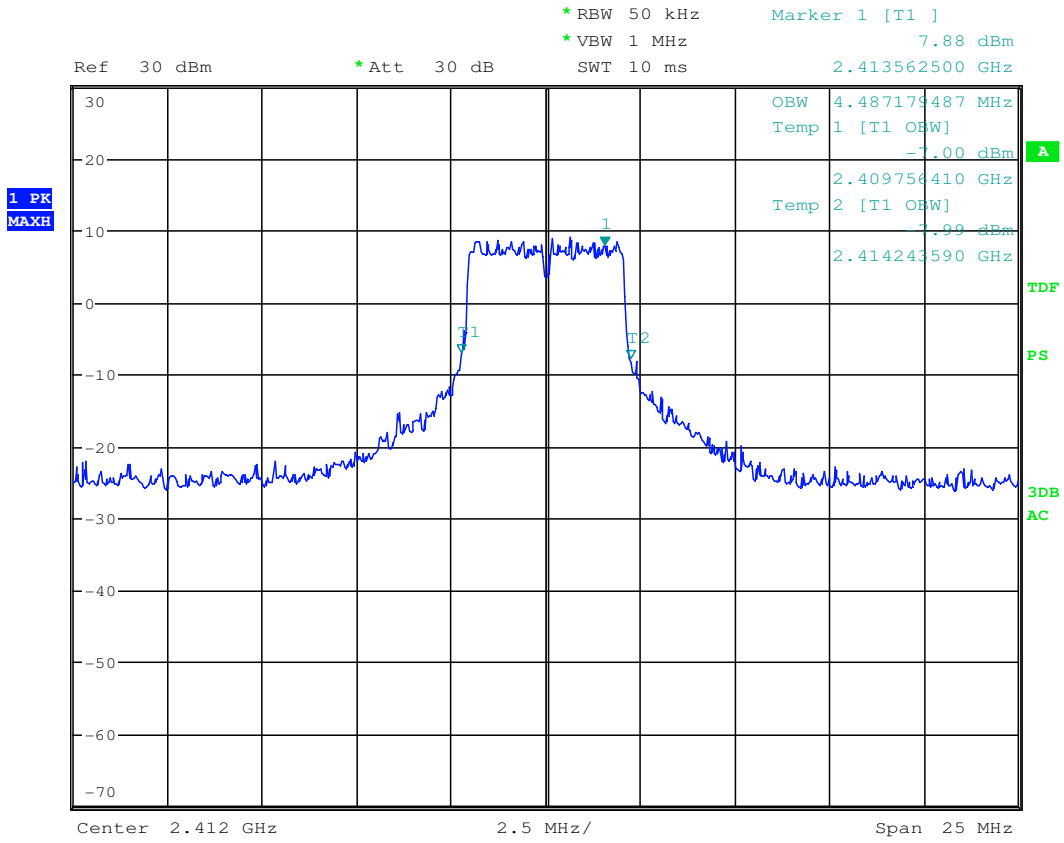
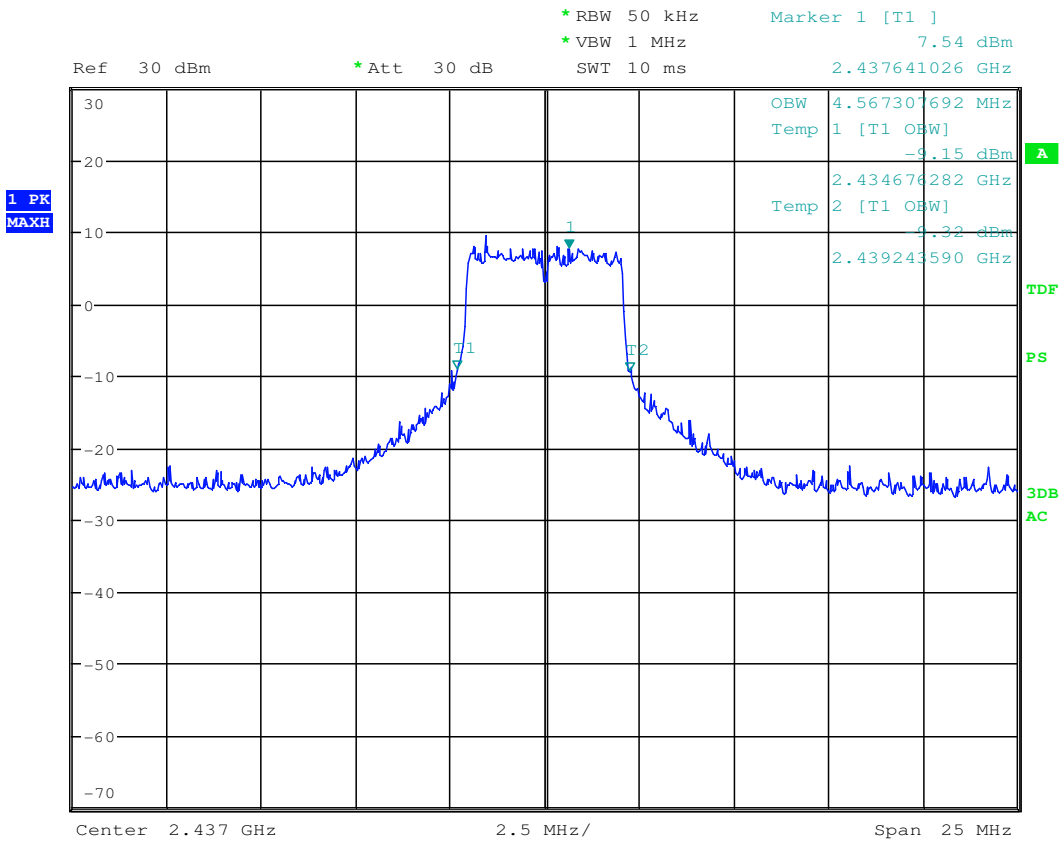


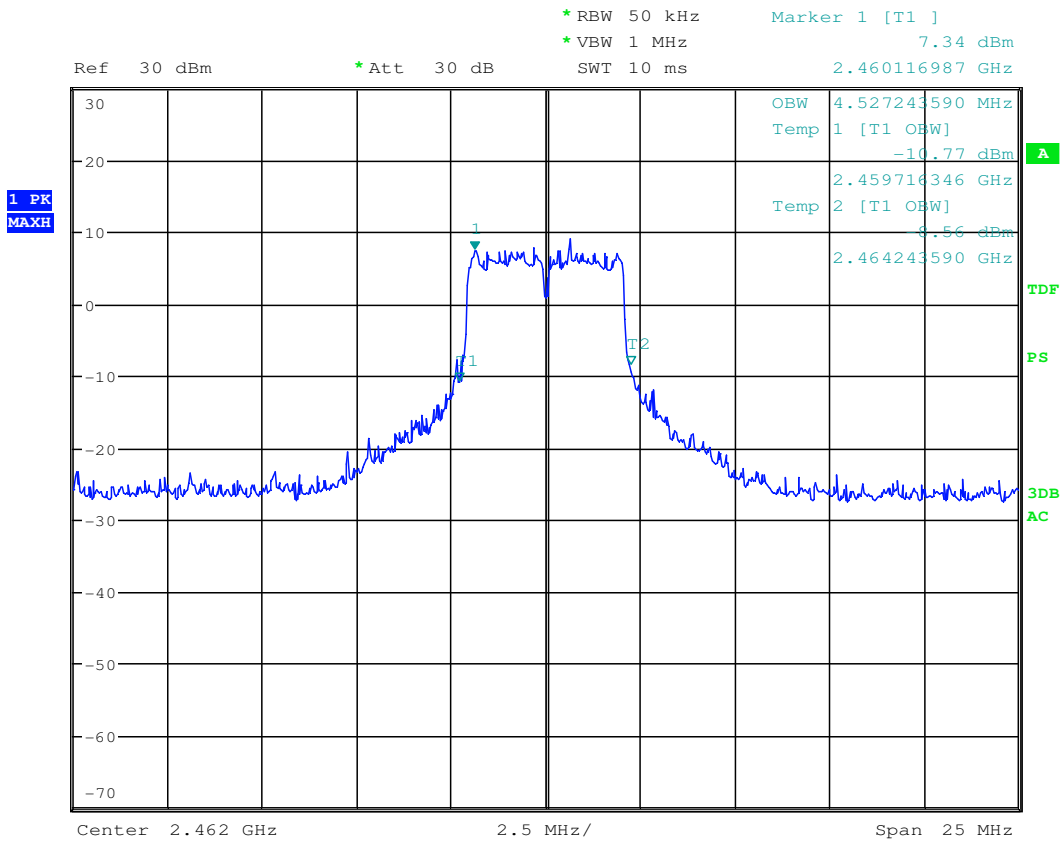
Date: 18.MAR.2009 14:09:43

7.4.2 802.11g

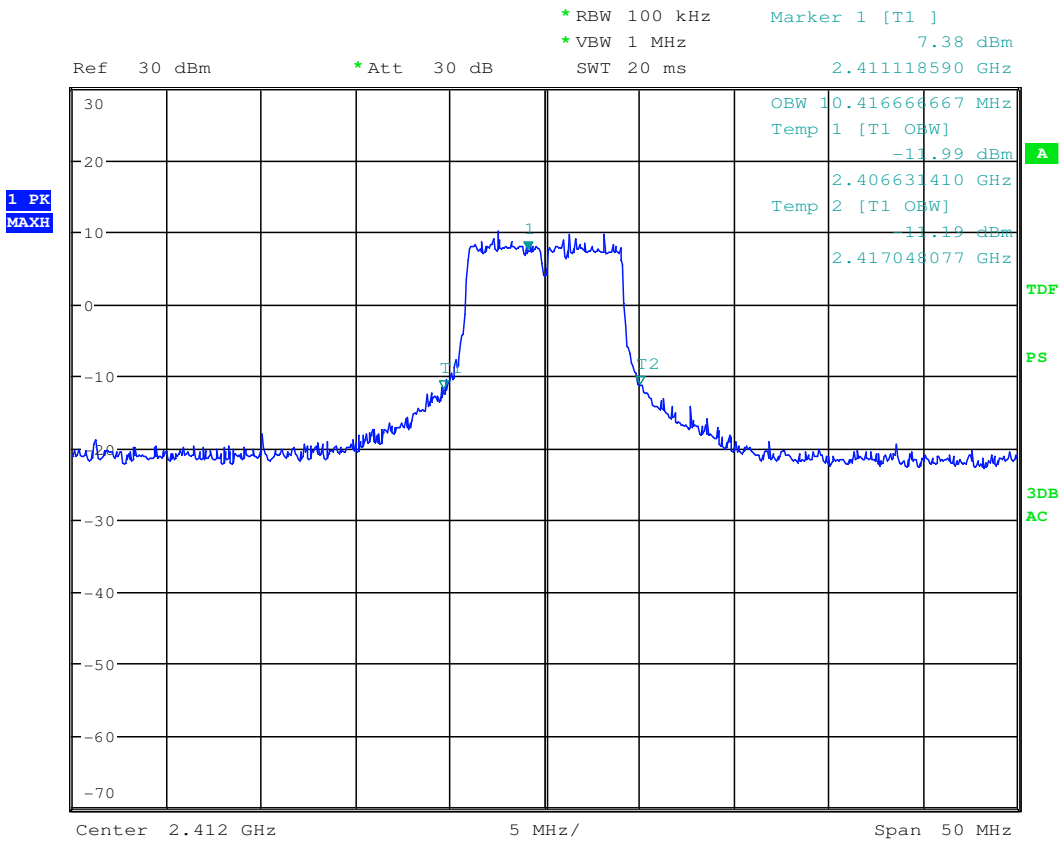

*RBW 50 kHz
*VBW 1 MHz
Ref 30 dBm
*Att 30 dB
SWT 10 ms
Marker 1 [T1]
7.88 dBm
2.413562500 GHz
OBW 4.487179487 MHz
Temp 1 [T1 OBW]
-7.00 dBm
2.409756410 GHz
Temp 2 [T1 OBW]
-7.99 dBm
2.414243590 GHz
1 PK
MAXH
A
TDF
PS
3DB
AC
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
T1
T2
1
Center 2.412 GHz
2.5 MHz/
Span 25 MHz
Date: 13.MAR.2009 19:36:03



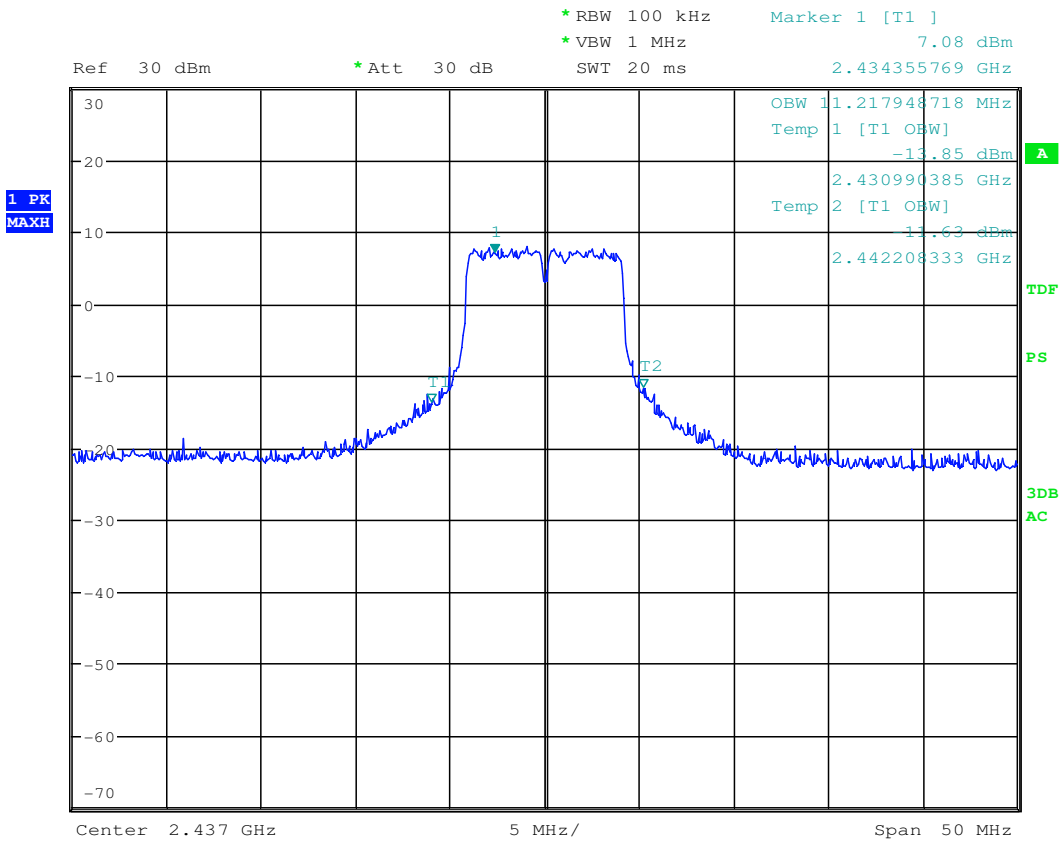
Date: 13.MAR.2009 19:37:16



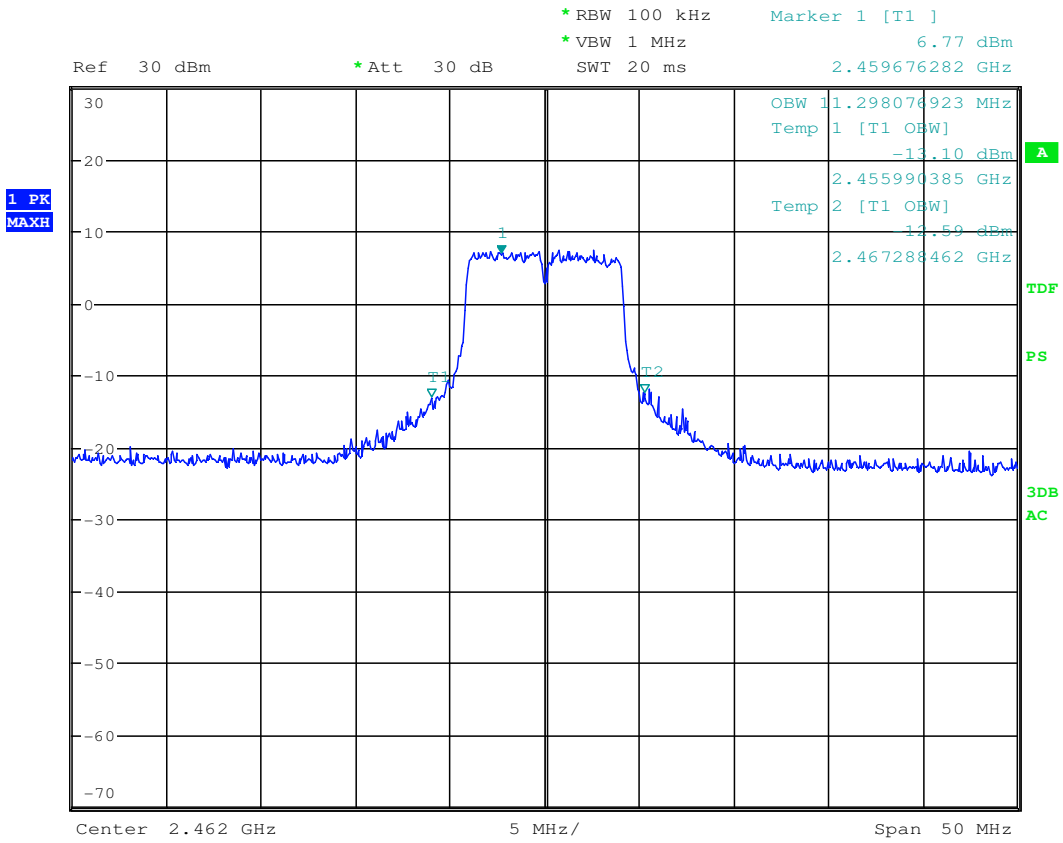
Date: 13.MAR.2009 19:38:29

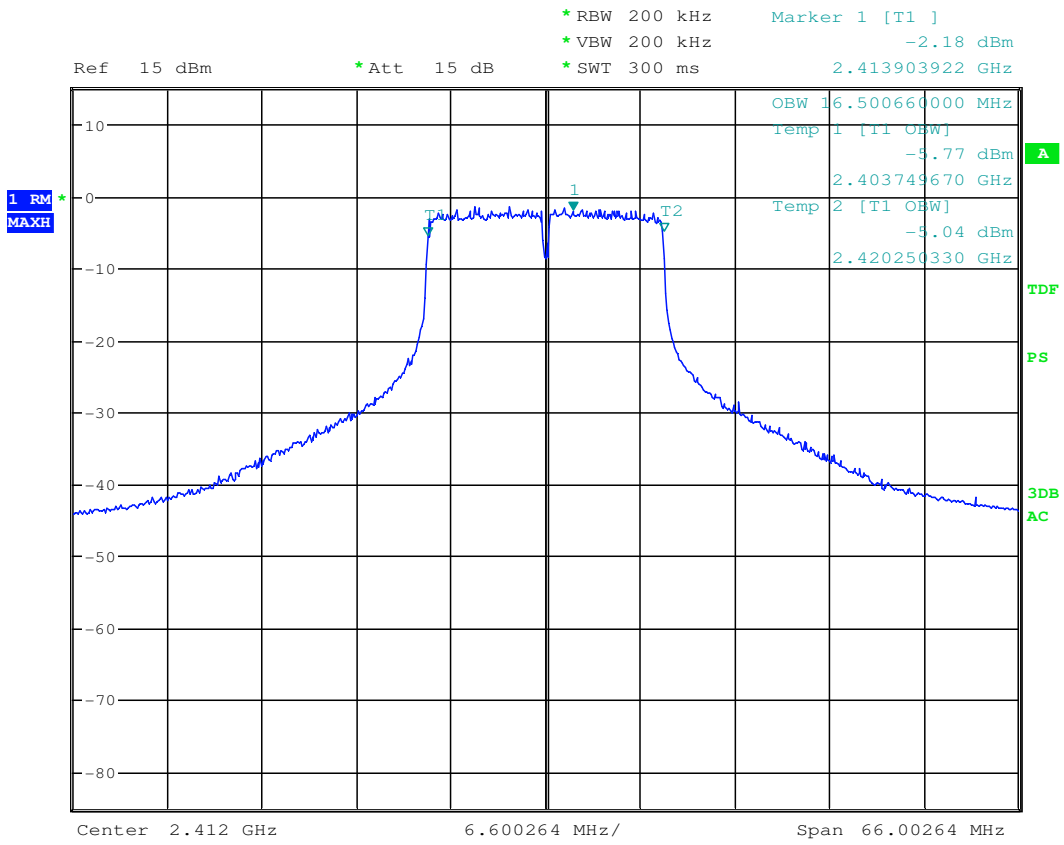


Date: 13.MAR.2009 19:20:40



Date: 13.MAR.2009 19:19:24


*RBW 100 kHz
*VBW 1 MHz
Ref 30 dBm
*Att 30 dB
SWT 20 ms
Marker 1 [T1]
6.77 dBm
2.459676282 GHz
OBW 11.298076923 MHz
Temp 1 [T1 OBW]
-13.10 dBm
2.455990385 GHz
Temp 2 [T1 OBW]
-13.59 dBm
2.467288462 GHz
1 PK
MAXH
A
TDF
PS
3DB
AC
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 13.MAR.2009 19:17:57



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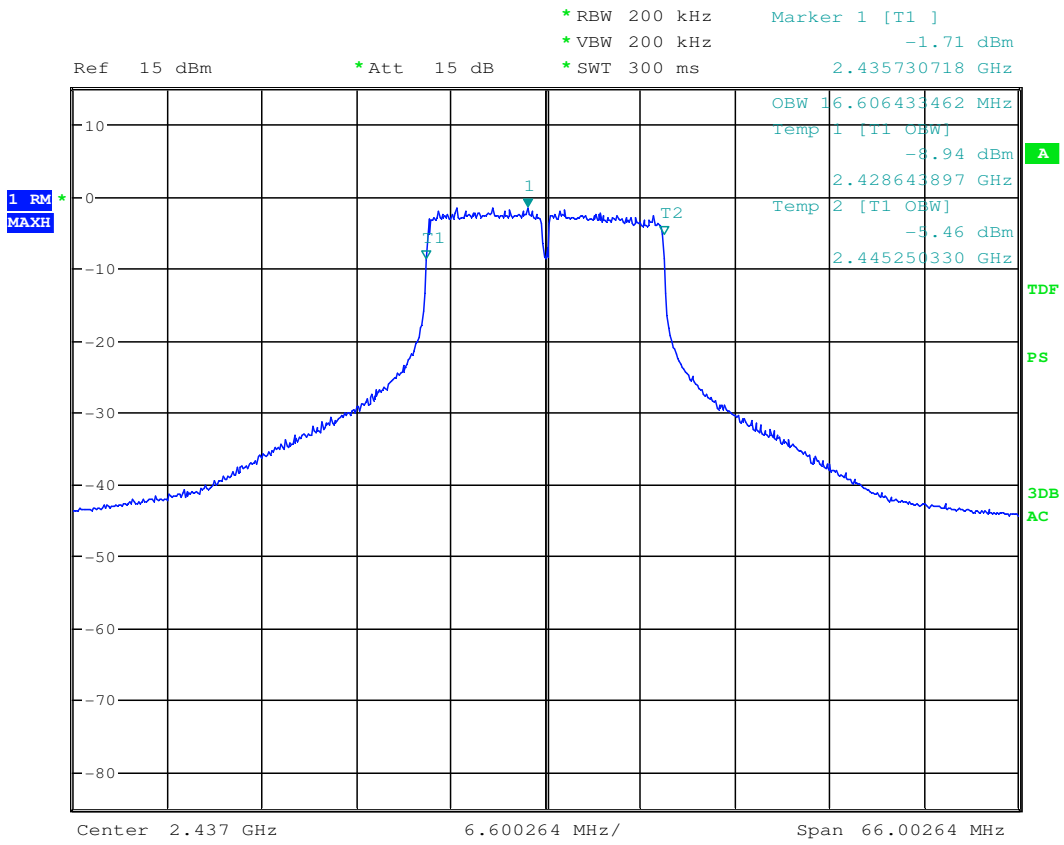
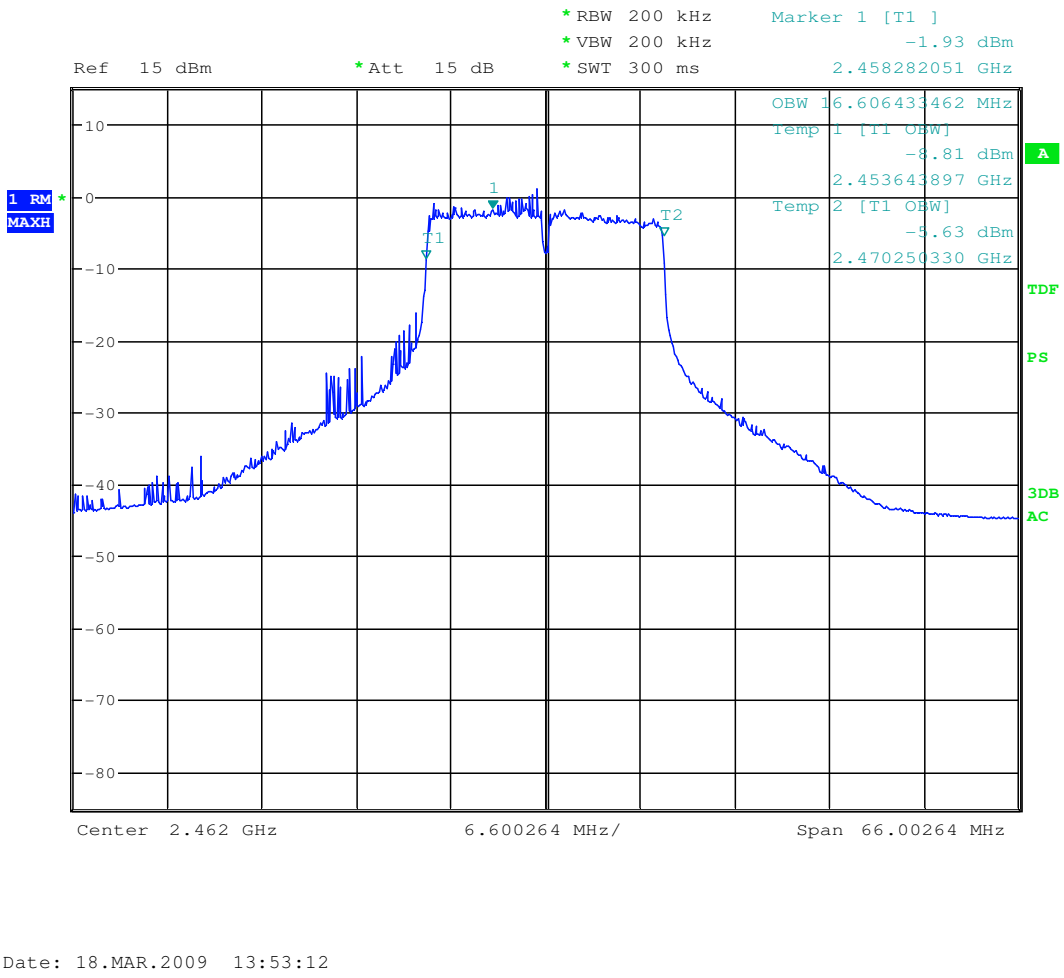


Date: 18.MAR.2009 13:55:19



7.4.3 Data Table – Occupied Bandwidth

Mode DSSS/ Channel BW = 5MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 1	2412	3.97	0.5	PASS
Ch 6	2437	3.97	0.5	PASS
Ch 11	2462	4.01	0.5	PASS

Mode OFDM/ Channel BW = 5MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 1	2412	4.49	0.5	PASS
Ch 6	2437	4.57	0.5	PASS
Ch 11	2462	4.53	0.5	PASS

Mode DSSS/ Channel BW = 10MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 1	2412	8.17	0.5	PASS
Ch 6	2437	8.17	0.5	PASS
Ch 11	2462	8.09	0.5	PASS

Mode OFDM/ Channel BW = 10MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 1	2412	10.42	0.5	PASS
Ch 6	2437	11.22	0.5	PASS
Ch 11	2462	11.30	0.5	PASS

Mode DSSS/ Channel BW = 20MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 1	2412	15.44	0.5	PASS
Ch 6	2437	15.87	0.5	PASS
Ch 11	2462	15.44	0.5	PASS

Mode OFDM / Channel BW = 20MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 1	2412	16.50	0.5	PASS
Ch 6	2437	16.60	0.5	PASS
Ch 11	2462	16.60	0.5	PASS

8.0 Power Spectral Density

8.1 Test Standard

FCC CFR 47, Part 15, Subpart B 15.247e.

| *(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.* |

8.2 Test Limits

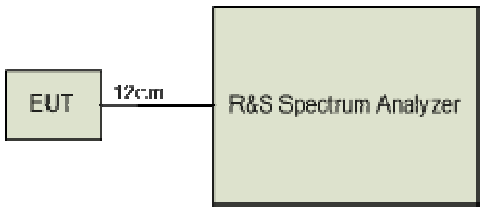
The transmitted power density shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The product was tested at low and high channels using both OFDM and DSSS modulations in 5,10, and 20 MHz bandwidths.

8.3.1 Test Setup Block Diagram



8.4 Test Results 15.247

The calculations below are based on the measurements done at 100 KHz RBW and shown in section 7 for occupied bandwidth. A factor of 15.23 dB is subtracted from the reading of marker 1 for correction to 3 KHz.

Data Table – Power Spectral Density

Mode DHSS/ Channel BW = 5MHz

Frequency(MHz)	PSD in 3 KHz (dBm)	Limit	Result
2412.0	2.11	8	PASS
2437,7	0.49	8	PASS
2461.4	0.68	8	PASS

Mode OFDM/ Channel BW = 5MHz

Frequency(MHz)	PSD in 3 KHz (dBm)	Limit	Result
2412.0	-0.27	8	PASS
2436.9	-2.02	8	PASS
2462.7	-2.62	8	PASS

Mode DHSS / Channel BW = 10MHz

Frequency(MHz)	PSD in 3 KHz (dBm)	Limit	Result
2412.7	-1.36	8	PASS
2437.6	-2.20	8	PASS
2461.7	-1.63	8	PASS

Mode OFDM/ Channel BW = 10MHz

Frequency(MHz)	PSD in 3 KHz (dBm)	Limit	Result
2413.9	-5.32	8	PASS
2438.4	-5.31	8	PASS
2463.4	-6.50	8	PASS

Mode DHSS / Channel BW = 20MHz

Frequency(MHz)	PSD in 3 KHz (dBm)	Limit	Result
2410.8	-6.27	8	PASS
2435.4	-5.45	8	PASS
2461.5	-7.60	8	PASS

Mode OFDM / Channel BW = 20MHz

Frequency(MHz)	PSD in 3 KHz (dBm)	Limit	Result
2412		8	PASS
2437		8	PASS
2462		8	PASS

9.0 RF Exposure Evaluation

FCC 1.1310 states the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Section 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Section 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation".

Frequency Range (MHZ)	Electric Field Strength (V/m)	Magnetic Field Strength (A/M)	Power Density (mW/cm^2)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

9.1 EUT Operating Condition

The maximum antenna gain is 19 dBi at 2.4 GHz.

9.2 RF exposure evaluation distance calculation

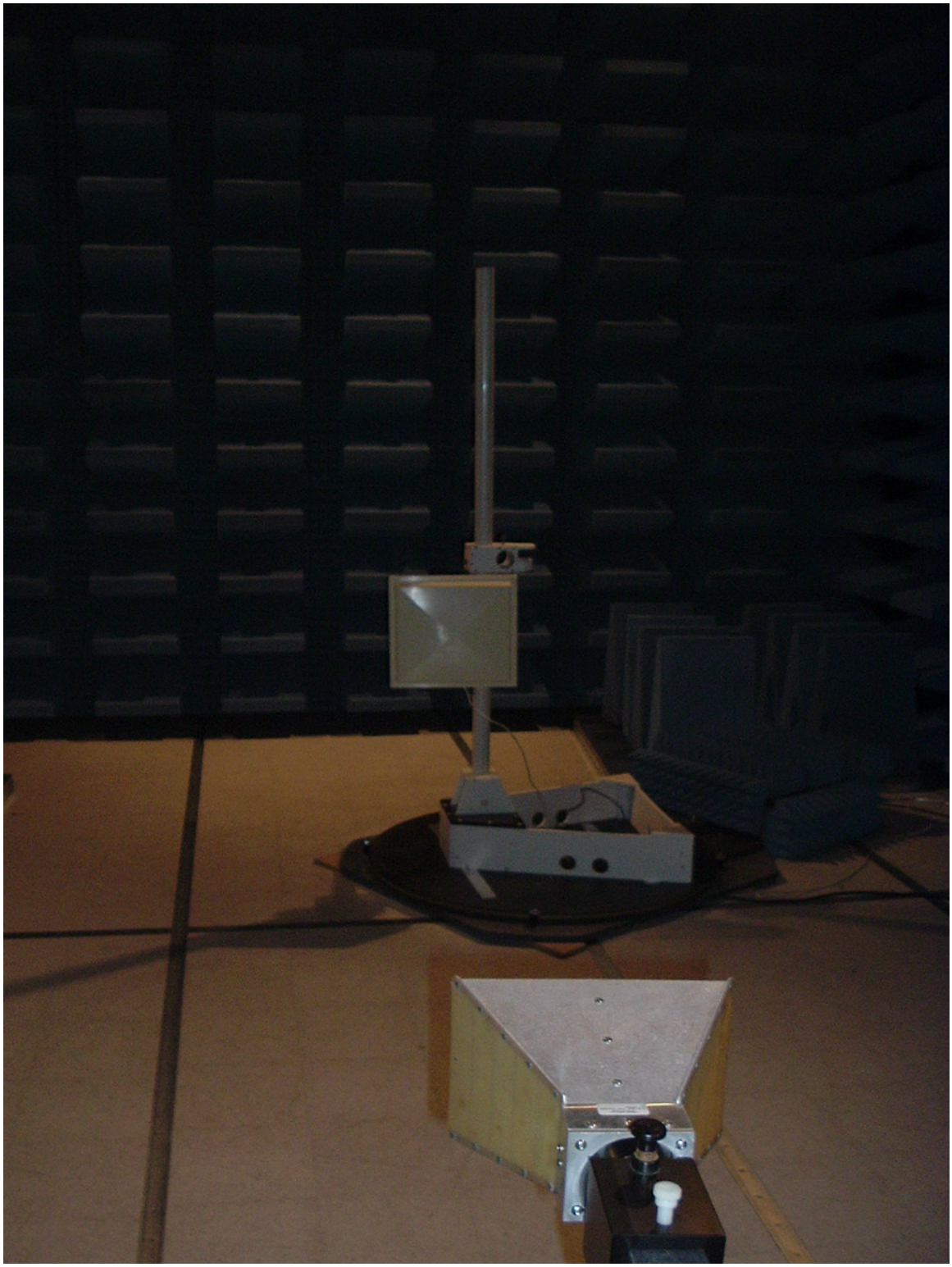
EUT with 19 dBi antenna

Freq (MHz)	Max Output Power to Antenna (dBm)	Antenna Gain (dBi)	r (cm)
2412	19.49	19	23.7
2437	19.60	19	24.0
2462	19.67	19	24.2

As shown above, the minimum distance where the MPE limit is reached is 24.2 cm for the EUT.

10.0 Test Photos

10.1 Radiated Emission Setup



10.2 Conducted Emission Setup