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CERTIFICATION TEST REPORT
PART 15.247C
IC RSS-210

For The Hand Held Data Collector
Model: WISard-550

FCC ID: XE3-WISARD550
IC: 8347A-WISARD550

PREPARED FOR:

WIS International
9265 Sky Park Court Suite 100
San Diego, CA 92123

Prepared on: April 24, 2009
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DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	April 24, 2009	Prepared By: Alan Laudani
-	April 24, 2009	Initial Release: Alan Laudani

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on April 21, 2009.
- Testing was performed on the unit described in this report on April 21, 2009 to April 23, 2009
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), Industry Canada, NVLAP or any other government agency.

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CERTIFICATION

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4–2003 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 15). The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample.

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.

Alan Laudani
EMC Engineer

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT:	WIS International 9265 Sky Park Court Suite 100 San Diego, CA 92123
CONTACT: E-Mail:	Contact contact@company.com
DATE (S) OF TEST:	April 21, 2009 to April 23, 2009
EQUIPMENT UNDER TEST (EUT):	Hand Held Data Collector
MODEL:	WISard-550
SERIAL NUMBER:	S614
CONDITION UPON RECEIPT:	Suitable for Test
TEST SPECIFICATION:	FCC, Part 15.247, Subpart C Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz bands and RSS 210 (Issue 7, June 2007) Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

1.2. Test Summary

Specification	*Frequency Range*	*Compliance Status*
FCC, CFR 47, Section 15.207	0.15 MHz - 30.00 MHz	Not tested. Battery Powered.
FCC, CFR 47, Section 15.209	30 MHz – 10th Harmonic	PASS
FCC CFR 47, §15.247 Plus Bandedge	2412--2462 MHz	PASS
RSS-210 - Low Power License Exempt Radio-communication Devices (All Frequency Bands)	2412--2462 MHz	PASS

Refer to the test results section for further details.

Alan Laudani
EMC Engineer

2. SYSTEM CONFIGURATION

2.1. Description and Method of Exercising the EUT

The WISard-550 is a Hand Held Data Collector. Its function is to collect inventory data. It includes a wireless LAN card for periodic transmission on demand of the data collected. For wireless testing, the EUT was exercised by a test program to maximize data transfer artificially for worst case testing. For conductive tests, a sample was tested in which the antenna was replaced by a SMA connector for direct connection into the spectrum analyzer. For data acquisition mode (normal use), a laptop notebook computer was connected to the LINKSYS access point. For immunity testing, if the notebook computer showed a drop of received data, or there is loss of functionality, this may be considered a failure.

The EUT's performance during test was evaluated against the performance criterion specified by applicable test standards. Performance results are detailed in the test results section of this report.

2.2. System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Hand Held Data Collector	WIS International Model: WISard-550 Serial #: S614	NA
Support – AC Adapter Laptop	DELL Model: PA-1650-05D2 Serial #: CN-OF7970-71615-77S-5FA7	1.5m, unshielded, 18 AWG, 3-wire, IEC connector
Support – Laptop Notebook	DELL Model: Inspiron 6400 Serial #:C0AD07899029301310	20 AWG coax
Support – Broadband Router	Linksys Model: Wireless-G Serial #: CGN91G913889	20 AWG Twin lead
Support – AC Adapter Router	Linksys Model: AD12V/0.5A-SW Serial #: 07090474986	2 prong wall wart

2.3. Device Interconnection and I/O Cables

Connection	I/O Cable
Laptop to Router	Ethernet 3m, unshielded, 26AWG, CAT 5 cable

2.4. Design Modifications for Compliance

The following design modifications were made to the EUT during testing.

No design modifications were made to the EUT during testing.

2.5. Technical Specifications of the EUT

Manufacturer: WIS International

Operating Frequency: 2412 MHz to 2462 MHz in the 2400-2483.5 MHz Band

Rated Power: 0.108 W

Modulation: DTS

Antenna Connector: None

Power Source: (4) AA batteries

3. DESCRIPTION OF TEST SITE AND ENVIRONMENT

3.1. Description of Test Site

The test site is located at 11696 Sorrento Valley Road, Suite F, San Diego, CA 92121. The site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications. The three and ten-meter Open Area Test Site (OATS) is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN 55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-2001 documents. The OATS normalized site attenuation characteristics are verified for compliance every year, and registered with the Federal Communications Commission under Registration Number 90579 and Industry Canada under 2040B-1 and 2040B-2.

3.2. Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	21--29 ^{o}C
Humidity range	:	15--40%
Pressure range	:	87 - 105 kPa

4. DESCRIPTION OF TESTING METHODS

4.1. Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document ANSI C63.4–2003, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on the following page.

Digital devices sold in Canada are required to comply with the Interference Causing Equipment Standard for Digital Apparatus, ICES-003. These test methods and limits are specified in the Canadian Standards Association's (CSA) Standard C108.8-M1983 (1-1-94 version) and are "essentially equivalent" with FCC, Part 15 and CISPR 22 (EN55022) rules for unintentional radiators per EMCAB-3, Issue 3 (May 1998). No further testing is required for compliance to ICES-003.

4.2. Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. The EUT is powered via a Line Impedance Stabilization Network (LISN). The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 kHz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

4.3. Configuration and Methods of Measurements for Frequency Identification

When performing all testing of equipment, the actual emissions of the EUT are segregated from ambient signals present within the laboratory or the open-field test range. Preliminary testing is performed to ensure that ambient signals are sufficiently low to allow for proper observation of the emissions from the EUT. Incoming power lines are filtered using a 120 dB, 30-ampere; 115/208-volt filter to assist in reducing ambient signals for tests of levels of conducted emissions. Ambients within the laboratory are compared to those noted at the nearby open-field site to discriminate between signals produced from the EUT and ambient signals. In the event that a significant emission is produced by the EUT at a frequency which is also demonstrating significant ambient signals, the spectrum analyzer is placed in the peak mode, the bandwidth is narrowed, the EUT's signal is centered on the analyzer, the scan width is expanded to 50 kHz while monitoring the audio to ensure that only the EUT signal is present, the analyzer is switched to quasi-peak mode, and the level of the EUT signal is recorded.

4.4. Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Next, the EUT and associated system are placed on a turntable on a ten meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten meters from the EUT.

The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. All significant radiated emissions are recorded when maximum radiation on each frequency is observed, in accordance with part 8 of ANSI C63.4–2003 and Section 15.33 of the FCC Rules. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance.

The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/m
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dB/m

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dB/m (antenna factor @ frequency)
36.9 dBuV/m Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

5. Test Results

5.1. Conducted Emissions

Part 15.207(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.

7.2.2 The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network. Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries. The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network

Frequency Range (MHz)	Conducted Limit (dBuV)	
	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.

5.1.1. Conducted Emissions Test Data – Transmit Mode

Client	WIS International	Temperature		°F
PAN #	24621-1	Relative Humidity		%
EUT Name	Hand Held Data Collector	Barometric Pressure		Hg
EUT Model	WISard-550	Test Location	Enclosure 1	
Governing Doc	CFR 47, Part 15B	Test Engineer	Alan Laudani	
Basic Standard	Sec. 15.207	Date		
Parameters	Not tested as EUT is battery powered and batteries are charged at a charging station.			

5.1.2. Conducted Emissions Test Data – Receive mode

Client	WIS International	Temperature		°F
PAN #	24621-1	Relative Humidity		%
EUT Name	Hand Held Data Collector	Barometric Pressure		Hg
EUT Model	WISard-550	Test Location	Enclosure 1	
Governing Doc	CFR 47, Part 15B	Test Engineer	Alan Laudani	
Basic Standard	Sec. 15.107	Date		
Parameters	Not tested as EUT is battery powered and batteries are charged at a charging station.			

5.2. Radiated Emissions Test Data – Digital Emissions

Emissions due to digital functions reported below, Emissions were searched over a range of 30 MHz to 25000 MHz
Example Frequency = 45.9 MHz
57.7 dBuV (spectrum analyzer reading)
+0.8 dB (cable loss @ frequency)
+11.2 dB/m (antenna factor @ frequency)
-32.6 dB (PreAmp Gain @ frequency)
37.1 dBuV/m Final adjusted value

Radiated Emissions Data

Job # :	24621-1	Date :	4-21-09	Page	1 of 1
NEX #:	126887	Time :	0945		
		Staff :	aal		
Client Name :	WIS International			EUT Voltage :	6
EUT Name :	Hand Held Data Collector			EUT Frequency :	DC
EUT Model # :	WISard-550			Phase:	
EUT Serial # :	S614			NOATS	
EUT Config. :	Normal transmiting within WIS 555 handheld computer			SOATS	X
				Distance < 1000 MHz:	3 m
				Distance > 1000 MHz:	3 m
Specification :	CFR47 Part 15, Subpart B, Class B				
Loop Ant. #:	NA				
Bicon Ant.#:	128_3m	Temp. (°C) :	29		
Log Ant.#:	110_3M	Humidity (%) :	15		
DRG Ant. #	NA	Spec An.#:	897		
Cable LF#:	SOATS	Spec An. Display #:	897		
Cable HF#:	NA	QP #:	897		
Preamp LF#:	827	PreSelect#:	NA		
Preamp HF#	NA				

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBµV)	Corrected Reading (dBµV/m)	Spec. limit (dBµV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
45.9	57.7	52.5	Q	-	1.0	57.7	37.1	40.0	-2.9	Pass	TRANSMITTER ON
100.0	51.1	48.5	Q	-	1.0	51.1	31.2	43.5	-12.3	Pass	
169.1	37.0	39.1	Q	-	1.0	39.1	23.0	43.5	-20.5	Pass	
208.0	43.9	50.2	Q	-	1.0	50.2	31.6	43.5	-11.9	Pass	
233.5	45.7	34.8	Q	-	2.5	45.7	26.7	46.0	-19.3	Pass	
258.1	53.6	39.5	Q	-	2.0	53.6	35.5	46.0	-10.5	Pass	
312.0	58.8	45.7	Q	-	1.0	58.8	43.9	46.0	-2.1	Pass	
364.0	53.3	35.5	Q	-	1.0	53.3	38.5	46.0	-7.5	Pass	
935.3	41.1	39.6	Q	-	1.0	41.1	37.2	46.0	-8.9	Pass	
											TRANSMITTER OFF
45.9	57.6	52.5	Q	-	1.0	57.6	37.0	40.0	-3.0	Pass	Receive mode
100.0	51.1	48.5	Q	-	1.0	51.1	31.2	43.5	-12.3	Pass	
169.1	37.0	39.1	Q	-	1.0	39.1	23.0	43.5	-20.5	Pass	
208.0	41.8	39.5	Q	-	1.0	41.8	23.2	43.5	-20.3	Pass	
233.5	41.2	35.5	Q	-	1.0	41.2	22.2	46.0	-23.8	Pass	
258.1	46.2	38.5	Q	-	1.0	46.2	28.1	46.0	-17.9	Pass	
312.0	49.4	43.2	Q	-	1.0	49.4	34.5	46.0	-11.5	Pass	
364.0	43.3	35.7	Q	-	1.0	43.3	28.5	46.0	-17.5	Pass	
935.3	37.8	34.4	Q	-	1.0	37.8	33.9	46.0	-12.1	Pass	

5.3. Bandwidth

RSS-Gen 4.6.1
When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

Sample Number:	WISard-550	Temperature:	29° C
Date:	April 21, 2009	Humidity:	15%
Modification State:	Lo/Mid/High Channels	Tester:	Alan Laudani
		Laboratory:	SOATS

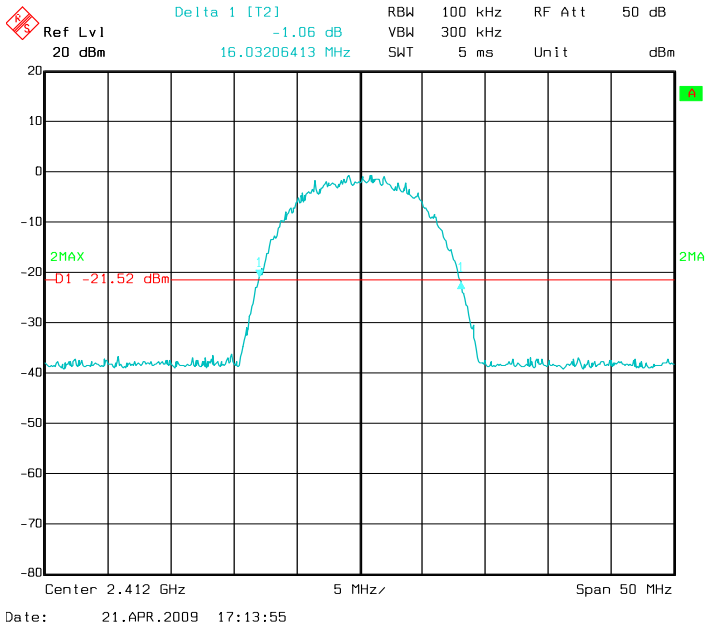
15.247(a)(1)
Measurements were conductively. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was measured, a DISPLAY line was drawn 20 dB lower than PEAK level. The bandwidth was determined from where the channel output spectrum intersected the display line. The EUT had new batteries installed prior to test.

Test Results:

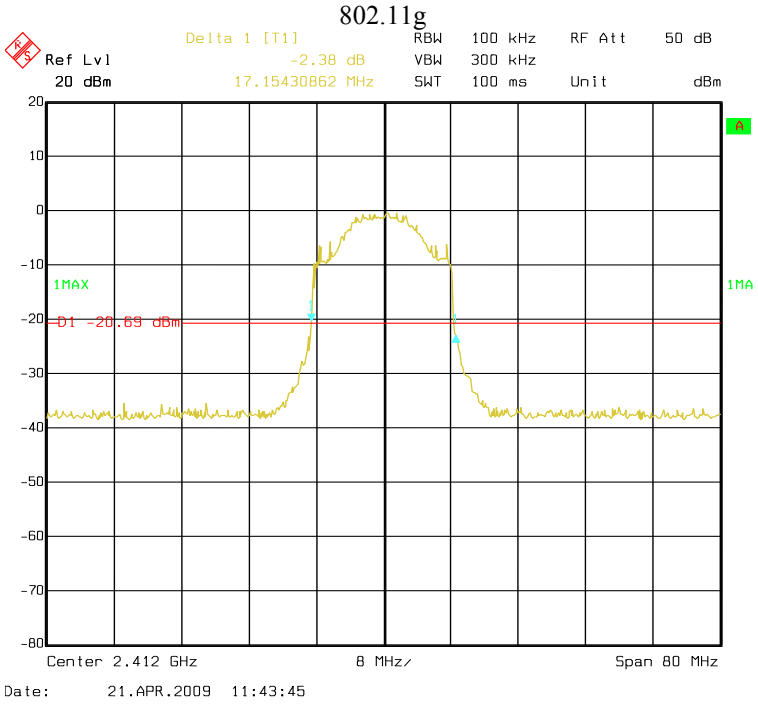
	20 dB Bandwidth (MHz)		
	Low Channel	Mid Channel	High Channel
B - Mode	16.0	15.5	16.1
G - Mode	17.1	17.1	17.0

Low Channel

802.11b

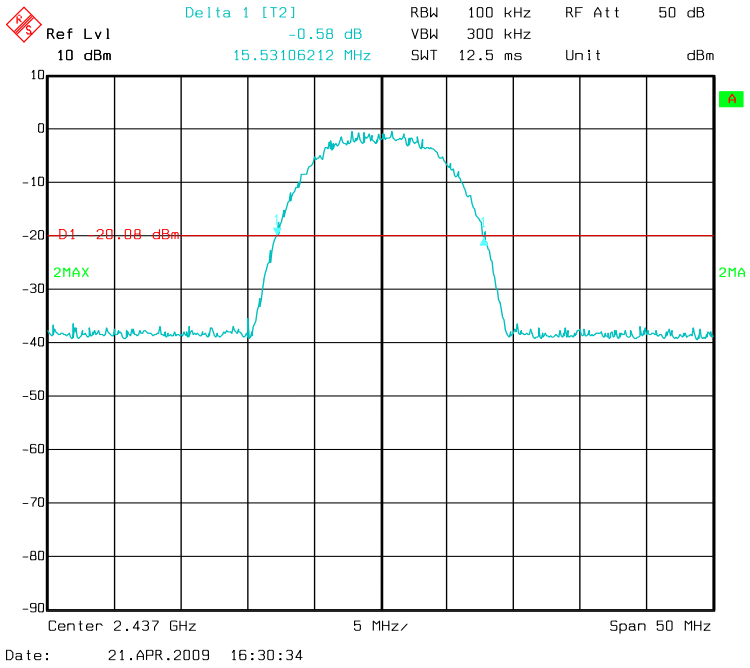


802.11g

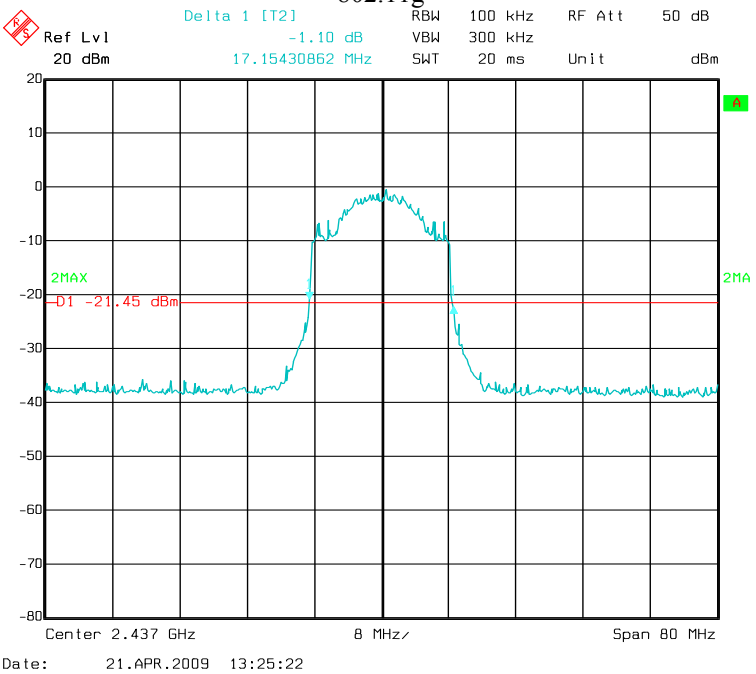


Mid Channel

802.11b

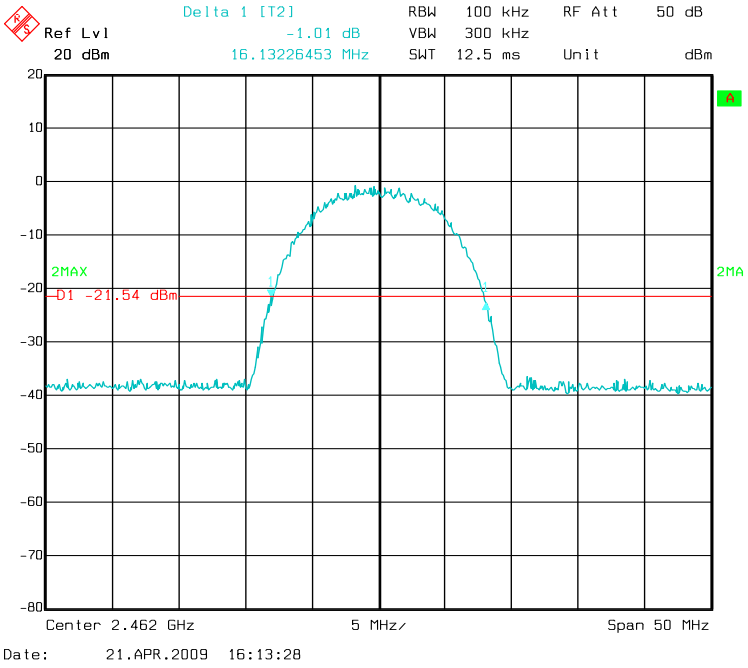


802.11g

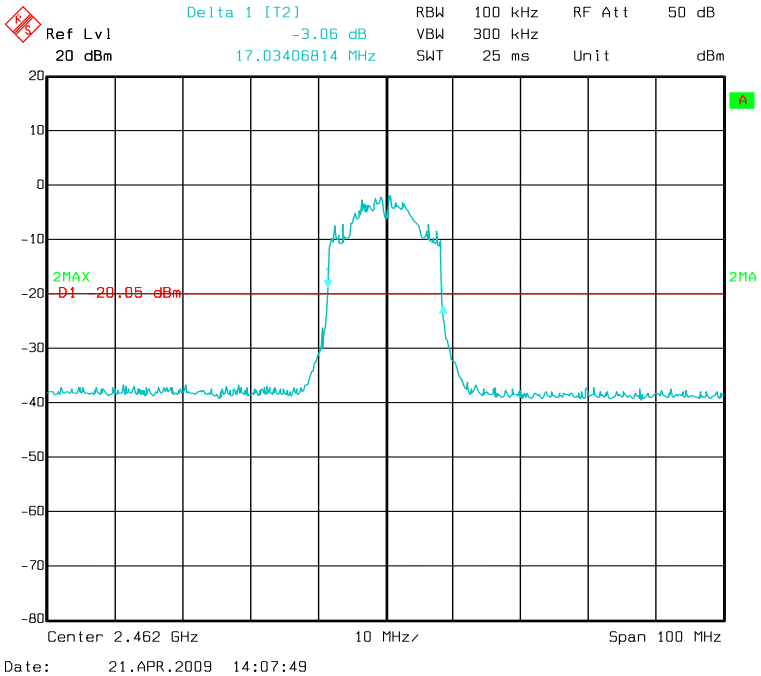


High Channel

802.11b



802.11g



5.4. Out-of-band Emissions / Conducted Emissions

15.247 (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 Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

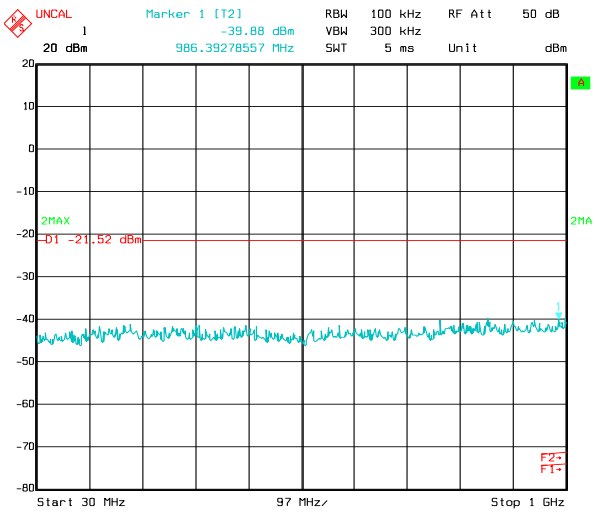
A8.5 Out-of-band Emissions

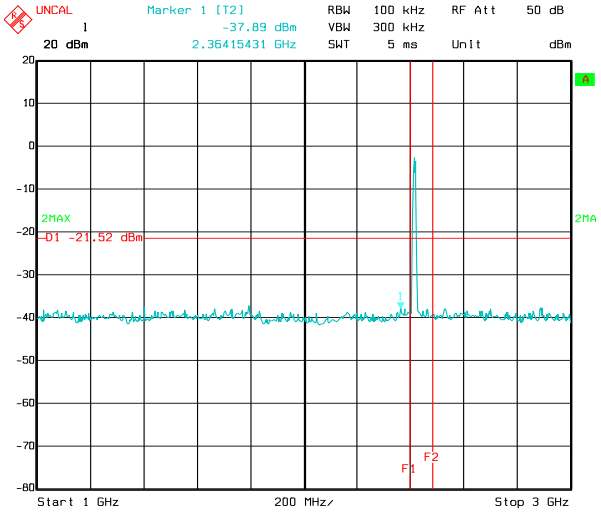
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based 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 Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

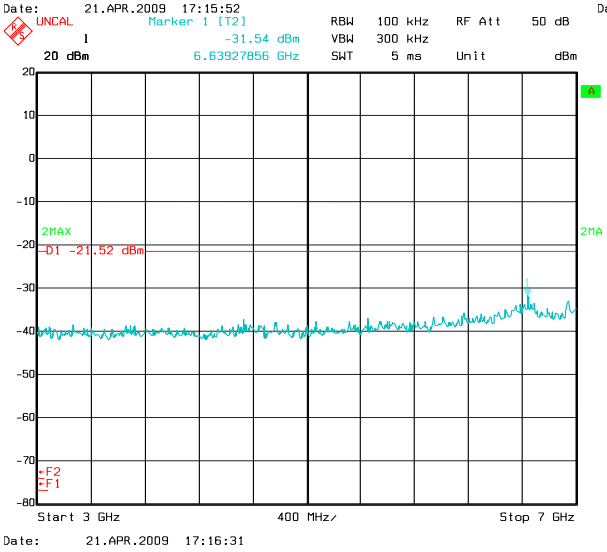
Test Results: EUT Complies
Plots from 30 to 25000MHz:

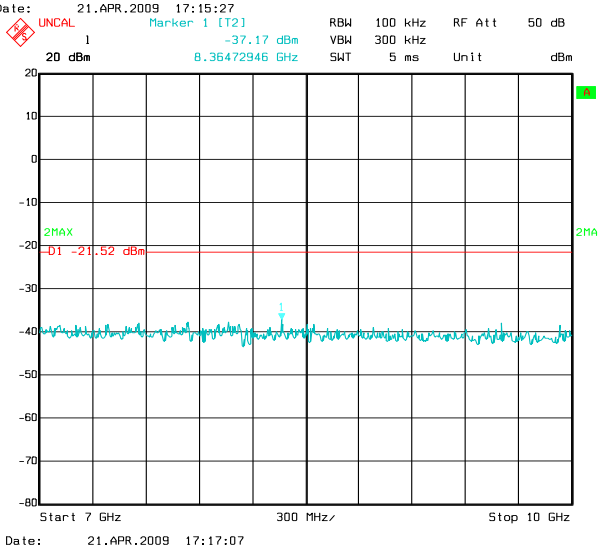
(Peak—Max Hold), Red limit line is 20dB below the highest in-band emission.

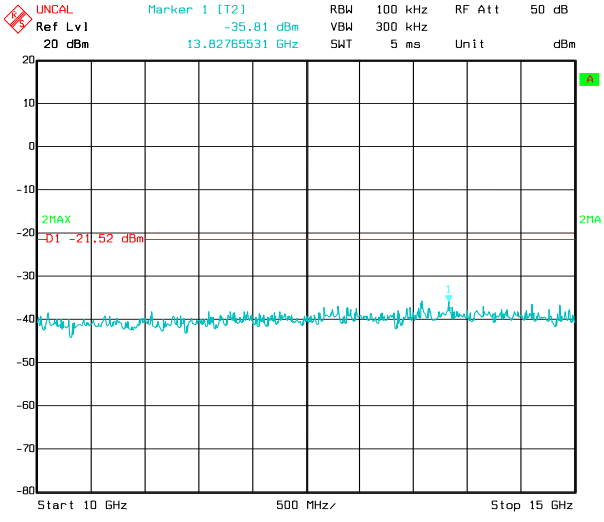
802.11b Mode Low Channel

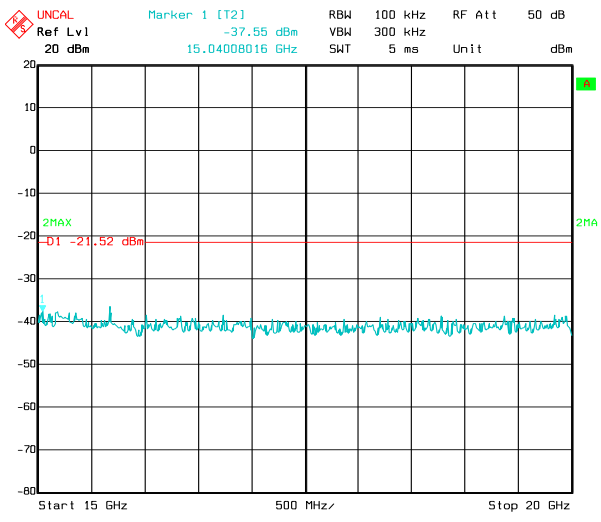









UNCAL
Ref Lvl
20 dBm
Marker 1 [T2]
-35.81 dBm
13.82765531 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 50 dB
Unit dBm
2MAX
D1 -21.52 dBm
2MA
Start 10 GHz
500 MHz/
Stop 15 GHz
Date 21.APR.2009 17:17:36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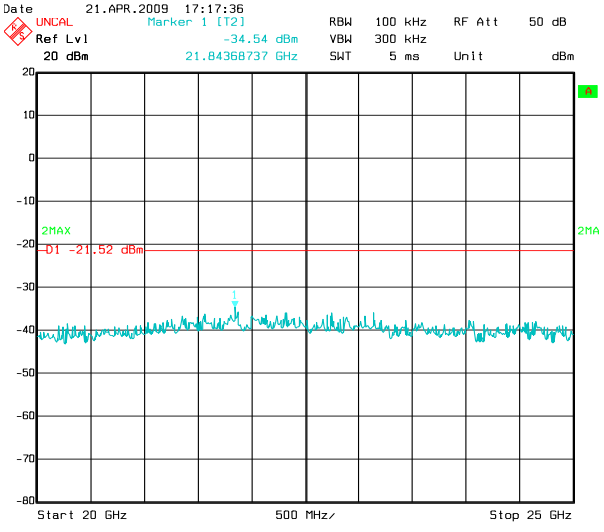
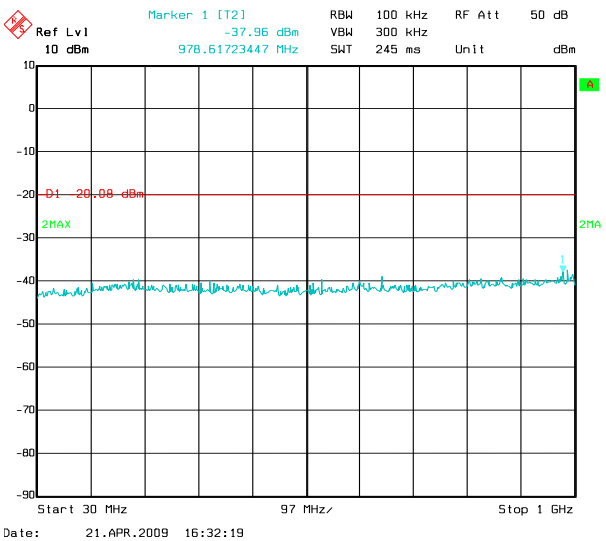
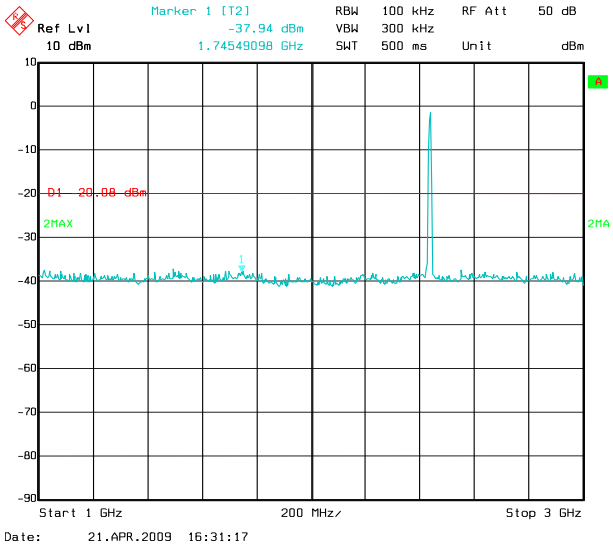
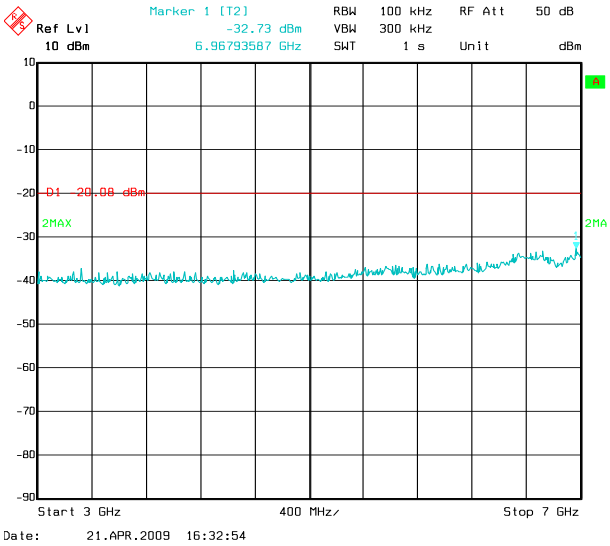
Marker 1 [T2]
-37.55 dBm
15.04008016 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 50 dB
Unit dBm
2MAX
D1 -21.52 dBm
2MA
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.APR.2009 17:18:15

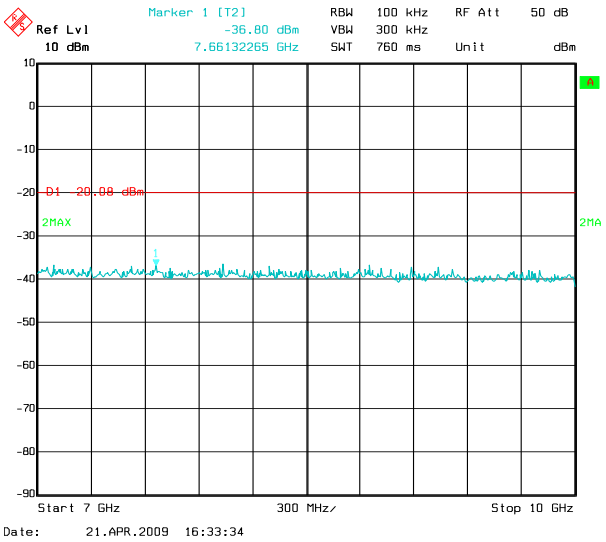

UNCAL
Ref Lvl
20 dBm
Marker 1 [T2]
-34.54 dBm
21.84368737 GHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 50 dB
Unit dBm
2MAX
D1 -21.52 dBm
2MA
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.APR.2009 17:18:41

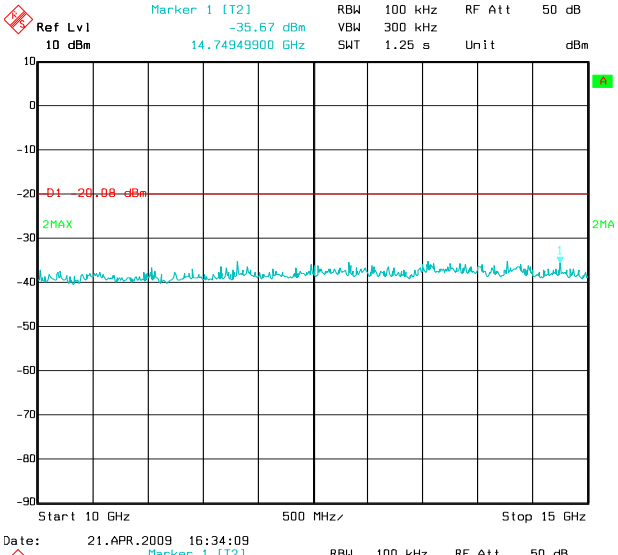
802.11b Mode Mid Channel

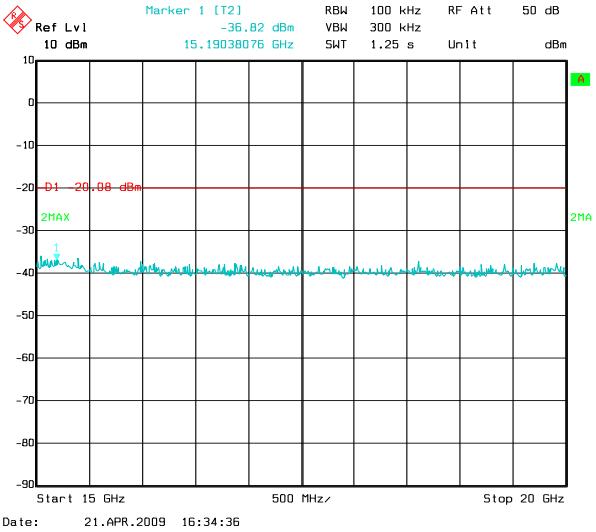


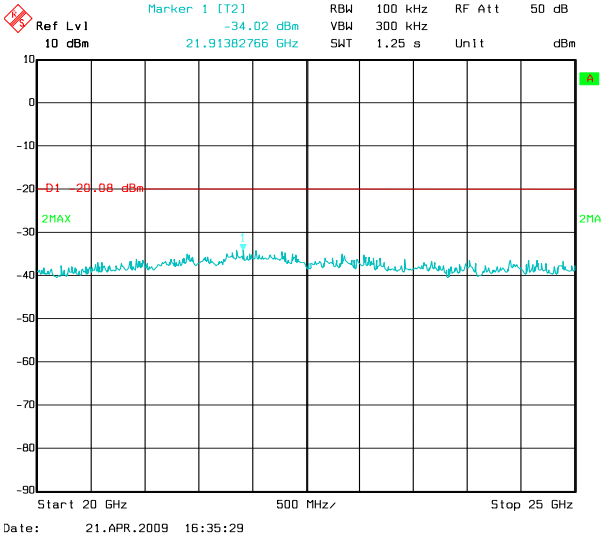




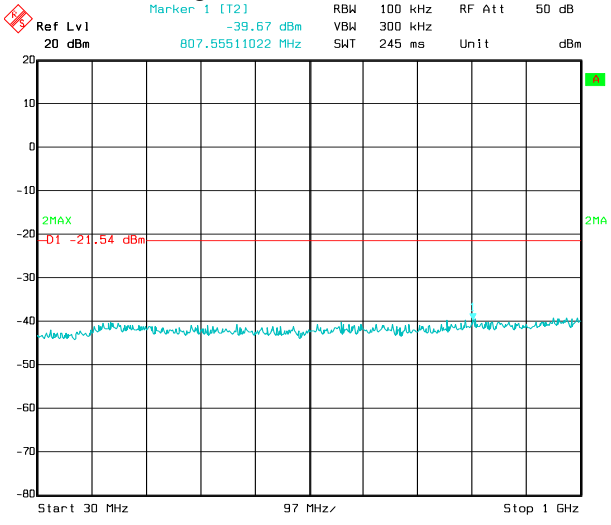


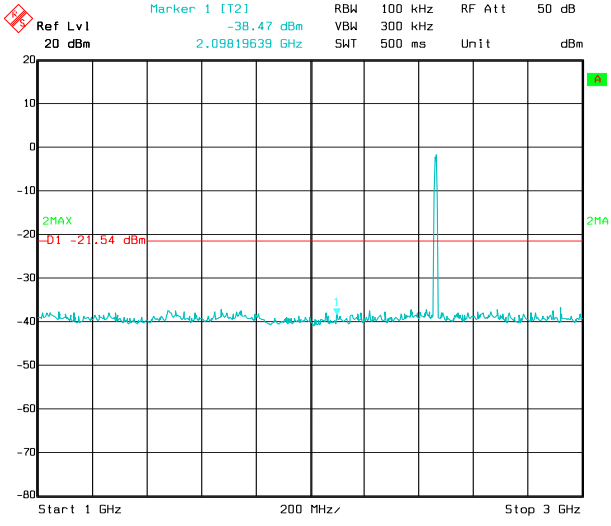

Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-35.67 dBm
VBW 300 kHz
10 dBm
14.74949900 GHz
SWT 1.25 s
Unit dBm
D1 -20.08 dBm
2MAX
2MA
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.APR.2009 16:34:09

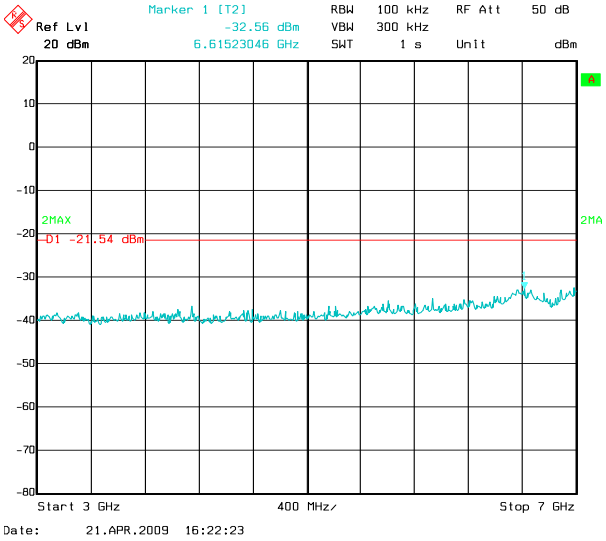

Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-36.82 dBm
VBW 300 kHz
10 dBm
15.19038076 GHz
SWT 1.25 s
Unit dBm
D1 -20.08 dBm
2MAX
2MA
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.APR.2009 16:34:36

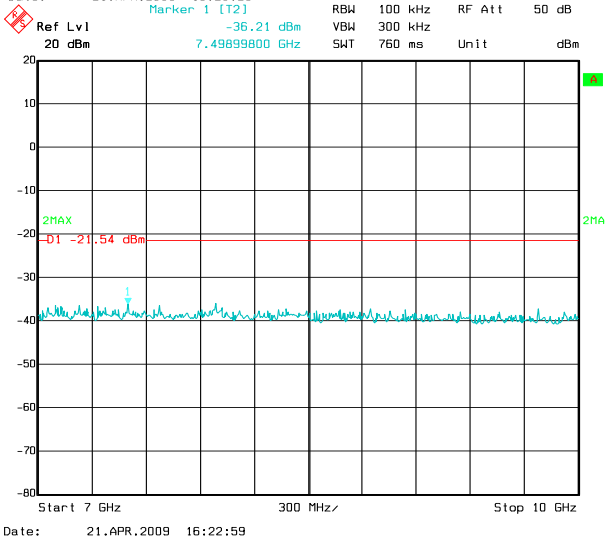

Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-34.02 dBm
VBW 300 kHz
10 dBm
21.91382766 GHz
SWT 1.25 s
Unit dBm
D1 -20.08 dBm
2MAX
2MA
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.APR.2009 16:35:29

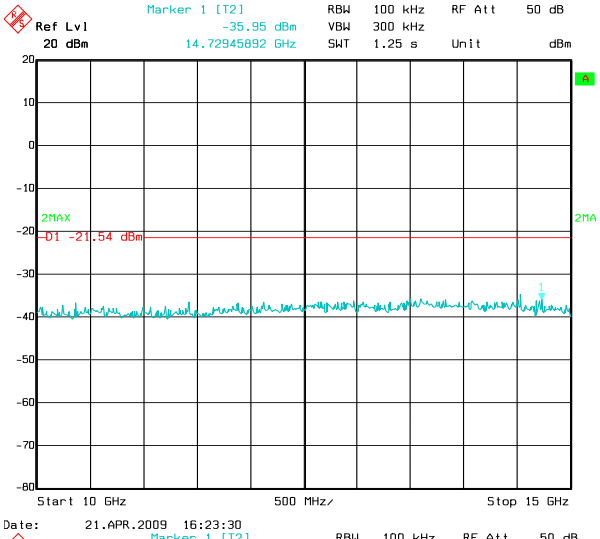
802.11b Mode High Channel

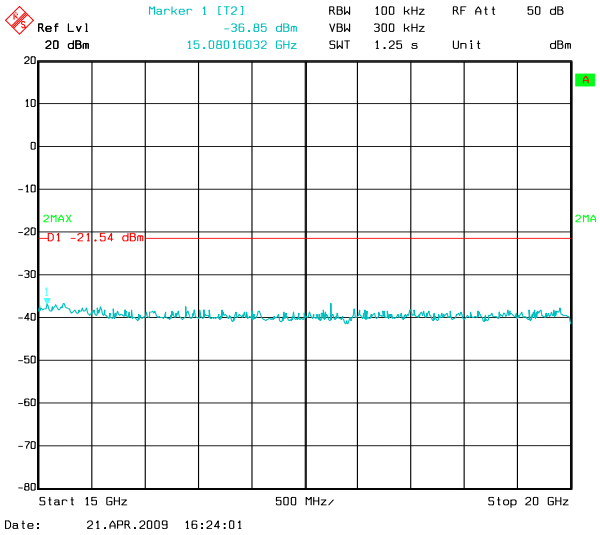


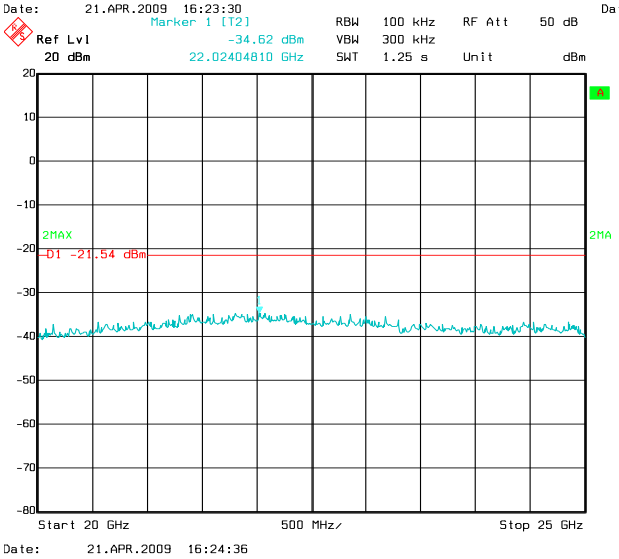




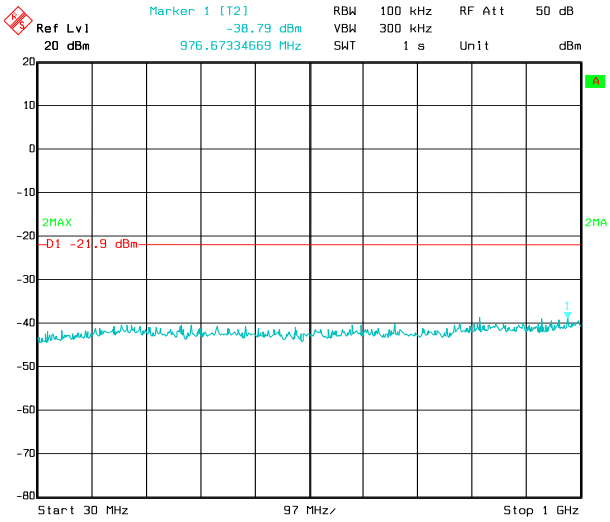


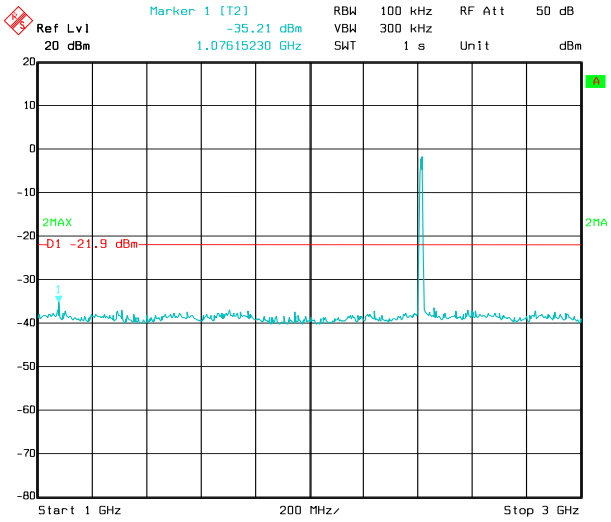

Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-35.95 dBm
VBW 300 kHz
20 dBm
14.72945892 GHz
SWT 1.25 s
Unit dBm
2MAX
D1 -21.54 dBm
2MA
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.APR.2009 16:23:30

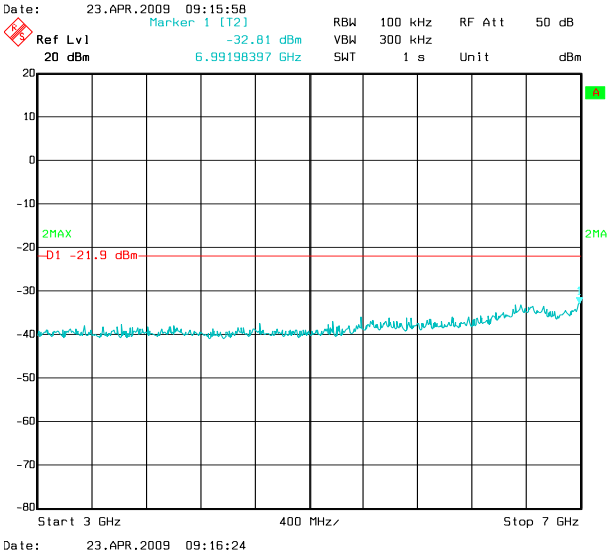

Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-36.85 dBm
VBW 300 kHz
20 dBm
15.08016032 GHz
SWT 1.25 s
Unit dBm
2MAX
D1 -21.54 dBm
2MA
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.APR.2009 16:24:01

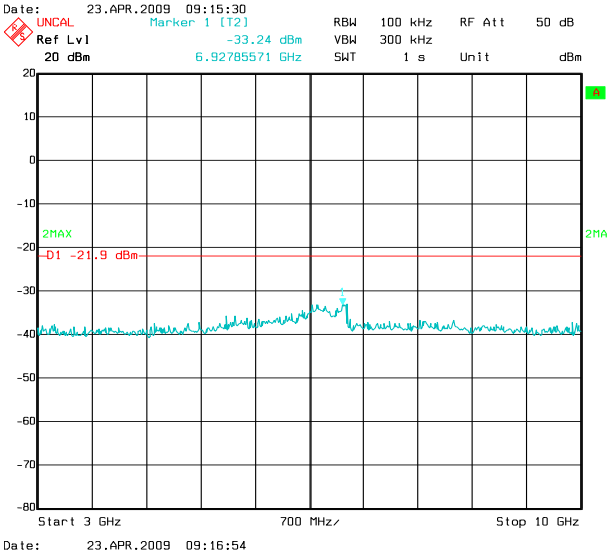

Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-34.62 dBm
VBW 300 kHz
20 dBm
22.02404810 GHz
SWT 1.25 s
Unit dBm
2MAX
D1 -21.54 dBm
2MA
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.APR.2009 16:24:36

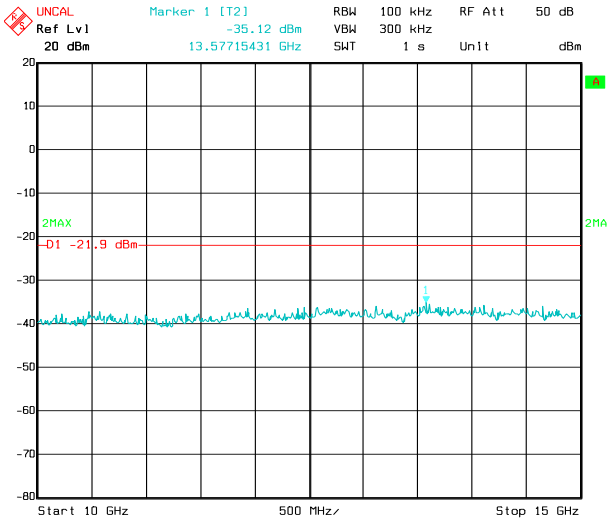
802.11g Mode Low Channel

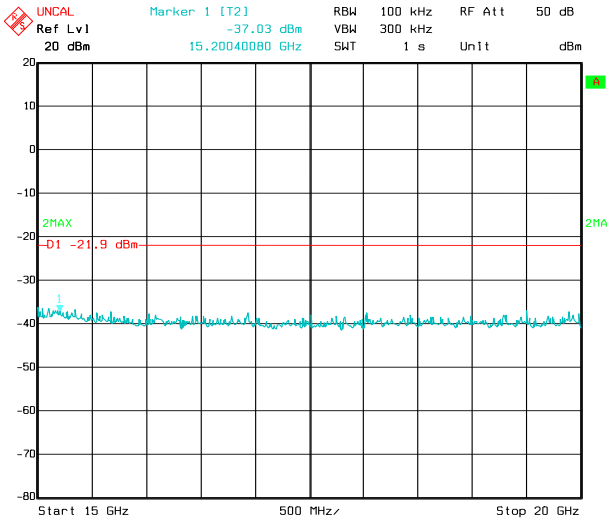


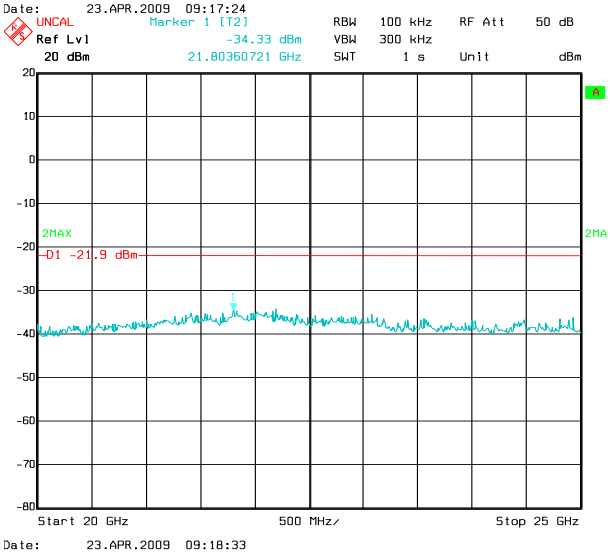




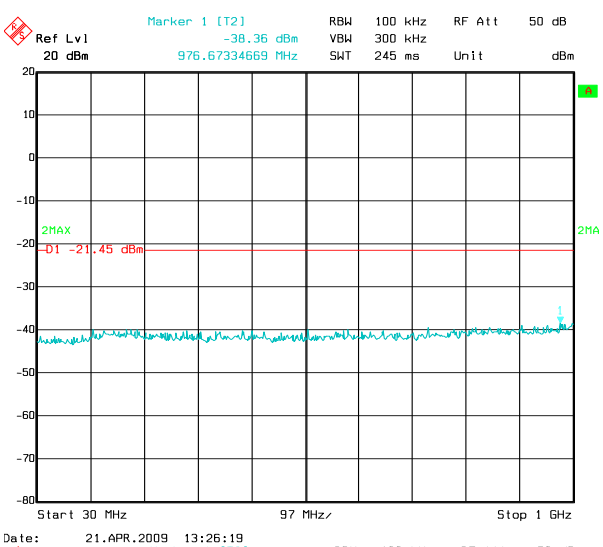


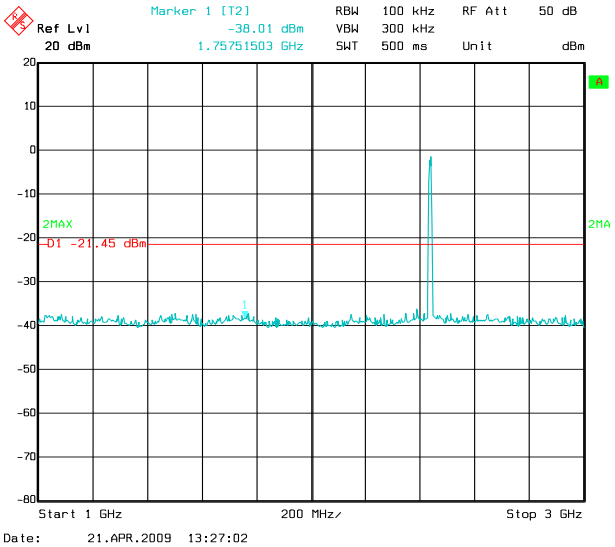

UNCAL
Ref Lvl
20 dBm
Marker 1 [T2]
-35.12 dBm
13.57715431 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1 s
RF Att 50 dB
Unit dBm
2MAX
D1 -21.9 dBm
2MA
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 23.APR.2009 09:17:24

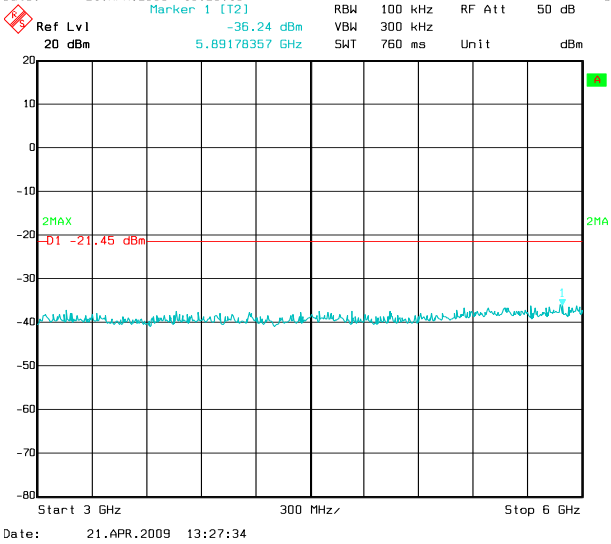

UNCAL
Ref Lvl
20 dBm
Marker 1 [T2]
-37.03 dBm
15.20040080 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1 s
RF Att 50 dB
Unit dBm
2MAX
D1 -21.9 dBm
2MA
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 23.APR.2009 09:18:02

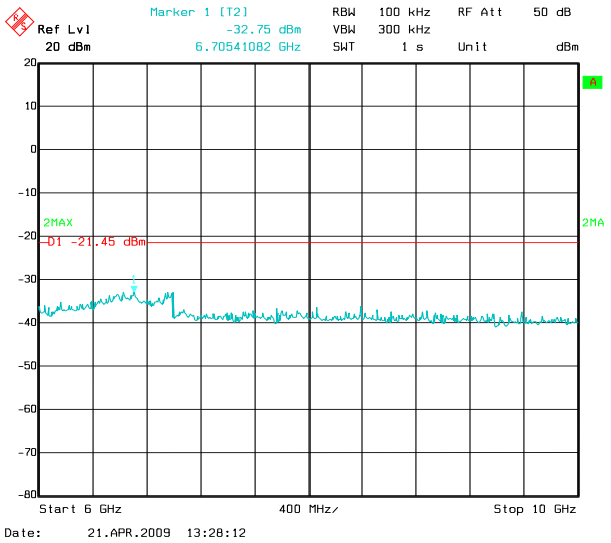

UNCAL
Ref Lvl
20 dBm
Marker 1 [T2]
-34.33 dBm
21.80360721 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1 s
RF Att 50 dB
Unit dBm
2MAX
D1 -21.9 dBm
2MA
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 23.APR.2009 09:18:33

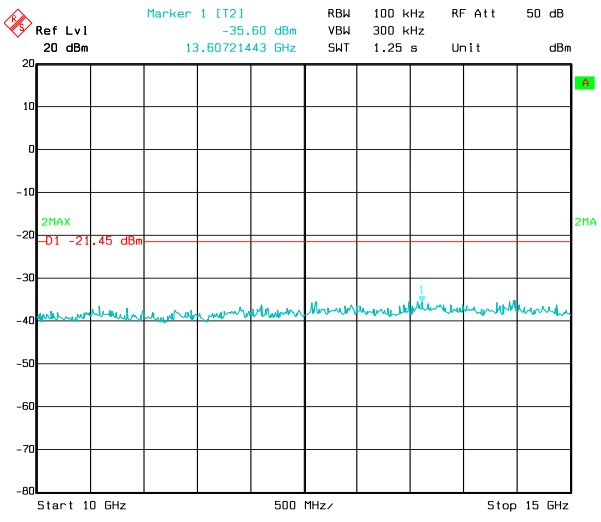
802.11g Mid Channel

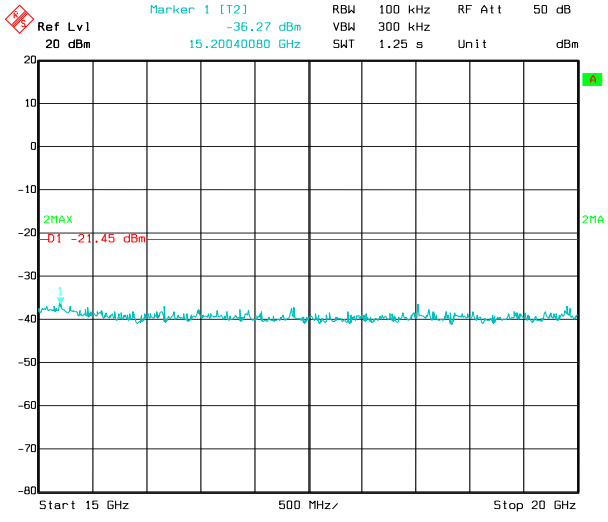


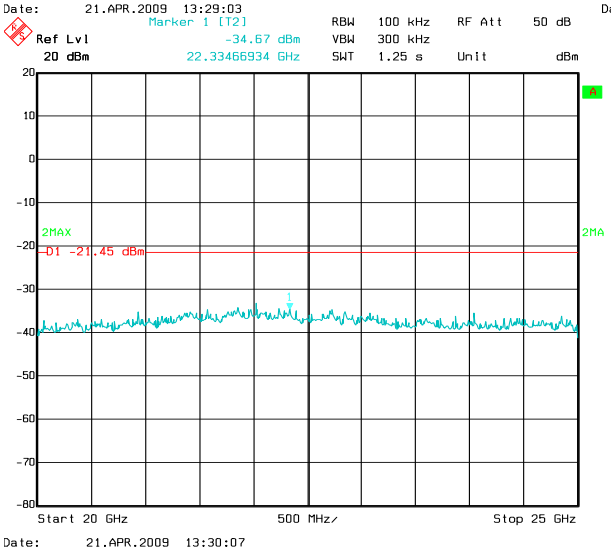




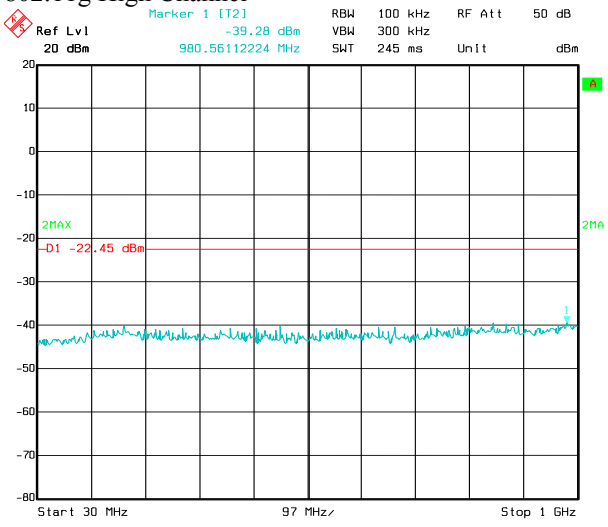


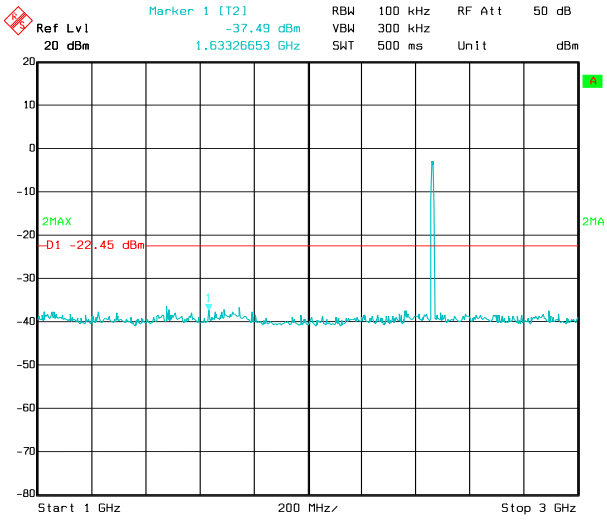

Marker 1 [T2]
-35.60 dBm
13.60721443 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1.25 s
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
2MAX
D1 -21.45 dBm
2MA
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.APR.2009 13:29:03

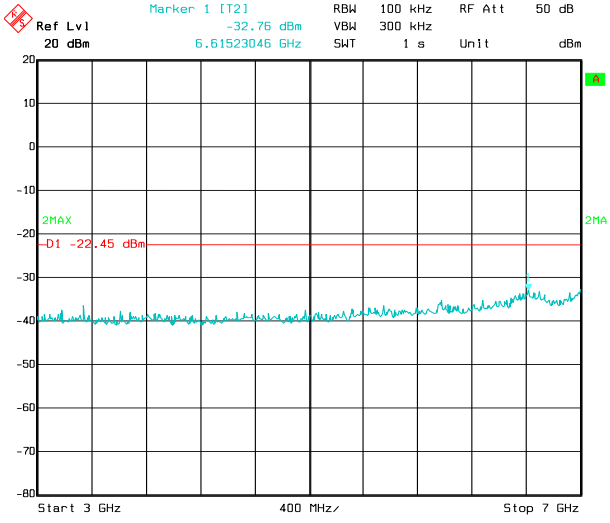

Marker 1 [T2]
-36.27 dBm
15.20040080 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1.25 s
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
2MAX
D1 -21.45 dBm
2MA
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.APR.2009 13:29:35

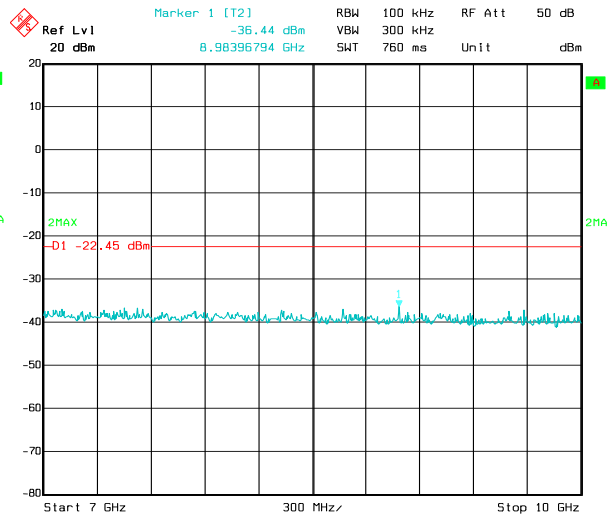

Marker 1 [T2]
-34.67 dBm
22.33466934 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1.25 s
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
2MAX
D1 -21.45 dBm
2MA
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.APR.2009 13:30:07

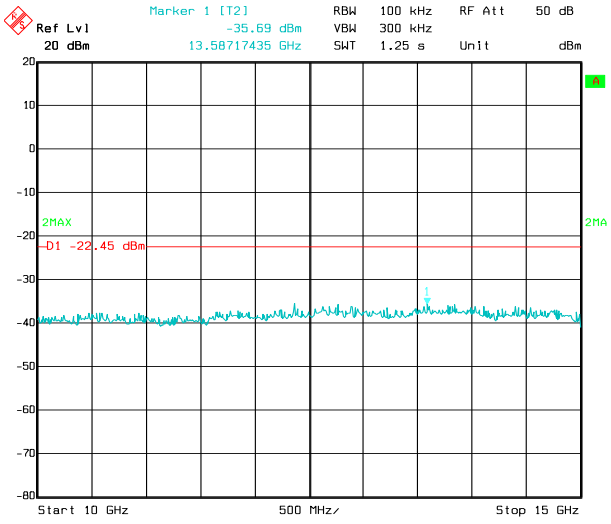
802.11g High Channel

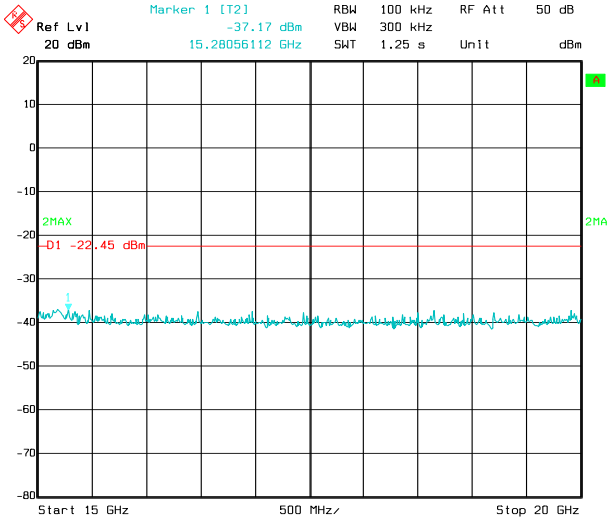


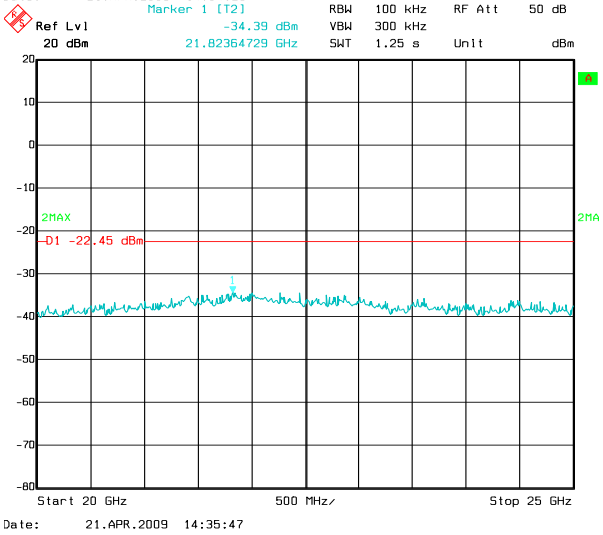







Marker 1 [T2]
-35.69 dBm
13.58717435 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1.25 s
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
2MAX
D1 -22.45 dBm
2MA
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.APR.2009 14:34:29


Marker 1 [T2]
-37.17 dBm
15.28056112 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1.25 s
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
2MAX
D1 -22.45 dBm
2MA
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.APR.2009 14:34:59


Marker 1 [T2]
-34.39 dBm
21.82364729 GHz
RBW 100 kHz
VBW 300 kHz
SWT 1.25 s
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
2MAX
D1 -22.45 dBm
2MA
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.APR.2009 14:35:47

5.5. Out-of-band Emissions / Radiated Emissions within Restricted Bands

(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 (uV/meter)	Measurement Distance (meter)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

15.247 (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 Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

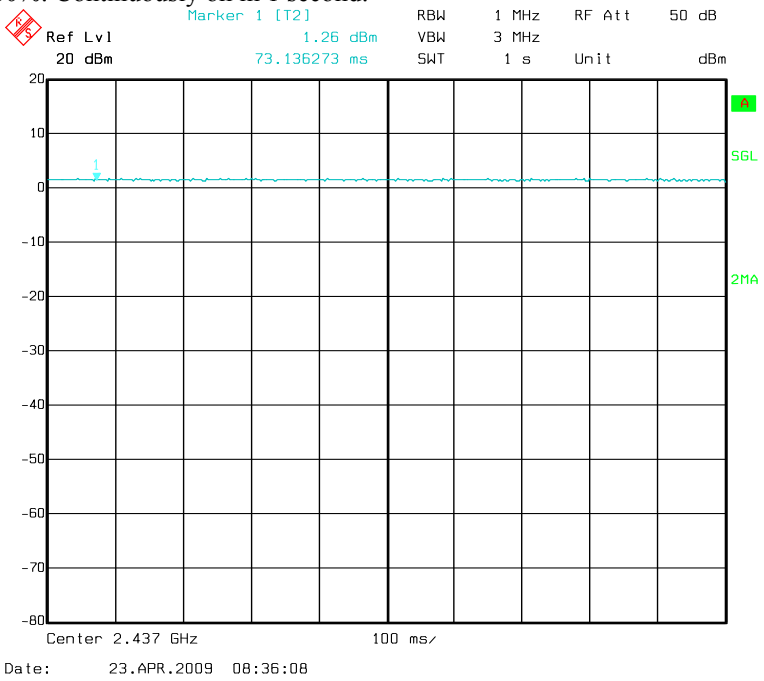
Test Results: EUT Complies

No emissions observed other than the fundamental.

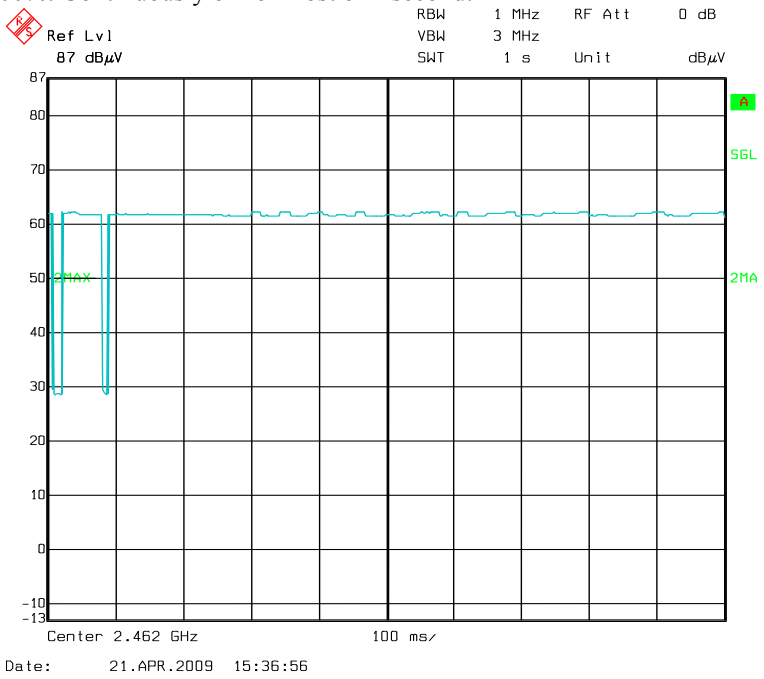
Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic, 25000 MHz.
  There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- The EUT was measured on three orthogonal axes. Worst case emissions presented.
- Radiated Measurements below 1GHz were performed at 3m with a Quasi-Peak detector (RBW 120kHz/VBW 300kHz) while Radiated Peak (RBW 1MHz/VBW 3MHz) and Average (RBW 1MHz/VBW 10Hz) measurements conducted above 1GHz.
- The device has an integral antenna.
- Worst case duty cycle 100%.
- Plots below of bandedge measurements illustrate tabled values below.

802.11g Duty Cycle100%: Continuously on in 1 second:

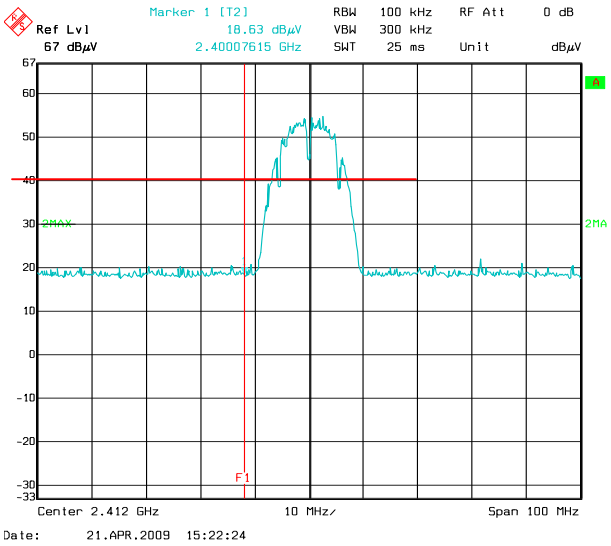


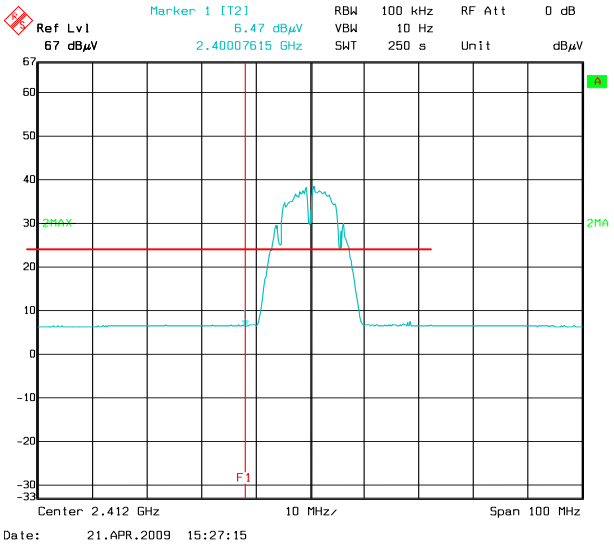
802.11b Duty Cycle 100%: Continuously on for most of 1 second:

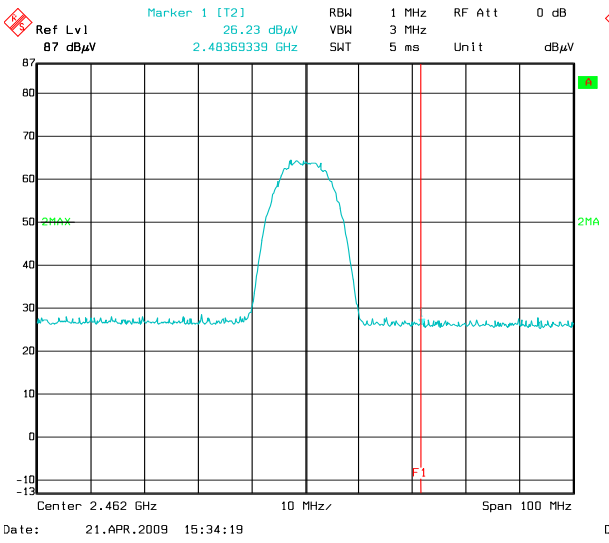


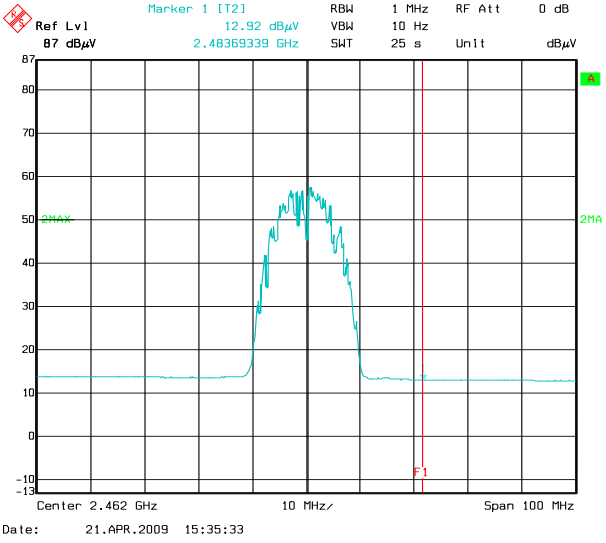
5.6. Bandedge Measurements

802.11b – Mode

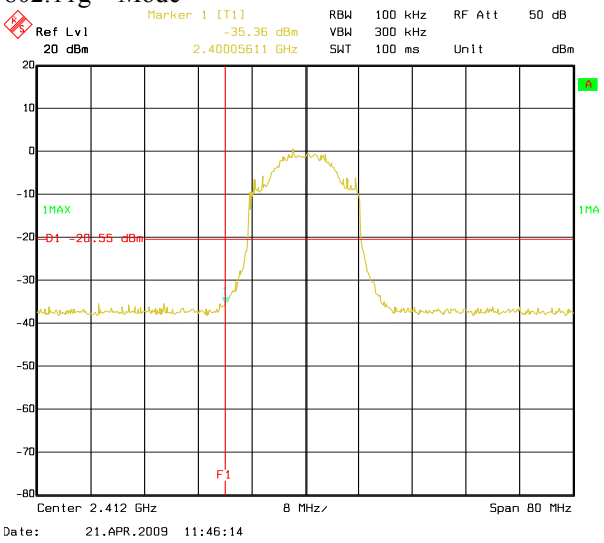


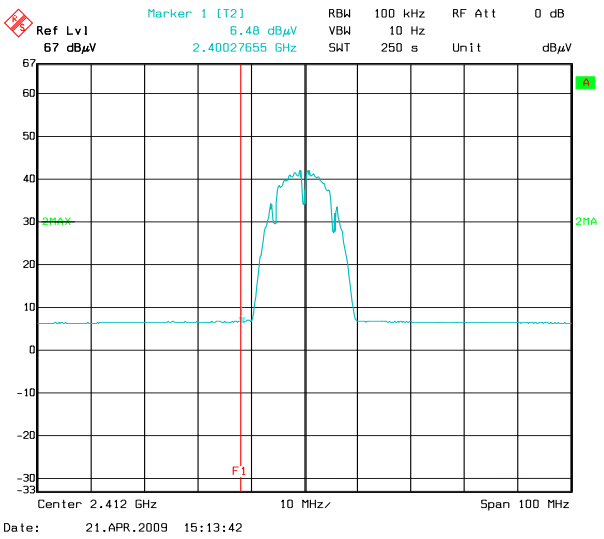


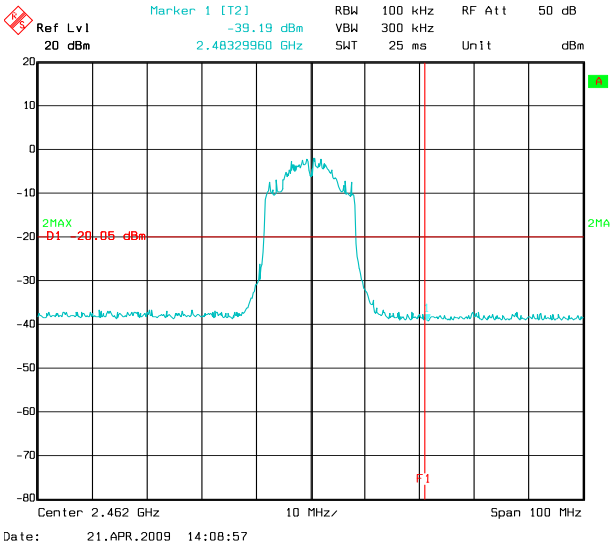


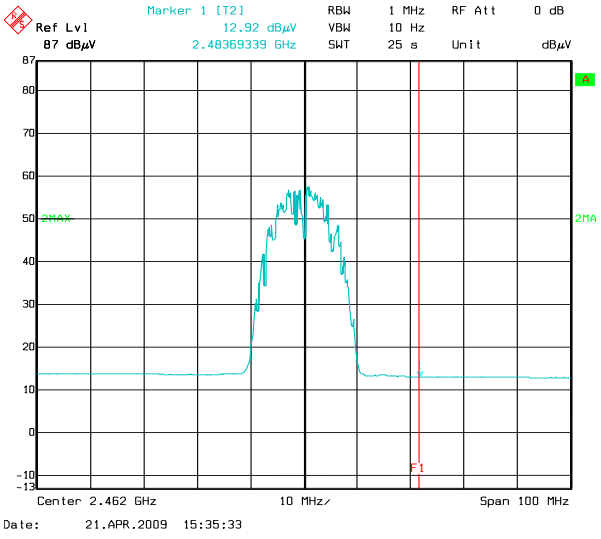


802.11g – Mode


Marker 1 [T1]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-35.36 dBm
VBW 300 kHz
20 dBm
2.40005611 GHz
SWT 100 ms
Unit dBm
1MAX
D1 -20.55 dBm
1MA
F1
Center 2.412 GHz
8 MHz/
Span 80 MHz
Date: 21.APR.2009 11:46:14


Marker 1 [T2]
RBW 100 kHz
RF Att 0 dB
Ref Lvl
6.48 dBµV
VBW 10 Hz
67 dBµV
2.40027655 GHz
SWT 250 s
Unit dBµV
2MAX
2MA
F1
Center 2.412 GHz
10 MHz/
Span 100 MHz
Date: 21.APR.2009 15:13:42


Marker 1 [T2]
RBW 100 kHz
RF Att 50 dB
Ref Lvl
-39.19 dBm
VBW 300 kHz
20 dBm
2.48329960 GHz
SWT 25 ms
Unit dBm
2MAX
D1 -20.05 dBm
2MA
F1
Center 2.462 GHz
10 MHz/
Span 100 MHz
Date: 21.APR.2009 14:08:57


Marker 1 [T2]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
12.92 dBµV
VBW 10 Hz
87 dBµV
2.48369339 GHz
SWT 25 s
Unit dBµV
2MAX
2MA
F1
Center 2.462 GHz
10 MHz/
Span 100 MHz
Date: 21.APR.2009 15:35:33

Radio Radiated Emissions.

Emissions due to radio functions reported below, Emissions were searched over a range of 30 MHz to 25000 MHz
No emissions excepting fundamental emissions within 20 dB of the limit are found.

Example Frequency = 2400 MHz
18.9 dBuV (spectrum analyzer peak hold reading)
+8.9 dB (cable loss @ frequency)
+27.3dB/m (antenna factor @ frequency)
55.1 dBuV/m final adjusted value

Radiated Emissions Data

Job # :	24621-1	Date :	4-21-09	Page 1 of 1	
NEX #:	126887	Time :	1300		
		Staff :	aal		
Client Name :	WIS International			EUT Voltage :	6
EUT Name :	Hand Held Data Collector			EUT Frequency :	DC
EUT Model # :	WISard-550			Phase:	
EUT Serial # :	S614			NOATS	
EUT Config. :	Normal transmiting high, low and mid channels			SOATS	X
				Distance < 1000 MHz:	3 m
				Distance > 1000 MHz:	3 m
Specification :	CFR47 Part 15, Subpart B, Class B				
Loop Ant. #:	NA				
Bicon Ant.#:	NA	Temp. (°C) :	29		
Log Ant.#:	NA	Humidity (%) :	15		
DRG Ant. #	752	Spec An.#:	835		
Cable LF#:	SOATS	Spec An. Display #:	835		
Cable HF#:	60FT	QP #:	NA		
Preamp LF#:	NA	PreSelect#:	NA		
Preamp HF#	317				

Quasi-Peak	RBW:	120 kHz
	Video Bandwidth	300 kHz
Peak	RBW:	1 MHz
	Video Bandwidth	3 MHz
Average	RBW:	1 MHz
	Video Bandwidth	10 Hz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBµV)	Corrected Reading (dBµV/m)	Spec. limit (dBµV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2400.0	18.9	17.2	P	-	1.0	18.9	55.1	74.0	-18.9	Pass	G-MODE
2400.0	6.5	6.4	A	-	1.0	6.5	42.7	54.0	-11.3	Pass	
				-	1.0						
2483.5	24.5	23.4	P	-	1.0	24.5	60.7	74.0	-13.3	Pass	
2483.5	11.3	11.3	A	-	1.0	11.3	47.5	54.0	-6.5	Pass	
				-	1.0						B- MODE
2400.0	18.6	18.5	P	-	1.0	18.6	54.8	74.0	-19.2	Pass	
2400.0	6.5	6.5	A	-	1.0	6.5	42.7	54.0	-11.3	Pass	
2483.5	26.2	25.1	P	-	1.0	26.2	62.4	74.0	-11.6	Pass	
2483.5	12.9	12.8	A	-	1.0	12.9	49.1	54.0	-4.9	Pass	

Emissions were investigated from 30 to 25000 MHz, no spurious emissions found within 20 dB of the limits.

5.7. Minimum 6dB RF Bandwidth

(a)(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.
A8.2 (a) The minimum 6 dB bandwidth shall be at least 500 kHz.

Sample Number:	WISard-550	Temperature:	29°C
Date:	April 21, 2009	Humidity:	15
Modification State:	Lo/Mid/High Channels	Tester:	Alan Laudani
		Laboratory:	SOATS

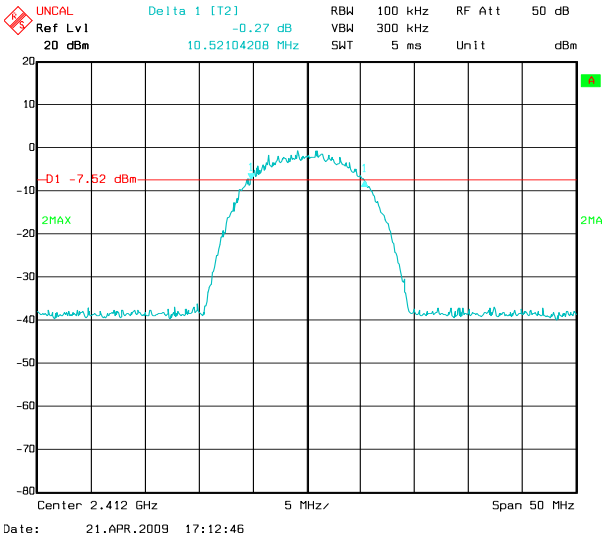
Test Results: EUT Complies.

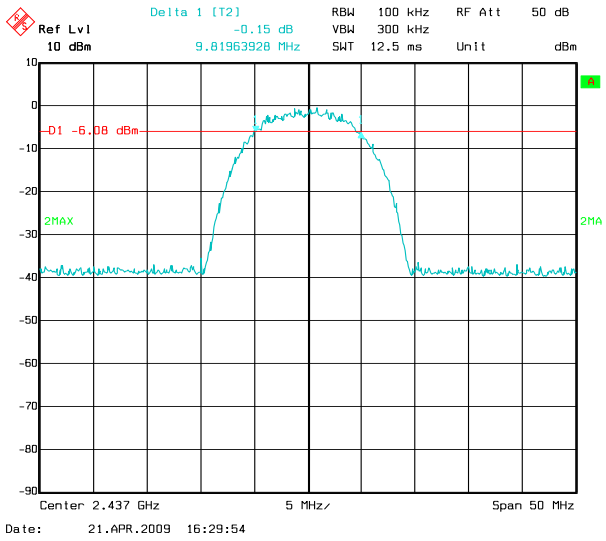
6dB Bandwidth:

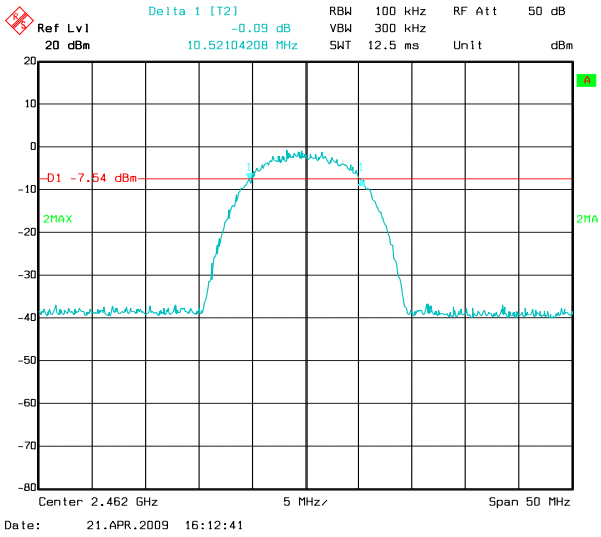
Measurements were made conductively. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

6 dB Bandwidth		
Channel	802.11b	802.11g
Low (2412 MHz)	10.5 MHz	15.1 MHz
Mid (2437MHz)	9.8 MHz	15.1 MHz
High (2462 MHz)	10.5 MHz	13.6 MHz

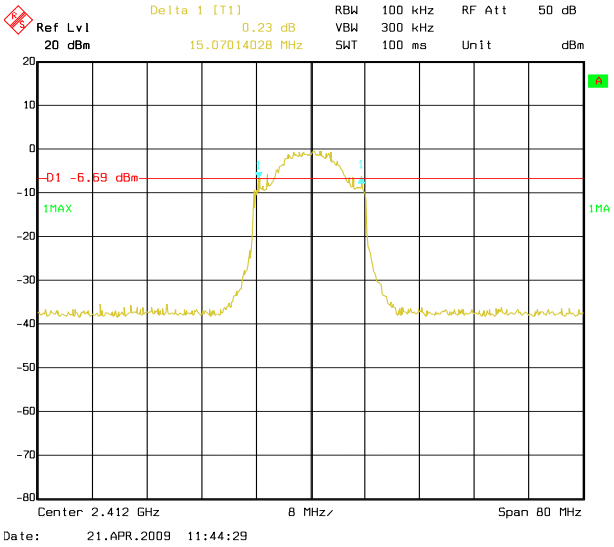
802.11b – Mode

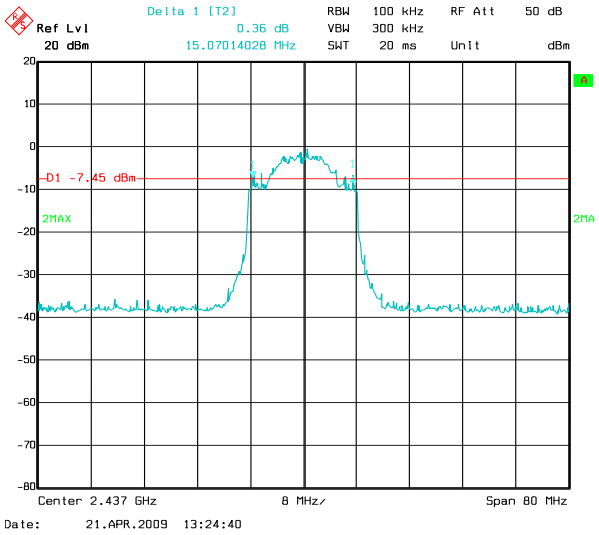

UNCAL
Ref Lvl
20 dBm
Delta 1 [T2]
-0.27 dB
10.52104208 MHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 50 dB
Unit dBm
D1 -7.52 dBm
2MAX
2MA
Center 2.412 GHz
5 MHz/
Span 50 MHz
Date: 21.APR.2009 17:12:46

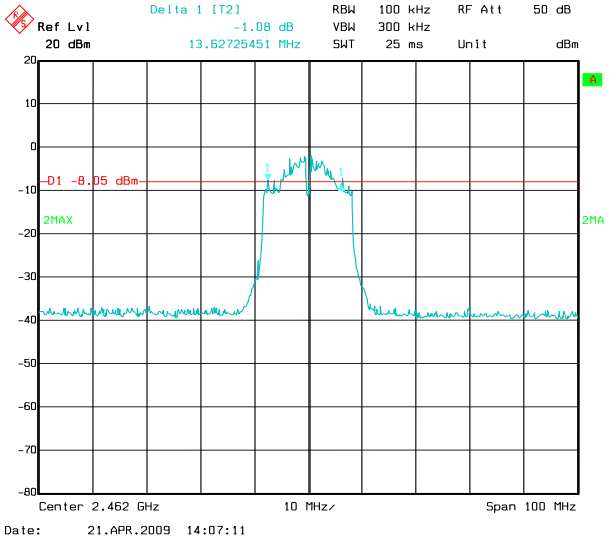

Ref Lvl
10 dBm
Delta 1 [T2]
-0.15 dB
9.81963928 MHz
RBW 100 kHz
VBW 300 kHz
SWT 12.5 ms
RF Att 50 dB
Unit dBm
D1 -6.08 dBm
2MAX
2MA
Center 2.437 GHz
5 MHz/
Span 50 MHz
Date: 21.APR.2009 16:29:54


Ref Lvl
20 dBm
Delta 1 [T2]
-0.09 dB
10.52104208 MHz
RBW 100 kHz
VBW 300 kHz
SWT 12.5 ms
RF Att 50 dB
Unit dBm
D1 -7.54 dBm
2MAX
2MA
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 21.APR.2009 16:12:41

802.11g – Mode


Delta 1 [T1]
0.23 dB
15.07014028 MHz
RBW 100 kHz
VBW 300 kHz
SWT 100 ms
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
D1 -6.59 dBm
1MAX
1MA
Center 2.412 GHz
8 MHz/
Span 80 MHz
Date: 21.APR.2009 11:44:29


Delta 1 [T2]
0.36 dB
15.07014028 MHz
RBW 100 kHz
VBW 300 kHz
SWT 20 ms
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
D1 -7.45 dBm
2MAX
2MA
Center 2.437 GHz
8 MHz/
Span 80 MHz
Date: 21.APR.2009 13:24:40


Delta 1 [T2]
-1.08 dB
13.62725451 MHz
RBW 100 kHz
VBW 300 kHz
SWT 25 ms
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
D1 -8.05 dBm
2MAX
2MA
Center 2.462 GHz
10 MHz/
Span 100 MHz
Date: 21.APR.2009 14:07:11

5.8. Maximum peak output power

(b) 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 one 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 signalling 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.

A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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 Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

Sample Number:	WISard-550	Temperature:	29°C
Date:	April 21, 2009	Humidity:	15%
Modification State:	Lo/Mid/High Channels	Tester:	Alan Laudani
		Laboratory:	SOATS

Test Results: EUT complies

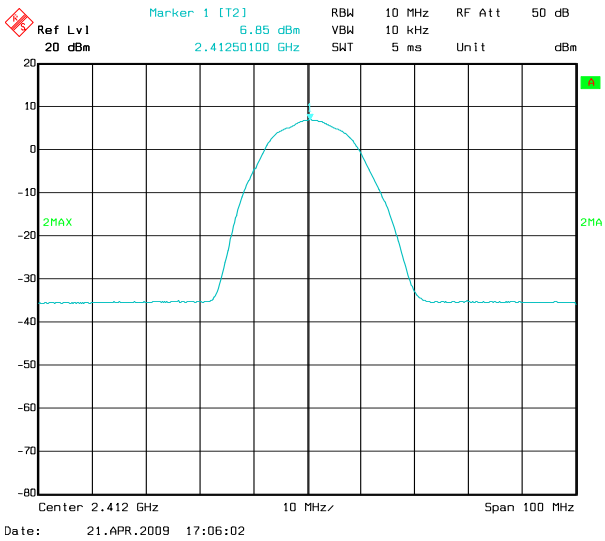
Additional Observations:

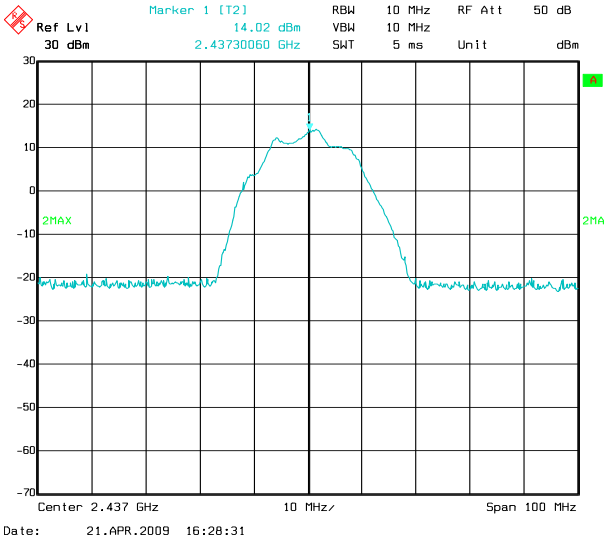
- Conducted Max hold peak measurements using 10 MHz RBW (10 MHz VBW). The antenna was removed from the circuit board and an SMA connector was soldered to the traces of the RF output amplifier.
- Plots of measurements on following pages.
- Peak Gain from Antenna Specification Sheet for Integrated Antenna and RF Solutions Mica 2.4 GHz SMD Antenna, part number 3030A5645.
- Measurements taken after installing fresh batteries.
- A correction factor was added to compensate for measurement by the formula: CF(bw) = 10 x log (measurement BW/20dB BW).

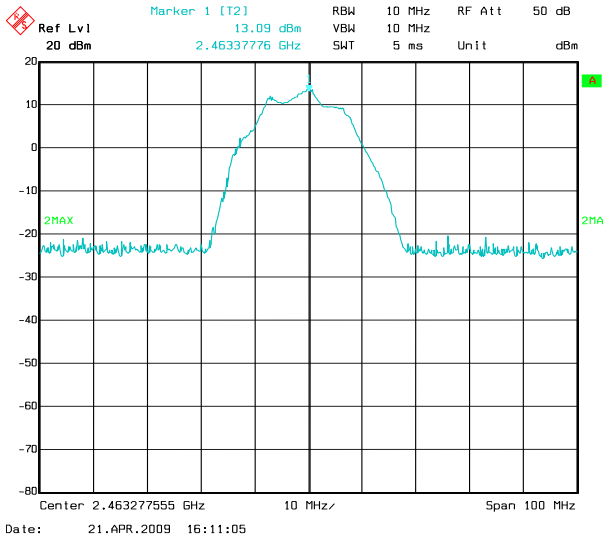
B - Mode	Low Channel	Mid Channel	High Channel	Units
20 dB Bandwidth	16.1	15.5	16.1	MHz
CF(bw)	2.1	1.9	2.1	dB
Measured	6.85	14.02	13.09	dBm
Result	8.9	15.9	15.2	dBm
Resutl		0.039		Watts
Peak Antenna Gain	1.8	1.8	1.8	dBi
EIRP	10.7	17.7	17.0	dBm
EIRP	0.012	**0.059**	0.050	Watts

G – Mode	Low Channel	Mid Channel	High Channel	Units
20 dB Bandwidth	17.1	17.1	17.0	MHz
CF(bw)	2.3	2.3	2.3	dB
Measured	16.20	15.51	13.26	dBm
Result	18.5	17.8	15.6	dBm
Result				Watts
Peak Antenna Gain	1.8	1.8	1.8	dBi
EIRP	20.3	19.6	17.4	dBm
EIRP	**0.108**	0.092	0.055	Watts

802.11b – Mode

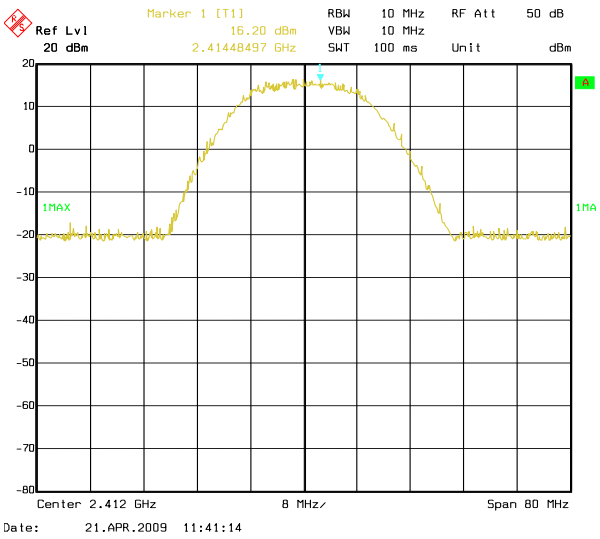


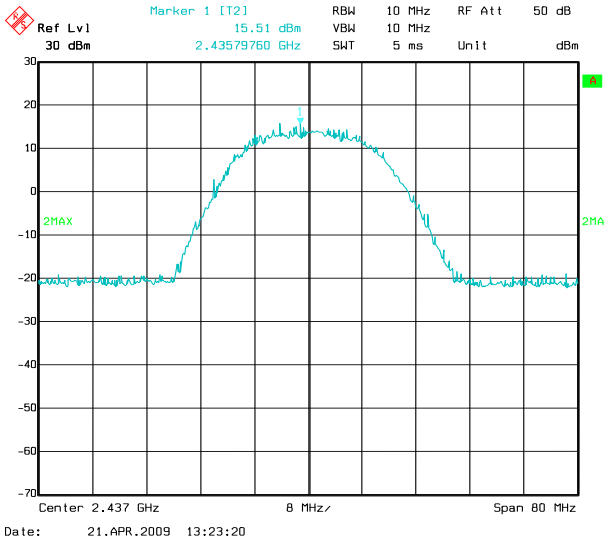


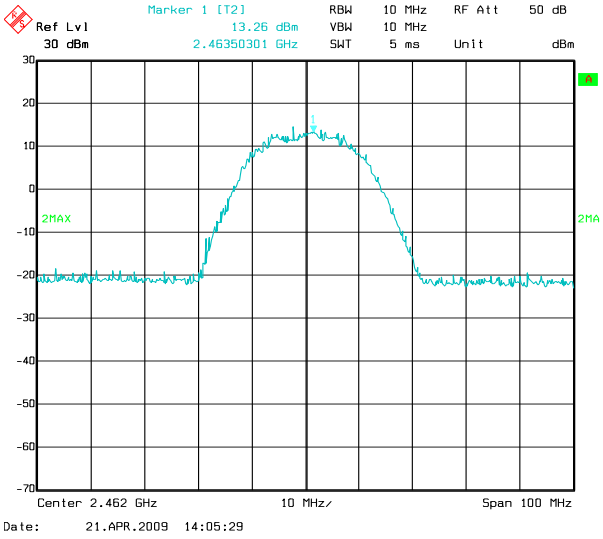


Channel set to 2462 MHz

802.11g – Mode


Marker 1 [T1]
16.20 dBm
2.41448497 GHz
RBW 10 MHz
VBW 10 MHz
SWT 100 ms
RF Att 50 dB
Unit dBm
Ref Lvl
20 dBm
1MAX
1MA
Center 2.412 GHz
8 MHz/
Span 80 MHz
Date: 21.APR.2009 11:41:14


Marker 1 [T2]
15.51 dBm
2.43579760 GHz
RBW 10 MHz
VBW 10 MHz
SWT 5 ms
RF Att 50 dB
Unit dBm
Ref Lvl
30 dBm
2MAX
2MA
Center 2.437 GHz
8 MHz/
Span 80 MHz
Date: 21.APR.2009 13:23:20


Marker 1 [T2]
13.26 dBm
2.46350301 GHz
RBW 10 MHz
VBW 10 MHz
SWT 5 ms
RF Att 50 dB
Unit dBm
Ref Lvl
30 dBm
2MAX
2MA
Center 2.462 GHz
10 MHz/
Span 100 MHz
Date: 21.APR.2009 14:05:29

5.9. Power Spectral Density

(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.
A8.2(b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration. This power spectral density shall be determined in accordance with the provisions of Section A8.4(4); (i.e. the power spectral density shall be determined using the same method for determining the conducted output power).

Sample Number:	WISard-550	Temperature:	29°C
Date:	April 21, 2009	Humidity:	15%
Modification State:	Lo/Mid/High Channels	Tester:	Alan Laudani
		Laboratory:	SOATS

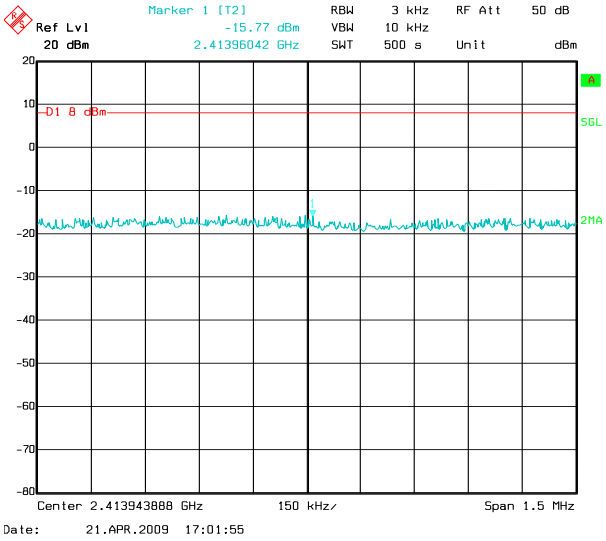
Test Results: EUT complies.

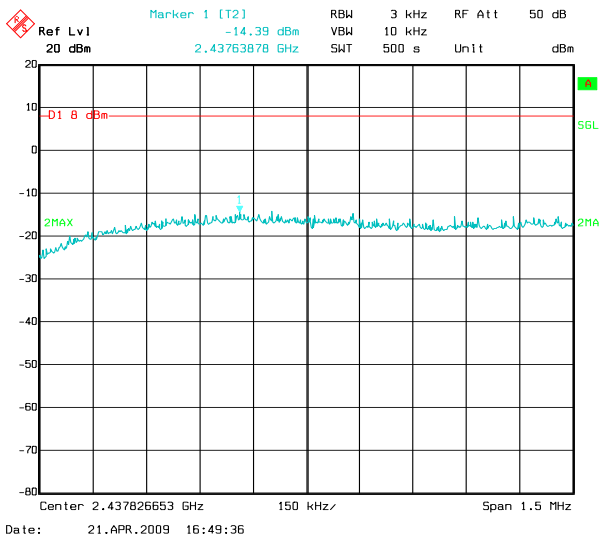
Additional Observations:

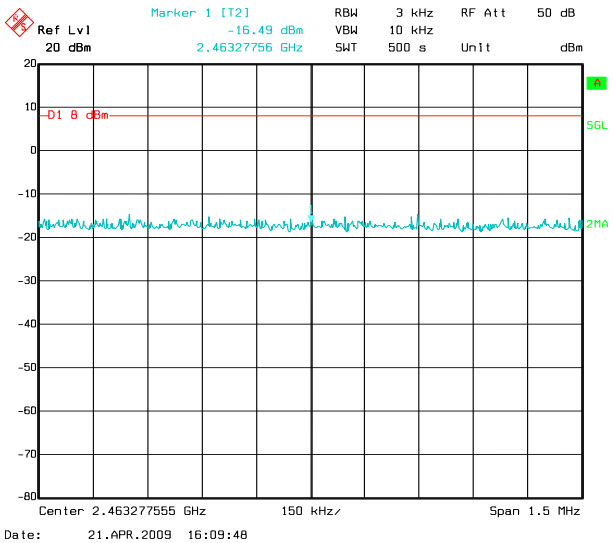
- Investigations were made conductively.
- Frequency set at maximum peak of emission envelope.
- Analyzer RES BW was set to 3 kHz, VBW to 10 kHz
- Span set to 1.5 MHz with sweep time of 500 seconds.
- Peak Max hold detector.

802.11b

Channel	Channel Frequency (MHz)	RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	PASS/FAIL
LO	2412	-15.77	8	Pass
MID	2437	-14.39	8	Pass
HIGH	2462	-16.49	8	Pass

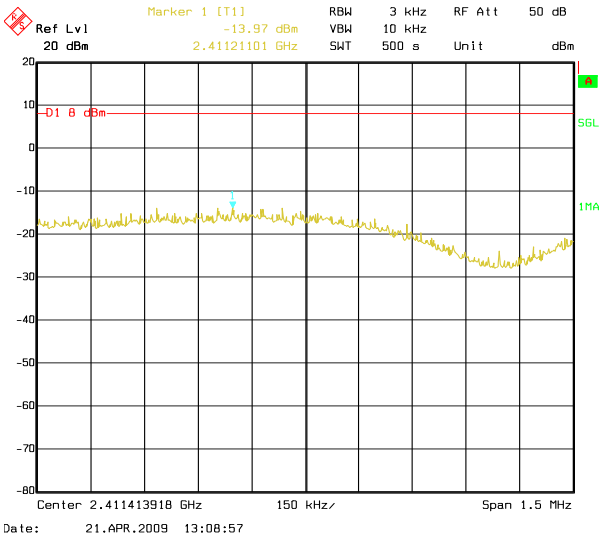


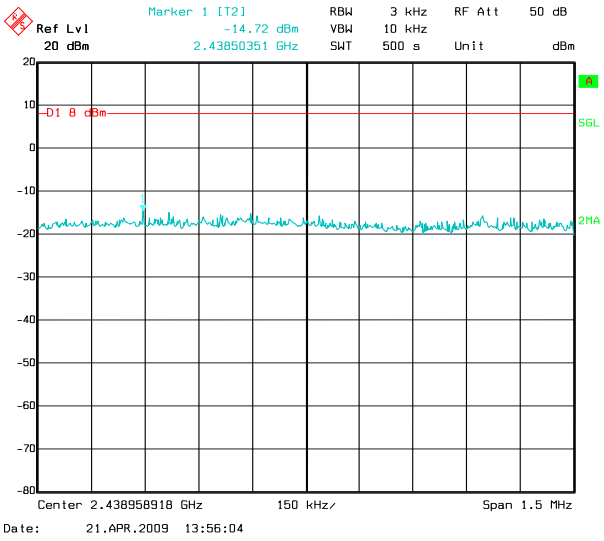


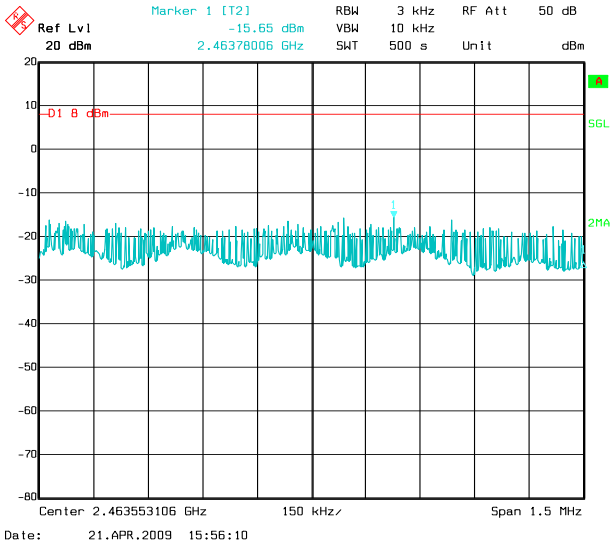


802.11g

Channel	Channel Frequency (MHz)	RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	PASS/FAIL
LO	2412	-13.97	8	Pass
MID	2437	-14.72	8	Pass
HIGH	2462	-15.65	8	Pass







5.10. Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
110	Antenna, Bicon	EMCO	3104	1217	10-Jan-09	10-Feb-11
128	Antenna, LPA	EMCO	3146	2882	09-Feb-09	09-Feb-11
317	Preamplifier	HP	8449A	2749A00167	16-Apr-09	16-Apr-10
752	Antenna, DRWG	EMCO	3115	4943	10-Oct-07	10-Oct-09
625	Antenna, DRWG	EMCO	3116	2325	Verified 4/21/09	
827	pre amp	Com-Power	PA-103	161032	27-Mar-09	27-Mar-10
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	31-Mar-09	31-Mar-10
897	Spectrum Analyzer	Rohde & Schwarz	FSP7	837620/009	18-Sep-08	18-Sep-09
919	Preamplifier	Spacek Labs MM-Wave Technology	100MHz to 40GHz	3M12 (SLK-35-3) and 3M13 (SLKa-35-4)	10-Nov-08	11-Nov-09