Nemko Test Report:	103079-3TRFWL
Applicant:	Waveteq Communications Inc #222 – 3121 Hill Rd Lake Country, BC V4V 1G1 Canada
Apparatus:	CM9
FCC ID:	VIS71300001
In Accordance With:	FCC Part 15 Subpart C, 15.247 FHSS System and Digitally Modulated Radiators 902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz
Authorized By:	 Jason Nixon, Wireless/Telecom Specialist
Date:	June 11, 2008
Total Number of Pages:	33

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	CM9
Specification:	FCC Part 15 Subpart C, 15.247
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Tests Performed By:	Heng Lin EMC/Wireless Specialist
Test Dates:	From March 06, 2008 to June 03, 2008

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	DTS – Digital Transmission System
Brand Name:	Waveteq Communications Inc
Model Name or Number:	CM9
Serial Number:	None
Nemko Sample Number:	1
FCC ID:	VIS71300001
Date of Receipt:	March 03, 2008

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	Dell
Model Name or Number:	PP05L
Serial Number:	CN-0G5152-48643-445-0906
Nemko Sample Number:	None
Connection Port:	Mini-PCI
Cable Length and Type:	0.2m Shielded Interface Bridge

Description:	Power Supply
Brand Name:	Dell
Model Name or Number:	HP-0Q065B83
Serial Number:	CN-05U092-47890-398-06YC
Nemko Sample Number:	None
Connection Port:	AC Input
Cable Length and Type:	2m Power cable

2.3 EUT Description

The EUT is WLAN a+b+g Mini-PCI Module.

2.4 Technical Specifications of the EUT

Operating Band:	2400 MHz – 2483.5 MHz
Operating Frequency:	2412 MHz – 2462 MHz
Modulation:	DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK,QPSK, 16-QAM, 64-QAM)
Occupied Bandwidth:	16.53 MHz
Channel Spacing:	20 MHz
Emission Designator:	16M53W7D
Antenna Data:	External Panel Antenna SPAPG20: 20.5 dBi External Omni Antenna SPDG80: 9 dBi
Power Supply Requirements:	3.3VDC from the host PC

2.5 EUT Setup diagram

2.6 Operation of the EUT during testing

The EUT worked in Transmitting mode or Receiving mode. The ART Application Program was used to control the EUT.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

FHSS System and Digitally Modulated Radiators

902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95% and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
Electro-Magnetic Interference Test Chamber	TDK	SAC-3	FA002047	May 06/08	May 06/09
Bilog	Sunol	JB3	FA002108	Jan. 21/08	Jan. 21/09
Horn Antenna #2	EMCO	3115	FA000825	Jan. 15/08	Jan. 15/09
Horn 18 – 26.5 GHz	Electro-Metrics	SH-50/60-1	FA000479	COU	COU
Horn 26 .5 – 40 GHz	Electro-Metrics	SH-50/60-2	FA000485	COU	COU
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 07/07	Dec. 07/08
LISN	Rohde & Schwarz	ENV216	FA002023	Sept. 04/07	Sept. 04/08
International Power Supply	California Inst.	3001i	FA001021	Jan. 16/08	Jan. 16/09
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	Jan 23/08	Jan 23/09
RF AMP	JCA	1-18GHz	FA002091	Oct 2/07	Oct 2/08
Attenuator	Narda	768-10	9709	COU	COU
Notch Filter	Microwave Circuits	5150-5350MHz	FA001941	COU	COU
Notch Filter	Microwave Circuits	5470-5725MHz	FA002012	COU	COU
Notch Filter	Microwave Circuits	5725-5850MHz	FA001921	COU	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU	COU

COU – Calibrate on Use
NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No : not applicable / not relevant.

Y Yes : Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested, mandatory but not assessed. (See Report Summary)

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.31(e)	Variation of power supply	Y	PASS
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.247(a)(1)	Frequency hopping systems	N	
15.247(a)(1)(i)	Frequency hopping systems operating in the 902-928 MHz band	N	
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725-5850 MHz band	N	
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400-2483.5 MHz band	N	
15.247(a)(2)	Systems using digital modulation techniques	Y	PASS
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band	N	
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	N	
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	N	
15.247(b)(4)	Maximum peak output power	Y	PASS
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	N	
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	PASS
15.247(e)	Power Spectral Density for Digitally Modulated Devices	Y	PASS
15.247(f)	Time of Occupancy for Hybrid Systems	N	

Notes:

Appendix A : Test Results

Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dBµV)

Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

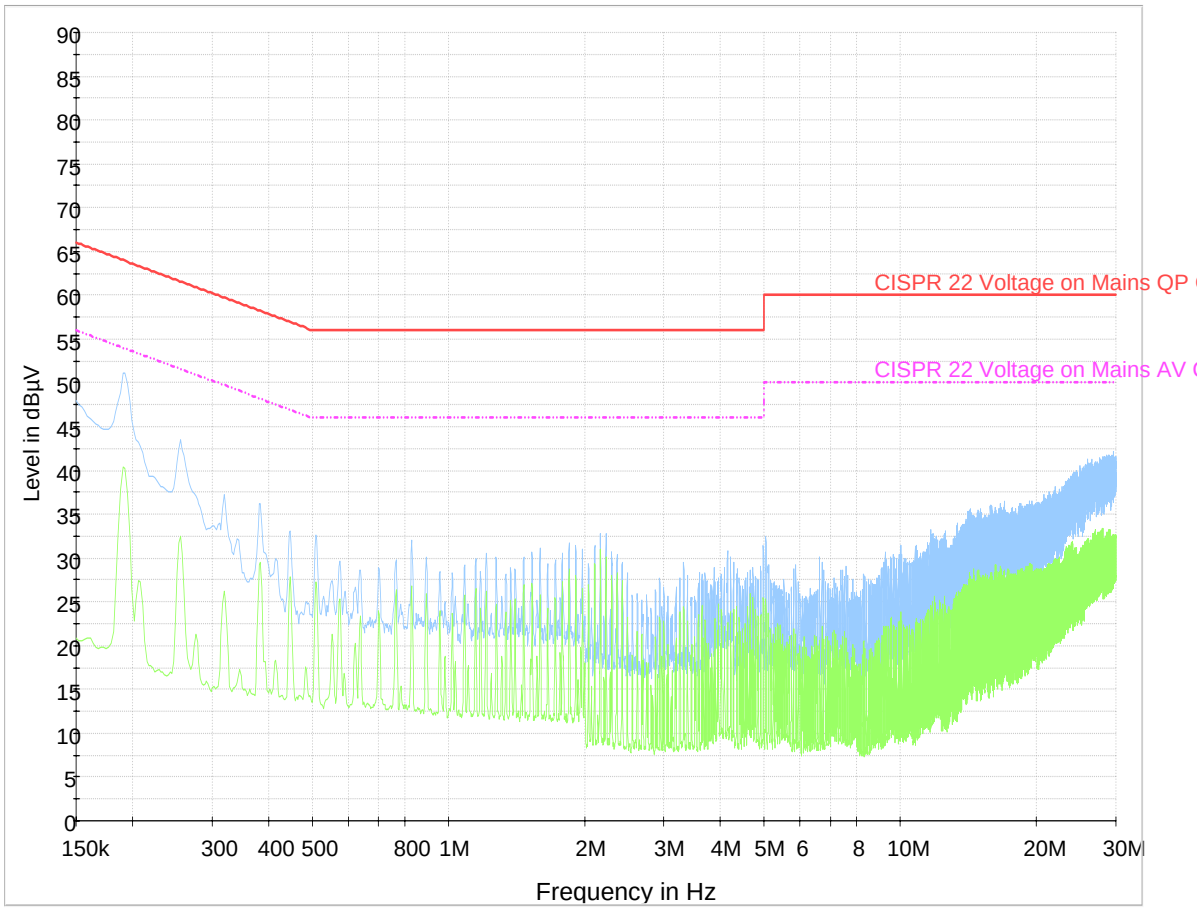
* Decreases with the logarithm of the frequency.

Test Results: Pass

Additional Observations:

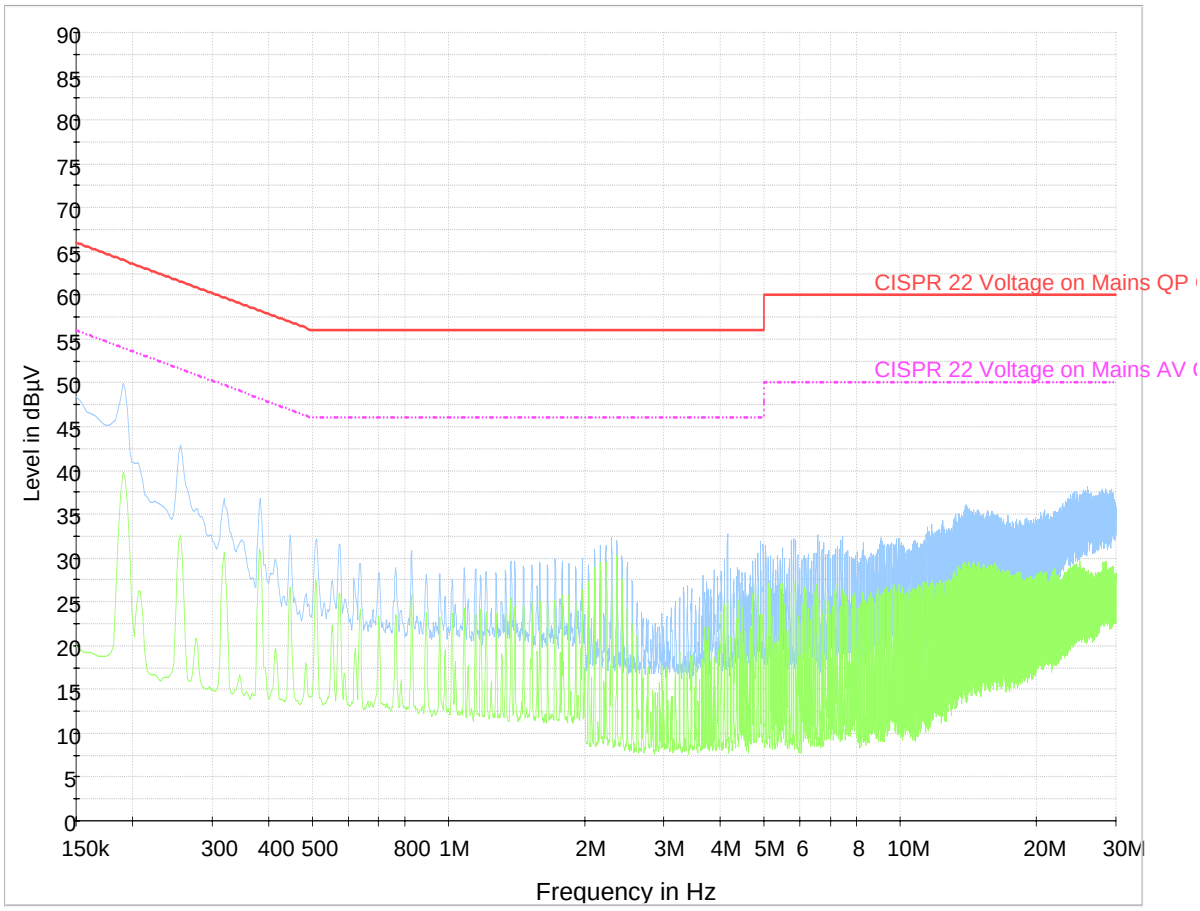
All plots were obtained using a sweeping receiver with an IF of 9kHz using a Peak and Average detector. The plots have been corrected with the cable loss and LISN loss to show compliance.

Phase



120VAC Phase
CISPR 22 Voltage on Mains QP Class B.Limit
CISPR 22 Voltage on Mains AV Class B.Limit
Preview Peak Detector
Preview Average Detector

Neutral



120VAC Neutral
CISPR 22 Voltage on Mains QP Class B Limit
CISPR 22 Voltage on Mains AV Class B Limit
Preview Peak Detector
Preview Average Detector

Clause 15.209(a) Radiated Emissions within Restricted Bands

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 (microvoltsmeter)	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

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

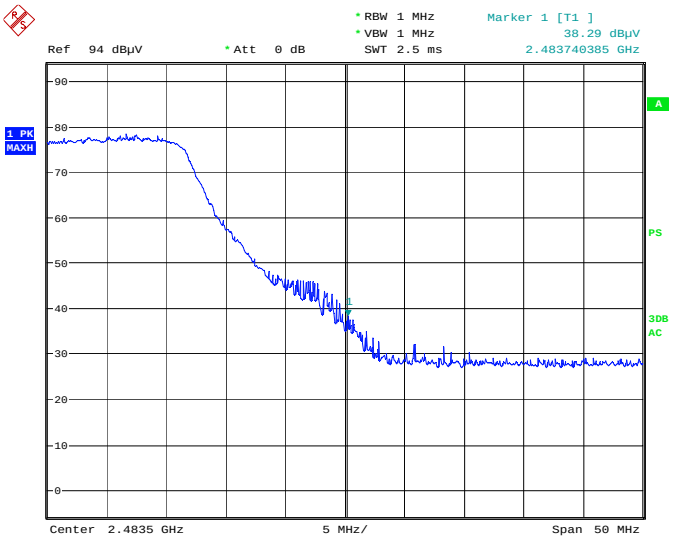
These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axis.

Measurement for 2.4835MHz Band Edge

9 dBi External Omni Antenna TX frequency: 2462 MHz (Ch11)

Restricted Band (MHz)	RCVD Signal (dBµV)	Cable Loss (dB)	AF (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	
2483.5	38.29	4.6	28.3	71.19	74.00	2.81	Peak
	18.39	4.6	28.3	51.29	54.00	2.71	Average



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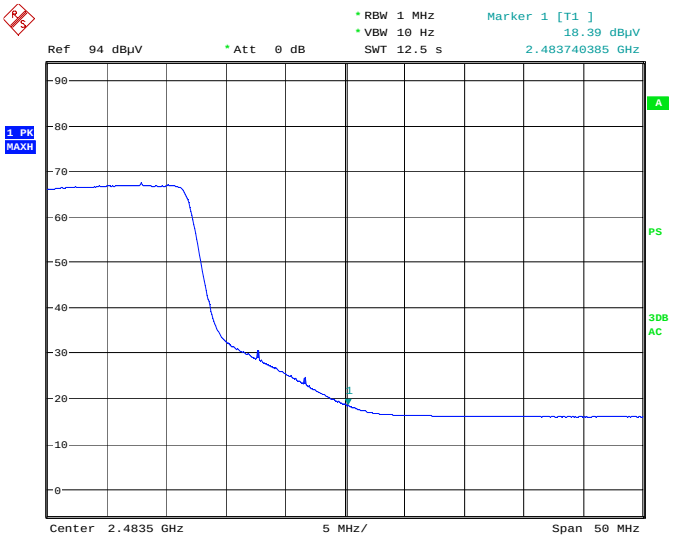

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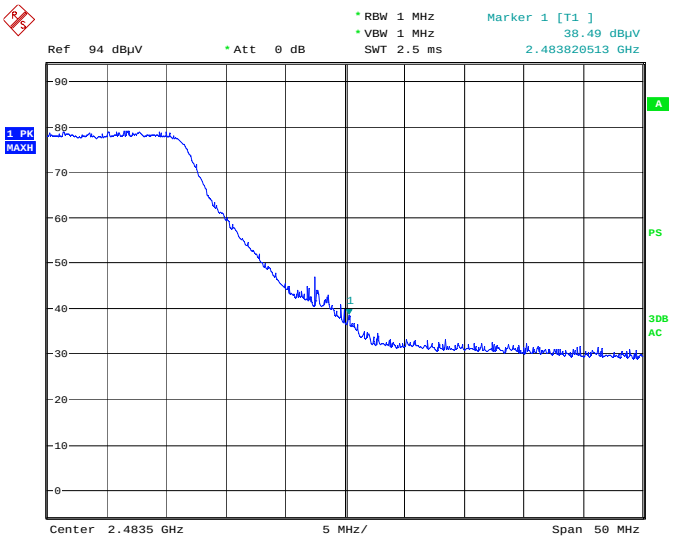
20.5 dBi External Panel Antenna TX frequency: 2462 MHz (Ch11)

Restricted Band (MHz)	RCVD Signal (dBµV)	Cable Loss (dB)	AF (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	
2483.5	38.49	4.6	28.3	71.39	74.00	2.61	Peak
	20.96	4.6	28.3	53.86	54.00	0.14	Average



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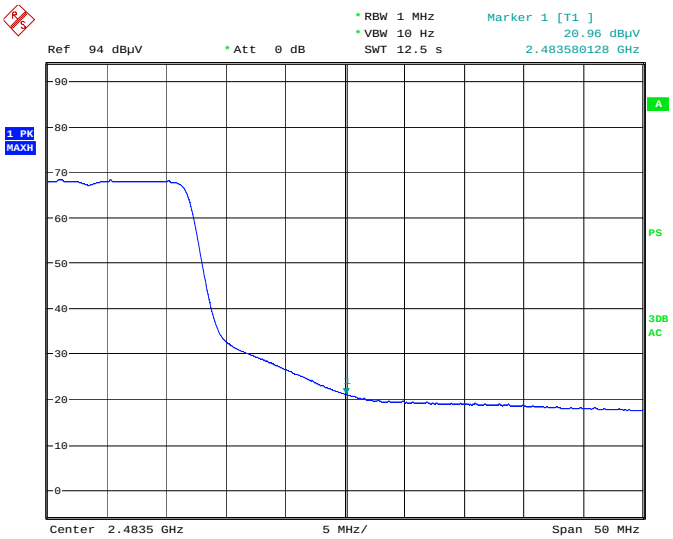

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Radiated Emission:

It was searched in both Vertical and Horizontal and only worst case presented.

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Cable Loss (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
9 dBi External Omni Antenna												
1	4824	Horn 2	V	55.28	33.2	6.5	44.8	0.09	50.18	74	23.82	Peak
									50.09	54	3.91	Average
2	4874	Horn 2	V	56.72	33.2	6.5	45.2	0.09	51.22	74	22.78	Peak
									51.13	54	2.87	Average
3	4924	Horn 2	V	55.43	33.2	6.5	45.1	0.09	50.03	74	23.97	Peak
									49.94	54	4.06	Average
20.5 dBi External Panel Antenna												
1	4824	Horn 2	V	55.89	33.2	6.5	44.8	0.09	50.79	74	23.21	Peak
									50.7	54	3.3	Average
2	4874	Horn 2	V	56.42	33.2	6.5	45.2	0.09	50.92	74	23.08	Peak
									50.83	54	3.17	Average
3	4924	Horn 2	V	55.57	33.2	6.5	45.1	0.09	50.17	74	23.83	Peak
									50.08	54	3.92	Average

Clause 15.247(a)(2) Systems using digital modulation techniques

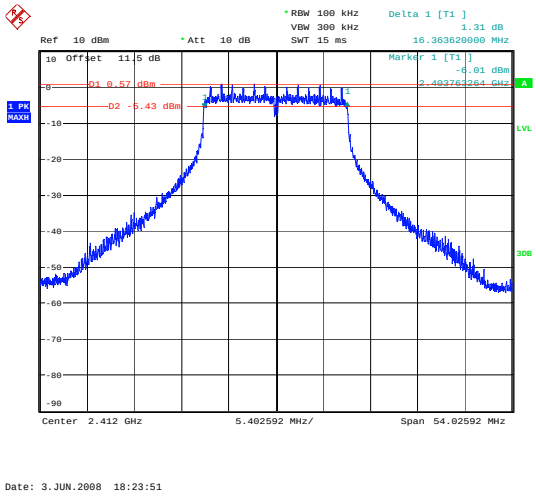
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

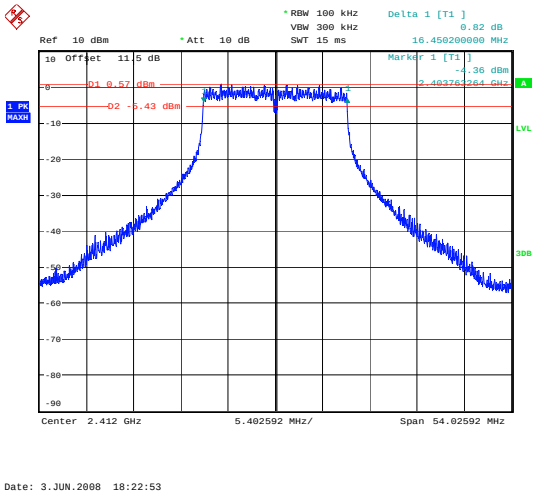
Test Results: Pass

6dB Bandwidth:

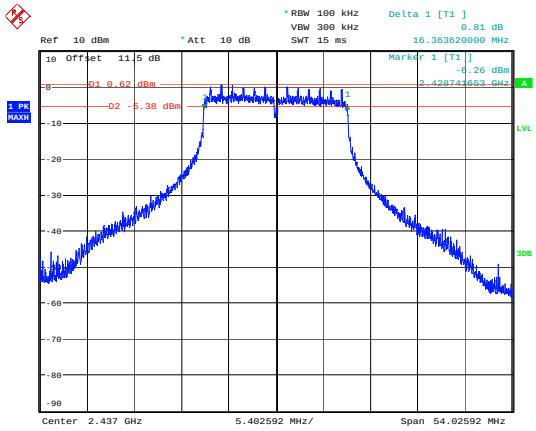
Channel	Operating Freqency (MHz)	Bandwidth (MHz)	
		6 Mbps	54Mbps
1	2412	16.36	16.45
6	2437	16.36	16.45
11	2462	16.46	16.53

Low Channel:





Mid Channel:



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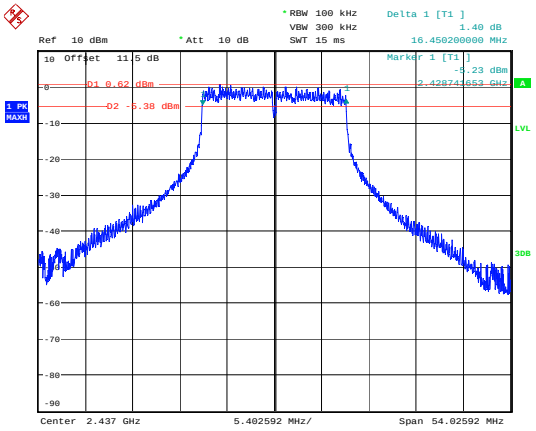

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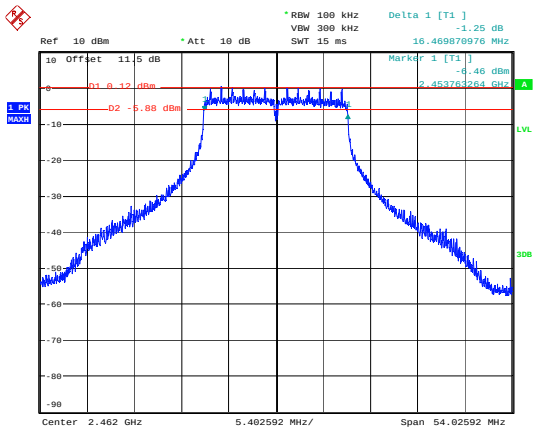
High Channel:



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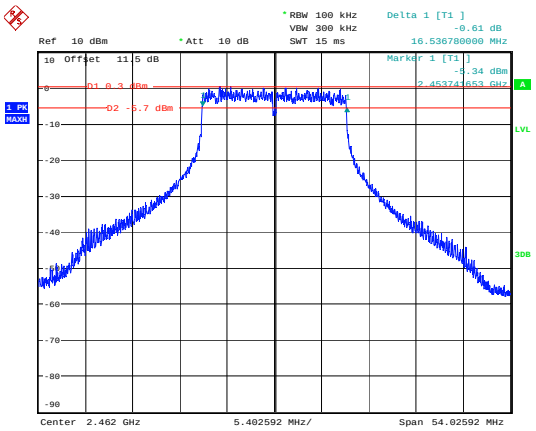

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Clause 15.247(b)(4) Maximum peak output power

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.

Test Results: Pass

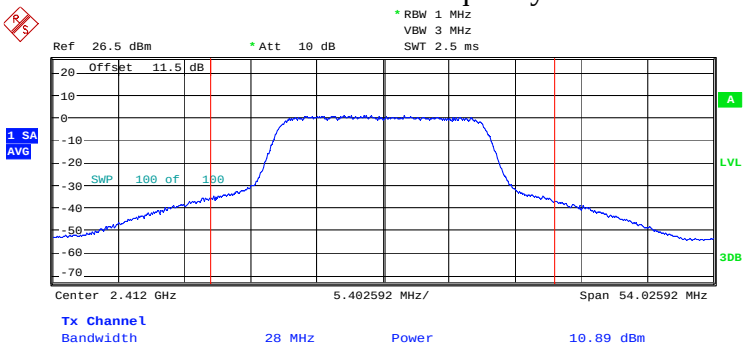
Additional Observation:

The output power was measured at +/-15% of the supply voltage and found that there was no change.

Output Power

Ch #	Freq. (MHz)	G_{ANT} (dBi)	Measured Power (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	2412	9	10.89	27	16.11	19.89	36	16.11
6	2437	9	10.10	27	16.9	19.1	36	16.9
11	2462	9	9.93	27	17.07	18.93	36	17.07
1	2412	20.5	9.83	15.5	5.67	30.33	36	5.67
6	2437	20.5	9.16	15.5	6.34	29.66	36	6.34
11	2462	20.5	8.65	15.5	6.85	29.15	36	6.85

9 dBi External Omni Antenna TX Frequency: 2412 MHz



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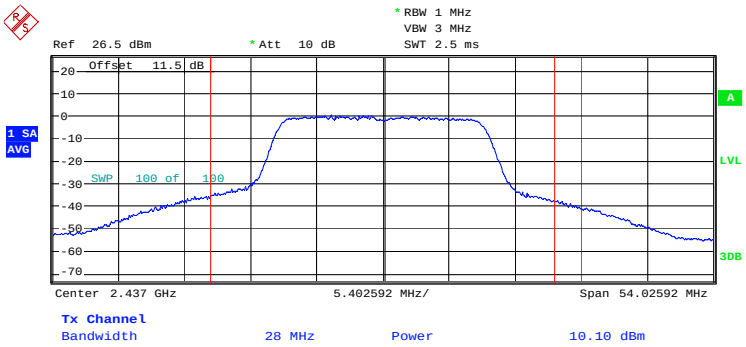
9 dBi External Omni Antenna TX Frequency: 2437 MHz



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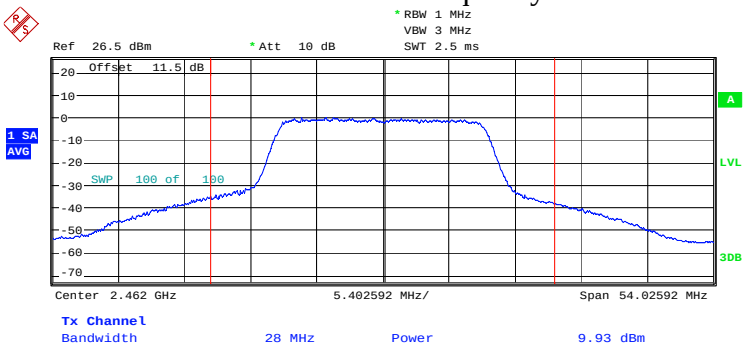
9 dBi External Omni Antenna TX Frequency: 2462 MHz



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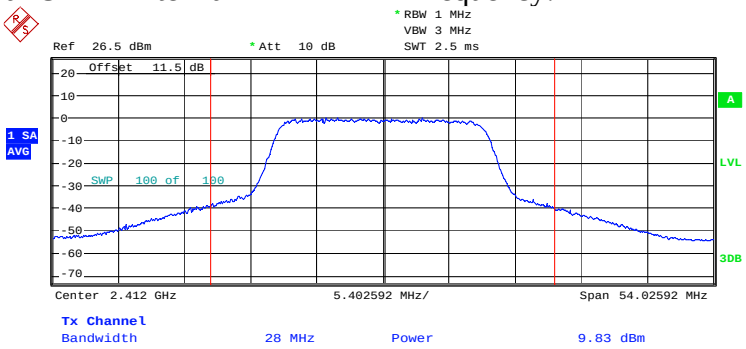

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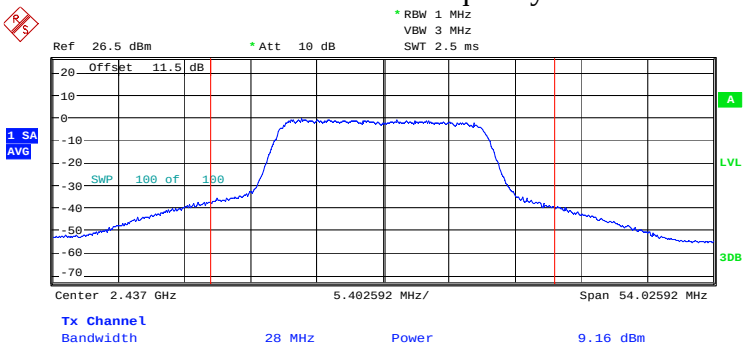
20.5 dBi External Panel Antenna TX Frequency: 2437 MHz



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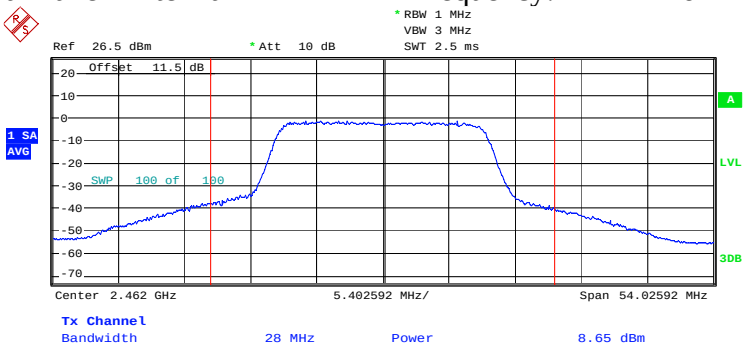
20.5 dBi External Panel Antenna TX Frequency: 2462 MHz



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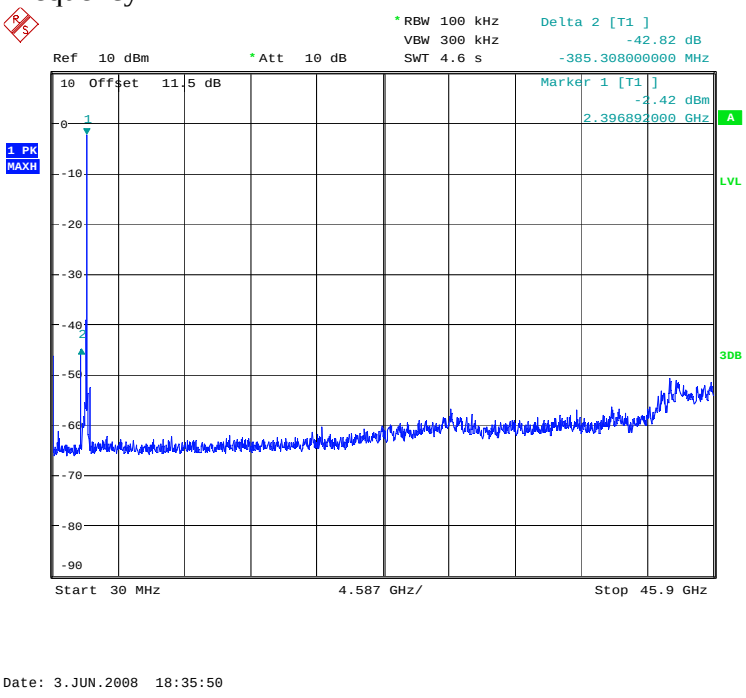
Clause 15.247(d) Radiated Emissions Not in Restricted Bands

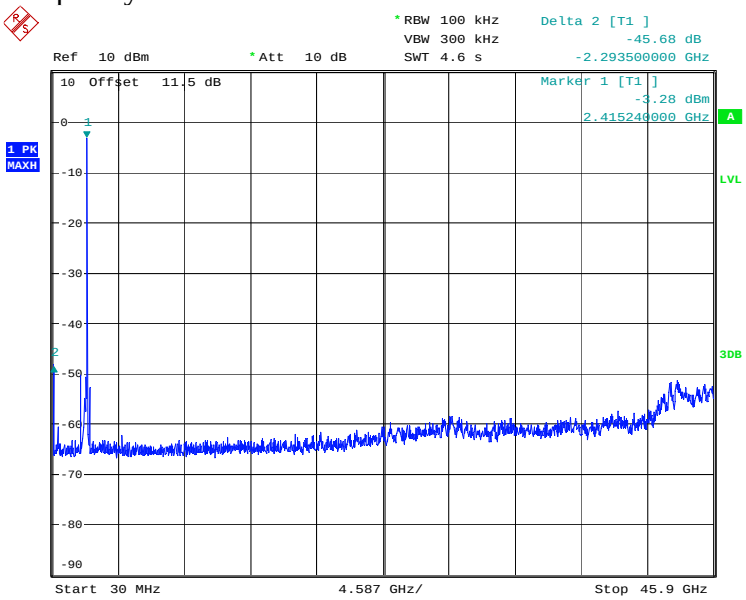
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Results: Pass

Conducted Spurious Emission:
Full Band – TX frequency 2412 MHz



Full Band – TX frequency 2437 MHz



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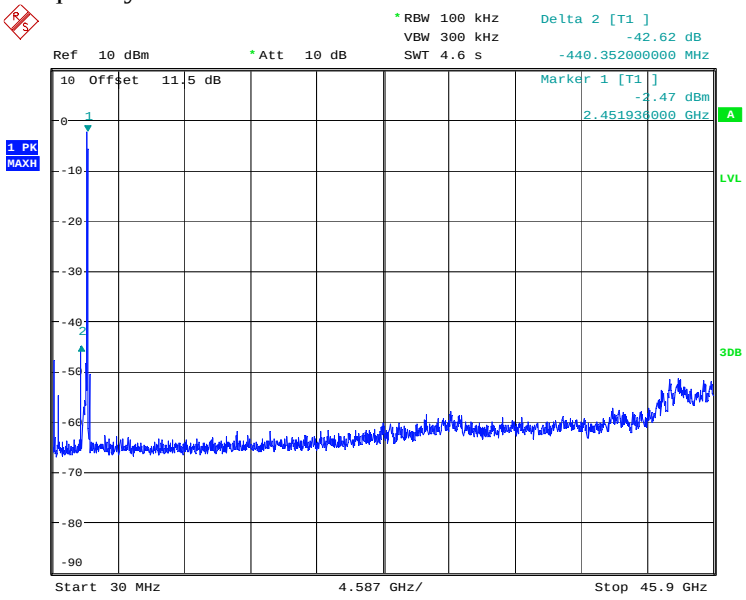

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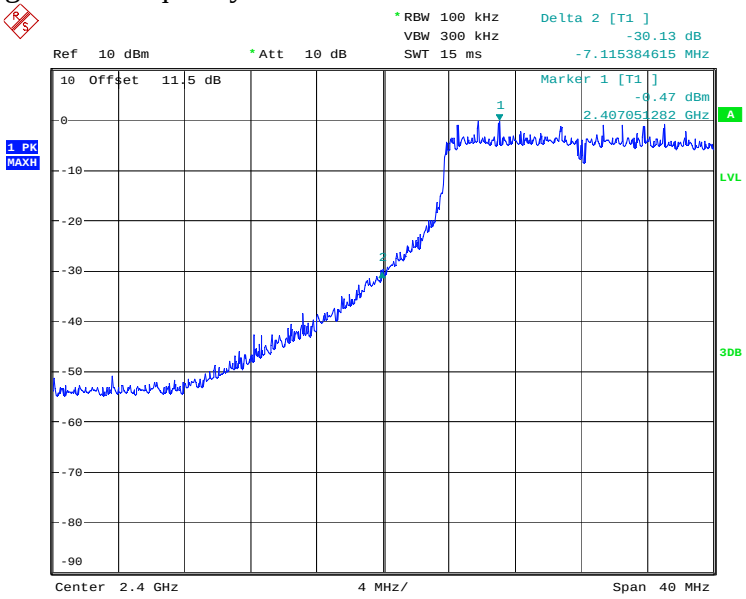
9 dBi External Omni Antenna

Lower Band Edge – TX frequency 2412 MHz



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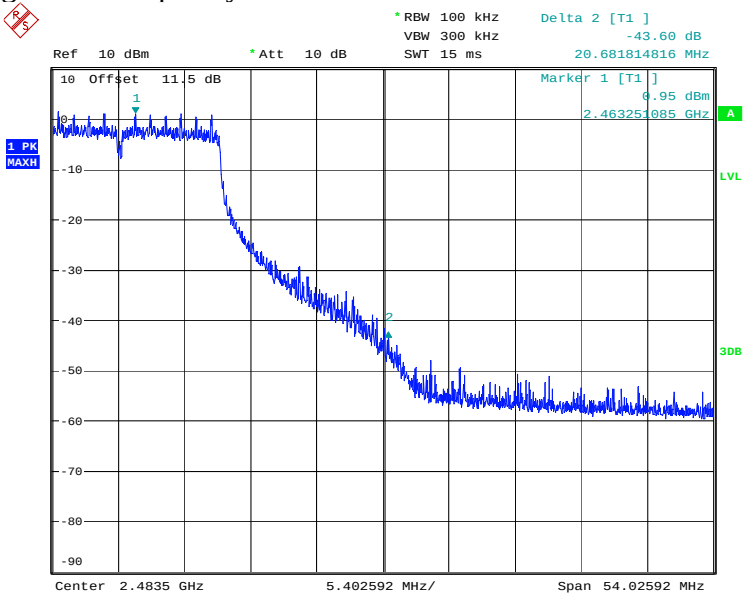
Upper Band Edge – TX frequency 2462



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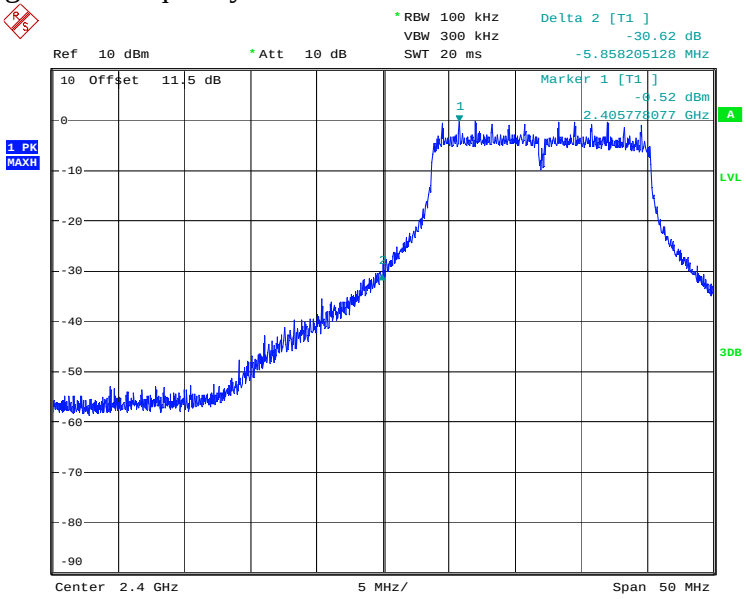
20 dBi External Panel Antenna

Lower Band Edge – TX frequency 2412 MHz



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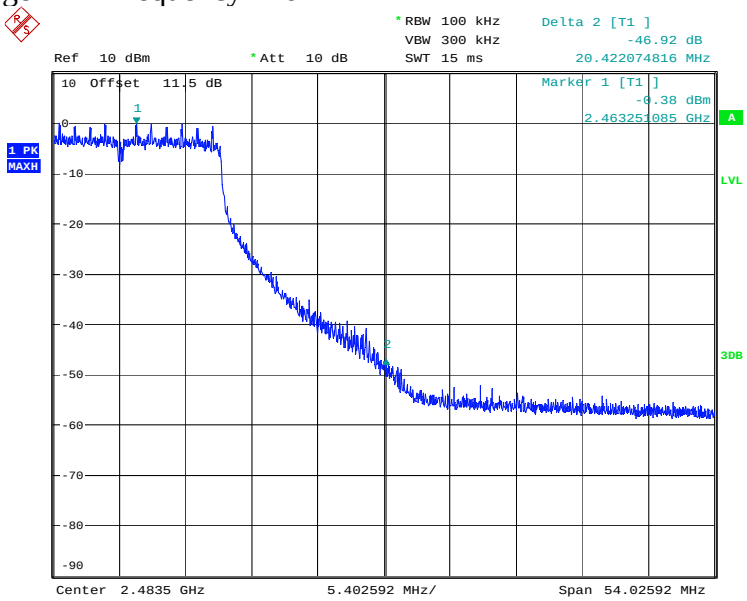
Upper Band Edge – TX frequency 2462



Date: 3.JUN.2008 18:31:08

Clause 15.247(e) Power Spectral Density for Digitally Modulated Devices

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.

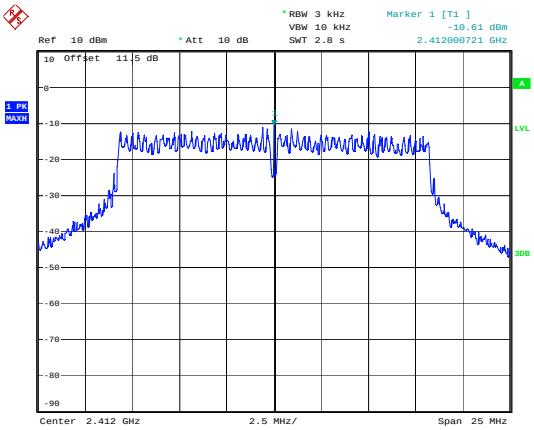
Test Results: Pass

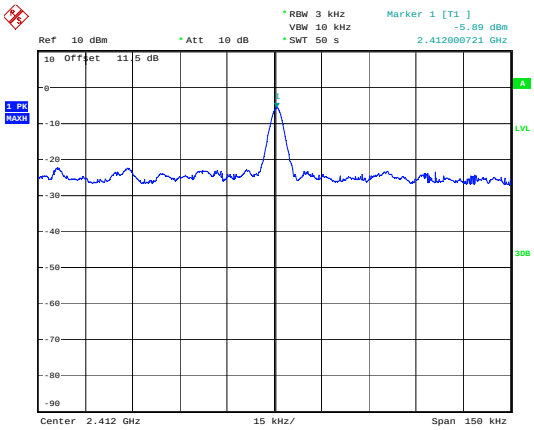
Power Spectrum Desity:

Ch #	Freq. (MHz)	G_{ANT} (dBi)	Measured PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
1	2412	9	-5.89	5	10.89
6	2437	9	-10.54	5	15.54
11	2462	9	-6.13	5	11.13
1	2412	20.5	-9.13	-6.5	2.63
6	2437	20.5	-10.96	-6.5	4.46
11	2462	20.5	-6.69	-6.5	0.19

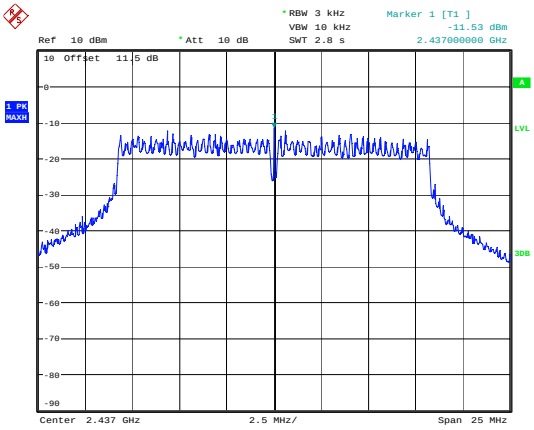
9 dBi External Omni Antenna

Low Channel – 2412 MHz

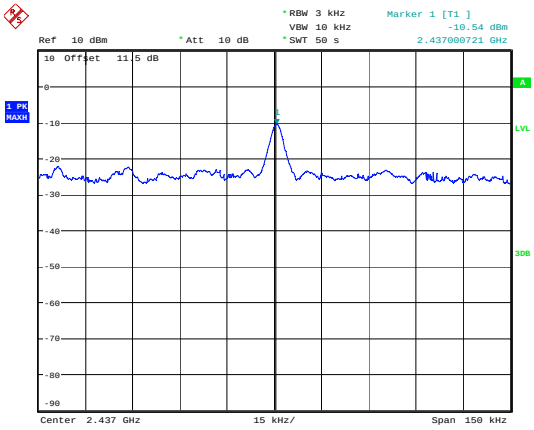




Mid Channel – 2437 MHz

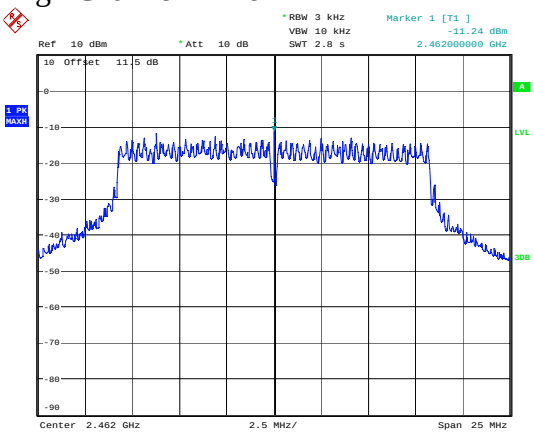


Date: 3.JUN.2008 21:52:37

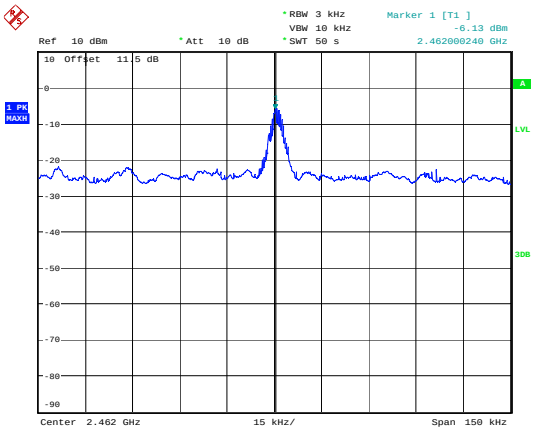


Date: 3.JUN.2008 21:56:20

High Channel – 2462 MHz



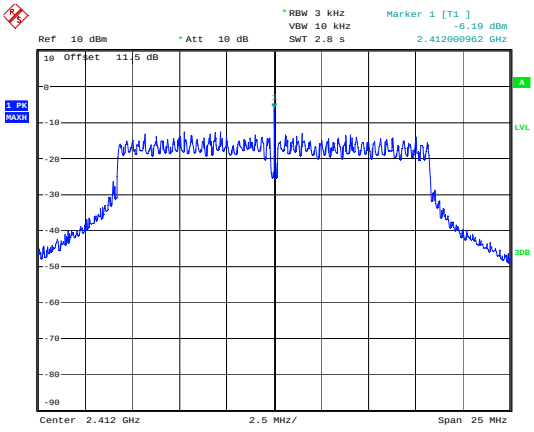
Date: 3.JUN.2008 21:57:02



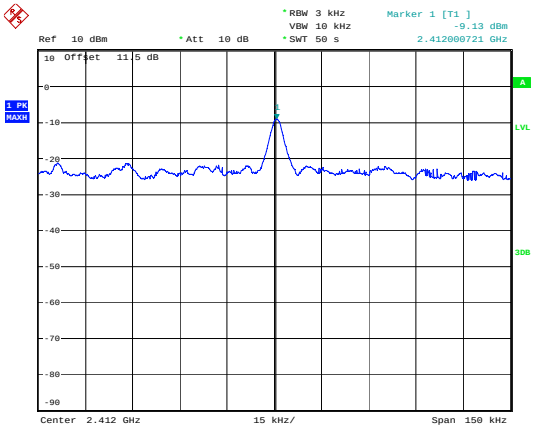
Date: 3.JUN.2008 22:01:12

20.5 dBi External Panel Antenna

Low Channel – 2412 MHz

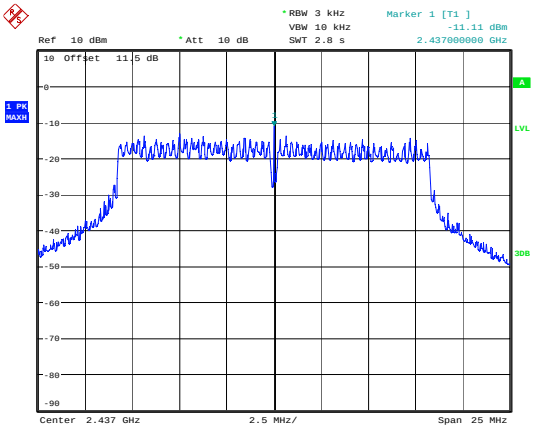


Date: 3.JUN.2008 21:46:50

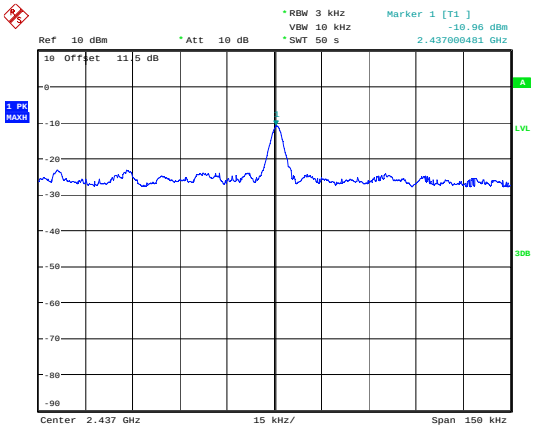


Date: 3.JUN.2008 21:51:18

Mid Channel – 2437 MHz

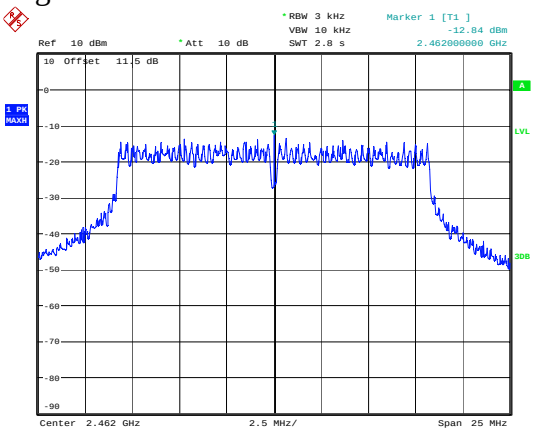


Date: 3.JUN.2008 21:53:19

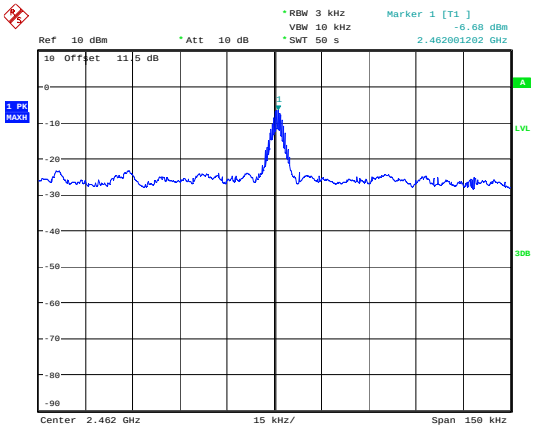


Date: 3.JUN.2008 21:54:39

High Channel – 2462 MHz



Date: 3.JUN.2008 21:57:33



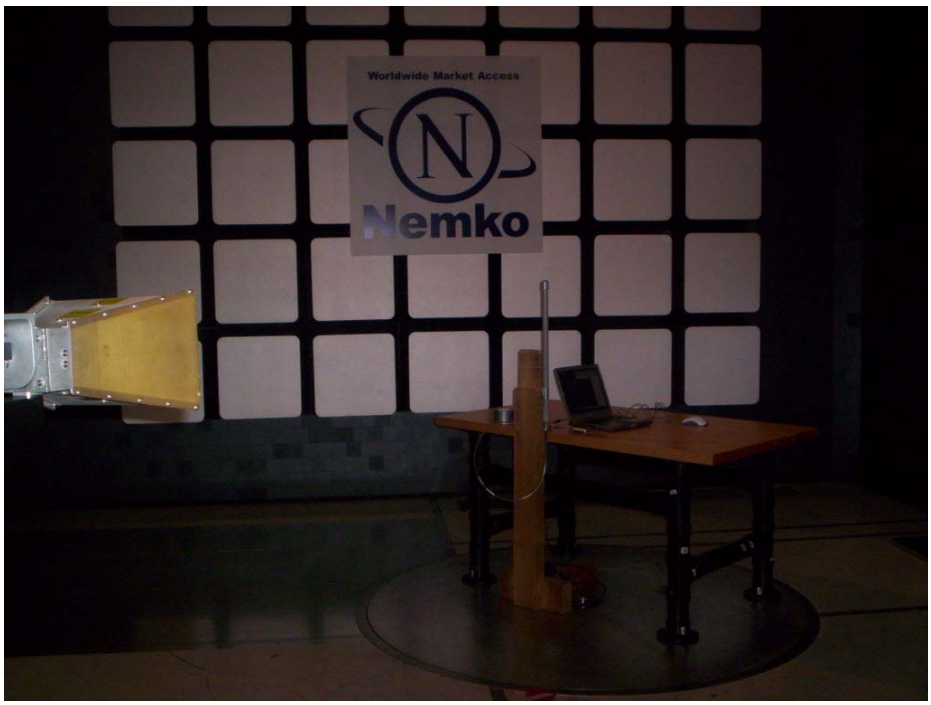
Date: 3.JUN.2008 21:59:12

Appendix B : Setup Photographs

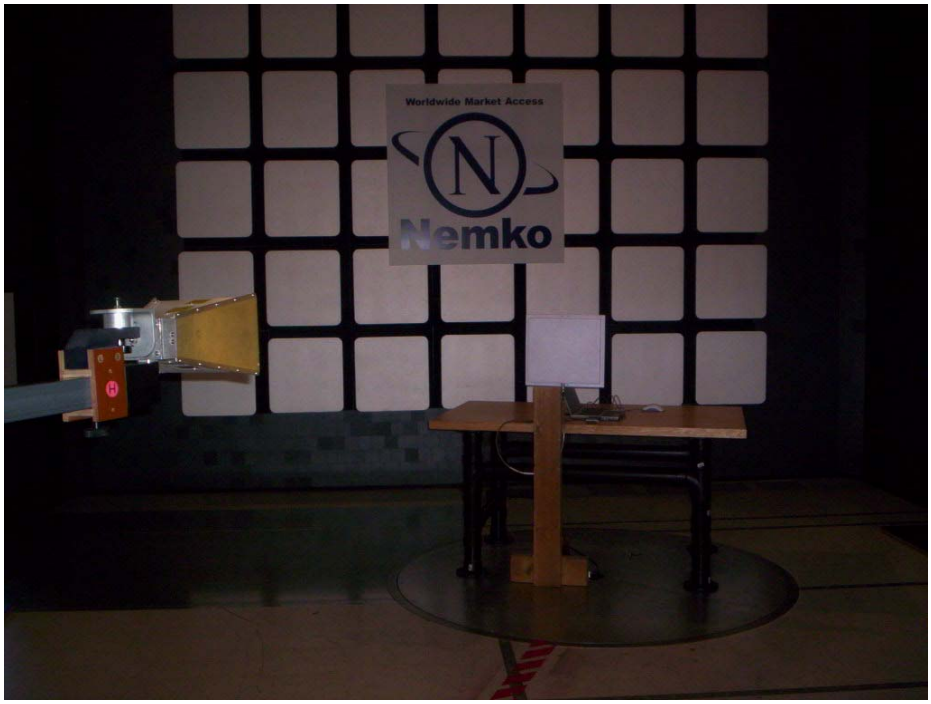
Conducted Emissions Setup:

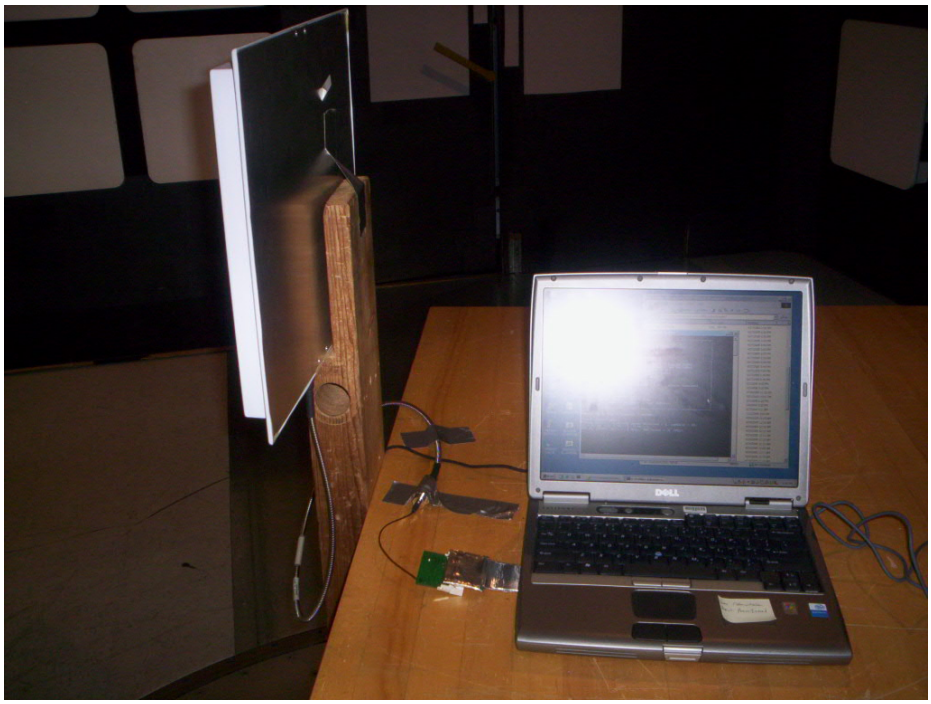
Spurious Emissions Setup:

CM9 Card with 9 dBi External Omni Antenna



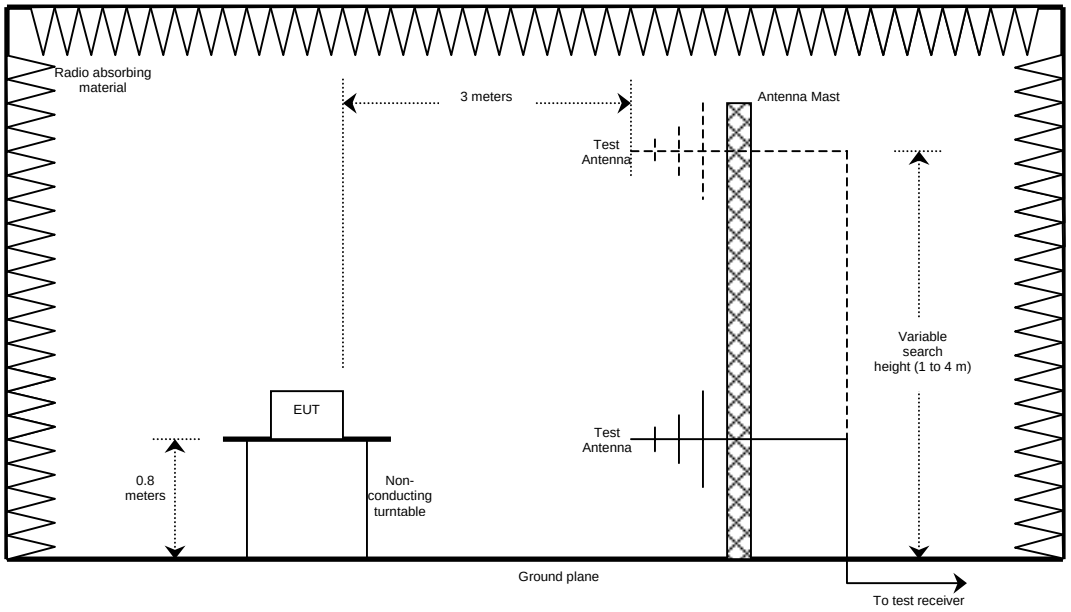
CM9 Card with 20.5 dBi External Panel Antenna





Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30MHz Test Site



Conducted Emissions Test Site