



www.nemko.com

Report Reference ID:	155793-1TRFWL
----------------------	---------------

Test specification:	<p>Title 47 - Telecommunication Chapter I - Federal Communications Commission Subchapter A - General Part 15 - Radio Frequency Devices Subpart C - Intentional Radiators</p> <p>§15.247 - Operation within the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz</p>
---------------------	--


Applicant:	<p>BelAir Networks Inc. 603 March Road, Ottawa, ON, Canada K2K 2M5</p>
------------	---

Apparatus:	DRU 2.4GHz radio
------------	------------------

Model:	B2CH114AA
--------	-----------

FCC ID:	RAR30002002
---------	-------------

Testing laboratory:	<p>Nemko Canada Inc. 303 River Road Ottawa, ON, Canada K1V 1H2</p> <p>Telephone: (613) 737-9680 Facsimile: (613) 737-9691</p>
---------------------	---

	Name and title	Date
Tested by:	David Duchesne, Wireless/EMC Specialist	December 7, 2010
Reviewed by:	 Richard Brazeau, Laboratory Manager	December 8, 2010



Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada.
 The tests included in this report are within the scope of this accreditation.

Table of contents

Section 1: Report summary	3
1.1 Test specification	3
1.2 Statement of compliance	3
1.3 Exclusions.....	3
1.4 Registration number	3
1.5 Test report revision history.....	3
1.6 Limits of responsibility.....	3
Section 2: Summary of test results	4
2.1 FCC Part 15 Subpart C – Intentional Radiators, test results.....	4
Section 3: Equipment under test (EUT) and application details.....	5
3.1 Product details	5
3.2 Sample information	5
3.3 EUT technical specifications	5
3.4 EUT description	5
3.5 Operation of the EUT during testing	5
3.6 EUT setup diagram.....	6
Section 4: Engineering considerations.....	7
4.1 Modifications incorporated in the EUT	7
4.2 Technical judgment.....	7
4.3 Deviations from laboratory tests procedures.....	7
Section 5: Test conditions	8
5.1 Power source and ambient temperatures	8
Section 6: Measurement uncertainty	9
Section 7: Test equipment	10
7.1 Test equipment list.....	10
Section 8: Testing data.....	11
8.1 Clause 15.207(a) Conducted limits	11
8.2 Clause 15.247(a)(2) Minimum 6 dB bandwidth for systems using digital modulation techniques	15
8.3 Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi	16
8.4 Clause 15.247(d) Spurious emissions	21
8.5 Clause 15.247(e) Power spectral density for digitally modulated devices.....	33
Section 8: Block diagrams of test set-ups.....	36

Section 1: Report summary

1.1 Test specification

FCC Part 15 Subpart C, 15.247

Operation within the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz.

1.2 Statement of compliance

In the configuration tested the EUT was found compliant

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc. 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.

See “Summary of test results” for full details.

1.3 Exclusions

None

1.4 Registration number

Test site FCC ID number: 176392 (3 m Semi anechoic chamber)

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

1.6 Limits of responsibility

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.

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Section 2: Summary of test results

2.1 FCC Part 15 Subpart C – Intentional Radiators, test results

General requirements for FCC Part 15

Part	Test description	Verdict
§15.31(e)	Variation of power source	See Notes 1
§15.31(m)	Number of operating frequencies	See Notes 2
§15.203	Antenna requirement	See Notes 3
§15.207(a)	Conducted limits	Pass

Specific requirements for FCC Part 15 Subpart C, 15.247

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	N/A
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	N/A
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	N/A
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	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/A
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	N/A
§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	Pass
§15.247(b)(4)	Maximum peak output power	Pass
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Pass
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	N/A
§15.247(d)	Spurious emissions	Pass
§15.247(e)	Power spectral density for digitally modulated devices	Pass
§15.247(f)	Time of occupancy for hybrid systems	N/A

Notes:

1. Transmit output power was measured while supply voltage was varied from 102 to 138 VAC (85 to 115 % of the nominal rated supply voltage). No change in transmit output power was observed
2. The frequency range over which the device operates is greater than 10 MHz. Tests were performed on three operating channels. (low, mid and high)
3. This requirement does not apply to intentional radiators that must be professionally installed.

Section 3: Equipment under test (EUT) and application details

3.1 Product details

Product name:	DRU 2.4GHz radio
Model name/number:	B2CH114AA
Serial number:	A000141488
Equipment class:	DTS

3.2 Sample information

Receipt date:	August 17, 2010
Nemko sample ID number:	Item # 1

3.3 EUT technical specifications

Operating band:	2400 – 2483.5 MHz
Operating frequency:	2412 – 2462 MHz
Modulation type:	802.11 b, g and n
Occupied bandwidth:	20 MHz
Antenna data:	<p>Antenna 1. 5 dBi, Model # BMAG00287-A Antenna 2. 8 dBi, Model # BNCKG0057 Antenna 3. 8 dBi, Model # BMAH00263-A Antenna 4. 16 dBi, Model # BNCKG0082</p> <p>Antennas 1 and 2 are omni Antenna 3 and 4 are directional antennas that can be used for point-to-point (P2P) operations and point to multi point (P2MP)</p>
Power source:	120/60Hz VAC

3.4 EUT description

The EUT is a MIMO combo WiFi module designed to operate in the 2.4–2.4835 GHz band, and 5.725–5.85 GHz band, 2×2 MIMO for 2.4 GHz, and 2×2 MIMO for 5 GHz.

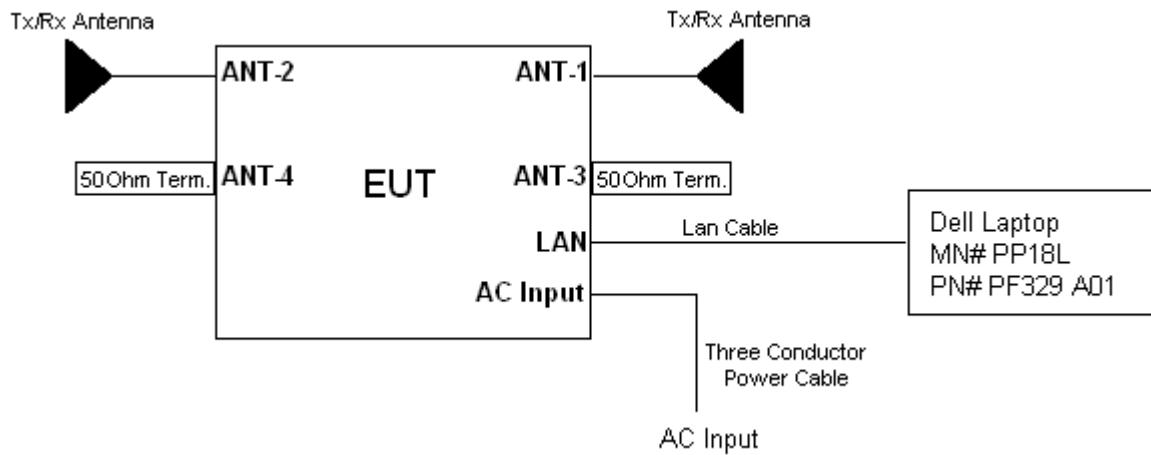
There are two independent radio units. This report covers the 2.4 GHz radio.

3.5 Operation of the EUT during testing

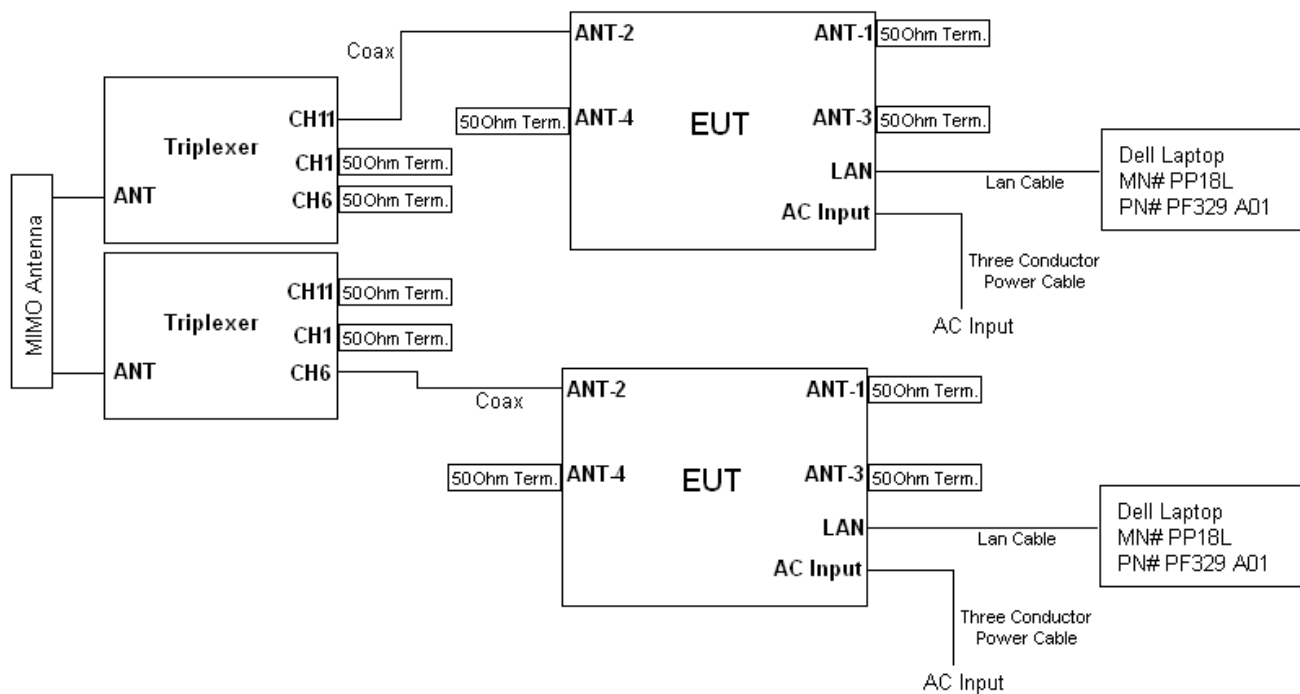
The EUT was controlled to transmit at desired frequency from laptop.

3.6 EUT setup diagram

setup



Setup with triplexer



Note: This is only a representative configuration.

Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

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

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

Section 5: Test conditions

5.1 Power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions

Temperature: 15–30 °C
Relative humidity: 20–75 %
Air pressure: 86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6: 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.

Section 7: Test equipment

7.1 Test equipment list

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	Mar. 09/11
Horn Antenna #2	EMCO	3115	FA000825	Jan. 18/11
Bilog antenna	Sunol	JB3	FA002108	Jan. 18/11
1-18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 07/10
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Jan. 14/11
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	Sept. 29/10
LISN	Rohde & Schwarz	ENV216	FA002023	Sept. 08/10
International Power Supply	California Inst.	3001i	FA001021	COU
Combiner	Mini-circuits	ZA3PD-4	FA001156	COU
Attenuator	Narda	776B-20	FA001153	COU
18-40 GHz Horn Antenna	EMCO	3116	FA001847	May 13/11
18-26 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU
2400 - 2483 MHz Notch Filter	Microwave Circuits	N0124411	FA001940	COU

Note: N/A = Not applicable, NCR = No cal required, COU = Cal on use

Section 8: Testing data

8.1 Clause 15.207(a) Conducted limits

§ 15.207 Conducted limits.

(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 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency (MHz)	Conducted limit (dB μ V)	
	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.

Special notes

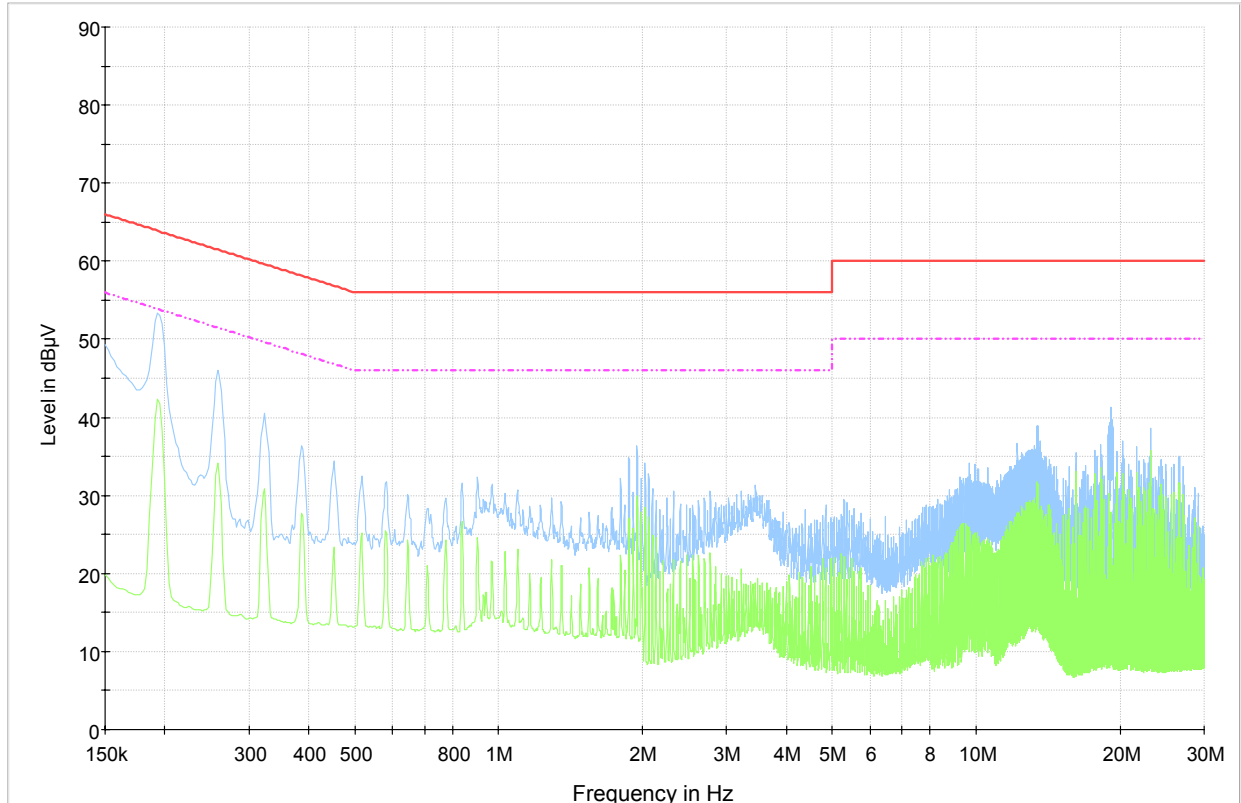
None



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data	Product: DRU 2.4GHz radio	
Test name: Clause 15.207(a) Conducted limits		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C		

Test data



- 120VAC/60Hz, Phase
- CISPR 22 Mains QP Class B Limit
- - - CISPR 22 Mains AV Class B Limit
- Preview Peak Detector
- Preview Average Detector

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/Spectrum analyzer settings:

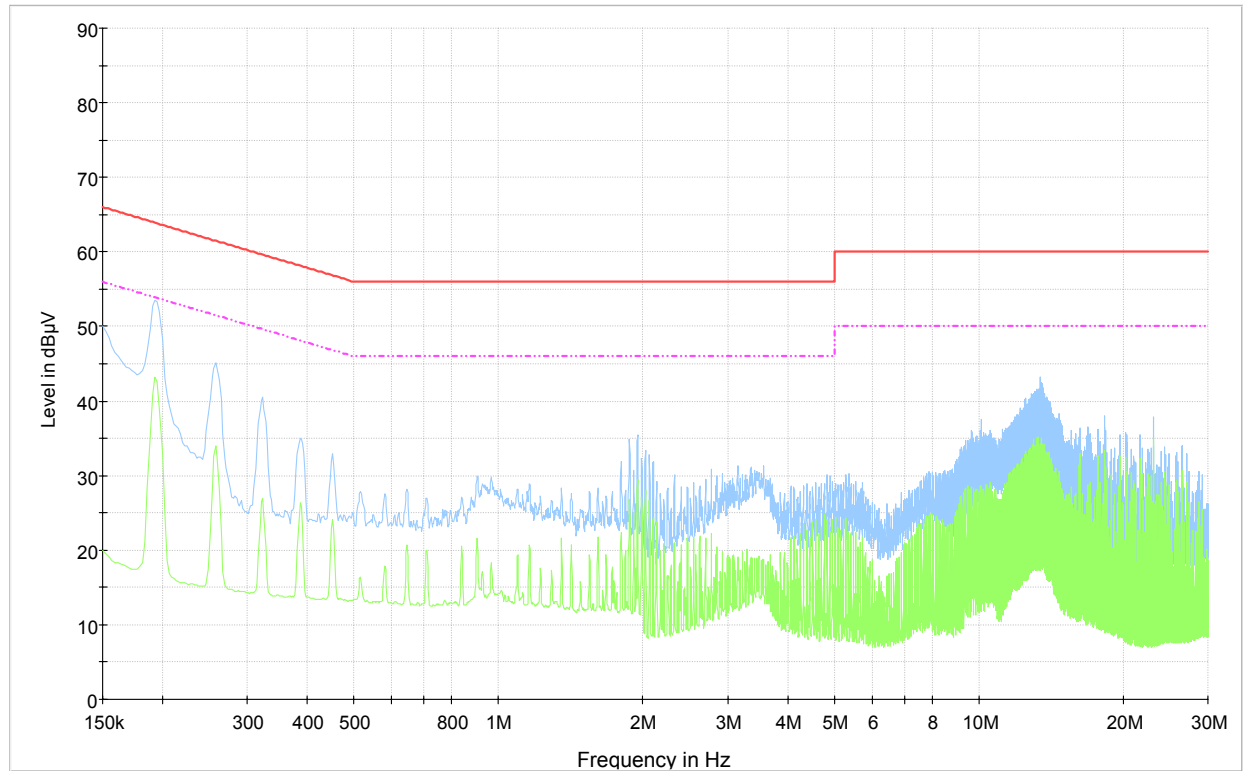
Preview measurements	Final measurement
Receiver: 9 kHz RBW, Peak and Average detector, max hold	Receiver: 9 kHz RBW, Quasi-peak and Average detector
Measurement time 100 ms	



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data	Product: DRU 2.4GHz radio	
Test name: Clause 15.207(a) Conducted limits		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C		

Test data, continued



- 120VAC/60Hz, Neutral
- CISPR 22 Mains QP Class B Limit
- - - CISPR 22 Mains AV Class B Limit
- Preview Peak Detector
- Preview Average Detector

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/Spectrum analyzer settings:	
Preview measurements	Final measurement
Receiver: 9 kHz RBW, Peak and Average detector, max hold	Receiver: 9 kHz RBW, Quasi-peak and Average detector
Measurement time 100 ms	

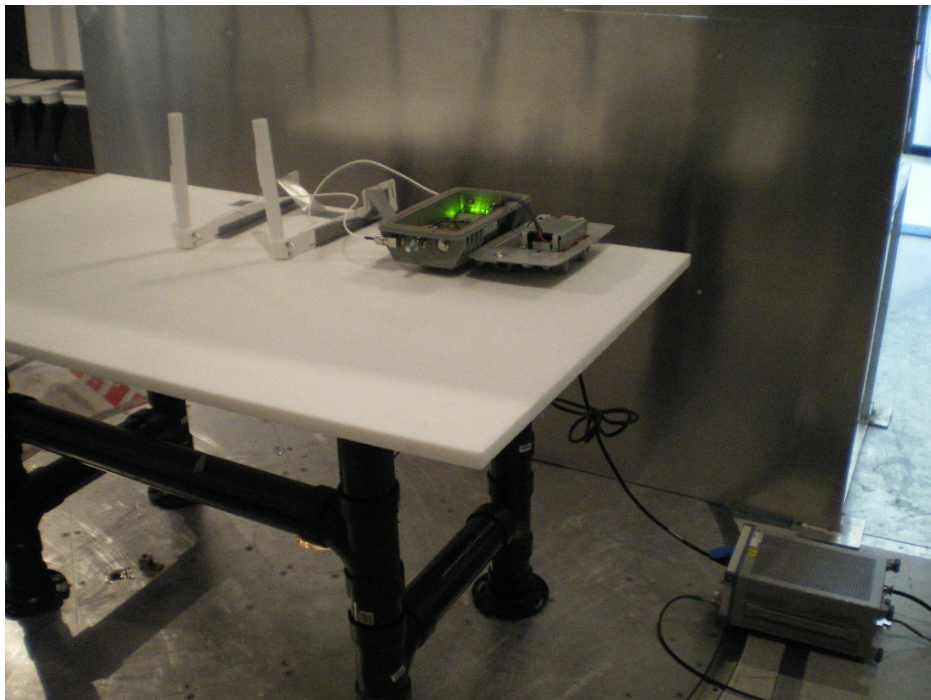


Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data	Product: DRU 2.4GHz radio	
Test name: Clause 15.207(a) Conducted limits		
Test date: August 27, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C		

Test data, continued

Setup photos



8.2 Clause 15.247(a)(2) Minimum 6 dB bandwidth for systems using digital modulation techniques

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

(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.

Special notes

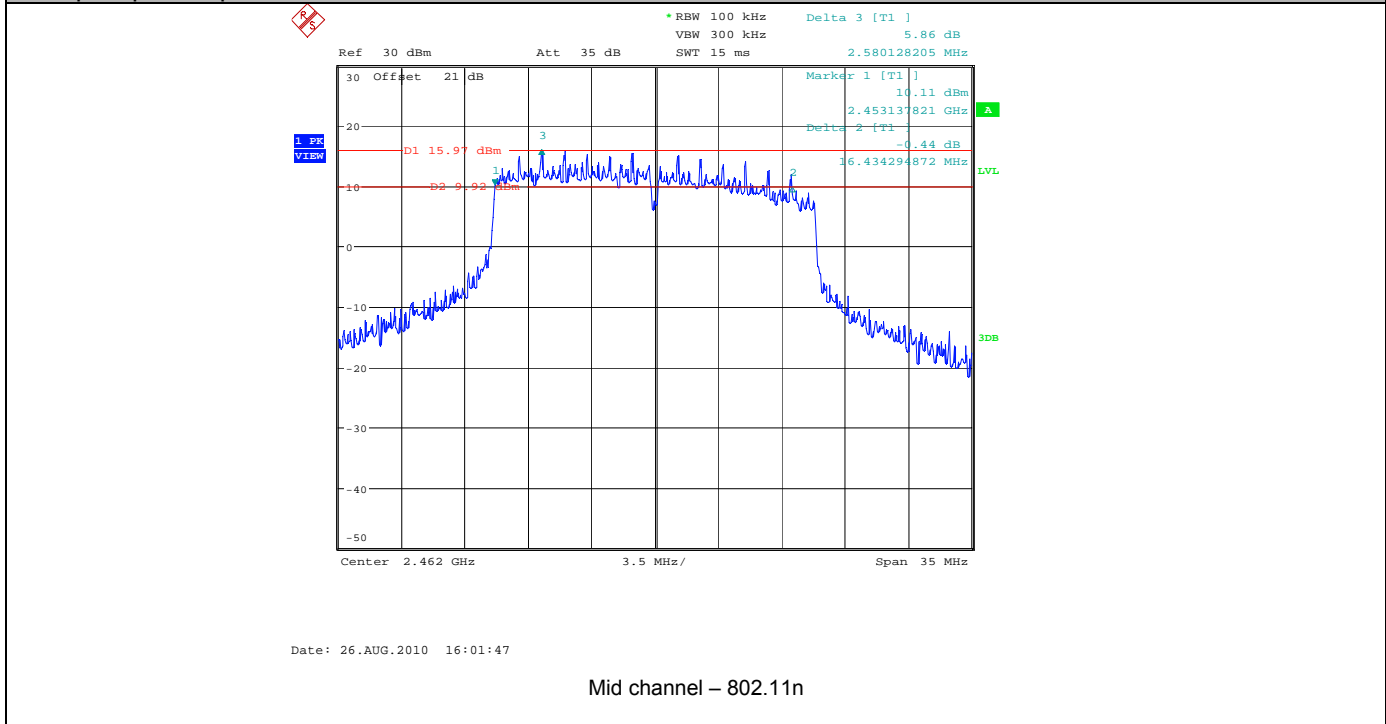
None


Test data

Modulation	Port	Frequency (MHz)	6 dB bandwidth (MHz)	Limit (MHz)
802.11n (11N rate MCS7 65 Mbps)	ANT-1	2412	16.434	0.5
		2437	17.72	0.5
		2462	16.71	0.5
802.11g (11A rate 7.54 Mbps)	ANT-1	2412	15.929	0.5
		2437	16.54	0.5
		2462	15.87	0.5
802.11b (11B rate CCK-11S 11.0 Mbps)	ANT-1	2412	11.77	0.5
		2437	12	0.5
		2462	11.61	0.5

- A peak detector with 100 kHz RBW and 300 kHz VBW was used to perform measurement.
- The span was wider than 6 dB bandwidth.

Sample spectral plots




 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data	Product: DRU 2.4GHz radio	
	Test name: Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi		
	Test date: August 18, 2010	Test engineer: David Duchesne	Verdict: Pass
	Specification: FCC Part 15 Subpart C		

8.3 Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

- (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 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 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.
 - (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
 - (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.
 - (iii) Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(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 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.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: DRU 2.4GHz radio
	Test name: Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi		
	Test date: August 18, 2010	Test engineer: David Duchesne	Verdict: Pass
	Specification: FCC Part 15 Subpart C		

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

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

(1) Fixed point-to-point operation:

- (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi
- (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.
- (iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(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.

Special notes

- The output RF power was measured on the antenna port 1 and 2 by means of a spectrum analyzer and following the *Power Output Option 2, Method 1* procedure from the FCC guidelines for Measurement of Digital Transmission Systems operating under Section 15.247. The total output power equal to the summary of the output RF power was measured on the antenna port 1 and 2.
- The EUT was additionally tested with BelAir 2.4GHz Triplexer (PN# BNCKG0138)



Section 8: Testing data	Product: DRU 2.4GHz radio
Test name: Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi	
Test date: August 18, 2010	Test engineer: David Duchesne
Verdict: Pass	
Specification: FCC Part 15 Subpart C	

Test data

Omni antenna

Modulation	Freq. (MHz)	SW setting	Conducted Avg. power ANT 1 (mW)	Conducted Avg. power ANT 2 (mW)	Combined output power (dBm)	Conducted output power limit (dBm)	Conducted output power margin (dB)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
802.11n	2412	25	67.800	71.846	21.45	30	8.55	5	0.5	25.95	36.00	10.05
	2437	42	368.012	385.319	28.77	30	1.23	5	0.5	33.27	36.00	2.73
	2462	27	78.190	71.600	21.75	30	8.25	5	0.5	26.25	36.00	9.75
802.11g	2412	25	68.500	72.321	21.49	30	8.51	5	0.5	25.99	36.00	10.01
	2437	42	357.253	372.324	28.63	30	1.37	5	0.5	33.13	36.00	2.87
	2462	28	87.110	81.455	22.27	30	7.73	5	0.5	26.77	36.00	9.23
802.11b	2412	42	257.911	282.776	27.33	30	2.67	5	0.5	31.83	36.00	4.17
	2437	42	249.432	260.732	27.08	30	2.92	5	0.5	31.58	36.00	4.42
	2462	41	242.353	239.641	26.83	30	3.17	5	0.5	31.33	36.00	4.67
802.11n	2412	25	67.800	71.846	21.45	28.5	7.05	8	0.5	28.95	36.00	7.05
	2437	40	306.179	340.878	28.11	28.5	0.39	8	0.5	35.61	36.00	0.39
	2462	23	48.960	44.425	19.70	28.5	8.80	8	0.5	27.20	36.00	8.80
802.11g	2412	25	68.500	72.321	21.49	28.5	7.01	8	0.5	28.99	36.00	7.01
	2437	40	292.998	317.693	27.86	28.5	0.64	8	0.5	35.36	36.00	0.64
	2462	25	62.21	58.1	20.80	28.5	7.70	8	0.5	28.30	36.00	7.70
802.11b	2412	42	257.911	282.776	27.33	28.5	1.17	8	0.5	34.83	36.00	1.17
	2437	42	249.432	260.732	27.08	28.5	1.42	8	0.5	34.58	36.00	1.42
	2462	40	219.039	216.406	26.39	28.5	2.11	8	0.5	33.89	36.00	2.11

- Output power limit = 30 dBm - ((antenna gain - cable loss) - 6 dBi) [for antennas greater than 6 dBi]
- Combined output power (dBm) = 10 Log (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW))
- EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))

Directional antennas (Point to Point P2P)

Modulation	Freq. (MHz)	SW setting	Conducted Avg. power ANT 1 (mW)	Conducted Avg. power ANT 2 (mW)	Combined output power (dBm)	Conducted output power limit (dBm)	Conducted output power margin (dB)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm)
802.11n	2412	27	87.850	90.667	22.52	29.5	6.98	8	0.5	30.02
	2437	40	306.179	340.878	28.11	29.5	1.39	8	0.5	35.61
	2462	31	125.320	118.775	23.88	29.5	5.62	8	0.5	31.38
802.11g	2412	28	98.640	101.609	23.02	29.5	6.48	8	0.5	30.52
	2437	40	292.998	317.693	27.86	29.5	1.64	8	0.5	35.36
	2462	33	160.08	159.991	25.05	29.5	4.45	8	0.5	32.55
802.11b	2412	42	257.911	282.776	27.33	29.5	2.17	8	0.5	34.83
	2437	42	249.432	260.732	27.08	29.5	2.42	8	0.5	34.58
	2462	42	263.132	256.641	27.16	29.5	2.34	8	0.5	34.66
802.11n	2412	34	184.959	197.404	25.82	26.83	1.01	16	0.5	41.32
	2437	36	220.952	234.287	26.58	26.83	0.25	16	0.5	42.08
	2462	37	241.841	234.100	26.78	26.83	0.06	16	0.5	42.28
802.11g	2412	34	187.112	204.902	25.93	26.83	0.90	16	0.5	41.43
	2437	37	229.405	246.682	26.78	26.83	0.06	16	0.5	42.28
	2462	36	215.807	220.803	26.40	26.83	0.43	16	0.5	41.90
802.11b	2412	40	221.009	252.552	26.75	26.83	0.08	16	0.5	42.25
	2437	41	212.340	246.727	26.62	26.83	0.21	16	0.5	42.12
	2462	40	219.039	216.406	26.39	26.83	0.44	16	0.5	41.89

- Output power limit = 30 dBm - ((antenna gain - cable loss) - 6 dBi) + 3 [for antennas greater than 6 dBi]
- Combined output power (dBm) = 10 Log (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW))
- EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))

Directional antenna (Point to Multipoint P2MP)

Modulation	Freq. (MHz)	SW setting	Conducted Avg. power ANT 1 (mW)	Conducted Avg. power ANT 2 (mW)	Combined output power (dBm)	Conducted output power limit (dBm)	Conducted output power margin (dB)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
802.11n	2412	27	87.850	90.667	22.52	28.50	5.98	8	0.5	30.02	36	5.98
	2437	40	306.179	340.878	28.11	28.50	0.39	8	0.5	35.61	36	0.39
	2462	31	125.320	118.775	23.88	28.50	4.62	8	0.5	31.38	36	4.62
802.11g	2412	28	98.640	101.609	23.02	28.50	5.48	8	0.5	30.52	36	5.48
	2437	40	292.998	317.693	27.86	28.50	0.64	8	0.5	35.36	36	0.64
	2462	33	160.08	159.991	25.05	28.50	3.45	8	0.5	32.55	36	3.45
802.11b	2412	42	257.911	282.776	27.33	28.50	1.17	8	0.5	34.83	36	1.17
	2437	42	249.432	260.732	27.08	28.50	1.42	8	0.5	34.58	36	1.42
	2462	42	263.132	256.641	27.16	28.50	1.34	8	0.5	34.66	36	1.34

- Output power limit = 30 dBm - ((antenna gain - cable loss) - 6 dBi) [for antennas greater than 6 dBi]
- Combined output power (dBm) = 10 Log (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW))
- EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data

Product: DRU 2.4GHz radio

Test name: Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi

Test date: August 18, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart C

Test data, continued

Directional antenna with triplexer (Point to Point P2P)

Modulation	Freq. (MHz)	SW setting	Conducted Avg. power ANT 1 (mW)	Conducted Avg. power ANT 2 (mW)	Combined output power (dBm)	Conducted output power limit (dBm)	Conducted output power margin (dB)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm)
802.11n	2412	32	100.187	98.910	22.99	26.83	3.84	16	0.5	38.49
	2437	42	209.276	194.096	26.06	26.83	0.78	16	0.5	41.56
	2462	42	230.148	217.141	26.51	26.83	0.33	16	0.5	42.01
802.11g	2412	32	98.976	100.497	23.00	26.83	3.83	16	0.5	38.50
	2437	42	215.871	197.317	26.16	26.83	0.67	16	0.5	41.66
	2462	42	243.116	222.112	26.68	26.83	0.16	16	0.5	42.18
802.11b	2412	42	204.452	174.137	25.78	26.83	1.05	16	0.5	41.28
	2437	42	156.916	171.061	25.16	26.83	1.67	16	0.5	40.66
	2462	42	158.933	164.612	25.10	26.83	1.73	16	0.5	40.60

- Output power limit = 30 dBm - ((antenna gain - cable loss) - 6 dBi) + 3 [for antennas greater than 6 dBi]
- Combined output power (dBm) = 10 Log (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW))
- EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))

Directional antenna with triplexer (Point to Multipoint P2MP)

Modulation	Freq. (MHz)	SW setting	Conducted Avg. power ANT 1 (mW)	Conducted Avg. power ANT 2 (mW)	Combined output power (dBm)	Conducted output power limit (dBm)	Conducted output power margin (dB)	Antenna gain (dBi)	Cable loss (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
802.11n	2412	26	49.507	47.546	19.87	20.50	0.63	16	0.5	35.37	36	0.63
	2437	28	49.160	51.627	20.03	20.50	0.47	16	0.5	35.53	36	0.47
	2462	28	51.705	49.685	20.06	20.50	0.44	16	0.5	35.56	36	0.44
802.11g	2412	26	48.984	48.774	19.90	20.50	0.60	16	0.5	35.40	36	0.60
	2437	27	47.069	46.623	19.72	20.50	0.78	16	0.5	35.22	36	0.78
	2462	27	49.128	44.830	19.73	20.50	0.77	16	0.5	35.23	36	0.77
802.11b	2412	29	49.553	51.606	20.05	20.50	0.45	16	0.5	35.55	36	0.45
	2437	30	47.607	46.203	19.72	20.50	0.78	16	0.5	35.22	36	0.78
	2462	30	47.292	46.553	19.72	20.50	0.78	16	0.5	35.22	36	0.78

- Output power limit = 30 dBm - ((antenna gain - cable loss) - 6 dBi) [for antennas greater than 6 dBi]
- Combined output power (dBm) = 10 Log (Conducted Avg. Power ANT-1 (mW) + Conducted Avg. Power ANT-2 (mW))
- EIRP (dBm) = Combined output power (dBm) + ((Antenna gain (dBi) - Cable loss (dB))

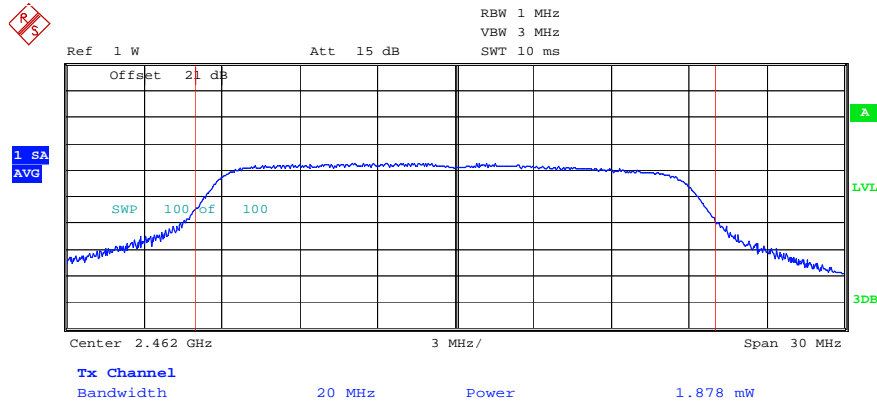


Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data		Product: DRU 2.4GHz radio
Test name: Clause 15.247(b) (3) and (4) Maximum peak conducted output power and Clause 15.247(c) (1) Operation with directional antenna gains greater than 6 dBi		
Test date: August 18, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C		

Test data, continued


Sample spectral plots



Date: 18.AUG.2010 15:18:19

High channel – 802.11n

Special note: Measured value from sample plot does not reflect the worst case. Plot provided to show spectrum settings.

 <small>Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2</small>	Section 8: Testing data		Product: DRU 2.4GHz radio
	Test name: Clause 15.247(d) Spurious emissions		
	Test date: August 25, 2010	Test engineer: David Duchesne	Verdict: Pass
	Specification: FCC Part 15 Subpart C		

8.4 Clause 15.247(d) Spurious emissions

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

- (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 §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)).

Special notes

Conducted measurements

- The spectrum was searched from 30 MHz to 10th harmonics for low (2412 MHz), mid (2437 MHz) and high (2462 MHz) carrier frequencies.
- All measurements for spurious emissions were performed conducted using a spectrum analyzer with Peak Detector with 100 kHz/300 kHz RBW/VBW.
- The spurious emissions were measured individually on antenna port 1 and 2, and combined with antenna port 1 and 2 by using a RF combiner.
- Spurious emissions were measured at triplexer output
- Spurious emissions were measured at triplexer output with multiple operating channels, This was achieved with multiple radio units.
- There were no additional emissions or change in existing emissions when both the 2.4 GHz radio and 5 GHz radios operated simultaneously.
- Only the worst-case test results are provided.



Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(d) Spurious emissions			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Special notes, continued

Radiated measurements

§15.209 – Radiated emission limits

Frequency (MHz)	Field strength		Measurement distance (m)
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)	
0.009–0.490	2400/F	67.6–20log(F)	300
0.490–1.705	24000/F	87.6–20log(F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

- Notes:
- F = fundamental frequency in kHz
 - In the emission table above, the tighter limit applies at the band edges.
 - For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

§15.205 – Restricted bands of operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

- The spectrum was searched from 30 MHz to 10th harmonics for low (2412 MHz), mid (2437 MHz) and high (2462 MHz) carrier frequencies
- These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.
- Peak Detector with 100 kHz/300 kHz RBW/VBW was used for measurements below 1 GHz and 1 MHz/3 MHz RBW/VBW for frequencies above 1 GHz. Since EUT has 100 % duty cycle average measurements were performed at the frequencies above 1 GHz with 1 MHz/10 Hz RBW/VBW spectrum analyzer settings.
- The EUT was additionally tested with BelAir 2.4GHz Triplexer, PN# BNCKG0138
- Spurious emissions were measured at triplexer output with multiple operating channels, This was achieved with multiple radio units.
- Only the worst-case test results are provided.



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data

Product: DRU 2.4GHz radio

Test name: Clause 15.247(d) Spurious emissions

Test date: August 25, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart C

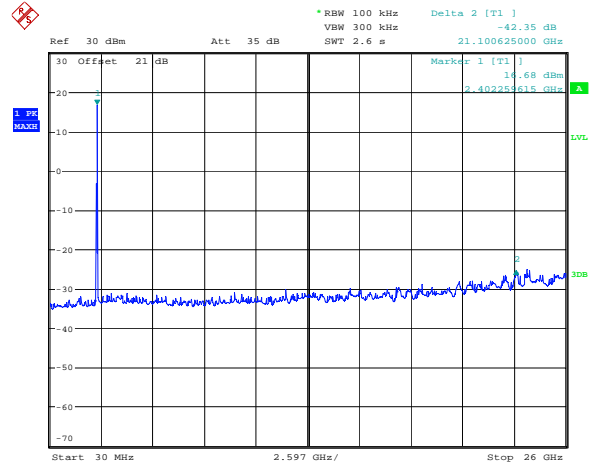
Test data

Conducted spurious emissions

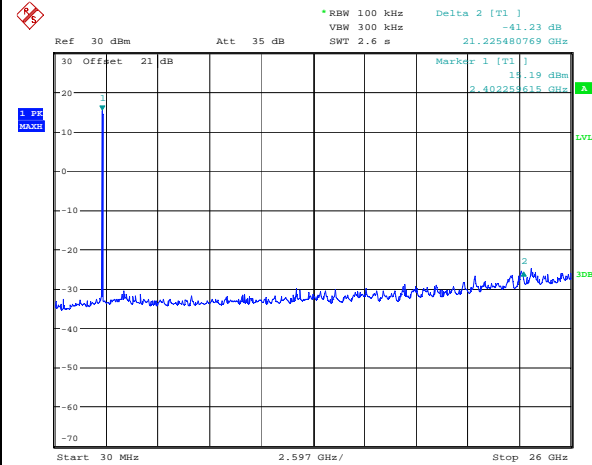
Port	Frequency (MHz)	Modulation	Below fundamental (dB)	Limit (dB)	Margin (dB)
ANT-1	2412	802.11n	42.35	30	12.35
	2437	802.11n	41.23	30	11.23
	2462	802.11n	41.59	30	11.59

Spectral plots

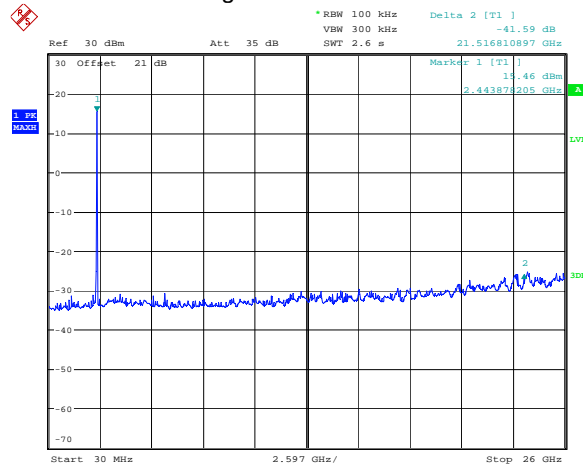
Low channel – 2412 MHz



Mid channel – 2437 MHz



High channel – 2462 MHz





Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data

Product: DRU 2.4GHz radio

Test name: Clause 15.247(d) Spurious emissions

Test date: August 25, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart C

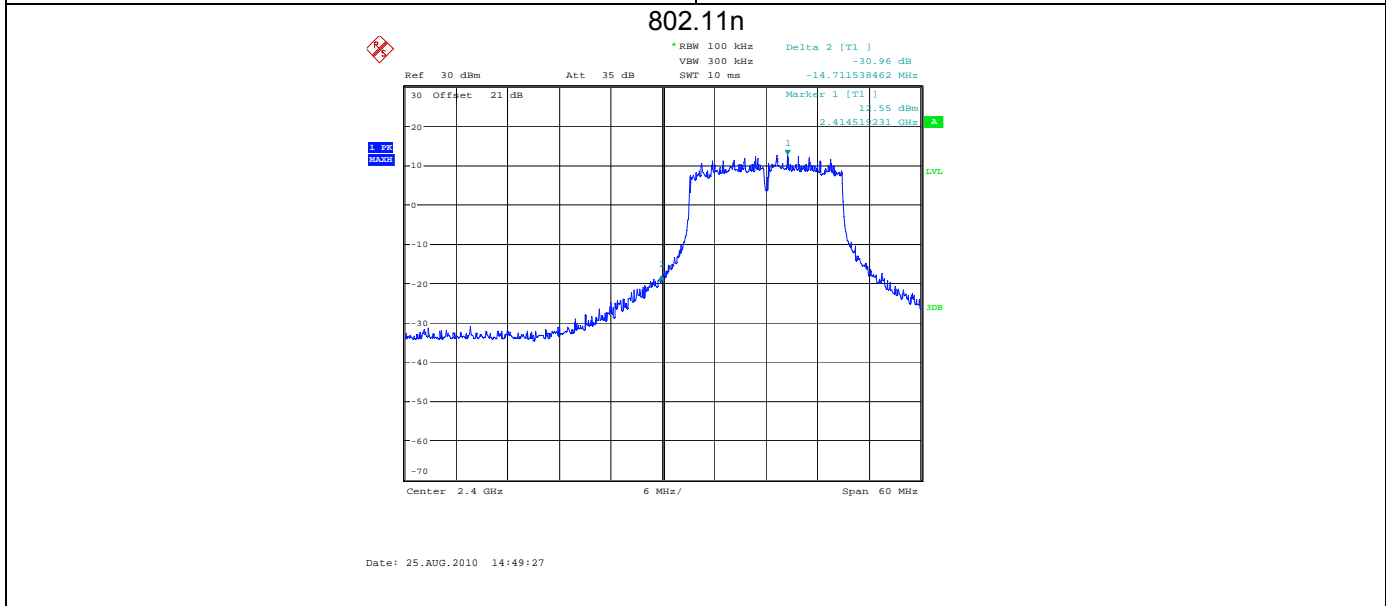
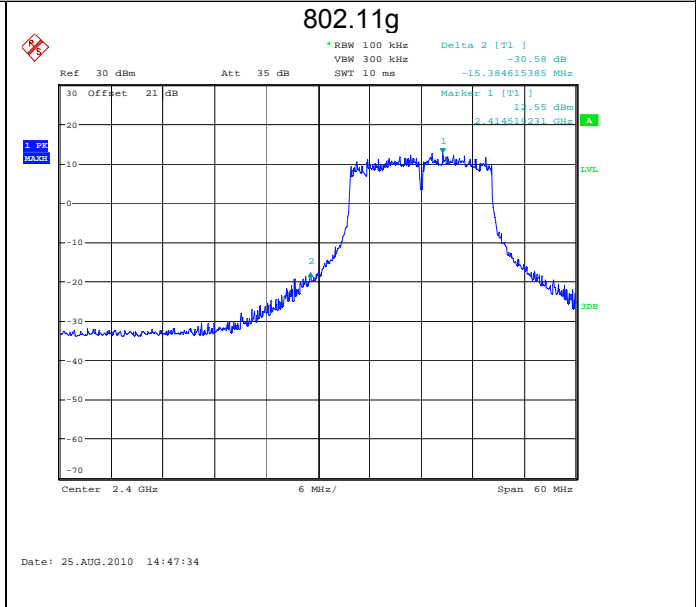
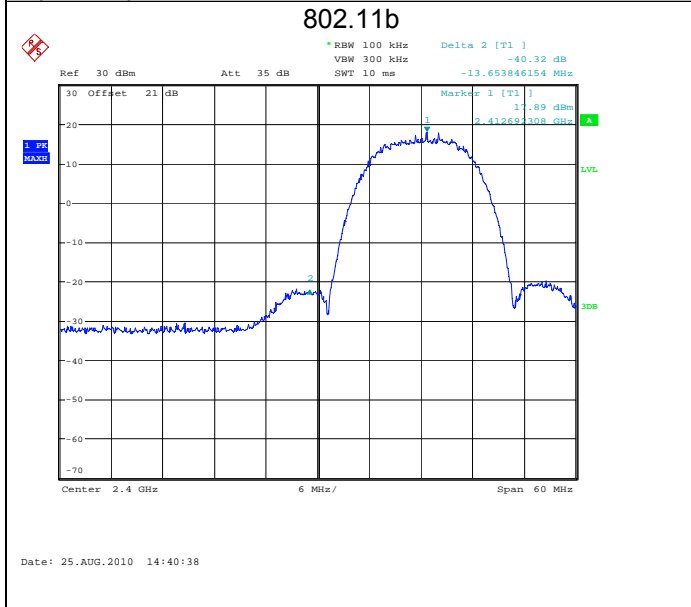
Test data, continued

Conducted spurious emissions, continued

Band edge measurements: Lower band edge

Port	Frequency (MHz)	Modulation	Below fundamental (dB)	Limit (dB)	Margin (dB)
ANT-1	2412	802.11b	40.32	30	10.32
	2412	802.11g	30.58	30	0.58
	2412	802.11n	30.96	30	0.96

Spectral plots





Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data

Product: DRU 2.4GHz radio

Test name: Clause 15.247(d) Spurious emissions

Test date: August 25, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart C

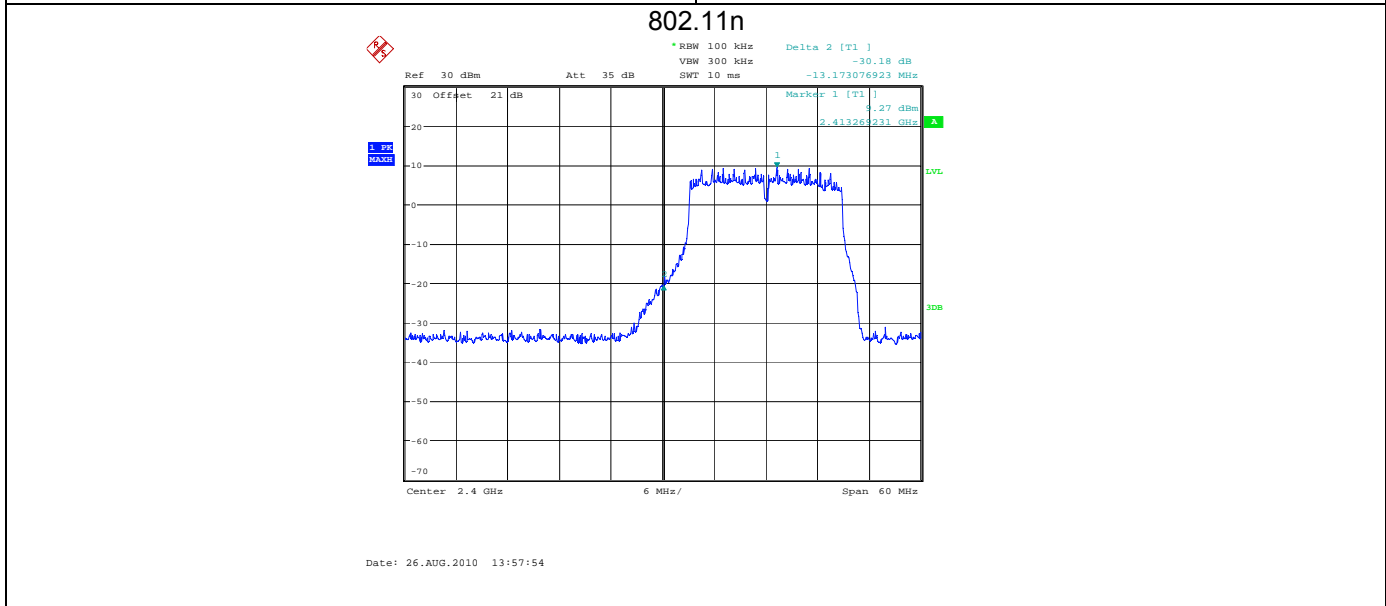
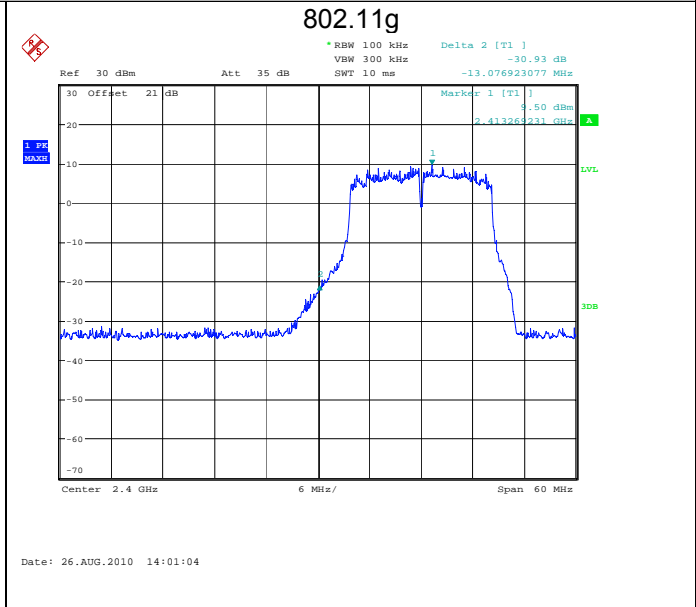
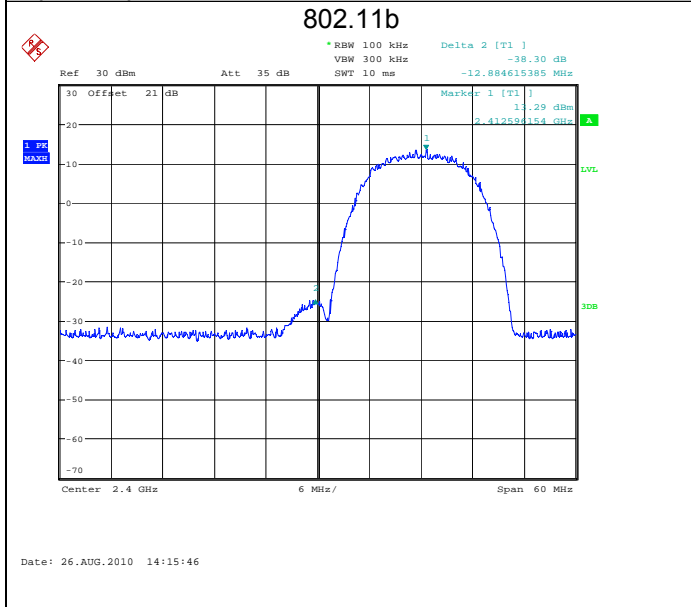
Test data, continued

Conducted spurious emissions, continued

Band edge measurements: Lower band edge (With triplexer)

Port	Frequency (MHz)	Modulation	Below fundamental (dB)	Limit (dB)	Margin (dB)
ANT-1	2412	802.11b	38.3	30	8.3
	2412	802.11g	30.93	30	0.93
	2412	802.11n	30.18	30	0.18

Spectral plots





Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data

Product: DRU 2.4GHz radio

Test name: Clause 15.247(d) Spurious emissions

Test date: August 25, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart C

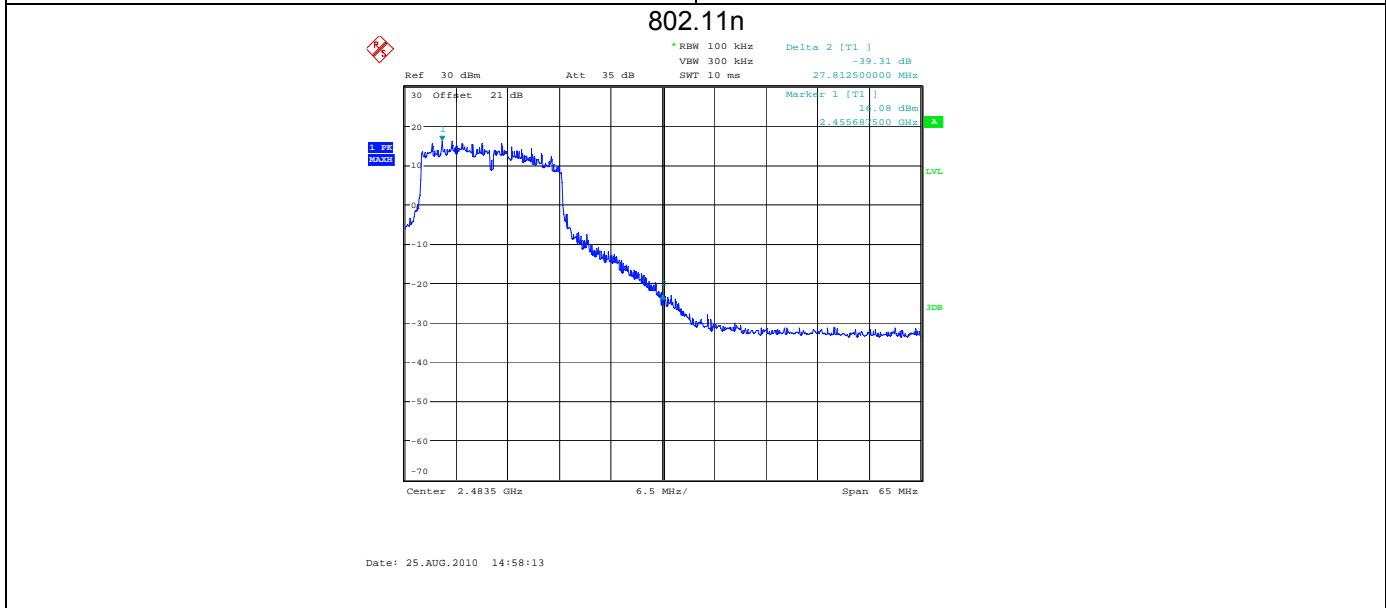
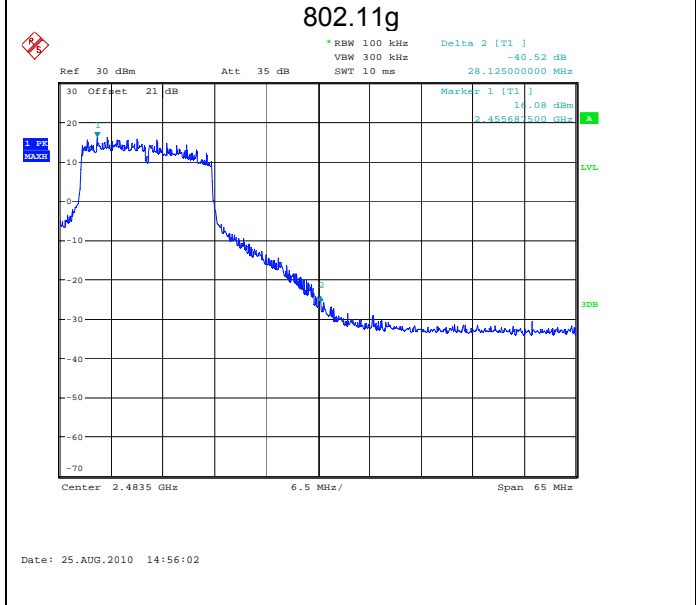
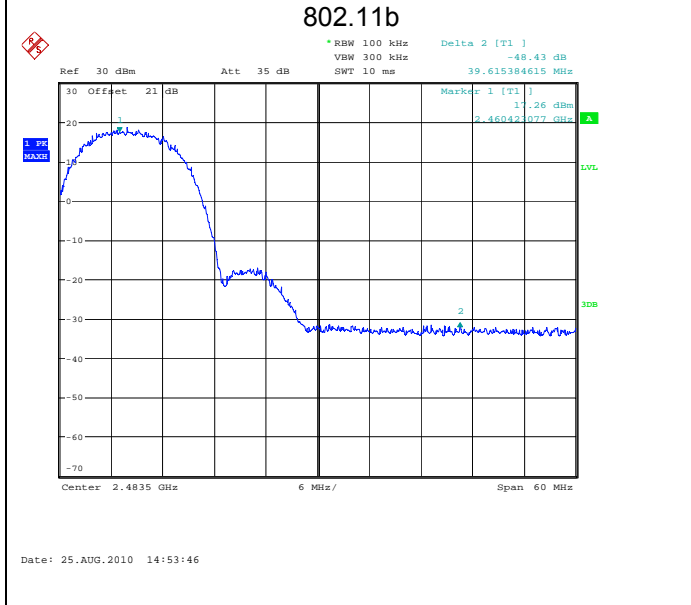
Test data, continued

Conducted spurious emissions, continued

Band edge measurements: Upper band edge

Port	Frequency (MHz)	Modulation	Below fundamental (dB)	Limit (dB)	Margin (dB)
ANT-1	2462	802.11b	48.43	30	18.43
	2462	802.11g	40.52	30	10.52
	2462	802.11n	39.31	30	9.31

Spectral plots





Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data

Product: DRU 2.4GHz radio

Test name: Clause 15.247(d) Spurious emissions

Test date: August 25, 2010

Test engineer: David Duchesne

Verdict: Pass

Specification: FCC Part 15 Subpart C

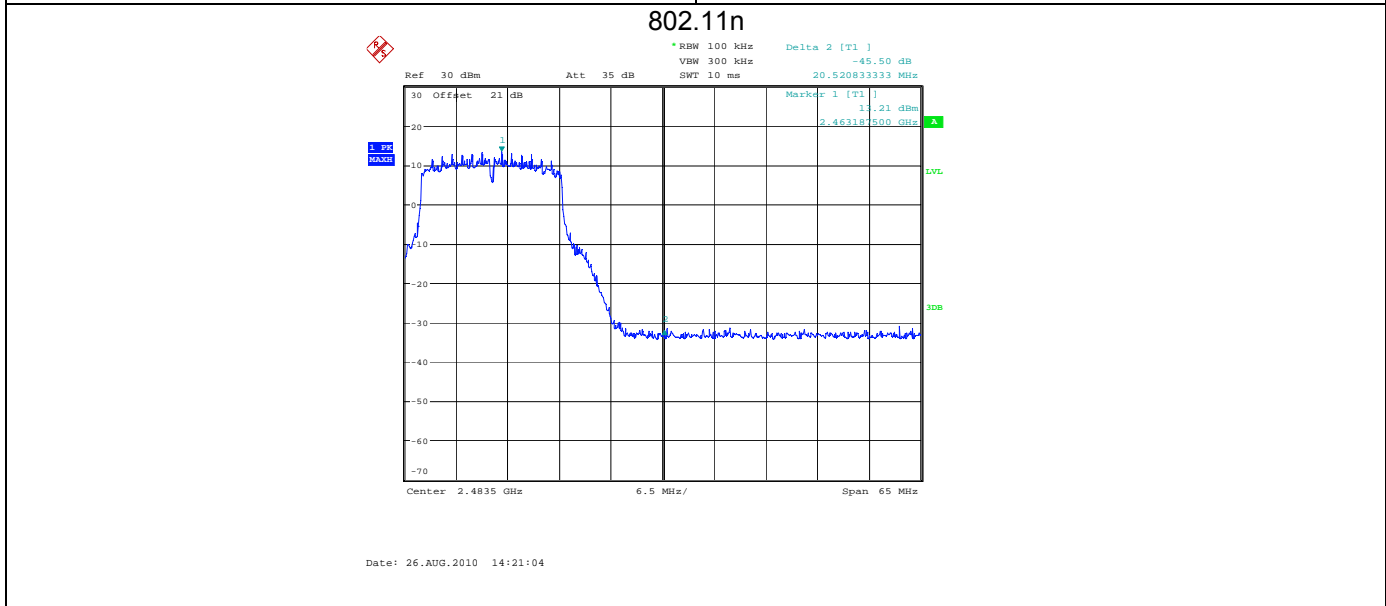
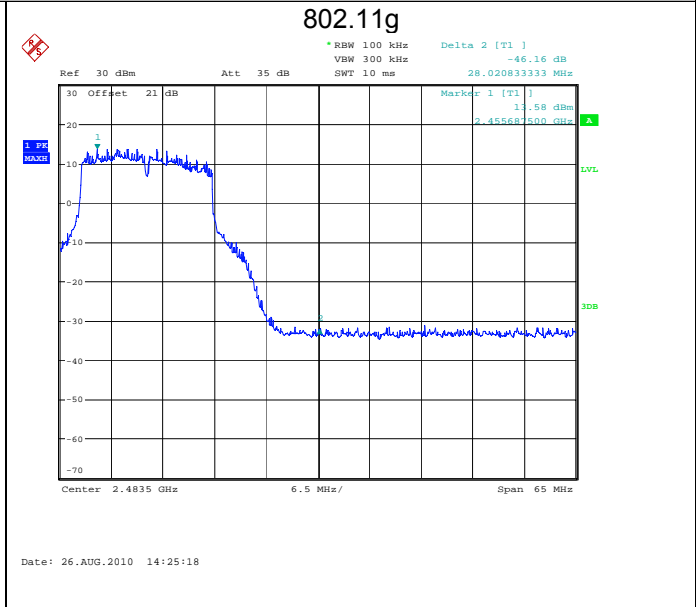
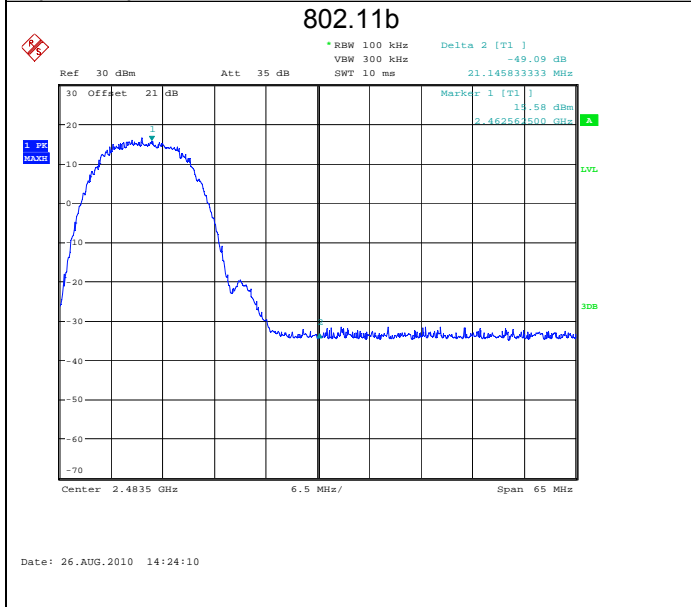
Test data, continued

Conducted spurious emissions, continued

Band edge measurements: Upper band edge (With triplexer)

Port	Frequency (MHz)	Modulation	Below fundamental (dB)	Limit (dB)	Margin (dB)
ANT-1	2462	802.11b	49.09	30	19.09
	2462	802.11g	46.16	30	16.16
	2462	802.11n	45.50	30	15.5

Spectral plots





Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(d) Spurious emissions			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Test data, continued

Radiated spurious emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205

Low Channel – 2412 MHz

Modulation	Antenna	Fundamental Freq. (MHz)	SW PWR setting	Freq. (MHz)	FS Peak (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	FS Avg. (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
802.11b6	Omni 5dBi	2412	42	2390	60.00	74.00	14.00	51.50	54.00	2.50
802.11g7	Omni 5dBi	2412	25	2390	69.80	74.00	4.20	51.75	54.00	2.25
802.11n7	Omni 5dBi	2412	25	2390	70.20	74.00	3.80	53.00	54.00	1.00
802.11b6	Omni 8dBi	2412	42	2388	66.62	74.00	7.38	52.56	54.00	1.44
802.11g7	Omni 8dBi	2412	25	2390	72.20	74.00	1.80	52.96	54.00	1.04
802.11n7	Omni 8dBi	2412	25	2390	69.68	74.00	4.32	52.03	54.00	1.97
802.11b6	Diectional 8dBi	2412	42	2388	65.22	74.00	8.78	53.17	54.00	0.83
802.11g7	Diectional 8dBi	2412	28	2389	73.21	74.00	0.79	51.92	54.00	2.08
802.11n7	Diectional 8dBi	2412	27	2390	72.19	74.00	1.81	53.80	54.00	0.20
802.11b6	Diectional 16dBi	2412	24	2390	62.62	74.00	11.38	49.86	54.00	4.14
802.11g7	Diectional 16dBi	2412	22	2390	66.55	74.00	7.45	51.30	54.00	2.70
802.11n7	Diectional 16dBi	2412	22	2390	71.56	74.00	2.44	53.26	54.00	0.74
802.11b6	Omni 5dBi	2412	42	4824	55.07	74.00	18.93	36.75	54.00	17.25
802.11g7	Omni 5dBi	2412	25	4824	49.98	74.00	24.02	-	54.00	-
802.11n7	Omni 5dBi	2412	25	4824	49.23	74.00	24.77	-	54.00	-
802.11b6	Omni 8dBi	2412	42	4824	49.71	74.00	24.29	-	54.00	-
802.11g7	Omni 8dBi	2412	25	4824	48.87	74.00	25.13	-	54.00	-
802.11n7	Omni 8dBi	2412	25	4824	49.06	74.00	24.94	-	54.00	-
802.11b6	Diectional 8dBi	2412	42	4824	50.16	74.00	23.84	-	54.00	-
802.11g7	Diectional 8dBi	2412	28	4824	50.71	74.00	23.29	-	54.00	-
802.11n7	Diectional 8dBi	2412	27	4824	47.00	74.00	27.00	-	54.00	-
802.11b6	Diectional 16dBi	2412	24	4824	50.31	74.00	23.69	-	54.00	-
802.11g7	Diectional 16dBi	2412	22	4824	49.60	74.00	24.40	-	54.00	-
802.11n7	Diectional 16dBi	2412	22	4824	49.29	74.00	24.71	-	54.00	-
802.11b6	Omni 5dBi	2412	42	7236	56.89	74.00	17.11	42.85	54.00	11.15
802.11g7	Omni 5dBi	2412	25	7236	55.46	74.00	18.54	41.47	54.00	12.53
802.11n7	Omni 5dBi	2412	25	7236	55.21	74.00	18.79	41.05	54.00	12.95
802.11b6	Omni 8dBi	2412	42	7236	55.47	74.00	18.53	41.28	54.00	12.72
802.11g7	Omni 8dBi	2412	25	7236	55.47	74.00	18.53	41.98	54.00	12.02
802.11n7	Omni 8dBi	2412	25	7236	55.40	74.00	18.60	42.52	54.00	11.48
802.11b6	Diectional 8dBi	2412	42	7236	55.68	74.00	18.32	41.37	54.00	12.63
802.11g7	Diectional 8dBi	2412	28	7236	55.64	74.00	18.36	41.07	54.00	12.93
802.11n7	Diectional 8dBi	2412	27	7236	55.74	74.00	18.26	41.23	54.00	12.77
802.11b6	Diectional 16dBi	2412	24	7236	56.19	74.00	17.81	41.39	54.00	12.61
802.11g7	Diectional 16dBi	2412	22	7236	55.68	74.00	18.32	41.24	54.00	12.76
802.11n7	Diectional 16dBi	2412	22	7236	56.49	74.00	17.51	41.34	54.00	12.66

- Test distance = 3m
- Field strength measurement has been corrected with transducer factors (i.e. antenna, cable loss, amplifier, and attenuators)



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(d) Spurious emissions			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Test data, continued

Radiated spurious emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205, continued

Mid Channel – 2437 MHz

Modulation	Antenna	Fundamental Freq. (MHz)	SW PWR setting	Freq. (MHz)	FS Peak (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	FS Avg. (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
802.11b6	Omni 5dBi	2437	42	4874	52.62	74.00	21.38	-	54.00	-
802.11g7	Omni 5dBi	2437	42	4874	50.08	74.00	23.92	-	54.00	-
802.11n7	Omni 5dBi	2437	42	4874	51.34	74.00	22.66	-	54.00	-
802.11b6	Omni 8dBi	2437	42	4874	50.26	74.00	23.74	-	54.00	-
802.11g7	Omni 8dBi	2437	40	4874	49.74	74.00	24.26	-	54.00	-
802.11n7	Omni 8dBi	2437	40	4874	50.55	74.00	23.45	-	54.00	-
802.11b6	Directional 8dBi	2437	42	4874	49.98	74.00	24.02	-	54.00	-
802.11g7	Directional 8dBi	2437	40	4874	49.79	74.00	24.21	-	54.00	-
802.11n7	Directional 8dBi	2437	40	4874	49.38	74.00	24.62	-	54.00	-
802.11b6	Directional 16dBi	2437	26	4874	50.00	74.00	24.00	-	54.00	-
802.11g7	Directional 16dBi	2437	23	4874	48.85	74.00	25.15	-	54.00	-
802.11n7	Directional 16dBi	2437	23	4874	49.30	74.00	24.70	-	54.00	-
802.11b6	Omni 5dBi	2437	42	7311	58.98	74.00	15.02	45.30	54.00	8.70
802.11g7	Omni 5dBi	2437	42	7311	60.87	74.00	13.13	45.13	54.00	8.87
802.11n7	Omni 5dBi	2437	42	7311	60.57	74.00	13.43	45.16	54.00	8.84
802.11b6	Omni 8dBi	2437	42	7311	56.81	74.00	17.19	42.17	54.00	11.83
802.11g7	Omni 8dBi	2437	40	7311	57.91	74.00	16.09	45.42	54.00	8.58
802.11n7	Omni 8dBi	2437	40	7311	58.08	74.00	15.92	42.81	54.00	11.19
802.11b6	Directional 8dBi	2437	42	7311	56.18	74.00	17.82	43.20	54.00	10.80
802.11g7	Directional 8dBi	2437	40	7311	57.00	74.00	17.00	42.30	54.00	11.70
802.11n7	Directional 8dBi	2437	40	7311	57.98	74.00	16.02	41.30	54.00	12.70
802.11b6	Directional 16dBi	2437	26	7311	55.81	74.00	18.19	41.22	54.00	12.78
802.11g7	Directional 16dBi	2437	23	7311	56.04	74.00	17.96	41.41	54.00	12.59
802.11n7	Directional 16dBi	2437	23	7311	58.06	74.00	15.94	41.37	54.00	12.63

- Test distance = 3m
- Field strength measurement has been corrected with transducer factors (i.e. antenna, cable loss, amplifier, and attenuators)



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(d) Spurious emissions			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Test data, continued

Radiated spurious emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205, continued

High Channel – 2462 MHz										
Modulation	Antenna	Fundamental Freq. (MHz)	SW PWR setting	Freq. (MHz)	FS Peak (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	FS Avg. (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
802.11b6	Omni 5dBi	2462	41	2489	64.12	74.00	9.88	52.55	54.00	1.45
802.11g7	Omni 5dBi	2462	28	2483.5	72.76	74.00	1.24	53.97	54.00	0.03
802.11n7	Omni 5dBi	2462	27	2483.5	69.79	74.00	4.21	53.47	54.00	0.53
802.11b6	Omni 8dBi	2462	40	2483.5	66.16	74.00	7.84	53.56	54.00	0.44
802.11g7	Omni 8dBi	2462	25	2483.5	72.67	74.00	1.33	53.55	54.00	0.45
802.11n7	Omni 8dBi	2462	23	2483.5	71.11	74.00	2.89	53.60	54.00	0.40
802.11b6	Diectional 8dBi	2462	42	2489.6	63.47	74.00	10.53	50.76	54.00	3.24
802.11g7	Diectional 8dBi	2462	33	2489.6	72.58	74.00	1.42	53.69	54.00	0.31
802.11n7	Diectional 8dBi	2462	31	2482.2	71.40	74.00	2.60	53.41	54.00	0.59
802.11b6	Diectional 16dBi	2462	23	2488	62.58	74.00	11.42	49.82	54.00	4.18
802.11g7	Diectional 16dBi	2462	23	2483.5	72.16	74.00	1.84	53.73	54.00	0.27
802.11n7	Diectional 16dBi	2462	26	2483.5	73.24	74.00	0.76	54.00	54.00	0.00
802.11b6	Omni 5dBi	2462	41	4924	50.00	74.00	24.00	-	54.00	-
802.11g7	Omni 5dBi	2462	28	4924	50.16	74.00	23.84	-	54.00	-
802.11n7	Omni 5dBi	2462	27	4924	49.76	74.00	24.24	-	54.00	-
802.11b6	Omni 8dBi	2462	40	4924	49.95	74.00	24.05	-	54.00	-
802.11g7	Omni 8dBi	2462	25	4924	49.29	74.00	24.71	-	54.00	-
802.11n7	Omni 8dBi	2462	23	4924	50.93	74.00	23.07	-	54.00	-
802.11b6	Diectional 8dBi	2462	42	4924	50.56	74.00	23.44	-	54.00	-
802.11g7	Diectional 8dBi	2462	33	4924	49.70	74.00	24.30	-	54.00	-
802.11n7	Diectional 8dBi	2462	31	4924	49.69	74.00	24.31	-	54.00	-
802.11b6	Diectional 16dBi	2462	23	4924	49.27	74.00	24.73	-	54.00	-
802.11g7	Diectional 16dBi	2462	23	4924	49.06	74.00	24.94	-	54.00	-
802.11n7	Diectional 16dBi	2462	26	4924	48.08	74.00	25.92	-	54.00	-
802.11b6	Omni 5dBi	2462	41	7386	56.98	74.00	17.02	42.06	54.00	11.94
802.11g7	Omni 5dBi	2462	28	7386	56.43	74.00	17.57	42.08	54.00	11.92
802.11n7	Omni 5dBi	2462	27	7386	56.52	74.00	17.48	42.00	54.00	12.00
802.11b6	Omni 8dBi	2462	40	7386	56.59	74.00	17.41	42.01	54.00	11.99
802.11g7	Omni 8dBi	2462	25	7386	56.46	74.00	17.54	41.08	54.00	12.92
802.11n7	Omni 8dBi	2462	23	7386	57.11	74.00	16.89	42.11	54.00	11.89
802.11b6	Diectional 8dBi	2462	42	7386	56.81	74.00	17.19	42.50	54.00	11.50
802.11g7	Diectional 8dBi	2462	33	7386	56.53	74.00	17.47	42.30	54.00	11.70
802.11n7	Diectional 8dBi	2462	31	7386	56.79	74.00	17.21	42.36	54.00	11.64
802.11b6	Diectional 16dBi	2462	23	7386	54.22	74.00	19.78	41.00	54.00	13.00
802.11g7	Diectional 16dBi	2462	23	7386	56.66	74.00	17.34	41.01	54.00	12.99
802.11n7	Diectional 16dBi	2462	26	7386	56.33	74.00	17.67	41.09	54.00	12.91

- Test distance = 3m
- Field strength measurement has been corrected with transducer factors (i.e. antenna, cable loss, amplifier, and attenuators)



Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(d) Spurious emissions			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Test data, continued

Radiated spurious emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205, continued

With Triplexer

Modulation	Antenna	Fundamental Freq. (MHz)	SW PWR setting	Freq. (MHz)	FS Peak (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	FS Avg. (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
Low Channel										
802.11b6	Diectional 16dBi	2412	42	2390	62.90	74.00	11.10	49.30	54.00	4.70
802.11g7	Diectional 16dBi	2412	32	2390	62.49	74.00	11.51	49.61	54.00	4.39
802.11n7	Diectional 16dBi	2412	32	2390	62.52	74.00	11.48	49.70	54.00	4.30
802.11b6	Diectional 16dBi	2412	42	4824	49.14	74.00	24.86	-	54.00	-
802.11g7	Diectional 16dBi	2412	32	4824	48.11	74.00	25.89	-	54.00	-
802.11n7	Diectional 16dBi	2412	32	4824	49.35	74.00	24.65	-	54.00	-
802.11b6	Diectional 16dBi	2412	42	7236	55.46	74.00	18.54	41.15	54.00	12.85
802.11g7	Diectional 16dBi	2412	32	7236	56.01	74.00	17.99	41.32	54.00	12.68
802.11n7	Diectional 16dBi	2412	32	7236	53.57	74.00	20.43	41.23	54.00	12.77
Mid Channel										
802.11b6	Diectional 16dBi	2437	42	4874	50.16	74.00	23.84	-	54.00	-
802.11g7	Diectional 16dBi	2437	42	4874	49.75	74.00	24.25	-	54.00	-
802.11n7	Diectional 16dBi	2437	42	4874	49.62	74.00	24.38	-	54.00	-
802.11b6	Diectional 16dBi	2437	42	7311	56.35	74.00	17.65	41.37	54.00	12.63
802.11g7	Diectional 16dBi	2437	42	7311	56.23	74.00	17.77	41.20	54.00	12.80
High Channel										
802.11b6	Diectional 16dBi	2462	42	2483.5	61.90	74.00	12.10	49.79	54.00	4.21
802.11g7	Diectional 16dBi	2462	42	2483.5	62.18	74.00	11.82	51.24	54.00	2.76
802.11n7	Diectional 16dBi	2462	42	2483.5	66.29	74.00	7.71	52.31	54.00	1.69
802.11b6	Diectional 16dBi	2462	42	4924	49.80	74.00	24.20	-	54.00	-
802.11g7	Diectional 16dBi	2462	42	4924	49.61	74.00	24.39	-	54.00	-
802.11n7	Diectional 16dBi	2462	42	4924	47.12	74.00	26.88	-	54.00	-
802.11b6	Diectional 16dBi	2462	42	7386	56.71	74.00	17.29	41.85	54.00	12.15
802.11g7	Diectional 16dBi	2462	42	7386	54.27	74.00	19.73	41.35	54.00	12.65
802.11n7	Diectional 16dBi	2462	42	7386	54.74	74.00	19.26	41.31	54.00	12.69

- Test distance = 3m
- Field strength measurement has been corrected with transducer factors (i.e. antenna, cable loss, amplifier, and attenuators)

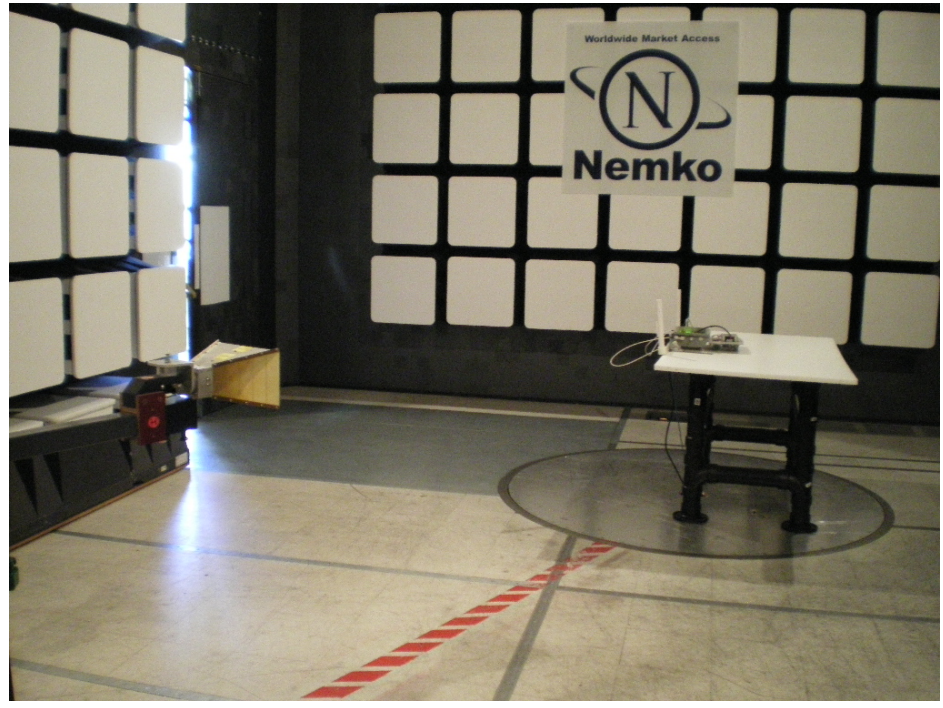
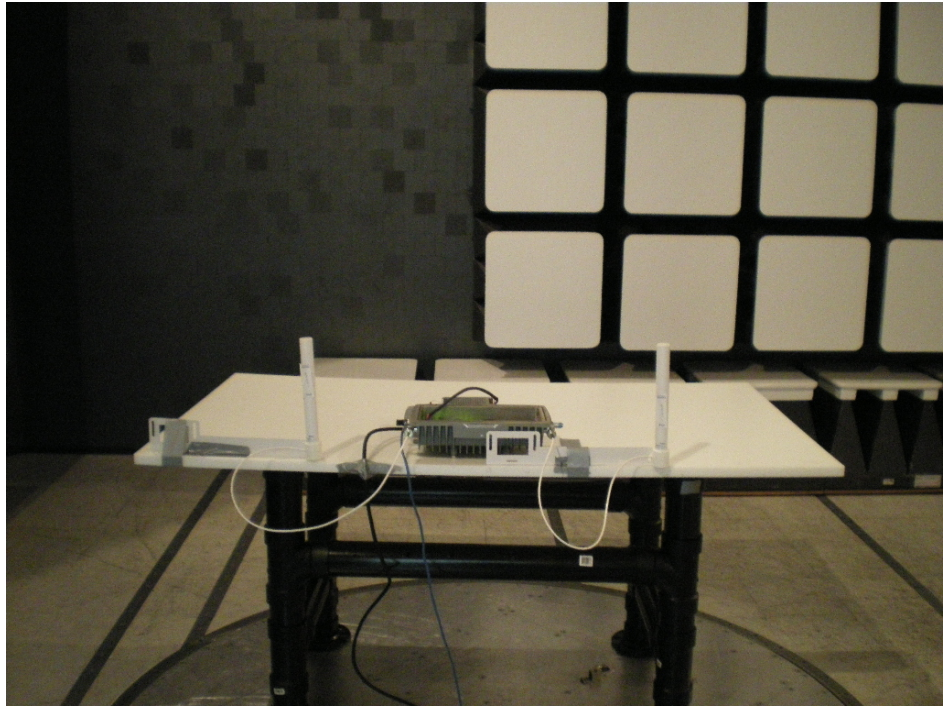


Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(d) Spurious emissions			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Test data, continued

Radiated spurious emissions Setup photos





Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

Section 8: Testing data	Product: DRU 2.4GHz radio	
Test name: Clause 15.247(e) Power spectral density for digitally modulated devices		
Test date: August 25, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C		

8.5 Clause 15.247(e) Power spectral density for digitally modulated devices

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

- (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.

Special notes

- The Power Spectral Density was measured on the antenna port 1 and 2 individually by means of a spectrum analyzer and following procedure described in 'PSD Option 1' in FCC guidelines for Measurement of Digital Transmission Systems operating under Section 15.247. The total PSD equal to the summary of the PSD was measured on the antenna port 1 and 2.
- The EUT was additionally tested with BelAir 2.4GHz Triplexer, PN# BNCKG0138



Section 8: Testing data	Product: DRU 2.4GHz radio	
Test name: Clause 15.247(e) Power spectral density for digitally modulated devices		
Test date: August 25, 2010	Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C		

Test data

Modulation	Frequency (MHz)	Antenna Gain (dBi)	SW setting	Conducted PSD Ant 1 (dBm/3 kHz)	Conducted PSD Ant 2 (dBm/3 kHz)	Combined PSD (dBm/3 kHz)	PSD Limit (dBm/3 kHz)	Margin (dB)
802.11n	2412	5.00	25	-5.88	-6.50	-3.17	8.00	11.17
	2437	5.00	42	0.61	2.38	4.59	8.00	3.41
	2462	5.00	27	-5.52	-4.34	-1.88	8.00	9.88
802.11g	2412	5.00	25	-5.80	-6.40	-3.08	8.00	11.08
	2437	5.00	42	0.20	2.04	4.23	8.00	3.77
	2462	5.00	28	-4.79	-4.47	-1.62	8.00	9.62
802.11b	2412	5.00	42	4.48	4.05	7.28	8.00	0.72
	2437	5.00	42	0.16	0.88	3.55	8.00	4.45
	2462	5.00	41	1.89	2.35	5.14	8.00	2.86
802.11n	2412	8.00	25	-5.88	-6.50	-3.17	8.00	11.17
	2437	8.00	40	0.14	2.30	4.36	8.00	3.64
	2462	8.00	23	-7.42	-7.01	-4.20	8.00	12.20
802.11g	2412	8.00	25	-5.80	-6.40	-3.08	8.00	11.08
	2437	8.00	40	-0.52	2.15	4.03	8.00	3.97
	2462	8.00	25	-6.68	-5.20	-2.87	8.00	10.87
802.11b	2412	8.00	42	4.48	4.05	7.28	8.00	0.72
	2437	8.00	42	0.16	0.88	3.55	8.00	4.45
	2462	8.00	40	1.83	2.35	5.11	8.00	2.89
802.11n	2412	8.00	27	-4.35	-5.79	-2.00	8.00	10.00
	2437	8.00	40	0.14	2.30	4.36	8.00	3.64
	2462	8.00	31	-3.95	-3.85	-0.89	8.00	8.89
802.11g	2412	8.00	28	-3.81	-4.91	-1.31	8.00	9.31
	2437	8.00	40	-0.52	2.15	4.03	8.00	3.97
	2462	8.00	33	-2.76	-2.15	0.57	8.00	7.43
802.11b	2412	8.00	42	4.48	4.05	7.28	8.00	0.72
	2437	8.00	42	0.16	0.88	3.55	8.00	4.45
	2462	8.00	42	1.94	2.36	5.17	8.00	2.83
802.11n	2412	16.00	34	-0.69	-3.87	1.02	8	6.98
	2437	16.00	36	-1.01	0.52	2.83	8	5.17
	2462	16.00	37	-0.21	1.00	3.45	8	4.55
802.11g	2412	16.00	34	-1.05	-2.48	1.30	8	6.70
	2437	16.00	37	-1.80	0.60	2.57	8	5.43
	2462	16.00	36	-1.55	-0.09	2.25	8	5.75
802.11b	2412	16.00	40	3.16	3.63	6.41	8	1.59
	2437	16.00	41	-0.31	0.09	2.90	8	5.10
	2462	16.00	40	1.83	2.35	5.11	8	2.89

With triplexer

Modulation	Frequency (MHz)	Antenna Gain (dBi)	SW setting	Conducted PSD Ant 1 (dBm/3 kHz)	Conducted PSD Ant 2 (dBm/3 kHz)	Combined PSD (dBm/3 kHz)	PSD Limit (dBm/3 kHz)	Margin (dB)
802.11n	2412	16.00	32	-6.09	-5.20	-2.61	8.00	10.61
	2437	16.00	42	0.03	0.70	3.39	8.00	4.61
	2462	16.00	42	0.16	-1.10	2.59	8.00	5.41
802.11g	2412	16.00	32	-5.08	-5.30	-2.18	8.00	10.18
	2437	16.00	42	-0.40	-1.30	2.18	8.00	5.82
	2462	16.00	42	0.22	-1.14	2.60	8.00	5.40
802.11b	2412	16.00	42	3.73	2.23	6.05	8.00	1.95
	2437	16.00	42	-1.16	0.45	2.73	8.00	5.27
	2462	16.00	42	2.98	-1.36	4.34	8.00	3.66

Combined PSD (dBm/MHz) = 10 * Log ((10[^](Conducted PSD Ant 1 (dBm/MHz)/10)) + (10[^]((Conducted PSD Ant 2 (dBm/MHz)/10)))

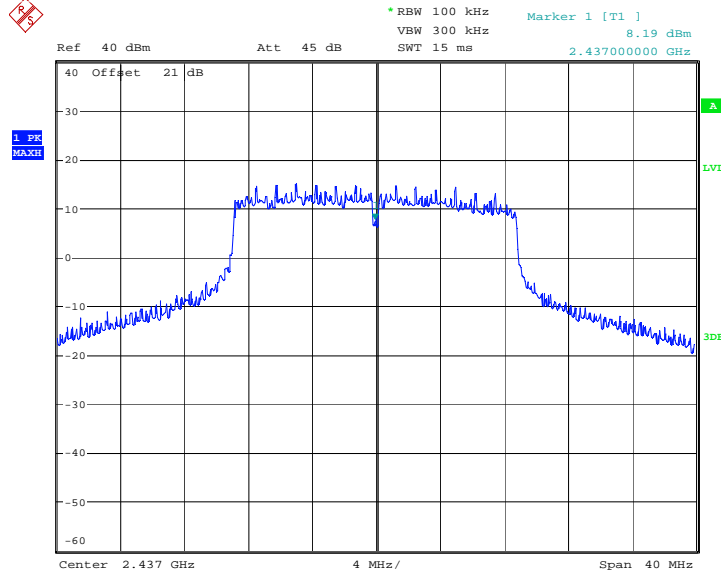


Nemko Canada Inc.,
303 River Rd, Ottawa, ON, Canada, K1V 1H2

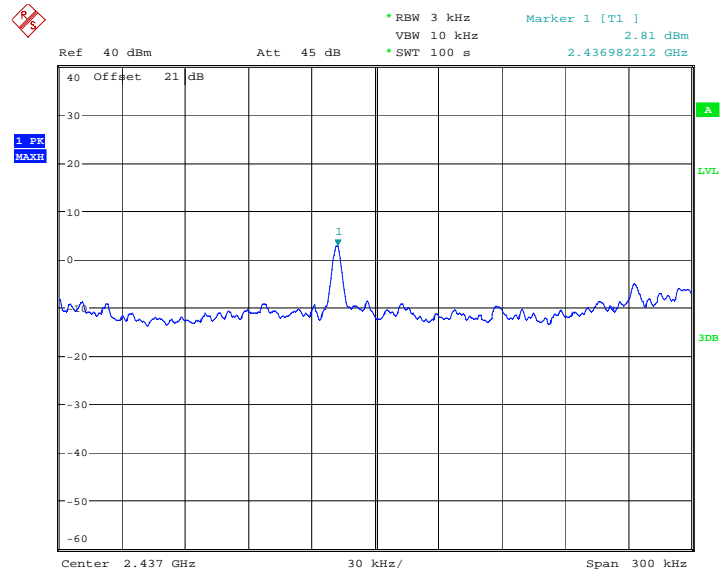
Section 8: Testing data		Product: DRU 2.4GHz radio	
Test name: Clause 15.247(e) Power spectral density for digitally modulated devices			
Test date: August 25, 2010		Test engineer: David Duchesne	Verdict: Pass
Specification: FCC Part 15 Subpart C			

Test data, continued

Sample spectral plots



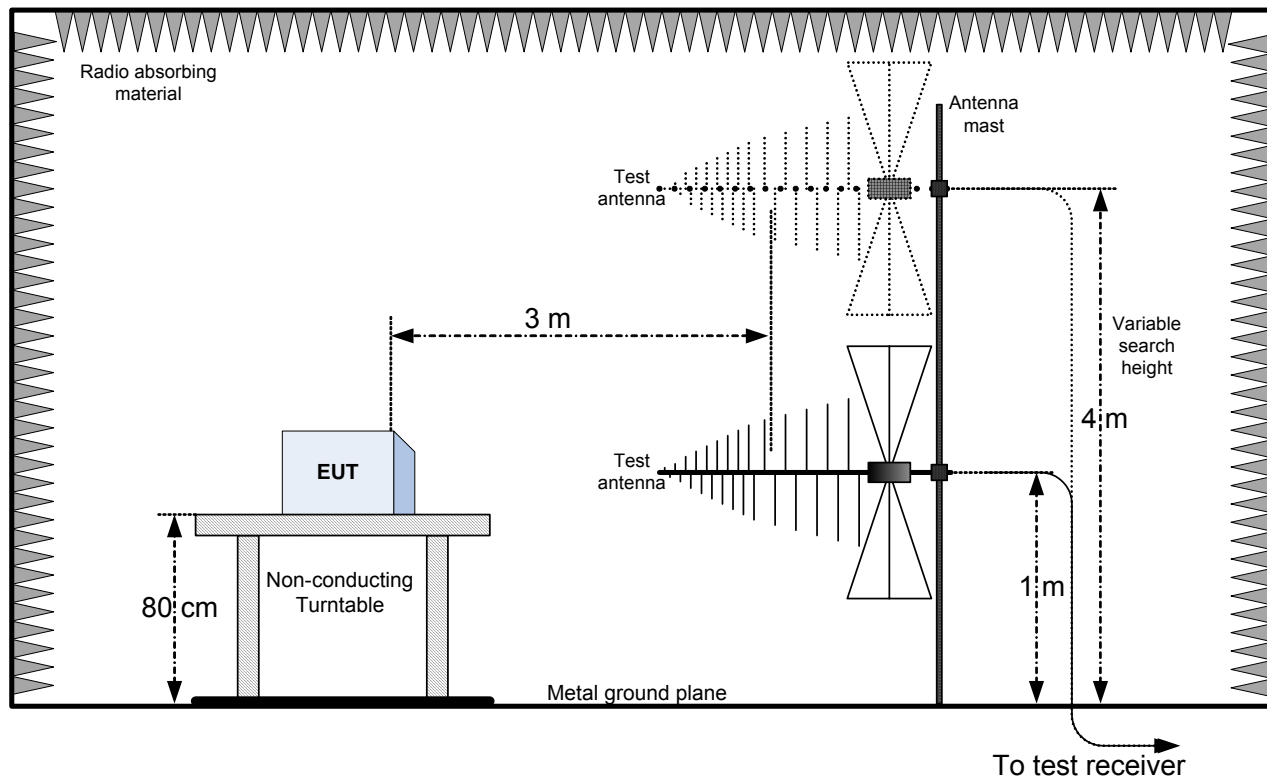
Date: 25.AUG.2010 09:55:15



Date: 25.AUG.2010 09:57:40

Section 8: Block diagrams of test set-ups

Radiated emissions set-up



Conducted emissions set-up

