



Test Report: 6W68128 Issue 2

Applicant: Newtrax Technologies Inc.
3674 Saint-Hubert
Montreal, Quebec
H2L 4A2

Apparatus: WN-100

FCC ID: TXKWN-100

In Accordance With: FCC Part 15 Subpart C, 15.247
FHSS System and Digitally Modulated Radiators
902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

Tested By: Nemko Canada Inc.
303 River Road
Ottawa, Ontario
K1V 1H2

A handwritten signature in blue ink, appearing to read 'Jason Nixon', with a stylized flourish at the end.

Authorized By:

Jason Nixon, Telecom Specialist

Date: August 25, 2006

Total Number of Pages: 33

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. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	WN-100
Specification:	FCC Part 15 Subpart C, 15.247
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Roman Kuleba, EMC/Wireless Specialist

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.

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Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows: WN-100 FHSS Transceiver

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
1	WN-100 Transceiver with RP-SMA Antenna Connector	I
2	WN-100 Transceiver with RP-SMA Antenna Connector	II
3	WN-100 Transceiver with standard SMA Output Connector	III
4 & 5	2.4 dBi Monopole Antenna (Antenna Factor)	M/N: ANT-916-CW-RCL
6 & 7	3.0 dBi Monopole Antenna	–
8	Test Software	–

The first samples were received on: June 19, 2006

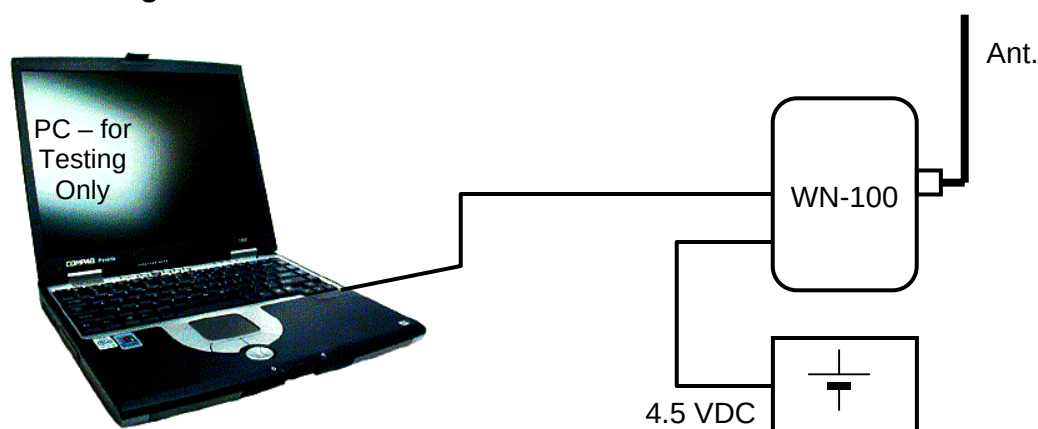
1.3 Theory of Operation

The WN-100 is a frequency hopping spread-spectrum transceiver designed for operation in 902 – 928 MHz band.

1.4 Technical Specifications of the EUT

Manufacturer:	Newtrax Technologies Inc.
Operating Frequency:	902.4 – 927.6 MHz
Peak Output Power:	14.02 dBm (Conducted)
Emission Designator	F1D
Rated Power:	14.0 dBm (Conducted)
Modulation:	FSK
Antenna Data:	1) 3.0 dBi Whip with coax. cable and magnetic base (Antenna Factor, ANT-ELE-S01-005) 2) 2.4 dBi Whip (Antenna Factor, ANT-916-CW-RCL)
Antenna Connector:	RP-SMA (Reversed Polarity SMA)
Power Source:	4.5 VDC Battery Pack

1.5 Block Diagram of the EUT



NOTE: The EUT is not a computer peripheral. The computer was used only to adjust the settings on the transceiver before the test and then disconnected.

Section 2 : Test Conditions

2.1 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

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

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

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 10/07
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 16/07
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 16/07
Biconical (1) Antenna	EMCO	3109	FA000805	May 03/07
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 29/06
Horn Antenna #2	EMCO	3115	FA000825	Dec. 16/06
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	COU
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	COU
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	COU
5.0 – 13.0 GHz Amplifier	DBS Microwave	DWT-186N23U40	FA001409	COU
Power Meter	HP	4418B	FA001678	May 16/07
Power Probe	HP	8487A	FA001741	May 22/07

* COU (Calibrate on Use)

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Additional Observations

There were no additional observations made during this assessment.

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 section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	N	N/A
15.209(a)	Radiated Emissions within Restricted Bands	Y	Pass
15.247(a)(1)	Frequency hopping systems	Y	Pass
15.247(a)(1)(i)	Frequency hopping systems operating in the 902-928 MHz band	Y	Pass
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725-5850 MHz band	N	N/A
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400-2483.5 MHz band	N	N/A
15.247(a)(2)	Systems using digital modulation techniques	N	N/A
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	N/A
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	Y	Pass
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	N/A
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	N/A
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	N/A
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	Pass
15.247(e)	Power Spectral Density for Digitally Modulated Devices	N	N/A
15.247(f)	Time of Occupancy for Hybrid Systems	N	N/A

Notes:

Appendix A: Test Results

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 (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100 ¹	3
88-216	150 ²	3
216-960	200 ³	3
Above 960	500	3

Test Conditions:

Sample Number:	1 & 2	Temperature:	23°C
Date:	July 25, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

Pass (See Attached Tables).

Additional Observations:

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

All measurements were performed using a Quasi-Peak Detector on frequencies below 1GHz and a Peak and Average Detector with 1MHz RBW on frequencies above 1GHz at a distance of 3 meters.

The EUT was measured on three orthogonal axes.

The EUT was tested with new batteries (maximum DC supply voltage).

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

No emissions within 20 dB below the limit were detected in frequency range 30 – 1000 MHz.

Radiated Emissions within Restricted Bands, continued

Tested configuration: WN-100 and 3.0 dBi Antenna (ANT-ELE-S01-005)

Polarization: Vertical

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	2707.2000	Horn2	V	74.0	29.8	59.1		5.4	50.1	74.0	23.9	Peak
2	2707.2000	Horn2	V	74.0	29.8	59.1	-26.7	5.4	23.5	54.0	30.5	Average
3	3609.6000	Horn2	V	86.5	32.4	58.3		6.3	67.0	74.0	7.0	Peak
4	3609.6000	Horn2	V	86.5	32.4	58.3	-26.7	6.3	40.3	54.0	13.7	Average
5	4512.0000	Horn2	V	60.0	33.2	54.8		8.1	46.5	74.0	27.5	Peak
6	4512.0000	Horn2	V	60.0	33.2	54.8	-26.7	8.1	19.9	54.0	34.1	Average
7	2745.6000	Horn2	V	77.0	29.9	59.2		5.4	53.1	74.0	20.9	Peak
8	2745.6000	Horn2	V	77.0	29.9	59.2	-26.7	5.4	26.5	54.0	27.5	Average
9	3660.8000	Horn2	V	89.4	32.5	58.2		6.4	70.1	74.0	3.9	Peak
10	3660.8000	Horn2	V	89.4	32.5	58.2	-26.7	6.4	43.4	54.0	10.6	Average
11	4576.0000	Horn2	V	62.6	33.2	54.9		8.2	49.1	74.0	24.9	Peak
12	4576.0000	Horn2	V	62.6	33.2	54.9	-26.7	8.2	22.5	54.0	31.5	Average
13	2782.8000	Horn2	V	76.9	29.9	59.2		5.5	53.0	74.0	21.0	Peak
14	2782.8000	Horn2	V	76.9	29.9	59.2	-26.7	5.5	26.4	54.0	27.6	Average
15	3710.4000	Horn2	V	89.1	32.5	58.1		6.6	70.1	74.0	3.9	Peak
16	3710.4000	Horn2	V	89.1	32.5	58.1	-26.7	6.6	43.5	54.0	10.5	Average
17	4638.0000	Horn2	V	62.9	33.3	54.9		9.3	50.5	74.0	23.5	Peak
18	4638.0000	Horn2	V	62.9	33.3	54.9	-26.7	9.3	23.9	54.0	30.1	Average

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: Positive Peak detector used

Radiated Emissions within Restricted Bands, continued

Tested configuration: WN-100 and 3.0 dBi Antenna (ANT-ELE-S01-005)

Polarization: Horizontal

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	2707.2000	Horn2	H	65.4	29.8	59.1		5.4	41.6	74.0	32.4	Peak
2	2707.2000	Horn2	H	65.4	29.8	59.1	-26.7	5.4	14.9	54.0	39.1	Average
3	3609.6000	Horn2	H	77.9	32.3	58.3		6.3	58.2	74.0	15.8	Peak
4	3609.6000	Horn2	H	77.9	32.3	58.3	-26.7	6.3	31.5	54.0	22.5	Average
5	4512.0000	Horn2	H	50.7	33.1	54.8		8.1	37.1	74.0	36.9	Peak
6	4512.0000	Horn2	H	50.7	33.1	54.8	-26.7	8.1	10.4	54.0	43.6	Average
7	2745.6000	Horn2	H	65.2	29.9	59.2		5.4	41.3	74.0	32.7	Peak
8	2745.6000	Horn2	H	65.2	29.9	59.2	-26.7	5.4	14.7	54.0	39.3	Average
9	3660.8000	Horn2	H	77.0	32.3	58.2		6.4	57.5	74.0	16.5	Peak
10	3660.8000	Horn2	H	77.0	32.3	58.2	-26.7	6.4	30.8	54.0	23.2	Average
11	4576.0000	Horn2	H	51.3	33.1	54.9		8.2	37.7	74.0	36.3	Peak
12	4576.0000	Horn2	H	51.3	33.1	54.9	-26.7	8.2	11.1	54.0	42.9	Average
13	2782.8000	Horn2	H	65.2	29.9	59.2		5.5	41.3	74.0	32.7	Peak
14	2782.8000	Horn2	H	65.2	29.9	59.2	-26.7	5.5	14.6	54.0	39.4	Average
15	3710.4000	Horn2	H	77.4	32.3	58.1		6.6	58.2	74.0	15.8	Peak
16	3710.4000	Horn2	H	77.4	32.3	58.1	-26.7	6.6	31.5	54.0	22.5	Average
17	4638.0000	Horn2	H	51.2	33.1	54.9		9.3	38.7	74.0	35.3	Peak
18	4638.0000	Horn2	H	51.2	33.1	54.9	-26.7	9.3	12.1	54.0	41.9	Average

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: Positive Peak detector used

Radiated Emissions within Restricted Bands, continued

Tested configuration: WN-100 and 2.4 dBi Whip Antenna (ANT-916-CW-RCL)

Polarization: Vertical

Frequency (MHz)		Antenna	Polarity	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	2707.2	Horn2	V	74.3	29.8	59.1		5.4	50.4	74.0	23.6	Peak
2	2707.2	Horn2	V	74.3	29.8	59.1	-26.7	5.4	23.7	54.0	30.3	Average
3	3609.6	Horn2	V	88.5	32.3	58.3		6.3	68.8	74.0	5.2	Peak
4	3609.6	Horn2	V	88.5	32.3	58.3	-26.7	6.3	42.1	54.0	11.9	Average
5	4512.0	Horn2	V	72.8	33.1	54.8		8.1	59.2	74.0	14.8	Peak
6	4512.0	Horn2	V	72.8	33.1	54.8	-26.7	8.1	32.5	54.0	21.5	Average
7	2745.6	Horn2	V	77.3	29.9	59.2		5.4	53.4	74.0	20.6	Peak
8	2745.6	Horn2	V	77.3	29.9	59.2	-26.7	5.4	26.7	54.0	27.3	Average
9	3660.8	Horn2	V	91.4	32.3	58.2		6.4	71.9	74.0	2.1	Peak
10	3660.8	Horn2	V	91.4	32.3	58.2	-26.7	6.4	45.2	54.0	8.8	Average
11	4576.0	Horn2	V	75.4	33.1	54.9		8.2	61.8	74.0	12.2	Peak
12	4576.0	Horn2	V	75.4	33.1	54.9	-26.7	8.2	35.1	54.0	18.9	Average
13	2782.8	Horn2	V	77.2	29.9	59.2		5.5	53.4	74.0	20.6	Peak
14	2782.8	Horn2	V	77.2	29.9	59.2	-26.7	5.5	26.7	54.0	27.3	Average
15	3710.4	Horn2	V	91.1	32.3	58.1		6.6	71.9	74.0	2.1	Peak
16	3710.4	Horn2	V	91.1	32.3	58.1	-26.7	6.6	45.2	54.0	8.8	Average
17	4638.0	Horn2	V	75.7	33.1	54.9		9.3	63.2	74.0	10.8	Peak
18	4638.0	Horn2	V	75.7	33.1	54.9	-26.7	9.3	36.5	54.0	17.5	Average

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Note 2: Positive Peak detector used

Radiated Emissions within Restricted Bands, continued

Tested configuration: WN-100 and 2.4 dBi Whip Antenna (ANT-916-CW-RCL)

Polarization: Horizontal

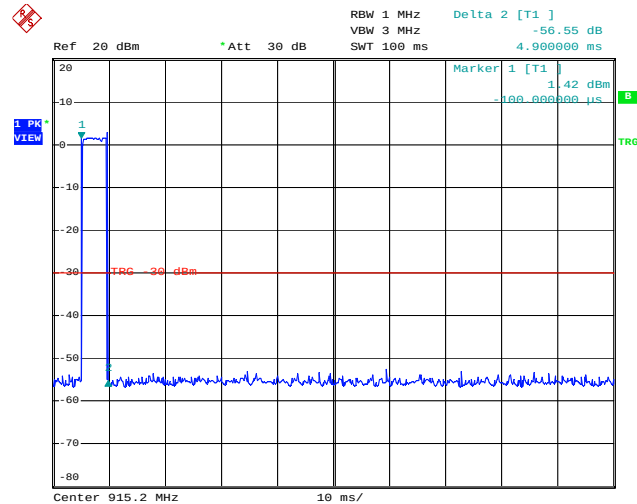
Frequency (MHz)		Antenna	Polarity	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	2707.2	Horn2	H	77.2	29.8	59.1		5.4	53.3	74.0	20.7	Peak
2	2707.2	Horn2	H	77.2	29.8	59.1	-26.7	5.4	26.6	54.0	27.4	Average
3	3609.6	Horn2	H	88.8	32.3	58.3		6.3	69.1	74.0	4.9	Peak
4	3609.6	Horn2	H	88.8	32.3	58.3	-26.7	6.3	42.4	54.0	11.6	Average
5	4512.0	Horn2	H	68.5	33.1	54.8		8.1	54.9	74.0	19.1	Peak
6	4512.0	Horn2	H	68.5	33.1	54.8	-26.7	8.1	28.2	54.0	25.8	Average
7	2745.6	Horn2	H	77.0	29.9	59.2		5.4	53.1	74.0	20.9	Peak
8	2745.6	Horn2	H	77.0	29.9	59.2	-26.7	5.4	26.4	54.0	27.6	Average
9	3660.8	Horn2	H	87.8	32.3	58.2		6.4	68.3	74.0	5.7	Peak
10	3660.8	Horn2	H	87.8	32.3	58.2	-26.7	6.4	41.6	54.0	12.4	Average
11	4576.0	Horn2	H	69.1	33.1	54.9		8.2	55.5	74.0	18.5	Peak
12	4576.0	Horn2	H	69.1	33.1	54.9	-26.7	8.2	28.8	54.0	25.2	Average
13	2782.8	Horn2	H	77.1	29.9	59.2		5.5	53.3	74.0	20.7	Peak
14	2782.8	Horn2	H	77.1	29.9	59.2	-26.7	5.5	26.6	54.0	27.4	Average
15	3710.4	Horn2	H	88.3	32.3	58.1		6.6	69.1	74.0	4.9	Peak
16	3710.4	Horn2	H	88.3	32.3	58.1	-26.7	6.6	42.4	54.0	11.6	Average
17	4638.0	Horn2	H	69.0	33.1	54.9		9.3	56.5	74.0	17.5	Peak
18	4638.0	Horn2	H	69.0	33.1	54.9	-26.7	9.3	29.8	54.0	24.2	Average

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

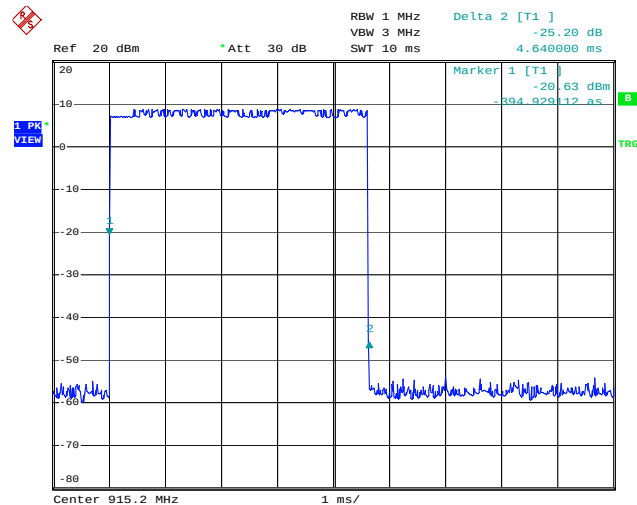
Note 2: Positive Peak detector used

Radiated Emissions within Restricted Bands, continued

Duty Cycle Correction:



Date: 28.JUL.2006 00:20:54



Date: 28.JUL.2006 00:49:52

Dwell Time: 4.64 ms

Duty Cycle Correction Factor = $20 \cdot \log_{10}(\text{Dwell Time}/100 \text{ ms})$ Duty Cycle Correction Factor = $20 \cdot \log_{10}(4.64 \text{ ms}/100 \text{ ms}) = -26.67 \text{ dB}$

Clause 15.247(a)(1) Frequency hopping systems

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

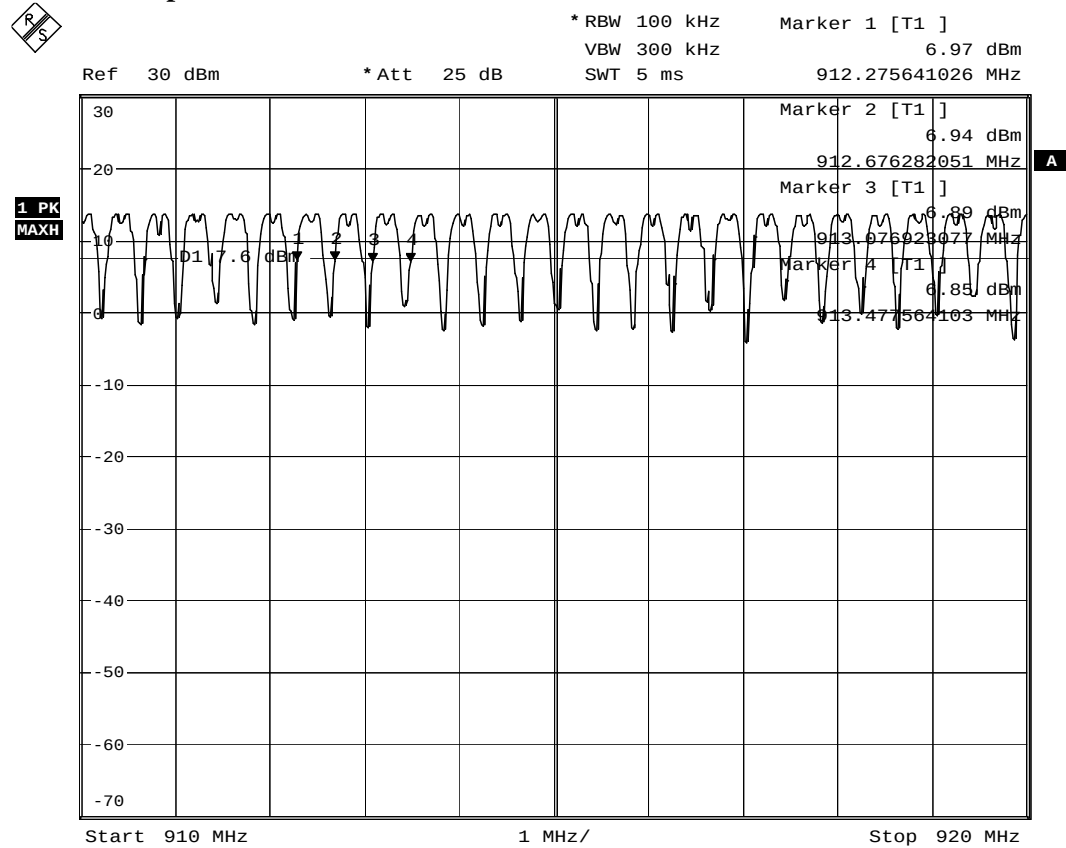
Test Conditions:

Sample Number:	3	Temperature:	23°C
Date:	July 25, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (see plots).

Frequency hopping systems, continued

Channel Separation: 400.6 kHz > 25 kHz



Date: 25.JUL.2006 22:04:13

Clause 15.247(a)(1)(i) Frequency hopping systems operating in the 902-928 MHz band

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Conditions:

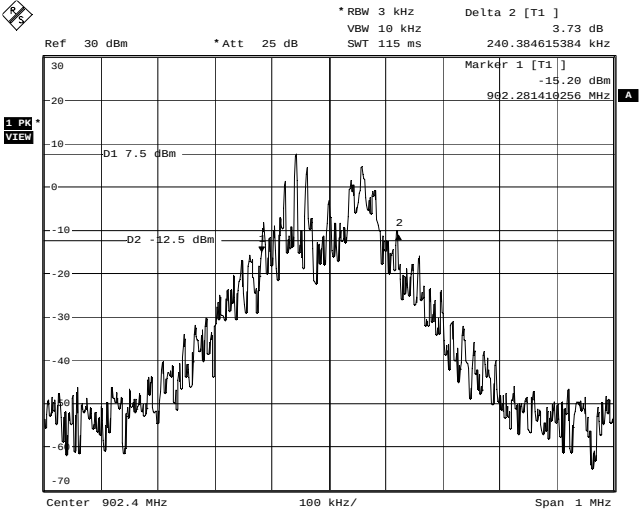
Sample Number:	3	Temperature:	23°C
Date:	July 25, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (see plots and calculations).

Frequency hopping systems operating in the 902-928 MHz band, continued

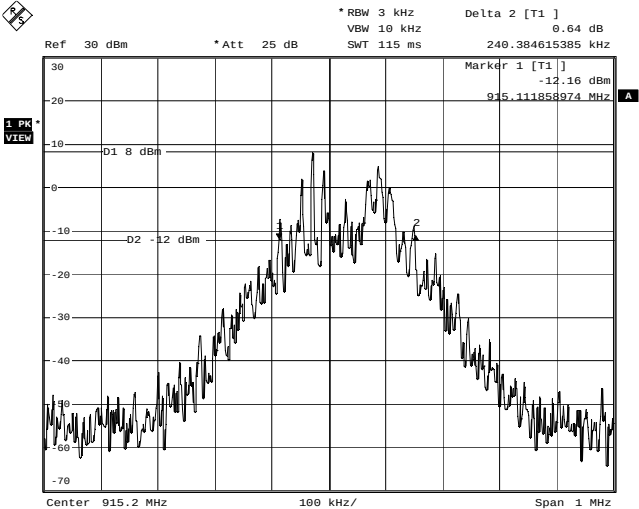
20dB Bandwidth:

Bottom Channel (902.4 MHz)
20 dB Occupied Bandwidth: 240.4 kHz



Date: 25.JUL.2006 16:11:23

Middle Channel (915.2 MHz)
20 dB Occupied Bandwidth: 240.4 kHz

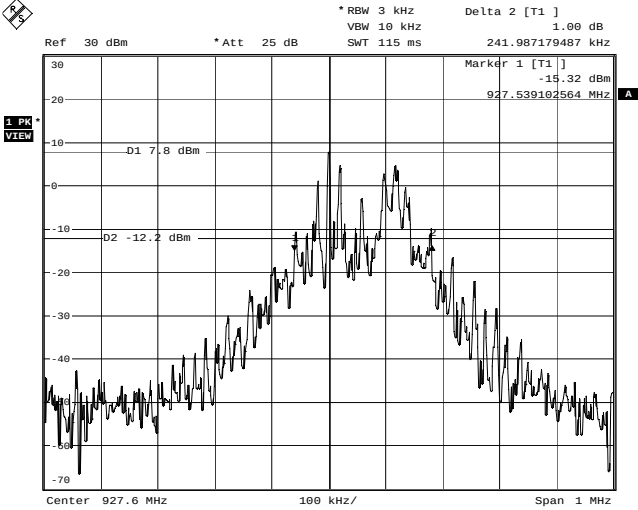


Date: 25.JUL.2006 16:14:19

Frequency hopping systems operating in the 902-928 MHz band, continued

20dB Bandwidth:

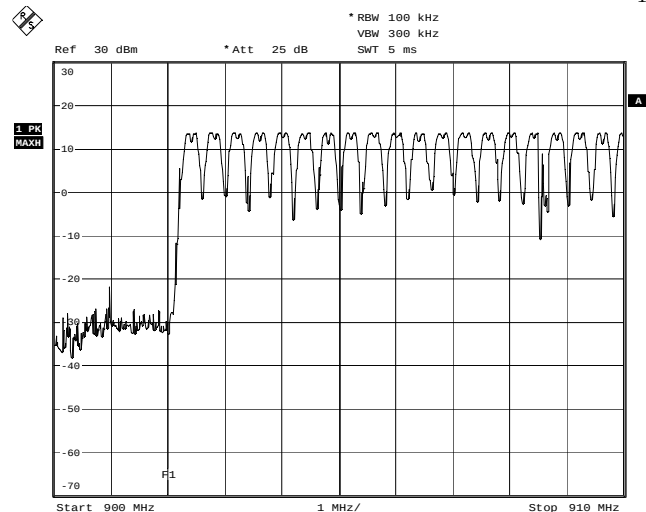
Top Channel (927.6 MHz)
20 dB Occupied Bandwidth: 242 kHz



Date: 25.JUL.2006 16:19:27

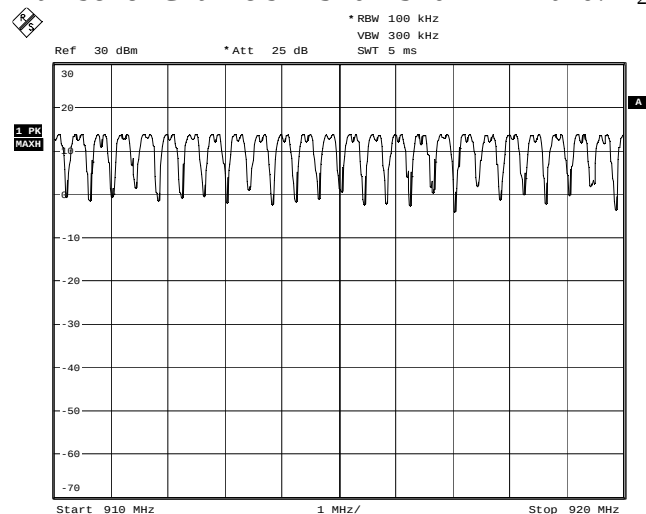
Frequency hopping systems operating in the 902-928 MHz band, continued

Number of Channels in 902 – 910 MHz Band: $N_1 = 19$



Date: 25.JUL.2006 21:04:20

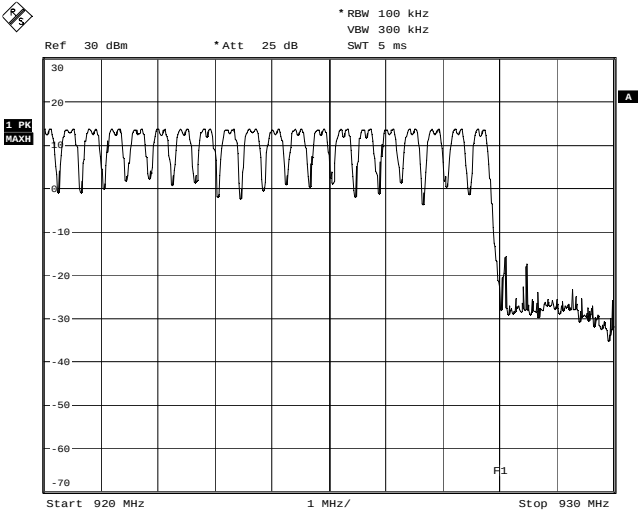
Number of Channels in 910 – 920 MHz Band: $N_2 = 25$



Date: 25.JUL.2006 22:02:00

Frequency hopping systems operating in the 902-928 MHz band, continued

Number of Channels in 920 – 928 MHz Band: $N_3 = 20$

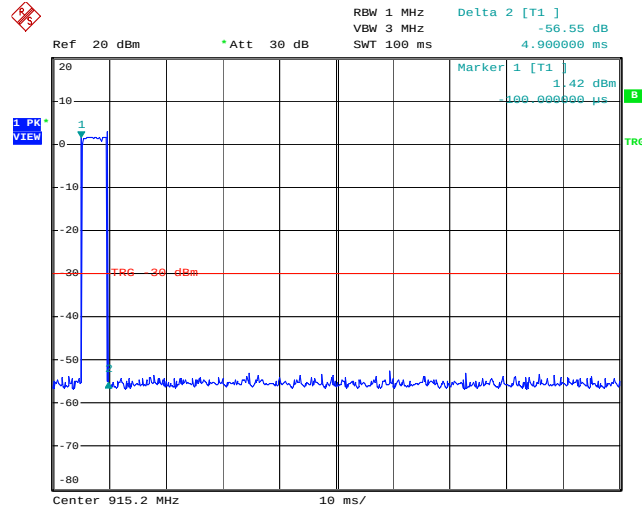


Date: 25.JUL.2006 23:19:22

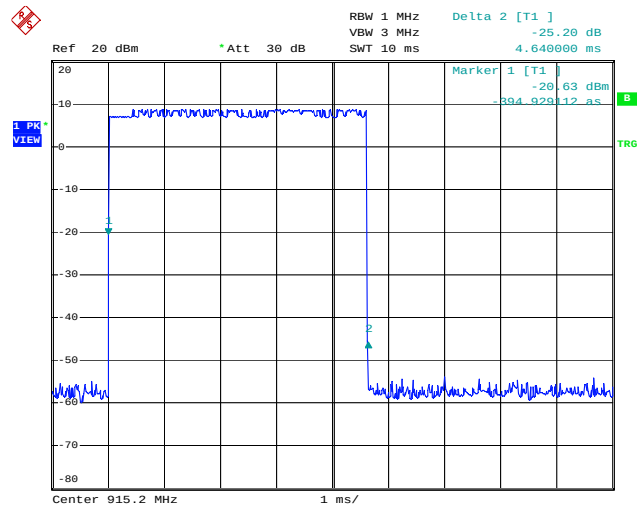
Total Number of Channels: $N = N_1 + N_2 + N_3 = 64$

Frequency hopping systems operating in the 902-928 MHz band, continued

Time of Occupancy (Dwell Time):



Date: 28.JUL.2006 00:20:54

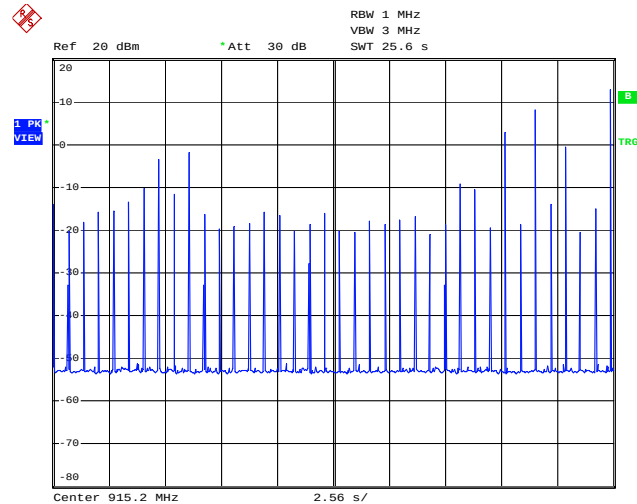


Date: 28.JUL.2006 00:49:52

Dwell Time in 100 ms: 4.64 ms

Frequency hopping systems operating in the 902-928 MHz band, continued

Time of Occupancy (Dwell Time):



Date: 28.JUL.2006 00:48:30

Required Test Period: $0.4 \text{ s} \times 64 \text{ channels} = 25.6 \text{ s}$

Number of Hits: $N = 38$

Total Dwell Time within Required Test Period: $4.64 \text{ ms} \times 38 = 176.32 \text{ ms} = 0.176 \text{ s} < 0.4 \text{ s}$

Dwell Time Limit: 0.4 s

Clause 15.247(b)(2) Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(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.

Test Conditions:

Sample Number:	3	Temperature:	23°C
Date:	July 25, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (see table and sample calculation).

Additional Observations:

The maximum peak output power of the transmitter was measured by means of a spectrum analyzer set to Maximum Peak Detector mode, with measurement bandwidth set to: RBW = 300 kHz > EBW = 242kHz, VBW = 1MHz > 3×RBW.

Maximum Peak Output Power, continued

Measured Conducted Peak Output Power:

Battery Voltage:		3.1 VDC	4.5 VDC	5.4 VDC
Channel	Freq. (MHz)	P _{TX} (dBm)	P _{TX} (dBm)	P _{TX} (dBm)
Bottom	902.4	13.80	14.00	14.02
Middle	915.2	13.74	13.92	13.95
Top	927.6	13.65	13.83	13.86

Maximum Peak Output Power:

Maximum Measured Conducted Peak Output Power = 14.02 dBm

All antennas used have a gain lower than 6.0 dBi.

Maximum Antenna Gain: 3.0 dBi

Maximum Peak Radiated Power = 14.02 dBm + 3.0 dBi = 17.02 dBm EIRP

Limit = 36.0 dBm EIRP

Margin = Limit – Maximum Peak Radiated Power = 36.0 dBm – 17.02 dBm = 18.98 dB

NOTE: The EUT was modified by the manufacturer to perform conducted measurements (standard SMA connector at the antenna port was provided instead of RP-SMA).

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 Conditions:

Sample Number:	1 & 2	Temperature:	23°C
Date:	July 25, 2006	Humidity:	36%
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results: Pass (See Attached Plots and Table).

Additional Observations:

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

All measurements were performed using a Quasi-Peak Detector on frequencies below 1GHz and a Peak and Average Detector with 1MHz RBW on frequencies above 1GHz at a distance of 3 meters.

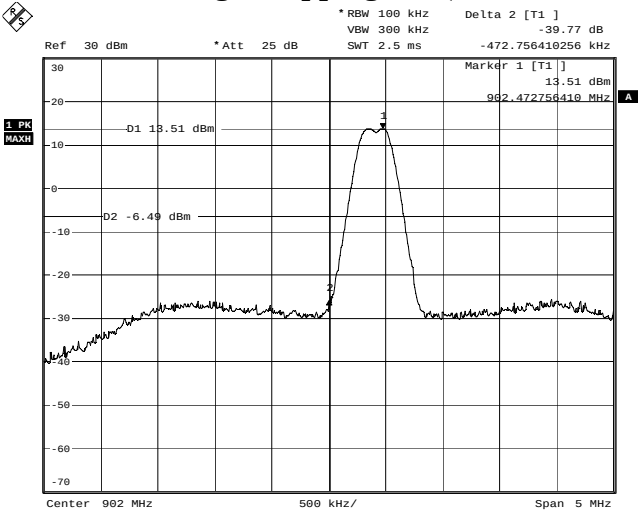
The EUT was measured on three orthogonal axes.

The EUT was tested with new batteries (maximum DC supply voltage).

No emissions within 20 dB below the limit were detected in frequency range 30 – 1000 MHz.

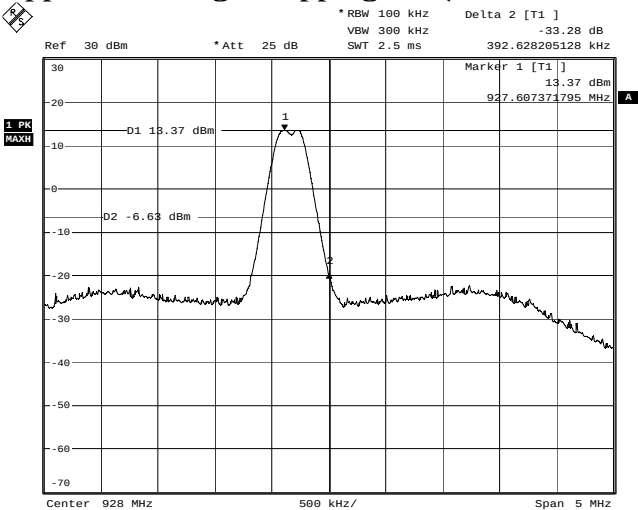
Radiated Emissions Not in Restricted Bands, continued

Lower Band-edge, Hopping Off (Tested at Antenna Port):



Date: 25.JUL.2006 16:46:39

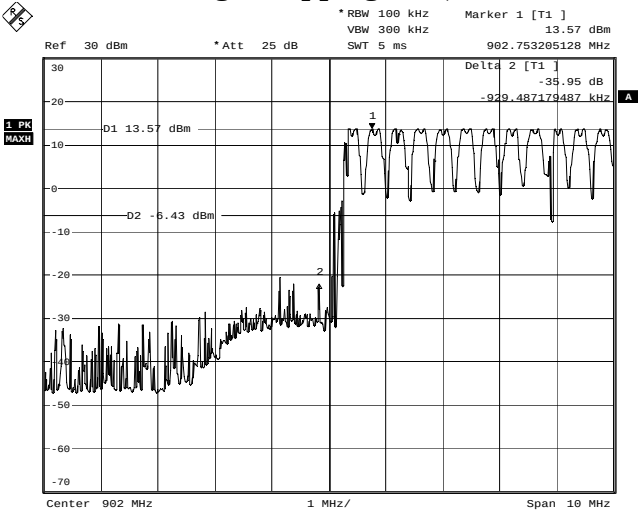
Upper Band-edge, Hopping Off (Tested at Antenna Port):



Date: 25.JUL.2006 16:43:30

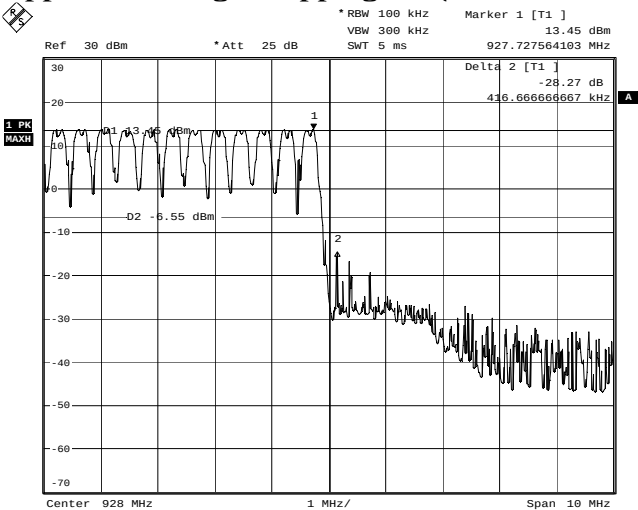
Radiated Emissions Not in Restricted Bands, continued

Lower Band-edge, Hopping On (Tested at Antenna Port):



Date: 25.JUL.2006 18:05:23

Upper Band-edge, Hopping On (Tested at Antenna Port):



Date: 25.JUL.2006 20:12:16

Radiated Emissions Not in Restricted Bands, continued

Tested configuration: WN-100 and 3.0 dBi Antenna (ANT-ELE-S01-005)

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	1804.8000	Horn2	V	80.0	27.6	47.9		4.1	63.8	74.0	10.2	Peak
2	1804.8000	Horn2	V	80.0	27.6	47.9	-26.7	4.1	37.1	54.0	16.9	Average
3	1830.4000	Horn2	V	82.9	27.6	47.9		4.1	66.7	74.0	7.3	Peak
4	1830.4000	Horn2	V	82.9	27.6	47.9	-26.7	4.1	40.0	54.0	14.0	Average
5	1855.2000	Horn2	V	83.0	27.6	48.0		4.2	66.8	74.0	7.2	Peak
6	1855.2000	Horn2	V	83.0	27.6	48.0	-26.7	4.2	40.2	54.0	13.8	Average
7	1804.8000	Horn2	H	70.5	27.7	47.9		4.1	54.4	74.0	19.6	Peak
8	1804.8000	Horn2	H	70.5	27.7	47.9	-26.7	4.1	27.7	54.0	26.3	Average
9	1830.4000	Horn2	H	70.8	27.7	47.9		4.1	54.8	74.0	19.2	Peak
10	1830.4000	Horn2	H	70.8	27.7	47.9	-26.7	4.1	28.0	54.0	26.0	Average
11	1855.2000	Horn2	H	70.9	27.7	48.0		4.2	54.8	74.0	19.2	Peak
12	1855.2000	Horn2	H	70.9	27.7	48.0	-26.7	4.2	28.2	54.0	25.8	Average
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole Note 2: Positive Peak detector used												

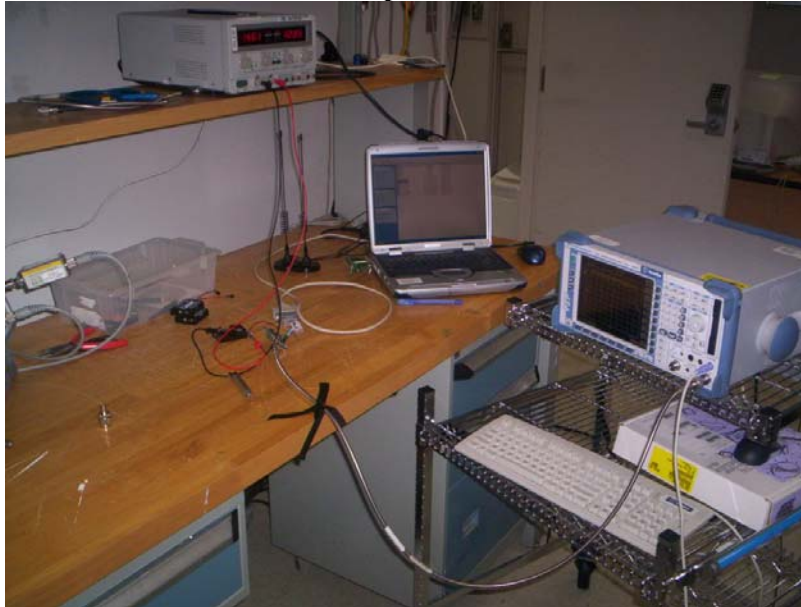
Radiated Emissions Not in Restricted Bands, continued

Tested configuration: WN-100 and 2.4 dBi Whip Antenna (ANT-916-CW-RCL)

Tested Configuration: W-100 and LP-21 Whip Antenna (F11-510-01-R02)												
Frequency (MHz)		Antenna	Polarity	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	1804.8	Horn2	V	83.4	27.6	47.9		4.1	67.2	74.0	6.8	Peak
2	1804.8	Horn2	V	83.4	27.6	47.9	-26.7	4.1	40.5	54.0	13.5	Average
									0.0			
3	1830.4	Horn2	V	86.1	27.6	47.9		4.1	69.9	74.0	4.1	Peak
4	1830.4	Horn2	V	86.1	27.6	47.9	-26.7	4.1	43.2	54.0	10.8	Average
5	1855.2	Horn2	V	86.3	27.6	48.0		4.2	70.1	74.0	3.9	Peak
6	1855.2	Horn2	V	86.3	27.6	48.0	-26.7	4.2	43.4	54.0	10.6	Average
7	1804.8	Horn2	H	75.8	27.7	47.9		4.1	59.7	74.0	14.3	Peak
8	1804.8	Horn2	H	75.8	27.7	47.9	-26.7	4.1	33.0	54.0	21.0	Average
											0.0	
9	1830.4	Horn2	H	76.1	27.7	47.9		4.1	60.0	74.0	14.0	Peak
10	1830.4	Horn2	H	76.1	27.7	47.9	-26.7	4.1	33.3	54.0	20.7	Average
11	1855.2	Horn2	H	76.2	27.7	48.0		4.2	60.1	74.0	13.9	Peak
12	1855.2	Horn2	H	76.2	27.7	48.0	-26.7	4.2	33.4	54.0	20.6	Average
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole Note 2: Positive Peak detector used												

Appendix B: Setup Photographs

Conducted Emissions Setup:

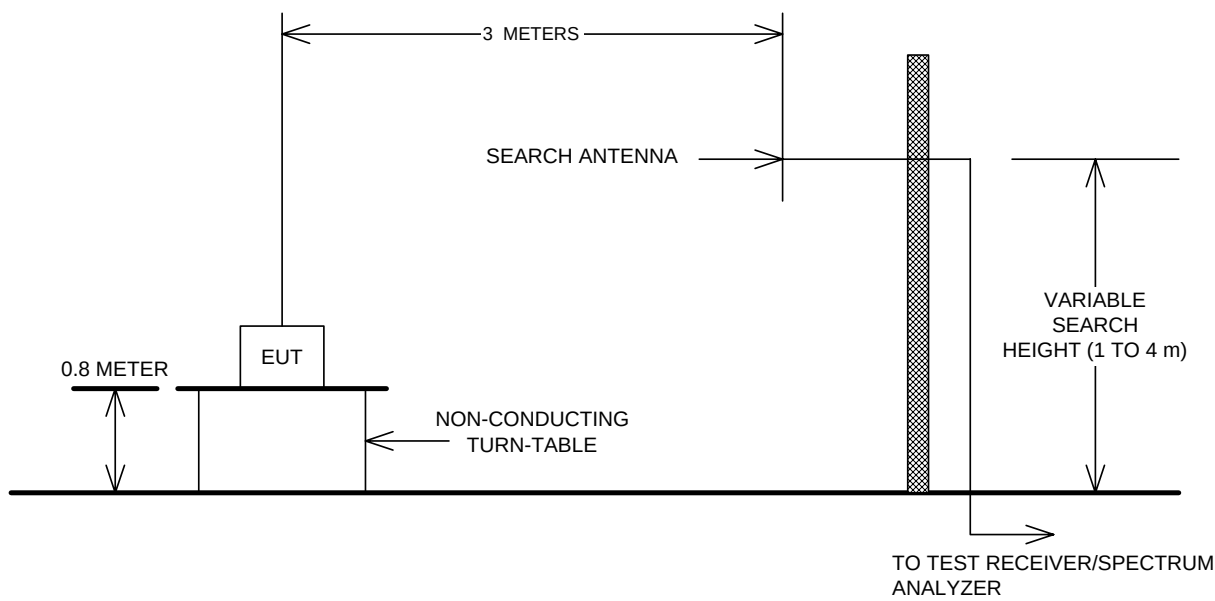


Spurious Emissions Setup:



Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions

