



Test Report: 6W68668.3

Applicant: DAP Technologies
955 Fernand Dufour
Vanier, Quebec G1M 3B2

Apparatus: B2B Wireless Lan + BT Combo Module

FCC ID: HDWF10040

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
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Authorized By: 
Jason Nixon, Telecom Specialist

Date: September 6, 2006

Total Number of Pages: 37

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:	B2B Wireless Lan + BT combo module
Specification:	FCC Part 15.247, Subpart C
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Xu Jin, 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:
B2B Wireless Lan + BT combo module

1.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
1	DAP Micro Computer MicroFlex CE5240	N/A

The first samples were received on: July 13, 2006

1.3 Technical Specifications of the EUT

Manufacturer:	DAP Technologies
Frequency Band	2400MHz-2483.5MHz
Operation Frequency	2402MHz-2480MHz
Rated Output Power*:	1dBm
Modulation:	FHSS, GFSK
Antenna information	2.7dBi gain antenna (Mica)
Antenna Connector	W.FL series, ultra small surface mounted coaxial connector.

* Manufacture's rated power is average power measured using a wide band power meter with a thermocouple detector.

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
Horn Antenna #1	EMCO	3115	FA000649	Jan. 12/07
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 3/07
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	Aug 2/07
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	Aug 2/07
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	Aug 2/07
5.0 - 18GHz Amplifier	Narda	DWT-186N23U40	FA001409	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU
Power Meter	HP	4418B	FA001678	May 16/07
Power Probe	HP	8487A	FA001741	May 22/07
LISN	EMCO	4825/2	FA001545	Jan. 30/07
Transient Limiter	Hewlett-Packard	1194 7A	FA000975	May 18/07
Climate Chamber	Thermotron	SM-16C	15649-S	COU

* 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.

Section 4: Results Summary

This section contains the following:

FCC Part 15.247, Subpart C: Test Result

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, 15.247: Test Results

Section	Clause	Test Description	Required	Result
1	15.207(a)	Power-line Conducted Emissions	Y	PASS
2	15.247(a)(1)	20dB Bandwidth	Y	PASS
3	15.247(b)(1)	Output Power	Y	PASS
4	15.247(d)	Spurious Emissions	Y	PASS
5	15.247(a)	Channel Separation	Y	PASS
6	15.247(a)	No of Hopping Channels and Occupancy Time	Y	PASS
7	15.31	Supply Voltage Variation	Y	PASS

Appendix A: Test Results

Section 1. Power Line Conducted Emissions

Criteria: Clause 15.207(a)

Frequency of Conducted limit (dB μ V)		
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 Conditions:

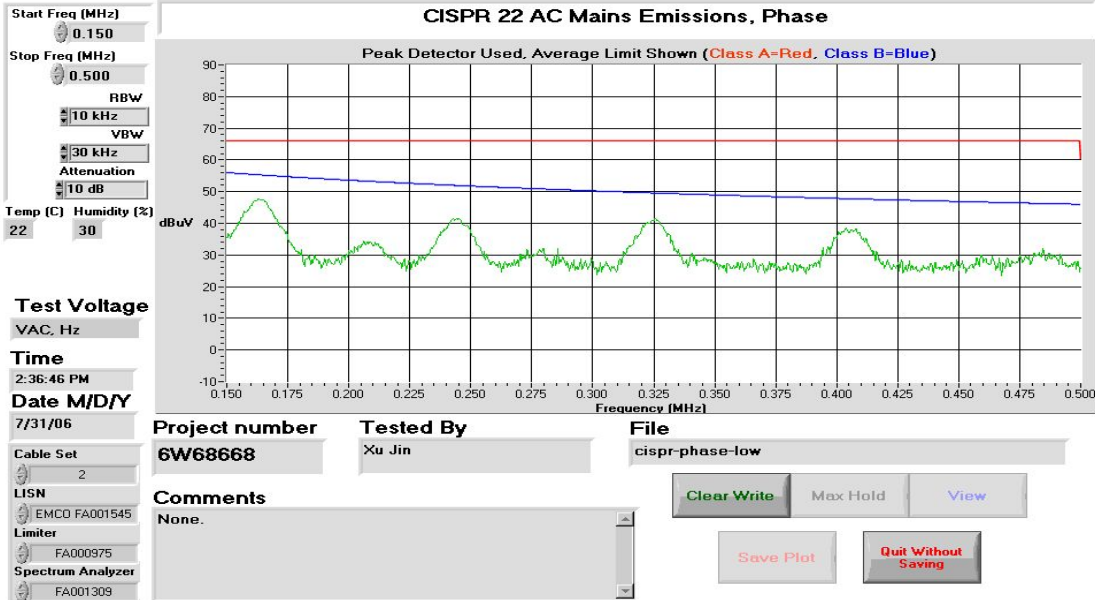
Sample Number:	1	Temperature:	22 °C
Date:	July 31, 2006	Humidity:	50 %
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

Test Results: Complies

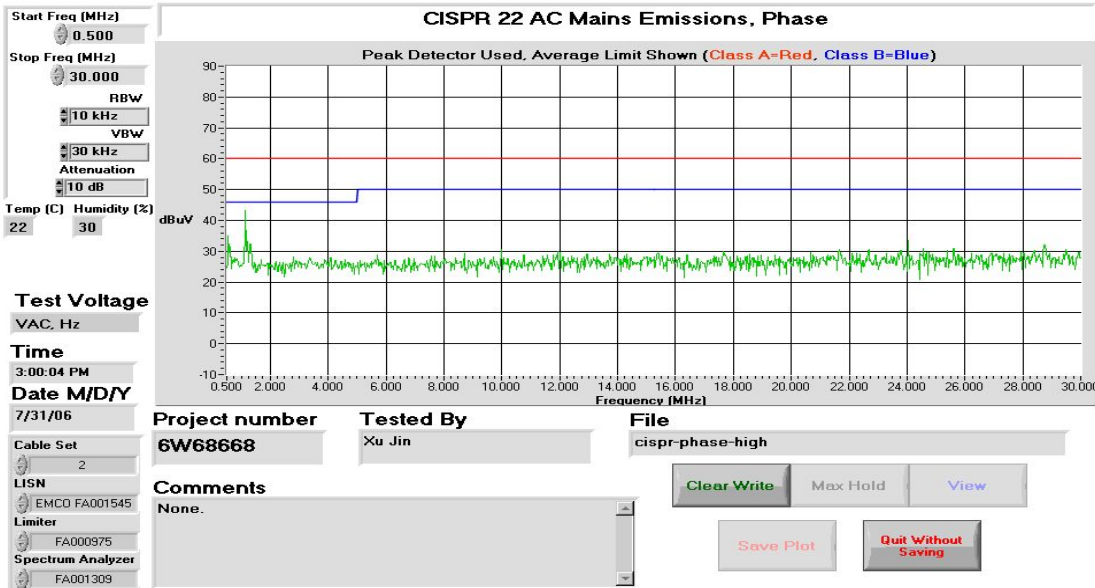
Test Data: See Attached Plots and Tables.

Conducted Disturbance at Mains, Plots

Phase, 0.150 – 0.500 MHz

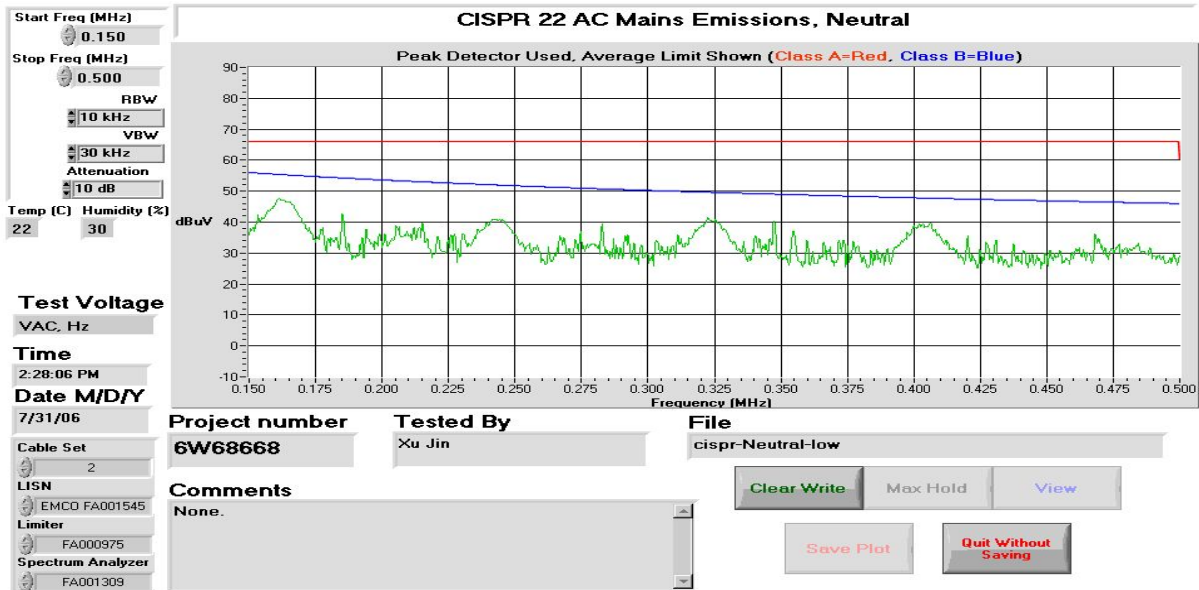


Phase, 0.500 – 30 MHz

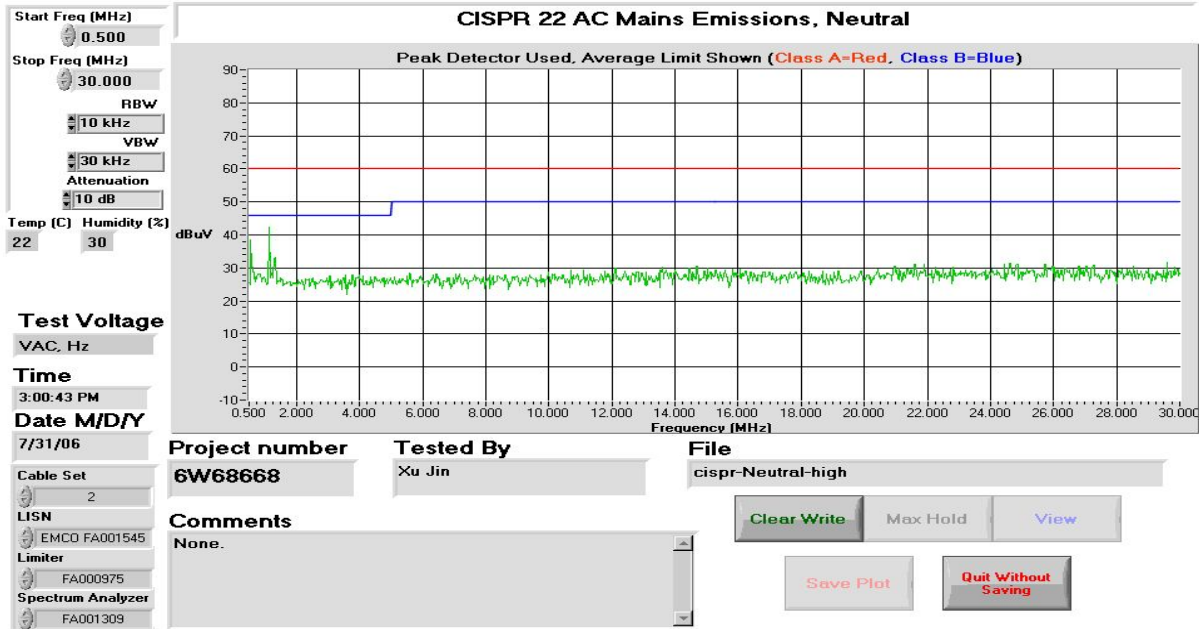


Conducted Disturbance at Mains Plots, continued

Neutral, 0.150 – 0.500 MHz



Neutral, 0.500 – 30 MHz



Section 2. 20dB Bandwidth

Criteria: Clause 15.247(a) (1)

<p>(1) 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.</p> <p>(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.</p>

Test Conditions:

Sample Number:	1	Temperature:	22 °C
Date:	Aug. 2, 2006	Humidity:	50 %
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

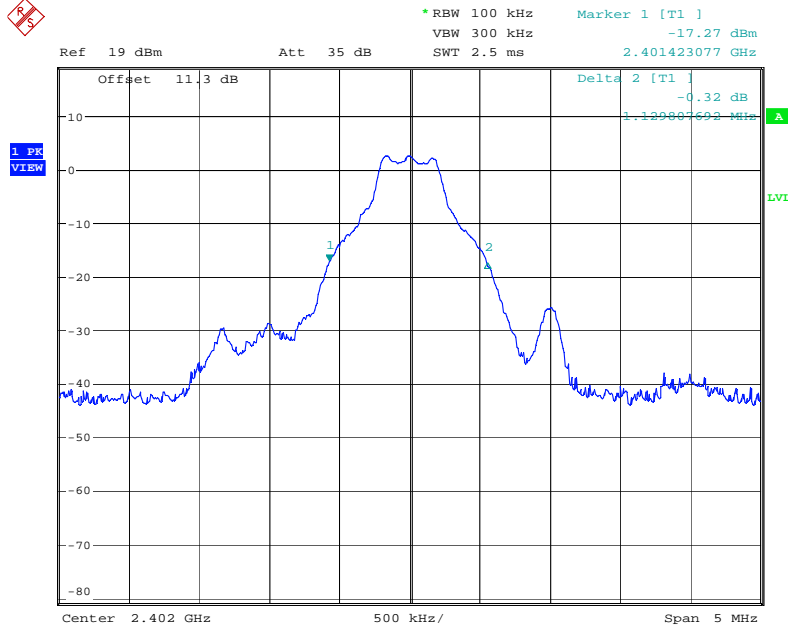
Test Results: Complies

Test Data: See attached table and graphics

20dB Occupied Bandwidth (MHz)

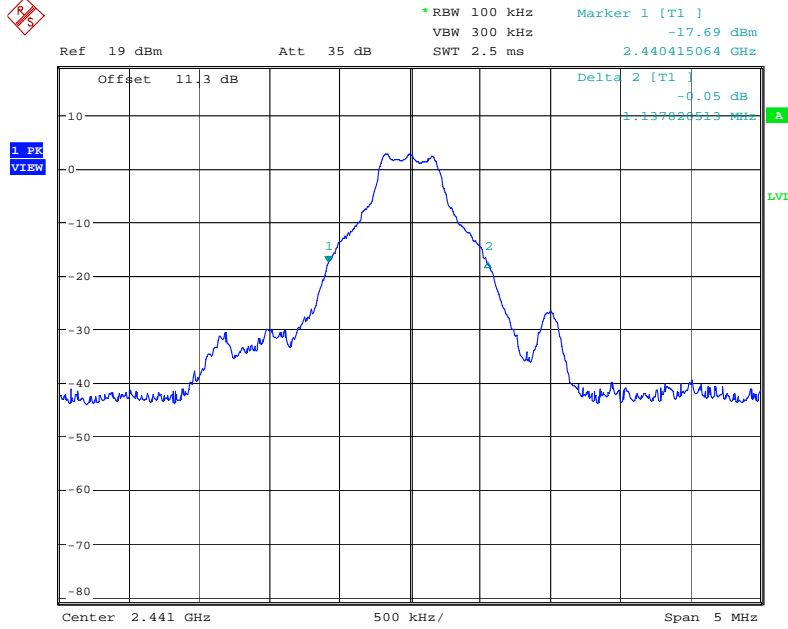
Operation Frequency(MHz)	2402	2441	2480
20dB Occupied Bandwidth (MHz)	1.13	1.11	1.13

Operation Frequency: 2402MHz



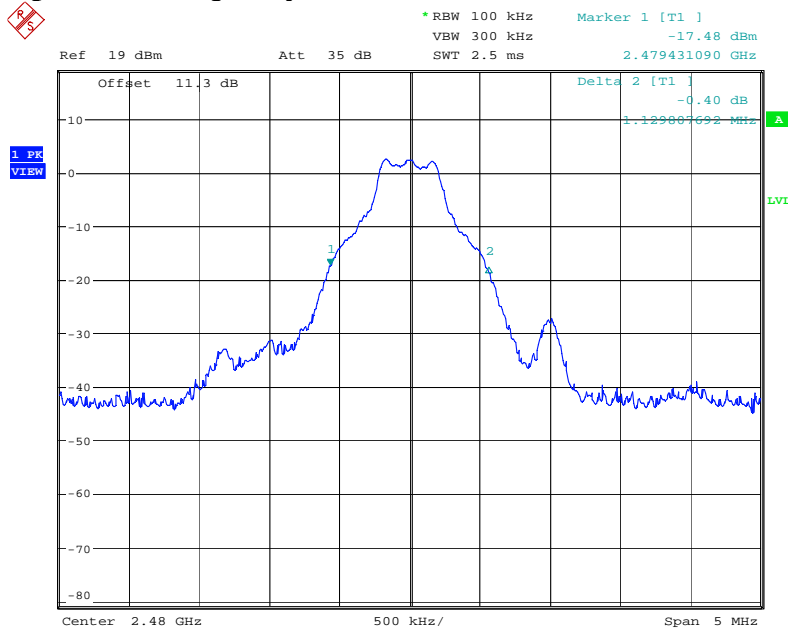
Date: 2.AUG.2006 09:11:58

Operation Frequency: 2441MHz



Date: 2.AUG.2006 09:13:16

Operation Frequency: 2480MHz



Date: 2.AUG.2006 09:15:01

Section 3. Output Power

Criteria: Clause 15.247(b)(1)

(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts..

(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:	1	Temperature:	22 °C
Date:	Aug. 1, 2006	Humidity:	50 %
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

Test Results: Complies

Test Data: See attached table and graphics

Conducted Output Power Test Data (dBm)

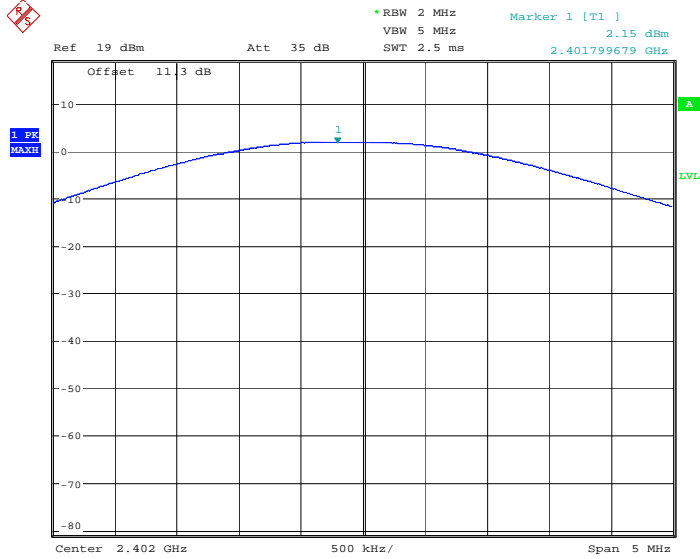
Frequency (MHz)	Conducted Output Power(dBm)
2402	2.4
2441	2.44
2480	2.48

Antenna gain= 2.7dBi

The max E.I.R.P= 2.48dBm+2.7dBi=5.18dBm (E.I.R.P)

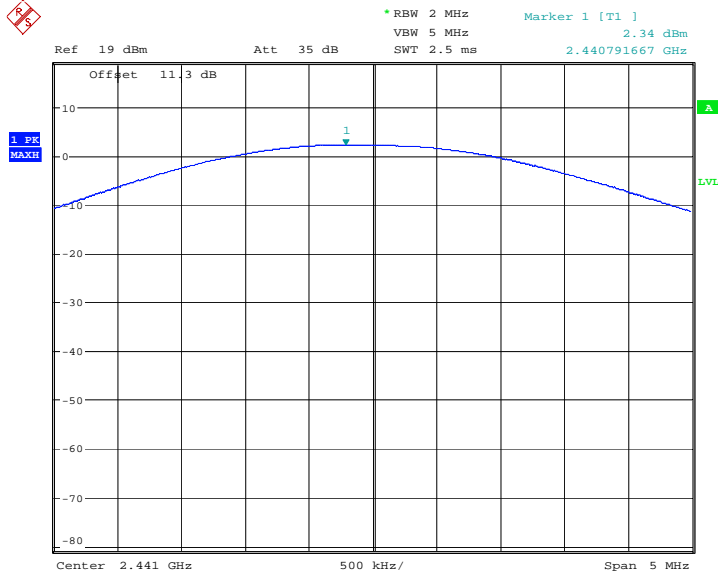
Limit: 30dBm+6dBi antenna (EIRP)

Operation Frequency: 2402MHz



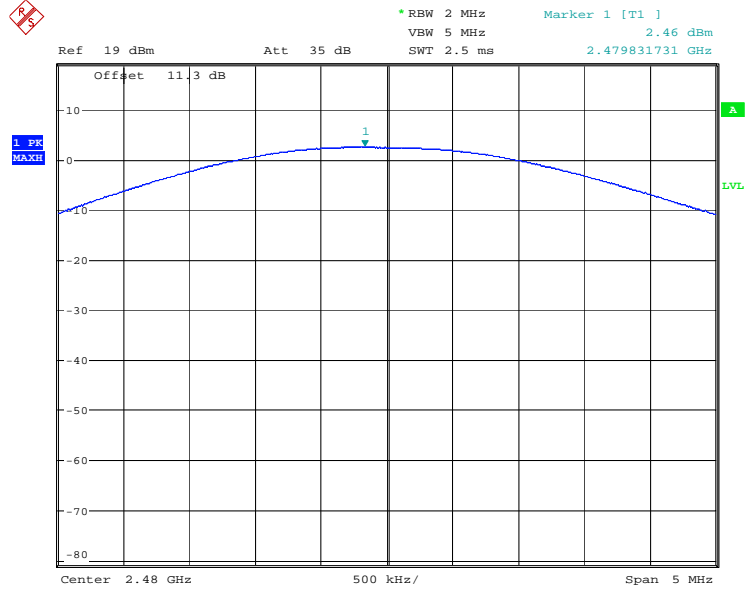
Date: 2.AUG.2006 09:41:40

Operation Frequency: 2441MHz



Date: 2.AUG.2006 09:42:22

Operation Frequency: 2480MHz



Date: 2.AUG.2006 09:43:07

Section 4. Spurious Emissions

Criteria: Clause 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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	Temperature:	22 °C
Date:	Aug 2, 2006	Humidity:	50 %
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

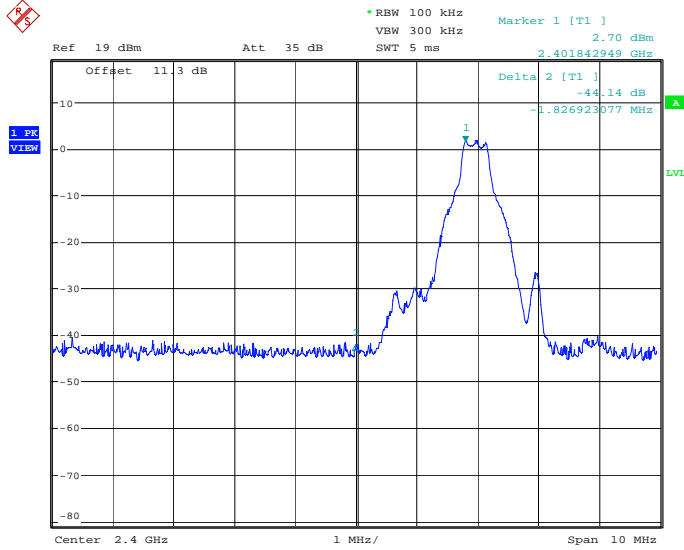
Test Results: Complies

Test Data: See attached table and graphics

Lower Band Edge Check

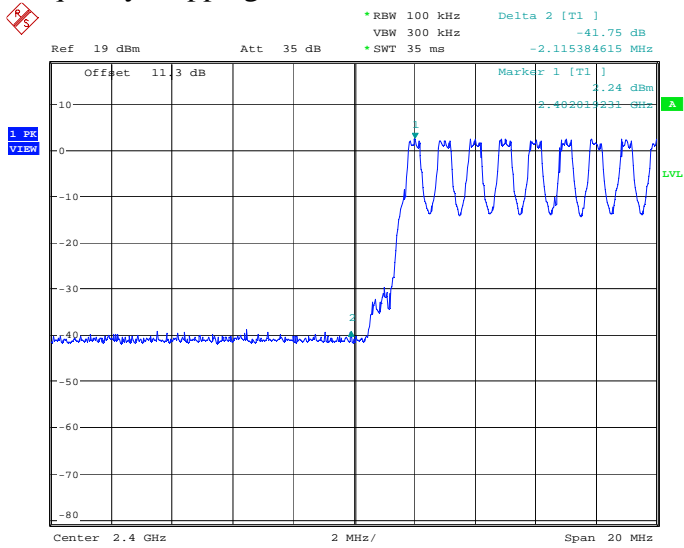
Operation Frequency: 2402MHz

Frequency Hopping off



Date: 2.AUG.2006 10:15:11

Frequency Hopping on

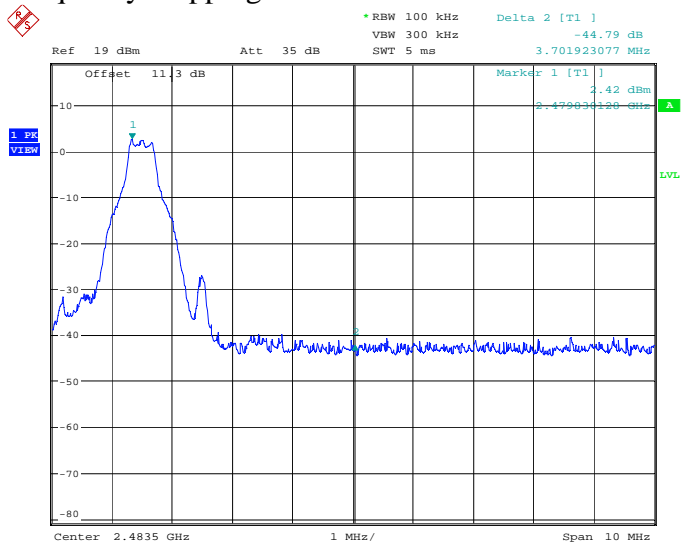


Date: 2.AUG.2006 10:24:52

Higher Bandedge Check

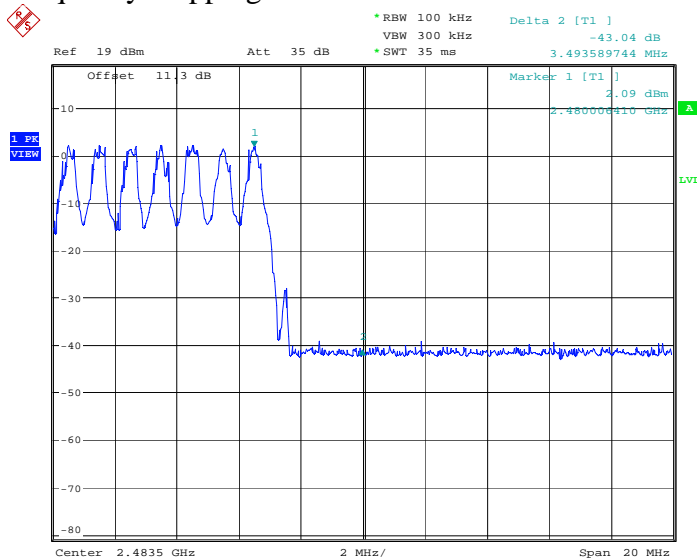
Operation Frequency: 2480MHz

Frequency Hopping off



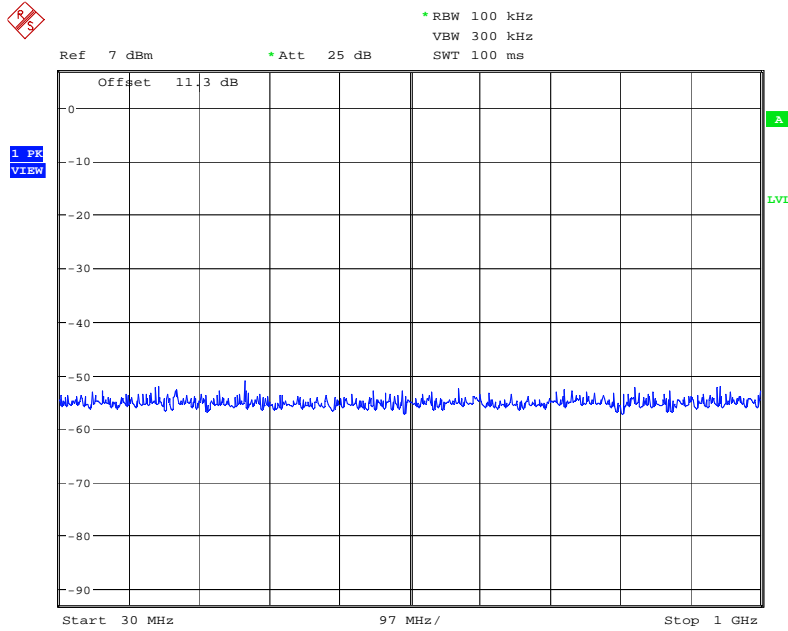
Date: 2.AUG.2006 10:16:51

Frequency Hopping on

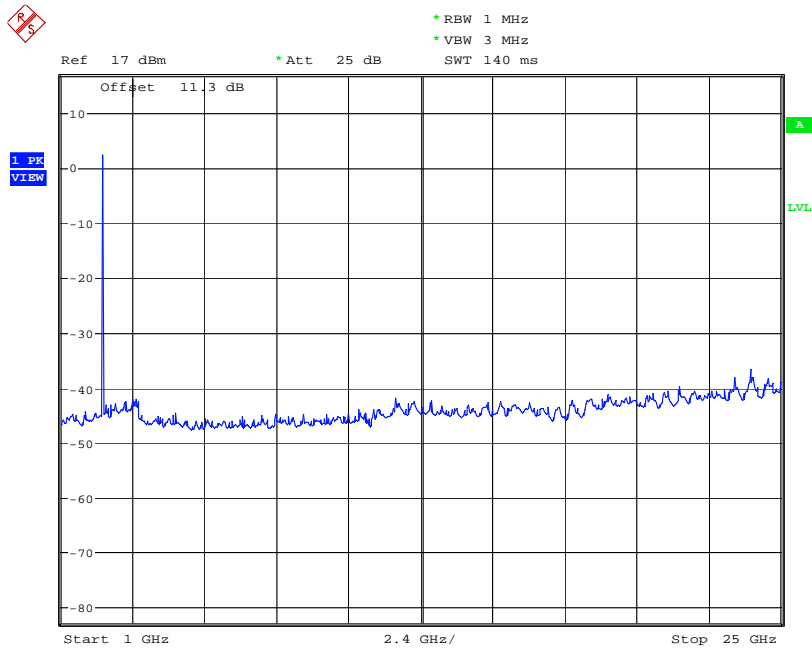


Date: 2.AUG.2006 10:19:43

Conducted Emissions



Date: 3.AUG.2006 13:57:38



Date: 3.AUG.2006 13:59:44

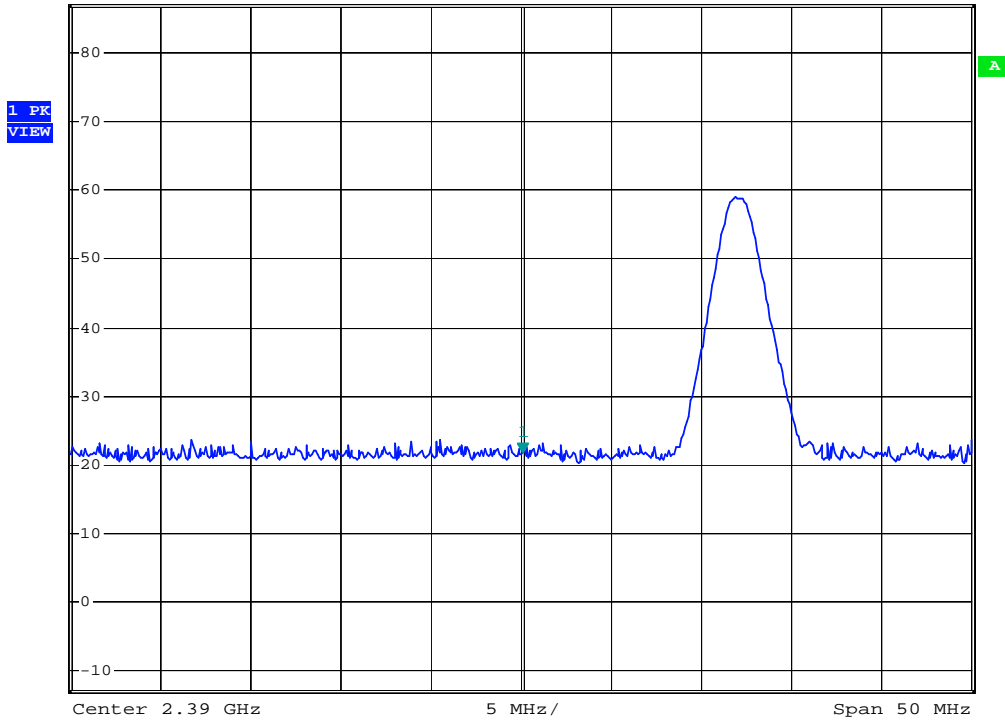
Restricted Band Checking

Operation Frequency: 2402MHz

Band Edge Level (PK) (dBμV)	Af (dB/m)	Cable Loss(dB)	Emission Level(dBμV/m)	Limit (dBμV/m)
21.63	28.6	4	54.23	74



Ref 87 dBμV *Att 0 dB *RBW 1 MHz Marker 1 [T1]
 *VBW 1 MHz 21.65 dBμV
 SWT 2.5 ms 2.390100000 GHz



Date: 1.AUG.2006 19:04:04

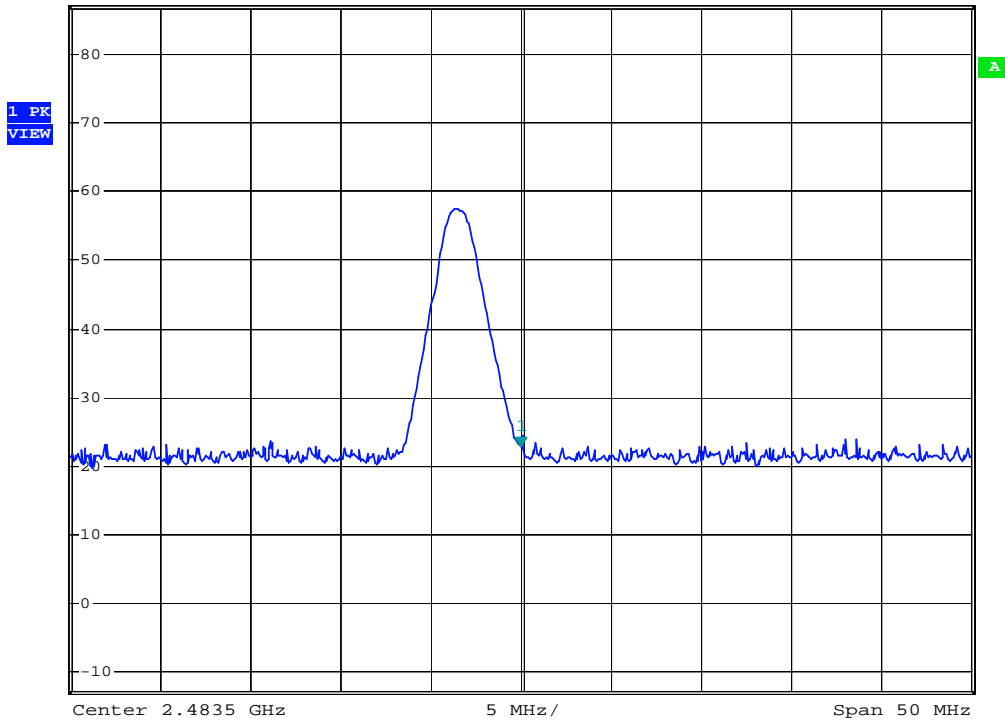
Average = 54.23dBuV/m -9.54dB(Duty Cycle Correction Factor)= 44.69dBuV/m
 Limit: 54dBuV/m

Operation Frequency: 2480MHz

Band Edge Level (PK) (dB μ v)	Af (dB/m)	Cable Loss(dB)	Emission Level(dB μ v/m)	Limit (dB μ v/m)
22.91	28.6	4	55.51	74



Ref 87 dB μ v *Att 0 dB *RBW 1 MHz Marker 1 [T1]
 *VBW 1 MHz 22.91 dB μ v
 SWT 2.5 ms 2.48350000 GHz



Date: 1.AUG.2006 19:05:59

Average = 55.51dBuV/m -9.54dB(Duty Cycle Correction Factor)= 45.97dBuV/m
 Limit: 54dBuV/m

Radiated Emissions

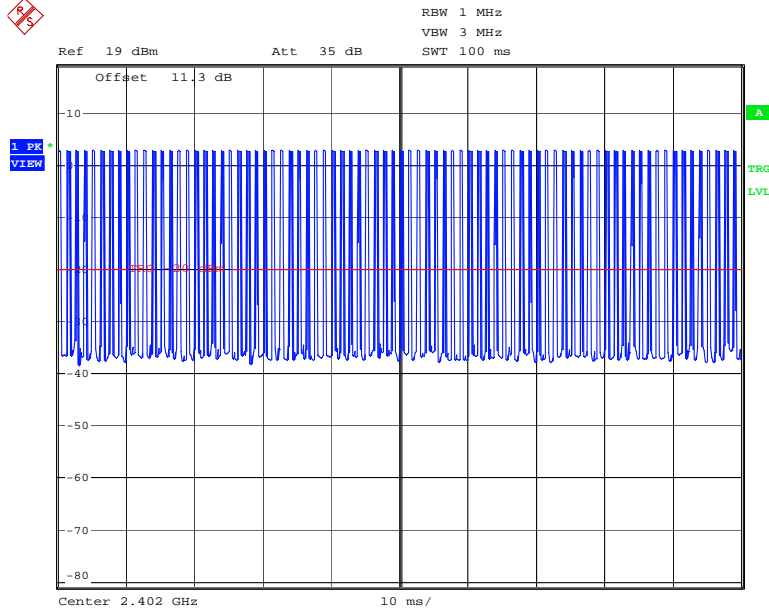
The EUT was searched from 30MHz to 10th harmonics, and for low, medium and high frequencies. Measurement has conducted on three orthogonal axes and at 3meter distance.

The spectrum analyser was set to Q-Peak detector mode with RBW/VBW as 100KHz/300KHz below 1GHz, and average detector with RBW/VBW as 1MHz/3MHz above 1GHz.

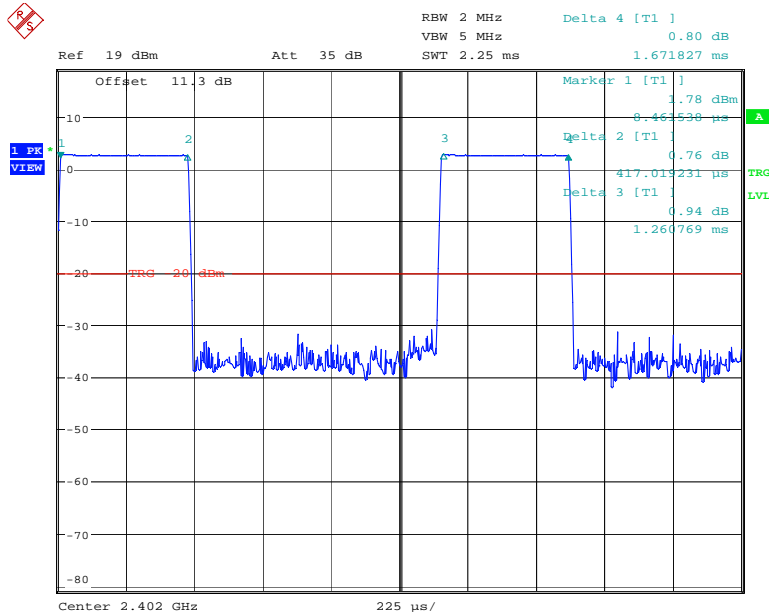
Only worst-case data was presented.

Freq. (MHz)	Ant.	Pol. V/H	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
30.2000	BC2	V	15.2	11.9	N/A	1.3	28.4	40.0	11.6	Q-Peak
30.2000	BC2	H	7.8	13.2	N/A	1.3	22.3	40.0	17.7	Q-Peak
160.2000	BC2	V	17.8	13.8	N/A	1.9	33.5	43.5	10.0	Q-Peak
160.2000	BC2	H	9.8	12.4	N/A	1.9	24.1	43.5	19.4	Q-Peak
288.0000	BC1	H	19.4	17.7	N/A	2.4	39.5	46	6.5	Q-Peak
288.0000	BC1	V	13.0	17.4	N/A	2.4	32.8	46	13.2	Q-Peak

Duty Cycle Plot:



Date: 2.AUG.2006 11:44:08



Date: 2.AUG.2006 09:56:30

Duty cycle Correction factor: $20\text{Log}\{(80 \times 0.417\text{ms})/100\text{ms}\} = -9.54\text{dB}$

Section 5. Channel Separation

Criteria: Clause 15.247(a)(1)

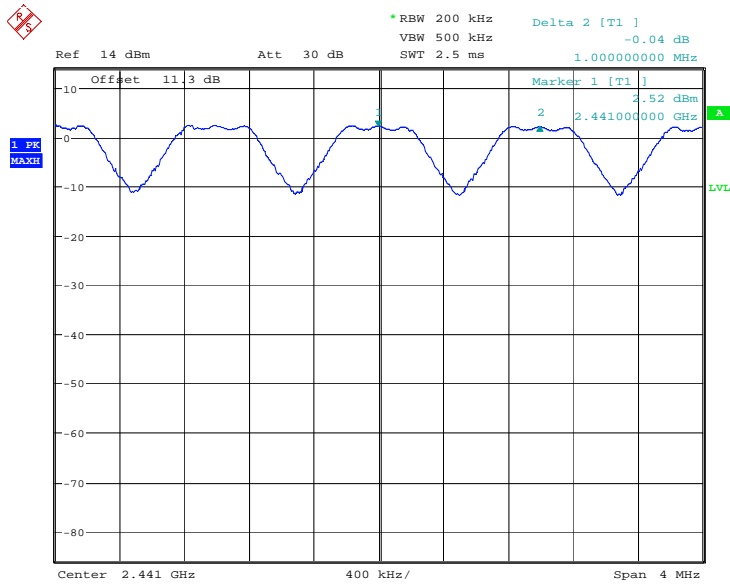
(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies 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:	1	Temperature:	22 °C
Date:	Aug. 4, 2006	Humidity:	50 %
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

Test Result: Complies

Test Data: See attached graphics



time between pulses
Date: 4.AUG.2006 16:24:42

Channel Separation: 1MHz

Section 6. No of Hopping Channels and Occupancy Time

Criteria: 15.247(a)(1)(iii)

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Conditions:

Sample Number:	1	Temperature:	22 °C
Date:	Aug.2, 2006	Humidity:	50%
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

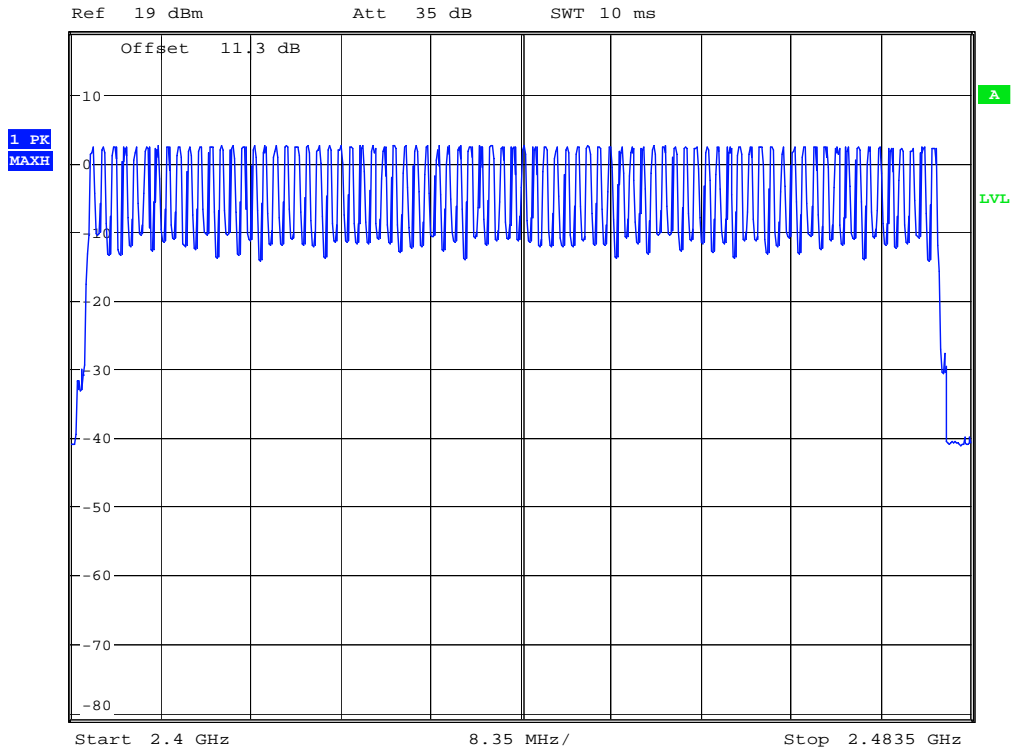
Test Result: Complies

Test Data: See attached graphics

Total Number of Hopping Channels=79

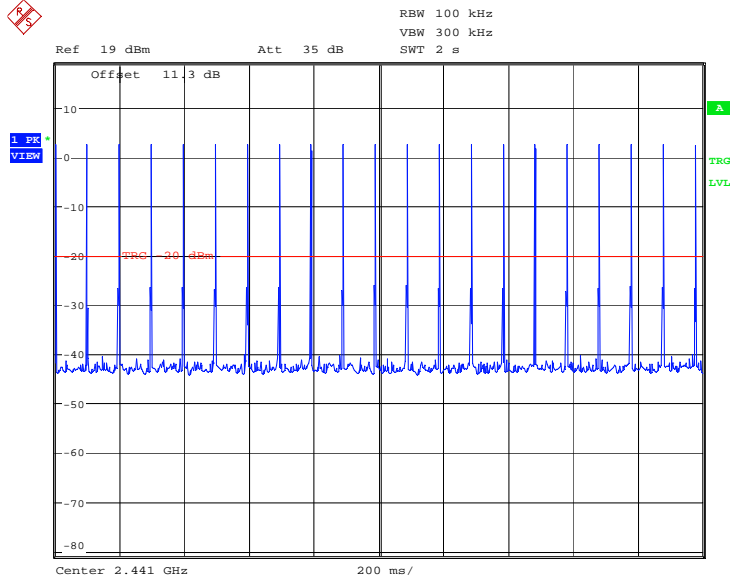


*RBW 100 kHz
VBW 300 kHz
SWT 10 ms

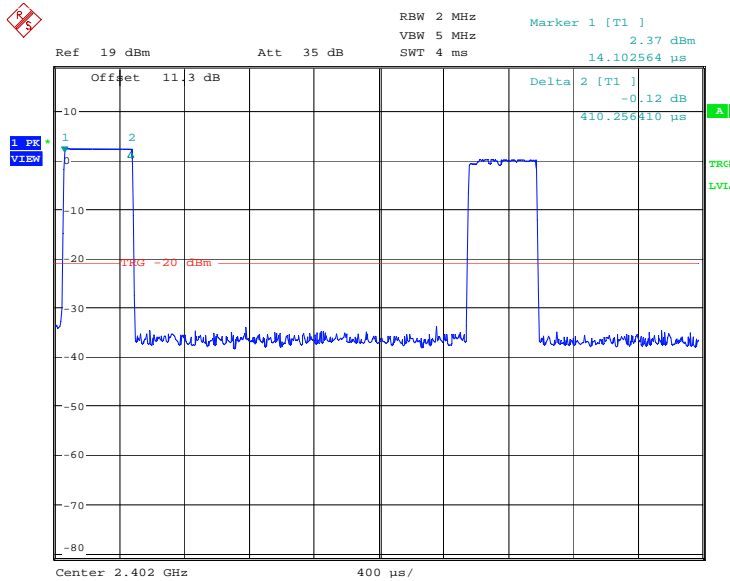


Date: 2.AUG.2006 11:07:02

Occupancy Time



Date: 2.AUG.2006 11:17:08



Date: 2.AUG.2006 11:20:29

Occupancy Time

Limit:

0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed, which is 0.4s within the period of time $0.4s * 79 = 31.6s$

Measurement data:

Time of Occupancy plots showing 21 hits per 2sec, therefore there would be $16 * 21 = 336$ hits within 32s

Total of Occupancy Time is therefore
 $= 336 * 0.41ms = 137.76ms$

Section 7. Supply Voltage Variation

Criteria: Clause 15.31

§ 15.31 (e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

Test Conditions:

Sample Number:	1	Temperature:	22 °C
Date:	Aug.3, 2006	Humidity:	50%
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Ottawa

Test Method: Average power for selected channels was verified under voltage extreme conditions using a wideband power meter with thermocouple detector.

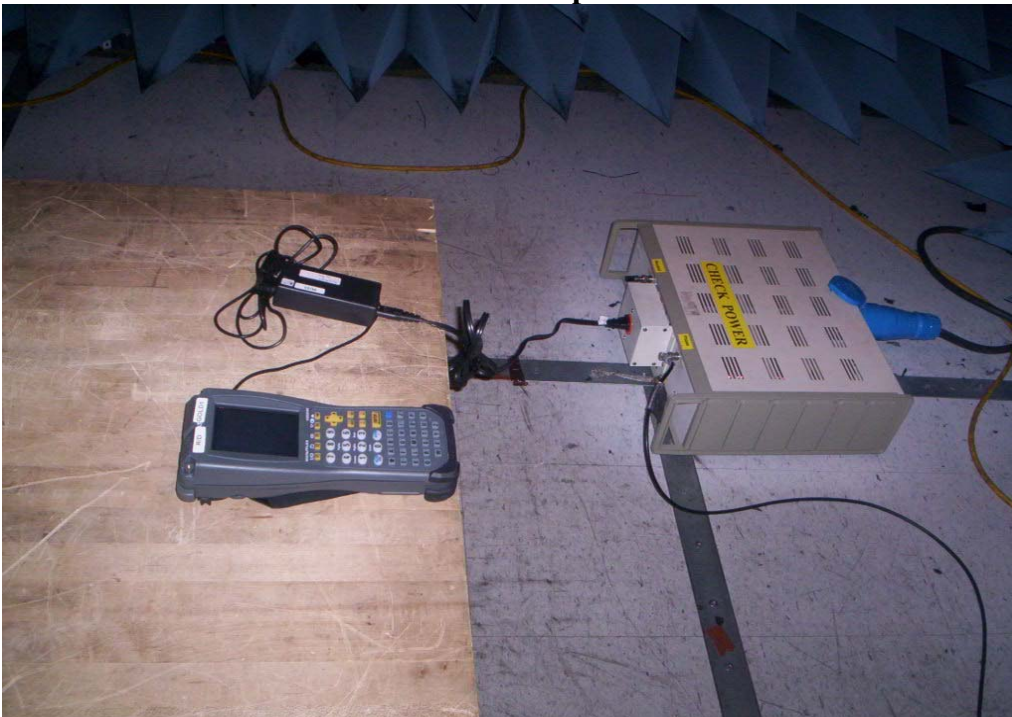
Extreme Voltage: ±15% of AC supply

Test Result: No change for output power level was noticed during the test.

Appendix B : Setup Photographs
Radiated Emission Setup Photos

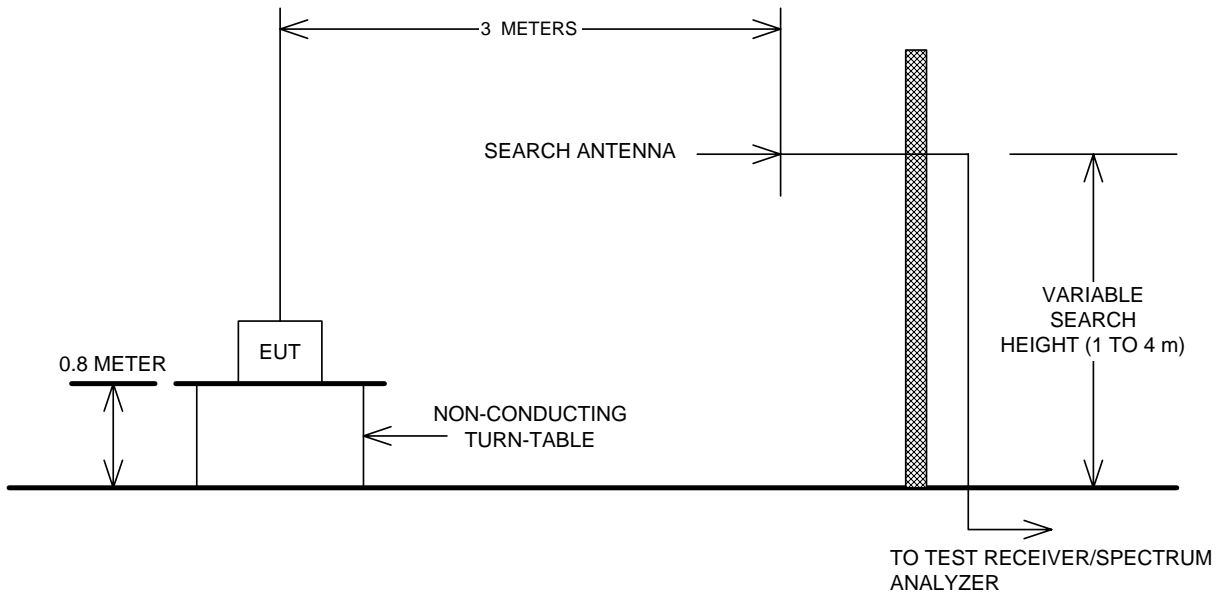


AC Power line Conducted Emissions Setup Photos

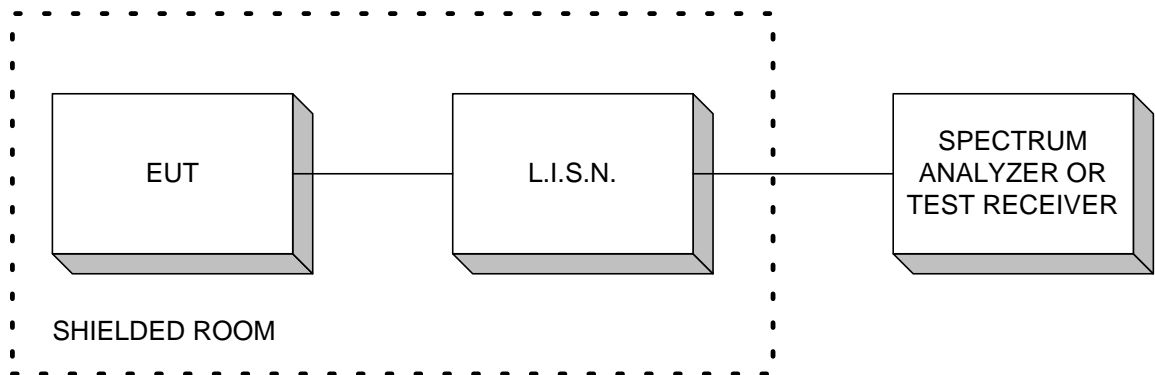


Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions



Conducted Measurements

