



Test Report: 5W57079.2


Applicant: Medical Intelligence
1170, Chemin Saint-Louis,
Sillery (Québec)
G1S 1E5, CANADA

Apparatus: Columba Charger and Base Station

FCC ID: TV9-MICLM-B001

In Accordance With: FCC Part 15 Subpart C, §15.249
Operation within the bands 902–928 MHz, 2400 –
2483.5 MHz, 5725 – 5875 MHz, and 24.0 –
24.25 GHz

Tested By: Nemko Canada Inc.
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Authorized By: 
Xu Jin, Wireless Specialist

Date: August 1, 2006

Total Number of Pages: 26

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:	Columba Charger and Base Station
Specification:	FCC Part 15 Subpart C, §15.249
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: Columba Charger and Base Station

1.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
1	Columba Base and Charger	SN: 200508000009-BS
2	CUI Inc. 120 VAC to 9 VDC Adaptor	MN: KA12D090050034U

The first samples were received on: January 26, 2006

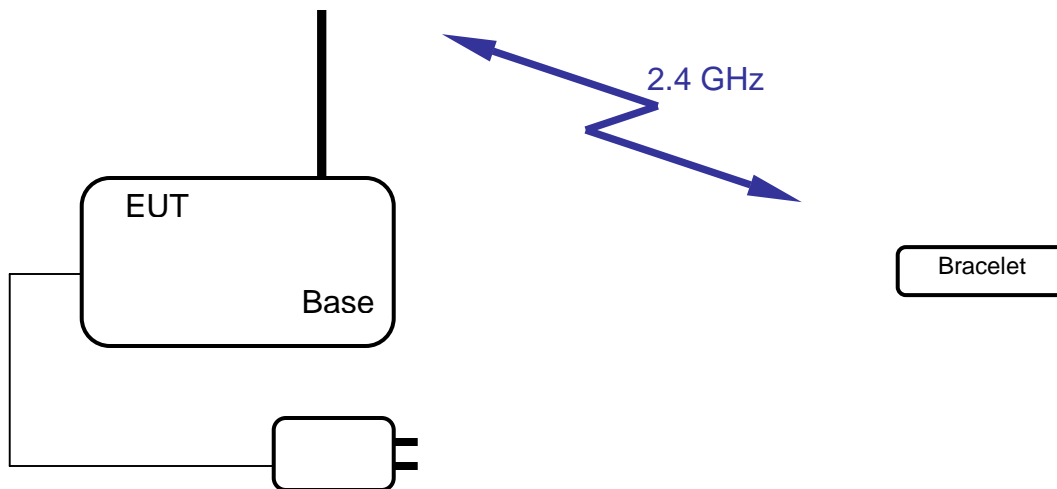
1.3 Theory of Operation

The Base and Charger (with 2.4 GHz transmitter) is the central component of the Columba tracking system for patients suffering from Alzheimer's disease and similar cognitive disorders. It continuously transmits a proximity message at 2.402 GHz, to be detected by a receiver in a bracelet on the patient's wrist. If the patient walks out of the range of the base, the bracelet (after not receiving the proximity message) will detect its position using a built-in GPS-receiver and transmit this information via GSM/GPRS cellular network to the center that is in charge of taking care of the patient.

1.4 Technical Specifications of the EUT

Manufacturer:	Medical Intelligence
Operating Frequency:	2402.0 MHz
Emission Designator	F1D
Modulation:	GFSK
Antenna Data:	Omni-directional Vertical Half-wave Dipole Gain: 2 dBi, Frequency Range: 2.4 – 2.5 GHz
Antenna Connector:	RP (Reverse Polarity) SMA
Power Source:	120 VAC to 9 VDC Adaptor

1.5 Block Diagram of the EUT



Section 2: Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, §15.249:
Operation within the bands 902–928 MHz,
2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz

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.	Last Cal.	Next Cal.
Spectrum Analyzer	Rhode & Schwarz	FSP40	FA001920	March 17/06	March 17/07
Power Meter	Hewlett Packard	E4418B	FA001413	May 15/06	May 15/07
Power Sensor	Hewlett Packard	8487A	FA001908	Apr. 4, 06	Apr. 4, 07
RF AMP	JCA	4-8 GHz	FA001497	COU*	COU*
RF AMP	JCA	2-4 GHz	FA001496	COU*	COU*
RF AMP	Narda	5 - 18GHz	FA001409	COU*	COU*
RF AMP	Narda	18 - 26.5GHz	FA001550	COU*	COU*
High Pass Filter (3.9GHz)	K&L	11SH10-4000	FA001340	COU*	COU*
Attenuator, 20 dB	Narda	776B-20	FA001153	COU*	COU*
Biconical (1) Antenna	EMCO	3109	FA000805	May 3/06	May 3/07
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 29/05	Aug. 29/06
Horn Antenna #2	EMCO	3115	FA000825	Dec. 16, 05	Dec. 16, 06
Horn Antenna #1	EMCO	3115	FA000649	Jan. 12, 06	Jan. 12, 07
LISN	EMCO	4825/2	FA001545	Jan. 30/06	Jan. 30/07
Transient Limiter	Hewlett-Packard	1194 7A	FA000975	May 25/05	May 25/06
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 18, 05	May 18, 06
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 18, 05	May 18, 06

* COU (Calibrate on Use)

** NCR (No Calibration Required)

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	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.249(a)	Radiated emissions not in Restricted Bands	Y	PASS
15.249(b)	Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	Y	PASS
15.249(d)	Spurious emissions (except Harmonics)	Y	PASS

Notes:

The Columba Base and Charger cannot operate in standby or receive mode.

Appendix A: Test Results

Clause 15.207(a) Power Line Conducted Emissions

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 of Emission (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.

Test Conditions:

Sample Number:	1	Temperature:	23 °C
Date:	February 28, 2006	Humidity:	36 %
Modification State:	0	Tester:	Michel Dorion
		Laboratory:	Ottawa

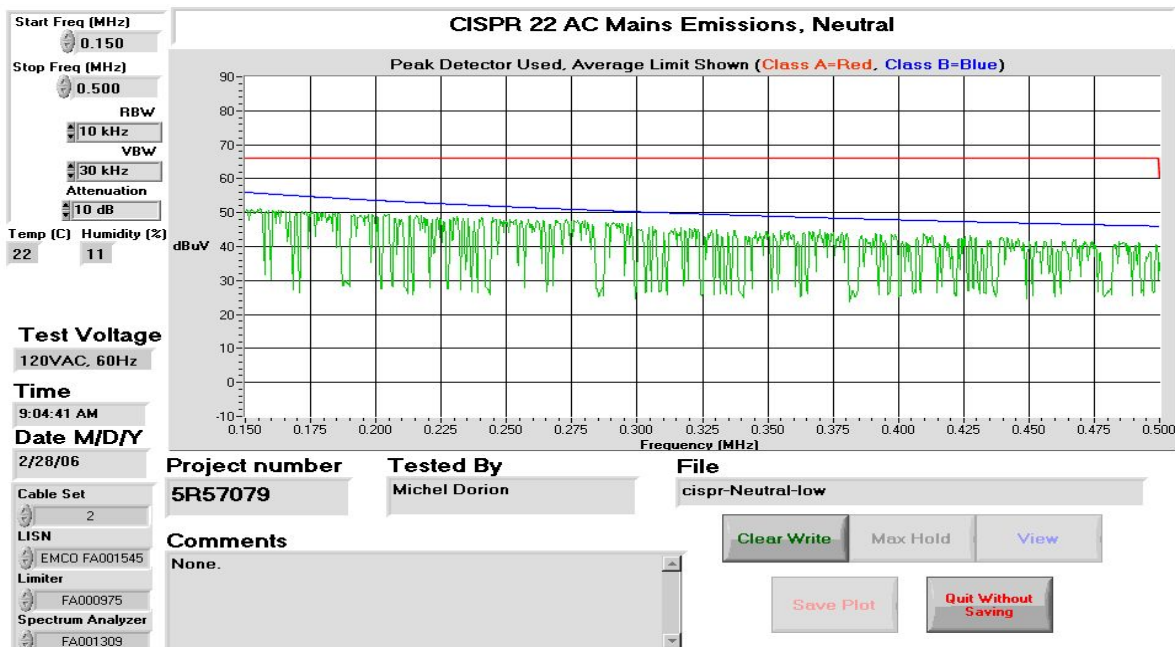
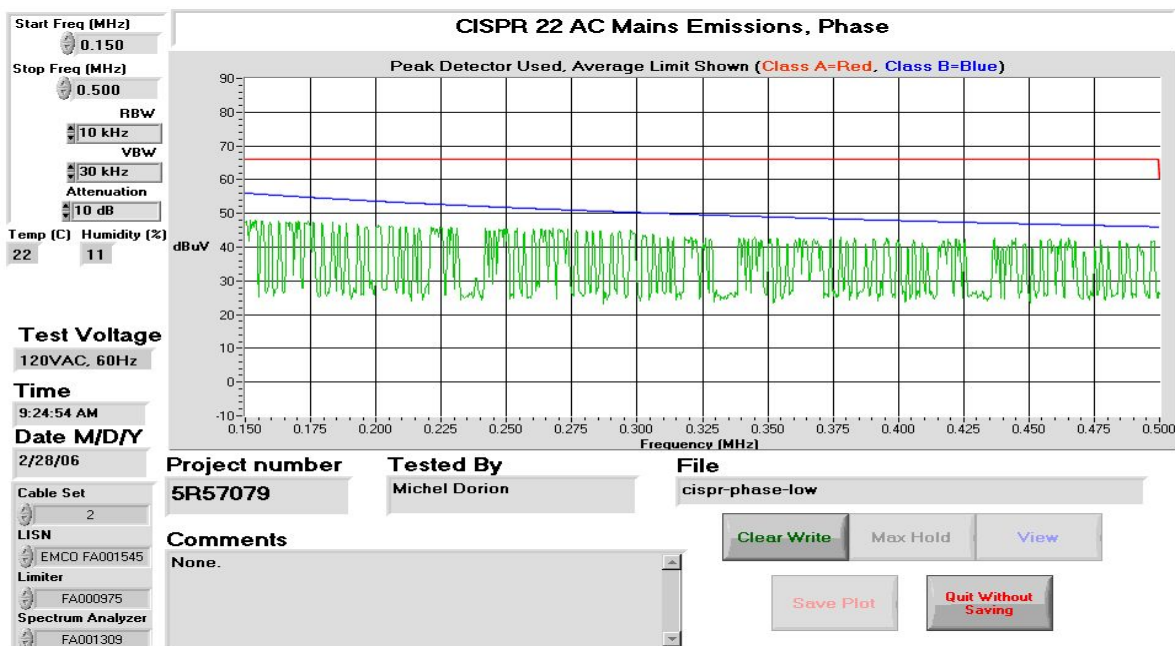
Test Results: See Attached Plots.

Additional Observations:

All readings have been corrected for the cable, LISN and transient limiter losses to show compliance. All plots were generated with a Peak Detector and Resolution Bandwidth: 9 kHz for comparison against average limits.

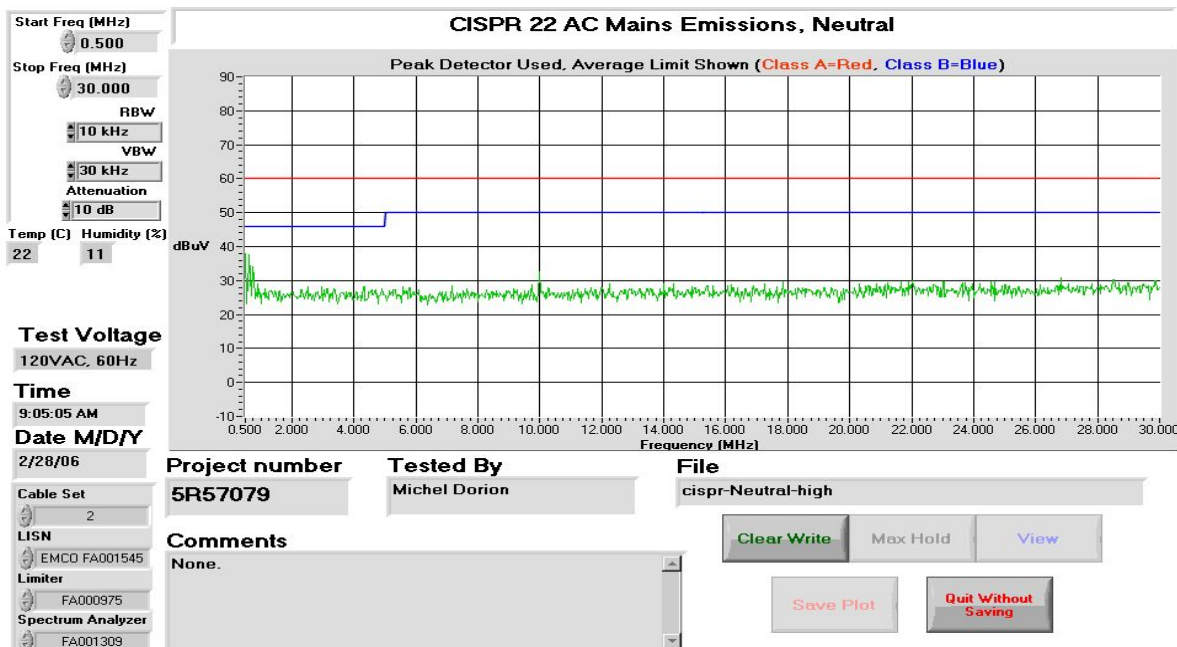
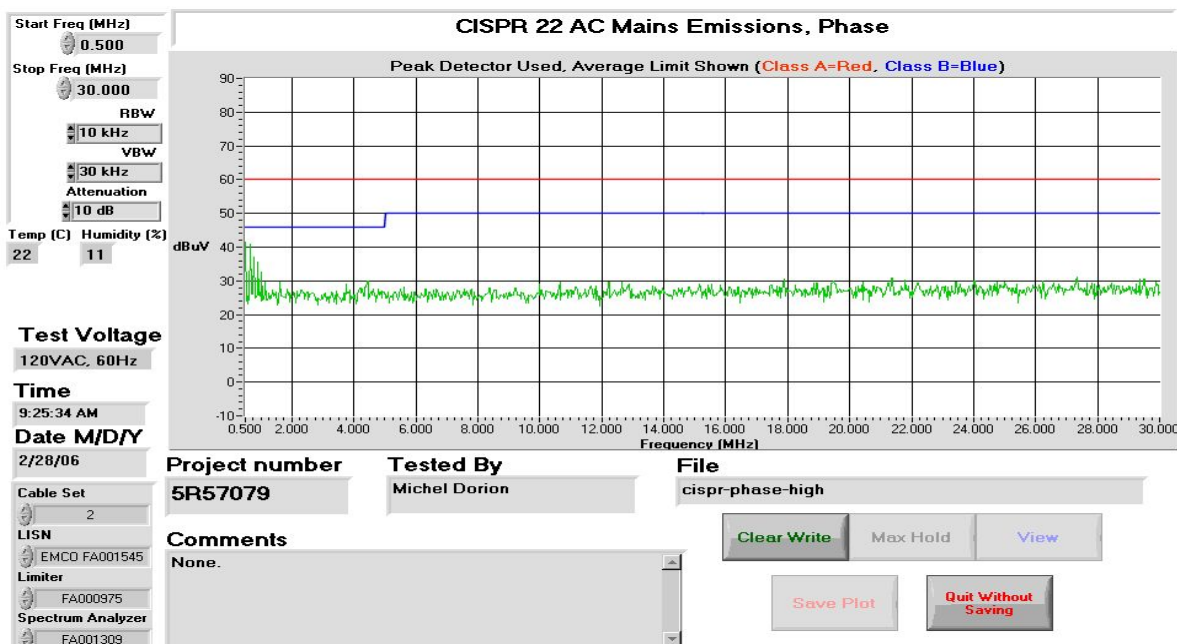
Power Line Conducted Emissions, continued

AC Ports, Conducted Emissions Plots



Power Line Conducted Emissions, continued

AC Ports, Conducted Emissions Plots, continued



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 (μ V/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	Temperature:	23 °C
Date:	July 1 – 2, 2006	Humidity:	36 %
Modification State:	0	Tester:	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

Pass (see attached table and plots).

Additional Observations:

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

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

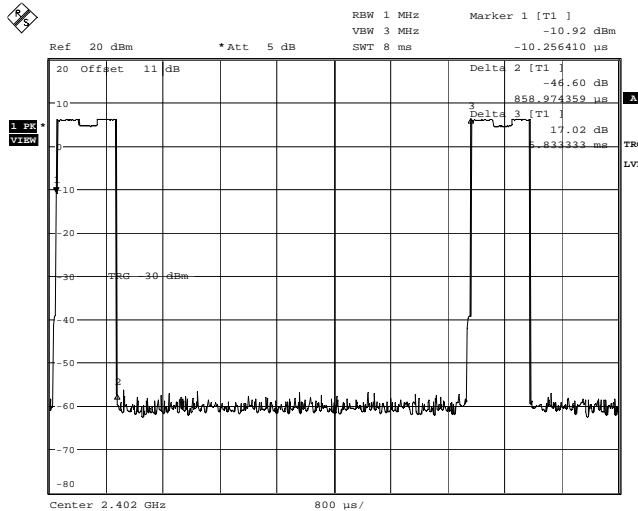
At frequencies below 1000 MHz, emissions were tested using measurement instrumentation employing a CISPR quasi-peak detector and RBW 100kHz. Above 1000 MHz emissions were measured using peak and average detector and RBW 1MHz. The EUT was measured on three orthogonal axes.

Radiated Emissions within Restricted Bands, continued

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain / Cable Loss (dB)	Duty Cycle Corr.	Distance Corr.	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	250.0000	BC1	H	15.4	16.1	2.3	N/A	N/A	33.8	46.0	12.2	Q-Peak
2	4804.0000	Horn2	V	83.0	33.3	-46.2	-16.6	N/A	70.1 53.5	74.0 54.0	3.9 0.5	Peak Average
3	4804.0000	Horn2	H	70.9	33.1	-46.2	-16.6	N/A	57.8 41.2	74.0 54.0	16.2 12.8	Peak Average
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole90												

Radiated Emissions within Restricted Bands, continued

Duty Cycle:



Duty Cycle:

$$x = T_{ON} / (T_{ON} + T_{OFF}) = \text{Delta 2} / \text{Delta 3}$$

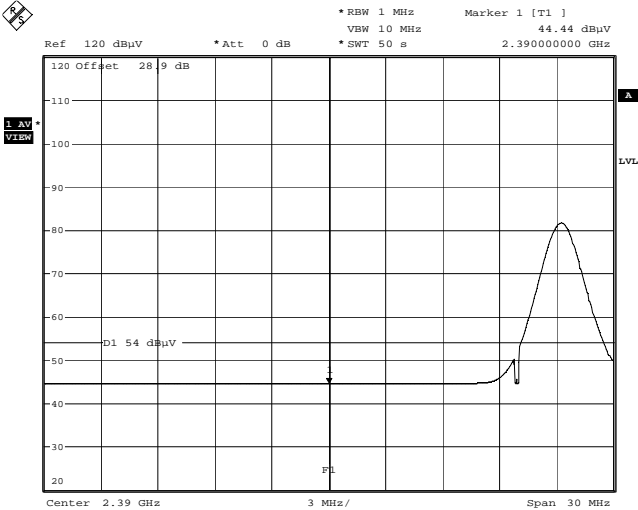
$$x = 0.147$$

$$20 \cdot \log_{10} (1/x) = 16.64 \text{ dB}$$

Date: 1.JUL.2006 22:53:15

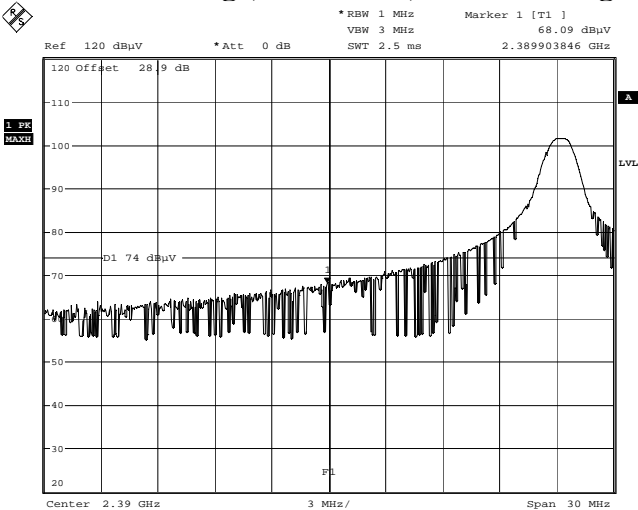
Radiated Emissions within Restricted Bands, continued

Lower Band-Edge, 2390 MHz, Average Reading



Date: 2.JUL.2006 18:07:24

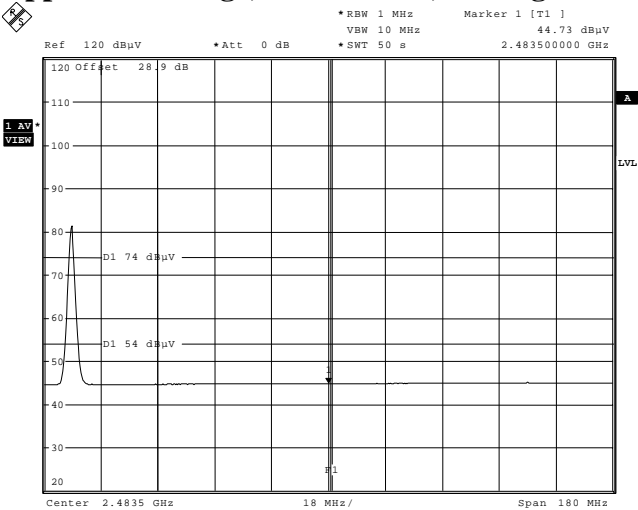
Lower Band-Edge, 2390 MHz, Peak Reading



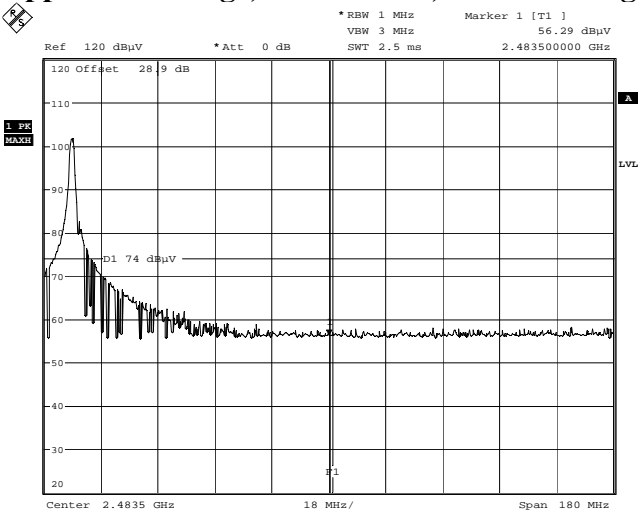
Date: 2.JUL.2006 18:09:49

Radiated Emissions within Restricted Bands, continued

Upper Band-Edge, 2483.5 MHz, Average Reading



Upper Band-Edge, 2483.5 MHz, Peak Reading



Date: 2.JUL.2006 18:14:57

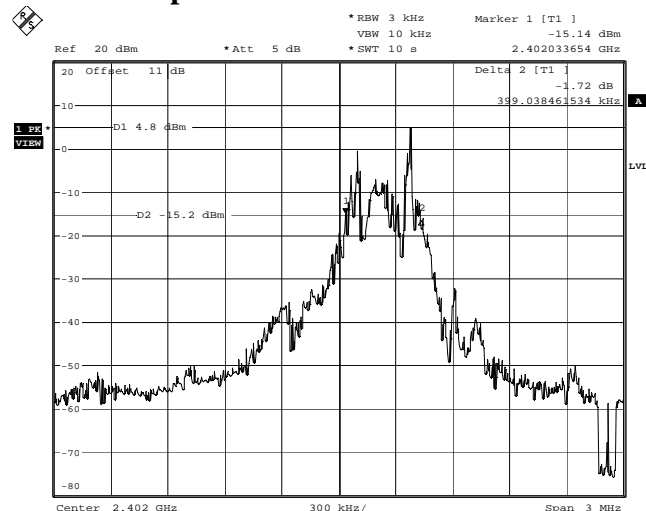
Clause 15.215(c) 20dB Bandwidth

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If the frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Conditions:

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

Test Results: See Attached Plot.

20 dB Occupied Bandwidth

Date: 1.JUL.2006 22:42:22

Clause 15.249(a) Radiated emissions not in Restricted Bands

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Test Conditions:

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

Test Results: See attached Table

Additional Observations:

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

The EUT was measured on three orthogonal axes.

During the test AC supply voltage was varied within $\pm 15\%$ of the nominal value. No measurable variation in radiated field was noticed.

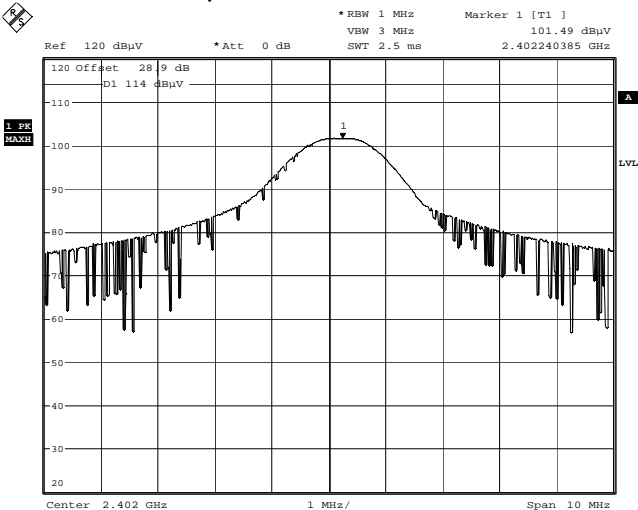
All measurement were performed at 3m using Peak Detector with 100kHz RBW/VBW below 1GHZ and 1MHz RBW/VBW above 1 GHz.

Radiated emissions not in Restricted Bands, continued

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr. (dB)	Cable Loss (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
300.0000	LP1	V	17.9 QP	15.6	N/A	N/A	2.3	33.8	46.0	12.2
600.5700	LP1	V	18.5 QP	19.6	N/A	N/A	2.6	36.1	46.0	9.9
675.0000	LP1	V	17.8 QP	20.7	N/A	N/A	3.5	41.6	46.0	4.4
750.0000	LP1	V	19.3 QP	20.8	N/A	N/A	3.7	42.2	46.0	3.8
825.0000	LP1	V	18.7 QP	22.0	N/A	N/A	4.2	44.3	46.0	1.7
7206.0000	Horn2	V	74.6 Peak	36.3	55.3	N/A	11.7	67.3	74.0	6.7
7206.0000	Horn2	V	74.6 Average	36.3	55.3	-16.6	11.7	50.7	54.0	3.3
7206.0000	Horn2	H	62.0 Peak	36.3	55.3	N/A	11.7	54.7	74.0	19.3
7206.0000	Horn2	H	62.0 Average	36.3	55.3	-16.6	11.7	38.1	54.0	15.9
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole Note 2: QP – Quasi Peak detector used										

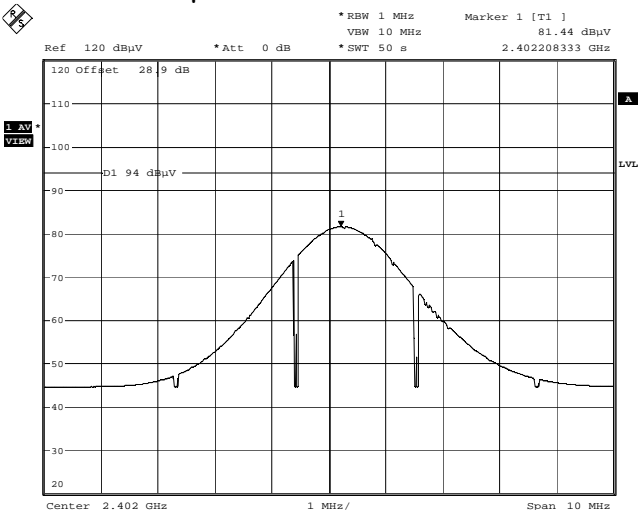
Radiated emissions not in Restricted Bands, continued

Peak Field Strength at 3m on fundamental frequency: 101.49 dB μ V/m
Limit: 114.0 dB μ V/m



Date: 2.JUL.2006 17:42:41

Average Field Strength at 3m on fundamental frequency: 81.44 dB μ V/m
Limit: 94.0 dB μ V/m



Date: 2.JUL.2006 17:47:27

Clause 15.249(d) Spurious emissions (except Harmonics)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Test Conditions:

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

Test Results: Pass.

Additional Observations:

The spectrum was searched from 30 MHz to 25GHz.

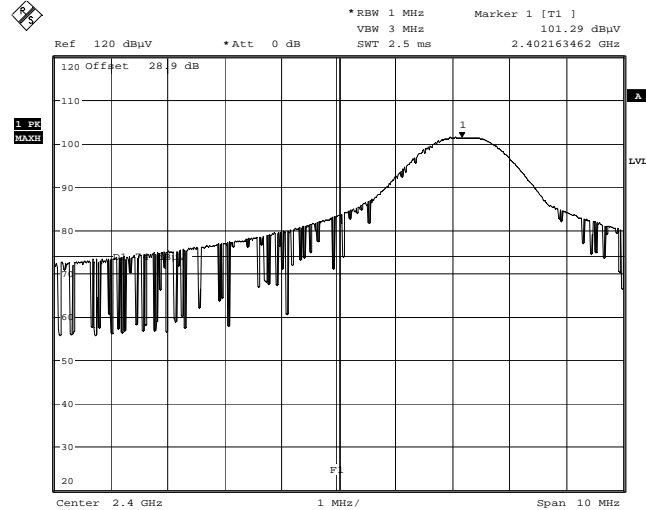
The EUT was measured on three orthogonal axes.

All measurement were performed at 3m using Peak Detector with 100kHz RBW/VBW below 1GHZ and 1MHz RBW/VBW above 1 GHz.

No emissions (except harmonics, see previous sections) within 20 dB below the limit were found.

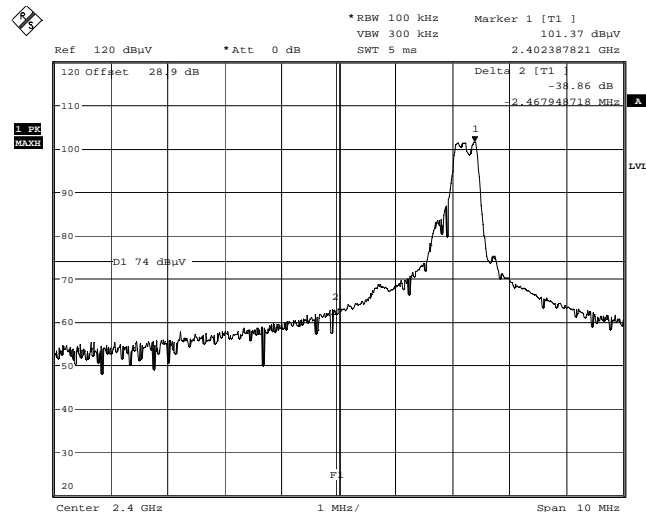
Spurious emissions (except Harmonics), continued

Lower Band Edge, 2400 MHz, Peak Limit



Measured Peak Field Strength in
 1 MHz RBW: 101.29 dBμV/m

Date: 2.JUL.2006 18:21:11



Delta Marker = -38.86 dB

Date: 2.JUL.2006 18:23:19

Therefore, Peak Field Strength at 2400 MHz Band Edge:

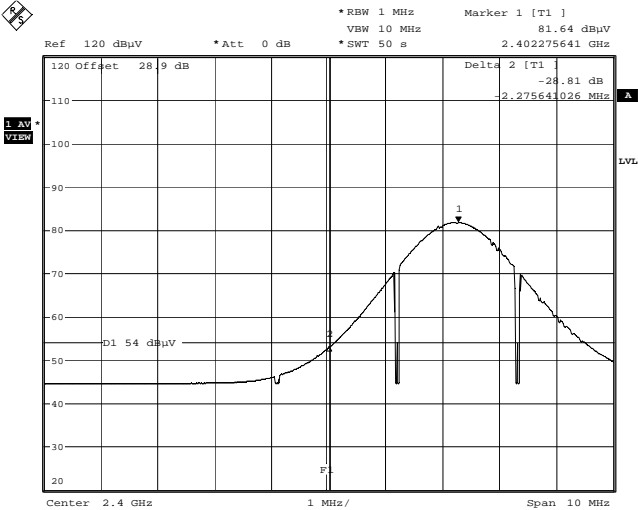
$$\text{Peak Field (@2400MHz)} = 101.29 \text{ dB}\mu\text{V/m} - 38.86 \text{ dB} = 62.43 \text{ dB}\mu\text{V/m}$$

$$\text{Peak Limit} = 74.0 \text{ dB}\mu\text{V/m}$$

$$\text{Margin} = 74.0 \text{ dB}\mu\text{V/m} - 62.43 \text{ dB}\mu\text{V/m} = 11.57 \text{ dB}$$

Spurious emissions (except Harmonics), continued

Lower Band Edge, 2400 MHz, Average Limit



Date: 2.JUL.2006 18:32:34

Appendix B: Setup Photographs

Conducted Emissions Setup:

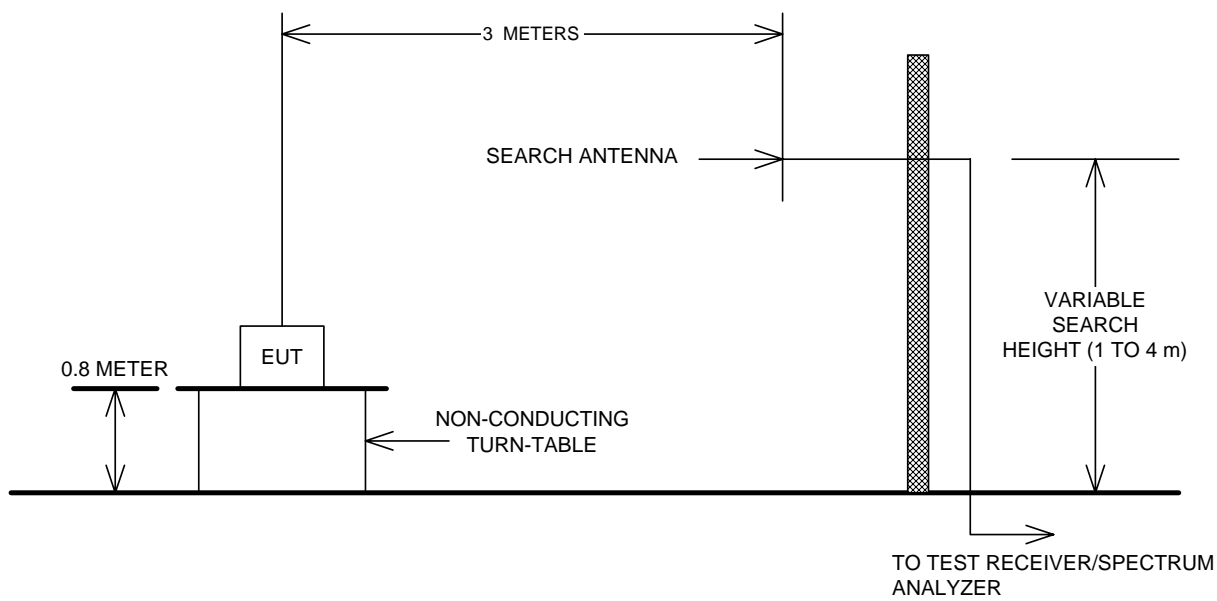


Spurious Emissions Setup:



Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions

