

KTL Test Report:	9R05236
Applicant:	EXI Wireless Systems Inc. Suite 100-13551 Commerce Parkway Richmond, B.C. V6V 2L1
Equipment Under Test: (E.U.T.)	Patient "TAG"
FCC ID:	HE7PTG
In Accordance With:	FCC Part 15, Subpart C For Low Power Transmitters Operating Periodically In The Band 40.66 - 40.77 MHz And Above 70 MHz
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	 K. Carr, Technologist
Date:	
Total Number of Pages:	28

EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG

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*EQUIPMENT: Patient "TAG"**FCC ID: HE7PTG*

Section 1. Summary of Test Results

Manufacturer: EXI Wireless Systems Inc.

Model No.: TAG

Serial No.: C09999

Date Received In Laboratory: December 23, 1999

KTL Identification No.: Item #1

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.231. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.



New Submission



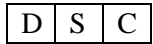
Production Unit



Class II Permissive Change



Pre-Production Unit



Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST
SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".

**NVLAP LAB CODE: 100351-0**TESTED BY: _____ DATE: _____
Kevin Rose, Test TechnicianTESTED BY: _____ DATE: _____
Glen Westwell, Technologist

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*EQUIPMENT: Patient "TAG"**FCC ID: HE7PTG*

Summary Of Test Data

Name of Test	Paragraph Number	Results
Radiated Emissions	15.231(b)	Complies
Occupied Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	Complies
Periodic Alternate Field Strength Requirements	15.231(e)	Complies

Footnotes For N/A's:**Test Conditions:**

Indoor Temperature: 24 °C
 Humidity: 32 %

Outdoor Temperature: 10 °C
 Humidity: 22 %

EQUIPMENT: Patient "TAG"

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Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Range:	433.92 MHz
Operating Frequency(ies) of Sample:	433.92 MHz
Type of Emission:	Pulse Width Modulation (PWM)
Emission Designator:	62 K5F1D
Supply Power Requirement:	3 Vdc Battery Cell

Duty Cycle Calculation:

TAG In Field

- (1) Transmission Pulse Width = 333 μ Sec
- (2) 30 Pulses in a 100 mSec period $\therefore 30 \times 333 \mu S = 9.99 \text{ mSec}$
- (3) $20 \text{ Log } \frac{9.99}{100} = -20 \text{ dB}\mu\text{V}$

TIC-Off Body Alarm

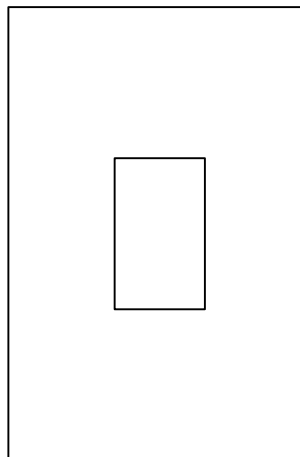
- (1) Tx Pulse Width = 53.3 mSec
- (2) 1 Pulse in a 100 mSec Period
- (3) $20 \text{ Log } \frac{53.3}{100} = -5.46 \text{ dB}\mu\text{V}$

Note: The TAG initiated communication (TIC)-Off Body Alarm duty cycle correction factor will be used to average the radiated peak emissions since this is the worst case application.

EQUIPMENT: Patient "TAG"
FCC ID: HE7PTG

Configuration of the Equipment Under Test

Patient "TAG"



EQUIPMENT: Patient "TAG"

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Section 3. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: N/A	DATE:

Minimum Standard:**Permissible Field Strength Limits (Momentarily Operated Devices)**

Fundamental Frequency (MHz)	Field Strength of Fundamental Microvolts/Meter at 3 meters; (watts)	Field Strength of Unwanted Emissions Microvolts/Meter at 3 meters; (watts)
40.66 - 40.70	2,250	225
70-130	1, 250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (note 1)	3,750	375
260-470 (note 1)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

Notes:

# Use quasi-peak or averaging meter.	For 130 - 174 MHz: $FS \text{ (microvolts/m)} = (56.82 \times F) - 6136$
* Linear interpolation with frequency F in MHz	For 260 - 470 MHz: $FS \text{ (microvolts/m)} = (41.67 \times F) - 7083$

Any emissions that fall within the restricted bands of 15.205 shall not exceed the following limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Test Results: N/A**Test Data:**

Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 3 MHz.

In the case of handheld equipment, the E.U.T. is rotated in three planes to obtain worst-case results.

EQUIPMENT: Patient "TAG"
FCC ID: HE7PTG

Radiated Photographs (Worst Case Configuration)

Front View



EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Glen Westwell	DATE: January 3, 2000

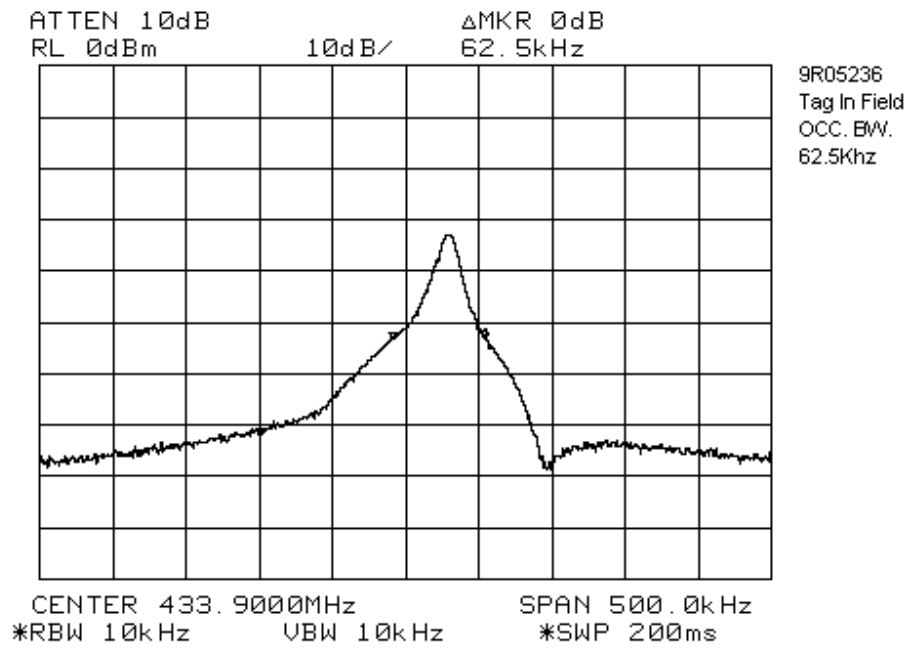
Minimum Standard: 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Results: Complies. See attached graph.

Test Data: See attached graph.

EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG



*EQUIPMENT: Patient "TAG"**FCC ID: HE7PTG*

Section 5. Periodic Alternate Field Strength Requirements

NAME OF TEST: Periodic Alternate Field Strength Requirements PARA. NO.: 15.231(e)

TESTED BY: Kevin Rose

DATE: January 3, 2000

Minimum Standard: 15.231(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following.

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500	50 to 150
174 - 260	1,500	150
260-470	1,500 to 5,000	150 to 500
Above 470	5,000	500

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Results: Complies.

Test Data: See attached table.

EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG

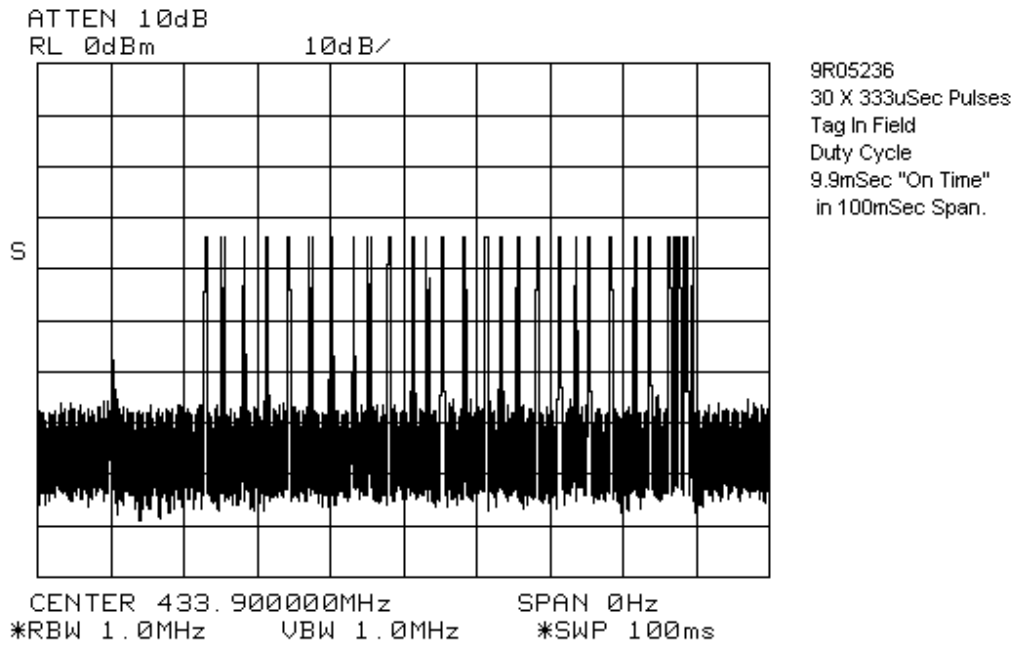
Test Data - Radiated Emissions: Fundamental & Harmonics Measured As "PEAK"
Limit Level Is Averaged As Per FCC 15.2131(e)

Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP		RBW(kHz): 120		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
433.92	E/D4	V			30.8	25.9		-5.4	51.3	73.0	21.7
433.92	E/D4	H			40.6	25.9		-5.4	61.1	73.0	11.9
867.85	E/D4	V			10.9	34.4		-5.4	39.9	53.0	13.1
867.85	E/D4	H			15.5	34.4		-5.4	44.5	53.0	8.5
Notes: B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole * Re-measured using dipole antenna. ** Includes cable loss when amplifier is not used. *** Includes cable loss. () Denotes failing emission level. Client Supplied EUT – Continuous C.W. Transmitter, therefore, a duty cycle correction factor of 5.4 dBµV was used to "average" the peak emission.											

Test Distance (meters) : 3		Range: A Tower		Receiver: 8564E		RBW(kHz): 1 MHz		Detector: Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1301.8	Hrn2	V			19.0	27.9		-5.4	41.5	53.0	11.5
1301.8	Hrn2	H			22.3	27.9		-5.4	44.8	53.0	8.2
1735.7	Hrn2	V			40.0	29.7	-42.7	-5.4	21.6	53.0	31.4
1735.7	Hrn2	H			44.3	29.7	-42.7	-5.4	25.9	53.0	27.1
2169.6	Hrn2	V			46.8	31.1	-46.6	-5.4	25.9	53.0	27.1
2169.6	Hrn2	H			54.6	31.1	-46.6	-5.4	33.7	53.0	19.3
2603.5	Hrn2	V			46.5	31.5	-45.6	-5.4	27.0	53.0	26.0
2603.5	Hrn2	H			52.5	31.5	-45.6	-5.4	33.0	53.0	20.0
3037.4	Hrn2	V			48.0	32.8	-44.1	-5.4	31.3	53.0	21.7
3037.4	Hrn2	H			49.6	32.8	-44.1	-5.4	32.9	53.0	20.1
3471.4	Hrn2	V			47.1	35.1	-42.3	-5.4	34.5	53.0	18.5
3471.4	Hrn2	H			49.8	35.1	-42.3	-5.4	37.2	53.0	15.8
3905.3	Hrn2	V			36.3	36.0	-42.6	-5.4	24.3	53.0	28.7
3905.3	Hrn2	H			38.1	36.0	-42.6	-5.4	26.1	53.0	26.9
4339.2	Hrn2	V			38.3	37.0	-43.1	-5.4	26.8	53.0	26.2
4339.2	Hrn2	H			39.5	37.0	-43.1	-5.4	28.0	53.0	25.0
Notes: B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole * Re-measured using dipole antenna. ** Includes cable loss when amplifier is not used. *** Includes cable loss. () Denotes failing emission level. Client Supplied EUT – Continuous C.W. Transmitter, therefore, a duty cycle correction factor of 5.4 dBµV was used to "average" the peak emission.											

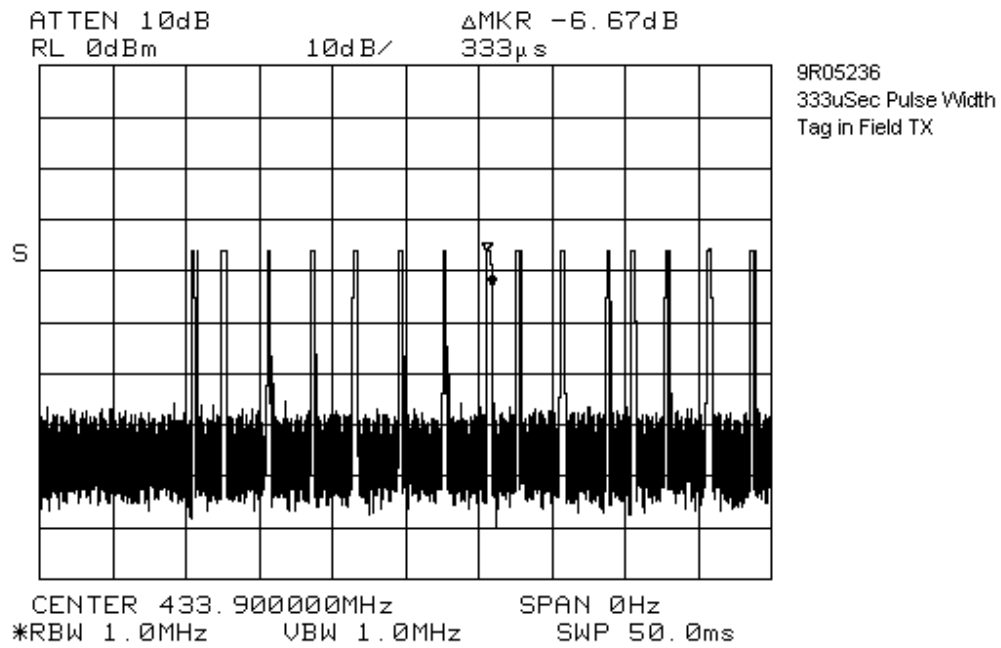
EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG

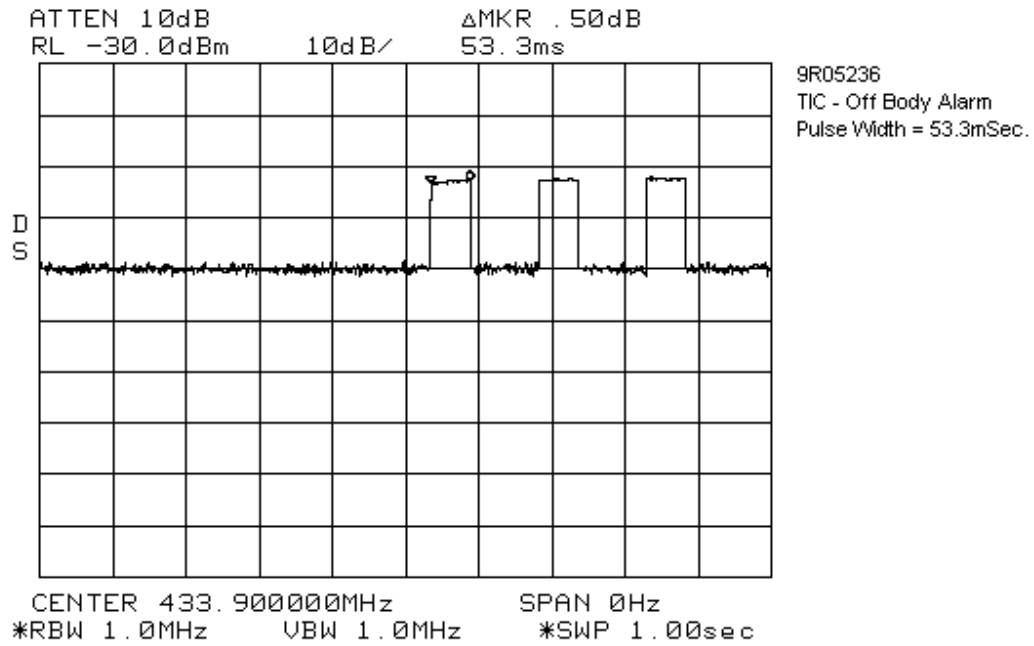


EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG

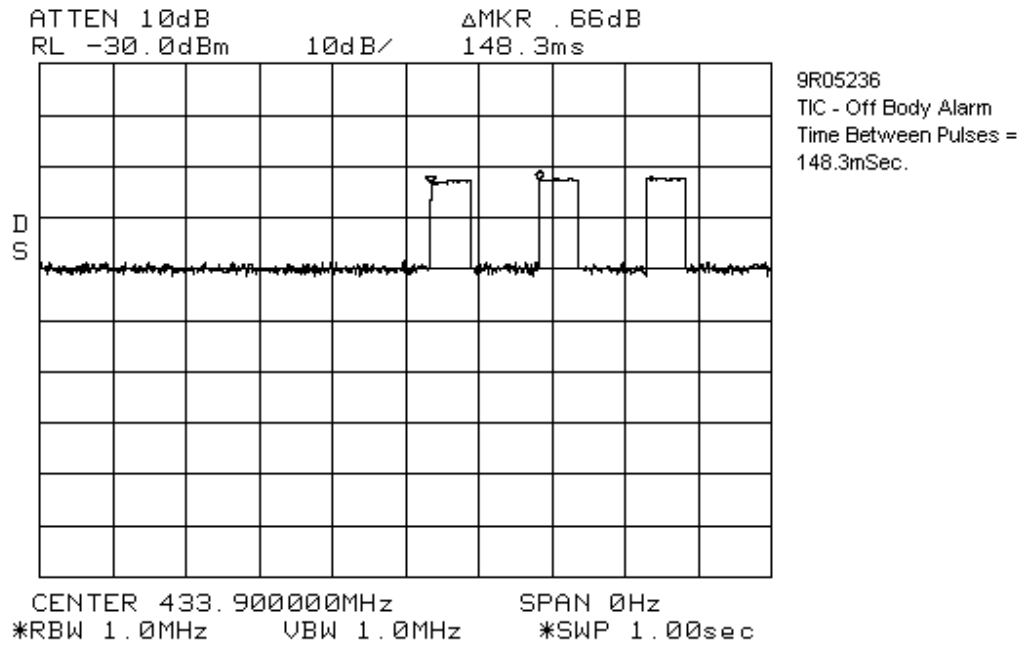


EQUIPMENT: Patient "TAG"
FCC ID: HE7PTG



EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG



December 22, 1999

KTL Ottawa Inc.
3325 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Atten: Gilles Phillion

Re: FCC Submission, Project No. 9R05173

EXI certifies that the Patient TAG product number HE7PTG serial number C09999 with firmware revision 6.6 accurately represents the performance of the typical manufactured product.

Signed



Bruce R. Barlow, P.Eng
For EXI Wireless systems Inc.
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Richmond, BC, V6V 2L1

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Project No.: 9R05236
Periodic Alternate Filed Strength Requirements
Customer Supplied Data
Page No.: 17 of 26

December 21, 1999

1779

Reference: 9R05173 FCC Submission for EXI Patient TAG
Subject: Resubmission with Patient TAG firmware revision 6.6

1.0 Overview

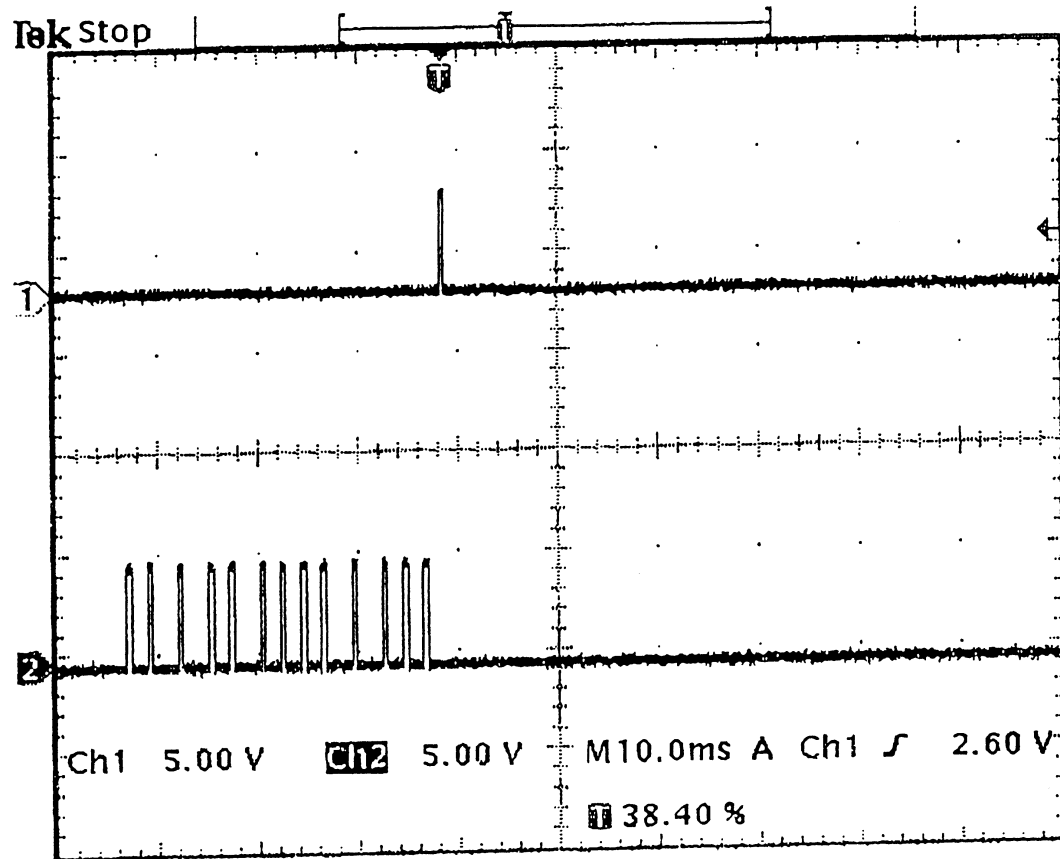
Recognizing that the modulation protocol of our firmware version 6.5 does not simultaneously meet the requirements of either 15.231(a) or (e) for the off body emission and the field response, we have developed a new version (6.6). This modifies the "off body" alarm emissions to one data transmission consisting of pulse modulated rf recognition code having a transmission length of nominally 350 msec. This message is repeated at a minimum of 12 seconds and is then repeated at time intervals that double to 4 minutes maximum. The message then continues to repeat at four minute intervals.

The "tag in field" coding is modified so that the single tag response occurs every 11.5 seconds, and the tag id code once every minute. The single tag response is typically 350 usec long. The duration of the tag ID code is less than 100 msec.

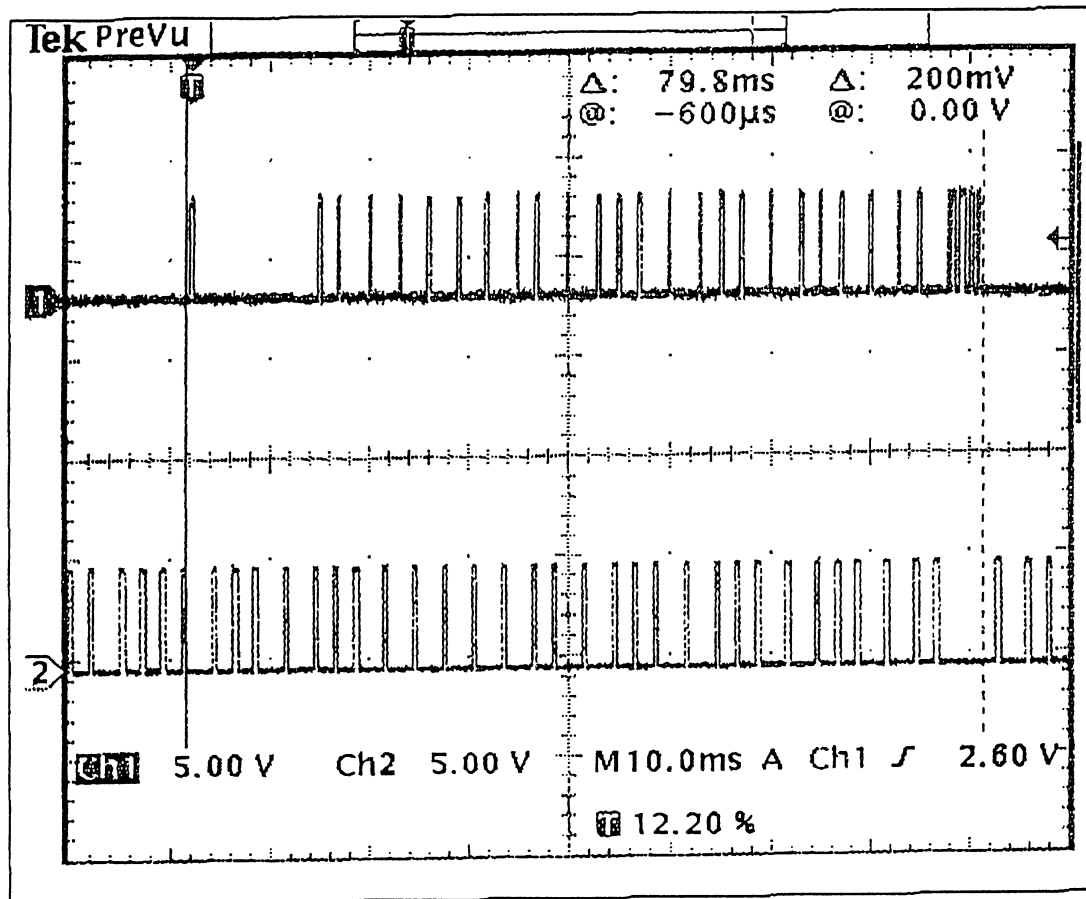
These modifications are designed to conform to the periodic rules under 15.231 (e).

2.0 TAG IN FIELD (TIF)

2.1 The following figure displays the Patient TAG ID single 350 usec pulse transmission in response to "wakeup and respond" command from the controller. The command occurs once every 11.5 seconds. Trace 1 is the tag pulse showing its relationship to the end of the controller "Wakeup and Respond" command, trace 2.

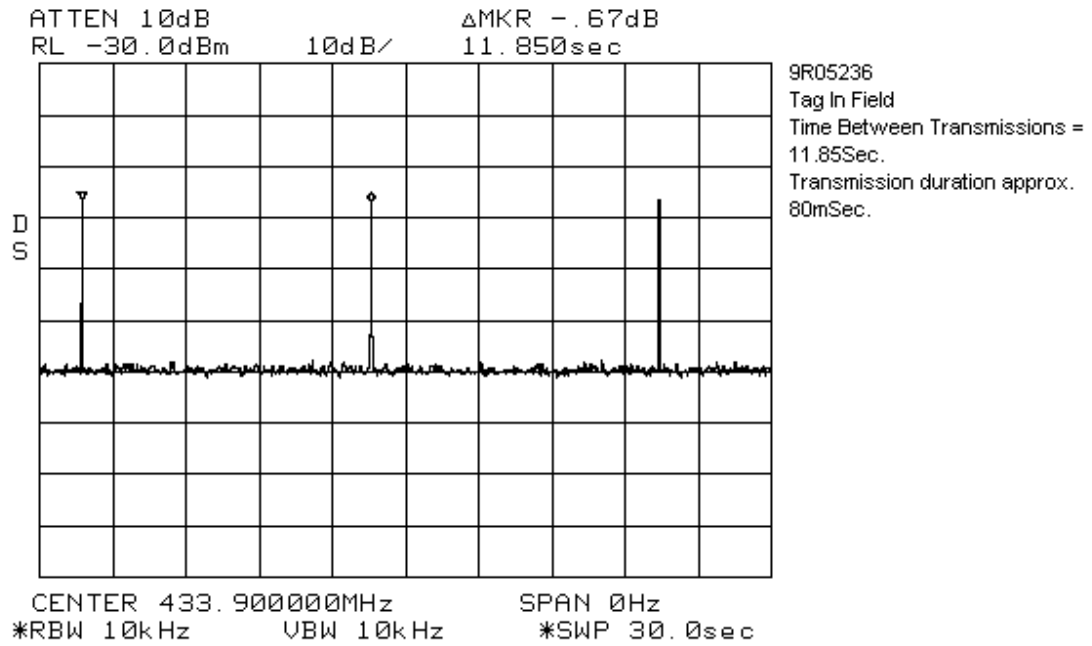


2.2 The following figure displays the Patient TAG ID code response that is sent once every 60 seconds (tag response to "Reset" command, issued once every sixty seconds). The pulse width is typically less than 350 usec. A total of 30 pulses are transmitted in a period of typically 80 msec.



EQUIPMENT: Patient "TAG"

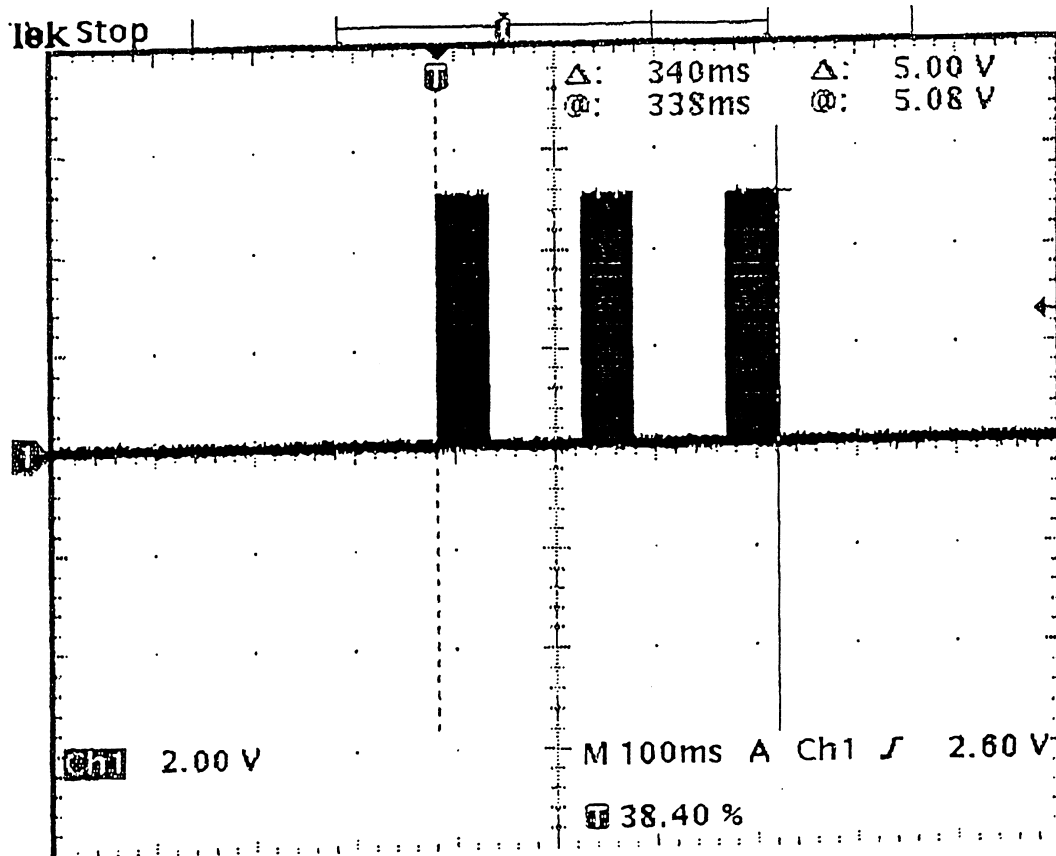
FCC ID: HE7PTG



3.0 TIC (Tag Initiated Communication – off body alarm)

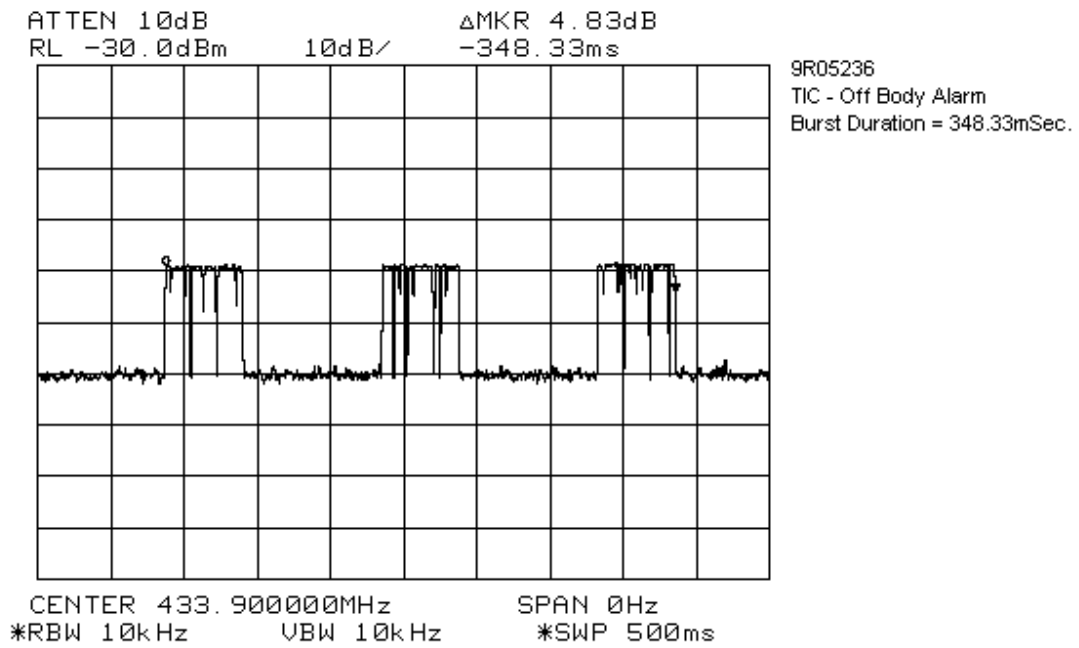
3.1 The following figure shows the full single Message transmission.

There are three data sequences, each with three words comprised of four characters. This occurs once on removal and is repeated after a minimum of 12 seconds. The message is then resent at intervals doubling (24, 48, 96 Seconds) to a maximum interval of 4 minutes.



EQUIPMENT: Patient "TAG"

FCC ID: HE7PTG

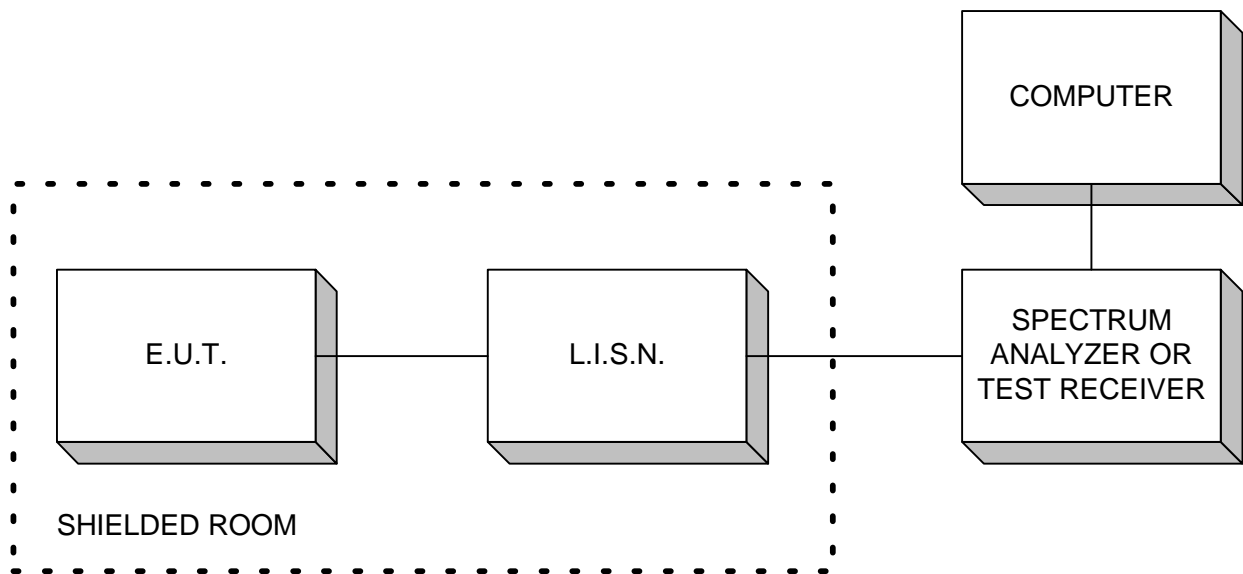


EQUIPMENT: Patient "TAG"

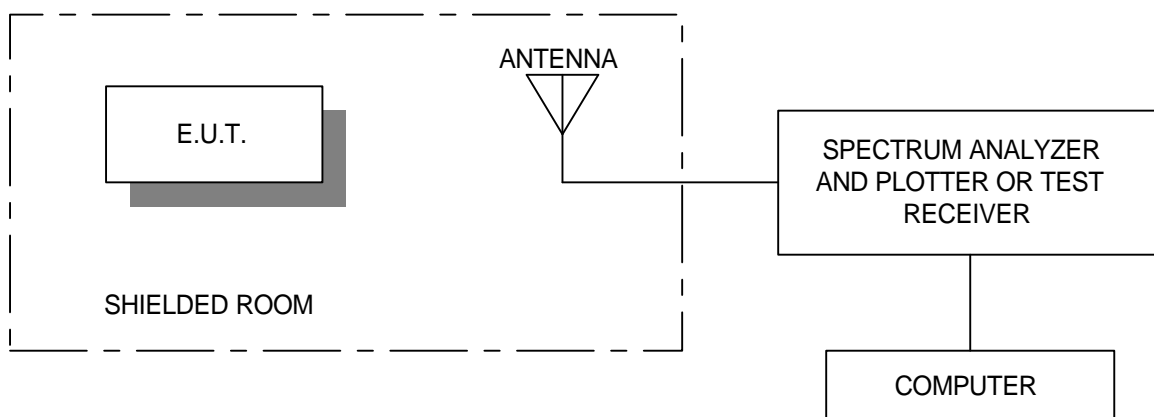
FCC ID: HE7PTG

Section 6. Block Diagrams

Conducted Emissions



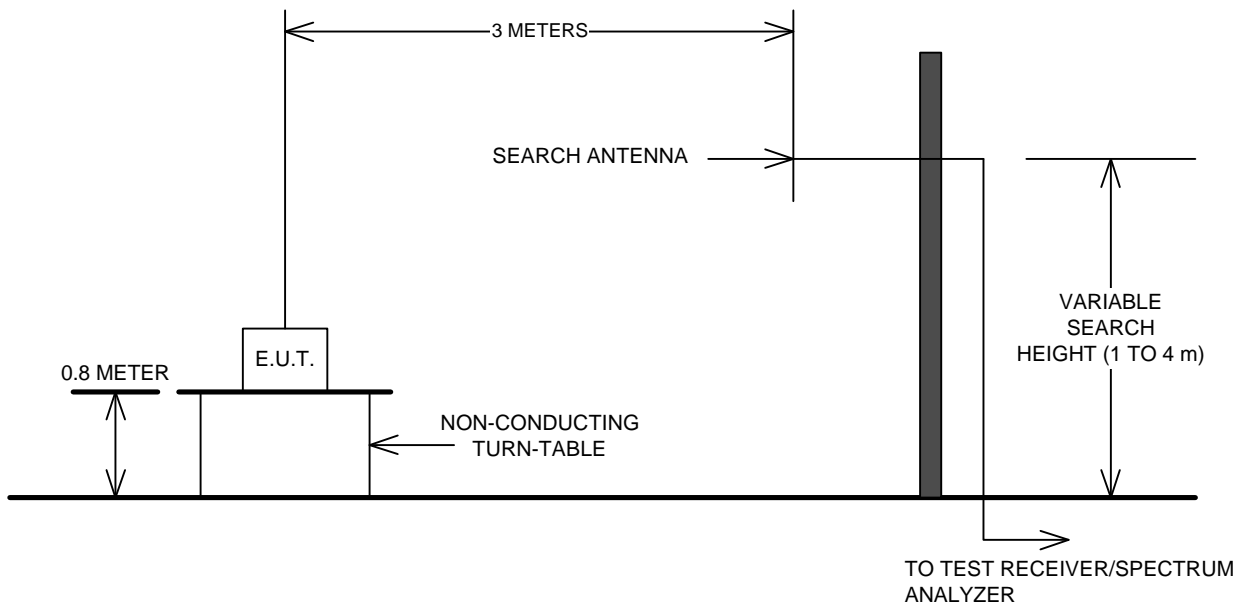
Radiated Prescan



EQUIPMENT: Patient "TAG"

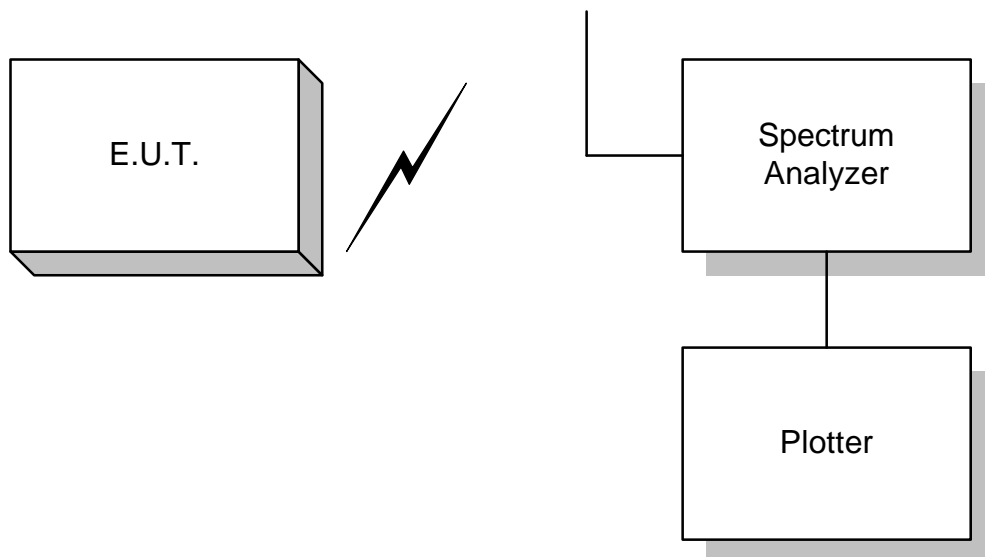
FCC ID: HE7PTG

Outdoor Test Site For Radiated Emissions



The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.

Occupied Bandwidth



*EQUIPMENT: Patient "TAG"**FCC ID: HE7PTG*

Section 7. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	3846A01407	May 31/99	May 31/00
1 Year	LISN	Rohde & Schwarz	ESH2-Z5	890485/017	Aug. 24/99	Aug. 24/00
1 Year	Receiver	Rohde & Schwarz	ESH3	872079/053	Oct. 5/99	Oct. 5/00
1 Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 29/99	Mar. 29/00
1 Year	Plotter	Hewlett Packard	7550A	FA001129	NCR	NCR

NA: Not Applicable
NCR: No Cal Required
COU: CAL On Use

KTL Ottawa

FCC PART 15, SUBPART C
FOR LOW POWER TRANSMITTERS
PROJECT NO.: 9R05236
ANNEX A

EQUIPMENT: Patient "TAG"
FCC ID: HE7PTG

ANNEX A
RESTRICTED BANDS

EQUIPMENT: Patient “TAG”
FCC ID: HE7PTG

Section A Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section , only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	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	2655-2900	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			