TEST REPORT

According to CFR 47 Part 15

Repeater/Supervisor GPS com 915 MHz

N°027124-CC-1-B

GYL technologies
Parc d'activités de Lanserre
21 rue de la Fuye
49610 JUIGNE SUR LOIRE
FRANCE
Tel. : +33 (0) 2.41.57.57.40
Fax : +33 (0) 2.41.45.25.77

This report concerns :	**Original grant** ✓ **Class II change** ☐
Equipment tested :	**Repeater/Supervisor GPS com 915 MHz**
Equipment FCC ID :	**VPM-RS-915**
Designed by :	CANBERRA ZI de Vauzelle 37600 LOCHES
Manufactured by :	CANBERRA ZI de Vauzelle 37600 LOCHES

Deferred grant requested per 47 CFR 0.457 (d)(1)(ii) **YES** ☐ **NO** ✓

if yes, defer until :

Company Named agrees to notify the Commission by :

of the intended date of announcement of the product so that the grant can be issued on the date

Transition rules requested per 15.37? **YES** ☐ **NO** ✓

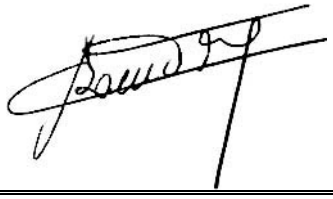
If no, assumed Part 15, Subpart B for intentional or unintentional radiator

The new 47 CFR [10-1-96 edition] provision

Summary

Other associated files :
027124 Exhibit 1 ID label VPM-RS-915
027124 Exhibit 2 External Photographs VPM-RS-915
027124 Exhibit 2b Internal Photographs VPM-RS-915
027124 Exhibit 4 user notice 86378_A VPM-RS-915
027124 Exhibit 4b user notice 86338_A VPM-RS-915
027124 Exhibit 5 Test set up photos VPM-RS-915
027124 Exhibit 6a Synoptic VPM-RS-915
027124 Exhibit 6b SCM 84231_A VPM-RS-915
027124 Exhibit 6c BOM E558020_A VPM-RS-915
027124 Exhibit 6d RF Synoptic&desciption VPM-RS-915
027124 Exhibit 6e RF BOM VPM-RS-915
027124 Exhibit 6f RF module datasheet VPM-RS-915
027124 Exhibit 6g RF schematic VPM-RS-915
027124 Exhibit 6h BOM E558010 VPM-RS-915
027124 Exhibit 7 CAN04_08301_A (System description) VPM-RS-915

1 Reference and record of revisions of the test report:

Test report number :	**Revision :**	**Number of pages**	**Modification reasons :**
027124–CC-1-a	a	20	Creation, April 2, 2008
027124–CC-1-b	b	20	Addition of measurements with CSP-Com application
Redactor : JL JAMET & O.ROY			**Date of writing** : July 25, 2008
Technical control: O. ROY 			**Quality Control: P. BOURVON** 

2 Interpretation and remarks:

2.1 RESULTS:

This equipment complies with the rules of the FCC section 15.247 and related sections concerning its radio functions.

3 GENERAL INFORMATION:

3.1 APPLICANT:

CANBERRA
ZI de Vauzelle
37600 LOCHES

3.2 MANUFACTURER:

CANBERRA
ZI de Vauzelle
37600 LOCHES

3.3 TEST DATE:

October 03, 2007 - October 25, 2007, July 2, 2008

3.4 TEST SITE:

GYL Technologies
Parc d'activités de Lanserre
49610 Juigné sur Loire – France
FCC registration Number: 90469

4 INTRODUCTION:

The following test report for a data transmission system with a radio part is written in accordance with Part 15 of the Federal Communications Commissions. The Equipment under Test (EUT) was a repeater/supervisor for GPS-Com 915MHz or CSP-Com 915MHz. The test results reported in this document relate only to the item that was tested.

The equipment can use two modes: repeater or supervisor. In supervisor mode, the equipment is connected to a computer and only one radio board and antenna is used. In repeater mode, the equipement uses both antennas and identical radio boards on different channels.

The difference between GPS-Com application and CSP-Com application concerns only the maximum duration of a transmission. Measurements are done with the worst case. It has been checked that the duration has no influence on peak values.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions of 2001. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurements were performed manually at GYL TECHNOLOGIES. The radiated emissions measurements required by the rules were performed on the three to ten meters, open field, test site maintained by GYL Technologies Parc d'activités de Lanserre, 49610 Juigné sur Loire , France. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission.

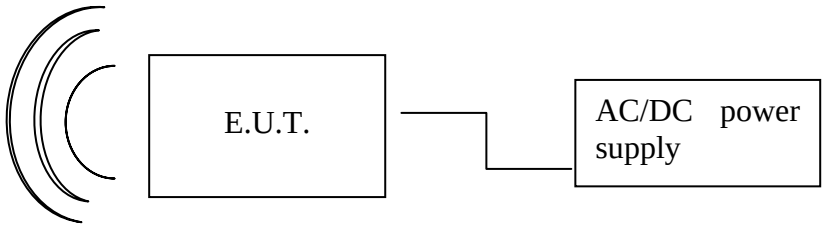
The power line conducted emission measurements were performed in a shielded enclosure also located at the Parc d'activités de Lanserre, 49610 Juigné sur Loire, France facility

5 MEASUREMENT EQUIPMENT LIST:

PART TYPE	MANUFACTURER	MODEL	GYL TECHNOLOGIES NUMBER	CALIBRATION DATE
RECEIVERS				
Receiver	Rohde & Schwarz	ESI 7	M02020	May 07, May 08
Spectrum analyzer	Rohde & Schwarz	FSEM 30	M02021	May 07, May 08
Filter 150 kHz	Rohde & Schwarz	EZ25	M02040	July-07
ARTIFICIAL MAINS NETWORKS				
LISN (50µH / 5/50Ω)	Rohde & Schwarz	ESH3-Z5	M02027	Jan 07, Jan-08
ANTENNAS				
Bilog (30-2000MHz)	CHASE	CBL-6112	M02031	June 07, June 08
Bilog (30-2000MHz)	CHASE	CBL-6112	M02032	June 07, June 08
Horn antenna	EMCO	3115	M02045	Jan-07, Jan 08

6 CONFIGURATION OF TESTED SYSTEM:

For all tests, the device under test was tested alone. It doesn't need any other equipment.



7 EXERCISING TEST CONDITIONS:

On the Repeater/Supervisor GPS com 915 MHz, we press on/off key, when the blue LED blinks the product is ready.
Measurements are done in hopping mode in all channels with modulation
For measurements that need to be done in one channel, the channel used was activated with a normal modulation transmission.

8 CONFORMANCE STATEMENT:

8.1 STANDARDS REFERENCED FOR THIS REPORT:

PART 2: 2004	Frequency allocations and Radio Treaty Matters General Rules and Regulations
PART 15: 2006	Radio frequency devices
ANSI C63.4-2003	Standard format measurements/technical report personal computer and peripherals

8.2 JUSTIFICATION:

As mentioned in paragraph 5 of this report, the equipment is a part of an alarm system. It can be installed in residential commercial or light industry areas the following sub clause of the standard mentioned above are

- Part 15.207 and 15.209 (subpart C) for respectively conducted and radiated emission for intentional radiator.
- Part 15.247 for intentional radiator in band 902-928 MHz

9 TEST ACCORDING TO CFR 47 Part 15

Tests performed by Olivier Maret, Olivier ROY & Jean-Luc JAMET at GYL Technologies laboratories from October 03, 2007 to October 25, 2007.

.

9.1 REFERENCE DOCUMENTATION:

FCC part 15 (Sub part B) §15.207, 15.209 and 15.247

9.2 POWER LINE CONDUCTED EMISSIONS MEASUREMENTS (15.207):

The power line conducted emission measurements were performed in a semi anechoic chamber. The EUT was assembled on a non conductive 80 centimeters high wooden table. Power was fed to the EUT through a 50 ohm / 50 micro-Henry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Rohde and Schwartz 150 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 150 kHz. Conducted emission levels were measured on each current-carrying line with the receiver operating in the CISPR quasi-peak mode (or average mode if applicable

9.3 RESULTS:

The conducted emissions initial measurement consists of a prescan (tester in receiver mode), in order to determine the maximum quasi peak and average values.

- If the conducted emissions have limits showing a margin lower than 5dB, data collection measurement is performed on the six (6) highest frequencies to determine the compliance of the EUT.
- If the conducted emissions have limits showing a margin greater than 5dB, data collection measurement is not performed and the curves are given as evidence of compliance.

The following table lists worst-case conducted emission data. Specifically: emission frequency, measurement level (including cable loss and transducer factors) in quasi-peak and average mode and margin.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and LIVE SIDE, herein referred to as Neutral, and Live respectively.

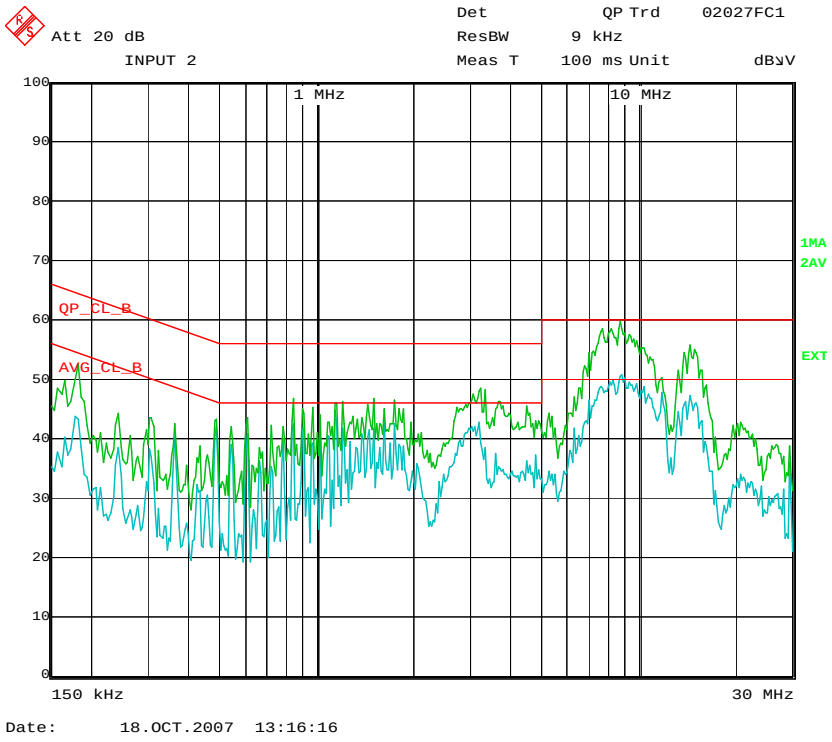
ESI 7 EMI TEST RECEIVER IN RECEIVER MODE	
Peak measurement time	5 ms
step size	4KHz
Preamplifier	OFF
Preselector	ON
Resolution, Band With	9 kHz
Final Quasi Peak measurement time	1 s minimum
Final average measurement time	1 sec minimum

All readings are quasi-peak unless stated otherwise.

9.3.1 Power supply

9.3.1.1 Neutral:

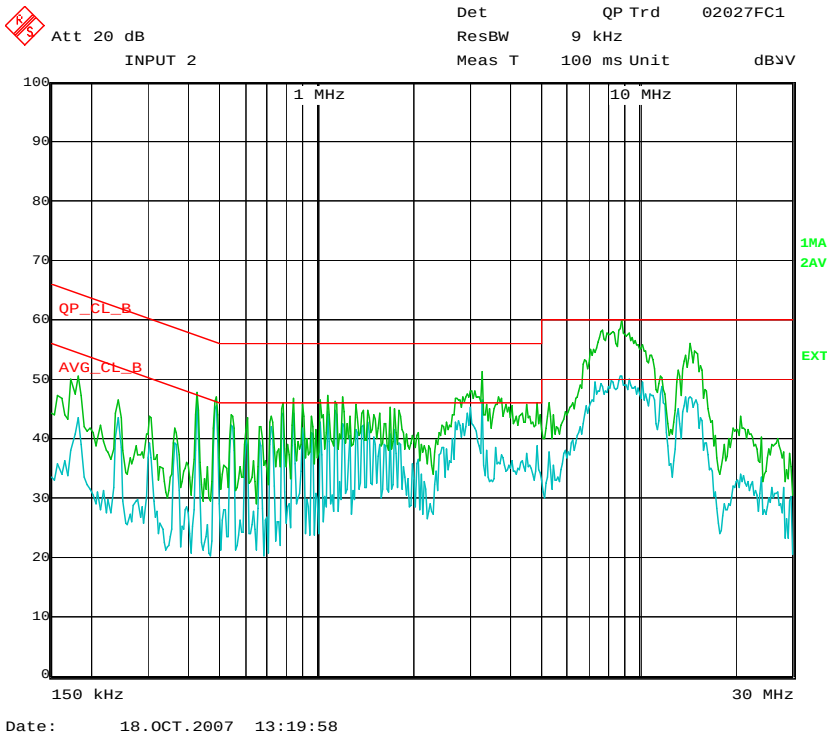
Legend: Blue curve represents quick average values
Green curve represents the peak values



Frequency (MHz)	Quasi-peak (dBµV)	QP margin (dB)
8,758	55,6	4,4
9,938	53,2	6,8
10,622	51,4	8,6
10,822	51,2	8,8
10,918	52	8
11,114	51,8	8,2
11,706	49,3	10,7

Frequency (MHz)	Average (dBµV)	Average margin (dB)
8,854	49,6	0,4
9,542	47,7	2,3
9,934	47,4	2,6
10,030	46,5	3,5
10,234	46,3	3,7
10,426	46,9	3,1
10,622	45,3	4,7

9.3.1.2 LIVE:



Frequency (MHz)	Quasi-peak (dBµV)	QP margin (dB)
8,854	55,7	4,3
10,326	53,1	6,9
10,922	50,8	9,2
11,018	51,9	8,1
11,114	51,9	8,1
11,218	48,7	11,3
13,374	49,0	11,0

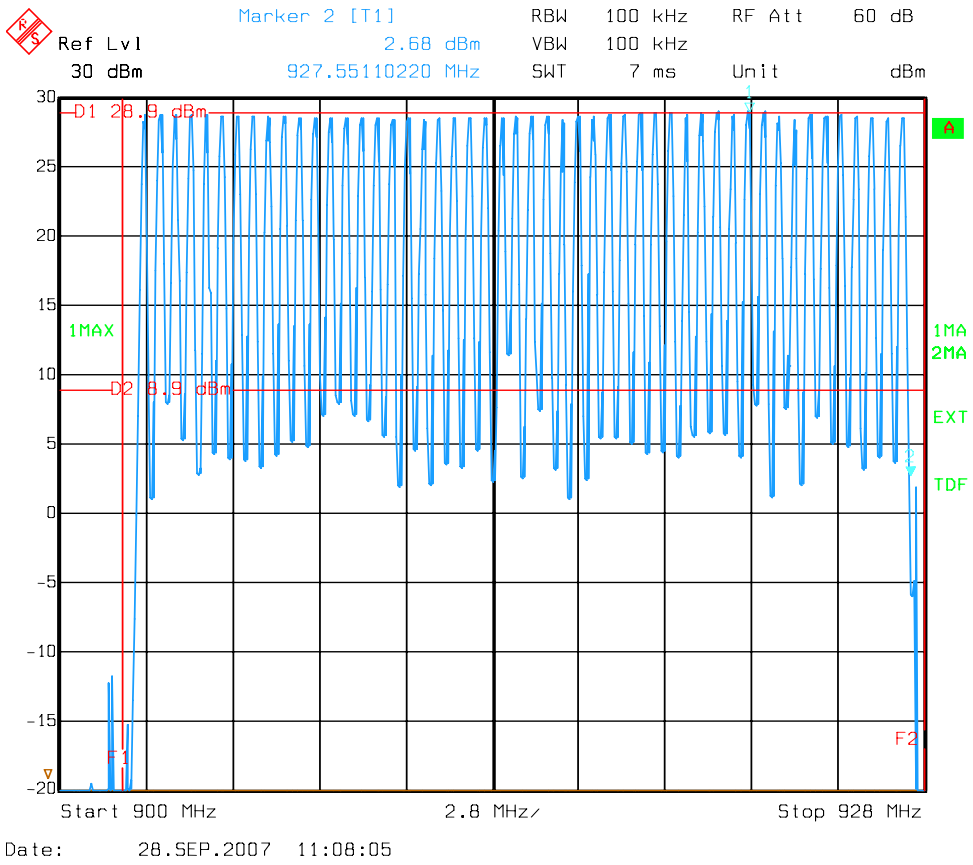
Frequency (MHz)	Average (dBµV)	Average margin (dB)
8,858	49,7	0,3
9,346	48,6	1,4
9,834	47,0	3,0
10,034	46,6	3,4
10,326	47,4	2,6
10,526	46,2	3,8
10,918	46,4	3,6

9.4 INTERPRETATION AND REMARKS:

The equipment complies with the §15.207 requirements.

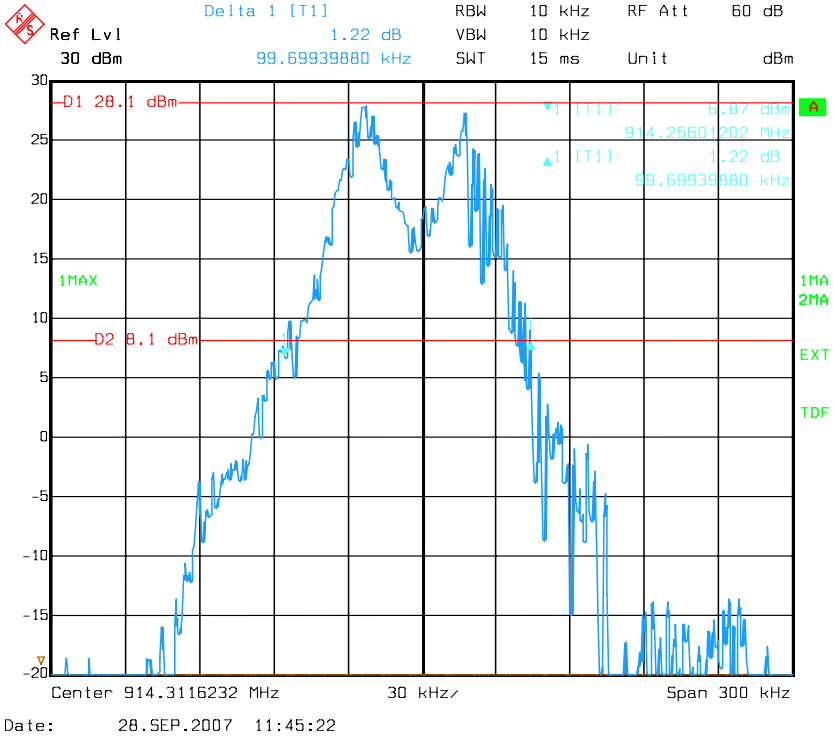
9.4.1 Intentional radiator operation within the band 902 – 928 MHz §15.247.

The system uses **50 channels** numbered from 1 to 50
At band edge F1(902 MHz), F2(928MHz), the level is far below this limit:
For details of frequency hopping technology used see Exhibit 7 (System description).

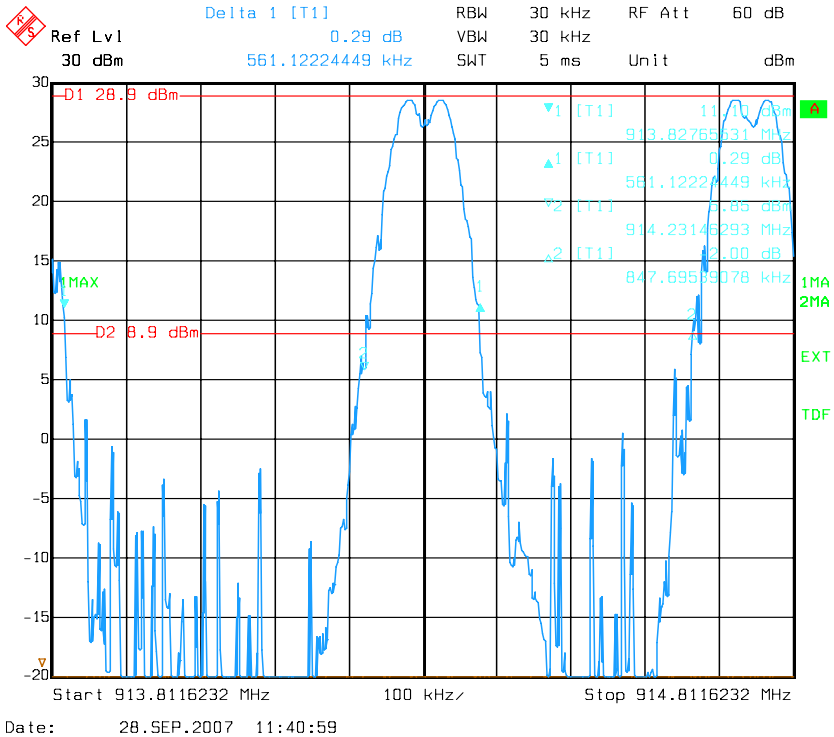


9.4.2 Frequency hopping channel separation (15.247 (a) (1))

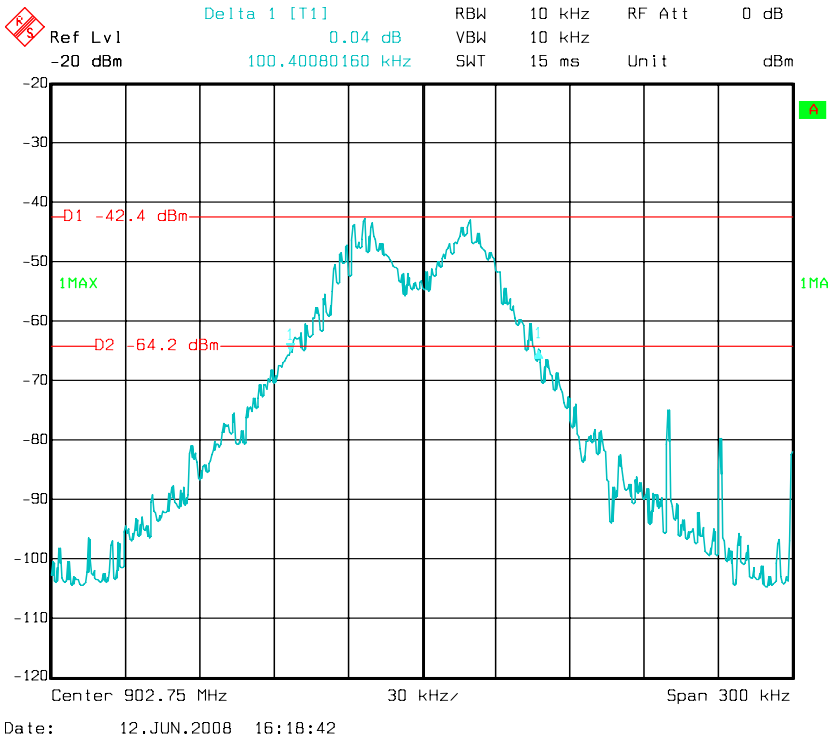
For a central channel

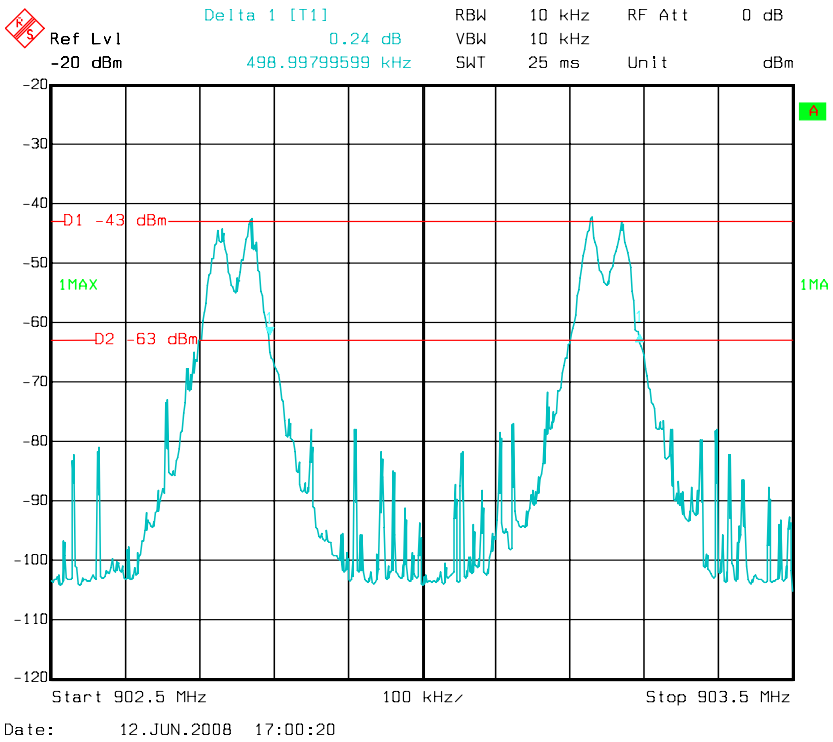


The 20dB bandwidth of each hopping channel is 100 kHz (less than 250 kHz)

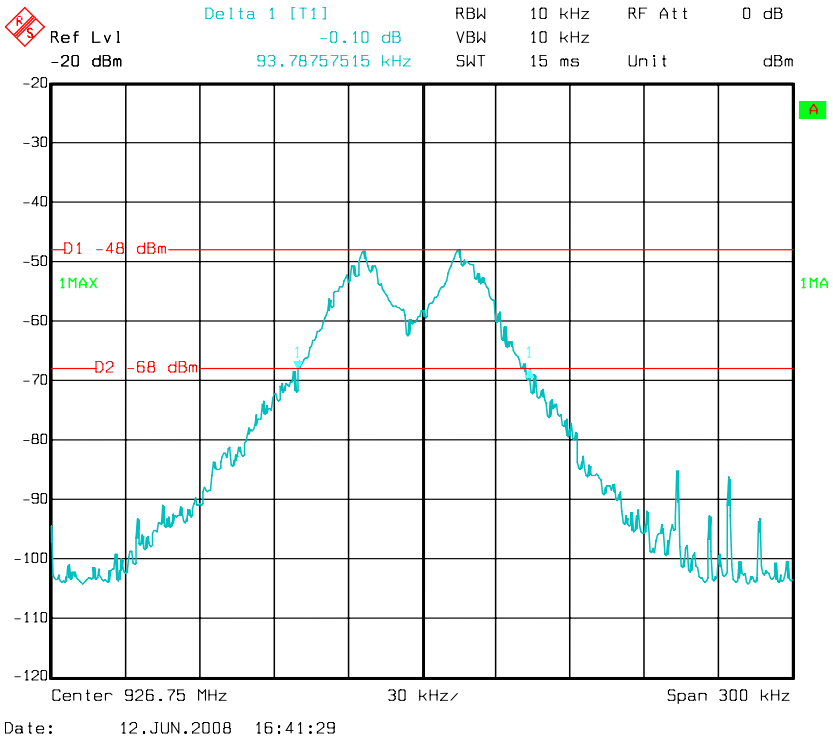


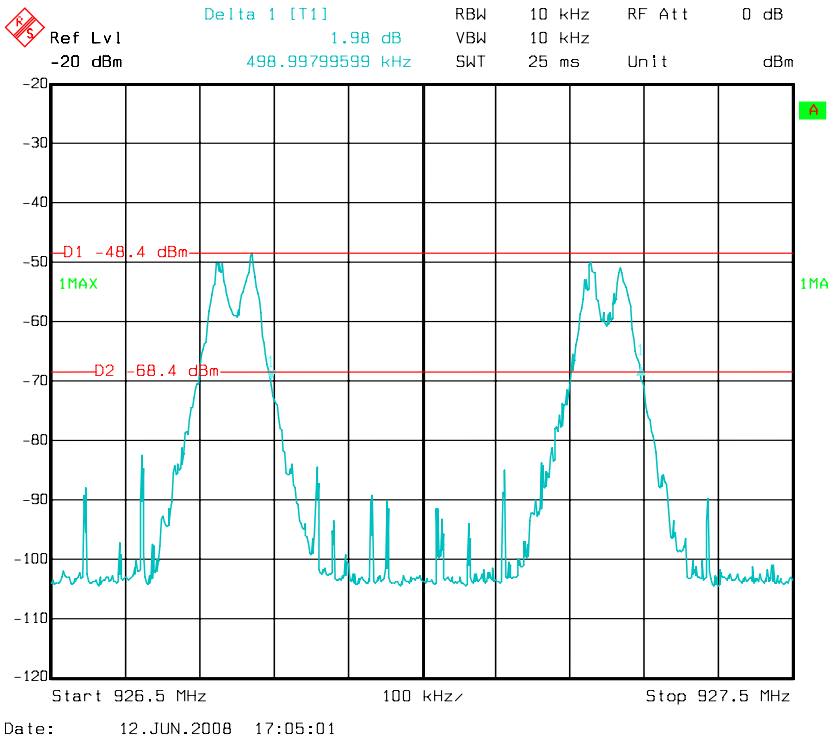
For a channel near bottom frequency





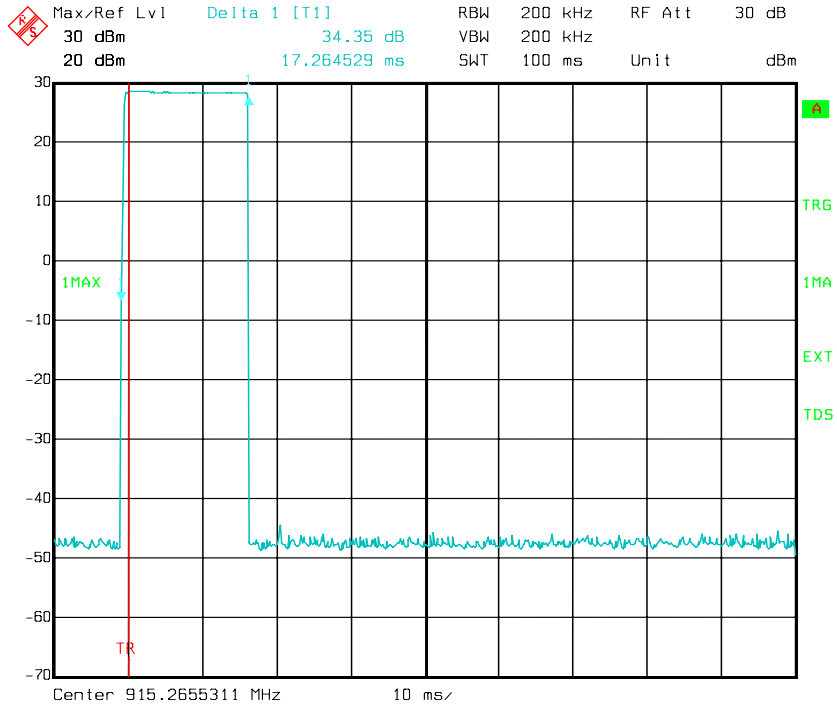
For a channel near top frequency

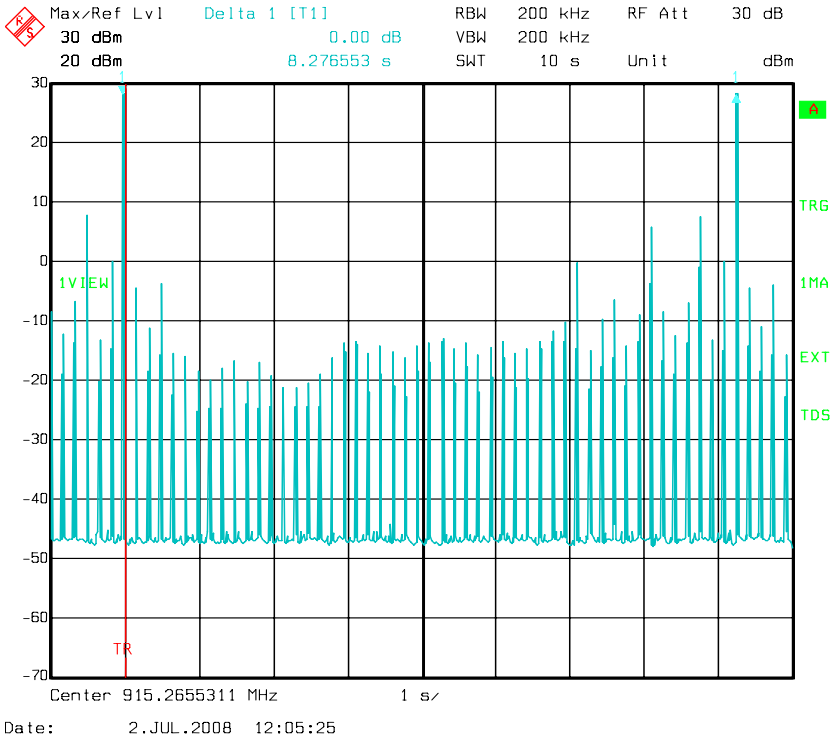




The channel separation is between 440kHz and 560 kHz (with an average at 500kHz) which is greater than the 20dB bandwidth.

The measurement during a long transmission in worst case gives **17.26 ms every 8.276 s** on each channel so the average time within a period of 20 seconds is **41.72 ms** which is less than the 400 ms limit.





That gives a maximum of 1 transmissions in a period of 100 ms so the duel time correction factor for spurious measurement is 20Log(17.3/100) = -15.24 dB.
If we consider that both emitter are working simultaneously, the correction factor reduces to **-9.24dB**.

9.4.3 Maximum peak output power

The maximum peak conducted power limit is 1W.
Measurement are done with RBW greater than the 20dB bandwidth.
A specific antenna connector is provided; measurement is done at antenna connector.
With additional Measurement at 3 m in OATS

Results	Peak Power (mW)	Peak At 3m (dBµV/m
Channel 1 902.75MHz	632	126.0
Channel 25 914.75MHz	562	126.6
Channel 50 927.25MHz	571	123.5

9.4.4 Antenna gain (15.247 § (b)(4)

The antenna is a rod antenna. Thus the antenna gain is less than 6dBi. Moreover, measurement of radiated emission reported at previous § shows a maximum gain of 5.9dBi for channel 25.

9.4.5 Spurious emissions (15.247 § (d))

In any 100 kHz bandwidth outside the frequency band, the level is at least 20 dB below that in the 100 kHz bandwidth within the band contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

9.4.5.1 RADIATED EMISSIONS MEASUREMENTS (15.209 in restricted bands):

Measurements below 1GHz

Before final measurements of radiated emissions were made on the open-field three/ten meter range; the EUT was pre-scanned in the semi anechoic at one meter distance. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a conductive turntable on isolated support, table, 0.8 meter above the ground plane. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. No video filter less than 10 times the resolution bandwidth was used. The range of the frequency spectrum to be investigated is specified in FCC Part 15. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Summary of settings

ESI 7 EMI TEST RECEIVER IN RECEIVER MODE	
Peak measurement time	5 ms
step size	40 kHz
Preamplifier	ON
Preselector	ON
Resolution, Band With	120 kHz
Final Quasi Peak measurement time	1 s minimum
Final average measurement time	1 s minimum

All readings are quasi-peak unless stated otherwise.

Spurious emissions measurement from 1GHz to 10GHz:

A pre-scan measurement is done very close to the product (less than 10cm) with 100kHz RBW and a max peak detector. Then measurements are performed at 1 m with 1MHz RBW and a video averaging (10Hz) for spurious measurement with normal hopping emission and reception.
Harmonics are peak measured with 1MHz RBW and an averaging due to the duty cycle correction factor if needed.
Spurious emissions are also made with a permanent emission on channel 1, channel 25 and channel 50.
Average limit in restricted bands §15.205 at 3 m is 54 dBµV/m (with a peak limit at 74 dBµV/m). Otherwise, the limit is only 20 dB under the emission level without averaging with duty cycle factor (conducted measurement).
The averaging correction factor is used only when necessary (margin lower than 10dB) and when the spurious radiation is pulsed in the same manner as the normal emission.

9.5 RESULTS:

The following data table lists the most significant emission frequencies, measured level, correction factor (includes cable and antenna corrections), corrected reading and the limit. The highest peaks are measured in quasi-peak detection mode at 3 meters distance.

Radiated emissions

Frequency (MHz)	Peak (dBµV/m)	Quasi peak (dBµV/m)	Limits Pk or QP	Margin (dB)	Polar.	Height (cm)	Angle (°)	Factor Corr. (dB)
65,289	47,17	27,05	106.6	59.4	V	120	348	7,92
81,317	41,90	28,68	106.6	64.7	V	159	245	9,76
398,132	43,76	38,78	106.6	62.8	V	145	345	21,67
405,509	50,36	43,25	46.0	2.8	V	148	345	21,53
412,900	47,88	44,92	106.6	58.7	V	148	345	21,80
427,620	39,34	37,30	106.6	67.3	V	148	345	22,05
451,078	50,74	43,81	106.6	55.9	V	101	345	22,12
471,864	43,83	40,20	106.6	62.8	V	129	345	22,30
774,358	53,41	46,57	106.6	53.2	V	153	345	26,08
804,138	60,71	57,27	106.6	45.9	V	153	345	26,24

Results over 1 GHz

Conducted emissions or radiated emissions (in restricted bands) over 1GHz
No spurious founded outside harmonics.

Max spurious for channels 01

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m Or Conducted (dBm)	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m) Or Conducted (dBm)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -9.24) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
1 806	2	-34.8		8.0					42.8
2 708	3	68.0	58.0	74.0			48.8	54.0	5.2
3 611	4	NF		74.0				54.0	
4 514	5	64.6	54.6	74.0			45.4	54.0	8.6
5 417	6	NF		74.0				54.0	
6 319	7	-21.1		8.0					29.1
7 222	8	NF		8.0					
8 125	9	NF		74.0				54.0	
9 028	10	NF		74.0				54.0	

Max spurious for channel 25

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m Or Conducted (dBm)	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m) Or Conducted (dBm)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -9.24) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
1 830	2	-34.6		8.0					42.6
2 744	3	67.6	57.6	74.0			48.4	54.0	5.6
3 659	4	NF		74.0				54.0	
4 574	5	64.6	54.6	74.0			45.4	54.0	8.6
5 489	6	NF		8.0					
6 403	7	-24.7		8.0					32.7
7 318	8	NF		74.0				54.0	
8 233	9	NF		74.0				54.0	
9 148	10	NF		74.0				54.0	

Max spurious for channels 50

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m Or Conducted (dBm)	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m) Or Conducted (dBm)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -9.24) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
1 855	2	-33.5		8.0					41.5
2 782	3	62.0	52.0	74.0			42.8	54.0	11.2
3 709	4	NF		74.0				54.0	
4 636	5	NF		74.0				54.0	
5 564	6	NF		8.0					
6 491	7	-20.3		8.0					28.3
7 418	8	NF		74.0				54.0	
8 345	9	NF		74.0				54.0	
9 273	10	NF		8.0					

(1) Peak measurement with 100 kHz RBW and VBW when frequency outside restricted bands.
Peak measurement with 1MHz RBW and VBW when frequency in restricted bands.
(2) Peak measurement with 1MHz RBW and 10HzVBW when frequency in restricted bands.

* NF means Noise Floor

9.5.1 Exposition of public to radio frequency energy.

In the frequency range of this product, the limit of S is 0.61mW/cm^2.
With the formula given in OET 65 and the measurement done for the power and antenna gain, we can compute that the minimum distance between a body and the antenna is:

According to manufacturer system description, the emission time is 17.3ms in a time slot of 165 ms for one transmitter thus the averaging is calculated for 2 transmitters as following:

R = square root [(562*3.9* (17.3/ 165) * 2)/ (4*Pi*0.61)]
R = 7.74 cm

The normal use of this product is with the antenna at a distance greater than 20cm.
In accordance with bulletin OET 65 C, there is no need to make SAR evaluation for such device.

9.6 Antenna requirements (§15.203)

Not applicable because the antenna has a special connector is not replaceable as stated in the user manual.

9.7 Measurement of frequency stability §15.215 (c)

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 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.

Measurements were conducted according to the operating temperature range given in the installation guide.

Frequencies (MHz)

Resultats						
Temperature	**-20°C**		**+20°C**		**+60°C**	
Power Supply	**3.3**	**4.2**	**3.3**	**4.2**	**3.3**	**4.2**
Channel 1	902,732364	902,732465	902,729158	902,728657	902,727655	902,727655
Channel 25	914,731463	914,731964	914,728256	914,729158	914,727154	914,726954
Channel 50	927,231964	927,232364	927,228056	927,228857	927,227154	927,227254

Neither voltage nor temperature variations affect the frequency stability that is better than ±10 ppm.