



ARF 53 WIRELESS MODEM

TEST REPORT

**FCC CFR 47 part 15
Industry Canada RSS210
And ICES-003**

**Radio Part 15.247
and RSS 210 Issue 5 Section 6.2.2(o)**

N°084102-CC-1-a

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FCC and IC CERTIFICATION TEST REPORT
EQUIPMENT FCC ID : U3Z-ARF7474
CANADA IC : 7016A-ARF7474
The 19 pages of this report are not sharable

Identification : 084102-CC-1-a
FCC registration # 90469
IC registration IC 4452

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This report concerns : Original grant Class II change

Equipment tested : ARF53 Wireless modem

Equipment FCC ID : U3Z-ARF7474

Designed by : ADEUNIS RF
283 RUE Louis Néel
38920 CROLLES FRANCE

Manufactured by : ADEUNIS RF
283 RUE Louis Néel
38920 CROLLES FRANCE

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



Company number: 7016A
Product name: ARF53 wireless modem
Model number: ARF7474A and ARF7474C
Manufacturer: ADEUNIS RF
283 rue Louis Néel
38920 CROLLES France

Tested to radio standards specification (RSS) No: RSS210 Issue 6

Open Area test site Industry Canada number: IC4452

Frequency range: 902.671.– 927.329 MHz

R.F. Power in Watts: P = 0.190 W

Antenna Gain: G = 1

Field strength: max level measured at 3 m is 118 dB μ V/m

Occupied bandwidth: 158 kHz for each channel.

Type of modulation: FSK

Emission designator: 158KF1D

Transmitter and Receiver spurious (worst case): 434.530 MHz, 2,31dB margin

ATTESTATION

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standards, and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:


Date: 30 May 2007

ROY Olivier, technical manager.




Summary

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	<p align="center"> FCC and IC CERTIFICATION TEST REPORT EQUIPMENT FCC ID : U3Z-ARF7474 CANADA IC : 7016A-ARF7474 The 19 pages of this report are not sharable </p>	<p align="right"> Identification : 084102-CC-1-a FCC registration # 90469 IC registration IC 4452 </p>
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1 Reference and record of revisions of the test report :

Test report number :	Revision :	Number of pages	Modification reasons :
084102-CC-1-a	a	19	Creation
Redactor : O.ROY		Date of writing : May 30, 2007	
Technical control: O. ROY 		Quality Control: F. NOURRY	

2 Interpretation and remarks :


2.1 RESULTS :

This equipment complies with the rules of the FCC section 15.247 and related sections.

This equipment complies with the rules of the IC RSS-210 section 6.2.2(o) and related sections

This equipment complies with the rules of the ICES-03 class B and related sections concerning its ITE

This equipment complies with the rules of the FCC section 15.107, 15.109 and related sections concerning its ITE (Information Technology Equipment) functions (PC communications...).

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3 GENERAL INFORMATION :

3.1 APPLICANT :

ADEUNIS RF
283 rue Louis Néel
38920 CROLLES France

3.2 MANUFACTURER :

ADEUNIS RF
283 rue Louis Néel
38920 CROLLES France

3.3 TEST DATE :

22 to 25 May 2007

3.4 TEST SITE :

GYL Technologies
Parc d'activités de Lanserre
49610 Juigné sur Loire – France
FCC registration Number : 90469
IC registration IC 4452



4 INTRODUCTION :

The following test report for Wireless modem (915 MHz radio link) is written in accordance with Part 15 of the Federal Communications Commissions and RSS-210 Issue 6 (2005) and ICES-03 of the Industry Canada. The Equipment Under Test (EUT) was ARF53 Wireless modem. The test results reported in this document relate only to the item that was tested.

The equipment can bear two different trade marks: ADEUNIS RF or MAGELLAN.

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.

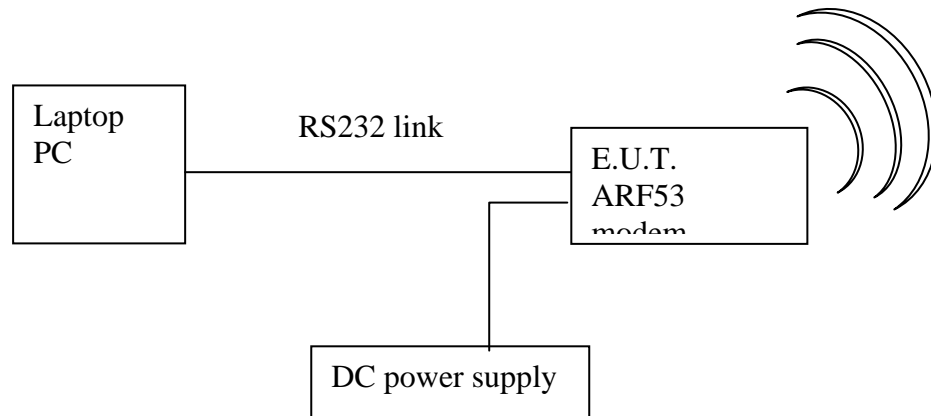
All radiated and conducted emissions measurements were performed manually at GYL TECHNOLOGIES. The radiated emissions measurements required by the rules were performed on the three to ten meters, open field, test site maintained by GYL Technologies Parc d'activités de Lanserre, 49610 Juigné sur Loire , 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
Spectrum analyzer	Rohde & Schwarz	FSEM 30	M02021	May-07
ANTENNAS				
Bilog (30-2000MHz)	CHASE	CBL-6112	M02031	Aug-06
Bilog (30-2000MHz)	CHASE	CBL-6112	M02032	Aug-06
Horn antenna	EMCO	3115	M02045	Aug-06

CONFIGURATION OF TESTED SYSTEM :



6 EXERCISING TEST CONDITIONS :

Measurements are done with quasi* continuous transmission of data through RS232. * the time slot without transmission is in receiver mode.

For radiated measurement above 1 GHz a complementary measurement is done with a continuous emission without hopping.



7 CONFORMANCE STATEMENT :

7.1 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 C63.4-2001	Standard format measurements/technical report personal computer and peripherals
ICES-003 Issue 4 : 2004	Digital apparatus
RSS210 Issue 6 : 2005	Low Power Licence-Exempt Radiocommunication Device

7.2 JUSTIFICATION :

The equipment is information technology equipment with a radio link. It can be installed in residential commercial or light industry areas the following sub clause of the standard mentioned above are

- Part 15.107 and 15.109 for respectively conducted and radiated emission for unintentional radiator (RS232 link).
- Part 15.207 and 15.209 for respectively conducted and radiated emission for intentional radiator.
- Part 15.247 for intentional radiator in band 902-928 MHz
- ICES-003 for conducted and radiated emission for unintentional radiator (RS232 link).
- RSS-210 section 6.2.2(o) for intentional radiator in band 902-928 MHz.



8 TEST ACCORDING TO CFR 47 Part 15, RSS210 and ICES-003

Tests performed by Olivier ROY at GYL Technologies laboratories from 22 to 25 May 2007.

8.1 REFERENCE DOCUMENTATION :

FCC part 15 §15.109, §15.209 and §15.247 of 2006.
ICES-003 ed4 class B and RSS-210 A8.

8.2 POWER LINE CONDUCTED EMISSIONS MEASUREMENTS:

Not applicable for this equipment (DC powered)

8.3 RADIATED EMISSIONS MEASUREMENTS:

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

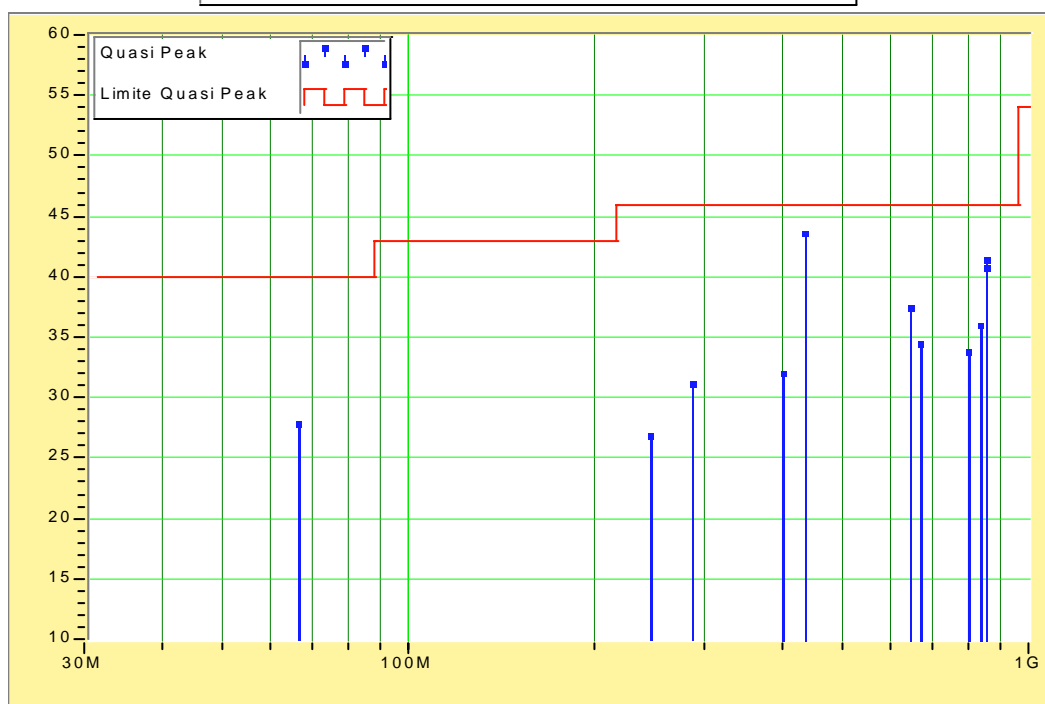
All readings are quasi-peak unless stated otherwise.

8.4 RESULTS (Class B):

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.

Frequency (MHz)	Peak (dB μ V/m)	Quasi peak (dB μ V/m)	Margin (dB)	Polar.	Height (cm)	Angle (°)	Factor Corr. (dB)	Comments
66,460	33,18	27,94	-12,06	V	105	130	7,81	
245,223	32,57	26,86	-19,14	V	187	308	16,44	
287,389	37,76	31,27	-14,73	V	206	310	17,46	
400,036	34,22	31,97	-14,03	H	143	148	22,03	
434,530	29,70	43,69	-2,31	H	143	148	22,17	
646,912	41,50	37,44	-8,56	H	103	149	24,14	
670,985	39,72	34,53	-11,47	H	104	353	24,41	
800,380	38,45	33,87	-12,13	H	107	220	25,52	
836,465	48,31	35,95	-10,05	V	107	12	26,00	
855,404	39,46	41,53	-4,47	H	107	12	25,62	
857,998	40,73	40,76	-5,24	H	129	12	26,28	
902.750	118.0		N.A.	V	126	10		Channel 0
914.750	117.0		N.A.	V	125	10		Channel 24
927.250	116.0		N.A.	V	125	10		Channel 49

Champ électrique (dB μ V/m) rayonné en fonction de la fréquence (Hz)





Spurious emissions measurement results 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 measured with 1MHz RBW and an averaging due to the duty cycle correction factor.

Spurious emissions are made with a permanent emission on channel 0, channel 24 and channel 49.

No further spurious emission detected with normal modulation with hopping and in receiving mode.

Average limit in restricted bands §15.205 and table 1 of RSS-210 at 3 m is 54 dBµV/m. Otherwise, the limit is only 20 dB under the emission level (98 dBµV/m at 3m) without averaging with duty cycle factor.

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.

Max spurious for channel 0.

Freq. (GHz)	Harm.	Peak (dBµV/m)	Peak corrected for 3 m distance (dBµV/m)	Limit (dBµV/m)	Averaging (duty cycle correction factor of -13.3) (dBµV/m)	Minimum Margin (dB)
1.00241		46.3	36.3	54	Not used	-17.3
1.01343		52.0	42.0	54	Not used	-12.0
1.02449		45.3	35.3	54	Not used	-18.7
1.80550	2	69.3	59.3	98		-52.0
2.70825	3	66.3	56.3	54	43.0	-11.0
3.60110	4	69.2	59.2	54	45.9	-8.1
4.51375	5	NF				
5.41650	6	NF				
6.13627		63.2	53.2	98		-44.8
6.31925	7	NF				
7.22200	8	NF				
8.12475	9	NF				
9.02750	10	NF				

* NF means Noise Floor at least 6 dB below the limit.



Max spurious for channel 24.

Freq. (GHz)	Harm.	Peak (dBμV/m)	Peak corrected for 3 m distance (dBμV/m)	Limit (dBμV/m)	Averaging (duty cycle correction factor of -13.3) (dBμV/m)	Minimum Margin (dB)
1.01419		60.4	50.4	54	37.1	-16.9
1.02538		64.4	54.4	54	41.1	-12.9
1.03640		58.7	48.7	54	35.4	-18.6
1.82950	2	68.1	58.1	98	44.8	-53.2
2.74425	3	64.2	54.2	54	40.9	-13.1
3.65900	4	65.8	55.8	54	42.5	-11.5
4.57375	5	NF				
5.48850	6	NF				
6.40325	7	NF				
7.31800	8	NF				
8.23275	9	NF				
9.14750	10	NF				

* NF means Noise Floor at least 6 dB below the limit.

Max spurious for channel 49.

Freq. (GHz)	Harm.	Peak (dBμV/m)	Peak corrected for 3 m distance (dBμV/m)	Limit (dBμV/m)	Averaging (duty cycle correction factor of -13.3) (dBμV/m)	Minimum Margin (dB)
1.85450	2	66	56	98	42.7	-55.3
2.78175	3	63.2	53.2	54	39.9	-14.1
3.70900	4	65.6	55.6	54	42.3	-11.7
4.63625	5	NF				
5.56350	6	NF				
6.49075	7	NF				
7.41800	8	NF				
8.34525	9	NF				
9.27250	10	NF				

* NF means Noise Floor at least 6 dB below the limit.

8.5 INTERPRETATION AND REMARKS :

The equipment complies with the §15.209 and ICES-003 requirements, class B for restricted bands and for receiver mode and 20 dB below max emission level elsewhere.



8.6 Intentional radiator operation within the band 902 – 928 MHz §15.247 :

The system uses **50 channels** numbered in hexadecimal from 0 to 49

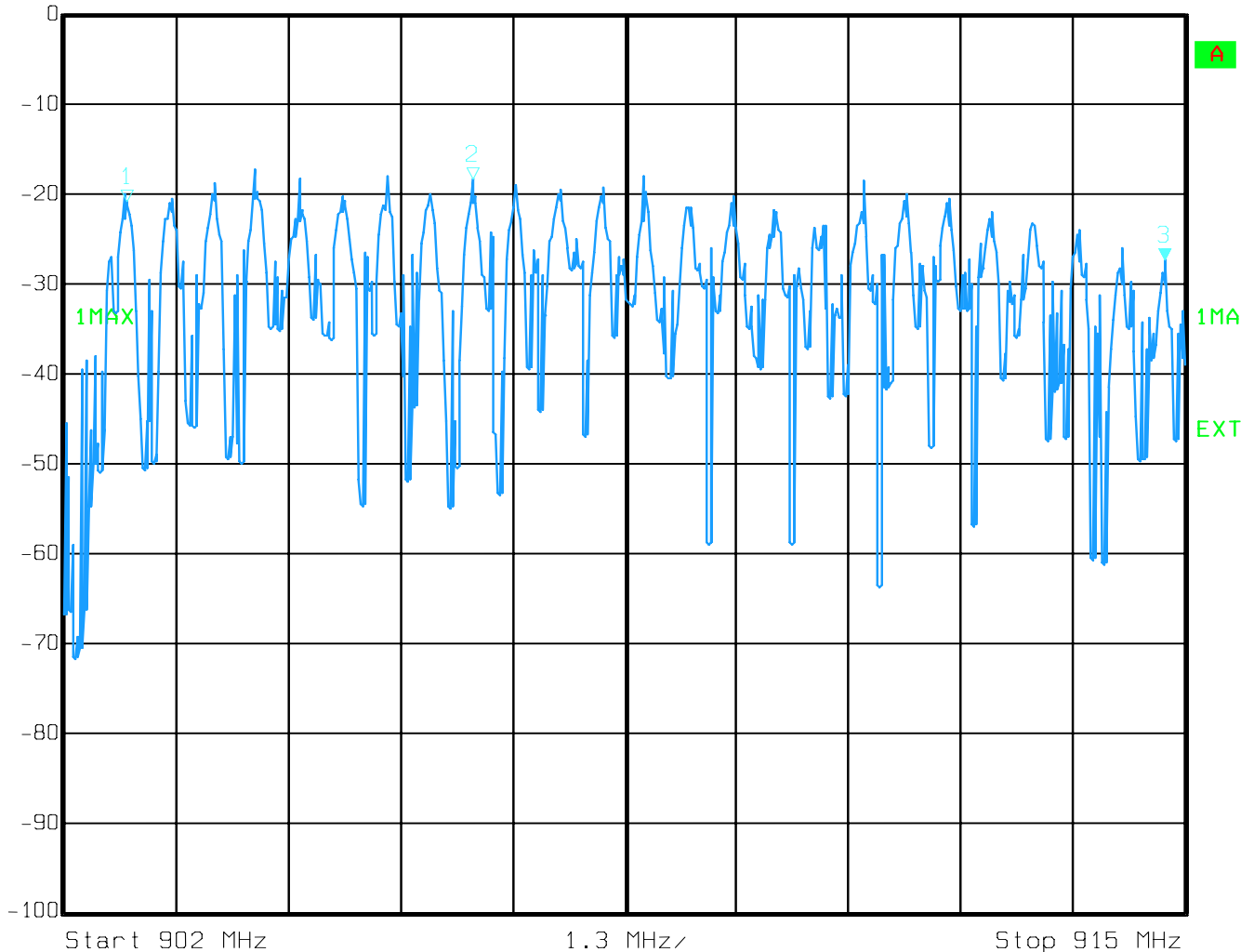
For details of frequency hopping technology used see Exhibit 7.

To make easier measurements a special test mode allow to select only one channel with its modulation.

8.6.1 Frequency hopping channel separation (15.247 (a) (1) RSS210 A8.1



Marker 3 [T1] RBW 10 kHz RF Att 20 dB
Ref Lvl -27.39 dBm VBW 10 kHz
0 dBm 914.76553106 MHz SWT 330 ms Unit dBm



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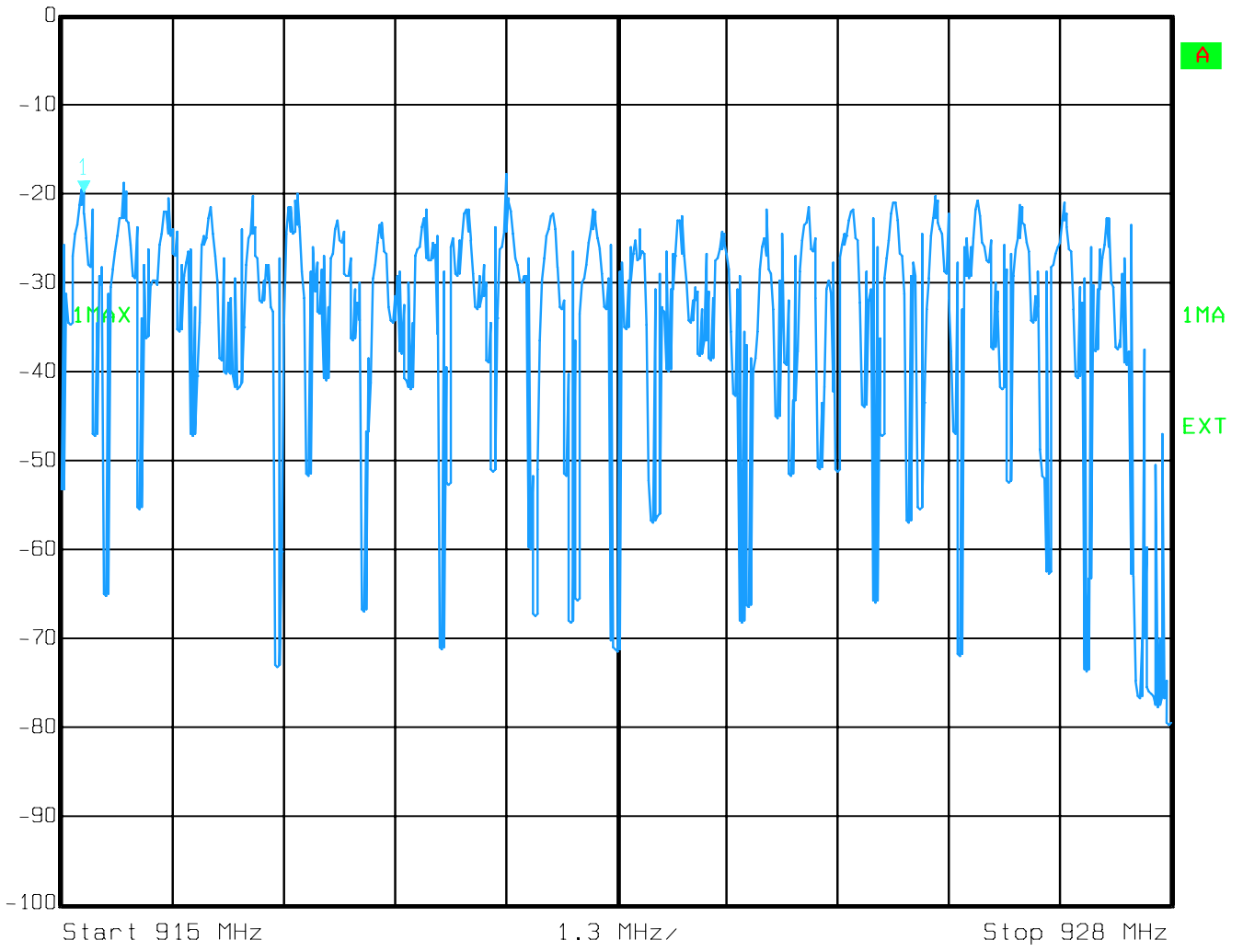


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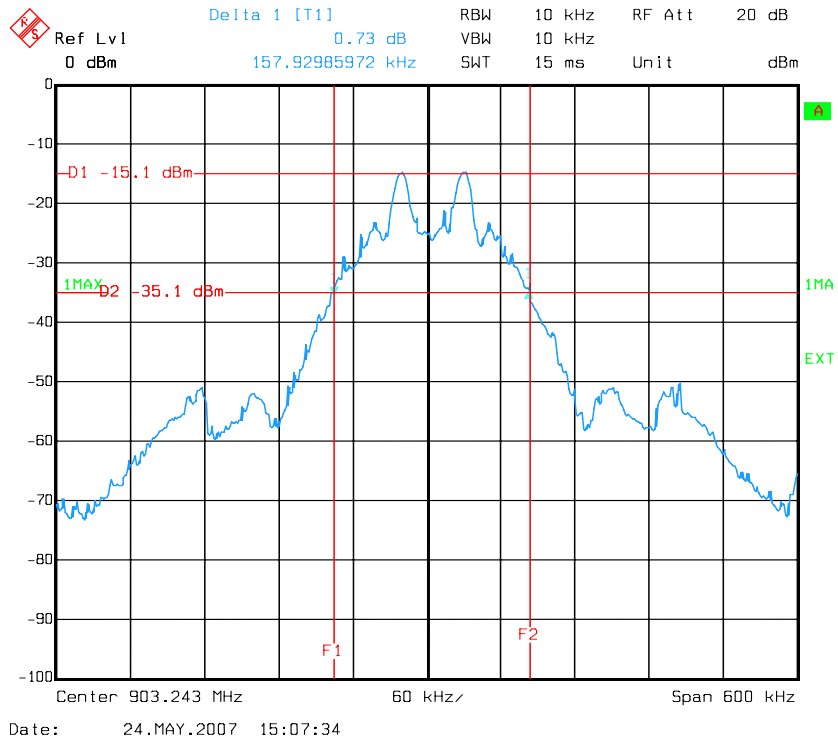
Marker 1 [T1] RBW 10 kHz RF Att 20 dB
Ref Lvl -19.94 dBm VBW 10 kHz
0 dBm 915.26052104 MHz SWT 330 ms Unit dBm



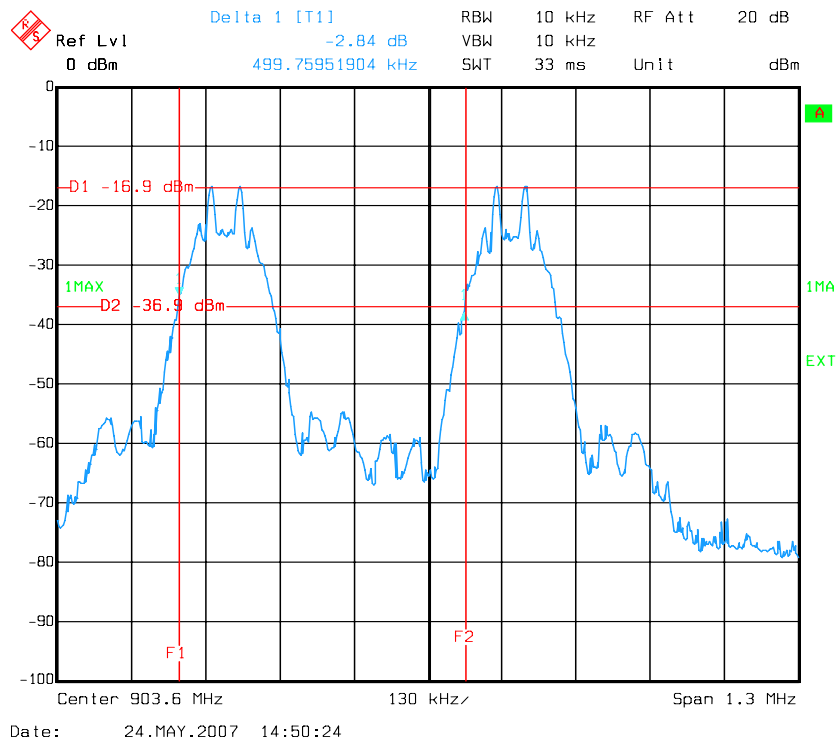
Date: 24.MAY.2007 16:06:05



The 20dB bandwidth of each hopping channel is 158 kHz. That is less than 500kHz



The channel separation is almost 500 kHz which is greater than the 20dB bandwidth.



The whole bandwidth is 25.158 MHz

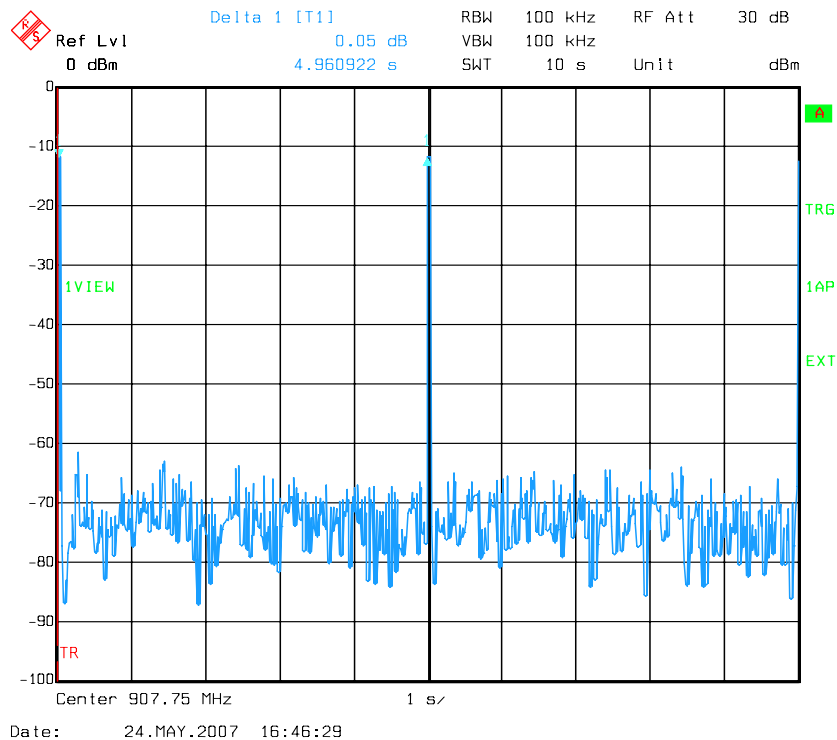
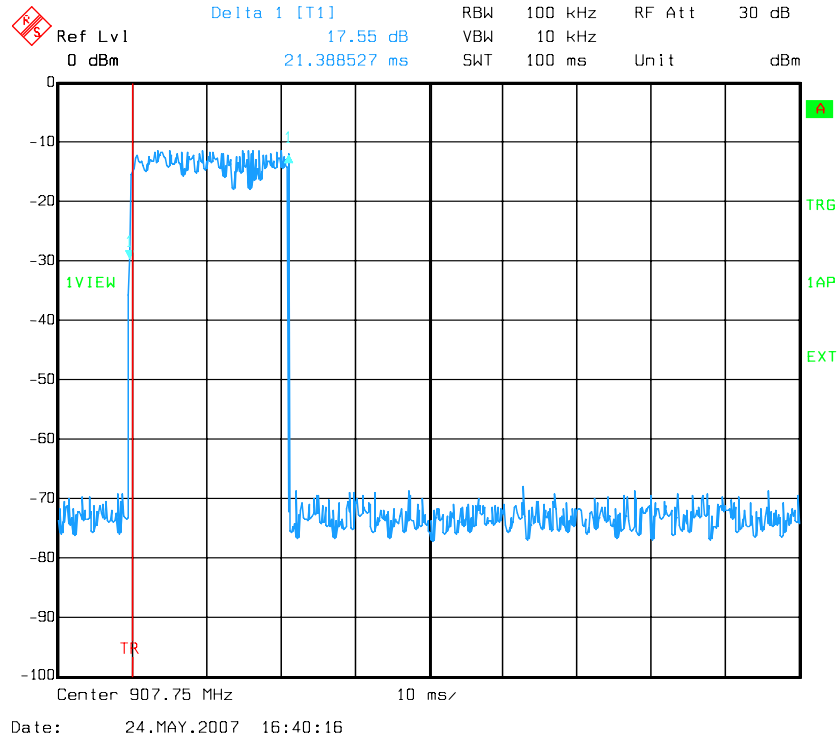


8.6.1.1 15.247 § (a)(1)(i) and RSS-210 A8.1 (3)

The system uses 50 channels in any conditions and the average time of occupancy on any channel is less than 0.4 seconds within a period of 20.0 seconds.

The measurement during a long transmission gives 21.4 ms every 4.96s on each channel so the average time within a period of 20.0 second is 86.3 ms which is less than the 400ms limit.

Thus the duty cycle correction factor is $20 \log (21.4/100) = -13.4 \text{ dB}$



8.6.2 Maximum peak conducted output power (15.247§ (b) (1)) RSS210 A8.4

The maximum peak conducted power limit is 1W.
 No antenna connector is provided, measurement is done at 3 m on an open area test site.
 Peak power is computed with

$$P(W) = (E(V/m) \times D (m))^2 / (30 \times G) \text{ with } G = 1 \text{ (isotropic antenna)}$$

Results	Peak dBµV/m At 3m	Peak Power (mW)
Channel 0	118	189
Channel 24	117	150
Channel 49	116	120

8.6.3 Antenna gain (15.247 § (b)(4))

The antenna is a rod antenna soldered on the PCB. Thus the antenna gain is less than 6dBi.

8.6.4 Spurious emission (15.247 § (d)) and RSS-210 A8.5

See §8.3

8.6.5 Exposition of public to radio frequency energy.

In the frequency range of this product, the limit of S is 0.61 mW/cm².

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:

$$R = \text{square root } (189 \times 0.61 / (4 \times \text{Pi} \times 1))$$

$$R = 3 \text{ cm}$$

The safe distance is far lower if we consider the averaging possibility.

The normal use of this product is with the antenna at a distance greater than 20cm as stated in user guide page 16.

In accordance with bulletin OET 65 C, there is no need to make SAR evaluation for such device.

In accordance with RSS-102 issue 2 section 2.5.2, there is no need to make SAR evaluation for such device.



8.7 Antenna requirements (§15.203)

Not applicable because the antenna is soldered in the equipment and not replaceable by user.

8.8 Measurement of frequency stability §15.215 (c) and RSS-GEN

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 and voltage range given in the user guide

Frequencies (MHz)

Results				
Temperature	-30°C		+85°C	
Power Supply	4.5 V	36 V	4.5 V	36 V
Channel 0 902,75MHz	902,74068	902,74969	902,74060	902,74010
Channel 25 915,25MHz	915,25300	915,25057	915,24068	915,24018
Channel 49 927.25MHz	927,25501	927,2508	927,24169	927,24118

Neither voltage nor temperature variations affect the frequency stability that is better than ± 15 ppm