TEST REPORT

According to FCC, CFR 47 Part 15

ARF62

N°084107-CC-1-b

GYL technologies
Parc d'activités de Lanserre
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This report concerns :	**Original grant** ✓ **Class II change** ☐
Equipment tested :	**ARF62**
Equipment FCC ID :	**U3Z-ARF750X**
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** ✓

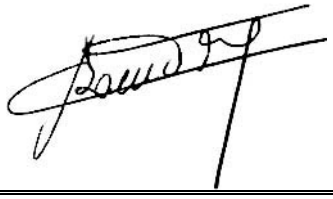
If no, assumed Part 15, Subpart B for intentional or unintentional radiator

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

Summary

Other associated files :
084107 Exhibit 1 ID label U3Z-ARF750X
084107 Exhibit 2 External Photographs U3Z-ARF750X
084107 Exhibit 2b Internal Photographs U3Z-ARF750X
084107 Exhibit 4 ARF62 User guide 08-01-V1-pcy U3Z-ARF750X
084107 Exhibit 5 Test set up photos U3Z-ARF750X
084107 Exhibit 6a ARF62_Synoptic
084107 Exhibit 6b RF Module - 7456-D_PCB_0801
084107 Exhibit 6c RF Module - 7456AD_BOM_05-12-07
084107 Exhibit 6d Motherboard - 7501-A_PCB_0702
084107 Exhibit 6e Motherboard - 7504CA_BOM_0702
084107 Exhibit 7 BlueCore4-External Databook
084107 Exhibit 7b technical description

1 Reference and record of revisions of the test report:

Test report number :	**Revision :**	**Number of pages**	**Modification reasons :**
084107-CC-1-a	a	21	Creation, April 28, 2008
084107-CC-1-b	b	28	Addition of middle channel measurements and AC adapter conducted measurement
Redactor : JL JAMET			**Date of writing** : 25 July 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, 15.207, 15.209 and related sections.

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:

March 17 to 26, 2008, June 13 and July 4 and 18,25, 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 wireless modem (2.4 GHz radio link) is written in accordance with Part 15 of the Federal Communications Commissions. The Equipment under Test (EUT) was ARF62 wireless modem. The test results reported in this document relate only to the item that was tested.

The modem is not a personal computer peripheral, but a RS232 device that is only used by professionals as an accessory for automatism. The distribution of the equipment is only through professionals networks.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions of 2003. 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 conducted and radiated 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.

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-08
ARTIFICIAL MAINS NETWORKS				
LISN (50µH / 5/50Ω)	THURLBY THANDAR	LISN 1600	M95010	June 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	3160-09	M04002	Jan-05
Horn antenna	EMCO	3115	M02045	Feb-07, Feb-08

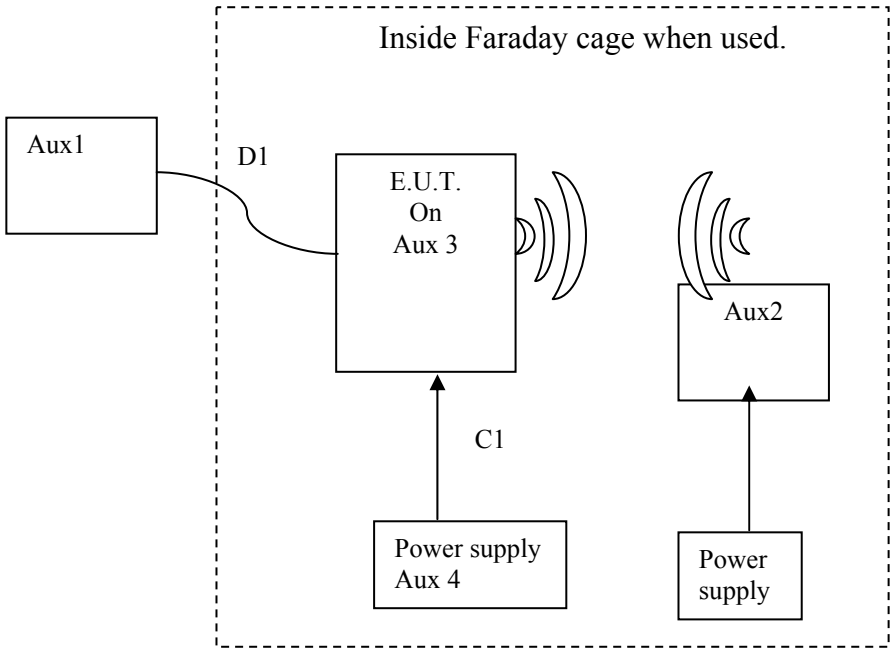
6 Auxiliary equipment:

Aux1: Laptop Model: Packed Bell NEC Serial number: H503300142.
Aux2: Dongle for send back the data to the EUT.
Aux3: mounting board
Aux4: AC/DC adapter for AC conducted emission.

7 List of cables:

	DC power input Name	Nbre fils	PE Y/N	outside Y/N	Imax	Pmax	test voltage1	test voltage2
C1	DC input	2	N	N			3,8	20
	Data I/O Name	**Schielded Y/N**	**Max length (m)**	**outside Y/N**	**local network Y/N**	**connected to AC power Y/N**	**Analog telecom line Y/N**	**Length for test**
D1	RS232	Y	2,99	N	N	N	N	4m

CONFIGURATION OF TESTED SYSTEM:



E.U.T: Equipment under test

8 EXERCISING TEST CONDITIONS:

The EUT converts data from a RS232 serial link into a radio frame, on a selected frequency (for the certification test only) or in hopping frequency mode, to be sent to similar equipment. Aux2 send back the data through a shunt on a DB9 connector to EUT. Then the data are displayed on the computer Aux1.

For fixed frequencies, these two channels are used:

- Lower frequency is named channel low at 2402MHz.
- Middle frequency is named channel low at 2446MHz.
- Higher frequency is named channel high at 2480MHz.

Measurements are done in hopping mode in all channels with modulation (a permanent emission of numeric stream).

For measurements that need to be done in one channel, the channel used was activated with the transmission with the normal modulation (GFSK +/-160kHz : Bluetooth basic data rate). The equipement can't be programmed with another modulation mode.

It is not possible to select the packet type. The transmission speed is limited by the RS232 link and thus the Bluetooth component never uses longer packets than those we have observed. For measurement we send as long messages as we can (big files).

For AC conducted measurement, we have used an AC/DC adapter connected on the jack.
The equipment can be powered through the RI pin of RS232* connector, it is exactly the same input as the Jack connector (depending on a jumper position). *in this case, the equipement can't be connected directly to a standard RS232, it can't be powered by a standard RS232 and always need a DC adapter.

The equipment uses a FHSS modulation.

9 CONFORMANCE STATEMENT:

9.1 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

9.2 JUSTIFICATION:

As mentioned in paragraph 5 of this report, the equipment is an information technology equipment with radio part. It can be installed in commercial or light industry areas the following sub clause of the standard mentioned above are:

- Part 15.247 for intentional radiator in ISM band 2400 to 2483.5 MHz.
- Part 15.207 and 15.209 (subpart C) for respectively conducted and radiated emission for intentional radiator.

10 TEST ACCORDING TO CFR 47 Part 15

Tests performed by JL JAMET at GYL Technologies laboratories from 17 to 26 March of 2008.

10.1 REFERENCE DOCUMENTATION :

FCC part 15 (Sub part B) 15.209 and 15.247 of 2005.

10.2 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

10.3 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.

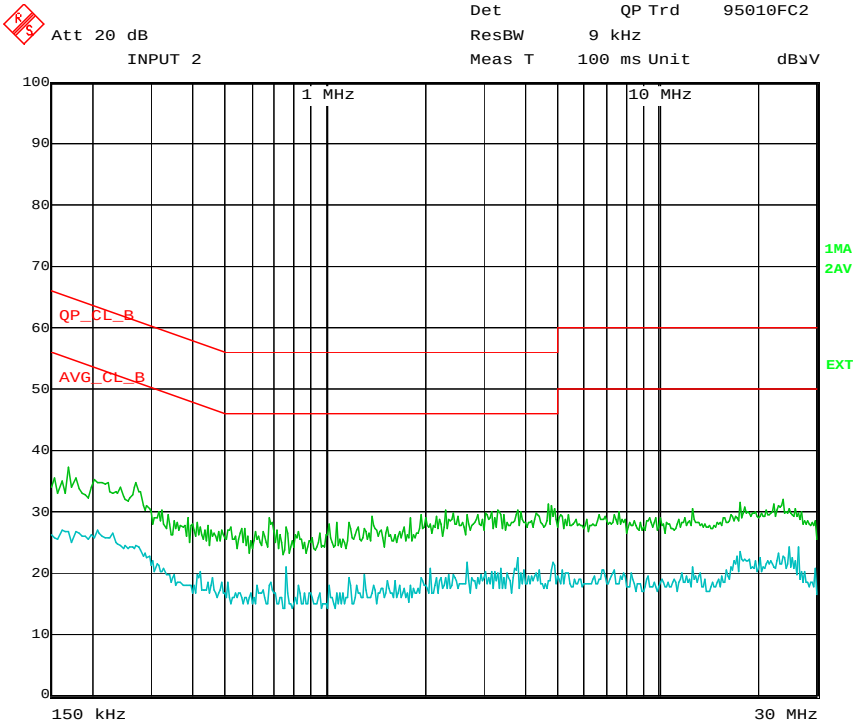
ESI 7 EMI TEST RECEIVER IN RECEIVER MODE	
Peak measurement time	5 ms
step size	4KHz
Preamplifier	OFF
Preselector	ON
Resolution, Band With	9 kHz
Final Quasi Peak measurement time	1 s minimum
Final average measurement time	1 sec minimum

All readings are quasi-peak unless stated otherwise.

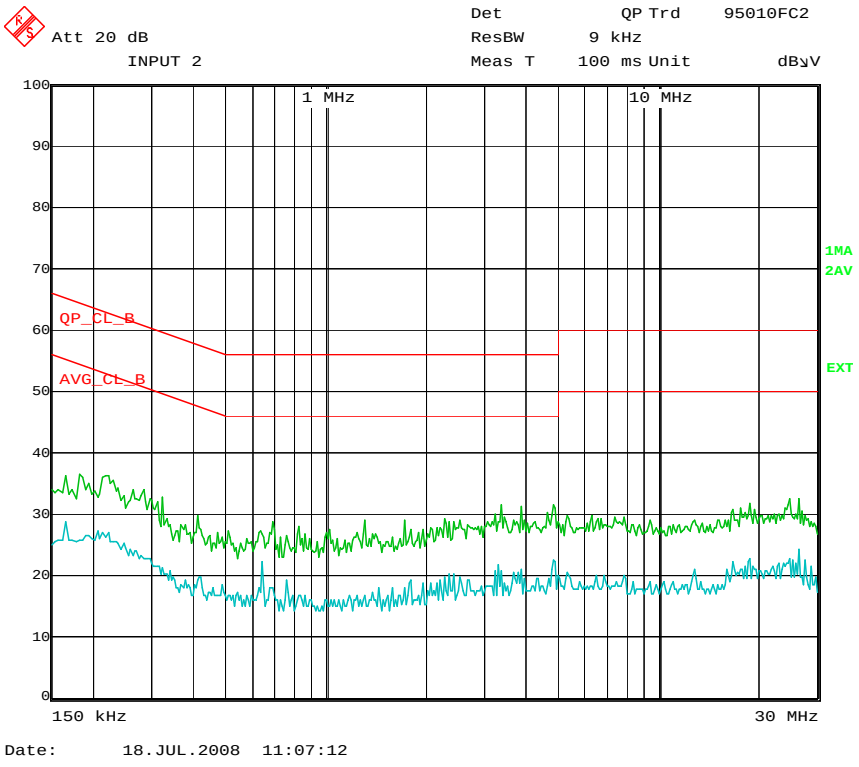
10.3.1 Power supply

10.3.1.1 Neutral:

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



10.3.1.2 LIVE:

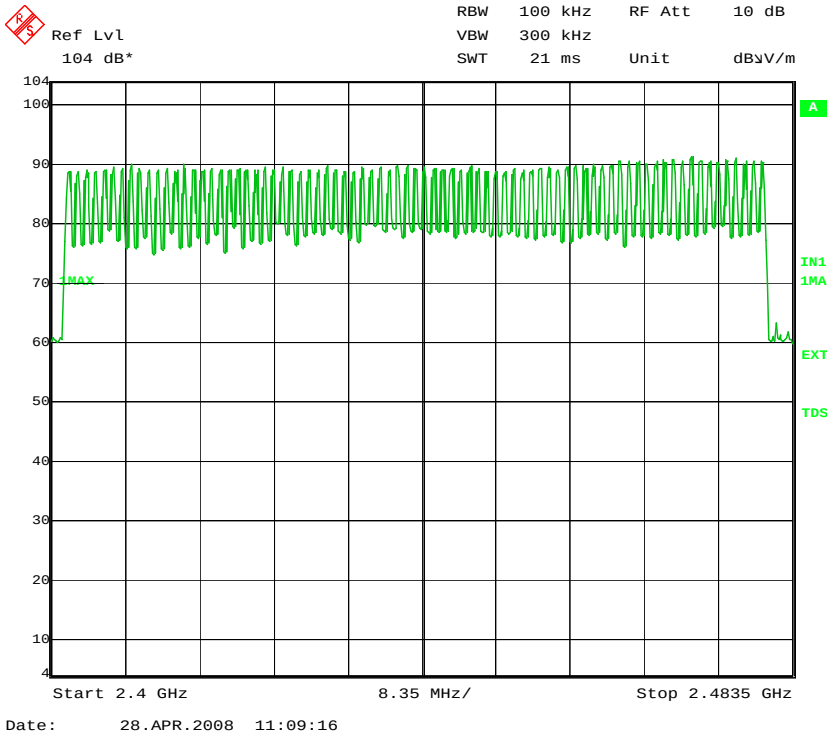


10.4 INTERPRETATION AND REMARKS:

The equipment complies with the §15.207 requirements, Class B

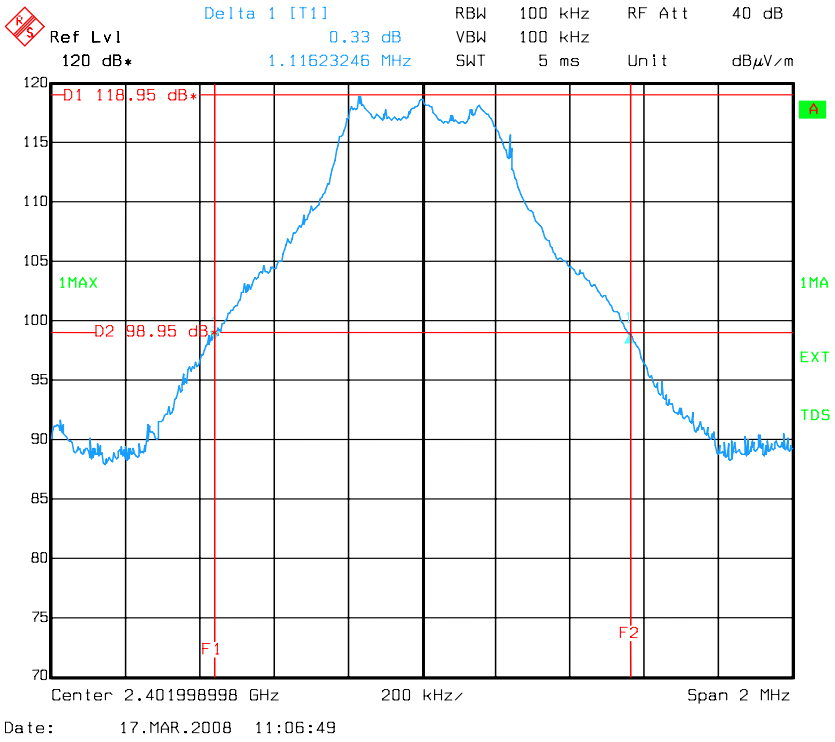
10.5 Intentional radiator operation within the band 2.4 – 2.483GHz §15.247.

The system uses 79 channels. For details of frequency hopping technology used see Exhibit 7 BlueCore4 datasheet. E.U.T. uses only Bluetooth basic data rate.

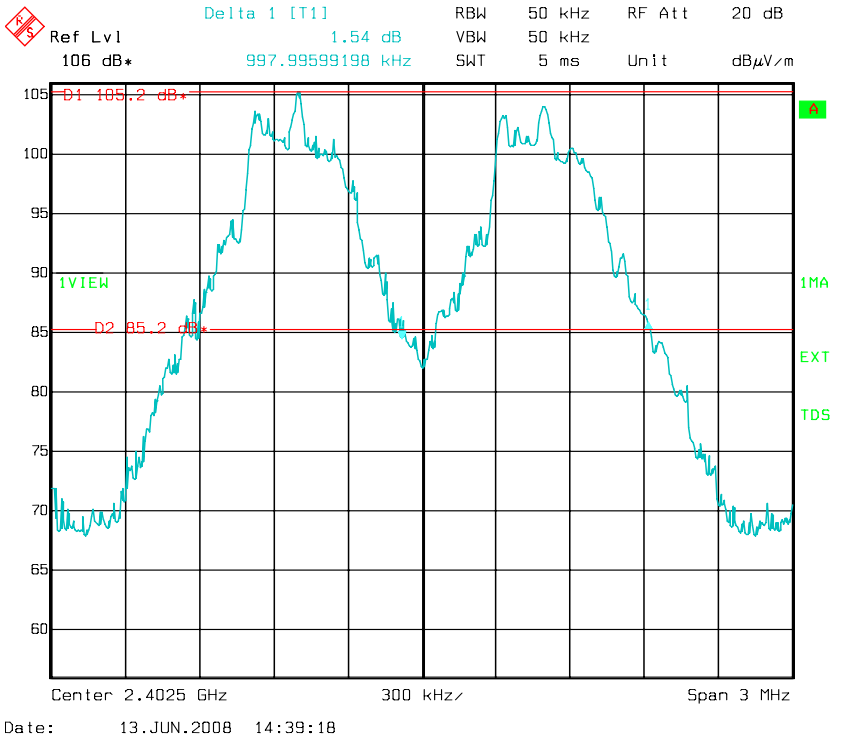


10.5.1 Frequency hopping channel separation (15.247 (a) (1))

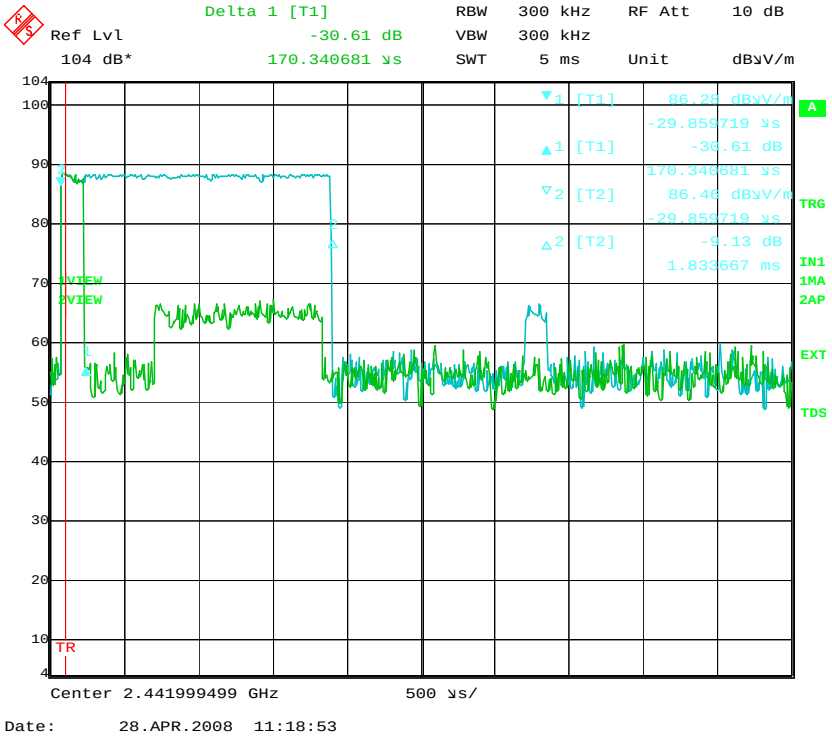
Each channel bandwidth in normal use is 1.12 MHz. This is allowed because the equipement uses an Adaptive frequency hopping system (as described in the data sheet of the component).



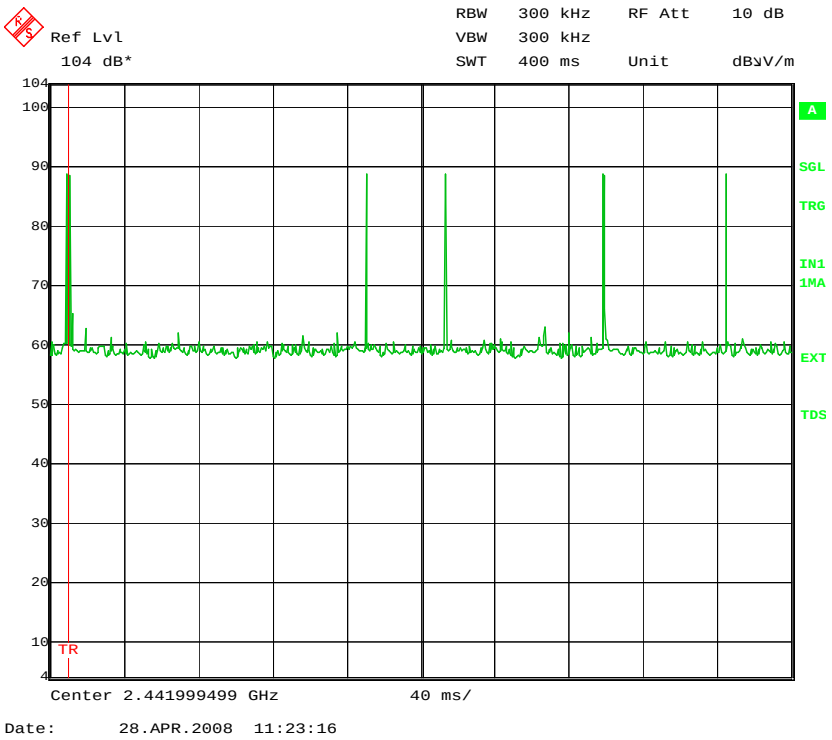
The channel separation is 1MHz.



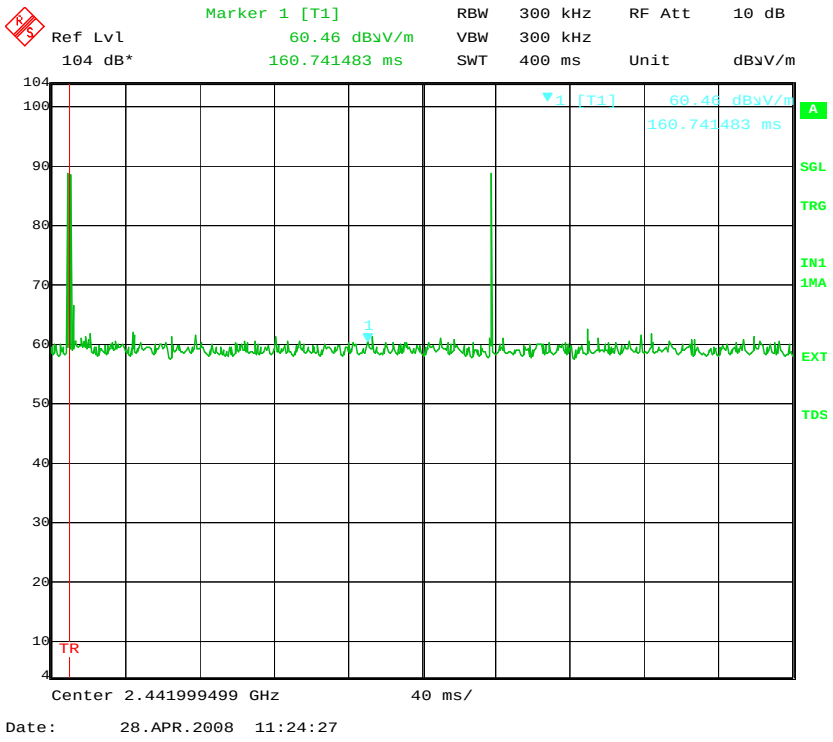
The measurement during a file transmission gives a maximum of 1834 µs every 40 to more than 200 ms on each channel so the average time within a period of 10 seconds is always less than the 400 ms limit.



Time between two channels not applicable with a Bluetooth transmission.
Observed near maximum repetition on the same channel :



Another repetition rate sample



A maximum of 2 transmissions (one short and one long) in a period of 100 ms has been observed so the dwell time correction factor for spurious measurement is 20Log(2/100) = **-34 dB**.

10.5.2 Maximum peak output power

The maximum peak conducted power can't be measured in this product (internal antenna without connector).

According to DA 00-705, the alternative test procedure is used to calculate the conducted peak power.

$$P = \frac{(E*d)^2}{30G}$$

For calculation, G is taken to be 1 (isotropic antenna, worst case).

The conducted limit is 0.125W.

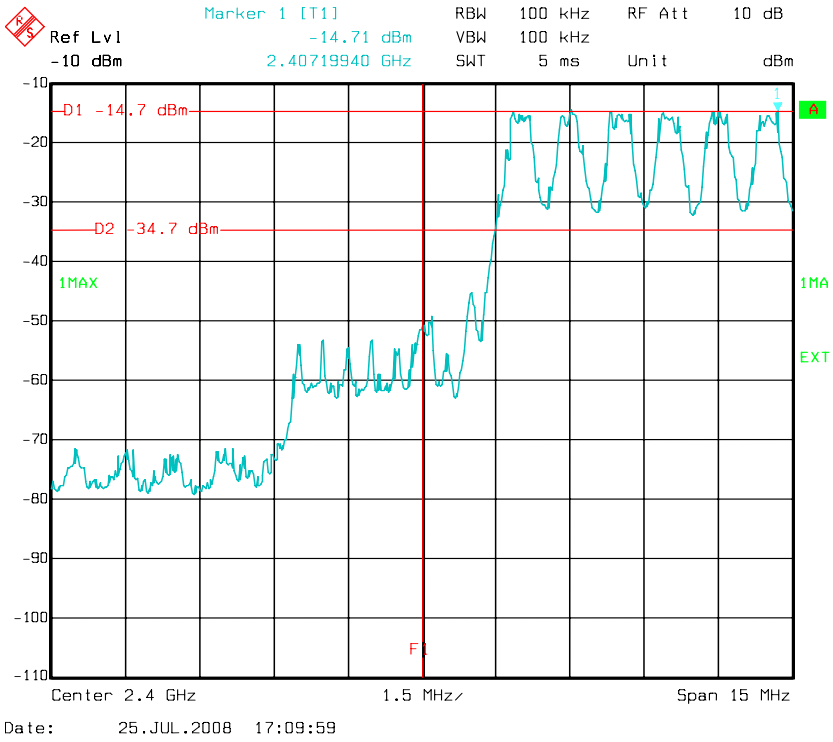
Measurements are done on OATS at 3 m distance.

Results	Frequency (MHz)	3 m dBµV/m	Power (mW)
Channel Low	2402	108.2	19.7
Middle Channel	2446	107.2	15.7
Channel High	2480	106.5	13.4

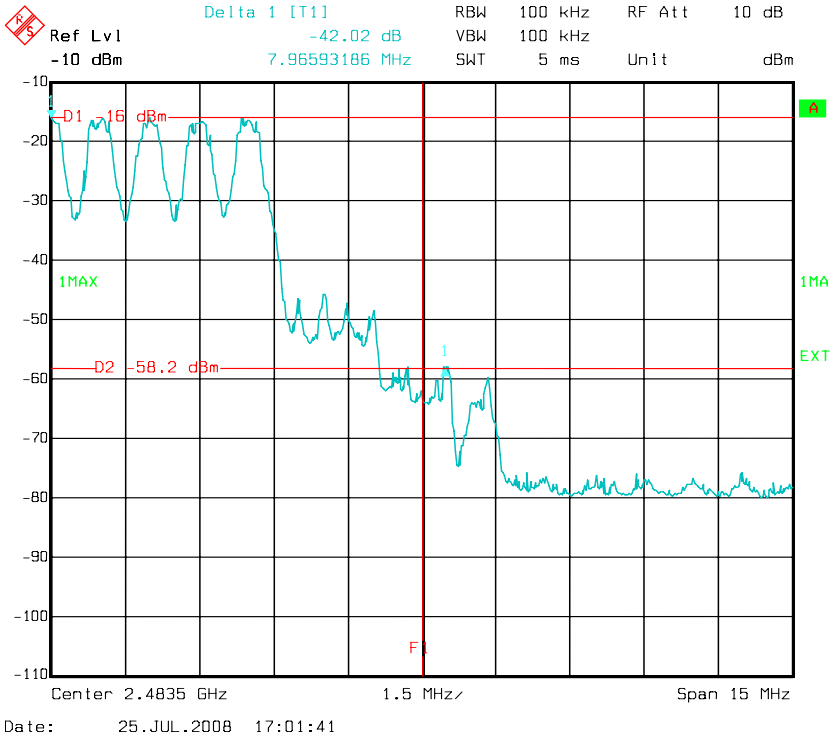
10.5.3 Spurious emissions (15.247 § (d))

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

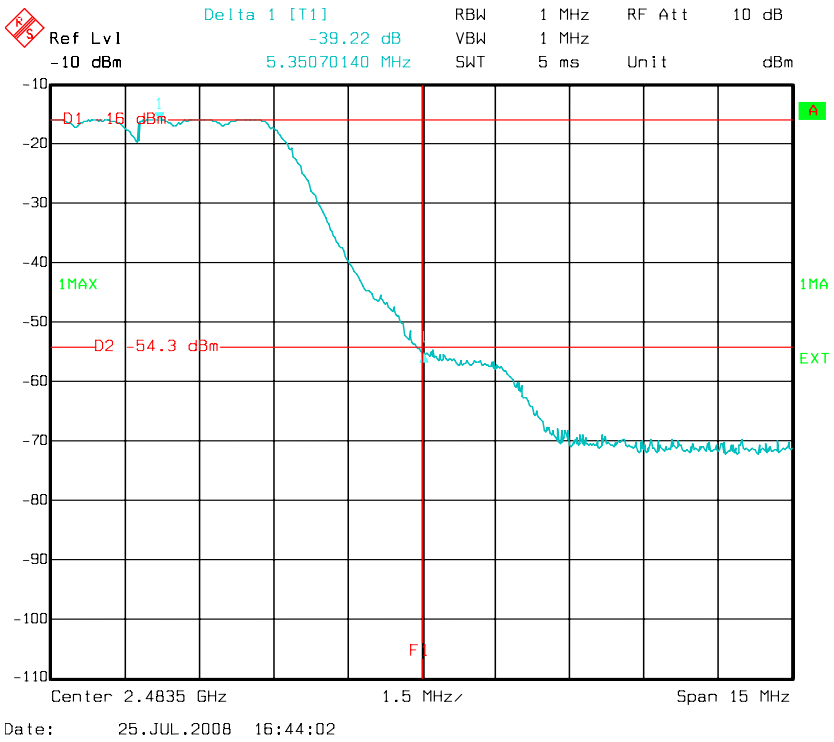
At band edge F1 (2.4 GHz), the level is far below this limit:



For F2 (2.4835 GHz)



For F2 with 1MHz BW



The maximum spurious is at 2484 MHz and is 39dB below the highest channel peak level.
The highest channel peak level is measured at 106 so the marker delta gives a peak level of 67 dBµV/m (below the 74 dBµV/m limit). With the averaging of -34dB, the average level is 32dBµV/m, far below the 54 dBµV/m limit.

SPURIOUS EMISSIONS MEASUREMENTS:

Spurious emissions measurement results from 30MHz to 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 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 100kHz for peak measurement and 120 kHz for quasi-peak, and the analyzer was operated in the CISPR quasi-peak detection mode when needed. 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 for measurements in restricted bands below 1GHz

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

Spurious emissions measurement results from 1GHz to 25GHz:

A pre-scan measurement is done very close to the product (less than 10cm) with 100 kHz 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.

Harmonics are peak measured with 1MHz RBW and an averaging due to the duty cycle correction factor.

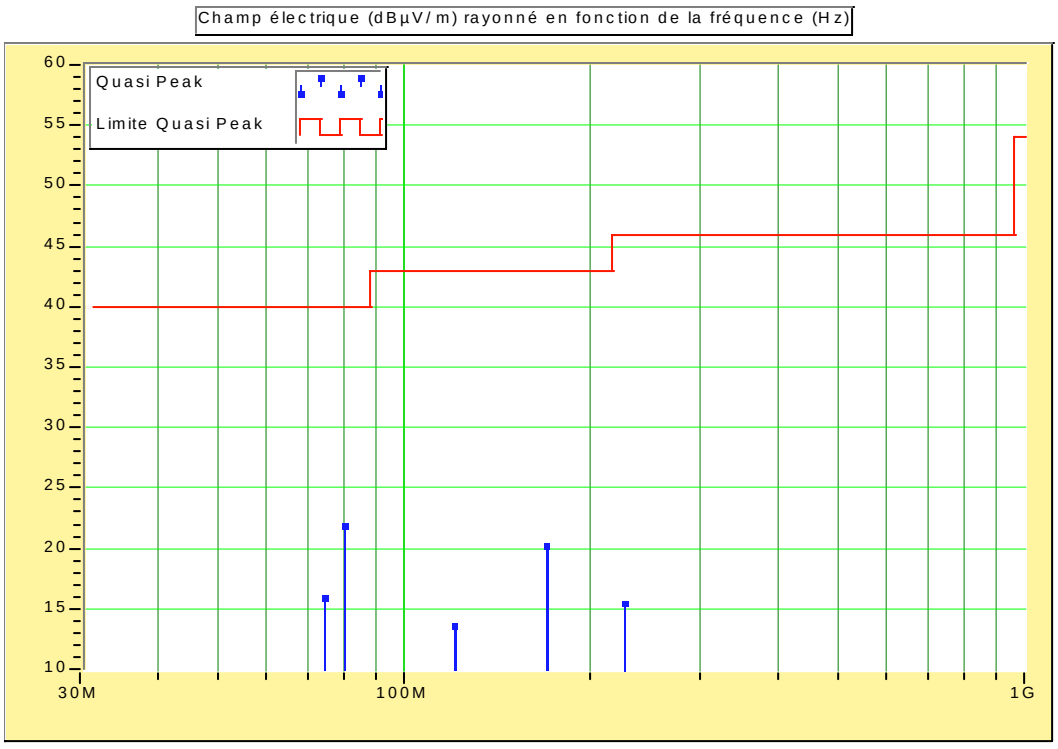
10.5.3.1 Spurious RESULTS:

Spurious emissions are made twice: with a permanent modulation and hopping active and with single channel with a permanent emission with normal modulation.

The following data table lists the most significant emission frequencies, measured level, correction factor (includes cable and antenna corrections), corrected reading and the limit.

3 m open area test site final measurements results

Frequency (MHz)	Peak (dBµV/m)	Quasi peak (dBµV/m)	Limits	Margin (dB)	Polar.	Height (cm)	Angle (°)	Factor Corr. (dB)
74,258	17,84	15,88	74	58,12	V	102	4	8,26
80,049	26,41	21,95	40	18,05	V	121	37	9,55
119,999	17,78	13,65	74	60,35	V	104	3	14,18
169,974	23,86	20,29	74	53,71	V	102	3	12,79
226,483	21,64	15,49	46	30.51	H	101	2	15,56



Over 1 GHz, no spurious except following results in transmitting mode at fixed frequency has been found outside the harmonics.

Average limit in restricted bands §15.205 at 3 m is 54 dBµV/m (74 dBµV/m for peak limit). Otherwise, the limit is only 20 dB under the emission level (88.2 dBµV/m at 3m) without averaging with duty cycle factor.

Max spurious for channel low (2402 MHz)

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -34) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
4804	2	71.2	61.2	74.0			27.2	54.0	12.8
7206	3	72.0	62.0	88.2					26.2
9608	4	72.0	62.0	88.2					26.2
12010	5	78.7	68.7	74.0			34.7	54.0	5.3
14412	6	76.0	66.0	88.2					22.2
16814	7	NF		88.2					
19216	8	57.7	47.7	74.0			13.7	54.0	26.3
21618	9	NF		88.2					
24020	10	59.6	49.6	88.2					38.6

(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

Max spurious for middle channel (2440 MHz)

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -34) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
4880	2	71.9	61.9	74.0			27.9	54.0	12.1
7320	3	68.0	58.0	74.0			24.0	54.0	16.0
9760	4	68.0	58.0	88.2					30.2
12200	5	81.0	71.0	74.0			37.0	54.0	3.0
14640	6	75.6	65.6	88.2					22.6
17080	7	NF		88.2					
19520	8	56.9	46.9	74.0			12.9	54.0	27.1
21960	9	NF		88.2					
24400	10	57.2	47.2	88.2					41.0

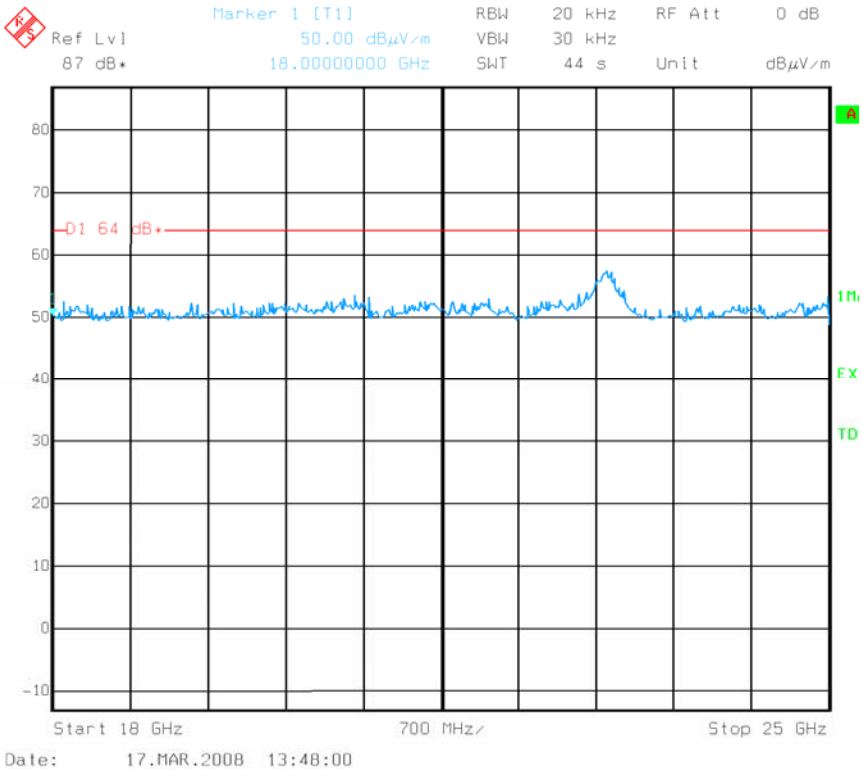
Max spurious for channel high (2480 MHz)

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -34) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
4960	2	70.5	60.5	74.0			26.5	54.0	13.5
7440	3	71.0	61.0	74.0			27.0	54.0	13.0
9920	4	71.0	61.0	88.2					27.2
12400	5	78.5	68.5	74.0			34.5	54.0	5.5
14880	6	75.5	65.5	88.2					22.7
17360	7	NF		88.2					
19837	8	58.7	48.7	74.0			14.7	54.0	25.3
22320	9	NF		74.0				54.0	
24803	10	57.7	47.7	88.2					40.5

Other spurious in hopping mode over 1GHz

Freq. (MHz)	H.	Peak(1) (dBµV/m) At 1m	Peak (1) corrected for 3 m distance (dBµV/m)	Peak Limit (dBµV/m)	Avg (2) (dBµV/m) At 1 m	Avg (2) corrected for 3 m distance (dBµV/m)	Averaging (duty cycle correction factor of -34) (dBµV/m)	Avg Limit (dBµV/m)	Min. Margin (dB)
1617		61.0	51.0	74.0	58.0	48.0		54.0	6.0
1643		61.5	51.5	88.2	59.5	49.5			36.7
2566		62.0	52.0	88.2	59.0	49.0			36.2
2600		62.0	52.0	88.2	59.0	49.0			36.2
2704		64.5	54.5	74.0	58.3	48.3		54.0	5.7

Noise Floor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18.00000000 GHz
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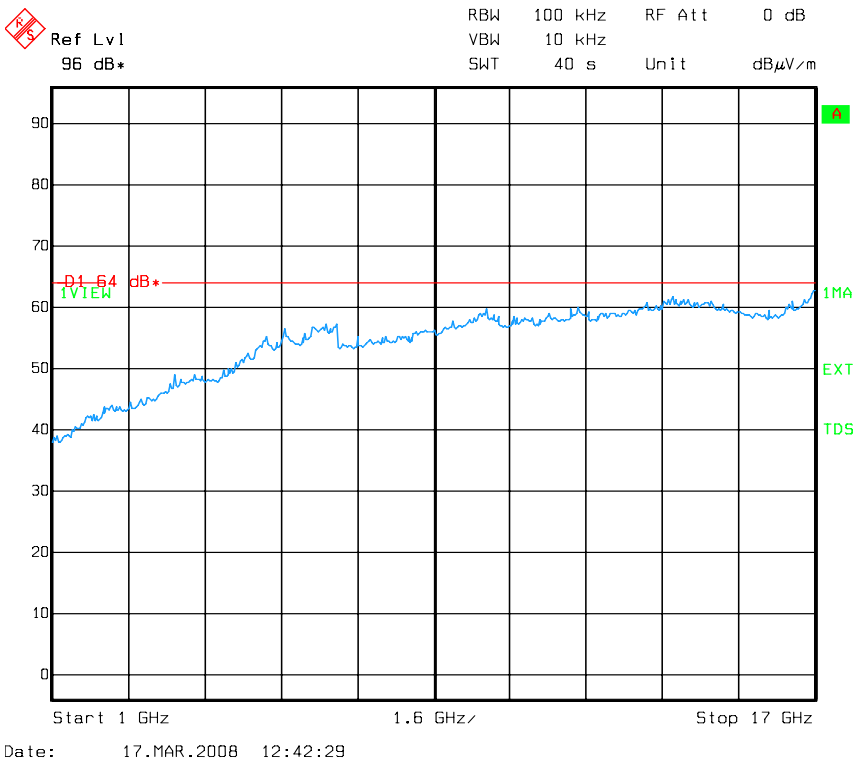
VBW 30 kHz
SWT 44 s
RF Att 0 dB
Unit dBµV/m
Ref Lvl
87 dB*
D1 64 dB*
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 17.MAR.2008 13:48:00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VBW 10 kHz
SWT 40 s
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Unit dBµV/m
Ref Lvl
96 dB*
D1 64 dB*
1VIEW
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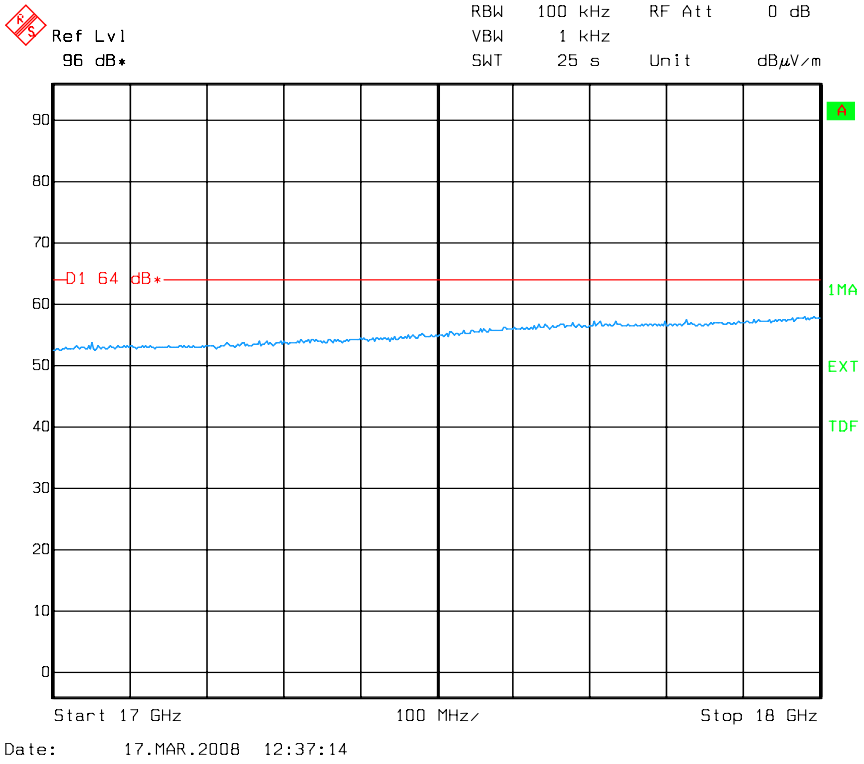
1.6 GHz/
Stop 17 GHz
Date: 17.MAR.2008 12:42:29


RBW 100 kHz
RF Att 0 dB
VBW 1 kHz
SWT 25 s
Unit dBµV/m
Ref Lvl
96 dB*
D1 64 dB*
1MA
EXT
TDF
Start 17 GHz
100 MHz/
Stop 18 GHz
Date: 17.MAR.2008 12:37:14

10.5.4 Exposition of public to radio frequency energy.

In the frequency range of this product, the limit of S is 1mW/cm^2.

With the formula given in OET 65 and the measurement of EIRP, we can compute that the minimum distance between a body and the antenna is:

For
R = square root (EIRP/(4*Pi*1))
R = square root (0.0197/(4*Pi*1))
R = 3.9 cm

If we consider the averaging possibility, the safe distance if far lower.

The normal use of this product is with the antenna at a distance greater than 20 cm from a body.

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

10.6 Antenna requirements

Not applicable because the antenna is located inside the equipment and is not replaceable without modifying the product.

10.7 Measurement of frequency stability

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)

Temperature	-30°C		20°C		70°C	
Power Supply	3.8 V	20 V	3.8 V	20 V	3.8 V	20 V
Channel 2402	2.402002	2.402007	2.402002	2.401995	2.402003	2.402003
Channel 2440	2.440017	2.440022	2.440020	2.440022	2.440019	2.440020
Channel 2480	2.480030	2.480035	2.480036	2.480036	2.480039	2.480038

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