

15, rue de la Claie
Z.I. Angers-Beaucouzé
49070 BEAUCOUZÉ
Tél. 02 41 73 26 27
Fax 02 41 73 26 40
e-mail : atlantique@emitech.fr
R.C.S. ANGERS 95 B 543
SIRET 344 545 645 00055

RA-06-24265-2/A Ed. 0

FCC CERTIFICATION RADIO Measurement Technical Report

**standard to apply:
FCC Part 15.247**

**Equipment under test:
PORTABLE HANDSFREE KIT
MYNOS**

**FCC ID :
RKXMYNOS**

**Company:
PARROT**

DISTRIBUTION: Mr GUERRAB

Company: PARROT

Number of pages: 35 including 4 annexes

Ed.	Date	Modified pages	Editing		Verification Approval	
			Name	Visa	Name	Visa
0	6-Sep-06	Creation	L. BERTHAUD	LB		

Duplication of this test report is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.

This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

PRODUCT: PORTABLE HANDSFREE KIT

Reference / model: MYNOS

Serial number: not communicated

MANUFACTURER: not communicated

COMPANY SUBMITTING THE PRODUCT:

Company: PARROT

Address: 174, quai de Jemmapes
75010 PARIS CEDEX
FRANCE

Responsible: Mr GUERRAB

DATES OF TEST: 26 and 27 June 2006
5 and 6 July 2006

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
EMITECH ATLANTIQUE open area test site in LA POUEZE (49)
FRANCE

Registration Number by FCC: 101696/FRN: 0006 6490 08

TESTED BY: L. BERTHAUD

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1.INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: PORTABLE HANDSFREE KIT MYNOS in accordance with normative reference.

2.PRODUCT DESCRIPTION

ITU Emission code: 1M00F7D

Class: B (residential environment)

Utilization: Bluetooth handsfree kit

Antenna type: internal antenna

Operating frequency range: I.S.M. band from 2400 MHz to 2483.5 MHz

Number of channels: 79

Channel spacing: 1 MHz

Frequency generation: ☐ SAW Resonator ☐ Crystal ☒ Synthetiser

Modulation: Frequency Hopping Spread Spectrum
☐ Amplitude ☐ Digital ☒ Frequency ☐ Phase

Power source: 3.7 Vd.c. (Li-Ion battery), a battery charger can be used

Power level, frequency range and channels characteristics are not user adjustable.

The details pictures of the product and the circuit boards are joined with this file.

3.NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below. They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

FCC Part 15 (2006)	Code of Federal Regulations Title 47 - Telecommunication Chapter 1 - Federal Communications Commission Part 15 - Radio frequency devices Subpart C - Intentional Radiators
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ANSI C63.4 (2003)	Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.
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Public Notice DA 00-705 (2000)	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.
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4.TEST METHODOLOGY

Radio performance tests procedures given in part 15:

- Paragraph 33: frequency range of radiated measurements
- Paragraph 35: measurement detector functions and bandwidths
- Paragraph 205: restricted bands of operation
- Paragraph 207: conducted limits
- Paragraph 209: radiated emission limits; general requirements
- Paragraph 247: operation within the bands 2400-2483.5 MHz

5.ADD ATTACHMENTS FILES

- “Synoptic “***
- “Block diagram “***
- “External photos and Product labeling “***
- “Assembly of components “***
- “Internal photos “***
- “Layout pcb “***
- “Bil of materials “***
- “Schematics “***
- “Product description “***
- “User guide “***

6. TESTS AND CONCLUSIONS

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				Note 9
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				Note 4
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 5
FCC Part 15.247	OPERATION WITHIN THE BAND 2400-2483.5 MHz					
	(a) (1) hopping systems	X				Note 1
	(a) (1) (i) 902 – 928 MHz			X		
	(a) (1) (ii) 5725 – 5850 MHz			X		
	(a) (1) (iii) 2400 – 2483.5 MHz	X				Note 2
	(a) (2) digital modulation techniques			X		
	(b) max output power	X				Note 6
	(c) operation with directional antenna gains > 6dBi			X		Note 3
	(d) intentional radiator	X				
	(e) peak power spectral density	X				Note 6
	(f) hybrid system			X		
	(g)	X				Note 7
	(h)	X				
	(i) RF exposure compliance	X				Note 8
	BAND EDGE COMPLIANCE	X				

NAP: Not Applicable

NAs: Not Asked

Note 1: the frequency hopping system have hopping channel carrier frequencies separated by 1 MHz. The system hop to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 20 dB bandwidth of the hopping channel (see annex 1).

Note 2: the frequency hopping system use more than 15 channels.

The timing by channel is 416.8 μ s.

During 79 channels $\times$ 0.4 s (part 15) = 31.6 s, any channel is used 152 times, then

$152 \times 416.8 \mu$ s = 63.35 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 0.4 s multiplied by the number of hopping channels employed, in normal operating mode (see annex 2).

Note 3: the antenna gain is less than 6 dBi.

Note 4: battery source power, a battery charger connected to the main power can be used. The equipment is not functional in charging mode.

Note 5: see FCC part 15.247 (d).

Note 6: conducted measurement is not possible (integral antenna), so we used the substitution method in open field.

Note 7: speech application.

Note 8: this type of equipment uses less than 0.5 W of output power with a high signal transmitting duty factor (section 3 from Oet 65c).

Note 9: internal antenna (pcb antenna), see annex 3.

Conclusion:

The sample of PORTABLE HANDSFREE KIT MYNOS submitted to the tests complies with the regulations of the standard FCC Part 15 in accordance with the limits or criteria defined in this report.

7.MEASUREMENT OF THE CONDUCTED DISTURBANCES**Standard:** FCC Part 15**Test procedure:** FCC Part 15 Sec 15.207**Limits:** Class B**Test equipment:**

TYPE	MANUFACTURER	EMITECH NUMBER
AC power supply	Schaffner Proflin 2115-400	2152
Test receiver	Rohde & Schwarz ESH3	0825
Pulse limiter	Rohde & Schwarz ESH3-Z2	976
Artificial main network	PMM L3-25	834
Spectrum analyzer	Hewlett packard HP8594	1030
Pulse limiter	Hewlett packard HP11947A	2565

Software used: BAT-EMC V3.1.7.1**Test set up:**

The test unit is placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane.

See photos in annex 4.

Equipment under test operating condition:

The equipment is powered with the AC power operating voltage of 115 V / 60 Hz.

The E.U.T. is in the Bluetooth communication with a cellular phone during the measurement.

Frequency range: 150 kHz - 30 MHz**Detection mode:** Peak / Average**Bandwidth:** 9 kHz

Results:**Measurement on the mains power supply:**

The first measurement is made with peak detector.

Curve N° 1: measurement on the Neutral with peak detector

Curve N° 2: measurement on the Line with peak detector

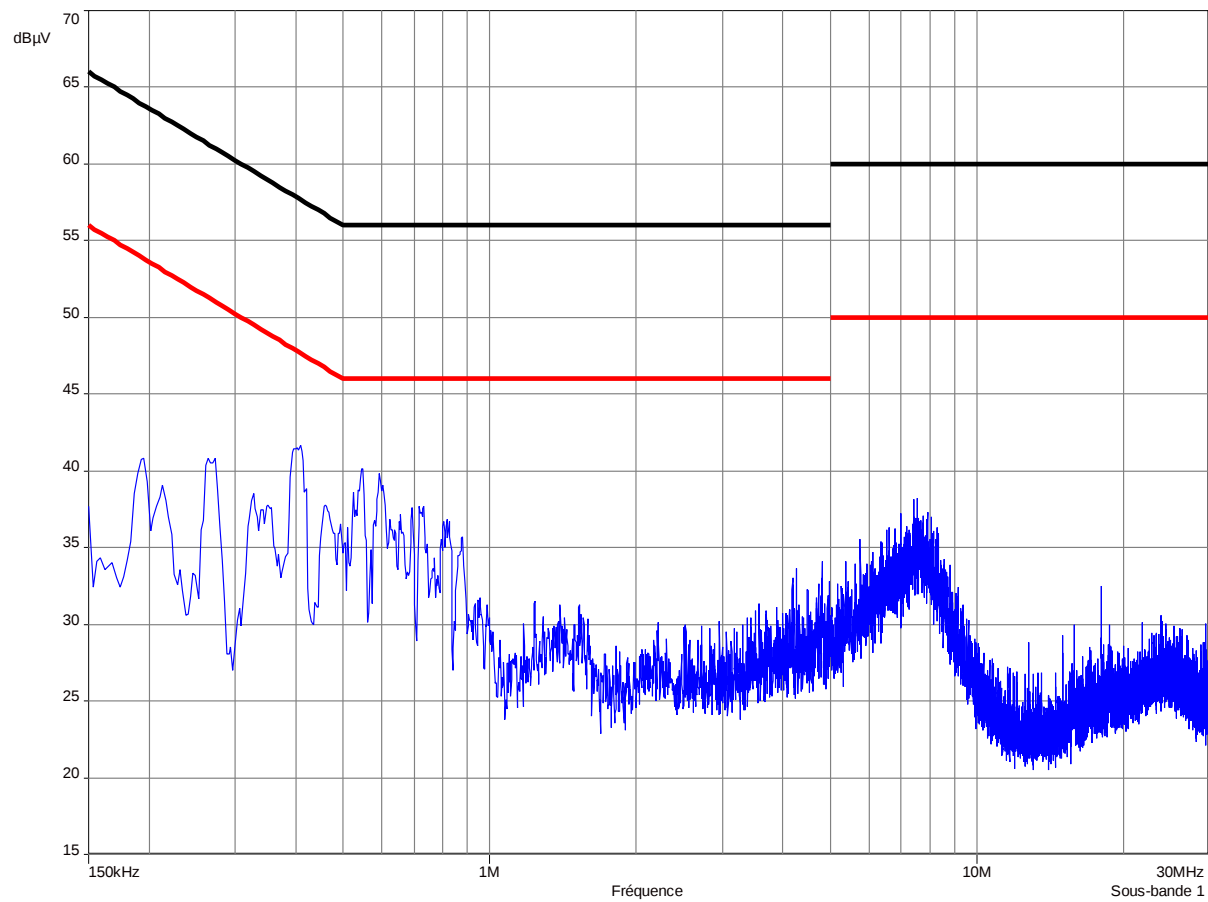
The frequencies which aren't 6 dB under the limits are analysed with Quasi-peak or Average detector, if necessary.

Curve N° 3: Average measurement on the Neutral from 300 kHz to 700 kHz

Curve N° 4: Average measurement on the Line from 300 kHz to 700 kHz

CURVE N°: 1.

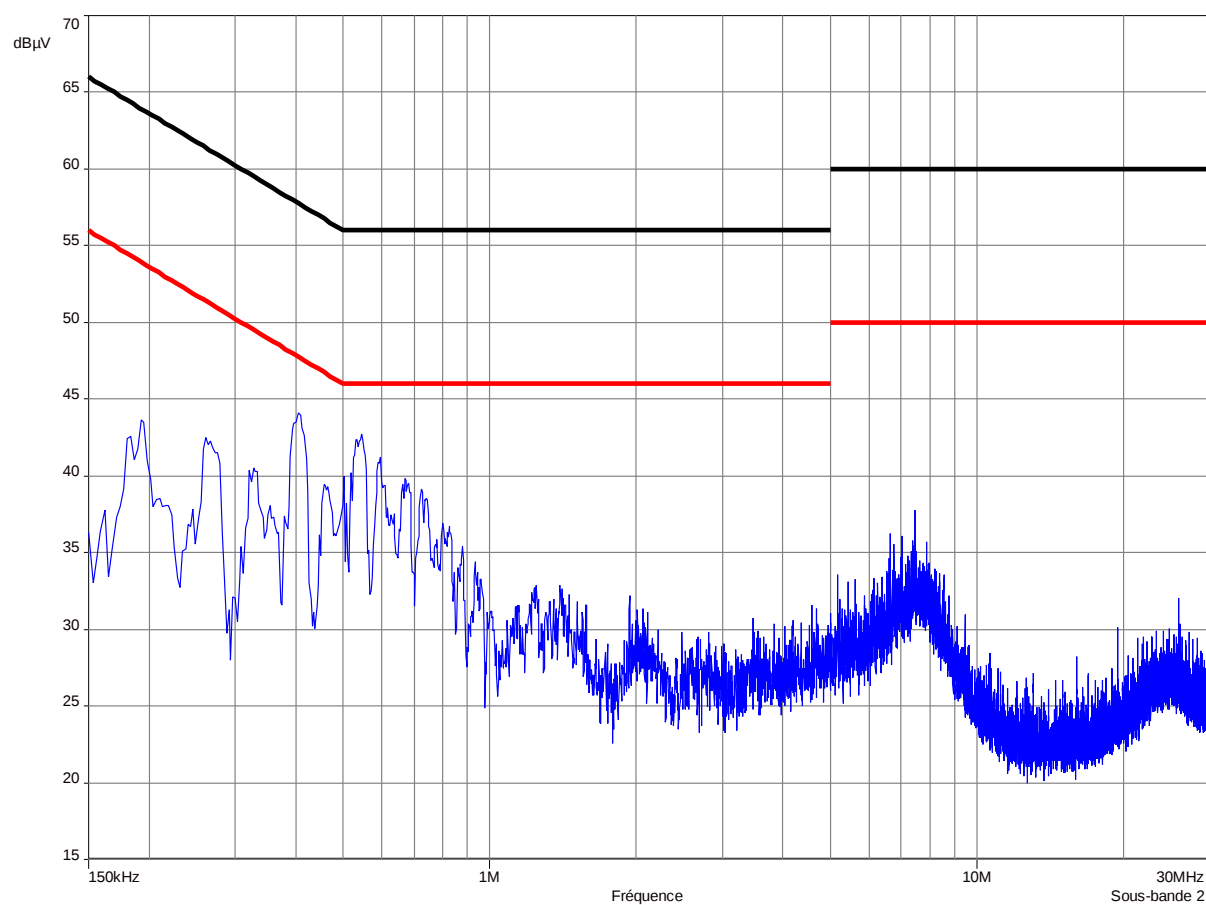
Measurement on the Neutral with peak detector



RBW = 10 kHz
VBW = 10 kHz
Sweep time = 500 ms/MHz
Max hold = 3 seconds

CURVE N°: 2.

Measurement on the Line with peak detector



RBW = 10 kHz

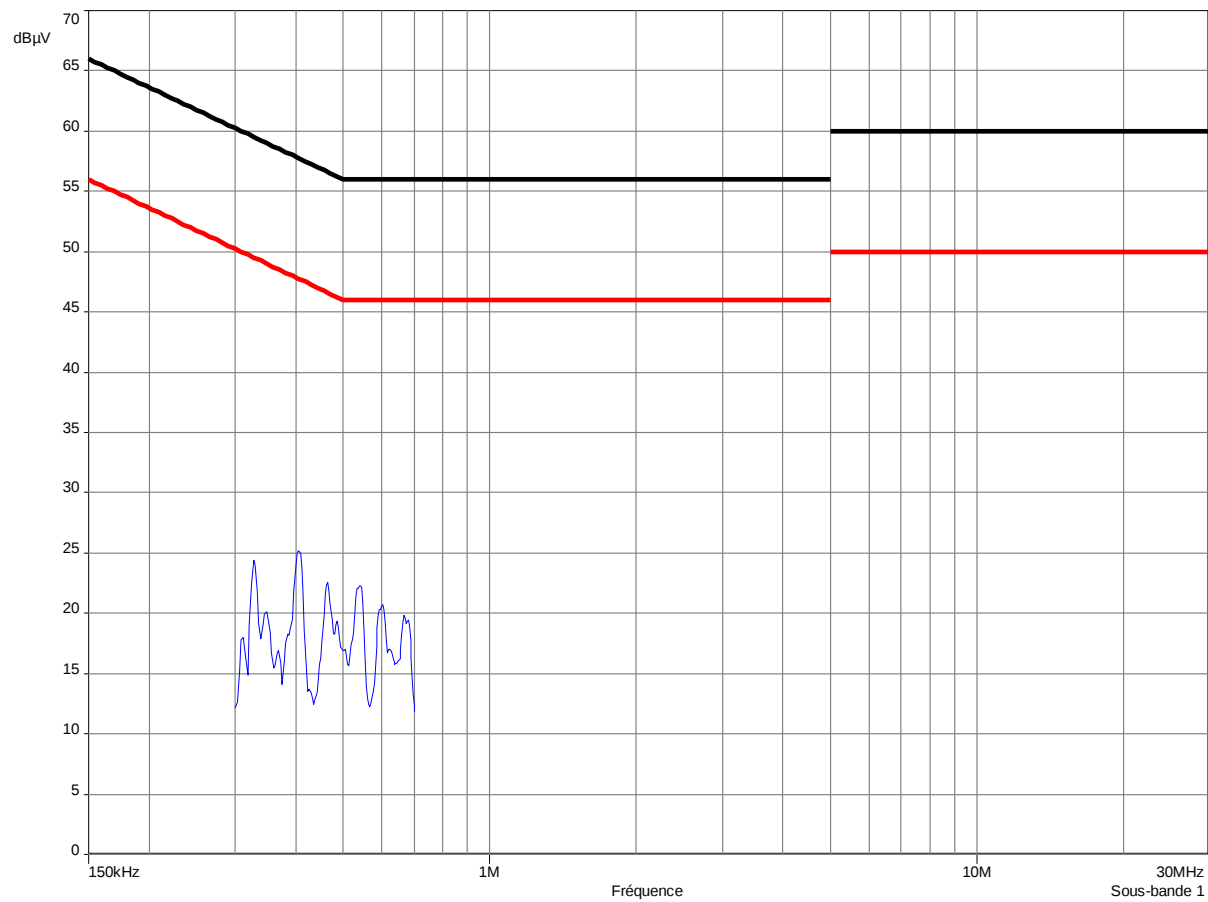
VBW = 10 kHz

Sweep time = 500 ms/MHz

Max hold = 3 seconds

CURVE N°: 3.

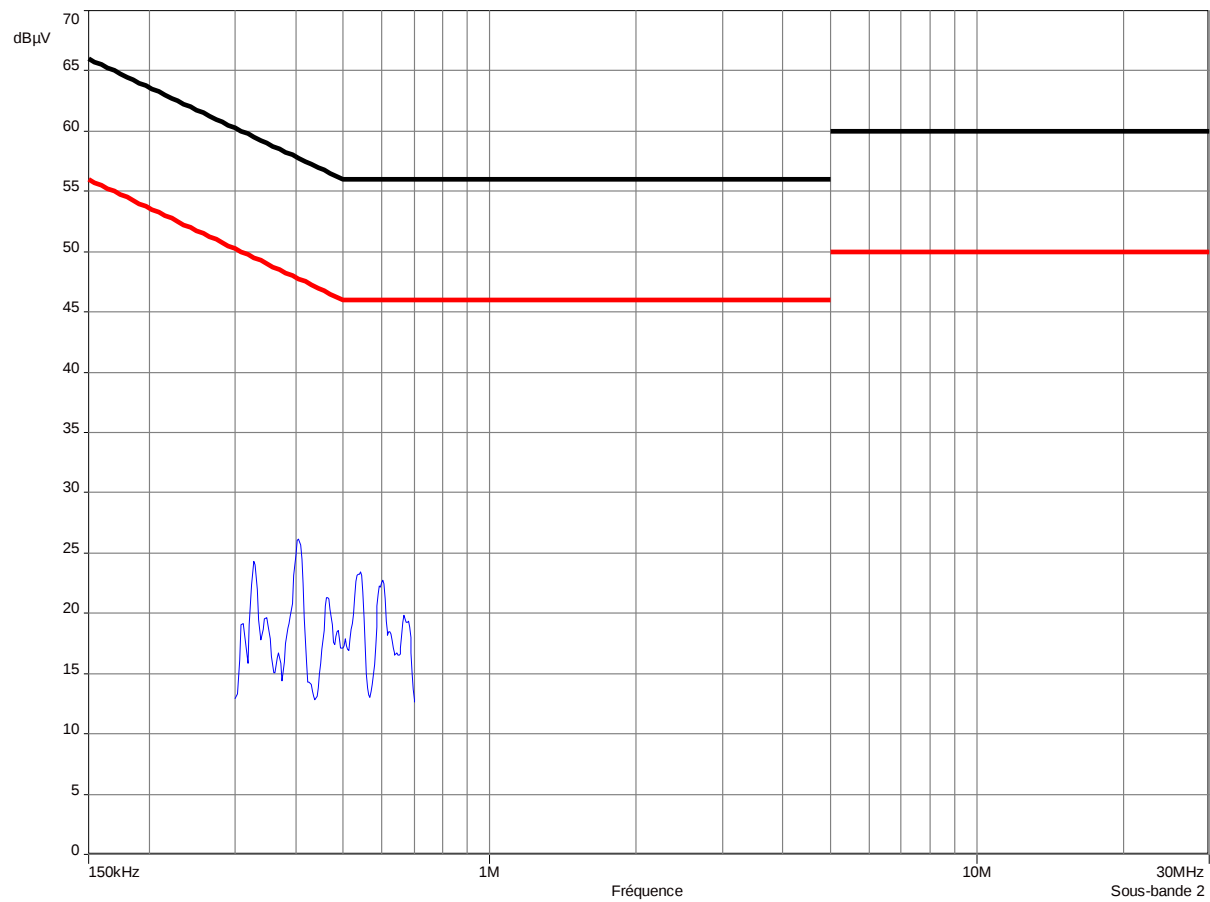
Average measurement on the Neutral from 300 kHz to 700 kHz



RBW = 10 kHz
Sweep time = 500 ms/pts

CURVE N°: 4.

Average measurement on the Line from 300 kHz to 700 kHz



RBW = 10 kHz
Sweep time = 500 ms/pts

8. PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247

Test equipment:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Diode detector OD20004A	Omniyig	2469
Oscilloscope THS 720	Tektronix	0940
Antenna RGA60	Electrometrics	1938
Antenna RGA60	Electrometrics	1204
Open site	EMITECH	1274
Radio frequency generator SME06	Rohde & Schwarz	1669
High pass filter HPM11630	Micro-tronics	1673
Low-noise amplifier 1 to 18 GHz	ALC	2648
Power meter 8541B	Gigatronics	3479
Power sensor 80401A	Gigatronics	3182
Multimeter 77-2	Fluke	812

Test set up:

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

We use for this measure outdoor test site, by substitution method. The measuring distance between the equipment and the test antenna is 3 m. The antenna have been oriented in the two polarizations, we have recorded only highest level.

In first the spectrum analyzer is replaced by a diode detector which is connected to the vertical channel of an oscilloscope.

The equipment under test is substituted by a signal generator with a calibrated double ridged guide antenna, and its level adjusted such that the deviation of the Y-trace of the oscilloscope reaches the level obtained with the E.U.T.

The output power level of the signal generator is measured with a calibrated RF power meter.

Then a measurement of the electro-magnetic field is realized, with a resolution bandwidth and video bandwidth adjusted at 1 MHz (detector: Peak).

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 23

Relative humidity (%): 58

Polarization of test antenna: vertical (height: 214 cm)

Position of equipment: up right (azimuth: 0 degree)

Sample n° 1

		Peak Output Power radiated at these frequencies (W): from 2402 MHz to 2480 MHz	Limits (W)
Normal test conditions	Nominal power source (V): 3.7	1.219×10^{-3}	1*

* the frequency hopping systems use at least 75 hopping channel.

Sample n° 1 Channel 1

		Level dBμV	Cable loss dB	Antenna factor dB	Electro-magnetic field (dBμV/m):	P* (W)
Normal test conditions	Nominal power source (V): 3.7	62.16	4.41	27.77	94.34	0.819×10^{-3}

Sample n° 1 Channel 40

		Level dBμV	Cable loss dB	Antenna factor dB	Electro-magnetic field (dBμV/m):	P* (W)
Normal test conditions	Nominal power source (V): 3.7	62.4	4.41	27.77	94.58	0.861×10^{-3}

Sample n° 1 Channel 79

		Level dBμV	Cable loss dB	Antenna factor dB	Electro-magnetic field (dBμV/m):	P* (W)
Normal test conditions	Nominal power source (V): 3.7	63.14	4.41	27.77	95.32	1.021×10^{-3}

* $P = (E \times d)^2 / (30 \times G_p)$ with $d = 3$ m and $G_p = 1$ **Test conclusion:**

RESPECTED STANDARD

9. PEAK POWER DENSITY

Standard: FCC Part 15

Test procedure: paragraph 15.247

Test equipment used:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Open site	Emitech	1274
Radiofrequency generator SME06	Rohde & Schwarz	1669
Antenna RGA-60	Electrometrics	1938
Antenna RGA-60	Electrometrics	1204
Power meter 8541B	Gigatronics	3479
Power sensor 80401A	Gigatronics	3182
Multimeter 77-2	Fluke	812

Measured condition:

We used the same method of the peak output power, but the oscilloscope and the diode is replaced by a spectrum analyzer used in combination with an RF power meter.

Resolution bandwidth: 3 kHz

Video bandwidth: 10 kHz

Test operating condition of the equipment:

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 23

Relative humidity (%): 58

We used for the power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 4.18

Voltage at the end of test (V): 4.14

Percentage of the voltage drop during the test (%): -0.9

Sample n° 1 Channel 1

	Peak power density at frequency: 2402 MHz
Normal test conditions	-15.08 dBm
Limits	+8 dBm

Sample n° 1 Channel 40

	Peak power density at frequency: 2441 MHz
Normal test conditions	-14.14 dBm
Limits	+8 dBm

Sample n° 1 Channel 79

	Peak power density at frequency: 2480 MHz
Normal test conditions	-12.8 dBm
Limits	+8 dBm

Test conclusion:

RESPECTED STANDARD

10. RADIATED EMISSION OF TRANSMITTER

Standard: FCC Part 15

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.247

Test equipment:

TYPE	MANUFACTURER	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS 10	Rohde & Schwarz	1219
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Loop antenna	EMCO	1406
Biconical antenna HP 11966C	Hewlett Packard	728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open site	Emitech	1274
Antenna RGA-60	Electrometrics	1204
Low-noise amplifier 2 to 18 GHz	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Antenna WR42	IMC	1939
Low-noise amplifier 18 to 26 GHz	ALC	3036
Multimeter 77-2	Fluke	812

Test set up:

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

Frequency range: from 9 kHz to harmonic 10 ($F_{\text{carrier}} \leq 10 \text{ GHz}$)

Detection mode: Quasi-peak ($F < 1 \text{ GHz}$)
Average ($F > 1 \text{ GHz}$)

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.247
1 MHz ($F > 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.247

Distance of antenna: between 30 m and 3 m according the frequencies and the limits.

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 22.5

Relative humidity (%): 46

We used for power source the internal battery of the equipment and we noted:

Voltage at the beginning of test (V): 4.18

Voltage at the end of test (V): 4.11

Percentage of the voltage drop during the test (%): -1.7

The polarity column refers to the antenna polarity at which the maximum emissions level is measured.

Channel 1

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4804	Avg	147	0	1000	V	15.99	54*	38.01
4804	Peak	147	0	1000	V	47.13	74	26.87

* restricted bands of operation in 15.205, this limit corresponding at the 15.209 section.

Channel 40

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4882	Avg	152	0	1000	V	14.61	54*	39.39
4882	Peak	152	0	1000	V	45.75	74	28.25

* restricted bands of operation in 15.205, this limit corresponding at the 15.209 section.

Channel 79

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4960	Avg	153	0	1000	V	19.7	54*	34.3
4960	Peak	153	0	1000	V	50.84	74	23.16

* restricted bands of operation in 15.205, this limit corresponding at the 15.209 section.

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the RF power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 95.12 dBμV/m on channel 79.

So the applicable limit is **75.12 dBμV/m**.

In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205 (a), must also comply with the radiated emissions limits specified in section 15.209 (a) (see section 15.205 (c)).

Test conclusion:

RESPECTED STANDARD

11.BAND EDGE COMPLIANCE

Standard: FCC part 15.247

Test procedure: Public Notice DA 00-705, Delta Marker method.

Test equipment used:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Antenna RGA-60	Electrometrics	1938

Measured condition:

Requirements: Emissions that fall in the restricted bands (part 15.205). These emissions must be less than or equal to 500 $\mu\text{V/m}$ (54 dB $\mu\text{V/m}$). Part 15.35b applies in the restricted bands.

Test procedure: An in band field strength measurement of the fundamental Emission using the RBw and detector function required by C63.4-2003 and FCC Rules.

Test operating condition of the equipment:

The equipment is locked in frequency hopping mode.

Results:

Lower Band Edge: from 2310 MHz to 2390 MHz, curve n° 5

Upper Band Edge: from 2483.5 MHz to 2500 MHz, curve n° 6

Sample n° 1:

Fundamental Frequency (MHz)	Field Strength Level of fundamental (dB $\mu\text{V/m}$)	Peak Or Average	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out of Band Emission Level (dB $\mu\text{V/m}$)**	Limit (dB $\mu\text{V/m}$)	Margin (dB)
2402	94.34	Peak	2389.16	-57.33	37.01 ⁽¹⁾	74	36.99
2480	95.32	Peak	2484.09	-58.22	37.1 ⁽¹⁾	74	36.9

* According to step 2 of Marker-Delta Method DA 00-705

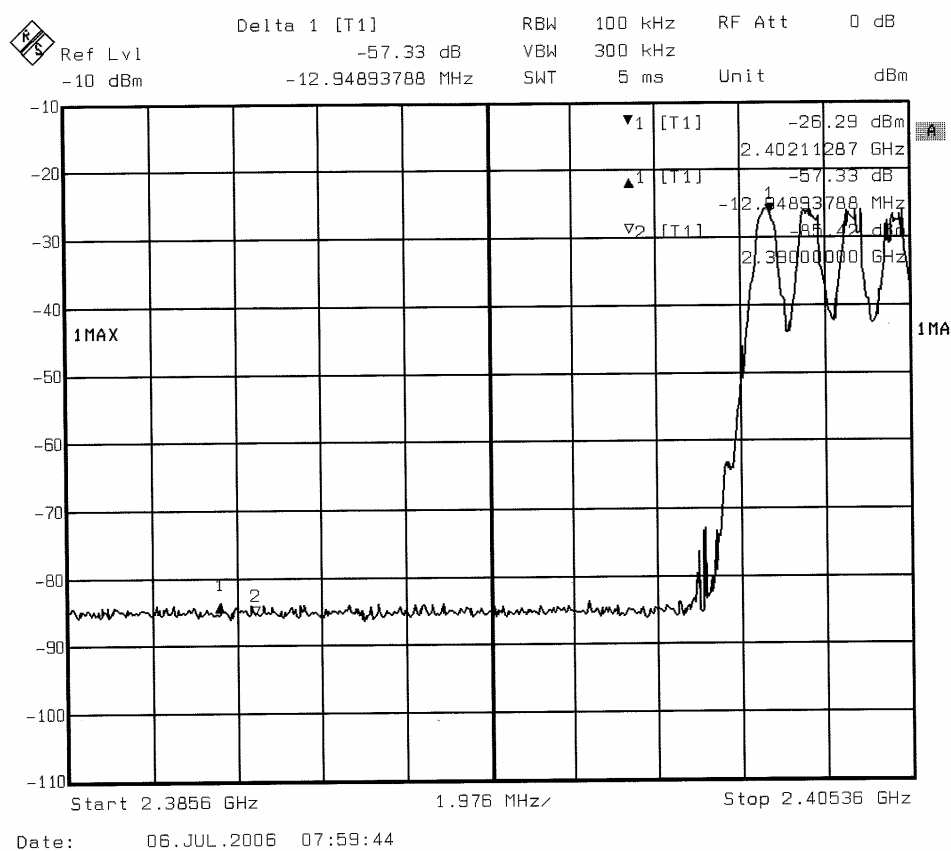
** According to step 3 of Marker-Delta Method:

Calculated Emission Level = Field Strength Level – Delta Marker Level

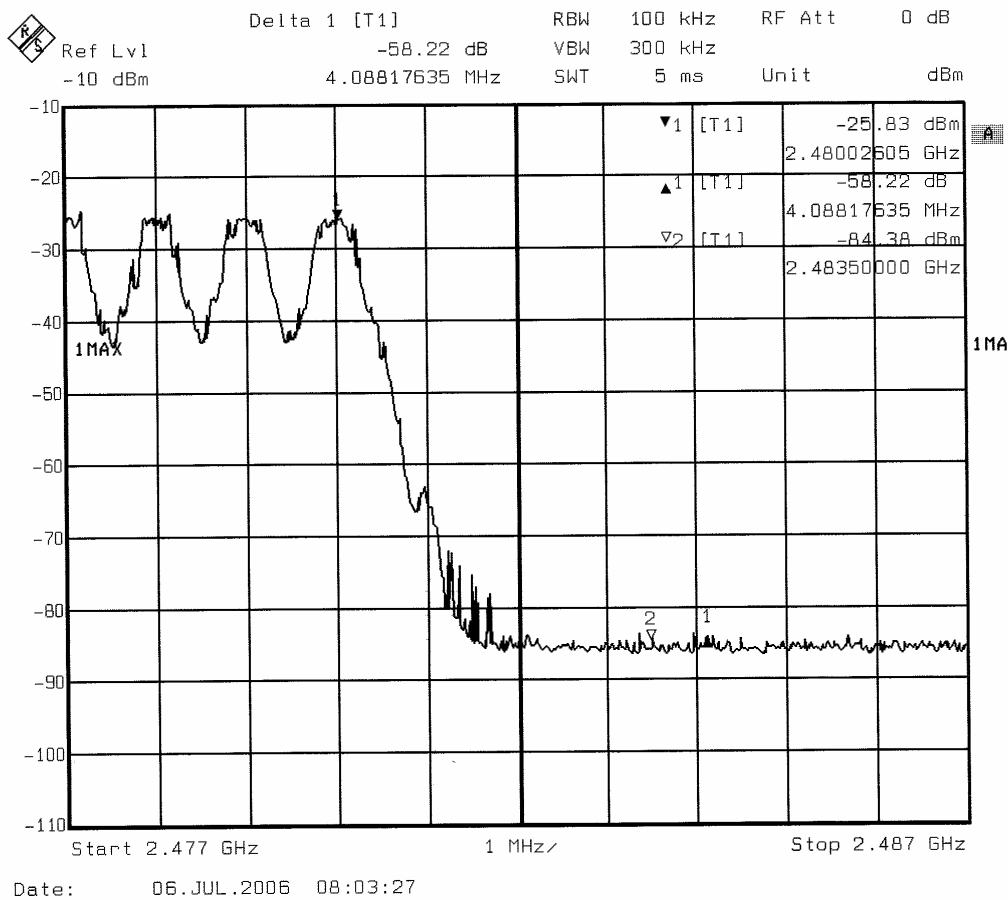
⁽¹⁾ the level is lower than the average limit (54 dB $\mu\text{V/m}$).

Test conclusion: RESPECTED PUBLIC NOTICE

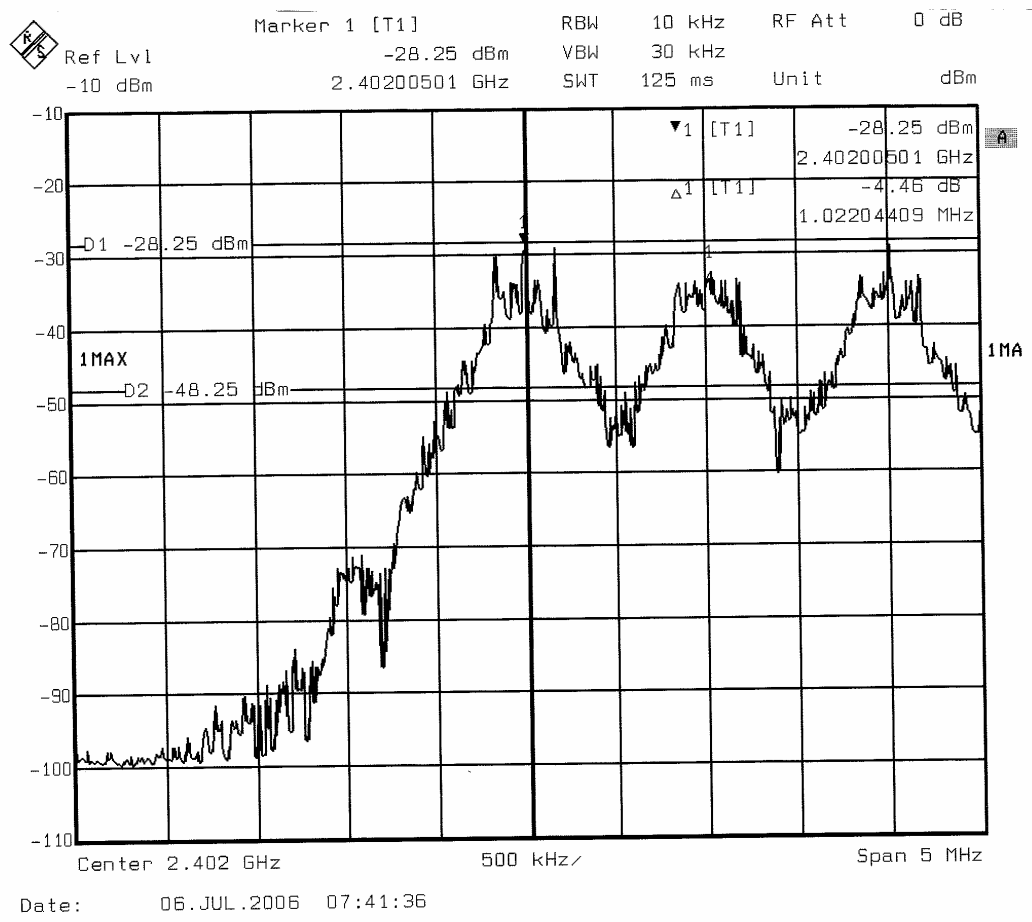
CURVE N° 5

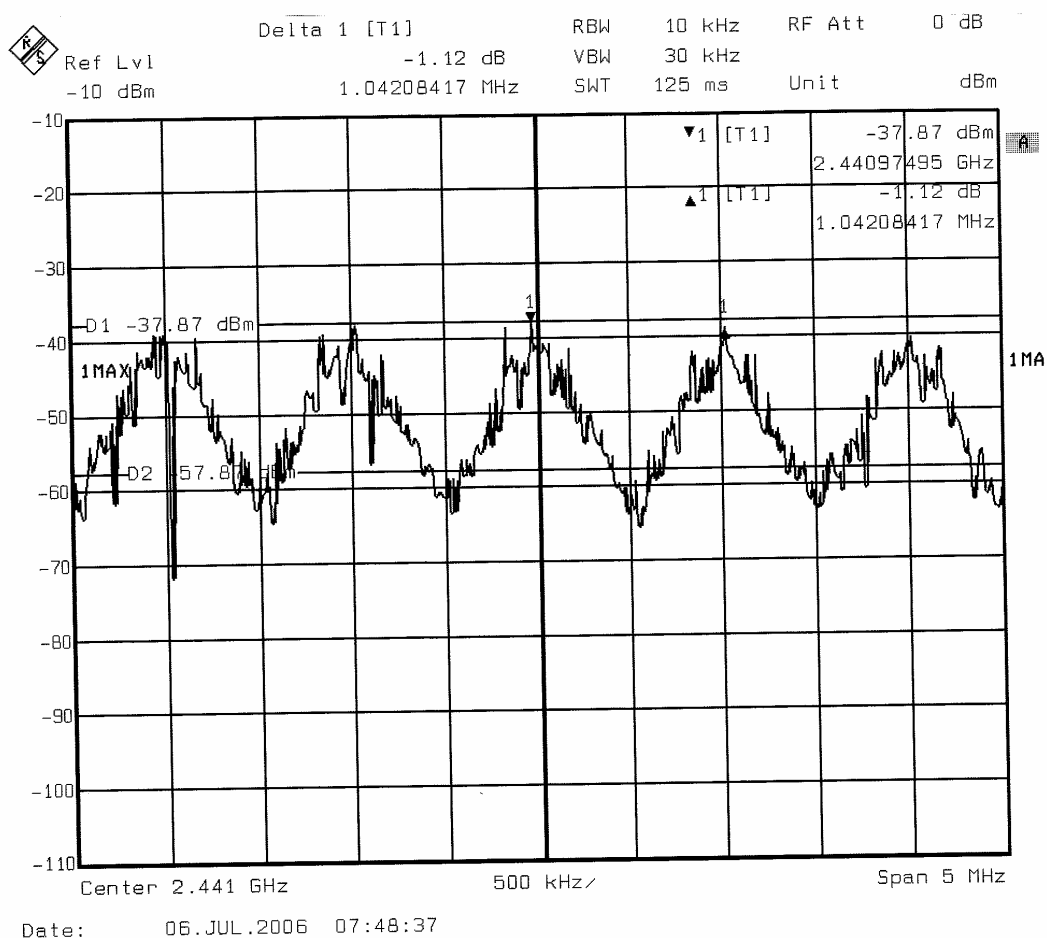


CURVE N° 6



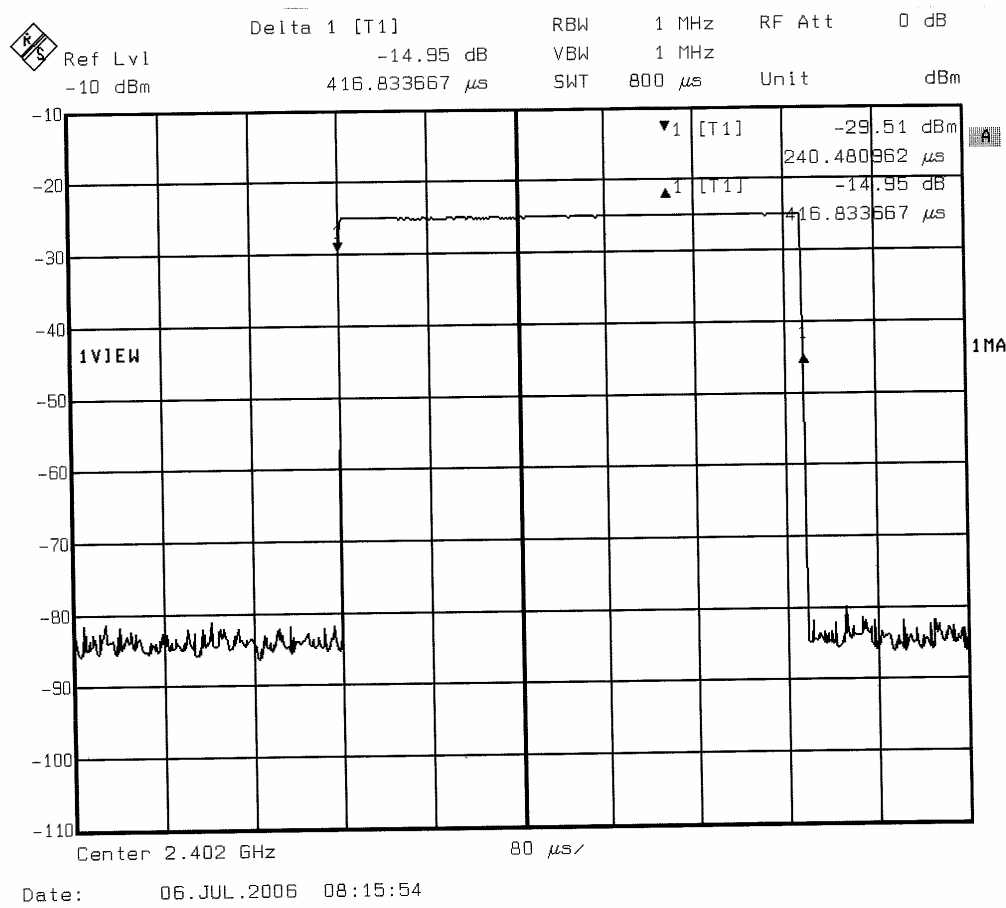
ANNEX 1: CHANNEL SEPARATION

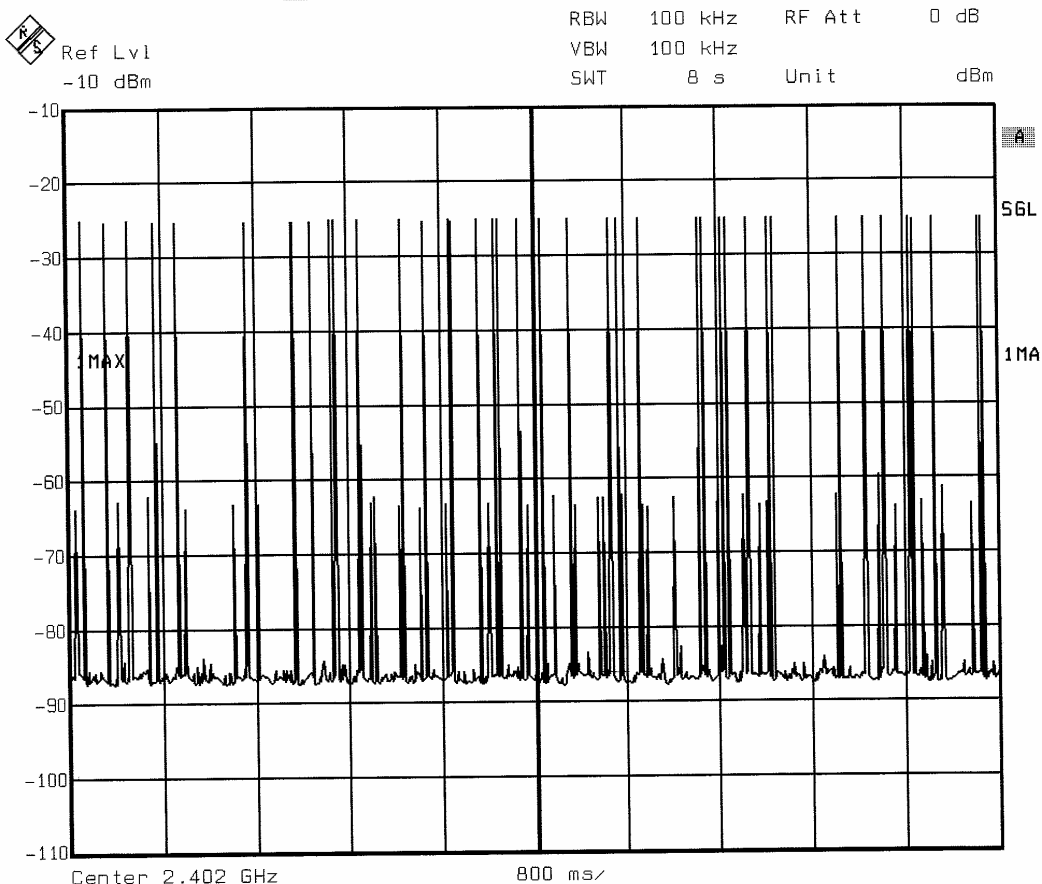




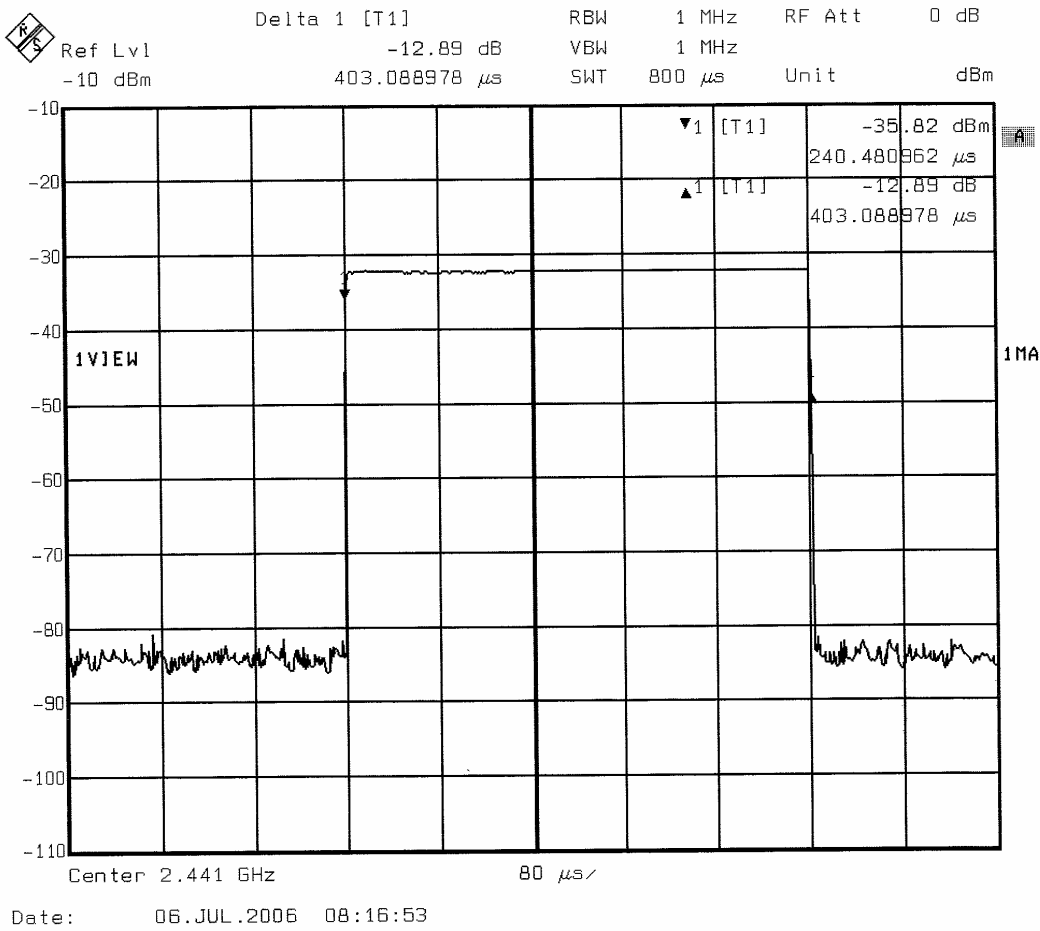


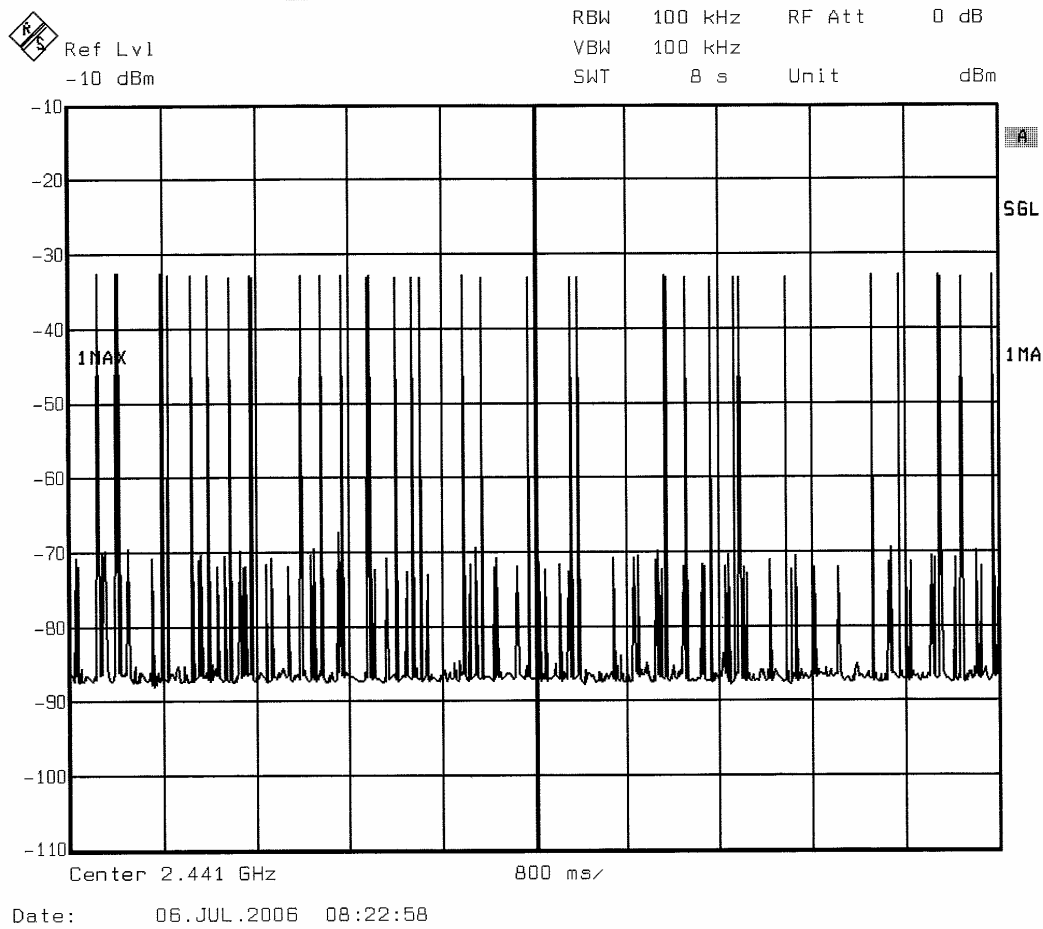
ANNEX 2: AVERAGE TIME OF OCCUPANCY ON ANY FREQUENCY

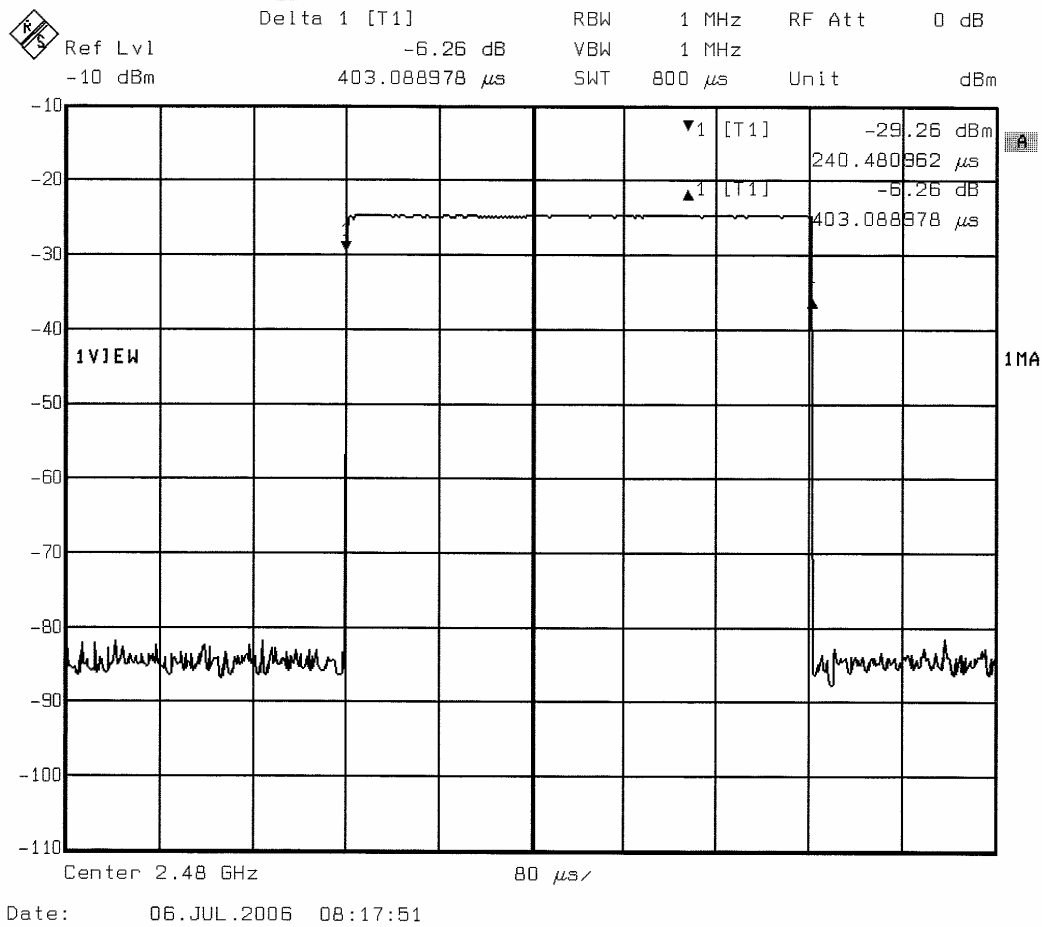


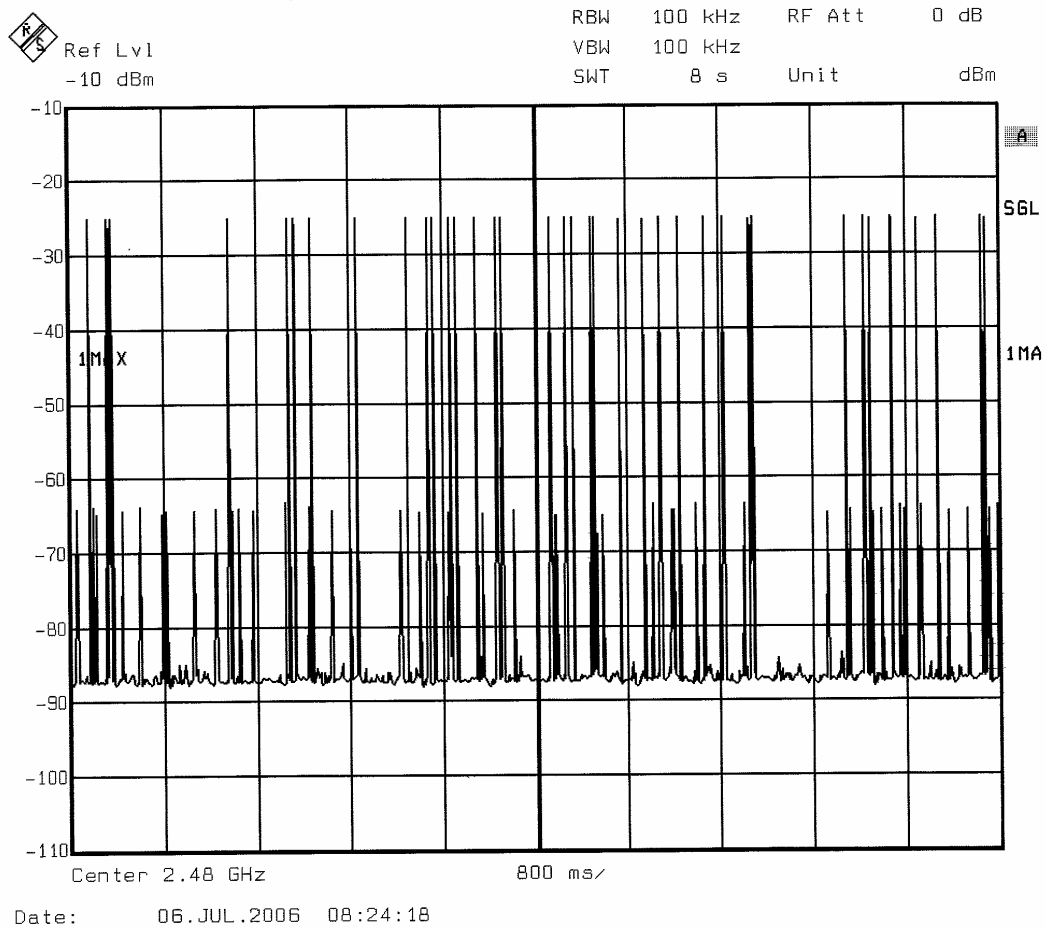


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ANNEX 3: PHOTOS OF THE EQUIPMENT UNDER TEST

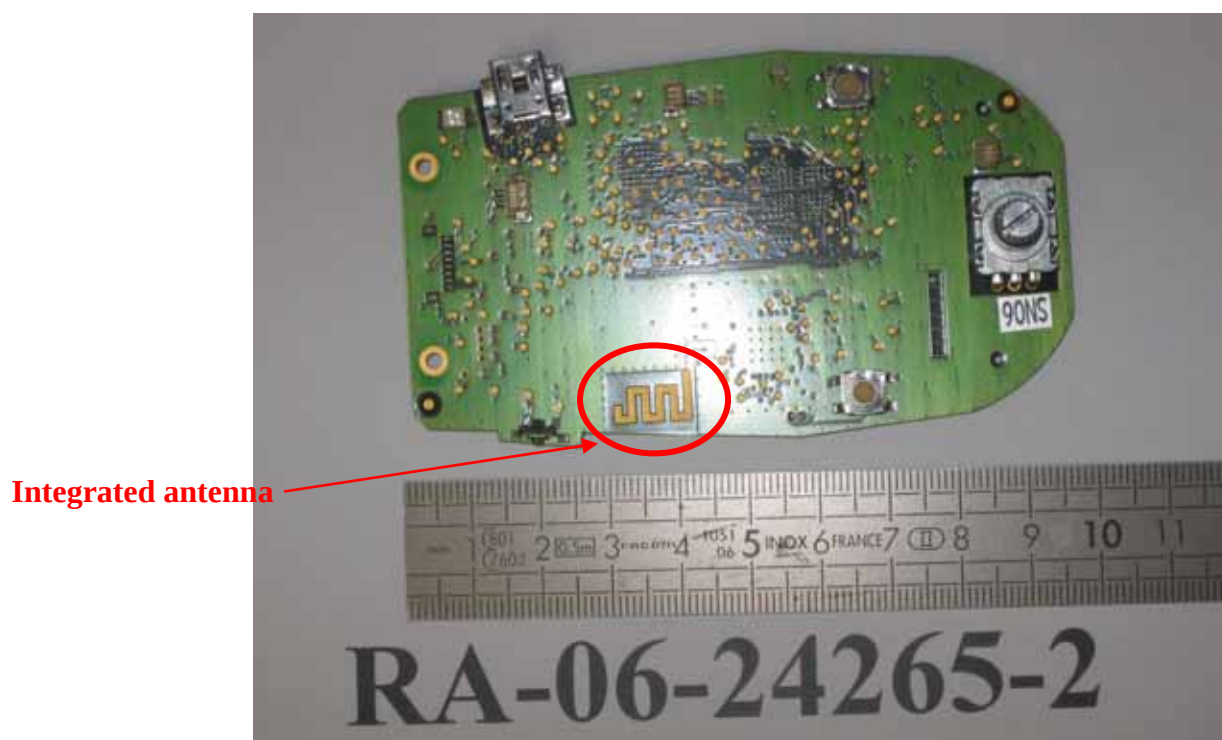
GENERAL VIEW



Printed circuit board: face 1



Printed circuit board: face 2



Integrated antenna

ANNEX 4: TEST SET UP

RADIATED MEASUREMENT



CONDUCTED MEASUREMENT



OPEN AREA TEST SITE

