



R051-24-09-105446-5/A Ed. 0

RADIO test report

**according to standard:
FCC Part 15**

**Equipment under test:
RELAY ANTENNA
ZBRA1**

**FCC ID:
Y7HZBRA1**

**Company:
SCHNEIDER ELECTRIC**

DISTRIBUTION: Mr BLANQUART

Company: SCHNEIDER ELECTRIC

Number of pages: 39 including 4 annexes

Ed.	Date	Modified pages	Written by		Technical Verification Quality Approval	
			Name	Visa	Name	Visa
0	3-Mar-11	Creation	M. DUMESNIL	M. D.		

Duplication of this document 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: RELAY ANTENNA

Reference / model: ZBRA1

Serial number: N°304 (modulated emission mode) sample n°1
N°287 (reception mode) sample n°3
N°297 (normal mode) sample n°4

MANUFACTURER: SCHNEIDER ELECTRIC

COMPANY SUBMITTING THE PRODUCT:

Company: SCHNEIDER ELECTRIC

Address: ZI N°3
BP 660
16340 L'ISLE D'ESPAGNAC
FRANCE

Responsible: Mr BLANQUART

DATE(S) OF TEST: 1 to 3 February 2011

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
EMITECH ATLANTIQUE open area test site in LA POUEZE (49)
FRANCE
FCC Registration Number: 101696/FRN: 0006 6490 08

TESTED BY: M. DUMESNIL

CONTENTS

TITLE	PAGE
1. INTRODUCTION.....	4
2. PRODUCT DESCRIPTION	4
3. NORMATIVE REFERENCE.....	4
4. TEST METHODOLOGY	5
5. ADD ATTACHMENTS FILES	5
6. TESTS AND CONCLUSIONS	6
6.1 unintentional radiator (subpart B)	6
6.2 intentional radiator (subpart C)	6
7. MEASUREMENT OF THE CONDUCTED DISTURBANCES.....	8
Measurement on the mains power supply:.....	9
Curve N° 1.....	10
Curve N° 2.....	11
8. RADIATED EMISSION LIMITS.....	12
9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS	14
Curve N° 3.....	16
Curve N° 4.....	17
Curve N° 5.....	18
Curve N° 6.....	19
Curve N° 7.....	21
Curve N° 8.....	22
Curve N° 9.....	23
Curve N° 10.....	24
10. MAXIMUM PEAK OUTPUT POWER	25
11. INTENTIONAL RADIATOR	27
12. PEAK POWER DENSITY.....	29
ANNEX 1: PHOTOS OF THE EQUIPMENT UNDER TEST	31
ANNEX 2: TEST SET UP	34
ANNEX 3: 6 dB BANDWIDTH.....	37
ANNEX 4: 20 dB BANDWIDTH.....	38

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: RELAY ANTENNA – ZBRA1 in accordance with normative reference.

2. PRODUCT DESCRIPTION

Number of samples used for the tests:

- sample N° 1: transmitter in modulated mode (N° 304)
- sample N° 3: receiver in reception mode (N° 287)
- sample N° 4: transceiver in normal mode (N° 297)

Class: B (residential environment)

Utilization: OFF control for "automation"

Antenna type and gain: integrated antenna, unknown gain

Operating frequency range: 2405 MHz

Number of channels: 1

Channel spacing: not concerned

Frequency generation: crystal

Modulation: GFSK

Power source: 24 Vd.c. or 110 Va.c.

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 (2010)	Radio Frequency Devices
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.
KDB Publication 558074 (2005)	Measurement of Digital Transmission Systems Operating under Section 15.247
Public Notice DA 00-705	Filing and Measurement Guideline for Frequency Hopping Spread Spectrum Systems.

4. TEST METHODOLOGY

Radio performance tests procedures given in part 15:

Subpart B –Unintentional Radiators

Paragraph 107: Conducted limits

Paragraph 109: Radiated emission limits

Paragraph 111: Antenna power conduction limits for receivers

Subpart C – Intentional Radiators

Paragraph 203: Antenna requirement

Paragraph 205: Restricted bands of operation

Paragraph 207: Conducted limits

Paragraph 209: Radiated emission limits; general requirements

Paragraph 212: Modular transmitter

Paragraph 215: Additional provisions to the general radiated emission limitations

Paragraph 247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 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

6.1 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.107	CONDUCTED LIMITS	X				
FCC Part 15.109	RADIATED EMISSION LIMITS	X				
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable

NAs: Not Asked

6.2 intentional radiator (subpart C)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				<i>Note 1</i>
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				<i>Note 2</i>
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) <i>Alternative to general radiated emission limits</i>	X				
	(b) <i>Unwanted emissions outside of §15.247 frequency bands</i>	X				<i>Note 3</i>
	(c) <i>20 dB bandwidth and band-edge compliance</i>	X				<i>Note 4</i>
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) <i>Hopping systems</i>			X		
	(a) (2) <i>Digital modulation techniques</i>	X				<i>Note 5</i>
	(b) <i>Maximum peak output power</i>	X				<i>Note 6</i>
	(c) <i>Operation with directional antenna gains > 6 dBi</i>			X		
	(d) <i>Intentional radiator</i>	X				
	(e) <i>Peak power spectral density</i>	X				
	(f) <i>Hybrid system</i>			X		
	(g) <i>Frequency hopping requirements</i>			X		
	(h) <i>Frequency hopping intelligence</i>			X		
	(i) <i>RF exposure compliance</i>	X				<i>Note 7</i>

NAp: Not Applicable

NAs: Not Asked

Note 1: integral antenna. Professionally installed equipment.

Note 2: see FCC part 15.247 (d).

Note 3: see FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

Note 4: the 20 dB bandwidth of the equipment is 4040 kHz in 120 Va.c. and 3980 kHz in 24 Vd.c. (see annex 4).

Note 5: the minimum 6 dB bandwidth of the equipment is 1680 kHz in 24 Vd.c. (see annex 3).

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

Note 7: this equipment uses less than 0.5 W of output power with a high signal transmitting duty factor (section 3 from Oet 65c).

Conclusion:

The sample of RELAY ANTENNA – ZBRA1 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: Paragraph 15.107/207

Test equipments:

TYPE	MANUFACTURER	EMITECH NUMBER
AC Power supply ALT 2000	K. SERRAS	2441
Test receiver ESH3	Rohde & Schwarz	1058
Pulse limiter ESH3-Z2	Rohde & Schwarz	0976
Artificial main network L3-25	PMM	0834
Spectrum analyzer 8594E	Hewlett Packard	1030
Transient limiter 11947A	Hewlett Packard	1092

Software used: BAT-EMC V 3.5.0.2

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.

The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.

See photos in annex 2.

Equipment under test operating condition:

The equipment under test alternates between reception and transmission mode.

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak

Bandwidth: 10 kHz (Peak)

Results:

Sample N° 4:

Measurement on the mains power supply:

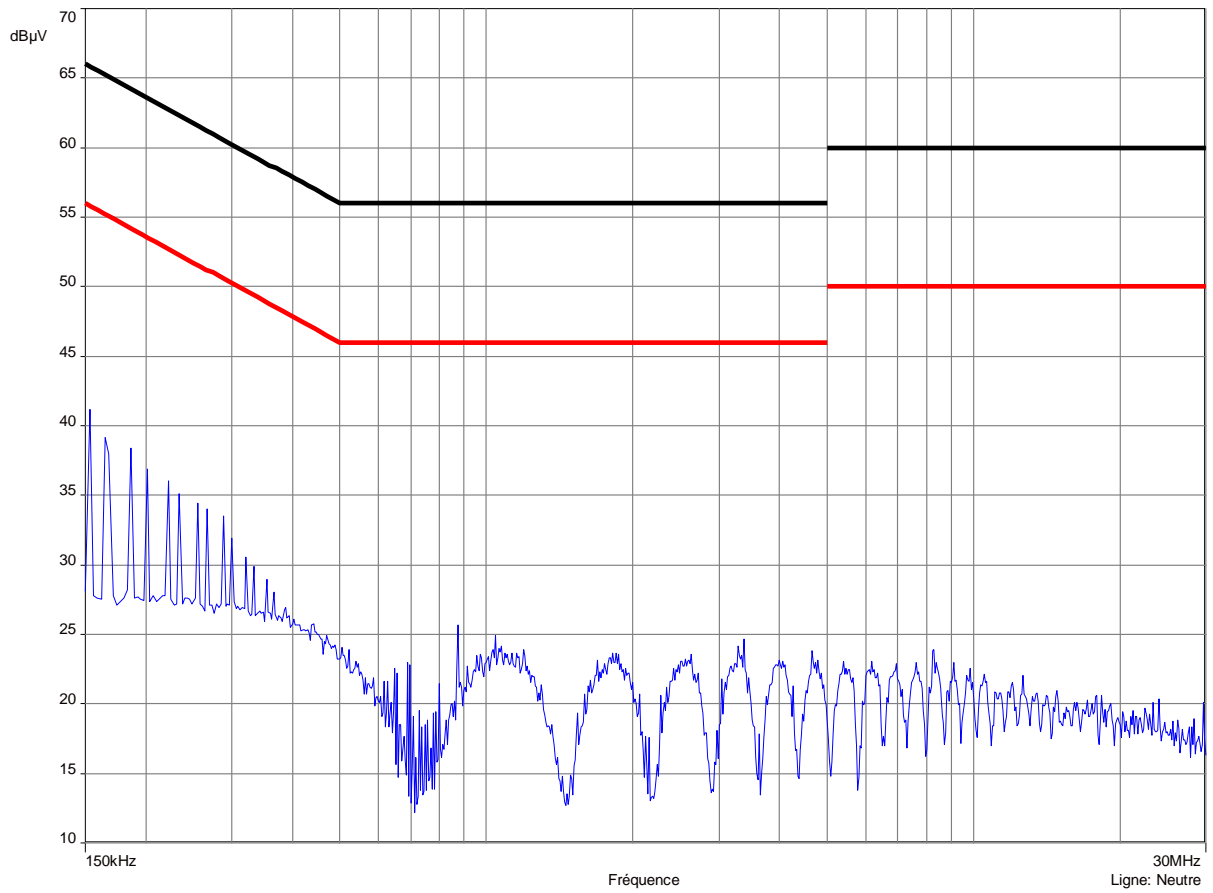
The measurement is made with peak detector.

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

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

CURVE N° 1.

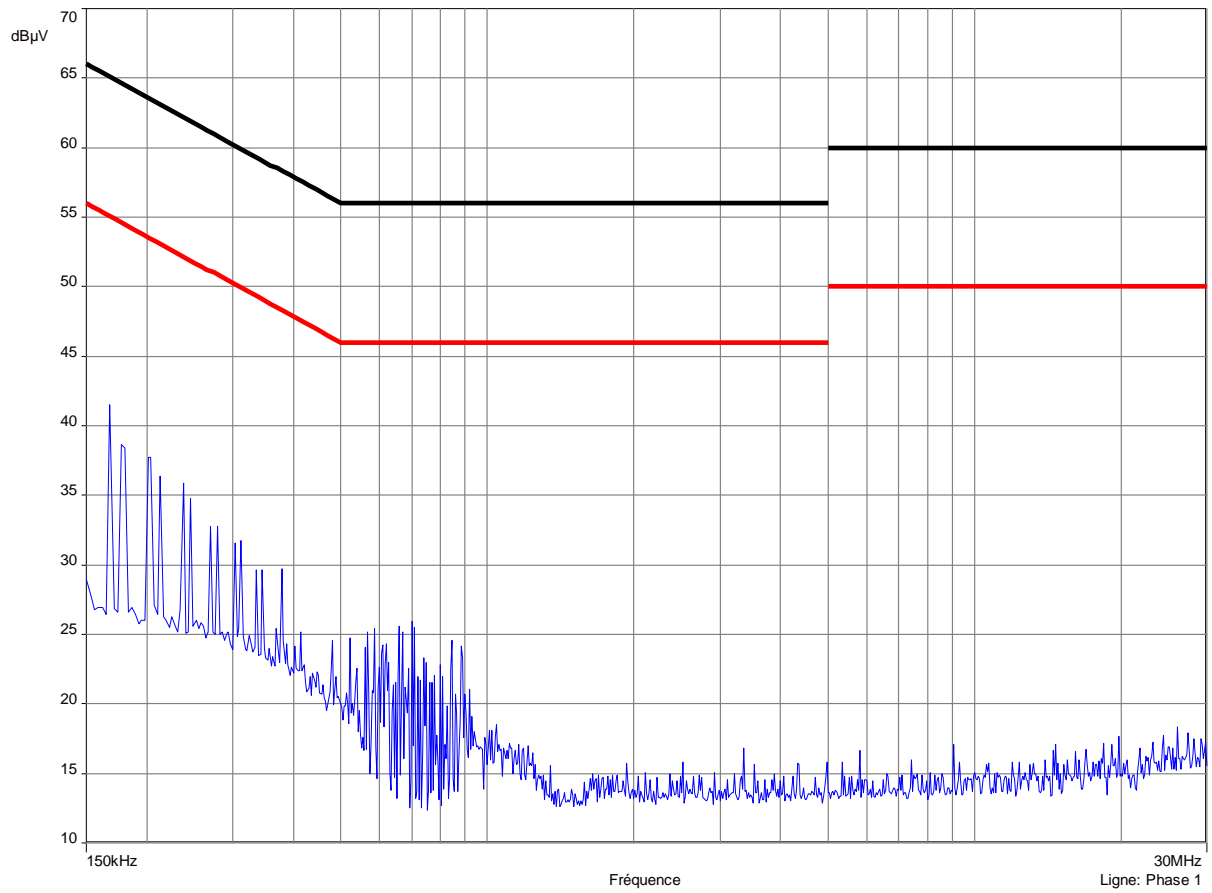
Measurement on the Neutral (120 Va.c) with peak detection



RBW filter: 10 kHz
 VBW filter: 10 kHz
 Sweep time: 500 ms/MHz

CURVE N° 2.

Measurement on the Line (120 Va.c) with peak detection



RBW filter: 10 kHz
 VBW filter: 10 kHz
 Sweep time: 500 ms/MHz

Test conclusion:

RESPECTED STANDARD

8. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: paragraph 109

Limit class: Class B

Test equipments:

TYPE	BRAND	EMITECH NUMBER
Test receiver	Rohde & Schwarz ESH3	1058
Test receiver	Rohde & Schwarz ESVS10	1219
Spectrum analyzer	Rohde & Schwarz FSP40	4088
Loop antenna	EMCO 6502	1406
Biconical antenna	Hewlett Packard 11966 C	0728
Log periodic antenna	Rohde & Schwarz HL 223	1999
Antenna RGA-60	Electrometrics	1204
Low noise amplifier 1 to 18 GHz	ALC	2648
High pass filter	Micro-tronics HPM11630	6609
Open area test site	EMITECH	1274
Power source 6303 DS	FI	4363
Multimeter	Fluke 77-2	0812
Variac	Dereix R213	1419
Low noise amplifier 2 to 18 GHz	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Meteo Station meteostar	Bioblock scientific	0943

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 azimuths correspond to the front of the equipment under test.

See photos in annex 2.

Frequency range: From 9 kHz to 5th harmonic of the highest frequency used (2405 MHz).

Detection mode: Quasi-peak (F < 1 GHz) Average (F > 1 GHz)

Bandwidth: 120 kHz (F < 1 GHz) 1 MHz (F > 1 GHz)

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment is blocked in continuous reception mode.

Results:

Ambient temperature (°C): 15.5
 Relative humidity (%): 50

Sample N°3:

Power supply: 110 Va.c through a variac

FREQUENCIES (MHz)	Detector Av: Average QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4810	Av	239	0	1000	H	42.32	54	11.68

Sample N°3:

Power supply: 24 Vd.c

FREQUENCIES (MHz)	Detector Av: Average QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4810	Av	238	0	1000	H	42.26	54	11.74

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Standard: FCC Part 15

Test procedure: Paragraph 15.215

Test equipments:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP7	Rohde & Schwarz	6796
Antenna RGA-60	Electrometrics	1204
Power source 6303DS	FI	4363
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419

Test set up:

Test realized in near field. All field strength measurements are correlated with the radiated maximum peak output power.

Test operating condition of the equipment:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 24
Relative humidity (%): 42

Sample N° 1:

Power supply: 110 V.a.c. through a variac
Lower Band Edge: from 2310 MHz to 2390 MHz
Upper Band Edge: from 2483.5 MHz to 2500 MHz

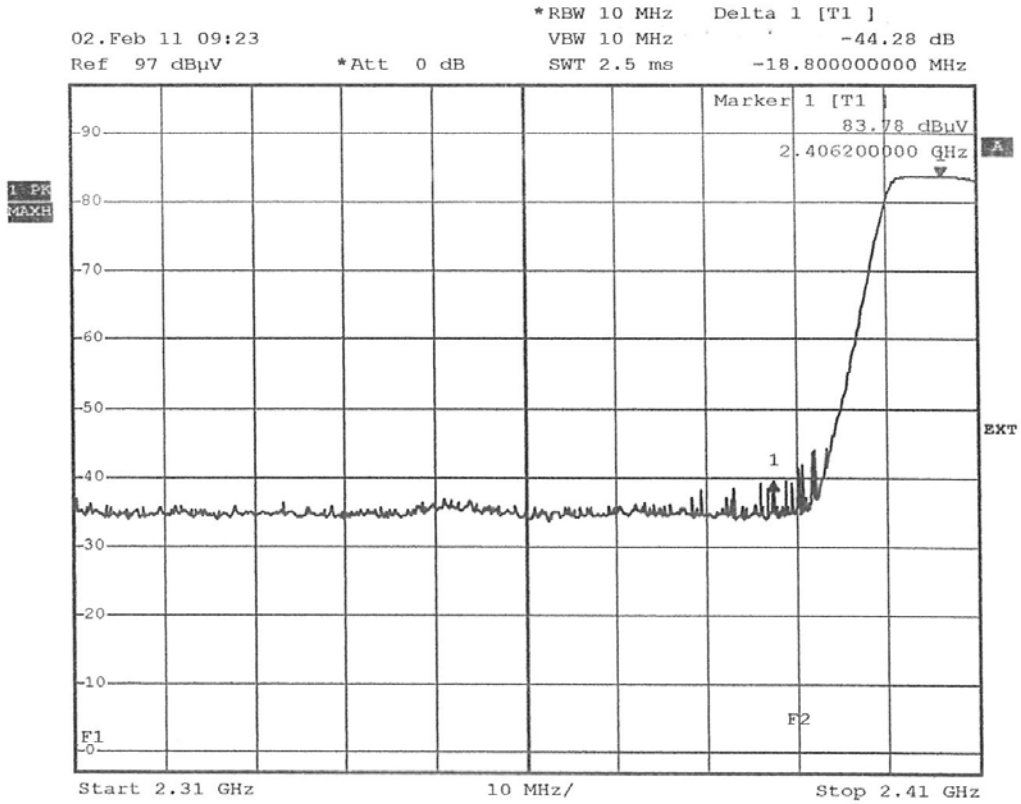
Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2406.2	97.57 (10 MHz)	Peak	2387.4	-44.28	53.29**	74	20.71
2405.6	93.15 (100 kHz)	Peak	2376.8	-50.78	42.37**	74	31.63
2405.2	97.57 (10 MHz)	Peak	2485.6	-47.15	50.42**	74	23.58
2404.6	93.15 (100 kHz)	Peak	2496.6	-49.52	43.63**	74	30.37

* *Marker-Delta method*

** *The peak level is lower than the average limit (54 dB μ V/m).*

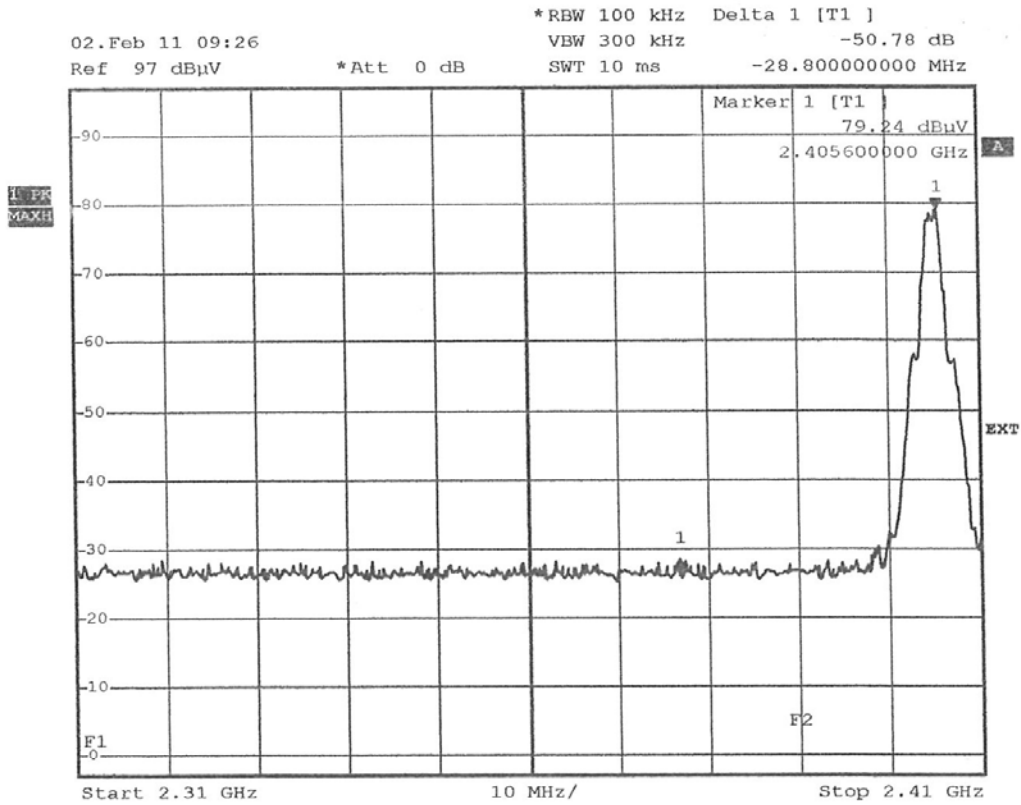
See curve n° 3 to curve n° 6 on the following pages.

CURVE N° 3.



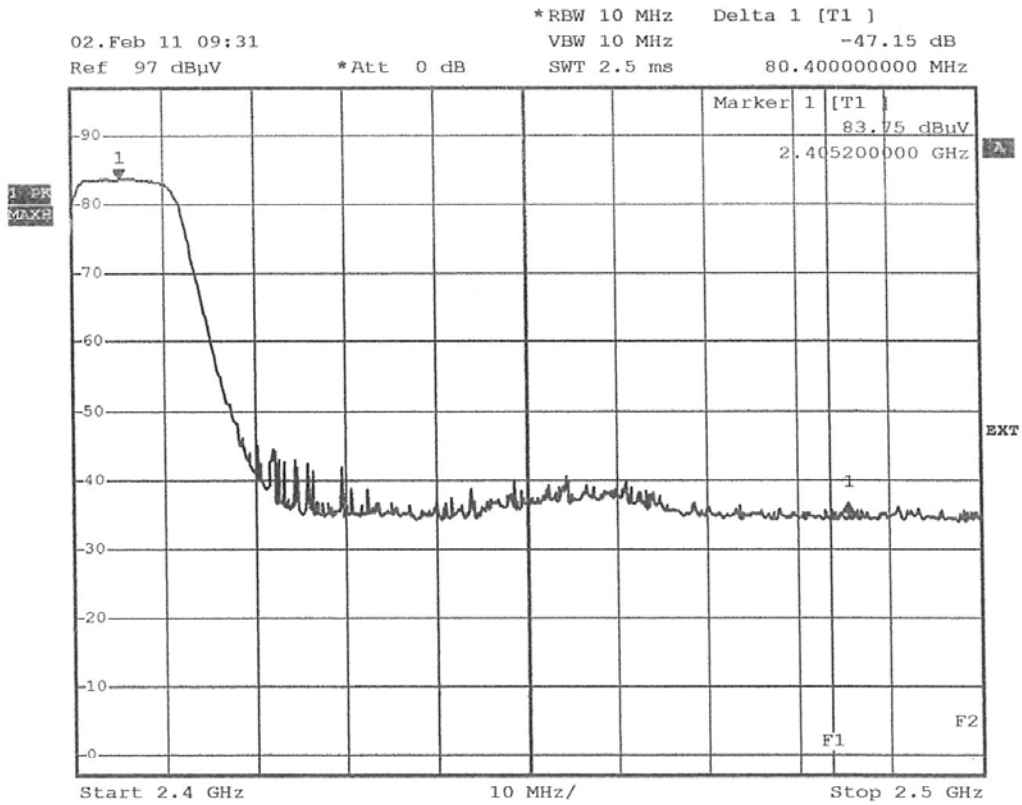
Date: 2.FEB.2011 09:23:45

CURVE N° 4.



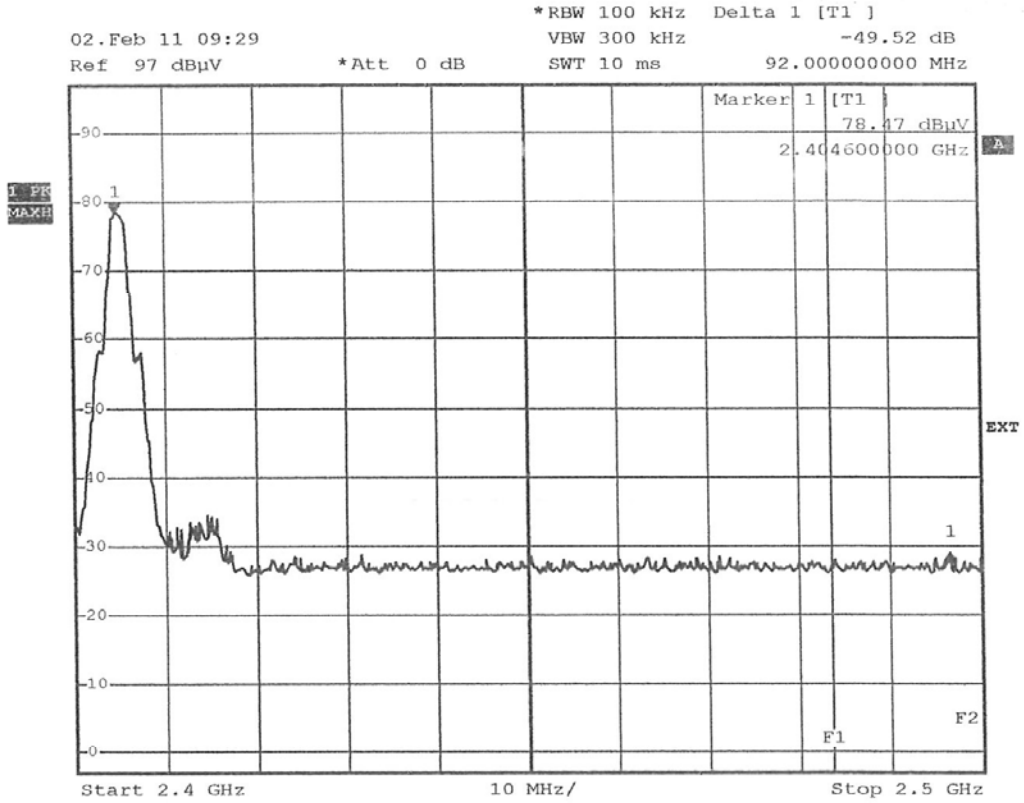
Date: 2.FEB.2011 09:26:15

CURVE N° 5.



Date: 2.FEB.2011 09:31:33

CURVE N° 6.



Date: 2.FEB.2011 09:29:48

Sample N° 1:

Power supply: 24 Vd.c. by an external power source

Lower Band Edge: from 2310 MHz to 2390 MHz

Upper Band Edge: from 2483.5 MHz to 2500 MHz

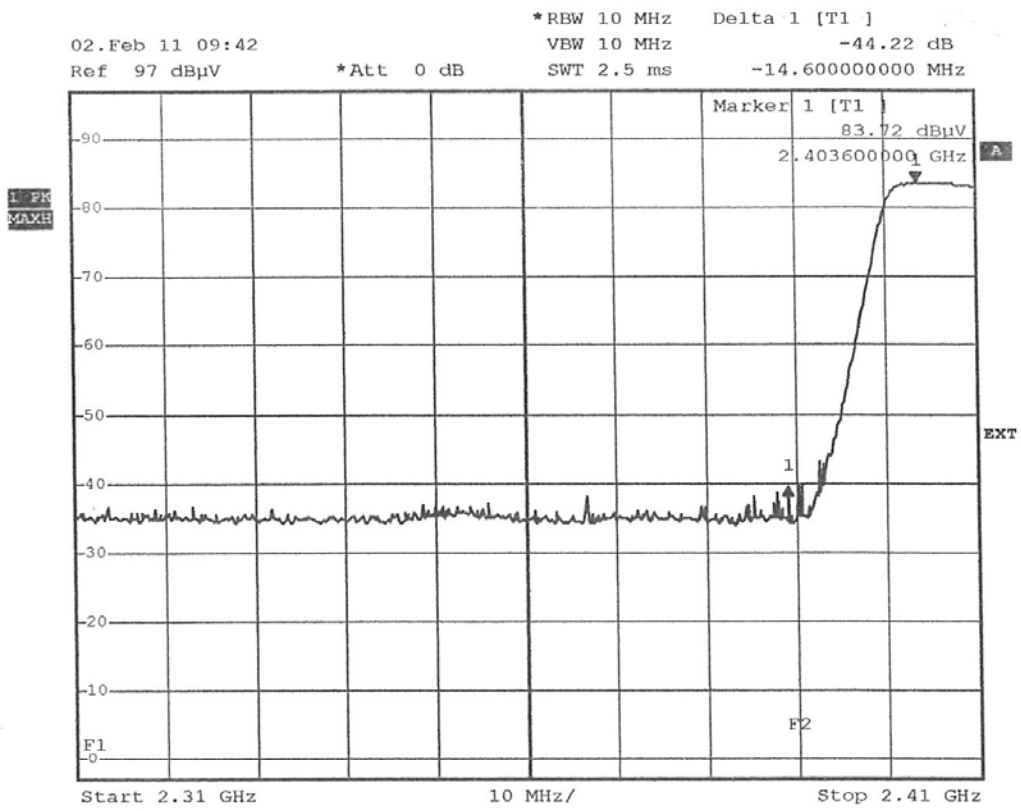
Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2403.6	97.81 (10 MHz)	Peak	2389	-44.22	53.59**	74	20.41
2405	93.71 (100 kHz)	Peak	2326	-49.34	44.37**	74	29.63
2403.6	97.81 (10 MHz)	Peak	2488	-46.54	51.27**	74	22.73
2404.6	93.71 (100 kHz)	Peak	2484.8	-49.69	44.02**	74	29.98

* Marker-Delta method

** The peak level is lower than the average limit (54 dB μ V/m).

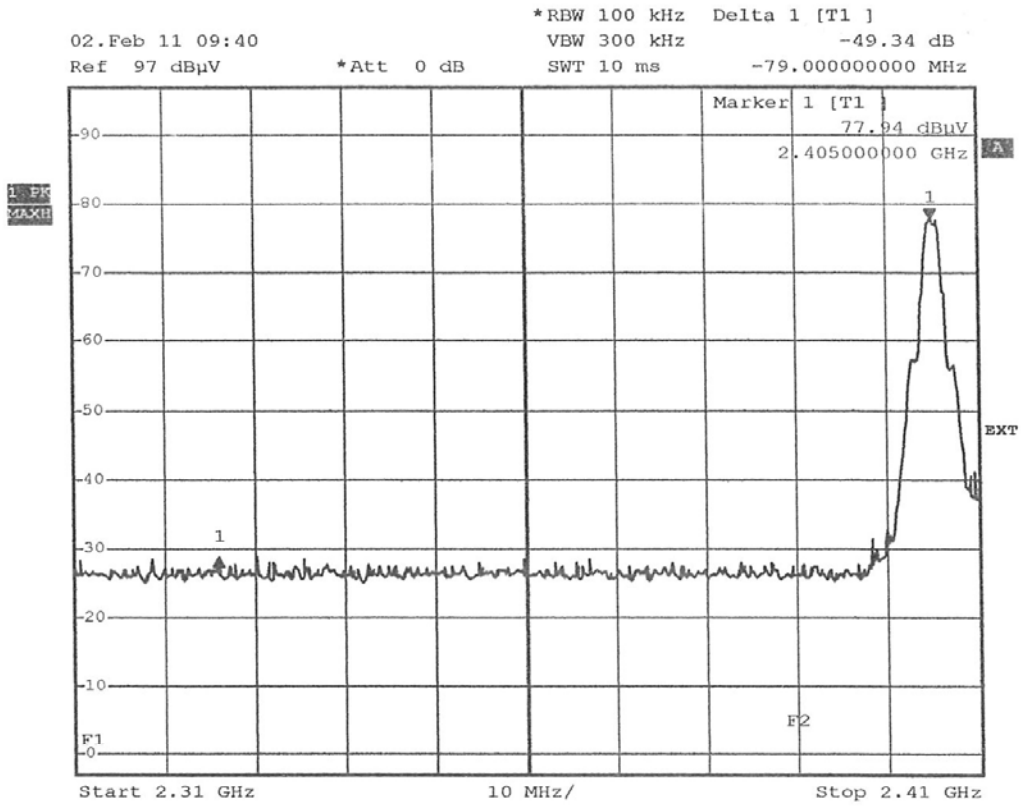
See curve n° 7 to curve n° 10 on the following pages.

CURVE N° 7.



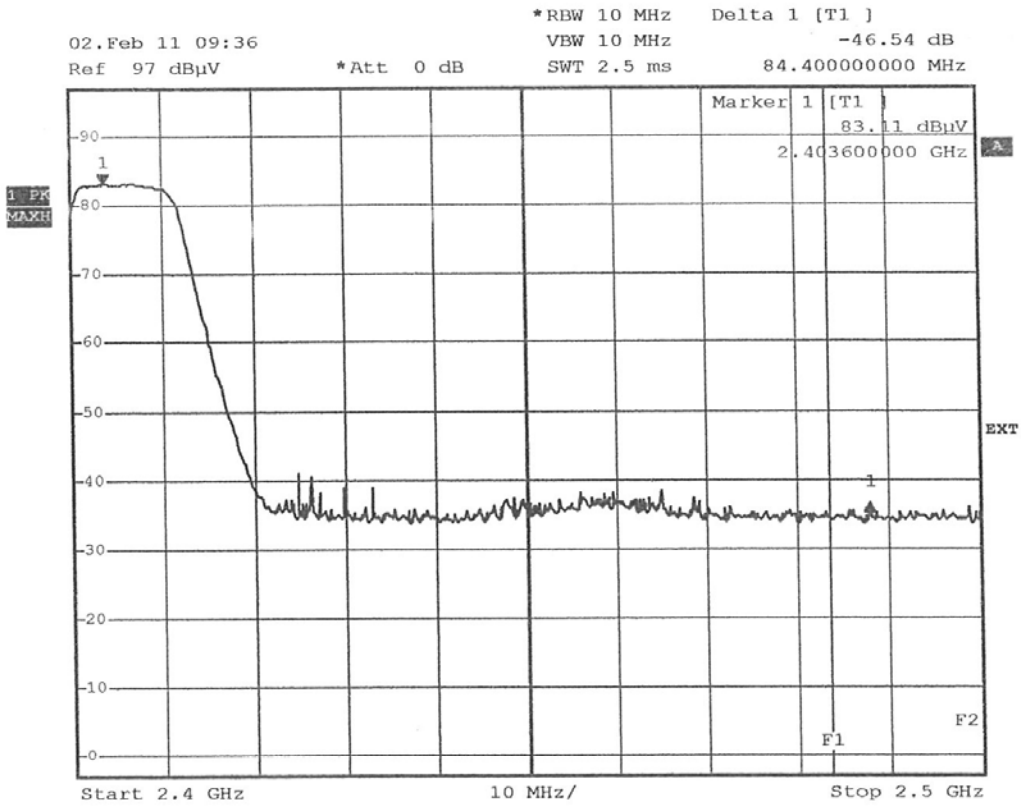
Date: 2.FEB.2011 09:42:31

CURVE N° 8.



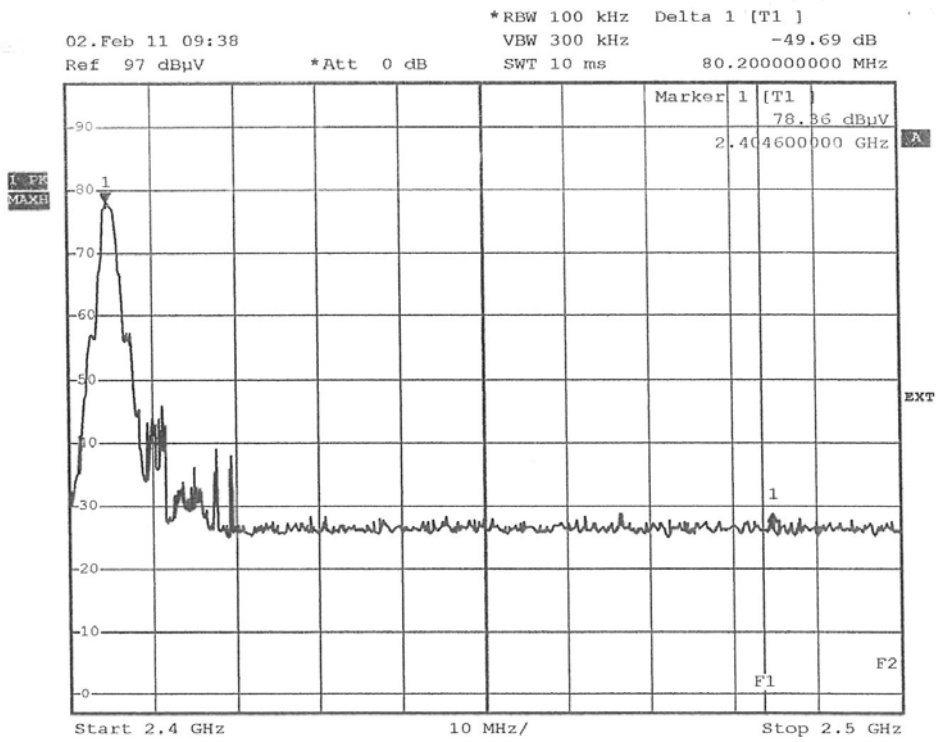
Date: 2.FEB.2011 09:40:49

CURVE N° 9.



Date: 2.FEB.2011 09:37:00

CURVE N° 10.



Date: 2.FEB.2011 09:38:52

Test conclusion:

RESPECTED STANDARD

10. MAXIMUM PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)

Test equipments:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Antenna RGA-60	Electrometrics	1204
Open area test site	EMITECH	1274
Power source 6303DS	FI	4363
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419
Meteo station meteostar	Bioblock Scientific	0943

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. The measuring distance between the equipment and the test antenna is 3 m. The test antenna has been oriented in the two polarizations, we have recorded only the highest level.

A measurement of the electro-magnetic field is realized, with a resolution bandwidth and video bandwidth adjusted at 10 MHz.

Distance of antenna: 3 meters

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 15
 Relative humidity (%): 51

Sample N° 1

Power supply: 110 Va.c. through a variac

		Level dBµV	Cable loss dB	Antenna factor dB	Electro-magnetic field (dBµV/m):	P* (W)	Limit (W)
Normal test conditions	Nominal power source (V): 110	63.49	5.46	28.62	97.57	1.714×10^{-3}	125×10^{-3}

Polarization of test antenna: vertical (height: 100 cm)

Position of equipment: see photos in annex 2 (azimuth: 350 degrees)

Sample N° 1

Power supply: 24 Vd.c. by an external power source

		Level dBµV	Cable loss dB	Antenna factor dB	Electro-magnetic field (dBµV/m):	P* (W)	Limit (W)
Normal test conditions	Nominal power source (V): 24	63.73	5.46	28.62	97.81	1.812×10^{-3}	125×10^{-3}

Polarization of test antenna: vertical (height: 100 cm)

Position of equipment: see photos in annex 2 (azimuth: 12 degrees)

* $P = (E \times d)^2 / (30 \times G_p)$ with $d = 3 \text{ m}$ and $G_p = 1$

Test conclusion:

RESPECTED STANDARD

11. INTENTIONAL RADIATOR

Standard: FCC Part 15

Test procedure: paragraph 15.205
 paragraph 15.209
 paragraph 15.247 (d)

Test equipments:

TYPE	MANUFACTURER	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS10	Rohde & Schwarz	1219
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna HP11966 C	Hewlett Packard	0728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Antenna RGA 60	Electrometrics	1204
Low-noise amplifier 2 to 18 GHz	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Open area test site	EMITECH	1274
Power source 6303DS	FI	4363
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419
Meteo Station meteostar	Bioblock Scientific	0943

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 10th harmonic of the highest fundamental frequency.

Bandwidth: 120 kHz (F < 1 GHz) or 100 kHz, following 15.205 or 15.247
 1 MHz (F > 1 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, only the highest level is recorded.

Equipment under test operating condition:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 15.5
 Relative humidity (%): 51

Sample N° 1

Power supply: 110 Va.c. through a variac

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4810	P	239	110	1000	V	51	74*	23
4810	Av	239	110	1000	V	40.06	54*	13.94

Sample N° 1

Power supply: 24 Vd.c. by an external power source

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)
4810	P	243	113	1000	H	50.76	74*	23.24
4810	Av	243	113	1000	H	40.33	54*	13.67

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

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency 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 93.71 dBµV/m.

So the applicable limit is 73.71 dBµV/m.

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

Test conclusion:

RESPECTED STANDARD

12. PEAK POWER DENSITY

Standard: FCC Part 15

Test procedure: paragraph 15.247 (e)

Test equipments:

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Antenna RGA 60	Electrometrics	1204
Open area test site	EMITECH	1274
Power source 6303DS	FI	4363
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419
Meteo station meteostar	Bioblock Scientific	0943

Test set up:

We used the same method of the peak output power measurement, but the equipment under test power level is recorded with the spectrum analyzer.

Resolution bandwidth: 3 kHz

Video bandwidth: 10 kHz

Test operating condition of the equipment:

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 15
 Relative humidity (%): 51

Sample N° 1

Power supply: 110 Va.c. through a variac

	Peak power density at frequency: 2405 MHz
Normal test conditions	-13.29
Limits	+8 dBm

Polarization of test antenna: vertical (height: 100 cm)
 Position of equipment: see photos in annex 2 (azimuth: 350 degrees)

Sample N° 1

Power supply: 24 Vd.c. by an external power source

	Peak power density at frequency: 2405 MHz
Normal test conditions	-11.40
Limits	+8 dBm

Polarization of test antenna: vertical (height: 100 cm)
 Position of equipment: see photos in annex 2 (azimuth: 12 degrees)

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 4 annexes to be forwarded □□□

ANNEX 1: PHOTOS OF THE EQUIPMENT UNDER TEST

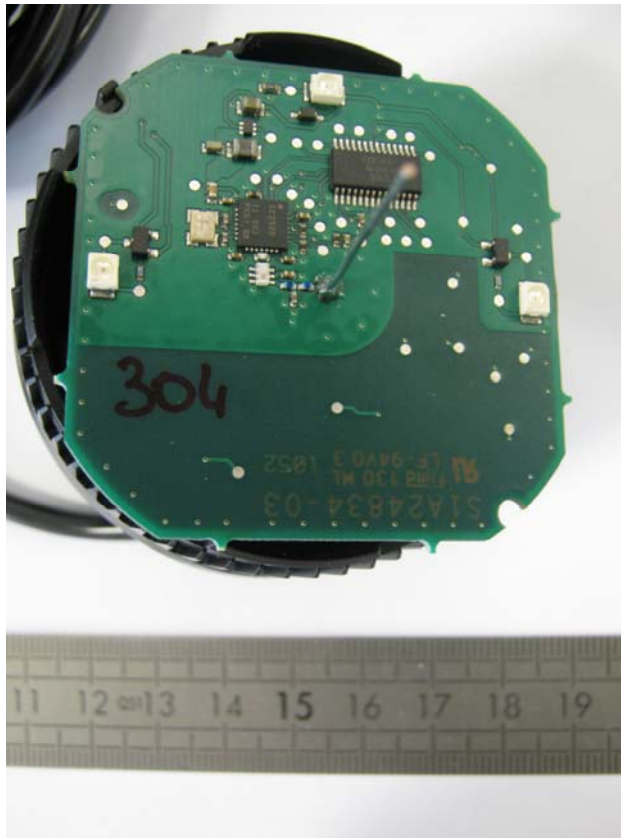
GENERAL VIEW



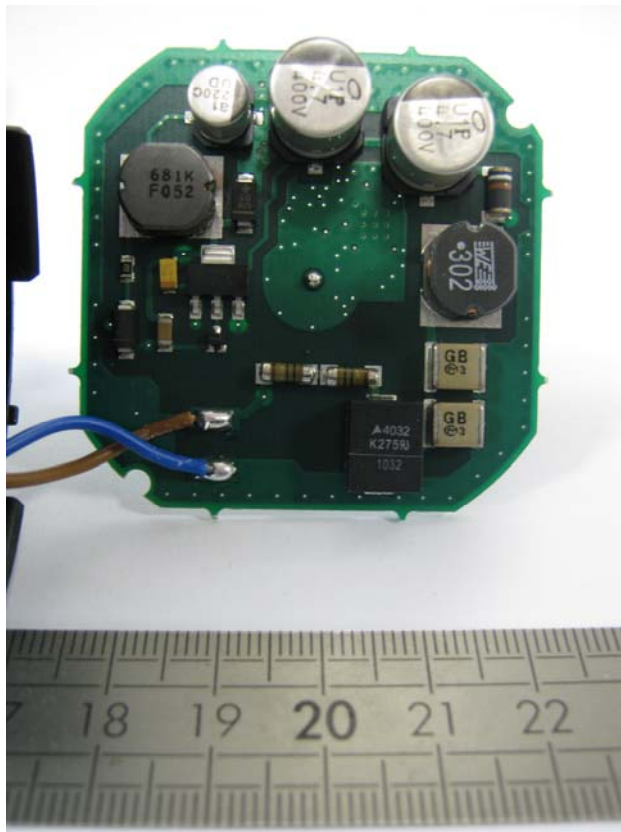
INTERNAL VIEW



PRINTED CIRCUIT BOARD: FACE 1



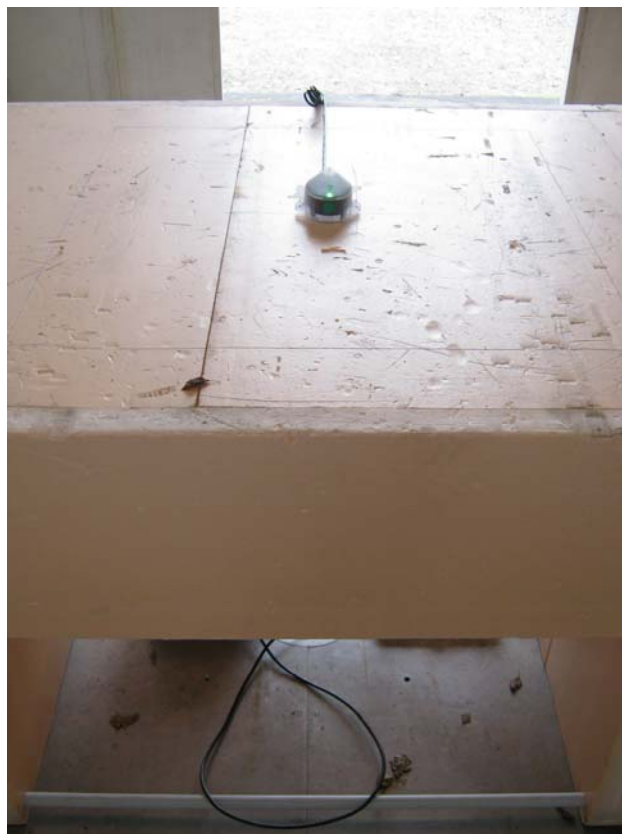
PRINTED CIRCUIT BOARD: FACE 2



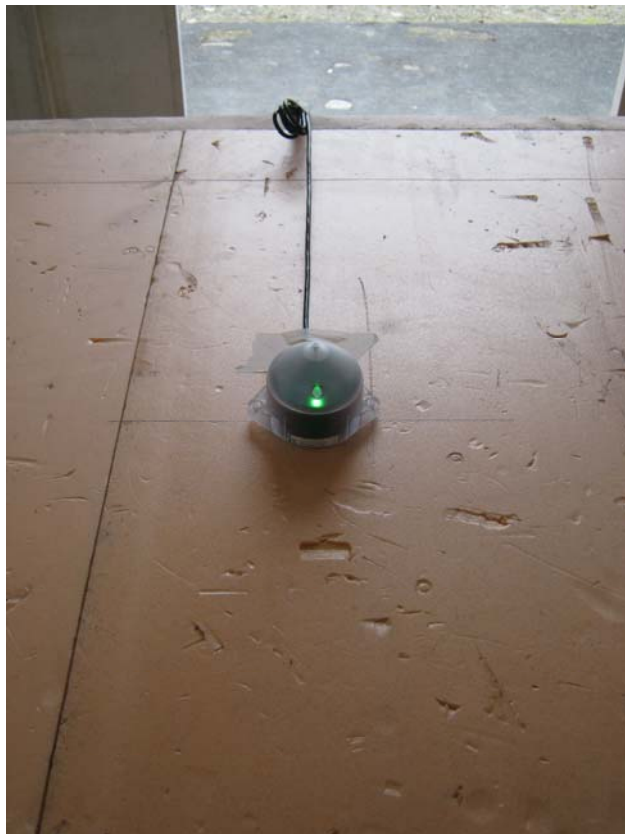
ANNEX 2: TEST SET UP

RADIATED MEASUREMENTS

ALIM DC



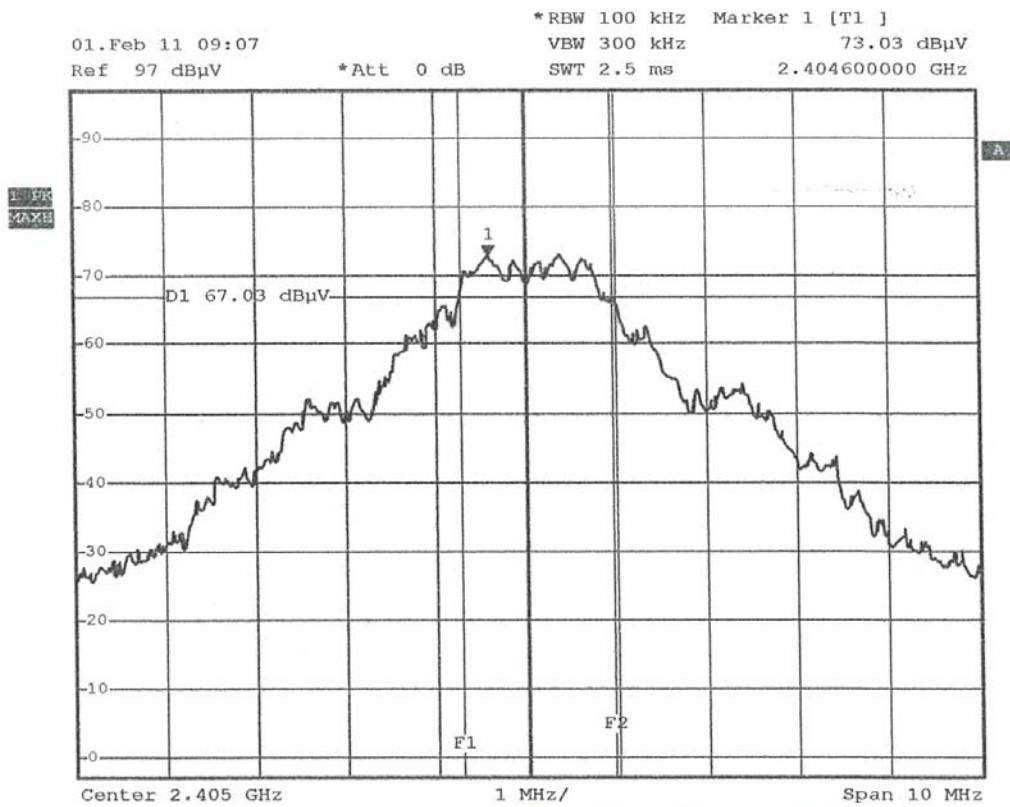
ALIM AC



CONDUCTED MEASUREMENTS



ANNEX 3: 6 dB BANDWIDTH



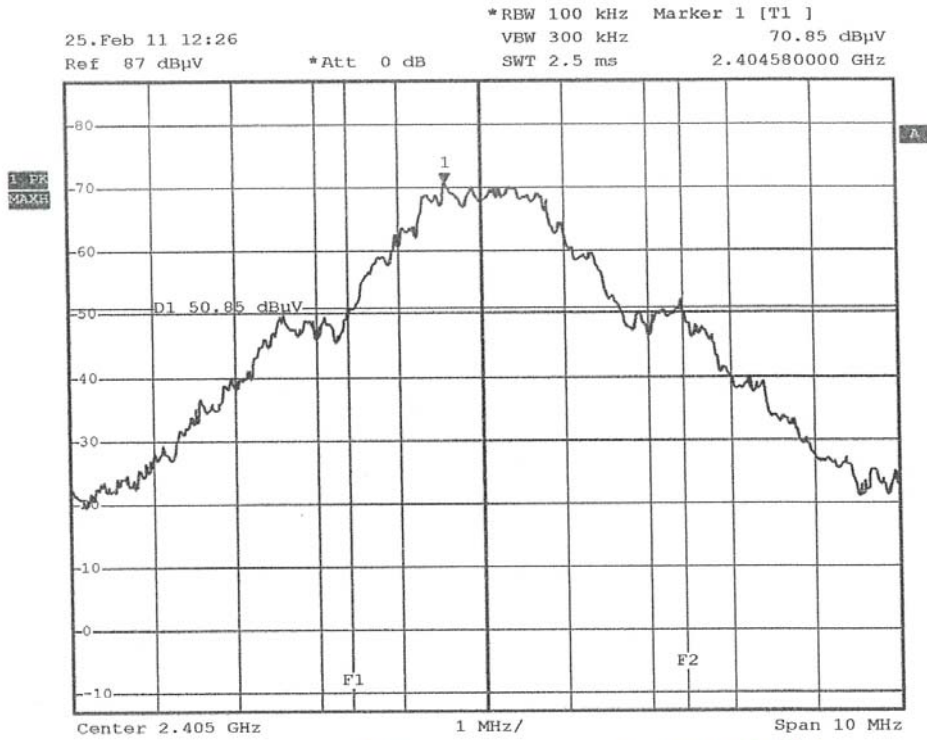
$F_1 = 2404,23 \text{ MHz}$ $F_2 = 2405,96 \text{ MHz}$

Date: 1.FEB.2011 09:07:33

$\Delta = 1,68 \text{ MHz}$

ANNEX 4: 20 dB BANDWIDTH

Alim AC



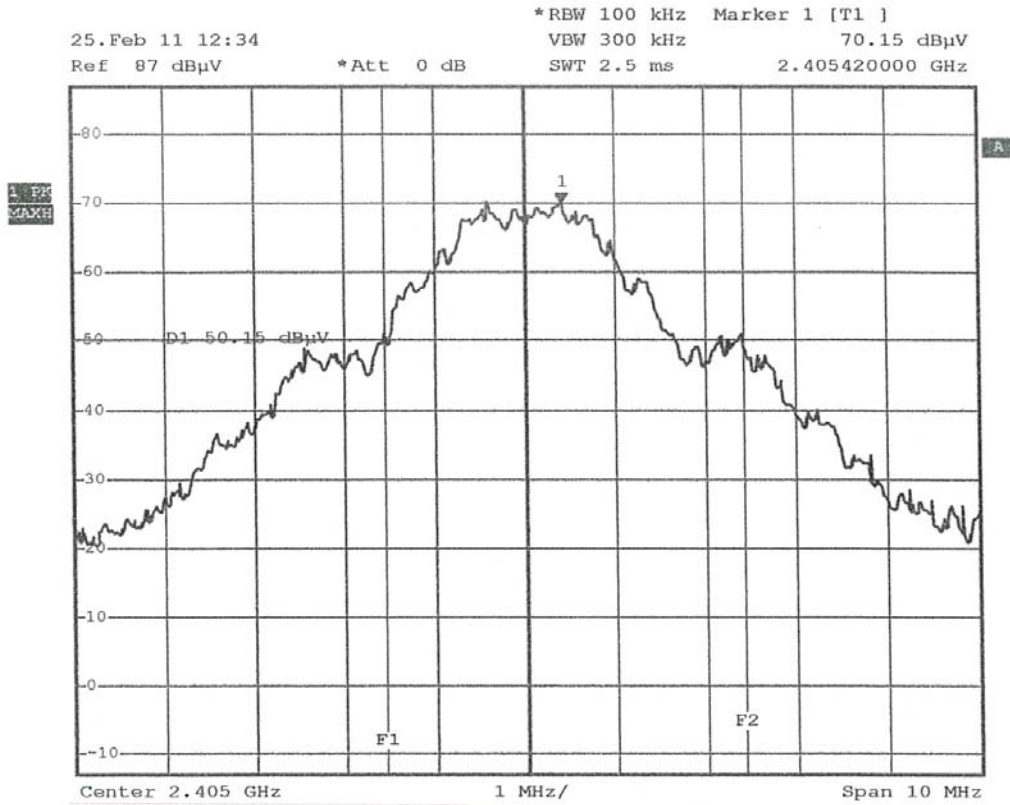
$F_1 = 2403,38 \text{ MHz}$

$F_2 = 2407,42 \text{ MHz}$

Date: 25.FEB.2011 12:26:59

$\Delta = 4,04 \text{ MHz}$

Alim DC



$F_1 = 2403,44 \text{ MHz}$

$F_2 = 2407,42 \text{ MHz}$

Date: 25.FEB.2011 12:34:32

$\Delta = 3,98 \text{ MHz}$