

R051-24-10-105624-1/A Ed. 1

RADIO test report

**according to standard:
FCC Part 15**

**Equipment under test:
MotionPod3: Controller**

**FCC ID:
JJ4-MCTL3**

**Company:
MOVEA SA**

DISTRIBUTION: Mr FLAMENT

Company: MOVEA SA

Number of pages: 38 including 4 annexes

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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: MotionPod3: Controller

Reference / model: 0

Serial number: B01091

MANUFACTURER: MOVEA SA

COMPANY SUBMITTING THE PRODUCT:

Company: MOVEA SA

Address: le Pulsar 5ème étage
4 avenue du Doyen Louis Weil
38000 GRENOBLE
FRANCE

Responsible: Mr FLAMENT

DATE(S) OF TEST: 14 to 16, 19 and 23 April 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: L. BERTHAUD

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1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: MotionPod3: Controller in accordance with normative reference.

All tests on the controller except conducted emissions have been realized with a computer DELL LATITUDE C510/C610; model n°PP01L; ref number: 01014; for use with adapter Model PA-6 and PA-8.

2. PRODUCT DESCRIPTION

Class: B (residential environment)

Utilization: wireless Motion Measurement unit
A mobile unit (MotionPod) measures motion data and sends data flow wirelessly to a Controller. Controller is connected to a computer (not included in the system). The MotionPod system is used for measuring motiondata of human being, therefore providing means to assess its motion. Uses typically include Rehabilitation.

Antenna type and gain: integral antenna, unknown gain

Operating frequency range: from 2402 MHz to 2482 MHz

Number of channels: 41

Channel spacing: 2 MHz

Frequency generation: synthesiser

Modulation: GFSK

Power source: 3.7 Vd.c (battery)

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 (2011)	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.

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 249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz.

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				Note 1
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

Remark: The unintentional part of the device under test is concerned by DoC procedure. The subpart B test results given in this report are therefore outside the scope of Certification Procedure.

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				Note 2
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				Note 1
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 3
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.249 frequency bands	X				Note 4
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.249	OPERATION WITHIN THE BANDS 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz AND 24.0-24.25 GHz					
	(a) Fundamental and harmonics field strength	X				Note 5
	(b) Fixed point-to-point operation			X		
	(c) Measurement distance	X				
	(d) Out-of-band emissions	X				
	(e) Field strength limits above 1 GHz	X				
	(f) §15.37 (d) requirement			X		

NAp: Not Applicable

NAs: Not Asked

Note 1: *These tests have been realized with a computer DELL, model n°PP04X; ref number: 06168/06135, for use with adapter PA-10 or PA-12.*

Note 2: *Integral antenna.*

Note 3: *See FCC part 15.249 (d).*

Note 4: *See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.*

Note 5: *For average measurements a duty cycle correction factor is used; see FCC part 15.35 (b).*

Conclusion:

The sample of MotionPod3: Controller 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

Limits: Class B

Test equipments:

TYPE	BRAND	EMITECH NUMBER
AC Power supply ALT 2000	K. SERRAS	2441
Test receiver ESH3	Rohde & Schwarz	1058
Pulse limiter ESH3-Z2	Rohde & Schwarz	2565
Artificial main network L3-25	PMM	0834
Spectrum analyzer FSEA	Rohde & Schwarz	5071
Meteo station 608-H1	Testo	7565

Software used: BAT-EMC V3.5.0.2

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 4.

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak

Bandwidth: 10 kHz (peak)

Equipment under test operating condition:

The equipment is blocked in reception mode.

Results: (Controller)

Ambient temperature (°C):	32.9
Relative humidity (%):	25.9

Measurement on the mains power supply:

The measurement is made with peak detector.

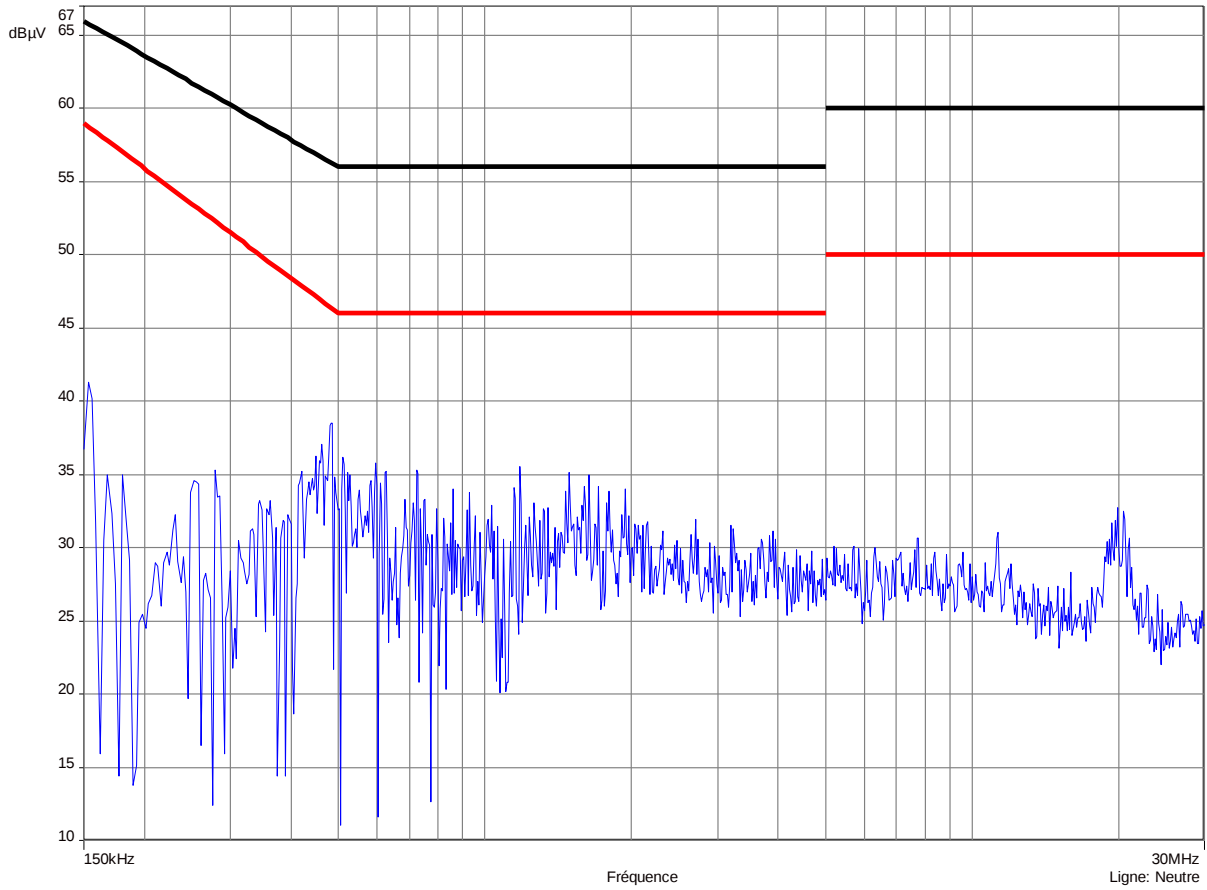
Curve N° 1: measurement on the Neutral with peak detector

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

The frequencies which are not 6 dB under the Quasi-Peak limit are analyzed with Average detector.

CURVE N° 1.

Measurement on the Neutral with peak detection



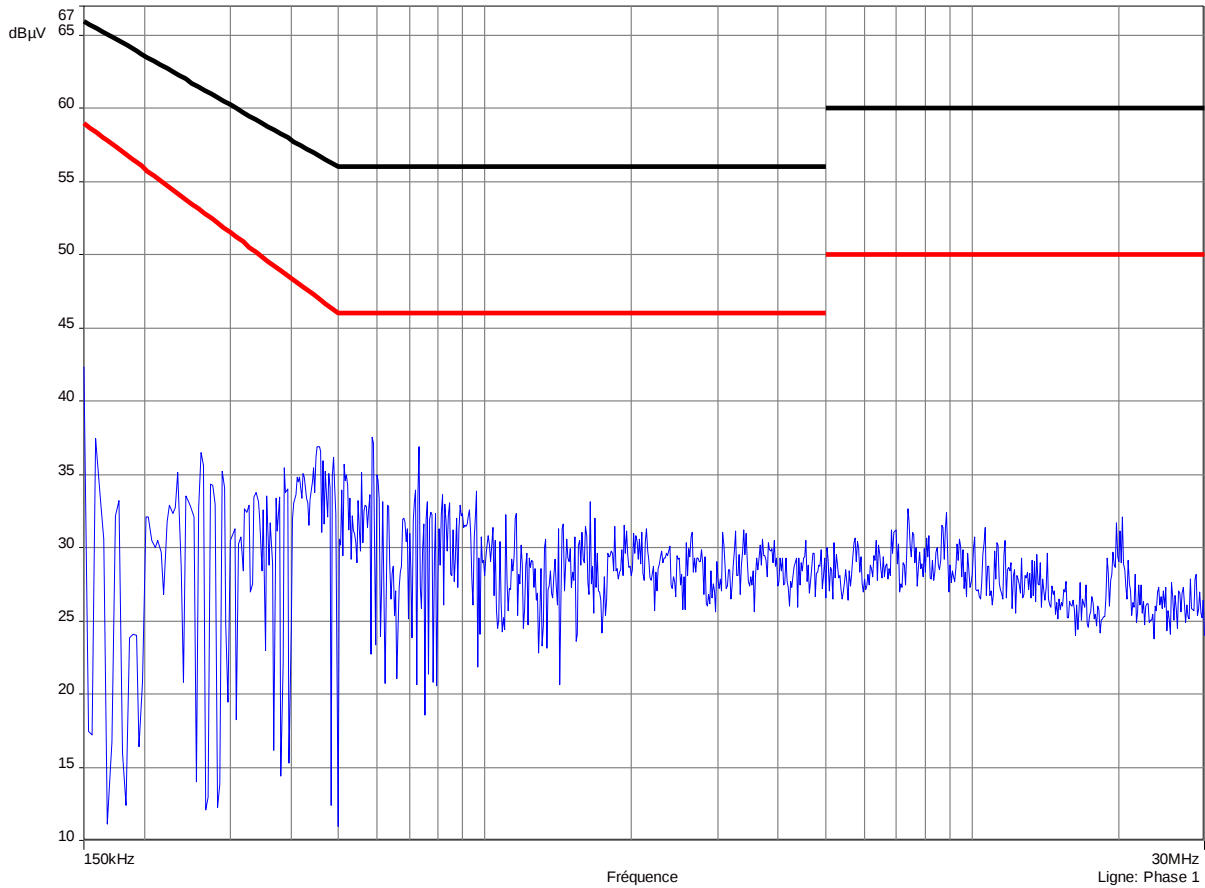
RBW filter: 10 kHz

VBW filter: 10 kHz

Sweep time: 500 ms/MHz

CURVE N° 2.

Measurement on the Line 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
Double ridged guide antenna	Electrometrics EM 6961	1204
Preamplifier 1 to 18 GHz	DBS Microwave DB97-1852	2648
High pass filter	Micro-tronics HPM11630	6609
Open area test site	EMITECH	1274
Multimeter	Fluke 77-2	0812
Variac	Dereix R213	1419
Meteostation 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.

Frequency range: From 9 kHz to 5th harmonic of the highest frequency used (2482 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 reception mode.

Results: (Controller)

Ambient temperature (°C): 17.5

Relative humidity (%): 51

Power source: by an USB port of computer powered in 120 Va.c

FREQUENCIES (MHz)	Detector P: Peak A: 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)
2754.510	P	103	93	1000	H	45.9	74	28.1
2754.510	A	103	93	1000	H	42.9	54	11.1

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. MEASUREMENT OF THE CONDUCTED DISTURBANCES

Standard: FCC Part 15

Test procedure: Paragraph 15.207

Test equipments:

TYPE	BRAND	EMITECH NUMBER
AC Power supply ALT 2000	K. SERRAS	2441
Test receiver ESH3	Rohde & Schwarz	1058
Pulse limiter ESH3-Z2	Rohde & Schwarz	2565
Artificial main network L3-25	PMM	0834
Spectrum analyzer FSEA	Rohde & Schwarz	5071
Meteo station 608-H1	Testo	7565

Software used: BAT-EMC V3.5.0.2

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 4.

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.

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Quasi-Peak / Average

Bandwidth: 10 kHz (peak)
9 kHz (Quasi-Peak / Average)

Results: (Controller)

Ambient temperature (°C): 32.5
Relative humidity (%): 26.2

Measurement on the mains power supply:

The measurement is made with peak detector.

Curve N° 3: measurement on the Neutral with peak detector

Curve N° 4: measurement on the Line with peak detector

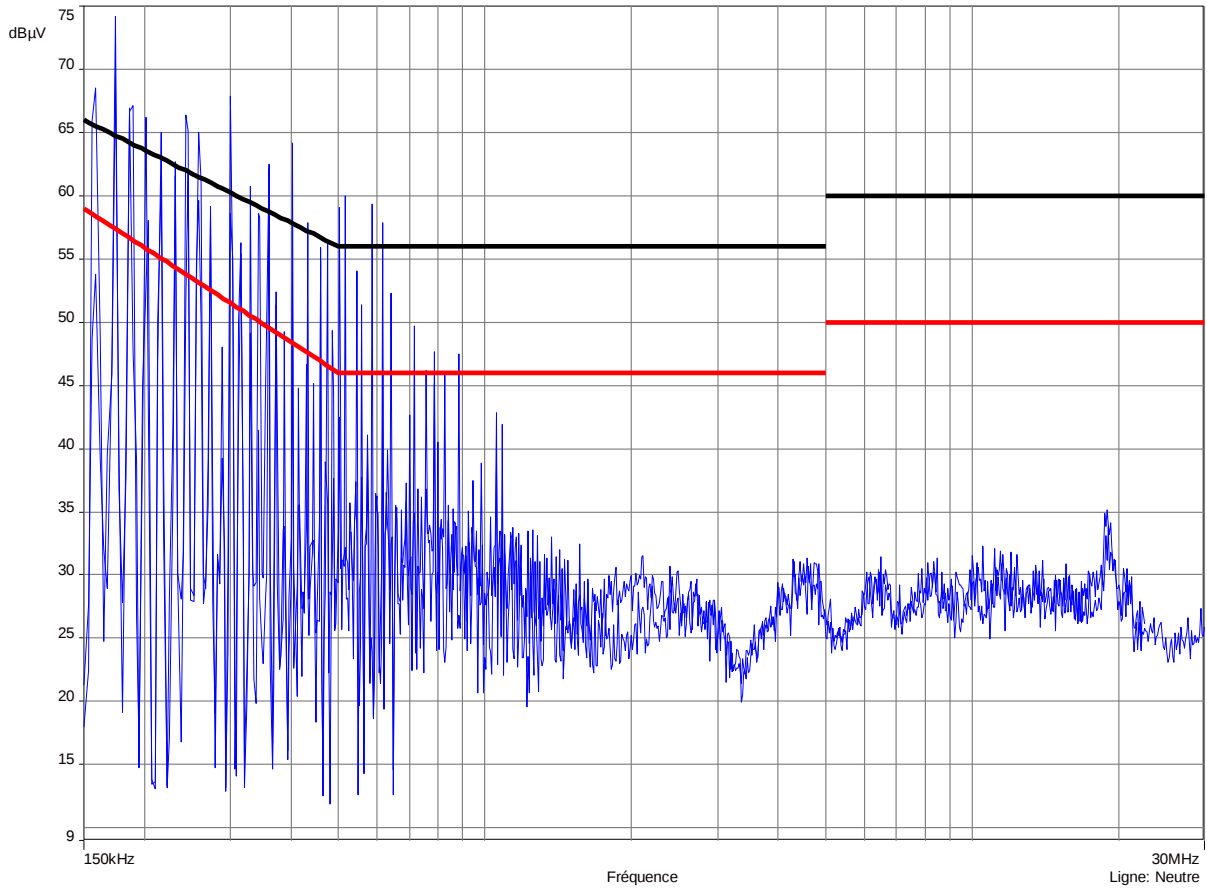
Measurement with Quasi-Peak detector:

FREQUENCIES (MHz)	NEUTRAL (dB μ V)	LIMITS (dB μ V)
0.174	26.4	64.77
0.186	24.9	64.21
0.216	24.3	62.97
0.231	29.5	62.41
0.246	31.2	61.89
0.258	32.1	61.50
0.273	28	61.03
0.300	25.1	60.24
0.315	25.1	59.84
0.330	25.1	59.45
0.360	28.7	58.73
0.432	31.1	57.22
0.459	35.3	56.71
0.474	31.8	56.45
0.501	33.8	56
0.546	28.7	56

FREQUENCIES (MHz)	LINE (dB μ V)	LIMITS (dB μ V)
0.159	31.3	65.52
0.174	27.5	64.77
0.189	28.9	64.08
0.201	29.5	63.57
0.216	27.8	62.97
0.231	32.2	62.41
0.243	35.3	61.99
0.258	33.9	61.50
0.273	28.2	61.03
0.300	26	60.24
0.315	27	59.84
0.342	33.2	59.16
0.360	30.2	58.73
0.402	27.2	57.81
0.459	36	56.71
0.516	31.3	56
0.588	32.2	56
0.615	27.7	56
0.642	26.5	56

CURVE N° 3.

Measurement on the Neutral with peak detection



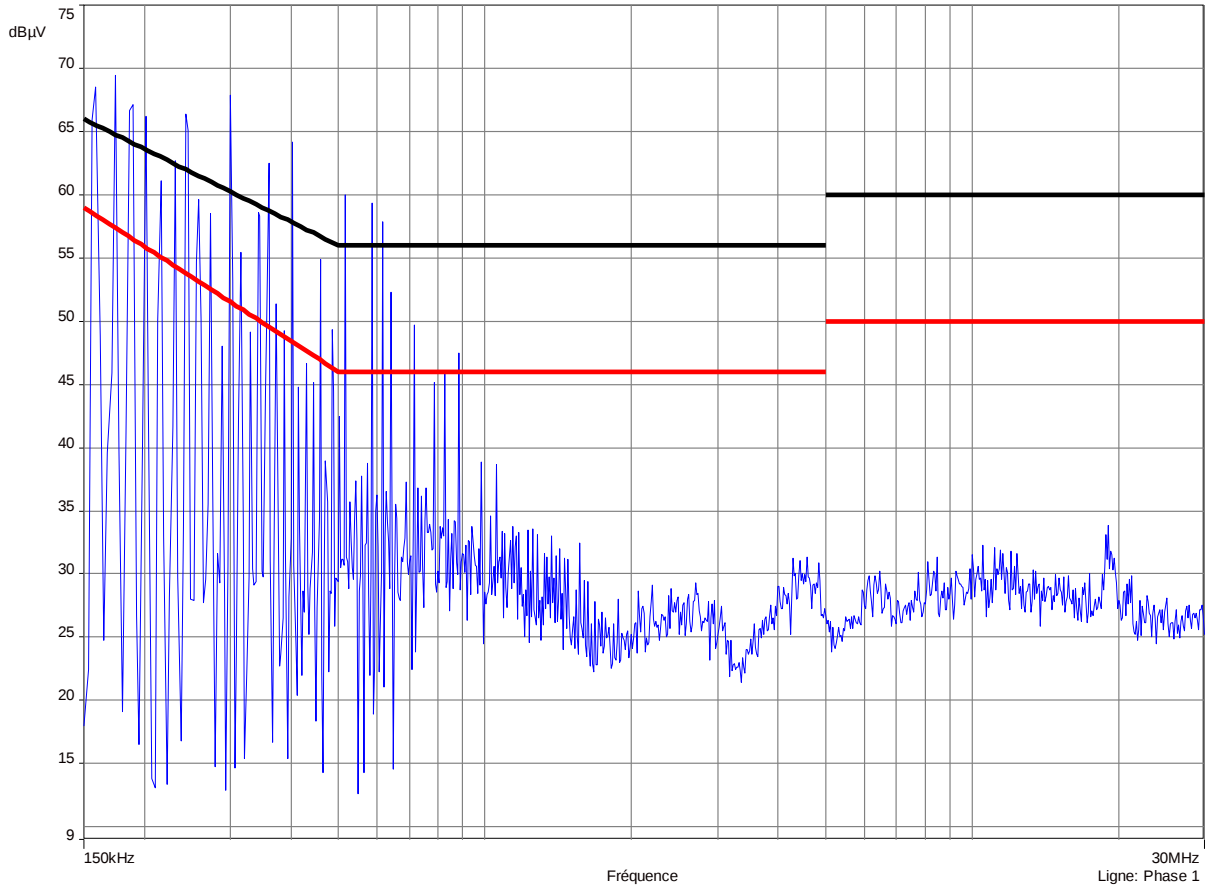
RBW filter: 10 kHz

VBW filter: 10 kHz

Sweep time: 500 ms/MHz

CURVE N° 4.

Measurement on the Line with peak detection



RBW filter: 10 kHz

VBW filter: 10 kHz

Sweep time: 500 ms/MHz

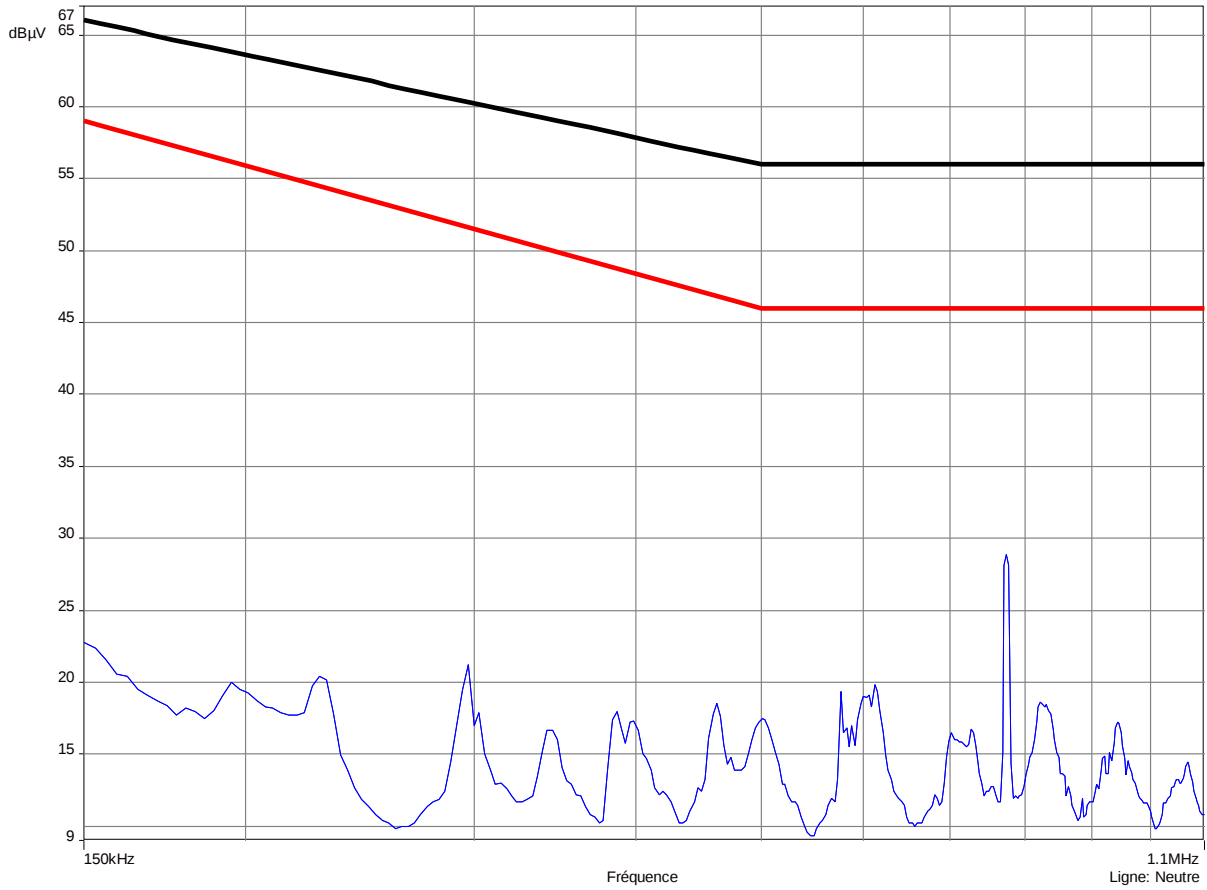
The frequencies which are not 6 dB under the Quasi-Peak limit are analyzed with Average detector.

Curve N° 5: average measurement on the Neutral, for the frequency range: 150 kHz-1.10 MHz

Curve N° 6: average measurement on the Line, for the frequency range: 150 kHz-900 kHz

CURVE N° 5.

Measurement on the Neutral with average detector from to 150 kHz-1.10 MHz

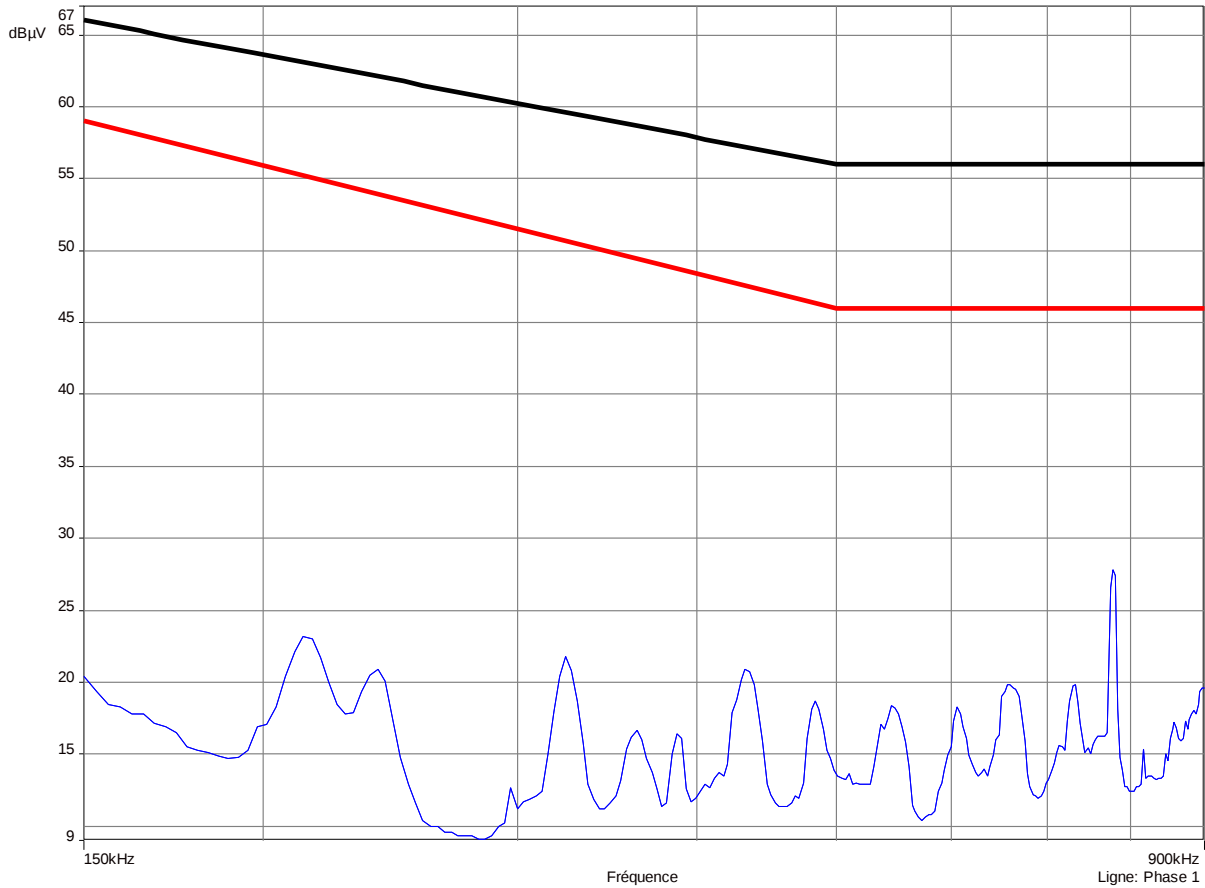


RBW filter: 9 kHz

Sweep time: 500 ms/MHz

CURVE N° 6.

Measurement on the Line with average detector from to 150 kHz-900 kHz



RBW filter: 9 kHz

Sweep time: 500 ms/MHz

Test conclusion:

RESPECTED STANDARD

10. 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
Double ridged guide antenna	Electrometrics EM 6961	1938
Multimeter	Fluke 77-2	0812
Variac	Dereix R213	1419
Meteo station AB888	Oregon Scientific	1539

Test set up:

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

The 20 dB bandwidth curves are given in annex 1.

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: (Controller)

Ambient temperature (°C): 24
Relative humidity (%): 30

Lower Band Edge: band from 2310 MHz to 2390 MHz
Upper Band Edge: band from 2483.5 MHz to 2500 MHz

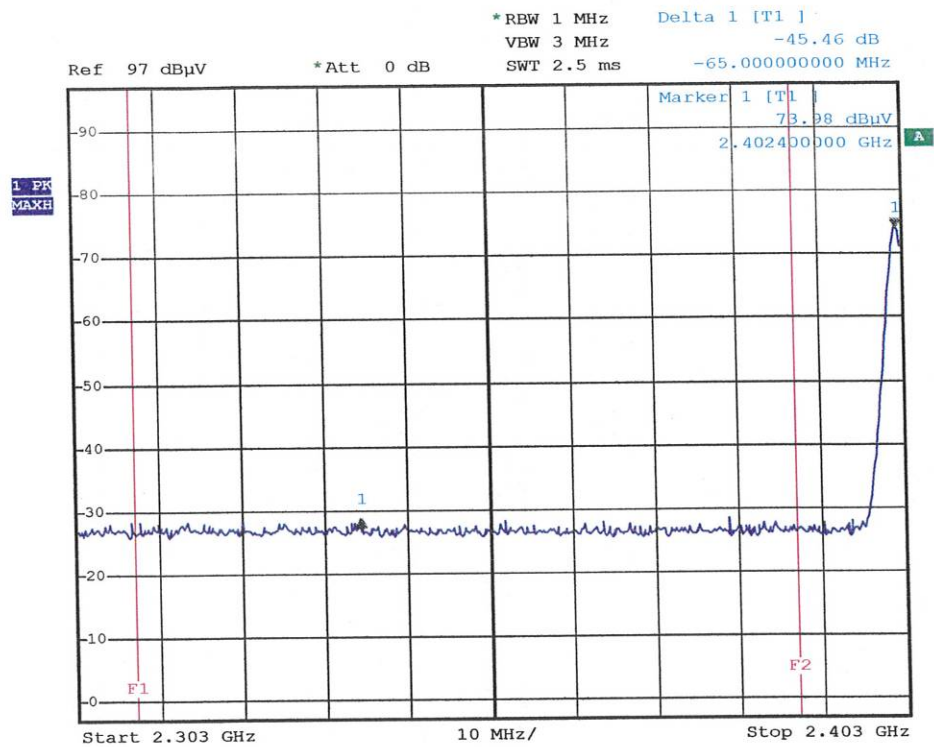
Sample n°1:

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	91.1	Peak	2337.4	-45.5	45.6**	74	28.4
2482	92.3	Peak	2485.36	-52	40.3**	74	33.7

* Marker-Delta method

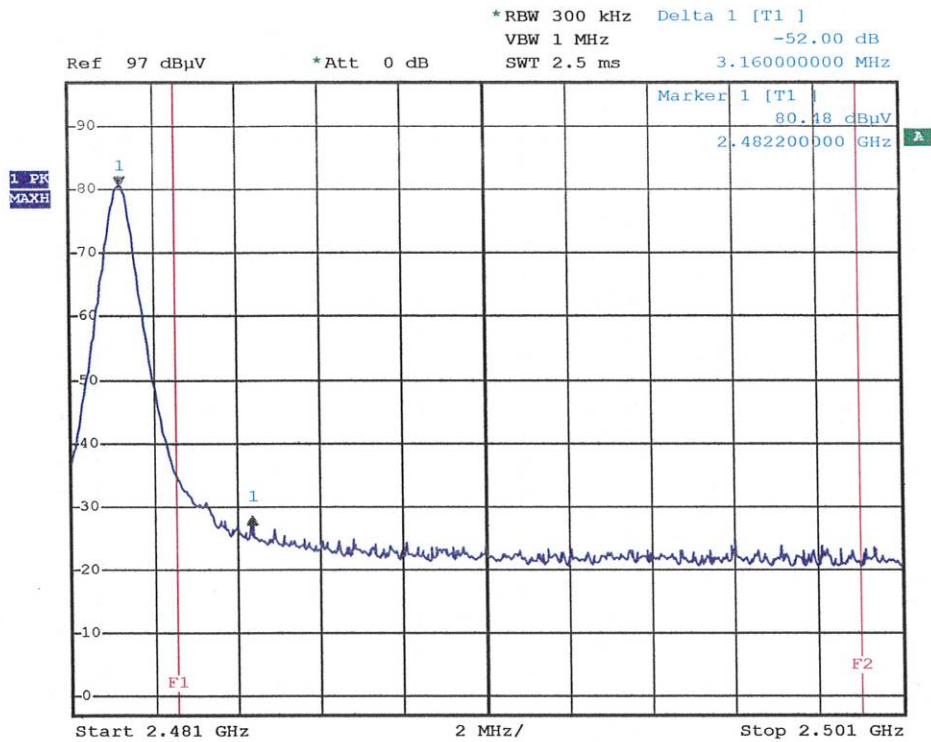
** The peak level is lower than the average limit (54 dBμV/m).

CURVE N° 7.



Date: 16.APR.2011 16:35:54

CURVE N° 8.



Date: 16.APR.2011 16:26:32

Test conclusion:

RESPECTED STANDARD

11. FUNDAMENTAL AND HARMONICS FIELD STRENGTH

Standard: FCC Part 15

Test procedure: paragraph 15.249 (a)

Test equipments:

TYPE	BRAND	EMITECH NUMBER
Spectrum analyzer	Rohde & Schwarz FSP40	4088
Double ridged guide antenna	Electrometrics EM 6961	1204
Open area test site	EMITECH	1274
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 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 1 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: (Controller)

Ambient temperature (°C): 21.5

Relative humidity (%): 37

Power source: by an USB port of computer powered in 120 Va.c

Low channel

FREQUENCIES (MHz)	Detector P: Peak A: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2402*	P	120	352	1000	H	91.1	114	22.9
2402*	A	120	352	1000	H	48	94	46.
4804	P	120	0	1000	V	55.7	74	18.3
4804	A	120	0	1000	V	12.6	54	41.4

Middle channel

FREQUENCIES (MHz)	Detector P: Peak A: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2438*	P	120	162	1000	H	91.7	114	22.3
2438*	A	120	162	1000	H	48.5	94	45.5
4876	P	106	0	1000	V	57.2	74	16.8
4876	A	106	0	1000	V	14.1	54	39.9

High channel

FREQUENCIES (MHz)	Detector P: Peak A: Average	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2482*	P	142	165	1000	H	92.3	114	21.7
2482*	A	142	165	1000	H	49.1	94	44.9
4964	P	115	0	1000	V	56.6	74	17.4
4964	A	115	0	1000	V	13.4	54	40.6

* Fundamental emission

** Average value is calculated based on Peak reading + duty cycle factor

$$\text{Duty cycle factor} = 20 \log \left[\frac{5 \times 0.1392 \times 10^{-3}}{100 \times 10^{-3}} \right] = -43.15 \text{ dB}$$

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

Test conclusion:

RESPECTED STANDARD

12. OUT-OF-BAND EMISSIONS

Standard: FCC Part 15

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.249 (d)

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
Double ridged guide antenna	Electrometrics EM 6961	1204
Preamplifier 1 to 18 GHz	DBS Microwave DB97-1852	2648
High pass filter	Micro-tronics HPM11630	6609
Low-noise amplifier 2 to 18 GHz	Microwave DB	1922
High pass filter HP12/3200-5AA	Filtek	
Open area test site	EMITECH	1274
Multimeter	Fluke 77-2	0812
Variac	Dereix R213	1419

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.

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 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: (Controller)

Ambient temperature (°C):	21.5
Relative humidity (%):	37

Power source: by an USB port of computer powered in 120 Va.c

Not any spurious has been detected.

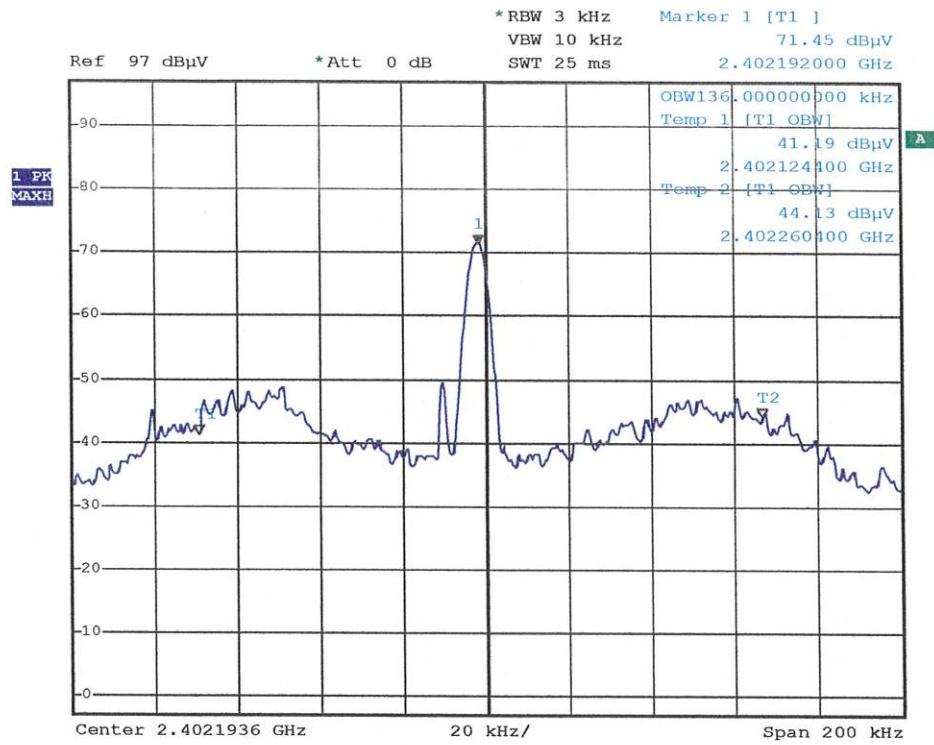
Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Test conclusion:

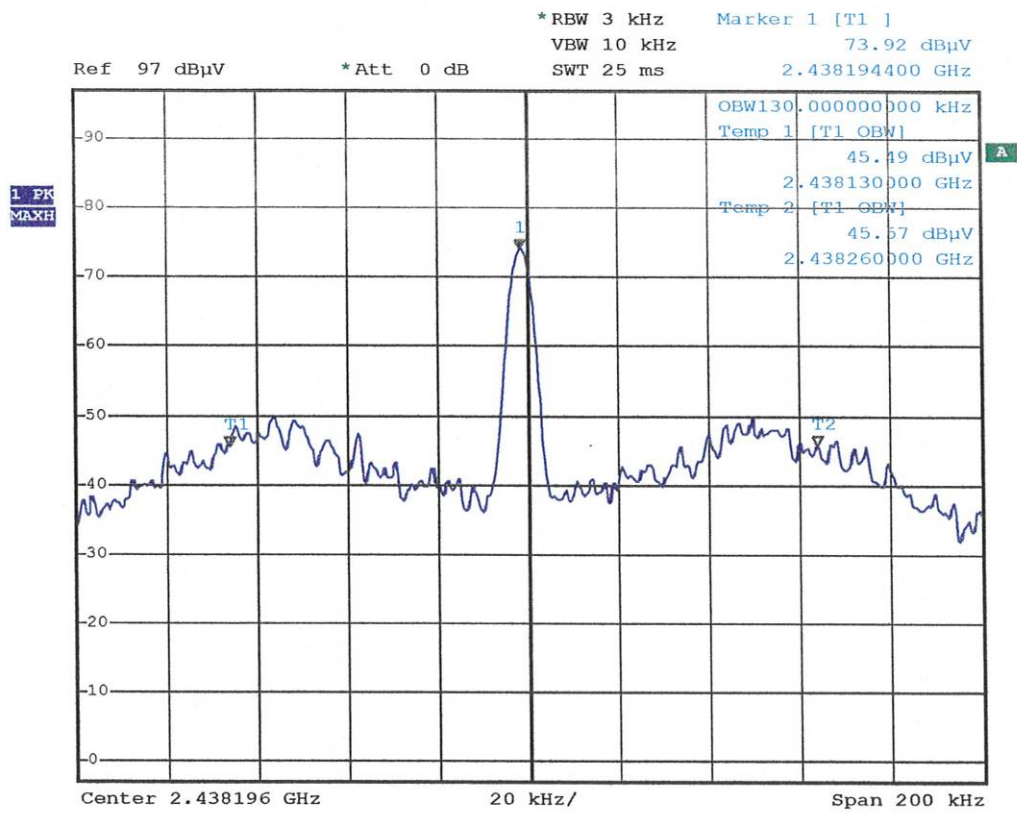
RESPECTED STANDARD

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

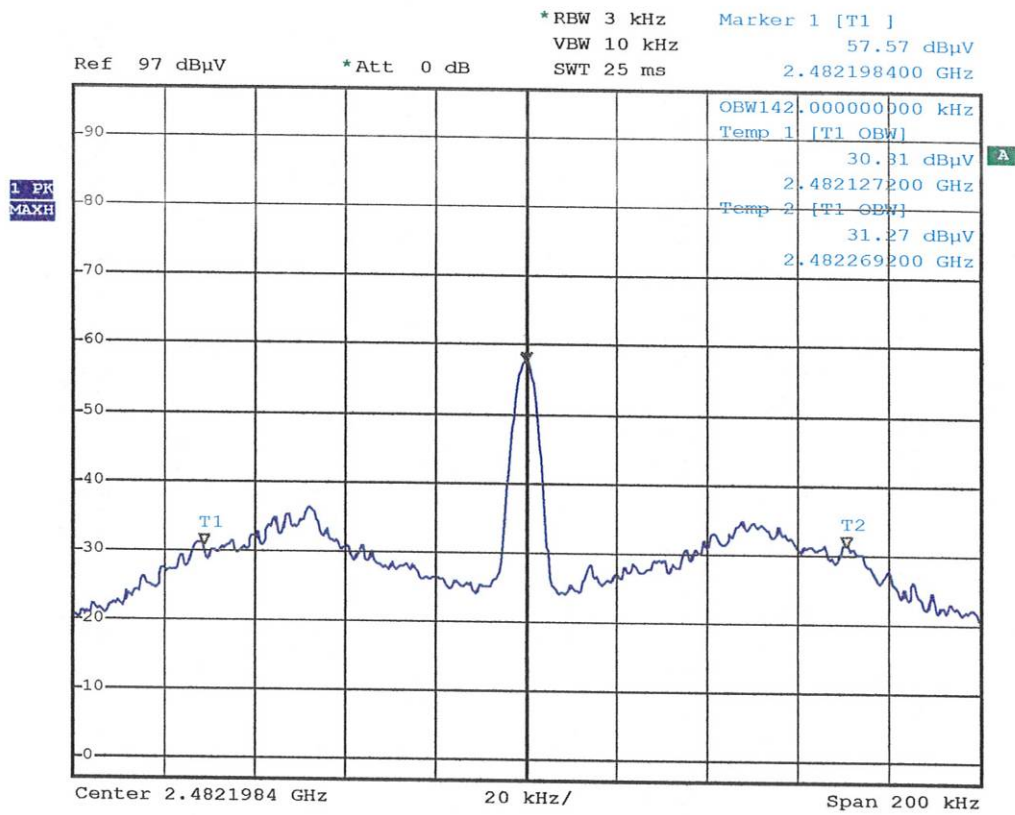
ANNEX 1: 20 dB BANDWIDTH



Date: 16.APR.2011 16:09:59



Date: 16.APR.2011 16:12:15



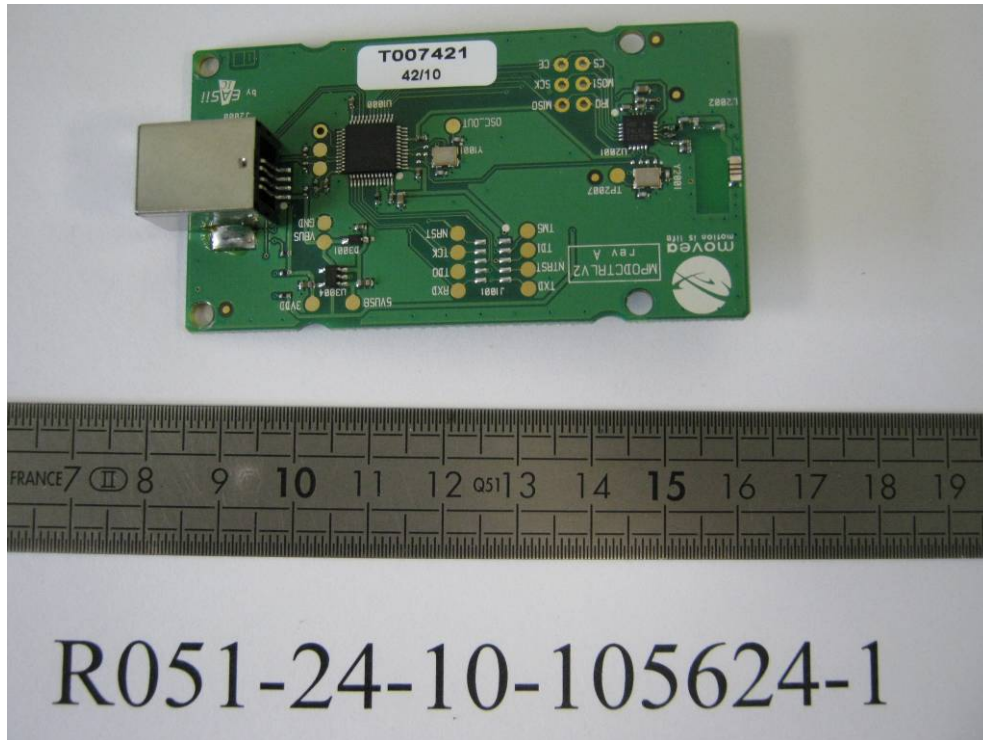
Date: 16.APR.2011 16:22:54

ANNEX 2: PHOTOS OF THE EQUIPMENT UNDER TEST

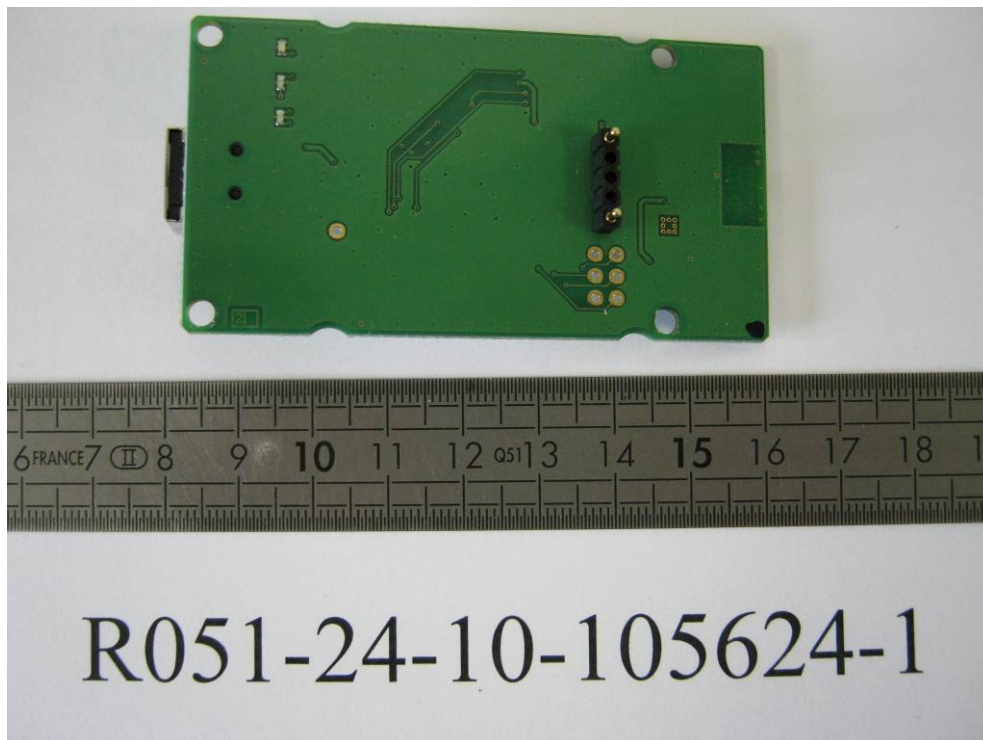
GENERAL VIEW



PRINTED CIRCUIT BOARD FACE 1:



PRINTED CIRCUIT BOARD FACE 2:

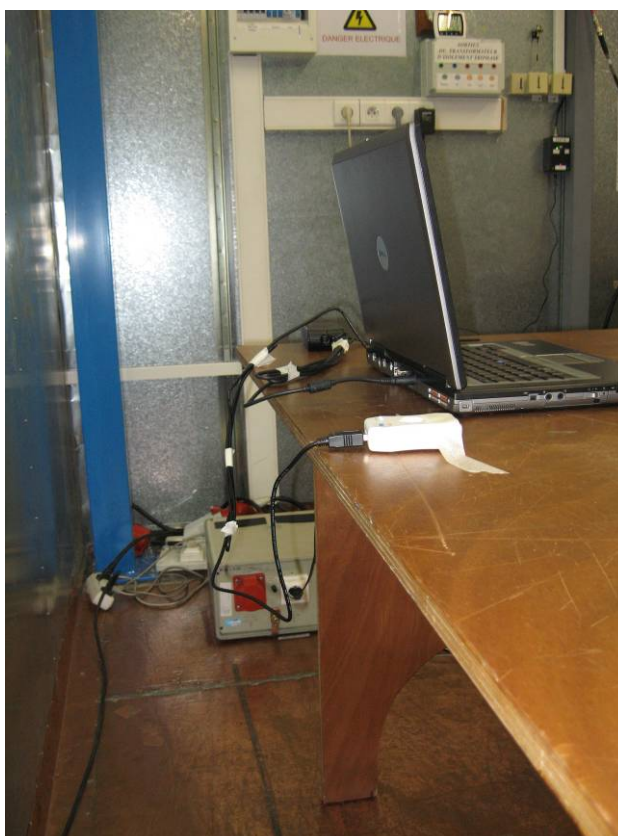


ANNEX 3: TEST SET UP AND OPEN AREA TEST SITE

RADIATED MEASUREMENT



CONDUCTED MEASUREMENT



OPEN AREA TEST SITE



ANNEX 4: TEST EQUIPMENT CALIBRATION DATES

Emitech number	Model	Type	last verification	next verification	validity
0728	11966C	biconical antenna	18/11/2008	18/11/2012	17/01/2013
0812	77-2	multimeter	22/03/2011	22/03/2013	21/05/2013
0834	L3-25	LISN	16/12/2009	16/12/2011	14/02/2012
1058	ESH3	test receiver	24/01/2011	24/01/2013	25/03/2013
1204	EM-6961	guide antenna	30/05/2008	30/05/2012	29/07/2012
1219	ESVS10	test receiver	23/02/2009	23/02/2011	24/04/2011
1274	Emitech	OATS	28/01/2010	28/01/2012	28/03/2012
1406	6502	loop antenna	13/01/2011	13/01/2013	14/03/2013
1419	R213	variac	*	*	*
1539	T-H-(P)	meteo station	27/10/2010	27/10/2012	26/12/2012
1922	HP12/3200-5AA	amplifier+high-pass filter	30/04/2010	30/04/2011	29/06/2011
1938	EM-6961	guide antenna	21/11/2008	21/11/2012	20/01/2013
1999	HL223	logperiodic antenna	18/11/2008	18/11/2012	17/01/2013
2441	ALT 2000	power source	*	*	*
2565	HP11947A	transient limiter	03/02/2010	03/02/2012	03/04/2012
2648	DB97-1852	amplifier	30/04/2010	30/04/2011	29/06/2011
4088	FSP40	spectrum analyzer	16/12/2009	16/12/2011	14/02/2012
5071	FSEA	spectrum analyzer	05/05/2009	05/05/2011	04/07/2011
6609	HPM11630	high-pass filter	21/03/2011	21/03/2013	20/05/2013
6796	FSP7	spectrum analyzer	04/06/2009	04/06/2011	03/08/2011
7565	608-H1	meteo station	13/04/2010	13/04/2012	12/06/2012

* These equipments are not verified; the output voltage is instead verified each time with a multimeter.