# R051-24-10-105624-2/A Ed. 0

# RADIO test report

**according to standard:**
**FCC Part 15**

**Equipment under test:**
**MotionPod3: MotionPod**

**FCC ID:**
**JJ4-MPOD3**

**Company:**
**MOVEA SA**

**DISTRIBUTION: Mr FLAMENT** **Company: MOVEA SA**

**Number of pages: 25 including 4 annexes**

| Ed. | Date | Modified pages | Written by Name | Visa | Technical Verification Quality Approval Name | Visa |
|---|---|---|---|---|---|---|
| 0 | 30-Jun-11 | Creation | M. DUMESNIL | M. D. | BERTHAUD L. | |

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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: MotionPod** |
| ***Reference / model:*** | 0 |
| ***Serial number:*** | 0107C1 |
| ***MANUFACTURER:*** | MOVEA SA |

***COMPANY SUBMITTING THE PRODUCT:***

| | |
|---|---|
| ***Company:*** | MOVEA SA |
| ***Address:*** | le Pulsar 5ème étage<br>4 avenue du Doyen Louis Weil<br>38000 GRENOBLE<br>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<br>EMITECH ATLANTIQUE open area test site in LA POUEZE (49) FRANCE<br>FCC Registration Number: 101696/FRN: 0006 6490 08 |
| ***TESTED BY:*** | M. DUMESNIL |

# CONTENTS

**TITLE** **PAGE**

## *1. INTRODUCTION*

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

## *2. PRODUCT DESCRIPTION*

| | |
|---|---|
| Class: | B (residential environment) |
| Utilization: | wireless Motion Measurement unit<br>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 | | |
| | | | | | | |
| 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 1* |
| | | | | | | |
| 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 | | | | *Note 2* |
| | | | | | | |
| 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 3* |
| | *(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 4* |
| | *(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: Integral antenna.*

*Note 2: See FCC part 15.249 (d).*

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

*Note 4: For average measurements a duty cycle correction factor is used; see FCC part 15.35 (b).*

**Conclusion:**

The sample of MotionPod3: MotionPod 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. 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 5$^{th}$ 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: (MotionPod)**

Ambient temperature (°C): 22
Relative humidity (%): 38

Power source:
We used for power source the internal battery of the equipment:

| 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) |
|---|---|---|---|---|---|---|---|---|
| 2827.376 | P | 128 | 318 | 1000 | H | 51 | 74 | 23 |
| 2827.376 | A | 128 | 318 | 1000 | H | 46.6 | 54 | 7.4 |

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

**Test conclusion:**

RESPECTED STANDARD

## *8. 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: (MotionPod)**

Ambient temperature (°C): 23.5
Relative humidity (%): 31

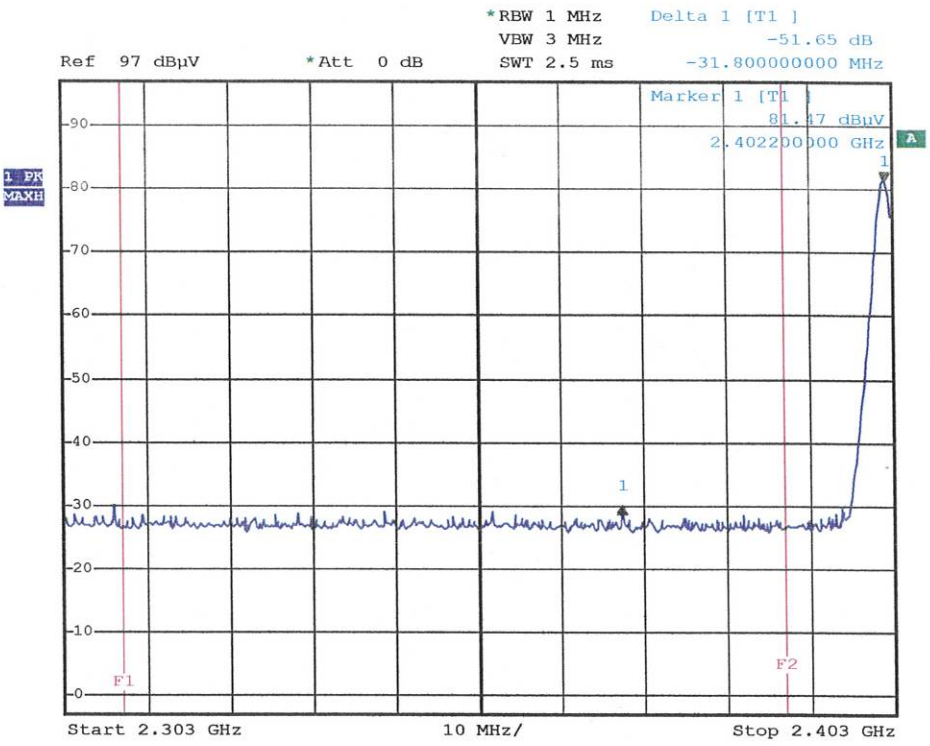
Lower Band Edge: band from 2310 MHz to 2390 MHz
Upper Band Edge: band from 2483.5 MHz to 2500 MHz

Sample n°1:

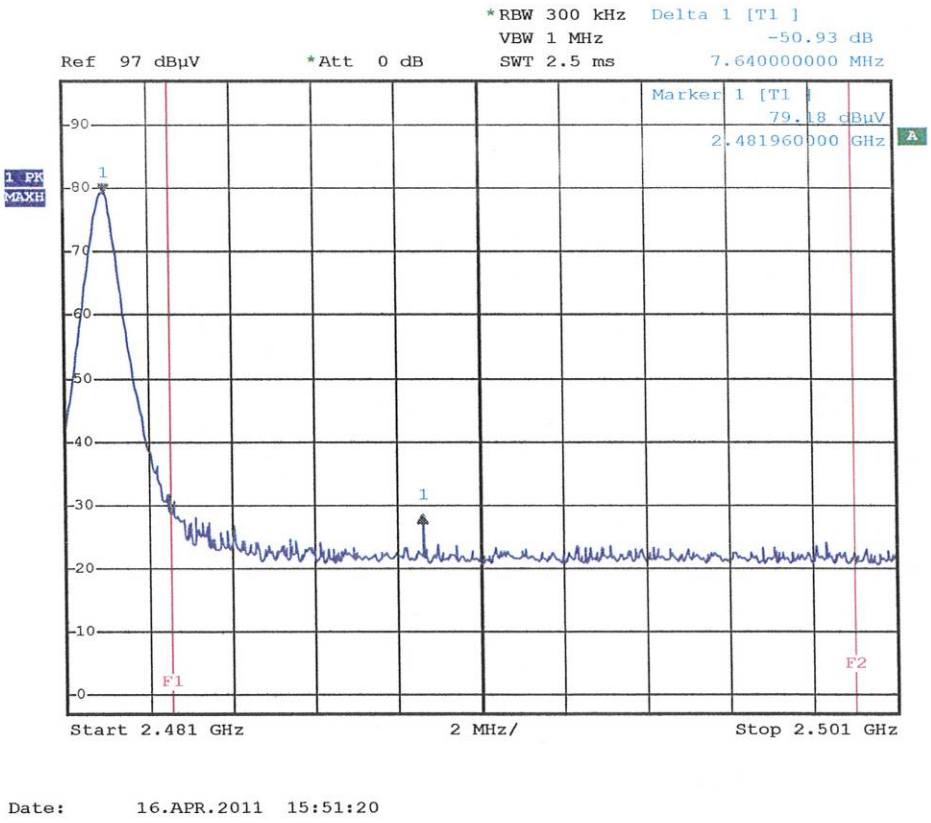
| Fundamental frequency (MHz) | Field Strength Level of fundamental (dBµV/m) | Detector (Peak or Average) | Frequency of maximum Band-edges Emission (MHz) | Delta Marker (dB)* | Calculated Max Out-of-Band Emission Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 2402 | 97.7 | Peak | 2370.4 | -51.7 | 46** | 74 | 28 |
| 2482 | 96.2 | Peak | 2489.6 | -50.9 | 45.3** | 74 | 28.7 |

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

**CURVE N° 1.**


*RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Delta 1 [T1 ]
-51.65 dB
-31.800000000 MHz
Ref 97 dBµV
*Att 0 dB
Marker 1 [T1 ]
81.47 dBµV
2.402200000 GHz
1 PK
MAXH
A
90
80
70
60
50
40
30
20
10
0
F1
F2
Start 2.303 GHz
10 MHz/
Stop 2.403 GHz
Date: 16.APR.2011 15:34:04

**CURVE N° 2.**




**Test conclusion:**

RESPECTED STANDARD

## *9. 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: (MotionPod)**

Ambient temperature (°C): 16
Relative humidity (%): 54

We used for power source the internal battery of the equipment:

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 | 121 | 35 | 1000 | H | 97.7 | 114 | 16.3 |
| 2402* | A | 121 | 35 | 1000 | H | 60.7** | 94 | 33.3 |
| 4804 | P | 100 | 347 | 1000 | H | 54.5 | 74 | 19.5 |
| 4804 | A | 100 | 347 | 1000 | H | 17.4** | 54 | 36.6 |

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 | 182 | 39 | 1000 | H | 96.2 | 114 | 17.8 |
| 2438* | A | 182 | 39 | 1000 | H | 59.2** | 94 | 34.8 |
| 4876 | P | 113 | 155 | 1000 | H | 56.8 | 74 | 17.2 |
| 4876 | A | 113 | 155 | 1000 | H | 19.8** | 54 | 34.2 |

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 | 121 | 43 | 1000 | H | 96.2 | 114 | 17.8 |
| 2482* | A | 121 | 43 | 1000 | H | 59.1** | 94 | 34.9 |
| 4964 | P | 111 | 177 | 1000 | H | 59.4 | 74 | 14.6 |
| 4964 | A | 111 | 177 | 1000 | H | 22.3** | 54 | 31.7 |

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

$$\text{Duty cycle factor} = 20 \text{ Log } \left[\frac{10 \times 0.14 \times 10^{-3}}{100 \times 10^{-3}}\right] = -37.07 \text{ dB}$$

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

**Test conclusion:**

RESPECTED STANDARD

## *10. 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 10$^{th}$ 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: (MotionPod)**

| | |
|---|---|
| Ambient temperature (°C): | 16 |
| Relative humidity (%): | 54 |

Power source:
We used for power source the internal battery of the equipment.

Not any spurious has been detected.

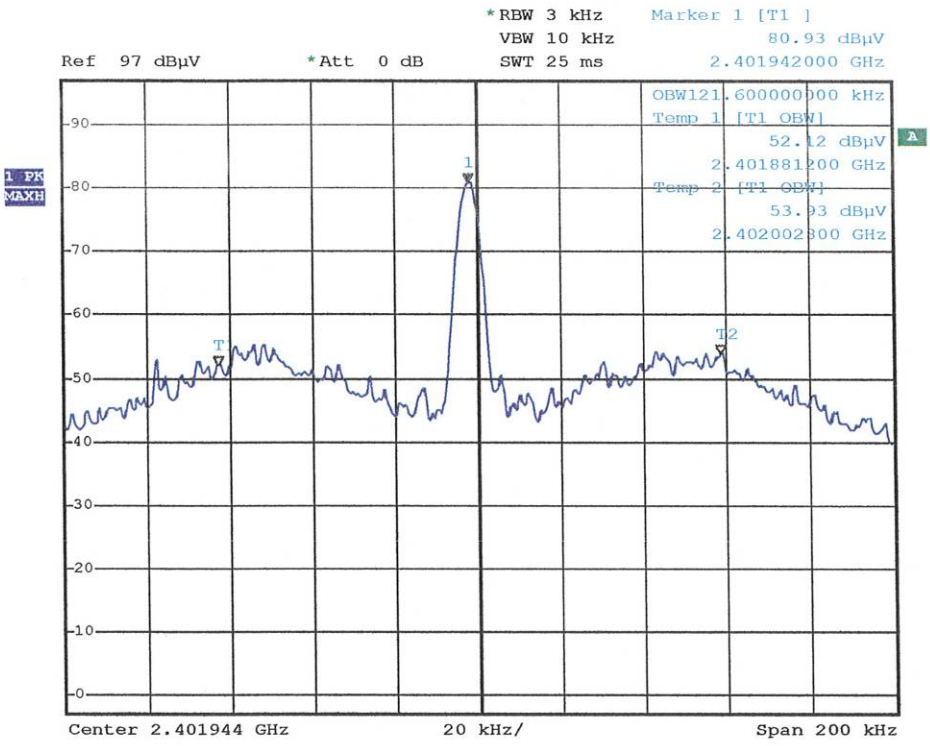
*Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.*

**Test conclusion:**

RESPECTED STANDARD

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

# ANNEX 1: 20 dB BANDWIDTH

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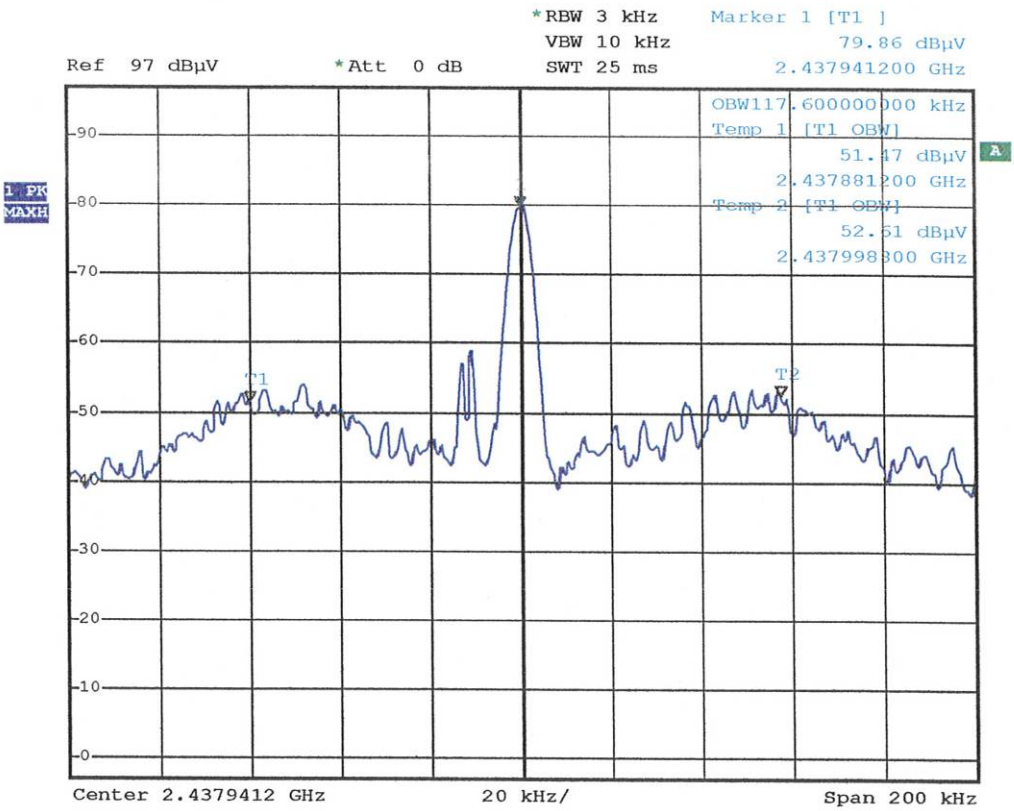


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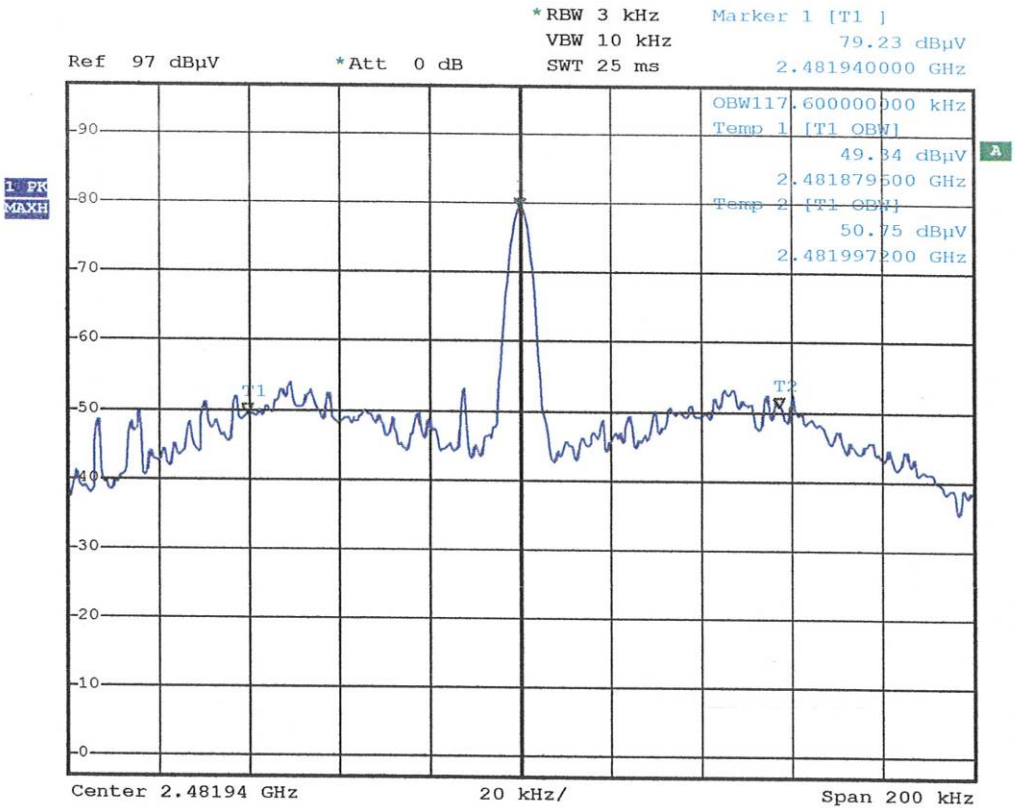
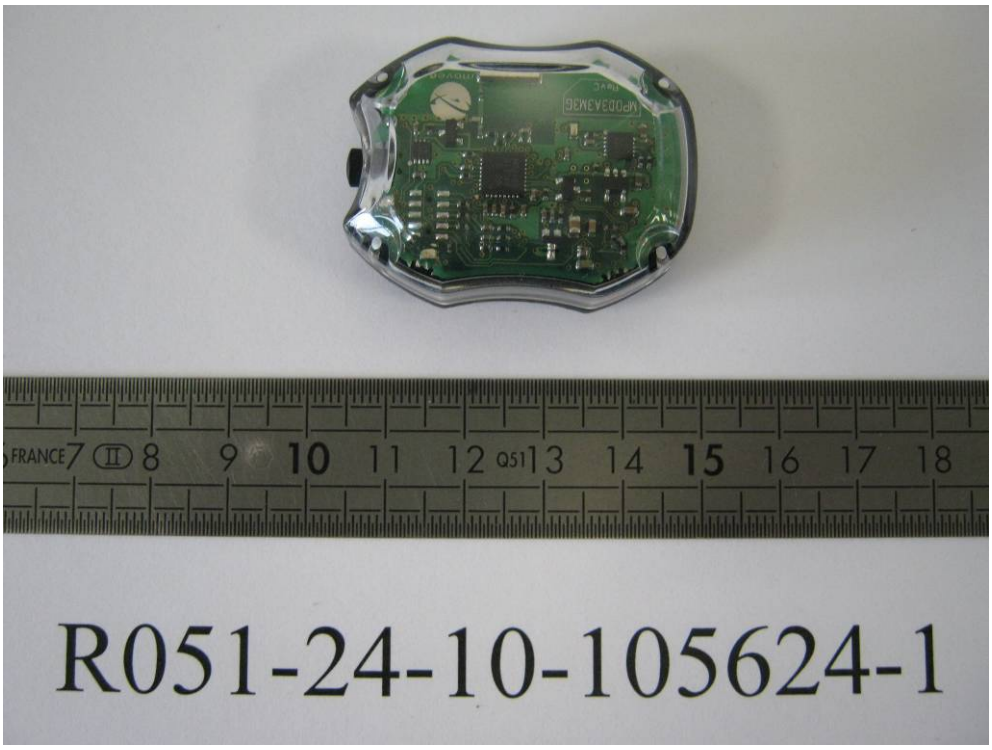
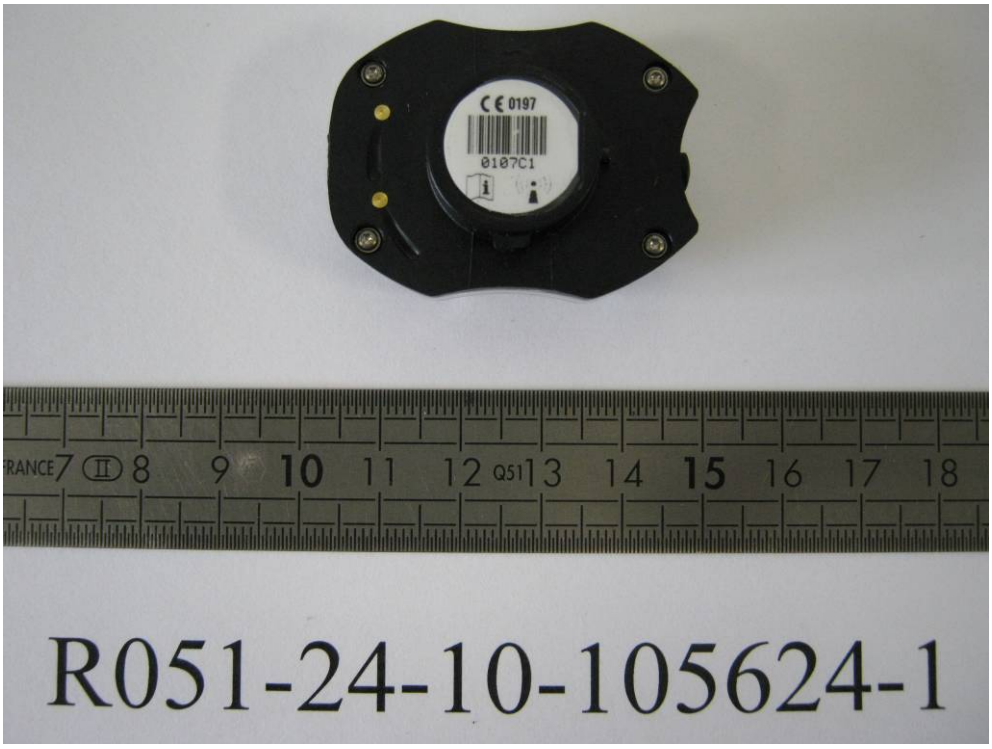



Date: 16.APR.2011 15:59:09

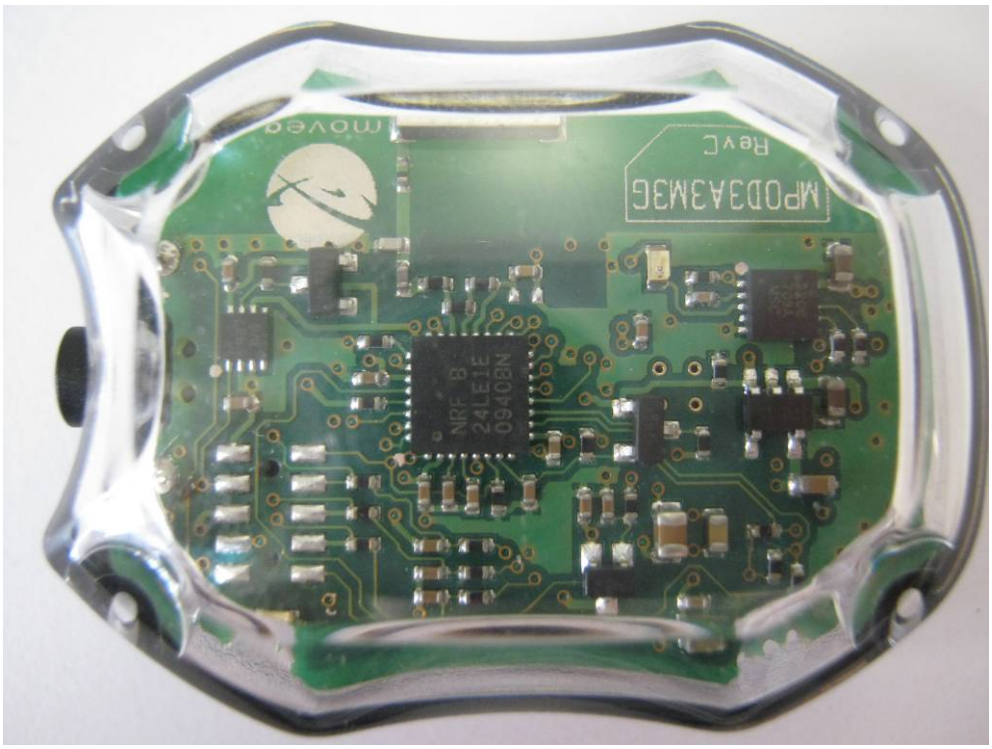
# ANNEX 2: PHOTOS OF THE EQUIPMENT UNDER TEST

**GENERAL VIEW**



**PRINTED CIRCUIT BOARD**



# ANNEX 3: TEST SET UP AND OPEN AREA TEST SITE

**RADIATED 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.*