

RR051-16-104793-1-A Ed. 0

Certification Radio test report

According to the standard
CFR 47 FCC PART 15

Equipment under test:
RFID READER - BIKE SELF-SERVICE SYSTEM

FCC ID:
2AJFFSMBOX2

Company:
SMOOVE

DISTRIBUTION: Mr DE PONTE

(Company: SMOOVE)

Number of pages: 36 with 7 annexes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
0	26-Oct-16	Creation	M. DUMESNIL Radio Technical Manager	

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.



Siège Social : Emitech - 3, rue des Coudriers - Z.A. de l'Observatoire - 78180 MONTIGNY LE BX - France
Siret : 344 545 645 00022 - Tél. : 33 (0)1 30 57 55 55 - Fax : 33 (0)1 30 43 74 48 - E-mail : contact@emitech.fr - URL : www.emitech.fr
S.A. au capital de 1 560 000 € - R.C.S. VERSAILLES 344 545 645 - APE 7112B

DESIGNATION OF PRODUCT: RFID READER – BIKE SELF-SERVICE SYSTEM

Serial number (S/N): LA05051

Reference / model (P/N): SM000333

Software version: 3.18

MANUFACTURER: SMOOVE

COMPANY SUBMITTING THE PRODUCT:

Company: SMOOVE

Address: 65 IMPASSE DES TROIS POINTES
34980 SAINT GELY DU FESC
FRANCE

Responsible: Mr DE PONTE

DATES OF TEST: From 13-SEPT-2016 to 26-OCT-2016

TESTING LOCATION: EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE
21 rue de la Fuye
49610 Juigne sur Loire
France
FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677

TESTED BY: S. LOUIS

VISA: SL

WRITTEN BY: S. LOUIS

CONTENTS

<i>TITLE</i>	<i>PAGE</i>
1. INTRODUCTION	4
2. PRODUCT DESCRIPTION	4
3. NORMATIVE REFERENCE	5
4. TEST METHODOLOGY	6
5. TEST EQUIPMENT CALIBRATION DATES	7
6. TESTS RESULTS SUMMARY	8
7. MEASUREMENT UNCERTAINTY	11
8. RADIATED EMISSION LIMITS	12
9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS	14
10. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz	16
11. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.010 MHZ	19
APPENDIX 1: Photographies of the equipment under test	21
APPENDIX 2: Test set up	24
APPENDIX 3: Test equipment list	26
APPENDIX 4: 99% bandwidth	28
APPENDIX 5: 20 dB bandwidth	29
APPENDIX 6: Band edge	30
APPENDIX 7: Spectrum mask	32

1. INTRODUCTION

This report presents the results of radio test carried out on the following equipment:
RFID reader – Bike self-service system, in accordance with normative reference.

The device under test integrates:

- A RFID module not certified referenced SPRINGCARD 559A98F9.
This RFID module can commute thanks to a relay between 2 antennas (RFID local and RFID remote).
The applicant declares that the 2 RFID cannot be used in the same time.
- A Zigbee 802.15.4 transceiver module with integral antenna already certified with
FCC ID: OUR-XBEEPRO.
The applicant declares that the 2 radios (RFID and Zigbee) cannot emit in the same time.

The host device of certified module shall be properly labeled to identify the module within.

2. PRODUCT DESCRIPTION

Sample 1: RFID Module

Class:	B
Utilization:	Bike self-service
Antenna type and gain:	1 / Integrate antenna referenced K0058-06-ANT, gain not communicated 2 / External (lamp) antenna, er au client), gain not communicated
Operating frequency range:	from 13.110 MHz to 14.010 MHz
Number of channels:	1
Channel spacing:	Not concerned
Modulation:	RFID protocol
Power source:	3.6Vdc lithium 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.

Sample 2: 802.15.4 Zigbee Module in reception

Class:	B
Utilization:	Bike self-service
Antenna type and gain:	Integrate antenna, gain not communicated
Operating frequency range:	from 2405 MHz to 2480 MHz
Number of channels:	16
Channel spacing:	5MHz
Modulation:	802.15.4 Zigbee
Power source:	3.6Vdc lithium 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.

CFR 47 FCC Part 15 (2016)	Radio Frequency Devices
ANSI C63.4	2014 Methods of measurement of Radio-Noise Emissions from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10	2013 Testing Unlicensed Wireless Devices.
447498 D01 General RF Exposure Guidance v06	RF Exposure procedures and equipment authorization policies for mobile and portable equipment

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart A –General

- Paragraph 19: labelling requirements
- Paragraph 21: information to user

Subpart B –Unintentional Radiators

- Paragraph 105: information to the user
- 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 225: Operation within the band 13.110-14.010 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Equipment	Model	Type	Last verification	Next verification	Validity
0000	BAT-EMC V3.6.0.32	Software	/	/	/
1406	EMCO 6502	Loop antenna	27/01/2015	27/01/2017	27/03/2017
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
7001	R&S FSBS	Spectrum Analyzer	05/03/2015	05/03/2017	05/05/2017
7045	MPC F0-100	Climatic chamber	05/09/2014	05/09/2016	05/11/2016
8511	HP 8447D	Low-noise amplifier	07/10/2015	07/10/2016	07/12/2016
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2015	12/06/2018	12/08/2018
8528	Schwarzbeck VHA 9103	Biconical antenna	15/03/2016	15/03/2019	15/05/2019
8535	EMCO 3115	Antenna	29/10/2012	29/10/2016	29/12/2016
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2015	12/06/2018	12/08/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8676	ISOTECH IDM106N	Multimeter	21/05/2015	21/05/2017	21/07/2017
8707	R&S ESI7	Test receiver	07/06/2016	07/06/2018	07/08/2018
8732	Emitech	OATS	18/02/2015	18/02/2018	18/04/2018
8749	La Crosse Technology WS-9232	Meteo station	03/09/2014	03/09/2016	03/11/2016
8750	La Crosse Technology WS-9232	Meteo station	03/09/2014	03/09/2016	03/11/2016
8783	EMCO 3147	Log periodic antenna	15/03/2016	15/03/2019	15/05/2019
8864	Champ libre Juigné. V3.4	Software	/	/	/
8893	Emitech	Outside room Hors cage	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
10739	LUCIX Corp S005180M3201	Low-noise amplifier	20/01/2016	20/01/2017	20/03/2017

6. TESTS RESULTS SUMMARY

6.1 general (subpart A)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.19	LABELLING REQUIREMENTS	X				See certification documents
FCC Part 15.21	INFORMATION TO USER	X				See certification documents

NAp: Not Applicable

NAs: Not Asked

6.2 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.105	INFORMATION TO THE USER	X				See certification documents
FCC Part 15.107	CONDUCTED LIMITS			X		EUT supplied by batteries
FCC Part 15.109	RADIATED EMISSION LIMITS	X				Class B
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable

NAs: Not Asked

6.3 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		EUT supplied by batteries
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS			X		Note 3
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 §15.225 frequency bands	X				Note 4
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHZ					
	(a) Field strength within the band 13.553-13.567 MHz	X				
	(b) Field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	X				
	(c) Field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	X				
	(d) Field strength outside the band 13.110-14.010 MHz	X				
	(e) Carrier frequency tolerance	X				
	(f) Powered tags			X		

NAP: Not Applicable NAs: Not Asked

Note 1: Integral antenna

Note 2: See FCC part 15.225 (d).

Note 3: The device under test integrates a Zigbee module already certified (FCC ID: OUR-XBEEPRO).

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

RF EXPOSURE:

In accordance with KDB 447498 D01 General RF Exposure Guidance v06, Paragraph 4.3.1.

Below 100MHz

The product must respect the exclusion limit for 1-g SAR (head and body) and for 10-g extremity SAR.

Maximum measured power = 46.57 dBμV/m at 10m = 0.710×10^{-6} mW at 13.56 MHz

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

For test separation distances ≤ 50 mm

The power threshold determined by the equation in 4.3.1.c) 1) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$

According this formula:

For 1-g SAR power exclusion threshold is:

Power threshold, mW = $\left[\left[\left(\frac{50 \times 3}{\sqrt{0.100}} \right) + (50 - 50) \times \left(\frac{100}{150} \right) \right] \times \left[1 + \log\left(\frac{100}{13.56} \right) \right] \times \frac{1}{2} \right]$

Power threshold, mW = 442.97 mW

For 10-g SAR power exclusion threshold is:

Power threshold, mW = $\left[\left[\left(\frac{50 \times 7.5}{\sqrt{0.100}} \right) + (50 - 50) \times \left(\frac{100}{150} \right) \right] \times \left[1 + \log\left(\frac{100}{13.56} \right) \right] \times \frac{1}{2} \right]$

Power threshold, mW = 1107.43 mW

The equipment fulfils the requirements on maximum conducted or equivalent isotropically radiated power (e.i.r.p) for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310 at the distance greater than 5 mm between the user and the antenna

7. MEASUREMENT UNCERTAINTY

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the results.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%.

Parameter	Emitech Uncertainty
RF power, conducted	$\pm 0.75\text{dB}$
Radiated emission valid to 26 GHz	
F < 62.5 MHz:	$\pm 5.14\text{ dB}$
62.5 MHz < F < 1 GHz:	$\pm 5.13\text{ dB}$
1 GHz < F < 26 GHz:	$\pm 5.16\text{ dB}$
AC Power Lines conducted emissions	$\pm 3.38\text{ dB}$
Temperature	$\pm 1\text{ }^{\circ}\text{C}$
Humidity	$\pm 5\text{ \%}$

8. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: paragraph 109

Limit class: Class B

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The measure is realized on open area test site under 1 GHz and in anechoic chamber above 1 GHz.

When the system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

See photos in appendix 2.

Frequency range:

- Sample 1: From 30MHz to 1GHz, (5th harmonic of the highest frequency used)
- Sample 2: From 30MHz to 12.4GHz, (5th harmonic of the highest frequency used)

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: 10 meters (in open area test site) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1.5 meter (in anechoic room)

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

Equipment under test operating condition:

The RFID module is in alternance in emission and reception.
Then, the Zigbee module is in reception mode.

Results:

Ambient temperature (°C): 27.2
Relative humidity (%): 47

Power source: We used for power source the internal battery fully charged.

Sample N° 1: RFID in reception mode

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
188.16	QP	140	300	120	V	17.31	27.71	43.5	15.79

P= Peak, QP=Quasi-peak, Av=Average

Sample N° 2: Zigbee module in reception mode

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
51.48	QP	100	0	120	V	11.18	21.58	40	18.42
107.47	QP	161	80	120	H	24.24	34.64	43.5	8.86
109.34	QP	100	110	120	V	12.38	22.78	43.5	20.72

P= Peak, QP=Quasi-peak, Av=Average

Applicable limits: for $30 \text{ MHz} \leq F \leq 88 \text{ MHz}$: 40 dBμV/m at 3 meters
for $88 \text{ MHz} < F \leq 216 \text{ MHz}$: 43.5 dBμV/m at 3 meters
for $216 \text{ MHz} < F \leq 960 \text{ MHz}$: 46 dBμV/m at 3 meters
Above 960 MHz : 54 dBμV/m at 3 meters

Test conclusion:

RESPECTED STANDARD

9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Standard: FCC Part 15

Test procedure: Paragraph 15.215

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 modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 21.2
Relative humidity (%): 37

Power source: We used for power source the internal battery fully charged.

Lower Band Edge: band from 13.09 MHz to 13.11 MHz
Upper Band Edge: band from 14.01 MHz to 14.03 MHz

Sample N° 1: RFID LOCAL

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)
13.56	46.89	Peak	13.063	-31.40	15.49	48.63	33.14
13.56	46.89	Peak	14.122	-35.68	11.21	48.63	37.42

**Marker-Delta method*

20 dB bandwidth curves are given in appendix 5; band-edge curves are given in appendix 6.

Sample N° 1: RFID REMOTE

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m) measured at 10m	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) at 10m	Margin (dB)
13.56	49.85	Peak	13.061	-31.83	18.02	48.63	30.61
13.56	49.85	Peak	14.064	-37.01	12.84	48.63	35.79

**Marker-Delta method*

20 dB bandwidth curves are given in appendix 5; band-edge curves are given in appendix 6.

Test conclusion:

RESPECTED STANDARD

10. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz

Standard: FCC Part 15

Test procedure: paragraph 15.225 (a), (b), (c), (e)

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

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

See photos in appendix 2

The frequency tolerance measure is realized in near-field.

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

Bandwidth: 9 kHz ($150 \text{ kHz} < F < 30 \text{ MHz}$)

Distance of antenna: 10 meters

Antenna height: 1 meter

Antenna polarization: oriented in the vertical plane. The lowest point of the loop is 1m above ground level.

Equipment under test operating condition:

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

Results:

Ambient temperature (°C): 27.2
Relative humidity (%): 47

Power source: We used for power source the internal battery fully charged.

Carrier field strength

Sample N° 1: RFID LOCAL

	Field strength (dB μ V/m) at frequency: 13.56 MHz
Normal test conditions measured at 10m	43.01
Normal test conditions computed at 30m	23.93
Limits (dB μ V/m)	84
Margin (dB)	60.07

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

Position of equipment: Refer appendix (azimuth: 11 degrees)

Sample N° 1: RFID REMOTE

	Field strength (dB μ V/m) at frequency: 13.56 MHz
Normal test conditions measured at 10m	46.57
Normal test conditions computed at 30m	27.49
Limits (dB μ V/m)	84
Margin (dB)	56.51

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

Position of equipment: Refer appendix (azimuth: 220 degrees)

Frequency stability:

Sample N° 1: RFID LOCAL

			Measured frequency difference (ppm)	Limits (ppm)
Normal test conditions	Temperature (°C): 20 Humidity (%):41	Minimal power source (V):3.06	+25.22	±100
		Maximal power source (V):4.14	+27.36	
Extreme test conditions	Minimal temperature (°C): -20	Nominal power source (V):3.60	+30.09	
	Maximal temperature (°C): +50	Nominal power source (V):3.60	+22.42	

Sample N° 1: RFID REMOTE

			Measured frequency difference (ppm)	Limits (ppm)
Normal test conditions	Temperature (°C): 20 Humidity (%):41	Minimal power source (V):3.06	+41.52	±100
		Maximal power source (V):4.14	+41.52	
Extreme test conditions	Minimal temperature (°C): -20	Nominal power source (V):3.60	+44.76	
	Maximal temperature (°C): +50	Nominal power source (V):3.60	+33.55	

Field strength within the band 13.110-14.010 MHz

See spectrum mask in appendix 7.

Test conclusion:

RESPECTED STANDARD

11. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.010 MHZ

Standard: FCC Part 15

Test procedure: paragraph 209
paragraph 15.225 (d)

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The measure is realized on open area test site under 1 GHz.

When the system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

See photos in appendix 2.

Frequency range: From 9 kHz to 135.6MHz (10th harmonic of the highest fundamental frequency)

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

Bandwidth: 200Hz ($9 \text{ kHz} < F < 150\text{kHz}$)
9 kHz ($150 \text{ kHz} < F < 30\text{MHz}$)
120 kHz ($30 \text{ MHz} < F < 1 \text{ GHz}$)

Distance of antenna: 10 meters (in open area test site) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1.5 meter (in anechoic room)

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

Equipment under test operating condition:

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

Results:

Ambient temperature (°C): 27.2
Relative humidity (%): 47

Power source: We used for power source the internal battery fully charged.

Sample N° 1: RFID LOCAL

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
40.68	QP	237	199	120	V	21.01	31.41	40	8.59
67.8	QP	400	0	120	H	12.53	22.93	40	17.07
188.16	QP	140	300	120	V	17.31	27.71	43.5	15.79

P= Peak, QP=Quasi-peak, Av=Average

Sample N° 1: RFID REMOTE

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
40.68	QP	275	0	120	V	19.85	30.25	40	9.75
45.2	QP	100	20	120	V	11.22	21.62	40	18.38
67.8	QP	400	140	120	V	12.28	22.68	40	17.32
108.46	QP	125	0	120	V	15.43	25.83	43.5	17.67
167	QP	100	256	120	V	16.62	27.12	43.5	16.38

P= Peak, QP=Quasi-peak, Av=Average

Applicable limits:

for 9 kHz ≤ F ≤ 490 kHz :	2400/F(kHz) at 300 meters
for 490 kHz < F ≤ 1.705 MHz :	24000/F(kHz) at 30 meters
for 1.705 MHz < F ≤ 30 MHz :	29.5 dBμV/m at 30 meters
for 30 MHz < F ≤ 88 MHz :	40 dBμV/m at 3 meters
for 88 MHz < F ≤ 216 MHz :	43.5 dBμV/m at 3 meters
for 216 MHz < F ≤ 960 MHz :	46 dBμV/m at 3 meters
Above 960 MHz :	54 dBμV/m at 3 meters

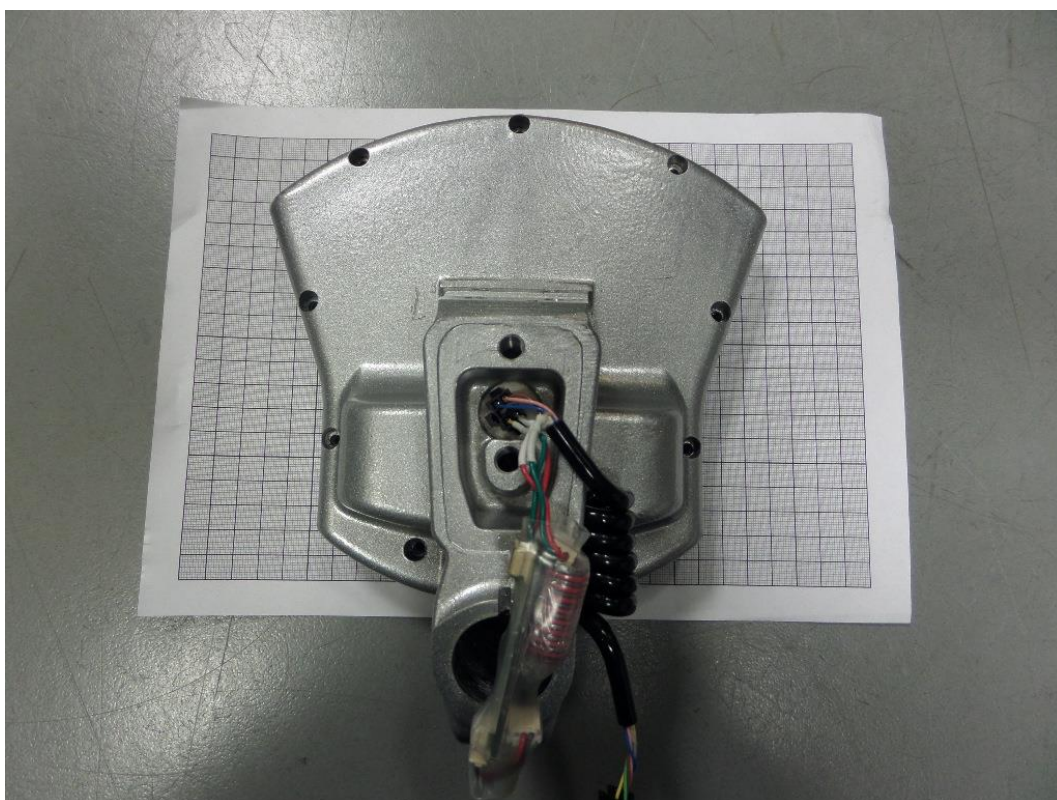
Test conclusion:

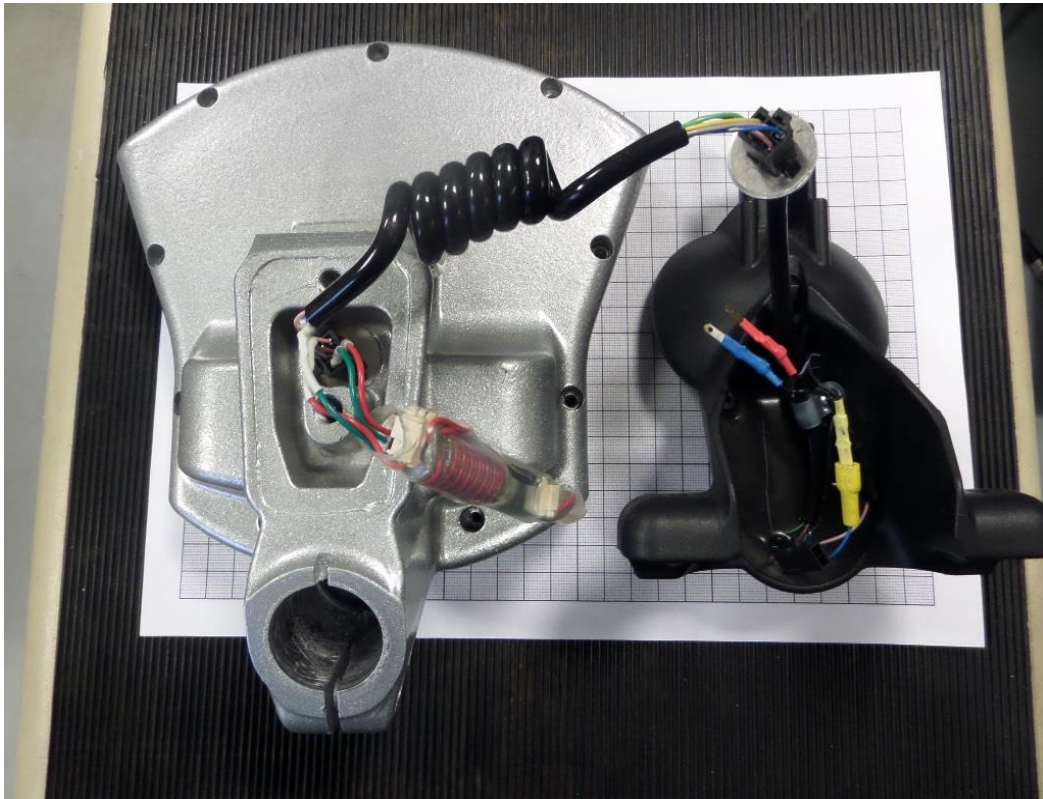
RESPECTED STANDARD

□□□ End of report, 7 annexes to be forwarded □□□

APPENDIX 1: Photographies of the equipment under test

External photos

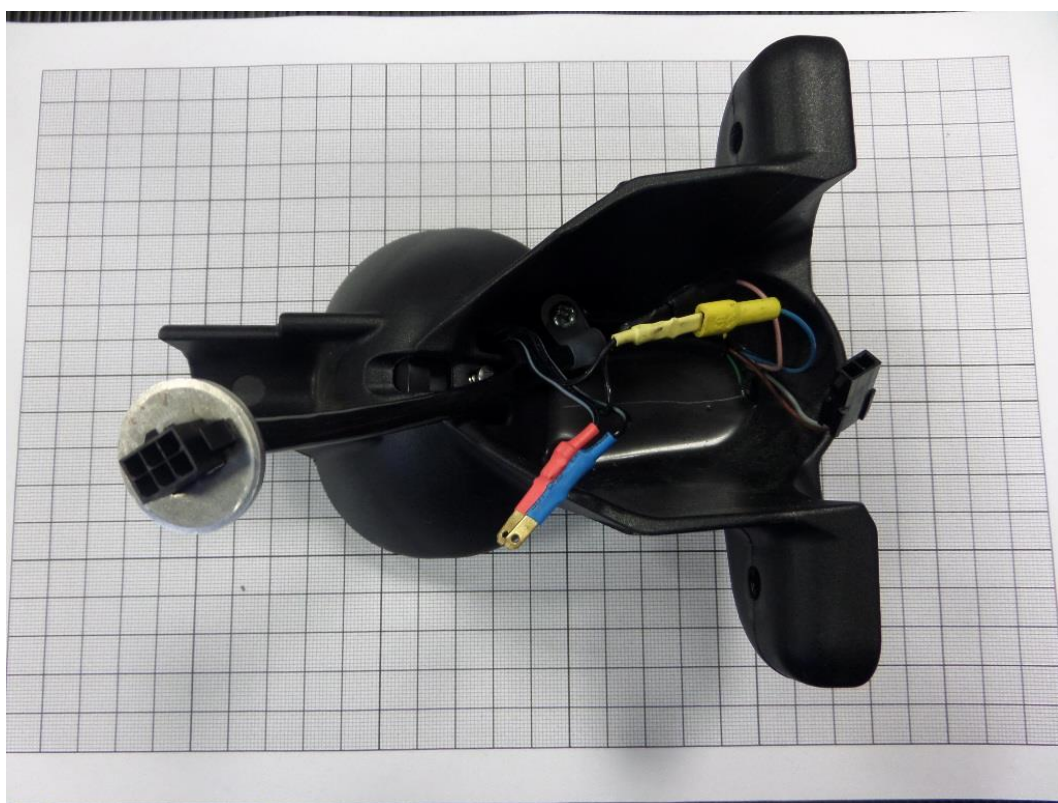




Internal photos

CONFIDENTIAL

External lamp antenna



APPENDIX 2: Test set up

In anechoic chamber



In open area test site



APPENDIX 3: Test equipment list

Radiated emission limits

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Antenna 3115	EMCO	8535
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX Corp.	10739
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.4	8864

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Outside room Hors cage	Emitech	8893
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

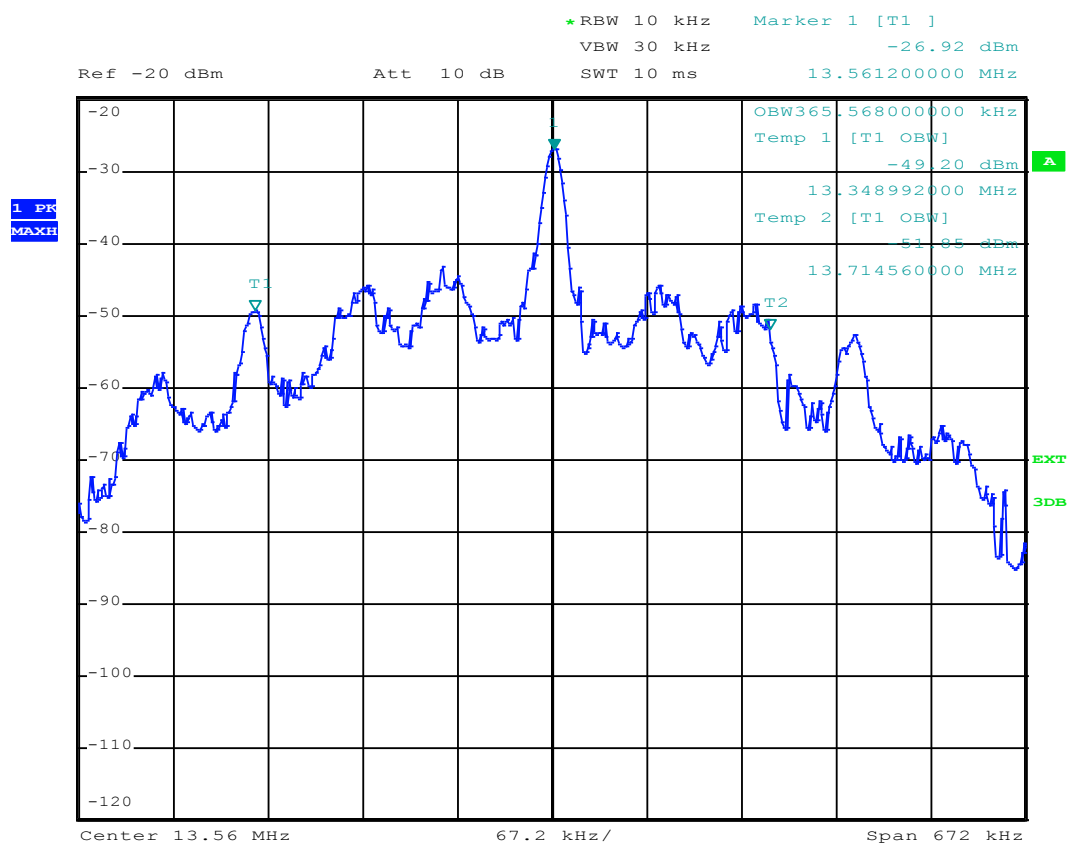
Operation within the band 13.110 – 14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSBS	Rohde & Schwarz	7001
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Climatic chamber F0-100	MPC	7045
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.4	8864

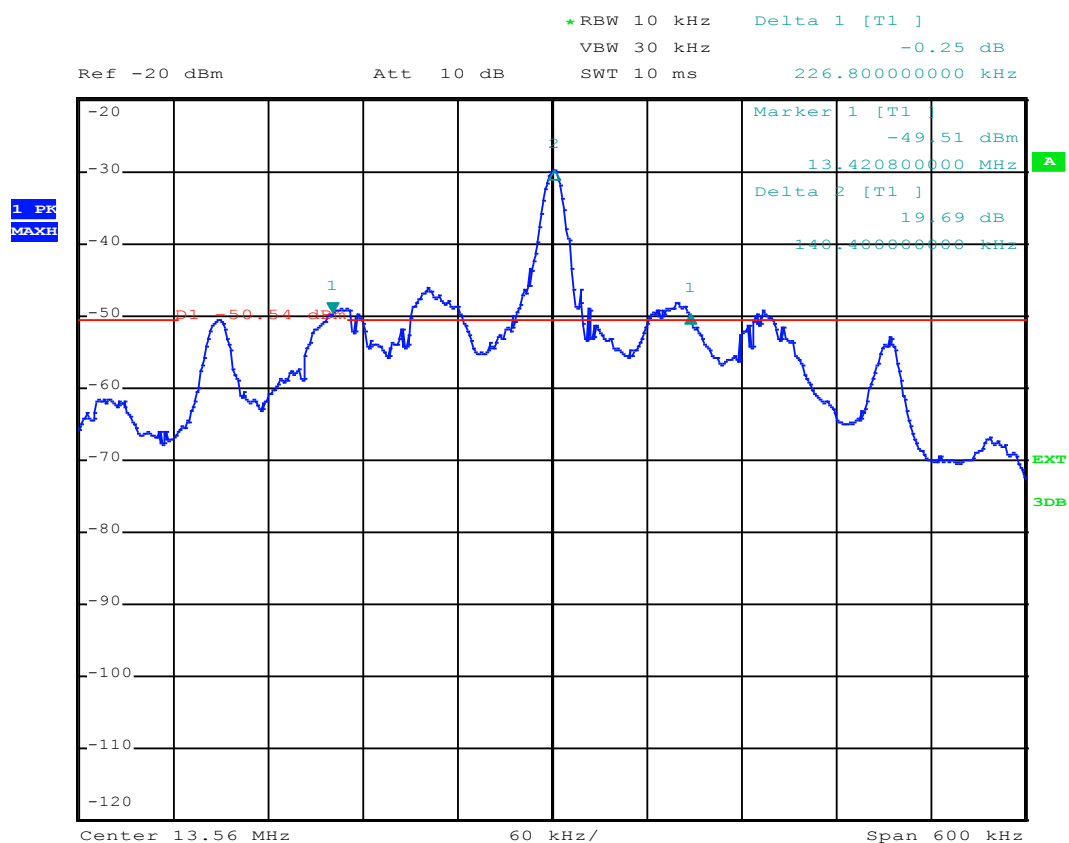
Field strength outside the band 13.110-14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Low-noise amplifier 8447D	Hewlett Packard	8511
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.4	8864

APPENDIX 4: 99% bandwidth

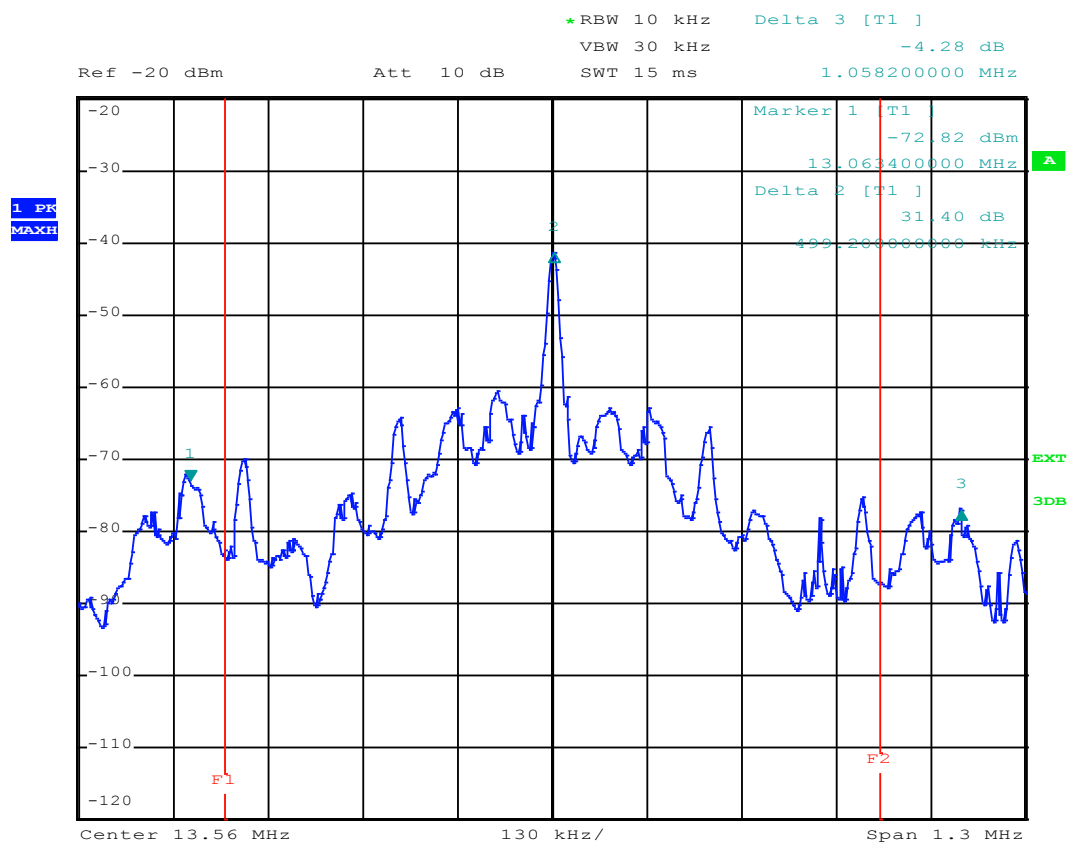


APPENDIX 5: 20 dB bandwidth

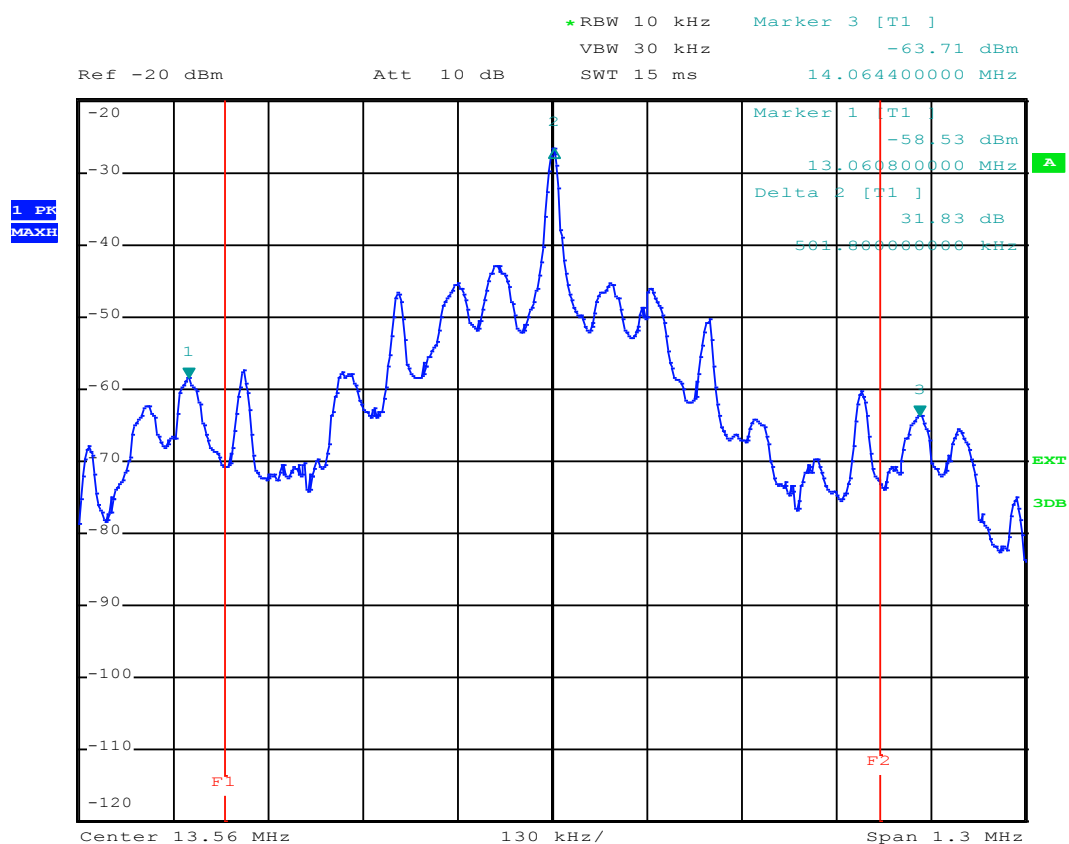


APPENDIX 6: Band edge

RFID LOCAL

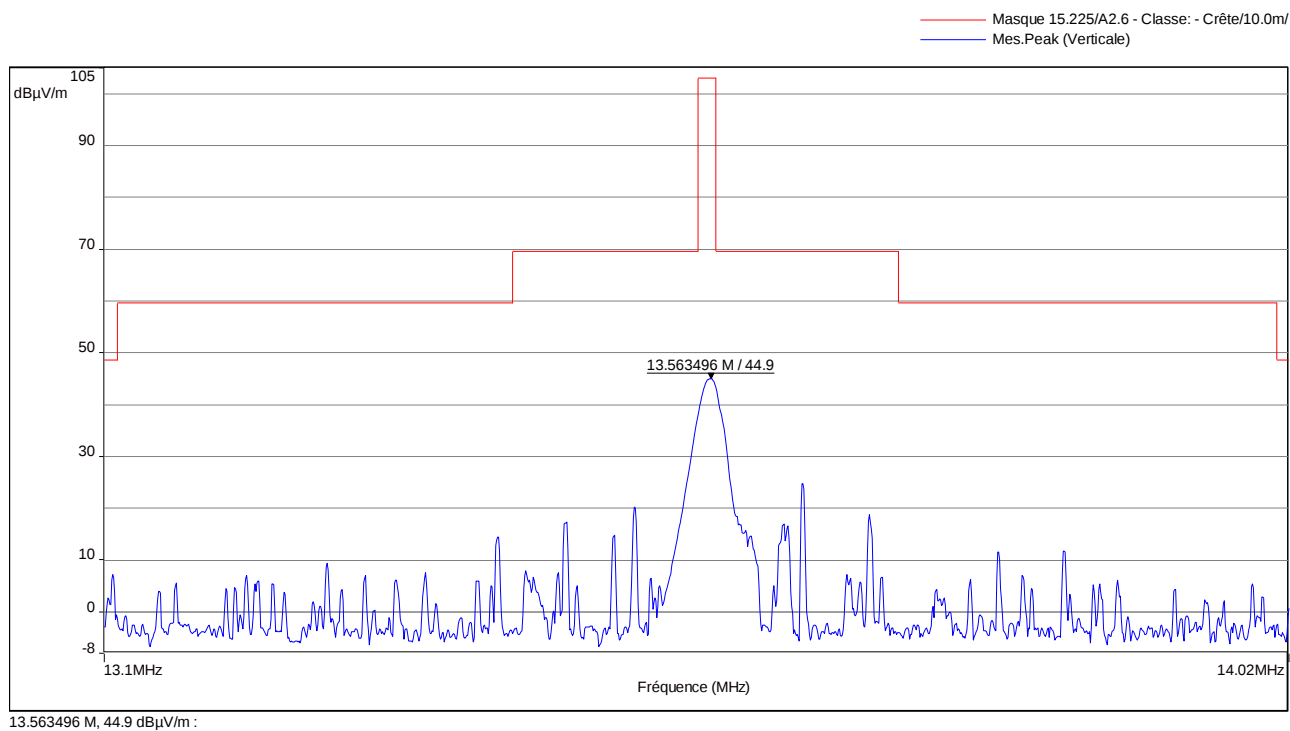


RFID REMOTE

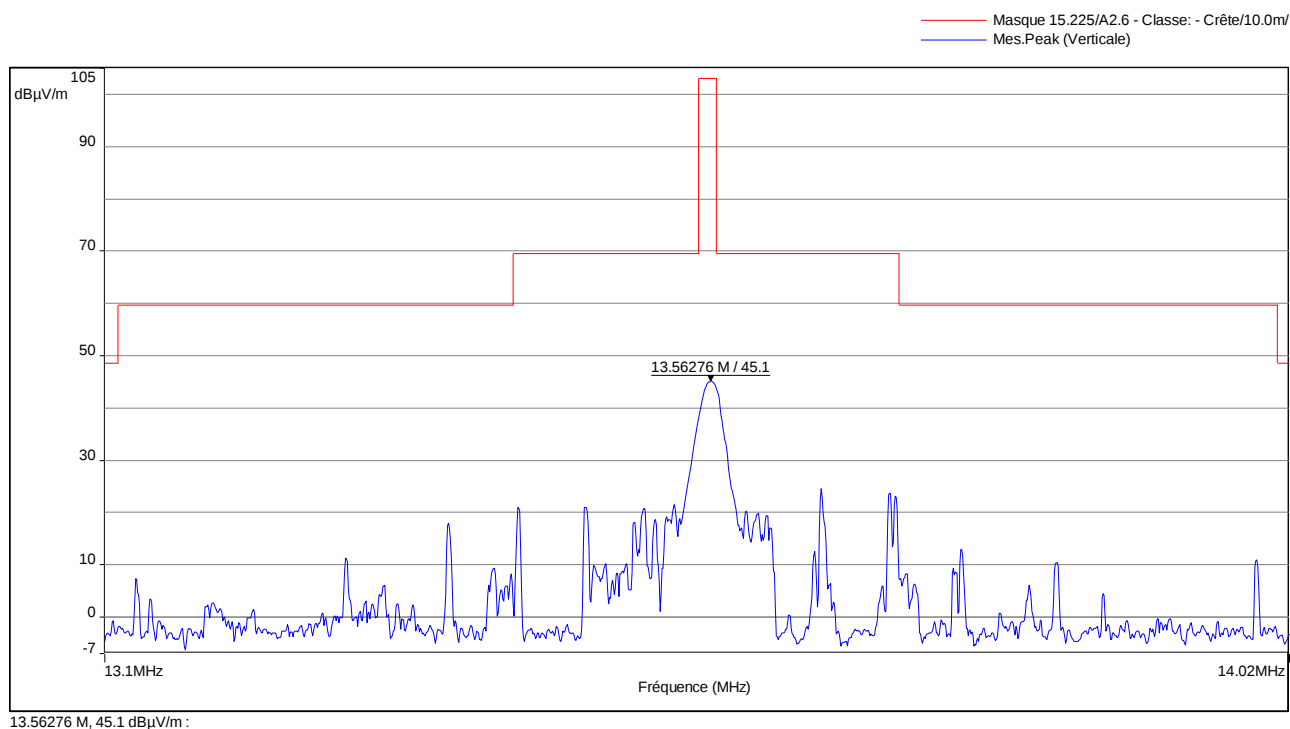


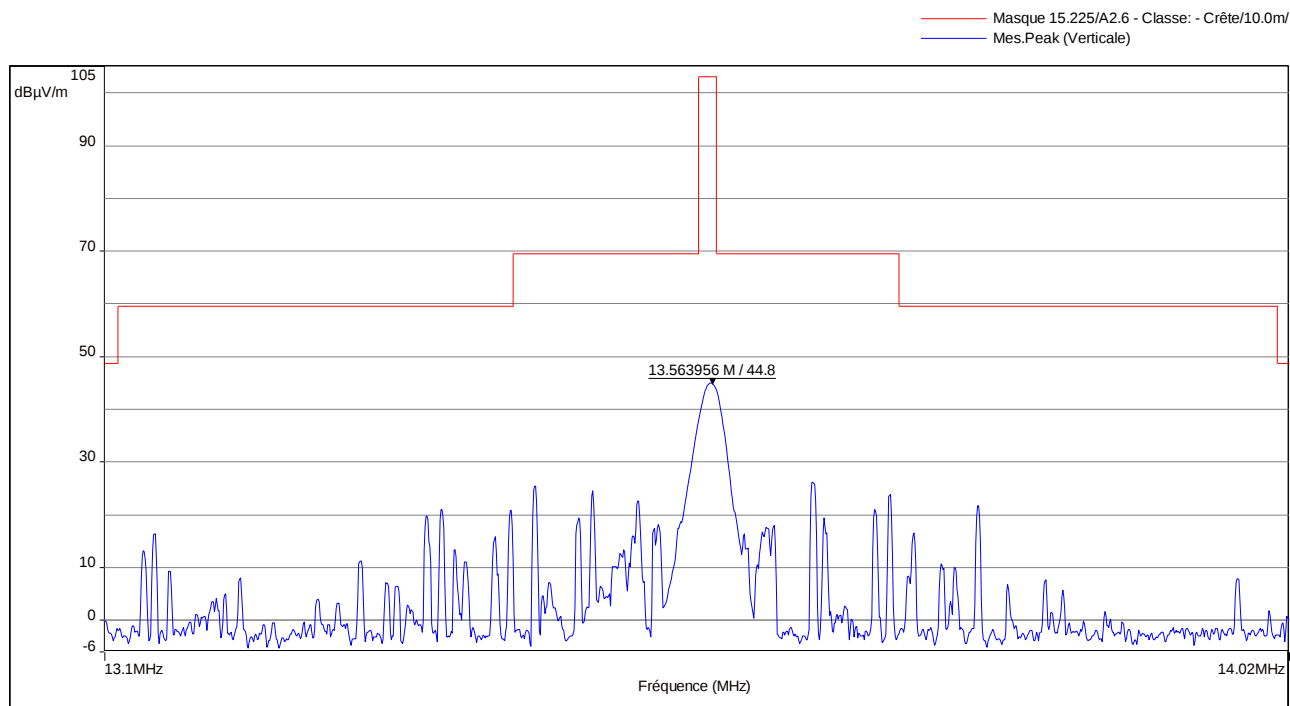
APPENDIX 7: Spectrum mask

Mask RFID LOCAL +20°C, 3.6Vdc

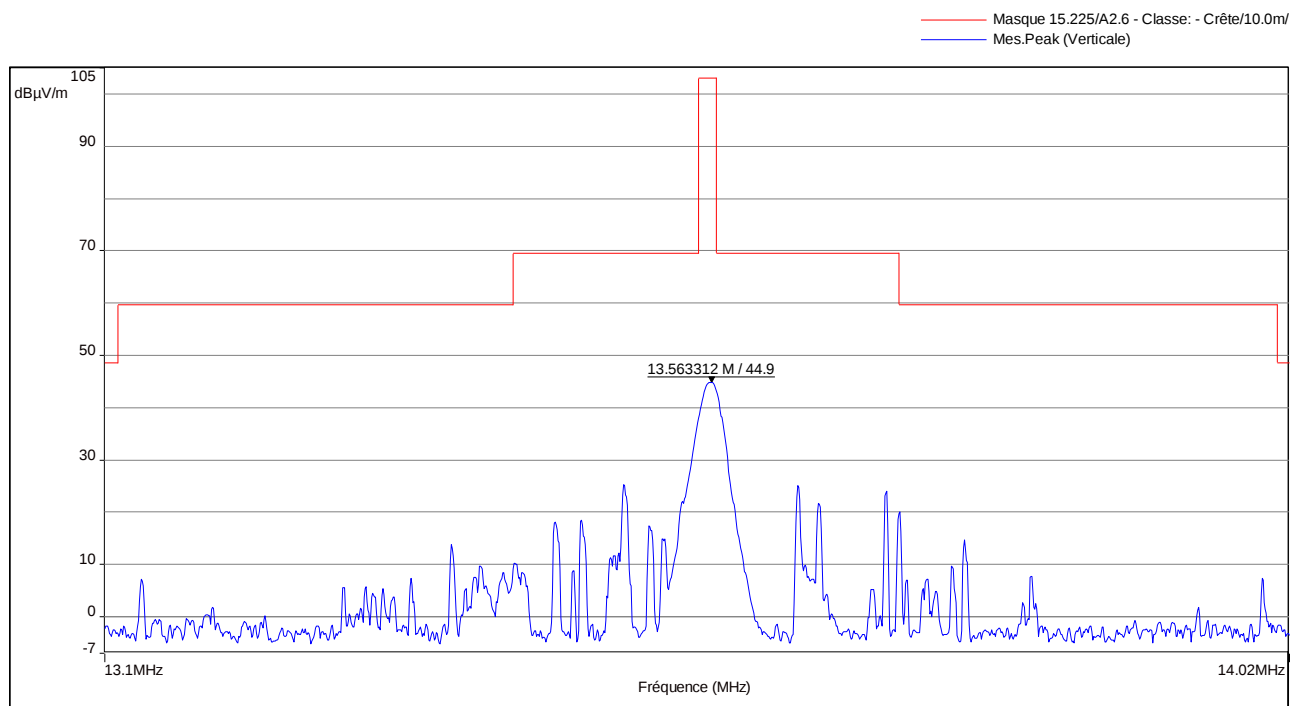


Mask RFID LOCAL +20°C, 3.06Vdc

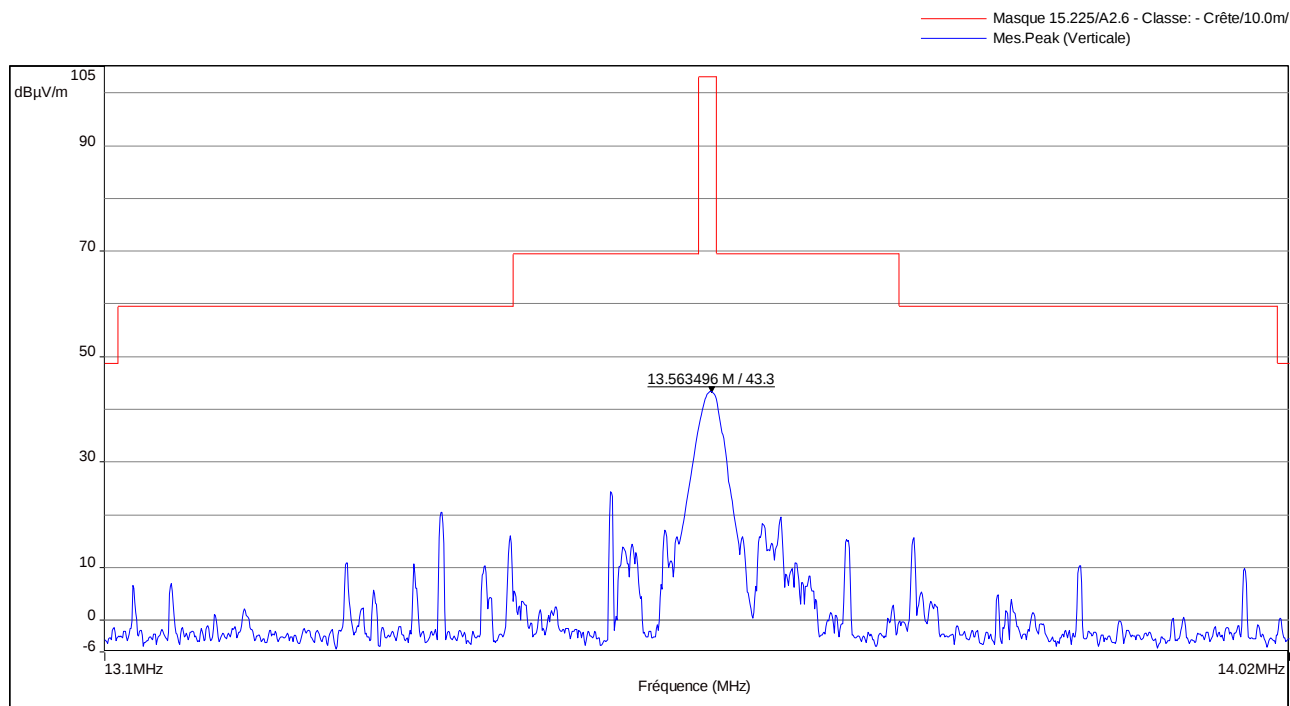


Mask RFID LOCAL +20°C, 4.14Vdc


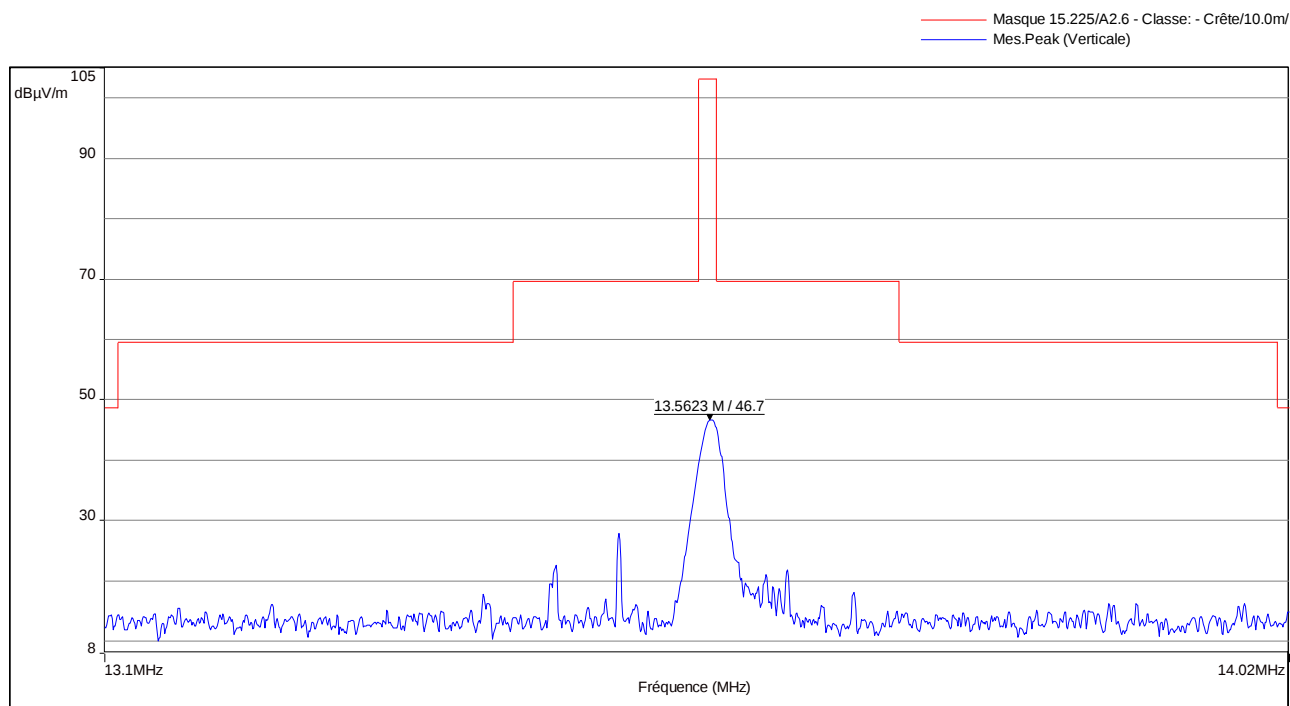
13.563956 M, 44.8 dBμV/m :

Mask RFID LOCAL -20°C, 3.6Vdc


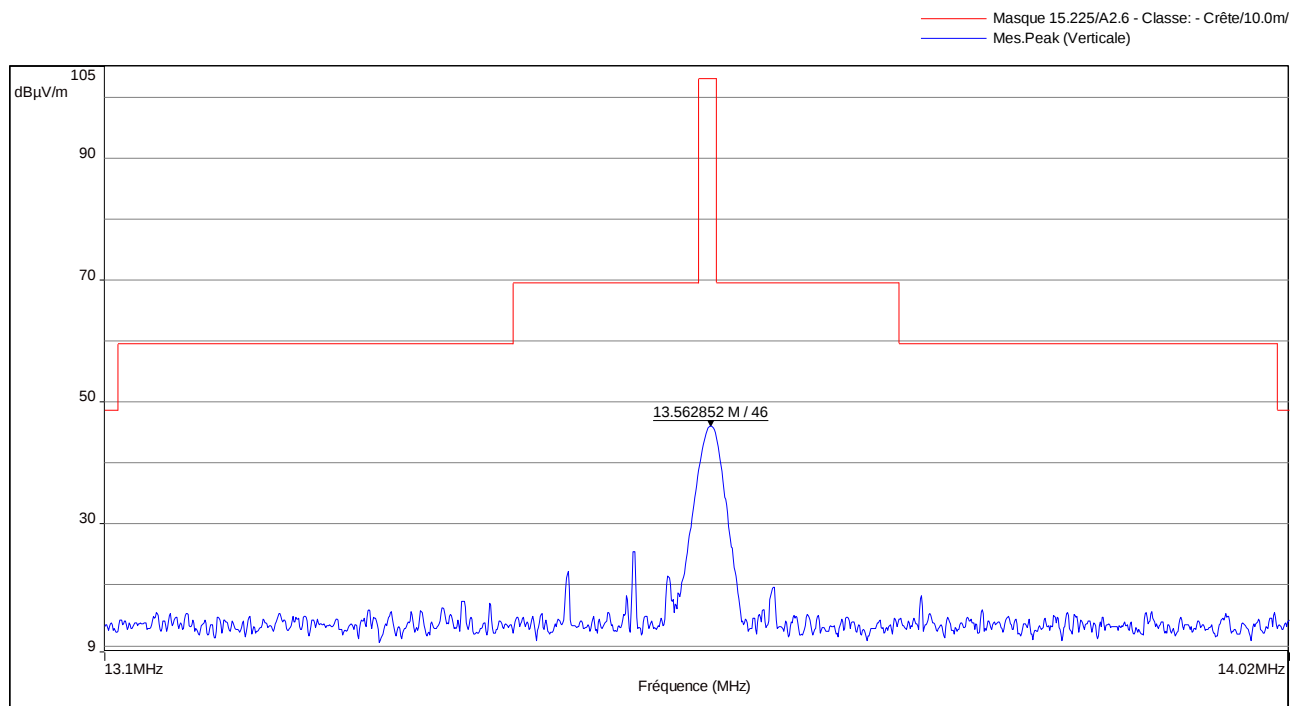
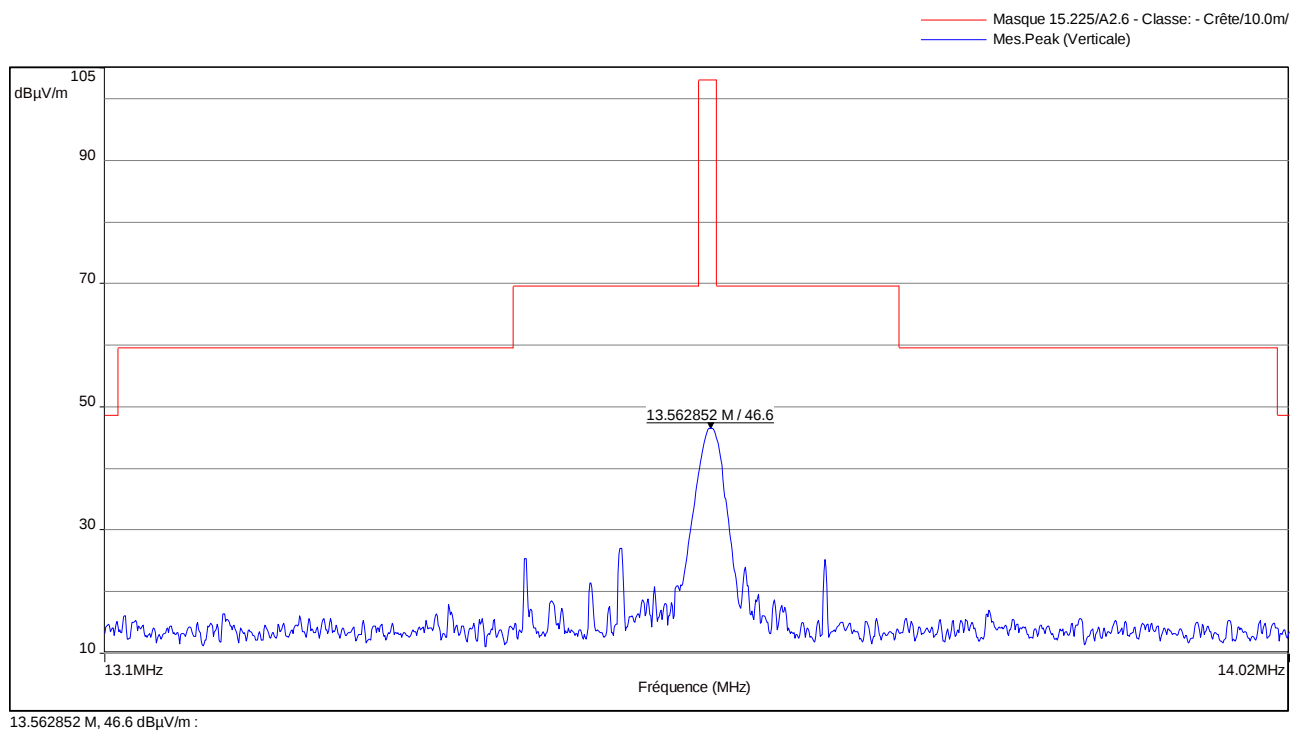
13.563312 M, 44.9 dBμV/m :

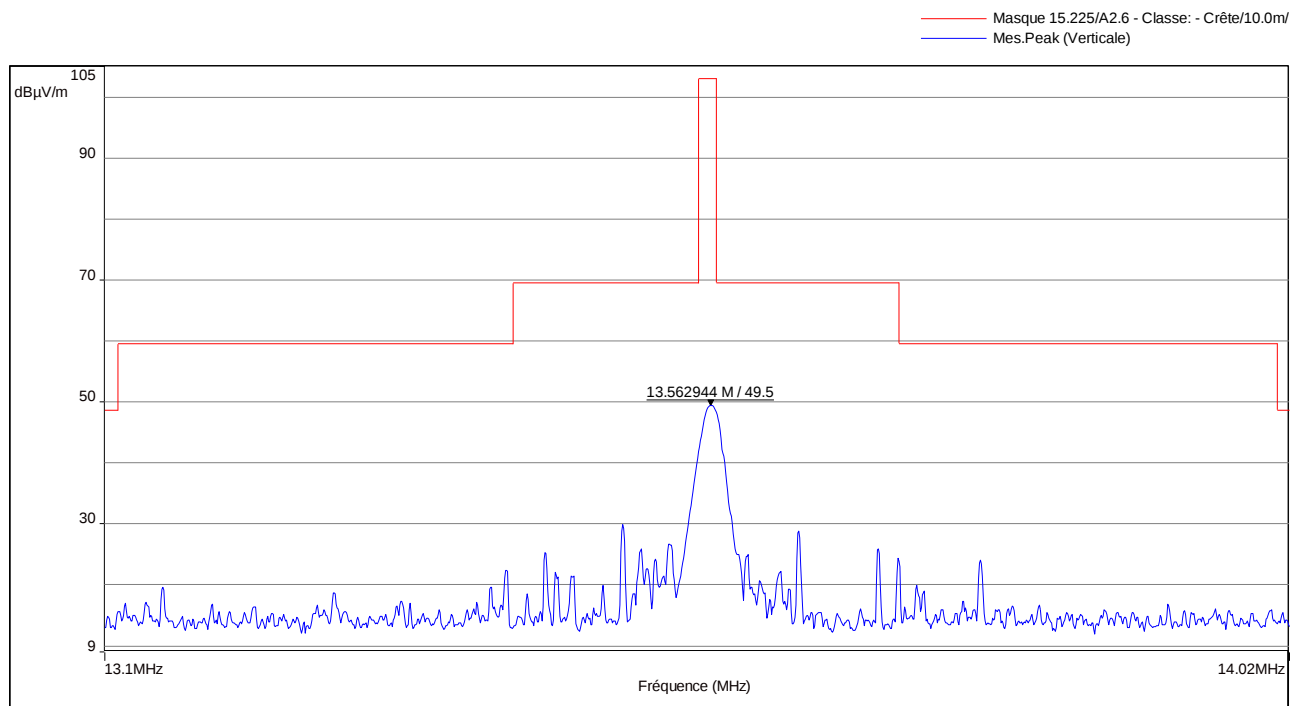
Mask RFID LOCAL +50°C, 3.6Vdc


13.563496 M, 43.3 dBμV/m :

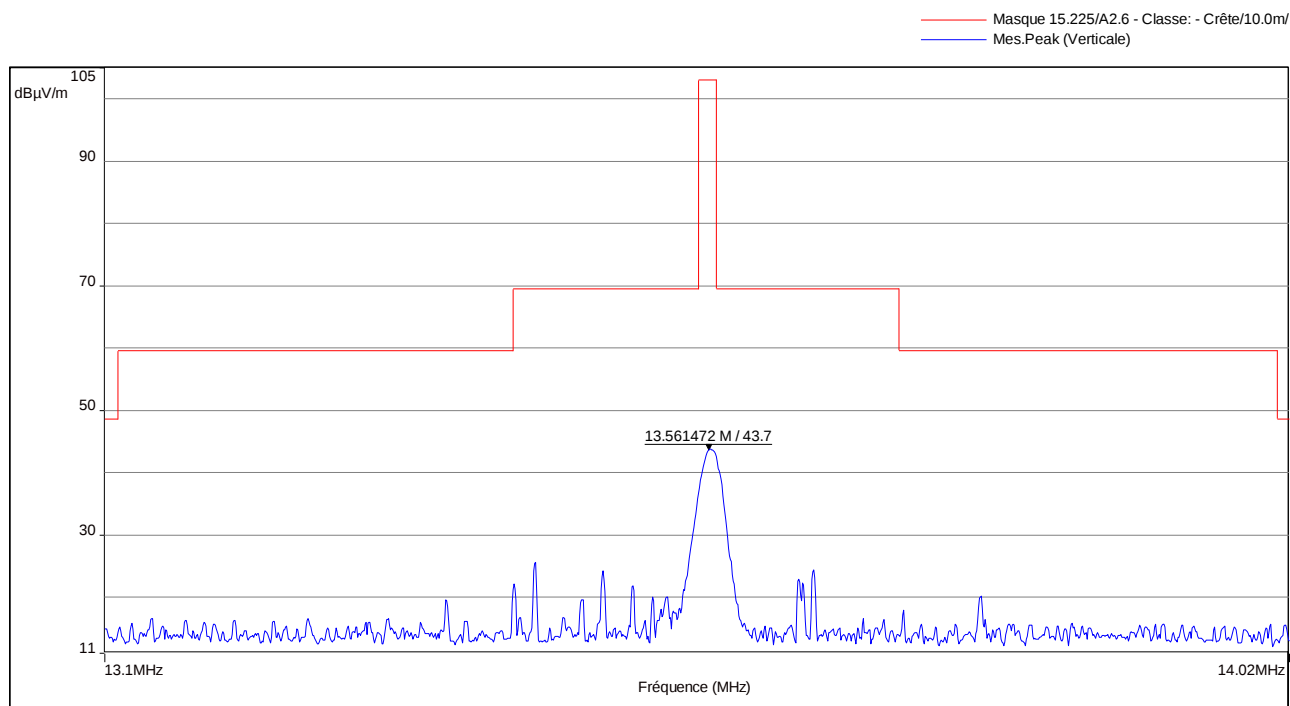
Mask RFID REMOTE +20°C, 3.6Vdc


13.5623 M, 46.7 dBμV/m :

Mask RFID REMOTE +20°C, 3.06Vdc

Mask RFID REMOTE +20°C, 4.14Vdc


Mask RFID REMOTE -20°C, 3.6Vdc


13.562944 M, 49.5 dBμV/m :

Mask RFID REMOTE +50°C, 3.6Vdc


13.561472 M, 43.7 dBμV/m :