

**RR051-16-104897-1-A Ed. 0**

## **Certification Radio test report**

**According to the standard**  
**CFR 47 FCC PART 15**

**Equipment under test:**  
**RFID AND BAR CODE READER**  
**IER 602Axx**

**FCC ID:**  
**WGO602-1356-10**

**Company:**  
**IER**

**DISTRIBUTION: Mr CALDEYROUX****(Company: IER)****Number of pages: 28 with 7 appendixes**

<b>Ed.</b>	<b>Date</b>	<b>Modified pages</b>	<b>Written by</b> Name	<b>Technical Verification and Quality Approval</b> Name	<b>Visa</b>
0	11-OCT-2016	Creation	S. LOUIS 	T. LEDRESSEUR	

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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.



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**DESIGNATION OF PRODUCT:** RFID AND BAR CODE READER

**Serial number (S/N):** 6020002138

**Reference / model (P/N):** IER602Axx

**Software version:** SIMU.221

**MANUFACTURER:** IER

**COMPANY SUBMITTING THE PRODUCT:**

**Company:** IER

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**Responsible:** Mr CALDEYROUX

**DATES OF TEST:** 10-OCT-2016 and 11-OCT-2016

**TESTING LOCATION:** EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE  
EMITECH ANGERS open area test site in JUIGNE SUR LOIRE (49)  
FRANCE  
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France  
FCC Accredited under US-EU MRA Designation Number: FR0009  
Test Firm Registration Number: 873677

**TESTED BY:** S. LOUIS

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## 1. INTRODUCTION

This report presents the results of radio test carried out on the following equipment: **RFID AND BAR CODE READER, IER 602Axx**, in accordance with normative reference.

## 2. PRODUCT DESCRIPTION

Class: B

Utilization: Tag and bar code reader

Antenna type and gain: integrate antenna, gain not communicated

Operating frequency range: 13.56 MHz

Number of channels: 1

Channel spacing: Not concerned

Modulation: RFID protocol

Power source: 120 Vac – 60Hz

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.

#### 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	19/11/2015	19/11/2017	19/01/2018
8508	California instruments 1251RP	Power source	12/10/2015	12/10/2016	12/12/2016
8511	HP 8447D	Low-noise amplifier	08/11/2016	08/11/2017	08/01/2018
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
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2015	12/06/2018	12/08/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8635	R&S EZ-25	High-pass filter	27/10/2016	27/10/2018	27/12/2018
8671	HUGER	Meteo station	23/09/2016	23/09/2018	23/11/2018
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
8720	R&S ESH3-Z5	LISN	08/11/2016	08/11/2018	08/01/2019
8732	Emitech	OATS	18/02/2015	18/02/2018	18/04/2018
8749	La Crosse Technology WS-9232	Meteo station	23/09/2016	23/09/2018	23/11/2018
8750	La Crosse Technology WS-9232	Meteo station	23/09/2016	23/09/2018	23/11/2018
8864	Champ libre Juigné. V3.4	Software	/	/	/
8893	Emitech	Outside room Hors cage	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9403	ESU8	Spectrum Analyzer	13/01/2016	13/01/2018	13/03/2018
9489	Absorber sheath current	Emitech	21/04/2016	21/04/2018	21/01/2018

## 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				Class B
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				
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) <i>Alternative to general radiated emission limits</i>	X				
	(b) <i>Unwanted emissions outside of §15.225 frequency bands</i>	X				Note 4
	(c) <i>20 dB bandwidth and band-edge compliance</i>	X				
FCC Part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHz					
	(a) <i>Field strength within the band 13.553-13.567 MHz</i>	X				
	(b) <i>Field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz</i>	X				
	(c) <i>Field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz</i>	X				
	(d) <i>Field strength outside the band 13.110-14.010 MHz</i>	X				
	(e) <i>Carrier frequency tolerance</i>	X				
	(f) <i>Powered tags</i>				X	

NAp: Not Applicable    NAs: Not Asked

Note 1: Professionally installed equipment.

Note 2: See FCC part 15.225 (d).

Note 3: Single modular transmitter.

The host devices of the certified modules shall be properly labeled to identify the module(s) within.

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

**RF EXPOSURE:**

Maximum measured power = 0.00014 mW at 13.56MHz

*During the normal use, the user can place his hand near (less than 50 mm) the antenna for scanning a tag. That's why the SAR exclusion (worst critical analyze) was realized*

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

*The product must respect the exclusion limit for 10-g extremity SAR and a separation distances less than 50mm:*

$$P(mW) < \frac{\frac{7.5 * 50(\text{mm})}{\sqrt{0.1(\text{GHz})}} * (1 + \log\left(\frac{100}{F(\text{MHz})}\right))}{2}$$

$$P(\text{mW}) < 1107.43\text{mW}$$

## 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	$\pm 0.75$ dB
Radiated emission valid to 26 GHz	
$F < 62.5$ MHz:	$\pm 5.14$ dB
$62.5$ MHz $< F < 1$ GHz:	$\pm 5.13$ dB
$1$ GHz $< F < 26$ GHz:	$\pm 5.16$ dB
AC Power Lines conducted emissions	$\pm 3.38$ dB
Temperature	$\pm 1$ °C
Humidity	$\pm 5$ %

## 8. MEASUREMENT OF THE CONDUCTED DISTURBANCES

**Standard:** FCC Part 15

**Test procedure:** Paragraph 15.207 and 15.107

**Software used:** BAT-EMC V3.6.0.32

**Test set up:**

The EUT is isolated and 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 appendix 2

**Frequency range:** 150 kHz - 30 MHz

**Detection mode:** Peak / Quasi-peak / Average

**Bandwidth:** 10 kHz / 9 kHz

**Equipment under test operating condition:**

The equipment is in alternance in emission and reception, at the highest output power level at which the transmitter is intended to operate.

**Results:**

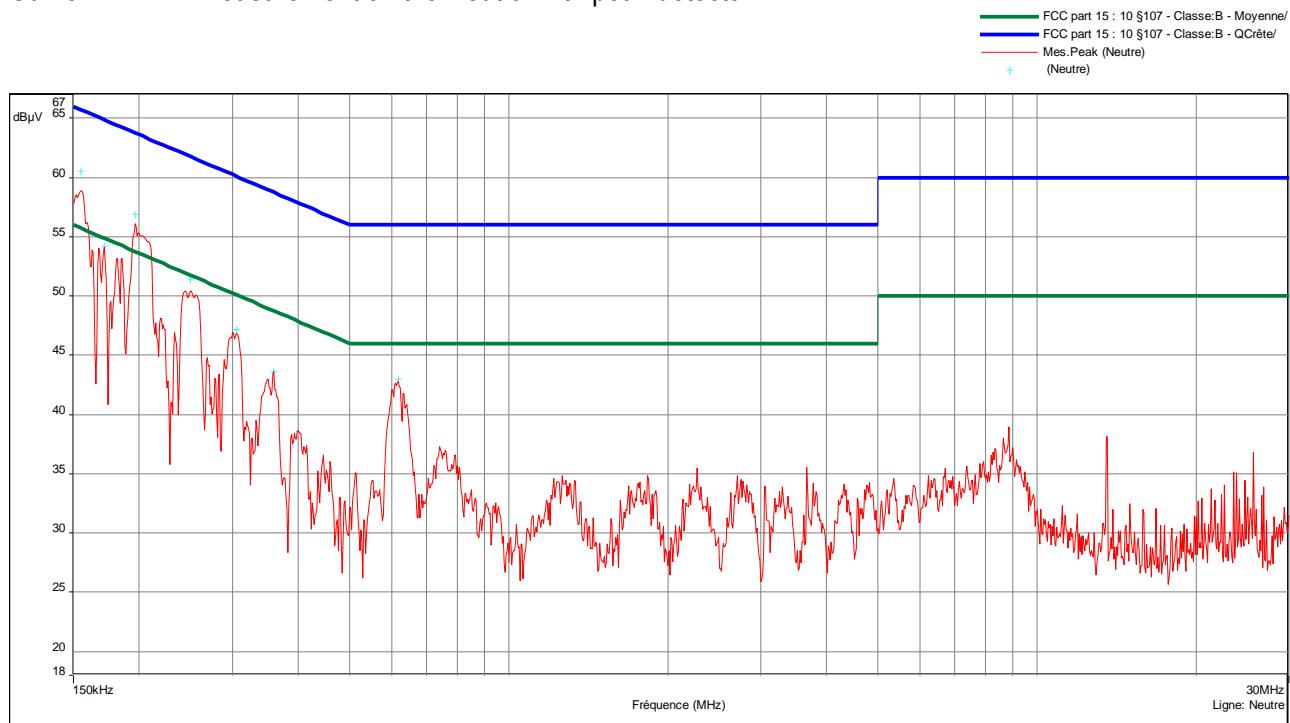
Ambient temperature (°C):	22.3
Relative humidity (%):	37

Sample N° 1:

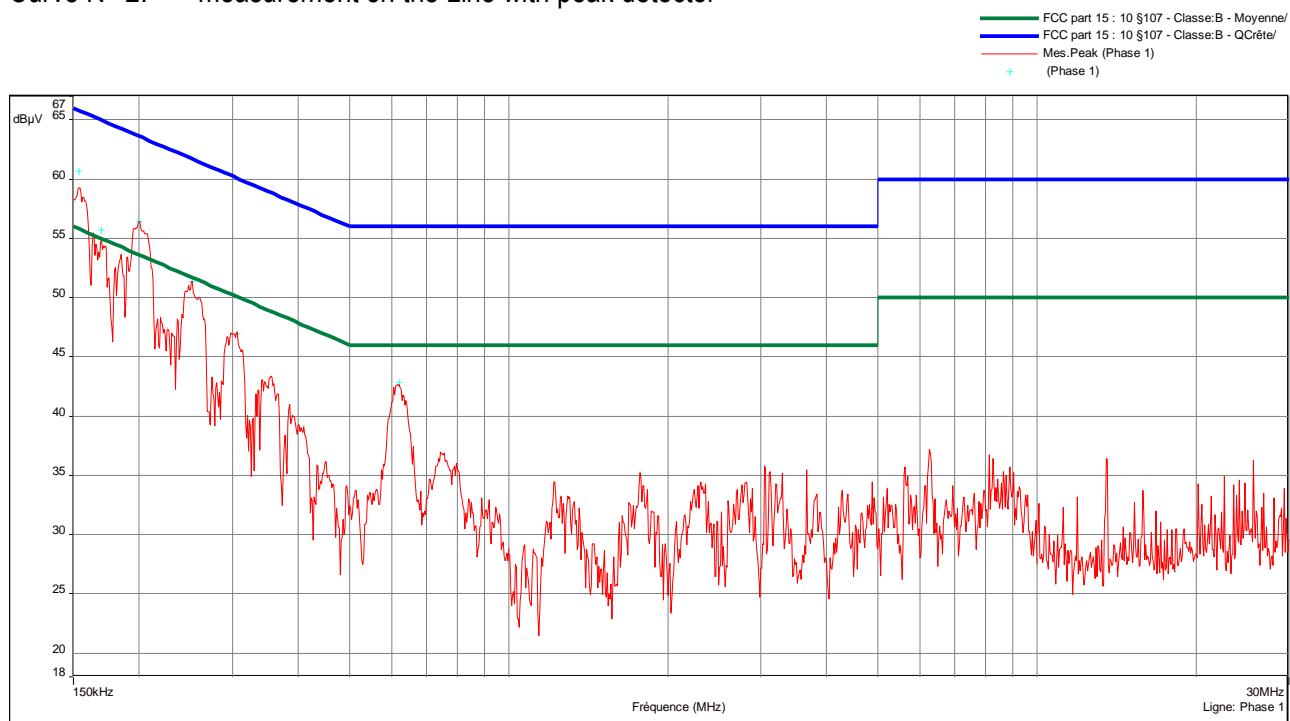
**Measurement on the mains power supply:**

The measurement is first realized 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 then analyzed with Quasi-peak detector.

**Neutral wire**

Frequency (MHz)	Quasi-peak (dB $\mu$ V)	QP Limit (dB $\mu$ V)	Margin (dB)
0,155185	57,38	65,718	8,338
0,171675	46,1	64,879	18,779
0,19658	53,07	63,754	10,684
0,25013	48,83	61,753	12,923
0,305295	44,27	60,098	15,828
0,359015	39,51	58,751	19,241
0,617925	40,64	56,000	15,360

**Line wire**

Frequency (MHz)	Quasi-peak (dB $\mu$ V)	QP Limit (dB $\mu$ V)	Margin (dB)
0,153825	57,94	65,791	7,851
0,169465	46,16	64,987	18,827
0,19998	54,09	63,611	9,521
0,251405	49	61,711	12,711
0,305975	44,26	60,079	15,819
0,621155	39,76	56,000	16,240

The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

**Neutral wire**

Frequency (MHz)	AVG (dB $\mu$ V)	AVG Limit (dB $\mu$ V)	Margin (dB)
0,155185	39,68	55,718	16,038
0,171675	16,65	54,879	38,229
0,19658	37,1	53,754	16,654
0,25013	35,64	51,753	16,113
0,305295	33,58	50,098	16,518
0,359015	28,24	48,751	20,511
0,617925	28,43	46,000	17,570

**Line wire**

Frequency (MHz)	AVG (dB $\mu$ V)	AVG Limit (dB $\mu$ V)	Margin (dB)
0,153825	42,05	55,791	13,741
0,169465	16,68	54,987	38,307
0,19998	40,52	53,611	13,091
0,251405	36,270	51,711	15,441
0,305975	33,630	50,079	16,449
0,621155	25,440	46,000	20,560

### 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 is in alternance in emission and reception, 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: 120Vac – 60 Hz

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:

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB $\mu$ V/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 (dB $\mu$ V/m)	Limit (dB $\mu$ V/m) at 10m	Margin (dB)
13.56	34.15**	Peak	13.056	33.11	1.04	48.63	47.59
13.56	34.15**	Peak	14.064	32.12	2.03	48.63	46.60

\*Marker-Delta method

\*\*The peak level is lower than the limit (48.63 dB $\mu$ V/m).

20 dB bandwidth curves are given in appendix 4; 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.

**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 is in alternance in emission and reception, at the highest output power level at which the transmitter is intended to operate.

**Results:**

**Carrier field strength**

Ambient temperature (°C): 22.4  
 Relative humidity (%): 39.4

Power source: 120Vac – 60 Hz

**Sample N° 1:**

Field strength (dB $\mu$ V/m) at frequency: 13.56 MHz	
<b>Normal test conditions measured at 10m</b>	32.36
<b>Normal test conditions computed at 30m</b>	13.28
<b>Limits (dB<math>\mu</math>V/m)</b>	84
<b>Margin (dB)</b>	70.72

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

Position of equipment: Refer appendix (azimuth: 101 degrees)

**Frequency stability**

		Measured frequency difference (ppm)	Limits (ppm)
<b>Normal test conditions</b>	Temperature (°C): 20	Minimal power source (V): 102Vac – 60Hz	28.24
	Humidity (%): 42	Maximal power source (V): 138Vac – 60Hz	28.17
<b>Extreme test conditions</b>	Minimal temperature (°C): -20	Nominal power source (V): 120Vac – 60Hz	29.50
	Maximal temperature (°C): +50	Nominal power source (V): 120Vac – 60Hz	27.36

**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 15.209 and 15.109  
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 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:** From 9 kHz to 1GHz

**Detection mode:** Quasi-peak ( $F < 1$  GHz)      Peak / Average ( $F > 1$  GHz)

**Bandwidth:** 200Hz (9 kHz < F < 150kHz)  
9 kHz (150 kHz < F < 30MHz)  
120 kHz (30 MHz < 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 equipment is in alternance in emission and reception, at the highest output power level at which the transmitter is intended to operate.

**Results:**

Ambient temperature (°C): 22.4  
 Relative humidity (%): 39

Power source: 120Vac – 60 Hz

Sample N° 1:

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dB $\mu$ V/m)	Field strength Computed at 3 m (dB $\mu$ V/m)	Limits (dB $\mu$ V/m) or (dBm)	Margin (dB)
30.34	QP	100	49	120	V	21.48	31.88	40	8.12
40.68	QP	100	213	120	V	25.09	35.49	40	4.51
54.24	QP	100	0	120	V	20.45	30.85	40	9.15
67.8	QP	400	180	120	V	15	25.4	40	14.6
72	QP	400	214	120	V	14.82	25.22	40	14.78
108.48	QP	100	228	120	V	20.38	30.78	43.5	12.72
135.6	QP	112	310	120	V	30.47	40.87	43.5	2.63
162.72	QP	100	343	120	V	26.40	36.80	43.5	6.70
244.08	QP	100	168	120	V	24.30	34.70	46	11.30

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

Applicable limits: for 9 kHz  $\leq$  F  $\leq$  490 kHz : 2400/F(kHz) at 300 meters  
 for 490 kHz  $<$  F  $\leq$  1.705 MHz : 24000/F(kHz) at 30 meters  
 for 1.705 MHz  $<$  F  $\leq$  30 MHz : 29.5 dB $\mu$ V/m at 30 meters  
 for 30 MHz  $<$  F  $\leq$  88 MHz : 40 dB $\mu$ V/m at 3 meters  
 for 88 MHz  $<$  F  $\leq$  216 MHz : 43.5 dB $\mu$ V/m at 3 meters  
 for 216 MHz  $<$  F  $\leq$  960 MHz : 46 dB $\mu$ V/m at 3 meters  
 Above 960 MHz : 54 dB $\mu$ V/m at 3 meters

**Test conclusion:**

RESPECTED STANDARD

□□□ *End of report, 7 appendixes to be forwarded* □□□

## APPENDIX 1: Photos of the equipment under test

CONFIDENTIAL

## APPENDIX 2: Test set up

CONFIDENTIAL

## APPENDIX 3: Test equipment list

### Conducted limits

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESU8	Rohde & Schwarz	9403
LISN 1600	Thurby Thandar Instruments	8720
High-pass filter EZ-25	Rohde & Schwarz	8635
Absorber sheath current	Emitech	9489
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station	HUGER	8671
Software	BAT-EMC V3.6.0.32	0000

### Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

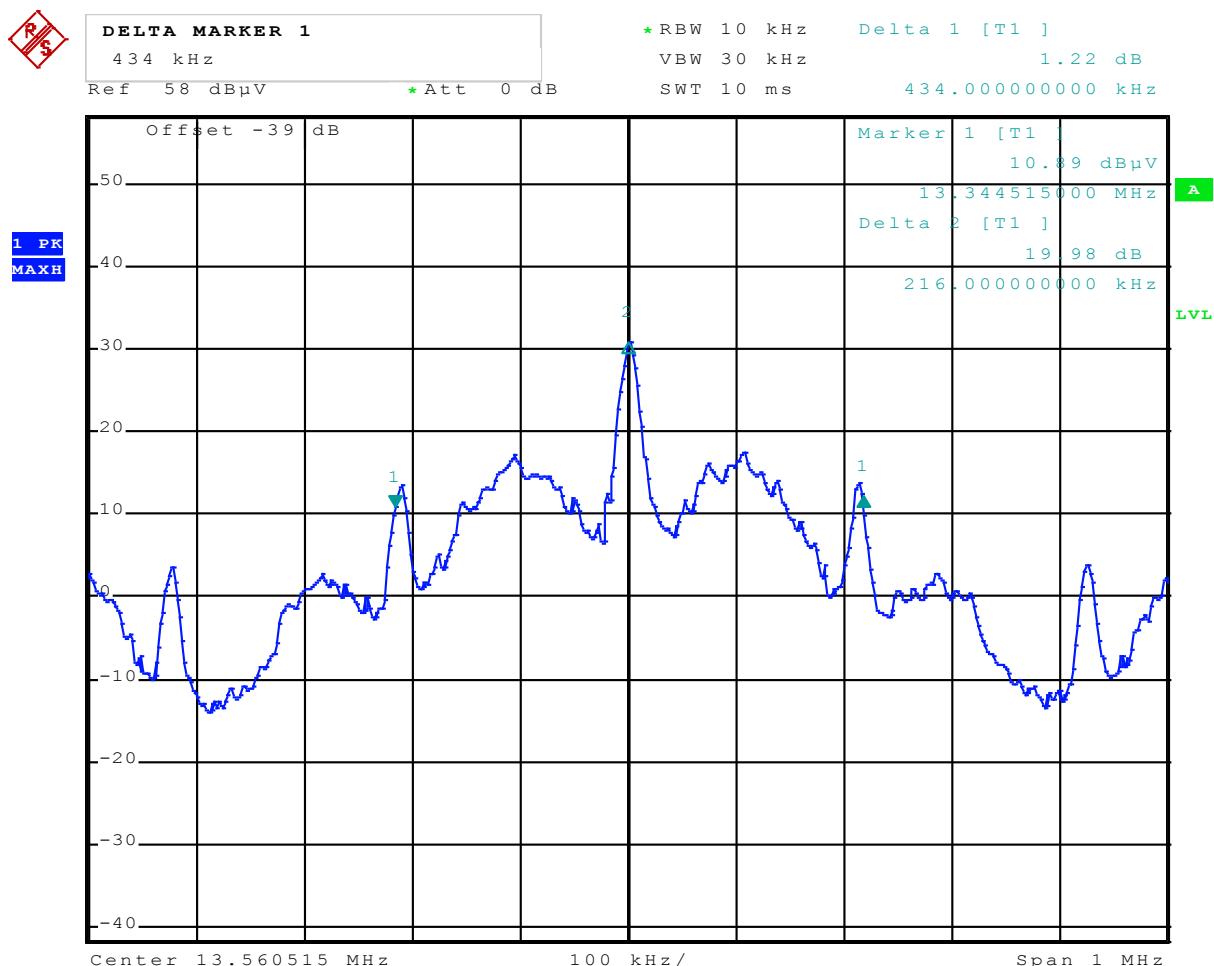
### Operation within the band 13.110 – 14.010 MHz

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
Power source 1251RP	California instruments	8508
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

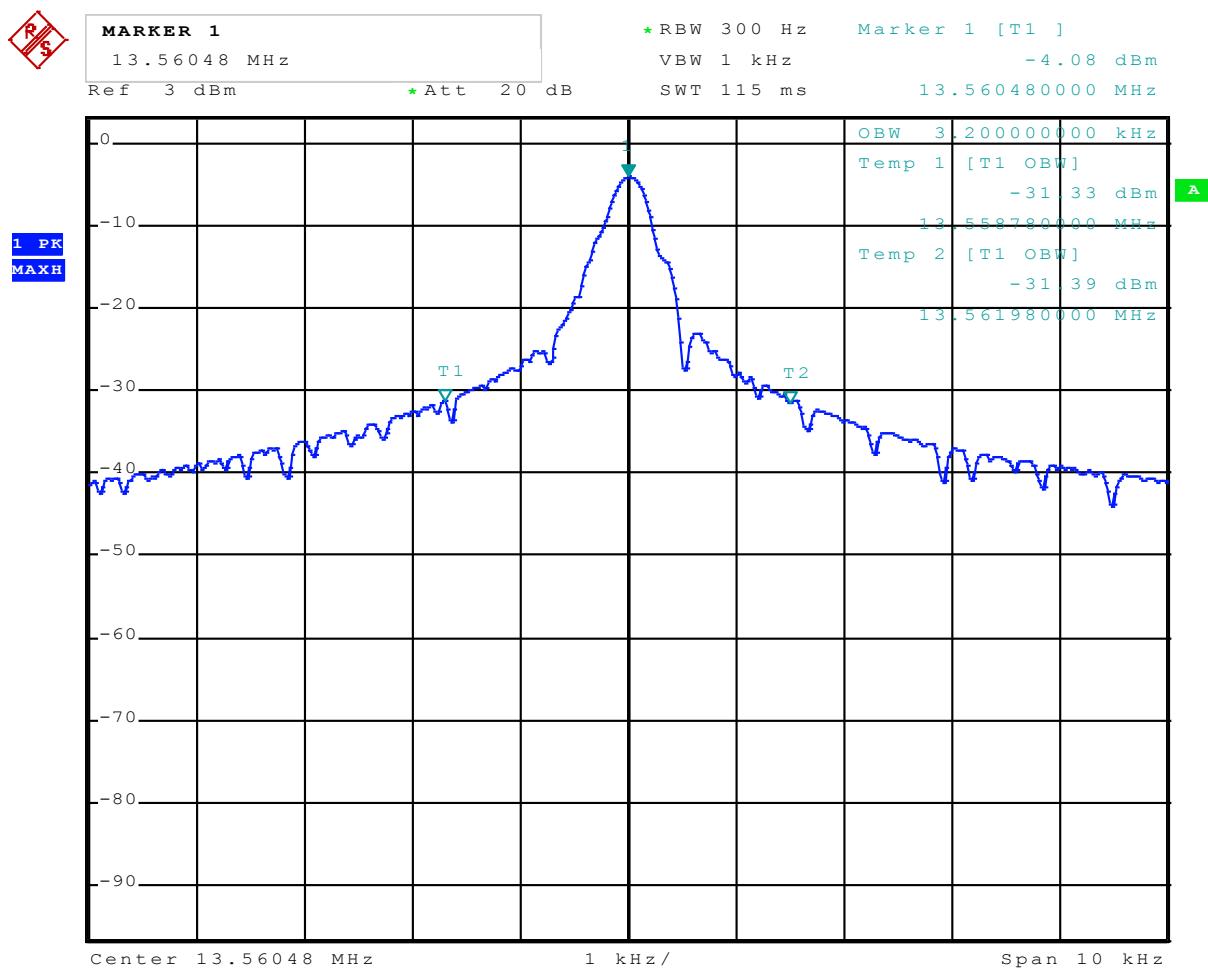
## Field strength outside the band 13.110-14.010 MHz

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
Power source 1251RP	California instruments	8508
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

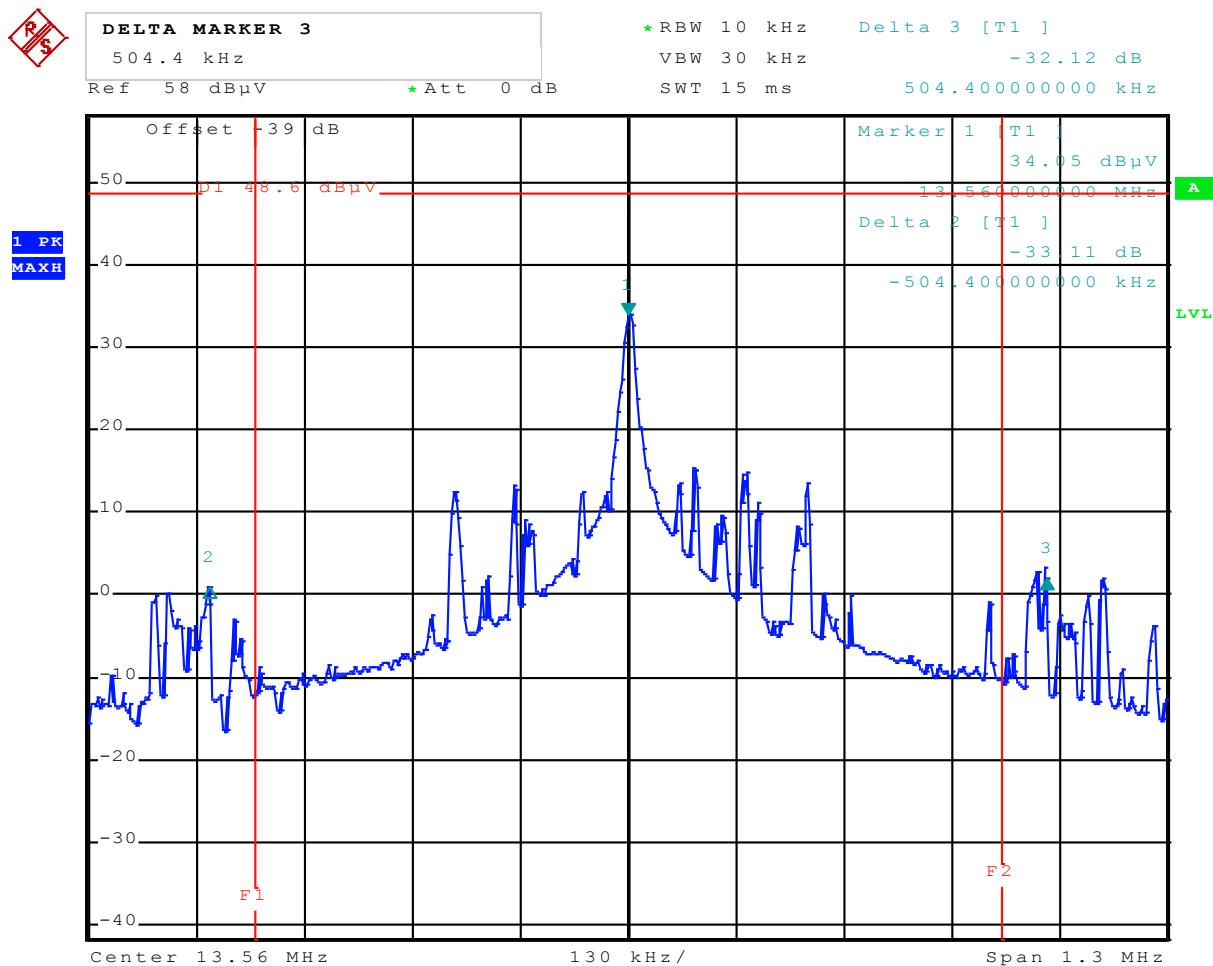
## APPENDIX 4: 20 dB bandwidth



## APPENDIX 5: 99% bandwidth

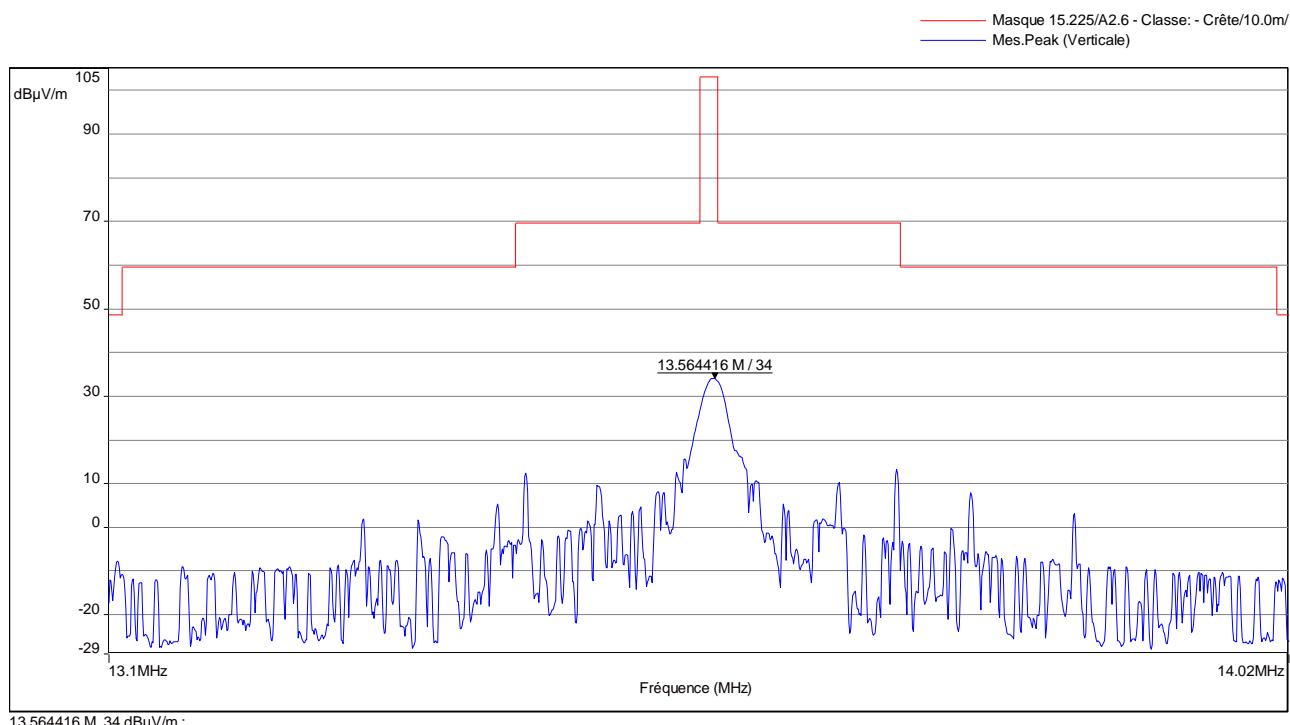


## APPENDIX 6: Band edge

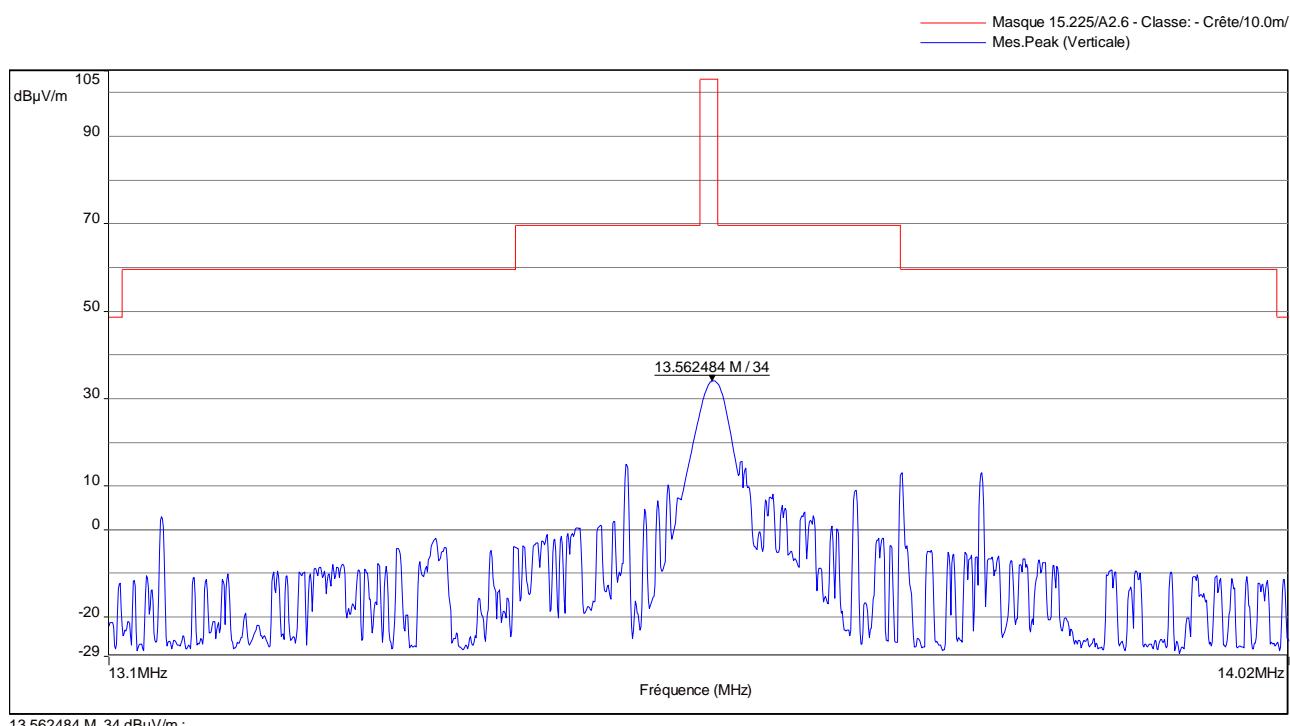


## APPENDIX 7: Spectrum mask

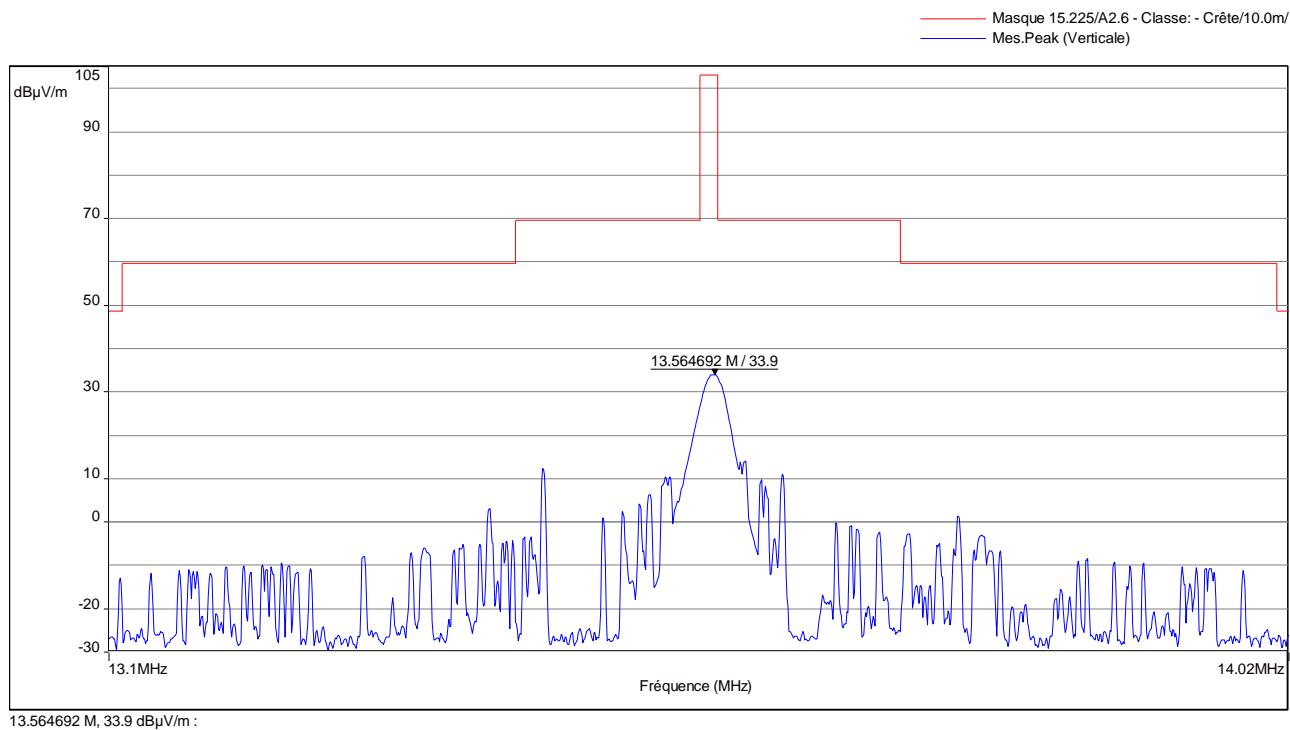
Mask +20°C, 120Vac- 60Hz



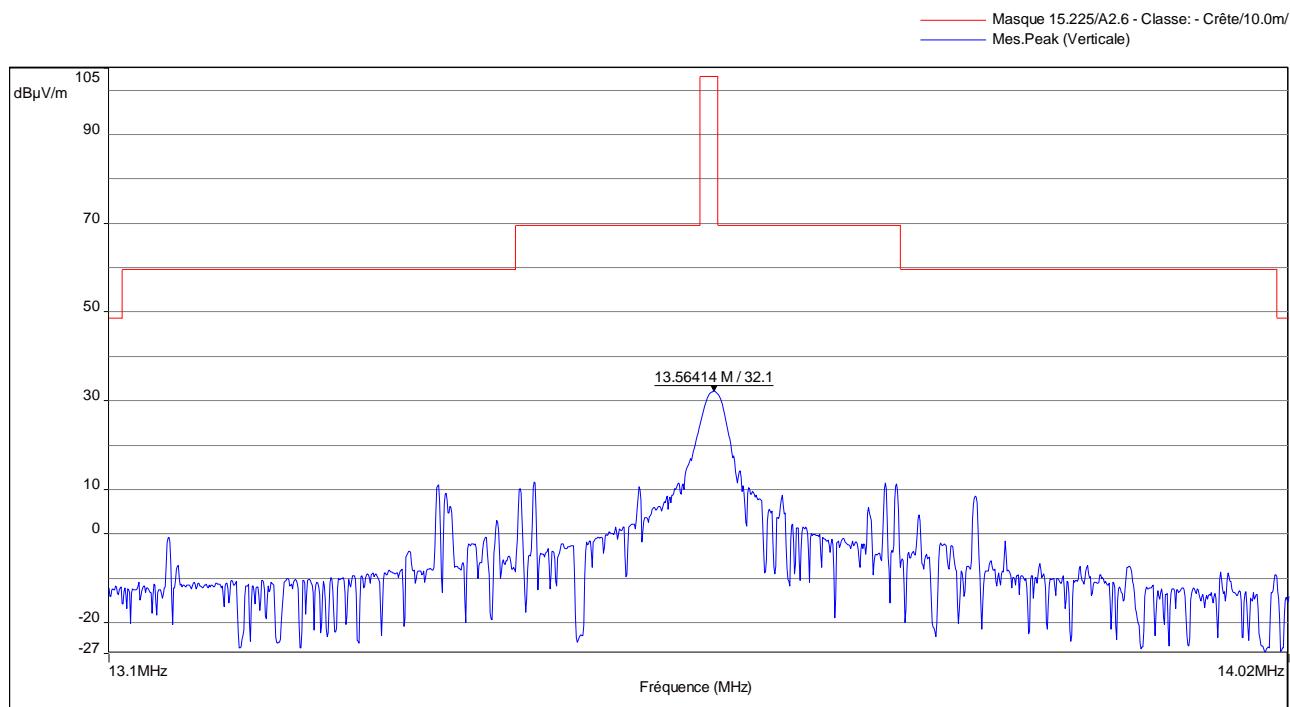
Mask +20°C, 102Vac- 60Hz



## Mask +20°C, 138Vac- 60Hz

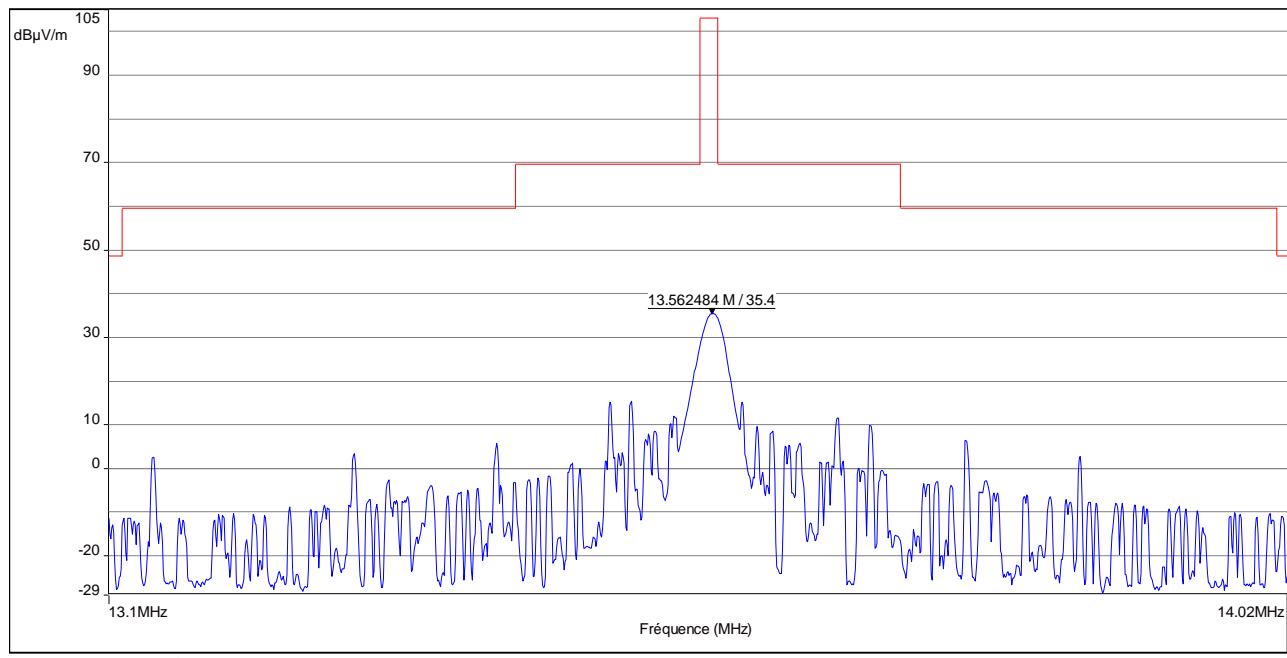

 13.564692 M, 33.9 dB $\mu$ V/m :

## Mask -20°C, 120Vac- 60Hz


 13.56414 M, 32.1 dB $\mu$ V/m :

## Mask +50°C, 120Vac- 60Hz

— Masque 15.225/A2.6 - Classe: - Crête/10.0m/  
— Mes.Peach (Verticale)



13.562484 M, 35.4 dB $\mu$ V/m :