RR051-12-106642-2-A Ed. 0

RADIO test report

According to the standard(s):
CFR 47, FCC Part 15

Equipment under test:
RFID card – Model: FC0062

FCC ID: S3X-FC0062

Company:
AES CHEMUNEX

DISTRIBUTION: Mr TAUGAIN Company: AES CHEMUNEX

Number of pages: 28 with 8 appendixes

Ed.	Date	Modified pages	Written by Name	Written by Visa	Technical Verification and Quality Approval Name	Technical Verification and Quality Approval Visa
0	27-Sep-13	Creation	T.LEDRESSEUR	T.L	BERTHAUD L.	

DESIGNATION OF PRODUCT:	*RFID card*
Serial number (S/N):	FC0062-CA
Reference / model (P/N):	FC0062
Software version:	see annex 8 for software settings
MANUFACTURER:	AES CHEMUNEX

COMPANY SUBMITTING THE PRODUCT:

Company:	AES CHEMUNEX
Address:	RUE MARYSE BASTIE KER LANN CS 17219 35217 BRUZ CEDEX - FRANCE
Responsible:	Mr TAUGAIN
Person(s) present(s) during the tests:	Mr TAUGAIN
DATE(S) OF TEST:	02/25/2013, 02/26/2013 and 02/27/2013
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE EMITECH ANGERS open area test site at JUIGNE SUR LOIRE (49) FRANCE FCC 2.948 Listed Site Registration Number: 90469 EMITECH ANGERS open area test site at BEAUCOUZE (49) FRANCE FCC 2.948 Listed Site Registration Number: 101696
TESTED BY:	*T.LEDRESSEUR*

CONTENTS

1. INTRODUCTION

This report presents the results of radio test carried out on the following equipment: RFID card - Model: FC0062, in accordance with normative reference.

2. PRODUCT DESCRIPTION

ITU Emission code:	681HD0D
Class:	A (commercial, industrial or business environment)
Utilization:	indoor use
Antenna type and gain:	Inductive loop antenna
Operating frequency range:	13.110 to 14.010MHz
Number of channels:	1
Channel spacing:	not concerned
Frequency generation:	Quartz
Modulation:	Amplitude
Power source:	12 Vd.c.

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15 (2013)	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 CFR 47 part 15:

Subpart B –Unintentional Radiators
- 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 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
1419	Dereix R213	Variac	/	/	*
4088	R&S FSP40	Spectrum analyzer	19/04/2012	19/04/2014	19/06/2014
4648	Anritsu 68369B	Radiofrequency generator	16/03/2011	16/03/2013	16/05/2013
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2012	12/06/2016	12/08/2016
8533	R&S HFH2-Z2	Magnetic field antenna	01/05/2012	01/05/2014	01/07/2014
8535	Emco 3115	Horn antenna	30/10/2012	30/10/2016	30/12/2016
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2012	12/06/2016	12/08/2016
8593	SIDT Cage 2	Full anechoic room	06/09/2011	06/09/2013	06/11/2013
8675	AOIP MN5102B	Multimeter	15/01/2013	15/01/2015	15/03/2015
8707	R&S ESI7	Test receiver	03/10/2012	03/10/2014	03/12/2014
8732	Emitech	OATS	09/06/2011	09/06/2013	09/08/2013
8742	R&S NRV-Z52	Power sensor	12/04/2011	12/04/2013	12/06/2013
8750	La Crosse Technology WS-9232	Meteo station	20/07/2012	20/07/2014	20/09/2014
8955	HP SMA-1m	Cable	10/01/2013	10/01/2015	10/03/2015
9237	N-5m	Cable	06/04/2012	06/04/2014	06/06/2014
9239	N-2m	Cable	04/04/2012	04/04/2014	04/06/2014
9243	N-7m	Cable	04/04/2012	04/04/2014	04/06/2014

** The equipment is not verified; instead, the output voltage is checked before each measurement with the calibrated multimeter.*

6. TESTS RESULTS SUMMARY

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		*DC/DC power supply*
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

6.2 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		*DC/DC power supply*
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 PCB antenna.

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.

Conclusion:

The sample RFID card – Model: FC0062 submitted to the tests complies with the technical regulations of the standard CFR 47 FCC Part 15 in accordance with the limits or criteria defined in this report.

7. RADIATED EMISSION LIMITS – Unintentional Radiators

Standard: CFR 47, FCC Part 15

Test procedure: paragraph 109

Limit class: Class B

Test set up:

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. 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: Peak (F > 30 MHz)

Bandwidth: 100 kHz (1GHz > F > 30 MHz) 30MHz (F> 1 GHz)

Distance of antenna: 10 meters for frequencies below 50 MHz, 3 meters for frequencies above 50 MHz.

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 standby mode.

Results:

Ambient temperature (°C): 21
Relative humidity (%): 26

Power source: 12V d.c.

Sample N° 1:

No significant spurious has been detected.

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

Test conclusion:

RESPECTED STANDARD

8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Standard: CFR 47, 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): 20.1
Relative humidity (%): 30

Lower Band Edge: 13.090 to 13.110
Upper Band Edge: 14.010 to 14.030

Sample N° 1:

Fundamental frequency (MHz)	Carrier field strength (dBµV/m)	Detector	Band-edge frequency (MHz)	Marker delta (dB)	Out-of-band level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
13.56	37.6	Peak	13.09	-36.5	1.1	29.5	28.4
13.56	37.6	Peak	14.03	-36.4	1.2	29.5	28.3

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

Test conclusion:

RESPECTED STANDARD

9. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz

Standard: CFR 47, FCC Part 15

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

Test set up:

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

Results:

Carrier field strength

Ambient temperature (°C): 21
Relative humidity (%): 26

Power source: 12 Vd.c.

Sample N° 1:

	Field strength* (dBµV/m) at frequency: MHz
Normal test conditions	37.6
Limits (dBµV/m)	84
Margin (dB)	46.4

Polarization of test antenna: Perpendicular (height: 150 cm)
Position of equipment: see photo in appendix 2.

*30m field strength value extrapolated from 10m field strength measure (56.7 dBµV/m) using extrapolation factor of 40dB/decade according to §15.31 of FCC rules.

Frequency stability

			Measured frequency difference (ppm)	Limits (ppm)
Normal test conditions	Temperature (°C): 20 Humidity (%): 31.2	Minimal power source (V): 8Vdc	51.77	±100
		Maximal power source (V): 30 Vdc	52.21	
Extreme test conditions	Minimal temperature (°C): -20	Nominal power source (V): 12 Vdc	79.13	
	Maximal temperature (°C): +55	Nominal power source (V): 12 Vdc	51.77	

Field strength within the band 13.110-14.010 MHz

See spectrum mask in appendix 7.

Test conclusion:

RESPECTED STANDARD

10. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.010 MHZ

Standard: CFR 47, FCC Part 15

Test procedure: paragraph 209
paragraph 15.225 (d)

Test set up:

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

See photos in appendix 2.

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

Detection mode: Quasi-peak

Bandwidth: 10 kHz (F < 30 MHz) 120 kHz (F > 30 MHz)

Distance of antenna: 10 meters for frequencies below 50 MHz, 3 meters for frequencies above 50 MHz.

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

Results:

Ambient temperature (°C):	21
Relative humidity (%):	26

Power source: 12 Vd.c.

No significant spurious has been detected.

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

Test conclusion:

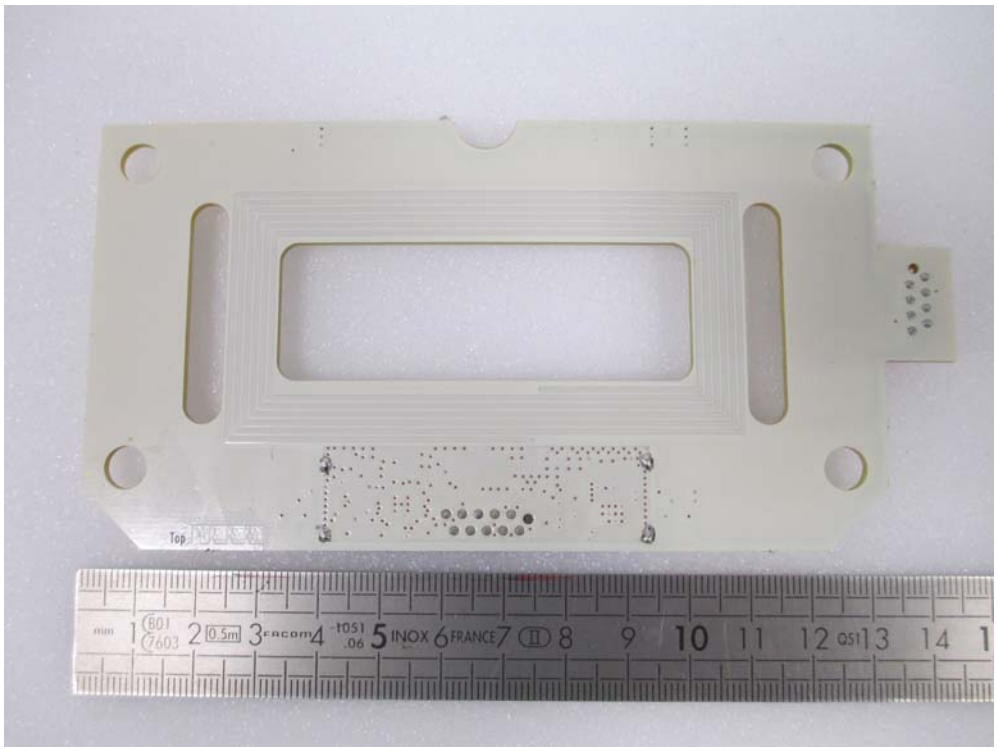
RESPECTED STANDARD

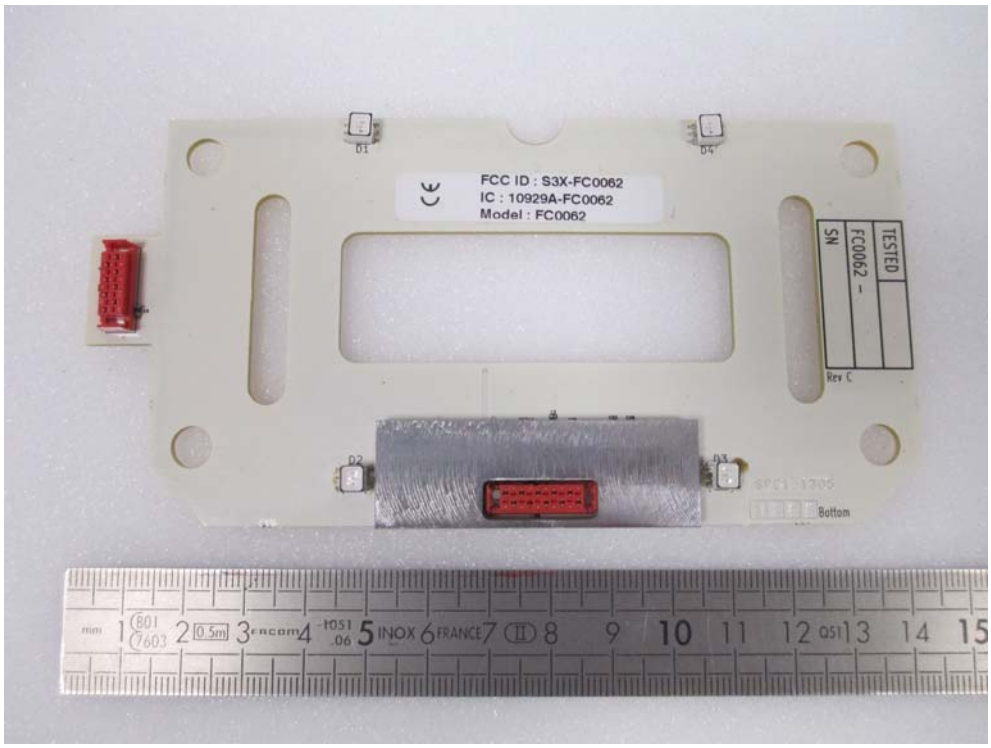
□□□ End of report, 8 appendixes to be forwarded □□□

APPENDIX 1: Photos of the equipment under test

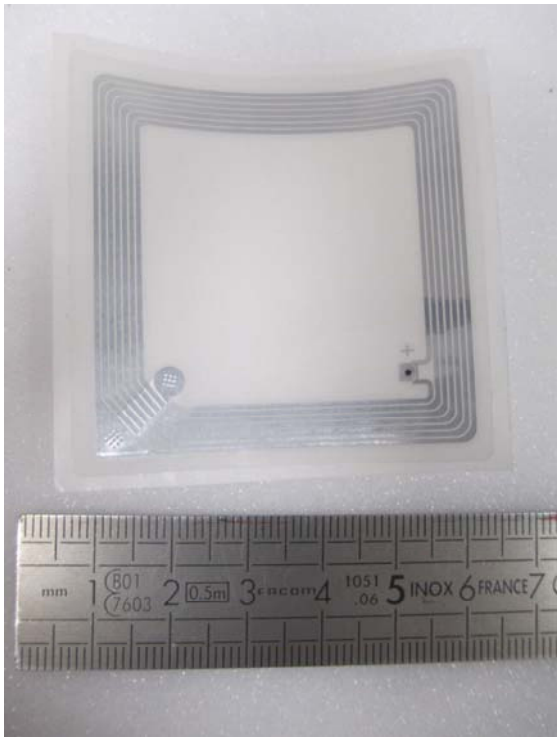
General view of the EUT

RFID reader

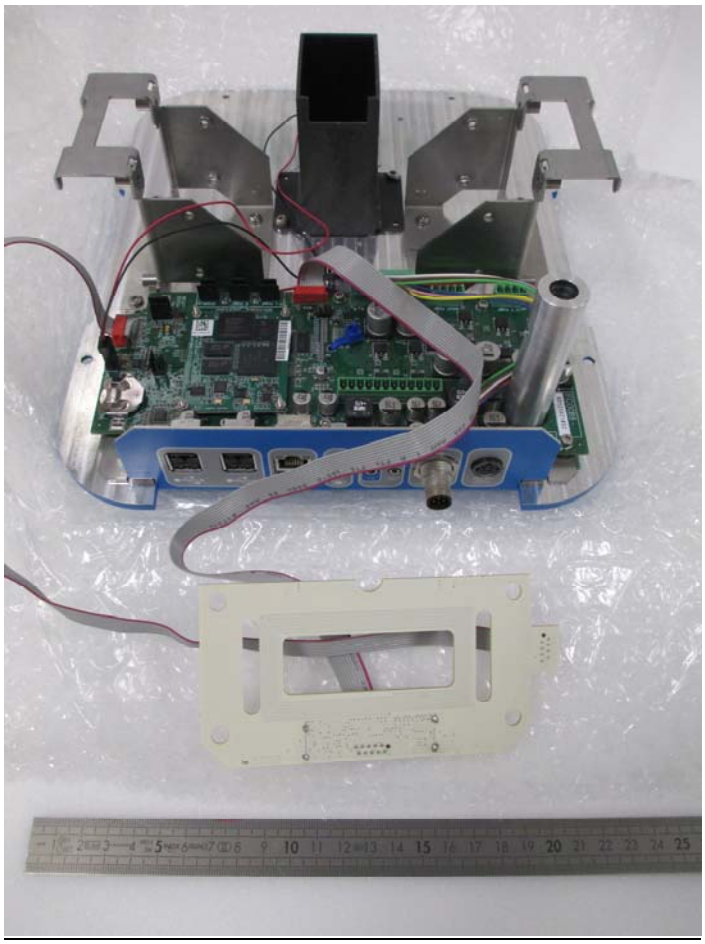




Passive tag

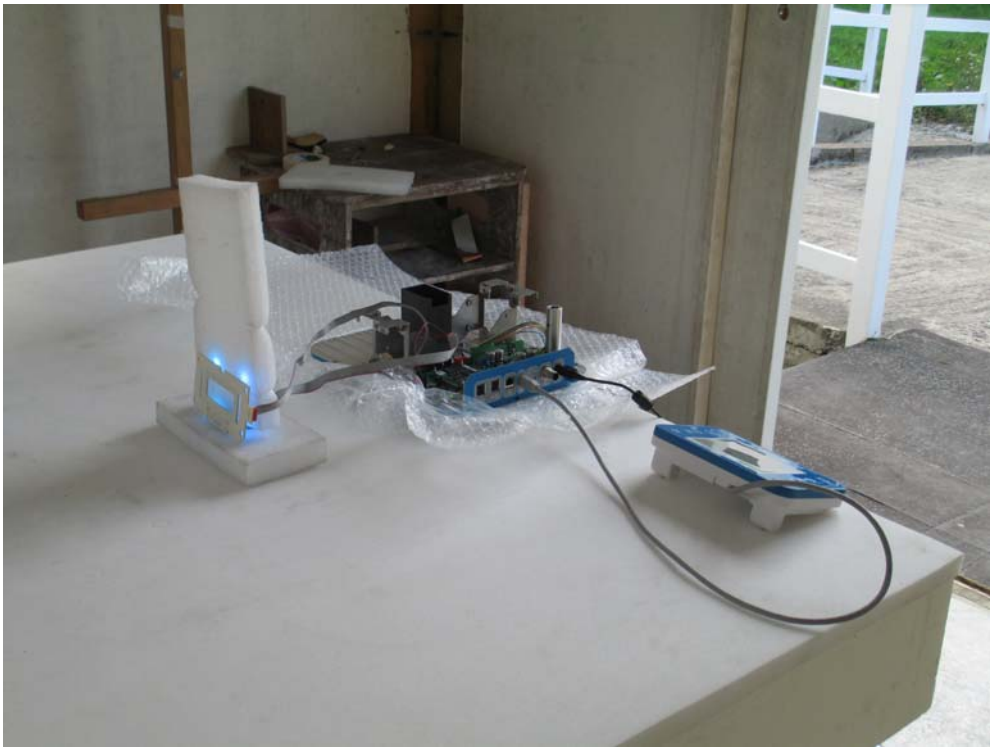


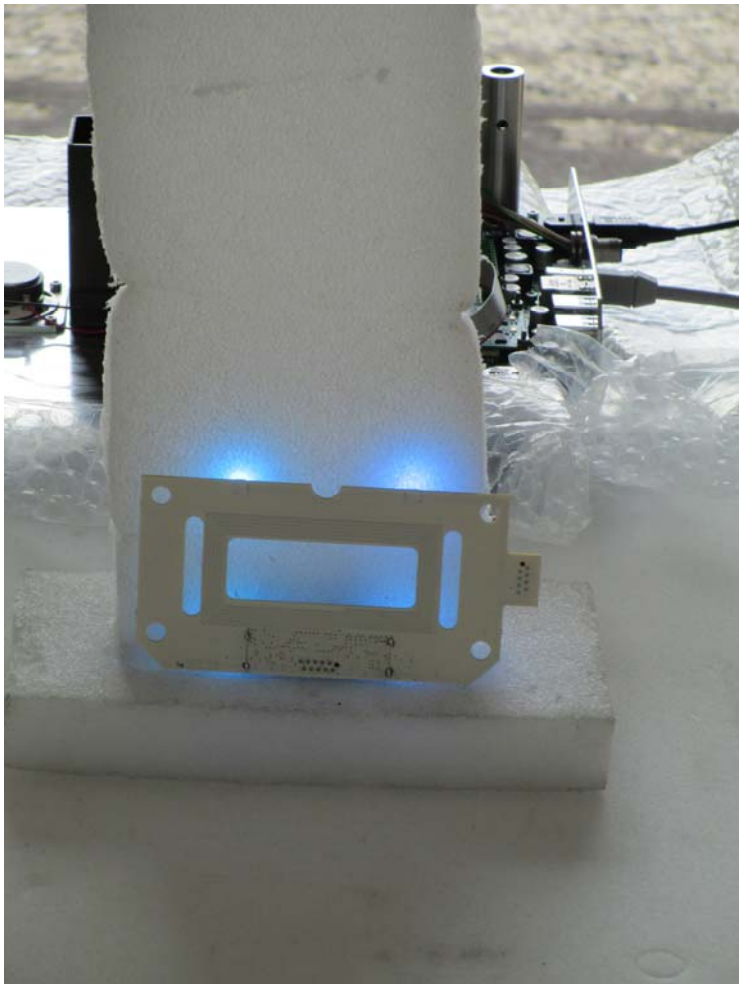
Auxiliary equipment



APPENDIX 2: Test set up

Open area test site





APPENDIX 3: Test equipment list

RADIATED EMISSION LIMITS

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Test receiver ESI7	Rohde & Schwarz	8707
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Active loop antenna HFH2-Z2	Rohde & Schwarz	8533
Dipole antenna VHAP	Schwarzbeck	7998
Dipole antenna UHAP	Schwarzbeck	7999
Préamplificateur 8447D	Hewlett Packard	8511
Radiofrequency generator SMR20	Rohde & Schwarz	8730
Alternostat E520	FERRIX	8779
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Open test site	EMITECH	8732

ADITIONAL PROVISIONS TO THE GENERAL RADIATED EMISISON LIMITATIONS

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum Analyzer FSBS	Rohde & Schwarz	7001
Modulation analyzer HP 8901B	Hewlett Packard	1211
Climatic chamber	MPC	2593
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750

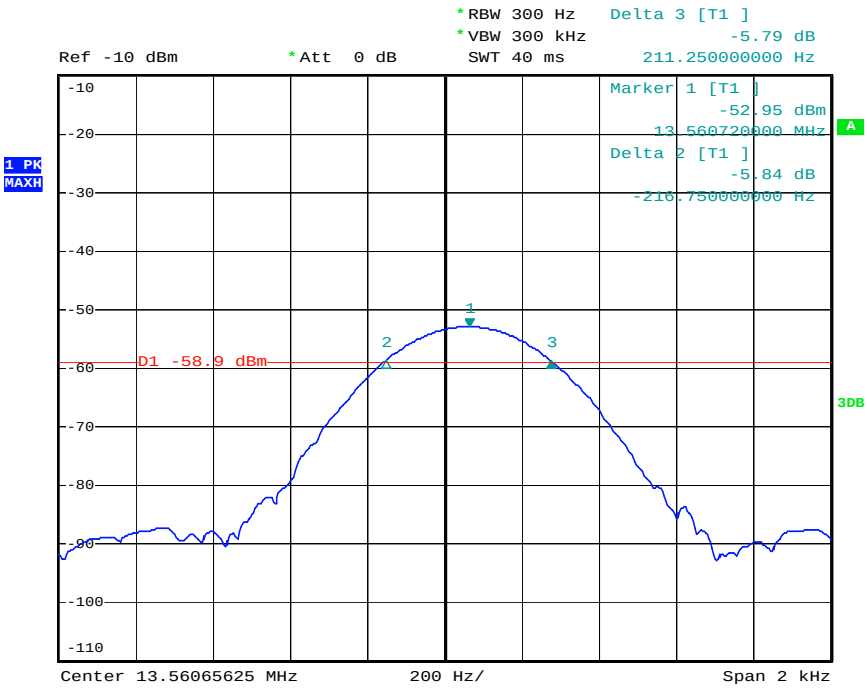
OPERATION WITHIN THE BAND 13.110 – 14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSBS	Rohde & Schwarz	7001
Modulation analyzer HP 8901B	Hewlett Packard	1211
Climatic chamber	MPC	2593
Active loop antenna HFH2-Z2	Rohde & Schwarz	8533
Meteo station WS-9232	La Crosse Technology	8750
Multimeter MN5102B	AOIP	8675
Open test site	EMITECH	8732

FIELD STRENGTH OUTSIDE THE BAND 13.110- 14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Test receiver ESI7	Rohde & Schwarz	8707
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Active loop antenna HFH2-Z2	Rohde & Schwarz	8533
Dipole antenna VHAP	Schwarzbeck	7998
Dipole antenna UHAP	Schwarzbeck	7999
Préamplificateur 8447D	Hewlett Packard	8511
Radiofrequency generator SMR20	Rohde & Schwarz	8730
Alternostat E520	FERRIX	8779
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Open test site	EMITECH	8732

APPENDIX 4: 6 dB bandwidth



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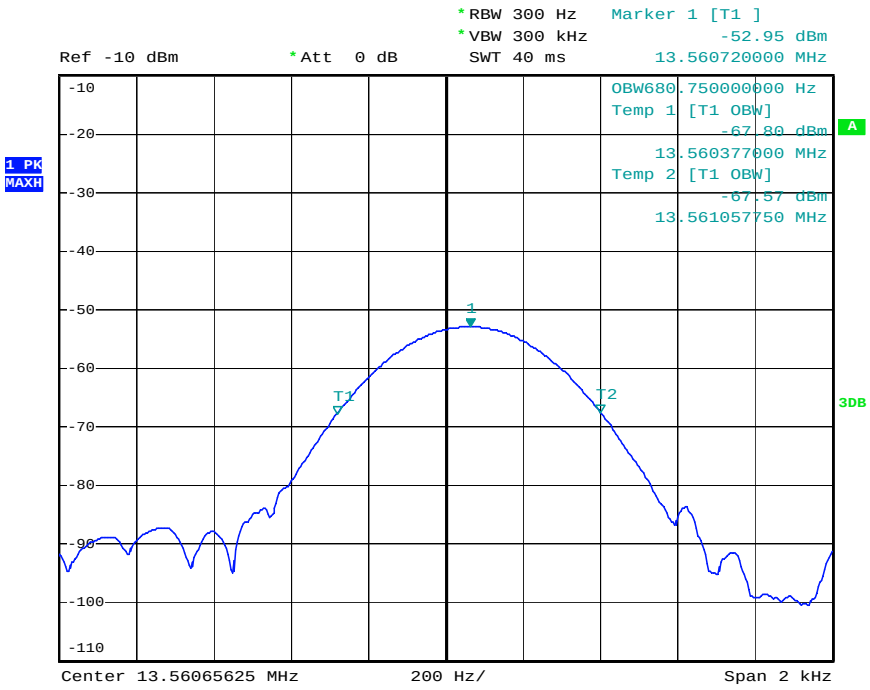
APPENDIX 5: 20 dB bandwidth



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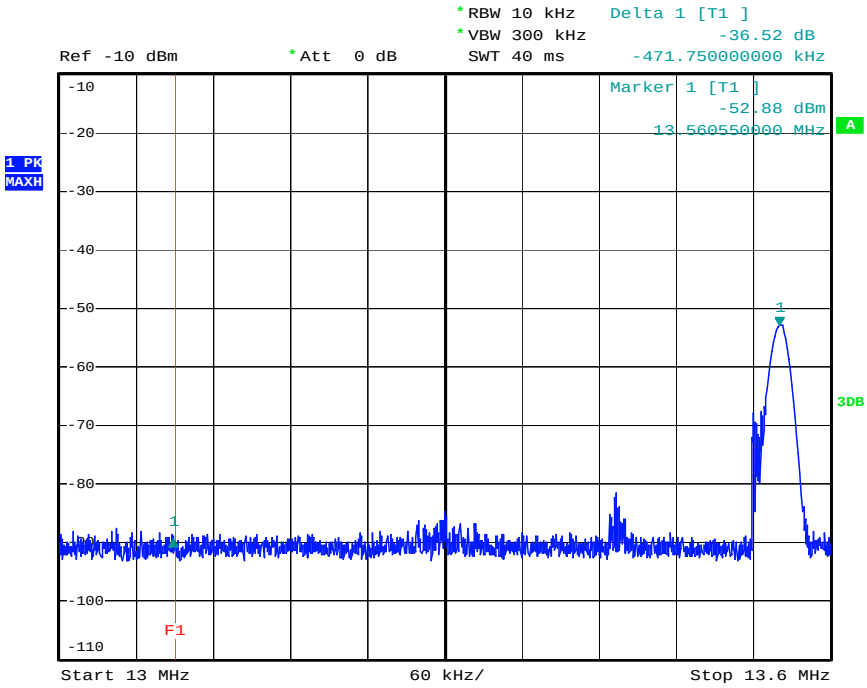
APPENDIX 6: band edge

Lower band edge



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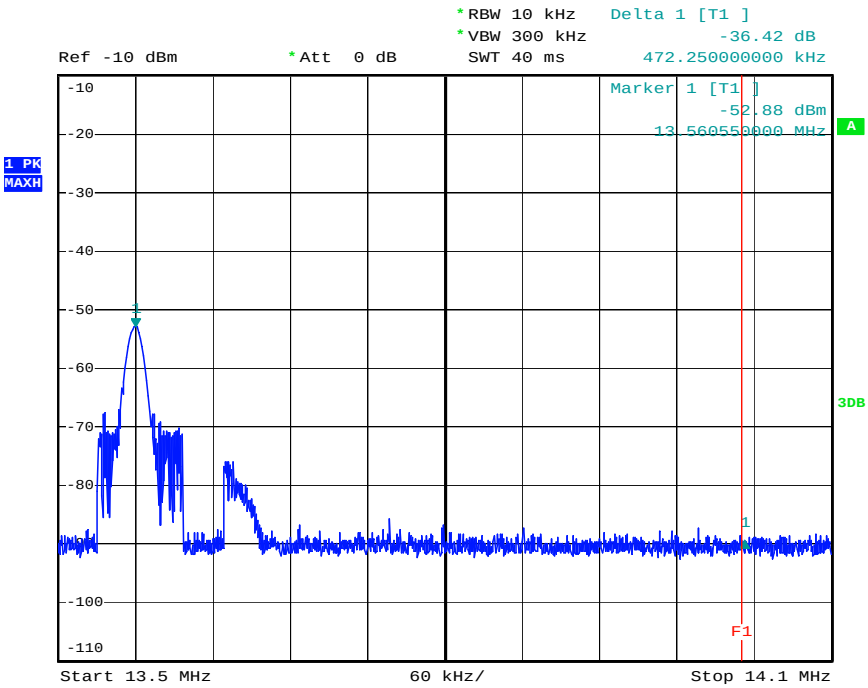
upper band edge



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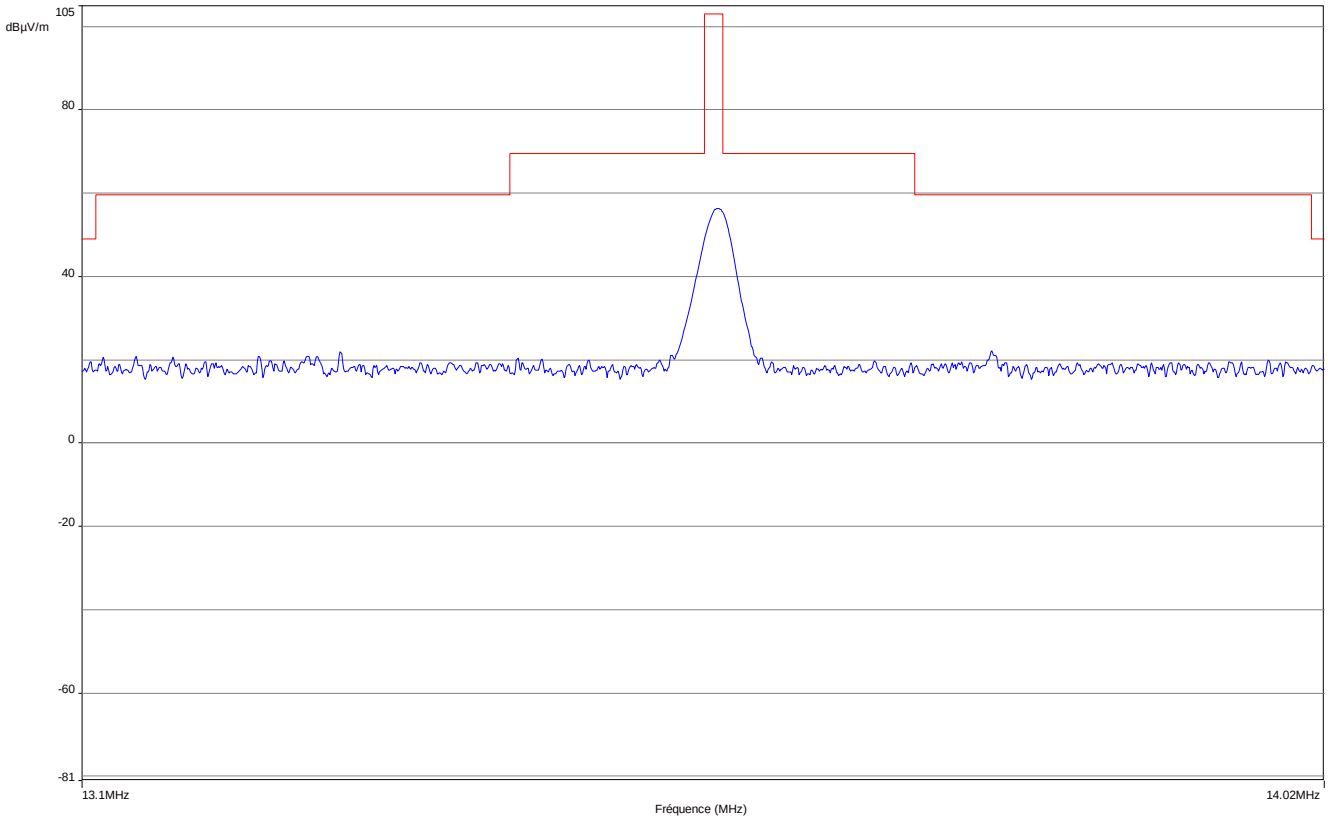
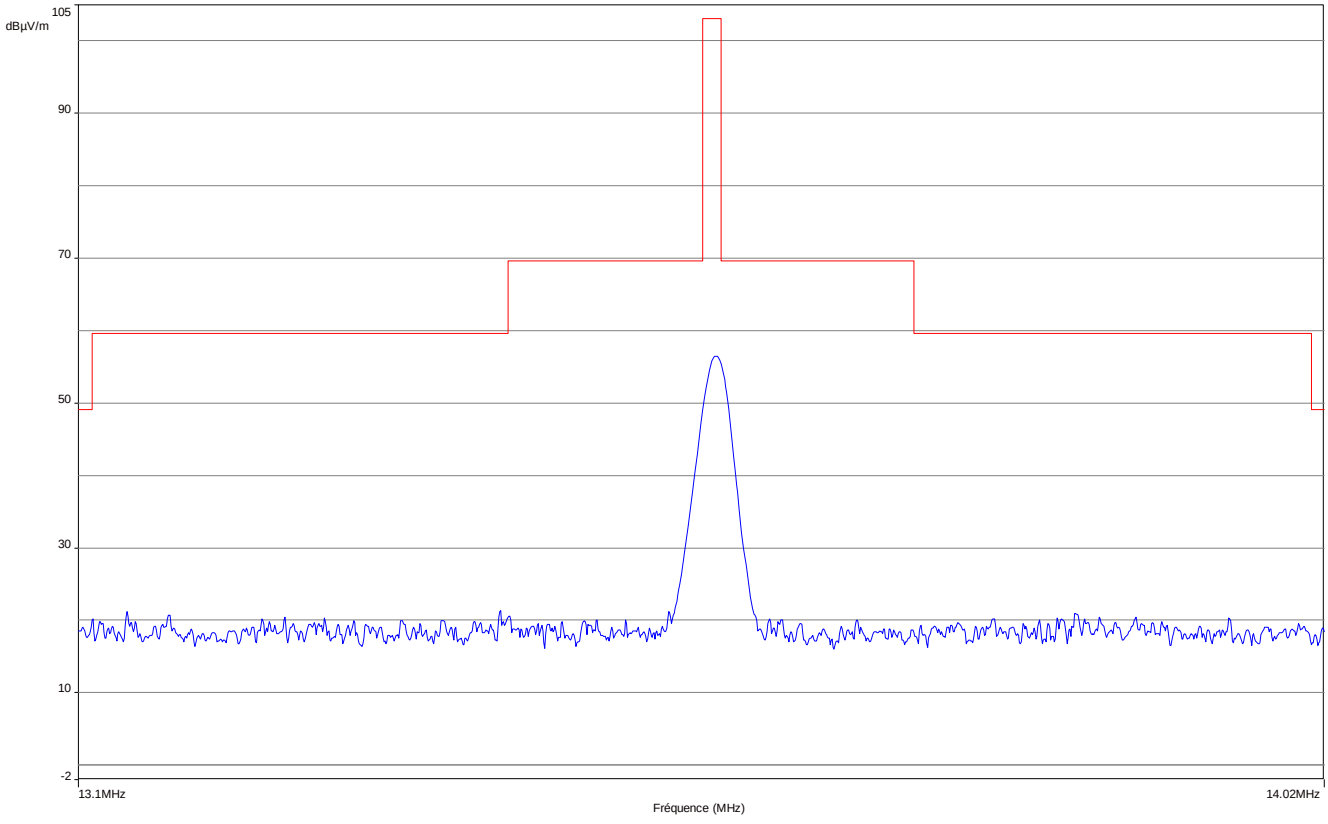
APPENDIX 7: spectrum mask

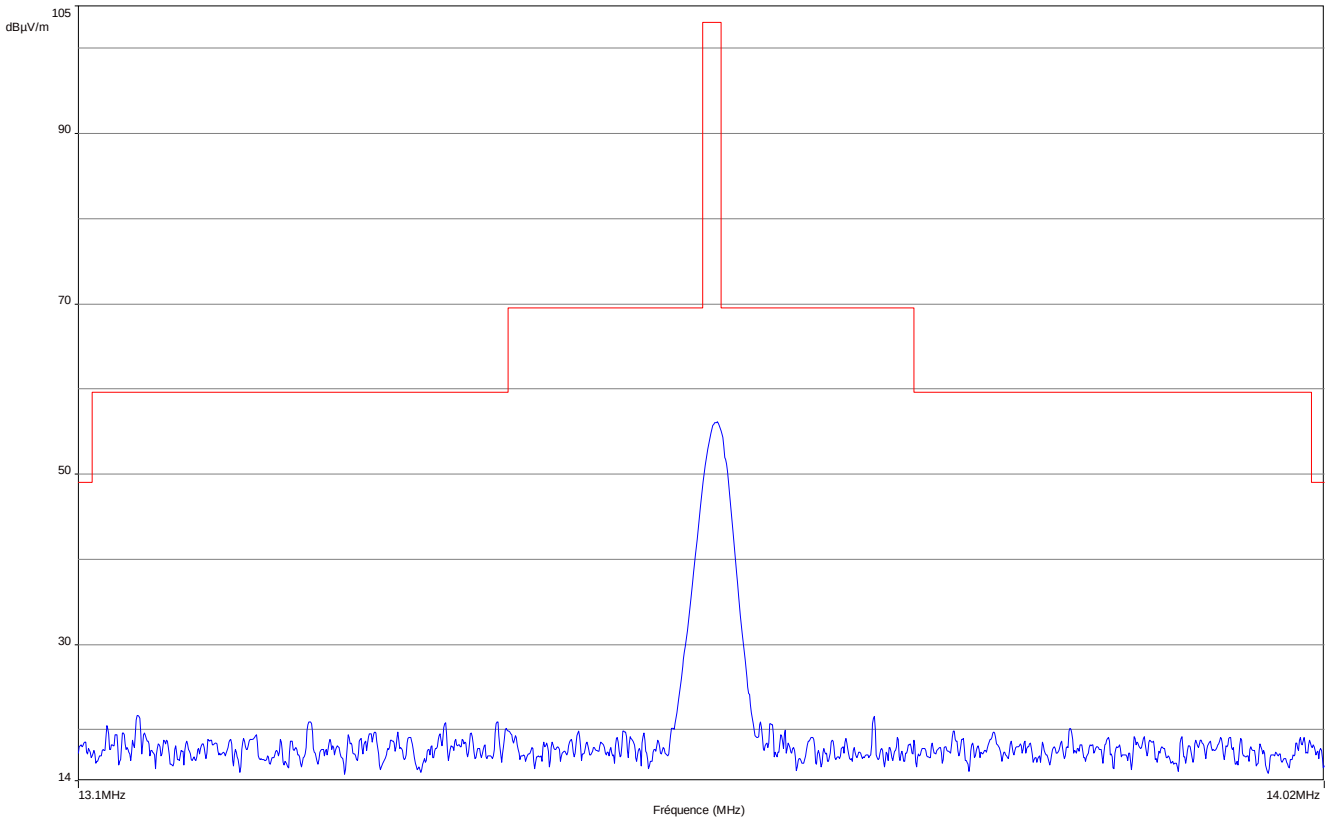
MASK +20°C, 8 Vdc



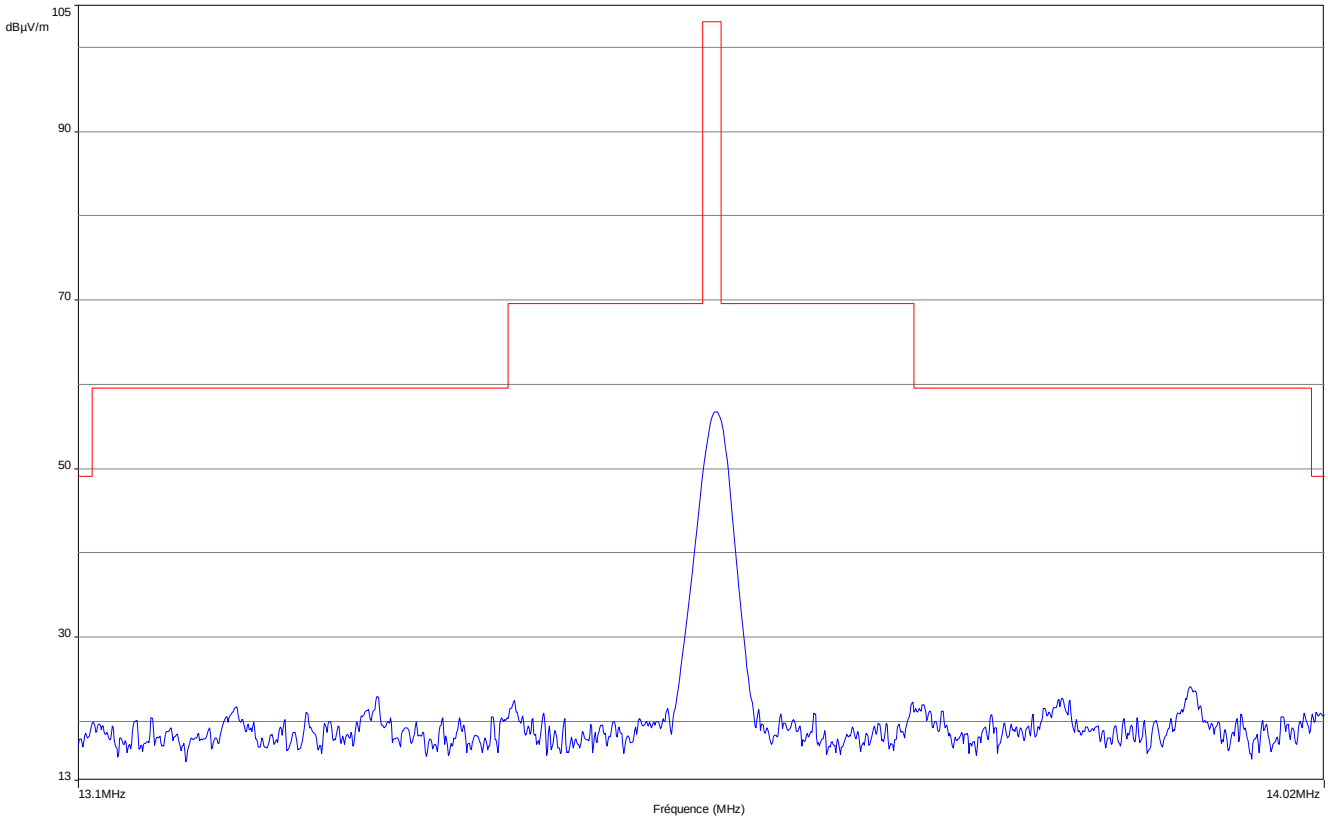
MASK +20°C, 30 Vdc



MASK -20°C, 12 Vdc



MASK +50°C, 12 Vdc



APPENDIX 8: Software settings

La configuration des registres par défaut pour les essais est la suivante :

Registres	Valeurs		Commentaires
0x00 : Chip status control	0x31		Full/Half power
0x01 : ISO Control	0x02		com. speed slower
0x02 : ISO 14443B TX Options	0x00		
0x03 : ISO 14443A Hight-Bit-Rate Options	0x00		
0x04 : TX Timer H-Byte	0xC1		
0x05 : TX Timer L-Byte	0xBB		
0x06 : TX Pulse Length Control	0x80		
0x07 : RX No Response Wait Time	0x14		Wait speed slower
0x08 : RX Wait Time	0x1F		
0x09 : Modulator and SYS_CLK Control	0x21		Modulation freq.
0x0A : RX Special Setting Register	0x40		Gain reduction 15dB
0x0B : Regulator and I/O Control	0x20		Regulator 5V to 4,3V
0x0C : IRQ Status Register	0x00		
0x0D : Collision Position and interrupt Mask Register	0x3F		
0x0E : Collision Position	0x00		
0x0F : RSSI Levels and Oscillator Status Register	0x40		
0x1C : FIFO Status	0x00		
0x1D : TX Length Byte1	0x00		
0x1E : TX Length Byte2	0x00		

Ne pouvant etre modifie