

R052-RAD-12-103774-2/A Ed.1

E.M.C. test report

standard to apply:
CFR 47 FCC Part 15 (2012)


Equipment under test:
TELEMATIC BOX FOR CAR-SHARING
Model: ZIBOX V3.2.1
FCC ID: Z57-321120708

Company:
EILEO

DISTRIBUTION: Mr Lemoult

Company: EILEO

Number of pages: 25 including 1 annexe

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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: *Telematic Box*

Reference / model: Zibox V3.2.1

Serial number: N°1 : HCS32124120000014 / IMEI N° 359628040184686
N°2 : HCS32124120000027 / IMEI N° 359628040184702

MANUFACTURER: *EILEO*

COMPANY SUBMITTING THE PRODUCT AND TECHNICAL SUPORT:

Company: EILEO

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Responsible: M. Lemoult

DATE(S) OF TEST: 09 to 17 July 2012
02 and 03 August 2012

TESTING LOCATION: EMITECH laboratory in Juigné sur Loire
(49) FRANCE
FCC 2.948 Listed Site Registration Number: 90469
EMITECH laboratory in Le Mans for prescan measurements.
(49) FRANCE

TESTED BY: G.Hyaumet

SUPERVISED BY: O. Roy

CONTENTS

TITLE	PAGE
1. INTRODUCTION	4
2. NORMATIVE REFERENCE.....	4
3. ABBREVIATIONS	4
4. TEST UNIT CONFIGURATION.....	4
5. EUT OPERATING CONDITION	5
6. TESTS AND CONCLUSIONS	6
6.1 unintentional radiator (subpart B)	6
6.2 intentional radiator (subpart C)	6
7. MEASUREMENT OF RADIATED INTERFERENCE FIELD STRENGTH.....	7
8. RADIATED EMISSION LIMITS; general requirements	12
9. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz	19
ANNEX N°1 : Photos of the equipment under test	

1. INTRODUCTION

This document presents the result of E.M.C. test carried out on the following equipment: Zibox V3.2.1 in accordance with normative reference.

The application of the equipment is a car-mounted device for fleet management automation.

The equipment under test integrates a GSM/GPRS module (FCC ID: QIPPH8) and a WiFi/Bluetooth module (FCC ID: U9R-W2CBW003) both already certified under single modular approval rules.

This test report concerns RFID function of the device under test : FCC ID: Z57-321120708

2. 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 (12)	Code of Federal Regulations Title 47 - Telecommunication Chapter 1 - Federal Communications Commission Part 15 - Radio frequency devices Subpart B - Unintentional Radiators Limits and methods of measurement of radio disturbance characteristics of information technology equipment
FCC Part 2 (00)	Frequency allocations and Radio Treaty Matters General Rules and Regulations
ANSI C63.4 (03)	Standard format measurements/technical report personal computer and peripherals.

3. ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	Equipment Under Test
RF	Radio Frequency
OATS	Open Area Test Site
DVB-T	Digital Video Broadcasting – Terrestrial

4. TEST UNIT CONFIGURATION

ANNEX 1	Photos of the equipment under test
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ITU Emission code: -

Class:B

Antenna type and gain: 4cm diameter loop, 1.5dBi

Operating frequency range: 13.56MHz

Number of channels: 1

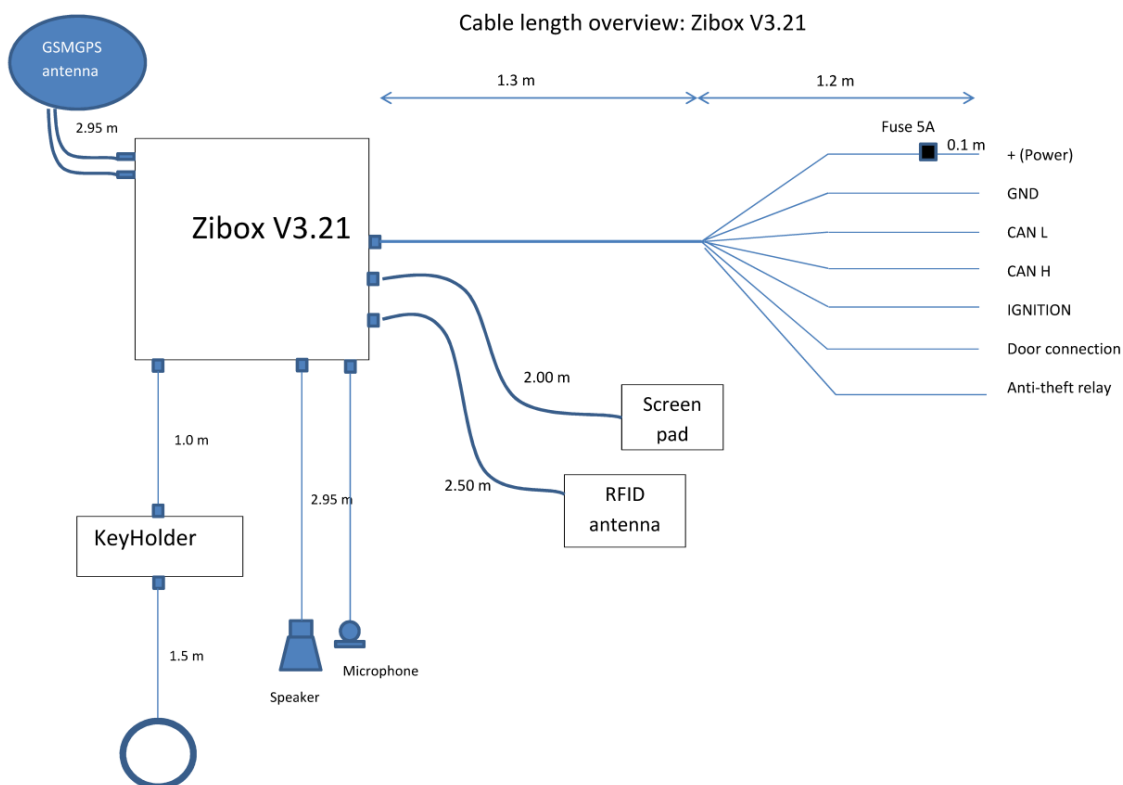
Frequency generation: -

Modulation: -

Power source: +12Vdc from car battery

5. EUT OPERATING CONDITION

EUT is linked to auxiliary devices as presented hereafter:



EUT is powered from a 12Vdc power source, with IGNITION wire connected to +12V or OV according to informations listed in the annexed document *software description for certification*.

Idle state means RFID reader is waiting for a tag, others functions are disabled. Idle state for RFID reader is not functional after a period. (Identified software bug)

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				Note

NAp: Not Applicable

NAs: Not Asked

Note: Criterion is respected when the RFID reader can detect a tag.

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				
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHz					
	Field strenght	X				
	Frequency tolerance	X				

NAp: Not Applicable

NAs: Not Asked

Note 1: Dedicated antenna.

Conclusion:

The sample Zibox V3.2.1 submitted for testing complies with the standard prescriptions CFR 47_FCC Part 15.225 and associated parts, according to limits or criteria defined in this report.

7. MEASUREMENT OF RADIATED INTERFERENCE FIELD STRENGTH

Standard: FCC Part 15

Test procedure: FCC Part 15

Unintentional Radiators: Sec.15.109

Limits: Class B

Test equipment:

For preview measurement:

Equipment	Manufacturer	Type	N°	Latest Verification	Next Verification
Spectrum analyzer	Rohde & Schwarz	FSM	7027	07/07/2010	07/07/2012
Low-noise amplifier	Miteq	JS4-00102600-35-5A	7185	11/01/2012	11/01/2013
Preamplifier	Kuhne	KU LNA BB 3000 A	9261	12/04/2012	12/04/2013
DC Power Supply	Rohde & Schwarz	NGSM32/10	7279	-	-
Meteo station	Testo	608-H1	7566	13/04/2010	13/04/2012
Multimeter	Fluke	87	7010	15/09/2010	15/09/2012
Shielded room	Siepel	10.7x6.6x7.2 m	7181	27/07/2010	-
Biconic antenna	Rohde & Schwarz	HK116	7170	16/01/2012	16/01/2016
Logperiodic antenna	Rohde & Schwarz	HL223	7171	16/01/2012	16/01/2016
Horn antenna	Emco	3115	7186	13/10/2010	13/10/2014
Software	Nexio	BAT EMC v3.6.0.24	0000	-	-
Turntable and mast controler	Rohde & Schwarz	HCC	7101	-	-

For final measurement:

Equipment	Manufacturer	Type	N°	Latest Verification	Next Verification
Spectrum analyzer	Rohde & Schwarz	ESIP07	8707	02/06/2011	02/06/2012
DC Power Supply	Rohde & Schwarz	NGSM32/10	7279	-	-
Meteo station	La Crosse Technology	WS-9232	8750	29/04/2010	29/04/2012
Multimeter	Fluke	87	7010	15/09/2010	15/09/2012
OATS	EMITECH	-	8736	10/01/2011	10/01/2013
Bi Logperiodic antenna	CHASE	CBL9112A	8530	11/06/2011	11/06/2013
Software	GYL Technologies	Logiciel champ libre V3.3	8864	-	-
Turntable and mast controler	GYL Technologies	-	8855	-	-

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, set in vertical then horizontal position.

Cables disposition of unit under test:

See photos of the test unit configuration in annex 1.

Frequency range: According the Sec.15.33 of the FCC Part 15 standard, the frequency range measured is indicated in the following table:

For unintentional radiator, including a digital device (Sec.15.33, §(b)(1) of the FCC Part 15 standard) :

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Above 1000	5 th harmonic of the highest frequency or 40GHz, whichever is lower

Detection mode: Quasi-peak for the range 30 MHz - 1 GHz
Average for $f > 1$ GHz

Bandwidth: 120 kHz for the range 30 MHz - 1 GHz
1 MHz for $f > 1$ GHz

Distance of antenna: class B: 3 meters, final measurement was performed with 10m distance

Antenna height: 1 to 4 m

Antenna polarization: vertical and horizontal

Equipment under test operating condition:

See paragraph 5.

Results:

For the range 30 MHz – 12.75 GHz, the preview measurements are made in Peak detection mode in semi anechoic room with a spectrum analyser.

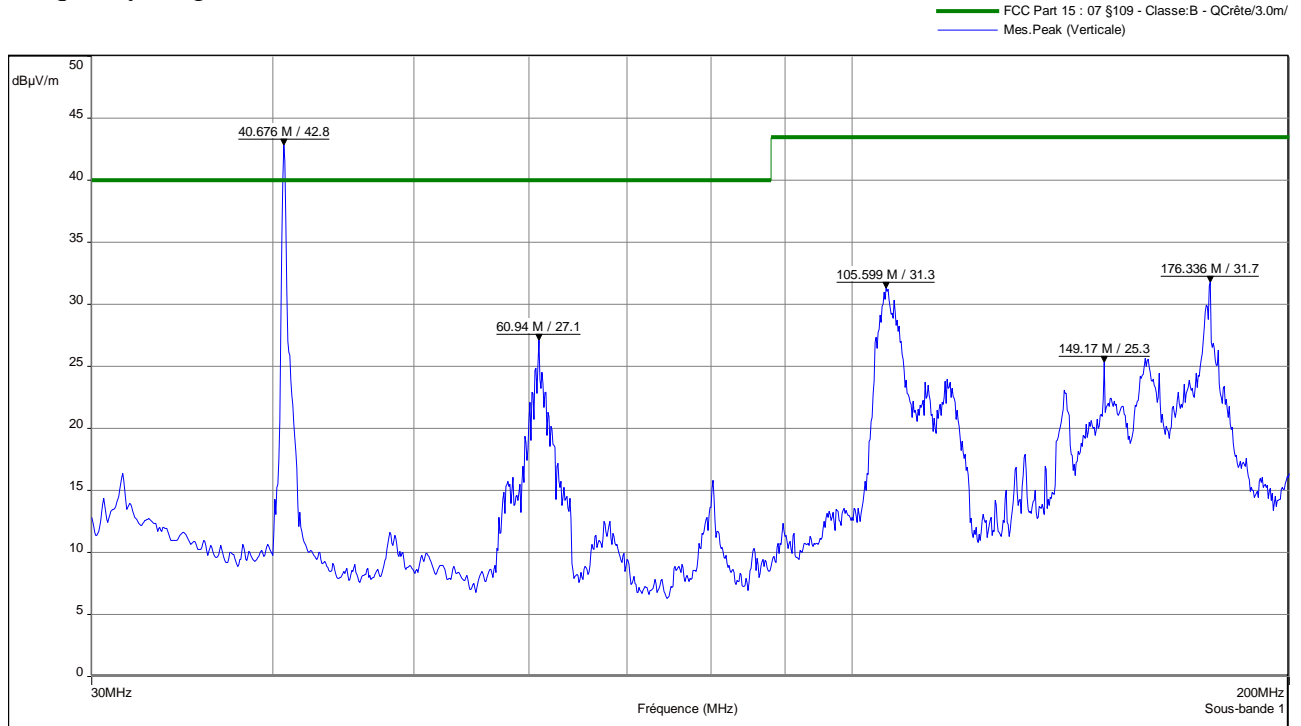
For $f > 1$ GHz, the measurements are made only with peak detector with a spectrum analyser.

Highest emissions levels are re-measured on OATS using a Quasi-peak detector and noted in the following table.

The polarity column refers to the antenna polarity at which the final maximum emissions level is measured.

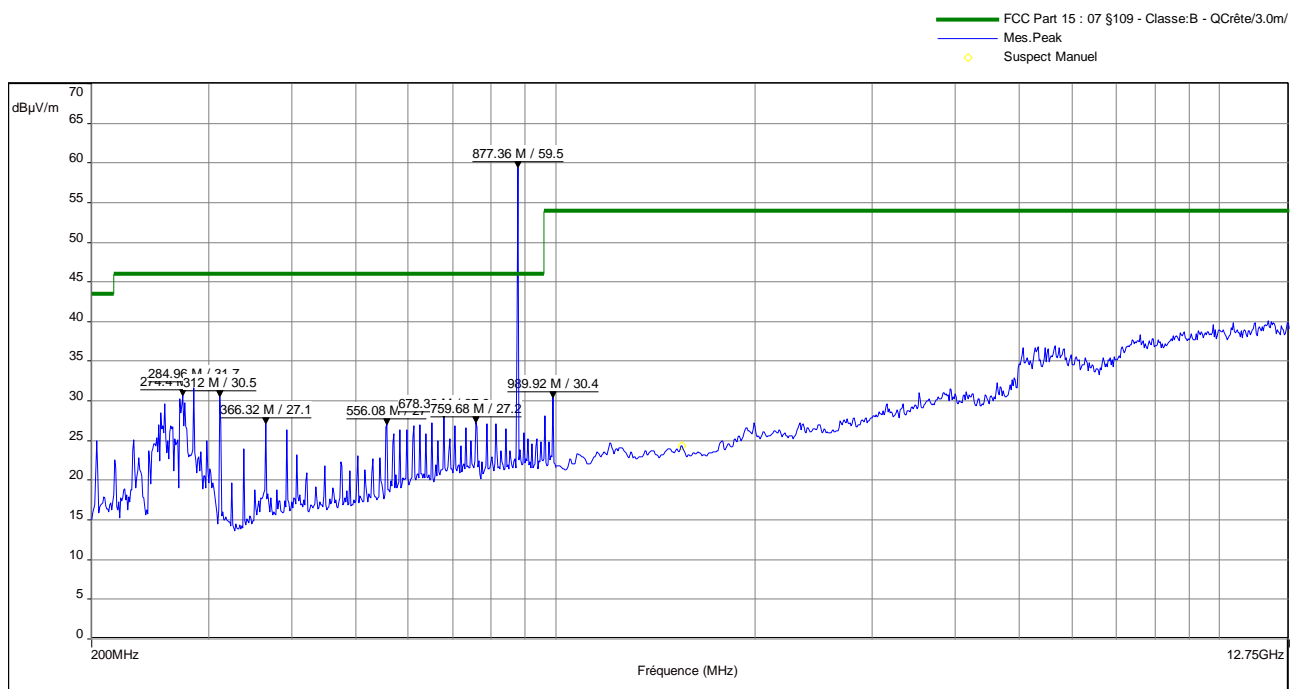
Preview measurement:
EUT N°1 set in vertical position

Frequency range 30MHz to 200MHz:



40.676 M, 42.8 dBμV/m : H3 13.56MHz
149.17 M, 25.3 dBμV/m : 1.2m 270°
176.336 M, 31.7 dBμV/m : 1.0m 225°
60.94 M, 27.1 dBμV/m : 2.0m 0°
105.599 M, 31.3 dBμV/m : 3.0m 190°

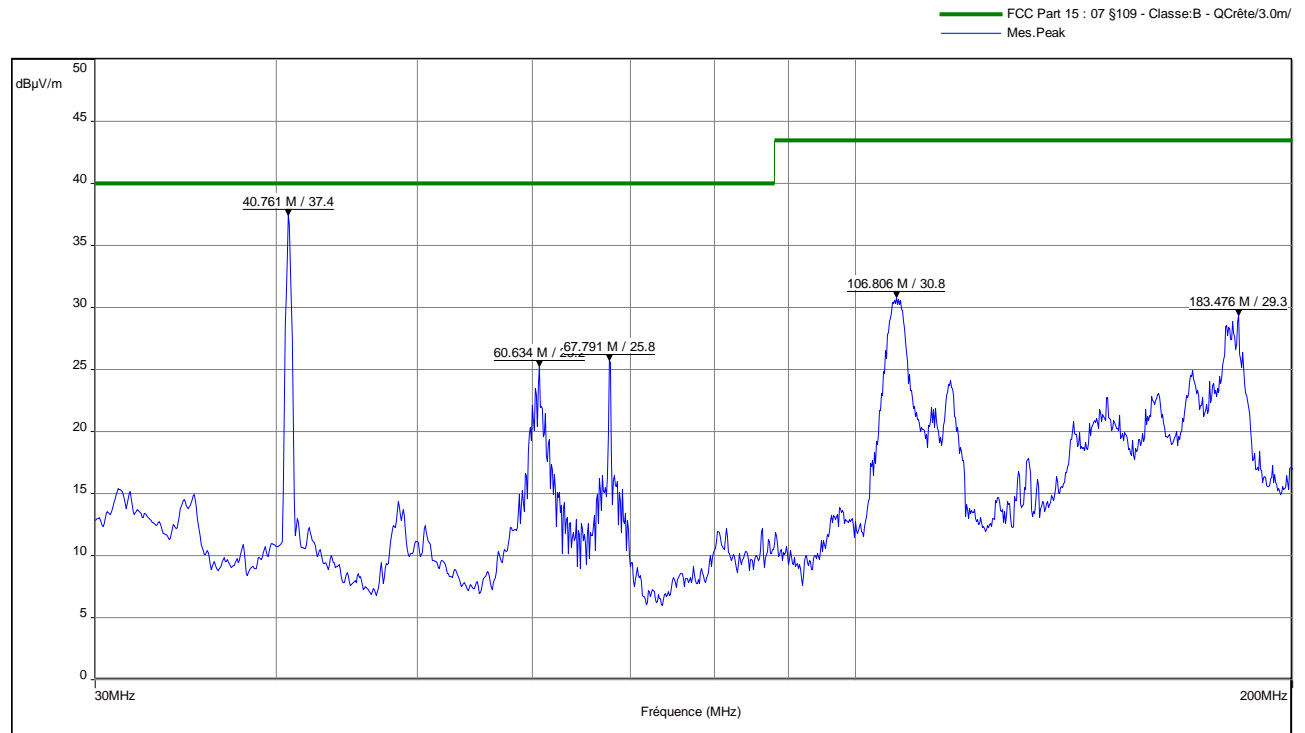
Frequency range 200MHz to 12.75GHz:



274.4 M, 30.7 dBμV/m : 1.0m 260°
284.96 M, 31.7 dBμV/m : 1.0m 110°
312 M, 30.5 dBμV/m : 1.0m 110°
366.32 M, 27.1 dBμV/m : 2.0m 190°
556.08 M, 27 dBμV/m : 1.4m 190°
678.32 M, 27.9 dBμV/m : 1.4m 190°
759.68 M, 27.2 dBμV/m : 1.4m
877.36 M, 59.5 dBμV/m : BCCH C162 GSM850
989.92 M, 30.4 dBμV/m : 2.0 125°

EUT N°1 set in horizontal position

Frequency range 30MHz to 200MHz:



40.761 M, 37.4 dBμV/m : H3 RFID

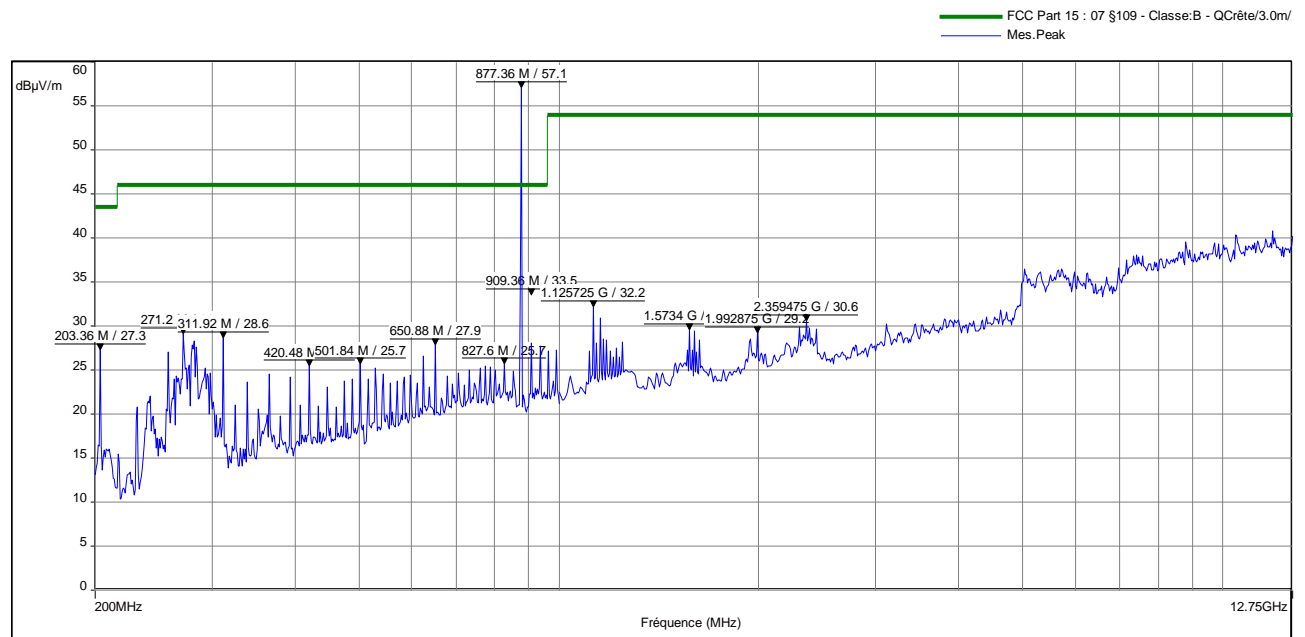
106.806 M, 30.8 dBμV/m : 3.0m 170°

183.476 M, 29.3 dBμV/m : 1.0m 300°

60.634 M, 25.2 dBμV/m : 2.0m 0°

67.791 M, 25.8 dBμV/m : 2.0m 0°

Frequency range 200MHz to 12.75GHz:



1.125725 G, 32.2 dBμV/m : 1.5m 145°

2.359475 G, 30.6 dBμV/m : 1.6m 180°

203.36 M, 27.3 dBμV/m : 1.0m 340°

420.48 M, 25.5 dBμV/m : 2.4m 180°

501.84 M, 25.7 dBμV/m : 2.4 m 0°

877.36 M, 57.1 dBμV/m : BCCh GSM850

909.36 M, 33.5 dBμV/m : BCCh GSM850

1.5734 G, 29.5 dBμV/m : 1.6m 180°

271.2 M, 29.1 dBμV/m : 1.0m 110°

650.88 M, 27.9 dBμV/m : 1.3m 0°

827.6 M, 25.7 dBμV/m : 1.3m 0°

1.992875 G, 29.2 dBμV/m : 1.6m 180°

311.92 M, 28.6 dBμV/m : 1.0 m 140°

827.6 M, 25.7 dBμV/m : 1.3m 0°

Final measurement

Ambient temperature (°C):23

Relative humidity (%): 58

EUT N°1 set in horizontal position:

F < 1GHz

FREQUENCIES (MHz)	Antenna height (cm)	Polarization H: Horizontal V: Vertical	Azimuth (degrees)	Field strength (dBμV/m)	Limits Quasi-Peak (dBμV/m)	Note
40,656	204	V	89	25,98	30	(1)H3 RFID
60,960	182	H	357	6,08	30	
105,599				-	33.52	(2)
149,190	177	V	357	11,36	33.52	
176,356	105	V	319	23,21	33.52	
203,380	407	V	-1	12,63	33.52	
271,220	100	V	172	15,93	36.44	
311,940	229	V	117	16,01	36.44	
650,882	149	V	354	19,00	36.44	
909,360	103	V	354	21,60	36.44	

Note 1: Measured level when RFID reader can detect a tag

Note 1: frequency included in broadband FM, not measured but with a great margin during prescan.

EUT N°1 set in vertical position:

F < 1GHz

FREQUENCIES (MHz)	Antenna height (cm)	Polarization H: Horizontal V: Vertical	Azimuth (degrees)	Field strength (dBμV/m)	Limits Quasi-Peak (dBμV/m)	Note
40,676	144	V	277	26,32	30	(1) H3 RFID
60,942	132	H	267	5,23	30	
105,599					33.52	(2)
149,170	100	V	2	18,93	33.52	
176,337	97	V	9	18,95	33.52	
274,398	184	H	32	16,46	36.44	
284,962	190	H	318	18,38	36.44	
311,884	212	H	36	21,23	36.44	
366,322	155	H	361	14,33	36.44	
556,08					36.44	(3)
678,340	101	H	45	18,08	36.44	
989,919	230	H	45	25,30	36.44	

Note 1: Measured level when RFID reader can detect a tag

Note 2: frequency included in broadband FM, not measured but with a great margin during prescan

Note 3: frequency included in broadband DVB-T, not measured but with a great margin during prescan

8. RADIATED EMISSION LIMITS; general requirements

Standard: FCC Part 15

Test procedure: paragraph 209

Test equipments:

For preview measurement:

Equipment	Manufacturer	Type	N°	Latest Verification	Next Verification
Spectrum analyzer	Rohde & Schwarz	FSM	7027	07/07/2010	07/07/2012
Low-noise amplifier	Miteq	JS4-00102600-35-5A	7185	11/01/2012	11/01/2013
Preamplifier	Kuhne	KU LNA BB 3000 A	9261	12/04/2012	12/04/2013
DC Power Supply	Rohde & Schwarz	NGSM32/10	7279	-	-
Meteo station	Testo	608-H1	7566	13/04/2010	13/04/2012
Multimeter	Fluke	87	7010	15/09/2010	15/09/2012
Shielded room	Siepel	10.7x6.6x7.2 m	7181	27/07/2010	-
Biconic antenna	Rohde & Schwarz	HK116	7170	16/01/2012	16/01/2016
Logperiodic antenna	Rohde & Schwarz	HL223	7171	16/01/2012	16/01/2016
Horn antenna	Emco	3115	7186	13/10/2010	13/10/2014
Software	Nexio	BAT EMC v3.6.0.24	0000	-	-
Turntable and mast controler	Rohde & Schwarz	HCC	7101	-	-

For final measurement:

Equipment	Manufacturer	Type	N°	Latest Verification	Next Verification
Spectrum analyzer	Rohde & Schwarz	ESIP07	8707	02/06/2011	02/06/2012
DC Power Supply	Rohde & Schwarz	NGSM32/10	7279	-	-
Meteo station	La Crosse Technology	WS-9232	8750	29/04/2010	29/04/2012
Multimeter	Fluke	87	7010	15/09/2010	15/09/2012
OATS	EMITECH	-	8736	10/01/2011	10/01/2013
Bi Logperiodic antenna	CHASE	CBL9112A	8530	11/06/2011	11/06/2013
Software	GYL Technologies	Logiciel champ libre V3.3	8864	-	-
Turntable and mast controler	GYL Technologies	-	8855	-	-

Test set up:

Preview measurement has been performed in an anechoic room, 3m distance from test antenna.

The system is then finally 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, set in vertical then horizontal position.

Cables disposition of unit under test:

See photos of the test unit configuration in annex 1.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (extended to 12.75GHz)

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

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$) 1 MHz ($F > 1 \text{ GHz}$)

Distance of antenna: 3 meters for preview measurement, final measurement was performed with 10m distance

Antenna height: 1 to 4 meters

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

Equipment under test operating condition:

EUT N°2 is in active state, without mobile communication

Results:

For the range 30 MHz – 12.75 GHz, the preview measurements are made in Peak detection mode in semi anechoic room with a spectrum analyser.

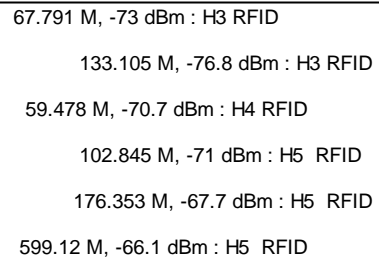
For $f > 1 \text{ GHz}$, the measurements are made only with peak detector with a spectrum analyser.

Highest emissions levels are re-measured on OATS using a Quasi-peak detector and noted in the following table.

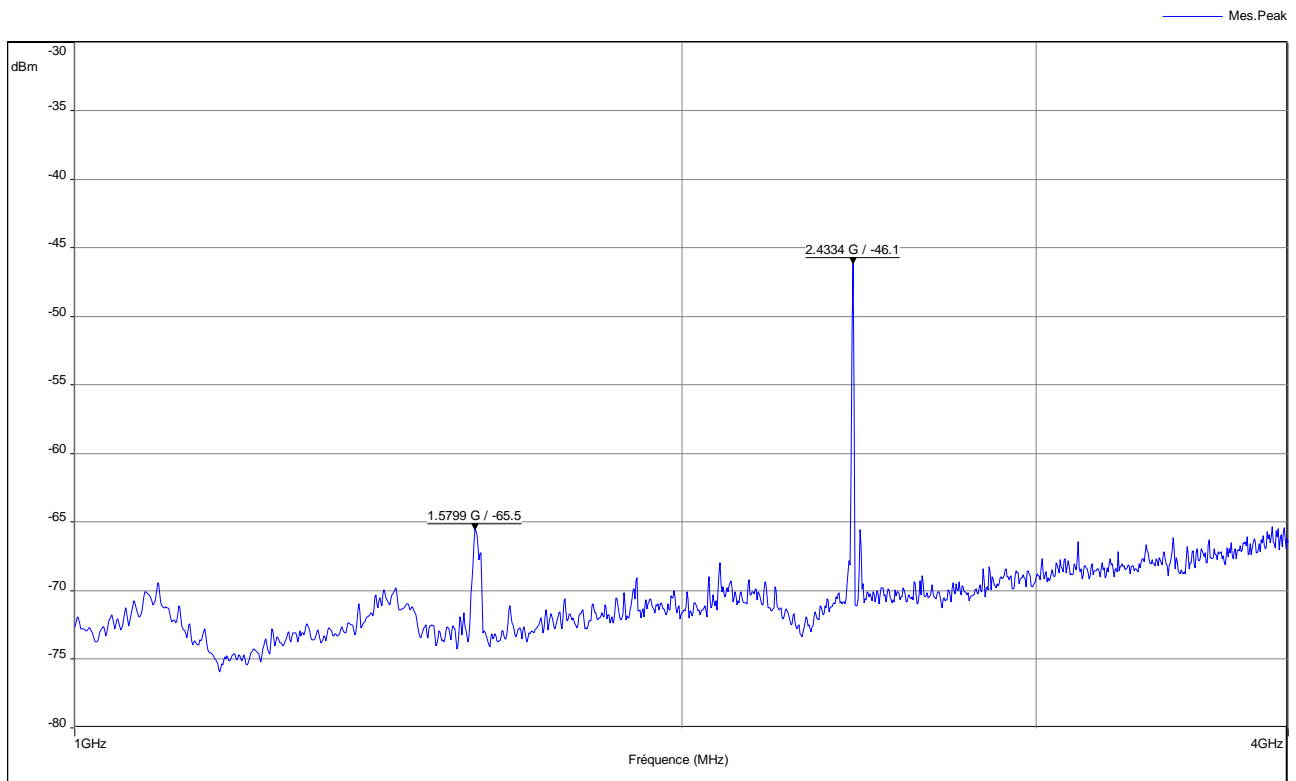
Preview measurement:

EUT N°2 set in horizontal position

Frequency range 9 kHz to 30MHz:



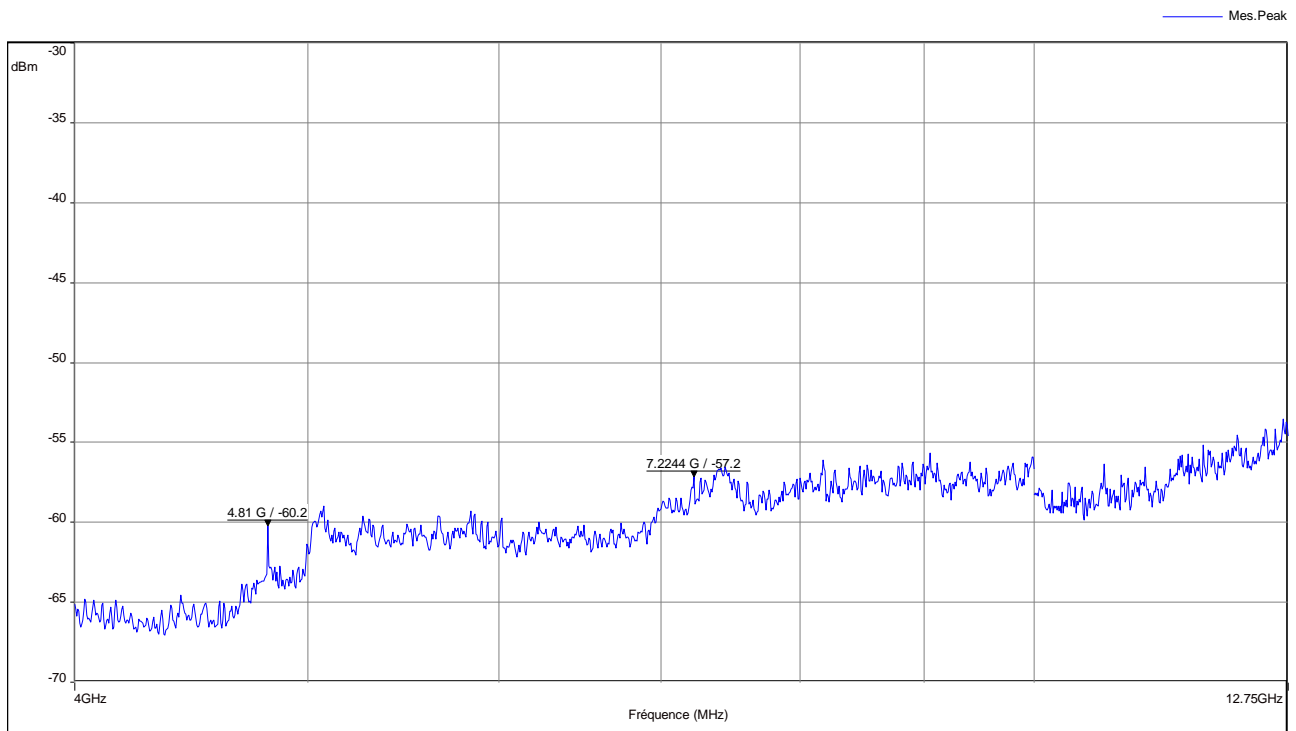
Frequency range 1GHz to 4GHz:



1.5799 G, -65.5 dBm : GPS

2.4334 G, -46.1 dBm : Wifi

Frequency range 4GHz to 12.75GHz:

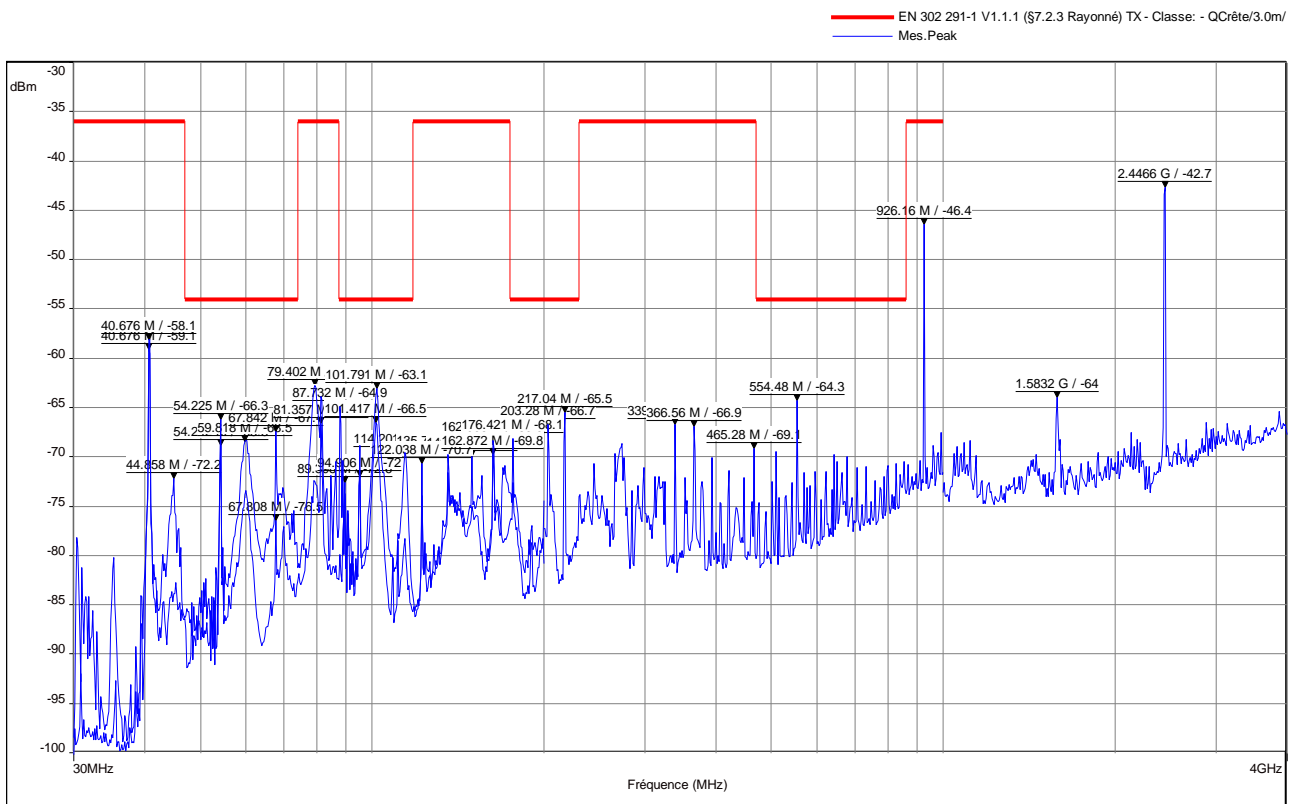


4.81 G, -60.2 dBm : CE6

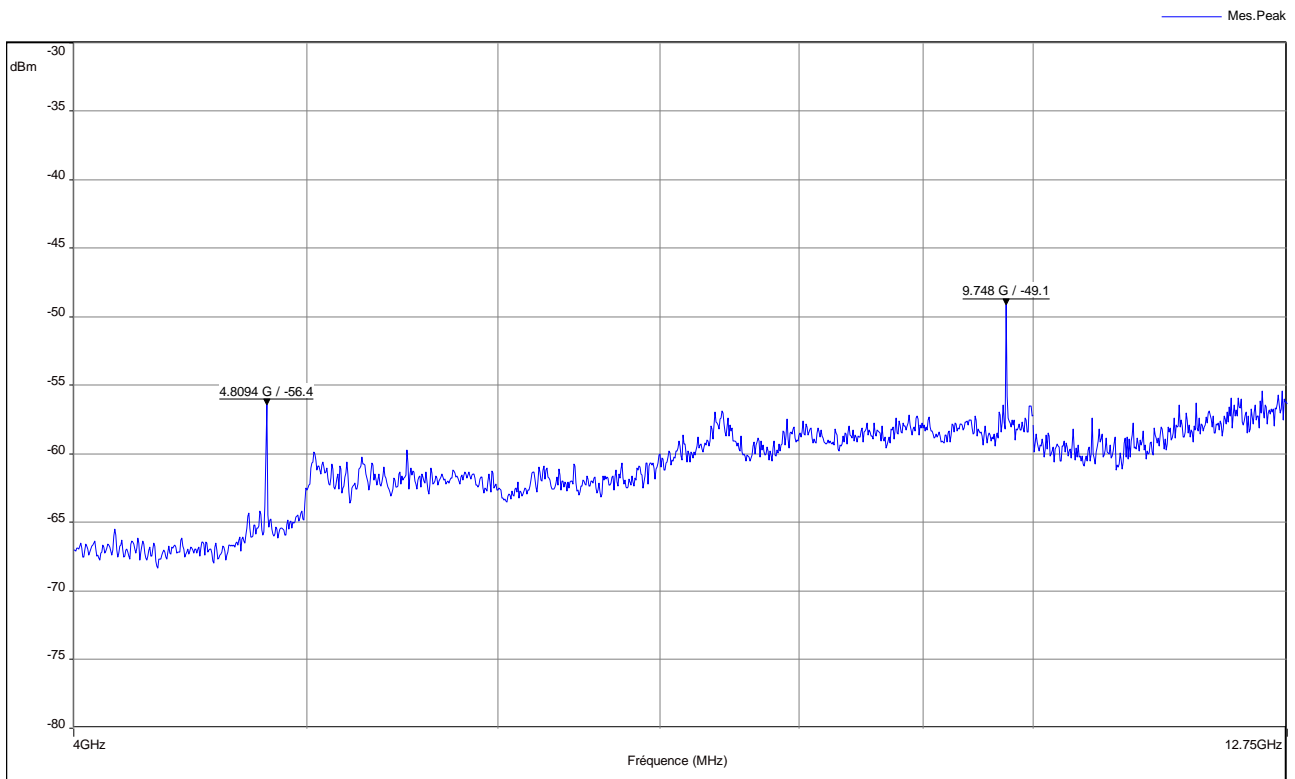
7.2244 G, -57.2 dBm : CE6

EUT N°2 set in vertical position:

Frequency range 30MHz to 4GHz:



Frequency range 4GHz to 12.75GHz:



4.8094 G, -56.4 dBm : H2 wifi

9.748 G, -49.1 dBm :

Final measurement:

Ambient temperature (°C): 24
Relative humidity (%): 52

EUT N°2 set in horizontal position

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
40,673	QP	100	220	V	20,41	30	-9,59
54,259	QP	98	135	V	8,57	30	-21,43
59,458	QP	331	359	H	5,53	30	-24,47
67,828	QP	331	248	V	6,95	30	-23,05
89,245	QP	100	360	H	Note 1	33.5	-
102,845	QP	100	360	H	Note 1	33.5	-
108,523	QP	126	362	H	9,76	33.5	-23,24
176,393	QP	240	227	V	8,26	33.5	-24,74
216,959	QP	186	322	V	18,4	36	-17,6
312,04	QP	240	361	V	12,88	36	-23,12
393,64	QP	255	183	V	13,34	36	-22,66
599,16	QP	154	277	H	30,03	36	-5,97

Note 1: frequency included in broadband FM, not measured

EUT N°2 set in vertical position:

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
40,696	QP	133	317	V	20,01	30	-9,99
54,245	QP	147	364	V	7,84	30	-22,16
79,382	QP	136	280	V	8,64	30	-21,36
81,377	QP	147	93	V	7,66	30	-22,34
101,791	QP	186	30	V	Note 1	33.5	-
122,018	QP	171	115	V	22,73	33.5	-10,27
162,892	QP	99	97	V	18,11	33.5	-14,89
203,427	QP	99	361	V	20,48	33.5	-12,52
216,96	QP	100	322	V	20,98	36	-15,02
339,38	QP	215	350	V	14,08	36	-21,92
366,54	QP	215	92	V	12,98	36	-23,02
465,3	QP	100	342	V	15,59	36	-20,41
554.48	QP	186	30	V	Note 2	36	-

Note 1: frequency included in broadband FM, not measured

Note 2: frequency included in broadband DVB-T, not measured

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

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. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz

Standard: FCC Part 15

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

Test equipments:

Equipment	Manufacturer	Type	N°	Latest Verification	Next Verification
Receiver	Rohde & Schwarz	ESIP07	8707	02/06/2011	02/06/2012
DC Power Supply	Rohde & Schwarz	NGSM32/10	7279	-	-
Meteo station	La Crosse Technology	WS-9232	8750	29/04/2010	29/04/2012
Multimeter	Fluke	87	7010	15/09/2010	15/09/2012
OATS	EMITECH	-	8736	10/01/2011	10/01/2013
Antenna	EMCO	6502	1406	13/01/2011	13/01/2013
Software	Nexio	BAT EMC v3.6.0.24	0000	-	-
Turntable and mast controler	GYL Technologies	-	8855	-	-

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.

See photos in annex

The frequency tolerance measure is realized in near-field.

Distance of antenna: 10 and 3 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 EUT N°2 is set on continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate .

Results:

a) Carrier field strength

Ambient temperature (°C):23

Relative humidity (%):58

Power source: 12Vdc

Antenna distance: 10m

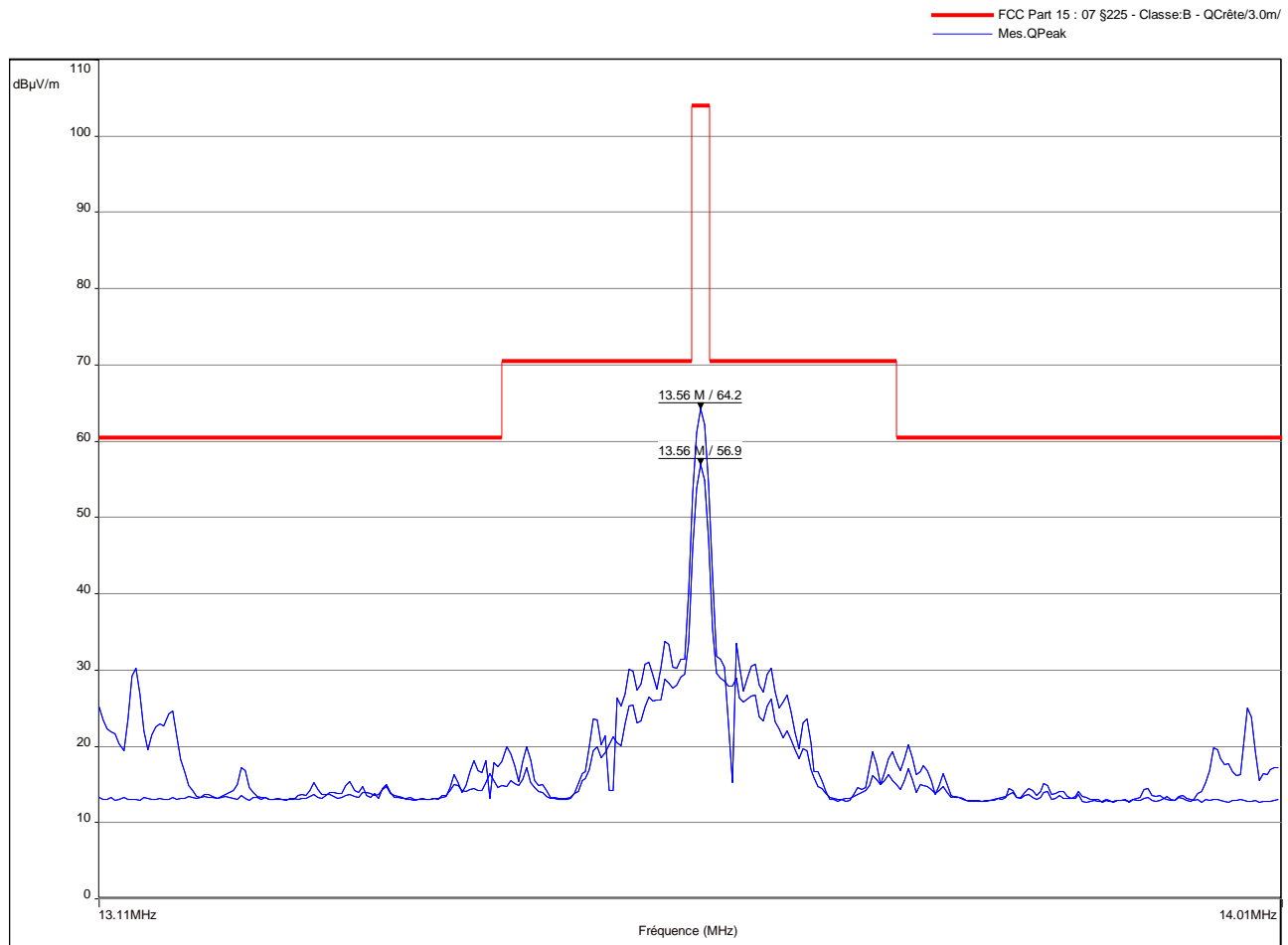
	Field strength (dBμV/m) at frequency: 13.56 MHz
Normal test conditions, RFID reader is vertical	58
Normal test conditions, RFID reader is horizontal	66.5
Limits (dBμV/m)	84

Highest levels measured on right side of EUT. See photo on annex N°1

b) and c) Field strength within the band 13.110-14.010 MHz

Antenna distance: 3 m

Reader is in vertical position, at a position 140°, antenna is parallel to EUT.

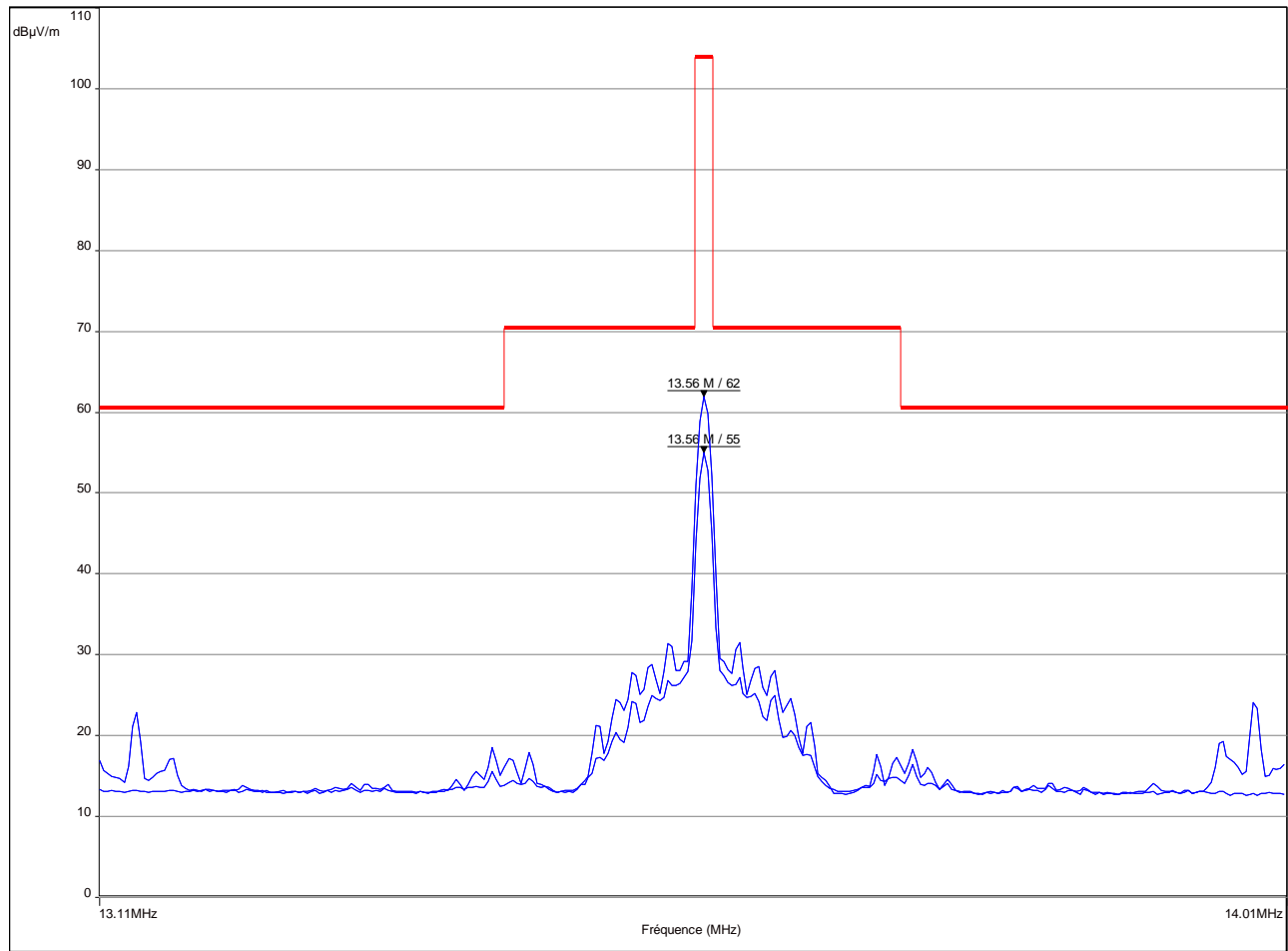


13.56 M, 64.2 dBμV/m : without TAG

13.56 M, 56.9 dBμV/m : with TAG

Reader is in horizontal position, at a position 140°, antenna is perpendicular to EUT.

FCC Part 15 : 07 §225 - Classe:B - QCrête/3.0m/
Mes.QPeak



13.56 M, 55 dBμV/m : With TAG

13.56 M, 62 dBμV/m : Without TAG

d) Field strength outside the band 13.110-14.010 MHz

See 15.209

e)Frequency stability

			Measured frequency difference (ppm)	Limits (ppm)
Normal test conditions	Temperature (°C): 20 Humidity (%):-	Minimal power source (V):10.2	3.76	±100
		Maximal power source (V):13.8	0.15	
Extreme test conditions	Minimal temperature (°C): -20	Nominal power source (V):12	7.23	
	Maximal temperature (°C): +50	Nominal power source (V):12	-2.73	

Test conclusion:

RESPECTED STANDARD

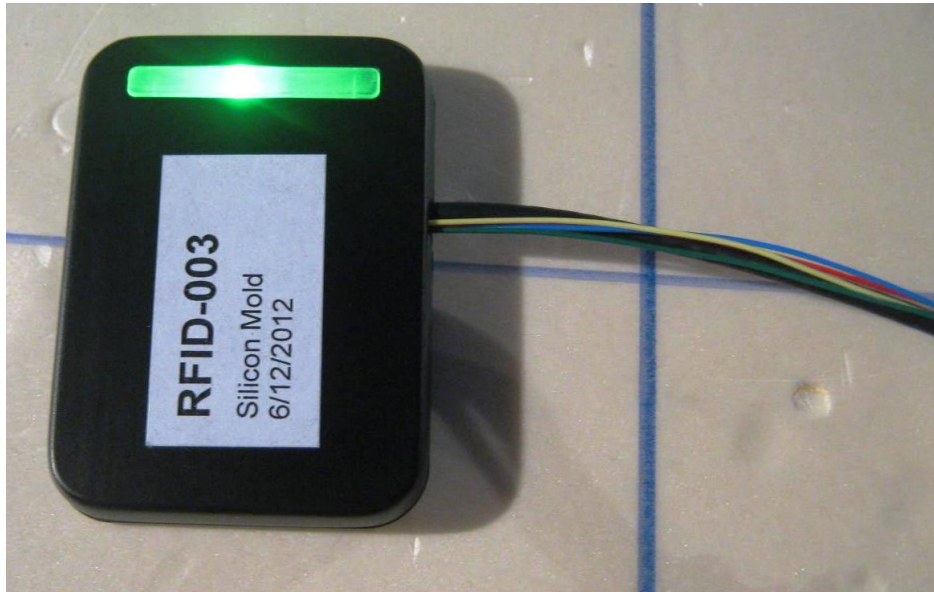
□□□ End of report, 2 annexes to be forwarded □□□

ANNEX N°1 : Photos of the equipment under test

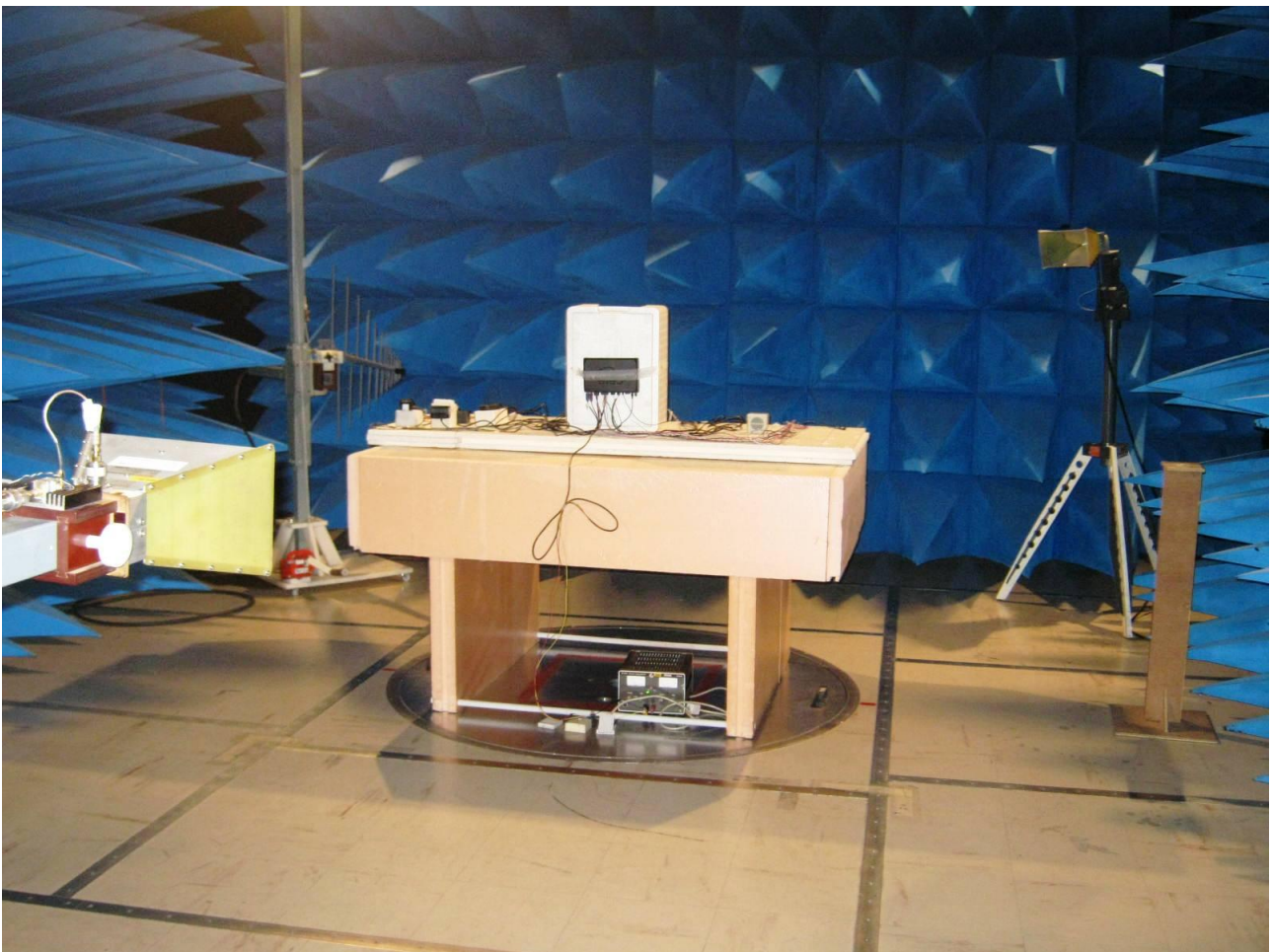
EUT :



TAG reader:



Preview measurement in semi anechoic room , EUT is in vertical position :



Preview measurement in anechoic room , EUT is in horizontal position :



Final measurement, EUT is in vertical position (right side face to test antenna):



Final measurement, EUT is in horizontal position (right side face to test antenna):

