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TEST REPORT

N°: 827941-R2-E **JDE : 133540**

Subject **Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: FCC CFR 47 Part 15, Subpart B et C RSS-210 Issue 8**

Issued to	**INGENICO** Rovaltain TGV – Quartier de la Gare 26300 – Alixan - FRANCE
Apparatus under test	
Product	**Terminal ISMP version Companion**
Trade mark	**INGENICO**
Manufacturer	**INGENICO**
Model	**ISMP2**
Model under test	**IMP452-11T2854A**
Serial number	**14344PP00007751 & 14344PP00007752**
FCCID	**XKB-IMP4B2**
ICID	**2586D-IMP4B2**
Test date	February 12th to 20th, 2015
Test location	Moirans
IC Test site	6500A-1 & 6500A-3
Test performed by	G.Deschamps
Composition of document	41 pages
Modification of the last version	None
Document issued on	April 20th, 2015

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SUMMARY

1. TEST PROGRAM

Standard:

- **FCC Part 15, Subpart B (Digital Devices)**
- **FCC Part 15, Subpart C**
- **ANSI C63.4 (2003)**
- **RSS-Gen Issue 3 – Dec 2010**
- **RSS-210 Issue 8 – Dec 2010**

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz *CFR 47 §15.207*	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 9kHz-30MHz *CFR 47 §15.209 (a)* *CFR 47 §15.225* *RSS-Gen §4.9*	**Measure at 300m** 9kHz-490kHz : 67.6dBµV/m /F(kHz) **Measure at 30m** 490kHz-1.705MHz : 87.6dBµV/m /F(kHz) 1.705MHz-30MHz : 29.5 dBµV/m			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Radiated emissions 30MHz-25GHz* *CFR 47 §15.209 (a)* *CFR 47 §15.225* *RSS-Gen §4.9* ***Highest frequency :400MHz (Declaration of provider)***	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Fundamental field strength limit *CFR 47 §15.225* *RSS-210 §A2.6*	**Operation within the band 13.110-14.010 MHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Fundamental frequency tolerance *CFR 47 §15.225* *RSS-210 §A2.6*	**Operation within the band 13.110-14.010 MHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Band edge compliance *CFR 47 §15.225* *RSS-210 §A2.6*	**Operation within the band 13.110-14.010 MHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Occupied bandwidth *RSS-Gen §4.6.1*	**No limit**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Receiver Spurious Emission** *RSS-Gen §4.10*	**See RSS-Gen §4.10**			☐ **PASS** ☐ **FAIL** ☑ **NA** ☐ **NP**

***§15.33:** The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.

- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.

If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

****Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

2. SYSTEM TEST CONFIGURATION

2.1. INFORMATIONS

There are 2 models of ISMP2:

	BCR	CLESS	Bluetooth	USB cable	PSU
IMP452-11T2854A (BCR Full Option Companion)	x	x	x	x	x
IMP422-11T2856A (No BCR Low Option Companion)		x	x	x	x

BCR : Barcode Reader embedded
CLESS : 13,56MHz RFID transceiver embedded

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
IMP452-11T2854A
Serial Number: 14344PP00007751 & 14344PP00007752

Photography of EUT

Power supply:
During all the tests, EUT is supplied by V_{nom}: 3.7 VDC
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Battery	☐ AC ☐ DC ☑ Battery	3.7 VDC	296118442 / None	-
PHIHONG	☐ AC ☑ DC ☐ Battery	100-240 VAC to 5 VDC, 0.3 A to 1 A and 50/60Hz	PSAI05R-050Q / D142700110A1	PHIHONG

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
PHIHONG	AC/DC	1.2	☐	☑	☑	-
Access1	Mini USB		☑	☑	☑	-

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Contactless card	-	-	
SAM	-	-	Two used.
Contact card	-	-	
IPod	A1509	CCQKTK66FFCJ	-

Radio frequency - Equipment information (2 RF modules):

****RF module:**	Bluetooth		
Frequency band:	[2400 – 2483.5] MHz		
Primary function type:	☑ Type I	☐ Type II	☐ Type III
Exclusion bands:	[2280 – 2607.675]MHz		
Device type – SRD classification:	☐ 1	☑ 2	☐ 3
Antenna type:	☐ External:	☑ Internal:	
Equipment intended for use as a:	☐ Fixed station	☑ Mobile station	
RF mode:	☑ TX	☐ TX /RX	☑ RX
Standby mode :	☐ Yes	☑ No	

**Comments: See the Bluetooth module tests results on the report: 827941-R1-E

Module tested:

RF module:	NC			
Frequency band:	[13.553 – 13.567] MHz			
Sub-band REC7003:	Annex9 (f)			
RF mode:	☐Transmitter	☑Transceiver	☐Receiver	☐Standby
Antenna type:	☐External:		☑Internal: PCB	
Antenna gain:	NC			
Extreme temperature range:	☐Category I (General) -20°C to +55°C	☐Category II (Portable) -10°C to +55°C	☑Category III (Indoor) +5°C to +35°C	
Extreme test source voltage:	☑±10%: 198 to 240V		☐other:	

2.3. EUT CONFIGURATION

The EUT is set in the following modes during tests with simulator / software: SDK 9.19
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

There are 2 configurations tested in pre-characterization and worst case is choice for all the tests:

Configuration 1:
IMP452-11T2854A with IPod and powered by power supply (PHIHONG). The following commands are used to test the EUT:
- Writing/Reading CAM0 (Smart card)
- Writing/Reading SAM 1& SAM2
- TX/RX communication on Contactless Card
- Bluetooth communication between IMP and the IPod

Configuration 2:
IMP452-11T2854A with IPod and powered by Battery. The following commands are used to test the EUT:
- Writing/Reading CAM0 (Smart card)
- Writing/Reading SAM 1& SAM2
- TX/RX communication on Contactless Card
- Bluetooth communication between IMP and the IPod
- Barcode activated (permanence)

2.4. EQUIPMENT MODIFICATIONS

☑ None ☐ Modification:

2.5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

3. CONDUCTED EMISSION DATA

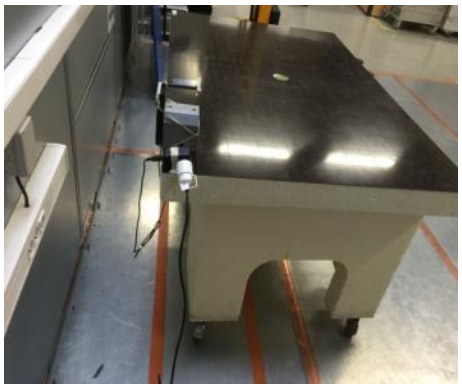
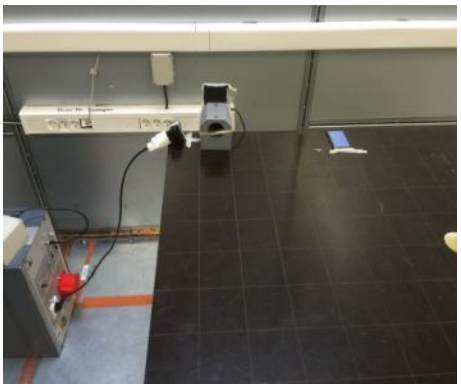
3.1. ENVIRONMENTAL CONDITIONS

Date of test : February 17th, 2015
Test performed by : G.Deschamps
Atmospheric pressure (hPa) : 1000
Relative humidity (%) : 24
Ambient temperature (°C) : 22

3.2. TEST SETUP

Mains terminals
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment)
☐ 10cm above the ground on isolating support (Floor standing equipment)
The distance between the EUT and the LISN is 80cm. The EUT is 40cm away for the vertical ground plane.

The EUT is powered by V_{nom}.
The EUT is powered through a LISN (measure). Auxiliaries are powered by another LISN.

Test setup

3.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + self	-	-	A5329578	05/14	05/15
Conducted emission comb generator	BARDET	-	A3169049	-	-
LISN tri-phase ESH2-Z5	RHODE & SCHWARZ	33852.19.53	C2320063	11/14	11/15
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	10/13	10/14
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	11/14	11/15

3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

3.5. TEST RESULTS

Mains terminals:
Results: (PEAK detection)
Results for configuration 1:

Graph identifier	Line	Mode	Comments
Emc# 1	L	TX	See annex 1
Emc# 2	N	TX	See annex 1

3.6. CONCLUSION

The sample of the equipment **IMP452-11T2854A**, Sn: **14344PP00007752**, tested in the configuration presented in this test report **satisfies** to requirements of class B limits of the standard FCC Part15B, for conducted emissions.

4. RADIATED EMISSION DATA (15.209)

4.1. ENVIRONMENTAL CONDITIONS

Date of test	:	: February 16th, 2015
Test performed by	:	: G.Deschamps
Atmospheric pressure (hPa)	:	: 984
Relative humidity (%)	:	: 24
Ambient temperature (°C)	:	: 23

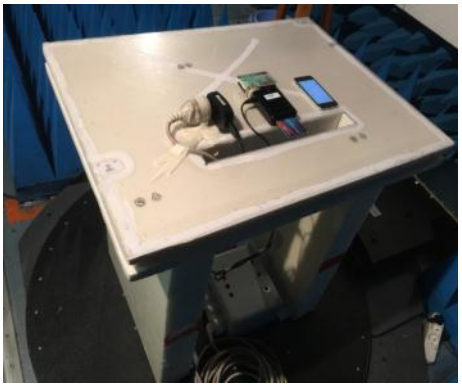
4.2. TEST SETUP

The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☐ 80cm above the ground on the non-conducting table (Table-top equipment)
☐ 10cm above the ground on isolating support (Floor standing equipment)
The EUT is powered by V_{nom}.

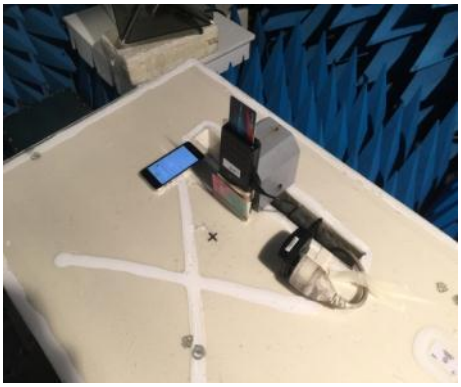


Test setup on OATS

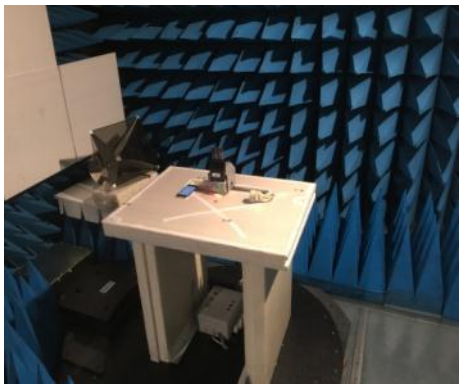
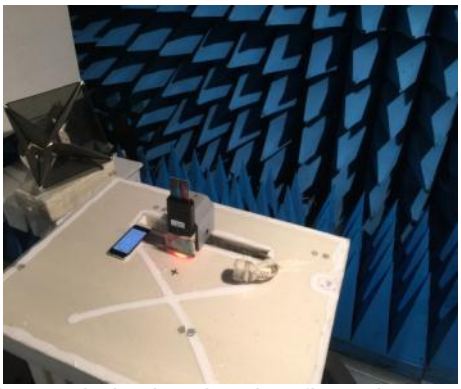




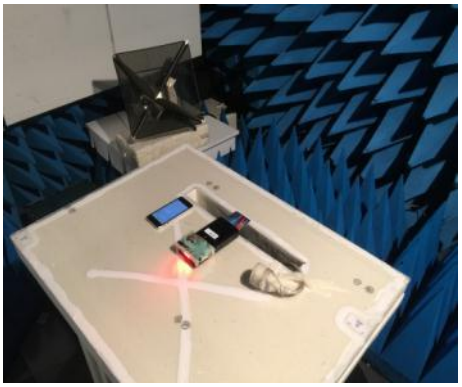
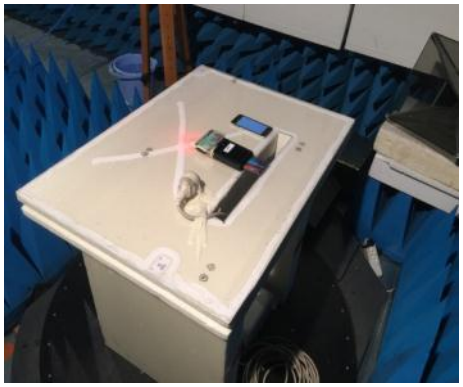
Test setup in anechoic chamber (configuration 1 and axis XY):


Test setup in anechoic chamber (configuration 1 and axis Z):


Test setup in anechoic chamber (configuration 2 and axis XY):

Test setup in anechoic chamber (configuration 2 and axis Z):

4.3. TEST METHOD

Pre-characterisation measurement: (9kHz – 2GHz)
A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 2GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test for maximized the emission measurement. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration.
The pre-characterization graphs are obtained in PEAK detection and PEAK/AVERAGE from 1GHz to 2GHz.

Characterization on 10 meters open site from 9kHz to 1GHz:
The product has been tested according to ANSI C63.4 (2003), FCC part 15 subpart C. Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC. The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart C §15.225 limits in the frequency range 13.553MHz 13.567MHz. Measurement bandwidth was 9kHz below 30MHz and 120kHz from 30 MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test for maximized the emission measurement. The height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.
Frequency list has been created with anechoic chamber pre-scan results.

Characterization on 3 meters full anechoic chamber from 1GHz to 2GHz:
The product has been tested at a distance of **3 meters** from the antenna and compared to the FCC part 15 subpart B §15.109 limits and C §15.209 limits. Measurement bandwidth was 1MHz from 1GHz to 2GHz.
Test is performed in horizontal (H) and vertical (V) polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.The height antenna is
☐ On mast, varied from 1m to 4m
☑ Fixed and centered on the EUT
Frequency list has been created with anechoic chamber pre-scan results.

4.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Bi-log	CHASE	CBL6111A	C2040051	04/14	04/16
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052	10/13	10/15
Antenna Bi-log	CHASE	CBL6111A	C2040172	04/13	04/15
Antenna horn	EMCO	3115	C2042029	09/14	09/15
Cable Measure @3m	-	-	A5329038	08/14	08/15
Cable Measure @3m	-	-	A5329206	01/14	01/15
Cable	-	-	A5329559	02/15	02/16
Cable Measure @1m	STORMFLEX	0	A5329680	10/14	10/15
Cable Measure @1m	STORMFLEX	0	A5329682	10/14	10/15
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	-	-
Radiated emission comb generator	BARDET	-	A3169050	-	-
HF Radiated emission comb generator	LCIE SUD EST	-	A3169088	-	-
OATS	-	-	F2000409	09/14	09/15
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	10/13	10/14
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	01/15	01/16
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371	-	-
Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066	F2000372	-	-
Antenna mast (OATS)	ETS Lindgren	2071-2	F2000392	-	-
Turntable (OATS)	ETS Lindgren	Model 2187	F2000403	-	-
Table	MATURO Gmbh	-	F2000437	-	-
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444	-	-

4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

4.6. TEST RESULTS

4.6.1. Pre-characterization at 3 meters [9kHz-30MHz]

See graph for 9kHz-30MHz band:

Graph identifier		Polarization	EUT position	Comments	
Emr#	3	0°	Axis XY	EUT configuration 1	See annex 1
Emr#	4	90°	Axis XY	EUT configuration 1	See annex 1
Emr#	5	0°	Axis Z	EUT configuration 1	See annex 1
Emr#	6	90°	Axis Z	EUT configuration 1	See annex 1
Emr#	7	0°	Axis XY	EUT configuration 2	See annex 1
Emr#	8	90°	Axis XY	EUT configuration 2	See annex 1
Emr#	9	0°	Axis Z	EUT configuration 2	See annex 1
Emr#	10	90°	Axis Z	EUT configuration 2	See annex 1

4.6.2. Pre-characterization at 3 meters [30MHz-1GHz]

See graphs for 30MHz-1GHz:

Graph identifier		Polarization	EUT position	Comments	
Emr#	11	H/V	Axis XY	EUT configuration 1	See annex 1
Emr#	12	H/V	Axis Z	EUT configuration 1	See annex 1
Emr#	13	H/V	Axis XY	EUT configuration 2	See annex 1
Emr#	14	H/V	Axis Z	EUT configuration 2	See annex 1

4.6.3. Pre-characterization at 3 meters [1GHz-2GHz]

See graphs for 1GHz-2GHz:

Graph identifier		Polarization	EUT position	Comments	
Emr#	15	H/V	Axis XY	EUT configuration 1	See annex 1
Emr#	16	H/V	Axis Z	EUT configuration 1	See annex 1
Emr#	17	H/V	Axis XY	EUT configuration 2	See annex 1
Emr#	18	H/V	Axis Z	EUT configuration 2	See annex 1

4.6.4. Characterization on 10 meters open site below 30 MHz

Worst case final data result:

Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

No	Frequency (MHz)	QPeak Limit (dBµV/m) @ 30m	Qpeak (dBµV/m) @ 30m	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. Factor (dB)	Comments
1	13.56	84	-21.1	-105.1	300	0	160	35.1	-
2	27.12	29.55	-41.4	**-41.4**	300	0	150	44.7	-

Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@30m = M@10m-19.1dB)

Limits Sub clause §15.225

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
13.553-13.567	15 848 84 dBµV/m	30
13.410-13.553 13.567-13.710	334 50.5 dBµV/m	30
13.110-13.410 13.710-14.010	106 40.5 dBµV/m	30

See following chapter of this test report for band edge measurements.

4.6.5. Characterization on 10 meters open site from 30MHz to 1GHz

Worst case final data result:

Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

Results for the configuration 1:

No	Frequency (MHz)	Limit QPeak (dBµV/m)	Measure QPeak (dBµV/m)	Margin QPeak (dB)	Angle Table (°)	Pol. Ant.	Ht. Ant. (cm)	FC (dB)	Remark
1	40.676	40.0	34.9	**-5.1**	100	V	100	13.9	Measure at 3m
2	54.225	40.0	32.7	**-7.3**	280	V	100	8.6	
3	65.037	40.0	36.2	**-3.8**	270	V	100	7.7	
4	74.693	40.0	34.1	**-5.9**	0	V	100	8.3	
5	110.342	43.5	29.8	**-13.7**	30	V	250	12.8	
6	483.800	46.0	32.3	**-13.7**	0	V	250	21.8	
7	870.720	46.0	39.1	**-6.9**	0	V	250	28.6	

Results for the configuration 2:

No	Frequency (MHz)	Limit QPeak (dBµV/m)	Measure QPeak (dBµV/m)	Margin QPeak (dB)	Angle Table (°)	Pol. Ant.	Ht. Ant. (cm)	FC (dB)	Remark
1	375.000	46.0	33.7	**-12.3**	240	V	400	18.9	
2	425.000	46.0	40.8	**-5.2**	140	V	260	20.3	
3	475.013	46.0	41.9	**-4.1**	115	V	300	21.6	
4	500.000	46.0	43.3	**-2.7**	166	V	350	22.2	
5	525.014	46.0	41.9	**-4.1**	122	V	275	22.7	
6	550.014	46.0	40.8	**-5.2**	147	V	282	23.3	
7	600.015	46.0	39.8	**-6.2**	155	V	275	24.3	
8	650.130	46.0	44.0	**-2.0**	150	V	100	25.1	Measure at 3m
9	675.019	46.0	40.0	**-6.0**	0	V	100	25.5	Measure at 3m
10	725.019	46.0	43.6	**-2.4**	103	V	250	26.3	
11	750.019	46.0	44.6	**-1.4**	180	V	250	26.6	
12	875.022	46.0	40.3	**-5.7**	160	V	140	28.7	Measure at 3m

Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
(M@3m = M@10m+10.5dB)

4.6.6. Characterization on 3meters anechoic chamber from 1GHz to 2GHz

Worst case final data result:

The frequency list is created from the results obtained during the pre-characterization in anechoic chamber.
Measurements are performed using a PEAK and AVERAGE detection.

No significant frequency observed (see annex 1)*
**Note: Measures have been done at 3m distance.*

4.7. CONCLUSION

The sample of the equipment **IMP452-11T2854A**, Sn: **14344PP00007752**, tested in the configuration presented in this test report **satisfies** to requirements of class B limits of the standard FCC Part15B and C, for radiated emissions.

5. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)

5.1. ENVIRONMENTAL CONDITIONS

Date of test	:	February 19th,2015
Test performed by	:	G.deschamps
Atmospheric pressure (hPa)	:	986
Relative humidity (%)	:	32
Ambient temperature (°C)	:	23

5.2. TEST SETUP

Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz
The equipment (RF box) is set in a climatic chamber. Measure is performed on one channel of RF module.

Test setup

5.3. TEST METHOD

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency when the temperature is varied from -20°C to +50°C at the nominal power voltage and the primary power voltage is varied from 85% to 115% of the rated supply voltage at 20°C.

5.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Loop	ELECTRO-METRICS	EM-6993	C2040210	09/14	09/15
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Cable	-	-	A5329634	10/14	10/15
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117	12/13	12/15
Thermometer	FLUKE	52II	B4045002	-	-
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020	07/14	07/15
HAR + Imped. Net Mono	SCHAFFNER	CCN1000	A7040078	-	-
Programable PSU, HAR/FLK	HEWLETT PACKARD	6842A	A2120003	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

5.6. TEST RESULTS

Temperature / **Voltage**	**-30°C**	**-20°C**	**20°C**	**+50°C**
Mains voltage: 110V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 - 0.000300 + 1.56	 - 0.000400 + 1.62	 **13.560000** **0.900000**	 - 0.000400 + 0.38
Mains voltage: 100V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 - 0.000400 + 1.51	 - 0.000200 + 1.57	 - 0.000200 - 0.20	 - 0.000400 + 0.38
Mains voltage: 126V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 - 0.000400 + 1.60	 - 0.000200 + 1.60	 - 0.000200 + 0.10	 - 0.000200 + 0.31

Frequency drift measured is 400**Hz** when the temperature is varied from -30°C to +50°C and voltage is varied.

5.1. CONCLUSION

The sample of the equipment **IMP452-11T2854A**, Sn: 14344PP00007751, tested in the configuration presented in this test report **satisfies** to requirements of the standard FCC Part15C, for fundamental frequency tolerance.

6. BAND-EDGE COMPLIANCE §15.209

6.1. ENVIRONMENTAL CONDITIONS

Date of test	:	February 19th,2015
Test performed by	:	G.deschamps
Atmospheric pressure (hPa)	:	986
Relative humidity (%)	:	32
Ambient temperature (°C)	:	23

6.2. TEST SETUP

For measurement, the power level calibration of the spectrum analyzer is related to the field strength measured in chapter radiated emission data.

Test setup

6.3. TEST METHOD

Frequency band 13.110-14.010MHz

Following plots show radiated emission level in the frequency band 13.110-14.010MHz with a RBW of 9kHz and a quasi-peak detector. The graphs are obtained with a measuring receiver.

6.4. TEST EQUIPMENT LIST

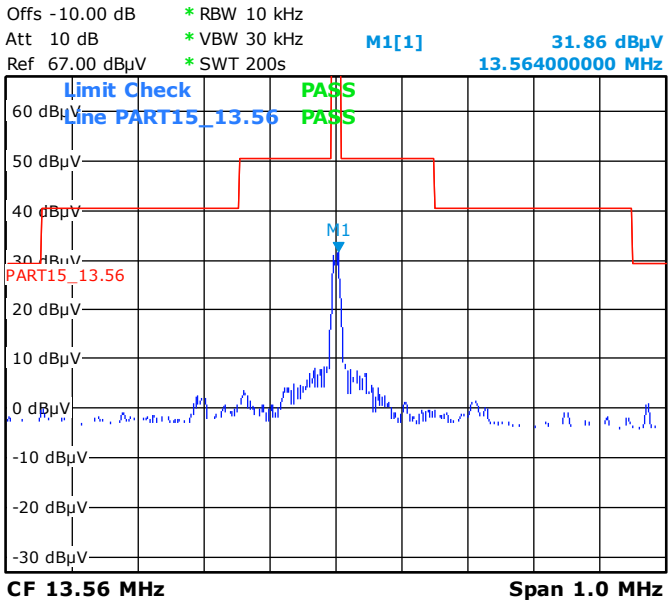
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Loop	ELECTRO-METRICS	EM-6993	C2040210	09/14	09/15
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Cable	-	-	A5329634	10/14	10/15
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117	12/13	12/15
Thermometer	FLUKE	52II	B4045002	-	-
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020	07/14	07/15
HAR + Imped. Net Mono	SCHAFFNER	CCN1000	A7040078	-	-
Programable PSU, HAR/FLK	HEWLETT PACKARD	6842A	A2120003	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

6.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

6.6. TEST RESULTS

Frequency band 13.110-14.010MHz



6.7. CONCLUSION

The sample of the equipment **IMP452-11T2854A**, Sn: 14344PP00007751, tested in the configuration presented in this test report **satisfies** to requirements of the standard FCC Part15C, for band-edge compliance.

7. OCCUPIED BANDWIDTH

7.1. ENVIRONMENTAL CONDITIONS

Date of test : February 19th,2015
Test performed by : G.deschamps
Atmospheric pressure (hPa) : 986
Relative humidity (%) : 32
Ambient temperature (°C) : 23

7.1. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.
Offset: Attenuator+cable 10.8

☐ ***Radiated measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

Measurement Procedure:
1. RBW used should not be lower than 1% of the selected span
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. OBW 99% function of spectrum analyzer used

7.2. TEST EQUIPMENT LIST

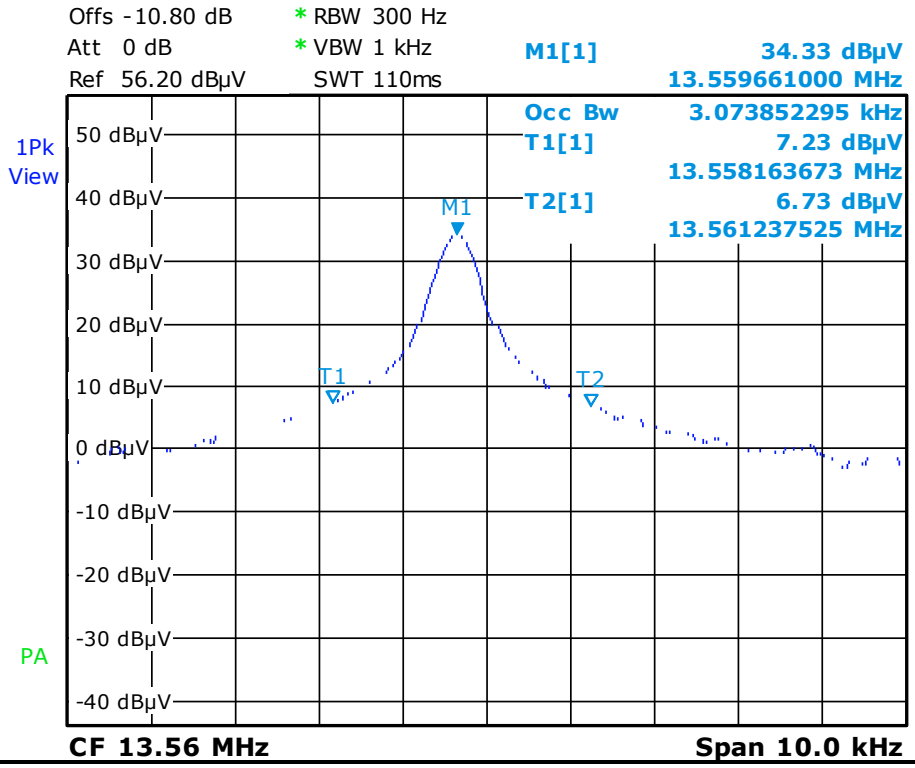
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Loop	ELECTRO-METRICS	EM-6993	C2040210	09/14	09/15
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Cable	-	-	A5329634	10/14	10/15
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117	12/13	12/15
Thermometer	FLUKE	52II	B4045002	-	-
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020	07/14	07/15
HAR + Imped. Net Mono	SCHAFFNER	CCN1000	A7040078	-	-
Programable PSU, HAR/FLK	HEWLETT PACKARD	6842A	A2120003	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

7.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

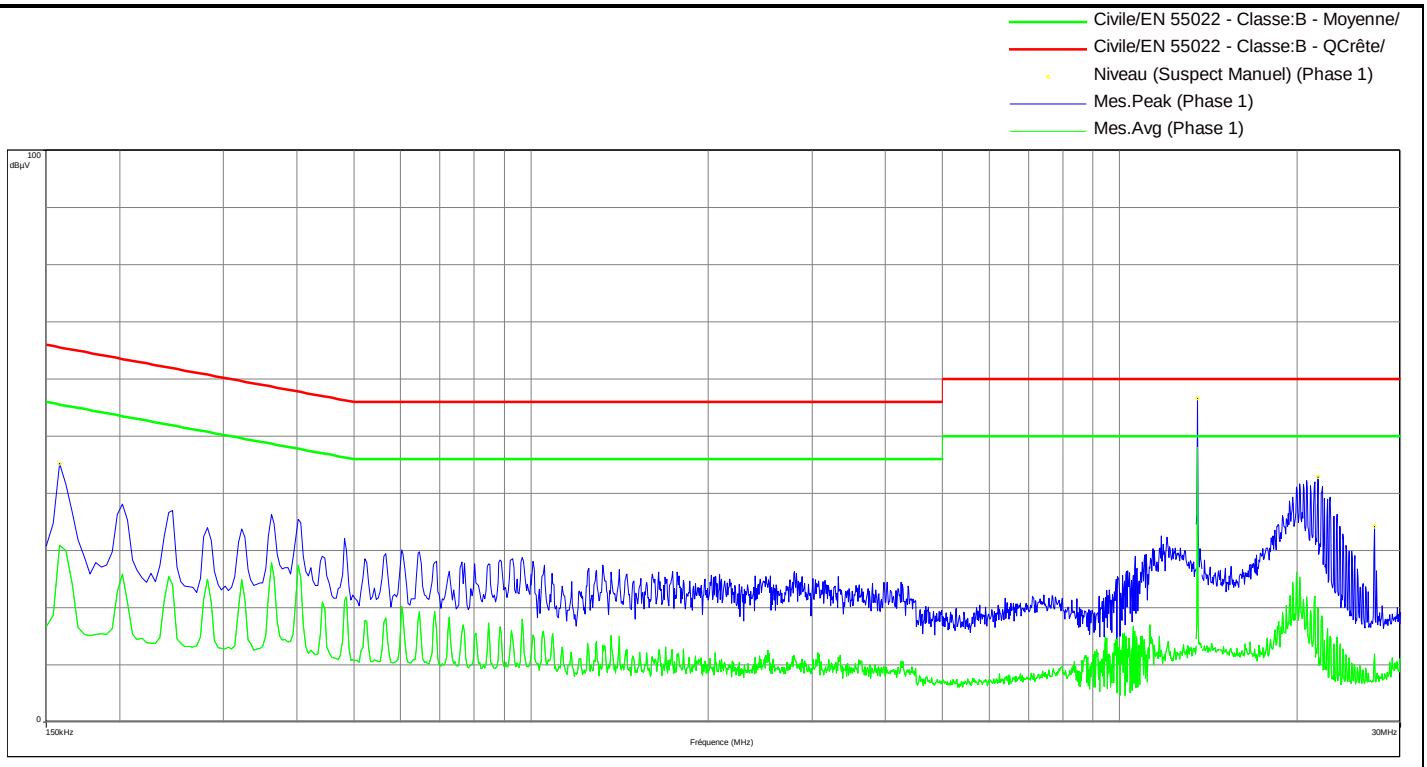
7.4. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (kHz)
Carrier	13.56	**3.073**



8. ANNEX 1 (GRAPHS)

CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	EN 55022	Configuration 1 - Line	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Line	**VBW :**	30kHz

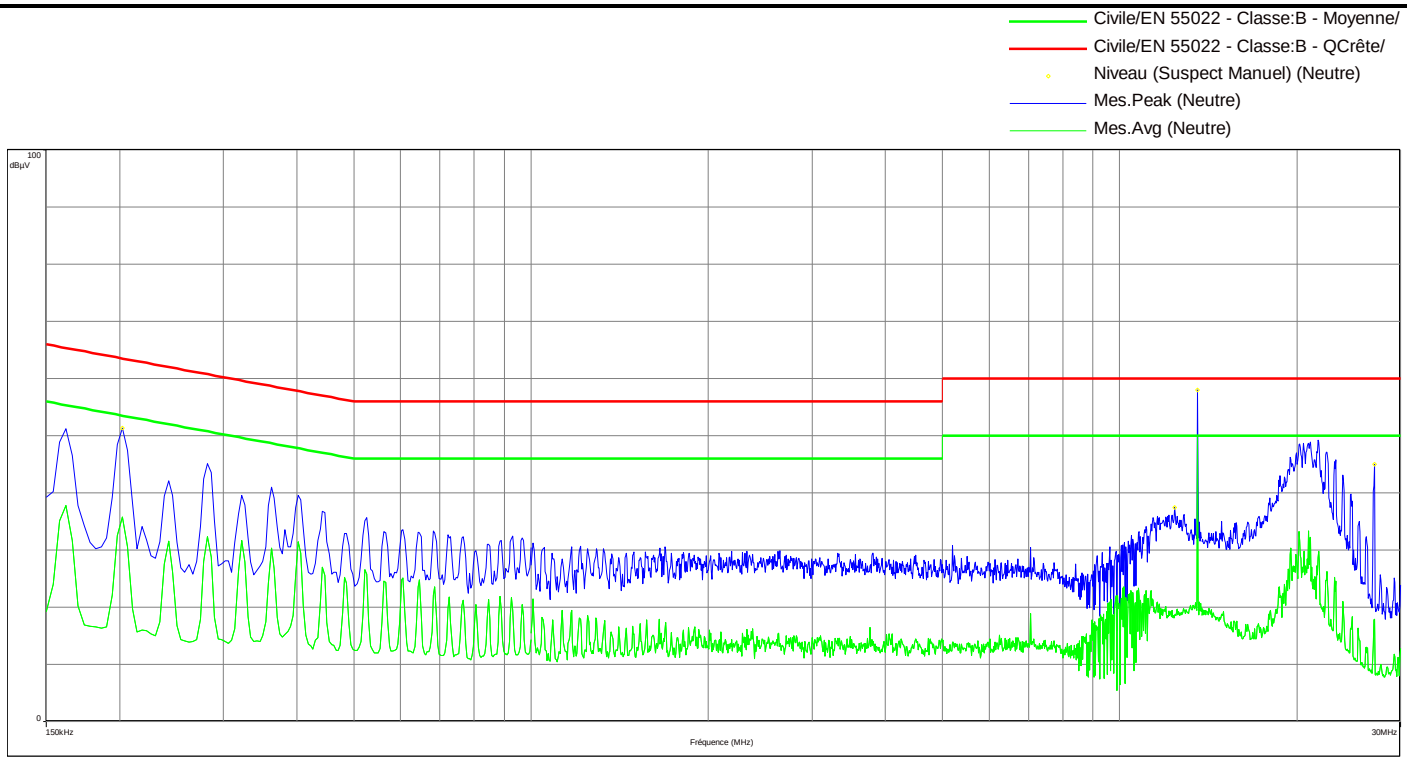


Spurious emissions

Frequency (MHz)	Peak (dBµV)
0.158	45.19
13.556*	56.72
21.724	42.94
27.108*	34.23

*RFID Frequencies

CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	EN 55022	Configuration 1 - Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz

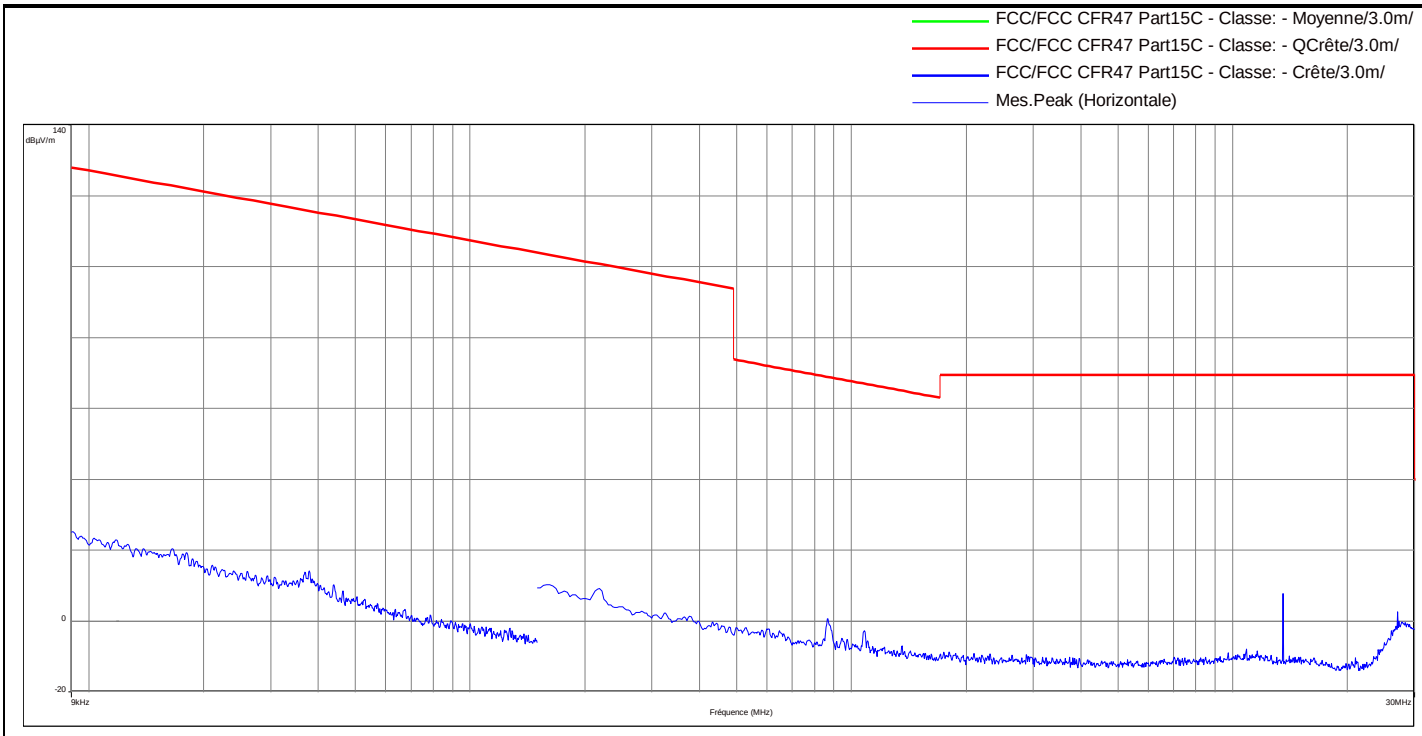


Spurious emissions

Frequency (MHz)	Peak (dBµV)
0.202	51.29
12.4	37.44
13.56*	58.03
27.084*	44.95

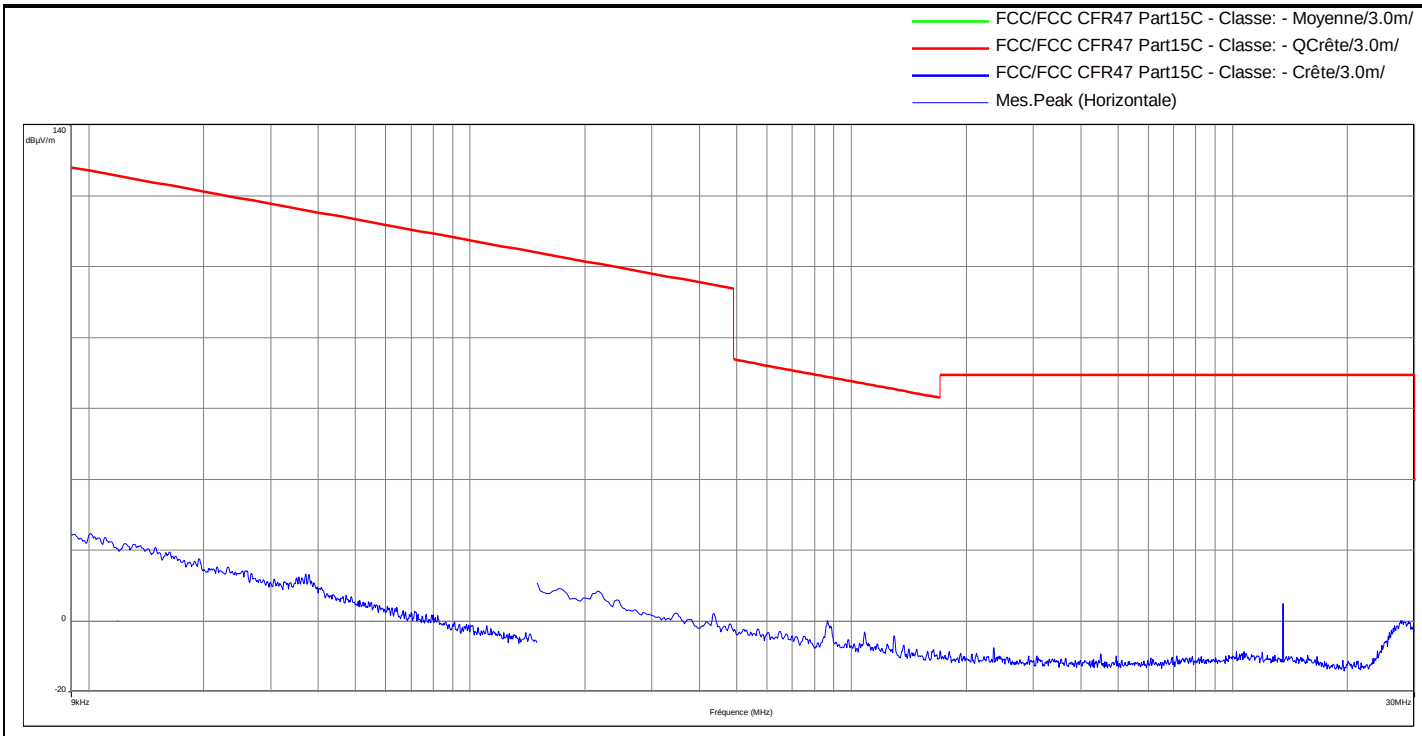
*RFID Frequencies.

RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 1 - (0°) - Axis XY	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



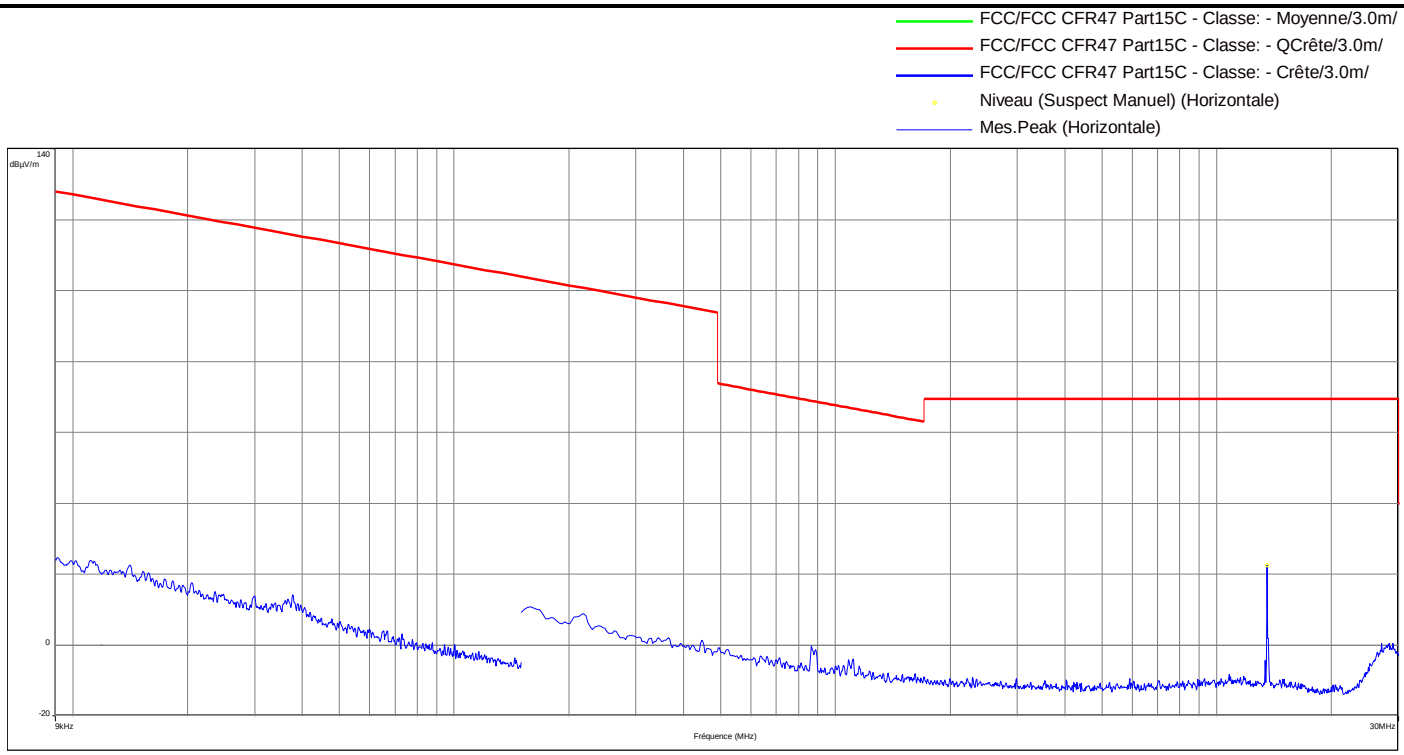
Spurious emissions

RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 1 - (90°) - Axis XY	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

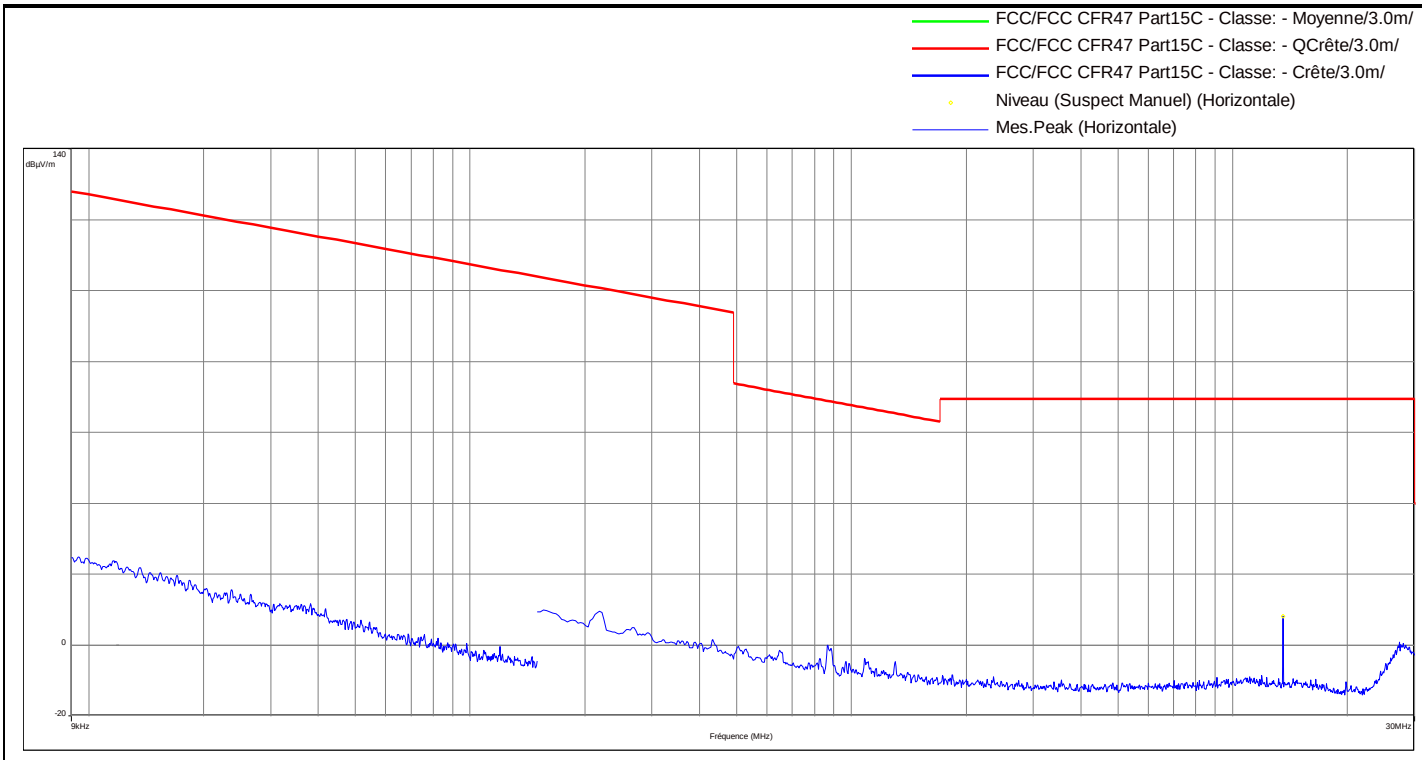
RADIATED EMISSIONS			
Graph name:	Emr#5	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 1 - (0°) - Axis Z	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV)
13.55862	22.47

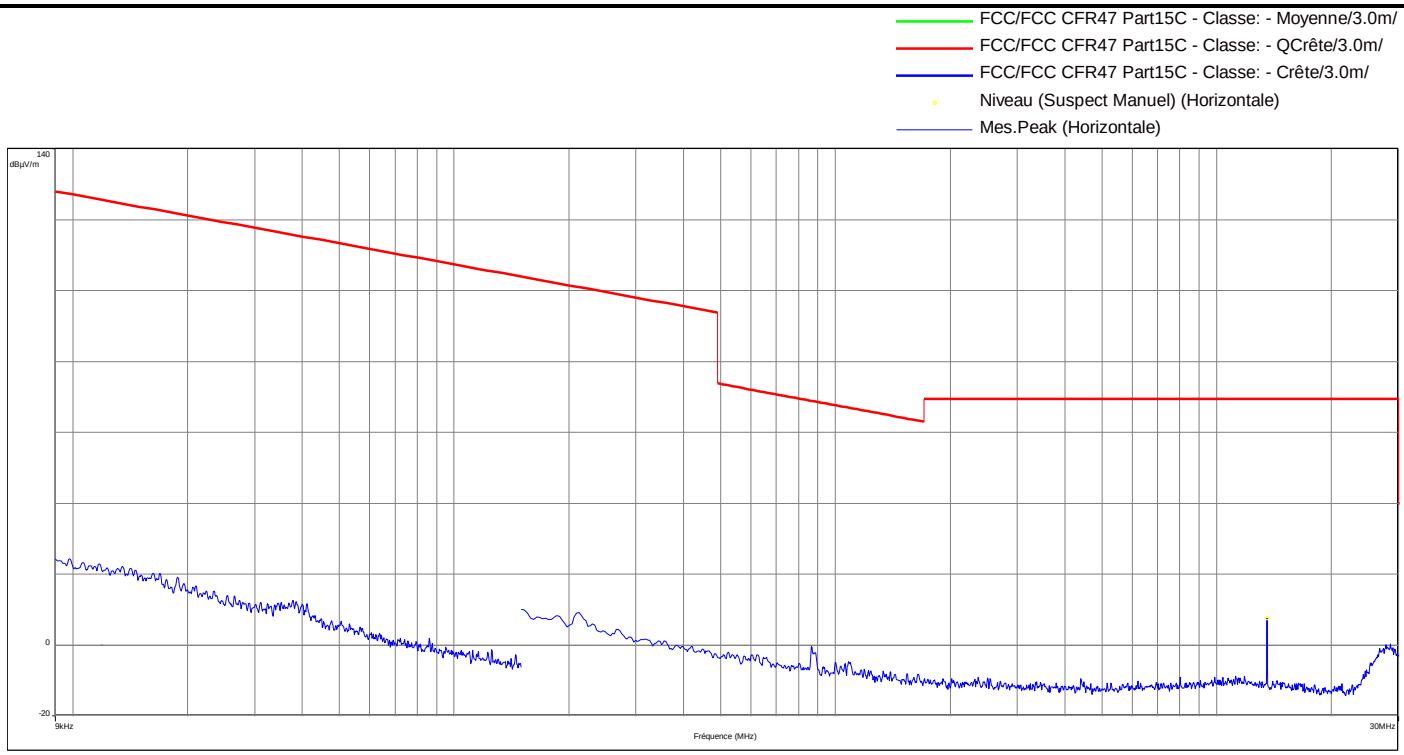
RADIATED EMISSIONS			
Graph name:	Emr#6	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 1 - (90°) - Axis Z	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV)
13.55862	8.07

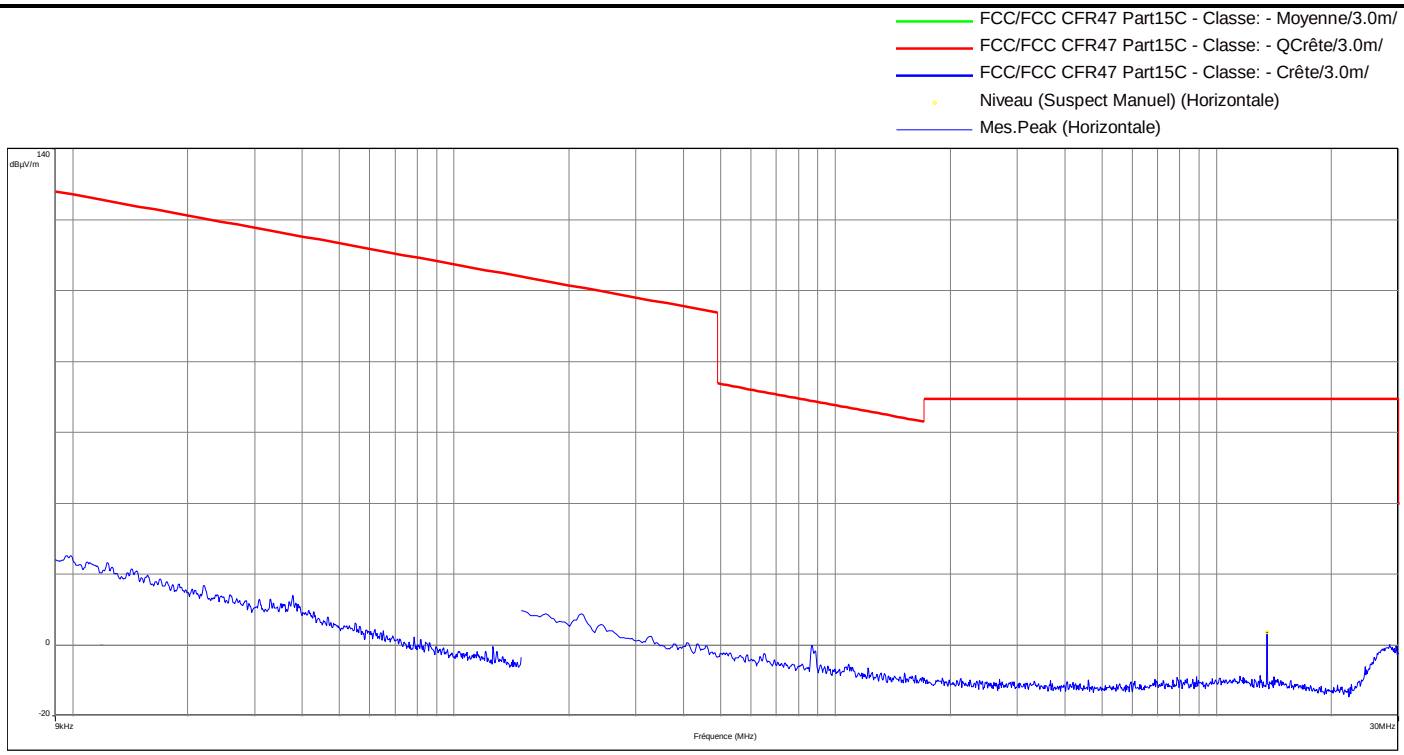
RADIATED EMISSIONS			
Graph name:	Emr#7	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 2 - (0°) - Axis XY	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV)
13.55862	7.59

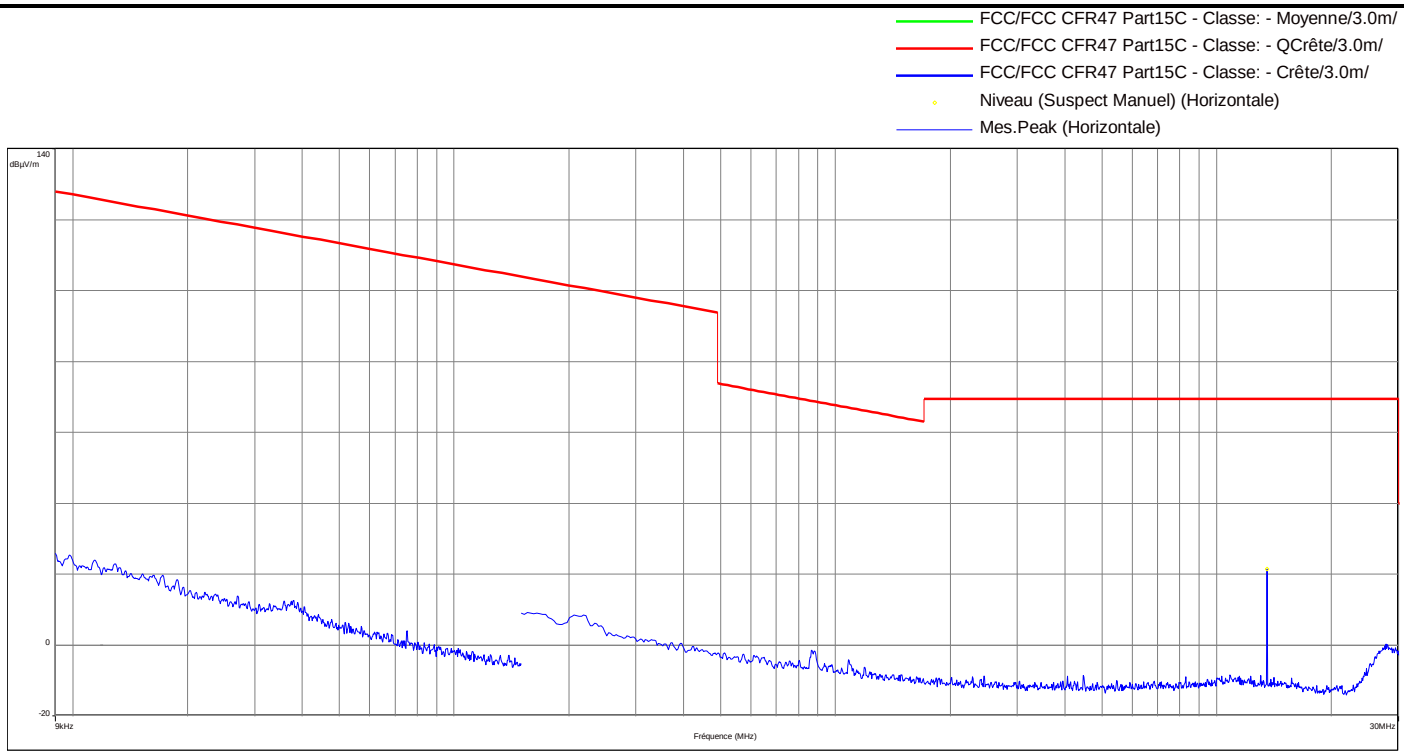
RADIATED EMISSIONS			
Graph name:	Emr#8	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 2 - (90°) - Axis XY	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV)
13.55862	3.62

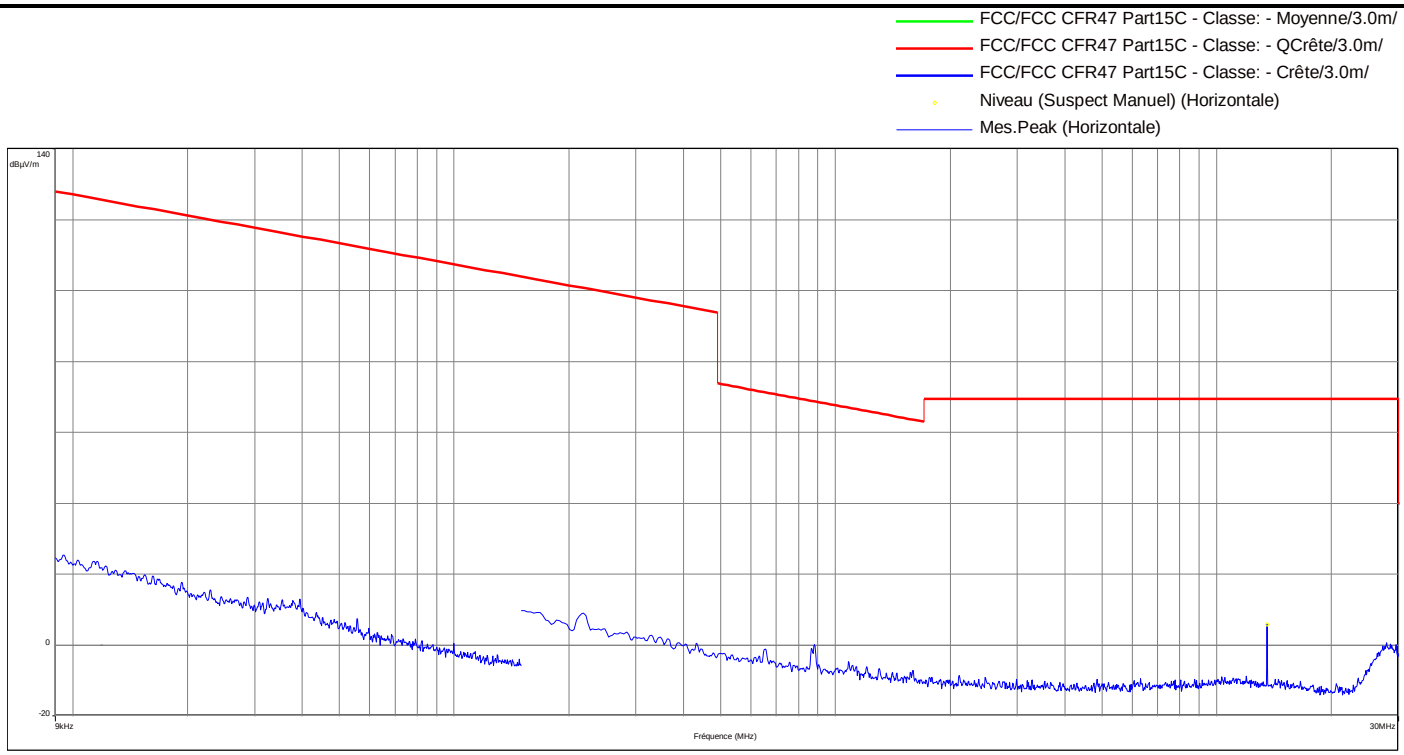
RADIATED EMISSIONS			
Graph name:	Emr#9	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 2 - (0°) - Axis Z	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV)
13.55862	21.5

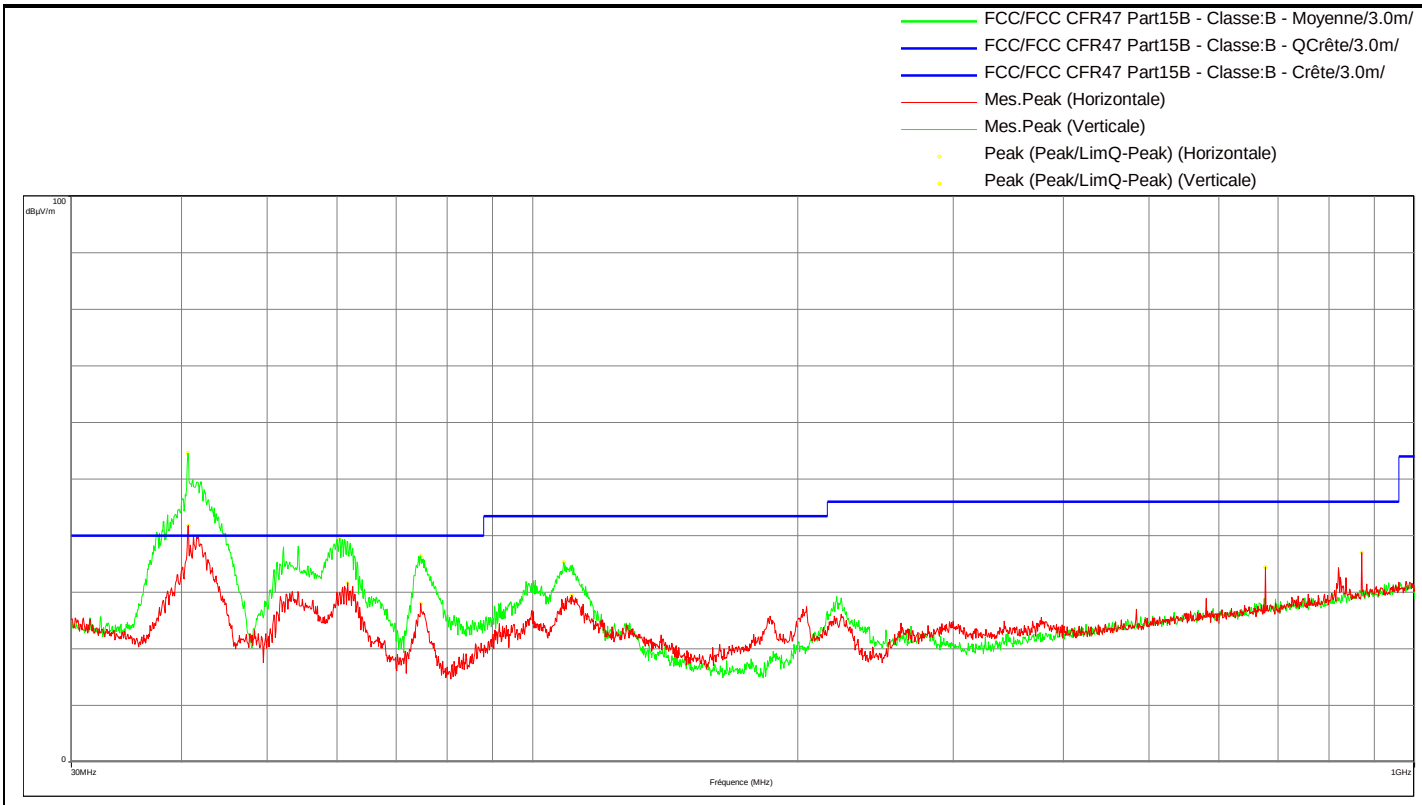
RADIATED EMISSIONS			
Graph name:	Emr#10	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Configuration 2 - (90°) - Axis Z	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV)
13.55862	5.75

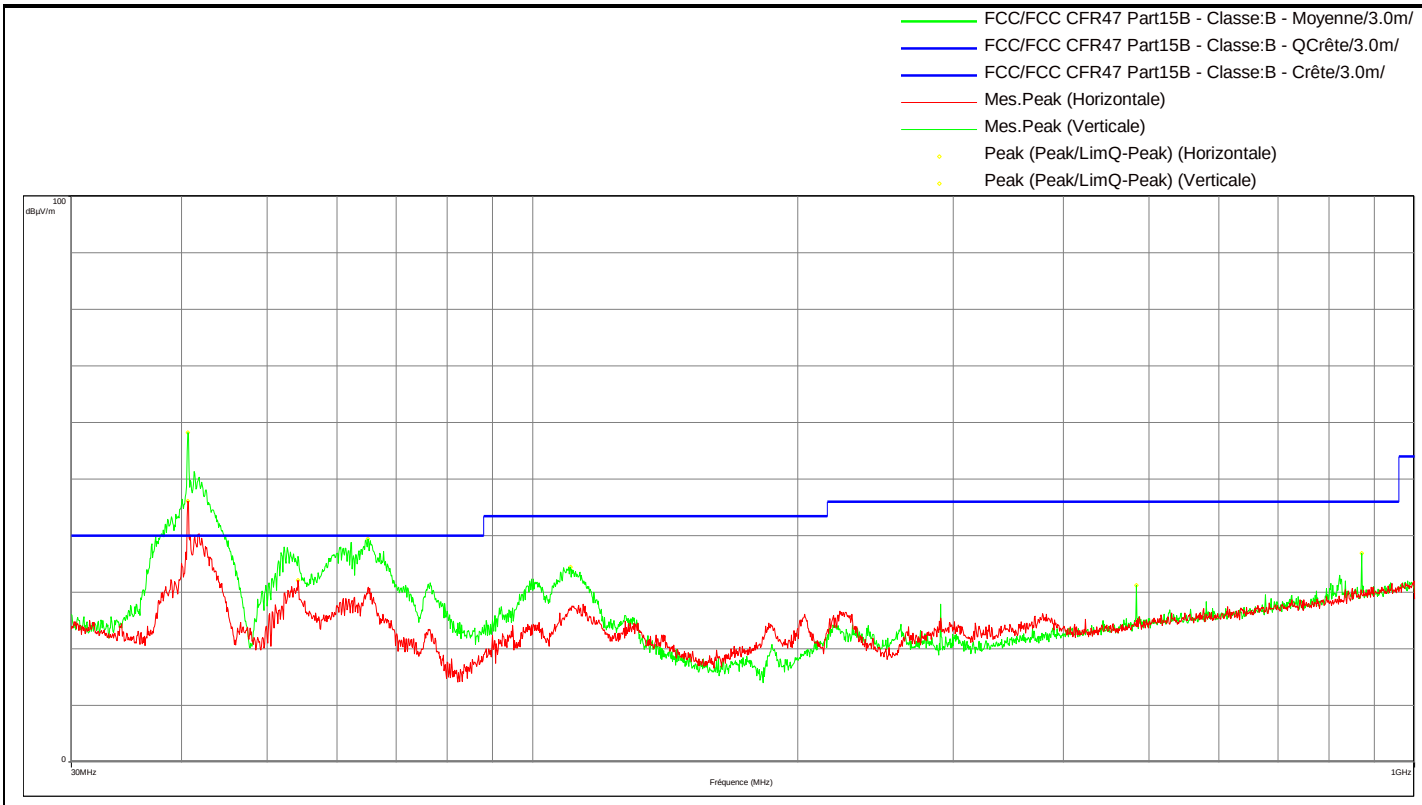
RADIATED EMISSIONS			
Graph name:	Emr#11	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 1 - (H+V) - Axis XY	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
40.693	41.81	Horizontal
61.739	31.64	Horizontal
74.693	27.95	Horizontal
110.869	29.45	Horizontal
677.24	34.48	Horizontal
870.76	37.03	Horizontal
40.676	54.56	Vertical
60.43	39.6	Vertical
74.693	36.43	Vertical
108.523	35.28	Vertical

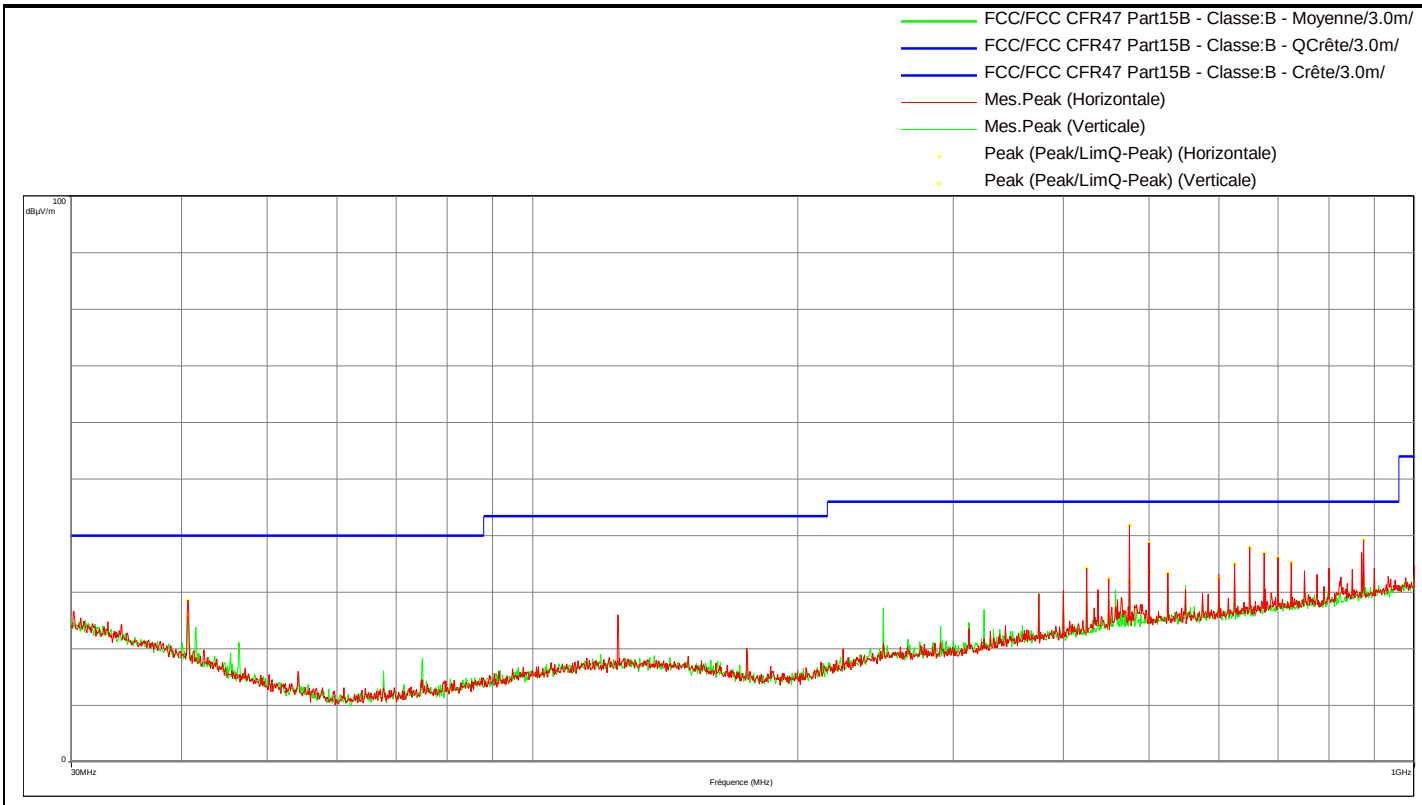
RADIATED EMISSIONS			
Graph name:	Emr#12	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 1 - (H+V) - Axis Z	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
40.676	46.13	Horizontal
54.225	32.12	Horizontal
40.676	58.17	Vertical
65.037	39.46	Vertical
110.342	34.44	Vertical
483.8	31.26	Vertical
870.72	36.93	Vertical

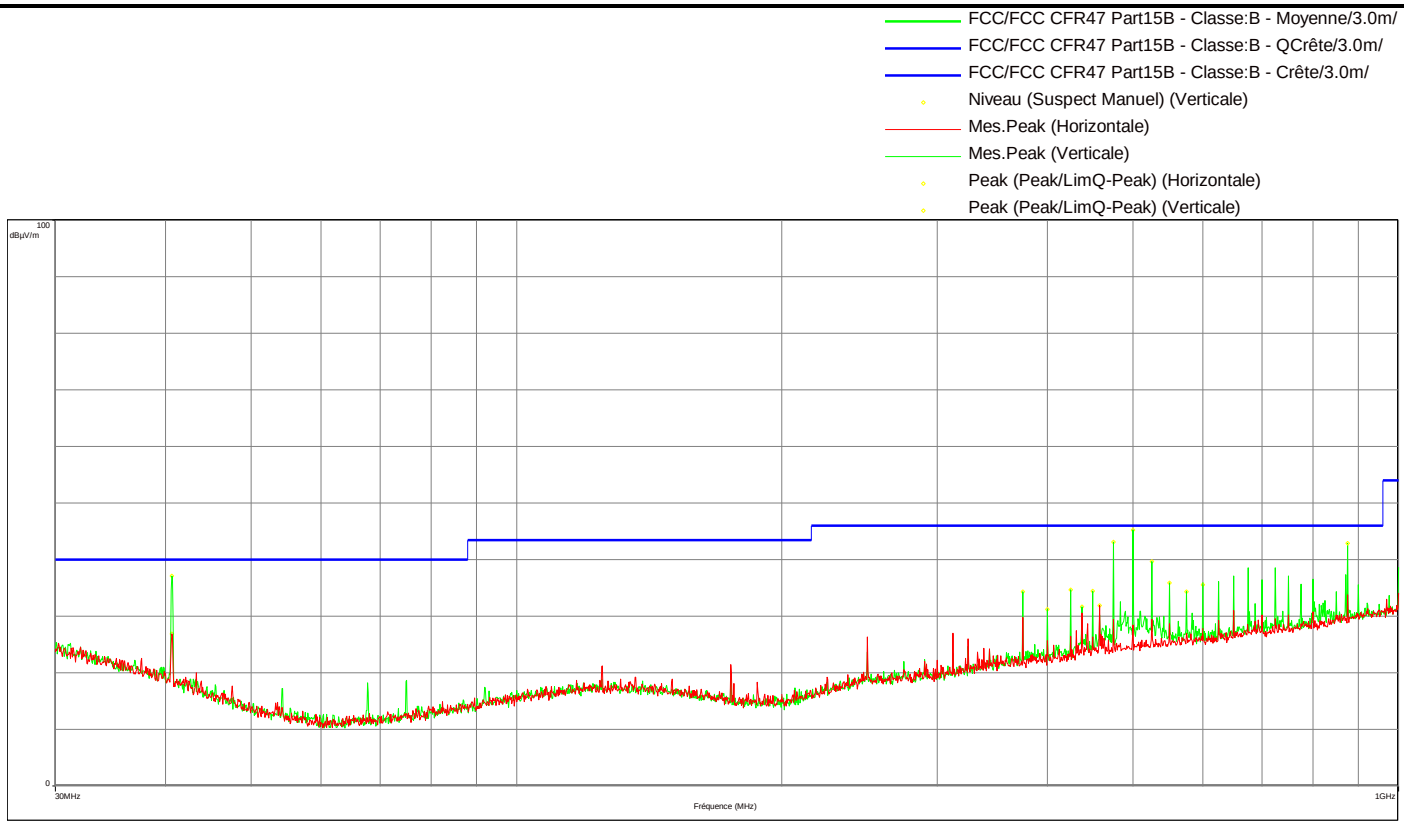
RADIATED EMISSIONS			
Graph name:	Emr#13	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 2 - (H+V) - Axis XY	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
40.676	28.61	Horizontal
425.04	34.25	Horizontal
450.04	32.38	Horizontal
475.04	41.74	Horizontal
500.04	38.7	Horizontal
525	33.36	Horizontal
600	32.45	Horizontal
625	35.01	Horizontal
650	37.86	Horizontal
675	36.87	Horizontal
700.04	36.14	Horizontal
725.04	35.2	Horizontal
875.04	39.23	Horizontal
40.676	25.7	Vertical
475.04	31.83	Vertical
500.04	33.53	Vertical

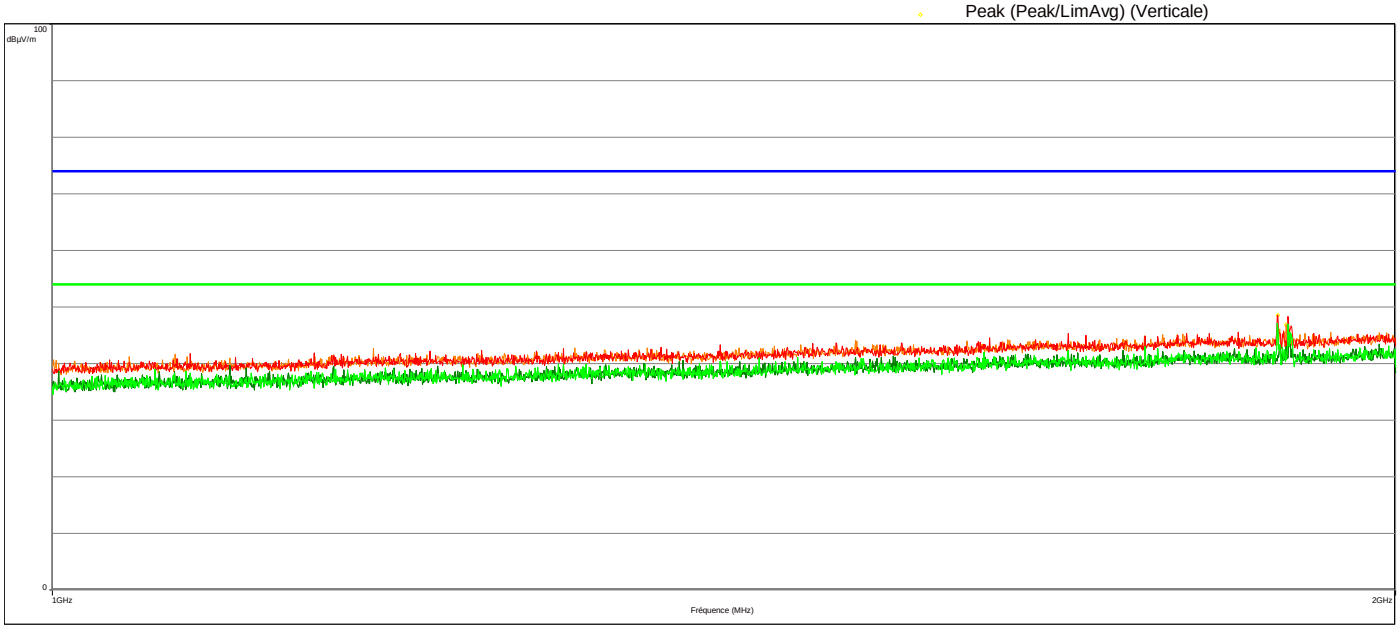
RADIATED EMISSIONS			
Graph name:	Emr#14	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 2 - (H+V) - Axis Z	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
40.659	26.88	Horizontal
458.36	31.87	Horizontal
40.676	37.09	Vertical
375	34.37	Vertical
400.04	31.2	Vertical
425.04	34.62	Vertical
437.52	31.65	Vertical
450.04	34.39	Vertical
475.04	43.15	Vertical
500.04	45.19	Vertical
525.04	39.64	Vertical
550.04	35.86	Vertical
575.08	34.29	Vertical
600	35.6	Vertical
875.04	42.89	Verticale

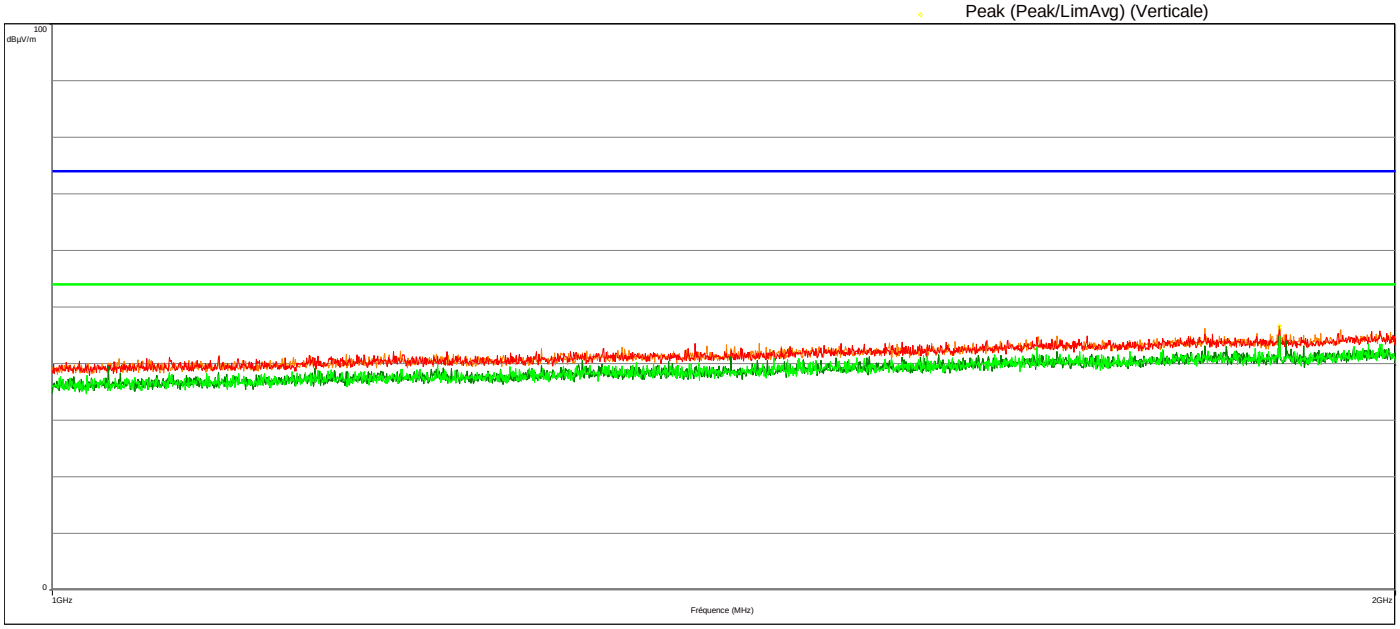
RADIATED EMISSIONS			
Graph name:	Emr#15	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 1 - Axis XY	
Class:	B		
Frequency range: [1GHz - 2GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
1881.9	48.56	Horizontal
1890	46.91	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#16	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 1 - Axis Z	
Class:	B		
Frequency range: [1GHz - 2GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

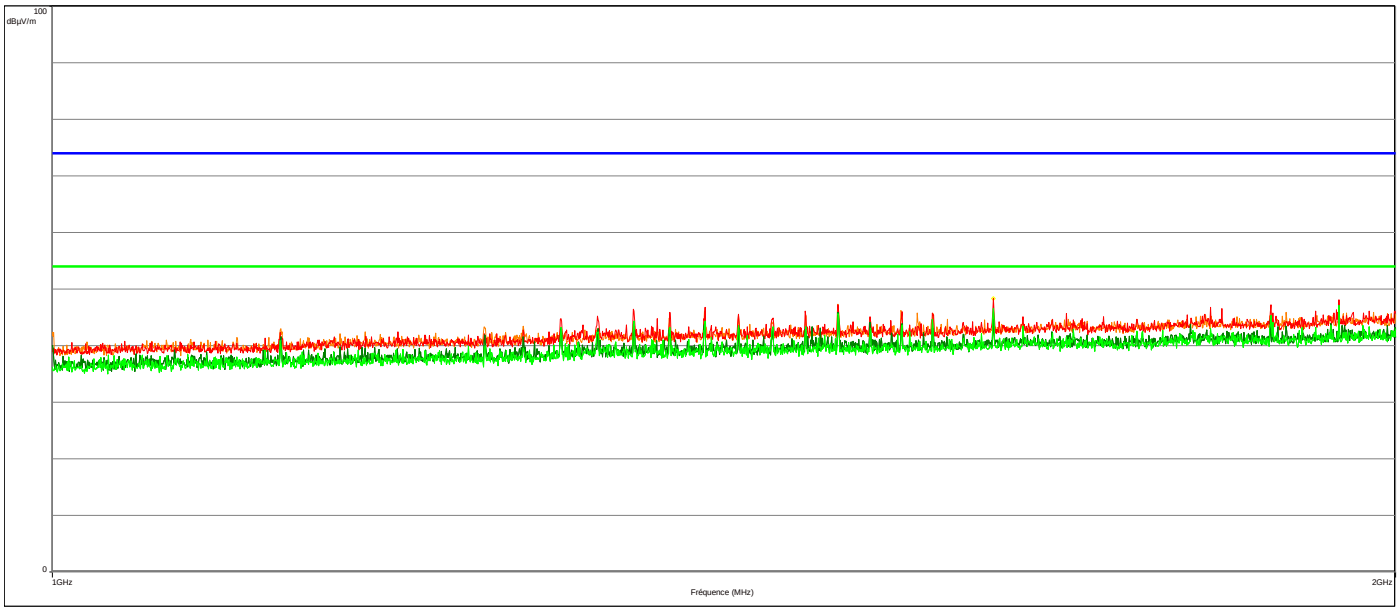
Frequency (MHz)	Peak (dBµV/m)	Polarization
1884.1	46.02	Horizontal
1883.5	46.71	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#17	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 2 - Axis XY	
Class:	B		
Frequency range: [1GHz - 2GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz

Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
1625.2	47.41	Horizontal
1956.2	46.04	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#18	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 2 - Axis Z	
Class:	B		
Frequency range: [1GHz - 2GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Polarization
1625.1	48.35	Horizontal

9. UNCERTAINTIES CHART

Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ± x**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ± y**
Mesure des perturbations conduites en tension sur le réseau d'énergie *Measurement of conducted disturbances in voltage on the power port*	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication *Measurement of conducted disturbances in voltage on the telecommunication port.*	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans *Measurement of radiated electric field on the Moirans open area test site*	5.07 dB	5.2 dB

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par la norme, la conformité de l'échantillon est établie directement par les niveaux limites applicables. / *The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the standard. The conformity of the sample is directly established by the applicable limits values.*