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LCIE

# TEST REPORT

N°: 836197-R2-E

JDE : 134462

<b>Subject</b>	Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: FCC CFR 47 Part 15, Subpart B et C RSS-210 Issue 8.1
<b>Issued to</b>	<b>MARKEM IMAJE</b> 9 rue Gaspar Monge BP 110 26501 BOURG-LES-VALENCE
<b>Apparatus under test</b>	<b>Imprimante industriel RFID / RFID industrial printer</b> <b>MARKEM IMAJE</b> <b>MARKEM IMAJE</b> 9450c FR14500358 2AAW8-MI9450C 11372A-MI9450C
<b>Test date</b>	From March 24 <sup>th</sup> to 30 <sup>th</sup> , 2015
<b>Test location</b>	Moirans
<b>IC Test site</b>	6500A-1 & 6500A-3
<b>Test performed by</b>	J.PAUC
<b>Composition of document</b>	28 pages
<b>Modification of the last version</b>	None
<b>Document issued on</b>	April 29 <sup>th</sup> , 2015

Written by :  
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Tests operator

Approved by :  
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Technical manager



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## 1. TEST PROGRAM

Standard:

- FCC Part 15, Subpart B (Digital Devices)
- FCC Part 15, Subpart C
- ANSI C63.4 (2003)
- RSS-210 Issue 8.1 – Feb 2015
- RSS-Gen Issue 4 – Nov 2014

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz CFR 47 §15.207	Frequency	Quasi-peak value (dB $\mu$ V)	Average value (dB $\mu$ V)	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> 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	<b>Measure at 300m</b> 9kHz-490kHz : 67.6dB $\mu$ V/m /F(kHz) <b>Measure at 30m</b> 490kHz-1.705MHz : 87.6dB $\mu$ V/m /F(kHz) 1.705MHz-30MHz : 29.5 dB $\mu$ V/m			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Radiated emissions 30MHz-25GHz* CFR 47 §15.209 (a) CFR 47 §15.225 RSS-Gen §4.9 <i>Highest frequency : (Declaration of provider)</i>	<b>Measure at 3m</b> 30MHz-88MHz : 40 dB $\mu$ V/m 88MHz-216MHz : 43.5 dB $\mu$ V/m 216MHz-960MHz : 46.0 dB $\mu$ V/m Above 960MHz : 54.0 dB $\mu$ V/m			
Fundamental field strength limit CFR 47 §15.225 RSS-210 §A2.6	<b>Operation within the band</b> <b>13.110-14.010 MHz</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Fundamental frequency tolerance CFR 47 §15.225 RSS-210 §A2.6	<b>Operation within the band</b> <b>13.110-14.010 MHz</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Band edge compliance CFR 47 §15.225 RSS-210 §A2.6	<b>Operation within the band</b> <b>13.110-14.010 MHz</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Occupied bandwidth RSS-Gen §4.6.1	<b>No limit</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Receiver Spurious Emission** RSS-Gen §4.10	<b>See RSS-Gen §4.10</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> 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. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it).  
 RFID is activated by software following option choice by user  
 All tests are performed with RFID ON, worst case

Printers 9450c, 9450Sc and 9450Ec are same electronics, differences are :

- 9450Sc has the same software as 9450c except more printing fonts.
- 9450Ec has the same software as 9450Sc except specific user interface.

### 2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

#### Equipment under test (EUT):

9450c

Serial Number: FR14500358



Photography of EUT

#### Power supply:

During all the tests, EUT is supplied by  $V_{nom}$ : 230VAC  
 For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Power supply	<input type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> Battery	100V-240V 50-60Hz	/	/

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Power supply	3 wires	2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Tachymeter input	/	5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Proximity cell input	/	6	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Status beacon input	/	3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Printing head (side printer)	/	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Printing head (side head)	/					

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Proximity cells	A35355B	/	/
Beacon PATLITE	A34792	/	Model MP
Tachymeter	A35356	/	/

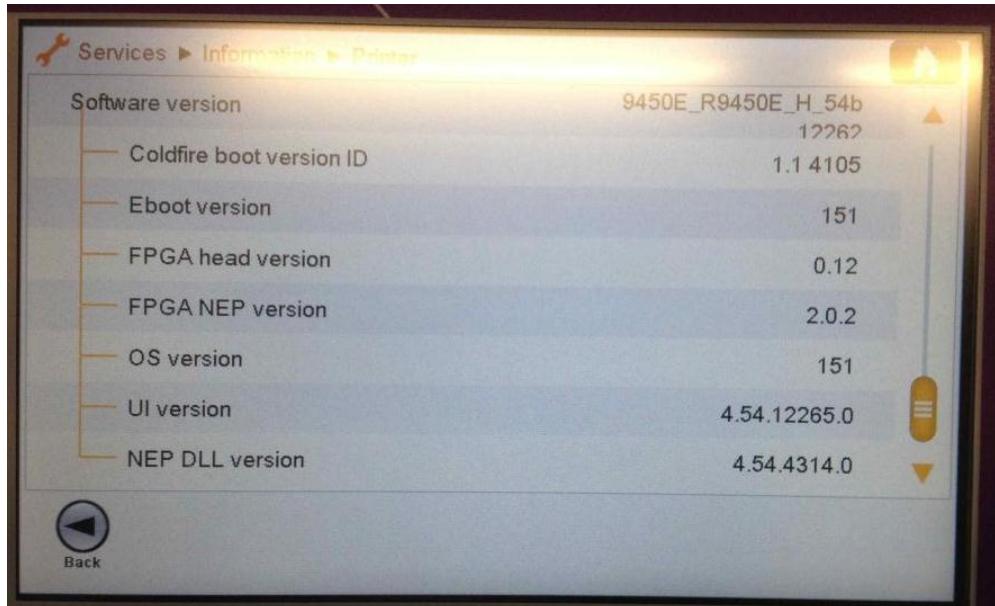
Equipment information:

<b>RF module:</b>	NC			
<b>Frequency band:</b>	[13.553 – 13.567] MHz			
<b>Sub-band REC7003:</b>	Annex9 (f)			
<b>RF mode:</b>	<input type="checkbox"/> Transmitter	<input checked="" type="checkbox"/> Transceiver	<input type="checkbox"/> Receiver	<input type="checkbox"/> Standby
<b>Receiver classification § 4.1.1</b>	<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	
<b>Antenna type:</b>	<input type="checkbox"/> External:	<input checked="" type="checkbox"/> Internal:		
<b>Antenna gain:</b>	NC			
<b>Extreme temperature range:</b>	<input type="checkbox"/> Category I (General) -20°C to +55°C	<input type="checkbox"/> Category II (Portable) -10°C to +55°C	<input checked="" type="checkbox"/> Category III (Indoor) +5°C to +35°C Test at +45°C instead +35°C	
<b>Extreme test source voltage:</b>	<input checked="" type="checkbox"/> ±15%: V <sub>min</sub> :93.5/60Hz V <sub>max</sub> 126V/60Hz	<input type="checkbox"/> other:		



### 2.3. EUT CONFIGURATION

Firmware / Software version of EUT:



Printer parameter:

- Message: 32 + 24 dots (Message of production)
- Printing speed: 100 mm/second

### 2.4. EQUIPMENT MODIFICATIONS

None       Modification: One supplementary turn in ferrite DOVER 74270056 at output of tachymeter, cells & light is done



This modification is implemented in all test done in this test report



## 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 52.5dB $\mu$ V 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 dB $\mu$ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dB $\mu$ V/m value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m.}$$



### 3. CONDUCTED EMISSION DATA

#### 3.1. ENVIRONMENTAL CONDITIONS

Date of test : March 30<sup>th</sup>, 2015  
 Test performed by : Jonathan SARTO  
 Atmospheric pressure (hPa) : 993  
 Relative humidity (%) : 34  
 Ambient temperature (°C) : 22

#### 3.2. TEST SETUP

##### **Mains terminals**

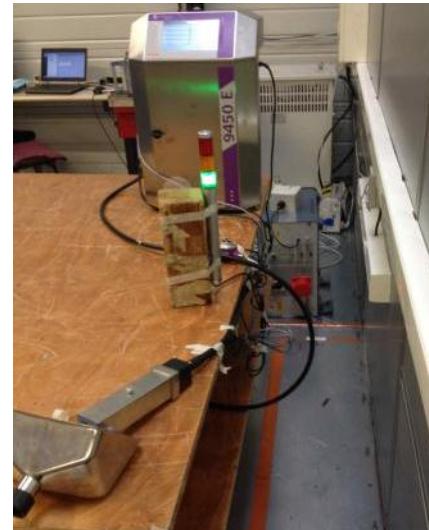
The EUT and auxiliaries are set:

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).



*Test setup*



### 3.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Cable + self	-	-	A5329578
Conducted emission comb generator	BARDET	-	A3169049
LISN tri-phase ESH2-Z5	RHODE & SCHWARZ	33852.19.53	C2320062
Receiver 9kHz – 3GHz	ROHDE & SCHWARZ	ESCI	A2642017
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204

### 3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None       Divergence:

### 3.5. TEST RESULTS

#### Mains terminals:

Measurements are performed on the phase (L1) and neutral (N) of the power line.

#### Results: (PEAK detection)

Graph identifier	Line	Comments
Emc# 1	Phase	See annex 1
Emc# 2	Neutral	See annex 1

### 3.6. CONCLUSION

The sample of the equipment 9450c, Sn: FR14500358, tested in the configuration presented in this test report satisfies to requirements of class A limits of the standard FCC Part15B, for conducted emissions.



## 4. RADIATED EMISSION DATA (15.209)

### 4.1. ENVIRONMENTAL CONDITIONS

Date of test	:	March 24 <sup>th</sup> , 2015	March 25 <sup>th</sup> , 2015
Test performed by	:	J.PAUC	J.PAUC
Atmospheric pressure (hPa)	:	990	991
Relative humidity (%)	:	29	30
Ambient temperature (°C)	:	21	22

### 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  $V_{nom}$ .



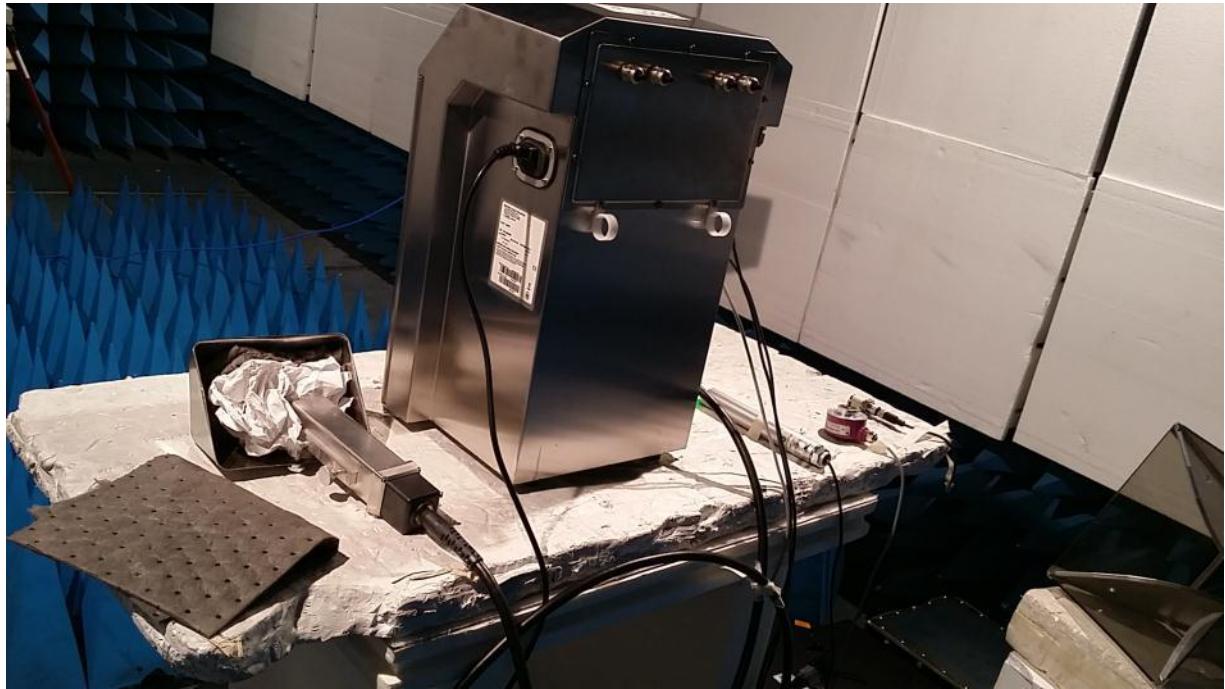
Test setup on OATS



Test setup on OATS



Test setup on Anechoic chamber (Front face)



#### 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

Normal Condition (Anechoic chamber)			
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Antenna horn	EMCO	3115	C2042029
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371
Table	LCIE	-	F2000461
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444
Antenna Bi-log	CHASE	CBL6111A	C2040172
Cable Measure (30MHz – 1GHz)	-		A5329038
Cable Measure (30MHz – 1GHz)	-	-	A5329206

#### 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# 1	0° & 90°	Axis XY	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# 2	Horizontal & Vertical	Axis XY	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# 3	Horizontal & Vertical	Axis XY	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 (dB $\mu$ V/m) @ 30m	Qpeak (dB $\mu$ V/m) @ 30m	Margin (Mes-Lim) (dB)	Angle Table	Pol Ant.	Ht Ant.	Correc. Factor (dB)	Comments
1	13.56	84	18	-66	30	0	100	35.1	/

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 (dB $\mu$ V/m)	Measurement distance (m)
13.553-13.567	15 848 84 dB $\mu$ V/m	30
13.410-13.553	334	30
13.567-13.710	50.5 dB $\mu$ V/m	30
13.110-13.410	106	30
13.710-14.010	40.5 dB $\mu$ V/m	

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

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

The product has been tested at a distance of 10 meters from the antenna and compared to the FCC part 15 subpart B §15.109 limits and C § 15.209 limits.

Measurement bandwidth was 120kHz from 30 MHz to 1GHz. Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continous linear turntable azimuth search was performed with 360 degrees range.

A summary of the worst case emissions found in all test configurations and modes is shown on clause §3.2

Frequencies due to RFID are measured following Part15C §15.209 and frequencies due to industrial printer (host equipment) are measured following Part 15B § 15.109 Class A above tenth harmonic of fundamental.

#### 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.

FCC Part 15C (30- 135.6MHz)							
Frequency (MHz)	Limit QPeak (dB $\mu$ V/m)	Measure QPeak (dB $\mu$ V/m)	Margin QPeak (dB)	Angle Table (°)	Pol. Ant.	Ht. Ant. (cm)	FC (dB)
40.680	40.0	29.9	<b>-10.1</b>	30	V	100	13.9
41.554	40.0	36.4	<b>-3.6</b>	0	V	100	13.4
45.708	40.0	29.7	<b>-10.3</b>	0	V	100	11.3
37.310	40.0	30.7	<b>-9.3</b>	75	V	100	15.7
49.873	40.0	31.8	<b>-8.2</b>	145	V	100	9.5
58.186	40.0	25.9	<b>-14.1</b>	55	V	110	7.9
62.419	40.0	19.6	<b>-20.4</b>	0	V	150	7.6
79.062	40.0	20.0	<b>-20.0</b>	124	V	147	8.7
70.443	40.0	25.7	<b>-14.3</b>	100	V	380	7.9
83.125	40.0	29.3	<b>-10.7</b>	175	V	108	9.2
149.621	43.5	31.6	<b>-11.9</b>	0	V	247	13.3
129.042	43.5	23.8	<b>-19.7</b>	45	H	150	13.8

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

FCC Part 15B (135.6MHz – 1GHz) – Class A							
Frequency (MHz)	Limit QPeak (dB $\mu$ V/m)	Measure QPeak (dB $\mu$ V/m)	Margin QPeak (dB)	Angle Table (°)	Pol. Ant.	Ht. Ant. (cm)	FC (dB)
157.942	43.5	20.6	<b>-22.9</b>	23	H	135	12.6
182.881	43.5	29.4	<b>-14.1</b>	65	H	165	11.4



#### 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.

Frequency (MHz)	Limit QPeak (dB $\mu$ V/m)	Measure QPeak (dB $\mu$ V/m)	Margin QPeak (dB)	Angle Table (°)	Pol. Ant.	Ht. Ant. (cm)	FC (dB)
No significant frequency observed							

*Note: Measures have been done at 3m distance.*

#### 4.7. CONCLUSION

The sample of the equipment 9450c, Sn: FR14500358, tested in the configuration presented in this test report satisfies to requirements of class A limits of the standard FCC Part15B and C, for radiated emissions.



## 5. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)

### 5.1. ENVIRONMENTAL CONDITIONS

Date of test : March 26<sup>th</sup> , 2015  
Test performed by : J.PAUC  
Atmospheric pressure (hPa) : 991  
Relative humidity (%) : 31  
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.



### 5.3. TEST METHOD

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency when the temperature is varied from 5°C to +45°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
Antenna Loop	ELECTRO-METRICS	EM-6993	C2040210
Cable SMA	-	18G	A5329373
CALIFORNIA System: 5kVA Mono	SCHAFFNER	NSG 1007	A2120007
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117
Data Logger card	AGILENT	34970A	A6449036
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

#### 5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None  Divergence:

Temperature range declared by provider for good function, in user manual, is from 5°C to 45°C.

Possible problem with ink limited the temperature of use.

#### 5.6. TEST RESULTS

Voltage	Temperature	5°C	20°C	+45°C
Mains voltage: 110V/60Hz				
Frequency Drift (MHz)		+ 0.000073		- 0.000112
Carrier level (dBc)		+ 0.35		- 0.25
Mains voltage: 93,5V/60Hz				
Frequency Drift (MHz)		+ 0.000073	+ 0.000000	- 0.000112
Carrier level (dBc)		+ 0.35	+ 0.01	- 0.23
Mains voltage: 126V/60Hz				
Frequency Drift (MHz)		+ 0.000072	+ 0.000000	- 0.000110
Carrier level (dBc)		+ 0.35	+ 0.00	- 0.25

Frequency drift measured is 73 Hz when the temperature is varied from 5°C to +45°C and voltage is varied.

#### 5.1. CONCLUSION

The sample of the equipment 9450c Sn: FR14500358, 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 : March 26<sup>th</sup> , 2015  
Test performed by : J.PAUC  
Atmospheric pressure (hPa) : 991  
Relative humidity (%) : 31  
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.

#### **Frequency band 13.553-13.567MHz**

Following plots show radiated emission level in the frequency band 13.55.-13.567MHz with a RBW of 1kHz. The graphs are obtained with a measuring receiver.



#### 6.4. TEST EQUIPMENT LIST

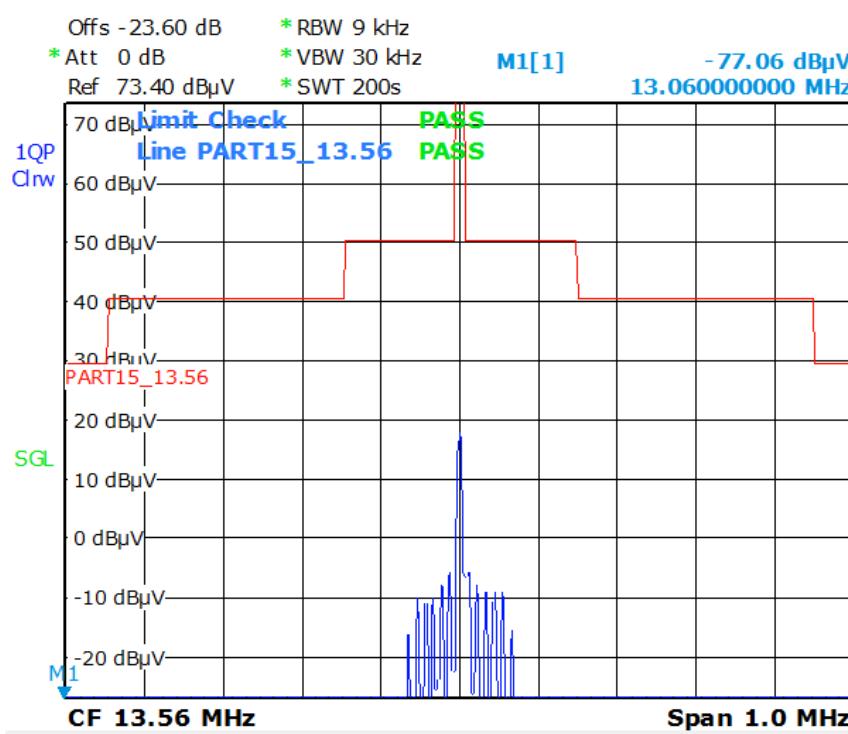
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Antenna Loop	ELECTRO-METRICS	EM-6993	C2040210
Cable SMA	-	18G	A5329373
CALIFORNIA System: 5kVA Mono	SCHAFFNER	NSG 1007	A2120007
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117
Data Logger card	AGILENT	34970A	A6449036
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

#### 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 9450c Sn: FR14500358, 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 : March 26<sup>th</sup> , 2015  
Test performed by : J.PAUC  
Atmospheric pressure (hPa) : 991  
Relative humidity (%) : 31  
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 10.3dB

**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.



Test Setup



**Measurement Procedure:**

1. RBW used should not be lower than 1% of the selected span
2. Set the video bandwidth (VBW)  $\geq 3 \times$  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
Antenna Loop	ELECTRO-METRICS	EM-6993	C2040210
Cable SMA	-	18G	A5329373
CALIFORNIA System: 5kVA Mono	SCHAFFNER	NSG 1007	A2120007
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117
Data Logger card	AGILENT	34970A	A6449036
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

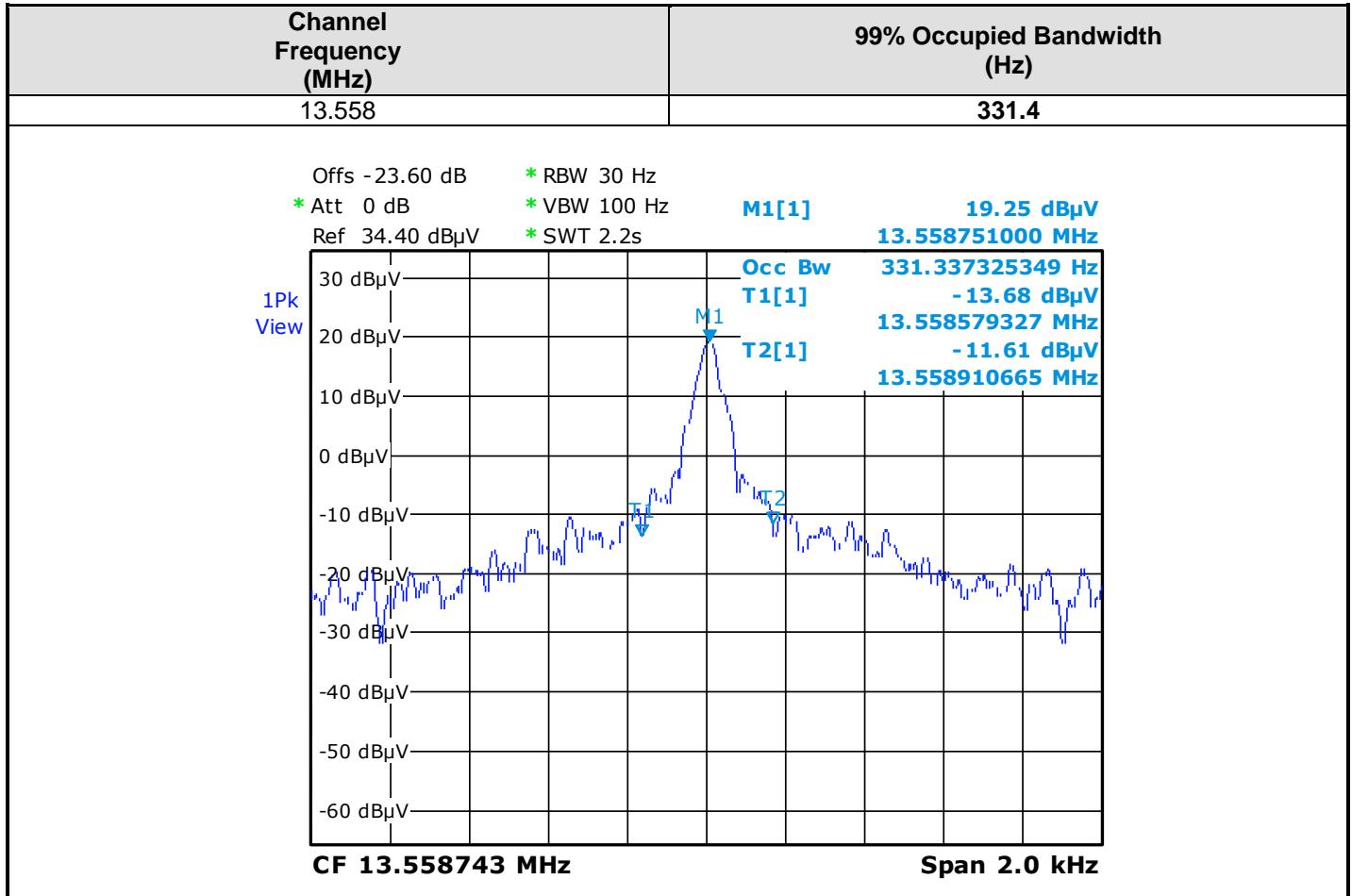
**7.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

None

Divergence:



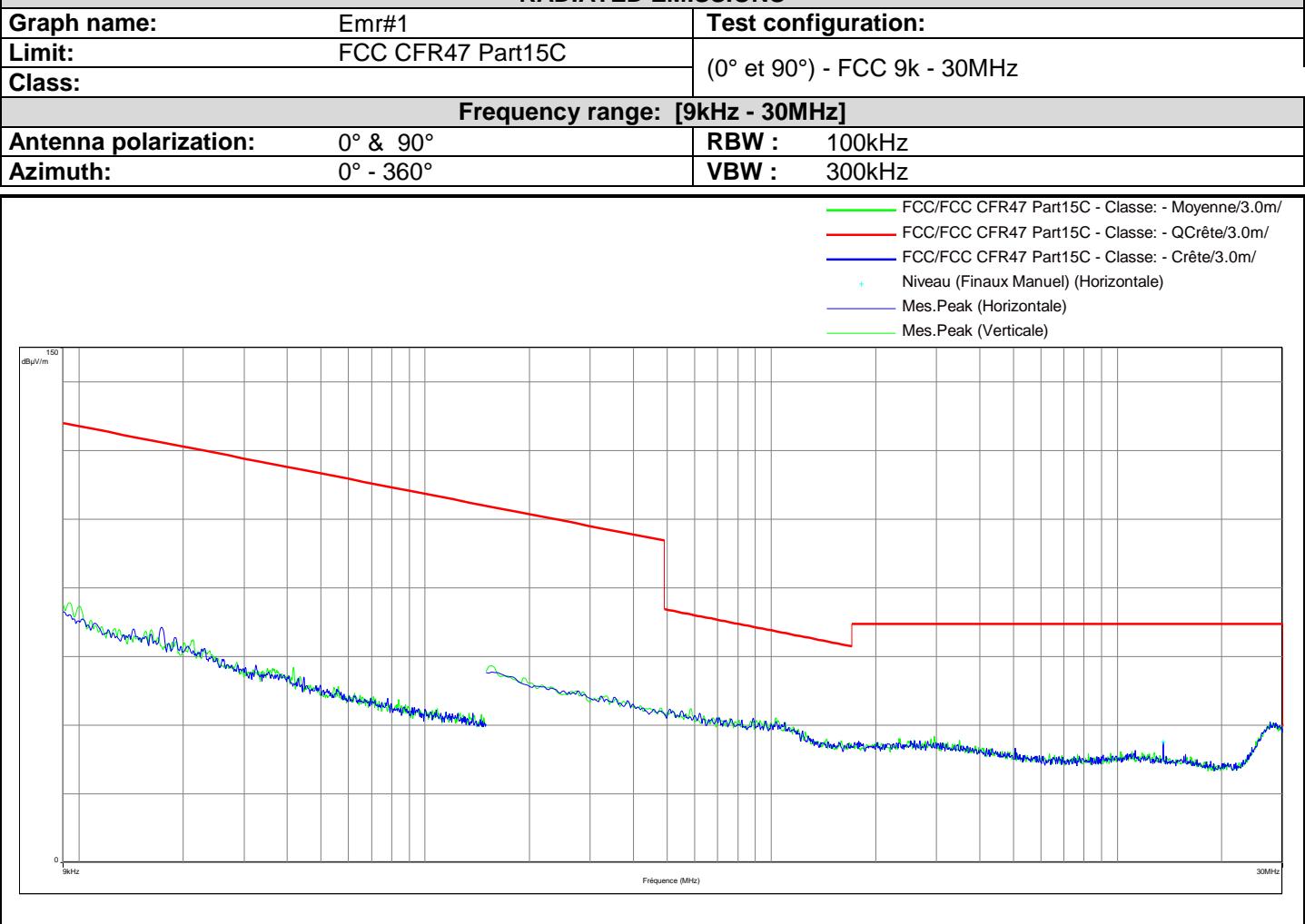
#### 7.4. TEST SEQUENCE AND RESULTS



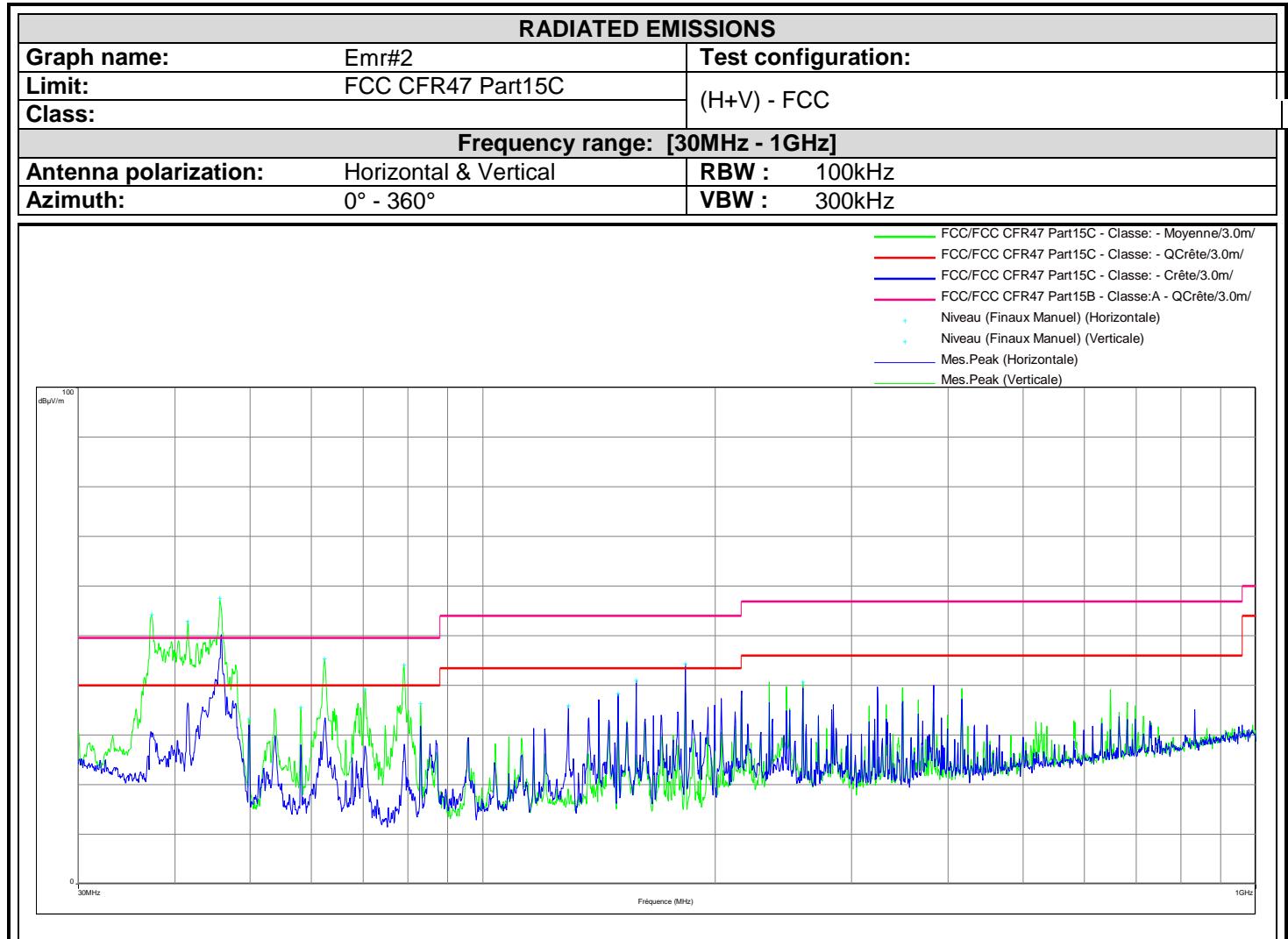


## 8. ANNEX 1 (GRAPHS)

### RADIATED EMISSIONS



Frequency (MHz)	Peak Level (dBµV/m)
13.55862	35.24



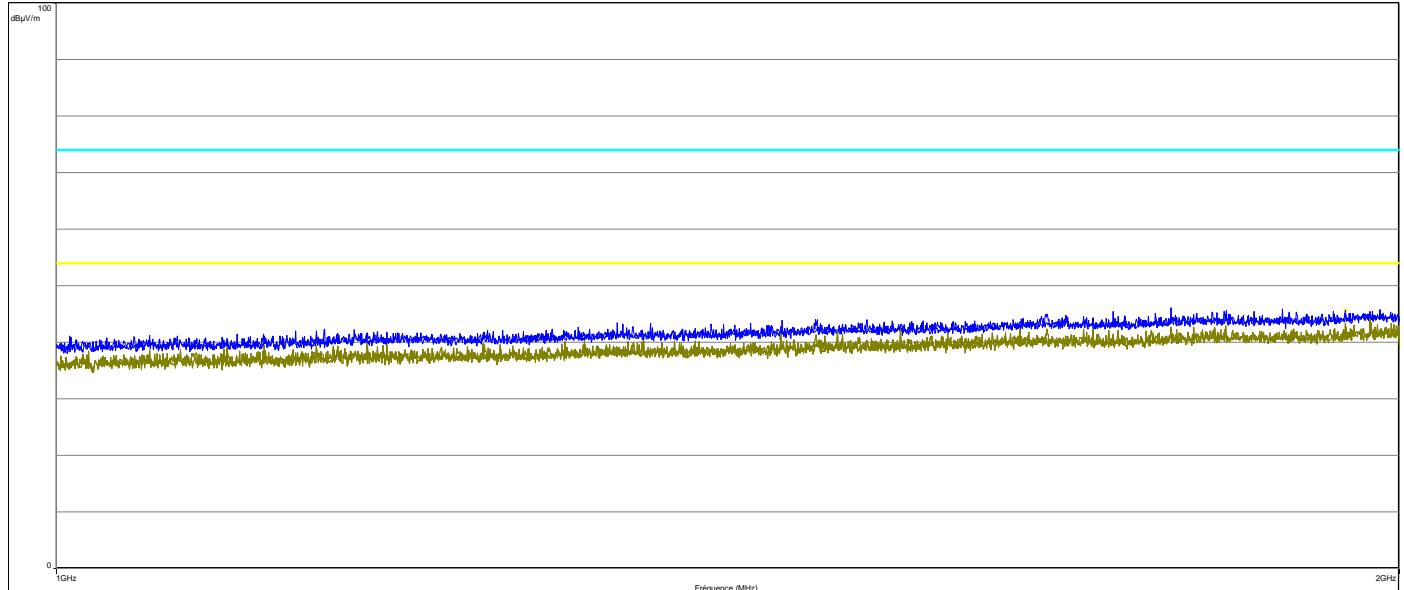
<b>Frequency (MHz)</b>	<b>Peak Level (dBµV/m)</b>
129.042	35.91
149.629	38.28
157.942	41.02
182.881	44.31
37.31	54.25
41.543	52.85
45.708	57.53
49.873	33.21
58.186	35.52
62.419	45.35
70.443	39.26
79.062	44.14
83.125	36.38
259.44	40.72



## RADIATED EMISSIONS

Graph name:	Emr#3	Test configuration:
Limit:	FCC CFR47 Part15C	(H+V) - FCC 1-2GHz
Class:	<b>Frequency range: [1GHz - 2GHz]</b>	
Antenna polarization:	Horizontal & Vertical	RBW : 1MHz
Azimuth:	0° - 360°	VBW : 3MHz

- FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/
- FCC/FCC CFR47 Part15C - Classe: - QCrête/3.0m/
- FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/
- Mes. Peak (Horizontale)
- Mes. Peak (Verticale)
- Mes. Avg (Horizontale)
- Mes. Avg (Verticale)
- Peak (Peak/LimAvg) (Verticale)



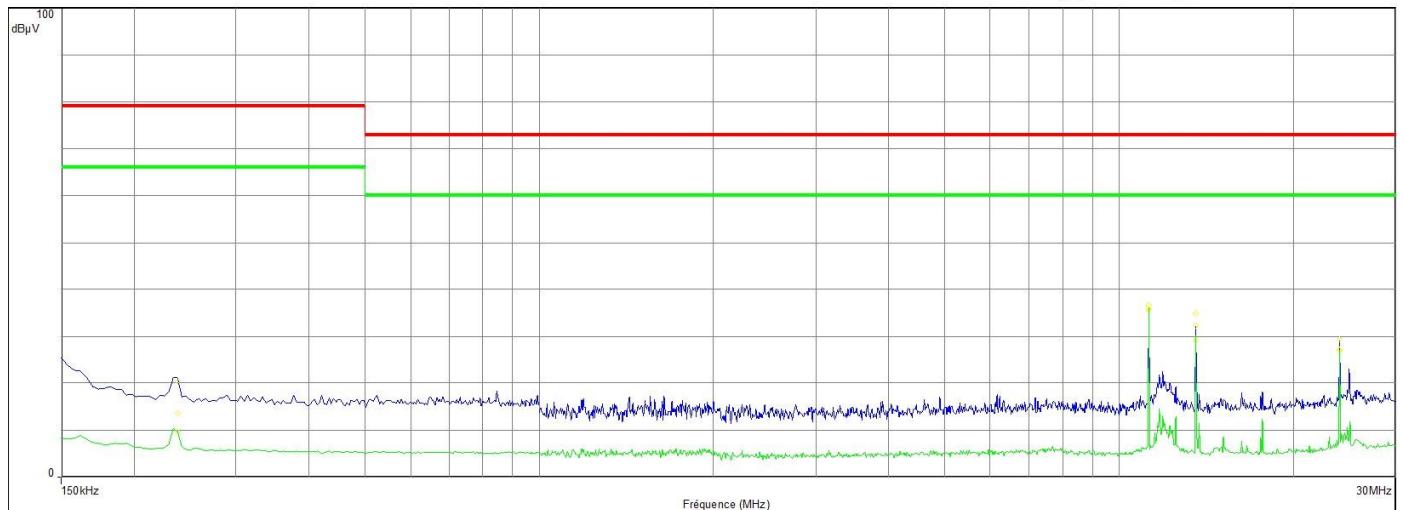
Frequency (MHz)	Peak Level (dBμV/m)
1945.2	45.72



## CONDUCTED EMISSIONS

Graph name:	Emc#1	Test configuration:
Limit:	EN 55022	Phase_110VAC (RSIL) ESCI
Class:	A	
<b>Frequency range: [150kHz - 30MHz]</b>		
Voltage / Frequency:	110VAC / 60Hz	RBW : 10kHz
Line:	Phase	VBW : 30kHz

- Civile/EN 55022 - Classe:A - Moyenne/
- Civile/EN 55022 - Classe:A - QCrête/
- Mes.Peak (SR 550xx) (Phase 1)
- Mes.QPeak (SR 550xx) (Phase 1)
- Mes.Avg (SR 550xx) (Phase 1)
- Mes.Peak (Phase 1)
- Mes.Avg (Phase 1)



## Spurious emissions

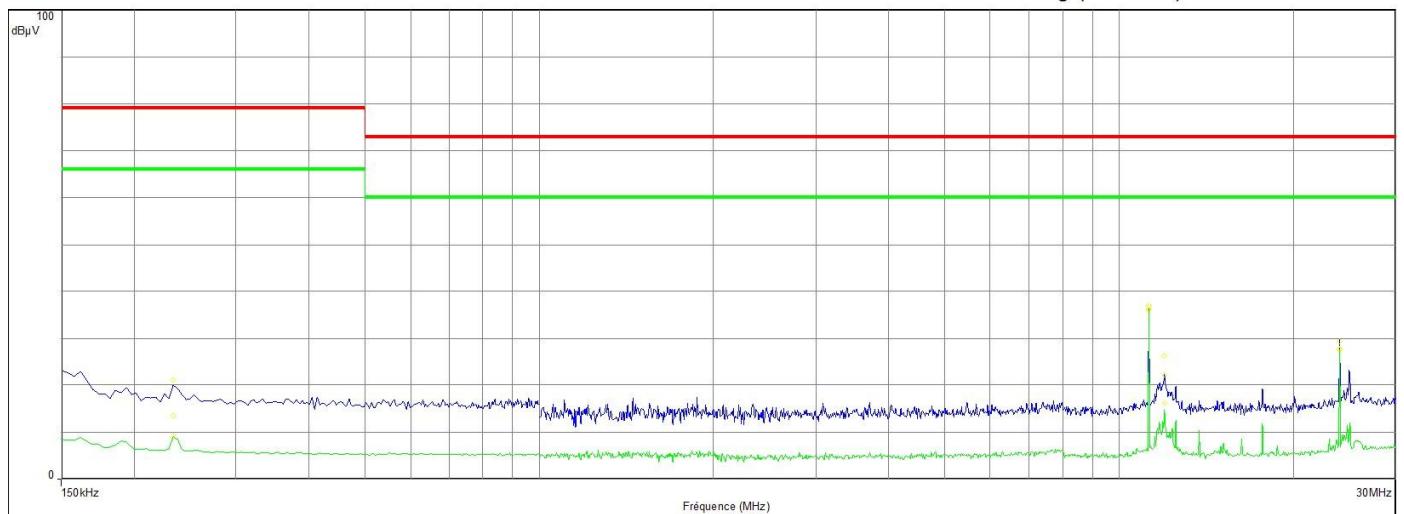
Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)
0.238	20.4	13.56	79	-65.44	9.53	66	-56.47
11.252	36.58	35.52	73	-37.48	35.72	60	-24.28
13.56	34.82	32.24	73	-40.76	29.25	60	-30.75
24	29.27	27.14	73	-45.86	26.92	60	-33.08



## CONDUCTED EMISSIONS

Graph name:	Emc#2	Test configuration:
Limit:	EN 55022	
Class:	A	Neutre_110VAC (RSIL) ESCI
<b>Frequency range: [150kHz - 30MHz]</b>		
Voltage / Frequency:	110VAC / 60Hz	RBW : 10kHz
Line:	Neutre	VBW : 30kHz

- Civile/EN 55022 - Classe:A - Moyenne/
- Civile/EN 55022 - Classe:A - QCrête/
- Mes.Peak (SR 550xx) (Phase 1)
- Mes.QPeak (SR 550xx) (Phase 1)
- Mes.Avg (SR 550xx) (Phase 1)
- Mes.Peak (Phase 1)
- Mes.Avg (Phase 1)



Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)
0.234	21.08	13.46	79	-65.54	8.94	66	-57.06
11.248	36.91	35.88	73	-37.12	36.07	60	-23.93
11.952	26.26	22.12	73	-50.88	16.06	60	-43.94
24	29.39	27.66	73	-45.34	27.47	60	-32.53



## 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 <i>Measurement of conducted disturbances in voltage on the power port</i>	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans <i>Measurement of radiated electric field on the Moirans open area test site</i>	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.