TEST REPORT

N°: 143160-689135-A(FILE#916702) **Version : 02**

Subject	**Electromagnetic compatibility tests according to the standards:** **FCC CFR 47 Part 15, Subpart C** **RSS-210 Issue 8.1**
Issued to	**INGENICO** **9 Avenue de la Gare Rovaltain TGV** **26300 VALENCE – FRANCE**
Apparatus under test	
Product	**Payment terminal**
Trade mark	**INGENICO**
Manufacturer	**INGENICO**
Model under test	**Desk/5000 CL/Eth/Mod/WiFi/BT**
Reference	**TCA33310133A**
Serial number	**160587313331013301015984**
FCCID	**XKB-D5000CLWIBT**
IC	**2586D-D5000CLWIBT**
Conclusion	See Test Program chapter
Test date	August 2, 2016 to September 24, 2016
Test location	MOIRANS
IC Test site	6500A-1 & 6500A-3
Composition of document	29 pages
Document issued on	December 19, 2016

Written by :
Gaetan DESCHAMPS
Tests operator

Approved by :
Anthony MERLIN
Technical manager

LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES
LCIE SUD-EST
ZI Centr'Alp
170, Rue de Chatagnon
38430 MOIRANS
Tél. 04 76 07 36 36

PUBLICATION HISTORY

Version	Date	Author	Modification
01	September 24, 2016	Gaetan DESCHAMPS	Creation of the document
02	December 19th, 2016	Gaetan DESCHAMPS	Modification of the document further to review

SUMMARY

1. TEST PROGRAM

Standard: **- FCC Part 15, Subpart C**
- ANSI C63.10 (2013)
- 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 (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 :*** ***(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. JUSTIFICATION

The EUT can be used with different configuration :

- ✓ **Initial functionnalities**
  - Cless Interface (RFID)
  - Bluetooth chipset: CSR8811 (CSR)
  - SAM1 & SAM2 readers
  - Host or slave (µUSB connector)
  - USB Host (Type A connector)
  - RS232 (COM1)
  - Modem RTC
  - Ethernet
- ✓ **With option card (internal)**
  - RS232-COM2
  - Jack Audio
  - SAM3
  - Bluetooth chipset: CSR8811 (CSR)
  - Chipset Marvell 88W8782
- ✓ **1 power supply**
  - PSM32W-080L6IN-R-

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
Desk/5000 CL/Eth/Mod/WiFi/BT
Serial Number: 160587313331013301015984

Photography of EUT

Power supply:
During all the tests, EUT is supplied by V_{nom}: 8VDC
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply_Phihong	☑ AC ☐ DC ☐ Battery	100-240V 50/60Hz	PHIHONG : PSM32W-080L6IN-R-	-

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply_Phihong	Input AC, 2 wires	1.8	☑	☐	☑	
	Output DC, Jack	1.8	☑	☐	☑	
Twist cable to Magicbox	Power supply Jack	2	☑	☐	☑	Supply Terminal
	RJ11					COM0
	RJ45					Ethernet line
	RJ11					Modem line
SAM1	SAM card	/	/	/	☑	/
SAM2	SAM card	/	/	/	☑	/
SAM3	SAM card	/	/	/	☑	/
CAM0	SAM card	/	/	/	☑	/
USB	USB port (Micro-B)	1	☑	☑	☑	/
USB HOST	USB port (Type A)	1	☑	☑	☑	/
MicroSD	Micro SD port	/	/	/	☑	/
COM2	Mini USB	1	☐	☑	☑	/
Audio	Audio Jack 3.5mm	1	☐	☑	☑	/

Inputs/outputs & Cable: Magicbox 51/2014 CUST P/N: 296165425 INGELEC P/N : MUL0885C						
Access	**Type**	**Length used (m)**	**Declared <3m**	**Shielded**	**Under test**	**Comments**
Supply Magicbox	Power supply Jack	1.5	☑	☐	☑	/
COM0	RJ11	3	☐	☐	☑	/
Ethernet	RJ45	5	☐	☐	☑	/
Modem	RJ11	5	☐	☐	☑	/
Magicbox cable twisted	Twist cable	2	☑	☐	☑	/

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Contactless Card	-	-	-

Equipment information:

Frequency band:	☑ [13.553–13.567]MHz		☐ [125]kHz	☐ [-] MHz
Sub-band REC7003:	☑ Annex 9 (j)		☐ Annex 9 (a3)	☐ Annex ( )
RF mode:	☐ Transmitter	☑ Transceiver	☐ Receiver	☐ Standby
Type:	☑ RFID	☐ EAS	☐ WPT	☐ Other:
Bandwidth:	☑ Narrowband (ISO15693, ISO18000-3…)		☐ Wideband (ISO14443, NFC…)	
Product class § 7.1.4	☐ 1	☑ 2	☐ 3	☐ 4
Receiver classification § 4.1.1:	☐ 1	☑ 2	☐ 3	
Equipment intended for use as a	☑ Fixed station		☐ Mobile station	
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined	
Antenna Type:	☐ External		☑ Internal	
Antenna connector:	☐ Permanent external	☐ Permanent internal	☑ None	☐ Temporary (only for tests)
Antenna Gain:	NC dBi			
Duty cycle:	☐ Continuous duty	☐ Intermittent duty	☑ Continuous operation	
Equipment type:	☑ Production model		☐ Prototype	
Temperature range:	Tmin:	☑ -20°C	☐ 0°C	☐ °C
	Tnom:	20°C		
	Tmax:	☐ 35°C	☑ 55°C	☐ °C
Type of power source:	☑ AC power supply	☐ DC power supply	☐ Battery (Select type)	
Test source voltage:	Vmin:	☑ 207V/50Hz	☐ VDC	
	Vnom:	☑ 230V/50Hz	☐ VDC	
	Vmax	☑ 253V/50Hz	☐ VDC	

NC : not communicated.

2.3. EUT CONFIGURATION

Firmware / Software version of EUT: SDK_OS 03.20.08

- Configuration :

Desk/5000-OP with contactless and option card

- 3 x SAM
- 2 x USB
- CAM0
- Jack Audio (Flat Signal)
- RS232-COM2
- RFID
- Magicbox 51/2014 CUST P/N: 296100075 INGELEC P/N : MUL0885C
    - Power Supply_ ingenico
    - Modem RTC
    - Ethernet
    - RS232-COM1

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.

2.6. CALIBRATION DATE

The calibration intervals are extended at 12+2 months. This extended interval is based on the fact that there is sufficient calibration data to statistically establish a trend or based on experience of use of the test equipment to assure good measurement results for a longer period

3. CONDUCTED EMISSION DATA

3.1. ENVIRONMENTAL CONDITIONS

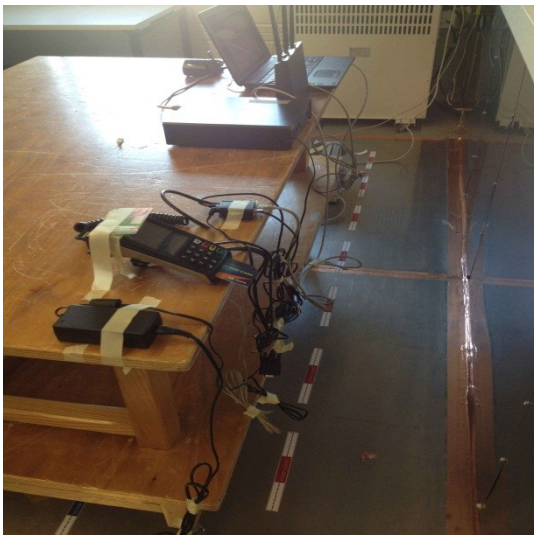
Date of test	:	September 23, 2016
Test performed by	:	Jonathan Sarto
Atmospheric pressure (hPa)	:	1003
Relative humidity (%)	:	32
Ambient temperature (°C)	:	20

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 METHOD

The product has been tested according to ANSI C63.10 and FCC Part 15 subpart C. The product has been tested with 120V/60Hz power line voltage and compared to the FCC Part 15 limits. Measurement bandwidth was 9kHz from 150kHz to 30MHz. This was followed by a Quasi-Peak, i.e. CISPR measurement for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary. The LISN (measure) is 50Ω / 50µH. The Peak data are shown on plots in annex 1. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured. Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.
Measurements are performed on the phase (L1) and neutral (N) of power line voltage. Graphs are obtained in PEAK detection. Measures are also performed in Quasi-Peak and Average for any strong signal.

3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + self	-	-	A5329585	04/16	04/17
Conducted emission comb generator	BARDET	-	A3169049	-	-
LISN	RHODE & SCHWARZ	ENV216	C2320123	02/16	02/17
LISN	RHODE & SCHWARZ	ENV216	C2320291	11/15	11/16
Load 50Ω	-	-	A7152030	04/16	04/17
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	08/16	08/17
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	01/16	01/17

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

3.6. TEST RESULTS

Measurements are performed on the phase (L1) and neutral (N) of the power line.
Results: (PEAK detection)
Measure on L1: graph **Emc#1** (see annex 1)
Measure on N: graph **Emc#2** (see annex 1)

3.7. CONCLUSION

Conducted emission data measurement performed on the sample of the product **Desk/5000 CL/Eth/Mod/WiFi/BT**, SN: 160587313331013301015984, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

4. RADIATED EMISSION DATA (15.209)

4.1. ENVIRONMENTAL CONDITIONS

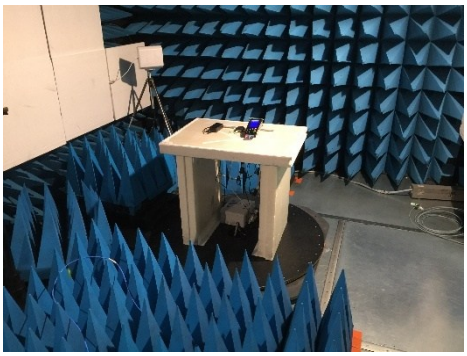
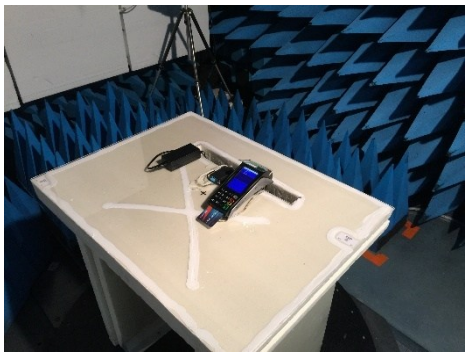
Date of test	:	August 4, 2016
Test performed by	:	Gaëtan DESCHAMPS
Atmospheric pressure (hPa)	:	1002
Relative humidity (%)	:	31
Ambient temperature (°C)	:	20

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) - Below 1GHz
☑ 150cm above the ground on the non-conducting table (Table-top equipment) - Above 1GHz
☐ 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
(Below 1GHz)



Test setup in anechoic chamber
(Above 1GHz)

4.3. TEST METHOD

The product has been tested according to ANSI C63.10, FCC part 15 subpart C.

Pre-characterisation measurement: (9kHz – 5GHz)
A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 5GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test to maximize 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:
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 limits. 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 to maximize 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 25GHz:
The product has been tested at a distance of **3 meters** from the antenna and compared to the FCC part 15 subpart C limits. Measurement bandwidth was 1MHz from 1GHz to 25GHz.
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 (EUT smaller than the beamwidth of the measurement antenna, ANSI C63.10 §6.6.5)
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
Amplifier 1-13GHz	LCIE SUD EST	-	A7102067	04/16	04/17
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/16	06/18
Antenna horn 18GHz	EMCO	3115	C2042027	11/15	11/16
Cable Measure @3m 18GHz	-	-	A5329038	08/15	08/16
Cable Measure @3m	-	-	A5329206	04/16	04/17
Cable Measure @1m	STORMFLEX	0	A5329680	01/16	01/17
Cable Measure Analyzer-Amplifier SMA	STORMFLEX	0	A5329681	05/16	05/17
Cable Measure @1m	STORMFLEX	0	A5329682	01/16	01/17
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
Radiated emission comb generator	BARDET	-	A3169050	-	-
HF Radiated emission comb generator	LCIE SUD EST	-	A3169088	-	-
OATS	-	-	F2000409	06/15	06/16
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	04/16	04/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	04/16	04/17
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16
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	-	-
Table	LCIE	-	F2000461	-	-
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# 1	0°/90°	Axis XY		See annex 1

See graphs for 30MHz-1GHz:

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr# 2	H/V	TX	Axis XY	Min	See annex 1

4.6.1. Pre-characterization at 3 meters [1GHz-5GHz]

See graphs for 1GHz-5GHz:

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr# 3	H/V	TX	Axis XY	Min	See annex 1

4.6.2. 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	46.1	**37.9**	120	0°	100		
2	27.12	29.5	11.9	**17.6**	120	0°	100		

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.

4.6.3. 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.

Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
37,531	23,5	QP	V	360	100	-	16,0	39,5	40,0	**-0,5**	
40,680	25,2	QP	V	360	100	-	14,3	39,5	40,0	**-0,5**	
81,204	18,7	QP	V	135	120	-	8,9	27,6	40,0	**-12,4**	
467,497	22,9	QP	V	280	100	-	21,3	44,2	46,0	**-1,8**	
743,700	12,0	QP	V	170	250	-	26,6	38,6	46,0	**-7,4**	
960,000	15,6	QP	H	61	100	-	30,2	45,8	46,0	**-0,2**	

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

4.6.4. Characterization on 3meters anechoic chamber from 1GHz to 5GHz

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

4.7. CONCLUSION

The sample of the equipment **Desk/5000 CL/Eth/Mod/WiFi/BT**, Sn: 160587313331013301015984, tested in the configuration presented in this test report **satisfies** to requirements of class B limits of the standard FCC Part 15 Subpart C, for radiated emissions.

5. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)

5.1. ENVIRONMENTAL CONDITIONS

Date of test	:	September 19, 2016
Test performed by	:	Gaëtan DESCHAMPS
Atmospheric pressure (hPa)	:	1024
Relative humidity (%)	:	31
Ambient temperature (°C)	:	20

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-6879	C2040052	11/15	11/17
Cable SMA	-	18G	A5329373	10/15	10/16
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
Climatic chamber	BIA CLIMATIC	CL 6-25	D1024032	01/00	
Multimeter - CEM	FLUKE	189	A1240171	03/16	03/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16
RSCommander	R&S	v1.6.4	L1000116	-	-
Thermometer (radio)	FLUKE	52 II	B4043150	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16

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)	 - 0.000008 + 0.10	 - 0.000008 + 0.10	 **13.559521** **46.100000**	 - 0.000070 - 0.10
Mains voltage: 93,5V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 + 0.000034 - 0.30	 + 0.000034 - 0.30	 + 0.000000 + 0.00	 - 0.000070 - 0.10
Mains voltage: 126V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 + 0.000030 - 0.30	 + 0.000030 - 0.30	 + 0.000000 + 0.00	 - 0.000080 - 0.20

Frequency drift measured is **114Hz** when the temperature is varied from -30°C to +50°C and voltage is varied.

5.7. CONCLUSION

The sample of the equipment **Desk/5000 CL/Eth/Mod/WiFi/BT**, Sn: 160587313331013301015984, tested in the configuration presented in this test report **satisfies** to requirements of the standard FCC Part 15 Subpart C, for fundamental frequency tolerance.

6. BAND-EDGE COMPLIANCE §15.209

6.1. ENVIRONMENTAL CONDITIONS

Date of test	:	September 21, 2016
Test performed by	:	Gaëtan DESCHAMPS
Atmospheric pressure (hPa)	:	1001
Relative humidity (%)	:	30
Ambient temperature (°C)	:	20

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

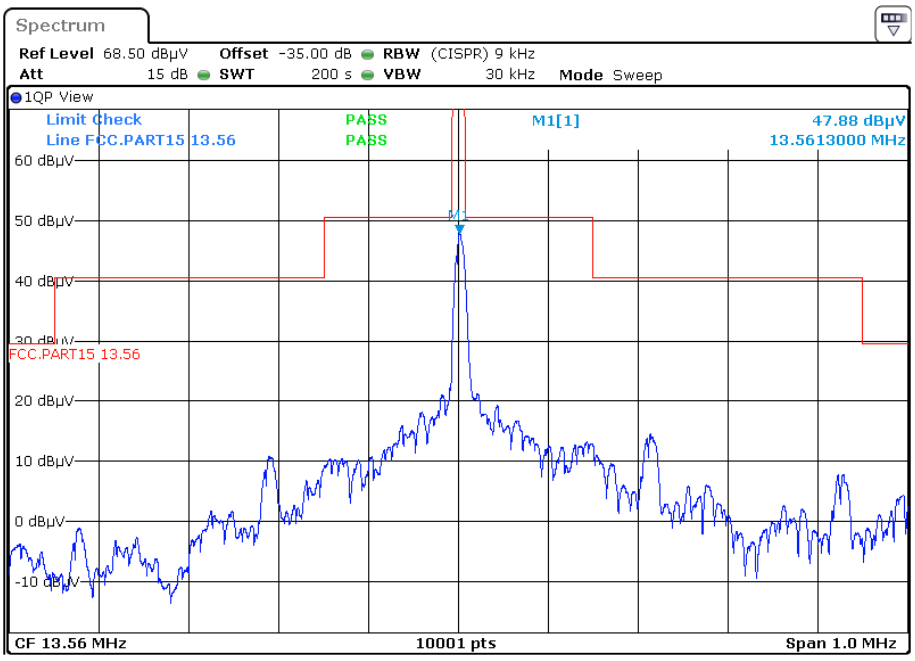
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052	11/15	11/17
Cable SMA	-	18G	A5329373	10/15	10/16
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
Climatic chamber	BIA CLIMATIC	CL 6-25	D1024032	01/00	
Multimeter - CEM	FLUKE	189	A1240171	03/16	03/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16
RSCommander	R&S	v1.6.4	L1000116	-	-
Thermometer (radio)	FLUKE	52 II	B4043150	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16

6.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

6.6. TEST RESULTS

Frequency band 13.553-13.567MHz



6.7. CONCLUSION

The sample of the equipment **Desk/5000 CL/Eth/Mod/WiFi/BT**, Sn: 160587313331013301015984, tested in the configuration presented in this test report **satisfies** to requirements of the standard FCC Part 15 Subpart C, for band-edge compliance.

7. OCCUPIED BANDWIDTH

7.1. ENVIRONMENTAL CONDITIONS

Date of test	:	September 21, 2016
Test performed by	:	Gaëtan DESCHAMPS
Atmospheric pressure (hPa)	:	1001
Relative humidity (%)	:	31
Ambient temperature (°C)	:	20

7.2. 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.

☑ ***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 in the range of 1% to 5% of the anticipated emission bandwidth
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

7.3. TEST EQUIPMENT LIST

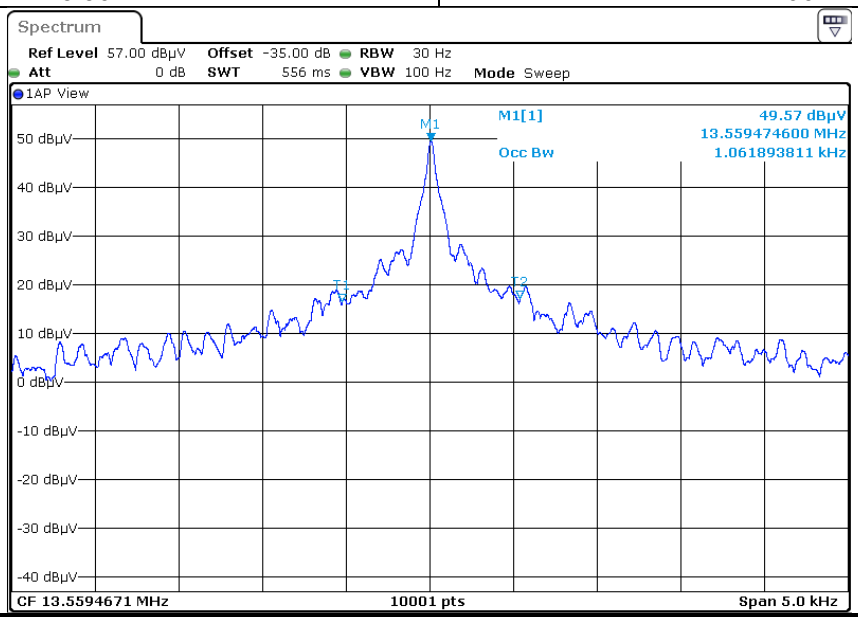
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052	11/15	11/17
Cable SMA	-	18G	A5329373	10/15	10/16
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
Climatic chamber	BIA CLIMATIC	CL 6-25	D1024032	01/00	
Multimeter - CEM	FLUKE	189	A1240171	03/16	03/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16
RSCommander	R&S	v1.6.4	L1000116	-	-
Thermometer (radio)	FLUKE	52 II	B4043150	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16

7.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

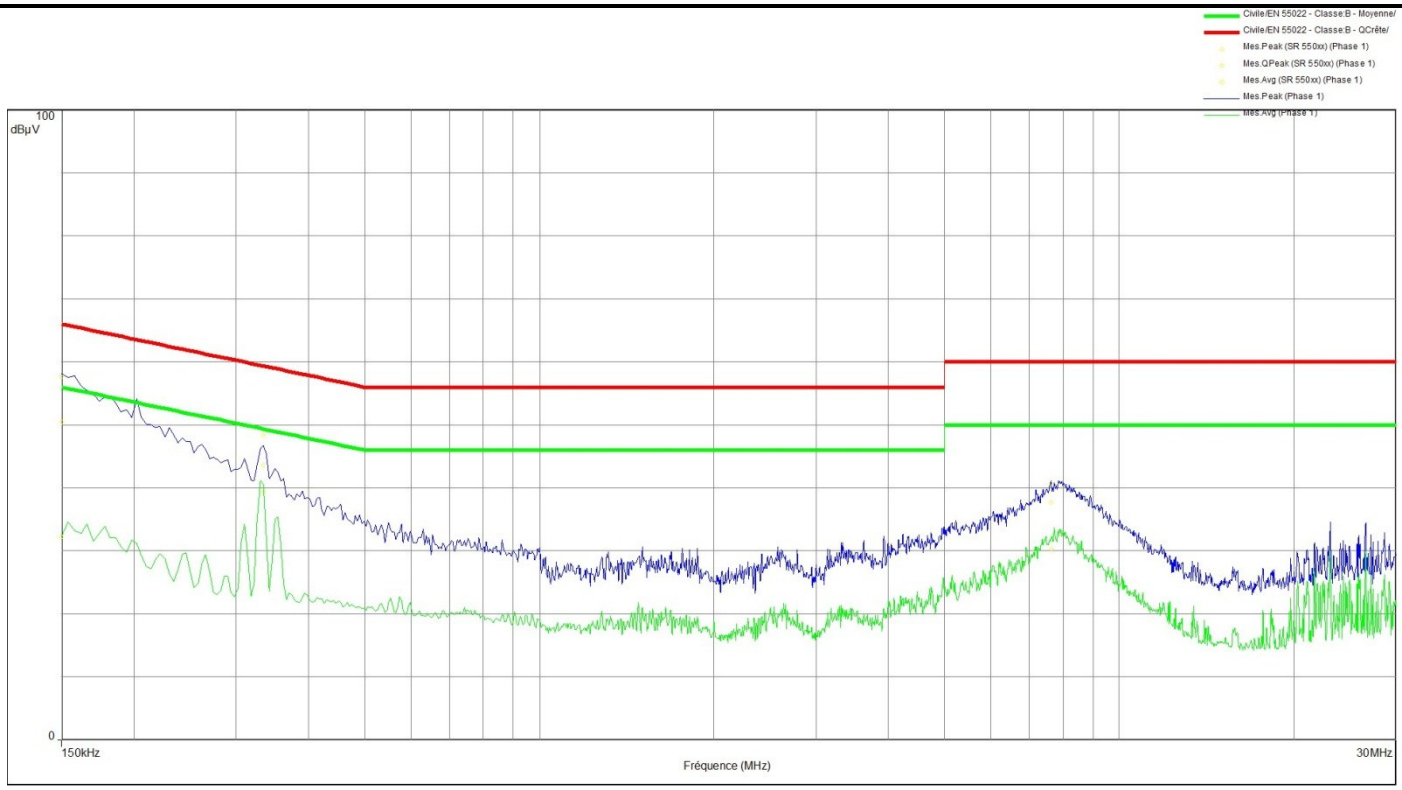
7.5. TEST SEQUENCE AND RESULTS

Channel	99% Occupied Bandwidth (kHz)
13.56	**1.06**



8. ANNEX 1 (GRAPHS)

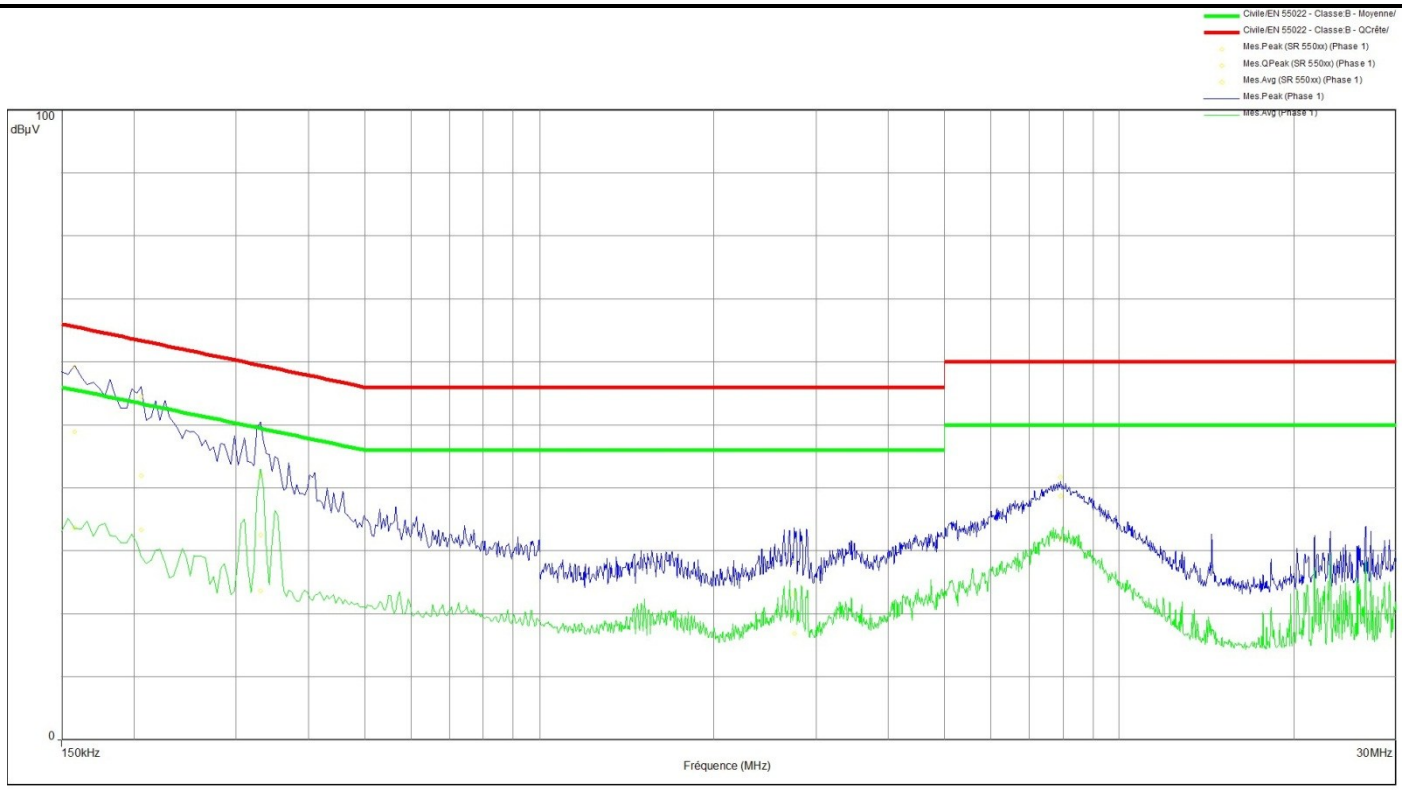
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	EN 55022	Phase FCC	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	110VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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)	Line
0.150	57.7	50.5	66.0	-15.5	32.2	56.0	-23.8	Phase 1
0.334	48.3	43.7	59.4	-15.7	39.4	49.4	-10.0	Phase 1
7.632	40.8	37.6	60.0	-22.4	30.2	50.0	-19.8	Phase 1

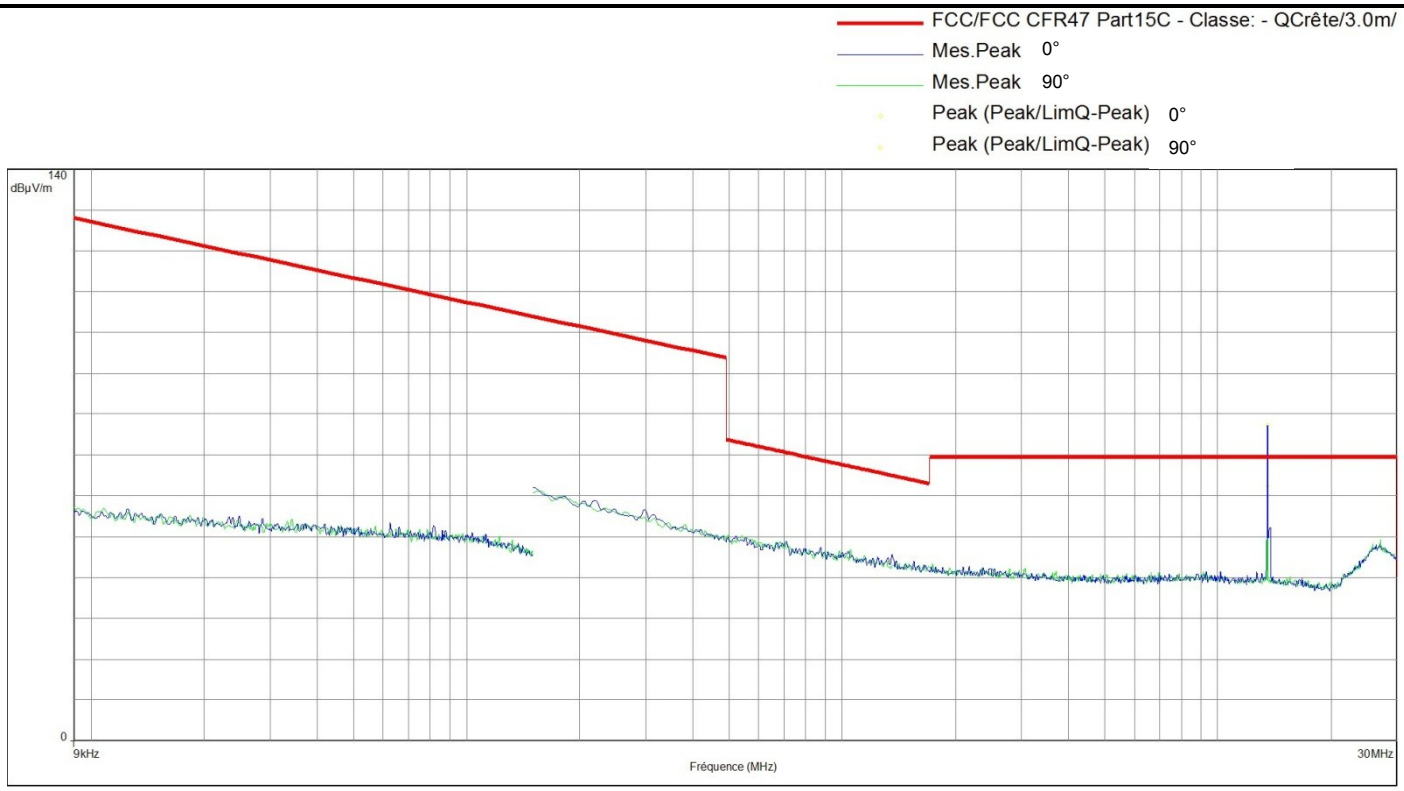
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	EN 55022	Neutral FCC	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	110VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



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)	Line
0.158	59.2	48.8	65.6	-16.8	33.6	55.6	-21.9	Phase 1
0.206	54.4	41.9	63.4	-21.5	33.3	53.4	-20.0	Phase 1
0.330	42.0	32.6	59.4	-26.9	23.7	49.4	-25.8	Phase 1
2.752	28.3	23.2	56.0	-32.8	16.9	46.0	-29.1	Phase 1
7.908	41.7	38.7	60.0	-21.3	31.9	50.0	-18.1	Phase 1

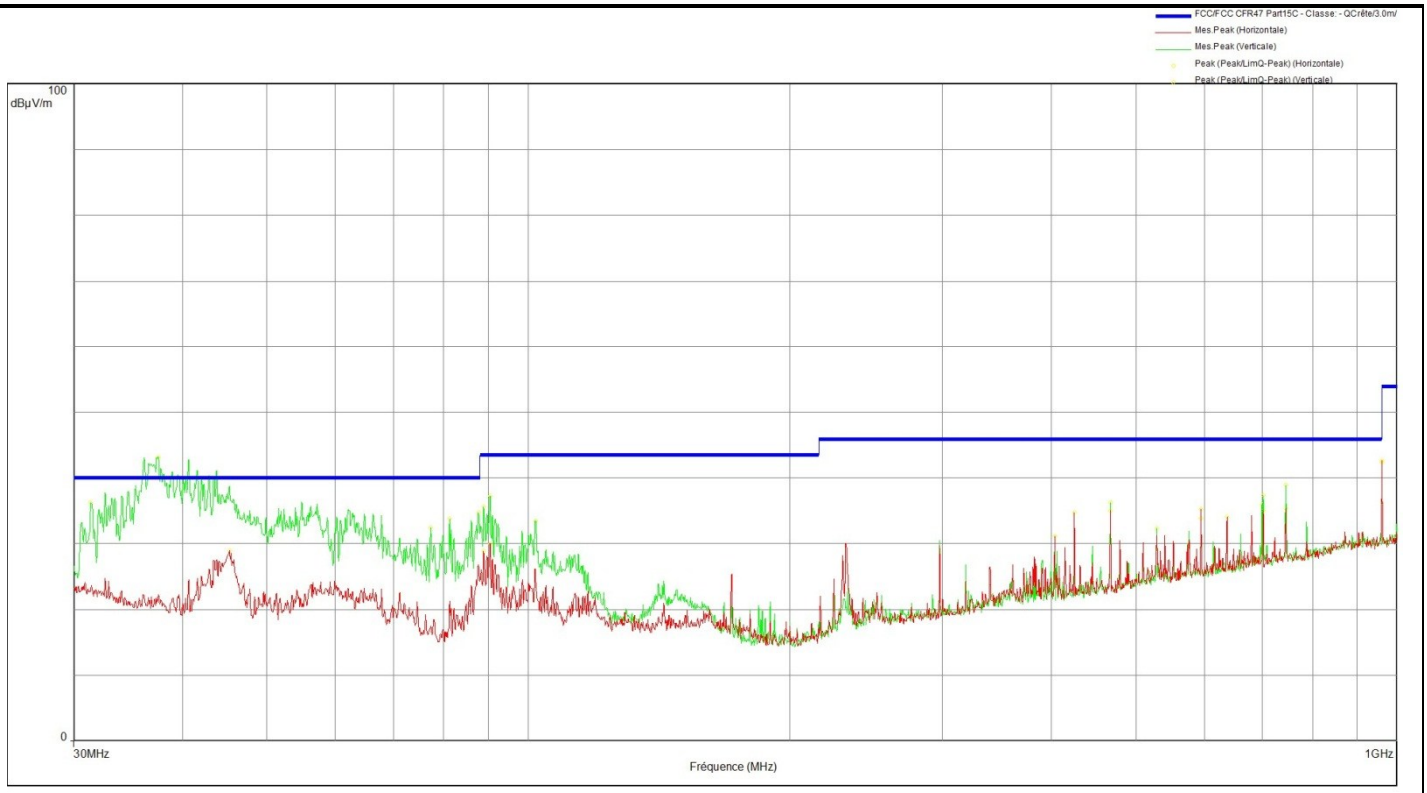
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(0°/90°) - Configuration 1 < 30MHz	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	Horizontal	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Polarization
13.559	77.2	69.5	7.7	0°
13.559	62.4	69.5	-7.2	90°

RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - Configuration 1 <1GHz	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz

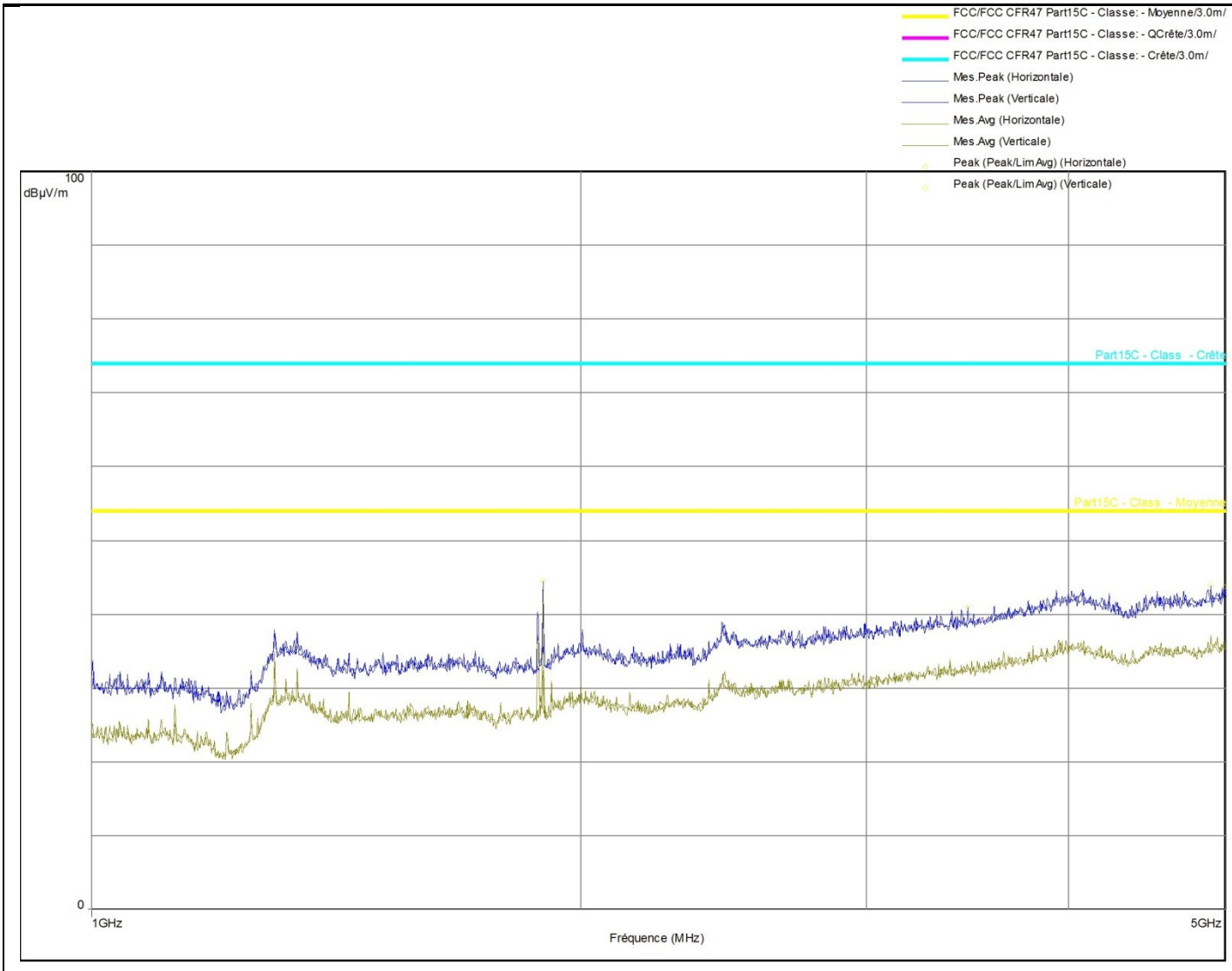


Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Polarization
45.317	28.9	40.0	-11.1	Horizontal
88.871	29.0	43.5	-14.5	Horizontal
90.367	30.0	43.5	-13.5	Horizontal
403.760	31.1	46.0	-14.9	Horizontal
425.000	34.8	46.0	-11.2	Horizontal
467.520	35.1	46.0	-10.9	Horizontal
595.000	35.3	46.0	-10.7	Horizontal
637.480	34.1	46.0	-11.9	Horizontal
701.240	35.1	46.0	-10.9	Horizontal
743.760	35.4	46.0	-10.6	Horizontal
960.000	42.7	46.0	-3.3	Horizontal
31.377	36.2	40.0	-3.8	Vertical
37.531	43.2	40.0	3.2	Vertical
77.209	32.4	40.0	-7.6	Vertical

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Polarization
81.204	33.8	40.0	-6.2	Vertical
87.630	34.8	40.0	-5.2	Vertical
88.871	35.6	43.5	-7.9	Vertical
90.367	37.3	43.5	-6.2	Vertical
101.927	33.4	43.5	-10.1	Vertical
467.520	36.4	46.0	-9.6	Vertical
528.880	32.3	46.0	-13.7	Vertical
595.040	33.9	46.0	-12.1	Vertical
698.880	36.0	46.0	-10.0	Vertical
701.240	37.4	46.0	-8.6	Vertical
743.720	38.9	46.0	-7.1	Vertical
960.000	42.5	46.0	-3.5	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - Configuration FCC >1GHz	
Class:			
Frequency range: [1GHz - 5GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimM (dBµV/m)	Peak-LimM (dB)	Polarization
1897.250	44.5	54.0	-9.5	Horizontal
4894.100	43.9	54.0	-10.1	Horizontal
3468.250	41.0	54.0	-13.0	Vertical
4986.950	43.8	54.0	-10.2	Vertical

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*	3.51 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.*	3.26 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.45 dB	3.6 dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	3.09 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*	5.20 dB	6.3 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.*