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# Rapport d'essai / Test report

N° 439408-R1-E

JDE : 115461

## DELIVRE A / ISSUED TO

: **INGENICO**  
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Rovaltain TGV - Quartier de la gare  
26958 VALENCE – France

## Objet / Subject

: Essais de compatibilité électromagnétique conformément aux normes  
*Electromagnetic compatibility tests according to the standards*  
**FCC CFR 47 Part 15, Subpart B et C.**  
**RSS-GEN / RSS-210**

## Matériel testé / Apparatus under test :

- . Produit / Product : **Terminal de payment / Payement terminal**
- . Marque / Trade mark : **INGENICO**
- . Constructeur / Manufacturer : **INGENICO**
- . Type / Model : **ICT250-11T1879A**
- . N° de série / serial number : **12180CT00000100 & 12180CT00000106**
- . FCC ID : **XKB-ICT250V3**
- . IC : **2586D-ICT250CLV3**

## Date des essais / Test date

: Du 1 Aout au 17 Septembre 2012 / *From August 1<sup>st</sup> to September 17<sup>th</sup>, 2012*

## Lieu d'essai / Test location

: **LCIE SUD-EST**  
ZI Centr'Alp – 170 rue de Chatagnon  
38430 MOIRANS - FRANCE

## Test réalisé par / Test performed by

: Anthony MERLIN

**Ce document comporte / Composition of document : 31 pages.**

MOIRANS, LE 26 NOVEMBRE 2012 / *NOVEMBER 26TH, 2012*

Ecrit par / *Written by,*  
Anthony MERLIN

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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-Gen Issue 3 – Dec 2010
  - RSS-210 Issue 8 – Dec 2010

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

\*§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.

**Highest frequency: 387MHz (Declaration of provider)**

\*\*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).

### 2.2. HARDWARE IDENTIFICATION

- **Equipment under test (EUT):**

ICT250-11T1879A

Serial number: 12180CT00000100 & 12180CT00000106  
FCC ID: XKB-ICT250V3  
IC: 2586D-ICT250CLV3

Conducted emission test only performed on 12180CT00000100 and all others tests performed on 12180CT00000106.

- **Power supply:**

- AC / DC Adaptor: INGENICO, Model PSM24W-080, P/N : 192020864
- Rating: 100-240VAC, 0.6A / 8.0VDC, 3.0A
- Frequency: 50-60Hz

During all the tests, EUT is supplied by this adaptor.

- **Inputs/outputs: Terminal**

- 1 x USB Host, not used, not tested
- 1 x USB Slave, not used, not tested
- 1 x Jack power supply DC to magicbox
- 1 x COM0 to magicbox
- 1 x Ethernet to magicbox
- 1 x Line to magicbox
- 2 x SAM
- 2 x CAM
- 1 x Printer
- 1 x Contactless

- **Inputs/outputs: Magicbox: 296105416**      **29/2012**

- 1 x Jack power supply DC
- 1 x COM0
- 1 x Ethernet
- 1 x Line

- **Cables:**

- 1 x Power supply cable, unshielded, length: 1.5m
- 1 x Line cable, unshielded, length: 2m
- 1 x Ethernet cable, unshielded, length: 2m
- 1 x Com cable, unshielded, length: 2m, with load
- 1 x Magicbox cable twisted, unshielded, length: 1.5m

- **Auxiliaries equipment used during test:**

- 1 x Contact card
- 1 x Contactless card
- 2 x SAM
- 1 x Laptop LENOVO with its power supply (Laptop of laboratory)
- 1 x TELTON Telephone line simulator TLS-5B-01, Sn: 014184



### 2.3. EUT CONFIGURATION

#### **Configuration n°1:**

The EUT is connected to a laptop PC with its Ethernet link. (Ping function activated).

The inboard software (TEST CEM) performed the followings tests and activates the followings functions:

- Printer ON,
- **Contact less is activated**
- Smartcards reading: CAM0, SAM1 and 2 (power ON and reading)
- Backlight and display are ON.

#### **Configuration n°2:**

The EUT is connected to a laptop PC with its Ethernet link. (Ping function activated).

The inboard software (TEST CEM) performed the followings tests and activates the followings functions:

- Printer ON,
- **Modem is online**
- Smartcards reading: CAM0, SAM1 and 2 (power ON and reading)
- Backlight and display are ON.

### 2.4. EQUIPMENT MODIFICATIONS

None

### 2.5. SPECIAL ACCESSORIES

None

### 3. RADIATED EMISSION DATA

#### 3.1. TEST CONDITIONS

Date of test : September 17<sup>th</sup>, 2012  
Test performed by : A.MERLIN  
Atmospheric pressure : 997mb  
Relative humidity : 41%  
Ambient temperature : 21°C

#### 3.2. TEST SETUP

The installation of EUT is identical for pre-characterization measurement in a 3 meters semi anechoic chamber and for measures on a 10 meters Open site.



*Radiated emission test setup*



**3.3. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Antenna Bi-log	CHASE	CBL6111A	C2040051
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052
Antenna Bi-log	CHASE	CBL6111A	C2040172
Antenna horn	EMCO	3115	C2042027
Cable N/N	-	-	A5329038
Cable	SUCOFLEX	106G	A5329061
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329188
Cable	UTIFLEX	-	A5329192
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329199
Cable N/N	-	-	A5329206
Semi-Anechoic chamber #3	SIEPEL	-	D3044017
Radiated emission comb generator	BARDET	-	A3169050
OATS	-	-	F2000409
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020
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

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

None



### 3.5. TEST SEQUENCE AND RESULTS

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

A pre-scan of all the setup has been performed in a 3 meters semi anechoic chamber. The distance between EUT and antenna is 3 meters. For Pre-characterization, the loop antenna was rotated during the test for maximized the emission measurement. Measurement performed on 3 axis of EUT. Frequency band investigated is 9kHz to 30MHz.

The pre-characterization graphs are obtained in PEAK detection.

**See graph for 9kHz-30MHz band:**      *Configuration n°1 – Worst case Axis Z*      **Emr#1**      (See annex 1)

#### 3.5.2. Pre-characterization [30MHz-2GHz]

For frequency band 30MHz to 1GHz, a pre-scan of all the setup has been performed in a 3 meters semi anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with a log-periodic antenna. The EUT is being rotated on 360° and on 3 axis during the measurement. The pre-characterization graphs are obtained in PEAK detection. For frequency band 1GHz to 2GHz, a search is performed in the semi-anechoic chamber in order to determine frequencies radiated by the EUT (Measuring distance reduced to 1m).

**See graphs for 30MHz-1GHz:**

H polarization	<i>Configuration n°1 – Worst case Axis XY</i>	<b>Emr#2</b>	(See annex 1)
V polarization	<i>Configuration n°1 – Worst case Axis XY</i>	<b>Emr#3</b>	(See annex 1)
H polarization	<i>Configuration n°2 – Worst case Axis XY</i>	<b>Emr#4</b>	(See annex 1)
V polarization	<i>Configuration n°2 – Worst case Axis XY</i>	<b>Emr#5</b>	(See annex 1)





**3.5.3. Characterization on 10 meters open site below 30 MHz**

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. Antenna height was 1m for both horizontal and vertical polarization. Antenna was rotated around its vertical axis. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT. A summary of the worst case emissions found in all test configurations and modes is shown on clauses 3.2.

Frequency (MHz)	QPeak Limit (dBµV/m) @ 30m	Qpeak (dBµV/m)	Qpeak-Limit (Margin dB)	Turntable Angle (deg)	Ant. Pol./ Angle (deg)	Tot Corr (dB)
13.56* <sup>1</sup>	84.0	40.2	-43.8	270	0	35.3
27.12* <sup>1</sup>	29.5	16.4	-13.1	270	0	39.3

\*<sup>1</sup>: 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 chapter 5 of this test report for band edge measurements.



**3.5.4. Characterization on 10 meters open site from 30MHz to 2GHz**

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 and 1MHz from 1GHz to 2 GHz.

Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT.

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

**Worst case final data result:**

***Configuration n°1***

No	Frequency (MHz)	QPeak Limit (dBµV/m)	Qpeak * (dBµV/m)	Qpeak-Limit (Margin, dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	40.678	40.0	38.6	-1.4	0	V	100	13.2	
2	43.798	40.0	38.3	-1.7	35	V	100	11.7	
3	45.051	40.0	36.9	-3.1	110	V	100	11.1	
4	51.002	40.0	35.1	-4.9	100	V	120	8.5	
5	54.238	40.0	36.2	-3.8	10	V	100	7.9	
6	66.209	40.0	29.4	-10.6	135	V	120	7.5	
7	67.798	40.0	30.5	-9.5	0	V	100	7.6	
8	86.055	40.0	39.1	-0.9	355	V	100	10.5	
9	266.637	46.0	42.0	-4.0	190	V	110	16.1	
10	271.398	46.0	37.6	-8.4	355	H	400	16.2	

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

***Frequency band 1GHz to 2GHz***

Measurements are performed using a PEAK and Average detection. (RBW = 1MHz)

No	Frequency (GHz)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
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No Significant Frequency observed

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

**RESULTS: PASS**



L C I E

**Configuration n°2**

No	Frequency (MHz)	QPeak Limit (dBµV/m)	Qpeak * (dBµV/m)	Qpeak-Limit (Margin, dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	38.945	40.0	36.5	-3.5	110	V	100	14.0	
2	42.958	40.0	36.0	-4.0	225	V	100	12.1	
3	43.876	40.0	36.4	-3.6	90	V	110	11.7	
4	45.279	40.0	36.9	-3.1	155	V	100	11.0	
5	51.034	40.0	34.4	-5.6	0	V	120	8.5	
6	55.309	40.0	32.6	-7.4	330	V	100	7.7	
7	66.271	40.0	27.8	-12.2	55	V	100	7.5	
8	70.852	40.0	29.9	-10.1	290	V	110	7.9	
9	139.266	43.5	43.2	-0.3	80	V	100	14.8	
10	266.637	46.0	41.9	-4.1	190	V	110	16.1	
11	271.398	46.0	37.9	-8.1	355	H	400	16.2	
12	299.966	46.0	32.2	-13.8	315	V	130	16.8	
13	699.917	46.0	39.7	-6.3	255	H	350	25.3	

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

**Frequency band 1GHz to 2GHz**

Measurements are performed using a PEAK and Average detection. (RBW = 1MHz)

No	Frequency (GHz)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
									No Significant Frequency observed

Note: Measures have been done at 3m distance.

RESULTS: PASS



### 3.6. 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.

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



**4. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)**

**4.1. TEST CONDITIONS**

Date of test : September 19<sup>th</sup>, 2012  
 Test performed by : A.MERLIN

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency when the temperature is varied from  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at the nominal power voltage and the primary power voltage is varied from 85% to 115% of the rated supply voltage at  $20^{\circ}\text{C}$ .

**4.2. TEMPERATURE AND VOLTAGE FLUCTUATION**

Temperature has been set at  $+20^{\circ}\text{C}$ ,  $-30^{\circ}\text{C}$ ,  $-20^{\circ}\text{C}$  and  $+50^{\circ}\text{C}$ .  
 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.

Temperature	-30°C	-20°C	20°C	+50°C
<b>Voltage</b>				
Mains voltage: 110V/60Hz Frequency Drift (MHz) Carrier level (dBc)	- 0.000041 - 1.0	+ 0.000020 - 1.1	<b>REF</b> <b>REF</b>	- 0.000014 - 1.1
Mains voltage: 93,5V/60Hz Frequency Drift (MHz) Carrier level (dBc)	- 0.000041 - 1.1	+ 0.000020 - 1.2	+ 0.000000 + 0.0	- 0.000014 - 1.1
Mains voltage: 126V/60Hz Frequency Drift (MHz) Carrier level (dBc)	- 0.000041 - 1.0	+ 0.000020 - 1.0	+ 0.000000 + 0.0	- 0.000014 - 1.1

Frequency drift measured is **41 Hz** when the temperature is varied from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  and voltage is varied from 120V/60Hz  $\pm 15\%$ .

**4.3. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Passive loop antenna	EMCO	7405-901	A2240015
Cable SMA	-	-	A5329580
CALIFORNIA System: 5kVA PSU	SCHAFFNER	NSG 1007	A7043026
Climatic chamber	BIA CLIMATIC	CL 6-25	D1022117
Multimeter	FLUKE	189	A1240171
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

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

None

**5. BAND-EDGE COMPLIANCE §15.209****5.1. TEST CONDITIONS**

Date of test : September 17<sup>th</sup>, 2012  
Test performed by : A.MERLIN  
Atmospheric pressure : 997mb  
Relative humidity : 41%  
Ambient temperature : 21°C

**5.2. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052
Cable N/N	-	-	A5329038
Cable	UTIFLEX	-	A5329192
Cable N/N	-	-	A5329206
Semi-Anechoic chamber #3	SIEPEL	-	D3044017
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

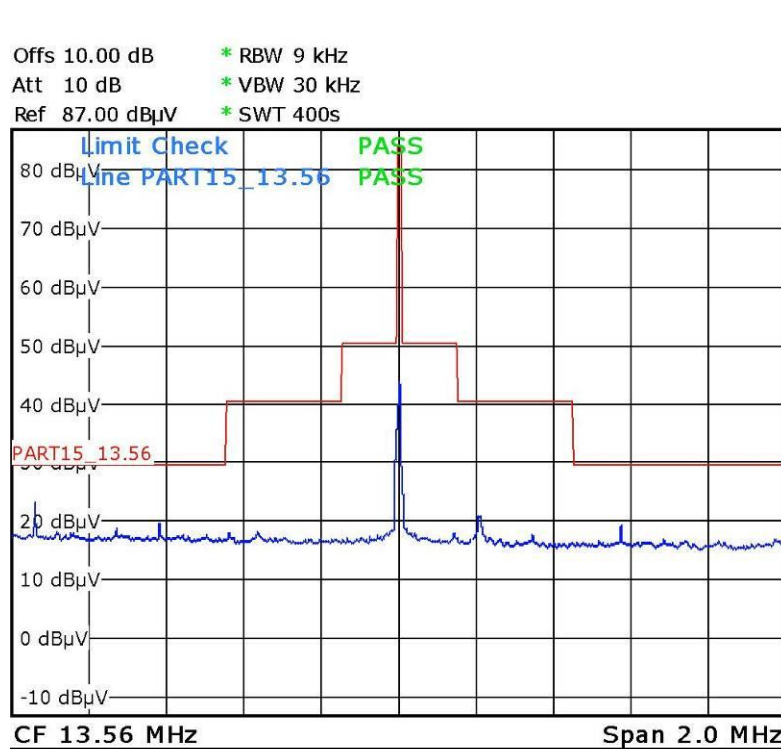
**5.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

None



**5.4. 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 ESU8.



**6. OCCUPIED BANDWIDTH****6.1. CLIMATIC CONDITIONS**

Date of test : September 17<sup>th</sup>, 2012  
Test performed by : A.MERLIN  
Atmospheric pressure : 997mb  
Relative humidity : 41%  
Ambient temperature : 21°C

**6.1. TEST EQUIPMENT LIST**

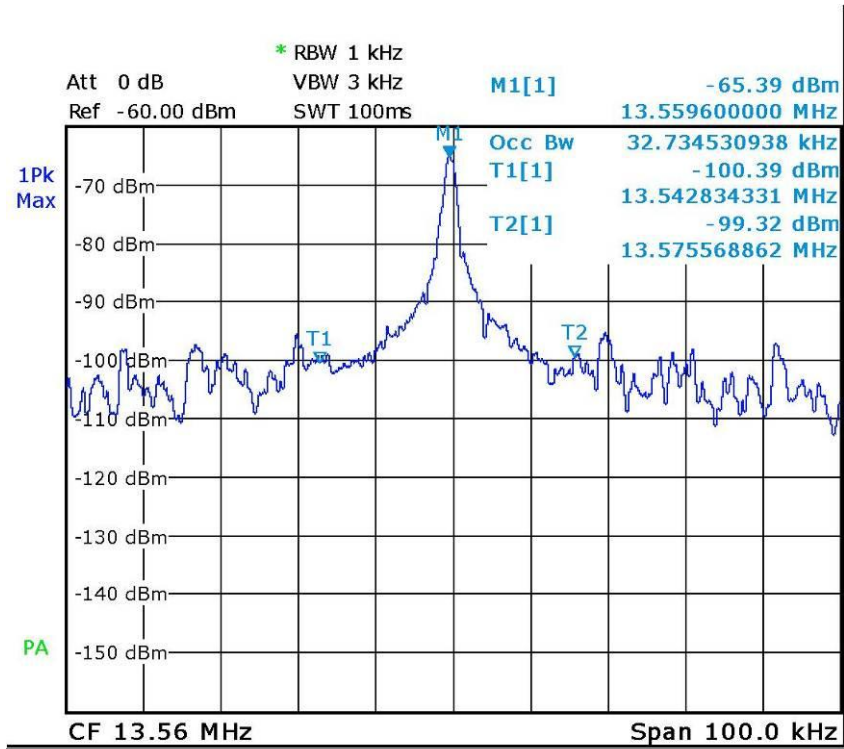
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052
Cable N/N	-	-	A5329038
Cable	UTIFLEX	-	A5329192
Cable N/N	-	-	A5329206
Semi-Anechoic chamber #3	SIEPEL	-	D3044017
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

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

None



**6.3. TEST RESULTS**



Measured occupied bandwidth is **32.7kHz**  
 Measurement settings:  
 RBW = 1kHz / Video BW = 3kHz SPAN = 100kHz

## 7. CONDUCTED EMISSION DATA

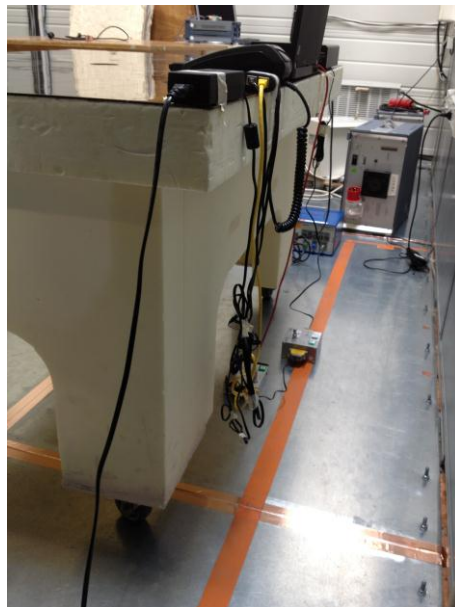
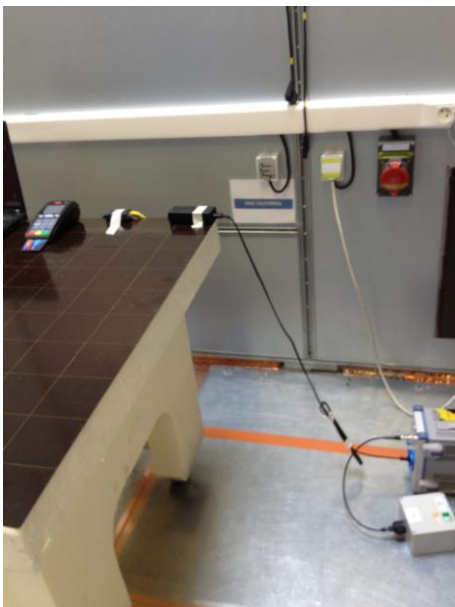
### 7.1. TEST CONDITIONS

Date of test : August 1<sup>st</sup>, 2012  
Test performed by : A.MERLIN  
Atmospheric pressure : 989hPa  
Relative humidity : 41%  
Ambient temperature : 24°C

### 7.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT

The product has been tested according to ANSI C63.4-(2003) and FCC Part 15 subpart B and C. The product has been tested with 120V/60Hz power line voltage and compared to the FCC Part 15 subpart B §15.107 and C §15.207 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz. Measurement is made with a Rohde & Schwarz ESU8 receiver in peak mode. 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  $50\Omega / 50\mu\text{H}$ . 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.

The EUT is placed on the ground reference plane, at 80cm from the LISN. The distance between the EUT and the vertical ground plane is 40cm. Auxiliaries are powered by another LISN. The cable has been shorted to 1meter length. The EUT is powered through the LISN (measure).

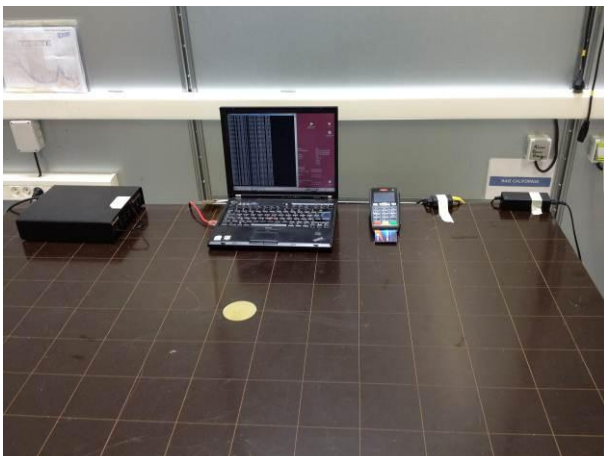
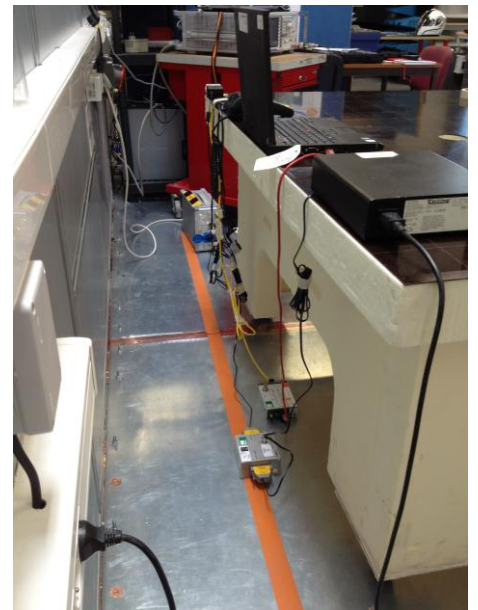
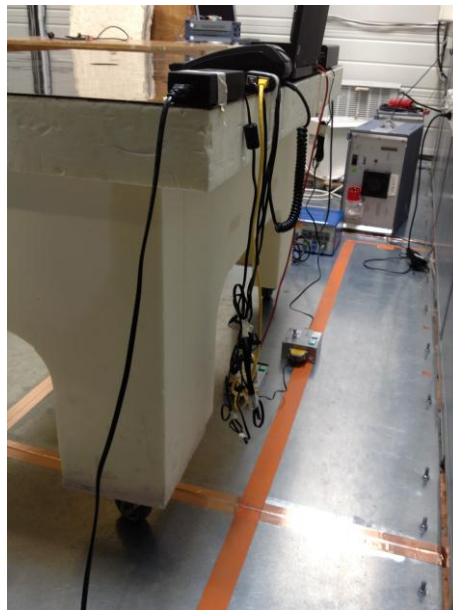




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Configuration n°1



Configuration n°2

**7.3. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Cable	-	-	A5329578
Conducted emission comb generator	BARDET	-	A3169049
ISN 4 wires	RHODE & SCHWARZ	ENY41	C2320066
ISN 4 wires	TESEQ	T400A	C2320124
LISN	TELEMETER ELECTRONIC	NNB-2/16Z	C2320061
LISN	RHODE & SCHWARZ	ENV216	C2320123
Load 50Ω	-	-	A7152023
Load 50Ω	-	-	A7152032
Load 50Ω	-	-	A7152036
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019
Thermo-hygrometer	HUGER	-	B4204052
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204

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

None

**7.5. TEST SEQUENCE AND RESULTS**

Measurements are performed on the phase (L1) and neutral (N) of power line voltage. A measurement is also performed with a 50Ω dummy load replacing the transmitter antenna in order to demonstrate that some 13.56MHz may be cross-coupled to AC line connection. Graphs are obtained in PEAK detection. Measures are also performed in Quasi-Peak and Average for any strong signal.

Measure on L1:	graph Emc#1	<i>Configuration n°1</i>	(see annex 1)
Measure on N:	graph Emc#2	<i>Configuration n°1</i>	(see annex 1)
Measure on L1:	graph Emc#3	<i>Configuration n°2</i>	(see annex 1)
Measure on N:	graph Emc#4	<i>Configuration n°2</i>	(see annex 1)

**RESULT: PASS**



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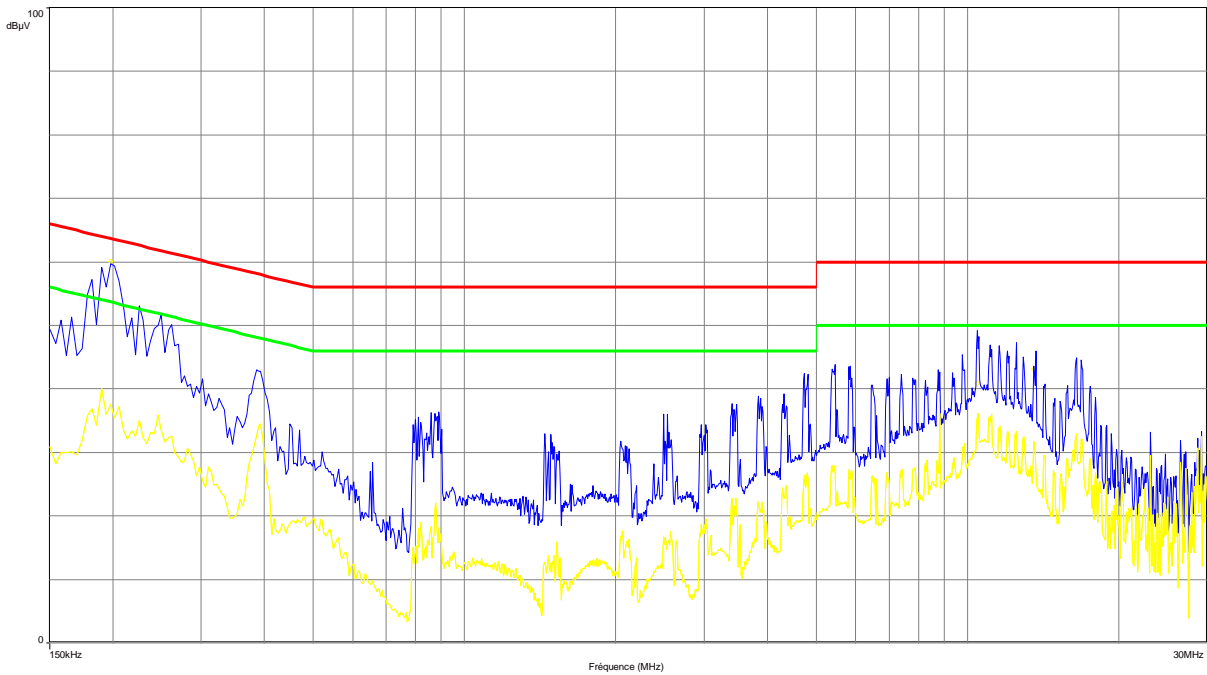
**8. ANNEX 1 (GRAPHS)**

**RADIATED EMISSIONS**

<b>Graph name :</b>	Emc#1	<b>Test configuration:</b>
<b>Limit :</b>	EN 55022	ICT250 - Configuration n°1
<b>Class :</b>	B	

**PARAMETERS**

<b>Voltage / Frequency :</b>	110VAC / 60Hz	<b>Legend:</b>	
<b>Line :</b>	Phase1	<span style="background-color: blue; width: 15px; height: 15px; display: inline-block;"></span> <b>Peak Measure</b>	<span style="background-color: yellow; width: 15px; height: 15px; display: inline-block;"></span> <b>Average Measure</b>
<b>RBW :</b>	9kHz	<span style="background-color: red; width: 15px; height: 15px; display: inline-block;"></span> <b>QPeak Limit</b>	<span style="background-color: green; width: 15px; height: 15px; display: inline-block;"></span> <b>Average Limit</b>
<b>VBW :</b>	30kHz		
<b>Frequency :</b>	150kHz- 30MHz		



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.198	29.28	53.69	<b>-24.41</b>	43.07	63.69	<b>-20.63</b>
10.462	30.53	50.00	<b>-19.47</b>	40.24	60.00	<b>-19.76</b>
13.558	27.23	50.00	<b>-22.77</b>	48.00	60.00	<b>-12.00</b>



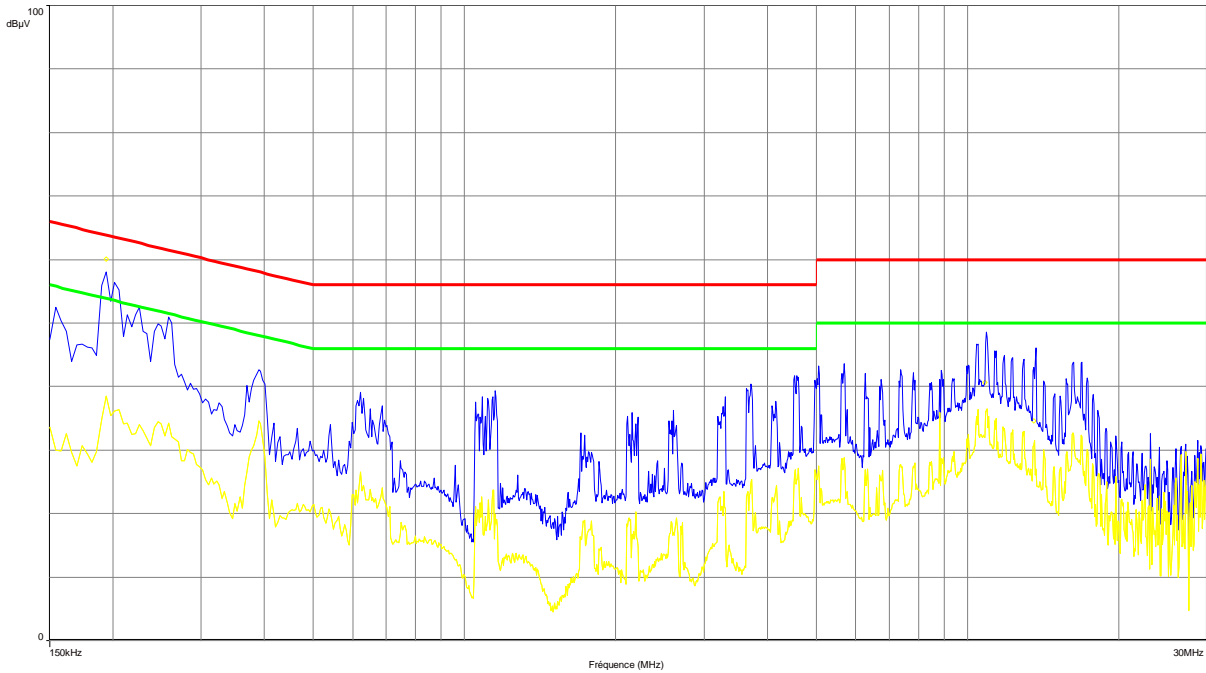
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**RADIATED EMISSIONS**

<b>Graph name :</b>	Emc#2	<b>Test configuration:</b>
<b>Limit :</b>	EN 55022	ICT250 - Configuration n°1
<b>Class :</b>	B	

**PARAMETERS**

<b>Voltage / Frequency :</b>	110VAC / 60Hz	<b>Legend:</b>	
<b>Line :</b>	Neutral	Peak Measure	Average Measure
<b>RBW :</b>	9kHz		
<b>VBW :</b>	30kHz	QPeak Limit	Average Limit
<b>Frequency :</b>	150kHz- 30MHz		



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.194	33.81	53.86	<b>-20.05</b>	51.12	63.86	<b>-12.74</b>
10.842	30.94	50.00	<b>-19.06</b>	36.68	60.00	<b>-23.32</b>
13.562	24.08	50.00	<b>-25.92</b>	36.76	60.00	<b>-23.24</b>



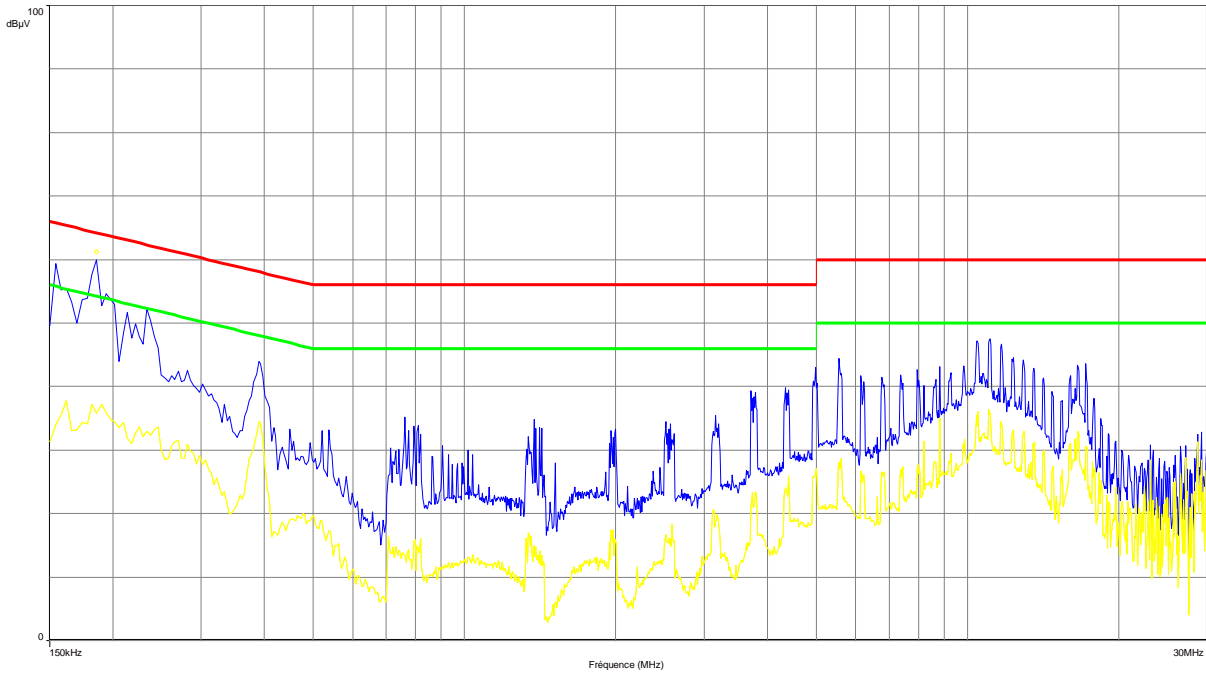
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**RADIATED EMISSIONS**

<b>Graph name :</b>	Emc#3	<b>Test configuration:</b>
<b>Limit :</b>	EN 55022	ICT250 - Configuration n°2
<b>Class :</b>	B	

**PARAMETERS**

<b>Voltage / Frequency :</b>	110VAC / 60Hz	<b>Legend:</b>	
<b>Line :</b>	Phase1	<span style="background-color: blue; width: 15px; height: 15px; display: inline-block;"></span> <b>Peak Measure</b>	<span style="background-color: yellow; width: 15px; height: 15px; display: inline-block;"></span> <b>Average Measure</b>
<b>RBW :</b>	9kHz	<span style="background-color: red; width: 15px; height: 15px; display: inline-block;"></span> <b>QPeak Limit</b>	<span style="background-color: green; width: 15px; height: 15px; display: inline-block;"></span> <b>Average Limit</b>
<b>VBW :</b>	30kHz		
<b>Frequency :</b>	150kHz- 30MHz		



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.186	35.50	54.21	<b>-18.71</b>	52.49	64.21	<b>-11.73</b>
11.106	30.28	50.00	<b>-19.72</b>	39.86	60.00	<b>-20.14</b>





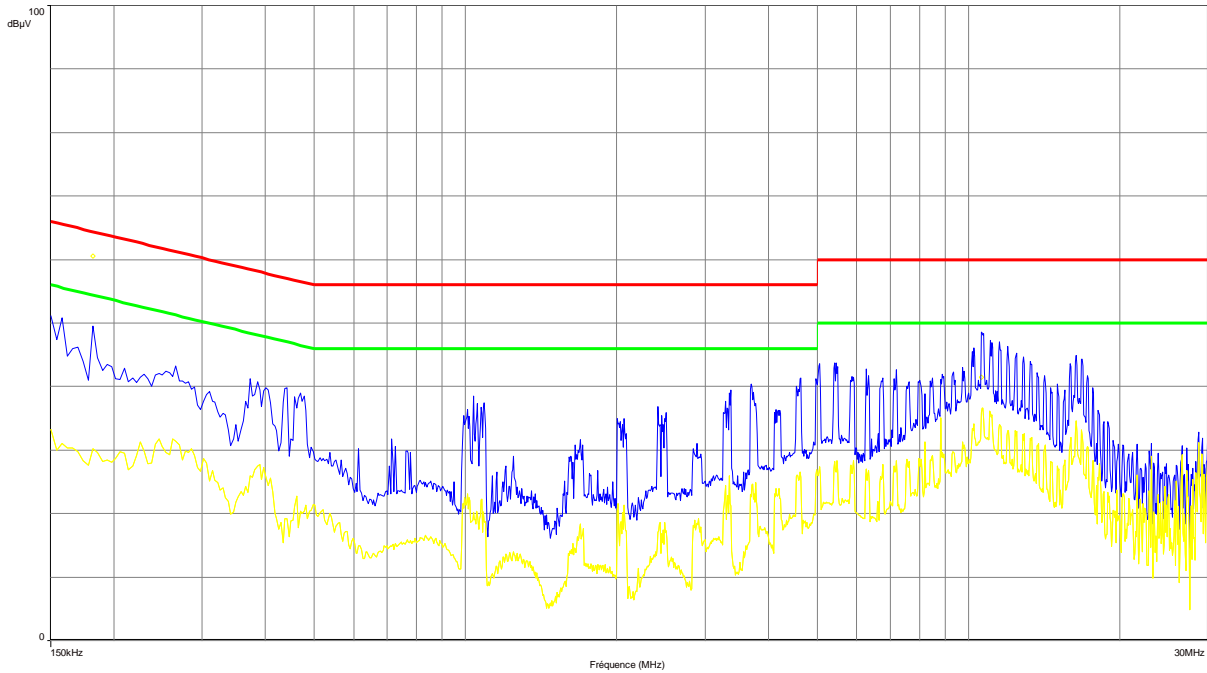
L C I E

**RADIATED EMISSIONS**

<b>Graph name :</b>	Emc#4	<b>Test configuration:</b>
<b>Limit :</b>	EN 55022	ICT250 - Configuration n°2
<b>Class :</b>	B	

**PARAMETERS**

<b>Voltage / Frequency :</b>	110VAC / 60Hz	<b>Legend:</b>	
<b>Line :</b>	Neutral	<span style="background-color: blue; width: 15px; height: 15px; display: inline-block;"></span> <b>Peak Measure</b>	<span style="background-color: yellow; width: 15px; height: 15px; display: inline-block;"></span> <b>Average Measure</b>
<b>RBW :</b>	9kHz	<span style="background-color: red; width: 15px; height: 15px; display: inline-block;"></span> <b>QPeak Limit</b>	<span style="background-color: green; width: 15px; height: 15px; display: inline-block;"></span> <b>Average Limit</b>
<b>VBW :</b>	30kHz		
<b>Frequency :</b>	150kHz- 30MHz		



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.182	33.12	54.39	<b>-21.27</b>	48.94	64.39	<b>-15.46</b>
10.606	30.70	50.00	<b>-19.30</b>	37.29	60.00	<b>-22.71</b>





L C I E



**RADIATED EMISSIONS**

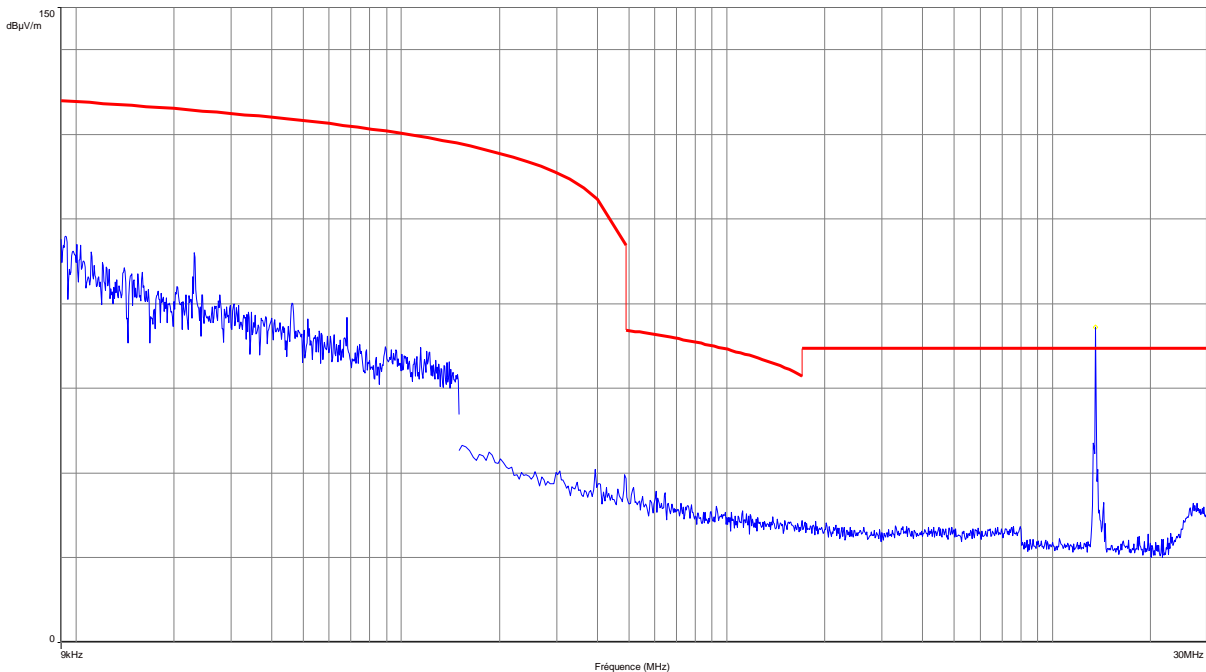
<b>Graph name :</b>	Emr#1	<b>Test configuration:</b>
<b>Limit :</b>	FCC Part15C	ICT250 - Axis Z (Worst case)
<b>Class :</b>	B	

**PARAMETERS**

<b>Antenna polarization:</b>	Parallel	<b>Legend:</b>
<b>Azimuth :</b>	0° - 360°	 Peak Measure
<b>RBW :</b>	100Hz	 QPeak Limit@3m
<b>VBW :</b>	300Hz	
<b>Frequency :</b>	9kHz- 150kHz	

**PARAMETERS**

<b>Antenna polarization:</b>	Parallel	<b>Legend:</b>
<b>Azimuth :</b>	0° - 360°	 Peak Measure
<b>RBW :</b>	10kHz	 QPeak Limit@3m
<b>VBW :</b>	30kHz	
<b>Frequency :</b>	150kHz- 30MHz	



Frequency (MHz)	Peak (dBµV/m)
13.558	74.43



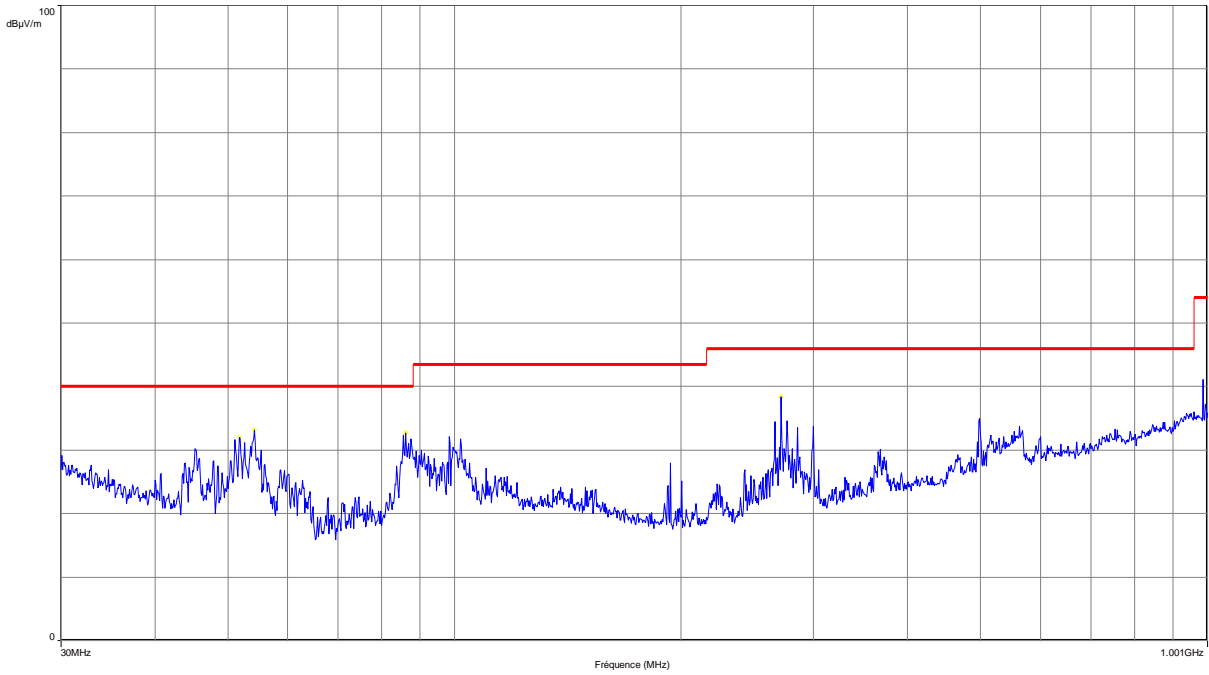
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**RADIATED EMISSIONS**

<b>Graph name :</b>	Emr#2	<b>Test configuration: 1</b>
<b>Limit :</b>	FCC Part15C	ICT250 - Axis XY (Worst case)
<b>Class :</b>	-	

**PARAMETERS**

<b>Antenna polarization:</b>	Horizontale	<b>Legend:</b>
<b>Azimuth :</b>	0° - 360°	<span style="background-color: blue; color: white;">█</span> Peak Measure
<b>RBW :</b>	100kHz	<span style="background-color: red; color: white;">█</span> QPeak Limit@3m
<b>VBW :</b>	300kHz	
<b>Frequency :</b>	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
51.80	31.96
54.24	33.19
86.04	32.66
271.4	38.36



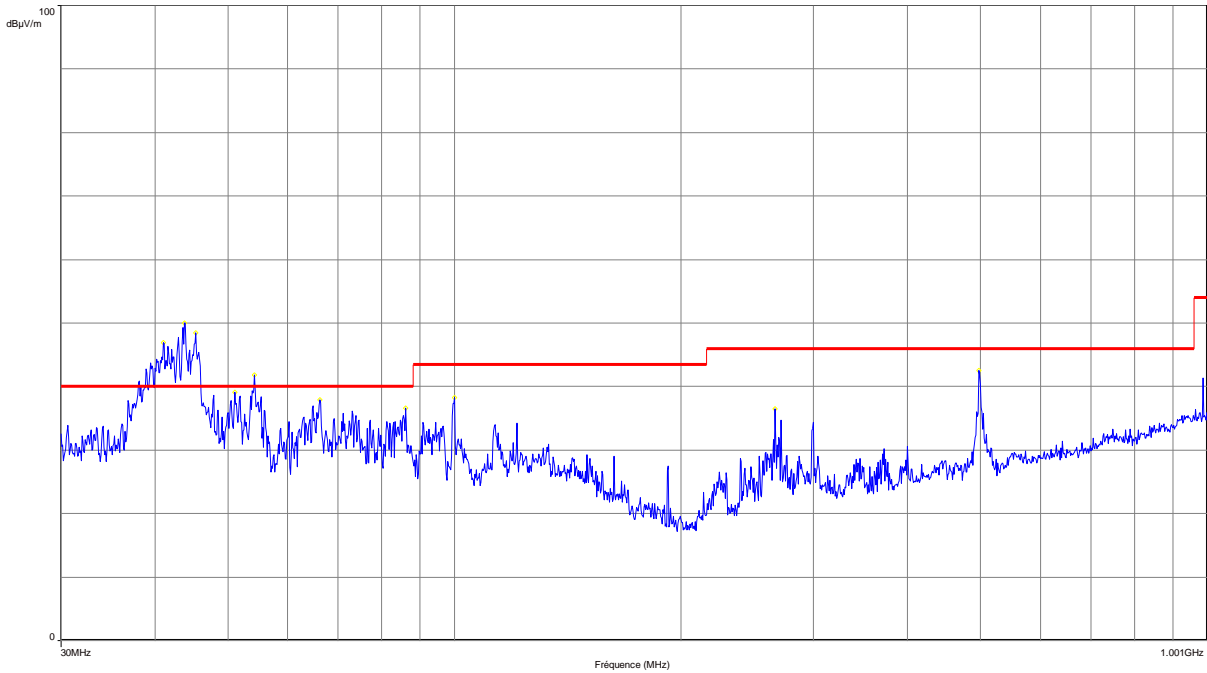
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**RADIATED EMISSIONS**

<b>Graph name :</b>	Emr#3	<b>Test configuration: 1</b>
<b>Limit :</b>	FCC Part15C	ICT250 - Axis XY (Worst case)
<b>Class :</b>	-	

**PARAMETERS**

<b>Antenna polarization:</b>	Verticale	<b>Legend:</b>
<b>Azimuth :</b>	0° - 360°	<span style="background-color: blue; color: white;">█</span> Peak Measure
<b>RBW :</b>	100kHz	<span style="background-color: red; color: white;">█</span> QPeak Limit@3m
<b>VBW :</b>	300kHz	
<b>Frequency :</b>	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
41.04	46.93
43.80	50.03
45.32	48.46
51.04	39.10
54.20	41.77
66.28	37.92
86.04	36.59
99.92	38.26
266.64	36.5
496.96	42.49



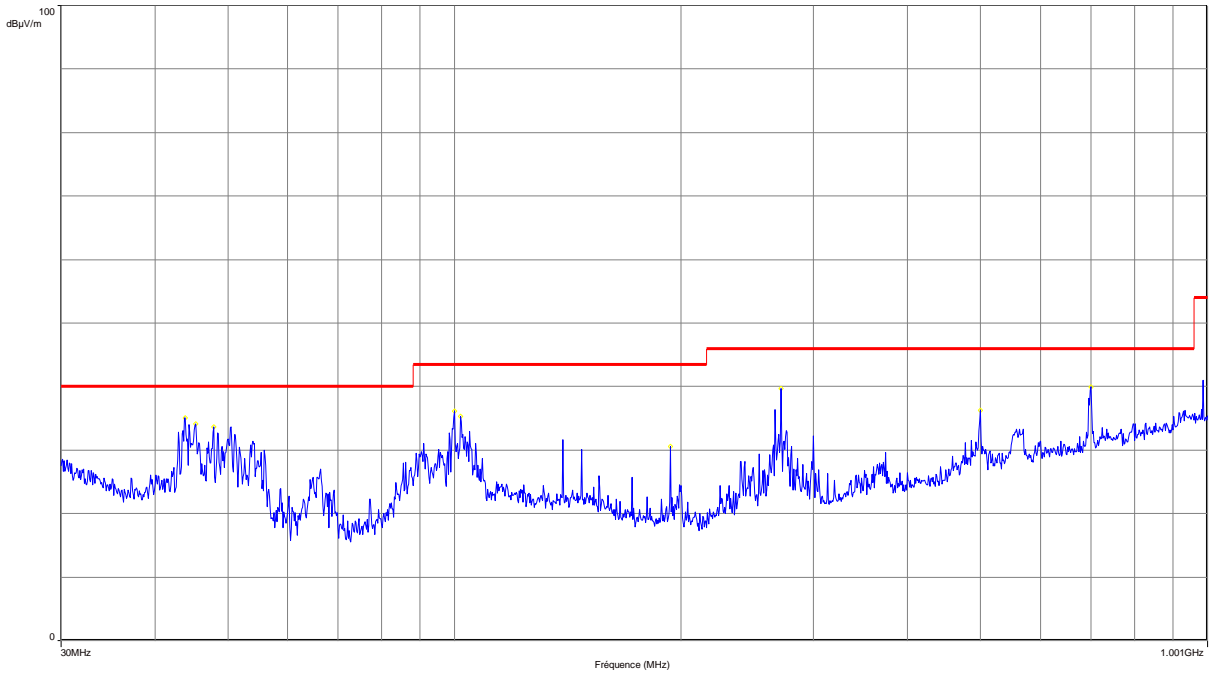
L C I E

**RADIATED EMISSIONS**

<b>Graph name :</b>	Emr#4	<b>Test configuration: 2</b>
<b>Limit :</b>	FCC Part15C	ICT250 - Axis XY (Worst case)
<b>Class :</b>	-	

**PARAMETERS**

<b>Antenna polarization:</b>	Horizontale	<b>Legend:</b>
<b>Azimuth :</b>	0° - 360°	<span style="background-color: blue; color: white;">█</span> Peak Measure
<b>RBW :</b>	100kHz	<span style="background-color: red; color: white;">█</span> QPeak Limit@3m
<b>VBW :</b>	300kHz	
<b>Frequency :</b>	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
43.84	35.11
45.28	34.11
47.84	33.69
99.96	36.09
101.92	35.27
193.60	30.63
271.40	39.69
499.16	36.20
699.92	39.89



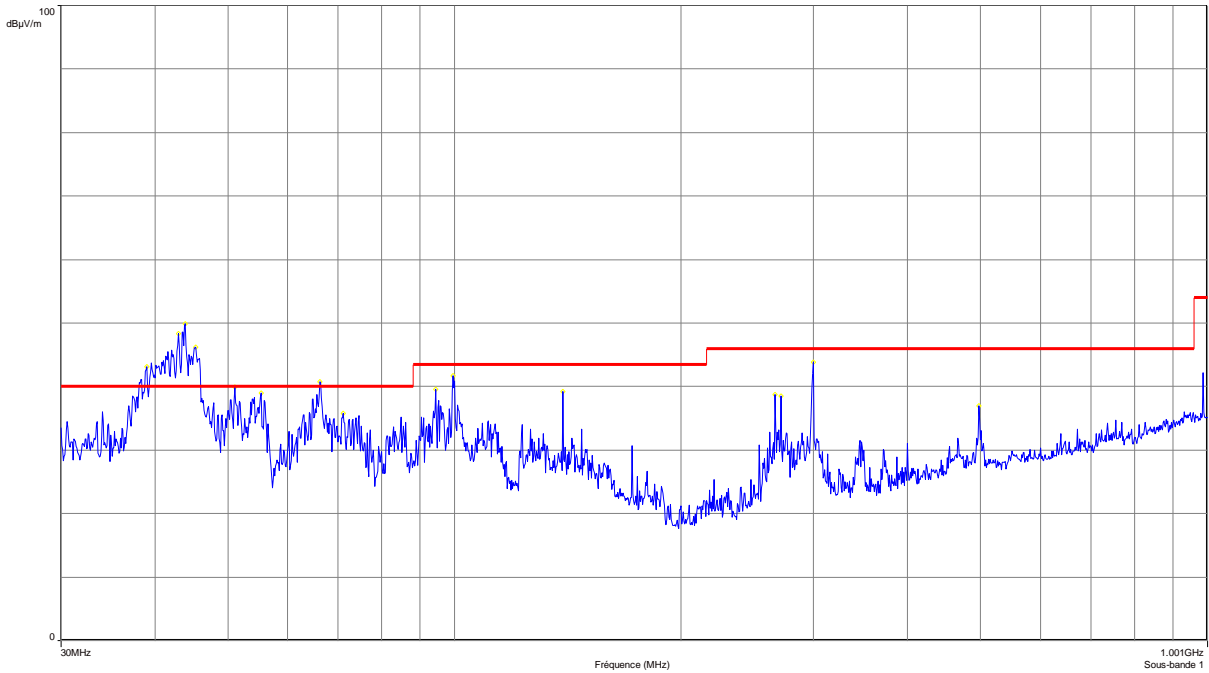
L C I E

**RADIATED EMISSIONS**

<b>Graph name :</b>	Emr#5	<b>Test configuration: 2</b>
<b>Limit :</b>	FCC Part15C	ICT250 - Axis XY (Worst case)
<b>Class :</b>	-	

**PARAMETERS**

<b>Antenna polarization:</b>	Verticale	<b>Legend:</b>
<b>Azimuth :</b>	0° - 360°	<span style="background-color: blue; color: white;">█</span> Peak Measure
<b>RBW :</b>	100kHz	<span style="background-color: red; color: white;">█</span> QPeak Limit@3m
<b>VBW :</b>	300kHz	
<b>Frequency :</b>	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
38.96	43.15
42.96	48.38
43.84	49.83
45.28	46.24
51.04	39.93
55.32	38.96
66.28	40.70
71.16	35.78
94.36	39.59
99.48	41.69
139.28	39.17
266.68	38.79
271.40	38.48
299.60	43.81
497.60	36.99



**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.