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LCIE

Rapport d'essai / Test report

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Objet / Subject : Essais de compatibilité électromagnétique conformément aux normes :
Electromagnetic compatibility tests according to the standards:
FCC CFR 47 Part 15, Subpart B.
ANSI C63.4 (2003)

Matériel testé / Apparatus under test :

- . **Produit / Product** : **IUR250**
- . **Marque / Trade mark** : **INGENICO**
- . **Constructeur / Manufacturer** : **INGENICO**
- . **Type / Model** : **IUR250-01T1659A**
- . **N° de série / serial number** : **11293IU00000518**
- . **FCCID** : **XKB-IUR250**

Date des essais / Test date : Du 21 au 29 Novembre 2011 / *From November 21st to 29th, 2011*

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 / Nicolas BILLAUD

document comporte / Composition of document: 15 pages

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MOIRANS, LE 31 JANVIER 2012 / *JANUARY 31ST, 2012*

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1. TEST PROGRAM

Standard: - FCC Part 15, Subpart B (Digital Devices)
 - ANSI C63.4 (2003)

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	Frequency	Quasi-peak value (dBµV)	Average value (dBµV)	COMPLY
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 30MHz-1GHz*	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			COMPLY

*§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: 58MHz (Declaration of provider)



2. APPARATUS UNDER TEST: CONFIGURATION

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

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

IUR250-01T1659A
FCCID: XKB-IUR250

Serial Number: 11293IU00000518

- **Option:**

- Motorised blocking of card, option installed in serial number tested.
IUR250-01T1659A can be provided with or without this option.

- **Power supply:**

- USB
- Rating: 5VDC
- Frequency: DC

- **Inputs/outputs:**

- 1 x USB port
- 1 x SMART CARD
- 1 x Earth
- 1 x RJ11, not used, maintenance only, not tested.

- **Cables:**

- 1 x USB shielded cable
- 1 x plait of mass

- **Auxiliaries equipment used during test:**

- 1 x IUP250-01T1760A - SN: 11293IU00000311
- 1 x laptop TOSHIBA SATELITE S1410-704 (PS141E-04YCM-3V), sn: 13594938G

2.2. RUNNING MODE

The EUT exercise program used during testing was exercised the EUT in a manner similar to a typical use. Test is done in loop we check that the number of tested loop is continuously increasing and that no error is reported on the screen of the IUP250 for conducted emission test. For radiated emission test we used the laptop and we check that the IUR is well functioning before and after measures.

2.3. EQUIPMENT MODIFICATIONS

None

2.4. SPECIAL ACCESSORIES

None

3. MEASUREMENT OF CONDUCTED EMISSION (150kHz-30MHz)

3.1. TEST CONDITIONS

Date of test : November 21st, 2011
Test performed by : A. MERLIN / N. BILLAUD
Atmospheric pressure : 992hPa
Relative humidity : 29%
Ambient temperature : 25.0°C

3.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT

The product has been tested according to ANSI C63.4-(2003) and FCC Part 15 subpart B.

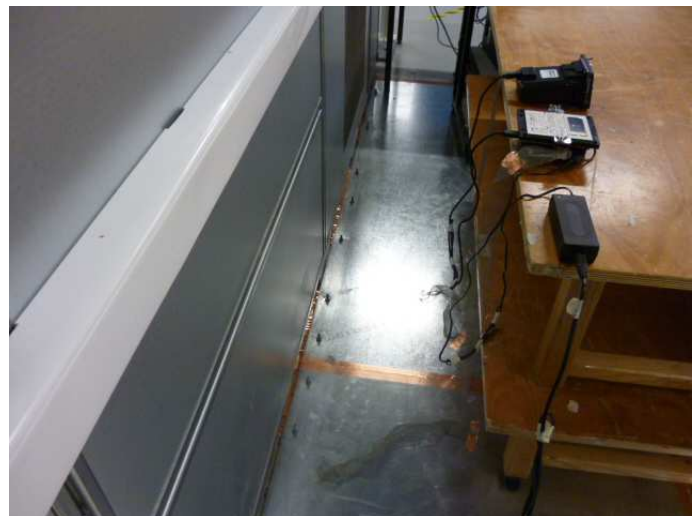
The product has been tested with 110V/60Hz power line voltage and compared to the FCC Part 15 subpart B §15.107 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

The EUT with its auxiliaries are set on a non-conducting table 80cm above the ground reference plane. The distance between the EUT and the LISN is 80cm. The EUT is 40cm away for the vertical ground plane. The EUT is powered through a LISN (measure). Auxiliaries are powered by another LISN.

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 and auxiliaries) 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.





3.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N°LCIE
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019
Transient limiter	HEWLETT PACKARD	11947A	A4049061
Cable	-	-	A5329197
LISN	EMCO	3825/2	C2320068

3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

3.5. MEASUREMENTS RESULTS

Mains terminals 110Vac/60Hz:

Measurements are performed on the phase (L1) and neutral (N) of the power line of the IUP250.

Measure on L1: graph **Emc#1** (see annex 1)

Measure on N: graph **Emc#2** (see annex 1)

RESULT: PASS

**4. MEASUREMENT OF RADIATED EMISSION (30MHz-1GHz)****4.1. TEST CONDITIONS**

Date of test : November 29th, 2011
Test performed by : A. MERLIN / N. BILLAUD
Atmospheric pressure : 999hPa
Relative humidity : 29%
Ambient temperature : 22.0°C

4.2. SETUP FOR RADIATED EMISSIONS MEASUREMENT

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 on the non-conducting table of 80 cm height.

The EUT is powered by 230Vac/50Hz (PC and auxiliaries)

Pre-characterisation measurement:

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. During the measurement, the EUT is rotated on a 360° range.

The pre-characterization graphs are obtained in PEAK detection.

For frequency band 1GHz to 12.5GHz, a search is performed in the semi-anechoic chamber in order to determine frequencies radiated by the EUT (Measuring distance reduced to 1m).

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

The product has been tested according to ANSI C63.4 (2003), FCC part 15 subpart B. 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** (30MHz to 1GHz) from the antenna and corrected according to requirements of 15.109.e).

Results are compared to the FCC part 15 subpart B §15.109 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. Continuous linear turntable azimuth search was performed with 360 degrees range.



Radiated emission test setup



4.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019
Radiated emission comb generator	BARDET	-	A3169050
Cable	-	-	A5329183
Cable	UTIFLEX	-	A5329189
Semi-Anechoic chamber #1	SIEPEL	-	D3044016
Antenna Bi-log	CHASE	CBL6111A	C2040172
Cable N/N	-	-	A5329038
Cable N/N	-	-	A5329206
Semi-Anechoic chamber #3	SIEPEL	-	D3044017
Antenna Bi-log	CHASE	CBL6111A	C2040051
Cable	SUCOFLEX	106G	A5329061
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329188
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329199
OATS	-	-	F2000409
Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066	F2000372
Antenna mast (OATS)	ETS Lindgren	2071-2	F2000392
Turntable (OATS)	ETS Lindgren	Model 2187	F2000403

4.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

4.5. MEASUREMENTS RESULTS

Pre-characterisation measurement: pre-scan measurement at 3m (PEAK detection, graph examples)

Polarisation H: graph **Emr#1** (see annex 1)

Polarisation V: graph **Emr#2** (see annex 1)

QUALIFICATION: 10 meters measurement on the Open Area Test Site.

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

Frequency range 30MHz to 1GHz:

Measurements are performed using a QUASI-PEAK detection (RBW=120kHz)

No	Frequency (MHz)	Limit Quasi-Peak (dBµV/m)	Measure Quasi-Peak (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	44.280	40.0	27.6	-12.4	0	V	100	11.6	PASS
2	60.320	40.0	28.0	-12.0	180	V	200	6.5	PASS

Note: Measures have been done at 10m distance and corrected according to requirements of 15.109.e) (M@3m = M@10m+10.5dB)



4.6. 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 μ V is obtained. The antenna factor of 7.4 and a cable factor of 1.1 is added. The amplifier gain of 29dB is subtracted, giving field strength of 32 dB μ V/m.

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

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

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



5. UNCERTAINTIES CHART

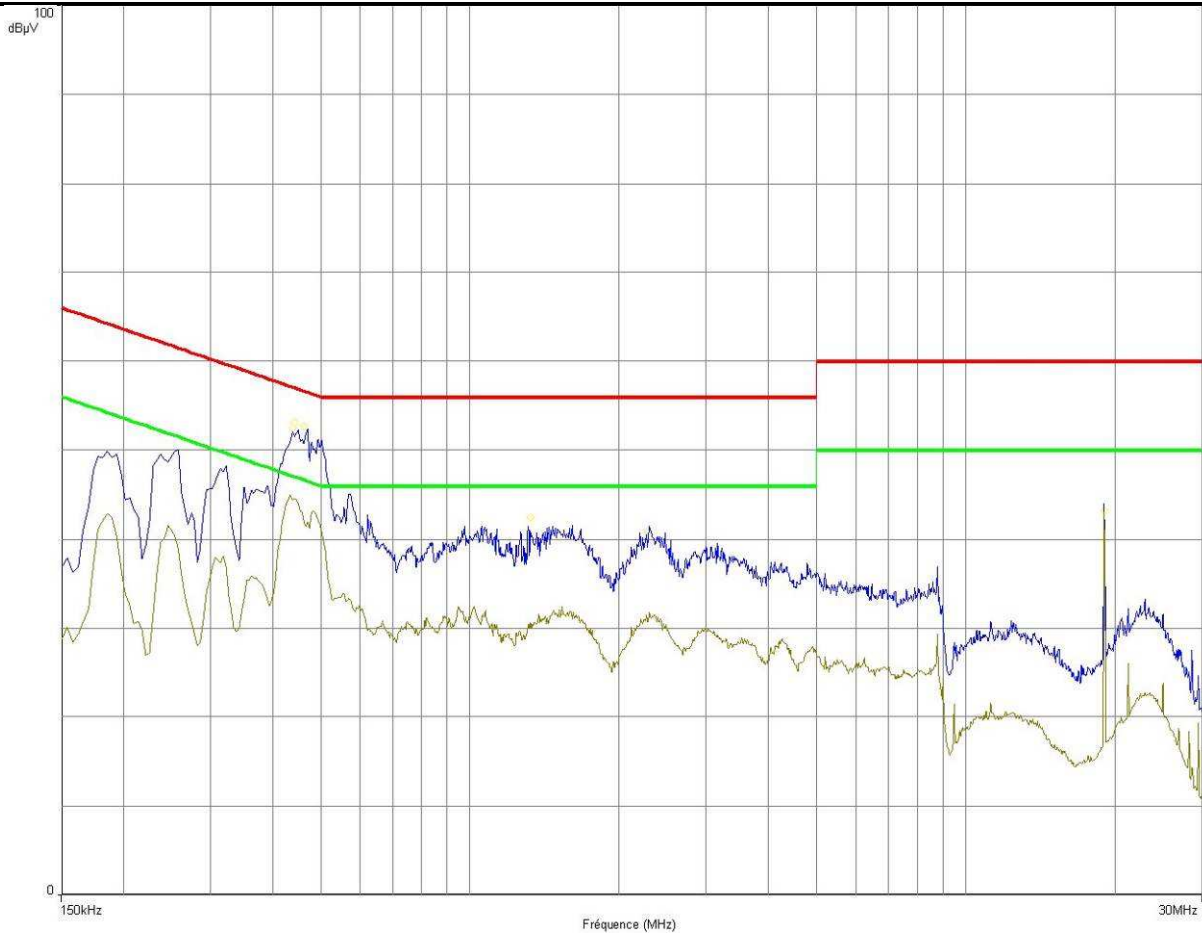
Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ± x	Incertitude limite du CISPR / CISPR uncertainty limit ± y
Mesure des perturbations conduites en tension sur le réseau d'énergie (monophasé) <i>Measurement of conducted disturbances in voltage on the power port (single line)</i>	3.57 dB	3.6 dB
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
Mesure du champ électrique rayonné IN SITU de 30 à 1000 MHz <i>IN SITU measurement of radiated electric field from 30 to 1000MHz</i>	A l'étude / Under consideration	5.2 dB



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6. ANNEX 1 (GRAPHS)

CONDUCTED EMISSIONS			
Graph name :	Emc#1	Test configuration:	
Limit :	FCC PART15B	Phase	
Class :	B		
PARAMETERS			
Voltage / Frequency :	230VAC / 50Hz	Legend:	
Line :	Phase1	Peak Measure	Average Measure
RBW :	9kHz		
VBW :	30kHz	QPeak Limit	Average Limit
Frequency :	150kHz- 30MHz		

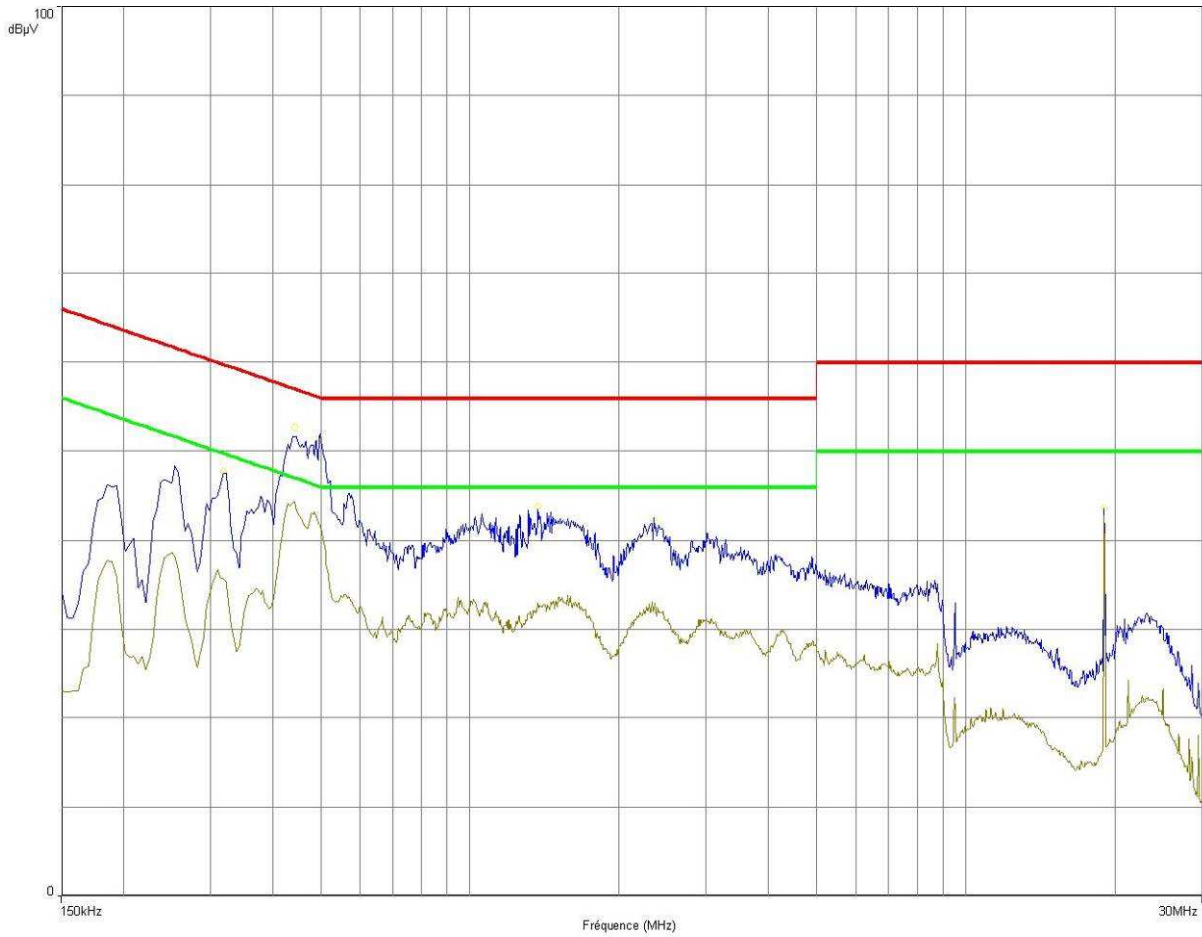


Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.438	44.66	46.88	-2.21	49.71	56.88	-7.16
0.442	44.55	46.51	-1.96	49.98	56.51	-6.53
0.462	42.45	46.00	-3.55	48.87	56.00	-7.13
1.322	29.99	46.00	-16.01	36.25	56.00	-19.75
2.286	30.88	46.00	-15.12	35.99	56.00	-20.01
19.046	41.81	50.00	-8.19	42.06	60.00	-17.94



L C I E

CONDUCTED EMISSIONS		
Graph name :	Emc#2	Test configuration:
Limit :	FCC PART15B	Neutral
Class :	B	
PARAMETERS		
Voltage / Frequency :	230VAC / 50Hz	Legend:
Line :	Phase2	Peak Measure
RBW :	9kHz	Average Measure
VBW :	30kHz	QPeak Limit
Frequency :	150kHz- 30MHz	Average Limit



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.318	36.14	49.76	-13.62	44.38	59.76	-15.38
0.442	44.34	47.10	-2.76	49.67	57.10	-7.43
0.498	41.61	46.03	-4.42	47.25	56.03	-8.78
1.370	32.27	46.00	-13.73	37.97	56.00	-18.03
2.346	31.77	46.00	-14.23	37.16	56.00	-18.84
19.046	42.30	50.00	-7.70	42.52	60.00	-17.48



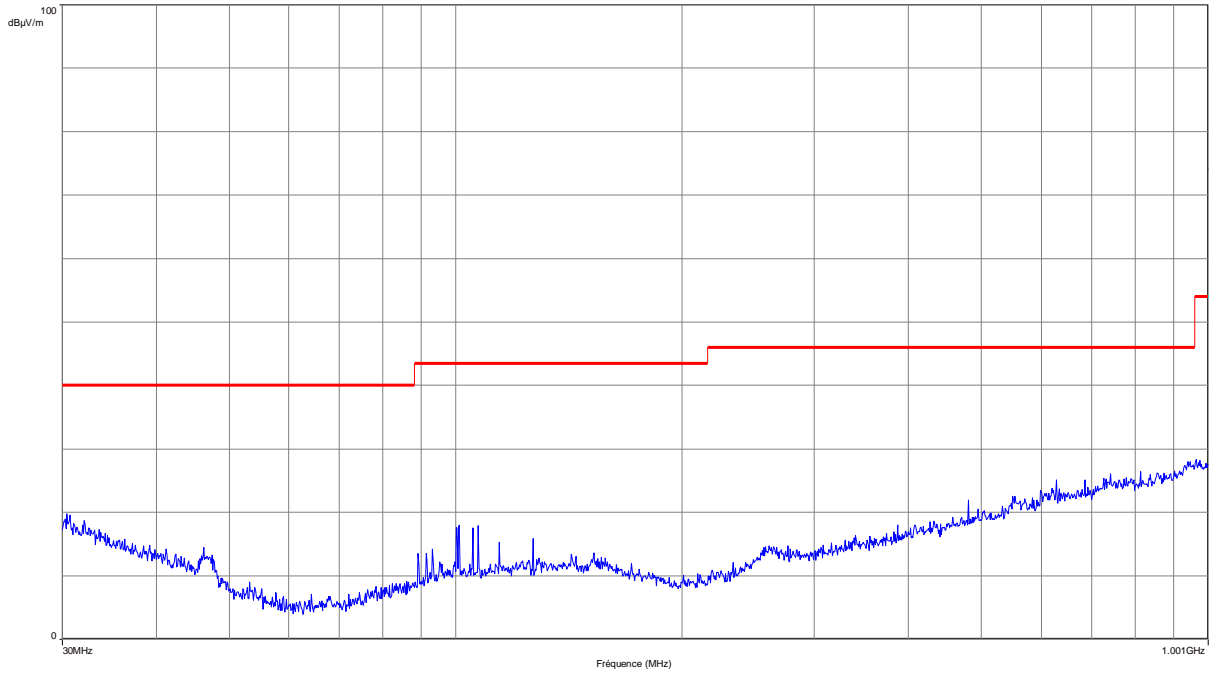
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RADIATED EMISSIONS

Graph name :	EMR#1	Test configuration:
Limit :	FCC Part15B	
Class :	B	

PARAMETERS

Antenna polarization:	Horizontale	Legend:
Azimuth :	0° - 360°	Peak Measure
RBW :	100kHz	QPeak Limit@3m
VBW :	300kHz	
Frequency :	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
No frequency has been detected.	



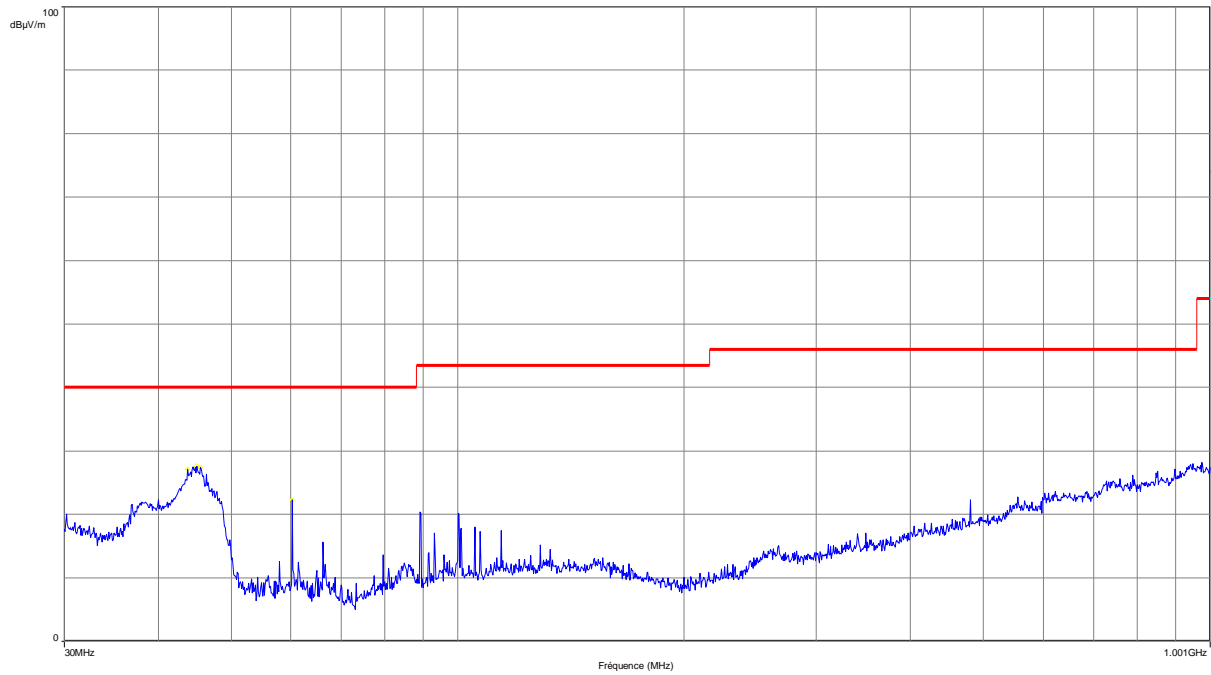
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RADIATED EMISSIONS

Graph name :	EMR#2	Test configuration:
Limit :	FCC Part15B	
Class :	B	

PARAMETERS

Antenna polarization:	Verticale	Legend:
Azimuth :	0° - 360°	█ Peak Measure
RBW :	100kHz	█ QPeak Limit@3m
VBW :	300kHz	
Frequency :	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
43.80	27.18
44.96	27.57
45.56	27.41
60.32	22.27