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Rapport d'essai / Test report

N° 221171-A1-R2-E

JDE : 113232

DELIVRE A / ISSUED TO

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Objet / Subject

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

Matériel testé / Apparatus under test

- . Produit / Product : **Lecteur sans contact / Contactless reader**
- . Marque / Trade mark : **INGENICO**
- . Constructeur / Manufacturer : **INGENICO**
- . Type / Model : **IUC180-00T1969 / IUC180-00T1990 / IUC180-00T1989**
- . Type sous test / Model under test : **IUC180-00T1989**
- . N° de série / serial number : **11283IU00000246**
- . FCC ID : **XKB-IUC18X-WD**
- . IC : **2586D-IUC18XWD**

Date des essais / Test date

: Du 2 au 12 Avril 2012 / *From April 2nd to 12th, 2012*

Lieu d'essai / Test location

: **LCIE SUD-EST**
ZI Centr'Alp – 170 rue de Chatagnon
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Test réalisé par / Test performed by

: Anthony MERLIN

Ce document comporte / Composition of document : 25 pages.

MOIRANS, LE 19 JUILLET 2012 / JULY 19TH, 2012

Ecrit par / *Written by*,
Anthony MERLIN

Approuvé par / *Approved by*
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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) |
|--|---|--------------------------------|-----------------------------|-----------------------|
| Limits for conducted disturbance at mains ports 150kHz-30MHz | Frequency | Quasi-peak value (dBµV) | Average value (dBµV) | PASS |
| | 150-500kHz | 66 to 56 | 56 to 46 | |
| | 0.5-5MHz | 56 | 46 | |
| | 5-30MHz | 60 | 50 | |
| Radiated emissions 9kHz-30MHz <i>CFR 47 §15.209 (a)</i> <i>CFR 47 §15.225</i> <i>RSS-Gen §4.9</i> | 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 |
| Radiated emissions 30MHz-25GHz* <i>CFR 47 §15.209 (a)</i> <i>CFR 47 §15.225</i> <i>RSS-Gen §4.9</i> | 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 |
| Fundamental field strength limit <i>CFR 47 §15.225</i> <i>RSS-210 §A2.6</i> | Operation within the band 13.110-14.010 MHz | | | PASS |
| Fundamental frequency tolerance <i>CFR 47 §15.225</i> <i>RSS-210 §A2.6</i> | Operation within the band 13.110-14.010 MHz | | | |
| Band edge compliance <i>CFR 47 §15.225</i> <i>RSS-210 §A2.6</i> | Operation within the band 13.110-14.010 MHz | | | PASS |
| Occupied bandwidth <i>RSS-Gen §4.6.1</i> | No limit | | | PASS |
| Receiver Spurious Emission** <i>RSS-Gen §4.10</i> | See RSS-Gen §4.10 | | | Not Applicable |

*§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).

The equipment IUC180 can be used with several internal option cards:

- COM2 + MDB Configuration n°2 – IUC180-00T1990
- COM2 + MDB + GPRS modular approval Configuration n°3 – IUC180-00T1989

The Equipment Under Test will be the configuration n°3 to represent others configurations (Worst case)
IUC180 has to be integrated in unattended devices. The test configuration is given by the manufacturer

2.2. HARDWARE IDENTIFICATION

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

IUC180-00T1989

Serial number: 11283IU00000246

FCC ID: **XKB-IUC18X-WD**

- Internal max frequencies <500MHz (Declaration of provider)

- **Power supply:**

- DC voltage, 12-30VDC, tested at 12VDC (worst case)

During all the tests, EUT is supplied by an AC/DC adaptor, not supplied with EUT so not tested, PHIHONG PSM36W-120TW, 100-240VAC / 1.5A / 50-60Hz, output 12VDC / 3A.

- **Input/output:**

- 1 x Power supply connector, 2 wires
- 5 x USB
- 1 x LAN
- 2 x COM
- 1 x Earth
- 1 x Jack "Clock"
- 1 x MDB master
- 1 x MDB slave, same connector that power supply
- 2 x SMA connector, GPRS and Bluetooth
- 2 x SAM
- 1 x SIM
- 1 x MicroSD

- **Modular Approval contained:**

- 1 x GPRS module, SAGEMCOM, HILO V2 INGENICO, FCC ID: VW3HILOV2

- **Auxiliaries used for testing:**

- 1 x Laptop TOSHIBA SATELLITE, PS141E-04YC, Sn: 13594938G
- 2 x SAM
- 1 x SIM
- 1 x Contactless card

• **I/O cables used for testing:**

- 1 x AC power cord, 2 wires, unshielded: 2m
- 1 x DC power supply cable (fixed on mains power unit), unshielded: 1.75m
- 1 x Ethernet cable Type: STP Cat 5e, shielded: 1m
- 5 x USB cables, shielded: 1m
- 2 x RS232 Com cables, RJ11, unshielded, 1.5m (COM 0 & COM 2)
- 1 x MDB-slave '6 pins' <-> MDB-master '8 pins' cable, unshielded, 4 wires, length: 1m
- 1 x Jack cable, unshielded, length: 0.2cm

• **Equipment information – 13.56MHz:**

- Type: Bluetooth Other: 13.56MHz RFID
- Frequency band: [13.56] MHz
- Number of channel: 1
- RF mode: TX/RX RX Standby
- Antenna type: Internal
- Antenna connector: Permanent external Permanent internal Temporary (only for tests)
 None
- Normal power source: 12VDC (host)
- Extreme temperature range: -30°C to +55°C
- Extreme test source voltage: 12VDC ±10% other:

2.3. EUT CONFIGURATION

For all tests:

A generic program test is loaded on EUT, in order to perform in loop following functions:

- Reading / writing SAM card (SAM1 & SAM2)
- Reading / writing µSD card (MMC)
- RX/TX on Serial port (COM0 & COM2)
- RX/TX between MDB master and slave
- Reading Contactless card

With laptop:

- Continuous Ethernet communication is performed from EUT to Laptop (Ping)

2.4. EQUIPMENT MODIFICATIONS

A ferrite (integrated secondary power supply PHIHONG PSM36W-120TW) is set on two wires which provided 12Vdc (MDB slave connector side).

A ferrite type WE 74271222(Two turns) is set on others MDB slave wires



3. RADIATED EMISSION DATA

3.1. CLIMATIC CONDITIONS

Date of test : April 2nd, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 993hPa
Relative humidity : 36%
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 | - | - | A5329183 |
| Cable OATS (Mast at 10m) | UTIFLEX | - | A5329188 |
| Cable | UTIFLEX | - | A5329189 |
| Cable | - | - | A5329191 |
| Cable OATS (Mast at 10m) | UTIFLEX | - | A5329199 |
| Semi-Anechoic chamber #1 | SIEPEL | - | D3044016 |
| 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 |
| Thermo-hygrometer | OREGON | BAR206 | B4204078 |
| Antenna mast (OATS) | LCIE | - | F2000288 |
| Turntable chamber (Cage#3) | ETS Lingren | Model 2165 | F2000371 |
| Turntable / Mast controller (OATS) | ETS Lindgren | Model 2066 | F2000372 |
| Turntable controller (Cage#2-3) | ETS Lingren | Model 2066 | F2000393 |
| Turntable (OATS) | ETS Lindgren | Model 2187 | F2000403 |
| Turntable chamber (Cage#2) | ETS Lingren | Model 2165 | F2000404 |
| Turntable chamber (Cage#1) | MATURO Gmbh | TT 2.0 SI | F2000406 |
| Antenna mast (Cage#1) | MATURO Gmbh | AM 4.0 | F2000407 |
| Turntable controller (Cage#1) | MATURO Gmbh | Control Unit | F2000408 |
| Table | LCIE | - | F2000438 |

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:

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

Emr#2

(See annex 1)

V polarization

Emr#3

(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* ¹ | 84.0 | 38.9 | -45.1 | 270 | 0 | 35.3 |

*¹: 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 2GHz.

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:

| 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 | 38.7 | -1.3 | 260 | V | 100 | 13.2 | |
| 2 | 54.237 | 40.0 | 32.3 | -7.7 | 270 | V | 100 | 7.9 | |
| 3 | 67.796 | 40.0 | 34.1 | -5.9 | 270 | V | 100 | 7.6 | |
| 4 | 81.230 | 40.0 | 36.1 | -3.9 | 120 | V | 100 | 9.5 | |
| 5 | 193.560 | 43.5 | 39.7 | -3.8 | 0 | V | 100 | 12.6 | |
| 6 | 274.996 | 46.0 | 33.8 | -12.2 | 300 | H | 200 | 16.3 | |
| 7 | 290.288 | 46.0 | 39.4 | -6.6 | 315 | V | 100 | 16.6 | |
| 8 | 624.880 | 46.0 | 37.9 | -8.1 | 355 | H | 300 | 24.2 | |

*: 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 |
|----|-----------------|------------------------|--------------------------|-----------------------|-------------------|----------|--------------|---------------------|----------|
|----|-----------------|------------------------|--------------------------|-----------------------|-------------------|----------|--------------|---------------------|----------|

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 μ 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 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.

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



4. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)

4.1. TEST CONDITIONS

Date of test : April 12th, 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 -30°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°C .

4.1. TEMPERATURE AND VOLTAGE FLUCTUATION

Temperature has been set at $+20^{\circ}\text{C}$, -20°C , -30°C and $+50^{\circ}\text{C}$.
 Voltage is varied from 10.2VDC to 13.8VDC
 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.

| Voltage | Temperature | -30°C | -20°C | 20°C | +55°C |
|-------------------------------|-------------|------------|------------|------------|------------|
| Mains voltage: 12.0VDC | | | | | |
| Frequency Drift (MHz) | | - 0.000007 | - 0.000005 | REF | + 0.000015 |
| Carrier level (dBc) | | - 1.1 | - 1.0 | REF | - 0.6 |
| Mains voltage: 10.2VDC | | | | | |
| Frequency Drift (MHz) | | - 0.000007 | - 0.000005 | + 0.000000 | + 0.000015 |
| Carrier level (dBc) | | - 1.1 | - 1.0 | + 0.0 | - 0.6 |
| Mains voltage: 13.8VDC | | | | | |
| Frequency Drift (MHz) | | - 0.000007 | - 0.000005 | + 0.000000 | + 0.000015 |
| Carrier level (dBc) | | - 1.1 | - 1.0 | + 0.0 | - 0.6 |

Frequency drift measured is **15 Hz** when the temperature is varied from -30°C to $+50^{\circ}\text{C}$ and voltage is varied from 12.0VDC $\pm 15\%$.

**4.2. TEST EQUIPMENT LIST**

| DESCRIPTION | MANUFACTURER | MODEL | N° LCIE |
|----------------------|-----------------|----------|----------|
| Passive loop antenna | EMCO | 7405-901 | A2240015 |
| Cable N/N | - | - | A5329038 |
| Climatic chamber | BIA CLIMATIC | CL 6-25 | D1022117 |
| Multimeter | FLUKE | 189 | A1240171 |
| Power supply DC 100V | HEWLETT PACKARD | 6634B | A704282 |
| Receiver 9kHz - 6GHz | ROHDE & SCHWARZ | FSL6 | A2642020 |

4.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

DC voltage is varied (worst case) because AC/DC adaptor won't sell with equipment.

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

Date of test : April 3rd, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1000hPa
Relative humidity : 41%
Ambient temperature : 21°C

5.2. TEST EQUIPMENT LIST

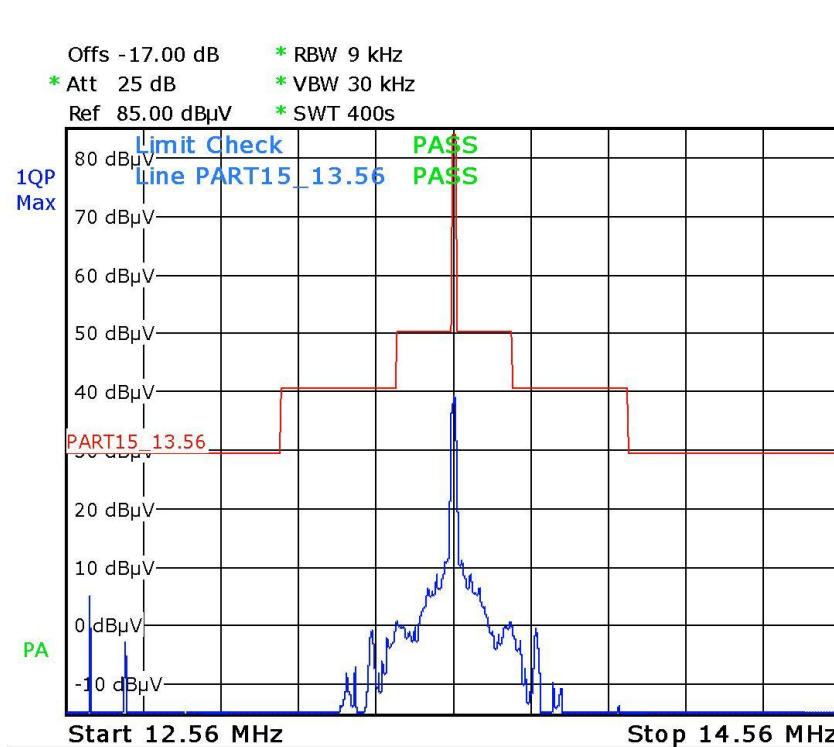
| DESCRIPTION | MANUFACTURER | MODEL | N° LCIE |
|----------------------|-----------------|---------|----------|
| Antenna Loop | ELECTRO-METRICS | EM-6879 | C2040052 |
| Cable | - | - | A5329190 |
| Receiver 9kHz - 6GHz | ROHDE & SCHWARZ | FSL6 | A2642020 |

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 analyser.



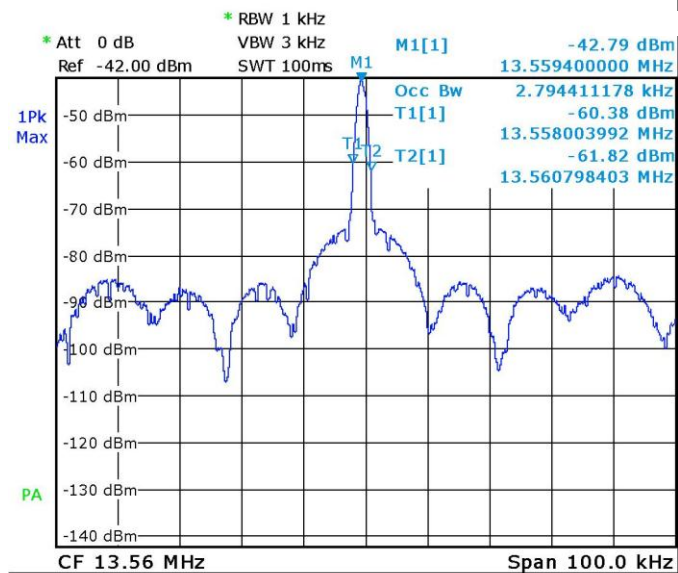
6. OCCUPIED BANDWIDTH

6.1. CLIMATIC CONDITIONS

Date of test : April 5th, 2012
 Test performed by : A.MERLIN
 Atmospheric pressure : 984hPa
 Relative humidity : 42%
 Ambient temperature : 22°C

6.2. TEST RESULTS

13.56MHz Measurement:



Measured occupied bandwidth is **2.8 kHz**

Measurement settings:

RBW = 1kHz / Video BW = 3kHz / SPAN = 100kHz

6.3. TEST EQUIPMENT LIST

| DESCRIPTION | MANUFACTURER | MODEL | N° LCIE |
|----------------------|-----------------|---------|----------|
| Cable SMA/SMA | - | - | A5329373 |
| Receiver 20Hz – 8GHz | ROHDE & SCHWARZ | ESU8 | A2642019 |
| Antenna Loop | ELECTRO-METRICS | EM-6879 | C2040052 |
| Cable | - | - | A5329190 |

6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None



7. CONDUCTED EMISSION DATA

7.1. CLIMATIC CONDITIONS

Date of test : April 6th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 983hPa
Relative humidity : 43%
Ambient temperature : 21°C

7.1. 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 30MHz.

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 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.

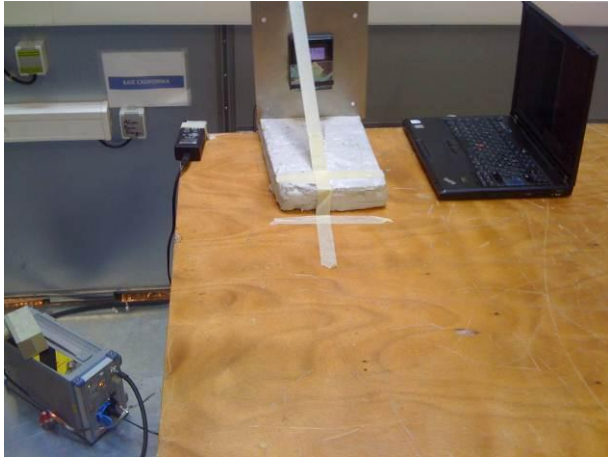
Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

7.2. TEST SETUP

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 trough the LISN (measure).



Conducted emission test setup

**7.3. TEST EQUIPMENT LIST**

| DESCRIPTION | MANUFACTURER | MODEL | N° LCIE |
|-----------------------------------|-----------------|---------|----------|
| Cable | - | - | A5329562 |
| Conducted emission comb generator | BARDET | - | A3169049 |
| LISN | RHODE & SCHWARZ | ENV216 | C2320123 |
| Receiver 20Hz – 8GHz | ROHDE & SCHWARZ | ESU8 | A2642019 |
| Thermo-hygrometer | LACROSS Techn. | WS-2357 | B4206014 |
| 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.
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 (see annex 1)
Measure on N: graph Emc#2 (see annex 1)

RESULT: PASS



L C I E

8. ANNEX 1 (GRAPHS)

RADIATED EMISSIONS

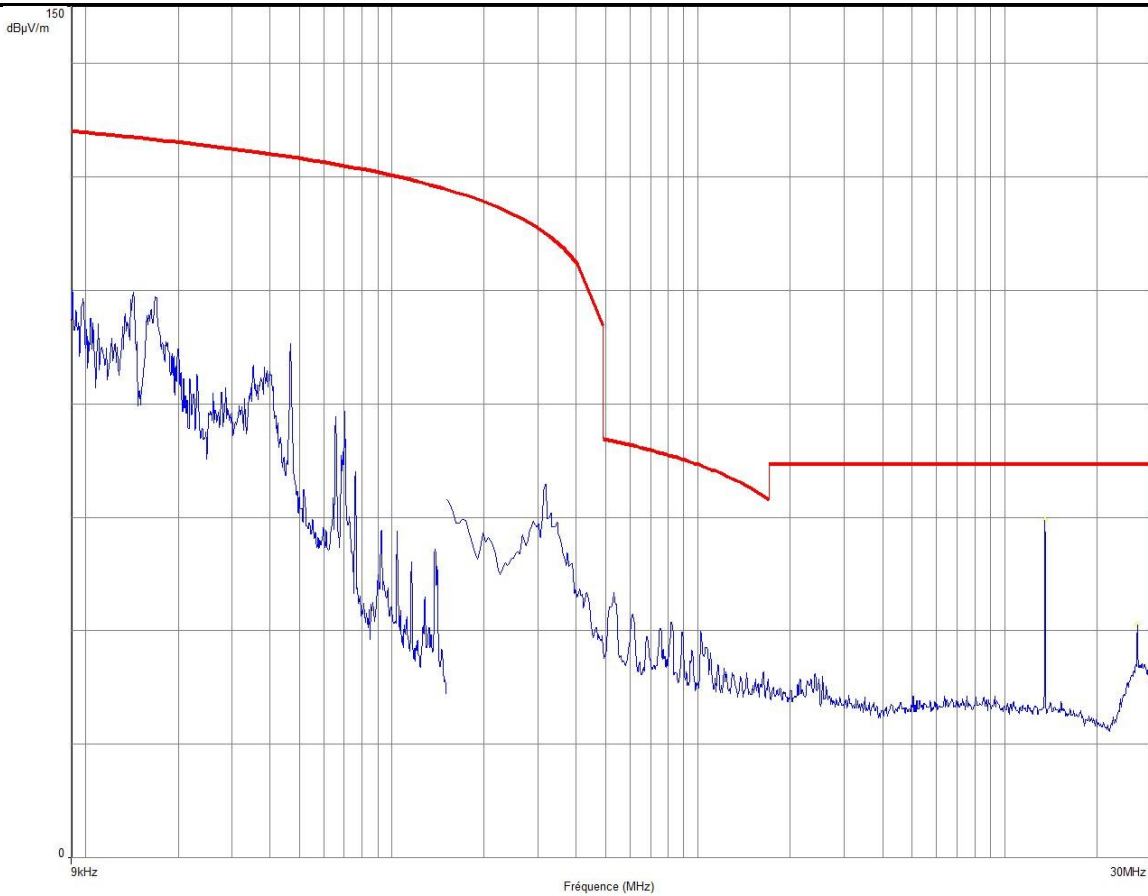
| | | |
|---------------------|-------------|--------------------------------|
| Graph name : | Emr#1 | Test configuration: |
| Limit : | FCC Part15C | Configuration n°3 (worst case) |
| Class : | Class B | |

PARAMETERS

| | | |
|------------------------------|--------------|----------------|
| Antenna polarization: | Horizontale | Legend: |
| Azimuth : | 0° - 360° | Peak Measure |
| RBW : | 100Hz | QPeak Limit@3m |
| VBW : | 300Hz | |
| Frequency : | 9kHz- 150kHz | |

PARAMETERS

| | | |
|------------------------------|---------------|----------------|
| Antenna polarization: | Horizontale | Legend: |
| Azimuth : | 0° - 360° | Peak Measure |
| RBW : | 10kHz | QPeak Limit@3m |
| VBW : | 30kHz | |
| Frequency : | 150kHz- 30MHz | |



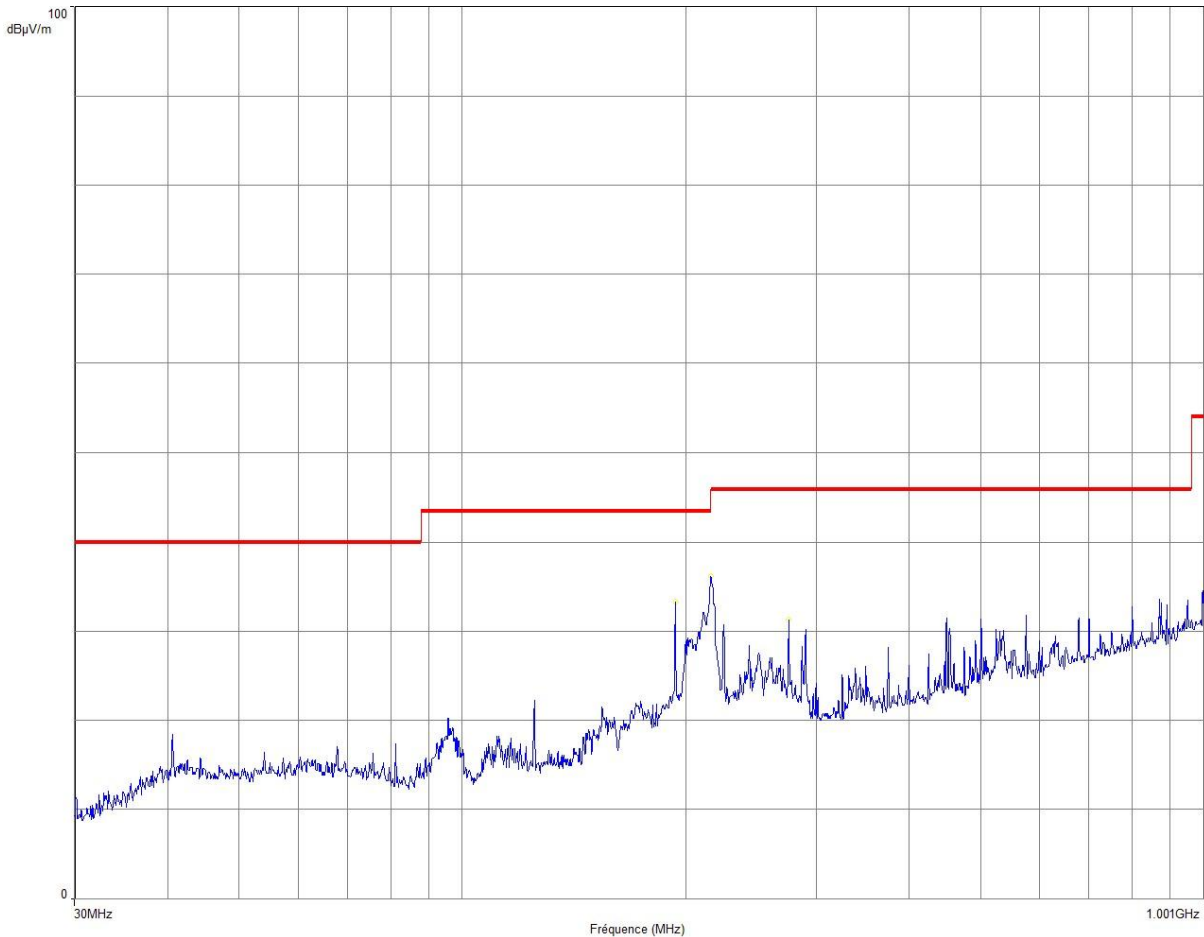
| Frequency (MHz) | Peak (dBµV/m) |
|-----------------|---------------|
| 13.558* | 59.51 |
| 27.122 | 41.04 |

*Carrier Frequency



L C I E

| RADIATED EMISSIONS | | |
|-----------------------|-----------------|--------------------------------|
| Graph name : | Emr#2 | Test configuration: |
| Limit : | FCC Part15C | Configuration n°3 (worst case) |
| Class : | Class B | |
| PARAMETERS | | |
| Antenna polarization: | Horizontale | Legend: |
| Azimuth : | 0° - 360° | Peak Measure |
| RBW : | 100kHz | |
| VBW : | 300kHz | QPeak Limit@3m |
| Frequency : | 30MHz- 1.001GHz | |

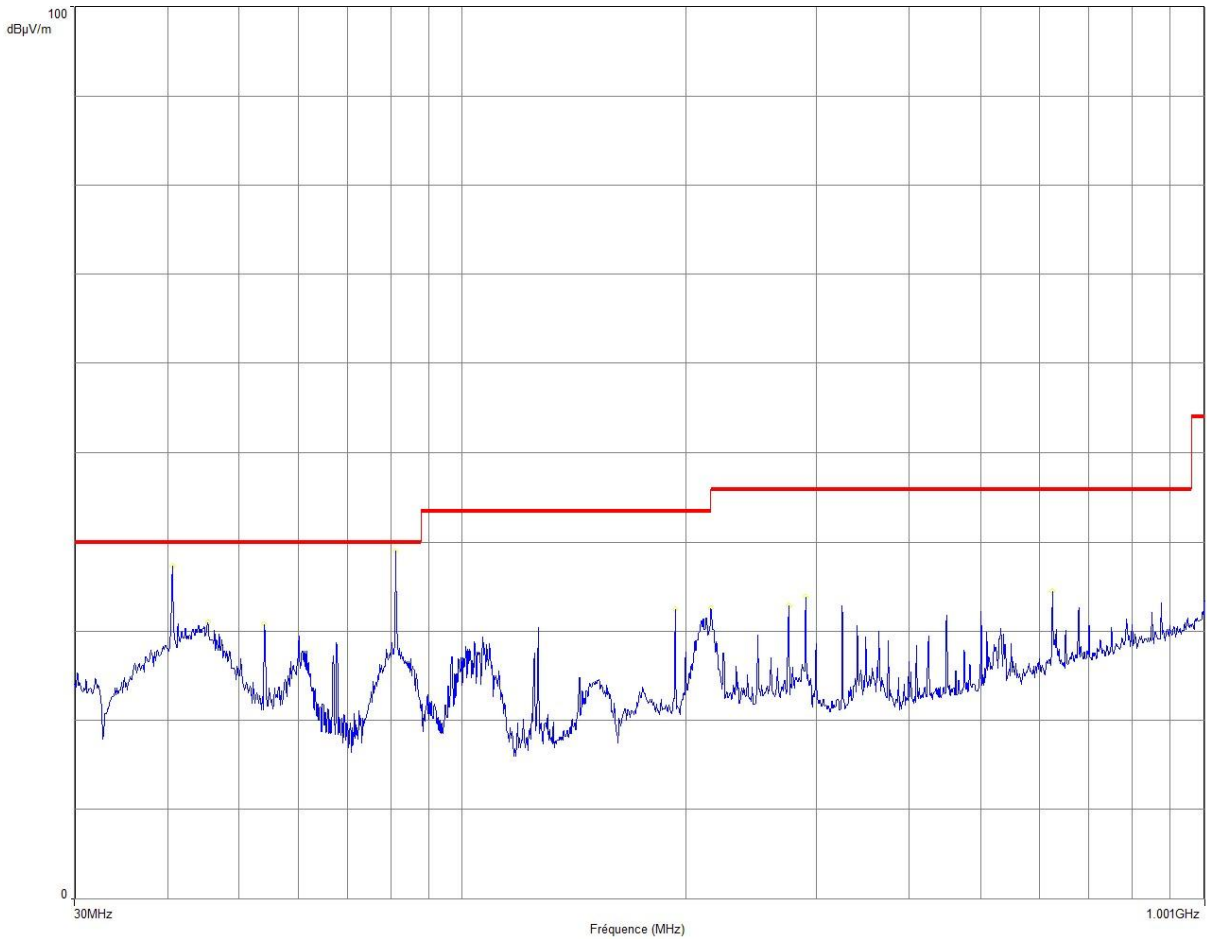


| Frequency (MHz) | Peak (dBµV/m) |
|-----------------|---------------|
| 193.56 | 33.27 |
| 216.52 | 36.15 |
| 275.44 | 31.27 |



L C I E

| RADIATED EMISSIONS | | |
|------------------------------|-----------------|--|
| Graph name : | Emr#3 | Test configuration: |
| Limit : | FCC Part15C | Configuration n°3 (worst case) |
| Class : | 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) |
|-----------------|---------------|
| 40.60 | 37.30 |
| 45.40 | 31.00 |
| 54.12 | 30.80 |
| 81.28 | 38.99 |
| 193.64 | 32.47 |
| 216.48 | 32.55 |
| 275.04 | 32.87 |
| 290.24 | 33.91 |
| 624.88 | 34.55 |



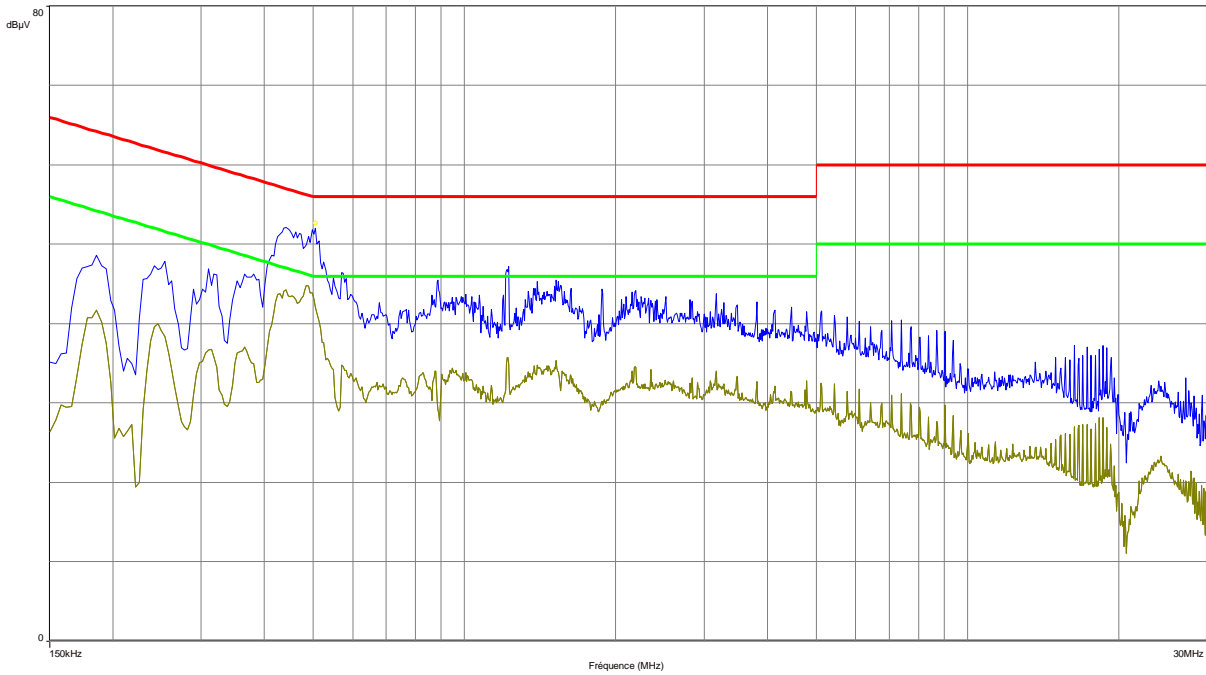
L C I E

RADIATED EMISSIONS

| | | |
|---------------------|----------|--------------------------------|
| Graph name : | Emc#1 | Test configuration: |
| Limit : | EN 55022 | Configuration n°3 (worst case) |
| Class : | B | |

PARAMETERS

| | | | |
|------------------------------|---------------|----------------|-----------------|
| Voltage / Frequency : | 110VAC / 60Hz | Legend: | |
| Line : | Phase | 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) |
|-----------------|------------|----------------|-------------------|--------------|-----------------|-----------------------|
| 0.506 | 41.92 | 46.00 | -4.08 | 49.18 | 56.00 | -6.82 |



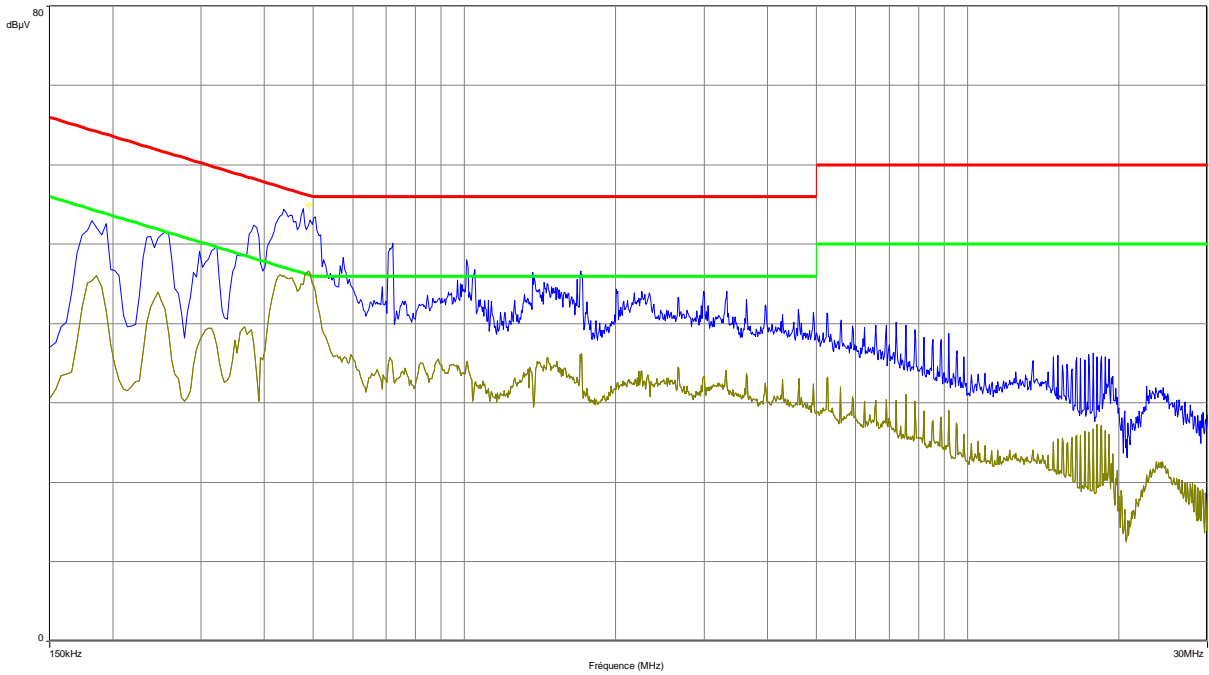
L C I E

RADIATED EMISSIONS

| | | |
|---------------------|----------|--------------------------------|
| Graph name : | Emc#2 | Test configuration: |
| Limit : | EN 55022 | Configuration n°3 (worst case) |
| Class : | B | |

PARAMETERS

| | | | |
|------------------------------|---------------|----------------|-----------------|
| Voltage / Frequency : | 110VAC / 60Hz | Legend: | |
| Line : | Neutral | 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) |
|-----------------|------------|----------------|-------------------|--------------|-----------------|-----------------------|
| 0.490 | 46.01 | 46.17 | -0.16 | 51.22 | 56.17 | -4.95 |



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.