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Rapport d'essai / *Test report*

JDE : 114913 **N°** 441427-R1-E

DELIVRE A / *ISSUED TO* : **GEMALTO**
Avenue du Pic de Bertagne
BP 100
13881 GEMENOS – France

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* : **Lecteur de carte / Card reader**
- Marque / *Trade mark* : **GEMALTO**
- Constructeur / *Manufacturer* : **GEMALTO**
- Type / *Model* : **IDBRIDGE CT40**
- N° de série / *serial number* : **R12425324800040**
- FCCID : **MESIDBCT40**

Date des essais / *Test date* : Le 18 Juin 2012 / *June 18th, 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

document comporte / *Composition of document:* 15 pages

MOIRANS, LE 4 JUILLET 2012 / *JULY 4TH, 2012*

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SUMMARY

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)**	**PASS**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 30MHz-1GHz* Highest frequency < 104MHz (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**

***§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.

2. APPARATUS UNDER TEST: CONFIGURATION

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

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

IDBRIDGE CT40 **Serial Number: R12425324800040**

- **Inputs/outputs:**

- USB cable

- **Cables:**

- USB cable, shielded, length: 1.5m

- **Auxiliaries equipment used during test:**

- 1 x Laptop TOSHIBA SATELITE S1410-704 (PS141E-04YCM-3V), Sn: 13594938G

2.2. RUNNING MODE

The EUT exercise program (Apitest) used during radiated and conducted testing in loop was designed to exercise the EUT in a manner similar to a typical use:

- Smart card: Reading – comparison
- Answer To Reset (ATR)

2.3. EQUIPMENT MODIFICATIONS

None

2.4. SPECIAL ACCESSORIES

None

3. MEASUREMENT OF CONDUCTED EMISSION (150KHZ-30MHZ)

3.1. TEST CONDITIONS

Date of test : June 18th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 994hPa
Relative humidity : 42%
Ambient temperature : 23°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 150kHz to 30MHz. 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
Conducted emission comb generator	BARDET	-	A3169049
LISN	RHODE & SCHWARZ	ENV216	C2320123
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019
Thermo-hygrometer	HUGER	-	B4204052
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204

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 PC.

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 : June 18th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 994hPa
Relative humidity : 42%
Ambient temperature : 23°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 USB, laptop port.

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.

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
Antenna Bi-log	CHASE	CBL6111A	C2040051
Antenna Bi-log	CHASE	CBL6111A	C2040172
Cable N/N	-	-	A5329038
Cable	SUCOFLEX	106G	A5329061
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329188
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 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020
Receiver 20-1000MHz	ROHDE & SCHWARZ	ESVS30	A2642006
Thermo-hygrometer	HUGER	-	B4204052
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 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
Table	MATURO Gmbh	-	F2000437

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**	*Axis X/Y, worst case*	(see annex 1)
Polarisation V:	graph **Emr#2**	*Axis X/Y, worst case*	(see annex 1)

QUALIFICATION: 10 / 3 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 (Meas-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	38.320	40.0	34.6	**-5.4**	230	V	100	14.2	/
2	52.800	40.0	38.9	**-1.1**	220	V	100	8.2	/
3	64.400	40.0	31.3	**-8.7**	210	V	120	7.3	/
4	73.900	40.0	29.1	**-10.9**	70	V	200	8.4	/
5	114.280	43.5	30.0	**-13.5**	130	V	100	14.7	/
6	214.840	43.5	33.0	**-10.5**	275	H	220	13.4	/
7	298.280	46.0	38.3	**-7.7**	75	V	110	16.8	/
8	497.960	46.0	36.7	**-9.3**	310	V	220	21.7	/
9	996.121	54.0	42.3	**-11.7**	300	V	320	29.5	/

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 52.5dBµV 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 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.

5. UNCERTAINTIES CHART

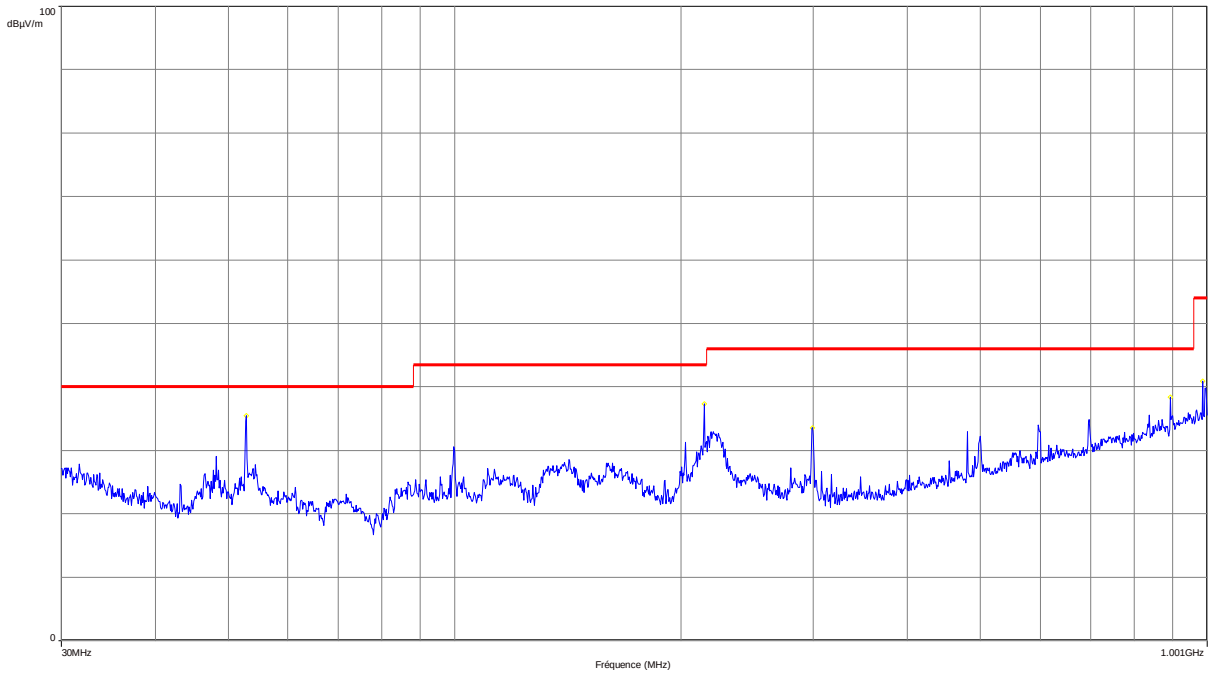
Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ± x**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ± y**
Mesure des perturbations conduites en tension sur le réseau d'énergie (monophasé) *Measurement of conducted disturbances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

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par le CISPR, la conformité de l'échantillon est établie directement par les niveaux limites applicables. Ce tableau regroupe l'ensemble des incertitudes maximales pour les essais réalisables dans le laboratoire, qu'ils aient été ou non réalisés dans le cadre du présent rapport / *The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report*

6. ANNEX 1 (GRAPHS)

RADIATED EMISSIONS		
Graph name :	Emr#1	**Test configuration:**
Limit :	FCC Part15B	Pol H - IDBridge CT40
Class :	B	

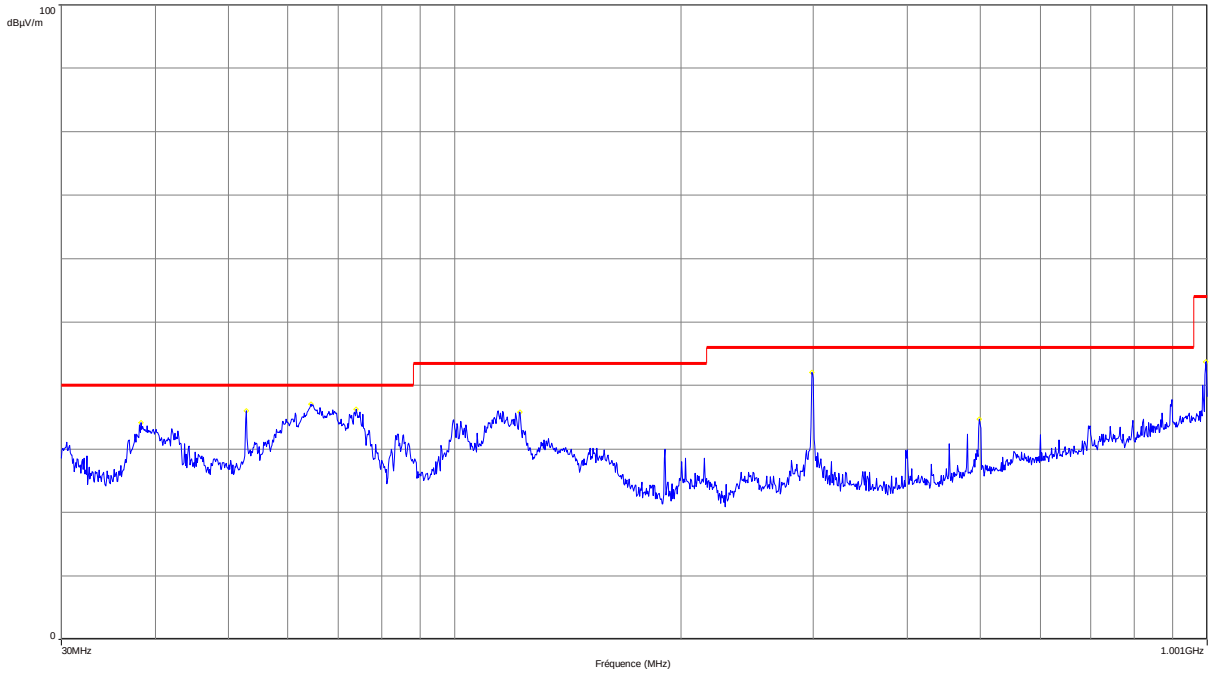
PARAMETERS		
Antenna polarization:	Horizontale	**Legend:**
Azimuth :	0°- 360°	**Peak Measure**
RBW :	100kHz	
VBW :	300kHz	**QPeak Limit@3m**
Frequency :	30MHz- 1.001GHz	



Frequency (MHz)	Peak (dBµV/m)
52.84	35.48
214.84	37.29
299.00	33.59
894.80	38.41
987.52	40.86

RADIATED EMISSIONS		
Graph name :	Emr#2	**Test configuration:**
Limit :	FCC Part15B	Pol V - IDBridge CT40
Class :	B	

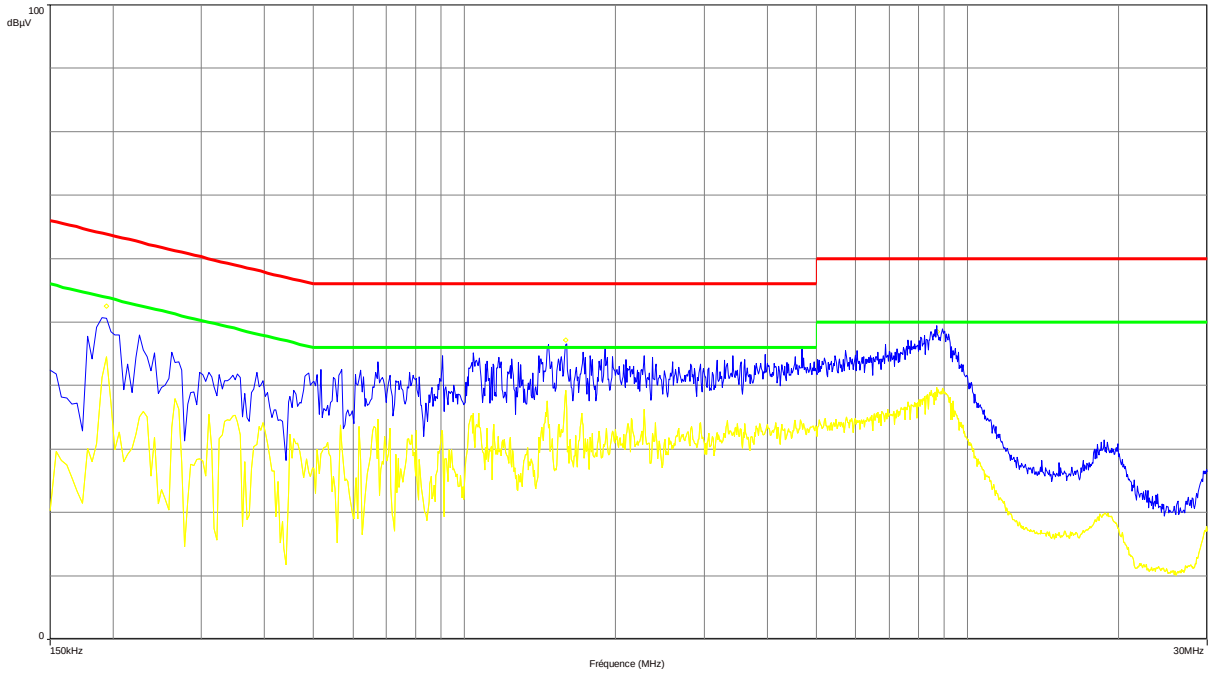
PARAMETERS			
Antenna polarization:	Verticale	**Legend:**	
Azimuth :	0°- 360°		**Peak Measure**
RBW :	100kHz		
VBW :	300kHz		**QPeak Limit@3m**
Frequency :	30MHz- 1.001GHz		



Frequency (MHz)	Peak (dBµV/m)
38.32	34.11
52.80	36.05
64.40	37.12
73.92	36.21
122.00	35.80
298.28	42.09
497.96	34.74
996.12	43.74

RADIATED EMISSIONS		
Graph name :	Emc#1	**Test configuration:**
Limit :	EN 55022	Phase - 110VAC/60Hz
Class :	B	

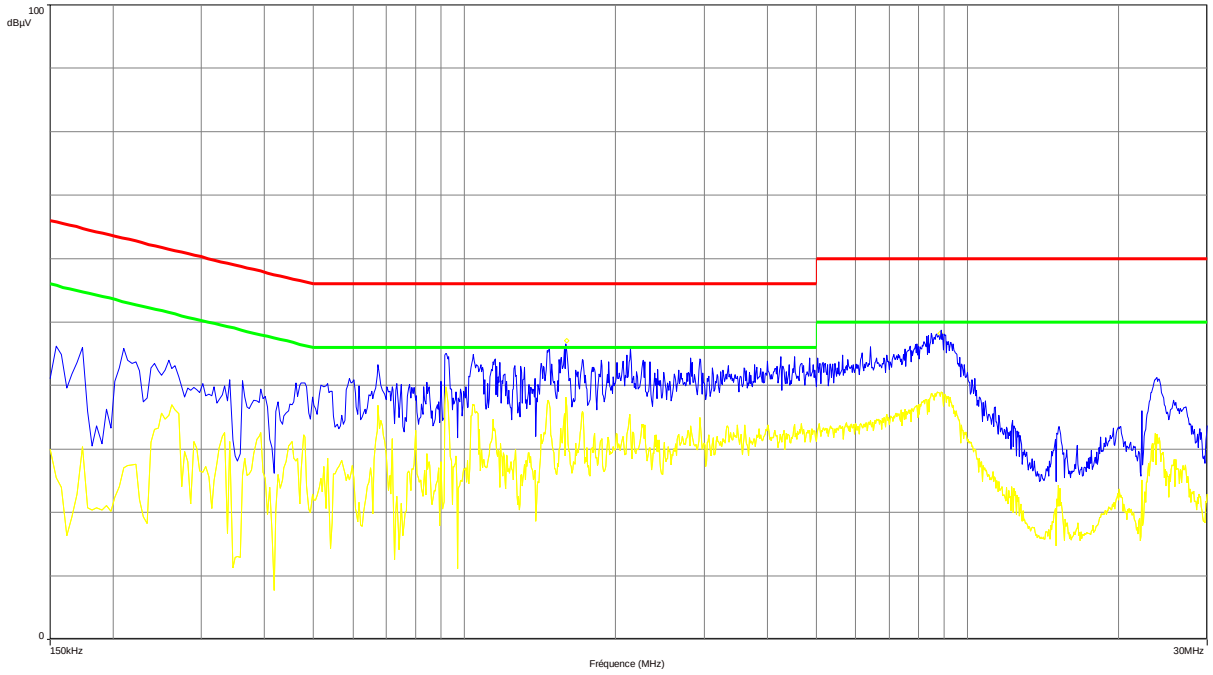
PARAMETERS					
Voltage / Frequency :	110VAC/60Hz	**Legend:**			
Line :	Phase		**Peak Measure**		**Average Measure**
RBW :	9kHz				
VBW :	30kHz		**QPeak Limit**		**Average Limit**
Frequency :	150kHz- 30MHz				



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
0.194	35.66	53.86	**-18.20**	46.29	63.86	**-17.57**
1.590	36.10	46.00	**-9.90**	43.61	56.00	**-12.39**
8.714	37.39	50.00	**-12.61**	43.29	60.00	**-16.71**

RADIATED EMISSIONS		
Graph name :	Emc#2	**Test configuration:**
Limit :	EN 55022	Neutral - 110VAC/60Hz
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)
1.598	35.51	46.00	**-10.49**	43.19	56.00	**-12.81**
8.838	37.31	50.00	**-12.69**	43.10	60.00	**-16.90**