

LCIE
Etablissement de Moirans
ZI Centr'Alp
170, rue de Chatagnon
38430 Moirans

RCS Grenoble 408 363 174

Tél. : +33 4 76 07 36 36
Fax : +33 4 76 55 90 88



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Rapport d'essai / Test report

N° 200901-5116CR-A2-R1-E

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GENEVE – SUISSE

Objet / Subject

Essais de compatibilité électromagnétique conformément aux normes :
Electromagnetic compatibility tests according to the standards:
- FCC CFR 47 Part 15, Subpart C (chapter 15.247)
- IC Radio Standards Specification : RSS-210

Matériel testé / Apparatus under test :

• Produit / Product	: Energy Meter Node (EMN)
• Marque / Trade mark	: LEM
• Constructeur / Manufacturer	: LEM
• Type / Model	: EMN 1000 W0 & EMN 500 D3-SP2
• N° de série / serial number *	: 19047 *
• FCC ID	: UVJ-EMN-A2-L-24
• IC number	: 6881A-EMNA2L24

* : information donnée par le client / information given by the customer

Date des essais / Test date

: Du 23 au 27 février 2009 / February 23rd to 27th, 2009

Lieu d'essai / Test location

: BUREAU VERITAS LCIE SUD-EST
ZI Centr'Alp – 170 rue de Chatagnon
38430 MOIRANS - France

Test réalisé par / Test performed by : Laurent CHAPUS

Ce document comporte / Composition of document : 3 pages.

MOIRANS, LE 22 SEPTEMBRE 2009 / SEPTEMBER 22nd, 2009

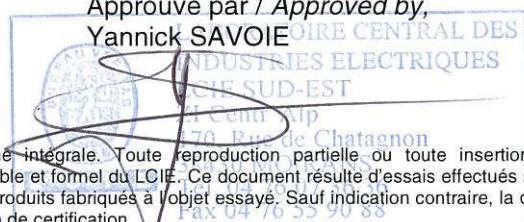
Ecrit par / Written by
Laurent CHAPUS

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Approuvé par / Approved by,

Yannick SAVOIE



LCIE

33, av du Général Leclerc
BP 8
92266 Fontenay-aux-Roses cedex
France

Tél : +33 1 40 95 60 60
Fax : +33 1 40 95 86 56
contact@lcie.fr
www.lcie.fr

Société par Actions Simplifiée
au capital de 15 745 984 €
RCS Nanterre B 408 363 174
www.lcie.com



1. TEST PROGRAM

Standard: FCC CFR 47, PART 15, Subpart C

ANSI C63-4 (2003).

Requirements for intentional radiator. Chapter 15.247 (Operation within the band 2400-2483.5 MHz)

Digitally modulated radiators.

FCC Guidance "Measurement of Digital Transmission Systems operating under Section 15.247"

Standard: RSS-210 Issue 7 -Jun 2007 (Annex 8)

RSS-Gen Issue 2 - Jun 2007

TEST	Paragraph number (FCC Part 15.247)	Spec. (FCC Part 15.247)	RESULTS (comments)
Power line conducted emissions	15.207 (a)	Table 15.207 (a)	PASS
Minimum 6dB bandwidth	15.247 (a)(2)	Shall be at least 500kHz	PASS
Peak Output Power	15.247 (b) (3)	1W max.	PASS
Spurious emissions (Radiated)	15.247 (d)	Table 15.209 (a) Restricted bands	PASS
Peak Power Spectral Density	15.247 (e)	Shall not be greater than 8dBm in any 3 kHz band	PASS

General conclusion:

Measures performed on samples of the product EMN 1000 W0 & EMN 500 D3-SP2, Sn: 19047, in configuration and description presented in this test report, show compliance levels with FCC CFR 47, Part 15 C, section 15.247 and related sections.

Measures performed on samples of the product EMN 1000 W0 & EMN 500 D3-SP2, Sn: 19047, in configuration and description presented in this test report, show compliance levels with IC standards RSS-Gen and RSS-210.



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2. SYSTEM TEST CONFIGURATION

2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it).
Product range covered by this test report:

Product type	Product description	Electrical Scheme xx				
		W0	W2	W3	W4	D3
EMN CT	EMN 20 xx	o	o	o	o	o
	EMN 100 xx	o	o	o	o	o
EMN RT	EMN 200 xx	o	o	o	o	o
	EMN 500 xx	o	o	o	o	o
	EMN 1000 xx	o	o	o	o	o
	EMN 2000 xx	o	o	o	o	o
	EMN CT SP2	EMN 100 xx -SP2				o
EMN RT SP2	EMN 500 xx -SP2					o
	EMN 2000 xx -SP2					o
		o = available				

example: EMN 100 D3-SP2

The equipment EMN 1000 W0 and EMN 500 D3-SP2 will be used for test, as representative of the range of product.
Equipments listed above contain the 2.4GHz module: ZMN2430HPA (CIRONNET Inc.).
The model as above are identical to each other, except their model designation and probe dynamic range.

2.2. HARDWARE IDENTIFICATION

- Equipment under test (EUT):**

EMN 1000 W0 & EMN 500 D3-SP2

Serial number: 19047
FCC ID:UVJ-EMN-A2-L-24
IC: 6881A-EMNA2L24

Equipment information:

- Dimensions: 11cm x 5.5cm x 3.5cm
- Frequency band : from 2400MHz to 2483.5MHz
- Number of channel: 15
- Channel separation: 5MHz (from 2405MHz to 2480MHz)
- Antenna connector: none
- Integral antenna gain: 1dBi
- Nominal output power: 10dBm (10mW)
- Inboard 2.4GHz module: ZMN2430HPA (CIRONNET Inc.)
- Duty cycle: 10ms (max) on a period of 100ms

- Input/output:**

EMN 1000 W0

- 4x Terminals for primary voltage connection (N/L1/L2/L3)
- 3x Rogowski coil cables (1m cables, attached to equipment)

EMN 500 D3-SP2

- 4x Terminals for primary voltage connection (PE/L1/L2/L3)
- 1x DC power supply input (1.5m cable, attached to equipment)



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- 2x Rogowski coil cables (1m cables, attached to equipment)

- **Auxiliaries used for testing:**

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
LEM EMN 1000 W0 *	UVJ-EMN-A2- L-24	Energy meter node	Power supply / voltage measurement: unshielded (1m)
EMN 500 D3-SP2 (19047) *			Current coil: coaxial
LEM EMN test platform	None	Energy meter node	DC power cable: unshielded (1m)
LEM MG-5424 Sn: 0307160163	D.O.C	Mesh Gate 2.4GHz (standalone gateway)	Power supply: unshielded Serial: shielded
TOSHIBA SATELITE S1410-704 (PS141E-04YCM-3V) sn: 13594938G with its power supply unit (PA3201U-1ACA SEB100P2-15.0)	D.O.C	Laptop Personal Computer	Power cable unshielded USB cable: shielded
USB232 U232-P9 Sn: 0701SP004661	D.O.C	USB to serial converter	USB: shielded
EGSTON N2EFSW3 DC: 0808	None	AC/DC power adapter (Used for SP2 model)	DC power cable: unshielded (1.4m)

*: Equipment under test

2.3. EQUIPMENT MODIFICATIONS

None

2.4. EUT EXERCISE SOFTWARE

Standard equipments are provided with choose of the lowest, middle and highest channel with normal modulation.

Special modules are provided for test with:

- Permanent transmission with data transfer (modulation) on lowest, middle and highest channel.
- Permanent emission without modulation on lowest, middle and highest channel.

Special modules are used with an EMN test platform.

2.5. EUT CONFIGURATION

Tests are performed with frequency fixed to lowest, middle and highest channels.

2.6. SPECIAL ACCESSORIES

None



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3. POWER LINES CONDUCTED EMISSIONS (150kHz-30MHz)

3.1. CLIMATIC CONDITIONS

Date of test : February 27th, 2009
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 35%
Ambient temperature : 22°C

3.2. SET-UP

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

The product has been tested with 110V/60Hz power line voltage and compared to the FCC Part 15 subpart 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 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. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

3.4. MEASUREMENTS RESULTS

Mains terminals 110V/60Hz – EMN 1000 W0

Results: (PEAK detection)

Measure on N:	graph Emc#1	(see annex 1)
Measure on L1:	graph Emc#2	(see annex 1)
Measure on L2:	graph Emc#3	(see annex 1)
Measure on L3:	graph Emc#4	(see annex 1)

RESULT: PASS



Mains terminals 110V/60Hz – EMN 500 D3-SP2

Results: (PEAK detection)

Measure on N of power supply adapter:	graph Emc#5	(see annex 1)
Measure on L1 of power supply adapter:	graph Emc#6	(see annex 1)
Measure on L1 (measure):	graph Emc#7	(see annex 1)
Measure on L2 (measure):	graph Emc#8	(see annex 1)
Measure on L3 (measure):	graph Emc#9	(see annex 1)

RESULT: PASS



4. MEASUREMENT OF RADIATED EMISSION (30MHz TO 1GHz) – UNINTENTIONAL RADIATION

4.1. CLIMATIC CONDITIONS

Date of test : February 27th, 2009
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 35%
Ambient temperature : 22°C

4.2. SETUP FOR RADIATED EMISSIONS MEASUREMENT

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

The EUT is set on the non-conducting table of 80 cm height.

Pre-characterisation measurement:

A pre-scan of all the setup has been performed in a 3 meters full 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 (90°step)

The pre-characterization graphs are obtained in PEAK detection.

For frequency band 1GHz to 12.5GHz, a manual search is performed in the anechoic chamber in order to determine frequencies radiated by the EUT.

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 **3 meters** from the antenna and compared to the FCC part 15 subpart C, class B §15.209 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.

A summary of the worst case emissions found in all test configurations and modes is shown on clause 3.4 (Pre-characterization results).

4.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None.



4.4. MEASUREMENTS RESULTS

PRE-CHARACTERISATION MEASUREMENT: pre-scan measurement at 3m (PEAK detection)

EMN 1000-W0

Polarisation H: graph **Emr1#H** (30MHz-1GHz) (see annex 1)
Polarisation V: graph **Emr1#V** (30MHz-1GHz) (see annex 1)

EMN 500 D3-SP2

Polarisation H: graph **Emr2#H** (30MHz-1GHz) (see annex 1)
Polarisation V: graph **Emr2#V** (30MHz-1GHz) (see annex 1)

QUALIFICATION: Open Area Test Site measurement.

Frequency list has been created with anechoic chamber pre-scan results.

No	Frequency (MHz)	Limit Quasi-Peak (dB μ V/m)	Measure * Quasi-Peak (dB μ V/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
No unintentional radiation observed									

4.5. 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 52.5dB 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 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.

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



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5. OCCUPIED BANDWIDTH

5.1. CLIMATIC CONDITIONS

Date of test : February 27th, 2009
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 40%
Ambient temperature : 20°C

5.2. SET-UP

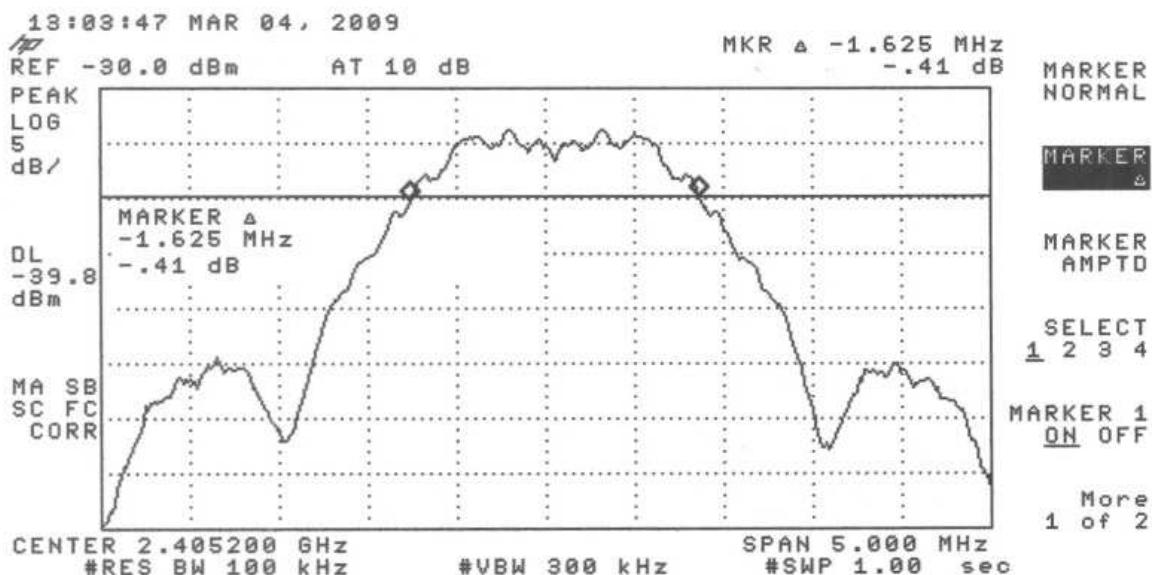
The tested equipment is set to transmit operation with nominal modulation on lowest, middle and highest channel.

- **Method of measurement**

Radiated emission (no antenna connector)

5.3. MEASUREMENT DATA

Measured 6dB bandwidth on lower channel: 1.625MHz
Measured 6dB bandwidth on middle channel: 1.600MHz
Measured 6dB bandwidth on highest channel: 1.625MHz



Occupied bandwidth (lower channel)
RBW = 100kHz / VBW = 300kHz

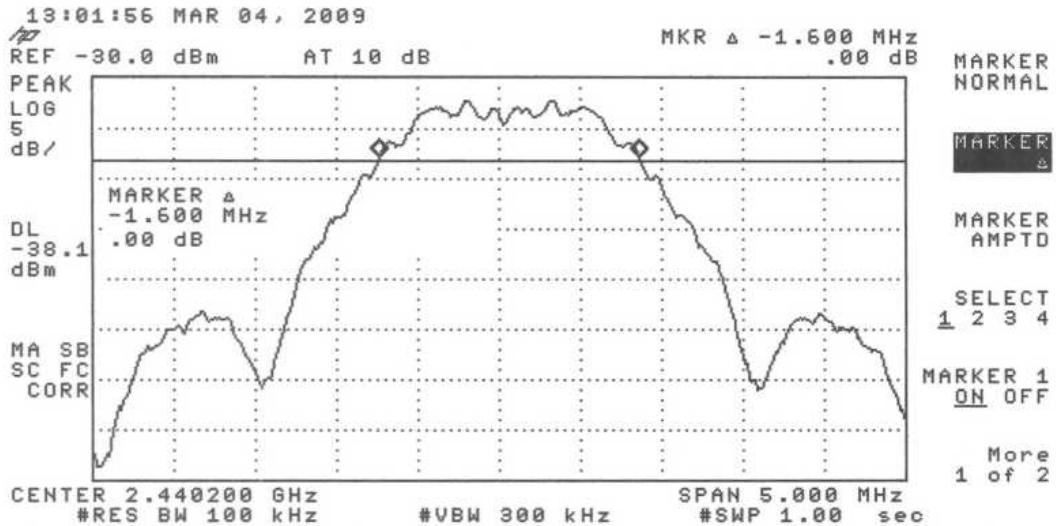
Note: Markers are 6dB below the peak output power.



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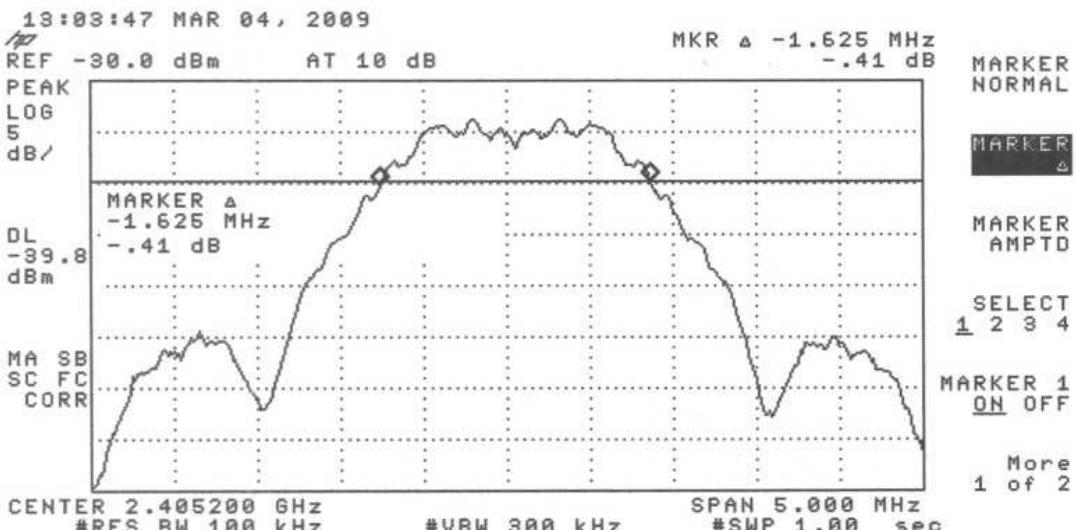
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Occupied bandwidth (Mid channel)
RBW = 100kHz / VBW = 300kHz

Note: Markers are 6dB below the peak output power.



Occupied bandwidth (High channel)
RBW = 100kHz / VBW = 300kHz

Note: Markers are 6dB below the peak output power

RESULT: PASS

Limit: Minimum 6dB bandwidth shall be at least 500MHz



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6. PEAK POWER OUTPUT

6.1. CLIMATIC CONDITIONS

Date of test : February 22th, 2009
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 40%
Ambient temperature : 20°C

6.2. SET-UP

The tested equipment is set to transmit operation with nominal modulation on lowest and highest channel.
The RBW of the spectrum analyzer is set to 3MHz (greater than the 6dB bandwidth of the equipment). VBW = 3MHz.

• Method of measurement

Radiated emission (no possibility to add antenna connector to the PCB)

The procedure set forth in ANSI C63.4 were followed with respect to maximising the peak emission.

Antenna conducted measurements could not be performed on this device, therefore radiated tests were performed to show compliance with the peak output power limit according to the alternative test methods in the FCC KDB Publication N°558074 "Guidance on measurements for Digital Transmission Systems (47 CFR 15.247).

The power was calculated using the following equation:

$$P = (E \times D)^2 / (30 \times G)$$

Where G is the numerical gain of the transmitting antenna with reference to an isotropic radiator

D is the distance in meters from which the field strength was measured

E is the maximum field strength in V/m

6.3. MEASUREMENT DATA

Measurement result:

Measurements are performed in normal test conditions.

Integral antenna gain: 0dBi. (Worst case)

Detector PEAK

Low channel

Frequency (MHz)	Maximum field strength at 3m dB μ V/m	Calculation of peak output power (mW)	Limit (mW)
2405	102.6	5.4	1000

Mid channel

Frequency (MHz)	Maximum field strength at 3m dB μ V/m	Calculation of peak output power (mW)	Limit (mW)
2440	104.7	8.8	1000

High channel

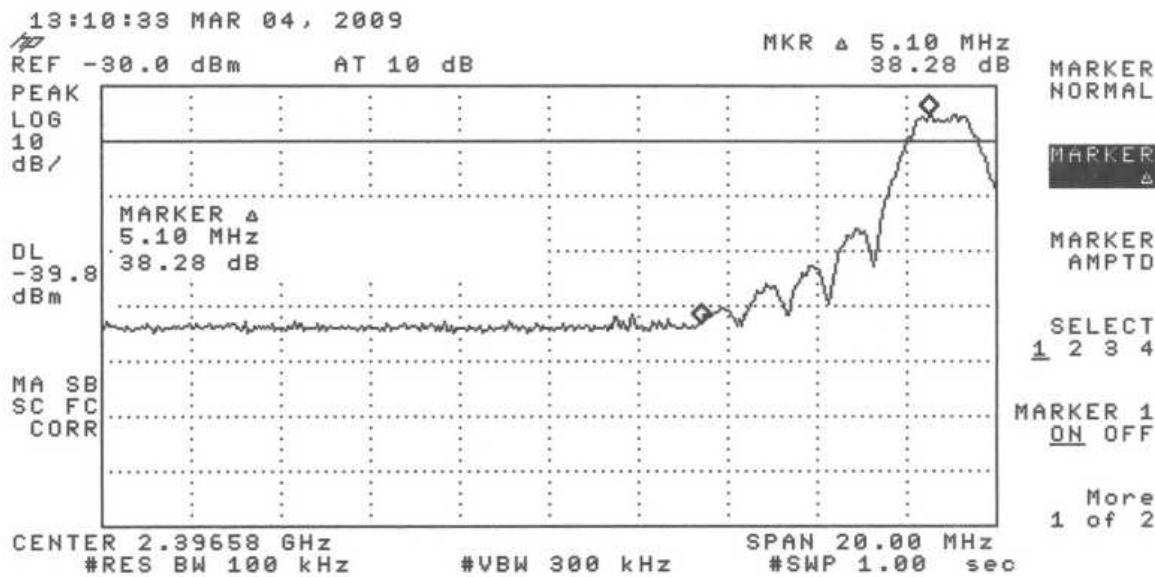
Frequency (MHz)	Maximum field strength at 3m dB μ V/m	Calculation of peak output power (mW)	Limit (mW)
2480	101.7	4.4	1000



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6.4. BAND-EDGE COMPLIANCE

1- The lower band-edge compliance was determined using the marker-delta method in which the radio frequency power that is produced by the EUT is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.



Lower band-edge compliance

Note: Peak marker is 2405.1 MHz

RESULT: at 2400MHz, the observed level is 38.3dB below the peak level → PASS (shall be greater than 20dBc)

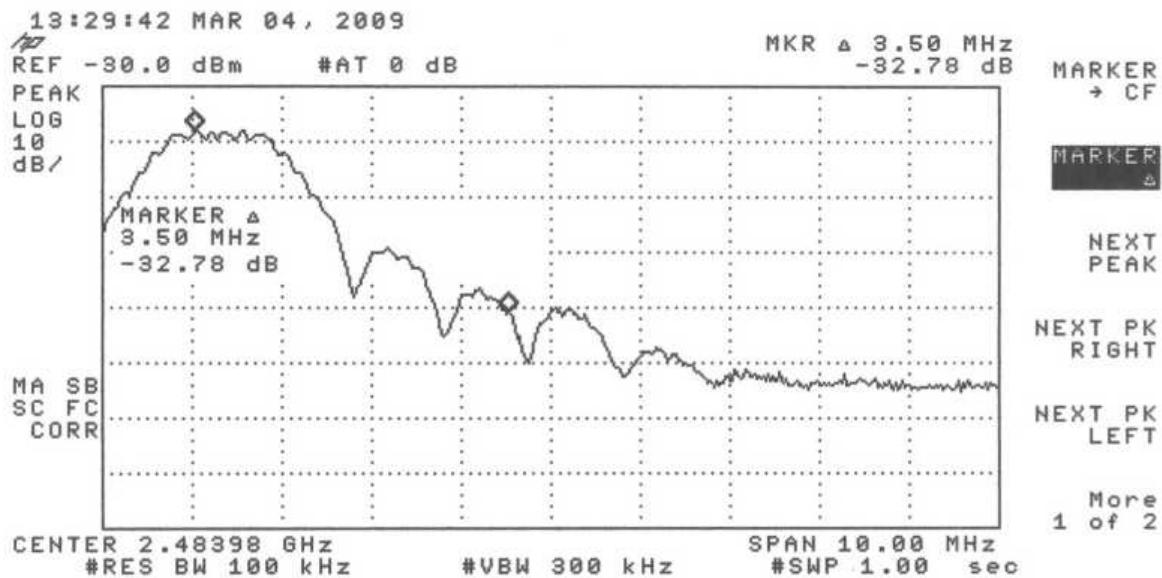


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2- The upper band-edge compliance was determined using the radiated mark-delta method. The radiated field strength of the fundamental emission was first determined and then the mark-delta method was used to determine the field-strength of the band-edge emissions.



Upper band-edge compliance

Note: Upper marker is 2483.5 MHz

RESULT: Field strength at upper band-edge is 32.8dB below $101.7 \text{ dB}\mu\text{V/m} = 68.9 \text{ dB}\mu\text{V/m}$ (Limit is $74 \text{ dB}\mu\text{V/m}$ for peak value)

RESULT: Field strength at upper band-edge is 32.8dB below $81.7 \text{ dB}\mu\text{V/m} = 48.9 \text{ dB}\mu\text{V/m}$ (Limit is $54 \text{ dB}\mu\text{V/m}$ for average value)

Duty cycle correction factor: -20dB (Max transmission time is 10ms on a period of 100ms)



7. SPURIOUS EMISSIONS (RADIATED)

7.1. CLIMATIC CONDITIONS

Date of test : February 22th, 2009
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 40%
Ambient temperature : 20°C

7.2. TEST SETUP

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

Equipment configuration and running mode:

- EUT is ON;
- EUT was transmitting continuously on low, mid and high channels, with normal modulation for spurious emissions measurement

The product has been tested according to ANSI C63.4(2003), FCC part 15 subpart C. Radiated Emission 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 **3 meters** from the antenna.

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.

Equipment was moved to position that maximized emission. (3 axis measurements)

• Method of measurement

Radiated emission. No antenna connector on the tested equipment.

Frequency band investigated is 9kHz to 25GHz.

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with appropriate measuring antennas. The EUT is being rotated on 360° during the measurement.

Final measurements are performed on the 3-meters Open Area test Site.



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7.3. MEASUREMENT DATA

Measurement data: spurious emissions

EUT Configuration: Transmit at 2405MHz

No	Frequency (MHz)	Measured field (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Peak / Average	Comments
1	2405	102.6	-			Fundamental
2	4810	59.0	74.0	15.0	PK	Restricted band
	4810	45.0	54.0	9.0	AV	Restricted band
3	7215	45.2	82.6	37.4	PK	(Noise floor)
4	9620	41.0	82.6	41.6	PK	(Noise floor)
5	12025	43.2	74.0	30.8	PK	Restricted band (Noise floor)
	12025	23.2	54.0	30.8	AV	Restricted band (Noise floor)

EUT Configuration: Transmit at 2440MHz

No	Frequency (MHz)	Measured field (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Peak / Average	Comments
1	2440	104.7	-			Fundamental
2	4880	57.0	74.0	17.0	PK	Restricted band
	4880	43.0	54.0	11.0	AV	Restricted band
3	7320	45.0	74.0	29.0	PK	Restricted band (Noise floor)
	7320	25.0	54.0	29.0	AV	Restricted band (Noise floor)
4	9760	40.0	84.7	44.7	PK	(Noise floor)
5	12200	43.0	74.0	31.0	PK	Restricted band (Noise floor)
	12200	23.0	54.0	31.0	AV	Restricted band (Noise floor)

EUT Configuration: Transmit at 2480MHz

No	Frequency (MHz)	Measured field (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Peak / Average	Comments
1	2480	101.7	-			Fundamental
2	4960	58.0	74.0	16.0	PK	Restricted band
	4960	44.0	54.0	10.0	AV	Restricted band
3	7440	45.0	74.0	29.0	PK	Restricted band (Noise floor)
	7440	25.0	54.0	29.0	AV	Restricted band (Noise floor)
4	9920	40.0	84.7	44.7	PK	(Noise floor)
5	12400	43.0	74.0	31.0	PK	Restricted band (Noise floor)
	12400	23.0	54.0	31.0	AV	Restricted band (Noise floor)

Note 1: Peak measurement with 100 kHz RBW and VBW when frequency outside restricted bands.

Peak measurement with 1MHz RBW and VBW when frequency in restricted bands.

Note 2: Average measurement with 1MHz RBW and 10Hz VBW when frequency in restricted bands.

(The average emissions were further correcting for the duty cycle of the EUT)



7.4. 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.

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



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8. PEAK POWER SPECTRAL DENSITY

8.1. CLIMATIC CONDITIONS

Date of test : February 22th, 2009
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 40%
Ambient temperature : 20°C

8.2. TEST SETUP

The peak power density was measured in accordance with the FCC publication "Guidance on Measurements for Digital Transmission Systems".

The emission peak within the passband was located and zoomed in.

The spectrum analyzer RBW was 3kHz and VBW was 10kHz.

A peak detector using the max hold function was utilized.

8.3. MEASUREMENT DATA

Low channel

<i>Frequency</i> (MHz)	<i>Peak Power spectral density</i> (dBm)	<i>Limit</i> (dBm)
2405	-7.3	8.0

Mid channel

<i>Frequency</i> (MHz)	<i>Peak Power spectral density</i> (dBm)	<i>Limit</i> (dBm)
2440	-6.6	8.0

High channel

<i>Frequency</i> (MHz)	<i>Peak Power spectral density</i> (dBm)	<i>Limit</i> (dBm)
2480	-10.0	8.0



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9. TEST EQUIPMENT LIST

	N° LCIE	TYPE	COMPANY	REF	SN
RADIATED EMISSION MEASUREMENT (PRE-SCAN SEMI-ANECHOIC CHAMBER #2)					
	A5329032VO	Absorption clamp	LUTHI	MDS21	2826
	A5329044VO	Absorption clamp	RHODE ET SCHWARZ	85024A	194.0100.50
X	A4049060VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	222033
X	A7186006VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447F	3113A07116
	A7085008VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	2944A06838
	A7085009VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	2944A08871
	A7085010VO	Amplifier 10MHz – 1300 MHz	A-INFO INC	JXWBLA-T	
X	C2040146VO	Antenna Bi-Log XWing	TESEQ	CBL6144	25904
	C2042027VO	Antenna horn	EMCO	3115	6382
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	BBHA9170232
	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
X	A5329045VO	Cable EMR (s-Anechoic chamber)			
X	A5329056VO	Cable Radiat EMI (Pre-amp/Analyzer)			
X	A5329057VO	Cable Radiat. EMI (Pre-amp/cage)			
	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
X	A4060030VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	
X	A3169050VO	Radiated emission comb generator	BARDET		PR17B
X	D3044015VO	Semi-Anechoic chamber #2	SIEPEL		
X	A4060029VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	
X	A4060028VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	
X	F2000404VO	Turntable chamber	ETS Lingren	Model 2165	00085780
X	F2000393VO	Turntable controller chamber	ETS Lingren	Model 2066	
RADIATED EMISSION MEASUREMENT (OPEN AREA TEST SITE)					
	A4049059VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	2811A01134
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	222033
X	A7102026VO	Amplifier 8-26GHz	ALDETEC	ALS01452	1
	A7102019VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447F Opt 64	3113A06394
X	C2040050VO	Antenna biconic	EMCO	3104C	9401-4636
	C2040051VO	Antenna Bi-log	CHASE	CBL6111A	1628
X	C2042027VO	Antenna horn	EMCO	3115	6382
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	BBHA9170232
X	C2040056VO	Antenna log-periodic	EMCO	3146	2178
	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
X	F2000288VO	Antenna mast	EMCO	1050	
	C2040057VO	Antenna monopole	AH SYSTEM	SAS-551	181
X	A5329048VO	Cable EMR OATS	SUCOFLEX	106G	553
X	A5329185VO	Cable OATS	UTIFLEX		
	A5329188VO	Cable OATS (Mast at 10m)	UTIFLEX		
X	A5329076VO	Cable OATS (Mast at 3m)	UTIFLEX		
	A5329196VO	Cable OATS (Turntable)	UTIFLEX		
	A2640011VO	Measurement receiver 9kHz-30MHz	ROHDE ET SCHWARZ	ESH3	972079/117
X	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
	A4060027VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	2837A00784
X	A3169050VO	Radiated emission comb generator	BARDET		PR17B
	A4060017VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	2732A04155
X	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
	A4060016VO	Spectrum analyzer 9kHz – 1.8GHz	HEWLETT PACKARD	8591E	3536A00384
	A4060019VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	2816A16603
X	F2000403VO	Turntable	ETS LINDGREN	Model 2187	
X	F2000286VO	Turntable / Antenna mast controller	ETS LINDGREN	Model 2066	
CONDUCTED MEASUREMENT EMISSION					
X	A5329061VO	Cable Conduct. EMI			
	A5329060VO	Cable Conduct. EMI			
X	A3169049VO	Conducted emission comb generator	BARDET		CGPR12
	A4040015	Clickmeter	SCHAFFNER	DIA1512D	22338
	A5329037VO	Current injection probe	SCHAFFNER	CIP8213	52
	A1290017VO	Current probe	SCHAFFNER	CSP9160	1097
	A5329036VO	Direct Injection Module 100+50 Ohms	LCIE	MID01-100 ohms	
	A7156004VO	Direct Injection Module 100+50 Ohms	LUTHI	CR100A	221
	A5329042VO	Ferrite Tube	LUTHI	FTC 101	4485



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	N°LCIE	TYPE	COMPANY	REF	SN
	A1092042VO	Ferrite Tube	LUTHI	FTC101	4763
	C2320059VO	LISN	EMCO	3810/2SH	9511/1182
	C2320068VO	LISN	EMCO	3825/2	9309/2122
	C2320061VO	LISN	TELEMETER ELECTRONIC	NNB-2/16Z	98010
X	C2320062VO	LISN tri-phase ESH2-Z5	RHODE ET SCHWARZ	33852.19.53	841223/008
	C2320063VO	LISN tri-phase ESH2-Z5	RHODE ET SCHWARZ	33852.19.53	841223/007
X	C2320123VO	LISN	RHODE ET SCHWARZ	ENV216	100037
	A2640011VO	Measurement receiver 9kHz-30MHz	ROHDE ET SCHWARZ	ESH3	972079/117
X	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
	C2320067VO	ISN 2 x 2 wires	RHODE ET SCHWARZ	ENY22	836727/015
	C2320066VO	ISN 4 wires	RHODE ET SCHWARZ	ENY41	838119/023
	C2320124VO	ISN 4 wires	TESEQ	T400A	24873
	D3044016VO	Semi-Anechoic chamber #1	SIEPEL		
	D3044017VO	Semi-Anechoic chamber #3	SIEPEL		
	D3044015VO	Semi-Anechoic chamber #2	SIEPEL		
X	D3044010VO	Faraday Cage	RAY PROOF		4854
X	A4049061VO	Transient limiter	HEWLETT PACKARD	11947A	3107A01596
	A4089117VO	Voltage probe	LCIE		



L C I E

10. UNCERTAINTIES CHART

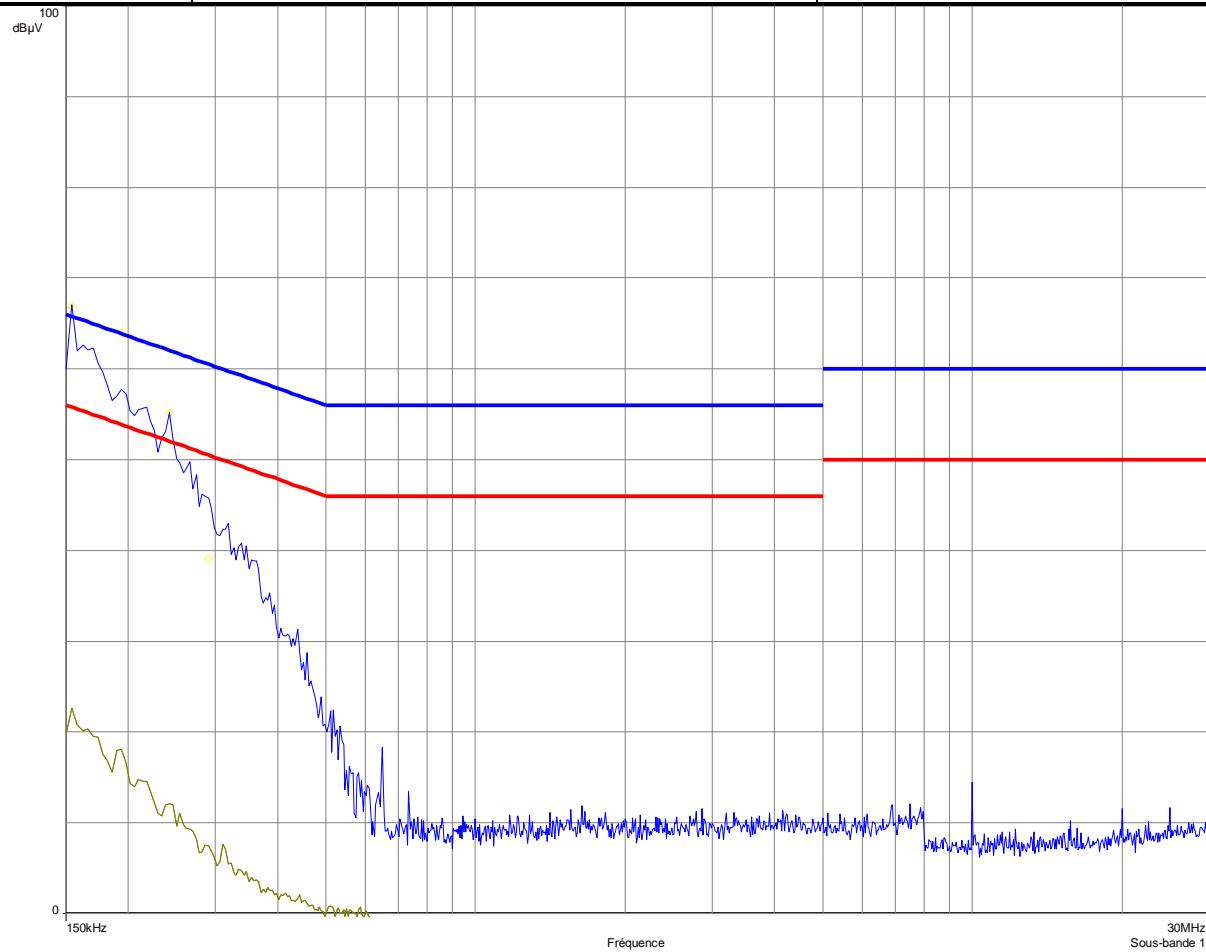
Type de mesure / <i>Kind of measurement</i>	Incertitude élargie laboratoire / <i>Wide uncertainty laboratory</i> (k=2) ± x	Incertitude limite du CISPR / <i>CISPR uncertainty limit</i> ± y
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in 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



L C I E

11. ANNEX 1 (GRAPHS)

CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 1000 W0
Graph name:	Emc#1	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 1 (L1)	
RBW:	9kHz	

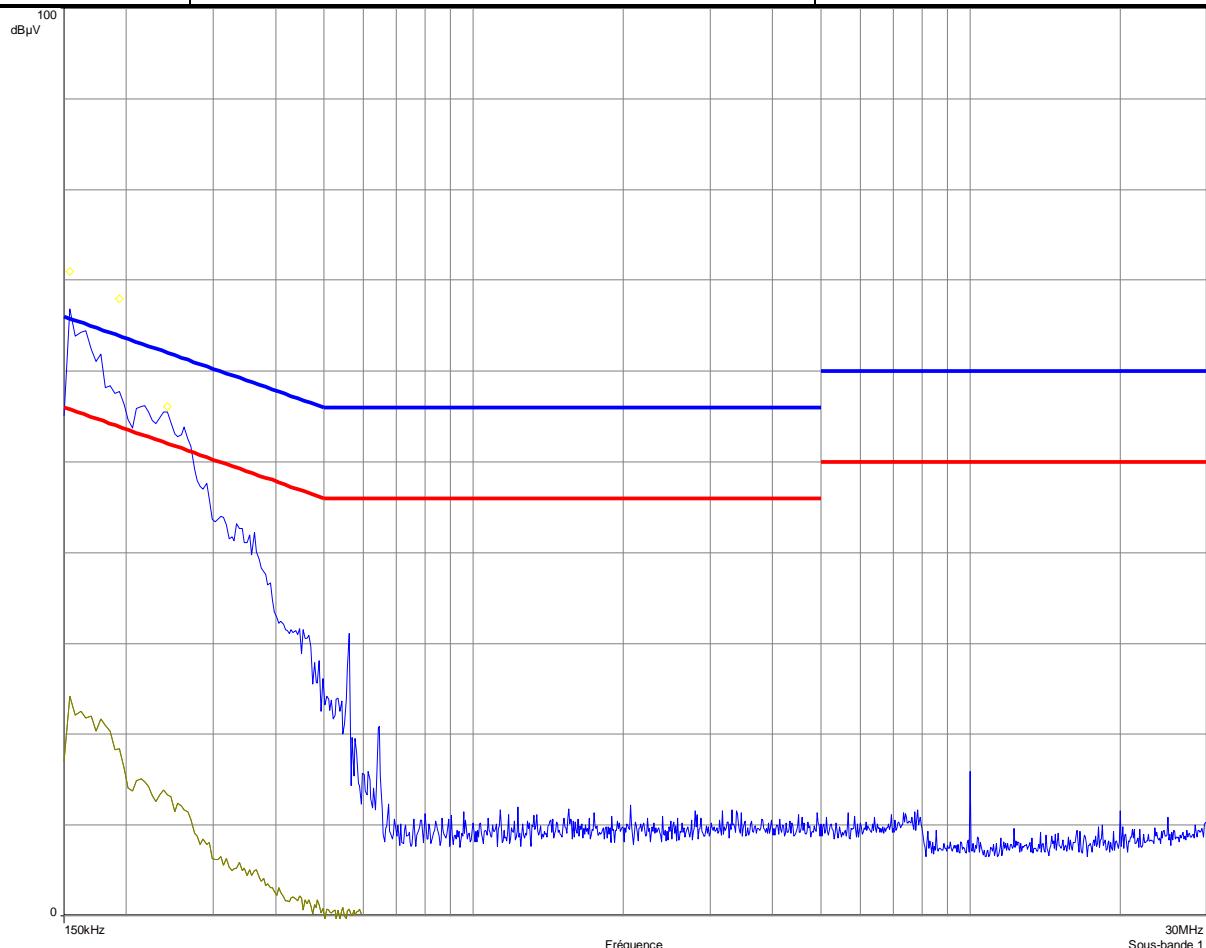


Frequency (MHz)	Measure Peak dB μ V	Measure Average dB μ V	Limit Average dB μ V	Avg-Lim (Margin) dB	Measure Q-Peak dB μ V	Limit QPeak dB μ V	QP-Limit (Margin) dB	RESULTS Pass/Fail
0.154	66.8	25.1	55.8	-30.6	57.0	65.8	-8.8	P
0.194	63.9	21.1	53.9	-32.8	50.5	63.9	-13.4	P
0.242	55.2	17.7	52.0	-34.4	45.9	62.0	-16.1	P
0.290	39.1	4.6	50.5	-45.9	25.0	60.5	-35.5	P



L C I E

CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 1000 W0
Graph name:	Emc#2	
Voltage / Frequency	110V/60Hz	
Line/Port	Neutral (N)	
RBW:	9kHz	

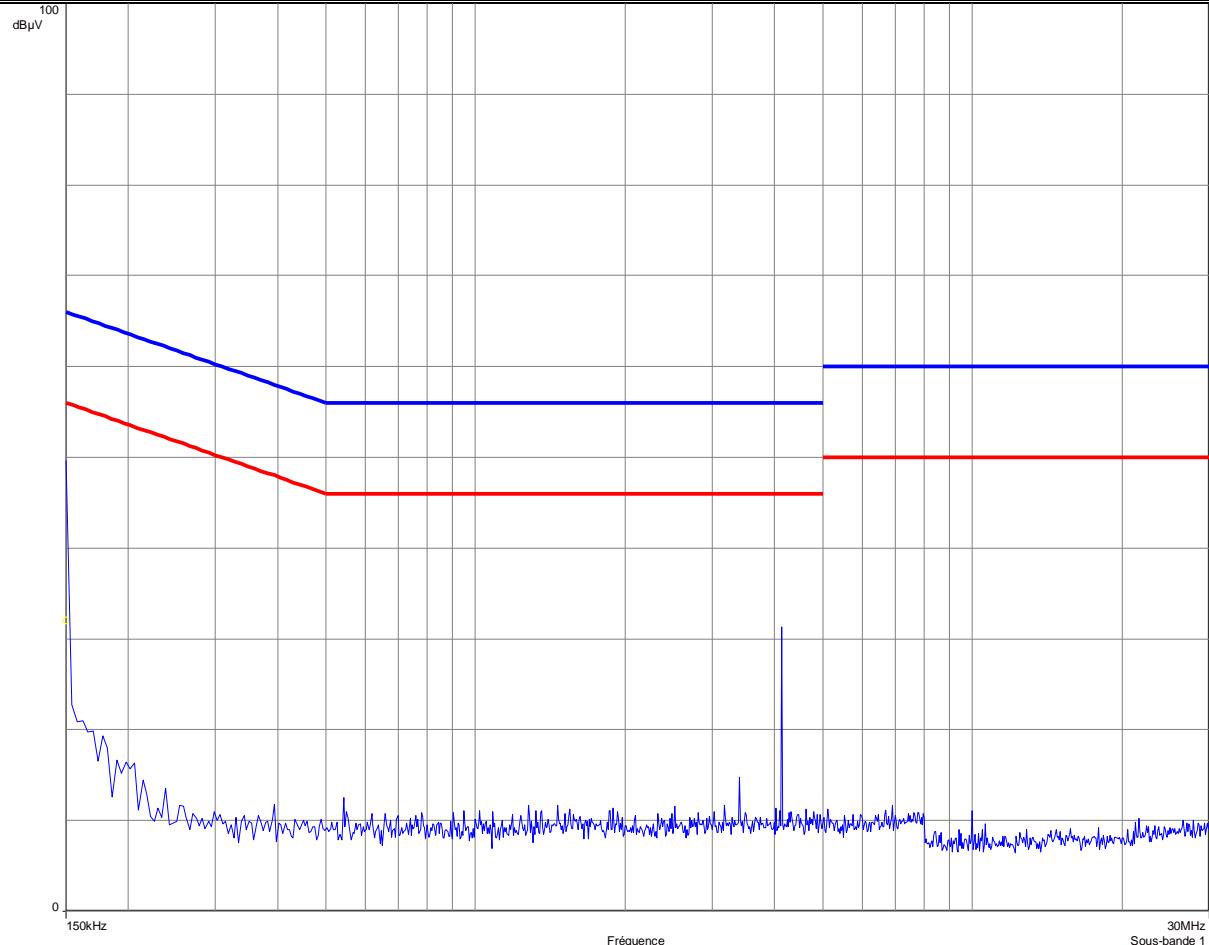


Frequency (MHz)	Measure Peak dB μ V	Measure Average dB μ V	Limit Average dB μ V	Avg-Lim (Margin) dB	Measure Q-Peak dB μ V	Limit QPeak dB μ V	QP-Limit (Margin) dB	RESULTS Pass/Fail
0.154	71.0	26.6	55.8	-29.2	59.7	65.8	-6.1	P
0.194	67.9	21.6	53.9	-32.3	52.2	63.9	-11.7	P
0.242	56.1	18.1	52.0	-33.9	47.0	62.0	-15.0	P



L C I E

CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 1000 W0
Graph name:	Emc#3	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 2 (L2)	
RBW:	9kHz	

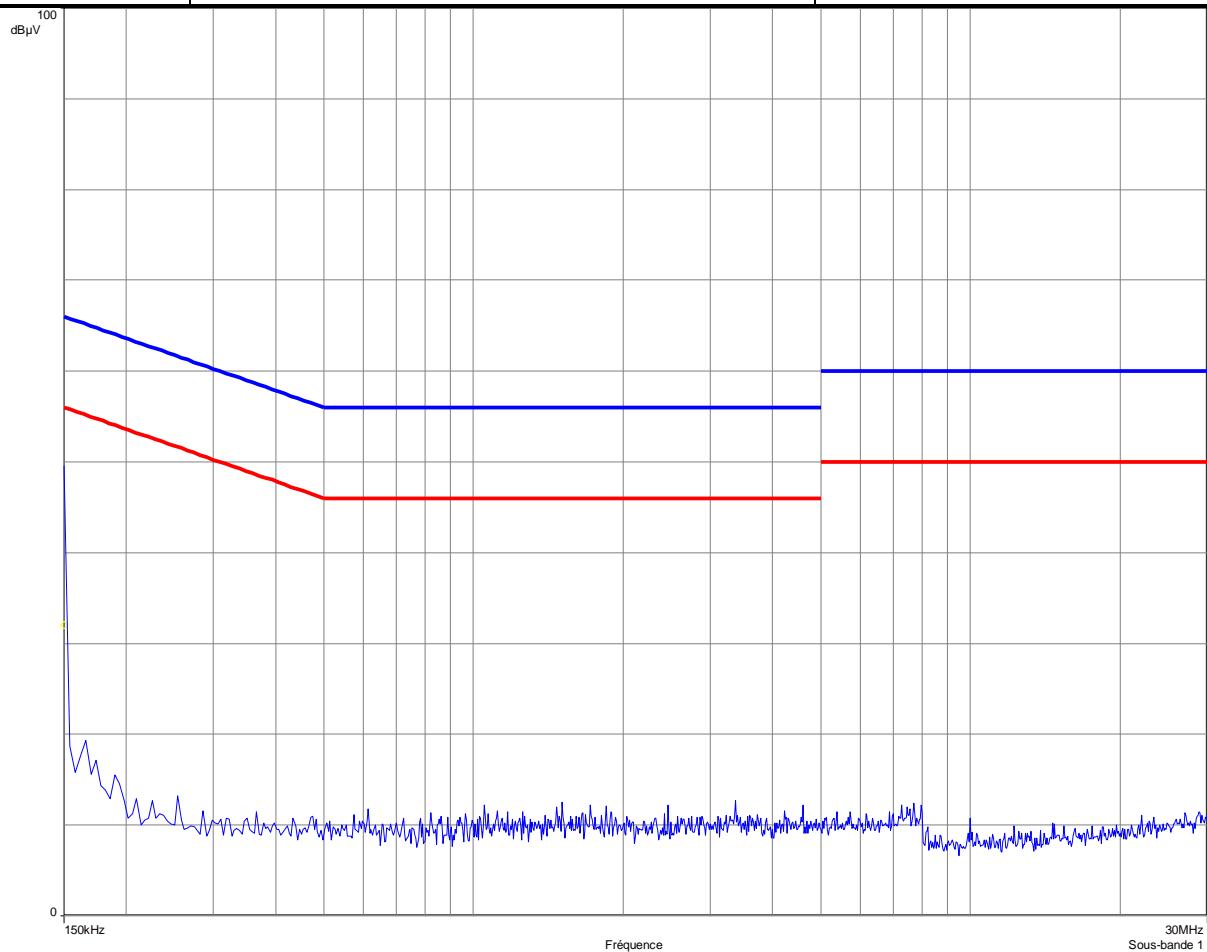


Frequency (MHz)	Measure Peak dB μ V	Measure Average dB μ V	Limit Average dB μ V	Avg-Lim (Margin) dB	Measure Q-Peak dB μ V	Limit QPeak dB μ V	QP-Limit (Margin) dB	RESULTS Pass/Fail
0.150	32.1	17.2	56.0	-38.8	25.7	66.0	-40.3	P



L C I E

CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 1000 W0
Graph name:	Emc#4	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 3 (L3)	
RBW:	9kHz	

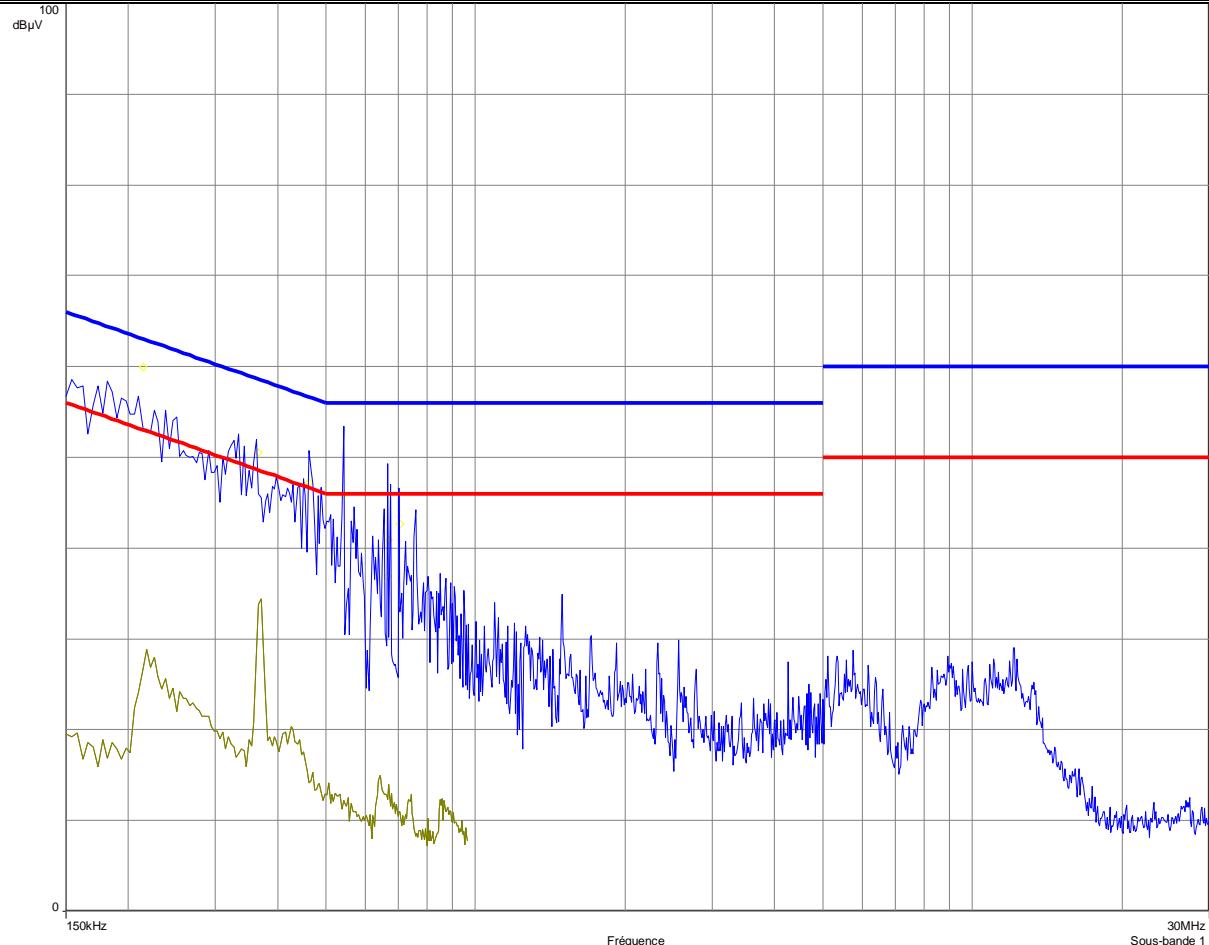


Frequency (MHz)	Measure Peak dB μ V	Measure Average dB μ V	Limit Average dB μ V	Avg-Lim (Margin) dB	Measure Q-Peak dB μ V	Limit QPeak dB μ V	QP-Limit (Margin) dB	RESULTS Pass/Fail
0.150	32.0	17.4	56.0	-38.6	26.2	66.0	-39.8	P



L C I E

CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 500 D3-SP2 Power supply adapter
Graph name:	Emc#5	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 1 (L1)	
RBW:	9kHz	

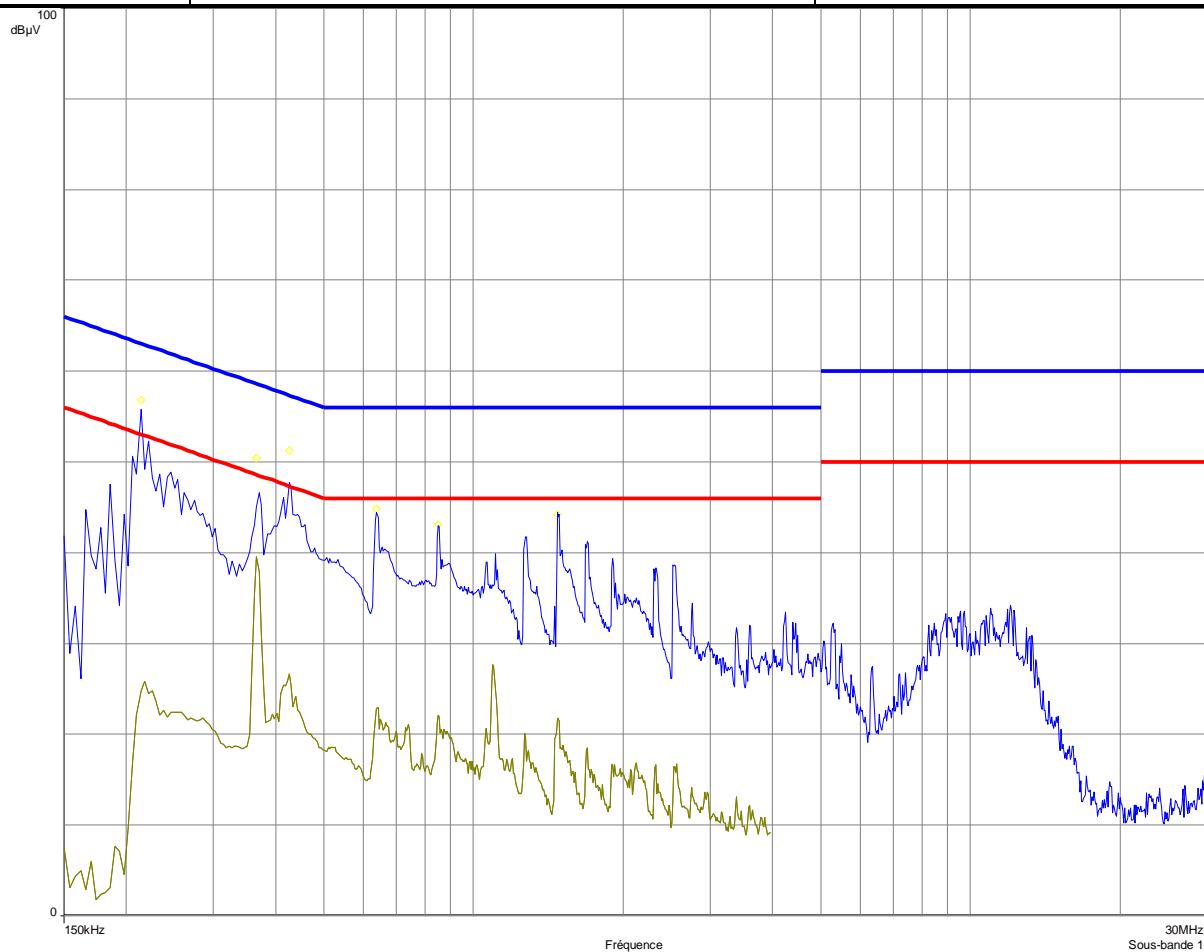


Frequency (MHz)	Measure Peak dBµV	Measure Average dBµV	Limit Average dBµV	Avg-Lim (Margin) dB	Measure Q-Peak dBµV	Limit QPeak dBµV	QP-Limit (Margin) dB	RESULTS Pass/Fail
0.154	66.8	25.1	55.8	-30.6	57.0	65.8	-8.8	P
0.194	63.9	21.1	53.9	-32.8	50.5	63.9	-13.4	P
0.242	55.2	17.7	52.0	-34.4	45.9	62.0	-16.1	P
0.290	39.1	4.6	50.5	-45.9	25.0	60.5	-35.5	P



L C I E

CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 500 D3-SP2 Power supply adapter
Graph name:	Emc#6	
Voltage / Frequency	110V/60Hz	
Line/Port	Neutral (N)	
RBW:	9kHz	

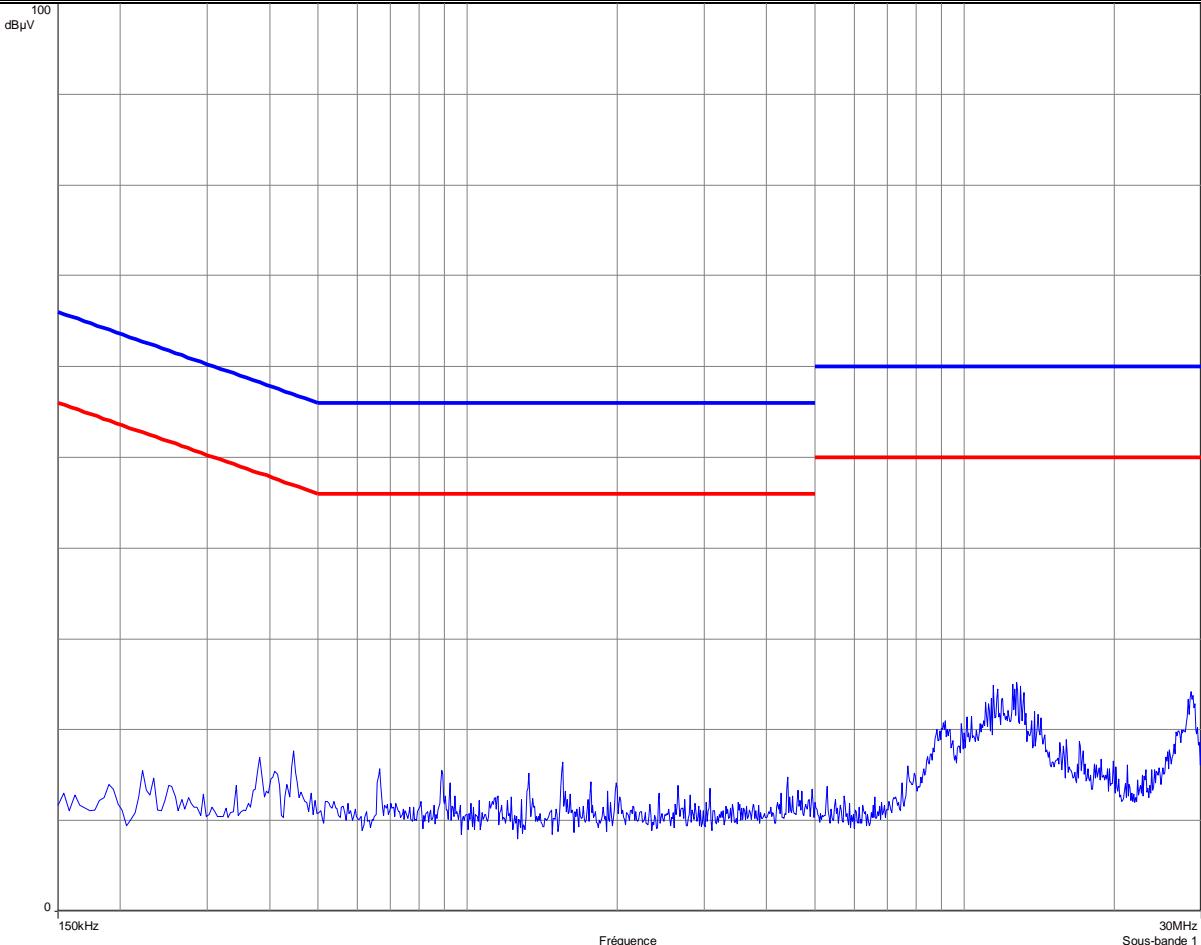


Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Q-Peak dBμV	Limit QPeak dBμV	QP-Limit (Margin) dB	RESULTS Pass/Fail
0.214	56.9	27.0	53.1	-26.1	49.0	63.1	-14.1	P
0.366	50.4	39.6	48.5	-8.9	44.6	58.5	-13.9	P
0.426	51.3	26.5	47.3	-20.9	45.1	57.3	-12.2	P
0.638	44.8	23.1	46.0	-22.9	41.4	56.0	-14.6	P
0.850	43.1	22.2	46.0	-23.8	39.6	56.0	-16.4	P
1.478	44.3	21.8	46.0	-24.2	38.9	56.0	-17.1	P



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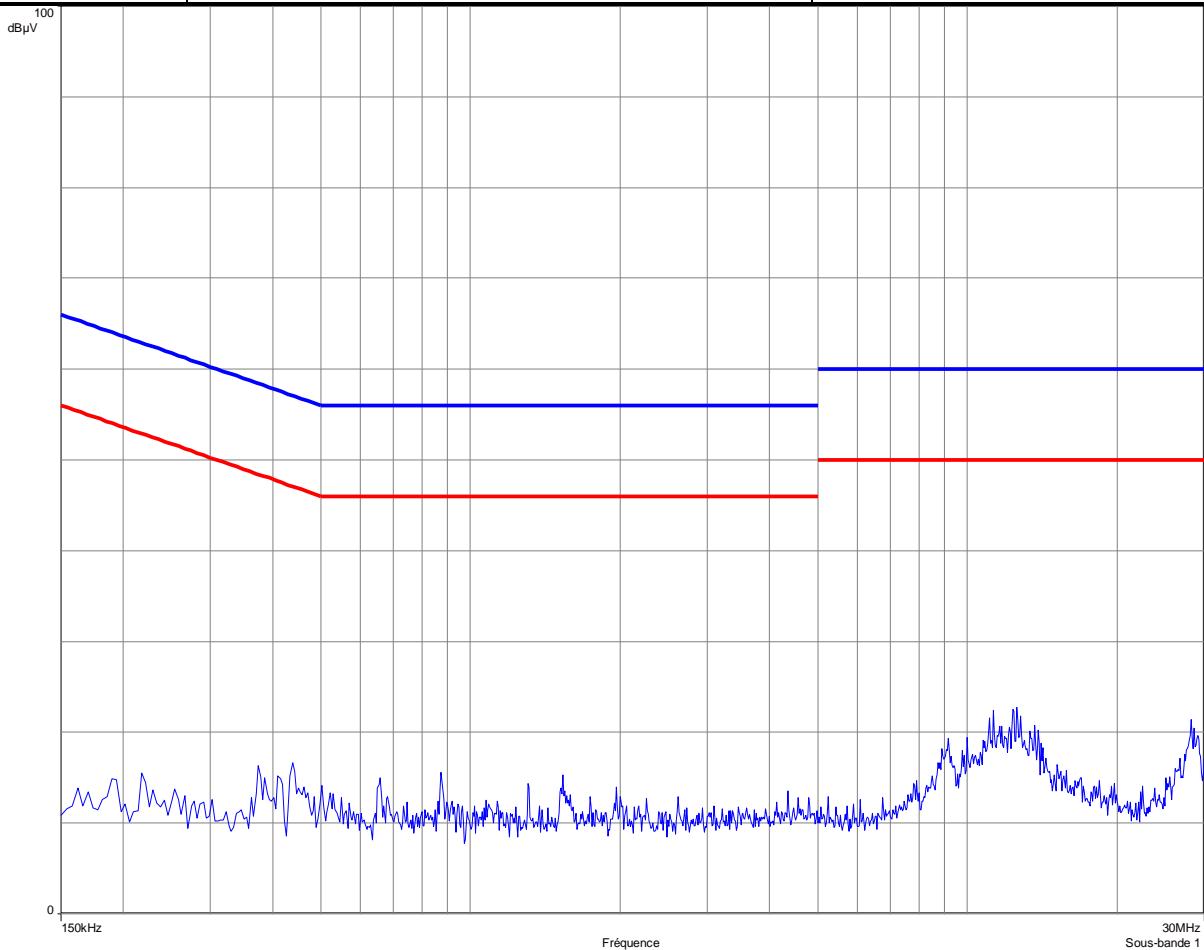
CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 500 D3-SP2 Measure terminal
Graph name:	Emc#7	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 1 (L1)	
RBW:	9kHz	





L C I E

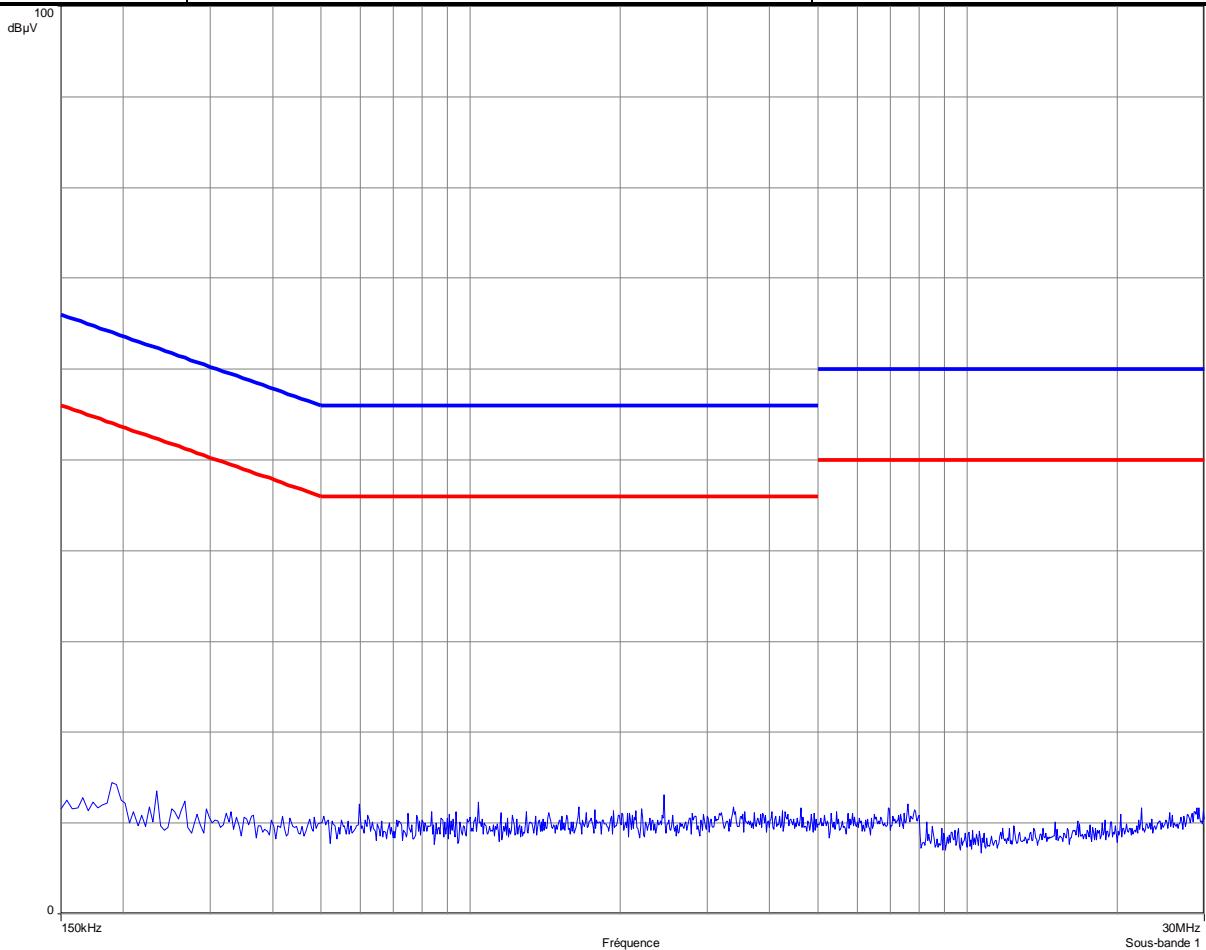
CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 500 D3-SP2 Measure terminal
Graph name:	Emc#8	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 2 (L2)	
RBW:	9kHz	





L C I E

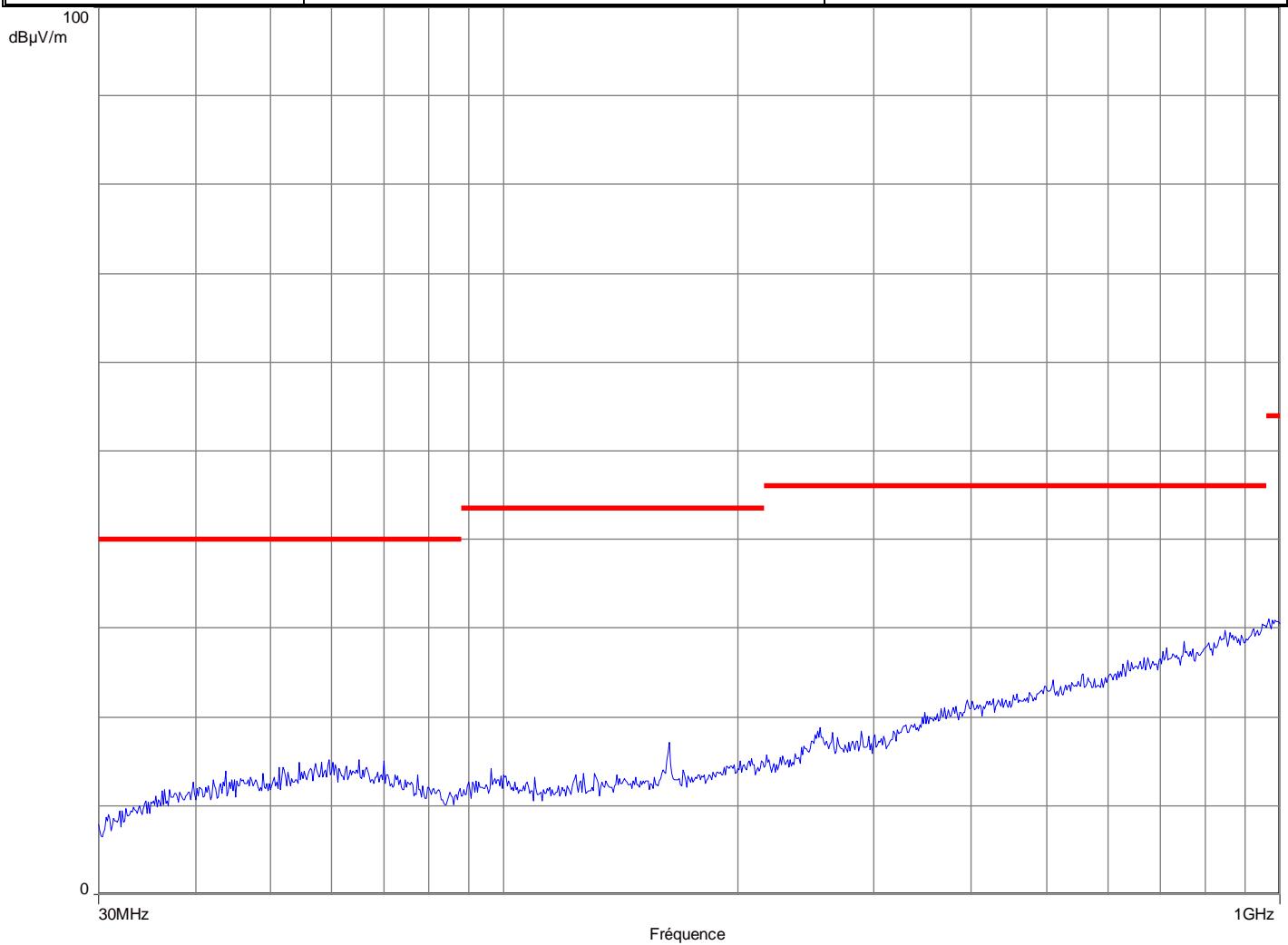
CONDUCTED EMISSIONS – AC MAINS		Test configuration: EMN 500 D3-SP2 Measure terminal
Graph name:	Emc#9	
Voltage / Frequency	110V/60Hz	
Line/Port	Line 3 (L3)	
RBW:	9kHz	





L C I E

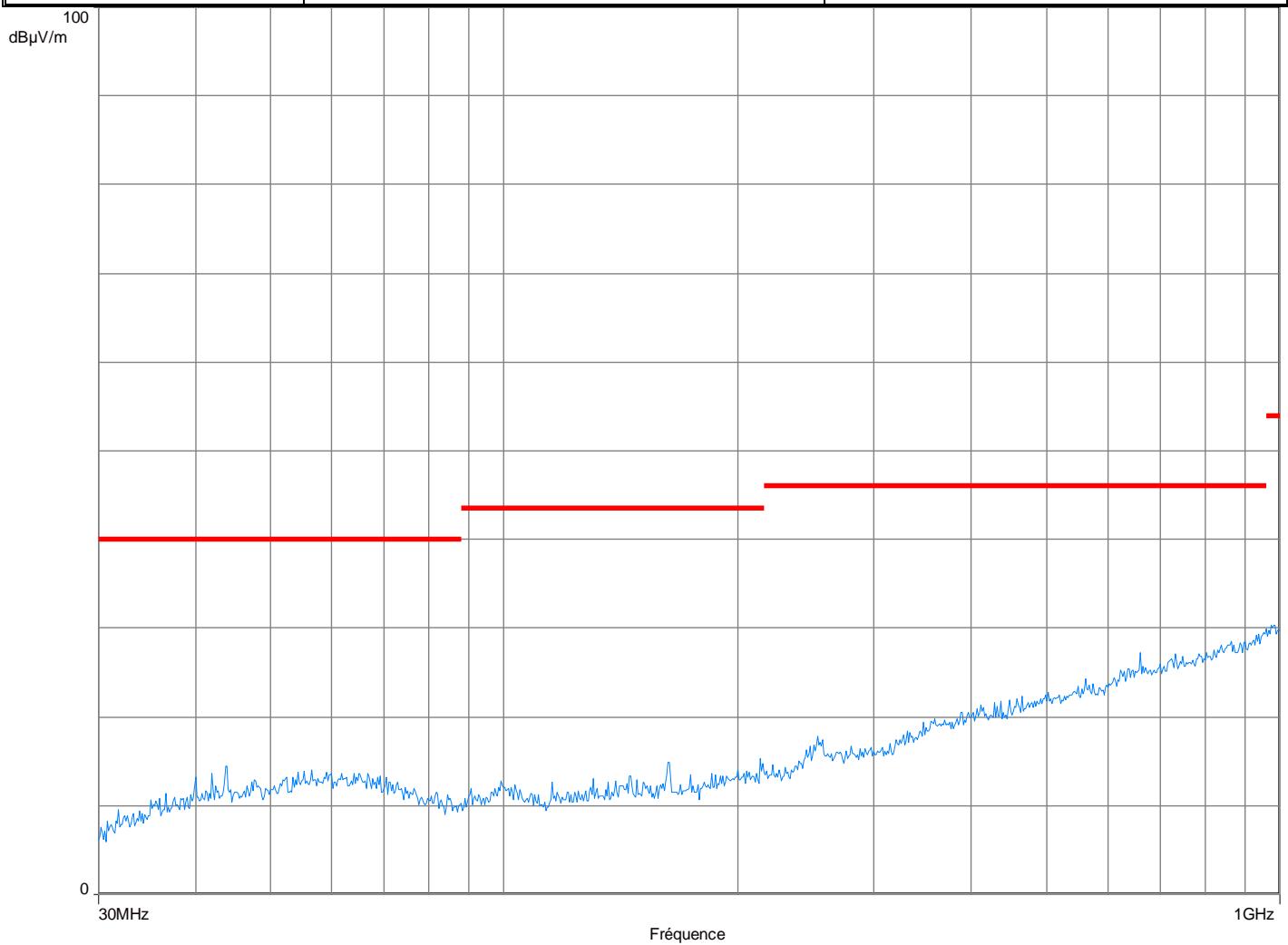
RADIATED EMISSIONS (30MHz-1GHz)		Test configuration:
Graph name:	Emr1#H	EMN 1000 W0
Antenna polarisation	Horizontal	
Azimuth:	0° → 360° / 90° step (maxhold)	
RBW / VBW :	120kHz / 300kHz	





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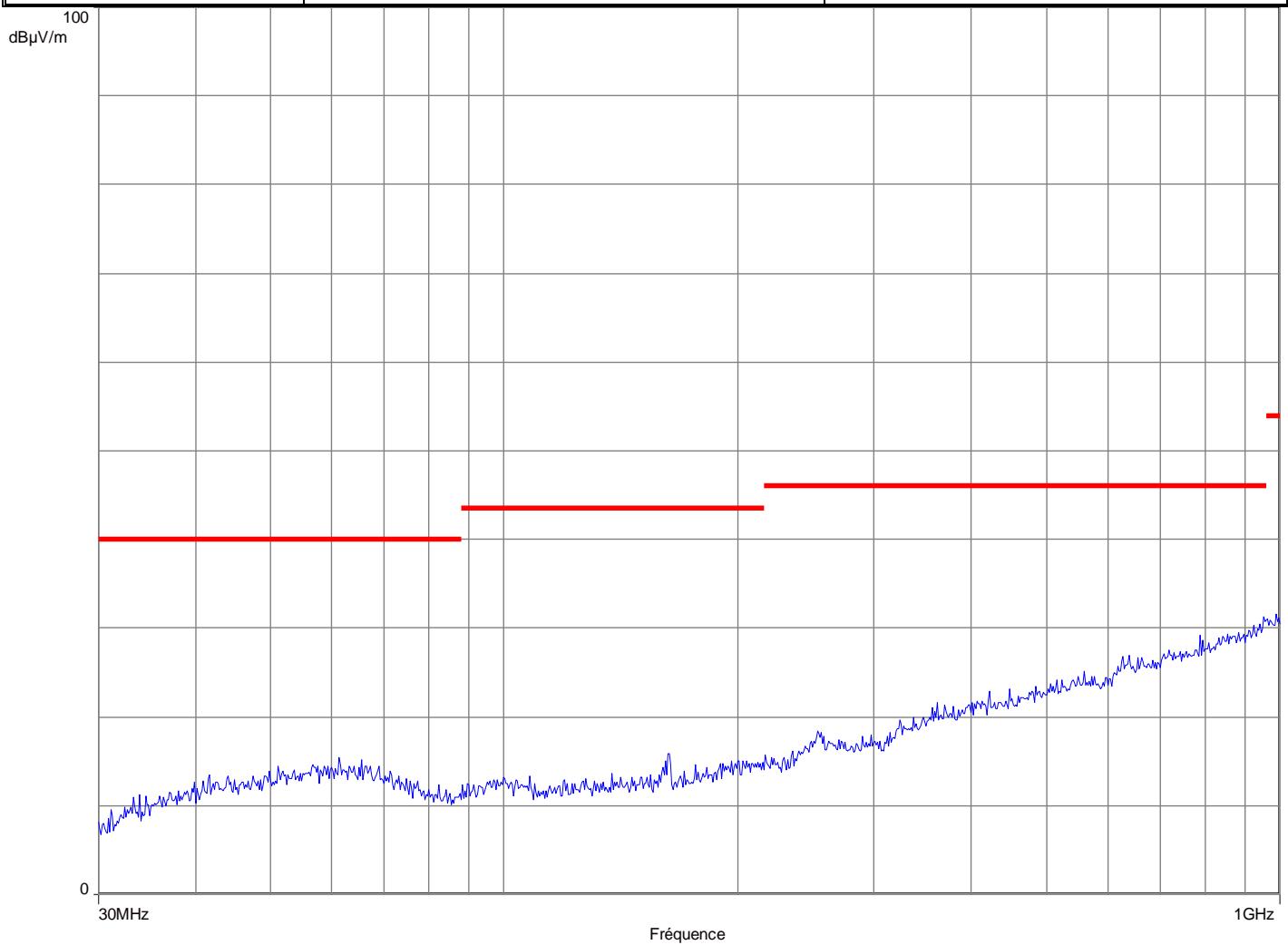
RADIATED EMISSIONS (30MHz-1GHz)		Test configuration:
Graph name:	Emr1#V	EMN 1000 W0
Antenna polarisation	Vertical	
Azimuth:	0° → 360° / 90° step (maxhold)	
RBW / VBW :	120kHz / 300kHz	





L C I E

RADIATED EMISSIONS (30MHz-1GHz)		Test configuration:
Graph name:	Emr2#H	EMN 500 D3-SP2
Antenna polarisation	Horizontal	
Azimuth:	0° → 360° / 90° step (maxhold)	
RBW / VBW :	120kHz / 300kHz	





L C I E

RADIATED EMISSIONS (30MHz-1GHz)		Test configuration:
Graph name:	Emr2#V	EMN 500 D3-SP2
Antenna polarisation	Vertical	
Azimuth:	0° → 360° / 90° step (maxhold)	
RBW / VBW :	120kHz / 300kHz	

