



LCIE

Rapport d'essai / Test report

N° 333785-A1-R2-E

JDE : 111374

DELIVRE A / ISSUED TO

: PHONAK COMMUNICATION AG
LAENGGASSE 17
3280 MURTEN - SWITZERLAND

Objet / Subject

: compatibilité électromagnétique conformément aux normes
FCC CFR 47 Part 15, Subpart B et C
RSS-210 Issue 8
Electromagnetic compatibility tests according to the standards
FCC CFR 47 Part 15, Subpart B and C
RSS-210 Issue 8

Matériel testé / Apparatus under test :

- Produit / Product : **Solution auditive RF / RF hearing product**
- Marque / Trade mark : **PHONAK COMMUNICATION AG**
- Constructeur / Manufacturer : **PHONAK COMMUNICATION AG**
- Type / Model : **DigiMaster X**
- N° de série / serial number : **DMX_V4.0_01**
- FCC ID : **KWC-DSFX**
- IC : **2262A-DSFX**

Date des essais / Test date

: Du 13 au 17 Février 2012 / From February 13th to 17th, 2012

Lieu d'essai / Test location

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

Test réalisé par / Test performed by

: Anthony MERLIN

Ce document comporte / Composition of document : 40 pages.

MOIRANS, LE 16 MARS 2012 / MARCH 16TH, 2012

Ecrit par / Written by,
Anthony MERLIN

Approuvé par / Approved by
Jacques DORQUIN

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1. TEST PROGRAM

Standard:

- FCC Part 15, Subpart C 15.247
- ANSI C63.4 (2003)
- RSS-210 Issue 8 – Dec 2010
- RSS-Gen Issue 3 – 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 CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-210 §A8.5	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* CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-210 §A8.5	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
Maximum Peak Output Power CFR 47 §15.247 (b) RSS-210 §A8.4(1)	Limit: 21dBm Conducted or Radiated measurement			PASS
Hopping Channel Separation CFR 47 §15.247 (a) (1) RSS-210 §A8.1(b)	Minimum between: Two-third 20dB Bandwidth or 25kHz Whichever is greater			PASS
Number of Hopping Frequencies CFR 47 §15.247 (a) (1) (iii) RSS-210 §A8.1(d)	At least 15 channels used			PASS
Time of Occupancy (Dwell Time) CFR 47 §15.247 (a) (1) (iii) RSS-210 §A8.1(d)	Maximum 0.4 sec within 16sec			PASS
Band Edge Measurement CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-210 §A8.5	Limit: -20dBc			PASS
Occupied bandwidth RSS-Gen §4.6.1	No limit			PASS
Receiver Spurious Emission** RSS-Gen §4.10	See RSS-Gen §4.10			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.

**Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.



2. SYSTEM TEST CONFIGURATION

2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it).

2.2. HARDWARE IDENTIFICATION

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

DigiMaster X

Serial number: **DMX_V4.0_01**
FCC ID: **KWC-DSFX**

- **Power supply n°1:**

- AC / DC Adaptor: Goldem Profit Electronics Ltd, model GPE060A-050100-Z, Sn: A/12297EA
- Rating: 100-240VAC 0.2A, 5VDC 1A.
- Frequency: 50/60Hz

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

- **Power supply n°2:**

- Mini USB port: 5VDC

During all the tests, EUT is supplied by USB port of laptop.

- **Input/output:**

- 1 x Power supply port, mini USB
- 1 x Audio OUT, jack
- 1 x Mini USB female, for INSPIRO

- **Auxiliaries used for testing:**

- 1 x INSPIRO, PHONAK, Sn: S0948NY4YF, for charging.
- 1 x Laptop LENOVO with its AC/DC adaptor.

- **I/O cables used for testing:**

- AC/DC adaptor cable, mini USB, shielded, length: 2m.
- 1 x Audio jack cables, shielded, length: 2m

- **Equipment information:**

- Frequency band: [2400 – 2483.5] MHz
- Number of channel: 40
- Channel separation: 2MHz
- Channel tested: 2402MHz, 2440MHz, 2480MHz
- RF mode: ☒TX/RX ☐RX ☐Standby
- Antenna type: PCB
- Antenna connector: ☐Permanent external ☐Permanent internal ☒Temporary (only for tests)
- Normal power source: 5VDC by AC/DC adaptor
- Spread Spectrum: FHSS
- Modulation: GFSK
- Protocol: Proprietary protocol of Phonak PWP (Phonak Wireless Protocol)
- Data rate: 2Mbps



2.3. EUT CONFIGURATION

Following configurations are set to performed different tests:

- Permanent emission with modulation without FHSS, highest, middle and lowest channel used.
- Permanent emission with modulation with FHSS

Software used: Phonak AudioHub RF Test Interface v1.1 Preliminary

Parameters:

- RF Channel: 2 / 40 /80
- RF Power: 0

DigiMaster X can charge INSPIRO (itself is set OFF) and emit simultaneously, tests results presented in this test report is the worst case.

DigiMaster X can be supplied by AC/DC adaptor or USB laptop, tests results presented in this test report is the worst case.

2.4. EQUIPMENT MODIFICATIONS

None

2.5. SPECIAL ACCESSORIES

None

3. CONDUCTED EMISSION DATA

3.1. CLIMATIC CONDITIONS

Date of test : February 13th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1002hPa
Relative humidity : 16%
Ambient temperature : 21°C

3.1. 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 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.

3.2. 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.

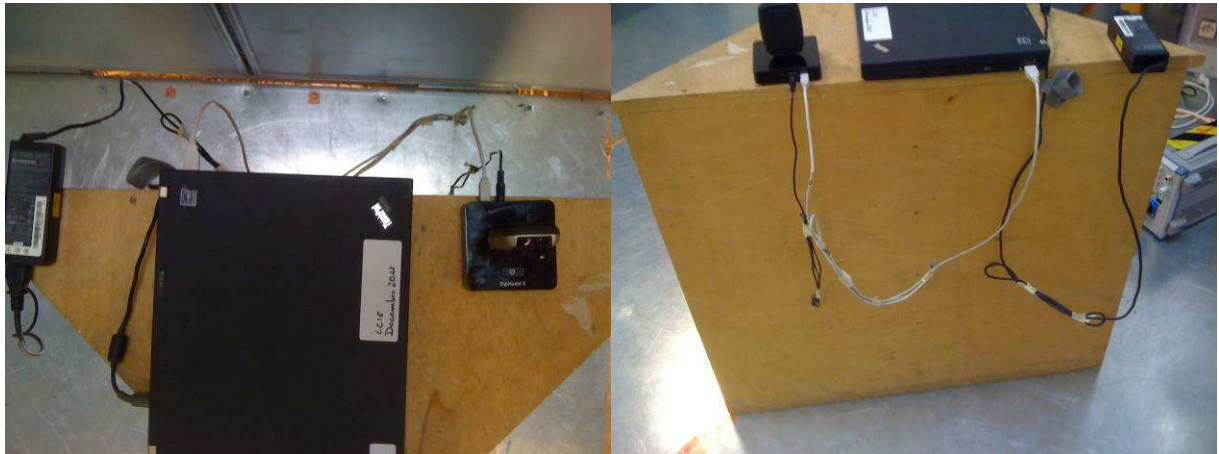
Auxiliaries are powered by another LISN.

The cable has been shorted to 1meter length. The EUT is powered trough the LISN (measure).





Setup with AC/DC adaptor





Setup with Laptop

**3.3. TEST EQUIPMENT LIST**

Description	Manufacturer	Model	Identifier
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019
Cable	-	-	A5329197
LISN	RHODE & SCHWARZ	ENV216	C2320123
Conducted emission comb generator	BARDET	-	A3169049
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204
Conducted emission comb generator	BARDET	-	A3169049
Conducted emission comb generator	BARDET	-	A3169049

3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

3.5. 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.

Power supply n°1:

Measure on L1:	graph Emc#1	(see annex 1)
Measure on N:	graph Emc#2	(see annex 1)

Power supply n°2:

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

RESULT: PASS

4. RADIATED EMISSION DATA

4.1. CLIMATIC CONDITIONS

Date of test	: February 14 th , 2012	February 16 th , 2012
Test performed by	: A.MERLIN	
Atmospheric pressure	: 1004hPa	991hPa
Relative humidity	: 21%	37%
Ambient temperature	: 20°C	20°C

4.2. 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.



Power supply n°1



Power supply n°2



4.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N°LCIE	Cal_Date	Cal_Due
Amplifier 8 GHz	HEROTEK	A1080304A	A7102024	01/11	01/12
Amplifier 8-26GHz	ALDETEC	ALS01452	A7102026	12/10	12/11
Antenna Bi-log	CHASE	CBL6111A	C2040051	08/10	08/12
Antenna Bi-log	CHASE	CBL6111A	C2040172	05/11	05/13
Antenna horn	EMCO	3115	C2042027	11/11	11/12
Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	C2042028	-	-
Cable N/N	-	-	A5329038	04/11	04/12
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329188	05/11	05/12
Cable OATS (Mast at 10m)	UTIFLEX	-	A5329199	05/11	05/12
Cable	-	-	A5329562	07/11	07/12
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	-	-
Radiated emission comb generator	BARDET	-	A3169050	-	-
OATS	-	-	F2000409	09/11	09/12
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	10/10	10/11
Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	A4060018	04/11	04/12
Thermo-hygrometer	HUGER	-	B4204052	04/10	04/12
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	-	-
Table	MATURO GmbH	-	F2000437	-	-

4.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None



4.5. TEST SEQUENCE AND RESULTS

4.5.1. 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.

4.5.2. Pre-characterization [30MHz-25GHz]

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 25GHz, a search is performed in the semi-anechoic chamber in order to determine frequencies radiated by the EUT (Measuring distance reduced to 1m and 20cm for frequencies from 12GHz to 25GHz).

See graphs for 30MHz-1GHz:

H polarization	With power supply n°1	Emr#1	(See annex 1)
V polarization	With power supply n°1	Emr#2	(See annex 1)
H polarization	With power supply n°2	Emr#3	(See annex 1)
V polarization	With power supply n°2	Emr#4	(See annex 1)

4.5.3. 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 §15.109 limits and C §15.209.

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 in following tables.

Frequency (MHz)	QPeak Limit (dBµV/m) @ 30m	Qpeak (dBµV/m)	Qpeak-Limit (Margin dB)	Turntable Angle (deg)	Ant. Pol./ Angle (deg)	Tot Corr (dB)
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No frequency observed

*: Measure have been done at 10m distance and corrected according to requirements of 15.209.e) ($M@30m = M@10m - 19.1dB$)



4.5.4. Characterization on 10 meters open site from 30MHz to 25GHz

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 25GHz.

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	35.879	40.0	37.8	-2.2	45	V	100	14.9	Power Supply n°2
2	42.016	40.0	34.1	-5.9	355	V	100	12.5	Power Supply n°2
3	44.498	40.0	35.0	-5.0	175	V	100	11.7	Power Supply n°2
4	67.933	40.0	26.0	-14.0	0	V	100	7.4	Power Supply n°1
5	77.999	40.0	38.6	-1.4	80	V	200	8.6	Power Supply n°1
6	115.401	43.5	32.8	-10.7	160	V	100	14.0	Power Supply n°1
7	191.999	43.5	39.5	-4.0	85	V	200	12.0	Power Supply n°1
8	287.999	46.0	41.6	-4.4	250	H	350	16.0	Power Supply n°1
9	575.999	46.0	43.7	-2.3	240	V	400	23.1	Power Supply n°1

*: 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 25GHz

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

Worst case final data result: DigiMaster X + AC/DC adaptor

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
1	4.804	54.0	39.9	-14.1	40	V	110	2.5	-
2	4.880	54.0	39.7	-14.3	55	V	110	2.5	-
3	4.960	54.0	39.1	-14.9	45	V	110	2.5	-
4	7.320	54.0	48.7	-5.3	165	V	100	6.4	-
5	7.440	54.0	47.7	-6.3	160	V	110	6.4	-

No	Frequency (GHz)	Limit Peak (dBµV/m)	Measure Peak (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4.804	74.0	52.1	-21.9	40	V	110	2.5	-
2	4.880	74.0	51.3	-22.7	55	V	110	2.5	-
3	4.960	74.0	51.2	-22.8	45	V	110	2.5	-
4	7.320	74.0	61.2	-12.8	165	V	100	6.4	-
5	7.440	74.0	60.7	-13.3	160	V	110	6.4	-

Note: Measures have been done at 3m distance.

RESULTS: PASS

**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 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.

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

**5. MAXIMUM PEAK OUTPUT POWER (15.247)****5.1. TEST CONDITIONS**

Date of test : February 13th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1002hPa
Relative humidity : 16%
Ambient temperature : 20°C

5.2. EQUIPMENT CONFIGURATION

Modulation: GFSK
Power supply n°1: Worst case presented

5.3. SETUP

Conducted measurement:

The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10MHz VBW.

The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

5.4. TEST EQUIPMENT LIST

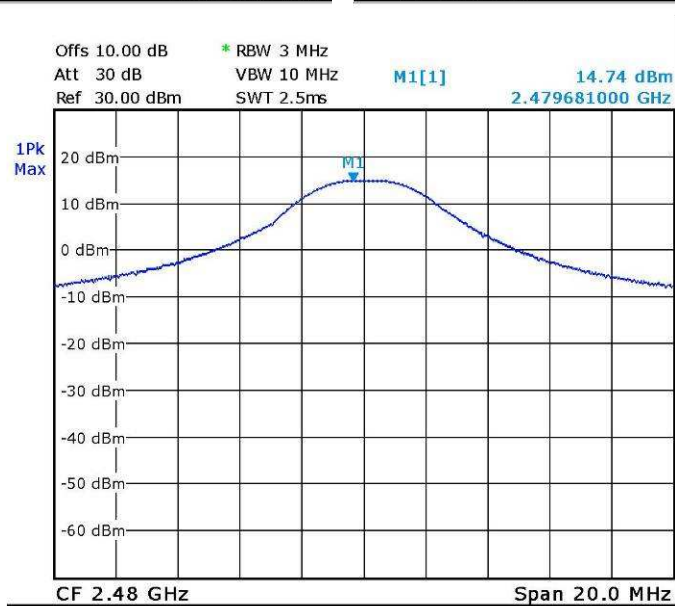
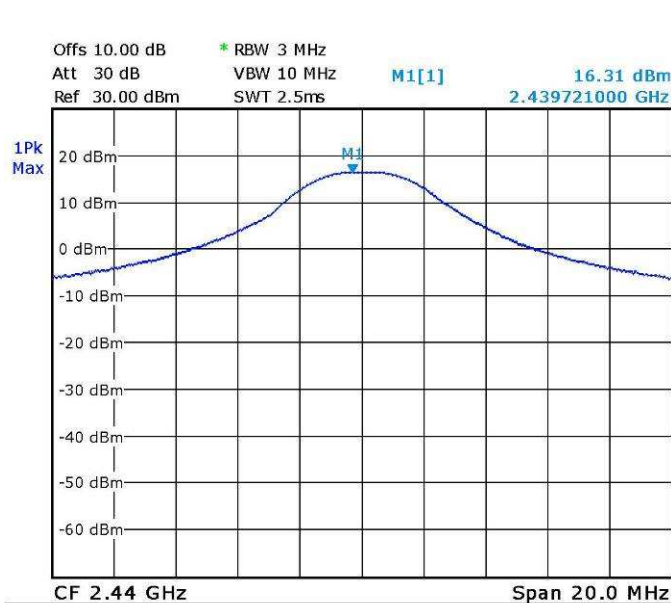
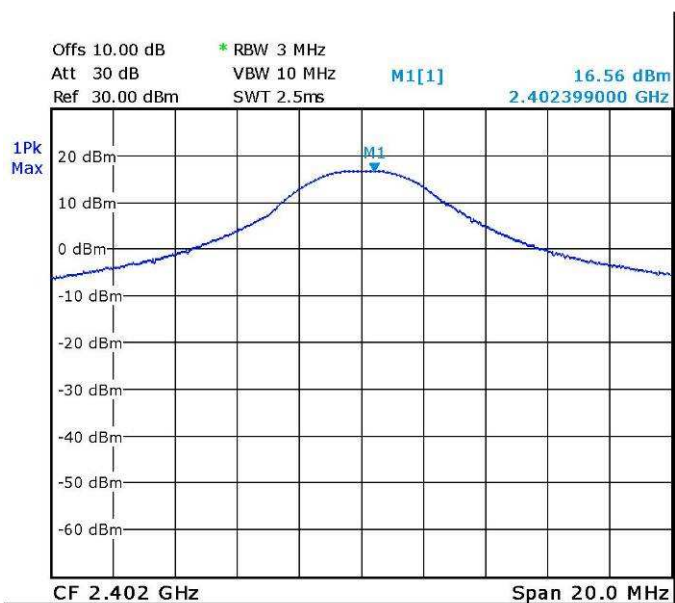
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Attenuator 10dB	-	-	A7122126
Cable SMA/SMA	-	-	A5329041
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

Modulation: GFSK

Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)	PASS / FAIL
2402	16.6	21.0	P
2440	16.3	21.0	P
2480	14.8	21.0	P



**6. HOPPING CHANNEL SEPARATION (15.247)****6.1. TEST CONDITIONS**

Date of test : February 13th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1002hPa
Relative humidity : 16%
Ambient temperature : 20°C

6.2. LIMIT

For frequency hopping system operating in the 2400-2483.5MHz, if the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB Bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

6.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Hopping sequence: ON
Power supply n°1: Worst case presented

6.4. SETUP – 20DB BANDWIDTH

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with the Peak Output Power measured. The EUT is turn ON and using the MaxHold function, the frequency separation of two frequencies that were attenuated 20dB from the Peak Output Power level. A delta marker is used to measure the frequency difference as the emission bandwidth.

6.5. SETUP – ADJACENT CHANNEL SEPARATION

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with the Peak Output Power measured. The EUT is turn ON and using the MaxHold function, the separation of two adjacent channels is recorded. A delta marker is used to measure the frequency difference.

6.6. TEST EQUIPMENT LIST

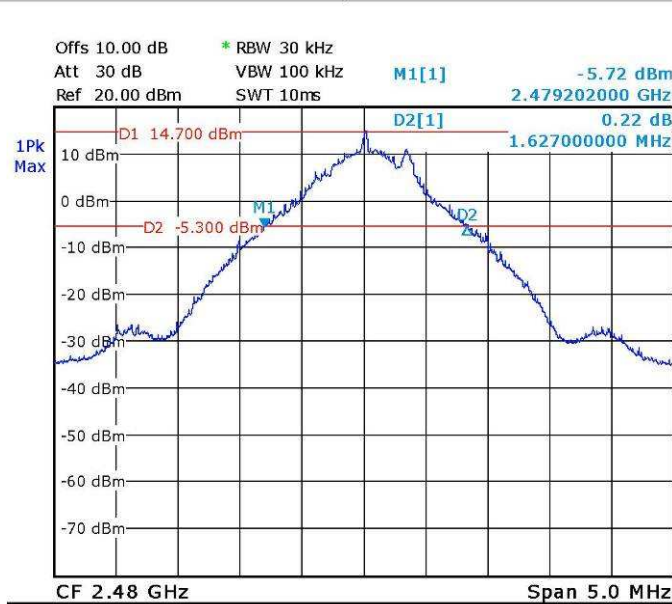
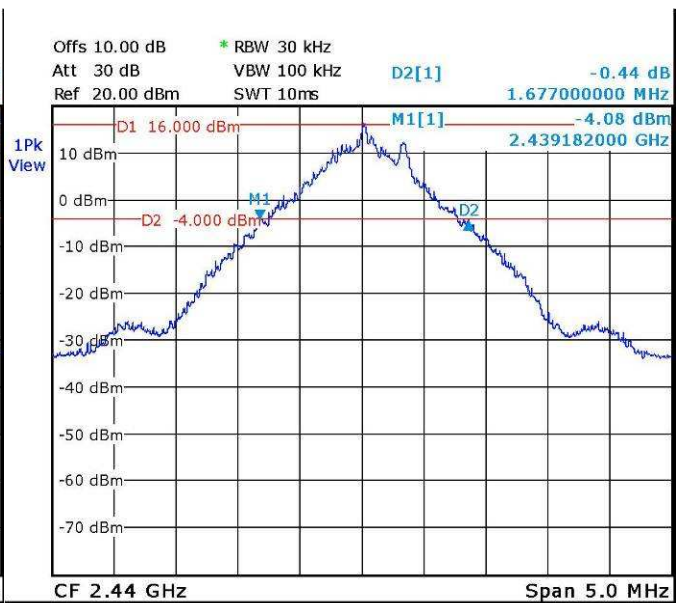
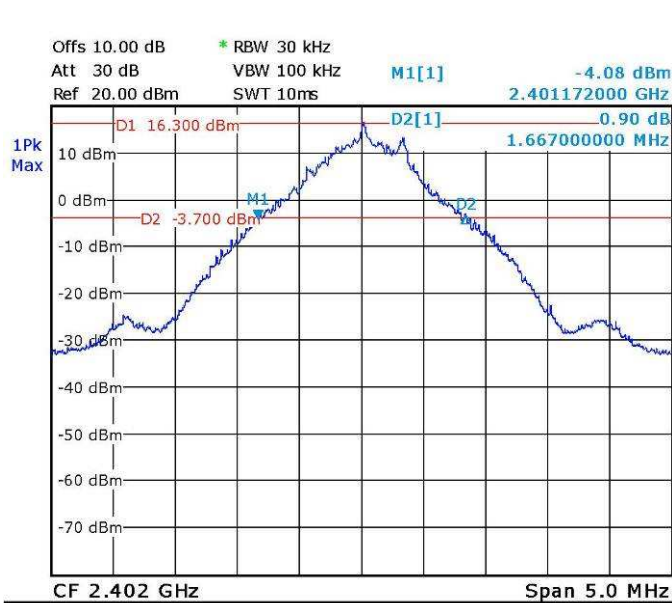
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Attenuator 10dB	-	-	A7122126
Cable SMA/SMA	-	-	A5329041
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

6.7. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

6.8. RESULTS – 20DB BANDWIDTH

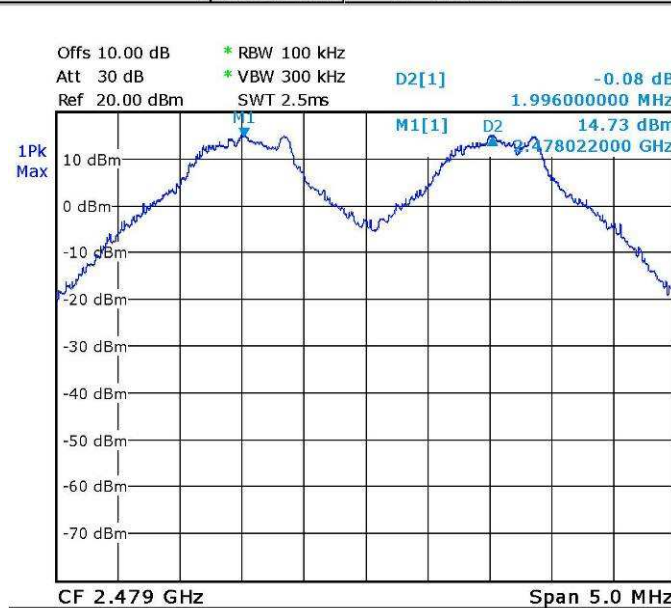
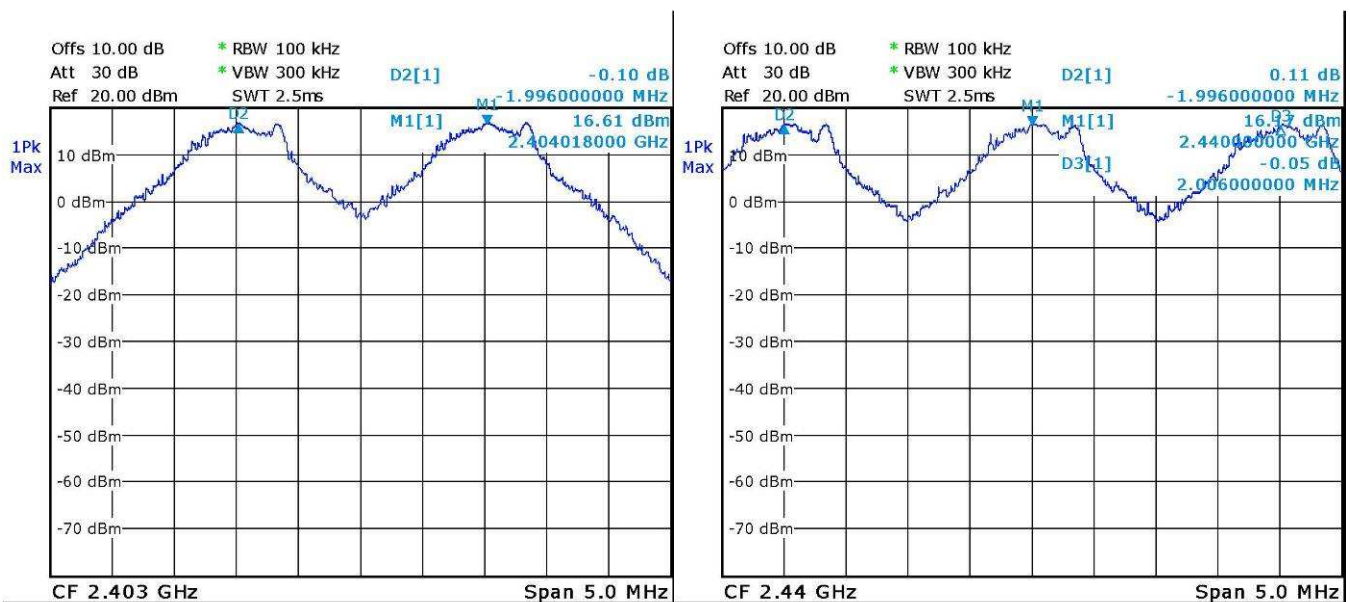
Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	1.667
39	2440	1.677
78	2480	1.627



6.9. SETUP – ADJACENT CHANNEL SEPARATION

Channel Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	PASS / FAIL
2402	1.996	1.667	1.112	P
2440	1.996	1.677	1.118	P
2480	1.996	1.627	1.085	P

Limit used: Two-third 20dB Bandwidth



**7. NUMBER OF HOPPING FREQUENCIES (15.247)****7.1. TEST CONDITIONS**

Date of test : February 13th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1002hPa
Relative humidity : 16%
Ambient temperature : 20°C

7.2. LIMIT

For frequency hopping system operating in the 2400-2483.5MHz, at least 15 channels frequencies must be used and should be equally spaced.

7.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Hopping sequence: ON
Power supply n°1: Worst case presented

7.4. SETUP

The EUT is placed in an anechoic chamber. The EUT is turn ON and using the MaxHold function and a delta marker the number of frequencies used for this FHSS system is recorded, see following graphs.

RBW: 100kHz

VBW: 300kHz

7.5. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N°LCIE
Attenuator 10dB	-	-	A7122126
Cable SMA/SMA	-	-	A5329041
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

7.6. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

**8. TIME OF OCCUPANCY (DWEELL TIME) (15.247)****8.1. TEST CONDITIONS**

Date of test : February 13th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1002hPa
Relative humidity : 16%
Ambient temperature : 20°C

8.2. LIMIT

The average time of occupancy on any channel shall not be greater than 0.4 seconds within period of 0.4 seconds multiplied by the number of hopping channels employed.

8.3. EQUIPMENT CONFIGURATION

Modulation:
Channel frequency:
Hopping sequence: ON
Power supply n°1: Worst case presented

8.4. SETUP

The EUT is placed in an anechoic chamber. The EUT is turn ON; the Dwell Time is measured and calculated using the zero SPAN mode on a channel frequency and a SWEEP with an adapter value to measure the number of transmission within a period and the time of transmission

RBW: 100kHz
VBW: 300kHz

8.5. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N°LCIE
Attenuator 10dB	-	-	A7122126
Cable SMA/SMA	-	-	A5329041
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

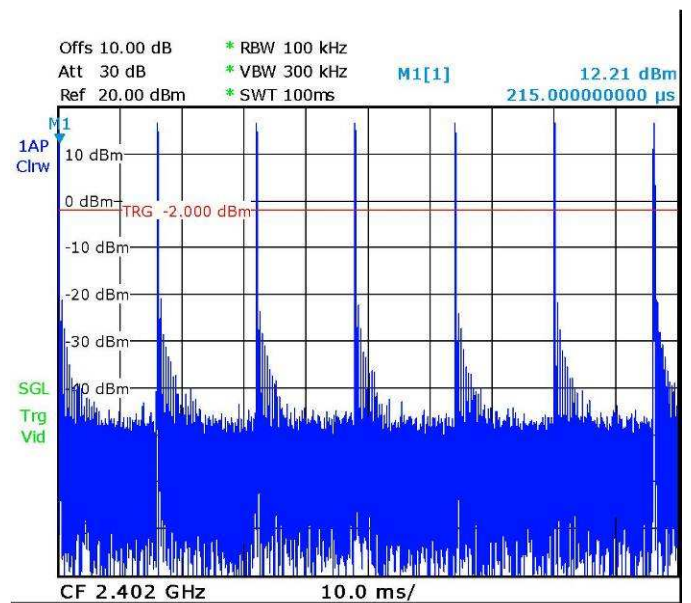
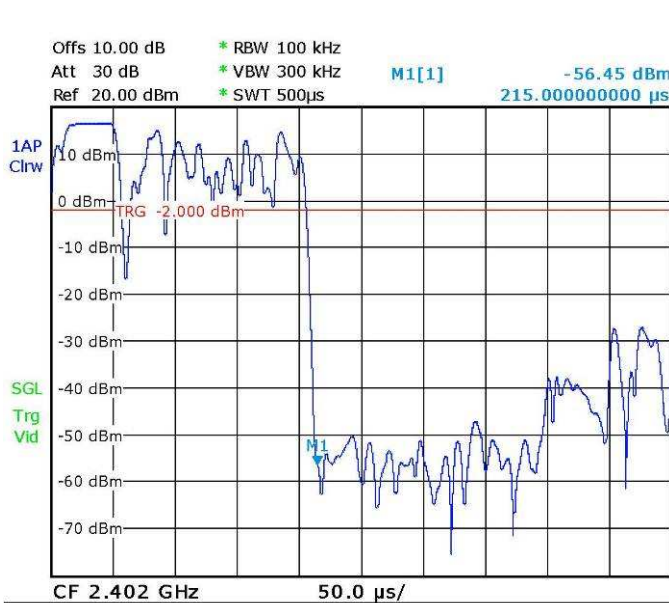
8.1. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

8.2. RESULTS

Number of transmission in the period	Length of transmission time (ms)	Result (ms)	Limit (ms)	PASS / FAIL
70 (times/sec) * tps de transmit	215µs	241	400	PASS

Note: Period of 16 seconds (40 channels x 0.4)



**9. BAND EDGE MEASUREMENT (15.247)****9.1. TEST CONDITIONS**

Date of test : February 13th, 2012
Test performed by : A.MERLIN
Atmospheric pressure : 1002hPa
Relative humidity : 16%
Ambient temperature : 20°C

9.2. LIMIT

In Bandedge, the limit of spurious emissions are below -20dB of the highest emission level of operating band (in 100kHz RBW).

In the restrict band (2310-2390MHz) and (2483.5-2500MHz) including bandedge, the limit of spurious emissions are 15.209. (RBW:1MHz / VBW:1MHz)

9.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Hopping sequence: ON
Power supply n°1: Worst case presented

9.4. SETUP

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with Peak Output Power measurement. The EUT is turn ON; the graphs of the restrict frequency band are recorded with a display line indicating the highest level and other the 20dB offset below to show compliance with 15.247 (d) and 15.205. The emissions in restricted bands are compared to 15.209 limits.

RBW: 100kHz

VBW: 300kHz

9.5. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Attenuator 10dB	-	-	A7122126
Cable SMA/SMA	-	-	A5329041
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020
Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	A4060018

9.6. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

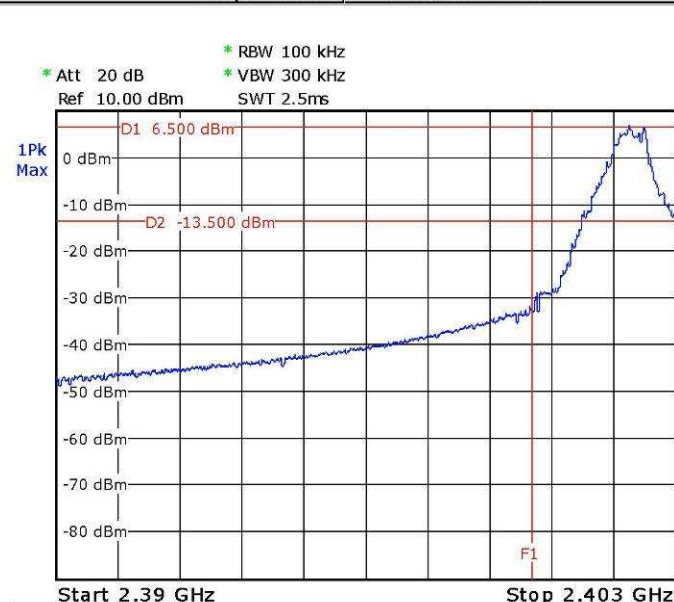
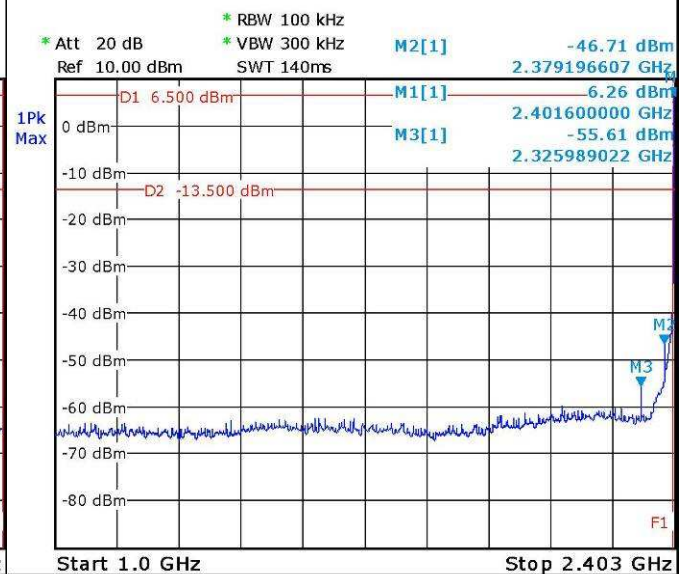
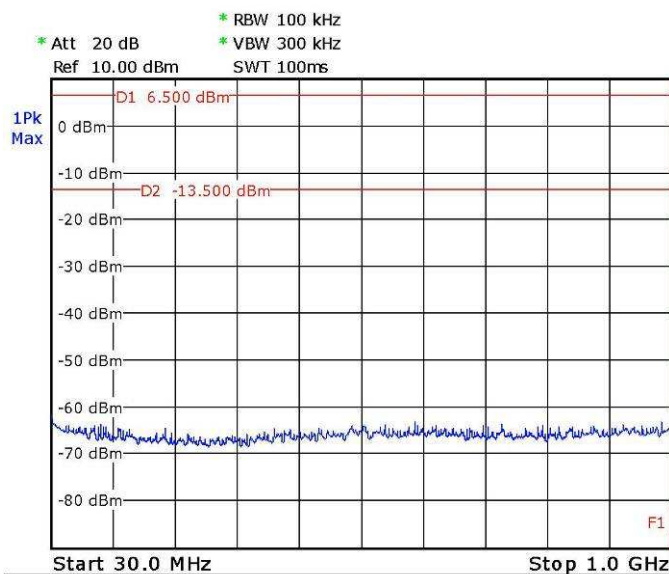
9.7. RESULTS

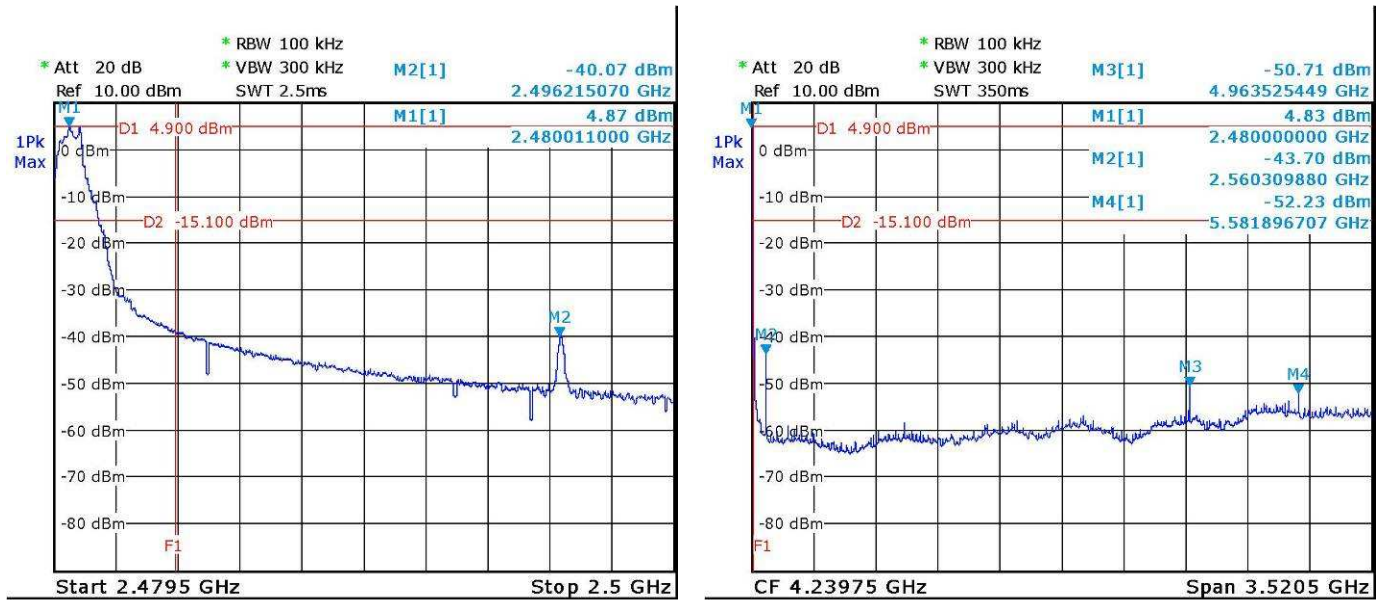
Restricted Band (2310-2390) MHz

Frequency (MHz)	Maximum field strength in restrict band (dBμV/m)	Limit (dBμV/m)	Detector
2325.989	47.0	74	PK
2379.197	53.5	74	PK
2379.197	41.1	54	AV

Restricted Band (2483.5-2500) MHz

Frequency (MHz)	Maximum field strength in restrict band (dBμV/m)	Limi (dBμV/m)	Detector
2496.215	57.8	74	PK
2496.215	39.9	54	AV





Measurement from 6GHz to 26GHz: No frequency observed

Note: For frequencies from 6GHz to 26GHz, it isn't possible to export screenshots.

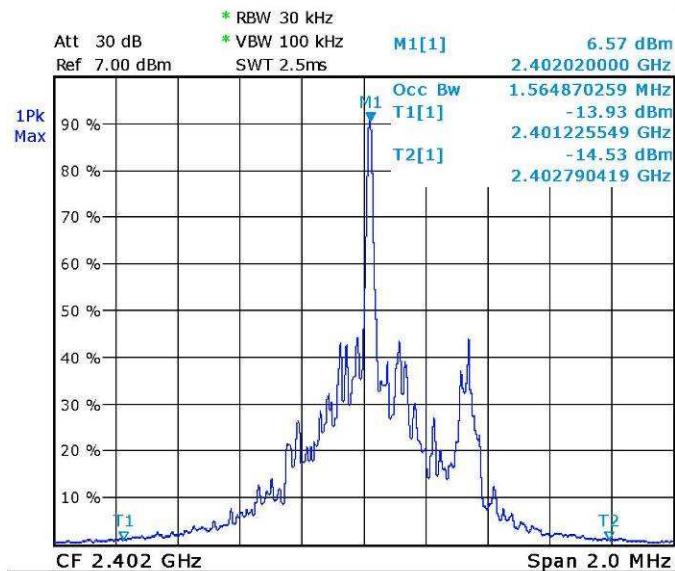
10. OCCUPIED BANDWIDTH – RSS-210

10.1. CLIMATIC CONDITIONS

Date of test : February 14th, 2012
 Test performed by : A.MERLIN
 Atmospheric pressure : 1004mb
 Relative humidity : 21%
 Ambient temperature : 21°C

10.2. TEST RESULTS

Carrier Frequency: 2402MHz



Measured occupied bandwidth is **1.56MHz**

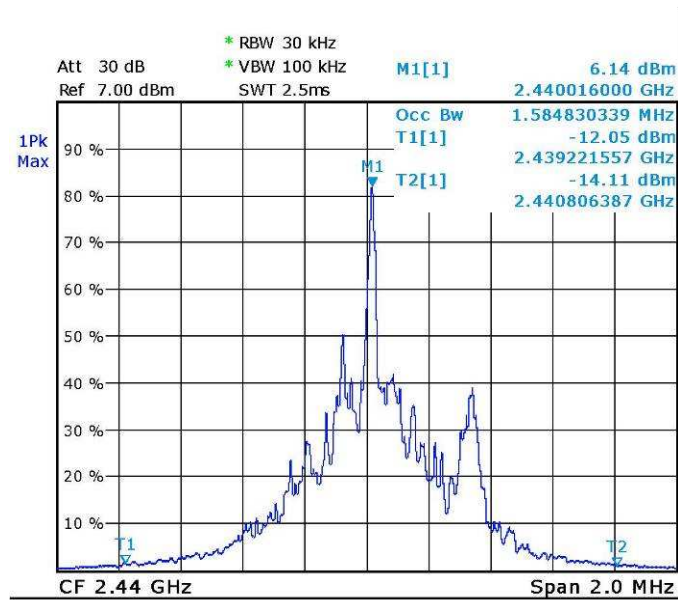
Measurement settings:

RBW = 30kHz / Video BW = 100kHz

Linear unit

The occupied bandwidth is measured where 99% of the power envelop is above the displayed line.

Carrier Frequency: 2440MHz



Measured occupied bandwidth is **1.58MHz**

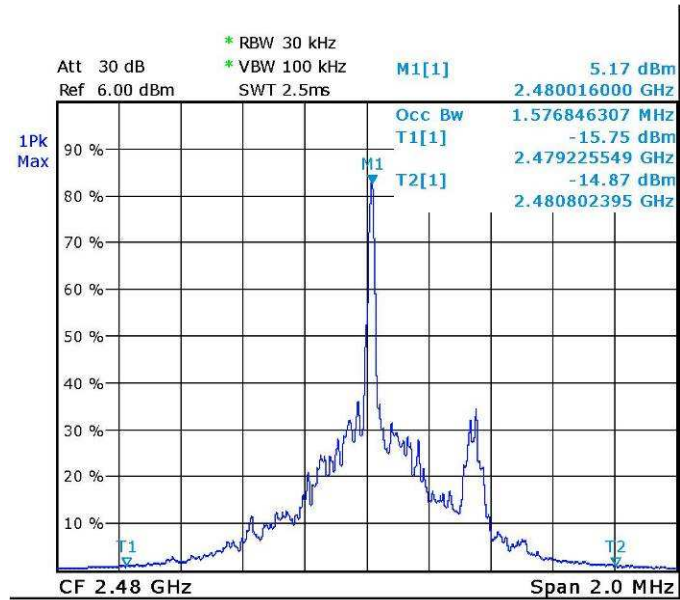
Measurement settings:

RBW = 30kHz / Video BW = 100kHz

Linear unit

The occupied bandwidth is measured where 99% of the power envelop is above the displayed line.

Carrier Frequency: 2480MHz



Measured occupied bandwidth is **1.57MHz**

Measurement settings:

RBW = 30kHz / Video BW = 100kHz

Linear unit

The occupied bandwidth is measured where 99% of the power envelop is above the displayed line.



10.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE
Attenuator 10dB	-	-	A7122126
Cable SMA/SMA	-	-	A5329041
Receiver 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642020

10.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

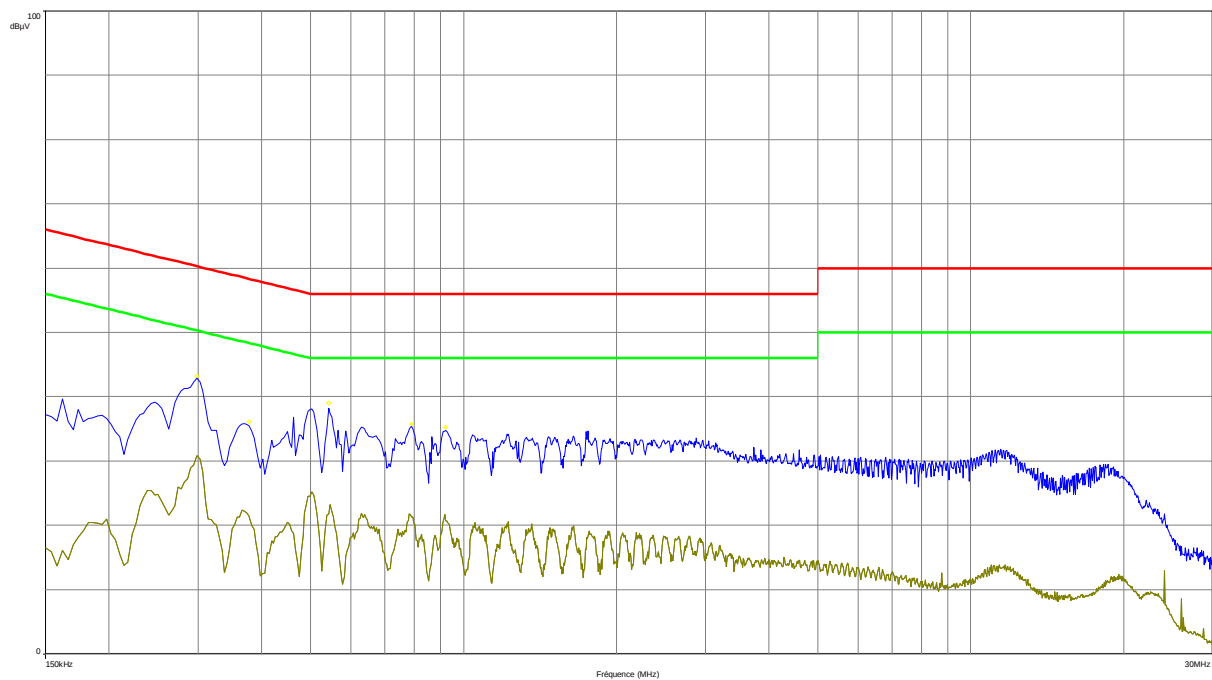
11. ANNEX 1 (GRAPHS)

RADIATED EMISSIONS

Graph name :	Emc#1	Test configuration:
Limit :	EN 55022	DIGIMASTER X with AC/DC Adaptor
Class :	B	

PARAMETERS

Voltage / Frequency :	110VAC / 60Hz	Legend:			
Line :	Phase1		Peak Measure		Average Measure
RBW :	9kHz			QPeak Limit	
VBW :	30kHz				
Frequency :	150kHz- 30MHz				



Frequency (MHz)	Avg (dBμV)	Lim Avg (dBμV)	Avg-LimAvg (dBμV)	QPeak (dBμV)	LimQPeak (dBμV)	QPeak-LimQPeak (dBμV)
0.298	30.44	50.30	-19.86	38.26	60.30	-22.04
0.378	21.83	48.32	-26.49	30.02	58.32	-28.30
0.542	22.47	46.00	-23.53	31.33	56.00	-24.67
0.790	22.02	46.00	-23.98	30.50	56.00	-25.50
0.922	21.50	46.00	-24.50	30.00	56.00	-26.00
1.758	19.10	46.00	-26.90	27.87	56.00	-28.13

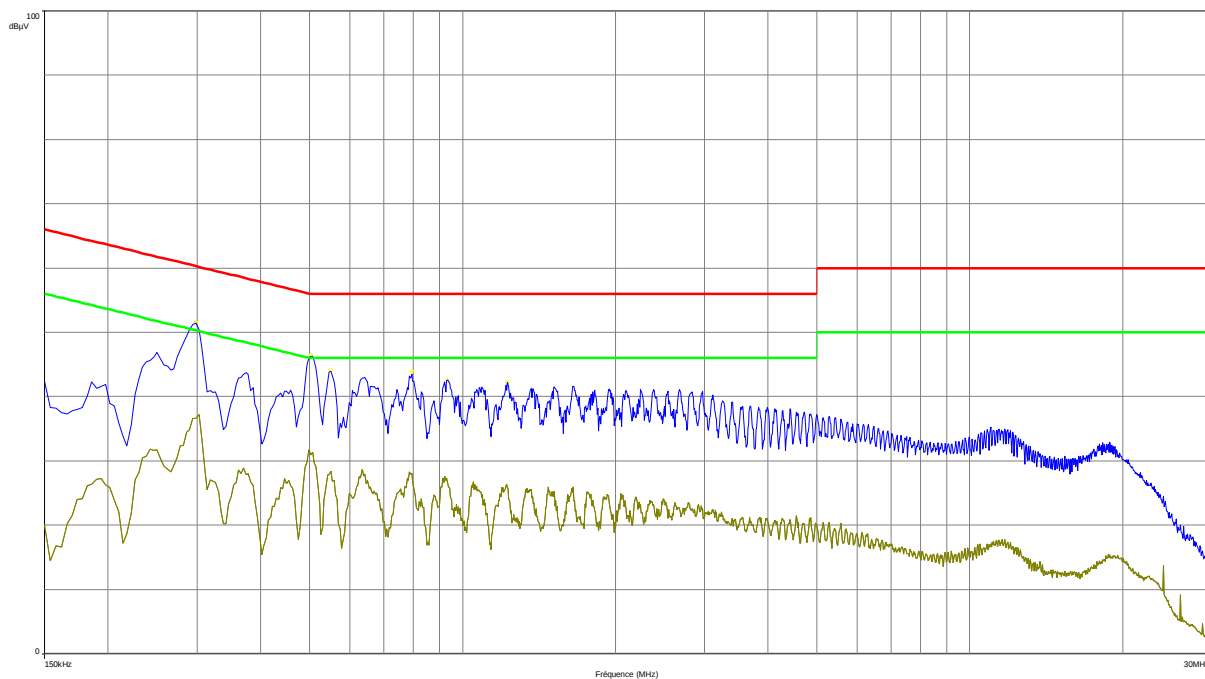


RADIATED EMISSIONS

Graph name :	Emc#2	Test configuration:
Limit :	EN 55022	DIGIMASTER X with AC/DC Adaptor
Class :	B	

PARAMETERS

Voltage / Frequency :	110VAC / 60Hz	Legend:		
Line :	Neutre	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)
0.298	35.73	50.3	-14.57	44.44	60.30	-15.85
0.502	30.09	46.00	-15.91	38.95	56.00	-17.05
0.550	26.97	46.00	-19.03	36.00	56.00	-20.00
0.794	26.20	46.00	-19.80	35.28	56.00	-20.72
0.934	25.34	46.00	-20.66	33.98	56.00	-22.02
1.226	24.81	46.00	-21.19	33.86	56.00	-22.14

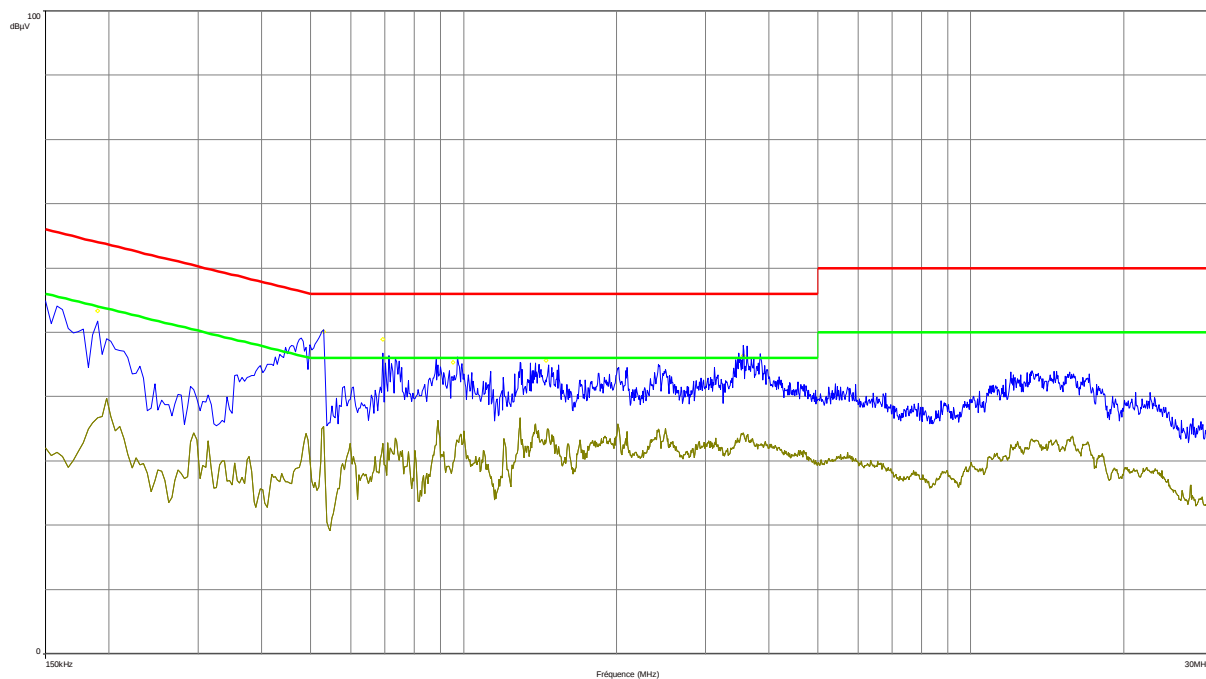


RADIATED EMISSIONS

Graph name :	Emc#3	Test configuration:
Limit :	EN 55022	DIGIMASTER X supplied by USB laptop
Class :	B	

PARAMETERS

Voltage / Frequency :	110VAC / 60Hz	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)
0.190	37.44	54.04	-16.59	45.05	64.04	-18.99
0.530	34.45	46.00	-11.55	48.57	56.00	-7.43
0.694	32.04	46.00	-13.96	38.79	56.00	-17.21
0.954	31.42	46.00	-14.58	38.21	56.00	-17.79
1.454	32.12	46.00	-13.88	38.79	56.00	-17.21
3.554	32.62	46.00	-13.38	39.36	56.00	-16.64

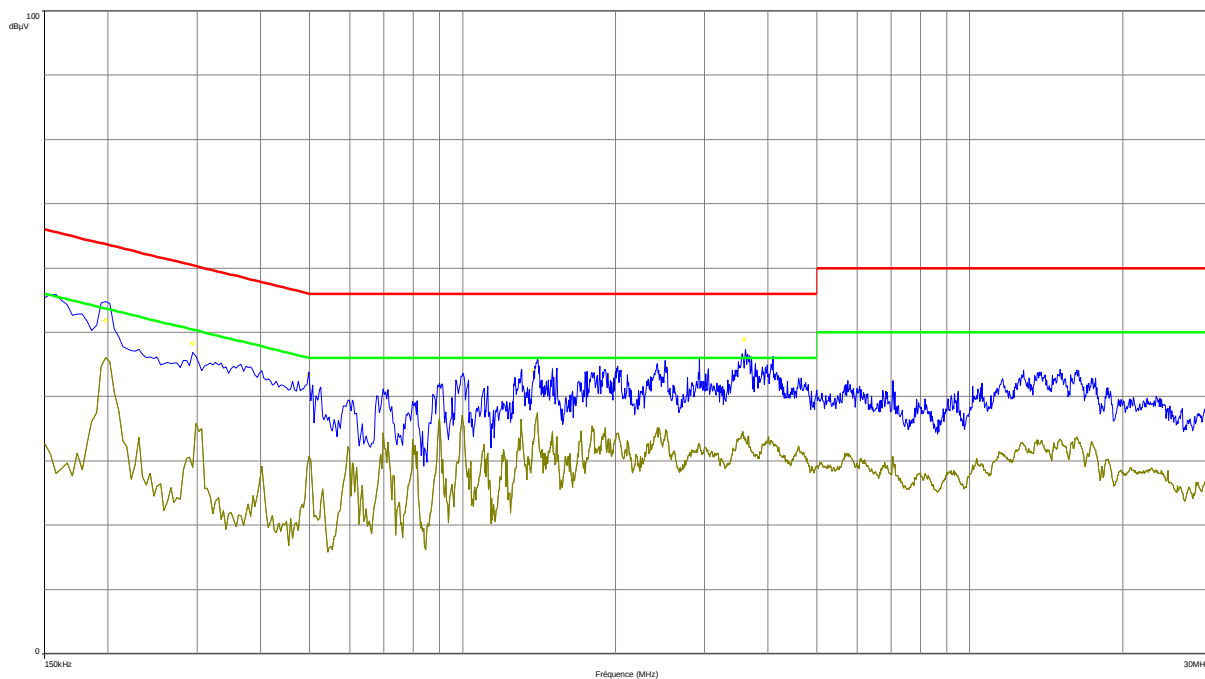


RADIATED EMISSIONS

Graph name :	Emc#4	Test configuration:
Limit :	EN 55022	DIGIMASTER X supplied by USB laptop
Class :	B	

PARAMETERS

Voltage / Frequency :	110VAC / 60Hz	Legend:		
Line :	Neutre	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)
0.198	38.92	53.69	-14.77	46.95	63.69	-16.74
0.294	30.27	50.41	-20.14	39.43	60.41	-20.98
0.498	29.44	46.03	-16.59	35.92	56.03	-20.11
1.378	33.47	46.00	-12.53	39.90	56.00	-16.10
1.938	33.11	46.00	-12.89	38.81	56.00	-17.19
2.510	33.93	46.00	-12.07	39.84	56.00	-16.16
3.586	32.83	46.00	-13.17	39.76	56.00	-16.24

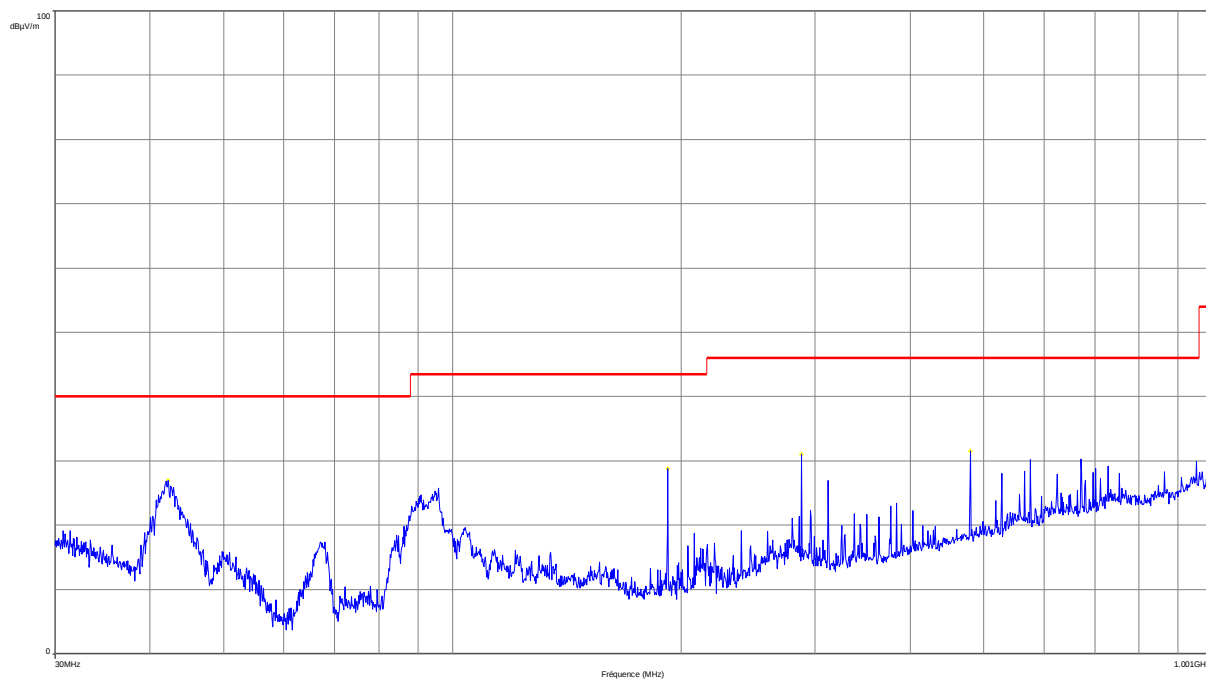


RADIATED EMISSIONS

Graph name :	Emr#1	Test configuration:
Limit :	FCC Part15C	DIGIMASTER X with AC/DC Adaptor
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)
42.28	26.93
192.00	28.84
288.00	31.05
480.00	31.52

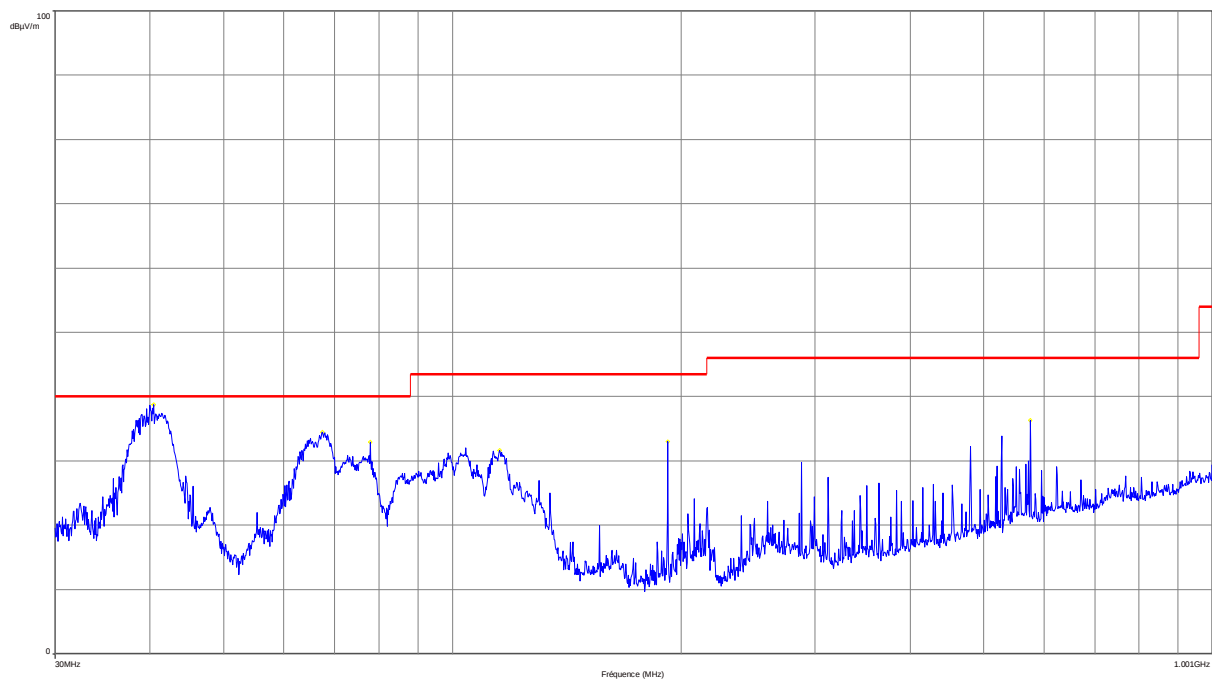


RADIATED EMISSIONS

Graph name :	Emr#2	Test configuration:
Limit :	FCC Part15C	DIGIMASTER X with AC/DC Adaptor
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)
40.44	38.72
67.48	34.48
78.00	32.93
115.36	31.67
192.00	33.00
576.00	36.29

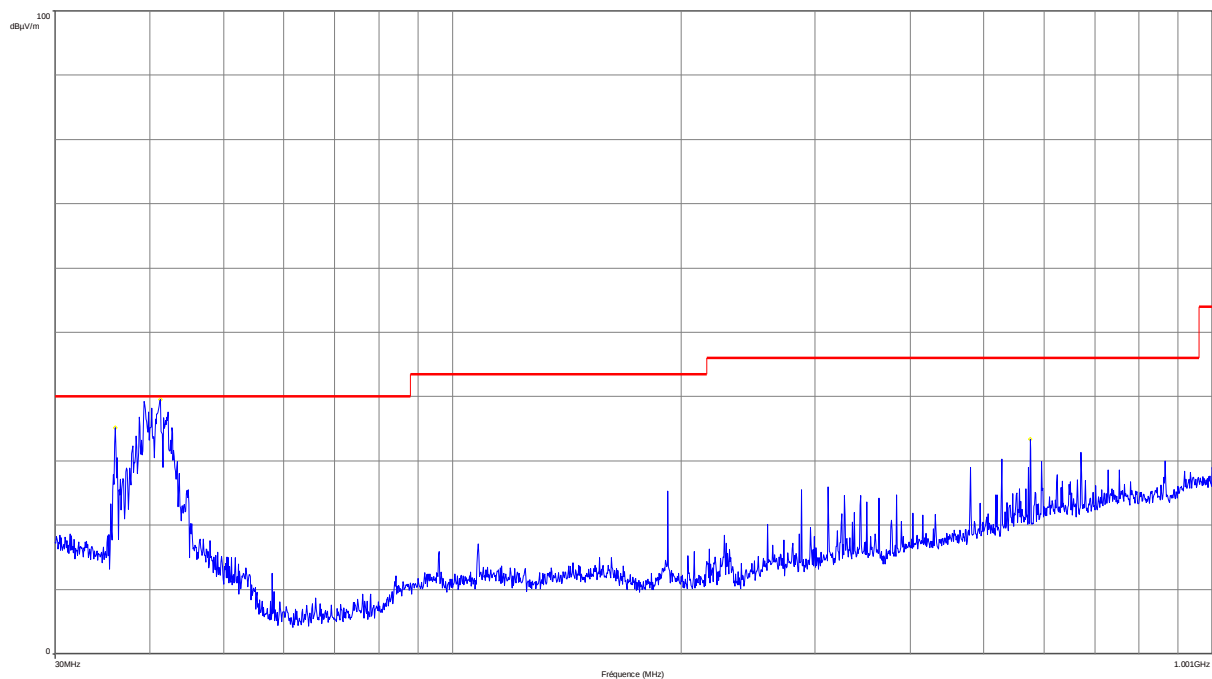


RADIATED EMISSIONS

Graph name :	Emr#3	Test configuration:
Limit :	FCC Part15C	DIGIMASTER X with Laptop
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)
36.00	35.12
41.28	39.59
575.96	33.35

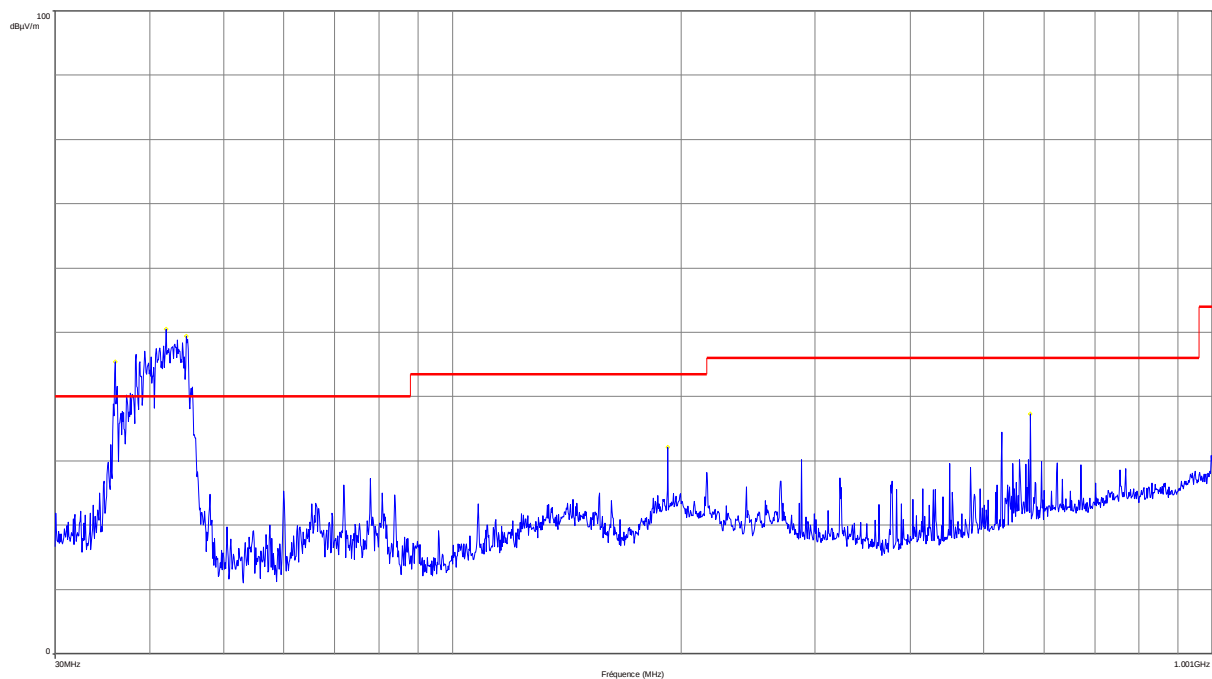


RADIATED EMISSIONS

Graph name :	Emr#4	Test configuration:
Limit :	FCC Part15C	DIGIMASTER X with Laptop
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)
36.00	45.46
42.00	50.46
44.68	49.39
192.00	32.15
576.00	37.34

**12. 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.