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# TEST REPORT

N°: 770941-A1-R2-E

JDE : 661007

**Subject** Electromagnetic compatibility and Radio spectrum Matters  
(ERM) tests according to standards:  
FCC CFR 47 Part 15, Subpart B et C  
RSS-210 Issue 8

**Issued to** ACOEM  
200 Chemin des Ormeaux  
69578 LIMONEST - FRANCE

**Apparatus under test**

↳ Product **MXX Captor**  
↳ Trade mark **ACOEM**  
↳ Manufacturer **ACOEM**  
↳ Model **EGL1102000 – EGL1103000 – EGL1104000**  
↳ Model under test **EGL1103000**  
↳ Serial number **EAGLE- 00099F & EAGLE- 000989**  
↳ FCCID **2AC3Z-EGL1102**  
↳ ICID **12336A-EGL1102**

**Test date** From October 13<sup>th</sup> to 21<sup>st</sup>, 2014

**Test location** Moirans

**Test performed by** Anthony MERLIN / Gaëtan DESCHAMPS

**Composition of document** 31 pages

**Modification of the last version** None

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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
<b>Limits for conducted disturbance at mains ports</b> 150kHz-30MHz	<b>Frequency</b>	<b>Quasi-peak value (dBµV)</b>	<b>Average value (dBµV)</b>	<input type="checkbox"/> PASS <input type="checkbox"/> FAIL <input checked="" type="checkbox"/> NA <input type="checkbox"/> NP
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
<b>Radiated emissions</b> 9kHz-30MHz CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-210 §A8.5	<b>Measure at 300m</b> 9kHz-490kHz : 67.6dBµV/m /F(kHz) <b>Measure at 30m</b> 490kHz-1.705MHz : 87.6dBµV/m /F(kHz) 1.705MHz-30MHz : 29.5 dBµV/m			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Radiated emissions</b> 30MHz-25GHz* CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-210 §A8.5 <b>Highest frequency :</b> <b>(Declaration of provider)</b>	<b>Measure at 3m</b> 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Bandwidth 6dB</b> CFR 47 §15.247 (a) (2) RSS-210 §A8.2	<b>At least 500kHz</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Maximum Peak Output Power</b> CFR 47 §15.247 (b) RSS-210 §A8.4 (4)	<b>Limit: 30dBm</b> Conducted or Radiated measurement			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Band Edge Measurement</b> CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-210 §A8.5	<b>Limit: -20dBc or</b> <b>Radiated emissions limits in restricted bands</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Power spectral Density</b> CFR 47 §15.247 (e) RSS-210 §A8.2	<b>Limit: 8dBm/3kHz</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Occupied bandwidth</b> RSS-Gen §4.6.1	<b>No limit</b>			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
<b>Receiver Spurious Emission**</b> RSS-Gen §4.10	<b>See RSS-Gen §4.10</b>			<input type="checkbox"/> PASS <input type="checkbox"/> FAIL <input checked="" type="checkbox"/> NA <input type="checkbox"/> NP

\*§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. SYSTEM TEST CONFIGURATION

### 2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

#### Equipment under test (EUT):

EGL1103000

Serial Number: EAGLE- 00099F



Photography of EUT

#### Power supply:

During all the tests, EUT is supplied by  $V_{nom}$ : 3.6VDC

For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Battery	<input type="checkbox"/> AC <input type="checkbox"/> DC <input checked="" type="checkbox"/> Battery	3.6VDC		

**Inputs/outputs - Cable:**

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
None						

**Auxiliary equipment used during test:**

Type	Reference	Sn	Comments
Laptop DELL	Precision	8P3J5S1	-
ITE power supply	PW180KB4800N01	-	-
GATEWAY	-	EAGLE- 0009B3	Used in "Remote" mode

**Equipment information:**

Type:	<b>ZIGBEE</b>			
Frequency band:	[2400 – 2483.5] MHz			
Sub-band REC7003:	Annex 3 (a)			
Spectrum Modulation:	<input checked="" type="checkbox"/> DSSS			
Number of Channel:	15			
Spacing channel:	5MHz			
Channel bandwidth:	2MHz			
Transmit chains:	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
	<input checked="" type="checkbox"/> Single antenna	<input type="checkbox"/> Symmetrical	<input type="checkbox"/> Asymmetrical	
Beam forming gain:	Gain 1: 3dBi	Gain 2: dBi	Gain 3: dBi	Gain 4: dBi
Receiver chains	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined	
Ad-Hoc mode:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No		
Adaptivity mode:	<input type="checkbox"/> Yes (Load Based)	<input type="checkbox"/> Off mode	<input checked="" type="checkbox"/> No	
	Clear Channel Assessment Time:			None
	q value for Load Based Equipment:			None
Duty cycle:	<input checked="" type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input type="checkbox"/> Continuous operation	
Equipment type:	<input checked="" type="checkbox"/> Production model	<input type="checkbox"/> Prototype		
Module reference:	AT86RF233-ZU			

Temperature range:	Tmin:	<input checked="" type="checkbox"/> -20°C	<input type="checkbox"/> 0°C	<input type="checkbox"/> °C
	Tnom:	20°C		
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C	<input checked="" type="checkbox"/> 85°C
Test source voltage:	<input type="checkbox"/> AC:	<input type="checkbox"/> DC:	<input checked="" type="checkbox"/> Battery: 3.6VDC / lithium-thionyl chloride (Li-SOCl <sub>2</sub> )	



CHANNEL PLAN	
Channel	Frequency (MHz)
<b>Cmin: 11</b>	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
<b>Cmid: 18</b>	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
<b>Cmax: 25</b>	2475
26*	2480

\*Not used by the provider.

DATA RATE		
Data Rate (Mbps)	Modulation Type	Worst Case Modulation
0.25	O-QPSK	<input checked="" type="checkbox"/>

## 2.2. EUT CONFIGURATION

The EUT is set in the following modes during tests with simulator / software (Unknown):

The command is send by Gateway in "Remote" mode.

- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception
- The power is set at 3dBm

## 2.3. EQUIPMENT MODIFICATIONS

☒ None ☐ Modification:



#### 2.4. 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 $\mu$ 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 $\mu$ V/m.

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

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

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



### 3. RADIATED EMISSION DATA

#### 3.1. ENVIRONMENTAL CONDITIONS

Date of test : October 15<sup>th</sup>, 2014  
 Test performed by : A.Merlin / G.Deschamps  
 Atmospheric pressure (hPa) : 998  
 Relative humidity (%) : 48  
 Ambient temperature (°C) : 23

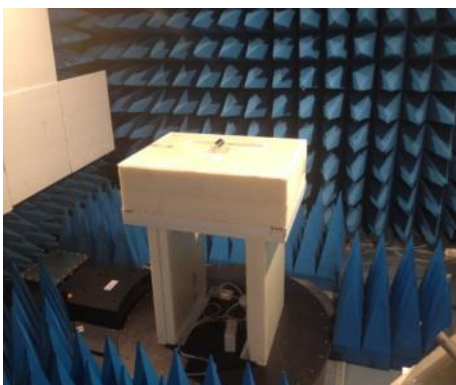
#### 3.2. TEST SETUP

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.

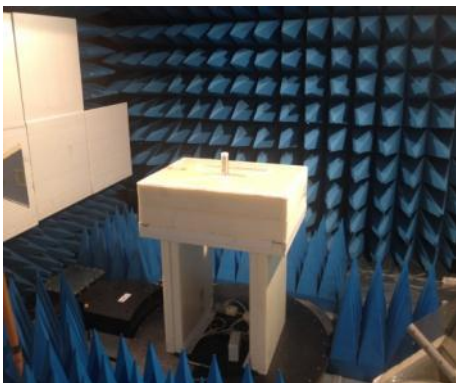
The EUT and auxiliaries are set:

- ☒ 80cm above the ground on the non-conducting table (Table-top equipment)
- ☐ 10cm above the ground on isolating support (Floor standing equipment)

The EUT is powered by  $V_{nom}$ .



Configuration 1 in Axis XY



Configuration 1 in Axis Z





### 3.1. TEST METHOD

#### Pre-characterisation measurement: (30MHz – 25GHz)

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 25GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test to maximize the emission measurement. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration.

The pre-characterization graphs are obtained in PEAK detection and PEAK/AVERAGE from 1GHz to 25GHz.

#### 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 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 below 30MHz and 120kHz from 30 MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test to maximize the emission measurement. The height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown. Frequency list has been created with anechoic chamber pre-scan results.

#### Characterization on 3 meters full anechoic chamber from 1GHz to 25GHz:

The product has been tested at a distance of **3 meters** from the antenna and compared to the FCC part 15 subpart B §15.109 limits and C §15.209 limits. Measurement bandwidth was 1MHz from 1GHz to 25GHz.

Test is performed in horizontal (H) and vertical (V) polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown. The height antenna is

☐ On mast, varied from 1m to 4m

☒ Fixed and centered on the EUT. Frequency list has been created with anechoic chamber pre-scan results.

**3.2. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna horn	EMCO	3115	C2042027	09/14	09/15
Cable - Measure	-	-	A5329038	08/14	08/15
Cable Measure	-	-	A5329206	01/14	01/15
Cable Measure	-	-	A5329604	04/13	04/14
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	-	-
Radiated emission comb generator	BARDET	-	A3169050	-	-
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15
Table	LCIE	-	F2000461	-	-
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444	-	-

**3.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

☒ None ☐ Divergence:

**3.4. TEST RESULTS****3.4.1. Pre-characterization at 3 meters [30MHz-1GHz]**

See graphs for 30MHz-1GHz:

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr# 1	H	TX	Axis XY	Min	See annex 1
Emr# 2	V	TX	Axis XY	Min	See annex 1
Emr# 3	H	TX	Axis Z	Min	See annex 1
Emr# 4	V	TX	Axis Z	Min	See annex 1

**3.4.2. Characterization on 10 meters open site from 30MHz to 1GHz****Worst case final data result:**

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

No	Frequency (MHz)	QPeak Limit (dBµV/m) @ 30m	Qpeak (dBµV/m) @ 30m	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. Factor (dB)	Comments
No significant frequency observed, see annex 1.									

*Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)  
(M@3m = M@10m+10.5dB)*

**3.4.3. Characterization on 3meters anechoic chamber from 1GHz to 25GHz****Worst case final data result:**

The frequency list is created from the results obtained during the pre-characterization in anechoic chamber.  
Measurements are performed using a PEAK and AVERAGE detection.

No	Frequency (MHz)	Limit Peak (dBµV/m)	Measure Peak (dBµV/m)	Margin Peak (dB)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin Average (dB)	Angle Table (°)	Pol. Ant.	Ht. Ant. (cm)	FC (dB)	Comments
1	2483.923	74.0	68.4	-5.6	54.0	47.8	-6.2	37	H	100	31.1	Axis XY
2	2485.089	74.0	68.4	-5.6	54.0	47.8	-6.2	37	H	100	31.1	Axis XY
3	2485.910	74.0	68.4	-5.6	54.0	47.8	-6.2	37	H	100	31.1	Axis XY
4	2487.021	74.0	68.4	-5.6	54.0	47.8	-6.2	37	H	100	31.1	Axis XY
5	2487.934	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
6	2489.058	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
7	2489.951	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
8	2491.018	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
9	2491.979	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
10	2493.094	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
11	2494.024	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
12	2495.022	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
13	2496.045	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
14	2497.027	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
15	2498.014	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
16	2499.000	74.0	68.4	-5.6	54.0	47.8	-6.2	36	H	100	31.1	Axis XY
17	4810.000	74.0	57.7	-16.3	54.0	43.8	-10.2	120	H	100	36.3	Axis XY
18	4880.000	74.0	57.9	-16.1	54.0	42.6	-11.4	120	H	100	36.4	Axis XY
19	4950.000	74.0	57.9	-16.1	54.0	42.7	-11.3	120	H	100	36.6	Axis XY

*Note: Measures have been done at 3m distance.*

**3.5. CONCLUSION**

Radiated emission data measurement performed on the sample of the product **EGL1103000**, SN: **EAGLE- 00099F**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-210 Issue 8 limits.



## 4. BANDWIDTH (15.247)

### 4.1. TEST CONDITIONS

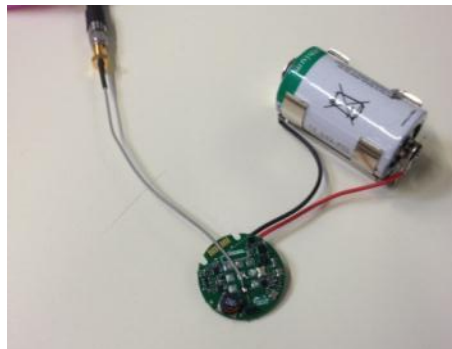
Date of test : October 20<sup>th</sup>, 2014  
Test performed by : A.Merlin / G.Deschamps  
Atmospheric pressure (hPa) : 989  
Relative humidity (%) : 47  
Ambient temperature (°C) : 24

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

Offset: cable 0.53dB



☐ **Radiated measurement:**

The EUT is placed in an anechoic chamber; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete, a delta marker is used to measure the frequency difference as the emission bandwidth.

**Measurement Procedure:**

1. Set resolution bandwidth (RBW) = 100kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.

**4.3. TEST EQUIPMENT LIST**

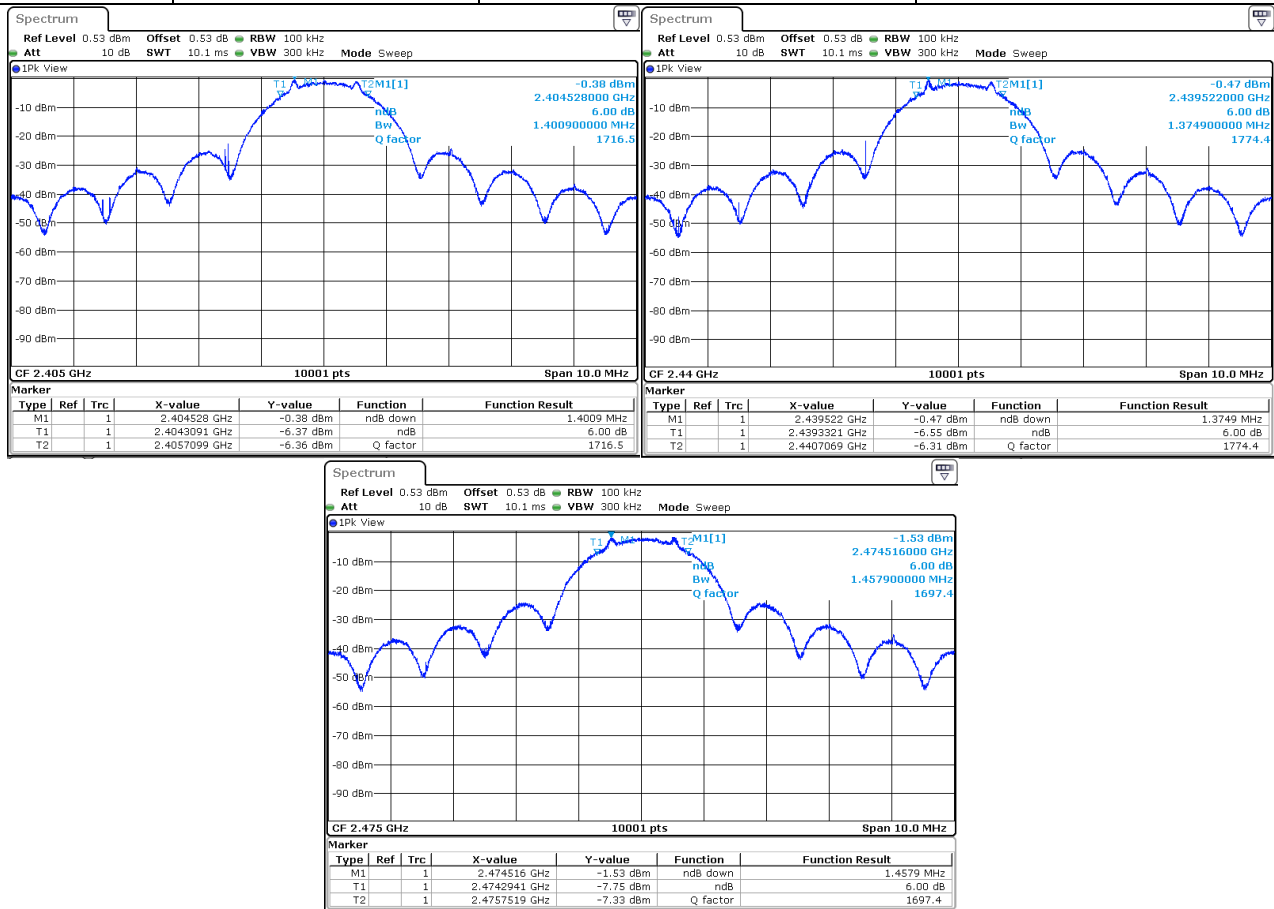
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable Measure	-	-	A5329603	08/14	08/15
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

**4.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**☒ None☐ Divergence:



#### 4.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Bandwidth Limit (kHz)
Cmin	2405	1400.9	>500
Cmid	2440	1374.9	>500
Cmax	2475	1457.9	>500



#### 4.6. CONCLUSION

Bandwidth measurement performed on the sample of the product **EGL1103000**, SN: **EAGLE- 00099F**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-210 Issue 8 limits.



## 5. MAXIMUM PEAK OUTPUT POWER (15.247)

### 5.1. TEST CONDITIONS

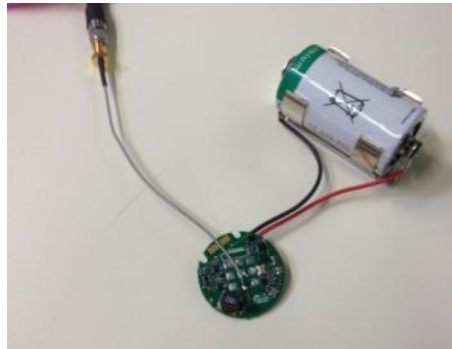
Date of test : October 20<sup>th</sup>, 2014  
 Test performed by : A.Merlin / G.Deschamps  
 Atmospheric pressure (hPa) : 989  
 Relative humidity (%) : 47  
 Ambient temperature (°C) : 24

### 5.2. 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.

Offset: cable 0.53dB



#### ☐ **Radiated measurement:**

The EUT is placed in an anechoic chamber; the center frequency of the spectrum analyzer is set to the fundamental frequency.

The product has been tested at a distance of 3 meters from the antenna. 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 following table. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

To demonstrate compliance with peak output power requirement of section 15.247 (b), the transmitter's peak output power is calculated using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:

- E is the measured maximum fundamental field strength in V/m.
- G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.
- d is the distance in meters from which the field strength was measured.
- P is the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$



**Maximum peak conducted output power**

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

- ☒ **RBW  $\geq$  DTS bandwidth**

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- Set the RBW  $\geq$  DTS bandwidth.
- Set VBW  $\geq 3 \times$  RBW.
- Set span  $\geq 3 \times$  RBW
- Sweep time = auto couple.
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use peak marker function to determine the peak amplitude level.

- ☐ **Integrated band power method**

This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.

- Set the RBW = 1 MHz.
- Set the VBW  $\geq 3 \times$  RBW
- Set the span  $\geq 1.5 \times$  DTS bandwidth.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges

**5.3. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable Measure	-	-	A5329603	08/14	08/15
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

**5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

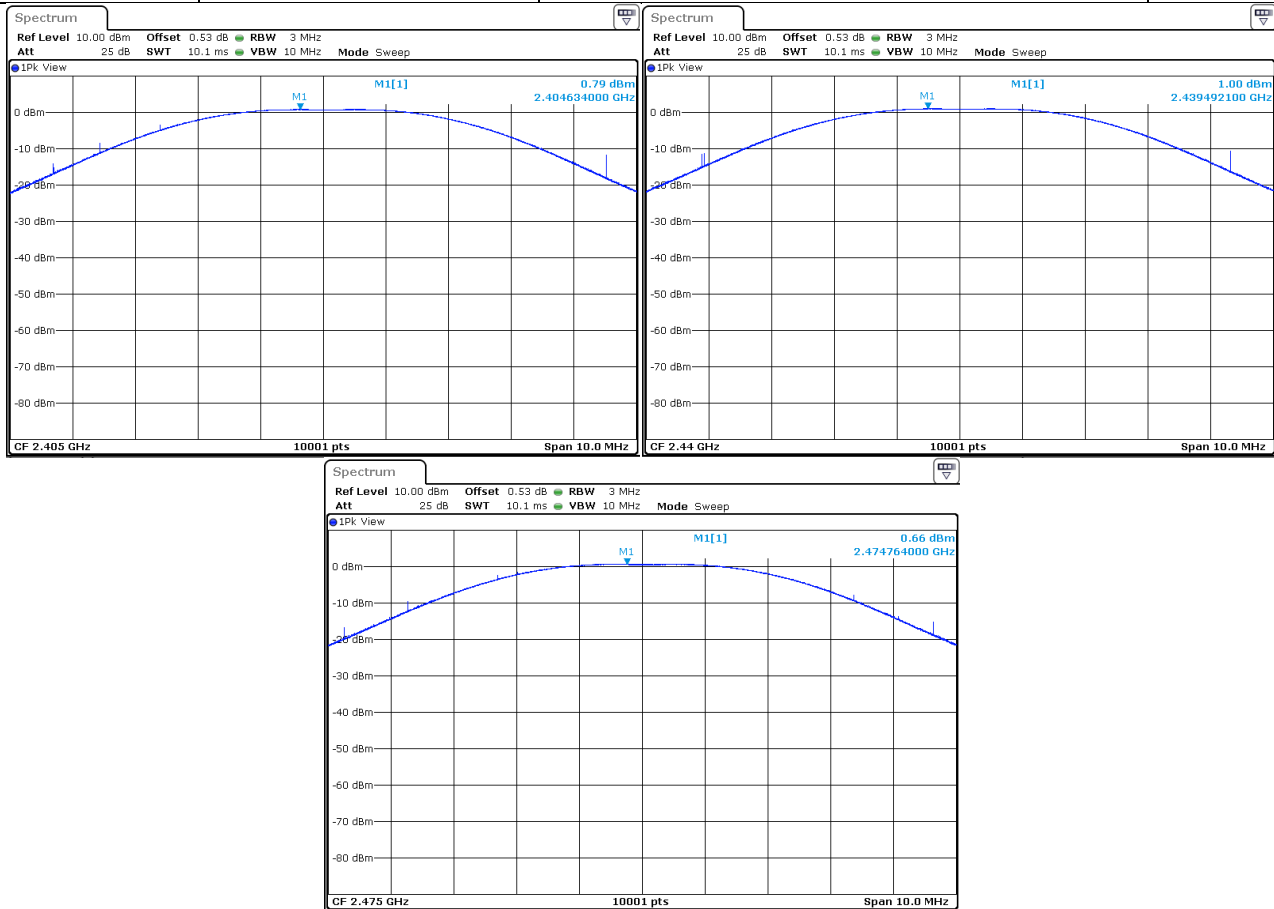
☒ None

☐ Divergence:

## 5.5. TEST SEQUENCE AND RESULTS

### Modulation:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin	2405	0.79	30.0
Cmid	2440	1.00	30.0
Cmax	2475	0.66	30.0



## 5.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product **EGL1103000**, SN: **EAGLE-00099F**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-210 Issue 8 limits.



## 6. POWER SPECTRAL DENSITY (15.247)

### 6.1. TEST CONDITIONS

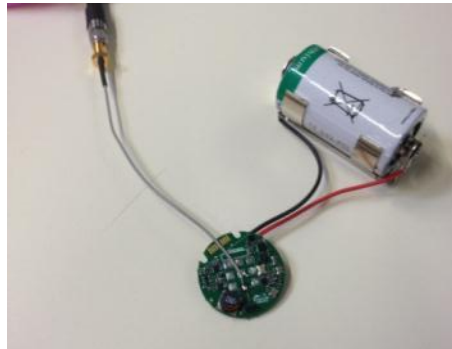
Date of test : October 20<sup>th</sup>, 2014  
 Test performed by : A.Merlin / G.Deschamps  
 Atmospheric pressure (hPa) : 989  
 Relative humidity (%) : 47  
 Ambient temperature (°C) : 24

### 6.2. 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.

Offset: Attenuator+cable 0.53dB



#### ☐ **Radiated measurement:**

The EUT is placed in an anechoic chamber; the center frequency of the spectrum analyzer is set to the fundamental frequency.

The product has been tested at a distance of 3 meters from the antenna. 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 following table. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

To demonstrate compliance with peak output power requirement of section 15.247 (b), the transmitter's peak output power is calculated using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:

- E is the measured maximum fundamental field strength in V/m.
- G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.
- d is the distance in meters from which the field strength was measured.
- P is the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$

**Measurement Procedure PKPSD:**

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW}$
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

**6.3. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable Measure	-	-	A5329603	08/14	08/15
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

**6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

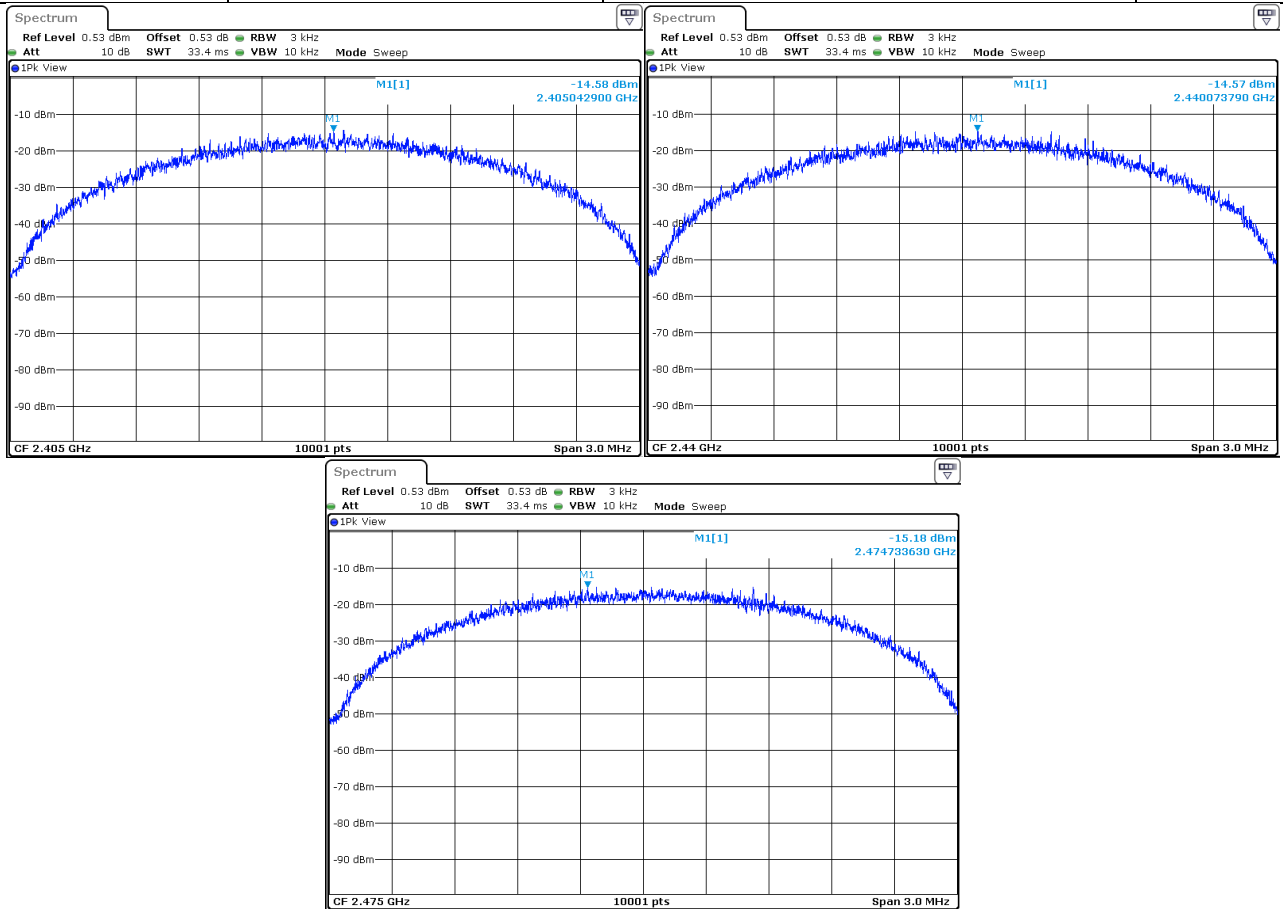
☒ None ☐ Divergence:



## 6.5. TEST SEQUENCE AND RESULTS

### Modulation:

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2405	-14.58	8.0
Cmid	2440	-14.57	8.0
Cmax	2475	-15.18	8.0



## 6.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **EGL1103000**, SN: **EAGLE- 00099F**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-210 Issue 8 limits.



## 7. BAND EDGE MEASUREMENT (15.247)

### 7.1. TEST CONDITIONS

Date of test : October 20<sup>th</sup>, 2014  
 Test performed by : A.Merlin / G.Deschamps  
 Atmospheric pressure (hPa) : 989  
 Relative humidity (%) : 47  
 Ambient temperature (°C) : 24

### 7.2. LIMIT

#### **RF antenna conducted test:**

Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB. For -20dBc limit, lowest power output level is considered, worst case.

#### **Radiated emission test:**

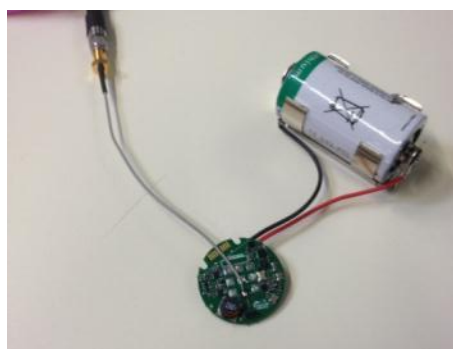
Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See results in Radiated emissions section before.

### 7.3. 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



### 7.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable Measure	-	-	A5329603	08/14	08/15
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

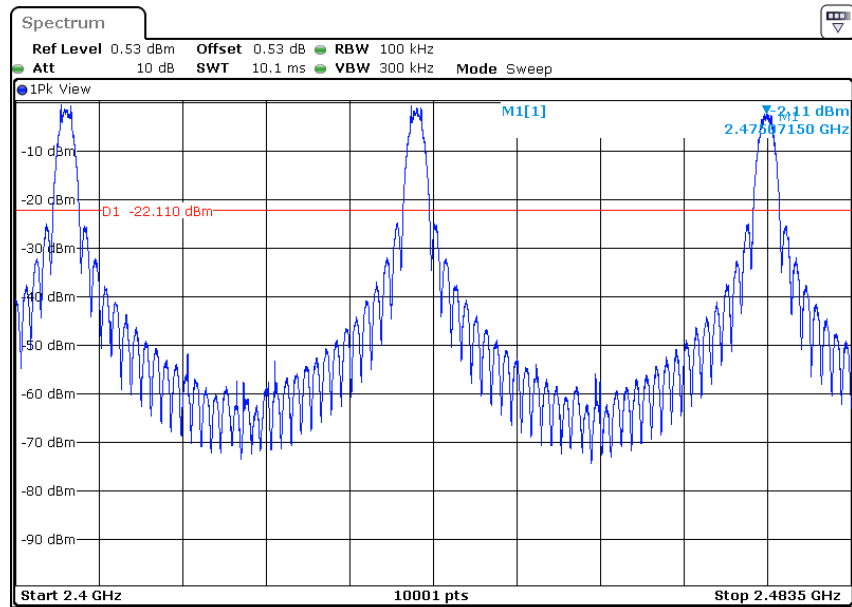
## 7.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None

☐ Divergence:

## 7.6. TEST SEQUENCE AND RESULTS

Offset: Attenuator+cable 0.53dB

**GRAPH / MODULATION.**


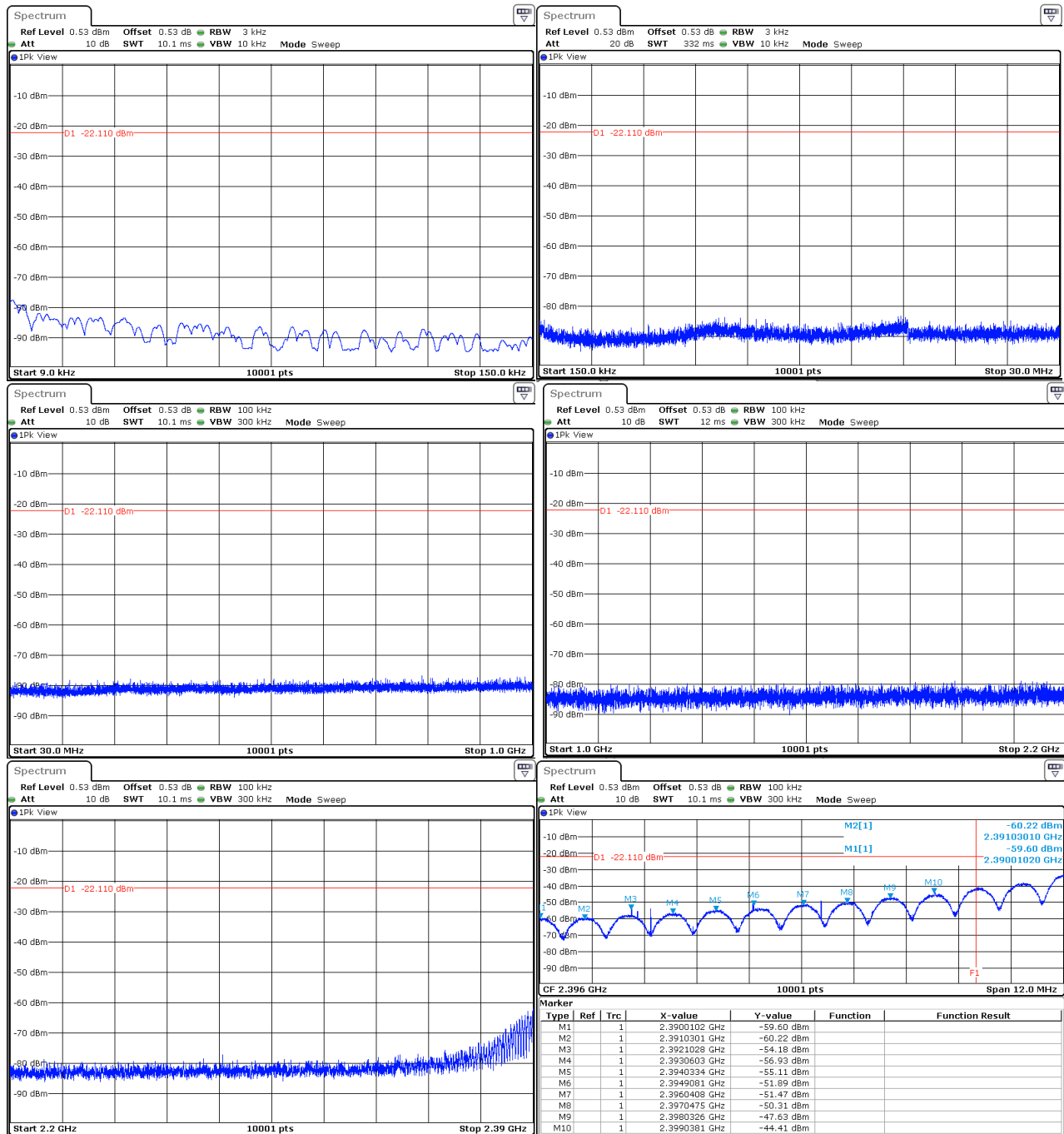
-20dbc limit used:

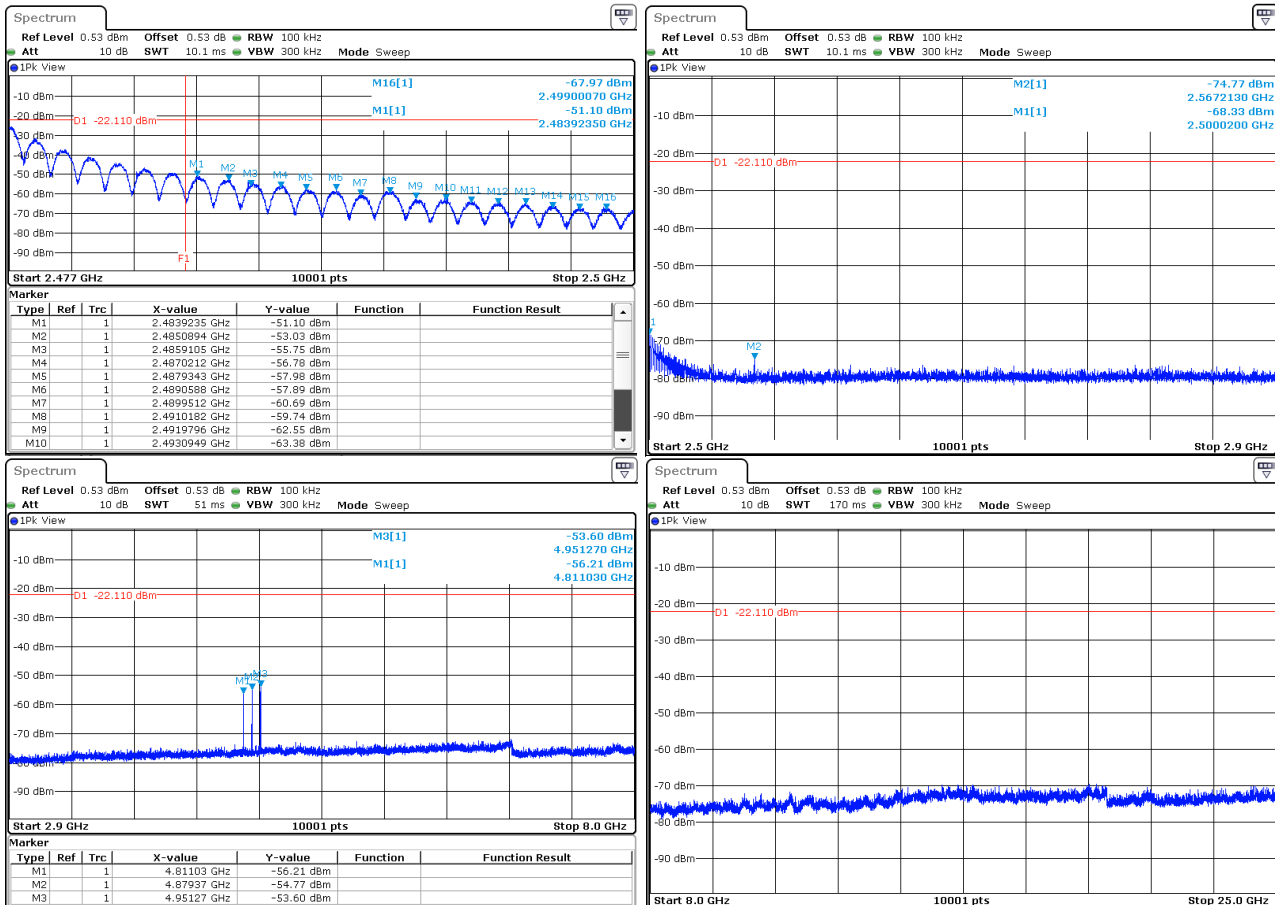
Worst case: Channel max, limit at -22.11dBm





**Graphs 9kHz to 25GHz:**





**Measurement from 6GHz to 26GHz:** No frequency observed

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

## 7.7. CONCLUSION

Band Edge Measurement performed on the sample of the product **EGL1103000**, SN: **EAGLE- 00099F**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-210 Issue 8 limits.



## 8. OCCUPIED BANDWIDTH

### 8.1. TEST CONDITIONS

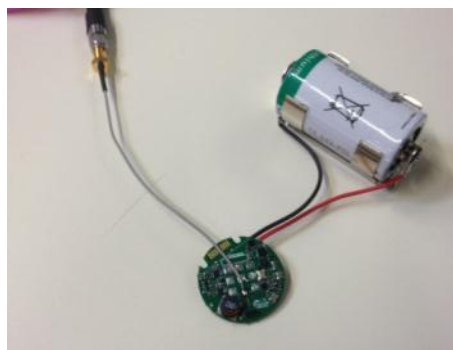
Date of test : October 20<sup>th</sup>, 2014  
 Test performed by : A.Merlin / G.Deschamps  
 Atmospheric pressure (hPa) : 989  
 Relative humidity (%) : 47  
 Ambient temperature (°C) : 24

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

Offset: cable 0.53dB



#### ☐ Radiated measurement:

The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

#### Measurement Procedure:

1. RBW used should not be lower than 1% of the selected span
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. OBW 99% function of spectrum analyzer used

### 8.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable Measure	-	-	A5329603	08/14	08/15
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	01/14	01/15
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15

### 8.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

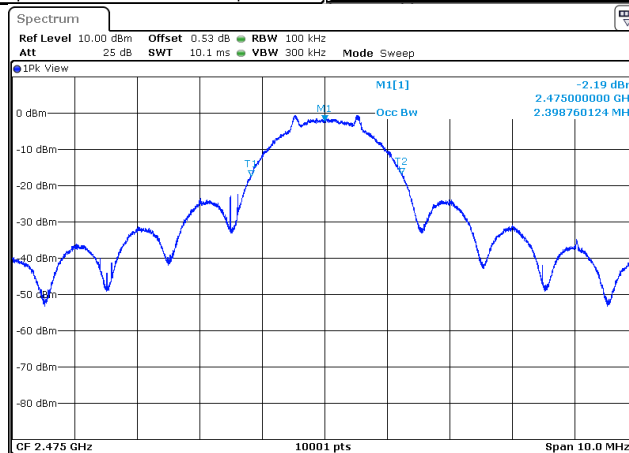
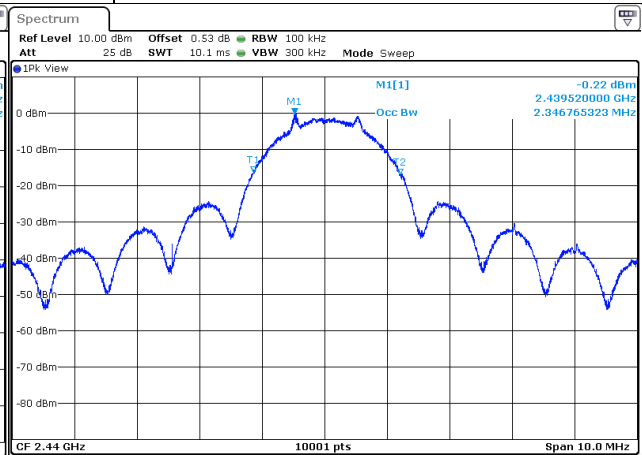
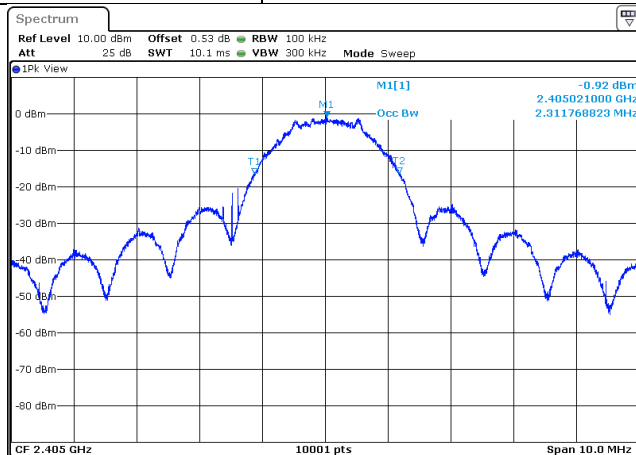
☒ None

☐ Divergence:



8.5. TEST SEQUENCE AND RESULTS

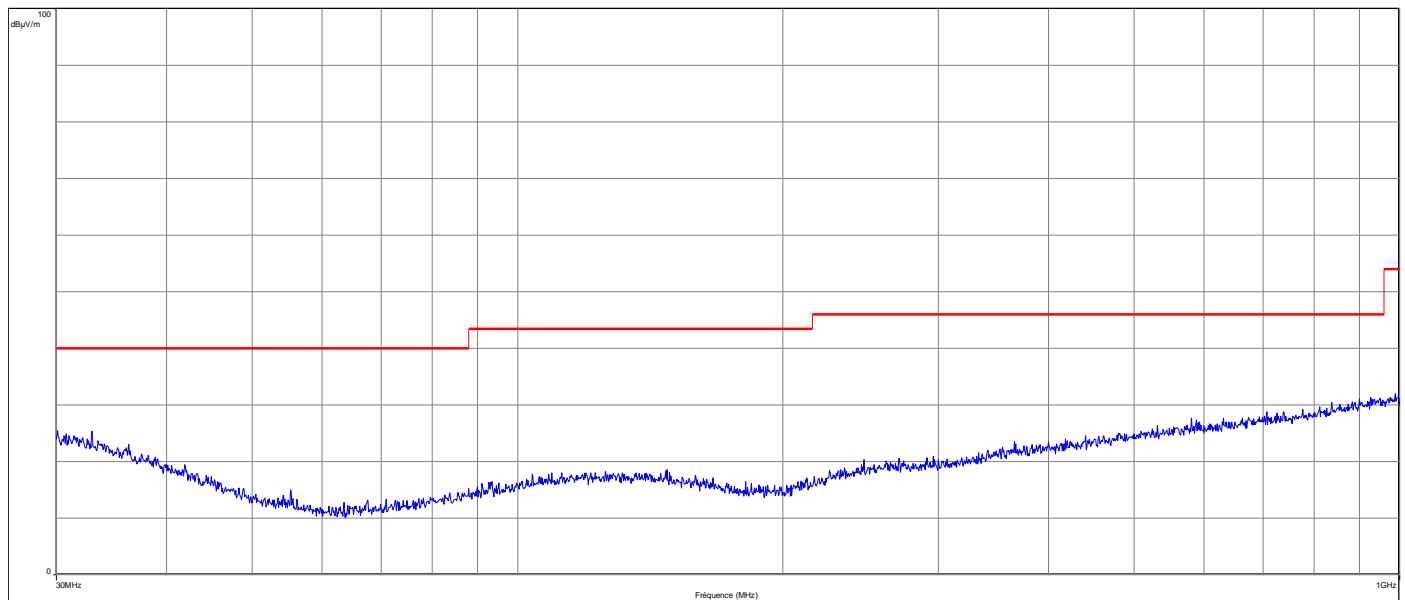
Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)
Cmin	2405	2.311
Cmid	2440	2.346
Cmax	2475	2.398



**9. ANNEX 1 (GRAPHS < 1GHz)****RADIATED EMISSIONS**

Graph name:	Emr#1	Test configuration:	
Limit:	FCC CFR47 Part15B	MXX - Axis XY - (H) - Cmin	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15B - Classe:B - Moyenne/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - QCrête/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - Crête/3.0m/  
— Mes.Peak (Horizontale)

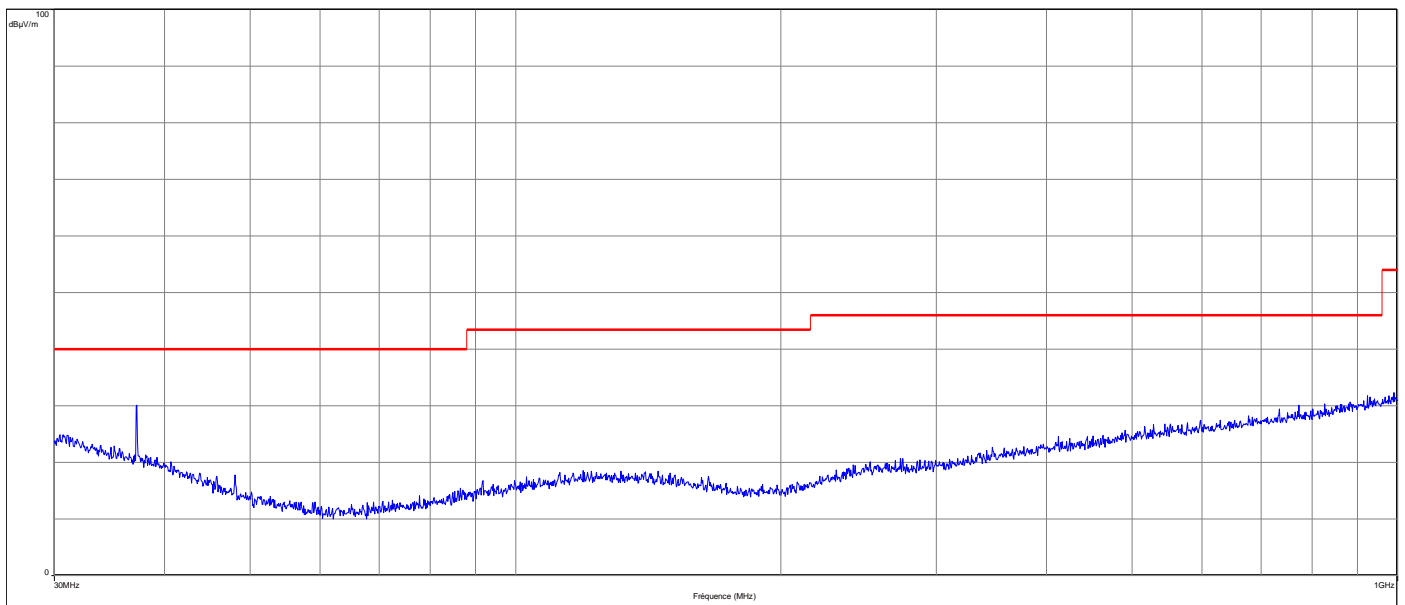
**Spurious emissions**



### RADIATED EMISSIONS

Graph name:	Emr#2	Test configuration:	
Limit:	FCC CFR47 Part15B	MXX - Axis XY - (V) - Cmin	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Vertical	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15B - Classe:B - Moyenne/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - QCrête/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - Crête/3.0m/  
— Mes.Peak (Verticale)



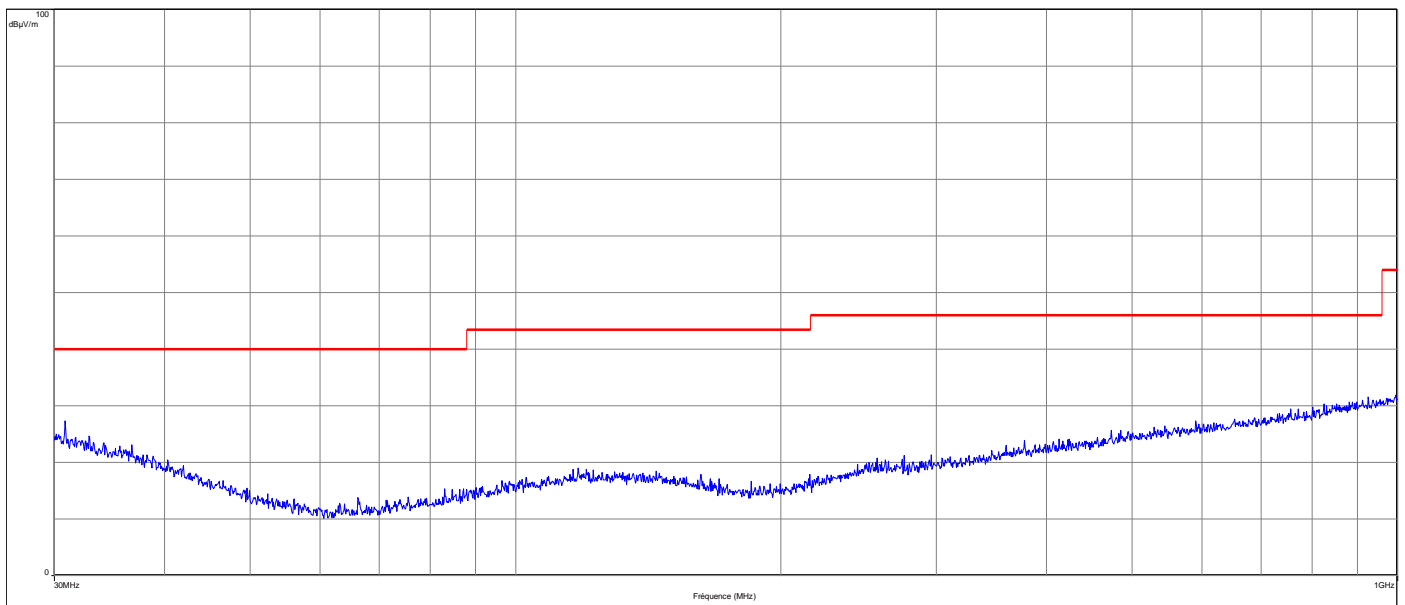
**Spurious emissions**



### RADIATED EMISSIONS

Graph name:	Emr#3	Test configuration:	
Limit:	FCC CFR47 Part15B	MXX - Axis Z - (H) - Cmin	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15B - Classe:B - Moyenne/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - QCrête/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - Crête/3.0m/  
— Mes.Peak (Horizontale)



**Spurious emissions**

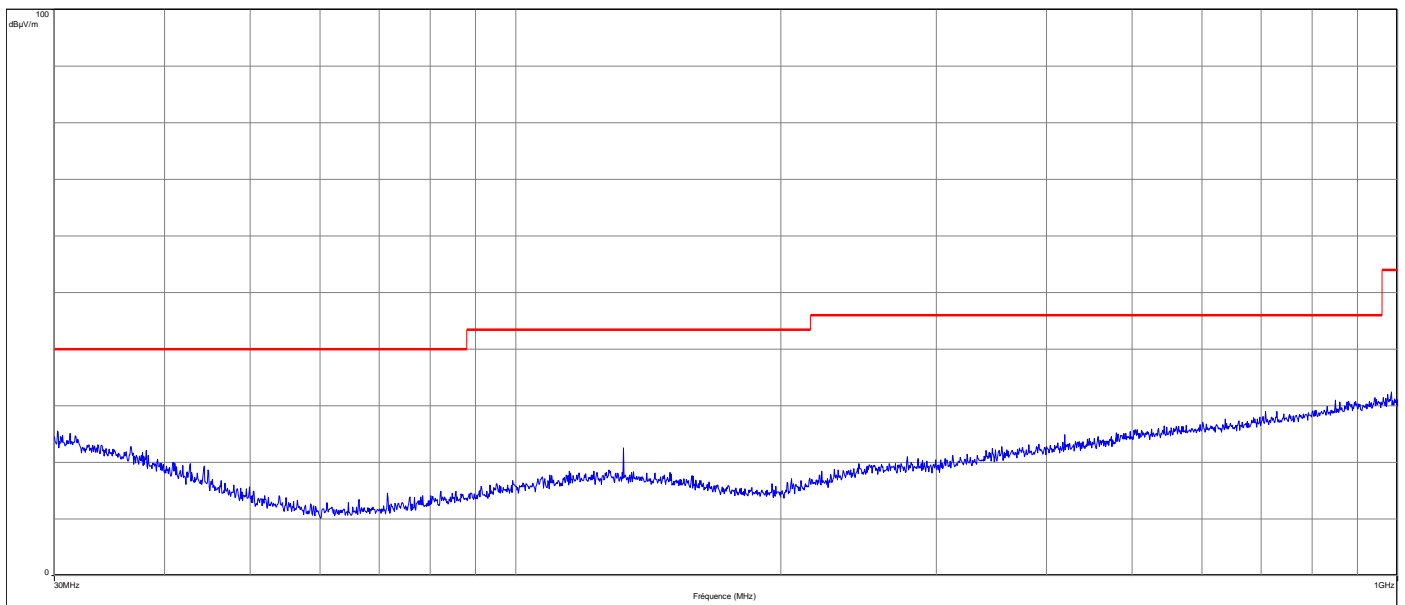




**RADIATED EMISSIONS**

Graph name:	Emr#4	Test configuration:	
Limit:	FCC CFR47 Part15B	MXX - Axis Z - (V) - Cmin	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Vertical	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15B - Classe:B - Moyenne/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - QCrête/3.0m/  
— FCC/FCC CFR47 Part15B - Classe:B - Crête/3.0m/  
— Mes.Peak (Verticale)



**Spurious emissions**

**10. 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.