

# TEST REPORT

N°: 832764-R2-E

JDE : 135342

## Subject

**Electromagnetic compatibility and Radio spectrum Matters  
(ERM) tests according to standards:  
FCC CFR 47 Part 15, Subpart B et C  
RSS-247 Ed 1.0**

## Issued to

**HIKOB**  
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## Product

**HIKOB GATEWAY**

## Trade mark

**HIKOB**

## Manufacturer

**HIKOB**

## Model under test

**PGW1A / PGW1B / PGW1C**

## Serial number

**BA:DB:0B:01:13/00:11:7B**

## FCCID

**2AFCS-PGW10**

## ICID

**20474-PGW10**

## Test date

From May 5<sup>th</sup> to June 24<sup>th</sup>, 2015

## Test location

Moirans

## IC Test site

6500A-1 & 6500A-3

## Test performed by

Jonathan PAUC / Jonathan SARTO

## Composition of document

40 pages

## Modification of the last version

None

## Document issued on

October 30th, 2015

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## 1. TEST PROGRAM

**Standard:**

- FCC Part 15, Subpart C 15.247
- ANSI C63.4 (2014) / ANSI C63.10 (2013)
- RSS-247 Issue 1.0 – May 2015
- RSS-Gen Issue 4 – Nov 2014
- 558074 D01 DTS Measurement Guidance v03r03

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 checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input 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-247 §5.5	<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 type="checkbox"/> PASS <input type="checkbox"/> FAIL <input checked="" type="checkbox"/> NA <input type="checkbox"/> NP
<b>Radiated emissions</b> 30MHz-25GHz* CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-247 §5.5 <b>Highest frequency :</b> <b>600MHz (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-247 §5.2.1	<b>At least 500kHz</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-247 §5.2.2	<b>Limit: 8dBm/3kHz</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-247 §5.4.4	<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-247 §5.5	<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>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. JUSTIFICATION

There are 3 models:

- ✓ PGW1A: 2.4GHz antenna internal and GPS, external used of equipment
- ✓ PGW1B: 2.4GHz antenna internal without GPS, external used of equipment
- ✓ PGW1C: 2.4GHz antenna external without GPS, internal used of equipment

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

#### Equipment under test (EUT):

PGW1A / PGW1B / PGW1C

Serial Number: BA:DB:0B:01:13/00:11:7B



Equipment Under Test

#### Power supply:

During all the tests, EUT is supplied by  $V_{nom}$  240V/50Hz from PHIHONG  
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	<input type="checkbox"/> AC <input checked="" type="checkbox"/> DC <input type="checkbox"/> Battery	Primary: 100-240V (50-60Hz) Secondary: 56Vdc (to Gateway)	PHIHONG Switching power supply POE21U-1AF	/

#### Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Access1	Ethernet Port	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	/
Access2	SMA port (only for configuration n°1)	/	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	/

#### Antenna:

Id	Reference	Configuration
Antenna 1	Extronics iANT 212 Sn: 133297 With isolator iSOLATE500-2400 sn: 127026	1
Antenna 2	Molex 47950XXX	2



### Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Notebook computer	W310CZ	NKW310CZ0003K01978	/
RFID reader	IDENTIVE	AMID2US00-KBD	/

### Equipment information:

Type:	<b>DTS</b>		
Frequency band:	[2400 – 2483.5] MHz		
Spectrum Modulation:	<input checked="" type="checkbox"/> DSSS		
Number of Channel:	15		
Spacing channel:	5MHz		
Channel bandwidth:	2MHz		
Antenna Type:	<input checked="" type="checkbox"/> Integral – Antenna 2	<input checked="" type="checkbox"/> External – Antenna 1	<input type="checkbox"/> Dedicated
Antenna connector:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Temporary for test
Transmit chains:	1		
	Single antenna		
	Gain Antenna 1: 2dBi		Gain Antenna 2: 3dBi
Beam forming gain:	No		
Receiver chains	1		
Duty cycle:	<input checked="" type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input type="checkbox"/> 100% duty
Equipment type:	<input checked="" type="checkbox"/> Production model		<input type="checkbox"/> Pre-production model
Operating temperature range:	Tmin:	<input checked="" type="checkbox"/> -20°C	<input type="checkbox"/> 0°C
	Tnom:	20°C	
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C
Type of power source:	<input checked="" type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input type="checkbox"/> Battery (Select Type)
Operating voltage range:	Vmin:	<input checked="" type="checkbox"/> 93.5V/50Hz	<input type="checkbox"/> Vdc
	Vnom:	<input checked="" type="checkbox"/> 110V/60Hz	<input type="checkbox"/> Vdc
	Vmax:	<input checked="" type="checkbox"/> 126.5V/50Hz	<input type="checkbox"/> Vdc



### 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

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

### NFC

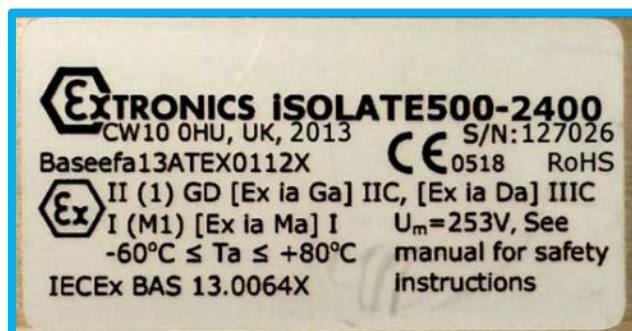
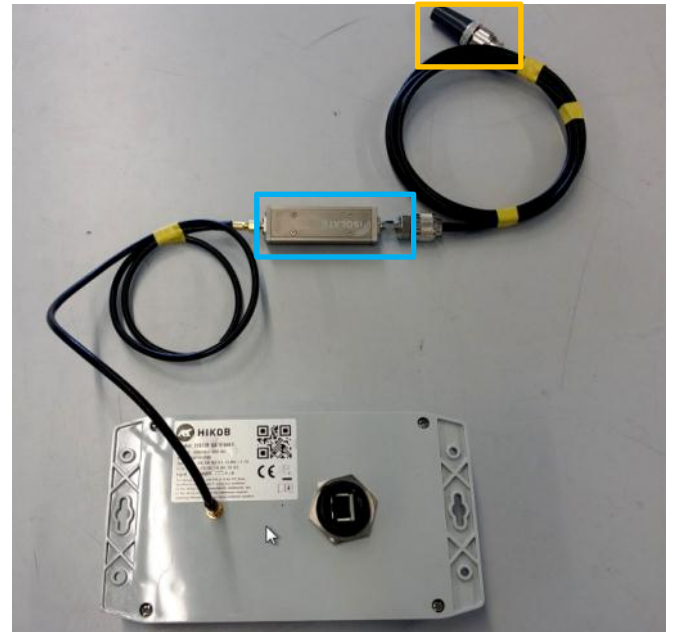
<b>RF module:</b>	EUT is a passive TAG, no RF module inside, not under test.			
<b>Frequency band:</b>	[13.553–13.567 ] MHz			
<b>RF mode:</b>	<input type="checkbox"/> Transmitter	<input type="checkbox"/> Transceiver	<input checked="" type="checkbox"/> Receiver	<input type="checkbox"/> Standby

**NC: not communicated by customer**



### 2.3. EUT CONFIGURATION

Configuration n°1 :



Antenna 1: Extronics iANT212

Isolator

Configuration n°2 :



Antenna 2 : Molex 47950XXXX

## 2.4. EUT RUNNING MODE

### ZIGBEE:

The EUT is set in the following modes during tests with software:

- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

### §15.209 Part 15 Subpart B:

A continuous communication through Ethernet link is performed between Laptop & EUT

## 2.5. EQUIPMENT MODIFICATIONS

☒ None
 ☐ Modification:





## 2.6. 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 $\mu$ 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. CONDUCTED EMISSION DATA

#### 3.1. ENVIRONMENTAL CONDITIONS

Date of test : June 24<sup>th</sup>, 2015  
Test performed by : Jonathan SARTO  
Atmospheric pressure (hPa) : 998  
Relative humidity (%) : 40  
Ambient temperature (°C) : 21

#### 3.2. TEST SETUP

##### **Mains terminals**

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 distance between the EUT and the LISN is 80cm. The EUT is 40cm away for the vertical ground plane.

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

The EUT is powered through a LISN (measure). Auxiliaries are powered by another LISN.



Test setup

#### 3.3. TEST METHOD

The product has been tested according to ANSI C63.4 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 150kHz to 30MHz. 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.

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.



### 3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + self	-	-	A5329578	07/15	07/16
Conducted emission comb generator	BARDET	-	A3169049	-	-
LISN	RHODE & SCHWARZ	ENV216	C2320123	02/15	02/16
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	04/15	04/16
Thermo-hygrometer (C1)	OREGON	WMR 80	B4206013	02/15	02/16
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	11/14	11/15

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

☒ None ☐ Divergence:

### 3.6. TEST RESULTS

Measurements are performed on the phase (L1) and neutral (N) of the power line.

**Results: (PEAK detection)**

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

### 3.7. CONCLUSION

Conducted emission data measurement performed on the sample of the product **PGW1A / PGW1B / PGW1C**, SN: **BA:DB:0B:01:13/00:11:7B**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 Ed 1.0 limits.

## 4. RADIATED EMISSION DATA

### 4.1. ENVIRONMENTAL CONDITIONS

Date of test	Jonathan PAUC	Jonathan PAUC
Test performed by	June 7 <sup>th</sup> , 2015	June 8 <sup>th</sup> , 2015
Atmospheric pressure (hPa)	1000	1005
Relative humidity (%)	42	46
Ambient temperature (°C)	24	25

### 4.2. 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) - Below 1GHz
- ☒ 150cm above the ground on the non-conducting table (Table-top equipment) - Above 1GHz
- ☐ 10cm above the ground on isolating support (Floor standing equipment)

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



XY Axis



Z Axis

Test setup in anechoic chamber  
Setup 15.247 & Subpart B (Configuration n°1)





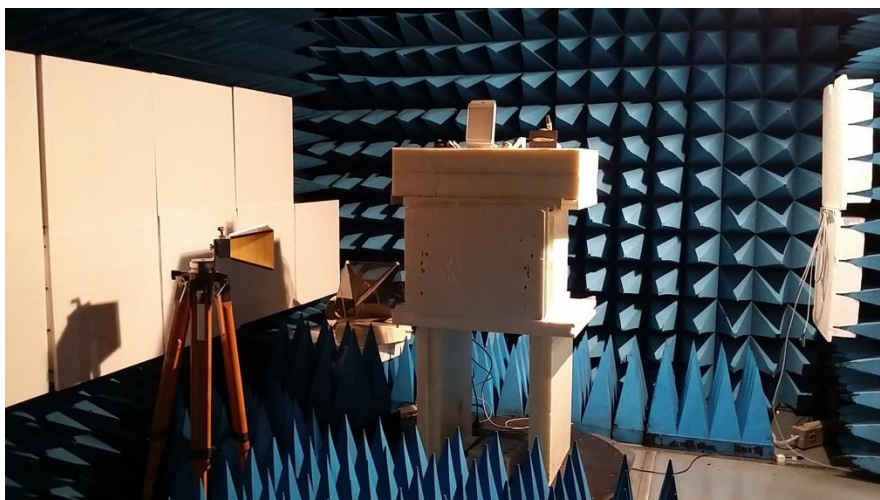
XY Axis



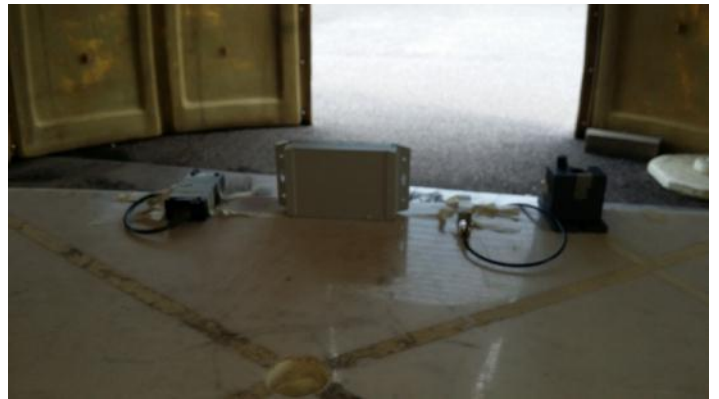
Z Axis

Test setup in anechoic chamber

**Setup 15.247 (ZIGBEE)& Subpart B (Configuration n°2)**



Above 1GHz setup



Test setup on OATS - §15.247 & §15.209 Configuration n°1 (Worst case)





#### 4.3. TEST METHOD

##### Pre-characterisation measurement: (30MHz – 6GHz)

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 6GHz. 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 6GHz.

*Pre-characterisation Measurements are performed for §15.209 Subpart B*

*For §15.247 measurement see conducted measurement done in band edge chapter §8, in order to monitor presence or not of frequencies in restricted band .*

##### Characterization on 10 meters open site from 30MHz to 1GHz:

The product has been tested according to ANSI C63.10 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 limits. Measurement bandwidth was 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.

*Characterisation on band 30MHz to 1GHz is done on Open site for §15.247 only if frequencies are observed in restricted band*

##### 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 (EUT smaller than the beamwidth of the measurement antenna, ANSI C63.10 §6.6.5)

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



#### 4.4. TEST EQUIPMENT LIST

Anechoic chamber					
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Amplifier 1-13GHz	LCIE SUD EST	-	A7102067	10/14	10/15
Antenna Loop	ELECTRO-METRICS	EM-6879	C2040052	10/13	10/15
Antenna Bi-log	CHASE	CBL6111A	C2040172	04/13	06/15
Antenna horn	EMCO	3115	C2042029	09/14	09/15
Cable Measure @3m	-	6	A5329038	08/14	08/15
Cable Measure @3m	-	-	A5329206	04/15	04/16
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	-	-
Radiated emission comb generator	BARDET	-	A3169050	-	-
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	01/15	01/16
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	04/15	04/16
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	04/14	04/15
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371	-	-
Table	LCIE	-	F2000461	-	-

Characterisation OATS					
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Bi-log	CHASE	CBL6111A	C2040051	04/14	04/16
Cable	SUCOFLEX	106G	A5329061	03/15	03/16
Cable	-	-	A5329069	10/14	10/15
Cable (OATS)	-	-	A5329623	10/14	10/15
Radiated emission comb generator	BARDET	-	A3169050	-	-
OATS	-	-	F2000409	09/14	09/15
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	04/15	04/16
Antenna mast (OATS)	LCIE	-	F2000288	-	-
Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066	F2000372	-	-
Antenna mast (OATS)	ETS Lindgren	2071-2	F2000392	-	-
Turntable (OATS)	ETS Lindgren	Model 2187	F2000403	-	-
Table	MATURO GmbH	-	F2000437	-	-

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

☒ None

☐ Divergence:



#### 4.6. TEST RESULTS

##### 4.6.1. Pre-characterization at 3 meters [30MHz-1GHz]

See graphs for 30MHz-1GHz:

§15.209 – PART B – Configuration n°1				
Graph identifier	Polarization	Mode	EUT position	Comments
Emr# 1	H & V	TX	Axis XY	See annex 1
Emr# 2	H & V	TX	Axis Z	See annex 1

##### 4.6.2. Pre-characterization at 3 meters [1GHz-6GHz]

See graphs for 1GHz-6GHz:

§15.209 – PART B – Configuration n°1				
Graph identifier	Polarization	Mode	EUT position	Comments
Emr# 3	H & V	TX	Axis XY	See annex 1
Emr# 4	H & V	TX	Axis Z	See annex 1

**4.6.1. 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.

§15.209 – Part 15 Subpart B									
No	Frequency (MHz)	Limit Quasi-Peak (dBµV/m)	Measure Quasi-Peak (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. Factor (dB)	Comments
1	34.624	40.0	35.7	-4.3	360	V	114	17.2	/
2	37.361	40.0	35.3	-4.7	204	V	250	15.7	/
3	66.278	40.0	36.7	-3.3	292	V	223	7.8	/
4	86.083	40.0	34.0	-6.0	237	V	250	9.7	/
5	100.635	43.5	38.3	-5.2	135	V	100	11.9	(*)
6	130.079	43.5	35.6	-7.9	287	V	100	13.8	/
7	157.891	43.5	35.6	-7.9	324	V	101	12.6	/

*Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)*

*(M@3m = M@10m+10.5dB)*

(\*) Due to external noise disturbances, measurement is performed in Anechoic chamber D3044016



#### 4.6.2. 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.

§15.247 – Configuration n°1												
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)	Remark
1	2484.087	74.0	63.9	<b>-10.1</b>	54.0	52.9	<b>-1.1</b>	204	V	100	30.4	pos Z
2	2485.039	74.0	58.4	<b>-15.6</b>	54.0	48.1	<b>-5.9</b>	231	V	100	30.4	pos Z
3	2486.069	74.0	57.6	<b>-16.4</b>	54.0	46.8	<b>-7.2</b>	197	V	100	30.4	pos Z
4	2487.046	74.0	53.1	<b>-20.9</b>	54.0	43.8	<b>-10.2</b>	191	V	100	30.4	pos Z
5	4961.170	74.0	36.7	<b>-37.3</b>	54.0	36.7	<b>-17.3</b>	0	V	100	36.7	pos Z

§15.247 – Configuration n°2												
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)	Remark
6	2484.087	74.0	59.5	<b>-14.5</b>	54.0	48.9	<b>-5.1</b>	339	H	100	30.4	pos Z
7	2485.039	74.0	55.4	<b>-18.6</b>	54.0	46.0	<b>-8.0</b>	185	H	100	30.4	pos Z
8	2486.069	74.0	53.2	<b>-20.8</b>	54.0	43.4	<b>-10.6</b>	169	H	100	30.4	pos Z
9	2487.046	74.0	52.5	<b>-21.5</b>	54.0	42.0	<b>-12.0</b>	165	H	100	30.4	pos Z
10	2488.101	74.0	50.9	<b>-23.1</b>	54.0	40.0	<b>-14.0</b>	168	H	100	30.4	pos Z
11	2489.044	74.0	49.6	<b>-24.4</b>	54.0	38.7	<b>-15.3</b>	160	H	100	30.4	pos Z
12	2490.124	74.0	49.8	<b>-24.2</b>	54.0	37.7	<b>-16.3</b>	160	H	100	30.4	pos Z
13	2491.068	74.0	48.9	<b>-25.1</b>	54.0	36.8	<b>-17.2</b>	164	H	100	30.4	pos Z
14	2492.073	74.0	46.4	<b>-27.6</b>	54.0	34.2	<b>-19.8</b>	167	H	100	30.4	pos Z
15	2493.088	74.0	46.0	<b>-28.0</b>	54.0	33.9	<b>-20.1</b>	200	H	100	30.4	pos Z
16	4961.170	74.0	56.4	<b>-17.6</b>	54.0	43.5	<b>-10.5</b>	337	V	100	36.7	pos Z

Note: Measures have been done at 3m distance, all 3 channel testing was done.

#### 4.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product PGW1A / PGW1B / PGW1C, SN: BA:DB:0B:01:13/00:11:7B, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 Ed 1.0 limits.



## 5. BANDWIDTH (15.247)

### 5.1. TEST CONDITIONS

Date of test : May 5<sup>th</sup>, 2015  
Test performed by : J.PAUC  
Atmospheric pressure (hPa) : 990  
Relative humidity (%) : 46  
Ambient temperature (°C) : 22.6

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

Offset: Attenuator+cable 10.1dB

☐ **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: §8.1 Option 1 (DTS Measurement Guidance)**

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.

### 5.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	11/14	11/15
Cable	-	-	A5329604	12/14	12/15

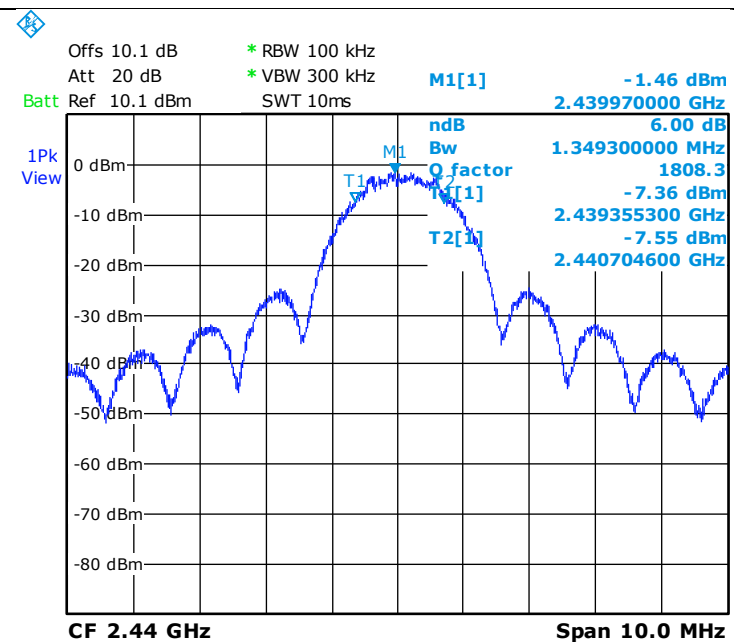
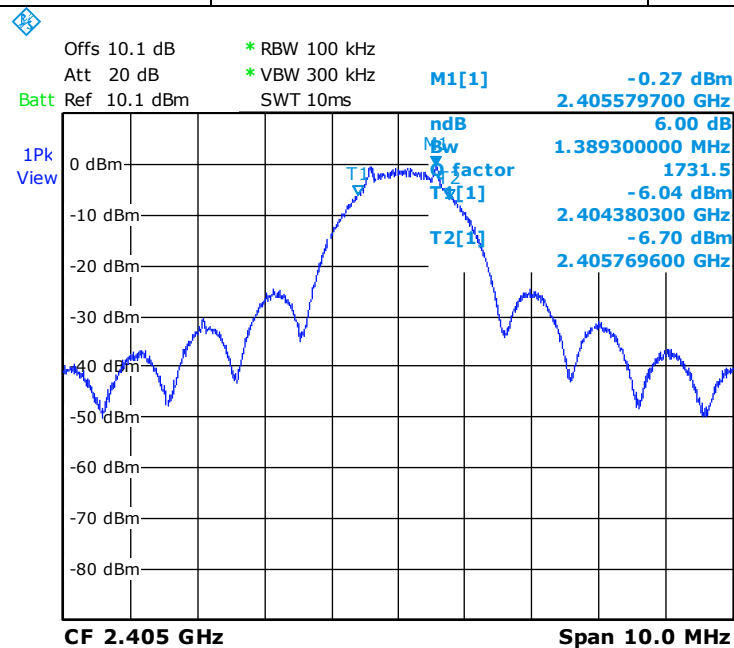
### 5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

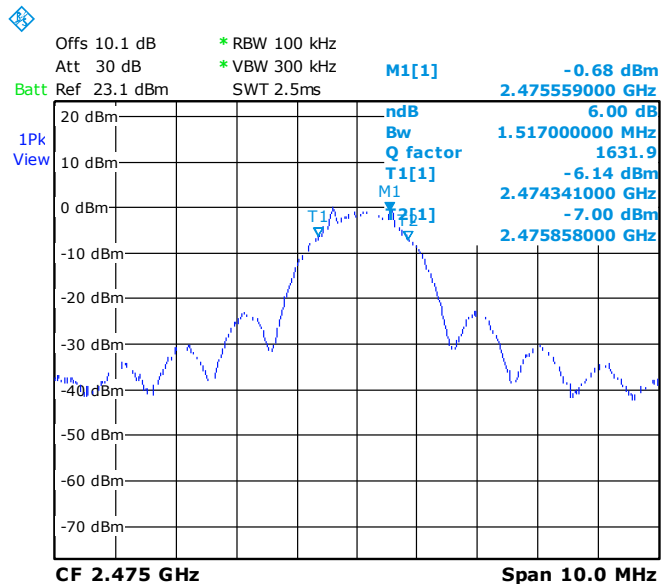
☒ None ☐ Divergence:



### 5.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Bandwidth Limit (kHz)
Cmin	2405	1389.3	>500
Cmid	2440	1349.3	>500
Cmax	2475	1517.0	>500





5.6. CONCLUSION

Bandwidth measurement performed on the sample of the product PGW1A / PGW1B / PGW1C, SN: BA:DB:0B:01:13/00:11:7B, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 Ed 1.0 limits.



## 6. MAXIMUM PEAK OUTPUT POWER (15.247)

### 6.1. TEST CONDITIONS

Date of test : May 5<sup>th</sup>, 2015  
 Test performed by : J.PAUC  
 Atmospheric pressure (hPa) : 990  
 Relative humidity (%) : 46  
 Ambient temperature (°C) : 22.6

### 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 10.1dB

#### ☐ **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 §9.1.1 (DTS Measurement Guidance)**

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

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq 3 \times$  RBW.
- c) Set span  $\geq 3 \times$  RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) 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.

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

### **6.3. TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	11/14	11/15
Cable	-	-	A5329604	12/14	12/15

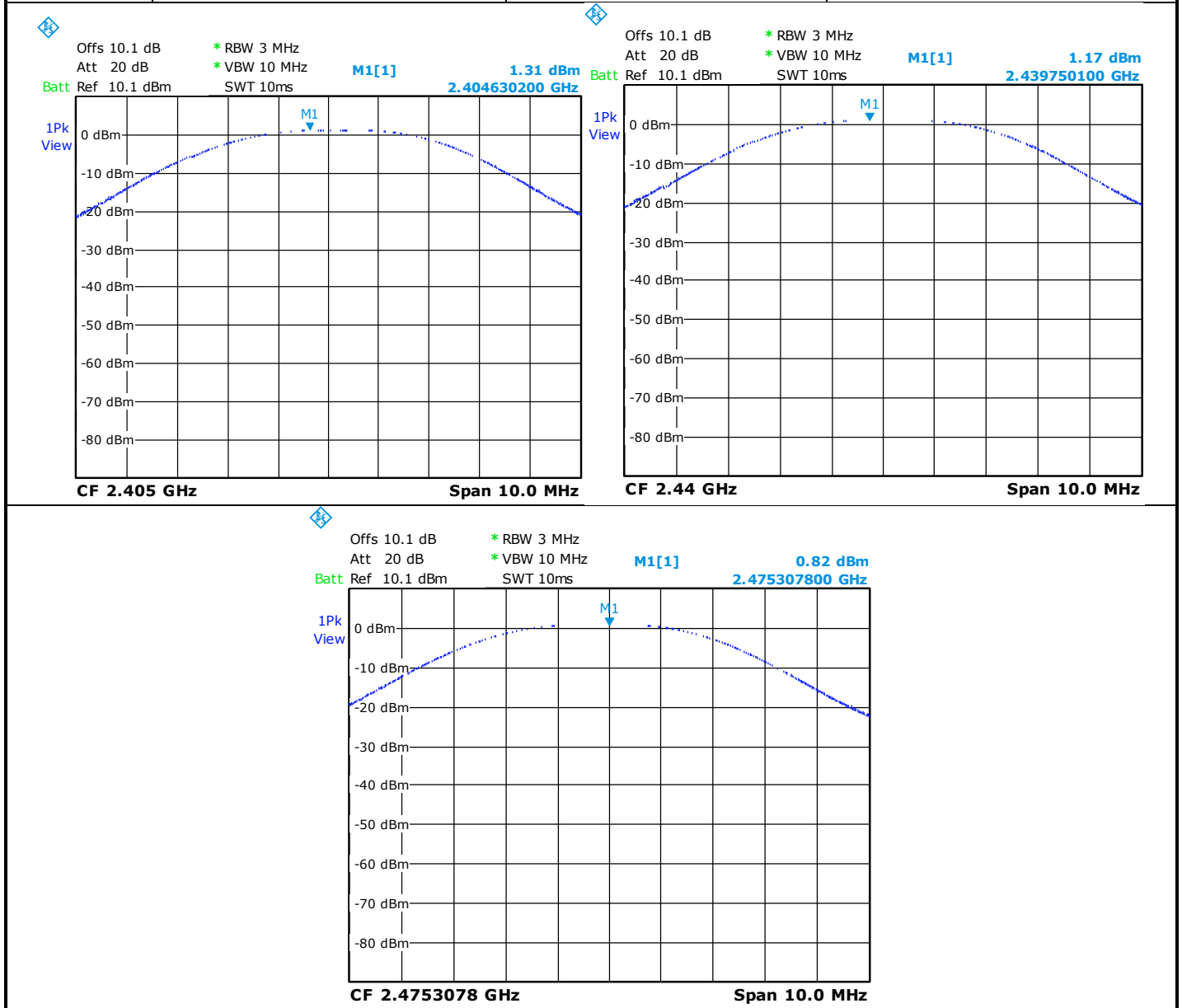
### **6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

- ☒ None ☐ Divergence:

## 6.5. TEST SEQUENCE AND RESULTS

### Modulation:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin	2405	1.3	30.0
Cmid	2440	1.2	30.0
Cmax	2475	0.8	30.0



## 6.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product PGW1A / PGW1B / PGW1C, SN: BA:DB:0B:01:13/00:11:7B, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 Ed 1.0 limits.



## 7. POWER SPECTRAL DENSITY (15.247)

### 7.1. TEST CONDITIONS

Date of test : May 5<sup>th</sup>, 2015  
Test performed by : J.PAUC  
Atmospheric pressure (hPa) : 990  
Relative humidity (%) : 46  
Ambient temperature (°C) : 22.6

### 7.2. 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 10.1dB

☐ **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: §10.2 (DTS Measurement Guidance)**

- 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 kHz ≤ RBW ≤ 100 kHz.
- d) Set the VBW ≥ 3 □ 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.

### 7.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	11/14	11/15
Cable	-	-	A5329604	12/14	12/15





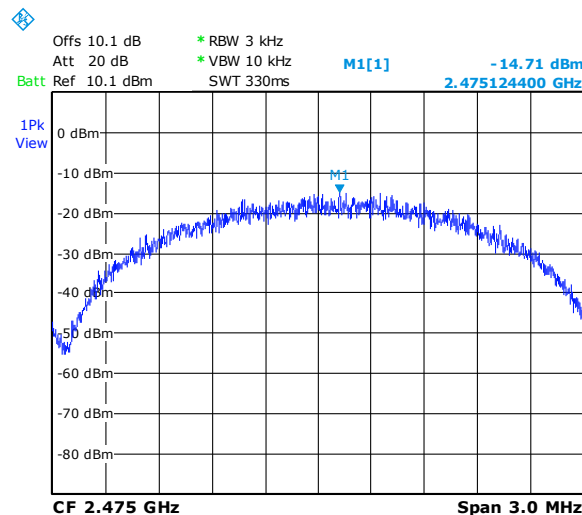
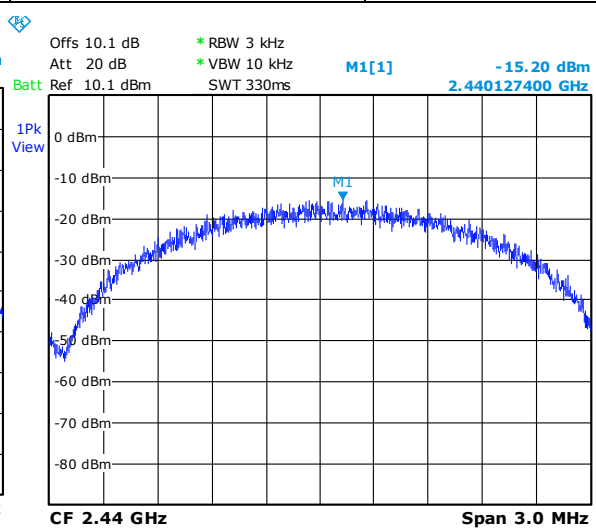
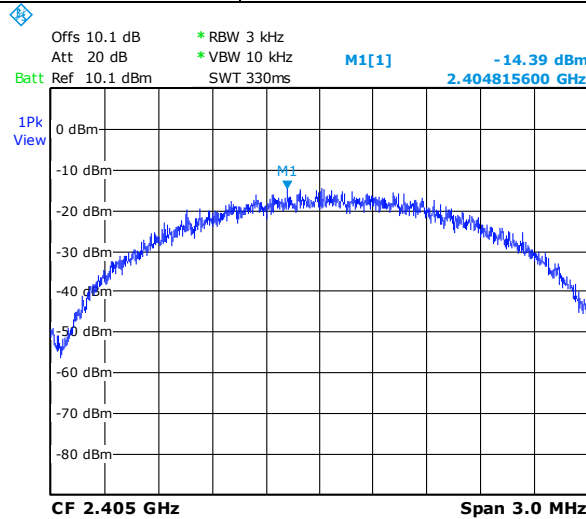
#### 7.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

#### 7.5. TEST SEQUENCE AND RESULTS

##### Modulation:

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2405	-14.4	8.0
Cmid	2440	-15.2	8.0
Cmax	2475	-14.7	8.0



#### 7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product PGW1A / PGW1B / PGW1C, SN: BA:DB:0B:01:13/00:11:7B, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 Ed 1.0 limits.



## 8. BAND EDGE MEASUREMENT (15.247)

### 8.1. TEST CONDITIONS

Date of test : May 7<sup>th</sup>, 2015  
Test performed by : J. PAUC  
Atmospheric pressure (hPa) 990  
Relative humidity (%) 34  
Ambient temperature (°C) 21

### 8.2. LIMIT

#### **RF antenna conducted test: § 11 (DTS Measurement Guidance)**

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: § 12 (DTS Measurement Guidance)**

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.

### 8.3. 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

### 8.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	01/15	01/16
Cable	-	-	A5329604	12/14	12/15

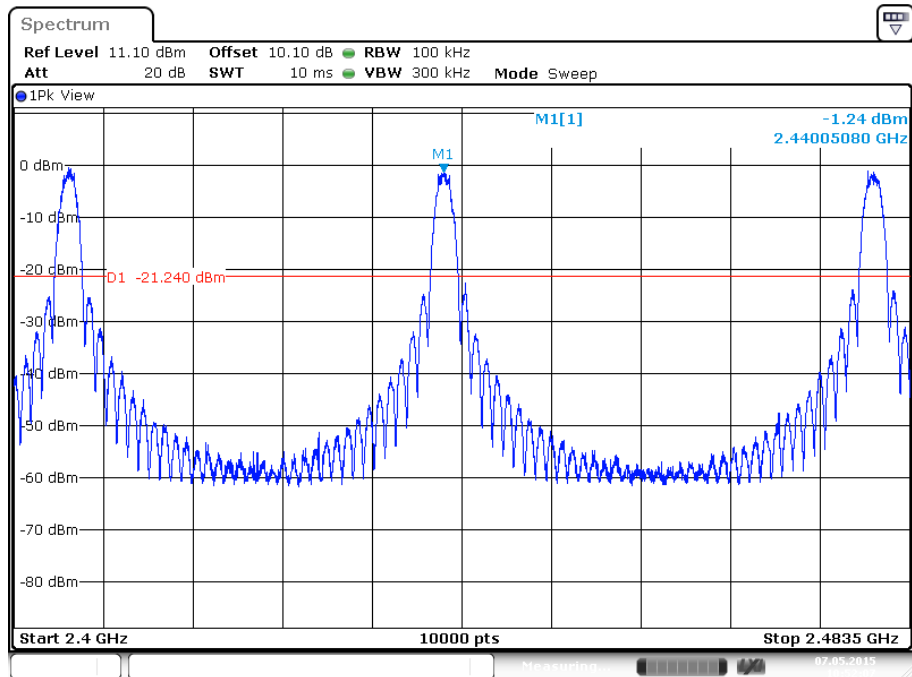
### 8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None

☐ Divergence:

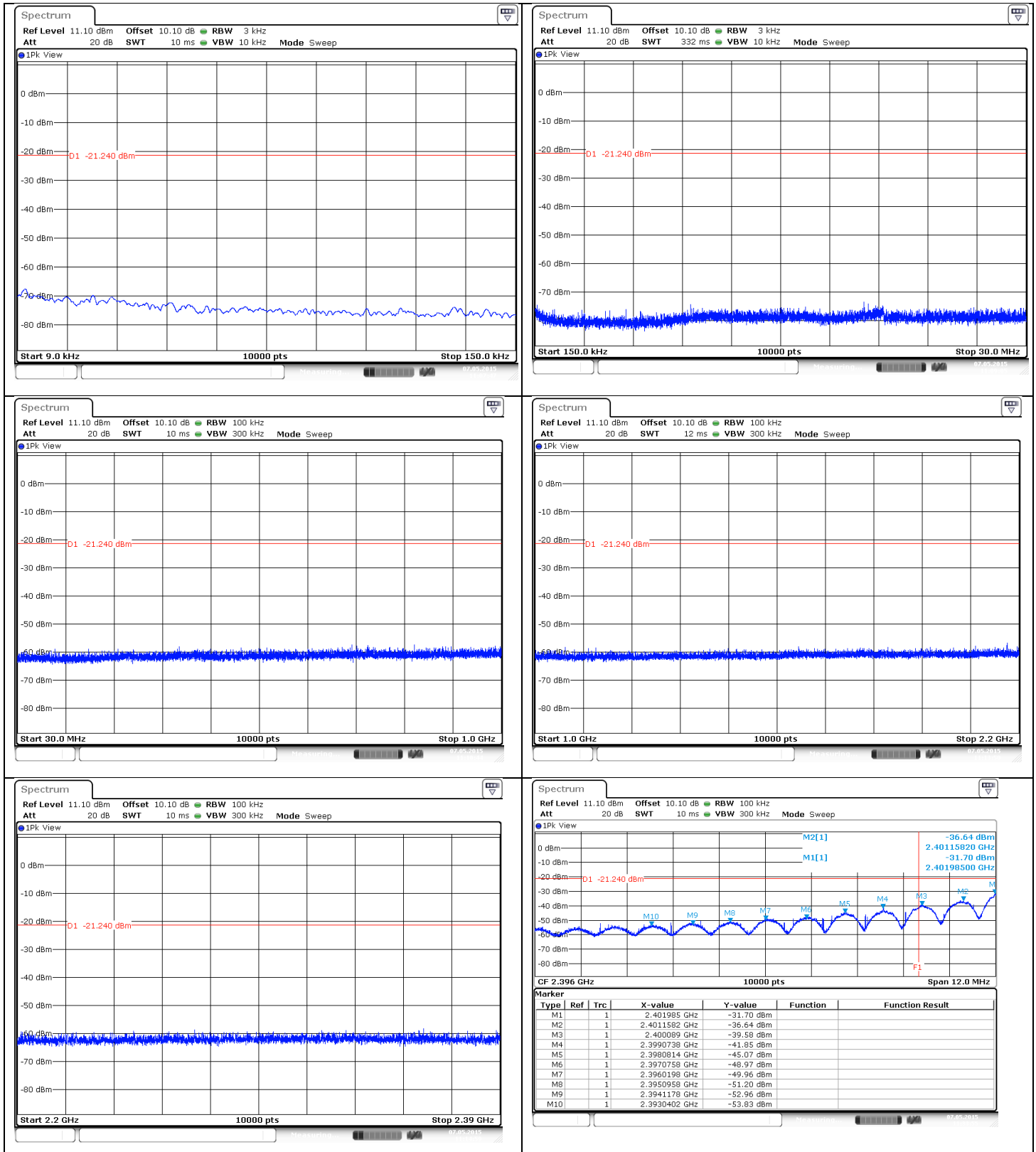
## 8.6. TEST SEQUENCE AND RESULTS

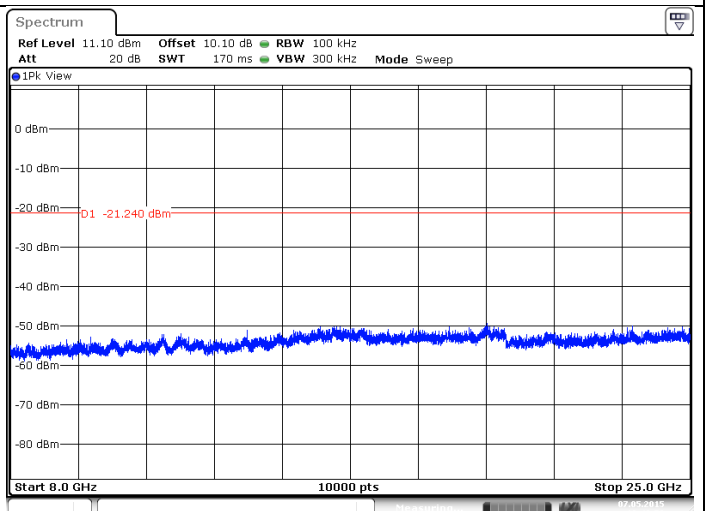
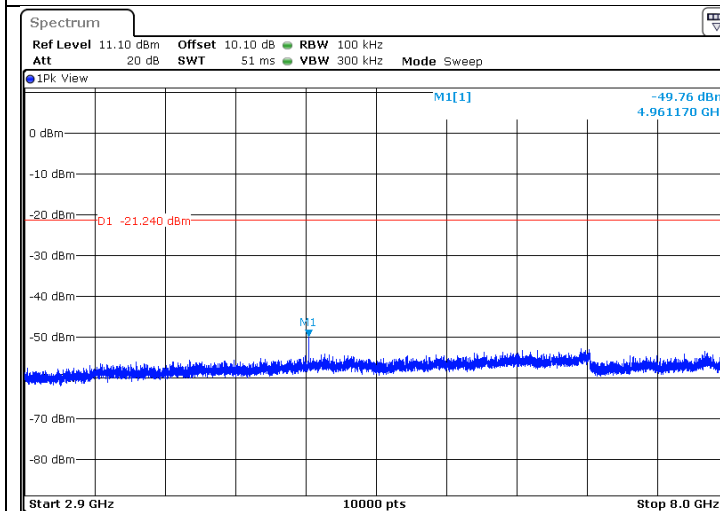
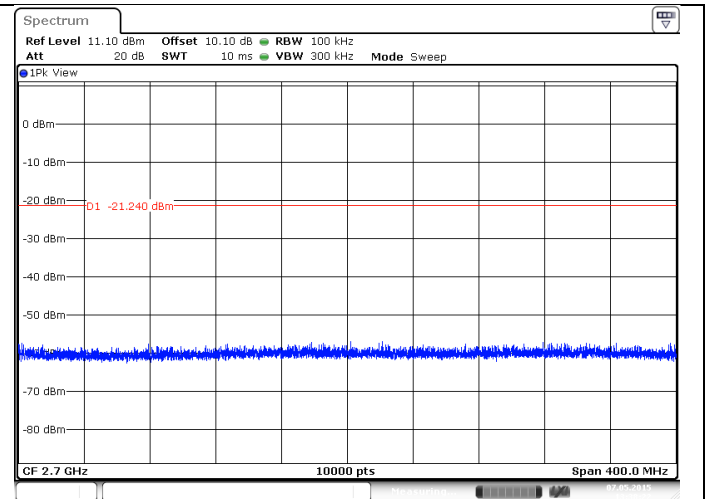
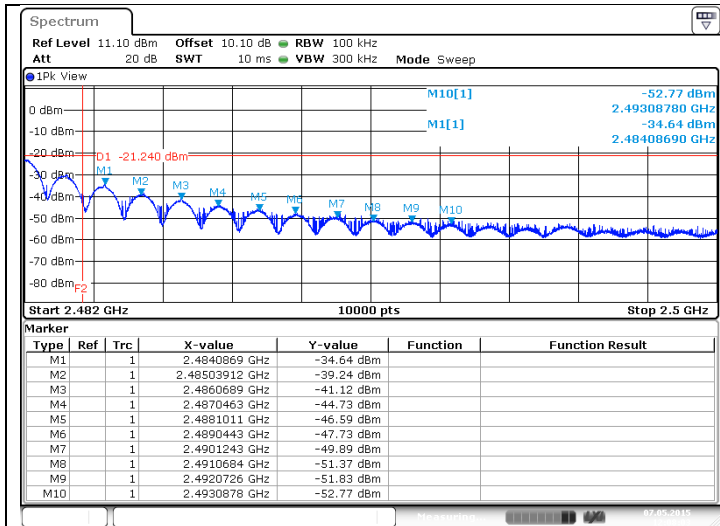
Offset: Attenuator+cable 10.1dB  
GRAPH / MODULATION.



-20dbc limit used : Worst case: Middle Channel, limit at -21.24 dBm

## Graphs 9kHz to 25GHz:





## 8.7. CONCLUSION

Band Edge Measurement performed on the sample of the product PGW1A / PGW1B / PGW1C, SN: BA:DB:0B:01:13/00:11:7B, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 Ed 1.0 limits.





## 9. OCCUPIED BANDWIDTH

### 9.1. TEST CONDITIONS

Date of test : May 5<sup>th</sup>, 2015  
Test performed by : J.PAUC  
Atmospheric pressure (hPa) : 990  
Relative humidity (%) : 46  
Ambient temperature (°C) : 22.6

### 9.2. 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: Attenuator+cable 10.1dB

☐ **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

### 9.3. TEST EQUIPMENT LIST

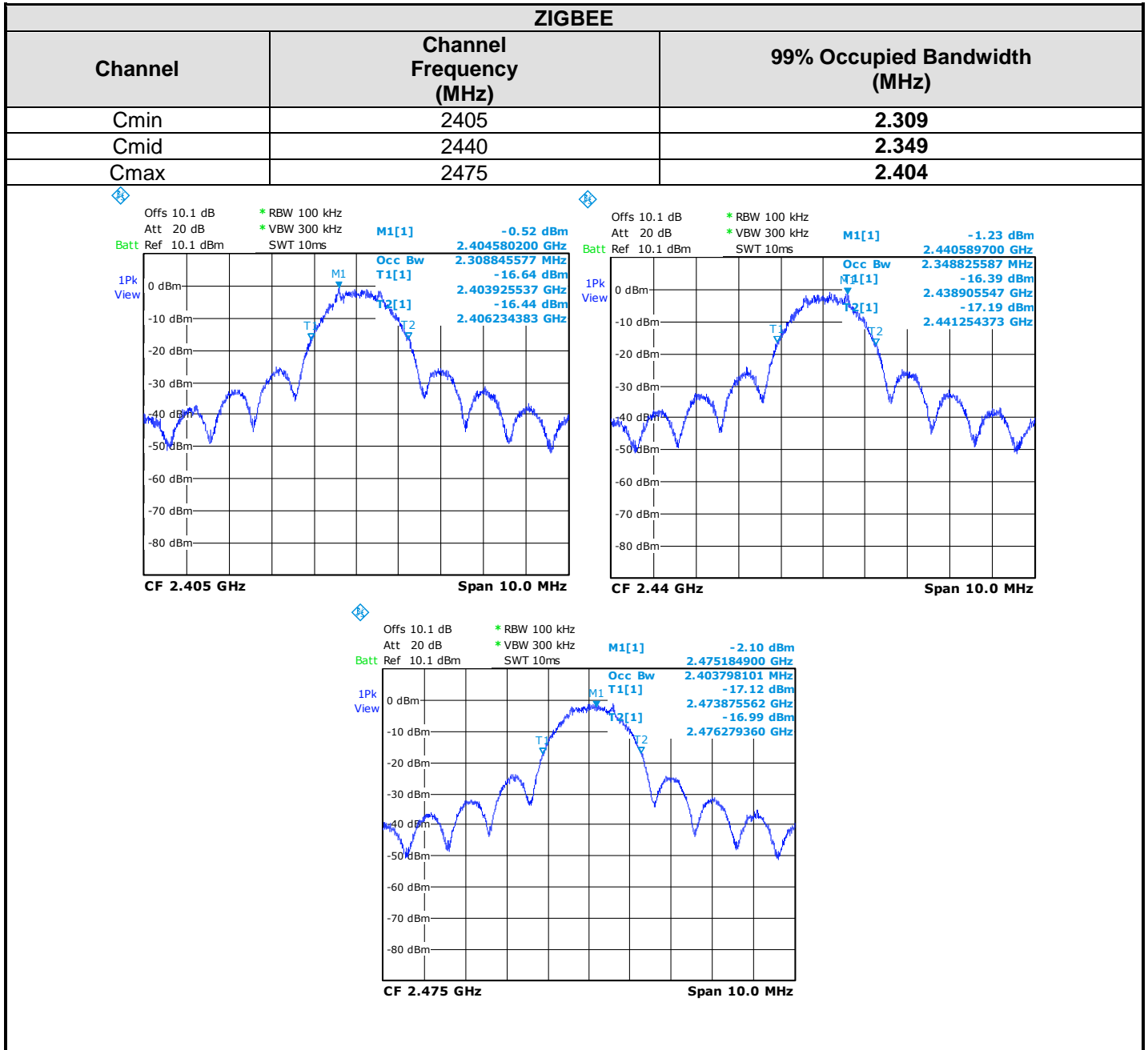
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	11/14	11/15
Cable	-	-	A5329604	12/14	12/15

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

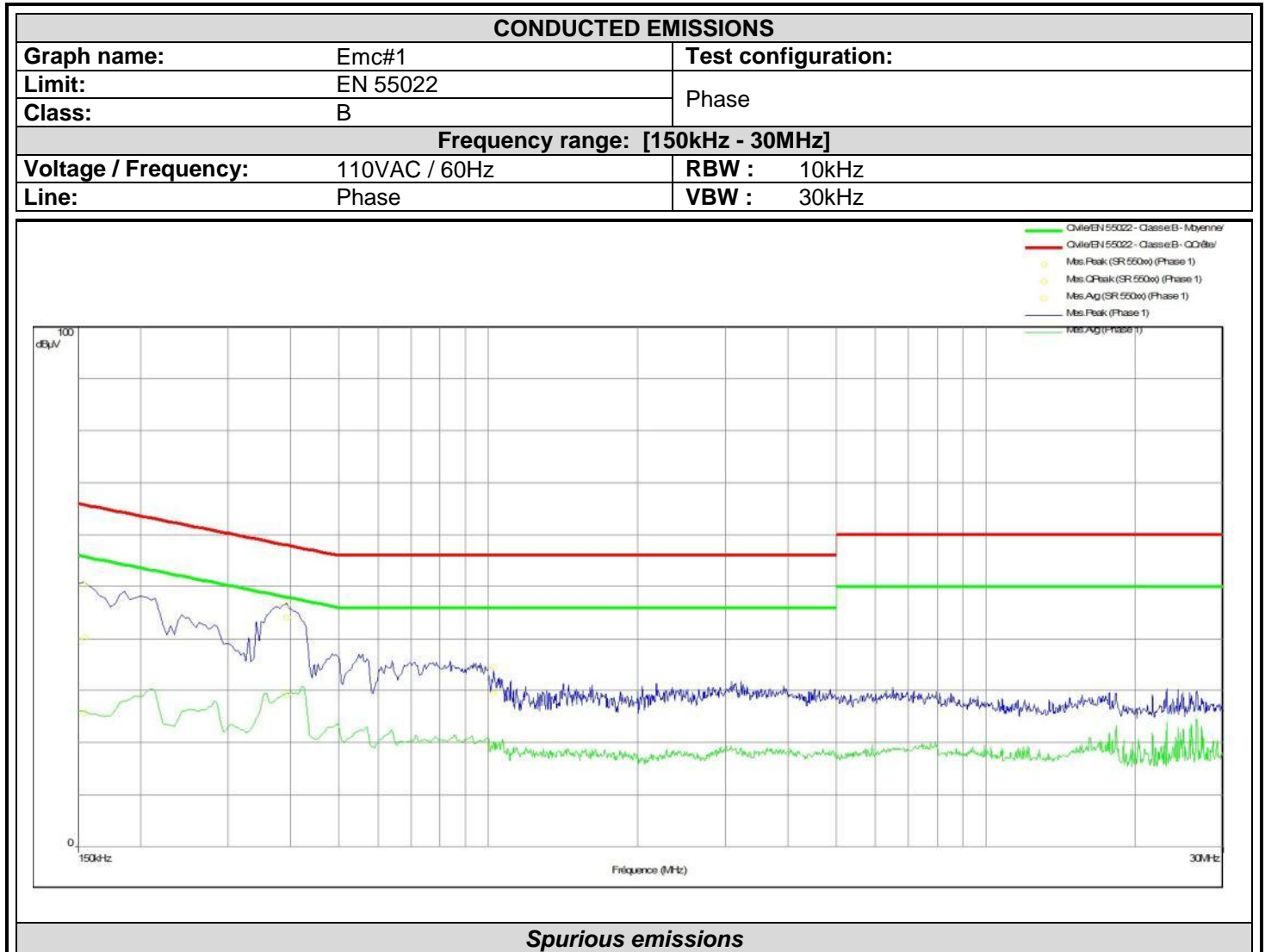
☒ None

☐ Divergence:

## 9.5. TEST SEQUENCE AND RESULTS



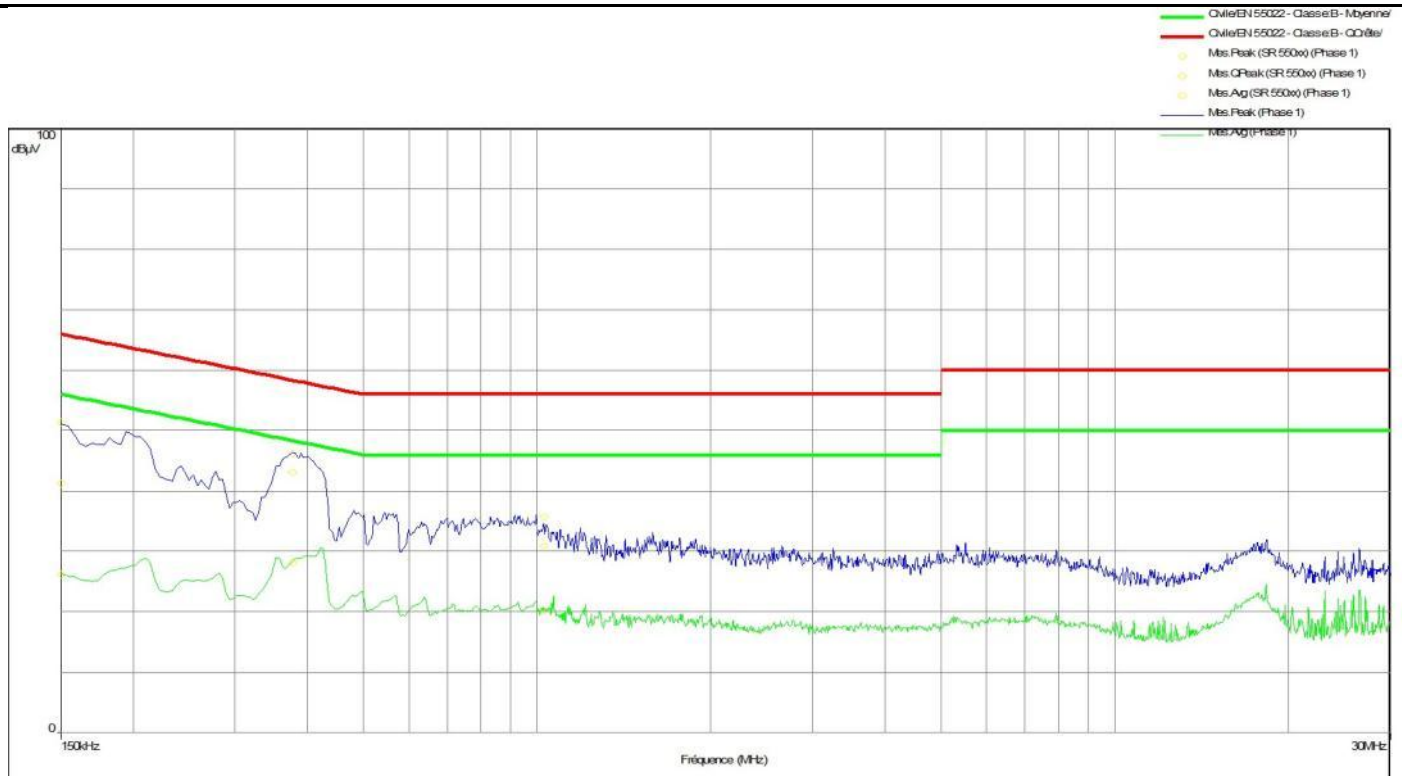
## 10. ANNEX 1 (GRAPHS)



Fréquence (MHz)	Mes.Peak (dBμV)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)
0.154	50.39	40.19	65.78	-25.59	25.71	55.78	-30.07
0.394	46.57	44.06	57.98	-13.92	29.35	47.98	-18.63
1.024	34.58	29.45	56	-26.55	19.29	46	-26.71

### CONDUCTED EMISSIONS

Graph name:	Emc#2	Test configuration:	
Limit:	EN 55022	Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	110VAC / 60Hz	RBW :	10kHz
Line:	Neutre	VBW :	30kHz



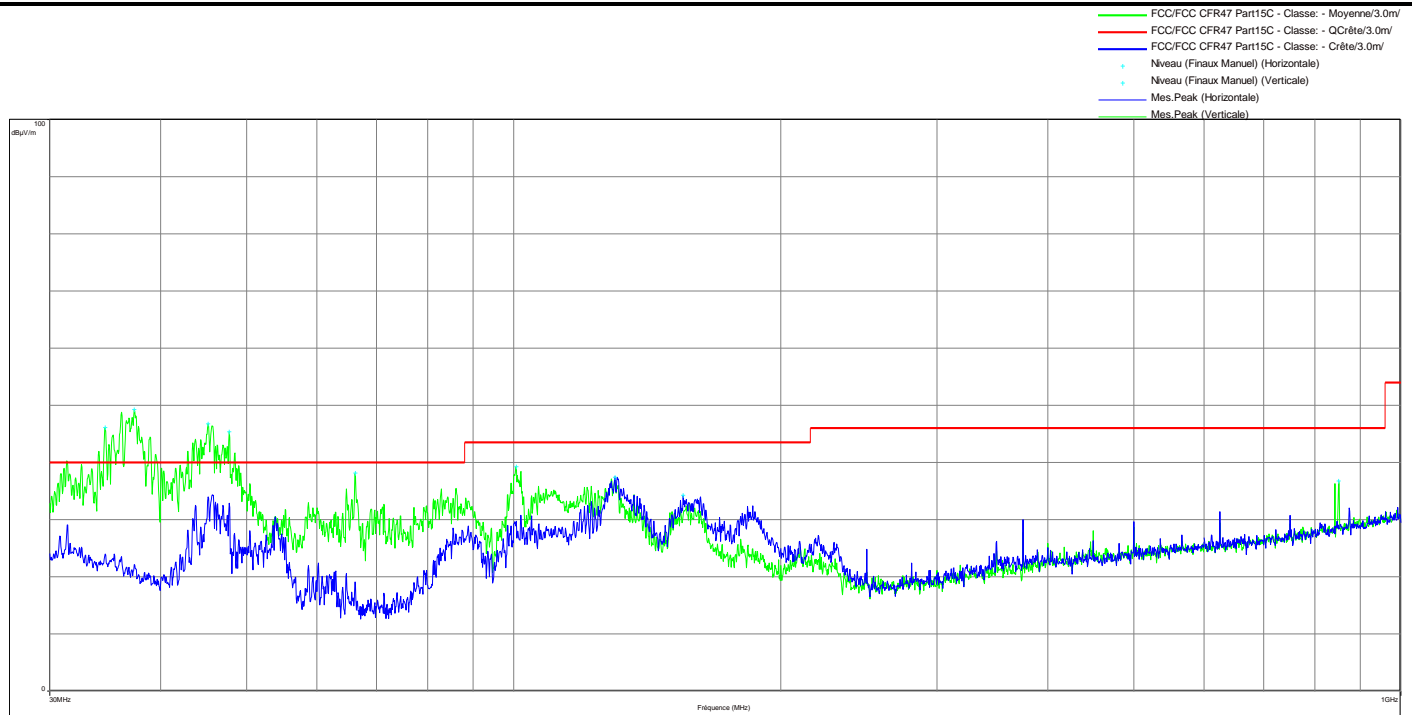
### Spurious emissions

Fréquence (MHz)	Mes. Peak (dBμV)	Mes. QPeak (dBμV)	LimQP (dBμV)	Mes. QPeak-LimQP (dB)	Mes. Avg (dBμV)	LimAvg (dBμV)	Mes. Avg-LimAvg (dB)
0.15	51.41	41.28	66	-24.72	26.17	56	-29.83
0.378	46.2	43.06	58.32	-15.26	28.11	48.32	-20.21
1.028	35.72	30.9	56	-25.1	20.24	46	-25.76



### RADIATED EMISSIONS

Graph name:	Emr#1	Test configuration:  Cfg1 - (H+V) - Axis XY
Limit:	FCC CFR47 Part15B	
Class:	B	
Frequency range: [30MHz - 1GHz]		
Antenna polarization:	Horizontal & Vertical	RBW : 100kHz
Azimuth:	0° - 360°	VBW : 300kHz

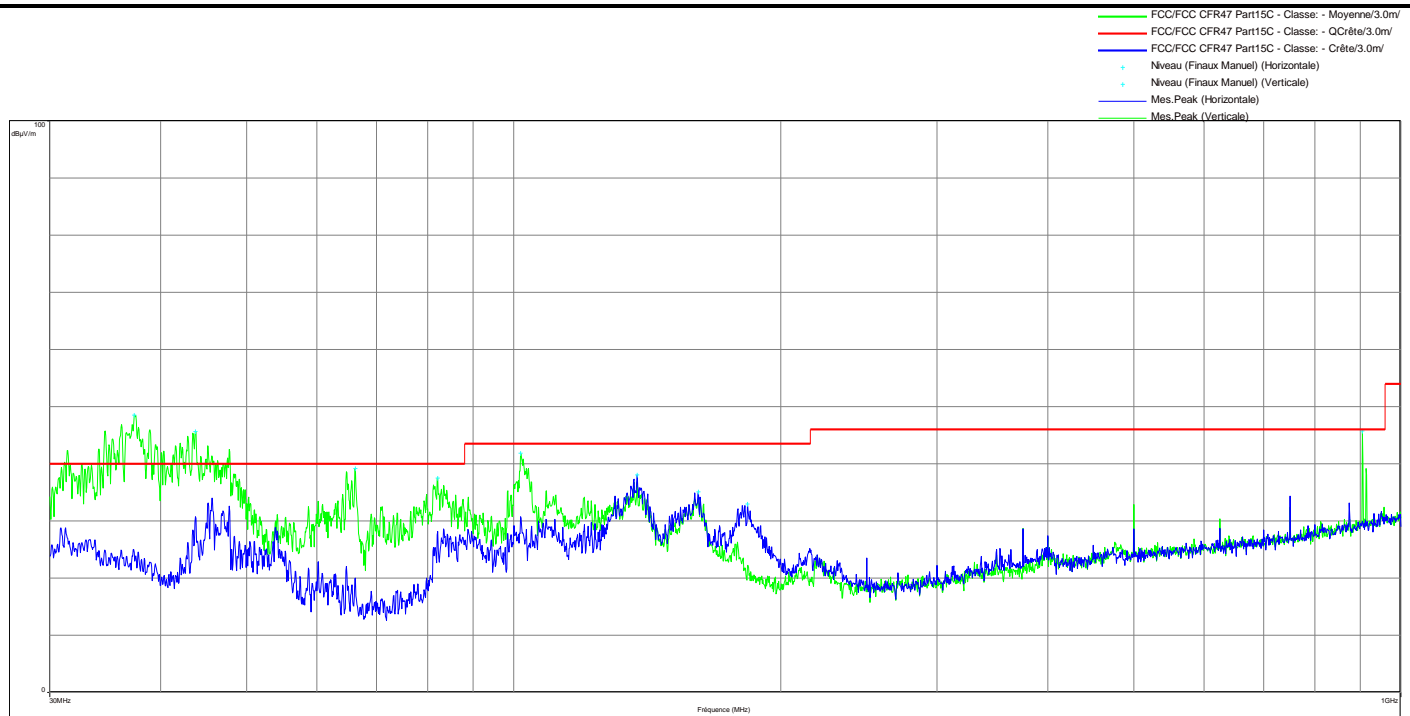


Frequency(MHz)	Peak Level(dBμV/m)
155.239	34.25
34.624	46.09
37.361	49.23
45.249	46.73
47.799	45.36
66.278	38.14
100.635	39.3
130.079	37.39
851.4	36.76



### RADIATED EMISSIONS

Graph name:	Emr#2	Test configuration:
Limit:	FCC CFR47 Part15B	Cfg1 - (H+V) - Axis Z
Class:	B	
Frequency range: [30MHz - 1GHz]		
Antenna polarization:	Horizontal & Vertical	RBW : 100kHz
Azimuth:	0° - 360°	VBW : 300kHz



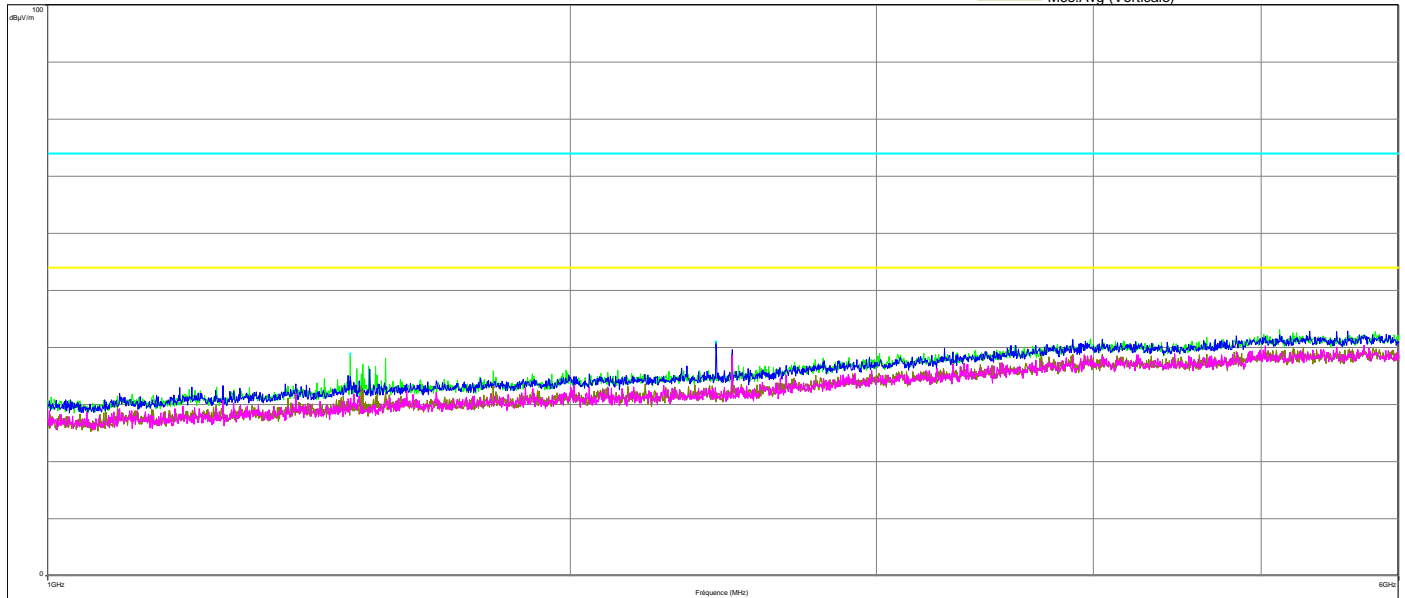
Frequency(MHz)	Peak Level(dBμV/m)
137.746	38.01
161.444	35.12
183.493	33
37.378	48.56
43.787	45.67
66.278	39.16
82.054	37.53
101.876	41.82
905.04	45.79



### RADIATED EMISSIONS

Graph name:	Emr#3	Test configuration:	
Limit:	FCC CFR47 Part15B	Cfg1 - (H+V) - FCC >1GHz Axis XY	
Class:	B		
Frequency range: [1GHz - 6GHz]			
Antenna polarization:	Horizontal & Vertical	RBW :	1MHz
Azimuth:	0° - 360°	VBW :	3MHz

- FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/
- FCC/FCC CFR47 Part15C - Classe: - QCrête/3.0m/
- FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/
- Niveau (Finaux Manuel) (Horizontale)
- Niveau (Finaux Manuel) (Verticale)
- Mes.Peak (Horizontale)
- Mes.Peak (Verticale)
- Mes.Avg (Horizontale)
- Mes.Avg (Verticale)



Frequency(MHz)	Peak Level(dBμV/m)
2426	41.02
1493.5	38.88

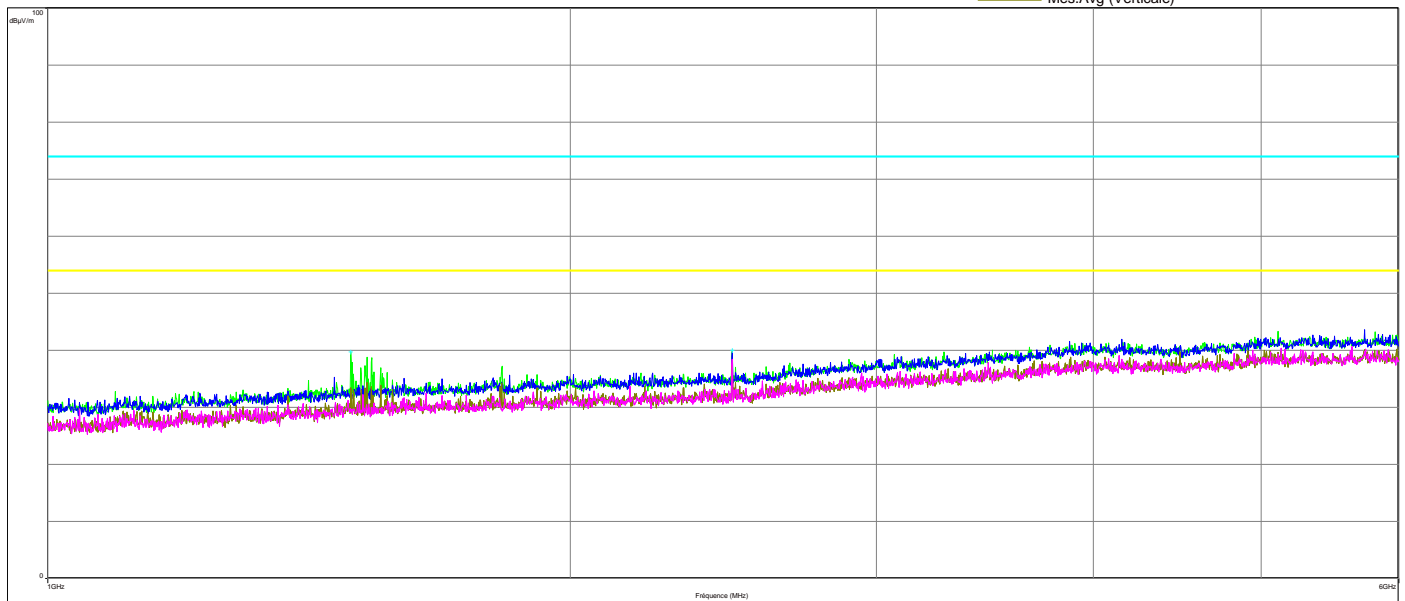




### RADIATED EMISSIONS

Graph name:	Emr#4	Test configuration:	
Limit:	FCC CFR47 Part15C	Cfg1 - (H+V) - FCC >1GHz Axis Z	
Class:	B		
Frequency range: [1GHz - 6GHz]			
Antenna polarization:	Horizontal & Vertical	RBW :	1MHz
Azimuth:	0° - 360°	VBW :	3MHz

FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/  
FCC/FCC CFR47 Part15C - Classe: - QCrête/3.0m/  
FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/  
+ Niveau (Finaux Manuel) (Verticale)  
Mes.Peak (Horizontale)  
Mes.Peak (Verticale)  
Mes.Avg (Horizontale)  
Mes.Avg (Verticale)



Frequency (MHz)	Peak Level(dBμV/m)
1494	39.74
2478.25	39.98

**11. 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.