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

RCS Grenoble 408 363 174

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

TEST REPORT

N°: 832764-R3-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** 66 Boulevard Niels Bohr CS52132 69603 VILLEURBANNE CEDEX
Apparatus under test	
Product	**AZURE LION**
Trade mark	**HIKOB**
Manufacturer	**HIKOB**
Model under test	**PAL2A**
Serial number	**None**
FCCID	**2AFCS-PAL20**
ICID	**20474-PAL20**
Test date	From June 3rd to June 14th, 2015
Test location	Moirans
IC Test site	6500A-1 & 6500A-3
Test performed by	J.PAUC
Composition of document	28 pages
Document issued on	October 30th, 2015

Written by :
Jonathan PAUC
Tests operator

Approved by :
Anthony MERLIN
Technical manager

LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES
LCIE SUD-EST
ZI Centr'Alp
170, Rue de Chatagnon
38430 MOIRANS
Tél. 04 76 07 36 36
Fax 04 76 55 90 88

SUMMARY

1. TEST PROGRAM

Standard:

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

EMISSION TEST	LIMITS			RESULTS
Limits for conducted disturbance at mains ports 150kHz-30MHz	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	☐ **PASS** ☐ **FAIL** ☑ **NA** ☐ **NP**
	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-247 §5.5*	**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** ☐ **FAIL** ☑ **NA** ☐ **NP**
Radiated emissions 30MHz-25GHz* *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5* ***Highest frequency : <108MHz*** ***(Declaration of provider)***	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Bandwidth 6dB *CFR 47 §*15.247 (a) (2) *RSS-247 §5.2.1*	**At least 500kHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Power spectral Density *CFR 47 §15.247 (e)* *RSS-247 §5.2.2*	**Limit: 30dBm** Conducted or Radiated measurement			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Maximum Peak Output Power *CFR 47 §*15.247 (b) *RSS-247 §5.4.4*	**Limit: -20dBc or** **Radiated emissions limits in restricted bands**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Band Edge Measurement *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5*	**Limit: 8dBm/3kHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Occupied bandwidth *RSS-Gen §4.6.1*	**No limit**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Receiver Spurious Emission** *RSS-Gen §4.10*	**See RSS-Gen §4.10**			☐ **PASS** ☐ **FAIL** ☑ **NA** ☐ **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.

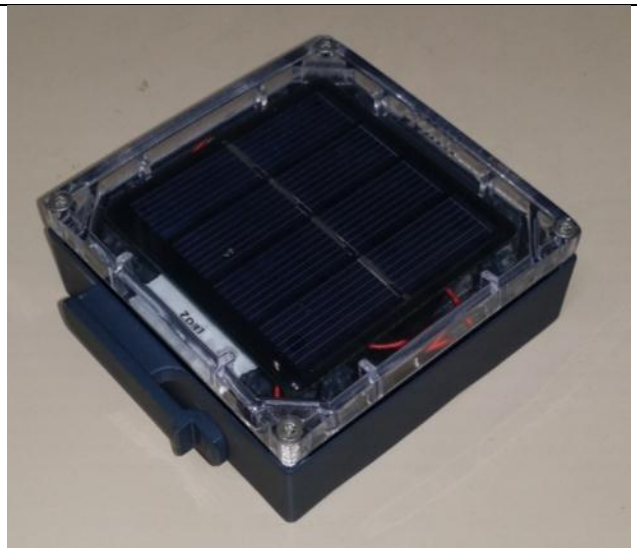
If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

2. SYSTEM TEST CONFIGURATION

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

PAL2A **Serial Number: None**



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
Supply1	☐ AC ☐ DC ☑ Battery	3.6V 6Ah	Lithium 1S1P NCA103450	/

Inputs/outputs - Cable:

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

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Gateway Ethernet / Zigbee	HIKOB GATEWAY	BA:DB:0B:01:13/00:11:7B	/
Notebook computer	W310CZ	NKW310CZ0003K01978	/
Antenna	Extronics iANT212	133297	/
Isolator	Extronics ISOLATE500-2400	127026	/

Equipment information:

Type:	**DTS**		
Frequency band:	[2400 – 2483.5] MHz		
Sub-band REC7003:	Annex 3 (a)		
Spectrum Modulation:	☑ DSSS		
Number of Channel:	15		
Spacing channel:	5MHz		
Channel bandwidth:	2MHz		
Antenna Type:	☑ Integral	☐ External	☐ Dedicated
Antenna connector:	☐ Yes	☑ No	☐ Temporary for test
Transmit chains:	1		
	Single antenna		
	Gain 1: 3dBi		
Beam forming gain:	No		
Receiver chains	1		
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined
Ad-Hoc mode:	☐ Yes	☑ No	
Duty cycle:	☑ Continuous duty	☐ Intermittent duty	☐ 100% duty
Equipment type:	☑ Production model	☐ Pre-production model	
Type of power source:	☐ AC power supply	☐ DC power supply	☑ Battery (Select Type)
Operating voltage range:	Vmin:	☐ 207V/50Hz	☑ 2.9Vdc
	Vnom:	☐ 230V/50Hz	☑ 3.6Vdc
	Vmax	☐ 253V/50Hz	☑ 4.2Vdc

NC: Not communicated by customer

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

DATA RATE		
Data Rate (Mbps)	**Modulation Type**	**Worst Case Modulation**
0.25	O-QPSK	☑

2.2. EUT CONFIGURATION

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

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 52.5dBµV 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 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

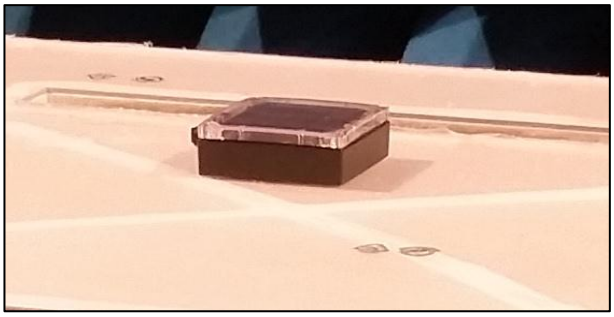
3. RADIATED EMISSION DATA

3.1. ENVIRONMENTAL CONDITIONS

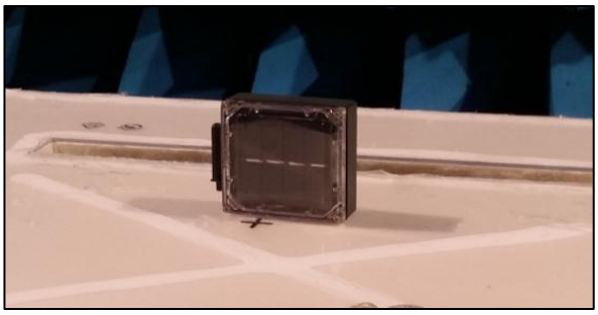
Date of test	Jonathan PAUC
Test performed by	June 8th , 2015
Atmospheric pressure (hPa)	1005
Relative humidity (%)	46
Ambient temperature (°C)	25

3.2. TEST SETUP

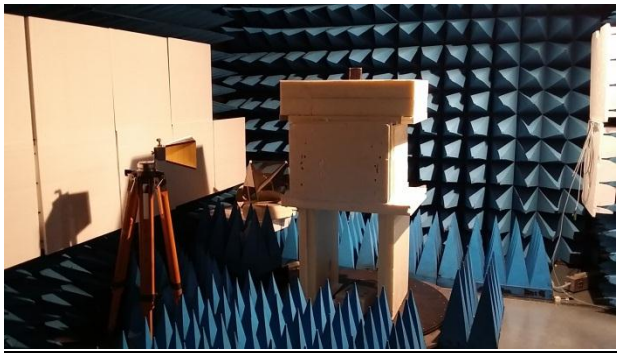
The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
☑ 150cm above the ground on 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}.



Position XY



Position Z



Above 1GHz setup
Test setup in anechoic chamber

3.3. TEST METHOD

Pre-characterisation measurement: (9kHz – -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.

See §7 , conducted measurements are performed ,
characterisation are done on frequencies observed in restricted band

Characterization on 10 meters open site from 9kHz to 1GHz:

The product has been tested according to ANSI C63.4, 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 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 (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.

3.4. 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	-	-

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

3.6. TEST RESULTS

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

See graphs for 30MHz-1GHz:

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

3.6.2. 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)	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
No significant frequency observed, see annex1									

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

3.6.3. 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)	Remark
1	2484.008	74.0	58.3	**-15.7**	54.0	48.5	**-5.5**	237	H	100	30.4	Pos XY
2	2485.050	74.0	57.4	**-16.6**	54.0	46.6	**-7.4**	0	H	100	30.4	Pos XY
3	2486.047	74.0	52.8	**-21.2**	54.0	42.7	**-11.3**	0	H	100	30.4	Pos XY
4	2490.979	74.0	49.9	**-24.1**	54.0	39.9	**-14.1**	208	H	100	30.4	Pos XY
5	2499.031	74.0	47.1	**-26.9**	54.0	34.8	**-19.2**	154	H	100	30.4	Pos XY
6	4950.970	74.0	54.9	**-19.1**	54.0	42.2	**-11.8**	0	H	100	36.7	Pos XY
7	7423.960	74.0	54.5	**-19.5**	54.0	39.1	**-14.9**	0	H	100	40.6	Pos XY
8	12367.000	74.0	54.9	**-19.1**	54.0	43.3	**-10.7**	45	H	100	44.5	Pos XY

Note: Measures have been done at 3m distance.

3.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product PAL2A, SN: None, 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. BANDWIDTH (15.247)

4.1. TEST CONDITIONS

Date of test :Jonathan PAUC
Test performed by :June 3rd, 2015
Atmospheric pressure (hPa) : 2003
Relative humidity (%) :40
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: Attenuator+cable 10.6dB

☐ ***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) ≥ 3 x 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

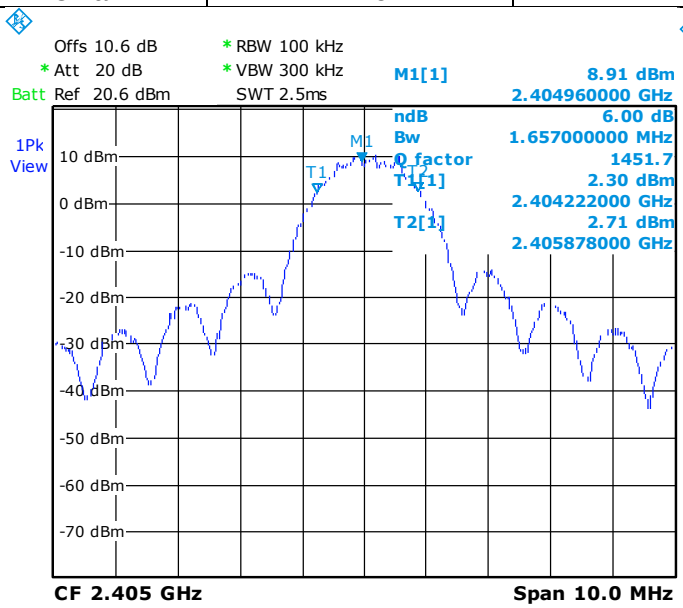
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	12/14	12/15
Cable	-	-	A5329603	12/14	12/15

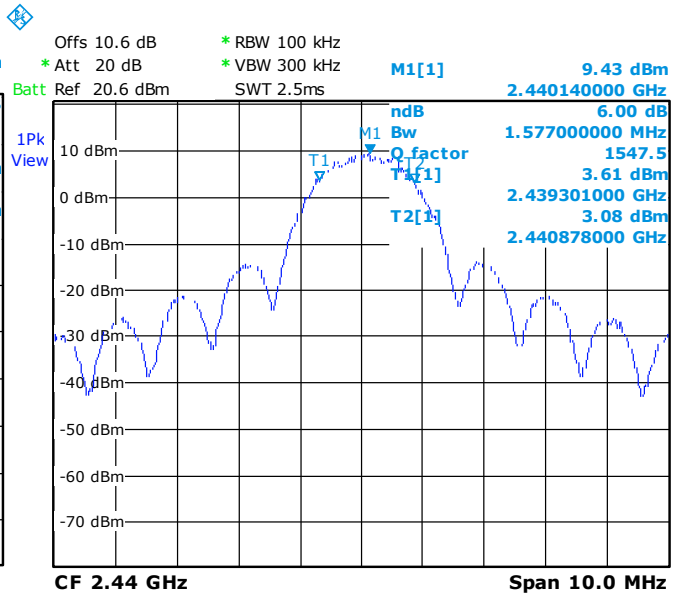
4.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

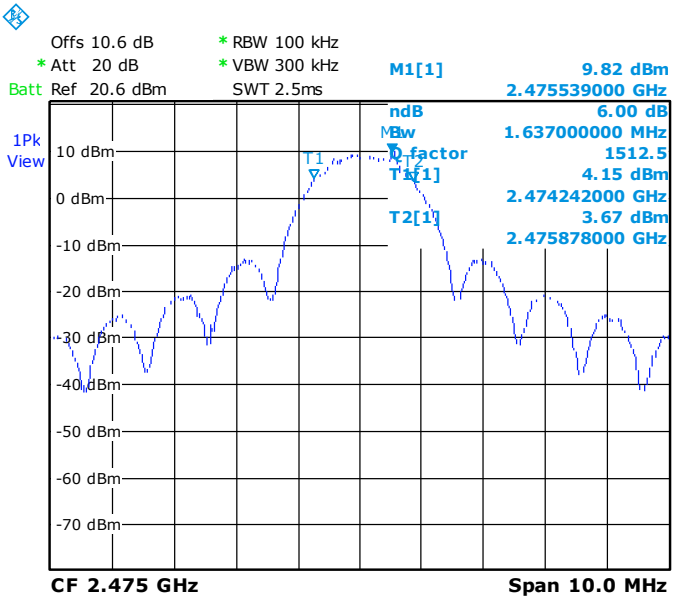
☑ None ☐ Divergence:

4.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Bandwidth Limit (MHz)
Cmin	2405	**1.657**	**>0.5**
Cmid	2440	**1.577**	**>0.5**
Cmax	2475	**1.637**	**>0.5**







4.6. CONCLUSION

Bandwidth measurement performed on the sample of the product PAL2A, SN: None, 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. MAXIMUM PEAK OUTPUT POWER (15.247)

5.1. TEST CONDITIONS

Date of test	:Jonathan PAUC
Test performed by	:June 3rd, 2015
Atmospheric pressure (hPa)	: 2003
Relative humidity (%)	:40
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: Attenuator+cable 10.6dB

☐ ***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 ≥ 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 ≥ DTS bandwidth.
b) Set VBW ≥ 3 x RBW.
c) Set span ≥ 3 x 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 ≥ 3 x RBW
c) Set the span ≥ 1.5 x 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

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	12/14	12/15
Cable	-	-	A5329603	12/14	12/15

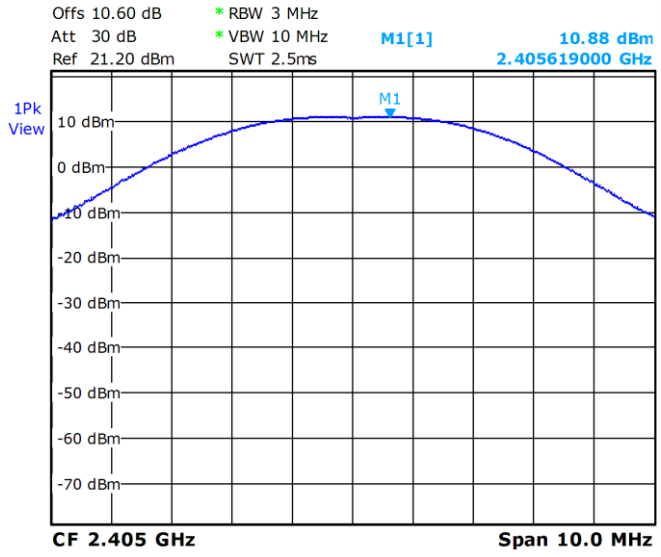
5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

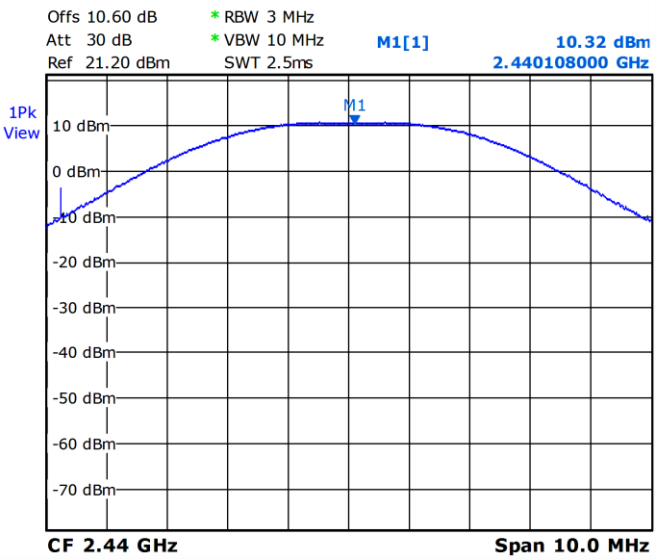
☑ None ☐ Divergence:

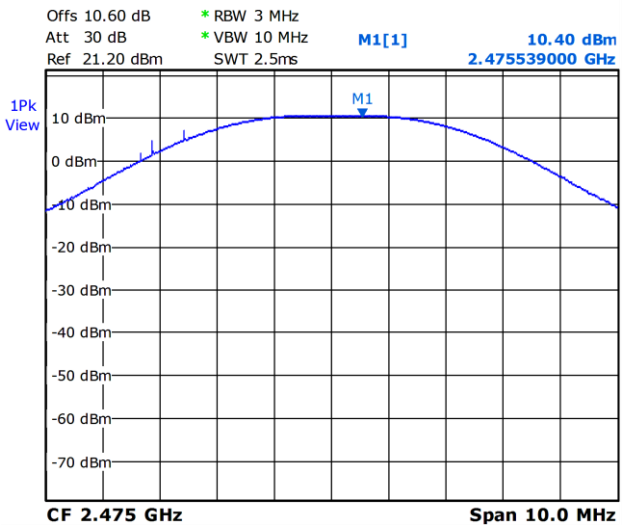
5.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin	2405	**10.9**	30.0
Cmid	2440	**10.3**	30.0
Cmax	2475	**10.4**	30.0







5.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product PAL2A, SN: None, 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. POWER SPECTRAL DENSITY (15.247)

6.1. TEST CONDITIONS

Date of test :Jonathan PAUC
Test performed by :June 3rd, 2015
Atmospheric pressure (hPa) : 2003
Relative humidity (%) :40
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 10.6dB

☐ ***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.

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	12/14	12/15
Cable	-	-	A5329603	12/14	12/15

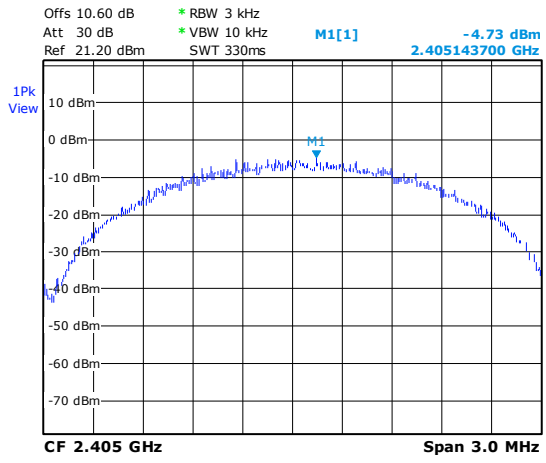
6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

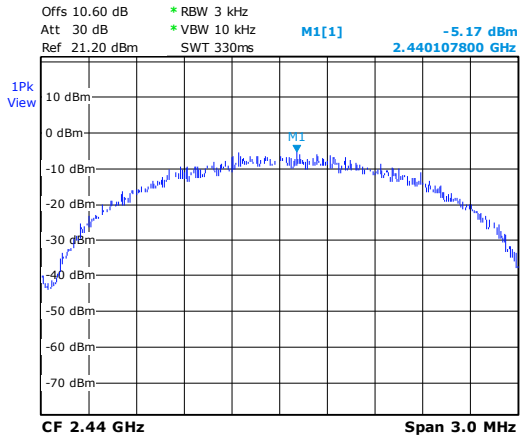
☑ None ☐ Divergence:

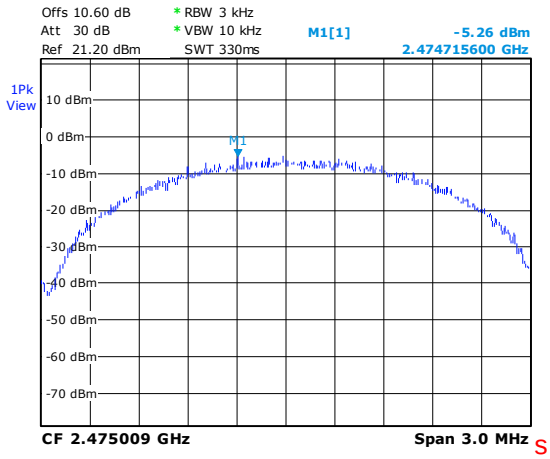
6.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2405	**-4.7**	8.0
Cmid	2440	**-5.2**	8.0
Cmax	2475	**-5.3**	8.0







S

6.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product PAL2A, SN: None, 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. BAND EDGE MEASUREMENT (15.247)

7.1. TEST CONDITIONS

Date of test	Jonathan PAUC
Test performed by	June 8th , 2015
Atmospheric pressure (hPa)	1105
Relative humidity (%)	46
Ambient temperature (°C)	25

7.2. 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.

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

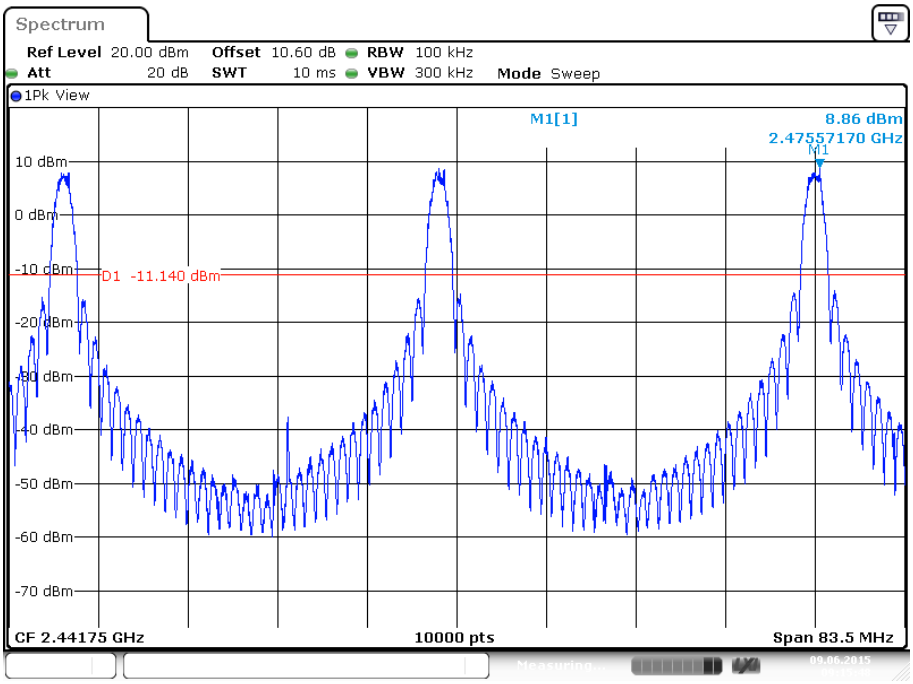
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	12/14	12/15
Cable	-	-	A5329603	12/14	12/15

7.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

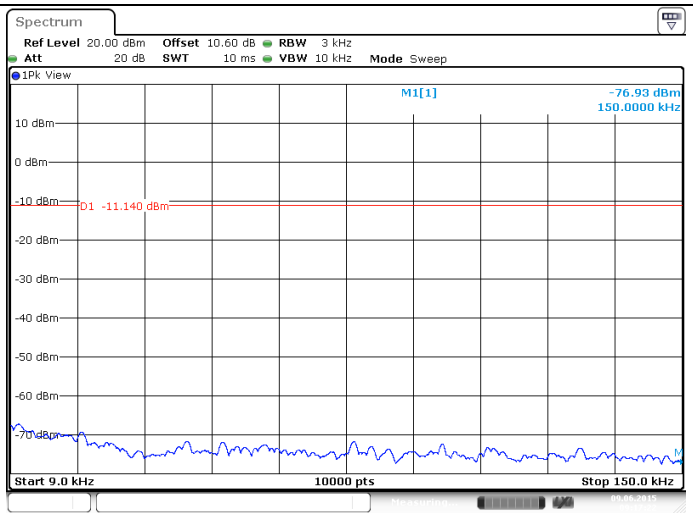
☑ None ☐ Divergence:

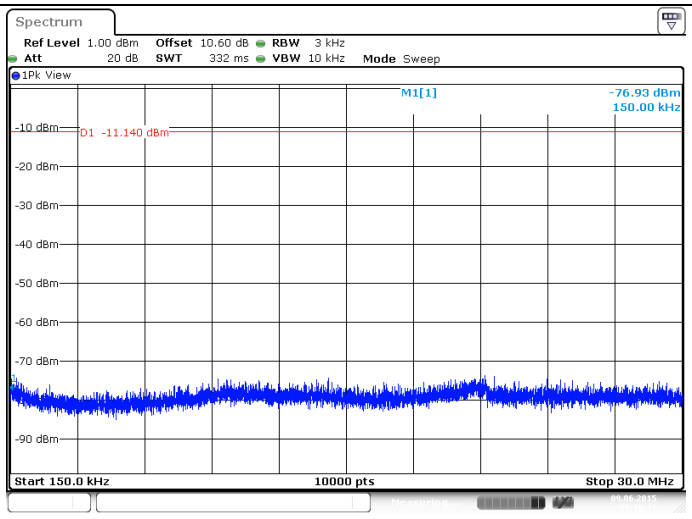
7.6. TEST SEQUENCE AND RESULTS

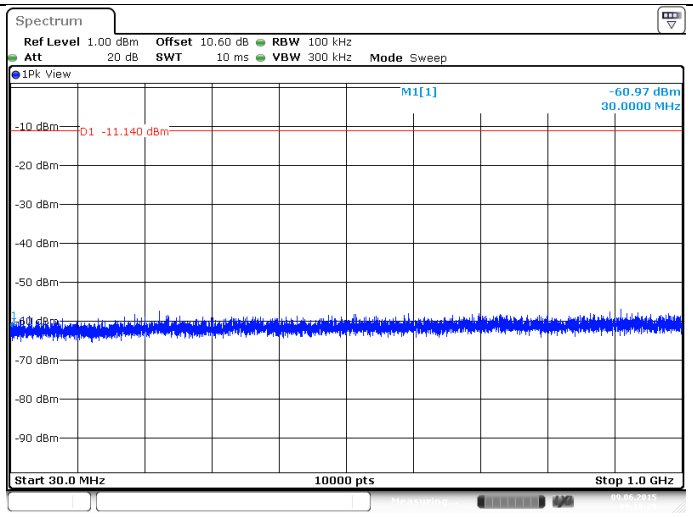
Offset: Attenuator+cable 10.6dB
GRAPH / MODULATION.

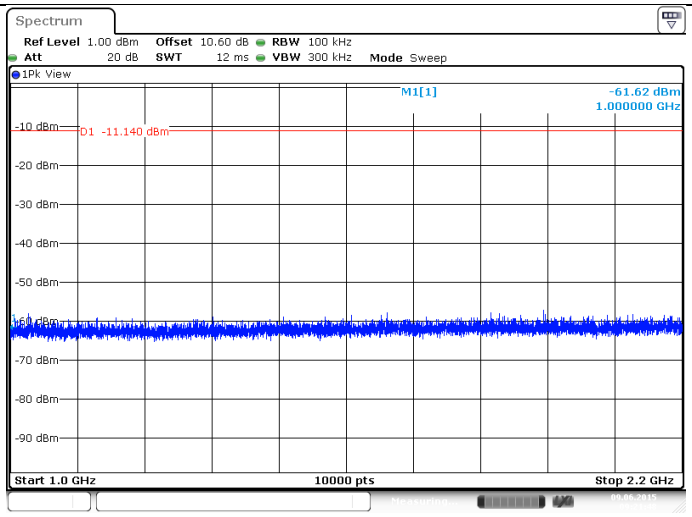


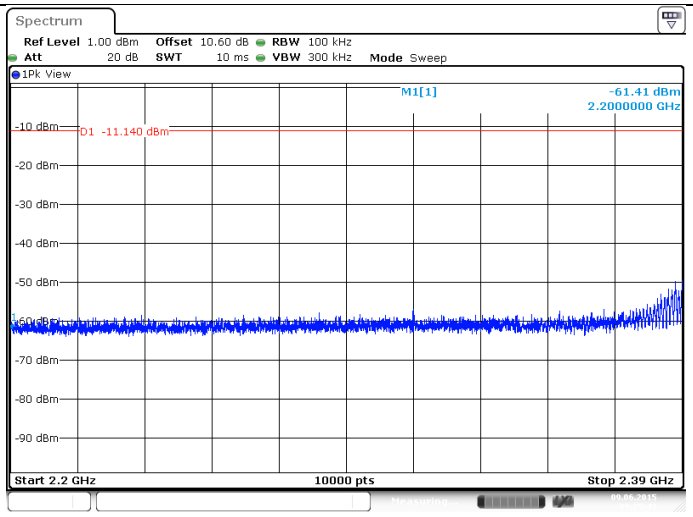
-20dBc limit used: **Worst case: Middle Channel , limit at -11.14dBm**

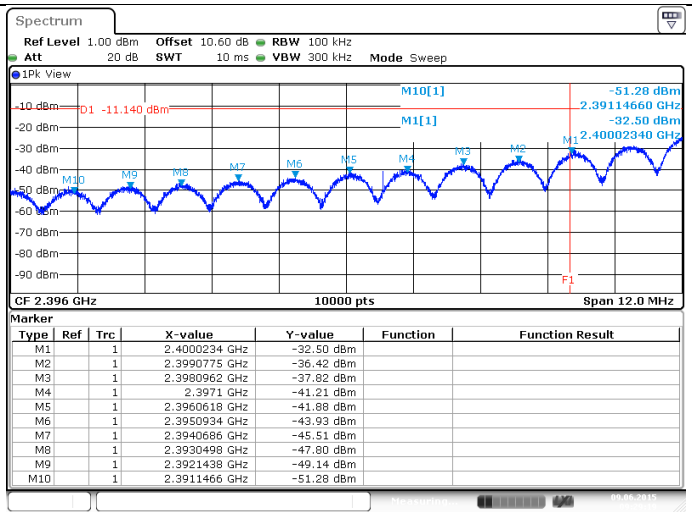






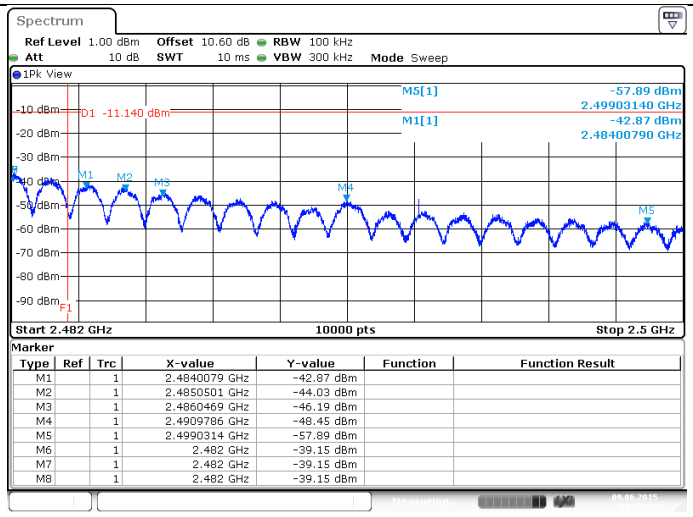


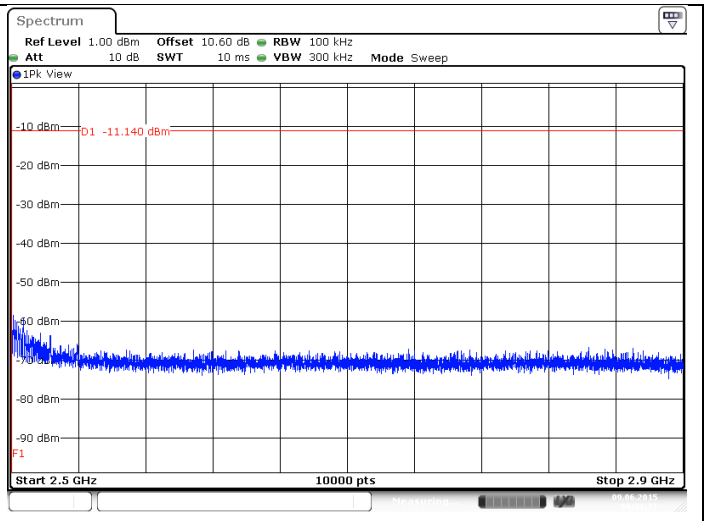


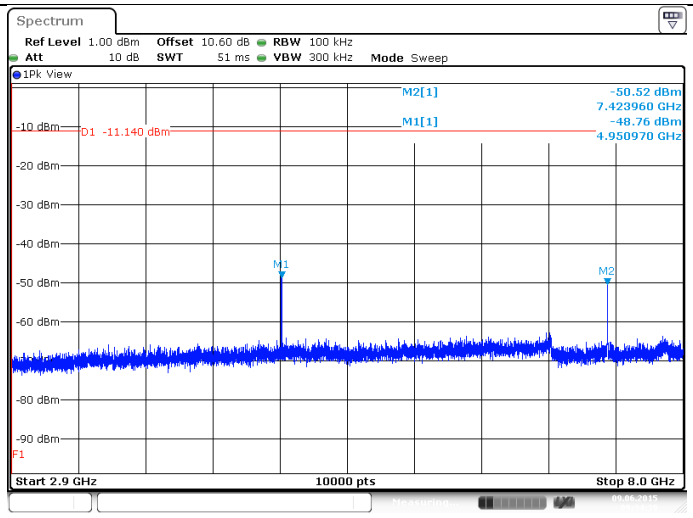


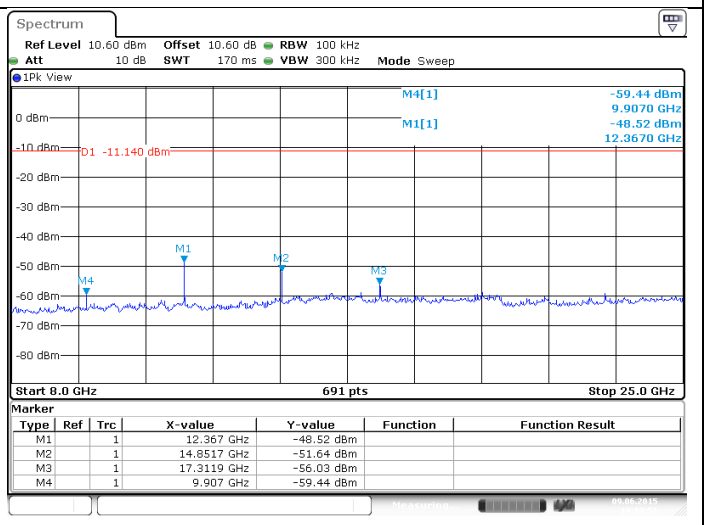
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4000234 GHz	-32.50 dBm		
M2		1	2.3990775 GHz	-36.42 dBm		
M3		1	2.3980962 GHz	-37.82 dBm		
M4		1	2.3971 GHz	-41.21 dBm		
M5		1	2.3960618 GHz	-41.88 dBm		
M6		1	2.3950934 GHz	-43.93 dBm		
M7		1	2.3940686 GHz	-45.51 dBm		
M8		1	2.3930498 GHz	-47.80 dBm		
M9		1	2.3921438 GHz	-49.14 dBm		
M10		1	2.3911466 GHz	-51.28 dBm		









7.1. CONCLUSION

Band Edge Measurement performed on the sample of the product PAL2A, SN: None, 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. OCCUPIED BANDWIDTH

8.1. TEST CONDITIONS

Date of test :Jonathan PAUC
Test performed by :June 3rd, 2015
Atmospheric pressure (hPa) : 2003
Relative humidity (%) :40
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: Attenuator+cable 10.6dB

☐ ***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) ≥ 3 x 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

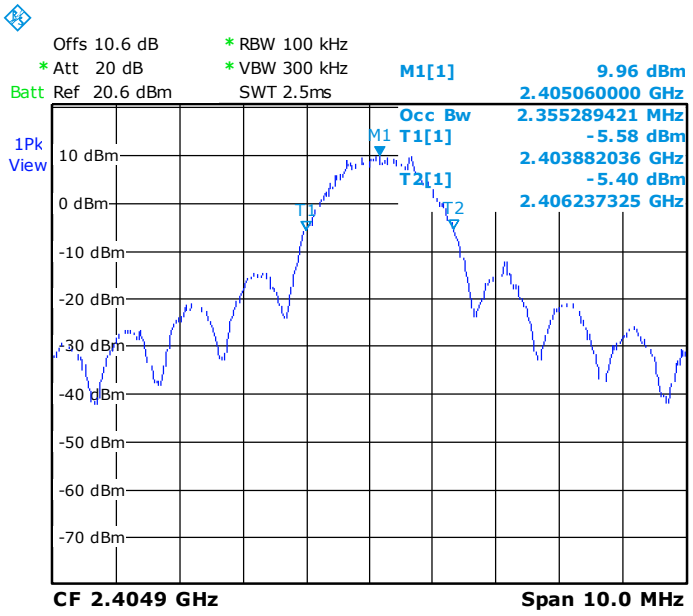
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	CA_DATE	CAIDUE
Attenuator 10dB	JFW	-	A7122166	10/14	10/15
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A2642049	12/14	12/15
Cable	-	-	A5329603	12/14	12/15

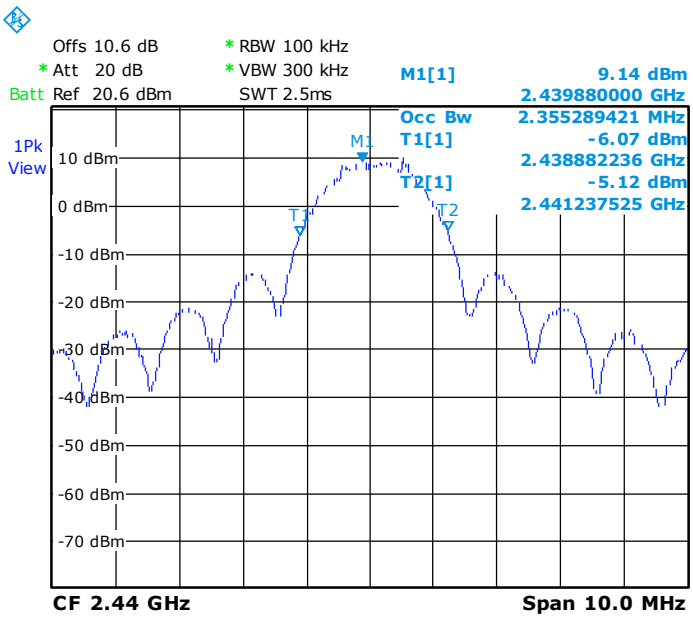
8.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

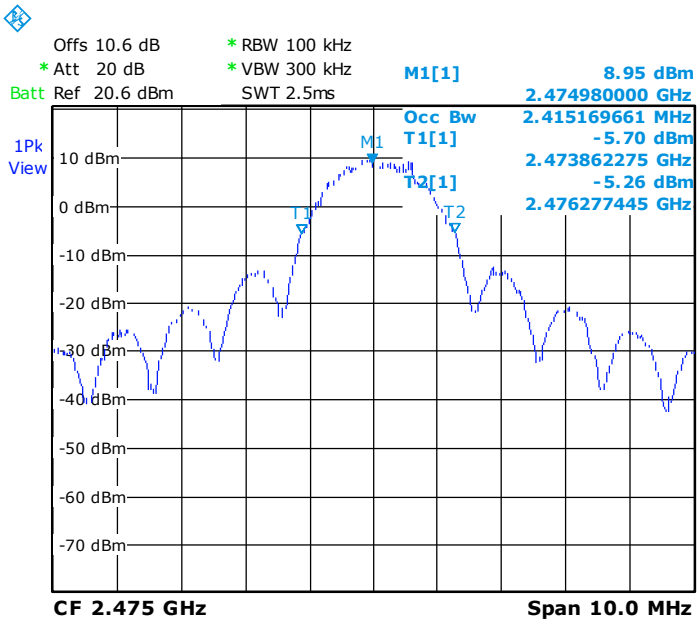
☑ None ☐ Divergence:

8.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)
Cmin	2405	**2.355**
Cmid	2440	**2.355**
Cmax	2475	**2.415**

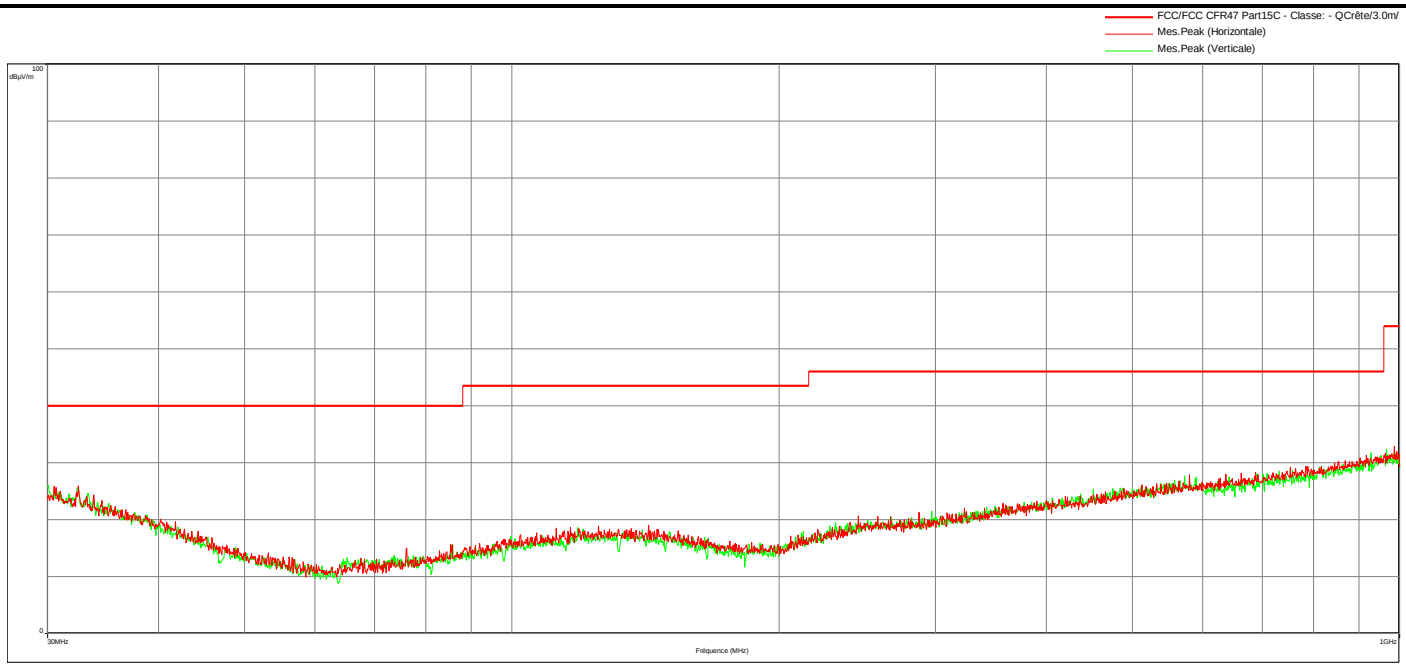




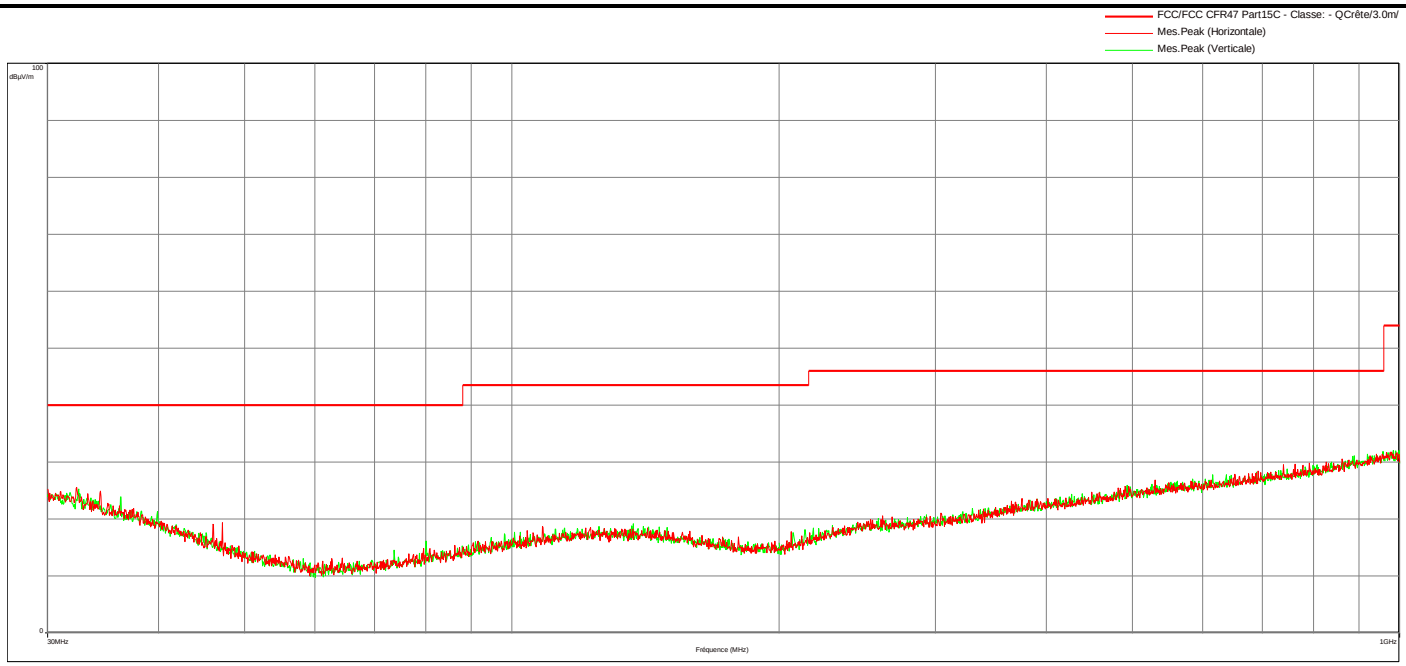


9. ANNEX 1 (GRAPHS)

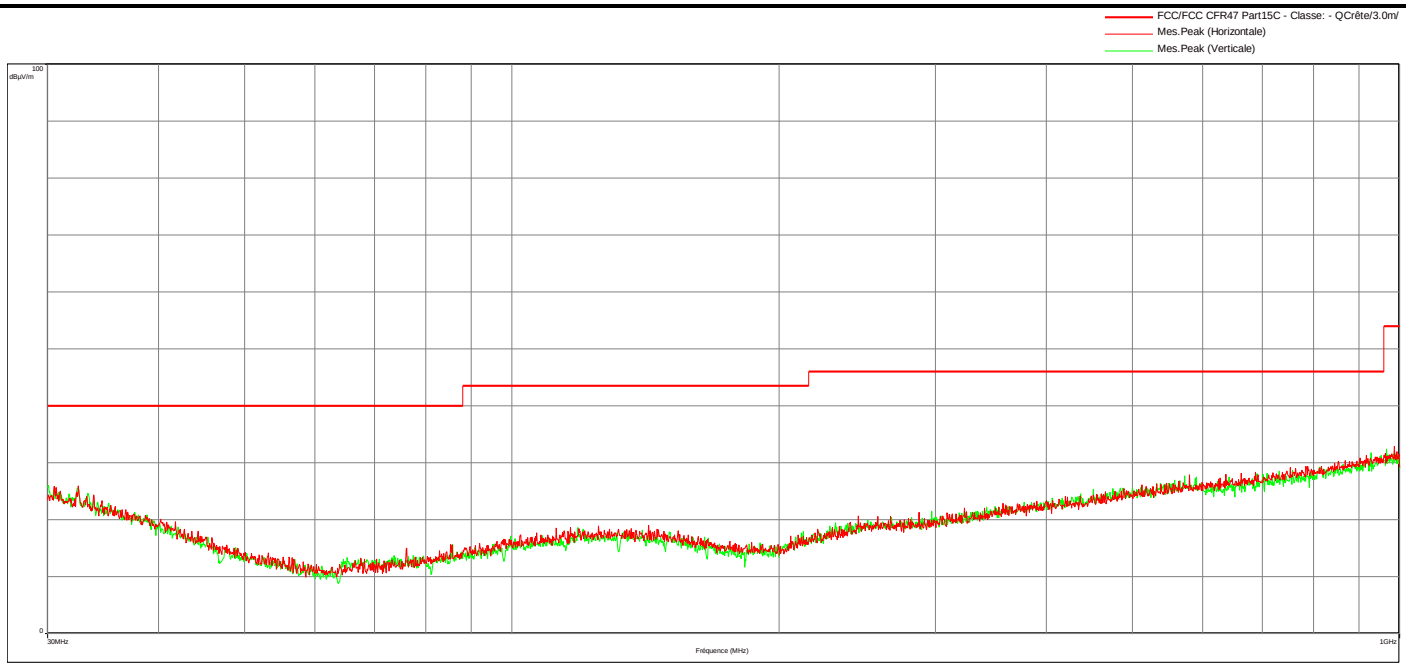
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Emr1 - (H+V) - CMin - FCC - Axis XY	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



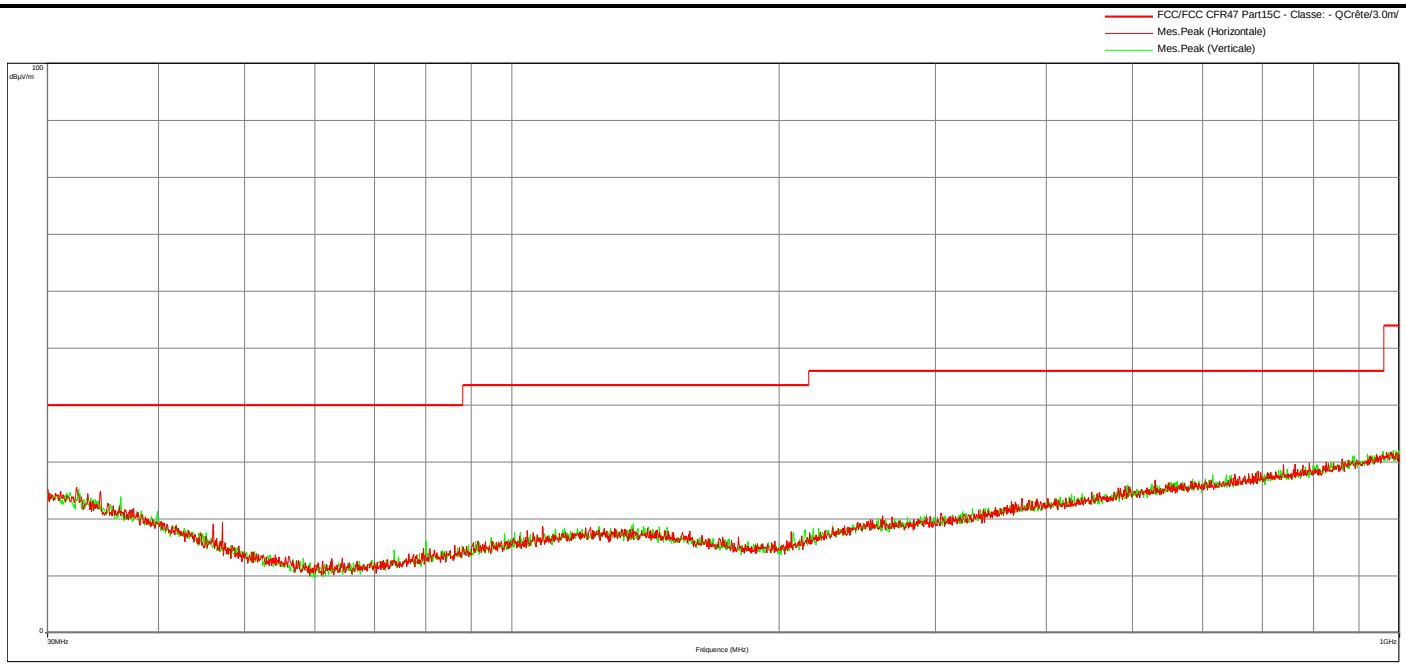
RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Emr2 - (H+V) - CMax - FCC - Axis XY	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Emr3 - (H+V) - CMin - FCC - Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Emr4 - (H+V) - CMax - FCC - Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



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 *Measurement of conducted disturbances in voltage on the power port*	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication *Measurement of conducted disturbances in voltage on the telecommunication port.*	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans *Measurement of radiated electric field on the Moirans open area test site*	5.07 dB	5.2 dB

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.*