TEST REPORT

N°: 158305-729579-B (FILE#1011014) **Version : 02**

Subject	**Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: FCC CFR 47 Part 15, Subpart C RSS-247 Issue 2.0**
Issued to	**INGENICO** 9 avenue de la Gare – Rovaltain TGV - B.P. 25156 26958 VALENCE Cedex 9 FRANCE
Apparatus under test	
↳ Product	NFC card reader module
↳ Trade mark	**INGENICO**
↳ Manufacturer	**INGENICO**
↳ Family range	**OPEN1500 POE/BT/RS232 – OPEN2500 POE/BT/RS232**
↳ Model under test	**OPEN2500 POE/BT/RS232**
↳ Serial number	**18163000149 / 1816300112**
↳ FCCID	**XKB-OPE15CLBT**
↳ IC	**2586D-OPE15CLBT**
Conclusion	See Test Program chapter
Test date	November 15, 2018 to November 21, 2018
Test location	MOIRANS
IC Test site	6500A-1 & 6500A-3
Composition of document	54 pages
Document issued on	March 13, 2019

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	December 4, 2018	Majid MOURZAGH	Creation of the document
02	March 13, 2019	Majid MOURZAGH	Modification model

Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.

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1. TEST PROGRAM

Standard:

- **FCC Part 15, Subpart C 15.247**
- **ANSI C63.10 (2013)**
- **RSS-247 Issue 2.0**
- **RSS-Gen Issue 5**
- **558074 D01 DTS Measurement Guidance v05**

EMISSION TEST	LIMITS			RESULTS (Comments)
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 :600MHz*** ***(Declaration of provider)***	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m 960MHz-1GHz : 54.0 dBµV/m 1GHz – 25GHz: 54.0 dBµV/m (AV) 74.0 dBµV/m (PK)			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Maximum Peak Output Power *CFR 47 §15.247 (b)* *RSS-247 §5.4*	**Limit: 21dBm** Conducted or Radiated measurement			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Hopping Channel Separation *CFR 47 §15.247 (a) (1)* *RSS-247 §5.1*	**Minimum between:** Two-third 20dB Bandwidth or 25kHz Whichever is greater			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Number of Hopping Frequencies *CFR 47 §15.247 (a) (1) (iii)* *RSS-247 §5.1*	**At least 15 channels used**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Time of Occupancy (Dwell Time) *CFR 47 §15.247 (a) (1) (iii)* *RSS-247 §5.1*	**Maximum 0.4 sec within 31.6sec**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Band Edge Measurement *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5*	**Limit: -20dBc**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Occupied bandwidth *RSS-Gen §6.7*	**No limit**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Receiver Spurious Emission** *RSS-Gen §7.3*	**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**

***§15.33:** The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.
- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.

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

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

2. SYSTEM TEST CONFIGURATION

2.1. JUSTIFICATION

All test are performed with 24VDC on supply1
Conducted and radiated emission data are also performed with 48VDC on supply2 (POE).

Open1500 and OPEN 2500 are same electronics, difference is plastic casing.

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
OPEN2500 POE/BT/RS232
Serial Number: 18163000149

Photography of EUT

Power supply:

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

Name	Type	Rating	Reference / Sn	Configuration	Comments
Supply1	☑ DC	12-24VDC	/	Configuration n°1	/
Supply2	☑ DC	48VDC	/	Configuration n°2	Power supply on POE (Power Over Eternet)

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	L+N	1.	☐	☐	☑	Configuration n°1
Supply2	2 wires	1.3	☐	☐	☑	Configuration n°2
Ethernet_cable	RJ45 (Ethernet)	1.8	☐	☐	☑	/
COM0_cable	RS232	1	☐	☐	☑	/
USB_Device_cable	USB	0.9	☐	☐	☑	/
Access4	microSD (MMC)		☐	☐	☑	/
Access5	SAM1		☐	☐	☑	/
Access6	SAM2		☐	☐	☑	/

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
CBT Bluetooth tester	ROHDE & SCHWARZ	CBT	A2440007
POE adapter	TP-LINK / TL-POE200A	2168528003068	48VDC
AC/DC power source	TP-LINK Technologies Co	T480050-2C1	Input 100-240Vac Output 48VDC
Laptop	DELL	/	/
Laptop	TOSHIBA	/	/

Equipment information:

Bluetooth Classic Type:	☐ **v1.2**	☐ **v2.0**	☐ **v2.1+EDR**	☐ **v3.0+HS**			
	☐ **v4.0**	☑ **v4.1**	☐ **v4.2**				
Frequency band:	[2400 – 2483.5] MHz						
Sub-band REC7003:	Annex 3 (a)						
Spectrum Modulation:	☑ FHSS						
Number of Channel:	Maximum:	79	Minimum:	20			
Spacing channel:	1MHz						
Channel bandwidth:	1MHz						
Antenna Type:	☐ Integral	☑ External	☐ Dedicated				
Antenna connector:	☑ Yes	☐ No	☐ Temporary for test				
Transmit chains:	☐ 1						
	Single antenna						
	Gain 1: -1.3dBi						
Beam forming gain:	No						
Receiver chains	1						
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined				
Ad-Hoc mode:	☐ Yes	☑ No					
Dwell time:	400ms						
Adaptivity mode:	☑ Yes (Load Based DAA)	☐ Off mode	☐ No				
	Clear Channel Assessment Time:		Xµs				
Duty cycle:	☐ Continuous duty	☐ Intermittent duty	☑ 100% duty				
Equipment type:	☑ Production model	☐ Pre-production model					
Operating temperature range:	Tmin:	☑ -20°C	☐ 0°C	☐ X°C			
	Tnom:	20°C					
	Tmax:	☐ 35°C	☑ 55°C	☐ X°C			
Type of power source:	☑ AC power supply	☑ DC power supply	☐ Battery				
Operating voltage range:		Configuration n°1 (Supply1)	Configuration n°2 (Supply2)				
	Vmin:	☑ 10.8VDC	☑ 43.2VDC				
	Vnom:	☑ 24 VDC	☑ 48 VDC				
	Vmax	☑ 26.4 VDC	☑ 52.8 VDC				
Geo-location capability:	☐ Yes (The geographical location determined by the equipment is not accessible to the end user as defined in section 4.3.1.13.2 of ETSI EN 300 328 V2.1.1 standard)	☑ No					
Minimum performance criteria for Receiver blocking test:	☑ PER less than or equal to 10%	☐ Alternative performance criteria (4)					

(4): Description of the alternative performance criteria:

CHANNEL PLAN					
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
Cmin: 0	**2402**	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	**Cmid: 39**	**2441**	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	**Cmax: 78**	**2480**
25	2427	52	2454		
26	2428	53	2455		

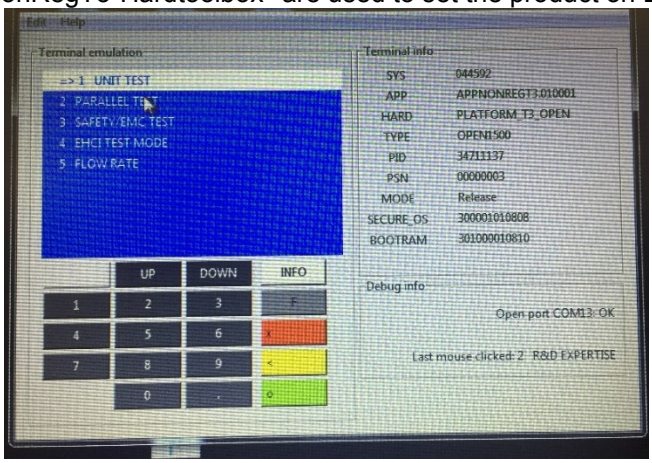
DATA RATE				
Available for EUT	**Modulation type**	**Max. Data Rate (Mbps)**	**Packet type**	**Worst Case Modulation**
☐	GFSK	1	1-DM1	☐
☑	GFSK	1	1-DH1	☐
☐	GFSK	1	1-DM3	☐
☑	GFSK	1	1-DH3	☐
☐	GFSK	1	1-DM5	☐
☑	GFSK	1	1-DH5	☑
☐	GFSK	1	AUX1	☐
☑	π/4 DQPSK	2	2-DH1	☐
☑	π/4 DQPSK	2	2-DH3	☐
☑	π/4 DQPSK	2	2-DH5	☑
☑	8DPSK	3	3-DH1	☐
☑	8DPSK	3	3-DH3	☐
☑	8DPSK	3	3-DH5	☑

2.3. EUT CONFIGURATION

Hardware information		
Firmware (if applicable):	**V. :**	**OS044592**
Software (if applicable):	**V. :**	**HTB010001**
/		

The EUT is set in the following modes during tests with CBT Bluetooth tester
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

The specific test software “AppNonRegT3-Hardtoolbox” are used to set the product on DUT mode



2.4. EQUIPMENT MODIFICATIONS

☑ None ☐ Modification:

2.5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:
FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV 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.

2.6. CALIBRATION DATE

The calibration intervals are extended at 12+2 months. This extended interval is based on the fact that there is sufficient calibration data to statistically establish a trend or based on experience of use of the test equipment to assure good measurement results for a longer period

3. CONDUCTED EMISSION DATA

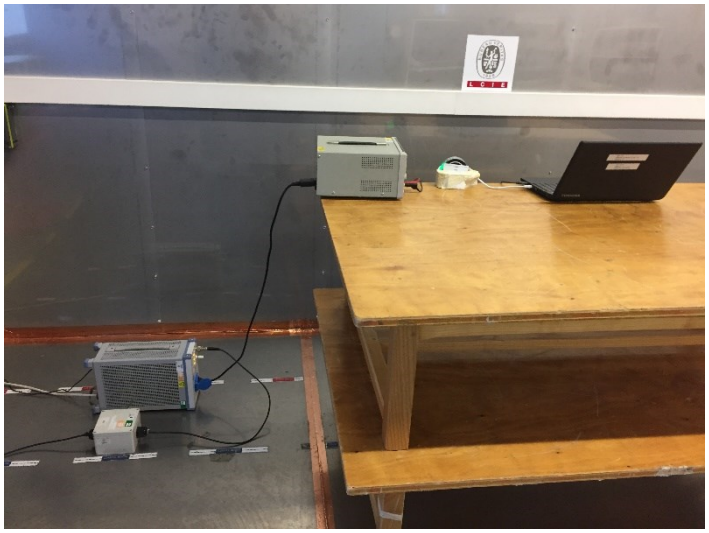
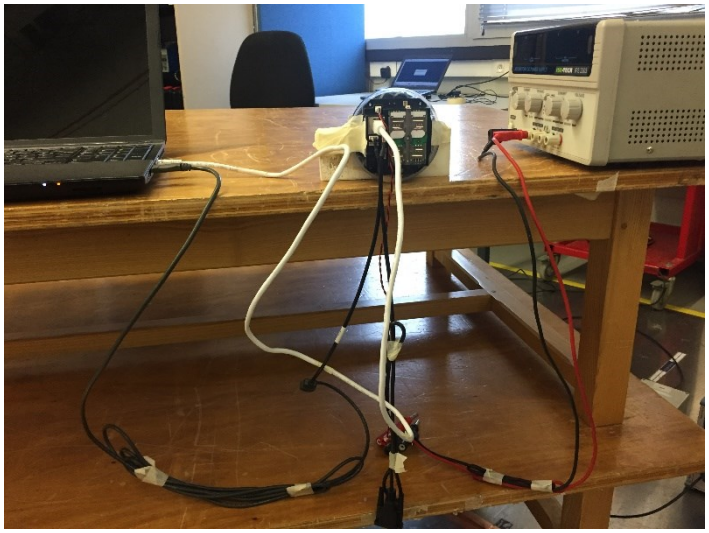
3.1. ENVIRONMENTAL CONDITIONS

Date of test	:	November 19, 2018
Test performed by	:	Majid Mourzagh
Atmospheric pressure (hPa)	:	999
Relative humidity (%)	:	45
Ambient temperature (°C)	:	21

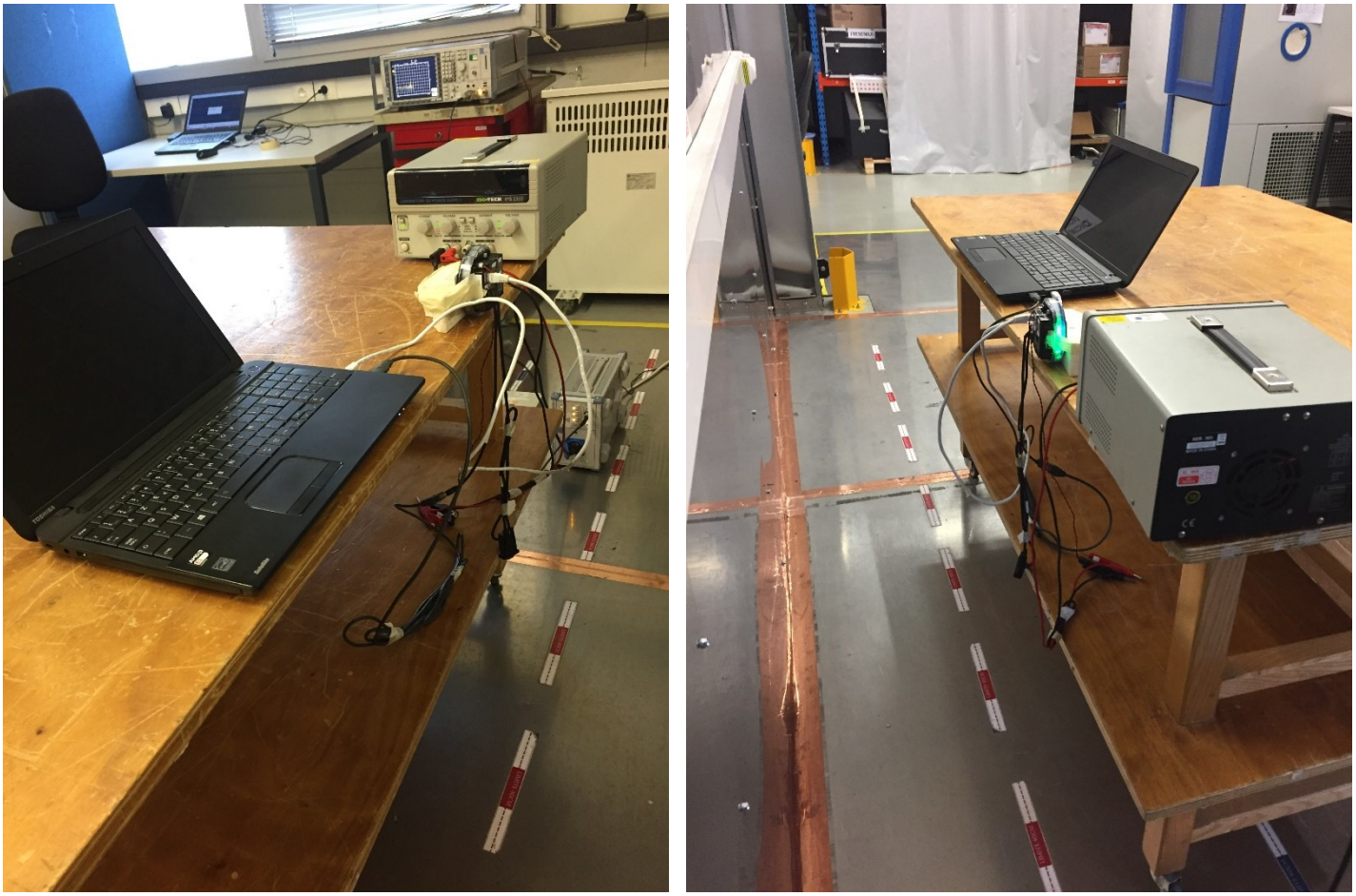
3.2. TEST SETUP

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.

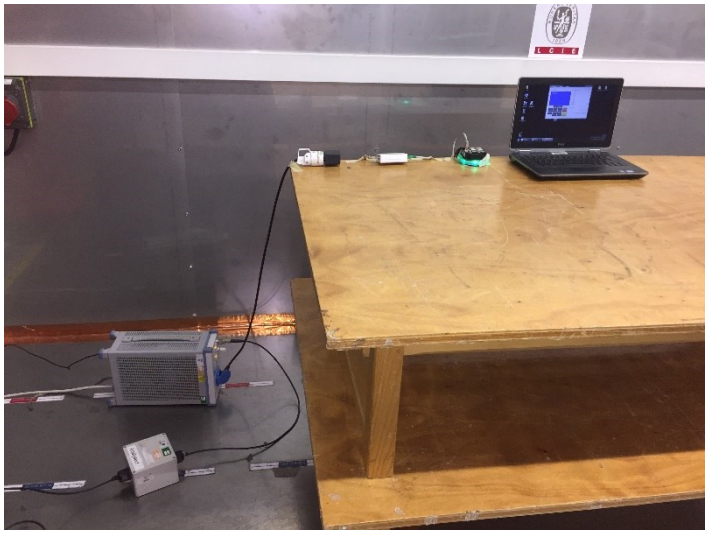
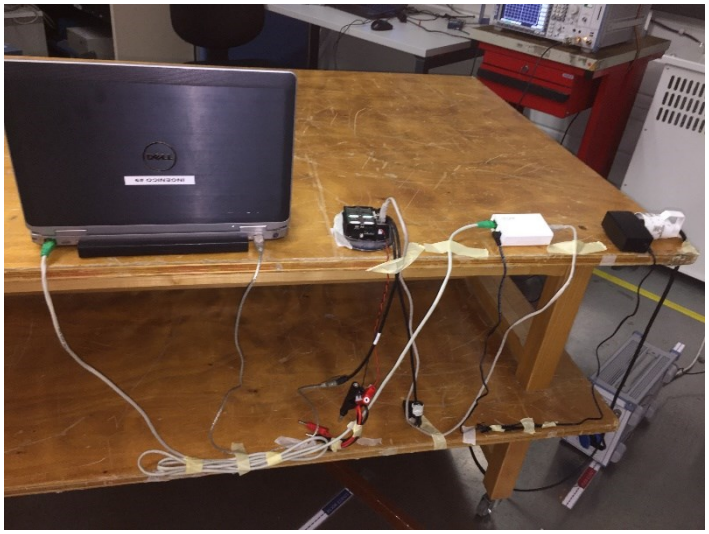
The EUT is powered by 120VAC/60Hz.
The EUT is powered through a LISN (measure). Auxiliaries are powered by another LISN.

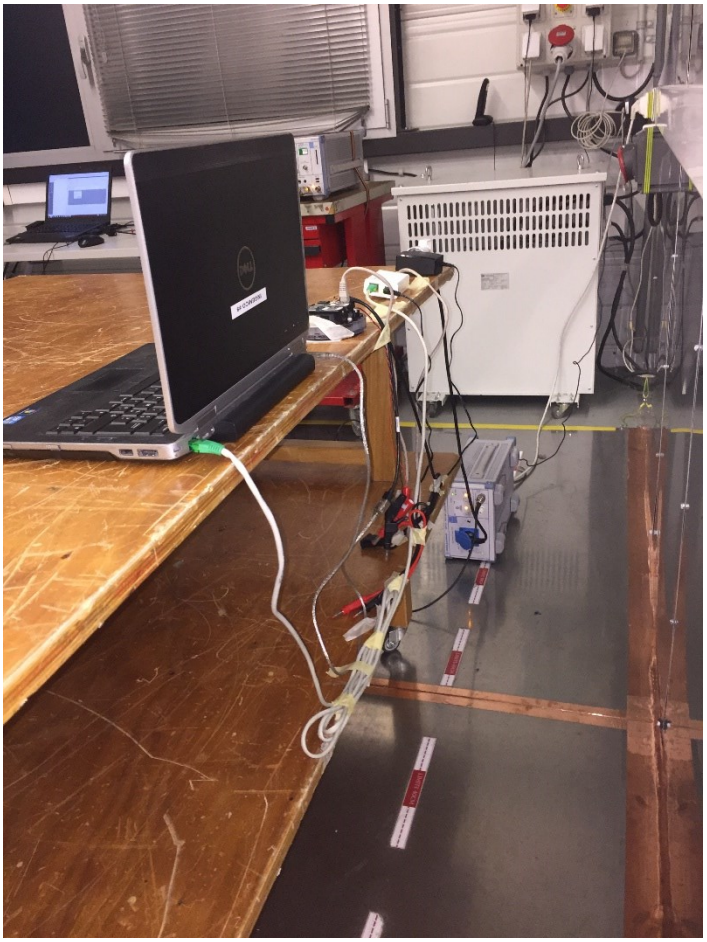
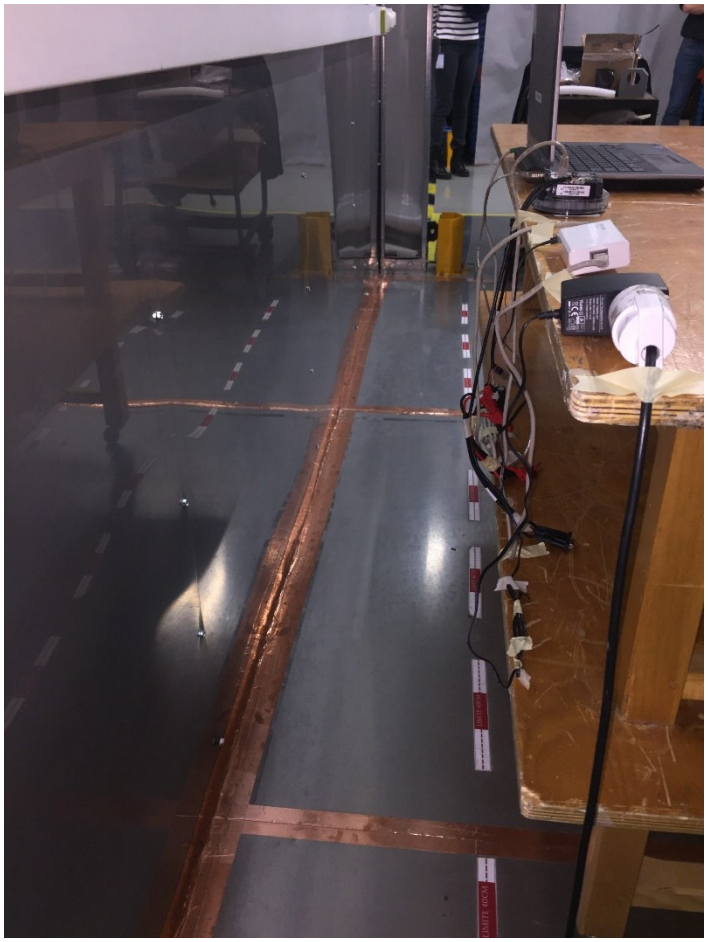
Configuration n°1



Configuration n°1

Configuration n°2

Configuration n°2

Test setup

3.3. TEST METHOD

The product has been tested according to ANSI C63.10 and FCC Part 15 subpart C. The product has been tested with 120V/60Hz power line voltage and compared to the FCC Part 15 subpart C 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	10/18	10/19
EMC comb generator	LCIE SUD EST	-	A3169098	-	-
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	12/18
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	02/18	02/19

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)

Graph identifier	Line	Mode	Configuration	Comments
Emc# 1	L	TX	Configuration n°1	See annex 1
Emc# 2	N	TX	Configuration n°1	See annex 1

Graph identifier	Line	Mode	Configuration	Comments
Emc# 3	L	TX	Configuration n°2	See annex 1
Emc# 4	N	TX	Configuration n°2	See annex 1

3.7. CONCLUSION

Conducted emission data measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **18163000149**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

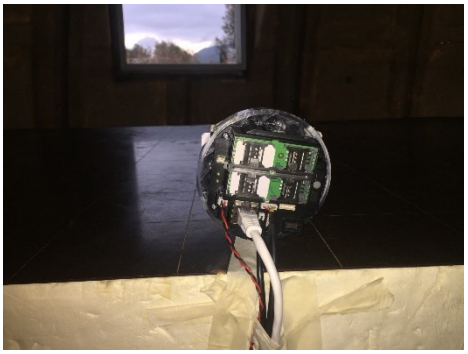
4. RADIATED EMISSION DATA

4.1. ENVIRONMENTAL CONDITIONS

Date of test	:	November 16, 2018
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	998
Relative humidity (%)	:	42
Ambient temperature (°C)	:	21

4.2. TEST SETUP

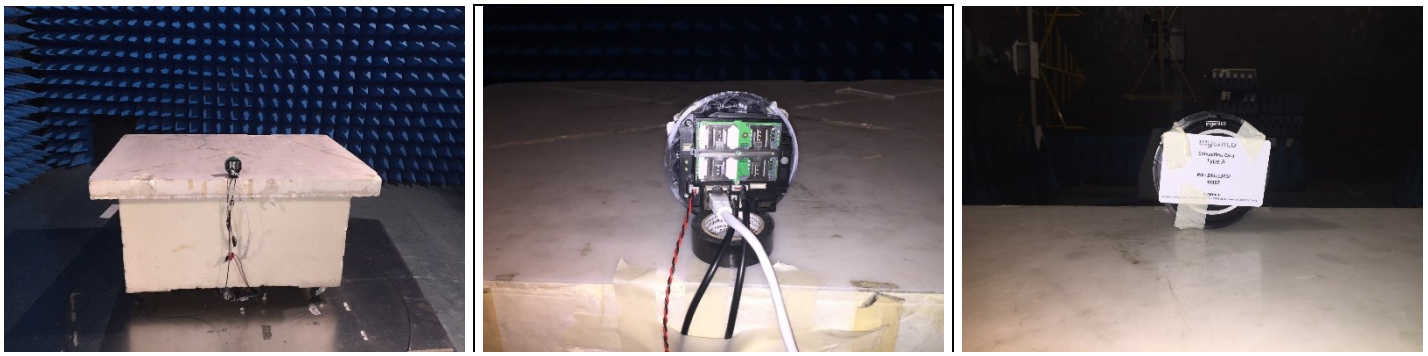
The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
☐ 150cm above the ground on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



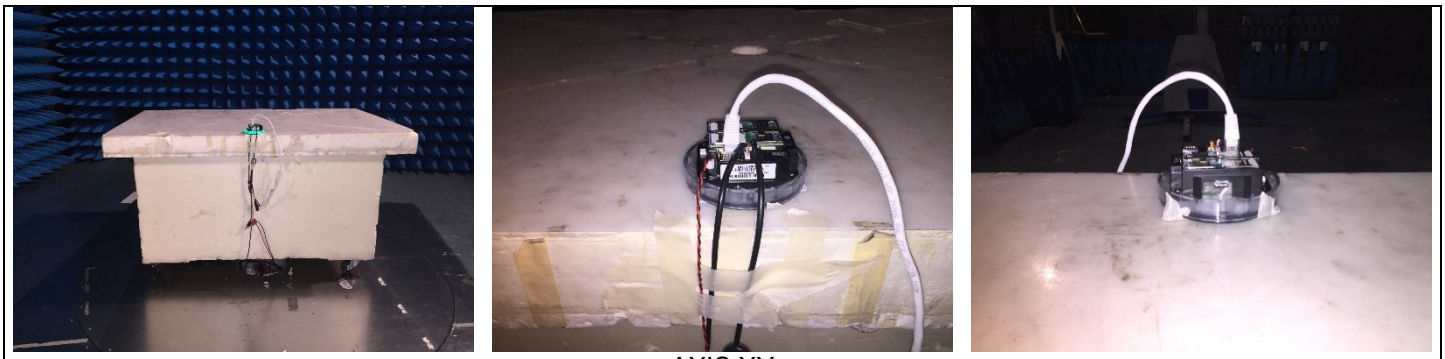
AXIS Z

AXIS XY

Test setup on OATS



AXIS Z



AXIS XY

Test setup in anechoic chamber

4.3. TEST METHOD

The product has been tested according to ANSI C63.10, FCC part 15 subpart C.

Pre-characterisation measurement: (9kHz – 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.

Characterization on 10 meters open site from 9kHz to 1GHz:
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 6GHz:
The product has been tested at a distance of **3 meters** from the antenna and compared to the FCC part 15 subpart C limits. Measurement bandwidth was 1MHz from 1GHz to 6GHz.
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 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	A7085008	12/17	12/18
Antenna Bi-Log	AH System	SAS-521-7	C2040180	09/18	09/20
Cable	-	6GHz	A5329191	06/18	06/19
Emission Cable	MICRO-COAX	18GHz	A5329657	06/18	06/19
Emission Cable	MICRO-COAX	18GHz	A5329658	03/18	03/19
Semi-Anechoic chamber #1	SIEPEL	-	D3044016	09/18	09/19
Radiated emission comb generator	BARDET	-	A3169050	-	-
HF Radiated emission comb generator	LCIE SUD EST	-	A3169088	-	-
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	12/18
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	06/18	06/19
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
Thermo-hygrometer (C1)	OREGON	WMR 80	B4206013	06/18	06/20
Turntable chamber (Cage#1)	MATURO Gmbh	TT 2.0 SI	F2000406	-	-
Antenna mast (Cage#1)	MATURO Gmbh	AM 4.0	F2000407	-	-
Turntable controller (Cage#1)	MATURO Gmbh	Control Unit	F2000408	-	-
Table C1/OATS	LCIE	-	F2000445	-	-

OATS					
DESCRIPTION	**MANUFACTURER**	**MODEL**	**N° LCIE**	**Cal_Date**	**Cal_Due**
Antenna Bi-log	CHASE	CBL6111A	C2040051	01/18	01/19
Emission Cable	SUCOFLEX	6GHz	A5329061	03/18	03/19
Cable (OATS)	-	1GHz	A5329623	03/18	03/19
Radiated emission comb generator	BARDET	-	A3169050	-	-
OATS	-	-	F2000409	10/17	10/18
Receiver 20-1000MHz	ROHDE & SCHWARZ	ESVS30	A2642006	12/17	12/19
Facteur OATS 30M-1GHz	LCIE	V3	L2000035	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20
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 C1/OATS	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:

Graph identifier	Polarization	Mode	EUT position	Channel	Configuration	Comments
Emr# 1	H/V	TX	Axis XY	Hopping	Configuration n°1	See annex 1
Emr# 2	H/V	TX	Axis Z	Hopping	Configuration n°1	See annex 1

Graph identifier	Polarization	Mode	EUT position	Channel	Configuration	Comments
Emr# 3	H/V	TX	Axis XY	Hopping	Configuration n°2	See annex 1
Emr# 4	H/V	TX	Axis Z	Hopping	Configuration n°2	See annex 1

4.6.2. Characterization on 10 meters open site below 30 MHz

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 §9.7									

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

4.6.3. 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.

Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
250.000	18.0	QP	V	70	100	15.9	33.9	46.0	**-12.1**
275.000	14.0	QP	V	70	100	16.4	30.4	46.0	**-15.6**
500.000	11.2	QP	V	80	130	22.5	33.7	46.0	**-12.3**

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

4.6.4. Characterization on 3meters anechoic chamber from 1GHz to 6GHz

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 (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. Factor (dB)	Comments
No significant frequency observed , see §9.7									

No	Frequency (MHz)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. Factor (dB)	Comments
No significant frequency observed , see §9.7									

4.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **18163000149**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

5. MAXIMUM PEAK OUTPUT POWER (15.247)

5.1. ENVIRONMENTAL CONDITIONS

Date of test	:	November 16, 2018
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	998
Relative humidity (%)	:	42
Ambient temperature (°C)	:	21

5.2. EQUIPMENT CONFIGURATION

Packet type: 1-DH5 / 2-DH5 / 3-DH5 Worst case presented
Hopping sequence: ☐ ON ☑ OFF

5.3. TEST SETUP

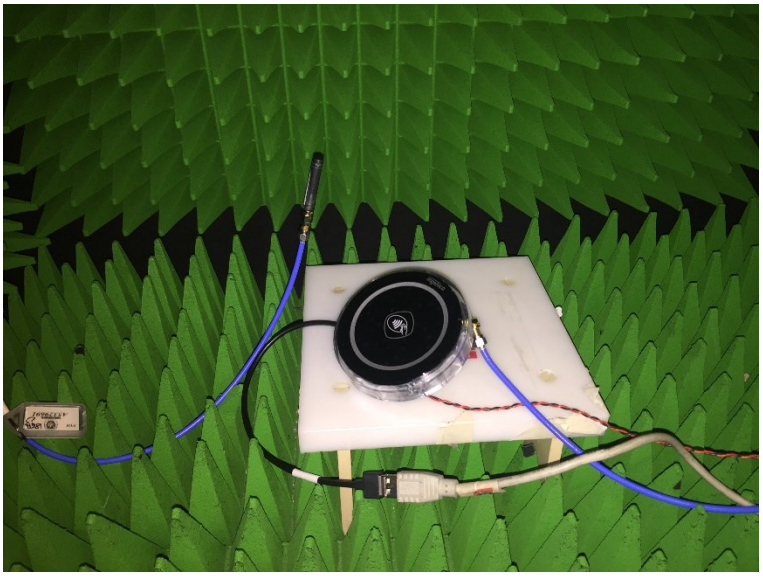
☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10MHz VBW.
The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

☐ ***Radiated measurement:***
The product has been tested at a distance of 3 meters from the antenna and using 3MHz RBW and 10MHz VBW.
Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT.
A summary of the worst case emissions found in all test configurations and modes is shown on 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, utilizing a RBW ≥ the 20 dB bandwidth of the emission, VBW > RBW, peak detector function. Follow the procedures in C63.4-1992 with respect to maximizing the emission.
- 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:

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



Test setup

5.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable SMA	-	18G	A5329373	12/17	12/18
Cable SMA	-	6GHz	A5329635	02/18	02/19
Cable SMA 60cm	STORMFLEX	18GHz	A5329688	02/18	02/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/19
Antenna		SMA	C2040219	-	-
Full Anechoic Room	SIEPEL	-	D3044024	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20

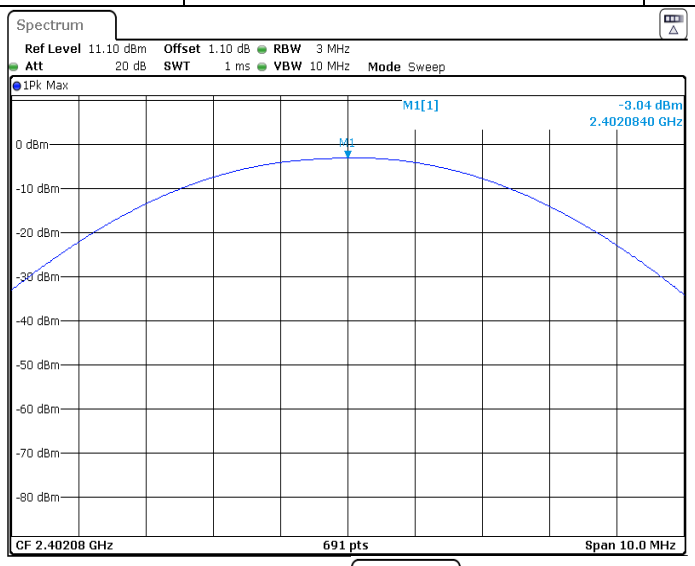
5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

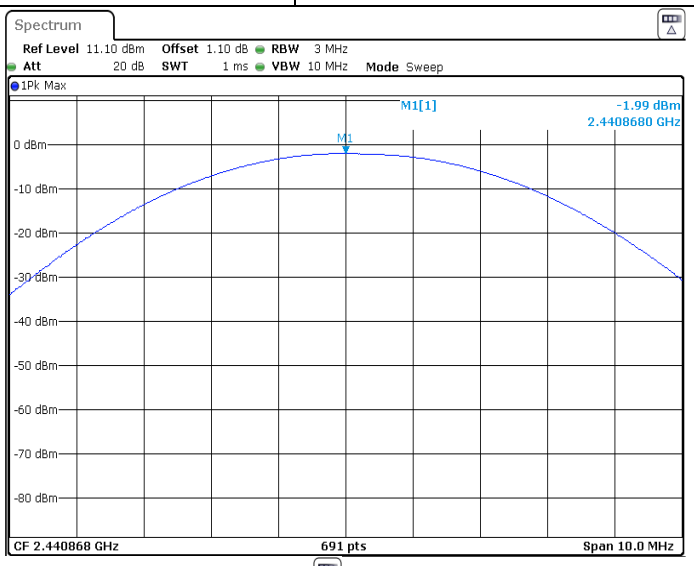
☑ None ☐ Divergence:

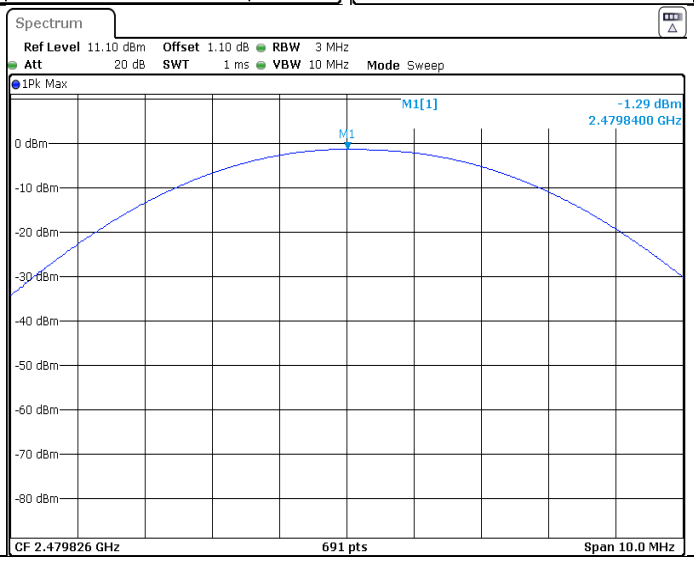
5.6. TEST RESULTS

GFSK DH5

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
0	2402	-3.04	21
39	2441	-1.99	21
78	2480	-1.29	21

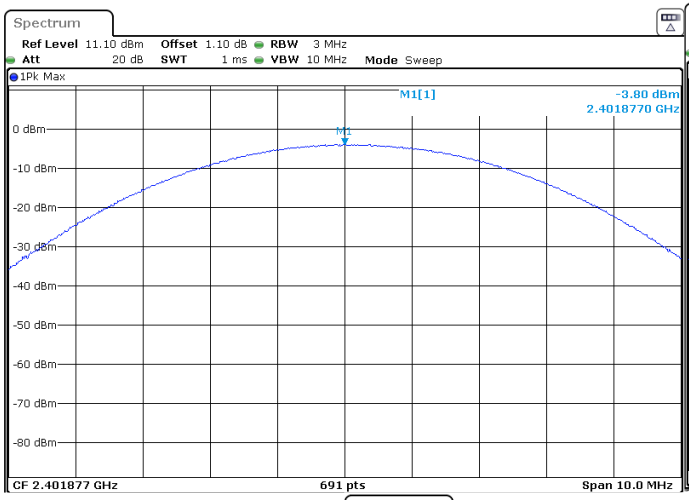


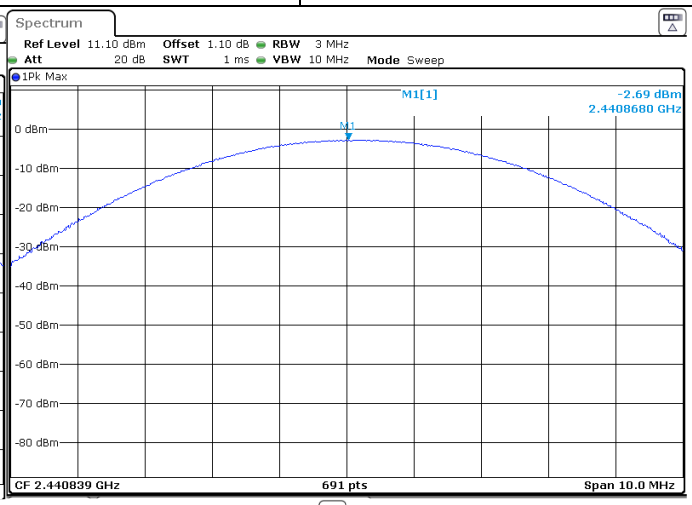


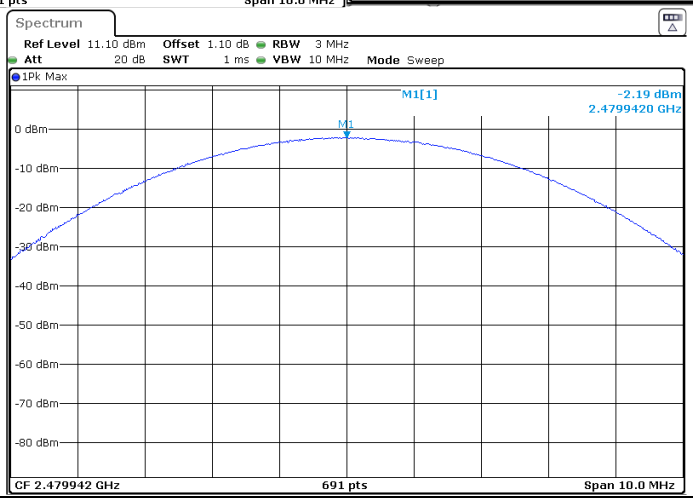


π/4 DQPSK 2-DH5

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
0	2402	-3.8	-21
39	2441	-2.69	-21
78	2480	-2.19	-21

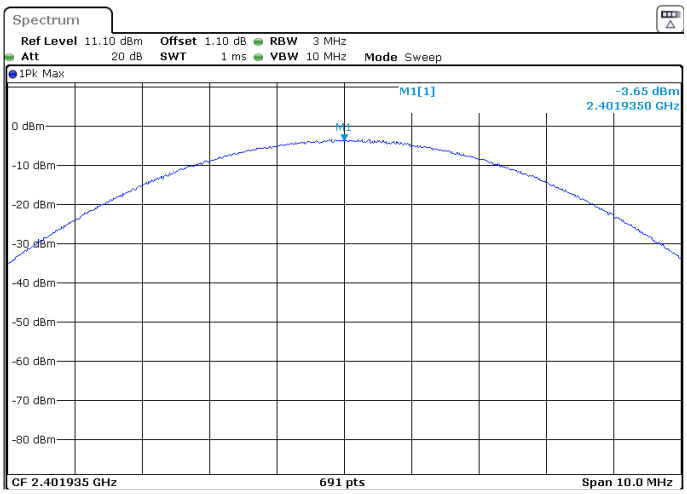


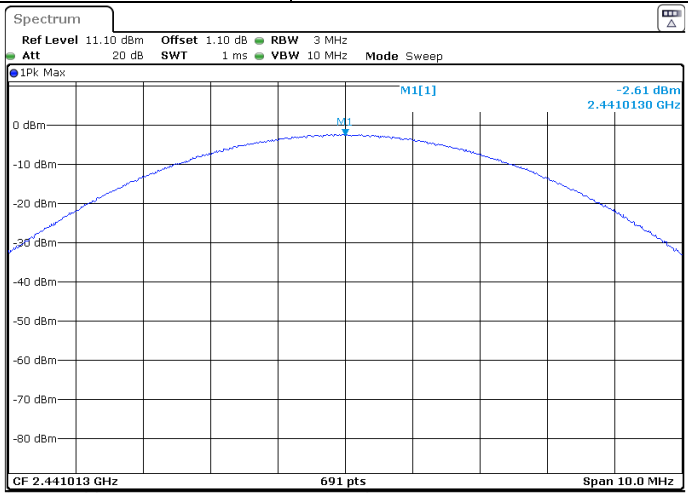


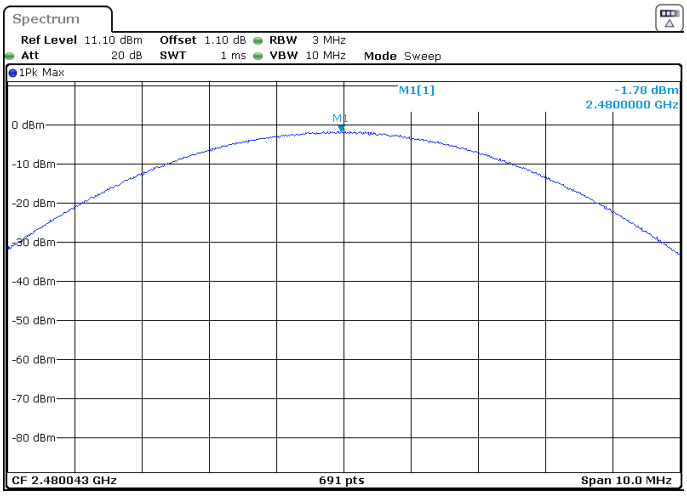


8DPSK 3-DH5

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
0	2402	-3.65	-21
39	2441	-2.61	-21
78	2480	-1.78	-21







5.7. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **1816300112**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

6. HOPPING CHANNEL SEPARATION (15.247)

6.1. ENVIRONMENTAL CONDITIONS

Date of test	:	November 16, 2018
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	998
Relative humidity (%)	:	42
Ambient temperature (°C)	:	21

6.2. LIMIT

For frequency hopping system, hopping channel carrier frequencies must be separated by a minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

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

6.3. EQUIPMENT CONFIGURATION

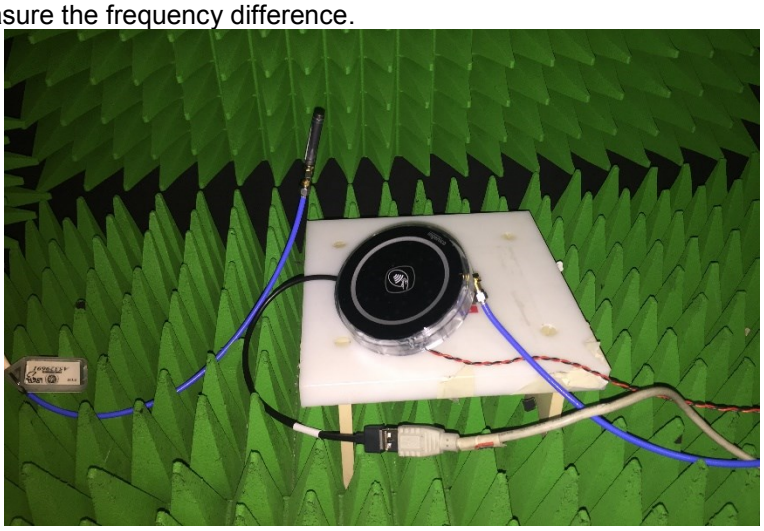
Packet type: 1-DH5 / 2-DH5 / 3-DH5
Hopping sequence: ☐ ON ☑ OFF

6.4. SETUP – 20DB BANDWIDTH

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

6.5. SETUP – ADJACENT CHANNEL SEPARATION

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



Test setup

6.6. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable SMA	-	18G	A5329373	12/17	12/18
Cable SMA	-	6GHz	A5329635	02/18	02/19
Cable SMA 60cm	STORMFLEX	18GHz	A5329688	02/18	02/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/19
Antenna		SMA	C2040219	-	-
Full Anechoic Room	SIEPEL	-	D3044024	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20

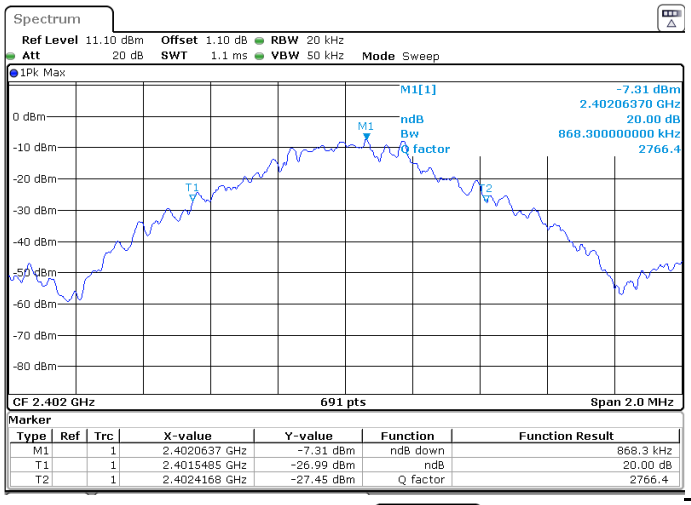
6.7. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

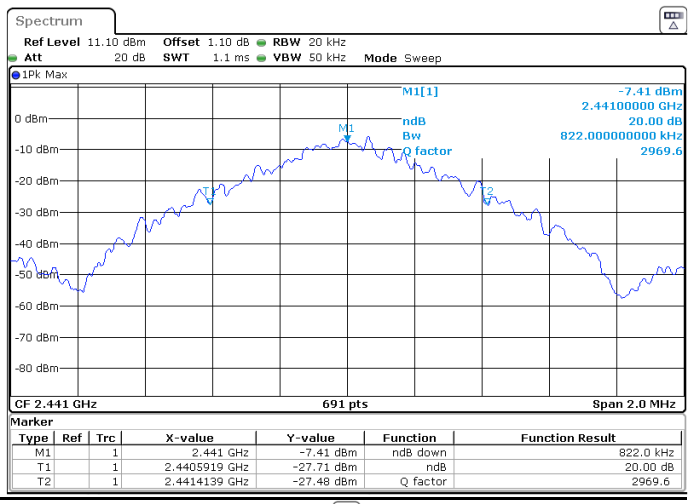
☑ None ☐ Divergence:

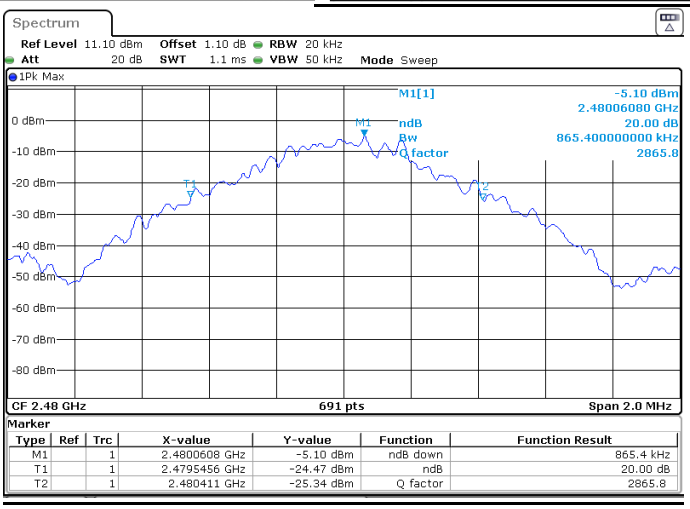
6.8. TEST SEQUENCE AND RESULTS

GFSK DH5:

20DB BANDWIDTH:

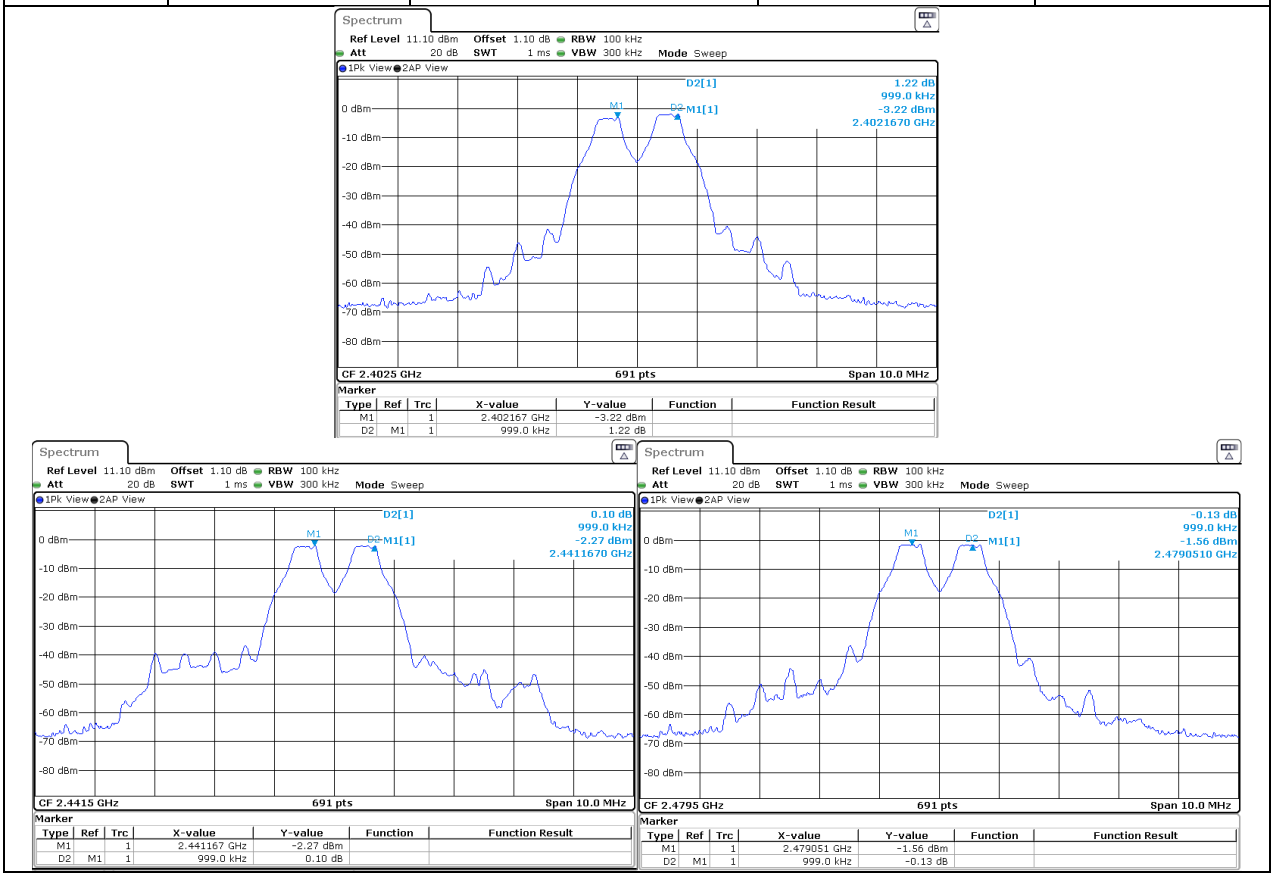






Modulation:

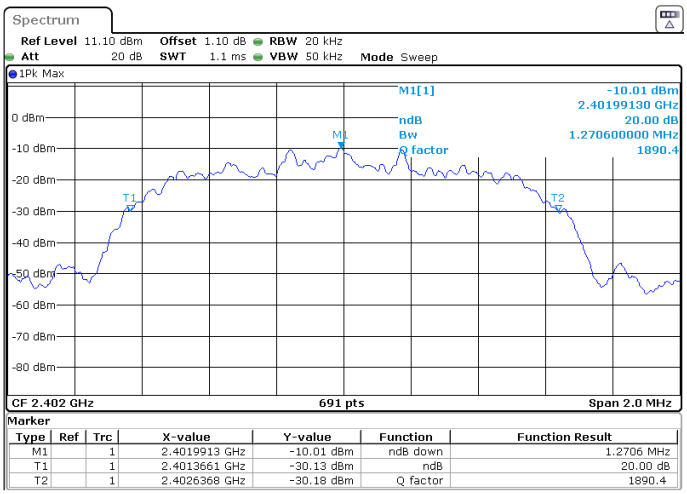
Channel	Channel Frequency (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Minimum Limit (kHz)
Cmin	2402	999	868.3	578.9
Cmid	2441	999	822	548
Cmax	2480	999	865.4	576.9

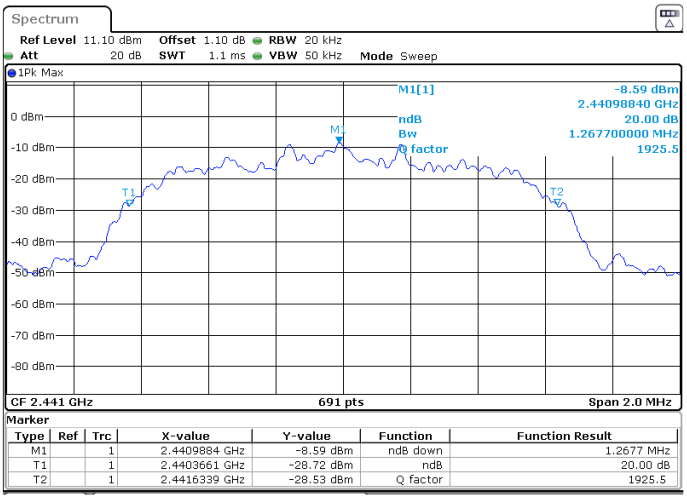


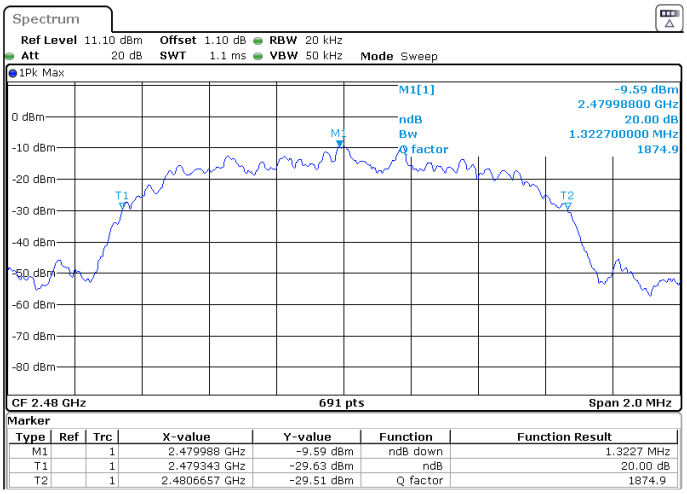
Limit used: Two-third 20dB Bandwidth

π/4 DQPSK 2-DH5:

20DB BANDWIDTH:

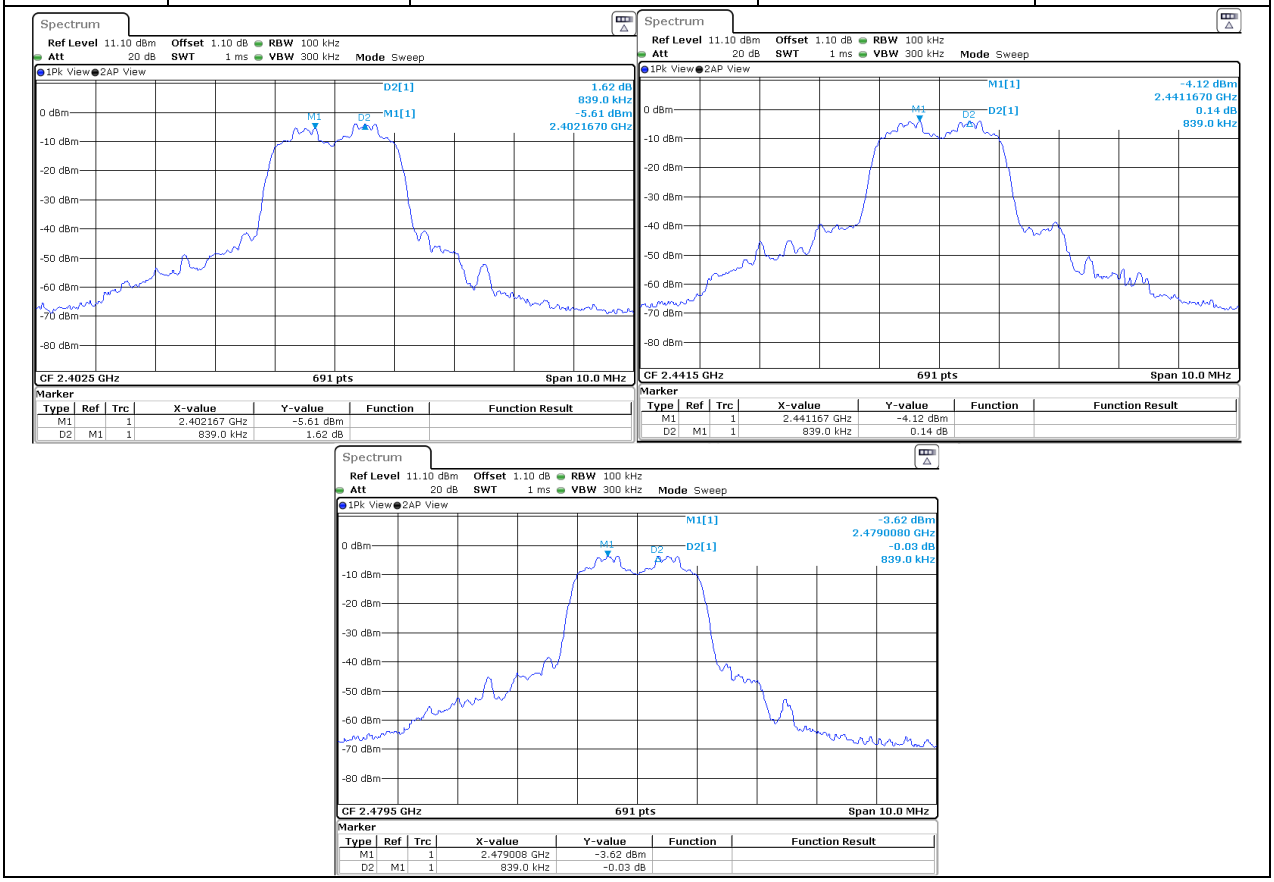






Modulation:

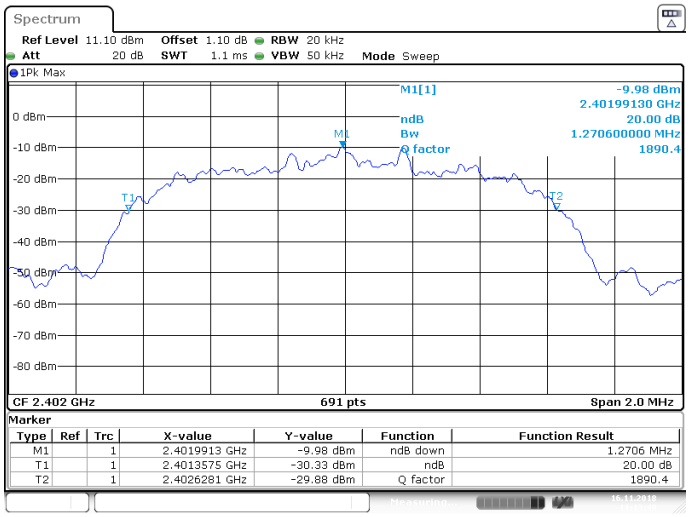
Channel	Channel Frequency (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Minimum Limit (kHz)
Cmin	2402	839	1270.6	847.1
Cmid	2441	839	1267.7	845.1
Cmax	2480	839	1322.7	881.8



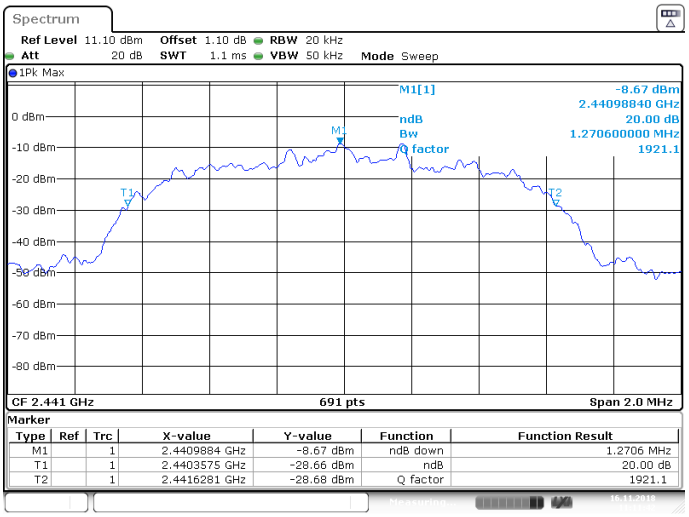
Limit used: Two-third 20dB Bandwidth

8DPSK 3-DH5:

20DB BANDWIDTH:



Date: 16.NOV.2018 11:13:48



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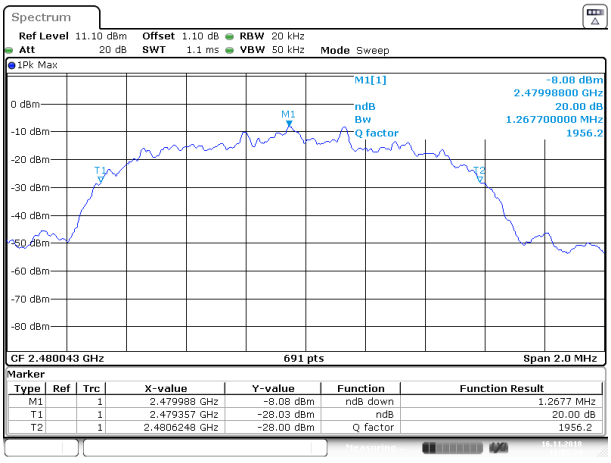
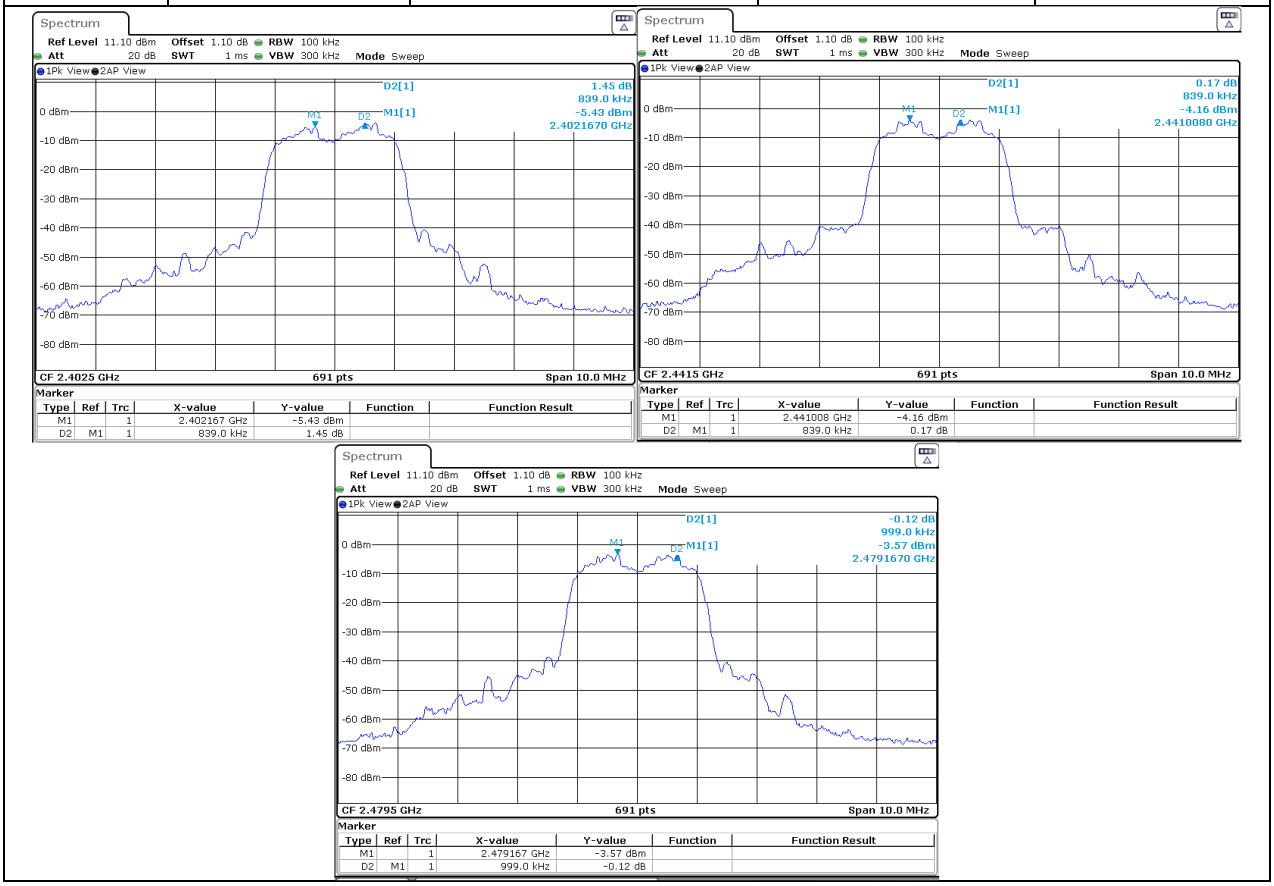


Date: 16.NOV.2018 11:05:34

Modulation:

Channel	Channel Frequency (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Minimum Limit (kHz)
Cmin	**2402**	**839**	**1270.6**	**847.1**
Cmid	**2441**	**839**	**1270.6**	**847.1**
Cmax	**2480**	**999**	**1267.7**	**845.1**



Limit used: Two-third 20dB Bandwidth

6.9. CONCLUSION

Hopping Channel Separation measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **1816300112**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

7. NUMBER OF HOPPING FREQUENCIES (15.247)

7.1. ENVIRONMENTAL CONDITIONS

Date of test : November 16, 2018
Test performed by : Majid MOURZAGH
Atmospheric pressure (hPa) : 998
Relative humidity (%) : 42
Ambient temperature (°C) : 21

7.2. LIMIT

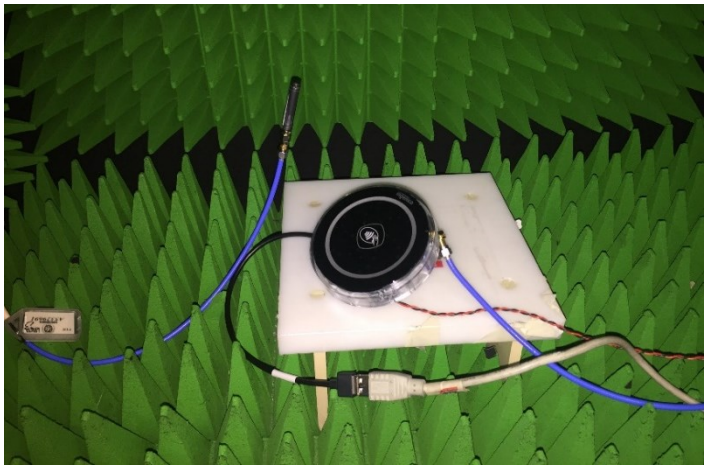
For frequency hopping system operating in the 2400-2483.5MHz, at least 15 channels frequencies must be used and should be equally spaced.

7.3. EQUIPMENT CONFIGURATION

Packet type: 1-DH5 / 2-DH5 / 3-DH5
Hopping sequence: ☑ ON ☐ OFF

7.4. SETUP

The EUT is placed in an anechoic chamber. The EUT is turn ON and using the MaxHold function and a delta marker the number of frequencies used for this FHSS system is recorded, see following graphs.
RBW: 100kHz
VBW: 300kHz



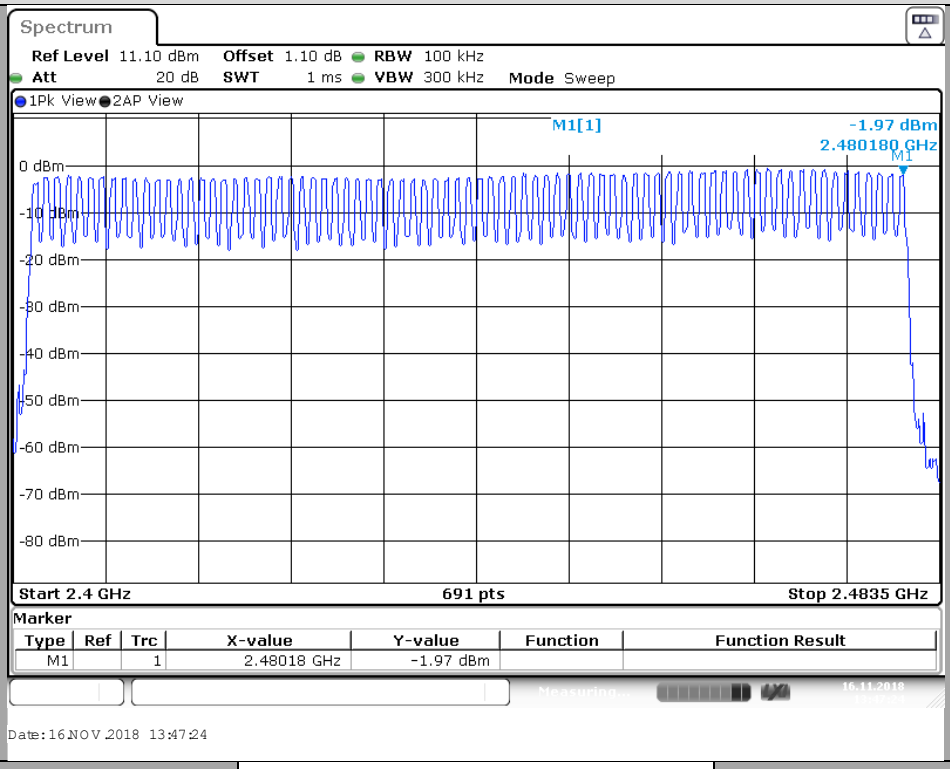
7.5. TEST EQUIPMENT LIST

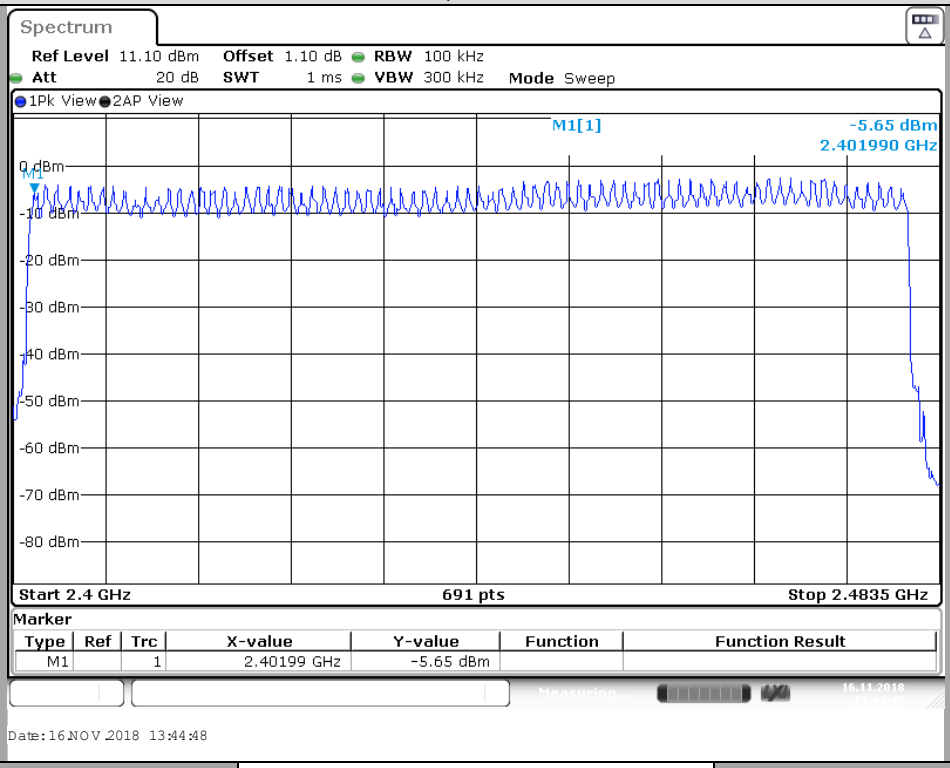
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable SMA	-	18G	A5329373	12/17	12/18
Cable SMA	-	6GHz	A5329635	02/18	02/19
Cable SMA 60cm	STORMFLEX	18GHz	A5329688	02/18	02/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/19
Antenna		SMA	C2040219	-	-
Full Anechoic Room	SIEPEL	-	D3044024	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/18

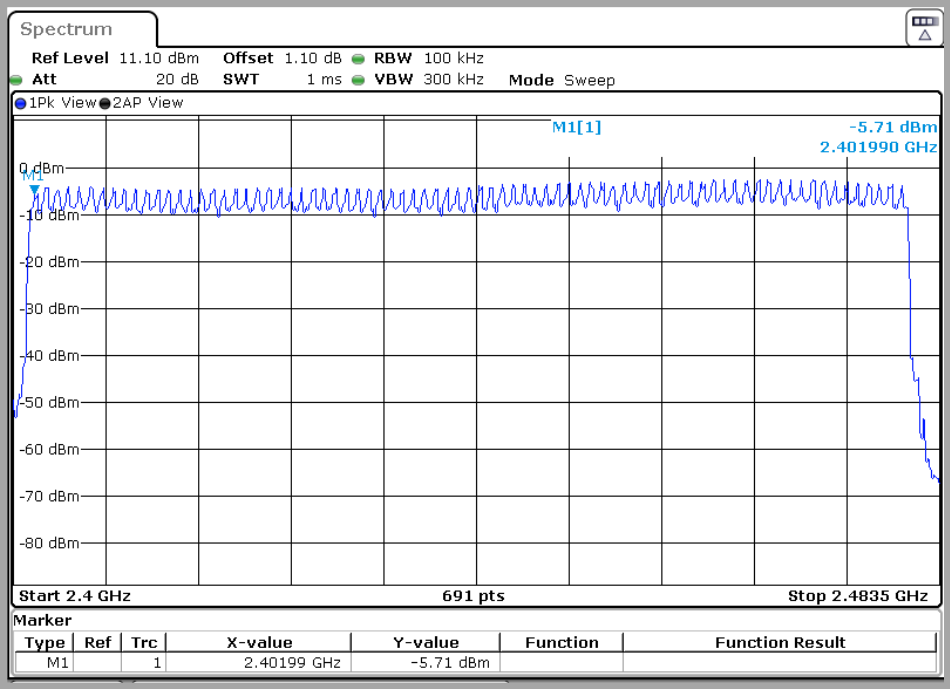
7.6. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

7.7. TEST SEQUENCE AND RESULTS

GFSK DH5		
		
Hopping Sequence	**79**	**Channels**

π/4 DQPSK 2-DH5		
		
Hopping Sequence	**79**	**Channels**

8DPSK 3-DH5		
		
Hopping Sequence	**79**	**Channels**

7.8. CONCLUSION

Number of hopping frequencies measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **1816300112,** in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

8. TIME OF OCCUPANCY (DWELL TIME) (15.247)

8.1. ENVIRONMENTAL CONDITIONS

Date of test	:	November 19, 2018
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	999
Relative humidity (%)	:	39
Ambient temperature (°C)	:	20

8.2. LIMIT

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

8.3. EQUIPMENT CONFIGURATION

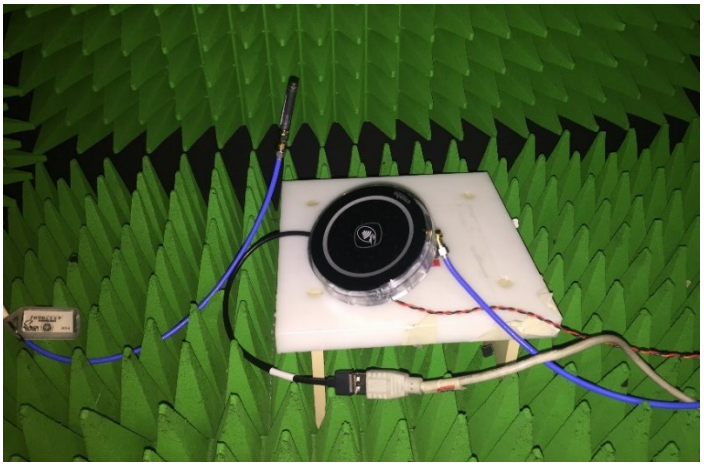
Packet type: 3-DH1 / 3-DH3 / 3-DH5 worst case presented
Hopping sequence: ☑ ON ☐ OFF

8.4. 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.

☐ ***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:
Dwell Time is measured and calculated using the zero SPAN mode on a channel frequency and a SWEEP with an adapter value to measure the number of transmission within a period and the time of transmission
RBW: 100kHz
VBW: 300kHz



8.5. TEST EQUIPMENT LIST

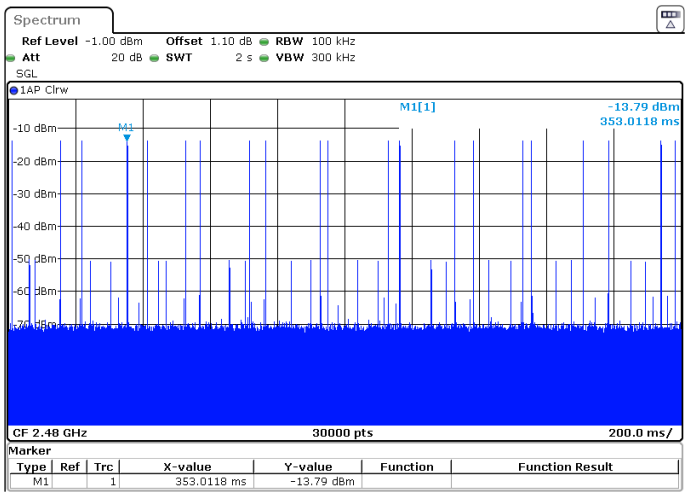
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable SMA	-	18G	A5329373	12/17	12/18
Cable SMA	-	6GHz	A5329635	02/18	02/19
Cable SMA 60cm	STORMFLEX	18GHz	A5329688	02/18	02/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/19
Antenna		SMA	C2040219	-	-
Full Anechoic Room	SIEPEL	-	D3044024	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20

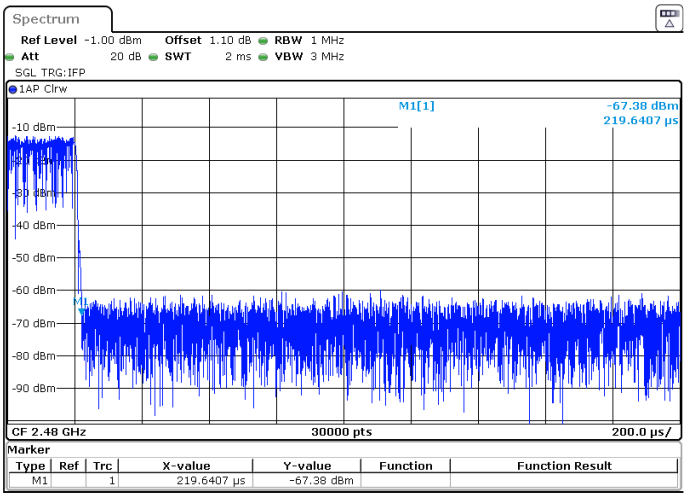
8.6. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

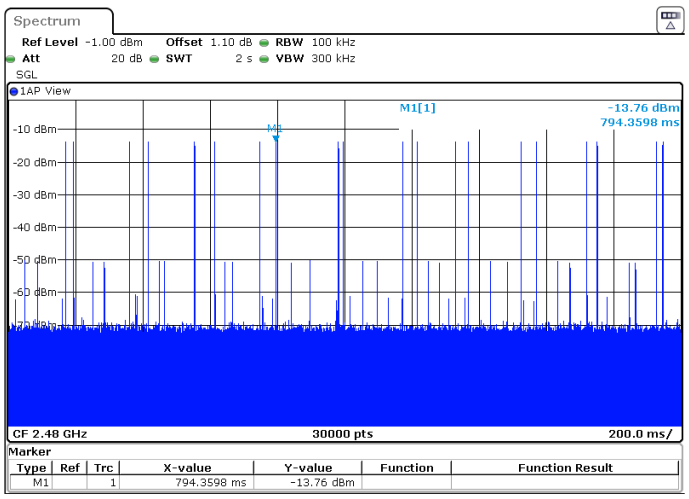
8.7. TEST SEQUENCE AND RESULTS

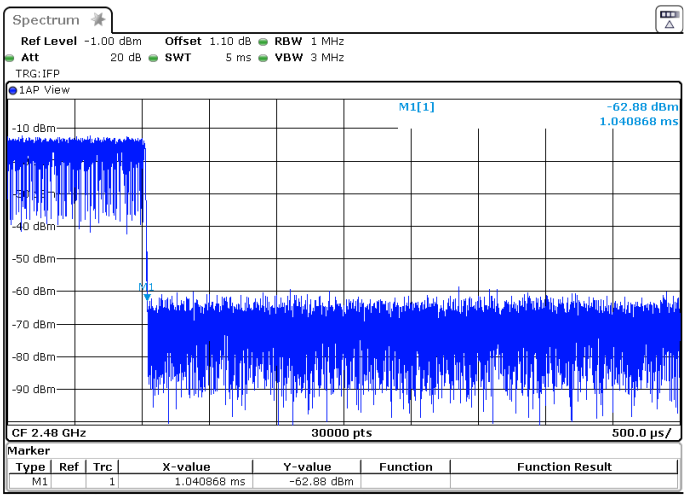
Packet Mode	Number of transmission in the period	Length of transmission time (ms)	Result (ms)	Limit (ms)
3-DH1	**21 (times/ 2 sec) * 15.8**	**0.219**	**72.877**	**400**



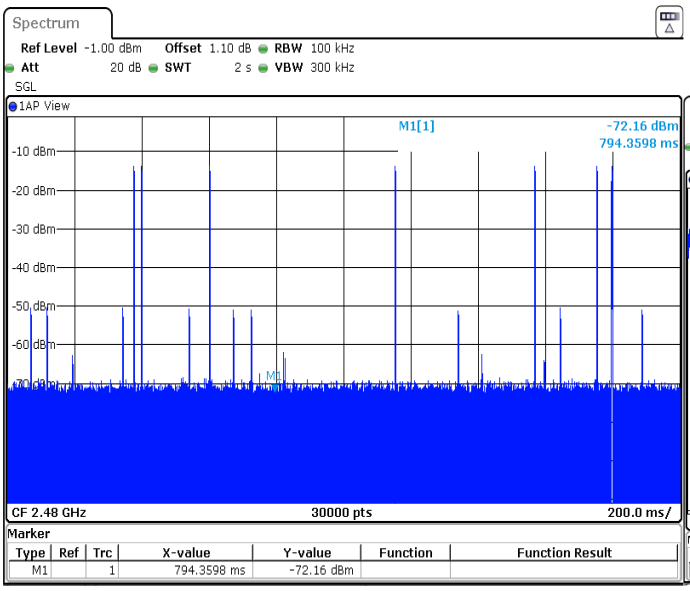


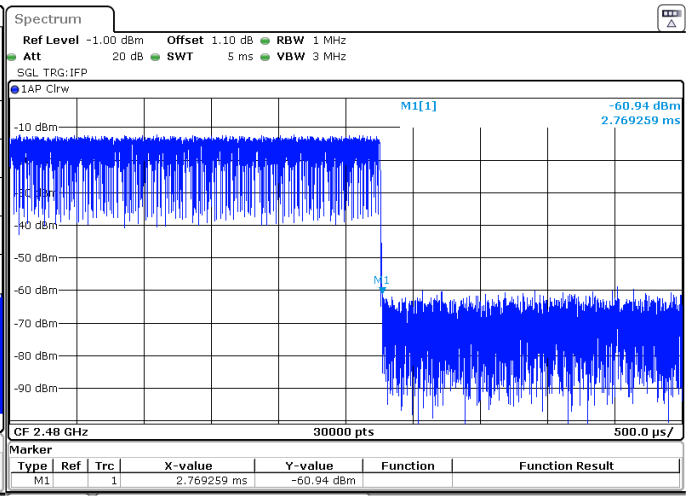
3-DH3	**17 (times/ 2 sec) * 15.8**	**1.0408**	**279.577**	**400**





3-DH5	7 (times/ 2 sec) * 15.8	2.769	306.280	400





Note: Period of 31.6 seconds (79 channels x 0.4)

8.8. CONCLUSION

Time of occupancy measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **1816300112,** in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

9. BAND EDGE MEASUREMENT (15.247)

9.1. ENVIRONMENTAL CONDITIONS

Date of test : November 16, 2018
Test performed by : Majid MOURZAGH
Atmospheric pressure (hPa) : 998
Relative humidity (%) : 42
Ambient temperature (°C) : 21

9.2. 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.*

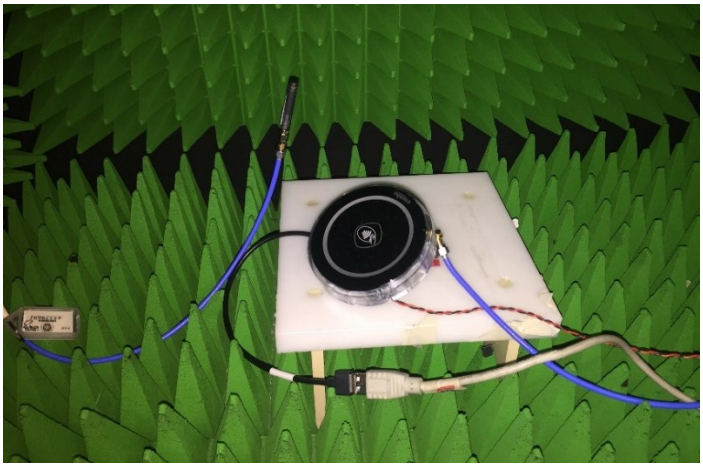
Radiated emission test:
Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for 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.

9.3. EQUIPMENT CONFIGURATION

Packet type: 1-DH5 / 2-DH5 / 3-DH5 Worst case presented
Hopping sequence: ☐ ON ☑ OFF

9.4. SETUP

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with Peak Output Power measurement. The EUT is turn ON; the graphs of the restrict frequency band are recorded with a display line indicating the highest level and other the 20dB offset below to show compliance with 15.247 (d) and 15.205. The emissions in restricted bands are compared to 15.209 limits.
RBW: 100kHz
VBW: 300kHz



9.5. TEST EQUIPMENT LIST

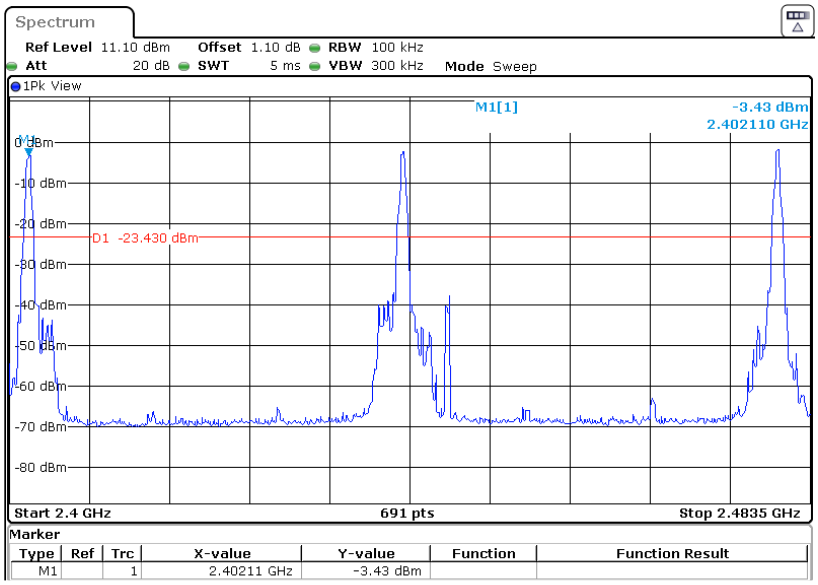
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable SMA	-	18G	A5329373	12/17	12/18
Cable SMA	-	6GHz	A5329635	02/18	02/19
Cable SMA 60cm	STORMFLEX	18GHz	A5329688	02/18	02/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/19
Antenna		SMA	C2040219	-	-
Full Anechoic Room	SIEPEL	-	D3044024	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/18

9.6. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

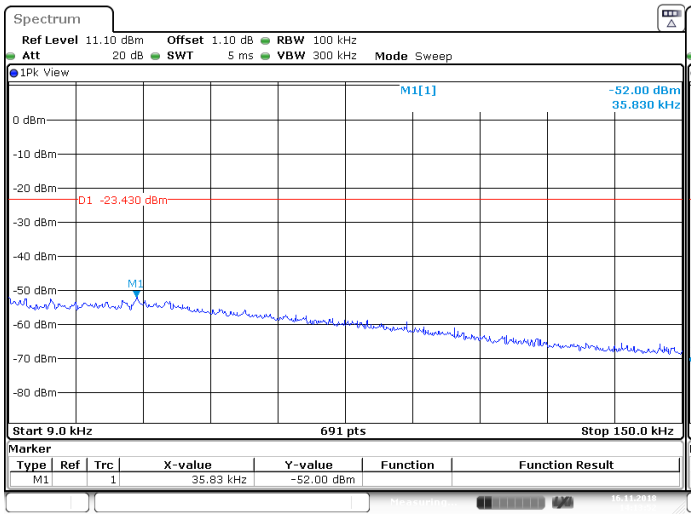
☑ None ☐ Divergence:

9.7. TEST SEQUENCE AND RESULTS

NOTE:
1. Average value =Peak value + 20 Log (duty cycle) = Peak value – 30.1dB.
2. The DH5 packet was the worst case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correction factor be equal to: 20log (3.125/100) = -30.1 dB.



Worst case: Cmin and display line at -23.43dBm.



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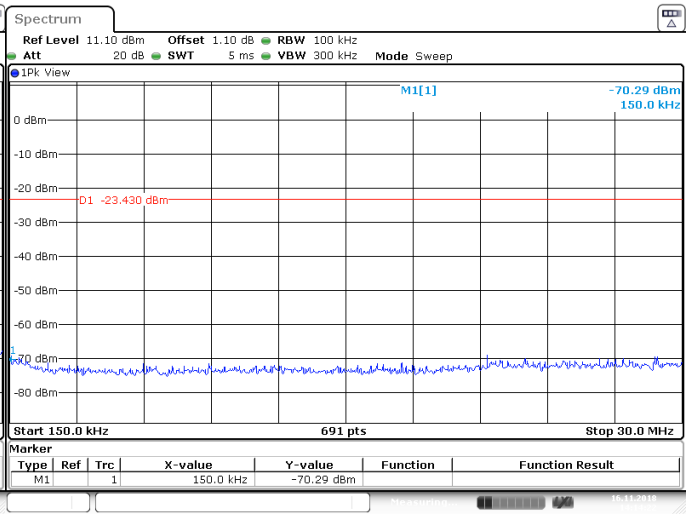

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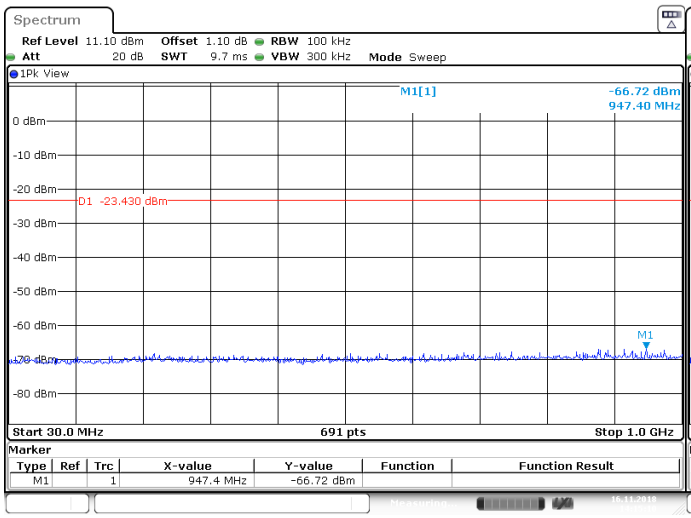

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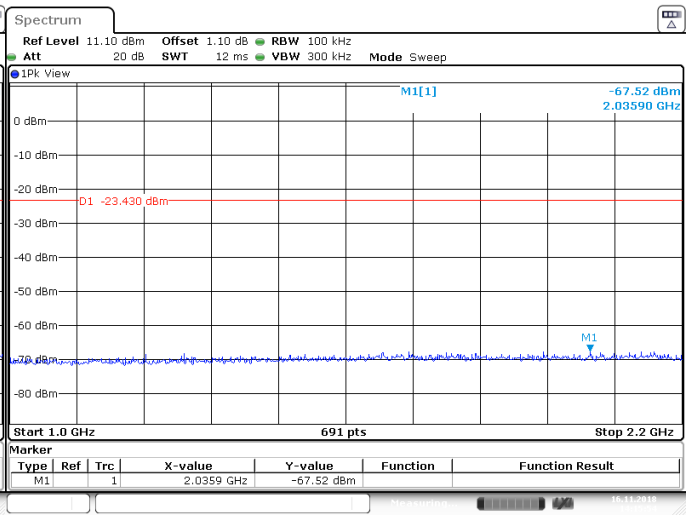

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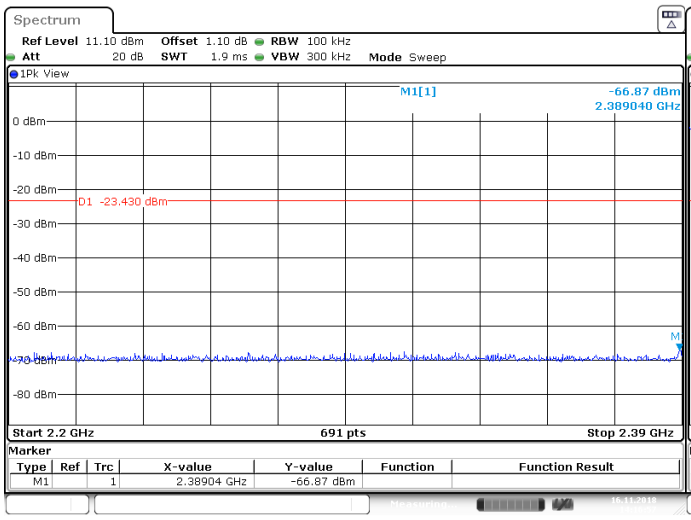

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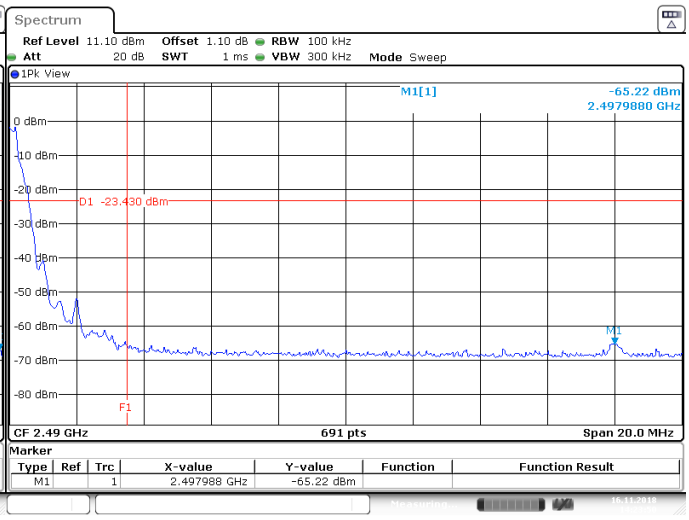

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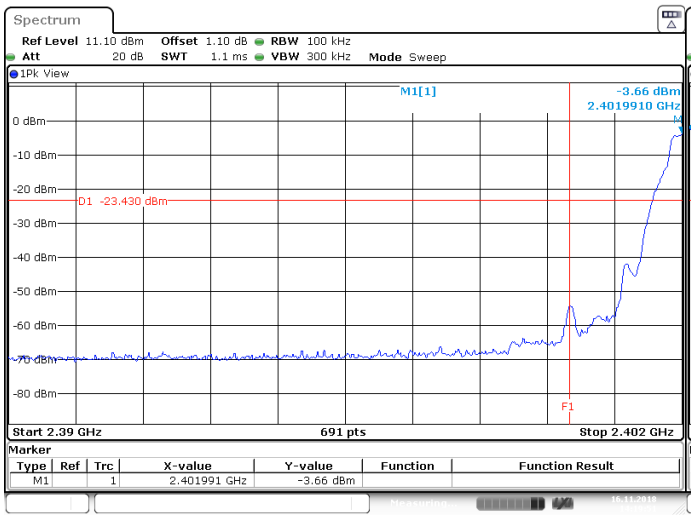

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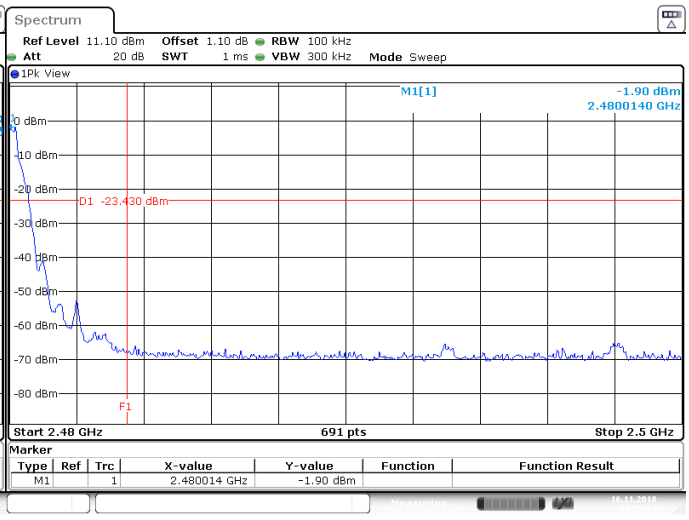

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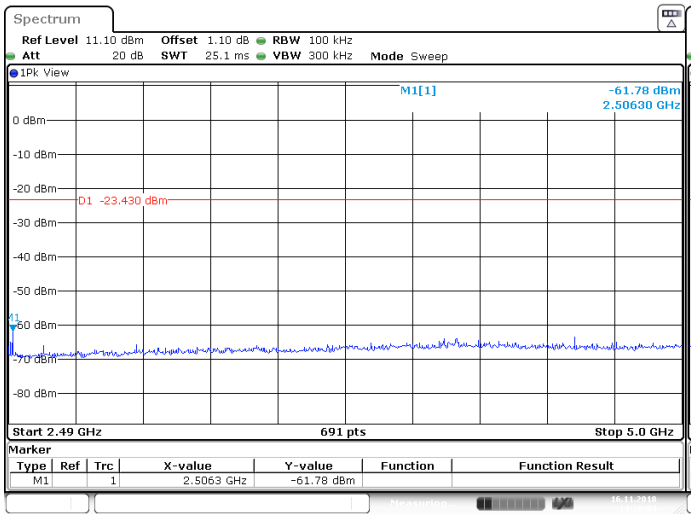

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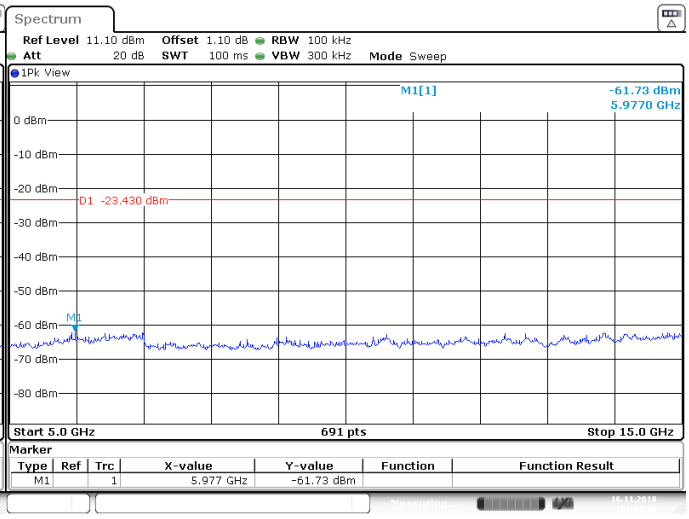

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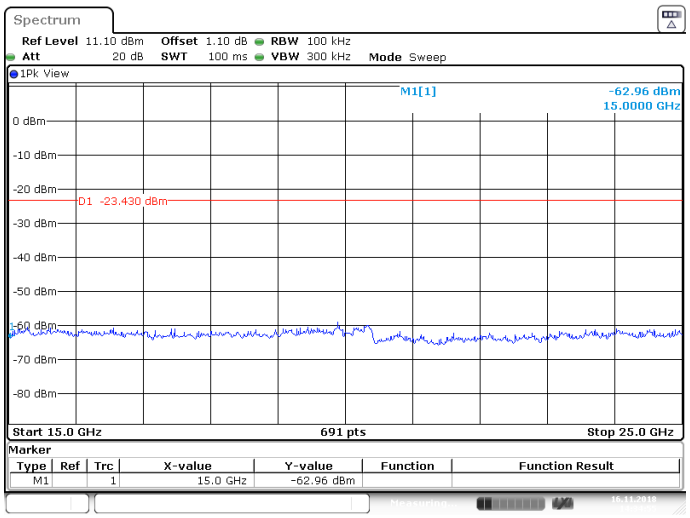


Date: 16.NOV.2018 14:34:55

9.8. CONCLUSION

Band edge measurement performed on the sample of the product **OPEN2500 POE/BT/RS232**, SN: **1816300112**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

10. OCCUPIED BANDWIDTH

10.1. ENVIRONMENTAL CONDITIONS

Date of test : November 19, 2018
Test performed by : Majid MOURZAGH
Atmospheric pressure (hPa) : 999
Relative humidity (%) : 39
Ambient temperature (°C) : 20

10.2. EQUIPMENT CONFIGURATION

Packet type: 1-DH5 / 2-DH5 / 3-DH5 worst case presented
Hopping sequence: ☐ ON ☑ OFF

10.3. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.
Offset: Attenuator+cable 10.3dB

☐ ***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 in the range of 1% to 5% of the anticipated emission bandwidth
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

10.4. TEST EQUIPMENT LIST

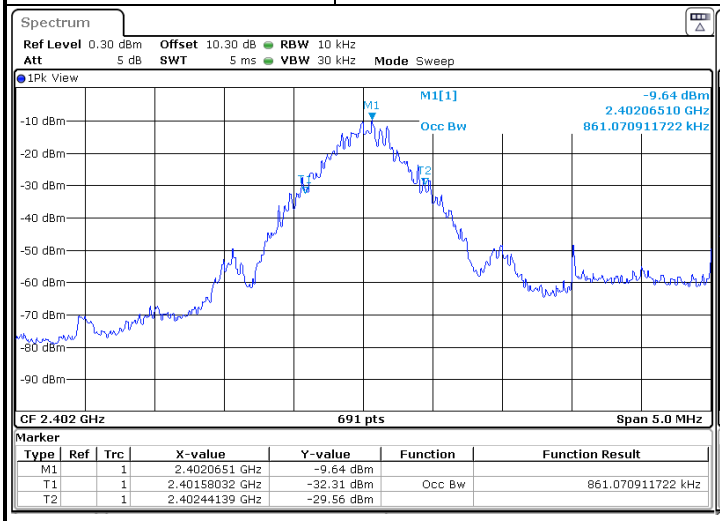
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable SMA	-	18G	A5329373	12/17	12/18
Cable SMA	-	6GHz	A5329635	02/18	02/19
Cable SMA 60cm	STORMFLEX	18GHz	A5329688	02/18	02/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/19
Antenna		SMA	C2040219	-	-
Full Anechoic Room	SIEPEL	-	D3044024	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	10/18	10/20
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/18

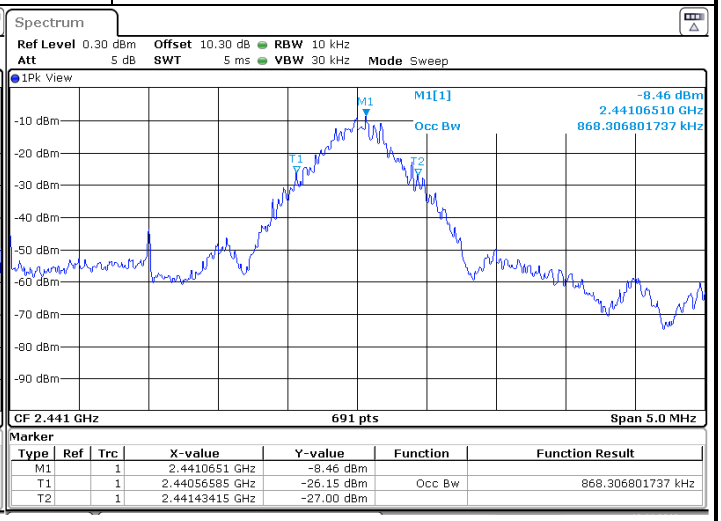
10.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

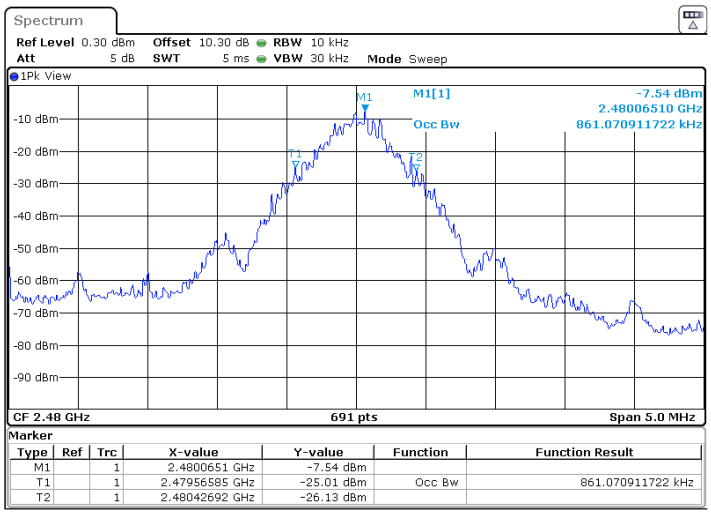
☑ None ☐ Divergence:

10.6. EST SEQUENCE AND RESULTS

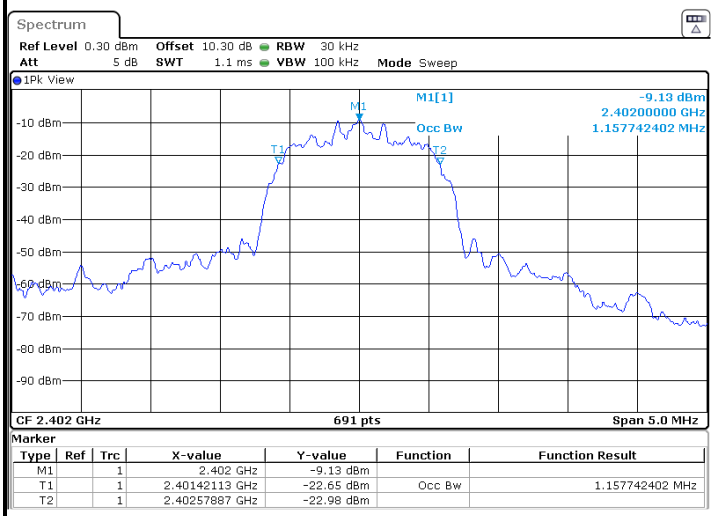
1-DH5		
Channel	**Channel Frequency (MHz)**	**99% Occupied Bandwidth (kHz)**
Cmin	2402	**861.079**
Cmid	2441	**868.307**
Cmax	2480	**861.071**

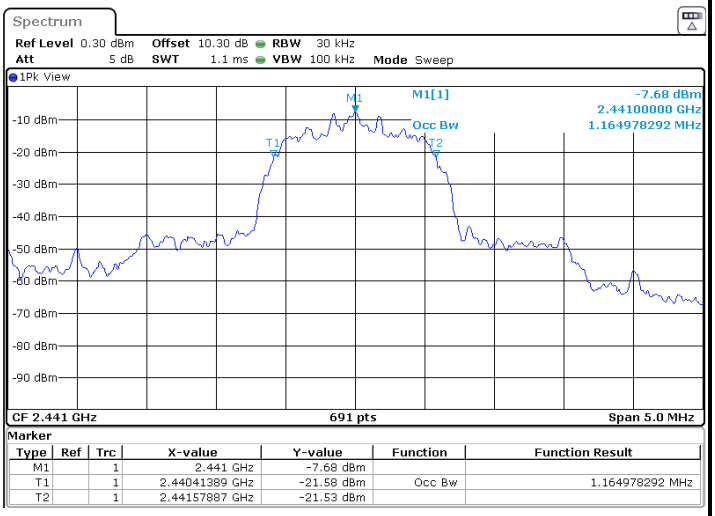


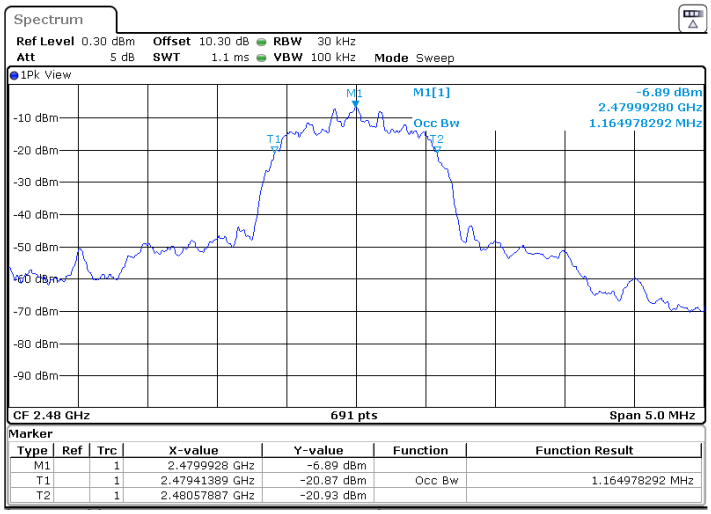




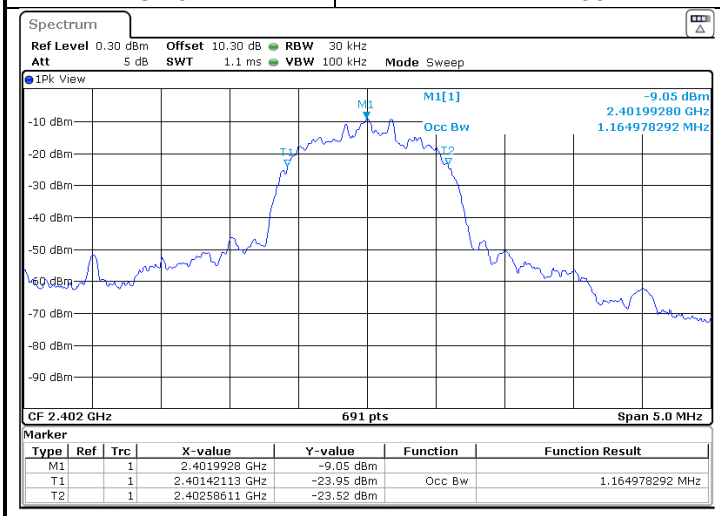
2-DH5		
Channel	**Channel Frequency (MHz)**	**99% Occupied Bandwidth (kHz)**
Cmin	2402	**1157.742**
Cmid	2441	**1164.978**
Cmax	2480	**1164.798**

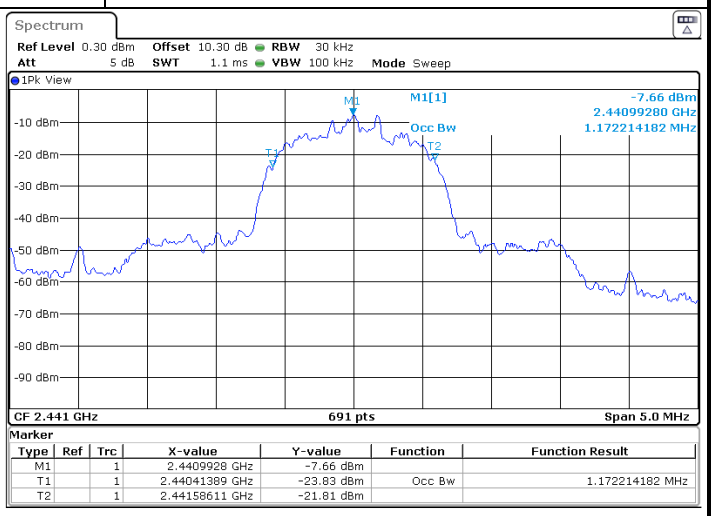


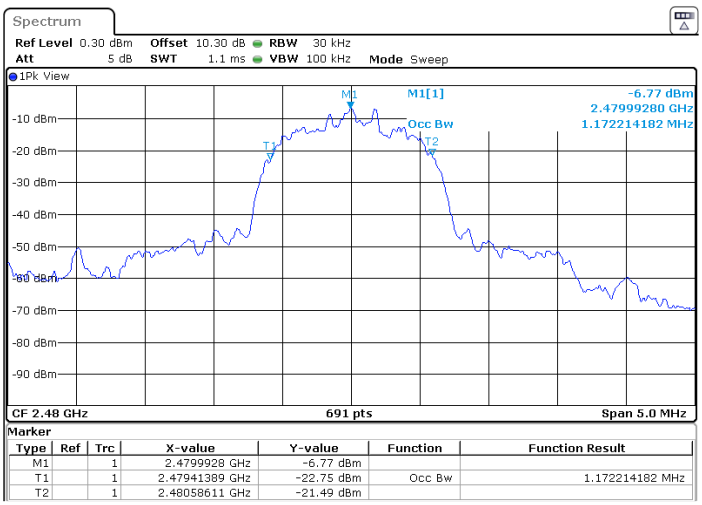




3-DH5		
Channel	**Channel Frequency (MHz)**	**99% Occupied Bandwidth (MHz)**
Cmin	2402	**1164.978**
Cmid	2441	**1172.214**
Cmax	2480	**1172.141**

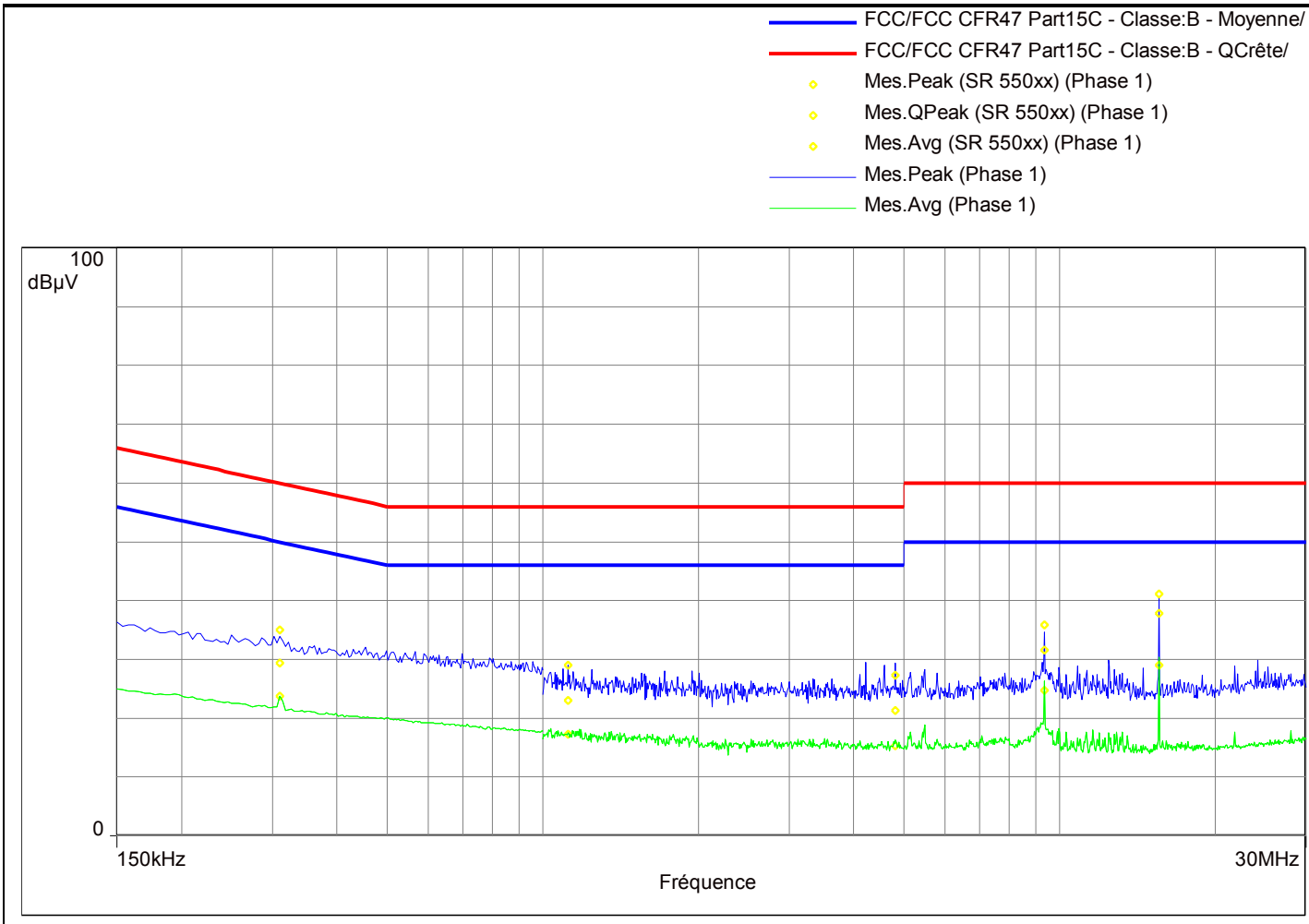






11. ANNEX 1 (GRAPHS)

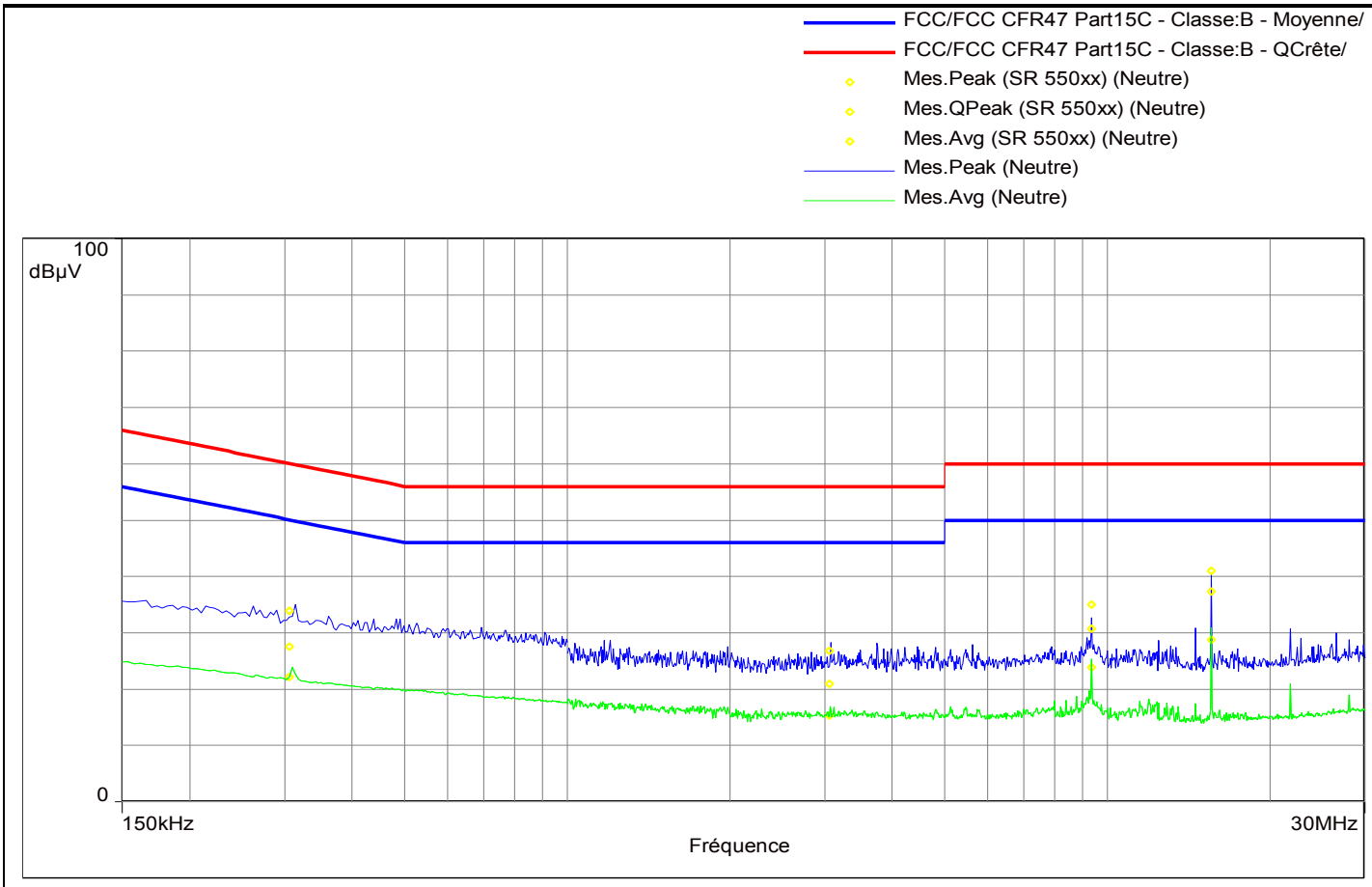
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Line :120V/60 Hz (BT)	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.310	35.0	29.3	60.0	-30.6	23.7	50.0	-26.3	Phase 1	19.5
1.120	29.0	23.0	56.0	-33.0	17.2	46.0	-28.8	Phase 1	19.5
4.804	27.3	21.3	56.0	-34.7	15.3	46.0	-30.7	Phase 1	19.8
9.348	35.9	31.6	60.0	-28.4	24.8	50.0	-25.2	Phase 1	20.2
15.576	41.2	37.9	60.0	-22.1	29.1	50.0	-20.9	Phase 1	20.6

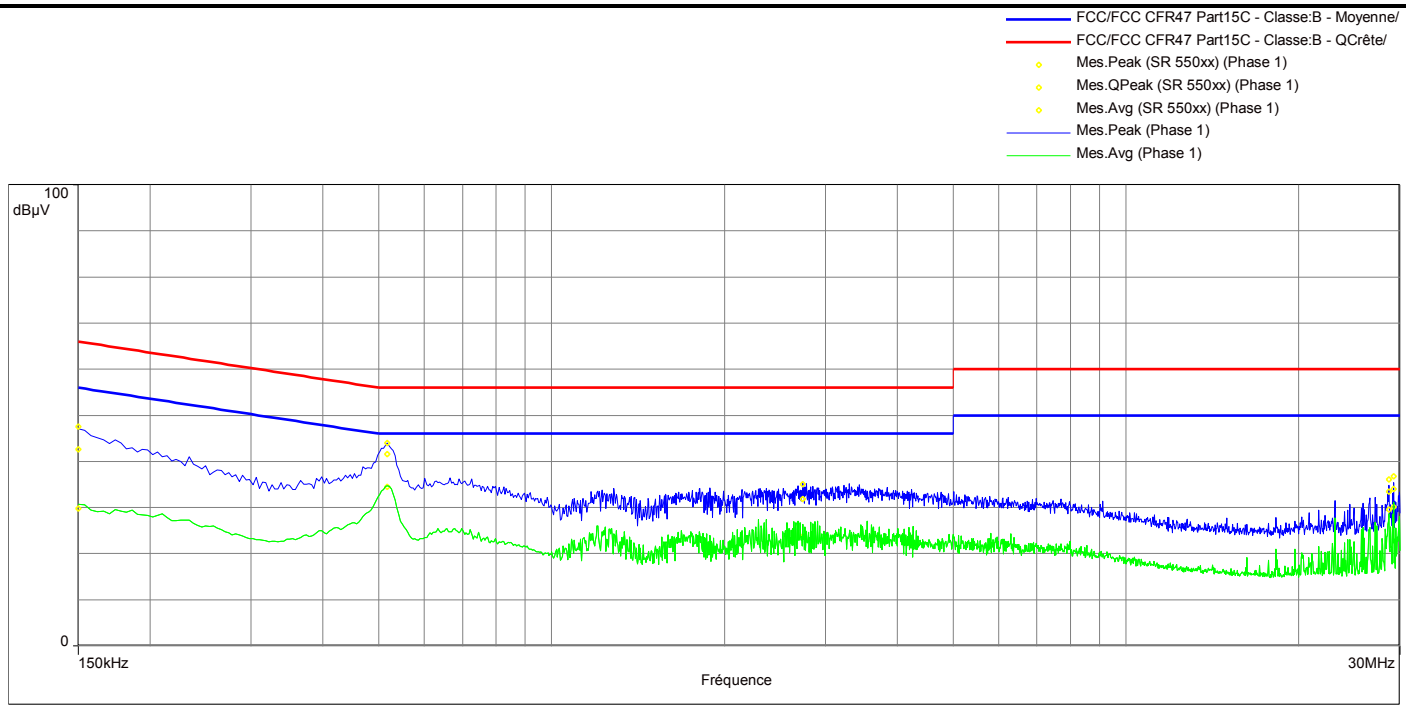
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Neutral :120V/60 Hz (BT)	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.306	33.9	27.6	60.1	-32.5	22.1	50.1	-27.9	Neutre	19.4
3.064	26.8	21.0	56.0	-35.0	15.3	46.0	-30.7	Neutre	19.7
9.344	35.1	30.8	60.0	-29.2	23.9	50.0	-26.1	Neutre	20.2
15.568	41.0	37.4	60.0	-22.6	28.7	50.0	-21.3	Neutre	20.6

CONDUCTED EMISSIONS			
Graph name:	Emc#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Line :120V/60 Hz (BT)	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz

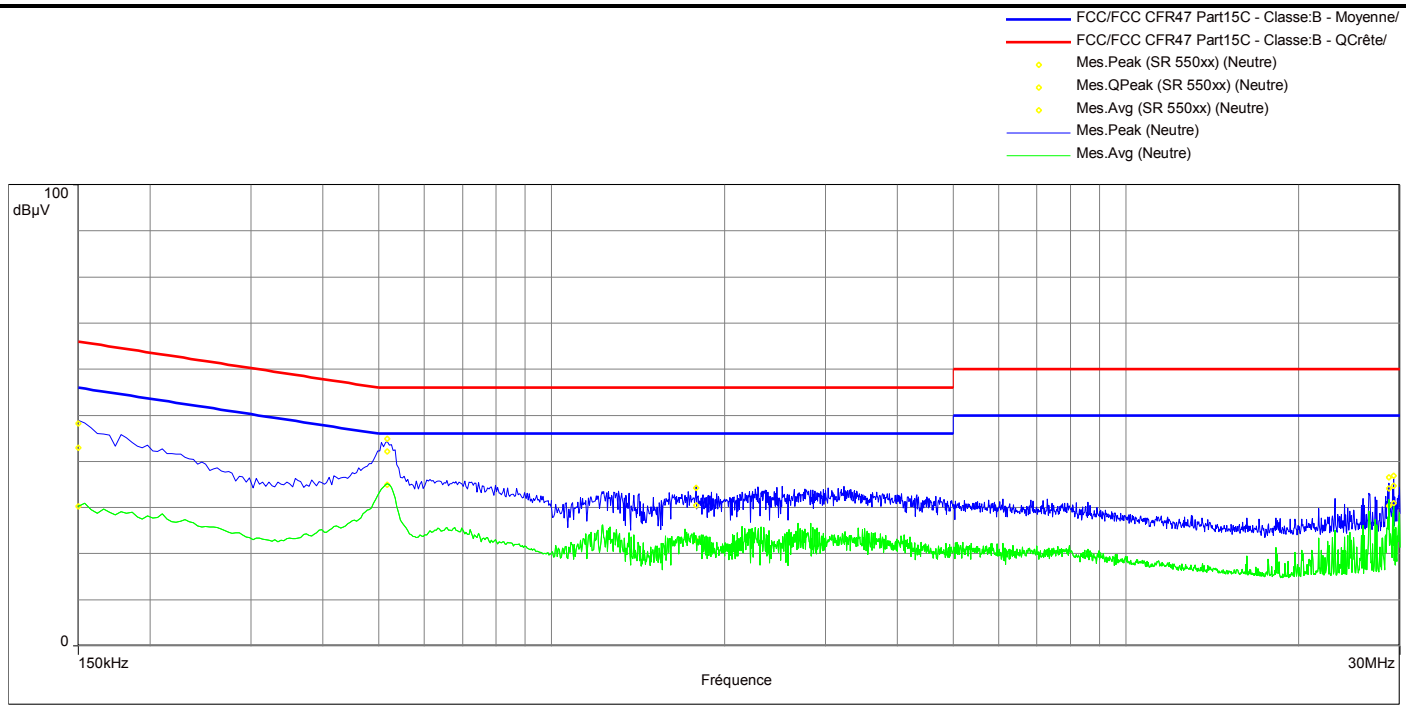


Spurious emissions

SR 550xx (5)

Fréquence (MHz)	SB	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Position	Correction (dB)
0.15	1	47.50	42.67	66.00	-23.33	29.74	56.00	-26.26	Phase 1	19.40
0.518	1	44.00	41.59	56.00	-14.41	34.52	46.00	-11.48	Phase 1	19.54
2.74	2	35.11	31.87	56.00	-24.13	23.75	46.00	-22.25	Phase 1	19.68
28.684	2	36.08	33.42	60.00	-26.58	29.56	50.00	-20.44	Phase 1	21.36
29.236	2	36.79	34.03	60.00	-25.97	30.17	50.00	-19.83	Phase 1	21.39

CONDUCTED EMISSIONS			
Graph name:	Emc#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Neutral :120V/60 Hz (BT)	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz

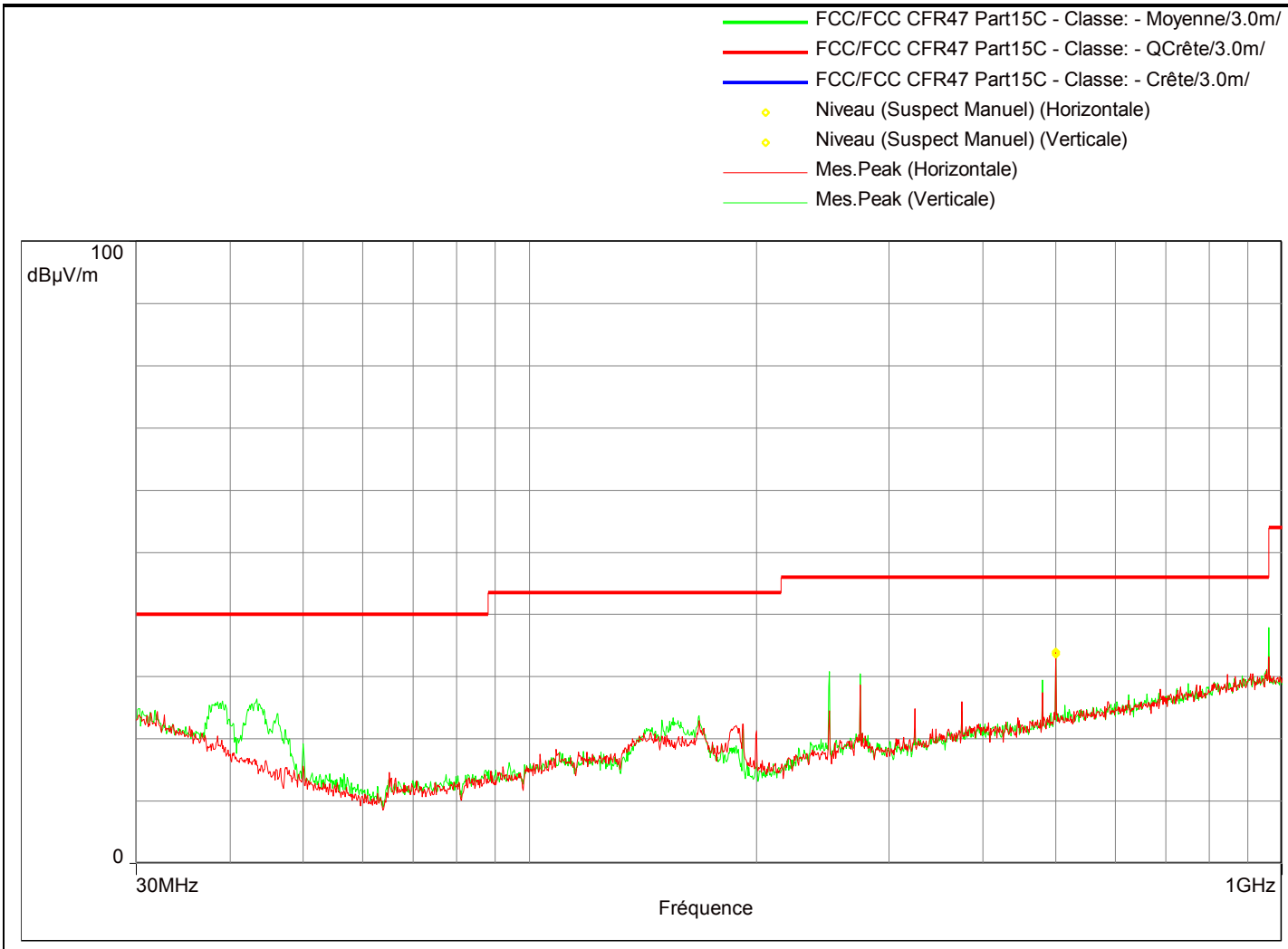


Spurious emissions

SR 550xx (5)

Fréquence (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Position	Correction (dB)
0.15	48.20	42.97	66.00	-23.03	30.22	56.00	-25.78	Neutre	19.40
0.518	44.86	42.14	56.00	-13.86	35.00	46.00	-11.00	Neutre	19.54
1.784	34.24	30.51	56.00	-25.49	22.90	46.00	-23.10	Neutre	19.60
28.684	36.57	34.14	60.00	-25.86	30.34	50.00	-19.66	Neutre	21.36
29.236	36.95	34.76	60.00	-25.24	30.92	50.00	-19.08	Neutre	21.39

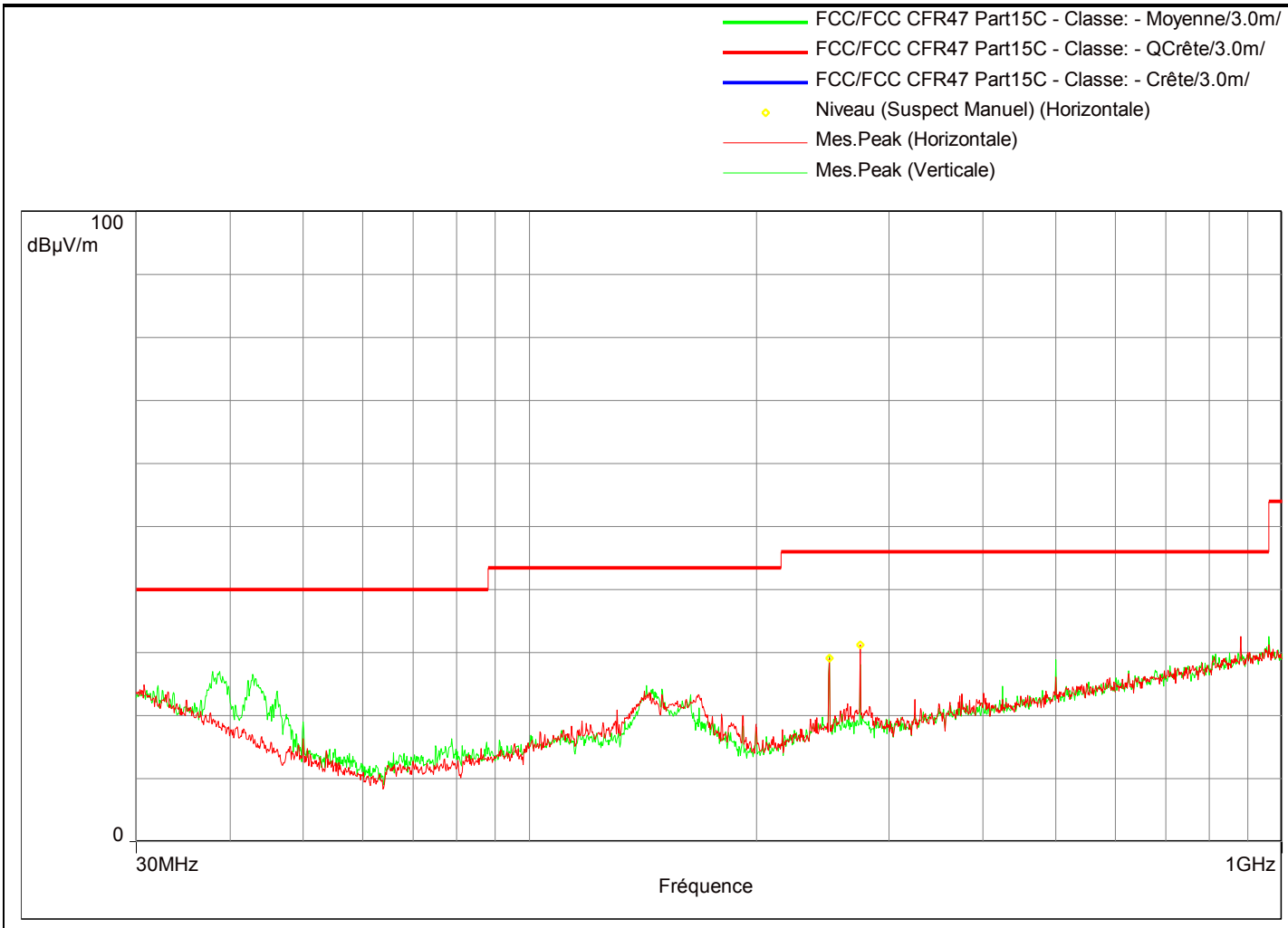
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - BT Hopping Mode mode - Axis XY with configuration n°1	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
500.000	34.0	Horizontal
500.000	33.6	Vertical

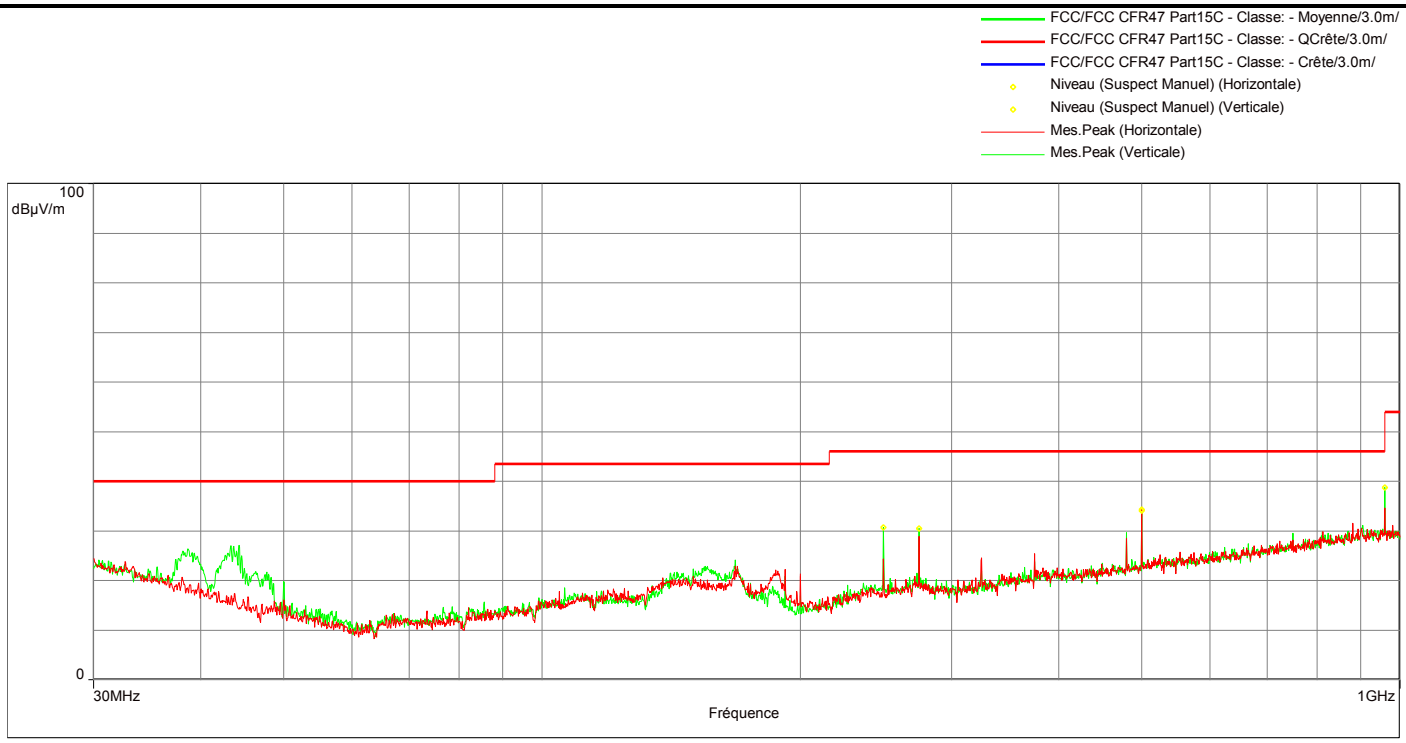
RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - BT Hopping Mode mode - Axis Z with configuration n°1	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
250.000	29.1	Horizontal
275.000	31.2	Horizontal

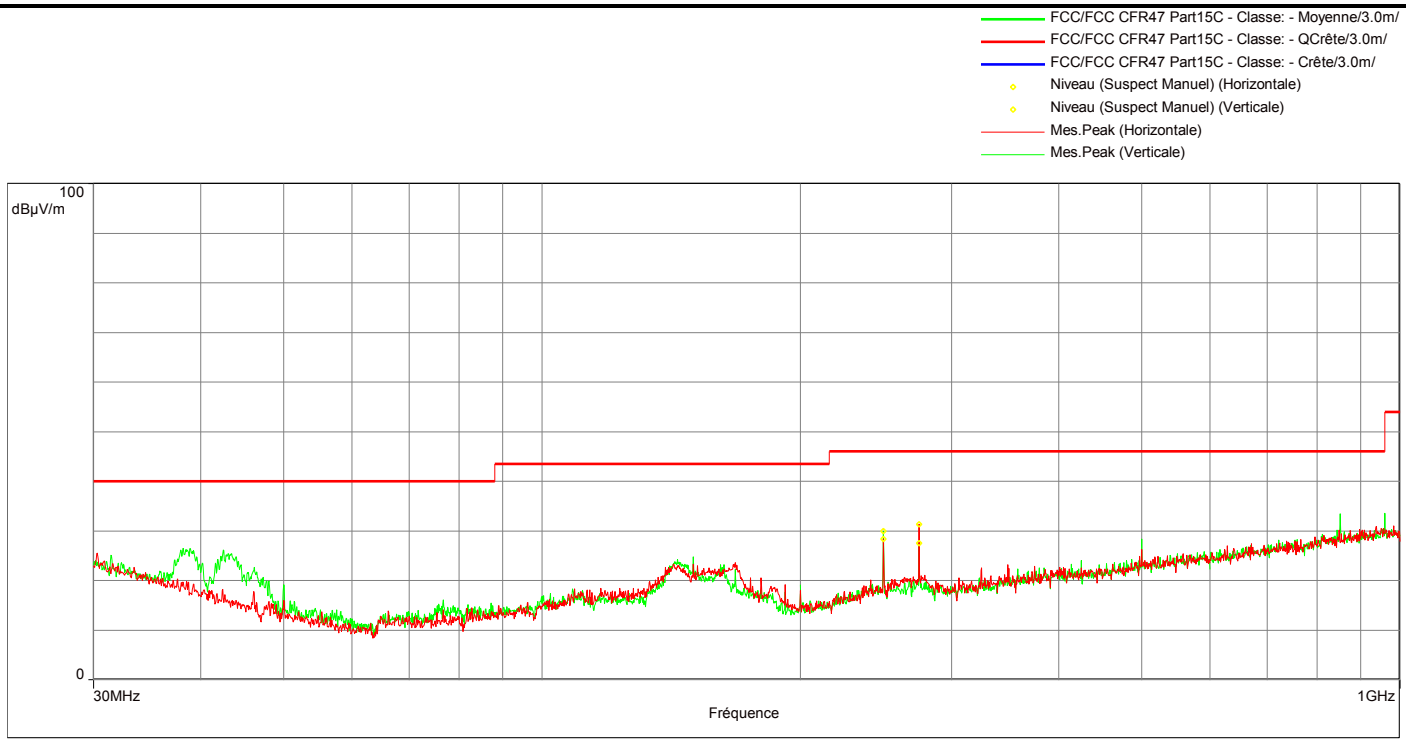
RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - BT Hopping Mode mode - Axis XY with configuration n°2	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
500.000	34.3	Horizontal
250.000	30.7	Vertical
275.000	30.4	Vertical
500.000	34.0	Vertical
960.000	38.7	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - BT Hopping Mode mode - Axis Z with configuration n°2	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
250.000	28.3	Horizontal
275.000	31.3	Horizontal
250.000	30.0	Vertical
275.000	27.5	Vertical

12. UNCERTAINTIES CHART

Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ± x**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ± y**
Mesure des perturbations conduites en tension sur le réseau d'énergie *Measurement of conducted disturbances in voltage on the power port*	3.51 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.*	3.26 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.45 dB	3.6 dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	3.09 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*	5.20 dB	6.3 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.*