TEST REPORT

N°: 143624-690538-A **(File#833764)** **Version : 02**

Subject	**Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: FCC CFR 47 Part 15, Subpart C RSS-247 Issue 1.0**
Issued to	**01dB-metravib SAS (ACOEM)** 200 chemin des Ormeaux 69578 - LIMONEST FRANCE
Apparatus under test	
↳ Product	Vibration environment monitoring device
↳ Trade mark	**01dB**
↳ Manufacturer	**01dB Metravib SAS (ACOEM)**
↳ Model under test	**VMT1002000T**
↳ Serial number	**10067**
↳ FCCID	**2AC3Z-VMT1002000**
↳ IC	**12336A-VMT1002000**
Conclusion	See Test Program chapter §1
Test date	August 30, 2016 to September 22, 2016
Test location	MOIRANS
IC Test site	6500A-1 & 6500A-3
Composition of document	64 pages
Document issued on	February 7, 2017

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	February 7, 2017	Jonathan PAUC	Creation of the document Test report is not fully completed Missing information not provided by manufacturer
02	February 7th, 2017	Jonathan PAUC	Test report completed

SUMMARY

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1. TEST PROGRAM

Standard:

- **FCC Part 15, Subpart C 15.247**
- **ANSI C63.10 (2013)**
- **RSS-247 Issue 1.0 – May 2015**
- **RSS-Gen Issue 4 – Nov 2014**
- **558074 D01 DTS Measurement Guidance v03r05**

EMISSION TEST	LIMITS			RESULTS
Limits for conducted disturbance at mains ports 150kHz-30MHz (Class B)	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP** **(configuration n°2)**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Limits for conducted disturbance at mains ports 150kHz-30MHz (Class A)	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP** **(configuration n°3)**
	150-500kHz	79	66	
	0.5-5MHz	73	60	
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 :*** ***(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*	**At least 500kHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Power spectral Density *CFR 47 §15.247 (e)* *RSS-247 §5.2*	**Limit: 8dBm/3kHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Maximum Peak Output Power *CFR 47 §15.247 (b)* *RSS-247 §5.4*	**Limit: 30dBm** Conducted or Radiated measurement			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Band Edge Measurement *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5*	**Limit: -20dBc or** **Radiated emissions limits in restricted bands**			☑ **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):

VMT1002000T **Serial Number:** 10067

Photography of EUT

Power supply:

During all the tests, EUT is supplied by V_{nom}: 240 / 50Hz VAC or 120 / 60Hz (Primary of Supply 2 & Supply3)
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☐ DC ☑ Battery	3.75V	1S3P-INT176065	/
Supply2	☑ AC ☑ DC ☐ Battery	100-240 | 50/60Hz	ZLD1201500 (Giga-Concept)	External power supply Not Water proof
Supply3	☑ AC ☑ DC ☐ Battery	100-240 | 50/60Hz	LPF-25-12 (Mean Well)	External power supply Water proof

Inputs/outputs - Cable:

Access	Type		Ref cable	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	Power (12V _ 1.3A)		/		☐	☐	☑	/
Access1	GPS Antenna		/	/	☐	☑	☑	/
Access2	WIFI Antenna		/	/	☐	☑	☑	/
Access3	GSM Antenna		/	/	☐	☑	☑	/
Access4	TTL output		VMT1010000	3	☐	☑	☑	/
Access5	Ethernet – type Cat5e (100Mbps)		VMT1009000A	9.9	☐	☑	☑	/
Access6	Ext Sensors	BNC cable splitter for external sensor	VMT1011000	1.5	☐	☑	☑	/
		3 x Addition BNC extenders	VMT1036000	10 each	☐	☑	☑	/
Access7	USB port (Type Mini-A Femal)		/	/	☐	☐	☐	/
Access8	Ground		/	/	☐	☐	☑	/
Access9	Sim Slot		/	/	☐	☐	☐	/

Antennas:

Type	Antenna ID	Reference	Sn	Gain (dBi)	Comments
GSM Antenna	Antenna 1	TAOGLAS TG.22.112	/	2.5	/
GPS Antenna	Antenna 2	NEALCOM 668-0006-52	01351085	/	/
Wifi Antenna	Antenna 3	RF Solution ANT-24G-S21-SMA	/	0	/

NC: Not communicated by customer

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
GPS variable gain repeater	GPS Sources GPSRKL1-V-P230/5	/	/
Laptop	Notebook Computer W550EU	/	/
Velocimeter Wilcoxon 793V	Model 793V	19974	/
Velocimeter Wilcoxon 793V	Model 793V	19976	/
Velocimeter Wilcoxon 793V	Model 793V	19975	/
Digital Radiocommunication Tester	CMU200	A2440006	/

Radio frequency - Equipment information:

Type:	**WIFI**				
RF Module	APM6998				
Frequency band:	[2400 – 2483.5] MHz				
Sub-band REC7003:	Annex 3 (a)				
Standard:	☑ 802.11b	☑ 802.11g	☑ 802.11n HT20	☐ 802.11n HT40	
Spectrum Modulation:	☑ DSSS		☑ OFDM		
Number of Channel:	13				
Spacing channel:	5 MHz				
Channel bandwidth:	☑ 20MHz		☐ 40MHz		
Antenna Type:	☐ Integral	☑ External	☐ Dedicated		
Antenna connector:	☑ Yes	☐ No	☐ Temporary for test		
Transmit chains:	☑ 1	☐ 2	☐ 3	☐ 4	
	☑ Single antenna	☐ Symmetrical	☐ Asymmetrical		
	Gain 1: 0 dBi	Gain 2: dBi	Gain 3: dBi	Gain 4: dBi	Accumuled Gain: dBi
Beam forming gain:	☐ Yes: dB		☑ No		
Receiver chains	☑ 1	☐ 2	☐ 3	☐ 4	
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined		
Ad-Hoc mode:	☑ Yes		☐ No		
Adaptivity mode:	☑ Yes (Load Based)	☐ Off mode	☐ No		
	Clear Channel Assessment Time		/		
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:	Vnom:	☑ 230V/50Hz or 120V /60Hz	☑ 4.2 Vdc		
Geo-location capability:	☐ Yes (The geographical location determined by the equipment is not accessible to the end user as defined in section 4.3.2.12.2 of ETSI EN 300 328 V1.9.1 standard)		☑ No		

NC: Not communicated by customer

CHANNEL PLAN	
802.11b / 802.11g / 802.11n HT20	
Channel	Frequency (MHz)
Cmin: 1	**2412**
2	2417
3	2422
4	2427
5	2432
Cmid: 6	**2437**
7	2442
8	2447
9	2452
10	2457
Cmax: 11	2462

DATA RATE		
802.11b		
Data Rate (Mbps)	**Modulation Type**	**Modulation Worst Case**
1	DBPSK	☐
2	DQPSK	☐
5.5	DQPSK	☐
11	CCK	☑

DATA RATE		
802.11g		
Data Rate (Mbps)	**Modulation Type**	**Modulation Worst Case**
6	BPSK	☐
9	BPSK	☐
12	QPSK	☐
18	QPSK	☐
24	16-QAM	☐
36	16-QAM	☑
48	64-QAM	☐
54	64-QAM	☐

DATA RATE						
802.11n HT20 (Table 1)						
Available for EUT	MCS Index	Spatial streams	Modulation	Data Rate (Mbps)		Worst Case Modulation
				(GI = 800ns)	(GI = 400ns)	
☑	0	1	BPSK	6.5	7.2	☐
☑	1	1	QPSK	13	14.4	☑
☑	2	1	QPSK	19.5	21.7	☐
☑	3	1	16-QAM	26	28.9	☐
☑	4	1	16-QAM	39	43.3	☐
☑	5	1	64-QAM	52	57.8	☐
☑	6	1	64-QAM	58.5	65	☐
☑	7	1	64-QAM	65	72.2	☐
☐	8	2	BPSK	13	14.4	☐
☐	9	2	QPSK	26	28.9	☐
☐	10	2	QPSK	39	43.3	☐
☐	11	2	16-QAM	52	57.8	☐
☐	12	2	16-QAM	78	86.7	☐
☐	13	2	64-QAM	104	115.6	☐
☐	14	2	64-QAM	117	130.3	☐
☐	15	2	64-QAM	130	144.4	☐
☐	16	3	BPSK	19.5	21.7	☐
☐	17	3	QPSK	39	43.3	☐
☐	18	3	QPSK	58.5	65	☐
☐	19	3	16-QAM	78	86.7	☐
☐	20	3	16-QAM	117	130	☐
☐	21	3	64-QAM	156	173.3	☐
☐	22	3	64-QAM	175.5	195	☐
☐	23	3	64-QAM	195	216.7	☐
☐	24	4	BPSK	26	28.9	☐
☐	25	4	QPSK	52	57.8	☐
☐	26	4	QPSK	78	86.7	☐
☐	27	4	16-QAM	104	115.6	☐
☐	28	4	16-QAM	156	173.3	☐
☐	29	4	64-QAM	208	231.1	☐
☐	30	4	64-QAM	234	260	☐
☐	31	4	64-QAM	260	288.9	☐

DATA RATE									
802.11n HT20 (Table 2)									
Available for EUT	MCS Index	Spatial streams	Modulation				Data Rate (Mbps)		Worst Case Modulation
							(GI = 800ns)	(GI = 400ns)	
☐	32	1	BPSK	-	-	-	-	-	☐
☐	33	2	16-QAM	QPSK	-	-	39	43.3	☐
☐	34	2	64-QAM	QPSK	-	-	52	57.8	☐
☐	35	2	64-QAM	16-QAM	-	-	65	72.2	☐
☐	36	2	16-QAM	QPSK	-	-	58.5	65	☐
☐	37	2	64-QAM	QPSK	-	-	78	86.7	☐
☐	38	2	64-QAM	16-QAM	-	-	97.5	108.3	☐
☐	39	3	16-QAM	QPSK	QPSK	-	52	57.8	☐
☐	40	3	16-QAM	16-QAM	QPSK	-	65	72.2	☐
☐	41	3	64-QAM	QPSK	QPSK	-	65	72.2	☐
☐	42	3	64-QAM	16-QAM	QPSK	-	78	86.7	☐
☐	43	3	64-QAM	16-QAM	16-QAM	-	91	101.1	☐
☐	44	3	64-QAM	64-QAM	QPSK	-	91	101.1	☐
☐	45	3	64-QAM	64-QAM	16-QAM	-	104	115.6	☐
☐	46	3	16-QAM	QPSK	QPSK	-	78	86.7	☐
☐	47	3	16-QAM	16-QAM	QPSK	-	97.5	108.3	☐
☐	48	3	64-QAM	QPSK	QPSK	-	97.5	108.3	☐
☐	49	3	64-QAM	16-QAM	QPSK	-	117	130	☐
☐	50	3	64-QAM	16-QAM	16-QAM	-	136.5	151.7	☐
☐	51	3	64-QAM	64-QAM	QPSK	-	136.5	151.7	☐
☐	52	3	64-QAM	64-QAM	16-QAM	-	156	173.3	☐
☐	53	4	16-QAM	QPSK	QPSK	QPSK	65	72.2	☐
☐	54	4	16-QAM	16-QAM	QPSK	QPSK	78	86.7	☐
☐	55	4	16-QAM	16-QAM	16-QAM	QPSK	91	101.1	☐
☐	56	4	64-QAM	QPSK	QPSK	QPSK	78	86.7	☐
☐	57	4	64-QAM	16-QAM	QPSK	QPSK	91	101.1	☐
☐	58	4	64-QAM	16-QAM	16-QAM	QPSK	104	115.6	☐
☐	59	4	64-QAM	16-QAM	16-QAM	16-QAM	117	130	☐
☐	60	4	64-QAM	QPSK	QPSK	QPSK	104	115.6	☐
☐	61	4	64-QAM	16-QAM	16-QAM	QPSK	117	130	☐
☐	62	4	64-QAM	16-QAM	16-QAM	16-QAM	130	144.4	☐
☐	63	4	64-QAM	64-QAM	64-QAM	QPSK	130	144.4	☐
☐	64	4	64-QAM	64-QAM	64-QAM	16-QAM	143	158.9	☐
☐	65	4	16-QAM	QPSK	QPSK	QPSK	97.5	108.3	☐
☐	66	4	16-QAM	16-QAM	QPSK	QPSK	117	130	☐
☐	67	4	16-QAM	16-QAM	16-QAM	QPSK	136.5	151.7	☐
☐	68	4	64-QAM	QPSK	QPSK	QPSK	117	130	☐
☐	69	4	64-QAM	16-QAM	QPSK	QPSK	136.5	151.7	☐
☐	70	4	64-QAM	16-QAM	16-QAM	QPSK	156	173.3	☐
☐	71	4	64-QAM	16-QAM	16-QAM	16-QAM	175.5	195	☐
☐	72	4	64-QAM	64-QAM	QPSK	QPSK	156	173.3	☐
☐	73	4	64-QAM	64-QAM	16-QAM	QPSK	175.5	195	☐
☐	74	4	64-QAM	64-QAM	16-QAM	16-QAM	195	216.7	☐
☐	75	4	64-QAM	64-QAM	64-QAM	QPSK	195	216.7	☐
☐	76	4	64-QAM	64-QAM	64-QAM	16-QAM	214.5	238.3	☐

3G information			
RF module:	Telit HE910-G		
UMTS Band VIII:	☑ UMTS VIII 882 MHz to 913 MHz (TX) and 927 MHz to 960 MHz (IDLE)		
Power Class:	24 dBm		
Antenna Type:	☐ Integral	☑ External	☐ Dedicated
Antenna gain:	2.5 dBi		
UMTS Band I:	☑ UMTS I 1922 MHz to 1978 MHz (TX) and 2112 MHz to 2168 MHz (IDLE)		
Power Class:	24 dBm		
Antenna Type:	☐ Integral	☑ External	☐ Dedicated
Antenna gain:	2.5 dBi		
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined
Standby mode:	☑ Yes	☐ No	
Equipment intended use:	☑ Fixed	☐ Mobile	
Equipment type:	☑ Production model	☐ Pre-production model	
Operating temperature range:	Tnom:	20 °C	
Type of power source:	☐ AC power supply	☑ DC power supply	☑ Battery

GPS			
RF module:	µBlox MAX-M8Q		
Frequency band:	NC		
Receiver classification § 4.1.1	☐1	☑2	☐3
Receiver bandwidth:	NC		
Antenna type:	☑External:	☐Internal:	
Antenna gain:	NC		
Equipment type:	☑ Production model	☐ Prototype	

NC: Not communicated by customer

2.2. EUT CONFIGURATION

Setup Configuration n°1(Inner Battery)

EUT is power on it's inner Battery.

Setup Configuration n°2(Power supply ZLD1201500)

EUT is power through AC/DC adapter reference ZLD1201500 (Giga-concept)

Setup Configuration n°3 (Power supply LPF-25-12)

EUT is power through AC/DC adapter reference LPF-25-12 (Mean Well)

2.2.1. Configuration digital device (only used in §3 and §4):

- Continuous External sensor measurements are performed
- GPS reception enabled
- GSM reception enabled

Firmware / Software:
CE Core (NK.BIN) based on 0.06Q6 release

2.2.2. Configuration radio device(used in §4, §5, §6, §7, §8 and §9):

The EUT is set in the following modes during tests:
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception
All tests are performed at Cmin, Cmid and Cmax.

Firmware / Software:
APM PDAUniTest Software (7.2.1.15)

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.

2.5. 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	:	September 22, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	1000
Relative humidity (%)	:	44
Ambient temperature (°C)	:	20

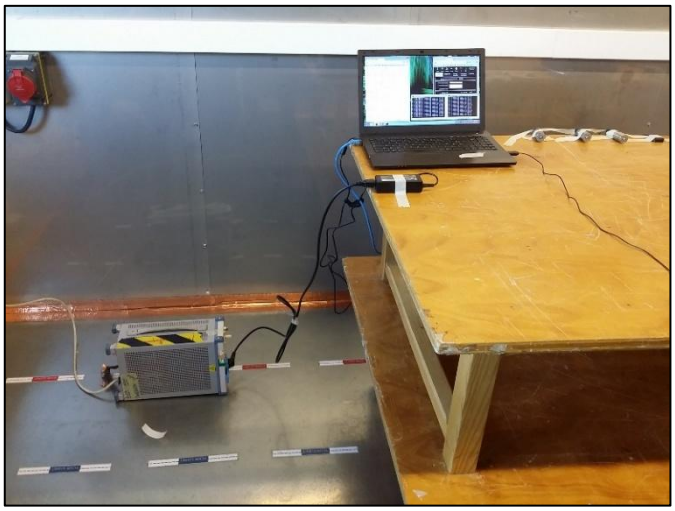
3.2. TEST SETUP

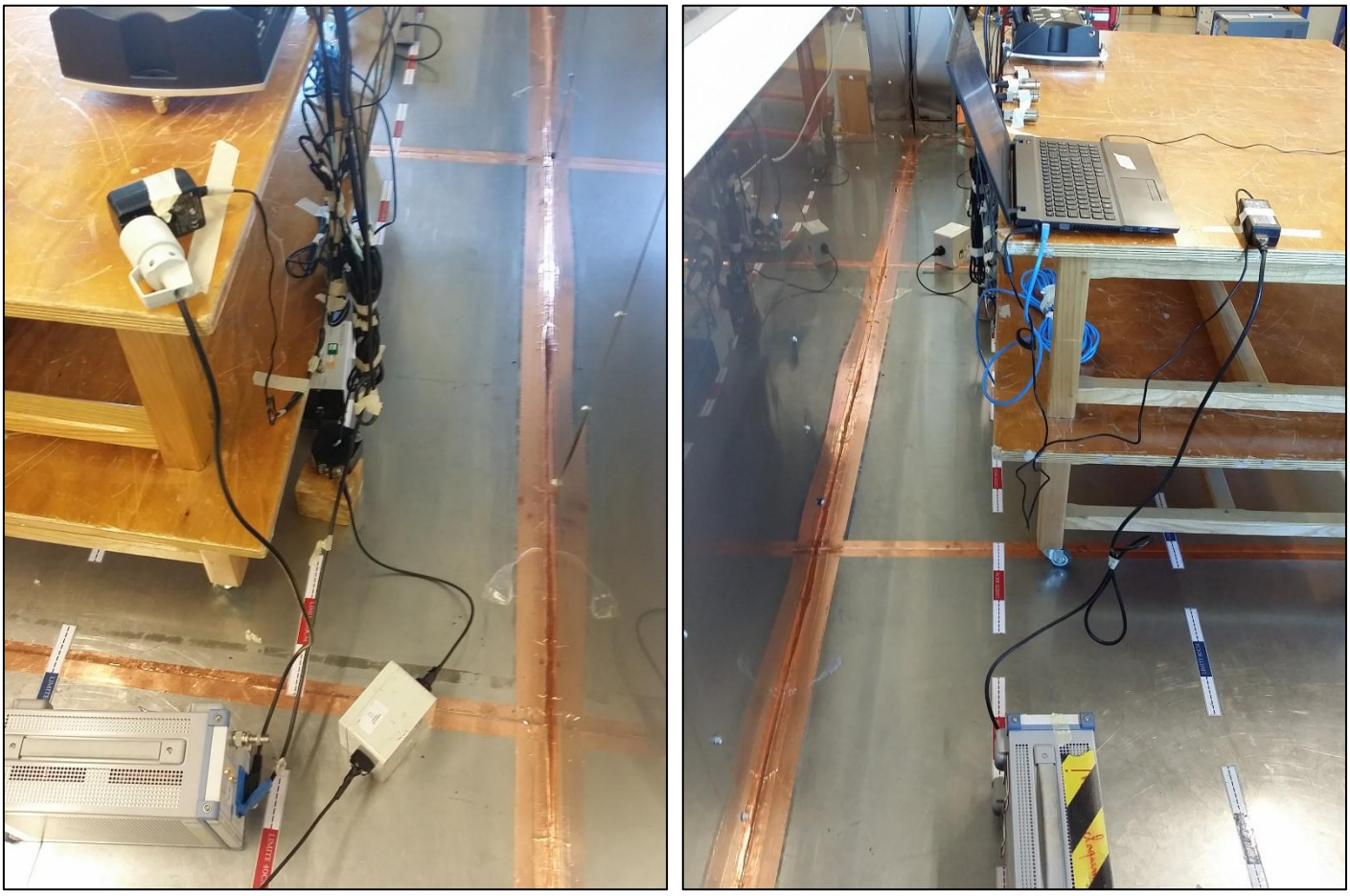
Mains terminals

The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment)
☐ 10cm above the ground on isolating support (Floor standing equipment)
The distance between the EUT and the LISN is 80cm. The EUT is 40cm away for the vertical ground plane.

The EUT is powered by V_{nom}.
The EUT is powered through a LISN (measure). Auxiliaries are powered by another LISN.

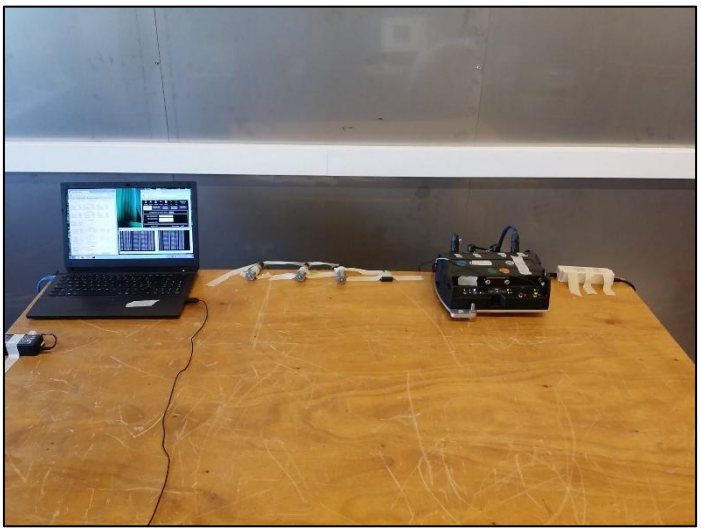
Setup Configuration n°2(Power supply ZLD1201500)

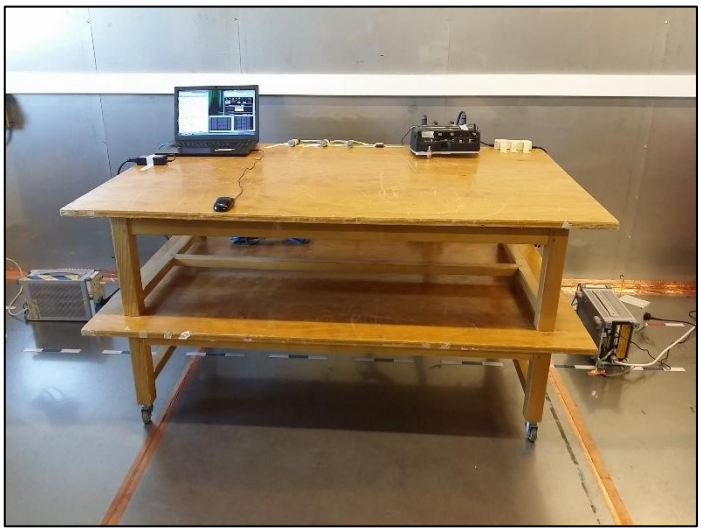


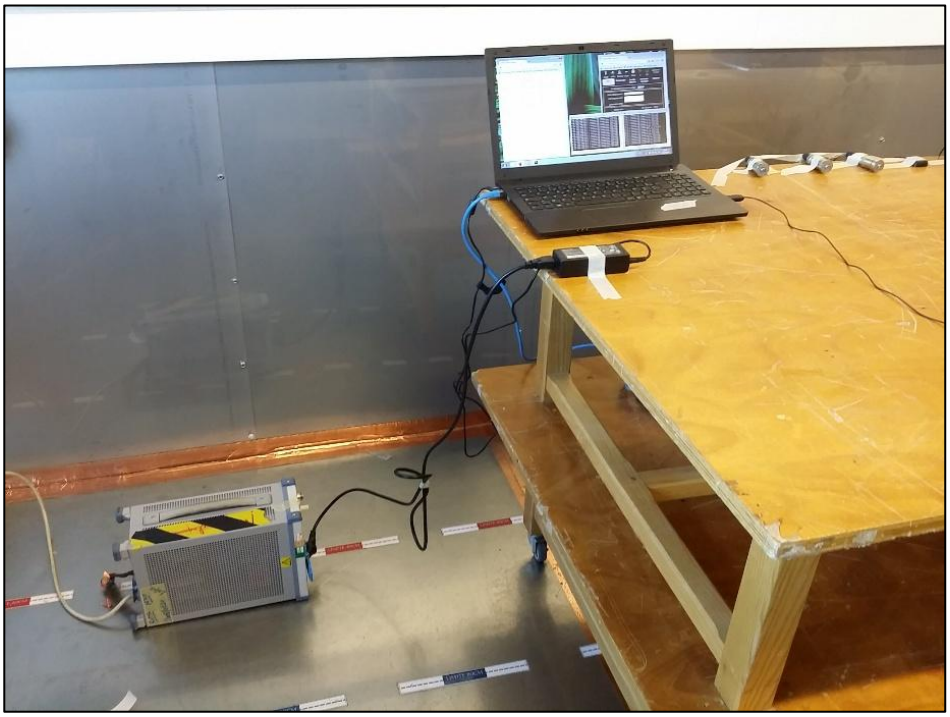


Test setup – Configuration n°2

Setup Configuration n°3 (Power supply LPF-25-12)







Test setup – Configuration n°3

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 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	-	-	A5329585	04/16	04/17
Coupling Decoupling Network	TESEQ	CDN T8	C2320140	04/16	04/18
ISN 8 wires	TESEQ	T800	C2320170	08/16	08/17
LISN	RHODE & SCHWARZ	ENV216	C2320123	02/16	02/17
LISN	RHODE & SCHWARZ	ENV216	C2320291	11/15	11/16
Load 50Ω	-	-	A7152030	04/16	04/17
Probe - Current	SCHAFFNER	CSP9160	A1290017	06/16	06/18
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	08/16	08/17
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	01/16	01/17

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)

Configuration n° 2

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

Configuration n° 3

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

3.1. CONCLUSION

Conducted emission data measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration n°2 and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits (Class B).

Conducted emission data measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration n°3 and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits (Class A).

4. RADIATED EMISSION DATA

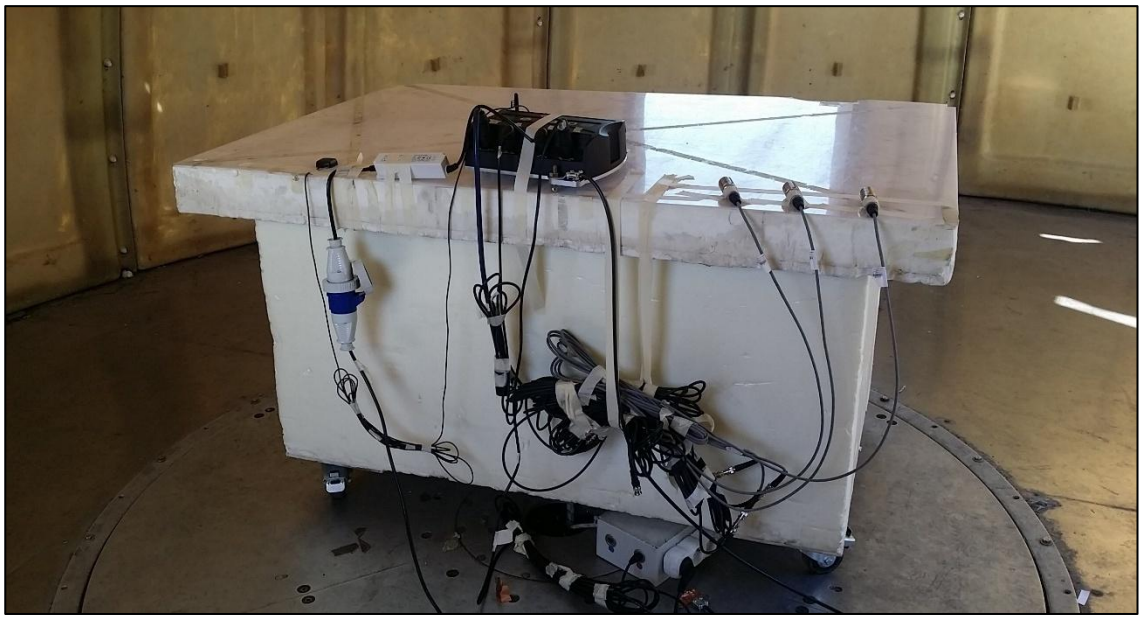
4.1. ENVIRONMENTAL CONDITIONS

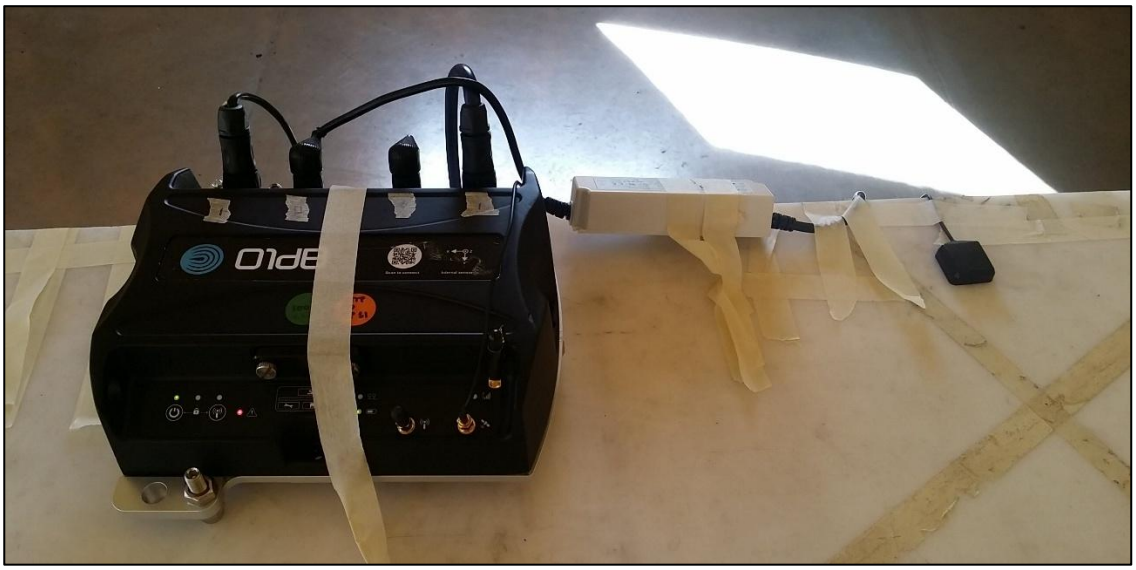
Date of test	:	August 30, 2016	August 31st, 2016
Test performed by	:	Jonathan PAUC	Jonathan PAUC
Atmospheric pressure (hPa)	:	999	999
Relative humidity (%)	:	39	39
Ambient temperature (°C)	:	26	21

4.2. TEST SETUP

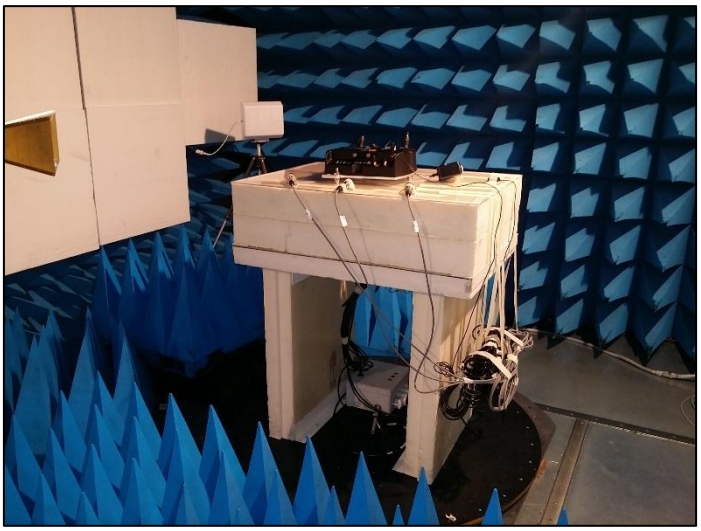
The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
☑ 150cm above the ground on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

OATS – Configuration n°2

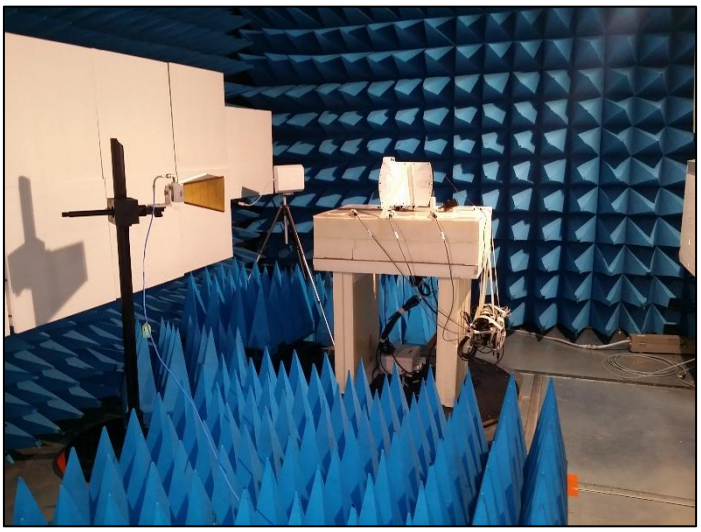


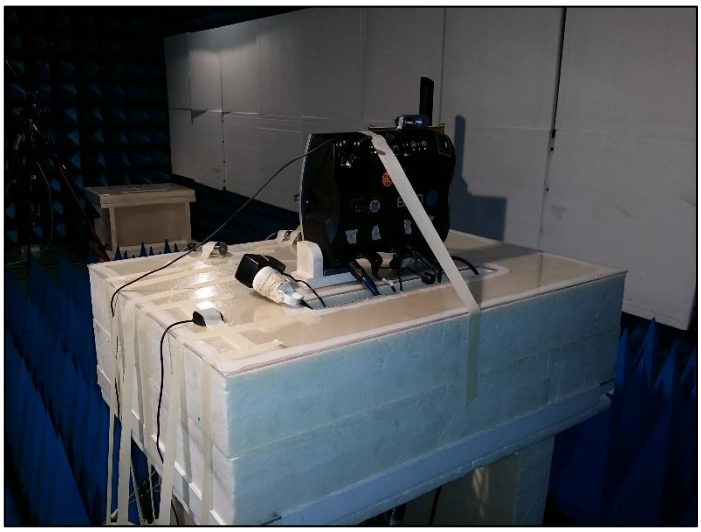


OATS – Configuration n°3
Test setup on OATS



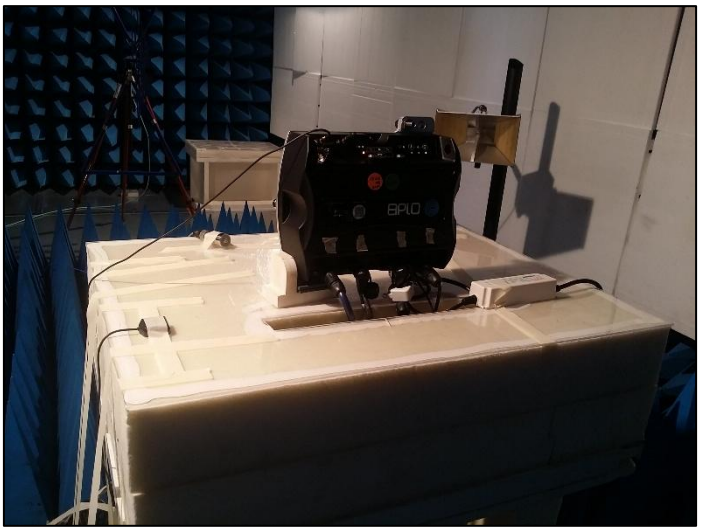
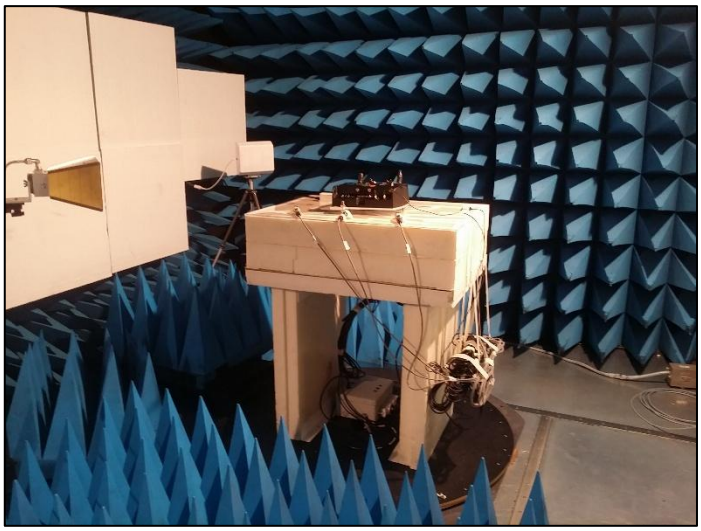
XY Plan



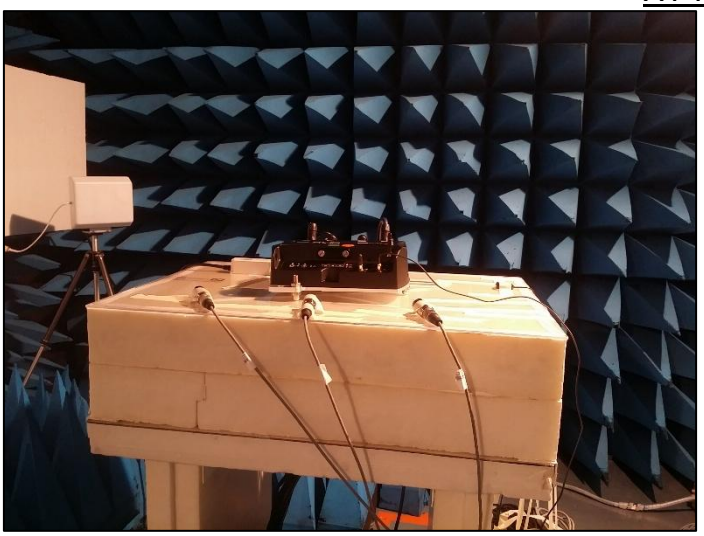
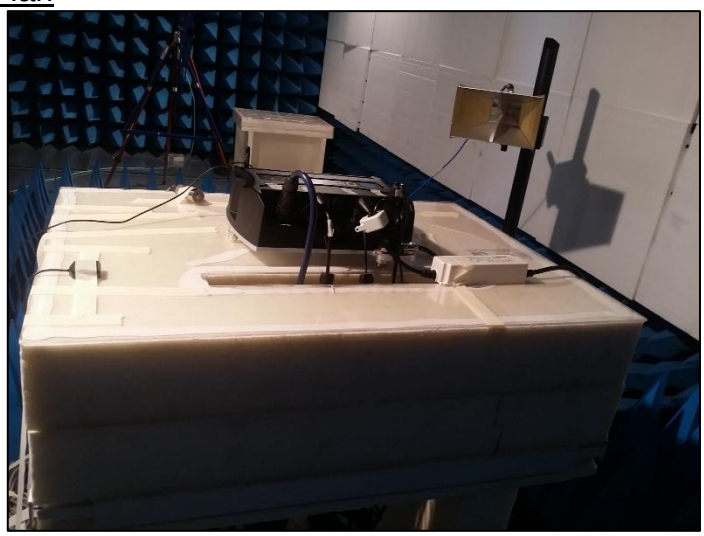


Z Plan

Test setup in anechoic chamber < 1GHz (Configuration n°2)

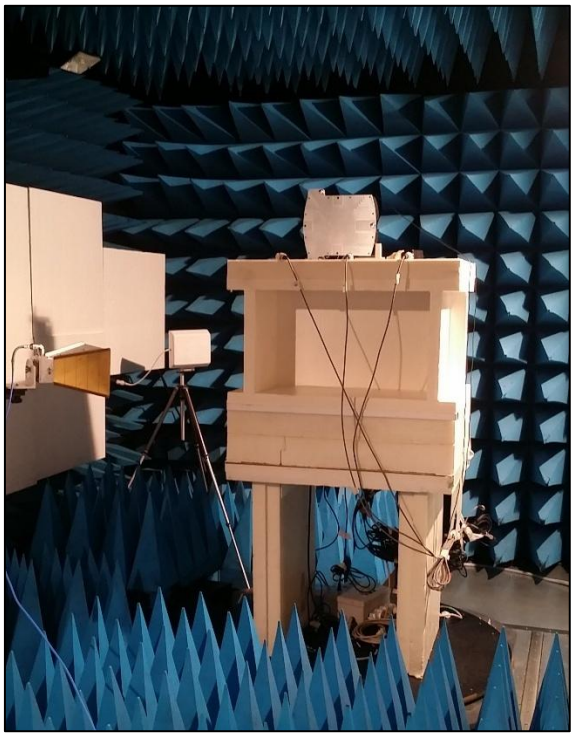
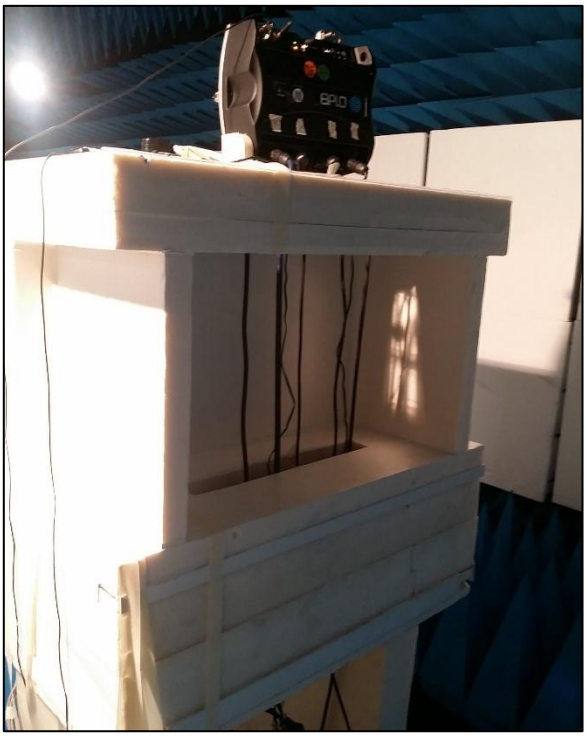



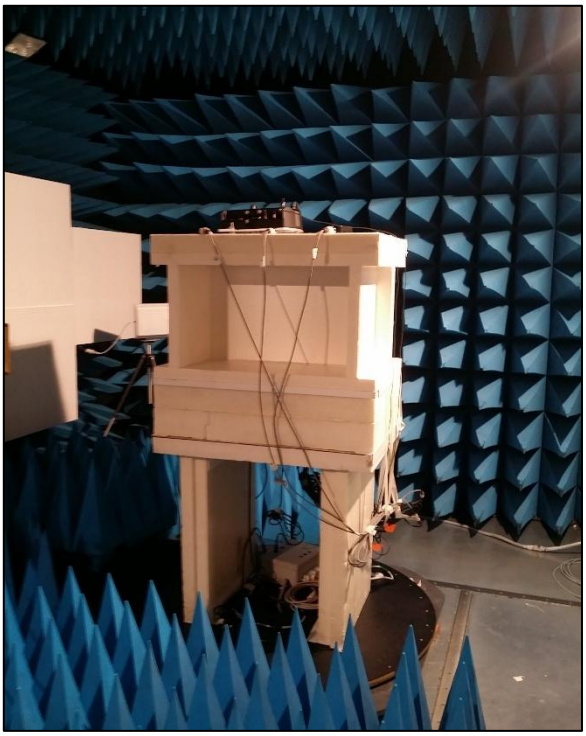
XY Plan

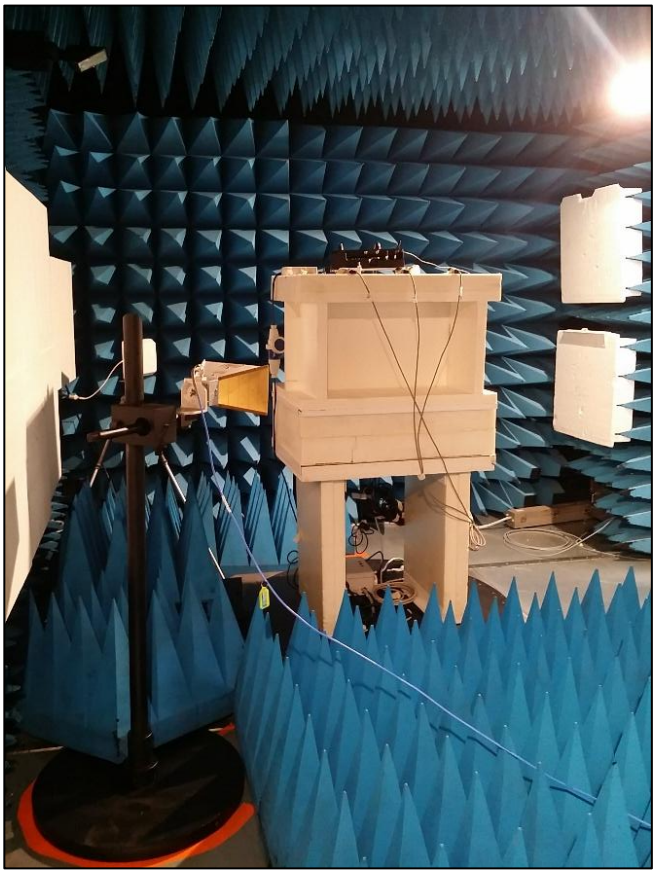
Z Plan

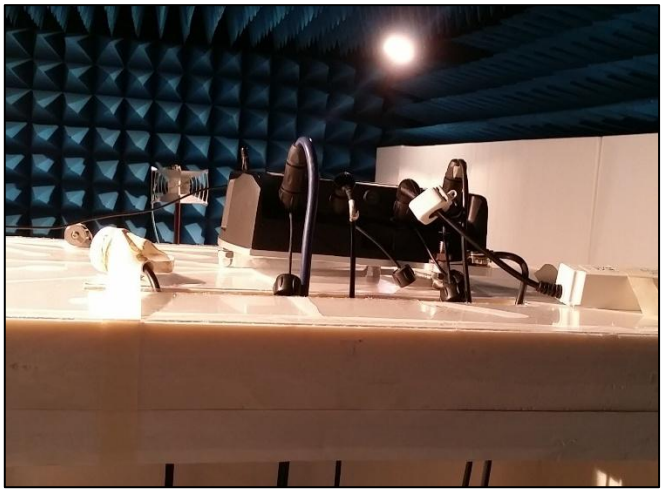
Test setup in anechoic chamber < 1GHz (Configuration n°3)



Configuration n°2
Test setup in anechoic chamber >1GHz



Configuration n°3
Test setup in anechoic chamber >1GHz

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 25GHz:
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

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/16	06/18
Cable	-	-	A5329069	11/15	11/16
Cable (OATS)	-	-	A5329623	01/16	01/17
Radiated emission comb generator	BARDET	-	A3169050	-	-
OATS	-	-	F2000409	08/16	08/17
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	08/16	08/17
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	10/16	10/17
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	LCIE	-	F2000438	-	-

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Bi-log	CHASE	CBL6111A	C2040172	06/16	06/18
Cable Measure @3m	-	-	A5329206	04/16	04/17
Cable	-	-	A5329590	09/16	09/17
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206022	08/16	08/17
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371	-	-
Table	LCIE	-	F2000461	-	-
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444	-	-
Antenna horn 18GHz	AINFO	LB	C2042055	08/16	08/17
Amplifier 1-13GHz	LCIE SUD EST		A7102067	04/16	04/17
Cable Measure @1m	STORMFLEX	_	A5329680	01/16	01/17
Cable Measure Analyzer-Amplifier SMA	STORMFLEX	_	A5329681	05/16	05/17
Cable Measure @1m	STORMFLEX	_	A5329682	01/16	01/17

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	Configuration ID	Comments
Emr# 1	H & V	TX	Axis XY	2	See annex 1
Emr# 2	H & V	TX	Axis Z	2	See annex 1
Emr# 3	H & V	TX	Axis XY	3	See annex 1
Emr# 4	H & V	TX	Axis Z	3	See annex 1

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

See graphs for 1GHz-6GHz:

Graph identifier	Polarization	Mode	EUT position	Configuration ID	Comments
Emr# 5	H & V	TX	Axis XY	2	See annex 1
Emr# 6	H & V	TX	Axis Z	2	See annex 1
Emr# 7	H & V	TX	Axis XY	3	See annex 1
Emr# 8	H & V	TX	Axis Z	3	See annex 1

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)
32.567	15	QP	V	237	144	18.7	33.7	40	**-6.3**
36.137	9.2	QP	V	253	111	16.7	25.9	40	**-14.1**
38.867	16.2	QP	V	240	298	15.3	31.5	40	**-8.5**
43.515	15.9	QP	V	132	100	12.6	28.5	40	**-11.5**
45.249	21.5	QP	V	0	100	11.6	33.1	40	**-6.9**
47.799	20.7	QP	V	0	100	10.4	31.1	40	**-8.9**
50.434	21.5	QP	V	96	144	9.2	30.7	40	**-9.3**
62.436	24.5	QP	V	310	262	7.4	31.9	40	**-8.1**
64.777	22.1	QP	V	155	195	7.5	29.6	40	**-10.4**
66.765	19.5	QP	V	260	163	7.6	27.1	40	**-12.9**
74.000	21.9	QP	V	282	213	8.1	30.0	40	**-10.0**
236.36	20.5	QP	V	235	303	14.3	34.8	46	**-11.2**
249.96	25.3	QP	V	38	100	15.4	40.7	46	**-5.3**
333.343	22.3	QP	V	160	100	17.5	39.8	46	**-6.2**
333.343	16.8	QP	V	220	100	17.5	34.3	46	**-11.7**
375.000	15.7	QP	H	203	100	18.9	34.6	46	**-11.4**
377.79	16	QP	V	180	110	18.9	34.9	46	**-11.1**
422.24	15.8	QP	H	236	272	20.2	36	46	**-10.0**
600.02	18.8	QP	V	170	291	24.3	43.1	46	**-2.9**

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 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.

Configuration Digital Device									
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)**
2200.670	39.5	Pk	V	0	150	-1.7	37.7	74.0	**-36.3**
2294.915	37.8	Pk	V	45	150	-1.5	36.3	74.0	**-37.7**
2388.661	38.9	Pk	V	55	150	-1.4	37.5	74.0	**-36.5**
2200.670	25.5	Av	V	0	150	-1.7	23.8	54.0	**-30.2**
2294.915	26.4	Av	V	45	150	-1.5	24.9	54.0	**-29.1**
2388.661	25.6	Av	V	55	150	-1.4	24.2	54.0	**-29.8**

Configuration Radio Device									
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)**
4824.012	44.9	Pk	V	0	150	4.5	49.4	74.0	**-24.6**
4874.016	45.6	Pk	V	430	150	4.6	50.2	74.0	**-23.8**
4924.005	50.2	Pk	V	323	150	4.7	54.9	74.0	**-19.1**
4824.012	30.1	Av	V	0	150	4.5	34.6	54.0	**-19.4**
4874.016	29.8	Av	V	430	150	4.6	34.4	54.0	**-19.6**
4924.005	29.8	Av	V	323	150	4.7	34.5	54.0	**-19.5**

Note: Measures have been done at 3m distance.

4.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

5. BANDWIDTH (15.247)

5.1. TEST CONDITIONS

Date of test	:	September 2, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	998
Relative humidity (%)	:	43
Ambient temperature (°C)	:	22

5.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.
Offset: Attenuator+cable 11.5dB

☐ ***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.

5.3. TEST EQUIPMENT LIST

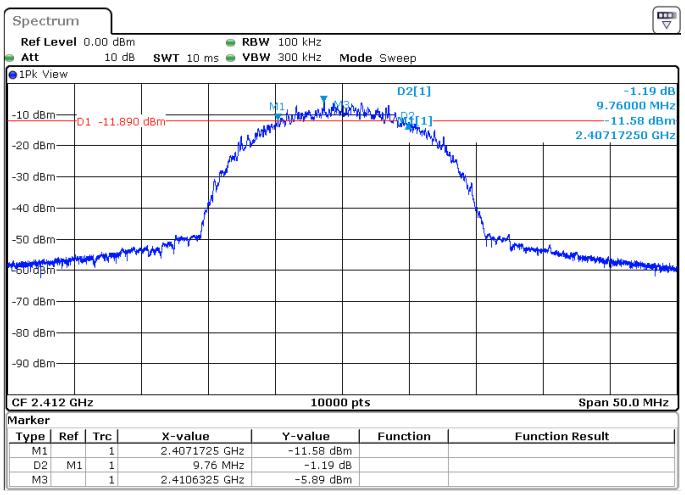
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable 40GHz 2m coudé		-	A5329720	05/16	05/17
Attenuator 10dB	AEROFLEX		A7122267	06/16	06/17
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16

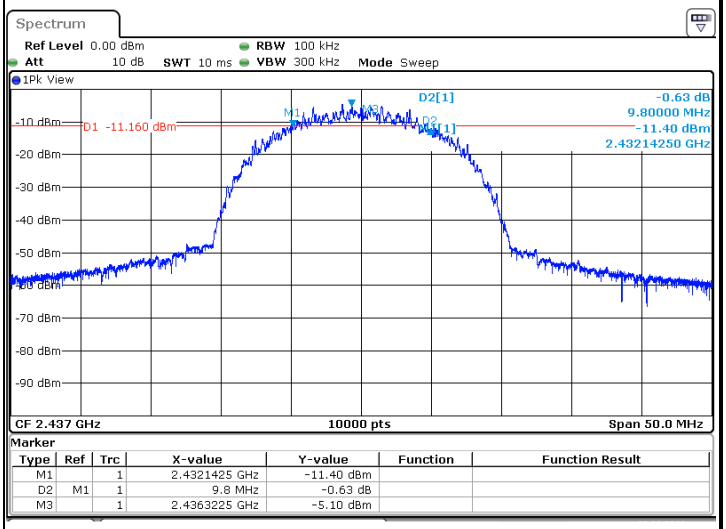
5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

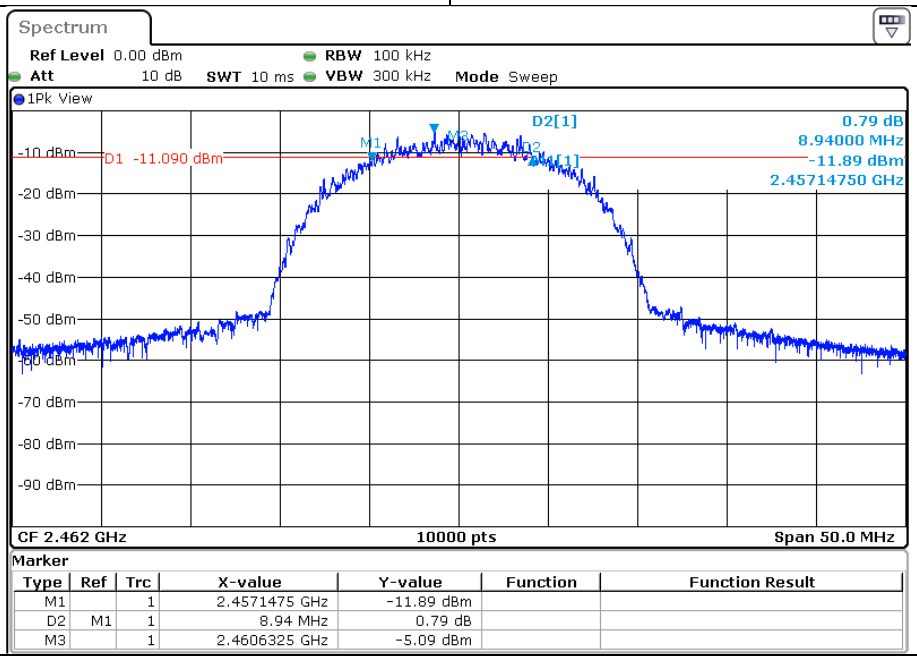
☑ None ☐ Divergence:

5.5. TEST SEQUENCE AND RESULTS

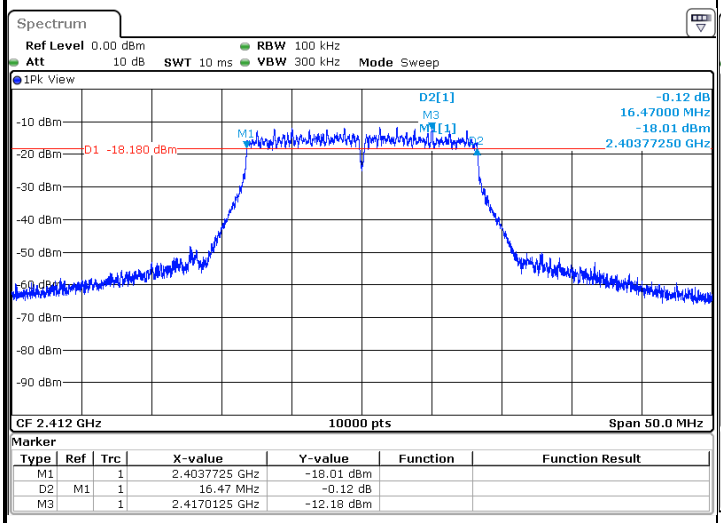
802.11.b			
Channel	**Channel Frequency (MHz)**	**6dB Bandwidth (MHz)**	**Bandwidth Limit (MHz)**
Cmin	2412	**9.8**	**>0.5**
Cmid	2437	**9.8**	**>0.5**
Cmax	2462	**8.9**	**>0.5**

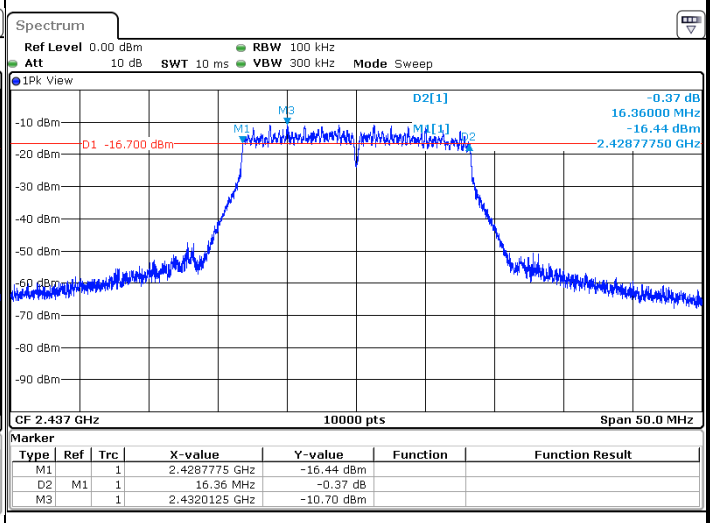


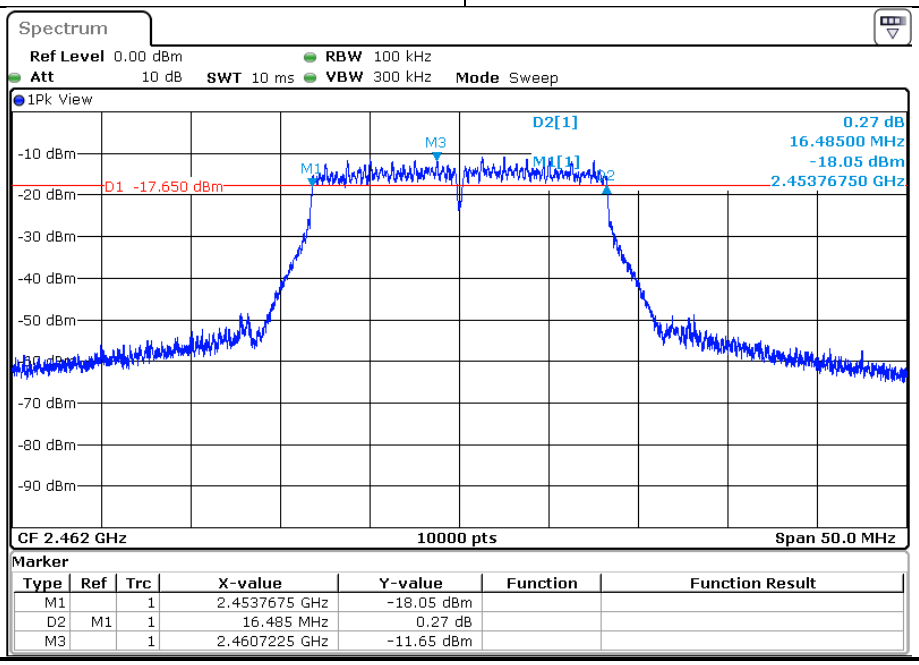




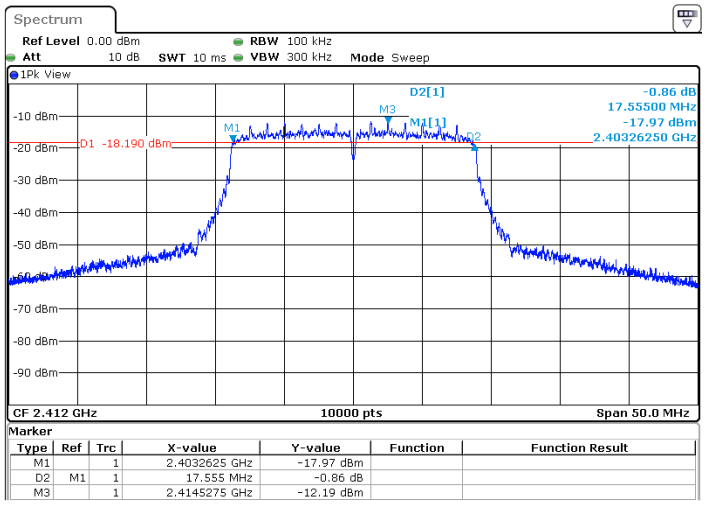
802.11.g			
Channel	**Channel Frequency (MHz)**	**6dB Bandwidth (MHz)**	**Bandwidth Limit (MHz)**
Cmin	2412	**16.5**	**>0.5**
Cmid	2437	**16.4**	**>0.5**
Cmax	2462	**16.5**	**>0.5**

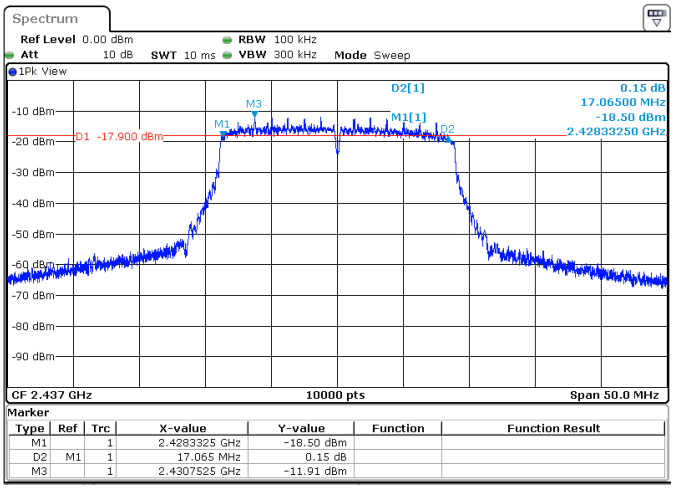


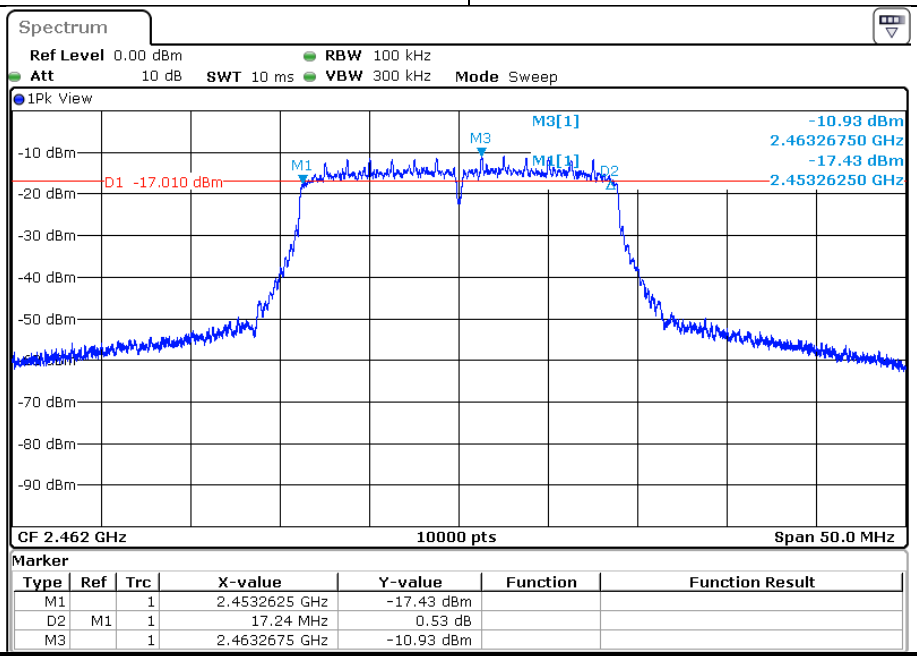




802.11.HT20			
Channel	**Channel Frequency (MHz)**	**6dB Bandwidth (MHz)**	**Bandwidth Limit (MHz)**
Cmin	2412	**17.6**	**>0.5**
Cmid	2437	**17.1**	**>0.5**
Cmax	2462	**17.2**	**>0.5**







5.1. CONCLUSION

Bandwidth measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

6. MAXIMUM PEAK OUTPUT POWER (15.247)

6.1. TEST CONDITIONS

Date of test	:	September 2, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	998
Relative humidity (%)	:	43
Ambient temperature (°C)	:	22

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 11.5dB

☐ ***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

- ***☑PKPM1 Peak power meter method §9.1.2 (DTS Measurement Guidance)***

6.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122166	11/15	11/16
Attenuator 10dB	AEROFLEX		A7122268	06/16	06/17
Cable Measure Analyzer-Amplifier SMA	STORMFLEX	0	A5329681	05/16	05/17
Cable			A5329188	11/15	11/16
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	08/16	08/17
RF Power sensor	DARE	RPR3006W	A1503029	01/16	01/17
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16

6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

6.5. TEST SEQUENCE AND RESULTS

Modulation: Modulation: **802.11.b**

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin (1)	2412	**16.2**	30.0
Cmid (6)	2437	**16.1**	30.0
Cmax (11)	2462	**15.6**	30.0

Modulation: Modulation: **802.11.g**

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin (1)	2412	**13.6**	30.0
Cmid (6)	2437	**13.4**	30.0
Cmax (11)	2462	**13.0**	30.0

Modulation: Modulation: **802.11.n**

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin (1)	2412	**13.0**	30.0
Cmid (6)	2437	**12.9**	30.0
Cmax (11)	2462	**12.4**	30.0

6.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

7. POWER SPECTRAL DENSITY (15.247)

7.1. TEST CONDITIONS

Date of test	:	September 2, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	990
Relative humidity (%)	:	35
Ambient temperature (°C)	:	21

7.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency.
Offset: Attenuator+cable 11.5dB

☐ ***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.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.1. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

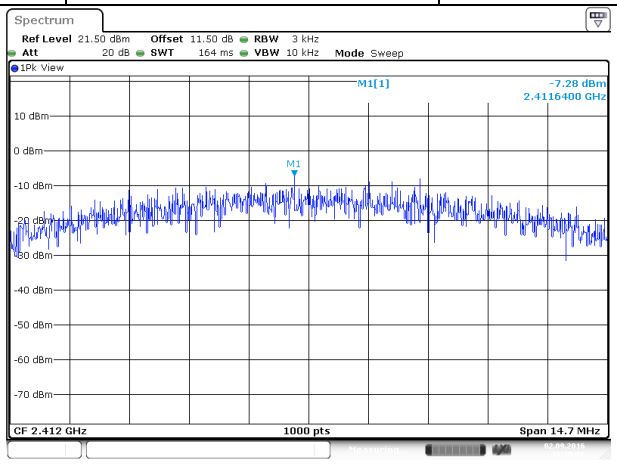
7.2. TEST EQUIPMENT LIST

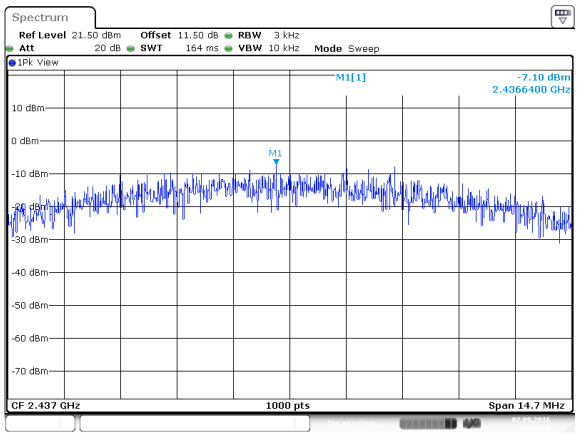
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable 40GHz 2m coudé		-	A5329720	05/16	05/17
Attenuator 10dB	AEROFLEX		A7122267	06/16	06/17
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	11/16

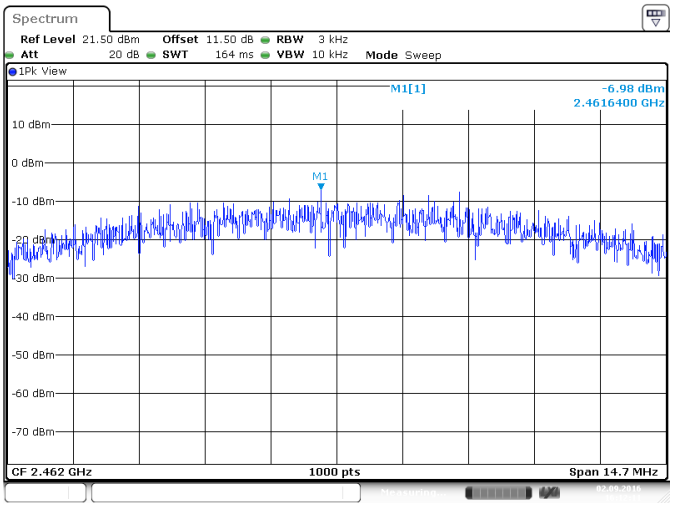
7.3. TEST SEQUENCE AND RESULTS

Modulation: **802.11.b**

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2412	**-7.3**	8.0
Cmid	2437	**-7.1**	8.0
Cmax	2462	**-7.0**	8.0

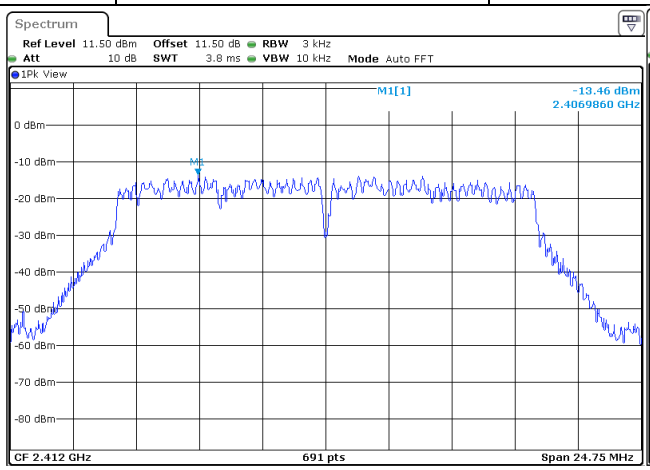


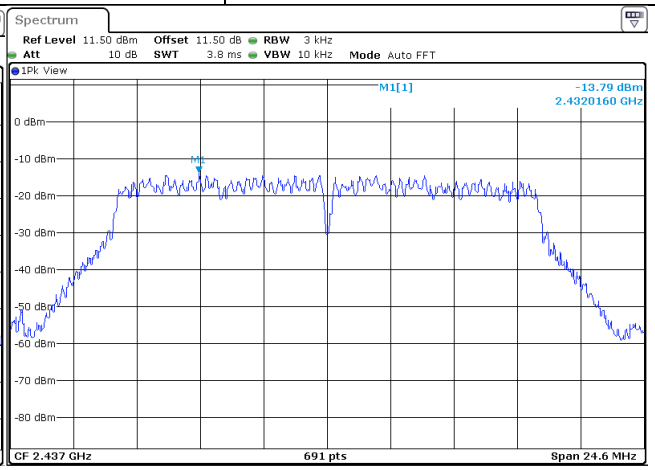


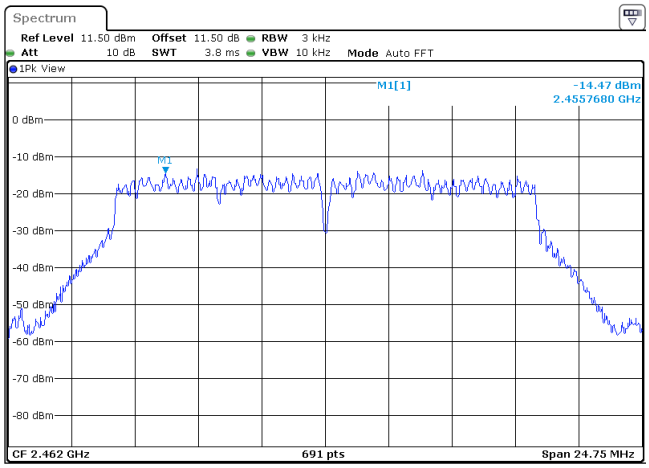


Modulation: **802.11.g**

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2412	**-13.5**	8.0
Cmid	2437	**-13.8**	8.0
Cmax	2462	**-14.6**	8.0

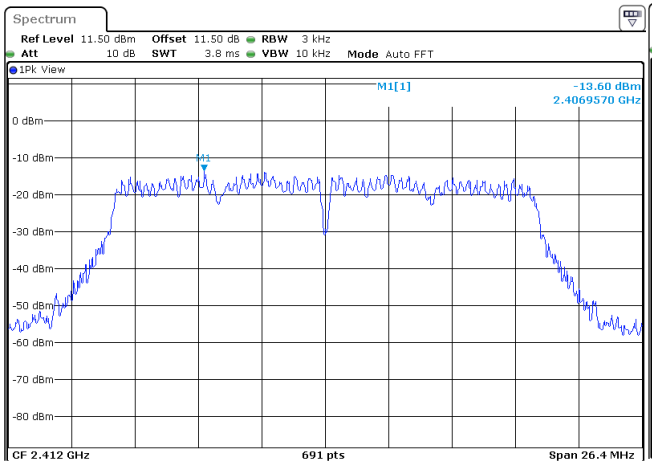


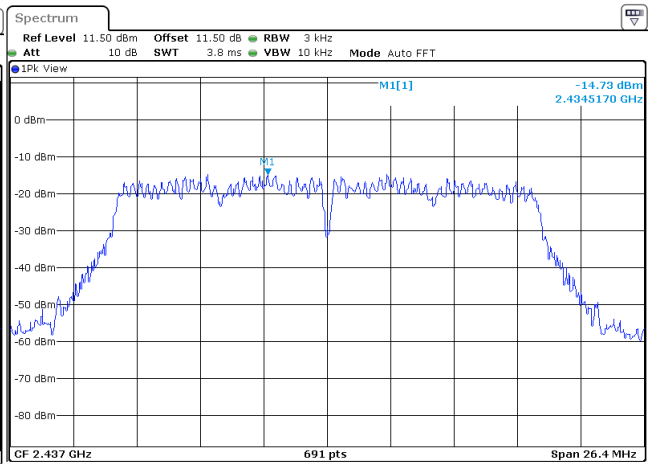


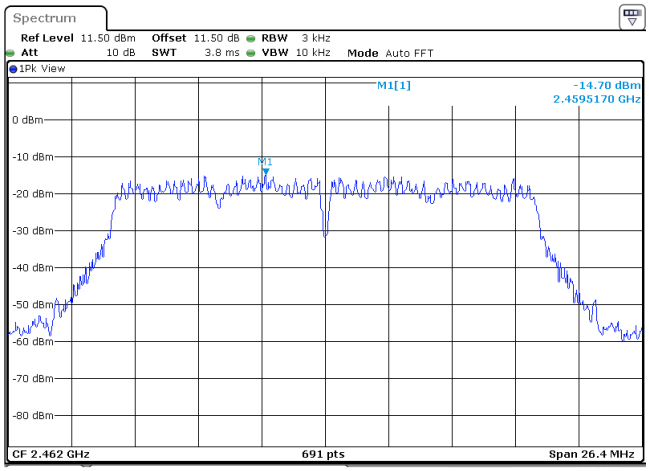


Modulation: **802.11.n HT20**

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2412	**-13.6**	8.0
Cmid	2437	**-14.7**	8.0
Cmax	2462	**-14.7**	8.0







7.1. CONCLUSION

Power Spectral Density measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

8. BAND EDGE MEASUREMENT (15.247)

8.1. TEST CONDITIONS

Date of test	:	September 14, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	991
Relative humidity (%)	:	45
Ambient temperature (°C)	:	21

8.2. LIMIT

RF antenna conducted test: § 11 (DTS Measurement Guidance)
Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB. *For -20dBc limit, lowest power output level is considered, worst case.*

Radiated emission test: § 12 (DTS Measurement Guidance)
Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See results in Radiated emissions section before.

8.3. SETUP

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

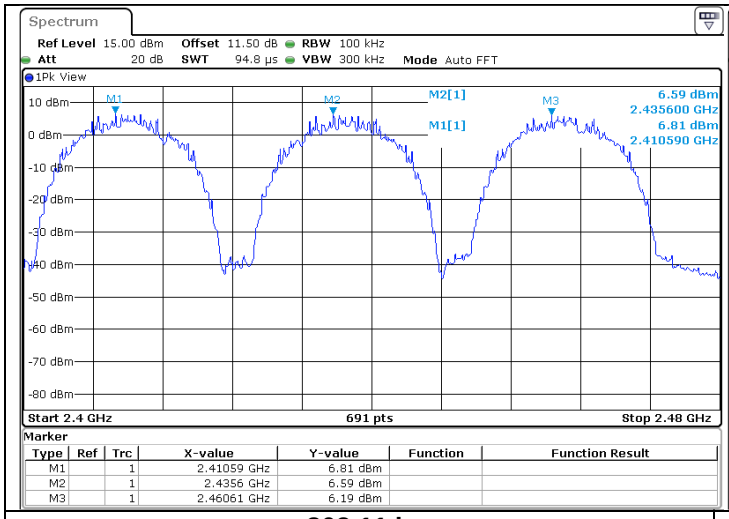
8.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122166	11/15	11/16
Attenuator 10dB	AEROFLEX		A7122268	06/16	06/17
Cable Measure Analyzer-Amplifier SMA	STORMFLEX	0	A5329681	05/16	05/17
Cable			A5329188	11/15	11/16
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	08/16	08/17
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16

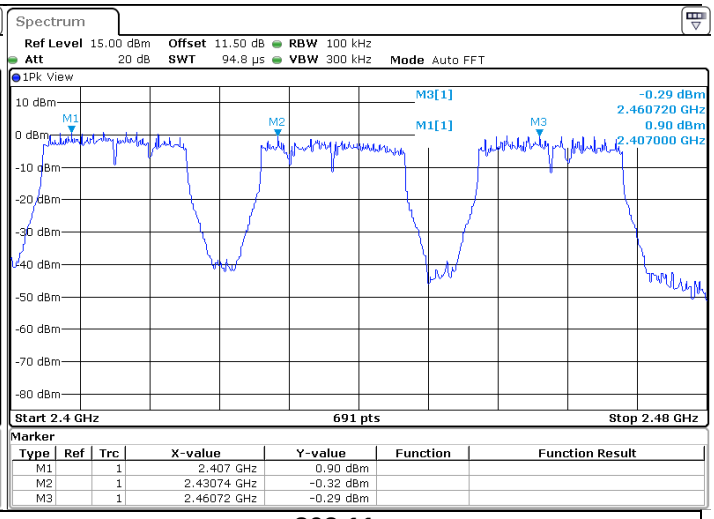
8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

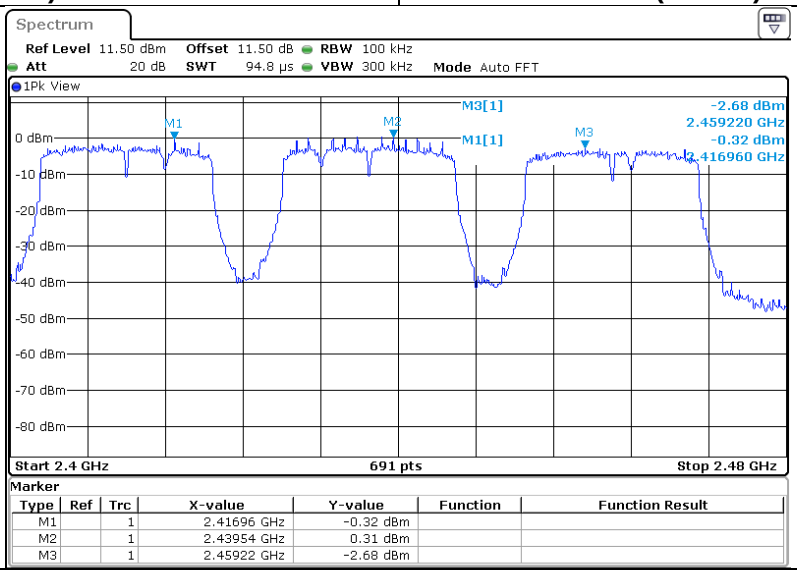
8.6. TEST SEQUENCE AND RESULTS



802.11.b
Limit (-20dBc) : -13.8 dBm

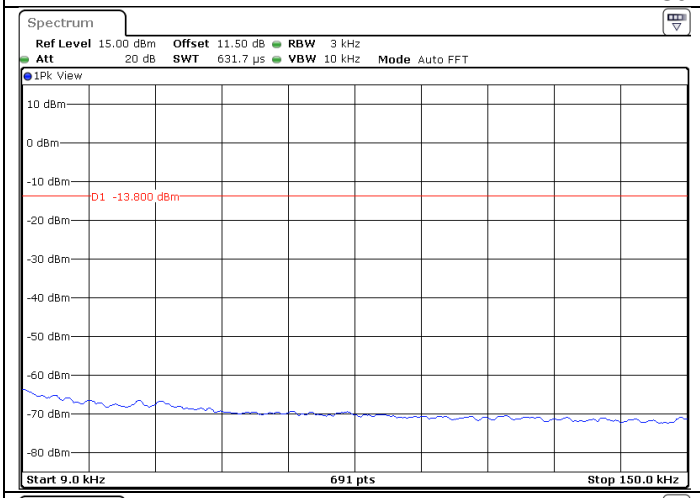


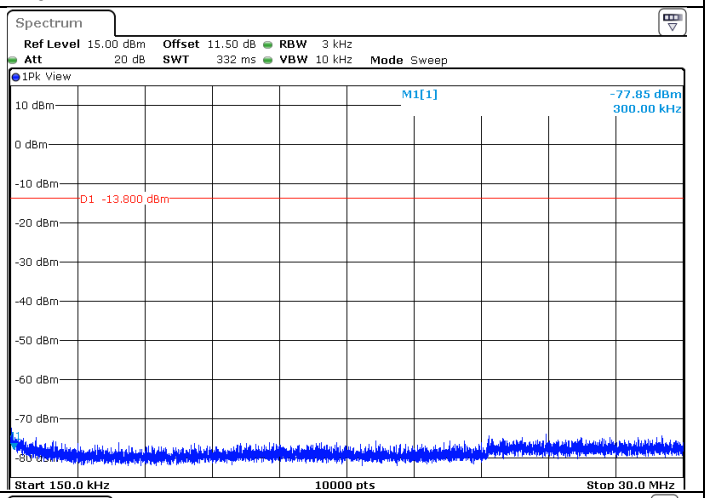
802.11.g
Limit(-20dBc) : -20.3 dBm

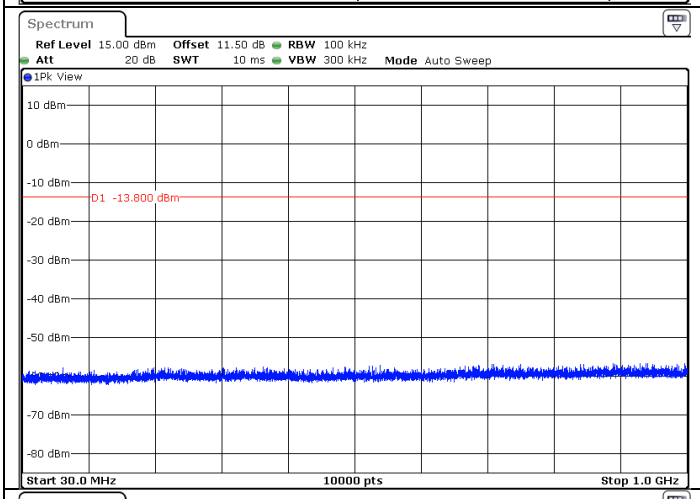


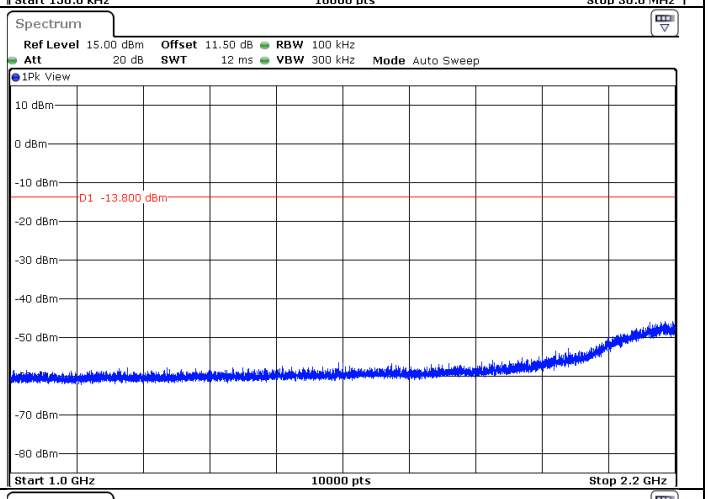
802.11.n HT20
Limit(-20dBc) : -22.7dBm

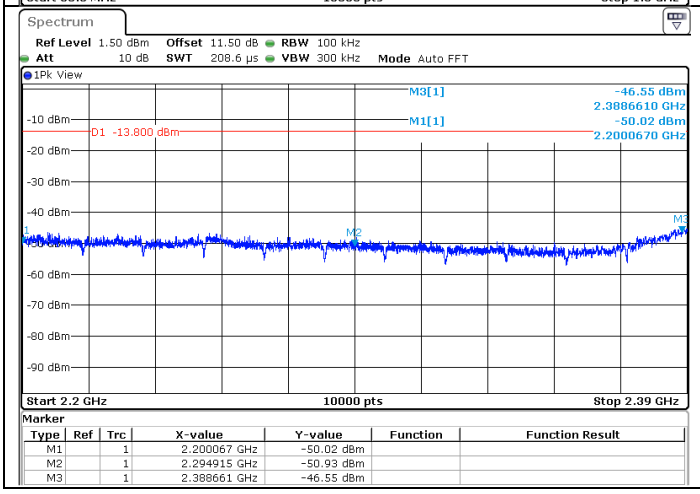
802.11.b





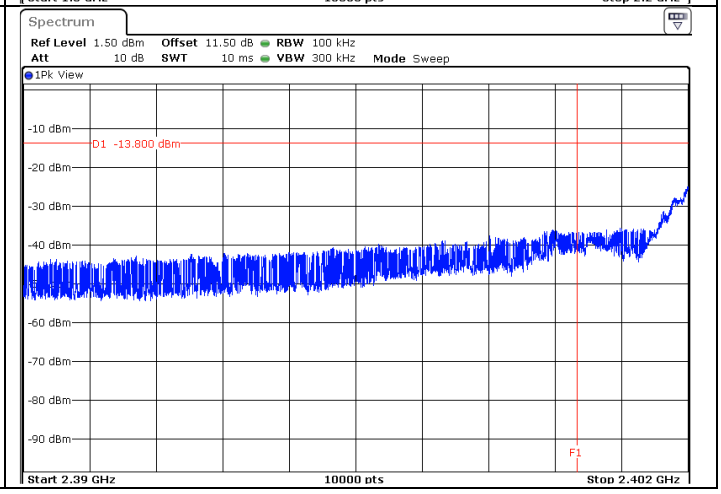




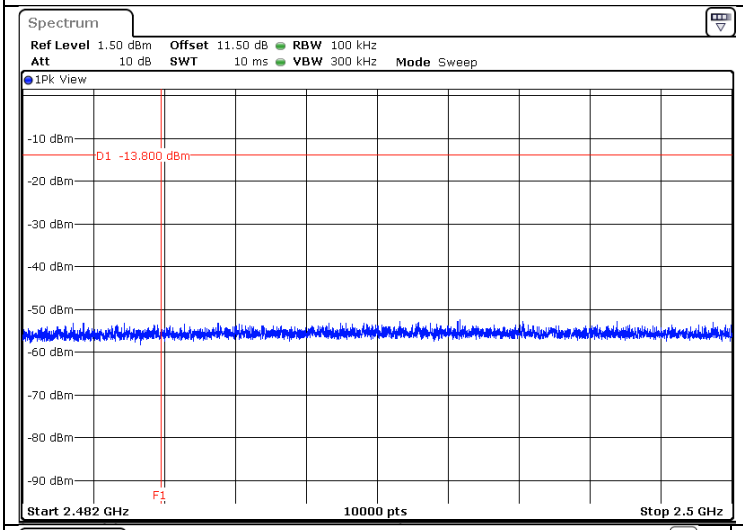


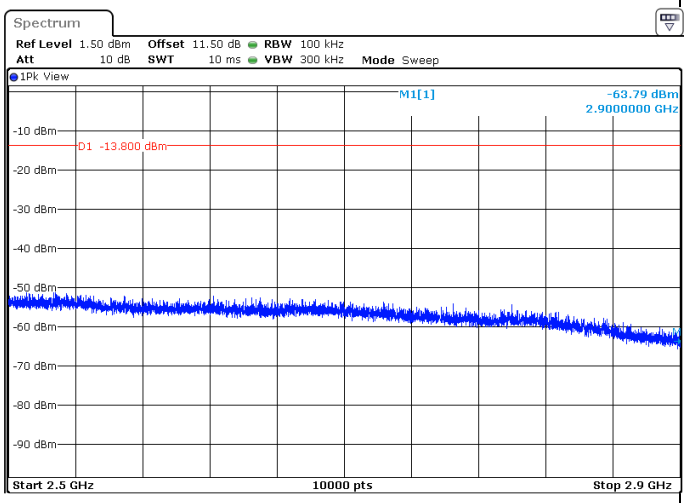
Marker

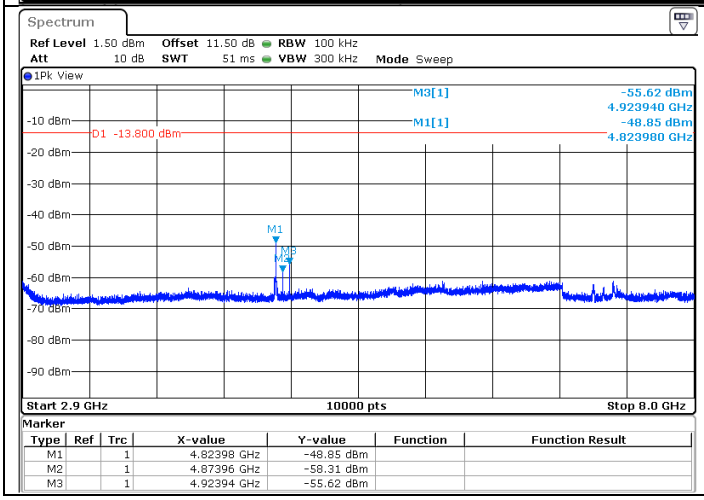
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.200067 GHz	-50.02 dBm		
M2		1	2.294915 GHz	-50.93 dBm		
M3		1	2.388661 GHz	-46.55 dBm		



802.11.b

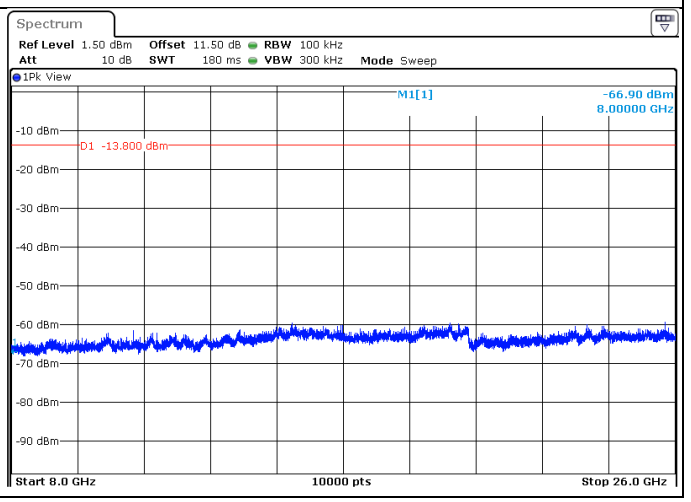




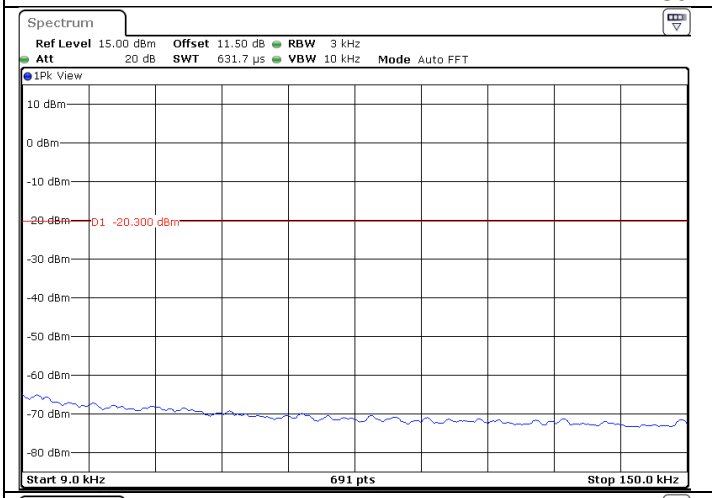


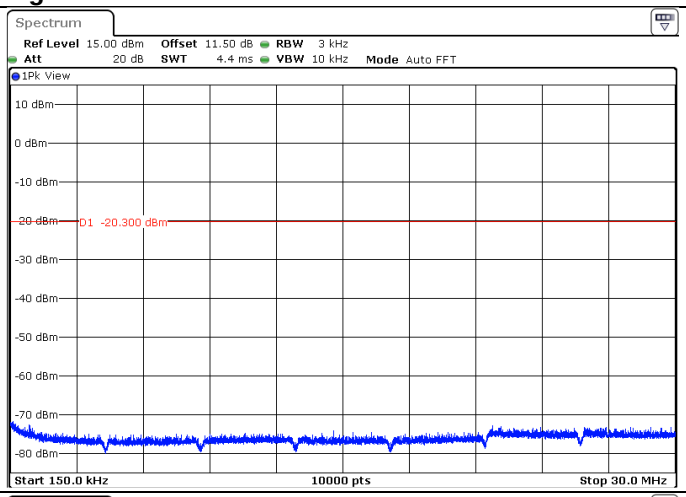
Marker

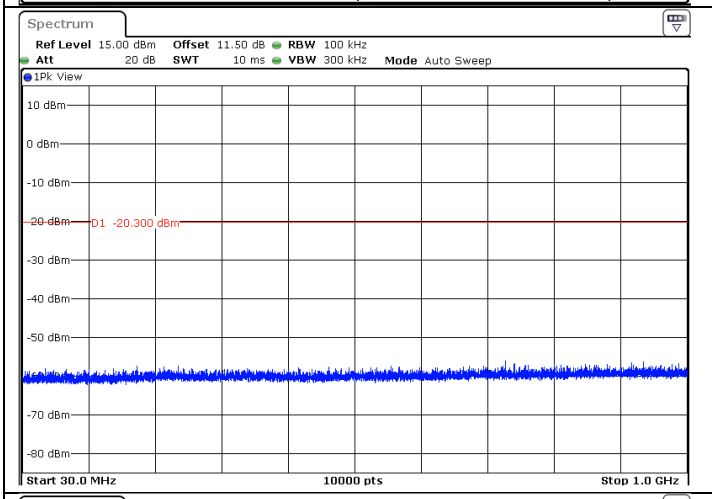
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	4.82398 GHz	-48.85 dBm		
M2		1	4.87396 GHz	-58.31 dBm		
M3		1	4.92394 GHz	-55.62 dBm		

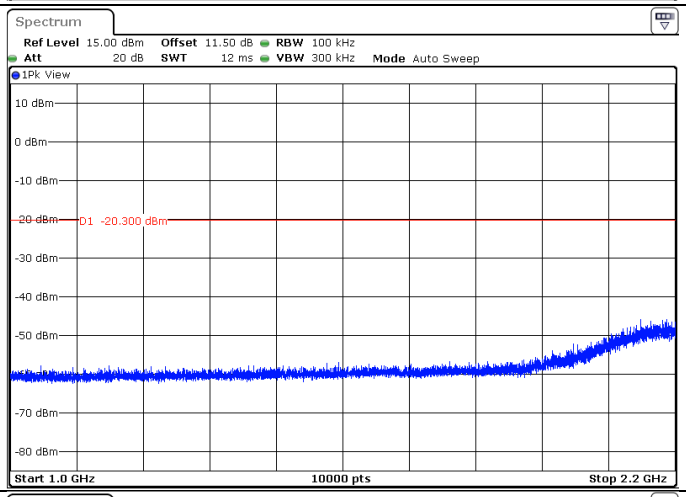


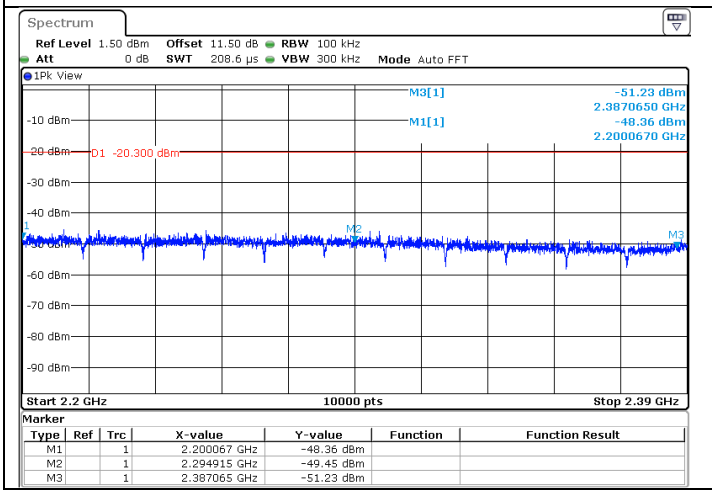
802.11.g





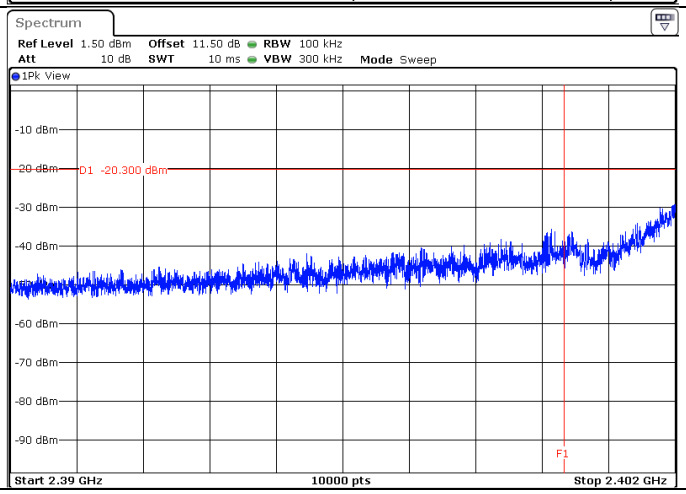






Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.200067 GHz	-48.36 dBm		
M2		1	2.294915 GHz	-49.45 dBm		
M3		1	2.387065 GHz	-51.23 dBm		



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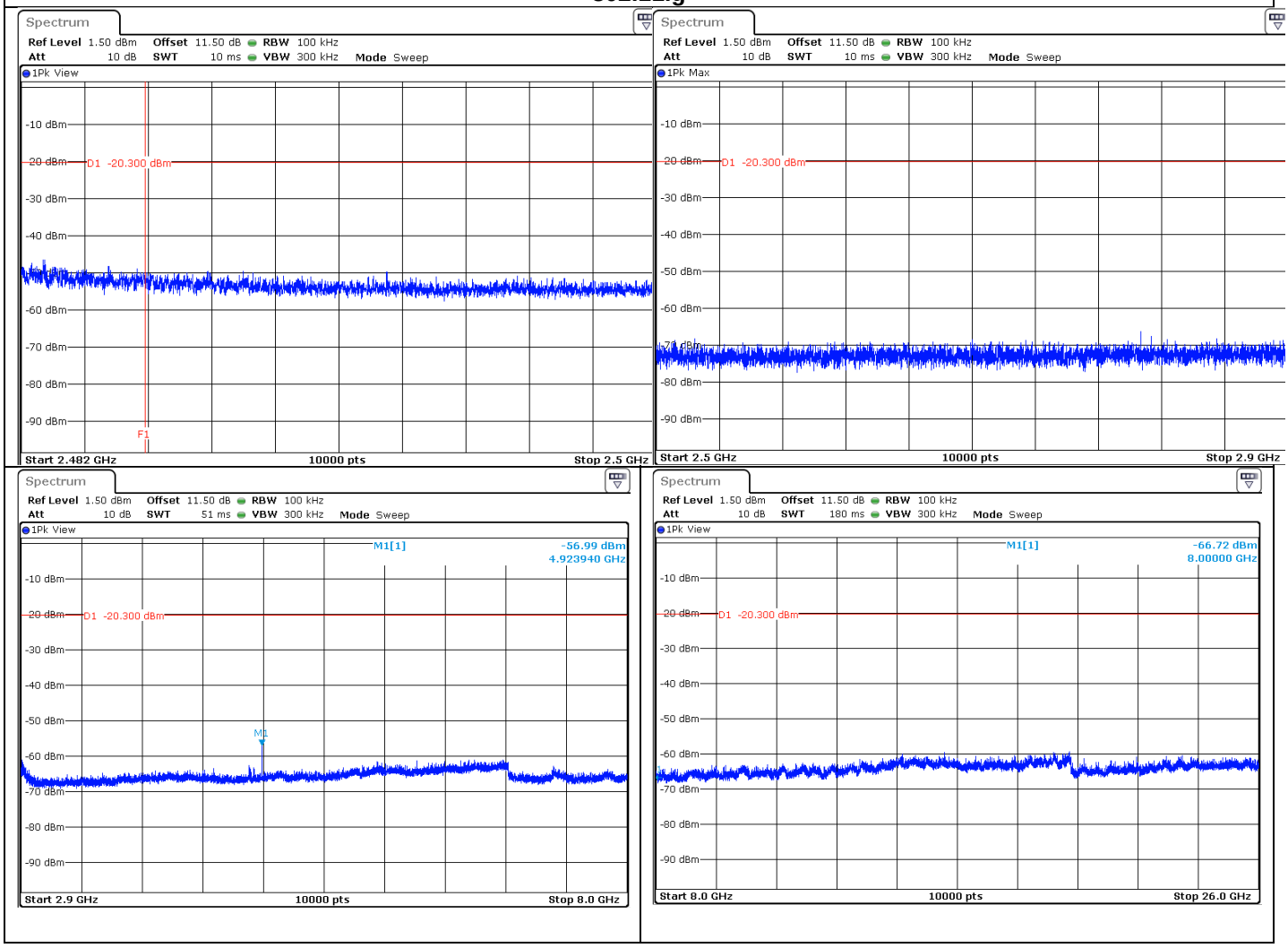
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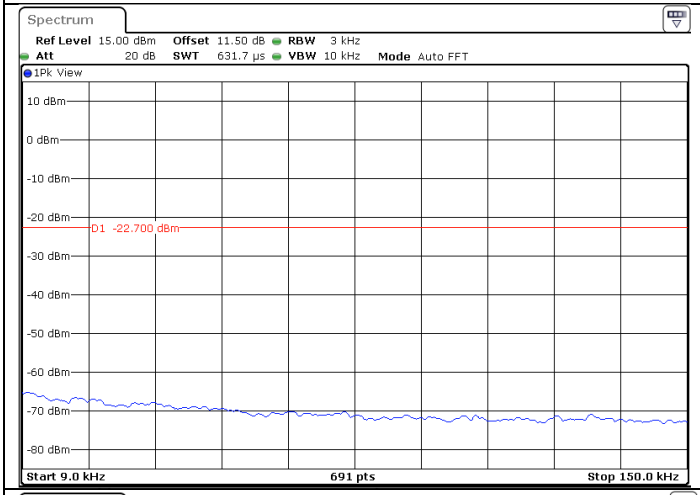
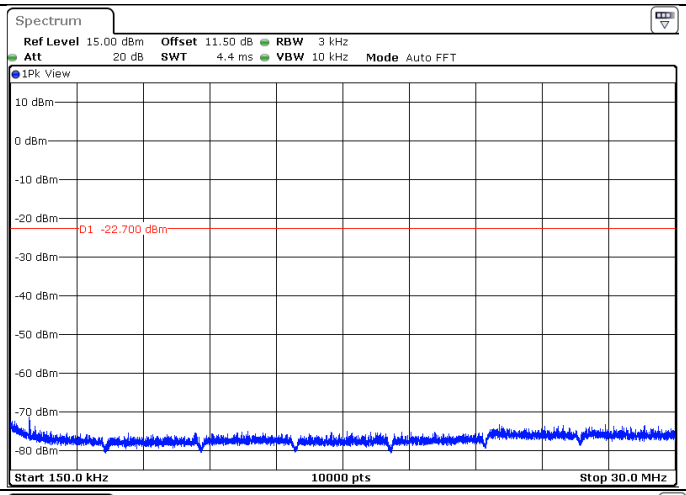
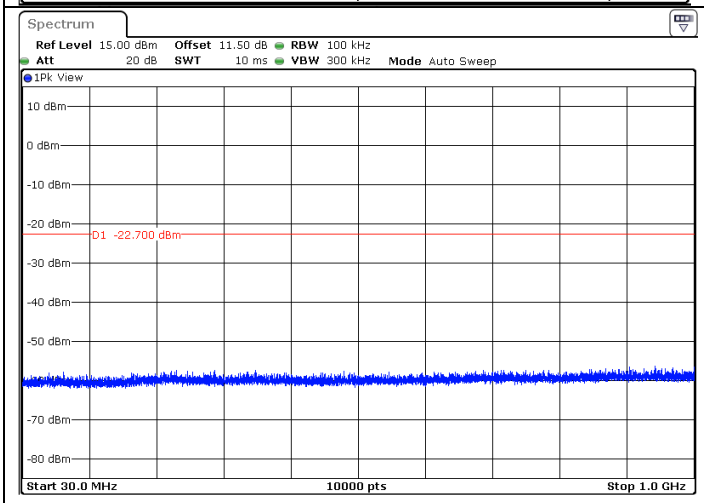
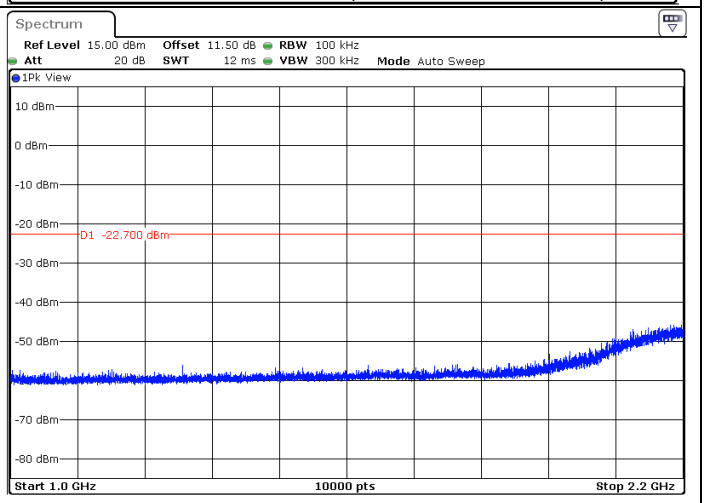
Ref Level 1.50 dBm Offset 11.50 dB RBW 100 kHz
Att 10 dB SWT 10 ms VBW 300 kHz Mode Sweep
1Pk View
D1 -20.300 dBm
F1
Start 2.482 GHz 10000 pts Stop 2.5 GHz
Spectrum
Ref Level 1.50 dBm Offset 11.50 dB RBW 100 kHz
Att 10 dB SWT 10 ms VBW 300 kHz Mode Sweep
1Pk Max
D1 -20.300 dBm
Start 2.5 GHz 10000 pts Stop 2.9 GHz
Spectrum
Ref Level 1.50 dBm Offset 11.50 dB RBW 100 kHz
Att 10 dB SWT 51 ms VBW 300 kHz Mode Sweep
1Pk View
M1[1] -56.99 dBm 4.923940 GHz
D1 -20.300 dBm
Start 2.9 GHz 10000 pts Stop 8.0 GHz
Spectrum
Ref Level 1.50 dBm Offset 11.50 dB RBW 100 kHz
Att 10 dB SWT 180 ms VBW 300 kHz Mode Sweep
1Pk View
M1[1] -66.72 dBm 8.00000 GHz
D1 -20.300 dBm
Start 8.0 GHz 10000 pts Stop 26.0 GHz

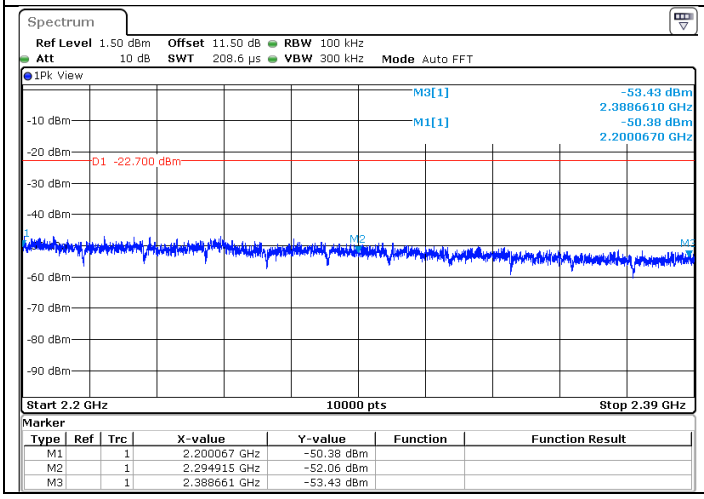
802.11.n HT20





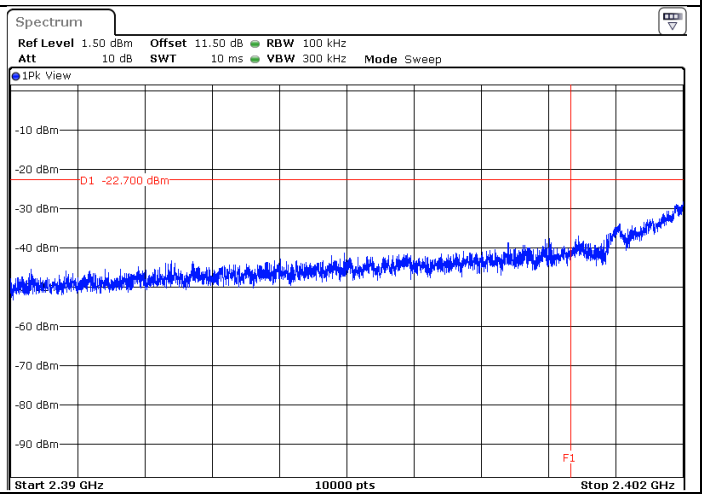




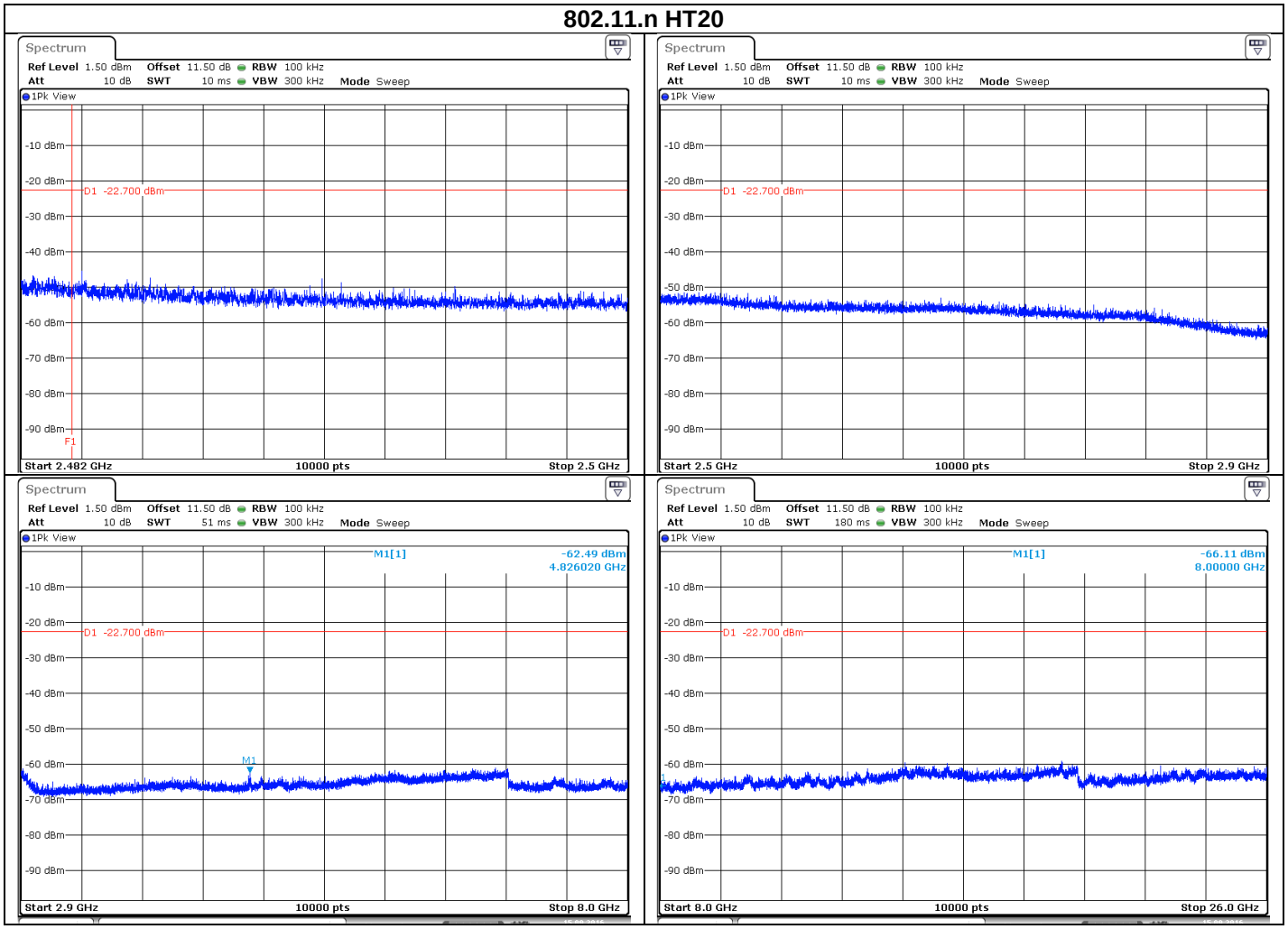


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.200067 GHz	-50.38 dBm		
M2		1	2.294915 GHz	-52.06 dBm		
M3		1	2.388661 GHz	-53.43 dBm		



802.11.n HT20



8.7. CONCLUSION

Band Edge Measurement performed on the sample of the product VMT1002000T, SN: 10067, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

9. OCCUPIED BANDWIDTH

9.1. TEST CONDITIONS

Date of test	:	September 27, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	990
Relative humidity (%)	:	31
Ambient temperature (°C)	:	21

9.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.
Offset: Attenuator+cable 21.6dB

☐ ***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:

a) RBW shall be in the range of 1% to 5% of the anticipated occupied bandwidth
b) Set the video bandwidth (VBW) ≥ 3 x RBW
c) SPAN = Capture all products of the modulation process
d) Detector = Peak.
e) Trace mode = max hold.
f) Sweep = auto couple.
g) Allow the trace to stabilize.
h) OBW 99% function of spectrum analyzer used

9.3. TEST EQUIPMENT LIST

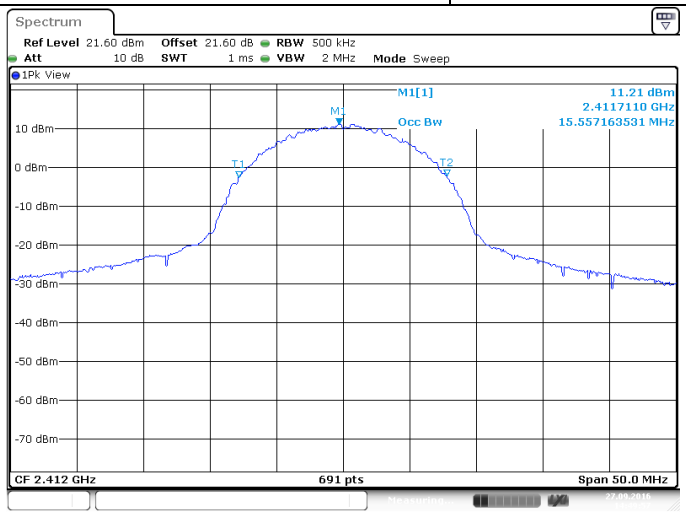
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122166	11/15	11/16
Attenuator 10dB	AEROFLEX		A7122268	06/16	06/17
Cable Measure Analyzer-Amplifier SMA	STORMFLEX	0	A5329681	05/16	05/17
Cable			A5329188	11/15	11/16
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	08/16	08/17
Thermo-hygrometer (PM2)	OREGON	BAR916HG-G	B4206011	09/15	09/16

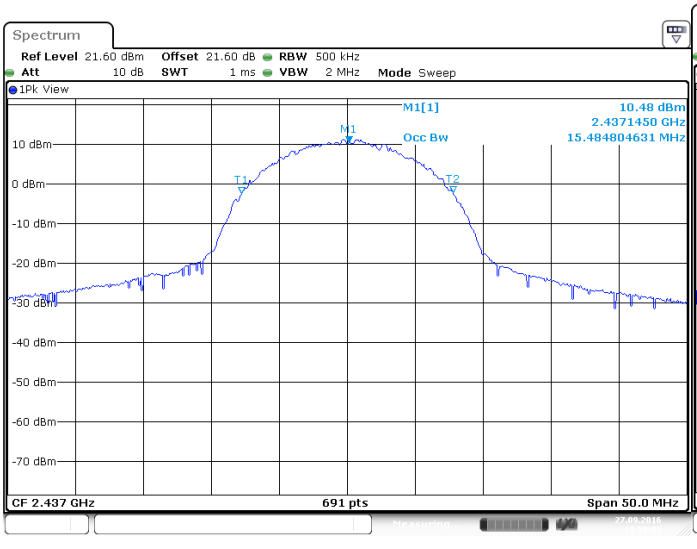
9.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

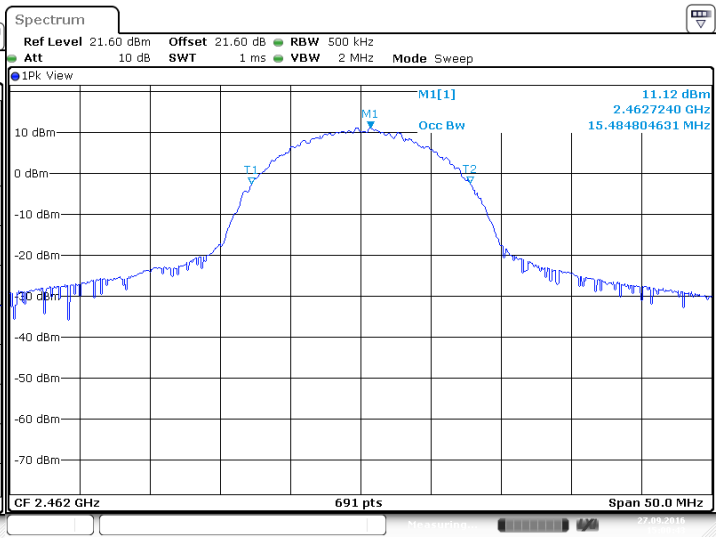
☑ None ☐ Divergence:

9.5. TEST SEQUENCE AND RESULTS

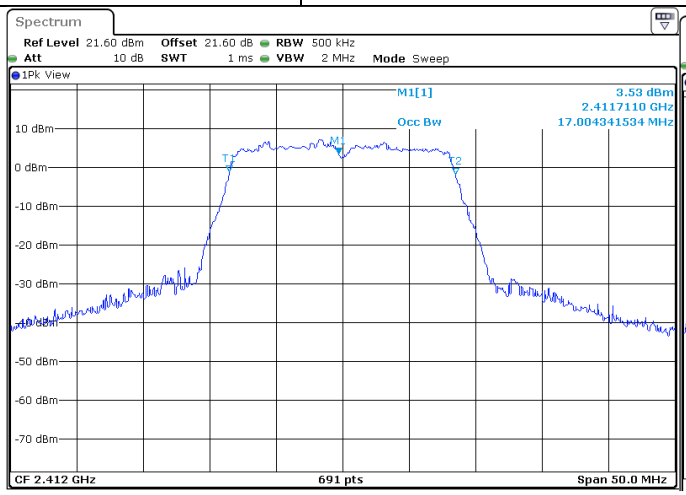
802.11.b		
Channel	**Channel Frequency (MHz)**	**99% Occupied Bandwidth (MHz)**
Cmin	2412	**15.558**
Cmid	2437	**15.485**
Cmax	2462	**15.485**

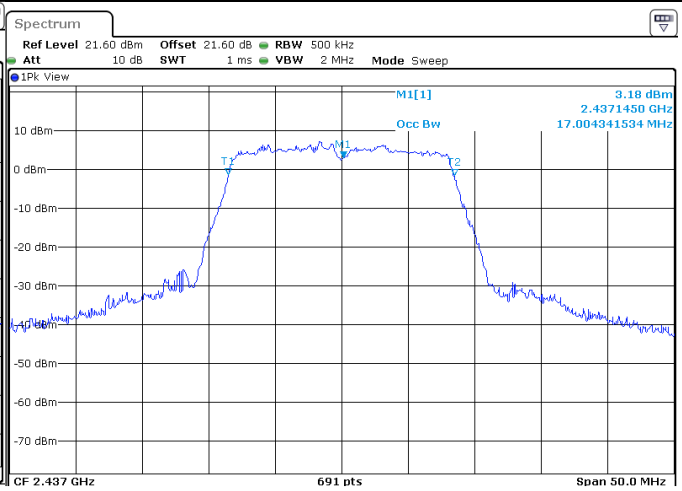


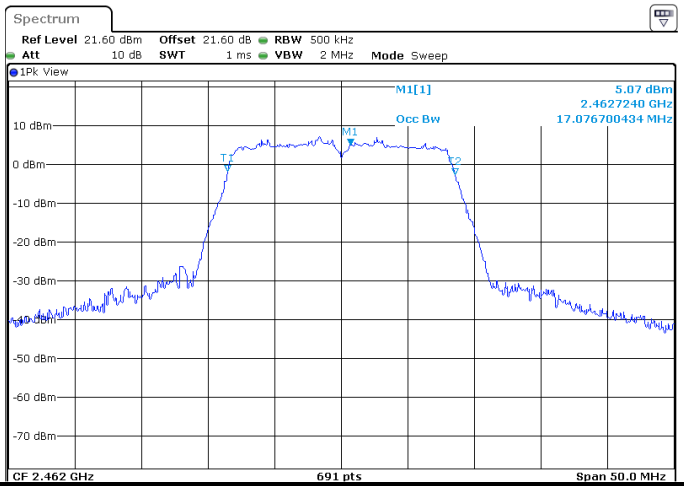




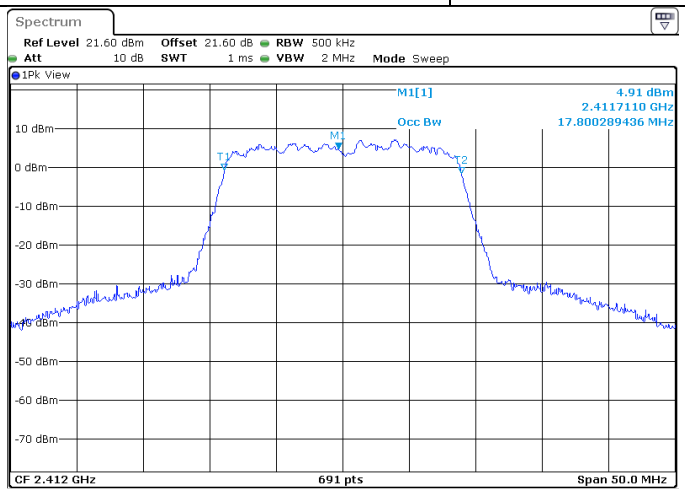
802.11.g		
Channel	**Channel Frequency (MHz)**	**99% Occupied Bandwidth (MHz)**
Cmin	2412	**17.005**
Cmid	2437	**17.005**
Cmax	2462	**17.077**

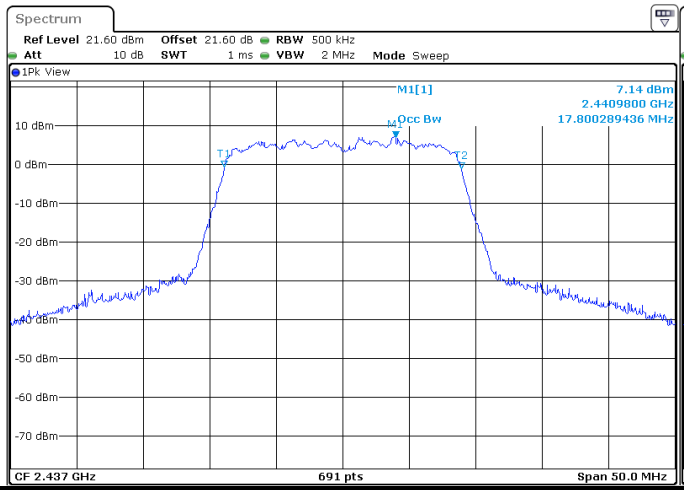


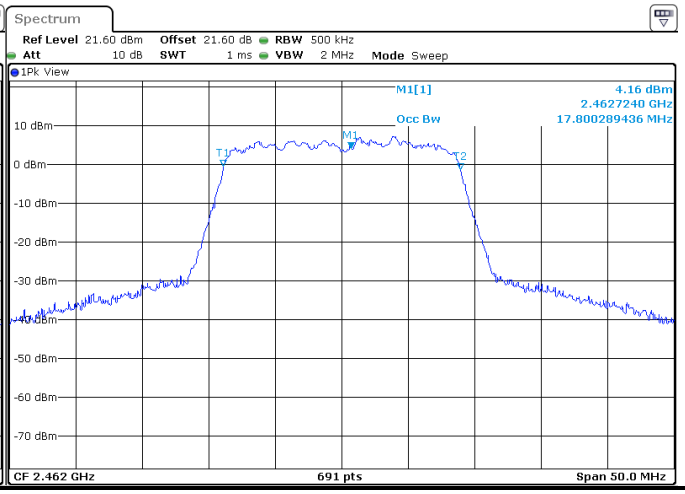




802.11.n HT20		
Channel	**Channel Frequency (MHz)**	**99% Occupied Bandwidth (MHz)**
Cmin	2412	**17.801**
Cmid	2437	**17.801**
Cmax	2462	**17.801**

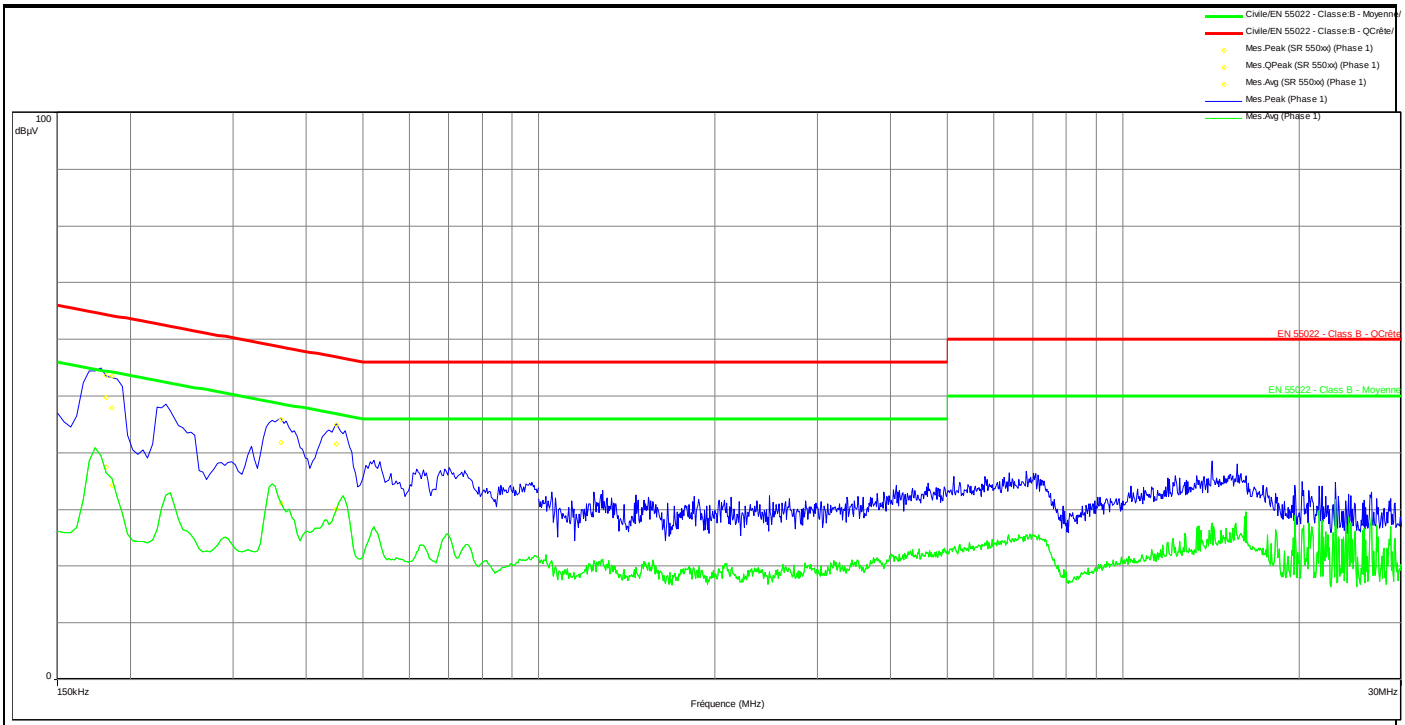






10. ANNEX 1 (GRAPHS)

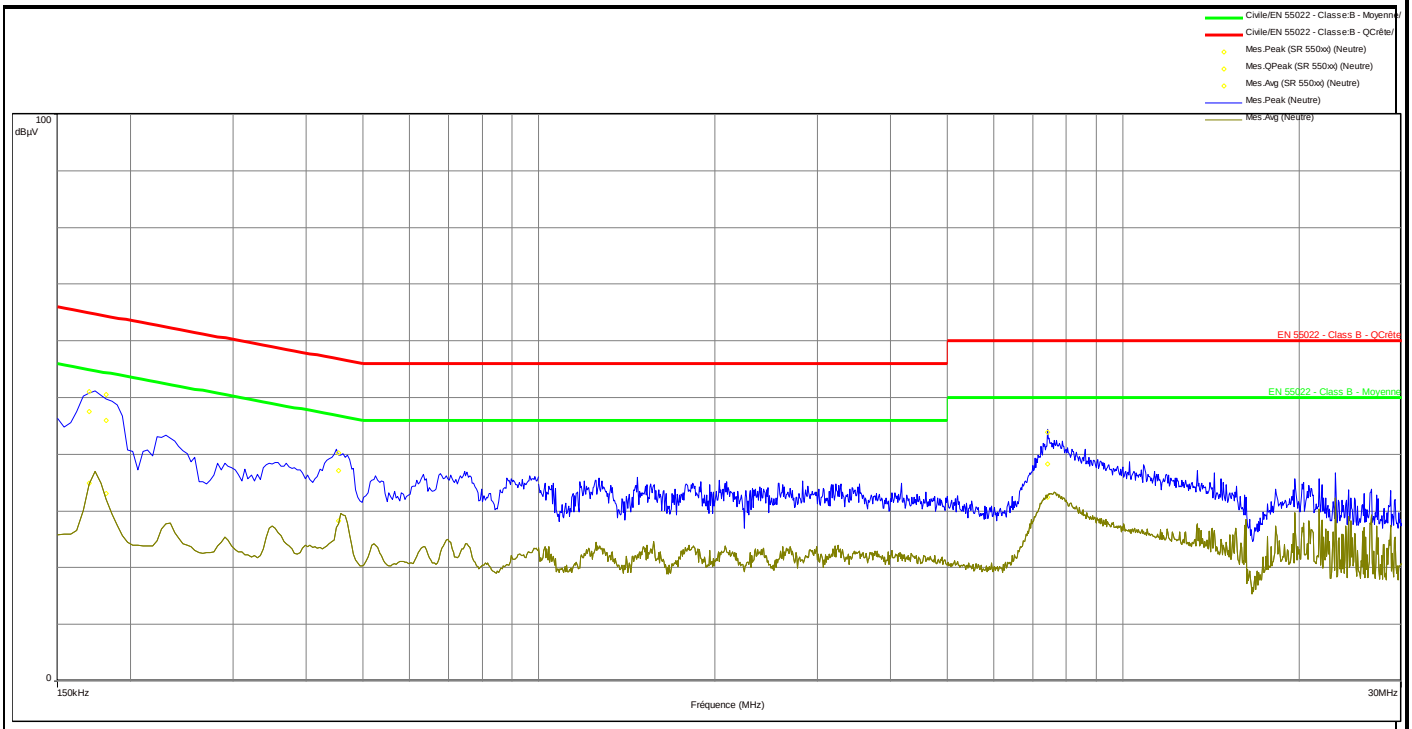
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	EN 55022	P_Config 2 - Phase 120_60Hz - Alim FCC	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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
0.180	53.7	49.7	64.6	-14.9	37.5	54.6	-17.1	Phase 1
0.184	53.5	48.0	62.3	-14.3	34.3	52.3	-18.0	Phase 1
0.360	45.8	41.8	59.0	-17.2	31.2	49.0	-17.8	Phase 1
0.451	45.0	41.6	56.6	-15.0	30.2	46.6	-16.4	Phase 1

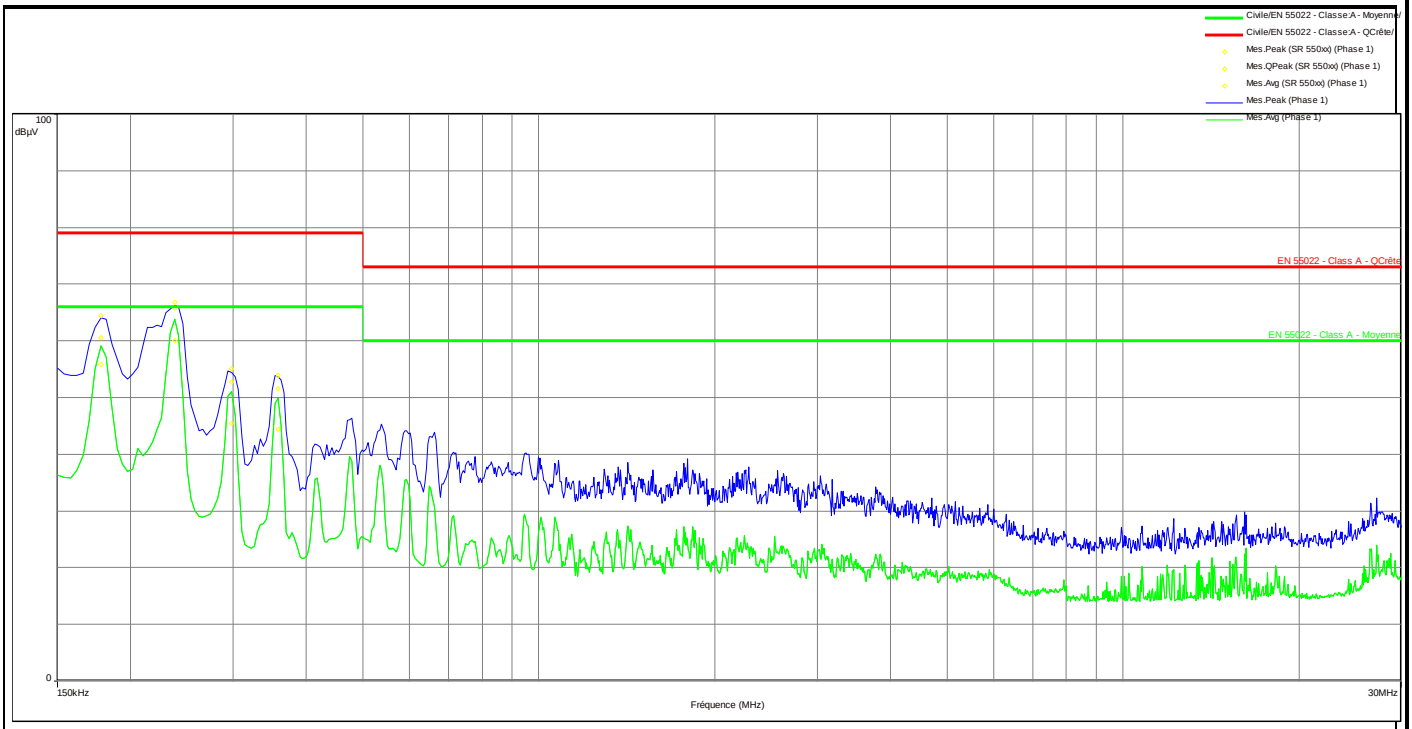
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	EN 55022	P_Config 2 - Neutral 120_60Hz - Alim FCC	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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
0.170	51.1	47.5	64.8	-17.3	34.8	54.8	-19.9	Neutre
0.180	50.6	45.9	62.4	-16.5	33.1	52.4	-19.4	Neutre
0.455	40.3	37.1	56.9	-19.8	28.3	46.9	-18.6	Neutre
7.435	43.9	38.3	60.0	-21.7	32.4	50.0	-17.6	Neutre

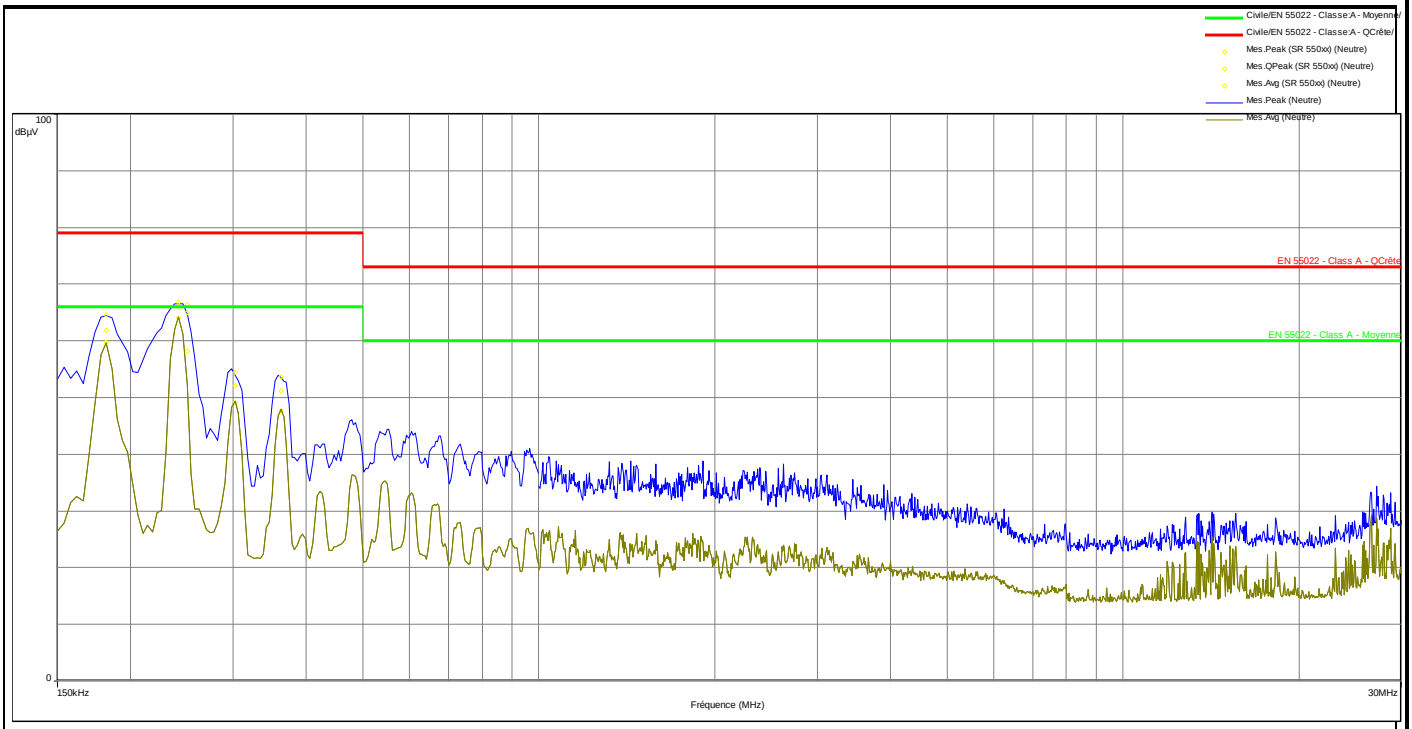
CONDUCTED EMISSIONS			
Graph name:	Emc#3	**Test configuration:**	
Limit:	EN 55022	P_Config 3 - Phase 120_60Hz - Alim FCC	
Class:	A		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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
0.178	64.5	60.6	79.0	-18.4	55.9	66.0	-10.1	Phase 1
0.238	66.8	65.7	79.0	-13.3	60.1	66.0	-5.9	Phase 1
0.298	55.1	52.7	79.0	-26.3	45.4	66.0	-20.6	Phase 1
0.358	53.9	51.6	79.0	-27.4	44.4	66.0	-21.6	Phase 1

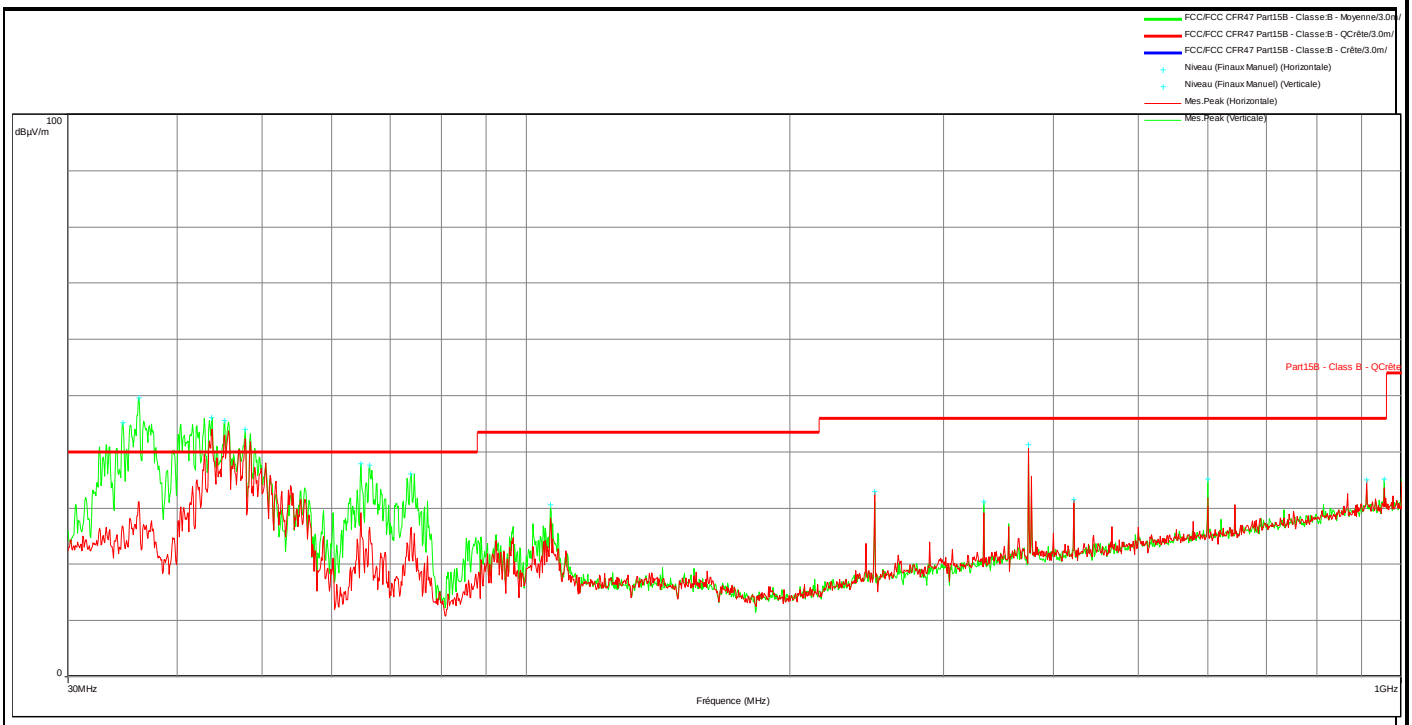
CONDUCTED EMISSIONS			
Graph name:	Emc#4	**Test configuration:**	
Limit:	EN 55022	P_Config 3 - Neutral 120_60Hz - Alim FCC	
Class:	A		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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
0.182	64.6	61.9	79.0	-17.1	59.8	66.0	-6.2	Neutral
0.241	66.8	66.0	79.0	-13.0	64.0	66.0	-2.0	Neutral
0.248	66.4	65.0	79.0	-14.0	58.2	66.0	-7.8	Neutral
0.302	54.4	52.1	79.0	-26.9	49.0	66.0	-17.0	Neutral
0.363	53.7	51.2	79.0	-27.8	47.7	66.0	-18.3	Neutral

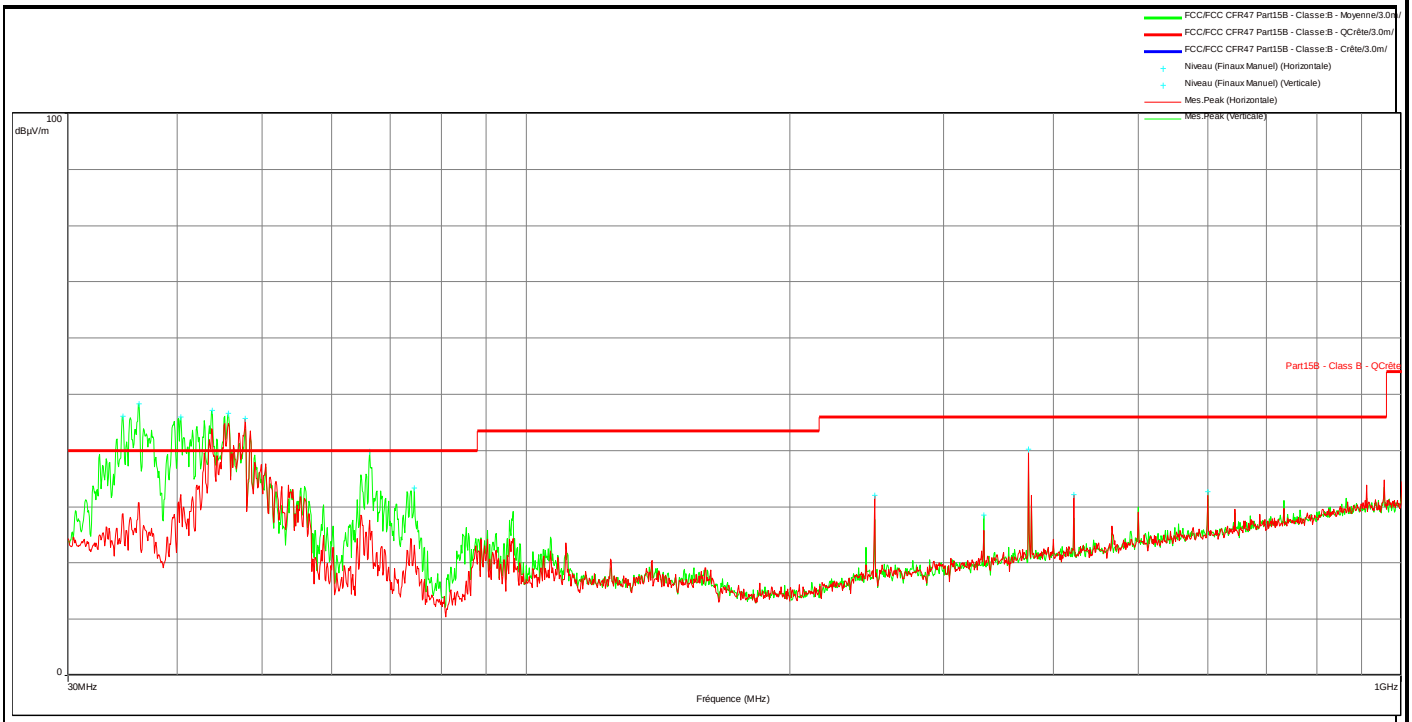
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 2 <1GHz - XY (FCC)	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
250.000	32.9	Horizontal
375.000	41.3	Horizontal
422.240	31.5	Horizontal
911.160	35.1	Horizontal
34.641	45.2	Vertical
36.137	49.6	Vertical
43.787	46.1	Vertical
45.249	45.5	Vertical
47.799	44.0	Vertical
64.765	37.9	Vertical
66.278	37.6	Vertical
73.911	36.0	Vertical
106.687	30.6	Vertical
333.360	31.2	Vertical
600.000	35.1	Vertical
955.600	35.2	Vertical

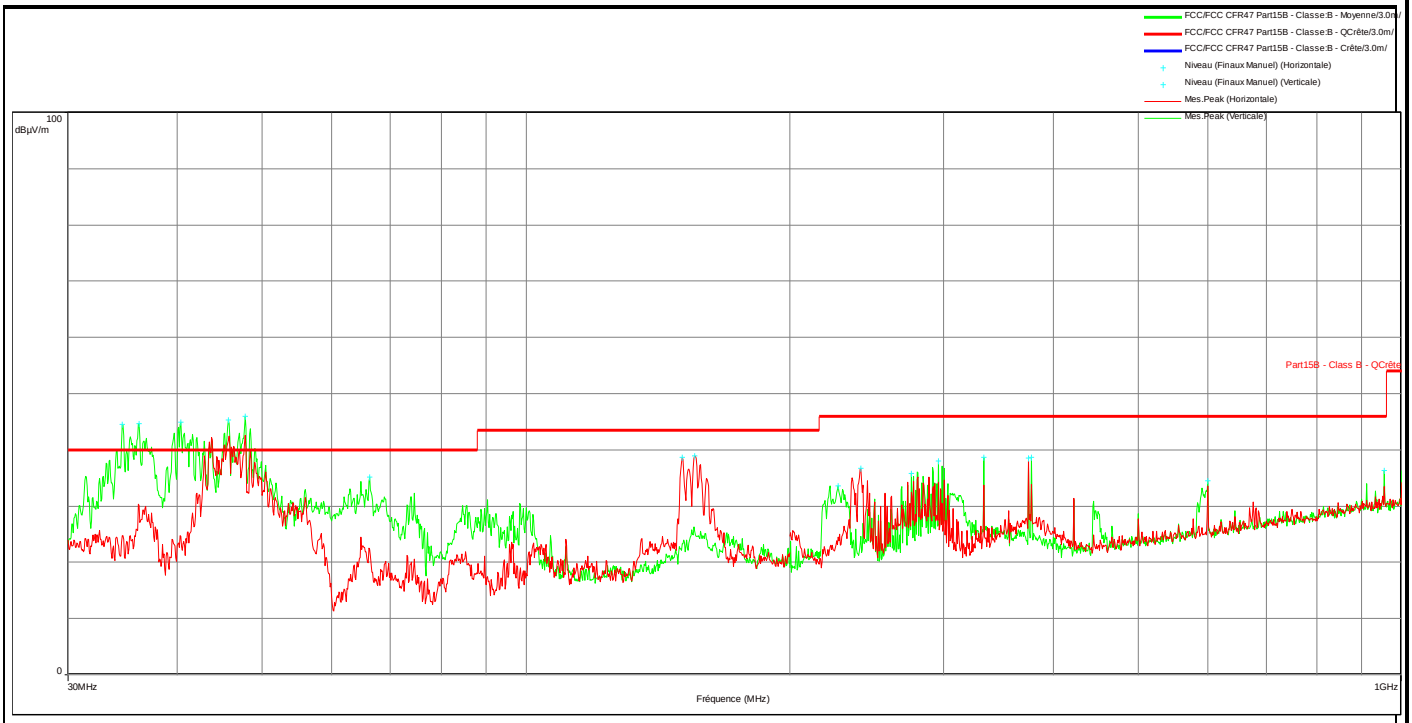
RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 2 <1GHz - Z (FCC)	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
47.799	45.7	Horizontal
250.000	32.1	Horizontal
375.000	40.2	Horizontal
422.240	32.2	Horizontal
600.000	32.7	Horizontal
34.641	46.1	Vertical
36.137	48.4	Vertical
40.336	46.0	Vertical
43.804	47.2	Vertical
45.708	46.7	Vertical
66.278	39.8	Vertical
74.557	33.3	Vertical
333.320	28.6	Vertical

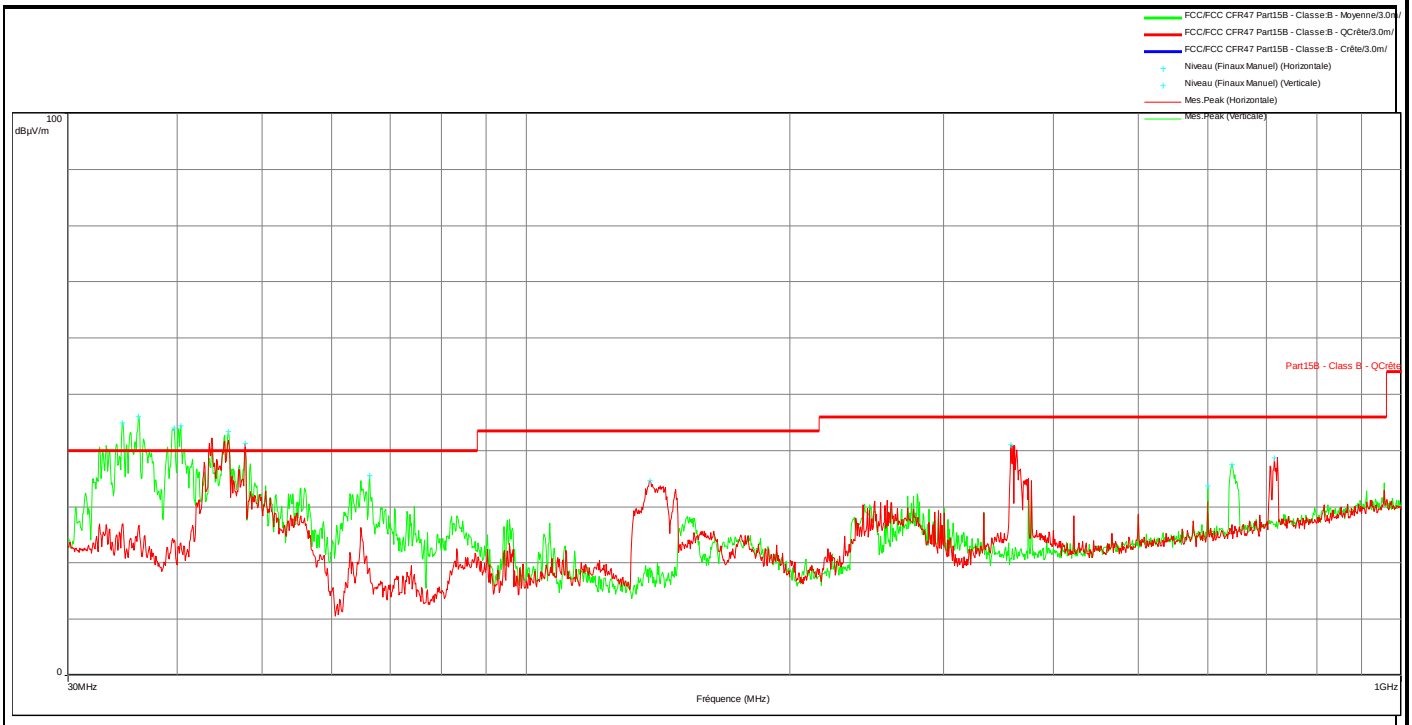
RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 3 <1GHz - XY (FCC)	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
150.751	38.6	Horizontal
155.902	39.0	Horizontal
241.000	36.7	Horizontal
375.000	38.5	Horizontal
34.624	44.5	Vertical
36.137	44.7	Vertical
40.319	44.9	Vertical
45.725	45.3	Vertical
47.799	46.0	Vertical
66.278	35.2	Vertical
227.280	33.6	Vertical
275.640	35.8	Vertical
295.840	38.0	Vertical
333.360	38.7	Vertical
377.800	38.7	Vertical
600.000	34.5	Vertical
955.600	36.3	Vertical

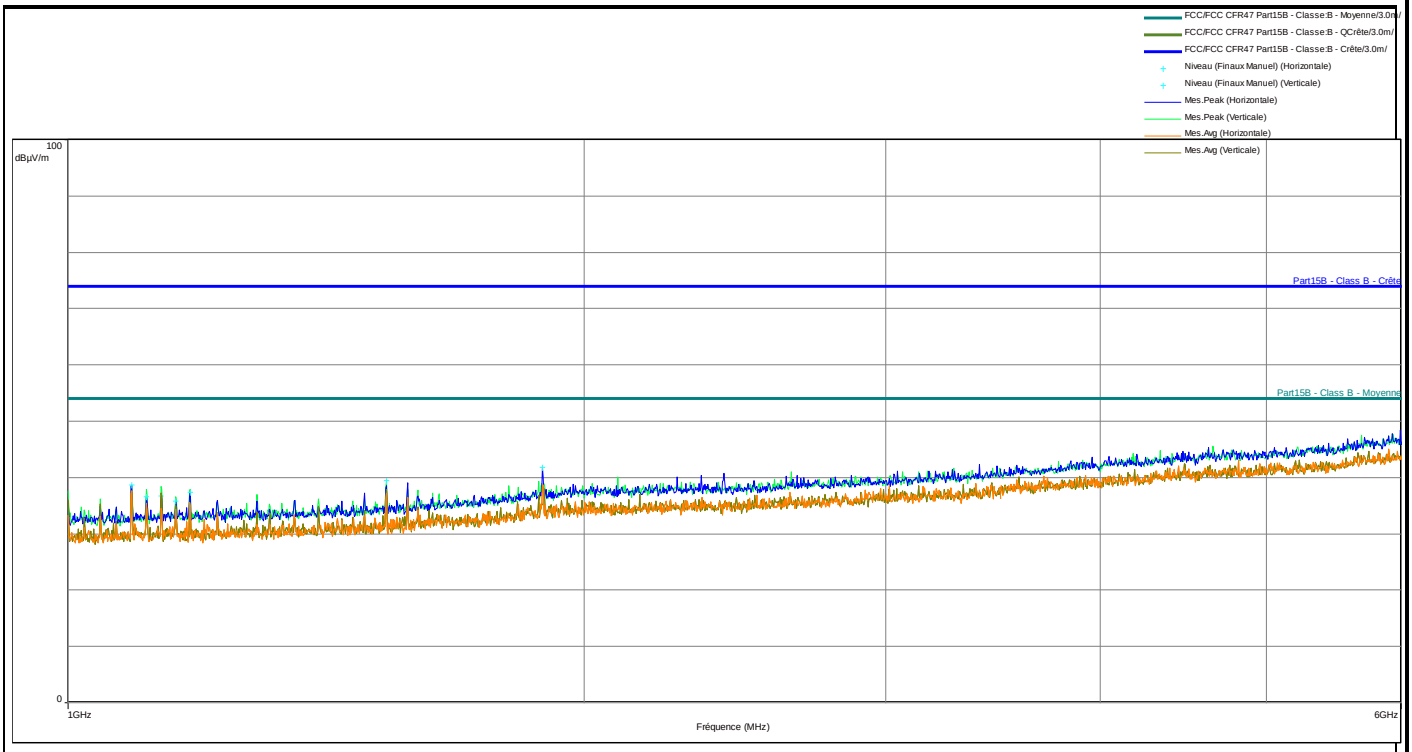
RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 3 <1GHz - Z (FCC)	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
47.799	41.2	Horizontal
138.494	34.6	Horizontal
358.040	41.0	Horizontal
715.360	38.7	Horizontal
34.624	44.9	Vertical
36.120	46.2	Vertical
39.639	44.0	Vertical
40.336	44.4	Vertical
45.725	43.4	Vertical
66.278	35.5	Vertical
600.000	33.7	Vertical
639.280	37.5	Vertical

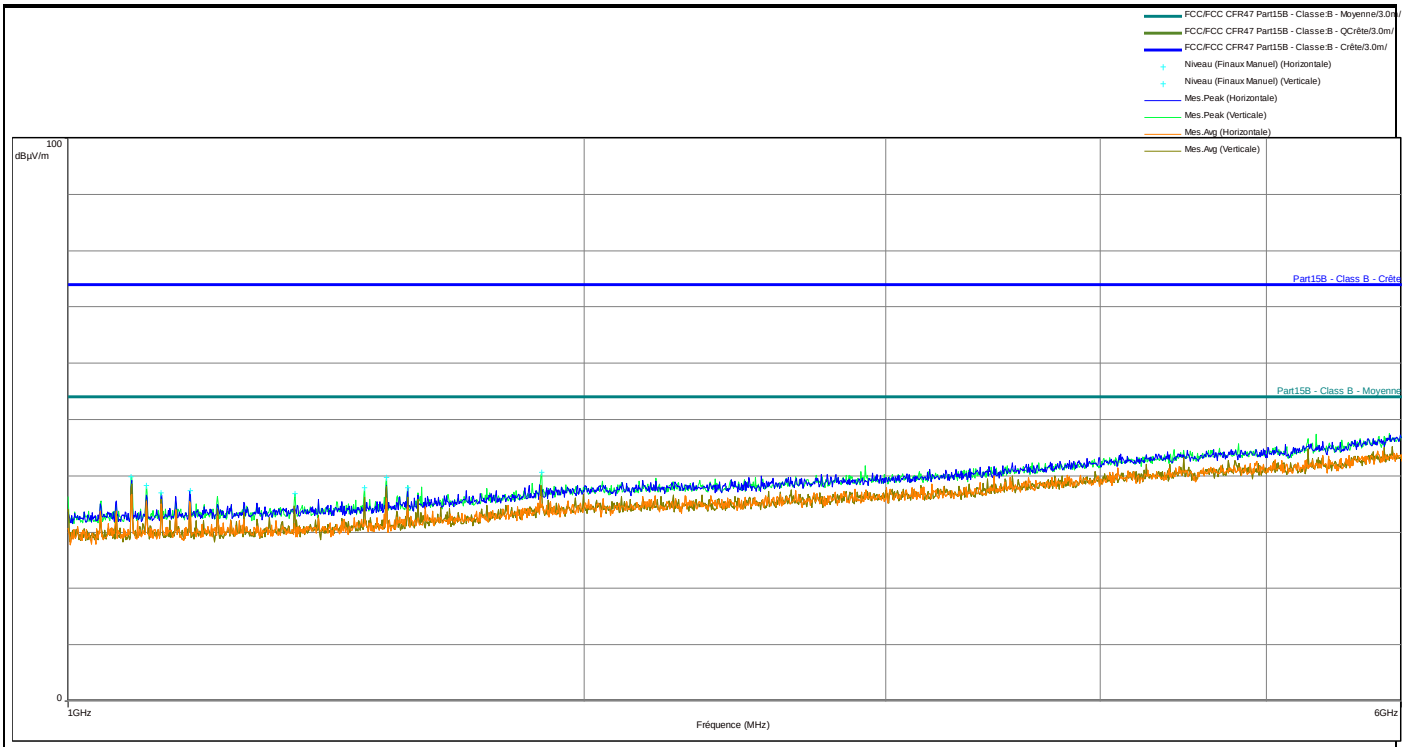
RADIATED EMISSIONS			
Graph name:	Emr#5	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 2 > 1GHz - XY (FCC)	
Class:	B		
Frequency range: [1GHz - 6GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
1089.000	38.6	Horizontal
1111.000	36.6	Horizontal
1133.250	36.7	Horizontal
1155.750	35.9	Horizontal
1178.000	37.4	Horizontal
1891.750	41.8	Horizontal
1533.750	39.4	Vertical

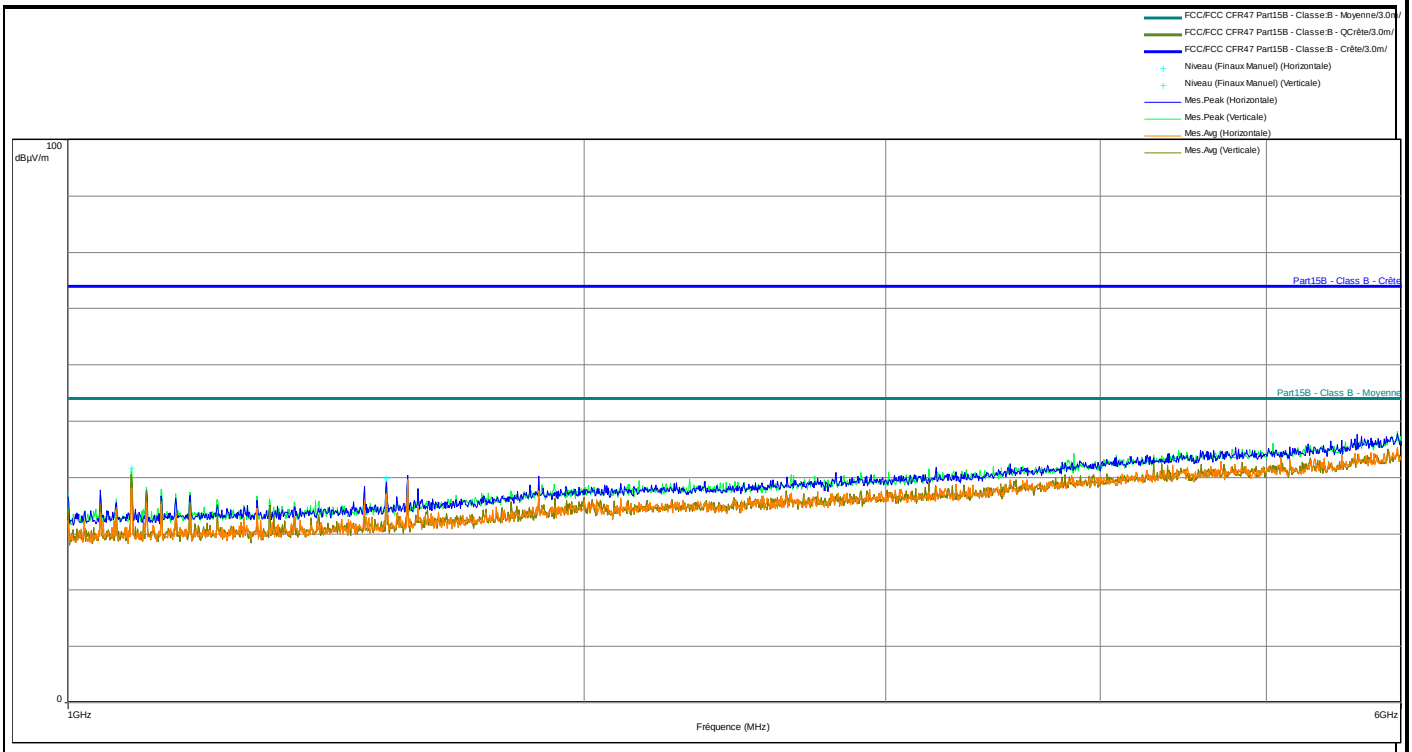
RADIATED EMISSIONS			
Graph name:	Emr#6	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 2 > 1GHz - Z (FCC)	
Class:	B		
Frequency range: [1GHz - 6GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
1178.000	37.3	Horizontal
1577.500	37.9	Horizontal
1088.750	39.9	Vertical
1111.250	38.3	Vertical
1133.250	36.9	Vertical
1356.250	36.8	Vertical
1489.000	37.9	Vertical
1533.250	39.8	Vertical
1888.750	40.6	Vertical

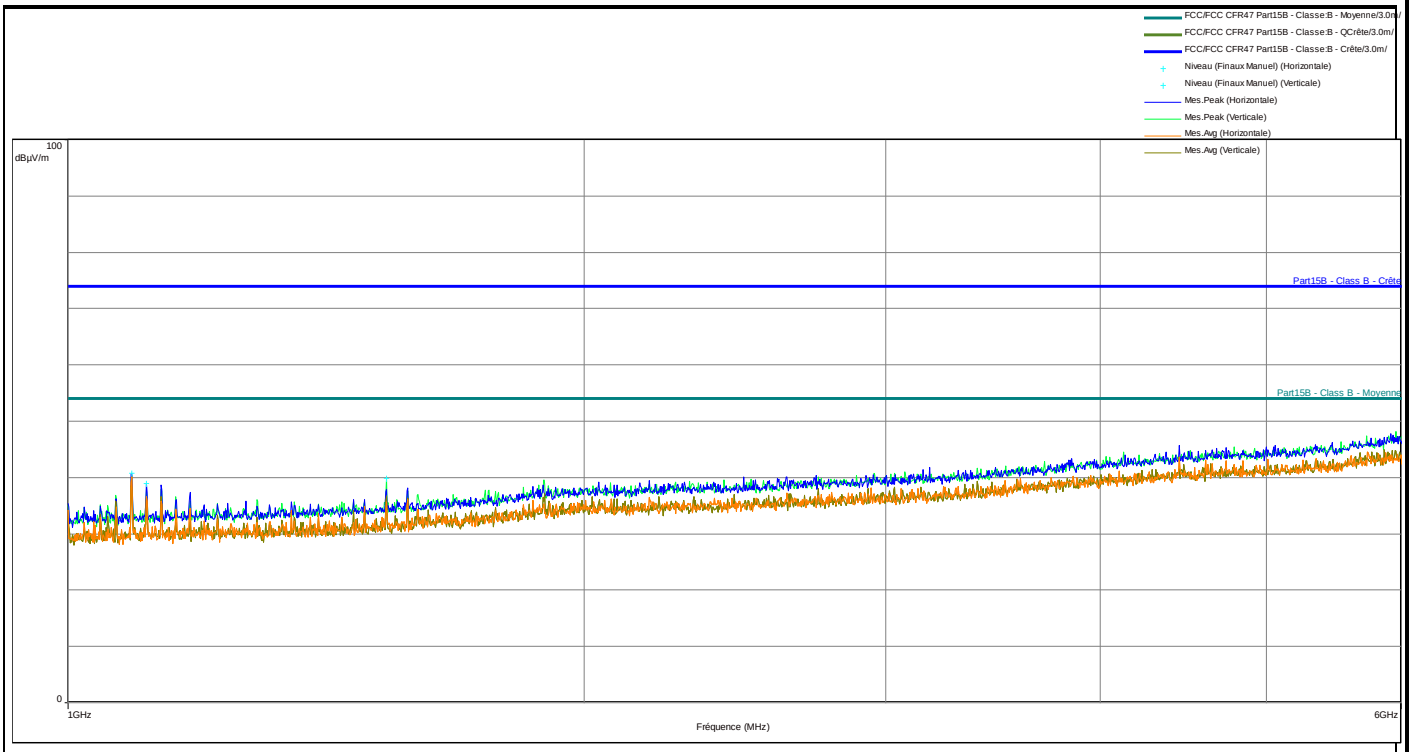
RADIATED EMISSIONS			
Graph name:	Emr#7	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 3 > 1GHz - XY (FCC)	
Class:	B		
Frequency range: [1GHz - 6GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
1533.250	39.8	Horizontal
1089.000	41.7	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#8	**Test configuration:**	
Limit:	FCC CFR47 Part15B	(H+V) - Configuration 3 > 1GHz - Z (FCC)	
Class:	B		
Frequency range: [1GHz - 6GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
1089.000	40.8	Horizontal
1111.250	39.0	Horizontal
1533.250	39.9	Vertical

11. UNCERTAINTIES CHART

Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ± x**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ± y**
Mesure des perturbations conduites en tension sur le réseau d'énergie *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.*