TEST REPORT

N°: 145899-697640-A (FILE#938083) **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	**SCHNEIDER ELECTRIC INDUSTRIES FRANCE** Site 38TEC / T11-2A13, 37 quai Paul Louis Merlin 38050 - GRENOBLE FRANCE
Apparatus under test	
Product	Easergy LV150 Low voltage Power
Trade mark	**SCHNEIDER ELECTRIC INDUSTRIES FRANCE**
Manufacturer	**SCHNEIDER ELECTRIC INDUSTRIES FRANCE**
Trade Name	**Easergy LV150**
Model under test	**EMS59300**
Serial number	**NHA9257300-1640281**
FCCID	**2AHHK-EASERGYLV150**
Conclusion	See Test Program chapter §1
Test date	December 22, 2016 to June 1, 2017
Test location	MOIRANS
IC Test site	6500A-1 & 6500A-3
Composition of document	41 pages
Document issued on	November 15, 2017

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	June 28, 2017	Jonathan PAUC	Creation of the document Information missing not declared by provider
02	November 15, 2017	Jonathan PAUC	Adding of information

SUMMARY

1. TEST PROGRAM

Standard:

- **FCC Part 15, Subpart C 15.247**
- **ANSI C63.10 (2013)**
- **RSS-247 Issue 2.0**
- **RSS-Gen Issue 4**
- **558074 D01 DTS Measurement Guidance v04**

EMISSION TEST	LIMITS			RESULTS
Limits for conducted disturbance at mains ports 150kHz-30MHz	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 9kHz-30MHz *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5*	**Measure at 300m** 9kHz-490kHz : 67.6dBµV/m /F(kHz) **Measure at 30m** 490kHz-1.705MHz : 87.6dBµV/m /F(kHz) 1.705MHz-30MHz : 29.5 dBµV/m			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Radiated emissions 30MHz-25GHz* *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5* ***Highest frequency :*** ***(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):

EMS59300 **Serial Number:**
NHA9257300-1640281

Photography of EUT

Power supply:
During all the tests, EUT is supplied by V_{nom}: 12Vdc
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☑ DC ☐ Battery	12Vdc	/	/

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	Power supply DC (24VDC)	0.1	☐	☐	☑	
2	Ethernet 1	3	☐	☑	☑	
3	Ethernet 2	3	☐	☑	☑	
4	Ethernet 3	3	☐	☑	☑	
5	I/O 3 wires – Port 1	1	☐	☐	☑	
6	I/O 3 wires – Port 2	1	☐	☐	☑	
7	I/O 3 wires – Port 3	1	☐	☐	☑	
8	I/O 6 wires – Port 4	1	☐	☐	☑	

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
BASE	SCHNEIDER ELECTRIC EMS58588 Easergy PS50-48	RN16110002 EAV96678	/
Laptop	HEWLETT PACKARD EliteBook8570w	5CB3083QBZ	/

Type:	☑ **ZIGBEE**		☐ **RF4CE**	
Frequency band:	[2400 – 2483.5] MHz			
Sub-band REC7003:	Annex 3 (a)			
Spectrum Modulation:	☑ DSSS			
Number of Channel:	16			
Spacing channel:	5 MHz			
Channel bandwidth:	2 MHz			
Antenna Type:	☑ Integral	☐ External	☐ Dedicated	
Antenna connector:	☐ Yes	☑ No	☐ Temporary for test	
Transmit chains:	☑ 1			
	Single antenna			
	Gain: 5.3 dBi			
Beam forming gain:	No			
Receiver chains	1			
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined	
Ad-Hoc mode:	☐ Yes		☑ No	
Adaptivity mode:	☐ Yes (Load Based DAA)	☐ Off mode	☑ No	
	Clear Channel Assessment Time:		µs	
Duty cycle:	☑ Continuous duty	☐ Intermittent duty	☐ 100% duty	
Equipment type:	☑ Production model		☐ Pre-production model	
Operating temperature range:	Tmin:	☐ -20°C	☐ 0°C	☑ -40°C
	Tnom:	20°C		
	Tmax:	☐ 35°C	☐ 55°C	☑ 70°C
Type of power source:	☑ AC power supply	☐ DC power supply	☐ Battery	
Operating voltage range:	Vnom:	☑ 230V/50Hz	☐ XVdc	

NC: ***Not communicated by customer***

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

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

2.2. EUT CONFIGURATION

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

All tests are performed at Cmin, Cmid and Cmax.

During test a continuous communication is performed trought Ethernet links to computer

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	:	June 1, 2017
Test performed by	:	Mamady FOFANA
Atmospheric pressure (hPa)	:	990
Relative humidity (%)	:	37
Ambient temperature (°C)	:	22

3.2. TEST SETUP

Mains terminals

The EUT and auxiliaries are set:

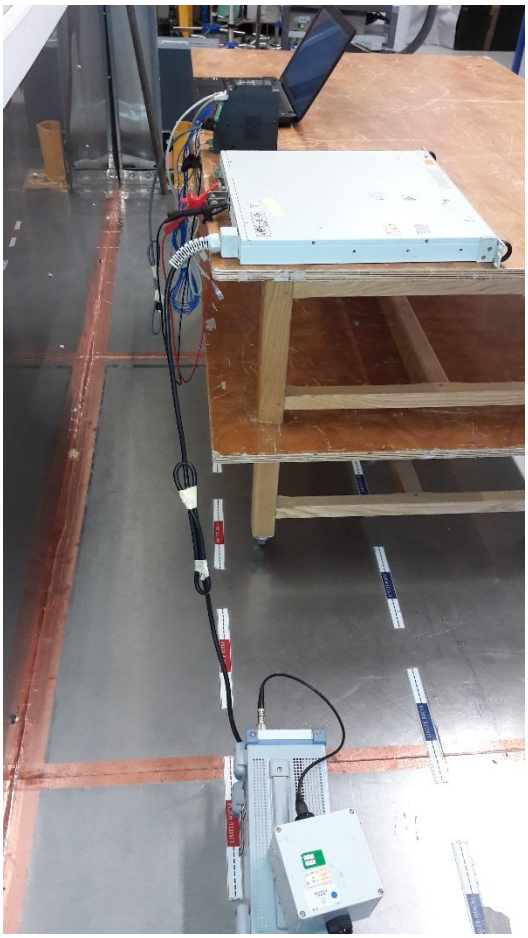
☑ 80cm above the ground on the non-conducting table (Table-top equipment)

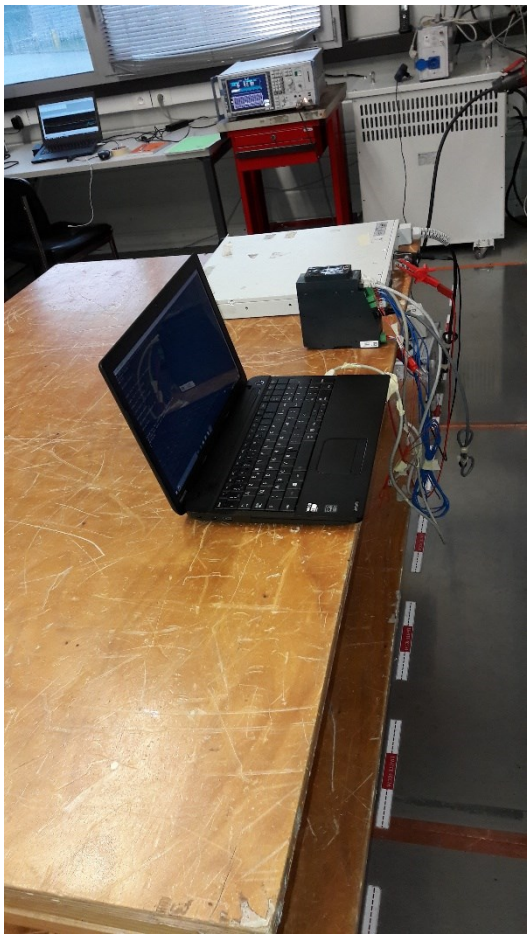
☐ 10cm above the ground on isolating support (Floor standing equipment)

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

The EUT is powered by V_{nom}.

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





Test setup

3.3. TEST METHOD

The product has been tested according to ANSI C63.10 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	04/17	04/18
EMC comb generator	LCIE SUD EST	-	A3169098	-	-
LISN	RHODE & SCHWARZ	ENV216	C2320291	12/16	12/17
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	B4206022	08/16	08/17
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	01/17	01/18
Linear Power supply	TDK Lambda	GEN30-50	A7044055	-	-

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

3.6. TEST RESULTS

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

Measure on L1	on linear power supply GEN30-50:	graph **Emc#1**	(see annex 1)
Measure on N:	on linear power supply GEN30-50:	graph **Emc#2**	(see annex 1)

3.7. CONCLUSION

Conducted emission data measurement performed on the sample of the product EMS59300, SN: NHA9257300-1640281, 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

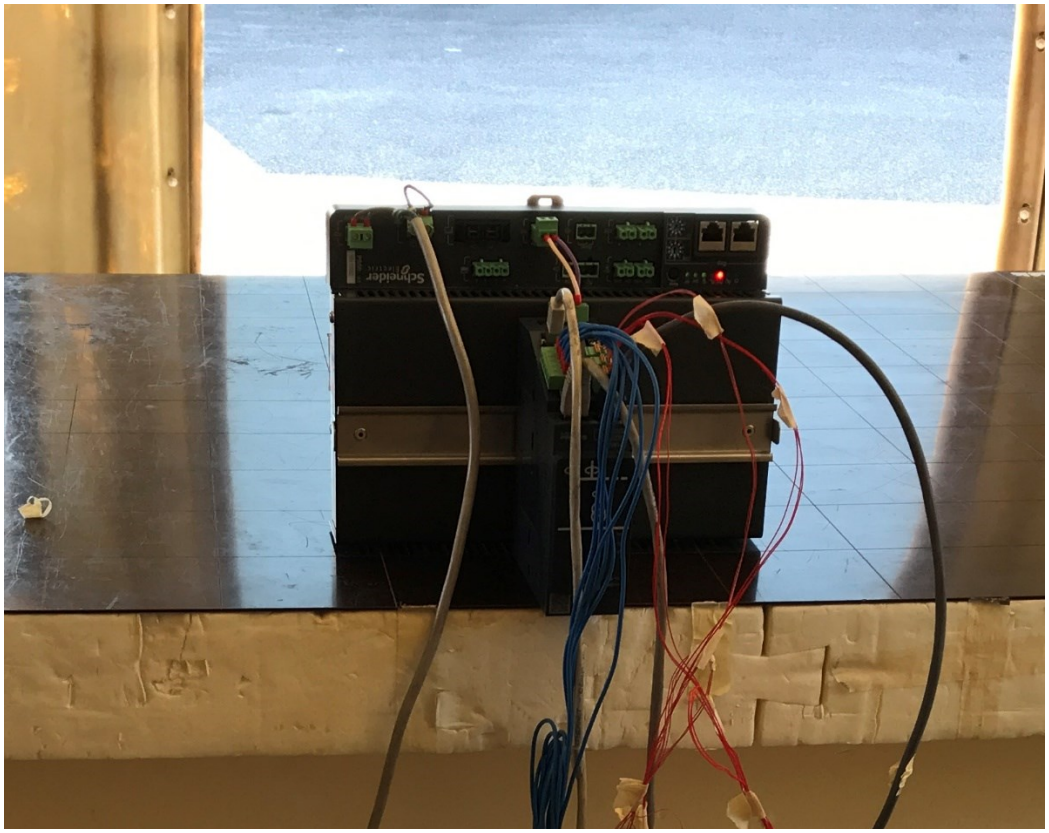
4.1. ENVIRONMENTAL CONDITIONS

Date of test	:	June 1, 2017
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	995
Relative humidity (%)	:	34
Ambient temperature (°C)	:	22

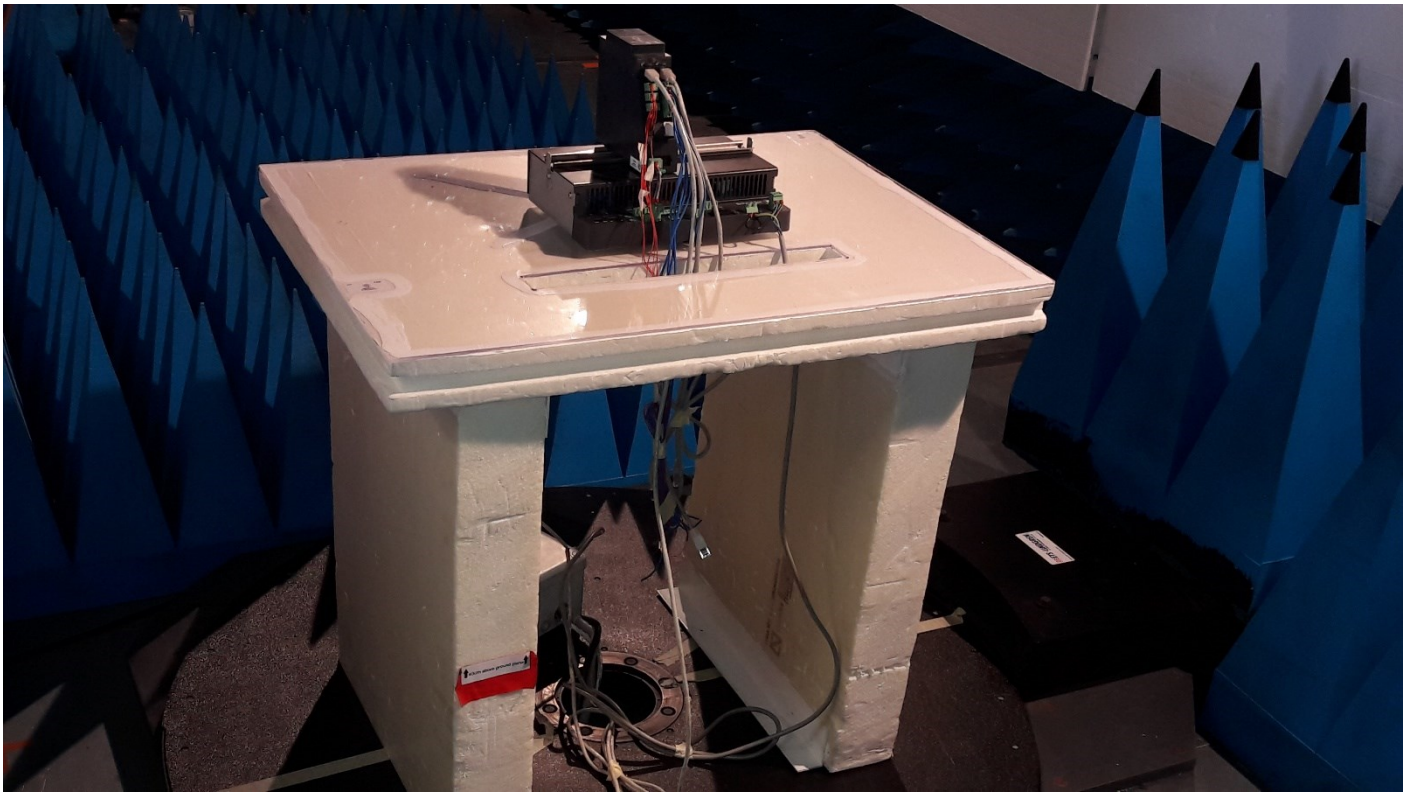
4.2. TEST SETUP

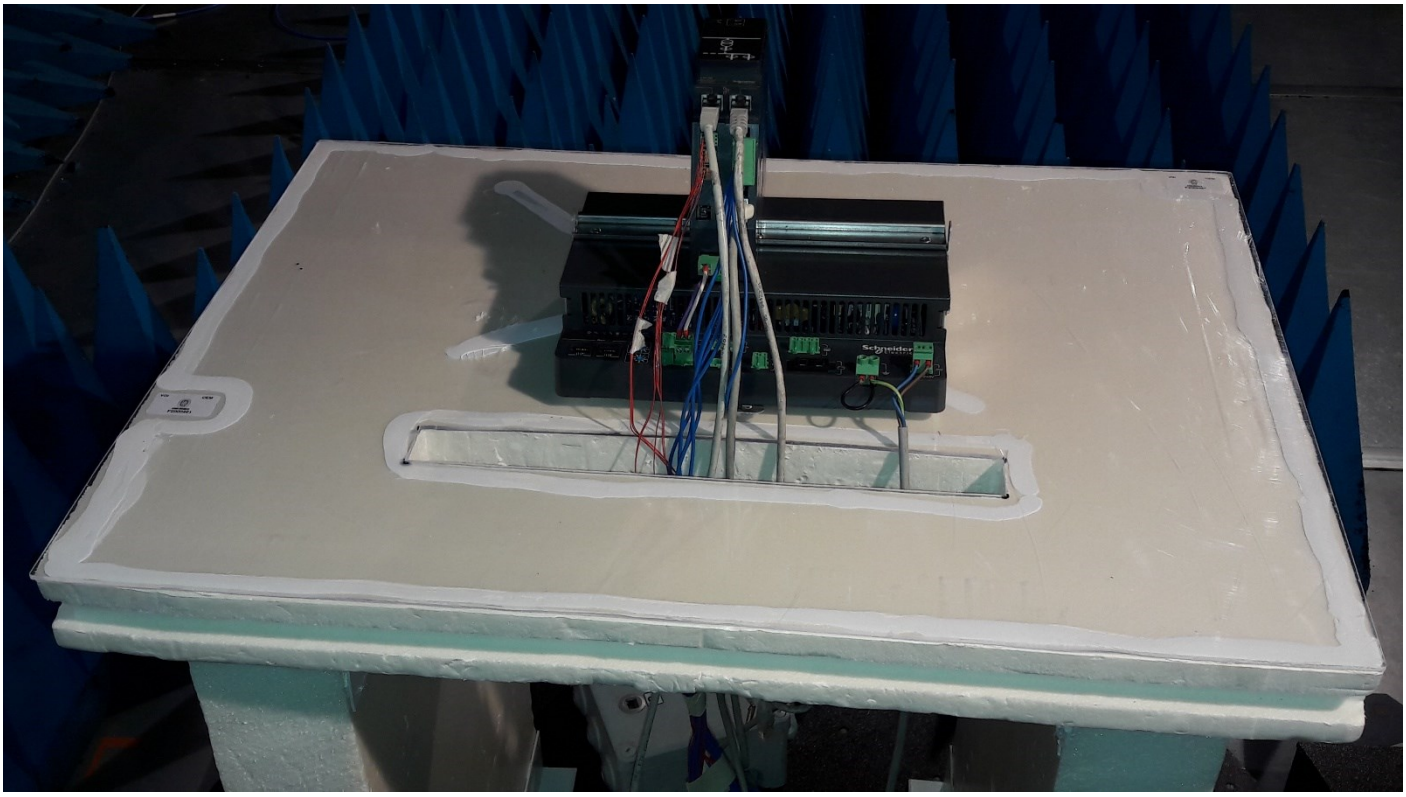
The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
☑ 150cm above the ground on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

Test setup on OATS

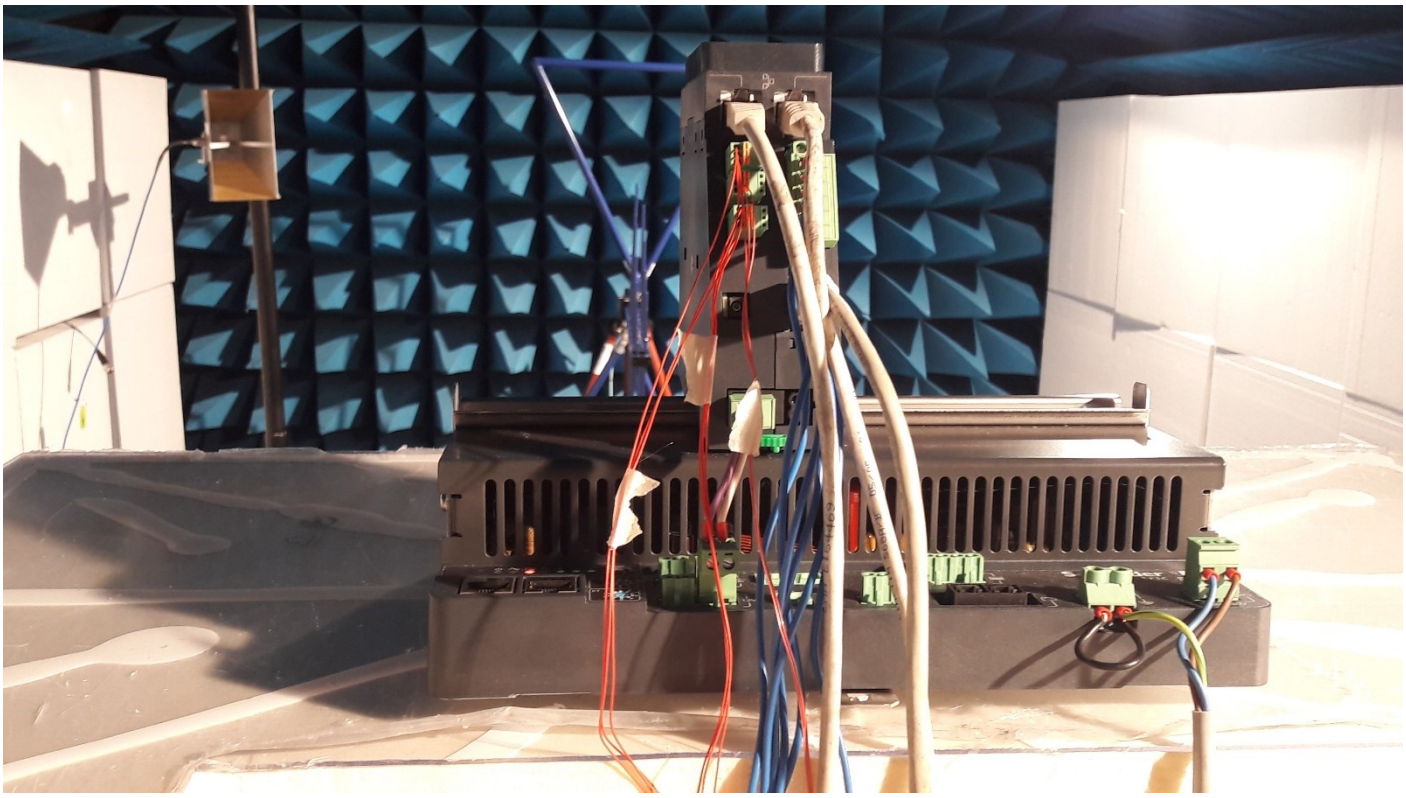


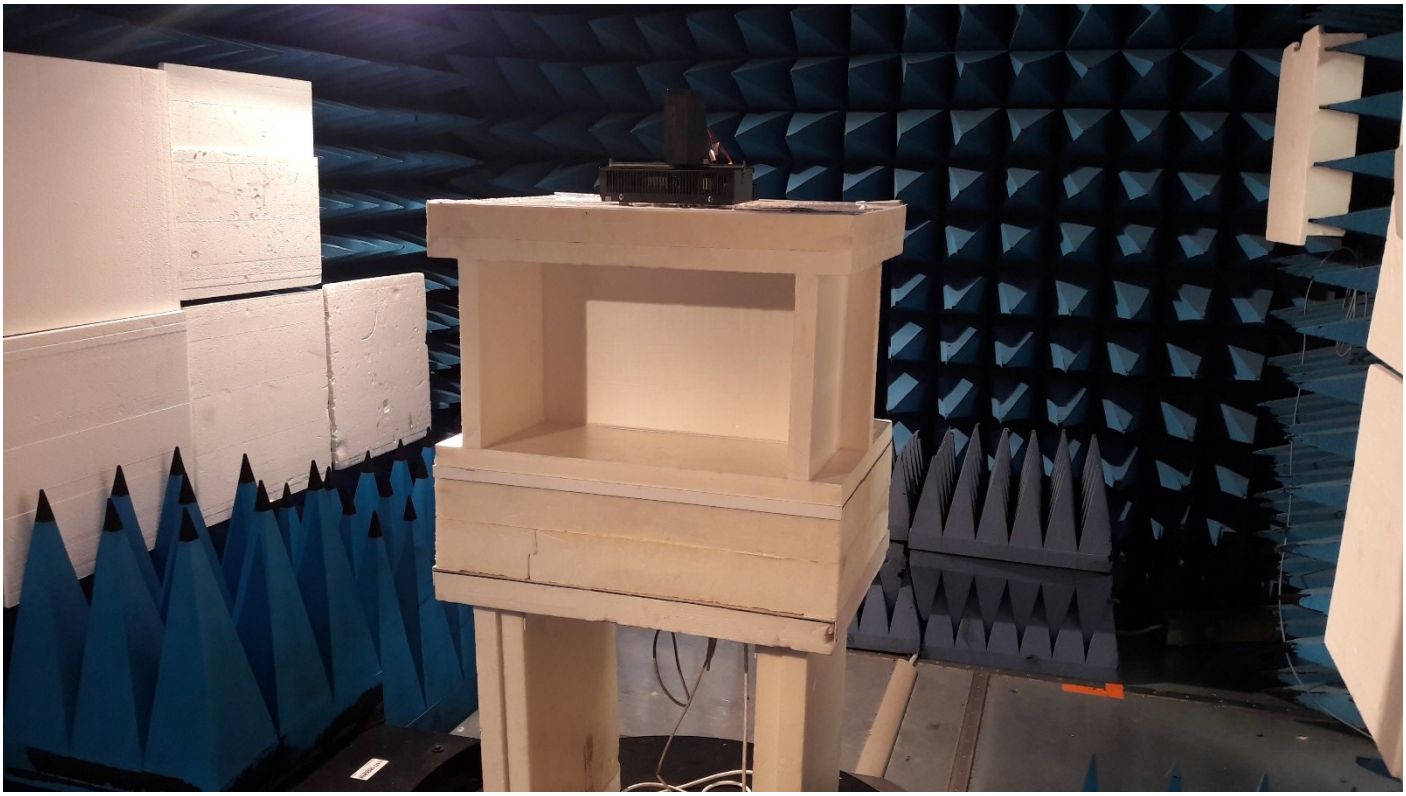
Test setup on OATS





Test setup Annechoic chamber <1GHz





Test setup Annechoic chamber >1GHz

4.3. TEST METHOD

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

Pre-characterisation measurement: (30MHz – 1GHz)
A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 12.75GHz. 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 12.75GHz.

Characterization on 10 meters open site from 30MHz 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 25GHz.
Test is performed in horizontal (H) and vertical (V) polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.The height antenna is
☐ On mast, varied from 1m to 4m
☑ Fixed and centered on the EUT (EUT smaller than the beamwidth of the measurement antenna, ANSI C63.10 §6.6.5)
Frequency list has been created with anechoic chamber pre-scan results.

4.4. TEST EQUIPMENT LIST

ANECHOIC CHAMBER					
DESCRIPTION	**MANUFACTURER**	**MODEL**	**N° LCIE**	**Cal_Date**	**Cal_Due**
Amplifier 1-13GHz	LCIE SUD EST	-	A7102067	05/17	05/18
Antenna Bi-log	CHASE	CBL6111A	C2040172	06/16	06/18
Antenna horn 18GHz	EMCO	3115	C2042029	08/16	08/18
Attenuator 10dB	AEROFLEX	-	A7122206	06/17	06/18
Cable Measure @3m 18GHz	-	-	A5329038	10/16	10/17
Cable Measure @3m	-	-	A5329206	06/17	06/18
Cable Measure @1m	STORMFLEX	0	A5329680	01/17	01/18
Cable Measure Analyzer-Amplifier SMA	STORMFLEX	0	A5329681	05/16	05/17
Cable Measure @1m	STORMFLEX	0	A5329682	01/17	01/18
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
HF Radiated emission comb generator	LCIE SUD EST	-	A3169088	-	-
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	08/16	08/17
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
RSCommander	R&S	v1.6.4	L1000116	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	10/16	10/17
Thermo-hygrometer (PM2)	KIMO	HQ 210	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	-	-

OATS					
DESCRIPTION	**MANUFACTURER**	**MODEL**	**N° LCIE**	**Cal_Date**	**Cal_Due**
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/16	06/18
Cable	-	-	A5329069	12/16	12/17
Radiated emission comb generator	BARDET	-	A3169050	-	-
OATS	-	-	F2000409	08/16	08/17
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	08/16	08/17
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	MATURO Gmbh	-	F2000437	-	-

4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

4.6. TEST RESULTS

See graphs for 30MHz-1GHz:

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

4.6.1. Pre-characterization at 3 meters [1GHz-25GHz]

See graphs for 1GHz-12.75GHz:

Graph identifier		Polarization	Mode	EUT position	Channel	Comments
Emr#	4	H & V	TX	Axis Z	Min	See annex 1
Emr#	5	H & V	TX	Axis Z	Mid	See annex 1
Emr#	6	H & V	TX	Axis Z	Max	See annex 1

No frequency observed above 12.75GHz

4.6.2. Characterization on 10 meters open site from 30MHz to 1GHz

Worst case final data result:
Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

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)
37.001	19.9	QP	V	359	250	16.4	36.3	40.0	**-3.7**
74.986	28.7	QP	V	0	306	8.3	37.0	40.0	**-3.0**
149.570	21.2	QP	V	209	300	13.3	34.5	43.5	**-9.0**
379.457	15.5	QP	V	204	290	19.3	34.8	46.0	**-11.2**
475.057	15.9	QP	V	127	400	21.8	37.7	46.0	**-8.3**

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

4.6.3. Characterization on 3meters anechoic chamber from 1GHz to 25GHz

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

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)
4961.100	45.0	Pk	V	204	150	5.2	50.2	74.0	-23.8
4961.100	39.0	Av	V	204	150	5.2	44.2	54.0	-9.8
4880.000	44.6	PK	V	240	150	5.0	49.6	74.0	-24.4
4880.000	31.5	Av	V	147	150	5.0	36.6	54.0	-17.4
5186.850	41.6	Pk	V	0	150	5.3	46.9	74.0	-27.1
4810.307	42.4	Pk	V	67	150	4.9	47.2	74.0	-26.8
4810.530	32.5	Av	V	67	150	4.9	37.4	54.0	-16.6
2485.359	41.5	Pk	H	133	150	-0.9	40.6	74.0	-33.4
2487.234	43.7	Pk	H	133	150	-0.9	42.8	74.0	-31.2
2487.234	42.9	Pk	V	275	150	-0.9	42.0	74.0	-32.0
2487.230	44.1	Pk	V	129	150	-0.9	43.2	74.0	-30.8
2485.359	31.5	Av	H	133	150	-0.9	30.6	54.0	-23.4
2487.234	33.7	Av	H	133	150	-0.9	32.8	54.0	-21.2
2487.234	32.9	Av	V	275	150	-0.9	32.0	54.0	-22.0
2487.230	34.1	Av	V	129	150	-0.9	33.2	54.0	-20.8

Note: Measures have been done at 3m distance.

4.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product EMS59300, SN: NHA9257300-1640281, 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	:	December 22, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	1000
Relative humidity (%)	:	22
Ambient temperature (°C)	:	27

5.2. SETUP

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

☐ ***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

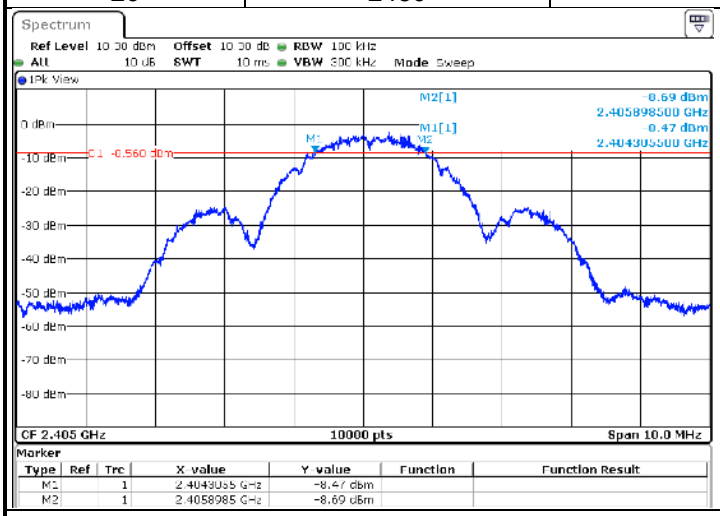
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122267	06/16	06/17
Cable 40GHz 2m coudé	-	-	A5329720	05/16	05/17
Climatic chamber	BIA CLIMATIC	CL 6-25	D1024032	01/00	
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	12/16

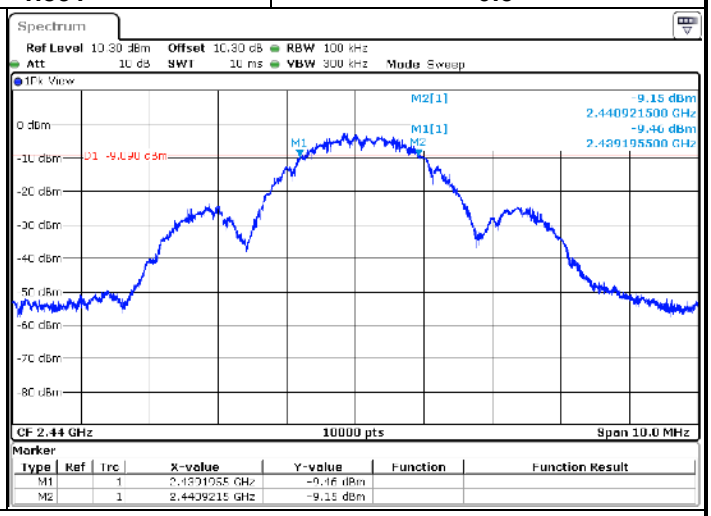
5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

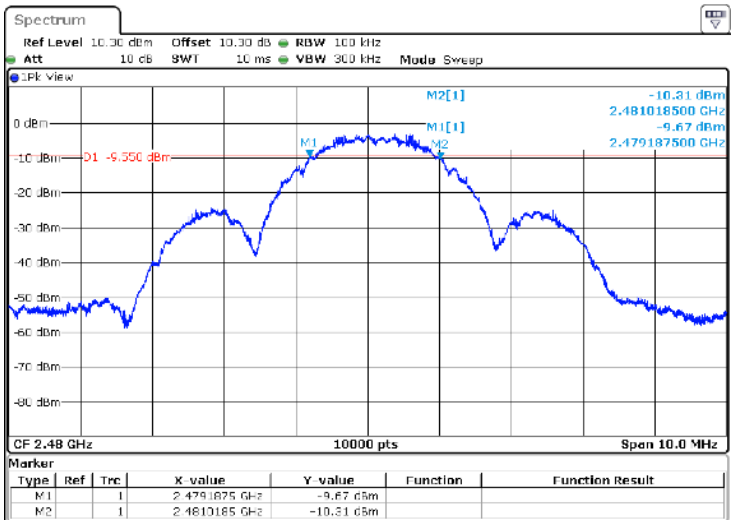
☑ None ☐ Divergence:

5.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Bandwidth Limit (MHz)
11	2405	**1.593**	**>0.5**
18	2440	**1.726**	**>0.5**
26	2480	**1.831**	**>0.5**







5.6. CONCLUSION

Bandwidth measurement performed on the sample of the product EMS59300, SN: NHA9257300-1640281, 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	:	December 22, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	1000
Relative humidity (%)	:	22
Ambient temperature (°C)	:	27

6.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency.
Offset: Attenuator+cable 10.3dB

☐ ***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

6.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122267	06/16	06/17
Cable 40GHz 2m coudé	-	-	A5329720	05/16	05/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	12/16

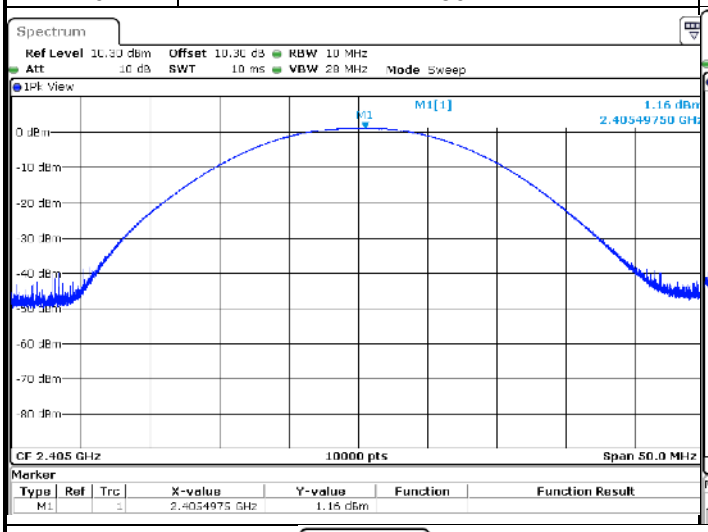
6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

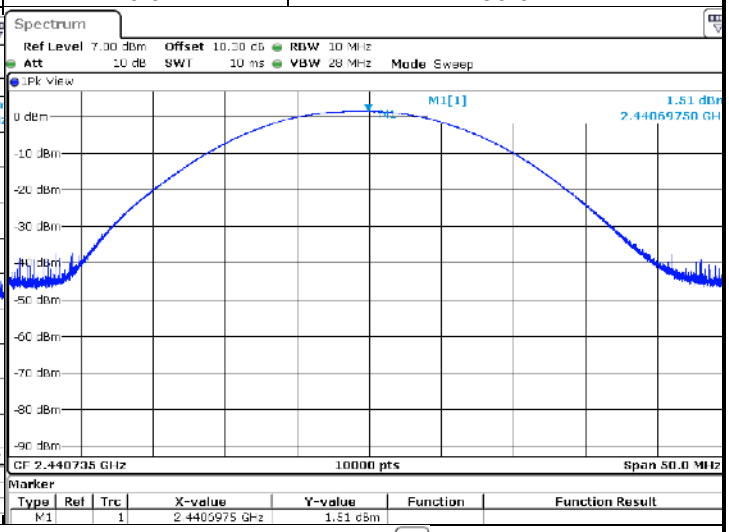
☑ None ☐ Divergence:

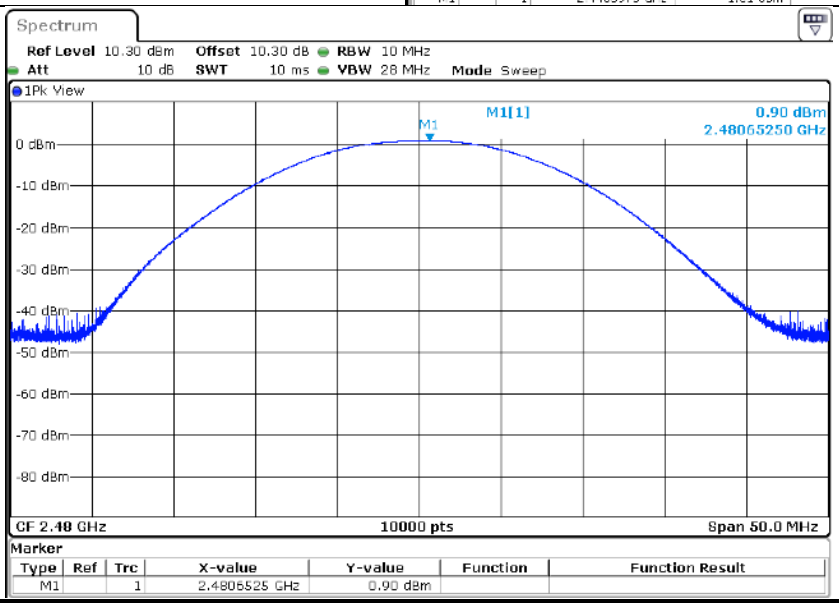
6.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
1	2405	**1.2**	30.0
11	2440	**1.5**	30.0
26	2480	**0.9**	30.0







6.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product EMS59300, SN: NHA9257300-1640281, 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	:	December 22, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	1000
Relative humidity (%)	:	27
Ambient temperature (°C)	:	22

7.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency.
Offset: Attenuator+cable 10.3dB

☐ ***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.

7.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122267	06/16	06/17
Cable 40GHz 2m coudé	-	-	A5329720	05/16	05/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	12/16

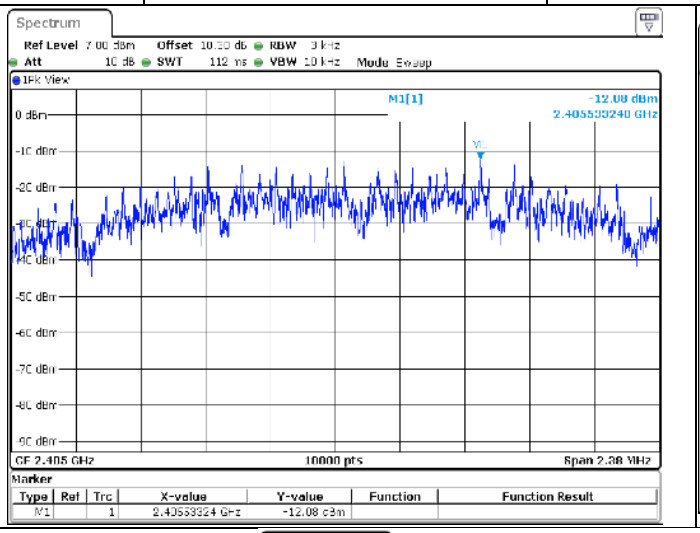
7.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

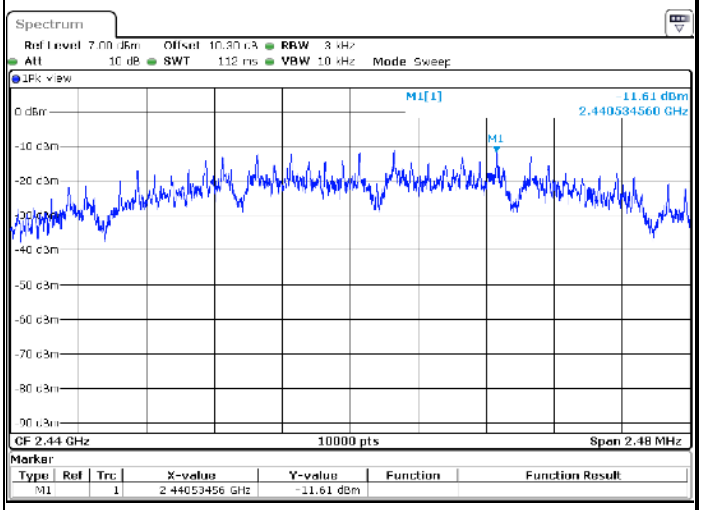
☑ None ☐ Divergence:

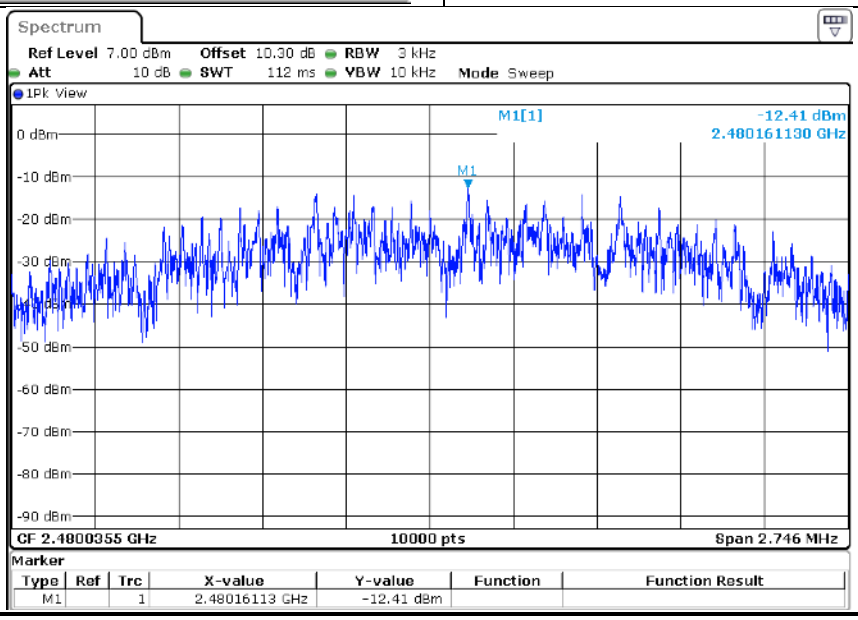
7.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
11	2405	**-12.1**	8.0
18	2440	**-11.6**	8.0
26	2480	**-12.4**	8.0







7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product EMS59300, SN: NHA9257300-1640281, 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	:	December 23, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	1001
Relative humidity (%)	:	21
Ambient temperature (°C)	:	36

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

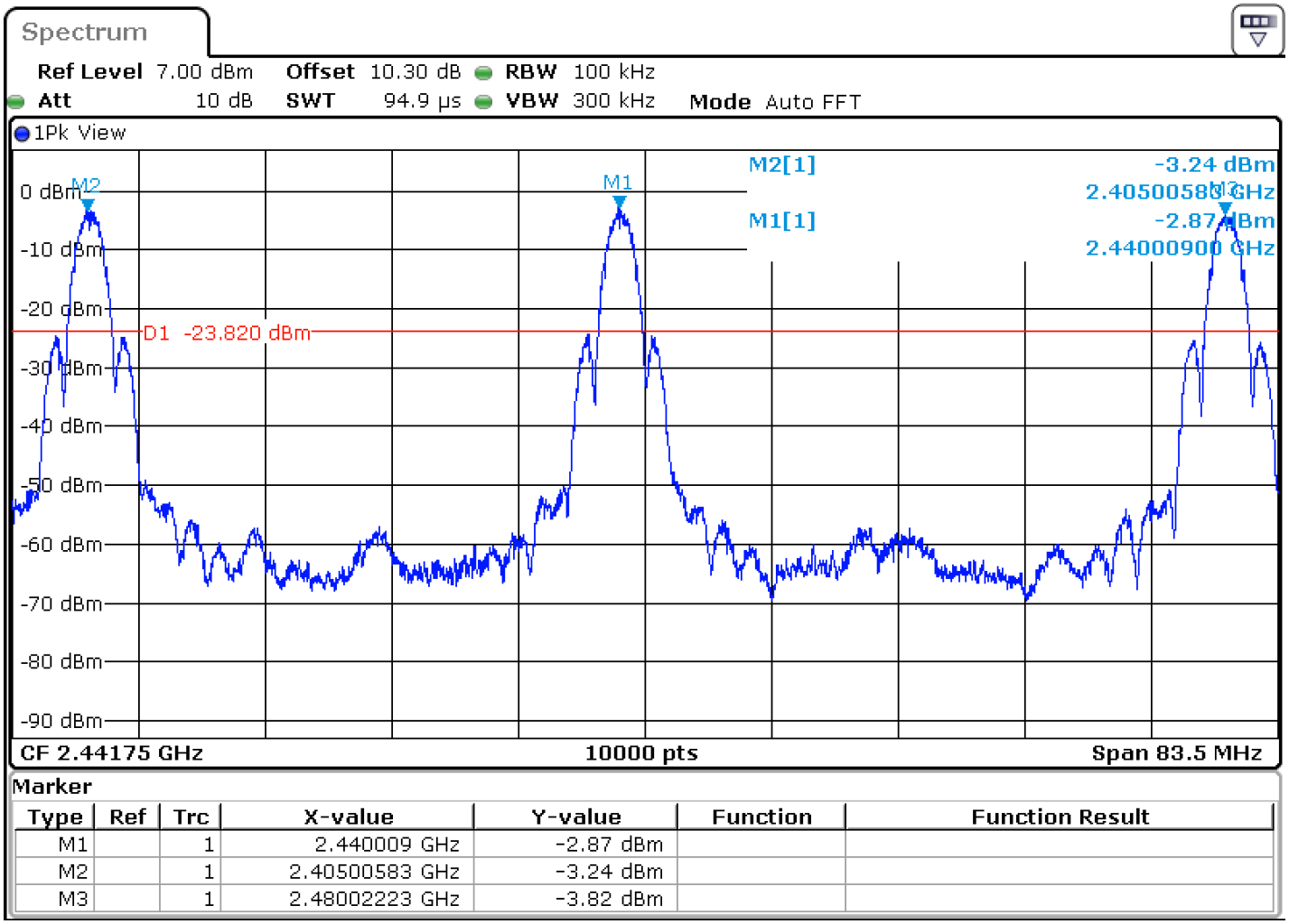
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122267	06/16	06/17
Cable 40GHz 2m coudé	-	-	A5329720	05/16	05/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	12/16

8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

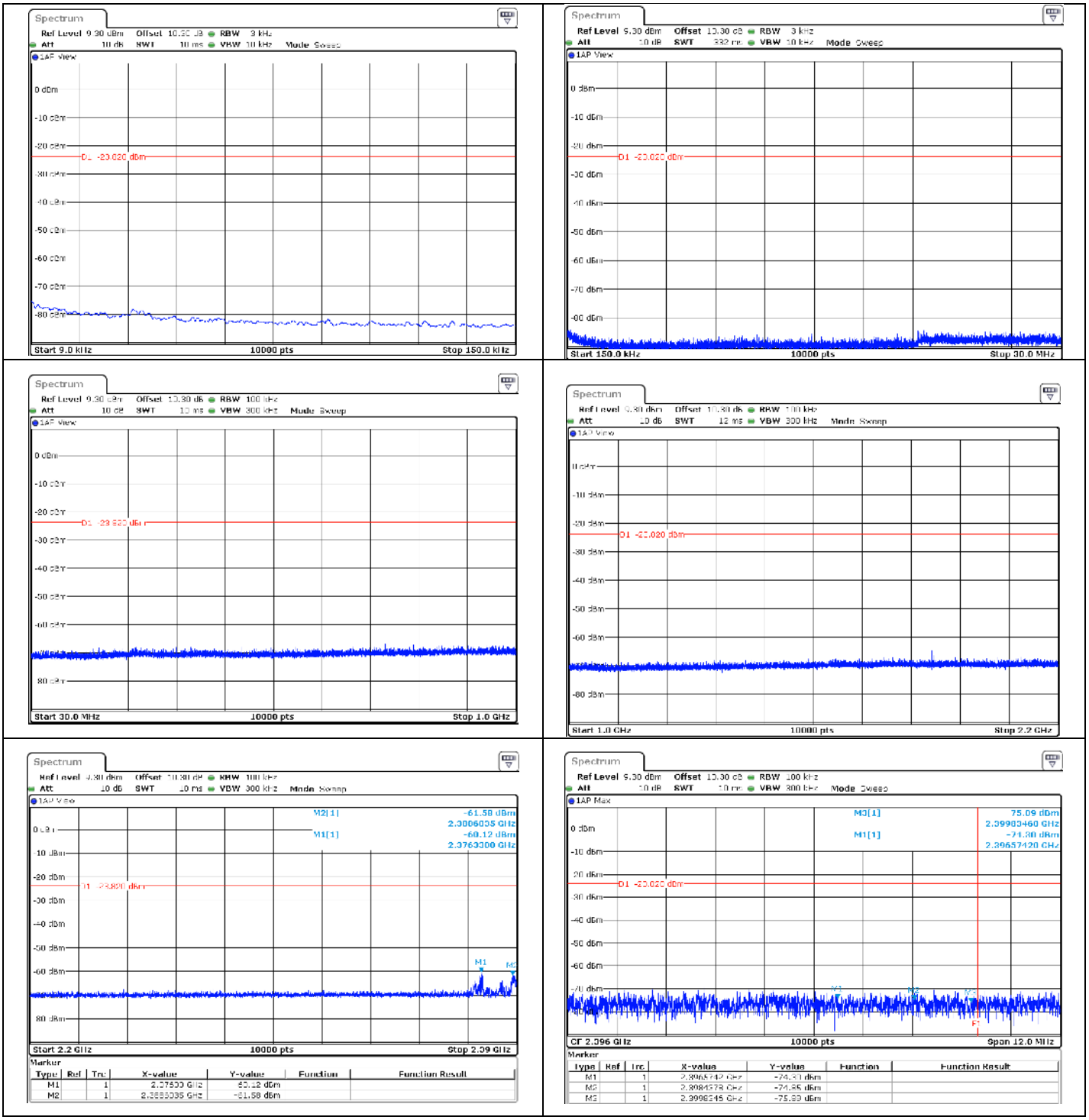
8.6. TEST SEQUENCE AND RESULTS

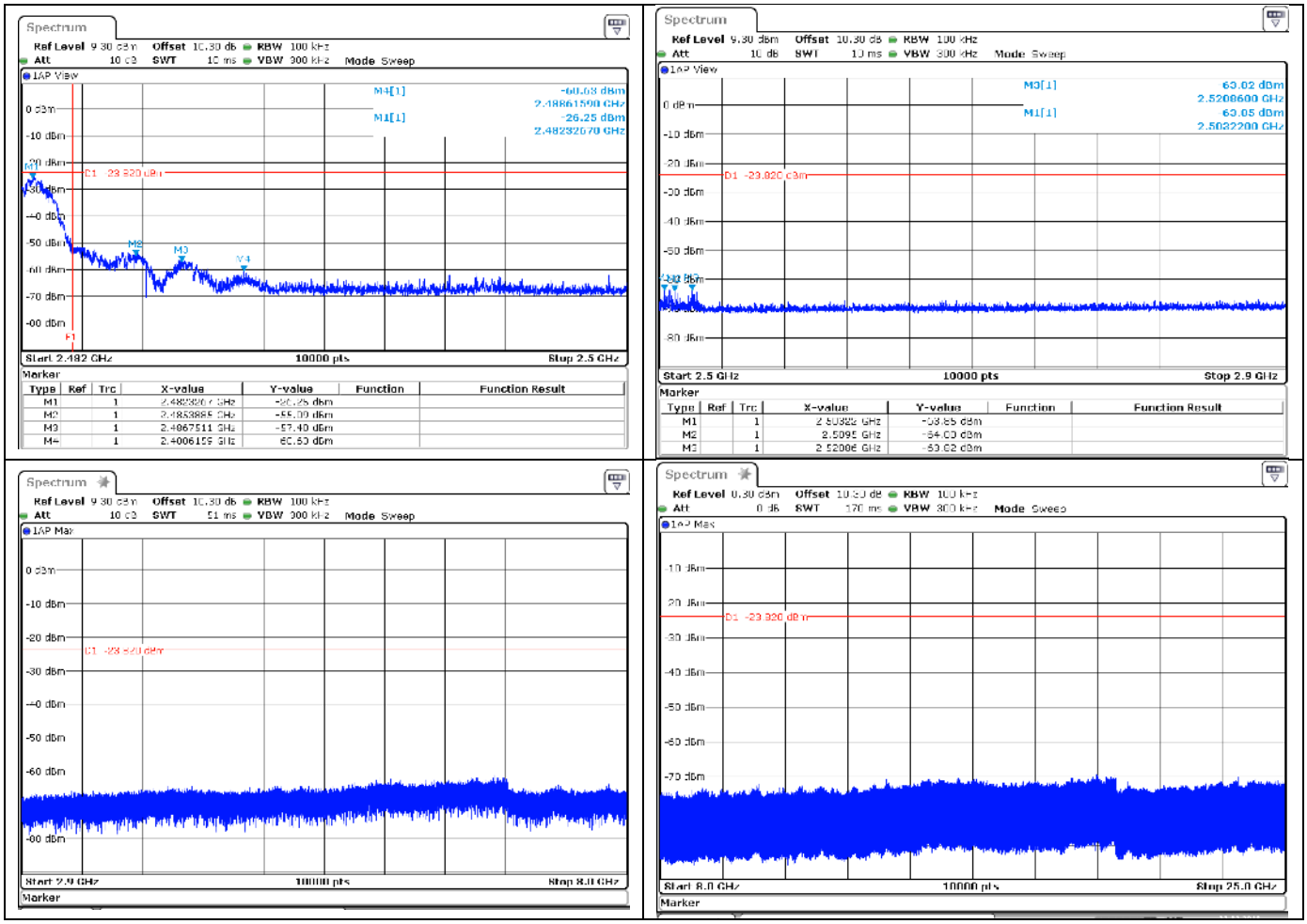
Offset: Attenuator+cable 10.3dB



-20dBc limit used : worst case : Middle Channel, limit at -23.82dB

Graphs 9kHz to 25GHz





8.7. CONCLUSION

Band Edge Measurement performed on the sample of the product EMS59300, SN: NHA9257300-1640281, 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	:	December 23, 2016
Test performed by	:	Jonathan PAUC
Atmospheric pressure (hPa)	:	1012
Relative humidity (%)	:	21.7
Ambient temperature (°C)	:	25

9.2. SETUP

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

☐ ***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:

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

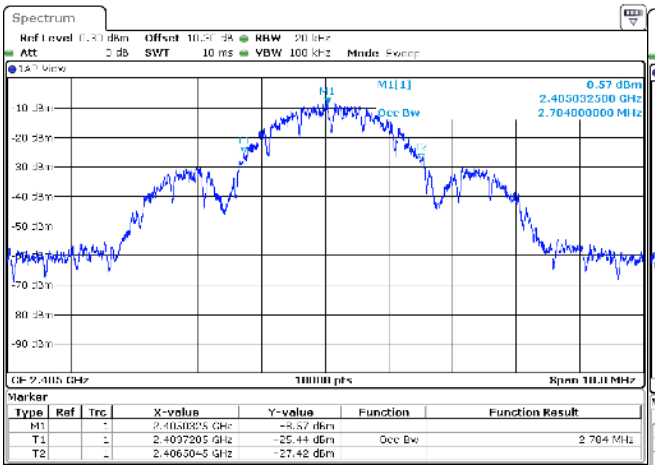
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122267	06/16	06/17
Cable 40GHz 2m coudé	-	-	A5329720	05/16	05/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	11/15	12/16

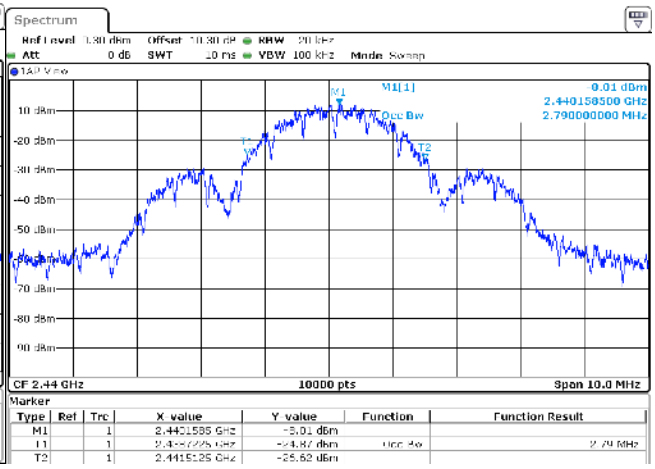
9.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

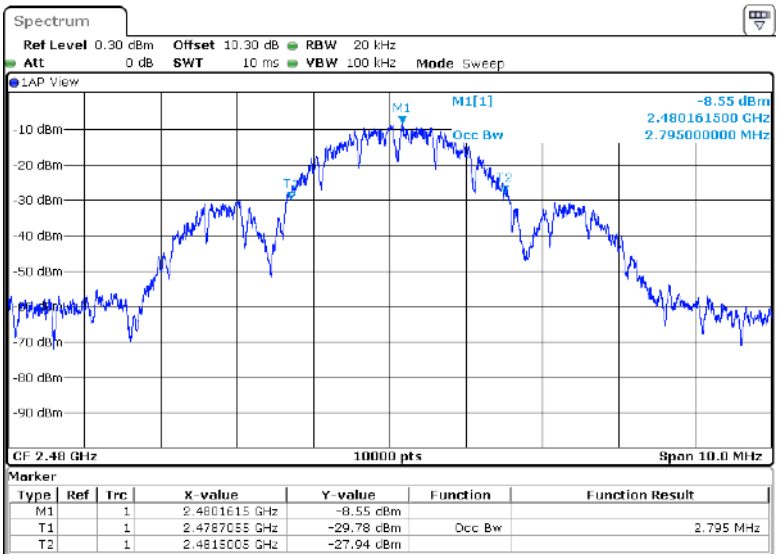
☑ None ☐ Divergence:

9.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)
11	2405	**2.784**
18	2440	**2.790**
26	2480	**2.795**

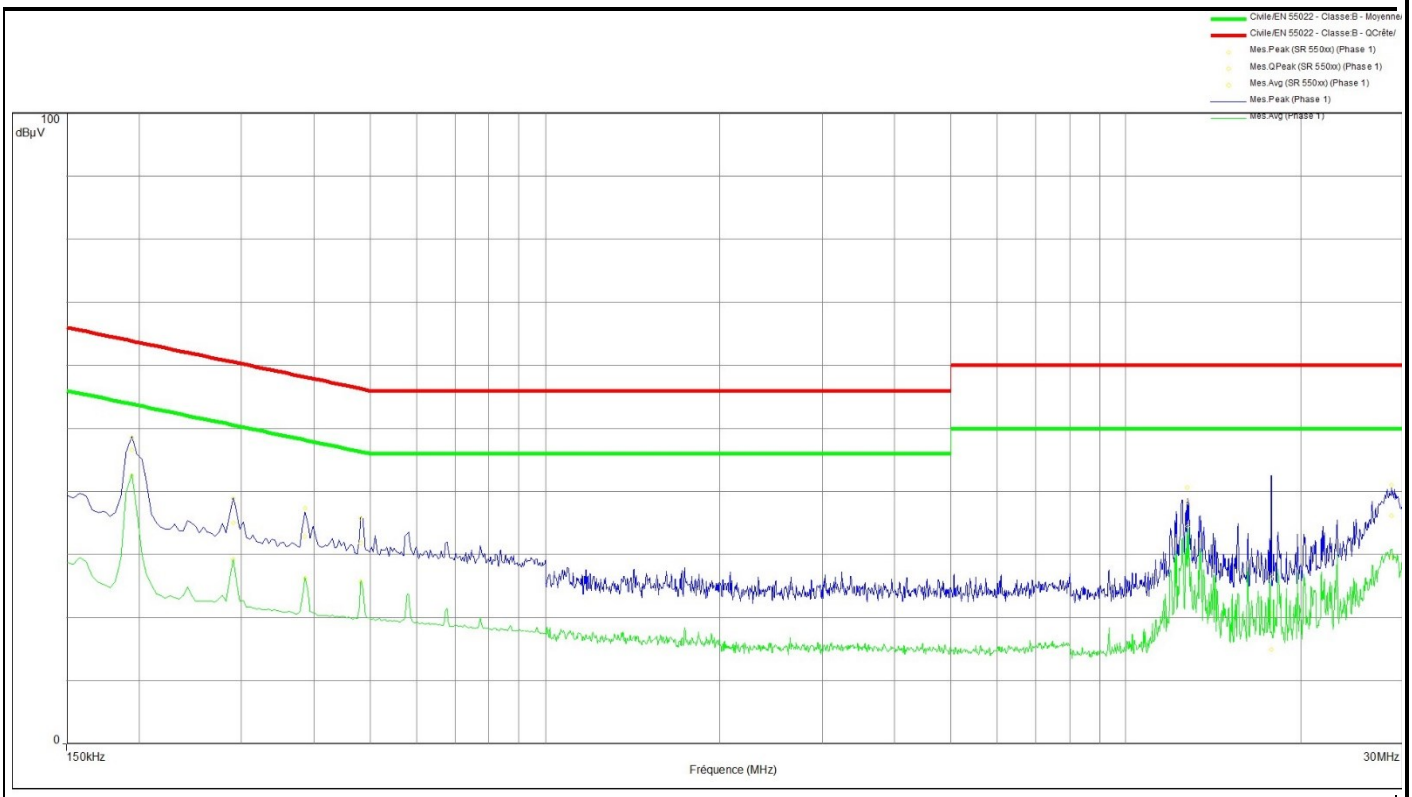






10. ANNEX 1 (GRAPHS)

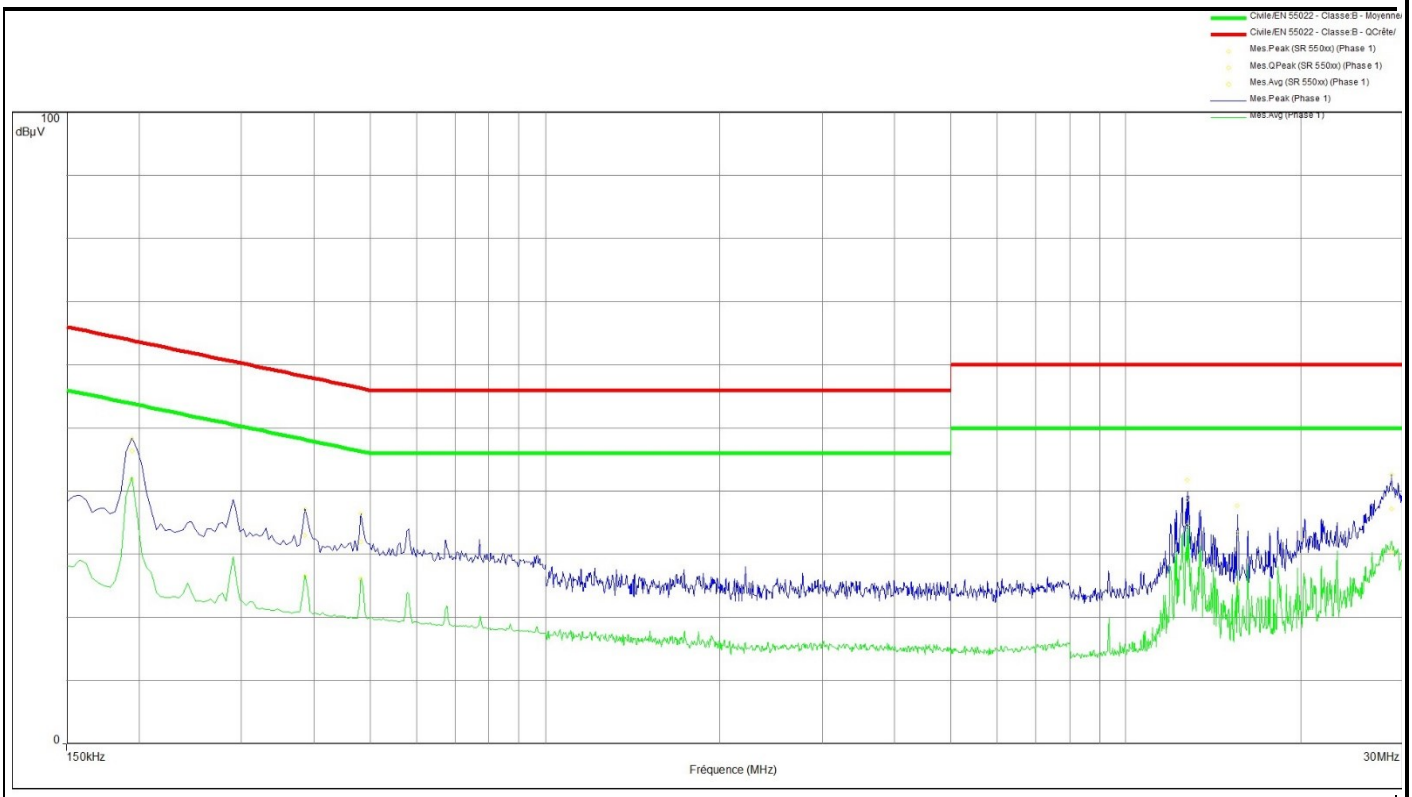
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	EN 55022	phase-LV150	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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
0.194	48.6	46.6	63.9	-17.3	42.5	53.9	-11.4	Phase
0.290	39.0	35.1	60.5	-25.4	29.2	50.5	-21.3	Phase
0.386	37.3	32.9	58.2	-25.2	26.2	48.2	-21.9	Phase
0.482	35.8	31.8	56.3	-24.5	25.7	46.3	-20.6	Phase
12.748	40.7	38.4	60.0	-21.6	34.5	50.0	-15.5	Phase
17.772	26.5	20.7	60.0	-39.3	14.9	50.0	-35.1	Phase
28.680	41.0	36.2	60.0	-23.8	29.5	50.0	-20.5	Phase

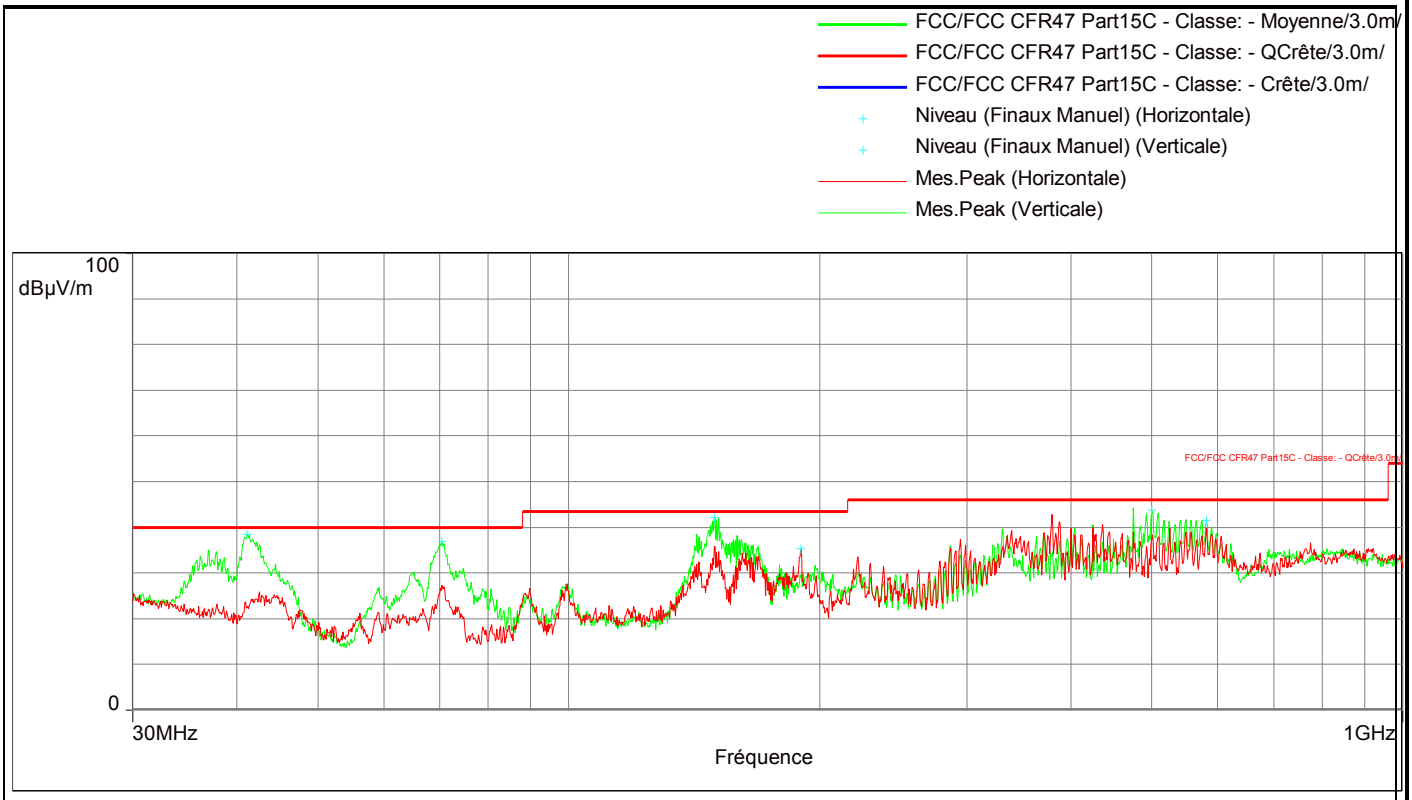
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	EN 55022	Neutral-LV150	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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
0.194	48.3	46.4	63.9	-17.5	41.9	53.9	-11.9	Neutral
0.386	37.1	33.0	58.2	-25.1	26.5	48.2	-21.6	Neutral
0.482	36.5	32.0	56.3	-24.3	26.1	46.3	-20.2	Neutral
12.748	41.8	38.6	60.0	-21.4	34.6	50.0	-15.4	Neutral
15.564	37.7	33.3	60.0	-26.7	25.2	50.0	-24.8	Neutral
28.688	42.5	37.2	60.0	-22.8	30.4	50.0	-19.6	Neutral

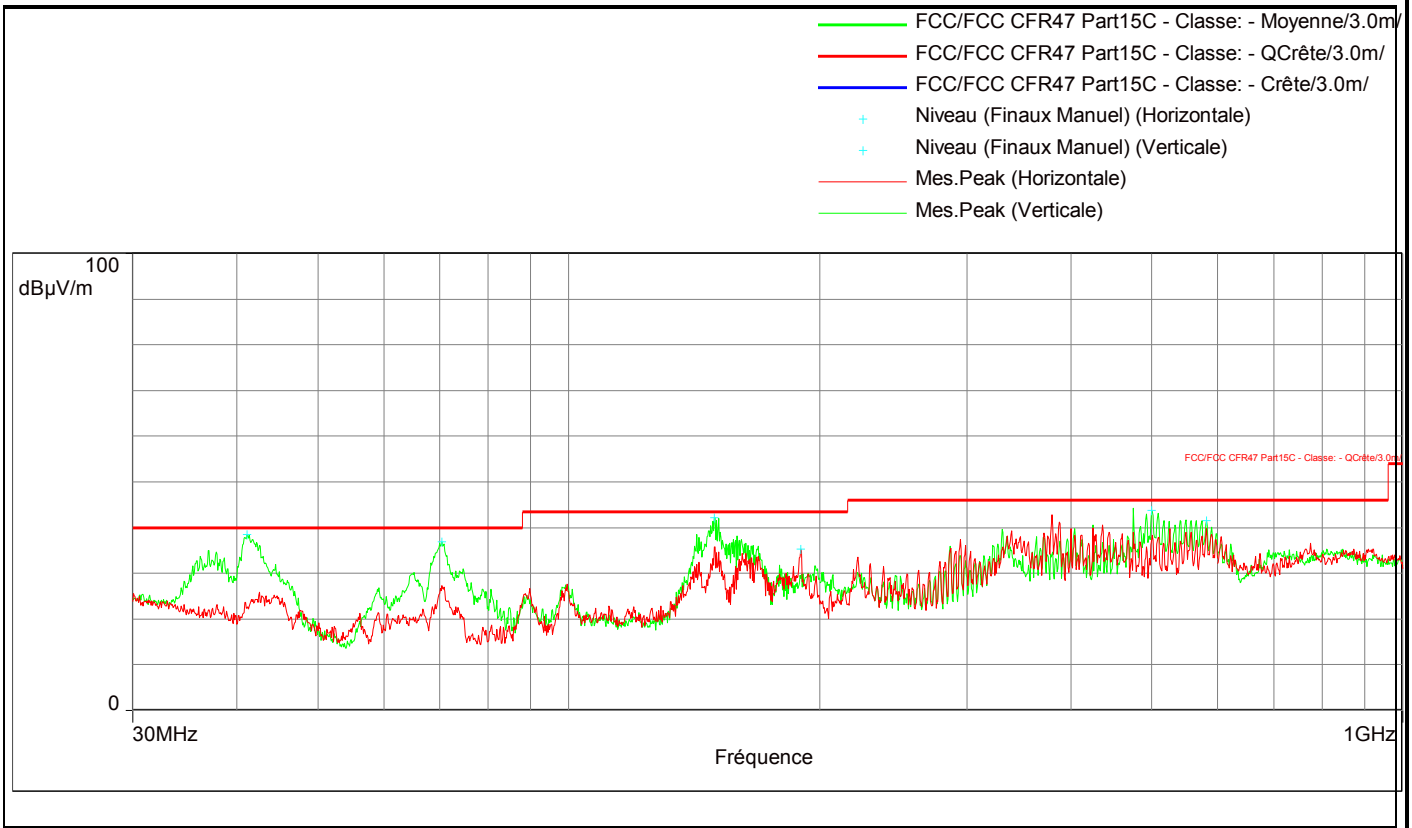
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - CMin - TX mode - Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
189.867	35.2	Horizontal
41.170	38.6	Vertical
70.464	36.9	Vertical
149.590	42.2	Vertical
499.870	43.8	Vertical
581.398	41.6	Vertical

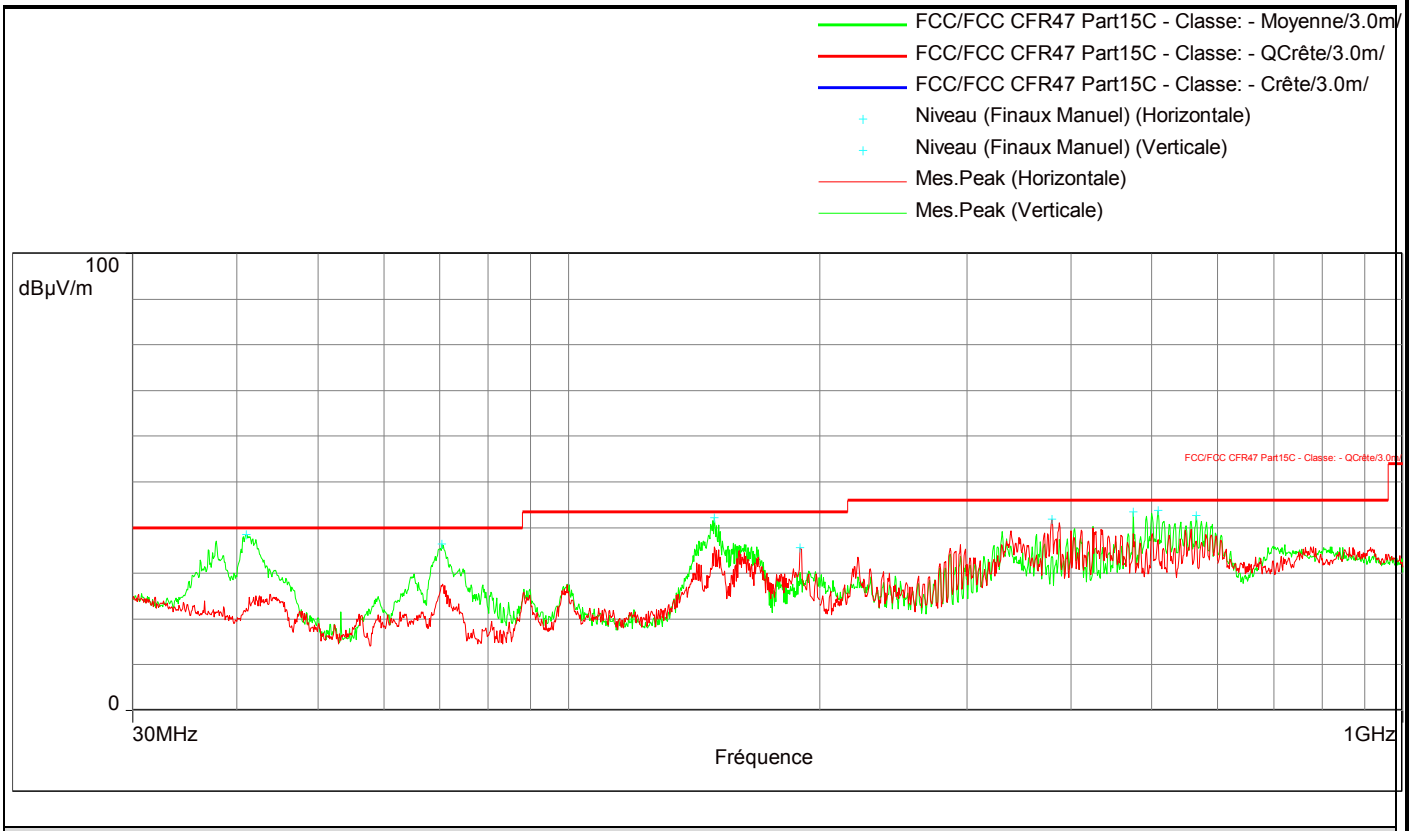
RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - CMid- TX mode - Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
189.865	35.3	Horizontal
41.170	37.6	Vertical
70.464	33.9	Vertical
149.590	42.2	Vertical
475.068	43.4	Vertical
499.871	42.8	Vertical
581.398	41.6	Vertical

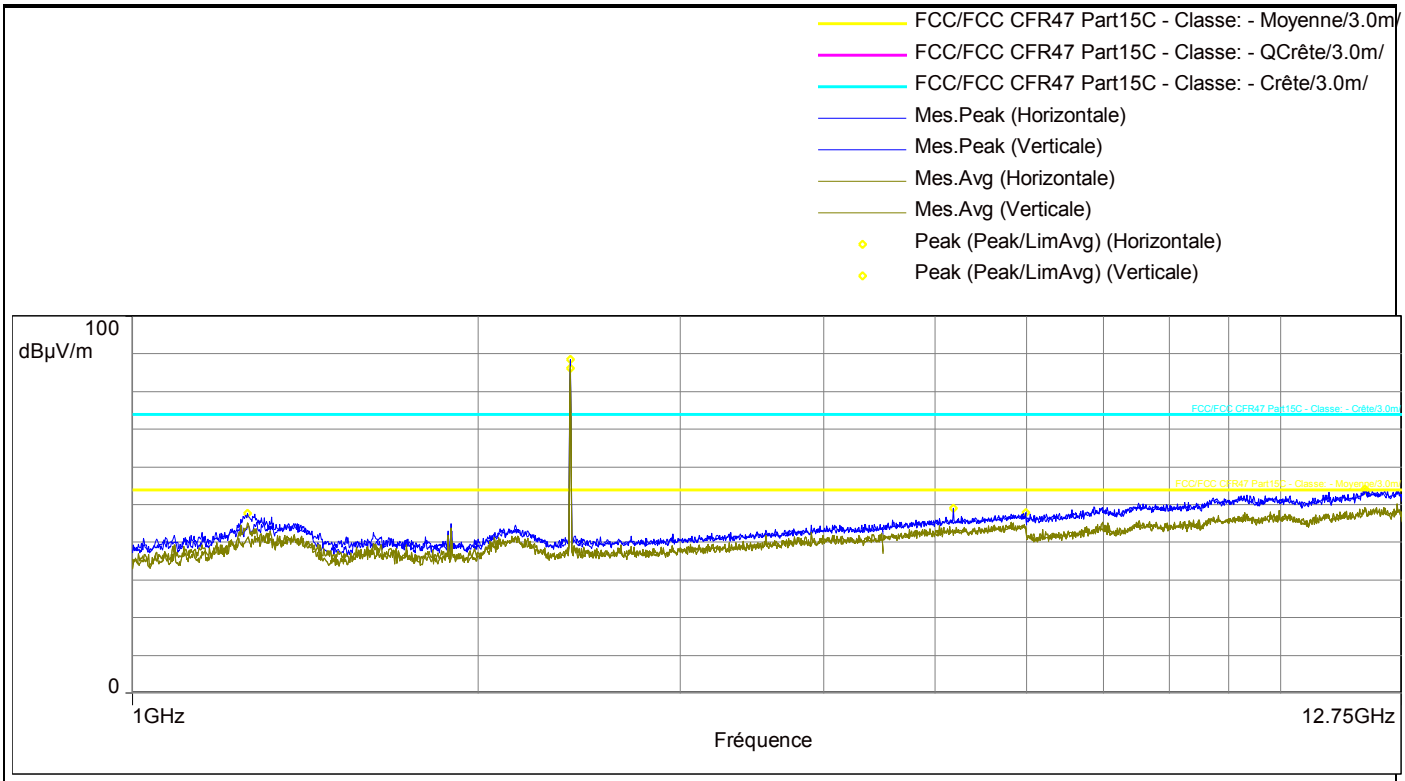
RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - CMax - TX mode - Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
189.425	35.6	Horizontal
379.538	41.8	Horizontal
41.068	38.5	Vertical
70.464	36.4	Vertical
149.539	42.1	Vertical
475.068	43.4	Vertical
508.751	43.8	Vertical
565.957	42.7	Vertical

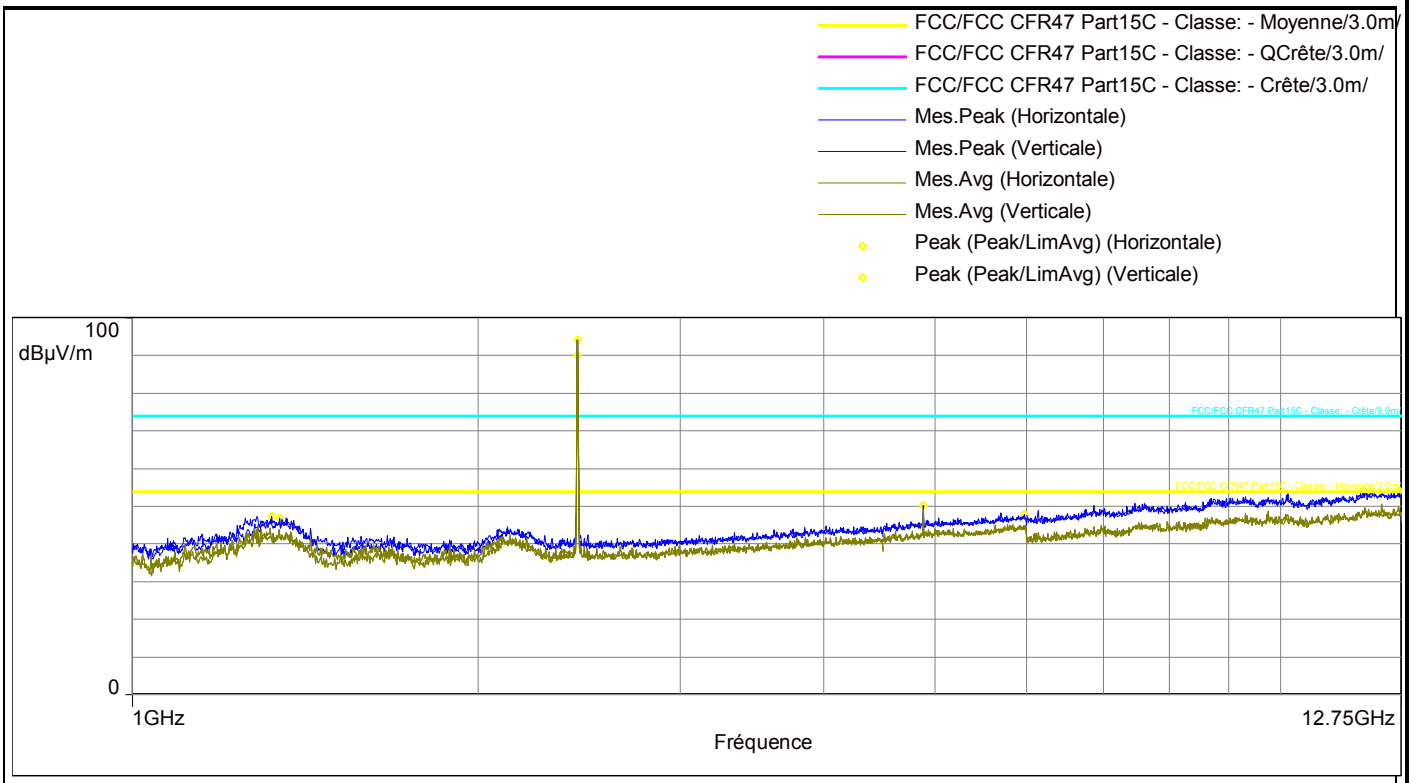
RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - -LV150 >1GHz - Cmin	
Class:			
Frequency range: [1GHz - 12.75GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimM (dBµV/m)	Peak-LimM (dB)	Polarization
1258.650	47.6	54.0	-6.4	Horizontal
2404.900	88.6	54.0	34.6	Horizontal
5993.100	47.9	54.0	-6.1	Horizontal
11836.725	54.1	54.0	0.1	Horizontal
2404.550	86.2	54.0	32.2	Vertical
5186.850	49.1	54.0	-4.9	Vertical
11856.975	53.8	54.0	-0.2	Vertical

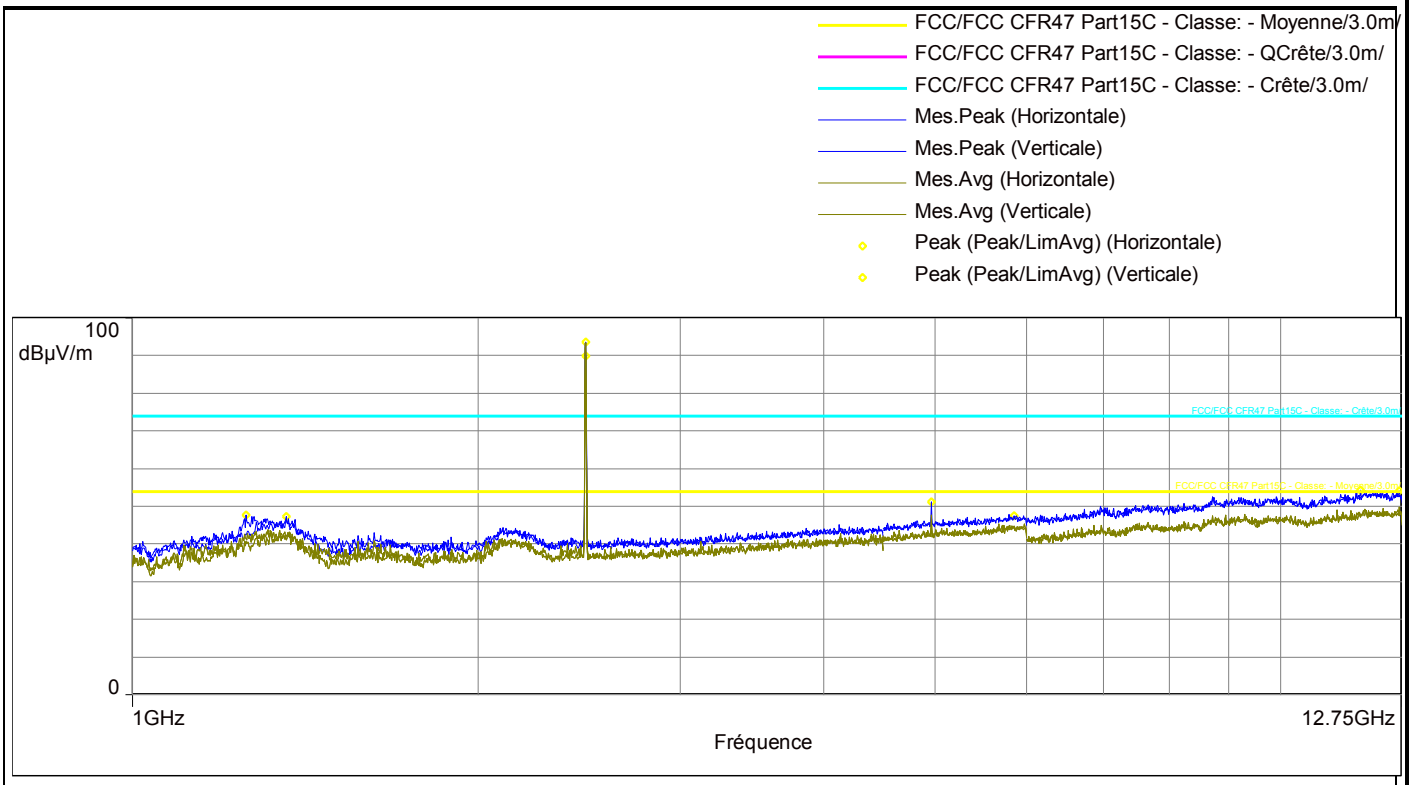
RADIATED EMISSIONS			
Graph name:	Emr#5	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) -LV150 >1GHz-Cmid	
Class:			
Frequency range: [1GHz - 12.75GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimM (dBµV/m)	Peak-LimM (dB)	Polarization
1321.300	47.3	54.0	-6.7	Horizontal
2439.900	90.1	54.0	36.1	Horizontal
5975.700	47.8	54.0	-6.2	Horizontal
11799.600	54.0	54.0	0.0	Horizontal
1343.000	46.9	54.0	-7.1	Vertical
2439.900	94.2	54.0	40.2	Vertical
4879.650	50.3	54.0	-3.7	Vertical
12666.300	54.2	54.0	0.2	Vertical

RADIATED EMISSIONS			
Graph name:	Emr#6	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - LV150 >1GHz-Cmax	
Class:			
Frequency range: [1GHz - 12.75GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimM (dBµV/m)	Peak-LimM (dB)	Polarization
1254.800	47.6	54.0	-6.4	Horizontal
2479.800	90.0	54.0	36.0	Horizontal
5860.500	47.4	54.0	-6.6	Horizontal
12666.975	54.2	54.0	0.2	Horizontal
1360.500	47.3	54.0	-6.7	Vertical
2479.800	93.5	54.0	39.5	Vertical
4961.100	51.1	54.0	-2.9	Vertical
11720.625	54.3	54.0	0.3	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.*

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