Template : March 5th, 2024

TEST REPORT

N°: **21490906-798426-F (FILE#7873522)** Version: **01**

Subject	**Electromagnetic compatibility tests according to the standards:** **FCC CFR 47 Part 15, Subpart B** **ANSI C63.4 / ANSI C63.4a** **ICES-003**
Issued to	**INGENICO TERMINALS** 9 Avenue de la gare - Rovaltain TGV BP25156 26958 – VALENCE Cedex 9 FRANCE
Apparatus under test	
Product	**Payment Terminal**
Trade mark	**INGENICO**
Manufacturer	**INGENICO**
Family range	**AXIUM**
Model under test	**AXIUM RX9000**
Serial number	**2419MR900128**
FCCID	**XKB-RX9CLWBT**
IC	**2586D-RX9CLWBT**
Conclusion	See Test Program chapter
Test date	February 19, 2024 to March 13, 2024 & May 21, 2024
Test location	LCIE Grenoble
FCC Test site	FR0008 - 197516 (MOI)
ISED Test site	6500A (MOI)
Sample receipt date	February 19, 2024
Composition of document	32 pages
Document issued on	August 09, 2024

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	August 09, 2024	Jonathan SARTO	Creation of the document

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

SUMMARY

1. TEST PROGRAM

1.1. FCC PART15B

Standard:

- ✓ **FCC Part 15, Subpart B (Digital Devices)**
- ✓ **ANSI C63.4 (2014) / ANSI C63.4a (2017)**
- ✓ **ICES-003 (2020)**

1.1.1. Requirements for disturbance emissions – Class B

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance 150kHz-30MHz **FCC §15.107 / ICES-003**	**Access: AC power**			**PASS**
	Frequency	**Quasi-peak**	**Average**	
	150-500kHz	66 to 56 dBµV	56 to 46 dBµV	
	0.5-5MHz	56 dBµV	46 dBµV	
	5-30MHz	60 dBµV	50 dBµV	
Radiated emissions 30MHz-1GHz **FCC §15.109**	**Access: Enclosure port of ancillary equipment**			**PASS**
	Frequency	**Quasi-peak @3m**		
	30MHz-88MHz	40.0 dBµV/m		
	88MHz-216MHz	43.5 dBµV/m		
	216MHz-960MHz	46.0 dBµV/m		
	Above 960MHz	54.0 dBµV/m		
Radiated emissions 30MHz-1GHz **ICES-003**	**Access: Enclosure port of ancillary equipment**			**PASS**
	Frequency	**Quasi-peak @3m**		
	30MHz-88MHz	40.0 dBµV/m		
	88MHz-216MHz	43.5 dBµV/m		
	216MHz-230MHz	46.0 dBµV/m		
	230MHz-960MHz	47.0 dBµV/m		
	Above 960MHz	54.0 dBµV/m		
Radiated emissions 1GHz-40GHz* **FCC §15.109 / ICES-003**	**Access: Enclosure port of ancillary equipment**			**PASS**
	Frequency	**Peak @3m**	**Average @3m**	
	1- 6GHz	74.0 dBµV/m	54.0 dBµV/m	

NA: Not Applicable / NP: Not Performed, not requested by the customer (It cannot be taken into account for the declaration of conformity)
D: Divergence, the last version is used to make it possible to test the product with the standard which describes the current state of the art and thus to answer as well as possible his environment of final use. If this test is covered by the COFRAC accreditation, the declaration of conformity for product standard only are carried out outside the framework of accreditation.
*§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.
Special condition for intentional radiator:

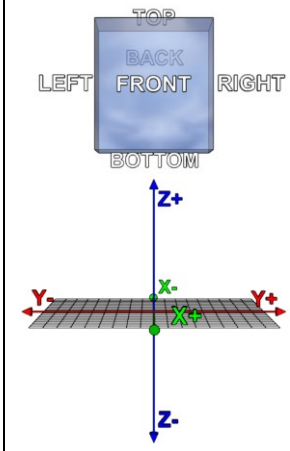
- For a composite system comprised of a digital device using a clock frequency of 1 GHz as the highest frequency for the digital logic and an intentional radiator operating at 2.4 GHz, the composite is required to be investigated to the upper frequency of 24 GHz (in this case, 10 times the intentional radiator frequency is the higher frequency).

- For a composite system comprised of a digital device using a clock frequency of 2 GHz as the highest frequency for the digital logic and an intentional radiator operating at 913 MHz, the composite is required to be investigated to the upper frequency of 10 GHz (in this case, 5 times the unintentional radiator clock frequency is the higher frequency).

2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES)

Equipment under test (EUT):

Model under test :	**AXIUM RX9000**
Serial Number:	**2419MR900128**
	
Dimensions:	20cm x 17cm x 2.5cm (Length x Width x Height)
Type :	Panel / Rack / Cabinet (considered like table-top)

Power supply:
During all the tests, EUT is supplied by V_{nom}: **12.6(POE) and 8(Combox)VDC**
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	DC	Input :48VDC 0.27A Output: 12.6V 0.82A	INGENICO POE Box / 192231010143071	Powered via POE box
Supply2	DC	8/12V 3.2A/2.5A	INGENICO Combox / 296230248AB	Powered via Combox

NC: Not communicated by provider

Earth:

Access	Type	Length (m)	Width (mm)	Thickness (mm)	Under test	Comments
None						

NC: Not communicated by provider

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Access1	iDMI config1	2.5	Yes	Yes	Yes	Config POE
Access2	iDMI config 2	2.5	Yes	Yes	Yes	Config Combox

NC: Not communicated by provider

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	DELL	-	-
POE BOX	INGENICO POE Box	192231010143071	-
POE supply	PowerDsine 3501G	-	-
COMBOX	INGENICO Combox	296230248AB	-
Combox supply	Ktec KSA-32A-080300M2	-	-

NC: Not communicated by provider

2.2. EUT CONFIGURATION

Hardware information			
Highest internal frequency (PLL, Quartz, Clock, Microprocessor…):	**$F_{Highest}$:**	**1800**	**MHz**
Firmware (if applicable):	**V. :**	-	
Software (App version):	**V. :**	2.2.8_Build20230517	
Time necessary for the EUT to be exercised and to respond:	**Dwell:**	**3**	**s**

NC: Not communicated by provider

Running mode n°1:

*Setup:*The WIFI and the Bluetooth are actived. A ping is performed on Ethernet. Authenticate Tests are launched on EUT.

Authenticate tests:

Test function	Test modules activated	Test function	Test modules activated
LCD	☒	Enet	☐
Print	☐	WIFI	☐
Buzzer	☒	Bluetooth	☐
RFCard	☒	Mag Card	☐
4G	☐	IC Card	☒
Video	☒	SAM1 Card	☒
Audio	☒	SAM2 Card	☐
Reboot	☐	SAM3 Card	☐
Flash	☐	SAMV IDCard	☐
Front camera	☒	USB	☒
Record	☒	MagicBox Usb-B	☐
Scan head scanning	☐	UdiskModule	☐
Rear camera	☒	TFCard	☐

2.3. EQUIPMENT MODIFICATIONS DURING THE TESTS

None

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

2.5. TEST DISTANCE EXTRAPOLATION – FCC/ISED

The field strength is extrapolated to the new measurement distance using formula from FCC Part15.31 (f) and §6.5-6.6 RSS-GEN:

Below 30MHz,

$$FS_{\text{limit}} = FS_{\text{max}} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

Above 30MHz,

$$FS_{\text{limit}} = FS_{\text{max}} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

Where:
FS_{limit} is the calculation of field strength at the limit distance, expressed in dBµV/m
FS_{max} is the measured field strength, expressed in dBµV/m
$d_{measure}$ is the distance of the measurement point from the EUT
d_{limit} is the reference limit distance

2.6. CALIBRATION DATE

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

3. MEASUREMENT OF CONDUCTED EMISSION

3.1. TEST CONDITIONS

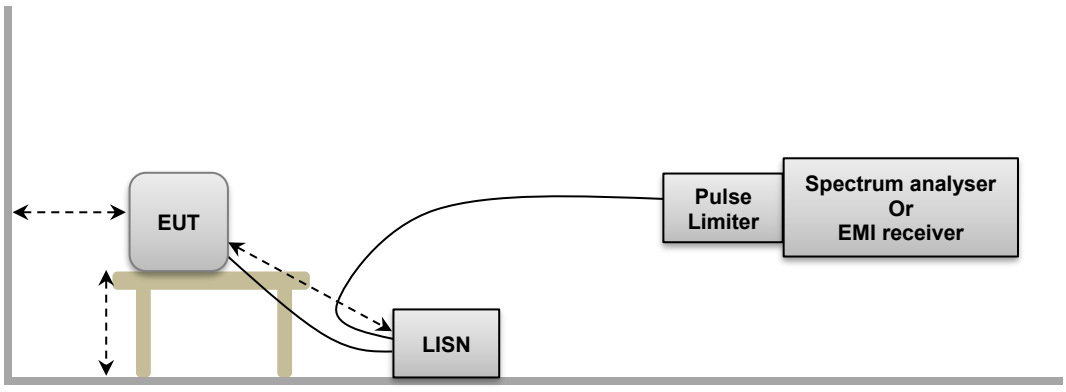
Date of test	:	February 19, 2024
Test performed by	:	Jonathan SARTO
Atmospheric pressure (hPa)	:	1006
Relative humidity (%)	:	40
Ambient temperature (°C)	:	23

3.2. TEST SETUP

Test procedure:
ANSI C63.4 & FCC Part 15 subpart B

The EUT and auxiliaries are set 80cm above the ground on the non-conducting table (Table-top equipment) at 80cm from the LISN, the cable has been shorted to 1meter length. The distance between the EUT and the vertical ground plane is 40cm. Measurement is made with a receiver in peak mode. 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. Interconnecting cables and equipment's were moved to position that maximized emission. The EUT is powered like specified in following table, through a LISN (measure); auxiliaries are powered by another LISN.

Type	Measurement performed:	
☐ AC / ☑ DC (Auxiliary used)	☑ 120VAC/60Hz	☑ 240VAC/50Hz
☐ USB (Laptop auxiliary)	☐ 120VAC/60Hz (Laptop auxiliary)	☐ 240VAC/50Hz (Laptop auxiliary)



Test setup of AC Power Line Conducted Emissions

Configuration 1: with POE

Configuration 2: with Combox

Photo of AC Power Line Conducted Emissions

3.3. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
BAT EMC	NEXIO	v3.21.0.32	L1000115		
Cable + self	_	_	A5329578	05/22	05/24
EMC comb generator	LCIE SUD EST	_	A3169098		
LISN	ROHDE & SCHWARZ	ENV216	C2320291	07/23	07/24
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	03/23	03/25
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	05/23	05/25
Transient limiter	ROHDE & SCHWARZ	ESH3-Z2	A7122204	08/22	08/24
Load 50Ω - BNC	AEROFLEX	_	A7152072	07/23	07/24
LISN	ROHDE & SCHWARZ	ESH3-Z5	C2320314	07/23	07/24

3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

3.5. TEST RESULTS – RUNNING MODE N°1

Mains terminals:

SUPPLY1

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

Results: (PEAK detection)

Graph identifier		Line	Comments	
Emc#	1	Phase	120VAC/60Hz – configuration 1	See below
Emc#	2	Neutral	120VAC/60Hz – configuration 1	See below
Emc#	3	Phase	240VAC/50Hz – configuration 1	See below
Emc#	4	Neutral	240VAC/50Hz – configuration 1	See below

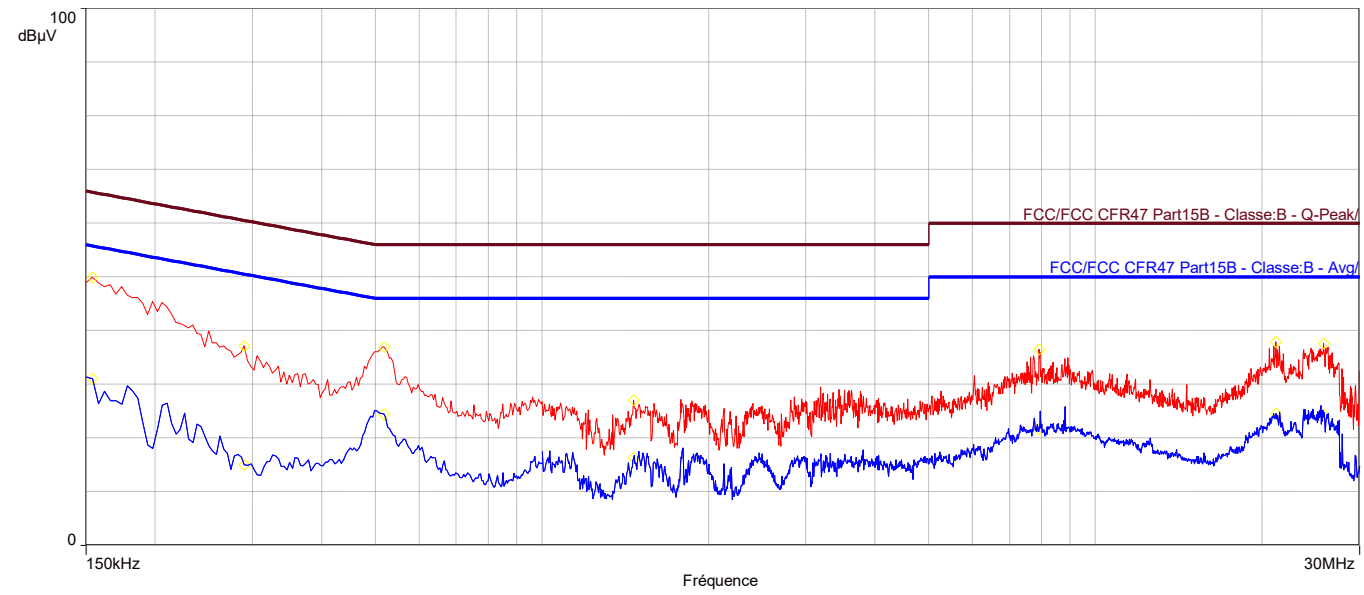
SUPPLY2

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

Results: (PEAK detection)

Graph identifier		Line	Comments	
Emc#	5	Phase	120VAC/60Hz – configuration 2	See below
Emc#	6	Neutral	120VAC/60Hz – configuration 2	See below
Emc#	7	Phase	240VAC/50Hz – configuration 2	See below
Emc#	8	Neutral	240VAC/50Hz – configuration 2	See below

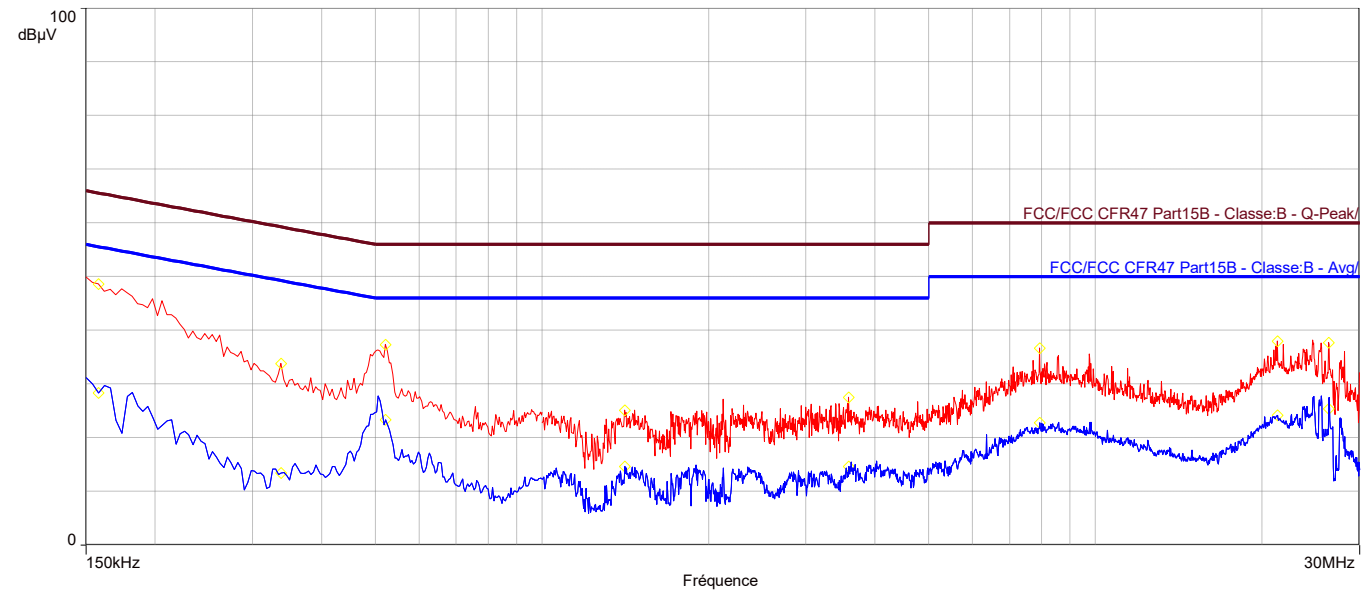
CONDUCTED EMISSIONS					
Graph name:	Emc#1	**Test configuration:**			
Limit:	FCC CFR47 Part15B	Configuration 1 : POE			
Class:	B				
Frequency range: [150kHz - 30MHz]					
Voltage / Frequency:	120V/60Hz	**RBW:**	10kHz	**VBW:**	30kHz
Line:	**Phase**	**Trace color & detector:**		PEAK AVG	



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.154	44.2	65.8	**-21.6**	28.3	55.8	**-27.5**
0.290	30.0	60.5	**-30.6**	16.0	50.5	**-34.5**
0.518	32.6	56.0	**-23.4**	23.3	46.0	**-22.7**
1.464	22.6	56.0	**-33.4**	15.8	46.0	**-30.2**
7.908	27.8	60.0	**-32.2**	21.3	50.0	**-28.7**
21.192	31.7	60.0	**-28.3**	23.1	50.0	**-26.9**
25.876	25.7	60.0	**-34.3**	18.3	50.0	**-31.7**

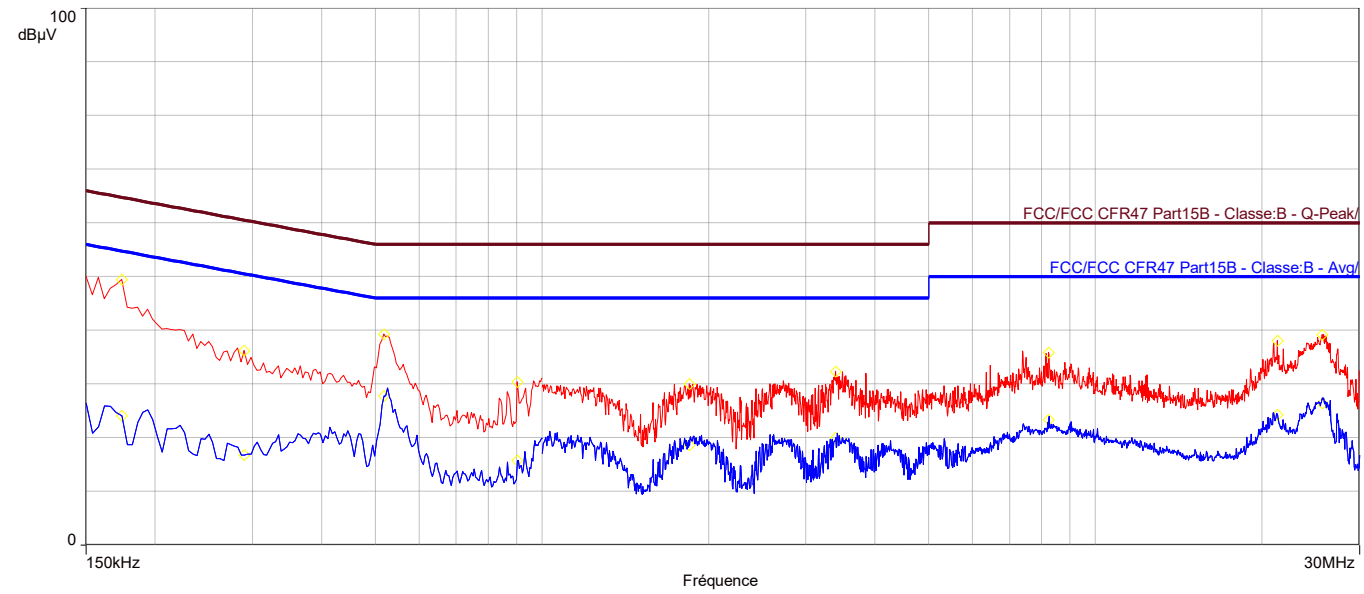
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 1 : POE	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120V/60Hz	**RBW:** 10kHz	**VBW:** 30kHz
Line:	**Neutral**	**Trace color & detector:**	PEAK AVG



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.158	44.2	65.6	**-21.3**	27.1	55.6	**-28.4**
0.338	24.8	59.2	**-34.4**	12.1	49.2	**-37.2**
0.522	31.6	56.0	**-24.4**	22.1	46.0	**-23.9**
1.412	19.8	56.0	**-36.2**	12.5	46.0	**-33.5**
3.580	20.2	56.0	**-35.8**	12.9	46.0	**-33.1**
7.928	28.0	60.0	**-32.0**	21.1	50.0	**-28.9**
21.316	29.7	60.0	**-30.3**	22.6	50.0	**-27.4**
26.404	26.5	60.0	**-33.5**	19.5	50.0	**-30.5**

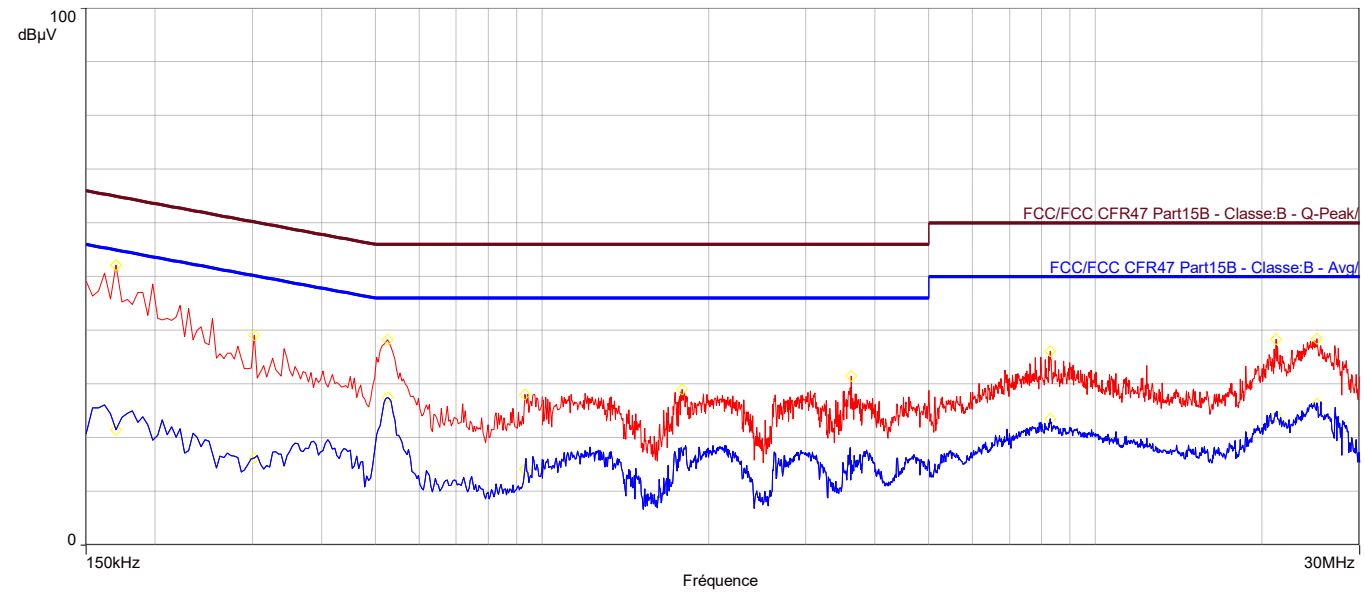
CONDUCTED EMISSIONS			
Graph name:	Emc#3	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 1 : POE	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240V/50Hz	**RBW:** 10kHz	**VBW:** 30kHz
Line:	**Phase**	**Trace color & detector:**	PEAK AVG



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.174	37.7	64.8	**-27.0**	20.5	54.8	**-34.3**
0.290	26.9	60.5	**-33.6**	17.9	50.5	**-32.6**
0.518	34.5	56.0	**-21.5**	25.4	46.0	**-20.6**
0.902	22.2	56.0	**-33.8**	14.3	46.0	**-31.7**
1.848	26.0	56.0	**-30.0**	18.9	46.0	**-27.1**
3.396	25.6	56.0	**-30.4**	17.9	46.0	**-28.1**
8.228	28.5	60.0	**-31.5**	21.4	50.0	**-28.6**
21.312	33.1	60.0	**-26.9**	22.6	50.0	**-27.4**
25.688	31.0	60.0	**-29.0**	23.0	50.0	**-27.0**

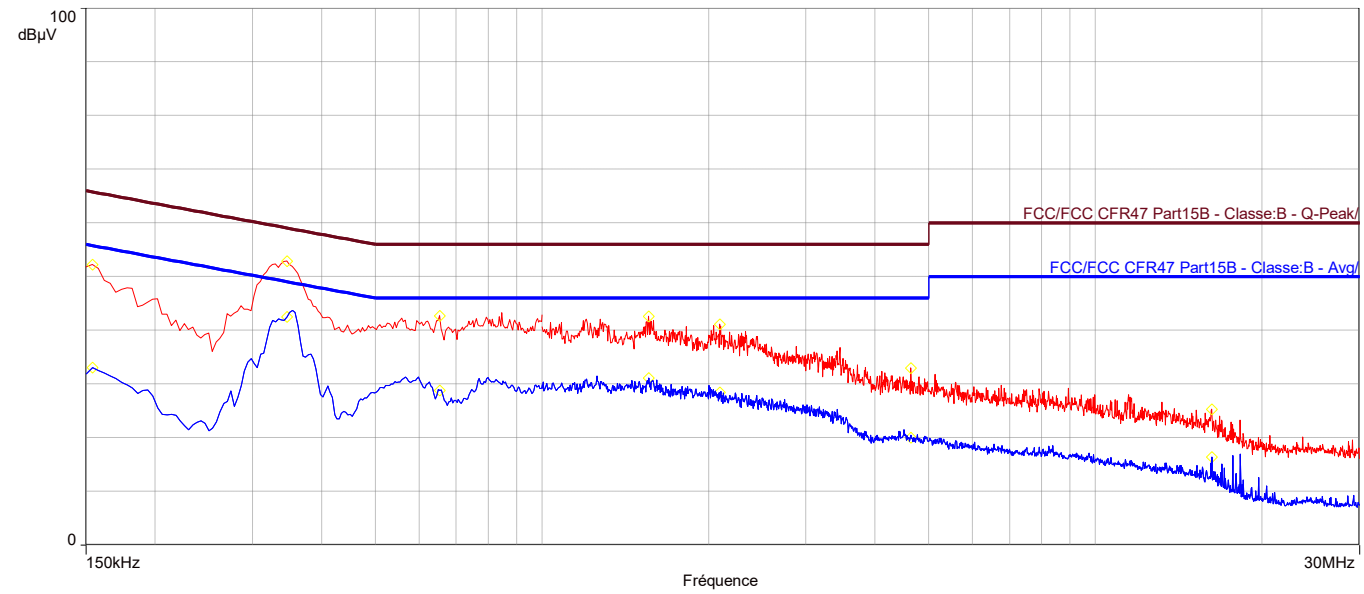
CONDUCTED EMISSIONS			
Graph name:	Emc#4	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 1 : POE	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240V/50Hz	**RBW:** 10kHz	**VBW:** 30kHz
Line:	**Neutral**	**Trace color & detector:**	PEAK AVG



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.170	37.9	65.0	**-27.1**	21.7	55.0	**-33.3**
0.302	22.4	60.2	**-37.7**	10.6	50.2	**-39.6**
0.526	33.6	56.0	**-22.4**	24.9	46.0	**-21.1**
0.930	24.0	56.0	**-32.0**	15.4	46.0	**-30.6**
1.792	23.4	56.0	**-32.6**	15.8	46.0	**-30.2**
3.616	24.1	56.0	**-31.9**	17.0	46.0	**-29.0**
8.288	27.6	60.0	**-32.4**	21.2	50.0	**-28.8**
21.192	31.9	60.0	**-28.1**	22.9	50.0	**-27.1**
25.104	33.3	60.0	**-26.7**	26.0	50.0	**-24.0**

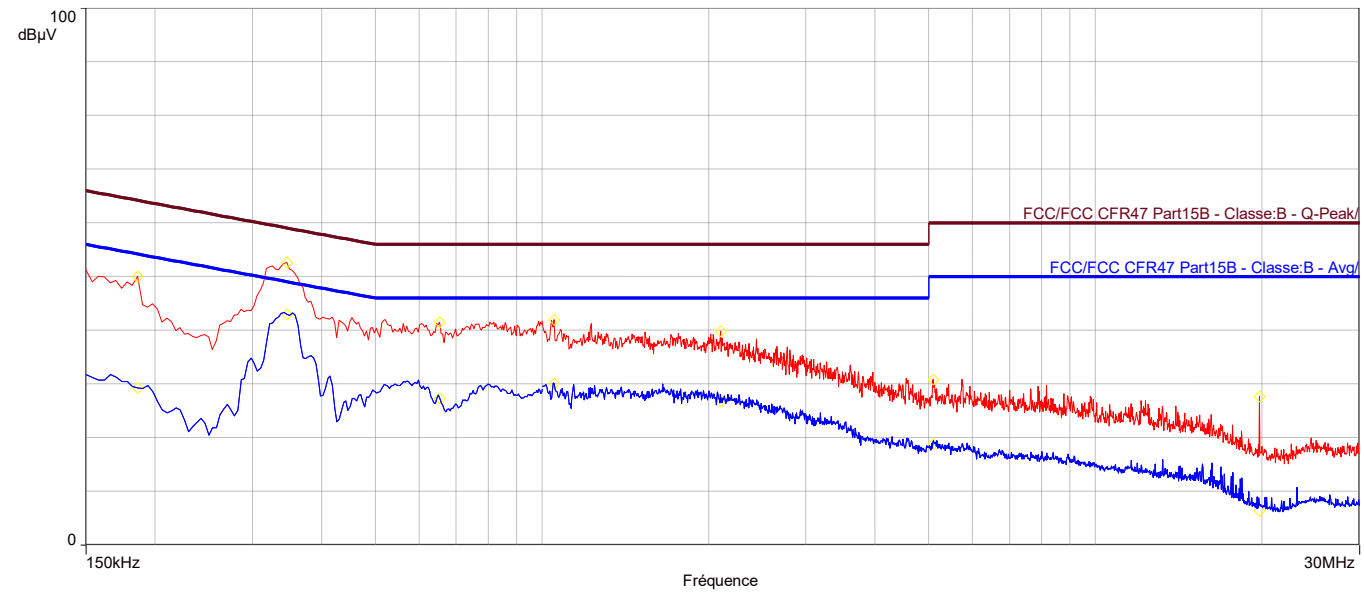
CONDUCTED EMISSIONS			
Graph name:	Emc#5	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 2 : Combox	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120V/60Hz	**RBW:** 10kHz	**VBW:** 30kHz
Line:	**Phase**	**Trace color & detector:**	PEAK AVG



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.154	44.8	65.8	**-21.0**	30.5	55.8	**-25.3**
0.346	51.1	59.1	**-8.0**	41.9	49.1	**-7.2**
0.654	38.0	56.0	**-18.0**	28.2	46.0	**-17.8**
1.560	36.6	56.0	**-19.4**	29.1	46.0	**-16.9**
2.096	34.4	56.0	**-21.6**	26.9	46.0	**-19.1**
4.640	25.4	56.0	**-30.6**	19.3	46.0	**-26.7**
16.228	21.6	60.0	**-38.4**	16.7	50.0	**-33.3**

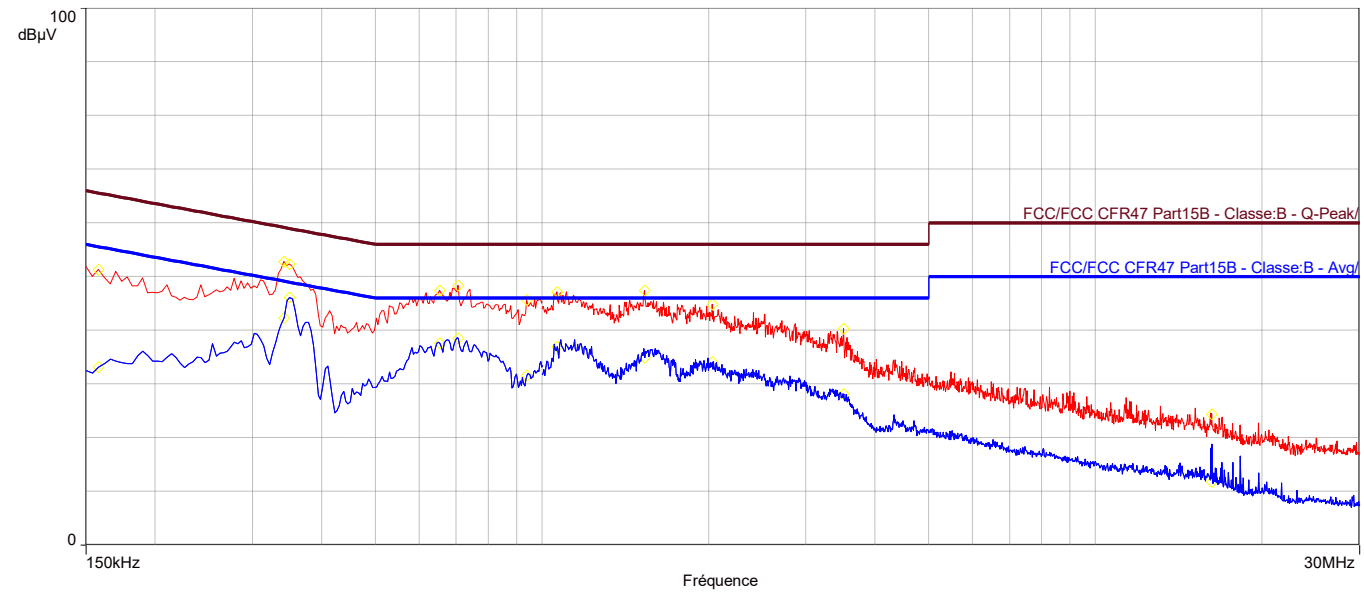
CONDUCTED EMISSIONS			
Graph name:	Emc#6	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 2 : Combox	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120V/60Hz	**RBW:** 10kHz	**VBW:** 30kHz
Line:	**Neutral**	**Trace color & detector:**	PEAK AVG



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.186	39.9	64.2	**-24.3**	28.4	54.2	**-25.8**
0.346	50.4	59.1	**-8.6**	41.1	49.1	**-8.0**
0.654	36.9	56.0	**-19.1**	27.9	46.0	**-18.1**
1.052	38.1	56.0	**-17.9**	28.7	46.0	**-17.3**
2.104	34.4	56.0	**-21.6**	27.1	46.0	**-18.9**
5.092	23.5	60.0	**-36.5**	17.7	50.0	**-32.3**
19.784	11.7	60.0	**-48.3**	6.2	50.0	**-43.8**

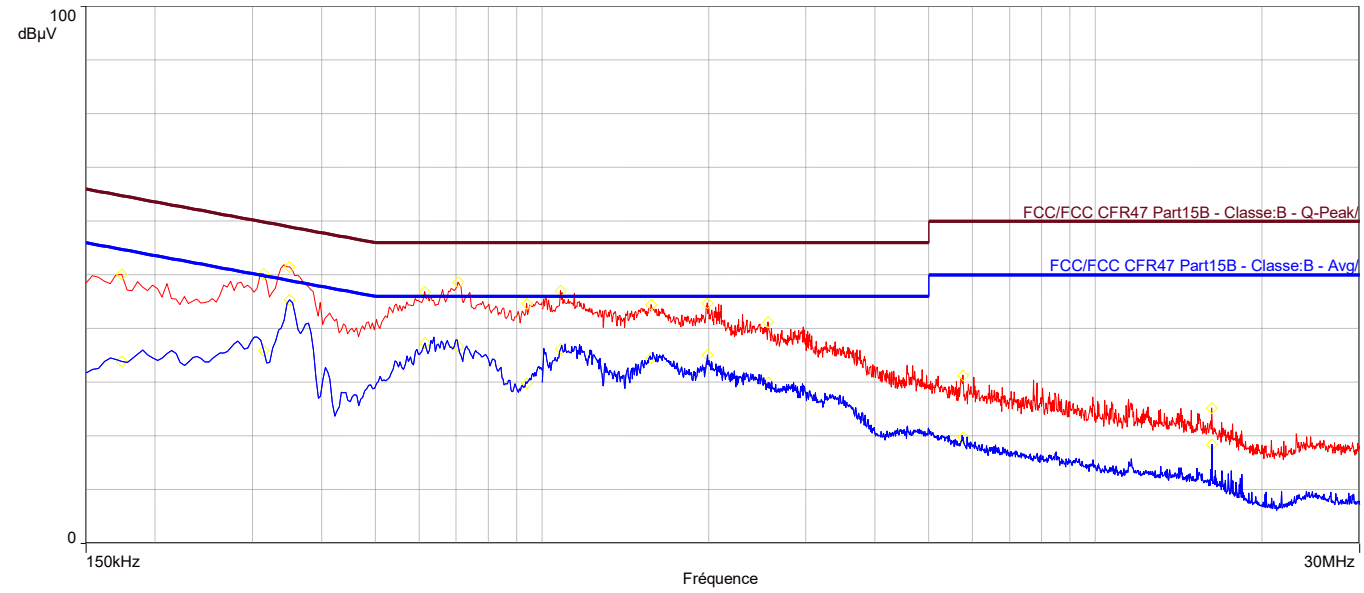
CONDUCTED EMISSIONS			
Graph name:	Emc#7	**Test configuration:**	
Limit:	FCC CFR47 Part15B	Configuration 2 : Combox	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240V/50Hz	**RBW:** 10kHz	**VBW:** 30kHz
Line:	**Phase**	**Trace color & detector:**	PEAK AVG



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.158	44.3	65.6	**-21.3**	32.4	55.6	**-23.2**
0.342	50.5	59.2	**-8.7**	42.3	49.2	**-6.9**
0.350	51.3	59.0	**-7.6**	45.6	49.0	**-3.4**
0.654	43.8	56.0	**-12.2**	37.2	46.0	**-8.8**
0.706	43.8	56.0	**-12.2**	36.5	46.0	**-9.5**
0.938	38.0	56.0	**-18.0**	28.7	46.0	**-17.3**
1.064	43.2	56.0	**-12.8**	34.1	46.0	**-11.9**
1.532	43.1	56.0	**-12.9**	34.9	46.0	**-11.1**
2.032	40.5	56.0	**-15.5**	33.0	46.0	**-13.0**
3.508	34.4	56.0	**-21.6**	26.8	46.0	**-19.2**
16.236	17.7	60.0	**-42.3**	11.8	50.0	**-38.2**

CONDUCTED EMISSIONS					
Graph name:	Emc#8	**Test configuration:**			
Limit:	FCC CFR47 Part15B	Configuration 2 : Combox			
Class:	B				
Frequency range: [150kHz - 30MHz]					
Voltage / Frequency:	240V/50Hz	**RBW:**	10kHz	**VBW:**	30kHz
Line:	**Neutral**	**Trace color & detector:**		PEAK AVG	



Spurious emissions

Frequency (MHz)	QPeak (dBµV)	Lim.QPeak (dBµV)	QPeak-Lim.QPeak (dB)	CISPR.AVG (dBµV)	Lim.CISPR.AVG (dBµV)	CISPR.AVG-Lim.CISPR.AVG (dB)
0.174	42.4	64.8	**-22.4**	32.8	54.8	**-21.9**
0.314	45.8	59.9	**-14.0**	35.6	49.9	**-14.3**
0.350	50.6	59.0	**-8.4**	44.8	49.0	**-4.2**
0.614	42.8	56.0	**-13.2**	36.1	46.0	**-9.9**
0.706	43.1	56.0	**-12.9**	35.2	46.0	**-10.8**
0.938	38.6	56.0	**-17.4**	29.6	46.0	**-16.4**
1.080	43.5	56.0	**-12.5**	35.4	46.0	**-10.6**
1.576	41.3	56.0	**-14.7**	33.6	46.0	**-12.4**
1.988	39.7	56.0	**-16.3**	32.1	46.0	**-13.9**
2.560	37.6	56.0	**-18.4**	29.2	46.0	**-16.8**
5.760	24.9	60.0	**-35.1**	18.1	50.0	**-31.9**
16.228	21.9	60.0	**-38.1**	17.6	50.0	**-32.4**

3.6. CONCLUSION

The sample of the equipment **AXIUM RX9000**, Sn : **2419MR900128**, tested in the configuration presented in this test report **satisfies** to requirements of the product family standard applied (See §Test Program) for conducted emissions.

4. MEASUREMENT OF RADIATED EMISSION

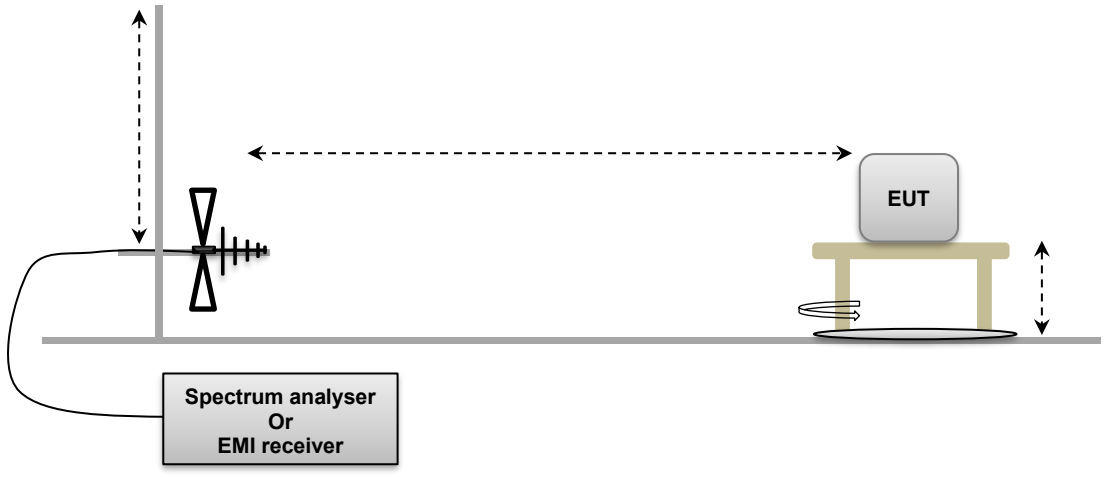
4.1. TEST CONDITIONS

Date of test	:	March 07, 2024	March 12, 2024	May 21, 2024
Test performed by	:	Jonathan SARTO	Jonathan SARTO	Akram HAKKARI
Atmospheric pressure (hPa)	:	989	991	34
Relative humidity (%)	:	33	40	22
Ambient temperature (°C)	:	23	23	

4.2. TEST SETUP

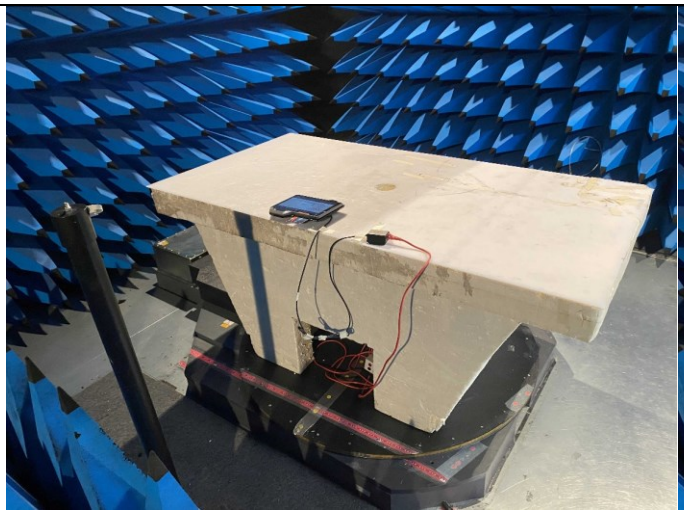
Test procedure:
ANSI C63.4 & FCC Part 15 subpart B

The EUT and auxiliaries are set 80cm above the ground on the non-conducting table (Table-top equipment).
The EUT is powered by V_{nom}.

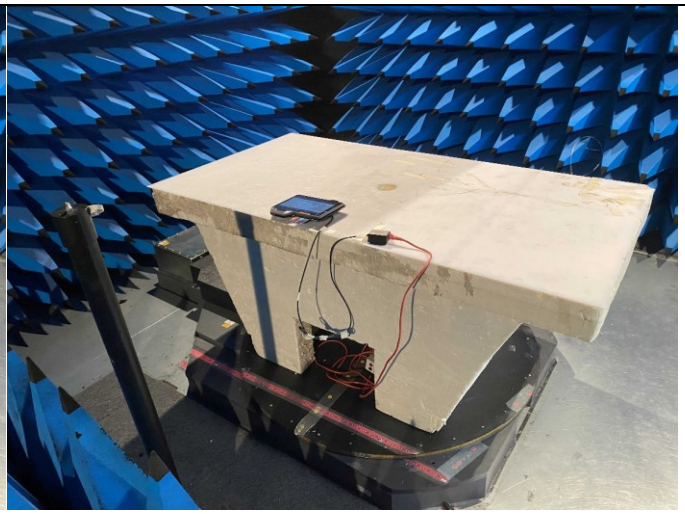


Test setup of Radiated Emission

Same setup is used in semi anechoic chamber during pre-characterization, with a distance of 3m between EUT and antenna.



Configuration 1



Configuration 2

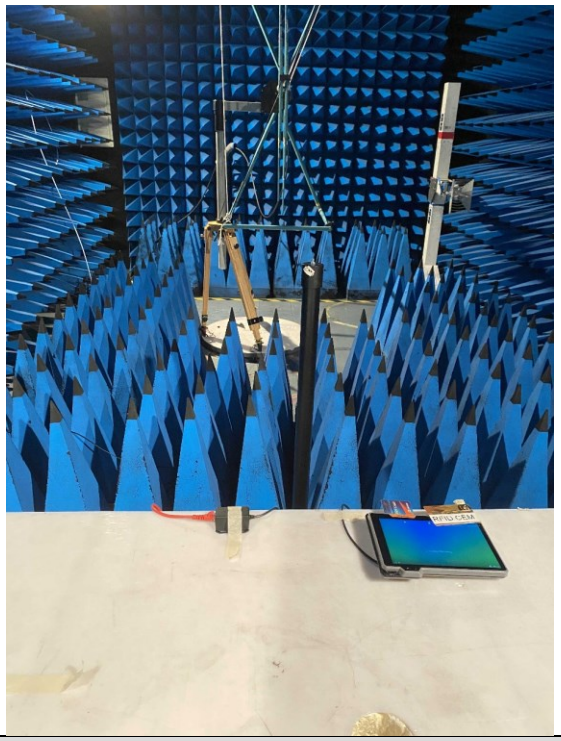
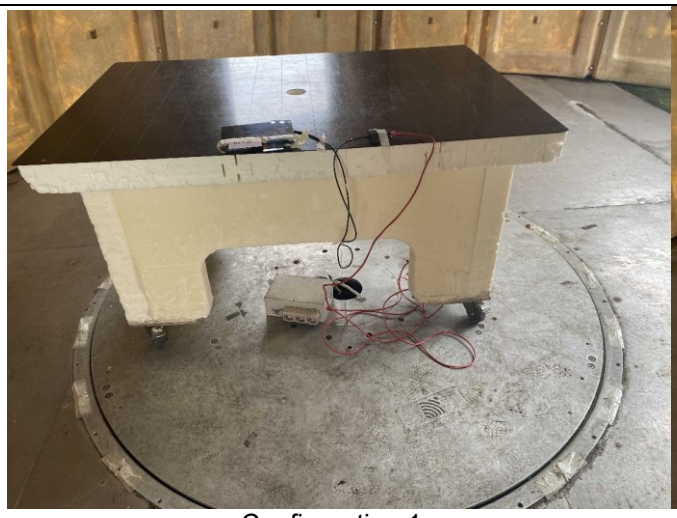


Photo in anechoic chamber – Frequency <1GHz



Configuration 1

Configuration 2

Photo on OATS

Photo in anechoic chamber – Frequency >1GHz

4.3. TEST METHOD

4.3.1. 30MHz –1GHz

Pre-qualification measurement

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber. Test is performed with antenna centered on EUT in horizontal (H) and vertical (V) polarization, continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are performed on all axis of EUT used in normal configuration. The pre-characterization graphs are obtained in PEAK detection.

Qualification

The installation of EUT is identical than for pre-qualification measurements on an Open Area Test Site with a 10 meters distance between EUT and antenna. In this case, it corrected according to requirements of 15.209.e), M@3m = M@10m+10.5dB. Test is performed in horizontal (H) and vertical (V) polarization and the height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are 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.

Minimal beamwidth of the measurement antenna used: Teseq CBL 6111 / w@3m - 4.2m x 4.2m

4.3.2. 1GHz – 26GHz:

Pre-qualification measurement

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. Test is performed with antenna centered on EUT in horizontal (H) and vertical (V) polarization, continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are performed on all axis of EUT used in normal configuration. The pre-characterization graphs are obtained in PEAK and AVERAGE detection.

Qualification

The installation of EUT is identical for pre-characterization measurements. Test is performed in horizontal (H) and vertical (V) polarization and the height antenna is fixed and centered on the EUT, EUT smaller than the beamwidth of the measurement antenna.
Minimal beamwidth of the measurement antenna used: A-INFO LB-10180 / w@3m - 1.4m x 1.4m <6GHz / 2.0m x 2.0m <14GHz / 0.7m x 0.7m <18GHz
Continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are 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.

4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Amplifier 10kHz - 13.5GHz	LCIE SUD EST	_	A7085028	04/23	04/25
Antenna Bi-Log XWing	TESEQ	CBL6144	C2040146		
BAT EMC	NEXIO	v3.21.0.32	L1000115		
Cable 0.75m	SUCOFLEX	18GHz	A5329919	07/23	07/24
Cable 2.2m N	SUCOFLEX	SF118A/2x11N/2.2M	A5329990	07/23	07/24
Cable 5m	SUCOFLEX	18GHz	A5329918	10/23	10/24
Comb EMR HF	YORK	CGE01	A3169114		
Radiated emission comb generator	BARDET	_	A3169050		
Semi-Anechoic chamber #2	SIEPEL	_	D3044015	09/23	09/24
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A4060049	09/22	09/24
Table C2	LCIE	_	F2000438		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	05/23	05/25
Turntable chamber (Cage#2)	ETS Lingren	Model 2165	F2000404		
Turntable controller (Cage#2)	ETS Lingren	Model 2066	F2000393		
Antenna Bi-log	CHASE	CBL6111A	C2040172	04/22	04/24
Antenna Mat (OATS)	ETS Lingren	2071-2	F2000392		
Biconic Antenna	EATON	94455-1	C2040234	05/23	05/25
Cable (OATS)	_	1GHz	A5329623	09/23	09/24
CALCUL_FACTEURS	LCIE SUD EST	V4	L2000035		
Emission Cable	RADIALEX		A5329061	07/23	07/24
Emission Cable	MICRO-COAX	1GHz	A5329656	09/23	09/24
OATS	_	_	F2000409	08/23	08/24
Receiver 20-1000MHz	ROHDE & SCHWARZ	ESVS30	A2642006	05/22	05/24
Table C1/OATS	LCIE	_	F2000445		
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372		

Amplifier 10MHz - 18GHz	LCIE SUD EST	_	A7102082	05/22	05/24
Antenna horn 18GHz	EMCO	3115	C2042029	03/22	03/25
BAT EMC	NEXIO	v3.21.0.32	L1000115		
CABLE	TELEDYNE	R82-0404-0.5M	A5330010	03/22	03/25
Cable 0.75m	-	18GHz	A5329900	08/22	08/24
Cable SMA 40cm	WITHWAVE	W101-SM1-0.4M	A5329979	10/23	10/26
Comb EMR HF	YORK	CGE01	A3169114		
CONTROLLER	INNCO	CO3000	D3044034		
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	08/22	08/25
Emission Cable (SMA 3.3m)	TELEDYNE	26GHz	A5329875	08/22	08/25
Filter Matrice	LCIE SUD EST	Combined filters	A7484078	03/23	03/25
Rehausse Table C3	LCIE	_	F2000511		
Rehausse Table C3	LCIE	_	F2000507		
Semi-Anechoic chamber #3 (BF)	SIEPEL	_	D3044017_BF	04/22	04/25
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	_	D3044017_VSWR	04/22	04/25
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/23	09/25
Table C3	LCIE	_	F2000461		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	05/23	05/25
TILT	INNCO	TILT	D3044033		
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		

4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

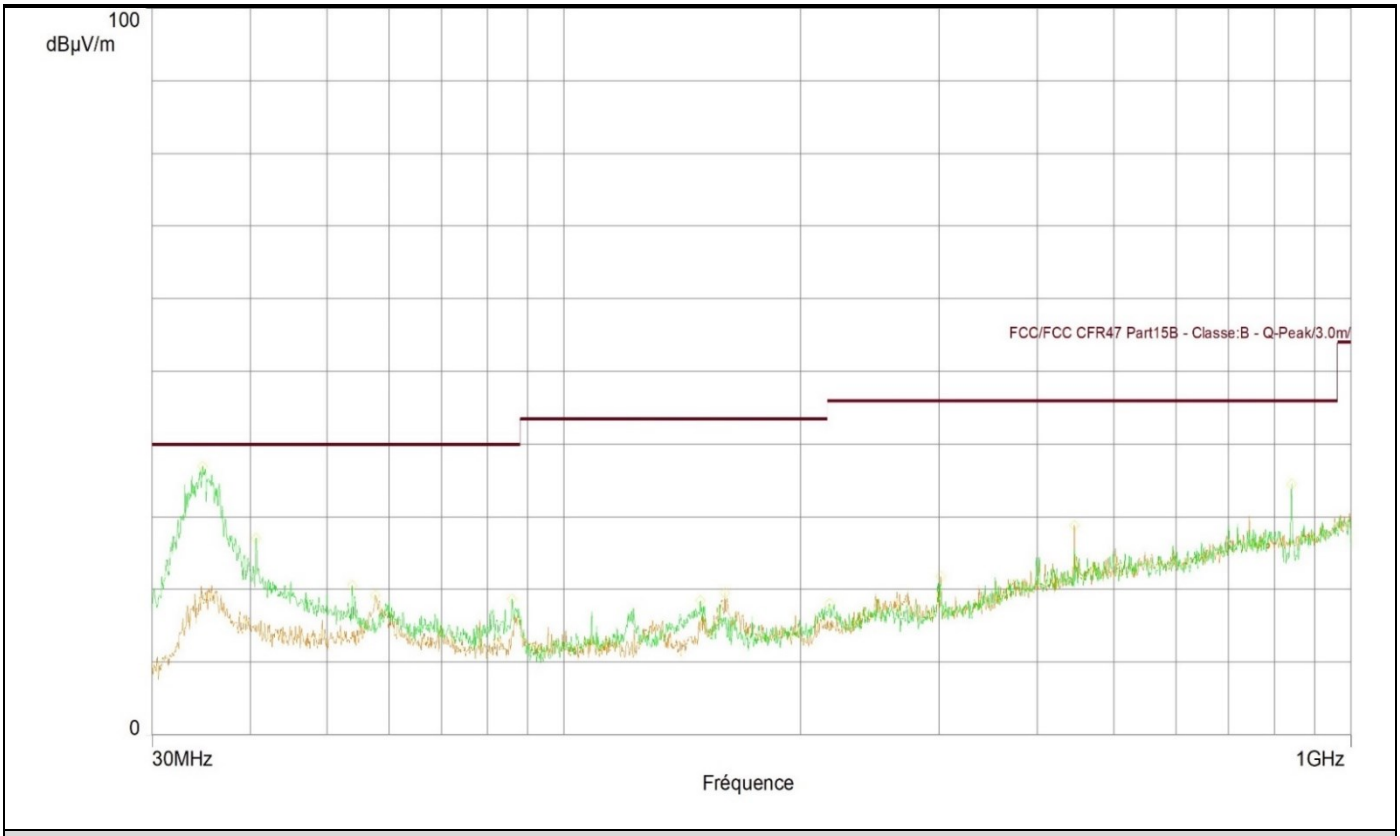
4.6. TEST RESULTS – RUNNING MODE N°1

4.6.1. 30MHz –1GHz

Pre-qualification measurement

Graph identifier		Polarization	EUT position	Comments	
Emr#	1	Vertical+Horizontal	Axis XY	Config 1 : POE	See below
Emr#	2	Vertical+Horizontal	Axis XY	Config 2 : Combox	See below

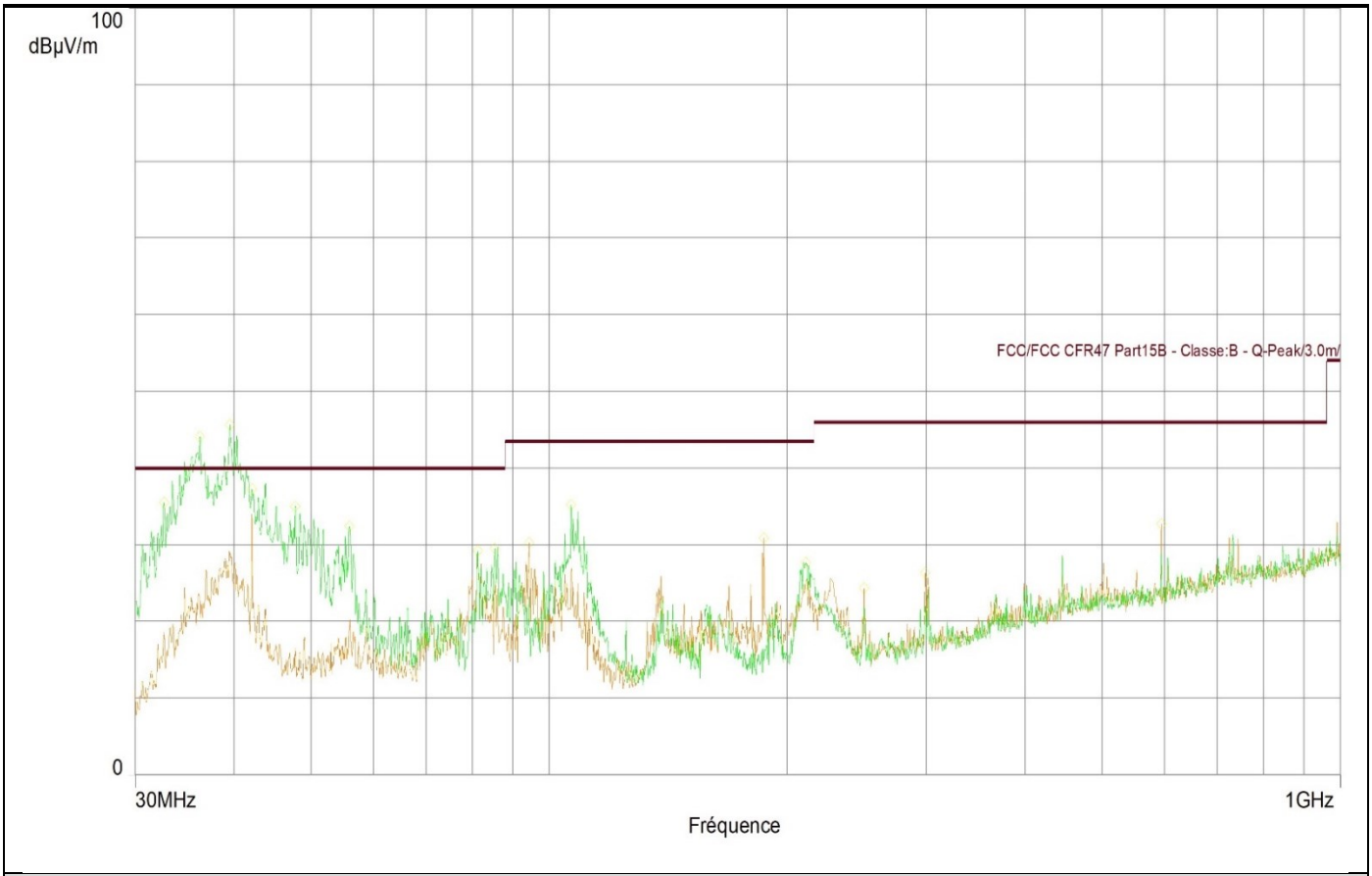
RADIATED EMISSIONS					
Graph name:	Emr#1	**Test configuration:**			
Limit:	FCC CFR47 Part15B	C2 - FSL (H+V) [0.03-1]GHz conf1			
Class:	B				
Frequency range: [30MHz - 1GHz]					
Antenna polarization:	Horizontal & Vertical	**RBW:**	100kHz	**VBW:**	300kHz
Azimuth: 0° - 360°	**Trace color & detector:** F<GHz: Only Peak detector: Antenna Polarization: Vertical Horizontal				



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Lim.Q-Peak (dBµV/m)	Peak-Lim.Q-Peak (dB)	Polarization
34.794	37.0	40.0	**-3.0**	Vertical
40.676	27.1	40.0	**-12.9**	Vertical
53.834	20.6	40.0	**-19.4**	Vertical
86.015	18.7	40.0	**-21.3**	Vertical
149.170	18.5	43.5	**-25.0**	Vertical
217.520	18.1	46.0	**-27.9**	Vertical
840.000	34.5	46.0	**-11.5**	Vertical
57.642	19.2	40.0	**-20.8**	Horizontal
160.220	19.5	43.5	**-24.0**	Horizontal
301.200	21.8	46.0	**-24.2**	Horizontal
445.520	28.9	46.0	**-17.1**	Horizontal

RADIATED EMISSIONS					
Graph name:	Emr#2	**Test configuration:**			
Limit:	FCC CFR47 Part15B	C2 - FSL (H+V) [0.03-1]GHz conf2			
Class:	B				
Frequency range: [30MHz - 1GHz]					
Antenna polarization:	Horizontal & Vertical	**RBW:**	100kHz	**VBW:**	300kHz
Azimuth: 0° - 360°	**Trace color & detector:** F<GHz: Only Peak detector: Antenna Polarization: Vertical Horizontal				



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Lim.Q-Peak (dBµV/m)	Peak-Lim.Q-Peak (dB)	Polarization
32.601	35.5	40.0	**-4.5**	Vertical
36.205	44.1	40.0	**4.1**	Vertical
39.503	45.7	40.0	**5.7**	Vertical
42.138	37.3	40.0	**-2.7**	Vertical
47.799	35.1	40.0	**-4.9**	Vertical
55.925	32.4	40.0	**-7.6**	Vertical
81.187	29.3	40.0	**-10.7**	Vertical
85.505	29.6	40.0	**-10.4**	Vertical
106.687	35.2	43.5	**-8.3**	Vertical
211.280	27.7	43.5	**-15.8**	Vertical
94.345	30.3	43.5	**-13.2**	Horizontal

Frequency (MHz)	Peak (dBµV/m)	Lim.Q-Peak (dBµV/m)	Peak-Lim.Q-Peak (dB)	Polarization
186.808	30.9	43.5	**-12.6**	Horizontal
249.960	24.4	46.0	**-21.6**	Horizontal
298.800	26.4	46.0	**-19.6**	Horizontal
594.000	32.8	46.0	**-13.2**	Horizontal

Qualification

The frequency list is created from the results obtained during the pre-qualification.
Measurements are performed using a QUASI-PEAK detection.

Config 1									
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)**
34.8000	15.6	QP	V	41	100	14.3	29.9	40.0	**-10.1**
40.7000	18.5	QP	V	134	100	14.1	32.6	40.0	**-7.4**

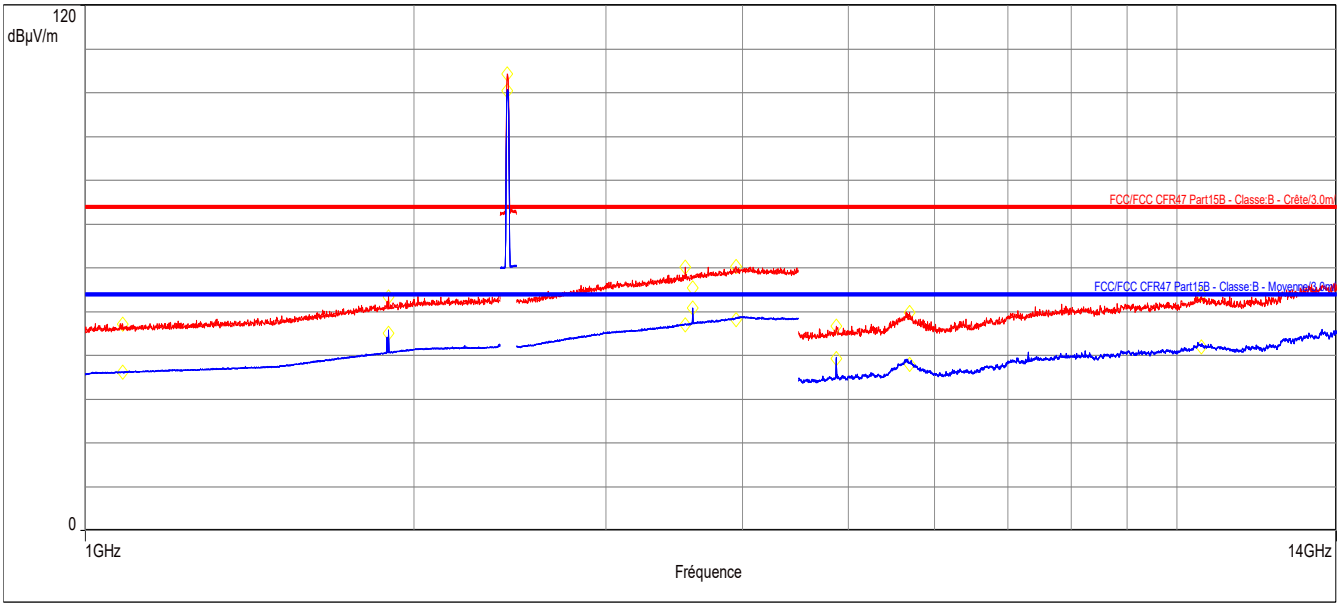
Config 2										
Test Frequency (MHz)	**Meter Reading dB(µV)**	**Detector (Pk/QP/Av)**	**Polarity (V/H)**	**Azimuth (Degrees)**	**Antenna Height (cm)**	**Transducer Factor (dB)**	**Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Remark**
32.6000	21.1	QP	V	190	100	14.2	35.3	40.0	**-4.7**	
36.2000	20.0	QP	V	61	100	14.3	34.3	40.0	**-5.7**	
39.5000	24.0	QP	V	0	100	14.2	38.2	40.0	**-1.8**	
42.1000	24.2	QP	V	256	100	13.9	38.1	40.0	**-1.9**	
47.8000	22.3	QP	V	360	100	12.8	35.1	40.0	**-4.9**	
55.9000	18.0	QP	V	0	100	10.6	28.6	40.0	**-11.4**	
85.5000	23.1	QP	V	35	100	11.1	34.2	40.0	**-5.8**	
94.3000	12.0	QP	H	359	150	12.8	24.8	43.5	**-18.7**	Measure performed at 3m
106.7000	16.5	QP	V	0	150	13.0	29.5	43.5	**-14.0**	Measure performed at 3m
138.4000	18.2	QP	V	110	109	17.0	35.2	43.5	**-8.3**	
186.8000	13.5	QP	V	0	100	16.1	29.6	43.5	**-13.9**	
211.3000	16.0	QP	V	280	100	12.1	28.1	43.5	**-15.4**	
594.0000	18.0	QP	H	133	200	26.3	44.3	46.0	**-1.7**	

4.6.2. 1GHz - 26GHz

Pre-qualification measurement

Graph identifier		Polarization	EUT position	Comments	
Emr#	3	Vertical+Horizontal	Axis XY	Config 2 : 1-14GHz	See below
Emr#	4	Vertical+Horizontal	Axis XY	Config 2 : 14-26GHz	See below

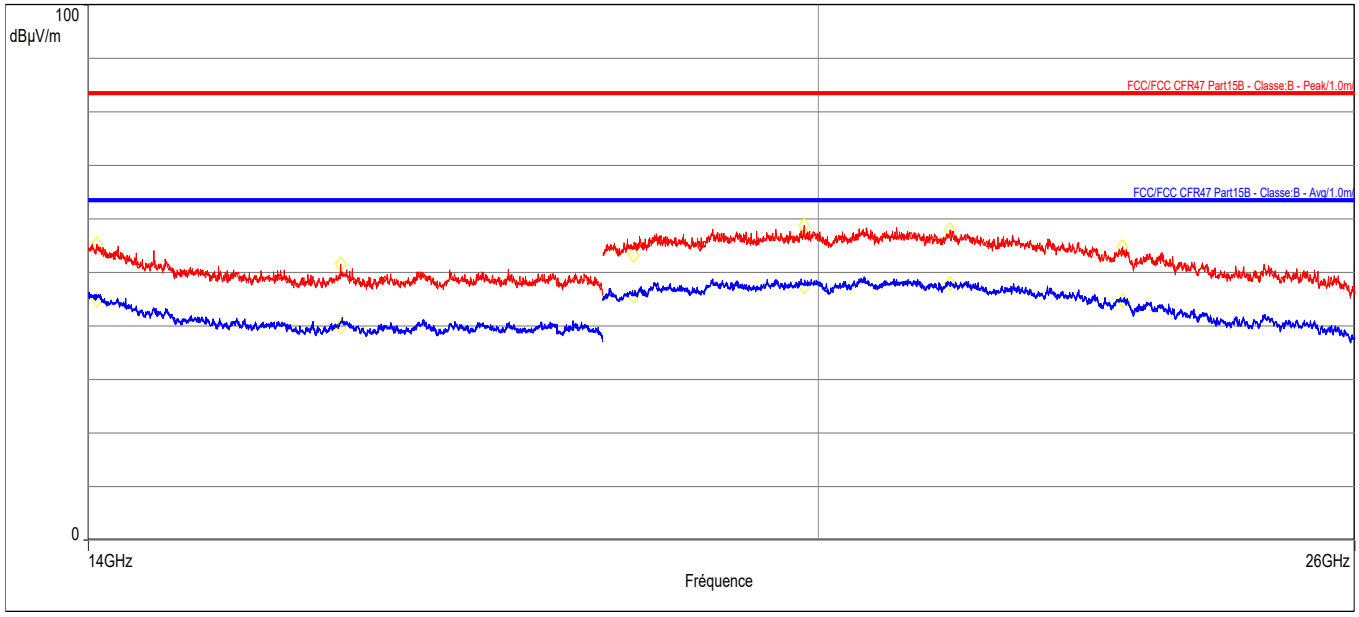
RADIATED EMISSIONS				
Graph name:	Emr#3	**Test configuration:**		
Limit:	FCC CFR47 Part15B	(H+V) - Cmid - TX mode - Automatic Axis 15B		
Class:	B			
Frequency range: [1GHz - 14GHz]				
Antenna polarization:	Horizontal & Vertical	**RBW:** 1MHz	**VBW:** 3MHz	
Azimuth: 0° - 360°	**Trace color & detector:** F>GHz: for both Antenna Polarization: detector: PEAK AVG			



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Lim.Peak (dBµV/m)	Peak-Lim.Peak (dB)	Average (dBµV/m)	Lim.Average (dBµV/m)	Average-Lim.Average (dB)	Azimuth (°)	Polarization
2436.072	104.28	74.00	**30.28**	100.45	54.00	**46.45**	0.00	Horizontal
5688.450	49.86	74.00	**-24.14**	37.99	54.00	**-16.01**	0.00	Horizontal
10525.850	53.95	74.00	**-20.05**	41.98	54.00	**-12.02**	59.80	Horizontal
4873.350	46.71	74.00	**-27.29**	39.32	54.00	**-14.68**	89.70	Vertical
1081.900	47.05	74.00	**-26.95**	36.12	54.00	**-17.88**	90.10	Horizontal
3943.849	60.36	74.00	**-13.64**	48.12	54.00	**-5.88**	59.70	Horizontal
3544.986	60.21	74.00	**-13.79**	46.92	54.00	**-7.08**	0.40	Vertical
3599.834	55.35	74.00	**-18.65**	50.83	54.00	**-3.17**	0.40	Vertical
1895.650	53.41	74.00	**-20.59**	45.09	54.00	**-8.91**	89.40	Vertical

RADIATED EMISSIONS				
Graph name:	Emr#4	**Test configuration:**		
Limit:	FCC CFR47 Part15B	(H+V) - CMid - TX mode - Automatic Axis 15B		
Class:	B			
Frequency range: [14GHz - 26GHz]				
Antenna polarization:	Horizontal & Vertical	**RBW:** 1MHz	**VBW:** 3MHz	
Azimuth: 0° - 360°	**Trace color & detector:** F>GHz: for both Antenna Polarization: detector: PEAK AVG			



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	Lim.Peak (dBµV/m)	Peak-Lim.Peak (dB)	Average (dBµV/m)	Lim.Average (dBµV/m)	Average-Lim.Average (dB)	Azimuth (°)	Polarization
14059.500	55.35	83.50	**-28.15**	44.99	63.50	**-18.51**	149.70	Horizontal
15839.000	51.55	83.50	**-31.95**	39.87	63.50	**-23.63**	30.10	Horizontal
18273.000	53.22	83.50	**-30.28**	45.71	63.50	**-17.79**	0.20	Horizontal
19863.000	58.75	83.50	**-24.75**	47.38	63.50	**-16.12**	149.50	Horizontal
23211.000	54.82	83.50	**-28.68**	44.80	63.50	**-18.70**	29.30	Horizontal
21335.000	58.02	83.50	**-25.48**	47.91	63.50	**-15.59**	0.00	Vertical

Qualification

The frequency list is created from the results obtained during the pre-qualification.
Measurements are performed using a PEAK and AVERAGE detection.

No frequency observed due at EUT.

4.7. CONCLUSION

The sample of the equipment **AXIUM RX9000**, Sn : **2419MR900128**, tested in the configuration presented in this test report **satisfies** to requirements of the product family standard applied (See §Test Program) for radiated emissions.

5. 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 (monophasé /triphasé) 150kHz-30MHz *Measurement of conducted disturbances in voltage on the power port (single & three phases)150kHz-30MHz* LISN 50Ω/50µH Capacitive Voltage Probe	 3.3dB 3.7dB	 3.4dB 3.9dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 30MHz à 1GHz *Measurement of radiated electric field in half-anechoic Faraday room From 30MHz to 1GHz*	6.3dB	6.3dB
Mesure du champ électrique rayonné en cage de Faraday anéchoïque de 1GHz à 6GHz *Measurement of radiated electric field in full-anechoic Faraday room From 1GHz à 6GHz*	5.2dB	5.2dB
Mesure du champ électrique rayonné en cage de Faraday anéchoïque de 6GHz à 18GHz *Measurement of radiated electric field in full-anechoic Faraday room From 6GHz to 18GHz*	5.5dB	5.5dB
Mesure du champ électrique rayonné sur le site en espace libre de Moirans 30MHz – 1GHz. *Measurement of radiated electric field on the Moirans open area test site 30MHz – 1GHz.*	6.3dB	6.3dB

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par le CISPR, la conformité de l'échantillon est établie directement par les niveaux limites applicables. Ce tableau regroupe l'ensemble des incertitudes maximales pour les essais réalisables dans le laboratoire, qu'ils aient été ou non réalisés dans le cadre du présent rapport */ The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report*

Note - L'incertitude de mesure instrumentale est déterminée selon la CISPR 16-4-2. / *The instrumentation measurement uncertainty is determined according to CISPR16-4-2*