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TEST REPORT

N°: 15469973 **–** 779746-B **Version : 03**

Subject	**Electromagnetic compatibility (EMC):** **47 CFR Part 15.107 & Part 15.109** **Subpart B of 2021** **ANSI C63.4 of 2014** **ICES-003 issue 7 of 2020** (*)
Issued to	ADVEEZ 4 Avenue Jean Monnet 31770 COLOMIERS FRANCE

Apparatus under test

Product	GPS TRACKER
Trade mark	ADVEEZ
Manufacturer	ADVEEZ
Model under test	FAMA LITE
Family product	FAMA OBD / FAMA Lite (See details on P5)
Serial number	AD-FOA07-0822455
FCC ID	R8T-FAMA-OBDLITE

Test date	January 30, 2023 to January 31, 2023
Test location	LCIE, Ecuelles
FCC registration Number	582868
FCC designation Number	FR0010
Test performed by	**Laurent Deneux**
Composition of document	27 pages
Initial issue	February 2, 2023
Document issued on	April 4, 2024

Written by :	**Approved by :**
Laurent Deneux	**Julien Boutaud**
Tests operator	**Technical manager**

PUBLICATION HISTORY

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.

Version	Date	Author	Modification
01	February 2, 2023	Laurent DENEUX	Creation of the document
02	December 21, 2023	Jerome Petitjean	addition of the FAMA ODB reference in equipment of the same family (chapter 2.1)
03	April 4, 2024	Laurent DENEUX	Addition a label (page 7), FCC ID number and FCC registration & designation number

Date of receipt of test item: January 27, 2023

SUMMARY

1. Test Program

References

- ✓ **CFR 47 Part 15 Subpart B - Radio frequency devices - Unintentional radiators 2021**
- ✓ **ICES -003 issue 7 of 2020** (F)
- ✓ **ANSI 63.4 of 2014**

Emission tests:

Test Description	Main characteristics	Test result - Comments
Measurement of radiated electric field in shielded room 15.109 (a), (b) & (c)	☐ **Class A** ☐ **Class B**	☐ **PASS** ☐ **FAIL** ☑ **NA** ☐ **NP (Limited Program)**
Measurement of radiated electric field in open space	☐ **Class A** ☑ **Class B**	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP (Limited Program)**
Measurement of conducted disturbance on the AC main power port 15.107 (a) (c) (d)	☐ **Class A** ☑ **Class B**	☑ **PASS (1)** ☐ **FAIL** ☐ **NA (1)** ☐ **NP (Limited Program)**

(1): EUT not directly or indirectly connected to the AC Power Public Network

The product is compliant according to CFR 47 Part 15 Subpart B - Radio frequency devices - Unintentional radiators & ICES -003 standards.

PASS: EUT complies with standard's requirement
FAIL: EUT does not comply with standard's requirement
NA: Not Applicable
NP: Test Not Performed

2. Equipment Description (declared by provider)

2.1. EQUIPMENT OF THE SAME FAMILY

-Tests are performed on the most complete product FAMA LITE**, SN: AD-FOA07-0822455. See Table below for difference between products.**

Product	FAMA OBD	FAMA LITE
BLE (HW & SW)	Same	
LTE/GSM (HW & SW)	Same	
GNSS (HW & SW)	Same	
Antenna LTE & GNSS	Same	
Hardware (PCB et components)	Same	
Software (functionality)	1 peripheral CAN and 1 peripheral OBD	2 peripherals CAN
Enclosure	Same	
Cable connector (FAMA side)	Same	
Cable	without sheath	with V-W1 sheath

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT): FAMA LITE **Serial Number:** AD-FOA07-0822455

Equipment Under Test

Inputs/outputs - Cable:

Access	Inputs / Outputs	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Power supply and data	Input /output	Others	1.5		☐	☑	
Antenna	Input	Antenna	2.5		☑	☑	GPS
Antenna	Input	Antenna	2.5		☑	☑	GSM

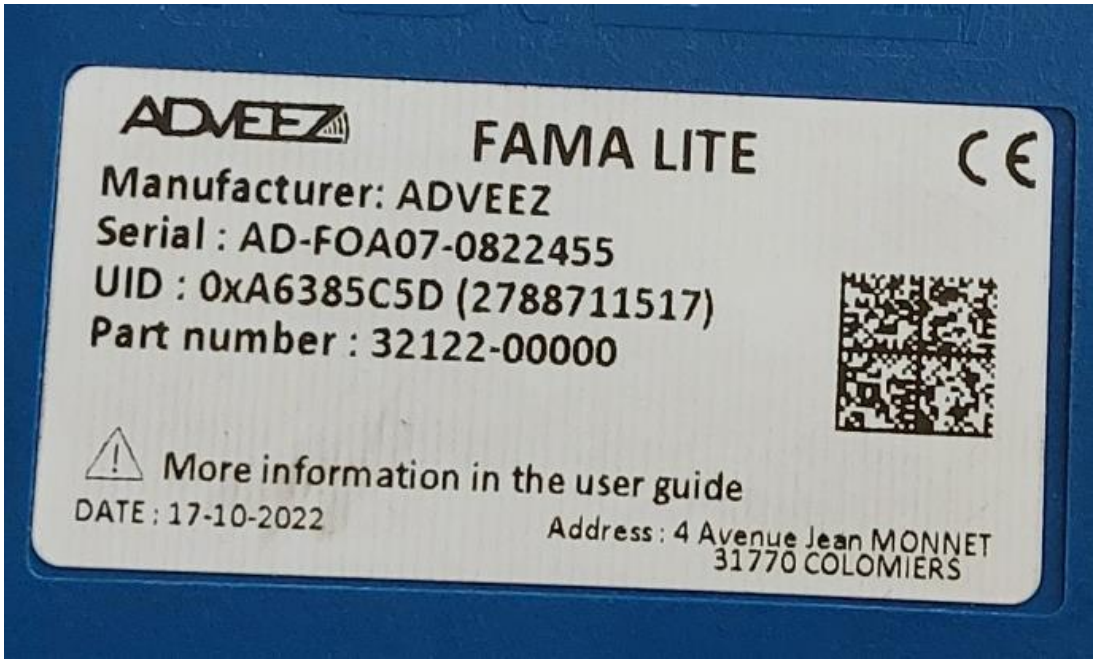
Auxiliary equipment used during test:

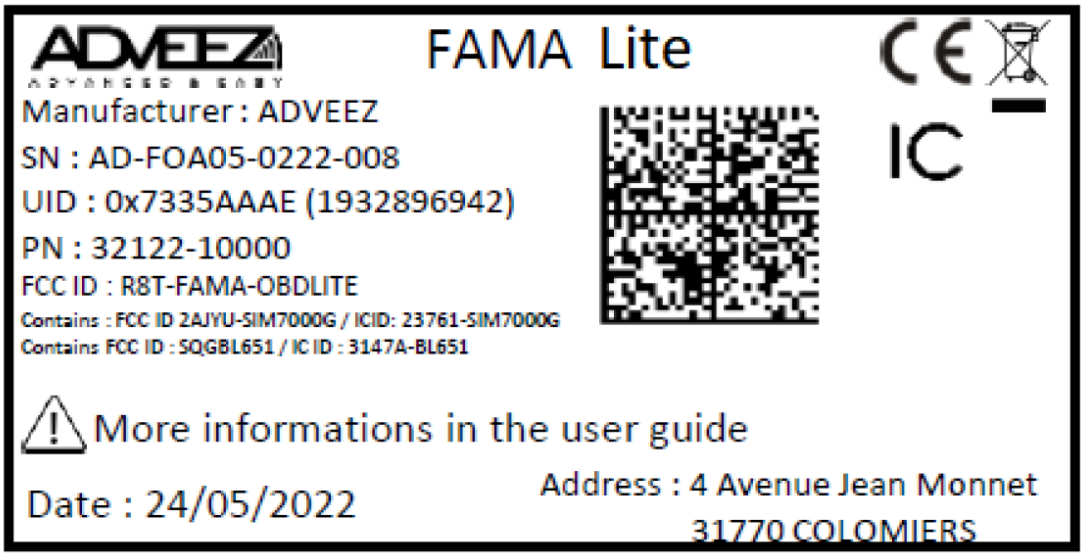
Type	Reference	Sn	Comments
Power supply 12v-DC	HP6201B	-	No tested

Equipment information: (Declared by provider)

Apparatus Description	GPS tracker			
Type of power source:	☑ AC power supply	☐ DC power supply	☑ Battery (Lithium)	
Test source voltage:	Vmin-Vmax:	☑ 120V- 240 V / 50 - 60 Hz	☑ 3.7VDc	
Operating Modes	Mode 1	Automatic (<3s) – Verification of Bluetooth and 2G/4G communications, Powered by 240V-50Hz		
	Mode 2	Automatic (<3s) – Verification of Bluetooth and 2G/4G communications, Powered by 120V-60Hz		
	Mode 3	Automatic (<3s) – Verification of Bluetooth and 2G/4G communications, Powered by internal battery 3.7Vdc		
	Mode 4	Mode 4		
Highest internal frequency (PLL, Quartz, Clock, Microprocessor…):	**$F_{Highest}$:**	**NC**	**MHz**	

2.3. EQUIPMENT LABELLING





Equipment Labelling

2.4. EQUIPMENT MODIFICATIONS

☑ None ☐ Modification:

2.5. Field Strength Calculation

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

$FS = RA + AF + CF - AG$

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

Example:
Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

2.6. 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

3. Measurement of radiated emissions

3.1. ENVIRONMENTAL CONDITIONS

Test performed by	: **Laurent Deneux**
Date of test	: January 31, 2023
Ambient temperature	: 42°C
Relative humidity	: 18%

3.2. TEST SETUP

Specifications:

Frequency	30 – 1000 MHz	RBW 120 kHz
	1-6GHz	RBW 1MHz
Detector	Peak and Quasi-Peak	

Pre characterization in semi anechoic room is performed to define the critical frequencies

Operating conditions:

- The Equipment under Test is installed:

☐ Measure in semi anechoic room

☑ Measure in open area site

- Measuring distance:

☑ 3m

☑ 10m

- Deviation method:

☐ Yes

☑ No

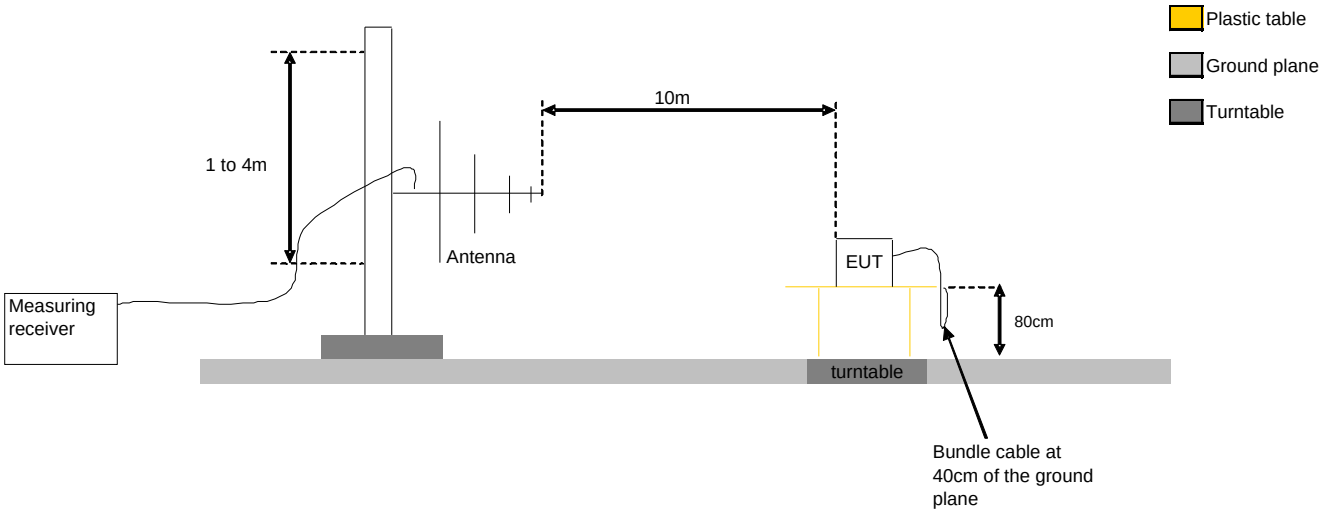
-Product installation:

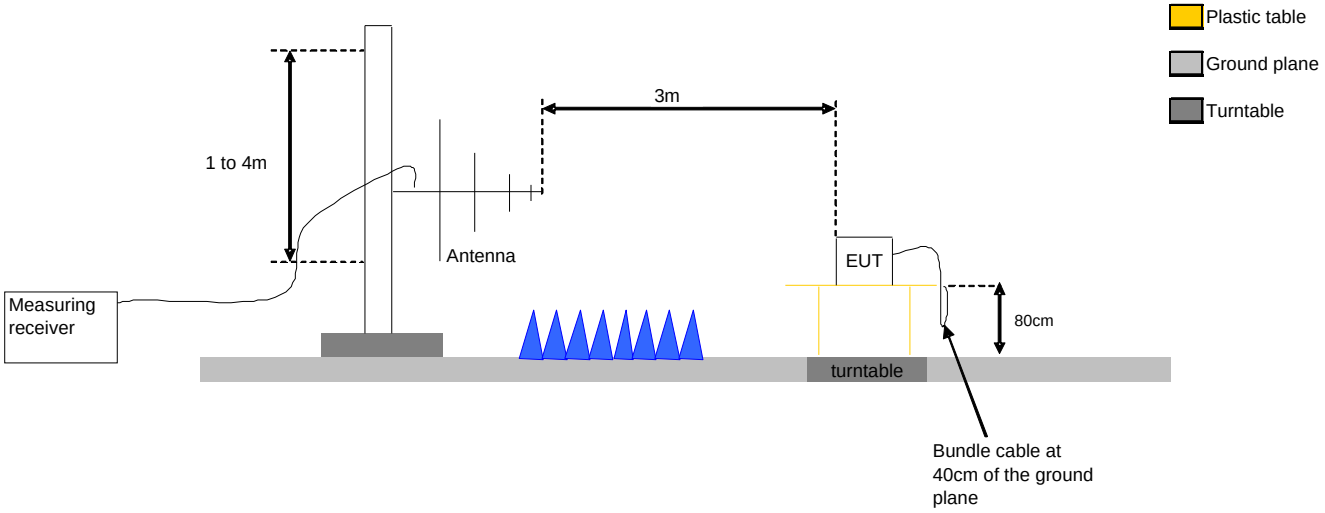
☑ The EUT was tested as a tabletop equipment and was placed on a non-conducting platform the top of which is 0.8m above the metal ground plane.

☐ The EUT is at 10cm height from reference plane

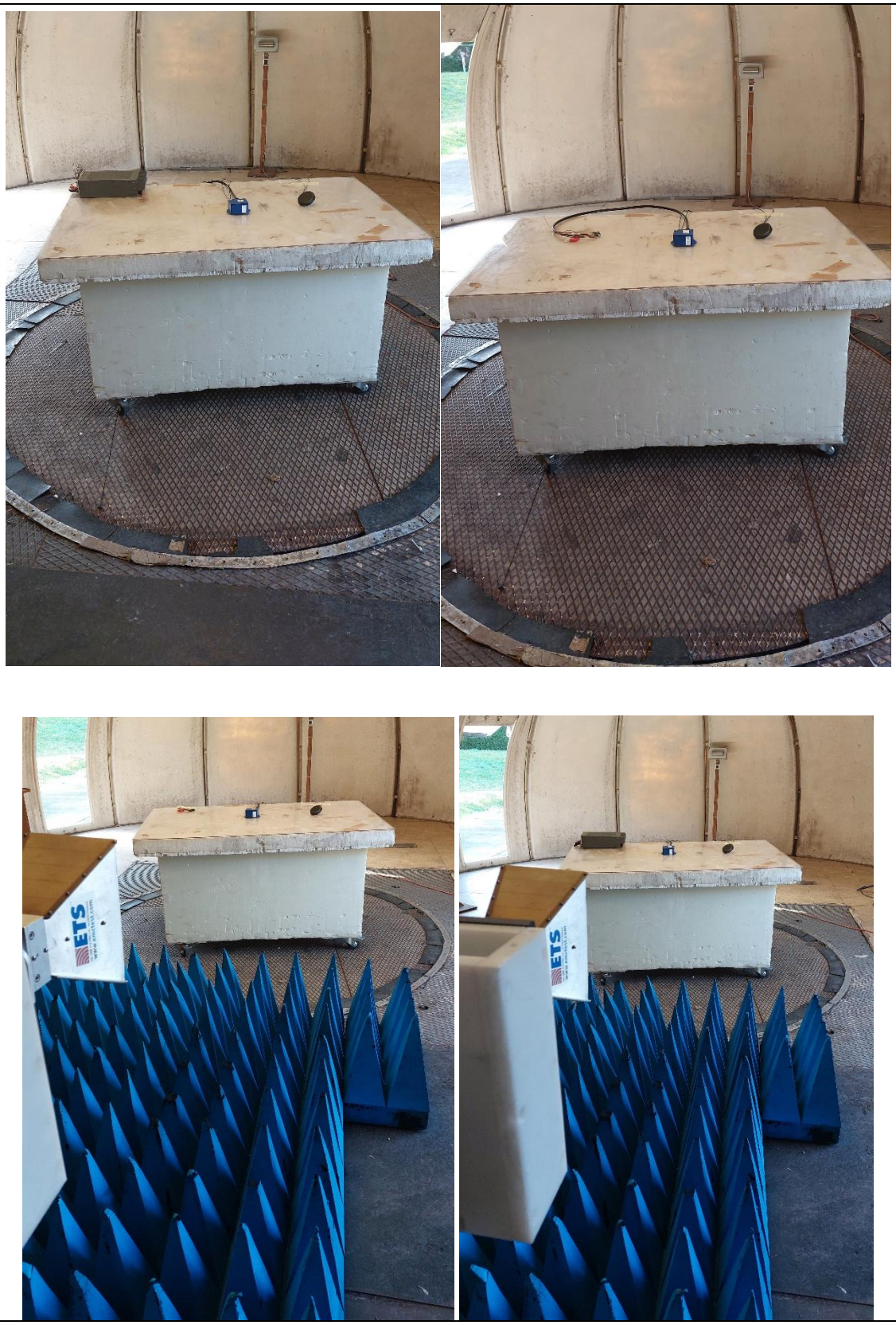
Operating mode:

☑ Mode 1 ☐ Mode 2 ☑ Mode 3 …





Test Set up for radiated measurement in open area test site above 1GHZ



Measurement of radiated disturbances.

3.3. LIMIT FOR FCC

☐ Class A in open area test site

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average	Distance
30-88MHz	39.5	-	-	10m
88 – 216MHz	43.9	-	-	10m
216 – 960 MHz	46.9	-	-	10m
960 – 1000 MHz	50	-	-	10m
1000-6000MHz	-	80	60	3m

☑ Class B in open area test site

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average	Distance
30-88MHz	30	-	-	10m
88 – 216MHz	33.5	-	-	10m
216 – 960 MHz	36	-	-	10m
960 – 1000 MHz	43.9	-	-	10m
1000-6000MHz	-	74	54	3m

3.4. LIMIT FOR IECS 003

☐ Class A in open area test site

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average	Distance
30-88MHz	40	-	-	10m
88 – 216MHz	43.5	-	-	10m
216 – 230 MHz	46.4	-	-	10m
230 – 960 MHz	47			10m
960 – 1000 MHz	49.5	-	-	10m
1000-6000MHz	-	80	60	3m

☑ Class B in open area test site

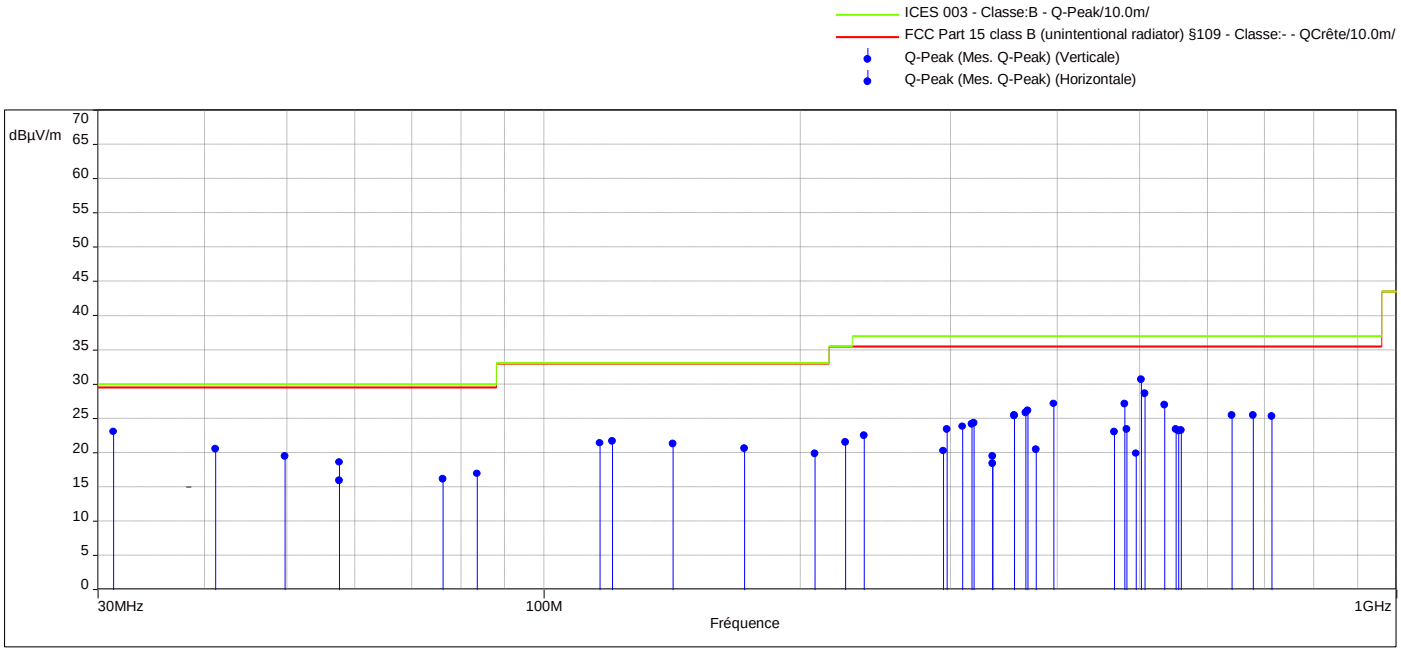
Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average	Distance
30-88MHz	30	-	-	10m
88 – 216MHz	33.1	-	-	10m
216 – 230 MHz	35.6	-	-	10m
230 – 960 MHz	37			10m
960 – 1000 MHz	43.5	-	-	10m
1000-6000MHz	-	74	54	3m

3.5. TEST EQUIPMENT LIST

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
OATS	-	-	F2000400	2022/02	2023/02
Receiver	ROHDE & SCHWARZ	ESIB	A2642021	2021/02	2023/02
Preamplifier	BONN	BLNA 3018-8F305	A7080053	2021/11	2023/11
Antenna bilog	CHASE	CBL 6112A	C2040040	2021/04	2023/04
Horn antenna	ETS	3115	C2042016	2021/04	2023/04
Cable	-	-	A5330032	2022/08	2023/08
Cable	-	-	A5329449	2022/11	2023/11
Cable			A4529577	2022/06	2023/06
Software V3.19.1.21	NEXIO	BAT-EMC	-	-	-

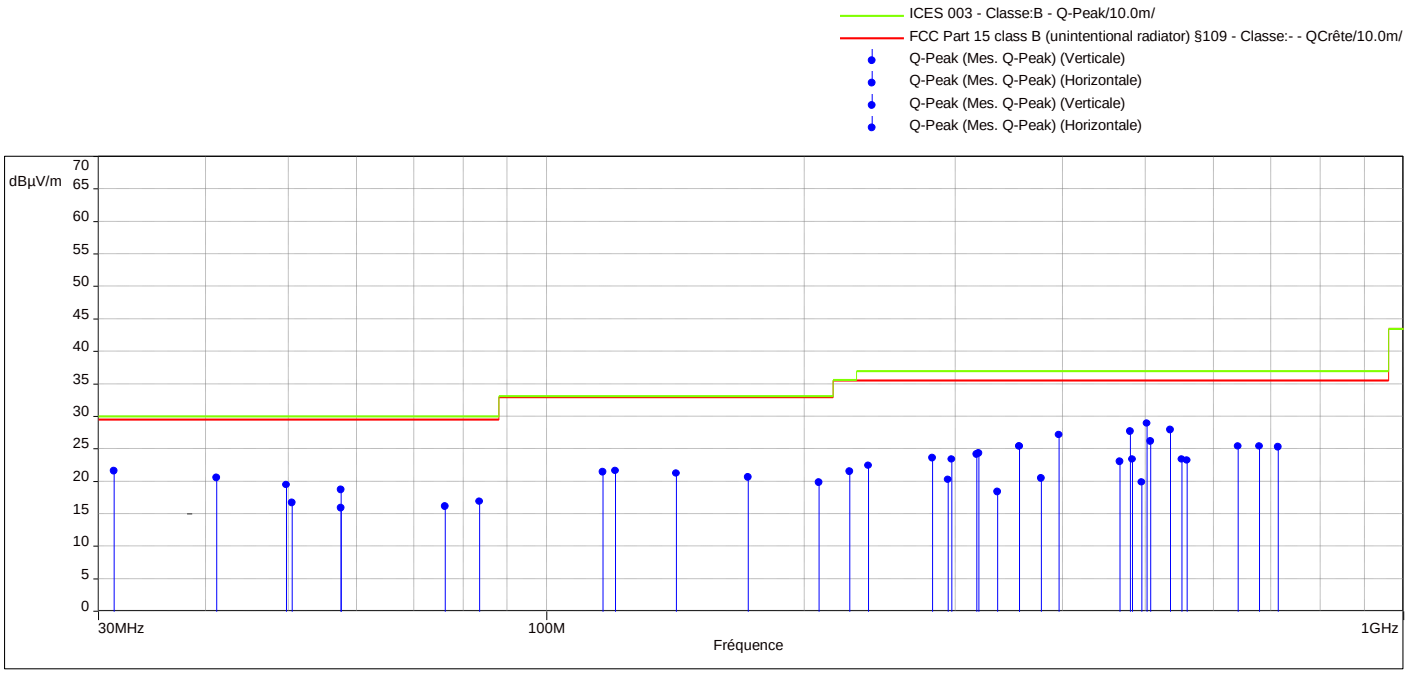
3.6. RESULTS

Diagram N°1
Mode 1
Vertical & horizontal Polarization (30MHz-1GHz)



	Frequency (MHz)	level (dBµV/m)	limit ICES 003 class B	Margin ICES 003 class B	limit FCC class B	Margin Fcc Part class B
Vertical	31.3	23.06	30	6.94	29.5	6.44
Vertical	356	25.41	37	11.59	35.5	10.09
Vertical	501.9	30.68	37	6.32	35.5	4.82
Vertical	534.6	26.98	37	10.02	35.5	8.52
Horizontal	369.2	26.11	37	10.89	35.5	9.39
Horizontal	396	27.16	37	9.84	35.5	8.34
Horizontal	480.1	27.11	37	9.89	35.5	8.39
Horizontal	506.7	28.62	37	8.38	35.5	6.88

Diagram N°1
Mode 3
Vertical & horizontal Polarization (30MHz-1GHz)



	Frequency (MHz)	level (dBµV/m)	limit ICES 003 class B	Margin ICES 003 class B	limit FCC class B	Margin Fcc Part class B
Vertical	31.3	21.57	30	8.43	29.5	7.93
Vertical	282.2	23.54	37	13.46	35.5	11.96
Vertical	501.9	28.93	37	8.07	35.5	6.57
Vertical	534.6	27.88	37	9.12	35.5	7.62
Horizontal	50.5	16.72	30	13.28	29.5	12.78
Horizontal	396	27.16	37	9.84	35.5	8.34
Horizontal	480.1	27.67	37	9.33	35.5	7.83
Horizontal	506.7	26.19	37	10.81	35.5	9.31

3.7. CONCLUSION

Measures of Radiated Emission, performed on the sample of the product FAMA LITE, SN: AD-FOA07-0822455, in configuration and description presented in this test report, show levels conform to the FCC part 15 & ICES -003 limits.

4. Measurement of conducted disturbance

4.1. ENVIRONMENTAL CONDITIONS

Test performed by	: **Laurent Deneux**
Date of test	: January 30, 2023
Ambient temperature	: 20°C
Relative humidity	: 45%

4.2. TEST SETUP

Specifications:

Frequency	0.15 – 30 MHz	RBW 9 kHz
Detector	Peak , Quasi Peak and average	

The measurement is performed on power supply with a LISN and telecommunication lines with RSI or current clamp for shielded cables.

Operating conditions:

- Deviation method:

☐ Yes

☑ No

-Product installation:

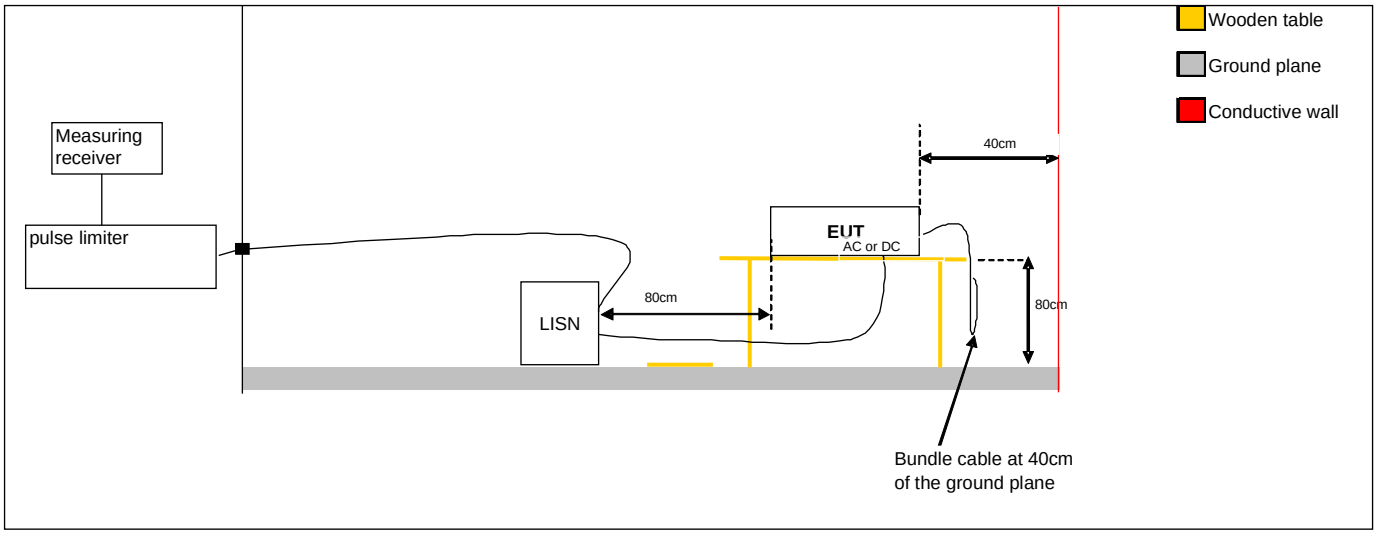
☑ The EUT is installed on a wooden table 80 cm above the reference plane, at 80cm of the LISN and at 40cm of the vertical conductive wall

☐ The EUT is installed on a wooden table 40 cm above the reference plane, at 80cm of the LISN.

☐ The EUT is installed 10 cm above the reference plane, at 80cm of the LISN..

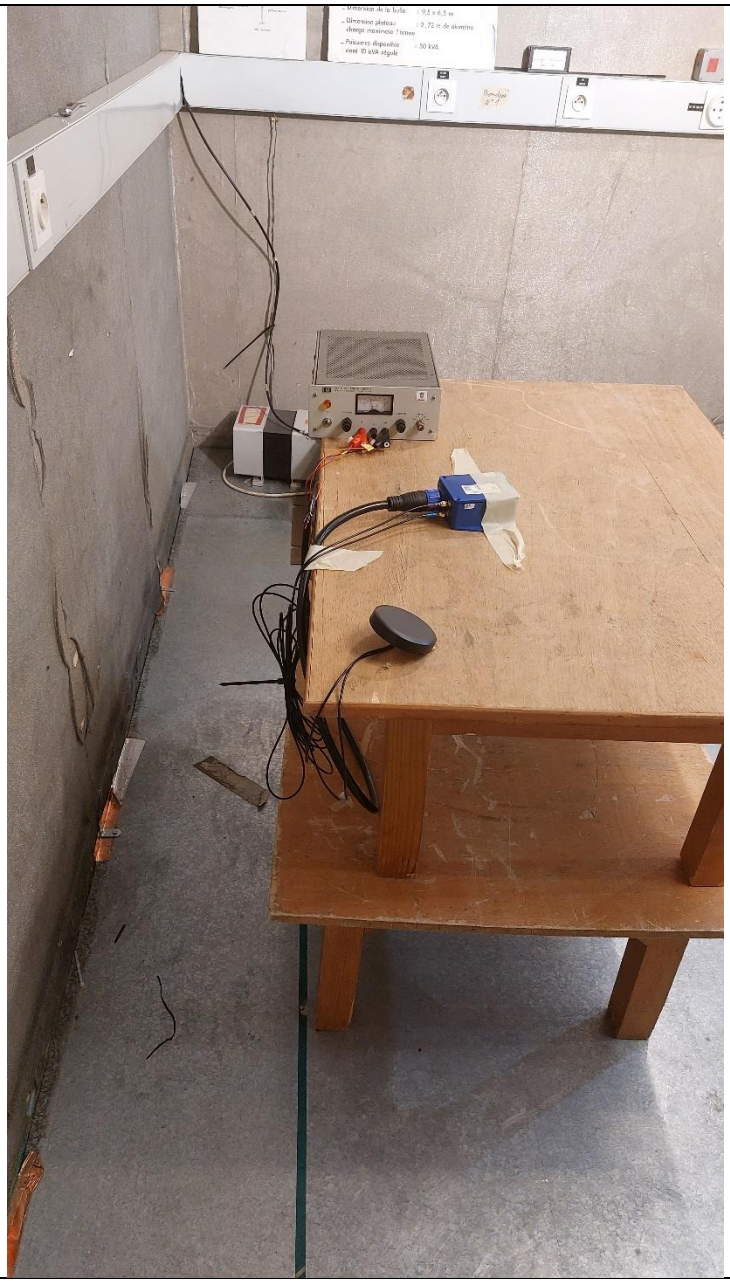
Operating mode:

☑ Mode 1 ☑ Mode 2 ☐ Mode 3 …



Test set up of conducted emission on power supply

Test set up of conducted emission on power supply



Test set up of conducted emission on power supply

4.3. LIMIT

☐ Power supply Class A

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) average
0.15-0.5MHz	79	66
0.5-30 MHz	73	60

☑ Power supply Class B

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) average
0.15-0.5MHz	66-56	56-46
0.5-5 MHz	56	46
5-30 MHz	60	50

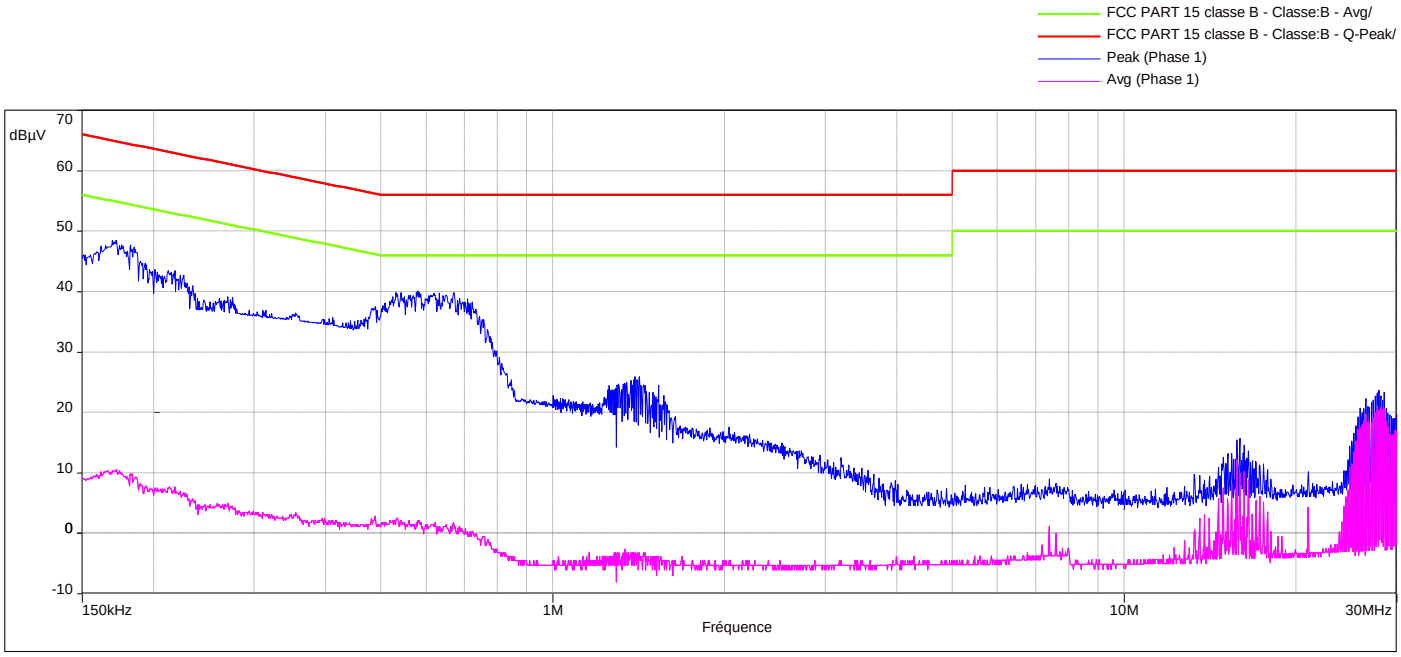
4.4. TEST EQUIPMENT LIST

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Receiver	ROHDE & SCHWARZ	ESIB	A2642021	2021/02	2023/02
Limiter	ROHDE & SCHWARZ	ESH3-Z2	A2649008	2022/06	2024/06
Network V / V ISLN	ROHDE & SCHWARZ	ESH2-Z5	C2322002	2022/10	2023/11
Absorber cable	LCIE	-	A5329589	2021/11	2023/11
Cable N(6m)	-	-	A5329417	2022/11	2023/11
Power supply	DANA	DSC5000	A7044076	-	-
Software V3.19.1.21	NEXIO	BAT-EMC	-	-	-

4.5. RESULTS

Diagram N°1

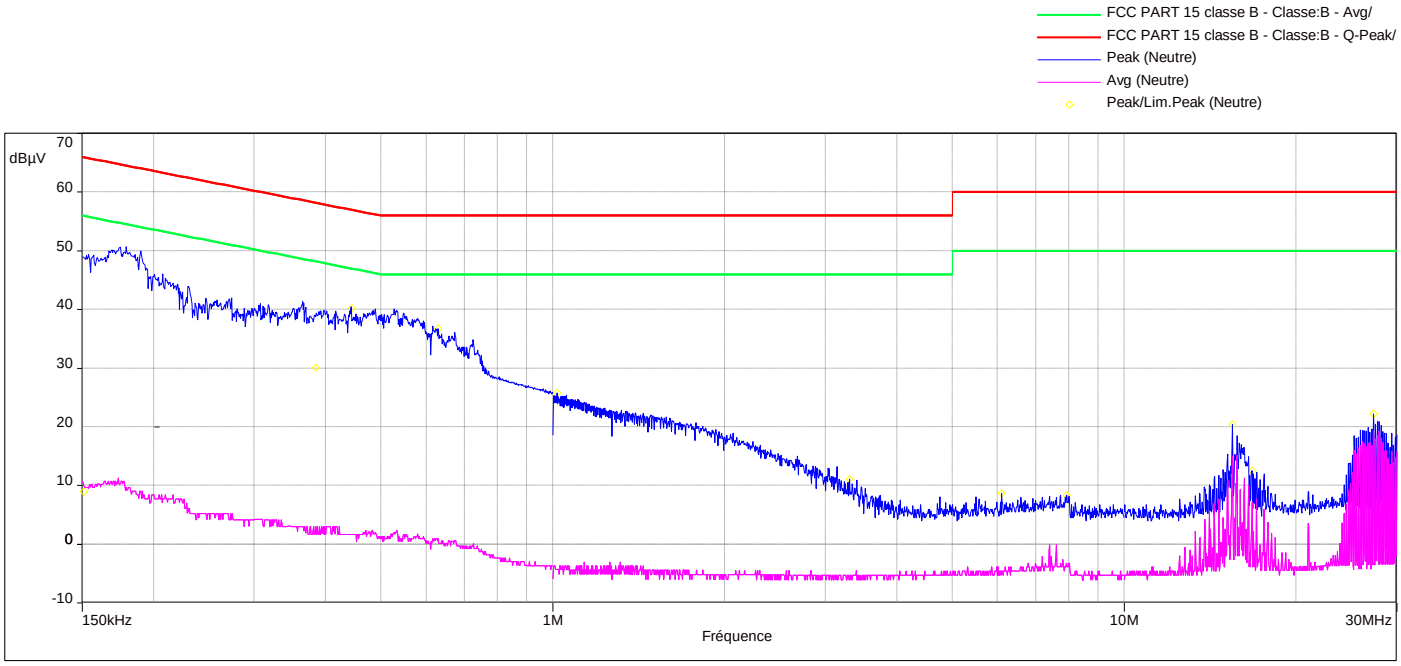
Phase 240V/50Hz



Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin peak/Quasi Peak (dB)	Average Level (dBµV)	Average Limit (dBµV)	Margin Avg/Avg (dB)
0.172	47.8	-	64.7	16.9	10.3	54.7	44.4
0.582	39.4	-	56	16.6	1.8	46	44.2
1.4	25.4	-	56	30.6	-3.8	46	49.8
15.75	15.4	-	60	44.6	12	50	38
27.73	22.7	-	60	37.3	20.9	50	29.1

Diagram N°2

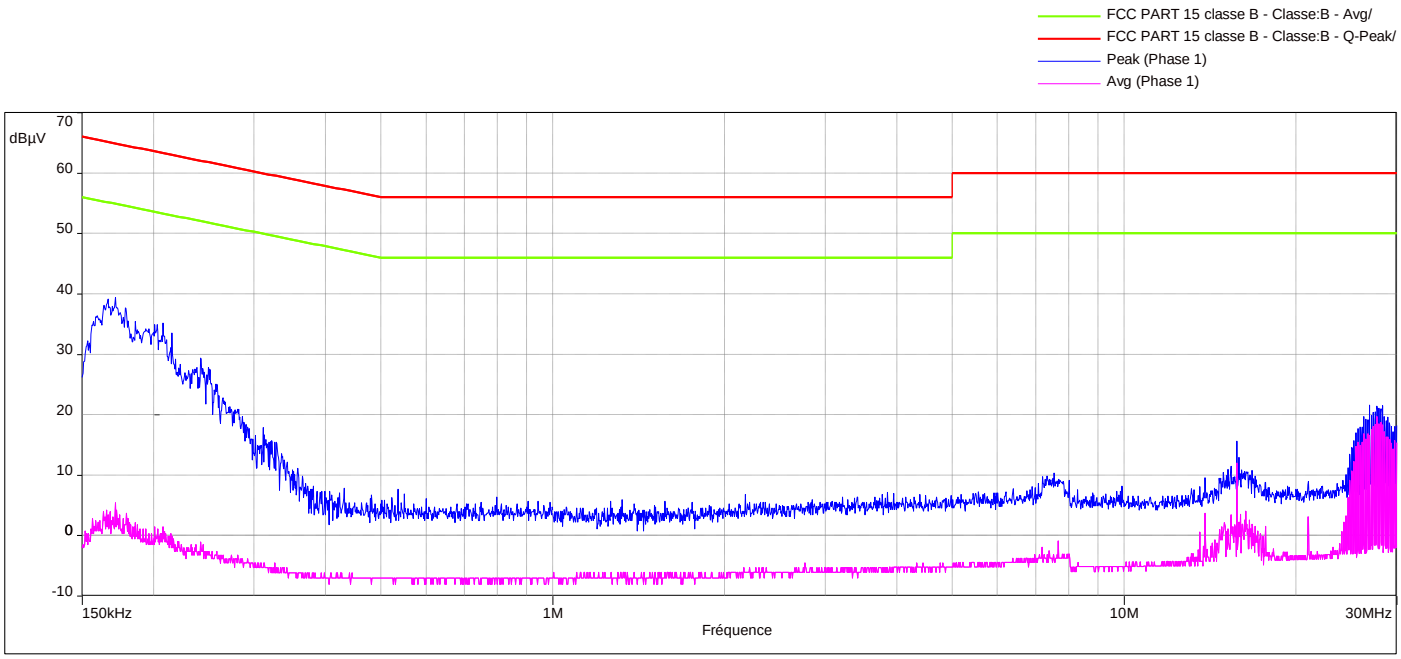
Neutral 240V/50Hz



Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin peak/Quasi Peak (dB)	Average Level (dBµV)	Average Limit (dBµV)	Margin Avg/Avg (dB)
0.172	50	-	64.7	14.7	11.2	54.7	43.5
0.525	39.2	-	56	16.8	1.7	46	44.3
1.478	21.8	-	56	34.2	-5	46	51
15.46	20.45	-	60	39.55	15	50	35
27.31	22.24	-	60	37.76	19	50	31

Diagram N°3

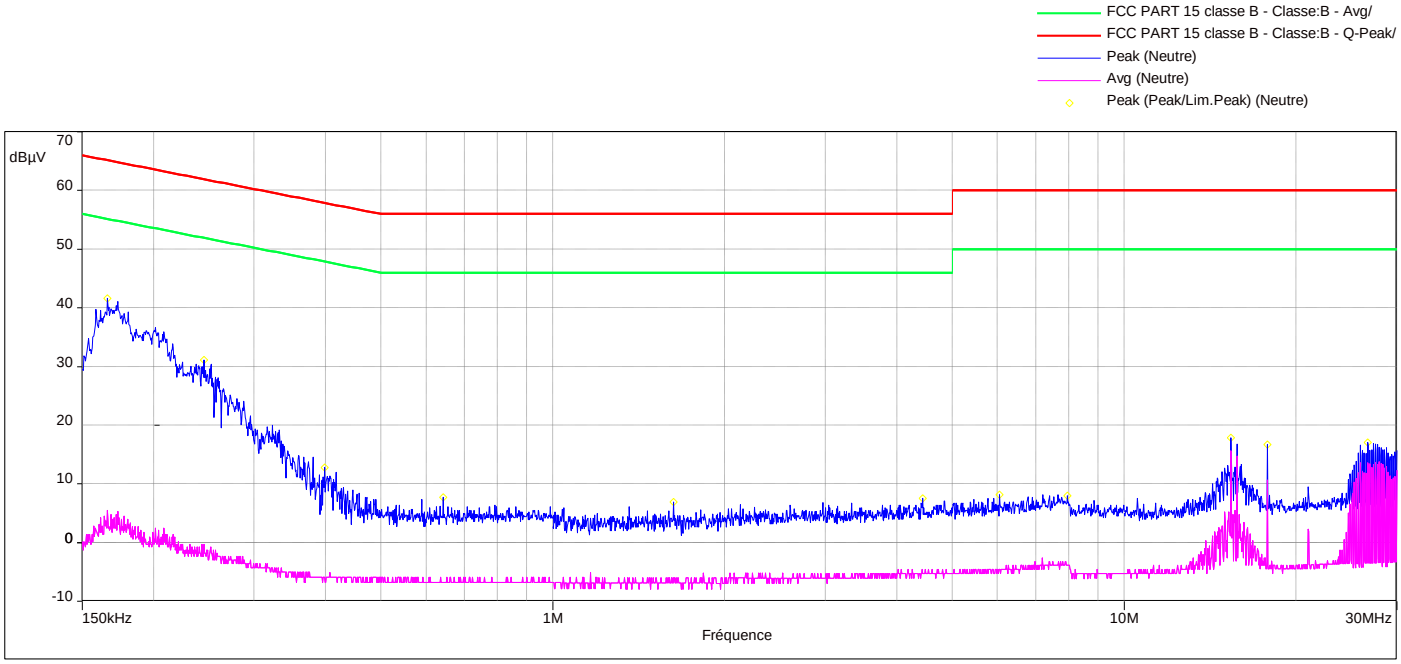
Phase 120/60Hz



Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin peak/Quasi Peak (dB)	Average Level (dBµV)	Average Limit (dBµV)	Margin Avg/Avg (dB)
0.172	39.4	-	64.7	25.3	5.4	54.7	49.3
0.536	15.7	-	56	40.3	-7	46	53
7.67	10.2	-	56	45.8	-0.9	46	46.9
15.75	15.5	-	60	44.5	12	50	38
27.72	21.5	-	60	38.5	19.6	50	30.4

Diagram N°4

Neutral 120/60Hz



Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin peak/Quasi Peak (dB)	Average Level (dBµV)	Average Limit (dBµV)	Margin Avg/Avg (dB)
0.166	41.64	-	64.7	23.06	5.5	54.7	49.2
0.642	7.7	-	56	48.3	-6.8	46	52.8
15.37	17.8	-	56	38.2	15.37	46	30.63
17.79	16.7	-	60	43.3	110.67	50	-60.67
27.31	16.2	-	60	43.8	13.3	50	36.7

4.6. CONCLUSION

Measures of Conducted Emission, performed on the sample of the product FAMA LITE, SN: AD-FOA07-0822455, in configuration and description presented in this test report, show levels conform to the FCC part 15 & ICES -003 limits.

5. Uncertainties Chart

Kind of measurement	Wide uncertainty laboratory (k=2) ±x(dB)	CISPR uncertainty limit ±y(dB)
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	3.68	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)	3.22	3.4
Measurement of conducted disturbances in Capacitive voltage (150 kHz – 30 MHz)	3.69	3.9
Measurement of conducted disturbances in voltage AAN avec aLCL = 55 … 40 dBc	4.15	4.2
Measurement of conducted disturbances in voltage AAN avec aLCL = 65 … 50 dBc	4.54	4.59
Measurement of conducted disturbances in voltage AAN avec aLCL = 75 … 60 dBc	4.97	5.03
Measurement of conducted disturbances in current (current clamp)	2.9	2.9
Measurement of disturbance power	4.31	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC	4.48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on OATS & SAC	5.79	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position on OATS & SAC at 3m	6.3	6.3
Measurement of radiated electric field from 6 to 18GHz	5.36	5.5
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in OATS at 10m	5.7	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in in OATS at 10m	5.61	6.3
Measurement of radiated electric field from 1 to 6 GHz	4.98	5.2
Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Ecuelles)	4.48	/
Measurement of current harmonics	11.11%	/
Measurement of Flicker	9.26%	/
Immunity to radiated. radio-frequency. electromagnetic field in SAC C01 (80MHz-1GHz)	2.26	/
Immunity to radiated. radio-frequency. electromagnetic field in SAC C01 (1-6GHz)	2.42	/
Immunity to radiated. radio-frequency. electromagnetic field in SAC V01 (80MHz-1GHz)	2.5	/
Immunity to radiated. radio-frequency. electromagnetic field in SAC V01 (1-6GHz)	2.64	/
Immunity to radiated. radio-frequency. electromagnetic field in SAC V05 (80MHz-1GHz)	2.27	/
Immunity to radiated. radio-frequency. electromagnetic field in SAC V05 (1-6GHz)	2.64	/

End of test report

AUTO CONTROL

1. Measurement of radiated emissions

Polarity antenna	Frequency MHz	Level measured dBµV/m
Vertical	65	39.4
Vertical	115	49
Vertical	515	48.4
Vertical	900	38.8

2. Measurement of conducted disturbance