



LCIE

TEST REPORT

N°: 13407699 - 775412

Version : 02

Subject	Electromagnetic compatibility (EMC) : FCC CFR 47 Part 15, Subpart B of 2019 ANSI C63.4 of 2014 ICES-003 issue 7 of 2020
Issued to	ATCOM TELEMETRIE 15 rue Jean Bertin – BP 79 45430 Checy France
Apparatus under test	
↔ Product	AT_CRA <i>Inductive power supply and communication system for telemetry</i>
↔ Trade mark	Atcom Télémétrie
↔ Manufacturer	Atcom Télémétrie
↔ Model under test	AT_CRA
↔ Serial number	2210001
Test date	February 28, 2022
Test location	LCIE, Villebon
Designation Number	FR0010
Registration Number	582868
Test performed by	Willy Daclinat
Composition of document	21 pages
Document issued on	November 23, 2022

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Approved by :
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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	April 1, 2022	Willy DACLINAT	Creation of the document
02	November 23, 2022	Ali AKEB	Correction of the model Name/Manufacturer Adding FCC accreditation information

Date of receipt of test item February 28, 2022



SUMMARY

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1. Test Program

References

- ✓ CFR 47 Part 15 Subpart B - Radio frequency devices - Unintentional radiators 2019
- ✓ ICES -003 issue 7 of 2020
- ✓ 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)	<input checked="" type="checkbox"/> Class A <input type="checkbox"/> Class B	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP (Limited Program)
Measurement of radiated electric field in open space	<input type="checkbox"/> Class A <input type="checkbox"/> Class B	<input type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP (Limited Program)
Measurement of conducted disturbance on the AC main power port 15.107 (a) (c) (d)	<input checked="" type="checkbox"/> Class A <input type="checkbox"/> Class B	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA (1) <input type="checkbox"/> 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. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT): AT_CRA

Serial Number: 2210001



Equipment Under Test



Inputs/outputs - Cable:

Access	Inputs / Outputs	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Main power supply	Input	L1-N-PE	2	Yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Data	Input	BNC	15	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Power supply	Output	Others	15	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	RF-N Connector
Network	Bidirectionel	RJ45	15	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Pc	Model : 501U	C7N0bC26156128F	-
-	-	-	-

Equipment information: (Declared by provider)

Apparatus Description	Telemetry system intended to carry out vibration measurements via strain gauges placed in the turbine of a turbojet. This product is intended for use on the ground in test benches.EUT		
Type of power source:	<input checked="" type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input type="checkbox"/> Battery (Select Type)
Test source voltage:	Vmin-Vmax:	<input checked="" type="checkbox"/> 85 - 264 V / 47 - 63 Hz	<input type="checkbox"/> Vnom VDC
Operating Modes	Mode 1	All components of the system are in functioning. The system is fully operational	
	Mode 2	-	
	Mode 3	-	
	Mode 4	-	



2.2. EQUIPMENT LABELLING

No labelling

Equipment Labelling

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 52.5dB μ V 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 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$



3. Measurement of radiated emissions

3.1. ENVIRONMENTAL CONDITIONS

Test performed by : **Willy Daclinat**
Date of test : February 28, 2022
Ambient temperature : 18°C
Relative humidity : 40%

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:

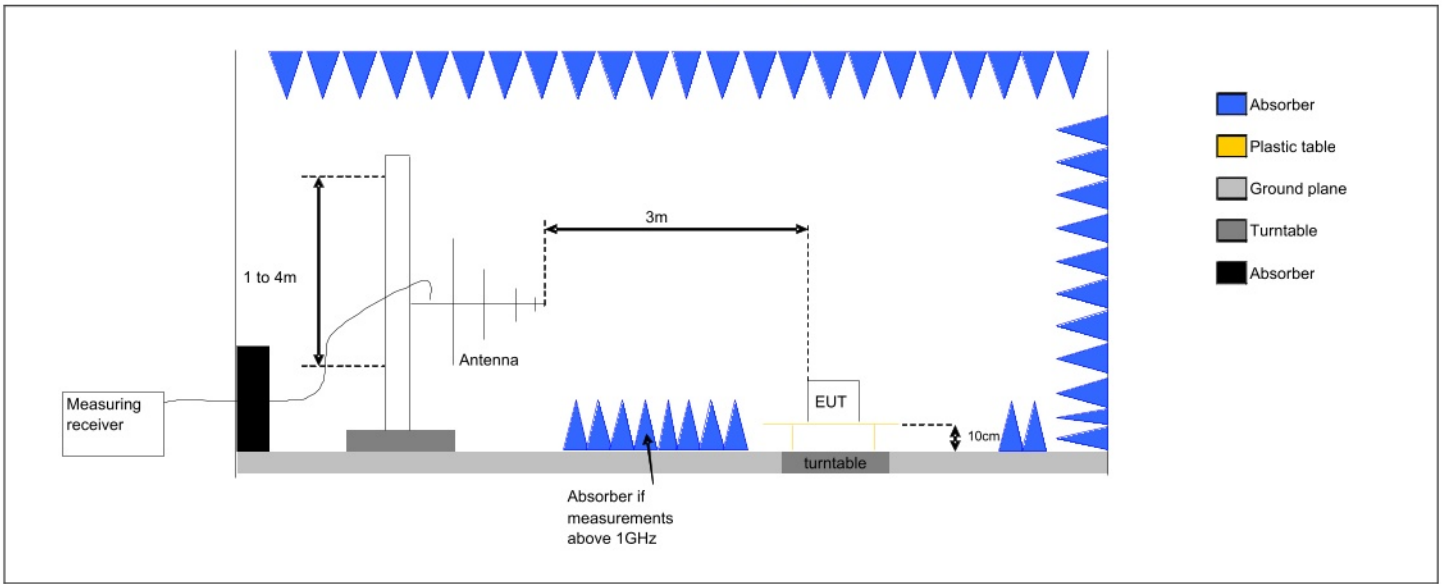
- Yes
 No

-Product installation:

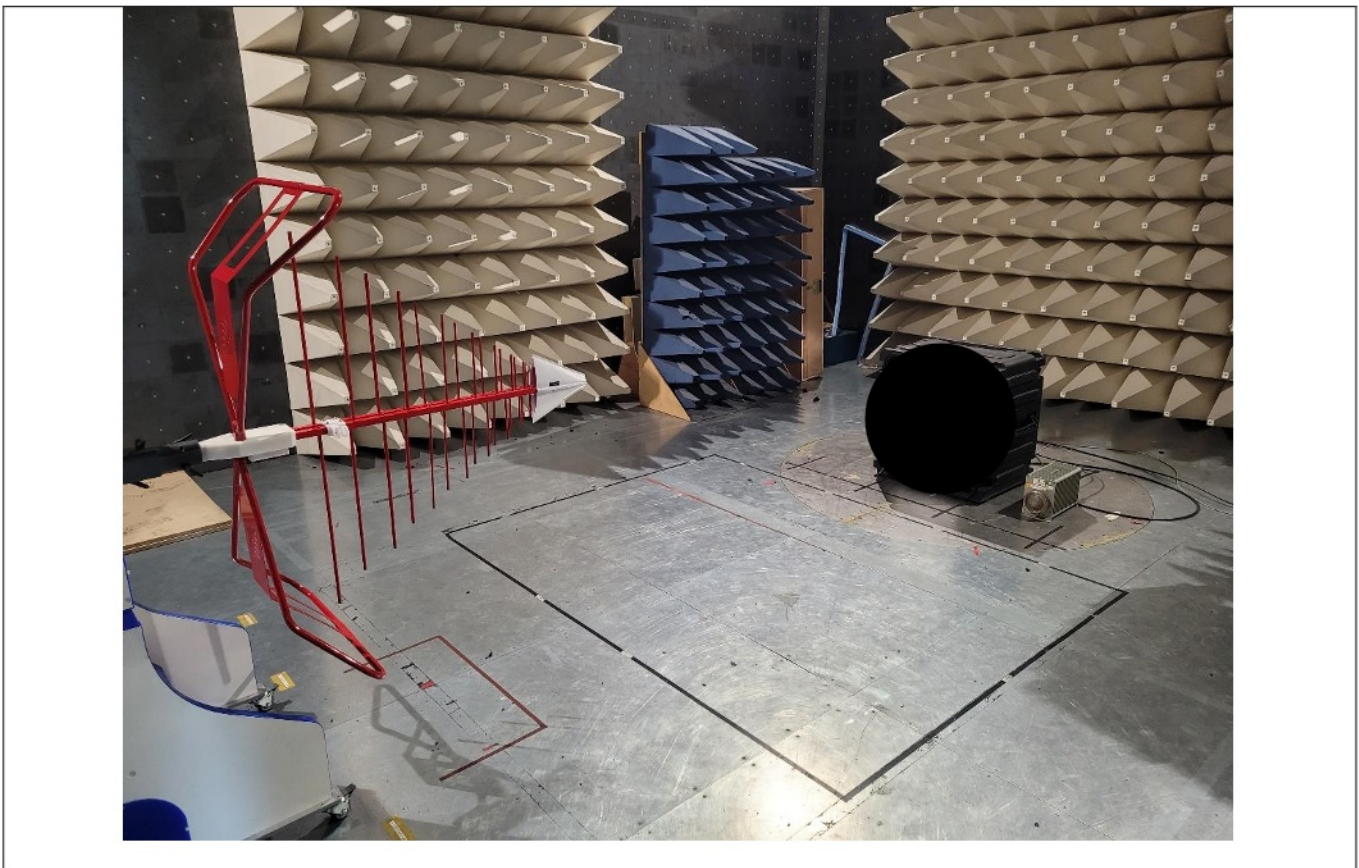
- The EUT was tested as a tabletop equipment and was placed on a non-conducting platform the top of which is 0.8m above the metal ground plane.
 The EUT is at 10cm height from reference plane

Operating mode:

- Mode 1 Mode 2 Mode 3 ...



Test Set up for radiated measurement in semi anechoic chamber



Measurement of radiated disturbances.



3.3. LIMIT

at 3m Class A

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average
30-88MHz	49.5	-	-
88 – 216MHz	53.9	-	-
216 – 960 MHz	56.9	-	-
960 – 1000 MHz	60	-	-
1000-6000MHz	-	80	60

at 3m Class B

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average
30-88MHz	40	-	-
88 – 216MHz	43.5	-	-
216 – 960 MHz	46	-	-
960 – 1000 MHz	53.9	-	-
1000-6000MHz	-	73.9	53.9

at 10m Class A

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average
30-88MHz	39.5	-	-
88 – 216MHz	43.9	-	-
216 – 960 MHz	46.9	-	-
960 – 1000 MHz	50	-	-
1000-6000MHz	-	70	50

at 10m Class B

Frequency Bands/frequencies	dB (µV/m) quasi-peak	dB (µV/m) peak	dB (µV/m) average
30-88MHz	30	-	-
88 – 216MHz	33.5	-	-
216 – 960 MHz	36	-	-
960 – 1000 MHz	43.9	-	-
1000-6000MHz	-	63.9	43.9



3.4. TEST EQUIPMENT LIST

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi anechoic chamber	SIEPEL	V05 (ANE)	D3044031	2021/03	2024/03
Semi anechoic chamber	SIEPEL	V05 (VSWR)	D3044031	2021/03	2024/03
Software v3.20.0.17	NEXIO	BAT-EMC	LCIE	-	-
Thermo-hygrometer	OTIO	-	B4204094	2021/10	2023/10
Cable	-	-	A5329747	2020/10	2022/02
Cable	-	-	A5329994	2020/12	2022/04
Bilog antenna	ETS LINDGREN	3142E	C2040271	2021/01	2023/03
Receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2021/04	2023/04
Horn antenna	A-infoMW	Broadband 1-18	C2042056	2021/04	2023/04
Preamplifier	SCHWARZBECK	BBV9743 B	A7080076	2021/03	2022/03



3.5. RESULTS

Diagram N°1 Horizontal Polarization (30MHz-1GHz)

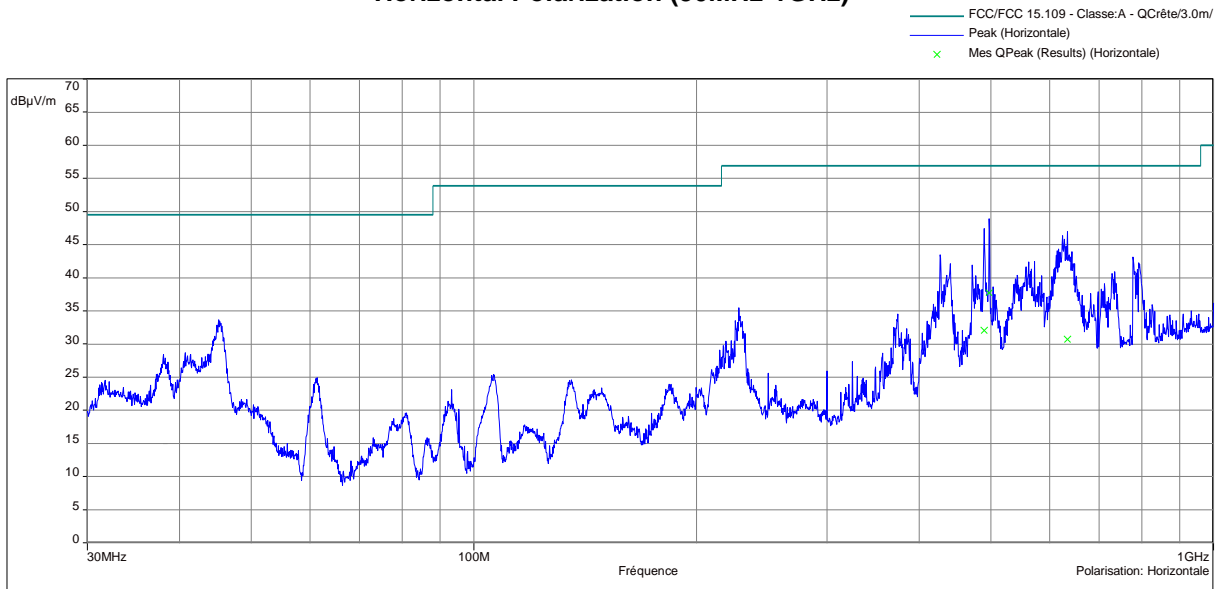


Diagram N°2 Vertical Polarization (30MHz-1GHz)

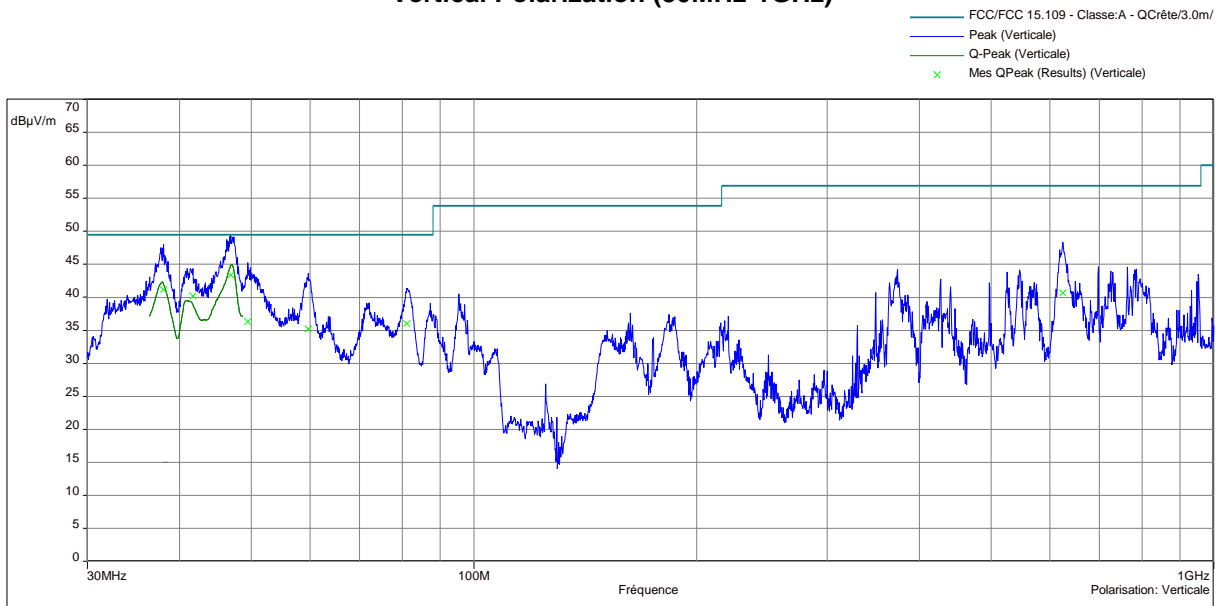




Diagram N°3 Horizontal Polarization (1GHz-6GHz)

- FCC/FCC 15.109 - Classe:A - Moyenne/3.0m/
- FCC/FCC 15.109 - Classe:A - Crête/3.0m/
- Peak (Horizontale)
- Avg (Horizontale)

Description Sous-bande 1

Fréquences: 1 GHz - 6 GHz (Mode: Lin, Pas: 500 kHz)

Réglages: RBW: 1MHz, VBW: Auto, Durée balayage : 10 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : On: 10 dB, LN Preamp : Off, Preselecteur: Off

Polarisation:Horizontale

Distance: 3 m

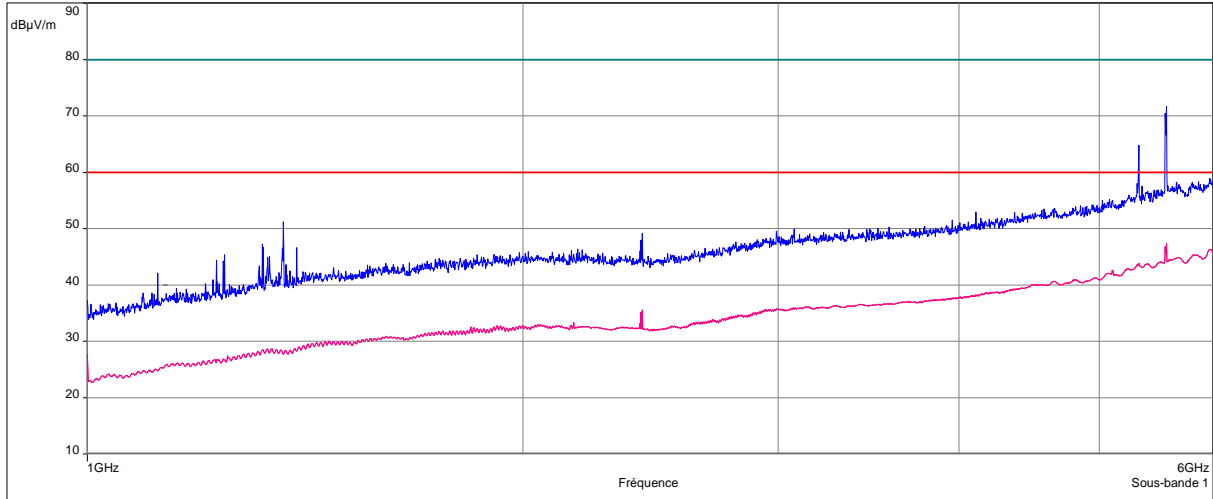


Diagram N°4 Vertical Polarization (1GHz-6GHz)

- FCC/FCC 15.109 - Classe:A - Moyenne/3.0m/
- FCC/FCC 15.109 - Classe:A - Crête/3.0m/
- Peak (Suspect Manuel) (Verticale)
- Avg (Suspect Manuel) (Verticale)
- Peak (Verticale)
- Avg (Verticale)

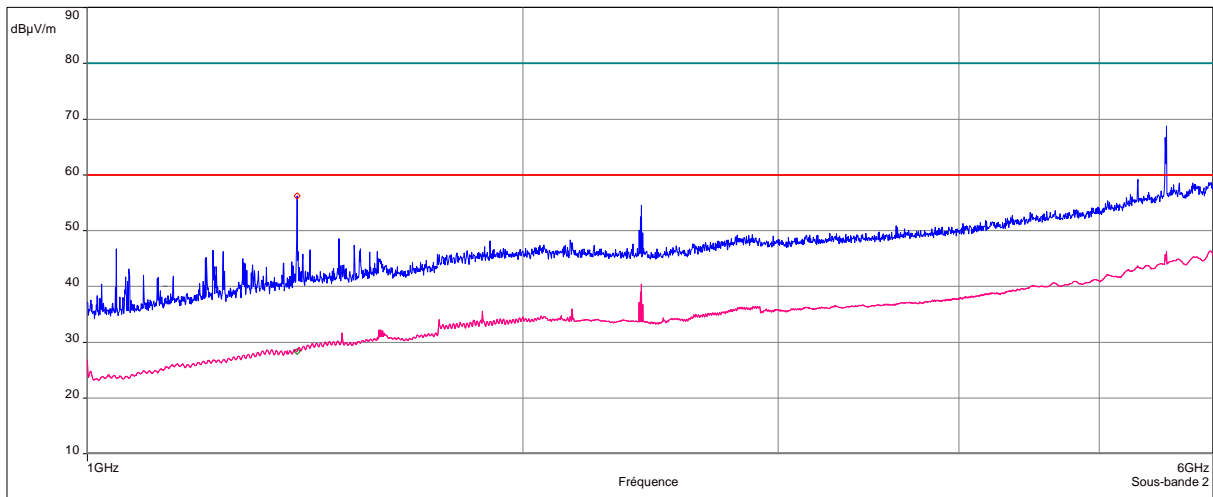
Description Sous-bande 2

Fréquences: 1 GHz - 6 GHz (Mode: Lin, Pas: 500 kHz)

Réglages: RBW: 1MHz, VBW: Auto, Durée balayage : 10 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : On: 10 dB, LN Preamp : Off, Preselecteur: Off

Polarisation:Verticale

Distance: 3 m





3.6. CONCLUSION

Measures of Radiated Emission, performed on the sample of the product AT_CRA, SN: 2210001, 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 : **Willy Daclinat**
Date of test : February 28, 2022
Ambient temperature : 21°C
Relative humidity : 40%

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:

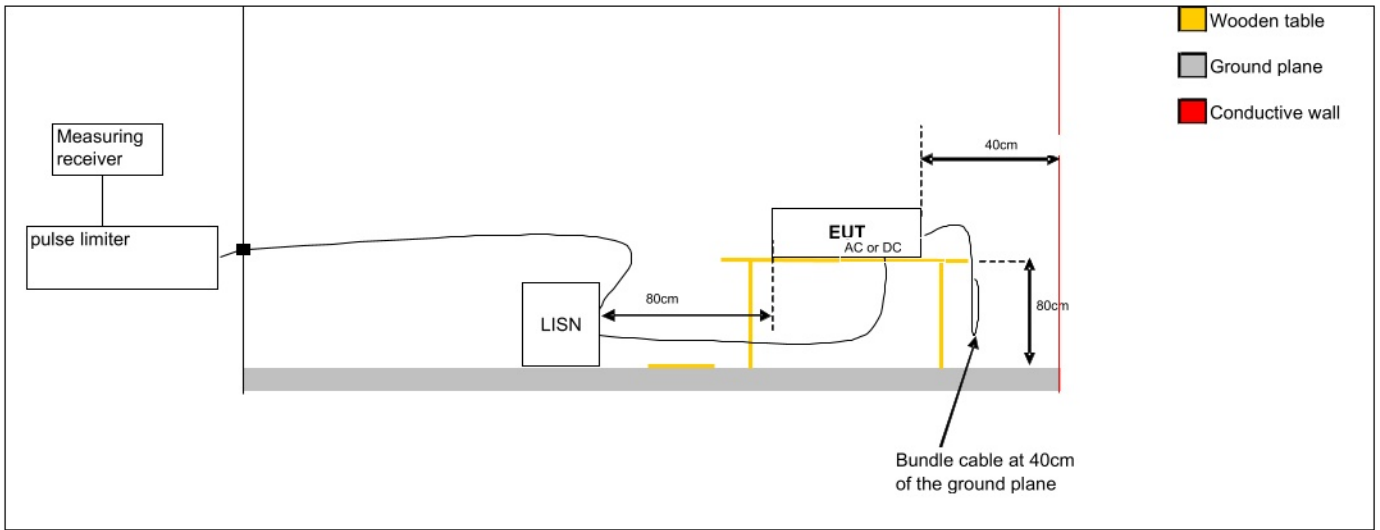
- Yes
 No

-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



4.3. LIMIT

Power supply Class A

Frequency Bands/frequencies	dB ($\mu\text{V/m}$) quasi-peak	dB ($\mu\text{V/m}$) average
0.15-0.5MHz	79	66
0.5-30 MHz	73	60

Power supply Class B

Frequency Bands/frequencies	dB ($\mu\text{V/m}$) quasi-peak	dB ($\mu\text{V/m}$) 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
Reference ground plane 3 x 6,5 m	LCIE	V03	-	-	-
Software v3.20.0.17	NEXIO	BAT-EMC	LCIE	-	-
Thermo-hygrometer	OTIO	-	B4204093	2020/12	2022/12
Receiver	ROHDE & SCHWARZ	ESCI	A2642016	2020/12	2022/12
Current absorber	LCIE	-	A5329924	2021/03	2023/03
Cable	-	-	A5329994	2020/12	2022/04
Variable power supply AC	DANA	DSC 10.000M	-	-	-
RSIL	ROHDE & SCHWARZ	ENV216	C2320163	2021/02	2023/02



4.5. RESULTS

Diagram N°1

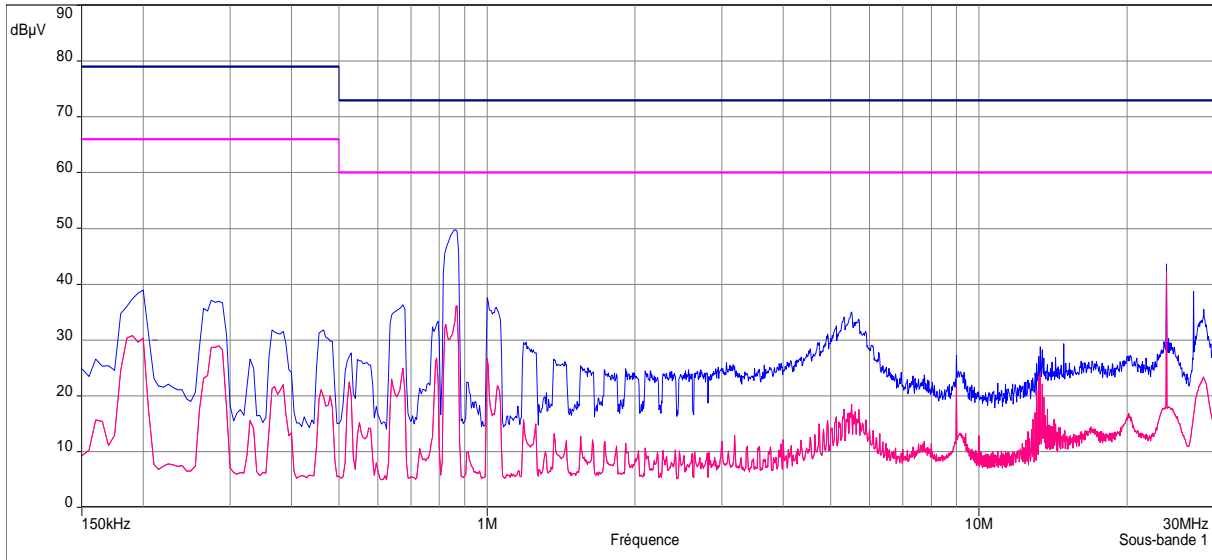
- FCC/FCC 15.207 - Classe:A - Moyenne/
- FCC/FCC 15.207 - Classe:A - QCrête/
- Peak (Phase 1)
- Avg (Phase 1)

Description Sous-bande 1

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur: On

Ligne:Phase 1



Phase 240V/50Hz

Diagram N°2

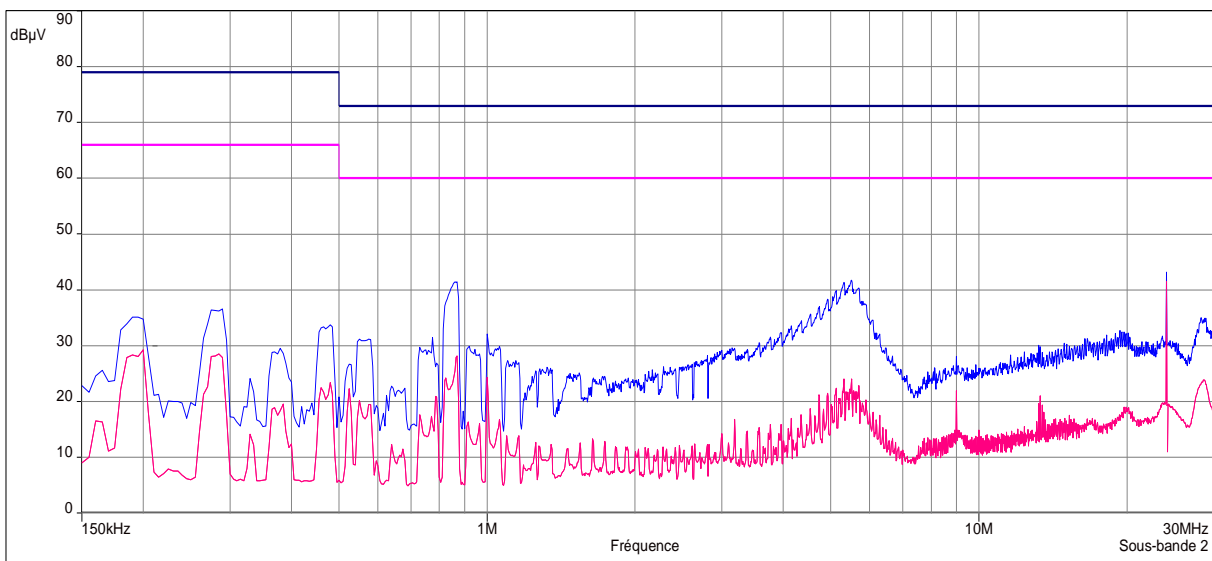
- FCC/FCC 15.207 - Classe:A - Moyenne/
- FCC/FCC 15.207 - Classe:A - QCrête/
- Peak (Neutre)
- Avg (Neutre)

Description Sous-bande 2

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur: On

Ligne:Neutre



Neutral 240V/50Hz



Diagram N°3

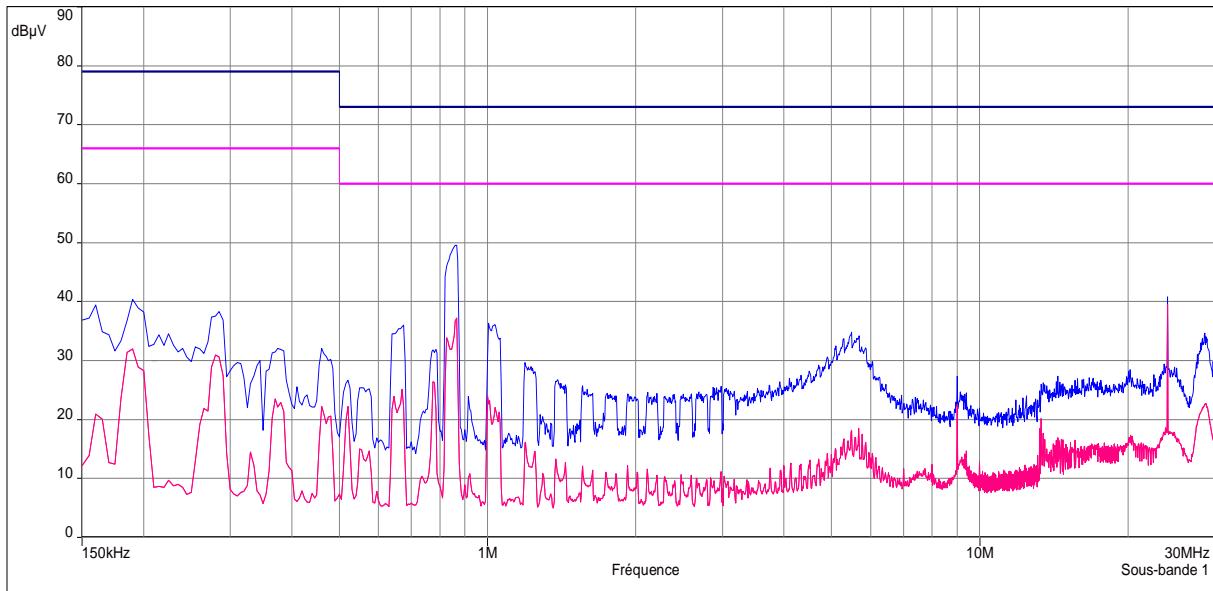
- FCC/FCC 15.207 - Classe:A - Moyenne/
- FCC/FCC 15.207 - Classe:A - QCrête/
- Peak (Phase 1)
- Avg (Phase 1)

Description Sous-bande 1

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur: On

Ligne:Phase 1



Phase 120/60Hz

Diagram N°4

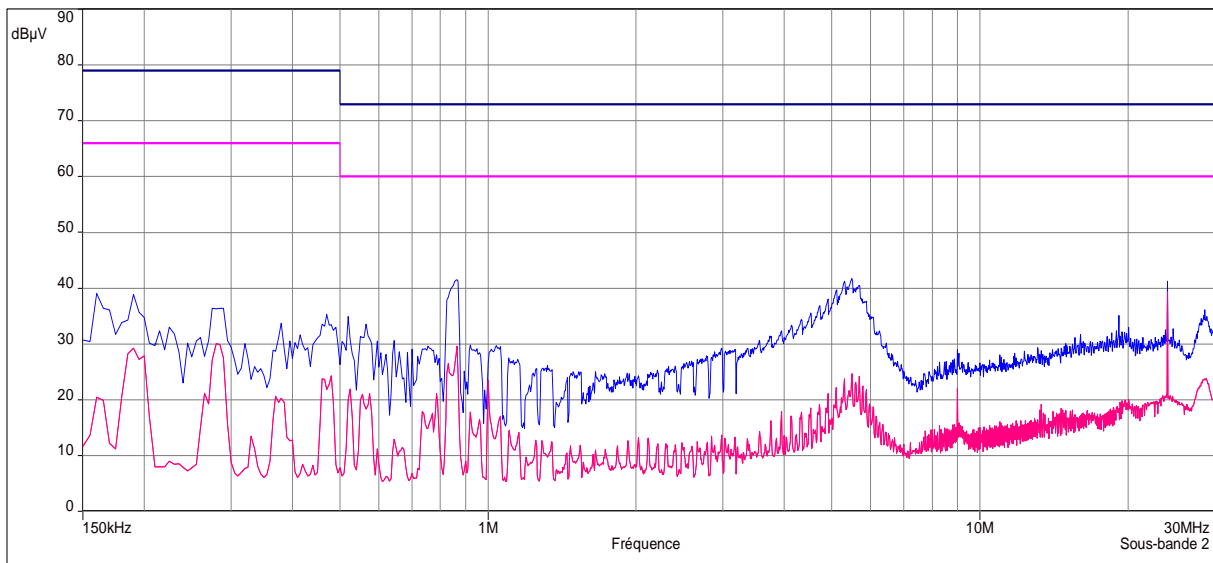
- FCC/FCC 15.207 - Classe:A - Moyenne/
- FCC/FCC 15.207 - Classe:A - QCrête/
- Peak (Neutre)
- Avg (Neutre)

Description Sous-bande 2

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur: On

Ligne:Neutre



Neutral 120/60Hz



4.6. CONCLUSION

Measures of Conducted Emission, performed on the sample of the product AT_CRA, SN: 2210001, 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) $\pm x$ (dB)	CISPR uncertainty limit $\pm y$ (dB)
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	2.67	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)	2.67	3.4
Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)	3.67	5.0
Measurement of conducted disturbances in current (current clamp)	2.73	2.9
Measurement of disturbance power	4.26	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01	4.48	/
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01	4.48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Ecuelles)	4.87	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Ecuelles)	4.94	6.3
Measurement of radiated electric field from 1 to 6 GHz on the Ecuelles site	5.38	5.2
Measurement of radiated electric field from 6 to 18GHz on the Ecuelles site	5.92	5.5
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC C01	5.29	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC C01	5.36	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V01	5.25	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V01	5.32	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V05	5.15	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V05	5.22	6.3
Measurement of radiated electric field from 1 to 6 GHz C01	4.84	5.2
Measurement of radiated electric field from 6 to 18 GHz C01	5.02	5.5
Measurement of radiated electric field from 1 to 6 GHz V01	4.57	5.2
Measurement of radiated electric field from 1 to 6 GHz V05	4.59	5.2
Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Ecuelles)	4.48	/

End of test report