

RRA-EMIESS24A523TEX-05Av0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

Equipment under test:

TPMS-IR21

FCC ID: ***2BCPN-IR21***


Company:

TEXYS INTERNATIONAL

Distribution: Mr DAGNET Thibault

(Company: TEXYS INTERNATIONAL)

Number of pages: 20 with 3 annexes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
0	7-Jun-24	Creation	JC. BOGA, Laboratory Manager	

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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

Information in italics are declared by the manufacturer/customer and are under his responsibility

DESIGNATION OF PRODUCT: *TPMS-IR21*

Serial number (S/N): *U23052490*

Reference / model (P/N): *TPMS-IR21*

Software version: *V1.06*

MANUFACTURER: Texys International

COMPANY SUBMITTING THE PRODUCT:

Company: Texys International

Address: ZA des Chamonds 16 rue Edouard Branly
58640 Varennes-Vauzelles
FRANCE

Responsible: Mr DAGNET Thibault

DATE(S) OF TEST: From 8-Apr-24 to 26-Apr-24

TESTING LOCATION: EMITECH LYON laboratory at CHASSIEU (69) FRANCE

FCC Accredited under US-EU MRA Designation Number: FR0013
Test Firm Registration Number: 807590

ISED Accredited under CANADA-EU MRA Designation Number: FR0007
Industry Canada Registration Number: 4379D

TESTED BY: T. LEDRESSEUR

VISA:



WRITTEN BY: T. LEDRESSEUR

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REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	4-Jun-24	/	Creation

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **TPMS-IR21**, in accordance with normative reference.

The equipment under test integrates:

- SRD emitter (433.98MHz).
- RFID receiver (125 kHz)

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	TPMS Sensor system
Antenna type and gain:	integral antenna (unknown gain)
Operating frequency range:	433.98
Number of channels:	1
Channel spacing:	Not concerned
Modulation:	2-GFSK
Power source:	Internal battery 3.6 Vdc

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

Power mode	Condition	Data sent (TPMS-RS21)	Data sent (TPMS-IR21)
Storage	Deflated tyre	No Transmission	No Transmission
Stationary, cold wheel	Inflated tyre, no movement, Temperature $\leq 50^{\circ}\text{C}$	Every 10 seconds: AT, BT, P, RH	Every 10 seconds: AT, BT, P, RH
Stationary, hot wheel	Inflated tyre, no movement, Temperature $> 50^{\circ}\text{C}$	Every 10 seconds: AT, BT, P, RH	Every 10 seconds: AT, BT, P, RH, RT, TT
Moving	Inflated tyre, movement, Temperature $> 50^{\circ}\text{C}$	Every 1 second: AT, BT, P, RH	Every 1 second: AT, BT, P, RH, RT, TT
Transient	Puncture detected	Every 0.5 second: AT, BT, P, RH	Every 0.5 second: AT, BT, P, RH, RT, TT

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below. They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15 (2024) Radio Frequency Devices

ANSI C63.10 2013
Procedures for Compliance Testing of Unlicensed Wireless Devices.

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart C – Intentional Radiators

- Paragraph 203: Antenna requirement
- Paragraph 205: Restricted bands of operation
- Paragraph 207: Conducted limits
- Paragraph 209: Radiated emission limits; general requirements
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
0	BAT-EMC V3.18.0.26	Software	/	/	/
5609	EMCO 3146A	Log periodic antenna	14/12/2021	3	14/12/2024
5625	EMCO 3104	Biconical antenna	06/02/2023	3	06/02/2026
6970	Schwarzbeck BBHA 9120D	Antenna	16/12/2021	3	16/12/2025
7651	SIDT Cage	Anechoic chamber	/	/	/
10262	Agilent Technologies 8449B	Low-noise amplifier	27/02/2024	1	27/02/2025
11316	Agilent N9010A	Receiver	05/09/2023	1	05/09/2024
15775	RFPA INT-BA011000-25	Low-noise amplifier	29/02/2024	1	29/02/2025
15776	Rohde & Schwarz FSV40	Spectrum Analyzer	22/02/2024	1	22/02/2025
15790	Testo 608-H1	Meteo station	20/11/2023	1	20/11/2024
15892	HUBER et SUHNER N 18GHz 3m	Cable	31/05/2023	2	31/05/2025
15905	HUBER et SUHNER N 18GHz 4.5m	Cable	31/05/2023	2	31/05/2025
15907	HUBER et SUHNER N 18GHz 3.5m	Cable	31/05/2023	2	31/05/2025
15934	HUBER et SUHNER N 18GHz 2.5m	Cable	31/05/2023	2	31/05/2025

6. TESTS RESULTS SUMMARY

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				Note 1
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.231 frequency bands	X				
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.231	PERIODIC OPERATION IN THE BAND 40.66-40.70 MHZ AND ABOVE 70 MHZ					
	(a) Transmission time restrictions	X				Moving mode
	(b) Field strength of emissions	X				
	(c) Bandwidth of emission	X				
	(d) Carrier frequency tolerance within the band 40.66-40.70 MHz	X				
	(e) Exceeding periodic rate limitations	X				Stationary mode

NAP: Not Applicable

NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.231 (b).

Note 3: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

7. MEASUREMENT UNCERTAINTY

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the result(s)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%.

Parameter	Emitech Uncertainty
RF power, conducted	$\pm 0.8\text{dB}$
Radiated emission valid to 26 GHz	
9kHz – 30MHz	$\pm 2.7. \text{ dB}$
30MHz – 1GHz	$\pm 5.0 \text{ dB}$
1GHz – 18GHz	$\pm 5.3 \text{ dB}$
18GHz – 40GHz	$\pm 6.1 \text{ dB}$
AC Power Lines conducted emissions	$\pm 3.4 \text{ dB}$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 5 \%$

8. OCCUPIED BANDWIDTH

Temperature (°C) : 21

Humidity (%HR): 40

Date : April 10, 2024

Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure:

Paragraph 231 (c)

Method of paragraphs 6.9.3 of ANSI C63.10 (99% Measurement)

Method of paragraphs 6.9.2 of ANSI C63.10 (20dB Measurement)

Test set up:

Radiated test

Test realized in near field.

Setting:

Measure	99%	20dB
Center frequency	The centre frequency of the channel under test	
Detector	Peak	
Span	1.5 to 5 times the OBW	2 to 5 times the OBW
RBW	1% to 5% of the OBW	1% to 5% of the OBW
VBW	3 x RBW	3 x RBW
Trace	Max hold	
Sweep	Auto	

Test operating condition of the equipment:

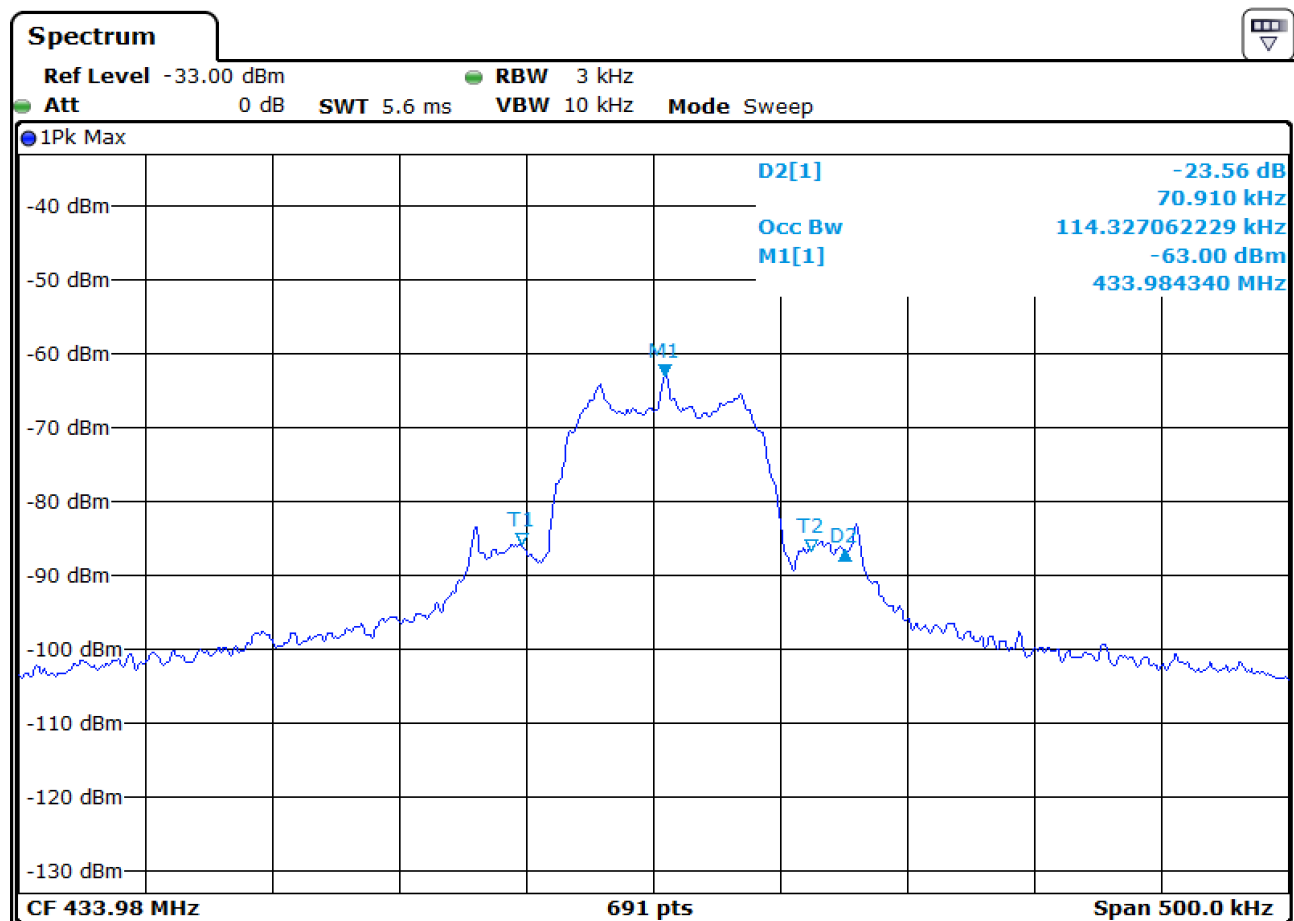
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

We used for power source the internal battery

Results:

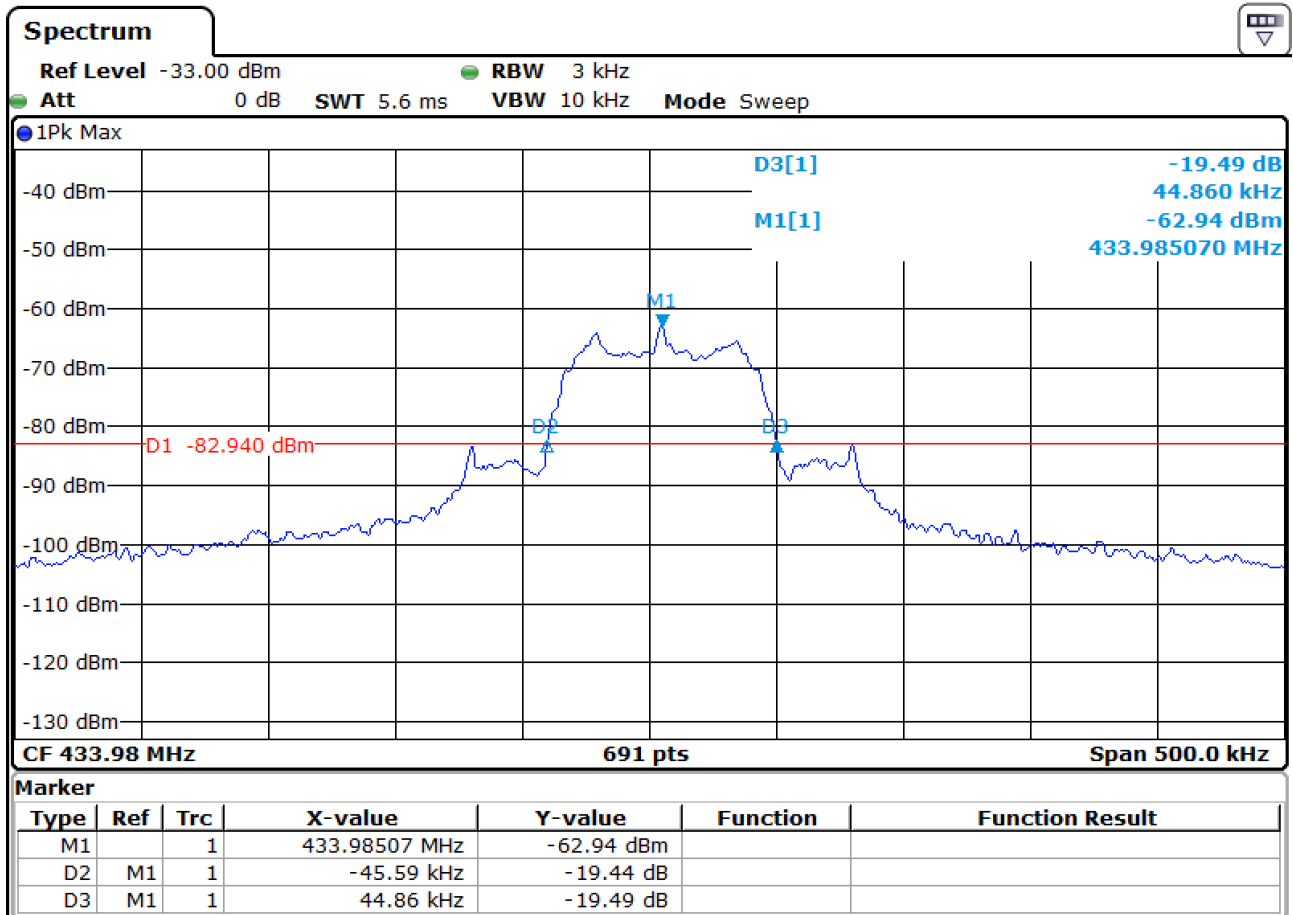
Sample N° 1

99% bandwidth



Measure realized for reporting only

20dB bandwidth



20dB bandwidth: 90.45 kHz

Limit:

0.25 % of the center frequency: 1.08495 MHz

Test conclusion:

RESPECTED STANDARD

9. PERIODIC OPERATION IN THE BAND 40.66 – 40.70 MHZ AND ABOVE 70 MHZ

Temperature (°C) : 21**Humidity (%HR):** 40**Date :** April 10, 2024**Technician :** T. LEDRESSEUR**Standard:** FCC Part 15**Test procedure:** paragraph 231 (b), (d), (e)**Test set up:**

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The measure is realized in anechoic chambre.

The system is tested in anechoic chamber, the EUT is placed on a rotating table.

Zero degree azimuths correspond to the front of the device under test.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (433.98MHz)**Detection mode:** Quasi-peak (F < 1 GHz)

Peak / Average (F > 1 GHz)

Bandwidth: 200Hz (9 kHz < F < 150kHz)
9 kHz (150 kHz < F < 30MHz)
120 kHz (30 MHz < F < 1 GHz)
1 MHz (F > 1 GHz)**Distance of antenna:** 3 m**Antenna height:** 1 to 4 meters**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

We used for power source the internal battery

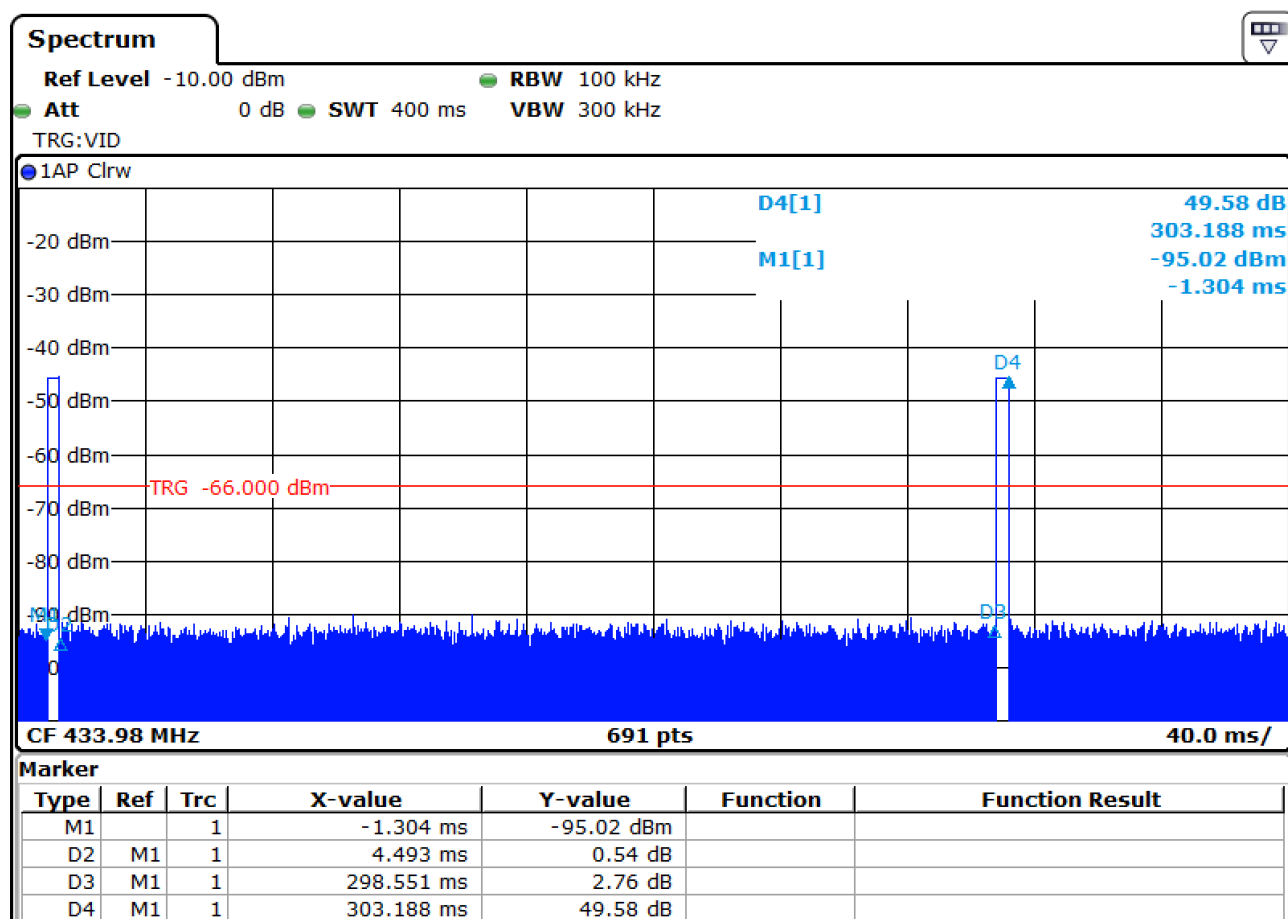
The average was realized using a correction factor for pulse operation. (according to 15.35(c))

$$Y = 20\log(x/100)$$

Y= correction factor (dB)

X: pulse duration (ms)

Worst case Ton time on 100ms, this mode is only used during test.



Results:

Sample N° 1

Field strength of fundamental

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBμV/m)	Duty cycle correction factor (dB)	Average Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
433.98	P	120	V	66.14	-	-	72.87	6.73

P= Peak, QP=Quasi-peak, Av=Average

Field strength of spurious emissions

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBμV/m)	Duty cycle correction factor (dB)	Average Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
867.91	P	100	H	44.19	-	-	52.87	8.68
1302	P	1000	H	47.88	-	-	54	6.12
1735.6	P	1000	H	38.07	-	-	54	15.93
2170	P	1000	H	43.76	-	-	54	10.24
2604.4	P	1000	H	48.69	-	-	54	5.31
3038	P	1000	H	49.07	-	-	54	4.93
3472.4	P	1000	H	50.49	-	-	54	3.51
3906	P	1000	H	53.79	-	-	54	0.21
4340.4	P	1000	H	51.39	-	-	54	2.61

P= Peak, QP=Quasi-peak, Av=Average

Applicable limits: see paragraph.231 e)

Test conclusion:

RESPECTED STANDARD

10. TRANSMISSION TIME – STATIONARY MODE

Temperature (°C) : 21

Humidity (%HR): 40

Date : April 10, 2024

Technician : T. LEDRESSEUR

Standard: FCC Part 15**Test procedure:**

Paragraph 231 (e)

Test set up:Radiated test

Test realized in near field.

The measure was realized with a spectrum analyzer. The sweep points were set to maximum for higher the time resolution. The marker was set to the edges in order to measure the duration time and then recorded.

Test operating condition of the equipment:

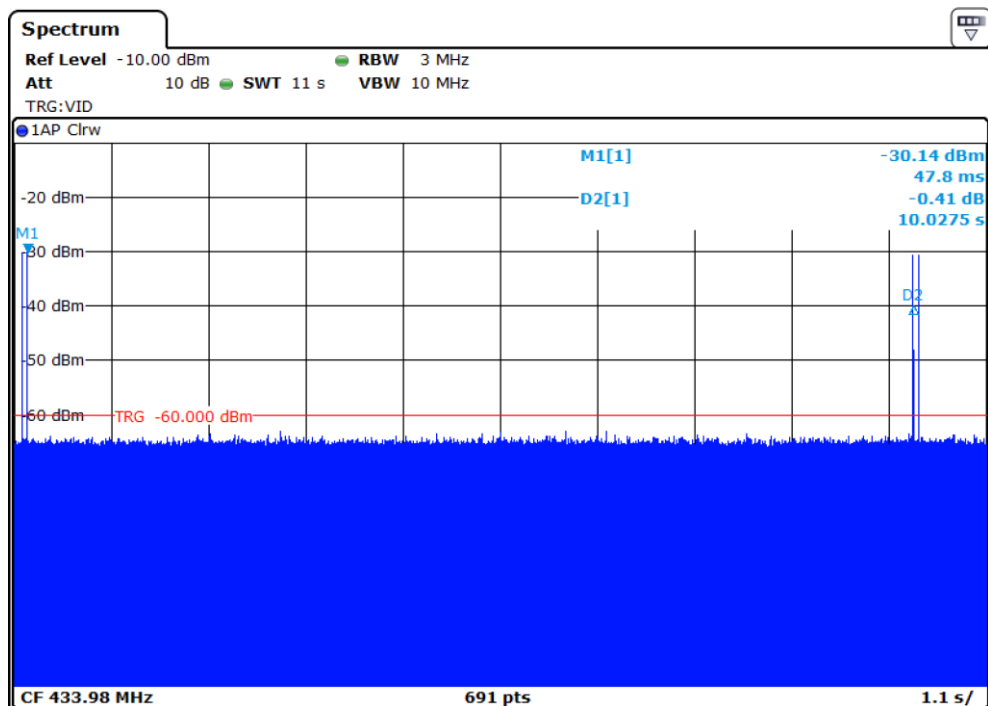
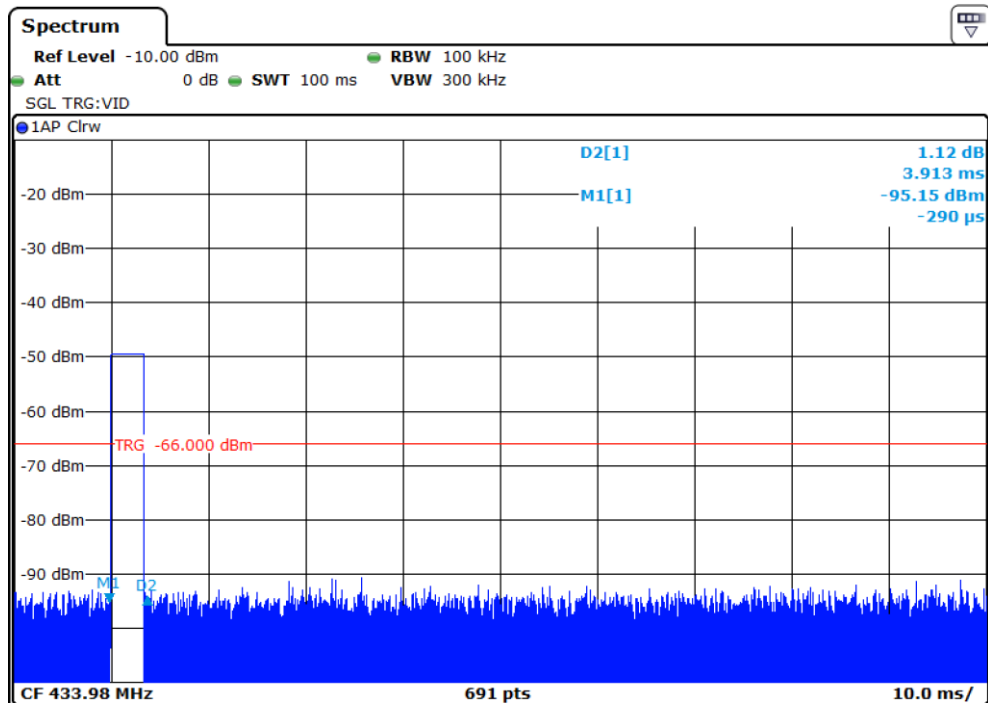
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

We used for power source the internal battery

Results:

Transmission time (ms)	Limit (s)
3.91	< 1

Silent period (s)	Limit (s)
10.0275	> 10



Test conclusion:

RESPECTED STANDARD

11. TRANSMISSION TIME – MOVING MODE

Temperature (°C) : 21

Humidity (%HR): 40

Date : April 10, 2024

Technician : T. LEDRESSEUR

Standard: FCC Part 15

Test procedure:

Paragraph 231 (a)

Test set up:Radiated test

Test realized in near field.

The measure was realized with a spectrum analyzer. The sweep points were set to maximum for higher the time resolution. The marker was set to the edges in order to measure the duration time and then recorded.

Test operating condition of the equipment:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

We used for power source the internal battery

Results:

Transmission time (ms)
3.91

Limits :

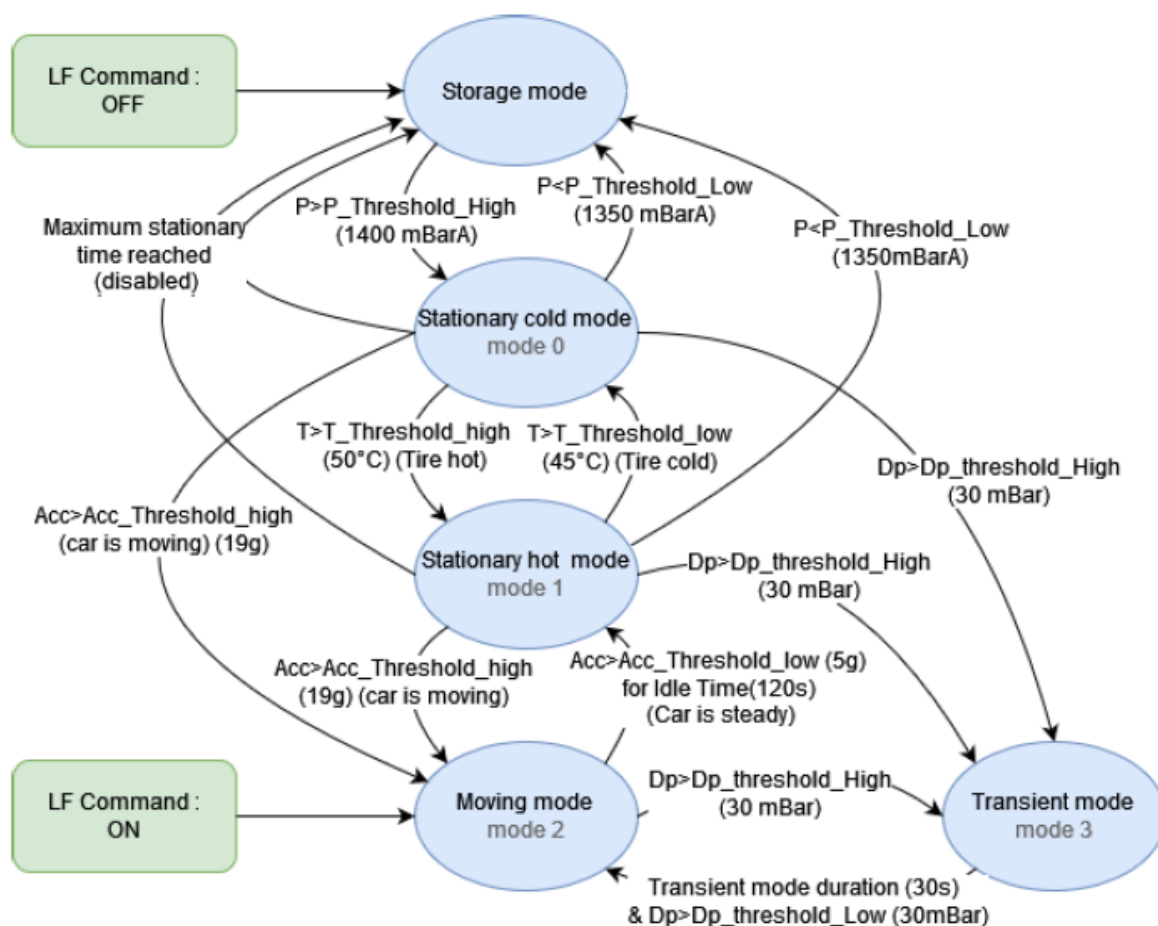
(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

Operating modes declared by the manufacturer.



Test conclusion:

RESPECTED STANDARD

□□□ End of report, (2) annexes to be forwarded □□□

APPENDIX 1: Test equipment list

Occupied bandwidth

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum Analyzer FSV40	Rohde & Schwarz	15776
Meteo station 608-H1	Testo	15790

Periodic operation in the band 40.66 – 40.70 MHz and above 70 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	Siepel	7651
Test receiver N9010A	Agilent	11316
Spectrum Analyzer FSV40	Rohde & Schwarz	15776
Biconical antenna 3104	EMCO	5625
Log periodic antenna 3146A	EMCO	5609
Antenna BBHA 9120D	Schwarzbeck	6970
Low-noise amplifier INT-BA011000-25	RFPA	15775
Low-noise amplifier 8449B	Agilent Technologies	10262
N-3M Cable	Huber + Suhner	15892
N-4.5M Cable	Huber + Suhner	15905
N-3.5M Cable	Huber + Suhner	15907
N-2.5M Cable	Huber + Suhner	15934
Meteo station 608-H1	Testo	15790
Software	BAT-EMC V3.18.0.26	0000

TRANSMISSION TIME – STATIONARY MODE

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum Analyzer FSV40	Rohde & Schwarz	15776
Meteo station 608-H1	Testo	15790

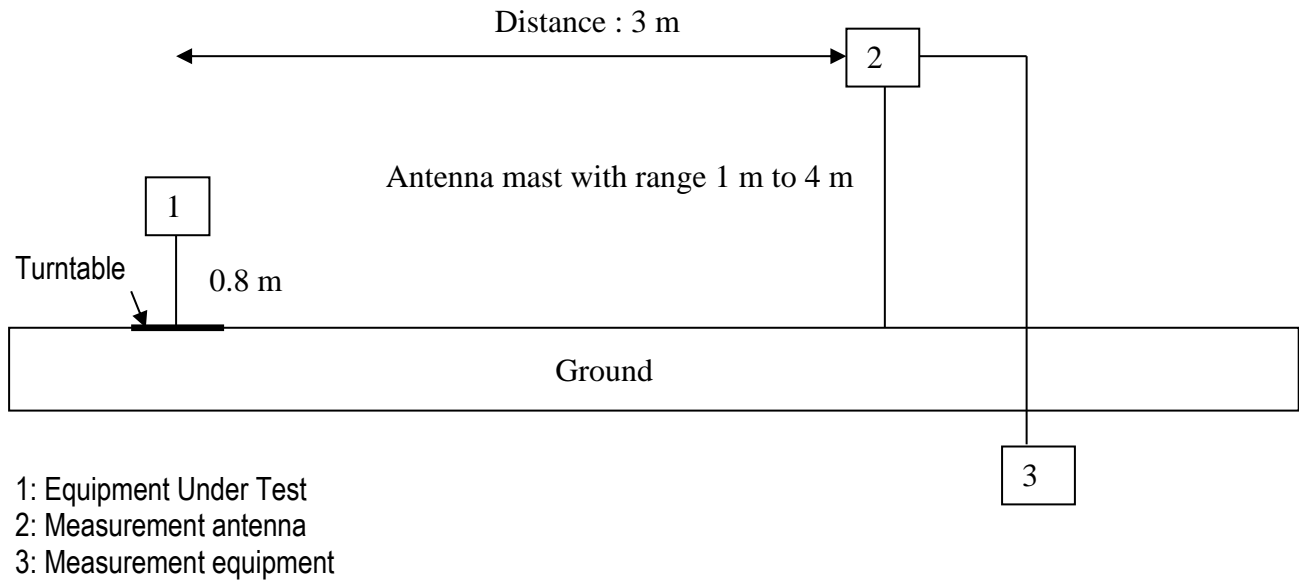
TRANSMISSION TIME – MOVING MODE

TYPE	MANUFACTURER	EMITECH NUMBER
Spectrum Analyzer FSV40	Rohde & Schwarz	15776
Meteo station 608-H1	Testo	15790

APPENDIX 2: Radiated Test Setup

Anechoic chamber setup

Between 30 MHz and 1 GHz



Above 1 GHz

