RRA-EMIESS23G756WAT-01Av0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

RSS GEN – Issue 5
RSS 247 – Issue 3

Equipment under test:

Toran'O

FCC ID: *2AGTV-50-70-244*
IC NUMBER: *32028-5070244*

Company:

WATTECO

Distribution: Mr LEFORT **(Company:** WATTECO**)**

Number of pages: 77 with 2 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	13-Jan-25	Creation	S. LOUIS, Radio Technician	p/o

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S51 RTY 000 INT 00015 [04]

DESIGNATION OF PRODUCT:	***Toran'O***
Serial number (S/N):	*Adresse MAC (DevEUI) = 70B3D5E75E017187*
MPN:	*50-70-252-000*
Model:	*Toran'O Product Line*
Software version:	*v3.5.2.6404*
MANUFACTURER:	*WATTECO*

COMPANY SUBMITTING THE PRODUCT:

Company:	WATTECO
Address:	POLE DE TECHNELLYS BATIMENT H – BOITE AUX LETTRE N°60 165 RUE DE LA MONTAGNE DY SALUT 56600 - LANESTER FRANCE
Responsible:	Mr LEFORT
Person(s) present during the tests:	/
DATES OF TEST:	From 2-Sep-24 to 6-Sep-24
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE FCC Accredited under US-EU MRA Designation Number: FR0009 Test Firm Registration Number: 873677 ISED Accredited under CANADA-EU MRA Designation Number: FR0001 Industry Canada Registration Number: 4452A
TESTED BY:	B. VOVARD
WRITTEN BY:	B. VOVARD

VISA:

CONTENTS

REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	**5-Sep-24**	/	Creation

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: ***Toran'O***, in accordance with normative reference.

The device under test integrates a LoRa not certified function.

This radio report concerns only the test realized on FHSS band (125 kHz Bandwidth).

2. PRODUCT DESCRIPTION

Category of equipment (ISED): I

Class: B

Utilization: Residential

Antenna type and gain: Integral antenna (Maximum Gain : 5.92 dBi)

Operating frequency range: From 902 MHz to 928 MHz

Frequency tested: 902.3 MHz, 908.7 MHz, 914.9 MHz for transmission

Frequencies plan detailed transmitter:

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
902,3+i*0,2MHz (i=0 à 63)	125	64	200

Number of channels: 64

Channel spacing: 200 kHz

Modulation: LoRa with spread factor 7 to 10

Power source: 3.6 Vdc LS17500 battery 3.6 Ah

During test the output power was adjusted at the maximal level with the following setting (13 dB).

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.

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 ComplianceTesting of Unlicensed Wireless Devices.
558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules.
RSP-100	Issue 12, August 2019 Certification of Radio Apparatus and Broadcasting equipment
RSS-Gen	Issue 5, April 2018 General Requirements for Compliance of Radio Apparatus
RSS-247	Issue 3, August 2023 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) 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 209: Radiated emission limits; general requirements
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

Radio performance tests procedures given in RSS-Gen:

- Paragraph 2 - General
- Paragraph 3 - Normative publications and related documents
- Paragraph 4 - Labelling requirements
- Paragraph 6 - General administrative and technical requirements
- Paragraph 8 - Licence-exempt Radio Apparatus

Radio performance tests procedures given in RSS-247:

- Paragraph 3 - Certification requirements
- Paragraph 4 - Measurement method
- Paragraph 5 - Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 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	/	/	/
1406	EMCO 6502	Loop antenna	04/04/2024	1	04/04/2025
4393	Wainwright WLJS800-C11/60EE	Low Pass Filter	06/02/2023	3	05/02/2026
7171	R&S HL223	Antenna	19/05/2022	3	18/05/2025
7190	R&S HL223	Antenna	17/03/2022	3	16/03/2025
7240	Emco 3110	Biconical antenna	17/03/2022	3	16/03/2025
7279	SUCOFLEX SF104 N 1.5m	Cable	31/05/2024	2	31/05/2026
7302	HP1200MHz	High-pass filter	16/08/2022	3	15/08/2025
7566	Testo 608-H1	Meteo station	12/12/2022	2	11/12/2024
8262	Filtek HP12/3200-5AA	High pass filter	16/08/2022	3	15/08/2025
8528	Schwarzbeck VHA 9103	Biconical antenna	19/05/2022	3	18/05/2025
8549	Midwest Microwave 20dB	Attenuator	07/03/2022	3	06/03/2025
8732	Emitech	OATS	28/03/2022	3	27/03/2025
8785	N-1.5m Emitech	Cable	10/07/2024	2	10/07/2026
8813	Emitech	N Cable	04/06/2024	2	04/06/2026
8855	EMITECH	Turntable and mat controller	/	/	/
8864	Champ libre Juigné. V3.5	Software	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
8972	K&L Microwave 500-1000MHz	Notch filter	/	/	/
9399	N-1m	Cable	29/01/2024	2	28/01/2026
10759	COMTEST Cage 3	Anechoic chamber	/	/	/
10771	EMCO 3117	Antenna	30/11/2022	3	30/11/2025
10789	MATURO	Turntable and mat controller NCD	/	/	/
12590	LUCIX Corp S005180M3201	Low-noise amplifier	29/05/2024	1	29/05/2025
14303	SUCOFLEX N-2m	cable	01/12/2022	2	30/11/2024
14903	Fluke 177	Multimeter	22/12/2023	2	21/12/2025
15666	R&S FSV40	Spectrum Analyzer	27/09/2022	2	26/09/2024
17008	R&S ESW44	Test receiver	03/05/2024	1	03/05/2025

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
19246	HYTEM - N - 5m	Cable	22/01/2024	2	21/01/2026
19249	HYTEM - N - 2.5m	Cable	22/01/2024	2	21/01/2026
19274	ASC - ASC805C	Low-noise amplifier	12/01/2024	1	11/01/2025
//	RS Commander V2.4.2	Software	/	/	/

6. TESTS RESULTS SUMMARY

6.1 CFR 47 part 15 requirements

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		Supplied by battery
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
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 §15.247 frequency bands	X				Note 3
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems	X				Note 5
	(a) (2) Digital modulation techniques			X		
	(b) Maximum peak output power	X				Note 4
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density			X		
	(f) Hybrid system			X		Note 6
	(g) Frequency hopping requirements	X				LoRa protocol
	(h) Frequency hopping intelligence	X				LoRa protocol
	(i) RF exposure compliance	X				

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.247 (d).

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

Note 4: Conducted measurement is not possible (integral antenna), so we used the radiated method in open field.

Note 5: The transceiver used LoRa protocol.

With Spread Factor 7:

The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of the 20 dB bandwidth of the hopping channel (144.306 kHz).

The frequency hopping system uses 64 channels.
The maximum timing by channel is 100.275 ms.

During 20 s, any channel is used 3 times (see appendix 5), then 3 x 100.275 ms = 300.825 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 20 seconds, in normal operating mode.

Number of channels	Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (ms)	Limits (ms)
64	20	100.275	3	300.825	400

With Spread Factor 10:

The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of the 20 dB bandwidth of the hopping channel (138.746 kHz).

The frequency hopping system uses 64 channels.

The maximum timing by channel is 98.235 ms

During 20 s, any channel is used 3 times (see appendix 5), then 3 x 98.235 ms = 294.705 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 10 / 20 / 30 / 0.4 seconds multiplied by the number of hopping channels employed, in normal operating mode.

Number of channels	Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (ms)	Limits (ms)
64	20	98.235	3	294.705	400

Note 6: Not applicable because the EUT use only the FHSS protocol.

6.2 RSS-Gen requirements

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
Paragraph 8	Licence-exempt radio apparatus					
§ 8.1	Measurement Bandwidths and Detector Functions	X				
§ 8.2	Pulsed operation	X				
§ 8.3	Prohibition of amplifiers	X				
§ 8.4	User manual notice	X				See certification documents
§ 8.5	Measurement of licence-exempt devices on-site (in-situ)			X		
§ 8.6	Operating frequency range of devices in master/slave networks	X				
§ 8.7	Radio frequency identification (RFID) devices			X		
§ 8.8	AC power line conducted emissions limits			X		Suplied by battery
§ 8.9	Transmitter emission limits	X				
§ 8.10	Restricted frequency bands	X				
§ 8.11	Frequency stability			X		

NAp: Not Applicable NAs: Not Asked

6.3 RSS-247 requirements

Test Procedure RSS-247	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
Paragraph 5	Standard specifications for frequency hopping system and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz					
5.1	Frequency hopping systems (FHSS)	X				Note 1
5.2	Digital transmission systems			X		
5.3	Hybrid systems			X		Note 2
5.4	Transmitter output power and equivalent isotropically radiated power (e.i.r.p.) requirements	X				
5.5	Unwanted emissions	X				

NAp: Not Applicable NAs: Not Asked

Note 1: The transceiver used LoRa protocol.

With Spread Factor 7:

The channel bandwidth is the 20 dB emission bandwidth measured with the hopping stopped. We used the special function "occupied power bandwidth" from the spectrum analyzer which used the same methodology as described in the standard.
Channel 902.3 MHz = 147.145 kHz
Channel 908.7 MHz = 144.306 kHz
Channel 914.9 MHz = 147.185 kHz

The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of the 20 dB bandwidth of the hopping channel (144.306 kHz).

The frequency hopping system uses 64 channels.
The maxiimum timing by channel is 100.275 ms.

During 20 s, any channel is used 3 times, then 3 x 100.275 ms = 300.825 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 20 seconds, in normal operating mode.

Number of channels	Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (ms)	Limits (ms)
64	20	100.275	3	300.825	400

With Spread Factor 10:

The channel bandwidth is the 20 dB emission bandwidth measured with the hopping stopped. We used the special function "occupied power bandwidth" from the spectrum analyzer which used the same methodology as described in the standard.
Channel 902.3 MHz = 138.746 kHz
Channel 908.7 MHz = 141.506 kHz
Channel 914.9 MHz = 143.026 kHz

The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of the 20 dB bandwidth of the hopping channel (138.746 kHz).

The frequency hopping system uses 64 channels.
The maximum timing by channel is 98.235 ms

During 20 s, any channel is used 3 times, then 3 x 98.235 ms = 294.705 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 20 seconds, in normal operating mode.

Number of channels	Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (ms)	Limits (ms)
64	20	98.235	3	294.705	400

Note 2: Not applicable because the EUT use only the FHSS protocol.

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	± 0.8dB
Radiated emission valid to 26 GHz 9kHz – 30MHz 30MHz – 1GHz 1GHz – 18GHz 18GHz – 40GHz	 ± 4.3 dB ± 5.9 dB ± 4.8 dB ± 5.9 dB
AC Power Lines conducted emissions	± 3.7 dB
Temperature	± 0.95 °C
Humidity	± 4.6 %

8. CARRIER FREQUENCY SEPARATION

Temperature (°C) : 25 **Humidity (%HR):** 44 **Date :** September 4, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:

Method of paragraphs 7.8.2 of ANSI C63.10

Test set up:

Radiated test

Test realized in near field.

Setting:

Center frequency	Centre of two adjacent channels
Detector	Peak
Span	Wide enough to capture the peaks of two adjacent channels
RBW	Approximately 30% of the channel spacing
VBW	≥ 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.

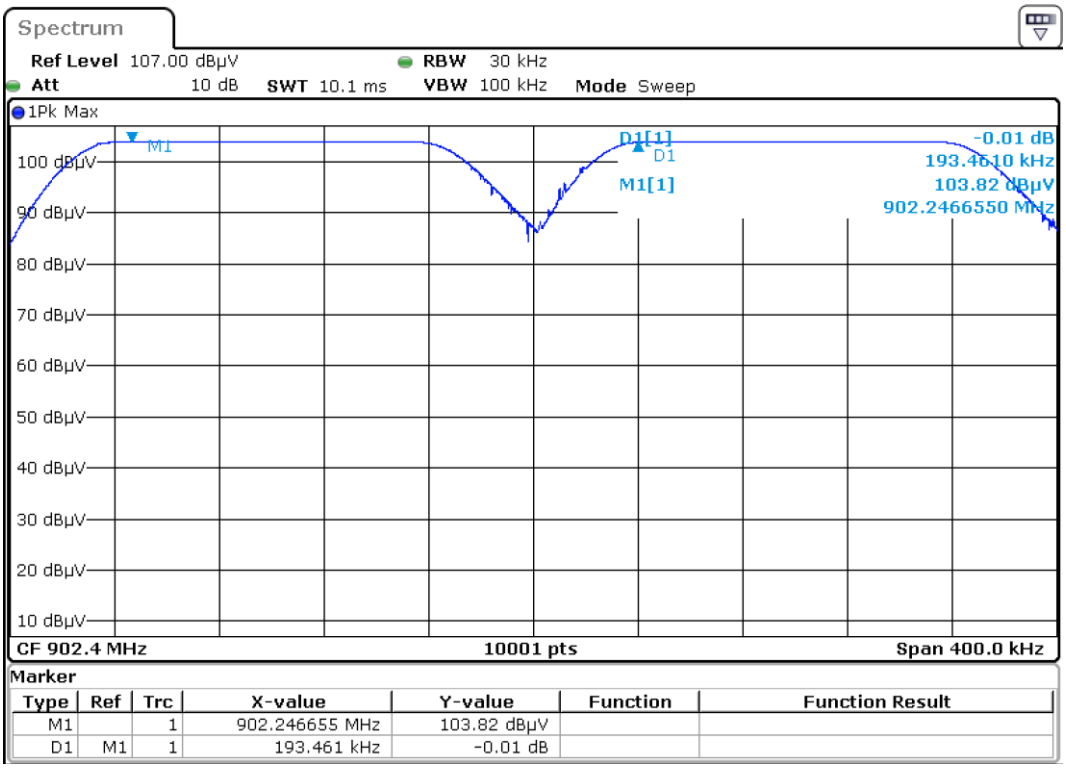
We used for power source the internal battery and we noted:
Voltage at the beginning of test (Vdc): 3.62
Voltage at the end of test (Vdc): 3.61
Percentage of voltage drop during the test (%): 0.27

Results:

Sample N° 1

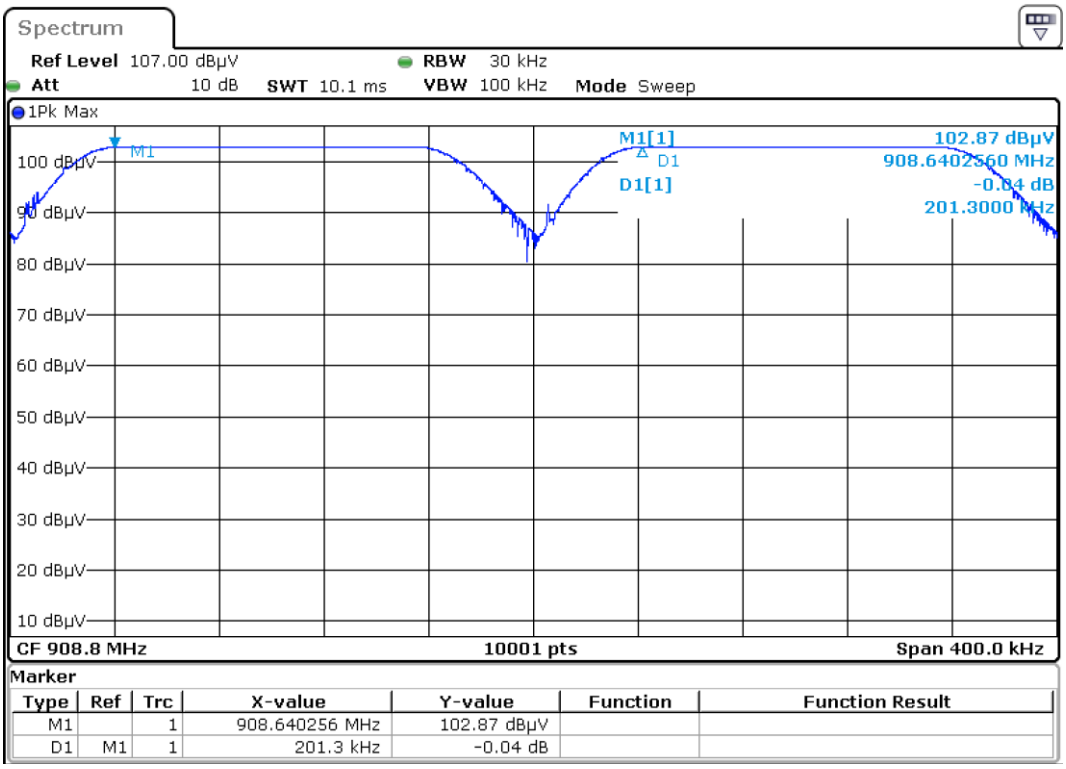
Spread Factor 7

Channel 902.3 MHz and Channel 902.5 MHz



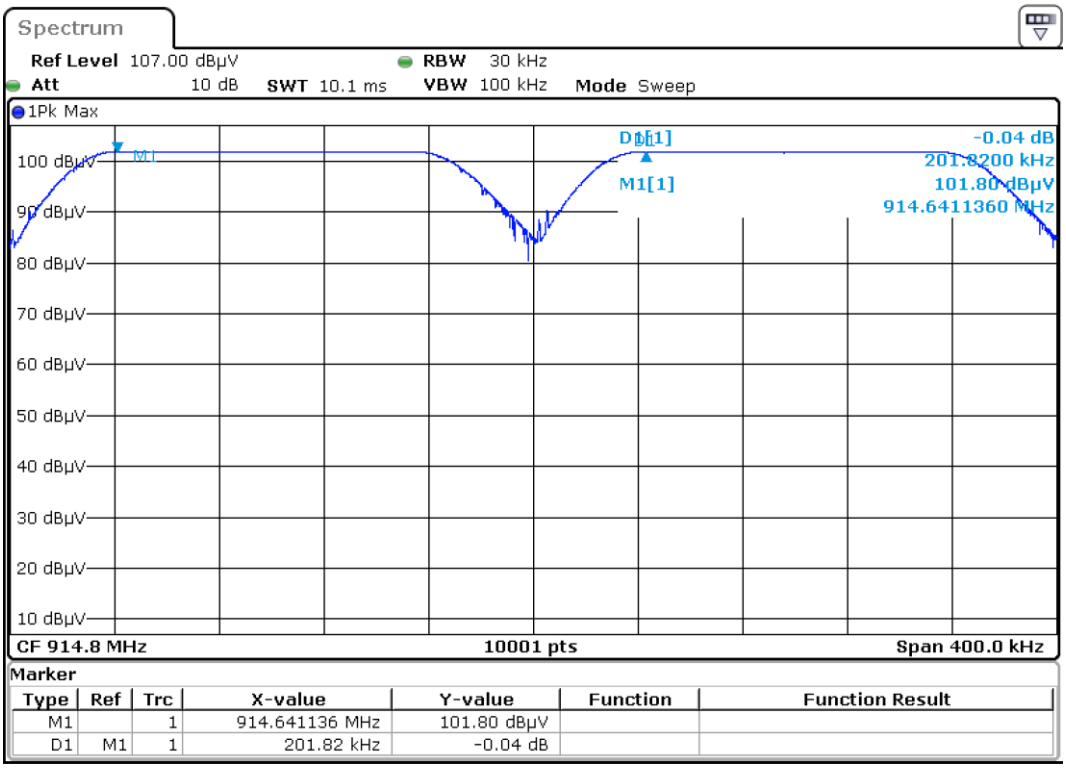
Result : 193.461 kHz

Channel 908.7 MHz and Channel 908.9 MHz



Result : 201.3 kHz

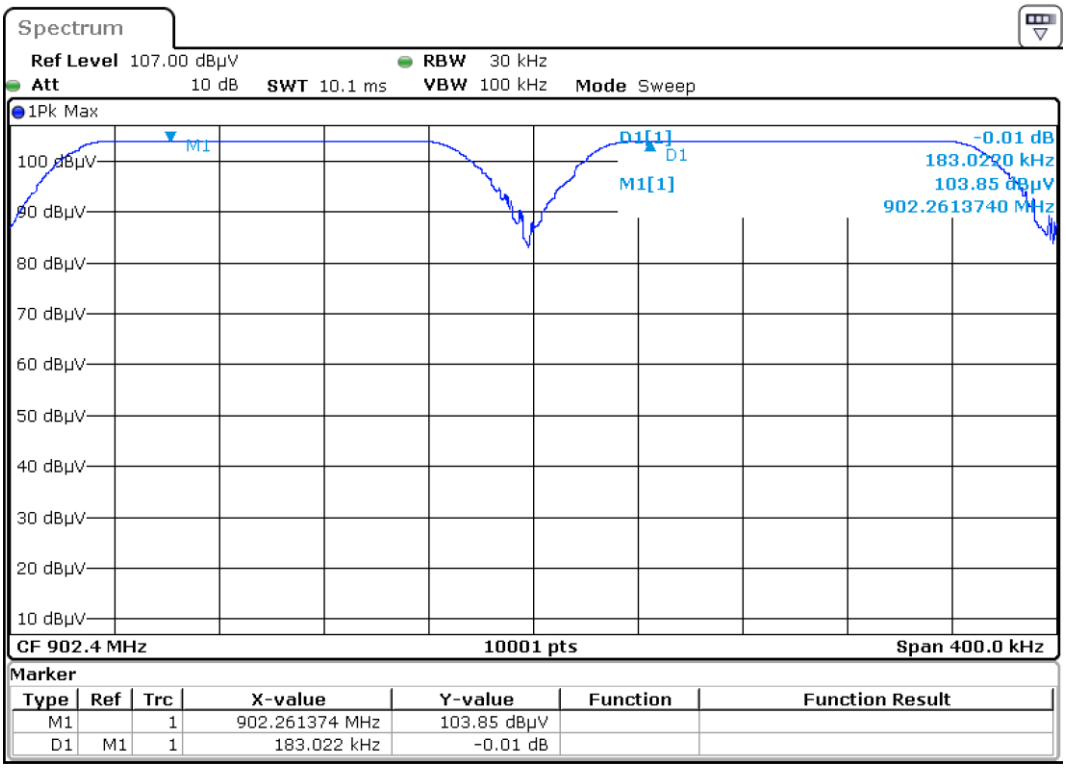
Channel 914.7 MHz and Channel 914.9 MHz



Result : 201.82 kHz

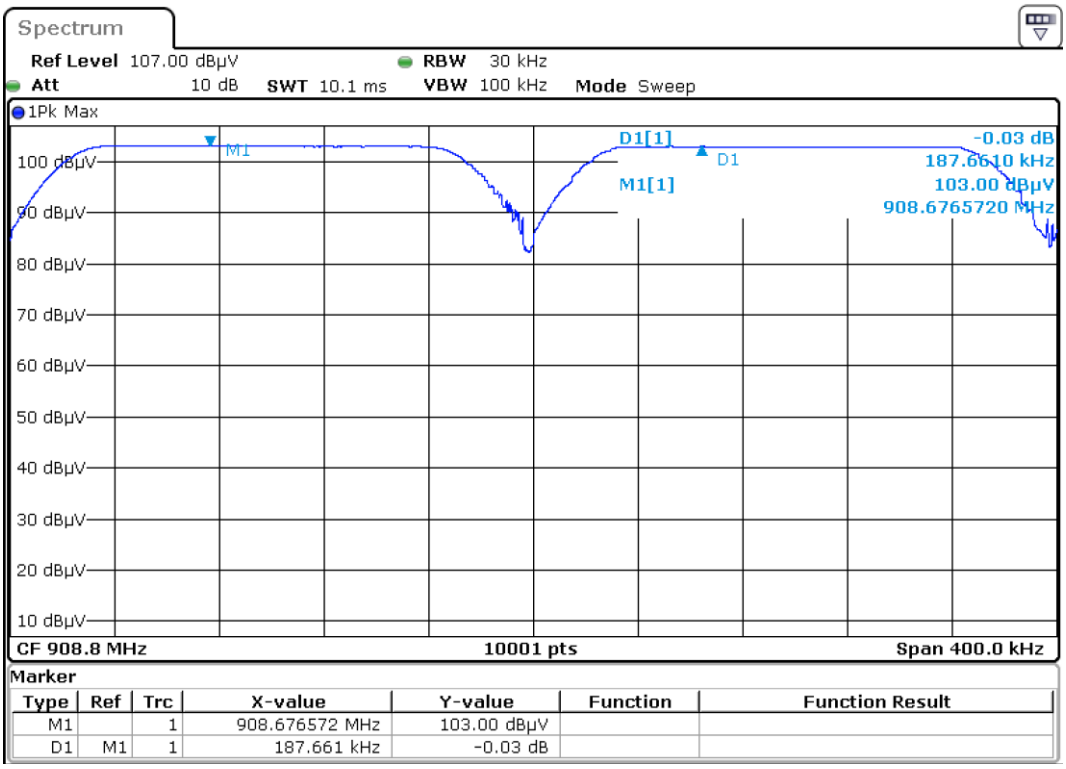
Spread Factor 10

Channel 902.3 MHz and Channel 902.5 MHz



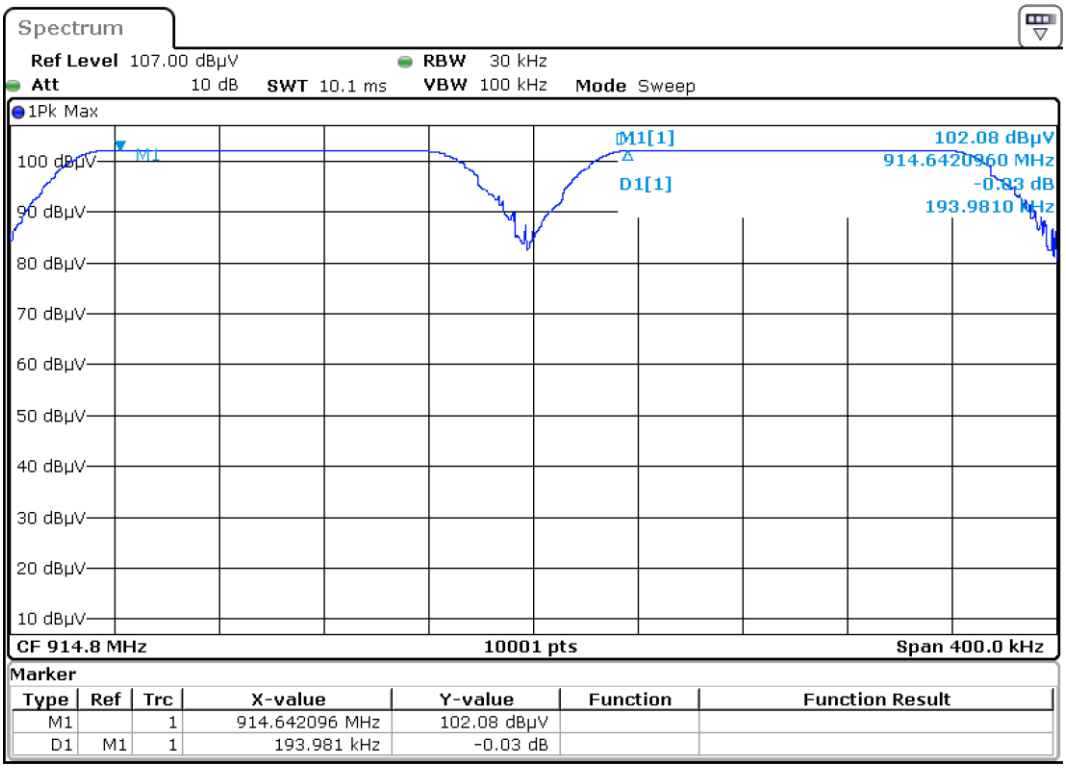
Result : 183.022 kHz

Channel 908.7 MHz and Channel 908.9 MHz



Result : 187.661 kHz

Channel 914.7 MHz and Channel 914.9 MHz



Result : 193.981 kHz

Limit:

The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater.

Test conclusion:

RESPECTED STANDARD

9. NUMBER OF HOPPING FREQUENCIES

Temperature (°C) : 25 **Humidity (%HR):** 44 **Date :** September 4, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:

Method of paragraphs 7.8.3 of ANSI C63.10

Test set up:

Radiated test

Test realized in near field.

Setting:

Detector	Peak
Span	The frequency band of operation
RBW	Less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller
VBW	≥ RBW
Trace	Max hold
Sweep	Auto.

Test operating condition of the equipment:

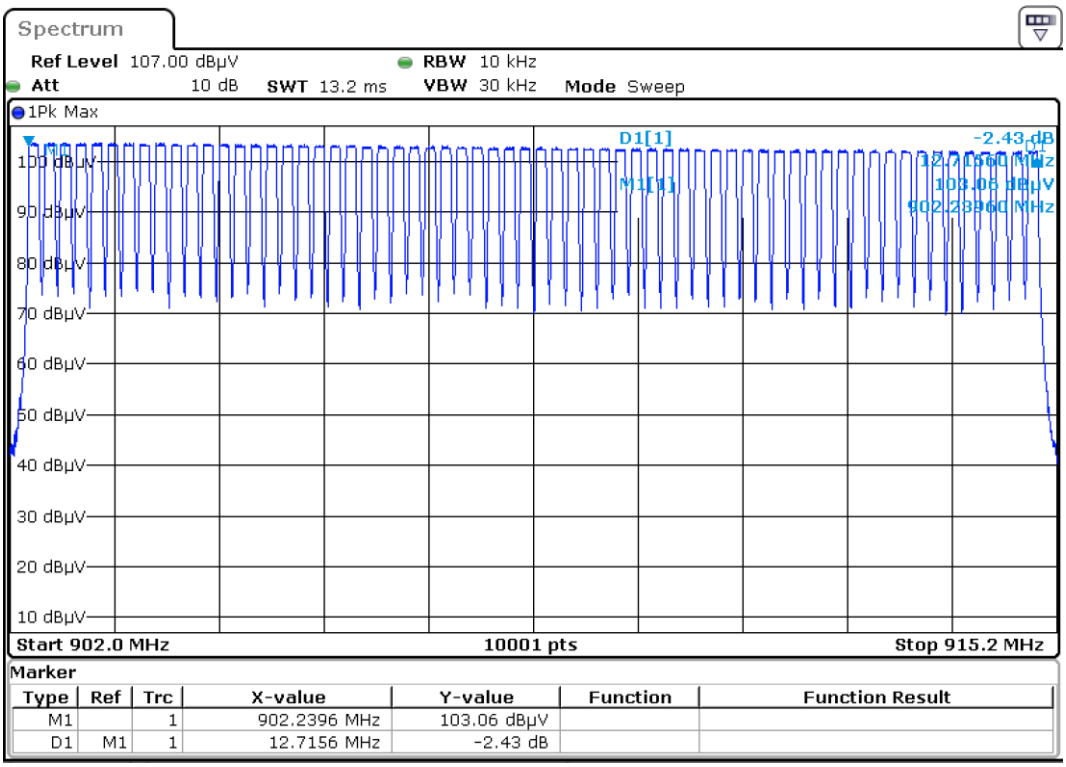
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

We used for power source the internal battery and we noted:
Voltage at the beginning of test (Vdc): 3.62
Voltage at the end of test (Vdc): 3.61
Percentage of voltage drop during the test (%): 0.27

Results:

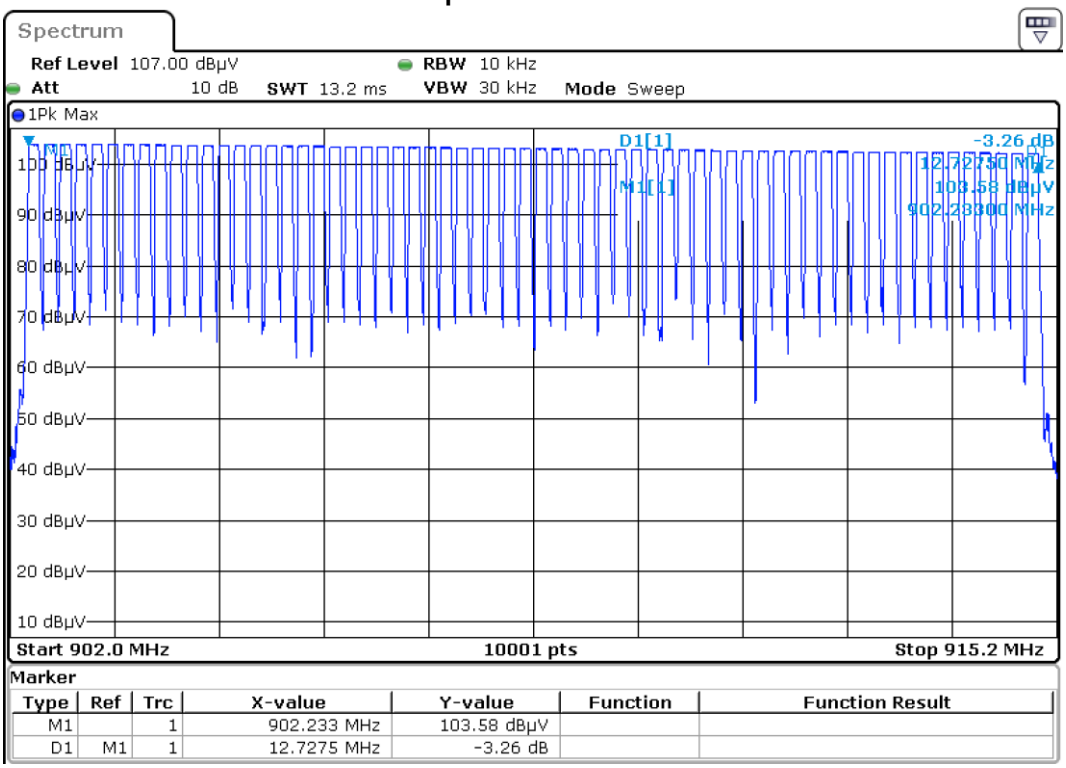
Sample N° 1

Spread Factor 7



Number of channel used: 64

Spread Factor 10



Number of channel used: 64

Limit:

≥ 50 hopping frequencies

Test conclusion:

RESPECTED STANDARD

10. DWELL TIME

Temperature (°C) : 25 **Humidity (%HR):** 44 **Date :** September 4, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:

Method of paragraphs 7.8.4 of ANSI C63.10

Test set up:

Radiated test

Test realized in near field.

Setting:

Center frequency	Hopping channel
Detector	Peak
Span	Zero
RBW	≤ channel spacing
VBW	≥ RBW
Trace	Max hold
Sweep	First : As necessary to capture the entire dwell time per hopping channel Second: sweep time to determine the number of hops over the period specified in the requirements

Test operating condition of the equipment:

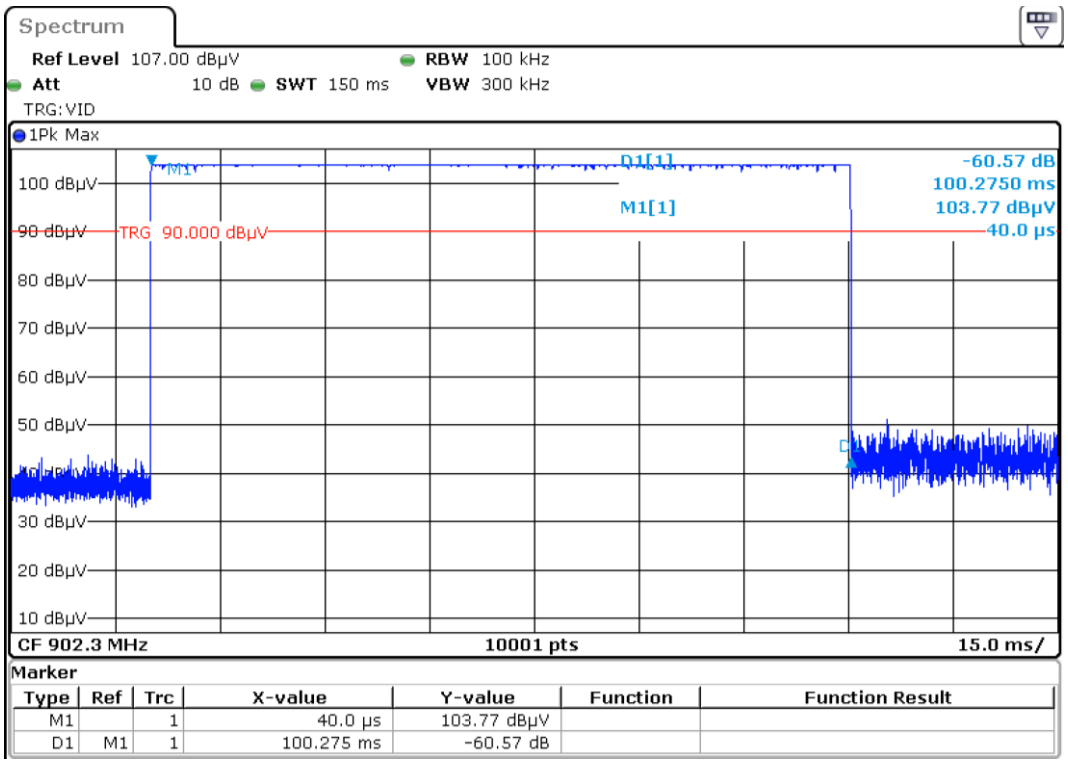
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

We used for power source the internal battery and we noted:
Voltage at the beginning of test (Vdc): 3.62
Voltage at the end of test (Vdc): 3.61
Percentage of voltage drop during the test (%): 0.27

Results:

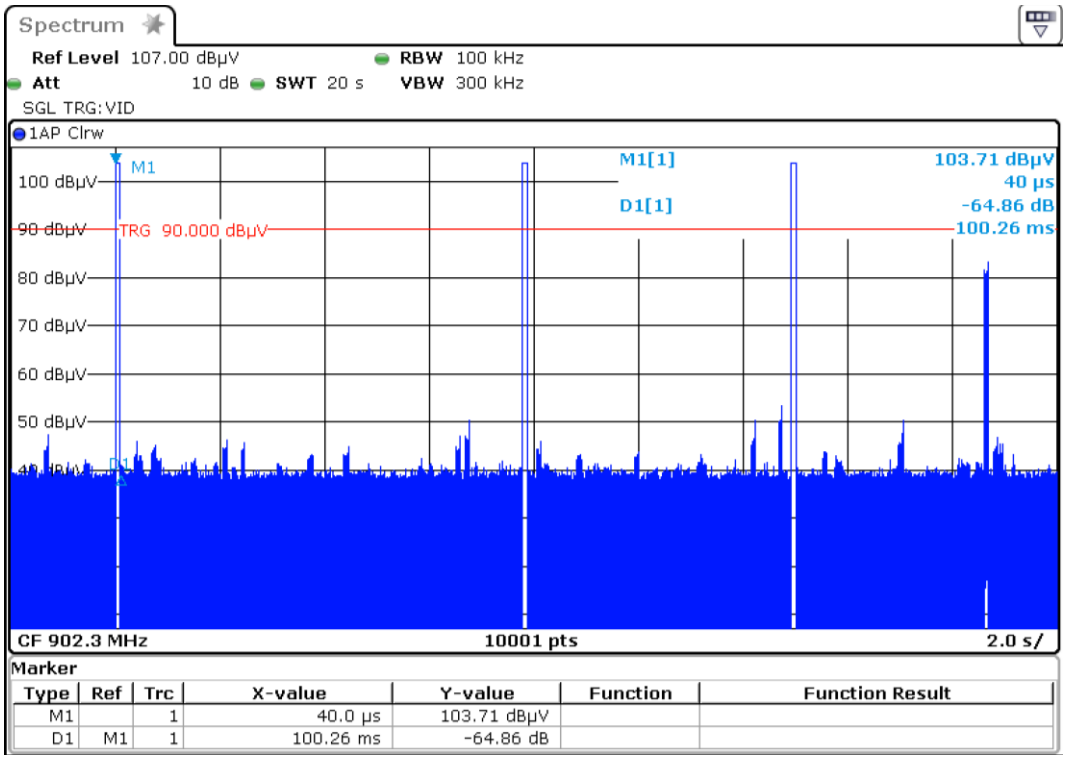
Sample N° 1

Burst duration - Channel 902.3 MHz – Spread Factor 7



Result : 100.275 ms

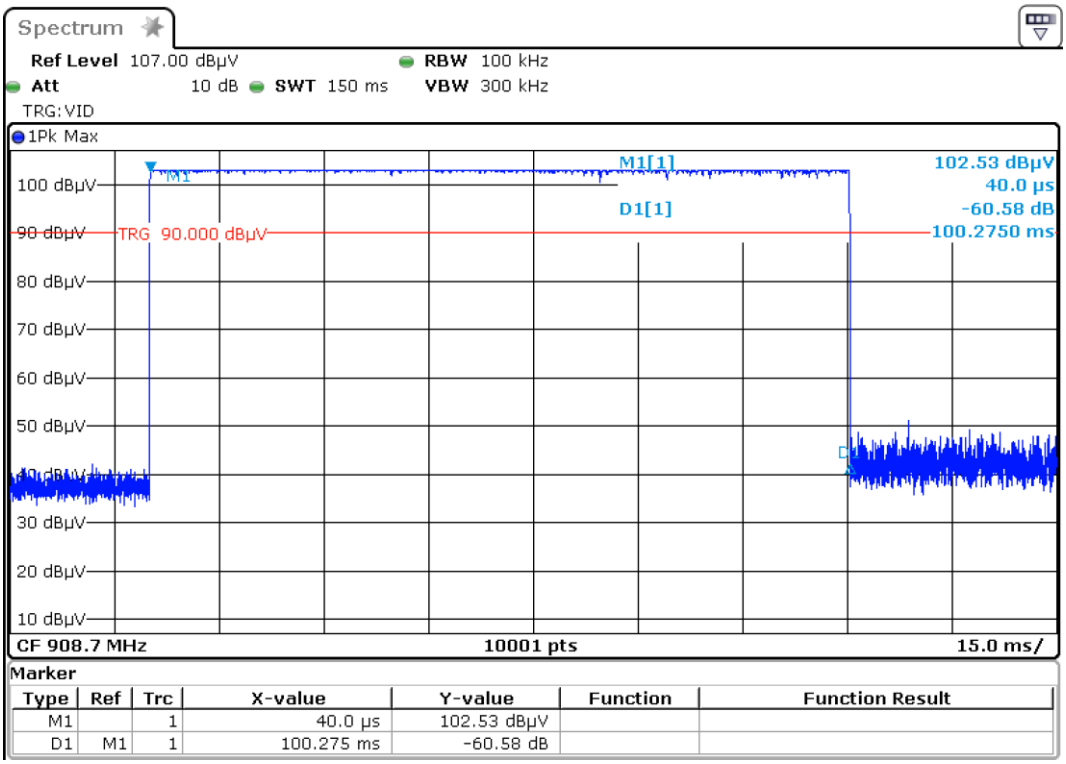
Burst repetition during observation period duration - Channel 902.3 MHz – Spread Factor 7



Result : 3 repetitions

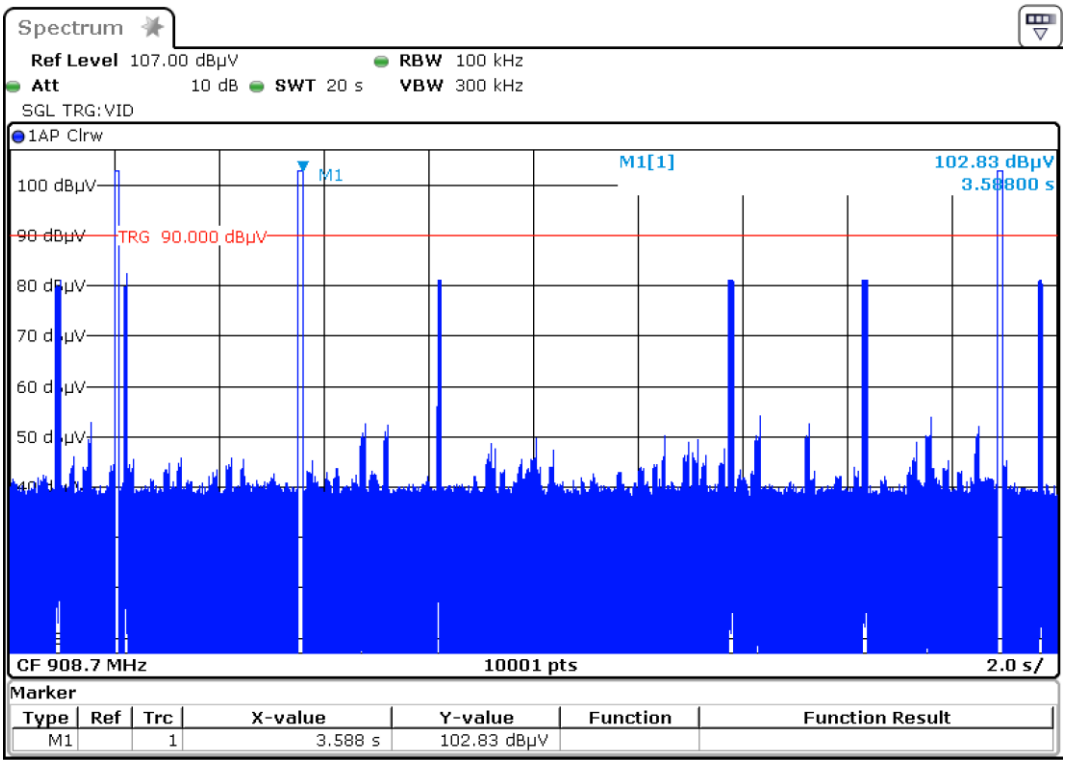
Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	Average time of occupancy on any channel (ms)	Limits (ms)
20	100.275	3	300.825	400

Burst duration - Channel 908.7 MHz – Spread Factor 7



Result : 100.275 ms

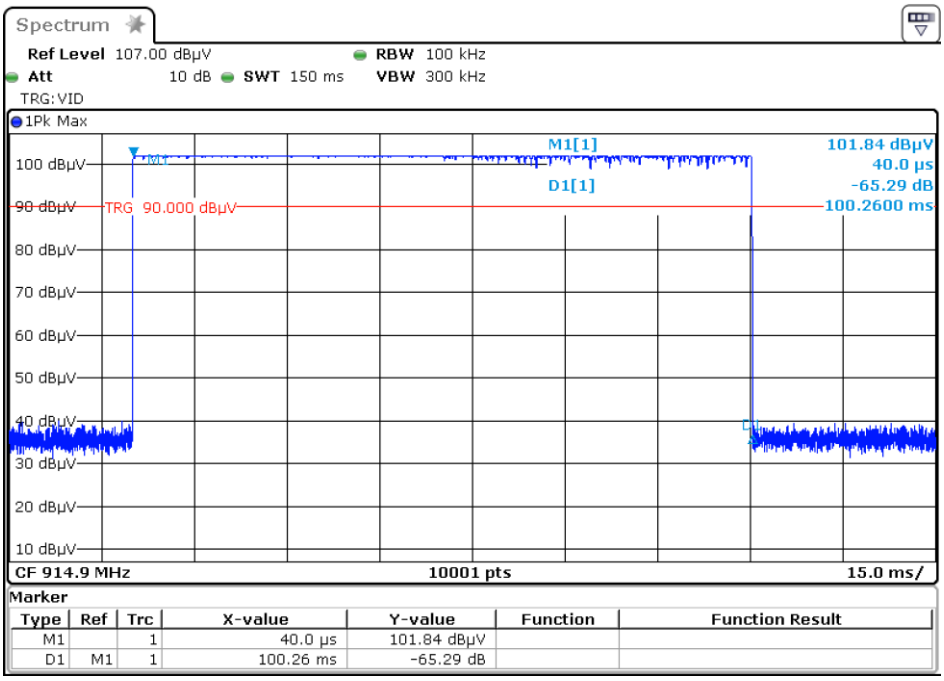
Burst repetition during observation period duration - Channel 908.7 MHz – Spread Factor 7



Result : 3 repetitions

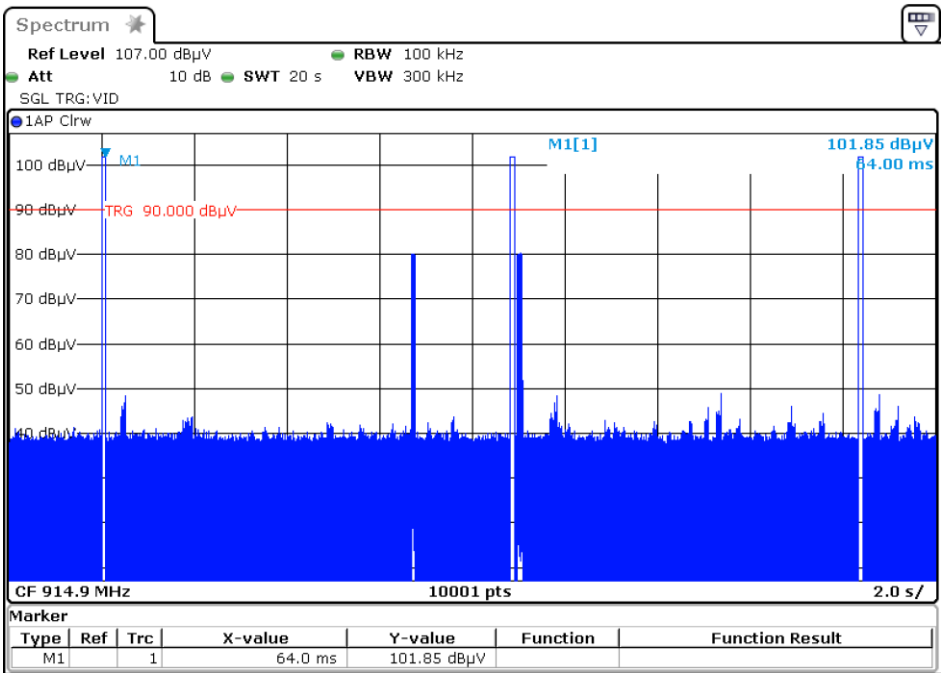
Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	Average time of occupancy on any channel (ms)	Limits (ms)
20	100.275	3	300.825	400

Burst duration - Channel 914.9 MHz – Spread Factor 7



Result : 100.26 ms

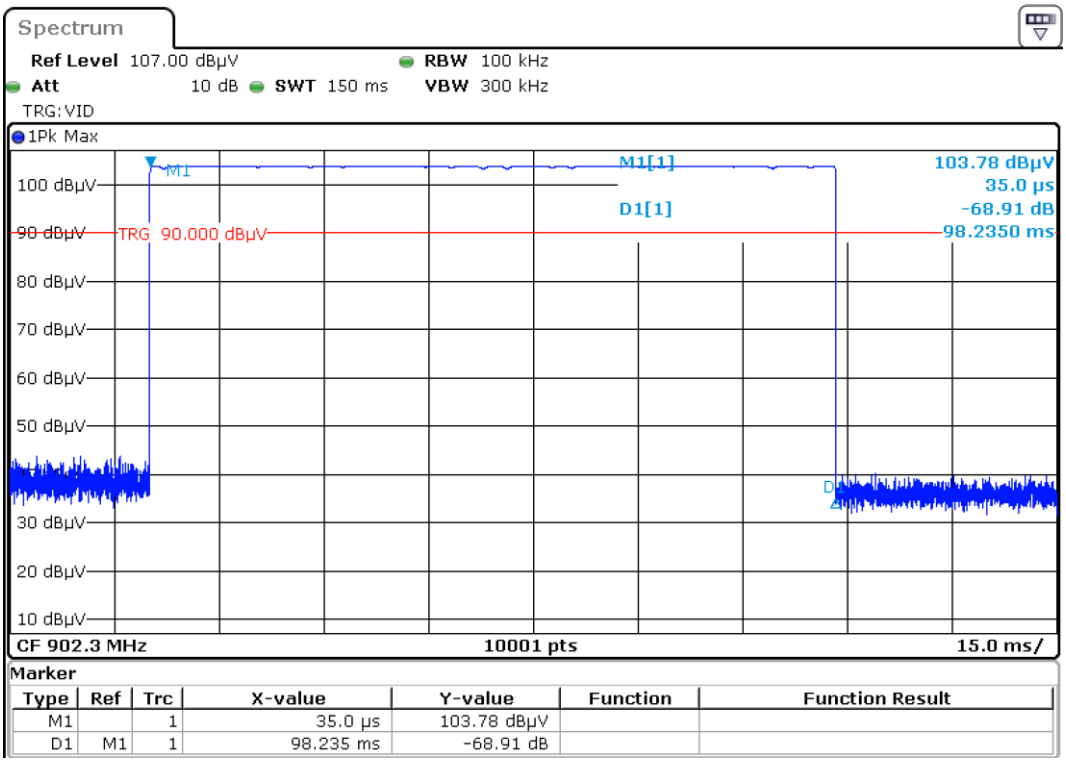
Burst repetition during observation period duration - Channel 914.9 MHz – Spread Factor 7



Result : 3 repetitions

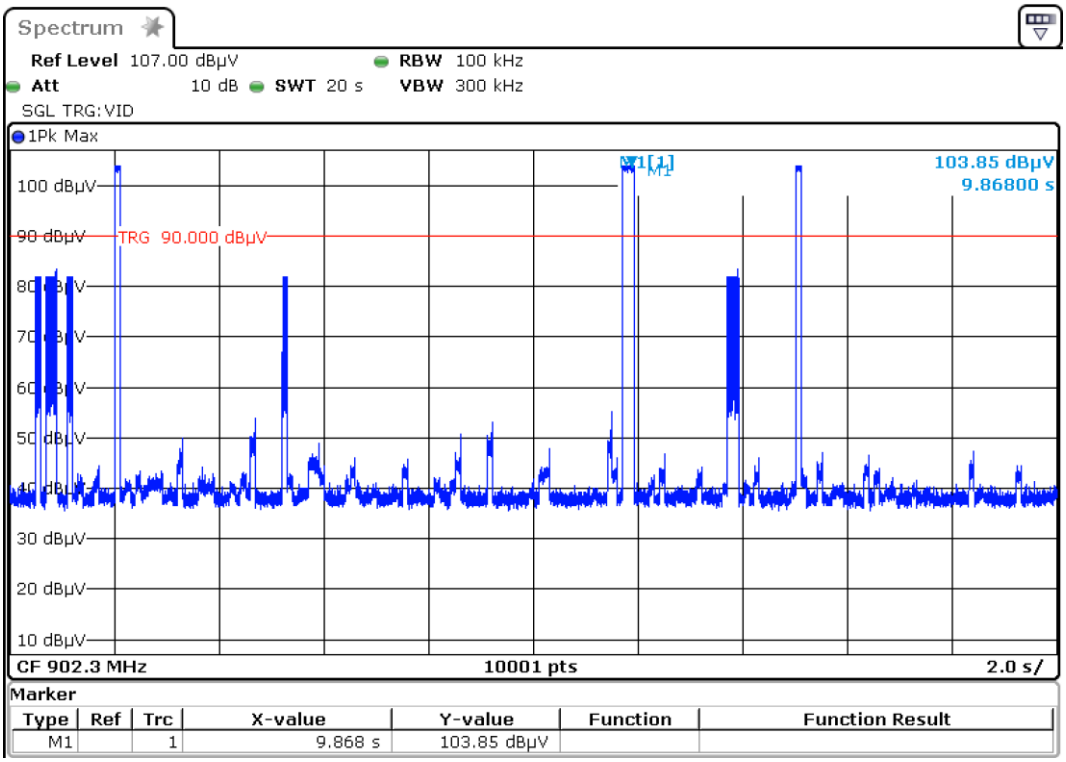
Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	Average time of occupancy on any channel (ms)	Limits (ms)
20	100.26	3	300.78	400

Burst duration - Channel 902.3 MHz – Spread Factor 10



Result : 98.235 ms

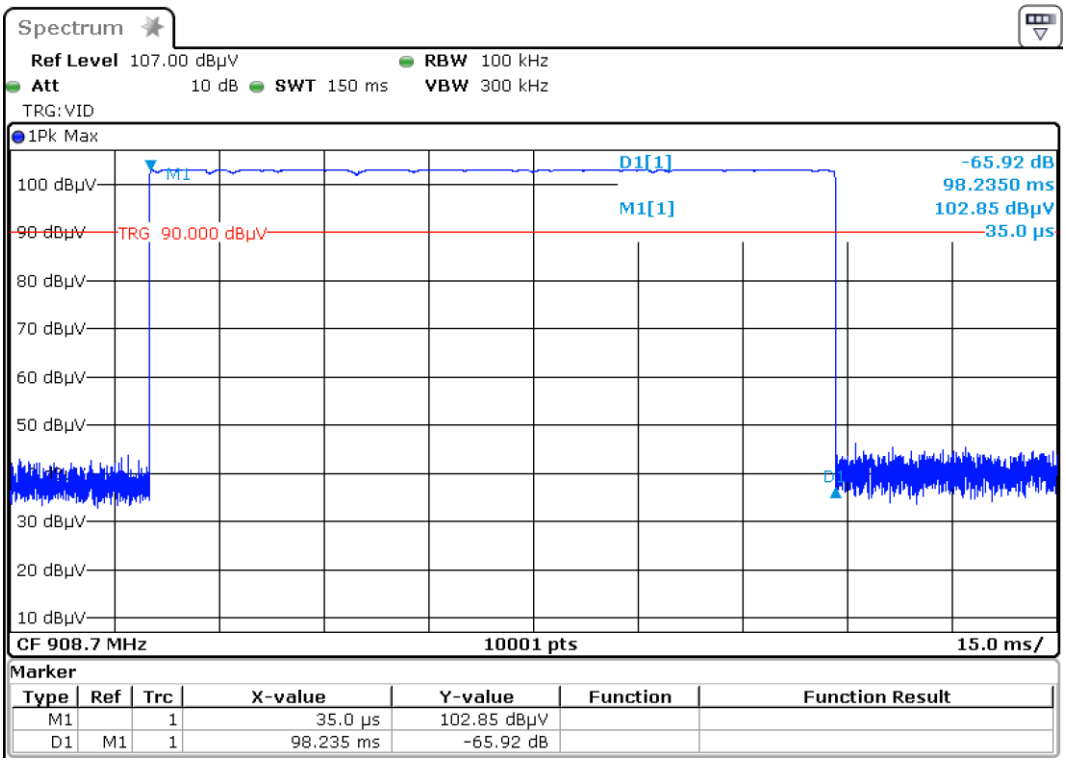
Burst repetition during observation period duration - Channel 902.3 MHz – Spread Factor 10



Result : 3 repetitions

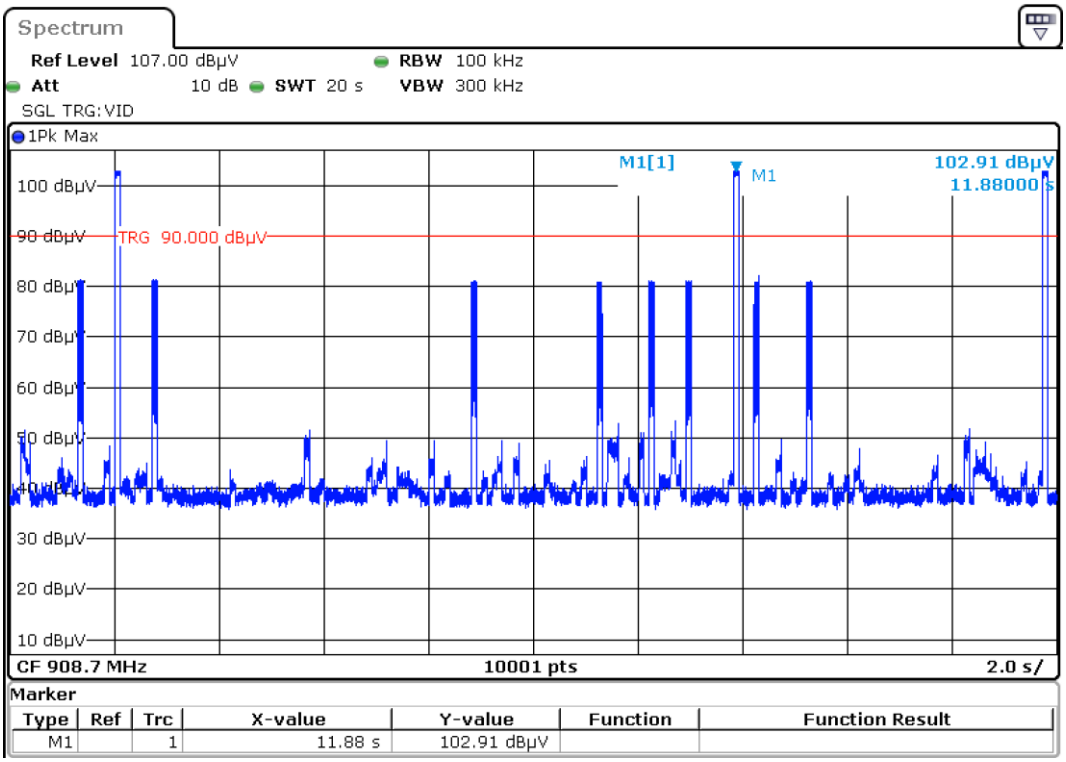
Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	Average time of occupancy on any channel (ms)	Limits (ms)
20	98.235	3	294.705	400

Burst duration - Channel 908.7 MHz – Spread Factor 10



Result : 98.235 ms

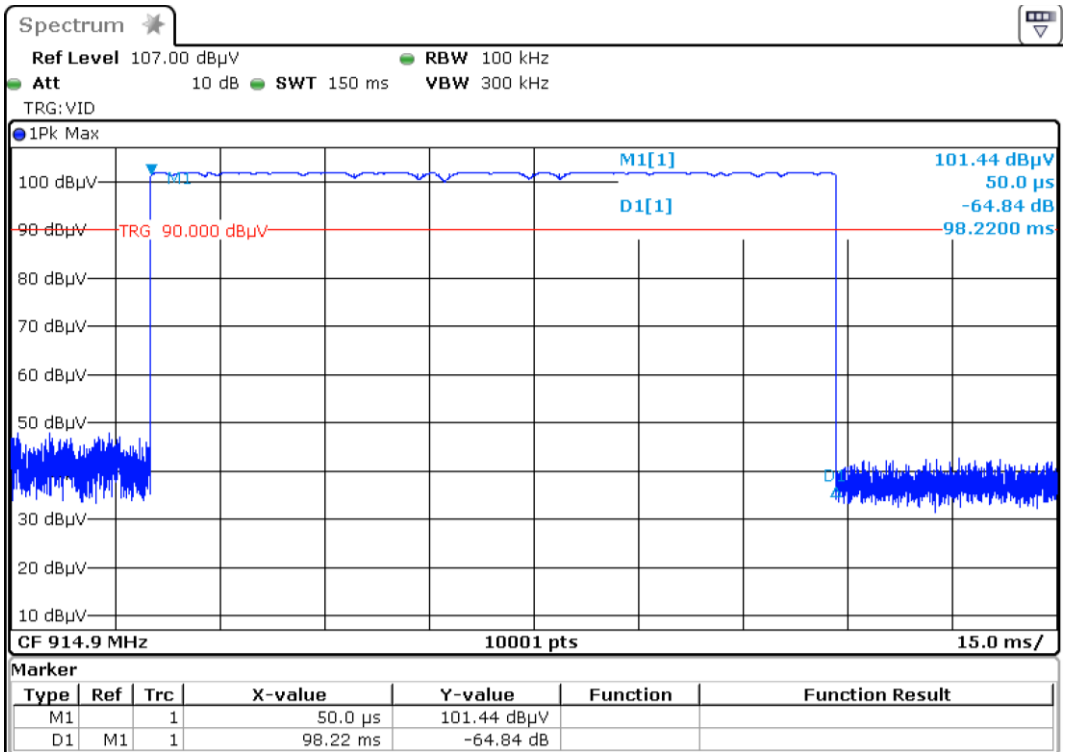
Burst repetition during observation period duration - Channel 908.7 MHz – Spread Factor 10



Result : 3 repetitions

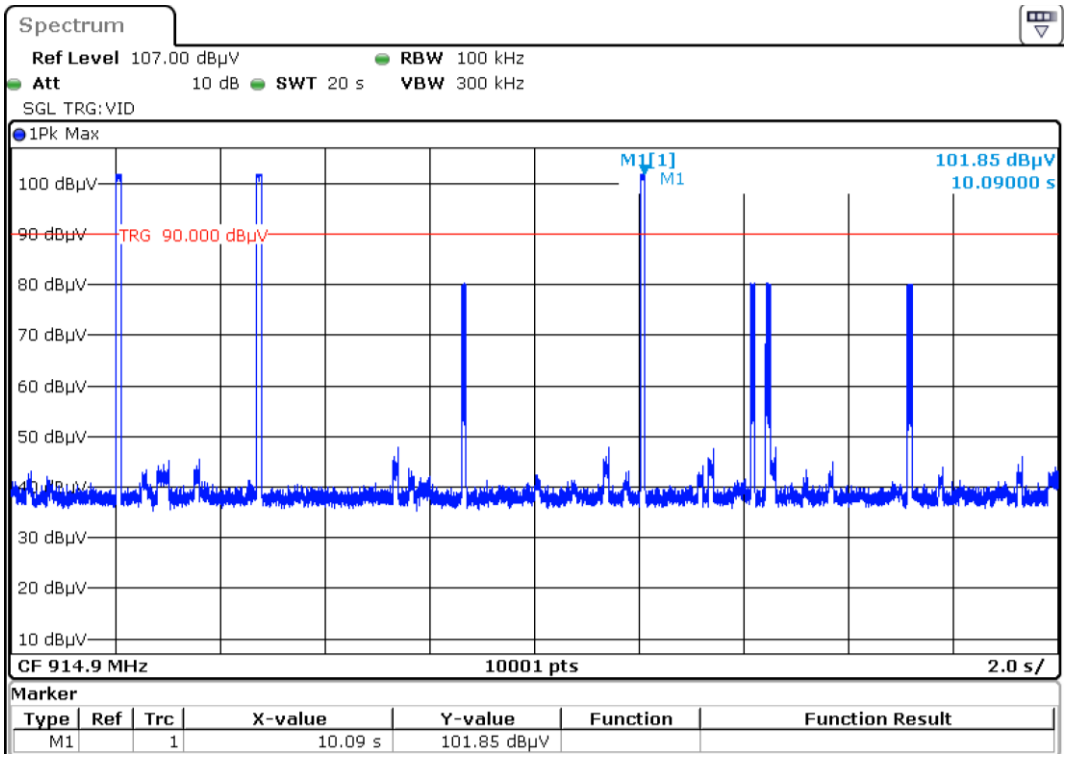
Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	Average time of occupancy on any channel (ms)	Limits (ms)
20	98.235	3	294.705	400

Burst duration - Channel 914.9 MHz – Spread Factor 10



Result : 98.22 ms

Burst repetition during observation period duration - Channel 914.9 MHz – Spread Factor 10



Result : 3 repetitions

Observation period (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	Average time of occupancy on any channel (ms)	Limits (ms)
20	98.220	3	294.66	400

Test conclusion:

RESPECTED STANDARD

11. OCCUPIED BANDWIDTH

Temperature (°C) : 25 **Humidity (%HR):** 44 **Date :** September 4, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:

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.

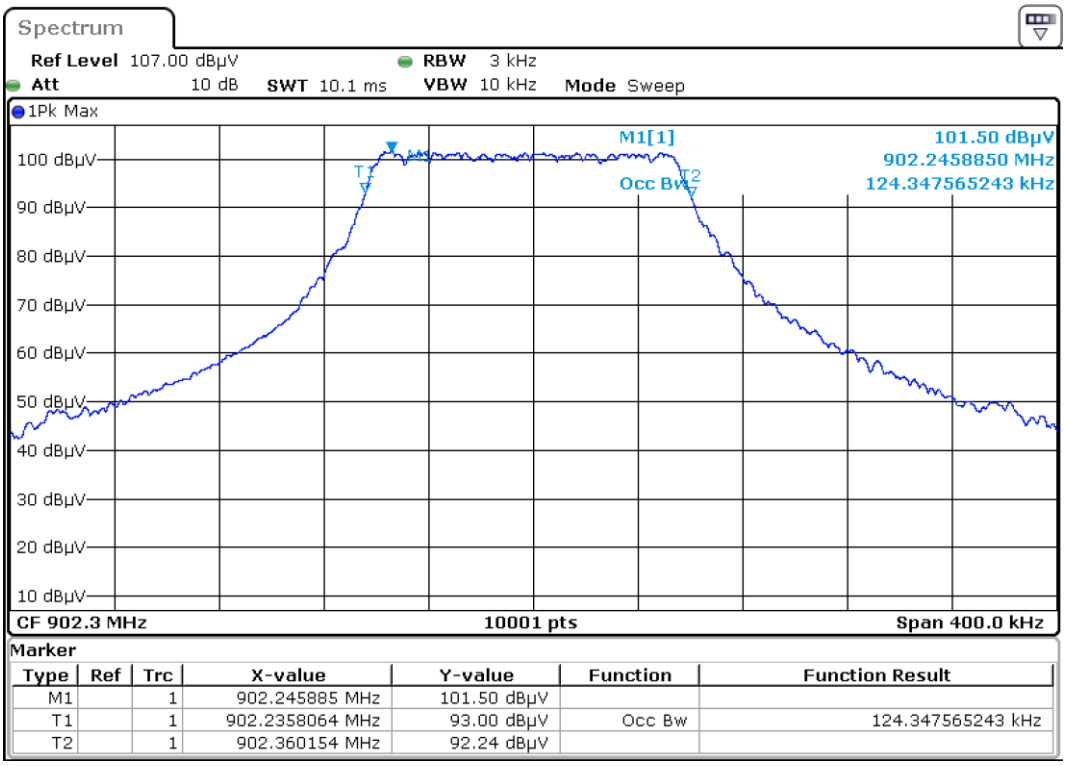
We used for power source the internal battery and we noted:
Voltage at the beginning of test (Vdc): 3.62
Voltage at the end of test (Vdc): 3.61
Percentage of voltage drop during the test (%): 0.27

Results:

Sample N° 1

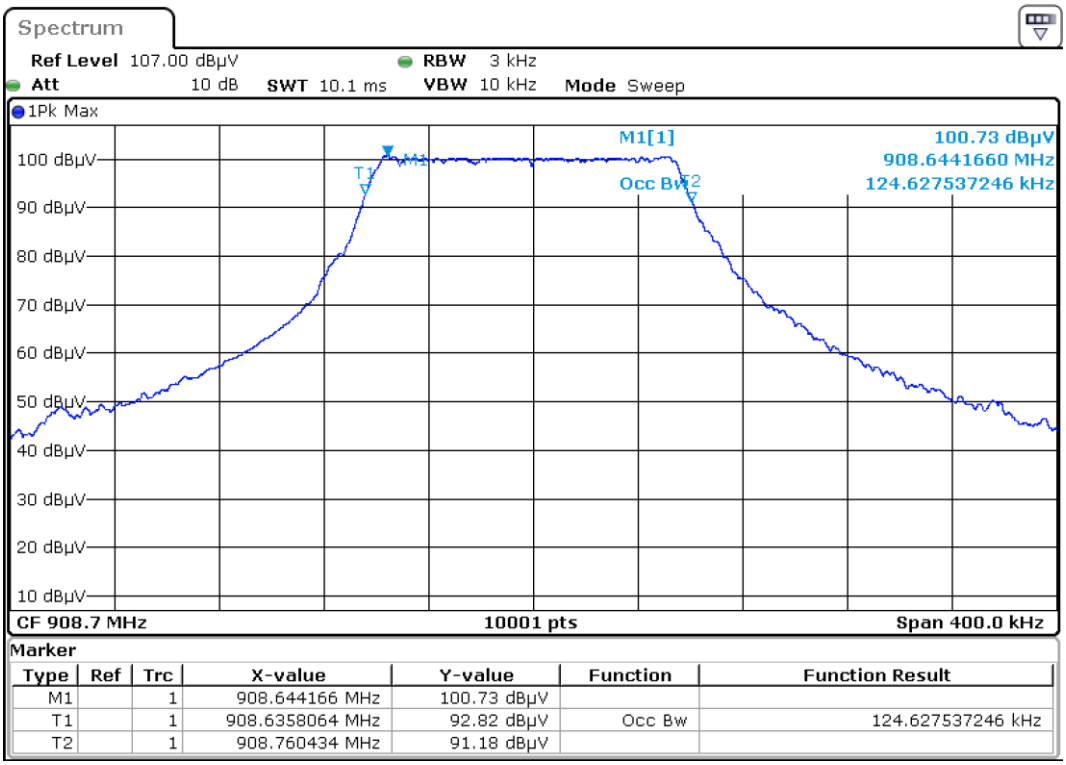
Spread Factor 7

99% bandwidth – Channel 902.3 MHz



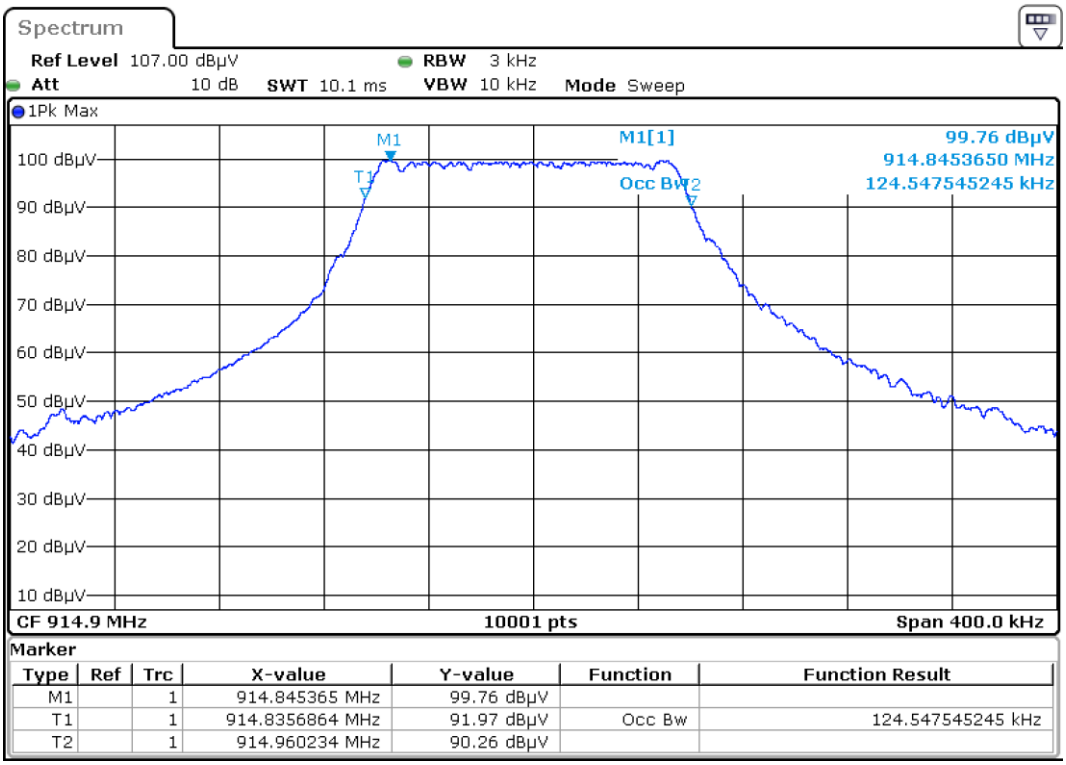
Result : 124.347 kHz

99% bandwidth – Channel 908.7 MHz



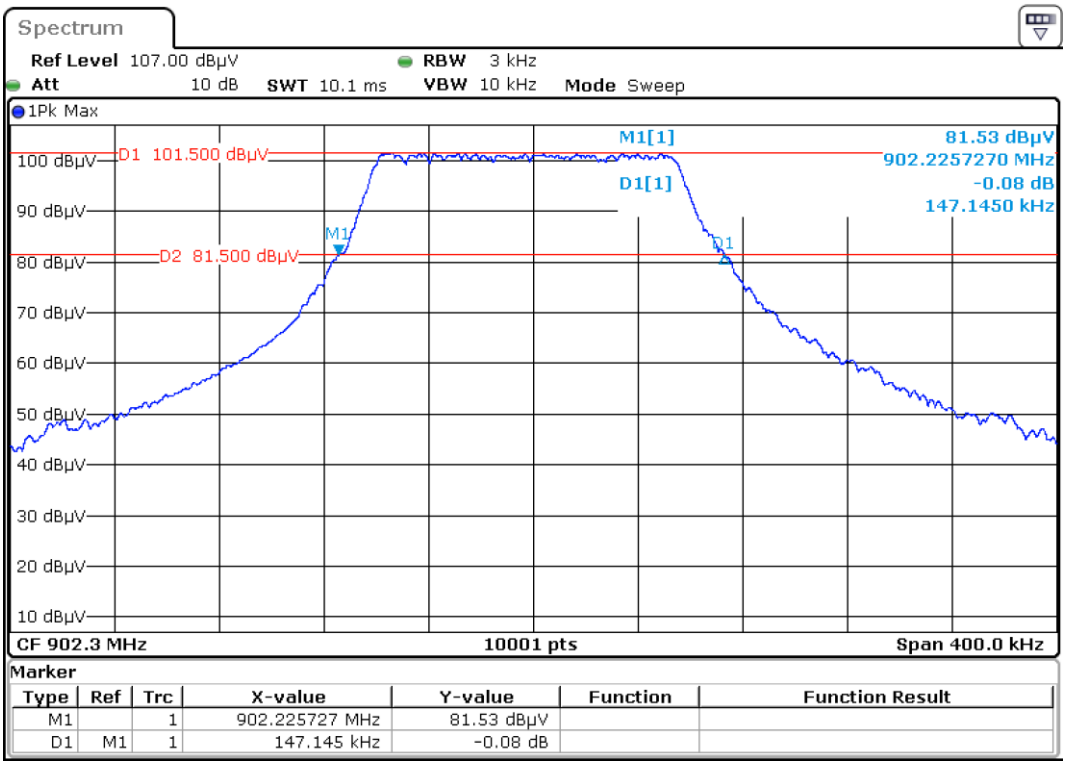
Result : 124.627 kHz

99% bandwidth – Channel 914.9 MHz



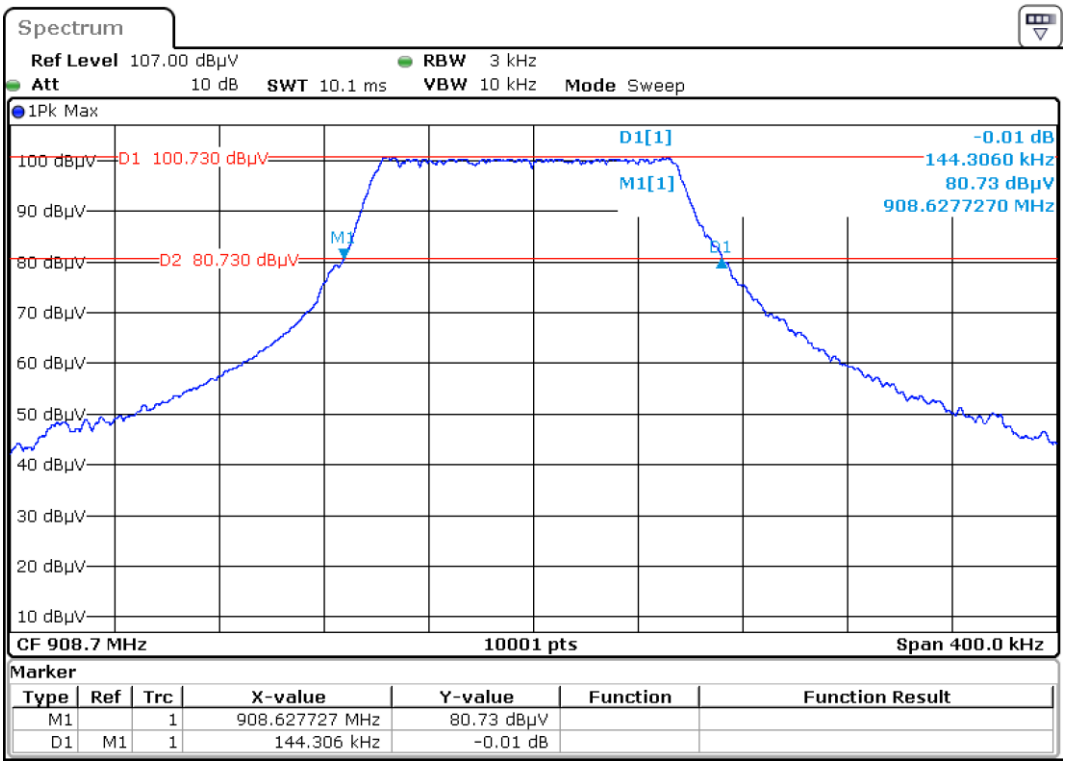
Result : 124.547 kHz

20dB bandwidth – Channel 902.3 MHz



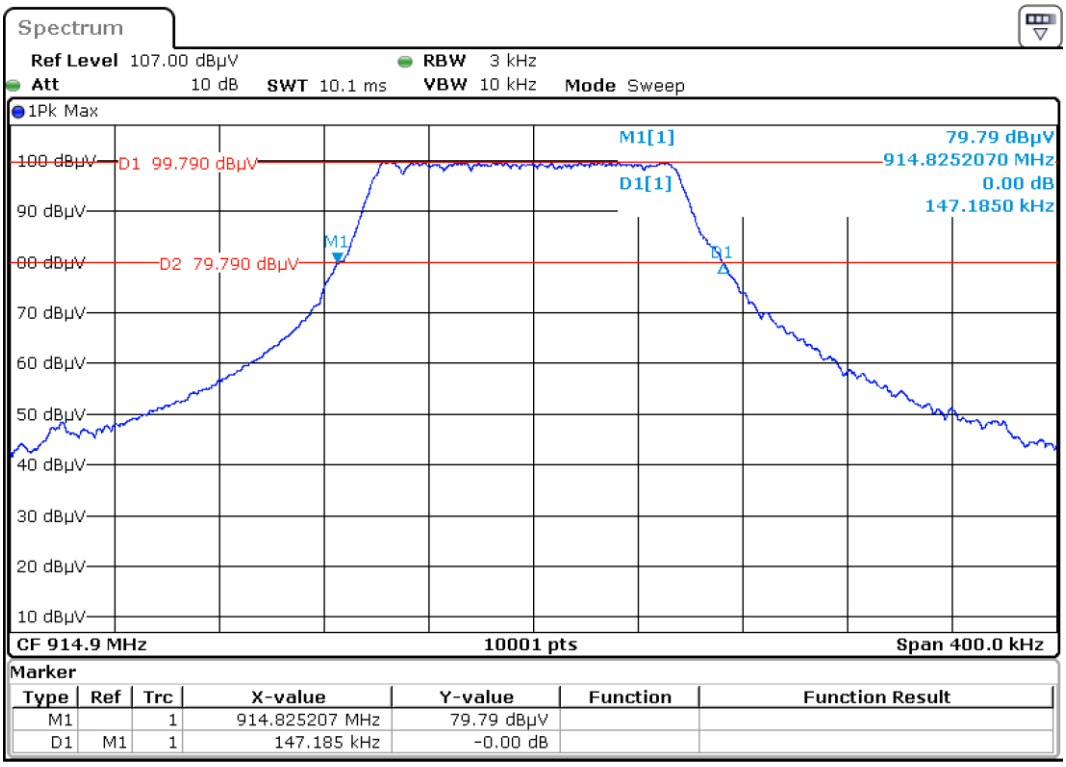
Result : 147.145 kHz

20dB bandwidth – Channel 908.7 MHz



Result : 144.306 kHz

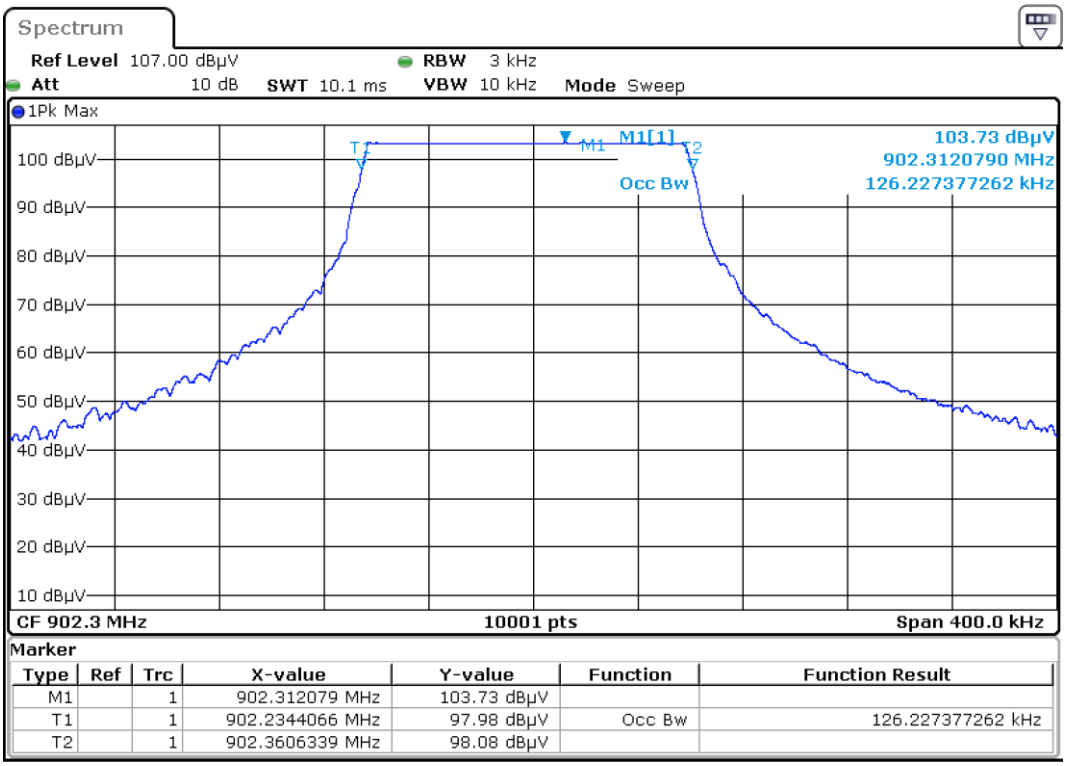
20dB bandwidth – Channel 914.9 MHz



Result : 147.185 kHz

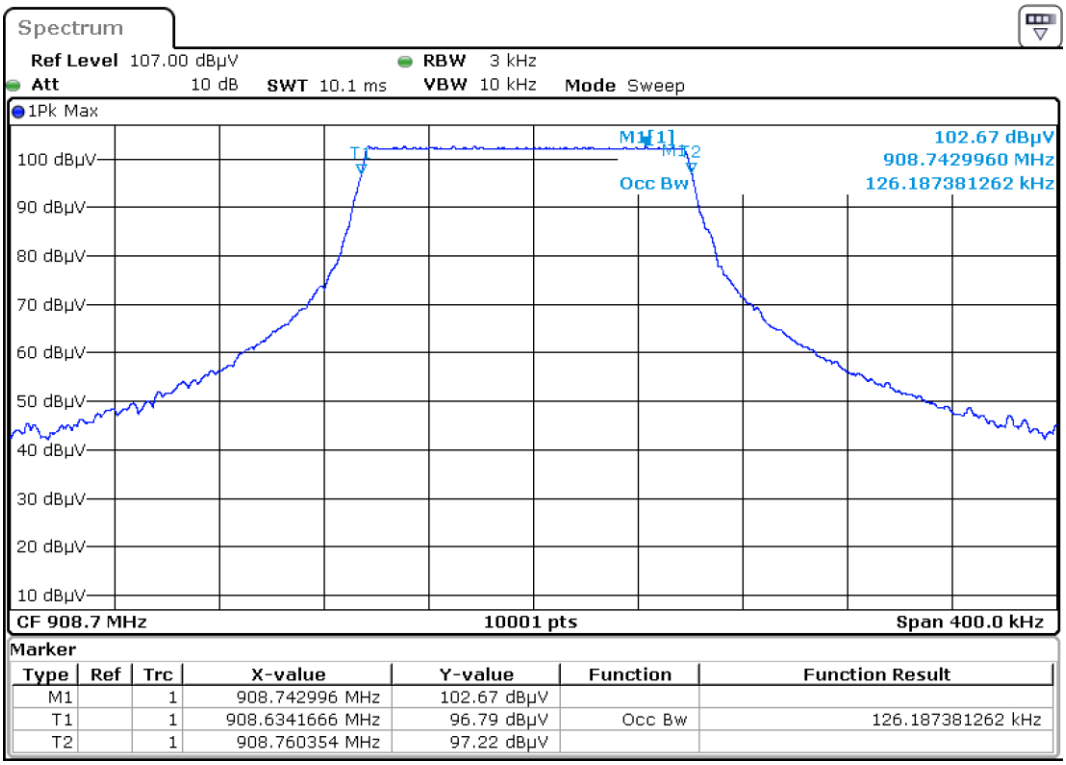
Spread Factor 10

99% bandwidth – Channel 902.3 MHz



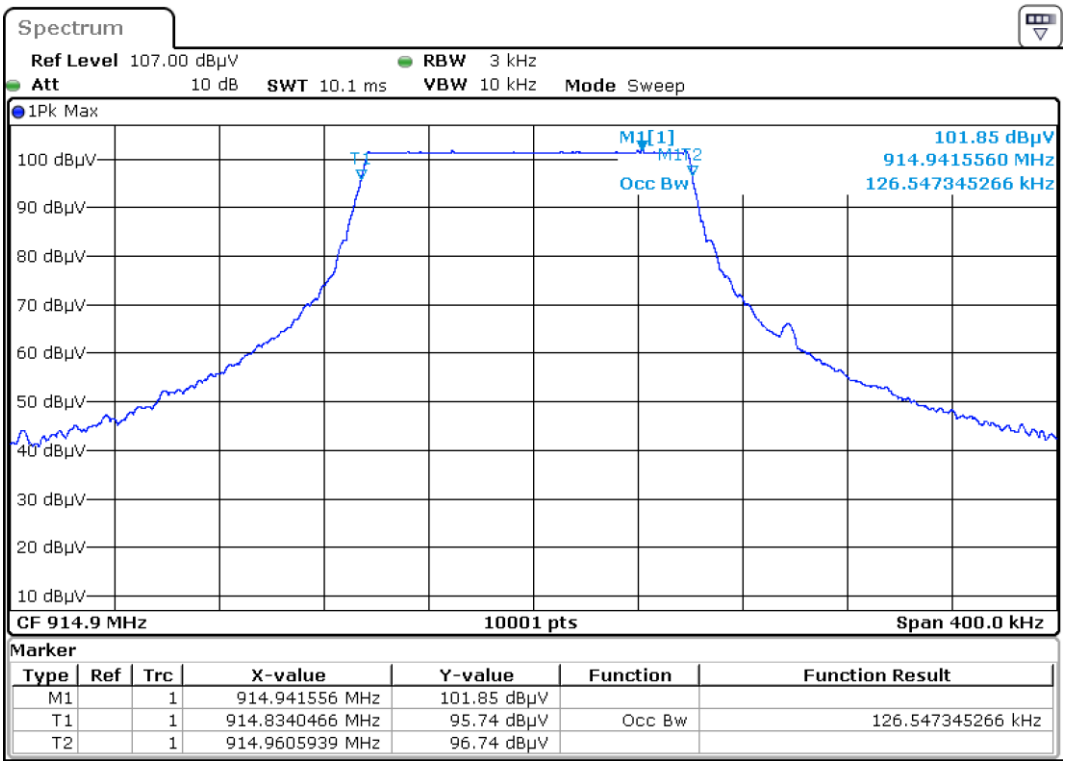
Result : 126.227 kHz

99% bandwidth – Channel 908.7 MHz



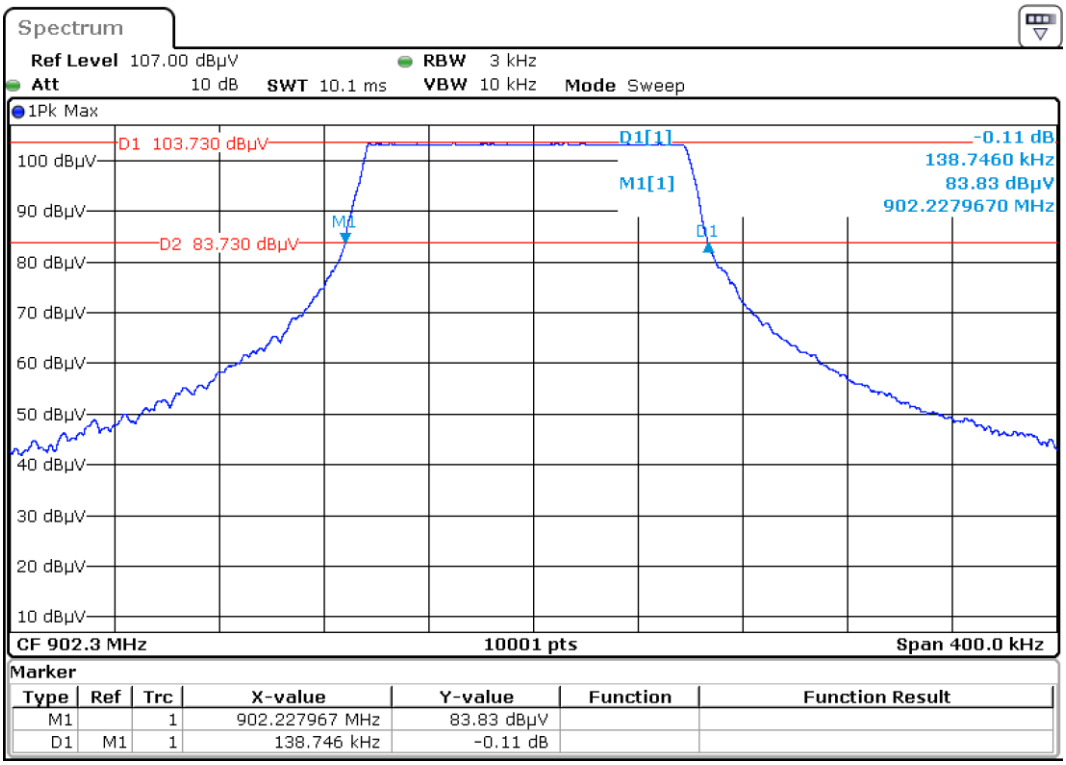
Result : 126.187 kHz

99% bandwidth – Channel 914.9 MHz



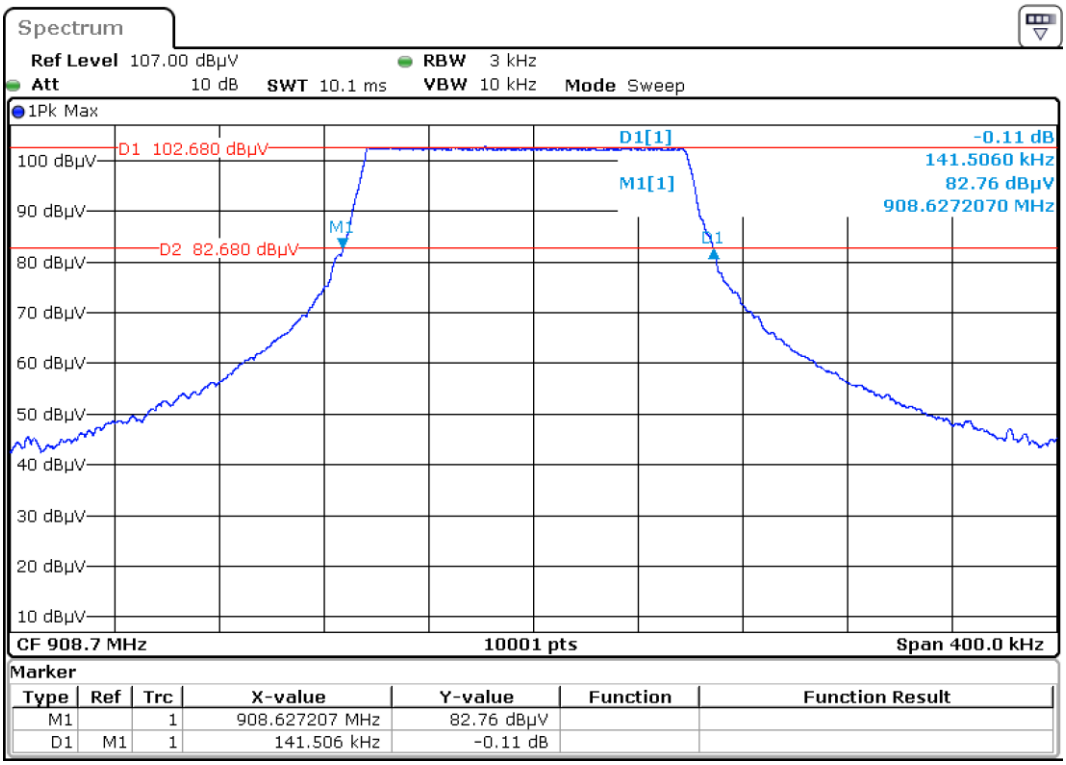
Result : 126.547 kHz

20dB bandwidth – Channel 902.3 MHz



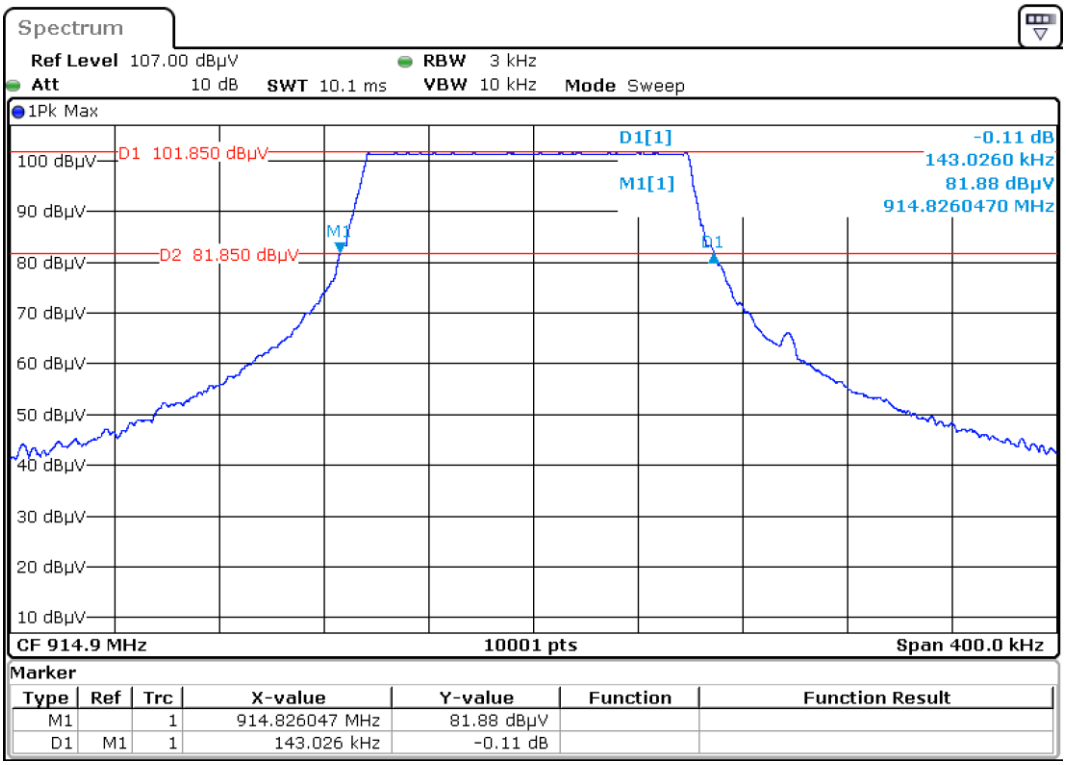
Result : 138.746 kHz

20dB bandwidth – Channel 908.7 MHz



Result : 141.506 kHz

20dB bandwidth – Channel 914.9 MHz



Result : 143.026 kHz

12. BAND EDGE

Temperature (°C) : 26 **Humidity (%HR):** 48 **Date :** September 3, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:

Method of paragraphs 7.8.6 and 6.10.6 of ANSI C63.10

Test set up:

Test realized in near field. All field strength measurements are correlated with the radiated maximum peak output power.

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.

First the measure is realized with hopping function disabled and then repeated with the hopping function activated.

We used for power source the internal battery and we noted:

Voltage at the beginning of test (Vdc):	3.65
Voltage at the end of test (Vdc):	3.62
Percentage of voltage drop during the test (%):	0.82

Results:

Lower Band Edge: From 900 MHz to 902 MHz
Upper Band Edge: From 928 MHz to 930 MHz

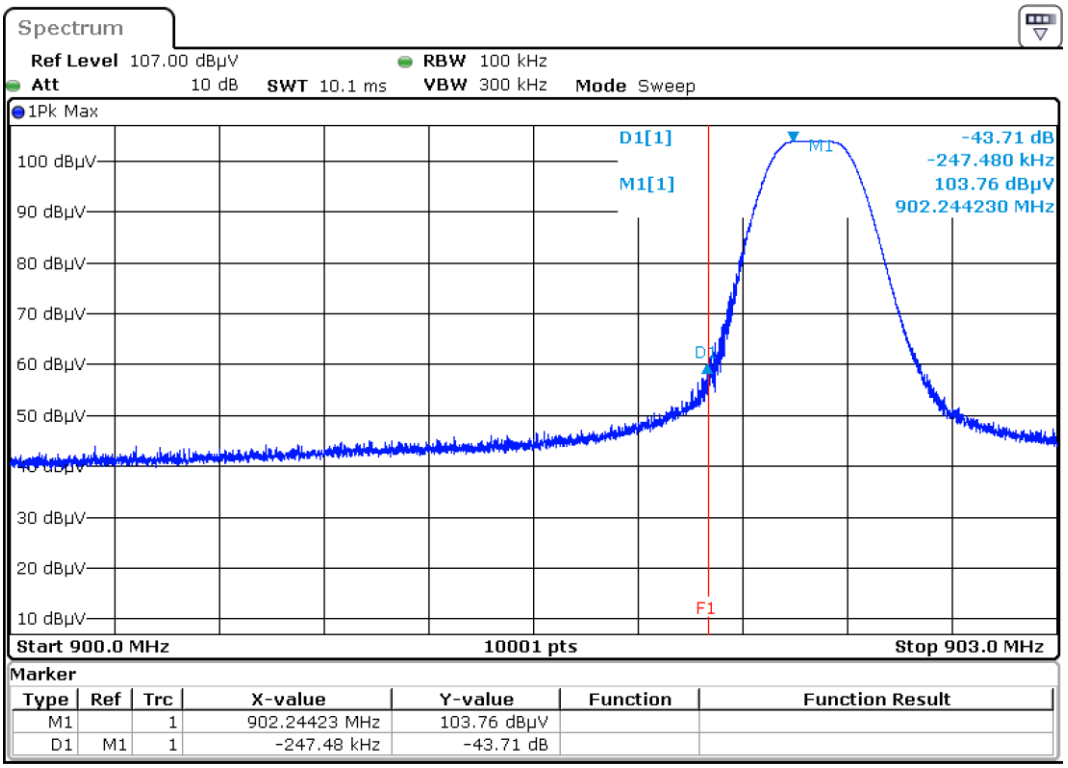
Spread Factor 7

Sample N° 1

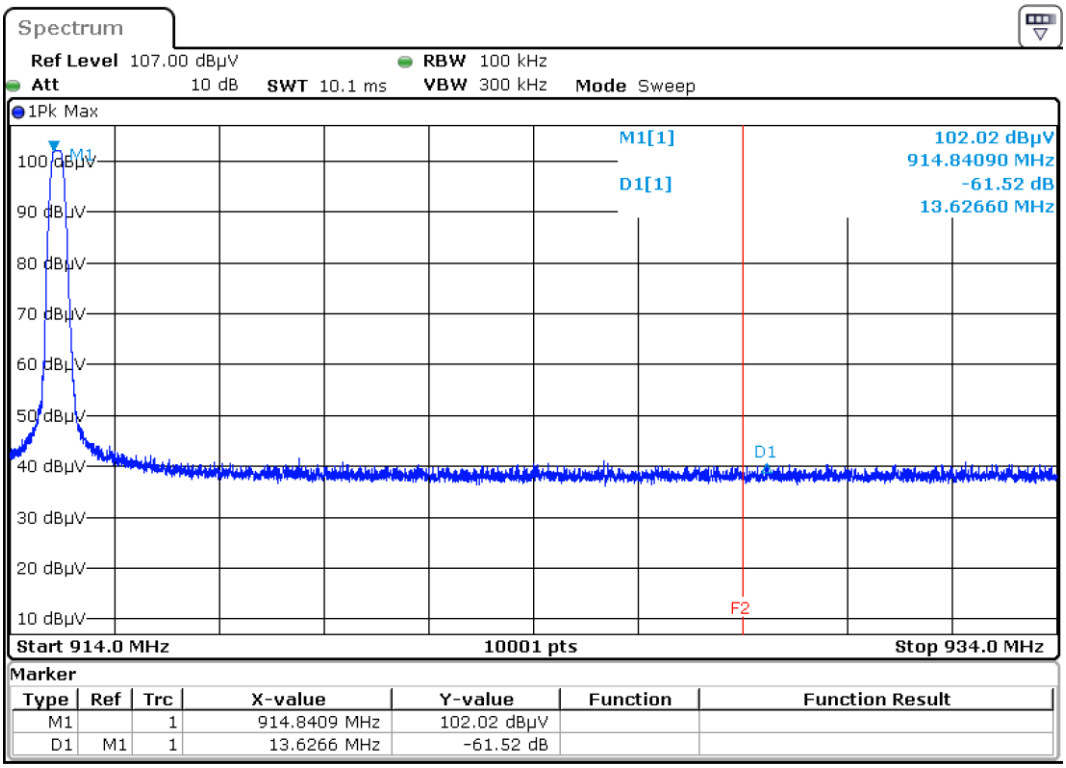
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.3	103.33	Peak	901.996	-43.71	59.62	83.33	23.71
914.9	102.37	Peak	928.467	-61.52	40.85	82.37	41.52

(1) Marker-Delta method

Low channel



High channel

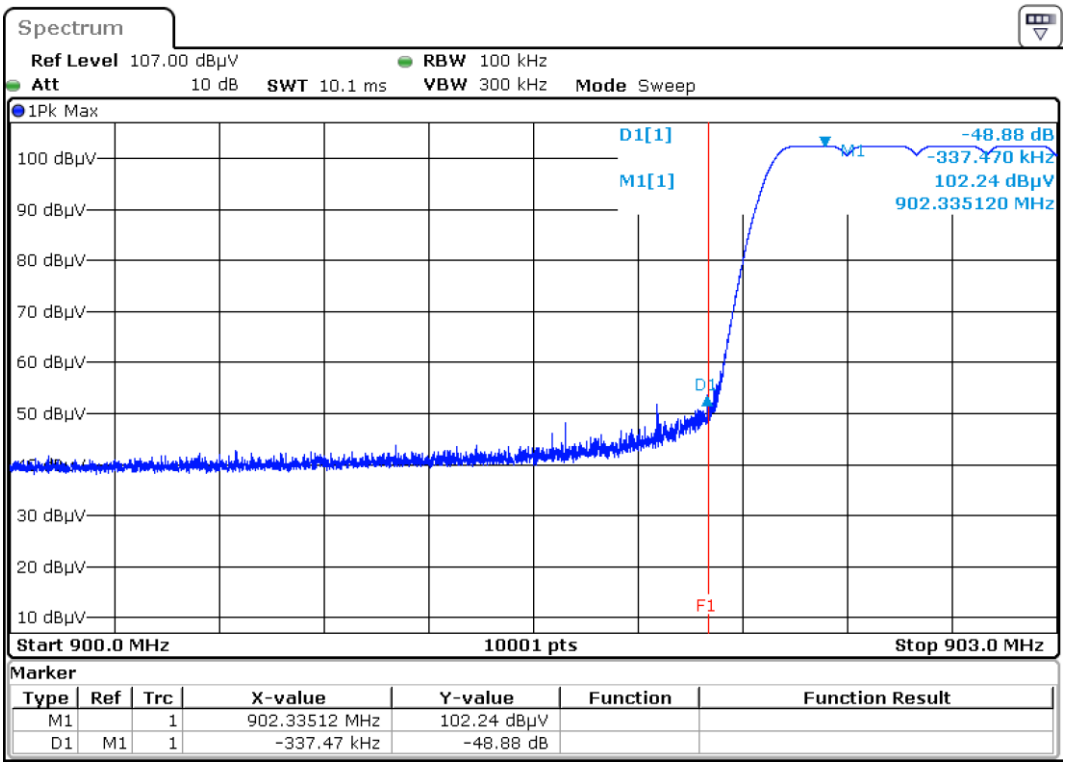


Sample N° 1

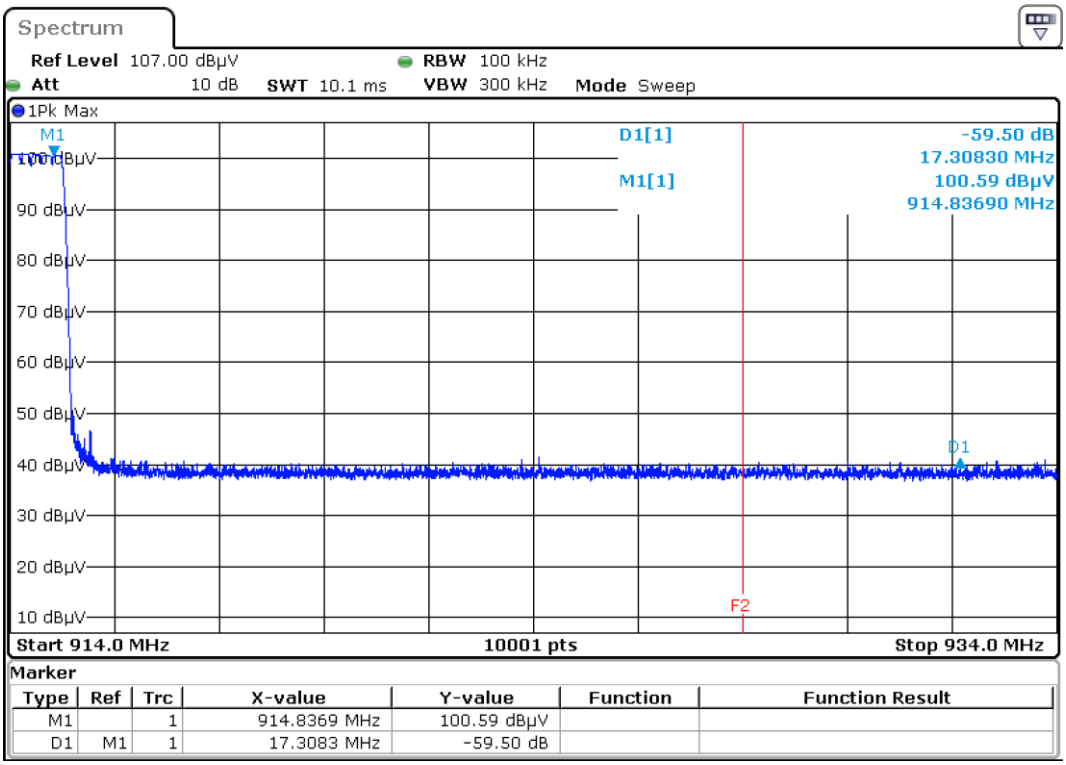
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.3	103.33	Peak	901.997	-48.88	54.45	83.33	28.88
914.9	102.37	Peak	932.172	-59.50	42.87	82.37	39.50

(1) Marker-Delta method

Low channel –hopping function activated



High channel –hopping function activated



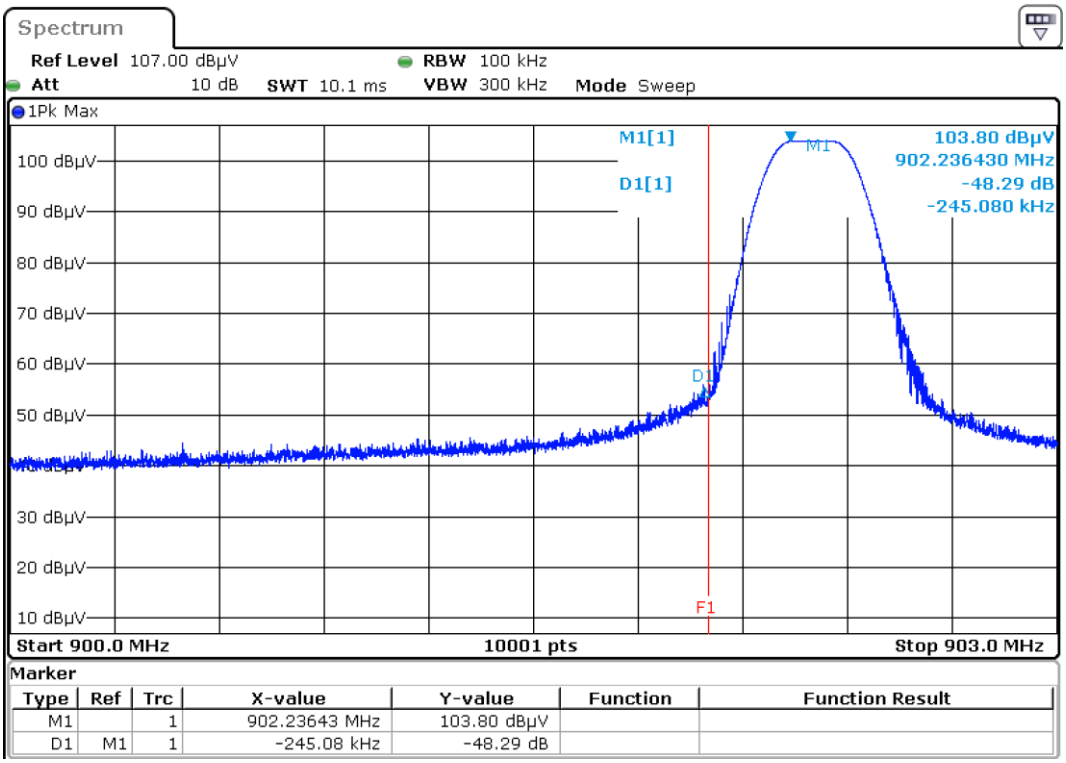
Spread Factor 10

Sample N° 1

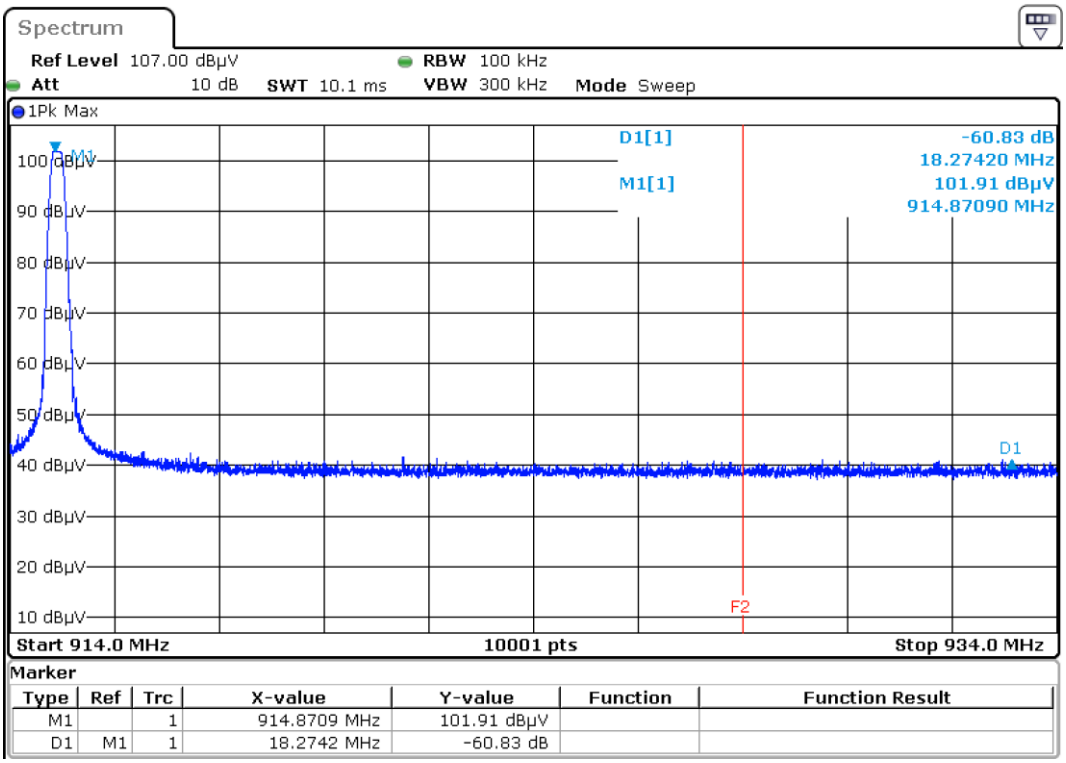
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.3	103.31	Peak	901.991	-48.29	55.02	83.31	28.29
914.9	102.63	Peak	933.145	-60.83	41.8	82.63	40.83

(1) Marker-Delta method

Low channel



High channel

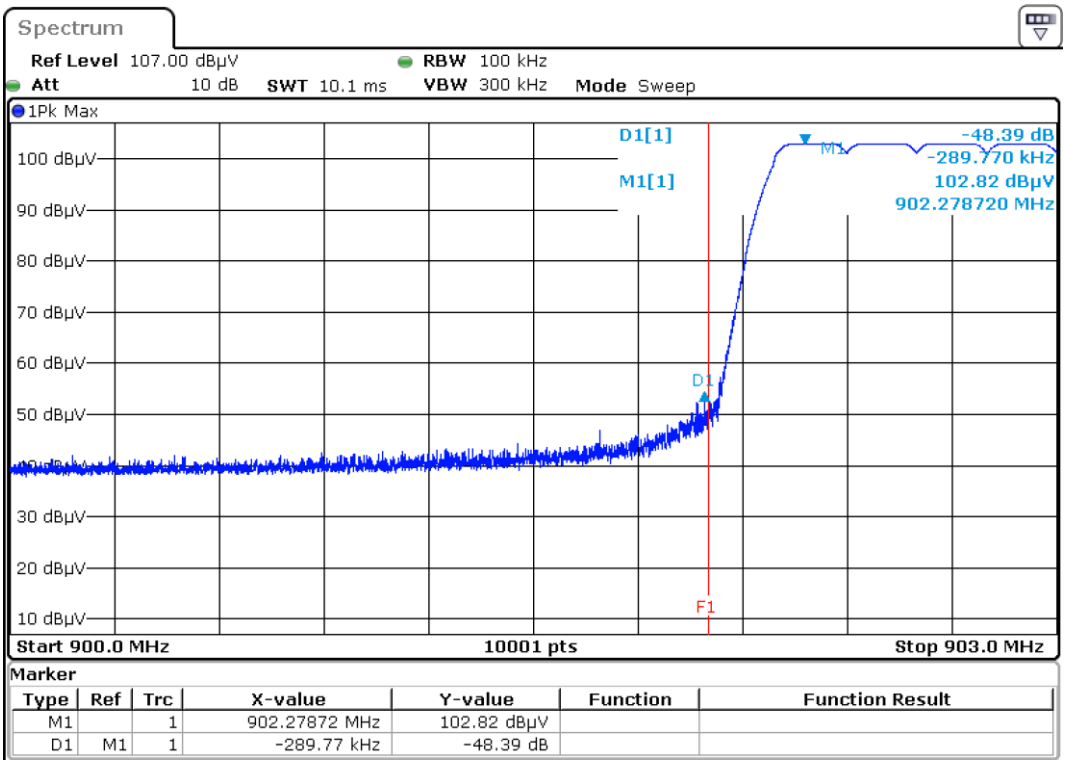


Sample N° 1

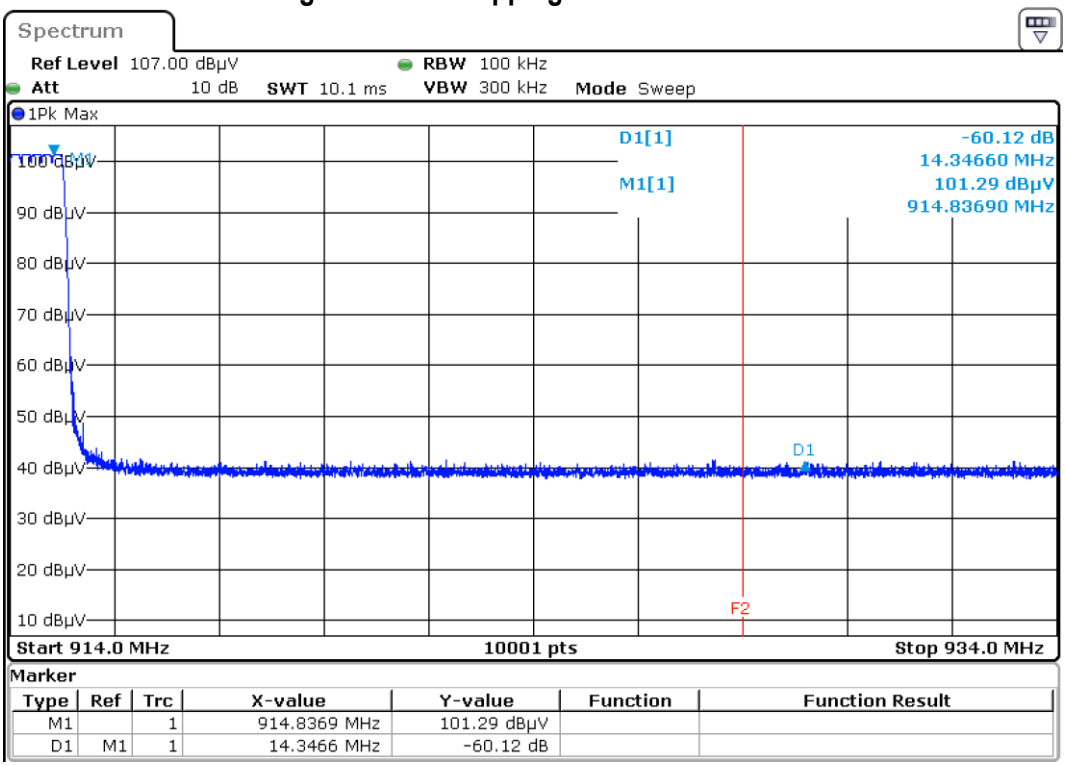
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
902.3	103.31	Peak	901.989	-48.39	54.92	83.31	28.39
914.9	102.63	Peak	929.183	-60.12	42.51	82.63	40.12

(1) Marker-Delta method

Low channel –hopping function activated



High channel –hopping function activated



Test conclusion:

RESPECTED STANDARD

13. PEAK CONDUCTED OUTPUT POWER

Temperature (°C) : 23 **Humidity (%HR):** 58 **Date :** September 6, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:
For FCC Part 15: paragraph 15.247 (b)
For RSS-247: paragraph 5.4

Method of paragraph 7.8.5 of ANSI C63.10

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in these two normal positions.

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

The system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane.

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

See test setup in appendix 2

Distance of antenna: 10 meters (in open area test site)

Antenna height: 1 to 4 meters (in open area test site)

Antenna polarization: vertical and horizontal (only the highest level is recorded)

The measurement of the radiated electro-magnetic field is realized with an analyser and peak detector. The resolution bandwidth is adjusted at 1 MHz and video bandwidth at 3 MHz.

Finally the radiated electro-magnetic field is converted in dBm with the following formula:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna with a Gain (unit in dBi) different following the frequencies used.

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 and we noted:

Voltage at the beginning of test (Vdc):	3.67
Voltage at the end of test (Vdc):	3.65
Percentage of voltage drop during the test (%):	0.54

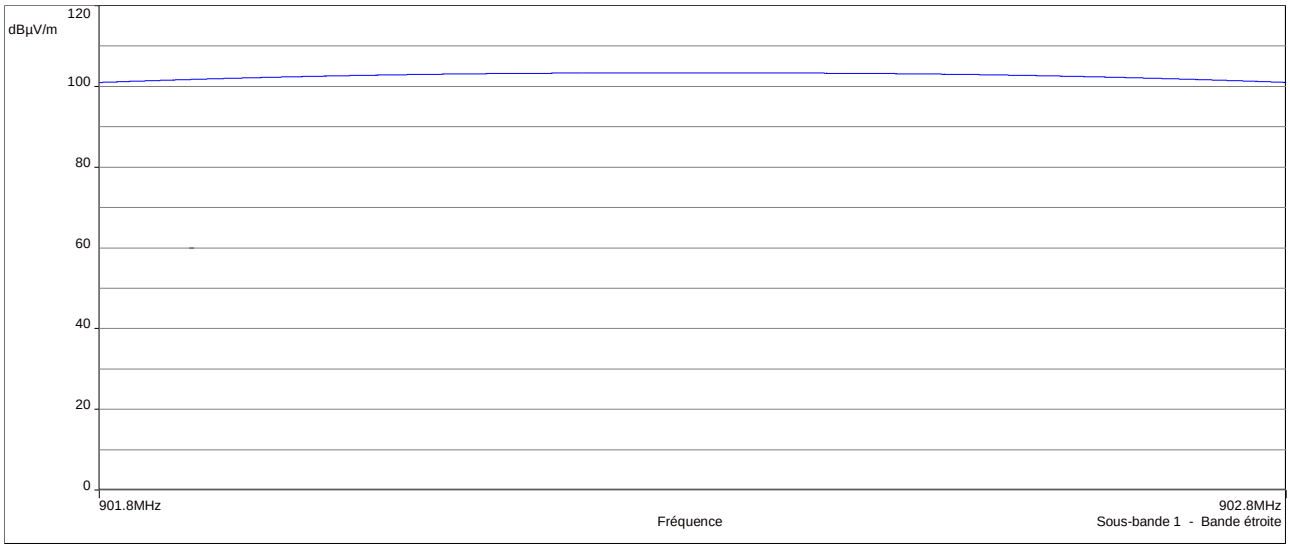
Results:

Sample N° 1 Low Channel (F = 902.3 MHz) – SF7

	Electro-magnetic field (dBµV/m):	Maximum Peak conducted output power		Limit
		(dBm)	(W)	(W)
Nominal supply voltage:	103.33	12.61	0.018	1

Polarization of test antenna: Horizontal (height: 115 cm)
Position of equipment: Position 2 (azimuth: 20 degrees)

Maximum Peak conducted output power:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 5.92 dBi.

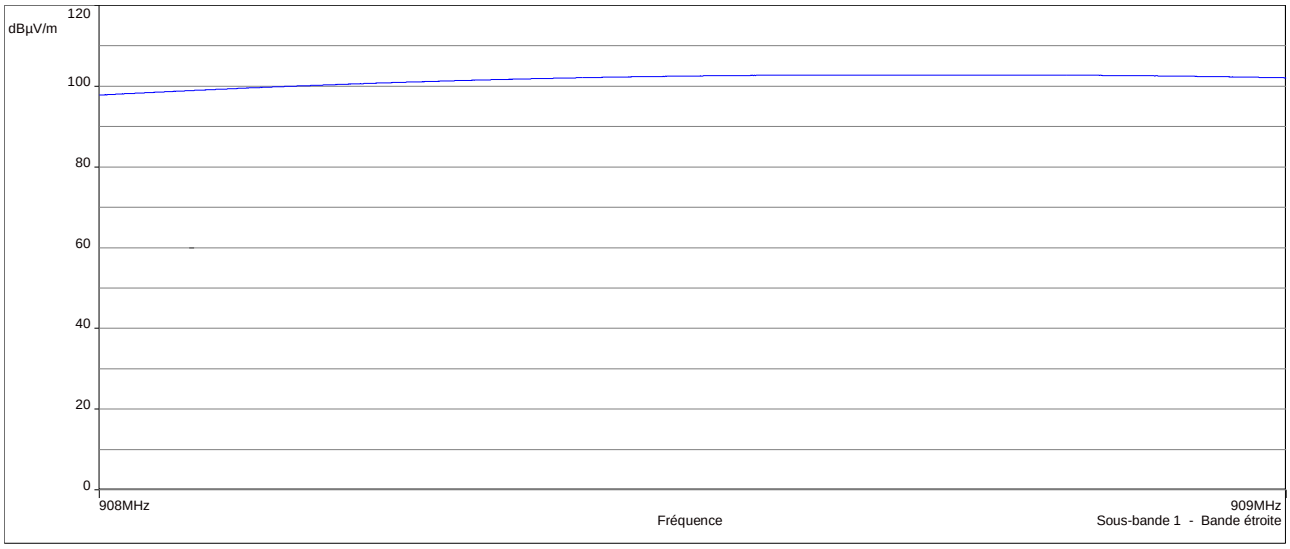


Sample N° 1 Central Channel (F = 908.7 MHz) – SF7

	Electro-magnetic field (dBµV/m):	Maximum Peak conducted output power		Limit
		(dBm)	(W)	(W)
Nominal supply voltage:	102.78	12.56	0.018	1

Polarization of test antenna: Horizontal (height: 114 cm)
Position of equipment: Position 2 (azimuth: 20 degrees)

Maximum Peak conducted output power:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 5.42 dBi.

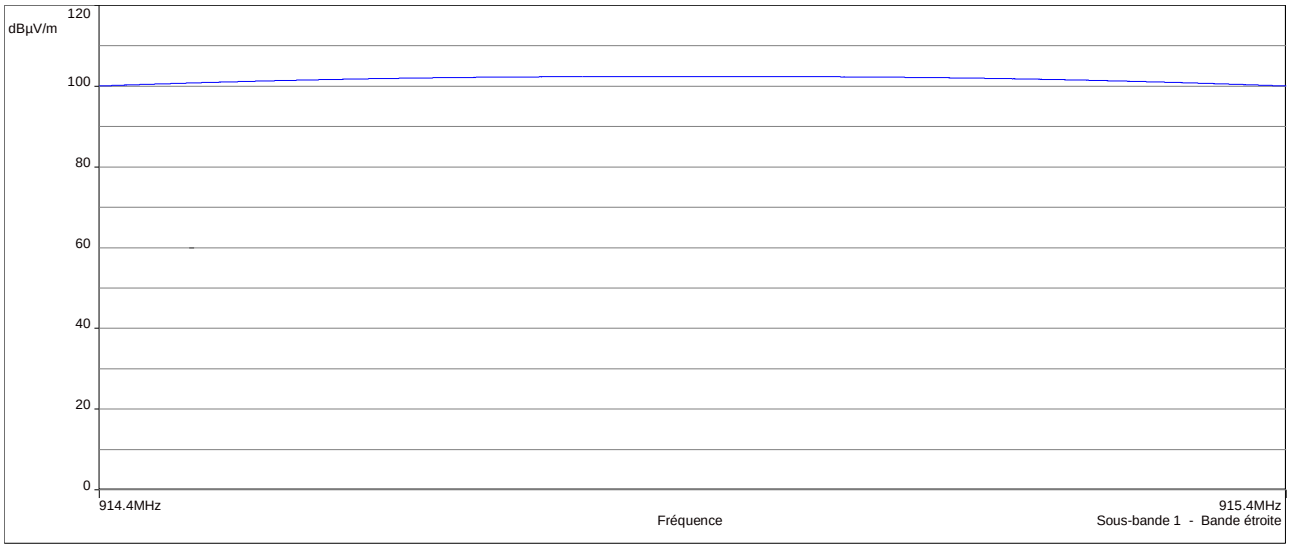


Sample N° 1 High Channel (F = 914.9 MHz) – SF7

	Electro-magnetic field (dBµV/m):	Maximum Peak conducted output power		Limit
		(dBm)	(W)	(W)
Nominal supply voltage:	102.37	12.52	0.018	1

Polarization of test antenna: Horizontal (height: 114 cm)
Position of equipment: Position 2 (azimuth: 20 degrees)

Maximum Peak conducted output power:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 5.05 dBi.

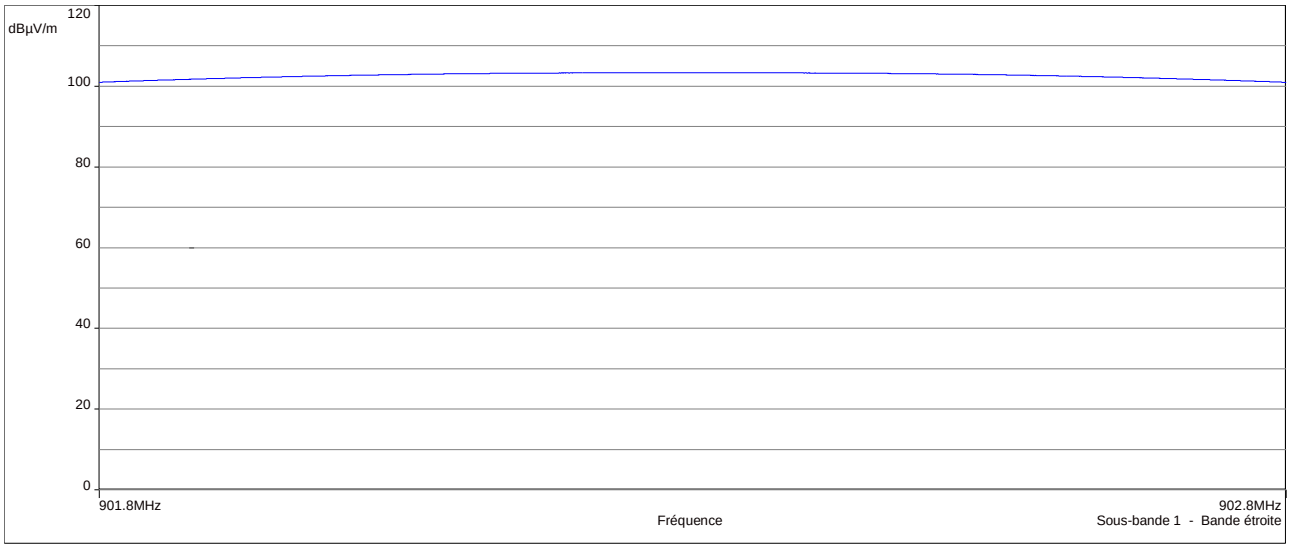


Sample N° 1 Low Channel (F = 902.3 MHz) – SF10

	Electro-magnetic field (dBµV/m):	Maximum Peak conducted output power		Limit
		(dBm)	(W)	(W)
Nominal supply voltage:	103.31	12.64	0.018	1

Polarization of test antenna: Horizontal (height: 115 cm)
Position of equipment: Position 2 (azimuth: 20 degrees)

Maximum Peak conducted output power:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 5.87 dBi.

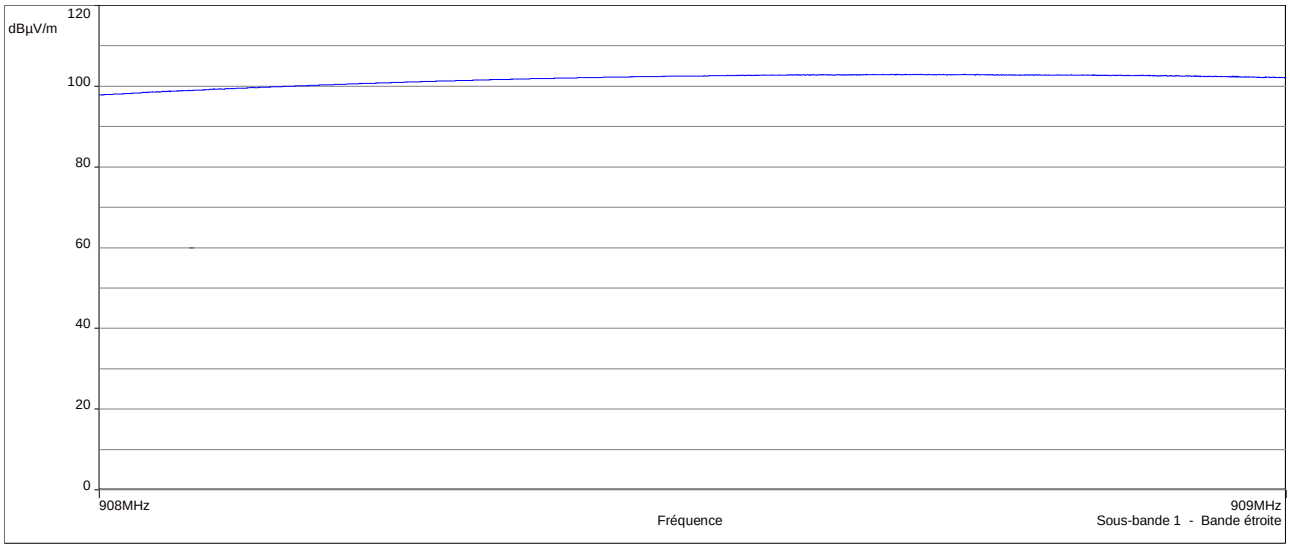


Sample N° 1 Central Channel (F = 908.7 MHz) – SF10

	Electro-magnetic field (dBµV/m):	Maximum Peak conducted output power		Limit
		(dBm)	(W)	(W)
Nominal supply voltage:	102.93	12.55	0.018	1

Polarization of test antenna: Horizontal (height: 114 cm)
Position of equipment: Position 2 (azimuth: 20 degrees)

Maximum Peak conducted output power:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 5.58 dBi.

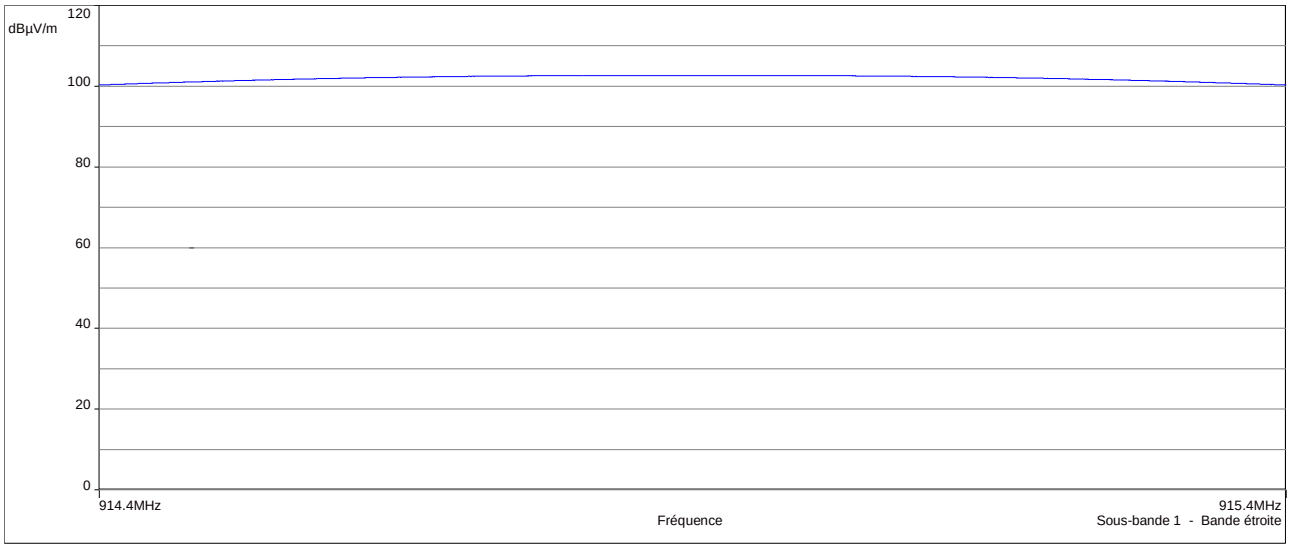


Sample N° 1 High Channel (F = 914.9 MHz) – SF10

	Electro-magnetic field (dBµV/m):	Maximum Peak conducted output power		Limit
		(dBm)	(W)	(W)
Nominal supply voltage:	102.63	12.52	0.018	1

Polarization of test antenna: Horizontal (height: 114 cm)
Position of equipment: Position 2 (azimuth: 20 degrees)

Maximum Peak conducted output power:
EIRP(dBm) = E (dBµV/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna Gain = 5.31 dBi.



Test conclusion:

RESPECTED STANDARD

14. RADIATED SPURIOUS EMISSIONS

Temperature (°C) : 23 **Humidity (%HR):** 58 **Date :** September 6, 2024
Technician : B. VOVARD

Standard: FCC Part 15
RSS-247

Test procedure:
For FCC Part 15: paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)
For RSS-247: paragraph 5.5

Emissions in non-restricted frequency bands method of paragraph 7.8 of ANSI C63.10
Emissions in restricted frequency bands method of paragraph 5.9 of ANSI C63.10

Test set up:

First an exploratory radiated measurement was performed. this phase the product is oriented in these two normal positions.

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

The measure is realized on open area test site under 1 GHz and in anechoic chamber above 1 GHz.

When the system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane.
When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5 m from a ground plane.

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

See test setup in appendix 2

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (10 GHz)

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)
100 kHz / 1 MHz (F > 1 GHz)

Distance of antenna: 10 meters (in open area test site) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1 to 2.5 meters or 0.5 m above the top of the EUT, whichever is higher (in anechoic room)

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 and we noted:

Voltage at the beginning of test (Vdc):	3.67
Voltage at the end of test (Vdc):	3.65
Percentage of voltage drop during the test (%):	0.54

Results:

Sample N° 1 Low Channel (F = 902.3 MHz) – SF7

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBµV/m)	Limits at 3 m (dBµV/m)	Margin (dB)
1804.6	P	102	100	V	53.92	83.33	29.41
2706.7 (1)	P	100	1000	H	48.22 (2)	74	25.78
3609.4 (1)	P	150	1000	H	46.44 (2)	74	27.56
4511.6 (1)	P	163	1000	V	46.66 (2)	74	27.34
5414.4 (1)	P	100	1000	H	48.28 (2)	74	25.72
6316.8	P	174	100	H	47.37	83.33	35.96
7219.2	P	101	100	H	46.77	83.33	36.56
8120.6 (1)	P	149	1000	V	54.40	74	19.60
8120.6 (1)	Av	149	1000	V	50.71	54	3.29
9023 (1)	P	103	1000	H	52.58 (2)	74	21.42

P= Peak, QP=Quasi-peak, Av=Average
(1) Restricted bands of operation in 15.205
(1) Restricted bands of operation as defined in Table 6 of RSS-Gen
(2) The peak level is lower than the average limit (54 dBµV/m)

Sample N° 1 Central Channel (F = 908.7 MHz) – SF7

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBµV/m)	Limits at 3 m (dBµV/m)	Margin (dB)
1817.4	P	102	100	V	52.63	83.33	30.70
2725.9 (1)	P	203	1000	V	52.57 (2)	74	21.43
3634.6 (1)	P	150	1000	H	45.35 (2)	74	28.65
4543.5 (1)	P	163	1000	V	47.31 (2)	74	26.69
5450.8 (1)	P	189	1000	V	47.91 (2)	74	26.09
6359.9	P	174	100	H	46.34	83.33	36.99
7268.8 (1)	P	100	1000	V	49.83 (2)	74	24.17
8177.4 (1)	P	149	1000	V	54.88	74	19.12
8177.4 (1)	Av	149	1000	V	50.92	54	3.08
9087 (1)	P	197	1000	V	53.31 (2)	74	20.69

P= Peak, QP=Quasi-peak, Av=Average
(1) Restricted bands of operation in 15.205
(1) Restricted bands of operation as defined in Table 6 of RSS-Gen
(2) The peak level is lower than the average limit (54 dBµV/m)

Sample N° 1 High Channel (F = 914.9 MHz) – SF7

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBµV/m)	Limits at 3 m (dBµV/m)	Margin (dB)
1829.8	P	102	100	V	53.90	83.33	29.43
2745.4 (1)	P	198	1000	H	56.08	74	17.92
2745.4 (1)	Av	198	1000	H	51.76	54	2.24
3660.1 (1)	P	150	1000	H	46.46 (2)	74	27.54
4574.5 (1)	P	163	1000	V	48.77 (2)	74	25.23
5489.4	P	100	100	H	48.41	83.33	34.92
6404.8	P	184	100	H	46.77	83.33	36.56
7318.8 (1)	P	100	1000	V	53.36 (2)	74	20.64
8234.1 (1)	P	149	1000	V	58.76	74	15.24
8234.1 (1)	Av	149	1000	V	53.95	54	0.05
9149 (1)	P	239	1000	V	56.25	74	17.75
9149 (1)	Av	239	1000	V	52.78	54	1.22

P= Peak, QP=Quasi-peak, Av=Average
(1) Restricted bands of operation in 15.205
(1) Restricted bands of operation as defined in Table 6 of RSS-Gen
(2) The peak level is lower than the average limit (54 dBµV/m)

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 103.33 dBµV/m on channel at 902.3 MHz. So the applicable limit is 83.33 dBµV/m.

In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

In addition, radiated emissions which fall in the restricted band, as defined in Table 6 of RSS-Gen, must also comply with the radiated emission limits specified in Table 4 and Table 5 of RSS-Gen.

Sample N° 1 Low Channel (F = 902.3 MHz) – SF10

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBµV/m)	Limits at 3 m (dBµV/m)	Margin (dB)
1804.6	P	102	100	V	55.23	83.31	28.08
2706.7 (1)	P	100	1000	H	48.60 (2)	74	25.40
3609.4 (1)	P	150	1000	H	46.48 (2)	74	27.52
4511.6 (1)	P	163	1000	V	47.63 (2)	74	26.37
5414.4 (1)	P	189	1000	V	47.95 (2)	74	26.05
6316.8	P	150	100	V	47.73	83.31	35.58
7219.2	P	100	100	V	47.97	83.31	35.34
8120.6 (1)	P	149	1000	V	54.91	74	19.09
8120.6 (1)	Av	149	1000	V	51.25	54	2.75
9023 (1)	P	197	1000	H	53.21 (2)	74	20.79

P= Peak, QP=Quasi-peak, Av=Average
(1) Restricted bands of operation in 15.205
(1) Restricted bands of operation as defined in Table 6 of RSS-Gen
(2) The peak level is lower than the average limit (54 dBµV/m)

Sample N° 1 Central Channel (F = 908.7 MHz) – SF10

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBµV/m)	Limits at 3 m (dBµV/m)	Margin (dB)
1817.4	P	102	100	V	54.80	83.31	28.51
2725.9 (1)	P	100	1000	H	52.43 (2)	74	21.57
3634.6 (1)	P	150	1000	H	45.70 (2)	74	28.30
4543.5 (1)	P	163	1000	V	48.87 (2)	74	25.13
5450.8 (1)	P	189	1000	V	48.76 (2)	74	25.24
6359.9	P	150	100	V	47.74	83.31	35.57
7268.8 (1)	P	100	1000	V	50.51 (2)	74	23.49
8177.4 (1)	P	149	1000	V	55.17	74	18.83
8177.4 (1)	Av	149	1000	V	52.41	54	1.59
9087 (1)	P	197	1000	V	53.59 (2)	74	20.41

P= Peak, QP=Quasi-peak, Av=Average
(1) Restricted bands of operation in 15.205
(1) Restricted bands of operation as defined in Table 6 of RSS-Gen
(2) The peak level is lower than the average limit (54 dBµV/m)

Sample N° 1 High Channel (F = 914.9 MHz) – SF10

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dBµV/m)	Limits at 3 m (dBµV/m)	Margin (dB)
1829.8	P	102	100	V	51.29	83.31	32.02
2745.4 (1)	P	100	1000	H	54.29	74	19.71
2745.4 (1)	Av	100	1000	H	53.17	54	0.83
3660.1 (1)	P	150	1000	V	46.18 (2)	74	27.82
4574.5 (1)	P	163	1000	V	50.24 (2)	74	23.76
5489.4	P	189	100	V	49.04	83.31	34.27
6404.8	P	150	100	V	47.90	83.31	35.41
7318.8 (1)	P	100	1000	V	52.62 (2)	74	21.38
8234.1 (1)	P	149	1000	V	57.07	74	16.93
8234.1 (1)	Av	149	1000	V	53.88	54	0.12
9149 (1)	P	197	1000	V	56.14	74	17.86
9149 (1)	Av	197	1000	V	53.98	54	0.02

P= Peak, QP=Quasi-peak, Av=Average
(1) Restricted bands of operation in 15.205
(1) Restricted bands of operation as defined in Table 6 of RSS-Gen
(2) The peak level is lower than the average limit (54 dBµV/m)

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 103.31 dBµV/m on channel at 902.3 MHz. So the applicable limit is 83.31 dBµV/m.

In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

In addition, radiated emissions which fall in the restricted band, as defined in Table 6 of RSS-Gen, must also comply with the radiated emission limits specified in Table 4 and Table 5 of RSS-Gen.

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 2 appendixes to be forwarded □□□

APPENDIX 1: Test equipment list

Carrier frequency separation

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
Low-noise amplifier ASC805C	ASC	19274
Attenuator 20dB	Midwest Microwave	8549
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	RS Commander V2.4.2	//

Number of hopping frequencies

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
Low-noise amplifier ASC805C	ASC	19274
Attenuator 20dB	Midwest Microwave	8549
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	RS Commander V2.4.2	//

Dwell time

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
Low-noise amplifier ASC805C	ASC	19274
Attenuator 20dB	Midwest Microwave	8549
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	RS Commander V2.4.2	//

Occupied bandwidth

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
Low-noise amplifier ASC805C	ASC	19274
Attenuator 20dB	Midwest Microwave	8549
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	RS Commander V2.4.2	//

Band edge

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
Low-noise amplifier ASC805C	ASC	19274
Attenuator 20dB	Midwest Microwave	8549
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	RS Commander V2.4.2	//

Peak conducted output power

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESW44	Rohde & Schwarz	17008
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7171
Log periodic antenna HL223	Rohde & Schwarz	7190
N-1.5M Cable	SUCOFLEX	7279
N-1.5M Cable	EMITECH	8813
N-1.5M Cable	GYL	8785
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.18.0.26	0000

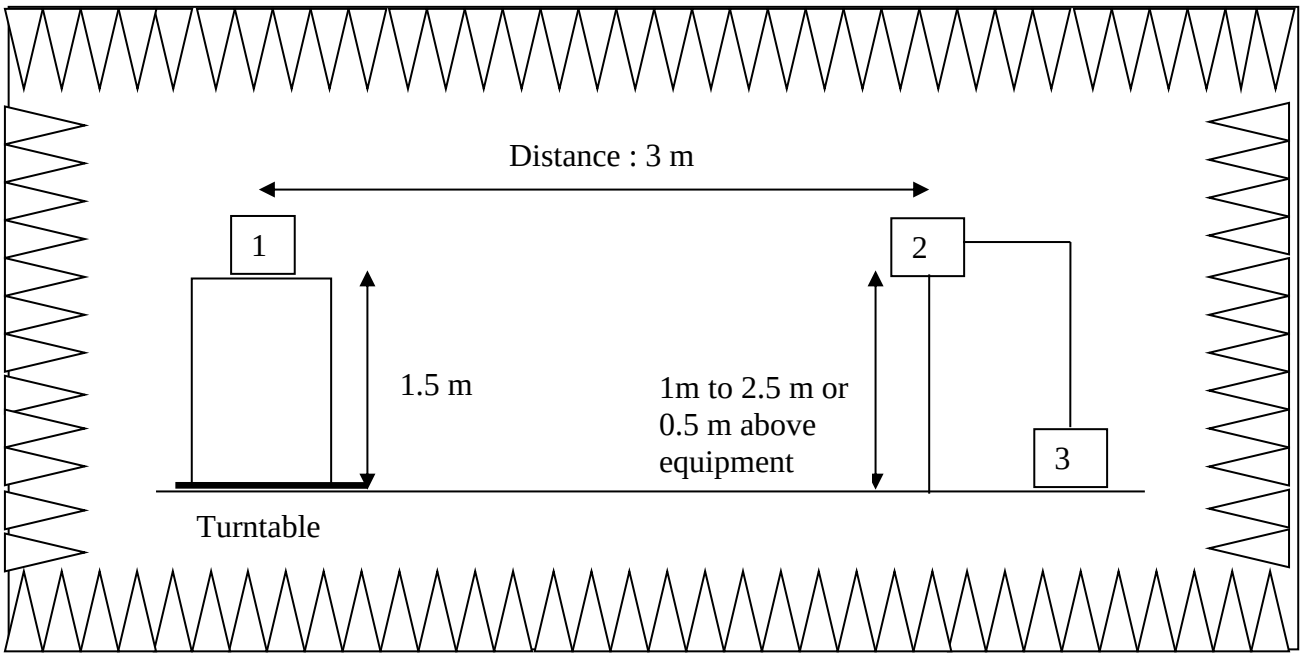
Radiated spurious emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESW44	Rohde & Schwarz	17008
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Loop antenna 6502	EMCO	1406
Biconical antenna VHA 9103	Schwarzbeck	8528
Biconical antenna 3110	Emco	7240
Log periodic antenna HL223	Rohde & Schwarz	7171
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3117	ETS-Lindgren	10771
Low-noise amplifier ASC805C	ASC	19274
Low-noise amplifier S005180M3201	LUCIX Corp.	12590
N-1.5M Cable	SUCOFLEX	7279
N-1.5M Cable	EMITECH	8813
N-1.5M Cable	GYL	8785
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
Low pass filter WLJS800-C11/60EE	Wainwright	4393
Notch filter 500-1000MHz	K&L Microwave	8972
High pass filter HP1200MHz	HP	7302
High pass filter HP12/3200-5AA	Filtek	8262
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.18.0.26	0000
Software	Champ libre Juigné. V3.5	8864

APPENDIX 2: Radiated Test Setup

Anechoic chamber setup

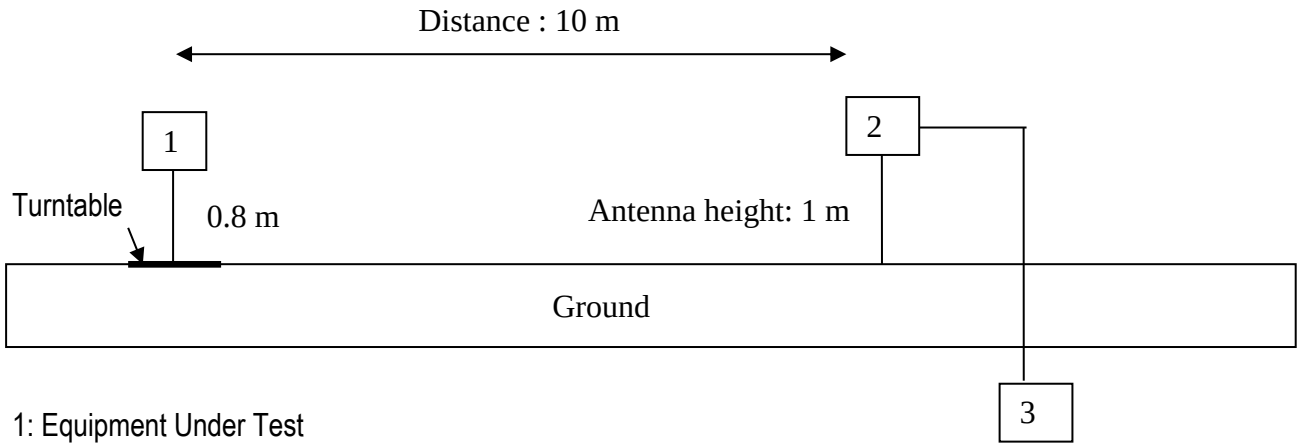
Above 1 GHz



1: Equipment Under Test
2: Measurement antenna
3: Measurement equipment

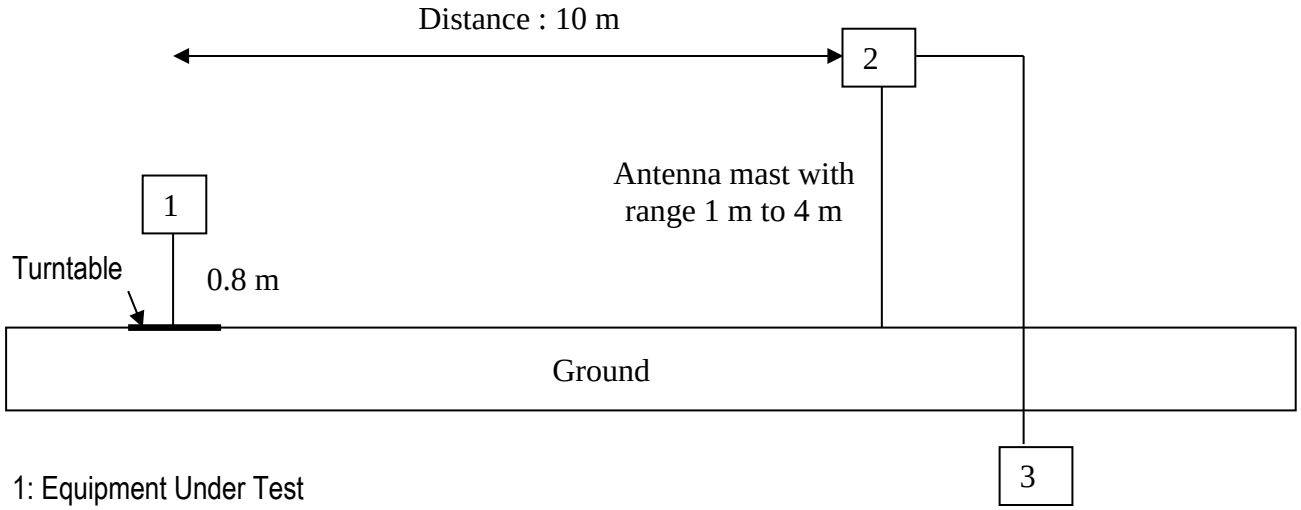
Open area setup

Below 30 MHz



1: Equipment Under Test
2: Measurement antenna
3: Measurement equipment

Between 30 MHz and 1 GHz



1: Equipment Under Test
2: Measurement antenna
3: Measurement equipment