

RR-21-B311-KER-1-A Ed. 0

## Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

RSS GEN – Issue 5

RSS 247 – Issue 2

Equipment under test:

*Wirnet™ iStation 915H*

FCC ID: **2AFYS-KLKWI915H**

IC NUMBER: **20637-KLKWI915H**

Company:

**KERLINK**

**Distribution:** Mr GILBERT

(Company: KERLINK)

**Number of pages:** 45 with 1 appendix

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
0	8-Nov-21	Creation	S. LOUIS, Radio Technician	

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



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**DESIGNATION OF PRODUCT:** WirnetTM iStation 915H

**Serial number (S/N):** 041CJa010202

**Reference / model (P/N):** Wirnet iStation 915H

**Software version for test:** 4.2.2

**Firmware version for test:** Keros 5.0.1-klk14

**MANUFACTURER:** KERLINK

**COMPANY SUBMITTING THE PRODUCT:**

**Company:** KERLINK

**Address:** 1 RUE JACQUELINE AURIOL  
35235 THORIGNE-FOUILLARD  
FRANCE

**Responsible:** Mr DELIBIE

**DATES OF TEST:** From 27-Oct-21 to 29-Oct-21

**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:** T. LEDRESSEUR

**VISA:**



**WRITTEN BY:** T. LEDRESSEUR

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## REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	29-Oct-21	/	Creation

## 1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **Wirnet™ iStation 915H**, in accordance with normative reference.

The product is a LoRa gateway composed by a LoRa function not certified and a 3G/LTE module already certified FCC ID: XMR201903EG25G). / (IC:10224A-201903EG25G).

The LoRa can emit following 2 frequencies plan:

- 923.3 MHz to 927.5 MHz (DTS class)
- 903.9MHz to 905.3 MHz (Hybrid)

This radio test report concerns only the test realized in order to certify the LoRa Hybrid function, CFR47 FCC subpart C (§15.247).

## 2. PRODUCT DESCRIPTION

Category of equipment (ISED): I

Class: B

Utilization: Residential use

Power source: 120 Vac – 60 Hz by AC/DC POE adapter

Antenna type and gain: External antenna, gain 6dBi (dipole array)

Operating frequency range: From 903.9 MHz to 905.3 MHz

Number of channels: 8

Channel spacing: 200kHz

Modulation: LoRa (Chirp spread spectrum)

Spread Factor: 9

During test the output power was adjusted at the maximal level with the following setting (Power 24)

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 (2021)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for Compliance Testing of Unlicensed Wireless Devices.
558074 D01 DTS v05 r02	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
RSS-Gen	Issue 5, April 2018 General Requirements for Compliance of Radio Apparatus
RSS-247	Issue 2, February 2017 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 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 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	13/04/2021	1	13/04/2022
4087	Filtek LP03/1000-7GH	Low Pass Filter	25/02/2020	3	24/02/2023
4088	R&S FSP40	Spectrum Analyzer	04/05/2020	2	04/05/2022
7279	SUCOFLEX SF104 N 1.5m	Cable	11/06/2020	2	11/06/2022
7310	Filtek HP12/1200-5AA	High-pass filter	25/02/2020	3	24/02/2023
8508	California instruments 1251RP	Power source	(1)	(1)	(1)
8528	Schwarzbeck VHA 9103	Biconical antenna	09/03/2019	3	08/03/2022
8535	EMCO 3115	Antenna	28/04/2020	3	28/04/2023
8549	Midwest Microwave 20dB	Attenuator	21/03/2019	3	20/03/2022
8590	RG214 N-5m	Cable	25/02/2020	2	24/02/2022
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8635	R&S EZ-25	High-pass filter	04/09/2021	3	03/09/2024
8719	Thurby Thandar Instruments 1600	LISN	26/02/2020	2	25/02/2022
8732	Emitech	OATS	03/07/2019	3	02/07/2022
8750	La Crosse Technology WS-9232	Meteo station	22/09/2020	2	22/09/2022
8783	EMCO 3147	Log periodic antenna	09/03/2019	3	08/03/2022
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	/	/	/
9398	N-1.5m	cable	11/06/2020	2	11/06/2022
10651	EMITECH	Absorber sheath current	25/02/2020	2	24/02/2022
10730	Mini-circuit ZFL-1000LN	Low-noise amplifier	26/01/2021	1	26/01/2022
10788	Emitech	Outside room Hors cage	/	/	/
10811	R&S EMC 32	Software	/	/	/
11592	R&S NRV-Z86	Power Sensor	03/08/2021	2	03/08/2023
12590	LUCIX Corp S005180M3201	Low-noise amplifier	26/07/2021	1	26/07/2022
12911	Huber + Suhner N-2m	cable	11/06/2020	2	11/06/2022
12912	Huber + Suhner N-5m	cable	11/06/2020	2	11/06/2022
14302	SUCOFLEX N-1m	cable	26/01/2021	2	26/01/2023
14303	SUCOFLEX N-2m	cable	26/01/2021	2	26/01/2023

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
14304	SUCOFLEX N-2.5m	cable	26/01/2021	2	26/01/2023
14736	MATURO	Turntable and mat controller MCU	/	/	/
14831	Fluke 177	Multimeter	25/02/2020	2	24/02/2022
15882	SUCOFLEX	cable N 5m	26/01/2021	2	26/01/2023
17008	R&S ESW44	Test Receiver	17/04/2020	2	17/04/2022

(1) The equipment is not verified; instead, the output voltage is checked before each measurement with the calibrated multimeter.

## 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				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS	X				Note 3
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 4
	(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	
	(a) (2) Digital modulation techniques				X	
	(b) Maximum peak output power	X				
	(c) Operation with directional antenna gains > 6 dBi				X	
	(d) Intentional radiator	X				
	(e) Peak power spectral density	X				
	(f) Hybrid system	X				
	(g) Frequency hopping requirements	X				
	(h) Frequency hopping intelligence	X				
	(i) RF exposure compliance	X				

NAp: Not Applicable

NAs: Not Asked

Note 1: Professionally installed

Note 2: See FCC part 15.247 (d).

Note 3: The host devices of the certified modules shall be properly labeled to identify the module(s) within.

Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

## 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				
§ 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		
5.2	Digital transmission systems			X		
5.3	Hybrid systems	X				
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

**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	$\pm 0.75$ dB
Radiated emission valid to 26 GHz	
$F < 62.5$ MHz:	$\pm 5.14$ dB
$62.5$ MHz $< F < 1$ GHz:	$\pm 5.13$ dB
$1$ GHz $< F < 26$ GHz:	$\pm 5.16$ dB
AC Power Lines conducted emissions	$\pm 3.38$ dB
Temperature	$\pm 1$ °C
Humidity	$\pm 5$ %

## 8. AC CONDUCTED EMISSIONS

**Temperature (°C) : 22**

**Humidity (%HR): 43**

**Date : October 28, 2021**

**Technician : T. LEDRESSEUR**

**Standard:** FCC Part 15  
RSS-Gen

**Test procedure:**

For FCC Part 15: Paragraph 15.207  
For RSS-Gen: Paragraph 8.8  
Method of paragraph 6.2 of ANSI C63.10

**Software used:** BAT-EMC V3.18.0.26

**Test set up:**

The EUT is isolated and placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane. The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.

**Frequency range:** 150 kHz - 30 MHz

**Detection mode:** Peak / Quasi-peak / Average

**Bandwidth:** 10 kHz / 9 kHz

**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.

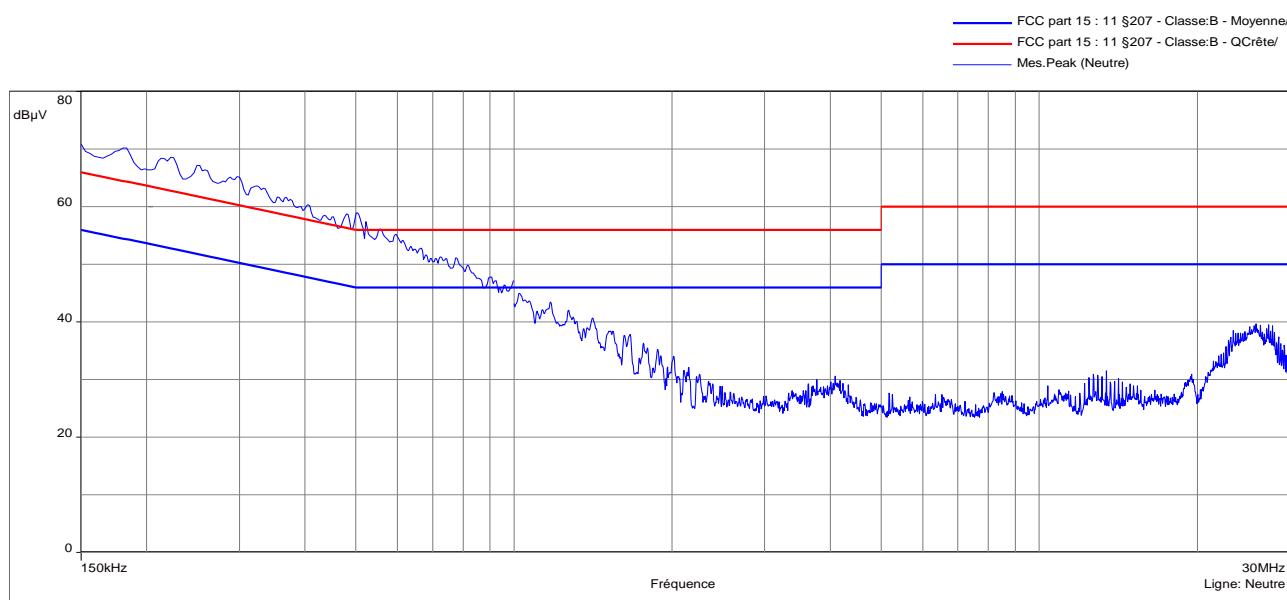
## Results:

### Sample N° 1:

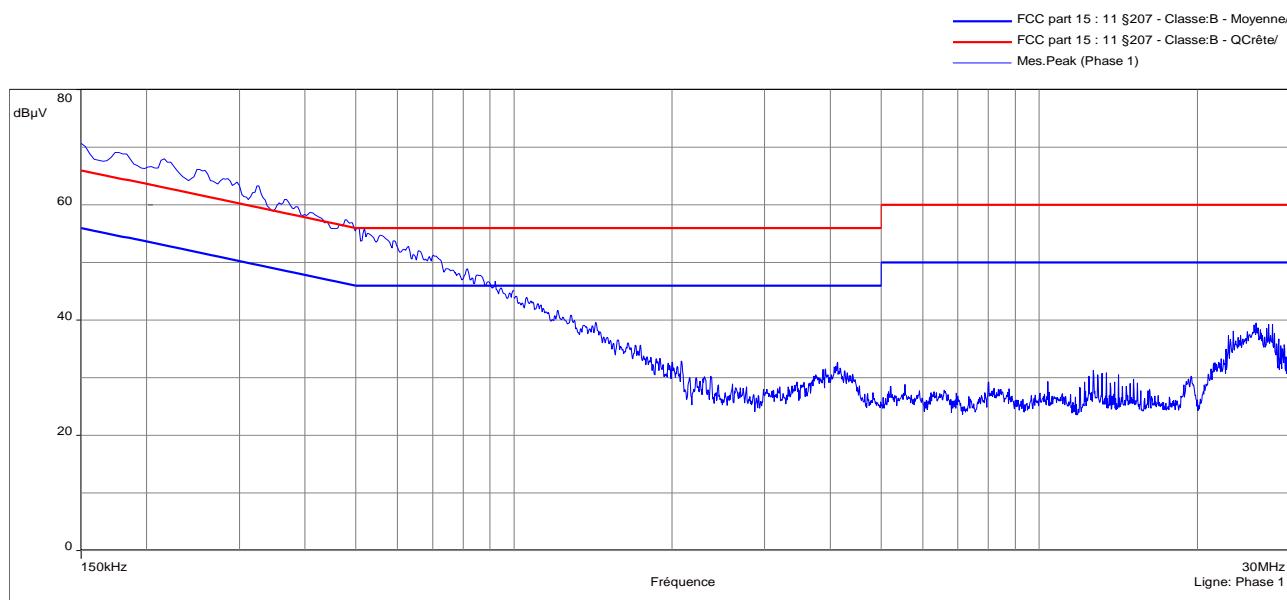
#### Measurement on the mains power supply:

The measurement is first realized with peak detector.

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



The highest frequencies are then analyzed with Quasi-peak detector and Average detector

Table N° 1: measurement on the Neutral, for the frequency range:

Frequency	Quasi-peak	QP Limit	QP margin
(MHz)	(dB $\mu$ V)	(dB $\mu$ V)	(dB)
0.150	65.58	66.0	0.42
0.183	64.12	64.3	0.18
0.249	59.93	61.8	1.87
0.258	61.19	61.5	0.31
0.261	60.19	61.4	1.21
0.288	58.49	60.6	2.11
0.294	59.16	60.4	1.24
0.297	58.62	60.3	1.68
0.330	56.99	59.4	2.41
0.366	54.37	58.6	4.23
0.369	54.25	58.5	4.25
0.372	53.55	58.5	4.95
0.516	51.68	56.0	4.32
0.598	45.54	56.0	10.46
0.778	40.94	56.0	15.06

Frequency	Average	Average Limit	Average margin
(MHz)	(dB $\mu$ V)	(dB $\mu$ V)	(dB)
0.150	47.63	56.0	8.37
0.183	47.39	54.3	6.91
0.249	39.03	51.8	12.77
0.258	43.22	51.5	8.28
0.261	41.32	51.4	10.08
0.288	38.58	50.6	12.02
0.294	41.02	50.4	9.38
0.297	39.95	50.3	10.35
0.330	38.33	49.4	11.07
0.366	35.18	48.6	13.42
0.369	35.88	48.5	12.62
0.372	34.18	48.5	14.32
0.516	34.97	46.0	11.03
0.598	24.64	46.0	21.36
0.778	21.86	46.0	24.14

Table N° 2: measurement on the Line, for the frequency range:

Frequency	Quasi-peak	QP Limit	QP margin
(MHz)	(dB $\mu$ V)	(dB $\mu$ V)	(dB)
0.150	61.91	66.0	4.09
0.177	63.77	64.6	0.83
0.216	62.19	63.0	0.81
0.285	58.64	60.7	2.06
0.369	52.27	58.5	6.23
0.814	39.7	56.0	16.3

Frequency	Average	Average Limit	Average margin
(MHz)	(dB $\mu$ V)	(dB $\mu$ V)	(dB)
0.150	40.11	56.0	15.89
0.177	46.7	54.6	7.9
0.216	44.32	53.0	8.68
0.285	40.04	50.7	10.66
0.369	28.78	48.5	19.72
0.814	19.31	46.0	26.69

**Test conclusion:**

RESPECTED STANDARD

## 9. CARRIER FREQUENCY SEPARATION

Temperature (°C) : 21

Humidity (%HR): 42

Date : October 27, 2021

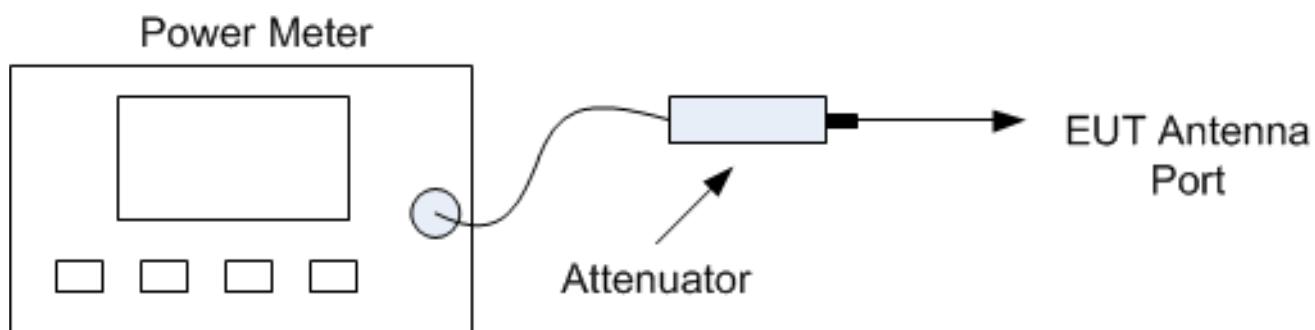
Technician : T. LEDRESSEUR

Standard: FCC Part 15  
RSS-247

Test procedure: Method of paragraphs 7.8.2 of ANSI C63.10

Test set up:

Conducted test



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	$\geq$ RBW
Trace	Max hold
Sweep	Auto.

Test operating condition of the equipment:

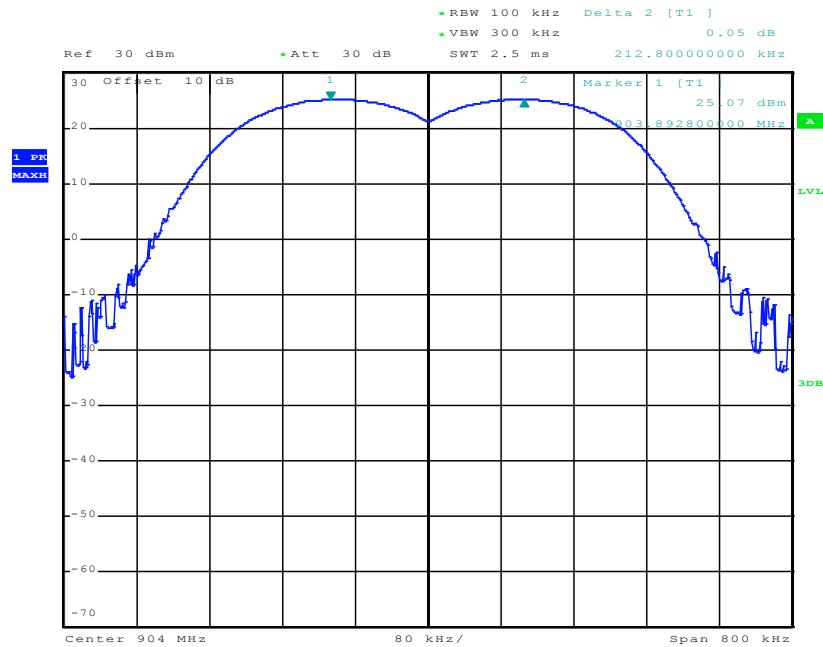
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac – 60 Hz by AC/DC adapter

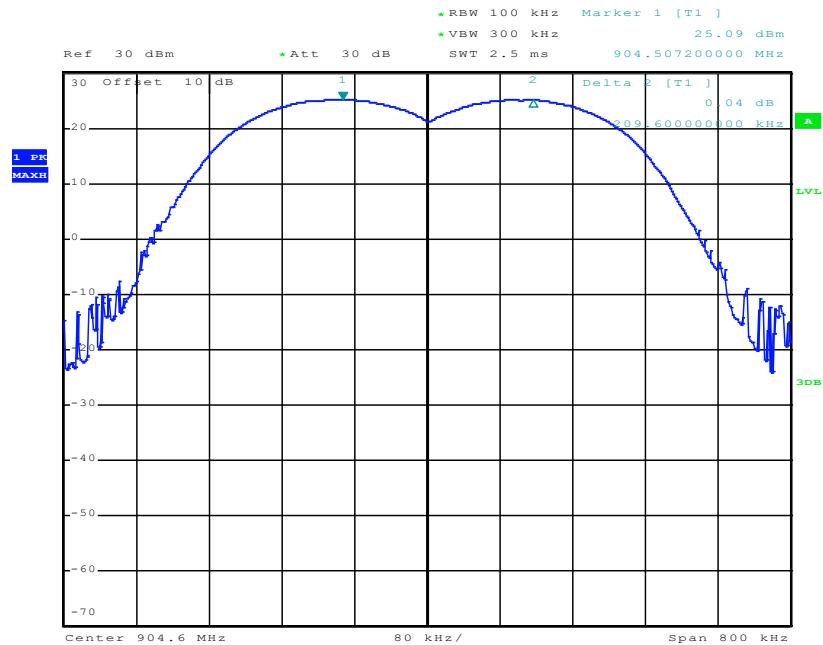
Percentage of voltage variation during the test (%):  $\pm 1$

**Results:**
Sample N° 1

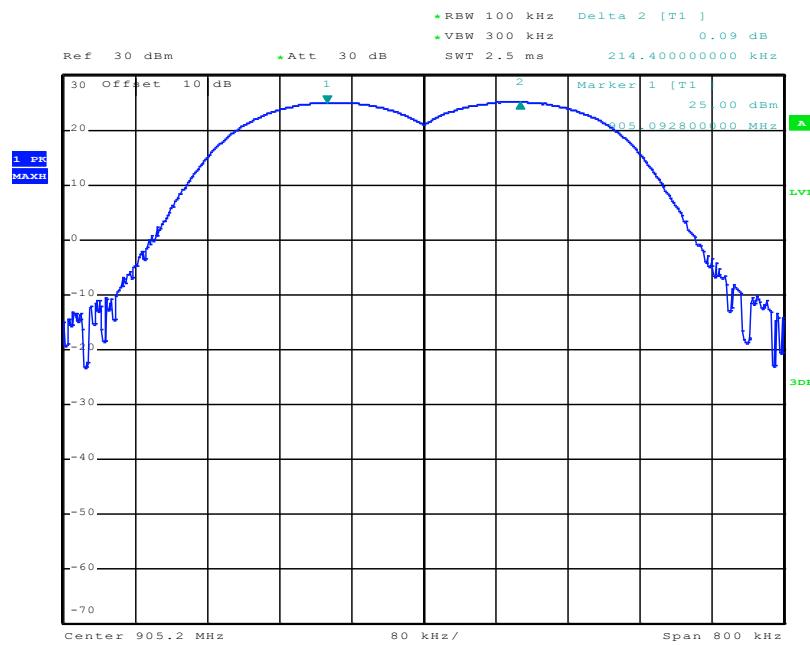
## Channel 903.9 MHz and Channel 904.1 MHz



## Channel 904.5 MHz and Channel 904.7 MHz



## Channel 905.1 MHz and Channel 905.3 MHz


**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

## 10. NUMBER OF HOPPING FREQUENCIES

Temperature (°C) : 21

Humidity (%HR): 42

Date : October 27, 2021

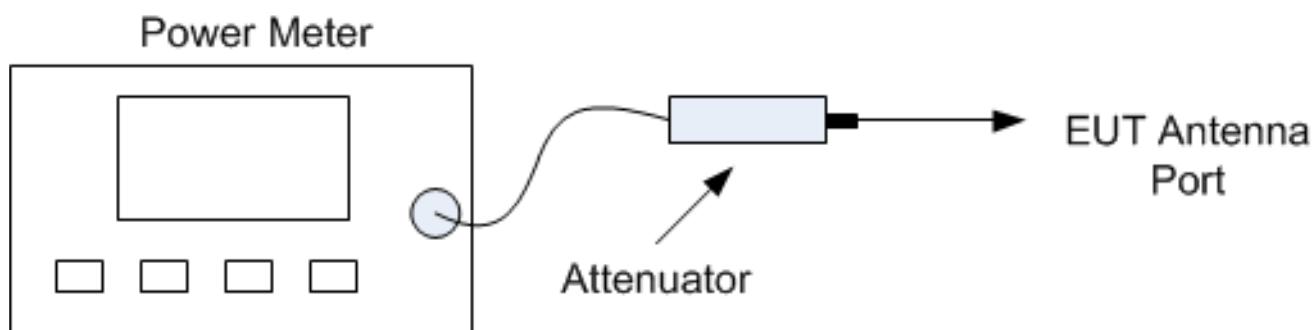
Technician : T. LEDRESSEUR

Standard: FCC Part 15  
RSS-247

Test procedure: Method of paragraphs 7.8.3 of ANSI C63.10

Test set up:

Conducted test



Setting:

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

### **Test operating condition of the equipment:**

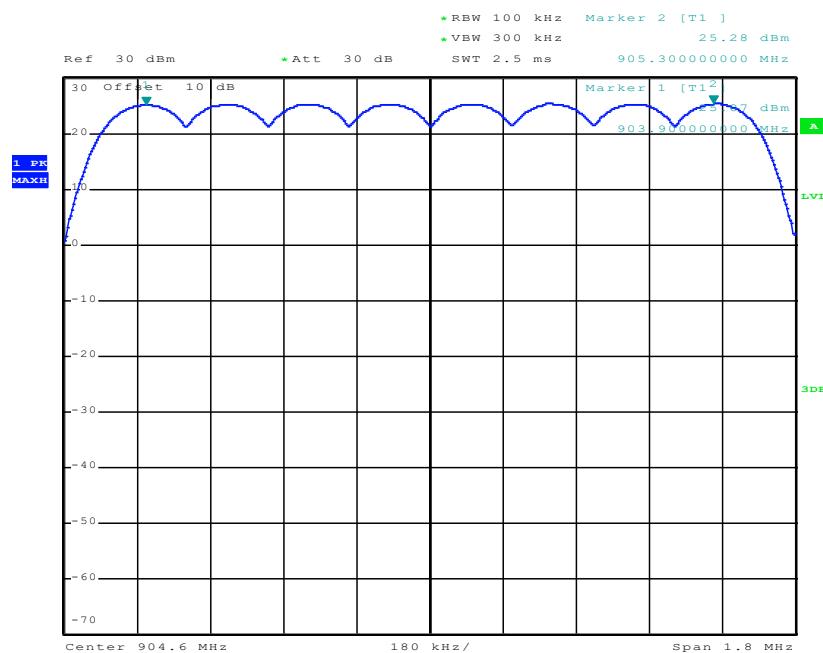
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac – 60 Hz by AC/DC adapter

Percentage of voltage variation during the test (%):  $\pm 1$

## Results:

## Sample N° 1



Number of channel used: 8

Measure realized for reporting only

## Test conclusion:

## RESPECTED STANDARD

## 11. DWELL TIME

Temperature (°C) : 21

Humidity (%HR): 42

Date : October 27, 2021

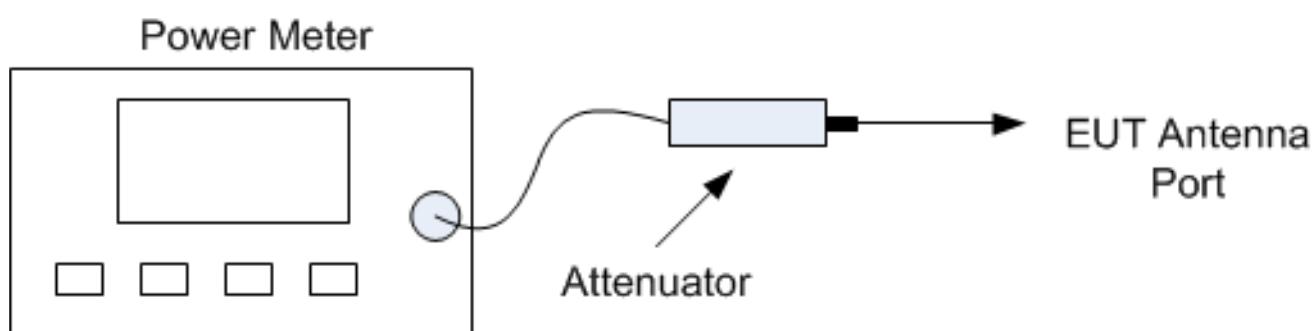
Technician : T. LEDRESSEUR

Standard: FCC Part 15  
RSS-247

Test procedure: Method of paragraphs 7.8.4 of ANSI C63.10

Test set up:

Conducted test



Setting:

Center frequency	Hopping channel
Detector	Peak
Span	Zero
RBW	$\leq$ channel spacing
VBW	$\geq$ RBW
Trace	Max hold
Sweep	<u>First</u> : As necessary to capture the entire dwell time per hopping channel <u>Second</u> : sweep time to determine the number of hops over the period specified in the requirements

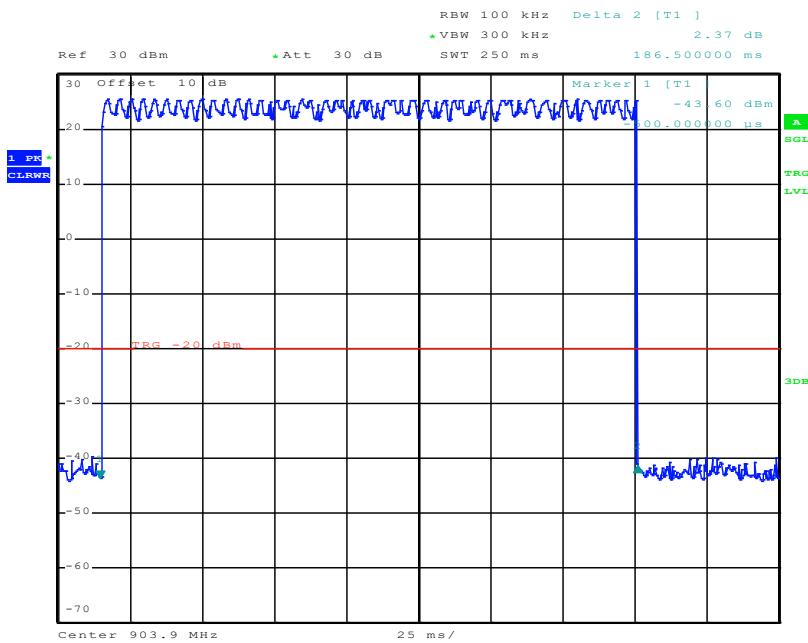
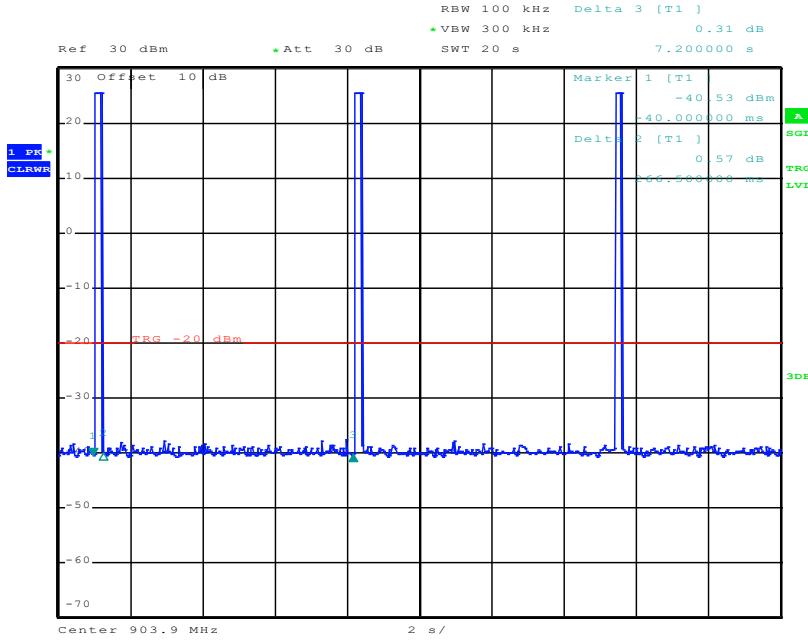
**Test operating condition of the equipment:**

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.

Power source: 120 Vac – 60 Hz by AC/DC adapter

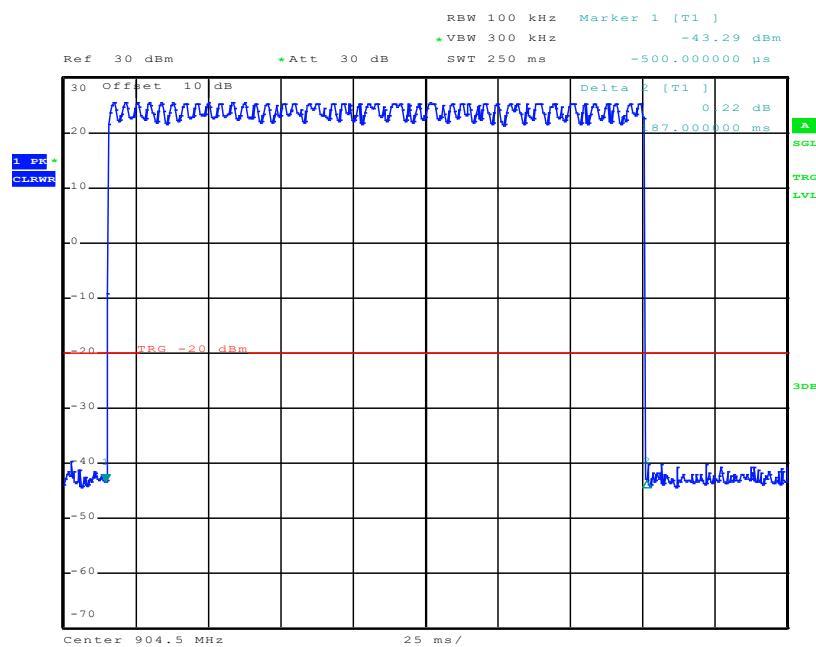
Percentage of voltage variation during the test (%):

$\pm 1$

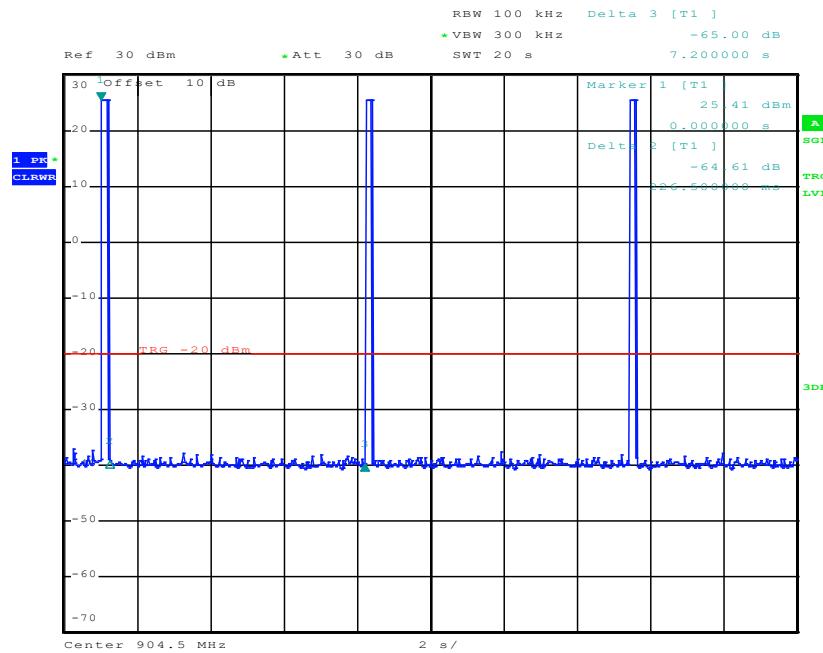
**Results:**
Sample N° 1
**Burst duration - Channel 903.9 MHz**

**Burst repetition during observation period duration - Channel 903.9 MHz**


Number of channels	Observation period (0.4s * Nbr of channel) (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (s)	Limits (s)
8	3.2	186.5	1	0.1865	0.4

## Burst duration - Channel 904.5 MHz

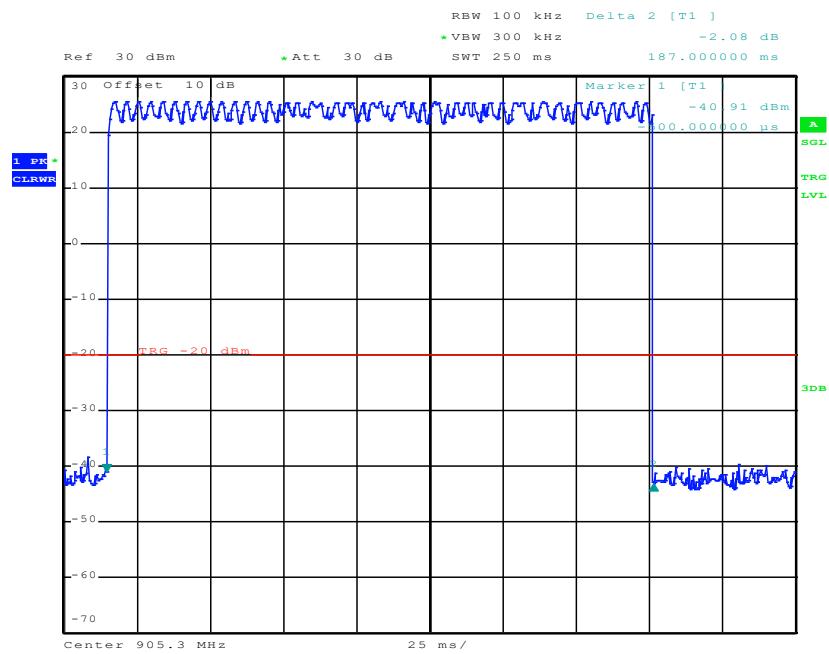


## Burst repetition during observation period duration - Channel 904.5 MHz

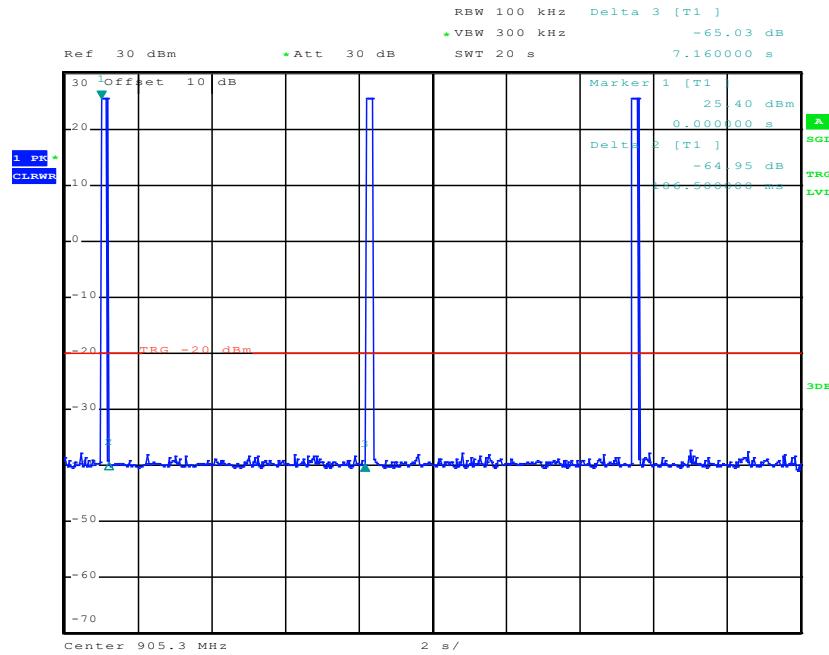


Number of channels	Observation period (0.4s * Nbr of channel) (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (s)	Limits (s)
8	3.2	187	1	0.187	0.4

## Burst duration - Channel 905.3 MHz



## Burst repetition during observation period duration - Channel 905.3 MHz



Number of channels	Observation period (0.4s * Nbr of channel) (s)	Maximal Duration of each burst (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (s)	Limits (s)
8	3.2	187	1	0.187	0.4

## Test conclusion:

## RESPECTED STANDARD

## 12. OCCUPIED BANDWIDTH

Temperature (°C) : 21

Humidity (%HR): 42

Date : October 27, 2021

Technician : T. LEDRESSEUR

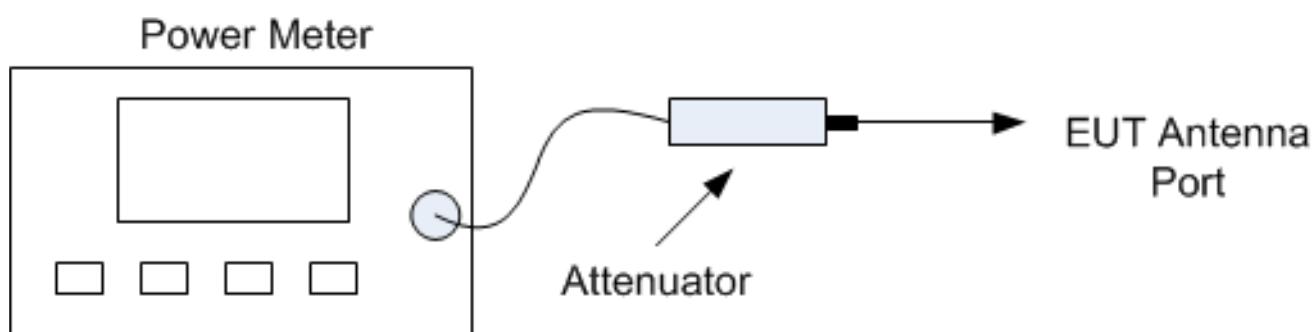
Standard: FCC Part 15  
RSS-247

**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:**

Conducted test



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:**

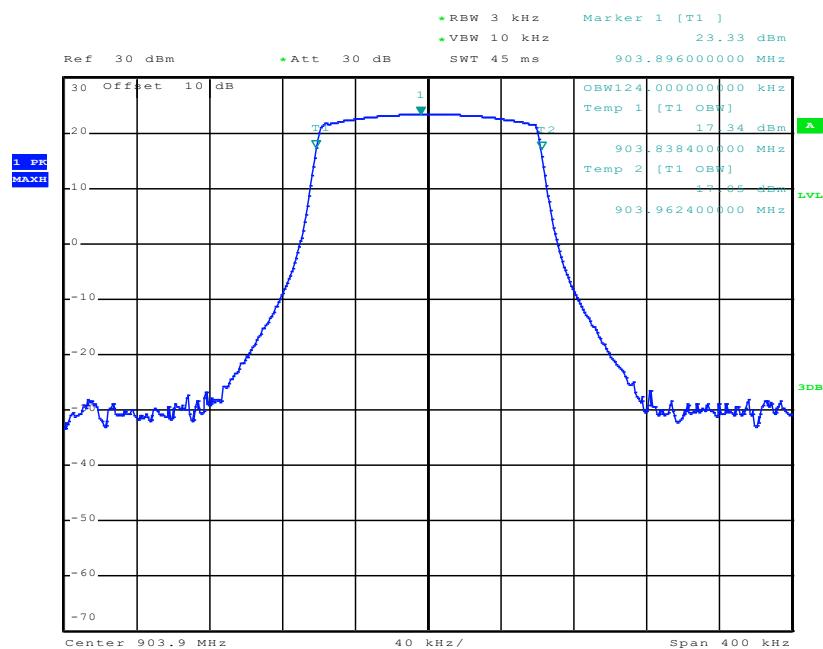
The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac – 60 Hz by AC/DC adapter

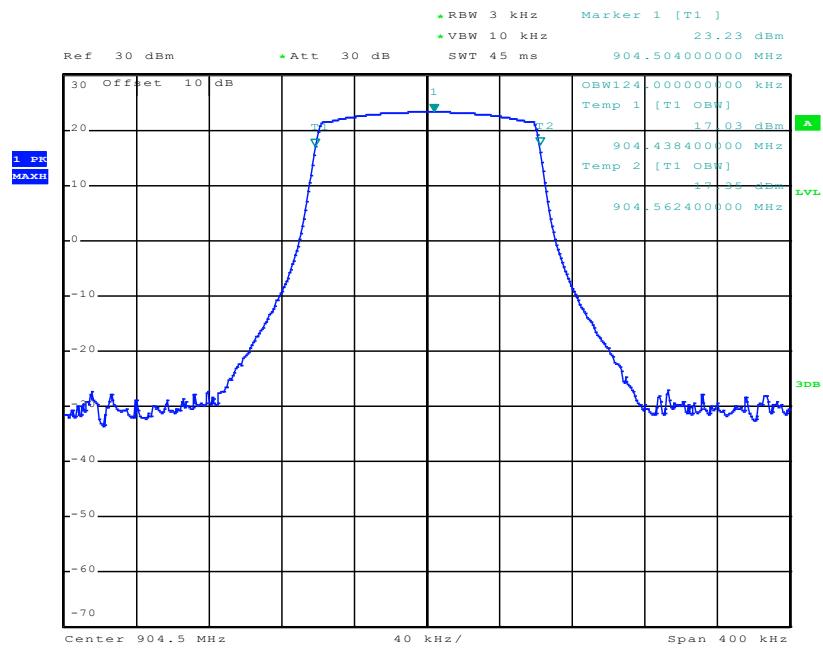
Percentage of voltage variation during the test (%):  $\pm 1$

**Results:**
Sample N° 1

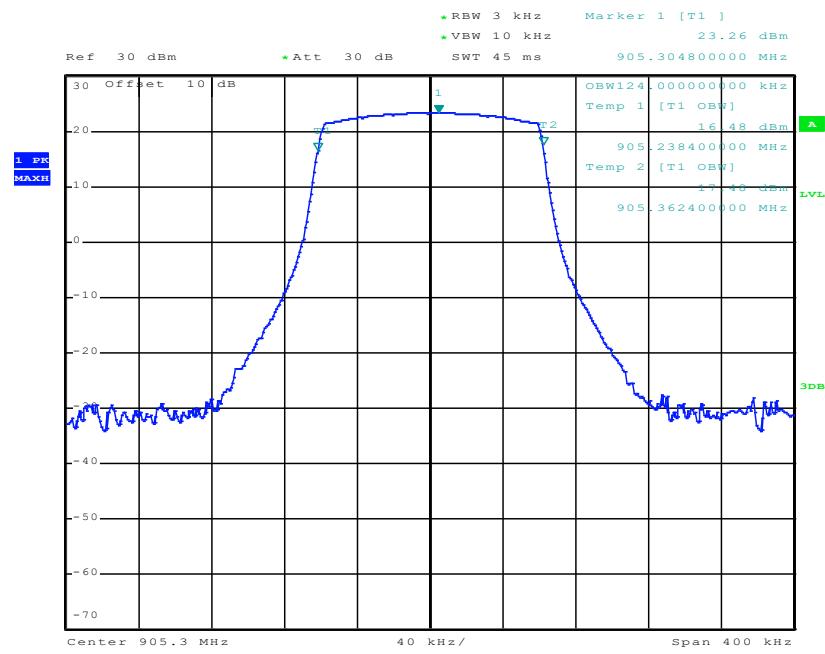
## 99% bandwidth – Channel 903.9 MHz



## 99% bandwidth – Channel 904.5 MHz

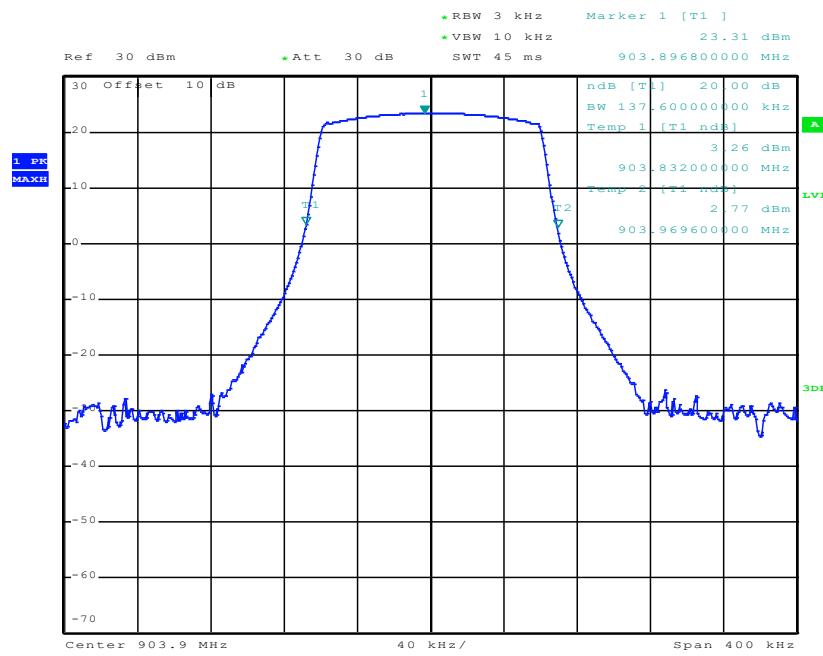


99% bandwidth – Channel 905.3 MHz

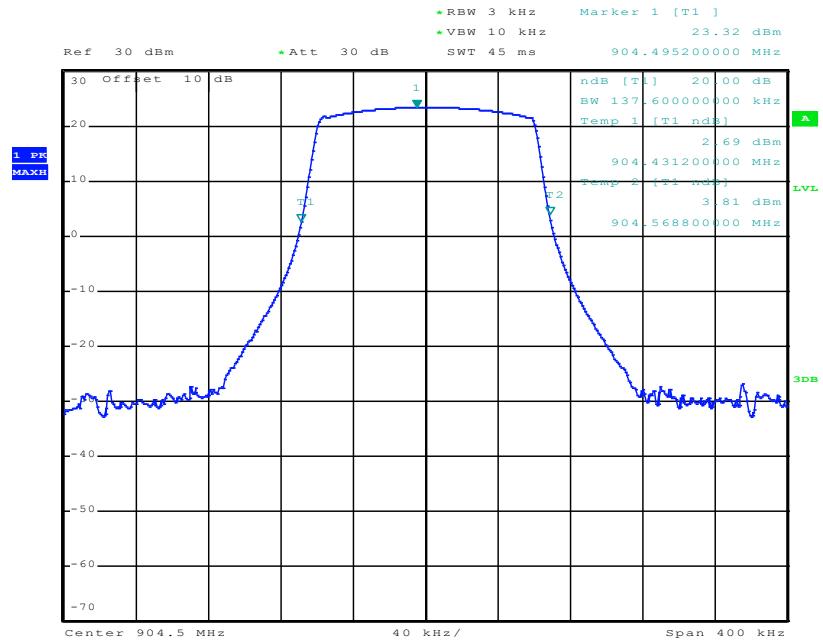


Measure realized for reporting only

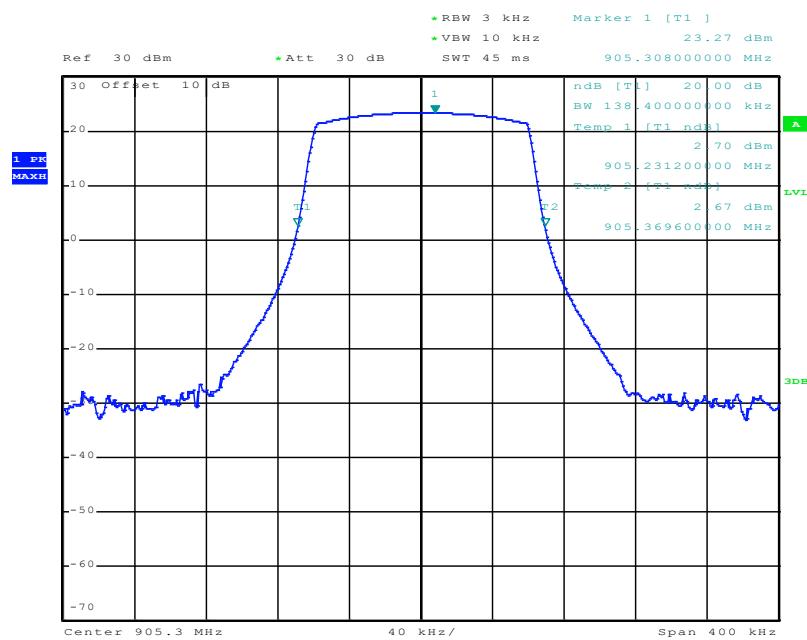
## 20dB bandwidth – Channel 903.9 MHz



## 20dB bandwidth – Channel 904.5 MHz



## 20dB bandwidth – Channel 905.3 MHz



Measure realized for reporting only

**Test conclusion:**

RESPECTED STANDARD

**13. BAND EDGE****Temperature (°C) : 21****Humidity (%HR): 42****Date : October 27, 2021****Technician : T. LEDRESSEUR****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.

Power source: 120 Vac – 60 Hz by AC/DC adapter

Percentage of voltage variation during the test (%):  $\pm 1$ 

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

**Results:**

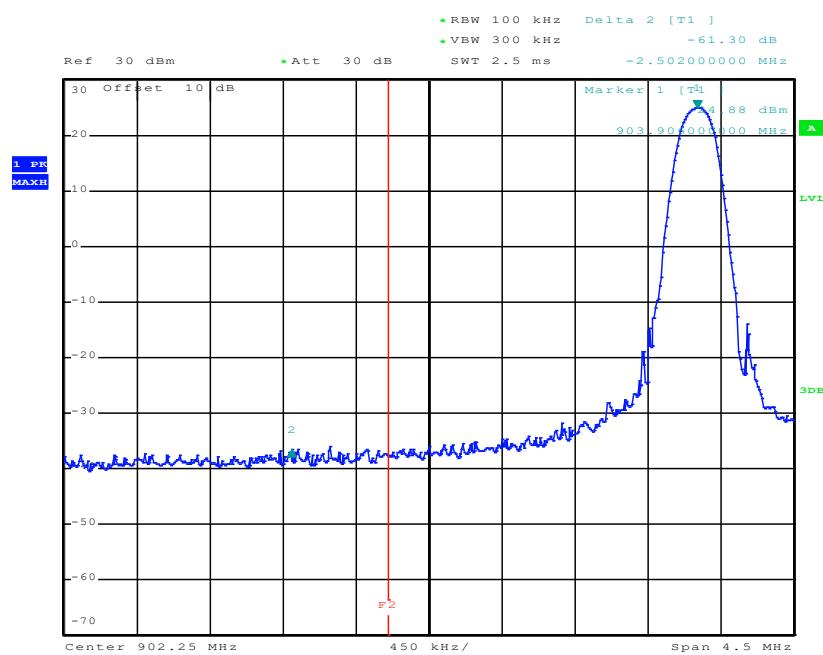
Lower Band Edge: From 900 MHz to 902 MHz

Upper Band Edge: From 928 MHz to 930 MHz

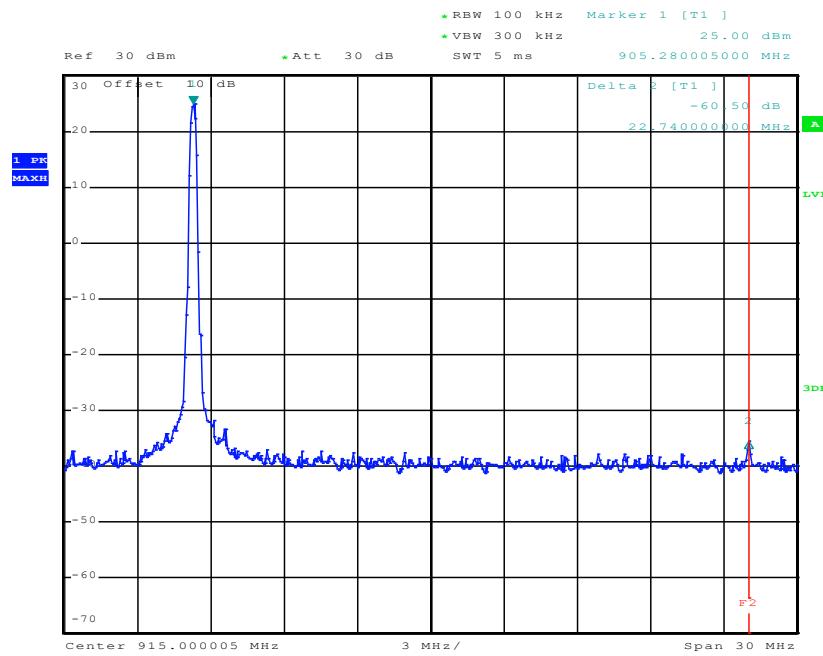
## Sample N° 1

Fundamental frequency (MHz)	RBW (kHz)	Detector	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dBc)	Limit (dBc)	Margin (dB)
903.9	100	Peak	901.403	61.3	30	31.3
905.3	100	Peak	928.02	60.5	30	30.5

## Low channel



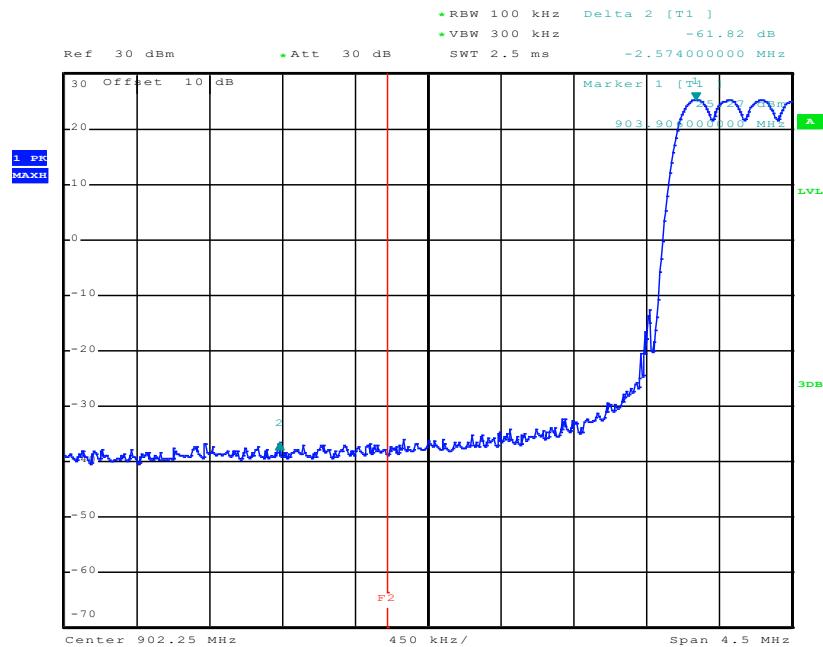
## High channel



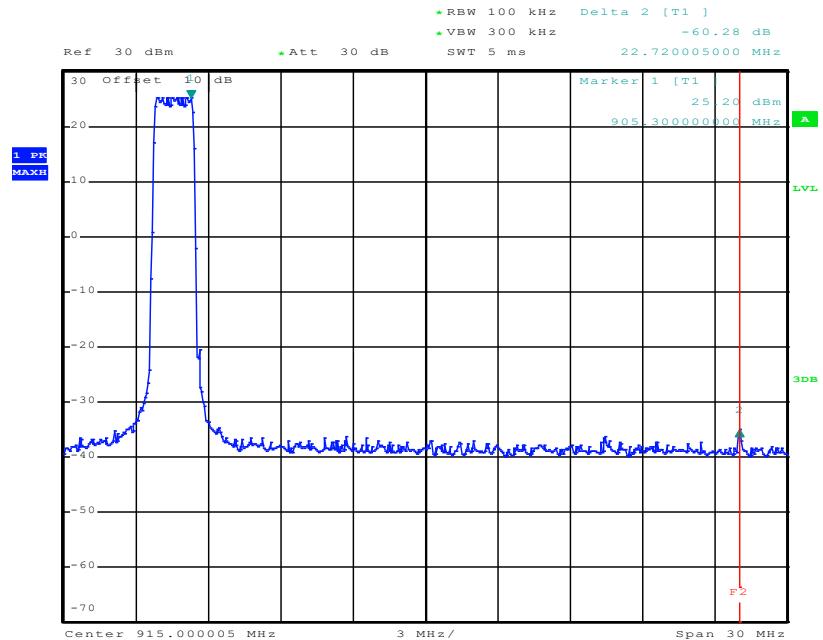
## Sample N° 1

Fundamental frequency (MHz)	RBW (kHz)	Detector	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dBc)	Limit (dBc)	Margin (dB)
903.9	100	Peak	901.331	61.82	30	31.82
905.3	100	Peak	928.02	60.28	30	30.28

## Low channel -hopping function activated



## High channel -hopping function activated



## Test conclusion:

RESPECTED STANDARD

## 14. CONDUCTED OUTPUT POWER

Temperature (°C) : 21

Humidity (%HR): 42

Date : October 27, 2021

Technician : T. LEDRESSEUR

Standard: FCC Part 15  
RSS-247

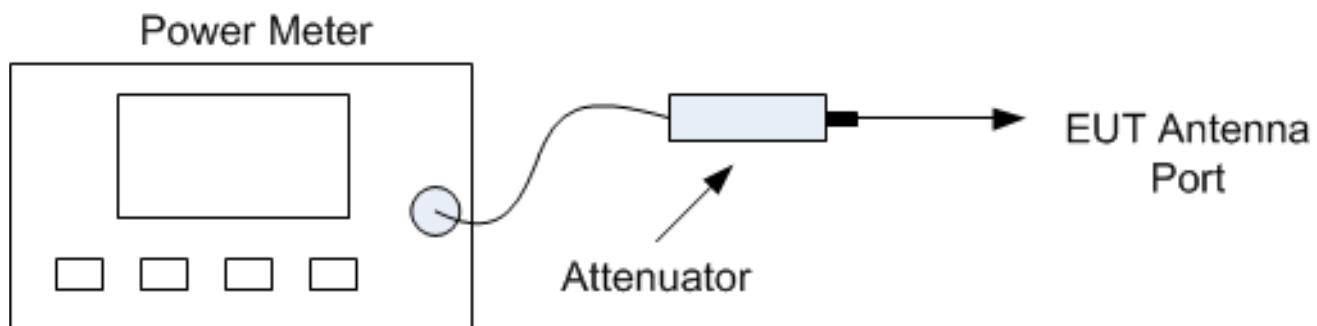
**Test procedure:**

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

AVGPM-G method (using a gated RF average-reading power meter) of paragraph 11.9.2.3.2 of ANSI C63.10

**Test set up:**

Conducted test



The measure is realized in conducted mode with a calibrated gated RF average reading power meter.

**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.

Power source: 120 Vac – 60 Hz by AC/DC adapter

Percentage of voltage variation during the test (%):  $\pm 1$

**Results:**

Sample N° 1      Channel 903.9MHz

	Maximum conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	24.6	0.288	1

Declared maximum antenna gain: 6 dBi

Sample N° 1      Channel 904.5MHz

	Maximum conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	24.6	0.288	1

Declared maximum antenna gain: 6 dBi

Sample N° 1      Channel 905.3MHz

	Maximum conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	24.6	0.288	1

Declared maximum antenna gain: 6 dBi

**Test conclusion:**

RESPECTED STANDARD

**15. RADIATED SPURIOUS EMISSIONS****Temperature (°C) : 22****Humidity (%HR): 43****Date : October 28, 2021****Technician : T. LEDRESSEUR****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 11.11 of ANSI C63.10

Emissions in restricted frequency bands method of paragraph 11.12 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 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 photos in appendix 2.

**Frequency range:** From 9 kHz to 10<sup>th</sup> harmonic of the highest fundamental frequency (905.3 MHz)

**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) / 1.5 meter (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.

Power source: 120 Vac – 60 Hz by AC/DC adapter

Percentage of voltage variation during the test (%):  $\pm 1$

**Results:**
Sample N° 1      Channel 903.9 MHz

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dB $\mu$ V/m)	Limits at 3 m (dB $\mu$ V/m)	Margin (dB)
1807.8	P	100	V	35.8	95.83	60.03
2711.7 (1)	P	1000	V	36.59 (2) (3)	74	37.41
3615.6 (1)	P	1000	V	39.46 (2) (3)	74	34.54
4519.5 (1)	P	1000	V	41.6 (2) (3)	74	32.4
5423.4 (1)	P	1000	V	42.52 (2) (3)	74	31.48
6327.3	P	100	V	43.4 (2)	95.83	52.43

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

(1) Restricted bands of operation in 15.205 and in Table 6 of RSS-Gen

(2) Noise floor

 (3) The peak level is lower than the average limit (54 dB $\mu$ V/m)

Sample N° 1      Channel 904.5 MHz

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dB $\mu$ V/m)	Limits at 3 m (dB $\mu$ V/m)	Margin (dB)
1809	P	100	V	36.1	95.83	59.73
2712.9 (1)	P	1000	V	36.47 (2) (3)	74	37.53
3616.8 (1)	P	1000	V	38.83 (2) (3)	74	35.17
4520.7 (1)	P	1000	V	40.93 (2) (3)	74	33.07
5424.6 (1)	P	1000	V	41.48 (2) (3)	74	32.52
6328.5	P	100	V	44.5 (2)	95.83	51.33

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

(1) Restricted bands of operation in 15.205 and in Table 6 of RSS-Gen

(2) Noise floor

 (3) The peak level is lower than the average limit (54 dB $\mu$ V/m)

Sample N° 1      Channel 905.3 MHz

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dB $\mu$ V/m)	Limits at 3 m (dB $\mu$ V/m)	Margin (dB)
1810.6	P	100	V	38.1	95.83	57.73
2714.5 (1)	P	1000	V	36.89 (2) (3)	74	37.11
3618.4 (1)	P	1000	V	40.1 (2) (3)	74	33.9
4522.3 (1)	P	1000	V	41.93 (2) (3)	74	32.07
5426.2 (1)	P	1000	V	42.83 (2) (3)	74	31.17
6330.1	P	100	V	42.5 (2)	95.83	53.33

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

(1) Restricted bands of operation in 15.205 and in Table 6 of RSS-Gen

(2) Noise floor

(3) The peak level is lower than the average limit (54 dB $\mu$ V/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 30 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 125.83 dB $\mu$ V/m on channel 903.9MHz.

So the applicable limit is 95.83 dB $\mu$ V/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

## 16. CONDUCTED POWER SPECTRAL DENSITY

Temperature (°C) : 21

Humidity (%HR): 42

Date : October 27, 2021

Technician : T. LEDRESSEUR

Standard: FCC Part 15  
RSS-247

**Test procedure:**

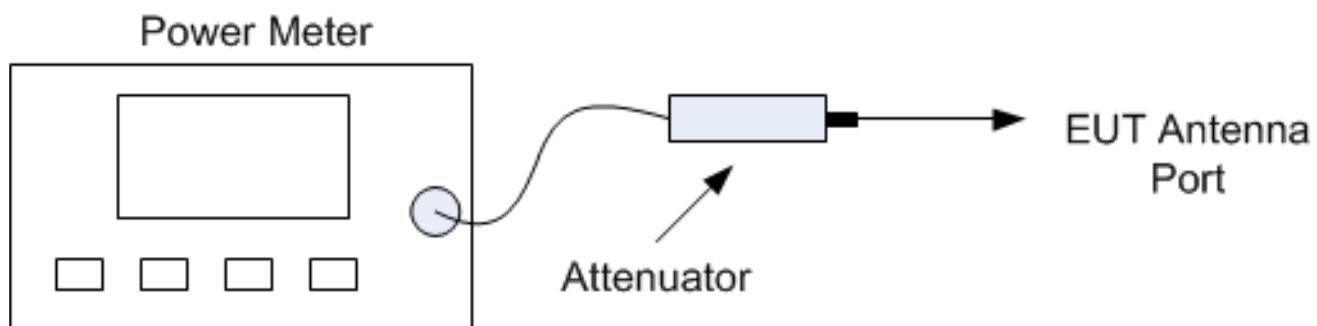
For FCC Part 15: paragraph 15.247 (e), paragraph 15.247 (f)

For RSS-247: paragraph 5.2

AVG PSD-1 of paragraph 11.10.3 of ANSI C63.10

**Test set up:**

Conducted test



The measure is realized in conducted mode with an analyser.

Span: 400 kHz

Resolution bandwidth: 3kHz

Video bandwidth: 10kHz

Detector: Power averaging (RMS)

Number of points: 501

Sweep time: auto couple

Trace mode: Average (RMS) over 1000 trace

Then the peak marker function is 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.

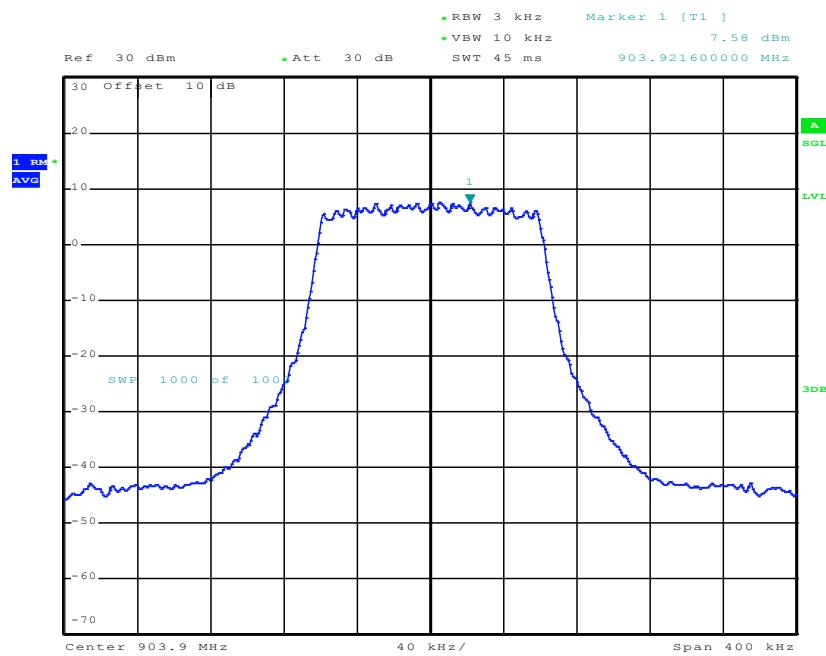
Power source: 120 Vac – 60 Hz by AC/DC adapter

Percentage of voltage variation during the test (%):  $\pm 1$

**Results:**

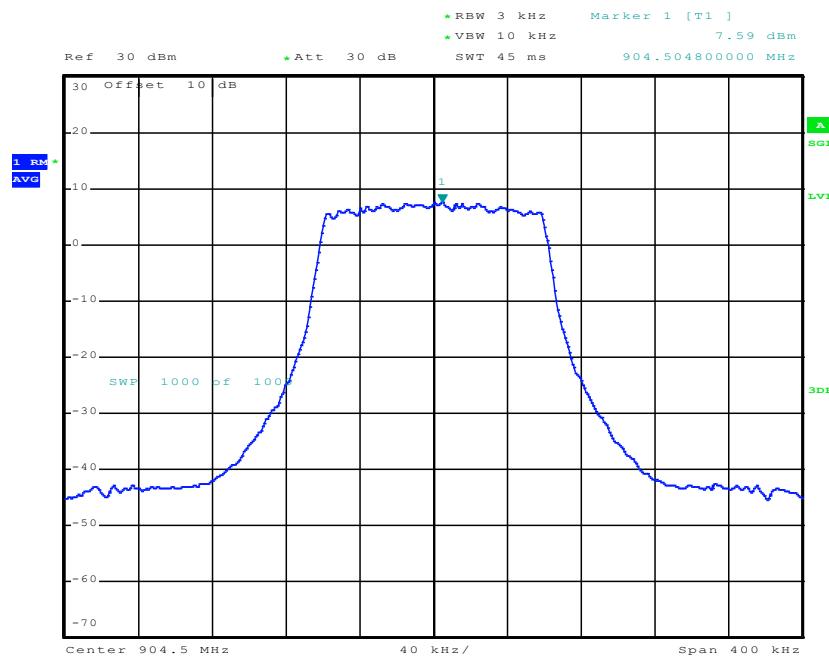
Sample N° 1      Channel 903.9 MHz

	Maximum conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	7.58	8



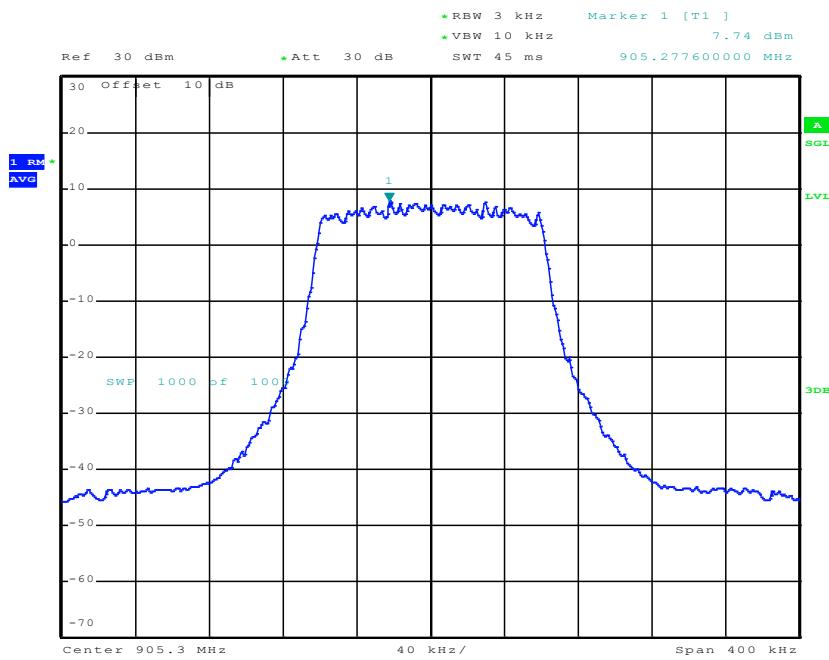
Sample N° 1 Channel 904.5 MHz

	Maximum conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
<b>Nominal supply voltage:</b>	7.59	8



Sample N° 1      Channel 905.3 MHz

	Maximum conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
<b>Nominal supply voltage:</b>	7.74	8



## APPENDIX 1: Test equipment list

### AC conducted emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	10788
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Test Receiver ESW44	Rohde & Schwarz	17008
LISN 1600	Thurby Thandar Instruments	8719
High-pass filter EZ-25	Rohde & Schwarz	8635
Absorber sheath current	Emitech	10651
Cable N-5m RG214	GYL Technologies	8590
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.18.0.26	0000

### Carrier frequency separation

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-1.5M Cable	SUCOFLEX	7279
Attenuator 20dB	Midwest Microwave	8549
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

### Number of hopping frequencies

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-1.5M Cable	SUCOFLEX	7279
Attenuator 20dB	Midwest Microwave	8549
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

**Dwell time**

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-1.5M Cable	SUCOFLEX	7279
Attenuator 20dB	Midwest Microwave	8549
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

**Occupied bandwidth**

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-1.5M Cable	SUCOFLEX	7279
Power source 1251RP	California instruments	8508
Attenuator 20dB	Midwest Microwave	8549
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

**Band edge**

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-1.5M Cable	SUCOFLEX	7279
Power source 1251RP	California instruments	8508
Attenuator 20dB	Midwest Microwave	8549
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

## Conducted output power

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Power sensor NRV-Z86	Rohde & Schwarz	11592
N-1.5M Cable	SUCOFLEX	7279
Power source 1251RP	California instruments	8508
Attenuator 20dB	Midwest Microwave	8549
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software EMC 32	Rohde et Schwarz	10811

## Radiated spurious emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Anechoic Chamber	EMITECH	8593
Turntable controller 1060C	MATURO	14736
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Test Receiver ESW44	Rohde & Schwarz	17008
Loop antenna 6502	EMCO	1406
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna 3147	EMCO	8783
Antenna 3115	EMCO	8535
Low-noise amplifier ZFL-1000LN	Mini-circuit	10730
Low-noise amplifier S005180M3201	LUCIX Corp.	12590
N-1.5M Cable	SUCOFLEX	7279
N-1.5M Cable	SUCOFLEX	9398
N-2M Cable	Huber + Suhner	12911
N-5M Cable	SUCOFLEX	15882
N-1M Cable	SUCOFLEX	14302
N-2M Cable	SUCOFLEX	14303
N-2.5M Cable	SUCOFLEX	14304
N-5M Cable	Huber + Suhner	12912
Notch filter 500-1000MHz	K&L Microwave	8972
Low pass filter LP03/1000-7GH	Filtek	4087
High pass filter HP12/1200-5AA	Filtek	7310
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.18.0.26	0000
Software	Champ libre Juigné. V3.5	8864

**Conducted power spectral density**

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-1.5M Cable	SUCOFLEX	7279
Power source 1251RP	California instruments	8508
Attenuator 20dB	Midwest Microwave	8549
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-