



FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test Report No:
5529ERM.003

Test Report

USA FCC Part 15.247, 15.205, 15.207, 15.209;

Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

CANADA RSS-247, RSS-Gen

Digital Transmission Systems, Frequency Hopping Systems and License-Exempt Local Area Network Devices in 902-928 MHz, 2400-2483.5 MHz, 5150-5350MHz, and 5470-5895 MHz bands.

(*) Identification of item tested	Alarm.com 4MP Outdoor PoE Spotlight Camera
(*) Trademark	Alarm.com
(*) Model and /or type reference	ADC-VC730P
(*) Derived model not tested	--
Other identification of the product	FCC ID: YL6-143VC730P IC: 9111A-143VC730P HVIN: ADC-VC730P
(*) Features	LoRa, White Spotlight, Night Vision (IR), Sounds, Two-Way Audio, Video Analytics (sensor 1/3", 4MP, HDR), Video Streaming, and Recording
Manufacturer	Alarm.com 8281 Greensboro Dr #100 Tysons, VA 22102, USA
Test method requested, standard	USA FCC Part 15.247 (11-18-2024): Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz USA FCC Part 15.205 (11-18-2024): Restricted bands of operation. USA FCC Part 15.209 (11-18-2024) Edition: Radiated emission limits; general requirements. USA FCC Part 15.207 (11-18-2024 Edition): Conducted limits; general requirements. CANADA RSS-247 Issue 4 (July 2025). CANADA RSS-Gen Issue 5 (April 2018)/A1 (March 2019)/A2 (Feb 2021). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2020/Cor1-2023: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager 
Date of issue	2026-01-07
Report template No	FDT08_25 (*) "Data provided by the client"

Digitally signed by Domingo Galvez Duenas
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Acronyms

Acronym ID	Acronym Description
E.I.R.P.	Effective Isotropic Radiated Power
Avg COT	Average Channel Occupancy Time
Avg Power	Maximum Average Conducted Output Power
Detector	Detector used
Ebw	Emission Bandwidth
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
Freq Sep	Frequency Separation
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
NHC	Number of Hopping Channels
NHp	Number of hops over the period
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
PSD	Power Spectral Density
Peak Power	Maximum Peak Conducted Output Power
Pol	Polarization
Port	Active Port
RU	Resource Unit
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01 and CAB ID US0215.

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements, and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

Test case	Frequency (MHz)	U(k=2)	Units
RF Power and PSD	2402-2483	0.88	dB
Occupied Bandwidth		1.87	%
Dwell Time		0.01	%
Band Edge	30-7000	0.64	dB
Conducted Spurious Emission	30 - 1000	0.48	dB
	1000 - 40000	0.94	dB
Radiated Spurious Emission	30-180	4.27	dB
	180-1000	3.14	dB
	1000-18000	3.3	dB
	18000-40000	3.49	dB

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a mini-bullet camera with Two-Way Audio and an adjustable ball joint mount designed for use in indoor and outdoor environments. As part of the commercial Pro Series line, the camera enables intelligent analytics for object detection and business activity tracking. In addition to cloud clip storage, the ADC-VC730P supports 24/7 recording to an optional onboard microSD card and/or the Commercial Stream Video Recorder.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

The sample(s) is composed of the following elements, accessories and auxiliary equipment:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	5529/01	4MP Outdoor PoE Spotlight Camera (Inpaq)	Alarm.com / ADC-VC730P	--	2025-10-29	Element Under Test
S/01	5529/09	AC Adapter (ADC-VC730P DUT)	WB-18U12FU	Y4j231379900	2025-10-28	Accessory
S/01	5517/01	Laptop	DELL / P98G	--	2025-10-13	Accessory
S/01	01568	Wireless Access Point	NETGEAR / R6250	3DK64779A53B2	--	Auxiliary Element
S/02	5529/04	4MP Outdoor PoE Spotlight Camera (Lynwave)	Alarm.com / ADC-VC730P	--	2025-10-29	Element Under Test
S/02	5529/09	AC Adapter (ADC-VC730P DUT)	WB-18U12FU	Y4j231379900	2025-10-28	Accessory
S/02	5517/01	Laptop	DELL / P98G	--	2025-10-13	Accessory
S/02	01568	Wireless Access Point	NETGEAR / R6250	3DK64779A53B2	--	Auxiliary Element
S/03	5529/05	4MP Outdoor PoE Spotlight Camera (Conducted Sample)	Alarm.com / ADC-VC730P	--	2025-10-29	Element Under Test
S/03	5529/09	AC Adapter (ADC-VC730P DUT)	WB-18U12FU	Y4j231379900	2025-10-28	Accessory
S/03	5517/01	Laptop	DELL / P98G	--	2025-10-13	Accessory

Notes referenced to samples during the project:

Id	Note
S/01	Sample S/01, was used for the following test(s): All the Continuous conducted emission on Power leads, and the Emission limitations radiated (RSE) tests indicated in appendix A. (Inpaq)
S/02	Sample S/02, was used for the following test(s): All the Emission limitations radiated (RSE) tests indicated in appendix A. (Lynwave)
S/03	Sample S/03, was used for the following test(s): All RF Conducted tests indicated in appendix A. (Inpaq)

Test sample description

Test Sample description (compulsory information for EMC and RF testing services)

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	12V DC Port			[]	[]	[]	
	Ethernet Port			[X]	[]	[]	
	SD Card Slot			[]	[]	[]	
				[]	[]	[]	
				[]	[]	[]	
.....			[]	[]	[]		
Supplementary information to the ports..... :		Ethernet connection: 10/100 Mbps RJ-45					
Rated power supply..... :	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC: 12V, 1.5A					
[X]	DC: PoE, Type 1 - IEEE 802.3af						
Rated Power..... :	12.95 W						
Clock frequencies..... :	No data Provided						
Other parameters..... :	No data Provided						
Software version..... :	05020-17-g8bba						
Hardware version..... :	HWV0101						
Dimensions in cm (W x H x D)..... :	7.8 x 7.8 x 12.2						
Mounting position..... :	[]	Table top equipment					
	[X]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[]	Hand-held equipment					
	[]	Other:					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	SX1262 (QFN Package)		LoRa Module		Semtech		
							
							
							
Accessories (not part of the test item)..... :	Description		Type		Manufacturer		
	Model: PYS-18UP120150U		AC/DC Adapter		PYS		
	Model: WB-18U12FU 18W		AC/DC Adapter		Asian Power Devices		
	Model: WB-18U12R 18W		AC/DC Adapter		Asian Power Devices		
	Model: TPE-113GI /A		PoE Adapter		TrendNet		
	Model: MR7350		Wi-Fi Access Point		LinkSys		
	Model: Latitude 5410 and LA65NM191		Test PC and charger		Dell		
Documents as provided by the applicant..... :	Description		File name		Issue date		
	Declaration Equipment Data		FDT30_19		2025-12-01		
							
							
							

⁽³⁾ Only for Medical Equipment

Identification of the client

Alarm.com
8281 Greensboro Dr #100
Tysons, VA 22102, USA

Testing period and place

Test Location	DEKRA Certification, Inc. 405 Glenn Dr. Suite 12, Sterling, VA 20164 United States of America
Date (start)	2025-11-02
Date (finish)	2025-11-03

Document history

Report number	Date	Description
5529ERM.003	2026-01-07	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the semi anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: Prudhvi Kothapalli, Juliana Cherry, Yuqi Wang, Fahim Tahiree, Victor Albrecht, Yuri Barone and Koji Nishimoto.

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P

Summary

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-Gen / FCC 15.207 - [CE] Continuous conducted emission on Power leads		P	--
RSS-Gen / RSS-247 - [99dBW] Transmitter 99% Occupied Bandwidth		P	--
RSS-247 / FCC 15.247 - [6dBw] 6 dB Bandwidth		P	--
RSS-247 / FCC 15.247 - [20dBW] 20 dB Bandwidth		P	--
RSS-247 / FCC 15.247 - [CFS] Carrier Frequency Separation		P	--
RSS-247 / FCC 15.247 - [DwT] Time of Occupancy (Dwell Time)		P	--
RSS-247 / FCC 15.247 - [NHC] Number of hopping channels		P	--
RSS-247 / FCC 15.247 - [Avcp] Maximum Average Conducted Output Power		P	Refer 1
RSS-247 / FCC 15.247 - [Pkcp] Maximum Average Conducted Output Power		N/A	Refer 1
RSS-247 / FCC 15.247 - [Bndedge] Band-edge emissions compliance (Transmitter)		P	--
RSS-247 / FCC 15.247 - [RSE] Emission limitations radiated (Transmitter)		P	Refer 2
RSS-247 / FCC 15.247 - [Psd] Power spectral density		P	Refer 1
Supplementary information and remarks:			
- When testing hybrid mode, power and PSD should be tested using the average detector test methods. - The DUT has an integral antenna, and no conducted testing is required.			

List of equipment used during the test

FCC 47 CFR Part 15.247 / RSS-247

Test Equipment for [CE] Continuous conducted emission on Power leads

Control Num	Equipment	Manufacturer	Serial	Model	Next calibration
01082	LINE IMPEDANCE STABILIZATION NETWORK	NARDA	233WT60911	PMM L3-32	2027-02-20
01215	MONITOR ROOM	FRANKONIA	F169021-3	MR	---
01216	TEST TABLE (RED COLOR)	NA	Not Appl.	N/A	---
01012	ESR26 EMI TEST RECEIVER	ROHDE & SCHWARZ	101478	ESR26	2027-04-23
01010	ESR7 EMI TEST RECEIVER	ROHDE & SCHWARZ	101790	ESR7	2027-04-11
01073	PULSE LIMITER	---	111WX70503	PMM PL01	2027-02-21
01374	ESR7 EMI TEST RECEIVER	ROHDE & SCHWARZ	102390	ESR7	2026-06-05
01314	WIRELESS MEASUREMENT SOFTWARE R&S EMC32	ROHDE & SCHWARZ	1040-OT102236	---	---

Test Equipment for RF Conducted

Control Num	Equipment	Manufacturer	Serial	Model	Next calibration
01374	ESR7 EMI TEST RECEIVER	ROHDE & SCHWARZ	102390	ESR7	2026-06-05
01569	SHIELDED CHAMBER - 2	FRANKONIA	F219025-3	RF Lab - 2	---
01491	SMB 100B SIGNAL GENERATOR	ROHDE & SCHWARZ	103471	SMB100B	2028-03-20
01042	SMBV 100A VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	262575	SMBV100A	2026-06-06
01474	ETHERNET SNMP THERMOMETER	HW GROUP	60038038766	HWg-STE Plain	2026-10-24

Test Equipment for [RSE] Emission limitations radiated (Transmitter)

Control Num	Equipment	Manufacturer	Serial	Model	Next calibration
00981	LOW NOISE PREAMPLIFIER (1-18GHz)	BONN ELEKTRONIK	1711156B	BLMA0118-2A	2026-02-21
01010	ESR7 EMI TEST RECEIVER	ROHDE & SCHWARZ	101790	ESR7	2027-04-11
01014	FSV40 SIGNAL ANALYZER 40GHZ	ROHDE & SCHWARZ	101626	FSV40	2026-10-04
01057	3115 DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA (750 MHz-18 GHz)	ETS LINDGREN	00211373	3115	2026-07-18
01066	3142E BICONILOG ANTENNA	ETS LINDGREN	00208586	3142E	2028-02-03
01108	ETHERNET SNMP THERMOMETER	HW GROUP	60038026954	HWg-STE Plain	2026-10-18
01111	ETHERNET SNMP THERMOMETER	HW GROUP	60038026577	HWg-STE Plain	2026-10-24
01179	SEMI-ANECHOIC CHAMBER	FRANKONIA	F169021	SAC 3plus 'L'	---
01213	CONTROL ROOM	FRANKONIA	F169021-1	CR	---
01314	WIRELESS MEASUREMENT SOFTWARE R&S EMC32	ROHDE & SCHWARZ	1040-OT102236	---	---
01566	FRANKONIA TRANSPARENT RF SQUARE TEST TABLE	FRANKONIA	RFSqtab01	RF Sq table	---

Appendix A: Test results. LoRa

Appendix A

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Product information

The following information is provided by the client

Information	Description
Modulation	CSS
Frequency band/Range	ISM US (902-928MHz)
Maximum RF Output Power	22 dBm
Operation mode	
- Mode	DTS: 500kHz channels FHSS: Hopping over 64 channels using 125kHz BW channel Hybrid: Hopping over 8 channels using 125kHz BW channel
- Operating Frequency Range	902-928 MHz
- Channel Spacing	200kHz (125kHz BW), 1.6MHz (500kHz BW)
- Number of Channels	64 (125kHz BW) or 8x uplink channels 903.0-914MHz/8x downlink channels 923.3-927.5 MHz/4x WOR channels 916.7-921.5 MHz
- Nominal Channel Bandwidth	125kHz, 500kHz
Antenna type	Omni-directional Flexible PCB
Antenna gain	0.31 dBi (Inpaq) and -1.7 dBi (Lynwave)
Nominal Voltage	
- Supply Voltage	12 Vdc / PoE, Type 1 - IEEE 802.3af
- Type of power source	AC Adapter / PoE
Equipment type	LoRa

Description of test conditions

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

LoRa

TEST CONDITIONS	DESCRIPTION		
TC/01 FHSS mode	<u>Power supply (V):</u> Transformer Operated: 12 Vdc <u>Temperature (°C):</u> $T_{nom} = +15$ to $+35$ <u>Test Frequencies for Radiated/Conducted tests:</u> Hopping over 64 channels <table><tr><td>125 kHz Bandwidth Spreading Factor = 10</td></tr><tr><td>Lowest channel: 902.3 MHz Middle channel: 908.7 MHz Highest channel: 914.9 MHz</td></tr></table>	125 kHz Bandwidth Spreading Factor = 10	Lowest channel: 902.3 MHz Middle channel: 908.7 MHz Highest channel: 914.9 MHz
125 kHz Bandwidth Spreading Factor = 10			
Lowest channel: 902.3 MHz Middle channel: 908.7 MHz Highest channel: 914.9 MHz			
TC/02 Hybrid mode	<u>Power supply (V):</u> Transformer Operated: 12 Vdc <u>Temperature (°C):</u> $T_{nom} = +15$ to $+35$ <u>Test Frequencies for Radiated/Conducted tests:</u> Hopping over 8 channels <table><tr><td>125 kHz Bandwidth Spreading Factor = 10</td></tr><tr><td>Lowest channel: 902.3 MHz Middle channel: 908.7 MHz Highest channel: 914.9 MHz</td></tr></table>	125 kHz Bandwidth Spreading Factor = 10	Lowest channel: 902.3 MHz Middle channel: 908.7 MHz Highest channel: 914.9 MHz
125 kHz Bandwidth Spreading Factor = 10			
Lowest channel: 902.3 MHz Middle channel: 908.7 MHz Highest channel: 914.9 MHz			
TC/03 DTS mode	<u>Power supply (V):</u> Transformer Operated: 12 Vdc <u>Temperature (°C):</u> $T_{nom} = +15$ to $+35$ <u>Test Frequencies for Radiated/Conducted tests:</u> <table><tr><td>500 kHz Bandwidth Spreading Factor = 12</td></tr><tr><td>Lowest channel: 903.0 MHz Middle channel: 914.2 MHz Highest channel: 927.5 MHz</td></tr></table>	500 kHz Bandwidth Spreading Factor = 12	Lowest channel: 903.0 MHz Middle channel: 914.2 MHz Highest channel: 927.5 MHz
500 kHz Bandwidth Spreading Factor = 12			
Lowest channel: 903.0 MHz Middle channel: 914.2 MHz Highest channel: 927.5 MHz			

Test cases details

FCC 47 CFR Part 15.247 / RSS-247

RSS-Gen / FCC 15.207 - [CE] Continuous conducted emission on Power leads

Limits

- FCC Rules and Regulations 47 CFR Part 15, Subpart C, Secs. 15.207:**

(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

Frequency range (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0,15 to 0,5	66 – 56 ⁽¹⁾	56 – 46 ⁽¹⁾
0,5 to 5	56	46
5 to 30	60	50

(1) The limit decreases with the logarithm of the frequency

- RSS-Gen Issue 5, Secs 8.8:**

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μ H / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT.

Frequency range (MHz)	Limit (dB μ V) ⁽¹⁾	
	Quasi-Peak	Average
0,15 to 0,5	66 – 56 ⁽¹⁾	56 – 46 ⁽¹⁾
0,5 to 5	56	46
5 to 30	60	50

(1) At the transition frequency, the lower limit applies

(2) The limit decreases with the logarithm of the frequency

TEST SETUP:

The EUT is placed on the test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rest of the EUT.

The EUT is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 ohms LISN port

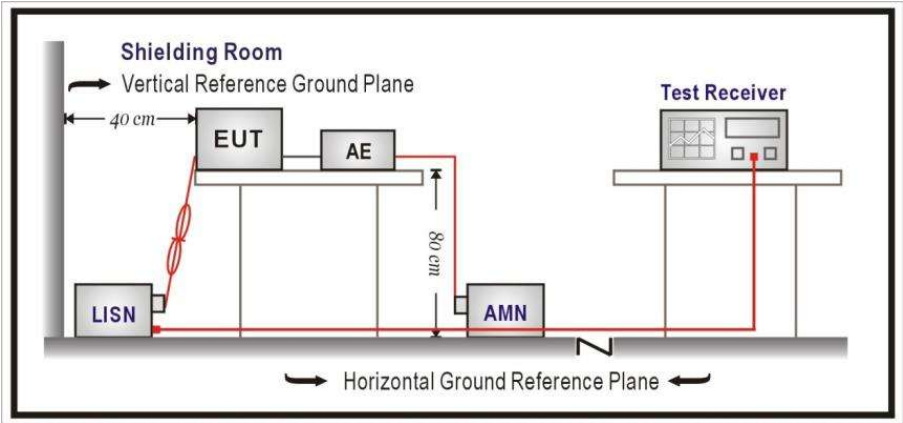


Fig A1: Generic setup for measurements from 0.150 to 30 MHz

Code: CEmmnnHH

- CE: Conducted Emission,
- mm: Sample number,
- nn: Operation mode,
- HH: Wire L1: Phase1, 0N: Neutro)

Results

S/	OM	Code	Line	Freq Rng (MHz)	V
01	OM/01	CE01010N	N	[0.15, 30]	P
01	OM/01	CE0101L1	L1	[0.15, 30]	P

Verdict

Pass

Attachments

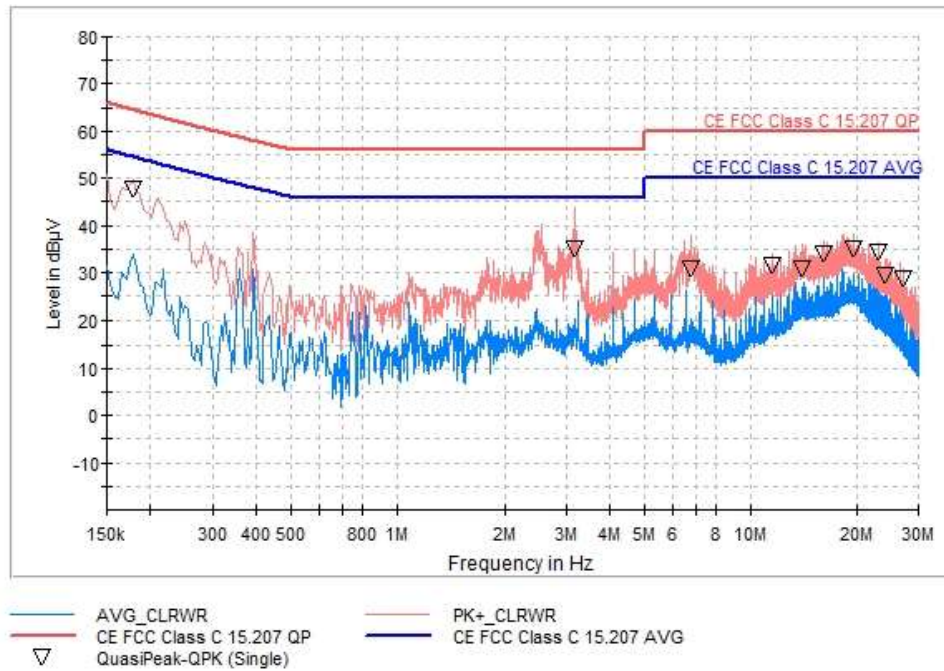
EMC Test Code = CE02010N Conducted Emissions - Tested Line = N

Frequency Range MHz = [0.15, 30]

Sample ID: S/01

Operation Mode: OM/01. DUT ON. LoRa in Tx mode. Frequency: 902.3 MHz. Powered by 12 Vdc

Images:



Tables:

Continuous Conducted Emissions

Frequency (MHz)	QuasiPeak (dBµV)	Line	Margin - QPK (dB)	Limit - QPK (dBµV)
0.178000	47.6	N	16.9	64.5
3.170000	34.8	N	21.2	56.0
6.774000	30.6	N	29.4	60.0
11.582000	31.3	N	28.7	60.0
14.086000	30.8	N	29.2	60.0
16.230000	33.9	N	26.1	60.0
19.710000	35.0	N	25.0	60.0
23.130000	34.2	N	25.8	60.0
24.046000	29.2	N	30.8	60.0
27.158000	28.7	N	31.3	60.0

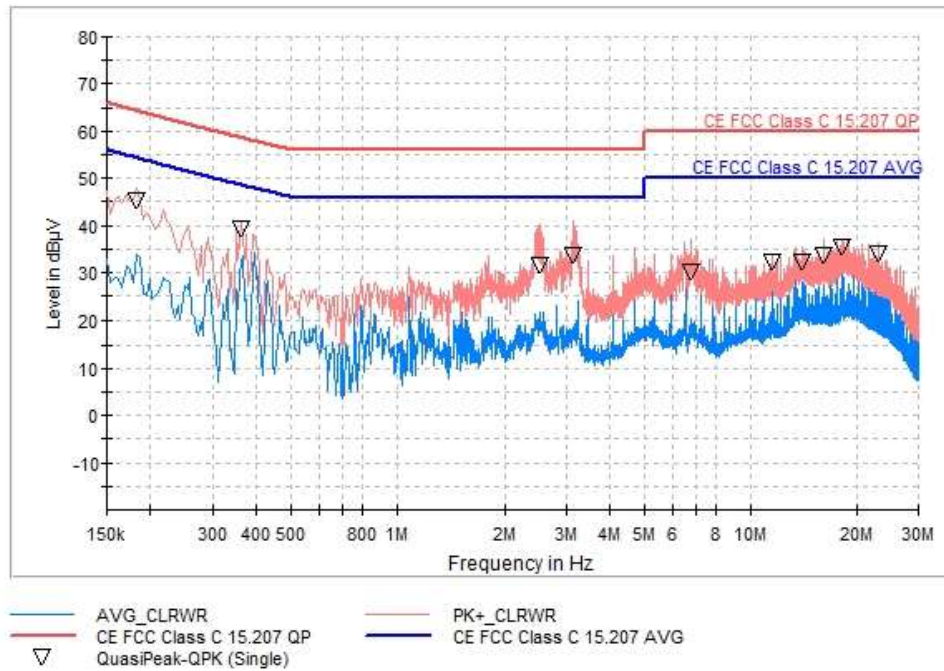
EMC Test Code = CE0201L1 Conducted Emissions - Tested Line = L1

Frequency Range MHz = [0.15, 30]

Sample ID: S/01

Operation Mode: OM/01. DUT ON. LoRa in Tx mode. Frequency: 902.3 MHz. Powered by 12 Vdc

Images:



Tables:

Continuous Conducted Emissions

Frequency (MHz)	QuasiPeak (dBµV)	Line	Margin - QPK (dB)	Limit - QPK (dBµV)
0.182000	45.1	L1	19.2	64.3
0.362000	39.2	L1	19.3	58.5
2.534000	31.5	L1	24.5	56.0
3.150000	33.4	L1	22.6	56.0
6.774000	30.2	L1	29.8	60.0
11.590000	32.2	L1	27.8	60.0
14.094000	32.0	L1	28.1	60.0
16.230000	33.4	L1	26.7	60.0
18.242000	35.2	L1	24.8	60.0
23.130000	33.8	L1	26.2	60.0

RSS-Gen / RSS-247 - [99dBW] Transmitter 99% Occupied Bandwidth

Limits

CANADA RSS-247 Issue 4 (July 2025):

2.4 RSS-Gen compliance

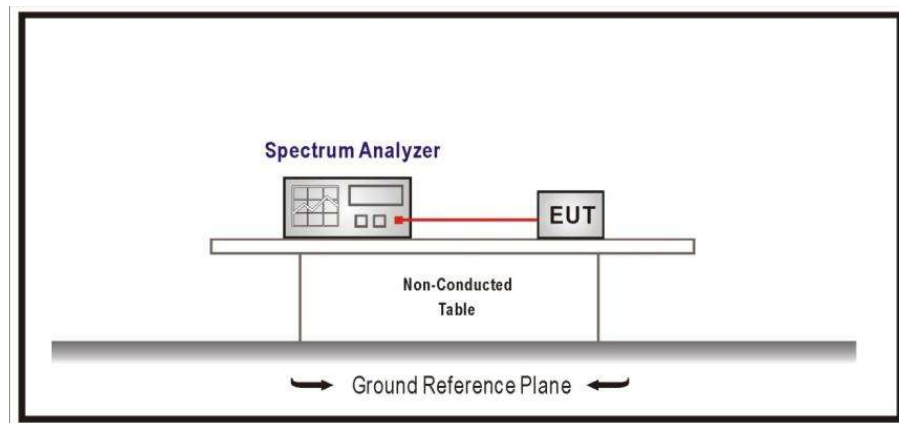
Equipment being certified under this standard shall also comply with the general requirements set out in Radio Standards Specification RSS-Gen, General Requirements for Compliance of Radio Apparatus. Where contradictions exist between this standard and RSS-Gen, this standard shall take precedence.

CANADA RSS-Gen Issue 5 (April 2018)/A1 (March 2019)/A2 (Feb 2021):

6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

TEST SETUP:



Modulation: LoRa (CSS), FHSS = 125 kHz

Sample ID: S/03

TC/03

Results

Freq (MHz)	Port	Occ Ch BW (kHz)
902.30000	1	127.194
908.70000	1	129.950
914.90000	1	133.221

Modulation: LoRa (CSS), DTS = 500 kHz

Sample ID: S/03

TC/03

Results

Freq (MHz)	Port	Occ Ch BW (kHz)
903.00000	1	547.804
914.20000	1	531.996
927.50000	1	551.714

Verdict

Pass

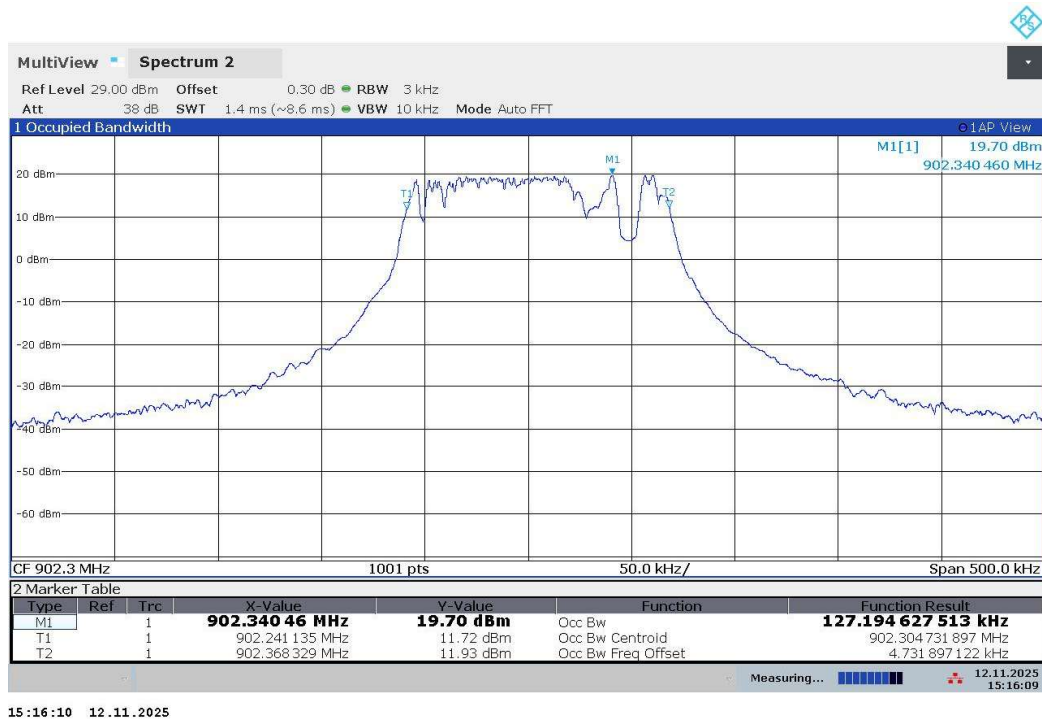
Attachments

Operation Band MHz = [902, 928] FHSS = 125 kHz

Frequency MHz = 902.30000 Active Port = 1

Modulation = LoRa (CSS)

Images:



Operation Band MHz = [902, 928] FHSS = 125 kHz

Frequency MHz = 908.70000 Active Port = 1

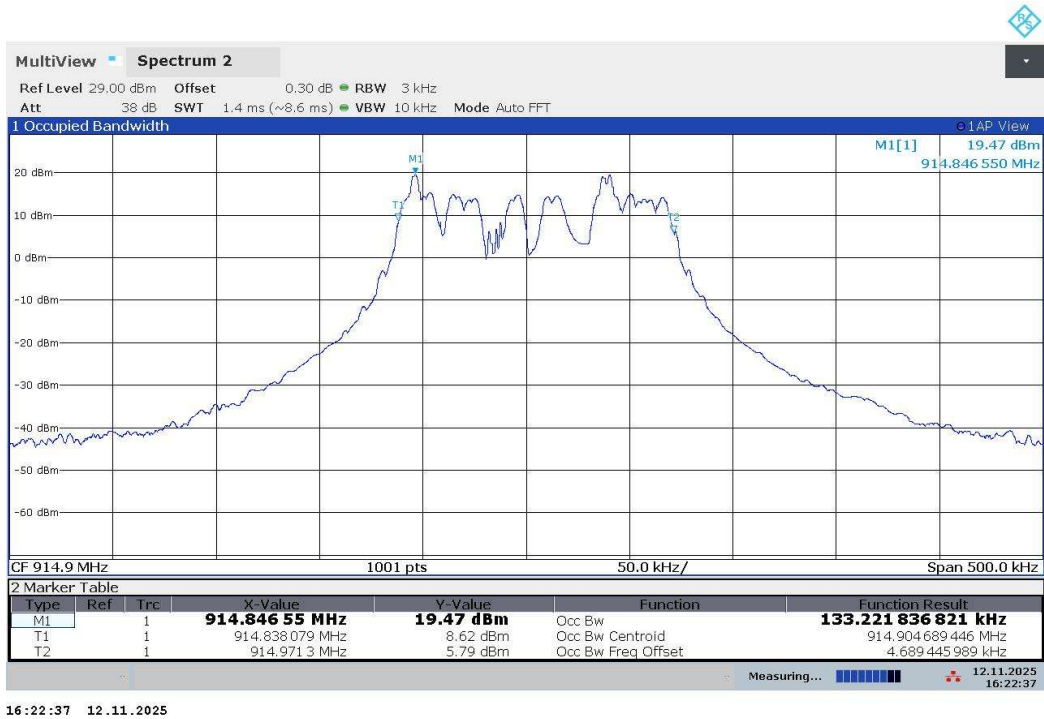
Modulation = LoRa (CSS)

Images:



Operation Band MHz = [902, 928] FHSS = 125 KHz
Frequency MHz = 914.90000 Active Port = 1
Modulation = LoRa (CSS)

Images:



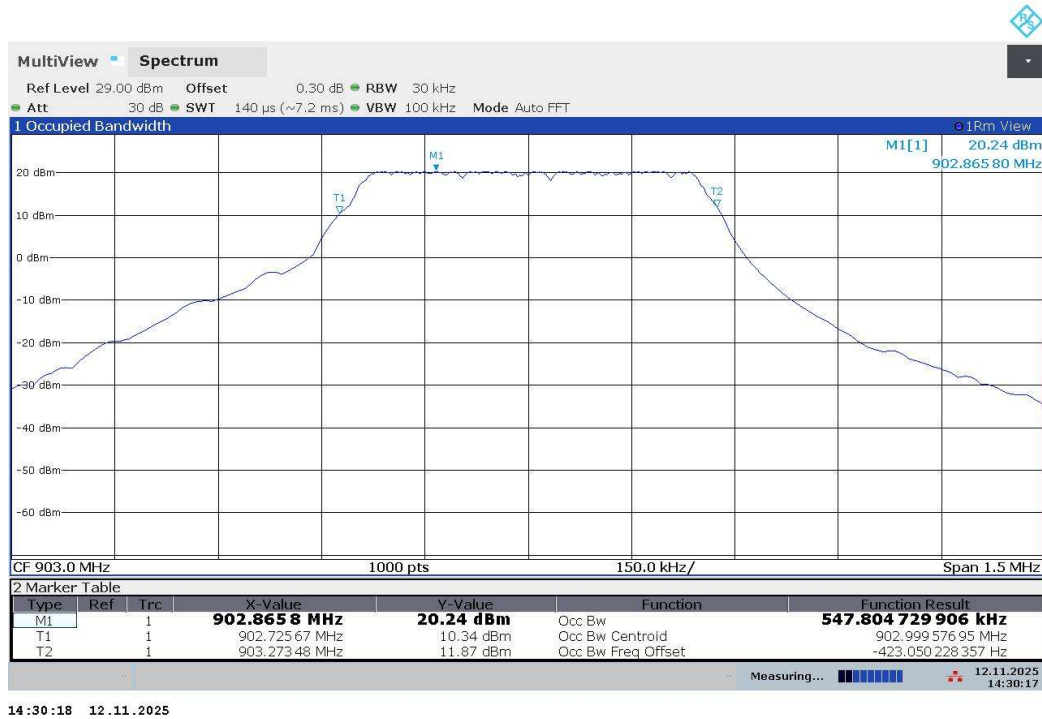
Attachments

Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 903.00000 Active Port = 1

Modulation = LoRa (CSS)

Images:

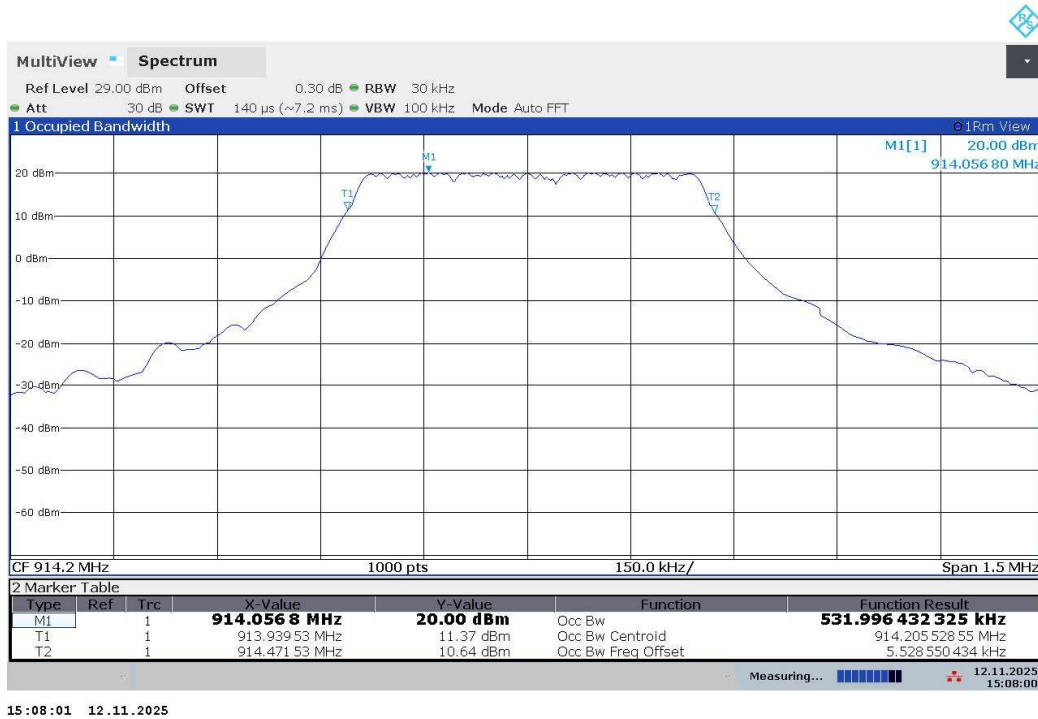


Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 914.20000 Active Port = 1

Modulation = LoRa (CSS)

Images:

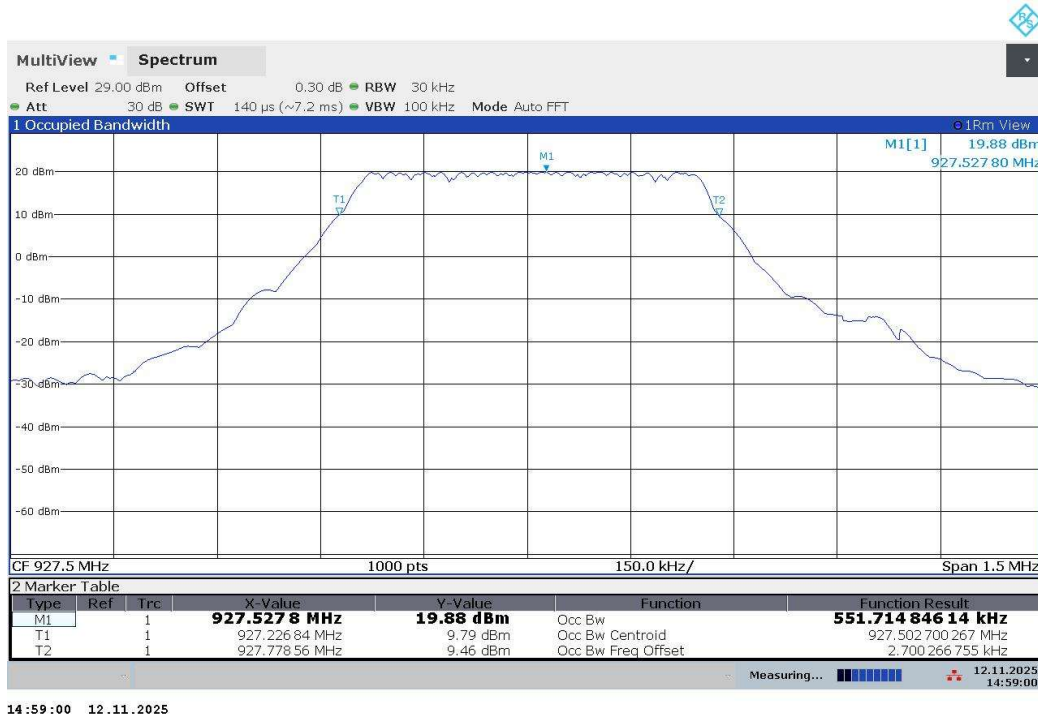


Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 927.50000 Active Port = 1

Modulation = LoRa (CSS)

Images:



RSS-247 / FCC 15.247 - [6dBw] 6 dB Bandwidth

Limits

USA FCC Part 15.247 (11-18-2024):

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions.

(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

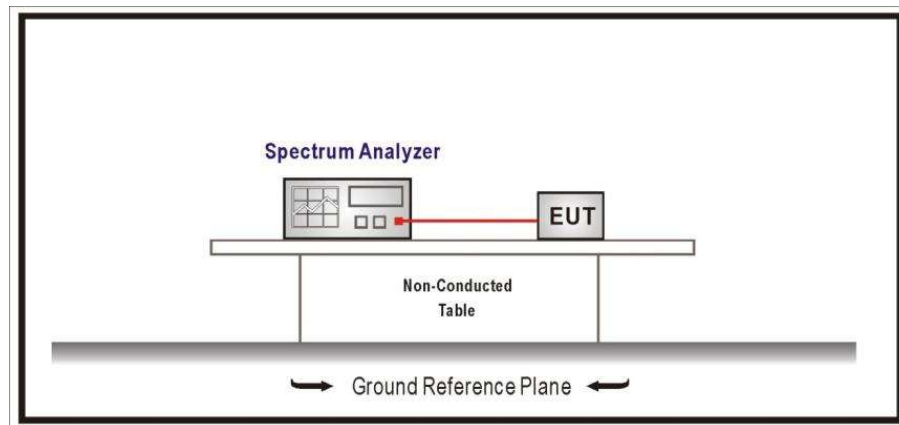
CANADA RSS-247 Issue 4 (July 2025):

6.3.1 Bandwidth and conducted power spectral density

The following applies to the bands 902-928 MHz and 2400-2483.5 MHz:

- a. the minimum 6 dB bandwidth shall be 500 kHz.

TEST SETUP:



Modulation: LoRa (CSS), DTS = 500 kHz

Sample ID: S/03

TC/03

Results

Freq (MHz)	Port	Occ Ch BW (kHz)
903.00000	1	643.6
914.20000	1	639.0
927.50000	1	648.0

Verdict

Pass

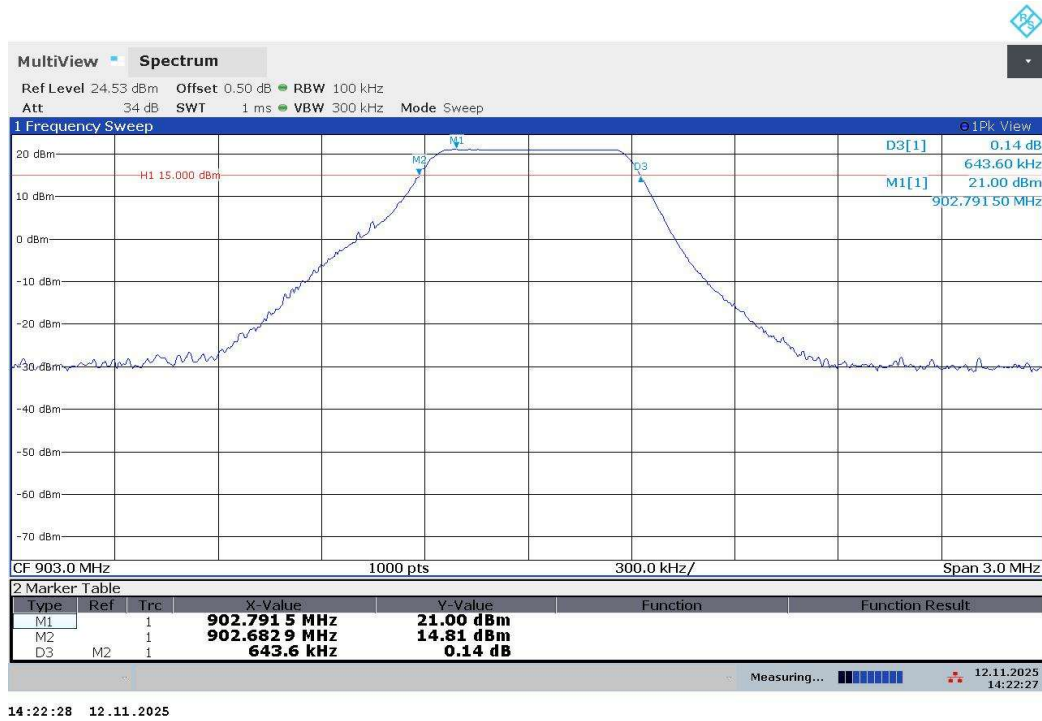
Attachments

Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 903.00000 Active Port = 1

Modulation = LoRa (CSS)

Images:



Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 914.20000 Active Port = 1

Modulation = LoRa (CSS)

Images:

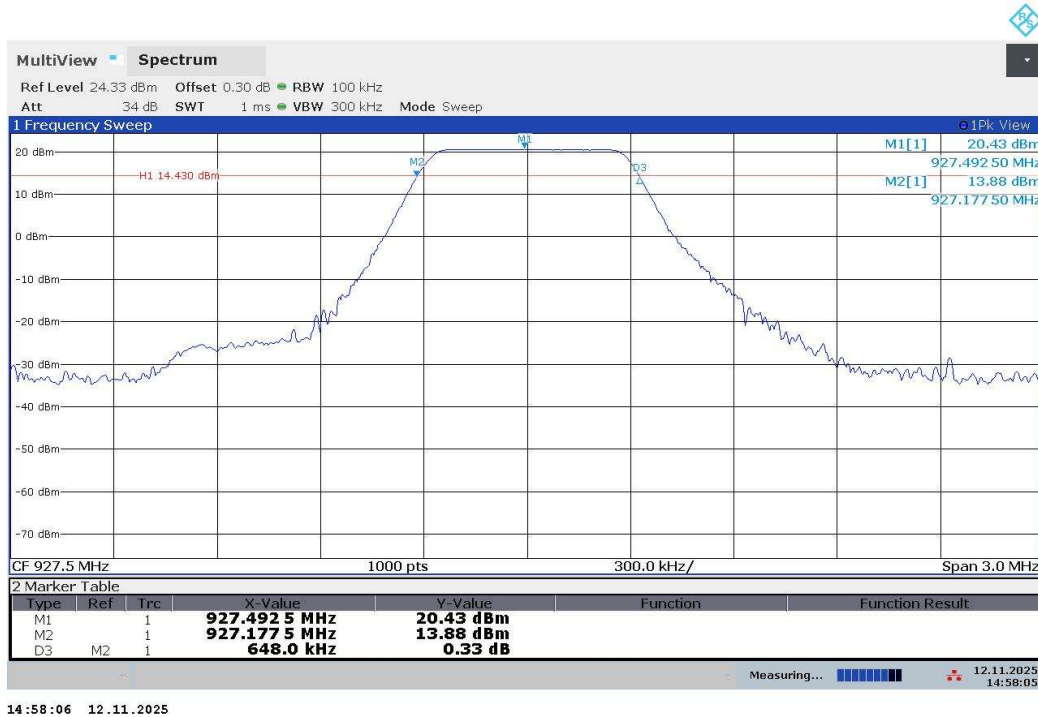


Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 927.50000 Active Port = 1

Modulation = LoRa (CSS)

Images:



RSS-247 / FCC 15.247 - [20dBW] 20 dB Bandwidth

Limits

USA FCC Part 15.247 (11-18-2024):

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions.

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

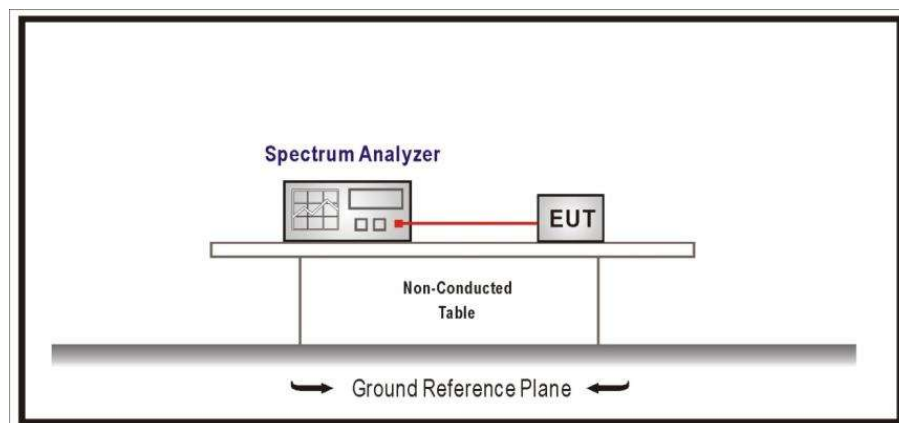
CANADA RSS-247 Issue 4 (July 2025):

6.2.1 General requirements for bandwidth and hopping channels applicable to all bands

The following bandwidth and hopping channel requirements shall apply to FHS operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz:

- a. the bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system's RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hop set. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST SETUP:



Modulation: LoRa (CSS), FHSS = 125 KHz

Sample ID: S/03

TC/03

Results

Freq (MHz)	Port	Occ Ch BW (kHz)
902.30000	1	138.930
908.70000	1	141.000
914.90000	1	142.000

Verdict

Pass

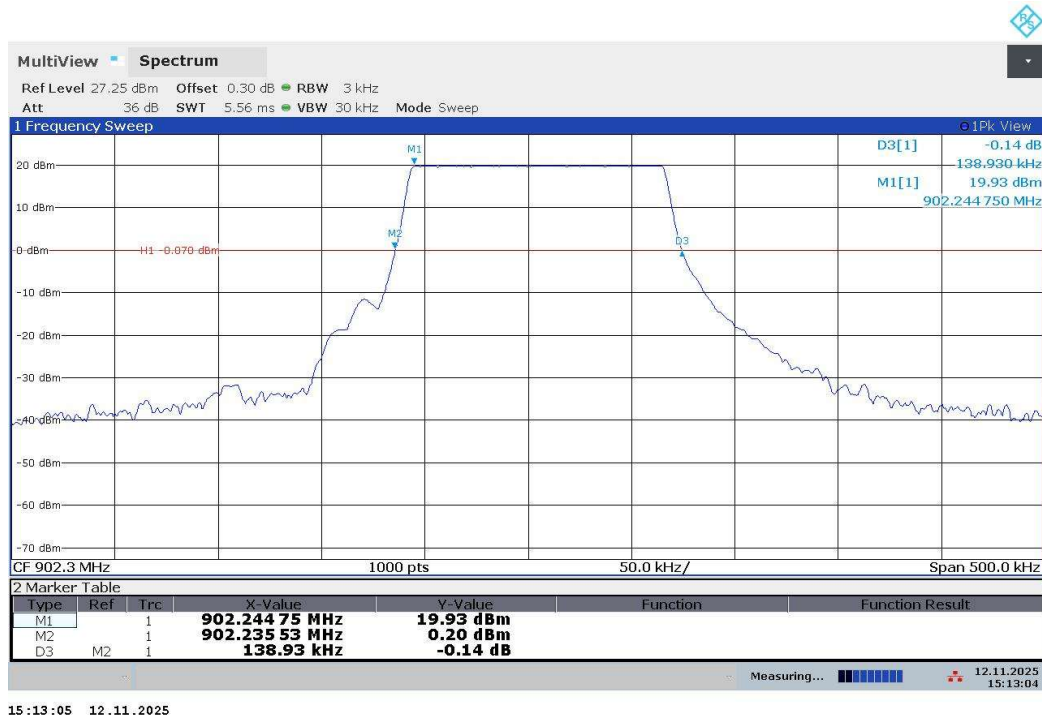
Attachments

Operation Band MHz = [902, 928] FHSS = 125 KHz

Frequency MHz = 902.30000 Active Port = 1

Modulation = LoRa (CSS)

Images:

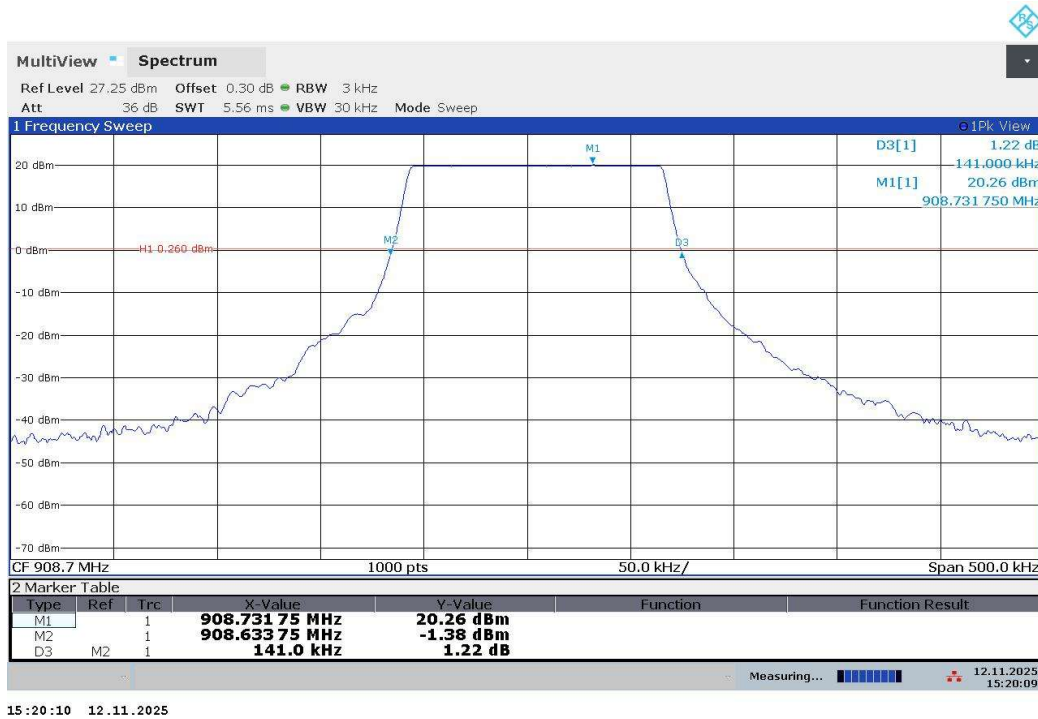


Operation Band MHz = [902, 928] FHSS = 125 KHz

Frequency MHz = 908.70000 Active Port = 1

Modulation = LoRa (CSS)

Images:

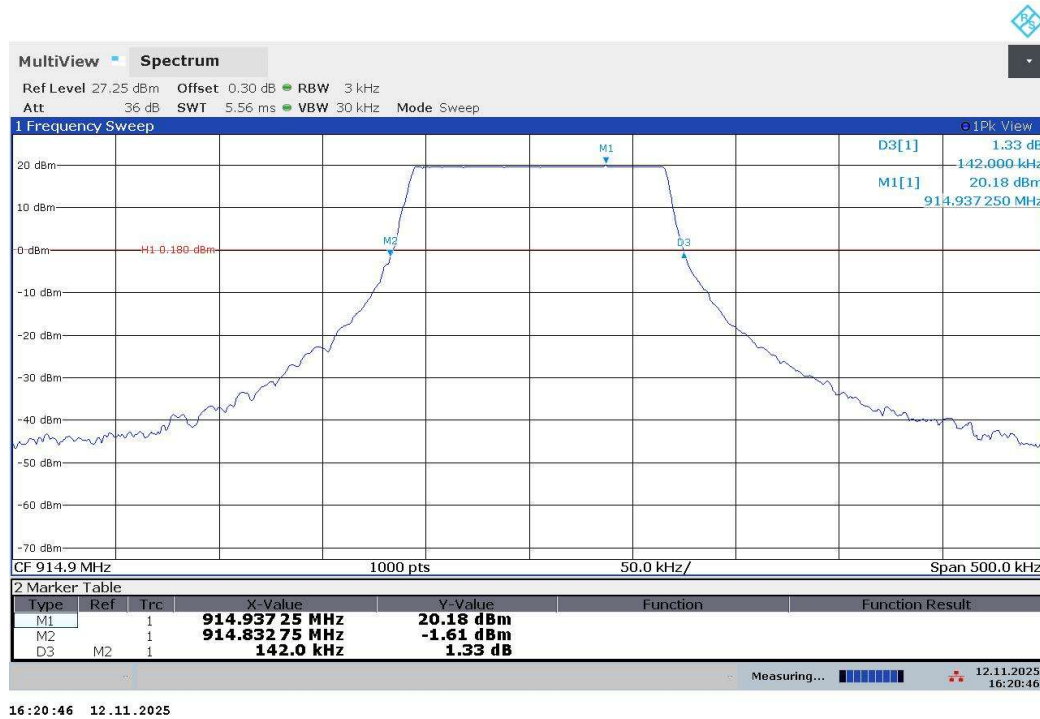


Operation Band MHz = [902, 928] FHSS = 125 KHz

Frequency MHz = 914.90000 Active Port = 1

Modulation = LoRa (CSS)

Images:



RSS-247 / FCC 15.247 - [CFS] Carrier Frequency Separation

Limits

USA FCC Part 15.247 (11-18-2024):

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions.

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

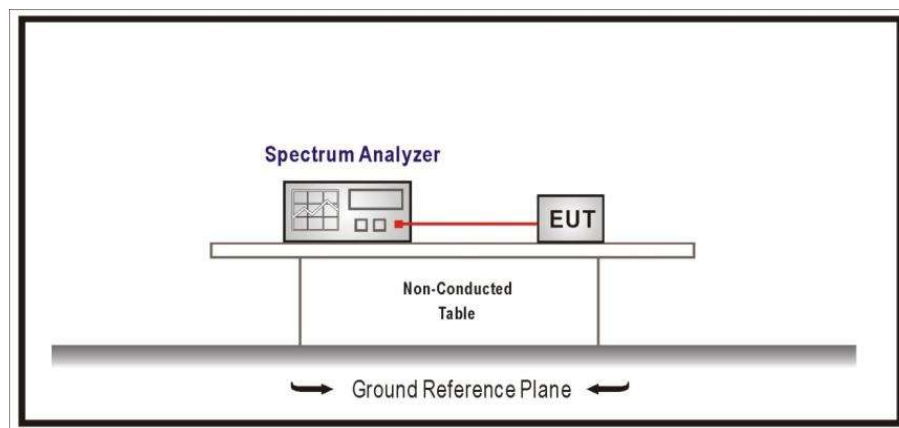
CANADA RSS-247 Issue 4 (July 2025):

6.2.1 General requirements for bandwidth and hopping channels applicable to all bands

The following bandwidth and hopping channel requirements shall apply to FHS operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz:

- b. the hopping channel carrier frequencies shall be separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

TEST SETUP:



Modulation: LoRa (CSS), FHSS = 125kHz

Sample ID: S/03

TC/01

Results

Equipment	Port	Freq Sep (kHz)
FHSS	1	178.230

Modulation: LoRa (CSS), Hybrid = 125kHz

Sample ID: S/03

TC/02

Results

Equipment	Port	Freq Sep (kHz)
Hybrid	1	211.025

Verdict

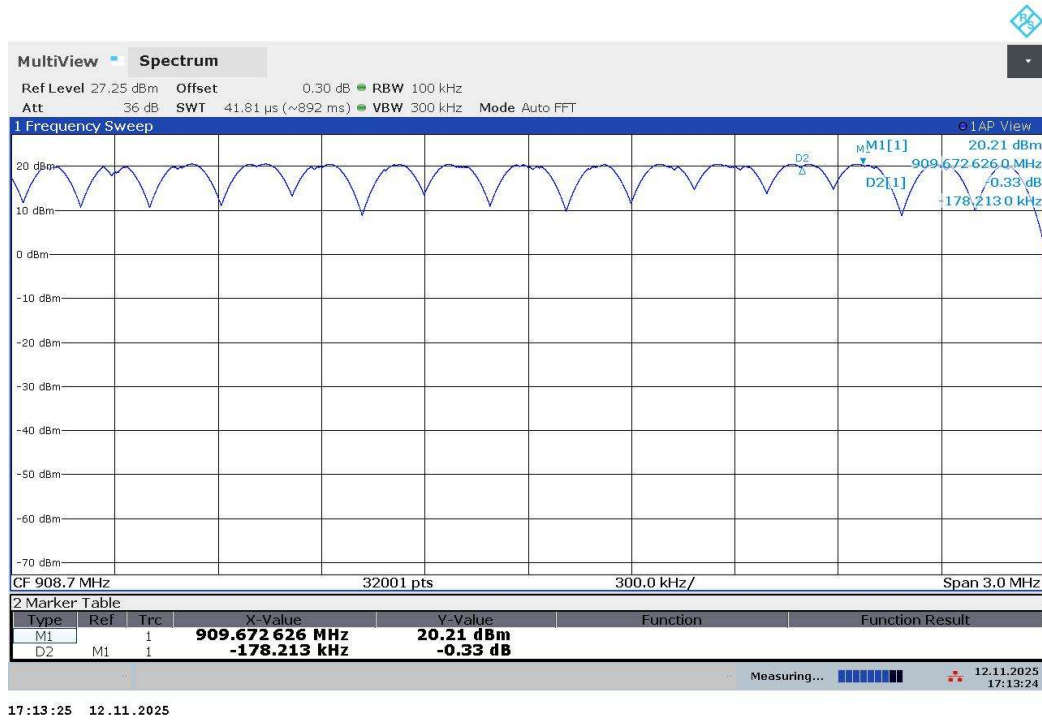
Pass

Attachments

Operation Band MHz = [902, 928] FHSS = 125kHz

Modulation = LoRa (CSS) Active Port = 1

Images:



Operation Band MHz = [902, 928] Hybrid = 125kHz
Modulation = LoRa (CSS) Active Port = 1

Images:



RSS-247 / FCC 15.247 - [DwT] Time of Occupancy (Dwell Time)

Limits

USA FCC Part 15.247 (11-18-2024):

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions.

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

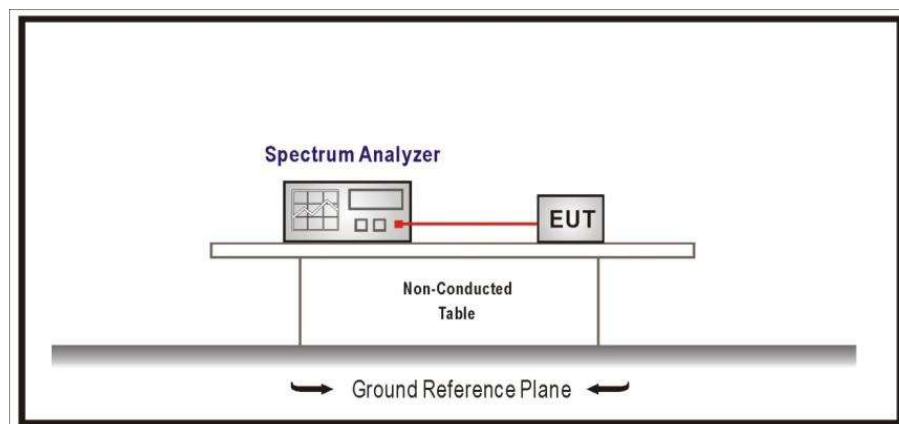
CANADA RSS-247 Issue 4 (July 2025):

6.2.3.1 Bandwidth and hopping channels

The following bandwidth and hopping channel requirements shall apply:

- b. FHS operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 s within a period of 0.4 s, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

TEST SETUP:



$$\text{DH1 time slot} = \text{Pulse Duration} \times (1600/(2 \times 79)) \times \text{A period time}/1000$$

$$\text{DH3 time slot} = \text{Pulse Duration} \times (1600/(4 \times 79)) \times \text{A period time}/1000$$

$$\text{DH5 time slot} = \text{Pulse Duration} \times (1600/(6 \times 79)) \times \text{A period time}/1000$$

$$\text{A period time} = 0.4 \times 79 = 31.6 \text{ seconds}$$

Modulation: LoRa (CSS), FHSS = 125kHz

Sample ID: S/03

TC/01

Results

Equipment	Port	Avg COT (ms)
FHSS	1	276.875

Modulation : LoRa (CSS), Hybrid = 125kHz

Sample ID: S/03

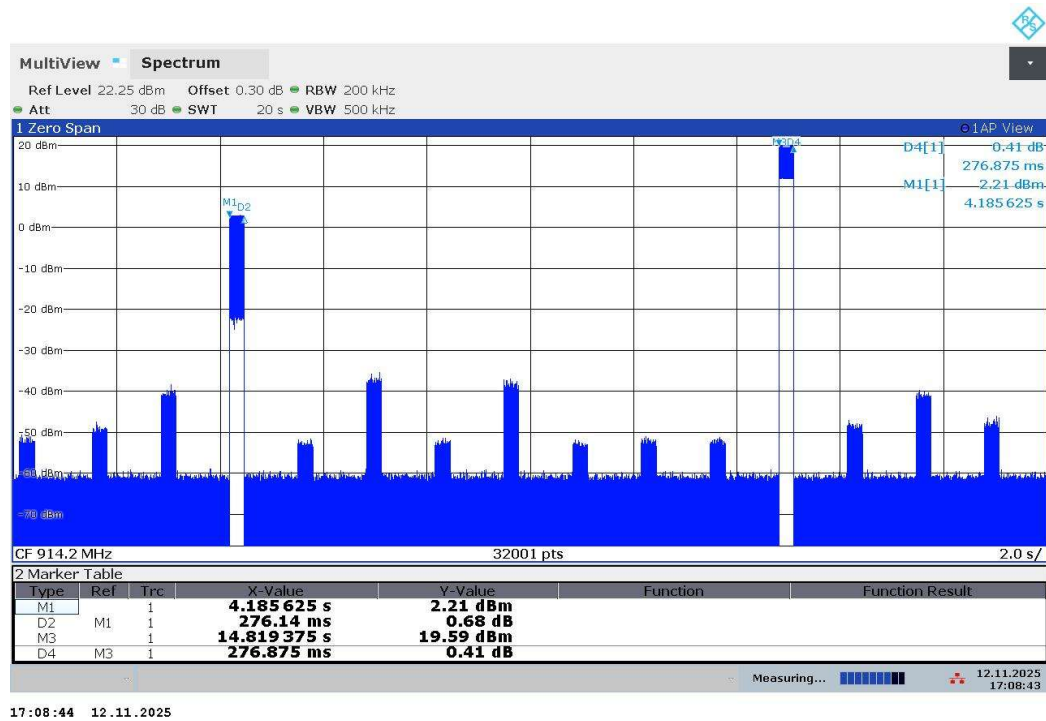
TC/02

Results

Equipment	Port	Avg COT (ms)
Hybrid	1	288.579
Hybrid	1	288.750

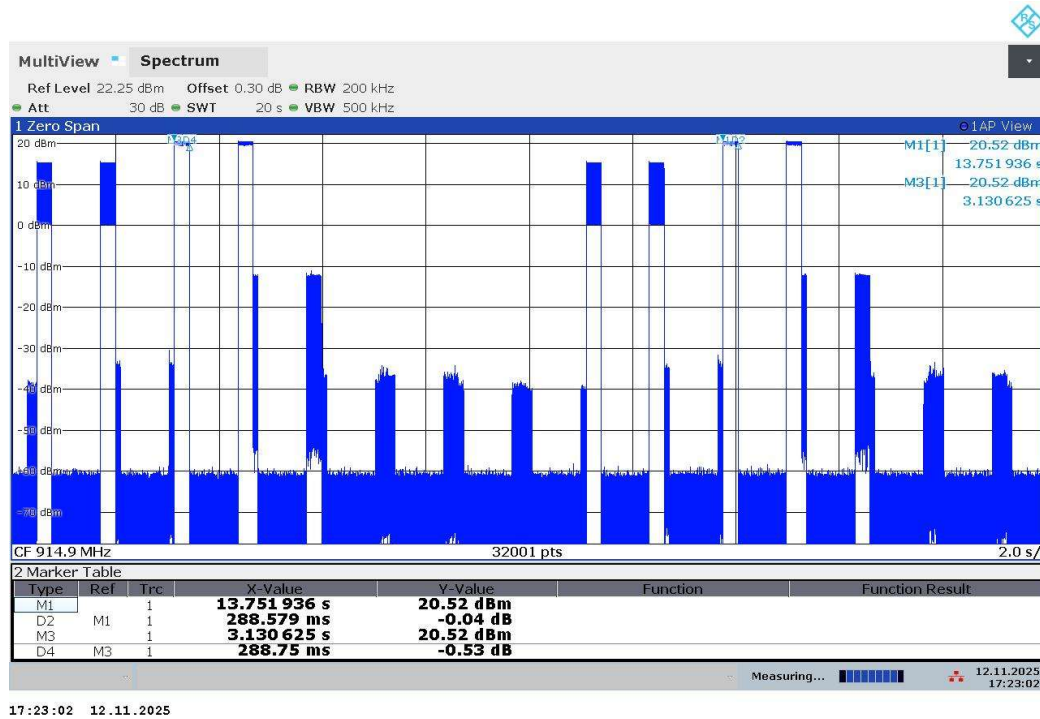
Verdict

Pass



Operation Band MHz = [902, 928] Hybrid = 125kHz
Modulation = LoRa (CSS) Active Port = 1

Images:



RSS-247 / FCC 15.247 - [NHC] Number of hopping channels

Limits

USA FCC Part 15.247 (11-18-2024):

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions.

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

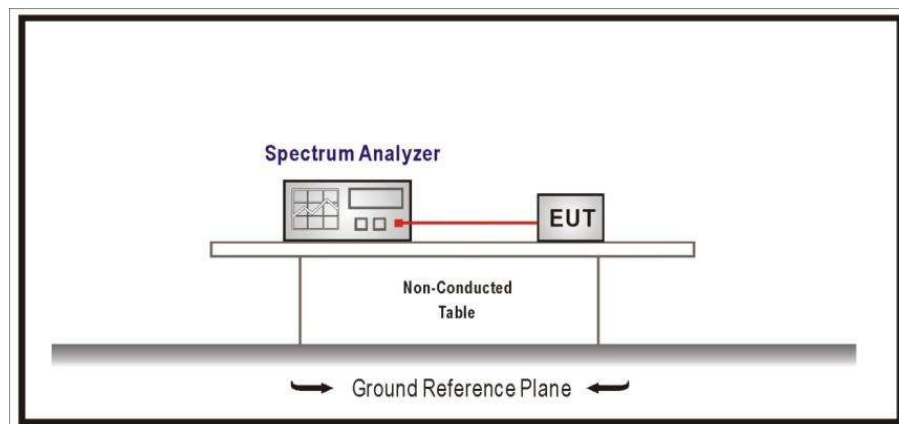
CANADA RSS-247 Issue 4 (July 2025):

6.2.3.1 Bandwidth and hopping channels

The following bandwidth and hopping channel requirements shall apply:

- b. FHS operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 s within a period of 0.4 s, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

TEST SETUP:



Modulation: LoRa (CSS), FHSS = 125kHz

Sample ID: S/03

TC/01

Results

Equipment	Port	NHC
FHSS	1	64

Modulation: LoRa (CSS), Hybrid = 125kHz

Sample ID: S/03

TC/02

Results

Equipment	Port	NHC
Hybrid	1	8

Verdict

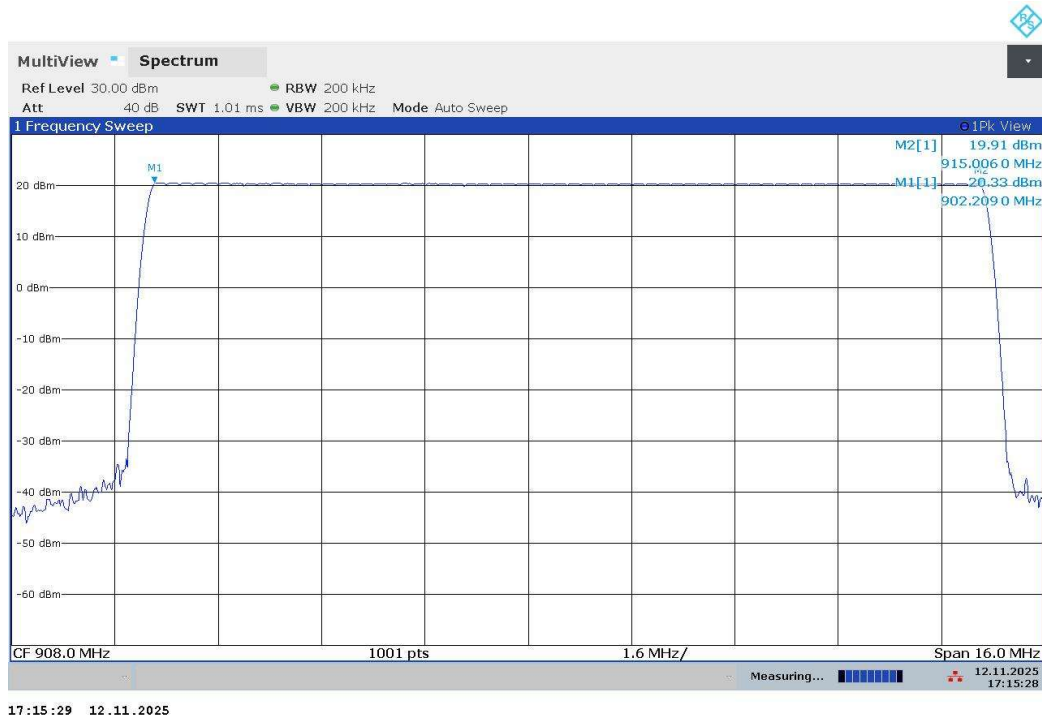
Pass

Attachments

Operation Band MHz = [902, 928] FHSS = 125kHz

Modulation = LoRa (CSS) Active Port = 1

Images:



Operation Band MHz = [902, 928] Hybrid = 125kHz
Modulation = LoRa (CSS) Active Port = 1

Images:



RSS-247 / FCC 15.247 - [Avcp] Maximum Average Conducted Output Power

Limits

USA FCC Part 15.247 (11-18-2024) :

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one-Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

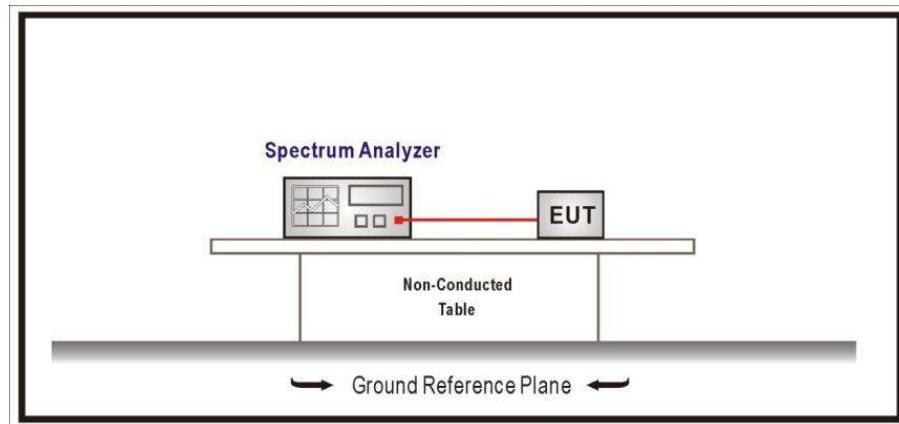
CANADA RSS-247 Issue 4 (July 2025):

6.3.2 Transmitter output power and e.i.r.p. requirements

For DTS operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W, and the e.i.r.p. shall not exceed 4 W, except as provided in section 6.5 a) and b).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power.

TEST SETUP:



The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power

Maximum declared antenna gain (LoRa): 0.31 dBi (Inpaq), and -1.7 dBi (Lynwave)

Power Directional Gain: = Antenna gain + $10\log(N_{ANT})$

Modulation: LoRa (CSS), FHSS = 125 KHz

Sample ID: S/03

TC/01

Results

Freq (MHz)	Port	Avg Power (dBm)	E.I.R.P. (dBm)
902.30000	1	22.20	22.51
908.70000	1	22.00	22.31
914.90000	1	21.90	22.21

Verdict

Pass

Modulation: LoRa (CSS), DTS = 500kHz

Sample ID: S/03

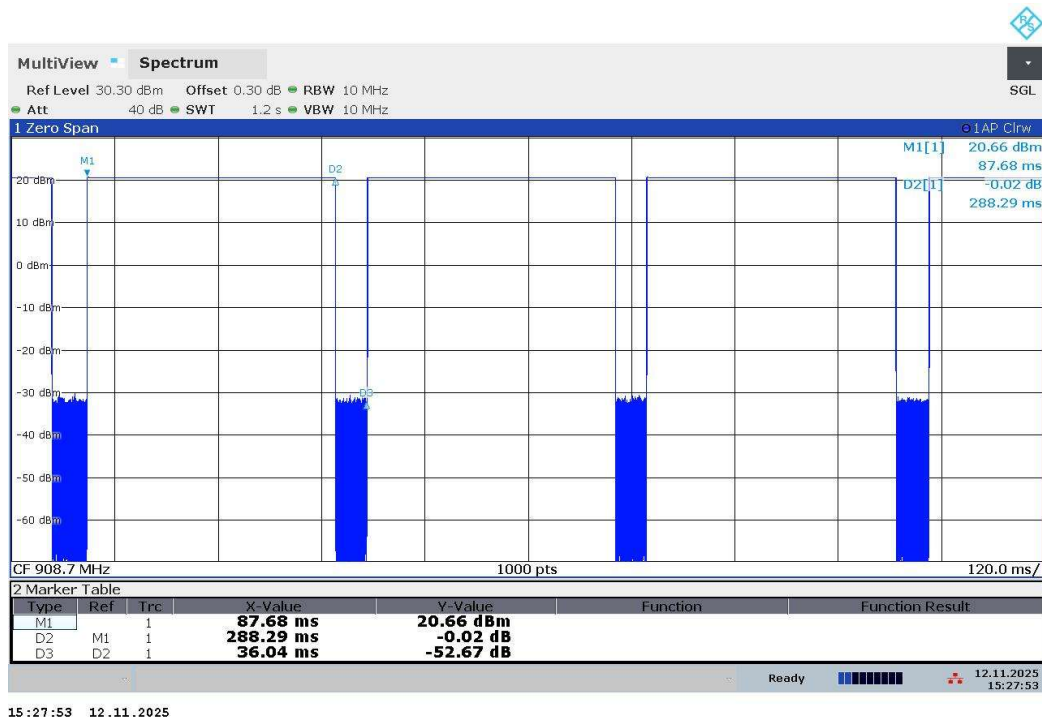
TC/01

Results

Freq (MHz)	Port	Avg Power (dBm)	E.I.R.P. (dBm)
903.00000	1	24.00	24.31
914.20000	1	23.00	23.31
927.50000	1	23.30	23.61

Verdict

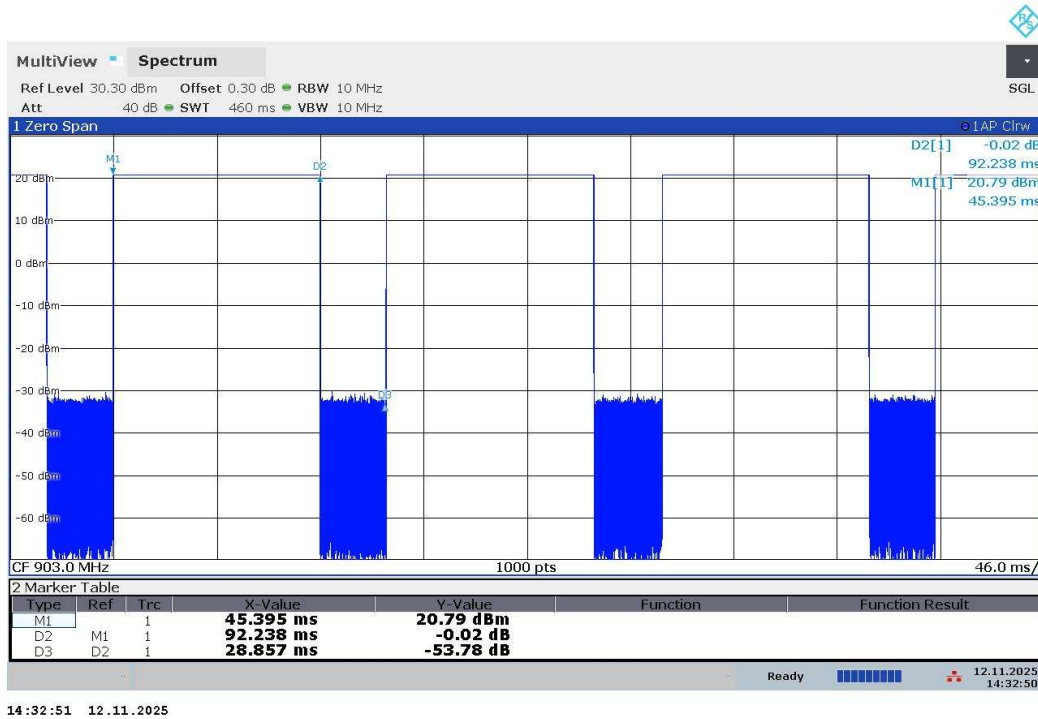
Pass



Operation Band MHz = [902, 928] DTS = 500kHz

Modulation = LoRa (CSS) Active Port = 1

Images:



RSS-247 / FCC 15.247 - [Bndedge] Band-edge emissions compliance (Transmitter)

Limits

USA FCC Part 15.247 (11-18-2024) :

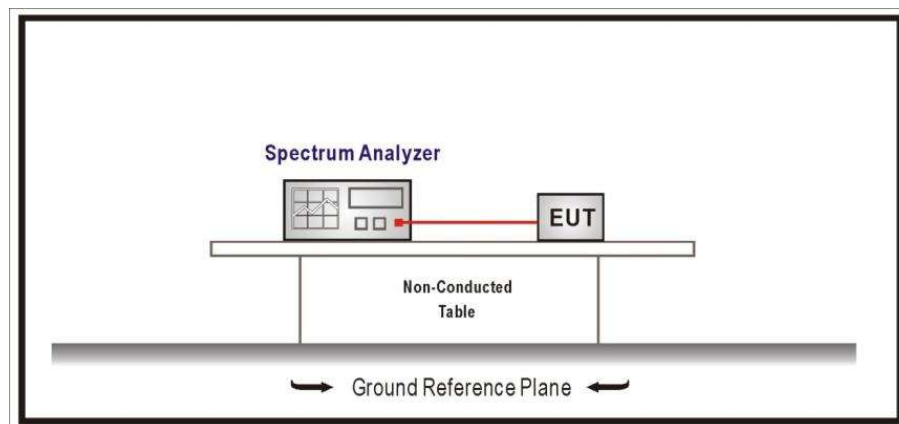
(d)) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Secs. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Secs. 15.205(a), must also comply with the radiated emission limits specified in Secs. 15.209(a) (see Secs. 15.205(c)).

CANADA RSS-247 Issue 4 (July 2025):

6.6 Unwanted Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum device, digitally modulated device, or hybrid system is operating, the RF power that is produced 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 – based on either an RF conducted or a radiated measurement – provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 6.3.2, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

TEST SETUP:



Modulation: LoRa (CSS), Hybrid = 125kHz

Sample ID: S/03, TC/02

Results

Freq (MHz)	Port	Freq (MHz)	Level (dBm)
902.30000	1	901.9830	-29.85
914.90000	1	929.3550	-54.65

Modulation: LoRa (CSS), FHSS = 125kHz

Sample ID: S/03, TC/01

Results

Freq (MHz)	Port	Freq (MHz)	Level (dBm)
902.30000	1	901.8990	-32.98
914.90000	1	929.2050	-53.48

Modulation: LoRa (CSS), FHSS = 125 KHz

Sample ID: S/03, TC/03

Results

Freq (MHz)	Port	Freq (MHz)	Level (dBm)
902.30000	1	901.9743	-25.58
914.90000	1	928.6900	-53.20

Modulation: LoRa (CSS), DTS = 500kHz

Sample ID: S/03, TC/01

Results

Freq (MHz)	Port	Freq (MHz)	Level (dBm)
903.00000	1	901.8445	-29.91
927.50000	1	928.0100	-11.45

Verdict

Pass

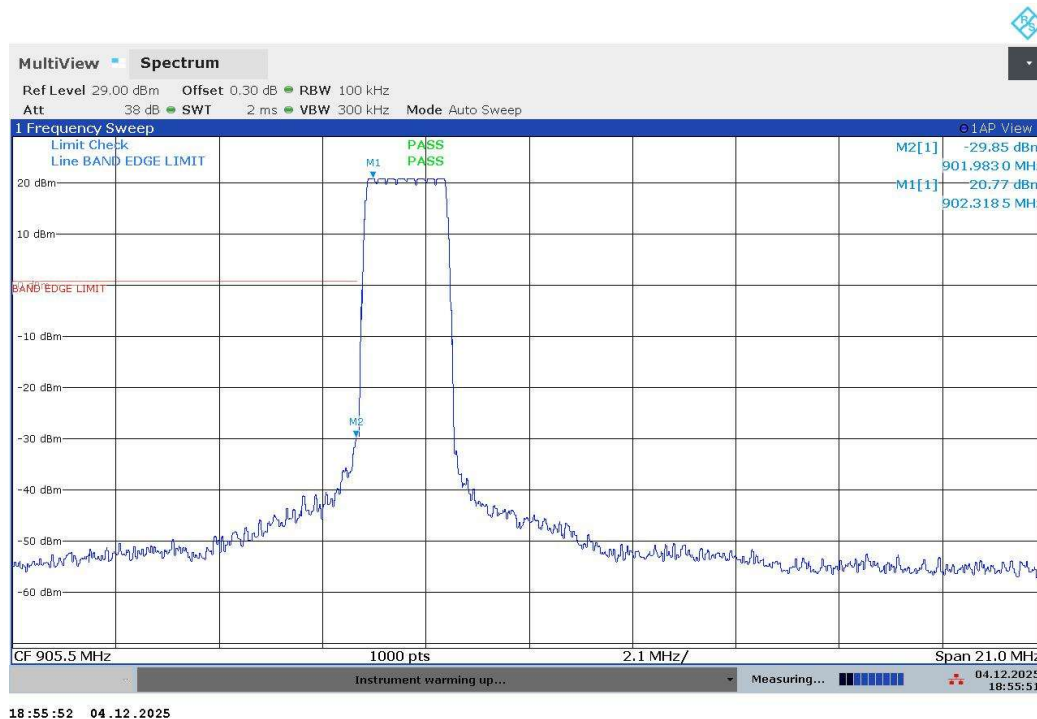
Attachments

Operation Band MHz = [902, 928] Hybrid = 125kHz

Frequency MHz = 902.30000 Active Port = 1

Modulation = LoRa (CSS)

Images:

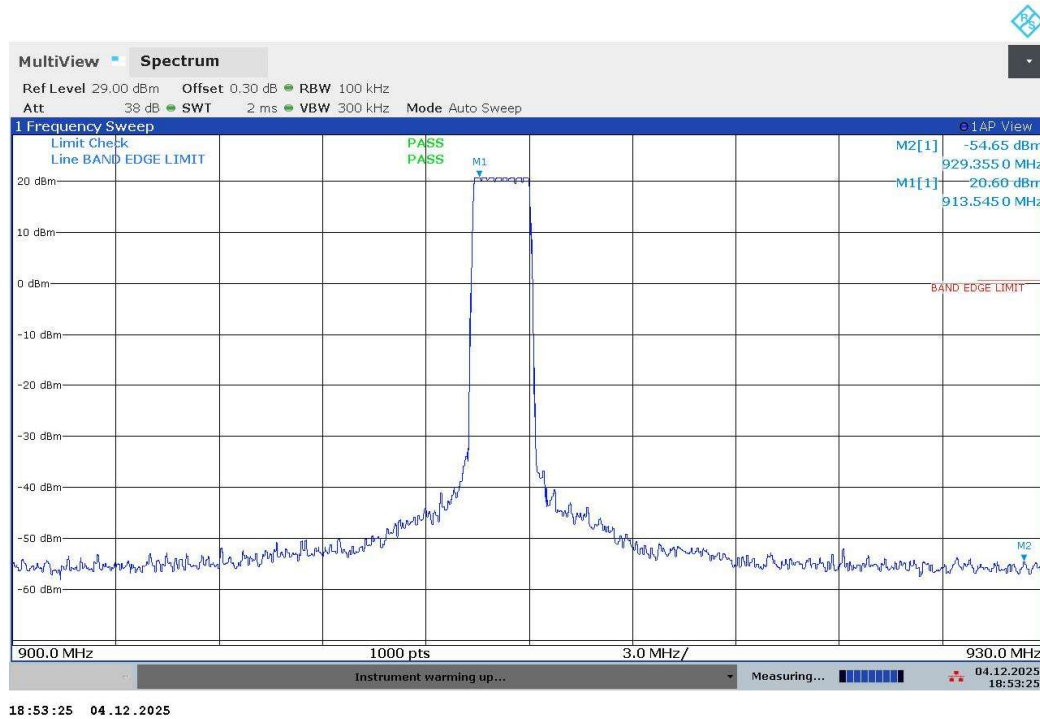


Operation Band MHz = [902, 928] Hybrid = 125kHz

Frequency MHz = 914.90000 Active Port = 1

Modulation = LoRa (CSS)

Images:



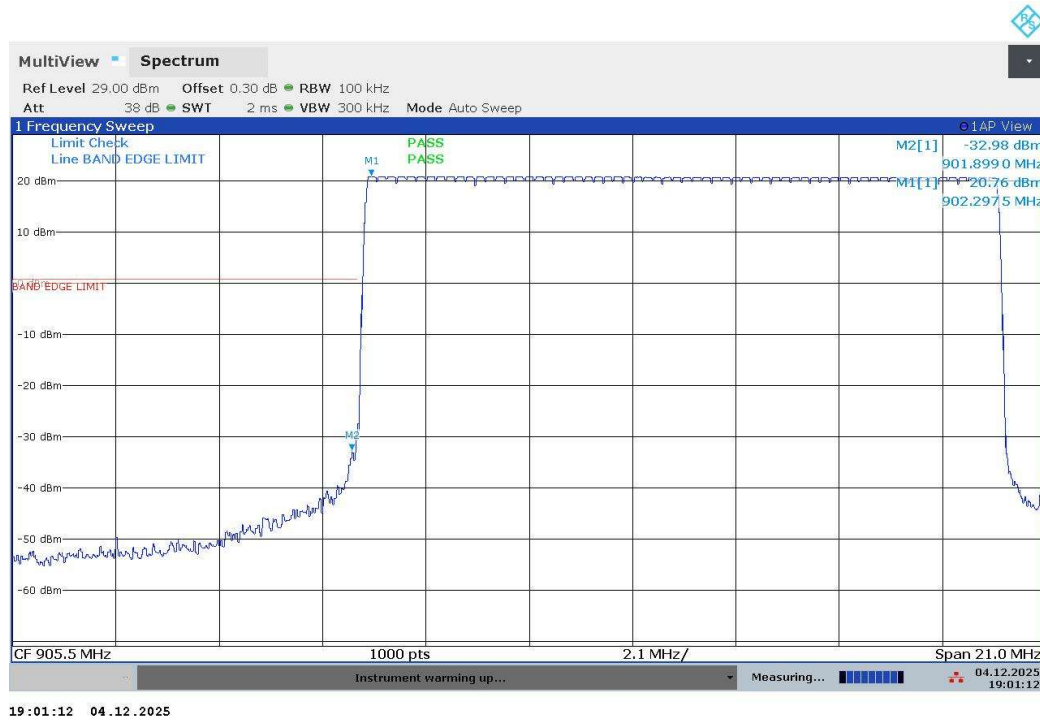
Attachments

Operation Band MHz = [902, 928] FHSS = 125kHz

Frequency MHz = 902.30000 Active Port = 1

Modulation = LoRa (CSS)

Images:

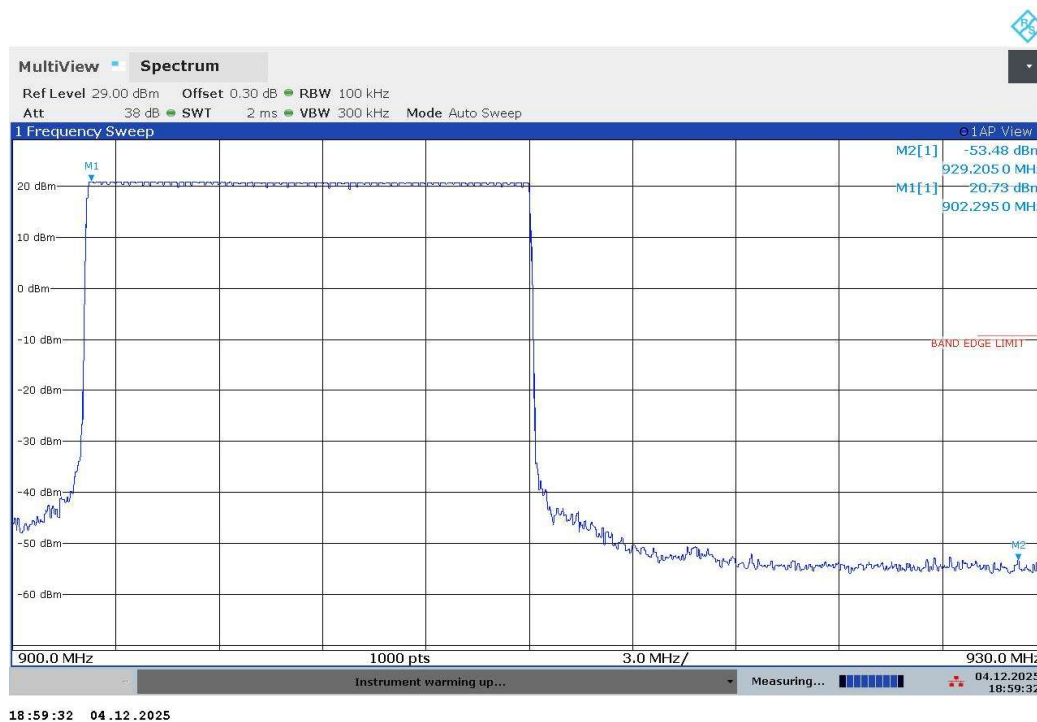


Operation Band MHz = [902, 928] FHSS = 125kHz

Frequency MHz = 914.90000 Active Port = 1

Modulation = LoRa (CSS)

Images:



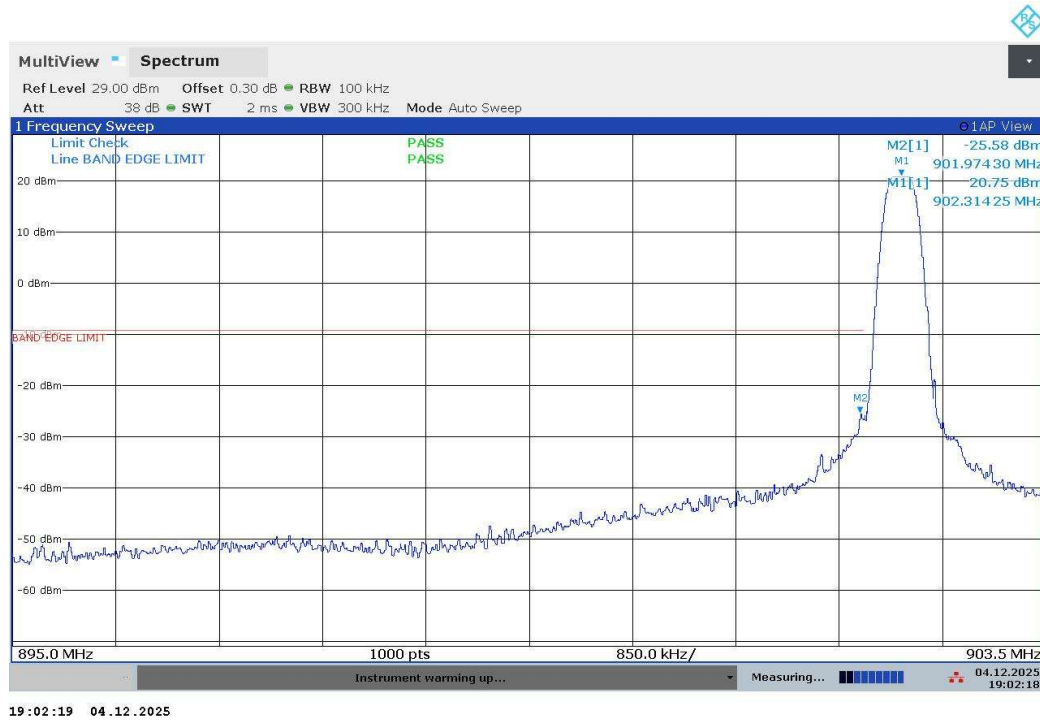
Attachments

Operation Band MHz = [902, 928] FHSS = 125 KHz

Frequency MHz = 902.30000 Active Port = 1

Modulation = LoRa (CSS)

Images:

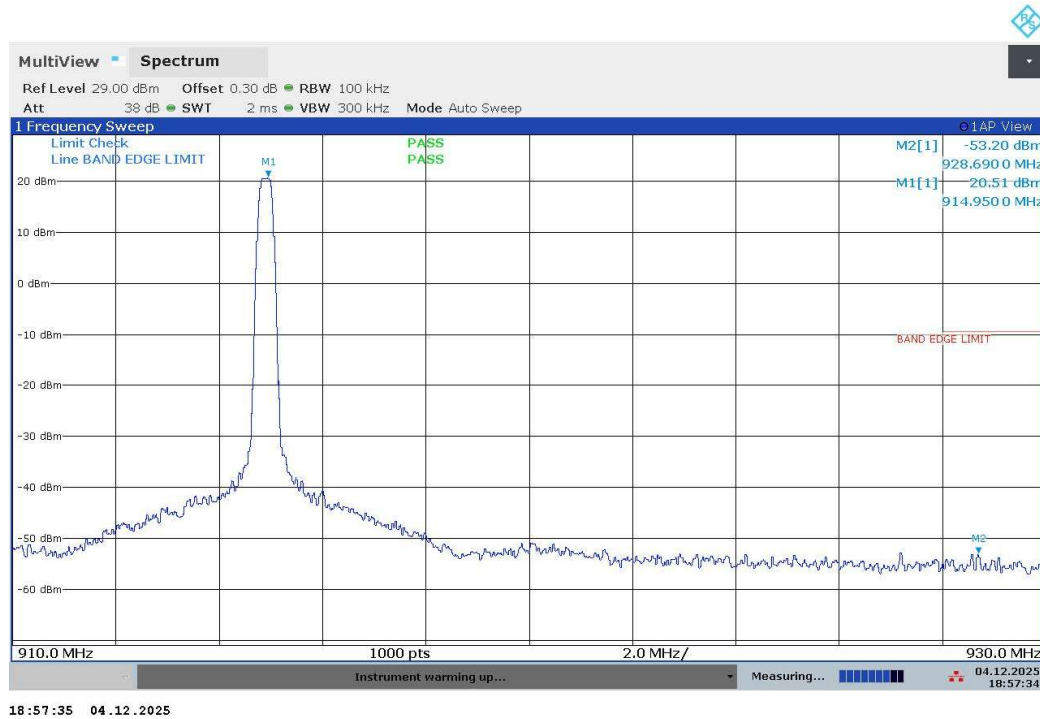


Operation Band MHz = [902, 928] FHSS = 125 KHz

Frequency MHz = 914.90000 Active Port = 1

Modulation = LoRa (CSS)

Images:



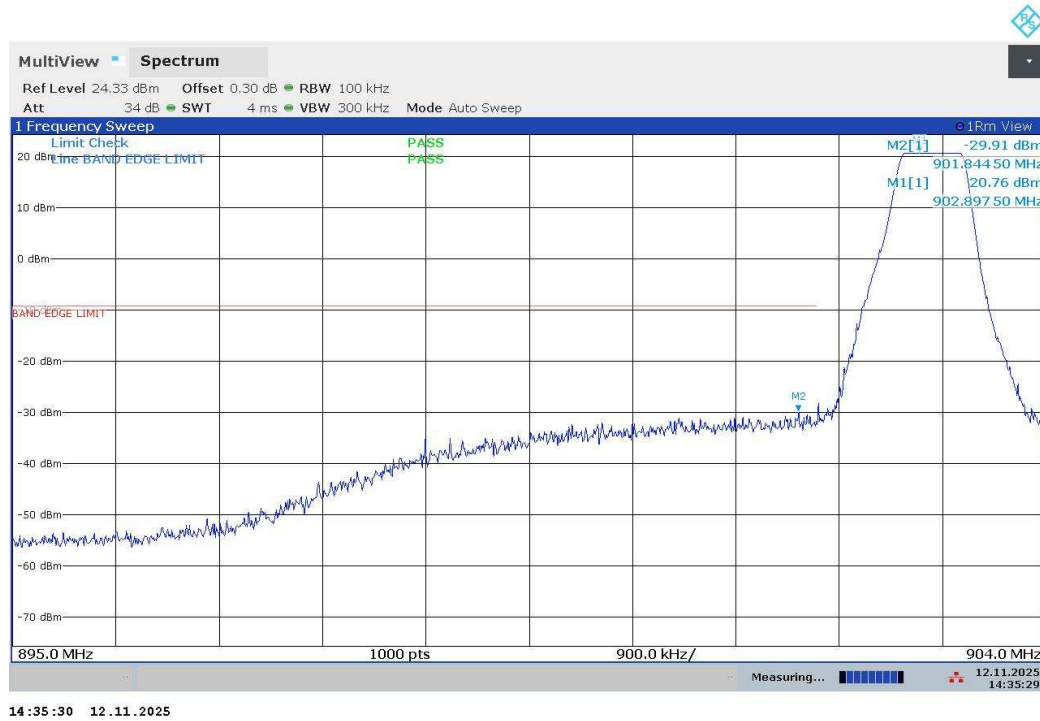
Attachments

Operation Band MHz = [902, 928] DTS = 500kHz

Frequency MHz = 903.00000 Active Port = 1

Modulation = LoRa (CSS)

Images:

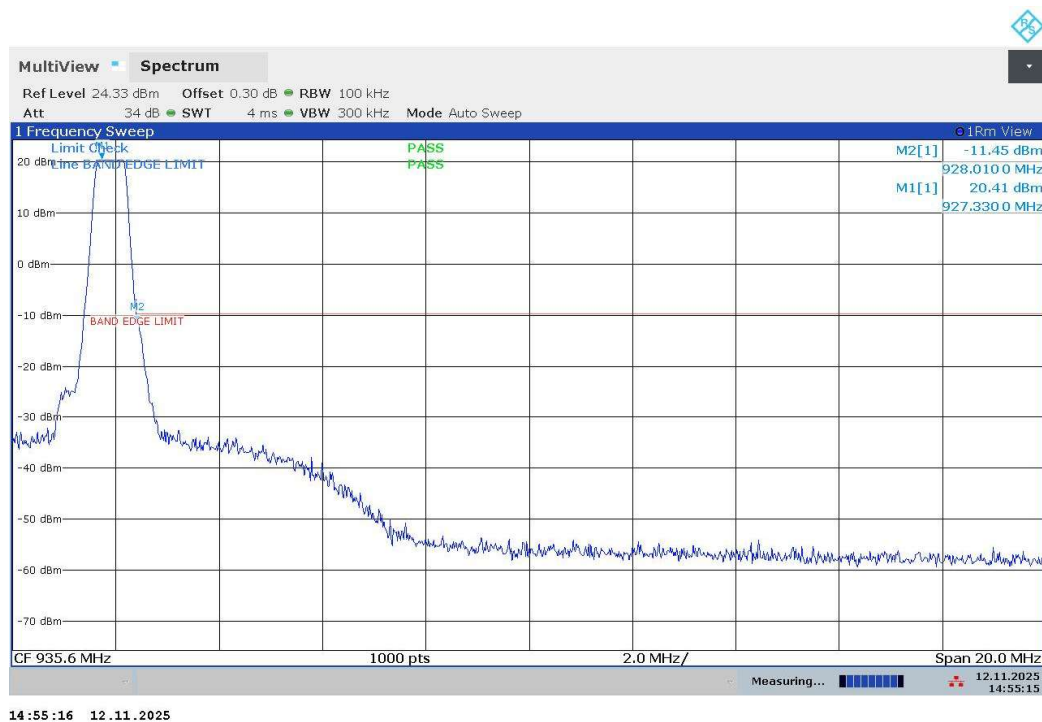


Operation Band MHz = [902, 928] FHSS = 500 KHz

Frequency MHz = 927.50000 Active Port = 1

Modulation = LoRa (CSS)

Images:



RSS-247 / FCC 15.247 - [RSE] Emission limitations radiated (Transmitter)

Limits

USA FCC Part 15.247 (05-05-2025):

FCC Rules and Regulations 47 CFR Part 15, Subpart C, Secs. 15.247:

(d) 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Secs. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Secs. 15.205(a), must also comply with the radiated emission limits specified in Secs. 15.209(a) (see Secs. 15.205(c)).

FCC Rules and Regulations 47 CFR Part 15, Subpart C, Secs. 15.209:

(a) the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100 ⁽¹⁾	40	3
88 - 216	150 ⁽¹⁾	43.5	3
216 - 960	200 ⁽¹⁾	46	3
Above 960	500	54	3

Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Secs. 15.231 and 15.241

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(f) In accordance with Secs. 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Secs. 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Secs. 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Secs. 15.109 that are applicable to the incorporated digital device.

FCC Rules and Regulations 47 CFR Part 15, Subpart B, Secs. 15.109:

(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in the Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment—Radio Disturbance Characteristics—Limits and Methods of Measurement" (incorporated by reference, see § 15.38). In addition:

(2) If, in accordance with § 15.33 of this part, measurements must be performed above 1000 MHz, compliance above 1000 MHz shall be demonstrated with the emission limit in paragraph (a) or (b) of this section, as appropriate. Measurements above 1000 MHz may be performed at the distance specified in the CISPR 22 publications for

measurements below 1000 MHz provided the limits in paragraphs (a) and (b) of this section are extrapolated to the new measurement distance using an inverse linear distance extrapolation factor (20 dB/decade), e.g., the radiated limit above 1000 MHz for a Class B digital device is 150 $\mu\text{V/m}$, as measured at a distance of 10 meters.

Frequency range (MHz)	Class A limits		Class B limits	
	AVG Limit for 3 m ⁽¹⁾ (dB $\mu\text{V/m}$)	PK Limit for 3 m ^(1,2) (dB $\mu\text{V/m}$)	AVG Limit for 3 m ⁽¹⁾ (dB $\mu\text{V/m}$)	PK Limit for 3 m ^(1,2) (dB $\mu\text{V/m}$)
1000 - 3000	60	80	54	74
3000 - 6000	60	80	54	74
6000 - 40000 ⁽³⁾	60	80	54	74

- Limits are specified by FCC at a distance of 10m and extrapolated here for 3m by adding inverse linear distance (1/d) proportionality factor of 20dB/decade, used per §15.31(f)(1)
- Frequencies above 1 GHz, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test, as per §15.35(b)
- According with the CISPR 22 (third Edition) There are no limits in the frequency range of 6 - 40 GHz, so expand the frequency range beyond 6GHz using the same limits.

FCC Rules and Regulations 47 CFR Part 15, Subpart C, Secs. 15.205:

(1) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

(MHz)	(MHz)	(MHz)	(GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	⁽²⁾
13.36-13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

CANADA RSS-247 Issue 4 (July 2025):

2.4 RSS-Gen compliance

Equipment being certified under this standard shall also comply with the general requirements set out in Radio Standards Specification RSS-Gen, General Requirements for Compliance of Radio Apparatus. Where contradictions exist between this standard and RSS-Gen, this standard shall take precedence.

CANADA RSS-Gen Issue 5 (April 2018):

8.9 Transmitter emission limits:

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

General field strength limits at frequencies above 30 MHz

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

General field strength limits at frequencies below 30 MHz

Frequency Range (MHz)	Field strength (µA/m)	Field strength (dBµA/m)	Measurement distance (m)
0.009-0.490 ⁽¹⁾	6.37/F(kHz)	-	300
0.490-1.705	63.7/F(kHz)	-	30
1.705 - 30.0	0.08	-	30

- The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

RSS-Gen Issue 5, Secs 8.10:

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government use.

- c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7 – Restricted frequency bands

(MHz)	(MHz)	(MHz)	(GHz)
0.090-0.110	16.42-16.423	1435-1626.5	13.25-13.4
0.495-0.505	16.69475-16.69525	1645.5-1646.5	14.47-14.5
2.1735-2.1905	16.80425-16.80475	1660-1710	15.35-16.2
3.020 - 3.026	25.5-25.67	1718.8-1722.2	17.7-21.4
4.125-4.128	37.5-38.25	2200-2300	22.01-23.12
4.17725-4.17775	73-74.6	2310-2390	23.6-24.0
4.20725-4.20775	74.8-75.2	2483.5-2500	31.2-31.8
5.677 - 5.683	108-121.94	2655-2900	36.43-36.5
6.215-6.218	123-138	3260-3267	Above 38.6
6.26775-6.26825	149.9-150.05	3332-3339	
6.31175-6.31225	156.52475-156.52525	3345.8-3358	
8.291-8.294	156.7-156.9	3500-4400	
8.362-8.366	162.0125-167.17	4.5-5.15	
8.37625-8.38675	167.72-173.2	5.35-5.46	
8.41425-8.41475	240-285	7.25-7.75	
12.29-12.293	322-335.4	8.025-8.5	
12.51975-12.52025	399.9-410	9.0-9.2	
12.57675-12.57725	608-614	9.3-9.5	
13.36-13.41	960-1427	10.6-12.7	

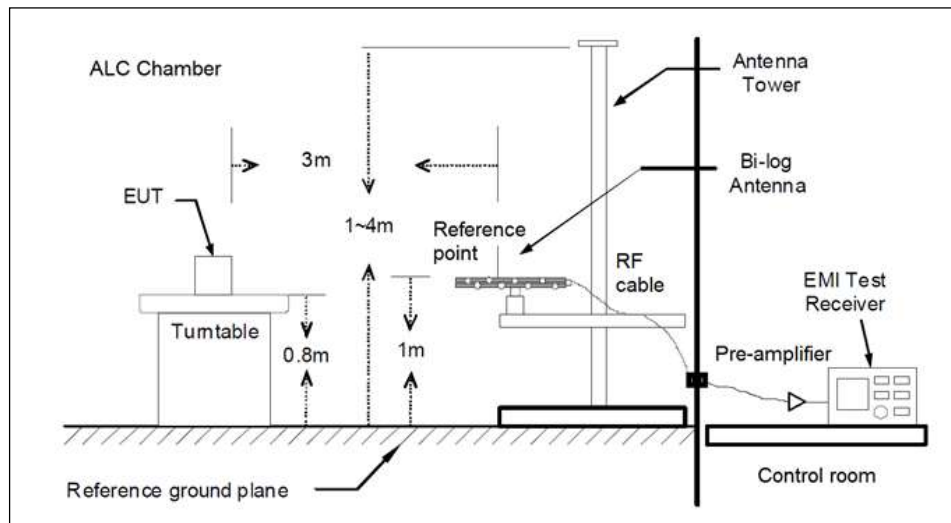
TEST SETUP:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency ranges 30-1000 MHz (Bilog antenna) and 1-18 GHz (Double ridge horn antennas).

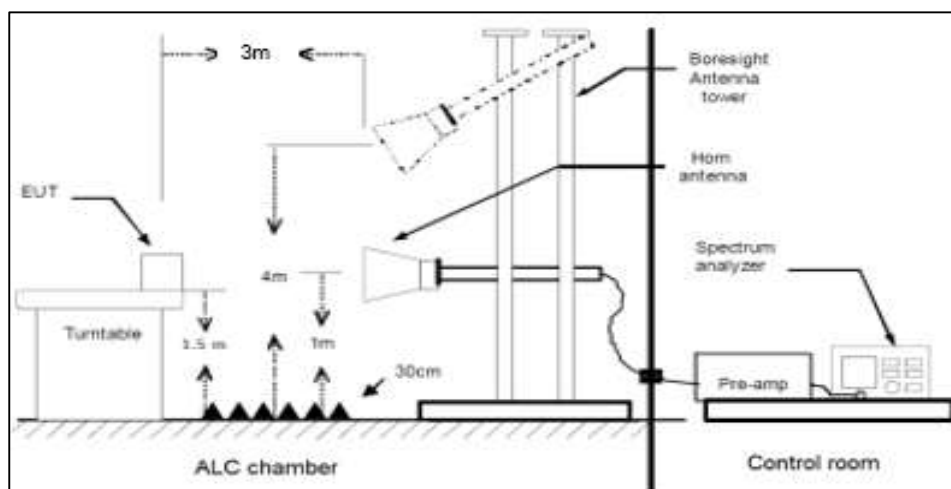
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.



Radiated measurements Setup $f < 1$ GHz



Radiated measurements setup $1 < f < 18$ GHz

Frequency range 9KHz – 30 MHz

No radiofrequency signal generated in the device found below 10° sub-harmonic, no further investigation required.

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Modulation: LoRa (CSS)

Sample ID: S/01

TC/03

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Margin to Limit (dB)	Pol	Detector
[0.03, 1]	[902, 928]	LoRa	903.00000	1	37.760000	17.4	23.6	H	QP
					74.086500	14.0	26.0	V	QP
					110.461500	13.0	30.5	V	QP
					163.569000	18.5	25.0	V	QP
					245.049000	17.5	28.5	V	QP
					400.394500	21.5	24.5	V	QP
					903.000000	Fundamental	--	H	QP
[1, 18]					1600.000000	37.6	16.4	H	AVG
					2709.000000	52.3	1.7	V	AVG
					3611.500000	36.6	17.4	V	AVG
					4515.000000	41.9	12.1	H	AVG
					8127.500000	44.0	10.0	V	AVG

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [902, 928]

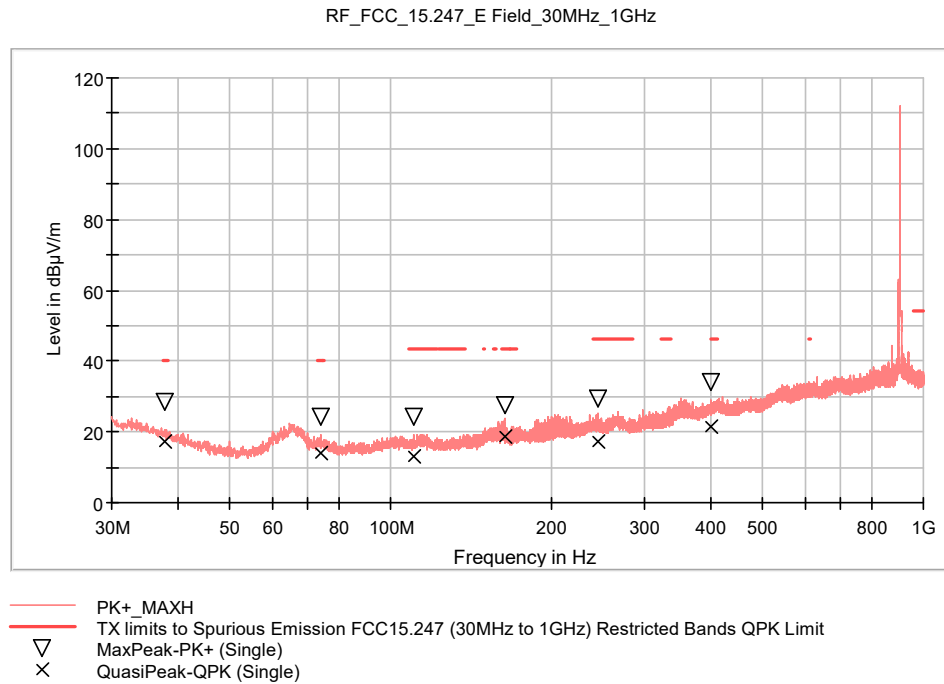
Sample ID: S/01

Frequency MHz = 903.00000

Active Port = 1

Modulation = LoRa (CSS)

Images:



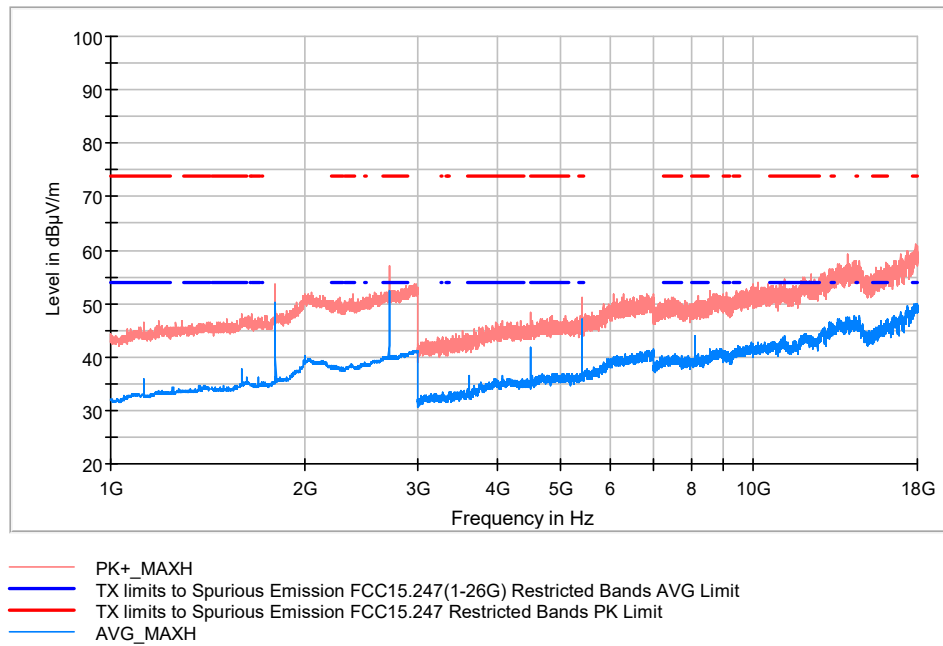
Frequency Range GHz = [1, 18] Operation Band MHz = [902, 928]

Sample ID: S/01 Frequency MHz = 903.00000

Active Port = 1 Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_1GHz_18GHz_HPF



Modulation: LoRa (CSS)

Sample ID: S/01

TC/03

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Margin to Limit (dB)	PoI	Detector
[0.03, 1]	[902, 928]	LoRa	914.20000	1	38.245000	23.0	17.0	V	QP
					74.086500	25.9	14.1	V	QP
					115.796500	28.5	15.0	V	QP
					163.375000	25.7	17.8	V	QP
					261.975500	27.3	18.7	V	QP
					608.362500	19.5	26.5	V	QP
[1, 18]					913.961000	Fundamental	--	H	QP
					2743.000000	50.8	3.2	V	AVG
					3656.500000	38.3	15.7	H	AVG
					4571.000000	45.6	8.4	H	AVG
					7313.500000	44.7	9.3	H	AVG

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [902, 928]

Sample ID: S/01

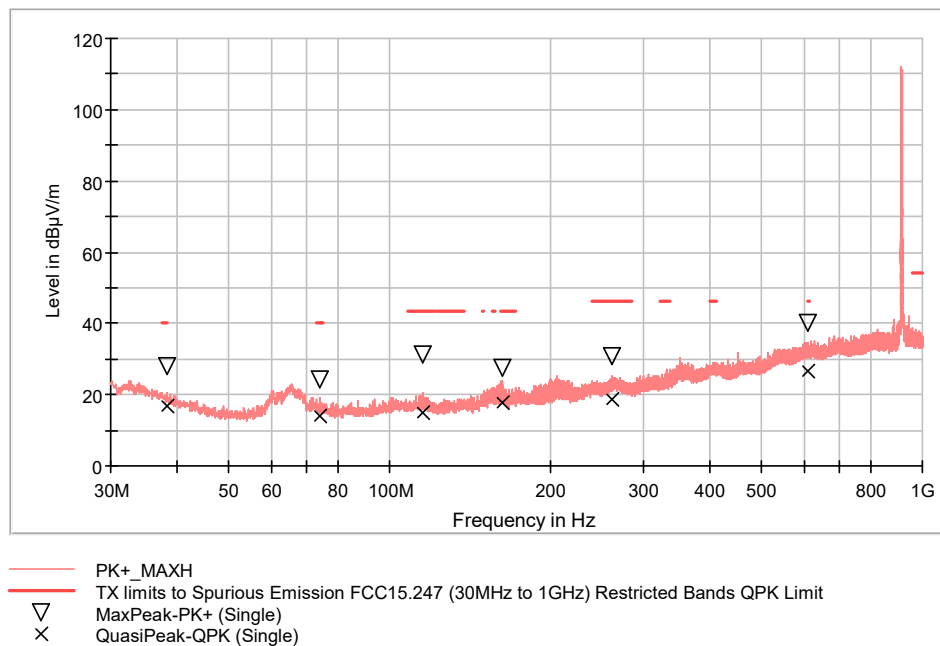
Frequency MHz = 914.20000

Active Port = 1

Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_30MHz_1GHz



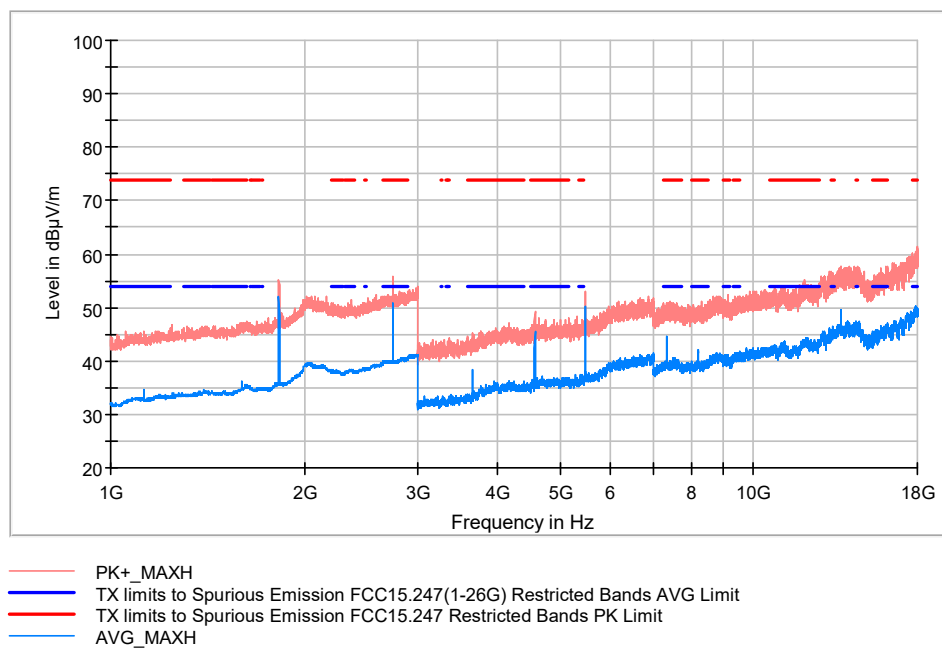
Frequency Range GHz = [1, 18] Operation Band MHz = [902, 928]

Sample ID: S/01 Frequency MHz = 914.20000

Active Port = 1 Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_1GHz_18GHz_HPF



Modulation: LoRa (CSS)

Sample ID: S/01

TC/03

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Margin to Limit (dB)	PoI	Detector
[0.03, 1]	[902, 928]	LoRa	927.50000	1	73.650000	25.7	14.3	V	QP
					113.614000	29.8	13.7	V	QP
					164.490500	26.4	17.1	V	QP
					263.139500	27.2	18.8	V	QP
					334.580000	25.0	21.0	V	QP
					403.062000	24.5	21.5	V	QP
[1, 18]	[902, 928]	LoRa	927.50000	1	927.380000	Fundamental	--	H	QP
					2782.000000	49.3	4.7	H	AVG
					3709.500000	39.8	14.2	H	AVG
					4637.000000	44.7	9.3	H	AVG
					8348.000000	42.2	11.8	V	AVG

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [902, 928]

Sample ID: S/01

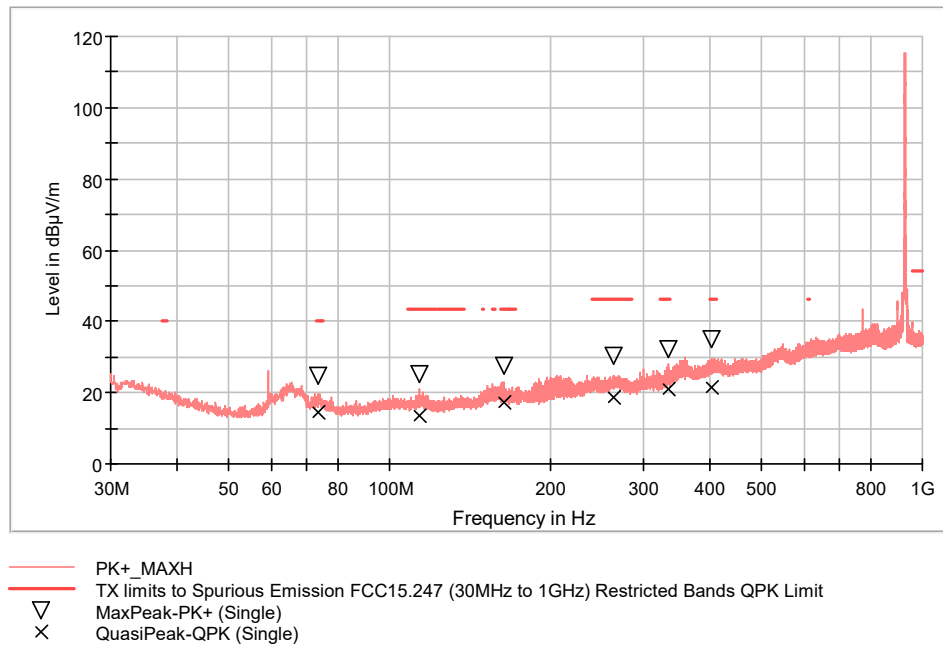
Frequency MHz = 927.50000

Active Port = 1

Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_30MHz_1GHz



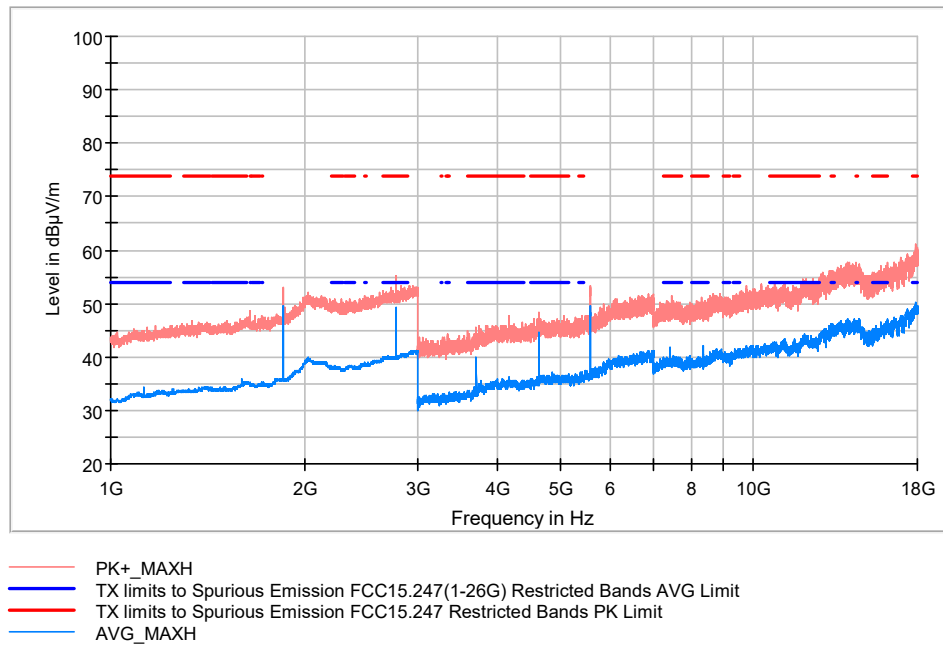
Frequency Range GHz = [1, 18] Operation Band MHz = [902, 928]

Sample ID: S/01 Frequency MHz = 927.50000

Active Port = 1 Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_1GHz_18GHz_HPF



Frequency range 9KHz – 30 MHz

No radiofrequency signal generated in the device found below 10° sub-harmonic, no further investigation required.

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Modulation: LoRa (CSS)

Sample ID: S/02

TC/03

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Margin to Limit (dB)	PoI	Detector
[0.03, 1]	[902, 928]	LoRa	903.00000	1	73.795500	24.4	15.6	V	QP
					114.341500	29.1	14.4	V	QP
					165.072500	28.0	15.5	V	QP
					244.176000	27.3	18.7	V	QP
					405.681000	23.6	22.4	V	QP
					611.660500	19.2	26.8	V	QP
[1, 18]	[902, 928]	LoRa	903.00000	1	902.760000	Fundamental	--	H	QP
					2709.000000	48.8	5.2	H	AVG
					3611.000000	41.2	12.8	H	AVG
					4515.000000	46.4	7.6	H	AVG
					5419.000000	44.8	9.2	H	AVG

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [902, 928]

Sample ID: S/02

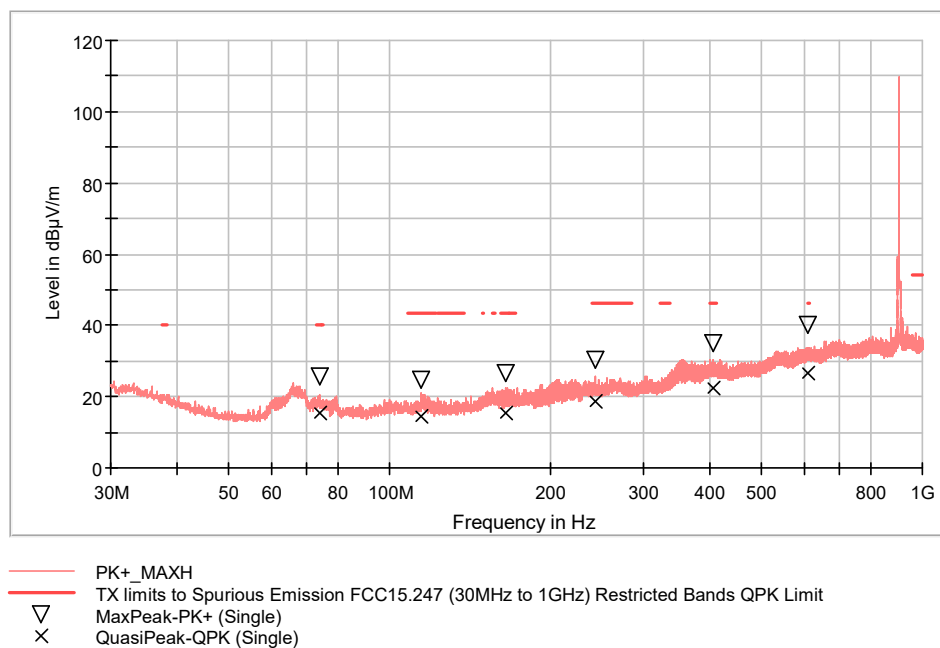
Frequency MHz = 903.00000

Active Port = 1

Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_30MHz_1GHz



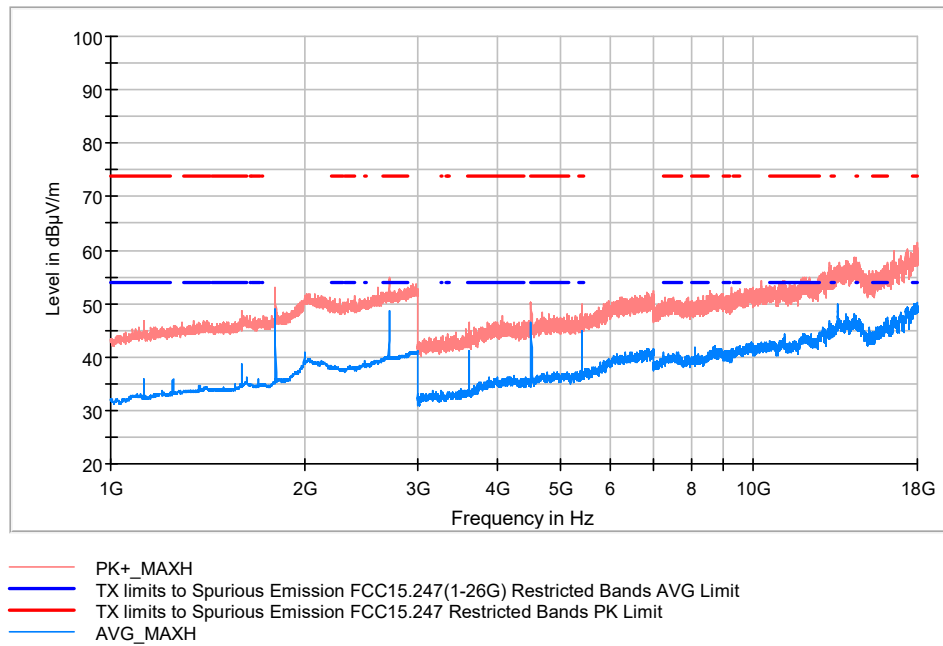
Frequency Range GHz = [1, 18] Operation Band MHz = [902, 928]

Sample ID: S/02 Frequency MHz = 903.00000

Active Port = 1 Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_1GHz_18GHz_HPF



Modulation: LoRa (CSS)

Sample ID: S/02

TC/03

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Margin to Limit (dB)	Pol	Detector
[0.03, 1]	[902, 928]	LoRa	914.20000	1	37.517500	17.6	22.4	H	QP
					74.183500	14.9	25.1	V	QP
					117.639500	12.9	30.6	V	QP
					162.647500	16.9	26.6	V	QP
					402.819500	21.7	24.3	V	QP
					612.048500	26.9	19.1	V	QP
[1, 18]	[902, 928]	LoRa	914.20000	1	914.010500	Fundamental	--	H	QP
					1600.000000	42.4	11.6	V	AVG
					2742.500000	45.2	8.8	H	AVG
					3657.000000	40.0	14.0	H	AVG
					4571.000000	45.2	8.8	H	AVG

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [902, 928]

Sample ID: S/02

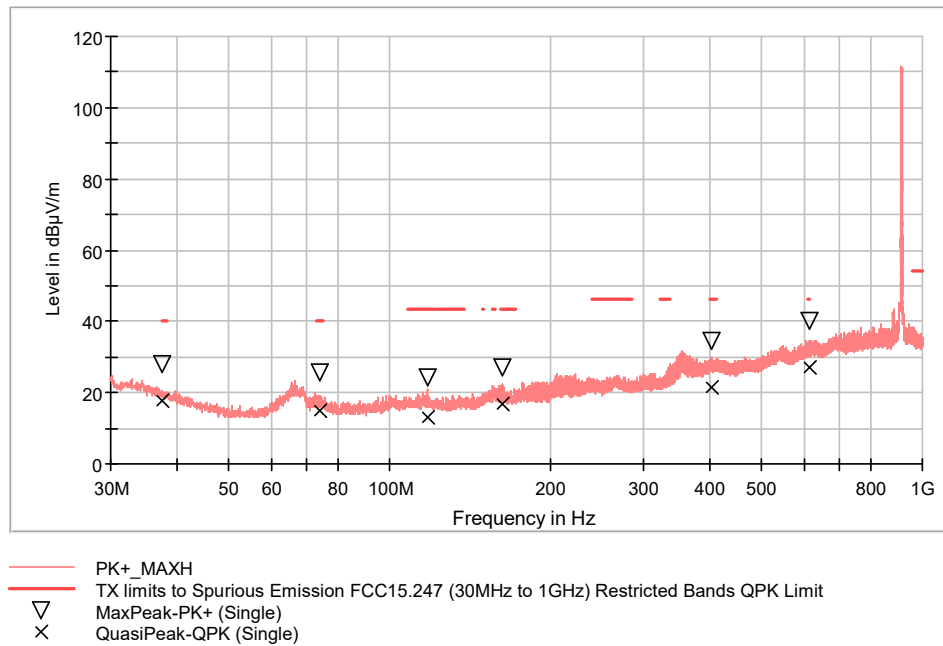
Frequency MHz = 914.20000

Active Port = 1

Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_30MHz_1GHz



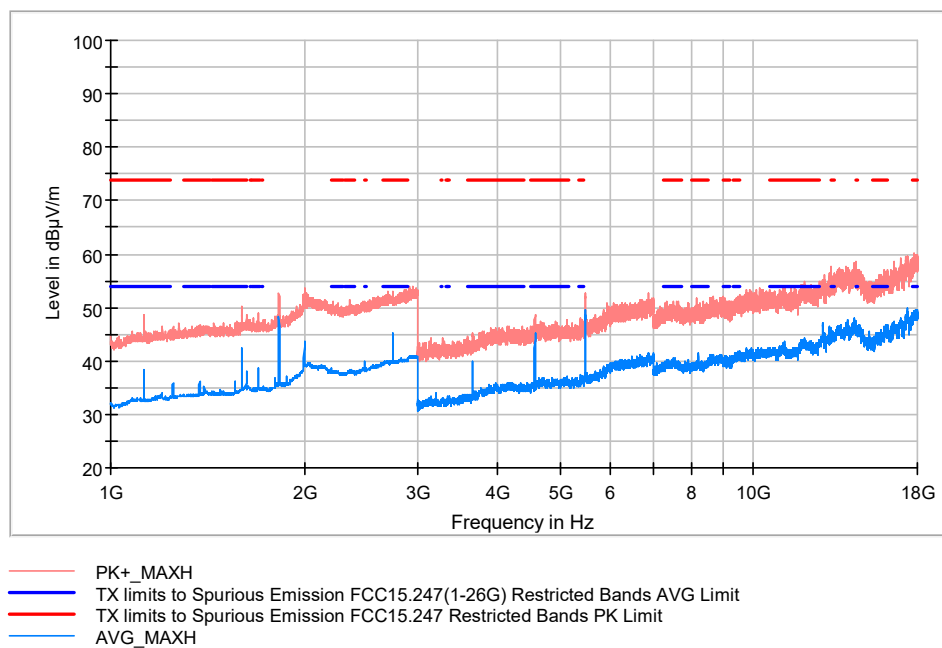
Frequency Range GHz = [1, 18] Operation Band MHz = [902, 928]

Sample ID: S/02 Frequency MHz = 914.20000

Active Port = 1 Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_1GHz_18GHz_HPF



Modulation: LoRa (CSS)

Sample ID: S/02

TC/03

Results

Freq Rng (GHz)	Operation Band (MHz)	Equipment	Freq (MHz)	Port	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Margin to Limit (dB)	PoI	Detector
[0.03, 1]	[902, 928]	LoRa	927.50000	1	37.711500	17.5	22.5	H	QP
					73.504500	14.6	25.4	V	QP
					116.427000	13.9	29.6	V	QP
					262.315000	18.3	27.7	V	QP
					404.371500	21.8	24.2	H	QP
					610.399500	26.8	19.2	V	QP
					927.783500	Fundamental	--	V	QP
[1, 18]					1125.000000	38.5	15.5	V	AVG
					1600.000000	42.6	11.4	V	AVG
					3710.000000	38.4	15.6	V	AVG

Verdict

Pass

Attachments

Frequency Range GHz = [0.03, 1] Operation Band MHz = [902, 928]

Sample ID: S/02

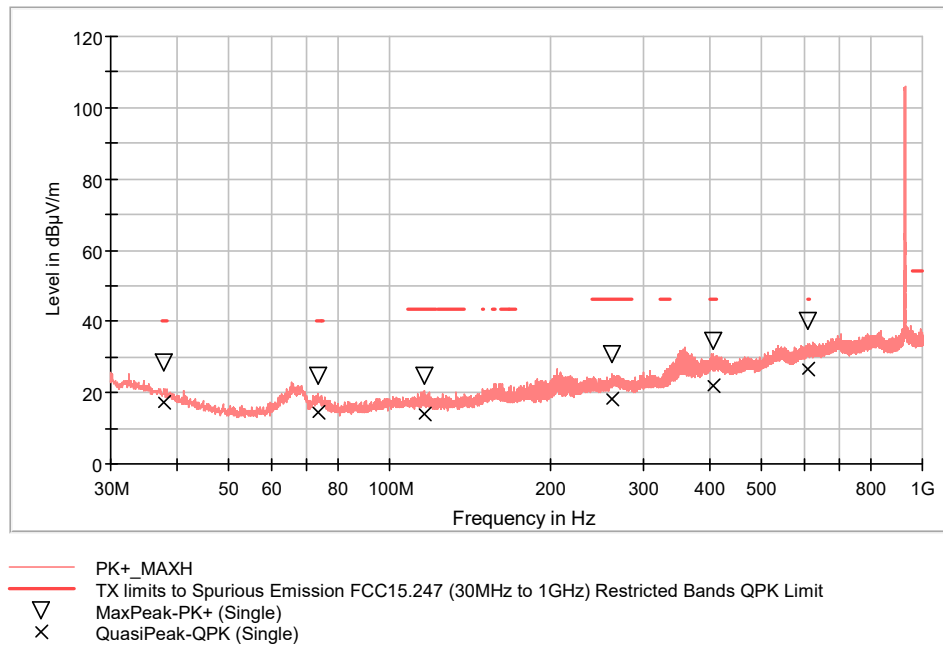
Frequency MHz = 927.50000

Active Port = 1

Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_30MHz_1GHz



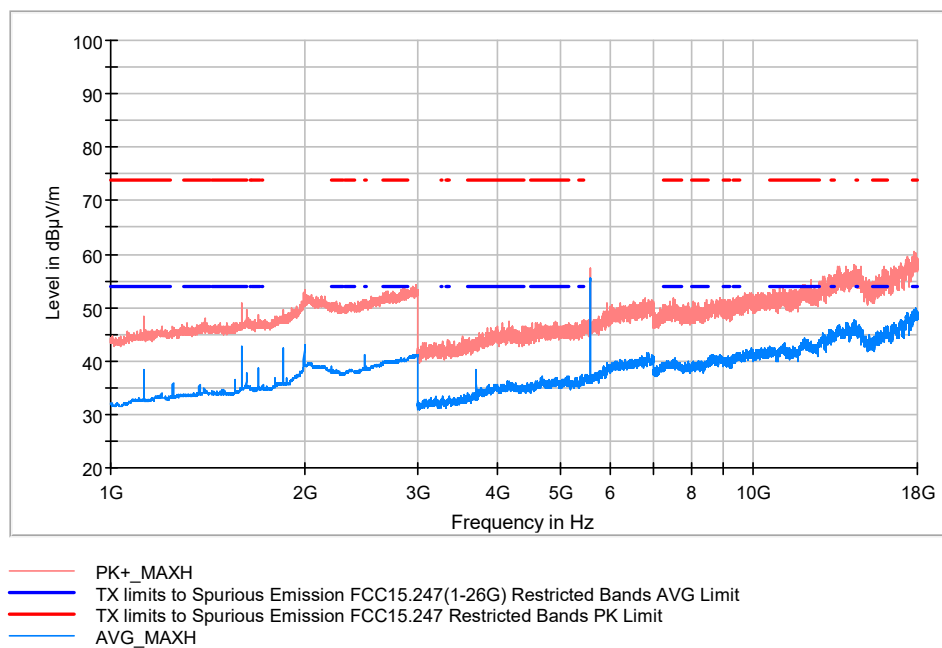
Frequency Range GHz = [1, 18] Operation Band MHz = [902, 928]

Sample ID: S/02 Frequency MHz = 927.50000

Active Port = 1 Modulation = LoRa (CSS)

Images:

RF_FCC_15.247_E Field_1GHz_18GHz_HPF



Radiated emission electromagnetic field

(30MHz – 1GHz)

Pre-Scan Spectrum Analyzer Parameters

Subrange	Preamp	Detectors	Bandwidth
30 MHz - 1 GHz	20 dB	PK+	100 kHz

Final Scan Spectrum Analyzer Parameters

Subrange	Preamp	Detectors	Bandwidth
30 MHz - 1 GHz	20 dB	QPK, PK+	120 kHz

(1GHz – 18GHz)

Pre-Scan Spectrum Analyzer Parameters

Subrange	Preamp	Detectors	Bandwidth
1 GHz - 18 GHz	20 dB	PK+; AVG	1 MHz

RSS-247 / FCC 15.247 - [Psd] Power Spectral Density

Limits

USA FCC Part 15.247 (11-18-2024) :

FCC 15.247:

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

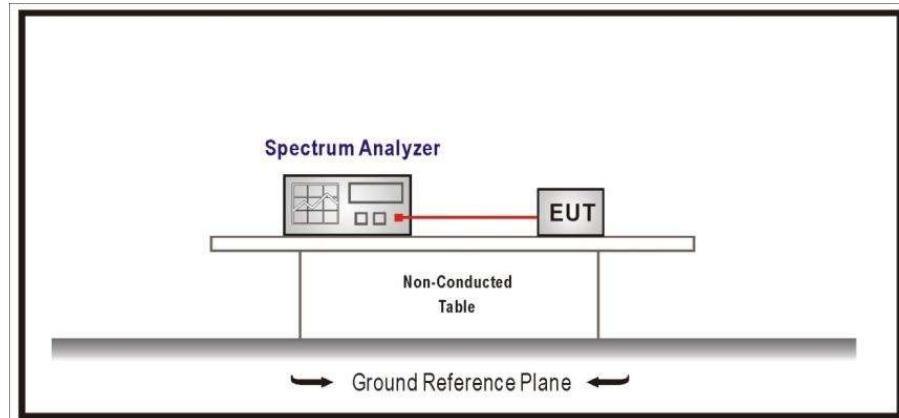
CANADA RSS-247 Issue 4 (July 2025):

6.3.1 Bandwidth and conducted power spectral density

The following applies to the bands 902-928 MHz and 2400-2483.5 MHz:

- b. the transmitter power spectral density conducted from the transmitter to the antenna(s) shall not be greater than 8 dBm/3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 6.3.2 The power spectral density shall be determined using the same method as is used to determine the maximum conducted output power.

TEST SETUP:



Modulation: LoRa (CSS), Hybrid = 125 kHz

Sample ID: S/03

TC/03

Results

Freq (MHz)	Port	PSD (dBm)	Margin to Limit (dB)
902.30000	1	6.17	1.83
908.70000	1	2.48	5.52
914.90000	1	4.37	3.63

Modulation: LoRa (CSS), DTS = 500 kHz

Sample ID: S/03

TC/03

Results

Freq (MHz)	Port	PSD (dBm)	Margin to Limit (dB)
903.00000	1	-6.27	14.27
914.20000	1	-5.29	13.29
927.50000	1	-5.77	13.77

Verdict

Pass

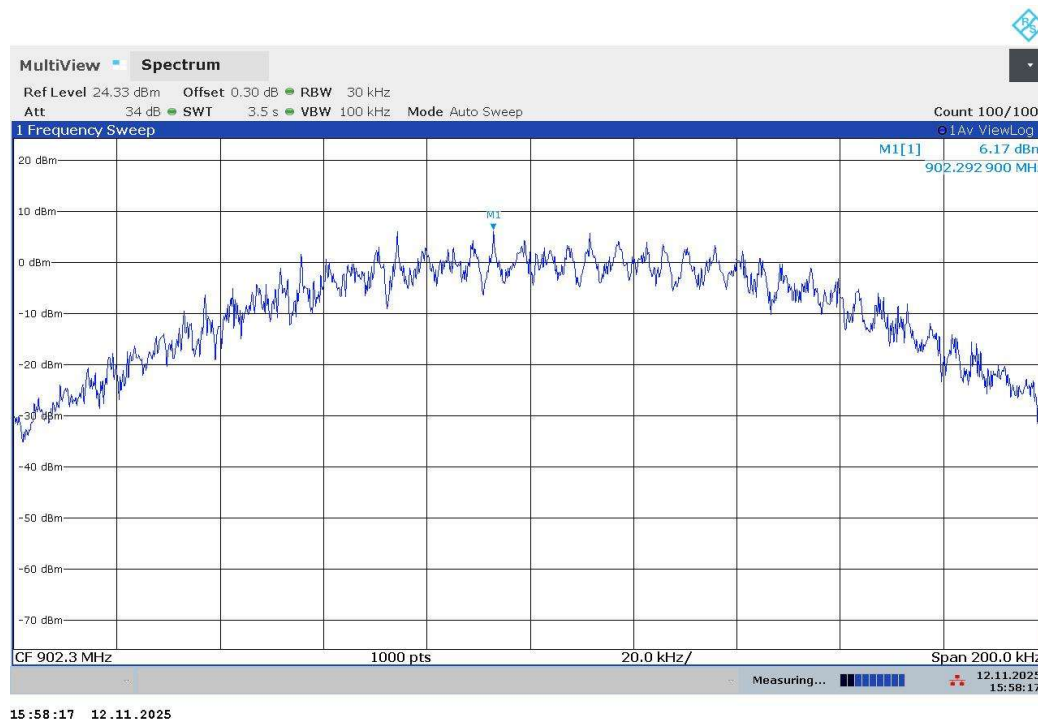
Attachments

Operation Band MHz = [902, 928] Hybrid = 125 kHz

Frequency MHz = 902.30000 Active Port = 1

Modulation = LoRa (CSS)

Images:

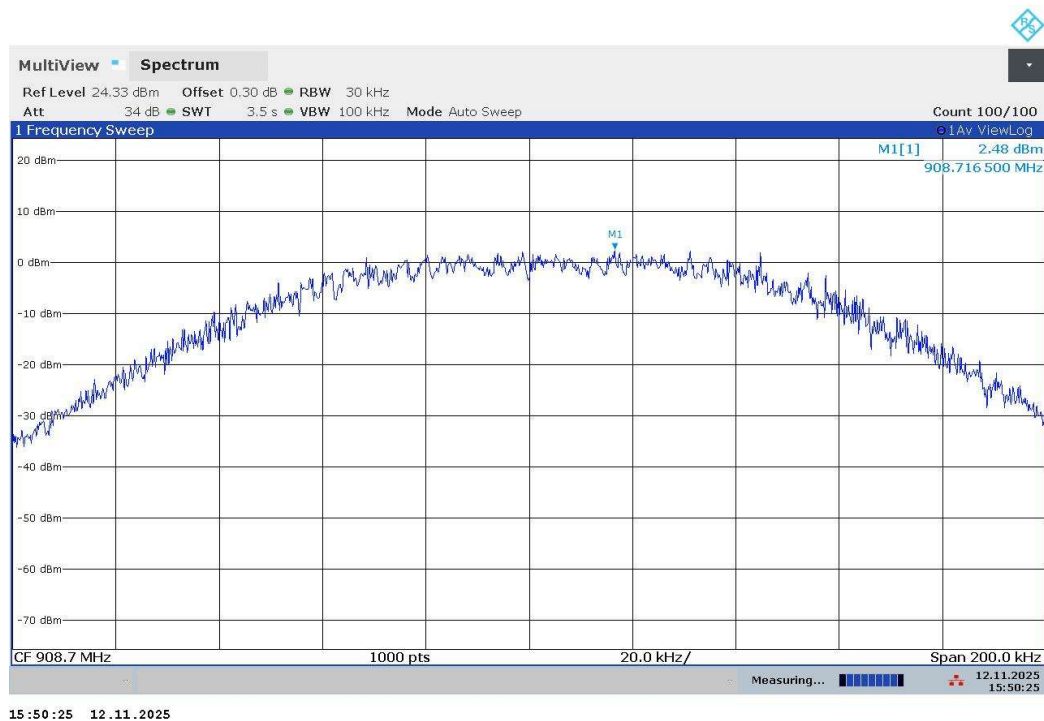


Operation Band MHz = [902, 928] Hybrid = 125 kHz

Frequency MHz = 908.70000 Active Port = 1

Modulation = LoRa (CSS)

Images:

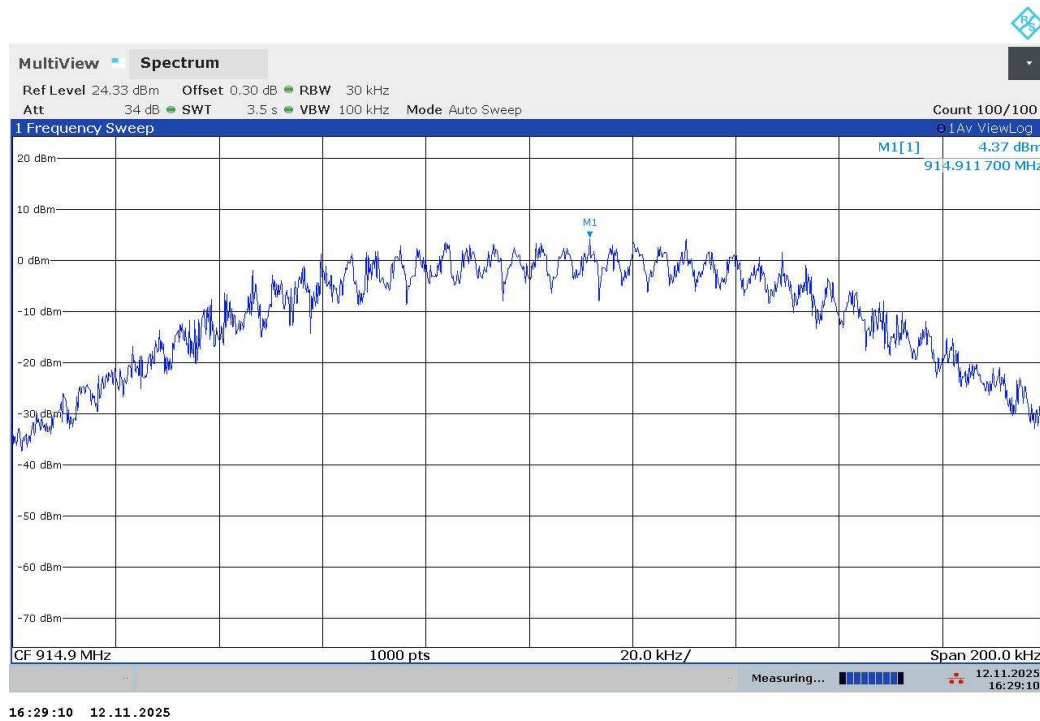


Operation Band MHz = [902, 928] Hybrid = 125 kHz

Frequency MHz = 914.90000 Active Port = 1

Modulation = LoRa (CSS)

Images:



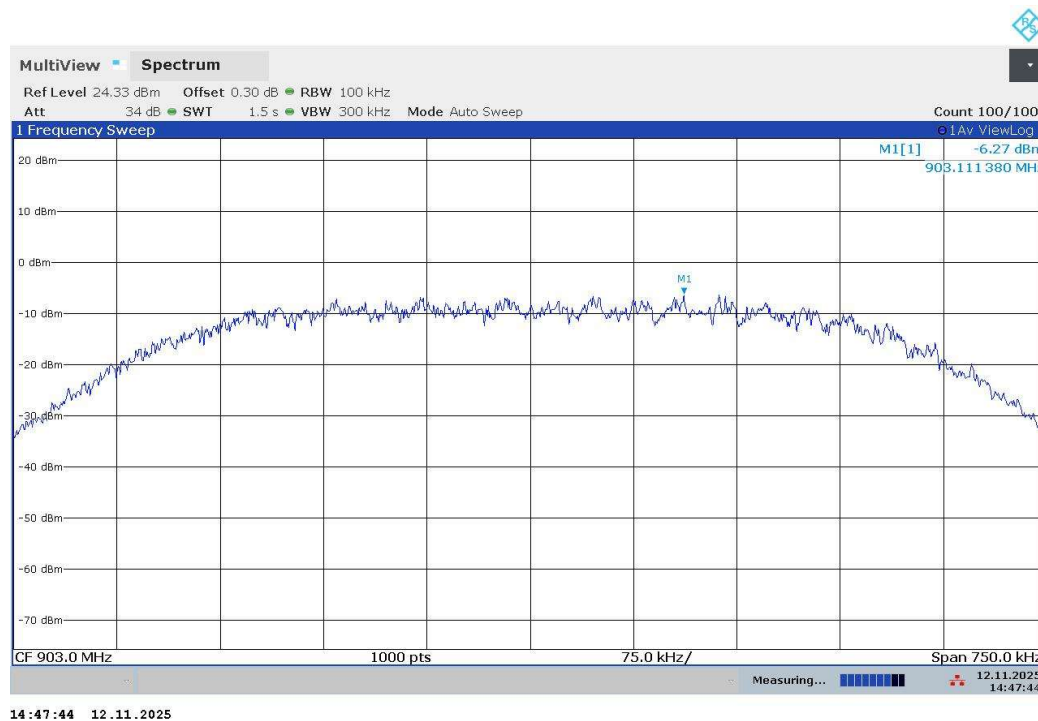
Attachments

Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 903.00000 Active Port = 1

Modulation = LoRa (CSS)

Images:

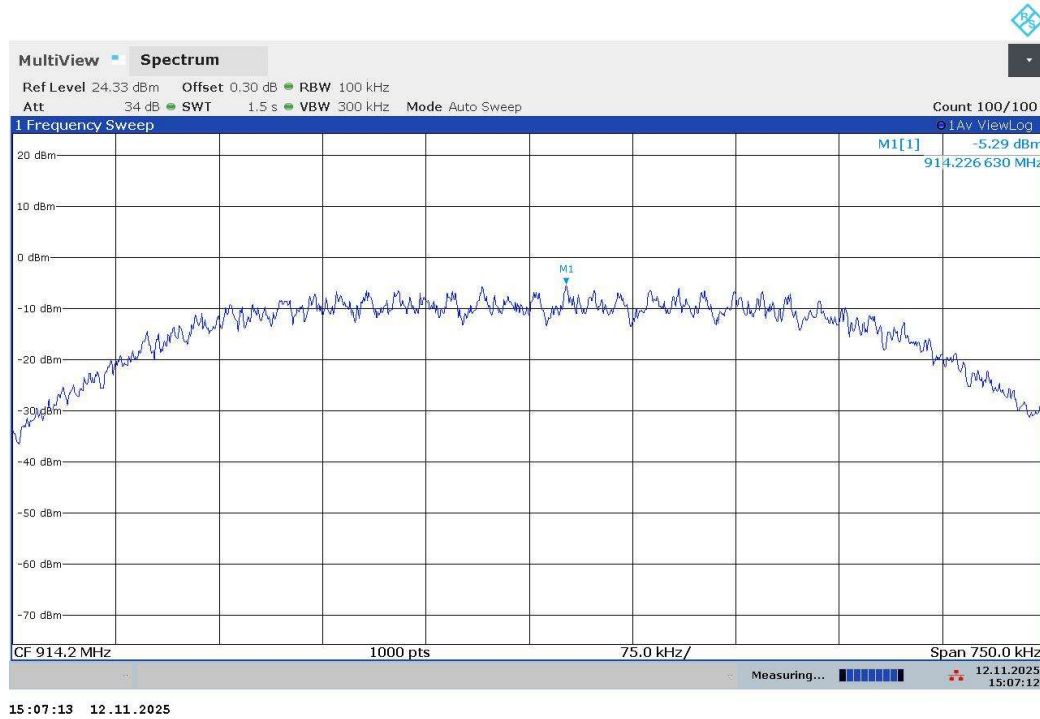


Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 914.20000 Active Port = 1

Modulation = LoRa (CSS)

Images:



Operation Band MHz = [902, 928] DTS = 500 kHz

Frequency MHz = 927.50000 Active Port = 1

Modulation = LoRa (CSS)

Images:

