



BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

**TEST STANDARDS:
FCC Part 15 Subpart C, IC RSS-Gen, IC RSS-247
DTS Intentional Radiator**

Woodstream Corporation Model V420 Lora Radio Mouse Snap Trap

**FCC ID: SNA-V420
ISED ID: 9458A-V420**

REPORT BEC-2127-01 REV1

TEST DATES: 03/08/2021 – 04/06/2021

**CUSTOMER:
Woodstream Corporation
69 North Locust Street
Lititz, PA 17543**

PREPARED BY: _____

Paul Banker, Test Engineer

REVIEWED and APPROVED BY: _____

Steve Fanella, Quality Manager

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Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	04/12/2021
1	Added EUT Test Software Version to Section 1.1. Added Section 2.9 Antenna Gain Information. Edited Section 2.11 to add the Serial Port Connection added to the Samples 2127-01 and 2127-03. Added description of X, Y and Z Orientation Planes Examined for Emissions Testing in Section 4.5.2.	04/26/2021	04/26/2021



1.0 Administrative Information

1.1 Project Details

Project Number	BEC-2127	
Manufacturer	Woodstream Corporation	
Model Number	V420	
EUT Description	VLINK Mouse Snap Trap with LoRa Radio Communication	
Serial Number	None	
Sample Types	Modified with SMA connector on transmitter output port (Antenna Conducted Sample)	Unmodified Sample (Radiated Sample)
Sample Numbers	2127-01	2127-03
FCC ID	SNA-V420	
ISED ID	9458A-V420	
Radio Chip Manufacturer	Semtech Corporation	
Radio Chip Model Number	SX1272	
Frequency of Operation	902 – 915 MHz	
Frequencies Tested	Low (903 MHz), Middle (909.4 MHz), High (914.2 MHz)	
Antenna Gain	-6.61 dBi	
FCC Classification	Digital Transmission System (DTS)	
Date Samples Received	03/08/2021	
EUT Firmware Version	1.3.1, built Tue 03/09/2021 7:59:52.26 (US 915)	
Condition Samples Received	Suitable for test	
Sample Type	Production unit	
Applicable FCC Rules	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System	
Applicable ISED Rules	RSS-Gen: General Requirements for Compliance of Radio Apparatus & RSS-247: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices	



1.2 Preface

This report documents product testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures, and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

1.3 Laboratory and Customer Information

Test Laboratory Location	BEC Incorporated 970 East High Street Pottstown, PA 19464
Test Personnel	Paul Banker / Steve Fanella / JR Fanella
BEC Laboratory Number FCC Registration	US1118
BEC Laboratory Number ISED Registration	7342A-1
Test Performed For	Woodstream Corporation 69 North Locust Street Lititz, PA 17543
Customer Technical Contact	Dwayne Arrighy
Customer Reference Number	PO # 183621

1.4 Measurement Uncertainty

Measurement	Measurement Distance	Frequency Range	Measurement Limit	Expanded Uncertainty
Radiated Disturbance	3 Meter	30 MHz – 1 GHz	Class B	4.12
Conducted Disturbance AC Mains	N/A	150 kHz – 30 MHz	Class A or B	2.69

No adjustments to measured data presented in this report are required because all values of uncertainty are less than the CISPR 16-4-2:2018 recommendations. These uncertainties have a coverage factor of $k = 2$, which yields approximately a 95% level of confidence for the near-normal distribution typical of most measurement results.

FCC Registered Test Site Number: US1118
 ISED Registered Test Site Number: 7342A-1



1.5 Test Result Summary Table

The Woodstream Model V420 LoRa Radio Mouse Snap Trap was tested and found to be compliant to the sections of the FCC Part 15 Subpart C and ISSED standards listed below:

Report Section	FCC Part 15, Subpart C	RSS-Gen	RSS-247	Test Description	Result
N/A	15.207	7.2		Conducted Limits (AC Power)	N/A
4.1	15.203(b)	Annex A 10(g)		Antenna Requirement	PASS
4.2	15.204	8.3		External RF power amplifiers and antenna modifications	PASS
4.3	ANSI C63.10, Section 11.6			Duty Cycle	Measured
4.4	15.247(d)	5.5	3.3	DTS Emissions in non-restricted frequency Bands 30 MHz to 10 GHz	PASS
4.5	15.205, 15.209 15.35(b)	8.1, 8.9, 8.10		DTS Emissions in restricted frequency Bands 30 MHz to 10GHz	PASS
4.6	15.247(a)(2)		5.2 (a)	6 dB Occupied Bandwidth	PASS
4.7	2.1049(h)		6.7	99% Occupied Bandwidth	PASS
4.8	15.247(b)(3)		5.4 (d)	Maximum Peak Power Output and EIRP	PASS
4.9	15.247(e)		5.2 (b)	Antenna Port, Power Spectral Density	PASS
4.10	15.247(d)		5.5	Band Edge Measurement	PASS



1.6 Condition of Received Sample

An evaluation of the EUT was conducted in order to verify test subject identity and condition and to ensure suitability for testing. No evidence of physical damage was noted. The test item condition was deemed acceptable for the performance of the requested test services.

1.7 Climatic Environment

Unless noted elsewhere in this report, the following were the ambient conditions in the laboratory during testing:

Temperature: $22^{\circ} \pm 5^{\circ}$

Humidity: $50\% \pm 20\%$

Barometric Pressure: $1000\text{mb} \pm 20\%$

1.8 Test Equipment

All test equipment is checked to manufacturer's specifications and, when applicable, have current N.I.S.T. traceable, ISO 9002 conforming certificates of calibration. Test equipment used for the tests described herein is listed in Appendix A.



2.0 Equipment Under Test

Unless otherwise noted in the individual test results sections, testing was performed on the EUT as follows.

2.1 EUT Description

The Woodstream Model V420 VLINK is a Mouse Snap Trap which incorporates a LoRa Radio to communicate trap status to a smart phone or network application.

The device is powered by two CR2032 coin cell batteries in parallel (3 V dc).

2.2 Product Category

FCC Part 15, Subpart C (Section 15.247), IC RSS-Gen, IC RSS-247

2.3 Product Classification

Intentional Radiator Testing Requirements, DTS Operation within the band of 902 - 928 MHz.

2.4 Test Configuration

The Woodstream Model V420 LoRa Radio Mouse Snap Trap Sample # 2127-01 was tested without a trap enclosure for all antenna terminal measurements. The Woodstream Model V420 LoRa Radio Mouse Snap Trap Sample # 2127-03 was tested for all radiated emissions tests.

2.5 Test Configuration Rationale

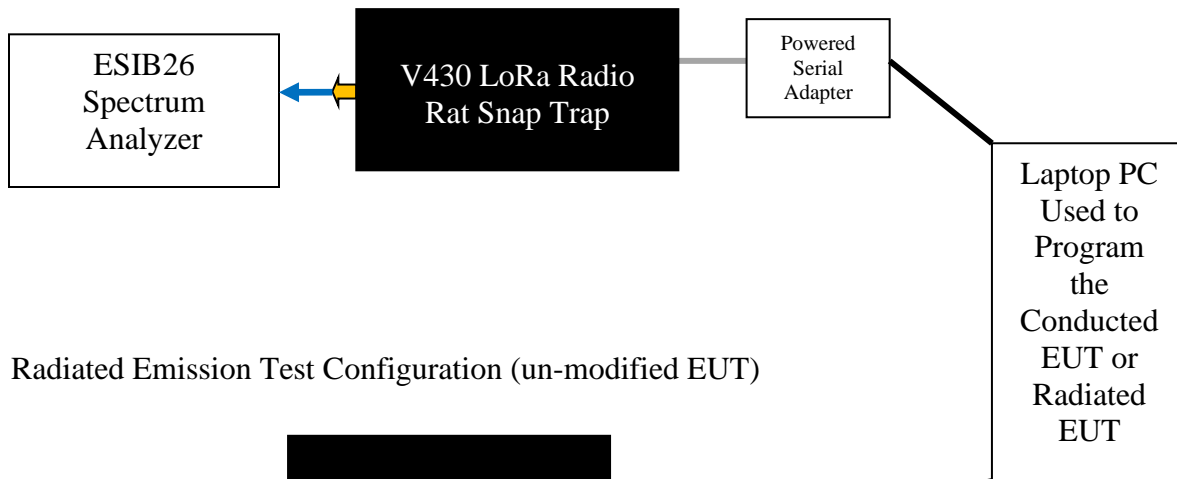
The modified radio of the Woodstream Model V420 LoRa Radio Mouse Snap Trap allows direct access to the output of the radio, without a transmission antenna. The unmodified unit is factory produced with modified software for EMI test purposes.



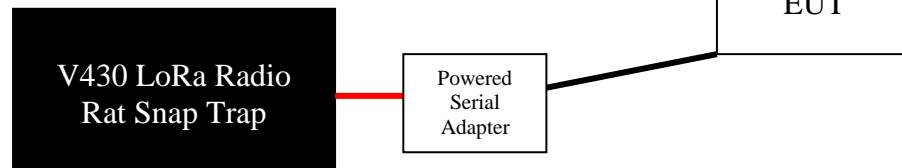
2.6 Test Configuration Diagrams

Block diagrams of the EUT configuration showing interconnection cables are illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.

Antenna Conducted Test Configuration (modified with SMA connector in place of antenna)



Radiated Emission Test Configuration (un-modified EUT)





2.7 EUT Information, Interconnection Cabling and Support Equipment

EUT Hardware

Description	Manufacturer	Model	Serial Number	Sample Number
Lora Radio Mouse Snap Trap (modified with SMA, test software)	Woodstream Corporation	V420	None	2127-01
Lora Radio Mouse Snap Trap (unmodified, test software)				2127-03

Interconnection Cable List (Conducted Test Setup)

Manufacturer	Model	Type	Shielding	Length	Description
Suhner	S04272B	High Frequency RF Cable 1 to 40 GHz	Double Braid	1 Meter	Measurement Cable from the Antenna SMA Connector to the Rohde and Schwarz ESIB26 Receiver. Asset # BEC-962

Support Equipment

Description	Manufacturer	Model	Serial Number
Powered Serial Adapter	Woodstream	2457159A_Y40	none
Lap Top Computer	Dell	Inspiron 15-3567	E4B4B16C-F475-4A3F- 9795-A06C5CB4AB43



2.8 Test Signals and Test Modulation

By design this product does not have an external Modulation input connector, therefore, normal operating modulation was used for all testing reported herein. The only test where modulation was not active was during testing of the Maximum Peak Power Output FCC Section 15.247(b) (3) (Section 4.6 of this report) to ensure that the un-modulated carrier was not higher than the modulated carrier.

The control unit in this product is a digital frequency transmitter. The EUT transmits to a discrete frequency on a specific channel. The Woodstream Model V420 LoRa Radio Mouse Snap Trap has 8 Channels available. The 8 Channels and frequencies that can be transmitted by the EUT are as follows:

Channel	Frequency (MHz)		Channel	Frequency (MHz)
0	903.0		4	909.4
1	904.6		5	911.0
2	906.2		6	912.6
3	907.8		7	914.2

For the required testing, the EUT was configured to transmit at low Channel 0 (903 MHz), middle Channel 4 (909.4 MHz) and high Channel 7 (914.2 MHz). The EUT operates with a 500 KHz bandwidth and a Spread Factor of 8. The maximum output power setting of 20 was used for all tests. The Duty Cycle of the LoRa Modulation signal is greater than 100%.

2.9 Antenna Gain

The antenna gain was derived using the formulae outlined in Appendix G of ANSI C63.10. The maximum peak output of the transmitter was measured at the SMA connector. The maximum radiated emission from the EUT with the internal antenna attached was measured at a distance of 3 meters from the EUT. The resultant antenna gain was the difference between EIRP at the transmitter terminals and the EIRP calculated from the field strength measured at 3m.

2.10 Grounding

There was no ground connection used; the EUT is battery powered and self-contained.

2.11 EUT Modifications

The Woodstream Model V420 LoRa Radio Mouse Snap Trap Samples 2127-01 and 2127-03 were modified to add a Serial Port for programming the EUTs radio. Also, an SMA connector was added directly to the antenna output on the main board of the Woodstream Model V420 LoRa Radio Mouse Snap Trap Sample 2127-01.

2.12 EUT Pictures Woodstream Model V420 LoRa Radio Mouse Snap Trap

See Appendix B Woodstream V420 LoRa Radio Mouse Snap Trap External Photos



3.0 Applicable Requirements, Methods, and Procedures

4.6 Applicable Requirements

The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied and where appropriate, provide a presumption of compliance to one or more of the following requirements or to other requirements at the discretion of the customer, regulatory agencies, or other entities.

4.6.2 FCC Requirements

Code of Federal Regulations: Title 47 – Telecommunication

Chapter I – Federal Communications Commission

Sub-chapter A – General

Part 15 – Radio Frequency Devices

Subpart C – Intentional Radiators

3.1.2 Innovation, Science and Economic Development Canada (ISED)

RSS-Gen Issue 5 March 2019 Amendment 1: 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

3.1.3 Basic Test Methods and Test Procedures

KDB Document 558074 D01 15.247 Meas Guidance v05r02, Guidance for Performing Compliance Measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules.

ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.2 Deviations or Exclusions from the Requirements

No deviations or exclusions were made.



4.6 Test Results

4.1 Antenna Requirement (47 CFR 15.203)(RSS-GEN ANNEX A (10)(g))

The antenna used by the Woodstream Model V420 LoRa Radio Mouse Snap Trap is the external, metal bail. There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the requirements of this section.

4.2 External RF power amps/antenna modifications (47 CFR 15.204)(RSS-GEN 8.3)

There are no RF power amplifier kits available to be used with the Woodstream Model V420 LoRa Radio Mouse Snap Trap. There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the requirements of this section.

4.3 Duty Cycle of the DTS Fundamental Transmission

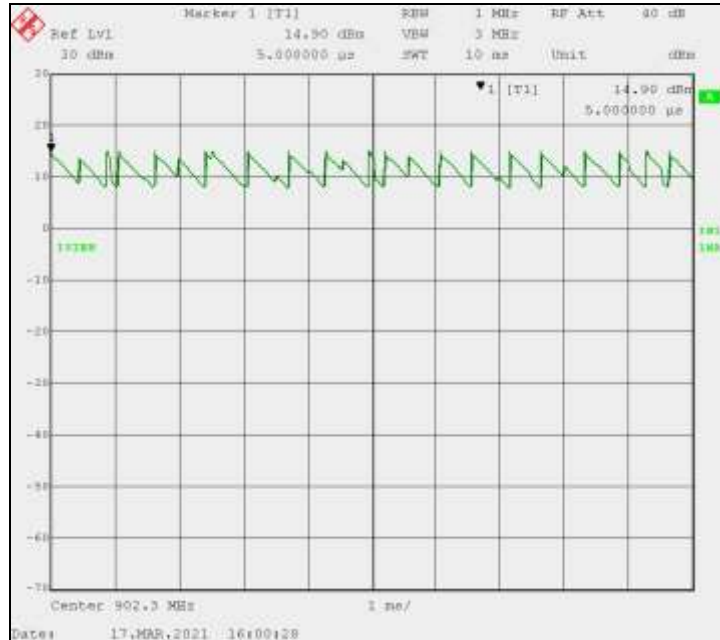
The duty cycle of the DTS transmission should be 100%. This ensures that the various emissions measured for this certification test will be made with the transmitter fully active. Duty cycles less than 98% can be used and a duty cycle correction factor can be calculated to reduce the peak level of the emission for radiated emission tests. The procedure of ANSI C63.10, Section 11.6 was used to evaluate the duty cycle of this device.



4.3.1 Duty Cycle Measurement Results (03/17/2021)

The fundamental transmission signal, tuned to 903 MHz, was displayed on the spectrum analyzer with zero frequency span and 1 MHz RBW and 3 MHz VBW to determine the duty cycle. The depiction below shows a continuous transmission. There is no off time while the transmitter is active with LoRa modulation. Therefore, the duty cycle is 100%.

Duty Cycle of DTS Transmission





4.4 DTS Emissions in Non-restricted Frequency Bands (FCC Section 15.247(d), RSS-247 Sec.5)

4.4.1 DTS Emissions in Non-restricted Frequency Bands Test Procedure

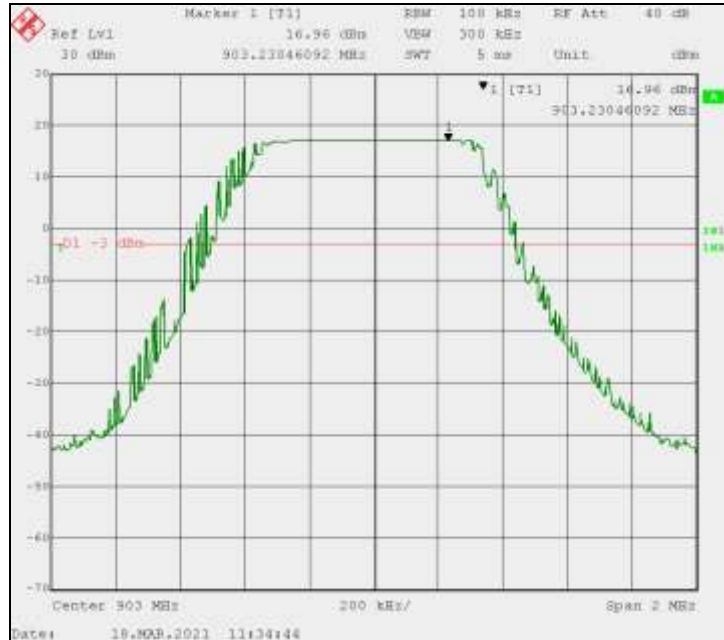
A measurement of the emissions in non-restricted frequency bands was made for to low (Channel 0), middle (Channel 4) and high (Channel 7) channel frequencies. The signal output was maximized with LoRa modulation with 500 kHz bandwidth and Spread Factor of 8. The procedure for the test is ANSI C63.10, Section 11.11. The frequency spectrum from 9 kHz to 10 GHz was divided into five bands: 9 kHz – 100 MHz, 100-500 MHz, 500 M – 1 GHz , 1 – 5 GHz and 5 – 10 GHz. An in-line high-pass filter was used to measure frequencies above 1 GHz. Each of the three fundamental test frequencies was measured for the reference value to determine the -20 dBc value.

Spectrum Analyzer Settings

RBW	100	kHz
VBW	300	kHz
Span	Varies	MHz
Sweep(Auto)	Varies	ms



4.4.2 DTS Emissions in Non-restricted Frequency Bands Reference Measurement Channel 0 (03/18/2021)

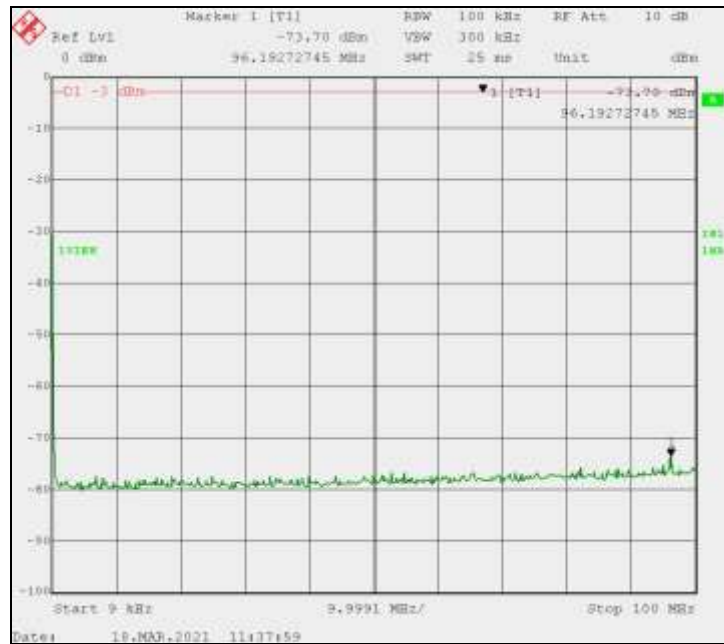


The peak level of 16.96 dBm is the maximum peak output of the Woodstream Model V420 LoRa Radio Mouse Snap Trap. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -3.0 dBm and is displayed on the plots below.

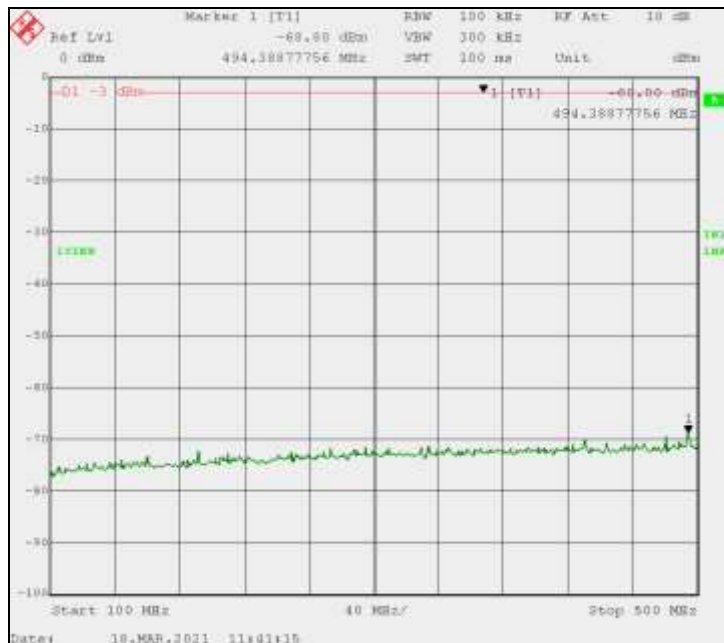


4.4.3 DTS Emissions in Non-restricted Frequency Bands Channel 0 Test Results (03/18/2021)

9 kHz – 100 MHz

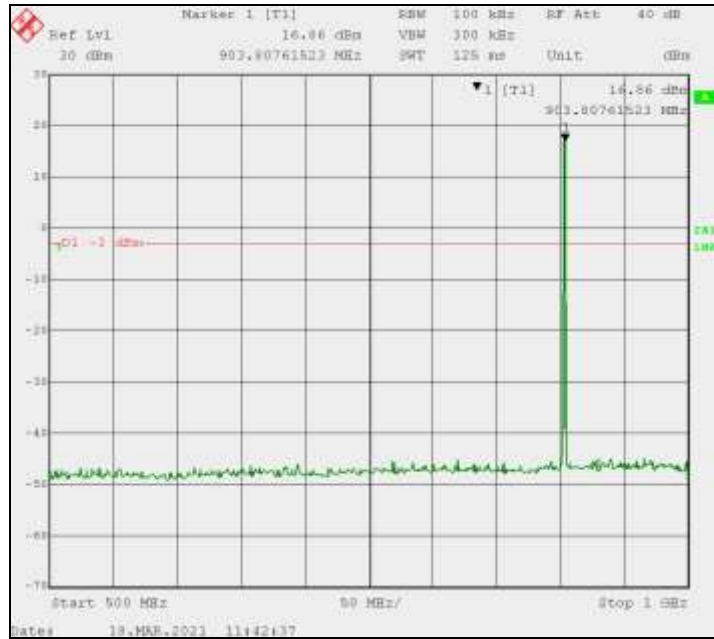


100 MHz – 500 MHz

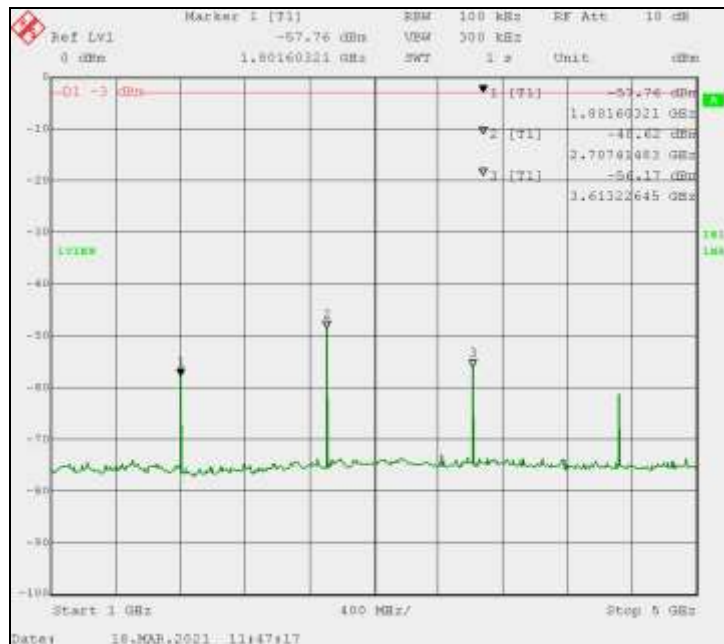




500 MHz – 1000 MHz

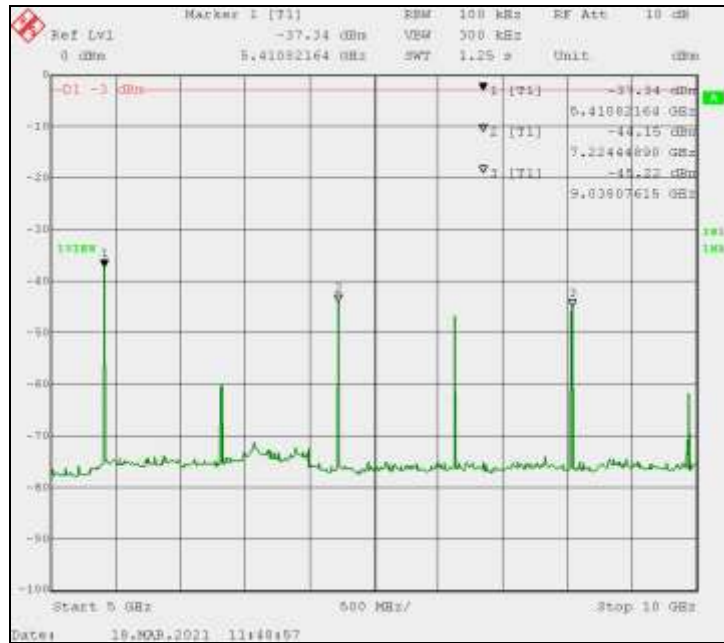


1 GHz – 5 GHz





5 GHz – 10 GHz

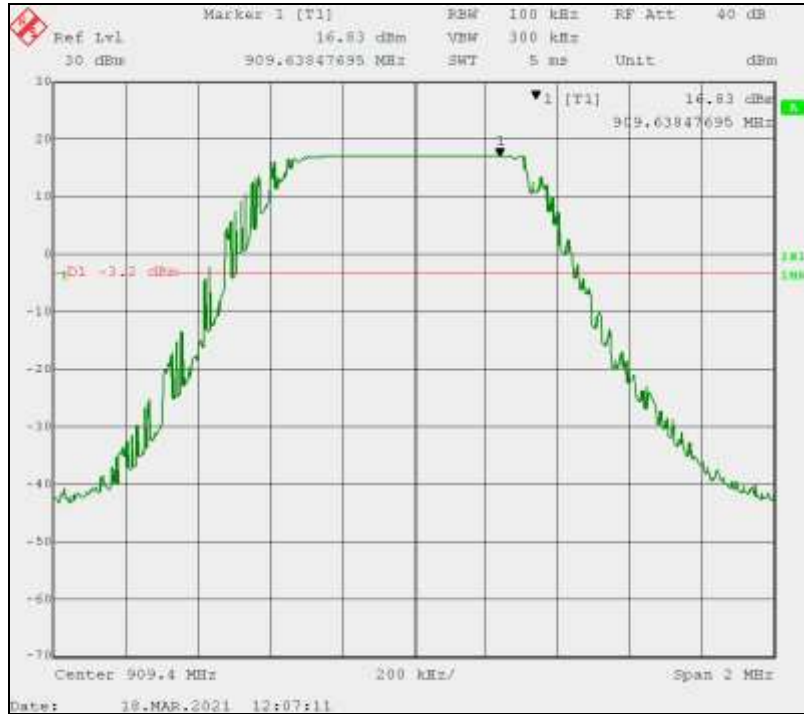


Highest Emissions: Channel 0

Channel #	Frequency GHz	Level dBc	Limit dBc	Margin dB	Result
0	5.4108	-54.30	-20.00	-34.30	Pass
0	7.2244	-61.11	-20.00	-41.11	Pass
0	9.0381	-62.18	-20.00	-42.18	Pass



4.4.4 DTS Emissions in Non-restricted Frequency Bands Reference Measurement Channel 4 (03/18/2021)

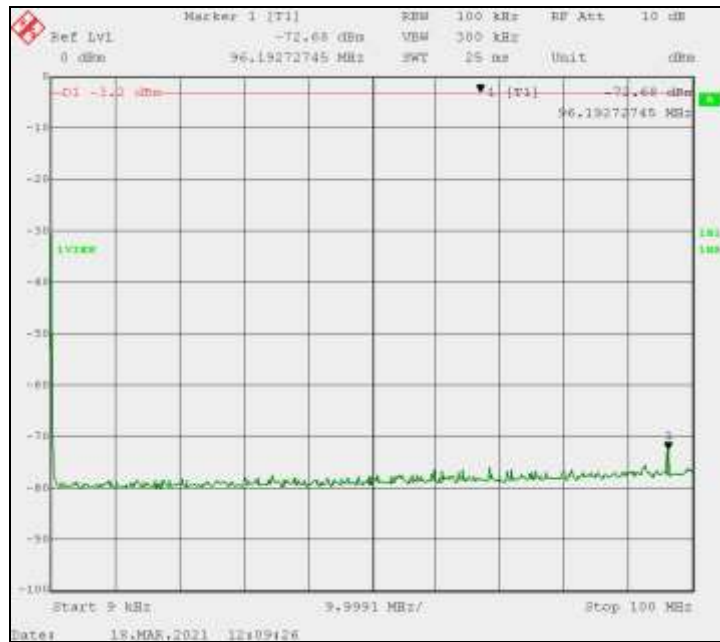


The peak level of 16.83 dBm is the maximum peak output of the Woodstream Model V420 LoRa Radio Mouse Snap Trap. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -3.2 dBm and is displayed on the plots below.

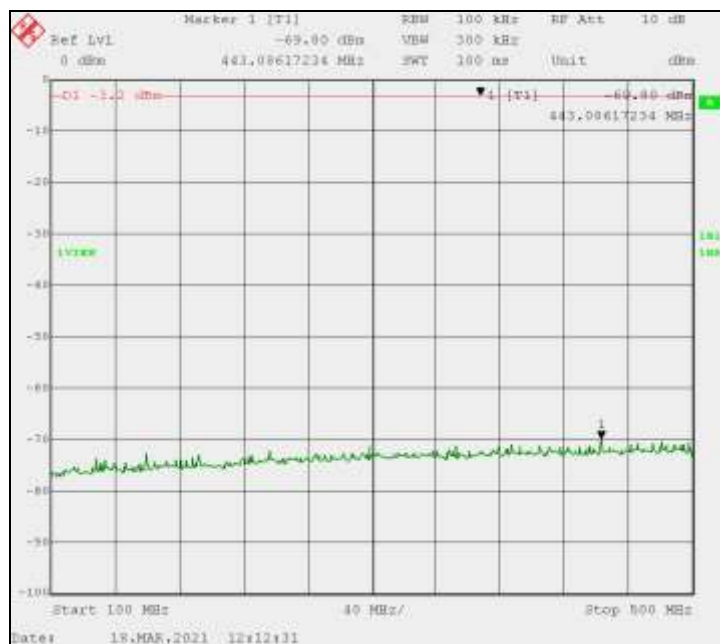


4.4.5 DTS Emissions in Non-restricted Frequency Bands Channel 4 Test Results (03/18/2021)

9 kHz – 100 MHz

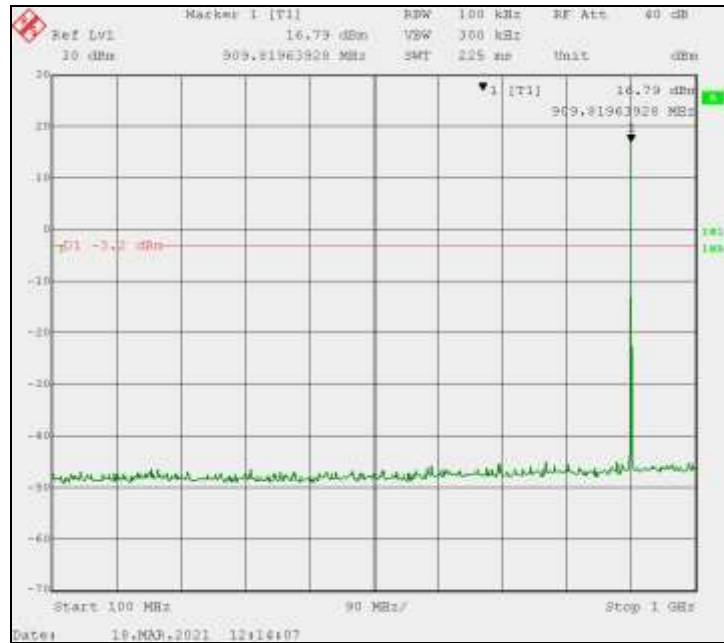


100 MHz – 500 MHz

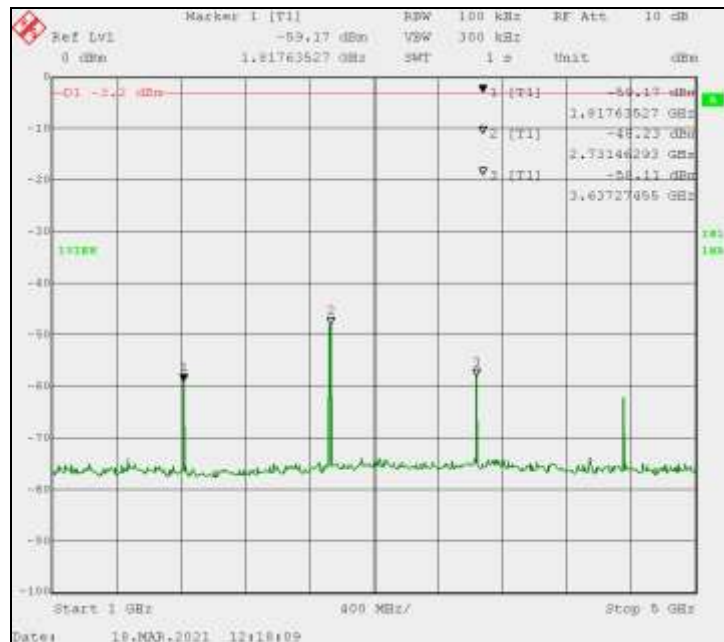




500 MHz – 1000 MHz

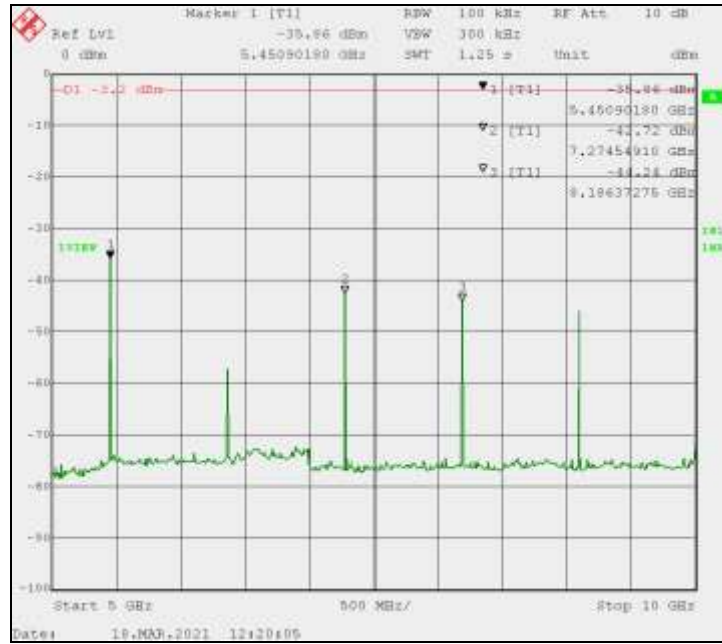


1 GHz – 5 GHz





5 GHz – 10 GHz

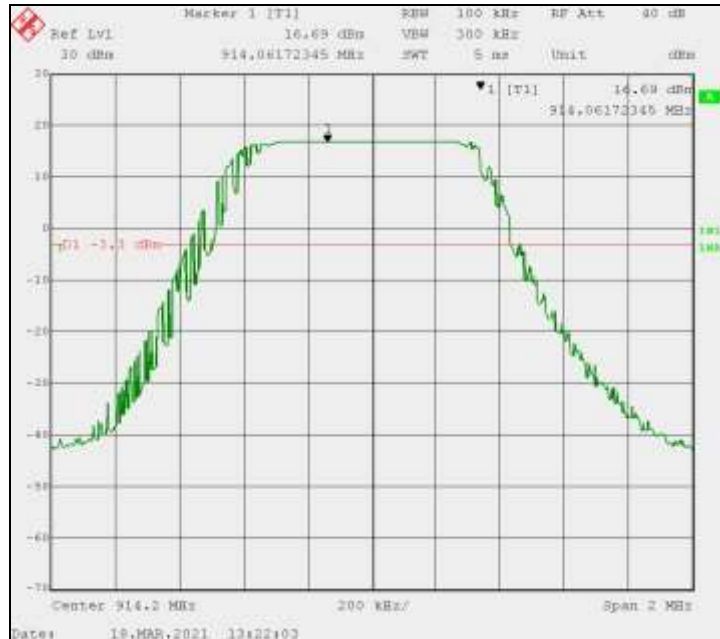


Highest Emissions: Channel 4

Channel #	Frequency (GHz)	Level (dBc)	Limit (dBc)	Margin (dB)	Result
4	5.4510	-52.69	-20.00	-32.69	Pass
4	7.2745	-59.55	-20.00	-39.55	Pass
4	8.1864	-61.07	-20.00	-41.07	Pass



4.4.6 DTS Emissions in Non-restricted Frequency Bands Reference Measurement Channel 7 (03/18/2021)

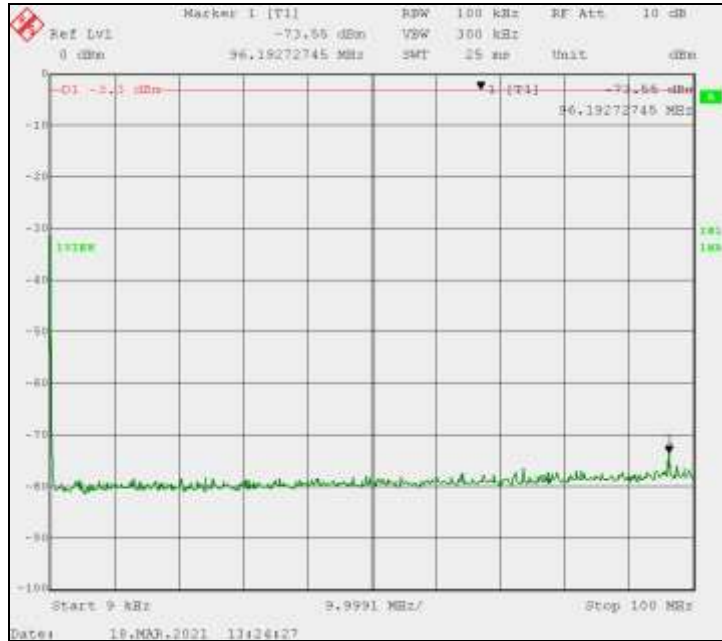


The peak level of 16.69 dBm is the maximum peak output of the Woodstream Model V420 LoRa Radio Mouse Snap Trap. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -3.3 dBm and is displayed on the plots below.

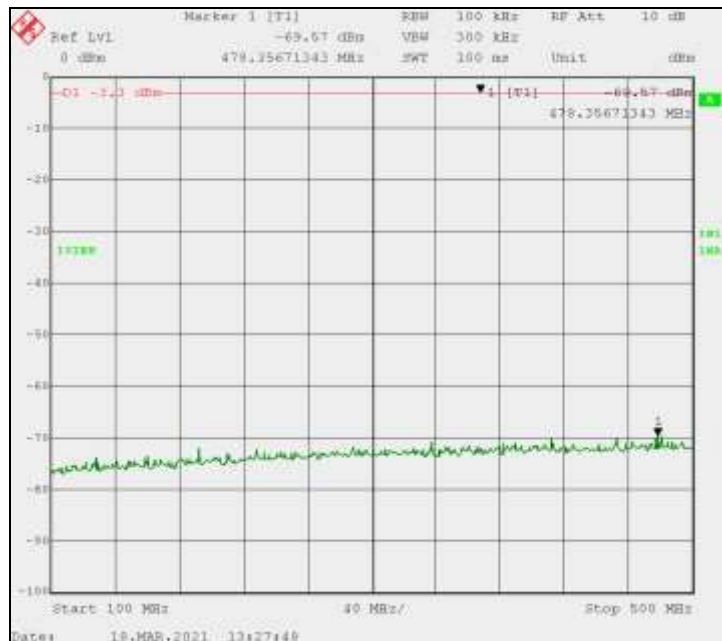


4.4.7 DTS Emissions in Non-restricted Frequency Bands Channel 7 Test Results (03/18/2021)

9 kHz – 100 MHz

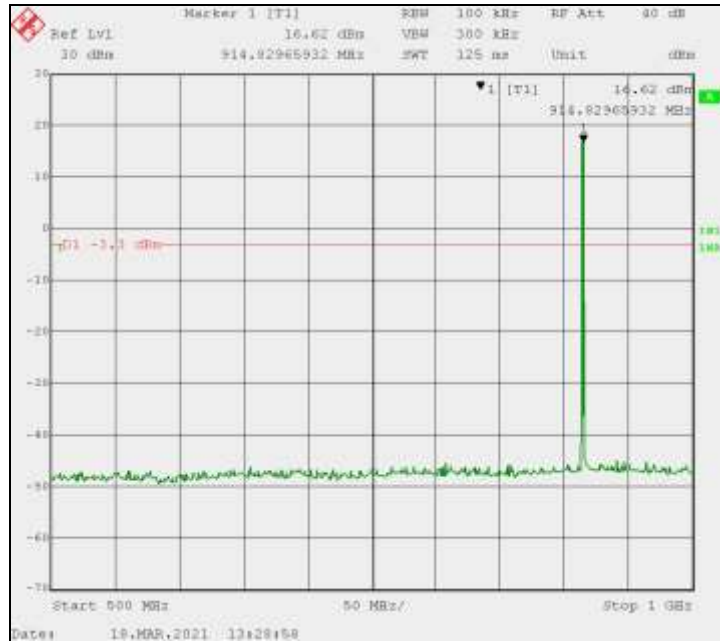


100 MHz – 500 MHz

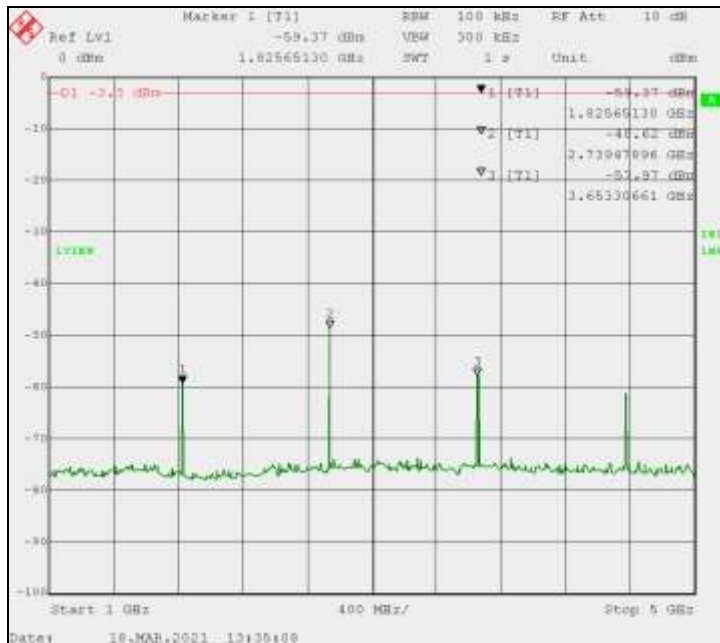




500 MHz – 1000 MHz

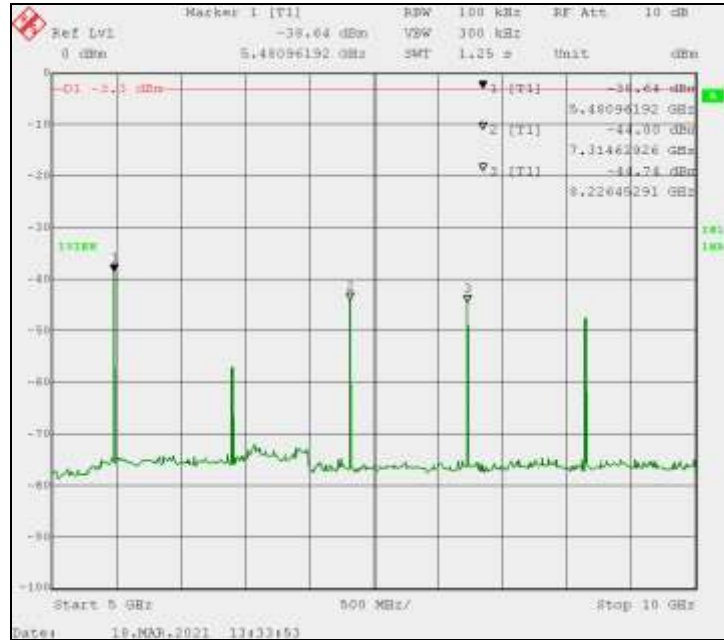


1 GHz – 5 GHz





5 GHz – 10 GHz



Highest Emissions: Channel 7

Channel #	Frequency (GHz)	Level (dBc)	Limit (dBc)	Margin (dB)	Result
7	5.4810	-55.33	-20.00	-35.33	Pass
7	7.3146	-60.69	-20.00	-40.69	Pass
7	8.2264	-61.43	-20.00	-41.43	Pass

Test Results: The Antenna Conducted Spurious Emissions of the Woodstream Model V420 LoRa Radio Mouse Snap Trap, at Low, Middle and High Frequencies, are below the carrier 20 dBc limit and therefore compliant with the limits specified in FCC Section 15.247(d).



4.5 DTS Radiated Emissions in Non-restricted and Restricted Frequency Bands, 30 MHz – 10 GHz (47 CFR 15.205 & 15.209)(RSS-GEN 8.9 & 8.10)

The emissions from the Woodstream Model V420 LoRa Radio Mouse Snap Trap, which fall in the restricted bands of operation and unrestricted bands of operation, detailed in this section, comply with the limits of 15.209. The Woodstream Model V420 LoRa Radio Mouse Snap Trap was tested at three frequencies: low (903 MHz), middle (909.4 MHz) and high (914.2 MHz). The transmitter was operated at maximum output power (20), 500 kHz bandwidth and Spread Factor of 8.

Measurement of the signals was performed with the EUT on a turntable and a variable height antenna mast at 3 meters distance. The signals residing in restricted bands of operation are indicated in the tables below.

4.5.1 Non-restricted and Restricted Bands Test Facility

OATS

The Open Area Test Site (OATS) is an all-weather facility with a wooden enclosure that contains a ground level 4-foot diameter turntable capable of rotating equipment 360 degrees. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This non-metallic enclosure and the 3 and 10 meter test range existing outside the enclosure rest upon a protective insulating material, which in turn covers a flat, metal, continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel indoors. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment. The test site complies with the requirements of ANSI C63.4 and ANSI C63.10.

SR#1

The Semi-Anechoic Shielded Room (SR#1) is a ferrite and absorber lined chamber which houses a 5-foot diameter turntable capable of rotating equipment 360 degrees and antenna mast for Horizontal and Vertical polarity measurements. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This 3 meter shielded enclosure has a raised computer floor with metal tile bottoms providing a continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel outside the chamber. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment.

The chamber complies with the requirements of ANSI C63.4 and ANSI C63.10.



4.5.2 Non-restricted and Restricted Bands Radiated Emissions Test Procedure

Radiated Emissions 30 MHz – 40 GHz

The EMI receiver was set to quasi-peak mode for frequencies from 30MHz to 1GHz and the appropriate CISPR bandwidths were employed. The receiver was set to average mode for frequencies above 1GHz with the appropriate CISPR bandwidths were employed.

Three orthogonal positions of the EUT were evaluated for maximum emissions. The position of the EUT, with the base of the trap placed on the horizontal surface of the 80-cm table, was determined to be the axis that produced the highest emissions.

Significant emissions found during the preliminary scans were maximized by rotating the turntable and varying the antenna height. Both horizontal and vertical antenna polarities were also investigated for suspect emissions. The signals are maximized and measured using the in house generated RADE or off the shelf TILE software. The support equipment and test item(s) were powered off in turn to determine the source of the emissions where appropriate.

Field strengths were calculated as follows:

Field Strength (dB μ V/m) = Meter Reading (dB μ V) + Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)

Measurements were made with the Woodstream Model V420 LoRa Radio Mouse Snap Trap transmitting at low (Channel 0), middle (Channel 4) and high (Channel 7). LoRa modulation with 500 kHz bandwidth was applied with the spread factor = 8. The following tables are the highest emissions recorded and summarized. Restricted band signals are marked with an asterisk. Other spurious emissions are shown to demonstrate compliance of the EUT enclosure to 15.209 limits.



4.5.3 DTS Emissions in Non-restricted and Restricted Bands of Operation, 30 MHz – 1000 MHz Test Results (03/26/2021 and 04/06/2021)

Low Channel 0 (903 MHz)

Freq MHz	PkLevel dBuV/m	Quasi-Peak dBuV/m	Pol H or V	Azimuth degrees	Hght cm	C/F dB	Limit dBuV/m	Margin dB	Result
30.864	21.12	19.09	H	359	140	-0.85	40.00	-20.91	Pass
42.611	11.86	10.84	V	068	204	-8.98	40.00	-29.16	Pass
239.978	19.43	19.97	H	296	101	-7.47	46.02	-26.05	Pass
363.826	17.60	15.52	V	283	178	-4.32	46.02	-30.50	Pass
519.818	18.91	19.23	V	100	200	-1.61	46.02	-26.79	Pass
579.914	21.65	19.82	H	175	234	-0.74	46.02	-26.20	Pass
634.050	22.10	21.08	H	271	177	0.13	46.02	-24.94	Pass
773.793	23.03	22.11	V	312	193	1.96	46.02	-23.91	Pass
862.599	26.36	24.13	H	156	111	3.37	46.02	-21.89	Pass
875.308	26.83	23.90	V	039	120	3.55	46.02	-22.12	Pass
968.779*	29.59	25.21	H	316	198	4.81	53.98	-28.77	Pass
995.736*	27.13	24.85	V	312	147	5.02	53.98	-29.13	Pass

*Restricted Band Signal

Middle Channel 4 (909.4 MHz)

Freq MHz	PkLevel dBuV/m	Quasi-Peak dBuV/m	Pol H or V	Azimuth degrees	Hght cm	C/F dB	Limit dBuV/m	Margin dB	Result
30.873	22.87	19.01	H	022	150	-0.85	40.00	-20.99	Pass
100.455	11.22	10.82	V	025	136	-9.80	43.52	-32.70	Pass
240.000*	20.96	18.44	H	068	143	-7.47	46.02	-27.58	Pass
287.990	20.18	19.18	H	000	126	-5.35	46.02	-26.84	Pass
433.425	19.03	23.00	V	035	184	-2.84	46.02	-23.02	Pass
433.825	20.04	21.64	H	193	193	-2.84	46.02	-24.38	Pass
743.742	23.98	22.47	V	001	215	1.67	46.02	-23.55	Pass
857.859	25.68	23.90	V	099	184	3.44	46.02	-22.12	Pass
865.938	26.57	24.03	H	064	184	3.38	46.02	-21.99	Pass
975.261*	27.05	24.92	H	077	157	4.79	53.98	-29.06	Pass
975.608*	26.37	24.87	V	033	173	4.82	53.98	-29.11	Pass

*Restricted Band Signal



High Channel 7 (914.2 MHz)

Freq MHz	PkLevel dBuV/m	Quasi-Peak dBuV/m	Pol H or V	Azimuth degrees	Hght cm	C/F dB	Limit dBuV/m	Margin dB	Result
33.520	20.08	17.52	V	183	100	-2.47	40.00	-22.48	Pass
100.622	14.36	12.52	V	195	105	-9.75	43.52	-31.00	Pass
122.712	14.20	13.03	H	015	178	-6.65	43.52	-30.49	Pass
388.438	18.18	18.30	H	015	245	-3.94	46.02	-27.72	Pass
484.635	20.36	18.76	V	218	231	-2.02	46.02	-27.26	Pass
526.940	21.02	19.33	H	287	241	-1.48	46.02	-26.69	Pass
550.972	20.26	18.58	V	360	136	-1.49	46.02	-27.44	Pass
638.325	21.94	21.15	H	136	185	0.23	46.02	-24.87	Pass
821.083	26.02	23.21	H	281	110	3.06	46.02	-22.81	Pass
857.838	24.23	23.76	V	048	101	3.44	46.02	-22.26	Pass
926.324	26.07	24.54	V	238	127	4.27	46.02	-21.48	Pass
968.702*	29.51	25.07	H	222	173	4.82	53.98	-28.91	Pass

*Restricted Band Signal

Receive Mode

Freq MHz	PkLevel dBuV/m	Quasi-Peak dBuV/m	Pol H or V	Azimuth degrees	Hght cm	C/F dB	Limit dBuV/m	Margin dB	Result
31.182	19.81	18.81	V	325	127	-1.14	40.00	-21.19	Pass
31.728	20.19	18.32	H	359	188	-1.63	40.00	-21.68	Pass
120.883*	15.56	13.19	H	104	173	-6.70	43.52	-30.33	Pass
157.550	14.40	12.46	H	091	178	-7.18	43.52	-31.06	Pass
167.240	14.15	11.97	H	174	230	-7.70	43.52	-31.55	Pass
196.878	11.85	12.12	H	017	208	-7.53	43.52	-31.40	Pass
256*	17.94	17.45	H	171	141	-8.52	46.02	-28.57	Pass
351.985	15.91	16.52	H	049	130	-7.86	46.02	-29.50	Pass
482.351	15.50	13.14	V	244	142	-7.73	46.02	-32.88	Pass
514.932	17.18	14.01	H	254	100	-6.83	46.02	-32.01	Pass
568.709	15.67	14.11	V	175	141	-6.25	46.02	-31.91	Pass
704.566	18.76	15.23	V	254	156	-5.46	46.02	-30.79	Pass
712.066	17.54	15.14	V	253	214	-5.41	46.02	-30.88	Pass
784.840	17.05	15.50	H	225	208	-4.89	46.02	-30.52	Pass
797.563	17.63	15.88	V	275	216	-4.86	46.02	-30.14	Pass
912.785	17.42	16.53	V	199	214	-3.96	46.02	-29.49	Pass

*Restricted Band Signal

Test Results: The Woodstream Model V420 LoRa Radio Mouse Snap Trap, operating in DTS mode and receive mode, comply with the requirements of 47 CFR Part 15.205 and RSS-Gen Section 8.10 for restricted bands of operation with a margin of 20.91 dB.



4.5.4 DTS Emissions in Non-restricted and Restricted Bands of Operation, 1 – 10 GHz Test Results (03/23/2021 – 03/25/2021)

Low Channel 0 (903 MHz)

Freq	Pk Level	AVG Level	Pol	Azimuth	Hght	C/F	15.35(b) Peak Limit	Peak Margin	15.209 AVG Limit	AVG Margin	Result
GHz	dBuV/m	dBuV/m	H or V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.8063	50.14	46.90	V	045	102	-8.16	73.98	-23.84	53.98	-7.08	Pass
1.8063	50.49	47.74	H	090	237	-8.16	73.98	-23.49	53.98	-6.24	Pass
1.8608	32.75	23.38	H	265	242	-7.64	73.98	-41.23	53.98	-30.60	Pass
2.1174	33.33	24.52	V	298	143	-6.75	73.98	-40.65	53.98	-29.46	Pass
2.70841*	38.56	31.14	H	317	161	-4.53	73.98	-35.42	53.98	-22.84	Pass
2.70929*	45.26	38.94	V	046	108	-4.53	73.98	-28.72	53.98	-15.04	Pass
3.61192*	40.52	32.93	V	000	127	-1.14	73.98	-33.46	53.98	-21.05	Pass
3.62331*	37.46	28.09	H	324	157	-1.06	73.98	-36.52	53.98	-25.89	Pass
5.42057*	40.29	30.95	V	122	113	3.30	73.98	-33.69	53.98	-23.03	Pass
9.02514*	45.82	37.64	V	055	223	6.80	73.98	-28.16	53.98	-16.34	Pass
9.03959*	46.49	37.81	H	048	208	6.80	73.98	-27.49	53.98	-16.17	Pass

*Restricted Band Signal

Middle Channel 4 (909.4 MHz)

Freq	Pk Level	AVG Level	Pol	Azimuth	Hght	C/F	15.35(b) Peak Limit	Peak Margin	15.209 AVG Limit	AVG Margin	Result
GHz	dBuV/m	dBuV/m	H or V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.8185	49.82	43.57	V	56	173	-8.02	73.98	-24.16	53.98	-10.41	Pass
1.8187	48.07	43.86	H	90	199	-8.02	73.98	-25.91	53.98	-10.12	Pass
2.0773	33.89	24.15	V	199	186	-6.93	73.98	-40.09	53.98	-29.83	Pass
2.7277*	40.69	33.83	H	201	192	-4.50	73.98	-33.29	53.98	-20.15	Pass
2.7283*	44.85	39.50	V	343	121	-4.50	73.98	-29.13	53.98	-14.48	Pass
3.2371	36.11	25.94	H	147	115	-2.06	73.98	-37.87	53.98	-28.04	Pass
3.6381*	41.58	32.73	V	359	118	-0.96	73.98	-32.40	53.98	-21.25	Pass
5.4554*	44.42	33.23	V	185	119	3.30	73.98	-29.56	53.98	-20.75	Pass
8.0915*	46.69	37.16	H	268	128	5.42	73.98	-27.29	53.98	-16.82	Pass
9.0926*	50.87	40.82	V	360	119	6.88	73.98	-23.11	53.98	-13.16	Pass
9.0946*	52.49	41.25	H	360	186	6.88	73.98	-21.49	53.98	-12.73	Pass

*Restricted Band Signal



High Channel 7 (914.2 MHz)

Freq	Pk Level	AVG Level	Pol	Azimuth	Hght	C/F	15.35(b) Peak Limit	Peak Margin	15.209 AVG Limit	AVG Margin	Result
GHz	dBuV/m	dBuV/m	H or V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.8281	48.43	42.80	V	35	104	-7.92	73.98	-25.55	53.98	-11.18	Pass
1.8285	47.07	42.68	H	145	135	-7.91	73.98	-26.91	53.98	-11.30	Pass
2.7365*	34.11	25.33	V	216	129	-4.49	73.98	-39.87	53.98	-28.65	Pass
2.7433*	39.99	31.45	H	51	244	-4.48	73.98	-33.99	53.98	-22.53	Pass
3.1341	38.68	27.25	H	163	159	-2.16	73.98	-35.30	53.98	-26.73	Pass
3.6508*	36.77	27.66	V	359	186	-0.88	73.98	-37.21	53.98	-26.32	Pass
5.4422*	39.99	30.47	H	1	208	3.30	73.98	-33.99	53.98	-23.51	Pass
5.4854	45.88	35.25	V	15	221	3.33	73.98	-28.10	53.98	-18.73	Pass
6.3457	39.09	30.36	V	5	156	3.08	73.98	-34.89	53.98	-23.62	Pass
9.1401*	51.09	39.98	V	1	242	6.95	73.98	-22.89	53.98	-14.00	Pass
9.1430*	50.33	40.48	H	2	132	6.95	73.98	-23.65	53.98	-13.50	Pass

*Restricted Band Signal

Receive Mode

Freq	Pk Level	AVG Level	Pol	Azimuth	Hght	C/F	15.35(b) Peak Limit	Peak Margin	15.209 AVG Limit	AVG Margin	Result
GHz	dBuV/m	dBuV/m	H or V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.8211	30.85	22.24	V	37	141	-8.00	73.98	-43.13	53.98	-31.74	Pass
1.8623	31.31	23.26	H	193	200	-7.63	73.98	-42.67	53.98	-30.72	Pass
2.6370	34.16	23.69	H	268	106	-4.68	73.98	-39.82	53.98	-30.29	Pass
2.7369*	35.12	24.30	V	261	135	-4.49	73.98	-38.86	53.98	-29.68	Pass
3.5042	35.03	26.22	H	102	104	-1.57	73.98	-38.95	53.98	-27.76	Pass
3.6569*	36.67	27.19	V	273	103	-0.82	73.98	-37.31	53.98	-26.79	Pass
5.4974	39.48	30.00	V	45	219	3.35	73.98	-34.50	53.98	-23.98	Pass
7.6098*	44.44	35.29	H	332	233	4.61	73.98	-29.54	53.98	-18.69	Pass
7.8412	45.97	36.04	H	235	169	4.88	73.98	-28.01	53.98	-17.94	Pass
8.1460*	45.52	37.35	V	205	143	5.46	73.98	-28.46	53.98	-16.63	Pass
9.1463*	48.87	37.94	V	64	168	6.96	73.98	-25.11	53.98	-16.04	Pass
9.5057	46.74	38.58	H	235	188	7.69	73.98	-27.24	53.98	-15.40	Pass

*Restricted Band Signal

Test Results: The Woodstream Model V420 LoRa Radio Mouse Snap Trap, operating in DTS and receive modes, comply with the requirements of 47 CFR Part 15.205 and RSS-Gen Section 8.10 with a margin of 6.24 dB.



4.6 DTS 6 dB Occupied Bandwidth (FCC Section 15.247(a)(2) RSS-247 5.2(a))

4.6.1 6 dB Occupied Bandwidth – Test Procedure

The minimum DTS (6 dB) bandwidth, specified in FCC Section 15.247(a) (2) was measured using a Spectrum Analyzer with 100 kHz resolution bandwidth and 300 kHz video bandwidth. Transmission frequencies at low (Channel 0), middle (Channel 4) and high (Channel 7) were measured with LoRa modulation with a bandwidth of 500 kHz and spread factor of 8. The test procedure of ANSI C63.10, Section 11.8, Option 1, was used.

Spectrum Analyzer Settings:

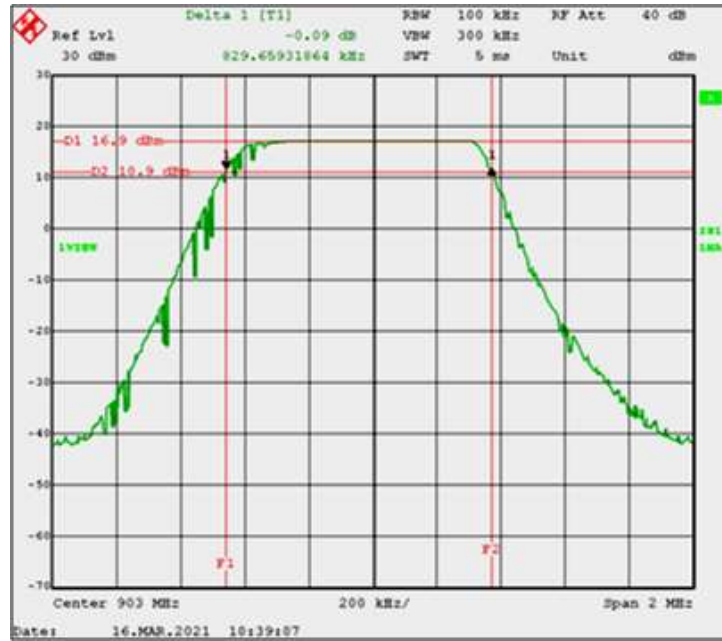
RBW	100	kHz
VBW	300	kHz
Span	2	MHz
Sweep Time	5	ms

4.6.2 DTS (6 dB) Occupied Bandwidth Test Results (03/16/2021)

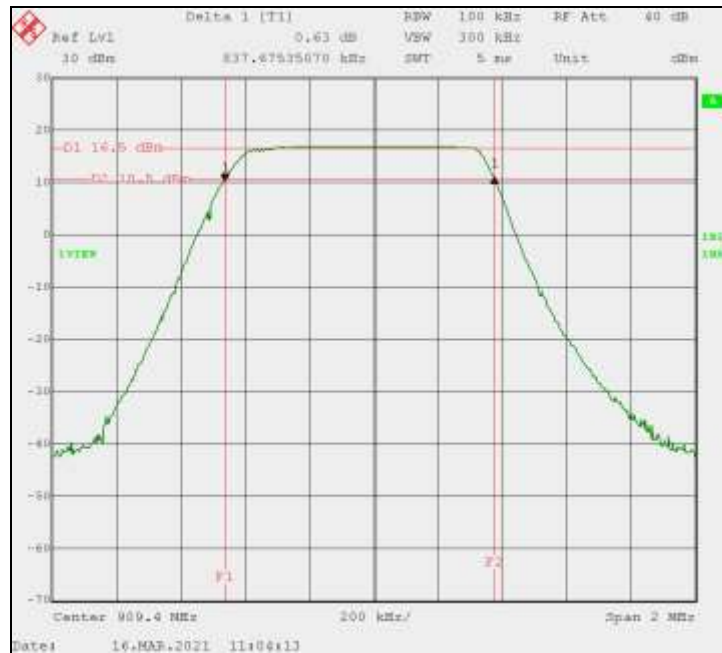
Channel #	Frequency MHz	Spread Factor #	Measured 6 dB Bandwidth kHz	15.247 (a)(2) BW (Minimum) kHz	Margin kHz	Result
0	903.0	8	829.66	500.00	329.66	Pass
4	909.4		837.67		337.67	Pass
7	914.2		877.75		377.75	Pass



Channel 0: 903.00 MHz SF=8

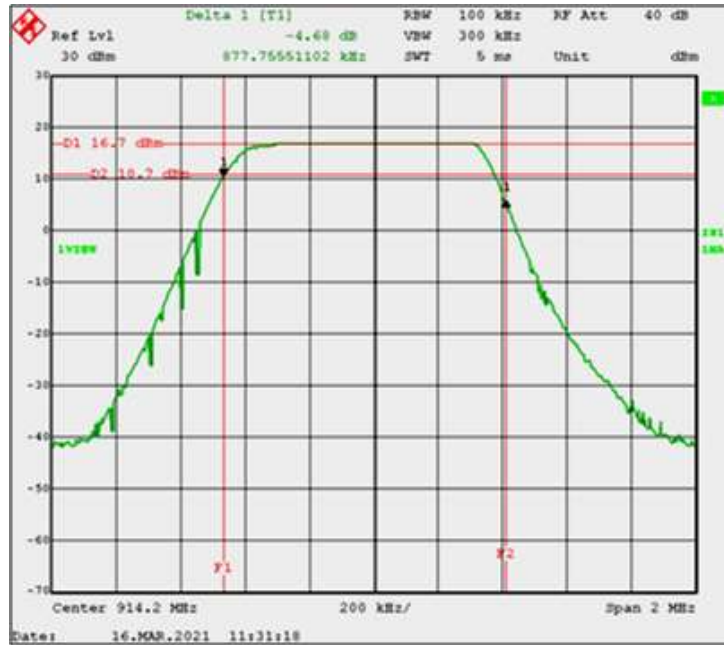


Channel 4: 909.40 MHz SF=8





Channel 7: 914.20 MHz SF=8



Test Results: The DTS, 6 dB, Occupied Bandwidth measurements for the Woodstream Model V420 LoRa Radio Mouse Snap Trap were measured and are compliant to FCC and ISED requirements.



4.7 DTS 99% Occupied Bandwidth RSS-Gen 6.7

4.7.1 DTS 99% Occupied Bandwidth – Test Procedure

The 99% Occupied Bandwidth measurement per RSS-Gen Section 6.7 was measured using a Spectrum Analyzer with 30 kHz resolution bandwidth and 100 kHz video bandwidth. Transmission frequencies at low (Channel 0), middle (Channel 4) and high (Channel 7) were measured with LoRa modulation, 500 kHz bandwidth and spread factor of 8. The test procedure of ANSI C63.10, Section 6.9.3 was used.

Spectrum Analyzer Settings:

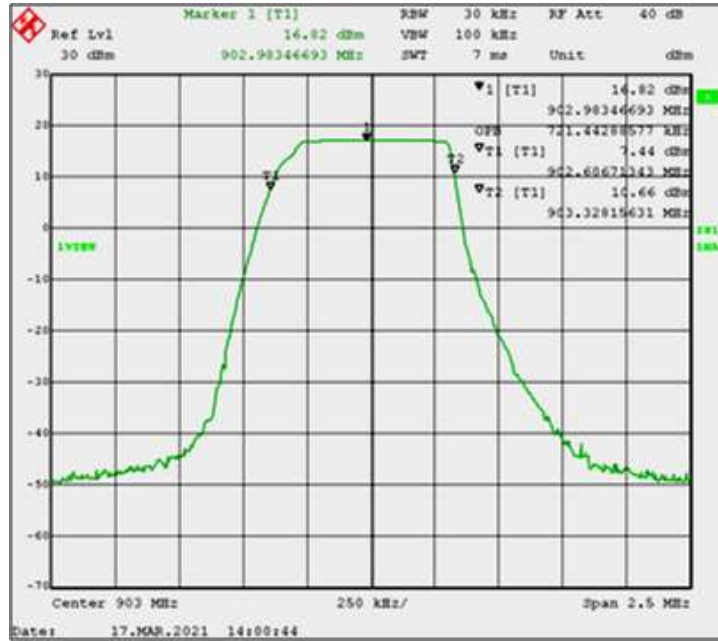
RBW	30	kHz
VBW	100	kHz
Span	2	MHz
Sweep Time	7	ms

4.7.2 DTS 99% Occupied Bandwidth Test Results (03/16/2021)

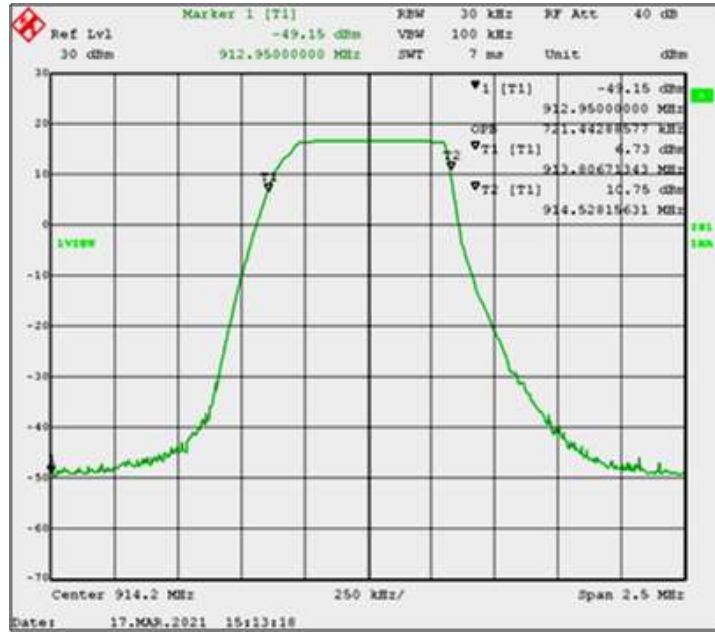
Channel	Frequency (MHz)	500 kHz BW Spread Factor	99% BW (kHz)
0	903.0	8	721.44
32	909.4		721.44
63	914.9		721.44



Channel 0: 903.00 MHz SF=8

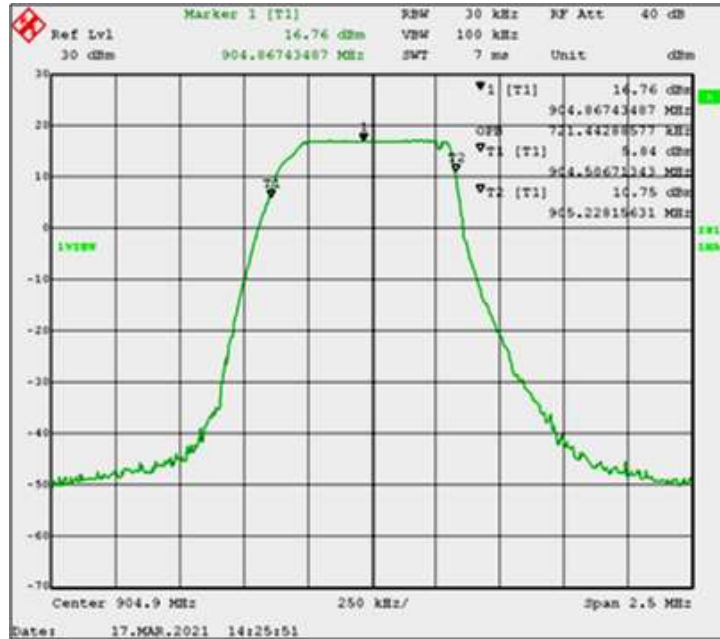


Channel 4: 909.40 MHz SF=8





Channel 7: 914.20 MHz SF=8



Test Results: The DTS 99% Occupied Bandwidth measurements for the Woodstream Model V420 LoRa Radio Mouse Snap Trap were measured for RSS-Gen Section 6.7 requirement.



4.8 Maximum Conducted Output Power and EIRP (FCC Part 15.247(b)(3), RSS-247 Section 5.4(d))

4.8.1 Maximum Conducted Output Power Test Procedure

A conducted power measurement of the output frequency was measured according to ANSI C63.10, Section 11.9.1.1. Spectrum Analyzer Resolution Bandwidth and Frequency Span were based upon the Operating Bandwidth (OBW) measured in the previous section. Transmission frequencies at low (Channel 0), middle (Channel 4) and high (Channel 7) were measured with LoRa modulation and spread factor of 8

Spectrum Analyzer Settings:

RBW	1	MHz
VBW	3	MHz
Span	3	MHz
Sweep	5	ms

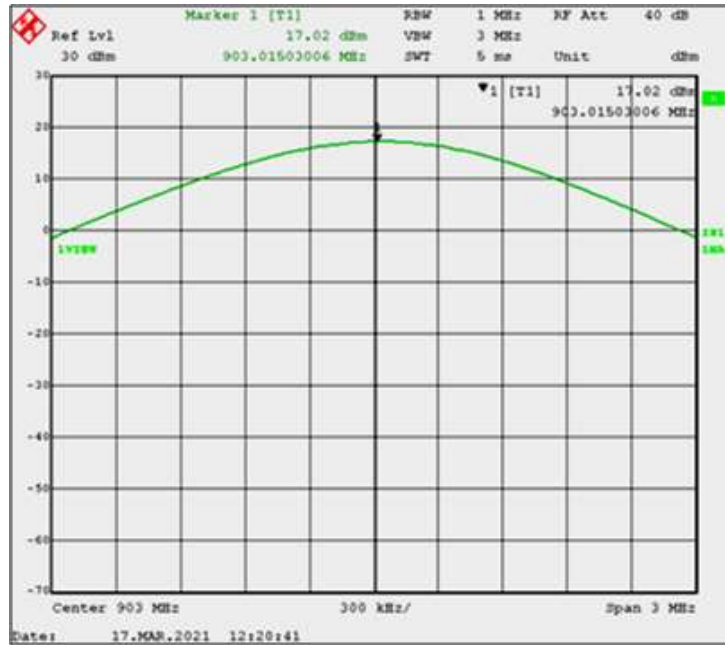
4.8.2 Maximum Conducted Output Power Test Results (03/17/2021)

Channel	Modulation	Frequency (MHz)	Measured Level	Cable # 962 Loss	Total		Limit		Margin	
					dBm	Watts	dBm	Watts	dBm	Watts
0	None	903.0	17.02	0.26	17.28	0.053	30.00	1.000	-12.72	-0.947
4		909.4	16.89	0.26	17.15	0.052	30.00	1.000	-12.85	-0.948
7		914.2	16.88	0.26	17.14	0.052	30.00	1.000	-12.86	-0.948
0	LoRa BW 500 kHz SF = 8	903.0	17.02	0.26	17.28	0.053	30.00	1.000	-12.72	-0.947
4		909.4	16.90	0.26	17.16	0.052	30.00	1.000	-12.84	-0.948
7		914.2	16.88	0.26	17.14	0.052	30.00	1.000	-12.86	-0.948

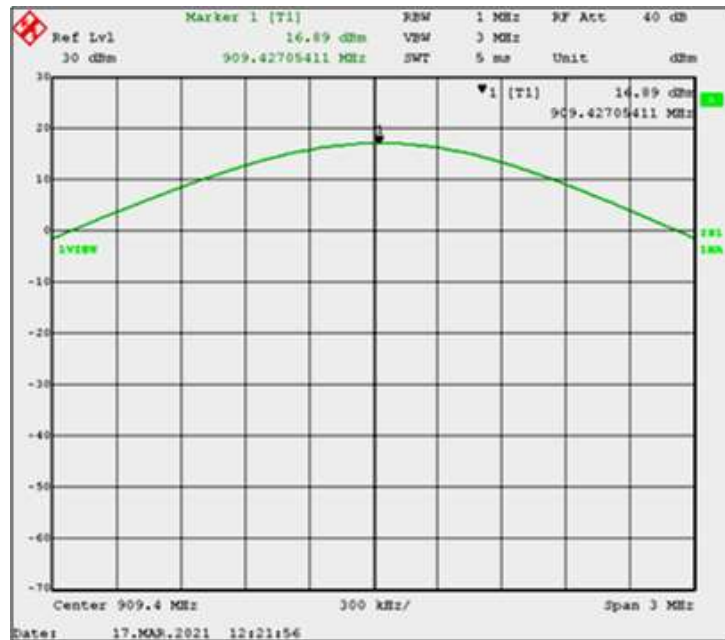
Below are the spectrum analyzer screens of the peak output power measurements.



Channel 0: 903 MHz No Modulation

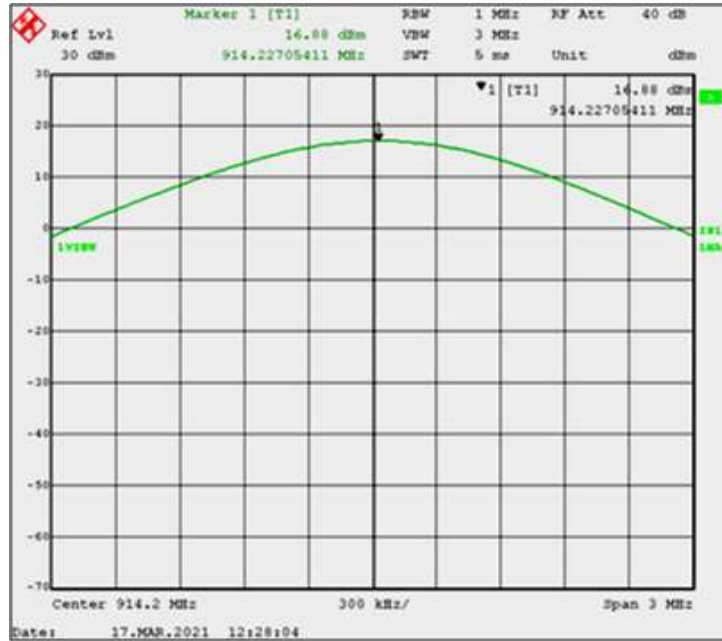


Channel 4: 909.4 MHz No Modulation

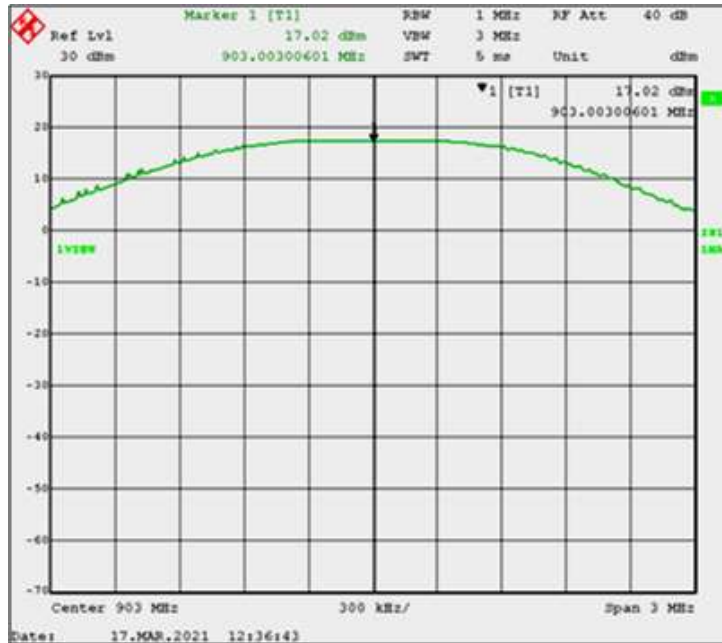




Channel 7: 914.2 MHz No Modulation

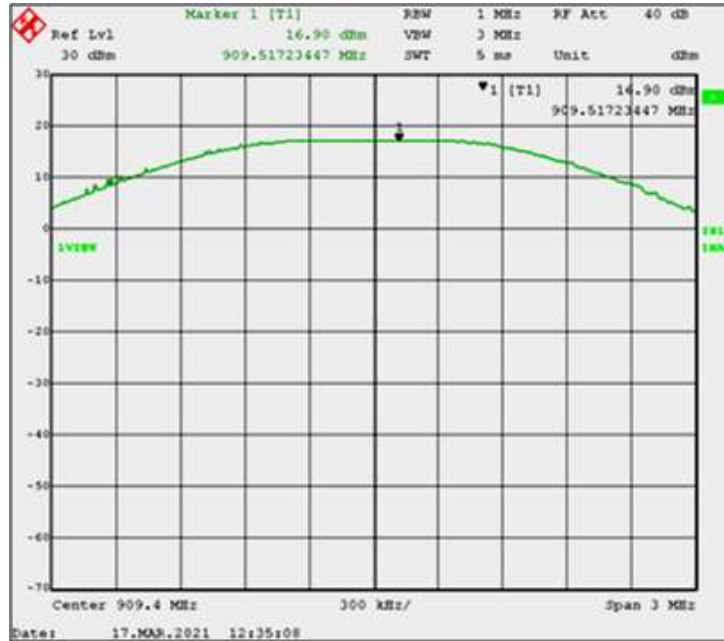


Channel 0: 903 MHz LoRa Modulation

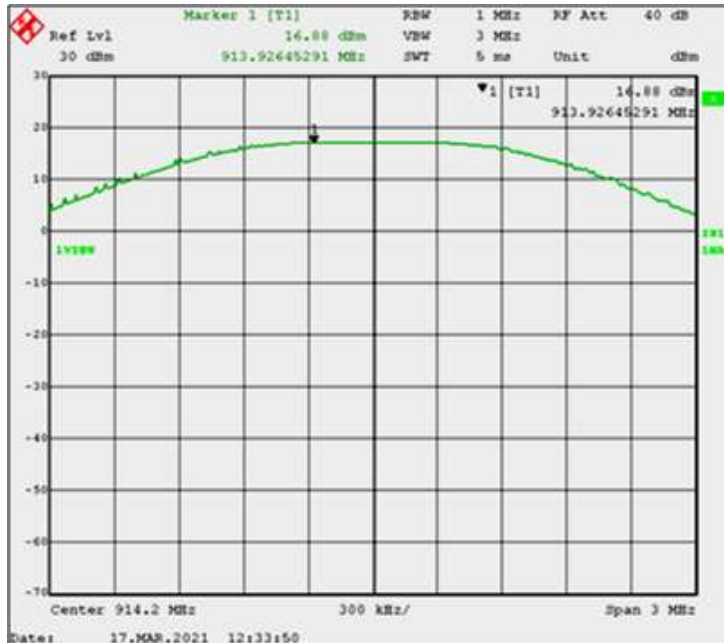




Channel 4: 909.4 MHz LoRa Modulation



Channel 7: 914.2 MHz LoRa Modulation



Test Results: The Maximum Conducted Output Power peak measurements for the Woodstream Model V420 LoRa Radio Mouse Snap Trap, with and without modulation, are compliant with the limits specified in FCC Section 15.247(b)(3).



4.8.3 EIRP Calculation RSS-247 (03/17/2021)

The gain of the antenna used in the Woodstream Model V420 LoRa Radio Mouse Snap Trap is -6.61 dBi. Applying the antenna gain to the maximum peak transmitter output produces the following values of EIRP.

Channel	Modulation	Frequency (MHz)	Corrected Measured Level		Antenna Gain		EIRP				Result
			dBm	Watts	Isotropic	Numeric	Total		Limit Watts	Margin Watts	
							dBm	Watts			
0	None	903.0	17.28	0.053	-6.61	0.218	10.67	0.012	4.00	-3.988	Pass
4		909.4	17.15	0.052			10.54	0.011		-3.989	Pass
7		914.2	17.14	0.052			10.53	0.011		-3.989	Pass
0	LoRa 500 kHz BW SF = 8	903.0	17.28	0.053			10.67	0.012		-3.988	Pass
4		909.4	17.16	0.052			10.55	0.011		-3.989	Pass
7		914.2	17.14	0.052			10.53	0.011		-3.989	Pass

The results in the above table show compliance to the ISED requirements for EIRP limits of RSS-247.



4.9 Power Spectral Density (FCC Section 15.247(e), RSS-247 Section 5.2(b))

4.9.1 Power Spectral Density Test Procedure

A conducted power measurement of the output frequency was measured using a peak detector for the Woodstream V420 for each of the low (Channel 0), middle (Channel 4) and high (Channel 7) channel frequencies. The signal output was maximized with LoRa modulation with 500 kHz bandwidth using a Spread Factor of 8. The test procedure of ANSI C63.10, Section 11.10.2 (PKPSD) was used.

Spectrum Analyzer Settings:

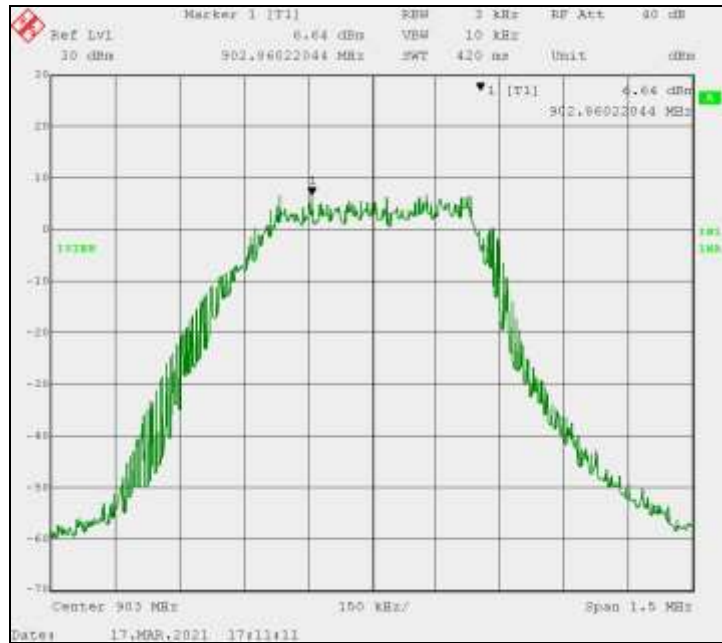
RBW	3	kHz
VBW	10	kHz
Span	1.5	MHz
Sweep(Auto)	420	ms

4.9.2 Power Spectral Density Test Results (03/17/2021)

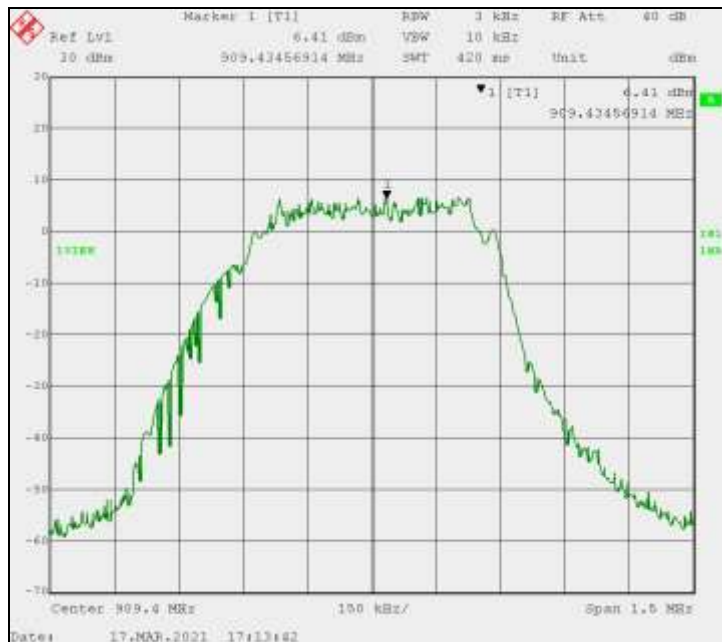
Channel	LoRa Modulation Spread Factor	Frequency (MHz)	Measured Level	Cable # 962 Loss	Total	Limit	Margin
			dBm	dB	dBm	dBm	dBm
0	8	903.0	6.64	0.26	6.90	8.00	-1.10
4		909.4	6.41	0.26	6.67	8.00	-1.33
7		914.2	6.31	0.26	6.57	8.00	-1.43



Channel 0, 903 MHz, LoRa Modulation

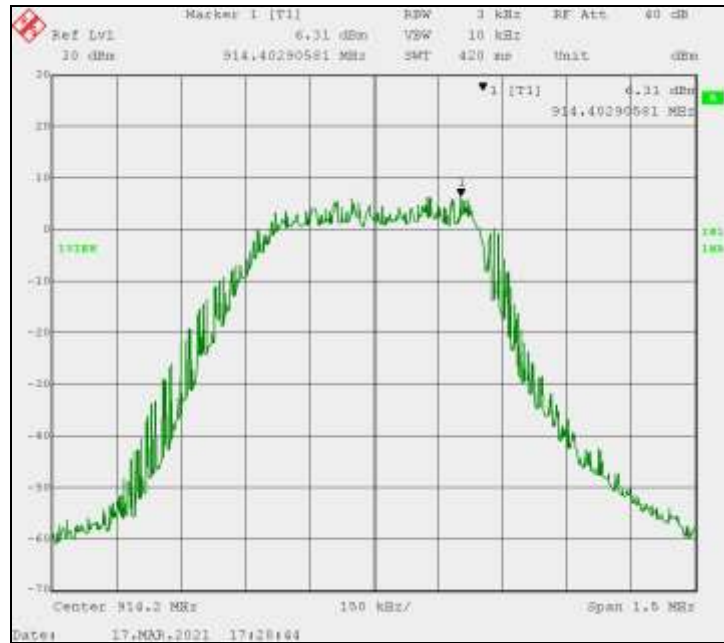


Channel 4, 909.4 MHz, LoRa Modulation





Channel 7, 914.2 MHz, LoRa Modulation



Test Results: The Power Spectral Density measurements of the Woodstream Model V420 LoRa Radio Mouse Snap Trap are compliant with the limits specified in FCC Section 15.247(e) and RSS-247.



4.10 Band Edge Measurement (FCC Part 15.247(d), RSS-247 5.5)

4.10.1 Band Edge Measurement Test Procedure

Band edge measurements were recorded on the EUT while operating with a modulated carrier at 903 MHz (Channel 0) and 914.2 MHz (Channel 7). The Authorized Band Edge measurements were made using the Relative Method of Section 6.10.4 of ANSI C63.10. The Spectrum Analyzer Screens below show emissions between the modulated carrier, at low and high frequencies and the lower and upper band edges.

Spectrum Analyzer Settings:

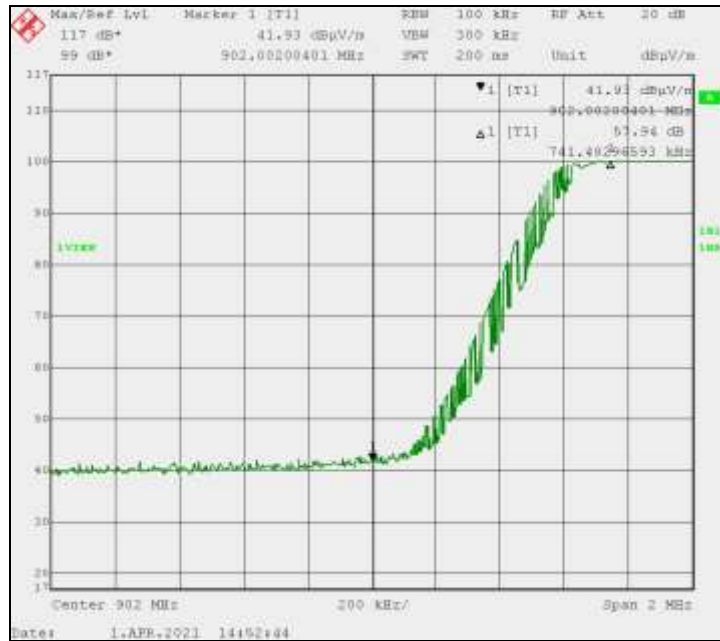
RBW	100 kHz
VBW	300 kHz
Span	Varies
Sweep	Varies

4.10.2 Band Edge Measurement Test Results (04/01/2021)

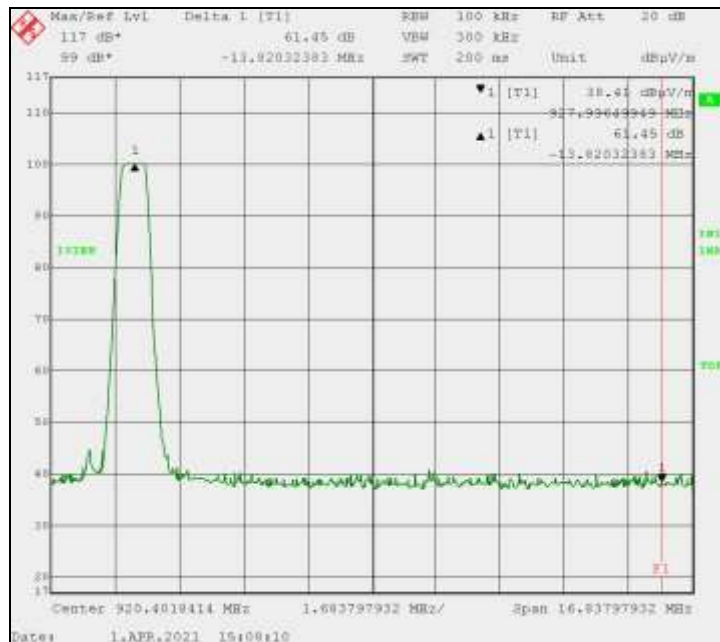
Channel	Frequency (MHz)	Peak Transmit	Band Edge Measurement			
			Peak Level	Limit	Delta	Margin
0	903.0	99.87	41.93	20.00	57.94	-37.94
7	914.2	99.86	38.41	20.00	61.45	-41.45



Low Channel 0, 903 MHz, 500 kHz BW, Spread Factor = 8



High Channel 63, 914.2 MHz, 500 kHz BW, Spread Factor = 8



Test Results: The Band Edge measurements of the Woodstream Model V420 LoRa Radio Mouse Snap Trap show that emissions at the band edges of the Operating Frequency Bandwidth are below the Carrier Peak Level – 20 dBc required by 47 CFR Part 15.247(d) and ISED RSS-247, Section 5.5.



5.0 Test Setup Photos

See Appendix C Woodstream V420 LoRa Mouse Snap Trap Test Setup Photos



Appendix A – Test Equipment

Equipment	Manufacturer	Model #	Serial #	BEC #	Calibration Date	Calibration Cycle	Calibration Due Date
EMI Receiver (20 Hz – 26.5 GHz)	Rohde & Schwarz	ESIB 26	836119/006	1010	07/02/19	3 Years	07/02/22
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A022108	712	06/26/18	3 Years	06/26/21
9kHz-3GHz EMC Analyzer	Agilent	E7402A	US39440162	883	02/27/18	3 Years 3 Months	05/27/21
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A020714	882	05/16/18	3 Years	05/16/21
Amplifier (.09 – 1300 MHz)	Hewlett Packard	8447F	3313A06658	807	01/13/21	2 Years	01/13/23
EMC Analyzer (9 kHz - 1.8 GHz)	Hewlett Packard	8593EM	3710A00214	1026	03/23/20	3 Years	03/23/23
Amplifier System (0.5 – 50 GHz)	Hewlett Packard	83015A 83017A	3123A00360 & 3332A00219	1027	10/13/20	2 Years	10/13/22
Double Ridged Horn Antenna (1 - 18 GHz)	EMCO	3115	9705-5225	1028	11/19/18	2 Years	11/19/21
Shielded Room #1	ETS Lindgren	12-2/2-0	4078	859	08/17/19	3 Years	08/17/22
OATS Site (30 MHz – 1 GHz)	BEC	N/A	N/A	705	08/03/20	1 Year	08/03/21
Temp/Humidity Meter	Control Company	4096	151872672	780	10/13/20	2 Years	10/13/22
Notch Filter	Anatech	AE915N S2095	10	923	08/16/18	3 Years	08/16/21



High-Pass Filter	Trilithic Inc.	6HC1500 /18000- 3-KK	20044046	741	02/27/20	3 Years	02/27/23
Software (Tile Instrument Control System)	Quantum Change/EMC Systems	Version 3	N/A	N/A	No Cal. Required	No Cal. Required	No Cal. Required
Radiated Emissions Test Software	BEC	RADE	2.2	N/A	No Cal. Required	No Cal. Required	No Cal. Required