BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

TEST STANDARDS:
FCC Part 15 Subpart C
DSS Intentional Radiator Class II Permissive Change

Woodstream Corporation
Model SFM11R2D SigFox Radio Module as used in V400S Control Unit
With Model V460S Connected Control Rodent Rat Trap

FCC ID: SNA-SFM11R2D

REPORT BEC-1993-01

TEST DATES: 10/28/2019 – 10/30/2019

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

PREPARED BY: _____
Paul Banker, Test Engineer

REVIEWED and APPROVED BY: _____
Steve Fanella, Quality Manager

ACCREDITED
Testing Cert #2957.01

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Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	10/31/2019

1.0 Administrative Information

1.1 General Project Information

Project Number	BEC-1993
Manufacturer	Woodstream Corporation
SigFox Radio Module Model Number	SFM11R2D
SigFox Radio Module Serial #	None
SigFox Radio Module Sample Number	1993-01
FCC ID	SNA-SFM11R2D
Host Product	Woodstream V400S Control Unit
Host Product Serial #	N/A
Frequency of Operation	902.1 – 904.7 MHz
Antenna Gain	+ 3 dBi
Modulation Type	DBPSK
FCC Classification	DSS
Date Samples Received	10/28/2019
Condition Samples Received	Suitable for test
Sample Type	Production unit
EUT Description	Connected Control Rodent Traps with SigFox Radio Communication
Applicable FCC Rules	47 CFR Part 2.1093, KDB 447498 D01

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# 179899 REV 1

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 that the CISPR 16-4-2:2011 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 V400S SigFox Radio Control Unit with Model SFM11R2D SigFox Radio was tested to the following standards:

Report Section	FCC Part 15, Subpart C Section	Test Description	Result
4.1	15.205(a)	Restricted Bands of Operation 30 MHz to 10 GHz	**PASS**
4.2	15.209	Spurious Radiated Emissions, 30 MHz to 10 GHz	**PASS**

Interpretation of Test Results: The EUT was tested using the SigFox radio tested in a non-hopping mode as required by FCC rules. The resultant data is measurement data for low, middle and high frequencies.

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 ° ± 5 °
Humidity: 50% ± 20%
Barometric Pressure: 1000mb ± 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 SigFox Connected Rodent Traps utilize a Woodstream Model V400S SigFox Radio Control Unit with Model SFM11R2D SigFox Radio to communicate trap status to a smart phone or network application. The SigFox Radio Control Unit Model V400S is used with the Model V460S Rat Trap Enclosure.

2.2 Product Category

FCC Part 15, Subpart C (Section 15.247)

2.3 Product Classification

Intentional Radiator Testing Requirements DSS for Frequency Hopper Operation within the band of 902 - 928 MHz.

2.4 Test Configuration

The Woodstream Model V400S SigFox Radio Control Unit Sample # 1993-01 was installed in the large Model V460S Rat Trap Enclosure for all radiated emissions tests. The SigFox Radio was programmed to transmit at Low, Middle and High Frequencies during the Radiated Emissions testing with all electronics active and powered up.

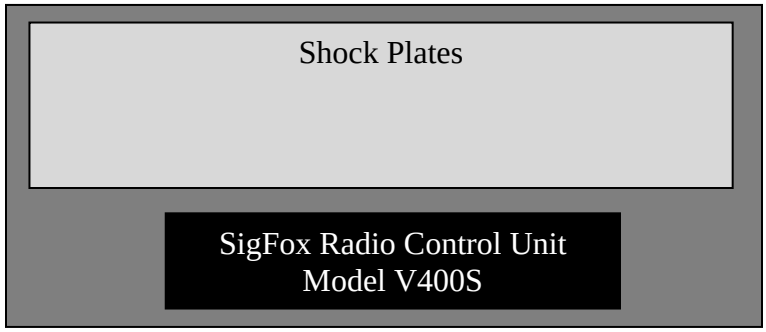
2.5 Test Configuration Rationale

The tested configuration is representative of the rat trap enclosure available by the manufacturer that is used with the Woodstream Model V400S SigFox Radio Control Unit. The Frequencies tested are based on the channels used with the Woodstream Model V400S SigFox Radio Control Unit.

2.6 Test Configuration Diagrams (Radiated Measurements)

A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests. EUT has no I/O Cables and is under battery power.

Model V460S Rat Trap Enclosure With V400S SigFox Control Unit



2.7 EUT Information, Interconnection Cabling and Support Equipment

EUT Hardware

Description	Manufacturer	Model	Serial Number	Sample Number
SigFox Radio Control Unit	Woodstream Corporation	V400S	N/A	1993-01
SigFox Connected Rodent Trap-Large Tunnel Trap Enclosure	Woodstream Corporation	V460S	N/A	N/A

Support Equipment

Description	Manufacturer	Model	Serial Number
USB to Serial Port Adapter	Sparkfun	FTDI Basic	None
Lap Top Computer	Dell	PP04X	CN-OHN338-48643-84F-0307

2.8 EUT Radio Test Frequencies

The following table lists the frequency boundaries of the WISOL Model SFM11R2D SigFox Radio Module. The Frequencies tested were taken from UL Frequency Range Column RC2 which would be the ones used with the Woodstream V400S SigFox Radio Control Unit.

Table 2-1 and Table 2-2 define frequency ranges where an end-point may communicate. Depending on local regulations, one or several 200kHz reference macro channels are defined within these frequency ranges.

When local regulations require frequency hopping techniques, end-point shall use 25kHz micro-channels. It shall implement at least 6 contiguous micro-channels within each usable frequency segment (see 3.13.3).

Table 2-1 : UL frequency ranges

Frequency (in MHz)	RC1	RC2	RC3	RC4	RC5	RC6
low boundary	868.030	902.100	923.100	920.700	923.200	865.100
center (*)	868.130	902.200	923.200	920.800	923.300	865.200
high boundary	868.230	904.700	923.300	923.300	923.400	865.300

(*): center frequency of first UL reference macro channel

Table 2-2 : DL frequency ranges

Frequency (in MHz)	RC1	RC2	RC3	RC4	RC5	RC6
low boundary	869.425	905.100	922.100	922.200	922.200	866.200
center (*)	869.525	905.200	922.200	922.300	922.300	866.300
high boundary	869.625	907.700	922.300	924.800	922.400	866.400

(*): center frequency of first DL reference macro channel

2.9 EUT Power and Grounding

The EUT is battery powered by 4, 1.5Vdc batteries and self-contained. Connection to external ground was not used.

2.10 EUT Modifications

No modifications were made to the Woodstream Model V400S SigFox Radio Control Unit Sample # 1993-01

3.0 Applicable Requirements, Methods, and Procedures

3.1 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.

3.1.1 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 Basic Test Methods and Test Procedures

ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Federal Communications Commission, Office of Engineering and Technology Laboratory Division**,** KDB 178918 D01 Permissive Change Policy V06

3.2 Deviations or Exclusions from the Requirements

No deviations or exclusions were made.

4.0 Test Results

4.1 Restricted Bands of Operation 30 MHz - 10 GHz (47 CFR 15.205)

The radiated emissions from the Woodstream Model V400S SigFox Radio Control Unit are shown below. The EUT operated in non-hopping mode at low, middle and high frequencies. The Woodstream Model V400S SigFox Radio Control Unit was tested with the Model V460S enclosure. Measurement of the signals was performed with the EUT on a turntable and a variable height antenna mast at 3 meters distance.

Spurious missions from the Woodstream Model V400S SigFox Radio Control Unit that fall into the following restricted bands of Part 15.205 are required to comply with the limits of 15.209 shown in the subsequent table.

47 CFR Part 15.205

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
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	>38
13.36-13.41			

47 CFR Part 15.209, Radiated emission limits; general requirements

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

4.1.1 Restricted Bands of Operation 30 MHz – 1000 MHz (10/28/2019 – 10/29/2019)

Woodstream Model V400S Low Frequency (902.1 MHz)

Frequency	Peak	Quasi-Peak	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	47 CFR Part 15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m		Degrees	cm	dB	dBuV/m	dB	
128.826	17.65	16.21	H	316	140	-6.73	43.52	-27.31	Pass
131.905	17.69	16.07	V	086	152	-6.90	43.52	-27.45	Pass
165.466	17.05	15.42	V	066	194	-7.54	43.52	-28.10	Pass
960.052	21.84	19.83	V	323	255	-3.47	53.98	-34.15	Pass
961.010	22.28	19.82	H	118	241	-3.44	53.98	-34.16	Pass
975.753	22.56	20.06	V	109	101	-3.29	53.98	-33.92	Pass
991.522	21.15	20.19	H	111	234	-3.12	53.98	-33.79	Pass

Woodstream Model V400S Middle Frequency (902.2 MHz)

Frequency	Peak	Quasi-Peak	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	47 CFR Part 15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m		Degrees	cm	dB	dBuV/m	dB	
115.853	16.04	14.34	V	288	161	-7.05	43.52	-29.18	Pass
126.402	15.81	15.63	H	196	108	-6.69	43.52	-27.89	Pass
961.155	20.97	18.01	V	112	115	-3.44	53.98	-35.97	Pass

Woodstream Model V400S Low Frequency (904.7 MHz)

Frequency	Peak	Quasi-Peak	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	47 CFR Part 15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m		Degrees	cm	dB	dBuV/m	dB	
119.258	16.71	14.44	V	042	250	-6.79	43.52	-29.08	Pass
126.972	16.45	14.33	H	042	168	-6.74	43.52	-29.19	Pass
129.056	16.00	14.49	V	357	198	-6.73	43.52	-29.03	Pass
960.055	19.03	17.90	V	154	242	-3.47	53.98	-36.08	Pass
960.595	20.49	17.87	H	360	134	-3.45	53.98	-36.11	Pass
989.980	21.90	18.24	V	000	230	-3.13	53.98	-35.74	Pass
993.827	20.17	18.26	V	113	194	-3.11	53.98	-35.72	Pass

Test Results: The Woodstream Model V400S SigFox Radio Control Unit complies with the requirements of 47 CFR Part 15.205 margin of 3.11 dB.

4.1.2 Restricted Bands of Operation 1 GHz – 10 GHz (10/29/2019 – 10/30/2019)

Woodstream Model V400S Low Frequency (902.1 MHz)

Frequency	Peak Level Measured	Average Level Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part 15.209 Average Limit	FCC Part 15.209 Average Margin	FCC Part 15.35b Peak Limit	FCC Part 15.35b Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.3760	30.37	20.59	H	211	147.7	-10.86	53.98	-33.389	73.98	-43.61	Pass
1.5089	32.89	22.35	H	359	162.8	-10.41	53.98	-31.628	73.98	-41.09	Pass
1.5115	32.21	22.15	V	254	170	-10.39	53.98	-31.834	73.98	-41.77	Pass
1.5666	29.96	21.43	H	132	156	-10.02	53.98	-32.55	73.98	-44.02	Pass
1.5831	31.29	21.41	V	268	125	-9.97	53.98	-32.568	73.98	-42.69	Pass
1.6767	32.53	21.24	H	301	163.7	-9.48	53.98	-32.737	73.98	-41.45	Pass
1.6919	30.95	21.34	V	125	185	-9.28	53.98	-32.644	73.98	-43.03	Pass
2.7063	40.33	33.41	V	360	180	-3.93	53.98	-20.573	73.98	-33.65	Pass
7.6430	46.07	36.49	H	135	134.3	6.04	53.98	-17.488	73.98	-27.91	Pass
8.0721	47.49	38.68	V	307	116	6.85	53.98	-15.304	73.98	-26.49	Pass
8.2119	47.22	38.7	V	24	112	6.99	53.98	-15.277	73.98	-26.76	Pass
8.2791	46.97	38.64	H	72	102.9	7.11	53.98	-15.344	73.98	-27.01	Pass
9.3727	47.23	39.21	V	294	202	8.53	53.98	-14.77	73.98	-26.75	Pass

Woodstream Model V400S Middle Frequency (902.2 MHz)

Frequency	Peak Level Measured	Average Level Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part 15.209 Average Limit	FCC Part 15.209 Average Margin	FCC Part 15.35b Peak Limit	FCC Part 15.35b Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.0033	32.01	22.51	V	284	125	-12.49	53.98	-31.474	73.98	-41.97	Pass
1.3260	31.93	22.18	H	298	101.5	-11.32	53.98	-31.802	73.98	-42.05	Pass
1.4991	31.86	21.36	V	328	100	-10.49	53.98	-32.621	73.98	-42.12	Pass
1.5131	32.44	21.88	H	238	123.4	-10.38	53.98	-32.103	73.98	-41.54	Pass
2.7066	39.41	34.91	V	3	123	-3.93	53.98	-19.07	73.98	-34.57	Pass
4.9029	38.61	29.3	H	277	100	2.81	53.98	-24.679	73.98	-35.37	Pass
8.0960	47.42	38.58	H	251	102.2	6.87	53.98	-15.398	73.98	-26.56	Pass
8.1636	46.99	38.77	V	231	176	6.93	53.98	-15.214	73.98	-26.99	Pass
9.1473	49.09	39.14	H	98	101.9	8.31	53.98	-14.837	73.98	-24.89	Pass

Woodstream Model V400S Low Frequency (904.7 MHz)

Frequency	Peak Level Measured	Average Level Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part 15.209 Average Limit	FCC Part 15.209 Average Margin	FCC Part 15.35b Peak Limit	FCC Part 15.35b Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.0003	32.85	22.61	V	286	158	-12.49	53.98	-31.37	73.98	-41.13	Pass
1.0062	32.73	23.11	H	150	101.9	-12.49	53.98	-30.87	73.98	-41.25	Pass
1.3018	31.93	21.94	V	360	109	-11.46	53.98	-32.04	73.98	-42.05	Pass
1.3223	32.05	22.42	H	356	193.8	-11.34	53.98	-31.56	73.98	-41.93	Pass
1.5053	31.92	21.99	H	290	124.6	-10.44	53.98	-31.99	73.98	-42.06	Pass
1.5102	30.76	22.08	V	198	204	-10.40	53.98	-31.90	73.98	-43.22	Pass
2.7141	42.90	38.81	V	21	120	-3.92	53.98	-15.17	73.98	-31.08	Pass
3.8193	39.20	28.05	V	260	170	1.17	53.98	-25.93	73.98	-34.78	Pass
4.3761	38.05	28.40	H	178	158.9	1.24	53.98	-25.58	73.98	-35.93	Pass
8.0922	47.41	38.50	V	319	212	6.87	53.98	-15.48	73.98	-26.57	Pass
8.2514	47.49	38.10	H	93	121.9	7.04	53.98	-15.88	73.98	-26.49	Pass

Test Results: The Woodstream Model V400S SigFox Radio Control Unit complies with the requirements of 47 CFR Part 15.205 with margin of 14.77 dB.

4.2 Radiated Spurious Emissions 30 MHz – 10 GHz (47 CFR 15.209(a))

SR#1

The Semi-Anechoic Shielded Room (SR#1) is an 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 test site complies with the attenuation measurements specified in ANSI C63.4:2014

Radiated Emissions 30MHz – 10 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. 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 (dBµV/m) = Meter Reading (dBµV) + Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)

4.2.1 Radiated Spurious Emissions 30 MHz – 1000 MHz Measurement (10/28/2019 - 11/29/2019)

The spurious signal measurements made between 30 MHz and 1 GHz are listed below.

Woodstream Model V400S Low Frequency (902.1 MHz)

Frequency	Peak	Quasi-Peak	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	Part 15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m		Degrees	cm	dB	dBuV/m	dB	
30.394	23.73	22.75	V	286	185	-0.68	40.00	-17.25	Pass
31.270	23.28	22.21	H	321	100	-1.22	40.00	-17.79	Pass
37.160	19.84	18.16	H	009	183	-5.25	40.00	-21.84	Pass
67.053	16.21	15.93	V	039	102	-12.77	40.00	-24.07	Pass
157.913	19.84	19.62	H	006	177	-7.18	43.52	-23.90	Pass
168.106	17.24	15.20	V	262	255	-7.78	43.52	-28.32	Pass
179.116	16.33	14.41	H	251	240	-8.57	43.52	-29.11	Pass
189.955	15.29	14.57	V	314	131	-8.46	43.52	-28.95	Pass
199.797	17.20	15.96	V	037	182	-7.09	43.52	-27.56	Pass
200.558	19.43	15.94	V	169	141	-7.10	43.52	-27.58	Pass
201.461	17.35	15.88	H	265	182	-7.14	43.52	-27.64	Pass
211.210	15.85	15.62	H	359	166	-7.75	43.52	-27.90	Pass
882.273	28.99	27.76	V	100	240	-4.21	46.02	-18.26	Pass
882.285	33.48	33.08	H	044	099	-4.21	46.02	-12.94	Pass
890.087	24.97	26.40	H	024	157	-4.21	46.02	-19.62	Pass
892.192	29.44	28.44	H	022	103	-4.16	46.02	-17.58	Pass
898.370	35.95	35.48	H	033	101	-4.10	46.02	-10.54	Pass
898.838	29.12	27.16	V	311	104	-4.10	46.02	-18.86	Pass
902.094	86.06	73.81	H	029	100	-4.09	46.02	27.79	N/A[1]
902.094	78.38	78.24	V	300	101	-4.09	46.02	32.22	N/A[1]
929.620	24.97	19.38	V	284	111	-3.79	46.02	-26.64	Pass
941.922	22.07	19.67	V	143	109	-3.68	46.02	-26.35	Pass
957.595	23.20	19.80	H	001	220	-3.50	46.02	-26.22	Pass

[1] The signal is the transmitter fundamental frequency; not subject to the 15.209 limit.

Woodstream Model V400S Middle Frequency (902.2 MHz)

Frequency	Peak	Quasi-Peak	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	Part 15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m		Degrees	cm	dB	dBuV/m	dB	
30.784	22.96	20.78	V	132	232	-0.87	40.00	-19.22	Pass
31.157	24.27	21.75	H	089	213	-1.12	40.00	-18.25	Pass
67.183	17.08	19.26	V	028	104	-12.76	40.00	-20.74	Pass
144.510	17.54	14.82	H	191	119	-7.30	43.52	-28.70	Pass
148.154	17.14	14.81	H	267	171	-7.26	43.52	-28.71	Pass
148.582	16.62	14.00	V	108	214	-7.25	43.52	-29.52	Pass
153.686	16.99	14.07	V	062	147	-7.21	43.52	-29.45	Pass
160.873	18.33	14.76	H	012	197	-7.25	43.52	-28.76	Pass
190.500	14.67	13.01	V	121	132	-8.41	43.52	-30.51	Pass
197.008	15.20	14.48	H	314	183	-7.50	43.52	-29.04	Pass
202.591	17.09	14.74	H	006	135	-7.20	43.52	-28.78	Pass
209.069	16.03	13.79	V	001	245	-7.61	43.52	-29.73	Pass
215.235	18.15	13.27	V	233	104	-8.02	43.52	-30.25	Pass
866.655	19.43	17.86	H	088	125	-4.30	46.02	-28.16	Pass
882.570	27.39	24.54	V	116	146	-4.21	46.02	-21.48	Pass
882.597	33.37	18.45	H	027	100	-4.21	46.02	-27.57	Pass
892.402	29.49	27.58	H	027	101	-4.16	46.02	-18.44	Pass
893.360	25.75	25.06	H	036	100	-4.14	46.02	-20.96	Pass
897.788	27.45	24.15	V	291	101	-4.10	46.02	-21.87	Pass
899.047	32.93	31.40	H	040	162	-4.10	46.02	-14.62	Pass
902.182	76.35	73.38	V	300	101	-4.08	46.02	27.36	N/A[1]
902.184	84.45	84.18	H	030	101	-4.08	46.02	38.16	N/A[1]
902.184	76.39	43.53	V	300	102	-4.08	46.02	-2.49	N/A[1]
912.970	22.53	21.04	V	080	200	-3.96	46.02	-24.98	Pass
912.982	23.17	21.56	H	352	240	-3.96	46.02	-24.46	Pass
955.648	22.38	17.95	V	011	114	-3.53	46.02	-28.07	Pass
959.625	20.71	18.18	H	153	250	-3.47	46.02	-27.84	Pass

[1] The signal is the transmitter fundamental frequency; not subject to the 15.209 limit.

Woodstream Model V400S Low Frequency (904.7 MHz)

Frequency	Peak	Quasi-Peak	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	Part 15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m		Degrees	cm	dB	dBuV/m	dB	
31.373	20.81	20.26	V	034	188	-1.31	40.00	-19.74	Pass
67.256	13.53	18.35	V	263	115	-12.76	40.00	-21.65	Pass
107.518	14.74	12.90	H	304	229	-8.22	43.52	-30.62	Pass
158.061	15.68	14.01	H	073	199	-7.18	43.52	-29.51	Pass
178.283	13.20	12.78	V	319	255	-8.57	43.52	-30.74	Pass
179.981	15.71	12.62	V	186	133	-8.65	43.52	-30.90	Pass
203.475	15.61	13.99	H	229	252	-7.25	43.52	-29.53	Pass
204.006	15.04	13.98	V	234	223	-7.27	43.52	-29.54	Pass
207.970	14.74	13.65	H	281	192	-7.53	43.52	-29.87	Pass
884.390	18.41	17.06	V	031	233	-4.17	46.02	-28.96	Pass
890.069	28.42	27.35	V	115	156	-4.21	46.02	-18.67	Pass
890.072	33.78	32.49	H	030	100	-4.21	46.02	-13.53	Pass
891.644	20.96	17.02	V	246	249	-4.17	46.02	-29.00	Pass
897.372	26.00	24.01	H	043	104	-4.10	46.02	-22.01	Pass
900.569	24.55	20.38	V	085	220	-4.10	46.02	-25.64	Pass
901.027	31.50	29.50	H	030	139	-4.09	46.02	-16.52	Pass
904.679	77.09	58.26	H	030	100	-4.07	46.02	N/A[1]	Pass
904.682	70.29	69.28	V	304	101	-4.07	46.02	N/A[1]	Pass
918.418	18.23	17.16	H	283	245	-3.92	46.02	-28.86	Pass
930.760	18.01	17.48	H	274	255	-3.77	46.02	-28.54	Pass
941.474	21.22	17.67	H	213	187	-3.68	46.02	-28.35	Pass
950.646	19.93	17.84	H	247	119	-3.54	46.02	-28.18	Pass

[1] The signal is the transmitter fundamental frequency; not subject to the 15.209 limit.

Test Results: The Woodstream Model V400S SigFox Radio Control Unit complies with the requirements of 47 CFR Part 15.209 with a margin of 13.53 dB.

4.2.2 Radiated Spurious Emissions 1 GHz – 10 GHz Measurement (10/29/2018-10/30/2019)

The spurious signal measurements made between 30 MHz and 1 GHz are listed below.

Woodstream Model V400S Low Frequency (902.1 MHz)

Frequency	Peak Level Measured	Average Level Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part 15.209 Average Limit	FCC Part 15.209 Average Margin	FCC Part 15.35b Peak Limit	FCC Part 15.35b Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.2999	32.89	22.81	H	214	156.9	-11.47	53.98	-31.166	73.98	-41.09	Pass
1.8041	47.78	46.52	H	132	153.9	-7.75	53.98	-7.463	73.98	-26.20	Pass
1.8042	46.71	44.43	V	313	140	-7.75	53.98	-9.547	73.98	-27.27	Pass
1.8042	45.84	44.16	V	346	100	-7.75	53.98	-9.819	73.98	-28.14	Pass
1.9425	32.23	23.48	V	145	194	-6.81	53.98	-30.504	73.98	-41.75	Pass
2.0204	32.96	22.79	V	13	135	-6.68	53.98	-31.192	73.98	-41.02	Pass
2.0486	33.26	23.66	H	102	121.4	-6.6	53.98	-30.319	73.98	-40.72	Pass
2.0971	35.22	24.45	H	317	101.2	-6.37	53.98	-29.535	73.98	-38.76	Pass
2.1122	35.23	23.83	V	212	196	-6.31	53.98	-30.151	73.98	-38.75	Pass
2.4065	34.47	24.29	H	304	101	-4.99	53.98	-29.695	73.98	-39.51	Pass
7.7973	45.74	36.96	H	120	115.8	6.21	53.98	-17.024	73.98	-28.24	Pass
8.6945	47.52	38.71	H	64	134.9	7.99	53.98	-15.272	73.98	-26.46	Pass
9.5802	48.13	38.31	V	248	199	8.34	53.98	-15.668	73.98	-25.85	Pass

Woodstream Model V400S Middle Frequency (902.2 MHz)

Frequency	Peak Level Measured	Average Level Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part 15.209 Average Limit	FCC Part 15.209 Average Margin	FCC Part 15.35b Peak Limit	FCC Part 15.35b Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.2975	33.23	22.22	V	359	129	-11.48	53.98	-31.758	73.98	-40.75	Pass
1.8044	47.79	46.29	H	273	170.3	-7.74	53.98	-7.695	73.98	-26.19	Pass
1.8044	46.07	44.15	V	339	102	-7.74	53.98	-9.827	73.98	-27.91	Pass
2.4128	32.73	23.88	H	138	182.1	-4.98	53.98	-30.105	73.98	-41.25	Pass
3.1624	35.9	26.98	H	114	156.5	-1.3	53.98	-27.001	73.98	-38.08	Pass
3.4885	36.8	26.72	H	65	178.5	-0.66	53.98	-27.263	73.98	-37.18	Pass
3.5993	37.01	27.38	V	237	143	-0.31	53.98	-26.596	73.98	-36.97	Pass
4.4018	37.54	28.39	V	167	142	1.31	53.98	-25.593	73.98	-36.44	Pass

Woodstream Model V400S Low Frequency (904.7 MHz)

Frequency	Peak Level Measured	Average Level Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part 15.209 Average Limit	FCC Part 15.209 Average Margin	FCC Part 15.35b Peak Limit	FCC Part 15.35b Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.8093	49.86	48.43	H	276	156.9	-7.69	53.98	-5.55	73.98	-24.12	Pass
1.8094	48.32	45.33	V	343	189	-7.69	53.98	-8.65	73.98	-25.66	Pass
2.0872	33.67	23.98	H	148	125.7	-6.42	53.98	-30.00	73.98	-40.31	Pass
2.4215	33.08	24.02	H	294	117.1	-4.97	53.98	-29.96	73.98	-40.90	Pass
3.1563	37.45	26.98	H	350	189.5	-1.31	53.98	-27.00	73.98	-36.53	Pass
3.1585	37.00	26.24	V	118	113	-1.31	53.98	-27.74	73.98	-36.98	Pass
3.5907	35.68	27.00	V	27	204	-0.34	53.98	-26.98	73.98	-38.30	Pass
5.9903	41.72	31.52	V	172	180	4.67	53.98	-22.46	73.98	-32.26	Pass
6.6154	43.16	33.78	H	322	146.7	4.33	53.98	-20.20	73.98	-30.82	Pass

Test Results: The Woodstream Model V400S SigFox Radio Control Unit complies with the requirements of 47 CFR Part 15.209 with margin of 5.55 dB.

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	2 Years	06/26/20
9kHz-3GHz EMC Analyzer	Agilent	E7402A	US39440162	883	02/27/18	3 Years	02/27/21
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A020714	882	05/16/18	2 Years	05/16/20
Amplifier (.09 – 1300 MHz)	Hewlett Packard	8447F	3313A06658	807	01/09/19	2 Years	01/09/21
EMC Analyzer (9 kHz - 26.5 GHz)	Hewlett Packard	8593EM	3710A00214	1026	03/02/17	3 Years	03/02/20
Amplifier System (0.5 – 50 GHz)	Hewlett Packard	83015A 83017A	3123A00360 & 3332A00219	1027	10/14/18	2 Years	10/14/20
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	05/17/18	2 Years	05/17/20

OATS Site (30 MHz – 1 GHz)	BEC	N/A	N/A	705	05/16/19	1 Year	05/16/20
Temp/Humidity Meter	Control Company	4096	170522942	780	04/08/19	2 Years	04/08/21
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