BEC INCORPORATED

ANTENNA GAIN VALUE CALCULATION REPORT

REFERENCE DOCUMENTS:
KDB 789033 D02
ANSI C63.10

Woodstream Corporation Model V430B
VLINK Rodent Snap Trap with LoRa Radio

FCC ID: SNA-V430B

REPORT# BEC-2287-07

CUSTOMER:
Woodstream Corporation
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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	01/23/2024
1	Moved the Radiated Analyzer Settings from Section 1.2 to 1.2.1 to clarify that the same settings were used for both Radiated and Conducted measurements	04/04/2024	04/04/2024

1.0 Administrative Information

1.1 General Information Table

Project Number	BEC-2287
Manufacturer	Woodstream Corporation
Model Number Tested	V430B
EUT Sample Type	FCC Test Code Radiated Sample
EUT Serial Number	SR231218WS00067
EUT Sample Number	2287-02
EUT Sample Type	FCC Test Code Antenna Conducted Sample
EUT Serial Number	3
EUT Sample Number	2287-01
EUT Firmware Version	2.3.4
Frequency of Operation	902 – 915 MHz
FCC Band	902 – 928 MHz
Antenna Gain Calculated Value	+ 2.11 dBi
Antenna Type	Inverted-F PCB Trace
Modulation	LoRa
Date Samples Received	12/20/2023
Sample Type and Condition Received	Production Unit Suitable for Test
EUT Description	Rodent Snap Trap
FCC ID	SNA-V430B
ANSI and FCC KDB Guidance Documents	KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section G 2(d) ANSI C63.10, Section 11.9: 2020

1.2 Radiated EIRP (dBm) Test Method

"EIRP" is calculated using the following KDB Guidance found in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section G 2(d). The field strength for the Highest Peak Corrected Fundamental Tx Frequency was converted from dBuV/m at 3 meters to EIRP in (dBm) by subtracting 95.2.

Per KDB 789033, Section G.2(d):

d) If *radiated* measurements are performed, field strength is then converted to EIRP as follows:

(i) EIRP = ((E×d)^2) / 30

where:

- E is the field strength in V/m;
- d is the measurement distance in m;
- EIRP is the equivalent isotropically radiated power in W.

(ii) Working in dB units, the preceding equation is equivalent to:

EIRP[dBm] = E[dBμV/m] + 20 log (d[m]) − 104.77

(iii) Or, if d is 3 m:

EIRP[dBm] = E[dBμV/m] − 95.2

EUT was set to transmit at 909.4 MHz with LoRa modulation using the following transmission settings of Power=15, Operating Bandwidth=500 kHz, Data Spread Factor=8.

1.2.1 Radiated EIRP (dBm) Test Results (12/22/2023)

The Radiated Emissions data below reflect the peak measurement of the Fundamental Transmit frequency at 903.0 MHz. The EUT was maximized in the X, Y and Z axes with the receiving antenna in both horizontal and vertical polarity to find the worst-case amplitude. The Y-Axis was the highest amplitude for the transmit frequency. The final peak corrected value is 111.77 dBuV/m.

The table below is the highest radiated measurement of the fundamental showing the highest amplitude in the Y-Axis @ 903 MHz.

The Settings on the Measurement Analyzer for measuring the Radiated Fundamental Tx Frequency were:

Measurement Analyzer Settings	
Sample Tested	2287-02 Under Battery Power with Tx 909.4 MHz, Power: 15, Bandwidth: 500 kHz, Spread Factor: 8
Frequency:	909.4 MHz
Span:	3 MHz
RBW	1 MHz
VBW	3 MHz
Attenuation	20 dB
Ref Level	120 dBuV
Detector	Peak
Highest Axis Amplitude	X Axis

Date	12/22/2023
Temp	19°C
Humidity	35%
Pre-Test Verification	YES
EUT Axis Tested	X Axis

Frequency	Peak Measured	Corrected Peak	Antenna Polarity	Turntable Angle	Antenna Height	Distance	Correction Factors @ 909.4 MHz
MHz	dBuV	dBuV	H/V	degrees	cm	Meters	dB
909.4	107.2	**111.64**	H	0	105	3.00	4.44

Radiated EIRP Calculation Using KDB 789033 D002 Section G 2 (d). [3M Peak Measurement-95.2]	**16.436**	Final Radiated EIRP (dBm)

EIRP Calculation:
111.64 dBuV/m minus 95.2= **16.44 dBm (Radiated EIRP)**

1.3 Maximum Conducted Output Power (dBm) Test Method

The test methods detailed in ANSI C63.10, Section 11.9 Maximum Peak Conducted Output Power were used for measurements in this section. Maximum Conducted Output Power was measured at the Tx Fundamental Frequency of 909.4 MHz during Bench testing of the EUT radio. EUT was set to transmit at 909.4 MHz with LoRa modulation using the following transmission settings of Power=15, Operating Bandwidth=500 kHz, Data Spread Factor=8.

The Settings on the Measurement Analyzer for measuring the Antenna Conducted Fundamental Tx Frequency were:

Measurement Analyzer Settings	
Sample Tested	2287-01 Under Battery Power with Tx 909.4 MHz, Power: 15, Bandwidth: 500 kHz, Spread Factor: 8
Frequency:	909.4 MHz
Span:	5 MHz
RBW	1 MHz
VBW	3 MHz
Attenuation	40 dB
Ref Level	30 dBm
Detector	Peak

1.3.1 Maximum Conducted Output Power (dBm) Test Results (01/08/2024)

Channel	Modulation	Frequency (MHz)	Measured Level (dBm)	Cable # 962 Loss (dB)	Corrected Measured Output		Limit		Margin	
					dBm	Watts	dBm	Watts	dBm	Watts
0	LoRa: Output Setting=15, BW=500 kHz, Spread Factor = 8	903.0	14.07	0.26	14.33	0.027	30.00	1.000	-15.67	-0.973
4		909.4	14.00	0.26	14.26	0.027	30.00	1.000	-15.74	-0.973
7		914.2	14.00	0.26	14.26	0.027	30.00	1.000	-15.74	-0.973

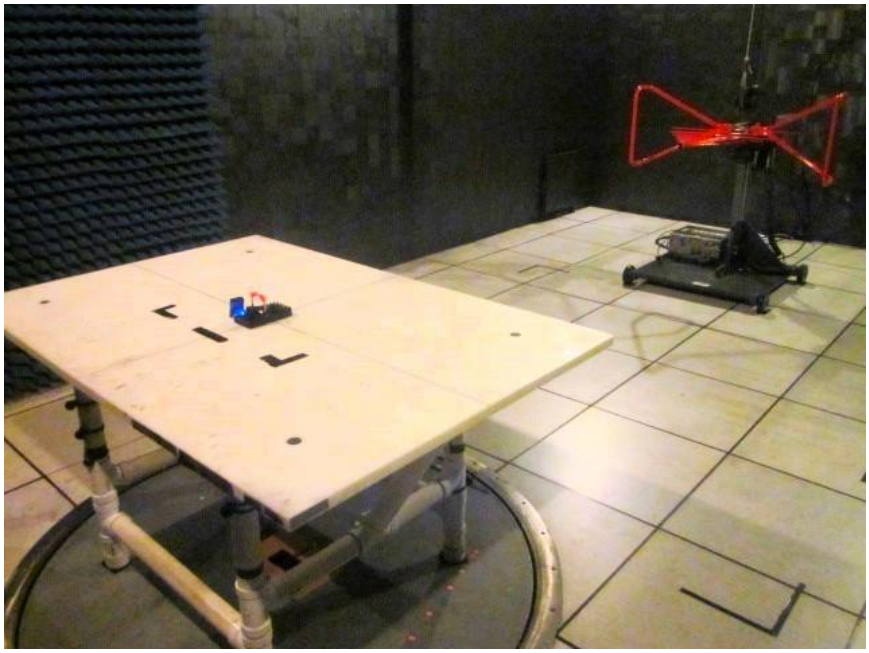
Maximum Conducted Output Power at the Tx Fundamental Frequency of 909.4 MHz during Bench testing of the EUT radio = + 14.33 dBm (Maximum Conducted Output Power Final Corrected Level)

1.4 Antenna Gain Value Calculation (EIRP Minus Maximum Conducted Output Power)

Antenna Gain Value is calculated as the difference between the Radiated EIRP measurement value of the Peak Corrected Fundamental Tx Frequency Minus the Peak Corrected Maximum Conducted Output Power.

Radiated EIRP (dBm): 16.44 dBm
Maximum Conducted Output Power (dBm): - 14.33 dBm
Calculated Antenna Gain **+ 2.11 dBi**

1.5 Test Setup Photograph for Radiated Measurement in X-Axis



1.6 Test Setup Photograph for Antenna Conducted Maximum Output Power