BEC INCORPORATED

ANTENNA GAIN VALUE CALCULATION REPORT

REFERENCE DOCUMENTS:
KDB 789033 D02
ANSI C63.10

Woodstream Corporation Model V440
VLINK Bait Box Rodent Trap with LoRa Radio

FCC ID: SNA-V440

REPORT# BEC-2224-07

CUSTOMER:
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ACCREDITED
Testing Cert #2557.01

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Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	11/02/2022

1.0 Administrative Information

1.1 General Information Table

Project Number	BEC-2224
Manufacturer	Woodstream Corporation
Model Number Tested	V440
EUT Sample Type	FCC Test Code Radiated Sample
EUT Serial Number	None
EUT Sample Number	2224-01
EUT Sample Type	FCC Test Code Antenna Conducted Sample
EUT Serial Number	None
EUT Sample Number	2224-02
EUT Firmware Version	FW Version 1.2.10 MCU: AVR32DA32
Frequency of Operation	902 – 915 MHz
FCC Band	902 – 928 MHz
Antenna Gain Calculated Value	+ 5.06 dBi
Antenna Type	Inverted-F PCB Trace
Modulation	LoRa
Date Samples Received	09/23/2022
Sample Type and Condition Received	Production Unit Suitable for Test
EUT Description	Bait Box Rodent Trap
FCC ID	SNA-V440
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 903 MHz with LoRa modulation using the following transmission settings of Power=20, Operating Bandwidth=500 kHz, Data Spread Factor=8.

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

Measurement Analyzer Settings	
Sample Tested	2224-03 Under Battery Power with Tx 903.0 MHz, Power: 20, Bandwidth: 500 kHz, Spread Factor: 8
Frequency:	903.0 MHz
Span:	3 MHz
RBW	1 MHz
VBW	3 MHz
Attenuation	20 dB
Ref Level	120 dBuV
Detector	Peak
Highest Axis Amplitude	Y Axis

1.2.1 Radiated EIRP (dBm) Test Results (09/28/2022)

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.

Date	9/28/2022
Temp	21C
Humidity	45%
Pre-Test Verification	Yes-Pass
EUT Axis Tested	Y Axis

Frequency	Peak	Corrected Peak	Polarity	TT angle	Ant Height	Correction Factors @ 903 MHz
MHz	dBuV	dBuV/m	H/V	degrees	cm	dB
902.765	107.72	**111.77**	V	91	105	4.05

Radiated EIRP Calculation Using KDB 789033 D002 Section G 2 (d). **16.57** Final Radiated EIRP (dBm)

EIRP Calculation:
111.77 dBuV/m minus 95.2= **16.57 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 903.0 MHz during Bench testing of the EUT radio. EUT was set to transmit at 903 MHz with LoRa modulation using the following transmission settings of Power=20, Operating Bandwidth=500 kHz, Data Spread Factor=8.

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

Measurement Analyzer Settings	
Span	5 MHz
RBW	1 MHz
VBW	3 MHz
Sweep Time	5 ms
Attenuation	50 dB
Ref Level	20 dBm

1.3.1 Maximum Conducted Output Power (dBm) Test Results (10/12/2022)

Channel	Modulation	Frequency (MHz)	Measured Level	Cable # 811 Loss (dB)	Final Corrected Total		Limit		Margin	
					dBm	Watts	dBm	Watts	dBm	Watts
0	LoRa BW 500 kHz SF = 8	903.0	11.33	0.18	11.51	0.014	30.00	1.000	-18.49	-0.986
4		909.4	11.18	0.24	11.42	0.014	30.00	1.000	-18.58	-0.986
7		914.2	11.18	0.20	11.38	0.014	30.00	1.000	-18.62	-0.986

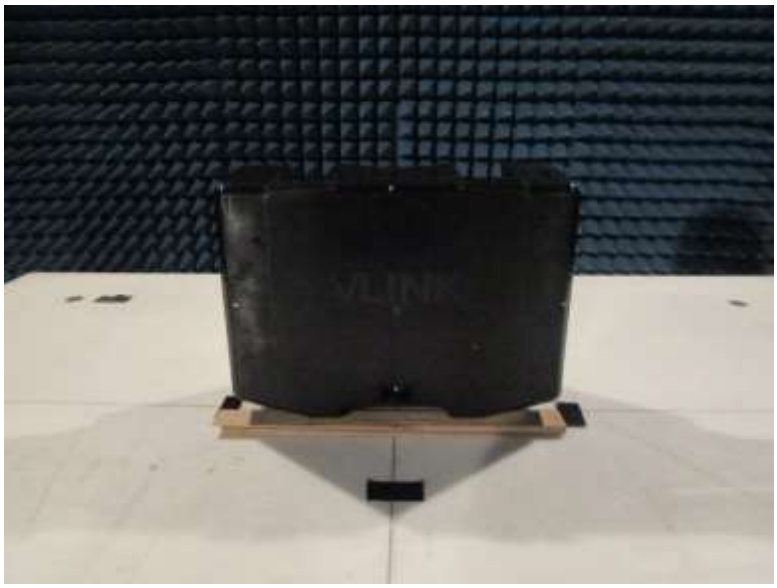
Maximum Conducted Output Power at the Tx Fundamental Frequency of 903.0 MHz during Bench testing of the EUT radio = + 11.51 dBm (Maximum Conducted Output Power Final Corrected Level)

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): 16.57 dBm
Maximum Conducted Output Power (dBm): - 11.51 dBm
Calculated Antenna Gain **+ 5.06 dBi**

1.5 Test Setup Photograph for Radiated Measurement in Y-Axis



1.6 Test Setup Photograph for Antenna Conducted Maximum Conducted Output Power