EMC Technologies (NZ) Ltd
PO Box 68-307
Newton, Auckland 1145
New Zealand
Phone 09 360 0862
Fax 09 360 0861
E-Mail Address: aucklab@ihug.co.nz
Web Site: www.emctech.com.au

TEST REPORT

Woodsonix SB800 Wooden Pole Ultrasonic Transmitter (Red Probe)

tested to the

Code of Federal Regulations (CFR) 47

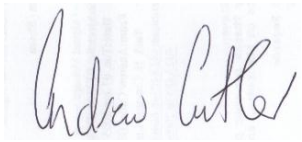
Part 15 – Radio Frequency Devices, Subpart C – Intentional Radiators

Section 15.249 – Operation in the band 900 – 928 MHz

for

Woodsonix Ltd

This Test Report is issued with the authority of:



Andrew Cutler - General Manager

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Table of Contents

1. STATEMENT OF COMPLIANCE

The **Woodsonix SB800 Wooden Pole Ultrasonic Transmitter (Red Probe)** complies with 47 CFR Part 15 and in particular Sections, 15.205, 15.207, 15.209, 15.215 and 15.249 as detailed below when tested in accordance with ANSI C63.4 – 2003.

2. RESULTS SUMMARY

The results of testing carried out in August 2014 are detailed below.

Clause	Description	Result
15.201	Equipment authorisation requirement	Applied
15.203	Antenna requirement	Complies
15.204	External power amplifiers	Not applicable
15.205	Operation in restricted bands	Complies
15.207	Conducted emissions	Not applicable
15.209	Radiated emissions	See below
15.215	Additional provisions	Complies
15.249 (a)	Field strength of fundamental	Complies
15.249 (a)	Field strength of harmonics	Complies
15.249 (b)	Fixed, point to point operations	Not applicable
15.249 (c)	3 metre measurement distance	Noted
15.249 (d)	Spurious emission levels except harmonics	Complies
15.249 (e)	Detectors above 1000 MHz	Noted
15.249 (f)	Reference to section 15.37(d)	Noted

3. CLIENT INFORMATION

Company Name Woodsonix Ltd

Address PO Box 491
Drury

City Auckland 2247

Country New Zealand

Contact Mr Brian Mitchell

4. DESCRIPTION OF TEST SAMPLE

Brand Name	Woodsonix
Model Number	SB800
Product	Wooden Pole Ultrasonic Transmitter (Red Probe)
Manufacturer	Woodsonix Ltd
Country of Origin	New Zealand
Serial Number	SB8000124 + SB8000112
FCC ID	2AC4P-WSSB800TX

Product Description

This system consists of three items as detailed below:

- Ultrasonic transmitter (red probe) that transmits an ultrasonic pulse and then transmits a burst of RF on 914.500 MHz to indicate that a pulse has been transmitted.

- Ultrasonic receiver (blue probe) that receives an ultrasonic pulse and then transmits a burst of RF on 914.500 MHz to indicate that a pulse has been received.

- A receiver unit that operates on 914500 MHz which then combines both transmissions and makes a measurement which is then displayed on the LCD screen.

This report describes the measurements made on the Ultrasonic transmitter (Red Probe).

5. EQUIPMENT PARAMETERS

The 900 MHz transmitter in this device has the following RF specifications:

FCC Band:	900 MHz – 928 MHz
Test Frequency:	914.500 MHz
Operating Frequencies:	914.500 MHz
Rated Power:	10.0 uW (-20.0 dBm)
Modulation Type:	FSK Data
Antenna Type:	Internal Whip
Power Supply:	Internal batteries
Clock frequencies	6 MHz

6. ATTESTATION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

This report contains no corrections.

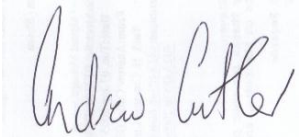
Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

7. TEST RESULTS

Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device as it contains a 900 MHz transmitter.

Section 15.203 – Antenna requirement

This device uses an internal 900 MHz antenna that has no external connector.

Result: Complies

Section 15.204: External radio frequency power amplifiers and antenna modifications

An external power amplifier is not supplied with this device and it is not possible to attach an external power amplifier.

Result: Complies.

Section 15.205 – Restricted bands of operation

Refer to measurements made with reference to Section 15.249 (a).

This device operates in the 900 – 928 MHz which is not a restricted band.

Result: Complies

Section 15.207: Conducted limits

Device is powered using internal batteries.

Device cannot be directly or indirectly attached to the public AC mains supply

This section is therefore not applicable.

Section 15.209 – Radiated emissions below 30 MHz

In accordance with section 15.249 (d) the general emission limits specified in Section 15.209 (a) have been applied to all emissions except the transmitter harmonics.

See Section 15.249 (a) for further details.

As this device contains a digital device that operates using frequencies below 30 MHz, 6 MHz clock, low frequency measurements were attempted between 100 kHz – 30 MHz at the open area test site over a distance of 10 metres using a loop antenna, the centre of which was, 1 metre above the ground.

Testing was carried out using when the device operating normally when powered using the supplied internal batteries and when it was communicating with the Blue Probe and the Receiver.

Testing was carried out in the X, Y and Z planes.

The general limits described in 15.209 have been applied with the 300 metre and 30 metre limits being extrapolated by a factor of 40 dB per decade as allowed for in section 15.31(d)(2).

Between 9 – 90 kHz and between 110 – 490 kHz an Average detector and a Peak detector were used.

Where a peak detector was used the limit was increased by +20 dB

Between 90 kHz and 110 kHz band between 490 kHz and 30 MHz a Quasi Peak detector was used.

No emissions were detected on these frequencies of interest and no other emissions were detected from this device over the range of 9 kHz – 30 MHz

Result: Complies
Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (9 kHz – 30 MHz) ± 4.8 dB

Section 15.209 – Radiated emissions above 30 MHz

In accordance with section 15.249 (d) the general emission limits specified in Section 15.209 (a) have been applied to all emissions except the transmitter harmonics.

See Section 15.249 (a) for further details.

Testing for general radiated emissions was carried out over the frequency range of 30 MHz to 1000 MHz as the highest frequency in use by the digital device in this device is less than 108 MHz (6 MHz).

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand. This site conforms to the requirements of CISPR 16 and ANSI C63.4 - 2003.

Testing was carried out using when the device operating normally when powered using the supplied internal batteries and when it was communicating with the Blue Probe and the Receiver.

Testing was carried out in the X, Y and Z planes.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

Above 30 MHz the emission is measured in both vertical and horizontal antenna polarisations, where appropriate, using a quasi peak detector.

The emission level was determined in field strength by taking the following into consideration:

Level (dBμV/m) = Receiver Reading (dBμV) + Antenna Factor (dB) + Coax Loss (dB)

Result: Complies

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (30 – 1000 MHz) ± 4.1 dB

Results:

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector	BW (kHz)
162.000	23.7	32.1	43.5	11.4	Horizontal	Quasi Peak	120
168.000	28.2	36.1	43.5	7.4	Horizontal	Quasi Peak	120
171.000	24.7	32.7	43.5	10.8	Horizontal	Quasi Peak	120
174.000	33.1	39.5	43.5	4.0	Horizontal	Quasi Peak	120
177.000	28.0	35.0	43.5	8.5	Horizontal	Quasi Peak	120
180.000	34.2	39.3	43.5	4.2	Horizontal	Quasi Peak	120
183.000	25.6	34.2	43.5	9.3	Horizontal	Quasi Peak	120
186.000	29.7	37.0	43.5	6.5	Horizontal	Quasi Peak	120
192.000	26.9	34.8	43.5	8.7	Horizontal	Quasi Peak	120
216.000	25.2	31.7	43.5	11.8	Horizontal	Quasi Peak	120
222.000	29.2	35.7	46.0	10.3	Horizontal	Quasi Peak	120
228.000	30.4	35.6	46.0	10.4	Horizontal	Quasi Peak	120
234.000	29.1	33.9	46.0	12.1	Horizontal	Quasi Peak	120
276.000	26.7	32.2	46.0	13.8	Horizontal	Quasi Peak	120
282.000	27.0	32.3	46.0	13.7	Horizontal	Quasi Peak	120
345.000	27.8	30.0	46.0	16.0	Horizontal	Quasi Peak	120
348.000	27.8	29.8	46.0	16.2	Horizontal	Quasi Peak	120
357.000	29.0		46.0	17.0	Vertical	Quasi Peak	120
500.000	30.4	32.2	46.0	13.8	Horizontal	Quasi Peak	120
507.000	32.3	32.5	46.0	13.5	Horizontal	Quasi Peak	120
513.000	32.5	34.2	46.0	11.8	Horizontal	Quasi Peak	120
525.000	33.5	32.6	46.0	12.5	Vertical	Quasi Peak	120
531.000	33.0	32.3	46.0	13.0	Vertical	Quasi Peak	120
537.000	33.3	33.1	46.0	12.7	Vertical	Quasi Peak	120
543.000	33.3		46.0	12.7	Vertical	Quasi Peak	120
549.000	33.1		46.0	12.9	Vertical	Quasi Peak	120
555.000	33.0	30.7	46.0	13.0	Vertical	Quasi Peak	120

All further emissions observed from the system tested had a margin to the limit that exceeded 15 dB when measurements were attempted up to 1000 MHz using either horizontal or vertical polarisations.

Section 15.215 (c) – Additional provisions to the general radiated emission limitations

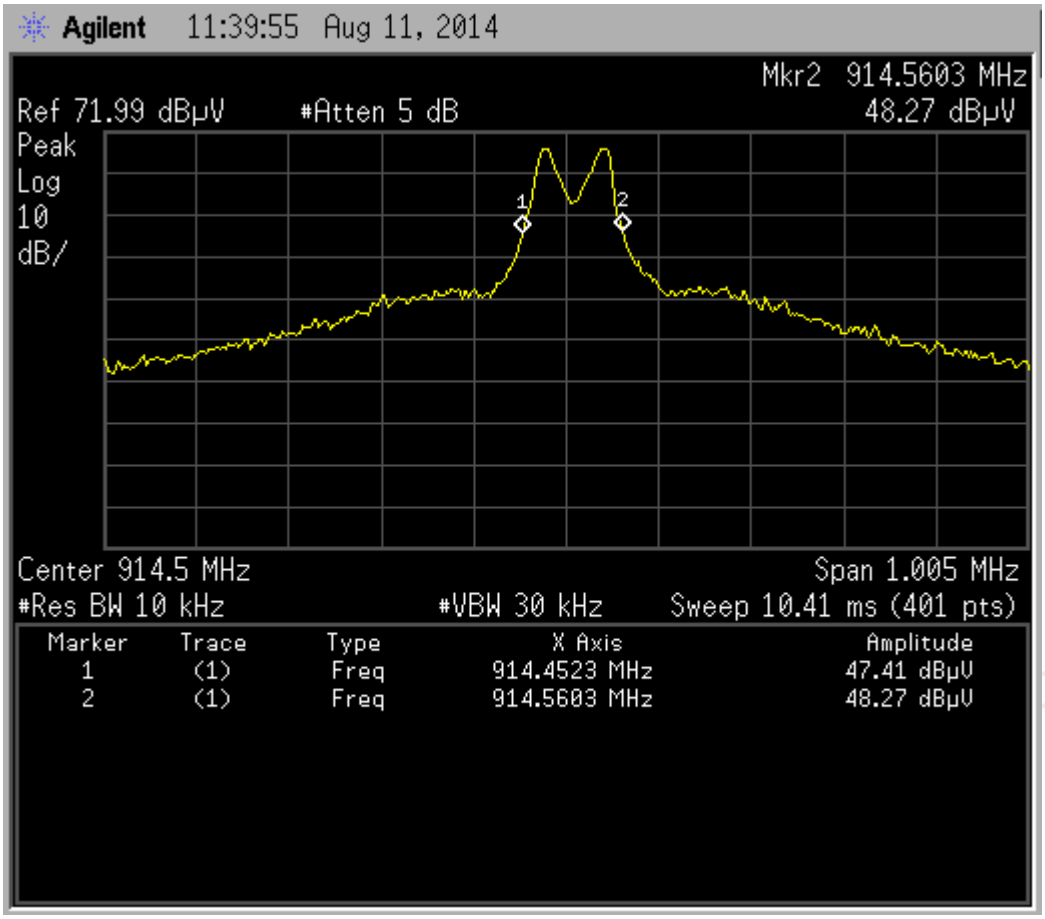
The device operates in the 900 – 928 MHz band.

Relative spectrum mask measurements have been made when the device was operating on 914.500 MHz.

Measurements were made at the -20 dB points.

Frequency (MHz)	F low (MHz)	F high (MHz)
914.500	914.4523	914.5603

The device can be seen to stay within the band of 900 – 928 MHz at the -20 dB points



Results: Complies

Section 15.249 (a) – Field strength of the Fundamental and Harmonics

Radiated emission measurements were carried out with the limits as per section 15.249 (a) being applied to the Fundamental and Harmonics of each transmitter.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland.

The transmitter was placed on the test table top which was a total of 0.8 m above the test site ground plane.

Measurements of the radiated field were made 3 metres from the transmitting antenna.

Measurements below 1000 MHz were made using a Quasi Peak Detector with a bandwidth of 120 kHz.

Measurements above 1000 MHz were made using an average detector with a bandwidth of 1.0 MHz and also a peak detector with a bandwidth of 1.0 MHz.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height with an automated antenna tower.

All emissions were measured in both vertical and horizontal antenna polarisations.

The emission is measured in both vertical and horizontal antenna polarisations with no measurements were made above the 10^{th} harmonic.

Testing was carried out using when the probe was transmitting continuously on 914.500 MHz when powered using the supplied internal batteries.

Testing was carried out in the X, Y and Z planes.

The emission level is determined in field strength by taking the following into consideration:

Level (dBμV/m) = Receiver Reading (dBμV) + Antenna Factor (dB/m) + Coax Loss (dB) – Amplifier Gain (dB)

Fundamental emission

Testing was carried out as detailed below

Axis	Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna
Y	914.5	60.8	68.7	94.0	25.3	Horizontal
X	914.5	59.3	70.5	94.0	23.5	Horizontal
Z	914.5	65.4	58.5	94.0	28.6	Vertical

Section 15.249 specifies a limit of 50 mV/m (94 dBuV/m) when a quasi peak detector is used for devices operating in the band of 900 – 928 MHz.

This limit has been converted to dBuV/m using the formula 20 * (log 0.050 / 0.000001)

Measurements were made in the Y, X and Z axis.

Result: Complies.
Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (30 – 25,000 MHz) ± 4.1 dB

Spurious emissions when transmitting on 914.5 MHz

Frequency (MHz)	Vertical (dBuV/m)	Horizontal (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Detector	BW (MHz)
1829.0	47.5	47.2	74.0	26.5	Vertical	Peak	1.0
1829.0	34.6	35.1	54.0	18.9	Horizontal	Average	1.0
2743.5	< 49	< 49	74.0	> 25	Vertical	Peak	1.0
2743.5	< 36	< 36	54.0	> 18	Vertical	Average	1.0
3658.0	56.9	58.3	74.0	15.7	Horizontal	Peak	1.0
3658.0	47.1	52.1	54.0	1.9	Horizontal	Average	1.0
4572.5	< 54	< 54	74.0	> 20	Vert/Hort	Peak	1.0
4572.5	< 41	< 41	54.0	> 13	Vert/Hort	Average	1.0
5487.0	< 57	< 57	74.0	> 17	Vert/Hort	Peak	1.0
5487.0	< 44	< 44	54.0	> 10	Vert/Hort	Average	1.0
6401.5	< 60	< 60	74.0	> 14	Vert/Hort	Peak	1.0
6401.5	< 47	< 47	54.0	> 7	Vert/Hort	Average	1.0
7316.0	< 55	< 55	74.0	> 19	Vert/Hort	Peak	1.0
7316.0	< 42	< 42	54.0	> 12	Vert/Hort	Average	1.0
8230.5	< 56	< 56	74.0	> 18	Vert/Hort	Peak	1.0
8230.5	< 43	< 43	54.0	> 11	Vert/Hort	Average	1.0
9145.0	< 56	< 56	74.0	> 18	Vert/Hort	Peak	1.0
9145.0	< 43	< 43	54.0	> 11	Vert/Hort	Average	1.0

Measurements were attempted at a distance of 3 metres using vertical and horizontal polarisations when the device was placed in the X, Y and Z axes.

Measurements were made using a peak and an average detector with a 1 MHz bandwidth.

As per section 15.249 a limit of 500 uV/m applies to the harmonic emissions when an average detector is used.

This limit has been converted to dBuV/m using the formula 20 * (log 500) with a factor of + 20 dB being added to determine the peak limit.

Result: Complies.
Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (30 – 25,000 MHz) ± 4.1 dB

8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref	Cal Due	Interval
Aerial Controller	EMCO	1090	9112-1062	RFS 3710	Not applic	-
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708	Not applic	-
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612	7 Feb 2015	1 year
Horn Antenna	EMCO	3115	9511-4629	E1526	14 June 2017	3 year
Horn Antenna	EMCO	3116	92035	-	10 May 2016	3 year
Log Periodic	Schwarzbeck	VUSLP 9111	9111-228	3785	7 Feb 2015	1 year
Receiver	R & S	ESIB 40	100171	R-27-1	29 Jan 2015	1 year
Spectrum Analyser	Hewlett Packard	E7405A	US39150142	3771	7 July 2015	1 year
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709	Not applic	-
VHF Balun	Schwarzbeck	VHA 9103	-	RFS 3603	7 Feb 2015	1 year
Loop Antenna	EMCO	6502	9003-2485	3798	14 Jul 2017	3 year

At the time of testing all test equipment was within calibration.

9. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was last updated in June 2014.

In addition testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025.

All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/IEC/ISO 17025.

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with a number of accreditation bodies in various economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

10. PHOTOGRAPHS

External photos

Test set up photos - X Plane

Y plane

Z plane