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**EMI TEST REPORT FOR CERTIFICATION
to
FCC PART 80**

FCC ID: SF5-00200

Test Sample: Maritime Survivor Locating Device
Model: V100
Manufacturer: Mobilarm Limited

Report Number: M090504_Cert_V100

Issue Date: 4th August 2009

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Report No. M090504_Cert_V100

Test Sample: Maritime Survivor Locating Device
Model: V100
Manufacturer: Mobilarm Limited

FCC ID: SF5-00200
Equipment Type: Intentional Radiator (Transceiver)

Tested for: Mobilarm Limited
Address: 768 Canning Highway
Applecross WA 6153
Australia
Contact: Patrick Jones – Engineering Manager

Test Standards: FCC Part 80 – Stations in the Maritime Services
ANSI/TIA 603-C: 2004

Test Dates: 25th June to 3rd August 2009



Senior Engineers: Rob Weir
Chieu Huynh

Attestation: *I hereby certify that the device(s) described herein were tested as described in this report and that the data included is that which was obtained during such testing.*



Authorised Signatory: Chieu Huynh
Senior EMC Engineer
EMC Technologies Pty Ltd

EMI TEST REPORT FOR CERTIFICATION to FCC PART 80

1.0 INTRODUCTION

EMI testing was performed on the Maritime Survivor Locating Device, Model: V100. The test sample **complied** with the requirements of 47 CFR, Part 80 – Stations in the Maritime Services.

Test results and procedures were performed in accordance with the following Federal Communications Commission (FCC) standards/regulations:

47 CFR, Part 80	Stations in the Maritime Services
Section 80.205	Bandwidths
Section 80.207	Classes of emission
Section 80.209	Transmitter frequency tolerances
Section 80.211	Emission limitations
Section 80.213	Modulation requirements
Section 80.215	Transmitter power

The measurement procedure used was in accordance with ANSI/TIA 603-C: 2004.

1.1 Summary of Results

FCC Part 80 Clauses	Test Performed	Results
80.205	Bandwidths	Complies
80.207	Classes of emission	Complies
80.209	Transmitter frequency tolerances	Complies
80.211	Emission limitations	Complies
80.213	Modulation requirements	Complies
80.215	Transmitter power	Complies

1.2 Modifications by EMC Technologies

No modifications were required.

2.0 GENERAL INFORMATION

(Information supplied by the Client)

2.1 EUT Details

Test Sample:	Maritime Survivor Locating Device
Model Name:	V100
Manufacturer:	Mobilarm Limited
Transmitter Frequencies:	Channel 16, 156.800 MHz Channel 70, 156.525 MHz
Transmitter Power:	1 Watt
Microprocessor:	CC1110F32 Integrated Radio Chip
Crystal Frequency:	26 MHz
Antenna Type and Gain:	Helical antenna and unity gain at 156.5 MHz
Power Rating:	9 V _{dc} at 800mA self contained battery powered

2.2 Operational Description

The Mobilarm V100 is a fully automated Maritime Survivor Locating Device (MSLD) designed specifically for the commercial marine environment to ensure a quick, effective rescue in a man overboard emergency.

2.3 Test Configuration

The V100, when activated, transmits a synthesised radiotelephone voice message on channel 16 and a Digital Selective Calling data message on channel 70. Both messages include location co-ordinates determined by an integrated GPS receiver.

Measurements of the transmission characteristics were made with a 50Ω artificial antenna connected to the antenna port of the V100. Radiated emission tests were made with the flexible antenna released from its stored position.

2.4 Test Procedure

Emissions measurements were performed in accordance with the procedures of ANSI/TIA 603-C: 2004. Radiated emissions tests were performed at a distance of 3 metres from the EUT.

2.5 Test Facility

2.5.1 General

EMC Technologies Pty Ltd is listed by the FCC as a test laboratory able to perform compliance testing for the public. EMC Technologies is listed as an FCC part 47CFR2.948 test lab and may perform the testing required under Parts 15 and 18 – **FCC Registration Number 90560**

EMC Technologies Pty Ltd has also been accredited as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 & 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0001.**

EMC Technologies open area test site (OATS) has also been accepted by Industry Canada for the performance of radiated measurements in accordance with RSS 212, Issue 1 (Provisional) - **Industry Canada OATS number - IC 3569B-1.**

Radiated Emission measurements were performed at EMC Technologies Open Area Test Site (OATS) situated at Lerderderg Gorge, near the township of Bacchus Marsh in Victoria, Australia.

Conducted measurements at an antenna ports were performed at EMC Technologies' laboratory in Keilor Park, Victoria Australia.

2.5.2 NATA Accreditation

EMC Technologies is accredited in Australia to test to the following standards by the National Association of Testing Authorities (NATA).

“FCC Part 15 unintentional and intentional emitters in the frequency range 9kHz to 18 GHz excluding TV receivers (15.117 and 15.119), TV interface devices (15.115), cable ready consumer electronic equipment (15.118), cable locating equipment (15.213) and unlicensed national information infrastructure devices (Sub part E).”

The current full scope of accreditation can be found on the NATA website: www.nata.asn.au It also includes a large number of emissions, immunity, SAR, EMR and Safety standards.

NATA is the Australian national laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

2.6 Test Equipment Calibration

All measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI). All equipment calibration is traceable to Australia national standards at the National Measurements Institute. The reference antenna calibration was performed by NMI and the working antennas (biconical and log-periodic) calibrated by the NATA approved procedures. The complete list of test equipment used for the measurements, including calibration dates and traceability is contained in Appendix A

2.7 Ambients at OATS

The Open Area Test Site (OATS) is an area of low background ambient signals. No significant broadband ambients are present however commercial radio and TV signals exceed the limit in the FM radio, VHF and UHF television bands. Radiated prescan measurements were performed in the shielded enclosure to check for possible radiated emissions at the frequencies where the OATS ambient signals exceeded the test limit.

3.0 TRANSMITTER POWER MEASUREMENTS

Testing was performed in accordance with the requirements of FCC Part 80.215(e).

Measurements of the carrier power at the antenna port were performed while the test sample continuously transmitted.

The transmitter output was connected to the spectrum analyser in peak hold mode via a calibrated attenuator and cable.

A resolution bandwidth of 1 kHz and video bandwidth of 1 kHz were utilised.

Rated power: 1 Watt (30dBm)

Channel	Frequency MHz	Measured Power dBm	Power Plots
16	156.8	30.03	Appendix I
70	156.525	30.07	similar to above

The supply voltage was reduced to the minimum operating level of 7V as specified by the client and the power at the antenna port measured.

Channel	Frequency MHz	Measured Power dBm
16	156.8	30.01
70	156.525	30.02

4.0 BANDWIDTHS

Testing was performed in accordance with the requirements of FCC Part 80.205(a).

Measurements of the transmitted 99% power bandwidth were performed while the test sample continuously transmitted with dot pattern modulation.

The transmitter output was connected to the spectrum analyser in peak hold mode via a calibrated attenuator and cable.

A resolution bandwidth of 1 kHz and video bandwidth of 1 kHz were utilised.

Channel	Frequency MHz	Bandwidth kHz	Limit kHz	BW Plots
16	156.8	10.85	16	Appendix H
70	156.525	10.75	16	Appendix H

5.0 MODULATION REQUIREMENTS – OCCUPIED BANDWIDTH

Testing was performed in accordance with the requirements of FCC Part 80.211(f).

Measurements of the occupied bandwidth were performed while the test sample continuously transmitted with dot pattern modulation.

The transmitter output was connected to the spectrum analyser in peak hold mode via a calibrated attenuator and cable.

A resolution bandwidth of 500 Hz and video bandwidth of 500 Hz were utilised.

Complied - Refer to Appendix K for Emission Mask Plots.

6.0 EMISSIONS LIMITATIONS – OUT OF BANDS (Spurious and Harmonics)

Testing was performed in accordance with the requirements of FCC Part 80.211(f).

As per 80.211(f)(3) – The limits of any emissions shall be attenuated by at least $43 + 10\log(P)$ dB, where P is the measured transmitter output power.

Therefore, the emissions shall be attenuated by at least 43 (where P = 1 Watt).

6.1 Conducted RF Measurements - Antenna Port

Measurements of spurious emissions conducted to the antenna port were performed while the test sample continuously transmitted an un-modulated signal.

The transmitter output was connected to the EMC test receiver via a calibrated attenuator and cable.

Frequency (MHz)	Receiver bandwidth
0.009 – 0.150	200 Hz
0.150 – 30.0	9 kHz
30 – 1000	120 kHz
1000 – 2000	120 kHz

Channel 70, 156.525 MHz

Frequency MHz	Measured Level dBm	dB below carrier	Results
156.525	30.0	Transmit Frequency	
313.050	-42.1	72.1	Complied
469.575	-54.2	84.2	Complied
626.100	-55.6	85.6	Complied

Channel 16, 156.800 MHz

Frequency MHz	Measured Level dBm	dB below carrier	Results
156.800	30.0	Transmit Frequency	
313.600	-42.4	72.4	Complied
470.400	-53.6	83.6	Complied
627.200	-55.1	85.1	Complied

Complied - Refer to Appendix J for Conducted RF Plots

6.2 Radiated Emissions

The measurements were made at the open area test site at a distance of 3 metres.

The EUT was slowly rotated with the Peak Detector set to Max-Hold. This was performed for two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable, and by varying the antenna height. Each significant peak was investigated. This process was performed for both horizontal and vertical antenna polarisations.

A calibrated Biconical antenna was used for measurements between 30 MHz to 232 MHz.

A calibrated Logperiodic antenna was used for measurements between 230 MHz to 1000 MHz.

A calibrated EMCO 3115 horn antenna was used for measurements between 1 GHz to 2 GHz.

RBW = 120 kHz and VBW = 300 kHz for frequency band 30 MHz – 1000 MHz

RBW = 1 MHz and VBW = 1 MHz for frequency band 1 GHz – 2 GHz

The receiver bandwidth was set to 6 dB.

Measurements were conducted as per ANSI/TIA 603-C using the substitution method. Both channels (16: 156.8 MHz and 70: 156.525 MHz) were tested and the results were found to be the same. Worst emission results were reported.

Frequency MHz	Polarisation	dB below carrier	Results
312.96	Vertical	45.1	Complied
469.43	Vertical	46.2	Complied
625.91	Vertical	56.8	Complied
782.38	Vertical	62.4	Complied
938.86	Vertical	60.0	Complied
1096.7	Vertical	62.7	Complied
Other frequencies were at least 63 dB below the carrier			Complied

Frequency MHz	Polarisation	dB below carrier	Results
312.96	Horizontal	49.4	Complied
470.04	Horizontal	50.2	Complied
626.70	Horizontal	63.7	Complied
783.38	Horizontal	62.6	Complied
940.85	Horizontal	71.3	Complied
Other frequencies were at least 63 dB below the carrier			Complied

7.0 TRANSMITTER FREQUENCY TOLERANCES

Testing was performed in accordance with the requirements of FCC Part 80.209(a).

Measurements of the carrier frequency were performed while the test sample continuously transmitted an un-modulated signal.

The transmitter output was connected to the spectrum analyser and the frequency variation from the nominal value calculated.

The measurements were performed with the ambient temperature varied from -30°C to +50 °C. The transmitter frequency was recorded every 10°C step and the results are reported.

Channel 16, 156.800 MHz

Temperature (°C)	Frequency Error Hz	Frequency Error ppm	Limits ppm	Results
-30	-219	1.4	10	Pass
-20	-197	1.3		
-10	-171	1.1		
0	-202	1.3		
+10	-208	1.3		
+20	-179	1.1		
+30	-179	1.1		
+40	-159	1.0		
+50	-150	1.0		

Channel 70, 156.525 MHz

Temperature (°C)	Frequency Error Hz	Frequency Error ppm	Limits ppm	Results
-30	-206	1.3	10	Pass
-20	-204	1.3		
-10	-170	1.1		
0	-203	1.3		
+10	-201	1.3		
+20	-186	1.2		
+30	-176	1.1		
+40	-171	1.1		
+50	-146	0.9		

8.0 COMPLIANCE STATEMENT

The Maritime Survivor Locating Device, Model: V100 **complied** with the requirements of 47 CFR, Part 80 – Stations in the Maritime Services.

FCC Part 80 Clauses	Test Performed	Results
80.205	Bandwidths	Complies
80.207	Classes of emission	Complies
80.209	Transmitter frequency tolerances	Complies
80.211	Emission limitations	Complies
80.213	Modulation requirements	Complies
80.215	Transmitter power	Complies

9.0 MEASUREMENT UNCERTAINTIES

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Conducted Emissions:	9 kHz to 30 MHz	±3.2 dB
Radiated Emissions:	9 kHz to 30 MHz	±4.1 dB
	30 MHz to 300 MHz	±5.1 dB
	300 MHz to 1000 MHz	±4.7 dB
	1 GHz to 18 GHz	±4.6 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

10.0 TEST REPORT APPENDICES

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