

# MRT AU9 EPIRB

## ETSI Radio Performance Assessment

31 March 2010

Product:	AU9 EPIRB (personnel worn) 121.5 MHz Emergency Radio Beacon
Manufacturer:	Marine Rescue technology Units 3,4 - Front Street Court Middleton-u-wolds Drifffield YO25 9TZ
Serial Number(s):	Samples designated #1, #2 & #3
Dates tested:	03/12/2009, 17/12/2009, 21/12/2009, 26/01/2009 & 18/03/2010
Standards Tested to:	ETSI EN 300 152-1 V1.2.2 (2000-08), ETSI EN 300 152-2 V1.1.1 (2000-08) – (under article 3.2 of the R&TTE Directive 1999/5/EC) ETSI EN 300 152-3 V1.1.1 (2001-05) – (under article 3.3(e) of the R&TTE Directive 1999/5/EC)
Summary:	The sample tested met the requirements subject to the variations set out herein.
Tested by:	T. P. Jarvis
Report Author:	T. P. Jarvis

Project: MT075-ETSI1

STATUS: issued

# 1 Introduction

## 1.1 Manufacturer Information

The AU9 is a personnel worn Emergency Position Indicating Radio Beacon (EPIRB). When armed it is automatically activated after continuous immersion in water for more than five seconds. The unit transmits continuously on the international airband distress channel (121.5 MHz) using the ITU-R distress call (down-swept tone recommendation M.690-1) until recovered and disarmed. In addition the unit transmits a short data message once every 20 seconds containing its unique identifier and its current GPS (if fitted with the optional GPS receiver).



- (i) Operating frequency = 121.5 MHz. Channel bandwidth = 25 KHz. Modulation type = AM, as specified in ITU-R M.690-1.
- (ii) Ports: (1) Antenna cable (550mm). The sample designated #1 has a combined VHF/GPS antenna. The sample designated #2 has only a 50ohm dummy load termination (appendix D). The sample designated #3 has only a VHF antenna.
- (iii) EUT Software version was V1.36 (no debug)

## 1.2 Notes relating to the assessment

Transmission Frequency:	121.5 and 121.65 MHz
ERPEP Nominal:	100 mW & 500mW versions
Transmitter Class:	Narrowband, BW=25 KHz
Power Source:	2 x Varta CAAA Lithium Manganese batteries (3V per cell)
Temperature range:	Cat 1: -20°C to +55°C
Type designation (JETDS):	PRT
Speech Facility:	None
Data Facility:	1200 bps ASK (ID+GPS position)
Data Modulation Type:	A1D
Data Burst Duty Cycle:	100 mS every 20 S

**Table 1 – Additional Information**

## 1.3 Variations

### 1.3.1 ETSI EN 300 152-2 V1.1.1 (2000-08)

- 1 Clause 5.3.3 “Radiation produced by operation of the test facility” The limit for test transmissions (25 nW ERPEP) was exceeded. The manufacturer requires a higher level of test transmission to activate ship mast-top Direction Finding (DF) rescue equipment during test. Sample #1 produced a test level of 4.3 uW when tested.

### 1.3.2 ETSI EN 300 152-3 V1.1.1 (2001-05)

- 1 Clause 4.1.2.1 “activated by the use of two simple, but independent mechanical actions” The manufacturer markets a variant of the product designated AU9 HT that is solely activated by immersion in seawater as required by his customers.
- 2 Clause 4.1.2.1 “Initial activation shall break a seal which shall not be replaceable by the user”. The rubber sealing ring on the AU9 is replaceable as required by the manufacturer and his customers.
- 3 Clause 4.3.1 “Vibration test” this test was replaced with the more severe vibration test specified in section 8.2.1.2 (Cat U) of EuroCAE ED-14F (March 2008).
- 4 Clause 4.3.2.3 “Damp heat” this test was replaced with the more severe damp heat test specified in section 6.3.3 (Cat C) of EuroCAE ED-14F (March 2008).
- 5 Clauses 4.3.2.6 “Corrosion”, 4.3.2.9 “Solar radiation” & 4.3.2.10 “Oil resistance” – not tested. Manufacturer asserts that the materials used meet the requirements (ABS used is Toyalac FR ABS 8841).

## 1.4 Summary of Compliance

The samples submitted meet the requirements of ETSI EN 300 152-2 V1.1.1 (2000-08) and ETSI EN 300 152-3 V1.1.1 (2001-05) as described in this report subject to the variations described in this report.

## 1.5 Modifications

- MOD1* Applied to sample #1 plug in TX card – increased C34 to 22nF to reduce the spectral carrier power ratio.
- MOD2* Applied to sample #2 case – ABS card guide insert glued in place using solvent cement (active ingredients: Methyl Ethyl Ketone, Acetone), to improve drop test performance.
- MOD3* Sample #3 antenna – reduced size of hyper-bright led indicator section of the antenna to improve quality of the over-moulding and its ruggedness.

## 1.6 Result Table

### 1.6.1 ETSI EN 300 152-2 V1.1.1 (2000-08)

Test	Applied to	Clause	Mod State	Result	Appendix
Frequency Error	Sample #1	4.2.1	MOD1	PASS	A
Spurious Emissions	Sample #1	4.2.2	Unmodified	PASS	B
Test Facility Radiated ERPEP	Sample #1	4.2.3	MOD1	Non Compliant	See Section 1.3.1

### 1.6.2 ETSI EN 300 152-3 V1.1.1 (2001-05) Conformance Requirements

Test	Applied to	Clause	Mod State	Result	Appendix
Modulation Depth	Sample #1	4.4.1.1	MOD1	PASS	
Modulation Duty Cycle	Sample #1	4.4.1.2	MOD1	PASS	
Sweep Characteristics	Sample #1	4.4.1.3	MOD1	PASS	
Spectral Carrier Power Ratio	Sample #1	4.4.2	MOD1	PASS	
Transmit Power Radiated ERPEP	Sample #1	4.4.3	Unmodified	PASS	

### 1.6.3 ETSI EN 300 152-3 V1.1.1 (2001-05) Environmental Requirements

Test	Applied to	Clause	Mod State	Result	Appendix
Vibration Test	Sample #2	4.3.1	Unmodified	PASS <sup>1</sup>	
Dry Heat	Sample #1	4.3.2.2	MOD1	PASS	A.2

<sup>1</sup> tested to 8.2.1.2 (Cat U) of EuroCAE ED-14F (March 2008), see section 1.3.2.

Test	Applied to	Clause	Mod State	Result	Appendix
Damp Heat	Sample #2	4.3.2.3	Unmodified	PASS <sup>2</sup>	
Low Temperature	Sample #1 Sample #3	4.3.2.4	MOD1 MOD3	PASS	A.3
Drop Test	Sample #1	4.3.2.5	MOD2	PASS	
Thermal Shock	Sample #1	4.3.2.7	MOD1	PASS	
Buoyancy Test	Sample #1	4.3.2.8	MOD1	PASS	
Protection of the Transmitter	Sample #1	4.3.2.11	MOD1	PASS	

#### 1.6.4 ETSI EN 300 152-3 V1.1.1 (2001-05) Labelling Assessment

Assessment	Clause	Appendix
Frequency	4.2.1.4	C.1
Serial Number	4.2.1.4	C.2
Type designation	4.2.1.4	C.2
User instructions	4.2.1.4	C.1
Battery type	4.2.1.4	C.1
Use warning	4.2.1.4	C.1
Battery change date	4.2.1.4	C.3

Signed 31 March 2010:

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<sup>2</sup> tested to 6.3.3 (Cat C) EuroCAE ED-14F (March 2008), see section 1.3.3.

## A Appendix: Frequency Error V Supply Voltage

### A.1 At 21°C

Battery Voltage	Frequency Error (Hz)	Result
7.0	+ 430 .	PASS
6.0	+ 310 .	PASS
5.0	+ 160 .	PASS
4.0	- 60 .	PASS
3.5	- 85 .	PASS
3.0	- 720 .	PASS
2.5	- 1060 .	PASS
2.0	- 1350 .	PASS
1.5	No transmission	PASS

### A.2 At 55°C

Battery Voltage	Frequency Error (Hz)	Result
7.0	+ 1000 .	PASS
6.0	+ 830 .	PASS
5.0	+ 580 .	PASS
4.0	+ 250 .	PASS
3.5	+ 20 .	PASS
3.0	- 1030 .	PASS
2.5	- 1520 .	PASS
2.0	- 1670 .	PASS
1.5	No transmission	PASS

### A.3 At -20°C

Battery Voltage	Frequency Error (Hz)	Result
7.0	- 810 .	PASS
6.0	- 760 .	PASS
5.0	- 720 .	PASS
4.0	- 750 .	PASS
3.5	- 930 .	PASS
3.0	- 1150 .	PASS
2.5	- 1360 .	PASS
2.0	- 1460 .	PASS
1.5	No transmission	PASS

## B Appendix: Spurious Emissions

### VHF Radiated Emissions

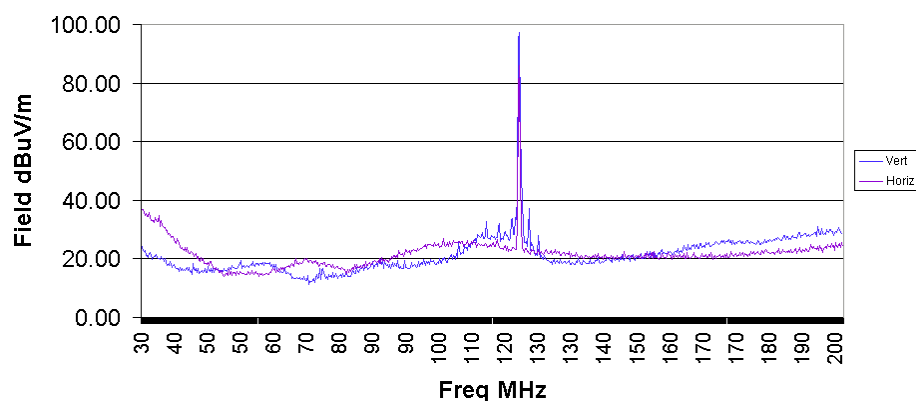


Fig B.1 – VHF Radiated Emissions

## FCC UHF Radiated Emissions

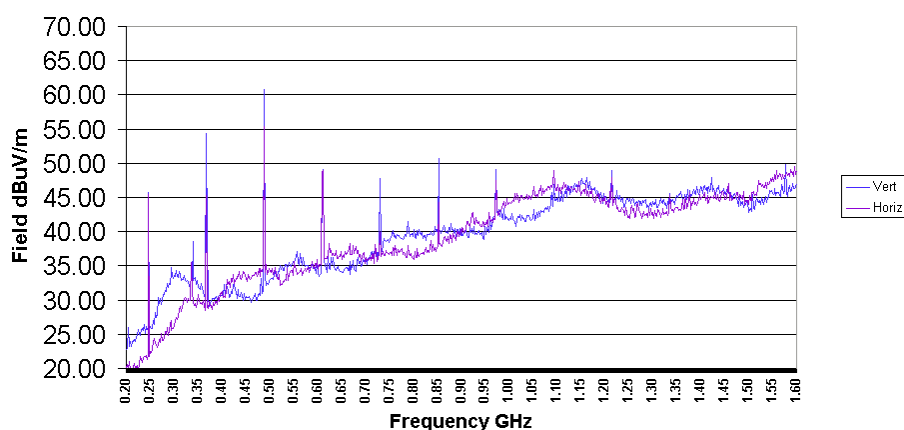


Fig B.2 – UHF Radiated Emissions

Frequency MHz	Harmonic	ERPEP (Vertical)	ERPEP (Horiz)	ERPEP (Vertical)	ERPEP (Horiz)	Limit
121.50	Fund	15.19 dBm	-11.54 dBm	33.04 mW	0.07 mW	>25.00 mW
243.00	2	-48.41 dBm	-54.48 dBm	0.014 uW	0.004 uW	<0.200 uW
364.50	3	-40.28 dBm	-51.94 dBm	0.094 uW	0.006 uW	<0.200 uW
486.00	4	-38.94 dBm	-41.72 dBm	0.128 uW	0.067 uW	<0.200 uW
607.50	5	-42.44 dBm	-47.13 dBm	0.057 uW	0.019 uW	<0.200 uW
729.00	6	-41.49 dBm	-42.09 dBm	0.071 uW	0.062 uW	<0.200 uW
850.50	7	-38.58 dBm	-42.98 dBm	0.139 uW	0.050 uW	<0.200 uW
972.00	8	-41.28 dBm	-45.65 dBm	0.074 uW	0.027 uW	<0.200 uW
1093.50	9	-42.45 dBm	-43.64 dBm	0.057 uW	0.043 uW	<0.200 uW

Fig B.3 – ERPEP Radiated Emissions

## C Appendix: Labelling

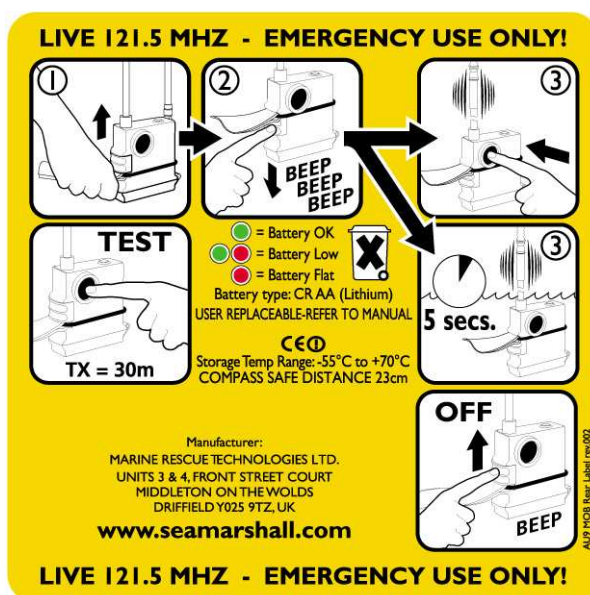


Fig C.1 – AU9 Back Label





Fig C.2 – AU9 Front and Top Labels



Fig C.3 – AU9 Bottom Label



## D Appendix: Samples

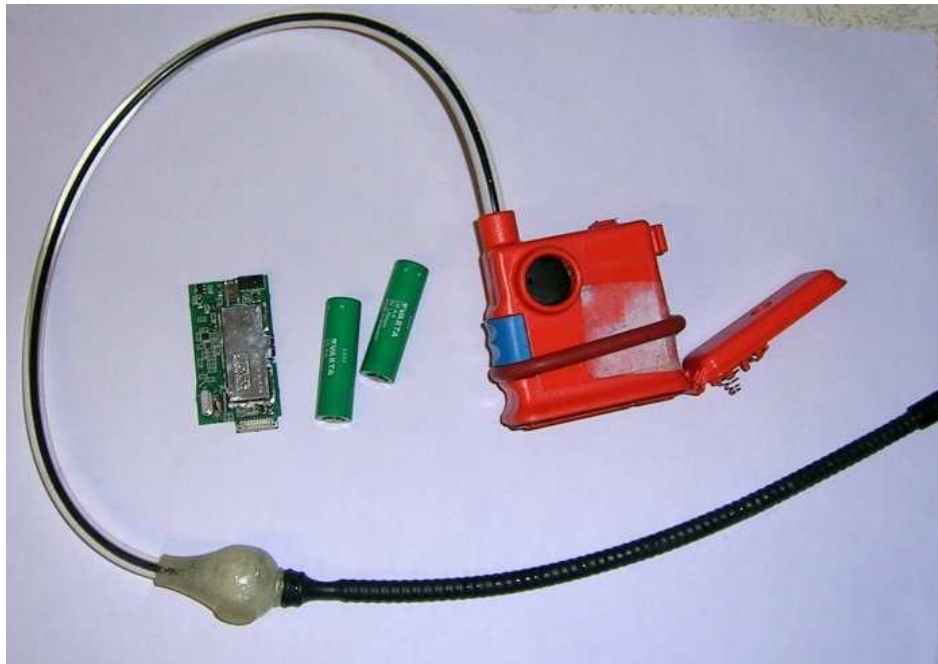


Fig D.1 – Sample #1 (housing open, TX card removed)



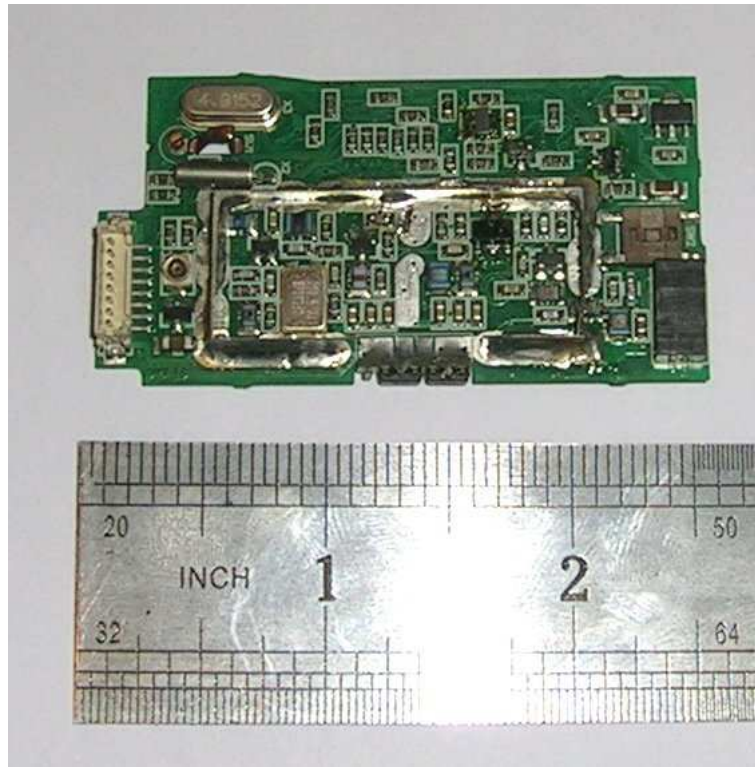
Fig D.2 – Sample #1 (TX card only in 50Ω Test Fixture)



**Fig D.3 – Sample #2 (housing open, TX card removed)**



**Fig D.4 – Sample #3**

**Fig D.5 – Sample #3 TX card**

## **E Appendix: test equipment used**

	<b>Item</b>	<b>Serial</b>
1	Advantest R3265 Spectrum Analyser	35060047
2	Marconi 2965 Radio Test Set	132702/040
3	Wiltron 6409 RF Analyser	K935021
4	Wiltron 6400-6NF50 Autotester	90138
5	RadioCAD RC015-2 Pre-amplifier	#0002
6	ETS Biconical Antenna #3109	#3261
7	ETS Log-Periodic Antenna 3148	0004-1165
8	Wier Micro-reg DC bench supply	14878
9	LEC Special Projects Environmental Chamber	
10	Thermometers Direct C16 Thermo-Hygrometer	100166
11	Maycom AR108 airband scanner	07030096
12	Tenma 72-7925 Multimeter	1060799657
13	GW Instek GDS-840C Oscilloscope	
14	RadioCAD Salty Man (ETSI TR 102 273-7 V1.2.1 (2001-12))	

<ENDS>